BTube

Generated by Doxygen 1.8.13

Contents

1 Namespace Index **1**

1.1 Namespace List . . . 1

2 Hierarchical Index **3**

2.1 Class Hierarchy . . . 3

3 Class Index **7**

3.1 Class List . . . 7

4 Namespace Documentation **11**

4.1 QCP Namespace Reference . . . 11

4.1.1 Detailed Description . . . 12

4.1.2 Enumeration Type Documentation . . . 12

4.1.2.1 AntialiasedElement . . . 12

4.1.2.2 ExportPen . . . 12

4.1.2.3 Interaction . . . 13

4.1.2.4 MarginSide . . . 13

4.1.2.5 PlottingHint . . . 14

4.1.2.6 ResolutionUnit . . . 14

4.1.2.7 SelectionRectMode . . . 15

4.1.2.8 SelectionType . . . 15

4.1.2.9 SignDomain . . . 16

5 Class Documentation 17
5.1 APITest Class Reference 17
5.1.1 Member Function Documentation 17
5.1.1.1 printTestResult() 17
5.2 QCPAxisPainterPrivate::CachedLabel Struct Reference 18
5.3 DatenEingabe Class Reference 18
5.4 Fluid Class Reference 18
5.4.1 Detailed Description 19
5.4.2 Member Function Documentation 19
5.4.2.1 get_cp() 19
5.4.2.2 get_cp_strom() 19
5.4.2.3 get_dichte() 20
5.4.2.4 get_massenstrom() 20
5.4.2.5 get_my() 20
5.4.2.6 get_nue() 20
5.4.2.7 get_t_ein() 20
5.4.2.8 set_massenstrom() 20
5.4.2.9 set_t_ein() 21
5.5 LambdaTurbulentGlattSolver Class Reference 21
5.5.1 Detailed Description 21
5.6 Plotter Class Reference 21
5.6.1 Detailed Description 22
5.6.2 Constructor & Destructor Documentation 22
5.6.2.1 Plotter() 22
5.6.2.2 ∼Plotter() 22
5.6.3 Member Function Documentation 22
5.6.3.1 erstellePlot() 23
5.7 QCPAbstractItem Class Reference 25
5.7.1 Detailed Description 26
5.7.2 Clipping 27

5.7.3 Using items . . . 27
5.7.4 Creating own items . . . 28
5.7.4.1 Allowing the item to be positioned . . . 28
5.7.4.2 The draw function . . . 28
5.7.4.3 The selectTest function . . . 28
5.7.4.4 Providing anchors . . . 29
5.7.5 Constructor & Destructor Documentation . . . 29
5.7.5.1 QCPAbstractItem() . . . 29
5.7.6 Member Function Documentation . . . 29
5.7.6.1 anchor() . . . 29
5.7.6.2 anchors() . . . 30
5.7.6.3 hasAnchor() . . . 30
5.7.6.4 position() . . . 30
5.7.6.5 positions() . . . 31
5.7.6.6 selectionChanged . . . 31
5.7.6.7 selectTest() . . . 31
5.7.6.8 setClipAxisRect() . . . 32
5.7.6.9 setClipToAxisRect() . . . 32
5.7.6.10 setSelectable() . . . 32
5.7.6.11 setSelected() . . . 33
5.8 QCPAbstractLegendItem Class Reference . . . 33
5.8.1 Detailed Description . . . 34
5.8.2 Constructor & Destructor Documentation . . . 35
5.8.2.1 QCPAbstractLegendItem() . . . 35
5.8.3 Member Function Documentation . . . 35
5.8.3.1 selectionChanged . . . 35
5.8.3.2 selectTest() . . . 35
5.8.3.3 setFont() . . . 36
5.8.3.4 setSelectable() . . . 36
5.8.3.5 setSelected() . . . 36

5.8.3.6 setSelectedFont() 36
5.8.3.7 setSelectedTextColor() 37
5.8.3.8 setTextColor() 37
5.9 QCPAbstractPaintBuffer Class Reference 37
5.9.1 Detailed Description 38
5.9.2 Constructor & Destructor Documentation 38
5.9.2.1 QCPAbstractPaintBuffer() 39
5.9.3 Member Function Documentation 39
5.9.3.1 clear() 39
5.9.3.2 donePainting() 39
5.9.3.3 draw() 39
5.9.3.4 reallocateBuffer() 40
5.9.3.5 setDevicePixelRatio() 40
5.9.3.6 setInvalidated() 40
5.9.3.7 setSize() 41
5.9.3.8 startPainting() 41
5.10 QCPAbstractPlottable Class Reference 41
5.10.1 Detailed Description 44
5.10.2 Creating own plottables 44
5.10.3 Constructor & Destructor Documentation 45
5.10.3.1 QCPAbstractPlottable() 45
5.10.4 Member Function Documentation 45
5.10.4.1 addToLegend() [1/2] 46
5.10.4.2 addToLegend() [2/2] 46
5.10.4.3 coordsToPixels() [1/2] 46
5.10.4.4 coordsToPixels() [2/2] 47
5.10.4.5 getKeyRange() 47
5.10.4.6 getValueRange() 47
5.10.4.7 interface1D() 48
5.10.4.8 pixelsToCoords() [1/2] 48

5.10.4.9 pixelsToCoords() [2/2] 48
5.10.4.10 removeFromLegend() [1/2] 49
5.10.4.11 removeFromLegend() [2/2] 49
5.10.4.12 rescaleAxes() 49
5.10.4.13 rescaleKeyAxis() 50
5.10.4.14 rescaleValueAxis() 50
5.10.4.15 selectableChanged 50
5.10.4.16 selected() 50
5.10.4.17 selection() 50
5.10.4.18 selectionChanged [1/2] 51
5.10.4.19 selectionChanged [2/2] 51
5.10.4.20 selectionDecorator() 51
5.10.4.21 selectTest() 52
5.10.4.22 setAntialiasedFill() 52
5.10.4.23 setAntialiasedScatters() 53
5.10.4.24 setBrush() 53
5.10.4.25 setKeyAxis() 53
5.10.4.26 setName() 53
5.10.4.27 setPen() 54
5.10.4.28 setSelectable() 54
5.10.4.29 setSelection() 54
5.10.4.30 setSelectionDecorator() 55
5.10.4.31 setValueAxis() 55
5.11 QCPAbstractPlottable1D< DataType > Class Template Reference 55
5.11.1 Detailed Description 56
5.11.2 Constructor & Destructor Documentation 57
5.11.2.1 QCPAbstractPlottable1D() 57
5.11.3 Member Function Documentation 57
5.11.3.1 dataCount() 57
5.11.3.2 dataMainKey() 57

5.11.3.3 dataMainValue() 58
5.11.3.4 dataPixelPosition() 58
5.11.3.5 dataSortKey() 58
5.11.3.6 dataValueRange() 59
5.11.3.7 drawPolyline() 59
5.11.3.8 findBegin() 59
5.11.3.9 findEnd() 60
5.11.3.10 getDataSegments() 60
5.11.3.11 interface1D() 60
5.11.3.12 selectTest() 61
5.11.3.13 selectTestRect() 61
5.11.3.14 sortKeyIsMainKey() 61
5.12 QCPAxis Class Reference 62
5.12.1 Detailed Description 66
5.12.2 Member Enumeration Documentation 66
5.12.2.1 AxisType 66
5.12.2.2 LabelSide 66
5.12.2.3 ScaleType 67
5.12.2.4 SelectablePart 67
5.12.3 Constructor & Destructor Documentation 68
5.12.3.1 QCPAxis() 68
5.12.4 Member Function Documentation 68
5.12.4.1 coordToPixel() 68
5.12.4.2 getPartAt() 68
5.12.4.3 graphs() 69
5.12.4.4 grid() 69
5.12.4.5 items() 69
5.12.4.6 marginSideToAxisType() 69
5.12.4.7 moveRange() 69
5.12.4.8 opposite() 70

5.12.4.9 orientation() [1/2] 70
5.12.4.10 orientation() [2/2] 70
5.12.4.11 pixelOrientation() 70
5.12.4.12 pixelToCoord() 71
5.12.4.13 plottables() 71
5.12.4.14 rangeChanged [1/2] 71
5.12.4.15 rangeChanged [2/2] 71
5.12.4.16 rescale() 72
5.12.4.17 scaleRange() [1/2] 72
5.12.4.18 scaleRange() [2/2] 72
5.12.4.19 scaleTypeChanged 72
5.12.4.20 selectableChanged 73
5.12.4.21 selectionChanged 73
5.12.4.22 selectTest() 73
5.12.4.23 setBasePen() 74
5.12.4.24 setLabel() 74
5.12.4.25 setLabelColor() 74
5.12.4.26 setLabelFont() 74
5.12.4.27 setLabelPadding() 75
5.12.4.28 setLowerEnding() 75
5.12.4.29 setNumberFormat() 75
5.12.4.30 setNumberPrecision() 76
5.12.4.31 setOffset() 76
5.12.4.32 setPadding() 76
5.12.4.33 setRange() [1/3] 76
5.12.4.34 setRange() [2/3] 77
5.12.4.35 setRange() [3/3] 77
5.12.4.36 setRangeLower() 77
5.12.4.37 setRangeReversed() 77
5.12.4.38 setRangeUpper() 78

5.12.4.39 setScaleRatio() 78
5.12.4.40 setScaleType() 78
5.12.4.41 setSelectableParts() 78
5.12.4.42 setSelectedBasePen() 79
5.12.4.43 setSelectedLabelColor() 79
5.12.4.44 setSelectedLabelFont() 79
5.12.4.45 setSelectedParts() 79
5.12.4.46 setSelectedSubTickPen() 80
5.12.4.47 setSelectedTickLabelColor() 80
5.12.4.48 setSelectedTickLabelFont() 80
5.12.4.49 setSelectedTickPen() 80
5.12.4.50 setSubTickLength() 81
5.12.4.51 setSubTickLengthIn() 81
5.12.4.52 setSubTickLengthOut() 81
5.12.4.53 setSubTickPen() 81
5.12.4.54 setSubTicks() 82
5.12.4.55 setTicker() 82
5.12.4.56 setTickLabelColor() 82
5.12.4.57 setTickLabelFont() 83
5.12.4.58 setTickLabelPadding() 83
5.12.4.59 setTickLabelRotation() 83
5.12.4.60 setTickLabels() 83
5.12.4.61 setTickLabelSide() 83
5.12.4.62 setTickLength() 84
5.12.4.63 setTickLengthIn() 84
5.12.4.64 setTickLengthOut() 84
5.12.4.65 setTickPen() 84
5.12.4.66 setTicks() 85
5.12.4.67 setUpperEnding() 85
5.12.4.68 ticker() 85

5.13 QCPAxisPainterPrivate Class Reference 86
5.13.1 Constructor & Destructor Documentation 87
5.13.1.1 QCPAxisPainterPrivate() 87
5.14 QCPAxisRect Class Reference 87
5.14.1 Detailed Description 90
5.14.2 Constructor & Destructor Documentation 90
5.14.2.1 QCPAxisRect() 90
5.14.3 Member Function Documentation 90
5.14.3.1 addAxes() 91
5.14.3.2 addAxis() 91
5.14.3.3 axes() [1/2] 91
5.14.3.4 axes() [2/2] 92
5.14.3.5 axis() 92
5.14.3.6 axisCount() 92
5.14.3.7 bottom() 92
5.14.3.8 bottomLeft() 92
5.14.3.9 bottomRight() 93
5.14.3.10 center() 93
5.14.3.11 elements() 93
5.14.3.12 graphs() 93
5.14.3.13 height() 93
5.14.3.14 insetLayout() 94
5.14.3.15 items() 94
5.14.3.16 left() 94
5.14.3.17 mouseMoveEvent() 94
5.14.3.18 mousePressEvent() 95
5.14.3.19 mouseReleaseEvent() 95
5.14.3.20 plottables() 96
5.14.3.21 rangeDragAxes() 96
5.14.3.22 rangeDragAxis() 96

5.14.3.23 rangeZoomAxes() . . . 96
5.14.3.24 rangeZoomAxis() . . . 97
5.14.3.25 rangeZoomFactor() . . . 97
5.14.3.26 removeAxis() . . . 97
5.14.3.27 right() . . . 97
5.14.3.28 setBackground() [1/3] . . . 98
5.14.3.29 setBackground() [2/3] . . . 98
5.14.3.30 setBackground() [3/3] . . . 98
5.14.3.31 setBackgroundScaled() . . . 99
5.14.3.32 setBackgroundScaledMode() . . . 99
5.14.3.33 setRangeDrag() . . . 99
5.14.3.34 setRangeDragAxes() [1/3] . . . 100
5.14.3.35 setRangeDragAxes() [2/3] . . . 100
5.14.3.36 setRangeDragAxes() [3/3] . . . 100
5.14.3.37 setRangeZoom() . . . 101
5.14.3.38 setRangeZoomAxes() [1/3] . . . 101
5.14.3.39 setRangeZoomAxes() [2/3] . . . 101
5.14.3.40 setRangeZoomAxes() [3/3] . . . 102
5.14.3.41 setRangeZoomFactor() [1/2] . . . 102
5.14.3.42 setRangeZoomFactor() [2/2] . . . 102
5.14.3.43 setupFullAxesBox() . . . 102
5.14.3.44 size() . . . 103
5.14.3.45 top() . . . 103
5.14.3.46 topLeft() . . . 103
5.14.3.47 topRight() . . . 103
5.14.3.48 update() . . . 103
5.14.3.49 wheelEvent() . . . 104
5.14.3.50 width() . . . 104
5.14.3.51 zoom() [1/2] . . . 104
5.14.3.52 zoom() [2/2] . . . 105

5.15 QCPAxisTicker Class Reference 105
5.15.1 Detailed Description 106
5.15.2 Creating own axis tickers 106
5.15.3 Member Enumeration Documentation 107
5.15.3.1 TickStepStrategy 107
5.15.4 Constructor & Destructor Documentation 107
5.15.4.1 QCPAxisTicker() 107
5.15.5 Member Function Documentation 108
5.15.5.1 generate() 108
5.15.5.2 setTickCount() 108
5.15.5.3 setTickOrigin() 108
5.15.5.4 setTickStepStrategy() 109
5.16 QCPAxisTickerDateTime Class Reference 109
5.16.1 Detailed Description 110
5.16.2 Constructor & Destructor Documentation 111
5.16.2.1 QCPAxisTickerDateTime() 111
5.16.3 Member Function Documentation 111
5.16.3.1 dateTimeToKey() [1/2] 111
5.16.3.2 dateTimeToKey() [2/2] 111
5.16.3.3 keyToDateTime() 112
5.16.3.4 setDateTimeFormat() 112
5.16.3.5 setDateTimeSpec() 112
5.16.3.6 setTickOrigin() [1/2] 113
5.16.3.7 setTickOrigin() [2/2] 113
5.17 QCPAxisTickerFixed Class Reference 113
5.17.1 Detailed Description 114
5.17.2 Member Enumeration Documentation 114
5.17.2.1 ScaleStrategy 114
5.17.3 Constructor & Destructor Documentation 115
5.17.3.1 QCPAxisTickerFixed() 115

5.17.4 Member Function Documentation 115
5.17.4.1 setScaleStrategy() 115
5.17.4.2 setTickStep() 115
5.18 QCPAxisTickerLog Class Reference 116
5.18.1 Detailed Description 116
5.18.2 Constructor & Destructor Documentation 117
5.18.2.1 QCPAxisTickerLog() 117
5.18.3 Member Function Documentation 117
5.18.3.1 setLogBase() 117
5.18.3.2 setSubTickCount() 117
5.19 QCPAxisTickerPi Class Reference 117
5.19.1 Detailed Description 118
5.19.2 Member Enumeration Documentation 119
5.19.2.1 FractionStyle 119
5.19.3 Constructor & Destructor Documentation 119
5.19.3.1 QCPAxisTickerPi() 119
5.19.4 Member Function Documentation 119
5.19.4.1 setFractionStyle() 119
5.19.4.2 setPeriodicity() 120
5.19.4.3 setPiSymbol() 120
5.19.4.4 setPiValue() 120
5.20 QCPAxisTickerText Class Reference 120
5.20.1 Detailed Description 121
5.20.2 Constructor & Destructor Documentation 121
5.20.2.1 QCPAxisTickerText() 122
5.20.3 Member Function Documentation 122
5.20.3.1 addTick() 122
5.20.3.2 addTicks() [1/2] 122
5.20.3.3 addTicks() [2/2] 123
5.20.3.4 clear() 123

5.20.3.5 createTickVector() 123

5.20.3.6 getSubTickCount() 124

5.20.3.7 getTickLabel() 124

5.20.3.8 getTickStep() 124

5.20.3.9 setSubTickCount() 124

5.20.3.10 setTicks() [1/2] 125

5.20.3.11 setTicks() [2/2] 125

5.20.3.12 ticks() 125

5.21 QCPAxisTickerTime Class Reference 126

5.21.1 Detailed Description 127

5.21.2 Member Enumeration Documentation 127

5.21.2.1 TimeUnit 127

5.21.3 Constructor & Destructor Documentation 127

5.21.3.1 QCPAxisTickerTime() 128

5.21.4 Member Function Documentation 128

5.21.4.1 setFieldWidth() 128

5.21.4.2 setTimeFormat() 128

5.22 QCPBars Class Reference 129

5.22.1 Detailed Description 130

5.22.2 Changing the appearance 130

5.22.3 Usage 131

5.22.4 Member Enumeration Documentation 131

5.22.4.1 WidthType 131

5.22.5 Constructor & Destructor Documentation 131

5.22.5.1 QCPBars() 131

5.22.6 Member Function Documentation 132

5.22.6.1 addData() [1/2] 132

5.22.6.2 addData() [2/2] 132

5.22.6.3 barAbove() 132

5.22.6.4 barBelow() 133

5.22.6.5 data() 133
5.22.6.6 dataPixelPosition() 133
5.22.6.7 getKeyRange() 133
5.22.6.8 getValueRange() 134
5.22.6.9 moveAbove() 134
5.22.6.10 moveBelow() 135
5.22.6.11 selectTest() 135
5.22.6.12 selectTestRect() 135
5.22.6.13 setBarsGroup() 136
5.22.6.14 setBaseValue() 136
5.22.6.15 setData() [1/2] 136
5.22.6.16 setData() [2/2] 137
5.22.6.17 setStackingGap() 137
5.22.6.18 setWidth() 137
5.22.6.19 setWidthType() 137
5.23 QCPBarsData Class Reference 138
5.23.1 Detailed Description 138
5.23.2 Constructor & Destructor Documentation 138
5.23.2.1 QCPBarsData() [1/2] 139
5.23.2.2 QCPBarsData() [2/2] 139
5.23.3 Member Function Documentation 139
5.23.3.1 fromSortKey() 139
5.23.3.2 mainKey() 139
5.23.3.3 mainValue() 139
5.23.3.4 sortKey() 140
5.23.3.5 sortKeyIsMainKey() 140
5.23.3.6 valueRange() 140
5.24 QCPBarsGroup Class Reference 140
5.24.1 Detailed Description 141
5.24.2 Usage 142

5.24.3 Example 142

5.24.4 Member Enumeration Documentation 142

5.24.4.1 SpacingType 142

5.24.5 Constructor & Destructor Documentation 143

5.24.5.1 QCPBarsGroup() 143

5.24.6 Member Function Documentation 143

5.24.6.1 append() 143

5.24.6.2 bars() [1/2] 143

5.24.6.3 bars() [2/2] 143

5.24.6.4 clear() 144

5.24.6.5 contains() 144

5.24.6.6 insert() 144

5.24.6.7 isEmpty() 144

5.24.6.8 remove() 145

5.24.6.9 setSpacing() 145

5.24.6.10 setSpacingType() 145

5.24.6.11 size() 145

5.25 QCPColorGradient Class Reference 146

5.25.1 Detailed Description 147

5.25.2 Member Enumeration Documentation 147

5.25.2.1 ColorInterpolation 147

5.25.2.2 GradientPreset 147

5.25.3 Constructor & Destructor Documentation 148

5.25.3.1 QCPColorGradient() [1/2] 148

5.25.3.2 QCPColorGradient() [2/2] 148

5.25.4 Member Function Documentation 149

5.25.4.1 clearColorStops() 149

5.25.4.2 colorize() [1/2] 149

5.25.4.3 colorize() [2/2] 149

5.25.4.4 inverted() 150

5.25.4.5 loadPreset() 150
5.25.4.6 setColorInterpolation() 150
5.25.4.7 setColorStopAt() 150
5.25.4.8 setColorStops() 151
5.25.4.9 setLevelCount() 151
5.25.4.10 setPeriodic() 151
5.26 QCPColorMap Class Reference 152
5.26.1 Detailed Description 153
5.26.2 Changing the appearance 154
5.26.3 Transparency 154
5.26.4 Usage 154
5.26.5 Constructor & Destructor Documentation 154
5.26.5.1 QCPColorMap() 155
5.26.6 Member Function Documentation 155
5.26.6.1 data() 155
5.26.6.2 dataRangeChanged 155
5.26.6.3 dataScaleTypeChanged 155
5.26.6.4 getKeyRange() 156
5.26.6.5 getValueRange() 156
5.26.6.6 gradientChanged 157
5.26.6.7 rescaleDataRange() 157
5.26.6.8 selectTest() 157
5.26.6.9 setColorScale() 158
5.26.6.10 setData() 158
5.26.6.11 setDataRange() 159
5.26.6.12 setDataScaleType() 159
5.26.6.13 setGradient() 159
5.26.6.14 setInterpolate() 160
5.26.6.15 setTightBoundary() 160
5.26.6.16 updateLegendIcon() 160

5.27 QCPColorMapData Class Reference 161
5.27.1 Detailed Description 162
5.27.2 Constructor & Destructor Documentation 162
5.27.2.1 QCPColorMapData() [1/2] 162
5.27.2.2 QCPColorMapData() [2/2] 163
5.27.3 Member Function Documentation 163
5.27.3.1 alpha() 163
5.27.3.2 cellToCoord() 163
5.27.3.3 clear() 164
5.27.3.4 clearAlpha() 164
5.27.3.5 coordToCell() 164
5.27.3.6 fill() 164
5.27.3.7 fillAlpha() 165
5.27.3.8 isEmpty() 165
5.27.3.9 operator=() 165
5.27.3.10 recalculateDataBounds() 165
5.27.3.11 setAlpha() 166
5.27.3.12 setCell() 166
5.27.3.13 setData() 166
5.27.3.14 setKeyRange() 167
5.27.3.15 setKeySize() 167
5.27.3.16 setRange() 167
5.27.3.17 setSize() 168
5.27.3.18 setValueRange() 168
5.27.3.19 setValueSize() 168
5.28 QCPColorScale Class Reference 169
5.28.1 Detailed Description 170
5.28.2 Constructor & Destructor Documentation 171
5.28.2.1 QCPColorScale() 171
5.28.3 Member Function Documentation 171

5.28.3.1 axis() . . . 171
5.28.3.2 colorMaps() . . . 171
5.28.3.3 dataRangeChanged . . . 171
5.28.3.4 dataScaleTypeChanged . . . 172
5.28.3.5 gradientChanged . . . 172
5.28.3.6 mouseMoveEvent() . . . 172
5.28.3.7 mousePressEvent() . . . 173
5.28.3.8 mouseReleaseEvent() . . . 173
5.28.3.9 rescaleDataRange() . . . 174
5.28.3.10 setBarWidth() . . . 174
5.28.3.11 setDataRange() . . . 174
5.28.3.12 setDataScaleType() . . . 174
5.28.3.13 setGradient() . . . 175
5.28.3.14 setLabel() . . . 175
5.28.3.15 setRangeDrag() . . . 175
5.28.3.16 setRangeZoom() . . . 175
5.28.3.17 setType() . . . 175
5.28.3.18 update() . . . 176
5.28.3.19 wheelEvent() . . . 176
5.29 QCPColorScaleAxisRectPrivate Class Reference . . . 177
5.29.1 Constructor & Destructor Documentation . . . 177
5.29.1.1 QCPColorScaleAxisRectPrivate() . . . 178
5.30 QCPCurve Class Reference . . . 178
5.30.1 Detailed Description . . . 180
5.30.2 Changing the appearance . . . 180
5.30.3 Usage . . . 180
5.30.4 Member Enumeration Documentation . . . 180
5.30.4.1 LineStyle . . . 180
5.30.5 Constructor & Destructor Documentation . . . 181
5.30.5.1 QCPCurve() . . . 181

5.30.6 Member Function Documentation 181
5.30.6.1 addData() [1/4] 181
5.30.6.2 addData() [2/4] 182
5.30.6.3 addData() [3/4] 182
5.30.6.4 addData() [4/4] 182
5.30.6.5 data() 182
5.30.6.6 getKeyRange() 183
5.30.6.7 getValueRange() 183
5.30.6.8 selectTest() 184
5.30.6.9 setData() [1/3] 184
5.30.6.10 setData() [2/3] 184
5.30.6.11 setData() [3/3] 185
5.30.6.12 setLineStyle() 185
5.30.6.13 setScatterSkip() 185
5.30.6.14 setScatterStyle() 186
5.31 QCPCurveData Class Reference 186
5.31.1 Detailed Description 187
5.31.2 Constructor & Destructor Documentation 187
5.31.2.1 QCPCurveData() [1/2] 187
5.31.2.2 QCPCurveData() [2/2] 187
5.31.3 Member Function Documentation 187
5.31.3.1 fromSortKey() 188
5.31.3.2 mainKey() 188
5.31.3.3 mainValue() 188
5.31.3.4 sortKey() 188
5.31.3.5 sortKeyIsMainKey() 188
5.31.3.6 valueRange() 189
5.32 QCPDataContainer< DataType > Class Template Reference 189
5.32.1 Detailed Description 190
5.32.2 Requirements for the DataType template parameter 191

5.32.3 Constructor & Destructor Documentation 191
5.32.3.1 QCPDataContainer() 191
5.32.4 Member Function Documentation 191
5.32.4.1 add() [1/3] 192
5.32.4.2 add() [2/3] 192
5.32.4.3 add() [3/3] 192
5.32.4.4 at() 193
5.32.4.5 begin() 193
5.32.4.6 clear() 193
5.32.4.7 constBegin() 193
5.32.4.8 constEnd() 193
5.32.4.9 dataRange() 194
5.32.4.10 end() 194
5.32.4.11 findBegin() 194
5.32.4.12 findEnd() 194
5.32.4.13 isEmpty() 195
5.32.4.14 keyRange() 195
5.32.4.15 limitIteratorsToDataRange() 195
5.32.4.16 remove() [1/2] 195
5.32.4.17 remove() [2/2] 196
5.32.4.18 removeAfter() 196
5.32.4.19 removeBefore() 196
5.32.4.20 set() [1/2] 197
5.32.4.21 set() [2/2] 197
5.32.4.22 setAutoSqueeze() 197
5.32.4.23 size() 198
5.32.4.24 sort() 198
5.32.4.25 squeeze() 198
5.32.4.26 valueRange() 198
5.32.5 Friends And Related Function Documentation 199

5.32.5.1 qcpLessThanSortKey() 199
5.33 QCPDataRange Class Reference 199
5.33.1 Detailed Description 200
5.33.2 Constructor & Destructor Documentation 200
5.33.2.1 QCPDataRange() [1/2] 200
5.33.2.2 QCPDataRange() [2/2] 200
5.33.3 Member Function Documentation 201
5.33.3.1 adjusted() 201
5.33.3.2 bounded() 201
5.33.3.3 contains() 201
5.33.3.4 expanded() 201
5.33.3.5 intersection() 202
5.33.3.6 intersects() 202
5.33.3.7 isEmpty() 202
5.33.3.8 isValid() 202
5.33.3.9 length() 203
5.33.3.10 setBegin() 203
5.33.3.11 setEnd() 203
5.33.3.12 size() 203
5.33.4 Friends And Related Function Documentation 204
5.33.4.1 operator<<() 204
5.34 QCPDataSelection Class Reference 204
5.34.1 Detailed Description 205
5.34.2 Iterating over a data selection 205
5.34.3 Constructor & Destructor Documentation 205
5.34.3.1 QCPDataSelection() [1/2] 206
5.34.3.2 QCPDataSelection() [2/2] 206
5.34.4 Member Function Documentation 206
5.34.4.1 addDataRange() 206
5.34.4.2 clear() 206

5.34.4.3 contains() . . . 206
5.34.4.4 dataPointCount() . . . 207
5.34.4.5 dataRange() . . . 207
5.34.4.6 dataRangeCount() . . . 207
5.34.4.7 dataRanges() . . . 207
5.34.4.8 enforceType() . . . 208
5.34.4.9 intersection() [1/2] . . . 208
5.34.4.10 intersection() [2/2] . . . 208
5.34.4.11 inverse() . . . 208
5.34.4.12 isEmpty() . . . 209
5.34.4.13 operator+=() [1/2] . . . 209
5.34.4.14 operator+=() [2/2] . . . 209
5.34.4.15 operator-=() [1/2] . . . 209
5.34.4.16 operator-=() [2/2] . . . 209
5.34.4.17 operator==() . . . 209
5.34.4.18 simplify() . . . 210
5.34.4.19 span() . . . 210
5.34.5 Friends And Related Function Documentation . . . 210
5.34.5.1 operator+ [1/4] . . . 210
5.34.5.2 operator+ [2/4] . . . 210
5.34.5.3 operator+ [3/4] . . . 210
5.34.5.4 operator+ [4/4] . . . 211
5.34.5.5 operator- [1/4] . . . 211
5.34.5.6 operator- [2/4] . . . 211
5.34.5.7 operator- [3/4] . . . 211
5.34.5.8 operator- [4/4] . . . 211
5.34.5.9 operator<<() . . . 211
5.35 QCPErrorBars Class Reference . . . 212
5.35.1 Detailed Description . . . 213
5.35.2 Changing the appearance . . . 214

5.35.3 Member Enumeration Documentation 214
5.35.3.1 ErrorType 214
5.35.4 Constructor & Destructor Documentation 214
5.35.4.1 QCPErrorBars() 214
5.35.5 Member Function Documentation 215
5.35.5.1 addData() [1/4] 215
5.35.5.2 addData() [2/4] 215
5.35.5.3 addData() [3/4] 215
5.35.5.4 addData() [4/4] 216
5.35.5.5 data() 216
5.35.5.6 dataCount() 216
5.35.5.7 dataMainKey() 216
5.35.5.8 dataMainValue() 217
5.35.5.9 dataPixelPosition() 217
5.35.5.10 dataSortKey() 217
5.35.5.11 dataValueRange() 217
5.35.5.12 findBegin() 218
5.35.5.13 findEnd() 218
5.35.5.14 getKeyRange() 219
5.35.5.15 getValueRange() 219
5.35.5.16 interface1D() 220
5.35.5.17 selectTest() 220
5.35.5.18 selectTestRect() 221
5.35.5.19 setData() [1/3] 221
5.35.5.20 setData() [2/3] 222
5.35.5.21 setData() [3/3] 222
5.35.5.22 setDataPlottable() 222
5.35.5.23 setErrorType() 223
5.35.5.24 setSymbolGap() 223
5.35.5.25 setWhiskerWidth() 223

5.35.5.26 sortKeyIsMainKey() 223
5.36 QCPErrorBarsData Class Reference 223
5.36.1 Detailed Description 224
5.36.2 Constructor & Destructor Documentation 224
5.36.2.1 QCPErrorBarsData() [1/3] 224
5.36.2.2 QCPErrorBarsData() [2/3] 224
5.36.2.3 QCPErrorBarsData() [3/3] 224
5.37 QCPFinancial Class Reference 225
5.37.1 Detailed Description 226
5.37.2 Changing the appearance 227
5.37.3 Usage 227
5.37.4 Member Enumeration Documentation 227
5.37.4.1 ChartStyle 227
5.37.4.2 WidthType 228
5.37.5 Constructor & Destructor Documentation 228
5.37.5.1 QCPFinancial() 228
5.37.6 Member Function Documentation 228
5.37.6.1 addData() [1/2] 229
5.37.6.2 addData() [2/2] 229
5.37.6.3 data() 230
5.37.6.4 getKeyRange() 230
5.37.6.5 getValueRange() 230
5.37.6.6 selectTest() 231
5.37.6.7 selectTestRect() 231
5.37.6.8 setBrushNegative() 231
5.37.6.9 setBrushPositive() 232
5.37.6.10 setChartStyle() 232
5.37.6.11 setData() [1/2] 232
5.37.6.12 setData() [2/2] 233
5.37.6.13 setPenNegative() 233

5.37.6.14 setPenPositive() 233

5.37.6.15 setTwoColored() 234

5.37.6.16 setWidth() 234

5.37.6.17 setWidthType() 234

5.37.6.18 timeSeriesToOhlc() 235

5.38 QCPFinancialData Class Reference 235

5.38.1 Detailed Description 236

5.38.2 Constructor & Destructor Documentation 236

5.38.2.1 QCPFinancialData() [1/2] 236

5.38.2.2 QCPFinancialData() [2/2] 236

5.38.3 Member Function Documentation 236

5.38.3.1 fromSortKey() 237

5.38.3.2 mainKey() 237

5.38.3.3 mainValue() 237

5.38.3.4 sortKey() 237

5.38.3.5 sortKeyIsMainKey() 237

5.38.3.6 valueRange() 238

5.39 QCPGraph Class Reference 238

5.39.1 Detailed Description 240

5.39.2 Changing the appearance 240

5.39.2.1 Filling under or between graphs 240

5.39.3 Member Enumeration Documentation 241

5.39.3.1 LineStyle 241

5.39.4 Constructor & Destructor Documentation 241

5.39.4.1 QCPGraph() 241

5.39.5 Member Function Documentation 242

5.39.5.1 addData() [1/2] 242

5.39.5.2 addData() [2/2] 242

5.39.5.3 data() 242

5.39.5.4 getKeyRange() 243

5.39.5.5 getValueRange() 243
5.39.5.6 getVisibleDataBounds() 244
5.39.5.7 selectTest() 244
5.39.5.8 setAdaptiveSampling() 244
5.39.5.9 setChannelFillGraph() 245
5.39.5.10 setData() [1/2] 245
5.39.5.11 setData() [2/2] 246
5.39.5.12 setLineStyle() 246
5.39.5.13 setScatterSkip() 246
5.39.5.14 setScatterStyle() 247
5.40 QCPGraphData Class Reference 247
5.40.1 Detailed Description 248
5.40.2 Constructor & Destructor Documentation 248
5.40.2.1 QCPGraphData() [1/2] 248
5.40.2.2 QCPGraphData() [2/2] 248
5.40.3 Member Function Documentation 248
5.40.3.1 fromSortKey() 248
5.40.3.2 mainKey() 249
5.40.3.3 mainValue() 249
5.40.3.4 sortKey() 249
5.40.3.5 sortKeyIsMainKey() 249
5.40.3.6 valueRange() 249
5.41 QCPGrid Class Reference 250
5.41.1 Detailed Description 251
5.41.2 Constructor & Destructor Documentation 251
5.41.2.1 QCPGrid() 251
5.41.3 Member Function Documentation 251
5.41.3.1 setAntialiasedSubGrid() 251
5.41.3.2 setAntialiasedZeroLine() 251
5.41.3.3 setPen() 252

5.41.3.4 setSubGridPen() 252
5.41.3.5 setSubGridVisible() 252
5.41.3.6 setZeroLinePen() 252
5.42 QCPItemAnchor Class Reference 253
5.42.1 Detailed Description 253
5.42.2 Constructor & Destructor Documentation 254
5.42.2.1 QCPItemAnchor() 254
5.42.3 Member Function Documentation 254
5.42.3.1 pixelPosition() 254
5.42.3.2 toQCPItemPosition() 254
5.43 QCPItemBracket Class Reference 255
5.43.1 Detailed Description 256
5.43.2 Member Enumeration Documentation 256
5.43.2.1 BracketStyle 256
5.43.3 Constructor & Destructor Documentation 257
5.43.3.1 QCPItemBracket() 257
5.43.4 Member Function Documentation 257
5.43.4.1 selectTest() 257
5.43.4.2 setLength() 258
5.43.4.3 setPen() 258
5.43.4.4 setSelectedPen() 258
5.43.4.5 setStyle() 259
5.44 QCPItemCurve Class Reference 259
5.44.1 Detailed Description 260
5.44.2 Constructor & Destructor Documentation 260
5.44.2.1 QCPItemCurve() 260
5.44.3 Member Function Documentation 261
5.44.3.1 selectTest() 261
5.44.3.2 setHead() 261
5.44.3.3 setPen() 262

5.44.3.4 setSelectedPen() 262
5.44.3.5 setTail() 262
5.45 QCPItemEllipse Class Reference 263
5.45.1 Detailed Description 264
5.45.2 Constructor & Destructor Documentation 264
5.45.2.1 QCPItemEllipse() 264
5.45.3 Member Function Documentation 264
5.45.3.1 selectTest() 265
5.45.3.2 setBrush() 265
5.45.3.3 setPen() 266
5.45.3.4 setSelectedBrush() 266
5.45.3.5 setSelectedPen() 266
5.46 QCPItemLine Class Reference 267
5.46.1 Detailed Description 268
5.46.2 Constructor & Destructor Documentation 268
5.46.2.1 QCPItemLine() 268
5.46.3 Member Function Documentation 268
5.46.3.1 selectTest() 268
5.46.3.2 setHead() 269
5.46.3.3 setPen() 269
5.46.3.4 setSelectedPen() 269
5.46.3.5 setTail() 270
5.47 QCPItemPixmap Class Reference 270
5.47.1 Detailed Description 271
5.47.2 Constructor & Destructor Documentation 272
5.47.2.1 QCPItemPixmap() 272
5.47.3 Member Function Documentation 272
5.47.3.1 selectTest() 272
5.47.3.2 setPen() 273
5.47.3.3 setPixmap() 273

5.47.3.4 setScaled() . . . 273
5.47.3.5 setSelectedPen() . . . 273
5.48 QCPItemPosition Class Reference . . . 274
5.48.1 Detailed Description . . . 275
5.48.2 Member Enumeration Documentation . . . 275
5.48.2.1 PositionType . . . 275
5.48.3 Constructor & Destructor Documentation . . . 276
5.48.3.1 QCPItemPosition() . . . 276
5.48.4 Member Function Documentation . . . 276
5.48.4.1 parentAnchor() . . . 276
5.48.4.2 pixelPosition() . . . 277
5.48.4.3 setAxes() . . . 277
5.48.4.4 setAxisRect() . . . 277
5.48.4.5 setCoords() [1/2] . . . 277
5.48.4.6 setCoords() [2/2] . . . 278
5.48.4.7 setParentAnchor() . . . 278
5.48.4.8 setParentAnchorX() . . . 278
5.48.4.9 setParentAnchorY() . . . 279
5.48.4.10 setPixelPosition() . . . 279
5.48.4.11 setType() . . . 279
5.48.4.12 setTypeX() . . . 280
5.48.4.13 setTypeY() . . . 280
5.48.4.14 toQCPItemPosition() . . . 280
5.48.4.15 type() . . . 281
5.49 QCPItemRect Class Reference . . . 281
5.49.1 Detailed Description . . . 282
5.49.2 Constructor & Destructor Documentation . . . 282
5.49.2.1 QCPItemRect() . . . 283
5.49.3 Member Function Documentation . . . 283
5.49.3.1 selectTest() . . . 283

5.49.3.2 setBrush() 284
5.49.3.3 setPen() 284
5.49.3.4 setSelectedBrush() 284
5.49.3.5 setSelectedPen() 284
5.50 QCPItemStraightLine Class Reference 285
5.50.1 Detailed Description 285
5.50.2 Constructor & Destructor Documentation 286
5.50.2.1 QCPItemStraightLine() 286
5.50.3 Member Function Documentation 286
5.50.3.1 selectTest() 286
5.50.3.2 setPen() 287
5.50.3.3 setSelectedPen() 287
5.51 QCPItemText Class Reference 287
5.51.1 Detailed Description 289
5.51.2 Constructor & Destructor Documentation 289
5.51.2.1 QCPItemText() 289
5.51.3 Member Function Documentation 290
5.51.3.1 selectTest() 290
5.51.3.2 setBrush() 290
5.51.3.3 setColor() 291
5.51.3.4 setFont() 291
5.51.3.5 setPadding() 291
5.51.3.6 setPen() 291
5.51.3.7 setPositionAlignment() 291
5.51.3.8 setRotation() 292
5.51.3.9 setSelectedBrush() 292
5.51.3.10 setSelectedColor() 292
5.51.3.11 setSelectedFont() 292
5.51.3.12 setSelectedPen() 292
5.51.3.13 setText() 293

5.51.3.14 setTextAlignment() 293
5.52 QCPItemTracer Class Reference 293
5.52.1 Detailed Description 295
5.52.2 Member Enumeration Documentation 295
5.52.2.1 TracerStyle 295
5.52.3 Constructor & Destructor Documentation 296
5.52.3.1 QCPItemTracer() 296
5.52.4 Member Function Documentation 296
5.52.4.1 selectTest() 296
5.52.4.2 setBrush() 297
5.52.4.3 setGraph() 297
5.52.4.4 setGraphKey() 297
5.52.4.5 setInterpolating() 298
5.52.4.6 setPen() 298
5.52.4.7 setSelectedBrush() 298
5.52.4.8 setSelectedPen() 298
5.52.4.9 setSize() 299
5.52.4.10 setStyle() 299
5.52.4.11 updatePosition() 299
5.53 QCPLayer Class Reference 299
5.53.1 Detailed Description 300
5.53.2 Default layers 301
5.53.3 Controlling the rendering order via layers 301
5.53.4 Replotting only a specific layer 301
5.53.5 Member Enumeration Documentation 301
5.53.5.1 LayerMode 301
5.53.6 Constructor & Destructor Documentation 302
5.53.6.1 QCPLayer() 302
5.53.7 Member Function Documentation 302
5.53.7.1 children() 302

5.53.7.2 index() 302
5.53.7.3 replot() 303
5.53.7.4 setMode() 303
5.53.7.5 setVisible() 303
5.54 QCPLayerable Class Reference 304
5.54.1 Detailed Description 305
5.54.2 Constructor & Destructor Documentation 305
5.54.2.1 QCPLayerable() 305
5.54.3 Member Function Documentation 306
5.54.3.1 layerChanged 306
5.54.3.2 mouseDoubleClickEvent() 306
5.54.3.3 mouseMoveEvent() 307
5.54.3.4 mousePressEvent() 307
5.54.3.5 mouseReleaseEvent() 308
5.54.3.6 parentLayerable() 308
5.54.3.7 realVisibility() 308
5.54.3.8 selectTest() 309
5.54.3.9 setAntialiased() 309
5.54.3.10 setLayer() [1/2] 310
5.54.3.11 setLayer() [2/2] 310
5.54.3.12 setVisible() 310
5.54.3.13 wheelEvent() 310
5.55 QCPLayout Class Reference 311
5.55.1 Detailed Description 312
5.55.2 Constructor & Destructor Documentation 312
5.55.2.1 QCPLayout() 312
5.55.3 Member Function Documentation 312
5.55.3.1 clear() 312
5.55.3.2 elementAt() 313
5.55.3.3 elementCount() 313

5.55.3.4 elements() 313
5.55.3.5 remove() 314
5.55.3.6 removeAt() 314
5.55.3.7 simplify() 314
5.55.3.8 sizeConstraintsChanged() 315
5.55.3.9 take() 315
5.55.3.10 takeAt() 315
5.55.3.11 update() 316
5.56 QCPLayoutElement Class Reference 316
5.56.1 Detailed Description 318
5.56.2 Member Enumeration Documentation 318
5.56.2.1 UpdatePhase 318
5.56.3 Constructor & Destructor Documentation 318
5.56.3.1 QCPLayoutElement() 319
5.56.4 Member Function Documentation 319
5.56.4.1 elements() 319
5.56.4.2 layout() 319
5.56.4.3 maximumSizeHint() 319
5.56.4.4 minimumSizeHint() 320
5.56.4.5 rect() 320
5.56.4.6 selectTest() 320
5.56.4.7 setAutoMargins() 321
5.56.4.8 setMarginGroup() 321
5.56.4.9 setMargins() 321
5.56.4.10 setMaximumSize() [1/2] 322
5.56.4.11 setMaximumSize() [2/2] 322
5.56.4.12 setMinimumMargins() 322
5.56.4.13 setMinimumSize() [1/2] 322
5.56.4.14 setMinimumSize() [2/2] 323
5.56.4.15 setOuterRect() 323

5.56.4.16 update() 323
5.57 QCPLayoutGrid Class Reference 324
5.57.1 Detailed Description 325
5.57.2 Member Enumeration Documentation 325
5.57.2.1 FillOrder 325
5.57.3 Constructor & Destructor Documentation 326
5.57.3.1 QCPLayoutGrid() 326
5.57.4 Member Function Documentation 326
5.57.4.1 addElement() [1/2] 326
5.57.4.2 addElement() [2/2] 327
5.57.4.3 columnCount() 327
5.57.4.4 element() 327
5.57.4.5 elementAt() 328
5.57.4.6 elementCount() 328
5.57.4.7 elements() 328
5.57.4.8 expandTo() 329
5.57.4.9 hasElement() 329
5.57.4.10 indexToRowCol() 329
5.57.4.11 insertColumn() 330
5.57.4.12 insertRow() 330
5.57.4.13 maximumSizeHint() 330
5.57.4.14 minimumSizeHint() 330
5.57.4.15 rowColToIndex() 331
5.57.4.16 rowCount() 331
5.57.4.17 setColumnSpacing() 331
5.57.4.18 setColumnStretchFactor() 332
5.57.4.19 setColumnStretchFactors() 332
5.57.4.20 setFillOrder() 332
5.57.4.21 setRowSpacing() 333
5.57.4.22 setRowStretchFactor() 333

5.57.4.23 setRowStretchFactors() 333
5.57.4.24 setWrap() 334
5.57.4.25 simplify() 334
5.57.4.26 take() 334
5.57.4.27 takeAt() 335
5.58 QCPLayoutInset Class Reference 335
5.58.1 Detailed Description 336
5.58.2 Member Enumeration Documentation 336
5.58.2.1 InsetPlacement 336
5.58.3 Constructor & Destructor Documentation 337
5.58.3.1 QCPLayoutInset() 337
5.58.4 Member Function Documentation 337
5.58.4.1 addElement() [1/2] 337
5.58.4.2 addElement() [2/2] 337
5.58.4.3 elementAt() 338
5.58.4.4 elementCount() 338
5.58.4.5 insetAlignment() 338
5.58.4.6 insetPlacement() 338
5.58.4.7 insetRect() 339
5.58.4.8 selectTest() 339
5.58.4.9 setInsetAlignment() 339
5.58.4.10 setInsetPlacement() 339
5.58.4.11 setInsetRect() 340
5.58.4.12 simplify() 340
5.58.4.13 take() 340
5.58.4.14 takeAt() 341
5.59 QCPLegend Class Reference 341
5.59.1 Detailed Description 343
5.59.2 Member Enumeration Documentation 344
5.59.2.1 SelectablePart 344

5.59.3 Constructor & Destructor Documentation . . . 344
5.59.3.1 QCPLegend() . . . 344
5.59.4 Member Function Documentation . . . 344
5.59.4.1 addItem() . . . 344
5.59.4.2 clearItems() . . . 345
5.59.4.3 hasItem() . . . 345
5.59.4.4 hasItemWithPlottable() . . . 345
5.59.4.5 item() . . . 345
5.59.4.6 itemCount() . . . 346
5.59.4.7 itemWithPlottable() . . . 346
5.59.4.8 removeItem() [1/2] . . . 346
5.59.4.9 removeItem() [2/2] . . . 347
5.59.4.10 selectedItems() . . . 347
5.59.4.11 selectionChanged . . . 347
5.59.4.12 selectTest() . . . 348
5.59.4.13 setBorderPen() . . . 348
5.59.4.14 setBrush() . . . 348
5.59.4.15 setFont() . . . 348
5.59.4.16 setIconBorderPen() . . . 349
5.59.4.17 setIconSize() [1/2] . . . 349
5.59.4.18 setIconSize() [2/2] . . . 349
5.59.4.19 setIconTextPadding() . . . 349
5.59.4.20 setSelectableParts() . . . 349
5.59.4.21 setSelectedBorderPen() . . . 350
5.59.4.22 setSelectedBrush() . . . 350
5.59.4.23 setSelectedFont() . . . 350
5.59.4.24 setSelectedIconBorderPen() . . . 350
5.59.4.25 setSelectedParts() . . . 351
5.59.4.26 setSelectedTextColor() . . . 351
5.59.4.27 setTextColor() . . . 351

5.60 QCPLineEnding Class Reference 352
5.60.1 Detailed Description 352
5.60.2 Member Enumeration Documentation 353
5.60.2.1 EndingStyle 353
5.60.3 Constructor & Destructor Documentation 353
5.60.3.1 QCPLineEnding() [1/2] 353
5.60.3.2 QCPLineEnding() [2/2] 353
5.60.4 Member Function Documentation 354
5.60.4.1 realLength() 354
5.60.4.2 setInverted() 354
5.60.4.3 setLength() 354
5.60.4.4 setStyle() 354
5.60.4.5 setWidth() 355
5.61 QCPMarginGroup Class Reference 355
5.61.1 Detailed Description 356
5.61.2 Example 356
5.61.3 Constructor & Destructor Documentation 356
5.61.3.1 QCPMarginGroup() 356
5.61.4 Member Function Documentation 357
5.61.4.1 clear() 357
5.61.4.2 elements() 357
5.61.4.3 isEmpty() 357
5.62 QCPPaintBufferPixmap Class Reference 357
5.62.1 Detailed Description 358
5.62.2 Constructor & Destructor Documentation 358
5.62.2.1 QCPPaintBufferPixmap() 358
5.62.3 Member Function Documentation 358
5.62.3.1 clear() 358
5.62.3.2 draw() 359
5.62.3.3 reallocateBuffer() 359

5.62.3.4 startPainting() 359
5.63 QCPPainter Class Reference 360
5.63.1 Detailed Description 360
5.63.2 Member Enumeration Documentation 361
5.63.2.1 PainterMode 361
5.63.3 Constructor & Destructor Documentation 361
5.63.3.1 QCPPainter() [1/2] 361
5.63.3.2 QCPPainter() [2/2] 361
5.63.4 Member Function Documentation 361
5.63.4.1 begin() 362
5.63.4.2 drawLine() 362
5.63.4.3 makeNonCosmetic() 362
5.63.4.4 restore() 362
5.63.4.5 save() 363
5.63.4.6 setAntialiasing() 363
5.63.4.7 setMode() 363
5.63.4.8 setModes() 363
5.63.4.9 setPen() [1/3] 364
5.63.4.10 setPen() [2/3] 364
5.63.4.11 setPen() [3/3] 364
5.64 QCPPlottableInterface1D Class Reference 365
5.64.1 Detailed Description 365
5.64.2 Member Function Documentation 365
5.64.2.1 dataCount() 366
5.64.2.2 dataMainKey() 366
5.64.2.3 dataMainValue() 366
5.64.2.4 dataPixelPosition() 366
5.64.2.5 dataSortKey() 367
5.64.2.6 dataValueRange() 367
5.64.2.7 findBegin() 367

5.64.2.8 findEnd() 368
5.64.2.9 selectTestRect() 368
5.64.2.10 sortKeyIsMainKey() 369
5.65 QCPPlottableLegendItem Class Reference 369
5.65.1 Detailed Description 370
5.65.2 Constructor & Destructor Documentation 370
5.65.2.1 QCPPlottableLegendItem() 370
5.65.3 Member Function Documentation 370
5.65.3.1 minimumSizeHint() 371
5.66 QCPRange Class Reference 371
5.66.1 Detailed Description 372
5.66.2 Constructor & Destructor Documentation 372
5.66.2.1 QCPRange() [1/2] 372
5.66.2.2 QCPRange() [2/2] 373
5.66.3 Member Function Documentation 373
5.66.3.1 bounded() 373
5.66.3.2 center() 373
5.66.3.3 contains() 373
5.66.3.4 expand() [1/2] 374
5.66.3.5 expand() [2/2] 374
5.66.3.6 expanded() [1/2] 374
5.66.3.7 expanded() [2/2] 375
5.66.3.8 normalize() 375
5.66.3.9 operator*=() 375
5.66.3.10 operator+=() 375
5.66.3.11 operator-=() 375
5.66.3.12 operator/=() 376
5.66.3.13 sanitizedForLinScale() 376
5.66.3.14 sanitizedForLogScale() 376
5.66.3.15 size() 376

5.66.3.16 validRange() [1/2] 376
5.66.3.17 validRange() [2/2] 377
5.66.4 Friends And Related Function Documentation 377
5.66.4.1 operator* [1/2] 377
5.66.4.2 operator* [2/2] 377
5.66.4.3 operator+ [1/2] 377
5.66.4.4 operator+ [2/2] 377
5.66.4.5 operator- 378
5.66.4.6 operator/ 378
5.66.4.7 operator<<() 378
5.66.5 Member Data Documentation 378
5.66.5.1 maxRange 378
5.66.5.2 minRange 379
5.67 QCPScatterStyle Class Reference 379
5.67.1 Detailed Description 380
5.67.2 Specifying a scatter style 381
5.67.3 Leaving the color/pen up to the plottable 381
5.67.4 Custom shapes and pixmaps 381
5.67.5 Member Enumeration Documentation 381
5.67.5.1 ScatterProperty 381
5.67.5.2 ScatterShape 382
5.67.6 Constructor & Destructor Documentation 382
5.67.6.1 QCPScatterStyle() [1/7] 383
5.67.6.2 QCPScatterStyle() [2/7] 383
5.67.6.3 QCPScatterStyle() [3/7] 383
5.67.6.4 QCPScatterStyle() [4/7] 383
5.67.6.5 QCPScatterStyle() [5/7] 384
5.67.6.6 QCPScatterStyle() [6/7] 384
5.67.6.7 QCPScatterStyle() [7/7] 384
5.67.7 Member Function Documentation 384

5.67.7.1 applyTo() 385
5.67.7.2 drawShape() [1/2] 385
5.67.7.3 drawShape() [2/2] 385
5.67.7.4 isNone() 385
5.67.7.5 isPenDefined() 386
5.67.7.6 setBrush() 386
5.67.7.7 setCustomPath() 386
5.67.7.8 setFromOther() 386
5.67.7.9 setPen() 387
5.67.7.10 setPixmap() 387
5.67.7.11 setShape() 387
5.67.7.12 setSize() 387
5.67.7.13 undefinePen() 388
5.68 QCPSelectionDecorator Class Reference 388
5.68.1 Detailed Description 389
5.68.2 Constructor & Destructor Documentation 389
5.68.2.1 QCPSelectionDecorator() 389
5.68.3 Member Function Documentation 389
5.68.3.1 applyBrush() 390
5.68.3.2 applyPen() 390
5.68.3.3 copyFrom() 390
5.68.3.4 drawDecoration() 390
5.68.3.5 getFinalScatterStyle() 391
5.68.3.6 setBrush() 391
5.68.3.7 setPen() 391
5.68.3.8 setScatterStyle() 391
5.68.3.9 setUsedScatterProperties() 391
5.69 QCPSelectionDecoratorBracket Class Reference 392
5.69.1 Detailed Description 393
5.69.2 Member Enumeration Documentation 393

5.69.2.1 BracketStyle 393
5.69.3 Constructor & Destructor Documentation 393
5.69.3.1 QCPSelectionDecoratorBracket() 393
5.69.4 Member Function Documentation 393
5.69.4.1 drawBracket() 394
5.69.4.2 drawDecoration() 394
5.69.4.3 setBracketBrush() 394
5.69.4.4 setBracketHeight() 394
5.69.4.5 setBracketPen() 394
5.69.4.6 setBracketStyle() 395
5.69.4.7 setBracketWidth() 395
5.69.4.8 setTangentAverage() 395
5.69.4.9 setTangentToData() 395
5.70 QCPSelectionRect Class Reference 396
5.70.1 Detailed Description 397
5.70.2 Constructor & Destructor Documentation 397
5.70.2.1 QCPSelectionRect() 397
5.70.3 Member Function Documentation 397
5.70.3.1 accepted 397
5.70.3.2 cancel() 398
5.70.3.3 canceled 398
5.70.3.4 changed 398
5.70.3.5 isActive() 398
5.70.3.6 range() 399
5.70.3.7 setBrush() 399
5.70.3.8 setPen() 399
5.70.3.9 started 399
5.71 QCPStatisticalBox Class Reference 400
5.71.1 Detailed Description 401
5.71.2 Changing the appearance 401

5.71.3 Usage 402
5.71.4 Constructor & Destructor Documentation 402
5.71.4.1 QCPStatisticalBox() 402
5.71.5 Member Function Documentation 402
5.71.5.1 addData() [1/2] 402
5.71.5.2 addData() [2/2] 403
5.71.5.3 data() 403
5.71.5.4 drawStatisticalBox() 403
5.71.5.5 getKeyRange() 404
5.71.5.6 getValueRange() 404
5.71.5.7 selectTest() 405
5.71.5.8 selectTestRect() 405
5.71.5.9 setData() [1/2] 405
5.71.5.10 setData() [2/2] 406
5.71.5.11 setMedianPen() 406
5.71.5.12 setOutlierStyle() 406
5.71.5.13 setWhiskerAntialiased() 406
5.71.5.14 setWhiskerBarPen() 407
5.71.5.15 setWhiskerPen() 407
5.71.5.16 setWhiskerWidth() 407
5.71.5.17 setWidth() 408
5.72 QCPStatisticalBoxData Class Reference 408
5.72.1 Detailed Description 409
5.72.2 Constructor & Destructor Documentation 409
5.72.2.1 QCPStatisticalBoxData() [1/2] 409
5.72.2.2 QCPStatisticalBoxData() [2/2] 410
5.72.3 Member Function Documentation 410
5.72.3.1 fromSortKey() 410
5.72.3.2 mainKey() 410
5.72.3.3 mainValue() 410

5.72.3.4 sortKey() 411
5.72.3.5 sortKeyIsMainKey() 411
5.72.3.6 valueRange() 411
5.73 QCPTextElement Class Reference 411
5.73.1 Detailed Description 413
5.73.2 Constructor & Destructor Documentation 413
5.73.2.1 QCPTextElement() [1/5] 413
5.73.2.2 QCPTextElement() [2/5] 413
5.73.2.3 QCPTextElement() [3/5] 414
5.73.2.4 QCPTextElement() [4/5] 414
5.73.2.5 QCPTextElement() [5/5] 414
5.73.3 Member Function Documentation 414
5.73.3.1 clicked 415
5.73.3.2 doubleClicked 415
5.73.3.3 maximumSizeHint() 415
5.73.3.4 minimumSizeHint() 415
5.73.3.5 mouseDoubleClickEvent() 416
5.73.3.6 mousePressEvent() 416
5.73.3.7 mouseReleaseEvent() 416
5.73.3.8 selectionChanged 416
5.73.3.9 selectTest() 417
5.73.3.10 setFont() 417
5.73.3.11 setSelectable() 417
5.73.3.12 setSelected() 417
5.73.3.13 setSelectedFont() 418
5.73.3.14 setSelectedTextColor() 418
5.73.3.15 setText() 418
5.73.3.16 setTextColor() 418
5.73.3.17 setTextFlags() 419
5.74 QCPVector2D Class Reference 419

5.74.1 Detailed Description 420
5.74.2 Constructor & Destructor Documentation 421
5.74.2.1 QCPVector2D() [1/4] 421
5.74.2.2 QCPVector2D() [2/4] 421
5.74.2.3 QCPVector2D() [3/4] 421
5.74.2.4 QCPVector2D() [4/4] 421
5.74.3 Member Function Documentation 421
5.74.3.1 distanceSquaredToLine() [1/2] 421
5.74.3.2 distanceSquaredToLine() [2/2] 422
5.74.3.3 distanceToStraightLine() 422
5.74.3.4 dot() 422
5.74.3.5 isNull() 422
5.74.3.6 length() 423
5.74.3.7 lengthSquared() 423
5.74.3.8 normalize() 423
5.74.3.9 normalized() 423
5.74.3.10 operator*=() 424
5.74.3.11 operator+=() 424
5.74.3.12 operator-=() 424
5.74.3.13 operator/=() 424
5.74.3.14 perpendicular() 424
5.74.3.15 setX() 424
5.74.3.16 setY() 425
5.74.3.17 toPoint() 425
5.74.3.18 toPointF() 425
5.74.4 Friends And Related Function Documentation 425
5.74.4.1 operator<<() 425
5.75 QCustomPlot Class Reference 426
5.75.1 Detailed Description 430
5.75.2 Member Enumeration Documentation 430

5.75.2.1 LayerInsertMode 430

5.75.2.2 RefreshPriority 430

5.75.3 Constructor & Destructor Documentation 431

5.75.3.1 QCustomPlot() 431

5.75.4 Member Function Documentation 431

5.75.4.1 addGraph() 431

5.75.4.2 addLayer() 432

5.75.4.3 afterReplot 432

5.75.4.4 axisClick 432

5.75.4.5 axisDoubleClick 433

5.75.4.6 axisRect() 433

5.75.4.7 axisRectAt() 433

5.75.4.8 axisRectCount() 434

5.75.4.9 axisRects() 434

5.75.4.10 beforeReplot 434

5.75.4.11 clearGraphs() 434

5.75.4.12 clearItems() 435

5.75.4.13 clearPlottables() 435

5.75.4.14 currentLayer() 435

5.75.4.15 deselectAll() 435

5.75.4.16 graph() [1/2] 436

5.75.4.17 graph() [2/2] 436

5.75.4.18 graphCount() 436

5.75.4.19 hasInvalidatedPaintBuffers() 436

5.75.4.20 hasItem() 437

5.75.4.21 hasPlottable() 437

5.75.4.22 item() [1/2] 437

5.75.4.23 item() [2/2] 437

5.75.4.24 itemAt() 438

5.75.4.25 itemClick 438

5.75.4.26 itemCount() 438
5.75.4.27 itemDoubleClick 439
5.75.4.28 layer() [1/2] 439
5.75.4.29 layer() [2/2] 439
5.75.4.30 layerCount() 440
5.75.4.31 layoutElementAt() 440
5.75.4.32 legendClick 440
5.75.4.33 legendDoubleClick 441
5.75.4.34 mouseDoubleClick 441
5.75.4.35 mouseMove 441
5.75.4.36 mousePress 441
5.75.4.37 mouseRelease 442
5.75.4.38 mouseWheel 442
5.75.4.39 moveLayer() 442
5.75.4.40 plotLayout() 442
5.75.4.41 plottable() [1/2] 443
5.75.4.42 plottable() [2/2] 443
5.75.4.43 plottableAt() 443
5.75.4.44 plottableClick 444
5.75.4.45 plottableCount() 444
5.75.4.46 plottableDoubleClick 444
5.75.4.47 removeGraph() [1/2] 445
5.75.4.48 removeGraph() [2/2] 445
5.75.4.49 removeItem() [1/2] 445
5.75.4.50 removeItem() [2/2] 445
5.75.4.51 removeLayer() 446
5.75.4.52 removePlottable() [1/2] 446
5.75.4.53 removePlottable() [2/2] 446
5.75.4.54 replot() 447
5.75.4.55 rescaleAxes() 447

5.75.4.56 saveBmp() 447
5.75.4.57 saveJpg() 448
5.75.4.58 savePdf() 449
5.75.4.59 savePng() 450
5.75.4.60 saveRastered() 451
5.75.4.61 selectedAxes() 451
5.75.4.62 selectedGraphs() 452
5.75.4.63 selectedItems() 452
5.75.4.64 selectedLegends() 452
5.75.4.65 selectedPlottables() 452
5.75.4.66 selectionChangedByUser 453
5.75.4.67 selectionRect() 453
5.75.4.68 setAntialiasedElement() 453
5.75.4.69 setAntialiasedElements() 454
5.75.4.70 setAutoAddPlottableToLegend() 454
5.75.4.71 setBackground() [1/3] 454
5.75.4.72 setBackground() [2/3] 455
5.75.4.73 setBackground() [3/3] 455
5.75.4.74 setBackgroundScaled() 455
5.75.4.75 setBackgroundScaledMode() 456
5.75.4.76 setBufferDevicePixelRatio() 456
5.75.4.77 setCurrentLayer() [1/2] 456
5.75.4.78 setCurrentLayer() [2/2] 457
5.75.4.79 setInteraction() 457
5.75.4.80 setInteractions() 457
5.75.4.81 setMultiSelectModifier() 458
5.75.4.82 setNoAntialiasingOnDrag() 459
5.75.4.83 setNotAntialiasedElement() 459
5.75.4.84 setNotAntialiasedElements() 459
5.75.4.85 setOpenGl() 460

5.75.4.86 setPlottingHint() . . . 460
5.75.4.87 setPlottingHints() . . . 461
5.75.4.88 setSelectionRect() . . . 461
5.75.4.89 setSelectionRectMode() . . . 461
5.75.4.90 setSelectionTolerance() . . . 462
5.75.4.91 setViewport() . . . 462
5.75.4.92 toPainter() . . . 462
5.75.4.93 toPixmap() . . . 463
5.75.5 Member Data Documentation . . . 463
5.75.5.1 legend . . . 463
5.75.5.2 xAxis . . . 463
5.75.5.3 xAxis2 . . . 464
5.75.5.4 yAxis . . . 464
5.75.5.5 yAxis2 . . . 464
5.76 Rohr Class Reference . . . 465
5.76.1 Detailed Description . . . 465
5.76.2 Member Function Documentation . . . 465
5.76.2.1 get_kA() . . . 466
5.76.2.2 get_querschnitt() . . . 466
5.76.2.3 get_radius() . . . 466
5.77 Rohrstroemung Class Reference . . . 467
5.77.1 Detailed Description . . . 467
5.77.2 Member Function Documentation . . . 468
5.77.2.1 get_lambda() . . . 468
5.78 QCPAxisPainterPrivate::TickLabelData Struct Reference . . . 468

Index **469**

Chapter 1

Namespace Index

1.1 Namespace List

Here is a list of all documented namespaces with brief descriptions:

QCP 11

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

APITest 17
QCPAxisPainterPrivate::CachedLabel 18
Fluid 18
LambdaTurbulentGlattSolver 21
QCPAbstractPaintBuffer 37
- QCPPaintBufferPixmap 357

QCPAxisPainterPrivate 86
QCPAxisTicker 105
- QCPAxisTickerDateTime 109
- QCPAxisTickerFixed 113
- QCPAxisTickerLog 116
- QCPAxisTickerPi 117
- QCPAxisTickerText 120
- QCPAxisTickerTime 126

QCPBarsData 138
QCPColorGradient 146
QCPColorMapData 161
QCPCurveData 186
QCPDataContainer< DataType > 189
QCPDataRange 199
QCPDataSelection 204
QCPErrorBarsData 223
QCPFinancialData 235
QCPGraphData 247
QCPItemAnchor 253
- QCPItemPosition 274

QCPLineEnding 352
QCPPlottableInterface1D 365
- QCPAbstractPlottable1D< DataType > 55
- QCPAbstractPlottable1D< QCPBarsData > 55
  - QCPBars 129
- QCPAbstractPlottable1D< QCPCurveData > 55
  - QCPCurve 178
- QCPAbstractPlottable1D< QCPFinancialData > 55

QCPFinancial . . . 225
QCPAbstractPlottable1D< QCPGraphData > . . . 55
QCPGraph . . . 238
QCPAbstractPlottable1D< QCPStatisticalBoxData > . . . 55
QCPStatisticalBox . . . 400
QCPErrorBars . . . 212
QCPRange . . . 371
QCPScatterStyle . . . 379
QCPSelectionDecorator . . . 388
QCPSelectionDecoratorBracket . . . 392
QCPStatisticalBoxData . . . 408
QCPVector2D . . . 419
QDialog
DatenEingabe . . . 18
Plotter . . . 21
QObject
QCPBarsGroup . . . 140
QCPLayer . . . 299
QCPLayerable . . . 304
QCPAbstractItem . . . 25
QCPItemBracket . . . 255
QCPItemCurve . . . 259
QCPItemEllipse . . . 263
QCPItemLine . . . 267
QCPItemPixmap . . . 270
QCPItemRect . . . 281
QCPItemStraightLine . . . 285
QCPItemText . . . 287
QCPItemTracer . . . 293
QCPAbstractPlottable . . . 41
QCPAbstractPlottable1D< DataType > . . . 55
QCPAbstractPlottable1D< QCPBarsData > . . . 55
QCPAbstractPlottable1D< QCPCurveData > . . . 55
QCPAbstractPlottable1D< QCPFinancialData > . . . 55
QCPAbstractPlottable1D< QCPGraphData > . . . 55
QCPAbstractPlottable1D< QCPStatisticalBoxData > . . . 55
QCPColorMap . . . 152
QCPErrorBars . . . 212
QCPAxis . . . 62
QCPGrid . . . 250
QCPLayoutElement . . . 316
QCPAbstractLegendItem . . . 33
QCPPlottableLegendItem . . . 369
QCPAxisRect . . . 87
QCPColorScaleAxisRectPrivate . . . 177
QCPColorScale . . . 169
QCPLayout . . . 311
QCPLayoutGrid . . . 324
QCPLegend . . . 341
QCPLayoutInset . . . 335
QCPTextElement . . . 411
QCPSelectionRect . . . 396
QCPMarginGroup . . . 355
QPainter
QCPPainter . . . 360
QWidget
QCustomPlot . . . 426

Rohr 465
Rohrstroemung 467
QCPAxisPainterPrivate::TickLabelData 468

Chapter 3

Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

APITest . . . 17
QCPAxisPainterPrivate::CachedLabel . . . 18
DatenEingabe . . . 18
Fluid
Stellt ein Fluid zur Verfügung . . . 18
LambdaTurbulentGlattSolver
The LambdaTurbulentGlattSolver class . . . 21
Plotter
Erstellung einer neuen Klasse mit dem Namen Plotter . . . 21
QCPAbstractItem
The abstract base class for all items in a plot . . . 25
QCPAbstractLegendItem
The abstract base class for all entries in a QCPLegend . . . 33
QCPAbstractPaintBuffer
The abstract base class for paint buffers, which define the rendering backend . . . 37
QCPAbstractPlottable
The abstract base class for all data representing objects in a plot . . . 41
QCPAbstractPlottable1D< DataType >
A template base class for plottables with one-dimensional data . . . 55
QCPAxis
Manages a single axis inside a QCustomPlot . . . 62
QCPAxisPainterPrivate . . . 86
QCPAxisRect
Holds multiple axes and arranges them in a rectangular shape . . . 87
QCPAxisTicker
The base class tick generator used by QCPAxis to create tick positions and tick labels . . . 105
QCPAxisTickerDateTime
Specialized axis ticker for calendar dates and times as axis ticks . . . 109
QCPAxisTickerFixed
Specialized axis ticker with a fixed tick step . . . 113
QCPAxisTickerLog
Specialized axis ticker suited for logarithmic axes . . . 116
QCPAxisTickerPi
Specialized axis ticker to display ticks in units of an arbitrary constant, for example pi . . . 117
QCPAxisTickerText
Specialized axis ticker which allows arbitrary labels at specified coordinates . . . 120

QCPAxisTickerTime
Specialized axis ticker for time spans in units of milliseconds to days 126
QCPBars
A plottable representing a bar chart in a plot 129
QCPBarsData
Holds the data of one single data point (one bar) for QCPBars 138
QCPBarsGroup
Groups multiple QCPBars together so they appear side by side 140
QCPColorGradient
Defines a color gradient for use with e.g. QCPColorMap 146
QCPColorMap
A plottable representing a two-dimensional color map in a plot 152
QCPColorMapData
Holds the two-dimensional data of a QCPColorMap plottable 161
QCPColorScale
A color scale for use with color coding data such as QCPColorMap 169
QCPColorScaleAxisRectPrivate 177
QCPCurve
A plottable representing a parametric curve in a plot 178
QCPCurveData
Holds the data of one single data point for QCPCurve 186
QCPDataContainer< DataType >
The generic data container for one-dimensional plottables 189
QCPDataRange
Describes a data range given by begin and end index 199
QCPDataSelection
Describes a data set by holding multiple QCPDataRange instances 204
QCPErrorBars
A plottable that adds a set of error bars to other plottables 212
QCPErrorBarsData
Holds the data of one single error bar for QCPErrorBars 223
QCPFinancial
A plottable representing a financial stock chart 225
QCPFinancialData
Holds the data of one single data point for QCPFinancial 235
QCPGraph
A plottable representing a graph in a plot 238
QCPGraphData
Holds the data of one single data point for QCPGraph 247
QCPGrid
Responsible for drawing the grid of a QCPAxis 250
QCPItemAnchor
An anchor of an item to which positions can be attached to 253
QCPItemBracket
A bracket for referencing/highlighting certain parts in the plot 255
QCPItemCurve
A curved line from one point to another 259
QCPItemEllipse
An ellipse 263
QCPItemLine
A line from one point to another 267
QCPItemPixmap
An arbitrary pixmap 270
QCPItemPosition
Manages the position of an item 274
QCPItemRect
A rectangle 281

QCPItemStraightLine
A straight line that spans infinitely in both directions 285
QCPItemText
A text label 287
QCPItemTracer
Item that sticks to QCPGraph data points 293
QCPLayer
A layer that may contain objects, to control the rendering order 299
QCPLayerable
Base class for all drawable objects 304
QCPLayout
The abstract base class for layouts 311
QCPLayoutElement
The abstract base class for all objects that form the layout system 316
QCPLayoutGrid
A layout that arranges child elements in a grid 324
QCPLayoutInset
A layout that places child elements aligned to the border or arbitrarily positioned 335
QCPLegend
Manages a legend inside a QCustomPlot 341
QCPLineEnding
Handles the different ending decorations for line-like items 352
QCPMarginGroup
A margin group allows synchronization of margin sides if working with multiple layout elements 355
QCPPaintBufferPixmap
A paint buffer based on QPixmap, using software raster rendering 357
QCPPainter
QPainter subclass used internally 360
QCPPlottableInterface1D
Defines an abstract interface for one-dimensional plottables 365
QCPPlottableLegendItem
A legend item representing a plottable with an icon and the plottable name 369
QCPRange
Represents the range an axis is encompassing 371
QCPScatterStyle
Represents the visual appearance of scatter points 379
QCPSelectionDecorator
Controls how a plottable's data selection is drawn 388
QCPSelectionDecoratorBracket
A selection decorator which draws brackets around each selected data segment 392
QCPSelectionRect
Provides rect/rubber-band data selection and range zoom interaction 396
QCPStatisticalBox
A plottable representing a single statistical box in a plot 400
QCPStatisticalBoxData
Holds the data of one single data point for QCPStatisticalBox 408
QCPTextElement
A layout element displaying a text 411
QCPVector2D
Represents two doubles as a mathematical 2D vector 419
QCustomPlot
The central class of the library. This is the QWidget which displays the plot and interacts with the user 426
Rohr
Stellt ein Rohrbauteil zur Verfügung 465
Rohrstroemung
Beschriebt eine Rohrströmung 467
QCPAxisPainterPrivate::TickLabelData 468

Chapter 4

Namespace Documentation

4.1 QCP Namespace Reference

Enumerations

- enum ResolutionUnit { ruDotsPerMeter, ruDotsPerCentimeter, ruDotsPerInch }
- enum ExportPen { epNoCosmetic, epAllowCosmetic }
- enum SignDomain { sdNegative, sdBoth, sdPositive }
- enum MarginSide {
  msLeft = 0x01, msRight = 0x02, msTop = 0x04, msBottom = 0x08,
  msAll = 0xFF, msNone = 0x00 }
- enum AntialiasedElement {
  aeAxes = 0x0001, aeGrid = 0x0002, aeSubGrid = 0x0004, aeLegend = 0x0008,
  aeLegendItems = 0x0010, aePlottables = 0x0020, aeItems = 0x0040, aeScatters = 0x0080,
  aeFills = 0x0100, aeZeroLine = 0x0200, aeOther = 0x8000, aeAll = 0xFFFF,
  aeNone = 0x0000 }
- enum PlottingHint { phNone = 0x000, phFastPolylines = 0x001, phImmediateRefresh = 0x002, phCache↩
  Labels = 0x004 }
- enum Interaction {
  iRangeDrag = 0x001, iRangeZoom = 0x002, iMultiSelect = 0x004, iSelectPlottables = 0x008,
  iSelectAxes = 0x010, iSelectLegend = 0x020, iSelectItems = 0x040, iSelectOther = 0x080 }
- enum SelectionRectMode { srmNone, srmZoom, srmSelect, srmCustom }
- enum SelectionType {
  stNone, stWhole, stSingleData, stDataRange,
  stMultipleDataRanges }

Functions

- bool **isInvalidData** (double value)
- bool **isInvalidData** (double value1, double value2)
- void **setMarginValue** (QMargins &margins, QCP::MarginSide side, int value)
- int **getMarginValue** (const QMargins &margins, QCP::MarginSide side)

Variables

- const QMetaObject **staticMetaObject**

4.1.1 Detailed Description

The QCP Namespace contains general enums, QFlags and functions used throughout the QCustomPlot library.

It provides QMetaObject-based reflection of its enums and flags via *QCP::staticMetaObject*.

4.1.2 Enumeration Type Documentation

4.1.2.1 AntialiasedElement

`enum QCP::AntialiasedElement`

Defines what objects of a plot can be forcibly drawn antialiased/not antialiased. If an object is neither forcibly drawn antialiased nor forcibly drawn not antialiased, it is up to the respective element how it is drawn. Typically it provides a *setAntialiased* function for this.

`AntialiasedElements` is a flag of or-combined elements of this enum type.

See also

QCustomPlot::setAntialiasedElements, QCustomPlot::setNotAntialiasedElements

Enumerator

aeAxes	`0x0001` Axis base line and tick marks
aeGrid	`0x0002` Grid lines
aeSubGrid	`0x0004` Sub grid lines
aeLegend	`0x0008` Legend box
aeLegendItems	`0x0010` Legend items
aePlottables	`0x0020` Main lines of plottables
aeItems	`0x0040` Main lines of items
aeScatters	`0x0080` Scatter symbols of plottables (excluding scatter symbols of type ssPixmap)
aeFills	`0x0100` Borders of fills (e.g. under or between graphs)
aeZeroLine	`0x0200` Zero-lines, see QCPGrid::setZeroLinePen
aeOther	`0x8000` Other elements that don't fit into any of the existing categories
aeAll	`0xFFFF` All elements
aeNone	`0x0000` No elements

4.1.2.2 ExportPen

`enum QCP::ExportPen`

Defines how cosmetic pens (pens with numerical width 0) are handled during export.

See also

QCustomPlot::savePdf

Enumerator

epNoCosmetic	Cosmetic pens are converted to pens with pixel width 1 when exporting.
epAllowCosmetic	Cosmetic pens are exported normally (e.g. in PDF exports, cosmetic pens always appear as 1 pixel on screen, independent of viewer zoom level)

4.1.2.3 Interaction

`enum QCP::Interaction`

Defines the mouse interactions possible with QCustomPlot.

`Interactions` is a flag of or-combined elements of this enum type.

See also

QCustomPlot::setInteractions

Enumerator

iRangeDrag	`0x001` Axis ranges are draggable (see QCPAxisRect::setRangeDrag, QCPAxisRect::setRangeDragAxes)
iRangeZoom	`0x002` Axis ranges are zoomable with the mouse wheel (see QCPAxisRect::setRangeZoom, QCPAxisRect::setRangeZoomAxes)
iMultiSelect	`0x004` The user can select multiple objects by holding the modifier set by QCustomPlot::setMultiSelectModifier while clicking
iSelectPlottables	`0x008` Plottables are selectable (e.g. graphs, curves, bars,... see QCPAbstractPlottable)
iSelectAxes	`0x010` Axes are selectable (or parts of them, see QCPAxis::setSelectableParts)
iSelectLegend	`0x020` Legends are selectable (or their child items, see QCPLegend::setSelectableParts)
iSelectItems	`0x040` Items are selectable (Rectangles, Arrows, Textitems, etc. see QCPAbstractItem)
iSelectOther	`0x080` All other objects are selectable (e.g. your own derived layerables, other layout elements,...)

4.1.2.4 MarginSide

`enum QCP::MarginSide`

Defines the sides of a rectangular entity to which margins can be applied.

See also

QCPLayoutElement::setAutoMargins, QCPAxisRect::setAutoMargins

Enumerator

msLeft	`0x01` left margin
msRight	`0x02` right margin
msTop	`0x04` top margin
msBottom	`0x08` bottom margin
msAll	`0xFF` all margins
msNone	`0x00` no margin

4.1.2.5 PlottingHint

`enum QCP::PlottingHint`

Defines plotting hints that control various aspects of the quality and speed of plotting.

See also

QCustomPlot::setPlottingHints

Enumerator

phNone	`0x000` No hints are set
phFastPolylines	`0x001` Graph/Curve lines are drawn with a faster method. This reduces the quality especially of the line segment joins, thus is most effective for pen sizes larger than 1. It is only used for solid line pens.
phImmediateRefresh	`0x002` causes an immediate repaint() instead of a soft update() when QCustomPlot::replot() is called with parameter QCustomPlot::rpRefreshHint. This is set by default to prevent the plot from freezing on fast consecutive replots (e.g. user drags ranges with mouse).
phCacheLabels	`0x004` axis (tick) labels will be cached as pixmaps, increasing replot performance.

4.1.2.6 ResolutionUnit

`enum QCP::ResolutionUnit`

Defines the different units in which the image resolution can be specified in the export functions.

See also

QCustomPlot::savePng, QCustomPlot::saveJpg, QCustomPlot::saveBmp, QCustomPlot::saveRastered

Enumerator

ruDotsPerMeter	Resolution is given in dots per meter (dpm)
ruDotsPerCentimeter	Resolution is given in dots per centimeter (dpcm)
ruDotsPerInch	Resolution is given in dots per inch (DPI/PPI)

4.1.2.7 SelectionRectMode

`enum QCP::SelectionRectMode`

Defines the behaviour of the selection rect.

See also

QCustomPlot::setSelectionRectMode, QCustomPlot::selectionRect, QCPSelectionRect

Enumerator

srmNone	The selection rect is disabled, and all mouse events are forwarded to the underlying objects, e.g. for axis range dragging.
srmZoom	When dragging the mouse, a selection rect becomes active. Upon releasing, the axes that are currently set as range zoom axes (QCPAxisRect::setRangeZoomAxes) will have their ranges zoomed accordingly.
srmSelect	When dragging the mouse, a selection rect becomes active. Upon releasing, plottable data points that were within the selection rect are selected, if the plottable's selectability setting permits. (See data selection mechanism for details.)
srmCustom	When dragging the mouse, a selection rect becomes active. It is the programmer's responsibility to connect according slots to the selection rect's signals (e.g. QCPSelectionRect::accepted) in order to process the user interaction.

4.1.2.8 SelectionType

`enum QCP::SelectionType`

Defines the different ways a plottable can be selected. These images show the effect of the different selection types, when the indicated selection rect was dragged:

See also

QCPAbstractPlottable::setSelectable, QCPDataSelection::enforceType

Enumerator

stNone	The plottable is not selectable.
stWhole	Selection behaves like stMultipleDataRanges, but if there are any data points selected, the entire plottable is drawn as selected.

Enumerator

stSingleData	One individual data point can be selected at a time.
stDataRange	Multiple contiguous data points (a data range) can be selected.
stMultipleDataRanges	Any combination of data points/ranges can be selected.

4.1.2.9 SignDomain

`enum QCP::SignDomain`

Represents negative and positive sign domain, e.g. for passing to QCPAbstractPlottable::getKeyRange and QCPAbstractPlottable::getValueRange.

This is primarily needed when working with logarithmic axis scales, since only one of the sign domains can be visible at a time.

Enumerator

sdNegative	The negative sign domain, i.e. numbers smaller than zero.
sdBoth	Both sign domains, including zero, i.e. all numbers.
sdPositive	The positive sign domain, i.e. numbers greater than zero.

Chapter 5

Class Documentation

5.1 APITest Class Reference

Static Public Member Functions

- static void printTestResult (const bool result, const char ∗testName, const char ∗autor, const char ∗testFall="", const char ∗dateiName="")

    Setzt die Daten für den jeweiligen Test.
- static void printTestStartHeader ()

    Nicht relevant: Gibt den Header am Anfang der Tests aus.
- static void printTestEndFooter ()

    Gibt die Zusammenfassung am Ende der Tests aus.

5.1.1 Member Function Documentation

5.1.1.1 printTestResult()

```
static void APITest::printTestResult (
             const bool result,
             const char * testName,
             const char * autor,
             const char * testFall = "",
             const char * dateiName = "" )  [inline], [static]
```

Setzt die Daten für den jeweiligen Test.

Parameters

result	Ergebnis des Tests true=Erfolgreich false=Fehlgeschlagen
testName	Name des Tests, damit dieser anschließend identifiziert werden kann
autor	Name des Autors, der den Test geschrieben hat
testFall	Was wird getestet. Ein Stichpunkt bzw. ein Satz genügt
dateiName	In welcher Datei befindet sich der Test

The documentation for this class was generated from the following file:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/tests/test.↩
  h

5.2 QCPAxisPainterPrivate::CachedLabel Struct Reference

Public Attributes

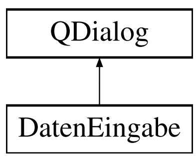
- QPointF **offset**
- QPixmap **pixmap**

The documentation for this struct was generated from the following file:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
  h

5.3 DatenEingabe Class Reference

Inheritance diagram for DatenEingabe:



Public Member Functions

- **DatenEingabe** (QWidget ∗parent=0)

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/dateneingabe.↩
  h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/dateneingabe.↩
  cpp

5.4 Fluid Class Reference

Stellt ein Fluid zur Verfügung.

```
#include <fluid.h>
```

Public Member Functions

- **Fluid** (double dichte, double nue, double cp)
- double get_massenstrom ()

  Massenstrom wird zurückgegeben.
- double get_dichte ()

  Dichte wird zurückgegeben.
- double get_nue ()

  kinematische Viskosität wird zurückgegen
- double get_cp ()

  Wärmekapazität wird zurückgegeben.
- double get_cp_strom ()

  Wärmekapazitätsstrom wird zurückgegen.
- double get_t_ein ()

  Gibt Eintrittstemperatur des Fluids zurück.
- double get_my ()

  dynamische Viskosität wird zurückgegeben
- void set_massenstrom (double massenstrom)

  Setzt den Massenstrom des Fluids.
- void set_t_ein (double t_ein)

  Setzt die Eintrittstemperatur.

5.4.1 Detailed Description

Stellt ein Fluid zur Verfügung.

5.4.2 Member Function Documentation

5.4.2.1 get_cp()

```
double Fluid::get_cp ( )
```

Wärmekapazität wird zurückgegeben.

isobare spezifische Wärmekapazität ausgeben

5.4.2.2 get_cp_strom()

```
double Fluid::get_cp_strom ( )
```

Wärmekapazitätsstrom wird zurückgegen.

cp-Strom ausgeben

5.4.2.3 get_dichte()

```
double Fluid::get_dichte ( )
```

Dichte wird zurückgegeben.

Dichte ausgeben.

5.4.2.4 get_massenstrom()

```
double Fluid::get_massenstrom ( )
```

Massenstrom wird zurückgegeben.

Massenstrom ausgeben.

5.4.2.5 get_my()

```
double Fluid::get_my ( )
```

dynamische Viskosität wird zurückgegeben

dynamische Viskosität ausgeben

5.4.2.6 get_nue()

```
double Fluid::get_nue ( )
```

kinematische Viskosität wird zurückgegen

kinematische Viskosität ausgeben

5.4.2.7 get_t_ein()

```
double Fluid::get_t_ein ( )
```

Gibt Eintrittstemperatur des Fluids zurück.

Eintrittstemperatur ausgeben.

5.4.2.8 set_massenstrom()

```
void Fluid::set_massenstrom (
             double massenstrom )
```

Setzt den Massenstrom des Fluids.

Massenstrom setzen.

5.4.2.9 set_t_ein()

```
void Fluid::set_t_ein (
            double t_ein )
```

Setzt die Eintrittstemperatur.

Eintrittstemperatur setzen.

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/fluid.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/fluid.↩ cpp

5.5 LambdaTurbulentGlattSolver Class Reference

The LambdaTurbulentGlattSolver class.

```
#include <stroemung.h>
```

Public Member Functions

- double get_lambda (double Re)
  Solver für Lambda bei hydraulisch glatten, turbulenten Strömungen.

5.5.1 Detailed Description

The LambdaTurbulentGlattSolver class.

Löst die Gleichung für den Rohrreibungsbeiwert Lambda, für Re $>$ 100000 und hydraulisch glatte Rohre numerisch.

The documentation for this class was generated from the following files:

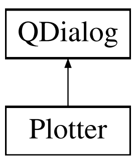
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/stroemung.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/stroemung.↩ cpp

5.6 Plotter Class Reference

Erstellung einer neuen Klasse mit dem Namen Plotter.

```
#include <plotter.h>
```

Inheritance diagram for Plotter:



Public Member Functions

- Plotter (QWidget ∗parent=0)

  Konstruktorinitialiserung; "explict" verhindert versehentliche Übergabe von anderen Datentypen und deren Konvertierung in ein QWidget.
- ∼Plotter ()

  Destruktorinitialisierung.
- void erstellePlot (Rohr rohr, Fluid fluid)

  Plotterfunktion mit der Übergabe der Datentypen Rohr und Fluid.

5.6.1 Detailed Description

Erstellung einer neuen Klasse mit dem Namen Plotter.

5.6.2 Constructor & Destructor Documentation

5.6.2.1 Plotter()

```
Plotter::Plotter (
            QWidget ∗ parent = 0 )  [explicit]
```

Konstruktorinitialiserung; "explict" verhindert versehentliche Übergabe von anderen Datentypen und deren Konvertierung in ein QWidget.

Präprozessoranweisungen.

Konstruktor für die Plotterfunktion

5.6.2.2 ∼Plotter()

```
Plotter::∼Plotter ( )
```

Destruktorinitialisierung.

Freigeben des Speicherplatzes nach Beenden des Plotters durch einen Destruktor.

5.6.3 Member Function Documentation

5.6.3.1 erstellePlot()

```
void Plotter::erstellePlot (
            Rohr rohr,
            Fluid fluid )
```

Plotterfunktion mit der Übergabe der Datentypen Rohr und Fluid.

Anlegen der Länge und des Radius als Variable damit Koordinatensysteme und for-Schleifen angepasst werden. Diese Variablen werden in allen drei Plotter verwendet

Temperaturprofil initilaisieren von QVectoren mit Einträgen von 0..100

Iterieren über ortsabhängige get_temp-Funktion

Graphen erstellen und Achsen festlegen:

Achsenbeschriftung:

Achsenbereich x-Achse geht von 0 bis zur Länge des Rohres

Unterscheidung ob t_aussen oder t_ein größer ist; entsprechendes Setzen der y-Achsenbereichs

Bestimmung eines Wertes damit die größten/kleinsten Werte nicht am Rand liegen

y-Achse beginnt kurz unter t_ein und endet kurz über t_aussen

Analoges Vorgehen wie im if-Statement

See also

if(rohr.get_t_aussen >= fluid.get_t_ein())

Warning

rohrstroemung.get_start_starpressur ist noch nicht implementiert. Enstprechende Zeilen werden auskommentiert

Druckgradient

Initilaisieren von QVectoren mit Einträgen von 0..100

Achsenbereich Bestimmung eines Wertes damit die größten/kleinsten Werte nicht am Rand liegen

x-Achse geht von 0 bis zur Länge des Rohres

Legt den y-Achsenbereich fest

Der Druck im Rohr wird aufgrund der Reibung ständig abnehmen. Eine Fallunterscheidung wie bei der Temperatur ist daher nicht nötig. Der Bereich wird festgelegt vom niedirgsten Druckwert (m[100]) und dem Anfangsdruck. Zusätzlich wird noch ein Offset genau wie bei dem Temperaturverlauf berücksichtigt

Strömungsprofil Möglichkeit die Farbskala durch Dragging oder Zoomen zu ändern

Achsenbeschriftung

aufstellen der QCPColorMap

Warning

> Wir verwenden die Variablen s für die Länge, t für den Radius und u für die FLuidgeschwindigekeit ,damit dies nicht mit den Vatriablen aus dem Temperaturprofil kollidiert

Größe der ColorMap wird festgelegt

Die ColorMap wird ns∗nt groß sein bzw. Bildpunkte haben. Der Achsberecheich für die x-Achse geht von 0 über die gesamte Länge des Rohres. Der Achsbereich für die y-Achse geht über den Gesamtenquerschnitt (von -r bis r)

Iterartion über die Strömungsfunktion und Speicherung der Werte in einer Cell.

Über die multivariate Funktion der Geschwindigkeit wird mittels zweier for-Schleifen iteriert. Die Daten werden dann der QColorMap zugewiesen

Anpassung der Iterationsschritte an die Länge und Radius des Rohrs.

Der Radius geht von -r bis r, sodass dieser Iterationsschritt nur mit dem Faktor (r/100) angepasst werden muss

Hinzufügen der Farbskala

Skala wird der richtigen Achse zugewiesen

Vertikale Farbskala auf der rechten Seite

Verbindung von Farbe der Skala mit der Farbe der ColorMap

Hinzufügen der Skalenbeschriftung

Laden eines Farbgradient aus den Voreinstellung

gpJet ist ein Fabrverlauf der für numerische Analysen verwendet wird und passt daher auf unseren Anwendungsfall

Die Farbdimension wird so angepasst, sodass alle erzeugten Datenpunkten auch eine Farbe zugewiesen bekommen.

Die Anpassung an die Werte geschieht automatisch, sodass die Bandbreite von der geringsten auftretenden Greschwindigkeit zur maximalen Geschwindigkeit geht.

Achsen und ColorMap an sich sollen direkt aneinaderliegen:

Anpassung der Größe der Achsen an Widgetgröße:

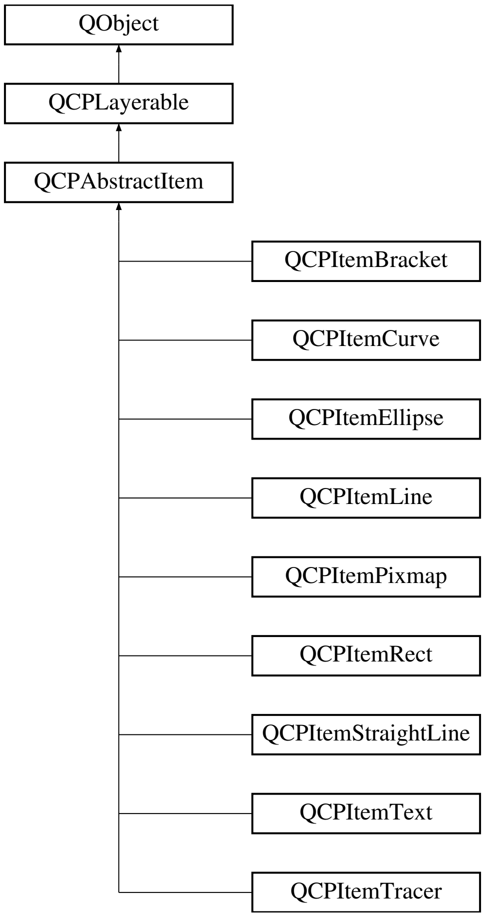
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/plotter.↩
h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/plotter.↩
cpp

5.7 QCPAbstractItem Class Reference

The abstract base class for all items in a plot.

Inheritance diagram for QCPAbstractItem:



Signals

- void selectionChanged (bool selected)
- void **selectableChanged** (bool selectable)

Public Member Functions

- QCPAbstractItem (QCustomPlot ∗parentPlot)
- bool **clipToAxisRect** () const
- QCPAxisRect ∗ **clipAxisRect** () const
- bool **selectable** () const
- bool **selected** () const
- void setClipToAxisRect (bool clip)
- void setClipAxisRect (QCPAxisRect ∗rect)
- Q_SLOT void setSelectable (bool selectable)
- Q_SLOT void setSelected (bool selected)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩ OVERRIDE=0

- QList< QCPItemPosition * > positions () const
- QList< QCPItemAnchor * > anchors () const
- QCPItemPosition * position (const QString &name) const
- QCPItemAnchor * anchor (const QString &name) const
- bool hasAnchor (const QString &name) const

Protected Member Functions

- virtual QCP::Interaction **selectionCategory** () const Q_DECL_OVERRIDE
- virtual QRect **clipRect** () const Q_DECL_OVERRIDE
- virtual void **applyDefaultAntialiasingHint** (QCPPainter *painter) const Q_DECL_OVERRIDE
- virtual void **draw** (QCPPainter *painter) Q_DECL_OVERRIDE=0
- virtual void **selectEvent** (QMouseEvent *event, bool additive, const QVariant &details, bool *selection←StateChanged) Q_DECL_OVERRIDE
- virtual void **deselectEvent** (bool *selectionStateChanged) Q_DECL_OVERRIDE
- virtual QPointF **anchorPixelPosition** (int anchorId) const
- double **rectDistance** (const QRectF &rect, const QPointF &pos, bool filledRect) const
- QCPItemPosition * **createPosition** (const QString &name)
- QCPItemAnchor * **createAnchor** (const QString &name, int anchorId)

Protected Attributes

- bool **mClipToAxisRect**
- QPointer< QCPAxisRect > **mClipAxisRect**
- QList< QCPItemPosition * > **mPositions**
- QList< QCPItemAnchor * > **mAnchors**
- bool **mSelectable**
- bool **mSelected**

Friends

- class **QCustomPlot**
- class **QCPItemAnchor**

5.7.1 Detailed Description

The abstract base class for all items in a plot.

In QCustomPlot, items are supplemental graphical elements that are neither plottables (QCPAbstractPlottable) nor axes (QCPAxis). While plottables are always tied to two axes and thus plot coordinates, items can also be placed in absolute coordinates independent of any axes. Each specific item has at least one QCPItemPosition member which controls the positioning. Some items are defined by more than one coordinate and thus have two or more QCPItemPosition members (For example, QCPItemRect has *topLeft* and *bottomRight*).

This abstract base class defines a very basic interface like visibility and clipping. Since this class is abstract, it can't be instantiated. Use one of the subclasses or create a subclass yourself to create new items.

The built-in items are:

QCPItemLine	A line defined by a start and an end point. May have different ending styles on each side (e.g. arrows).
QCPItemStraightLine	A straight line defined by a start and a direction point. Unlike QCPItemLine, the straight line is infinitely long and has no endings.
QCPItemCurve	A curve defined by start, end and two intermediate control points. May have different ending styles on each side (e.g. arrows).
QCPItemRect	A rectangle
QCPItemEllipse	An ellipse
QCPItemPixmap	An arbitrary pixmap
QCPItemText	A text label
QCPItemBracket	A bracket which may be used to reference/highlight certain parts in the plot.
QCPItemTracer	An item that can be attached to a QCPGraph and sticks to its data points, given a key coordinate.

5.7.2 Clipping

Items are by default clipped to the main axis rect (they are only visible inside the axis rect). To make an item visible outside that axis rect, disable clipping via setClipToAxisRect(false).

On the other hand if you want the item to be clipped to a different axis rect, specify it via setClipAxisRect. This clipAxisRect property of an item is only used for clipping behaviour, and in principle is independent of the coordinate axes the item might be tied to via its position members (QCPItemPosition::setAxes). However, it is common that the axis rect for clipping also contains the axes used for the item positions.

5.7.3 Using items

First you instantiate the item you want to use and add it to the plot:

by default, the positions of the item are bound to the x- and y-Axis of the plot. So we can just set the plot coordinates where the line should start/end:

If we don't want the line to be positioned in plot coordinates but a different coordinate system, e.g. absolute pixel positions on the QCustomPlot surface, we need to change the position type like this:

Then we can set the coordinates, this time in pixels:

and make the line visible on the entire QCustomPlot, by disabling clipping to the axis rect:

For more advanced plots, it is even possible to set different types and parent anchors per X/Y coordinate of an item position, using for example QCPItemPosition::setTypeX or QCPItemPosition::setParentAnchorX. For details, see the documentation of QCPItemPosition.

5.7.4 Creating own items

To create an own item, you implement a subclass of QCPAbstractItem. These are the pure virtual functions, you must implement:

- selectTest
- draw

See the documentation of those functions for what they need to do.

5.7.4.1 Allowing the item to be positioned

As mentioned, item positions are represented by QCPItemPosition members. Let's assume the new item shall have only one point as its position (as opposed to two like a rect or multiple like a polygon). You then add a public member of type QCPItemPosition like so:

```
QCPItemPosition * const myPosition;
```

the const makes sure the pointer itself can't be modified from the user of your new item (the QCPItemPosition instance it points to, can be modified, of course). The initialization of this pointer is made easy with the create←Position function. Just assign the return value of this function to each QCPItemPosition in the constructor of your item. createPosition takes a string which is the name of the position, typically this is identical to the variable name. For example, the constructor of QCPItemExample could look like this:

```
QCPItemExample::QCPItemExample(QCustomPlot *parentPlot) :
  QCPAbstractItem(parentPlot),
  myPosition(createPosition("myPosition"))
{
  // other constructor code
}
```

5.7.4.2 The draw function

To give your item a visual representation, reimplement the draw function and use the passed QCPPainter to draw the item. You can retrieve the item position in pixel coordinates from the position member(s) via QCPItemPosition←::pixelPosition.

To optimize performance you should calculate a bounding rect first (don't forget to take the pen width into account), check whether it intersects the clipRect, and only draw the item at all if this is the case.

5.7.4.3 The selectTest function

Your implementation of the selectTest function may use the helpers QCPVector2D::distanceSquaredToLine and rectDistance. With these, the implementation of the selection test becomes significantly simpler for most items. See the documentation of selectTest for what the function parameters mean and what the function should return.

5.7.4.4 Providing anchors

Providing anchors (QCPItemAnchor) starts off like adding a position. First you create a public member, e.g.

```
QCPItemAnchor * const bottom;
```

and create it in the constructor with the createAnchor function, assigning it a name and an anchor id (an integer enumerating all anchors on the item, you may create an own enum for this). Since anchors can be placed anywhere, relative to the item's position(s), your item needs to provide the position of every anchor with the reimplementation of the anchorPixelPosition(int anchorId) function.

In essence the QCPItemAnchor is merely an intermediary that itself asks your item for the pixel position when anything attached to the anchor needs to know the coordinates.

5.7.5 Constructor & Destructor Documentation

5.7.5.1 QCPAbstractItem()

```
QCPAbstractItem::QCPAbstractItem (
            QCustomPlot * parentPlot )  [explicit]
```

Base class constructor which initializes base class members.

5.7.6 Member Function Documentation

5.7.6.1 anchor()

```
QCPItemAnchor * QCPAbstractItem::anchor (
            const QString & name ) const
```

Returns the QCPItemAnchor with the specified *name*. If this item doesn't have an anchor by that name, returns 0.

This function provides an alternative way to access item anchors. Normally, you access anchors direcly by their member pointers (which typically have the same variable name as *name*).

See also

anchors, position

5.7.6.2 anchors()

```
QList< QCPItemAnchor * > QCPAbstractItem::anchors ( ) const [inline]
```

Returns all anchors of the item in a list. Note that since a position (QCPItemPosition) is always also an anchor, the list will also contain the positions of this item.

See also

positions, anchor

5.7.6.3 hasAnchor()

```
bool QCPAbstractItem::hasAnchor (
            const QString & name ) const
```

Returns whether this item has an anchor with the specified *name*.

Note that you can check for positions with this function, too. This is because every position is also an anchor (QCPItemPosition inherits from QCPItemAnchor).

See also

anchor, position

5.7.6.4 position()

```
QCPItemPosition * QCPAbstractItem::position (
            const QString & name ) const
```

Returns the QCPItemPosition with the specified *name*. If this item doesn't have a position by that name, returns 0.

This function provides an alternative way to access item positions. Normally, you access positions direcly by their member pointers (which typically have the same variable name as *name*).

See also

positions, anchor

5.7.6.5 positions()

```
QList< QCPItemPosition * > QCPAbstractItem::positions ( ) const [inline]
```

Returns all positions of the item in a list.

See also

anchors, position

5.7.6.6 selectionChanged

```
void QCPAbstractItem::selectionChanged (
            bool selected ) [signal]
```

This signal is emitted when the selection state of this item has changed, either by user interaction or by a direct call to setSelected.

5.7.6.7 selectTest()

```
virtual double QCPAbstractItem::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const [pure virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Reimplemented from QCPLayerable.

Implemented in QCPItemBracket, QCPItemTracer, QCPItemPixmap, QCPItemEllipse, QCPItemText, QCPItem←Rect, QCPItemCurve, QCPItemLine, and QCPItemStraightLine.

5.7.6.8 setClipAxisRect()

```
void QCPAbstractItem::setClipAxisRect (
            QCPAxisRect * rect )
```

Sets the clip axis rect. It defines the rect that will be used to clip the item when setClipToAxisRect is set to true.

See also

setClipToAxisRect

5.7.6.9 setClipToAxisRect()

```
void QCPAbstractItem::setClipToAxisRect (
            bool clip )
```

Sets whether the item shall be clipped to an axis rect or whether it shall be visible on the entire QCustomPlot. The axis rect can be set with setClipAxisRect.

See also

setClipAxisRect

5.7.6.10 setSelectable()

```
void QCPAbstractItem::setSelectable (
            bool selectable )
```

Sets whether the user can (de-)select this item by clicking on the QCustomPlot surface. (When QCustomPlot::set↩ Interactions contains QCustomPlot::iSelectItems.)

However, even when *selectable* was set to false, it is possible to set the selection manually, by calling setSelected.

See also

QCustomPlot::setInteractions, setSelected

5.7.6.11 setSelected()

```
void QCPAbstractItem::setSelected (
            bool selected )
```

Sets whether this item is selected or not. When selected, it might use a different visual appearance (e.g. pen and brush), this depends on the specific item though.

The entire selection mechanism for items is handled automatically when QCustomPlot::setInteractions contains QCustomPlot::iSelectItems. You only need to call this function when you wish to change the selection state manually.

This function can change the selection state even when setSelectable was set to false.

emits the selectionChanged signal when *selected* is different from the previous selection state.

See also

setSelectable, selectTest

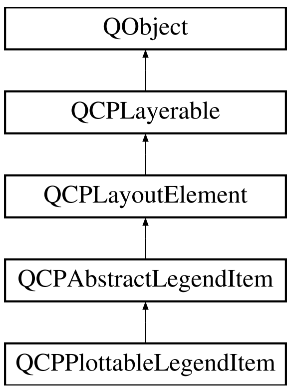
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.cpp

5.8 QCPAbstractLegendItem Class Reference

The abstract base class for all entries in a QCPLegend.

Inheritance diagram for QCPAbstractLegendItem:



Signals

- void selectionChanged (bool selected)
- void **selectableChanged** (bool selectable)

Public Member Functions

- QCPAbstractLegendItem (QCPLegend *parent)
- QCPLegend * **parentLegend** () const
- QFont **font** () const
- QColor **textColor** () const
- QFont **selectedFont** () const
- QColor **selectedTextColor** () const
- bool **selectable** () const
- bool **selected** () const
- void setFont (const QFont &font)
- void setTextColor (const QColor &color)
- void setSelectedFont (const QFont &font)
- void setSelectedTextColor (const QColor &color)
- Q_SLOT void setSelectable (bool selectable)
- Q_SLOT void setSelected (bool selected)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant *details=0) const Q_DECL_↩ OVERRIDE

Protected Member Functions

- virtual QCP::Interaction **selectionCategory** () const Q_DECL_OVERRIDE
- virtual void **applyDefaultAntialiasingHint** (QCPPainter *painter) const Q_DECL_OVERRIDE
- virtual QRect **clipRect** () const Q_DECL_OVERRIDE
- virtual void **draw** (QCPPainter *painter) Q_DECL_OVERRIDE=0
- virtual void **selectEvent** (QMouseEvent *event, bool additive, const QVariant &details, bool *selection↩ StateChanged) Q_DECL_OVERRIDE
- virtual void **deselectEvent** (bool *selectionStateChanged) Q_DECL_OVERRIDE

Protected Attributes

- QCPLegend * **mParentLegend**
- QFont **mFont**
- QColor **mTextColor**
- QFont **mSelectedFont**
- QColor **mSelectedTextColor**
- bool **mSelectable**
- bool **mSelected**

Friends

- class **QCPLegend**

Additional Inherited Members

5.8.1 Detailed Description

The abstract base class for all entries in a QCPLegend.

It defines a very basic interface for entries in a QCPLegend. For representing plottables in the legend, the subclass QCPPlottableLegendItem is more suitable.

Only derive directly from this class when you need absolute freedom (e.g. a custom legend entry that's not even associated with a plottable).

You must implement the following pure virtual functions:

- draw (from QCPLayerable)

You inherit the following members you may use:

QCPLegend *mParentLegend	A pointer to the parent QCPLegend.
QFont mFont	The generic font of the item. You should use this font for all or at least the most prominent text of the item.

5.8.2 Constructor & Destructor Documentation

5.8.2.1 QCPAbstractLegendItem()

```
QCPAbstractLegendItem::QCPAbstractLegendItem (
            QCPLegend * parent ) [explicit]
```

Constructs a QCPAbstractLegendItem and associates it with the QCPLegend *parent*. This does not cause the item to be added to *parent*, so QCPLegend::addItem must be called separately.

5.8.3 Member Function Documentation

5.8.3.1 selectionChanged

```
void QCPAbstractLegendItem::selectionChanged (
            bool selected ) [signal]
```

This signal is emitted when the selection state of this legend item has changed, either by user interaction or by a direct call to setSelected.

5.8.3.2 selectTest()

```
double QCPAbstractLegendItem::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const [virtual]
```

Layout elements are sensitive to events inside their outer rect. If *pos* is within the outer rect, this method returns a value corresponding to 0.99 times the parent plot's selection tolerance. However, layout elements are not selectable by default. So if *onlySelectable* is true, -1.0 is returned.

See QCPLayerable::selectTest for a general explanation of this virtual method.

QCPLayoutElement subclasses may reimplement this method to provide more specific selection test behaviour.

Reimplemented from QCPLayoutElement.

5.8.3.3 setFont()

```
void QCPAbstractLegendItem::setFont (
            const QFont & font )
```

Sets the default font of this specific legend item to *font*.

See also

setTextColor, QCPLegend::setFont

5.8.3.4 setSelectable()

```
void QCPAbstractLegendItem::setSelectable (
            bool selectable )
```

Sets whether this specific legend item is selectable.

See also

setSelectedParts, QCustomPlot::setInteractions

5.8.3.5 setSelected()

```
void QCPAbstractLegendItem::setSelected (
            bool selected )
```

Sets whether this specific legend item is selected.

It is possible to set the selection state of this item by calling this function directly, even if setSelectable is set to false.

See also

setSelectableParts, QCustomPlot::setInteractions

5.8.3.6 setSelectedFont()

```
void QCPAbstractLegendItem::setSelectedFont (
            const QFont & font )
```

When this legend item is selected, *font* is used to draw generic text, instead of the normal font set with setFont.

See also

setFont, QCPLegend::setSelectedFont

5.8.3.7 setSelectedTextColor()

```
void QCPAbstractLegendItem::setSelectedTextColor (
            const QColor & color )
```

When this legend item is selected, *color* is used to draw generic text, instead of the normal color set with setText↩ Color.

See also

setTextColor, QCPLegend::setSelectedTextColor

5.8.3.8 setTextColor()

```
void QCPAbstractLegendItem::setTextColor (
            const QColor & color )
```

Sets the default text color of this specific legend item to *color*.

See also

setFont, QCPLegend::setTextColor

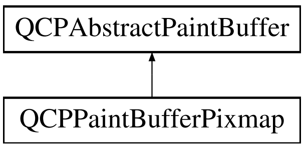
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.9 QCPAbstractPaintBuffer Class Reference

The abstract base class for paint buffers, which define the rendering backend.

Inheritance diagram for QCPAbstractPaintBuffer:



Public Member Functions

- QCPAbstractPaintBuffer (const QSize &size, double devicePixelRatio)
- QSize **size** () const
- bool **invalidated** () const
- double **devicePixelRatio** () const
- void setSize (const QSize &size)
- void setInvalidated (bool invalidated=true)
- void setDevicePixelRatio (double ratio)
- virtual QCPPainter ∗ startPainting ()=0
- virtual void donePainting ()
- virtual void draw (QCPPainter ∗painter) const =0
- virtual void clear (const QColor &color)=0

Protected Member Functions

- virtual void reallocateBuffer ()=0

Protected Attributes

- QSize **mSize**
- double **mDevicePixelRatio**
- bool **mInvalidated**

5.9.1 Detailed Description

The abstract base class for paint buffers, which define the rendering backend.

This abstract base class defines the basic interface that a paint buffer needs to provide in order to be usable by QCustomPlot.

A paint buffer manages both a surface to draw onto, and the matching paint device. The size of the surface can be changed via setSize. External classes (QCustomPlot and QCPLayer) request a painter via startPainting and then perform the draw calls. Once the painting is complete, donePainting is called, so the paint buffer implementation can do clean up if necessary. Before rendering a frame, each paint buffer is usually filled with a color using clear (usually the color is `Qt::transparent`), to remove the contents of the previous frame.

The simplest paint buffer implementation is QCPPaintBufferPixmap which allows regular software rendering via the raster engine. Hardware accelerated rendering via pixel buffers and frame buffer objects is provided by QCPPaintBufferGlPbuffer and QCPPaintBufferGlFbo. They are used automatically if QCustomPlot::setOpenGl is enabled.

5.9.2 Constructor & Destructor Documentation

5.9.2.1 QCPAbstractPaintBuffer()

```
QCPAbstractPaintBuffer::QCPAbstractPaintBuffer (
            const QSize & size,
            double devicePixelRatio )  [explicit]
```

Creates a paint buffer and initializes it with the provided *size* and *devicePixelRatio*.

Subclasses must call their reallocateBuffer implementation in their respective constructors.

5.9.3 Member Function Documentation

5.9.3.1 clear()

```
void QCPAbstractPaintBuffer::clear (
            const QColor & color )  [pure virtual]
```

Fills the entire buffer with the provided *color*. To have an empty transparent buffer, use the named color `Qt::transparent`.

This method must not be called if there is currently a painter (acquired with startPainting) active.

Implemented in QCPPaintBufferPixmap.

5.9.3.2 donePainting()

```
void QCPAbstractPaintBuffer::donePainting ( )  [inline], [virtual]
```

If you have acquired a QCPPainter to paint onto this paint buffer via startPainting, call this method as soon as you are done with the painting operations and have deleted the painter.

paint buffer subclasses may use this method to perform any type of cleanup that is necessary. The default implementation does nothing.

5.9.3.3 draw()

```
void QCPAbstractPaintBuffer::draw (
            QCPPainter * painter ) const  [pure virtual]
```

Draws the contents of this buffer with the provided *painter*. This is the method that is used to finally join all paint buffers and draw them onto the screen.

Implemented in QCPPaintBufferPixmap.

5.9.3.4 reallocateBuffer()

`void QCPAbstractPaintBuffer::reallocateBuffer ( ) [protected], [pure virtual]`

Reallocates the internal buffer with the currently configured size (setSize) and device pixel ratio, if applicable (set↩DevicePixelRatio). It is called as soon as any of those properties are changed on this paint buffer.

Note

Subclasses of QCPAbstractPaintBuffer must call their reimplementation of this method in their constructor, to perform the first allocation (this can not be done by the base class because calling pure virtual methods in base class constructors is not possible).

Implemented in QCPPaintBufferPixmap.

5.9.3.5 setDevicePixelRatio()

```
void QCPAbstractPaintBuffer::setDevicePixelRatio (
            double ratio )
```

Sets the the device pixel ratio to *ratio*. This is useful to render on high-DPI output devices. The ratio is automatically set to the device pixel ratio used by the parent QCustomPlot instance.

The buffer is reallocated (by calling reallocateBuffer), so any painters that were obtained by startPainting are invalidated and must not be used after calling this method.

Note

This method is only available for Qt versions 5.4 and higher.

5.9.3.6 setInvalidated()

```
void QCPAbstractPaintBuffer::setInvalidated (
            bool invalidated = true )
```

Sets the invalidated flag to *invalidated*.

This mechanism is used internally in conjunction with isolated replotting of QCPLayer instances (in QCPLayer↩::lmBuffered mode). If QCPLayer::replot is called on a buffered layer, i.e. an isolated repaint of only that layer (and its dedicated paint buffer) is requested, QCustomPlot will decide depending on the invalidated flags of other paint buffers whether it also replots them, instead of only the layer on which the replot was called.

The invalidated flag is set to true when QCPLayer association has changed, i.e. if layers were added or removed from this buffer, or if they were reordered. It is set to false as soon as all associated QCPLayer instances are drawn onto the buffer.

Under normal circumstances, it is not necessary to manually call this method.

5.9.3.7 setSize()

```
void QCPAbstractPaintBuffer::setSize (
            const QSize & size )
```

Sets the paint buffer size.

The buffer is reallocated (by calling reallocateBuffer), so any painters that were obtained by startPainting are invalidated and must not be used after calling this method.

If *size* is already the current buffer size, this method does nothing.

5.9.3.8 startPainting()

```
QCPPainter * QCPAbstractPaintBuffer::startPainting ( )  [pure virtual]
```

Returns a QCPPainter which is ready to draw to this buffer. The ownership and thus the responsibility to delete the painter after the painting operations are complete is given to the caller of this method.

Once you are done using the painter, delete the painter and call donePainting.

While a painter generated with this method is active, you must not call setSize, setDevicePixelRatio or clear.

This method may return 0, if a painter couldn't be activated on the buffer. This usually indicates a problem with the respective painting backend.

Implemented in QCPPaintBufferPixmap.

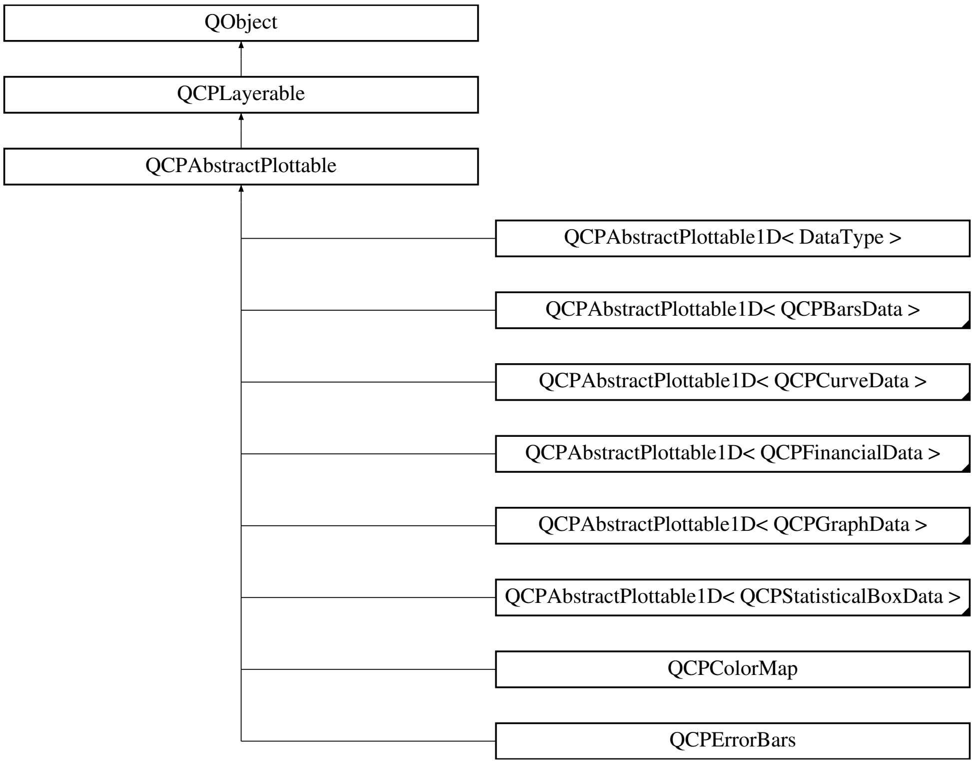
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
cpp

5.10 QCPAbstractPlottable Class Reference

The abstract base class for all data representing objects in a plot.

Inheritance diagram for QCPAbstractPlottable:



Signals

- void selectionChanged (bool selected)
- void selectionChanged (const QCPDataSelection &selection)
- void selectableChanged (QCP::SelectionType selectable)

Public Member Functions

- QCPAbstractPlottable (QCPAxis ∗keyAxis, QCPAxis ∗valueAxis)
- QString **name** () const
- bool **antialiasedFill** () const
- bool **antialiasedScatters** () const
- QPen **pen** () const
- QBrush **brush** () const
- QCPAxis ∗ **keyAxis** () const
- QCPAxis ∗ **valueAxis** () const
- QCP::SelectionType **selectable** () const
- bool selected () const
- QCPDataSelection selection () const
- QCPSelectionDecorator ∗ selectionDecorator () const
- void setName (const QString &name)
- void setAntialiasedFill (bool enabled)
- void setAntialiasedScatters (bool enabled)
- void setPen (const QPen &pen)
- void setBrush (const QBrush &brush)
- void setKeyAxis (QCPAxis ∗axis)
- void setValueAxis (QCPAxis ∗axis)
- Q_SLOT void setSelectable (QCP::SelectionType selectable)

- Q_SLOT void setSelection (QCPDataSelection selection)
- void setSelectionDecorator (QCPSelectionDecorator ∗decorator)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const =0
- virtual QCPPlottableInterface1D ∗ interface1D ()
- virtual QCPRange getKeyRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth) const =0
- virtual QCPRange getValueRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth, const QCPRange &inKeyRange=QCPRange()) const =0
- void coordsToPixels (double key, double value, double &x, double &y) const
- const QPointF coordsToPixels (double key, double value) const
- void pixelsToCoords (double x, double y, double &key, double &value) const
- void pixelsToCoords (const QPointF &pixelPos, double &key, double &value) const
- void rescaleAxes (bool onlyEnlarge=false) const
- void rescaleKeyAxis (bool onlyEnlarge=false) const
- void rescaleValueAxis (bool onlyEnlarge=false, bool inKeyRange=false) const
- bool addToLegend (QCPLegend ∗legend)
- bool addToLegend ()
- bool removeFromLegend (QCPLegend ∗legend) const
- bool removeFromLegend () const

Protected Member Functions

- virtual QRect **clipRect** () const Q_DECL_OVERRIDE
- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE=0
- virtual QCP::Interaction **selectionCategory** () const Q_DECL_OVERRIDE
- void **applyDefaultAntialiasingHint** (QCPPainter ∗painter) const Q_DECL_OVERRIDE
- virtual void **selectEvent** (QMouseEvent ∗event, bool additive, const QVariant &details, bool ∗selection↩ StateChanged) Q_DECL_OVERRIDE
- virtual void **deselectEvent** (bool ∗selectionStateChanged) Q_DECL_OVERRIDE
- virtual void **drawLegendIcon** (QCPPainter ∗painter, const QRectF &rect) const =0
- void **applyFillAntialiasingHint** (QCPPainter ∗painter) const
- void **applyScattersAntialiasingHint** (QCPPainter ∗painter) const

Protected Attributes

- QString **mName**
- bool **mAntialiasedFill**
- bool **mAntialiasedScatters**
- QPen **mPen**
- QBrush **mBrush**
- QPointer< QCPAxis > **mKeyAxis**
- QPointer< QCPAxis > **mValueAxis**
- QCP::SelectionType **mSelectable**
- QCPDataSelection **mSelection**
- QCPSelectionDecorator ∗ **mSelectionDecorator**

Friends

- class **QCustomPlot**
- class **QCPAxis**
- class **QCPPlottableLegendItem**

5.10.1 Detailed Description

The abstract base class for all data representing objects in a plot.

It defines a very basic interface like name, pen, brush, visibility etc. Since this class is abstract, it can't be instantiated. Use one of the subclasses or create a subclass yourself to create new ways of displaying data (see "Creating own plottables" below). Plottables that display one-dimensional data (i.e. data points have a single key dimension and one or multiple values at each key) are based off of the template subclass QCPAbstractPlottable1D, see details there.

All further specifics are in the subclasses, for example:

- A normal graph with possibly a line and/or scatter points QCPGraph (typically created with QCustomPlot↩::addGraph)
- A parametric curve: QCPCurve
- A bar chart: QCPBars
- A statistical box plot: QCPStatisticalBox
- A color encoded two-dimensional map: QCPColorMap
- An OHLC/Candlestick chart: QCPFinancial

5.10.2 Creating own plottables

Subclassing directly from QCPAbstractPlottable is only recommended if you wish to display two-dimensional data like QCPColorMap, i.e. two logical key dimensions and one (or more) data dimensions. If you want to display data with only one logical key dimension, you should rather derive from QCPAbstractPlottable1D.

If subclassing QCPAbstractPlottable directly, these are the pure virtual functions you must implement:

- selectTest
- draw
- drawLegendIcon
- getKeyRange
- getValueRange

See the documentation of those functions for what they need to do.

For drawing your plot, you can use the coordsToPixels functions to translate a point in plot coordinates to pixel coordinates. This function is quite convenient, because it takes the orientation of the key and value axes into account for you (x and y are swapped when the key axis is vertical and the value axis horizontal). If you are worried about performance (i.e. you need to translate many points in a loop like QCPGraph), you can directly use QCPAxis::coordToPixel. However, you must then take care about the orientation of the axis yourself.

Here are some important members you inherit from QCPAbstractPlottable:

QCustomPlot *mParentPlot	A pointer to the parent QCustomPlot instance. The parent plot is inferred from the axes that are passed in the constructor.
QString **mName**	The name of the plottable.
QPen **mPen**	The generic pen of the plottable. You should use this pen for the most prominent data representing lines in the plottable (e.g QCPGraph uses this pen for its graph lines and scatters)
QBrush **mBrush**	The generic brush of the plottable. You should use this brush for the most prominent fillable structures in the plottable (e.g. QCPGraph uses this brush to control filling under the graph)
QPointer<QCPAxis> **mKeyAxis**, **mValueAxis**	The key and value axes this plottable is attached to. Call their QCPAxis::coordToPixel functions to translate coordinates to pixels in either the key or value dimension. Make sure to check whether the pointer is null before using it. If one of the axes is null, don't draw the plottable.
QCPSelectionDecorator **mSelectionDecorator**	The currently set selection decorator which specifies how selected data of the plottable shall be drawn and decorated. When drawing your data, you must consult this decorator for the appropriate pen/brush before drawing unselected/selected data segments. Finally, you should call its QCPSelectionDecorator::drawDecoration method at the end of your draw implementation.
QCP::SelectionType **mSelectable**	In which composition, if at all, this plottable's data may be selected. Enforcing this setting on the data selection is done by QCPAbstractPlottable automatically.
QCPDataSelection **mSelection**	Holds the current selection state of the plottable's data, i.e. the selected data ranges (QCPDataRange).

5.10.3 Constructor & Destructor Documentation

5.10.3.1 QCPAbstractPlottable()

```
QCPAbstractPlottable::QCPAbstractPlottable (
            QCPAxis * keyAxis,
            QCPAxis * valueAxis )
```

Constructs an abstract plottable which uses *keyAxis* as its key axis ("x") and *valueAxis* as its value axis ("y"). *key↩ Axis* and *valueAxis* must reside in the same QCustomPlot instance and have perpendicular orientations. If either of these restrictions is violated, a corresponding message is printed to the debug output (qDebug), the construction is not aborted, though.

Since QCPAbstractPlottable is an abstract class that defines the basic interface to plottables, it can't be directly instantiated.

You probably want one of the subclasses like QCPGraph or QCPCurve instead.

5.10.4 Member Function Documentation

5.10.4.1 addToLegend() [1/2]

```
bool QCPAbstractPlottable::addToLegend (
            QCPLegend * legend )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds this plottable to the specified *legend*.

Creates a QCPPlottableLegendItem which is inserted into the legend. Returns true on success, i.e. when the legend exists and a legend item associated with this plottable isn't already in the legend.

If the plottable needs a more specialized representation in the legend, you can create a corresponding subclass of QCPPlottableLegendItem and add it to the legend manually instead of calling this method.

See also

removeFromLegend, QCPLegend::addItem

5.10.4.2 addToLegend() [2/2]

```
bool QCPAbstractPlottable::addToLegend ( )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds this plottable to the legend of the parent QCustomPlot (QCustomPlot::legend).

See also

removeFromLegend

5.10.4.3 coordsToPixels() [1/2]

```
void QCPAbstractPlottable::coordsToPixels (
            double key,
            double value,
            double & x,
            double & y ) const
```

Convenience function for transforming a key/value pair to pixels on the QCustomPlot surface, taking the orientations of the axes associated with this plottable into account (e.g. whether key represents x or y).

key and *value* are transformed to the coodinates in pixels and are written to *x* and *y*.

See also

pixelsToCoords, QCPAxis::coordToPixel

5.10.4.4 coordsToPixels() [2/2]

```
const QPointF QCPAbstractPlottable::coordsToPixels (
            double key,
            double value ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Transforms the given *key* and *value* to pixel coordinates and returns them in a QPointF.

5.10.4.5 getKeyRange()

```
QCPRange QCPAbstractPlottable::getKeyRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth ) const [pure virtual]
```

Returns the coordinate range that all data in this plottable span in the key axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSignDomain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getValueRange

Implemented in QCPErrorBars, QCPFinancial, QCPColorMap, QCPStatisticalBox, QCPBars, QCPCurve, and QCPGraph.

5.10.4.6 getValueRange()

```
QCPRange QCPAbstractPlottable::getValueRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth,
            const QCPRange & inKeyRange = QCPRange() ) const [pure virtual]
```

Returns the coordinate range that the data points in the specified key range (*inKeyRange*) span in the value axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSignDomain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

If *inKeyRange* has both lower and upper bound set to zero (is equal to `QCPRange()`), all data points are considered, without any restriction on the keys.

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getKeyRange

Implemented in QCPErrorBars, QCPFinancial, QCPColorMap, QCPStatisticalBox, QCPBars, QCPCurve, and QCPGraph.

5.10.4.7 interface1D()

```
QCPPlottableInterface1D * QCPAbstractPlottable::interface1D ( )  [inline], [virtual]
```

If this plottable is a one-dimensional plottable, i.e. it implements the QCPPlottableInterface1D, returns the *this* pointer with that type. Otherwise (e.g. in the case of a QCPColorMap) returns zero.

You can use this method to gain read access to data coordinates while holding a pointer to the abstract base class only.

Reimplemented in QCPErrorBars, QCPAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCPFinancialData >, QCPAbstractPlottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCPGraphData >, QCPAbstractPlottable1D< QCPBarsData >, and QCPAbstractPlottable1D< QCPCurveData >.

5.10.4.8 pixelsToCoords() [1/2]

```
void QCPAbstractPlottable::pixelsToCoords (
             double x,
             double y,
             double & key,
             double & value ) const
```

Convenience function for transforming a x/y pixel pair on the QCustomPlot surface to plot coordinates, taking the orientations of the axes associated with this plottable into account (e.g. whether key represents x or y).

x and *y* are transformed to the plot coodinates and are written to *key* and *value*.

See also

coordsToPixels, QCPAxis::coordToPixel

5.10.4.9 pixelsToCoords() [2/2]

```
void QCPAbstractPlottable::pixelsToCoords (
             const QPointF & pixelPos,
             double & key,
             double & value ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Returns the pixel input *pixelPos* as plot coordinates *key* and *value*.

5.10.4.10 removeFromLegend() [1/2]

```
bool QCPAbstractPlottable::removeFromLegend (
            QCPLegend * legend ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Removes the plottable from the specifed *legend*. This means the QCPPlottableLegendItem that is associated with this plottable is removed.

Returns true on success, i.e. if the legend exists and a legend item associated with this plottable was found and removed.

See also

addToLegend, QCPLegend::removeItem

5.10.4.11 removeFromLegend() [2/2]

```
bool QCPAbstractPlottable::removeFromLegend ( ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Removes the plottable from the legend of the parent QCustomPlot.

See also

addToLegend

5.10.4.12 rescaleAxes()

```
void QCPAbstractPlottable::rescaleAxes (
            bool onlyEnlarge = false ) const
```

Rescales the key and value axes associated with this plottable to contain all displayed data, so the whole plottable is visible. If the scaling of an axis is logarithmic, rescaleAxes will make sure not to rescale to an illegal range i.e. a range containing different signs and/or zero. Instead it will stay in the current sign domain and ignore all parts of the plottable that lie outside of that domain.

onlyEnlarge makes sure the ranges are only expanded, never reduced. So it's possible to show multiple plottables in their entirety by multiple calls to rescaleAxes where the first call has *onlyEnlarge* set to false (the default), and all subsequent set to true.

See also

rescaleKeyAxis, rescaleValueAxis, QCustomPlot::rescaleAxes, QCPAxis::rescale

5.10.4.13 rescaleKeyAxis()

```
void QCPAbstractPlottable::rescaleKeyAxis (
            bool onlyEnlarge = false ) const
```

Rescales the key axis of the plottable so the whole plottable is visible.

See rescaleAxes for detailed behaviour.

5.10.4.14 rescaleValueAxis()

```
void QCPAbstractPlottable::rescaleValueAxis (
            bool onlyEnlarge = false,
            bool inKeyRange = false ) const
```

Rescales the value axis of the plottable so the whole plottable is visible. If *inKeyRange* is set to true, only the data points which are in the currently visible key axis range are considered.

Returns true if the axis was actually scaled. This might not be the case if this plottable has an invalid range, e.g. because it has no data points.

See rescaleAxes for detailed behaviour.

5.10.4.15 selectableChanged

```
void QCPAbstractPlottable::selectableChanged (
            QCP::SelectionType selectable ) [signal]
```

This signal is emitted when the selectability of this plottable has changed.

See also

setSelectable

5.10.4.16 selected()

```
bool QCPAbstractPlottable::selected ( ) const [inline]
```

Returns true if there are any data points of the plottable currently selected. Use selection to retrieve the current QCPDataSelection.

5.10.4.17 selection()

```
QCPDataSelection QCPAbstractPlottable::selection ( ) const [inline]
```

Returns a QCPDataSelection encompassing all the data points that are currently selected on this plottable.

See also

selected, setSelection, setSelectable

5.10.4.18 selectionChanged [1/2]

```
void QCPAbstractPlottable::selectionChanged (
            bool selected )  [signal]
```

This signal is emitted when the selection state of this plottable has changed, either by user interaction or by a direct call to setSelection. The parameter *selected* indicates whether there are any points selected or not.

See also

selectionChanged(const QCPDataSelection &selection)

5.10.4.19 selectionChanged [2/2]

```
void QCPAbstractPlottable::selectionChanged (
            const QCPDataSelection & selection )  [signal]
```

This signal is emitted when the selection state of this plottable has changed, either by user interaction or by a direct call to setSelection. The parameter *selection* holds the currently selected data ranges.

See also

selectionChanged(bool selected)

5.10.4.20 selectionDecorator()

```
QCPSelectionDecorator * QCPAbstractPlottable::selectionDecorator ( ) const  [inline]
```

Provides access to the selection decorator of this plottable. The selection decorator controls how selected data ranges are drawn (e.g. their pen color and fill), see QCPSelectionDecorator for details.

If you wish to use an own QCPSelectionDecorator subclass, pass an instance of it to setSelectionDecorator.

5.10.4.21 selectTest()

```
virtual double QCPAbstractPlottable::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [pure virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Reimplemented from QCPLayerable.

Implemented in QCPErrorBars, QCPFinancial, QCPColorMap, QCPStatisticalBox, QCPBars, QCPCurve, QCP←Graph, QCPAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCPFinancialData >, QCPAbstract←Plottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCPGraphData >, QCPAbstractPlottable1D< QCPBarsData >, and QCPAbstractPlottable1D< QCPCurveData >.

5.10.4.22 setAntialiasedFill()

```
void QCPAbstractPlottable::setAntialiasedFill (
            bool enabled )
```

Sets whether fills of this plottable are drawn antialiased or not.

Note that this setting may be overridden by QCustomPlot::setAntialiasedElements and QCustomPlot::setNot←AntialiasedElements.

5.10.4.23 setAntialiasedScatters()

```
void QCPAbstractPlottable::setAntialiasedScatters (
            bool enabled )
```

Sets whether the scatter symbols of this plottable are drawn antialiased or not.

Note that this setting may be overridden by QCustomPlot::setAntialiasedElements and QCustomPlot::setNot↩AntialiasedElements.

5.10.4.24 setBrush()

```
void QCPAbstractPlottable::setBrush (
            const QBrush & brush )
```

The brush is used to draw basic fills of the plottable representation in the plot. The Fill can be a color, gradient or texture, see the usage of QBrush.

For example, the QCPGraph subclass draws the fill under the graph with this brush, when it's not set to Qt::NoBrush.

See also

setPen

5.10.4.25 setKeyAxis()

```
void QCPAbstractPlottable::setKeyAxis (
            QCPAxis * axis )
```

The key axis of a plottable can be set to any axis of a QCustomPlot, as long as it is orthogonal to the plottable's value axis. This function performs no checks to make sure this is the case. The typical mathematical choice is to use the x-axis (QCustomPlot::xAxis) as key axis and the y-axis (QCustomPlot::yAxis) as value axis.

Normally, the key and value axes are set in the constructor of the plottable (or QCustomPlot::addGraph when working with QCPGraphs through the dedicated graph interface).

See also

setValueAxis

5.10.4.26 setName()

```
void QCPAbstractPlottable::setName (
            const QString & name )
```

The name is the textual representation of this plottable as it is displayed in the legend (QCPLegend). It may contain any UTF-8 characters, including newlines.

5.10.4.27 setPen()

```
void QCPAbstractPlottable::setPen (
            const QPen & pen )
```

The pen is used to draw basic lines that make up the plottable representation in the plot.

For example, the QCPGraph subclass draws its graph lines with this pen.

See also

setBrush

5.10.4.28 setSelectable()

```
void QCPAbstractPlottable::setSelectable (
            QCP::SelectionType selectable )
```

Sets whether and to which granularity this plottable can be selected.

A selection can happen by clicking on the QCustomPlot surface (When QCustomPlot::setInteractions contains QC↩ P::iSelectPlottables), by dragging a selection rect (When QCustomPlot::setSelectionRectMode is QCP::srmSelect), or programmatically by calling setSelection.

See also

setSelection, QCP::SelectionType

5.10.4.29 setSelection()

```
void QCPAbstractPlottable::setSelection (
            QCPDataSelection selection )
```

Sets which data ranges of this plottable are selected. Selected data ranges are drawn differently (e.g. color) in the plot. This can be controlled via the selection decorator (see selectionDecorator).

The entire selection mechanism for plottables is handled automatically when QCustomPlot::setInteractions contains iSelectPlottables. You only need to call this function when you wish to change the selection state programmatically.

Using setSelectable you can further specify for each plottable whether and to which granularity it is selectable. If *selection* is not compatible with the current QCP::SelectionType set via setSelectable, the resulting selection will be adjusted accordingly (see QCPDataSelection::enforceType).

emits the selectionChanged signal when *selected* is different from the previous selection state.

See also

setSelectable, selectTest

5.10.4.30 setSelectionDecorator()

```
void QCPAbstractPlottable::setSelectionDecorator (
            QCPSelectionDecorator * decorator )
```

Use this method to set an own QCPSelectionDecorator (subclass) instance. This allows you to customize the visual representation of selected data ranges further than by using the default QCPSelectionDecorator.

The plottable takes ownership of the *decorator*.

The currently set decorator can be accessed via selectionDecorator.

5.10.4.31 setValueAxis()

```
void QCPAbstractPlottable::setValueAxis (
            QCPAxis * axis )
```

The value axis of a plottable can be set to any axis of a QCustomPlot, as long as it is orthogonal to the plottable's key axis. This function performs no checks to make sure this is the case. The typical mathematical choice is to use the x-axis (QCustomPlot::xAxis) as key axis and the y-axis (QCustomPlot::yAxis) as value axis.

Normally, the key and value axes are set in the constructor of the plottable (or QCustomPlot::addGraph when working with QCPGraphs through the dedicated graph interface).

See also

setKeyAxis

The documentation for this class was generated from the following files:

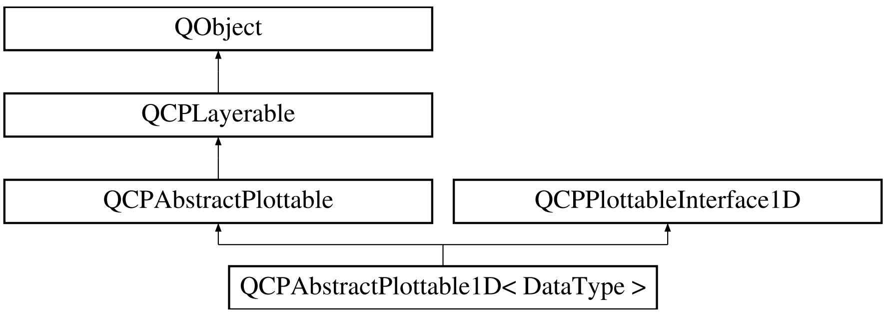
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.11 QCPAbstractPlottable1D< DataType > Class Template Reference

A template base class for plottables with one-dimensional data.

```
#include <qcustomplot.h>
```

Inheritance diagram for QCPAbstractPlottable1D< DataType >:



Public Member Functions

- QCPAbstractPlottable1D (QCPAxis *keyAxis, QCPAxis *valueAxis)
- virtual int dataCount () const
- virtual double dataMainKey (int index) const
- virtual double dataSortKey (int index) const
- virtual double dataMainValue (int index) const
- virtual QCPRange dataValueRange (int index) const
- virtual QPointF dataPixelPosition (int index) const
- virtual bool sortKeyIsMainKey () const
- virtual QCPDataSelection selectTestRect (const QRectF &rect, bool onlySelectable) const
- virtual int findBegin (double sortKey, bool expandedRange=true) const
- virtual int findEnd (double sortKey, bool expandedRange=true) const
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant *details=0) const
- virtual QCPPlottableInterface1D * interface1D ()

Protected Member Functions

- void getDataSegments (QList< QCPDataRange > &selectedSegments, QList< QCPDataRange > &unselectedSegments) const
- void drawPolyline (QCPPainter *painter, const QVector< QPointF > &lineData) const

Protected Attributes

- QSharedPointer< QCPDataContainer< DataType > > **mDataContainer**

Additional Inherited Members

5.11.1 Detailed Description

template<class DataType>
class QCPAbstractPlottable1D< DataType >

A template base class for plottables with one-dimensional data.

This template class derives from QCPAbstractPlottable and from the abstract interface QCPPlottableInterface1D. It serves as a base class for all one-dimensional data (i.e. data with one key dimension), such as QCPGraph and QCPCurve.

The template parameter *DataType* is the type of the data points of this plottable (e.g. QCPGraphData or QCP←CurveData). The main purpose of this base class is to provide the member *mDataContainer* (a shared pointer to a QCPDataContainer<DataType>) and implement the according virtual methods of the QCPPlottableInterface1D, such that most subclassed plottables don't need to worry about this anymore.

Further, it provides a convenience method for retrieving selected/unselected data segments via getDataSegments. This is useful when subclasses implement their draw method and need to draw selected segments with a different pen/brush than unselected segments (also see QCPSelectionDecorator).

This class implements basic functionality of QCPAbstractPlottable::selectTest and QCPPlottableInterface1D←::selectTestRect, assuming point-like data points, based on the 1D data interface. In spite of that, most plottable subclasses will want to reimplement those methods again, to provide a more accurate hit test based on their specific data visualization geometry.

5.11.2 Constructor & Destructor Documentation

5.11.2.1 QCPAbstractPlottable1D()

```
template<class DataType >
QCPAbstractPlottable1D< DataType >::QCPAbstractPlottable1D (
            QCPAxis * keyAxis,
            QCPAxis * valueAxis )
```

Forwards *keyAxis* and *valueAxis* to the QCPAbstractPlottable constructor and allocates the *mDataContainer*.

5.11.3 Member Function Documentation

5.11.3.1 dataCount()

```
template<class DataType >
int QCPAbstractPlottable1D< DataType >::dataCount ( ) const [virtual]
```

Returns the number of data points of the plottable.

Implements QCPPlottableInterface1D.

5.11.3.2 dataMainKey()

```
template<class DataType >
double QCPAbstractPlottable1D< DataType >::dataMainKey (
            int index ) const [virtual]
```

Returns the main key of the data point at the given *index*.

What the main key is, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implements QCPPlottableInterface1D.

5.11.3.3 dataMainValue()

```
template<class DataType >
double QCPAbstractPlottable1D< DataType >::dataMainValue (
            int index ) const [virtual]
```

Returns the main value of the data point at the given *index*.

What the main value is, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implements QCPPlottableInterface1D.

5.11.3.4 dataPixelPosition()

```
template<class DataType >
QPointF QCPAbstractPlottable1D< DataType >::dataPixelPosition (
            int index ) const [virtual]
```

Returns the pixel position on the widget surface at which the data point at the given *index* appears.

Usually this corresponds to the point of dataMainKey/dataMainValue, in pixel coordinates. However, depending on the plottable, this might be a different apparent position than just a coord-to-pixel transform of those values. For example, QCPBars apparent data values can be shifted depending on their stacking, bar grouping or configured base value.

Implements QCPPlottableInterface1D.

Reimplemented in QCPBars.

5.11.3.5 dataSortKey()

```
template<class DataType >
double QCPAbstractPlottable1D< DataType >::dataSortKey (
            int index ) const [virtual]
```

Returns the sort key of the data point at the given *index*.

What the sort key is, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implements QCPPlottableInterface1D.

5.11.3.6 dataValueRange()

```
template<class DataType >
QCPRange QCPAbstractPlottable1D< DataType >::dataValueRange (
            int index ) const  [virtual]
```

Returns the value range of the data point at the given *index*.

What the value range is, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implements QCPPlottableInterface1D.

5.11.3.7 drawPolyline()

```
template<class DataType >
void QCPAbstractPlottable1D< DataType >::drawPolyline (
            QCPPainter * painter,
            const QVector< QPointF > & lineData ) const  [protected]
```

A helper method which draws a line with the passed *painter*, according to the pixel data in *lineData*. NaN points create gaps in the line, as expected from QCustomPlot's plottables (this is the main difference to QPainter's regular drawPolyline, which handles NaNs by lagging or crashing).

Further it uses a faster line drawing technique based on QCPPainter::drawLine rather than `QPainter::drawPolyline` if the configured QCustomPlot::setPlottingHints() and *painter* style allows.

5.11.3.8 findBegin()

```
template<class DataType >
int QCPAbstractPlottable1D< DataType >::findBegin (
            double sortKey,
            bool expandedRange = true ) const  [virtual]
```

Returns the index of the data point with a (sort-)key that is equal to, just below, or just above *sortKey*. If *expandedRange* is true, the data point just below *sortKey* will be considered, otherwise the one just above.

This can be used in conjunction with findEnd to iterate over data points within a given key range, including or excluding the bounding data points that are just beyond the specified range.

If *expandedRange* is true but there are no data points below *sortKey*, 0 is returned.

If the container is empty, returns 0 (in that case, findEnd will also return 0, so a loop using these methods will not iterate over the index 0).

See also

findEnd, QCPDataContainer::findBegin

Implements QCPPlottableInterface1D.

5.11.3.9 findEnd()

```
template<class DataType >
int QCPAbstractPlottable1D< DataType >::findEnd (
            double sortKey,
            bool expandedRange = true ) const  [virtual]
```

Returns the index one after the data point with a (sort-)key that is equal to, just above, or just below *sortKey*. If *expandedRange* is true, the data point just above *sortKey* will be considered, otherwise the one just below.

This can be used in conjunction with findBegin to iterate over data points within a given key range, including the bounding data points that are just below and above the specified range.

If *expandedRange* is true but there are no data points above *sortKey*, the index just above the highest data point is returned.

If the container is empty, returns 0.

See also

findBegin, QCPDataContainer::findEnd

Implements QCPPlottableInterface1D.

5.11.3.10 getDataSegments()

```
template<class DataType >
void QCPAbstractPlottable1D< DataType >::getDataSegments (
            QList< QCPDataRange > & selectedSegments,
            QList< QCPDataRange > & unselectedSegments ) const  [protected]
```

Splits all data into selected and unselected segments and outputs them via *selectedSegments* and *unselected↩Segments*, respectively.

This is useful when subclasses implement their draw method and need to draw selected segments with a different pen/brush than unselected segments (also see QCPSelectionDecorator).

See also

setSelection

5.11.3.11 interface1D()

```
template<class DataType>
QCPPlottableInterface1D * QCPAbstractPlottable1D< DataType >::interface1D ( )  [inline], [virtual]
```

Returns a QCPPlottableInterface1D pointer to this plottable, providing access to its 1D interface.

Reimplemented from QCPAbstractPlottable.

5.11.3.12 selectTest()

```
template<class DataType >
double QCPAbstractPlottable1D< DataType >::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

Implements a point-selection algorithm assuming the data (accessed via the 1D data interface) is point-like. Most subclasses will want to reimplement this method again, to provide a more accurate hit test based on the true data visualization geometry.

Implements QCPAbstractPlottable.

Reimplemented in QCPFinancial, QCPStatisticalBox, QCPBars, QCPCurve, and QCPGraph.

5.11.3.13 selectTestRect()

```
template<class DataType >
QCPDataSelection QCPAbstractPlottable1D< DataType >::selectTestRect (
            const QRectF & rect,
            bool onlySelectable ) const  [virtual]
```

Implements a rect-selection algorithm assuming the data (accessed via the 1D data interface) is point-like. Most subclasses will want to reimplement this method again, to provide a more accurate hit test based on the true data visualization geometry.

Implements QCPPlottableInterface1D.

Reimplemented in QCPFinancial, QCPStatisticalBox, and QCPBars.

5.11.3.14 sortKeyIsMainKey()

```
template<class DataType >
bool QCPAbstractPlottable1D< DataType >::sortKeyIsMainKey ( ) const  [virtual]
```

Returns whether the sort key (dataSortKey) is identical to the main key (dataMainKey).

What the sort and main keys are, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implements QCPPlottableInterface1D.

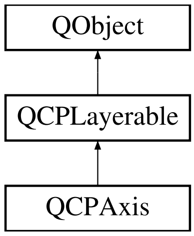
The documentation for this class was generated from the following file:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
h

5.12 QCPAxis Class Reference

Manages a single axis inside a QCustomPlot.

Inheritance diagram for QCPAxis:



Public Types

- enum AxisType { atLeft = 0x01, atRight = 0x02, atTop = 0x04, atBottom = 0x08 }
- enum LabelSide { lsInside, lsOutside }
- enum ScaleType { stLinear, stLogarithmic }
- enum SelectablePart { spNone = 0, spAxis = 0x001, spTickLabels = 0x002, spAxisLabel = 0x004 }

Signals

- void rangeChanged (const QCPRange &newRange)
- void rangeChanged (const QCPRange &newRange, const QCPRange &oldRange)
- void scaleTypeChanged (QCPAxis::ScaleType scaleType)
- void selectionChanged (const QCPAxis::SelectableParts &parts)
- void selectableChanged (const QCPAxis::SelectableParts &parts)

Public Member Functions

- QCPAxis (QCPAxisRect ∗parent, AxisType type)
- AxisType **axisType** () const
- QCPAxisRect ∗ **axisRect** () const
- ScaleType **scaleType** () const
- const QCPRange **range** () const
- bool **rangeReversed** () const
- QSharedPointer< QCPAxisTicker > ticker () const
- bool **ticks** () const
- bool **tickLabels** () const
- int **tickLabelPadding** () const
- QFont **tickLabelFont** () const
- QColor **tickLabelColor** () const
- double **tickLabelRotation** () const
- LabelSide **tickLabelSide** () const
- QString **numberFormat** () const
- int **numberPrecision** () const
- QVector< double > **tickVector** () const
- QVector< QString > **tickVectorLabels** () const
- int **tickLengthIn** () const

- int **tickLengthOut** () const
- bool **subTicks** () const
- int **subTickLengthIn** () const
- int **subTickLengthOut** () const
- QPen **basePen** () const
- QPen **tickPen** () const
- QPen **subTickPen** () const
- QFont **labelFont** () const
- QColor **labelColor** () const
- QString **label** () const
- int **labelPadding** () const
- int **padding** () const
- int **offset** () const
- SelectableParts **selectedParts** () const
- SelectableParts **selectableParts** () const
- QFont **selectedTickLabelFont** () const
- QFont **selectedLabelFont** () const
- QColor **selectedTickLabelColor** () const
- QColor **selectedLabelColor** () const
- QPen **selectedBasePen** () const
- QPen **selectedTickPen** () const
- QPen **selectedSubTickPen** () const
- QCPLineEnding **lowerEnding** () const
- QCPLineEnding **upperEnding** () const
- QCPGrid * grid () const
- Q_SLOT void setScaleType (QCPAxis::ScaleType type)
- Q_SLOT void setRange (const QCPRange &range)
- void setRange (double lower, double upper)
- void setRange (double position, double size, Qt::AlignmentFlag alignment)
- void setRangeLower (double lower)
- void setRangeUpper (double upper)
- void setRangeReversed (bool reversed)
- void setTicker (QSharedPointer< QCPAxisTicker > ticker)
- void setTicks (bool show)
- void setTickLabels (bool show)
- void setTickLabelPadding (int padding)
- void setTickLabelFont (const QFont &font)
- void setTickLabelColor (const QColor &color)
- void setTickLabelRotation (double degrees)
- void setTickLabelSide (LabelSide side)
- void setNumberFormat (const QString &formatCode)
- void setNumberPrecision (int precision)
- void setTickLength (int inside, int outside=0)
- void setTickLengthIn (int inside)
- void setTickLengthOut (int outside)
- void setSubTicks (bool show)
- void setSubTickLength (int inside, int outside=0)
- void setSubTickLengthIn (int inside)
- void setSubTickLengthOut (int outside)
- void setBasePen (const QPen &pen)
- void setTickPen (const QPen &pen)
- void setSubTickPen (const QPen &pen)
- void setLabelFont (const QFont &font)
- void setLabelColor (const QColor &color)
- void setLabel (const QString &str)

- void setLabelPadding (int padding)
- void setPadding (int padding)
- void setOffset (int offset)
- void setSelectedTickLabelFont (const QFont &font)
- void setSelectedLabelFont (const QFont &font)
- void setSelectedTickLabelColor (const QColor &color)
- void setSelectedLabelColor (const QColor &color)
- void setSelectedBasePen (const QPen &pen)
- void setSelectedTickPen (const QPen &pen)
- void setSelectedSubTickPen (const QPen &pen)
- Q_SLOT void setSelectableParts (const QCPAxis::SelectableParts &selectableParts)
- Q_SLOT void setSelectedParts (const QCPAxis::SelectableParts &selectedParts)
- void setLowerEnding (const QCPLineEnding &ending)
- void setUpperEnding (const QCPLineEnding &ending)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩ OVERRIDE
- Qt::Orientation orientation () const
- int pixelOrientation () const
- void moveRange (double diff)
- void scaleRange (double factor)
- void scaleRange (double factor, double center)
- void setScaleRatio (const QCPAxis ∗otherAxis, double ratio=1.0)
- void rescale (bool onlyVisiblePlottables=false)
- double pixelToCoord (double value) const
- double coordToPixel (double value) const
- SelectablePart getPartAt (const QPointF &pos) const
- QList< QCPAbstractPlottable ∗ > plottables () const
- QList< QCPGraph ∗ > graphs () const
- QList< QCPAbstractItem ∗ > items () const

Static Public Member Functions

- static AxisType marginSideToAxisType (QCP::MarginSide side)
- static Qt::Orientation orientation (AxisType type)
- static AxisType opposite (AxisType type)

Protected Member Functions

- virtual int **calculateMargin** ()
- virtual void **applyDefaultAntialiasingHint** (QCPPainter ∗painter) const Q_DECL_OVERRIDE
- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- virtual QCP::Interaction **selectionCategory** () const Q_DECL_OVERRIDE
- virtual void **selectEvent** (QMouseEvent ∗event, bool additive, const QVariant &details, bool ∗selection↩ StateChanged) Q_DECL_OVERRIDE
- virtual void **deselectEvent** (bool ∗selectionStateChanged) Q_DECL_OVERRIDE
- void **setupTickVectors** ()
- QPen **getBasePen** () const
- QPen **getTickPen** () const
- QPen **getSubTickPen** () const
- QFont **getTickLabelFont** () const
- QFont **getLabelFont** () const
- QColor **getTickLabelColor** () const
- QColor **getLabelColor** () const

Protected Attributes

- AxisType **mAxisType**
- QCPAxisRect ∗ **mAxisRect**
- int **mPadding**
- Qt::Orientation **mOrientation**
- SelectableParts **mSelectableParts**
- SelectableParts **mSelectedParts**
- QPen **mBasePen**
- QPen **mSelectedBasePen**
- QString **mLabel**
- QFont **mLabelFont**
- QFont **mSelectedLabelFont**
- QColor **mLabelColor**
- QColor **mSelectedLabelColor**
- bool **mTickLabels**
- QFont **mTickLabelFont**
- QFont **mSelectedTickLabelFont**
- QColor **mTickLabelColor**
- QColor **mSelectedTickLabelColor**
- int **mNumberPrecision**
- QLatin1Char **mNumberFormatChar**
- bool **mNumberBeautifulPowers**
- bool **mTicks**
- bool **mSubTicks**
- QPen **mTickPen**
- QPen **mSelectedTickPen**
- QPen **mSubTickPen**
- QPen **mSelectedSubTickPen**
- QCPRange **mRange**
- bool **mRangeReversed**
- ScaleType **mScaleType**
- QCPGrid ∗ **mGrid**
- QCPAxisPainterPrivate ∗ **mAxisPainter**
- QSharedPointer< QCPAxisTicker > **mTicker**
- QVector< double > **mTickVector**
- QVector< QString > **mTickVectorLabels**
- QVector< double > **mSubTickVector**
- bool **mCachedMarginValid**
- int **mCachedMargin**

Friends

- class **QCustomPlot**
- class **QCPGrid**
- class **QCPAxisRect**

5.12.1 Detailed Description

Manages a single axis inside a QCustomPlot.

Usually doesn't need to be instantiated externally. Access QCustomPlot's default four axes via QCustomPlot::xAxis (bottom), QCustomPlot::yAxis (left), QCustomPlot::xAxis2 (top) and QCustomPlot::yAxis2 (right).

Axes are always part of an axis rect, see QCPAxisRect.

Naming convention of axis parts

Overview of the spacings and paddings that define the geometry of an axis. The dashed gray line on the left represents the QCustomPlot widget border.

Each axis holds an instance of QCPAxisTicker which is used to generate the tick coordinates and tick labels. You can access the currently installed ticker or set a new one (possibly one of the specialized subclasses, or your own subclass) via setTicker. For details, see the documentation of QCPAxisTicker.

5.12.2 Member Enumeration Documentation

5.12.2.1 AxisType

`enum QCPAxis::AxisType`

Defines at which side of the axis rect the axis will appear. This also affects how the tick marks are drawn, on which side the labels are placed etc.

Enumerator

atLeft	`0x01` Axis is vertical and on the left side of the axis rect
atRight	`0x02` Axis is vertical and on the right side of the axis rect
atTop	`0x04` Axis is horizontal and on the top side of the axis rect
atBottom	`0x08` Axis is horizontal and on the bottom side of the axis rect

5.12.2.2 LabelSide

`enum QCPAxis::LabelSide`

Defines on which side of the axis the tick labels (numbers) shall appear.

See also

setTickLabelSide

Enumerator

lsInside	Tick labels will be displayed inside the axis rect and clipped to the inner axis rect.
lsOutside	Tick labels will be displayed outside the axis rect.

5.12.2.3 ScaleType

`enum QCPAxis::ScaleType`

Defines the scale of an axis.

See also

setScaleType

Enumerator

stLinear	Linear scaling.
stLogarithmic	Logarithmic scaling with correspondingly transformed axis coordinates (possibly also setTicker to a QCPAxisTickerLog instance).

5.12.2.4 SelectablePart

`enum QCPAxis::SelectablePart`

Defines the selectable parts of an axis.

See also

setSelectableParts, setSelectedParts

Enumerator

spNone	None of the selectable parts.
spAxis	The axis backbone and tick marks.
spTickLabels	Tick labels (numbers) of this axis (as a whole, not individually)
spAxisLabel	The axis label.

5.12.3 Constructor & Destructor Documentation

5.12.3.1 QCPAxis()

```
QCPAxis::QCPAxis (
            QCPAxisRect * parent,
            AxisType type ) [explicit]
```

Constructs an Axis instance of Type *type* for the axis rect *parent*.

Usually it isn't necessary to instantiate axes directly, because you can let QCustomPlot create them for you with QCPAxisRect::addAxis. If you want to use own QCPAxis-subclasses however, create them manually and then inject them also via QCPAxisRect::addAxis.

5.12.4 Member Function Documentation

5.12.4.1 coordToPixel()

```
double QCPAxis::coordToPixel (
            double value ) const
```

Transforms *value*, in coordinates of the axis, to pixel coordinates of the QCustomPlot widget.

5.12.4.2 getPartAt()

```
QCPAxis::SelectablePart QCPAxis::getPartAt (
            const QPointF & pos ) const
```

Returns the part of the axis that is hit by *pos* (in pixels). The return value of this function is independent of the user-selectable parts defined with setSelectableParts. Further, this function does not change the current selection state of the axis.

If the axis is not visible (setVisible), this function always returns spNone.

See also

setSelectedParts, setSelectableParts, QCustomPlot::setInteractions

5.12.4.3 graphs()

```
QList< QCPGraph * > QCPAxis::graphs ( ) const
```

Returns a list of all the graphs that have this axis as key or value axis.

See also

plottables, items

5.12.4.4 grid()

```
QCPGrid * QCPAxis::grid ( ) const [inline]
```

Returns the QCPGrid instance belonging to this axis. Access it to set details about the way the grid is displayed.

5.12.4.5 items()

```
QList< QCPAbstractItem * > QCPAxis::items ( ) const
```

Returns a list of all the items that are associated with this axis. An item is considered associated with an axis if at least one of its positions uses the axis as key or value axis.

See also

plottables, graphs

5.12.4.6 marginSideToAxisType()

```
QCPAxis::AxisType QCPAxis::marginSideToAxisType (
            QCP::MarginSide side ) [static]
```

Transforms a margin side to the logically corresponding axis type. (QCP::msLeft to QCPAxis::atLeft, QCP::msRight to QCPAxis::atRight, etc.)

5.12.4.7 moveRange()

```
void QCPAxis::moveRange (
            double diff )
```

If the scale type (setScaleType) is stLinear, *diff* is added to the lower and upper bounds of the range. The range is simply moved by *diff*.

If the scale type is stLogarithmic, the range bounds are multiplied by *diff*. This corresponds to an apparent "linear" move in logarithmic scaling by a distance of log(diff).

5.12.4.8 opposite()

```
QCPAxis::AxisType QCPAxis::opposite (
            QCPAxis::AxisType type )  [static]
```

Returns the axis type that describes the opposite axis of an axis with the specified *type*.

5.12.4.9 orientation() [1/2]

```
Qt::Orientation QCPAxis::orientation ( ) const  [inline]
```

Returns the orientation of this axis. The axis orientation (horizontal or vertical) is deduced from the axis type (left, top, right or bottom).

See also

orientation(AxisType type), pixelOrientation

5.12.4.10 orientation() [2/2]

```
static Qt::Orientation QCPAxis::orientation (
            AxisType type )  [inline], [static]
```

Returns the orientation of the specified axis type

See also

orientation(), pixelOrientation

5.12.4.11 pixelOrientation()

```
int QCPAxis::pixelOrientation ( ) const  [inline]
```

Returns which direction points towards higher coordinate values/keys, in pixel space.

This method returns either 1 or -1. If it returns 1, then going in the positive direction along the orientation of the axis in pixels corresponds to going from lower to higher axis coordinates. On the other hand, if this method returns -1, going to smaller pixel values corresponds to going from lower to higher axis coordinates.

For example, this is useful to easily shift axis coordinates by a certain amount given in pixels, without having to care about reversed or vertically aligned axes:

```
double newKey = keyAxis->pixelToCoord(keyAxis->coordToPixel(oldKey)+10*keyAxis->pixelOrientation());
```

newKey will then contain a key that is ten pixels towards higher keys, starting from *oldKey*.

5.12.4.12 pixelToCoord()

```
double QCPAxis::pixelToCoord (
            double value ) const
```

Transforms *value*, in pixel coordinates of the QCustomPlot widget, to axis coordinates.

5.12.4.13 plottables()

```
QList< QCPAbstractPlottable * > QCPAxis::plottables ( ) const
```

Returns a list of all the plottables that have this axis as key or value axis.

If you are only interested in plottables of type QCPGraph, see graphs.

See also

graphs, items

5.12.4.14 rangeChanged [1/2]

```
void QCPAxis::rangeChanged (
            const QCPRange & newRange ) [signal]
```

This signal is emitted when the range of this axis has changed. You can connect it to the setRange slot of another axis to communicate the new range to the other axis, in order for it to be synchronized.

You may also manipulate/correct the range with setRange in a slot connected to this signal. This is useful if for example a maximum range span shall not be exceeded, or if the lower/upper range shouldn't go beyond certain values (see QCPRange::bounded). For example, the following slot would limit the x axis to ranges between 0 and 10:

```
customPlot->xAxis->setRange(newRange.bounded(0, 10))
```

5.12.4.15 rangeChanged [2/2]

```
void QCPAxis::rangeChanged (
            const QCPRange & newRange,
            const QCPRange & oldRange ) [signal]
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Additionally to the new range, this signal also provides the previous range held by the axis as *oldRange*.

5.12.4.16 rescale()

```
void QCPAxis::rescale (
            bool onlyVisiblePlottables = false )
```

Changes the axis range such that all plottables associated with this axis are fully visible in that dimension.

See also

QCPAbstractPlottable::rescaleAxes, QCustomPlot::rescaleAxes

5.12.4.17 scaleRange() [1/2]

```
void QCPAxis::scaleRange (
            double factor )
```

Scales the range of this axis by *factor* around the center of the current axis range. For example, if *factor* is 2.0, then the axis range will double its size, and the point at the axis range center won't have changed its position in the QCustomPlot widget (i.e. coordinates around the center will have moved symmetrically closer).

If you wish to scale around a different coordinate than the current axis range center, use the overload scale←Range(double factor, double center).

5.12.4.18 scaleRange() [2/2]

```
void QCPAxis::scaleRange (
            double factor,
            double center )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Scales the range of this axis by *factor* around the coordinate *center*. For example, if *factor* is 2.0, *center* is 1.0, then the axis range will double its size, and the point at coordinate 1.0 won't have changed its position in the QCustomPlot widget (i.e. coordinates around 1.0 will have moved symmetrically closer to 1.0).

See also

scaleRange(double factor)

5.12.4.19 scaleTypeChanged

```
void QCPAxis::scaleTypeChanged (
            QCPAxis::ScaleType scaleType ) [signal]
```

This signal is emitted when the scale type changes, by calls to setScaleType

5.12.4.20 selectableChanged

```
void QCPAxis::selectableChanged (
            const QCPAxis::SelectableParts & parts )  [signal]
```

This signal is emitted when the selectability changes, by calls to setSelectableParts

5.12.4.21 selectionChanged

```
void QCPAxis::selectionChanged (
            const QCPAxis::SelectableParts & parts )  [signal]
```

This signal is emitted when the selection state of this axis has changed, either by user interaction or by a direct call to setSelectedParts.

5.12.4.22 selectTest()

```
double QCPAxis::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Reimplemented from QCPLayerable.

5.12.4.23 setBasePen()

```
void QCPAxis::setBasePen (
            const QPen & pen )
```

Sets the pen, the axis base line is drawn with.

See also

setTickPen, setSubTickPen

5.12.4.24 setLabel()

```
void QCPAxis::setLabel (
            const QString & str )
```

Sets the text of the axis label that will be shown below/above or next to the axis, depending on its orientation. To disable axis labels, pass an empty string as *str*.

5.12.4.25 setLabelColor()

```
void QCPAxis::setLabelColor (
            const QColor & color )
```

Sets the color of the axis label.

See also

setLabelFont

5.12.4.26 setLabelFont()

```
void QCPAxis::setLabelFont (
            const QFont & font )
```

Sets the font of the axis label.

See also

setLabelColor

5.12.4.27 setLabelPadding()

```
void QCPAxis::setLabelPadding (
             int padding )
```

Sets the distance between the tick labels and the axis label.

See also

setTickLabelPadding, setPadding

5.12.4.28 setLowerEnding()

```
void QCPAxis::setLowerEnding (
             const QCPLineEnding & ending )
```

Sets the style for the lower axis ending. See the documentation of QCPLineEnding for available styles.

For horizontal axes, this method refers to the left ending, for vertical axes the bottom ending. Note that this meaning does not change when the axis range is reversed with setRangeReversed.

See also

setUpperEnding

5.12.4.29 setNumberFormat()

```
void QCPAxis::setNumberFormat (
             const QString & formatCode )
```

Sets the number format for the numbers in tick labels. This *formatCode* is an extended version of the format code used e.g. by QString::number() and QLocale::toString(). For reference about that, see the "Argument Formats" section in the detailed description of the QString class.

formatCode is a string of one, two or three characters. The first character is identical to the normal format code used by Qt. In short, this means: 'e'/'E' scientific format, 'f' fixed format, 'g'/'G' scientific or fixed, whichever is shorter.

The second and third characters are optional and specific to QCustomPlot:
If the first char was 'e' or 'g', numbers are/might be displayed in the scientific format, e.g. "5.5e9", which is ugly in a plot. So when the second char of *formatCode* is set to 'b' (for "beautiful"), those exponential numbers are formatted in a more natural way, i.e. "5.5 [multiplication sign] 10 [superscript] 9". By default, the multiplication sign is a centered dot. If instead a cross should be shown (as is usual in the USA), the third char of *formatCode* can be set to 'c'. The inserted multiplication signs are the UTF-8 characters 215 (0xD7) for the cross and 183 (0xB7) for the dot.

Examples for *formatCode:*

- `g` normal format code behaviour. If number is small, fixed format is used, if number is large, normal scientific format is used
- `gb` If number is small, fixed format is used, if number is large, scientific format is used with beautifully typeset decimal powers and a dot as multiplication sign
- `ebc` All numbers are in scientific format with beautifully typeset decimal power and a cross as multiplication sign
- `fb` illegal format code, since fixed format doesn't support (or need) beautifully typeset decimal powers. Format code will be reduced to 'f'.
- `hello` illegal format code, since first char is not 'e', 'E', 'f', 'g' or 'G'. Current format code will not be changed.

5.12.4.30 setNumberPrecision()

```
void QCPAxis::setNumberPrecision (
            int precision )
```

Sets the precision of the tick label numbers. See QLocale::toString(double i, char f, int prec) for details. The effect of precisions are most notably for number Formats starting with 'e', see setNumberFormat

5.12.4.31 setOffset()

```
void QCPAxis::setOffset (
            int offset )
```

Sets the offset the axis has to its axis rect side.

If an axis rect side has multiple axes and automatic margin calculation is enabled for that side, only the offset of the inner most axis has meaning (even if it is set to be invisible). The offset of the other, outer axes is controlled automatically, to place them at appropriate positions.

5.12.4.32 setPadding()

```
void QCPAxis::setPadding (
            int padding )
```

Sets the padding of the axis.

When QCPAxisRect::setAutoMargins is enabled, the padding is the additional outer most space, that is left blank.

The axis padding has no meaning if QCPAxisRect::setAutoMargins is disabled.

See also

setLabelPadding, setTickLabelPadding

5.12.4.33 setRange() [1/3]

```
void QCPAxis::setRange (
            const QCPRange & range )
```

Sets the range of the axis.

This slot may be connected with the rangeChanged signal of another axis so this axis is always synchronized with the other axis range, when it changes.

To invert the direction of an axis, use setRangeReversed.

5.12.4.34 setRange() [2/3]

```
void QCPAxis::setRange (
            double lower,
            double upper )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets the lower and upper bound of the axis range.

To invert the direction of an axis, use setRangeReversed.

There is also a slot to set a range, see setRange(const QCPRange &range).

5.12.4.35 setRange() [3/3]

```
void QCPAxis::setRange (
            double position,
            double size,
            Qt::AlignmentFlag alignment )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets the range of the axis.

The *position* coordinate indicates together with the *alignment* parameter, where the new range will be positioned. *size* defines the size of the new axis range. *alignment* may be Qt::AlignLeft, Qt::AlignRight or Qt::AlignCenter. This will cause the left border, right border, or center of the range to be aligned with *position*. Any other values of *alignment* will default to Qt::AlignCenter.

5.12.4.36 setRangeLower()

```
void QCPAxis::setRangeLower (
            double lower )
```

Sets the lower bound of the axis range. The upper bound is not changed.

See also

setRange

5.12.4.37 setRangeReversed()

```
void QCPAxis::setRangeReversed (
            bool reversed )
```

Sets whether the axis range (direction) is displayed reversed. Normally, the values on horizontal axes increase left to right, on vertical axes bottom to top. When *reversed* is set to true, the direction of increasing values is inverted.

Note that the range and data interface stays the same for reversed axes, e.g. the *lower* part of the setRange interface will still reference the mathematically smaller number than the *upper* part.

5.12.4.38 setRangeUpper()

```
void QCPAxis::setRangeUpper (
            double upper )
```

Sets the upper bound of the axis range. The lower bound is not changed.

See also

setRange

5.12.4.39 setScaleRatio()

```
void QCPAxis::setScaleRatio (
            const QCPAxis * otherAxis,
            double ratio = 1.0 )
```

Scales the range of this axis to have a certain scale *ratio* to *otherAxis*. The scaling will be done around the center of the current axis range.

For example, if *ratio* is 1, this axis is the *yAxis* and *otherAxis* is *xAxis*, graphs plotted with those axes will appear in a 1:1 aspect ratio, independent of the aspect ratio the axis rect has.

This is an operation that changes the range of this axis once, it doesn't fix the scale ratio indefinitely. Note that calling this function in the constructor of the QCustomPlot's parent won't have the desired effect, since the widget dimensions aren't defined yet, and a resizeEvent will follow.

5.12.4.40 setScaleType()

```
void QCPAxis::setScaleType (
            QCPAxis::ScaleType type )
```

Sets whether the axis uses a linear scale or a logarithmic scale.

Note that this method controls the coordinate transformation. You will likely also want to use a logarithmic tick spacing and labeling, which can be achieved by setting an instance of QCPAxisTickerLog via setTicker. See the documentation of QCPAxisTickerLog about the details of logarithmic axis tick creation.

setNumberPrecision

5.12.4.41 setSelectableParts()

```
void QCPAxis::setSelectableParts (
            const QCPAxis::SelectableParts & selectableParts )
```

Sets whether the user can (de-)select the parts in *selectable* by clicking on the QCustomPlot surface. (When QCustomPlot::setInteractions contains iSelectAxes.)

However, even when *selectable* is set to a value not allowing the selection of a specific part, it is still possible to set the selection of this part manually, by calling setSelectedParts directly.

See also

SelectablePart, setSelectedParts

5.12.4.42 setSelectedBasePen()

```
void QCPAxis::setSelectedBasePen (
            const QPen & pen )
```

Sets the pen that is used to draw the axis base line when selected.

See also

setBasePen, setSelectableParts, setSelectedParts, QCustomPlot::setInteractions

5.12.4.43 setSelectedLabelColor()

```
void QCPAxis::setSelectedLabelColor (
            const QColor & color )
```

Sets the color that is used for the axis label when it is selected.

See also

setLabelColor, setSelectableParts, setSelectedParts, QCustomPlot::setInteractions

5.12.4.44 setSelectedLabelFont()

```
void QCPAxis::setSelectedLabelFont (
            const QFont & font )
```

Sets the font that is used for the axis label when it is selected.

See also

setLabelFont, setSelectableParts, setSelectedParts, QCustomPlot::setInteractions

5.12.4.45 setSelectedParts()

```
void QCPAxis::setSelectedParts (
            const QCPAxis::SelectableParts & selectedParts )
```

Sets the selected state of the respective axis parts described by SelectablePart. When a part is selected, it uses a different pen/font.

The entire selection mechanism for axes is handled automatically when QCustomPlot::setInteractions contains i↩ SelectAxes. You only need to call this function when you wish to change the selection state manually.

This function can change the selection state of a part, independent of the setSelectableParts setting.

emits the selectionChanged signal when *selected* is different from the previous selection state.

See also

SelectablePart, setSelectableParts, selectTest, setSelectedBasePen, setSelectedTickPen, setSelectedSub↩ TickPen, setSelectedTickLabelFont, setSelectedLabelFont, setSelectedTickLabelColor, setSelectedLabel↩ Color

5.12.4.46 setSelectedSubTickPen()

```
void QCPAxis::setSelectedSubTickPen (
            const QPen & pen )
```

Sets the pen that is used to draw the subticks when selected.

See also

setSubTickPen, setSelectableParts, setSelectedParts, QCustomPlot::setInteractions

5.12.4.47 setSelectedTickLabelColor()

```
void QCPAxis::setSelectedTickLabelColor (
            const QColor & color )
```

Sets the color that is used for tick labels when they are selected.

See also

setTickLabelColor, setSelectableParts, setSelectedParts, QCustomPlot::setInteractions

5.12.4.48 setSelectedTickLabelFont()

```
void QCPAxis::setSelectedTickLabelFont (
            const QFont & font )
```

Sets the font that is used for tick labels when they are selected.

See also

setTickLabelFont, setSelectableParts, setSelectedParts, QCustomPlot::setInteractions

5.12.4.49 setSelectedTickPen()

```
void QCPAxis::setSelectedTickPen (
            const QPen & pen )
```

Sets the pen that is used to draw the (major) ticks when selected.

See also

setTickPen, setSelectableParts, setSelectedParts, QCustomPlot::setInteractions

5.12.4.50 setSubTickLength()

```
void QCPAxis::setSubTickLength (
            int inside,
            int outside = 0 )
```

Sets the length of the subticks in pixels. *inside* is the length the subticks will reach inside the plot and *outside* is the length they will reach outside the plot. If *outside* is greater than zero, the tick labels and axis label will increase their distance to the axis accordingly, so they won't collide with the ticks.

See also

setTickLength, setSubTickLengthIn, setSubTickLengthOut

5.12.4.51 setSubTickLengthIn()

```
void QCPAxis::setSubTickLengthIn (
            int inside )
```

Sets the length of the inward subticks in pixels. *inside* is the length the subticks will reach inside the plot.

See also

setSubTickLengthOut, setSubTickLength, setTickLength

5.12.4.52 setSubTickLengthOut()

```
void QCPAxis::setSubTickLengthOut (
            int outside )
```

Sets the length of the outward subticks in pixels. *outside* is the length the subticks will reach outside the plot. If *outside* is greater than zero, the tick labels will increase their distance to the axis accordingly, so they won't collide with the ticks.

See also

setSubTickLengthIn, setSubTickLength, setTickLength

5.12.4.53 setSubTickPen()

```
void QCPAxis::setSubTickPen (
            const QPen & pen )
```

Sets the pen, subtick marks will be drawn with.

See also

setSubTickCount, setSubTickLength, setBasePen

5.12.4.54 setSubTicks()

```
void QCPAxis::setSubTicks (
            bool show )
```

Sets whether sub tick marks are displayed.

Sub ticks are only potentially visible if (major) ticks are also visible (see setTicks)

See also

setTicks

5.12.4.55 setTicker()

```
void QCPAxis::setTicker (
            QSharedPointer< QCPAxisTicker > ticker )
```

The axis ticker is responsible for generating the tick positions and tick labels. See the documentation of QCPAxisTicker for details on how to work with axis tickers.

You can change the tick positioning/labeling behaviour of this axis by setting a different QCPAxisTicker subclass using this method. If you only wish to modify the currently installed axis ticker, access it via ticker.

Since the ticker is stored in the axis as a shared pointer, multiple axes may share the same axis ticker simply by passing the same shared pointer to multiple axes.

See also

ticker

5.12.4.56 setTickLabelColor()

```
void QCPAxis::setTickLabelColor (
            const QColor & color )
```

Sets the color of the tick labels.

See also

setTickLabels, setTickLabelFont

5.12.4.57 setTickLabelFont()

```
void QCPAxis::setTickLabelFont (
             const QFont & font )
```

Sets the font of the tick labels.

See also

setTickLabels, setTickLabelColor

5.12.4.58 setTickLabelPadding()

```
void QCPAxis::setTickLabelPadding (
             int padding )
```

Sets the distance between the axis base line (including any outward ticks) and the tick labels.

See also

setLabelPadding, setPadding

5.12.4.59 setTickLabelRotation()

```
void QCPAxis::setTickLabelRotation (
             double degrees )
```

Sets the rotation of the tick labels. If *degrees* is zero, the labels are drawn normally. Else, the tick labels are drawn rotated by *degrees* clockwise. The specified angle is bound to values from -90 to 90 degrees.

If *degrees* is exactly -90, 0 or 90, the tick labels are centered on the tick coordinate. For other angles, the label is drawn with an offset such that it seems to point toward or away from the tick mark.

5.12.4.60 setTickLabels()

```
void QCPAxis::setTickLabels (
             bool show )
```

Sets whether tick labels are displayed. Tick labels are the numbers drawn next to tick marks.

5.12.4.61 setTickLabelSide()

```
void QCPAxis::setTickLabelSide (
             LabelSide side )
```

Sets whether the tick labels (numbers) shall appear inside or outside the axis rect.

The usual and default setting is lsOutside. Very compact plots sometimes require tick labels to be inside the axis rect, to save space. If *side* is set to lsInside, the tick labels appear on the inside are additionally clipped to the axis rect.

5.12.4.62 setTickLength()

```
void QCPAxis::setTickLength (
            int inside,
            int outside = 0 )
```

Sets the length of the ticks in pixels. *inside* is the length the ticks will reach inside the plot and *outside* is the length they will reach outside the plot. If *outside* is greater than zero, the tick labels and axis label will increase their distance to the axis accordingly, so they won't collide with the ticks.

See also

setSubTickLength, setTickLengthIn, setTickLengthOut

5.12.4.63 setTickLengthIn()

```
void QCPAxis::setTickLengthIn (
            int inside )
```

Sets the length of the inward ticks in pixels. *inside* is the length the ticks will reach inside the plot.

See also

setTickLengthOut, setTickLength, setSubTickLength

5.12.4.64 setTickLengthOut()

```
void QCPAxis::setTickLengthOut (
            int outside )
```

Sets the length of the outward ticks in pixels. *outside* is the length the ticks will reach outside the plot. If *outside* is greater than zero, the tick labels and axis label will increase their distance to the axis accordingly, so they won't collide with the ticks.

See also

setTickLengthIn, setTickLength, setSubTickLength

5.12.4.65 setTickPen()

```
void QCPAxis::setTickPen (
            const QPen & pen )
```

Sets the pen, tick marks will be drawn with.

See also

setTickLength, setBasePen

5.12.4.66 setTicks()

```
void QCPAxis::setTicks (
            bool show )
```

Sets whether tick marks are displayed.

Note that setting *show* to false does not imply that tick labels are invisible, too. To achieve that, see setTickLabels.

See also

setSubTicks

5.12.4.67 setUpperEnding()

```
void QCPAxis::setUpperEnding (
            const QCPLineEnding & ending )
```

Sets the style for the upper axis ending. See the documentation of QCPLineEnding for available styles.

For horizontal axes, this method refers to the right ending, for vertical axes the top ending. Note that this meaning does not change when the axis range is reversed with setRangeReversed.

See also

setLowerEnding

5.12.4.68 ticker()

```
QSharedPointer< QCPAxisTicker > QCPAxis::ticker ( ) const [inline]
```

Returns a modifiable shared pointer to the currently installed axis ticker. The axis ticker is responsible for generating the tick positions and tick labels of this axis. You can access the QCPAxisTicker with this method and modify basic properties such as the approximate tick count (QCPAxisTicker::setTickCount).

You can gain more control over the axis ticks by setting a different QCPAxisTicker subclass, see the documentation there. A new axis ticker can be set with setTicker.

Since the ticker is stored in the axis as a shared pointer, multiple axes may share the same axis ticker simply by passing the same shared pointer to multiple axes.

See also

setTicker

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.13 QCPAxisPainterPrivate Class Reference

Classes

- struct CachedLabel
- struct TickLabelData

Public Member Functions

- QCPAxisPainterPrivate (QCustomPlot ∗parentPlot)
- virtual void **draw** (QCPPainter ∗painter)
- virtual int **size** () const
- void **clearCache** ()
- QRect **axisSelectionBox** () const
- QRect **tickLabelsSelectionBox** () const
- QRect **labelSelectionBox** () const

Public Attributes

- QCPAxis::AxisType **type**
- QPen **basePen**
- QCPLineEnding **lowerEnding**
- QCPLineEnding **upperEnding**
- int **labelPadding**
- QFont **labelFont**
- QColor **labelColor**
- QString **label**
- int **tickLabelPadding**
- double **tickLabelRotation**
- QCPAxis::LabelSide **tickLabelSide**
- bool **substituteExponent**
- bool **numberMultiplyCross**
- int **tickLengthIn**
- int **tickLengthOut**
- int **subTickLengthIn**
- int **subTickLengthOut**
- QPen **tickPen**
- QPen **subTickPen**
- QFont **tickLabelFont**
- QColor **tickLabelColor**
- QRect **axisRect**
- QRect **viewportRect**
- double **offset**
- bool **abbreviateDecimalPowers**
- bool **reversedEndings**
- QVector< double > **subTickPositions**
- QVector< double > **tickPositions**
- QVector< QString > **tickLabels**

Protected Member Functions

- virtual QByteArray **generateLabelParameterHash** () const
- virtual void **placeTickLabel** (QCPPainter ∗painter, double position, int distanceToAxis, const QString &text, QSize ∗tickLabelsSize)
- virtual void **drawTickLabel** (QCPPainter ∗painter, double x, double y, const TickLabelData &labelData) const
- virtual TickLabelData **getTickLabelData** (const QFont &font, const QString &text) const
- virtual QPointF **getTickLabelDrawOffset** (const TickLabelData &labelData) const
- virtual void **getMaxTickLabelSize** (const QFont &font, const QString &text, QSize ∗tickLabelsSize) const

Protected Attributes

- QCustomPlot ∗ **mParentPlot**
- QByteArray **mLabelParameterHash**
- QCache< QString, CachedLabel > **mLabelCache**
- QRect **mAxisSelectionBox**
- QRect **mTickLabelsSelectionBox**
- QRect **mLabelSelectionBox**

5.13.1 Constructor & Destructor Documentation

5.13.1.1 QCPAxisPainterPrivate()

```
QCPAxisPainterPrivate::QCPAxisPainterPrivate (
            QCustomPlot * parentPlot )  [explicit]
```

Constructs a QCPAxisPainterPrivate instance. Make sure to not create a new instance on every redraw, to utilize the caching mechanisms.

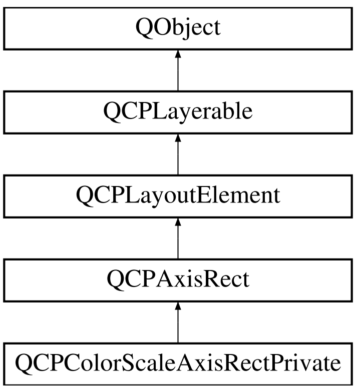
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.14 QCPAxisRect Class Reference

Holds multiple axes and arranges them in a rectangular shape.

Inheritance diagram for QCPAxisRect:



Public Member Functions

- QCPAxisRect (QCustomPlot *parentPlot, bool setupDefaultAxes=true)
- QPixmap **background** () const
- QBrush **backgroundBrush** () const
- bool **backgroundScaled** () const
- Qt::AspectRatioMode **backgroundScaledMode** () const
- Qt::Orientations **rangeDrag** () const
- Qt::Orientations **rangeZoom** () const
- QCPAxis * rangeDragAxis (Qt::Orientation orientation)
- QCPAxis * rangeZoomAxis (Qt::Orientation orientation)
- QList< QCPAxis * > rangeDragAxes (Qt::Orientation orientation)
- QList< QCPAxis * > rangeZoomAxes (Qt::Orientation orientation)
- double rangeZoomFactor (Qt::Orientation orientation)
- void setBackground (const QPixmap &pm)
- void setBackground (const QPixmap &pm, bool scaled, Qt::AspectRatioMode mode=Qt::KeepAspectRatio←ByExpanding)
- void setBackground (const QBrush &brush)
- void setBackgroundScaled (bool scaled)
- void setBackgroundScaledMode (Qt::AspectRatioMode mode)
- void setRangeDrag (Qt::Orientations orientations)
- void setRangeZoom (Qt::Orientations orientations)
- void setRangeDragAxes (QCPAxis *horizontal, QCPAxis *vertical)
- void setRangeDragAxes (QList< QCPAxis *> axes)
- void setRangeDragAxes (QList< QCPAxis *> horizontal, QList< QCPAxis *> vertical)
- void setRangeZoomAxes (QCPAxis *horizontal, QCPAxis *vertical)
- void setRangeZoomAxes (QList< QCPAxis *> axes)
- void setRangeZoomAxes (QList< QCPAxis *> horizontal, QList< QCPAxis *> vertical)
- void setRangeZoomFactor (double horizontalFactor, double verticalFactor)
- void setRangeZoomFactor (double factor)
- int axisCount (QCPAxis::AxisType type) const
- QCPAxis * axis (QCPAxis::AxisType type, int index=0) const
- QList< QCPAxis * > axes (QCPAxis::AxisTypes types) const
- QList< QCPAxis * > axes () const
- QCPAxis * addAxis (QCPAxis::AxisType type, QCPAxis *axis=0)
- QList< QCPAxis * > addAxes (QCPAxis::AxisTypes types)
- bool removeAxis (QCPAxis *axis)
- QCPLayoutInset * insetLayout () const
- void zoom (const QRectF &pixelRect)
- void zoom (const QRectF &pixelRect, const QList< QCPAxis *> &affectedAxes)
- void setupFullAxesBox (bool connectRanges=false)
- QList< QCPAbstractPlottable * > plottables () const
- QList< QCPGraph * > graphs () const
- QList< QCPAbstractItem * > items () const
- int left () const
- int right () const
- int top () const
- int bottom () const
- int width () const
- int height () const
- QSize size () const
- QPoint topLeft () const
- QPoint topRight () const
- QPoint bottomLeft () const
- QPoint bottomRight () const
- QPoint center () const
- virtual void update (UpdatePhase phase) Q_DECL_OVERRIDE
- virtual QList< QCPLayoutElement * > elements (bool recursive) const Q_DECL_OVERRIDE

Protected Member Functions

- virtual void **applyDefaultAntialiasingHint** (QCPPainter ∗painter) const Q_DECL_OVERRIDE
- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- virtual int **calculateAutoMargin** (QCP::MarginSide side) Q_DECL_OVERRIDE
- virtual void **layoutChanged** () Q_DECL_OVERRIDE
- virtual void mousePressEvent (QMouseEvent ∗event, const QVariant &details) Q_DECL_OVERRIDE
- virtual void mouseMoveEvent (QMouseEvent ∗event, const QPointF &startPos) Q_DECL_OVERRIDE
- virtual void mouseReleaseEvent (QMouseEvent ∗event, const QPointF &startPos) Q_DECL_OVERRIDE
- virtual void wheelEvent (QWheelEvent ∗event) Q_DECL_OVERRIDE
- void **drawBackground** (QCPPainter ∗painter)
- void **updateAxesOffset** (QCPAxis::AxisType type)

Protected Attributes

- QBrush **mBackgroundBrush**
- QPixmap **mBackgroundPixmap**
- QPixmap **mScaledBackgroundPixmap**
- bool **mBackgroundScaled**
- Qt::AspectRatioMode **mBackgroundScaledMode**
- QCPLayoutInset ∗ **mInsetLayout**
- Qt::Orientations **mRangeDrag**
- Qt::Orientations **mRangeZoom**
- QList< QPointer< QCPAxis > > **mRangeDragHorzAxis**
- QList< QPointer< QCPAxis > > **mRangeDragVertAxis**
- QList< QPointer< QCPAxis > > **mRangeZoomHorzAxis**
- QList< QPointer< QCPAxis > > **mRangeZoomVertAxis**
- double **mRangeZoomFactorHorz**
- double **mRangeZoomFactorVert**
- QList< QCPRange > **mDragStartHorzRange**
- QList< QCPRange > **mDragStartVertRange**
- QCP::AntialiasedElements **mAADragBackup**
- QCP::AntialiasedElements **mNotAADragBackup**
- QPoint **mDragStart**
- bool **mDragging**
- QHash< QCPAxis::AxisType, QList< QCPAxis ∗ > > **mAxes**

Friends

- class **QCustomPlot**

Additional Inherited Members

5.14.1 Detailed Description

Holds multiple axes and arranges them in a rectangular shape.

This class represents an axis rect, a rectangular area that is bounded on all sides with an arbitrary number of axes.

Initially QCustomPlot has one axis rect, accessible via QCustomPlot::axisRect(). However, the layout system allows to have multiple axis rects, e.g. arranged in a grid layout (QCustomPlot::plotLayout).

By default, QCPAxisRect comes with four axes, at bottom, top, left and right. They can be accessed via axis by providing the respective axis type (QCPAxis::AxisType) and index. If you need all axes in the axis rect, use axes. The top and right axes are set to be invisible initially (QCPAxis::setVisible). To add more axes to a side, use addAxis or addAxes. To remove an axis, use removeAxis.

The axis rect layerable itself only draws a background pixmap or color, if specified (setBackground). It is placed on the "background" layer initially (see QCPLayer for an explanation of the QCustomPlot layer system). The axes that are held by the axis rect can be placed on other layers, independently of the axis rect.

Every axis rect has a child layout of type QCPLayoutInset. It is accessible via insetLayout and can be used to have other layout elements (or even other layouts with multiple elements) hovering inside the axis rect.

If an axis rect is clicked and dragged, it processes this by moving certain axis ranges. The behaviour can be controlled with setRangeDrag and setRangeDragAxes. If the mouse wheel is scrolled while the cursor is on the axis rect, certain axes are scaled. This is controllable via setRangeZoom, setRangeZoomAxes and setRange↩ZoomFactor. These interactions are only enabled if QCustomPlot::setInteractions contains QCP::iRangeDrag and QCP::iRangeZoom.

Overview of the spacings and paddings that define the geometry of an axis. The dashed line on the far left indicates the viewport/widget border.

5.14.2 Constructor & Destructor Documentation

5.14.2.1 QCPAxisRect()

```
QCPAxisRect::QCPAxisRect (
            QCustomPlot * parentPlot,
            bool setupDefaultAxes = true )  [explicit]
```

Creates a QCPAxisRect instance and sets default values. An axis is added for each of the four sides, the top and right axes are set invisible initially.

5.14.3 Member Function Documentation

5.14.3.1 addAxes()

```
QList< QCPAxis * > QCPAxisRect::addAxes (
            QCPAxis::AxisTypes types )
```

Adds a new axis with addAxis to each axis rect side specified in *types*. This may be an `or`-combination of QCP↩ Axis::AxisType, so axes can be added to multiple sides at once.

Returns a list of the added axes.

See also

addAxis, setupFullAxesBox

5.14.3.2 addAxis()

```
QCPAxis * QCPAxisRect::addAxis (
            QCPAxis::AxisType type,
            QCPAxis * axis = 0 )
```

Adds a new axis to the axis rect side specified with *type*, and returns it. If *axis* is 0, a new QCPAxis instance is created internally. QCustomPlot owns the returned axis, so if you want to remove an axis, use removeAxis instead of deleting it manually.

You may inject QCPAxis instances (or sublasses of QCPAxis) by setting *axis* to an axis that was previously created outside QCustomPlot. It is important to note that QCustomPlot takes ownership of the axis, so you may not delete it afterwards. Further, the *axis* must have been created with this axis rect as parent and with the same axis type as specified in *type*. If this is not the case, a debug output is generated, the axis is not added, and the method returns 0.

This method can not be used to move *axis* between axis rects. The same *axis* instance must not be added multiple times to the same or different axis rects.

If an axis rect side already contains one or more axes, the lower and upper endings of the new axis (QCPAxis↩ ::setLowerEnding, QCPAxis::setUpperEnding) are set to QCPLineEnding::esHalfBar.

See also

addAxes, setupFullAxesBox

5.14.3.3 axes() [1/2]

```
QList< QCPAxis * > QCPAxisRect::axes (
            QCPAxis::AxisTypes types ) const
```

Returns all axes on the axis rect sides specified with *types*.

types may be a single QCPAxis::AxisType or an `or`-combination, to get the axes of multiple sides.

See also

axis

5.14.3.4 axes() [2/2]

```
QList< QCPAxis * > QCPAxisRect::axes ( ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Returns all axes of this axis rect.

5.14.3.5 axis()

```
QCPAxis * QCPAxisRect::axis (
            QCPAxis::AxisType type,
            int index = 0 ) const
```

Returns the axis with the given *index* on the axis rect side specified with *type*.

See also

axisCount, axes

5.14.3.6 axisCount()

```
int QCPAxisRect::axisCount (
            QCPAxis::AxisType type ) const
```

Returns the number of axes on the axis rect side specified with *type*.

See also

axis

5.14.3.7 bottom()

```
int QCPAxisRect::bottom ( ) const [inline]
```

Returns the pixel position of the bottom border of this axis rect. Margins are not taken into account here, so the returned value is with respect to the inner rect.

5.14.3.8 bottomLeft()

```
QPoint QCPAxisRect::bottomLeft ( ) const [inline]
```

Returns the bottom left corner of this axis rect in pixels. Margins are not taken into account here, so the returned value is with respect to the inner rect.

5.14.3.9 bottomRight()

```
QPoint QCPAxisRect::bottomRight ( ) const [inline]
```

Returns the bottom right corner of this axis rect in pixels. Margins are not taken into account here, so the returned value is with respect to the inner rect.

5.14.3.10 center()

```
QPoint QCPAxisRect::center ( ) const [inline]
```

Returns the center of this axis rect in pixels. Margins are not taken into account here, so the returned value is with respect to the inner rect.

5.14.3.11 elements()

```
QList< QCPLayoutElement * > QCPAxisRect::elements (
            bool recursive ) const [virtual]
```

Returns a list of all child elements in this layout element. If *recursive* is true, all sub-child elements are included in the list, too.

Warning

There may be entries with value 0 in the returned list. (For example, QCPLayoutGrid may have empty cells which yield 0 at the respective index.)

Reimplemented from QCPLayoutElement.

5.14.3.12 graphs()

```
QList< QCPGraph * > QCPAxisRect::graphs ( ) const
```

Returns a list of all the graphs that are associated with this axis rect.

A graph is considered associated with an axis rect if its key or value axis (or both) is in this axis rect.

See also

plottables, items

5.14.3.13 height()

```
int QCPAxisRect::height ( ) const [inline]
```

Returns the pixel height of this axis rect. Margins are not taken into account here, so the returned value is with respect to the inner rect.

5.14.3.14 insetLayout()

```
QCPLayoutInset * QCPAxisRect::insetLayout ( ) const [inline]
```

Returns the inset layout of this axis rect. It can be used to place other layout elements (or even layouts with multiple other elements) inside/on top of an axis rect.

See also

QCPLayoutInset

5.14.3.15 items()

```
QList< QCPAbstractItem * > QCPAxisRect::items ( ) const
```

Returns a list of all the items that are associated with this axis rect.

An item is considered associated with an axis rect if any of its positions has key or value axis set to an axis that is in this axis rect, or if any of its positions has QCPItemPosition::setAxisRect set to the axis rect, or if the clip axis rect (QCPAbstractItem::setClipAxisRect) is set to this axis rect.

See also

plottables, graphs

5.14.3.16 left()

```
int QCPAxisRect::left ( ) const [inline]
```

Returns the pixel position of the left border of this axis rect. Margins are not taken into account here, so the returned value is with respect to the inner rect.

5.14.3.17 mouseMoveEvent()

```
void QCPAxisRect::mouseMoveEvent (
            QMouseEvent * event,
            const QPointF & startPos ) [protected], [virtual]
```

This event gets called when the user moves the mouse while holding a mouse button, after this layerable has become the mouse grabber by accepting the preceding mousePressEvent.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`. The parameter *startPos* indicates the position where the initial mousePressEvent occured, that started the mouse interaction.

The default implementation does nothing.

See also

mousePressEvent, mouseReleaseEvent, mouseDoubleClickEvent, wheelEvent

Reimplemented from QCPLayerable.

5.14.3.18 mousePressEvent()

```
void QCPAxisRect::mousePressEvent (
            QMouseEvent * event,
            const QVariant & details )  [protected], [virtual]
```

This event gets called when the user presses a mouse button while the cursor is over the layerable. Whether a cursor is over the layerable is decided by a preceding call to selectTest.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`. The parameter *details* contains layerable-specific details about the hit, which were generated in the previous call to selectTest. For example, One-dimensional plottables like QCPGraph or QCPBars convey the clicked data point in the *details* parameter, as QCPDataSelection packed as QVariant. Multi-part objects convey the specific `SelectablePart` that was hit (e.g. QCPAxis::SelectablePart in the case of axes).

QCustomPlot uses an event propagation system that works the same as Qt's system. If your layerable doesn't reimplement the mousePressEvent or explicitly calls `event->ignore()` in its reimplementation, the event will be propagated to the next layerable in the stacking order.

Once a layerable has accepted the mousePressEvent, it is considered the mouse grabber and will receive all following calls to mouseMoveEvent or mouseReleaseEvent for this mouse interaction (a "mouse interaction" in this context ends with the release).

The default implementation does nothing except explicitly ignoring the event with `event->ignore()`.

See also

mouseMoveEvent, mouseReleaseEvent, mouseDoubleClickEvent, wheelEvent

Reimplemented from QCPLayerable.

5.14.3.19 mouseReleaseEvent()

```
void QCPAxisRect::mouseReleaseEvent (
            QMouseEvent * event,
            const QPointF & startPos )  [protected], [virtual]
```

This event gets called when the user releases the mouse button, after this layerable has become the mouse grabber by accepting the preceding mousePressEvent.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`. The parameter *startPos* indicates the position where the initial mousePressEvent occured, that started the mouse interaction.

The default implementation does nothing.

See also

mousePressEvent, mouseMoveEvent, mouseDoubleClickEvent, wheelEvent

Reimplemented from QCPLayerable.

5.14.3.20 plottables()

```
QList< QCPAbstractPlottable * > QCPAxisRect::plottables ( ) const
```

Returns a list of all the plottables that are associated with this axis rect.

A plottable is considered associated with an axis rect if its key or value axis (or both) is in this axis rect.

See also

graphs, items

5.14.3.21 rangeDragAxes()

```
QList< QCPAxis * > QCPAxisRect::rangeDragAxes (
            Qt::Orientation orientation )
```

Returns all range drag axes of the *orientation* provided.

See also

rangeZoomAxis, setRangeZoomAxes

5.14.3.22 rangeDragAxis()

```
QCPAxis * QCPAxisRect::rangeDragAxis (
            Qt::Orientation orientation )
```

Returns the range drag axis of the *orientation* provided. If multiple axes were set, returns the first one (use rangeDragAxes to retrieve a list with all set axes).

See also

setRangeDragAxes

5.14.3.23 rangeZoomAxes()

```
QList< QCPAxis * > QCPAxisRect::rangeZoomAxes (
            Qt::Orientation orientation )
```

Returns all range zoom axes of the *orientation* provided.

See also

rangeDragAxis, setRangeDragAxes

5.14.3.24 rangeZoomAxis()

```
QCPAxis * QCPAxisRect::rangeZoomAxis (
            Qt::Orientation orientation )
```

Returns the range zoom axis of the *orientation* provided. If multiple axes were set, returns the first one (use range↩ZoomAxes to retrieve a list with all set axes).

See also

setRangeZoomAxes

5.14.3.25 rangeZoomFactor()

```
double QCPAxisRect::rangeZoomFactor (
            Qt::Orientation orientation )
```

Returns the range zoom factor of the *orientation* provided.

See also

setRangeZoomFactor

5.14.3.26 removeAxis()

```
bool QCPAxisRect::removeAxis (
            QCPAxis * axis )
```

Removes the specified *axis* from the axis rect and deletes it.

Returns true on success, i.e. if *axis* was a valid axis in this axis rect.

See also

addAxis

5.14.3.27 right()

```
int QCPAxisRect::right ( ) const  [inline]
```

Returns the pixel position of the right border of this axis rect. Margins are not taken into account here, so the returned value is with respect to the inner rect.

5.14.3.28 setBackground() [1/3]

```
void QCPAxisRect::setBackground (
            const QPixmap & pm )
```

Sets *pm* as the axis background pixmap. The axis background pixmap will be drawn inside the axis rect. Since axis rects place themselves on the "background" layer by default, the axis rect backgrounds are usually drawn below everything else.

For cases where the provided pixmap doesn't have the same size as the axis rect, scaling can be enabled with setBackgroundScaled and the scaling mode (i.e. whether and how the aspect ratio is preserved) can be set with setBackgroundScaledMode. To set all these options in one call, consider using the overloaded version of this function.

Below the pixmap, the axis rect may be optionally filled with a brush, if specified with setBackground(const QBrush &brush).

See also

setBackgroundScaled, setBackgroundScaledMode, setBackground(const QBrush &brush)

5.14.3.29 setBackground() [2/3]

```
void QCPAxisRect::setBackground (
            const QPixmap & pm,
            bool scaled,
            Qt::AspectRatioMode mode = Qt::KeepAspectRatioByExpanding )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Allows setting the background pixmap of the axis rect, whether it shall be scaled and how it shall be scaled in one call.

See also

setBackground(const QPixmap &pm), setBackgroundScaled, setBackgroundScaledMode

5.14.3.30 setBackground() [3/3]

```
void QCPAxisRect::setBackground (
            const QBrush & brush )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets *brush* as the background brush. The axis rect background will be filled with this brush. Since axis rects place themselves on the "background" layer by default, the axis rect backgrounds are usually drawn below everything else.

The brush will be drawn before (under) any background pixmap, which may be specified with setBackground(const QPixmap &pm).

To disable drawing of a background brush, set *brush* to Qt::NoBrush.

See also

setBackground(const QPixmap &pm)

5.14.3.31 setBackgroundScaled()

```
void QCPAxisRect::setBackgroundScaled (
            bool scaled )
```

Sets whether the axis background pixmap shall be scaled to fit the axis rect or not. If *scaled* is set to true, you may control whether and how the aspect ratio of the original pixmap is preserved with setBackgroundScaledMode.

Note that the scaled version of the original pixmap is buffered, so there is no performance penalty on replots. (Except when the axis rect dimensions are changed continuously.)

See also

setBackground, setBackgroundScaledMode

5.14.3.32 setBackgroundScaledMode()

```
void QCPAxisRect::setBackgroundScaledMode (
            Qt::AspectRatioMode mode )
```

If scaling of the axis background pixmap is enabled (setBackgroundScaled), use this function to define whether and how the aspect ratio of the original pixmap passed to setBackground is preserved.

See also

setBackground, setBackgroundScaled

5.14.3.33 setRangeDrag()

```
void QCPAxisRect::setRangeDrag (
            Qt::Orientations orientations )
```

Sets which axis orientation may be range dragged by the user with mouse interaction. What orientation corresponds to which specific axis can be set with setRangeDragAxes(QCPAxis *horizontal, QCPAxis *vertical). By default, the horizontal axis is the bottom axis (xAxis) and the vertical axis is the left axis (yAxis).

To disable range dragging entirely, pass 0 as *orientations* or remove QCP::iRangeDrag from QCustomPlot::setInteractions. To enable range dragging for both directions, pass `Qt::Horizontal | Qt::Vertical` as *orientations*.

In addition to setting *orientations* to a non-zero value, make sure QCustomPlot::setInteractions contains QCP::iRangeDrag to enable the range dragging interaction.

See also

setRangeZoom, setRangeDragAxes, QCustomPlot::setNoAntialiasingOnDrag

5.14.3.34 setRangeDragAxes() [1/3]

```
void QCPAxisRect::setRangeDragAxes (
            QCPAxis * horizontal,
            QCPAxis * vertical )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets the axes whose range will be dragged when setRangeDrag enables mouse range dragging on the QCustomPlot widget. Pass 0 if no axis shall be dragged in the respective orientation.

Use the overload taking a list of axes, if multiple axes (more than one per orientation) shall react to dragging interactions.

See also

setRangeZoomAxes

5.14.3.35 setRangeDragAxes() [2/3]

```
void QCPAxisRect::setRangeDragAxes (
            QList< QCPAxis *> axes )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

This method allows to set up multiple axes to react to horizontal and vertical dragging. The drag orientation that the respective axis will react to is deduced from its orientation (QCPAxis::orientation).

In the unusual case that you wish to e.g. drag a vertically oriented axis with a horizontal drag motion, use the overload taking two separate lists for horizontal and vertical dragging.

5.14.3.36 setRangeDragAxes() [3/3]

```
void QCPAxisRect::setRangeDragAxes (
            QList< QCPAxis *> horizontal,
            QList< QCPAxis *> vertical )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

This method allows to set multiple axes up to react to horizontal and vertical dragging, and define specifically which axis reacts to which drag orientation (irrespective of the axis orientation).

5.14.3.37 setRangeZoom()

```
void QCPAxisRect::setRangeZoom (
            Qt::Orientations orientations )
```

Sets which axis orientation may be zoomed by the user with the mouse wheel. What orientation corresponds to which specific axis can be set with setRangeZoomAxes(QCPAxis *horizontal, QCPAxis *vertical). By default, the horizontal axis is the bottom axis (xAxis) and the vertical axis is the left axis (yAxis).

To disable range zooming entirely, pass 0 as *orientations* or remove QCP::iRangeZoom from QCustomPlot::setInteractions. To enable range zooming for both directions, pass `Qt::Horizontal | Qt::Vertical` as *orientations*.

In addition to setting *orientations* to a non-zero value, make sure QCustomPlot::setInteractions contains QCP::iRangeZoom to enable the range zooming interaction.

See also

setRangeZoomFactor, setRangeZoomAxes, setRangeDrag

5.14.3.38 setRangeZoomAxes() [1/3]

```
void QCPAxisRect::setRangeZoomAxes (
            QCPAxis * horizontal,
            QCPAxis * vertical )
```

Sets the axes whose range will be zoomed when setRangeZoom enables mouse wheel zooming on the QCustomPlot widget. Pass 0 if no axis shall be zoomed in the respective orientation.

The two axes can be zoomed with different strengths, when different factors are passed to setRangeZoomFactor(double horizontalFactor, double verticalFactor).

Use the overload taking a list of axes, if multiple axes (more than one per orientation) shall react to zooming interactions.

See also

setRangeDragAxes

5.14.3.39 setRangeZoomAxes() [2/3]

```
void QCPAxisRect::setRangeZoomAxes (
            QList< QCPAxis *> axes )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

This method allows to set up multiple axes to react to horizontal and vertical range zooming. The zoom orientation that the respective axis will react to is deduced from its orientation (QCPAxis::orientation).

In the unusual case that you wish to e.g. zoom a vertically oriented axis with a horizontal zoom interaction, use the overload taking two separate lists for horizontal and vertical zooming.

5.14.3.40 setRangeZoomAxes() [3/3]

```
void QCPAxisRect::setRangeZoomAxes (
            QList< QCPAxis *> horizontal,
            QList< QCPAxis *> vertical )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

This method allows to set multiple axes up to react to horizontal and vertical zooming, and define specifically which axis reacts to which zoom orientation (irrespective of the axis orientation).

5.14.3.41 setRangeZoomFactor() [1/2]

```
void QCPAxisRect::setRangeZoomFactor (
            double horizontalFactor,
            double verticalFactor )
```

Sets how strong one rotation step of the mouse wheel zooms, when range zoom was activated with setRangeZoom. The two parameters *horizontalFactor* and *verticalFactor* provide a way to let the horizontal axis zoom at different rates than the vertical axis. Which axis is horizontal and which is vertical, can be set with setRangeZoomAxes.

When the zoom factor is greater than one, scrolling the mouse wheel backwards (towards the user) will zoom in (make the currently visible range smaller). For zoom factors smaller than one, the same scrolling direction will zoom out.

5.14.3.42 setRangeZoomFactor() [2/2]

```
void QCPAxisRect::setRangeZoomFactor (
            double factor )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets both the horizontal and vertical zoom *factor*.

5.14.3.43 setupFullAxesBox()

```
void QCPAxisRect::setupFullAxesBox (
            bool connectRanges = false )
```

Convenience function to create an axis on each side that doesn't have any axes yet and set their visibility to true. Further, the top/right axes are assigned the following properties of the bottom/left axes:

- range (QCPAxis::setRange)
- range reversed (QCPAxis::setRangeReversed)
- scale type (QCPAxis::setScaleType)
- tick visibility (QCPAxis::setTicks)
- number format (QCPAxis::setNumberFormat)
- number precision (QCPAxis::setNumberPrecision)
- tick count of ticker (QCPAxisTicker::setTickCount)
- tick origin of ticker (QCPAxisTicker::setTickOrigin)

Tick label visibility (QCPAxis::setTickLabels) of the right and top axes are set to false.

If *connectRanges* is true, the rangeChanged signals of the bottom and left axes are connected to the QCPAxis↩::setRange slots of the top and right axes.

5.14.3.44 size()

```
QSize QCPAxisRect::size ( ) const  [inline]
```

Returns the pixel size of this axis rect. Margins are not taken into account here, so the returned value is with respect to the inner rect.

5.14.3.45 top()

```
int QCPAxisRect::top ( ) const  [inline]
```

Returns the pixel position of the top border of this axis rect. Margins are not taken into account here, so the returned value is with respect to the inner rect.

5.14.3.46 topLeft()

```
QPoint QCPAxisRect::topLeft ( ) const  [inline]
```

Returns the top left corner of this axis rect in pixels. Margins are not taken into account here, so the returned value is with respect to the inner rect.

5.14.3.47 topRight()

```
QPoint QCPAxisRect::topRight ( ) const  [inline]
```

Returns the top right corner of this axis rect in pixels. Margins are not taken into account here, so the returned value is with respect to the inner rect.

5.14.3.48 update()

```
void QCPAxisRect::update (
            UpdatePhase phase )  [virtual]
```

This method is called automatically upon replot and doesn't need to be called by users of QCPAxisRect.

Calls the base class implementation to update the margins (see QCPLayoutElement::update), and finally passes the rect to the inset layout (insetLayout) and calls its QCPInsetLayout::update function.

Reimplemented from QCPLayoutElement.

5.14.3.49 wheelEvent()

```
void QCPAxisRect::wheelEvent (
            QWheelEvent * event ) [protected], [virtual]
```

This event gets called when the user turns the mouse scroll wheel while the cursor is over the layerable. Whether a cursor is over the layerable is decided by a preceding call to selectTest.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`.

The `event->delta()` indicates how far the mouse wheel was turned, which is usually +/- 120 for single rotation steps. However, if the mouse wheel is turned rapidly, multiple steps may accumulate to one event, making `event->delta()` larger. On the other hand, if the wheel has very smooth steps or none at all, the delta may be smaller.

The default implementation does nothing.

See also

mousePressEvent, mouseMoveEvent, mouseReleaseEvent, mouseDoubleClickEvent

Reimplemented from QCPLayerable.

5.14.3.50 width()

```
int QCPAxisRect::width ( ) const [inline]
```

Returns the pixel width of this axis rect. Margins are not taken into account here, so the returned value is with respect to the inner rect.

5.14.3.51 zoom() [1/2]

```
void QCPAxisRect::zoom (
            const QRectF & pixelRect )
```

Zooms in (or out) to the passed rectangular region *pixelRect*, given in pixel coordinates.

All axes of this axis rect will have their range zoomed accordingly. If you only wish to zoom specific axes, use the overloaded version of this method.

See also

QCustomPlot::setSelectionRectMode

5.14.3.52 zoom() [2/2]

```
void QCPAxisRect::zoom (
            const QRectF & pixelRect,
            const QList< QCPAxis *> & affectedAxes )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Zooms in (or out) to the passed rectangular region *pixelRect*, given in pixel coordinates.

Only the axes passed in *affectedAxes* will have their ranges zoomed accordingly.

See also

QCustomPlot::setSelectionRectMode

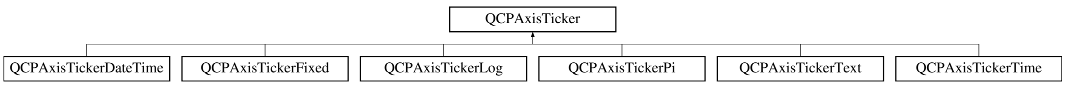
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
cpp

5.15 QCPAxisTicker Class Reference

The base class tick generator used by QCPAxis to create tick positions and tick labels.

Inheritance diagram for QCPAxisTicker:



Public Types

- enum TickStepStrategy { tssReadability, tssMeetTickCount }

Public Member Functions

- QCPAxisTicker ()
- TickStepStrategy **tickStepStrategy** () const
- int **tickCount** () const
- double **tickOrigin** () const
- void setTickStepStrategy (TickStepStrategy strategy)
- void setTickCount (int count)
- void setTickOrigin (double origin)
- virtual void generate (const QCPRange &range, const QLocale &locale, QChar formatChar, int precision, QVector< double > &ticks, QVector< double > *subTicks, QVector< QString > *tickLabels)

Protected Member Functions

- virtual double **getTickStep** (const QCPRange &range)
- virtual int **getSubTickCount** (double tickStep)
- virtual QString **getTickLabel** (double tick, const QLocale &locale, QChar formatChar, int precision)
- virtual QVector< double > **createTickVector** (double tickStep, const QCPRange &range)
- virtual QVector< double > **createSubTickVector** (int subTickCount, const QVector< double > &ticks)
- virtual QVector< QString > **createLabelVector** (const QVector< double > &ticks, const QLocale &locale, QChar formatChar, int precision)
- void **trimTicks** (const QCPRange &range, QVector< double > &ticks, bool keepOneOutlier) const
- double **pickClosest** (double target, const QVector< double > &candidates) const
- double **getMantissa** (double input, double *magnitude=0) const
- double **cleanMantissa** (double input) const

Protected Attributes

- TickStepStrategy **mTickStepStrategy**
- int **mTickCount**
- double **mTickOrigin**

5.15.1 Detailed Description

The base class tick generator used by QCPAxis to create tick positions and tick labels.

Each QCPAxis has an internal QCPAxisTicker (or a subclass) in order to generate tick positions and tick labels for the current axis range. The ticker of an axis can be set via QCPAxis::setTicker. Since that method takes a `QSharedPointer<QCPAxisTicker>`, multiple axes can share the same ticker instance.

This base class generates normal tick coordinates and numeric labels for linear axes. It picks a reasonable tick step (the separation between ticks) which results in readable tick labels. The number of ticks that should be approximately generated can be set via setTickCount. Depending on the current tick step strategy (setTickStepStrategy), the algorithm either sacrifices readability to better match the specified tick count (QCPAxisTicker::tssMeetTickCount) or relaxes the tick count in favor of better tick steps (QCPAxisTicker::tssReadability), which is the default.

The following more specialized axis ticker subclasses are available, see details in the respective class documentation:

QCPAxisTickerFixed	
QCPAxisTickerLog	
QCPAxisTickerPi	
QCPAxisTickerText	
QCPAxisTickerDateTime	
QCPAxisTickerTime	

5.15.2 Creating own axis tickers

Creating own axis tickers can be achieved very easily by sublassing QCPAxisTicker and reimplementing some or all of the available virtual methods.

In the simplest case you might wish to just generate different tick steps than the other tickers, so you only reimplement the method getTickStep. If you additionally want control over the string that will be shown as tick label, reimplement getTickLabel.

If you wish to have complete control, you can generate the tick vectors and tick label vectors yourself by reimplementing createTickVector and createLabelVector. The default implementations use the previously mentioned virtual methods getTickStep and getTickLabel, but your reimplementations don't necessarily need to do so. For example in the case of unequal tick steps, the method getTickStep loses its usefulness and can be ignored.

The sub tick count between major ticks can be controlled with getSubTickCount. Full sub tick placement control is obtained by reimplementing createSubTickVector.

See the documentation of all these virtual methods in QCPAxisTicker for detailed information about the parameters and expected return values.

5.15.3 Member Enumeration Documentation

5.15.3.1 TickStepStrategy

`enum QCPAxisTicker::TickStepStrategy`

Defines the strategies that the axis ticker may follow when choosing the size of the tick step.

See also

setTickStepStrategy

Enumerator

tssReadability	A nicely readable tick step is prioritized over matching the requested number of ticks (see setTickCount)
tssMeetTickCount	Less readable tick steps are allowed which in turn facilitates getting closer to the requested tick count.

5.15.4 Constructor & Destructor Documentation

5.15.4.1 QCPAxisTicker()

`QCPAxisTicker::QCPAxisTicker ( )`

Constructs the ticker and sets reasonable default values. Axis tickers are commonly created managed by a Q↩SharedPointer, which then can be passed to QCPAxis::setTicker.

5.15.5 Member Function Documentation

5.15.5.1 generate()

```
void QCPAxisTicker::generate (
            const QCPRange & range,
            const QLocale & locale,
            QChar formatChar,
            int precision,
            QVector< double > & ticks,
            QVector< double > * subTicks,
            QVector< QString > * tickLabels )  [virtual]
```

This is the method called by QCPAxis in order to actually generate tick coordinates (*ticks*), tick label strings (*tick←Labels*) and sub tick coordinates (*subTicks*).

The ticks are generated for the specified *range*. The generated labels typically follow the specified *locale*, *formatChar* and number *precision*, however this might be different (or even irrelevant) for certain QCPAxisTicker subclasses.

The output parameter *ticks* is filled with the generated tick positions in axis coordinates. The output parameters *subTicks* and *tickLabels* are optional (set them to 0 if not needed) and are respectively filled with sub tick coordinates, and tick label strings belonging to *ticks* by index.

5.15.5.2 setTickCount()

```
void QCPAxisTicker::setTickCount (
            int count )
```

Sets how many ticks this ticker shall aim to generate across the axis range. Note that *count* is not guaranteed to be matched exactly, as generating readable tick intervals may conflict with the requested number of ticks.

Whether the readability has priority over meeting the requested *count* can be specified with setTickStepStrategy.

5.15.5.3 setTickOrigin()

```
void QCPAxisTicker::setTickOrigin (
            double origin )
```

Sets the mathematical coordinate (or "offset") of the zeroth tick. This tick coordinate is just a concept and doesn't need to be inside the currently visible axis range.

By default *origin* is zero, which for example yields ticks {-5, 0, 5, 10, 15,...} when the tick step is five. If *origin* is now set to 1 instead, the correspondingly generated ticks would be {-4, 1, 6, 11, 16,...}.

5.15.5.4 setTickStepStrategy()

```
void QCPAxisTicker::setTickStepStrategy (
            QCPAxisTicker::TickStepStrategy strategy )
```

Sets which strategy the axis ticker follows when choosing the size of the tick step. For the available strategies, see TickStepStrategy.

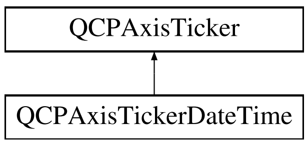
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.16 QCPAxisTickerDateTime Class Reference

Specialized axis ticker for calendar dates and times as axis ticks.

Inheritance diagram for QCPAxisTickerDateTime:



Public Member Functions

- QCPAxisTickerDateTime ()
- QString **dateTimeFormat** () const
- Qt::TimeSpec **dateTimeSpec** () const
- void setDateTimeFormat (const QString &format)
- void setDateTimeSpec (Qt::TimeSpec spec)
- void setTickOrigin (double origin)
- void setTickOrigin (const QDateTime &origin)

Static Public Member Functions

- static QDateTime keyToDateTime (double key)
- static double dateTimeToKey (const QDateTime dateTime)
- static double dateTimeToKey (const QDate date)

Protected Types

- enum **DateStrategy** { **dsNone**, **dsUniformTimeInDay**, **dsUniformDayInMonth** }

Protected Member Functions

- virtual double **getTickStep** (const QCPRange &range) Q_DECL_OVERRIDE
- virtual int **getSubTickCount** (double tickStep) Q_DECL_OVERRIDE
- virtual QString **getTickLabel** (double tick, const QLocale &locale, QChar formatChar, int precision) Q_DECL_OVERRIDE
- virtual QVector< double > **createTickVector** (double tickStep, const QCPRange &range) Q_DECL_OVERRIDE

Protected Attributes

- QString **mDateTimeFormat**
- Qt::TimeSpec **mDateTimeSpec**
- enum QCPAxisTickerDateTime::DateStrategy **mDateStrategy**

Additional Inherited Members

5.16.1 Detailed Description

Specialized axis ticker for calendar dates and times as axis ticks.

This QCPAxisTicker subclass generates ticks that correspond to real calendar dates and times. The plot axis coordinate is interpreted as Unix Time, so seconds since Epoch (January 1, 1970, 00:00 UTC). This is also used for example by QDateTime in the `toTime_t()/setTime_t()` methods with a precision of one second. Since Qt 4.7, millisecond accuracy can be obtained from QDateTime by using `QDateTime::fromMSecsSinceEpoch()/1000.0`. The static methods dateTimeToKey and keyToDateTime conveniently perform this conversion achieving a precision of one millisecond on all Qt versions.

The format of the date/time display in the tick labels is controlled with setDateTimeFormat. If a different time spec (time zone) shall be used, see setDateTimeSpec.

This ticker produces unequal tick spacing in order to provide intuitive date and time-of-day ticks. For example, if the axis range spans a few years such that there is one tick per year, ticks will be positioned on 1. January of every year. This is intuitive but, due to leap years, will result in slightly unequal tick intervals (visually unnoticeable). The same can be seen in the image above: even though the number of days varies month by month, this ticker generates ticks on the same day of each month.

If you would like to change the date/time that is used as a (mathematical) starting date for the ticks, use the setTickOrigin(const QDateTime &origin) method overload, which takes a QDateTime. If you pass 15. July, 9:45 to this method, the yearly ticks will end up on 15. July at 9:45 of every year.

The ticker can be created and assigned to an axis like this:

Note

If you rather wish to display relative times in terms of days, hours, minutes, seconds and milliseconds, and are not interested in the intricacies of real calendar dates with months and (leap) years, have a look at QCPAxisTickerTime instead.

5.16.2 Constructor & Destructor Documentation

5.16.2.1 QCPAxisTickerDateTime()

```
QCPAxisTickerDateTime::QCPAxisTickerDateTime ( )
```

Constructs the ticker and sets reasonable default values. Axis tickers are commonly created managed by a Q← SharedPointer, which then can be passed to QCPAxis::setTicker.

5.16.3 Member Function Documentation

5.16.3.1 dateTimeToKey() [1/2]

```
double QCPAxisTickerDateTime::dateTimeToKey (
            const QDateTime dateTime ) [static]
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

A convenience method which turns a QDateTime object into a double value that corresponds to seconds since Epoch (1. Jan 1970, 00:00 UTC). This is the format used as axis coordinates by QCPAxisTickerDateTime.

The accuracy achieved by this method is one millisecond, irrespective of the used Qt version (it works around the lack of a QDateTime::toMSecsSinceEpoch in Qt 4.6)

See also

keyToDateTime

5.16.3.2 dateTimeToKey() [2/2]

```
double QCPAxisTickerDateTime::dateTimeToKey (
            const QDate date ) [static]
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

A convenience method which turns a QDate object into a double value that corresponds to seconds since Epoch (1. Jan 1970, 00:00 UTC). This is the format used as axis coordinates by QCPAxisTickerDateTime.

See also

keyToDateTime

5.16.3.3 keyToDateTime()

```
QDateTime QCPAxisTickerDateTime::keyToDateTime (
            double key )  [static]
```

A convenience method which turns *key* (in seconds since Epoch 1. Jan 1970, 00:00 UTC) into a QDateTime object. This can be used to turn axis coordinates to actual QDateTimes.

The accuracy achieved by this method is one millisecond, irrespective of the used Qt version (it works around the lack of a QDateTime::fromMSecsSinceEpoch in Qt 4.6)

See also

dateTimeToKey

5.16.3.4 setDateTimeFormat()

```
void QCPAxisTickerDateTime::setDateTimeFormat (
            const QString & format )
```

Sets the format in which dates and times are displayed as tick labels. For details about the *format* string, see the documentation of QDateTime::toString().

Newlines can be inserted with "\n".

See also

setDateTimeSpec

5.16.3.5 setDateTimeSpec()

```
void QCPAxisTickerDateTime::setDateTimeSpec (
            Qt::TimeSpec spec )
```

Sets the time spec that is used for creating the tick labels from corresponding dates/times.

The default value of QDateTime objects (and also QCPAxisTickerDateTime) is `Qt::LocalTime`. However, if the date time values passed to QCustomPlot (e.g. in the form of axis ranges or keys of a plottable) are given in the UTC spec, set *spec* to `Qt::UTC` to get the correct axis labels.

See also

setDateTimeFormat

5.16.3.6 setTickOrigin() [1/2]

```
void QCPAxisTickerDateTime::setTickOrigin (
            double origin )
```

Sets the tick origin (see QCPAxisTicker::setTickOrigin) in seconds since Epoch (1. Jan 1970, 00:00 UTC). For the date time ticker it might be more intuitive to use the overload which directly takes a QDateTime, see setTick↵ Origin(const QDateTime &origin).

This is useful to define the month/day/time recurring at greater tick interval steps. For example, If you pass 15. July, 9:45 to this method and the tick interval happens to be one tick per year, the ticks will end up on 15. July at 9:45 of every year.

5.16.3.7 setTickOrigin() [2/2]

```
void QCPAxisTickerDateTime::setTickOrigin (
            const QDateTime & origin )
```

Sets the tick origin (see QCPAxisTicker::setTickOrigin) as a QDateTime *origin*.

This is useful to define the month/day/time recurring at greater tick interval steps. For example, If you pass 15. July, 9:45 to this method and the tick interval happens to be one tick per year, the ticks will end up on 15. July at 9:45 of every year.

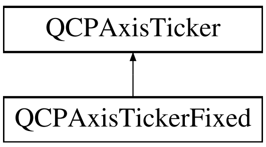
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↵ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↵ cpp

5.17 QCPAxisTickerFixed Class Reference

Specialized axis ticker with a fixed tick step.

Inheritance diagram for QCPAxisTickerFixed:



Public Types

- enum ScaleStrategy { ssNone, ssMultiples, ssPowers }

Public Member Functions

- QCPAxisTickerFixed ()
- double **tickStep** () const
- ScaleStrategy **scaleStrategy** () const
- void setTickStep (double step)
- void setScaleStrategy (ScaleStrategy strategy)

Protected Member Functions

- virtual double **getTickStep** (const QCPRange &range) Q_DECL_OVERRIDE

Protected Attributes

- double **mTickStep**
- ScaleStrategy **mScaleStrategy**

5.17.1 Detailed Description

Specialized axis ticker with a fixed tick step.

This QCPAxisTicker subclass generates ticks with a fixed tick step set with setTickStep. It is also possible to allow integer multiples and integer powers of the specified tick step with setScaleStrategy.

A typical application of this ticker is to make an axis only display integers, by setting the tick step of the ticker to 1.0 and the scale strategy to ssMultiples.

Another case is when a certain number has a special meaning and axis ticks should only appear at multiples of that value. In this case you might also want to consider QCPAxisTickerPi because despite the name it is not limited to only pi symbols/values.

The ticker can be created and assigned to an axis like this:

5.17.2 Member Enumeration Documentation

5.17.2.1 ScaleStrategy

```
enum QCPAxisTickerFixed::ScaleStrategy
```

Defines how the axis ticker may modify the specified tick step (setTickStep) in order to control the number of ticks in the axis range.

See also

setScaleStrategy

Enumerator

ssNone	Modifications are not allowed, the specified tick step is absolutely fixed. This might cause a high tick density and overlapping labels if the axis range is zoomed out.
ssMultiples	An integer multiple of the specified tick step is allowed. The used factor follows the base class properties of setTickStepStrategy and setTickCount.
ssPowers	An integer power of the specified tick step is allowed.

5.17.3 Constructor & Destructor Documentation

5.17.3.1 QCPAxisTickerFixed()

```
QCPAxisTickerFixed::QCPAxisTickerFixed ( )
```

Constructs the ticker and sets reasonable default values. Axis tickers are commonly created managed by a Q↩ SharedPointer, which then can be passed to QCPAxis::setTicker.

5.17.4 Member Function Documentation

5.17.4.1 setScaleStrategy()

```
void QCPAxisTickerFixed::setScaleStrategy (
            QCPAxisTickerFixed::ScaleStrategy strategy )
```

Sets whether the specified tick step (setTickStep) is absolutely fixed or whether modifications may be applied to it before calculating the finally used tick step, such as permitting multiples or powers. See ScaleStrategy for details.

The default strategy is ssNone, which means the tick step is absolutely fixed.

5.17.4.2 setTickStep()

```
void QCPAxisTickerFixed::setTickStep (
            double step )
```

Sets the fixed tick interval to *step*.

The axis ticker will only use this tick step when generating axis ticks. This might cause a very high tick density and overlapping labels if the axis range is zoomed out. Using setScaleStrategy it is possible to relax the fixed step and also allow multiples or powers of *step*. This will enable the ticker to reduce the number of ticks to a reasonable amount (see setTickCount).

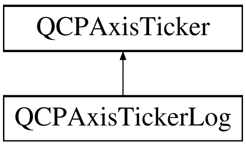
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.18 QCPAxisTickerLog Class Reference

Specialized axis ticker suited for logarithmic axes.

Inheritance diagram for QCPAxisTickerLog:



Public Member Functions

- QCPAxisTickerLog ()
- double **logBase** () const
- int **subTickCount** () const
- void setLogBase (double base)
- void setSubTickCount (int subTicks)

Protected Member Functions

- virtual double **getTickStep** (const QCPRange &range) Q_DECL_OVERRIDE
- virtual int **getSubTickCount** (double tickStep) Q_DECL_OVERRIDE
- virtual QVector< double > **createTickVector** (double tickStep, const QCPRange &range) Q_DECL_OVE↩ RRIDE

Protected Attributes

- double **mLogBase**
- int **mSubTickCount**
- double **mLogBaseLnInv**

Additional Inherited Members

5.18.1 Detailed Description

Specialized axis ticker suited for logarithmic axes.

This QCPAxisTicker subclass generates ticks with unequal tick intervals suited for logarithmic axis scales. The ticks are placed at powers of the specified log base (setLogBase).

Especially in the case of a log base equal to 10 (the default), it might be desirable to have tick labels in the form of powers of ten without mantissa display. To achieve this, set the number precision (QCPAxis::setNumberPrecision) to zero and the number format (QCPAxis::setNumberFormat) to scientific (exponential) display with beautifully typeset decimal powers, so a format string of `"eb"`. This will result in the following axis tick labels:

The ticker can be created and assigned to an axis like this:

5.18.2 Constructor & Destructor Documentation

5.18.2.1 QCPAxisTickerLog()

```
QCPAxisTickerLog::QCPAxisTickerLog ( )
```

Constructs the ticker and sets reasonable default values. Axis tickers are commonly created managed by a Q↩
SharedPointer, which then can be passed to QCPAxis::setTicker.

5.18.3 Member Function Documentation

5.18.3.1 setLogBase()

```
void QCPAxisTickerLog::setLogBase (
            double base )
```

Sets the logarithm base used for tick coordinate generation. The ticks will be placed at integer powers of *base*.

5.18.3.2 setSubTickCount()

```
void QCPAxisTickerLog::setSubTickCount (
            int subTicks )
```

Sets the number of sub ticks in a tick interval. Within each interval, the sub ticks are spaced linearly to provide a better visual guide, so the sub tick density increases toward the higher tick.

Note that *subTicks* is the number of sub ticks (not sub intervals) in one tick interval. So in the case of logarithm base 10 an intuitive sub tick spacing would be achieved with eight sub ticks (the default). This means e.g. between the ticks 10 and 100 there will be eight ticks, namely at 20, 30, 40, 50, 60, 70, 80 and 90.

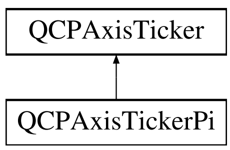
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
cpp

5.19 QCPAxisTickerPi Class Reference

Specialized axis ticker to display ticks in units of an arbitrary constant, for example pi.

Inheritance diagram for QCPAxisTickerPi:



Public Types

- enum FractionStyle { fsFloatingPoint, fsAsciiFractions, fsUnicodeFractions }

Public Member Functions

- QCPAxisTickerPi ()
- QString **piSymbol** () const
- double **piValue** () const
- bool **periodicity** () const
- FractionStyle **fractionStyle** () const
- void setPiSymbol (QString symbol)
- void setPiValue (double pi)
- void setPeriodicity (int multiplesOfPi)
- void setFractionStyle (FractionStyle style)

Protected Member Functions

- virtual double **getTickStep** (const QCPRange &range) Q_DECL_OVERRIDE
- virtual int **getSubTickCount** (double tickStep) Q_DECL_OVERRIDE
- virtual QString **getTickLabel** (double tick, const QLocale &locale, QChar formatChar, int precision) Q_DE↩ CL_OVERRIDE
- void **simplifyFraction** (int &numerator, int &denominator) const
- QString **fractionToString** (int numerator, int denominator) const
- QString **unicodeFraction** (int numerator, int denominator) const
- QString **unicodeSuperscript** (int number) const
- QString **unicodeSubscript** (int number) const

Protected Attributes

- QString **mPiSymbol**
- double **mPiValue**
- int **mPeriodicity**
- FractionStyle **mFractionStyle**
- double **mPiTickStep**

5.19.1 Detailed Description

Specialized axis ticker to display ticks in units of an arbitrary constant, for example pi.

This QCPAxisTicker subclass generates ticks that are expressed with respect to a given symbolic constant with a numerical value specified with setPiValue and an appearance in the tick labels specified with setPiSymbol.

Ticks may be generated at fractions of the symbolic constant. How these fractions appear in the tick label can be configured with setFractionStyle.

The ticker can be created and assigned to an axis like this:

5.19.2 Member Enumeration Documentation

5.19.2.1 FractionStyle

```
enum QCPAxisTickerPi::FractionStyle
```

Defines how fractions should be displayed in tick labels.

See also

setFractionStyle

Enumerator

fsFloatingPoint	Fractions are displayed as regular decimal floating point numbers, e.g. "0.25" or "0.125".
fsAsciiFractions	Fractions are written as rationals using ASCII characters only, e.g. "1/4" or "1/8".
fsUnicodeFractions	Fractions are written using sub- and superscript UTF-8 digits and the fraction symbol.

5.19.3 Constructor & Destructor Documentation

5.19.3.1 QCPAxisTickerPi()

```
QCPAxisTickerPi::QCPAxisTickerPi ( )
```

Constructs the ticker and sets reasonable default values. Axis tickers are commonly created managed by a Q↩ SharedPointer, which then can be passed to QCPAxis::setTicker.

5.19.4 Member Function Documentation

5.19.4.1 setFractionStyle()

```
void QCPAxisTickerPi::setFractionStyle (
            QCPAxisTickerPi::FractionStyle style )
```

Sets how the numerical/fractional part preceding the symbolic constant is displayed in tick labels. See FractionStyle for the various options.

5.19.4.2 setPeriodicity()

```
void QCPAxisTickerPi::setPeriodicity (
            int multiplesOfPi )
```

Sets whether the axis labels shall appear periodicly and if so, at which multiplicity of the symbolic constant.

To disable periodicity, set *multiplesOfPi* to zero.

For example, an axis that identifies 0 with 2pi would set *multiplesOfPi* to two.

5.19.4.3 setPiSymbol()

```
void QCPAxisTickerPi::setPiSymbol (
            QString symbol )
```

Sets how the symbol part (which is always a suffix to the number) shall appear in the axis tick label.

If a space shall appear between the number and the symbol, make sure the space is contained in *symbol*.

5.19.4.4 setPiValue()

```
void QCPAxisTickerPi::setPiValue (
            double pi )
```

Sets the numerical value that the symbolic constant has.

This will be used to place the appropriate fractions of the symbol at the respective axis coordinates.

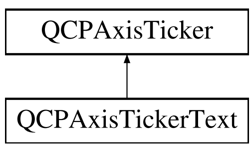
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.20 QCPAxisTickerText Class Reference

Specialized axis ticker which allows arbitrary labels at specified coordinates.

Inheritance diagram for QCPAxisTickerText:



Public Member Functions

- QCPAxisTickerText ()
- QMap< double, QString > & ticks ()
- int **subTickCount** () const
- void setTicks (const QMap< double, QString > &ticks)
- void setTicks (const QVector< double > &positions, const QVector< QString > labels)
- void setSubTickCount (int subTicks)
- void clear ()
- void addTick (double position, QString label)
- void addTicks (const QMap< double, QString > &ticks)
- void addTicks (const QVector< double > &positions, const QVector< QString > &labels)

Protected Member Functions

- virtual double getTickStep (const QCPRange &range) Q_DECL_OVERRIDE
- virtual int getSubTickCount (double tickStep) Q_DECL_OVERRIDE
- virtual QString getTickLabel (double tick, const QLocale &locale, QChar formatChar, int precision) Q_DEC↩ L_OVERRIDE
- virtual QVector< double > createTickVector (double tickStep, const QCPRange &range) Q_DECL_OVER↩ RIDE

Protected Attributes

- QMap< double, QString > **mTicks**
- int **mSubTickCount**

Additional Inherited Members

5.20.1 Detailed Description

Specialized axis ticker which allows arbitrary labels at specified coordinates.

This QCPAxisTicker subclass generates ticks which can be directly specified by the user as coordinates and associated strings. They can be passed as a whole with setTicks or one at a time with addTick. Alternatively you can directly access the internal storage via ticks and modify the tick/label data there.

This is useful for cases where the axis represents categories rather than numerical values.

If you are updating the ticks of this ticker regularly and in a dynamic fasion (e.g. dependent on the axis range), it is a sign that you should probably create an own ticker by subclassing QCPAxisTicker, instead of using this one.

The ticker can be created and assigned to an axis like this:

5.20.2 Constructor & Destructor Documentation

5.20.2.1 QCPAxisTickerText()

```
QCPAxisTickerText::QCPAxisTickerText ( )
```

Constructs the ticker and sets reasonable default values. Axis tickers are commonly created managed by a Q↩ SharedPointer, which then can be passed to QCPAxis::setTicker.

5.20.3 Member Function Documentation

5.20.3.1 addTick()

```
void QCPAxisTickerText::addTick (
            double position,
            QString label )
```

Adds a single tick to the axis at the given axis coordinate *position*, with the provided tick *label*.

See also

addTicks, setTicks, clear

5.20.3.2 addTicks() [1/2]

```
void QCPAxisTickerText::addTicks (
            const QMap< double, QString > & ticks )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided *ticks* to the ones already existing. The map key of *ticks* corresponds to the axis coordinate, and the map value is the string that will appear as tick label.

An alternative to manipulate ticks is to directly access the internal storage with the ticks getter.

See also

addTick, setTicks, clear

5.20.3.3 addTicks() [2/2]

```
void QCPAxisTickerText::addTicks (
            const QVector< double > & positions,
            const QVector< QString > & labels )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided ticks to the ones already existing. The entries of *positions* correspond to the axis coordinates, and the entries of *labels* are the respective strings that will appear as tick labels.

An alternative to manipulate ticks is to directly access the internal storage with the ticks getter.

See also

addTick, setTicks, clear

5.20.3.4 clear()

```
void QCPAxisTickerText::clear ( )
```

Clears all ticks.

An alternative to manipulate ticks is to directly access the internal storage with the ticks getter.

See also

setTicks, addTicks, addTick

5.20.3.5 createTickVector()

```
QVector< double > QCPAxisTickerText::createTickVector (
            double tickStep,
            const QCPRange & range ) [protected], [virtual]
```

Returns the externally provided tick coordinates which are in the specified *range*. If available, one tick above and below the range is provided in addition, to allow possible sub tick calculation. The parameter *tickStep* is ignored.

Reimplemented from QCPAxisTicker.

5.20.3.6 getSubTickCount()

```
int QCPAxisTickerText::getSubTickCount (
            double tickStep )  [protected], [virtual]
```

Returns the sub tick count that was configured with setSubTickCount.

Reimplemented from QCPAxisTicker.

5.20.3.7 getTickLabel()

```
QString QCPAxisTickerText::getTickLabel (
            double tick,
            const QLocale & locale,
            QChar formatChar,
            int precision )  [protected], [virtual]
```

Returns the tick label which corresponds to the key *tick* in the internal tick storage. Since the labels are provided externally, *locale*, *formatChar*, and *precision* are ignored.

Reimplemented from QCPAxisTicker.

5.20.3.8 getTickStep()

```
double QCPAxisTickerText::getTickStep (
            const QCPRange & range )  [protected], [virtual]
```

Since the tick coordinates are provided externally, this method implementation does nothing.

Reimplemented from QCPAxisTicker.

5.20.3.9 setSubTickCount()

```
void QCPAxisTickerText::setSubTickCount (
            int subTicks )
```

Sets the number of sub ticks that shall appear between ticks. For QCPAxisTickerText, there is no automatic sub tick count calculation. So if sub ticks are needed, they must be configured with this method.

5.20.3.10 setTicks() [1/2]

```
void QCPAxisTickerText::setTicks (
            const QMap< double, QString > & ticks )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets the ticks that shall appear on the axis. The map key of *ticks* corresponds to the axis coordinate, and the map value is the string that will appear as tick label.

An alternative to manipulate ticks is to directly access the internal storage with the ticks getter.

See also

addTicks, addTick, clear

5.20.3.11 setTicks() [2/2]

```
void QCPAxisTickerText::setTicks (
            const QVector< double > & positions,
            const QVector< QString > labels )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets the ticks that shall appear on the axis. The entries of *positions* correspond to the axis coordinates, and the entries of *labels* are the respective strings that will appear as tick labels.

See also

addTicks, addTick, clear

5.20.3.12 ticks()

```
QMap< double, QString > & QCPAxisTickerText::ticks ( ) [inline]
```

Returns a non-const reference to the internal map which stores the tick coordinates and their labels.

You can access the map directly in order to add, remove or manipulate ticks, as an alternative to using the methods provided by QCPAxisTickerText, such as setTicks and addTick.

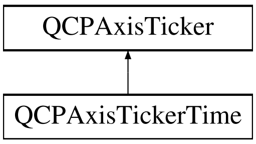
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.21 QCPAxisTickerTime Class Reference

Specialized axis ticker for time spans in units of milliseconds to days.

Inheritance diagram for QCPAxisTickerTime:



Public Types

- enum TimeUnit {
  tuMilliseconds, **tuSeconds**, **tuMinutes**, **tuHours**,
  tuDays }

Public Member Functions

- QCPAxisTickerTime ()
- QString **timeFormat** () const
- int **fieldWidth** (TimeUnit unit) const
- void setTimeFormat (const QString &format)
- void setFieldWidth (TimeUnit unit, int width)

Protected Member Functions

- virtual double **getTickStep** (const QCPRange &range) Q_DECL_OVERRIDE
- virtual int **getSubTickCount** (double tickStep) Q_DECL_OVERRIDE
- virtual QString **getTickLabel** (double tick, const QLocale &locale, QChar formatChar, int precision) Q_DE←CL_OVERRIDE
- void **replaceUnit** (QString &text, TimeUnit unit, int value) const

Protected Attributes

- QString **mTimeFormat**
- QHash< TimeUnit, int > **mFieldWidth**
- TimeUnit **mSmallestUnit**
- TimeUnit **mBiggestUnit**
- QHash< TimeUnit, QString > **mFormatPattern**

5.21.1 Detailed Description

Specialized axis ticker for time spans in units of milliseconds to days.

This QCPAxisTicker subclass generates ticks that corresponds to time intervals.

The format of the time display in the tick labels is controlled with setTimeFormat and setFieldWidth. The time coordinate is in the unit of seconds with respect to the time coordinate zero. Unlike with QCPAxisTickerDateTime, the ticks don't correspond to a specific calendar date and time.

The time can be displayed in milliseconds, seconds, minutes, hours and days. Depending on the largest available unit in the format specified with setTimeFormat, any time spans above will be carried in that largest unit. So for example if the format string is "%m:%s" and a tick at coordinate value 7815 (being 2 hours, 10 minutes and 15 seconds) is created, the resulting tick label will show "130:15" (130 minutes, 15 seconds). If the format string is "%h:%m:%s", the hour unit will be used and the label will thus be "02:10:15". Negative times with respect to the axis zero will carry a leading minus sign.

The ticker can be created and assigned to an axis like this:

Here is an example of a time axis providing time information in days, hours and minutes. Due to the axis range spanning a few days and the wanted tick count (setTickCount), the ticker decided to use tick steps of 12 hours:

The format string for this example is

Note

If you rather wish to display calendar dates and times, have a look at QCPAxisTickerDateTime instead.

5.21.2 Member Enumeration Documentation

5.21.2.1 TimeUnit

`enum QCPAxisTickerTime::TimeUnit`

Defines the logical units in which fractions of time spans can be expressed.

See also

setFieldWidth, setTimeFormat

5.21.3 Constructor & Destructor Documentation

5.21.3.1 QCPAxisTickerTime()

```
QCPAxisTickerTime::QCPAxisTickerTime ( )
```

Constructs the ticker and sets reasonable default values. Axis tickers are commonly created managed by a Q↩ SharedPointer, which then can be passed to QCPAxis::setTicker.

5.21.4 Member Function Documentation

5.21.4.1 setFieldWidth()

```
void QCPAxisTickerTime::setFieldWidth (
            QCPAxisTickerTime::TimeUnit unit,
            int width )
```

Sets the field widh of the specified *unit* to be *width* digits, when displayed in the tick label. If the number for the specific unit is shorter than *width*, it will be padded with an according number of zeros to the left in order to reach the field width.

See also

setTimeFormat

5.21.4.2 setTimeFormat()

```
void QCPAxisTickerTime::setTimeFormat (
            const QString & format )
```

Sets the format that will be used to display time in the tick labels.

The available patterns are:

- %z for milliseconds
- %s for seconds
- %m for minutes
- %h for hours
- %d for days

The field width (zero padding) can be controlled for each unit with setFieldWidth.

The largest unit that appears in *format* will carry all the remaining time of a certain tick coordinate, even if it overflows the natural limit of the unit. For example, if %m is the largest unit it might become larger than 59 in order to consume larger time values. If on the other hand %h is available, the minutes will wrap around to zero after 59 and the time will carry to the hour digit.

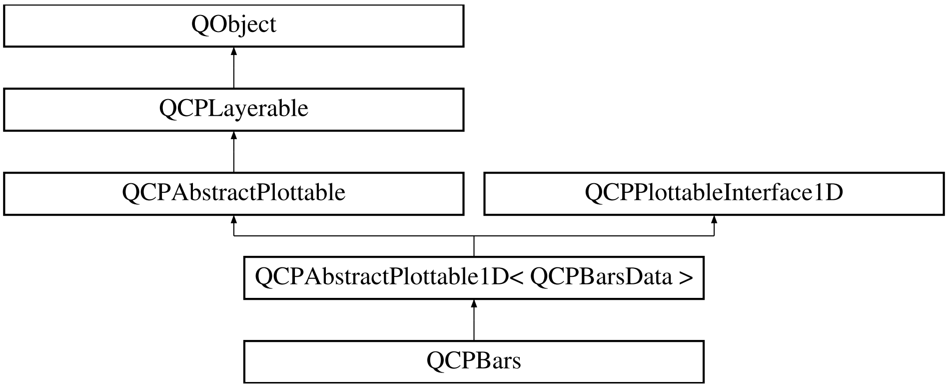
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.22 QCPBars Class Reference

A plottable representing a bar chart in a plot.

Inheritance diagram for QCPBars:



Public Types

- enum WidthType { wtAbsolute, wtAxisRectRatio, wtPlotCoords }

Public Member Functions

- QCPBars (QCPAxis *keyAxis, QCPAxis *valueAxis)
- double **width** () const
- WidthType **widthType** () const
- QCPBarsGroup * **barsGroup** () const
- double **baseValue** () const
- double **stackingGap** () const
- QCPBars * barBelow () const
- QCPBars * barAbove () const
- QSharedPointer< QCPBarsDataContainer > data () const
- void setData (QSharedPointer< QCPBarsDataContainer > data)
- void setData (const QVector< double > &keys, const QVector< double > &values, bool alreadySorted=false)
- void setWidth (double width)
- void setWidthType (WidthType widthType)
- void setBarsGroup (QCPBarsGroup *barsGroup)
- void setBaseValue (double baseValue)
- void setStackingGap (double pixels)
- void addData (const QVector< double > &keys, const QVector< double > &values, bool already←Sorted=false)
- void addData (double key, double value)
- void moveBelow (QCPBars *bars)
- void moveAbove (QCPBars *bars)
- virtual QCPDataSelection selectTestRect (const QRectF &rect, bool onlySelectable) const Q_DECL_OVE←RRIDE
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant *details=0) const Q_DECL_←OVERRIDE
- virtual QCPRange getKeyRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth) const Q_DECL_OVERRIDE
- virtual QCPRange getValueRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth, const QCPRange &inKeyRange=QCPRange()) const Q_DECL_OVERRIDE
- virtual QPointF dataPixelPosition (int index) const Q_DECL_OVERRIDE

Protected Member Functions

- virtual void **draw** (QCPPainter *painter) Q_DECL_OVERRIDE
- virtual void **drawLegendIcon** (QCPPainter *painter, const QRectF &rect) const Q_DECL_OVERRIDE
- void **getVisibleDataBounds** (QCPBarsDataContainer::const_iterator &begin, QCPBarsDataContainer::const_iterator &end) const
- QRectF **getBarRect** (double key, double value) const
- void **getPixelWidth** (double key, double &lower, double &upper) const
- double **getStackedBaseValue** (double key, bool positive) const

Static Protected Member Functions

- static void **connectBars** (QCPBars *lower, QCPBars *upper)

Protected Attributes

- double **mWidth**
- WidthType **mWidthType**
- QCPBarsGroup * **mBarsGroup**
- double **mBaseValue**
- double **mStackingGap**
- QPointer< QCPBars > **mBarBelow**
- QPointer< QCPBars > **mBarAbove**

Friends

- class **QCustomPlot**
- class **QCPLegend**
- class **QCPBarsGroup**

Additional Inherited Members

5.22.1 Detailed Description

A plottable representing a bar chart in a plot.

To plot data, assign it with the setData or addData functions.

5.22.2 Changing the appearance

The appearance of the bars is determined by the pen and the brush (setPen, setBrush). The width of the individual bars can be controlled with setWidthType and setWidth.

Bar charts are stackable. This means, two QCPBars plottables can be placed on top of each other (see QCPBars::moveAbove). So when two bars are at the same key position, they will appear stacked.

If you would like to group multiple QCPBars plottables together so they appear side by side as shown below, use QCPBarsGroup.

5.22.3 Usage

Like all data representing objects in QCustomPlot, the QCPBars is a plottable (QCPAbstractPlottable). So the plottable-interface of QCustomPlot applies (QCustomPlot::plottable, QCustomPlot::removePlottable, etc.)

Usually, you first create an instance:

which registers it with the QCustomPlot instance of the passed axes. Note that this QCustomPlot instance takes ownership of the plottable, so do not delete it manually but use QCustomPlot::removePlottable() instead. The newly created plottable can be modified, e.g.:

5.22.4 Member Enumeration Documentation

5.22.4.1 WidthType

`enum QCPBars::WidthType`

Defines the ways the width of the bar can be specified. Thus it defines what the number passed to setWidth actually means.

See also

setWidthType, setWidth

Enumerator

wtAbsolute	Bar width is in absolute pixels.
wtAxisRectRatio	Bar width is given by a fraction of the axis rect size.
wtPlotCoords	Bar width is in key coordinates and thus scales with the key axis range.

5.22.5 Constructor & Destructor Documentation

5.22.5.1 QCPBars()

```
QCPBars::QCPBars (
            QCPAxis * keyAxis,
            QCPAxis * valueAxis )  [explicit]
```

Constructs a bar chart which uses *keyAxis* as its key axis ("x") and *valueAxis* as its value axis ("y"). *keyAxis* and *valueAxis* must reside in the same QCustomPlot instance and not have the same orientation. If either of these restrictions is violated, a corresponding message is printed to the debug output (qDebug), the construction is not aborted, though.

The created QCPBars is automatically registered with the QCustomPlot instance inferred from *keyAxis*. This QCustomPlot instance takes ownership of the QCPBars, so do not delete it manually but use QCustomPlot::removePlottable() instead.

5.22.6 Member Function Documentation

5.22.6.1 addData() [1/2]

```
void QCPBars::addData (
            const QVector< double > & keys,
            const QVector< double > & values,
            bool alreadySorted = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided points in *keys* and *values* to the current data. The provided vectors should have equal length. Else, the number of added points will be the size of the smallest vector.

If you can guarantee that the passed data points are sorted by *keys* in ascending order, you can set *alreadySorted* to true, to improve performance by saving a sorting run.

Alternatively, you can also access and modify the data directly via the data method, which returns a pointer to the internal data container.

5.22.6.2 addData() [2/2]

```
void QCPBars::addData (
            double key,
            double value )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts. Adds the provided data point as *key* and *value* to the current data.

Alternatively, you can also access and modify the data directly via the data method, which returns a pointer to the internal data container.

5.22.6.3 barAbove()

```
QCPBars * QCPBars::barAbove ( ) const [inline]
```

Returns the bars plottable that is directly above this bars plottable. If there is no such plottable, returns 0.

See also

barBelow, moveBelow, moveAbove

5.22.6.4 barBelow()

`QCPBars * QCPBars::barBelow ( ) const [inline]`

Returns the bars plottable that is directly below this bars plottable. If there is no such plottable, returns 0.

See also

barAbove, moveBelow, moveAbove

5.22.6.5 data()

`QSharedPointer< QCPBarsDataContainer > QCPBars::data ( ) const [inline]`

Returns a shared pointer to the internal data storage of type QCPBarsDataContainer. You may use it to directly manipulate the data, which may be more convenient and faster than using the regular setData or addData methods.

5.22.6.6 dataPixelPosition()

```
QPointF QCPBars::dataPixelPosition (
            int index ) const [virtual]
```

Returns the pixel position on the widget surface at which the data point at the given *index* appears.

Usually this corresponds to the point of dataMainKey/dataMainValue, in pixel coordinates. However, depending on the plottable, this might be a different apparent position than just a coord-to-pixel transform of those values. For example, QCPBars apparent data values can be shifted depending on their stacking, bar grouping or configured base value.

Reimplemented from QCPAbstractPlottable1D< QCPBarsData >.

5.22.6.7 getKeyRange()

```
QCPRange QCPBars::getKeyRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth ) const [virtual]
```

Returns the coordinate range that all data in this plottable span in the key axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSignDomain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getValueRange

Implements QCPAbstractPlottable.

5.22.6.8 getValueRange()

```
QCPRange QCPBars::getValueRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth,
            const QCPRange & inKeyRange = QCPRange() ) const  [virtual]
```

Returns the coordinate range that the data points in the specified key range (*inKeyRange*) span in the value axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSign↩ Domain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

If *inKeyRange* has both lower and upper bound set to zero (is equal to `QCPRange()`), all data points are considered, without any restriction on the keys.

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getKeyRange

Implements QCPAbstractPlottable.

5.22.6.9 moveAbove()

```
void QCPBars::moveAbove (
            QCPBars * bars )
```

Moves this bars plottable above *bars*. In other words, the bars of this plottable will appear above the bars of *bars*. The move target *bars* must use the same key and value axis as this plottable.

Inserting into and removing from existing bar stacking is handled gracefully. If *bars* already has a bars object above itself, this bars object is inserted between the two. If this bars object is already between two other bars, the two other bars will be stacked on top of each other after the operation.

To remove this bars plottable from any stacking, set *bars* to 0.

See also

moveBelow, barBelow, barAbove

5.22.6.10 moveBelow()

```
void QCPBars::moveBelow (
            QCPBars * bars )
```

Moves this bars plottable below *bars*. In other words, the bars of this plottable will appear below the bars of *bars*. The move target *bars* must use the same key and value axis as this plottable.

Inserting into and removing from existing bar stacking is handled gracefully. If *bars* already has a bars object below itself, this bars object is inserted between the two. If this bars object is already between two other bars, the two other bars will be stacked on top of each other after the operation.

To remove this bars plottable from any stacking, set *bars* to 0.

See also

moveBelow, barAbove, barBelow

5.22.6.11 selectTest()

```
double QCPBars::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const [virtual]
```

Implements a point-selection algorithm assuming the data (accessed via the 1D data interface) is point-like. Most subclasses will want to reimplement this method again, to provide a more accurate hit test based on the true data visualization geometry.

Reimplemented from QCPAbstractPlottable1D< QCPBarsData >.

5.22.6.12 selectTestRect()

```
QCPDataSelection QCPBars::selectTestRect (
            const QRectF & rect,
            bool onlySelectable ) const [virtual]
```

Returns a data selection containing all the data points of this plottable which are contained (or hit by) *rect*. This is used mainly in the selection rect interaction for data selection (data selection mechanism).

If *onlySelectable* is true, an empty QCPDataSelection is returned if this plottable is not selectable (i.e. if QCP←AbstractPlottable::setSelectable is QCP::stNone).

Note

rect must be a normalized rect (positive or zero width and height). This is especially important when using the rect of QCPSelectionRect::accepted, which is not necessarily normalized. Use `QRect::normalized()` when passing a rect which might not be normalized.

Reimplemented from QCPAbstractPlottable1D< QCPBarsData >.

5.22.6.13 setBarsGroup()

```
void QCPBars::setBarsGroup (
            QCPBarsGroup * barsGroup )
```

Sets to which QCPBarsGroup this QCPBars instance belongs to. Alternatively, you can also use QCPBarsGroup↩ ::append.

To remove this QCPBars from any group, set *barsGroup* to 0.

5.22.6.14 setBaseValue()

```
void QCPBars::setBaseValue (
            double baseValue )
```

Sets the base value of this bars plottable.

The base value defines where on the value coordinate the bars start. How far the bars extend from the base value is given by their individual value data. For example, if the base value is set to 1, a bar with data value 2 will have its lowest point at value coordinate 1 and highest point at 3.

For stacked bars, only the base value of the bottom-most QCPBars has meaning.

The default base value is 0.

5.22.6.15 setData() [1/2]

```
void QCPBars::setData (
            QSharedPointer< QCPBarsDataContainer > data )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data container with the provided *data* container.

Since a QSharedPointer is used, multiple QCPBars may share the same data container safely. Modifying the data in the container will then affect all bars that share the container. Sharing can be achieved by simply exchanging the data containers wrapped in shared pointers:

If you do not wish to share containers, but create a copy from an existing container, rather use the QCPData↩ Container<DataType>::set method on the bar's data container directly:

See also

addData

5.22.6.16 setData() [2/2]

```
void QCPBars::setData (
            const QVector< double > & keys,
            const QVector< double > & values,
            bool alreadySorted = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data with the provided points in *keys* and *values*. The provided vectors should have equal length. Else, the number of added points will be the size of the smallest vector.

If you can guarantee that the passed data points are sorted by *keys* in ascending order, you can set *alreadySorted* to true, to improve performance by saving a sorting run.

See also

addData

5.22.6.17 setStackingGap()

```
void QCPBars::setStackingGap (
            double pixels )
```

If this bars plottable is stacked on top of another bars plottable (moveAbove), this method allows specifying a distance in *pixels*, by which the drawn bar rectangles will be separated by the bars below it.

5.22.6.18 setWidth()

```
void QCPBars::setWidth (
            double width )
```

Sets the width of the bars.

How the number passed as *width* is interpreted (e.g. screen pixels, plot coordinates,...), depends on the currently set width type, see setWidthType and WidthType.

5.22.6.19 setWidthType()

```
void QCPBars::setWidthType (
            QCPBars::WidthType widthType )
```

Sets how the width of the bars is defined. See the documentation of WidthType for an explanation of the possible values for *widthType*.

The default value is wtPlotCoords.

See also

setWidth

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.23 QCPBarsData Class Reference

Holds the data of one single data point (one bar) for QCPBars.

Public Member Functions

- QCPBarsData ()
- QCPBarsData (double key, double value)
- double sortKey () const
- double mainKey () const
- double mainValue () const
- QCPRange valueRange () const

Static Public Member Functions

- static QCPBarsData fromSortKey (double sortKey)
- static bool sortKeyIsMainKey ()

Public Attributes

- double **key**
- double **value**

5.23.1 Detailed Description

Holds the data of one single data point (one bar) for QCPBars.

The stored data is:

- *key:* coordinate on the key axis of this bar (this is the *mainKey* and the *sortKey*)
- *value:* height coordinate on the value axis of this bar (this is the *mainValue*)

The container for storing multiple data points is QCPBarsDataContainer. It is a typedef for QCPDataContainer with QCPBarsData as the DataType template parameter. See the documentation there for an explanation regarding the data type's generic methods.

See also

QCPBarsDataContainer

5.23.2 Constructor & Destructor Documentation

5.23.2.1 QCPBarsData() [1/2]

```
QCPBarsData::QCPBarsData ( )
```

Constructs a bar data point with key and value set to zero.

5.23.2.2 QCPBarsData() [2/2]

```
QCPBarsData::QCPBarsData (
            double key,
            double value )
```

Constructs a bar data point with the specified *key* and *value*.

5.23.3 Member Function Documentation

5.23.3.1 fromSortKey()

```
static QCPBarsData QCPBarsData::fromSortKey (
            double sortKey ) [inline], [static]
```

Returns a data point with the specified *sortKey*. All other members are set to zero.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.23.3.2 mainKey()

```
double QCPBarsData::mainKey ( ) const [inline]
```

Returns the *key* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.23.3.3 mainValue()

```
double QCPBarsData::mainValue ( ) const [inline]
```

Returns the *value* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.23.3.4 sortKey()

`double QCPBarsData::sortKey ( ) const [inline]`

Returns the *key* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.23.3.5 sortKeyIsMainKey()

`static static bool QCPBarsData::sortKeyIsMainKey ( ) [inline], [static]`

Since the member *key* is both the data point key coordinate and the data ordering parameter, this method returns true.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.23.3.6 valueRange()

`QCPRange QCPBarsData::valueRange ( ) const [inline]`

Returns a QCPRange with both lower and upper boundary set to *value* of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

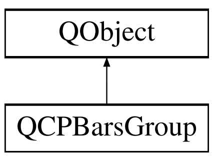
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.24 QCPBarsGroup Class Reference

Groups multiple QCPBars together so they appear side by side.

Inheritance diagram for QCPBarsGroup:



Public Types

- enum SpacingType { stAbsolute, stAxisRectRatio, stPlotCoords }

Public Member Functions

- QCPBarsGroup (QCustomPlot ∗parentPlot)
- SpacingType **spacingType** () const
- double **spacing** () const
- void setSpacingType (SpacingType spacingType)
- void setSpacing (double spacing)
- QList< QCPBars ∗ > bars () const
- QCPBars ∗ bars (int index) const
- int size () const
- bool isEmpty () const
- void clear ()
- bool contains (QCPBars ∗bars) const
- void append (QCPBars ∗bars)
- void insert (int i, QCPBars ∗bars)
- void remove (QCPBars ∗bars)

Protected Member Functions

- void **registerBars** (QCPBars ∗bars)
- void **unregisterBars** (QCPBars ∗bars)
- double **keyPixelOffset** (const QCPBars ∗bars, double keyCoord)
- double **getPixelSpacing** (const QCPBars ∗bars, double keyCoord)

Protected Attributes

- QCustomPlot ∗ **mParentPlot**
- SpacingType **mSpacingType**
- double **mSpacing**
- QList< QCPBars ∗ > **mBars**

Friends

- class **QCPBars**

5.24.1 Detailed Description

Groups multiple QCPBars together so they appear side by side.

When showing multiple QCPBars in one plot which have bars at identical keys, it may be desirable to have them appearing next to each other at each key. This is what adding the respective QCPBars plottables to a QCPBarsGroup achieves. (An alternative approach is to stack them on top of each other, see QCPBars::moveAbove.)

5.24.2 Usage

To add a QCPBars plottable to the group, create a new group and then add the respective bars intances:

Alternatively to appending to the group like shown above, you can also set the group on the QCPBars plottable via QCPBars::setBarsGroup.

The spacing between the bars can be configured via setSpacingType and setSpacing. The bars in this group appear in the plot in the order they were appended. To insert a bars plottable at a certain index position, or to reposition a bars plottable which is already in the group, use insert.

To remove specific bars from the group, use either remove or call QCPBars::setBarsGroup(0) on the respective bars plottable.

To clear the entire group, call clear, or simply delete the group.

5.24.3 Example

The image above is generated with the following code:

5.24.4 Member Enumeration Documentation

5.24.4.1 SpacingType

`enum QCPBarsGroup::SpacingType`

Defines the ways the spacing between bars in the group can be specified. Thus it defines what the number passed to setSpacing actually means.

See also

setSpacingType, setSpacing

Enumerator

stAbsolute	Bar spacing is in absolute pixels.
stAxisRectRatio	Bar spacing is given by a fraction of the axis rect size.
stPlotCoords	Bar spacing is in key coordinates and thus scales with the key axis range.

5.24.5 Constructor & Destructor Documentation

5.24.5.1 QCPBarsGroup()

```
QCPBarsGroup::QCPBarsGroup (
            QCustomPlot * parentPlot )
```

Constructs a new bars group for the specified QCustomPlot instance.

5.24.6 Member Function Documentation

5.24.6.1 append()

```
void QCPBarsGroup::append (
            QCPBars * bars )
```

Adds the specified *bars* plottable to this group. Alternatively, you can also use QCPBars::setBarsGroup on the *bars* instance.

See also

insert, remove

5.24.6.2 bars() [1/2]

```
QList< QCPBars * > QCPBarsGroup::bars ( ) const  [inline]
```

Returns all bars currently in this group.

See also

bars(int index)

5.24.6.3 bars() [2/2]

```
QCPBars * QCPBarsGroup::bars (
            int index ) const
```

Returns the QCPBars instance with the specified *index* in this group. If no such QCPBars exists, returns 0.

See also

bars(), size

5.24.6.4 clear()

```
void QCPBarsGroup::clear ( )
```

Removes all QCPBars plottables from this group.

See also

isEmpty

5.24.6.5 contains()

```
bool QCPBarsGroup::contains (
            QCPBars * bars ) const [inline]
```

Returns whether the specified *bars* plottable is part of this group.

5.24.6.6 insert()

```
void QCPBarsGroup::insert (
            int i,
            QCPBars * bars )
```

Inserts the specified *bars* plottable into this group at the specified index position *i*. This gives you full control over the ordering of the bars.

bars may already be part of this group. In that case, *bars* is just moved to the new index position.

See also

append, remove

5.24.6.7 isEmpty()

```
bool QCPBarsGroup::isEmpty ( ) const [inline]
```

Returns whether this bars group is empty.

See also

size

5.24.6.8 remove()

```
void QCPBarsGroup::remove (
            QCPBars * bars )
```

Removes the specified *bars* plottable from this group.

See also

contains, clear

5.24.6.9 setSpacing()

```
void QCPBarsGroup::setSpacing (
            double spacing )
```

Sets the spacing between adjacent bars. What the number passed as *spacing* actually means, is defined by the current SpacingType, which can be set with setSpacingType.

See also

setSpacingType

5.24.6.10 setSpacingType()

```
void QCPBarsGroup::setSpacingType (
            SpacingType spacingType )
```

Sets how the spacing between adjacent bars is interpreted. See SpacingType.

The actual spacing can then be specified with setSpacing.

See also

setSpacing

5.24.6.11 size()

```
int QCPBarsGroup::size ( ) const [inline]
```

Returns the number of QCPBars plottables that are part of this group.

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.25 QCPColorGradient Class Reference

Defines a color gradient for use with e.g. QCPColorMap.

Public Types

- enum ColorInterpolation { ciRGB, ciHSV }
- enum GradientPreset {
  gpGrayscale, gpHot, gpCold, gpNight,
  gpCandy, gpGeography, gpIon, gpThermal,
  gpPolar, gpSpectrum, gpJet, gpHues }

Public Member Functions

- QCPColorGradient ()
- QCPColorGradient (GradientPreset preset)
- bool **operator==** (const QCPColorGradient &other) const
- bool **operator!=** (const QCPColorGradient &other) const
- int **levelCount** () const
- QMap< double, QColor > **colorStops** () const
- ColorInterpolation **colorInterpolation** () const
- bool **periodic** () const
- void setLevelCount (int n)
- void setColorStops (const QMap< double, QColor > &colorStops)
- void setColorStopAt (double position, const QColor &color)
- void setColorInterpolation (ColorInterpolation interpolation)
- void setPeriodic (bool enabled)
- void colorize (const double *data, const QCPRange &range, QRgb *scanLine, int n, int dataIndexFactor=1, bool logarithmic=false)
- void colorize (const double *data, const unsigned char *alpha, const QCPRange &range, QRgb *scanLine, int n, int dataIndexFactor=1, bool logarithmic=false)
- QRgb **color** (double position, const QCPRange &range, bool logarithmic=false)
- void loadPreset (GradientPreset preset)
- void clearColorStops ()
- QCPColorGradient inverted () const

Protected Member Functions

- bool **stopsUseAlpha** () const
- void **updateColorBuffer** ()

Protected Attributes

- int **mLevelCount**
- QMap< double, QColor > **mColorStops**
- ColorInterpolation **mColorInterpolation**
- bool **mPeriodic**
- QVector< QRgb > **mColorBuffer**
- bool **mColorBufferInvalidated**

5.25.1 Detailed Description

Defines a color gradient for use with e.g. QCPColorMap.

This class describes a color gradient which can be used to encode data with color. For example, QCPColorMap and QCPColorScale have setGradient methods which take an instance of this class. Colors are set with setColor←StopAt(double position, const QColor &color) with a *position* from 0 to 1. In between these defined color positions, the color will be interpolated linearly either in RGB or HSV space, see setColorInterpolation.

Alternatively, load one of the preset color gradients shown in the image below, with loadPreset, or by directly specifying the preset in the constructor.

Apart from red, green and blue components, the gradient also interpolates the alpha values of the configured color stops. This allows to display some portions of the data range as transparent in the plot.

The ructor allows directly converting a GradientPreset to a QCPColorGradient. This means that you can directly pass GradientPreset to all the *setGradient* methods, e.g.:

The total number of levels used in the gradient can be set with setLevelCount. Whether the color gradient shall be applied periodically (wrapping around) to data values that lie outside the data range specified on the plottable instance can be controlled with setPeriodic.

5.25.2 Member Enumeration Documentation

5.25.2.1 ColorInterpolation

`enum QCPColorGradient::ColorInterpolation`

Defines the color spaces in which color interpolation between gradient stops can be performed.

See also

setColorInterpolation

Enumerator

ciRGB	Color channels red, green and blue are linearly interpolated.
ciHSV	Color channels hue, saturation and value are linearly interpolated (The hue is interpolated over the shortest angle distance)

5.25.2.2 GradientPreset

`enum QCPColorGradient::GradientPreset`

Defines the available presets that can be loaded with loadPreset. See the documentation there for an image of the presets.

Enumerator

gpGrayscale	Continuous lightness from black to white (suited for non-biased data representation)
gpHot	Continuous lightness from black over firey colors to white (suited for non-biased data representation)
gpCold	Continuous lightness from black over icey colors to white (suited for non-biased data representation)
gpNight	Continuous lightness from black over weak blueish colors to white (suited for non-biased data representation)
gpCandy	Blue over pink to white.
gpGeography	Colors suitable to represent different elevations on geographical maps.
gpIon	Half hue spectrum from black over purple to blue and finally green (creates banding illusion but allows more precise magnitude estimates)
gpThermal	Colors suitable for thermal imaging, ranging from dark blue over purple to orange, yellow and white.
gpPolar	Colors suitable to emphasize polarity around the center, with blue for negative, black in the middle and red for positive values.
gpSpectrum	An approximation of the visible light spectrum (creates banding illusion but allows more precise magnitude estimates)
gpJet	Hue variation similar to a spectrum, often used in numerical visualization (creates banding illusion but allows more precise magnitude estimates)
gpHues	Full hue cycle, with highest and lowest color red (suitable for periodic data, such as angles and phases, see setPeriodic)

5.25.3 Constructor & Destructor Documentation

5.25.3.1 QCPColorGradient() [1/2]

```
QCPColorGradient::QCPColorGradient ( )
```

Constructs a new, empty QCPColorGradient with no predefined color stops. You can add own color stops with setColorStopAt.

The color level count is initialized to 350.

5.25.3.2 QCPColorGradient() [2/2]

```
QCPColorGradient::QCPColorGradient (
            GradientPreset preset )
```

Constructs a new QCPColorGradient initialized with the colors and color interpolation according to *preset*.

The color level count is initialized to 350.

5.25.4 Member Function Documentation

5.25.4.1 clearColorStops()

```
void QCPColorGradient::clearColorStops ( )
```

Clears all color stops.

See also

setColorStops, setColorStopAt

5.25.4.2 colorize() [1/2]

```
void QCPColorGradient::colorize (
            const double * data,
            const QCPRange & range,
            QRgb * scanLine,
            int n,
            int dataIndexFactor = 1,
            bool logarithmic = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

This method is used to quickly convert a *data* array to colors. The colors will be output in the array *scanLine*. Both *data* and *scanLine* must have the length *n* when passed to this function. The data range that shall be used for mapping the data value to the gradient is passed in *range*. *logarithmic* indicates whether the data values shall be mapped to colors logarithmically.

if *data* actually contains 2D-data linearized via `[row*columnCount + column]`, you can set *dataIndexFactor* to `columnCount` to convert a column instead of a row of the data array, in *scanLine*. *scanLine* will remain a regular (1D) array. This works because *data* is addressed `data[i*dataIndexFactor]`.

Use the overloaded method to additionally provide alpha map data.

The QRgb values that are placed in *scanLine* have their r, g and b components premultiplied with alpha (see Q↩ Image::Format_ARGB32_Premultiplied).

5.25.4.3 colorize() [2/2]

```
void QCPColorGradient::colorize (
            const double * data,
            const unsigned char * alpha,
            const QCPRange & range,
            QRgb * scanLine,
            int n,
            int dataIndexFactor = 1,
            bool logarithmic = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Additionally to the other overload of colorize, this method takes the array *alpha*, which has the same size and structure as *data* and encodes the alpha information per data point.

The QRgb values that are placed in *scanLine* have their r, g and b components premultiplied with alpha (see Q↩ Image::Format_ARGB32_Premultiplied).

5.25.4.4 inverted()

```
QCPColorGradient QCPColorGradient::inverted ( ) const
```

Returns an inverted gradient. The inverted gradient has all properties as this QCPColorGradient, but the order of the color stops is inverted.

See also

setColorStops, setColorStopAt

5.25.4.5 loadPreset()

```
void QCPColorGradient::loadPreset (
            GradientPreset preset )
```

Clears the current color stops and loads the specified *preset*. A preset consists of predefined color stops and the corresponding color interpolation method.

The available presets are:

5.25.4.6 setColorInterpolation()

```
void QCPColorGradient::setColorInterpolation (
            QCPColorGradient::ColorInterpolation interpolation )
```

Sets whether the colors in between the configured color stops (see setColorStopAt) shall be interpolated linearly in RGB or in HSV color space.

For example, a sweep in RGB space from red to green will have a muddy brown intermediate color, whereas in HSV space the intermediate color is yellow.

5.25.4.7 setColorStopAt()

```
void QCPColorGradient::setColorStopAt (
            double position,
            const QColor & color )
```

Sets the *color* the gradient will have at the specified *position* (from 0 to 1). In between these color stops, the color is interpolated according to setColorInterpolation.

See also

setColorStops, clearColorStops

5.25.4.8 setColorStops()

```
void QCPColorGradient::setColorStops (
            const QMap< double, QColor > & colorStops )
```

Sets at which positions from 0 to 1 which color shall occur. The positions are the keys, the colors are the values of the passed QMap *colorStops*. In between these color stops, the color is interpolated according to setColor↩ Interpolation.

A more convenient way to create a custom gradient may be to clear all color stops with clearColorStops (or creating a new, empty QCPColorGradient) and then adding them one by one with setColorStopAt.

See also

clearColorStops

5.25.4.9 setLevelCount()

```
void QCPColorGradient::setLevelCount (
            int n )
```

Sets the number of discretization levels of the color gradient to *n*. The default is 350 which is typically enough to create a smooth appearance. The minimum number of levels is 2.

5.25.4.10 setPeriodic()

```
void QCPColorGradient::setPeriodic (
            bool enabled )
```

Sets whether data points that are outside the configured data range (e.g. QCPColorMap::setDataRange) are colored by periodically repeating the color gradient or whether they all have the same color, corresponding to the respective gradient boundary color.

As shown in the image above, gradients that have the same start and end color are especially suitable for a periodic gradient mapping, since they produce smooth color transitions throughout the color map. A preset that has this property is gpHues.

In practice, using periodic color gradients makes sense when the data corresponds to a periodic dimension, such as an angle or a phase. If this is not the case, the color encoding might become ambiguous, because multiple different data values are shown as the same color.

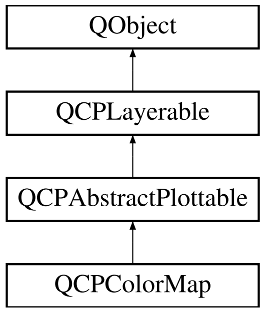
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.26 QCPColorMap Class Reference

A plottable representing a two-dimensional color map in a plot.

Inheritance diagram for QCPColorMap:



Signals

- void dataRangeChanged (const QCPRange &newRange)
- void dataScaleTypeChanged (QCPAxis::ScaleType scaleType)
- void gradientChanged (const QCPColorGradient &newGradient)

Public Member Functions

- QCPColorMap (QCPAxis ∗keyAxis, QCPAxis ∗valueAxis)
- QCPColorMapData ∗ data () const
- QCPRange **dataRange** () const
- QCPAxis::ScaleType **dataScaleType** () const
- bool **interpolate** () const
- bool **tightBoundary** () const
- QCPColorGradient **gradient** () const
- QCPColorScale ∗ **colorScale** () const
- void setData (QCPColorMapData ∗data, bool copy=false)
- Q_SLOT void setDataRange (const QCPRange &dataRange)
- Q_SLOT void setDataScaleType (QCPAxis::ScaleType scaleType)
- Q_SLOT void setGradient (const QCPColorGradient &gradient)
- void setInterpolate (bool enabled)
- void setTightBoundary (bool enabled)
- void setColorScale (QCPColorScale ∗colorScale)
- void rescaleDataRange (bool recalculateDataBounds=false)
- Q_SLOT void updateLegendIcon (Qt::TransformationMode transformMode=Qt::SmoothTransformation, const QSize &thumbSize=QSize(32, 18))
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩ OVERRIDE
- virtual QCPRange getKeyRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth) const Q_DECL_OVERRIDE
- virtual QCPRange getValueRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth, const QCPRange &inKeyRange=QCPRange()) const Q_DECL_OVERRIDE

Protected Member Functions

- virtual void **updateMapImage** ()
- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- virtual void **drawLegendIcon** (QCPPainter ∗painter, const QRectF &rect) const Q_DECL_OVERRIDE

Protected Attributes

- QCPRange **mDataRange**
- QCPAxis::ScaleType **mDataScaleType**
- QCPColorMapData ∗ **mMapData**
- QCPColorGradient **mGradient**
- bool **mInterpolate**
- bool **mTightBoundary**
- QPointer< QCPColorScale > **mColorScale**
- QImage **mMapImage**
- QImage **mUndersampledMapImage**
- QPixmap **mLegendIcon**
- bool **mMapImageInvalidated**

Friends

- class **QCustomPlot**
- class **QCPLegend**

5.26.1 Detailed Description

A plottable representing a two-dimensional color map in a plot.

The data is stored in the class QCPColorMapData, which can be accessed via the data() method.

A color map has three dimensions to represent a data point: The *key* dimension, the *value* dimension and the *data* dimension. As with other plottables such as graphs, *key* and *value* correspond to two orthogonal axes on the QCustomPlot surface that you specify in the QCPColorMap constructor. The *data* dimension however is encoded as the color of the point at (*key*, *value*).

Set the number of points (or *cells*) in the key/value dimension via QCPColorMapData::setSize. The plot coordinate range over which these points will be displayed is specified via QCPColorMapData::setRange. The first cell will be centered on the lower range boundary and the last cell will be centered on the upper range boundary. The data can be set by either accessing the cells directly with QCPColorMapData::setCell or by addressing the cells via their plot coordinates with QCPColorMapData::setData. If possible, you should prefer setCell, since it doesn't need to do any coordinate transformation and thus performs a bit better.

The cell with index (0, 0) is at the bottom left, if the color map uses normal (i.e. not reversed) key and value axes.

To show the user which colors correspond to which *data* values, a QCPColorScale is typically placed to the right of the axis rect. See the documentation there for details on how to add and use a color scale.

5.26.2 Changing the appearance

The central part of the appearance is the color gradient, which can be specified via setGradient. See the documentation of QCPColorGradient for details on configuring a color gradient.

The *data* range that is mapped to the colors of the gradient can be specified with setDataRange. To make the data range encompass the whole data set minimum to maximum, call rescaleDataRange.

5.26.3 Transparency

Transparency in color maps can be achieved by two mechanisms. On one hand, you can specify alpha values for color stops of the QCPColorGradient, via the regular QColor interface. This will cause the color map data which gets mapped to colors around those color stops to appear with the accordingly interpolated transparency.

On the other hand you can also directly apply an alpha value to each cell independent of its data, by using the alpha map feature of QCPColorMapData. The relevant methods are QCPColorMapData::setAlpha, QCPColorMapData::fillAlpha and QCPColorMapData::clearAlpha().

The two transparencies will be joined together in the plot and otherwise not interfere with each other. They are mixed in a multiplicative matter, so an alpha of e.g. 50% (128/255) in both modes simultaneously, will result in a total transparency of 25% (64/255).

5.26.4 Usage

Like all data representing objects in QCustomPlot, the QCPColorMap is a plottable (QCPAbstractPlottable). So the plottable-interface of QCustomPlot applies (QCustomPlot::plottable, QCustomPlot::removePlottable, etc.)

Usually, you first create an instance:

which registers it with the QCustomPlot instance of the passed axes. Note that this QCustomPlot instance takes ownership of the plottable, so do not delete it manually but use QCustomPlot::removePlottable() instead. The newly created plottable can be modified, e.g.:

Note

The QCPColorMap always displays the data at equal key/value intervals, even if the key or value axis is set to a logarithmic scaling. If you want to use QCPColorMap with logarithmic axes, you shouldn't use the QCPColorMapData::setData method as it uses a linear transformation to determine the cell index. Rather directly access the cell index with QCPColorMapData::setCell.

5.26.5 Constructor & Destructor Documentation

5.26.5.1 QCPColorMap()

```
QCPColorMap::QCPColorMap (
            QCPAxis * keyAxis,
            QCPAxis * valueAxis )  [explicit]
```

Constructs a color map with the specified *keyAxis* and *valueAxis*.

The created QCPColorMap is automatically registered with the QCustomPlot instance inferred from *keyAxis*. This QCustomPlot instance takes ownership of the QCPColorMap, so do not delete it manually but use QCustomPlot::removePlottable() instead.

5.26.6 Member Function Documentation

5.26.6.1 data()

```
QCPColorMapData * QCPColorMap::data ( ) const  [inline]
```

Returns a pointer to the internal data storage of type QCPColorMapData. Access this to modify data points (cells) and the color map key/value range.

See also

setData

5.26.6.2 dataRangeChanged

```
void QCPColorMap::dataRangeChanged (
            const QCPRange & newRange )  [signal]
```

This signal is emitted when the data range changes.

See also

setDataRange

5.26.6.3 dataScaleTypeChanged

```
void QCPColorMap::dataScaleTypeChanged (
            QCPAxis::ScaleType scaleType )  [signal]
```

This signal is emitted when the data scale type changes.

See also

setDataScaleType

5.26.6.4 getKeyRange()

```
QCPRange QCPColorMap::getKeyRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth ) const [virtual]
```

Returns the coordinate range that all data in this plottable span in the key axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSignDomain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getValueRange

Implements QCPAbstractPlottable.

5.26.6.5 getValueRange()

```
QCPRange QCPColorMap::getValueRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth,
            const QCPRange & inKeyRange = QCPRange() ) const [virtual]
```

Returns the coordinate range that the data points in the specified key range (*inKeyRange*) span in the value axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSign←Domain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

If *inKeyRange* has both lower and upper bound set to zero (is equal to `QCPRange()`), all data points are considered, without any restriction on the keys.

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getKeyRange

Implements QCPAbstractPlottable.

5.26.6.6 gradientChanged

```
void QCPColorMap::gradientChanged (
            const QCPColorGradient & newGradient )  [signal]
```

This signal is emitted when the gradient changes.

See also

setGradient

5.26.6.7 rescaleDataRange()

```
void QCPColorMap::rescaleDataRange (
            bool recalculateDataBounds = false )
```

Sets the data range (setDataRange) to span the minimum and maximum values that occur in the current data set. This corresponds to the rescaleKeyAxis or rescaleValueAxis methods, only for the third data dimension of the color map.

The minimum and maximum values of the data set are buffered in the internal QCPColorMapData instance (data). As data is updated via its QCPColorMapData::setCell or QCPColorMapData::setData, the buffered minimum and maximum values are updated, too. For performance reasons, however, they are only updated in an expanding fashion. So the buffered maximum can only increase and the buffered minimum can only decrease. In consequence, changes to the data that actually lower the maximum of the data set (by overwriting the cell holding the current maximum with a smaller value), aren't recognized and the buffered maximum overestimates the true maximum of the data set. The same happens for the buffered minimum. To recalculate the true minimum and maximum by explicitly looking at each cell, the method QCPColorMapData::recalculateDataBounds can be used. For convenience, setting the parameter *recalculateDataBounds* calls this method before setting the data range to the buffered minimum and maximum.

See also

setDataRange

5.26.6.8 selectTest()

```
double QCPColorMap::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Implements QCPAbstractPlottable.

5.26.6.9 setColorScale()

```
void QCPColorMap::setColorScale (
            QCPColorScale * colorScale )
```

Associates the color scale *colorScale* with this color map.

This means that both the color scale and the color map synchronize their gradient, data range and data scale type (setGradient, setDataRange, setDataScaleType). Multiple color maps can be associated with one single color scale. This causes the color maps to also synchronize those properties, via the mutual color scale.

This function causes the color map to adopt the current color gradient, data range and data scale type of *colorScale*. After this call, you may change these properties at either the color map or the color scale, and the setting will be applied to both.

Pass 0 as *colorScale* to disconnect the color scale from this color map again.

5.26.6.10 setData()

```
void QCPColorMap::setData (
            QCPColorMapData * data,
            bool copy = false )
```

Replaces the current data with the provided *data*.

If *copy* is set to true, the *data* object will only be copied. if false, the color map takes ownership of the passed data and replaces the internal data pointer with it. This is significantly faster than copying for large datasets.

5.26.6.11 setDataRange()

```
void QCPColorMap::setDataRange (
            const QCPRange & dataRange )
```

Sets the data range of this color map to *dataRange*. The data range defines which data values are mapped to the color gradient.

To make the data range span the full range of the data set, use rescaleDataRange.

See also

QCPColorScale::setDataRange

5.26.6.12 setDataScaleType()

```
void QCPColorMap::setDataScaleType (
            QCPAxis::ScaleType scaleType )
```

Sets whether the data is correlated with the color gradient linearly or logarithmically.

See also

QCPColorScale::setDataScaleType

5.26.6.13 setGradient()

```
void QCPColorMap::setGradient (
            const QCPColorGradient & gradient )
```

Sets the color gradient that is used to represent the data. For more details on how to create an own gradient or use one of the preset gradients, see QCPColorGradient.

The colors defined by the gradient will be used to represent data values in the currently set data range, see set←DataRange. Data points that are outside this data range will either be colored uniformly with the respective gradient boundary color, or the gradient will repeat, depending on QCPColorGradient::setPeriodic.

See also

QCPColorScale::setGradient

5.26.6.14 setInterpolate()

```
void QCPColorMap::setInterpolate (
            bool enabled )
```

Sets whether the color map image shall use bicubic interpolation when displaying the color map shrinked or expanded, and not at a 1:1 pixel-to-data scale.

5.26.6.15 setTightBoundary()

```
void QCPColorMap::setTightBoundary (
            bool enabled )
```

Sets whether the outer most data rows and columns are clipped to the specified key and value range (see QCPColorMapData::setKeyRange, QCPColorMapData::setValueRange).

if *enabled* is set to false, the data points at the border of the color map are drawn with the same width and height as all other data points. Since the data points are represented by rectangles of one color centered on the data coordinate, this means that the shown color map extends by half a data point over the specified key/value range in each direction.

5.26.6.16 updateLegendIcon()

```
void QCPColorMap::updateLegendIcon (
            Qt::TransformationMode transformMode = Qt::SmoothTransformation,
            const QSize & thumbSize = QSize(32, 18) )
```

Takes the current appearance of the color map and updates the legend icon, which is used to represent this color map in the legend (see QCPLegend).

The *transformMode* specifies whether the rescaling is done by a faster, low quality image scaling algorithm (Qt::FastTransformation) or by a slower, higher quality algorithm (Qt::SmoothTransformation).

The current color map appearance is scaled down to *thumbSize*. Ideally, this should be equal to the size of the legend icon (see QCPLegend::setIconSize). If it isn't exactly the configured legend icon size, the thumb will be rescaled during drawing of the legend item.

See also

setDataRange

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.cpp

5.27 QCPColorMapData Class Reference

Holds the two-dimensional data of a QCPColorMap plottable.

Public Member Functions

- QCPColorMapData (int keySize, int valueSize, const QCPRange &keyRange, const QCPRange &value↩ Range)
- QCPColorMapData (const QCPColorMapData &other)
- QCPColorMapData & operator= (const QCPColorMapData &other)
- int **keySize** () const
- int **valueSize** () const
- QCPRange **keyRange** () const
- QCPRange **valueRange** () const
- QCPRange **dataBounds** () const
- double **data** (double key, double value)
- double **cell** (int keyIndex, int valueIndex)
- unsigned char alpha (int keyIndex, int valueIndex)
- void setSize (int keySize, int valueSize)
- void setKeySize (int keySize)
- void setValueSize (int valueSize)
- void setRange (const QCPRange &keyRange, const QCPRange &valueRange)
- void setKeyRange (const QCPRange &keyRange)
- void setValueRange (const QCPRange &valueRange)
- void setData (double key, double value, double z)
- void setCell (int keyIndex, int valueIndex, double z)
- void setAlpha (int keyIndex, int valueIndex, unsigned char alpha)
- void recalculateDataBounds ()
- void clear ()
- void clearAlpha ()
- void fill (double z)
- void fillAlpha (unsigned char alpha)
- bool isEmpty () const
- void coordToCell (double key, double value, int ∗keyIndex, int ∗valueIndex) const
- void cellToCoord (int keyIndex, int valueIndex, double ∗key, double ∗value) const

Protected Member Functions

- bool **createAlpha** (bool initializeOpaque=true)

Protected Attributes

- int **mKeySize**
- int **mValueSize**
- QCPRange **mKeyRange**
- QCPRange **mValueRange**
- bool **mIsEmpty**
- double ∗ **mData**
- unsigned char ∗ **mAlpha**
- QCPRange **mDataBounds**
- bool **mDataModified**

Friends

- class **QCPColorMap**

5.27.1 Detailed Description

Holds the two-dimensional data of a QCPColorMap plottable.

This class is a data storage for QCPColorMap. It holds a two-dimensional array, which QCPColorMap then displays as a 2D image in the plot, where the array values are represented by a color, depending on the value.

The size of the array can be controlled via setSize (or setKeySize, setValueSize). Which plot coordinates these cells correspond to can be configured with setRange (or setKeyRange, setValueRange).

The data cells can be accessed in two ways: They can be directly addressed by an integer index with setCell. This is the fastest method. Alternatively, they can be addressed by their plot coordinate with setData. plot coordinate to cell index transformations and vice versa are provided by the functions coordToCell and cellToCoord.

A QCPColorMapData also holds an on-demand two-dimensional array of alpha values which (if allocated) has the same size as the data map. It can be accessed via setAlpha, fillAlpha and clearAlpha. The memory for the alpha map is only allocated if needed, i.e. on the first call of setAlpha. clearAlpha restores full opacity and frees the alpha map.

This class also buffers the minimum and maximum values that are in the data set, to provide QCPColorMap↩ ::rescaleDataRange with the necessary information quickly. Setting a cell to a value that is greater than the current maximum increases this maximum to the new value. However, setting the cell that currently holds the maximum value to a smaller value doesn't decrease the maximum again, because finding the true new maximum would require going through the entire data array, which might be time consuming. The same holds for the data minimum. This functionality is given by recalculateDataBounds, such that you can decide when it is sensible to find the true current minimum and maximum. The method QCPColorMap::rescaleDataRange offers a convenience parameter *recalculateDataBounds* which may be set to true to automatically call recalculateDataBounds internally.

5.27.2 Constructor & Destructor Documentation

5.27.2.1 QCPColorMapData() [1/2]

```
QCPColorMapData::QCPColorMapData (
            int keySize,
            int valueSize,
            const QCPRange & keyRange,
            const QCPRange & valueRange )
```

Constructs a new QCPColorMapData instance. The instance has *keySize* cells in the key direction and *valueSize* cells in the value direction. These cells will be displayed by the QCPColorMap at the coordinates *keyRange* and *valueRange*.

See also

setSize, setKeySize, setValueSize, setRange, setKeyRange, setValueRange

5.27.2.2 QCPColorMapData() [2/2]

```
QCPColorMapData::QCPColorMapData (
            const QCPColorMapData & other )
```

Constructs a new QCPColorMapData instance copying the data and range of *other*.

5.27.3 Member Function Documentation

5.27.3.1 alpha()

```
unsigned char QCPColorMapData::alpha (
            int keyIndex,
            int valueIndex )
```

Returns the alpha map value of the cell with the indices *keyIndex* and *valueIndex*.

If this color map data doesn't have an alpha map (because setAlpha was never called after creation or after a call to clearAlpha), returns 255, which corresponds to full opacity.

See also

setAlpha

5.27.3.2 cellToCoord()

```
void QCPColorMapData::cellToCoord (
            int keyIndex,
            int valueIndex,
            double * key,
            double * value ) const
```

Transforms cell indices given by *keyIndex* and *valueIndex* to cell indices of this QCPColorMapData instance. The resulting coordinates are returned via the output parameters *key* and *value*.

If you are only interested in a key or value coordinate, you may pass 0 as *key* or *value*.

Note

The QCPColorMap always displays the data at equal key/value intervals, even if the key or value axis is set to a logarithmic scaling. If you want to use QCPColorMap with logarithmic axes, you shouldn't use the QCPColorMapData::cellToCoord method as it uses a linear transformation to determine the cell index.

See also

coordToCell, QCPAxis::pixelToCoord

5.27.3.3 clear()

```
void QCPColorMapData::clear ( )
```

Frees the internal data memory.

This is equivalent to calling setSize(0, 0).

5.27.3.4 clearAlpha()

```
void QCPColorMapData::clearAlpha ( )
```

Frees the internal alpha map. The color map will have full opacity again.

5.27.3.5 coordToCell()

```
void QCPColorMapData::coordToCell (
            double key,
            double value,
            int * keyIndex,
            int * valueIndex ) const
```

Transforms plot coordinates given by *key* and *value* to cell indices of this QCPColorMapData instance. The resulting cell indices are returned via the output parameters *keyIndex* and *valueIndex*.

The retrieved key/value cell indices can then be used for example with setCell.

If you are only interested in a key or value index, you may pass 0 as *valueIndex* or *keyIndex*.

Note

The QCPColorMap always displays the data at equal key/value intervals, even if the key or value axis is set to a logarithmic scaling. If you want to use QCPColorMap with logarithmic axes, you shouldn't use the QCPColorMapData::coordToCell method as it uses a linear transformation to determine the cell index.

See also

cellToCoord, QCPAxis::coordToPixel

5.27.3.6 fill()

```
void QCPColorMapData::fill (
            double z )
```

Sets all cells to the value *z*.

5.27.3.7 fillAlpha()

```
void QCPColorMapData::fillAlpha (
            unsigned char alpha )
```

Sets the opacity of all color map cells to *alpha*. A value of 0 for *alpha* results in a fully transparent color map, and a value of 255 results in a fully opaque color map.

If you wish to restore opacity to 100% and free any used memory for the alpha map, rather use clearAlpha.

See also

setAlpha

5.27.3.8 isEmpty()

```
bool QCPColorMapData::isEmpty ( ) const [inline]
```

Returns whether this instance carries no data. This is equivalent to having a size where at least one of the dimensions is 0 (see setSize).

5.27.3.9 operator=()

```
QCPColorMapData & QCPColorMapData::operator= (
            const QCPColorMapData & other )
```

Overwrites this color map data instance with the data stored in *other*. The alpha map state is transferred, too.

5.27.3.10 recalculateDataBounds()

```
void QCPColorMapData::recalculateDataBounds ( )
```

Goes through the data and updates the buffered minimum and maximum data values.

Calling this method is only advised if you are about to call QCPColorMap::rescaleDataRange and can not guarantee that the cells holding the maximum or minimum data haven't been overwritten with a smaller or larger value respectively, since the buffered maximum/minimum values have been updated the last time. Why this is the case is explained in the class description (QCPColorMapData).

Note that the method QCPColorMap::rescaleDataRange provides a parameter *recalculateDataBounds* for convenience. Setting this to true will call this method for you, before doing the rescale.

5.27.3.11 setAlpha()

```
void QCPColorMapData::setAlpha (
            int keyIndex,
            int valueIndex,
            unsigned char alpha )
```

Sets the alpha of the color map cell given by *keyIndex* and *valueIndex* to *alpha*. A value of 0 for *alpha* results in a fully transparent cell, and a value of 255 results in a fully opaque cell.

If an alpha map doesn't exist yet for this color map data, it will be created here. If you wish to restore full opacity and free any allocated memory of the alpha map, call clearAlpha.

Note that the cell-wise alpha which can be configured here is independent of any alpha configured in the color map's gradient (QCPColorGradient). If a cell is affected both by the cell-wise and gradient alpha, the alpha values will be blended accordingly during rendering of the color map.

See also

fillAlpha, clearAlpha

5.27.3.12 setCell()

```
void QCPColorMapData::setCell (
            int keyIndex,
            int valueIndex,
            double z )
```

Sets the data of the cell with indices *keyIndex* and *valueIndex* to *z*. The indices enumerate the cells starting from zero, up to the map's size-1 in the respective dimension (see setSize).

In the standard plot configuration (horizontal key axis and vertical value axis, both not range-reversed), the cell with indices (0, 0) is in the bottom left corner and the cell with indices (keySize-1, valueSize-1) is in the top right corner of the color map.

See also

setData, setSize

5.27.3.13 setData()

```
void QCPColorMapData::setData (
            double key,
            double value,
            double z )
```

Sets the data of the cell, which lies at the plot coordinates given by *key* and *value*, to *z*.

Note

The QCPColorMap always displays the data at equal key/value intervals, even if the key or value axis is set to a logarithmic scaling. If you want to use QCPColorMap with logarithmic axes, you shouldn't use the QCPColorMapData::setData method as it uses a linear transformation to determine the cell index. Rather directly access the cell index with QCPColorMapData::setCell.

See also

setCell, setRange

5.27.3.14 setKeyRange()

```
void QCPColorMapData::setKeyRange (
            const QCPRange & keyRange )
```

Sets the coordinate range the data shall be distributed over in the key dimension. Together with the value range, This defines the rectangular area covered by the color map in plot coordinates.

The outer cells will be centered on the range boundaries given to this function. For example, if the key size (setKeySize) is 3 and *keyRange* is set to `QCPRange(2, 3)` there will be cells centered on the key coordinates 2, 2.5 and 3.

See also

setRange, setValueRange, setSize

5.27.3.15 setKeySize()

```
void QCPColorMapData::setKeySize (
            int keySize )
```

Resizes the data array to have *keySize* cells in the key dimension.

The current data is discarded and the map cells are set to 0, unless the map had already the requested size.

Setting *keySize* to zero frees the internal data array and isEmpty returns true.

See also

setKeyRange, setSize, setValueSize

5.27.3.16 setRange()

```
void QCPColorMapData::setRange (
            const QCPRange & keyRange,
            const QCPRange & valueRange )
```

Sets the coordinate ranges the data shall be distributed over. This defines the rectangular area covered by the color map in plot coordinates.

The outer cells will be centered on the range boundaries given to this function. For example, if the key size (setKeySize) is 3 and *keyRange* is set to `QCPRange(2, 3)` there will be cells centered on the key coordinates 2, 2.5 and 3.

See also

setSize

5.27.3.17 setSize()

```
void QCPColorMapData::setSize (
            int keySize,
            int valueSize )
```

Resizes the data array to have *keySize* cells in the key dimension and *valueSize* cells in the value dimension.

The current data is discarded and the map cells are set to 0, unless the map had already the requested size.

Setting at least one of *keySize* or *valueSize* to zero frees the internal data array and isEmpty returns true.

See also

setRange, setKeySize, setValueSize

5.27.3.18 setValueRange()

```
void QCPColorMapData::setValueRange (
            const QCPRange & valueRange )
```

Sets the coordinate range the data shall be distributed over in the value dimension. Together with the key range, This defines the rectangular area covered by the color map in plot coordinates.

The outer cells will be centered on the range boundaries given to this function. For example, if the value size (set←ValueSize) is 3 and *valueRange* is set to `QCPRange(2, 3)` there will be cells centered on the value coordinates 2, 2.5 and 3.

See also

setRange, setKeyRange, setSize

5.27.3.19 setValueSize()

```
void QCPColorMapData::setValueSize (
            int valueSize )
```

Resizes the data array to have *valueSize* cells in the value dimension.

The current data is discarded and the map cells are set to 0, unless the map had already the requested size.

Setting *valueSize* to zero frees the internal data array and isEmpty returns true.

See also

setValueRange, setSize, setKeySize

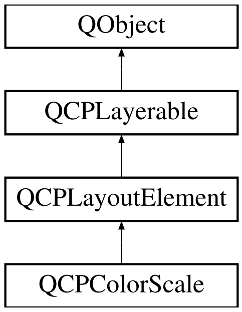
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.←h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.←cpp

5.28 QCPColorScale Class Reference

A color scale for use with color coding data such as QCPColorMap.

Inheritance diagram for QCPColorScale:



Signals

- void dataRangeChanged (const QCPRange &newRange)
- void dataScaleTypeChanged (QCPAxis::ScaleType scaleType)
- void gradientChanged (const QCPColorGradient &newGradient)

Public Member Functions

- QCPColorScale (QCustomPlot ∗parentPlot)
- QCPAxis ∗ axis () const
- QCPAxis::AxisType **type** () const
- QCPRange **dataRange** () const
- QCPAxis::ScaleType **dataScaleType** () const
- QCPColorGradient **gradient** () const
- QString **label** () const
- int **barWidth** () const
- bool **rangeDrag** () const
- bool **rangeZoom** () const
- void setType (QCPAxis::AxisType type)
- Q_SLOT void setDataRange (const QCPRange &dataRange)
- Q_SLOT void setDataScaleType (QCPAxis::ScaleType scaleType)
- Q_SLOT void setGradient (const QCPColorGradient &gradient)
- void setLabel (const QString &str)
- void setBarWidth (int width)
- void setRangeDrag (bool enabled)
- void setRangeZoom (bool enabled)
- QList< QCPColorMap ∗ > colorMaps () const
- void rescaleDataRange (bool onlyVisibleMaps)
- virtual void update (UpdatePhase phase) Q_DECL_OVERRIDE

Protected Member Functions

- virtual void **applyDefaultAntialiasingHint** (QCPPainter ∗painter) const Q_DECL_OVERRIDE
- virtual void mousePressEvent (QMouseEvent ∗event, const QVariant &details) Q_DECL_OVERRIDE
- virtual void mouseMoveEvent (QMouseEvent ∗event, const QPointF &startPos) Q_DECL_OVERRIDE
- virtual void mouseReleaseEvent (QMouseEvent ∗event, const QPointF &startPos) Q_DECL_OVERRIDE
- virtual void wheelEvent (QWheelEvent ∗event) Q_DECL_OVERRIDE

Protected Attributes

- QCPAxis::AxisType **mType**
- QCPRange **mDataRange**
- QCPAxis::ScaleType **mDataScaleType**
- QCPColorGradient **mGradient**
- int **mBarWidth**
- QPointer< QCPColorScaleAxisRectPrivate > **mAxisRect**
- QPointer< QCPAxis > **mColorAxis**

Friends

- class **QCPColorScaleAxisRectPrivate**

Additional Inherited Members

5.28.1 Detailed Description

A color scale for use with color coding data such as QCPColorMap.

This layout element can be placed on the plot to correlate a color gradient with data values. It is usually used in combination with one or multiple QCPColorMaps.

The color scale can be either horizontal or vertical, as shown in the image above. The orientation and the side where the numbers appear is controlled with setType.

Use QCPColorMap::setColorScale to connect a color map with a color scale. Once they are connected, they share their gradient, data range and data scale type (setGradient, setDataRange, setDataScaleType). Multiple color maps may be associated with a single color scale, to make them all synchronize these properties.

To have finer control over the number display and axis behaviour, you can directly access the axis. See the documentation of QCPAxis for details about configuring axes. For example, if you want to change the number of automatically generated ticks, call

Placing a color scale next to the main axis rect works like with any other layout element:

In this case we have placed it to the right of the default axis rect, so it wasn't necessary to call setType, since QCPAxis::atRight is already the default. The text next to the color scale can be set with setLabel.

For optimum appearance (like in the image above), it may be desirable to line up the axis rect and the borders of the color scale. Use a QCPMarginGroup to achieve this:

Color scales are initialized with a non-zero minimum top and bottom margin (setMinimumMargins), because vertical color scales are most common and the minimum top/bottom margin makes sure it keeps some distance to the top/bottom widget border. So if you change to a horizontal color scale by setting setType to QCPAxis::at↩ Bottom or QCPAxis::atTop, you might want to also change the minimum margins accordingly, e.g. `setMinimum↩ Margins(QMargins(6, 0, 6, 0))`.

5.28.2 Constructor & Destructor Documentation

5.28.2.1 QCPColorScale()

```
QCPColorScale::QCPColorScale (
            QCustomPlot * parentPlot )  [explicit]
```

Constructs a new QCPColorScale.

5.28.3 Member Function Documentation

5.28.3.1 axis()

```
QCPAxis * QCPColorScale::axis ( ) const  [inline]
```

Returns the internal QCPAxis instance of this color scale. You can access it to alter the appearance and behaviour of the axis. QCPColorScale duplicates some properties in its interface for convenience. Those are setDataRange (QCPAxis::setRange), setDataScaleType (QCPAxis::setScaleType), and the method setLabel (QCPAxis::setLabel). As they each are connected, it does not matter whether you use the method on the QCPColorScale or on its QC←PAxis.

If the type of the color scale is changed with setType, the axis returned by this method will change, too, to either the left, right, bottom or top axis, depending on which type was set.

5.28.3.2 colorMaps()

```
QList< QCPColorMap * > QCPColorScale::colorMaps ( ) const
```

Returns a list of all the color maps associated with this color scale.

5.28.3.3 dataRangeChanged

```
void QCPColorScale::dataRangeChanged (
            const QCPRange & newRange )  [signal]
```

This signal is emitted when the data range changes.

See also

setDataRange

5.28.3.4 dataScaleTypeChanged

```
void QCPColorScale::dataScaleTypeChanged (
            QCPAxis::ScaleType scaleType )  [signal]
```

This signal is emitted when the data scale type changes.

See also

setDataScaleType

5.28.3.5 gradientChanged

```
void QCPColorScale::gradientChanged (
            const QCPColorGradient & newGradient )  [signal]
```

This signal is emitted when the gradient changes.

See also

setGradient

5.28.3.6 mouseMoveEvent()

```
void QCPColorScale::mouseMoveEvent (
            QMouseEvent * event,
            const QPointF & startPos )  [protected], [virtual]
```

This event gets called when the user moves the mouse while holding a mouse button, after this layerable has become the mouse grabber by accepting the preceding mousePressEvent.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`. The parameter *startPos* indicates the position where the initial mousePressEvent occured, that started the mouse interaction.

The default implementation does nothing.

See also

mousePressEvent, mouseReleaseEvent, mouseDoubleClickEvent, wheelEvent

Reimplemented from QCPLayerable.

5.28.3.7 mousePressEvent()

```
void QCPColorScale::mousePressEvent (
            QMouseEvent * event,
            const QVariant & details ) [protected], [virtual]
```

This event gets called when the user presses a mouse button while the cursor is over the layerable. Whether a cursor is over the layerable is decided by a preceding call to selectTest.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`. The parameter *details* contains layerable-specific details about the hit, which were generated in the previous call to selectTest. For example, One-dimensional plottables like QCPGraph or QCPBars convey the clicked data point in the *details* parameter, as QCPDataSelection packed as QVariant. Multi-part objects convey the specific `SelectablePart` that was hit (e.g. QCPAxis::SelectablePart in the case of axes).

QCustomPlot uses an event propagation system that works the same as Qt's system. If your layerable doesn't reimplement the mousePressEvent or explicitly calls `event->ignore()` in its reimplementation, the event will be propagated to the next layerable in the stacking order.

Once a layerable has accepted the mousePressEvent, it is considered the mouse grabber and will receive all following calls to mouseMoveEvent or mouseReleaseEvent for this mouse interaction (a "mouse interaction" in this context ends with the release).

The default implementation does nothing except explicitly ignoring the event with `event->ignore()`.

See also

mouseMoveEvent, mouseReleaseEvent, mouseDoubleClickEvent, wheelEvent

Reimplemented from QCPLayerable.

5.28.3.8 mouseReleaseEvent()

```
void QCPColorScale::mouseReleaseEvent (
            QMouseEvent * event,
            const QPointF & startPos ) [protected], [virtual]
```

This event gets called when the user releases the mouse button, after this layerable has become the mouse grabber by accepting the preceding mousePressEvent.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`. The parameter *startPos* indicates the position where the initial mousePressEvent occured, that started the mouse interaction.

The default implementation does nothing.

See also

mousePressEvent, mouseMoveEvent, mouseDoubleClickEvent, wheelEvent

Reimplemented from QCPLayerable.

5.28.3.9 rescaleDataRange()

```
void QCPColorScale::rescaleDataRange (
            bool onlyVisibleMaps )
```

Changes the data range such that all color maps associated with this color scale are fully mapped to the gradient in the data dimension.

See also

setDataRange

5.28.3.10 setBarWidth()

```
void QCPColorScale::setBarWidth (
            int width )
```

Sets the width (or height, for horizontal color scales) the bar where the gradient is displayed will have.

5.28.3.11 setDataRange()

```
void QCPColorScale::setDataRange (
            const QCPRange & dataRange )
```

Sets the range spanned by the color gradient and that is shown by the axis in the color scale.

It is equivalent to calling QCPColorMap::setDataRange on any of the connected color maps. It is also equivalent to directly accessing the axis and setting its range with QCPAxis::setRange.

See also

setDataScaleType, setGradient, rescaleDataRange

5.28.3.12 setDataScaleType()

```
void QCPColorScale::setDataScaleType (
            QCPAxis::ScaleType scaleType )
```

Sets the scale type of the color scale, i.e. whether values are linearly associated with colors or logarithmically.

It is equivalent to calling QCPColorMap::setDataScaleType on any of the connected color maps. It is also equivalent to directly accessing the axis and setting its scale type with QCPAxis::setScaleType.

See also

setDataRange, setGradient

5.28.3.13 setGradient()

```
void QCPColorScale::setGradient (
            const QCPColorGradient & gradient )
```

Sets the color gradient that will be used to represent data values.

It is equivalent to calling QCPColorMap::setGradient on any of the connected color maps.

See also

setDataRange, setDataScaleType

5.28.3.14 setLabel()

```
void QCPColorScale::setLabel (
            const QString & str )
```

Sets the axis label of the color scale. This is equivalent to calling QCPAxis::setLabel on the internal axis.

5.28.3.15 setRangeDrag()

```
void QCPColorScale::setRangeDrag (
            bool enabled )
```

Sets whether the user can drag the data range (setDataRange).

Note that QCP::iRangeDrag must be in the QCustomPlot's interactions (QCustomPlot::setInteractions) to allow range dragging.

5.28.3.16 setRangeZoom()

```
void QCPColorScale::setRangeZoom (
            bool enabled )
```

Sets whether the user can zoom the data range (setDataRange) by scrolling the mouse wheel.

Note that QCP::iRangeZoom must be in the QCustomPlot's interactions (QCustomPlot::setInteractions) to allow range dragging.

5.28.3.17 setType()

```
void QCPColorScale::setType (
            QCPAxis::AxisType type )
```

Sets at which side of the color scale the axis is placed, and thus also its orientation.

Note that after setting *type* to a different value, the axis returned by axis() will be a different one. The new axis will adopt the following properties from the previous axis: The range, scale type, label and ticker (the latter will be shared and not copied).

5.28.3.18 update()

```
void QCPColorScale::update (
            UpdatePhase phase )  [virtual]
```

Updates the layout element and sub-elements. This function is automatically called before every replot by the parent layout element. It is called multiple times, once for every UpdatePhase. The phases are run through in the order of the enum values. For details about what happens at the different phases, see the documentation of UpdatePhase.

Layout elements that have child elements should call the update method of their child elements, and pass the current *phase* unchanged.

The default implementation executes the automatic margin mechanism in the upMargins phase. Subclasses should make sure to call the base class implementation.

Reimplemented from QCPLayoutElement.

5.28.3.19 wheelEvent()

```
void QCPColorScale::wheelEvent (
            QWheelEvent * event )  [protected], [virtual]
```

This event gets called when the user turns the mouse scroll wheel while the cursor is over the layerable. Whether a cursor is over the layerable is decided by a preceding call to selectTest.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`.

The `event->delta()` indicates how far the mouse wheel was turned, which is usually +/- 120 for single rotation steps. However, if the mouse wheel is turned rapidly, multiple steps may accumulate to one event, making `event->delta()` larger. On the other hand, if the wheel has very smooth steps or none at all, the delta may be smaller.

The default implementation does nothing.

See also

mousePressEvent, mouseMoveEvent, mouseReleaseEvent, mouseDoubleClickEvent

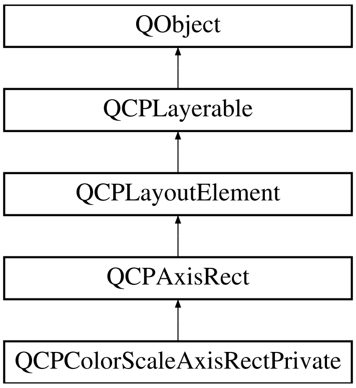
Reimplemented from QCPLayerable.

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.29 QCPColorScaleAxisRectPrivate Class Reference

Inheritance diagram for QCPColorScaleAxisRectPrivate:



Public Member Functions

- QCPColorScaleAxisRectPrivate (QCPColorScale ∗parentColorScale)

Protected Member Functions

- virtual void **draw** (QCPPainter ∗painter)
- void **updateGradientImage** ()
- Q_SLOT void **axisSelectionChanged** (QCPAxis::SelectableParts selectedParts)
- Q_SLOT void **axisSelectableChanged** (QCPAxis::SelectableParts selectableParts)

Protected Attributes

- QCPColorScale ∗ **mParentColorScale**
- QImage **mGradientImage**
- bool **mGradientImageInvalidated**

Friends

- class **QCPColorScale**

Additional Inherited Members

5.29.1 Constructor & Destructor Documentation

5.29.1.1 QCPColorScaleAxisRectPrivate()

```
QCPColorScaleAxisRectPrivate::QCPColorScaleAxisRectPrivate (
            QCPColorScale * parentColorScale )  [explicit]
```

Creates a new instance, as a child of *parentColorScale*.

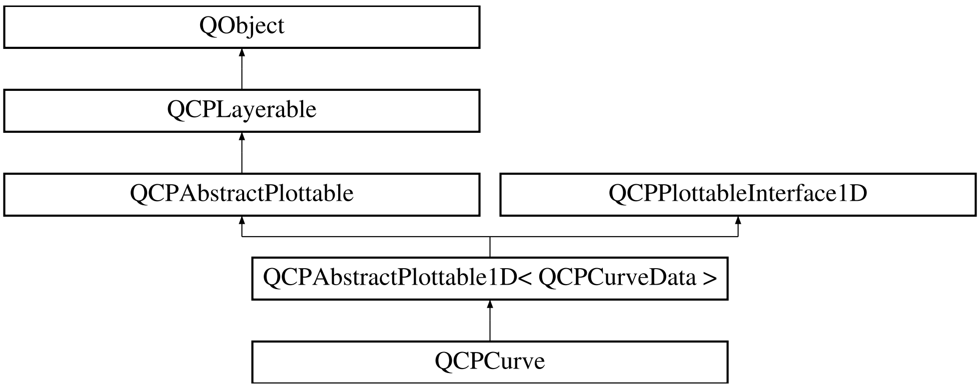
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.30 QCPCurve Class Reference

A plottable representing a parametric curve in a plot.

Inheritance diagram for QCPCurve:



Public Types

- enum LineStyle { lsNone, lsLine }

Public Member Functions

- QCPCurve (QCPAxis *keyAxis, QCPAxis *valueAxis)
- QSharedPointer< QCPCurveDataContainer > data () const
- QCPScatterStyle **scatterStyle** () const
- int **scatterSkip** () const
- LineStyle **lineStyle** () const
- void setData (QSharedPointer< QCPCurveDataContainer > data)
- void setData (const QVector< double > &t, const QVector< double > &keys, const QVector< double > &values, bool alreadySorted=false)
- void setData (const QVector< double > &keys, const QVector< double > &values)
- void setScatterStyle (const QCPScatterStyle &style)
- void setScatterSkip (int skip)

- void setLineStyle (LineStyle style)
- void addData (const QVector< double > &t, const QVector< double > &keys, const QVector< double > &values, bool alreadySorted=false)
- void addData (const QVector< double > &keys, const QVector< double > &values)
- void addData (double t, double key, double value)
- void addData (double key, double value)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant *details=0) const Q_DECL_OVERRIDE
- virtual QCPRange getKeyRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth) const Q_DECL_OVERRIDE
- virtual QCPRange getValueRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth, const QCPRange &inKeyRange=QCPRange()) const Q_DECL_OVERRIDE

Protected Member Functions

- virtual void **draw** (QCPPainter *painter) Q_DECL_OVERRIDE
- virtual void **drawLegendIcon** (QCPPainter *painter, const QRectF &rect) const Q_DECL_OVERRIDE
- virtual void **drawCurveLine** (QCPPainter *painter, const QVector< QPointF > &lines) const
- virtual void **drawScatterPlot** (QCPPainter *painter, const QVector< QPointF > &points, const QCPScatterStyle &style) const
- void **getCurveLines** (QVector< QPointF > *lines, const QCPDataRange &dataRange, double penWidth) const
- void **getScatters** (QVector< QPointF > *scatters, const QCPDataRange &dataRange, double scatterWidth) const
- int **getRegion** (double key, double value, double keyMin, double valueMax, double keyMax, double valueMin) const
- QPointF **getOptimizedPoint** (int prevRegion, double prevKey, double prevValue, double key, double value, double keyMin, double valueMax, double keyMax, double valueMin) const
- QVector< QPointF > **getOptimizedCornerPoints** (int prevRegion, int currentRegion, double prevKey, double prevValue, double key, double value, double keyMin, double valueMax, double keyMax, double valueMin) const
- bool **mayTraverse** (int prevRegion, int currentRegion) const
- bool **getTraverse** (double prevKey, double prevValue, double key, double value, double keyMin, double valueMax, double keyMax, double valueMin, QPointF &crossA, QPointF &crossB) const
- void **getTraverseCornerPoints** (int prevRegion, int currentRegion, double keyMin, double valueMax, double keyMax, double valueMin, QVector< QPointF > &beforeTraverse, QVector< QPointF > &afterTraverse) const
- double **pointDistance** (const QPointF &pixelPoint, QCPCurveDataContainer::const_iterator &closestData) const

Protected Attributes

- QCPScatterStyle **mScatterStyle**
- int **mScatterSkip**
- LineStyle **mLineStyle**

Friends

- class **QCustomPlot**
- class **QCPLegend**

Additional Inherited Members

5.30.1 Detailed Description

A plottable representing a parametric curve in a plot.

Unlike QCPGraph, plottables of this type may have multiple points with the same key coordinate, so their visual representation can have *loops*. This is realized by introducing a third coordinate *t*, which defines the order of the points described by the other two coordinates *x* and *y*.

To plot data, assign it with the setData or addData functions. Alternatively, you can also access and modify the curve's data via the data method, which returns a pointer to the internal QCPCurveDataContainer.

Gaps in the curve can be created by adding data points with NaN as key and value (`qQNaN()` or `std::numeric_limits<double>::quiet_NaN()`) in between the two data points that shall be separated.

5.30.2 Changing the appearance

The appearance of the curve is determined by the pen and the brush (setPen, setBrush).

5.30.3 Usage

Like all data representing objects in QCustomPlot, the QCPCurve is a plottable (QCPAbstractPlottable). So the plottable-interface of QCustomPlot applies (QCustomPlot::plottable, QCustomPlot::removePlottable, etc.)

Usually, you first create an instance:

which registers it with the QCustomPlot instance of the passed axes. Note that this QCustomPlot instance takes ownership of the plottable, so do not delete it manually but use QCustomPlot::removePlottable() instead. The newly created plottable can be modified, e.g.:

5.30.4 Member Enumeration Documentation

5.30.4.1 LineStyle

`enum QCPCurve::LineStyle`

Defines how the curve's line is represented visually in the plot. The line is drawn with the current pen of the curve (setPen).

See also

setLineStyle

Enumerator

lsNone	No line is drawn between data points (e.g. only scatters)
lsLine	Data points are connected with a straight line.

5.30.5 Constructor & Destructor Documentation

5.30.5.1 QCPCurve()

```
QCPCurve::QCPCurve (
            QCPAxis * keyAxis,
            QCPAxis * valueAxis )  [explicit]
```

Constructs a curve which uses *keyAxis* as its key axis ("x") and *valueAxis* as its value axis ("y"). *keyAxis* and *valueAxis* must reside in the same QCustomPlot instance and not have the same orientation. If either of these restrictions is violated, a corresponding message is printed to the debug output (qDebug), the construction is not aborted, though.

The created QCPCurve is automatically registered with the QCustomPlot instance inferred from *keyAxis*. This QCustomPlot instance takes ownership of the QCPCurve, so do not delete it manually but use QCustomPlot↩ ::removePlottable() instead.

5.30.6 Member Function Documentation

5.30.6.1 addData() [1/4]

```
void QCPCurve::addData (
            const QVector< double > & t,
            const QVector< double > & keys,
            const QVector< double > & values,
            bool alreadySorted = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided points in *t*, *keys* and *values* to the current data. The provided vectors should have equal length. Else, the number of added points will be the size of the smallest vector.

If you can guarantee that the passed data points are sorted by *keys* in ascending order, you can set *alreadySorted* to true, to improve performance by saving a sorting run.

Alternatively, you can also access and modify the data directly via the data method, which returns a pointer to the internal data container.

5.30.6.2 addData() [2/4]

```
void QCPCurve::addData (
            const QVector< double > & keys,
            const QVector< double > & values )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided points in *keys* and *values* to the current data. The provided vectors should have equal length. Else, the number of added points will be the size of the smallest vector.

The t parameter of each data point will be set to the integer index of the respective key/value pair.

Alternatively, you can also access and modify the data directly via the data method, which returns a pointer to the internal data container.

5.30.6.3 addData() [3/4]

```
void QCPCurve::addData (
            double t,
            double key,
            double value )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts. Adds the provided data point as *t*, *key* and *value* to the current data.

Alternatively, you can also access and modify the data directly via the data method, which returns a pointer to the internal data container.

5.30.6.4 addData() [4/4]

```
void QCPCurve::addData (
            double key,
            double value )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided data point as *key* and *value* to the current data.

The t parameter is generated automatically by increments of 1 for each point, starting at the highest t of previously existing data or 0, if the curve data is empty.

Alternatively, you can also access and modify the data directly via the data method, which returns a pointer to the internal data container.

5.30.6.5 data()

```
QSharedPointer< QCPCurveDataContainer > QCPCurve::data ( ) const  [inline]
```

Returns a shared pointer to the internal data storage of type QCPCurveDataContainer. You may use it to directly manipulate the data, which may be more convenient and faster than using the regular setData or addData methods.

5.30.6.6 getKeyRange()

```
QCPRange QCPCurve::getKeyRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth ) const  [virtual]
```

Returns the coordinate range that all data in this plottable span in the key axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSignDomain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getValueRange

Implements QCPAbstractPlottable.

5.30.6.7 getValueRange()

```
QCPRange QCPCurve::getValueRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth,
            const QCPRange & inKeyRange = QCPRange() ) const  [virtual]
```

Returns the coordinate range that the data points in the specified key range (*inKeyRange*) span in the value axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSign*↩ *Domain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

If *inKeyRange* has both lower and upper bound set to zero (is equal to `QCPRange()`), all data points are considered, without any restriction on the keys.

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getKeyRange

Implements QCPAbstractPlottable.

5.30.6.8 selectTest()

```
double QCPCurve::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const [virtual]
```

Implements a point-selection algorithm assuming the data (accessed via the 1D data interface) is point-like. Most subclasses will want to reimplement this method again, to provide a more accurate hit test based on the true data visualization geometry.

Reimplemented from QCPAbstractPlottable1D< QCPCurveData >.

5.30.6.9 setData() [1/3]

```
void QCPCurve::setData (
            QSharedPointer< QCPCurveDataContainer > data )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data container with the provided *data* container.

Since a QSharedPointer is used, multiple QCPCurves may share the same data container safely. Modifying the data in the container will then affect all curves that share the container. Sharing can be achieved by simply exchanging the data containers wrapped in shared pointers:

If you do not wish to share containers, but create a copy from an existing container, rather use the QCPDataContainer<DataType>::set method on the curve's data container directly:

See also

addData

5.30.6.10 setData() [2/3]

```
void QCPCurve::setData (
            const QVector< double > & t,
            const QVector< double > & keys,
            const QVector< double > & values,
            bool alreadySorted = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data with the provided points in *t*, *keys* and *values*. The provided vectors should have equal length. Else, the number of added points will be the size of the smallest vector.

If you can guarantee that the passed data points are sorted by *t* in ascending order, you can set *alreadySorted* to true, to improve performance by saving a sorting run.

See also

addData

5.30.6.11 setData() [3/3]

```
void QCPCurve::setData (
            const QVector< double > & keys,
            const QVector< double > & values )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data with the provided points in *keys* and *values*. The provided vectors should have equal length. Else, the number of added points will be the size of the smallest vector.

The t parameter of each data point will be set to the integer index of the respective key/value pair.

See also

addData

5.30.6.12 setLineStyle()

```
void QCPCurve::setLineStyle (
            QCPCurve::LineStyle style )
```

Sets how the single data points are connected in the plot or how they are represented visually apart from the scatter symbol. For scatter-only plots, set *style* to lsNone and setScatterStyle to the desired scatter style.

See also

setScatterStyle

5.30.6.13 setScatterSkip()

```
void QCPCurve::setScatterSkip (
            int skip )
```

If scatters are displayed (scatter style not QCPScatterStyle::ssNone), *skip* number of scatter points are skipped/not drawn after every drawn scatter point.

This can be used to make the data appear sparser while for example still having a smooth line, and to improve performance for very high density plots.

If *skip* is set to 0 (default), all scatter points are drawn.

See also

setScatterStyle

5.30.6.14 setScatterStyle()

```
void QCPCurve::setScatterStyle (
            const QCPScatterStyle & style )
```

Sets the visual appearance of single data points in the plot. If set to QCPScatterStyle::ssNone, no scatter points are drawn (e.g. for line-only plots with appropriate line style).

See also

QCPScatterStyle, setLineStyle

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↵ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↵ cpp

5.31 QCPCurveData Class Reference

Holds the data of one single data point for QCPCurve.

Public Member Functions

- QCPCurveData ()
- QCPCurveData (double t, double key, double value)
- double sortKey () const
- double mainKey () const
- double mainValue () const
- QCPRange valueRange () const

Static Public Member Functions

- static QCPCurveData fromSortKey (double sortKey)
- static bool sortKeyIsMainKey ()

Public Attributes

- double **t**
- double **key**
- double **value**

5.31.1 Detailed Description

Holds the data of one single data point for QCPCurve.

The stored data is:

- *t:* the free ordering parameter of this curve point, like in the mathematical vector *(x(t), y(t))*. (This is the *sortKey*)
- *key:* coordinate on the key axis of this curve point (this is the *mainKey*)
- *value:* coordinate on the value axis of this curve point (this is the *mainValue*)

The container for storing multiple data points is QCPCurveDataContainer. It is a typedef for QCPDataContainer with QCPCurveData as the DataType template parameter. See the documentation there for an explanation regarding the data type's generic methods.

See also

QCPCurveDataContainer

5.31.2 Constructor & Destructor Documentation

5.31.2.1 QCPCurveData() [1/2]

```
QCPCurveData::QCPCurveData ( )
```

Constructs a curve data point with t, key and value set to zero.

5.31.2.2 QCPCurveData() [2/2]

```
QCPCurveData::QCPCurveData (
              double t,
              double key,
              double value )
```

Constructs a curve data point with the specified *t*, *key* and *value*.

5.31.3 Member Function Documentation

5.31.3.1 fromSortKey()

```
static QCPCurveData QCPCurveData::fromSortKey (
            double sortKey ) [inline], [static]
```

Returns a data point with the specified *sortKey* (assigned to the data point's *t* member). All other members are set to zero.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.31.3.2 mainKey()

```
double QCPCurveData::mainKey ( ) const [inline]
```

Returns the *key* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.31.3.3 mainValue()

```
double QCPCurveData::mainValue ( ) const [inline]
```

Returns the *value* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.31.3.4 sortKey()

```
double QCPCurveData::sortKey ( ) const [inline]
```

Returns the *t* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.31.3.5 sortKeyIsMainKey()

```
static static bool QCPCurveData::sortKeyIsMainKey ( ) [inline], [static]
```

Since the member *key* is the data point key coordinate and the member *t* is the data ordering parameter, this method returns false.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.31.3.6 valueRange()

```
QCPRange QCPCurveData::valueRange ( ) const  [inline]
```

Returns a QCPRange with both lower and upper boundary set to *value* of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.32 QCPDataContainer< DataType > Class Template Reference

The generic data container for one-dimensional plottables.

```
#include <qcustomplot.h>
```

Public Types

- typedef QVector< DataType >::const_iterator **const_iterator**
- typedef QVector< DataType >::iterator **iterator**

Public Member Functions

- QCPDataContainer ()
- int size () const
- bool isEmpty () const
- bool **autoSqueeze** () const
- void setAutoSqueeze (bool enabled)
- void set (const QCPDataContainer< DataType > &data)
- void set (const QVector< DataType > &data, bool alreadySorted=false)
- void add (const QCPDataContainer< DataType > &data)
- void add (const QVector< DataType > &data, bool alreadySorted=false)
- void add (const DataType &data)
- void removeBefore (double sortKey)
- void removeAfter (double sortKey)
- void remove (double sortKeyFrom, double sortKeyTo)
- void remove (double sortKey)
- void clear ()
- void sort ()
- void squeeze (bool preAllocation=true, bool postAllocation=true)
- const_iterator constBegin () const
- const_iterator constEnd () const
- iterator begin ()
- iterator end ()
- const_iterator findBegin (double sortKey, bool expandedRange=true) const
- const_iterator findEnd (double sortKey, bool expandedRange=true) const
- const_iterator at (int index) const
- QCPRange keyRange (bool &foundRange, QCP::SignDomain signDomain=QCP::sdBoth)
- QCPRange valueRange (bool &foundRange, QCP::SignDomain signDomain=QCP::sdBoth, const QCP↩ Range &inKeyRange=QCPRange())
- QCPDataRange dataRange () const
- void limitIteratorsToDataRange (const_iterator &begin, const_iterator &end, const QCPDataRange &data↩ Range) const

Protected Member Functions

- void **preallocateGrow** (int minimumPreallocSize)
- void **performAutoSqueeze** ()

Protected Attributes

- bool **mAutoSqueeze**
- QVector< DataType > **mData**
- int **mPreallocSize**
- int **mPreallocIteration**

Related Functions

(Note that these are not member functions.)

- template<class DataType >
  bool qcpLessThanSortKey (const DataType &a, const DataType &b)

5.32.1 Detailed Description

template<class DataType>
class QCPDataContainer< DataType >

The generic data container for one-dimensional plottables.

This class template provides a fast container for data storage of one-dimensional data. The data type is specified as template parameter (called *DataType* in the following) and must provide some methods as described in the next section.

The data is stored in a sorted fashion, which allows very quick lookups by the sorted key as well as retrieval of ranges (see findBegin, findEnd, keyRange) using binary search. The container uses a preallocation and a postallocation scheme, such that appending and prepending data (with respect to the sort key) is very fast and minimizes reallocations. If data is added which needs to be inserted between existing keys, the merge usually can be done quickly too, using the fact that existing data is always sorted. The user can further improve performance by specifying that added data is already itself sorted by key, if he can guarantee that this is the case (see for example add(const QVector<DataType> &data, bool alreadySorted)).

The data can be accessed with the provided const iterators (constBegin, constEnd). If it is necessary to alter existing data in-place, the non-const iterators can be used (begin, end). Changing data members that are not the sort key (for most data types called *key*) is safe from the container's perspective.

Great care must be taken however if the sort key is modified through the non-const iterators. For performance reasons, the iterators don't automatically cause a re-sorting upon their manipulation. It is thus the responsibility of the user to leave the container in a sorted state when finished with the data manipulation, before calling any other methods on the container. A complete re-sort (e.g. after finishing all sort key manipulation) can be done by calling sort. Failing to do so can not be detected by the container efficiently and will cause both rendering artifacts and potential data loss.

Implementing one-dimensional plottables that make use of a QCPDataContainer<T> is usually done by subclassing from QCPAbstractPlottable1D<T>, which introduces an according *mDataContainer* member and some convenience methods.

5.32.2 Requirements for the DataType template parameter

The template parameter `DataType` is the type of the stored data points. It must be trivially copyable and have the following public methods, preferably inline:

- `double sortKey() const`
  Returns the member variable of this data point that is the sort key, defining the ordering in the container. Often this variable is simply called *key*.

- `static DataType fromSortKey(double sortKey)`
  Returns a new instance of the data type initialized with its sort key set to *sortKey*.

- `static bool sortKeyIsMainKey()`
  Returns true if the sort key is equal to the main key (see method `mainKey` below). For most plottables this is the case. It is not the case for example for QCPCurve, which uses *t* as sort key and *key* as main key. This is the reason why QCPCurve unlike QCPGraph can display parametric curves with loops.

- `double mainKey() const`
  Returns the variable of this data point considered the main key. This is commonly the variable that is used as the coordinate of this data point on the key axis of the plottable. This method is used for example when determining the automatic axis rescaling of key axes (QCPAxis::rescale).

- `double mainValue() const`
  Returns the variable of this data point considered the main value. This is commonly the variable that is used as the coordinate of this data point on the value axis of the plottable.

- `QCPRange valueRange() const`
  Returns the range this data point spans in the value axis coordinate. If the data is single-valued (e.g. QCP↩GraphData), this is simply a range with both lower and upper set to the main data point value. However if the data points can represent multiple values at once (e.g QCPFinancialData with its *high*, *low*, *open* and *close* values at each *key*) this method should return the range those values span. This method is used for example when determining the automatic axis rescaling of value axes (QCPAxis::rescale).

5.32.3 Constructor & Destructor Documentation

5.32.3.1 QCPDataContainer()

```
template<class DataType >
QCPDataContainer< DataType >::QCPDataContainer ( )
```

Constructs a QCPDataContainer used for plottable classes that represent a series of key-sorted data

5.32.4 Member Function Documentation

5.32.4.1 add() [1/3]

```
template<class DataType >
void QCPDataContainer< DataType >::add (
            const QCPDataContainer< DataType > & data )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided *data* to the current data in this container.

See also

set, remove

5.32.4.2 add() [2/3]

```
template<class DataType >
void QCPDataContainer< DataType >::add (
            const QVector< DataType > & data,
            bool alreadySorted = false )
```

Adds the provided data points in *data* to the current data.

If you can guarantee that the data points in *data* have ascending order with respect to the DataType's sort key, set *alreadySorted* to true to avoid an unnecessary sorting run.

See also

set, remove

5.32.4.3 add() [3/3]

```
template<class DataType >
void QCPDataContainer< DataType >::add (
            const DataType & data )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided single data point to the current data.

See also

remove

5.32.4.4 at()

```
template<class DataType>
QCPDataContainer::const_iterator QCPDataContainer< DataType >::at (
            int index ) const  [inline]
```

Returns a const iterator to the element with the specified *index*. If *index* points beyond the available elements in this container, returns constEnd, i.e. an iterator past the last valid element.

You can use this method to easily obtain iterators from a QCPDataRange, see the data selection page for an example.

5.32.4.5 begin()

```
template<class DataType>
QCPDataContainer::iterator QCPDataContainer< DataType >::begin ( )  [inline]
```

Returns a non-const iterator to the first data point in this container.

You can manipulate the data points in-place through the non-const iterators, but great care must be taken when manipulating the sort key of a data point, see sort, or the detailed description of this class.

5.32.4.6 clear()

```
template<class DataType >
void QCPDataContainer< DataType >::clear ( )
```

Removes all data points.

See also

remove, removeAfter, removeBefore

5.32.4.7 constBegin()

```
template<class DataType>
QCPDataContainer::const_iterator QCPDataContainer< DataType >::constBegin ( ) const  [inline]
```

Returns a const iterator to the first data point in this container.

5.32.4.8 constEnd()

```
template<class DataType>
QCPDataContainer::const_iterator QCPDataContainer< DataType >::constEnd ( ) const  [inline]
```

Returns a const iterator to the element past the last data point in this container.

5.32.4.9 dataRange()

```
template<class DataType>
QCPDataRange QCPDataContainer< DataType >::dataRange ( ) const  [inline]
```

Returns a QCPDataRange encompassing the entire data set of this container. This means the begin index of the returned range is 0, and the end index is size.

5.32.4.10 end()

```
template<class DataType>
QCPDataContainer::iterator QCPDataContainer< DataType >::end ( )  [inline]
```

Returns a non-const iterator to the element past the last data point in this container.

You can manipulate the data points in-place through the non-const iterators, but great care must be taken when manipulating the sort key of a data point, see sort, or the detailed description of this class.

5.32.4.11 findBegin()

```
template<class DataType >
QCPDataContainer< DataType >::const_iterator QCPDataContainer< DataType >::findBegin (
            double sortKey,
            bool expandedRange = true ) const
```

Returns an iterator to the data point with a (sort-)key that is equal to, just below, or just above *sortKey*. If *expanded↩ Range* is true, the data point just below *sortKey* will be considered, otherwise the one just above.

This can be used in conjunction with findEnd to iterate over data points within a given key range, including or excluding the bounding data points that are just beyond the specified range.

If *expandedRange* is true but there are no data points below *sortKey*, constBegin is returned.

If the container is empty, returns constEnd.

See also

findEnd, QCPPlottableInterface1D::findBegin

5.32.4.12 findEnd()

```
template<class DataType >
QCPDataContainer< DataType >::const_iterator QCPDataContainer< DataType >::findEnd (
            double sortKey,
            bool expandedRange = true ) const
```

Returns an iterator to the element after the data point with a (sort-)key that is equal to, just above or just below *sortKey*. If *expandedRange* is true, the data point just above *sortKey* will be considered, otherwise the one just below.

This can be used in conjunction with findBegin to iterate over data points within a given key range, including the bounding data points that are just below and above the specified range.

If *expandedRange* is true but there are no data points above *sortKey*, constEnd is returned.

If the container is empty, constEnd is returned.

See also

findBegin, QCPPlottableInterface1D::findEnd

5.32.4.13 isEmpty()

```
template<class DataType>
bool QCPDataContainer< DataType >::isEmpty ( ) const  [inline]
```

Returns whether this container holds no data points.

5.32.4.14 keyRange()

```
template<class DataType >
QCPRange QCPDataContainer< DataType >::keyRange (
            bool & foundRange,
            QCP::SignDomain signDomain = QCP::sdBoth )
```

Returns the range encompassed by the (main-)key coordinate of all data points. The output parameter *foundRange* indicates whether a sensible range was found. If this is false, you should not use the returned QCPRange (e.g. the data container is empty or all points have the same key).

Use *signDomain* to control which sign of the key coordinates should be considered. This is relevant e.g. for logarithmic plots which can mathematically only display one sign domain at a time.

If the DataType reports that its main key is equal to the sort key (*sortKeyIsMainKey*), as is the case for most plottables, this method uses this fact and finds the range very quickly.

See also

valueRange

5.32.4.15 limitIteratorsToDataRange()

```
template<class DataType >
void QCPDataContainer< DataType >::limitIteratorsToDataRange (
            const_iterator & begin,
            const_iterator & end,
            const QCPDataRange & dataRange ) const
```

Makes sure *begin* and *end* mark a data range that is both within the bounds of this data container's data, as well as within the specified *dataRange*.

This function doesn't require for *dataRange* to be within the bounds of this data container's valid range.

5.32.4.16 remove() [1/2]

```
template<class DataType >
void QCPDataContainer< DataType >::remove (
            double sortKeyFrom,
            double sortKeyTo )
```

Removes all data points with (sort-)keys between *sortKeyFrom* and *sortKeyTo*. if *sortKeyFrom* is greater or equal to *sortKeyTo*, the function does nothing. To remove a single data point with known (sort-)key, use remove(double sortKey).

See also

removeBefore, removeAfter, clear

5.32.4.17 remove() [2/2]

```
template<class DataType >
void QCPDataContainer< DataType >::remove (
            double sortKey )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Removes a single data point at *sortKey*. If the position is not known with absolute (binary) precision, consider using remove(double sortKeyFrom, double sortKeyTo) with a small fuzziness interval around the suspected position, depeding on the precision with which the (sort-)key is known.

See also

removeBefore, removeAfter, clear

5.32.4.18 removeAfter()

```
template<class DataType >
void QCPDataContainer< DataType >::removeAfter (
            double sortKey )
```

Removes all data points with (sort-)keys greater than or equal to *sortKey*.

See also

removeBefore, remove, clear

5.32.4.19 removeBefore()

```
template<class DataType >
void QCPDataContainer< DataType >::removeBefore (
            double sortKey )
```

Removes all data points with (sort-)keys smaller than or equal to *sortKey*.

See also

removeAfter, remove, clear

5.32.4.20 set() [1/2]

```
template<class DataType >
void QCPDataContainer< DataType >::set (
            const QCPDataContainer< DataType > & data )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data in this container with the provided *data*.

See also

add, remove

5.32.4.21 set() [2/2]

```
template<class DataType >
void QCPDataContainer< DataType >::set (
            const QVector< DataType > & data,
            bool alreadySorted = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data in this container with the provided *data*

If you can guarantee that the data points in *data* have ascending order with respect to the DataType's sort key, set *alreadySorted* to true to avoid an unnecessary sorting run.

See also

add, remove

5.32.4.22 setAutoSqueeze()

```
template<class DataType >
void QCPDataContainer< DataType >::setAutoSqueeze (
            bool enabled )
```

Sets whether the container automatically decides when to release memory from its post- and preallocation pools when data points are removed. By default this is enabled and for typical applications shouldn't be changed.

If auto squeeze is disabled, you can manually decide when to release pre-/postallocation with squeeze.

5.32.4.23 size()

```
template<class DataType>
int QCPDataContainer< DataType >::size ( ) const  [inline]
```

Returns the number of data points in the container.

5.32.4.24 sort()

```
template<class DataType >
void QCPDataContainer< DataType >::sort ( )
```

Re-sorts all data points in the container by their sort key.

When setting, adding or removing points using the QCPDataContainer interface (set, add, remove, etc.), the container makes sure to always stay in a sorted state such that a full resort is never necessary. However, if you choose to directly manipulate the sort key on data points by accessing and modifying it through the non-const iterators (begin, end), it is your responsibility to bring the container back into a sorted state before any other methods are called on it. This can be achieved by calling this method immediately after finishing the sort key manipulation.

5.32.4.25 squeeze()

```
template<class DataType >
void QCPDataContainer< DataType >::squeeze (
            bool preAllocation = true,
            bool postAllocation = true )
```

Frees all unused memory that is currently in the preallocation and postallocation pools.

Note that QCPDataContainer automatically decides whether squeezing is necessary, if setAutoSqueeze is left enabled. It should thus not be necessary to use this method for typical applications.

The parameters *preAllocation* and *postAllocation* control whether pre- and/or post allocation should be freed, respectively.

5.32.4.26 valueRange()

```
template<class DataType >
QCPRange QCPDataContainer< DataType >::valueRange (
            bool & foundRange,
            QCP::SignDomain signDomain = QCP::sdBoth,
            const QCPRange & inKeyRange = QCPRange() )
```

Returns the range encompassed by the value coordinates of the data points in the specified key range (*inKey*↩ *Range*), using the full *DataType::valueRange* reported by the data points. The output parameter *foundRange* indicates whether a sensible range was found. If this is false, you should not use the returned QCPRange (e.g. the data container is empty or all points have the same value).

If *inKeyRange* has both lower and upper bound set to zero (is equal to `QCPRange()`), all data points are considered, without any restriction on the keys.

Use *signDomain* to control which sign of the value coordinates should be considered. This is relevant e.g. for logarithmic plots which can mathematically only display one sign domain at a time.

See also

keyRange

5.32.5 Friends And Related Function Documentation

5.32.5.1 qcpLessThanSortKey()

```
template<class DataType >
bool qcpLessThanSortKey (
            const DataType & a,
            const DataType & b )  [related]
```

Returns whether the sort key of *a* is less than the sort key of *b*.

See also

QCPDataContainer::sort

The documentation for this class was generated from the following file:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
h

5.33 QCPDataRange Class Reference

Describes a data range given by begin and end index.

Public Member Functions

- QCPDataRange ()
- QCPDataRange (int begin, int end)
- bool **operator==** (const QCPDataRange &other) const
- bool **operator!=** (const QCPDataRange &other) const
- int **begin** () const
- int **end** () const
- int size () const
- int length () const
- void setBegin (int begin)
- void setEnd (int end)
- bool isValid () const
- bool isEmpty () const
- QCPDataRange bounded (const QCPDataRange &other) const
- QCPDataRange expanded (const QCPDataRange &other) const
- QCPDataRange intersection (const QCPDataRange &other) const
- QCPDataRange adjusted (int changeBegin, int changeEnd) const
- bool intersects (const QCPDataRange &other) const
- bool contains (const QCPDataRange &other) const

Related Functions

(Note that these are not member functions.)

- QDebug operator<< (QDebug d, const QCPDataRange &dataRange)

5.33.1 Detailed Description

Describes a data range given by begin and end index.

QCPDataRange holds two integers describing the begin (setBegin) and end (setEnd) index of a contiguous set of data points. The end index points to the data point above the last data point that's part of the data range, similarly to the nomenclature used in standard iterators.

Data Ranges are not bound to a certain plottable, thus they can be freely exchanged, created and modified. If a non-contiguous data set shall be described, the class QCPDataSelection is used, which holds and manages multiple instances of QCPDataRange. In most situations, QCPDataSelection is thus used.

Both QCPDataRange and QCPDataSelection offer convenience methods to work with them, e.g. bounded, expanded, intersects, intersection, adjusted, contains. Further, addition and subtraction operators (defined in QCPDataSelection) can be used to join/subtract data ranges and data selections (or mixtures), to retrieve a corresponding QCPDataSelection.

QCustomPlot's data selection mechanism is based on QCPDataSelection and QCPDataRange.

Note

Do not confuse QCPDataRange with QCPRange. A QCPRange describes an interval in floating point plot coordinates, e.g. the current axis range.

5.33.2 Constructor & Destructor Documentation

5.33.2.1 QCPDataRange() [1/2]

```
QCPDataRange::QCPDataRange ( )
```

Creates an empty QCPDataRange, with begin and end set to 0.

5.33.2.2 QCPDataRange() [2/2]

```
QCPDataRange::QCPDataRange (
            int begin,
            int end )
```

Creates a QCPDataRange, initialized with the specified *begin* and *end*.

No checks or corrections are made to ensure the resulting range is valid (isValid).

5.33.3 Member Function Documentation

5.33.3.1 adjusted()

```
QCPDataRange QCPDataRange::adjusted (
             int changeBegin,
             int changeEnd ) const  [inline]
```

Returns a data range where *changeBegin* and *changeEnd* were added to the begin and end indices, respectively.

5.33.3.2 bounded()

```
QCPDataRange QCPDataRange::bounded (
             const QCPDataRange & other ) const
```

Returns a data range that matches this data range, except that parts exceeding *other* are excluded.

This method is very similar to intersection, with one distinction: If this range and the *other* range share no intersection, the returned data range will be empty with begin and end set to the respective boundary side of *other*, at which this range is residing. (intersection would just return a range with begin and end set to 0.)

5.33.3.3 contains()

```
bool QCPDataRange::contains (
             const QCPDataRange & other ) const
```

Returns whether all data points described by this data range are also in *other*.

See also

intersects

5.33.3.4 expanded()

```
QCPDataRange QCPDataRange::expanded (
             const QCPDataRange & other ) const
```

Returns a data range that contains both this data range as well as *other*.

5.33.3.5 intersection()

```
QCPDataRange QCPDataRange::intersection (
            const QCPDataRange & other ) const
```

Returns the data range which is contained in both this data range and *other*.

This method is very similar to bounded, with one distinction: If this range and the *other* range share no intersection, the returned data range will be empty with begin and end set to 0. (bounded would return a range with begin and end set to one of the boundaries of *other*, depending on which side this range is on.)

See also

QCPDataSelection::intersection

5.33.3.6 intersects()

```
bool QCPDataRange::intersects (
            const QCPDataRange & other ) const
```

Returns whether this data range and *other* share common data points.

See also

intersection, contains

5.33.3.7 isEmpty()

```
bool QCPDataRange::isEmpty ( ) const [inline]
```

Returns whether this range is empty, i.e. whether its begin index equals its end index.

See also

size, length

5.33.3.8 isValid()

```
bool QCPDataRange::isValid ( ) const [inline]
```

Returns whether this range is valid. A valid range has a begin index greater or equal to 0, and an end index greater or equal to the begin index.

Note

Invalid ranges should be avoided and are never the result of any of QCustomPlot's methods (unless they are themselves fed with invalid ranges). Do not pass invalid ranges to QCustomPlot's methods. The invalid range is not inherently prevented in QCPDataRange, to allow temporary invalid begin/end values while manipulating the range. An invalid range is not necessarily empty (isEmpty), since its length can be negative and thus non-zero.

5.33.3.9 length()

```
int QCPDataRange::length ( ) const [inline]
```

Returns the number of data points described by this data range. Equivalent to size.

5.33.3.10 setBegin()

```
void QCPDataRange::setBegin (
            int begin ) [inline]
```

Sets the begin of this data range. The *begin* index points to the first data point that is part of the data range.

No checks or corrections are made to ensure the resulting range is valid (isValid).

See also

setEnd

5.33.3.11 setEnd()

```
void QCPDataRange::setEnd (
            int end ) [inline]
```

Sets the end of this data range. The *end* index points to the data point just above the last data point that is part of the data range.

No checks or corrections are made to ensure the resulting range is valid (isValid).

See also

setBegin

5.33.3.12 size()

```
int QCPDataRange::size ( ) const [inline]
```

Returns the number of data points described by this data range. This is equal to the end index minus the begin index.

See also

length

5.33.4 Friends And Related Function Documentation

5.33.4.1 operator<<()

```
QDebug operator<< (
            QDebug d,
            const QCPDataRange & dataRange )  [related]
```

Prints *dataRange* in a human readable format to the qDebug output.

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.34 QCPDataSelection Class Reference

Describes a data set by holding multiple QCPDataRange instances.

Public Member Functions

- QCPDataSelection ()
- QCPDataSelection (const QCPDataRange &range)
- bool operator== (const QCPDataSelection &other) const
- bool **operator!=** (const QCPDataSelection &other) const
- QCPDataSelection & operator+= (const QCPDataSelection &other)
- QCPDataSelection & operator+= (const QCPDataRange &other)
- QCPDataSelection & operator-= (const QCPDataSelection &other)
- QCPDataSelection & operator-= (const QCPDataRange &other)
- int dataRangeCount () const
- int dataPointCount () const
- QCPDataRange dataRange (int index=0) const
- QList< QCPDataRange > dataRanges () const
- QCPDataRange span () const
- void addDataRange (const QCPDataRange &dataRange, bool simplify=true)
- void clear ()
- bool isEmpty () const
- void simplify ()
- void enforceType (QCP::SelectionType type)
- bool contains (const QCPDataSelection &other) const
- QCPDataSelection intersection (const QCPDataRange &other) const
- QCPDataSelection intersection (const QCPDataSelection &other) const
- QCPDataSelection inverse (const QCPDataRange &outerRange) const

Friends

- const QCPDataSelection operator+ (const QCPDataSelection &a, const QCPDataSelection &b)
- const QCPDataSelection operator+ (const QCPDataRange &a, const QCPDataSelection &b)
- const QCPDataSelection operator+ (const QCPDataSelection &a, const QCPDataRange &b)
- const QCPDataSelection operator+ (const QCPDataRange &a, const QCPDataRange &b)
- const QCPDataSelection operator- (const QCPDataSelection &a, const QCPDataSelection &b)
- const QCPDataSelection operator- (const QCPDataRange &a, const QCPDataSelection &b)
- const QCPDataSelection operator- (const QCPDataSelection &a, const QCPDataRange &b)
- const QCPDataSelection operator- (const QCPDataRange &a, const QCPDataRange &b)

Related Functions

(Note that these are not member functions.)

- QDebug operator<< (QDebug d, const QCPDataSelection &selection)

5.34.1 Detailed Description

Describes a data set by holding multiple QCPDataRange instances.

QCPDataSelection manages multiple instances of QCPDataRange in order to represent any (possibly disjoint) set of data selection.

The data selection can be modified with addition and subtraction operators which take QCPDataSelection and QCPDataRange instances, as well as methods such as addDataRange and clear. Read access is provided by dataRange, dataRanges, dataRangeCount, etc.

The method simplify is used to join directly adjacent or even overlapping QCPDataRange instances. QCPDataSelection automatically simplifies when using the addition/subtraction operators. The only case when simplify is left to the user, is when calling addDataRange, with the parameter *simplify* explicitly set to false. This is useful if many data ranges will be added to the selection successively and the overhead for simplifying after each iteration shall be avoided. In this case, you should make sure to call simplify after completing the operation.

Use enforceType to bring the data selection into a state complying with the constraints for selections defined in QCP::SelectionType.

QCustomPlot's data selection mechanism is based on QCPDataSelection and QCPDataRange.

5.34.2 Iterating over a data selection

As an example, the following code snippet calculates the average value of a graph's data selection:

5.34.3 Constructor & Destructor Documentation

5.34.3.1 QCPDataSelection() [1/2]

```
QCPDataSelection::QCPDataSelection ( )  [explicit]
```

Creates an empty QCPDataSelection.

5.34.3.2 QCPDataSelection() [2/2]

```
QCPDataSelection::QCPDataSelection (
            const QCPDataRange & range )  [explicit]
```

Creates a QCPDataSelection containing the provided *range*.

5.34.4 Member Function Documentation

5.34.4.1 addDataRange()

```
void QCPDataSelection::addDataRange (
            const QCPDataRange & dataRange,
            bool simplify = true )
```

Adds the given *dataRange* to this data selection. This is equivalent to the += operator but allows disabling immediate simplification by setting *simplify* to false. This can improve performance if adding a very large amount of data ranges successively. In this case, make sure to call simplify manually, after the operation.

5.34.4.2 clear()

```
void QCPDataSelection::clear ( )
```

Removes all data ranges. The data selection then contains no data points.

isEmpty

5.34.4.3 contains()

```
bool QCPDataSelection::contains (
            const QCPDataSelection & other ) const
```

Returns true if the data selection *other* is contained entirely in this data selection, i.e. all data point indices that are in *other* are also in this data selection.

See also

QCPDataRange::contains

5.34.4.4 dataPointCount()

```
int QCPDataSelection::dataPointCount ( ) const
```

Returns the total number of data points contained in all data ranges that make up this data selection.

5.34.4.5 dataRange()

```
QCPDataRange QCPDataSelection::dataRange (
             int index = 0 ) const
```

Returns the data range with the specified *index*.

If the data selection is simplified (the usual state of the selection, see simplify), the ranges are sorted by ascending data point index.

See also

dataRangeCount

5.34.4.6 dataRangeCount()

```
int QCPDataSelection::dataRangeCount ( ) const [inline]
```

Returns the number of ranges that make up the data selection. The ranges can be accessed by dataRange via their index.

See also

dataRange, dataPointCount

5.34.4.7 dataRanges()

```
QList< QCPDataRange > QCPDataSelection::dataRanges ( ) const [inline]
```

Returns all data ranges that make up the data selection. If the data selection is simplified (the usual state of the selection, see simplify), the ranges are sorted by ascending data point index.

See also

dataRange

5.34.4.8 enforceType()

```
void QCPDataSelection::enforceType (
            QCP::SelectionType type )
```

Makes sure this data selection conforms to the specified *type* selection type. Before the type is enforced, simplify is called.

Depending on *type*, enforcing means adding new data points that were previously not part of the selection, or removing data points from the selection. If the current selection already conforms to *type*, the data selection is not changed.

See also

QCP::SelectionType

5.34.4.9 intersection() [1/2]

```
QCPDataSelection QCPDataSelection::intersection (
            const QCPDataRange & other ) const
```

Returns a data selection containing the points which are both in this data selection and in the data range *other*.

A common use case is to limit an unknown data selection to the valid range of a data container, using QCPDataContainer::dataRange as *other*. One can then safely iterate over the returned data selection without exceeding the data container's bounds.

5.34.4.10 intersection() [2/2]

```
QCPDataSelection QCPDataSelection::intersection (
            const QCPDataSelection & other ) const
```

Returns a data selection containing the points which are both in this data selection and in the data selection *other*.

5.34.4.11 inverse()

```
QCPDataSelection QCPDataSelection::inverse (
            const QCPDataRange & outerRange ) const
```

Returns a data selection which is the exact inverse of this data selection, with *outerRange* defining the base range on which to invert. If *outerRange* is smaller than the span of this data selection, it is expanded accordingly.

For example, this method can be used to retrieve all unselected segments by setting *outerRange* to the full data range of the plottable, and calling this method on a data selection holding the selected segments.

5.34.4.12 isEmpty()

```
bool QCPDataSelection::isEmpty ( ) const [inline]
```

Returns true if there are no data ranges, and thus no data points, in this QCPDataSelection instance.

See also

dataRangeCount

5.34.4.13 operator+=() [1/2]

```
QCPDataSelection & QCPDataSelection::operator+= (
            const QCPDataSelection & other )
```

Adds the data selection of *other* to this data selection, and then simplifies this data selection (see simplify).

5.34.4.14 operator+=() [2/2]

```
QCPDataSelection & QCPDataSelection::operator+= (
            const QCPDataRange & other )
```

Adds the data range *other* to this data selection, and then simplifies this data selection (see simplify).

5.34.4.15 operator-=() [1/2]

```
QCPDataSelection & QCPDataSelection::operator-= (
            const QCPDataSelection & other )
```

Removes all data point indices that are described by *other* from this data range.

5.34.4.16 operator-=() [2/2]

```
QCPDataSelection & QCPDataSelection::operator-= (
            const QCPDataRange & other )
```

Removes all data point indices that are described by *other* from this data range.

5.34.4.17 operator==()

```
bool QCPDataSelection::operator== (
            const QCPDataSelection & other ) const
```

Returns true if this selection is identical (contains the same data ranges with the same begin and end indices) to *other*.

Note that both data selections must be in simplified state (the usual state of the selection, see simplify) for this operator to return correct results.

5.34.4.18 simplify()

```
void QCPDataSelection::simplify ( )
```

Sorts all data ranges by range begin index in ascending order, and then joins directly adjacent or overlapping ranges. This can reduce the number of individual data ranges in the selection, and prevents possible double-counting when iterating over the data points held by the data ranges.

This method is automatically called when using the addition/subtraction operators. The only case when simplify is left to the user, is when calling addDataRange, with the parameter *simplify* explicitly set to false.

5.34.4.19 span()

```
QCPDataRange QCPDataSelection::span ( ) const
```

Returns a QCPDataRange which spans the entire data selection, including possible intermediate segments which are not part of the original data selection.

5.34.5 Friends And Related Function Documentation

5.34.5.1 operator+ [1/4]

```
const QCPDataSelection operator+ (
            const QCPDataSelection & a,
            const QCPDataSelection & b )  [friend]
```

Return a QCPDataSelection with the data points in *a* joined with the data points in *b*. The resulting data selection is already simplified (see QCPDataSelection::simplify).

5.34.5.2 operator+ [2/4]

```
const QCPDataSelection operator+ (
            const QCPDataRange & a,
            const QCPDataSelection & b )  [friend]
```

Return a QCPDataSelection with the data points in *a* joined with the data points in *b*. The resulting data selection is already simplified (see QCPDataSelection::simplify).

5.34.5.3 operator+ [3/4]

```
const QCPDataSelection operator+ (
            const QCPDataSelection & a,
            const QCPDataRange & b )  [friend]
```

Return a QCPDataSelection with the data points in *a* joined with the data points in *b*. The resulting data selection is already simplified (see QCPDataSelection::simplify).

5.34.5.4 operator+ [4/4]

```
const QCPDataSelection operator+ (
            const QCPDataRange & a,
            const QCPDataRange & b ) [friend]
```

Return a QCPDataSelection with the data points in *a* joined with the data points in *b*. The resulting data selection is already simplified (see QCPDataSelection::simplify).

5.34.5.5 operator- [1/4]

```
const QCPDataSelection operator- (
            const QCPDataSelection & a,
            const QCPDataSelection & b ) [friend]
```

Return a QCPDataSelection with the data points which are in *a* but not in *b*.

5.34.5.6 operator- [2/4]

```
const QCPDataSelection operator- (
            const QCPDataRange & a,
            const QCPDataSelection & b ) [friend]
```

Return a QCPDataSelection with the data points which are in *a* but not in *b*.

5.34.5.7 operator- [3/4]

```
const QCPDataSelection operator- (
            const QCPDataSelection & a,
            const QCPDataRange & b ) [friend]
```

Return a QCPDataSelection with the data points which are in *a* but not in *b*.

5.34.5.8 operator- [4/4]

```
const QCPDataSelection operator- (
            const QCPDataRange & a,
            const QCPDataRange & b ) [friend]
```

Return a QCPDataSelection with the data points which are in *a* but not in *b*.

5.34.5.9 operator<<()

```
QDebug operator<< (
            QDebug d,
            const QCPDataSelection & selection ) [related]
```

Prints *selection* in a human readable format to the qDebug output.

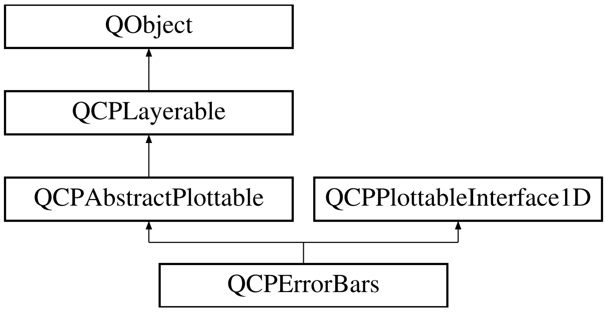
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
cpp

5.35 QCPErrorBars Class Reference

A plottable that adds a set of error bars to other plottables.

Inheritance diagram for QCPErrorBars:



Public Types

- enum ErrorType { etKeyError, etValueError }

Public Member Functions

- QCPErrorBars (QCPAxis ∗keyAxis, QCPAxis ∗valueAxis)
- QSharedPointer< QCPErrorBarsDataContainer > data () const
- QCPAbstractPlottable ∗ **dataPlottable** () const
- ErrorType **errorType** () const
- double **whiskerWidth** () const
- double **symbolGap** () const
- void setData (QSharedPointer< QCPErrorBarsDataContainer > data)
- void setData (const QVector< double > &error)
- void setData (const QVector< double > &errorMinus, const QVector< double > &errorPlus)
- void setDataPlottable (QCPAbstractPlottable ∗plottable)
- void setErrorType (ErrorType type)
- void setWhiskerWidth (double pixels)
- void setSymbolGap (double pixels)
- void addData (const QVector< double > &error)
- void addData (const QVector< double > &errorMinus, const QVector< double > &errorPlus)
- void addData (double error)
- void addData (double errorMinus, double errorPlus)
- virtual int dataCount () const
- virtual double dataMainKey (int index) const
- virtual double dataSortKey (int index) const
- virtual double dataMainValue (int index) const
- virtual QCPRange dataValueRange (int index) const
- virtual QPointF dataPixelPosition (int index) const
- virtual bool sortKeyIsMainKey () const
- virtual QCPDataSelection selectTestRect (const QRectF &rect, bool onlySelectable) const
- virtual int findBegin (double sortKey, bool expandedRange=true) const
- virtual int findEnd (double sortKey, bool expandedRange=true) const
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_OVERRIDE
- virtual QCPPlottableInterface1D ∗ interface1D () Q_DECL_OVERRIDE

Protected Member Functions

- virtual void **draw** (QCPPainter *painter) Q_DECL_OVERRIDE
- virtual void **drawLegendIcon** (QCPPainter *painter, const QRectF &rect) const Q_DECL_OVERRIDE
- virtual QCPRange getKeyRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth) const Q_DECL_OVERRIDE
- virtual QCPRange getValueRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth, const QCPRange &inKeyRange=QCPRange()) const Q_DECL_OVERRIDE
- void **getErrorBarLines** (QCPErrorBarsDataContainer::const_iterator it, QVector< QLineF > &backbones, QVector< QLineF > &whiskers) const
- void **getVisibleDataBounds** (QCPErrorBarsDataContainer::const_iterator &begin, QCPErrorBarsDataContainer::const_iterator &end, const QCPDataRange &rangeRestriction) const
- double **pointDistance** (const QPointF &pixelPoint, QCPErrorBarsDataContainer::const_iterator &closestData) const
- void **getDataSegments** (QList< QCPDataRange > &selectedSegments, QList< QCPDataRange > &unselectedSegments) const
- bool **errorBarVisible** (int index) const
- bool **rectIntersectsLine** (const QRectF &pixelRect, const QLineF &line) const

Protected Attributes

- QSharedPointer< QCPErrorBarsDataContainer > **mDataContainer**
- QPointer< QCPAbstractPlottable > **mDataPlottable**
- ErrorType **mErrorType**
- double **mWhiskerWidth**
- double **mSymbolGap**

Friends

- class **QCustomPlot**
- class **QCPLegend**

Additional Inherited Members

5.35.1 Detailed Description

A plottable that adds a set of error bars to other plottables.

The QCPErrorBars plottable can be attached to other one-dimensional plottables (e.g. QCPGraph, QCPCurve, QCPBars, etc.) and equips them with error bars.

Use setDataPlottable to define for which plottable the QCPErrorBars shall display the error bars. The orientation of the error bars can be controlled with setErrorType.

By using setData, you can supply the actual error data, either as symmetric error or plus/minus asymmetric errors. QCPErrorBars only stores the error data. The absolute key/value position of each error bar will be adopted from the configured data plottable. The error data of the QCPErrorBars are associated one-to-one via their index to the data points of the data plottable. You can directly access and manipulate the error bar data via data.

Set either of the plus/minus errors to NaN (`qQNaN()` or `std::numeric_limits<double>::quiet_NaN()`) to not show the respective error bar on the data point at that index.

5.35.2 Changing the appearance

The appearance of the error bars is defined by the pen (setPen), and the width of the whiskers (setWhiskerWidth). Further, the error bar backbones may leave a gap around the data point center to prevent that error bars are drawn too close to or even through scatter points. This gap size can be controlled via setSymbolGap.

5.35.3 Member Enumeration Documentation

5.35.3.1 ErrorType

```
enum QCPErrorBars::ErrorType
```

Defines in which orientation the error bars shall appear. If your data needs both error dimensions, create two QCPErrorBars with different ErrorType.

See also

setErrorType

Enumerator

etKeyError	The errors are for the key dimension (bars appear parallel to the key axis)
etValueError	The errors are for the value dimension (bars appear parallel to the value axis)

5.35.4 Constructor & Destructor Documentation

5.35.4.1 QCPErrorBars()

```
QCPErrorBars::QCPErrorBars (
            QCPAxis * keyAxis,
            QCPAxis * valueAxis )  [explicit]
```

Constructs an error bars plottable which uses *keyAxis* as its key axis ("x") and *valueAxis* as its value axis ("y"). *keyAxis* and *valueAxis* must reside in the same QCustomPlot instance and not have the same orientation. If either of these restrictions is violated, a corresponding message is printed to the debug output (qDebug), the construction is not aborted, though.

It is also important that the *keyAxis* and *valueAxis* are the same for the error bars plottable and the data plottable that the error bars shall be drawn on (setDataPlottable).

The created QCPErrorBars is automatically registered with the QCustomPlot instance inferred from *keyAxis*. This QCustomPlot instance takes ownership of the QCPErrorBars, so do not delete it manually but use QCustomPlot↩ ::removePlottable() instead.

5.35.5 Member Function Documentation

5.35.5.1 addData() [1/4]

```
void QCPErrorBars::addData (
            const QVector< double > & error )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds symmetrical error values as specified in *error*. The errors will be associated one-to-one by the data point index to the associated data plottable (setDataPlottable).

You can directly access and manipulate the error bar data via data.

See also

setData

5.35.5.2 addData() [2/4]

```
void QCPErrorBars::addData (
            const QVector< double > & errorMinus,
            const QVector< double > & errorPlus )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds asymmetrical errors as specified in *errorMinus* and *errorPlus*. The errors will be associated one-to-one by the data point index to the associated data plottable (setDataPlottable).

You can directly access and manipulate the error bar data via data.

See also

setData

5.35.5.3 addData() [3/4]

```
void QCPErrorBars::addData (
            double error )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds a single symmetrical error bar as specified in *error*. The errors will be associated one-to-one by the data point index to the associated data plottable (setDataPlottable).

You can directly access and manipulate the error bar data via data.

See also

setData

5.35.5.4 addData() [4/4]

```
void QCPErrorBars::addData (
            double errorMinus,
            double errorPlus )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds a single asymmetrical error bar as specified in *errorMinus* and *errorPlus*. The errors will be associated one-to-one by the data point index to the associated data plottable (setDataPlottable).

You can directly access and manipulate the error bar data via data.

See also

setData

5.35.5.5 data()

```
QSharedPointer< QCPErrorBarsDataContainer > QCPErrorBars::data ( ) const [inline]
```

Returns a shared pointer to the internal data storage of type QCPErrorBarsDataContainer. You may use it to directly manipulate the error values, which may be more convenient and faster than using the regular setData methods.

5.35.5.6 dataCount()

```
int QCPErrorBars::dataCount ( ) const [virtual]
```

Returns the number of data points of the plottable.

Implements QCPPlottableInterface1D.

5.35.5.7 dataMainKey()

```
double QCPErrorBars::dataMainKey (
            int index ) const [virtual]
```

Returns the main key of the data point at the given *index*.

What the main key is, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implements QCPPlottableInterface1D.

5.35.5.8 dataMainValue()

```
double QCPErrorBars::dataMainValue (
             int index ) const  [virtual]
```

Returns the main value of the data point at the given *index*.

What the main value is, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implements QCPPlottableInterface1D.

5.35.5.9 dataPixelPosition()

```
QPointF QCPErrorBars::dataPixelPosition (
             int index ) const  [virtual]
```

Returns the pixel position on the widget surface at which the data point at the given *index* appears.

Usually this corresponds to the point of dataMainKey/dataMainValue, in pixel coordinates. However, depending on the plottable, this might be a different apparent position than just a coord-to-pixel transform of those values. For example, QCPBars apparent data values can be shifted depending on their stacking, bar grouping or configured base value.

Implements QCPPlottableInterface1D.

5.35.5.10 dataSortKey()

```
double QCPErrorBars::dataSortKey (
             int index ) const  [virtual]
```

Returns the sort key of the data point at the given *index*.

What the sort key is, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implements QCPPlottableInterface1D.

5.35.5.11 dataValueRange()

```
QCPRange QCPErrorBars::dataValueRange (
             int index ) const  [virtual]
```

Returns the value range of the data point at the given *index*.

What the value range is, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implements QCPPlottableInterface1D.

5.35.5.12 findBegin()

```
int QCPErrorBars::findBegin (
            double sortKey,
            bool expandedRange = true ) const  [virtual]
```

Returns the index of the data point with a (sort-)key that is equal to, just below, or just above *sortKey*. If *expandedRange* is true, the data point just below *sortKey* will be considered, otherwise the one just above.

This can be used in conjunction with findEnd to iterate over data points within a given key range, including or excluding the bounding data points that are just beyond the specified range.

If *expandedRange* is true but there are no data points below *sortKey*, 0 is returned.

If the container is empty, returns 0 (in that case, findEnd will also return 0, so a loop using these methods will not iterate over the index 0).

See also

findEnd, QCPDataContainer::findBegin

Implements QCPPlottableInterface1D.

5.35.5.13 findEnd()

```
int QCPErrorBars::findEnd (
            double sortKey,
            bool expandedRange = true ) const  [virtual]
```

Returns the index one after the data point with a (sort-)key that is equal to, just above, or just below *sortKey*. If *expandedRange* is true, the data point just above *sortKey* will be considered, otherwise the one just below.

This can be used in conjunction with findBegin to iterate over data points within a given key range, including the bounding data points that are just below and above the specified range.

If *expandedRange* is true but there are no data points above *sortKey*, the index just above the highest data point is returned.

If the container is empty, returns 0.

See also

findBegin, QCPDataContainer::findEnd

Implements QCPPlottableInterface1D.

5.35.5.14 getKeyRange()

```
QCPRange QCPErrorBars::getKeyRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth ) const  [protected], [virtual]
```

Returns the coordinate range that all data in this plottable span in the key axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSignDomain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getValueRange

Implements QCPAbstractPlottable.

5.35.5.15 getValueRange()

```
QCPRange QCPErrorBars::getValueRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth,
            const QCPRange & inKeyRange = QCPRange() ) const  [protected], [virtual]
```

Returns the coordinate range that the data points in the specified key range (*inKeyRange*) span in the value axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSign←Domain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

If *inKeyRange* has both lower and upper bound set to zero (is equal to `QCPRange()`), all data points are considered, without any restriction on the keys.

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getKeyRange

Implements QCPAbstractPlottable.

5.35.5.16 interface1D()

```
virtual QCPPlottableInterface1D* QCPErrorBars::interface1D ( )  [inline], [virtual]
```

If this plottable is a one-dimensional plottable, i.e. it implements the QCPPlottableInterface1D, returns the *this* pointer with that type. Otherwise (e.g. in the case of a QCPColorMap) returns zero.

You can use this method to gain read access to data coordinates while holding a pointer to the abstract base class only.

Reimplemented from QCPAbstractPlottable.

5.35.5.17 selectTest()

```
double QCPErrorBars::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Implements QCPAbstractPlottable.

5.35.5.18 selectTestRect()

```
QCPDataSelection QCPErrorBars::selectTestRect (
            const QRectF & rect,
            bool onlySelectable ) const  [virtual]
```

Returns a data selection containing all the data points of this plottable which are contained (or hit by) *rect*. This is used mainly in the selection rect interaction for data selection (data selection mechanism).

If *onlySelectable* is true, an empty QCPDataSelection is returned if this plottable is not selectable (i.e. if QCP↩ AbstractPlottable::setSelectable is QCP::stNone).

Note

rect must be a normalized rect (positive or zero width and height). This is especially important when using the rect of QCPSelectionRect::accepted, which is not necessarily normalized. Use `QRect::normalized()` when passing a rect which might not be normalized.

Implements QCPPlottableInterface1D.

5.35.5.19 setData() [1/3]

```
void QCPErrorBars::setData (
            QSharedPointer< QCPErrorBarsDataContainer > data )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data container with the provided *data* container.

Since a QSharedPointer is used, multiple QCPErrorBars instances may share the same data container safely. Modifying the data in the container will then affect all QCPErrorBars instances that share the container. Sharing can be achieved by simply exchanging the data containers wrapped in shared pointers:

If you do not wish to share containers, but create a copy from an existing container, assign the data containers directly:

(This uses different notation compared with other plottables, because the QCPErrorBars uses a `QVector<QC↩ PErrorBarsData>` as its data container, instead of a QCPDataContainer.)

See also

addData

5.35.5.20 setData() [2/3]

```
void QCPErrorBars::setData (
            const QVector< double > & error )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets symmetrical error values as specified in *error*. The errors will be associated one-to-one by the data point index to the associated data plottable (setDataPlottable).

You can directly access and manipulate the error bar data via data.

See also

addData

5.35.5.21 setData() [3/3]

```
void QCPErrorBars::setData (
            const QVector< double > & errorMinus,
            const QVector< double > & errorPlus )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets asymmetrical errors as specified in *errorMinus* and *errorPlus*. The errors will be associated one-to-one by the data point index to the associated data plottable (setDataPlottable).

You can directly access and manipulate the error bar data via data.

See also

addData

5.35.5.22 setDataPlottable()

```
void QCPErrorBars::setDataPlottable (
            QCPAbstractPlottable * plottable )
```

Sets the data plottable to which the error bars will be applied. The error values specified e.g. via setData will be associated one-to-one by the data point index to the data points of *plottable*. This means that the error bars will adopt the key/value coordinates of the data point with the same index.

The passed *plottable* must be a one-dimensional plottable, i.e. it must implement the QCPPlottableInterface1D. Further, it must not be a QCPErrorBars instance itself. If either of these restrictions is violated, a corresponding qDebug output is generated, and the data plottable of this QCPErrorBars instance is set to zero.

For proper display, care must also be taken that the key and value axes of the *plottable* match those configured for this QCPErrorBars instance.

5.35.5.23 setErrorType()

```
void QCPErrorBars::setErrorType (
            ErrorType type )
```

Sets in which orientation the error bars shall appear on the data points. If your data needs both error dimensions, create two QCPErrorBars with different *type*.

5.35.5.24 setSymbolGap()

```
void QCPErrorBars::setSymbolGap (
            double pixels )
```

Sets the gap diameter around the data points that will be left out when drawing the error bar backbones. This gap prevents that error bars are drawn too close to or even through scatter points.

5.35.5.25 setWhiskerWidth()

```
void QCPErrorBars::setWhiskerWidth (
            double pixels )
```

Sets the width of the whiskers (the short bars at the end of the actual error bar backbones) to *pixels*.

5.35.5.26 sortKeyIsMainKey()

```
bool QCPErrorBars::sortKeyIsMainKey ( ) const [virtual]
```

Returns whether the sort key (dataSortKey) is identical to the main key (dataMainKey).

What the sort and main keys are, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implements QCPPlottableInterface1D.

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩
cpp

5.36 QCPErrorBarsData Class Reference

Holds the data of one single error bar for QCPErrorBars.

Public Member Functions

- QCPErrorBarsData ()
- QCPErrorBarsData (double error)
- QCPErrorBarsData (double errorMinus, double errorPlus)

Public Attributes

- double **errorMinus**
- double **errorPlus**

5.36.1 Detailed Description

Holds the data of one single error bar for QCPErrorBars.

The stored data is:

- *errorMinus:* how much the error bar extends towards negative coordinates from the data point position
- *errorPlus:* how much the error bar extends towards positive coordinates from the data point position

The container for storing the error bar information is QCPErrorBarsDataContainer. It is a typedef for `QVector<QCPErrorBarsData>`.

See also

QCPErrorBarsDataContainer

5.36.2 Constructor & Destructor Documentation

5.36.2.1 QCPErrorBarsData() [1/3]

```
QCPErrorBarsData::QCPErrorBarsData ( )
```

Constructs an error bar with errors set to zero.

5.36.2.2 QCPErrorBarsData() [2/3]

```
QCPErrorBarsData::QCPErrorBarsData (
            double error ) [explicit]
```

Constructs an error bar with equal *error* in both negative and positive direction.

5.36.2.3 QCPErrorBarsData() [3/3]

```
QCPErrorBarsData::QCPErrorBarsData (
            double errorMinus,
            double errorPlus )
```

Constructs an error bar with negative and positive errors set to *errorMinus* and *errorPlus*, respectively.

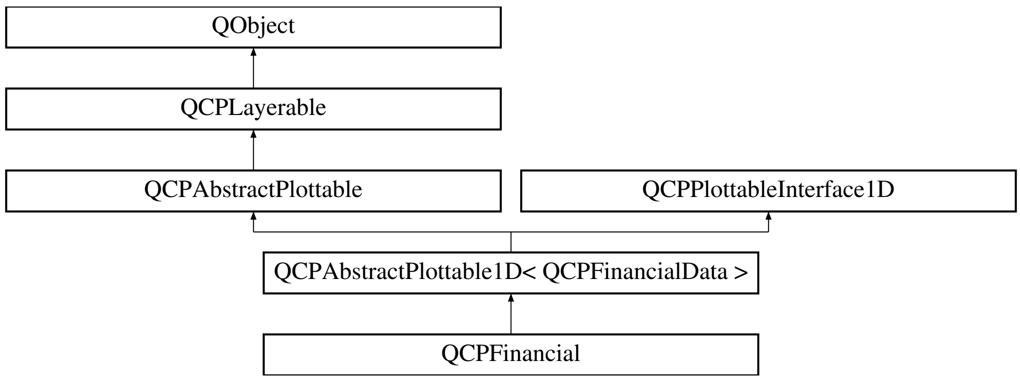
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.37 QCPFinancial Class Reference

A plottable representing a financial stock chart.

Inheritance diagram for QCPFinancial:



Public Types

- enum WidthType { wtAbsolute, wtAxisRectRatio, wtPlotCoords }
- enum ChartStyle { csOhlc, csCandlestick }

Public Member Functions

- QCPFinancial (QCPAxis ∗keyAxis, QCPAxis ∗valueAxis)
- QSharedPointer< QCPFinancialDataContainer > data () const
- ChartStyle **chartStyle** () const
- double **width** () const
- WidthType **widthType** () const
- bool **twoColored** () const
- QBrush **brushPositive** () const
- QBrush **brushNegative** () const
- QPen **penPositive** () const
- QPen **penNegative** () const
- void setData (QSharedPointer< QCPFinancialDataContainer > data)
- void setData (const QVector< double > &keys, const QVector< double > &open, const QVector< double > &high, const QVector< double > &low, const QVector< double > &close, bool alreadySorted=false)
- void setChartStyle (ChartStyle style)
- void setWidth (double width)
- void setWidthType (WidthType widthType)
- void setTwoColored (bool twoColored)
- void setBrushPositive (const QBrush &brush)
- void setBrushNegative (const QBrush &brush)
- void setPenPositive (const QPen &pen)
- void setPenNegative (const QPen &pen)
- void addData (const QVector< double > &keys, const QVector< double > &open, const QVector< double > &high, const QVector< double > &low, const QVector< double > &close, bool alreadySorted=false)
- void addData (double key, double open, double high, double low, double close)
- virtual QCPDataSelection selectTestRect (const QRectF &rect, bool onlySelectable) const Q_DECL_OVE↩RRIDE
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩OVERRIDE
- virtual QCPRange getKeyRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth) const Q_DECL_OVERRIDE
- virtual QCPRange getValueRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth, const QCPRange &inKeyRange=QCPRange()) const Q_DECL_OVERRIDE

Static Public Member Functions

- static QCPFinancialDataContainer timeSeriesToOhlc (const QVector< double > &time, const QVector< double > &value, double timeBinSize, double timeBinOffset=0)

Protected Member Functions

- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- virtual void **drawLegendIcon** (QCPPainter ∗painter, const QRectF &rect) const Q_DECL_OVERRIDE
- void **drawOhlcPlot** (QCPPainter ∗painter, const QCPFinancialDataContainer::const_iterator &begin, const QCPFinancialDataContainer::const_iterator &end, bool isSelected)
- void **drawCandlestickPlot** (QCPPainter ∗painter, const QCPFinancialDataContainer::const_iterator &begin, const QCPFinancialDataContainer::const_iterator &end, bool isSelected)
- double **getPixelWidth** (double key, double keyPixel) const
- double **ohlcSelectTest** (const QPointF &pos, const QCPFinancialDataContainer::const_iterator &begin, const QCPFinancialDataContainer::const_iterator &end, QCPFinancialDataContainer::const_iterator &closestDataPoint) const
- double **candlestickSelectTest** (const QPointF &pos, const QCPFinancialDataContainer::const_iterator &begin, const QCPFinancialDataContainer::const_iterator &end, QCPFinancialDataContainer::const_iterator &closestDataPoint) const
- void **getVisibleDataBounds** (QCPFinancialDataContainer::const_iterator &begin, QCPFinancialDataContainer::const_iterator &end) const
- QRectF **selectionHitBox** (QCPFinancialDataContainer::const_iterator it) const

Protected Attributes

- ChartStyle **mChartStyle**
- double **mWidth**
- WidthType **mWidthType**
- bool **mTwoColored**
- QBrush **mBrushPositive**
- QBrush **mBrushNegative**
- QPen **mPenPositive**
- QPen **mPenNegative**

Friends

- class **QCustomPlot**
- class **QCPLegend**

Additional Inherited Members

5.37.1 Detailed Description

A plottable representing a financial stock chart.

This plottable represents time series data binned to certain intervals, mainly used for stock charts. The two common representations OHLC (Open-High-Low-Close) bars and Candlesticks can be set via setChartStyle.

The data is passed via setData as a set of open/high/low/close values at certain keys (typically times). This means the data must be already binned appropriately. If data is only available as a series of values (e.g. *price* against *time*), you can use the static convenience function timeSeriesToOhlc to generate binned OHLC-data which can then be passed to setData.

The width of the OHLC bars/candlesticks can be controlled with setWidth and setWidthType. A typical choice is to set the width type to wtPlotCoords (the default) and the width to (or slightly less than) one time bin interval width.

5.37.2 Changing the appearance

Charts can be either single- or two-colored (setTwoColored). If set to be single-colored, lines are drawn with the plottable's pen (setPen) and fills with the brush (setBrush).

If set to two-colored, positive changes of the value during an interval (*close* $>=$ *open*) are represented with a different pen and brush than negative changes (*close* $<$ *open*). These can be configured with setPenPositive, setPenNegative, setBrushPositive, and setBrushNegative. In two-colored mode, the normal plottable pen/brush is ignored. Upon selection however, the normal selected pen/brush (provided by the selectionDecorator) is used, irrespective of whether the chart is single- or two-colored.

5.37.3 Usage

Like all data representing objects in QCustomPlot, the QCPFinancial is a plottable (QCPAbstractPlottable). So the plottable-interface of QCustomPlot applies (QCustomPlot::plottable, QCustomPlot::removePlottable, etc.)

Usually, you first create an instance:

which registers it with the QCustomPlot instance of the passed axes. Note that this QCustomPlot instance takes ownership of the plottable, so do not delete it manually but use QCustomPlot::removePlottable() instead. The newly created plottable can be modified, e.g.:

Here we have used the static helper method timeSeriesToOhlc, to turn a time-price data series into a 24-hour binned open-high-low-close data series as QCPFinancial uses.

5.37.4 Member Enumeration Documentation

5.37.4.1 ChartStyle

`enum QCPFinancial::ChartStyle`

Defines the possible representations of OHLC data in the plot.

See also

setChartStyle

Enumerator

csOhlc	Open-High-Low-Close bar representation.
csCandlestick	Candlestick representation.

5.37.4.2 WidthType

`enum QCPFinancial::WidthType`

Defines the ways the width of the financial bar can be specified. Thus it defines what the number passed to setWidth actually means.

See also

setWidthType, setWidth

Enumerator

wtAbsolute	width is in absolute pixels
wtAxisRectRatio	width is given by a fraction of the axis rect size
wtPlotCoords	width is in key coordinates and thus scales with the key axis range

5.37.5 Constructor & Destructor Documentation

5.37.5.1 QCPFinancial()

```
QCPFinancial::QCPFinancial (
            QCPAxis * keyAxis,
            QCPAxis * valueAxis )  [explicit]
```

Constructs a financial chart which uses *keyAxis* as its key axis ("x") and *valueAxis* as its value axis ("y"). *keyAxis* and *valueAxis* must reside in the same QCustomPlot instance and not have the same orientation. If either of these restrictions is violated, a corresponding message is printed to the debug output (qDebug), the construction is not aborted, though.

The created QCPFinancial is automatically registered with the QCustomPlot instance inferred from *keyAxis*. This QCustomPlot instance takes ownership of the QCPFinancial, so do not delete it manually but use QCustomPlot↩::removePlottable() instead.

5.37.6 Member Function Documentation

5.37.6.1 addData() [1/2]

```
void QCPFinancial::addData (
            const QVector< double > & keys,
            const QVector< double > & open,
            const QVector< double > & high,
            const QVector< double > & low,
            const QVector< double > & close,
            bool alreadySorted = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided points in *keys*, *open*, *high*, *low* and *close* to the current data. The provided vectors should have equal length. Else, the number of added points will be the size of the smallest vector.

If you can guarantee that the passed data points are sorted by *keys* in ascending order, you can set *alreadySorted* to true, to improve performance by saving a sorting run.

Alternatively, you can also access and modify the data directly via the data method, which returns a pointer to the internal data container.

See also

timeSeriesToOhlc

5.37.6.2 addData() [2/2]

```
void QCPFinancial::addData (
            double key,
            double open,
            double high,
            double low,
            double close )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided data point as *key*, *open*, *high*, *low* and *close* to the current data.

Alternatively, you can also access and modify the data directly via the data method, which returns a pointer to the internal data container.

See also

timeSeriesToOhlc

5.37.6.3 data()

```
QCPFinancialDataContainer * QCPFinancial::data ( ) const [inline]
```

Returns a pointer to the internal data storage of type QCPFinancialDataContainer. You may use it to directly manipulate the data, which may be more convenient and faster than using the regular setData or addData methods, in certain situations.

5.37.6.4 getKeyRange()

```
QCPRange QCPFinancial::getKeyRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth ) const [virtual]
```

Returns the coordinate range that all data in this plottable span in the key axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSignDomain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getValueRange

Implements QCPAbstractPlottable.

5.37.6.5 getValueRange()

```
QCPRange QCPFinancial::getValueRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth,
            const QCPRange & inKeyRange = QCPRange() ) const [virtual]
```

Returns the coordinate range that the data points in the specified key range (*inKeyRange*) span in the value axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSign↩ Domain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

If *inKeyRange* has both lower and upper bound set to zero (is equal to `QCPRange()`), all data points are considered, without any restriction on the keys.

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getKeyRange

Implements QCPAbstractPlottable.

5.37.6.6 selectTest()

```
double QCPFinancial::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

Implements a point-selection algorithm assuming the data (accessed via the 1D data interface) is point-like. Most subclasses will want to reimplement this method again, to provide a more accurate hit test based on the true data visualization geometry.

Reimplemented from QCPAbstractPlottable1D< QCPFinancialData >.

5.37.6.7 selectTestRect()

```
QCPDataSelection QCPFinancial::selectTestRect (
            const QRectF & rect,
            bool onlySelectable ) const  [virtual]
```

Returns a data selection containing all the data points of this plottable which are contained (or hit by) *rect*. This is used mainly in the selection rect interaction for data selection (data selection mechanism).

If *onlySelectable* is true, an empty QCPDataSelection is returned if this plottable is not selectable (i.e. if QCP↩ AbstractPlottable::setSelectable is QCP::stNone).

Note

> *rect* must be a normalized rect (positive or zero width and height). This is especially important when using the rect of QCPSelectionRect::accepted, which is not necessarily normalized. Use `QRect::normalized()` when passing a rect which might not be normalized.

Reimplemented from QCPAbstractPlottable1D< QCPFinancialData >.

5.37.6.8 setBrushNegative()

```
void QCPFinancial::setBrushNegative (
            const QBrush & brush )
```

If setTwoColored is set to true, this function controls the brush that is used to draw fills of data points with a negative trend (i.e. bars/candlesticks with close < open).

If *twoColored* is false, the normal plottable's pen and brush are used (setPen, setBrush).

See also

> setBrushPositive, setPenNegative, setPenPositive

5.37.6.9 setBrushPositive()

```
void QCPFinancial::setBrushPositive (
            const QBrush & brush )
```

If setTwoColored is set to true, this function controls the brush that is used to draw fills of data points with a positive trend (i.e. bars/candlesticks with close >= open).

If *twoColored* is false, the normal plottable's pen and brush are used (setPen, setBrush).

See also

setBrushNegative, setPenPositive, setPenNegative

5.37.6.10 setChartStyle()

```
void QCPFinancial::setChartStyle (
            QCPFinancial::ChartStyle style )
```

Sets which representation style shall be used to display the OHLC data.

5.37.6.11 setData() [1/2]

```
void QCPFinancial::setData (
            QSharedPointer< QCPFinancialDataContainer > data )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data container with the provided *data* container.

Since a QSharedPointer is used, multiple QCPFinancials may share the same data container safely. Modifying the data in the container will then affect all financials that share the container. Sharing can be achieved by simply exchanging the data containers wrapped in shared pointers:

If you do not wish to share containers, but create a copy from an existing container, rather use the QCPDataContainer<DataType>::set method on the financial's data container directly:

See also

addData, timeSeriesToOhlc

5.37.6.12 setData() [2/2]

```
void QCPFinancial::setData (
            const QVector< double > & keys,
            const QVector< double > & open,
            const QVector< double > & high,
            const QVector< double > & low,
            const QVector< double > & close,
            bool alreadySorted = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data with the provided points in *keys*, *open*, *high*, *low* and *close*. The provided vectors should have equal length. Else, the number of added points will be the size of the smallest vector.

If you can guarantee that the passed data points are sorted by *keys* in ascending order, you can set *alreadySorted* to true, to improve performance by saving a sorting run.

See also

addData, timeSeriesToOhlc

5.37.6.13 setPenNegative()

```
void QCPFinancial::setPenNegative (
            const QPen & pen )
```

If setTwoColored is set to true, this function controls the pen that is used to draw outlines of data points with a negative trend (i.e. bars/candlesticks with close < open).

If *twoColored* is false, the normal plottable's pen and brush are used (setPen, setBrush).

See also

setPenPositive, setBrushNegative, setBrushPositive

5.37.6.14 setPenPositive()

```
void QCPFinancial::setPenPositive (
            const QPen & pen )
```

If setTwoColored is set to true, this function controls the pen that is used to draw outlines of data points with a positive trend (i.e. bars/candlesticks with close >= open).

If *twoColored* is false, the normal plottable's pen and brush are used (setPen, setBrush).

See also

setPenNegative, setBrushPositive, setBrushNegative

5.37.6.15 setTwoColored()

```
void QCPFinancial::setTwoColored (
            bool twoColored )
```

Sets whether this chart shall contrast positive from negative trends per data point by using two separate colors to draw the respective bars/candlesticks.

If *twoColored* is false, the normal plottable's pen and brush are used (setPen, setBrush).

See also

setPenPositive, setPenNegative, setBrushPositive, setBrushNegative

5.37.6.16 setWidth()

```
void QCPFinancial::setWidth (
            double width )
```

Sets the width of the individual bars/candlesticks to *width* in plot key coordinates.

A typical choice is to set it to (or slightly less than) one bin interval width.

5.37.6.17 setWidthType()

```
void QCPFinancial::setWidthType (
            QCPFinancial::WidthType widthType )
```

Sets how the width of the financial bars is defined. See the documentation of WidthType for an explanation of the possible values for *widthType*.

The default value is wtPlotCoords.

See also

setWidth

5.37.6.18 timeSeriesToOhlc()

```
QCPFinancialDataContainer QCPFinancial::timeSeriesToOhlc (
            const QVector< double > & time,
            const QVector< double > & value,
            double timeBinSize,
            double timeBinOffset = 0 )  [static]
```

A convenience function that converts time series data (*value* against *time*) to OHLC binned data points. The return value can then be passed on to QCPFinancialDataContainer::set(const QCPFinancialDataContainer&).

The size of the bins can be controlled with *timeBinSize* in the same units as *time* is given. For example, if the unit of *time* is seconds and single OHLC/Candlesticks should span an hour each, set *timeBinSize* to 3600.

timeBinOffset allows to control precisely at what *time* coordinate a bin should start. The value passed as *time←BinOffset* doesn't need to be in the range encompassed by the *time* keys. It merely defines the mathematical offset/phase of the bins that will be used to process the data.

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.←h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.←cpp

5.38 QCPFinancialData Class Reference

Holds the data of one single data point for QCPFinancial.

Public Member Functions

- QCPFinancialData ()
- QCPFinancialData (double key, double open, double high, double low, double close)
- double sortKey () const
- double mainKey () const
- double mainValue () const
- QCPRange valueRange () const

Static Public Member Functions

- static QCPFinancialData fromSortKey (double sortKey)
- static bool sortKeyIsMainKey ()

Public Attributes

- double **key**
- double **open**
- double **high**
- double **low**
- double **close**

5.38.1 Detailed Description

Holds the data of one single data point for QCPFinancial.

The stored data is:

- *key:* coordinate on the key axis of this data point (this is the *mainKey* and the *sortKey*)
- *open:* The opening value at the data point (this is the *mainValue*)
- *high:* The high/maximum value at the data point
- *low:* The low/minimum value at the data point
- *close:* The closing value at the data point

The container for storing multiple data points is QCPFinancialDataContainer. It is a typedef for QCPDataContainer with QCPFinancialData as the DataType template parameter. See the documentation there for an explanation regarding the data type's generic methods.

See also

QCPFinancialDataContainer

5.38.2 Constructor & Destructor Documentation

5.38.2.1 QCPFinancialData() [1/2]

```
QCPFinancialData::QCPFinancialData ( )
```

Constructs a data point with key and all values set to zero.

5.38.2.2 QCPFinancialData() [2/2]

```
QCPFinancialData::QCPFinancialData (
            double key,
            double open,
            double high,
            double low,
            double close )
```

Constructs a data point with the specified *key* and OHLC values.

5.38.3 Member Function Documentation

5.38.3.1 fromSortKey()

```
static QCPFinancialData QCPFinancialData::fromSortKey (
            double sortKey )  [inline], [static]
```

Returns a data point with the specified *sortKey*. All other members are set to zero.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.38.3.2 mainKey()

```
double QCPFinancialData::mainKey ( ) const  [inline]
```

Returns the *key* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.38.3.3 mainValue()

```
double QCPFinancialData::mainValue ( ) const  [inline]
```

Returns the *open* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.38.3.4 sortKey()

```
double QCPFinancialData::sortKey ( ) const  [inline]
```

Returns the *key* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.38.3.5 sortKeyIsMainKey()

```
static static bool QCPFinancialData::sortKeyIsMainKey ( )  [inline], [static]
```

Since the member *key* is both the data point key coordinate and the data ordering parameter, this method returns true.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.38.3.6 valueRange()

`QCPRange QCPFinancialData::valueRange ( ) const [inline]`

Returns a QCPRange spanning from the *low* to the *high* value of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

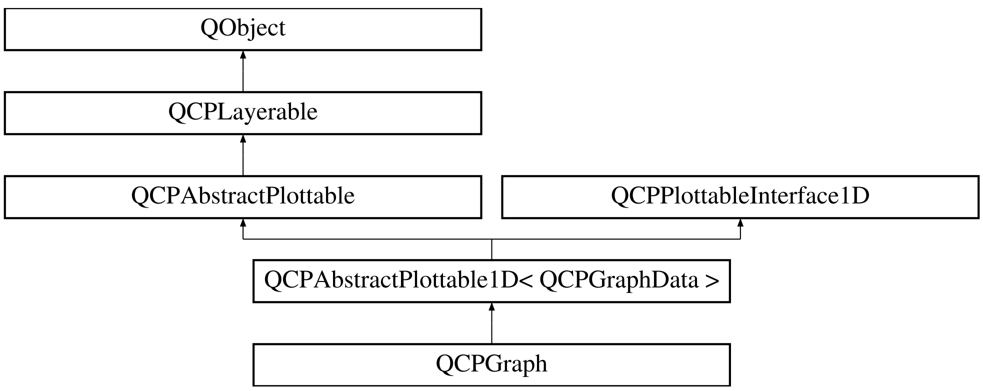
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.39 QCPGraph Class Reference

A plottable representing a graph in a plot.

Inheritance diagram for QCPGraph:



Public Types

- enum LineStyle {
  lsNone, lsLine, lsStepLeft, lsStepRight,
  lsStepCenter, lsImpulse }

Public Member Functions

- QCPGraph (QCPAxis *keyAxis, QCPAxis *valueAxis)
- QSharedPointer< QCPGraphDataContainer > data () const
- LineStyle **lineStyle** () const
- QCPScatterStyle **scatterStyle** () const
- int **scatterSkip** () const
- QCPGraph * **channelFillGraph** () const
- bool **adaptiveSampling** () const
- void setData (QSharedPointer< QCPGraphDataContainer > data)
- void setData (const QVector< double > &keys, const QVector< double > &values, bool alreadySorted=false)
- void setLineStyle (LineStyle ls)
- void setScatterStyle (const QCPScatterStyle &style)
- void setScatterSkip (int skip)
- void setChannelFillGraph (QCPGraph *targetGraph)
- void setAdaptiveSampling (bool enabled)
- void addData (const QVector< double > &keys, const QVector< double > &values, bool alreadySorted=false)
- void addData (double key, double value)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant *details=0) const Q_DECL_OVERRIDE
- virtual QCPRange getKeyRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth) const Q_DECL_OVERRIDE
- virtual QCPRange getValueRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth, const QCPRange &inKeyRange=QCPRange()) const Q_DECL_OVERRIDE

Protected Member Functions

- virtual void **draw** (QCPPainter *painter) Q_DECL_OVERRIDE
- virtual void **drawLegendIcon** (QCPPainter *painter, const QRectF &rect) const Q_DECL_OVERRIDE
- virtual void **drawFill** (QCPPainter *painter, QVector< QPointF > *lines) const
- virtual void **drawScatterPlot** (QCPPainter *painter, const QVector< QPointF > &scatters, const QCPScatterStyle &style) const
- virtual void **drawLinePlot** (QCPPainter *painter, const QVector< QPointF > &lines) const
- virtual void **drawImpulsePlot** (QCPPainter *painter, const QVector< QPointF > &lines) const
- virtual void **getOptimizedLineData** (QVector< QCPGraphData > *lineData, const QCPGraphDataContainer::const_iterator &begin, const QCPGraphDataContainer::const_iterator &end) const
- virtual void **getOptimizedScatterData** (QVector< QCPGraphData > *scatterData, QCPGraphDataContainer::const_iterator begin, QCPGraphDataContainer::const_iterator end) const
- void getVisibleDataBounds (QCPGraphDataContainer::const_iterator &begin, QCPGraphDataContainer::const_iterator &end, const QCPDataRange &rangeRestriction) const
- void **getLines** (QVector< QPointF > *lines, const QCPDataRange &dataRange) const
- void **getScatters** (QVector< QPointF > *scatters, const QCPDataRange &dataRange) const
- QVector< QPointF > **dataToLines** (const QVector< QCPGraphData > &data) const
- QVector< QPointF > **dataToStepLeftLines** (const QVector< QCPGraphData > &data) const
- QVector< QPointF > **dataToStepRightLines** (const QVector< QCPGraphData > &data) const
- QVector< QPointF > **dataToStepCenterLines** (const QVector< QCPGraphData > &data) const
- QVector< QPointF > **dataToImpulseLines** (const QVector< QCPGraphData > &data) const
- void **addFillBasePoints** (QVector< QPointF > *lines) const
- void **removeFillBasePoints** (QVector< QPointF > *lines) const
- QPointF **lowerFillBasePoint** (double lowerKey) const
- QPointF **upperFillBasePoint** (double upperKey) const
- const QPolygonF **getChannelFillPolygon** (const QVector< QPointF > *lines) const
- int **findIndexBelowX** (const QVector< QPointF > *data, double x) const
- int **findIndexAboveX** (const QVector< QPointF > *data, double x) const
- int **findIndexBelowY** (const QVector< QPointF > *data, double y) const
- int **findIndexAboveY** (const QVector< QPointF > *data, double y) const
- double **pointDistance** (const QPointF &pixelPoint, QCPGraphDataContainer::const_iterator &closestData) const

Protected Attributes

- LineStyle **mLineStyle**
- QCPScatterStyle **mScatterStyle**
- int **mScatterSkip**
- QPointer< QCPGraph > **mChannelFillGraph**
- bool **mAdaptiveSampling**

Friends

- class **QCustomPlot**
- class **QCPLegend**

Additional Inherited Members

5.39.1 Detailed Description

A plottable representing a graph in a plot.

Usually you create new graphs by calling QCustomPlot::addGraph. The resulting instance can be accessed via QCustomPlot::graph.

To plot data, assign it with the setData or addData functions. Alternatively, you can also access and modify the data via the data method, which returns a pointer to the internal QCPGraphDataContainer.

Graphs are used to display single-valued data. Single-valued means that there should only be one data point per unique key coordinate. In other words, the graph can't have *loops*. If you do want to plot non-single-valued curves, rather use the QCPCurve plottable.

Gaps in the graph line can be created by adding data points with NaN as value (`qQNaN()` or `std::numeric_limits<double>::quiet_NaN()`) in between the two data points that shall be separated.

5.39.2 Changing the appearance

The appearance of the graph is mainly determined by the line style, scatter style, brush and pen of the graph (setLineStyle, setScatterStyle, setBrush, setPen).

5.39.2.1 Filling under or between graphs

QCPGraph knows two types of fills: Normal graph fills towards the zero-value-line parallel to the key axis of the graph, and fills between two graphs, called channel fills. To enable a fill, just set a brush with setBrush which is neither Qt::NoBrush nor fully transparent.

By default, a normal fill towards the zero-value-line will be drawn. To set up a channel fill between this graph and another one, call setChannelFillGraph with the other graph as parameter.

See also

QCustomPlot::addGraph, QCustomPlot::graph

5.39.3 Member Enumeration Documentation

5.39.3.1 LineStyle

```
enum QCPGraph::LineStyle
```

Defines how the graph's line is represented visually in the plot. The line is drawn with the current pen of the graph (setPen).

See also

setLineStyle

Enumerator

lsNone	data points are not connected with any lines (e.g. data only represented with symbols according to the scatter style, see setScatterStyle)
lsLine	data points are connected by a straight line
lsStepLeft	line is drawn as steps where the step height is the value of the left data point
lsStepRight	line is drawn as steps where the step height is the value of the right data point
lsStepCenter	line is drawn as steps where the step is in between two data points
lsImpulse	each data point is represented by a line parallel to the value axis, which reaches from the data point to the zero-value-line

5.39.4 Constructor & Destructor Documentation

5.39.4.1 QCPGraph()

```
QCPGraph::QCPGraph (
            QCPAxis * keyAxis,
            QCPAxis * valueAxis )  [explicit]
```

Constructs a graph which uses *keyAxis* as its key axis ("x") and *valueAxis* as its value axis ("y"). *keyAxis* and *valueAxis* must reside in the same QCustomPlot instance and not have the same orientation. If either of these restrictions is violated, a corresponding message is printed to the debug output (qDebug), the construction is not aborted, though.

The created QCPGraph is automatically registered with the QCustomPlot instance inferred from *keyAxis*. This QCustomPlot instance takes ownership of the QCPGraph, so do not delete it manually but use QCustomPlot::removePlottable() instead.

To directly create a graph inside a plot, you can also use the simpler QCustomPlot::addGraph function.

5.39.5 Member Function Documentation

5.39.5.1 addData() [1/2]

```
void QCPGraph::addData (
            const QVector< double > & keys,
            const QVector< double > & values,
            bool alreadySorted = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided points in *keys* and *values* to the current data. The provided vectors should have equal length. Else, the number of added points will be the size of the smallest vector.

If you can guarantee that the passed data points are sorted by *keys* in ascending order, you can set *alreadySorted* to true, to improve performance by saving a sorting run.

Alternatively, you can also access and modify the data directly via the data method, which returns a pointer to the internal data container.

5.39.5.2 addData() [2/2]

```
void QCPGraph::addData (
            double key,
            double value )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided data point as *key* and *value* to the current data.

Alternatively, you can also access and modify the data directly via the data method, which returns a pointer to the internal data container.

5.39.5.3 data()

```
QSharedPointer< QCPGraphDataContainer > QCPGraph::data ( ) const [inline]
```

Returns a shared pointer to the internal data storage of type QCPGraphDataContainer. You may use it to directly manipulate the data, which may be more convenient and faster than using the regular setData or addData methods.

5.39.5.4 getKeyRange()

```
QCPRange QCPGraph::getKeyRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth ) const  [virtual]
```

Returns the coordinate range that all data in this plottable span in the key axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSignDomain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getValueRange

Implements QCPAbstractPlottable.

5.39.5.5 getValueRange()

```
QCPRange QCPGraph::getValueRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth,
            const QCPRange & inKeyRange = QCPRange() ) const  [virtual]
```

Returns the coordinate range that the data points in the specified key range (*inKeyRange*) span in the value axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSign*←*Domain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

If *inKeyRange* has both lower and upper bound set to zero (is equal to `QCPRange()`), all data points are considered, without any restriction on the keys.

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getKeyRange

Implements QCPAbstractPlottable.

5.39.5.6 getVisibleDataBounds()

```
void QCPGraph::getVisibleDataBounds (
            QCPGraphDataContainer::const_iterator & begin,
            QCPGraphDataContainer::const_iterator & end,
            const QCPDataRange & rangeRestriction ) const [protected]
```

This method outputs the currently visible data range via *begin* and *end*. The returned range will also never exceed *rangeRestriction*.

This method takes into account that the drawing of data lines at the axis rect border always requires the points just outside the visible axis range. So *begin* and *end* may actually indicate a range that contains one additional data point to the left and right of the visible axis range.

5.39.5.7 selectTest()

```
double QCPGraph::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const [virtual]
```

Implements a point-selection algorithm assuming the data (accessed via the 1D data interface) is point-like. Most subclasses will want to reimplement this method again, to provide a more accurate hit test based on the true data visualization geometry.

Reimplemented from QCPAbstractPlottable1D< QCPGraphData >.

5.39.5.8 setAdaptiveSampling()

```
void QCPGraph::setAdaptiveSampling (
            bool enabled )
```

Sets whether adaptive sampling shall be used when plotting this graph. QCustomPlot's adaptive sampling technique can drastically improve the replot performance for graphs with a larger number of points (e.g. above 10,000), without notably changing the appearance of the graph.

By default, adaptive sampling is enabled. Even if enabled, QCustomPlot decides whether adaptive sampling shall actually be used on a per-graph basis. So leaving adaptive sampling enabled has no disadvantage in almost all cases.

As can be seen, line plots experience no visual degradation from adaptive sampling. Outliers are reproduced reliably, as well as the overall shape of the data set. The replot time reduces dramatically though. This allows QCustomPlot to display large amounts of data in realtime.

Care must be taken when using high-density scatter plots in combination with adaptive sampling. The adaptive sampling algorithm treats scatter plots more carefully than line plots which still gives a significant reduction of replot times, but not quite as much as for line plots. This is because scatter plots inherently need more data points to be preserved in order to still resemble the original, non-adaptive-sampling plot. As shown above, the results still aren't quite identical, as banding occurs for the outer data points. This is in fact intentional, such that the boundaries of the data cloud stay visible to the viewer. How strong the banding appears, depends on the point density, i.e. the number of points in the plot.

For some situations with scatter plots it might thus be desirable to manually turn adaptive sampling off. For example, when saving the plot to disk. This can be achieved by setting *enabled* to false before issuing a command like QCustomPlot::savePng, and setting *enabled* back to true afterwards.

5.39.5.9 setChannelFillGraph()

```
void QCPGraph::setChannelFillGraph (
            QCPGraph * targetGraph )
```

Sets the target graph for filling the area between this graph and *targetGraph* with the current brush (setBrush).

When *targetGraph* is set to 0, a normal graph fill to the zero-value-line will be shown. To disable any filling, set the brush to Qt::NoBrush.

See also

setBrush

5.39.5.10 setData() [1/2]

```
void QCPGraph::setData (
            QSharedPointer< QCPGraphDataContainer > data )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data container with the provided *data* container.

Since a QSharedPointer is used, multiple QCPGraphs may share the same data container safely. Modifying the data in the container will then affect all graphs that share the container. Sharing can be achieved by simply exchanging the data containers wrapped in shared pointers:

If you do not wish to share containers, but create a copy from an existing container, rather use the QCPDataContainer<DataType>::set method on the graph's data container directly:

See also

addData

5.39.5.11 setData() [2/2]

```
void QCPGraph::setData (
            const QVector< double > & keys,
            const QVector< double > & values,
            bool alreadySorted = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data with the provided points in *keys* and *values*. The provided vectors should have equal length. Else, the number of added points will be the size of the smallest vector.

If you can guarantee that the passed data points are sorted by *keys* in ascending order, you can set *alreadySorted* to true, to improve performance by saving a sorting run.

See also

addData

5.39.5.12 setLineStyle()

```
void QCPGraph::setLineStyle (
            LineStyle ls )
```

Sets how the single data points are connected in the plot. For scatter-only plots, set *ls* to lsNone and setScatterStyle to the desired scatter style.

See also

setScatterStyle

5.39.5.13 setScatterSkip()

```
void QCPGraph::setScatterSkip (
            int skip )
```

If scatters are displayed (scatter style not QCPScatterStyle::ssNone), *skip* number of scatter points are skipped/not drawn after every drawn scatter point.

This can be used to make the data appear sparser while for example still having a smooth line, and to improve performance for very high density plots.

If *skip* is set to 0 (default), all scatter points are drawn.

See also

setScatterStyle

5.39.5.14 setScatterStyle()

```
void QCPGraph::setScatterStyle (
            const QCPScatterStyle & style )
```

Sets the visual appearance of single data points in the plot. If set to QCPScatterStyle::ssNone, no scatter points are drawn (e.g. for line-only-plots with appropriate line style).

See also

QCPScatterStyle, setLineStyle

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.40 QCPGraphData Class Reference

Holds the data of one single data point for QCPGraph.

Public Member Functions

- QCPGraphData ()
- QCPGraphData (double key, double value)
- double sortKey () const
- double mainKey () const
- double mainValue () const
- QCPRange valueRange () const

Static Public Member Functions

- static QCPGraphData fromSortKey (double sortKey)
- static bool sortKeyIsMainKey ()

Public Attributes

- double **key**
- double **value**

5.40.1 Detailed Description

Holds the data of one single data point for QCPGraph.

The stored data is:

- *key:* coordinate on the key axis of this data point (this is the *mainKey* and the *sortKey*)
- *value:* coordinate on the value axis of this data point (this is the *mainValue*)

The container for storing multiple data points is QCPGraphDataContainer. It is a typedef for QCPDataContainer with QCPGraphData as the DataType template parameter. See the documentation there for an explanation regarding the data type's generic methods.

See also

QCPGraphDataContainer

5.40.2 Constructor & Destructor Documentation

5.40.2.1 QCPGraphData() [1/2]

```
QCPGraphData::QCPGraphData ( )
```

Constructs a data point with key and value set to zero.

5.40.2.2 QCPGraphData() [2/2]

```
QCPGraphData::QCPGraphData (
            double key,
            double value )
```

Constructs a data point with the specified *key* and *value*.

5.40.3 Member Function Documentation

5.40.3.1 fromSortKey()

```
static QCPGraphData QCPGraphData::fromSortKey (
            double sortKey ) [inline], [static]
```

Returns a data point with the specified *sortKey*. All other members are set to zero.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.40.3.2 mainKey()

```
double QCPGraphData::mainKey ( ) const [inline]
```

Returns the *key* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.40.3.3 mainValue()

```
double QCPGraphData::mainValue ( ) const [inline]
```

Returns the *value* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.40.3.4 sortKey()

```
double QCPGraphData::sortKey ( ) const [inline]
```

Returns the *key* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.40.3.5 sortKeyIsMainKey()

```
static static bool QCPGraphData::sortKeyIsMainKey ( ) [inline], [static]
```

Since the member *key* is both the data point key coordinate and the data ordering parameter, this method returns true.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.40.3.6 valueRange()

```
QCPRange QCPGraphData::valueRange ( ) const [inline]
```

Returns a QCPRange with both lower and upper boundary set to *value* of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

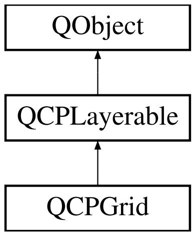
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.41 QCPGrid Class Reference

Responsible for drawing the grid of a QCPAxis.

Inheritance diagram for QCPGrid:



Public Member Functions

- QCPGrid (QCPAxis ∗parentAxis)
- bool **subGridVisible** () const
- bool **antialiasedSubGrid** () const
- bool **antialiasedZeroLine** () const
- QPen **pen** () const
- QPen **subGridPen** () const
- QPen **zeroLinePen** () const
- void setSubGridVisible (bool visible)
- void setAntialiasedSubGrid (bool enabled)
- void setAntialiasedZeroLine (bool enabled)
- void setPen (const QPen &pen)
- void setSubGridPen (const QPen &pen)
- void setZeroLinePen (const QPen &pen)

Protected Member Functions

- virtual void **applyDefaultAntialiasingHint** (QCPPainter ∗painter) const Q_DECL_OVERRIDE
- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- void **drawGridLines** (QCPPainter ∗painter) const
- void **drawSubGridLines** (QCPPainter ∗painter) const

Protected Attributes

- bool **mSubGridVisible**
- bool **mAntialiasedSubGrid**
- bool **mAntialiasedZeroLine**
- QPen **mPen**
- QPen **mSubGridPen**
- QPen **mZeroLinePen**
- QCPAxis ∗ **mParentAxis**

Friends

- class **QCPAxis**

Additional Inherited Members

5.41.1 Detailed Description

Responsible for drawing the grid of a QCPAxis.

This class is tightly bound to QCPAxis. Every axis owns a grid instance and uses it to draw the grid lines, sub grid lines and zero-line. You can interact with the grid of an axis via QCPAxis::grid. Normally, you don't need to create an instance of QCPGrid yourself.

The axis and grid drawing was split into two classes to allow them to be placed on different layers (both QCPAxis and QCPGrid inherit from QCPLayerable). Thus it is possible to have the grid in the background and the axes in the foreground, and any plottables/items in between. This described situation is the default setup, see the QCPLayer documentation.

5.41.2 Constructor & Destructor Documentation

5.41.2.1 QCPGrid()

```
QCPGrid::QCPGrid (
            QCPAxis * parentAxis )  [explicit]
```

Creates a QCPGrid instance and sets default values.

You shouldn't instantiate grids on their own, since every QCPAxis brings its own QCPGrid.

5.41.3 Member Function Documentation

5.41.3.1 setAntialiasedSubGrid()

```
void QCPGrid::setAntialiasedSubGrid (
            bool enabled )
```

Sets whether sub grid lines are drawn antialiased.

5.41.3.2 setAntialiasedZeroLine()

```
void QCPGrid::setAntialiasedZeroLine (
            bool enabled )
```

Sets whether zero lines are drawn antialiased.

5.41.3.3 setPen()

```
void QCPGrid::setPen (
            const QPen & pen )
```

Sets the pen with which (major) grid lines are drawn.

5.41.3.4 setSubGridPen()

```
void QCPGrid::setSubGridPen (
            const QPen & pen )
```

Sets the pen with which sub grid lines are drawn.

5.41.3.5 setSubGridVisible()

```
void QCPGrid::setSubGridVisible (
            bool visible )
```

Sets whether grid lines at sub tick marks are drawn.

See also

setSubGridPen

5.41.3.6 setZeroLinePen()

```
void QCPGrid::setZeroLinePen (
            const QPen & pen )
```

Sets the pen with which zero lines are drawn.

Zero lines are lines at value coordinate 0 which may be drawn with a different pen than other grid lines. To disable zero lines and just draw normal grid lines at zero, set *pen* to Qt::NoPen.

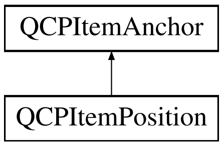
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.42 QCPItemAnchor Class Reference

An anchor of an item to which positions can be attached to.

Inheritance diagram for QCPItemAnchor:



Public Member Functions

- QCPItemAnchor (QCustomPlot *parentPlot, QCPAbstractItem *parentItem, const QString &name, int anchorId=-1)
- QString **name** () const
- virtual QPointF pixelPosition () const

Protected Member Functions

- virtual QCPItemPosition * toQCPItemPosition ()
- void **addChildX** (QCPItemPosition *pos)
- void **removeChildX** (QCPItemPosition *pos)
- void **addChildY** (QCPItemPosition *pos)
- void **removeChildY** (QCPItemPosition *pos)

Protected Attributes

- QString **mName**
- QCustomPlot * **mParentPlot**
- QCPAbstractItem * **mParentItem**
- int **mAnchorId**
- QSet< QCPItemPosition * > **mChildrenX**
- QSet< QCPItemPosition * > **mChildrenY**

Friends

- class **QCPItemPosition**

5.42.1 Detailed Description

An anchor of an item to which positions can be attached to.

An item (QCPAbstractItem) may have one or more anchors. Unlike QCPItemPosition, an anchor doesn't control anything on its item, but provides a way to tie other items via their positions to the anchor.

For example, a QCPItemRect is defined by its positions *topLeft* and *bottomRight*. Additionally it has various anchors like *top*, *topRight* or *bottomLeft* etc. So you can attach the *start* (which is a QCPItemPosition) of a QCPItemLine to one of the anchors by calling QCPItemPosition::setParentAnchor on *start*, passing the wanted anchor of the QCPItemRect. This way the start of the line will now always follow the respective anchor location on the rect item.

Note that QCPItemPosition derives from QCPItemAnchor, so every position can also serve as an anchor to other positions.

To learn how to provide anchors in your own item subclasses, see the subclassing section of the QCPAbstractItem documentation.

5.42.2 Constructor & Destructor Documentation

5.42.2.1 QCPItemAnchor()

```
QCPItemAnchor::QCPItemAnchor (
            QCustomPlot * parentPlot,
            QCPAbstractItem * parentItem,
            const QString & name,
            int anchorId = -1 )
```

Creates a new QCPItemAnchor. You shouldn't create QCPItemAnchor instances directly, even if you want to make a new item subclass. Use QCPAbstractItem::createAnchor instead, as explained in the subclassing section of the QCPAbstractItem documentation.

5.42.3 Member Function Documentation

5.42.3.1 pixelPosition()

```
QPointF QCPItemAnchor::pixelPosition ( ) const [virtual]
```

Returns the final absolute pixel position of the QCPItemAnchor on the QCustomPlot surface.

The pixel information is internally retrieved via QCPAbstractItem::anchorPixelPosition of the parent item, QCPItemAnchor is just an intermediary.

Reimplemented in QCPItemPosition.

5.42.3.2 toQCPItemPosition()

```
QCPItemPosition * QCPItemAnchor::toQCPItemPosition ( ) [inline], [protected], [virtual]
```

Returns 0 if this instance is merely a QCPItemAnchor, and a valid pointer of type QCPItemPosition* if it actually is a QCPItemPosition (which is a subclass of QCPItemAnchor).

This safe downcast functionality could also be achieved with a dynamic_cast. However, QCustomPlot avoids dynamic_cast to work with projects that don't have RTTI support enabled (e.g. -fno-rtti flag with gcc compiler).

Reimplemented in QCPItemPosition.

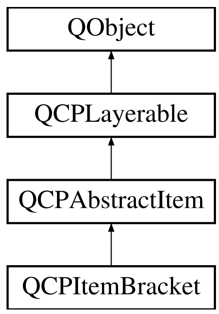
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.cpp

5.43 QCPItemBracket Class Reference

A bracket for referencing/highlighting certain parts in the plot.

Inheritance diagram for QCPItemBracket:



Public Types

- enum BracketStyle { bsSquare, bsRound, bsCurly, bsCalligraphic }

Public Member Functions

- QCPItemBracket (QCustomPlot ∗parentPlot)
- QPen **pen** () const
- QPen **selectedPen** () const
- double **length** () const
- BracketStyle **style** () const
- void setPen (const QPen &pen)
- void setSelectedPen (const QPen &pen)
- void setLength (double length)
- void setStyle (BracketStyle style)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩ OVERRIDE

Public Attributes

- QCPItemPosition ∗const **left**
- QCPItemPosition ∗const **right**
- QCPItemAnchor ∗const **center**

Protected Types

- enum **AnchorIndex** { **aiCenter** }

Protected Member Functions

- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- virtual QPointF **anchorPixelPosition** (int anchorId) const Q_DECL_OVERRIDE
- QPen **mainPen** () const

Protected Attributes

- QPen **mPen**
- QPen **mSelectedPen**
- double **mLength**
- BracketStyle **mStyle**

Additional Inherited Members

5.43.1 Detailed Description

A bracket for referencing/highlighting certain parts in the plot.

It has two positions, *left* and *right*, which define the span of the bracket. If *left* is actually farther to the left than *right*, the bracket is opened to the bottom, as shown in the example image.

The bracket supports multiple styles via setStyle. The length, i.e. how far the bracket stretches away from the embraced span, can be controlled with setLength.

Demonstrating the effect of different values for setLength, for styles bsCalligraphic and bsSquare. Anchors and positions are displayed for reference.

It provides an anchor *center*, to allow connection of other items, e.g. an arrow (QCPItemLine or QCPItemCurve) or a text label (QCPItemText), to the bracket.

5.43.2 Member Enumeration Documentation

5.43.2.1 BracketStyle

```
enum QCPItemBracket::BracketStyle
```

Defines the various visual shapes of the bracket item. The appearance can be further modified by setLength and setPen.

See also

setStyle

Enumerator

bsSquare	A brace with angled edges.
bsRound	A brace with round edges.
bsCurly	A curly brace.
bsCalligraphic	A curly brace with varying stroke width giving a calligraphic impression.

5.43.3 Constructor & Destructor Documentation

5.43.3.1 QCPItemBracket()

```
QCPItemBracket::QCPItemBracket (
            QCustomPlot * parentPlot )  [explicit]
```

Creates a bracket item and sets default values.

The created item is automatically registered with *parentPlot*. This QCustomPlot instance takes ownership of the item, so do not delete it manually but use QCustomPlot::removeItem() instead.

5.43.4 Member Function Documentation

5.43.4.1 selectTest()

```
double QCPItemBracket::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Implements QCPAbstractItem.

5.43.4.2 setLength()

```
void QCPItemBracket::setLength (
            double length )
```

Sets the *length* in pixels how far the bracket extends in the direction towards the embraced span of the bracket (i.e. perpendicular to the *left*-*right*-direction)

Demonstrating the effect of different values for setLength, for styles bsCalligraphic and bsSquare. Anchors and positions are displayed for reference.

5.43.4.3 setPen()

```
void QCPItemBracket::setPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the bracket.

Note that when the style is bsCalligraphic, only the color will be taken from the pen, the stroke and width are ignored. To change the apparent stroke width of a calligraphic bracket, use setLength, which has a similar effect.

See also

setSelectedPen

5.43.4.4 setSelectedPen()

```
void QCPItemBracket::setSelectedPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the bracket when selected

See also

setPen, setSelected

5.43.4.5 setStyle()

```
void QCPItemBracket::setStyle (
            QCPItemBracket::BracketStyle style )
```

Sets the style of the bracket, i.e. the shape/visual appearance.

See also

setPen

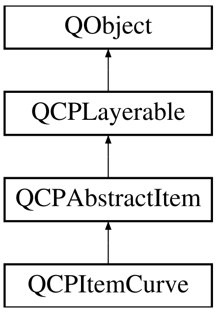
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.44 QCPItemCurve Class Reference

A curved line from one point to another.

Inheritance diagram for QCPItemCurve:



Public Member Functions

- QCPItemCurve (QCustomPlot ∗parentPlot)
- QPen **pen** () const
- QPen **selectedPen** () const
- QCPLineEnding **head** () const
- QCPLineEnding **tail** () const
- void setPen (const QPen &pen)
- void setSelectedPen (const QPen &pen)
- void setHead (const QCPLineEnding &head)
- void setTail (const QCPLineEnding &tail)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩ OVERRIDE

Public Attributes

- QCPItemPosition ∗const **start**
- QCPItemPosition ∗const **startDir**
- QCPItemPosition ∗const **endDir**
- QCPItemPosition ∗const **end**

Protected Member Functions

- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- QPen **mainPen** () const

Protected Attributes

- QPen **mPen**
- QPen **mSelectedPen**
- QCPLineEnding **mHead**
- QCPLineEnding **mTail**

Additional Inherited Members

5.44.1 Detailed Description

A curved line from one point to another.

It has four positions, *start* and *end*, which define the end points of the line, and two control points which define the direction the line exits from the start and the direction from which it approaches the end: *startDir* and *endDir*.

With setHead and setTail you may set different line ending styles, e.g. to create an arrow.

Often it is desirable for the control points to stay at fixed relative positions to the start/end point. This can be achieved by setting the parent anchor e.g. of *startDir* simply to *start*, and then specify the desired pixel offset with QCPItemPosition::setCoords on *startDir*.

5.44.2 Constructor & Destructor Documentation

5.44.2.1 QCPItemCurve()

```
QCPItemCurve::QCPItemCurve (
            QCustomPlot * parentPlot )  [explicit]
```

Creates a curve item and sets default values.

The created item is automatically registered with *parentPlot*. This QCustomPlot instance takes ownership of the item, so do not delete it manually but use QCustomPlot::removeItem() instead.

5.44.3 Member Function Documentation

5.44.3.1 selectTest()

```
double QCPItemCurve::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Implements QCPAbstractItem.

5.44.3.2 setHead()

```
void QCPItemCurve::setHead (
            const QCPLineEnding & head )
```

Sets the line ending style of the head. The head corresponds to the *end* position.

Note that due to the overloaded QCPLineEnding constructor, you may directly specify a QCPLineEnding::EndingStyle here, e.g.

```
setHead(QCPLineEnding::esSpikeArrow)
```

See also

setTail

5.44.3.3 setPen()

```
void QCPItemCurve::setPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the line

See also

setSelectedPen

5.44.3.4 setSelectedPen()

```
void QCPItemCurve::setSelectedPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the line when selected

See also

setPen, setSelected

5.44.3.5 setTail()

```
void QCPItemCurve::setTail (
            const QCPLineEnding & tail )
```

Sets the line ending style of the tail. The tail corresponds to the *start* position.

Note that due to the overloaded QCPLineEnding constructor, you may directly specify a QCPLineEnding::Ending↩ Style here, e.g.

```
setTail(QCPLineEnding::esSpikeArrow)
```

See also

setHead

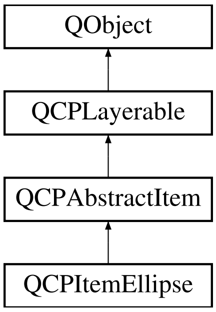
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.45 QCPItemEllipse Class Reference

An ellipse.

Inheritance diagram for QCPItemEllipse:



Public Member Functions

- QCPItemEllipse (QCustomPlot ∗parentPlot)
- QPen **pen** () const
- QPen **selectedPen** () const
- QBrush **brush** () const
- QBrush **selectedBrush** () const
- void setPen (const QPen &pen)
- void setSelectedPen (const QPen &pen)
- void setBrush (const QBrush &brush)
- void setSelectedBrush (const QBrush &brush)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩ OVERRIDE

Public Attributes

- QCPItemPosition ∗const **topLeft**
- QCPItemPosition ∗const **bottomRight**
- QCPItemAnchor ∗const **topLeftRim**
- QCPItemAnchor ∗const **top**
- QCPItemAnchor ∗const **topRightRim**
- QCPItemAnchor ∗const **right**
- QCPItemAnchor ∗const **bottomRightRim**
- QCPItemAnchor ∗const **bottom**
- QCPItemAnchor ∗const **bottomLeftRim**
- QCPItemAnchor ∗const **left**
- QCPItemAnchor ∗const **center**

Protected Types

- enum **AnchorIndex** {
  aiTopLeftRim, **aiTop**, **aiTopRightRim**, **aiRight**,
  aiBottomRightRim, **aiBottom**, **aiBottomLeftRim**, **aiLeft**,
  aiCenter }

Protected Member Functions

- virtual void **draw** (QCPPainter *painter) Q_DECL_OVERRIDE
- virtual QPointF **anchorPixelPosition** (int anchorId) const Q_DECL_OVERRIDE
- QPen **mainPen** () const
- QBrush **mainBrush** () const

Protected Attributes

- QPen **mPen**
- QPen **mSelectedPen**
- QBrush **mBrush**
- QBrush **mSelectedBrush**

Additional Inherited Members

5.45.1 Detailed Description

An ellipse.

It has two positions, *topLeft* and *bottomRight*, which define the rect the ellipse will be drawn in.

5.45.2 Constructor & Destructor Documentation

5.45.2.1 QCPItemEllipse()

```
QCPItemEllipse::QCPItemEllipse (
            QCustomPlot * parentPlot )  [explicit]
```

Creates an ellipse item and sets default values.

The created item is automatically registered with *parentPlot*. This QCustomPlot instance takes ownership of the item, so do not delete it manually but use QCustomPlot::removeItem() instead.

5.45.3 Member Function Documentation

5.45.3.1 selectTest()

```
double QCPItemEllipse::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Implements QCPAbstractItem.

5.45.3.2 setBrush()

```
void QCPItemEllipse::setBrush (
            const QBrush & brush )
```

Sets the brush that will be used to fill the ellipse. To disable filling, set *brush* to Qt::NoBrush.

See also

setSelectedBrush, setPen

5.45.3.3 setPen()

```
void QCPItemEllipse::setPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the line of the ellipse

See also

setSelectedPen, setBrush

5.45.3.4 setSelectedBrush()

```
void QCPItemEllipse::setSelectedBrush (
            const QBrush & brush )
```

Sets the brush that will be used to fill the ellipse when selected. To disable filling, set *brush* to Qt::NoBrush.

See also

setBrush

5.45.3.5 setSelectedPen()

```
void QCPItemEllipse::setSelectedPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the line of the ellipse when selected

See also

setPen, setSelected

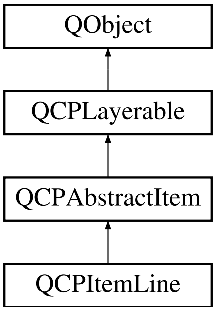
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.46 QCPItemLine Class Reference

A line from one point to another.

Inheritance diagram for QCPItemLine:



Public Member Functions

- QCPItemLine (QCustomPlot ∗parentPlot)
- QPen **pen** () const
- QPen **selectedPen** () const
- QCPLineEnding **head** () const
- QCPLineEnding **tail** () const
- void setPen (const QPen &pen)
- void setSelectedPen (const QPen &pen)
- void setHead (const QCPLineEnding &head)
- void setTail (const QCPLineEnding &tail)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩ OVERRIDE

Public Attributes

- QCPItemPosition ∗const **start**
- QCPItemPosition ∗const **end**

Protected Member Functions

- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- QLineF **getRectClippedLine** (const QCPVector2D &start, const QCPVector2D &end, const QRect &rect) const
- QPen **mainPen** () const

Protected Attributes

- QPen **mPen**
- QPen **mSelectedPen**
- QCPLineEnding **mHead**
- QCPLineEnding **mTail**

Additional Inherited Members

5.46.1 Detailed Description

A line from one point to another.

It has two positions, *start* and *end*, which define the end points of the line.

With setHead and setTail you may set different line ending styles, e.g. to create an arrow.

5.46.2 Constructor & Destructor Documentation

5.46.2.1 QCPItemLine()

```
QCPItemLine::QCPItemLine (
            QCustomPlot * parentPlot )  [explicit]
```

Creates a line item and sets default values.

The created item is automatically registered with *parentPlot*. This QCustomPlot instance takes ownership of the item, so do not delete it manually but use QCustomPlot::removeItem() instead.

5.46.3 Member Function Documentation

5.46.3.1 selectTest()

```
double QCPItemLine::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Implements QCPAbstractItem.

5.46.3.2 setHead()

```
void QCPItemLine::setHead (
            const QCPLineEnding & head )
```

Sets the line ending style of the head. The head corresponds to the *end* position.

Note that due to the overloaded QCPLineEnding constructor, you may directly specify a QCPLineEnding::EndingStyle here, e.g.

```
setHead(QCPLineEnding::esSpikeArrow)
```

See also

setTail

5.46.3.3 setPen()

```
void QCPItemLine::setPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the line

See also

setSelectedPen

5.46.3.4 setSelectedPen()

```
void QCPItemLine::setSelectedPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the line when selected

See also

setPen, setSelected

5.46.3.5 setTail()

```
void QCPItemLine::setTail (
            const QCPLineEnding & tail )
```

Sets the line ending style of the tail. The tail corresponds to the *start* position.

Note that due to the overloaded QCPLineEnding constructor, you may directly specify a QCPLineEnding::Ending↩ Style here, e.g.

```
setTail(QCPLineEnding::esSpikeArrow)
```

See also

setHead

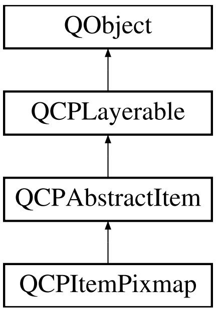
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.47 QCPItemPixmap Class Reference

An arbitrary pixmap.

Inheritance diagram for QCPItemPixmap:



Public Member Functions

- QCPItemPixmap (QCustomPlot ∗parentPlot)
- QPixmap **pixmap** () const
- bool **scaled** () const
- Qt::AspectRatioMode **aspectRatioMode** () const
- Qt::TransformationMode **transformationMode** () const
- QPen **pen** () const
- QPen **selectedPen** () const
- void setPixmap (const QPixmap &pixmap)
- void setScaled (bool scaled, Qt::AspectRatioMode aspectRatioMode=Qt::KeepAspectRatio, Qt::↩ TransformationMode transformationMode=Qt::SmoothTransformation)
- void setPen (const QPen &pen)
- void setSelectedPen (const QPen &pen)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩ OVERRIDE

Public Attributes

- QCPItemPosition ∗const **topLeft**
- QCPItemPosition ∗const **bottomRight**
- QCPItemAnchor ∗const **top**
- QCPItemAnchor ∗const **topRight**
- QCPItemAnchor ∗const **right**
- QCPItemAnchor ∗const **bottom**
- QCPItemAnchor ∗const **bottomLeft**
- QCPItemAnchor ∗const **left**

Protected Types

- enum **AnchorIndex** {
  aiTop, **aiTopRight**, **aiRight**, **aiBottom**,
  aiBottomLeft, **aiLeft** }

Protected Member Functions

- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- virtual QPointF **anchorPixelPosition** (int anchorId) const Q_DECL_OVERRIDE
- void **updateScaledPixmap** (QRect finalRect=QRect(), bool flipHorz=false, bool flipVert=false)
- QRect **getFinalRect** (bool ∗flippedHorz=0, bool ∗flippedVert=0) const
- QPen **mainPen** () const

Protected Attributes

- QPixmap **mPixmap**
- QPixmap **mScaledPixmap**
- bool **mScaled**
- bool **mScaledPixmapInvalidated**
- Qt::AspectRatioMode **mAspectRatioMode**
- Qt::TransformationMode **mTransformationMode**
- QPen **mPen**
- QPen **mSelectedPen**

Additional Inherited Members

5.47.1 Detailed Description

An arbitrary pixmap.

It has two positions, *topLeft* and *bottomRight*, which define the rectangle the pixmap will be drawn in. Depending on the scale setting (setScaled), the pixmap will be either scaled to fit the rectangle or be drawn aligned to the topLeft position.

If scaling is enabled and *topLeft* is further to the bottom/right than *bottomRight* (as shown on the right side of the example image), the pixmap will be flipped in the respective orientations.

5.47.2 Constructor & Destructor Documentation

5.47.2.1 QCPItemPixmap()

```
QCPItemPixmap::QCPItemPixmap (
            QCustomPlot * parentPlot )  [explicit]
```

Creates a rectangle item and sets default values.

The created item is automatically registered with *parentPlot*. This QCustomPlot instance takes ownership of the item, so do not delete it manually but use QCustomPlot::removeItem() instead.

5.47.3 Member Function Documentation

5.47.3.1 selectTest()

```
double QCPItemPixmap::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Implements QCPAbstractItem.

5.47.3.2 setPen()

```
void QCPItemPixmap::setPen (
            const QPen & pen )
```

Sets the pen that will be used to draw a border around the pixmap.

See also

setSelectedPen, setBrush

5.47.3.3 setPixmap()

```
void QCPItemPixmap::setPixmap (
            const QPixmap & pixmap )
```

Sets the pixmap that will be displayed.

5.47.3.4 setScaled()

```
void QCPItemPixmap::setScaled (
            bool scaled,
            Qt::AspectRatioMode aspectRatioMode = Qt::KeepAspectRatio,
            Qt::TransformationMode transformationMode = Qt::SmoothTransformation )
```

Sets whether the pixmap will be scaled to fit the rectangle defined by the *topLeft* and *bottomRight* positions.

5.47.3.5 setSelectedPen()

```
void QCPItemPixmap::setSelectedPen (
            const QPen & pen )
```

Sets the pen that will be used to draw a border around the pixmap when selected

See also

setPen, setSelected

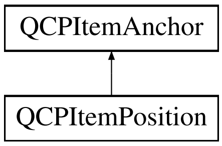
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.48 QCPItemPosition Class Reference

Manages the position of an item.

Inheritance diagram for QCPItemPosition:



Public Types

- enum PositionType { ptAbsolute, ptViewportRatio, ptAxisRectRatio, ptPlotCoords }

Public Member Functions

- QCPItemPosition (QCustomPlot ∗parentPlot, QCPAbstractItem ∗parentItem, const QString &name)
- PositionType type () const
- PositionType **typeX** () const
- PositionType **typeY** () const
- QCPItemAnchor ∗ parentAnchor () const
- QCPItemAnchor ∗ **parentAnchorX** () const
- QCPItemAnchor ∗ **parentAnchorY** () const
- double **key** () const
- double **value** () const
- QPointF **coords** () const
- QCPAxis ∗ **keyAxis** () const
- QCPAxis ∗ **valueAxis** () const
- QCPAxisRect ∗ **axisRect** () const
- virtual QPointF pixelPosition () const
- void setType (PositionType type)
- void setTypeX (PositionType type)
- void setTypeY (PositionType type)
- bool setParentAnchor (QCPItemAnchor ∗parentAnchor, bool keepPixelPosition=false)
- bool setParentAnchorX (QCPItemAnchor ∗parentAnchor, bool keepPixelPosition=false)
- bool setParentAnchorY (QCPItemAnchor ∗parentAnchor, bool keepPixelPosition=false)
- void setCoords (double key, double value)
- void setCoords (const QPointF &coords)
- void setAxes (QCPAxis ∗keyAxis, QCPAxis ∗valueAxis)
- void setAxisRect (QCPAxisRect ∗axisRect)
- void setPixelPosition (const QPointF &pixelPosition)

Protected Member Functions

- virtual QCPItemPosition ∗ toQCPItemPosition () Q_DECL_OVERRIDE

Protected Attributes

- PositionType **mPositionTypeX**
- PositionType **mPositionTypeY**
- QPointer< QCPAxis > **mKeyAxis**
- QPointer< QCPAxis > **mValueAxis**
- QPointer< QCPAxisRect > **mAxisRect**
- double **mKey**
- double **mValue**
- QCPItemAnchor * **mParentAnchorX**
- QCPItemAnchor * **mParentAnchorY**

5.48.1 Detailed Description

Manages the position of an item.

Every item has at least one public QCPItemPosition member pointer which provides ways to position the item on the QCustomPlot surface. Some items have multiple positions, for example QCPItemRect has two: *topLeft* and *bottomRight*.

QCPItemPosition has a type (PositionType) that can be set with setType. This type defines how coordinates passed to setCoords are to be interpreted, e.g. as absolute pixel coordinates, as plot coordinates of certain axes, etc. For more advanced plots it is also possible to assign different types per X/Y coordinate of the position (see setTypeX, setTypeY). This way an item could be positioned at a fixed pixel distance from the top in the Y direction, while following a plot coordinate in the X direction.

A QCPItemPosition may have a parent QCPItemAnchor, see setParentAnchor. This way you can tie multiple items together. If the QCPItemPosition has a parent, its coordinates (setCoords) are considered to be absolute pixels in the reference frame of the parent anchor, where (0, 0) means directly ontop of the parent anchor. For example, You could attach the *start* position of a QCPItemLine to the *bottom* anchor of a QCPItemText to make the starting point of the line always be centered under the text label, no matter where the text is moved to. For more advanced plots, it is possible to assign different parent anchors per X/Y coordinate of the position, see setParentAnchorX, setParentAnchorY. This way an item could follow another item in the X direction but stay at a fixed position in the Y direction. Or even follow item A in X, and item B in Y.

Note that every QCPItemPosition inherits from QCPItemAnchor and thus can itself be used as parent anchor for other positions.

To set the apparent pixel position on the QCustomPlot surface directly, use setPixelPosition. This works no matter what type this QCPItemPosition is or what parent-child situation it is in, as setPixelPosition transforms the coordinates appropriately, to make the position appear at the specified pixel values.

5.48.2 Member Enumeration Documentation

5.48.2.1 PositionType

`enum QCPItemPosition::PositionType`

Defines the ways an item position can be specified. Thus it defines what the numbers passed to setCoords actually mean.

See also

setType

Enumerator

ptAbsolute	Static positioning in pixels, starting from the top left corner of the viewport/widget.
ptViewportRatio	Static positioning given by a fraction of the viewport size. For example, if you call setCoords(0, 0), the position will be at the top left corner of the viewport/widget. setCoords(1, 1) will be at the bottom right corner, setCoords(0.5, 0) will be horizontally centered and vertically at the top of the viewport/widget, etc.
ptAxisRectRatio	Static positioning given by a fraction of the axis rect size (see setAxisRect). For example, if you call setCoords(0, 0), the position will be at the top left corner of the axis rect. setCoords(1, 1) will be at the bottom right corner, setCoords(0.5, 0) will be horizontally centered and vertically at the top of the axis rect, etc. You can also go beyond the axis rect by providing negative coordinates or coordinates larger than 1.
ptPlotCoords	Dynamic positioning at a plot coordinate defined by two axes (see setAxes).

5.48.3 Constructor & Destructor Documentation

5.48.3.1 QCPItemPosition()

```
QCPItemPosition::QCPItemPosition (
            QCustomPlot * parentPlot,
            QCPAbstractItem * parentItem,
            const QString & name )
```

Creates a new QCPItemPosition. You shouldn't create QCPItemPosition instances directly, even if you want to make a new item subclass. Use QCPAbstractItem::createPosition instead, as explained in the subclassing section of the QCPAbstractItem documentation.

5.48.4 Member Function Documentation

5.48.4.1 parentAnchor()

```
QCPItemAnchor * QCPItemPosition::parentAnchor ( ) const  [inline]
```

Returns the current parent anchor.

If different parent anchors were set for X and Y (setParentAnchorX, setParentAnchorY), this method returns the parent anchor of the Y coordinate. In that case rather use *parentAnchorX()* and *parentAnchorY()*.

See also

setParentAnchor

5.48.4.2 pixelPosition()

```
QPointF QCPItemPosition::pixelPosition ( ) const  [virtual]
```

Returns the final absolute pixel position of the QCPItemPosition on the QCustomPlot surface. It includes all effects of type (setType) and possible parent anchors (setParentAnchor).

See also

setPixelPosition

Reimplemented from QCPItemAnchor.

5.48.4.3 setAxes()

```
void QCPItemPosition::setAxes (
            QCPAxis * keyAxis,
            QCPAxis * valueAxis )
```

When setType is ptPlotCoords, this function may be used to specify the axes the coordinates set with setCoords relate to. By default they are set to the initial xAxis and yAxis of the QCustomPlot.

5.48.4.4 setAxisRect()

```
void QCPItemPosition::setAxisRect (
            QCPAxisRect * axisRect )
```

When setType is ptAxisRectRatio, this function may be used to specify the axis rect the coordinates set with set←Coords relate to. By default this is set to the main axis rect of the QCustomPlot.

5.48.4.5 setCoords() [1/2]

```
void QCPItemPosition::setCoords (
            double key,
            double value )
```

Sets the coordinates of this QCPItemPosition. What the coordinates mean, is defined by the type (setType, set←TypeX, setTypeY).

For example, if the type is ptAbsolute, *key* and *value* mean the x and y pixel position on the QCustomPlot surface. In that case the origin (0, 0) is in the top left corner of the QCustomPlot viewport. If the type is ptPlotCoords, *key* and *value* mean a point in the plot coordinate system defined by the axes set by setAxes. By default those are the QCustomPlot's xAxis and yAxis. See the documentation of setType for other available coordinate types and their meaning.

If different types were configured for X and Y (setTypeX, setTypeY), *key* and *value* must also be provided in the different coordinate systems. Here, the X type refers to *key*, and the Y type refers to *value*.

See also

setPixelPosition

5.48.4.6 setCoords() [2/2]

```
void QCPItemPosition::setCoords (
            const QPointF & pos )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets the coordinates as a QPointF *pos* where pos.x has the meaning of *key* and pos.y the meaning of *value* of the setCoords(double key, double value) method.

5.48.4.7 setParentAnchor()

```
bool QCPItemPosition::setParentAnchor (
            QCPItemAnchor * parentAnchor,
            bool keepPixelPosition = false )
```

Sets the parent of this QCPItemPosition to *parentAnchor*. This means the position will now follow any position changes of the anchor. The local coordinate system of positions with a parent anchor always is absolute pixels, with (0, 0) being exactly on top of the parent anchor. (Hence the type shouldn't be set to ptPlotCoords for positions with parent anchors.)

if *keepPixelPosition* is true, the current pixel position of the QCPItemPosition is preserved during reparenting. If it's set to false, the coordinates are set to (0, 0), i.e. the position will be exactly on top of the parent anchor.

To remove this QCPItemPosition from any parent anchor, set *parentAnchor* to 0.

If the QCPItemPosition previously had no parent and the type is ptPlotCoords, the type is set to ptAbsolute, to keep the position in a valid state.

This method sets the parent anchor for both X and Y directions. It is also possible to set different parents for X and Y, see setParentAnchorX, setParentAnchorY.

5.48.4.8 setParentAnchorX()

```
bool QCPItemPosition::setParentAnchorX (
            QCPItemAnchor * parentAnchor,
            bool keepPixelPosition = false )
```

This method sets the parent anchor of the X coordinate to *parentAnchor*.

For a detailed description of what a parent anchor is, see the documentation of setParentAnchor.

See also

setParentAnchor, setParentAnchorY

5.48.4.9 setParentAnchorY()

```
bool QCPItemPosition::setParentAnchorY (
            QCPItemAnchor * parentAnchor,
            bool keepPixelPosition = false )
```

This method sets the parent anchor of the Y coordinate to *parentAnchor*.

For a detailed description of what a parent anchor is, see the documentation of setParentAnchor.

See also

setParentAnchor, setParentAnchorX

5.48.4.10 setPixelPosition()

```
void QCPItemPosition::setPixelPosition (
            const QPointF & pixelPosition )
```

Sets the apparent pixel position. This works no matter what type (setType) this QCPItemPosition is or what parent-child situation it is in, as coordinates are transformed appropriately, to make the position finally appear at the specified pixel values.

Only if the type is ptAbsolute and no parent anchor is set, this function's effect is identical to that of setCoords.

See also

pixelPosition, setCoords

5.48.4.11 setType()

```
void QCPItemPosition::setType (
            QCPItemPosition::PositionType type )
```

Sets the type of the position. The type defines how the coordinates passed to setCoords should be handled and how the QCPItemPosition should behave in the plot.

The possible values for *type* can be separated in two main categories:

- The position is regarded as a point in plot coordinates. This corresponds to ptPlotCoords and requires two axes that define the plot coordinate system. They can be specified with setAxes. By default, the QCustom↩ Plot's x- and yAxis are used.
- The position is fixed on the QCustomPlot surface, i.e. independent of axis ranges. This corresponds to all other types, i.e. ptAbsolute, ptViewportRatio and ptAxisRectRatio. They differ only in the way the absolute position is described, see the documentation of PositionType for details. For ptAxisRectRatio, note that you can specify the axis rect with setAxisRect. By default this is set to the main axis rect.

Note that the position type ptPlotCoords is only available (and sensible) when the position has no parent anchor (setParentAnchor).

If the type is changed, the apparent pixel position on the plot is preserved. This means the coordinates as retrieved with coords() and set with setCoords may change in the process.

This method sets the type for both X and Y directions. It is also possible to set different types for X and Y, see setTypeX, setTypeY.

5.48.4.12 setTypeX()

```
void QCPItemPosition::setTypeX (
            QCPItemPosition::PositionType type )
```

This method sets the position type of the X coordinate to *type*.

For a detailed description of what a position type is, see the documentation of setType.

See also

setType, setTypeY

5.48.4.13 setTypeY()

```
void QCPItemPosition::setTypeY (
            QCPItemPosition::PositionType type )
```

This method sets the position type of the Y coordinate to *type*.

For a detailed description of what a position type is, see the documentation of setType.

See also

setType, setTypeX

5.48.4.14 toQCPItemPosition()

```
virtual QCPItemPosition* QCPItemPosition::toQCPItemPosition ( )  [inline], [protected], [virtual]
```

Returns 0 if this instance is merely a QCPItemAnchor, and a valid pointer of type QCPItemPosition* if it actually is a QCPItemPosition (which is a subclass of QCPItemAnchor).

This safe downcast functionality could also be achieved with a dynamic_cast. However, QCustomPlot avoids dynamic_cast to work with projects that don't have RTTI support enabled (e.g. -fno-rtti flag with gcc compiler).

Reimplemented from QCPItemAnchor.

5.48.4.15 type()

```
QCPItemPosition::PositionType * QCPItemPosition::type ( ) const  [inline]
```

Returns the current position type.

If different types were set for X and Y (setTypeX, setTypeY), this method returns the type of the X coordinate. In that case rather use *typeX()* and *typeY()*.

See also

setType

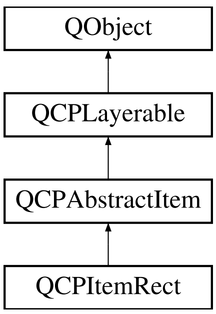
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.49 QCPItemRect Class Reference

A rectangle.

Inheritance diagram for QCPItemRect:



Public Member Functions

- QCPItemRect (QCustomPlot ∗parentPlot)
- QPen **pen** () const
- QPen **selectedPen** () const
- QBrush **brush** () const
- QBrush **selectedBrush** () const
- void setPen (const QPen &pen)
- void setSelectedPen (const QPen &pen)
- void setBrush (const QBrush &brush)
- void setSelectedBrush (const QBrush &brush)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩ OVERRIDE

Public Attributes

- QCPItemPosition *const **topLeft**
- QCPItemPosition *const **bottomRight**
- QCPItemAnchor *const **top**
- QCPItemAnchor *const **topRight**
- QCPItemAnchor *const **right**
- QCPItemAnchor *const **bottom**
- QCPItemAnchor *const **bottomLeft**
- QCPItemAnchor *const **left**

Protected Types

- enum **AnchorIndex** {
  aiTop, **aiTopRight**, **aiRight**, **aiBottom**,
  aiBottomLeft, **aiLeft** }

Protected Member Functions

- virtual void **draw** (QCPPainter *painter) Q_DECL_OVERRIDE
- virtual QPointF **anchorPixelPosition** (int anchorId) const Q_DECL_OVERRIDE
- QPen **mainPen** () const
- QBrush **mainBrush** () const

Protected Attributes

- QPen **mPen**
- QPen **mSelectedPen**
- QBrush **mBrush**
- QBrush **mSelectedBrush**

Additional Inherited Members

5.49.1 Detailed Description

A rectangle.

It has two positions, *topLeft* and *bottomRight*, which define the rectangle.

5.49.2 Constructor & Destructor Documentation

5.49.2.1 QCPItemRect()

```
QCPItemRect::QCPItemRect (
            QCustomPlot * parentPlot )  [explicit]
```

Creates a rectangle item and sets default values.

The created item is automatically registered with *parentPlot*. This QCustomPlot instance takes ownership of the item, so do not delete it manually but use QCustomPlot::removeItem() instead.

5.49.3 Member Function Documentation

5.49.3.1 selectTest()

```
double QCPItemRect::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Implements QCPAbstractItem.

5.49.3.2 setBrush()

```
void QCPItemRect::setBrush (
            const QBrush & brush )
```

Sets the brush that will be used to fill the rectangle. To disable filling, set *brush* to Qt::NoBrush.

See also

setSelectedBrush, setPen

5.49.3.3 setPen()

```
void QCPItemRect::setPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the line of the rectangle

See also

setSelectedPen, setBrush

5.49.3.4 setSelectedBrush()

```
void QCPItemRect::setSelectedBrush (
            const QBrush & brush )
```

Sets the brush that will be used to fill the rectangle when selected. To disable filling, set *brush* to Qt::NoBrush.

See also

setBrush

5.49.3.5 setSelectedPen()

```
void QCPItemRect::setSelectedPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the line of the rectangle when selected

See also

setPen, setSelected

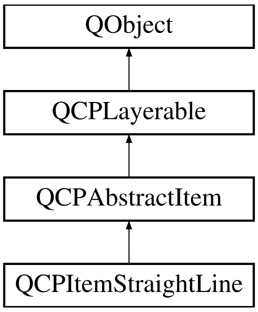
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.50 QCPItemStraightLine Class Reference

A straight line that spans infinitely in both directions.

Inheritance diagram for QCPItemStraightLine:



Public Member Functions

- QCPItemStraightLine (QCustomPlot *parentPlot)
- QPen **pen** () const
- QPen **selectedPen** () const
- void setPen (const QPen &pen)
- void setSelectedPen (const QPen &pen)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant *details=0) const Q_DECL_↩ OVERRIDE

Public Attributes

- QCPItemPosition *const **point1**
- QCPItemPosition *const **point2**

Protected Member Functions

- virtual void **draw** (QCPPainter *painter) Q_DECL_OVERRIDE
- QLineF **getRectClippedStraightLine** (const QCPVector2D &point1, const QCPVector2D &vec, const QRect &rect) const
- QPen **mainPen** () const

Protected Attributes

- QPen **mPen**
- QPen **mSelectedPen**

Additional Inherited Members

5.50.1 Detailed Description

A straight line that spans infinitely in both directions.

It has two positions, *point1* and *point2*, which define the straight line.

5.50.2 Constructor & Destructor Documentation

5.50.2.1 QCPItemStraightLine()

```
QCPItemStraightLine::QCPItemStraightLine (
            QCustomPlot * parentPlot )  [explicit]
```

Creates a straight line item and sets default values.

The created item is automatically registered with *parentPlot*. This QCustomPlot instance takes ownership of the item, so do not delete it manually but use QCustomPlot::removeItem() instead.

5.50.3 Member Function Documentation

5.50.3.1 selectTest()

```
double QCPItemStraightLine::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Implements QCPAbstractItem.

5.50.3.2 setPen()

```
void QCPItemStraightLine::setPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the line

See also

setSelectedPen

5.50.3.3 setSelectedPen()

```
void QCPItemStraightLine::setSelectedPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the line when selected

See also

setPen, setSelected

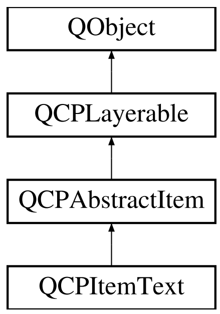
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.51 QCPItemText Class Reference

A text label.

Inheritance diagram for QCPItemText:



Public Member Functions

- QCPItemText (QCustomPlot *parentPlot)
- QColor **color** () const
- QColor **selectedColor** () const
- QPen **pen** () const
- QPen **selectedPen** () const
- QBrush **brush** () const
- QBrush **selectedBrush** () const
- QFont **font** () const
- QFont **selectedFont** () const
- QString **text** () const
- Qt::Alignment **positionAlignment** () const
- Qt::Alignment **textAlignment** () const
- double **rotation** () const
- QMargins **padding** () const
- void setColor (const QColor &color)
- void setSelectedColor (const QColor &color)
- void setPen (const QPen &pen)
- void setSelectedPen (const QPen &pen)
- void setBrush (const QBrush &brush)
- void setSelectedBrush (const QBrush &brush)
- void setFont (const QFont &font)
- void setSelectedFont (const QFont &font)
- void setText (const QString &text)
- void setPositionAlignment (Qt::Alignment alignment)
- void setTextAlignment (Qt::Alignment alignment)
- void setRotation (double degrees)
- void setPadding (const QMargins &padding)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant *details=0) const Q_DECL_↩ OVERRIDE

Public Attributes

- QCPItemPosition *const **position**
- QCPItemAnchor *const **topLeft**
- QCPItemAnchor *const **top**
- QCPItemAnchor *const **topRight**
- QCPItemAnchor *const **right**
- QCPItemAnchor *const **bottomRight**
- QCPItemAnchor *const **bottom**
- QCPItemAnchor *const **bottomLeft**
- QCPItemAnchor *const **left**

Protected Types

- enum **AnchorIndex** {
  aiTopLeft, **aiTop**, **aiTopRight**, **aiRight**,
  aiBottomRight, **aiBottom**, **aiBottomLeft**, **aiLeft** }

Protected Member Functions

- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- virtual QPointF **anchorPixelPosition** (int anchorId) const Q_DECL_OVERRIDE
- QPointF **getTextDrawPoint** (const QPointF &pos, const QRectF &rect, Qt::Alignment positionAlignment) const
- QFont **mainFont** () const
- QColor **mainColor** () const
- QPen **mainPen** () const
- QBrush **mainBrush** () const

Protected Attributes

- QColor **mColor**
- QColor **mSelectedColor**
- QPen **mPen**
- QPen **mSelectedPen**
- QBrush **mBrush**
- QBrush **mSelectedBrush**
- QFont **mFont**
- QFont **mSelectedFont**
- QString **mText**
- Qt::Alignment **mPositionAlignment**
- Qt::Alignment **mTextAlignment**
- double **mRotation**
- QMargins **mPadding**

Additional Inherited Members

5.51.1 Detailed Description

A text label.

Its position is defined by the member *position* and the setting of setPositionAlignment. The latter controls which part of the text rect shall be aligned with *position*.

The text alignment itself (i.e. left, center, right) can be controlled with setTextAlignment.

The text may be rotated around the *position* point with setRotation.

5.51.2 Constructor & Destructor Documentation

5.51.2.1 QCPItemText()

```
QCPItemText::QCPItemText (
            QCustomPlot * parentPlot )  [explicit]
```

Creates a text item and sets default values.

The created item is automatically registered with *parentPlot*. This QCustomPlot instance takes ownership of the item, so do not delete it manually but use QCustomPlot::removeItem() instead.

5.51.3 Member Function Documentation

5.51.3.1 selectTest()

```
double QCPItemText::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Implements QCPAbstractItem.

5.51.3.2 setBrush()

```
void QCPItemText::setBrush (
            const QBrush & brush )
```

Sets the brush that will be used do fill the background of the text. To disable the background, set *brush* to Qt::No↩ Brush.

See also

setSelectedBrush, setPen, setPadding

5.51.3.3 setColor()

```
void QCPItemText::setColor (
            const QColor & color )
```

Sets the color of the text.

5.51.3.4 setFont()

```
void QCPItemText::setFont (
            const QFont & font )
```

Sets the font of the text.

See also

setSelectedFont, setColor

5.51.3.5 setPadding()

```
void QCPItemText::setPadding (
            const QMargins & padding )
```

Sets the distance between the border of the text rectangle and the text. The appearance (and visibility) of the text rectangle can be controlled with setPen and setBrush.

5.51.3.6 setPen()

```
void QCPItemText::setPen (
            const QPen & pen )
```

Sets the pen that will be used do draw a rectangular border around the text. To disable the border, set *pen* to Qt::NoPen.

See also

setSelectedPen, setBrush, setPadding

5.51.3.7 setPositionAlignment()

```
void QCPItemText::setPositionAlignment (
            Qt::Alignment alignment )
```

Sets which point of the text rect shall be aligned with *position*.

Examples:

- If *alignment* is `Qt::AlignHCenter | Qt::AlignTop`, the text will be positioned such that the top of the text rect will be horizontally centered on *position*.
- If *alignment* is `Qt::AlignLeft | Qt::AlignBottom`, *position* will indicate the bottom left corner of the text rect.

If you want to control the alignment of (multi-lined) text within the text rect, use setTextAlignment.

5.51.3.8 setRotation()

```
void QCPItemText::setRotation (
            double degrees )
```

Sets the angle in degrees by which the text (and the text rectangle, if visible) will be rotated around *position*.

5.51.3.9 setSelectedBrush()

```
void QCPItemText::setSelectedBrush (
            const QBrush & brush )
```

Sets the brush that will be used do fill the background of the text, when the item is selected. To disable the background, set *brush* to Qt::NoBrush.

See also

setBrush

5.51.3.10 setSelectedColor()

```
void QCPItemText::setSelectedColor (
            const QColor & color )
```

Sets the color of the text that will be used when the item is selected.

5.51.3.11 setSelectedFont()

```
void QCPItemText::setSelectedFont (
            const QFont & font )
```

Sets the font of the text that will be used when the item is selected.

See also

setFont

5.51.3.12 setSelectedPen()

```
void QCPItemText::setSelectedPen (
            const QPen & pen )
```

Sets the pen that will be used do draw a rectangular border around the text, when the item is selected. To disable the border, set *pen* to Qt::NoPen.

See also

setPen

5.51.3.13 setText()

```
void QCPItemText::setText (
            const QString & text )
```

Sets the text that will be displayed. Multi-line texts are supported by inserting a line break character, e.g. '
'.

See also

setFont, setColor, setTextAlignment

5.51.3.14 setTextAlignment()

```
void QCPItemText::setTextAlignment (
            Qt::Alignment alignment )
```

Controls how (multi-lined) text is aligned inside the text rect (typically Qt::AlignLeft, Qt::AlignCenter or Qt::Align←Right).

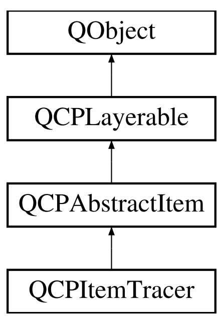
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.←h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.←cpp

5.52 QCPItemTracer Class Reference

Item that sticks to QCPGraph data points.

Inheritance diagram for QCPItemTracer:



Public Types

- enum TracerStyle {
  tsNone, tsPlus, tsCrosshair, tsCircle,
  tsSquare }

Public Member Functions

- QCPItemTracer (QCustomPlot *parentPlot)
- QPen **pen** () const
- QPen **selectedPen** () const
- QBrush **brush** () const
- QBrush **selectedBrush** () const
- double **size** () const
- TracerStyle **style** () const
- QCPGraph * **graph** () const
- double **graphKey** () const
- bool **interpolating** () const
- void setPen (const QPen &pen)
- void setSelectedPen (const QPen &pen)
- void setBrush (const QBrush &brush)
- void setSelectedBrush (const QBrush &brush)
- void setSize (double size)
- void setStyle (TracerStyle style)
- void setGraph (QCPGraph *graph)
- void setGraphKey (double key)
- void setInterpolating (bool enabled)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant *details=0) const Q_DECL_↩
  OVERRIDE
- void updatePosition ()

Public Attributes

- QCPItemPosition *const **position**

Protected Member Functions

- virtual void **draw** (QCPPainter *painter) Q_DECL_OVERRIDE
- QPen **mainPen** () const
- QBrush **mainBrush** () const

Protected Attributes

- QPen **mPen**
- QPen **mSelectedPen**
- QBrush **mBrush**
- QBrush **mSelectedBrush**
- double **mSize**
- TracerStyle **mStyle**
- QCPGraph * **mGraph**
- double **mGraphKey**
- bool **mInterpolating**

Additional Inherited Members

5.52.1 Detailed Description

Item that sticks to QCPGraph data points.

The tracer can be connected with a QCPGraph via setGraph. Then it will automatically adopt the coordinate axes of the graph and update its *position* to be on the graph's data. This means the key stays controllable via setGraphKey, but the value will follow the graph data. If a QCPGraph is connected, note that setting the coordinates of the tracer item directly via *position* will have no effect because they will be overriden in the next redraw (this is when the coordinate update happens).

If the specified key in setGraphKey is outside the key bounds of the graph, the tracer will stay at the corresponding end of the graph.

With setInterpolating you may specify whether the tracer may only stay exactly on data points or whether it interpolates data points linearly, if given a key that lies between two data points of the graph.

The tracer has different visual styles, see setStyle. It is also possible to make the tracer have no own visual appearance (set the style to tsNone), and just connect other item positions to the tracer *position* (used as an anchor) via QCPItemPosition::setParentAnchor.

Note

The tracer position is only automatically updated upon redraws. So when the data of the graph changes and immediately afterwards (without a redraw) the position coordinates of the tracer are retrieved, they will not reflect the updated data of the graph. In this case updatePosition must be called manually, prior to reading the tracer coordinates.

5.52.2 Member Enumeration Documentation

5.52.2.1 TracerStyle

```
enum QCPItemTracer::TracerStyle
```

The different visual appearances a tracer item can have. Some styles size may be controlled with setSize.

See also

setStyle

Enumerator

tsNone	The tracer is not visible.
tsPlus	A plus shaped crosshair with limited size.
tsCrosshair	A plus shaped crosshair which spans the complete axis rect.
tsCircle	A circle.
tsSquare	A square.

5.52.3 Constructor & Destructor Documentation

5.52.3.1 QCPItemTracer()

```
QCPItemTracer::QCPItemTracer (
            QCustomPlot * parentPlot )  [explicit]
```

Creates a tracer item and sets default values.

The created item is automatically registered with *parentPlot*. This QCustomPlot instance takes ownership of the item, so do not delete it manually but use QCustomPlot::removeItem() instead.

5.52.4 Member Function Documentation

5.52.4.1 selectTest()

```
double QCPItemTracer::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Implements QCPAbstractItem.

5.52.4.2 setBrush()

```
void QCPItemTracer::setBrush (
            const QBrush & brush )
```

Sets the brush that will be used to draw any fills of the tracer

See also

setSelectedBrush, setPen

5.52.4.3 setGraph()

```
void QCPItemTracer::setGraph (
            QCPGraph * graph )
```

Sets the QCPGraph this tracer sticks to. The tracer *position* will be set to type QCPItemPosition::ptPlotCoords and the axes will be set to the axes of *graph*.

To free the tracer from any graph, set *graph* to 0. The tracer *position* can then be placed freely like any other item position. This is the state the tracer will assume when its graph gets deleted while still attached to it.

See also

setGraphKey

5.52.4.4 setGraphKey()

```
void QCPItemTracer::setGraphKey (
            double key )
```

Sets the key of the graph's data point the tracer will be positioned at. This is the only free coordinate of a tracer when attached to a graph.

Depending on setInterpolating, the tracer will be either positioned on the data point closest to *key*, or will stay exactly at *key* and interpolate the value linearly.

See also

setGraph, setInterpolating

5.52.4.5 setInterpolating()

```
void QCPItemTracer::setInterpolating (
            bool enabled )
```

Sets whether the value of the graph's data points shall be interpolated, when positioning the tracer.

If *enabled* is set to false and a key is given with setGraphKey, the tracer is placed on the data point of the graph which is closest to the key, but which is not necessarily exactly there. If *enabled* is true, the tracer will be positioned exactly at the specified key, and the appropriate value will be interpolated from the graph's data points linearly.

See also

setGraph, setGraphKey

5.52.4.6 setPen()

```
void QCPItemTracer::setPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the line of the tracer

See also

setSelectedPen, setBrush

5.52.4.7 setSelectedBrush()

```
void QCPItemTracer::setSelectedBrush (
            const QBrush & brush )
```

Sets the brush that will be used to draw any fills of the tracer, when selected.

See also

setBrush, setSelected

5.52.4.8 setSelectedPen()

```
void QCPItemTracer::setSelectedPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the line of the tracer when selected

See also

setPen, setSelected

5.52.4.9 setSize()

```
void QCPItemTracer::setSize (
            double size )
```

Sets the size of the tracer in pixels, if the style supports setting a size (e.g. tsSquare does, tsCrosshair does not).

5.52.4.10 setStyle()

```
void QCPItemTracer::setStyle (
            QCPItemTracer::TracerStyle style )
```

Sets the style/visual appearance of the tracer.

If you only want to use the tracer *position* as an anchor for other items, set *style* to tsNone.

5.52.4.11 updatePosition()

```
void QCPItemTracer::updatePosition ( )
```

If the tracer is connected with a graph (setGraph), this function updates the tracer's *position* to reside on the graph data, depending on the configured key (setGraphKey).

It is called automatically on every redraw and normally doesn't need to be called manually. One exception is when you want to read the tracer coordinates via *position* and are not sure that the graph's data (or the tracer key with setGraphKey) hasn't changed since the last redraw. In that situation, call this function before accessing *position*, to make sure you don't get out-of-date coordinates.

If there is no graph set on this tracer, this function does nothing.

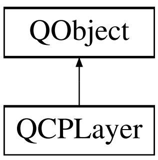
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.53 QCPLayer Class Reference

A layer that may contain objects, to control the rendering order.

Inheritance diagram for QCPLayer:



Public Types

- enum LayerMode { lmLogical, lmBuffered }

Public Member Functions

- QCPLayer (QCustomPlot ∗parentPlot, const QString &layerName)
- QCustomPlot ∗ **parentPlot** () const
- QString **name** () const
- int index () const
- QList< QCPLayerable ∗ > children () const
- bool **visible** () const
- LayerMode **mode** () const
- void setVisible (bool visible)
- void setMode (LayerMode mode)
- void replot ()

Protected Member Functions

- void **draw** (QCPPainter ∗painter)
- void **drawToPaintBuffer** ()
- void **addChild** (QCPLayerable ∗layerable, bool prepend)
- void **removeChild** (QCPLayerable ∗layerable)

Protected Attributes

- QCustomPlot ∗ **mParentPlot**
- QString **mName**
- int **mIndex**
- QList< QCPLayerable ∗ > **mChildren**
- bool **mVisible**
- LayerMode **mMode**
- QWeakPointer< QCPAbstractPaintBuffer > **mPaintBuffer**

Friends

- class **QCustomPlot**
- class **QCPLayerable**

5.53.1 Detailed Description

A layer that may contain objects, to control the rendering order.

The Layering system of QCustomPlot is the mechanism to control the rendering order of the elements inside the plot.

It is based on the two classes QCPLayer and QCPLayerable. QCustomPlot holds an ordered list of one or more instances of QCPLayer (see QCustomPlot::addLayer, QCustomPlot::layer, QCustomPlot::moveLayer, etc.). When replotting, QCustomPlot goes through the list of layers bottom to top and successively draws the layerables of the layers into the paint buffer(s).

A QCPLayer contains an ordered list of QCPLayerable instances. QCPLayerable is an abstract base class from which almost all visible objects derive, like axes, grids, graphs, items, etc.

5.53.2 Default layers

Initially, QCustomPlot has six layers: "background", "grid", "main", "axes", "legend" and "overlay" (in that order). On top is the "overlay" layer, which only contains the QCustomPlot's selection rect (QCustomPlot::selectionRect). The next two layers "axes" and "legend" contain the default axes and legend, so they will be drawn above plottables. In the middle, there is the "main" layer. It is initially empty and set as the current layer (see QCustomPlot::setCurrentLayer). This means, all new plottables, items etc. are created on this layer by default. Then comes the "grid" layer which contains the QCPGrid instances (which belong tightly to QCPAxis, see QCPAxis::grid). The Axis rect background shall be drawn behind everything else, thus the default QCPAxisRect instance is placed on the "background" layer. Of course, the layer affiliation of the individual objects can be changed as required (QCPLayerable::setLayer).

5.53.3 Controlling the rendering order via layers

Controlling the ordering of layerables in the plot is easy: Create a new layer in the position you want the layerable to be in, e.g. above "main", with QCustomPlot::addLayer. Then set the current layer with QCustomPlot::setCurrentLayer to that new layer and finally create the objects normally. They will be placed on the new layer automatically, due to the current layer setting. Alternatively you could have also ignored the current layer setting and just moved the objects with QCPLayerable::setLayer to the desired layer after creating them.

It is also possible to move whole layers. For example, If you want the grid to be shown in front of all plottables/items on the "main" layer, just move it above "main" with QCustomPlot::moveLayer.

The rendering order within one layer is simply by order of creation or insertion. The item created last (or added last to the layer), is drawn on top of all other objects on that layer.

When a layer is deleted, the objects on it are not deleted with it, but fall on the layer below the deleted layer, see QCustomPlot::removeLayer.

5.53.4 Replotting only a specific layer

If the layer mode (setMode) is set to lmBuffered, you can replot only this specific layer by calling replot. In certain situations this can provide better replot performance, compared with a full replot of all layers. Upon creation of a new layer, the layer mode is initialized to lmLogical. The only layer that is set to lmBuffered in a new QCustomPlot instance is the "overlay" layer, containing the selection rect.

5.53.5 Member Enumeration Documentation

5.53.5.1 LayerMode

```
enum QCPLayer::LayerMode
```

Defines the different rendering modes of a layer. Depending on the mode, certain layers can be replotted individually, without the need to replot (possibly complex) layerables on other layers.

See also

setMode

Enumerator

lmLogical	Layer is used only for rendering order, and shares paint buffer with all other adjacent logical layers.
lmBuffered	Layer has its own paint buffer and may be replotted individually (see replot).

5.53.6 Constructor & Destructor Documentation

5.53.6.1 QCPLayer()

```
QCPLayer::QCPLayer (
            QCustomPlot * parentPlot,
            const QString & layerName )
```

Creates a new QCPLayer instance.

Normally you shouldn't directly instantiate layers, use QCustomPlot::addLayer instead.

Warning

It is not checked that *layerName* is actually a unique layer name in *parentPlot*. This check is only performed by QCustomPlot::addLayer.

5.53.7 Member Function Documentation

5.53.7.1 children()

```
QList< QCPLayerable * > QCPLayer::children ( ) const [inline]
```

Returns a list of all layerables on this layer. The order corresponds to the rendering order: layerables with higher indices are drawn above layerables with lower indices.

5.53.7.2 index()

```
int QCPLayer::index ( ) const [inline]
```

Returns the index this layer has in the QCustomPlot. The index is the integer number by which this layer can be accessed via QCustomPlot::layer.

Layers with higher indices will be drawn above layers with lower indices.

5.53.7.3 replot()

```
void QCPLayer::replot ( )
```

If the layer mode (setMode) is set to lmBuffered, this method allows replotting only the layerables on this specific layer, without the need to replot all other layers (as a call to QCustomPlot::replot would do).

If the layer mode is lmLogical however, this method simply calls QCustomPlot::replot on the parent QCustomPlot instance.

QCustomPlot also makes sure to replot all layers instead of only this one, if the layer ordering has changed since the last full replot and the other paint buffers were thus invalidated.

See also

draw

5.53.7.4 setMode()

```
void QCPLayer::setMode (
            QCPLayer::LayerMode mode )
```

Sets the rendering mode of this layer.

If *mode* is set to lmBuffered for a layer, it will be given a dedicated paint buffer by the parent QCustomPlot instance. This means it may be replotted individually by calling QCPLayer::replot, without needing to replot all other layers.

Layers which are set to lmLogical (the default) are used only to define the rendering order and can't be replotted individually.

Note that each layer which is set to lmBuffered requires additional paint buffers for the layers below, above and for the layer itself. This increases the memory consumption and (slightly) decreases the repainting speed because multiple paint buffers need to be joined. So you should carefully choose which layers benefit from having their own paint buffer. A typical example would be a layer which contains certain layerables (e.g. items) that need to be changed and thus replotted regularly, while all other layerables on other layers stay static. By default, only the topmost layer called "overlay" is in mode lmBuffered, and contains the selection rect.

See also

replot

5.53.7.5 setVisible()

```
void QCPLayer::setVisible (
            bool visible )
```

Sets whether this layer is visible or not. If *visible* is set to false, all layerables on this layer will be invisible.

This function doesn't change the visibility property of the layerables (QCPLayerable::setVisible), but the QCP←Layerable::realVisibility of each layerable takes the visibility of the parent layer into account.

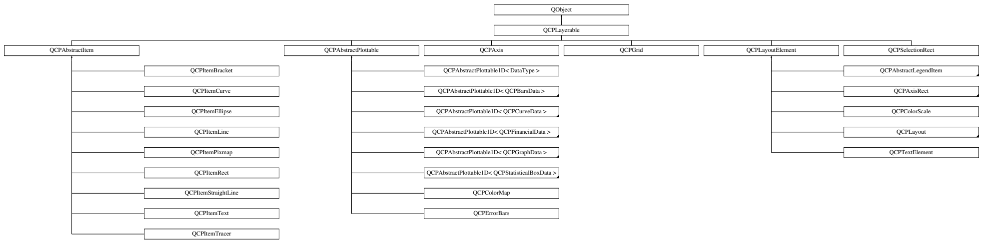
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.←h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.←cpp

5.54 QCPLayerable Class Reference

Base class for all drawable objects.

Inheritance diagram for QCPLayerable:



Signals

- void layerChanged (QCPLayer *newLayer)

Public Member Functions

- QCPLayerable (QCustomPlot *plot, QString targetLayer=QString(), QCPLayerable *parentLayerable=0)
- bool **visible** () const
- QCustomPlot * **parentPlot** () const
- QCPLayerable * parentLayerable () const
- QCPLayer * **layer** () const
- bool **antialiased** () const
- void setVisible (bool on)
- Q_SLOT bool setLayer (QCPLayer *layer)
- bool setLayer (const QString &layerName)
- void setAntialiased (bool enabled)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant *details=0) const
- bool realVisibility () const

Protected Member Functions

- virtual void **parentPlotInitialized** (QCustomPlot *parentPlot)
- virtual QCP::Interaction **selectionCategory** () const
- virtual QRect **clipRect** () const
- virtual void **applyDefaultAntialiasingHint** (QCPPainter *painter) const =0
- virtual void **draw** (QCPPainter *painter)=0
- virtual void **selectEvent** (QMouseEvent *event, bool additive, const QVariant &details, bool *selection↩StateChanged)
- virtual void **deselectEvent** (bool *selectionStateChanged)
- virtual void mousePressEvent (QMouseEvent *event, const QVariant &details)
- virtual void mouseMoveEvent (QMouseEvent *event, const QPointF &startPos)
- virtual void mouseReleaseEvent (QMouseEvent *event, const QPointF &startPos)
- virtual void mouseDoubleClickEvent (QMouseEvent *event, const QVariant &details)
- virtual void wheelEvent (QWheelEvent *event)
- void **initializeParentPlot** (QCustomPlot *parentPlot)
- void **setParentLayerable** (QCPLayerable *parentLayerable)
- bool **moveToLayer** (QCPLayer *layer, bool prepend)
- void **applyAntialiasingHint** (QCPPainter *painter, bool localAntialiased, QCP::AntialiasedElement overrideElement) const

Protected Attributes

- bool **mVisible**
- QCustomPlot ∗ **mParentPlot**
- QPointer< QCPLayerable > **mParentLayerable**
- QCPLayer ∗ **mLayer**
- bool **mAntialiased**

Friends

- class **QCustomPlot**
- class **QCPLayer**
- class **QCPAxisRect**

5.54.1 Detailed Description

Base class for all drawable objects.

This is the abstract base class most visible objects derive from, e.g. plottables, axes, grid etc.

Every layerable is on a layer (QCPLayer) which allows controlling the rendering order by stacking the layers accordingly.

For details about the layering mechanism, see the QCPLayer documentation.

5.54.2 Constructor & Destructor Documentation

5.54.2.1 QCPLayerable()

```
QCPLayerable::QCPLayerable (
            QCustomPlot * plot,
            QString targetLayer = QString(),
            QCPLayerable * parentLayerable = 0 )
```

Creates a new QCPLayerable instance.

Since QCPLayerable is an abstract base class, it can't be instantiated directly. Use one of the derived classes.

If *plot* is provided, it automatically places itself on the layer named *targetLayer*. If *targetLayer* is an empty string, it places itself on the current layer of the plot (see QCustomPlot::setCurrentLayer).

It is possible to provide 0 as *plot*. In that case, you should assign a parent plot at a later time with initializeParentPlot.

The layerable's parent layerable is set to *parentLayerable*, if provided. Direct layerable parents are mainly used to control visibility in a hierarchy of layerables. This means a layerable is only drawn, if all its ancestor layerables are also visible. Note that *parentLayerable* does not become the QObject-parent (for memory management) of this layerable, *plot* does. It is not uncommon to set the QObject-parent to something else in the constructors of QCPLayerable subclasses, to guarantee a working destruction hierarchy.

5.54.3 Member Function Documentation

5.54.3.1 layerChanged

```
void QCPLayerable::layerChanged (
            QCPLayer * newLayer )  [signal]
```

This signal is emitted when the layer of this layerable changes, i.e. this layerable is moved to a different layer.

See also

setLayer

5.54.3.2 mouseDoubleClickEvent()

```
void QCPLayerable::mouseDoubleClickEvent (
            QMouseEvent * event,
            const QVariant & details )  [protected], [virtual]
```

This event gets called when the user presses the mouse button a second time in a double-click, while the cursor is over the layerable. Whether a cursor is over the layerable is decided by a preceding call to selectTest.

The mouseDoubleClickEvent is called instead of the second mousePressEvent. So in the case of a double-click, the event succession is *pressEvent – releaseEvent – doubleClickEvent – releaseEvent*.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`. The parameter *details* contains layerable-specific details about the hit, which were generated in the previous call to selectTest. For example, One-dimensional plottables like QCPGraph or QCPBars convey the clicked data point in the *details* parameter, as QCPDataSelection packed as QVariant. Multi-part objects convey the specific `SelectablePart` that was hit (e.g. QCPAxis::SelectablePart in the case of axes).

Similarly to mousePressEvent, once a layerable has accepted the mouseDoubleClickEvent, it is considered the mouse grabber and will receive all following calls to mouseMoveEvent and mouseReleaseEvent for this mouse interaction (a "mouse interaction" in this context ends with the release).

The default implementation does nothing except explicitly ignoring the event with `event->ignore()`.

See also

mousePressEvent, mouseMoveEvent, mouseReleaseEvent, wheelEvent

Reimplemented in QCPTextElement.

5.54.3.3 mouseMoveEvent()

```
void QCPLayerable::mouseMoveEvent (
            QMouseEvent * event,
            const QPointF & startPos ) [protected], [virtual]
```

This event gets called when the user moves the mouse while holding a mouse button, after this layerable has become the mouse grabber by accepting the preceding mousePressEvent.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`. The parameter *startPos* indicates the position where the initial mousePressEvent occured, that started the mouse interaction.

The default implementation does nothing.

See also

mousePressEvent, mouseReleaseEvent, mouseDoubleClickEvent, wheelEvent

Reimplemented in QCPColorScale, and QCPAxisRect.

5.54.3.4 mousePressEvent()

```
void QCPLayerable::mousePressEvent (
            QMouseEvent * event,
            const QVariant & details ) [protected], [virtual]
```

This event gets called when the user presses a mouse button while the cursor is over the layerable. Whether a cursor is over the layerable is decided by a preceding call to selectTest.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`. The parameter *details* contains layerable-specific details about the hit, which were generated in the previous call to selectTest. For example, One-dimensional plottables like QCPGraph or QCPBars convey the clicked data point in the *details* parameter, as QCPDataSelection packed as QVariant. Multi-part objects convey the specific `SelectablePart` that was hit (e.g. QCPAxis::SelectablePart in the case of axes).

QCustomPlot uses an event propagation system that works the same as Qt's system. If your layerable doesn't reimplement the mousePressEvent or explicitly calls `event->ignore()` in its reimplementation, the event will be propagated to the next layerable in the stacking order.

Once a layerable has accepted the mousePressEvent, it is considered the mouse grabber and will receive all following calls to mouseMoveEvent or mouseReleaseEvent for this mouse interaction (a "mouse interaction" in this context ends with the release).

The default implementation does nothing except explicitly ignoring the event with `event->ignore()`.

See also

mouseMoveEvent, mouseReleaseEvent, mouseDoubleClickEvent, wheelEvent

Reimplemented in QCPColorScale, QCPTextElement, and QCPAxisRect.

5.54.3.5 mouseReleaseEvent()

```
void QCPLayerable::mouseReleaseEvent (
            QMouseEvent * event,
            const QPointF & startPos )  [protected], [virtual]
```

This event gets called when the user releases the mouse button, after this layerable has become the mouse grabber by accepting the preceding mousePressEvent.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`. The parameter *startPos* indicates the position where the initial mousePressEvent occured, that started the mouse interaction.

The default implementation does nothing.

See also

mousePressEvent, mouseMoveEvent, mouseDoubleClickEvent, wheelEvent

Reimplemented in QCPColorScale, QCPTextElement, and QCPAxisRect.

5.54.3.6 parentLayerable()

```
QCPLayerable * QCPLayerable::parentLayerable ( ) const  [inline]
```

Returns the parent layerable of this layerable. The parent layerable is used to provide visibility hierarchies in conjunction with the method realVisibility. This way, layerables only get drawn if their parent layerables are visible, too.

Note that a parent layerable is not necessarily also the QObject parent for memory management. Further, a layerable doesn't always have a parent layerable, so this function may return 0.

A parent layerable is set implicitly when placed inside layout elements and doesn't need to be set manually by the user.

5.54.3.7 realVisibility()

```
bool QCPLayerable::realVisibility ( ) const
```

Returns whether this layerable is visible, taking the visibility of the layerable parent and the visibility of this layerable's layer into account. This is the method that is consulted to decide whether a layerable shall be drawn or not.

If this layerable has a direct layerable parent (usually set via hierarchies implemented in subclasses, like in the case of QCPLayoutElement), this function returns true only if this layerable has its visibility set to true and the parent layerable's realVisibility returns true.

5.54.3.8 selectTest()

```
double QCPLayerable::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const  [virtual]
```

This function is used to decide whether a click hits a layerable object or not.

pos is a point in pixel coordinates on the QCustomPlot surface. This function returns the shortest pixel distance of this point to the object. If the object is either invisible or the distance couldn't be determined, -1.0 is returned. Further, if *onlySelectable* is true and the object is not selectable, -1.0 is returned, too.

If the object is represented not by single lines but by an area like a QCPItemText or the bars of a QCPBars plottable, a click inside the area should also be considered a hit. In these cases this function thus returns a constant value greater zero but still below the parent plot's selection tolerance. (typically the selectionTolerance multiplied by 0.99).

Providing a constant value for area objects allows selecting line objects even when they are obscured by such area objects, by clicking close to the lines (i.e. closer than 0.99∗selectionTolerance).

The actual setting of the selection state is not done by this function. This is handled by the parent QCustomPlot when the mouseReleaseEvent occurs, and the finally selected object is notified via the selectEvent/deselectEvent methods.

details is an optional output parameter. Every layerable subclass may place any information in *details*. This information will be passed to selectEvent when the parent QCustomPlot decides on the basis of this selectTest call, that the object was successfully selected. The subsequent call to selectEvent will carry the *details*. This is useful for multi-part objects (like QCPAxis). This way, a possibly complex calculation to decide which part was clicked is only done once in selectTest. The result (i.e. the actually clicked part) can then be placed in *details*. So in the subsequent selectEvent, the decision which part was selected doesn't have to be done a second time for a single selection operation.

You may pass 0 as *details* to indicate that you are not interested in those selection details.

See also

selectEvent, deselectEvent, mousePressEvent, wheelEvent, QCustomPlot::setInteractions

Reimplemented in QCPItemBracket, QCPItemTracer, QCPItemPixmap, QCPItemEllipse, QCPItemText, QCPItem↩Rect, QCPItemCurve, QCPItemLine, QCPItemStraightLine, QCPErrorBars, QCPFinancial, QCPColorMap, QCP↩StatisticalBox, QCPBars, QCPCurve, QCPGraph, QCPTextElement, QCPLegend, QCPAbstractLegendItem, QC↩PAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCPFinancialData >, QCPAbstractPlottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCPGraphData >, QCPAbstractPlottable1D< QCPBars↩Data >, QCPAbstractPlottable1D< QCPCurveData >, QCPAbstractItem, QCPAbstractPlottable, QCPAxis, QC↩PLayoutInset, and QCPLayoutElement.

5.54.3.9 setAntialiased()

```
void QCPLayerable::setAntialiased (
            bool enabled )
```

Sets whether this object will be drawn antialiased or not.

Note that antialiasing settings may be overridden by QCustomPlot::setAntialiasedElements and QCustomPlot::set↩NotAntialiasedElements.

5.54.3.10 setLayer() [1/2]

```
bool QCPLayerable::setLayer (
            QCPLayer * layer )
```

Sets the *layer* of this layerable object. The object will be placed on top of the other objects already on *layer*.

If *layer* is 0, this layerable will not be on any layer and thus not appear in the plot (or interact/receive events).

Returns true if the layer of this layerable was successfully changed to *layer*.

5.54.3.11 setLayer() [2/2]

```
bool QCPLayerable::setLayer (
            const QString & layerName )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts. Sets the layer of this layerable object by name

Returns true on success, i.e. if *layerName* is a valid layer name.

5.54.3.12 setVisible()

```
void QCPLayerable::setVisible (
            bool on )
```

Sets the visibility of this layerable object. If an object is not visible, it will not be drawn on the QCustomPlot surface, and user interaction with it (e.g. click and selection) is not possible.

5.54.3.13 wheelEvent()

```
void QCPLayerable::wheelEvent (
            QWheelEvent * event ) [protected], [virtual]
```

This event gets called when the user turns the mouse scroll wheel while the cursor is over the layerable. Whether a cursor is over the layerable is decided by a preceding call to selectTest.

The current pixel position of the cursor on the QCustomPlot widget is accessible via `event->pos()`.

The `event->delta()` indicates how far the mouse wheel was turned, which is usually +/- 120 for single rotation steps. However, if the mouse wheel is turned rapidly, multiple steps may accumulate to one event, making `event->delta()` larger. On the other hand, if the wheel has very smooth steps or none at all, the delta may be smaller.

The default implementation does nothing.

See also

mousePressEvent, mouseMoveEvent, mouseReleaseEvent, mouseDoubleClickEvent

Reimplemented in QCPColorScale, and QCPAxisRect.

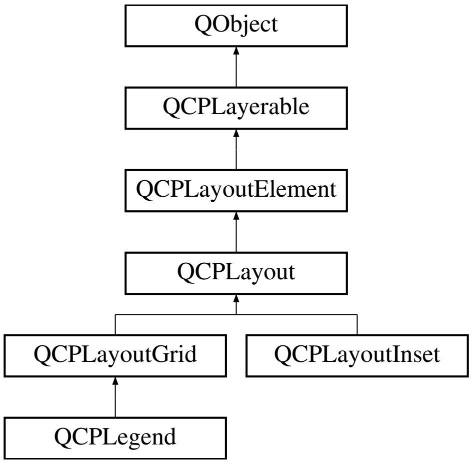
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.55 QCPLayout Class Reference

The abstract base class for layouts.

Inheritance diagram for QCPLayout:



Public Member Functions

- QCPLayout ()
- virtual void update (UpdatePhase phase) Q_DECL_OVERRIDE
- virtual QList< QCPLayoutElement ∗ > elements (bool recursive) const Q_DECL_OVERRIDE
- virtual int elementCount () const =0
- virtual QCPLayoutElement ∗ elementAt (int index) const =0
- virtual QCPLayoutElement ∗ takeAt (int index)=0
- virtual bool take (QCPLayoutElement ∗element)=0
- virtual void simplify ()
- bool removeAt (int index)
- bool remove (QCPLayoutElement ∗element)
- void clear ()

Protected Member Functions

- virtual void **updateLayout** ()
- void sizeConstraintsChanged () const
- void **adoptElement** (QCPLayoutElement ∗el)
- void **releaseElement** (QCPLayoutElement ∗el)
- QVector< int > **getSectionSizes** (QVector< int > maxSizes, QVector< int > minSizes, QVector< double > stretchFactors, int totalSize) const

Friends

- class **QCPLayoutElement**

Additional Inherited Members

5.55.1 Detailed Description

The abstract base class for layouts.

This is an abstract base class for layout elements whose main purpose is to define the position and size of other child layout elements. In most cases, layouts don't draw anything themselves (but there are exceptions to this, e.g. QCPLegend).

QCPLayout derives from QCPLayoutElement, and thus can itself be nested in other layouts.

QCPLayout introduces a common interface for accessing and manipulating the child elements. Those functions are most notably elementCount, elementAt, takeAt, take, simplify, removeAt, remove and clear. Individual subclasses may add more functions to this interface which are more specialized to the form of the layout. For example, QCP←LayoutGrid adds functions that take row and column indices to access cells of the layout grid more conveniently.

Since this is an abstract base class, you can't instantiate it directly. Rather use one of its subclasses like QCP←LayoutGrid or QCPLayoutInset.

For a general introduction to the layout system, see the dedicated documentation page The Layout System.

5.55.2 Constructor & Destructor Documentation

5.55.2.1 QCPLayout()

```
QCPLayout::QCPLayout ( )  [explicit]
```

Creates an instance of QCPLayout and sets default values. Note that since QCPLayout is an abstract base class, it can't be instantiated directly.

5.55.3 Member Function Documentation

5.55.3.1 clear()

```
void QCPLayout::clear ( )
```

Removes and deletes all layout elements in this layout. Finally calls simplify to make sure all empty cells are collapsed.

See also

remove, removeAt

5.55.3.2 elementAt()

```
QCPLayoutElement * QCPLayout::elementAt (
            int index ) const  [pure virtual]
```

Returns the element in the cell with the given *index*. If *index* is invalid, returns 0.

Note that even if *index* is valid, the respective cell may be empty in some layouts (e.g. QCPLayoutGrid), so this function may return 0 in those cases. You may use this function to check whether a cell is empty or not.

See also

elements, elementCount, takeAt

Implemented in QCPLayoutInset, and QCPLayoutGrid.

5.55.3.3 elementCount()

```
int QCPLayout::elementCount ( ) const  [pure virtual]
```

Returns the number of elements/cells in the layout.

See also

elements, elementAt

Implemented in QCPLayoutInset, and QCPLayoutGrid.

5.55.3.4 elements()

```
QList< QCPLayoutElement * > QCPLayout::elements (
            bool recursive ) const  [virtual]
```

Returns a list of all child elements in this layout element. If *recursive* is true, all sub-child elements are included in the list, too.

Warning

There may be entries with value 0 in the returned list. (For example, QCPLayoutGrid may have empty cells which yield 0 at the respective index.)

Reimplemented from QCPLayoutElement.

Reimplemented in QCPLayoutGrid.

5.55.3.5 remove()

```
bool QCPLayout::remove (
            QCPLayoutElement * element )
```

Removes and deletes the provided *element*. Returns true on success. If *element* is not in the layout, returns false.

This function internally uses takeAt to remove the element from the layout and then deletes the element. Note that some layouts don't remove the respective cell right away but leave an empty cell after successful removal of the layout element. To collapse empty cells, use simplify.

See also

removeAt, take

5.55.3.6 removeAt()

```
bool QCPLayout::removeAt (
            int index )
```

Removes and deletes the element at the provided *index*. Returns true on success. If *index* is invalid or points to an empty cell, returns false.

This function internally uses takeAt to remove the element from the layout and then deletes the returned element. Note that some layouts don't remove the respective cell right away but leave an empty cell after successful removal of the layout element. To collapse empty cells, use simplify.

See also

remove, takeAt

5.55.3.7 simplify()

```
void QCPLayout::simplify ( )  [virtual]
```

Simplifies the layout by collapsing empty cells. The exact behavior depends on subclasses, the default implementation does nothing.

Not all layouts need simplification. For example, QCPLayoutInset doesn't use explicit simplification while QCP←LayoutGrid does.

Reimplemented in QCPLayoutInset, and QCPLayoutGrid.

5.55.3.8 sizeConstraintsChanged()

```
void QCPLayout::sizeConstraintsChanged ( ) const [protected]
```

Subclasses call this method to report changed (minimum/maximum) size constraints.

If the parent of this layout is again a QCPLayout, forwards the call to the parent's sizeConstraintsChanged. If the parent is a QWidget (i.e. is the QCustomPlot::plotLayout of QCustomPlot), calls QWidget::updateGeometry, so if the QCustomPlot widget is inside a Qt QLayout, it may update itself and resize cells accordingly.

5.55.3.9 take()

```
bool QCPLayout::take (
            QCPLayoutElement * element ) [pure virtual]
```

Removes the specified *element* from the layout and returns true on success.

If the *element* isn't in this layout, returns false.

Note that some layouts don't remove the respective cell right away but leave an empty cell after successful removal of the layout element. To collapse empty cells, use simplify.

See also

takeAt

Implemented in QCPLayoutInset, and QCPLayoutGrid.

5.55.3.10 takeAt()

```
QCPLayoutElement * QCPLayout::takeAt (
            int index ) [pure virtual]
```

Removes the element with the given *index* from the layout and returns it.

If the *index* is invalid or the cell with that index is empty, returns 0.

Note that some layouts don't remove the respective cell right away but leave an empty cell after successful removal of the layout element. To collapse empty cells, use simplify.

See also

elementAt, take

Implemented in QCPLayoutInset, and QCPLayoutGrid.

5.55.3.11 update()

```
void QCPLayout::update (
            UpdatePhase phase )  [virtual]
```

First calls the QCPLayoutElement::update base class implementation to update the margins on this layout.

Then calls updateLayout which subclasses reimplement to reposition and resize their cells.

Finally, update is called on all child elements.

Reimplemented from QCPLayoutElement.

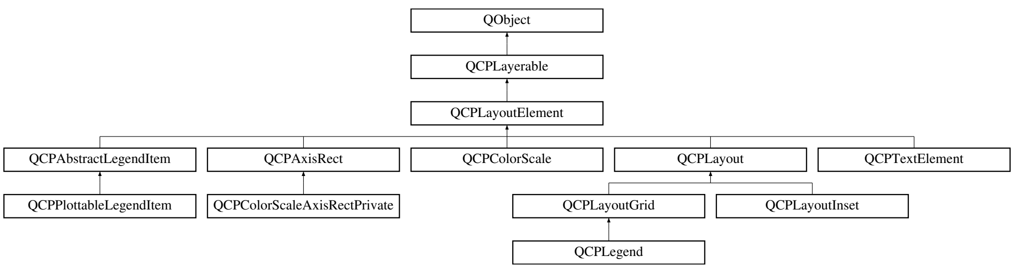
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.56 QCPLayoutElement Class Reference

The abstract base class for all objects that form the layout system.

Inheritance diagram for QCPLayoutElement:



Public Types

- enum UpdatePhase { upPreparation, upMargins, upLayout }

Public Member Functions

- QCPLayoutElement (QCustomPlot ∗parentPlot=0)
- QCPLayout ∗ layout () const
- QRect rect () const
- QRect **outerRect** () const
- QMargins **margins** () const
- QMargins **minimumMargins** () const
- QCP::MarginSides **autoMargins** () const
- QSize **minimumSize** () const
- QSize **maximumSize** () const
- QCPMarginGroup ∗ **marginGroup** (QCP::MarginSide side) const
- QHash< QCP::MarginSide, QCPMarginGroup ∗ > **marginGroups** () const
- void setOuterRect (const QRect &rect)
- void setMargins (const QMargins &margins)
- void setMinimumMargins (const QMargins &margins)
- void setAutoMargins (QCP::MarginSides sides)
- void setMinimumSize (const QSize &size)
- void setMinimumSize (int width, int height)
- void setMaximumSize (const QSize &size)
- void setMaximumSize (int width, int height)
- void setMarginGroup (QCP::MarginSides sides, QCPMarginGroup ∗group)
- virtual void update (UpdatePhase phase)
- virtual QSize minimumSizeHint () const
- virtual QSize maximumSizeHint () const
- virtual QList< QCPLayoutElement ∗ > elements (bool recursive) const
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩ OVERRIDE

Protected Member Functions

- virtual int **calculateAutoMargin** (QCP::MarginSide side)
- virtual void **layoutChanged** ()
- virtual void **applyDefaultAntialiasingHint** (QCPPainter ∗painter) const Q_DECL_OVERRIDE
- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- virtual void **parentPlotInitialized** (QCustomPlot ∗parentPlot) Q_DECL_OVERRIDE

Protected Attributes

- QCPLayout ∗ **mParentLayout**
- QSize **mMinimumSize**
- QSize **mMaximumSize**
- QRect **mRect**
- QRect **mOuterRect**
- QMargins **mMargins**
- QMargins **mMinimumMargins**
- QCP::MarginSides **mAutoMargins**
- QHash< QCP::MarginSide, QCPMarginGroup ∗ > **mMarginGroups**

Friends

- class **QCustomPlot**
- class **QCPLayout**
- class **QCPMarginGroup**

Additional Inherited Members

5.56.1 Detailed Description

The abstract base class for all objects that form the layout system.

This is an abstract base class. As such, it can't be instantiated directly, rather use one of its subclasses.

A Layout element is a rectangular object which can be placed in layouts. It has an outer rect (QCPLayoutElement↩ ::outerRect) and an inner rect (QCPLayoutElement::rect). The difference between outer and inner rect is called its margin. The margin can either be set to automatic or manual (setAutoMargins) on a per-side basis. If a side is set to manual, that margin can be set explicitly with setMargins and will stay fixed at that value. If it's set to automatic, the layout element subclass will control the value itself (via calculateAutoMargin).

Layout elements can be placed in layouts (base class QCPLayout) like QCPLayoutGrid. The top level layout is reachable via QCustomPlot::plotLayout, and is a QCPLayoutGrid. Since QCPLayout itself derives from QCP↩ LayoutElement, layouts can be nested.

Thus in QCustomPlot one can divide layout elements into two categories: The ones that are invisible by themselves, because they don't draw anything. Their only purpose is to manage the position and size of other layout elements. This category of layout elements usually use QCPLayout as base class. Then there is the category of layout elements which actually draw something. For example, QCPAxisRect, QCPLegend and QCPTextElement are of this category. This does not necessarily mean that the latter category can't have child layout elements. QCPLegend for instance, actually derives from QCPLayoutGrid and the individual legend items are child layout elements in the grid layout.

5.56.2 Member Enumeration Documentation

5.56.2.1 UpdatePhase

```
enum QCPLayoutElement::UpdatePhase
```

Defines the phases of the update process, that happens just before a replot. At each phase, update is called with the according UpdatePhase value.

Enumerator

upPreparation	Phase used for any type of preparation that needs to be done before margin calculation and layout.
upMargins	Phase in which the margins are calculated and set.
upLayout	Final phase in which the layout system places the rects of the elements.

5.56.3 Constructor & Destructor Documentation

5.56.3.1 QCPLayoutElement()

```
QCPLayoutElement::QCPLayoutElement (
            QCustomPlot * parentPlot = 0 )  [explicit]
```

Creates an instance of QCPLayoutElement and sets default values.

5.56.4 Member Function Documentation

5.56.4.1 elements()

```
QList< QCPLayoutElement * > QCPLayoutElement::elements (
            bool recursive ) const  [virtual]
```

Returns a list of all child elements in this layout element. If *recursive* is true, all sub-child elements are included in the list, too.

Warning

There may be entries with value 0 in the returned list. (For example, QCPLayoutGrid may have empty cells which yield 0 at the respective index.)

Reimplemented in QCPAxisRect, QCPLayoutGrid, and QCPLayout.

5.56.4.2 layout()

```
QCPLayout * QCPLayoutElement::layout ( ) const  [inline]
```

Returns the parent layout of this layout element.

5.56.4.3 maximumSizeHint()

```
QSize QCPLayoutElement::maximumSizeHint ( ) const  [virtual]
```

Returns the maximum size this layout element (the inner rect) may be expanded to.

if a maximum size (setMaximumSize) was not set manually, parent layouts consult this function to determine the maximum allowed size of this layout element. (A manual maximum size is considered set if it is smaller than Qt's QWIDGETSIZE_MAX.)

Reimplemented in QCPTextElement, and QCPLayoutGrid.

5.56.4.4 minimumSizeHint()

```
QSize QCPLayoutElement::minimumSizeHint ( ) const [virtual]
```

Returns the minimum size this layout element (the inner rect) may be compressed to.

if a minimum size (setMinimumSize) was not set manually, parent layouts consult this function to determine the minimum allowed size of this layout element. (A manual minimum size is considered set if it is non-zero.)

Reimplemented in QCPTextElement, QCPPlottableLegendItem, and QCPLayoutGrid.

5.56.4.5 rect()

```
QRect QCPLayoutElement::rect ( ) const [inline]
```

Returns the inner rect of this layout element. The inner rect is the outer rect (setOuterRect) shrinked by the margins (setMargins, setAutoMargins).

In some cases, the area between outer and inner rect is left blank. In other cases the margin area is used to display peripheral graphics while the main content is in the inner rect. This is where automatic margin calculation becomes interesting because it allows the layout element to adapt the margins to the peripheral graphics it wants to draw. For example, QCPAxisRect draws the axis labels and tick labels in the margin area, thus needs to adjust the margins (if setAutoMargins is enabled) according to the space required by the labels of the axes.

5.56.4.6 selectTest()

```
double QCPLayoutElement::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const [virtual]
```

Layout elements are sensitive to events inside their outer rect. If *pos* is within the outer rect, this method returns a value corresponding to 0.99 times the parent plot's selection tolerance. However, layout elements are not selectable by default. So if *onlySelectable* is true, -1.0 is returned.

See QCPLayerable::selectTest for a general explanation of this virtual method.

QCPLayoutElement subclasses may reimplement this method to provide more specific selection test behaviour.

Reimplemented from QCPLayerable.

Reimplemented in QCPTextElement, QCPLegend, QCPAbstractLegendItem, and QCPLayoutInset.

5.56.4.7 setAutoMargins()

```
void QCPLayoutElement::setAutoMargins (
            QCP::MarginSides sides )
```

Sets on which sides the margin shall be calculated automatically. If a side is calculated automatically, a minimum margin value may be provided with setMinimumMargins. If a side is set to be controlled manually, the value may be specified with setMargins.

Margin sides that are under automatic control may participate in a QCPMarginGroup (see setMarginGroup), to synchronize (align) it with other layout elements in the plot.

See also

setMinimumMargins, setMargins, QCP::MarginSide

5.56.4.8 setMarginGroup()

```
void QCPLayoutElement::setMarginGroup (
            QCP::MarginSides sides,
            QCPMarginGroup * group )
```

Sets the margin *group* of the specified margin *sides*.

Margin groups allow synchronizing specified margins across layout elements, see the documentation of QCP↩ MarginGroup.

To unset the margin group of *sides*, set *group* to 0.

Note that margin groups only work for margin sides that are set to automatic (setAutoMargins).

See also

QCP::MarginSide

5.56.4.9 setMargins()

```
void QCPLayoutElement::setMargins (
            const QMargins & margins )
```

Sets the margins of this layout element. If setAutoMargins is disabled for some or all sides, this function is used to manually set the margin on those sides. Sides that are still set to be handled automatically are ignored and may have any value in *margins*.

The margin is the distance between the outer rect (controlled by the parent layout via setOuterRect) and the inner rect (which usually contains the main content of this layout element).

See also

setAutoMargins

5.56.4.10 setMaximumSize() [1/2]

```
void QCPLayoutElement::setMaximumSize (
            const QSize & size )
```

Sets the maximum size for the inner rect of this layout element. A parent layout tries to respect the *size* here by changing row/column sizes in the layout accordingly.

5.56.4.11 setMaximumSize() [2/2]

```
void QCPLayoutElement::setMaximumSize (
            int width,
            int height )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets the maximum size for the inner rect of this layout element.

5.56.4.12 setMinimumMargins()

```
void QCPLayoutElement::setMinimumMargins (
            const QMargins & margins )
```

If setAutoMargins is enabled on some or all margins, this function is used to provide minimum values for those margins.

The minimum values are not enforced on margin sides that were set to be under manual control via setAutoMargins.

See also

setAutoMargins

5.56.4.13 setMinimumSize() [1/2]

```
void QCPLayoutElement::setMinimumSize (
            const QSize & size )
```

Sets the minimum size for the inner rect of this layout element. A parent layout tries to respect the *size* here by changing row/column sizes in the layout accordingly.

If the parent layout size is not sufficient to satisfy all minimum size constraints of its child layout elements, the layout may set a size that is actually smaller than *size*. QCustomPlot propagates the layout's size constraints to the outside by setting its own minimum QWidget size accordingly, so violations of *size* should be exceptions.

5.56.4.14 setMinimumSize() [2/2]

```
void QCPLayoutElement::setMinimumSize (
            int width,
            int height )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets the minimum size for the inner rect of this layout element.

5.56.4.15 setOuterRect()

```
void QCPLayoutElement::setOuterRect (
            const QRect & rect )
```

Sets the outer rect of this layout element. If the layout element is inside a layout, the layout sets the position and size of this layout element using this function.

Calling this function externally has no effect, since the layout will overwrite any changes to the outer rect upon the next replot.

The layout element will adapt its inner rect by applying the margins inward to the outer rect.

See also

rect

5.56.4.16 update()

```
void QCPLayoutElement::update (
            UpdatePhase phase ) [virtual]
```

Updates the layout element and sub-elements. This function is automatically called before every replot by the parent layout element. It is called multiple times, once for every UpdatePhase. The phases are run through in the order of the enum values. For details about what happens at the different phases, see the documentation of UpdatePhase.

Layout elements that have child elements should call the update method of their child elements, and pass the current *phase* unchanged.

The default implementation executes the automatic margin mechanism in the upMargins phase. Subclasses should make sure to call the base class implementation.

Reimplemented in QCPColorScale, QCPAxisRect, and QCPLayout.

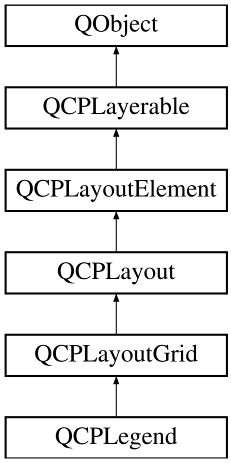
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.57 QCPLayoutGrid Class Reference

A layout that arranges child elements in a grid.

Inheritance diagram for QCPLayoutGrid:



Public Types

- enum FillOrder { foRowsFirst, foColumnsFirst }

Public Member Functions

- QCPLayoutGrid ()
- int rowCount () const
- int columnCount () const
- QList< double > **columnStretchFactors** () const
- QList< double > **rowStretchFactors** () const
- int **columnSpacing** () const
- int **rowSpacing** () const
- int **wrap** () const
- FillOrder **fillOrder** () const
- void setColumnStretchFactor (int column, double factor)
- void setColumnStretchFactors (const QList< double > &factors)
- void setRowStretchFactor (int row, double factor)
- void setRowStretchFactors (const QList< double > &factors)
- void setColumnSpacing (int pixels)
- void setRowSpacing (int pixels)
- void setWrap (int count)
- void setFillOrder (FillOrder order, bool rearrange=true)
- virtual void **updateLayout** () Q_DECL_OVERRIDE
- virtual int elementCount () const Q_DECL_OVERRIDE
- virtual QCPLayoutElement * elementAt (int index) const Q_DECL_OVERRIDE
- virtual QCPLayoutElement * takeAt (int index) Q_DECL_OVERRIDE
- virtual bool take (QCPLayoutElement *element) Q_DECL_OVERRIDE
- virtual QList< QCPLayoutElement * > elements (bool recursive) const Q_DECL_OVERRIDE
- virtual void simplify () Q_DECL_OVERRIDE
- virtual QSize minimumSizeHint () const Q_DECL_OVERRIDE

- virtual QSize maximumSizeHint () const Q_DECL_OVERRIDE
- QCPLayoutElement ∗ element (int row, int column) const
- bool addElement (int row, int column, QCPLayoutElement ∗element)
- bool addElement (QCPLayoutElement ∗element)
- bool hasElement (int row, int column)
- void expandTo (int newRowCount, int newColumnCount)
- void insertRow (int newIndex)
- void insertColumn (int newIndex)
- int rowColToIndex (int row, int column) const
- void indexToRowCol (int index, int &row, int &column) const

Protected Member Functions

- void **getMinimumRowColSizes** (QVector< int > ∗minColWidths, QVector< int > ∗minRowHeights) const
- void **getMaximumRowColSizes** (QVector< int > ∗maxColWidths, QVector< int > ∗maxRowHeights) const

Protected Attributes

- QList< QList< QCPLayoutElement ∗ > > **mElements**
- QList< double > **mColumnStretchFactors**
- QList< double > **mRowStretchFactors**
- int **mColumnSpacing**
- int **mRowSpacing**
- int **mWrap**
- FillOrder **mFillOrder**

Additional Inherited Members

5.57.1 Detailed Description

A layout that arranges child elements in a grid.

Elements are laid out in a grid with configurable stretch factors (setColumnStretchFactor, setRowStretchFactor) and spacing (setColumnSpacing, setRowSpacing).

Elements can be added to cells via addElement. The grid is expanded if the specified row or column doesn't exist yet. Whether a cell contains a valid layout element can be checked with hasElement, that element can be retrieved with element. If rows and columns that only have empty cells shall be removed, call simplify. Removal of elements is either done by just adding the element to a different layout or by using the QCPLayout interface take or remove.

If you use addElement(QCPLayoutElement∗) without explicit parameters for *row* and *column*, the grid layout will choose the position according to the current setFillOrder and the wrapping (setWrap).

Row and column insertion can be performed with insertRow and insertColumn.

5.57.2 Member Enumeration Documentation

5.57.2.1 FillOrder

```
enum QCPLayoutGrid::FillOrder
```

Defines in which direction the grid is filled when using addElement(QCPLayoutElement∗). The column/row at which wrapping into the next row/column occurs can be specified with setWrap.

See also

setFillOrder

Enumerator

foRowsFirst	Rows are filled first, and a new element is wrapped to the next column if the row count would exceed setWrap.
foColumnsFirst	Columns are filled first, and a new element is wrapped to the next row if the column count would exceed setWrap.

5.57.3 Constructor & Destructor Documentation

5.57.3.1 QCPLayoutGrid()

```
QCPLayoutGrid::QCPLayoutGrid ( )  [explicit]
```

Creates an instance of QCPLayoutGrid and sets default values.

5.57.4 Member Function Documentation

5.57.4.1 addElement() [1/2]

```
bool QCPLayoutGrid::addElement (
            int row,
            int column,
            QCPLayoutElement * element )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the *element* to cell with *row* and *column*. If *element* is already in a layout, it is first removed from there. If *row* or *column* don't exist yet, the layout is expanded accordingly.

Returns true if the element was added successfully, i.e. if the cell at *row* and *column* didn't already have an element.

Use the overload of this method without explicit row/column index to place the element according to the configured fill order and wrapping settings.

See also

element, hasElement, take, remove

5.57.4.2 addElement() [2/2]

```
bool QCPLayoutGrid::addElement (
            QCPLayoutElement * element )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the *element* to the next empty cell according to the current fill order (setFillOrder) and wrapping (setWrap). If *element* is already in a layout, it is first removed from there. If necessary, the layout is expanded to hold the new element.

Returns true if the element was added successfully.

See also

setFillOrder, setWrap, element, hasElement, take, remove

5.57.4.3 columnCount()

```
int QCPLayoutGrid::columnCount ( ) const [inline]
```

Returns the number of columns in the layout.

See also

rowCount

5.57.4.4 element()

```
QCPLayoutElement * QCPLayoutGrid::element (
            int row,
            int column ) const
```

Returns the element in the cell in *row* and *column*.

Returns 0 if either the row/column is invalid or if the cell is empty. In those cases, a qDebug message is printed. To check whether a cell exists and isn't empty, use hasElement.

See also

addElement, hasElement

5.57.4.5 elementAt()

```
QCPLayoutElement * QCPLayoutGrid::elementAt (
            int index ) const  [virtual]
```

Note that the association of the linear *index* to the row/column based cells depends on the current setting of set←FillOrder.

See also

rowColToIndex

Implements QCPLayout.

5.57.4.6 elementCount()

```
virtual int QCPLayoutGrid::elementCount ( ) const  [inline], [virtual]
```

Returns the number of elements/cells in the layout.

See also

elements, elementAt

Implements QCPLayout.

5.57.4.7 elements()

```
QList< QCPLayoutElement * > QCPLayoutGrid::elements (
            bool recursive ) const  [virtual]
```

Returns a list of all child elements in this layout element. If *recursive* is true, all sub-child elements are included in the list, too.

Warning

There may be entries with value 0 in the returned list. (For example, QCPLayoutGrid may have empty cells which yield 0 at the respective index.)

Reimplemented from QCPLayout.

5.57.4.8 expandTo()

```
void QCPLayoutGrid::expandTo (
            int newRowCount,
            int newColumnCount )
```

Expands the layout to have *newRowCount* rows and *newColumnCount* columns. So the last valid row index will be *newRowCount-1*, the last valid column index will be *newColumnCount-1*.

If the current column/row count is already larger or equal to *newColumnCount/newRowCount,* this function does nothing in that dimension.

Newly created cells are empty, new rows and columns have the stretch factor 1.

Note that upon a call to addElement, the layout is expanded automatically to contain the specified row and column, using this function.

See also

simplify

5.57.4.9 hasElement()

```
bool QCPLayoutGrid::hasElement (
            int row,
            int column )
```

Returns whether the cell at *row* and *column* exists and contains a valid element, i.e. isn't empty.

See also

element

5.57.4.10 indexToRowCol()

```
void QCPLayoutGrid::indexToRowCol (
            int index,
            int & row,
            int & column ) const
```

Converts the linear index to row and column indices and writes the result to *row* and *column*.

The way the cells are indexed depends on setFillOrder. If it is foRowsFirst, the indices increase left to right and then top to bottom. If it is foColumnsFirst, the indices increase top to bottom and then left to right.

If there are no cells (i.e. column or row count is zero), sets *row* and *column* to -1.

For the retrieved *row* and *column* to be valid, the passed *index* must be valid itself, i.e. greater or equal to zero and smaller than the current elementCount.

See also

rowColToIndex

5.57.4.11 insertColumn()

```
void QCPLayoutGrid::insertColumn (
            int newIndex )
```

Inserts a new column with empty cells at the column index *newIndex*. Valid values for *newIndex* range from 0 (inserts a row at the left) to *rowCount* (appends a row at the right).

See also

insertRow

5.57.4.12 insertRow()

```
void QCPLayoutGrid::insertRow (
            int newIndex )
```

Inserts a new row with empty cells at the row index *newIndex*. Valid values for *newIndex* range from 0 (inserts a row at the top) to *rowCount* (appends a row at the bottom).

See also

insertColumn

5.57.4.13 maximumSizeHint()

```
QSize QCPLayoutGrid::maximumSizeHint ( ) const [virtual]
```

Returns the maximum size this layout element (the inner rect) may be expanded to.

if a maximum size (setMaximumSize) was not set manually, parent layouts consult this function to determine the maximum allowed size of this layout element. (A manual maximum size is considered set if it is smaller than Qt's QWIDGETSIZE_MAX.)

Reimplemented from QCPLayoutElement.

5.57.4.14 minimumSizeHint()

```
QSize QCPLayoutGrid::minimumSizeHint ( ) const [virtual]
```

Returns the minimum size this layout element (the inner rect) may be compressed to.

if a minimum size (setMinimumSize) was not set manually, parent layouts consult this function to determine the minimum allowed size of this layout element. (A manual minimum size is considered set if it is non-zero.)

Reimplemented from QCPLayoutElement.

5.57.4.15 rowColToIndex()

```
int QCPLayoutGrid::rowColToIndex (
            int row,
            int column ) const
```

Converts the given *row* and *column* to the linear index used by some methods of QCPLayoutGrid and QCPLayout.

The way the cells are indexed depends on setFillOrder. If it is foRowsFirst, the indices increase left to right and then top to bottom. If it is foColumnsFirst, the indices increase top to bottom and then left to right.

For the returned index to be valid, *row* and *column* must be valid indices themselves, i.e. greater or equal to zero and smaller than the current rowCount/columnCount.

See also

indexToRowCol

5.57.4.16 rowCount()

```
int QCPLayoutGrid::rowCount ( ) const [inline]
```

Returns the number of rows in the layout.

See also

columnCount

5.57.4.17 setColumnSpacing()

```
void QCPLayoutGrid::setColumnSpacing (
            int pixels )
```

Sets the gap that is left blank between columns to *pixels*.

See also

setRowSpacing

5.57.4.18 setColumnStretchFactor()

```
void QCPLayoutGrid::setColumnStretchFactor (
            int column,
            double factor )
```

Sets the stretch *factor* of *column*.

Stretch factors control the relative sizes of rows and columns. Cells will not be resized beyond their minimum and maximum widths/heights (QCPLayoutElement::setMinimumSize, QCPLayoutElement::setMaximumSize), regardless of the stretch factor.

The default stretch factor of newly created rows/columns is 1.

See also

setColumnStretchFactors, setRowStretchFactor

5.57.4.19 setColumnStretchFactors()

```
void QCPLayoutGrid::setColumnStretchFactors (
            const QList< double > & factors )
```

Sets the stretch *factors* of all columns. *factors* must have the size columnCount.

Stretch factors control the relative sizes of rows and columns. Cells will not be resized beyond their minimum and maximum widths/heights (QCPLayoutElement::setMinimumSize, QCPLayoutElement::setMaximumSize), regardless of the stretch factor.

The default stretch factor of newly created rows/columns is 1.

See also

setColumnStretchFactor, setRowStretchFactors

5.57.4.20 setFillOrder()

```
void QCPLayoutGrid::setFillOrder (
            FillOrder order,
            bool rearrange = true )
```

Sets the filling order and wrapping behaviour that is used when adding new elements with the method add↩Element(QCPLayoutElement∗).

The specified *order* defines whether rows or columns are filled first. Using setWrap, you can control at which row/column count wrapping into the next column/row will occur. If you set it to zero, no wrapping will ever occur. Changing the fill order also changes the meaning of the linear index used e.g. in elementAt and takeAt.

If you want to have all current elements arranged in the new order, set *rearrange* to true. The elements will be rearranged in a way that tries to preserve their linear index. However, empty cells are skipped during build-up of the new cell order, which shifts the succeding element's index. The rearranging is performed even if the specified *order* is already the current fill order. Thus this method can be used to re-wrap the current elements.

If *rearrange* is false, the current element arrangement is not changed, which means the linear indexes change (because the linear index is dependent on the fill order).

Note that the method addElement(int row, int column, QCPLayoutElement ∗element) with explicitly stated row and column is not subject to wrapping and can place elements even beyond the specified wrapping point.

See also

setWrap, addElement(QCPLayoutElement∗)

5.57.4.21 setRowSpacing()

```
void QCPLayoutGrid::setRowSpacing (
             int pixels )
```

Sets the gap that is left blank between rows to *pixels*.

See also

setColumnSpacing

5.57.4.22 setRowStretchFactor()

```
void QCPLayoutGrid::setRowStretchFactor (
             int row,
             double factor )
```

Sets the stretch *factor* of *row*.

Stretch factors control the relative sizes of rows and columns. Cells will not be resized beyond their minimum and maximum widths/heights (QCPLayoutElement::setMinimumSize, QCPLayoutElement::setMaximumSize), regardless of the stretch factor.

The default stretch factor of newly created rows/columns is 1.

See also

setColumnStretchFactors, setRowStretchFactor

5.57.4.23 setRowStretchFactors()

```
void QCPLayoutGrid::setRowStretchFactors (
             const QList< double > & factors )
```

Sets the stretch *factors* of all rows. *factors* must have the size rowCount.

Stretch factors control the relative sizes of rows and columns. Cells will not be resized beyond their minimum and maximum widths/heights (QCPLayoutElement::setMinimumSize, QCPLayoutElement::setMaximumSize), regardless of the stretch factor.

The default stretch factor of newly created rows/columns is 1.

See also

setRowStretchFactor, setColumnStretchFactors

5.57.4.24 setWrap()

```
void QCPLayoutGrid::setWrap (
            int count )
```

Sets the maximum number of columns or rows that are used, before new elements added with addElement(QC←PLayoutElement∗) will start to fill the next row or column, respectively. It depends on setFillOrder, whether rows or columns are wrapped.

If *count* is set to zero, no wrapping will ever occur.

If you wish to re-wrap the elements currently in the layout, call setFillOrder with *rearrange* set to true (the actual fill order doesn't need to be changed for the rearranging to be done).

Note that the method addElement(int row, int column, QCPLayoutElement ∗element) with explicitly stated row and column is not subject to wrapping and can place elements even beyond the specified wrapping point.

See also

setFillOrder

5.57.4.25 simplify()

```
void QCPLayoutGrid::simplify ( ) [virtual]
```

Simplifies the layout by collapsing rows and columns which only contain empty cells.

Reimplemented from QCPLayout.

5.57.4.26 take()

```
bool QCPLayoutGrid::take (
            QCPLayoutElement * element ) [virtual]
```

Removes the specified *element* from the layout and returns true on success.

If the *element* isn't in this layout, returns false.

Note that some layouts don't remove the respective cell right away but leave an empty cell after successful removal of the layout element. To collapse empty cells, use simplify.

See also

takeAt

Implements QCPLayout.

5.57.4.27 takeAt()

```
QCPLayoutElement * QCPLayoutGrid::takeAt (
            int index ) [virtual]
```

Note that the association of the linear *index* to the row/column based cells depends on the current setting of set↵ FillOrder.

See also

rowColToIndex

Implements QCPLayout.

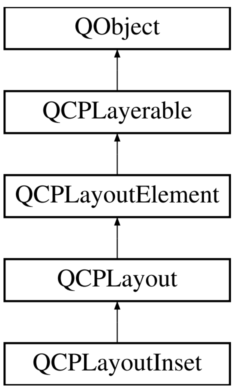
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↵ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↵ cpp

5.58 QCPLayoutInset Class Reference

A layout that places child elements aligned to the border or arbitrarily positioned.

Inheritance diagram for QCPLayoutInset:



Public Types

- enum InsetPlacement { ipFree, ipBorderAligned }

Public Member Functions

- QCPLayoutInset ()
- InsetPlacement insetPlacement (int index) const
- Qt::Alignment insetAlignment (int index) const
- QRectF insetRect (int index) const
- void setInsetPlacement (int index, InsetPlacement placement)
- void setInsetAlignment (int index, Qt::Alignment alignment)
- void setInsetRect (int index, const QRectF &rect)
- virtual void **updateLayout** () Q_DECL_OVERRIDE
- virtual int elementCount () const Q_DECL_OVERRIDE
- virtual QCPLayoutElement ∗ elementAt (int index) const Q_DECL_OVERRIDE
- virtual QCPLayoutElement ∗ takeAt (int index) Q_DECL_OVERRIDE
- virtual bool take (QCPLayoutElement ∗element) Q_DECL_OVERRIDE
- virtual void simplify () Q_DECL_OVERRIDE
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩ OVERRIDE
- void addElement (QCPLayoutElement ∗element, Qt::Alignment alignment)
- void addElement (QCPLayoutElement ∗element, const QRectF &rect)

Protected Attributes

- QList< QCPLayoutElement ∗ > **mElements**
- QList< InsetPlacement > **mInsetPlacement**
- QList< Qt::Alignment > **mInsetAlignment**
- QList< QRectF > **mInsetRect**

Additional Inherited Members

5.58.1 Detailed Description

A layout that places child elements aligned to the border or arbitrarily positioned.

Elements are placed either aligned to the border or at arbitrary position in the area of the layout. Which placement applies is controlled with the InsetPlacement (setInsetPlacement).

Elements are added via addElement(QCPLayoutElement ∗element, Qt::Alignment alignment) or addElement(Q↩ CPLayoutElement ∗element, const QRectF &rect). If the first method is used, the inset placement will default to ipBorderAligned and the element will be aligned according to the *alignment* parameter. The second method defaults to ipFree and allows placing elements at arbitrary position and size, defined by *rect*.

The alignment or rect can be set via setInsetAlignment or setInsetRect, respectively.

This is the layout that every QCPAxisRect has as QCPAxisRect::insetLayout.

5.58.2 Member Enumeration Documentation

5.58.2.1 InsetPlacement

```
enum QCPLayoutInset::InsetPlacement
```

Defines how the placement and sizing is handled for a certain element in a QCPLayoutInset.

Enumerator

ipFree	The element may be positioned/sized arbitrarily, see setInsetRect.
ipBorderAligned	The element is aligned to one of the layout sides, see setInsetAlignment.

5.58.3 Constructor & Destructor Documentation

5.58.3.1 QCPLayoutInset()

```
QCPLayoutInset::QCPLayoutInset ( )  [explicit]
```

Creates an instance of QCPLayoutInset and sets default values.

5.58.4 Member Function Documentation

5.58.4.1 addElement() [1/2]

```
void QCPLayoutInset::addElement (
            QCPLayoutElement * element,
            Qt::Alignment alignment )
```

Adds the specified *element* to the layout as an inset aligned at the border (setInsetAlignment is initialized with ipBorderAligned). The alignment is set to *alignment*.

alignment is an or combination of the following alignment flags: Qt::AlignLeft, Qt::AlignHCenter, Qt::AlighRight, Qt::AlignTop, Qt::AlignVCenter, Qt::AlignBottom. Any other alignment flags will be ignored.

See also

addElement(QCPLayoutElement ∗element, const QRectF &rect)

5.58.4.2 addElement() [2/2]

```
void QCPLayoutInset::addElement (
            QCPLayoutElement * element,
            const QRectF & rect )
```

Adds the specified *element* to the layout as an inset with free positioning/sizing (setInsetAlignment is initialized with ipFree). The position and size is set to *rect*.

rect is given in fractions of the whole inset layout rect. So an inset with rect (0, 0, 1, 1) will span the entire layout. An inset with rect (0.6, 0.1, 0.35, 0.35) will be in the top right corner of the layout, with 35% width and height of the parent layout.

See also

addElement(QCPLayoutElement ∗element, Qt::Alignment alignment)

5.58.4.3 elementAt()

```
QCPLayoutElement * QCPLayoutInset::elementAt (
            int index ) const [virtual]
```

Returns the element in the cell with the given *index*. If *index* is invalid, returns 0.

Note that even if *index* is valid, the respective cell may be empty in some layouts (e.g. QCPLayoutGrid), so this function may return 0 in those cases. You may use this function to check whether a cell is empty or not.

See also

elements, elementCount, takeAt

Implements QCPLayout.

5.58.4.4 elementCount()

```
int QCPLayoutInset::elementCount ( ) const [virtual]
```

Returns the number of elements/cells in the layout.

See also

elements, elementAt

Implements QCPLayout.

5.58.4.5 insetAlignment()

```
Qt::Alignment QCPLayoutInset::insetAlignment (
            int index ) const
```

Returns the alignment of the element with the specified *index*. The alignment only has a meaning, if the inset placement (setInsetPlacement) is ipBorderAligned.

5.58.4.6 insetPlacement()

```
QCPLayoutInset::InsetPlacement QCPLayoutInset::insetPlacement (
            int index ) const
```

Returns the placement type of the element with the specified *index*.

5.58.4.7 insetRect()

```
QRectF QCPLayoutInset::insetRect (
            int index ) const
```

Returns the rect of the element with the specified *index*. The rect only has a meaning, if the inset placement (setInsetPlacement) is ipFree.

5.58.4.8 selectTest()

```
double QCPLayoutInset::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const [virtual]
```

The inset layout is sensitive to events only at areas where its (visible) child elements are sensitive. If the selectTest method of any of the child elements returns a positive number for *pos*, this method returns a value corresponding to 0.99 times the parent plot's selection tolerance. The inset layout is not selectable itself by default. So if *only*↩ *Selectable* is true, -1.0 is returned.

See QCPLayerable::selectTest for a general explanation of this virtual method.

Reimplemented from QCPLayoutElement.

5.58.4.9 setInsetAlignment()

```
void QCPLayoutInset::setInsetAlignment (
            int index,
            Qt::Alignment alignment )
```

If the inset placement (setInsetPlacement) is ipBorderAligned, this function is used to set the alignment of the element with the specified *index* to *alignment*.

alignment is an or combination of the following alignment flags: Qt::AlignLeft, Qt::AlignHCenter, Qt::AlighRight, Qt::AlignTop, Qt::AlignVCenter, Qt::AlignBottom. Any other alignment flags will be ignored.

5.58.4.10 setInsetPlacement()

```
void QCPLayoutInset::setInsetPlacement (
            int index,
            QCPLayoutInset::InsetPlacement placement )
```

Sets the inset placement type of the element with the specified *index* to *placement*.

See also

InsetPlacement

5.58.4.11 setInsetRect()

```
void QCPLayoutInset::setInsetRect (
            int index,
            const QRectF & rect )
```

If the inset placement (setInsetPlacement) is ipFree, this function is used to set the position and size of the element with the specified *index* to *rect*.

rect is given in fractions of the whole inset layout rect. So an inset with rect (0, 0, 1, 1) will span the entire layout. An inset with rect (0.6, 0.1, 0.35, 0.35) will be in the top right corner of the layout, with 35% width and height of the parent layout.

Note that the minimum and maximum sizes of the embedded element (QCPLayoutElement::setMinimumSize, Q↩CPLayoutElement::setMaximumSize) are enforced.

5.58.4.12 simplify()

```
void QCPLayoutInset::simplify ( ) [inline], [virtual]
```

The QCPInsetLayout does not need simplification since it can never have empty cells due to its linear index structure. This method does nothing.

Reimplemented from QCPLayout.

5.58.4.13 take()

```
bool QCPLayoutInset::take (
            QCPLayoutElement * element ) [virtual]
```

Removes the specified *element* from the layout and returns true on success.

If the *element* isn't in this layout, returns false.

Note that some layouts don't remove the respective cell right away but leave an empty cell after successful removal of the layout element. To collapse empty cells, use simplify.

See also

takeAt

Implements QCPLayout.

5.58.4.14 takeAt()

```
QCPLayoutElement * QCPLayoutInset::takeAt (
            int index )  [virtual]
```

Removes the element with the given *index* from the layout and returns it.

If the *index* is invalid or the cell with that index is empty, returns 0.

Note that some layouts don't remove the respective cell right away but leave an empty cell after successful removal of the layout element. To collapse empty cells, use simplify.

See also

elementAt, take

Implements QCPLayout.

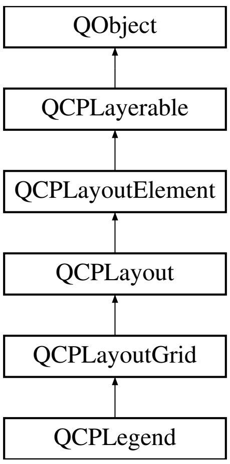
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↵ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↵ cpp

5.59 QCPLegend Class Reference

Manages a legend inside a QCustomPlot.

Inheritance diagram for QCPLegend:



Public Types

- enum SelectablePart { spNone = 0x000, spLegendBox = 0x001, spItems = 0x002 }

Signals

- void selectionChanged (QCPLegend::SelectableParts parts)
- void **selectableChanged** (QCPLegend::SelectableParts parts)

Public Member Functions

- QCPLegend ()
- QPen **borderPen** () const
- QBrush **brush** () const
- QFont **font** () const
- QColor **textColor** () const
- QSize **iconSize** () const
- int **iconTextPadding** () const
- QPen **iconBorderPen** () const
- SelectableParts **selectableParts** () const
- SelectableParts **selectedParts** () const
- QPen **selectedBorderPen** () const
- QPen **selectedIconBorderPen** () const
- QBrush **selectedBrush** () const
- QFont **selectedFont** () const
- QColor **selectedTextColor** () const
- void setBorderPen (const QPen &pen)
- void setBrush (const QBrush &brush)
- void setFont (const QFont &font)
- void setTextColor (const QColor &color)
- void setIconSize (const QSize &size)
- void setIconSize (int width, int height)
- void setIconTextPadding (int padding)
- void setIconBorderPen (const QPen &pen)
- Q_SLOT void setSelectableParts (const SelectableParts &selectableParts)
- Q_SLOT void setSelectedParts (const SelectableParts &selectedParts)
- void setSelectedBorderPen (const QPen &pen)
- void setSelectedIconBorderPen (const QPen &pen)
- void setSelectedBrush (const QBrush &brush)
- void setSelectedFont (const QFont &font)
- void setSelectedTextColor (const QColor &color)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩
OVERRIDE
- QCPAbstractLegendItem ∗ item (int index) const
- QCPPlottableLegendItem ∗ itemWithPlottable (const QCPAbstractPlottable ∗plottable) const
- int itemCount () const
- bool hasItem (QCPAbstractLegendItem ∗item) const
- bool hasItemWithPlottable (const QCPAbstractPlottable ∗plottable) const
- bool addItem (QCPAbstractLegendItem ∗item)
- bool removeItem (int index)
- bool removeItem (QCPAbstractLegendItem ∗item)
- void clearItems ()
- QList< QCPAbstractLegendItem ∗ > selectedItems () const

Protected Member Functions

- virtual void **parentPlotInitialized** (QCustomPlot ∗parentPlot) Q_DECL_OVERRIDE
- virtual QCP::Interaction **selectionCategory** () const Q_DECL_OVERRIDE
- virtual void **applyDefaultAntialiasingHint** (QCPPainter ∗painter) const Q_DECL_OVERRIDE
- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- virtual void **selectEvent** (QMouseEvent ∗event, bool additive, const QVariant &details, bool ∗selection↵ StateChanged) Q_DECL_OVERRIDE
- virtual void **deselectEvent** (bool ∗selectionStateChanged) Q_DECL_OVERRIDE
- QPen **getBorderPen** () const
- QBrush **getBrush** () const

Protected Attributes

- QPen **mBorderPen**
- QPen **mIconBorderPen**
- QBrush **mBrush**
- QFont **mFont**
- QColor **mTextColor**
- QSize **mIconSize**
- int **mIconTextPadding**
- SelectableParts **mSelectedParts**
- SelectableParts **mSelectableParts**
- QPen **mSelectedBorderPen**
- QPen **mSelectedIconBorderPen**
- QBrush **mSelectedBrush**
- QFont **mSelectedFont**
- QColor **mSelectedTextColor**

Friends

- class **QCustomPlot**
- class **QCPAbstractLegendItem**

5.59.1 Detailed Description

Manages a legend inside a QCustomPlot.

A legend is a small box somewhere in the plot which lists plottables with their name and icon.

Normally, the legend is populated by calling QCPAbstractPlottable::addToLegend. The respective legend item can be removed with QCPAbstractPlottable::removeFromLegend. However, QCPLegend also offers an interface to add and manipulate legend items directly: item, itemWithPlottable, itemCount, addItem, removeItem, etc.

Since QCPLegend derives from QCPLayoutGrid, it can be placed in any position a QCPLayoutElement may be positioned. The legend items are themselves QCPLayoutElements which are placed in the grid layout of the legend. QCPLegend only adds an interface specialized for handling child elements of type QCPAbstractLegendItem, as mentioned above. In principle, any other layout elements may also be added to a legend via the normal QCP↵ LayoutGrid interface. See the special page about The Layout System for examples on how to add other elements to the legend and move it outside the axis rect.

Use the methods setFillOrder and setWrap inherited from QCPLayoutGrid to control in which order (column first or row first) the legend is filled up when calling addItem, and at which column or row wrapping occurs.

By default, every QCustomPlot has one legend (QCustomPlot::legend) which is placed in the inset layout of the main axis rect (QCPAxisRect::insetLayout). To move the legend to another position inside the axis rect, use the methods of the QCPLayoutInset. To move the legend outside of the axis rect, place it anywhere else with the QCPLayout/QCPLayoutElement interface.

5.59.2 Member Enumeration Documentation

5.59.2.1 SelectablePart

`enum QCPLegend::SelectablePart`

Defines the selectable parts of a legend

See also

setSelectedParts, setSelectableParts

Enumerator

spNone	`0x000` None
spLegendBox	`0x001` The legend box (frame)
spItems	`0x002` Legend items individually (see selectedItems)

5.59.3 Constructor & Destructor Documentation

5.59.3.1 QCPLegend()

`QCPLegend::QCPLegend ( ) [explicit]`

Constructs a new QCPLegend instance with default values.

Note that by default, QCustomPlot already contains a legend ready to be used as QCustomPlot::legend

5.59.4 Member Function Documentation

5.59.4.1 addItem()

```
bool QCPLegend::addItem (
            QCPAbstractLegendItem * item )
```

Adds *item* to the legend, if it's not present already. The element is arranged according to the current fill order (setFillOrder) and wrapping (setWrap).

Returns true on sucess, i.e. if the item wasn't in the list already and has been successfuly added.

The legend takes ownership of the item.

See also

removeItem, item, hasItem

5.59.4.2 clearItems()

```
void QCPLegend::clearItems ( )
```

Removes all items from the legend.

5.59.4.3 hasItem()

```
bool QCPLegend::hasItem (
            QCPAbstractLegendItem * item ) const
```

Returns whether the legend contains *item*.

See also

hasItemWithPlottable

5.59.4.4 hasItemWithPlottable()

```
bool QCPLegend::hasItemWithPlottable (
            const QCPAbstractPlottable * plottable ) const
```

Returns whether the legend contains a QCPPlottableLegendItem which is associated with *plottable* (e.g. a QCP←Graph*). If such an item isn't in the legend, returns false.

See also

itemWithPlottable

5.59.4.5 item()

```
QCPAbstractLegendItem * QCPLegend::item (
            int index ) const
```

Returns the item with index *i*.

Note that the linear index depends on the current fill order (setFillOrder).

See also

itemCount, addItem, itemWithPlottable

5.59.4.6 itemCount()

```
int QCPLegend::itemCount ( ) const
```

Returns the number of items currently in the legend.

Note that if empty cells are in the legend (e.g. by calling methods of the QCPLayoutGrid base class which allows creating empty cells), they are included in the returned count.

See also

item

5.59.4.7 itemWithPlottable()

```
QCPPlottableLegendItem * QCPLegend::itemWithPlottable (
            const QCPAbstractPlottable * plottable ) const
```

Returns the QCPPlottableLegendItem which is associated with *plottable* (e.g. a QCPGraph*). If such an item isn't in the legend, returns 0.

See also

hasItemWithPlottable

5.59.4.8 removeItem() [1/2]

```
bool QCPLegend::removeItem (
            int index )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Removes the item with the specified *index* from the legend and deletes it.

After successful removal, the legend is reordered according to the current fill order (setFillOrder) and wrapping (setWrap), so no empty cell remains where the removed *item* was. If you don't want this, rather use the raw element interface of QCPLayoutGrid.

Returns true, if successful. Unlike QCPLayoutGrid::removeAt, this method only removes elements derived from QCPAbstractLegendItem.

See also

itemCount, clearItems

5.59.4.9 removeItem() [2/2]

```
bool QCPLegend::removeItem (
            QCPAbstractLegendItem * item )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Removes *item* from the legend and deletes it.

After successful removal, the legend is reordered according to the current fill order (setFillOrder) and wrapping (setWrap), so no empty cell remains where the removed *item* was. If you don't want this, rather use the raw element interface of QCPLayoutGrid.

Returns true, if successful.

See also

clearItems

5.59.4.10 selectedItems()

```
QList< QCPAbstractLegendItem * > QCPLegend::selectedItems ( ) const
```

Returns the legend items that are currently selected. If no items are selected, the list is empty.

See also

QCPAbstractLegendItem::setSelected, setSelectable

5.59.4.11 selectionChanged

```
void QCPLegend::selectionChanged (
            QCPLegend::SelectableParts selection )  [signal]
```

This signal is emitted when the selection state of this legend has changed.

See also

setSelectedParts, setSelectableParts

5.59.4.12 selectTest()

```
double QCPLegend::selectTest (
             const QPointF & pos,
             bool onlySelectable,
             QVariant * details = 0 ) const  [virtual]
```

Layout elements are sensitive to events inside their outer rect. If *pos* is within the outer rect, this method returns a value corresponding to 0.99 times the parent plot's selection tolerance. However, layout elements are not selectable by default. So if *onlySelectable* is true, -1.0 is returned.

See QCPLayerable::selectTest for a general explanation of this virtual method.

QCPLayoutElement subclasses may reimplement this method to provide more specific selection test behaviour.

Reimplemented from QCPLayoutElement.

5.59.4.13 setBorderPen()

```
void QCPLegend::setBorderPen (
             const QPen & pen )
```

Sets the pen, the border of the entire legend is drawn with.

5.59.4.14 setBrush()

```
void QCPLegend::setBrush (
             const QBrush & brush )
```

Sets the brush of the legend background.

5.59.4.15 setFont()

```
void QCPLegend::setFont (
             const QFont & font )
```

Sets the default font of legend text. Legend items that draw text (e.g. the name of a graph) will use this font by default. However, a different font can be specified on a per-item-basis by accessing the specific legend item.

This function will also set *font* on all already existing legend items.

See also

QCPAbstractLegendItem::setFont

5.59.4.16 setIconBorderPen()

```
void QCPLegend::setIconBorderPen (
            const QPen & pen )
```

Sets the pen used to draw a border around each legend icon. Legend items that draw an icon (e.g. a visual representation of the graph) will use this pen by default.

If no border is wanted, set this to *Qt::NoPen*.

5.59.4.17 setIconSize() [1/2]

```
void QCPLegend::setIconSize (
            const QSize & size )
```

Sets the size of legend icons. Legend items that draw an icon (e.g. a visual representation of the graph) will use this size by default.

5.59.4.18 setIconSize() [2/2]

```
void QCPLegend::setIconSize (
            int width,
            int height )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

5.59.4.19 setIconTextPadding()

```
void QCPLegend::setIconTextPadding (
            int padding )
```

Sets the horizontal space in pixels between the legend icon and the text next to it. Legend items that draw an icon (e.g. a visual representation of the graph) and text (e.g. the name of the graph) will use this space by default.

5.59.4.20 setSelectableParts()

```
void QCPLegend::setSelectableParts (
            const SelectableParts & selectable )
```

Sets whether the user can (de-)select the parts in *selectable* by clicking on the QCustomPlot surface. (When QCustomPlot::setInteractions contains QCP::iSelectLegend.)

However, even when *selectable* is set to a value not allowing the selection of a specific part, it is still possible to set the selection of this part manually, by calling setSelectedParts directly.

See also

SelectablePart, setSelectedParts

5.59.4.21 setSelectedBorderPen()

```
void QCPLegend::setSelectedBorderPen (
            const QPen & pen )
```

When the legend box is selected, this pen is used to draw the border instead of the normal pen set via setBorderPen.

See also

setSelectedParts, setSelectableParts, setSelectedBrush

5.59.4.22 setSelectedBrush()

```
void QCPLegend::setSelectedBrush (
            const QBrush & brush )
```

When the legend box is selected, this brush is used to draw the legend background instead of the normal brush set via setBrush.

See also

setSelectedParts, setSelectableParts, setSelectedBorderPen

5.59.4.23 setSelectedFont()

```
void QCPLegend::setSelectedFont (
            const QFont & font )
```

Sets the default font that is used by legend items when they are selected.

This function will also set *font* on all already existing legend items.

See also

setFont, QCPAbstractLegendItem::setSelectedFont

5.59.4.24 setSelectedIconBorderPen()

```
void QCPLegend::setSelectedIconBorderPen (
            const QPen & pen )
```

Sets the pen legend items will use to draw their icon borders, when they are selected.

See also

setSelectedParts, setSelectableParts, setSelectedFont

5.59.4.25 setSelectedParts()

```
void QCPLegend::setSelectedParts (
            const SelectableParts & selected )
```

Sets the selected state of the respective legend parts described by SelectablePart. When a part is selected, it uses a different pen/font and brush. If some legend items are selected and *selected* doesn't contain spItems, those items become deselected.

The entire selection mechanism is handled automatically when QCustomPlot::setInteractions contains iSelect↩ Legend. You only need to call this function when you wish to change the selection state manually.

This function can change the selection state of a part even when setSelectableParts was set to a value that actually excludes the part.

emits the selectionChanged signal when *selected* is different from the previous selection state.

Note that it doesn't make sense to set the selected state spItems here when it wasn't set before, because there's no way to specify which exact items to newly select. Do this by calling QCPAbstractLegendItem::setSelected directly on the legend item you wish to select.

See also

SelectablePart, setSelectableParts, selectTest, setSelectedBorderPen, setSelectedIconBorderPen, set↩ SelectedBrush, setSelectedFont

5.59.4.26 setSelectedTextColor()

```
void QCPLegend::setSelectedTextColor (
            const QColor & color )
```

Sets the default text color that is used by legend items when they are selected.

This function will also set *color* on all already existing legend items.

See also

setTextColor, QCPAbstractLegendItem::setSelectedTextColor

5.59.4.27 setTextColor()

```
void QCPLegend::setTextColor (
            const QColor & color )
```

Sets the default color of legend text. Legend items that draw text (e.g. the name of a graph) will use this color by default. However, a different colors can be specified on a per-item-basis by accessing the specific legend item.

This function will also set *color* on all already existing legend items.

See also

QCPAbstractLegendItem::setTextColor

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.60 QCPLineEnding Class Reference

Handles the different ending decorations for line-like items.

Public Types

- enum EndingStyle {
  esNone, esFlatArrow, esSpikeArrow, esLineArrow,
  esDisc, esSquare, esDiamond, esBar,
  esHalfBar, esSkewedBar }

Public Member Functions

- QCPLineEnding ()
- QCPLineEnding (EndingStyle style, double width=8, double length=10, bool inverted=false)
- EndingStyle **style** () const
- double **width** () const
- double **length** () const
- bool **inverted** () const
- void setStyle (EndingStyle style)
- void setWidth (double width)
- void setLength (double length)
- void setInverted (bool inverted)
- double **boundingDistance** () const
- double realLength () const
- void **draw** (QCPPainter ∗painter, const QCPVector2D &pos, const QCPVector2D &dir) const
- void **draw** (QCPPainter ∗painter, const QCPVector2D &pos, double angle) const

Protected Attributes

- EndingStyle **mStyle**
- double **mWidth**
- double **mLength**
- bool **mInverted**

5.60.1 Detailed Description

Handles the different ending decorations for line-like items.

For every ending a line-like item has, an instance of this class exists. For example, QCPItemLine has two endings which can be set with QCPItemLine::setHead and QCPItemLine::setTail.

The styles themselves are defined via the enum QCPLineEnding::EndingStyle. Most decorations can be modified regarding width and length, see setWidth and setLength. The direction of the ending decoration (e.g. direction an arrow is pointing) is controlled by the line-like item. For example, when both endings of a QCPItemLine are set to be arrows, they will point to opposite directions, e.g. "outward". This can be changed by setInverted, which would make the respective arrow point inward.

Note that due to the overloaded QCPLineEnding constructor, you may directly specify a QCPLineEnding::Ending↩ Style where actually a QCPLineEnding is expected, e.g.

5.60.2 Member Enumeration Documentation

5.60.2.1 EndingStyle

```
enum QCPLineEnding::EndingStyle
```

Defines the type of ending decoration for line-like items, e.g. an arrow.

The width and length of these decorations can be controlled with the functions setWidth and setLength. Some decorations like esDisc, esSquare, esDiamond and esBar only support a width, the length property is ignored.

See also

QCPItemLine::setHead, QCPItemLine::setTail, QCPItemCurve::setHead, QCPItemCurve::setTail, QCPAxis↩::setLowerEnding, QCPAxis::setUpperEnding

Enumerator

esNone	No ending decoration.
esFlatArrow	A filled arrow head with a straight/flat back (a triangle)
esSpikeArrow	A filled arrow head with an indented back.
esLineArrow	A non-filled arrow head with open back.
esDisc	A filled circle.
esSquare	A filled square.
esDiamond	A filled diamond (45 degrees rotated square)
esBar	A bar perpendicular to the line.
esHalfBar	A bar perpendicular to the line, pointing out to only one side (to which side can be changed with setInverted)
esSkewedBar	A bar that is skewed (skew controllable via setLength)

5.60.3 Constructor & Destructor Documentation

5.60.3.1 QCPLineEnding() [1/2]

```
QCPLineEnding::QCPLineEnding ( )
```

Creates a QCPLineEnding instance with default values (style esNone).

5.60.3.2 QCPLineEnding() [2/2]

```
QCPLineEnding::QCPLineEnding (
            QCPLineEnding::EndingStyle style,
            double width = 8,
            double length = 10,
            bool inverted = false )
```

Creates a QCPLineEnding instance with the specified values.

5.60.4 Member Function Documentation

5.60.4.1 realLength()

```
double QCPLineEnding::realLength ( ) const
```

Starting from the origin of this line ending (which is style specific), returns the length covered by the line ending symbol, in backward direction.

For example, the esSpikeArrow has a shorter real length than a esFlatArrow, even if both have the same setLength value, because the spike arrow has an inward curved back, which reduces the length along its center axis (the drawing origin for arrows is at the tip).

This function is used for precise, style specific placement of line endings, for example in QCPAxes.

5.60.4.2 setInverted()

```
void QCPLineEnding::setInverted (
            bool inverted )
```

Sets whether the ending decoration shall be inverted. For example, an arrow decoration will point inward when *inverted* is set to true.

Note that also the *width* direction is inverted. For symmetrical ending styles like arrows or discs, this doesn't make a difference. However, asymmetric styles like esHalfBar are affected by it, which can be used to control to which side the half bar points to.

5.60.4.3 setLength()

```
void QCPLineEnding::setLength (
            double length )
```

Sets the length of the ending decoration, if the style supports it. On arrows, for example, the length defines the size in pointing direction.

See also

setWidth

5.60.4.4 setStyle()

```
void QCPLineEnding::setStyle (
            QCPLineEnding::EndingStyle style )
```

Sets the style of the ending decoration.

5.60.4.5 setWidth()

```
void QCPLineEnding::setWidth (
            double width )
```

Sets the width of the ending decoration, if the style supports it. On arrows, for example, the width defines the size perpendicular to the arrow's pointing direction.

See also

setLength

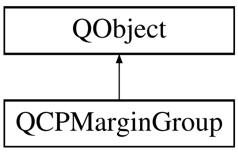
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.61 QCPMarginGroup Class Reference

A margin group allows synchronization of margin sides if working with multiple layout elements.

Inheritance diagram for QCPMarginGroup:



Public Member Functions

- QCPMarginGroup (QCustomPlot ∗parentPlot)
- QList< QCPLayoutElement ∗ > elements (QCP::MarginSide side) const
- bool isEmpty () const
- void clear ()

Protected Member Functions

- virtual int **commonMargin** (QCP::MarginSide side) const
- void **addChild** (QCP::MarginSide side, QCPLayoutElement ∗element)
- void **removeChild** (QCP::MarginSide side, QCPLayoutElement ∗element)

Protected Attributes

- QCustomPlot ∗ **mParentPlot**
- QHash< QCP::MarginSide, QList< QCPLayoutElement ∗ > > **mChildren**

Friends

- class **QCPLayoutElement**

5.61.1 Detailed Description

A margin group allows synchronization of margin sides if working with multiple layout elements.

QCPMarginGroup allows you to tie a margin side of two or more layout elements together, such that they will all have the same size, based on the largest required margin in the group.

In certain situations it is desirable that margins at specific sides are synchronized across layout elements. For example, if one QCPAxisRect is below another one in a grid layout, it will provide a cleaner look to the user if the left and right margins of the two axis rects are of the same size. The left axis of the top axis rect will then be at the same horizontal position as the left axis of the lower axis rect, making them appear aligned. The same applies for the right axes. This is what QCPMarginGroup makes possible.

To add/remove a specific side of a layout element to/from a margin group, use the QCPLayoutElement::setMargin↩Group method. To completely break apart the margin group, either call clear, or just delete the margin group.

5.61.2 Example

First create a margin group:

Then set this group on the layout element sides:

Here, we've used the first two axis rects of the plot and synchronized their left margins with each other and their right margins with each other.

5.61.3 Constructor & Destructor Documentation

5.61.3.1 QCPMarginGroup()

```
QCPMarginGroup::QCPMarginGroup (
            QCustomPlot * parentPlot )  [explicit]
```

Creates a new QCPMarginGroup instance in *parentPlot*.

5.61.4 Member Function Documentation

5.61.4.1 clear()

```
void QCPMarginGroup::clear ( )
```

Clears this margin group. The synchronization of the margin sides that use this margin group is lifted and they will use their individual margin sizes again.

5.61.4.2 elements()

```
QList< QCPLayoutElement * > QCPMarginGroup::elements (
            QCP::MarginSide side ) const  [inline]
```

Returns a list of all layout elements that have their margin *side* associated with this margin group.

5.61.4.3 isEmpty()

```
bool QCPMarginGroup::isEmpty ( ) const
```

Returns whether this margin group is empty. If this function returns true, no layout elements use this margin group to synchronize margin sides.

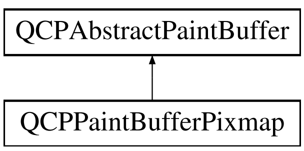
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.62 QCPPaintBufferPixmap Class Reference

A paint buffer based on QPixmap, using software raster rendering.

Inheritance diagram for QCPPaintBufferPixmap:



Public Member Functions

- QCPPaintBufferPixmap (const QSize &size, double devicePixelRatio)
- virtual QCPPainter ∗ startPainting () Q_DECL_OVERRIDE
- virtual void draw (QCPPainter ∗painter) const Q_DECL_OVERRIDE
- void clear (const QColor &color) Q_DECL_OVERRIDE

Protected Member Functions

- virtual void reallocateBuffer () Q_DECL_OVERRIDE

Protected Attributes

- QPixmap **mBuffer**

5.62.1 Detailed Description

A paint buffer based on QPixmap, using software raster rendering.

This paint buffer is the default and fall-back paint buffer which uses software rendering and QPixmap as internal buffer. It is used if QCustomPlot::setOpenGl is false.

5.62.2 Constructor & Destructor Documentation

5.62.2.1 QCPPaintBufferPixmap()

```
QCPPaintBufferPixmap::QCPPaintBufferPixmap (
            const QSize & size,
            double devicePixelRatio )  [explicit]
```

Creates a pixmap paint buffer instancen with the specified *size* and *devicePixelRatio*, if applicable.

5.62.3 Member Function Documentation

5.62.3.1 clear()

```
void QCPPaintBufferPixmap::clear (
            const QColor & color )  [virtual]
```

Fills the entire buffer with the provided *color*. To have an empty transparent buffer, use the named color `Qt::transparent`.

This method must not be called if there is currently a painter (acquired with startPainting) active.

Implements QCPAbstractPaintBuffer.

5.62.3.2 draw()

```
void QCPPaintBufferPixmap::draw (
            QCPPainter * painter ) const  [virtual]
```

Draws the contents of this buffer with the provided *painter*. This is the method that is used to finally join all paint buffers and draw them onto the screen.

Implements QCPAbstractPaintBuffer.

5.62.3.3 reallocateBuffer()

```
void QCPPaintBufferPixmap::reallocateBuffer ( )  [protected], [virtual]
```

Reallocates the internal buffer with the currently configured size (setSize) and device pixel ratio, if applicable (set↩ DevicePixelRatio). It is called as soon as any of those properties are changed on this paint buffer.

Note

Subclasses of QCPAbstractPaintBuffer must call their reimplementation of this method in their constructor, to perform the first allocation (this can not be done by the base class because calling pure virtual methods in base class constructors is not possible).

Implements QCPAbstractPaintBuffer.

5.62.3.4 startPainting()

```
QCPPainter * QCPPaintBufferPixmap::startPainting ( )  [virtual]
```

Returns a QCPPainter which is ready to draw to this buffer. The ownership and thus the responsibility to delete the painter after the painting operations are complete is given to the caller of this method.

Once you are done using the painter, delete the painter and call donePainting.

While a painter generated with this method is active, you must not call setSize, setDevicePixelRatio or clear.

This method may return 0, if a painter couldn't be activated on the buffer. This usually indicates a problem with the respective painting backend.

Implements QCPAbstractPaintBuffer.

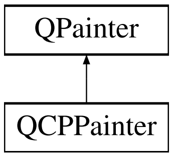
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.63 QCPPainter Class Reference

QPainter subclass used internally.

Inheritance diagram for QCPPainter:



Public Types

- enum PainterMode { pmDefault = 0x00, pmVectorized = 0x01, pmNoCaching = 0x02, pmNonCosmetic = 0x04 }

Public Member Functions

- QCPPainter ()
- QCPPainter (QPaintDevice *device)
- bool **antialiasing** () const
- PainterModes **modes** () const
- void setAntialiasing (bool enabled)
- void setMode (PainterMode mode, bool enabled=true)
- void setModes (PainterModes modes)
- bool begin (QPaintDevice *device)
- void setPen (const QPen &pen)
- void setPen (const QColor &color)
- void setPen (Qt::PenStyle penStyle)
- void drawLine (const QLineF &line)
- void **drawLine** (const QPointF &p1, const QPointF &p2)
- void save ()
- void restore ()
- void makeNonCosmetic ()

Protected Attributes

- PainterModes **mModes**
- bool **mIsAntialiasing**
- QStack< bool > **mAntialiasingStack**

5.63.1 Detailed Description

QPainter subclass used internally.

This QPainter subclass is used to provide some extended functionality e.g. for tweaking position consistency between antialiased and non-antialiased painting. Further it provides workarounds for QPainter quirks.

Warning

This class intentionally hides non-virtual functions of QPainter, e.g. setPen, save and restore. So while it is possible to pass a QCPPainter instance to a function that expects a QPainter pointer, some of the workarounds and tweaks will be unavailable to the function (because it will call the base class implementations of the functions actually hidden by QCPPainter).

5.63.2 Member Enumeration Documentation

5.63.2.1 PainterMode

`enum QCPPainter::PainterMode`

Defines special modes the painter can operate in. They disable or enable certain subsets of features/fixes/workarounds, depending on whether they are wanted on the respective output device.

Enumerator

pmDefault	`0x00` Default mode for painting on screen devices
pmVectorized	`0x01` Mode for vectorized painting (e.g. PDF export). For example, this prevents some antialiasing fixes.
pmNoCaching	`0x02` Mode for all sorts of exports (e.g. PNG, PDF,...). For example, this prevents using cached pixmap labels
pmNonCosmetic	`0x04` Turns pen widths 0 to 1, i.e. disables cosmetic pens. (A cosmetic pen is always drawn with width 1 pixel in the vector image/pdf viewer, independent of zoom.)

5.63.3 Constructor & Destructor Documentation

5.63.3.1 QCPPainter() [1/2]

`QCPPainter::QCPPainter ( )`

Creates a new QCPPainter instance and sets default values

5.63.3.2 QCPPainter() [2/2]

```
QCPPainter::QCPPainter (
            QPaintDevice * device )  [explicit]
```

Creates a new QCPPainter instance on the specified paint *device* and sets default values. Just like the analogous QPainter constructor, begins painting on *device* immediately.

Like begin, this method sets QPainter::NonCosmeticDefaultPen in Qt versions before Qt5.

5.63.4 Member Function Documentation

5.63.4.1 begin()

```
bool QCPPainter::begin (
            QPaintDevice * device )
```

Sets the QPainter::NonCosmeticDefaultPen in Qt versions before Qt5 after beginning painting on *device*. This is necessary to get cosmetic pen consistency across Qt versions, because since Qt5, all pens are non-cosmetic by default, and in Qt4 this render hint must be set to get that behaviour.

The Constructor QCPPainter(QPaintDevice ∗device) which directly starts painting also sets the render hint as appropriate.

Note

this function hides the non-virtual base class implementation.

5.63.4.2 drawLine()

```
void QCPPainter::drawLine (
            const QLineF & line )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Works around a Qt bug introduced with Qt 4.8 which makes drawing QLineF unpredictable when antialiasing is disabled. Thus when antialiasing is disabled, it rounds the *line* to integer coordinates and then passes it to the original drawLine.

Note

this function hides the non-virtual base class implementation.

5.63.4.3 makeNonCosmetic()

```
void QCPPainter::makeNonCosmetic ( )
```

Changes the pen width to 1 if it currently is 0. This function is called in the setPen overrides when the pmNonCosmetic mode is set.

5.63.4.4 restore()

```
void QCPPainter::restore ( )
```

Restores the painter (see QPainter::restore). Since QCPPainter adds some new internal state to QPainter, the save/restore functions are reimplemented to also save/restore those members.

Note

this function hides the non-virtual base class implementation.

See also

save

5.63.4.5 save()

```
void QCPPainter::save ( )
```

Saves the painter (see QPainter::save). Since QCPPainter adds some new internal state to QPainter, the save/restore functions are reimplemented to also save/restore those members.

Note

this function hides the non-virtual base class implementation.

See also

restore

5.63.4.6 setAntialiasing()

```
void QCPPainter::setAntialiasing (
            bool enabled )
```

Sets whether painting uses antialiasing or not. Use this method instead of using setRenderHint with QPainter↵ ::Antialiasing directly, as it allows QCPPainter to regain pixel exactness between antialiased and non-antialiased painting (Since Qt $<$ 5.0 uses slightly different coordinate systems for AA/Non-AA painting).

5.63.4.7 setMode()

```
void QCPPainter::setMode (
            QCPPainter::PainterMode mode,
            bool enabled = true )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets the mode of the painter. This controls whether the painter shall adjust its fixes/workarounds optimized for certain output devices.

5.63.4.8 setModes()

```
void QCPPainter::setModes (
            PainterModes modes )
```

Sets the mode of the painter. This controls whether the painter shall adjust its fixes/workarounds optimized for certain output devices.

5.63.4.9 setPen() [1/3]

```
void QCPPainter::setPen (
            const QPen & pen )
```

Sets the pen of the painter and applies certain fixes to it, depending on the mode of this QCPPainter.

Note

this function hides the non-virtual base class implementation.

5.63.4.10 setPen() [2/3]

```
void QCPPainter::setPen (
            const QColor & color )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets the pen (by color) of the painter and applies certain fixes to it, depending on the mode of this QCPPainter.

Note

this function hides the non-virtual base class implementation.

5.63.4.11 setPen() [3/3]

```
void QCPPainter::setPen (
            Qt::PenStyle penStyle )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets the pen (by style) of the painter and applies certain fixes to it, depending on the mode of this QCPPainter.

Note

this function hides the non-virtual base class implementation.

The documentation for this class was generated from the following files:

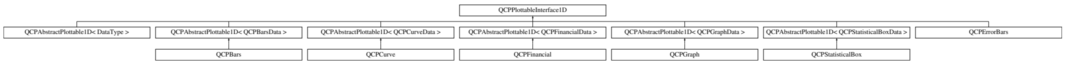
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.64 QCPPlottableInterface1D Class Reference

Defines an abstract interface for one-dimensional plottables.

`#include <qcustomplot.h>`

Inheritance diagram for QCPPlottableInterface1D:



Public Member Functions

- virtual int dataCount () const =0
- virtual double dataMainKey (int index) const =0
- virtual double dataSortKey (int index) const =0
- virtual double dataMainValue (int index) const =0
- virtual QCPRange dataValueRange (int index) const =0
- virtual QPointF dataPixelPosition (int index) const =0
- virtual bool sortKeyIsMainKey () const =0
- virtual QCPDataSelection selectTestRect (const QRectF &rect, bool onlySelectable) const =0
- virtual int findBegin (double sortKey, bool expandedRange=true) const =0
- virtual int findEnd (double sortKey, bool expandedRange=true) const =0

5.64.1 Detailed Description

Defines an abstract interface for one-dimensional plottables.

This class contains only pure virtual methods which define a common interface to the data of one-dimensional plottables.

For example, it is implemented by the template class QCPAbstractPlottable1D (the preferred base class for one-dimensional plottables). So if you use that template class as base class of your one-dimensional plottable, you won't have to care about implementing the 1d interface yourself.

If your plottable doesn't derive from QCPAbstractPlottable1D but still wants to provide a 1d interface (e.g. like QCPErrorBars does), you should inherit from both QCPAbstractPlottable and QCPPlottableInterface1D and accordingly reimplement the pure virtual methods of the 1d interface, matching your data container. Also, reimplement QCPAbstractPlottable::interface1D to return the `this` pointer.

If you have a QCPAbstractPlottable pointer, you can check whether it implements this interface by calling QCPAbstractPlottable::interface1D and testing it for a non-zero return value. If it indeed implements this interface, you may use it to access the plottable's data without needing to know the exact type of the plottable or its data point type.

5.64.2 Member Function Documentation

5.64.2.1 dataCount()

```
int QCPPlottableInterface1D::dataCount ( ) const [pure virtual]
```

Returns the number of data points of the plottable.

Implemented in QCPErrorBars, QCPAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCP←FinancialData >, QCPAbstractPlottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCPGraph←Data >, QCPAbstractPlottable1D< QCPBarsData >, and QCPAbstractPlottable1D< QCPCurveData >.

5.64.2.2 dataMainKey()

```
double QCPPlottableInterface1D::dataMainKey (
            int index ) const [pure virtual]
```

Returns the main key of the data point at the given *index*.

What the main key is, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implemented in QCPErrorBars, QCPAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCP←FinancialData >, QCPAbstractPlottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCPGraph←Data >, QCPAbstractPlottable1D< QCPBarsData >, and QCPAbstractPlottable1D< QCPCurveData >.

5.64.2.3 dataMainValue()

```
double QCPPlottableInterface1D::dataMainValue (
            int index ) const [pure virtual]
```

Returns the main value of the data point at the given *index*.

What the main value is, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implemented in QCPErrorBars, QCPAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCP←FinancialData >, QCPAbstractPlottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCPGraph←Data >, QCPAbstractPlottable1D< QCPBarsData >, and QCPAbstractPlottable1D< QCPCurveData >.

5.64.2.4 dataPixelPosition()

```
QPointF QCPPlottableInterface1D::dataPixelPosition (
            int index ) const [pure virtual]
```

Returns the pixel position on the widget surface at which the data point at the given *index* appears.

Usually this corresponds to the point of dataMainKey/dataMainValue, in pixel coordinates. However, depending on the plottable, this might be a different apparent position than just a coord-to-pixel transform of those values. For example, QCPBars apparent data values can be shifted depending on their stacking, bar grouping or configured base value.

Implemented in QCPErrorBars, QCPBars, QCPAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCPFinancialData >, QCPAbstractPlottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCP←GraphData >, QCPAbstractPlottable1D< QCPBarsData >, and QCPAbstractPlottable1D< QCPCurveData >.

5.64.2.5 dataSortKey()

```
double QCPPlottableInterface1D::dataSortKey (
            int index ) const  [pure virtual]
```

Returns the sort key of the data point at the given *index*.

What the sort key is, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implemented in QCPErrorBars, QCPAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCP↵ FinancialData >, QCPAbstractPlottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCPGraph↵ Data >, QCPAbstractPlottable1D< QCPBarsData >, and QCPAbstractPlottable1D< QCPCurveData >.

5.64.2.6 dataValueRange()

```
QCPRange QCPPlottableInterface1D::dataValueRange (
            int index ) const  [pure virtual]
```

Returns the value range of the data point at the given *index*.

What the value range is, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implemented in QCPErrorBars, QCPAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCP↵ FinancialData >, QCPAbstractPlottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCPGraph↵ Data >, QCPAbstractPlottable1D< QCPBarsData >, and QCPAbstractPlottable1D< QCPCurveData >.

5.64.2.7 findBegin()

```
int QCPPlottableInterface1D::findBegin (
            double sortKey,
            bool expandedRange = true ) const  [pure virtual]
```

Returns the index of the data point with a (sort-)key that is equal to, just below, or just above *sortKey*. If *expanded↵ Range* is true, the data point just below *sortKey* will be considered, otherwise the one just above.

This can be used in conjunction with findEnd to iterate over data points within a given key range, including or excluding the bounding data points that are just beyond the specified range.

If *expandedRange* is true but there are no data points below *sortKey*, 0 is returned.

If the container is empty, returns 0 (in that case, findEnd will also return 0, so a loop using these methods will not iterate over the index 0).

See also

findEnd, QCPDataContainer::findBegin

Implemented in QCPErrorBars, QCPAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCP↵ FinancialData >, QCPAbstractPlottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCPGraph↵ Data >, QCPAbstractPlottable1D< QCPBarsData >, and QCPAbstractPlottable1D< QCPCurveData >.

5.64.2.8 findEnd()

```
int QCPPlottableInterface1D::findEnd (
            double sortKey,
            bool expandedRange = true ) const  [pure virtual]
```

Returns the index one after the data point with a (sort-)key that is equal to, just above, or just below *sortKey*. If *expandedRange* is true, the data point just above *sortKey* will be considered, otherwise the one just below.

This can be used in conjunction with findBegin to iterate over data points within a given key range, including the bounding data points that are just below and above the specified range.

If *expandedRange* is true but there are no data points above *sortKey*, the index just above the highest data point is returned.

If the container is empty, returns 0.

See also

findBegin, QCPDataContainer::findEnd

Implemented in QCPErrorBars, QCPAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCPFinancialData >, QCPAbstractPlottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCPGraphData >, QCPAbstractPlottable1D< QCPBarsData >, and QCPAbstractPlottable1D< QCPCurveData >.

5.64.2.9 selectTestRect()

```
QCPDataSelection QCPPlottableInterface1D::selectTestRect (
            const QRectF & rect,
            bool onlySelectable ) const  [pure virtual]
```

Returns a data selection containing all the data points of this plottable which are contained (or hit by) *rect*. This is used mainly in the selection rect interaction for data selection (data selection mechanism).

If *onlySelectable* is true, an empty QCPDataSelection is returned if this plottable is not selectable (i.e. if QCPAbstractPlottable::setSelectable is QCP::stNone).

Note

rect must be a normalized rect (positive or zero width and height). This is especially important when using the rect of QCPSelectionRect::accepted, which is not necessarily normalized. Use `QRect::normalized()` when passing a rect which might not be normalized.

Implemented in QCPErrorBars, QCPFinancial, QCPStatisticalBox, QCPBars, QCPAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCPFinancialData >, QCPAbstractPlottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCPGraphData >, QCPAbstractPlottable1D< QCPBarsData >, and QCPAbstractPlottable1D< QCPCurveData >.

5.64.2.10 sortKeyIsMainKey()

```
bool QCPPlottableInterface1D::sortKeyIsMainKey ( ) const  [pure virtual]
```

Returns whether the sort key (dataSortKey) is identical to the main key (dataMainKey).

What the sort and main keys are, is defined by the plottable's data type. See the QCPDataContainer DataType documentation for details about this naming convention.

Implemented in QCPErrorBars, QCPAbstractPlottable1D< DataType >, QCPAbstractPlottable1D< QCPFinancialData >, QCPAbstractPlottable1D< QCPStatisticalBoxData >, QCPAbstractPlottable1D< QCPGraphData >, QCPAbstractPlottable1D< QCPBarsData >, and QCPAbstractPlottable1D< QCPCurveData >.

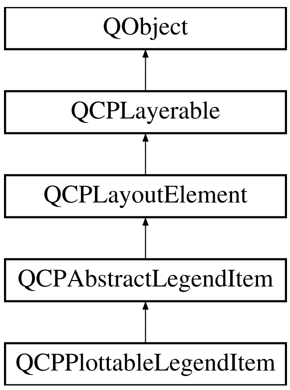
The documentation for this class was generated from the following file:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.h

5.65 QCPPlottableLegendItem Class Reference

A legend item representing a plottable with an icon and the plottable name.

Inheritance diagram for QCPPlottableLegendItem:



Public Member Functions

- QCPPlottableLegendItem (QCPLegend ∗parent, QCPAbstractPlottable ∗plottable)
- QCPAbstractPlottable ∗ **plottable** ()

Protected Member Functions

- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- virtual QSize minimumSizeHint () const Q_DECL_OVERRIDE
- QPen **getIconBorderPen** () const
- QColor **getTextColor** () const
- QFont **getFont** () const

Protected Attributes

- QCPAbstractPlottable * **mPlottable**

Additional Inherited Members

5.65.1 Detailed Description

A legend item representing a plottable with an icon and the plottable name.

This is the standard legend item for plottables. It displays an icon of the plottable next to the plottable name. The icon is drawn by the respective plottable itself (QCPAbstractPlottable::drawLegendIcon), and tries to give an intuitive symbol for the plottable. For example, the QCPGraph draws a centered horizontal line and/or a single scatter point in the middle.

Legend items of this type are always associated with one plottable (retrievable via the plottable() function and settable with the constructor). You may change the font of the plottable name with setFont. Icon padding and border pen is taken from the parent QCPLegend, see QCPLegend::setIconBorderPen and QCPLegend::setIcon↩TextPadding.

The function QCPAbstractPlottable::addToLegend/QCPAbstractPlottable::removeFromLegend creates/removes legend items of this type in the default implementation. However, these functions may be reimplemented such that a different kind of legend item (e.g a direct subclass of QCPAbstractLegendItem) is used for that plottable.

Since QCPLegend is based on QCPLayoutGrid, a legend item itself is just a subclass of QCPLayoutElement. While it could be added to a legend (or any other layout) via the normal layout interface, QCPLegend has specialized functions for handling legend items conveniently, see the documentation of QCPLegend.

5.65.2 Constructor & Destructor Documentation

5.65.2.1 QCPPlottableLegendItem()

```
QCPPlottableLegendItem::QCPPlottableLegendItem (
            QCPLegend * parent,
            QCPAbstractPlottable * plottable )
```

Creates a new legend item associated with *plottable*.

Once it's created, it can be added to the legend via QCPLegend::addItem.

A more convenient way of adding/removing a plottable to/from the legend is via the functions QCPAbstract↩Plottable::addToLegend and QCPAbstractPlottable::removeFromLegend.

5.65.3 Member Function Documentation

5.65.3.1 minimumSizeHint()

```
QSize QCPPlottableLegendItem::minimumSizeHint ( ) const [protected], [virtual]
```

Returns the minimum size this layout element (the inner rect) may be compressed to.

if a minimum size (setMinimumSize) was not set manually, parent layouts consult this function to determine the minimum allowed size of this layout element. (A manual minimum size is considered set if it is non-zero.)

Reimplemented from QCPLayoutElement.

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.66 QCPRange Class Reference

Represents the range an axis is encompassing.

Public Member Functions

- QCPRange ()
- QCPRange (double lower, double upper)
- bool **operator==** (const QCPRange &other) const
- bool **operator!=** (const QCPRange &other) const
- QCPRange & operator+= (const double &value)
- QCPRange & operator-= (const double &value)
- QCPRange & operator*= (const double &value)
- QCPRange & operator/= (const double &value)
- double size () const
- double center () const
- void normalize ()
- void expand (const QCPRange &otherRange)
- void expand (double includeCoord)
- QCPRange expanded (const QCPRange &otherRange) const
- QCPRange expanded (double includeCoord) const
- QCPRange bounded (double lowerBound, double upperBound) const
- QCPRange sanitizedForLogScale () const
- QCPRange sanitizedForLinScale () const
- bool contains (double value) const

Static Public Member Functions

- static bool validRange (double lower, double upper)
- static bool validRange (const QCPRange &range)

Public Attributes

- double **lower**
- double **upper**

Static Public Attributes

- static const double minRange = 1e-280
- static const double maxRange = 1e250

Friends

- const QCPRange operator+ (const QCPRange &, double)
- const QCPRange operator+ (double, const QCPRange &)
- const QCPRange operator- (const QCPRange &range, double value)
- const QCPRange operator* (const QCPRange &range, double value)
- const QCPRange operator* (double value, const QCPRange &range)
- const QCPRange operator/ (const QCPRange &range, double value)

Related Functions

(Note that these are not member functions.)

- QDebug operator<< (QDebug d, const QCPRange &range)

5.66.1 Detailed Description

Represents the range an axis is encompassing.

contains a *lower* and *upper* double value and provides convenience input, output and modification functions.

See also

QCPAxis::setRange

5.66.2 Constructor & Destructor Documentation

5.66.2.1 QCPRange() [1/2]

`QCPRange::QCPRange ( )`

Constructs a range with *lower* and *upper* set to zero.

5.66.2.2 QCPRange() [2/2]

```
QCPRange::QCPRange (
            double lower,
            double upper )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Constructs a range with the specified *lower* and *upper* values.

The resulting range will be normalized (see normalize), so if *lower* is not numerically smaller than *upper*, they will be swapped.

5.66.3 Member Function Documentation

5.66.3.1 bounded()

```
QCPRange QCPRange::bounded (
            double lowerBound,
            double upperBound ) const
```

Returns this range, possibly modified to not exceed the bounds provided as *lowerBound* and *upperBound*. If possible, the size of the current range is preserved in the process.

If the range shall only be bounded at the lower side, you can set *upperBound* to QCPRange::maxRange. If it shall only be bounded at the upper side, set *lowerBound* to -QCPRange::maxRange.

5.66.3.2 center()

```
double QCPRange::center ( ) const [inline]
```

Returns the center of the range, i.e. *(upper+lower)*∗*0.*5

5.66.3.3 contains()

```
bool QCPRange::contains (
            double value ) const [inline]
```

Returns true when *value* lies within or exactly on the borders of the range.

5.66.3.4 expand() [1/2]

```
void QCPRange::expand (
            const QCPRange & otherRange )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Expands this range such that *otherRange* is contained in the new range. It is assumed that both this range and *otherRange* are normalized (see normalize).

If this range contains NaN as lower or upper bound, it will be replaced by the respective bound of *otherRange*.

If *otherRange* is already inside the current range, this function does nothing.

See also

expanded

5.66.3.5 expand() [2/2]

```
void QCPRange::expand (
            double includeCoord )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Expands this range such that *includeCoord* is contained in the new range. It is assumed that this range is normalized (see normalize).

If this range contains NaN as lower or upper bound, the respective bound will be set to *includeCoord*.

If *includeCoord* is already inside the current range, this function does nothing.

See also

expand

5.66.3.6 expanded() [1/2]

```
QCPRange QCPRange::expanded (
            const QCPRange & otherRange ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Returns an expanded range that contains this and *otherRange*. It is assumed that both this range and *otherRange* are normalized (see normalize).

If this range contains NaN as lower or upper bound, the returned range's bound will be taken from *otherRange*.

See also

expand

5.66.3.7 expanded() [2/2]

```
QCPRange QCPRange::expanded (
            double includeCoord ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Returns an expanded range that includes the specified *includeCoord*. It is assumed that this range is normalized (see normalize).

If this range contains NaN as lower or upper bound, the returned range's bound will be set to *includeCoord*.

See also

expand

5.66.3.8 normalize()

```
void QCPRange::normalize ( ) [inline]
```

Makes sure *lower* is numerically smaller than *upper*. If this is not the case, the values are swapped.

5.66.3.9 operator*=()

```
QCPRange & QCPRange::operator*= (
            const double & value ) [inline]
```

Multiplies both boundaries of the range by *value*.

5.66.3.10 operator+=()

```
QCPRange & QCPRange::operator+= (
            const double & value ) [inline]
```

Adds *value* to both boundaries of the range.

5.66.3.11 operator-=()

```
QCPRange & QCPRange::operator-= (
            const double & value ) [inline]
```

Subtracts *value* from both boundaries of the range.

5.66.3.12 operator/=()

```
QCPRange & QCPRange::operator/= (
            const double & value )  [inline]
```

Divides both boundaries of the range by *value*.

5.66.3.13 sanitizedForLinScale()

```
QCPRange QCPRange::sanitizedForLinScale ( ) const
```

Returns a sanitized version of the range. Sanitized means for linear scales, that *lower* will always be numerically smaller (or equal) to *upper*.

5.66.3.14 sanitizedForLogScale()

```
QCPRange QCPRange::sanitizedForLogScale ( ) const
```

Returns a sanitized version of the range. Sanitized means for logarithmic scales, that the range won't span the positive and negative sign domain, i.e. contain zero. Further *lower* will always be numerically smaller (or equal) to *upper*.

If the original range does span positive and negative sign domains or contains zero, the returned range will try to approximate the original range as good as possible. If the positive interval of the original range is wider than the negative interval, the returned range will only contain the positive interval, with lower bound set to *rangeFac* or *rangeFac* $*$*upper*, whichever is closer to zero. Same procedure is used if the negative interval is wider than the positive interval, this time by changing the *upper* bound.

5.66.3.15 size()

```
double QCPRange::size ( ) const  [inline]
```

Returns the size of the range, i.e. *upper-lower*

5.66.3.16 validRange() [1/2]

```
bool QCPRange::validRange (
            double lower,
            double upper )  [static]
```

Checks, whether the specified range is within valid bounds, which are defined as QCPRange::maxRange and Q←CPRange::minRange. A valid range means:

- range bounds within -maxRange and maxRange
- range size above minRange
- range size below maxRange

5.66.3.17 validRange() [2/2]

```
bool QCPRange::validRange (
            const QCPRange & range )  [static]
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts. Checks, whether the specified range is within valid bounds, which are defined as QCPRange::maxRange and QCPRange::minRange. A valid range means:

- range bounds within -maxRange and maxRange
- range size above minRange
- range size below maxRange

5.66.4 Friends And Related Function Documentation

5.66.4.1 operator* [1/2]

```
const QCPRange operator* (
            const QCPRange & range,
            double value )  [friend]
```

Multiplies both boundaries of the range by *value*.

5.66.4.2 operator* [2/2]

```
const QCPRange operator* (
            double value,
            const QCPRange & range )  [friend]
```

Multiplies both boundaries of the range by *value*.

5.66.4.3 operator+ [1/2]

```
const QCPRange operator+ (
            const QCPRange & range,
            double value )  [friend]
```

Adds *value* to both boundaries of the range.

5.66.4.4 operator+ [2/2]

```
const QCPRange operator+ (
            double value,
            const QCPRange & range )  [friend]
```

Adds *value* to both boundaries of the range.

5.66.4.5 operator-

```
const QCPRange operator- (
            const QCPRange & range,
            double value ) [friend]
```

Subtracts *value* from both boundaries of the range.

5.66.4.6 operator/

```
const QCPRange operator/ (
            const QCPRange & range,
            double value ) [friend]
```

Divides both boundaries of the range by *value*.

5.66.4.7 operator<<()

```
QDebug operator<< (
            QDebug d,
            const QCPRange & range ) [related]
```

Prints *range* in a human readable format to the qDebug output.

5.66.5 Member Data Documentation

5.66.5.1 maxRange

```
const double QCPRange::maxRange = 1e250 [static]
```

Maximum values (negative and positive) the range will accept in range-changing functions. Larger absolute values would cause errors due to the 11-bit exponent of double precision numbers, corresponding to a maximum magnitude of roughly 1e308.

Warning

Do not use this constant to indicate "arbitrarily large" values in plotting logic (as values that will appear in the plot)! It is intended only as a bound to compare against, e.g. to prevent axis ranges from obtaining overflowing ranges.

See also

validRange, minRange

5.66.5.2 minRange

```
const double QCPRange::minRange = 1e-280  [static]
```

Minimum range size (*upper* - *lower*) the range changing functions will accept. Smaller intervals would cause errors due to the 11-bit exponent of double precision numbers, corresponding to a minimum magnitude of roughly 1e-308.

Warning

Do not use this constant to indicate "arbitrarily small" values in plotting logic (as values that will appear in the plot)! It is intended only as a bound to compare against, e.g. to prevent axis ranges from obtaining underflowing ranges.

See also

validRange, maxRange

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.67 QCPScatterStyle Class Reference

Represents the visual appearance of scatter points.

Public Types

- enum ScatterProperty {
  spNone = 0x00, spPen = 0x01, spBrush = 0x02, spSize = 0x04,
  spShape = 0x08, spAll = 0xFF }
- enum ScatterShape {
  ssNone, ssDot, ssCross, ssPlus,
  ssCircle, ssDisc, ssSquare, ssDiamond,
  ssStar, ssTriangle, ssTriangleInverted, ssCrossSquare,
  ssPlusSquare, ssCrossCircle, ssPlusCircle, ssPeace,
  ssPixmap, ssCustom }

Public Member Functions

- QCPScatterStyle ()
- QCPScatterStyle (ScatterShape shape, double size=6)
- QCPScatterStyle (ScatterShape shape, const QColor &color, double size)
- QCPScatterStyle (ScatterShape shape, const QColor &color, const QColor &fill, double size)
- QCPScatterStyle (ScatterShape shape, const QPen &pen, const QBrush &brush, double size)
- QCPScatterStyle (const QPixmap &pixmap)
- QCPScatterStyle (const QPainterPath &customPath, const QPen &pen, const QBrush &brush=Qt::NoBrush, double size=6)
- double **size** () const
- ScatterShape **shape** () const
- QPen **pen** () const
- QBrush **brush** () const
- QPixmap **pixmap** () const
- QPainterPath **customPath** () const
- void setFromOther (const QCPScatterStyle &other, ScatterProperties properties)
- void setSize (double size)
- void setShape (ScatterShape shape)
- void setPen (const QPen &pen)
- void setBrush (const QBrush &brush)
- void setPixmap (const QPixmap &pixmap)
- void setCustomPath (const QPainterPath &customPath)
- bool isNone () const
- bool isPenDefined () const
- void undefinePen ()
- void applyTo (QCPPainter ∗painter, const QPen &defaultPen) const
- void drawShape (QCPPainter ∗painter, const QPointF &pos) const
- void drawShape (QCPPainter ∗painter, double x, double y) const

Protected Attributes

- double **mSize**
- ScatterShape **mShape**
- QPen **mPen**
- QBrush **mBrush**
- QPixmap **mPixmap**
- QPainterPath **mCustomPath**
- bool **mPenDefined**

5.67.1 Detailed Description

Represents the visual appearance of scatter points.

This class holds information about shape, color and size of scatter points. In plottables like QCPGraph it is used to store how scatter points shall be drawn. For example, QCPGraph::setScatterStyle takes a QCPScatterStyle instance.

A scatter style consists of a shape (setShape), a line color (setPen) and possibly a fill (setBrush), if the shape provides a fillable area. Further, the size of the shape can be controlled with setSize.

5.67.2 Specifying a scatter style

You can set all these configurations either by calling the respective functions on an instance:

Or you can use one of the various constructors that take different parameter combinations, making it easy to specify a scatter style in a single call, like so:

5.67.3 Leaving the color/pen up to the plottable

There are two constructors which leave the pen undefined: QCPScatterStyle() and QCPScatterStyle(ScatterShape shape, double size). If those constructors are used, a call to isPenDefined will return false. It leads to scatter points that inherit the pen from the plottable that uses the scatter style. Thus, if such a scatter style is passed to QCPGraph, the line color of the graph (QCPGraph::setPen) will be used by the scatter points. This makes it very convenient to set up typical scatter settings:

Notice that it wasn't even necessary to explicitly call a QCPScatterStyle constructor. This works because QC↵ PScatterStyle provides a constructor that can transform a ScatterShape directly into a QCPScatterStyle instance (that's the QCPScatterStyle(ScatterShape shape, double size) constructor with a default for *size*). In those cases, C++ allows directly supplying a ScatterShape, where actually a QCPScatterStyle is expected.

5.67.4 Custom shapes and pixmaps

QCPScatterStyle supports drawing custom shapes and arbitrary pixmaps as scatter points.

For custom shapes, you can provide a QPainterPath with the desired shape to the setCustomPath function or call the constructor that takes a painter path. The scatter shape will automatically be set to ssCustom.

For pixmaps, you call setPixmap with the desired QPixmap. Alternatively you can use the constructor that takes a QPixmap. The scatter shape will automatically be set to ssPixmap. Note that setSize does not influence the appearance of the pixmap.

5.67.5 Member Enumeration Documentation

5.67.5.1 ScatterProperty

`enum QCPScatterStyle::ScatterProperty`

Represents the various properties of a scatter style instance. For example, this enum is used to specify which properties of QCPSelectionDecorator::setScatterStyle will be used when highlighting selected data points.

Specific scatter properties can be transferred between QCPScatterStyle instances via setFromOther.

Enumerator

spNone	`0x00` None
spPen	`0x01` The pen property, see setPen
spBrush	`0x02` The brush property, see setBrush
spSize	`0x04` The size property, see setSize
spShape	`0x08` The shape property, see setShape
spAll	`0xFF` All properties

5.67.5.2 ScatterShape

`enum QCPScatterStyle::ScatterShape`

Defines the shape used for scatter points.

On plottables/items that draw scatters, the sizes of these visualizations (with exception of ssDot and ssPixmap) can be controlled with the setSize function. Scatters are drawn with the pen and brush specified with setPen and setBrush.

Enumerator

ssNone	no scatter symbols are drawn (e.g. in QCPGraph, data only represented with lines)
ssDot	{ssDot.png} a single pixel (use ssDisc or ssCircle if you want a round shape with a certain radius)
ssCross	{ssCross.png} a cross
ssPlus	{ssPlus.png} a plus
ssCircle	{ssCircle.png} a circle
ssDisc	{ssDisc.png} a circle which is filled with the pen's color (not the brush as with ssCircle)
ssSquare	{ssSquare.png} a square
ssDiamond	{ssDiamond.png} a diamond
ssStar	{ssStar.png} a star with eight arms, i.e. a combination of cross and plus
ssTriangle	{ssTriangle.png} an equilateral triangle, standing on baseline
ssTriangleInverted	{ssTriangleInverted.png} an equilateral triangle, standing on corner
ssCrossSquare	{ssCrossSquare.png} a square with a cross inside
ssPlusSquare	{ssPlusSquare.png} a square with a plus inside
ssCrossCircle	{ssCrossCircle.png} a circle with a cross inside
ssPlusCircle	{ssPlusCircle.png} a circle with a plus inside
ssPeace	{ssPeace.png} a circle, with one vertical and two downward diagonal lines
ssPixmap	a custom pixmap specified by setPixmap, centered on the data point coordinates
ssCustom	custom painter operations are performed per scatter (As QPainterPath, see setCustomPath)

5.67.6 Constructor & Destructor Documentation

5.67.6.1 QCPScatterStyle() [1/7]

```
QCPScatterStyle::QCPScatterStyle ( )
```

Creates a new QCPScatterStyle instance with size set to 6. No shape, pen or brush is defined.

Since the pen is undefined (isPenDefined returns false), the scatter color will be inherited from the plottable that uses this scatter style.

5.67.6.2 QCPScatterStyle() [2/7]

```
QCPScatterStyle::QCPScatterStyle (
            ScatterShape shape,
            double size = 6 )
```

Creates a new QCPScatterStyle instance with shape set to *shape* and size to *size*. No pen or brush is defined.

Since the pen is undefined (isPenDefined returns false), the scatter color will be inherited from the plottable that uses this scatter style.

5.67.6.3 QCPScatterStyle() [3/7]

```
QCPScatterStyle::QCPScatterStyle (
            ScatterShape shape,
            const QColor & color,
            double size )
```

Creates a new QCPScatterStyle instance with shape set to *shape*, the pen color set to *color*, and size to *size*. No brush is defined, i.e. the scatter point will not be filled.

5.67.6.4 QCPScatterStyle() [4/7]

```
QCPScatterStyle::QCPScatterStyle (
            ScatterShape shape,
            const QColor & color,
            const QColor & fill,
            double size )
```

Creates a new QCPScatterStyle instance with shape set to *shape*, the pen color set to *color*, the brush color to *fill* (with a solid pattern), and size to *size*.

5.67.6.5 QCPScatterStyle() [5/7]

```
QCPScatterStyle::QCPScatterStyle (
            ScatterShape shape,
            const QPen & pen,
            const QBrush & brush,
            double size )
```

Creates a new QCPScatterStyle instance with shape set to *shape*, the pen set to *pen*, the brush to *brush*, and size to *size*.

Warning

In some cases it might be tempting to directly use a pen style like `Qt::NoPen` as *pen* and a color like `Qt::blue` as *brush*. Notice however, that the corresponding call `QCPScatterStyle(QCPScatterShape::ssCircle, Qt::NoPen, Qt::blue, 5)` doesn't necessarily lead C++ to use this constructor in some cases, but might mistake `Qt::NoPen` for a QColor and use the QCPScatterStyle(ScatterShape shape, const QColor &color, const QColor &fill, double size) constructor instead (which will lead to an unexpected look of the scatter points). To prevent this, be more explicit with the parameter types. For example, use `QBrush(Qt::blue)` instead of just `Qt::blue`, to clearly point out to the compiler that this constructor is wanted.

5.67.6.6 QCPScatterStyle() [6/7]

```
QCPScatterStyle::QCPScatterStyle (
            const QPixmap & pixmap )
```

Creates a new QCPScatterStyle instance which will show the specified *pixmap*. The scatter shape is set to ssPixmap.

5.67.6.7 QCPScatterStyle() [7/7]

```
QCPScatterStyle::QCPScatterStyle (
            const QPainterPath & customPath,
            const QPen & pen,
            const QBrush & brush = Qt::NoBrush,
            double size = 6 )
```

Creates a new QCPScatterStyle instance with a custom shape that is defined via *customPath*. The scatter shape is set to ssCustom.

The custom shape line will be drawn with *pen* and filled with *brush*. The size has a slightly different meaning than for built-in scatter points: The custom path will be drawn scaled by a factor of *size/6.0*. Since the default *size* is 6, the custom path will appear at a its natural size by default. To double the size of the path for example, set *size* to 12.

5.67.7 Member Function Documentation

5.67.7.1 applyTo()

```
void QCPScatterStyle::applyTo (
            QCPPainter * painter,
            const QPen & defaultPen ) const
```

Applies the pen and the brush of this scatter style to *painter*. If this scatter style has an undefined pen (isPen↩
Defined), sets the pen of *painter* to *defaultPen* instead.

This function is used by plottables (or any class that wants to draw scatters) just before a number of scatters with this style shall be drawn with the *painter*.

See also

drawShape

5.67.7.2 drawShape() [1/2]

```
void QCPScatterStyle::drawShape (
            QCPPainter * painter,
            const QPointF & pos ) const
```

Draws the scatter shape with *painter* at position *pos*.

This function does not modify the pen or the brush on the painter, as applyTo is meant to be called before scatter points are drawn with drawShape.

See also

applyTo

5.67.7.3 drawShape() [2/2]

```
void QCPScatterStyle::drawShape (
            QCPPainter * painter,
            double x,
            double y ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts. Draws the scatter shape with *painter* at position *x* and *y*.

5.67.7.4 isNone()

```
bool QCPScatterStyle::isNone ( ) const  [inline]
```

Returns whether the scatter shape is ssNone.

See also

setShape

5.67.7.5 isPenDefined()

```
bool QCPScatterStyle::isPenDefined ( ) const  [inline]
```

Returns whether a pen has been defined for this scatter style.

The pen is undefined if a constructor is called that does not carry *pen* as parameter. Those are QCPScatterStyle() and QCPScatterStyle(ScatterShape shape, double size). If the pen is undefined, the pen of the respective plottable will be used for drawing scatters.

If a pen was defined for this scatter style instance, and you now wish to undefine the pen, call undefinePen.

See also

setPen

5.67.7.6 setBrush()

```
void QCPScatterStyle::setBrush (
            const QBrush & brush )
```

Sets the brush that will be used to fill scatter points to *brush*. Note that not all scatter shapes have fillable areas. For example, ssPlus does not while ssCircle does.

See also

setPen

5.67.7.7 setCustomPath()

```
void QCPScatterStyle::setCustomPath (
            const QPainterPath & customPath )
```

Sets the custom shape that will be drawn as scatter point to *customPath*.

The scatter shape is automatically set to ssCustom.

5.67.7.8 setFromOther()

```
void QCPScatterStyle::setFromOther (
            const QCPScatterStyle & other,
            ScatterProperties properties )
```

Copies the specified *properties* from the *other* scatter style to this scatter style.

5.67.7.9 setPen()

```
void QCPScatterStyle::setPen (
            const QPen & pen )
```

Sets the pen that will be used to draw scatter points to *pen*.

If the pen was previously undefined (see isPenDefined), the pen is considered defined after a call to this function, even if *pen* is `Qt::NoPen`. If you have defined a pen previously by calling this function and now wish to undefine the pen, call undefinePen.

See also

setBrush

5.67.7.10 setPixmap()

```
void QCPScatterStyle::setPixmap (
            const QPixmap & pixmap )
```

Sets the pixmap that will be drawn as scatter point to *pixmap*.

Note that setSize does not influence the appearance of the pixmap.

The scatter shape is automatically set to ssPixmap.

5.67.7.11 setShape()

```
void QCPScatterStyle::setShape (
            QCPScatterStyle::ScatterShape shape )
```

Sets the shape to *shape*.

Note that the calls setPixmap and setCustomPath automatically set the shape to ssPixmap and ssCustom, respectively.

See also

setSize

5.67.7.12 setSize()

```
void QCPScatterStyle::setSize (
            double size )
```

Sets the size (pixel diameter) of the drawn scatter points to *size*.

See also

setShape

5.67.7.13 undefinePen()

```
void QCPScatterStyle::undefinePen ( )
```

Sets this scatter style to have an undefined pen (see isPenDefined for what an undefined pen implies).

A call to setPen will define a pen.

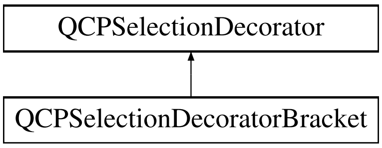
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.68 QCPSelectionDecorator Class Reference

Controls how a plottable's data selection is drawn.

Inheritance diagram for QCPSelectionDecorator:



Public Member Functions

- QCPSelectionDecorator ()
- QPen **pen** () const
- QBrush **brush** () const
- QCPScatterStyle **scatterStyle** () const
- QCPScatterStyle::ScatterProperties **usedScatterProperties** () const
- void setPen (const QPen &pen)
- void setBrush (const QBrush &brush)
- void setScatterStyle (const QCPScatterStyle &scatterStyle, QCPScatterStyle::ScatterProperties used↩ Properties=QCPScatterStyle::spPen)
- void setUsedScatterProperties (const QCPScatterStyle::ScatterProperties &properties)
- void applyPen (QCPPainter ∗painter) const
- void applyBrush (QCPPainter ∗painter) const
- QCPScatterStyle getFinalScatterStyle (const QCPScatterStyle &unselectedStyle) const
- virtual void copyFrom (const QCPSelectionDecorator ∗other)
- virtual void drawDecoration (QCPPainter ∗painter, QCPDataSelection selection)

Protected Member Functions

- virtual bool **registerWithPlottable** (QCPAbstractPlottable ∗plottable)

Protected Attributes

- QPen **mPen**
- QBrush **mBrush**
- QCPScatterStyle **mScatterStyle**
- QCPScatterStyle::ScatterProperties **mUsedScatterProperties**
- QCPAbstractPlottable ∗ **mPlottable**

Friends

- class **QCPAbstractPlottable**

5.68.1 Detailed Description

Controls how a plottable's data selection is drawn.

Each QCPAbstractPlottable instance has one QCPSelectionDecorator (accessible via QCPAbstractPlottable↩ ::selectionDecorator) and uses it when drawing selected segments of its data.

The selection decorator controls both pen (setPen) and brush (setBrush), as well as the scatter style (setScatter↩ Style) if the plottable draws scatters. Since a QCPScatterStyle is itself composed of different properties such as color shape and size, the decorator allows specifying exactly which of those properties shall be used for the selected data point, via setUsedScatterProperties.

A QCPSelectionDecorator subclass instance can be passed to a plottable via QCPAbstractPlottable::setSelection↩ Decorator, allowing greater customizability of the appearance of selected segments.

Use copyFrom to easily transfer the settings of one decorator to another one. This is especially useful since plotta- bles take ownership of the passed selection decorator, and thus the same decorator instance can not be passed to multiple plottables.

Selection decorators can also themselves perform drawing operations by reimplementing drawDecoration, which is called by the plottable's draw method. The base class QCPSelectionDecorator does not make use of this however. For example, QCPSelectionDecoratorBracket draws brackets around selected data segments.

5.68.2 Constructor & Destructor Documentation

5.68.2.1 QCPSelectionDecorator()

```
QCPSelectionDecorator::QCPSelectionDecorator ( )
```

Creates a new QCPSelectionDecorator instance with default values

5.68.3 Member Function Documentation

5.68.3.1 applyBrush()

```
void QCPSelectionDecorator::applyBrush (
            QCPPainter * painter ) const
```

Sets the brush of *painter* to the brush of this selection decorator.

See also

applyPen, getFinalScatterStyle

5.68.3.2 applyPen()

```
void QCPSelectionDecorator::applyPen (
            QCPPainter * painter ) const
```

Sets the pen of *painter* to the pen of this selection decorator.

See also

applyBrush, getFinalScatterStyle

5.68.3.3 copyFrom()

```
void QCPSelectionDecorator::copyFrom (
            const QCPSelectionDecorator * other )  [virtual]
```

Copies all properties (e.g. color, fill, scatter style) of the *other* selection decorator to this selection decorator.

5.68.3.4 drawDecoration()

```
void QCPSelectionDecorator::drawDecoration (
            QCPPainter * painter,
            QCPDataSelection selection )  [virtual]
```

This method is called by all plottables' draw methods to allow custom selection decorations to be drawn. Use the passed *painter* to perform the drawing operations. *selection* carries the data selection for which the decoration shall be drawn.

The default base class implementation of QCPSelectionDecorator has no special decoration, so this method does nothing.

Reimplemented in QCPSelectionDecoratorBracket.

5.68.3.5 getFinalScatterStyle()

```
QCPScatterStyle QCPSelectionDecorator::getFinalScatterStyle (
            const QCPScatterStyle & unselectedStyle ) const
```

Returns the scatter style that the parent plottable shall use for selected scatter points. The plottable's original (unselected) scatter style must be passed as *unselectedStyle*. Depending on the setting of setUsedScatterProperties, the returned scatter style is a mixture of this selecion decorator's scatter style (setScatterStyle), and *unselectedStyle*.

See also

applyPen, applyBrush, setScatterStyle

5.68.3.6 setBrush()

```
void QCPSelectionDecorator::setBrush (
            const QBrush & brush )
```

Sets the brush that will be used by the parent plottable to draw selected data segments.

5.68.3.7 setPen()

```
void QCPSelectionDecorator::setPen (
            const QPen & pen )
```

Sets the pen that will be used by the parent plottable to draw selected data segments.

5.68.3.8 setScatterStyle()

```
void QCPSelectionDecorator::setScatterStyle (
            const QCPScatterStyle & scatterStyle,
            QCPScatterStyle::ScatterProperties usedProperties = QCPScatterStyle::spPen )
```

Sets the scatter style that will be used by the parent plottable to draw scatters in selected data segments.

usedProperties specifies which parts of the passed *scatterStyle* will be used by the plottable. The used properties can also be changed via setUsedScatterProperties.

5.68.3.9 setUsedScatterProperties()

```
void QCPSelectionDecorator::setUsedScatterProperties (
            const QCPScatterStyle::ScatterProperties & properties )
```

Use this method to define which properties of the scatter style (set via setScatterStyle) will be used for selected data segments. All properties of the scatter style that are not specified in *properties* will remain as specified in the plottable's original scatter style.

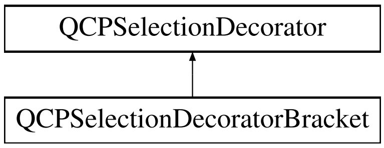
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.69 QCPSelectionDecoratorBracket Class Reference

A selection decorator which draws brackets around each selected data segment.

Inheritance diagram for QCPSelectionDecoratorBracket:



Public Types

- enum BracketStyle {
  bsSquareBracket, bsHalfEllipse, bsEllipse, bsPlus,
  bsUserStyle }

Public Member Functions

- QCPSelectionDecoratorBracket ()
- QPen **bracketPen** () const
- QBrush **bracketBrush** () const
- int **bracketWidth** () const
- int **bracketHeight** () const
- BracketStyle **bracketStyle** () const
- bool **tangentToData** () const
- int **tangentAverage** () const
- void setBracketPen (const QPen &pen)
- void setBracketBrush (const QBrush &brush)
- void setBracketWidth (int width)
- void setBracketHeight (int height)
- void setBracketStyle (BracketStyle style)
- void setTangentToData (bool enabled)
- void setTangentAverage (int pointCount)
- virtual void drawBracket (QCPPainter ∗painter, int direction) const
- virtual void drawDecoration (QCPPainter ∗painter, QCPDataSelection selection)

Protected Member Functions

- double **getTangentAngle** (const QCPPlottableInterface1D ∗interface1d, int dataIndex, int direction) const
- QPointF **getPixelCoordinates** (const QCPPlottableInterface1D ∗interface1d, int dataIndex) const

Protected Attributes

- QPen **mBracketPen**
- QBrush **mBracketBrush**
- int **mBracketWidth**
- int **mBracketHeight**
- BracketStyle **mBracketStyle**
- bool **mTangentToData**
- int **mTangentAverage**

5.69.1 Detailed Description

A selection decorator which draws brackets around each selected data segment.

Additionally to the regular highlighting of selected segments via color, fill and scatter style, this QCPSelection↩ Decorator subclass draws markers at the begin and end of each selected data segment of the plottable.

The shape of the markers can be controlled with setBracketStyle, setBracketWidth and setBracketHeight. The color/fill can be controlled with setBracketPen and setBracketBrush.

To introduce custom bracket styles, it is only necessary to sublcass QCPSelectionDecoratorBracket and reimplement drawBracket. The rest will be managed by the base class.

5.69.2 Member Enumeration Documentation

5.69.2.1 BracketStyle

`enum QCPSelectionDecoratorBracket::BracketStyle`

Defines which shape is drawn at the boundaries of selected data ranges.

Some of the bracket styles further allow specifying a height and/or width, see setBracketHeight and setBracket↩ Width.

Enumerator

bsSquareBracket	A square bracket is drawn.
bsHalfEllipse	A half ellipse is drawn. The size of the ellipse is given by the bracket width/height properties.
bsEllipse	An ellipse is drawn. The size of the ellipse is given by the bracket width/height properties.
bsPlus	A plus is drawn.
bsUserStyle	Start custom bracket styles at this index when subclassing and reimplementing drawBracket.

5.69.3 Constructor & Destructor Documentation

5.69.3.1 QCPSelectionDecoratorBracket()

`QCPSelectionDecoratorBracket::QCPSelectionDecoratorBracket ( )`

Creates a new QCPSelectionDecoratorBracket instance with default values.

5.69.4 Member Function Documentation

5.69.4.1 drawBracket()

```
void QCPSelectionDecoratorBracket::drawBracket (
            QCPPainter * painter,
            int direction ) const  [virtual]
```

Draws the bracket shape with *painter*. The parameter *direction* is either -1 or 1 and indicates whether the bracket shall point to the left or the right (i.e. is a closing or opening bracket, respectively).

The passed *painter* already contains all transformations that are necessary to position and rotate the bracket appropriately. Painting operations can be performed as if drawing upright brackets on flat data with horizontal key axis, with (0, 0) being the center of the bracket.

If you wish to sublcass QCPSelectionDecoratorBracket in order to provide custom bracket shapes (see QCP↩ SelectionDecoratorBracket::bsUserStyle), this is the method you should reimplement.

5.69.4.2 drawDecoration()

```
void QCPSelectionDecoratorBracket::drawDecoration (
            QCPPainter * painter,
            QCPDataSelection selection )  [virtual]
```

Draws the bracket decoration on the data points at the begin and end of each selected data segment given in *seletion*.

It uses the method drawBracket to actually draw the shapes.

Reimplemented from QCPSelectionDecorator.

5.69.4.3 setBracketBrush()

```
void QCPSelectionDecoratorBracket::setBracketBrush (
            const QBrush & brush )
```

Sets the brush that will be used to draw the brackets at the beginning and end of each selected data segment.

5.69.4.4 setBracketHeight()

```
void QCPSelectionDecoratorBracket::setBracketHeight (
            int height )
```

Sets the height of the drawn bracket. The height dimension is always perpendicular to the key axis of the data, or the tangent direction of the current data slope, if setTangentToData is enabled.

5.69.4.5 setBracketPen()

```
void QCPSelectionDecoratorBracket::setBracketPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the brackets at the beginning and end of each selected data segment.

5.69.4.6 setBracketStyle()

```
void QCPSelectionDecoratorBracket::setBracketStyle (
            QCPSelectionDecoratorBracket::BracketStyle style )
```

Sets the shape that the bracket/marker will have.

See also

setBracketWidth, setBracketHeight

5.69.4.7 setBracketWidth()

```
void QCPSelectionDecoratorBracket::setBracketWidth (
            int width )
```

Sets the width of the drawn bracket. The width dimension is always parallel to the key axis of the data, or the tangent direction of the current data slope, if setTangentToData is enabled.

5.69.4.8 setTangentAverage()

```
void QCPSelectionDecoratorBracket::setTangentAverage (
            int pointCount )
```

Controls over how many data points the slope shall be averaged, when brackets shall be aligned with the data (if setTangentToData is true).

From the position of the bracket, *pointCount* points towards the selected data range will be taken into account. The smallest value of *pointCount* is 1, which is effectively equivalent to disabling setTangentToData.

5.69.4.9 setTangentToData()

```
void QCPSelectionDecoratorBracket::setTangentToData (
            bool enabled )
```

Sets whether the brackets will be rotated such that they align with the slope of the data at the position that they appear in.

For noisy data, it might be more visually appealing to average the slope over multiple data points. This can be configured via setTangentAverage.

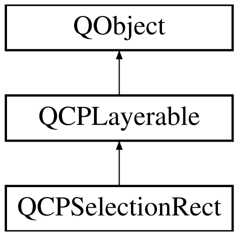
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.70 QCPSelectionRect Class Reference

Provides rect/rubber-band data selection and range zoom interaction.

Inheritance diagram for QCPSelectionRect:



Signals

- void started (QMouseEvent ∗event)
- void changed (const QRect &rect, QMouseEvent ∗event)
- void canceled (const QRect &rect, QInputEvent ∗event)
- void accepted (const QRect &rect, QMouseEvent ∗event)

Public Member Functions

- QCPSelectionRect (QCustomPlot ∗parentPlot)
- QRect **rect** () const
- QCPRange range (const QCPAxis ∗axis) const
- QPen **pen** () const
- QBrush **brush** () const
- bool isActive () const
- void setPen (const QPen &pen)
- void setBrush (const QBrush &brush)
- Q_SLOT void cancel ()

Protected Member Functions

- virtual void **startSelection** (QMouseEvent ∗event)
- virtual void **moveSelection** (QMouseEvent ∗event)
- virtual void **endSelection** (QMouseEvent ∗event)
- virtual void **keyPressEvent** (QKeyEvent ∗event)
- virtual void **applyDefaultAntialiasingHint** (QCPPainter ∗painter) const Q_DECL_OVERRIDE
- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE

Protected Attributes

- QRect **mRect**
- QPen **mPen**
- QBrush **mBrush**
- bool **mActive**

Friends

- class **QCustomPlot**

5.70.1 Detailed Description

Provides rect/rubber-band data selection and range zoom interaction.

QCPSelectionRect is used by QCustomPlot when the QCustomPlot::setSelectionRectMode is not QCP::srmNone. When the user drags the mouse across the plot, the current selection rect instance (QCustomPlot::setSelection←Rect) is forwarded these events and makes sure an according rect shape is drawn. At the begin, during, and after completion of the interaction, it emits the corresponding signals started, changed, canceled, and accepted.

The QCustomPlot instance connects own slots to the current selection rect instance, in order to react to an accepted selection rect interaction accordingly.

isActive can be used to check whether the selection rect is currently active. An ongoing selection interaction can be cancelled programmatically via calling cancel at any time.

The appearance of the selection rect can be controlled via setPen and setBrush.

If you wish to provide custom behaviour, e.g. a different visual representation of the selection rect (QCPSelection←Rect::draw), you can subclass QCPSelectionRect and pass an instance of your subclass to QCustomPlot::set←SelectionRect.

5.70.2 Constructor & Destructor Documentation

5.70.2.1 QCPSelectionRect()

```
QCPSelectionRect::QCPSelectionRect (
            QCustomPlot * parentPlot )   [explicit]
```

Creates a new QCPSelectionRect instance. To make QCustomPlot use the selection rect instance, pass it to Q←CustomPlot::setSelectionRect. *parentPlot* should be set to the same QCustomPlot widget.

5.70.3 Member Function Documentation

5.70.3.1 accepted

```
void QCPSelectionRect::accepted (
            const QRect & rect,
            QMouseEvent * event )   [signal]
```

This signal is emitted when the selection interaction was completed by the user releasing the mouse button.

Note that *rect* may have a negative width or height, if the selection is being dragged to the upper or left side of the selection rect origin.

5.70.3.2 cancel()

```
void QCPSelectionRect::cancel ( )
```

If there is currently a selection interaction going on (isActive), the interaction is canceled. The selection rect will emit the canceled signal.

5.70.3.3 canceled

```
void QCPSelectionRect::canceled (
            const QRect & rect,
            QInputEvent * event )  [signal]
```

This signal is emitted when the selection interaction was cancelled. Note that *event* is 0 if the selection interaction was cancelled programmatically, by a call to cancel.

The user may cancel the selection interaction by pressing the escape key. In this case, *event* holds the respective input event.

Note that *rect* may have a negative width or height, if the selection is being dragged to the upper or left side of the selection rect origin.

5.70.3.4 changed

```
void QCPSelectionRect::changed (
            const QRect & rect,
            QMouseEvent * event )  [signal]
```

This signal is emitted while the selection rect interaction is ongoing and the *rect* has changed its size due to the user moving the mouse.

Note that *rect* may have a negative width or height, if the selection is being dragged to the upper or left side of the selection rect origin.

5.70.3.5 isActive()

```
bool QCPSelectionRect::isActive ( ) const  [inline]
```

Returns true if there is currently a selection going on, i.e. the user has started dragging a selection rect, but hasn't released the mouse button yet.

See also

cancel

5.70.3.6 range()

```
QCPRange QCPSelectionRect::range (
            const QCPAxis * axis ) const
```

A convenience function which returns the coordinate range of the provided *axis*, that this selection rect currently encompasses.

5.70.3.7 setBrush()

```
void QCPSelectionRect::setBrush (
            const QBrush & brush )
```

Sets the brush that will be used to fill the selection rect. By default the selection rect is not filled, i.e. *brush* is `Qt::NoBrush`.

See also

setPen

5.70.3.8 setPen()

```
void QCPSelectionRect::setPen (
            const QPen & pen )
```

Sets the pen that will be used to draw the selection rect outline.

See also

setBrush

5.70.3.9 started

```
void QCPSelectionRect::started (
            QMouseEvent * event ) [signal]
```

This signal is emitted when a selection rect interaction was initiated, i.e. the user just started dragging the selection rect with the mouse.

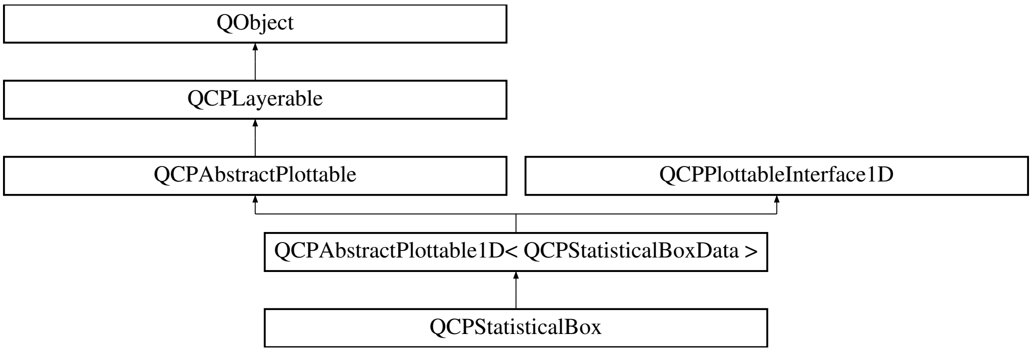
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.71 QCPStatisticalBox Class Reference

A plottable representing a single statistical box in a plot.

Inheritance diagram for QCPStatisticalBox:



Public Member Functions

- QCPStatisticalBox (QCPAxis ∗keyAxis, QCPAxis ∗valueAxis)
- QSharedPointer< QCPStatisticalBoxDataContainer > data () const
- double **width** () const
- double **whiskerWidth** () const
- QPen **whiskerPen** () const
- QPen **whiskerBarPen** () const
- bool **whiskerAntialiased** () const
- QPen **medianPen** () const
- QCPScatterStyle **outlierStyle** () const
- void setData (QSharedPointer< QCPStatisticalBoxDataContainer > data)
- void setData (const QVector< double > &keys, const QVector< double > &minimum, const QVector< double > &lowerQuartile, const QVector< double > &median, const QVector< double > &upperQuartile, const QVector< double > &maximum, bool alreadySorted=false)
- void setWidth (double width)
- void setWhiskerWidth (double width)
- void setWhiskerPen (const QPen &pen)
- void setWhiskerBarPen (const QPen &pen)
- void setWhiskerAntialiased (bool enabled)
- void setMedianPen (const QPen &pen)
- void setOutlierStyle (const QCPScatterStyle &style)
- void addData (const QVector< double > &keys, const QVector< double > &minimum, const QVector< double > &lowerQuartile, const QVector< double > &median, const QVector< double > &upperQuartile, const QVector< double > &maximum, bool alreadySorted=false)
- void addData (double key, double minimum, double lowerQuartile, double median, double upperQuartile, double maximum, const QVector< double > &outliers=QVector< double >())
- virtual QCPDataSelection selectTestRect (const QRectF &rect, bool onlySelectable) const Q_DECL_OVERRIDE
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_OVERRIDE
- virtual QCPRange getKeyRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth) const Q_DECL_OVERRIDE
- virtual QCPRange getValueRange (bool &foundRange, QCP::SignDomain inSignDomain=QCP::sdBoth, const QCPRange &inKeyRange=QCPRange()) const Q_DECL_OVERRIDE

Protected Member Functions

- virtual void **draw** (QCPPainter *painter) Q_DECL_OVERRIDE
- virtual void **drawLegendIcon** (QCPPainter *painter, const QRectF &rect) const Q_DECL_OVERRIDE
- virtual void drawStatisticalBox (QCPPainter *painter, QCPStatisticalBoxDataContainer::const_iterator it, const QCPScatterStyle &outlierStyle) const
- void **getVisibleDataBounds** (QCPStatisticalBoxDataContainer::const_iterator &begin, QCPStatisticalBox↵DataContainer::const_iterator &end) const
- QRectF **getQuartileBox** (QCPStatisticalBoxDataContainer::const_iterator it) const
- QVector< QLineF > **getWhiskerBackboneLines** (QCPStatisticalBoxDataContainer::const_iterator it) const
- QVector< QLineF > **getWhiskerBarLines** (QCPStatisticalBoxDataContainer::const_iterator it) const

Protected Attributes

- double **mWidth**
- double **mWhiskerWidth**
- QPen **mWhiskerPen**
- QPen **mWhiskerBarPen**
- bool **mWhiskerAntialiased**
- QPen **mMedianPen**
- QCPScatterStyle **mOutlierStyle**

Friends

- class **QCustomPlot**
- class **QCPLegend**

Additional Inherited Members

5.71.1 Detailed Description

A plottable representing a single statistical box in a plot.

To plot data, assign it with the setData or addData functions. Alternatively, you can also access and modify the data via the data method, which returns a pointer to the internal QCPStatisticalBoxDataContainer.

Additionally each data point can itself have a list of outliers, drawn as scatter points at the key coordinate of the respective statistical box data point. They can either be set by using the respective addData method or accessing the individual data points through data, and setting the `QVector<double> outliers` of the data points directly.

5.71.2 Changing the appearance

The appearance of each data point box, ranging from the lower to the upper quartile, is controlled via setPen and setBrush. You may change the width of the boxes with setWidth in plot coordinates.

Each data point's visual representation also consists of two whiskers. Whiskers are the lines which reach from the upper quartile to the maximum, and from the lower quartile to the minimum. The appearance of the whiskers can be modified with: setWhiskerPen, setWhiskerBarPen, setWhiskerWidth. The whisker width is the width of the bar perpendicular to the whisker at the top (for maximum) and bottom (for minimum). If the whisker pen is changed, make sure to set the `capStyle` to `Qt::FlatCap`. Otherwise the backbone line might exceed the whisker bars by a few pixels due to the pen cap being not perfectly flat.

The median indicator line inside the box has its own pen, setMedianPen.

The outlier data points are drawn as normal scatter points. Their look can be controlled with setOutlierStyle

5.71.3 Usage

Like all data representing objects in QCustomPlot, the QCPStatisticalBox is a plottable (QCPAbstractPlottable). So the plottable-interface of QCustomPlot applies (QCustomPlot::plottable, QCustomPlot::removePlottable, etc.)

Usually, you first create an instance:

which registers it with the QCustomPlot instance of the passed axes. Note that this QCustomPlot instance takes ownership of the plottable, so do not delete it manually but use QCustomPlot::removePlottable() instead. The newly created plottable can be modified, e.g.:

5.71.4 Constructor & Destructor Documentation

5.71.4.1 QCPStatisticalBox()

```
QCPStatisticalBox::QCPStatisticalBox (
            QCPAxis * keyAxis,
            QCPAxis * valueAxis )  [explicit]
```

Constructs a statistical box which uses *keyAxis* as its key axis ("x") and *valueAxis* as its value axis ("y"). *keyAxis* and *valueAxis* must reside in the same QCustomPlot instance and not have the same orientation. If either of these restrictions is violated, a corresponding message is printed to the debug output (qDebug), the construction is not aborted, though.

The created QCPStatisticalBox is automatically registered with the QCustomPlot instance inferred from *keyAxis*. This QCustomPlot instance takes ownership of the QCPStatisticalBox, so do not delete it manually but use QCustomPlot::removePlottable() instead.

5.71.5 Member Function Documentation

5.71.5.1 addData() [1/2]

```
void QCPStatisticalBox::addData (
            const QVector< double > & keys,
            const QVector< double > & minimum,
            const QVector< double > & lowerQuartile,
            const QVector< double > & median,
            const QVector< double > & upperQuartile,
            const QVector< double > & maximum,
            bool alreadySorted = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided points in *keys*, *minimum*, *lowerQuartile*, *median*, *upperQuartile* and *maximum* to the current data. The provided vectors should have equal length. Else, the number of added points will be the size of the smallest vector.

If you can guarantee that the passed data points are sorted by *keys* in ascending order, you can set *alreadySorted* to true, to improve performance by saving a sorting run.

Alternatively, you can also access and modify the data directly via the data method, which returns a pointer to the internal data container.

5.71.5.2 addData() [2/2]

```
void QCPStatisticalBox::addData (
            double key,
            double minimum,
            double lowerQuartile,
            double median,
            double upperQuartile,
            double maximum,
            const QVector< double > & outliers = QVector<double>() )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Adds the provided data point as *key*, *minimum*, *lowerQuartile*, *median*, *upperQuartile* and *maximum* to the current data.

Alternatively, you can also access and modify the data directly via the data method, which returns a pointer to the internal data container.

5.71.5.3 data()

```
QSharedPointer< QCPStatisticalBoxDataContainer > QCPStatisticalBox::data ( ) const [inline]
```

Returns a shared pointer to the internal data storage of type QCPStatisticalBoxDataContainer. You may use it to directly manipulate the data, which may be more convenient and faster than using the regular setData or addData methods.

5.71.5.4 drawStatisticalBox()

```
void QCPStatisticalBox::drawStatisticalBox (
            QCPPainter * painter,
            QCPStatisticalBoxDataContainer::const_iterator it,
            const QCPScatterStyle & outlierStyle ) const [protected], [virtual]
```

Draws the graphical representation of a single statistical box with the data given by the iterator *it* with the provided *painter*.

If the statistical box has a set of outlier data points, they are drawn with *outlierStyle*.

See also

getQuartileBox, getWhiskerBackboneLines, getWhiskerBarLines

5.71.5.5 getKeyRange()

```
QCPRange QCPStatisticalBox::getKeyRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth ) const  [virtual]
```

Returns the coordinate range that all data in this plottable span in the key axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSignDomain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getValueRange

Implements QCPAbstractPlottable.

5.71.5.6 getValueRange()

```
QCPRange QCPStatisticalBox::getValueRange (
            bool & foundRange,
            QCP::SignDomain inSignDomain = QCP::sdBoth,
            const QCPRange & inKeyRange = QCPRange() ) const  [virtual]
```

Returns the coordinate range that the data points in the specified key range (*inKeyRange*) span in the value axis dimension. For logarithmic plots, one can set *inSignDomain* to either QCP::sdNegative or QCP::sdPositive in order to restrict the returned range to that sign domain. E.g. when only negative range is wanted, set *inSignDomain* to QCP::sdNegative and all positive points will be ignored for range calculation. For no restriction, just set *inSign←Domain* to QCP::sdBoth (default). *foundRange* is an output parameter that indicates whether a range could be found or not. If this is false, you shouldn't use the returned range (e.g. no points in data).

If *inKeyRange* has both lower and upper bound set to zero (is equal to `QCPRange()`), all data points are considered, without any restriction on the keys.

Note that *foundRange* is not the same as QCPRange::validRange, since the range returned by this function may have size zero (e.g. when there is only one data point). In this case *foundRange* would return true, but the returned range is not a valid range in terms of QCPRange::validRange.

See also

rescaleAxes, getKeyRange

Implements QCPAbstractPlottable.

5.71.5.7 selectTest()

```
double QCPStatisticalBox::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const [virtual]
```

Implements a point-selection algorithm assuming the data (accessed via the 1D data interface) is point-like. Most subclasses will want to reimplement this method again, to provide a more accurate hit test based on the true data visualization geometry.

Reimplemented from QCPAbstractPlottable1D< QCPStatisticalBoxData >.

5.71.5.8 selectTestRect()

```
QCPDataSelection QCPStatisticalBox::selectTestRect (
            const QRectF & rect,
            bool onlySelectable ) const [virtual]
```

Returns a data selection containing all the data points of this plottable which are contained (or hit by) *rect*. This is used mainly in the selection rect interaction for data selection (data selection mechanism).

If *onlySelectable* is true, an empty QCPDataSelection is returned if this plottable is not selectable (i.e. if QCPAbstractPlottable::setSelectable is QCP::stNone).

Note

rect must be a normalized rect (positive or zero width and height). This is especially important when using the rect of QCPSelectionRect::accepted, which is not necessarily normalized. Use `QRect::normalized()` when passing a rect which might not be normalized.

Reimplemented from QCPAbstractPlottable1D< QCPStatisticalBoxData >.

5.71.5.9 setData() [1/2]

```
void QCPStatisticalBox::setData (
            QSharedPointer< QCPStatisticalBoxDataContainer > data )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data container with the provided *data* container.

Since a QSharedPointer is used, multiple QCPStatisticalBoxes may share the same data container safely. Modifying the data in the container will then affect all statistical boxes that share the container. Sharing can be achieved by simply exchanging the data containers wrapped in shared pointers:

If you do not wish to share containers, but create a copy from an existing container, rather use the QCPDataContainer<DataType>::set method on the statistical box data container directly:

See also

addData

5.71.5.10 setData() [2/2]

```
void QCPStatisticalBox::setData (
            const QVector< double > & keys,
            const QVector< double > & minimum,
            const QVector< double > & lowerQuartile,
            const QVector< double > & median,
            const QVector< double > & upperQuartile,
            const QVector< double > & maximum,
            bool alreadySorted = false )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Replaces the current data with the provided points in *keys*, *minimum*, *lowerQuartile*, *median*, *upperQuartile* and *maximum*. The provided vectors should have equal length. Else, the number of added points will be the size of the smallest vector.

If you can guarantee that the passed data points are sorted by *keys* in ascending order, you can set *alreadySorted* to true, to improve performance by saving a sorting run.

See also

addData

5.71.5.11 setMedianPen()

```
void QCPStatisticalBox::setMedianPen (
            const QPen & pen )
```

Sets the pen used for drawing the median indicator line inside the statistical boxes.

5.71.5.12 setOutlierStyle()

```
void QCPStatisticalBox::setOutlierStyle (
            const QCPScatterStyle & style )
```

Sets the appearance of the outlier data points.

Outliers can be specified with the method addData(double key, double minimum, double lowerQuartile, double median, double upperQuartile, double maximum, const QVector<double> &outliers)

5.71.5.13 setWhiskerAntialiased()

```
void QCPStatisticalBox::setWhiskerAntialiased (
            bool enabled )
```

Sets whether the statistical boxes whiskers are drawn with antialiasing or not.

Note that antialiasing settings may be overridden by QCustomPlot::setAntialiasedElements and QCustomPlot::set↵ NotAntialiasedElements.

5.71.5.14 setWhiskerBarPen()

```
void QCPStatisticalBox::setWhiskerBarPen (
            const QPen & pen )
```

Sets the pen used for drawing the whisker bars. Those are the lines parallel to the key axis at each end of the whisker backbone.

Whiskers are the lines which reach from the upper quartile to the maximum, and from the lower quartile to the minimum.

See also

setWhiskerPen

5.71.5.15 setWhiskerPen()

```
void QCPStatisticalBox::setWhiskerPen (
            const QPen & pen )
```

Sets the pen used for drawing the whisker backbone.

Whiskers are the lines which reach from the upper quartile to the maximum, and from the lower quartile to the minimum.

Make sure to set the `capStyle` of the passed *pen* to `Qt::FlatCap`. Otherwise the backbone line might exceed the whisker bars by a few pixels due to the pen cap being not perfectly flat.

See also

setWhiskerBarPen

5.71.5.16 setWhiskerWidth()

```
void QCPStatisticalBox::setWhiskerWidth (
            double width )
```

Sets the width of the whiskers in key coordinates.

Whiskers are the lines which reach from the upper quartile to the maximum, and from the lower quartile to the minimum.

See also

setWidth

5.71.5.17 setWidth()

```
void QCPStatisticalBox::setWidth (
            double width )
```

Sets the width of the boxes in key coordinates.

See also

setWhiskerWidth

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.72 QCPStatisticalBoxData Class Reference

Holds the data of one single data point for QCPStatisticalBox.

Public Member Functions

- QCPStatisticalBoxData ()
- QCPStatisticalBoxData (double key, double minimum, double lowerQuartile, double median, double upper↩ Quartile, double maximum, const QVector< double > &outliers=QVector< double >())
- double sortKey () const
- double mainKey () const
- double mainValue () const
- QCPRange valueRange () const

Static Public Member Functions

- static QCPStatisticalBoxData fromSortKey (double sortKey)
- static bool sortKeyIsMainKey ()

Public Attributes

- double **key**
- double **minimum**
- double **lowerQuartile**
- double **median**
- double **upperQuartile**
- double **maximum**
- QVector< double > **outliers**

5.72.1 Detailed Description

Holds the data of one single data point for QCPStatisticalBox.

The stored data is:

- *key:* coordinate on the key axis of this data point (this is the *mainKey* and the *sortKey*)
- *minimum:* the position of the lower whisker, typically the minimum measurement of the sample that's not considered an outlier.
- *lowerQuartile:* the lower end of the box. The lower and the upper quartiles are the two statistical quartiles around the median of the sample, they should contain 50% of the sample data.
- *median:* the value of the median mark inside the quartile box. The median separates the sample data in half (50% of the sample data is below/above the median). (This is the *mainValue*)
- *upperQuartile:* the upper end of the box. The lower and the upper quartiles are the two statistical quartiles around the median of the sample, they should contain 50% of the sample data.
- *maximum:* the position of the upper whisker, typically the maximum measurement of the sample that's not considered an outlier.
- *outliers:* a QVector of outlier values that will be drawn as scatter points at the *key* coordinate of this data point (see QCPStatisticalBox::setOutlierStyle)

The container for storing multiple data points is QCPStatisticalBoxDataContainer. It is a typedef for QCPDataContainer with QCPStatisticalBoxData as the DataType template parameter. See the documentation there for an explanation regarding the data type's generic methods.

See also

QCPStatisticalBoxDataContainer

5.72.2 Constructor & Destructor Documentation

5.72.2.1 QCPStatisticalBoxData() [1/2]

```
QCPStatisticalBoxData::QCPStatisticalBoxData ( )
```

Constructs a data point with key and all values set to zero.

5.72.2.2 QCPStatisticalBoxData() [2/2]

```
QCPStatisticalBoxData::QCPStatisticalBoxData (
            double key,
            double minimum,
            double lowerQuartile,
            double median,
            double upperQuartile,
            double maximum,
            const QVector< double > & outliers = QVector<double>() )
```

Constructs a data point with the specified *key*, *minimum*, *lowerQuartile*, *median*, *upperQuartile*, *maximum* and optionally a number of *outliers*.

5.72.3 Member Function Documentation

5.72.3.1 fromSortKey()

```
static QCPStatisticalBoxData QCPStatisticalBoxData::fromSortKey (
            double sortKey ) [inline], [static]
```

Returns a data point with the specified *sortKey*. All other members are set to zero.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.72.3.2 mainKey()

```
double QCPStatisticalBoxData::mainKey ( ) const [inline]
```

Returns the *key* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.72.3.3 mainValue()

```
double QCPStatisticalBoxData::mainValue ( ) const [inline]
```

Returns the *median* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.72.3.4 sortKey()

```
double QCPStatisticalBoxData::sortKey ( ) const [inline]
```

Returns the *key* member of this data point.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.72.3.5 sortKeyIsMainKey()

```
static static bool QCPStatisticalBoxData::sortKeyIsMainKey ( ) [inline], [static]
```

Since the member *key* is both the data point key coordinate and the data ordering parameter, this method returns true.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

5.72.3.6 valueRange()

```
QCPRange QCPStatisticalBoxData::valueRange ( ) const [inline]
```

Returns a QCPRange spanning from the *minimum* to the *maximum* member of this statistical box data point, possibly further expanded by outliers.

For a general explanation of what this method is good for in the context of the data container, see the documentation of QCPDataContainer.

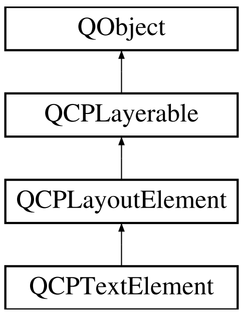
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.73 QCPTextElement Class Reference

A layout element displaying a text.

Inheritance diagram for QCPTextElement:



Signals

- void selectionChanged (bool selected)
- void **selectableChanged** (bool selectable)
- void clicked (QMouseEvent ∗event)
- void doubleClicked (QMouseEvent ∗event)

Public Member Functions

- QCPTextElement (QCustomPlot ∗parentPlot)
- QCPTextElement (QCustomPlot ∗parentPlot, const QString &text)
- QCPTextElement (QCustomPlot ∗parentPlot, const QString &text, double pointSize)
- QCPTextElement (QCustomPlot ∗parentPlot, const QString &text, const QString &fontFamily, double point↩ Size)
- QCPTextElement (QCustomPlot ∗parentPlot, const QString &text, const QFont &font)
- QString **text** () const
- int **textFlags** () const
- QFont **font** () const
- QColor **textColor** () const
- QFont **selectedFont** () const
- QColor **selectedTextColor** () const
- bool **selectable** () const
- bool **selected** () const
- void setText (const QString &text)
- void setTextFlags (int flags)
- void setFont (const QFont &font)
- void setTextColor (const QColor &color)
- void setSelectedFont (const QFont &font)
- void setSelectedTextColor (const QColor &color)
- Q_SLOT void setSelectable (bool selectable)
- Q_SLOT void setSelected (bool selected)
- virtual double selectTest (const QPointF &pos, bool onlySelectable, QVariant ∗details=0) const Q_DECL_↩ OVERRIDE
- virtual void mousePressEvent (QMouseEvent ∗event, const QVariant &details) Q_DECL_OVERRIDE
- virtual void mouseReleaseEvent (QMouseEvent ∗event, const QPointF &startPos) Q_DECL_OVERRIDE
- virtual void mouseDoubleClickEvent (QMouseEvent ∗event, const QVariant &details) Q_DECL_OVERRIDE

Protected Member Functions

- virtual void **applyDefaultAntialiasingHint** (QCPPainter ∗painter) const Q_DECL_OVERRIDE
- virtual void **draw** (QCPPainter ∗painter) Q_DECL_OVERRIDE
- virtual QSize minimumSizeHint () const Q_DECL_OVERRIDE
- virtual QSize maximumSizeHint () const Q_DECL_OVERRIDE
- virtual void **selectEvent** (QMouseEvent ∗event, bool additive, const QVariant &details, bool ∗selection↩ StateChanged) Q_DECL_OVERRIDE
- virtual void **deselectEvent** (bool ∗selectionStateChanged) Q_DECL_OVERRIDE
- QFont **mainFont** () const
- QColor **mainTextColor** () const

Protected Attributes

- QString **mText**
- int **mTextFlags**
- QFont **mFont**
- QColor **mTextColor**
- QFont **mSelectedFont**
- QColor **mSelectedTextColor**
- QRect **mTextBoundingRect**
- bool **mSelectable**
- bool **mSelected**

Additional Inherited Members

5.73.1 Detailed Description

A layout element displaying a text.

The text may be specified with setText, the formatting can be controlled with setFont, setTextColor, and setTextFlags.

A text element can be added as follows:

5.73.2 Constructor & Destructor Documentation

5.73.2.1 QCPTextElement() [1/5]

```
QCPTextElement::QCPTextElement (
            QCustomPlot * parentPlot )   [explicit]
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Creates a new QCPTextElement instance and sets default values. The initial text is empty (setText).

5.73.2.2 QCPTextElement() [2/5]

```
QCPTextElement::QCPTextElement (
            QCustomPlot * parentPlot,
            const QString & text )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Creates a new QCPTextElement instance and sets default values.

The initial text is set to *text*.

5.73.2.3 QCPTextElement() [3/5]

```
QCPTextElement::QCPTextElement (
            QCustomPlot * parentPlot,
            const QString & text,
            double pointSize )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Creates a new QCPTextElement instance and sets default values.

The initial text is set to *text* with *pointSize*.

5.73.2.4 QCPTextElement() [4/5]

```
QCPTextElement::QCPTextElement (
            QCustomPlot * parentPlot,
            const QString & text,
            const QString & fontFamily,
            double pointSize )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Creates a new QCPTextElement instance and sets default values.

The initial text is set to *text* with *pointSize* and the specified *fontFamily*.

5.73.2.5 QCPTextElement() [5/5]

```
QCPTextElement::QCPTextElement (
            QCustomPlot * parentPlot,
            const QString & text,
            const QFont & font )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Creates a new QCPTextElement instance and sets default values.

The initial text is set to *text* with the specified *font*.

5.73.3 Member Function Documentation

5.73.3.1 clicked

```
void QCPTextElement::clicked (
            QMouseEvent * event )  [signal]
```

This signal is emitted when the text element is clicked.

See also

doubleClicked, selectTest

5.73.3.2 doubleClicked

```
void QCPTextElement::doubleClicked (
            QMouseEvent * event )  [signal]
```

This signal is emitted when the text element is double clicked.

See also

clicked, selectTest

5.73.3.3 maximumSizeHint()

```
QSize QCPTextElement::maximumSizeHint ( ) const  [protected], [virtual]
```

Returns the maximum size this layout element (the inner rect) may be expanded to.

if a maximum size (setMaximumSize) was not set manually, parent layouts consult this function to determine the maximum allowed size of this layout element. (A manual maximum size is considered set if it is smaller than Qt's QWIDGETSIZE_MAX.)

Reimplemented from QCPLayoutElement.

5.73.3.4 minimumSizeHint()

```
QSize QCPTextElement::minimumSizeHint ( ) const  [protected], [virtual]
```

Returns the minimum size this layout element (the inner rect) may be compressed to.

if a minimum size (setMinimumSize) was not set manually, parent layouts consult this function to determine the minimum allowed size of this layout element. (A manual minimum size is considered set if it is non-zero.)

Reimplemented from QCPLayoutElement.

5.73.3.5 mouseDoubleClickEvent()

```
void QCPTextElement::mouseDoubleClickEvent (
            QMouseEvent * event,
            const QVariant & details )  [virtual]
```

Emits the doubleClicked signal.

Reimplemented from QCPLayerable.

5.73.3.6 mousePressEvent()

```
void QCPTextElement::mousePressEvent (
            QMouseEvent * event,
            const QVariant & details )  [virtual]
```

Accepts the mouse event in order to emit the according click signal in the mouseReleaseEvent.

Reimplemented from QCPLayerable.

5.73.3.7 mouseReleaseEvent()

```
void QCPTextElement::mouseReleaseEvent (
            QMouseEvent * event,
            const QPointF & startPos )  [virtual]
```

Emits the clicked signal if the cursor hasn't moved by more than a few pixels since the mousePressEvent.

Reimplemented from QCPLayerable.

5.73.3.8 selectionChanged

```
void QCPTextElement::selectionChanged (
            bool selected )  [signal]
```

This signal is emitted when the selection state has changed to *selected*, either by user interaction or by a direct call to setSelected.

See also

setSelected, setSelectable

5.73.3.9 selectTest()

```
double QCPTextElement::selectTest (
            const QPointF & pos,
            bool onlySelectable,
            QVariant * details = 0 ) const [virtual]
```

Returns 0.99∗selectionTolerance (see QCustomPlot::setSelectionTolerance) when *pos* is within the bounding box of the text element's text. Note that this bounding box is updated in the draw call.

If *pos* is outside the text's bounding box or if *onlySelectable* is true and this text element is not selectable (set↩ Selectable), returns -1.

Reimplemented from QCPLayoutElement.

5.73.3.10 setFont()

```
void QCPTextElement::setFont (
            const QFont & font )
```

Sets the *font* of the text.

See also

setTextColor, setSelectedFont

5.73.3.11 setSelectable()

```
void QCPTextElement::setSelectable (
            bool selectable )
```

Sets whether the user may select this text element.

Note that even when *selectable* is set to `false`, the selection state may be changed programmatically via set↩ Selected.

5.73.3.12 setSelected()

```
void QCPTextElement::setSelected (
            bool selected )
```

Sets the selection state of this text element to *selected*. If the selection has changed, selectionChanged is emitted.

Note that this function can change the selection state independently of the current setSelectable state.

5.73.3.13 setSelectedFont()

```
void QCPTextElement::setSelectedFont (
            const QFont & font )
```

Sets the *font* of the text that will be used if the text element is selected (setSelected).

See also

setFont

5.73.3.14 setSelectedTextColor()

```
void QCPTextElement::setSelectedTextColor (
            const QColor & color )
```

Sets the *color* of the text that will be used if the text element is selected (setSelected).

See also

setTextColor

5.73.3.15 setText()

```
void QCPTextElement::setText (
            const QString & text )
```

Sets the text that will be displayed to *text*. Multiple lines can be created by insertion of "\n".

See also

setFont, setTextColor, setTextFlags

5.73.3.16 setTextColor()

```
void QCPTextElement::setTextColor (
            const QColor & color )
```

Sets the *color* of the text.

See also

setFont, setSelectedTextColor

5.73.3.17 setTextFlags()

```
void QCPTextElement::setTextFlags (
            int flags )
```

Sets options for text alignment and wrapping behaviour. *flags* is a bitwise OR-combination of `Qt::Alignment↩ Flag` and `Qt::TextFlag` enums.

Possible enums are:

- Qt::AlignLeft
- Qt::AlignRight
- Qt::AlignHCenter
- Qt::AlignJustify
- Qt::AlignTop
- Qt::AlignBottom
- Qt::AlignVCenter
- Qt::AlignCenter
- Qt::TextDontClip
- Qt::TextSingleLine
- Qt::TextExpandTabs
- Qt::TextShowMnemonic
- Qt::TextWordWrap
- Qt::TextIncludeTrailingSpaces

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.74 QCPVector2D Class Reference

Represents two doubles as a mathematical 2D vector.

Public Member Functions

- QCPVector2D ()
- QCPVector2D (double x, double y)
- QCPVector2D (const QPoint &point)
- QCPVector2D (const QPointF &point)
- double **x** () const
- double **y** () const
- double & **rx** ()
- double & **ry** ()
- void setX (double x)
- void setY (double y)
- double length () const
- double lengthSquared () const
- QPoint toPoint () const
- QPointF toPointF () const
- bool isNull () const
- void normalize ()
- QCPVector2D normalized () const
- QCPVector2D perpendicular () const
- double dot (const QCPVector2D &vec) const
- double distanceSquaredToLine (const QCPVector2D &start, const QCPVector2D &end) const
- double distanceSquaredToLine (const QLineF &line) const
- double distanceToStraightLine (const QCPVector2D &base, const QCPVector2D &direction) const
- QCPVector2D & operator*= (double factor)
- QCPVector2D & operator/= (double divisor)
- QCPVector2D & operator+= (const QCPVector2D &vector)
- QCPVector2D & operator-= (const QCPVector2D &vector)

Friends

- const QCPVector2D **operator*** (double factor, const QCPVector2D &vec)
- const QCPVector2D **operator*** (const QCPVector2D &vec, double factor)
- const QCPVector2D **operator/** (const QCPVector2D &vec, double divisor)
- const QCPVector2D **operator+** (const QCPVector2D &vec1, const QCPVector2D &vec2)
- const QCPVector2D **operator-** (const QCPVector2D &vec1, const QCPVector2D &vec2)
- const QCPVector2D **operator-** (const QCPVector2D &vec)

Related Functions

(Note that these are not member functions.)

- QDebug operator<< (QDebug d, const QCPVector2D &vec)

5.74.1 Detailed Description

Represents two doubles as a mathematical 2D vector.

This class acts as a replacement for QVector2D with the advantage of double precision instead of single, and some convenience methods tailored for the QCustomPlot library.

5.74.2 Constructor & Destructor Documentation

5.74.2.1 QCPVector2D() [1/4]

```
QCPVector2D::QCPVector2D ( )
```

Creates a QCPVector2D object and initializes the x and y coordinates to 0.

5.74.2.2 QCPVector2D() [2/4]

```
QCPVector2D::QCPVector2D (
            double x,
            double y )
```

Creates a QCPVector2D object and initializes the *x* and *y* coordinates with the specified values.

5.74.2.3 QCPVector2D() [3/4]

```
QCPVector2D::QCPVector2D (
            const QPoint & point )
```

Creates a QCPVector2D object and initializes the x and y coordinates respective coordinates of the specified *point*.

5.74.2.4 QCPVector2D() [4/4]

```
QCPVector2D::QCPVector2D (
            const QPointF & point )
```

Creates a QCPVector2D object and initializes the x and y coordinates respective coordinates of the specified *point*.

5.74.3 Member Function Documentation

5.74.3.1 distanceSquaredToLine() [1/2]

```
double QCPVector2D::distanceSquaredToLine (
            const QCPVector2D & start,
            const QCPVector2D & end ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Returns the squared shortest distance of this vector (interpreted as a point) to the finite line segment given by *start* and *end*.

See also

distanceToStraightLine

5.74.3.2 distanceSquaredToLine() [2/2]

```
double QCPVector2D::distanceSquaredToLine (
            const QLineF & line ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Returns the squared shortest distance of this vector (interpreted as a point) to the finite line segment given by *line*.

See also

distanceToStraightLine

5.74.3.3 distanceToStraightLine()

```
double QCPVector2D::distanceToStraightLine (
            const QCPVector2D & base,
            const QCPVector2D & direction ) const
```

Returns the shortest distance of this vector (interpreted as a point) to the infinite straight line given by a *base* point and a *direction* vector.

See also

distanceSquaredToLine

5.74.3.4 dot()

```
double QCPVector2D::dot (
            const QCPVector2D & vec ) const [inline]
```

Returns the dot/scalar product of this vector with the specified vector *vec*.

5.74.3.5 isNull()

```
bool QCPVector2D::isNull ( ) const [inline]
```

Returns whether this vector is null. A vector is null if `qIsNull` returns true for both x and y coordinates, i.e. if both are binary equal to 0.

5.74.3.6 length()

```
double QCPVector2D::length ( ) const  [inline]
```

Returns the length of this vector.

See also

lengthSquared

5.74.3.7 lengthSquared()

```
double QCPVector2D::lengthSquared ( ) const  [inline]
```

Returns the squared length of this vector. In some situations, e.g. when just trying to find the shortest vector of a group, this is faster than calculating length, because it avoids calculation of a square root.

See also

length

5.74.3.8 normalize()

```
void QCPVector2D::normalize ( )
```

Normalizes this vector. After this operation, the length of the vector is equal to 1.

See also

normalized, length, lengthSquared

5.74.3.9 normalized()

```
QCPVector2D QCPVector2D::normalized ( ) const
```

Returns a normalized version of this vector. The length of the returned vector is equal to 1.

See also

normalize, length, lengthSquared

5.74.3.10 operator*=()

```
QCPVector2D & QCPVector2D::operator*= (
            double factor )
```

Scales this vector by the given *factor*, i.e. the x and y components are multiplied by *factor*.

5.74.3.11 operator+=()

```
QCPVector2D & QCPVector2D::operator+= (
            const QCPVector2D & vector )
```

Adds the given *vector* to this vector component-wise.

5.74.3.12 operator-=()

```
QCPVector2D & QCPVector2D::operator-= (
            const QCPVector2D & vector )
```

subtracts the given *vector* from this vector component-wise.

5.74.3.13 operator/=()

```
QCPVector2D & QCPVector2D::operator/= (
            double divisor )
```

Scales this vector by the given *divisor*, i.e. the x and y components are divided by *divisor*.

5.74.3.14 perpendicular()

```
QCPVector2D QCPVector2D::perpendicular ( ) const [inline]
```

Returns a vector perpendicular to this vector, with the same length.

5.74.3.15 setX()

```
void QCPVector2D::setX (
            double x ) [inline]
```

Sets the x coordinate of this vector to *x*.

See also

setY

5.74.3.16 setY()

```
void QCPVector2D::setY (
            double y )  [inline]
```

Sets the y coordinate of this vector to *y*.

See also

setX

5.74.3.17 toPoint()

```
QPoint QCPVector2D::toPoint ( ) const  [inline]
```

Returns a QPoint which has the x and y coordinates of this vector, truncating any floating point information.

See also

toPointF

5.74.3.18 toPointF()

```
QPointF QCPVector2D::toPointF ( ) const  [inline]
```

Returns a QPointF which has the x and y coordinates of this vector.

See also

toPoint

5.74.4 Friends And Related Function Documentation

5.74.4.1 operator<<()

```
QDebug operator<< (
            QDebug d,
            const QCPVector2D & vec )  [related]
```

Prints *vec* in a human readable format to the qDebug output.

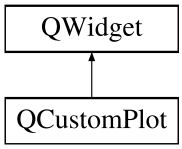
The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.75 QCustomPlot Class Reference

The central class of the library. This is the QWidget which displays the plot and interacts with the user.

Inheritance diagram for QCustomPlot:



Public Types

- enum LayerInsertMode { limBelow, limAbove }
- enum RefreshPriority { rpImmediateRefresh, rpQueuedRefresh, rpRefreshHint, rpQueuedReplot }

Signals

- void mouseDoubleClick (QMouseEvent ∗event)
- void mousePress (QMouseEvent ∗event)
- void mouseMove (QMouseEvent ∗event)
- void mouseRelease (QMouseEvent ∗event)
- void mouseWheel (QWheelEvent ∗event)
- void plottableClick (QCPAbstractPlottable ∗plottable, int dataIndex, QMouseEvent ∗event)
- void plottableDoubleClick (QCPAbstractPlottable ∗plottable, int dataIndex, QMouseEvent ∗event)
- void itemClick (QCPAbstractItem ∗item, QMouseEvent ∗event)
- void itemDoubleClick (QCPAbstractItem ∗item, QMouseEvent ∗event)
- void axisClick (QCPAxis ∗axis, QCPAxis::SelectablePart part, QMouseEvent ∗event)
- void axisDoubleClick (QCPAxis ∗axis, QCPAxis::SelectablePart part, QMouseEvent ∗event)
- void legendClick (QCPLegend ∗legend, QCPAbstractLegendItem ∗item, QMouseEvent ∗event)
- void legendDoubleClick (QCPLegend ∗legend, QCPAbstractLegendItem ∗item, QMouseEvent ∗event)
- void selectionChangedByUser ()
- void beforeReplot ()
- void afterReplot ()

Public Member Functions

- QCustomPlot (QWidget ∗parent=0)
- QRect **viewport** () const
- double **bufferDevicePixelRatio** () const
- QPixmap **background** () const
- bool **backgroundScaled** () const
- Qt::AspectRatioMode **backgroundScaledMode** () const
- QCPLayoutGrid ∗ plotLayout () const
- QCP::AntialiasedElements **antialiasedElements** () const
- QCP::AntialiasedElements **notAntialiasedElements** () const
- bool **autoAddPlottableToLegend** () const
- const QCP::Interactions **interactions** () const
- int **selectionTolerance** () const
- bool **noAntialiasingOnDrag** () const

- QCP::PlottingHints **plottingHints** () const
- Qt::KeyboardModifier **multiSelectModifier** () const
- QCP::SelectionRectMode **selectionRectMode** () const
- QCPSelectionRect ∗ selectionRect () const
- bool **openGl** () const
- void setViewport (const QRect &rect)
- void setBufferDevicePixelRatio (double ratio)
- void setBackground (const QPixmap &pm)
- void setBackground (const QPixmap &pm, bool scaled, Qt::AspectRatioMode mode=Qt::KeepAspectRatio←ByExpanding)
- void setBackground (const QBrush &brush)
- void setBackgroundScaled (bool scaled)
- void setBackgroundScaledMode (Qt::AspectRatioMode mode)
- void setAntialiasedElements (const QCP::AntialiasedElements &antialiasedElements)
- void setAntialiasedElement (QCP::AntialiasedElement antialiasedElement, bool enabled=true)
- void setNotAntialiasedElements (const QCP::AntialiasedElements &notAntialiasedElements)
- void setNotAntialiasedElement (QCP::AntialiasedElement notAntialiasedElement, bool enabled=true)
- void setAutoAddPlottableToLegend (bool on)
- void setInteractions (const QCP::Interactions &interactions)
- void setInteraction (const QCP::Interaction &interaction, bool enabled=true)
- void setSelectionTolerance (int pixels)
- void setNoAntialiasingOnDrag (bool enabled)
- void setPlottingHints (const QCP::PlottingHints &hints)
- void setPlottingHint (QCP::PlottingHint hint, bool enabled=true)
- void setMultiSelectModifier (Qt::KeyboardModifier modifier)
- void setSelectionRectMode (QCP::SelectionRectMode mode)
- void setSelectionRect (QCPSelectionRect ∗selectionRect)
- void setOpenGl (bool enabled, int multisampling=16)
- QCPAbstractPlottable ∗ plottable (int index)
- QCPAbstractPlottable ∗ plottable ()
- bool removePlottable (QCPAbstractPlottable ∗plottable)
- bool removePlottable (int index)
- int clearPlottables ()
- int plottableCount () const
- QList< QCPAbstractPlottable ∗ > selectedPlottables () const
- QCPAbstractPlottable ∗ plottableAt (const QPointF &pos, bool onlySelectable=false) const
- bool hasPlottable (QCPAbstractPlottable ∗plottable) const
- QCPGraph ∗ graph (int index) const
- QCPGraph ∗ graph () const
- QCPGraph ∗ addGraph (QCPAxis ∗keyAxis=0, QCPAxis ∗valueAxis=0)
- bool removeGraph (QCPGraph ∗graph)
- bool removeGraph (int index)
- int clearGraphs ()
- int graphCount () const
- QList< QCPGraph ∗ > selectedGraphs () const
- QCPAbstractItem ∗ item (int index) const
- QCPAbstractItem ∗ item () const
- bool removeItem (QCPAbstractItem ∗item)
- bool removeItem (int index)
- int clearItems ()
- int itemCount () const
- QList< QCPAbstractItem ∗ > selectedItems () const
- QCPAbstractItem ∗ itemAt (const QPointF &pos, bool onlySelectable=false) const
- bool hasItem (QCPAbstractItem ∗item) const
- QCPLayer ∗ layer (const QString &name) const

- QCPLayer ∗ layer (int index) const
- QCPLayer ∗ currentLayer () const
- bool setCurrentLayer (const QString &name)
- bool setCurrentLayer (QCPLayer ∗layer)
- int layerCount () const
- bool addLayer (const QString &name, QCPLayer ∗otherLayer=0, LayerInsertMode insertMode=limAbove)
- bool removeLayer (QCPLayer ∗layer)
- bool moveLayer (QCPLayer ∗layer, QCPLayer ∗otherLayer, LayerInsertMode insertMode=limAbove)
- int axisRectCount () const
- QCPAxisRect ∗ axisRect (int index=0) const
- QList< QCPAxisRect ∗ > axisRects () const
- QCPLayoutElement ∗ layoutElementAt (const QPointF &pos) const
- QCPAxisRect ∗ axisRectAt (const QPointF &pos) const
- Q_SLOT void rescaleAxes (bool onlyVisiblePlottables=false)
- QList< QCPAxis ∗ > selectedAxes () const
- QList< QCPLegend ∗ > selectedLegends () const
- Q_SLOT void deselectAll ()
- bool savePdf (const QString &fileName, int width=0, int height=0, QCP::ExportPen exportPen=QCP::ep←AllowCosmetic, const QString &pdfCreator=QString(), const QString &pdfTitle=QString())
- bool savePng (const QString &fileName, int width=0, int height=0, double scale=1.0, int quality=-1, int resolution=96, QCP::ResolutionUnit resolutionUnit=QCP::ruDotsPerInch)
- bool saveJpg (const QString &fileName, int width=0, int height=0, double scale=1.0, int quality=-1, int resolution=96, QCP::ResolutionUnit resolutionUnit=QCP::ruDotsPerInch)
- bool saveBmp (const QString &fileName, int width=0, int height=0, double scale=1.0, int resolution=96, Q←CP::ResolutionUnit resolutionUnit=QCP::ruDotsPerInch)
- bool saveRastered (const QString &fileName, int width, int height, double scale, const char ∗format, int quality=-1, int resolution=96, QCP::ResolutionUnit resolutionUnit=QCP::ruDotsPerInch)
- QPixmap toPixmap (int width=0, int height=0, double scale=1.0)
- void toPainter (QCPPainter ∗painter, int width=0, int height=0)
- Q_SLOT void replot (QCustomPlot::RefreshPriority refreshPriority=QCustomPlot::rpRefreshHint)

Public Attributes

- QCPAxis ∗ xAxis
- QCPAxis ∗ yAxis
- QCPAxis ∗ xAxis2
- QCPAxis ∗ yAxis2
- QCPLegend ∗ legend

Protected Member Functions

- virtual QSize **minimumSizeHint** () const Q_DECL_OVERRIDE
- virtual QSize **sizeHint** () const Q_DECL_OVERRIDE
- virtual void **paintEvent** (QPaintEvent ∗event) Q_DECL_OVERRIDE
- virtual void **resizeEvent** (QResizeEvent ∗event) Q_DECL_OVERRIDE
- virtual void **mouseDoubleClickEvent** (QMouseEvent ∗event) Q_DECL_OVERRIDE
- virtual void **mousePressEvent** (QMouseEvent ∗event) Q_DECL_OVERRIDE
- virtual void **mouseMoveEvent** (QMouseEvent ∗event) Q_DECL_OVERRIDE
- virtual void **mouseReleaseEvent** (QMouseEvent ∗event) Q_DECL_OVERRIDE
- virtual void **wheelEvent** (QWheelEvent ∗event) Q_DECL_OVERRIDE
- virtual void **draw** (QCPPainter ∗painter)
- virtual void **updateLayout** ()
- virtual void **axisRemoved** (QCPAxis ∗axis)

- virtual void **legendRemoved** (QCPLegend ∗legend)
- virtual Q_SLOT void **processRectSelection** (QRect rect, QMouseEvent ∗event)
- virtual Q_SLOT void **processRectZoom** (QRect rect, QMouseEvent ∗event)
- virtual Q_SLOT void **processPointSelection** (QMouseEvent ∗event)
- bool **registerPlottable** (QCPAbstractPlottable ∗plottable)
- bool **registerGraph** (QCPGraph ∗graph)
- bool **registerItem** (QCPAbstractItem ∗item)
- void **updateLayerIndices** () const
- QCPLayerable ∗ **layerableAt** (const QPointF &pos, bool onlySelectable, QVariant ∗selectionDetails=0) const
- QList< QCPLayerable ∗ > **layerableListAt** (const QPointF &pos, bool onlySelectable, QList< QVariant > ∗selectionDetails=0) const
- void **drawBackground** (QCPPainter ∗painter)
- void **setupPaintBuffers** ()
- QCPAbstractPaintBuffer ∗ **createPaintBuffer** ()
- bool hasInvalidatedPaintBuffers ()
- bool **setupOpenGl** ()
- void **freeOpenGl** ()

Protected Attributes

- QRect **mViewport**
- double **mBufferDevicePixelRatio**
- QCPLayoutGrid ∗ **mPlotLayout**
- bool **mAutoAddPlottableToLegend**
- QList< QCPAbstractPlottable ∗ > **mPlottables**
- QList< QCPGraph ∗ > **mGraphs**
- QList< QCPAbstractItem ∗ > **mItems**
- QList< QCPLayer ∗ > **mLayers**
- QCP::AntialiasedElements **mAntialiasedElements**
- QCP::AntialiasedElements **mNotAntialiasedElements**
- QCP::Interactions **mInteractions**
- int **mSelectionTolerance**
- bool **mNoAntialiasingOnDrag**
- QBrush **mBackgroundBrush**
- QPixmap **mBackgroundPixmap**
- QPixmap **mScaledBackgroundPixmap**
- bool **mBackgroundScaled**
- Qt::AspectRatioMode **mBackgroundScaledMode**
- QCPLayer ∗ **mCurrentLayer**
- QCP::PlottingHints **mPlottingHints**
- Qt::KeyboardModifier **mMultiSelectModifier**
- QCP::SelectionRectMode **mSelectionRectMode**
- QCPSelectionRect ∗ **mSelectionRect**
- bool **mOpenGl**
- QList< QSharedPointer< QCPAbstractPaintBuffer > > **mPaintBuffers**
- QPoint **mMousePressPos**
- bool **mMouseHasMoved**
- QPointer< QCPLayerable > **mMouseEventLayerable**
- QVariant **mMouseEventLayerableDetails**
- bool **mReplotting**
- bool **mReplotQueued**
- int **mOpenGlMultisamples**
- QCP::AntialiasedElements **mOpenGlAntialiasedElementsBackup**
- bool **mOpenGlCacheLabelsBackup**

Friends

- class **QCPLegend**
- class **QCPAxis**
- class **QCPLayer**
- class **QCPAxisRect**
- class **QCPAbstractPlottable**
- class **QCPGraph**
- class **QCPAbstractItem**

5.75.1 Detailed Description

The central class of the library. This is the QWidget which displays the plot and interacts with the user.

For tutorials on how to use QCustomPlot, see the website
`http://www.qcustomplot.com/`

5.75.2 Member Enumeration Documentation

5.75.2.1 LayerInsertMode

`enum QCustomPlot::LayerInsertMode`

Defines how a layer should be inserted relative to an other layer.

See also

addLayer, moveLayer

Enumerator

limBelow	Layer is inserted below other layer.
limAbove	Layer is inserted above other layer.

5.75.2.2 RefreshPriority

`enum QCustomPlot::RefreshPriority`

Defines with what timing the QCustomPlot surface is refreshed after a replot.

See also

replot

Enumerator

rpImmediateRefresh	Replots immediately and repaints the widget immediately by calling QWidget::repaint() after the replot.
rpQueuedRefresh	Replots immediately, but queues the widget repaint, by calling QWidget::update() after the replot. This way multiple redundant widget repaints can be avoided.
rpRefreshHint	Whether to use immediate or queued refresh depends on whether the plotting hint QCP::phImmediateRefresh is set, see setPlottingHints.
rpQueuedReplot	Queues the entire replot for the next event loop iteration. This way multiple redundant replots can be avoided. The actual replot is then done with rpRefreshHint priority.

5.75.3 Constructor & Destructor Documentation

5.75.3.1 QCustomPlot()

```
QCustomPlot::QCustomPlot (
            QWidget * parent = 0 )  [explicit]
```

Constructs a QCustomPlot and sets reasonable default values.

5.75.4 Member Function Documentation

5.75.4.1 addGraph()

```
QCPGraph * QCustomPlot::addGraph (
            QCPAxis * keyAxis = 0,
            QCPAxis * valueAxis = 0 )
```

Creates a new graph inside the plot. If *keyAxis* and *valueAxis* are left unspecified (0), the bottom (xAxis) is used as key and the left (yAxis) is used as value axis. If specified, *keyAxis* and *valueAxis* must reside in this QCustomPlot.

keyAxis will be used as key axis (typically "x") and *valueAxis* as value axis (typically "y") for the graph.

Returns a pointer to the newly created graph, or 0 if adding the graph failed.

See also

graph, graphCount, removeGraph, clearGraphs

5.75.4.2 addLayer()

```
bool QCustomPlot::addLayer (
            const QString & name,
            QCPLayer * otherLayer = 0,
            QCustomPlot::LayerInsertMode insertMode = limAbove )
```

Adds a new layer to this QCustomPlot instance. The new layer will have the name *name*, which must be unique. Depending on *insertMode*, it is positioned either below or above *otherLayer*.

Returns true on success, i.e. if there is no other layer named *name* and *otherLayer* is a valid layer inside this QCustomPlot.

If *otherLayer* is 0, the highest layer in the QCustomPlot will be used.

For an explanation of what layers are in QCustomPlot, see the documentation of QCPLayer.

See also

layer, moveLayer, removeLayer

5.75.4.3 afterReplot

```
void QCustomPlot::afterReplot ( )  [signal]
```

This signal is emitted immediately after a replot has taken place (caused by a call to the slot replot).

It is safe to mutually connect the replot slot with this signal on two QCustomPlots to make them replot synchronously, it won't cause an infinite recursion.

See also

replot, beforeReplot

5.75.4.4 axisClick

```
void QCustomPlot::axisClick (
            QCPAxis * axis,
            QCPAxis::SelectablePart part,
            QMouseEvent * event )  [signal]
```

This signal is emitted when an axis is clicked.

event is the mouse event that caused the click, *axis* is the axis that received the click and *part* indicates the part of the axis that was clicked.

See also

axisDoubleClick

5.75.4.5 axisDoubleClick

```
void QCustomPlot::axisDoubleClick (
            QCPAxis * axis,
            QCPAxis::SelectablePart part,
            QMouseEvent * event ) [signal]
```

This signal is emitted when an axis is double clicked.

event is the mouse event that caused the click, *axis* is the axis that received the click and *part* indicates the part of the axis that was clicked.

See also

axisClick

5.75.4.6 axisRect()

```
QCPAxisRect * QCustomPlot::axisRect (
            int index = 0 ) const
```

Returns the axis rect with *index*.

Initially, only one axis rect (with index 0) exists in the plot. If multiple axis rects were added, all of them may be accessed with this function in a linear fashion (even when they are nested in a layout hierarchy or inside other axis rects via QCPAxisRect::insetLayout).

See also

axisRectCount, axisRects

5.75.4.7 axisRectAt()

```
QCPAxisRect * QCustomPlot::axisRectAt (
            const QPointF & pos ) const
```

Returns the layout element of type QCPAxisRect at pixel position *pos*. This method ignores other layout elements even if they are visually in front of the axis rect (e.g. a QCPLegend). If there is no axis rect at that position, returns 0.

Only visible axis rects are used. If QCPLayoutElement::setVisible on the axis rect itself or on any of its parent elements is set to false, it will not be considered.

See also

layoutElementAt

5.75.4.8 axisRectCount()

`int QCustomPlot::axisRectCount ( ) const`

Returns the number of axis rects in the plot.

All axis rects can be accessed via QCustomPlot::axisRect().

Initially, only one axis rect exists in the plot.

See also

axisRect, axisRects

5.75.4.9 axisRects()

`QList< QCPAxisRect * > QCustomPlot::axisRects ( ) const`

Returns all axis rects in the plot.

See also

axisRectCount, axisRect

5.75.4.10 beforeReplot

`void QCustomPlot::beforeReplot ( ) [signal]`

This signal is emitted immediately before a replot takes place (caused by a call to the slot replot).

It is safe to mutually connect the replot slot with this signal on two QCustomPlots to make them replot synchronously, it won't cause an infinite recursion.

See also

replot, afterReplot

5.75.4.11 clearGraphs()

`int QCustomPlot::clearGraphs ( )`

Removes all graphs from the plot and deletes them. Corresponding legend items are also removed from the default legend (QCustomPlot::legend).

Returns the number of graphs removed.

See also

removeGraph

5.75.4.12 clearItems()

```
int QCustomPlot::clearItems ( )
```

Removes all items from the plot and deletes them.

Returns the number of items removed.

See also

removeItem

5.75.4.13 clearPlottables()

```
int QCustomPlot::clearPlottables ( )
```

Removes all plottables from the plot and deletes them. Corresponding legend items are also removed from the default legend (QCustomPlot::legend).

Returns the number of plottables removed.

See also

removePlottable

5.75.4.14 currentLayer()

```
QCPLayer * QCustomPlot::currentLayer ( ) const
```

Returns the layer that is set as current layer (see setCurrentLayer).

5.75.4.15 deselectAll()

```
void QCustomPlot::deselectAll ( )
```

Deselects all layerables (plottables, items, axes, legends,...) of the QCustomPlot.

Since calling this function is not a user interaction, this does not emit the selectionChangedByUser signal. The individual selectionChanged signals are emitted though, if the objects were previously selected.

See also

setInteractions, selectedPlottables, selectedItems, selectedAxes, selectedLegends

5.75.4.16 graph() [1/2]

```
QCPGraph * QCustomPlot::graph (
             int index ) const
```

Returns the graph with *index*. If the index is invalid, returns 0.

There is an overloaded version of this function with no parameter which returns the last created graph, see QCustomPlot::graph()

See also

graphCount, addGraph

5.75.4.17 graph() [2/2]

```
QCPGraph * QCustomPlot::graph ( ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Returns the last graph, that was created with addGraph. If there are no graphs in the plot, returns 0.

See also

graphCount, addGraph

5.75.4.18 graphCount()

```
int QCustomPlot::graphCount ( ) const
```

Returns the number of currently existing graphs in the plot

See also

graph, addGraph

5.75.4.19 hasInvalidatedPaintBuffers()

```
bool QCustomPlot::hasInvalidatedPaintBuffers ( ) [protected]
```

This method returns whether any of the paint buffers held by this QCustomPlot instance are invalidated.

If any buffer is invalidated, a partial replot (QCPLayer::replot) is not allowed and always causes a full replot (QCustomPlot::replot) of all layers. This is the case when for example the layer order has changed, new layers were added, layers were removed, or layer modes were changed (QCPLayer::setMode).

See also

QCPAbstractPaintBuffer::setInvalidated

5.75.4.20 hasItem()

```
bool QCustomPlot::hasItem (
            QCPAbstractItem * item ) const
```

Returns whether this QCustomPlot contains the *item*.

See also

item

5.75.4.21 hasPlottable()

```
bool QCustomPlot::hasPlottable (
            QCPAbstractPlottable * plottable ) const
```

Returns whether this QCustomPlot instance contains the *plottable*.

5.75.4.22 item() [1/2]

```
QCPAbstractItem * QCustomPlot::item (
            int index ) const
```

Returns the item with *index*. If the index is invalid, returns 0.

There is an overloaded version of this function with no parameter which returns the last added item, see QCustom↩
Plot::item()

See also

itemCount

5.75.4.23 item() [2/2]

```
QCPAbstractItem * QCustomPlot::item ( ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Returns the last item that was added to this plot. If there are no items in the plot, returns 0.

See also

itemCount

5.75.4.24 itemAt()

```
QCPAbstractItem * QCustomPlot::itemAt (
            const QPointF & pos,
            bool onlySelectable = false ) const
```

Returns the item at the pixel position *pos*. Items that only consist of single lines (e.g. QCPItemLine or QCPItem↩Curve) have a tolerance band around them, see setSelectionTolerance. If multiple items come into consideration, the one closest to *pos* is returned.

If *onlySelectable* is true, only items that are selectable (QCPAbstractItem::setSelectable) are considered.

If there is no item at *pos*, the return value is 0.

See also

plottableAt, layoutElementAt

5.75.4.25 itemClick

```
void QCustomPlot::itemClick (
            QCPAbstractItem * item,
            QMouseEvent * event ) [signal]
```

This signal is emitted when an item is clicked.

event is the mouse event that caused the click and *item* is the item that received the click.

See also

itemDoubleClick

5.75.4.26 itemCount()

```
int QCustomPlot::itemCount ( ) const
```

Returns the number of currently existing items in the plot

See also

item

5.75.4.27 itemDoubleClick

```
void QCustomPlot::itemDoubleClick (
            QCPAbstractItem * item,
            QMouseEvent * event ) [signal]
```

This signal is emitted when an item is double clicked.

event is the mouse event that caused the click and *item* is the item that received the click.

See also

itemClick

5.75.4.28 layer() [1/2]

```
QCPLayer * QCustomPlot::layer (
            const QString & name ) const
```

Returns the layer with the specified *name*. If there is no layer with the specified name, 0 is returned.

Layer names are case-sensitive.

See also

addLayer, moveLayer, removeLayer

5.75.4.29 layer() [2/2]

```
QCPLayer * QCustomPlot::layer (
            int index ) const
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Returns the layer by *index*. If the index is invalid, 0 is returned.

See also

addLayer, moveLayer, removeLayer

5.75.4.30 layerCount()

```
int QCustomPlot::layerCount ( ) const
```

Returns the number of currently existing layers in the plot

See also

layer, addLayer

5.75.4.31 layoutElementAt()

```
QCPLayoutElement * QCustomPlot::layoutElementAt (
            const QPointF & pos ) const
```

Returns the layout element at pixel position *pos*. If there is no element at that position, returns 0.

Only visible elements are used. If QCPLayoutElement::setVisible on the element itself or on any of its parent elements is set to false, it will not be considered.

See also

itemAt, plottableAt

5.75.4.32 legendClick

```
void QCustomPlot::legendClick (
            QCPLegend * legend,
            QCPAbstractLegendItem * item,
            QMouseEvent * event ) [signal]
```

This signal is emitted when a legend (item) is clicked.

event is the mouse event that caused the click, *legend* is the legend that received the click and *item* is the legend item that received the click. If only the legend and no item is clicked, *item* is 0. This happens for a click inside the legend padding or the space between two items.

See also

legendDoubleClick

5.75.4.33 legendDoubleClick

```
void QCustomPlot::legendDoubleClick (
            QCPLegend * legend,
            QCPAbstractLegendItem * item,
            QMouseEvent * event ) [signal]
```

This signal is emitted when a legend (item) is double clicked.

event is the mouse event that caused the click, *legend* is the legend that received the click and *item* is the legend item that received the click. If only the legend and no item is clicked, *item* is 0. This happens for a click inside the legend padding or the space between two items.

See also

legendClick

5.75.4.34 mouseDoubleClick

```
void QCustomPlot::mouseDoubleClick (
            QMouseEvent * event ) [signal]
```

This signal is emitted when the QCustomPlot receives a mouse double click event.

5.75.4.35 mouseMove

```
void QCustomPlot::mouseMove (
            QMouseEvent * event ) [signal]
```

This signal is emitted when the QCustomPlot receives a mouse move event.

It is emitted before QCustomPlot handles any other mechanism like range dragging. So a slot connected to this signal can still influence the behaviour e.g. with QCPAxisRect::setRangeDrag or QCPAxisRect::setRangeDrag↩ Axes.

Warning

It is discouraged to change the drag-axes with QCPAxisRect::setRangeDragAxes here, because the dragging starting point was saved the moment the mouse was pressed. Thus it only has a meaning for the range drag axes that were set at that moment. If you want to change the drag axes, consider doing this in the mousePress signal instead.

5.75.4.36 mousePress

```
void QCustomPlot::mousePress (
            QMouseEvent * event ) [signal]
```

This signal is emitted when the QCustomPlot receives a mouse press event.

It is emitted before QCustomPlot handles any other mechanism like range dragging. So a slot connected to this signal can still influence the behaviour e.g. with QCPAxisRect::setRangeDrag or QCPAxisRect::setRangeDrag↩ Axes.

5.75.4.37 mouseRelease

```
void QCustomPlot::mouseRelease (
            QMouseEvent * event )  [signal]
```

This signal is emitted when the QCustomPlot receives a mouse release event.

It is emitted before QCustomPlot handles any other mechanisms like object selection. So a slot connected to this signal can still influence the behaviour e.g. with setInteractions or QCPAbstractPlottable::setSelectable.

5.75.4.38 mouseWheel

```
void QCustomPlot::mouseWheel (
            QWheelEvent * event )  [signal]
```

This signal is emitted when the QCustomPlot receives a mouse wheel event.

It is emitted before QCustomPlot handles any other mechanisms like range zooming. So a slot connected to this signal can still influence the behaviour e.g. with QCPAxisRect::setRangeZoom, QCPAxisRect::setRangeZoomAxes or QCPAxisRect::setRangeZoomFactor.

5.75.4.39 moveLayer()

```
bool QCustomPlot::moveLayer (
            QCPLayer * layer,
            QCPLayer * otherLayer,
            QCustomPlot::LayerInsertMode insertMode = limAbove )
```

Moves the specified *layer* either above or below *otherLayer*. Whether it's placed above or below is controlled with *insertMode*.

Returns true on success, i.e. when both *layer* and *otherLayer* are valid layers in the QCustomPlot.

See also

layer, addLayer, moveLayer

5.75.4.40 plotLayout()

```
QCPLayoutGrid * QCustomPlot::plotLayout ( ) const  [inline]
```

Returns the top level layout of this QCustomPlot instance. It is a QCPLayoutGrid, initially containing just one cell with the main QCPAxisRect inside.

5.75.4.41 plottable() [1/2]

```
QCPAbstractPlottable * QCustomPlot::plottable (
            int index )
```

Returns the plottable with *index*. If the index is invalid, returns 0.

There is an overloaded version of this function with no parameter which returns the last added plottable, see QCustomPlot::plottable()

See also

plottableCount

5.75.4.42 plottable() [2/2]

```
QCPAbstractPlottable * QCustomPlot::plottable ( )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Returns the last plottable that was added to the plot. If there are no plottables in the plot, returns 0.

See also

plottableCount

5.75.4.43 plottableAt()

```
QCPAbstractPlottable * QCustomPlot::plottableAt (
            const QPointF & pos,
            bool onlySelectable = false ) const
```

Returns the plottable at the pixel position *pos*. Plottables that only consist of single lines (like graphs) have a tolerance band around them, see setSelectionTolerance. If multiple plottables come into consideration, the one closest to *pos* is returned.

If *onlySelectable* is true, only plottables that are selectable (QCPAbstractPlottable::setSelectable) are considered.

If there is no plottable at *pos*, the return value is 0.

See also

itemAt, layoutElementAt

5.75.4.44 plottableClick

```
void QCustomPlot::plottableClick (
            QCPAbstractPlottable * plottable,
            int dataIndex,
            QMouseEvent * event )  [signal]
```

This signal is emitted when a plottable is clicked.

event is the mouse event that caused the click and *plottable* is the plottable that received the click. The parameter *dataIndex* indicates the data point that was closest to the click position.

See also

plottableDoubleClick

5.75.4.45 plottableCount()

```
int QCustomPlot::plottableCount ( ) const
```

Returns the number of currently existing plottables in the plot

See also

plottable

5.75.4.46 plottableDoubleClick

```
void QCustomPlot::plottableDoubleClick (
            QCPAbstractPlottable * plottable,
            int dataIndex,
            QMouseEvent * event )  [signal]
```

This signal is emitted when a plottable is double clicked.

event is the mouse event that caused the click and *plottable* is the plottable that received the click. The parameter *dataIndex* indicates the data point that was closest to the click position.

See also

plottableClick

5.75.4.47 removeGraph() [1/2]

```
bool QCustomPlot::removeGraph (
            QCPGraph * graph )
```

Removes the specified *graph* from the plot and deletes it. If necessary, the corresponding legend item is also removed from the default legend (QCustomPlot::legend). If any other graphs in the plot have a channel fill set towards the removed graph, the channel fill property of those graphs is reset to zero (no channel fill).

Returns true on success.

See also

clearGraphs

5.75.4.48 removeGraph() [2/2]

```
bool QCustomPlot::removeGraph (
            int index )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Removes and deletes the graph by its *index*.

5.75.4.49 removeItem() [1/2]

```
bool QCustomPlot::removeItem (
            QCPAbstractItem * item )
```

Removes the specified item from the plot and deletes it.

Returns true on success.

See also

clearItems

5.75.4.50 removeItem() [2/2]

```
bool QCustomPlot::removeItem (
            int index )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Removes and deletes the item by its *index*.

5.75.4.51 removeLayer()

```
bool QCustomPlot::removeLayer (
            QCPLayer * layer )
```

Removes the specified *layer* and returns true on success.

All layerables (e.g. plottables and items) on the removed layer will be moved to the layer below *layer*. If *layer* is the bottom layer, the layerables are moved to the layer above. In both cases, the total rendering order of all layerables in the QCustomPlot is preserved.

If *layer* is the current layer (setCurrentLayer), the layer below (or above, if bottom layer) becomes the new current layer.

It is not possible to remove the last layer of the plot.

See also

layer, addLayer, moveLayer

5.75.4.52 removePlottable() [1/2]

```
bool QCustomPlot::removePlottable (
            QCPAbstractPlottable * plottable )
```

Removes the specified plottable from the plot and deletes it. If necessary, the corresponding legend item is also removed from the default legend (QCustomPlot::legend).

Returns true on success.

See also

clearPlottables

5.75.4.53 removePlottable() [2/2]

```
bool QCustomPlot::removePlottable (
            int index )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Removes and deletes the plottable by its *index*.

5.75.4.54 replot()

```
void QCustomPlot::replot (
            QCustomPlot::RefreshPriority refreshPriority = QCustomPlot::rpRefreshHint )
```

Causes a complete replot into the internal paint buffer(s). Finally, the widget surface is refreshed with the new buffer contents. This is the method that must be called to make changes to the plot, e.g. on the axis ranges or data points of graphs, visible.

The parameter *refreshPriority* can be used to fine-tune the timing of the replot. For example if your application calls replot very quickly in succession (e.g. multiple independent functions change some aspects of the plot and each wants to make sure the change gets replotted), it is advisable to set *refreshPriority* to QCustomPlot::rpQueued↩ Replot. This way, the actual replotting is deferred to the next event loop iteration. Multiple successive calls of replot with this priority will only cause a single replot, avoiding redundant replots and improving performance.

Under a few circumstances, QCustomPlot causes a replot by itself. Those are resize events of the QCustomPlot widget and user interactions (object selection and range dragging/zooming).

Before the replot happens, the signal beforeReplot is emitted. After the replot, afterReplot is emitted. It is safe to mutually connect the replot slot with any of those two signals on two QCustomPlots to make them replot synchronously, it won't cause an infinite recursion.

If a layer is in mode QCPLayer::lmBuffered (QCPLayer::setMode), it is also possible to replot only that specific layer via QCPLayer::replot. See the documentation there for details.

5.75.4.55 rescaleAxes()

```
void QCustomPlot::rescaleAxes (
            bool onlyVisiblePlottables = false )
```

Rescales the axes such that all plottables (like graphs) in the plot are fully visible.

if *onlyVisiblePlottables* is set to true, only the plottables that have their visibility set to true (QCPLayerable::set↩ Visible), will be used to rescale the axes.

See also

QCPAbstractPlottable::rescaleAxes, QCPAxis::rescale

5.75.4.56 saveBmp()

```
bool QCustomPlot::saveBmp (
            const QString & fileName,
            int width = 0,
            int height = 0,
            double scale = 1.0,
            int resolution = 96,
            QCP::ResolutionUnit resolutionUnit = QCP::ruDotsPerInch )
```

Saves a BMP image file to *fileName* on disc. The output plot will have the dimensions *width* and *height* in pixels, multiplied by *scale*. If either *width* or *height* is zero, the current width and height of the QCustomPlot widget is used instead. Line widths and texts etc. are not scaled up when larger widths/heights are used. If you want that effect, use the *scale* parameter.

For example, if you set both *width* and *height* to 100 and *scale* to 2, you will end up with an image file of size 200∗200 in which all graphical elements are scaled up by factor 2 (line widths, texts, etc.). This scaling is not done by stretching a 100∗100 image, the result will have full 200∗200 pixel resolution.

If you use a high scaling factor, it is recommended to enable antialiasing for all elements by temporarily setting QCustomPlot::setAntialiasedElements to QCP::aeAll as this allows QCustomPlot to place objects with sub-pixel accuracy.

The *resolution* will be written to the image file header and has no direct consequence for the quality or the pixel size. However, if opening the image with a tool which respects the metadata, it will be able to scale the image to match either a given size in real units of length (inch, centimeters, etc.), or the target display DPI. You can specify in which units *resolution* is given, by setting *resolutionUnit*. The *resolution* is converted to the format's expected resolution unit internally.

Returns true on success. If this function fails, most likely the BMP format isn't supported by the system, see Qt docs about QImageWriter::supportedImageFormats().

The objects of the plot will appear in the current selection state. If you don't want any selected objects to be painted in their selected look, deselect everything with deselectAll before calling this function.

Warning

If calling this function inside the constructor of the parent of the QCustomPlot widget (i.e. the MainWindow constructor, if QCustomPlot is inside the MainWindow), always provide explicit non-zero widths and heights. If you leave *width* or *height* as 0 (default), this function uses the current width and height of the QCustomPlot widget. However, in Qt, these aren't defined yet inside the constructor, so you would get an image that has strange widths/heights.

See also

savePdf, savePng, saveJpg, saveRastered

5.75.4.57 saveJpg()

```
bool QCustomPlot::saveJpg (
            const QString & fileName,
            int width = 0,
            int height = 0,
            double scale = 1.0,
            int quality = -1,
            int resolution = 96,
            QCP::ResolutionUnit resolutionUnit = QCP::ruDotsPerInch )
```

Saves a JPEG image file to *fileName* on disc. The output plot will have the dimensions *width* and *height* in pixels, multiplied by *scale*. If either *width* or *height* is zero, the current width and height of the QCustomPlot widget is used instead. Line widths and texts etc. are not scaled up when larger widths/heights are used. If you want that effect, use the *scale* parameter.

For example, if you set both *width* and *height* to 100 and *scale* to 2, you will end up with an image file of size 200∗200 in which all graphical elements are scaled up by factor 2 (line widths, texts, etc.). This scaling is not done by stretching a 100∗100 image, the result will have full 200∗200 pixel resolution.

If you use a high scaling factor, it is recommended to enable antialiasing for all elements by temporarily setting QCustomPlot::setAntialiasedElements to QCP::aeAll as this allows QCustomPlot to place objects with sub-pixel accuracy.

image compression can be controlled with the *quality* parameter which must be between 0 and 100 or -1 to use the default setting.

The *resolution* will be written to the image file header and has no direct consequence for the quality or the pixel size. However, if opening the image with a tool which respects the metadata, it will be able to scale the image to match either a given size in real units of length (inch, centimeters, etc.), or the target display DPI. You can specify in which units *resolution* is given, by setting *resolutionUnit*. The *resolution* is converted to the format's expected resolution unit internally.

Returns true on success. If this function fails, most likely the JPEG format isn't supported by the system, see Qt docs about QImageWriter::supportedImageFormats().

The objects of the plot will appear in the current selection state. If you don't want any selected objects to be painted in their selected look, deselect everything with deselectAll before calling this function.

Warning

If calling this function inside the constructor of the parent of the QCustomPlot widget (i.e. the MainWindow constructor, if QCustomPlot is inside the MainWindow), always provide explicit non-zero widths and heights. If you leave *width* or *height* as 0 (default), this function uses the current width and height of the QCustomPlot widget. However, in Qt, these aren't defined yet inside the constructor, so you would get an image that has strange widths/heights.

See also

savePdf, savePng, saveBmp, saveRastered

5.75.4.58 savePdf()

```
bool QCustomPlot::savePdf (
            const QString & fileName,
            int width = 0,
            int height = 0,
            QCP::ExportPen exportPen = QCP::epAllowCosmetic,
            const QString & pdfCreator = QString(),
            const QString & pdfTitle = QString() )
```

Saves a PDF with the vectorized plot to the file *fileName*. The axis ratio as well as the scale of texts and lines will be derived from the specified *width* and *height*. This means, the output will look like the normal on-screen output of a QCustomPlot widget with the corresponding pixel width and height. If either *width* or *height* is zero, the exported image will have the same dimensions as the QCustomPlot widget currently has.

Setting *exportPen* to QCP::epNoCosmetic allows to disable the use of cosmetic pens when drawing to the PDF file. Cosmetic pens are pens with numerical width 0, which are always drawn as a one pixel wide line, no matter what zoom factor is set in the PDF-Viewer. For more information about cosmetic pens, see the QPainter and QPen documentation.

The objects of the plot will appear in the current selection state. If you don't want any selected objects to be painted in their selected look, deselect everything with deselectAll before calling this function.

Returns true on success.

Warning

- If you plan on editing the exported PDF file with a vector graphics editor like Inkscape, it is advised to set *exportPen* to QCP::epNoCosmetic to avoid losing those cosmetic lines (which might be quite many, because cosmetic pens are the default for e.g. axes and tick marks).
- If calling this function inside the constructor of the parent of the QCustomPlot widget (i.e. the Main←Window constructor, if QCustomPlot is inside the MainWindow), always provide explicit non-zero widths and heights. If you leave *width* or *height* as 0 (default), this function uses the current width and height of the QCustomPlot widget. However, in Qt, these aren't defined yet inside the constructor, so you would get an image that has strange widths/heights.

pdfCreator and *pdfTitle* may be used to set the according metadata fields in the resulting PDF file.

Note

On Android systems, this method does nothing and issues an according qDebug warning message. This is also the case if for other reasons the define flag `QT_NO_PRINTER` is set.

See also

savePng, saveBmp, saveJpg, saveRastered

5.75.4.59 savePng()

```
bool QCustomPlot::savePng (
            const QString & fileName,
            int width = 0,
            int height = 0,
            double scale = 1.0,
            int quality = -1,
            int resolution = 96,
            QCP::ResolutionUnit resolutionUnit = QCP::ruDotsPerInch )
```

Saves a PNG image file to *fileName* on disc. The output plot will have the dimensions *width* and *height* in pixels, multiplied by *scale*. If either *width* or *height* is zero, the current width and height of the QCustomPlot widget is used instead. Line widths and texts etc. are not scaled up when larger widths/heights are used. If you want that effect, use the *scale* parameter.

For example, if you set both *width* and *height* to 100 and *scale* to 2, you will end up with an image file of size 200∗200 in which all graphical elements are scaled up by factor 2 (line widths, texts, etc.). This scaling is not done by stretching a 100∗100 image, the result will have full 200∗200 pixel resolution.

If you use a high scaling factor, it is recommended to enable antialiasing for all elements by temporarily setting QCustomPlot::setAntialiasedElements to QCP::aeAll as this allows QCustomPlot to place objects with sub-pixel accuracy.

image compression can be controlled with the *quality* parameter which must be between 0 and 100 or -1 to use the default setting.

The *resolution* will be written to the image file header and has no direct consequence for the quality or the pixel size. However, if opening the image with a tool which respects the metadata, it will be able to scale the image to match either a given size in real units of length (inch, centimeters, etc.), or the target display DPI. You can specify in which units *resolution* is given, by setting *resolutionUnit*. The *resolution* is converted to the format's expected resolution unit internally.

Returns true on success. If this function fails, most likely the PNG format isn't supported by the system, see Qt docs about QImageWriter::supportedImageFormats().

The objects of the plot will appear in the current selection state. If you don't want any selected objects to be painted in their selected look, deselect everything with deselectAll before calling this function.

If you want the PNG to have a transparent background, call setBackground(const QBrush &brush) with no brush (Qt::NoBrush) or a transparent color (Qt::transparent), before saving.

Warning

If calling this function inside the constructor of the parent of the QCustomPlot widget (i.e. the MainWindow constructor, if QCustomPlot is inside the MainWindow), always provide explicit non-zero widths and heights. If you leave *width* or *height* as 0 (default), this function uses the current width and height of the QCustomPlot widget. However, in Qt, these aren't defined yet inside the constructor, so you would get an image that has strange widths/heights.

See also

savePdf, saveBmp, saveJpg, saveRastered

5.75.4.60 saveRastered()

```
bool QCustomPlot::saveRastered (
            const QString & fileName,
            int width,
            int height,
            double scale,
            const char * format,
            int quality = -1,
            int resolution = 96,
            QCP::ResolutionUnit resolutionUnit = QCP::ruDotsPerInch )
```

Saves the plot to a rastered image file *fileName* in the image format *format*. The plot is sized to *width* and *height* in pixels and scaled with *scale*. (width 100 and scale 2.0 lead to a full resolution file with width 200.) If the *format* supports compression, *quality* may be between 0 and 100 to control it.

Returns true on success. If this function fails, most likely the given *format* isn't supported by the system, see Qt docs about QImageWriter::supportedImageFormats().

The *resolution* will be written to the image file header (if the file format supports this) and has no direct consequence for the quality or the pixel size. However, if opening the image with a tool which respects the metadata, it will be able to scale the image to match either a given size in real units of length (inch, centimeters, etc.), or the target display DPI. You can specify in which units *resolution* is given, by setting *resolutionUnit*. The *resolution* is converted to the format's expected resolution unit internally.

See also

saveBmp, saveJpg, savePng, savePdf

5.75.4.61 selectedAxes()

```
QList< QCPAxis * > QCustomPlot::selectedAxes ( ) const
```

Returns the axes that currently have selected parts, i.e. whose selection state is not QCPAxis::spNone.

See also

selectedPlottables, selectedLegends, setInteractions, QCPAxis::setSelectedParts, QCPAxis::setSelectable↩ Parts

5.75.4.62 selectedGraphs()

`QList< QCPGraph * > QCustomPlot::selectedGraphs ( ) const`

Returns a list of the selected graphs. If no graphs are currently selected, the list is empty.

If you are not only interested in selected graphs but other plottables like QCPCurve, QCPBars, etc., use selected↩ Plottables.

See also

setInteractions, selectedPlottables, QCPAbstractPlottable::setSelectable, QCPAbstractPlottable::setSelection

5.75.4.63 selectedItems()

`QList< QCPAbstractItem * > QCustomPlot::selectedItems ( ) const`

Returns a list of the selected items. If no items are currently selected, the list is empty.

See also

setInteractions, QCPAbstractItem::setSelectable, QCPAbstractItem::setSelected

5.75.4.64 selectedLegends()

`QList< QCPLegend * > QCustomPlot::selectedLegends ( ) const`

Returns the legends that currently have selected parts, i.e. whose selection state is not QCPLegend::spNone.

See also

selectedPlottables, selectedAxes, setInteractions, QCPLegend::setSelectedParts, QCPLegend::set↩ SelectableParts, QCPLegend::selectedItems

5.75.4.65 selectedPlottables()

`QList< QCPAbstractPlottable * > QCustomPlot::selectedPlottables ( ) const`

Returns a list of the selected plottables. If no plottables are currently selected, the list is empty.

There is a convenience function if you're only interested in selected graphs, see selectedGraphs.

See also

setInteractions, QCPAbstractPlottable::setSelectable, QCPAbstractPlottable::setSelection

5.75.4.66 selectionChangedByUser

```
void QCustomPlot::selectionChangedByUser ( )  [signal]
```

This signal is emitted after the user has changed the selection in the QCustomPlot, e.g. by clicking. It is not emitted when the selection state of an object has changed programmatically by a direct call to `setSelected()/set←Selection()` on an object or by calling deselectAll.

In addition to this signal, selectable objects also provide individual signals, for example QCPAxis::selectionChanged or QCPAbstractPlottable::selectionChanged. Note that those signals are emitted even if the selection state is changed programmatically.

See the documentation of setInteractions for details about the selection mechanism.

See also

selectedPlottables, selectedGraphs, selectedItems, selectedAxes, selectedLegends

5.75.4.67 selectionRect()

```
QCPSelectionRect * QCustomPlot::selectionRect ( ) const  [inline]
```

Allows access to the currently used QCPSelectionRect instance (or subclass thereof), that is used to handle and draw selection rect interactions (see setSelectionRectMode).

See also

setSelectionRect

5.75.4.68 setAntialiasedElement()

```
void QCustomPlot::setAntialiasedElement (
            QCP::AntialiasedElement antialiasedElement,
            bool enabled = true )
```

Sets whether the specified *antialiasedElement* is forcibly drawn antialiased.

See setAntialiasedElements for details.

See also

setNotAntialiasedElement

5.75.4.69 setAntialiasedElements()

```
void QCustomPlot::setAntialiasedElements (
            const QCP::AntialiasedElements & antialiasedElements )
```

Sets which elements are forcibly drawn antialiased as an *or* combination of QCP::AntialiasedElement.

This overrides the antialiasing settings for whole element groups, normally controlled with the *setAntialiasing* function on the individual elements. If an element is neither specified in setAntialiasedElements nor in setNot↩AntialiasedElements, the antialiasing setting on each individual element instance is used.

For example, if *antialiasedElements* contains QCP::aePlottables, all plottables will be drawn antialiased, no matter what the specific QCPAbstractPlottable::setAntialiased value was set to.

if an element in *antialiasedElements* is already set in setNotAntialiasedElements, it is removed from there.

See also

setNotAntialiasedElements

5.75.4.70 setAutoAddPlottableToLegend()

```
void QCustomPlot::setAutoAddPlottableToLegend (
            bool on )
```

If set to true, adding a plottable (e.g. a graph) to the QCustomPlot automatically also adds the plottable to the legend (QCustomPlot::legend).

See also

addGraph, QCPLegend::addItem

5.75.4.71 setBackground() [1/3]

```
void QCustomPlot::setBackground (
            const QPixmap & pm )
```

Sets *pm* as the viewport background pixmap (see setViewport). The pixmap is always drawn below all other objects in the plot.

For cases where the provided pixmap doesn't have the same size as the viewport, scaling can be enabled with setBackgroundScaled and the scaling mode (whether and how the aspect ratio is preserved) can be set with set↩BackgroundScaledMode. To set all these options in one call, consider using the overloaded version of this function.

If a background brush was set with setBackground(const QBrush &brush), the viewport will first be filled with that brush, before drawing the background pixmap. This can be useful for background pixmaps with translucent areas.

See also

setBackgroundScaled, setBackgroundScaledMode

5.75.4.72 setBackground() [2/3]

```
void QCustomPlot::setBackground (
            const QPixmap & pm,
            bool scaled,
            Qt::AspectRatioMode mode = Qt::KeepAspectRatioByExpanding )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Allows setting the background pixmap of the viewport, whether it shall be scaled and how it shall be scaled in one call.

See also

setBackground(const QPixmap &pm), setBackgroundScaled, setBackgroundScaledMode

5.75.4.73 setBackground() [3/3]

```
void QCustomPlot::setBackground (
            const QBrush & brush )
```

Sets the background brush of the viewport (see setViewport).

Before drawing everything else, the background is filled with *brush*. If a background pixmap was set with set↩ Background(const QPixmap &pm), this brush will be used to fill the viewport before the background pixmap is drawn. This can be useful for background pixmaps with translucent areas.

Set *brush* to Qt::NoBrush or Qt::Transparent to leave background transparent. This can be useful for exporting to image formats which support transparency, e.g. savePng.

See also

setBackgroundScaled, setBackgroundScaledMode

5.75.4.74 setBackgroundScaled()

```
void QCustomPlot::setBackgroundScaled (
            bool scaled )
```

Sets whether the viewport background pixmap shall be scaled to fit the viewport. If *scaled* is set to true, control whether and how the aspect ratio of the original pixmap is preserved with setBackgroundScaledMode.

Note that the scaled version of the original pixmap is buffered, so there is no performance penalty on replots. (Except when the viewport dimensions are changed continuously.)

See also

setBackground, setBackgroundScaledMode

5.75.4.75 setBackgroundScaledMode()

```
void QCustomPlot::setBackgroundScaledMode (
            Qt::AspectRatioMode mode )
```

If scaling of the viewport background pixmap is enabled (setBackgroundScaled), use this function to define whether and how the aspect ratio of the original pixmap is preserved.

See also

setBackground, setBackgroundScaled

5.75.4.76 setBufferDevicePixelRatio()

```
void QCustomPlot::setBufferDevicePixelRatio (
            double ratio )
```

Sets the device pixel ratio used by the paint buffers of this QCustomPlot instance.

Normally, this doesn't need to be set manually, because it is initialized with the regular *QWidget::devicePixelRatio* which is configured by Qt to fit the display device (e.g. 1 for normal displays, 2 for High-DPI displays).

Device pixel ratios are supported by Qt only for Qt versions since 5.4. If this method is called when QCustomPlot is being used with older Qt versions, outputs an according qDebug message and leaves the internal buffer device pixel ratio at 1.0.

5.75.4.77 setCurrentLayer() [1/2]

```
bool QCustomPlot::setCurrentLayer (
            const QString & name )
```

Sets the layer with the specified *name* to be the current layer. All layerables (QCPLayerable), e.g. plottables and items, are created on the current layer.

Returns true on success, i.e. if there is a layer with the specified *name* in the QCustomPlot.

Layer names are case-sensitive.

See also

addLayer, moveLayer, removeLayer, QCPLayerable::setLayer

5.75.4.78 setCurrentLayer() [2/2]

```
bool QCustomPlot::setCurrentLayer (
            QCPLayer * layer )
```

This is an overloaded member function, provided for convenience. It differs from the above function only in what argument(s) it accepts.

Sets the provided *layer* to be the current layer.

Returns true on success, i.e. when *layer* is a valid layer in the QCustomPlot.

See also

addLayer, moveLayer, removeLayer

5.75.4.79 setInteraction()

```
void QCustomPlot::setInteraction (
            const QCP::Interaction & interaction,
            bool enabled = true )
```

Sets the single *interaction* of this QCustomPlot to *enabled*.

For details about the interaction system, see setInteractions.

See also

setInteractions

5.75.4.80 setInteractions()

```
void QCustomPlot::setInteractions (
            const QCP::Interactions & interactions )
```

Sets the possible interactions of this QCustomPlot as an or-combination of QCP::Interaction enums. There are the following types of interactions:

Axis range manipulation is controlled via QCP::iRangeDrag and QCP::iRangeZoom. When the respective interaction is enabled, the user may drag axes ranges and zoom with the mouse wheel. For details how to control which axes the user may drag/zoom and in what orientations, see QCPAxisRect::setRangeDrag, QCPAxisRect::setRangeZoom, QCPAxisRect::setRangeDragAxes, QCPAxisRect::setRangeZoomAxes.

Plottable data selection is controlled by QCP::iSelectPlottables. If QCP::iSelectPlottables is set, the user may select plottables (graphs, curves, bars,...) and their data by clicking on them or in their vicinity (setSelectionTolerance). Whether the user can actually select a plottable and its data can further be restricted with the QCPAbstractPlottable::setSelectable method on the specific plottable. For details, see the special page about the data selection mechanism. To retrieve a list of all currently selected plottables, call selectedPlottables. If you're only interested in QCPGraphs, you may use the convenience function selectedGraphs.

Item selection is controlled by QCP::iSelectItems. If QCP::iSelectItems is set, the user may select items (QCPItemLine, QCPItemText,...) by clicking on them or in their vicinity. To find out whether a specific item is selected, call QCPAbstractItem::selected(). To retrieve a list of all currently selected items, call selectedItems.

Axis selection is controlled with QCP::iSelectAxes. If QCP::iSelectAxes is set, the user may select parts of the axes by clicking on them. What parts exactly (e.g. Axis base line, tick labels, axis label) are selectable can be controlled via QCPAxis::setSelectableParts for each axis. To retrieve a list of all axes that currently contain selected parts, call selectedAxes. Which parts of an axis are selected, can be retrieved with QCPAxis::selectedParts().

Legend selection is controlled with QCP::iSelectLegend. If this is set, the user may select the legend itself or individual items by clicking on them. What parts exactly are selectable can be controlled via QCPLegend::setSelectableParts. To find out whether the legend or any of its child items are selected, check the value of QCPLegend::selectedParts. To find out which child items are selected, call QCPLegend::selectedItems.

All other selectable elements The selection of all other selectable objects (e.g. QCPTextElement, or your own layerable subclasses) is controlled with QCP::iSelectOther. If set, the user may select those objects by clicking on them. To find out which are currently selected, you need to check their selected state explicitly.

If the selection state has changed by user interaction, the selectionChangedByUser signal is emitted. Each selectable object additionally emits an individual selectionChanged signal whenever their selection state has changed, i.e. not only by user interaction.

To allow multiple objects to be selected by holding the selection modifier (setMultiSelectModifier), set the flag QCP::iMultiSelect.

Note

In addition to the selection mechanism presented here, QCustomPlot always emits corresponding signals, when an object is clicked or double clicked. see plottableClick and plottableDoubleClick for example.

See also

setInteraction, setSelectionTolerance

5.75.4.81 setMultiSelectModifier()

```
void QCustomPlot::setMultiSelectModifier (
            Qt::KeyboardModifier modifier )
```

Sets the keyboard modifier that will be recognized as multi-select-modifier.

If QCP::iMultiSelect is specified in setInteractions, the user may select multiple objects (or data points) by clicking on them one after the other while holding down *modifier*.

By default the multi-select-modifier is set to Qt::ControlModifier.

See also

setInteractions

5.75.4.82 setNoAntialiasingOnDrag()

```
void QCustomPlot::setNoAntialiasingOnDrag (
            bool enabled )
```

Sets whether antialiasing is disabled for this QCustomPlot while the user is dragging axes ranges. If many objects, especially plottables, are drawn antialiased, this greatly improves performance during dragging. Thus it creates a more responsive user experience. As soon as the user stops dragging, the last replot is done with normal antialiasing, to restore high image quality.

See also

setAntialiasedElements, setNotAntialiasedElements

5.75.4.83 setNotAntialiasedElement()

```
void QCustomPlot::setNotAntialiasedElement (
            QCP::AntialiasedElement notAntialiasedElement,
            bool enabled = true )
```

Sets whether the specified *notAntialiasedElement* is forcibly drawn not antialiased.

See setNotAntialiasedElements for details.

See also

setAntialiasedElement

5.75.4.84 setNotAntialiasedElements()

```
void QCustomPlot::setNotAntialiasedElements (
            const QCP::AntialiasedElements & notAntialiasedElements )
```

Sets which elements are forcibly drawn not antialiased as an *or* combination of QCP::AntialiasedElement.

This overrides the antialiasing settings for whole element groups, normally controlled with the *setAntialiasing* function on the individual elements. If an element is neither specified in setAntialiasedElements nor in setNot↵ AntialiasedElements, the antialiasing setting on each individual element instance is used.

For example, if *notAntialiasedElements* contains QCP::aePlottables, no plottables will be drawn antialiased, no matter what the specific QCPAbstractPlottable::setAntialiased value was set to.

if an element in *notAntialiasedElements* is already set in setAntialiasedElements, it is removed from there.

See also

setAntialiasedElements

5.75.4.85 setOpenGl()

```
void QCustomPlot::setOpenGl (
            bool enabled,
            int multisampling = 16 )
```

This method allows to enable OpenGL plot rendering, for increased plotting performance of graphically demanding plots (thick lines, translucent fills, etc.).

If *enabled* is set to true, QCustomPlot will try to initialize OpenGL and, if successful, continue plotting with hardware acceleration. The parameter *multisampling* controls how many samples will be used per pixel, it essentially controls the antialiasing quality. If *multisampling* is set too high for the current graphics hardware, the maximum allowed value will be used.

You can test whether switching to OpenGL rendering was successful by checking whether the according getter *QCustomPlot::openGl()* returns true. If the OpenGL initialization fails, rendering continues with the regular software rasterizer, and an according qDebug output is generated.

If switching to OpenGL was successful, this method disables label caching (setPlottingHint(QCP::phCacheLabels, false)) and turns on QCustomPlot's antialiasing override for all elements (setAntialiasedElements(QCP::aeAll)), leading to a higher quality output. The antialiasing override allows for pixel-grid aligned drawing in the OpenGL paint device. As stated before, in OpenGL rendering the actual antialiasing of the plot is controlled with *multisampling*. If *enabled* is set to false, the antialiasing/label caching settings are restored to what they were before OpenGL was enabled, if they weren't altered in the meantime.

Note

OpenGL support is only enabled if QCustomPlot is compiled with the macro `QCUSTOMPLOT_USE_OPENGL` defined. This define must be set before including the QCustomPlot header both during compilation of the QCustomPlot library as well as when compiling your application. It is best to just include the line `DEFINES += QCUSTOMPLOT_USE_OPENGL` in the respective qmake project files.
If you are using a Qt version before 5.0, you must also add the module "opengl" to your `QT` variable in the qmake project files. For Qt versions 5.0 and higher, QCustomPlot switches to a newer OpenGL interface which is already in the "gui" module.

5.75.4.86 setPlottingHint()

```
void QCustomPlot::setPlottingHint (
            QCP::PlottingHint hint,
            bool enabled = true )
```

Sets the specified plotting *hint* to *enabled*.

See also

setPlottingHints

5.75.4.87 setPlottingHints()

```
void QCustomPlot::setPlottingHints (
            const QCP::PlottingHints & hints )
```

Sets the plotting hints for this QCustomPlot instance as an *or* combination of QCP::PlottingHint.

See also

setPlottingHint

5.75.4.88 setSelectionRect()

```
void QCustomPlot::setSelectionRect (
            QCPSelectionRect * selectionRect )
```

Sets the QCPSelectionRect instance that QCustomPlot will use if *mode* is not QCP::srmNone and the user performs a click-and-drag interaction. QCustomPlot takes ownership of the passed *selectionRect*. It can be accessed later via selectionRect.

This method is useful if you wish to replace the default QCPSelectionRect instance with an instance of a QCP←SelectionRect subclass, to introduce custom behaviour of the selection rect.

See also

setSelectionRectMode

5.75.4.89 setSelectionRectMode()

```
void QCustomPlot::setSelectionRectMode (
            QCP::SelectionRectMode mode )
```

Sets how QCustomPlot processes mouse click-and-drag interactions by the user.

If *mode* is QCP::srmNone, the mouse drag is forwarded to the underlying objects. For example, QCPAxisRect may process a mouse drag by dragging axis ranges, see QCPAxisRect::setRangeDrag. If *mode* is not QCP::srmNone, the current selection rect (selectionRect) becomes activated and allows e.g. rect zooming and data point selection.

If you wish to provide your user both with axis range dragging and data selection/range zooming, use this method to switch between the modes just before the interaction is processed, e.g. in reaction to the mousePress or mouse←Move signals. For example you could check whether the user is holding a certain keyboard modifier, and then decide which *mode* shall be set.

If a selection rect interaction is currently active, and *mode* is set to QCP::srmNone, the interaction is canceled (QCPSelectionRect::cancel). Switching between any of the other modes will keep the selection rect active. Upon completion of the interaction, the behaviour is as defined by the currently set *mode*, not the mode that was set when the interaction started.

See also

setInteractions, setSelectionRect, QCPSelectionRect

5.75.4.90 setSelectionTolerance()

```
void QCustomPlot::setSelectionTolerance (
            int pixels )
```

Sets the tolerance that is used to decide whether a click selects an object (e.g. a plottable) or not.

If the user clicks in the vicinity of the line of e.g. a QCPGraph, it's only regarded as a potential selection when the minimum distance between the click position and the graph line is smaller than *pixels*. Objects that are defined by an area (e.g. QCPBars) only react to clicks directly inside the area and ignore this selection tolerance. In other words, it only has meaning for parts of objects that are too thin to exactly hit with a click and thus need such a tolerance.

See also

setInteractions, QCPLayerable::selectTest

5.75.4.91 setViewport()

```
void QCustomPlot::setViewport (
            const QRect & rect )
```

Sets the viewport of this QCustomPlot. Usually users of QCustomPlot don't need to change the viewport manually.

The viewport is the area in which the plot is drawn. All mechanisms, e.g. margin caluclation take the viewport to be the outer border of the plot. The viewport normally is the rect() of the QCustomPlot widget, i.e. a rect with top left (0, 0) and size of the QCustomPlot widget.

Don't confuse the viewport with the axis rect (QCustomPlot::axisRect). An axis rect is typically an area enclosed by four axes, where the graphs/plottables are drawn in. The viewport is larger and contains also the axes themselves, their tick numbers, their labels, or even additional axis rects, color scales and other layout elements.

This function is used to allow arbitrary size exports with toPixmap, savePng, savePdf, etc. by temporarily changing the viewport size.

5.75.4.92 toPainter()

```
void QCustomPlot::toPainter (
            QCPPainter * painter,
            int width = 0,
            int height = 0 )
```

Renders the plot using the passed *painter*.

The plot is sized to *width* and *height* in pixels. If the *painter's* scale is not 1.0, the resulting plot will appear scaled accordingly.

Note

If you are restricted to using a QPainter (instead of QCPPainter), create a temporary QPicture and open a QCPPainter on it. Then call toPainter with this QCPPainter. After ending the paint operation on the picture, draw it with the QPainter. This will reproduce the painter actions the QCPPainter took, with a QPainter.

See also

toPixmap

5.75.4.93 toPixmap()

```
QPixmap QCustomPlot::toPixmap (
            int width = 0,
            int height = 0,
            double scale = 1.0 )
```

Renders the plot to a pixmap and returns it.

The plot is sized to *width* and *height* in pixels and scaled with *scale*. (width 100 and scale 2.0 lead to a full resolution pixmap with width 200.)

See also

toPainter, saveRastered, saveBmp, savePng, saveJpg, savePdf

5.75.5 Member Data Documentation

5.75.5.1 legend

```
QCPLegend * QCustomPlot::legend
```

A pointer to the default legend of the main axis rect. The legend is invisible by default. Use QCPLegend::setVisible to change this.

QCustomPlot offers convenient pointers to the axes (xAxis, yAxis, xAxis2, yAxis2) and the legend. They make it very easy working with plots that only have a single axis rect and at most one axis at each axis rect side. If you use the layout system to add multiple legends to the plot, use the layout system interface to access the new legend. For example, legends can be placed inside an axis rect's inset layout, and must then also be accessed via the inset layout. If the default legend is removed due to manipulation of the layout system (e.g. by removing the main axis rect), the corresponding pointer becomes 0.

If an axis convenience pointer is currently zero and a new axis rect or a corresponding axis is added in the place of the main axis rect, QCustomPlot resets the convenience pointers to the according new axes. Similarly the legend convenience pointer will be reset if a legend is added after the main legend was removed before.

5.75.5.2 xAxis

```
QCPAxis * QCustomPlot::xAxis
```

A pointer to the primary x Axis (bottom) of the main axis rect of the plot.

QCustomPlot offers convenient pointers to the axes (xAxis, yAxis, xAxis2, yAxis2) and the legend. They make it very easy working with plots that only have a single axis rect and at most one axis at each axis rect side. If you use the layout system to add multiple axis rects or multiple axes to one side, use the QCPAxisRect::axis interface to access the new axes. If one of the four default axes or the default legend is removed due to manipulation of the layout system (e.g. by removing the main axis rect), the corresponding pointers become 0.

If an axis convenience pointer is currently zero and a new axis rect or a corresponding axis is added in the place of the main axis rect, QCustomPlot resets the convenience pointers to the according new axes. Similarly the legend convenience pointer will be reset if a legend is added after the main legend was removed before.

5.75.5.3 xAxis2

`QCPAxis * QCustomPlot::xAxis2`

A pointer to the secondary x Axis (top) of the main axis rect of the plot. Secondary axes are invisible by default. Use QCPAxis::setVisible to change this (or use QCPAxisRect::setupFullAxesBox).

QCustomPlot offers convenient pointers to the axes (xAxis, yAxis, xAxis2, yAxis2) and the legend. They make it very easy working with plots that only have a single axis rect and at most one axis at each axis rect side. If you use the layout system to add multiple axis rects or multiple axes to one side, use the QCPAxisRect::axis interface to access the new axes. If one of the four default axes or the default legend is removed due to manipulation of the layout system (e.g. by removing the main axis rect), the corresponding pointers become 0.

If an axis convenience pointer is currently zero and a new axis rect or a corresponding axis is added in the place of the main axis rect, QCustomPlot resets the convenience pointers to the according new axes. Similarly the legend convenience pointer will be reset if a legend is added after the main legend was removed before.

5.75.5.4 yAxis

`QCPAxis * QCustomPlot::yAxis`

A pointer to the primary y Axis (left) of the main axis rect of the plot.

QCustomPlot offers convenient pointers to the axes (xAxis, yAxis, xAxis2, yAxis2) and the legend. They make it very easy working with plots that only have a single axis rect and at most one axis at each axis rect side. If you use the layout system to add multiple axis rects or multiple axes to one side, use the QCPAxisRect::axis interface to access the new axes. If one of the four default axes or the default legend is removed due to manipulation of the layout system (e.g. by removing the main axis rect), the corresponding pointers become 0.

If an axis convenience pointer is currently zero and a new axis rect or a corresponding axis is added in the place of the main axis rect, QCustomPlot resets the convenience pointers to the according new axes. Similarly the legend convenience pointer will be reset if a legend is added after the main legend was removed before.

5.75.5.5 yAxis2

`QCPAxis * QCustomPlot::yAxis2`

A pointer to the secondary y Axis (right) of the main axis rect of the plot. Secondary axes are invisible by default. Use QCPAxis::setVisible to change this (or use QCPAxisRect::setupFullAxesBox).

QCustomPlot offers convenient pointers to the axes (xAxis, yAxis, xAxis2, yAxis2) and the legend. They make it very easy working with plots that only have a single axis rect and at most one axis at each axis rect side. If you use the layout system to add multiple axis rects or multiple axes to one side, use the QCPAxisRect::axis interface to access the new axes. If one of the four default axes or the default legend is removed due to manipulation of the layout system (e.g. by removing the main axis rect), the corresponding pointers become 0.

If an axis convenience pointer is currently zero and a new axis rect or a corresponding axis is added in the place of the main axis rect, QCustomPlot resets the convenience pointers to the according new axes. Similarly the legend convenience pointer will be reset if a legend is added after the main legend was removed before.

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ cpp

5.76 Rohr Class Reference

Stellt ein Rohrbauteil zur Verfügung.

```
#include <rohr.h>
```

Public Member Functions

- **Rohr** (double l, double r, double k_s)
- double get_querschnitt ()
  Gibt Querschnittsfläche.
- double get_querschnitt (double x)
  Gibt den Querschnitt an der Stelle x zurück.
- double get_radius ()
  Gibt Radius zurück.
- double get_radius (double x)
  Gibt Radius an der Stelle x zurück.
- double get_laenge ()
  Gibt Länge zurück.
- double get_alpha_innen ()
  Gibt Konvektionswiderstand auf der Innenseite zurück.
- double get_alpha_aussen ()
  Gibt Konvektionswiderstand auf der Außenseite zurück.
- double get_kA ()
  Berechnet Wärmedurchgangskoeffizient.
- double get_kA (double x)
  Berechnet Wärmedurchgangskoeffizient an der Stelle x und speichert ihn auch unter kA.
- double get_t_aussen ()
  Gibt Aussentemperatur zurück.
- void set_alpha_aussen (double alpha_aussen)
  Setzt Wert für Konvektionswiderstand auf der Außenseite.
- void set_alpha_innen (double alpha_innen)
  Setzt Wert für Konvektionswiderstand auf der Innenseite.
- void set_t_aussen (double t_aussen)
  Setzt Wert für Aussentemperatur.
- double get_k_s ()
  Gibt Rohrrauheitswert aus.
- double get_startpressure ()
  Gibt Startdruck zurück.
- void set_startpressure (double p_ein)
  Setzt Wert für Startdruck.

5.76.1 Detailed Description

Stellt ein Rohrbauteil zur Verfügung.

5.76.2 Member Function Documentation

5.76.2.1 get_kA()

```
double Rohr::get_kA (
            double x )
```

Berechnet Wärmedurchgangskoeffizient an der Stelle x und speichert ihn auch unter kA.

Warning

Diese Funktion überschreiben, um kA=f(x) zu realisieren.

berechnet den Wert von kA an einer bestimmten Stelle. Kann überschrieben werden, um den Radius als kA=f(x) auszudrücken.

5.76.2.2 get_querschnitt()

```
double Rohr::get_querschnitt (
            double x )
```

Gibt den Querschnitt an der Stelle x zurück.

Warning

Basiert auf get_radius, daher wird r=f(x) hier automatisch berücksichtigt. Nicht doppelt überschreiben!

See also

Rohr::get_radius(double x)

5.76.2.3 get_radius()

```
double Rohr::get_radius (
            double x )
```

Gibt Radius an der Stelle x zurück.

Diese Funktion überschreiben, um r=f(x) zu realisieren gibt den Wert des Radius an einer bestimmten Stelle zurück. Kann überschrieben werden, um den Radius als r=f(x) auszudrücken.

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/rohr.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/rohr.↩ cpp

5.77 Rohrstroemung Class Reference

Beschriebt eine Rohrströmung.

```
#include <stroemung.h>
```

Public Member Functions

- **Rohrstroemung** (Rohr ∗rohr, Fluid ∗fluid)
- double get_Re ()

  Reynoldszahl des Member-Fluids berechnen (u∗d/nue)
- double get_lambda ()

  Rohrreibungszahl Lambda berechnen, in Abhängigkeit von Re.
- double get_speed ()

  Berechnung der Fluidgeschwindigkeit durch den Massenstorm.
- double get_bauart ()

  Berechnet Bauartszahl.
- double get_epsilon ()

  Gibt Leistungsgröße zurück.
- double get_temp (double x)

  Berechnet Austrittstemperatur.
- double get_pressure (double x)

  Berechnung des Drucks an der Stelle x.
- double get_temp ()

  Berechnet Temperatur an der Stelle x.
- double get_epsilon (double x)

  Berechnet Epsilon an der Stelle x.
- double get_bauart (double x)

  Berechnet die Bauart an der Stelle x.
- double get_stroemung (double r, double x)

  Berechnung des Strömungsprofils.
- void set_druckverlauf ()

  Ausfüllen des Druckverlauf-Arrays.
- void print_druckverlauf ()

  Eintragen des Druckverlauf-Arrays in Textdatei.

5.77.1 Detailed Description

Beschriebt eine Rohrströmung.

Benötigt dazu Objekte von Rohr und Fluid.

Warning

Es werden keine kompressiblen Fluide oder Ablösungen und Einlaufstörungen am Ein- und Ausgang des Rohrs berücksichtigt.

Note

Zur Laufzeitoptimierung werden dieser Funktion nur Pointer auf Rohr und Fluid übergeben!

5.77.2 Member Function Documentation

5.77.2.1 get_lambda()

```
double Rohrstroemung::get_lambda ( )
```

Rohrreibungszahl Lambda berechnen, in Abhängigkeit von Re.

See also

get_Re()

The documentation for this class was generated from the following files:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/stroemung.↩ h
- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/stroemung.↩ cpp

5.78 QCPAxisPainterPrivate::TickLabelData Struct Reference

Public Attributes

- QString **basePart**
- QString **expPart**
- QString **suffixPart**
- QRect **baseBounds**
- QRect **expBounds**
- QRect **suffixBounds**
- QRect **totalBounds**
- QRect **rotatedTotalBounds**
- QFont **baseFont**
- QFont **expFont**

The documentation for this struct was generated from the following file:

- /home/maximilian/Sync/Dokumente/2_Studium/2017_SS/Informatik/2_API/projektarbeit-berdoullies/src/qcustomplot.↩ h

Index

~Plotter
Plotter, 22

APITest, 17
printTestResult, 17
accepted
QCPSelectionRect, 397
add
QCPDataContainer, 191, 192
addAxes
QCPAxisRect, 90
addAxis
QCPAxisRect, 91
addData
QCPBars, 132
QCPCurve, 181, 182
QCPErrorBars, 215
QCPFinancial, 228, 229
QCPGraph, 242
QCPStatisticalBox, 402
addDataRange
QCPDataSelection, 206
addElement
QCPLayoutGrid, 326
QCPLayoutInset, 337
addGraph
QCustomPlot, 431
addItem
QCPLegend, 344
addLayer
QCustomPlot, 431
addTick
QCPAxisTickerText, 122
addTicks
QCPAxisTickerText, 122
addToLegend
QCPAbstractPlottable, 45, 46
adjusted
QCPDataRange, 201
afterReplot
QCustomPlot, 432
alpha
QCPColorMapData, 163
anchor
QCPAbstractItem, 29
anchors
QCPAbstractItem, 29
AntialiasedElement
QCP, 12
append
QCPBarsGroup, 143
applyBrush
QCPSelectionDecorator, 389
applyPen
QCPSelectionDecorator, 390
applyTo
QCPScatterStyle, 384
at
QCPDataContainer, 192
axes
QCPAxisRect, 91
axis
QCPAxisRect, 92
QCPColorScale, 171
axisClick
QCustomPlot, 432
axisCount
QCPAxisRect, 92
axisDoubleClick
QCustomPlot, 432
axisRect
QCustomPlot, 433
axisRectAt
QCustomPlot, 433
axisRectCount
QCustomPlot, 433
axisRects
QCustomPlot, 434
AxisType
QCPAxis, 66

barAbove
QCPBars, 132
barBelow
QCPBars, 132
bars
QCPBarsGroup, 143
beforeReplot
QCustomPlot, 434
begin
QCPDataContainer, 193
QCPPainter, 361
bottom
QCPAxisRect, 92
bottomLeft
QCPAxisRect, 92
bottomRight
QCPAxisRect, 92
bounded
QCPDataRange, 201

QCPRange, 373
BracketStyle
QCPItemBracket, 256
QCPSelectionDecoratorBracket, 393

cancel
QCPSelectionRect, 397
canceled
QCPSelectionRect, 398
cellToCoord
QCPColorMapData, 163
center
QCPAxisRect, 93
QCPRange, 373
changed
QCPSelectionRect, 398
ChartStyle
QCPFinancial, 227
children
QCPLayer, 302
clear
QCPAbstractPaintBuffer, 39
QCPAxisTickerText, 123
QCPBarsGroup, 143
QCPColorMapData, 163
QCPDataContainer, 193
QCPDataSelection, 206
QCPLayout, 312
QCPMarginGroup, 357
QCPPaintBufferPixmap, 358
clearAlpha
QCPColorMapData, 164
clearColorStops
QCPColorGradient, 149
clearGraphs
QCustomPlot, 434
clearItems
QCPLegend, 344
QCustomPlot, 434
clearPlottables
QCustomPlot, 435
clicked
QCPTextElement, 414
ColorInterpolation
QCPColorGradient, 147
colorMaps
QCPColorScale, 171
colorize
QCPColorGradient, 149
columnCount
QCPLayoutGrid, 327
constBegin
QCPDataContainer, 193
constEnd
QCPDataContainer, 193
contains
QCPBarsGroup, 144
QCPDataRange, 201
QCPDataSelection, 206
QCPRange, 373
coordToCell
QCPColorMapData, 164
coordToPixel
QCPAxis, 68
coordsToPixels
QCPAbstractPlottable, 46
copyFrom
QCPSelectionDecorator, 390
createTickVector
QCPAxisTickerText, 123
currentLayer
QCustomPlot, 435

data
QCPBars, 133
QCPColorMap, 155
QCPCurve, 182
QCPErrorBars, 216
QCPFinancial, 229
QCPGraph, 242
QCPStatisticalBox, 403
dataCount
QCPAbstractPlottable1D, 57
QCPErrorBars, 216
QCPPlottableInterface1D, 365
dataMainKey
QCPAbstractPlottable1D, 57
QCPErrorBars, 216
QCPPlottableInterface1D, 366
dataMainValue
QCPAbstractPlottable1D, 57
QCPErrorBars, 216
QCPPlottableInterface1D, 366
dataPixelPosition
QCPAbstractPlottable1D, 58
QCPBars, 133
QCPErrorBars, 217
QCPPlottableInterface1D, 366
dataPointCount
QCPDataSelection, 206
dataRange
QCPDataContainer, 193
QCPDataSelection, 207
dataRangeChanged
QCPColorMap, 155
QCPColorScale, 171
dataRangeCount
QCPDataSelection, 207
dataRanges
QCPDataSelection, 207
dataScaleTypeChanged
QCPColorMap, 155
QCPColorScale, 171
dataSortKey
QCPAbstractPlottable1D, 58
QCPErrorBars, 217
QCPPlottableInterface1D, 366
dataValueRange

QCPAbstractPlottable1D, 58
QCPErrorBars, 217
QCPPlottableInterface1D, 367
dateTimeToKey
QCPAxisTickerDateTime, 111
DatenEingabe, 18
deselectAll
QCustomPlot, 435
distanceSquaredToLine
QCPVector2D, 421
distanceToStraightLine
QCPVector2D, 422
donePainting
QCPAbstractPaintBuffer, 39
dot
QCPVector2D, 422
doubleClicked
QCPTextElement, 415
draw
QCPAbstractPaintBuffer, 39
QCPPaintBufferPixmap, 358
drawBracket
QCPSelectionDecoratorBracket, 393
drawDecoration
QCPSelectionDecorator, 390
QCPSelectionDecoratorBracket, 394
drawLine
QCPPainter, 362
drawPolyline
QCPAbstractPlottable1D, 59
drawShape
QCPScatterStyle, 385
drawStatisticalBox
QCPStatisticalBox, 403

element
QCPLayoutGrid, 327
elementAt
QCPLayout, 312
QCPLayoutGrid, 327
QCPLayoutInset, 337
elementCount
QCPLayout, 313
QCPLayoutGrid, 328
QCPLayoutInset, 338
elements
QCPAxisRect, 93
QCPLayout, 313
QCPLayoutElement, 319
QCPLayoutGrid, 328
QCPMarginGroup, 357
end
QCPDataContainer, 194
EndingStyle
QCPLineEnding, 353
enforceType
QCPDataSelection, 207
ErrorType
QCPErrorBars, 214
erstellePlot
Plotter, 22
expand
QCPRange, 373, 374
expandTo
QCPLayoutGrid, 328
expanded
QCPDataRange, 201
QCPRange, 374
ExportPen
QCP, 12

fill
QCPColorMapData, 164
fillAlpha
QCPColorMapData, 164
FillOrder
QCPLayoutGrid, 325
findBegin
QCPAbstractPlottable1D, 59
QCPDataContainer, 194
QCPErrorBars, 217
QCPPlottableInterface1D, 367
findEnd
QCPAbstractPlottable1D, 59
QCPDataContainer, 194
QCPErrorBars, 218
QCPPlottableInterface1D, 367
Fluid, 18
get_cp, 19
get_cp_strom, 19
get_dichte, 19
get_massenstrom, 20
get_my, 20
get_nue, 20
get_t_ein, 20
set_massenstrom, 20
set_t_ein, 20
FractionStyle
QCPAxisTickerPi, 119
fromSortKey
QCPBarsData, 139
QCPCurveData, 187
QCPFinancialData, 236
QCPGraphData, 248
QCPStatisticalBoxData, 410

generate
QCPAxisTicker, 108
get_cp
Fluid, 19
get_cp_strom
Fluid, 19
get_dichte
Fluid, 19
get_kA
Rohr, 465
get_lambda
Rohrstroemung, 468

get_massenstrom
Fluid, 20
get_my
Fluid, 20
get_nue
Fluid, 20
get_querschnitt
Rohr, 466
get_radius
Rohr, 466
get_t_ein
Fluid, 20
getDataSegments
QCPAbstractPlottable1D, 60
getFinalScatterStyle
QCPSelectionDecorator, 390
getKeyRange
QCPAbstractPlottable, 47
QCPBars, 133
QCPColorMap, 155
QCPCurve, 182
QCPErrorBars, 218
QCPFinancial, 230
QCPGraph, 242
QCPStatisticalBox, 403
getPartAt
QCPAxis, 68
getSubTickCount
QCPAxisTickerText, 123
getTickLabel
QCPAxisTickerText, 124
getTickStep
QCPAxisTickerText, 124
getValueRange
QCPAbstractPlottable, 47
QCPBars, 133
QCPColorMap, 156
QCPCurve, 183
QCPErrorBars, 219
QCPFinancial, 230
QCPGraph, 243
QCPStatisticalBox, 404
getVisibleDataBounds
QCPGraph, 243
gradientChanged
QCPColorMap, 156
QCPColorScale, 172
GradientPreset
QCPColorGradient, 147
graph
QCustomPlot, 435, 436
graphCount
QCustomPlot, 436
graphs
QCPAxis, 68
QCPAxisRect, 93
grid
QCPAxis, 69
hasAnchor
QCPAbstractItem, 30
hasElement
QCPLayoutGrid, 329
hasInvalidatedPaintBuffers
QCustomPlot, 436
hasItem
QCPLegend, 345
QCustomPlot, 436
hasItemWithPlottable
QCPLegend, 345
hasPlottable
QCustomPlot, 437
height
QCPAxisRect, 93

index
QCPLayer, 302
indexToRowCol
QCPLayoutGrid, 329
insert
QCPBarsGroup, 144
insertColumn
QCPLayoutGrid, 329
insertRow
QCPLayoutGrid, 330
insetAlignment
QCPLayoutInset, 338
insetLayout
QCPAxisRect, 93
InsetPlacement
QCPLayoutInset, 336
insetPlacement
QCPLayoutInset, 338
insetRect
QCPLayoutInset, 338
Interaction
QCP, 13
interface1D
QCPAbstractPlottable, 48
QCPAbstractPlottable1D, 60
QCPErrorBars, 219
intersection
QCPDataRange, 201
QCPDataSelection, 208
intersects
QCPDataRange, 202
inverse
QCPDataSelection, 208
inverted
QCPColorGradient, 149
isActive
QCPSelectionRect, 398
isEmpty
QCPBarsGroup, 144
QCPColorMapData, 165
QCPDataContainer, 194
QCPDataRange, 202
QCPDataSelection, 208

QCPMarginGroup, 357
isNone
QCPScatterStyle, 385
isNull
QCPVector2D, 422
isPenDefined
QCPScatterStyle, 385
isValid
QCPDataRange, 202
item
QCPLegend, 345
QCustomPlot, 437
itemAt
QCustomPlot, 437
itemClick
QCustomPlot, 438
itemCount
QCPLegend, 345
QCustomPlot, 438
itemDoubleClick
QCustomPlot, 438
itemWithPlottable
QCPLegend, 346
items
QCPAxis, 69
QCPAxisRect, 94

keyRange
QCPDataContainer, 195
keyToDateTime
QCPAxisTickerDateTime, 111

LabelSide
QCPAxis, 66
LambdaTurbulentGlattSolver, 21
layer
QCustomPlot, 439
layerChanged
QCPLayerable, 306
layerCount
QCustomPlot, 439
LayerInsertMode
QCustomPlot, 430
LayerMode
QCPLayer, 301
layout
QCPLayoutElement, 319
layoutElementAt
QCustomPlot, 440
left
QCPAxisRect, 94
legend
QCustomPlot, 463
legendClick
QCustomPlot, 440
legendDoubleClick
QCustomPlot, 440
length
QCPDataRange, 202
QCPVector2D, 422
lengthSquared
QCPVector2D, 423
limitIteratorsToDataRange
QCPDataContainer, 195
LineStyle
QCPCurve, 180
QCPGraph, 241
loadPreset
QCPColorGradient, 150

mainKey
QCPBarsData, 139
QCPCurveData, 188
QCPFinancialData, 237
QCPGraphData, 248
QCPStatisticalBoxData, 410
mainValue
QCPBarsData, 139
QCPCurveData, 188
QCPFinancialData, 237
QCPGraphData, 249
QCPStatisticalBoxData, 410
makeNonCosmetic
QCPPainter, 362
MarginSide
QCP, 13
marginSideToAxisType
QCPAxis, 69
maxRange
QCPRange, 378
maximumSizeHint
QCPLayoutElement, 319
QCPLayoutGrid, 330
QCPTextElement, 415
minRange
QCPRange, 378
minimumSizeHint
QCPLayoutElement, 319
QCPLayoutGrid, 330
QCPPlottableLegendItem, 370
QCPTextElement, 415
mouseDoubleClick
QCustomPlot, 441
mouseDoubleClickEvent
QCPLayerable, 306
QCPTextElement, 415
mouseMove
QCustomPlot, 441
mouseMoveEvent
QCPAxisRect, 94
QCPColorScale, 172
QCPLayerable, 306
mousePress
QCustomPlot, 441
mousePressEvent
QCPAxisRect, 94
QCPColorScale, 172
QCPLayerable, 307

QCPTextElement, 416
mouseRelease
QCustomPlot, 441
mouseReleaseEvent
QCPAxisRect, 95
QCPColorScale, 173
QCPLayerable, 307
QCPTextElement, 416
mouseWheel
QCustomPlot, 442
moveAbove
QCPBars, 134
moveBelow
QCPBars, 134
moveLayer
QCustomPlot, 442
moveRange
QCPAxis, 69

normalize
QCPRange, 375
QCPVector2D, 423
normalized
QCPVector2D, 423

operator<<
QCPDataRange, 204
QCPDataSelection, 211
QCPRange, 378
QCPVector2D, 425
operator*
QCPRange, 377
operator*=
QCPRange, 375
QCPVector2D, 423
operator+
QCPDataSelection, 210
QCPRange, 377
operator+=
QCPDataSelection, 209
QCPRange, 375
QCPVector2D, 424
operator-
QCPDataSelection, 211
QCPRange, 377
operator-=
QCPDataSelection, 209
QCPRange, 375
QCPVector2D, 424
operator/
QCPRange, 378
operator/=
QCPRange, 375
QCPVector2D, 424
operator=
QCPColorMapData, 165
operator==
QCPDataSelection, 209
opposite
QCPAxis, 69
orientation
QCPAxis, 70

PainterMode
QCPPainter, 361
parentAnchor
QCPItemPosition, 276
parentLayerable
QCPLayerable, 308
perpendicular
QCPVector2D, 424
pixelOrientation
QCPAxis, 70
pixelPosition
QCPItemAnchor, 254
QCPItemPosition, 276
pixelToCoord
QCPAxis, 70
pixelsToCoords
QCPAbstractPlottable, 48
plotLayout
QCustomPlot, 442
plottable
QCustomPlot, 442, 443
plottableAt
QCustomPlot, 443
plottableClick
QCustomPlot, 443
plottableCount
QCustomPlot, 444
plottableDoubleClick
QCustomPlot, 444
plottables
QCPAxis, 71
QCPAxisRect, 95
Plotter, 21
∼Plotter, 22
erstellePlot, 22
Plotter, 22
PlottingHint
QCP, 14
position
QCPAbstractItem, 30
PositionType
QCPItemPosition, 275
positions
QCPAbstractItem, 30
printTestResult
APITest, 17

QCPAbstractItem, 25
anchor, 29
anchors, 29
hasAnchor, 30
position, 30
positions, 30
QCPAbstractItem, 29
selectTest, 31

selectionChanged, 31
setClipAxisRect, 31
setClipToAxisRect, 32
setSelectable, 32
setSelected, 32
QCPAbstractLegendItem, 33
QCPAbstractLegendItem, 35
selectTest, 35
selectionChanged, 35
setFont, 35
setSelectable, 36
setSelected, 36
setSelectedFont, 36
setSelectedTextColor, 36
setTextColor, 37
QCPAbstractPaintBuffer, 37
clear, 39
donePainting, 39
draw, 39
QCPAbstractPaintBuffer, 38
reallocateBuffer, 39
setDevicePixelRatio, 40
setInvalidated, 40
setSize, 40
startPainting, 41
QCPAbstractPlottable, 41
addToLegend, 45, 46
coordsToPixels, 46
getKeyRange, 47
getValueRange, 47
interface1D, 48
pixelsToCoords, 48
QCPAbstractPlottable, 45
removeFromLegend, 48, 49
rescaleAxes, 49
rescaleKeyAxis, 49
rescaleValueAxis, 50
selectTest, 51
selectableChanged, 50
selected, 50
selection, 50
selectionChanged, 50, 51
selectionDecorator, 51
setAntialiasedFill, 52
setAntialiasedScatters, 52
setBrush, 53
setKeyAxis, 53
setName, 53
setPen, 53
setSelectable, 54
setSelection, 54
setSelectionDecorator, 54
setValueAxis, 55
QCPAbstractPlottable1D< DataType >, 55
QCPAbstractPlottable1D
dataCount, 57
dataMainKey, 57
dataMainValue, 57
dataPixelPosition, 58
dataSortKey, 58
dataValueRange, 58
drawPolyline, 59
findBegin, 59
findEnd, 59
getDataSegments, 60
interface1D, 60
QCPAbstractPlottable1D, 57
selectTest, 60
selectTestRect, 61
sortKeyIsMainKey, 61
QCPAxis, 62
AxisType, 66
coordToPixel, 68
getPartAt, 68
graphs, 68
grid, 69
items, 69
LabelSide, 66
marginSideToAxisType, 69
moveRange, 69
opposite, 69
orientation, 70
pixelOrientation, 70
pixelToCoord, 70
plottables, 71
QCPAxis, 68
rangeChanged, 71
rescale, 71
scaleRange, 72
ScaleType, 67
scaleTypeChanged, 72
selectTest, 73
selectableChanged, 72
SelectablePart, 67
selectionChanged, 73
setBasePen, 73
setLabel, 74
setLabelColor, 74
setLabelFont, 74
setLabelPadding, 74
setLowerEnding, 75
setNumberFormat, 75
setNumberPrecision, 75
setOffset, 76
setPadding, 76
setRange, 76, 77
setRangeLower, 77
setRangeReversed, 77
setRangeUpper, 77
setScaleRatio, 78
setScaleType, 78
setSelectableParts, 78
setSelectedBasePen, 78
setSelectedLabelColor, 79
setSelectedLabelFont, 79
setSelectedParts, 79

setSelectedSubTickPen, 79
setSelectedTickLabelColor, 80
setSelectedTickLabelFont, 80
setSelectedTickPen, 80
setSubTickLength, 80
setSubTickLengthIn, 81
setSubTickLengthOut, 81
setSubTickPen, 81
setSubTicks, 81
setTickLabelColor, 82
setTickLabelFont, 82
setTickLabelPadding, 83
setTickLabelRotation, 83
setTickLabelSide, 83
setTickLabels, 83
setTickLength, 83
setTickLengthIn, 84
setTickLengthOut, 84
setTickPen, 84
setTicker, 82
setTicks, 84
setUpperEnding, 85
ticker, 85
QCPAxisPainterPrivate, 86
QCPAxisPainterPrivate, 87
QCPAxisPainterPrivate::CachedLabel, 18
QCPAxisPainterPrivate::TickLabelData, 468
QCPAxisRect, 87
addAxes, 90
addAxis, 91
axes, 91
axis, 92
axisCount, 92
bottom, 92
bottomLeft, 92
bottomRight, 92
center, 93
elements, 93
graphs, 93
height, 93
insetLayout, 93
items, 94
left, 94
mouseMoveEvent, 94
mousePressEvent, 94
mouseReleaseEvent, 95
plottables, 95
QCPAxisRect, 90
rangeDragAxes, 96
rangeDragAxis, 96
rangeZoomAxes, 96
rangeZoomAxis, 96
rangeZoomFactor, 97
removeAxis, 97
right, 97
setBackground, 97, 98
setBackgroundScaled, 98
setBackgroundScaledMode, 99
setRangeDrag, 99
setRangeDragAxes, 99, 100
setRangeZoom, 100
setRangeZoomAxes, 101
setRangeZoomFactor, 102
setupFullAxesBox, 102
size, 102
top, 103
topLeft, 103
topRight, 103
update, 103
wheelEvent, 103
width, 104
zoom, 104
QCPAxisTicker, 105
generate, 108
QCPAxisTicker, 107
setTickCount, 108
setTickOrigin, 108
setTickStepStrategy, 108
TickStepStrategy, 107
QCPAxisTickerDateTime, 109
dateTimeToKey, 111
keyToDateTime, 111
QCPAxisTickerDateTime, 111
setDateTimeFormat, 112
setDateTimeSpec, 112
setTickOrigin, 112, 113
QCPAxisTickerFixed, 113
QCPAxisTickerFixed, 115
ScaleStrategy, 114
setScaleStrategy, 115
setTickStep, 115
QCPAxisTickerLog, 116
QCPAxisTickerLog, 117
setLogBase, 117
setSubTickCount, 117
QCPAxisTickerPi, 117
FractionStyle, 119
QCPAxisTickerPi, 119
setFractionStyle, 119
setPeriodicity, 119
setPiSymbol, 120
setPiValue, 120
QCPAxisTickerText, 120
addTick, 122
addTicks, 122
clear, 123
createTickVector, 123
getSubTickCount, 123
getTickLabel, 124
getTickStep, 124
QCPAxisTickerText, 121
setSubTickCount, 124
setTicks, 124, 125
ticks, 125
QCPAxisTickerTime, 126
QCPAxisTickerTime, 127

setFieldWidth, 128
setTimeFormat, 128
TimeUnit, 127
QCPBars, 129
addData, 132
barAbove, 132
barBelow, 132
data, 133
dataPixelPosition, 133
getKeyRange, 133
getValueRange, 133
moveAbove, 134
moveBelow, 134
QCPBars, 131
selectTest, 135
selectTestRect, 135
setBarsGroup, 135
setBaseValue, 136
setData, 136
setStackingGap, 137
setWidth, 137
setWidthType, 137
WidthType, 131
QCPBarsData, 138
fromSortKey, 139
mainKey, 139
mainValue, 139
QCPBarsData, 138, 139
sortKey, 139
sortKeyIsMainKey, 140
valueRange, 140
QCPBarsGroup, 140
append, 143
bars, 143
clear, 143
contains, 144
insert, 144
isEmpty, 144
QCPBarsGroup, 143
remove, 144
setSpacing, 145
setSpacingType, 145
size, 145
SpacingType, 142
QCPColorGradient, 146
clearColorStops, 149
ColorInterpolation, 147
colorize, 149
GradientPreset, 147
inverted, 149
loadPreset, 150
QCPColorGradient, 148
setColorInterpolation, 150
setColorStopAt, 150
setColorStops, 150
setLevelCount, 151
setPeriodic, 151
QCPColorMap, 152
data, 155
dataRangeChanged, 155
dataScaleTypeChanged, 155
getKeyRange, 155
getValueRange, 156
gradientChanged, 156
QCPColorMap, 154
rescaleDataRange, 157
selectTest, 157
setColorScale, 158
setData, 158
setDataRange, 158
setDataScaleType, 159
setGradient, 159
setInterpolate, 159
setTightBoundary, 160
updateLegendIcon, 160
QCPColorMapData, 161
alpha, 163
cellToCoord, 163
clear, 163
clearAlpha, 164
coordToCell, 164
fill, 164
fillAlpha, 164
isEmpty, 165
operator=, 165
QCPColorMapData, 162
recalculateDataBounds, 165
setAlpha, 165
setCell, 166
setData, 166
setKeyRange, 166
setKeySize, 167
setRange, 167
setSize, 167
setValueRange, 168
setValueSize, 168
QCPColorScale, 169
axis, 171
colorMaps, 171
dataRangeChanged, 171
dataScaleTypeChanged, 171
gradientChanged, 172
mouseMoveEvent, 172
mousePressEvent, 172
mouseReleaseEvent, 173
QCPColorScale, 171
rescaleDataRange, 173
setBarWidth, 174
setDataRange, 174
setDataScaleType, 174
setGradient, 174
setLabel, 175
setRangeDrag, 175
setRangeZoom, 175
setType, 175
update, 175

wheelEvent, 176
QCPColorScaleAxisRectPrivate, 177
QCPColorScaleAxisRectPrivate, 177
QCPCurve, 178
addData, 181, 182
data, 182
getKeyRange, 182
getValueRange, 183
LineStyle, 180
QCPCurve, 181
selectTest, 183
setData, 184
setLineStyle, 185
setScatterSkip, 185
setScatterStyle, 185
QCPCurveData, 186
fromSortKey, 187
mainKey, 188
mainValue, 188
QCPCurveData, 187
sortKey, 188
sortKeyIsMainKey, 188
valueRange, 188
QCPDataContainer
add, 191, 192
at, 192
begin, 193
clear, 193
constBegin, 193
constEnd, 193
dataRange, 193
end, 194
findBegin, 194
findEnd, 194
isEmpty, 194
keyRange, 195
limitIteratorsToDataRange, 195
QCPDataContainer, 191
qcpLessThanSortKey, 199
remove, 195
removeAfter, 196
removeBefore, 196
set, 196, 197
setAutoSqueeze, 197
size, 197
sort, 198
squeeze, 198
valueRange, 198
QCPDataContainer< DataType >, 189
QCPDataRange, 199
adjusted, 201
bounded, 201
contains, 201
expanded, 201
intersection, 201
intersects, 202
isEmpty, 202
isValid, 202
length, 202
operator<<, 204
QCPDataRange, 200
setBegin, 203
setEnd, 203
size, 203
QCPDataSelection, 204
addDataRange, 206
clear, 206
contains, 206
dataPointCount, 206
dataRange, 207
dataRangeCount, 207
dataRanges, 207
enforceType, 207
intersection, 208
inverse, 208
isEmpty, 208
operator<<, 211
operator+, 210
operator+=, 209
operator-, 211
operator-=, 209
operator==, 209
QCPDataSelection, 205, 206
simplify, 209
span, 210
QCPErrorBars, 212
addData, 215
data, 216
dataCount, 216
dataMainKey, 216
dataMainValue, 216
dataPixelPosition, 217
dataSortKey, 217
dataValueRange, 217
ErrorType, 214
findBegin, 217
findEnd, 218
getKeyRange, 218
getValueRange, 219
interface1D, 219
QCPErrorBars, 214
selectTest, 220
selectTestRect, 220
setData, 221, 222
setDataPlottable, 222
setErrorType, 222
setSymbolGap, 223
setWhiskerWidth, 223
sortKeyIsMainKey, 223
QCPErrorBarsData, 223
QCPErrorBarsData, 224
QCPFinancial, 225
addData, 228, 229
ChartStyle, 227
data, 229
getKeyRange, 230

getValueRange, 230
QCPFinancial, 228
selectTest, 230
selectTestRect, 231
setBrushNegative, 231
setBrushPositive, 231
setChartStyle, 232
setData, 232
setPenNegative, 233
setPenPositive, 233
setTwoColored, 233
setWidth, 234
setWidthType, 234
timeSeriesToOhlc, 234
WidthType, 228
QCPFinancialData, 235
fromSortKey, 236
mainKey, 237
mainValue, 237
QCPFinancialData, 236
sortKey, 237
sortKeyIsMainKey, 237
valueRange, 237
QCPGraph, 238
addData, 242
data, 242
getKeyRange, 242
getValueRange, 243
getVisibleDataBounds, 243
LineStyle, 241
QCPGraph, 241
selectTest, 244
setAdaptiveSampling, 244
setChannelFillGraph, 244
setData, 245
setLineStyle, 246
setScatterSkip, 246
setScatterStyle, 246
QCPGraphData, 247
fromSortKey, 248
mainKey, 248
mainValue, 249
QCPGraphData, 248
sortKey, 249
sortKeyIsMainKey, 249
valueRange, 249
QCPGrid, 250
QCPGrid, 251
setAntialiasedSubGrid, 251
setAntialiasedZeroLine, 251
setPen, 251
setSubGridPen, 252
setSubGridVisible, 252
setZeroLinePen, 252
QCPItemAnchor, 253
pixelPosition, 254
QCPItemAnchor, 254
toQCPItemPosition, 254
QCPItemBracket, 255
BracketStyle, 256
QCPItemBracket, 257
selectTest, 257
setLength, 257
setPen, 258
setSelectedPen, 258
setStyle, 258
QCPItemCurve, 259
QCPItemCurve, 260
selectTest, 261
setHead, 261
setPen, 261
setSelectedPen, 262
setTail, 262
QCPItemEllipse, 263
QCPItemEllipse, 264
selectTest, 264
setBrush, 265
setPen, 265
setSelectedBrush, 266
setSelectedPen, 266
QCPItemLine, 267
QCPItemLine, 268
selectTest, 268
setHead, 269
setPen, 269
setSelectedPen, 269
setTail, 269
QCPItemPixmap, 270
QCPItemPixmap, 272
selectTest, 272
setPen, 272
setPixmap, 273
setScaled, 273
setSelectedPen, 273
QCPItemPosition, 274
parentAnchor, 276
pixelPosition, 276
PositionType, 275
QCPItemPosition, 276
setAxes, 277
setAxisRect, 277
setCoords, 277
setParentAnchor, 278
setParentAnchorX, 278
setParentAnchorY, 278
setPixelPosition, 279
setType, 279
setTypeX, 279
setTypeY, 280
toQCPItemPosition, 280
type, 280
QCPItemRect, 281
QCPItemRect, 282
selectTest, 283
setBrush, 283
setPen, 284

setSelectedBrush, 284
setSelectedPen, 284
QCPItemStraightLine, 285
QCPItemStraightLine, 286
selectTest, 286
setPen, 286
setSelectedPen, 287
QCPItemText, 287
QCPItemText, 289
selectTest, 290
setBrush, 290
setColor, 290
setFont, 291
setPadding, 291
setPen, 291
setPositionAlignment, 291
setRotation, 291
setSelectedBrush, 292
setSelectedColor, 292
setSelectedFont, 292
setSelectedPen, 292
setText, 292
setTextAlignment, 293
QCPItemTracer, 293
QCPItemTracer, 296
selectTest, 296
setBrush, 296
setGraph, 297
setGraphKey, 297
setInterpolating, 297
setPen, 298
setSelectedBrush, 298
setSelectedPen, 298
setSize, 298
setStyle, 299
TracerStyle, 295
updatePosition, 299
QCPLayer, 299
children, 302
index, 302
LayerMode, 301
QCPLayer, 302
replot, 302
setMode, 303
setVisible, 303
QCPLayerable, 304
layerChanged, 306
mouseDoubleClickEvent, 306
mouseMoveEvent, 306
mousePressEvent, 307
mouseReleaseEvent, 307
parentLayerable, 308
QCPLayerable, 305
realVisibility, 308
selectTest, 308
setAntialiased, 309
setLayer, 309, 310
setVisible, 310
wheelEvent, 310
QCPLayout, 311
clear, 312
elementAt, 312
elementCount, 313
elements, 313
QCPLayout, 312
remove, 313
removeAt, 314
simplify, 314
sizeConstraintsChanged, 314
take, 315
takeAt, 315
update, 315
QCPLayoutElement, 316
elements, 319
layout, 319
maximumSizeHint, 319
minimumSizeHint, 319
QCPLayoutElement, 318
rect, 320
selectTest, 320
setAutoMargins, 320
setMarginGroup, 321
setMargins, 321
setMaximumSize, 321, 322
setMinimumMargins, 322
setMinimumSize, 322
setOuterRect, 323
update, 323
UpdatePhase, 318
QCPLayoutGrid, 324
addElement, 326
columnCount, 327
element, 327
elementAt, 327
elementCount, 328
elements, 328
expandTo, 328
FillOrder, 325
hasElement, 329
indexToRowCol, 329
insertColumn, 329
insertRow, 330
maximumSizeHint, 330
minimumSizeHint, 330
QCPLayoutGrid, 326
rowColToIndex, 330
rowCount, 331
setColumnSpacing, 331
setColumnStretchFactor, 331
setColumnStretchFactors, 332
setFillOrder, 332
setRowSpacing, 332
setRowStretchFactor, 333
setRowStretchFactors, 333
setWrap, 333
simplify, 334

- take, 334
- takeAt, 334

QCPLayoutInset, 335
- addElement, 337
- elementAt, 337
- elementCount, 338
- insetAlignment, 338
- InsetPlacement, 336
- insetPlacement, 338
- insetRect, 338
- QCPLayoutInset, 337
- selectTest, 339
- setInsetAlignment, 339
- setInsetPlacement, 339
- setInsetRect, 339
- simplify, 340
- take, 340
- takeAt, 340

QCPLegend, 341
- addItem, 344
- clearItems, 344
- hasItem, 345
- hasItemWithPlottable, 345
- item, 345
- itemCount, 345
- itemWithPlottable, 346
- QCPLegend, 344
- removeItem, 346
- selectTest, 347
- SelectablePart, 344
- selectedItems, 347
- selectionChanged, 347
- setBorderPen, 348
- setBrush, 348
- setFont, 348
- setIconBorderPen, 348
- setIconSize, 349
- setIconTextPadding, 349
- setSelectableParts, 349
- setSelectedBorderPen, 349
- setSelectedBrush, 350
- setSelectedFont, 350
- setSelectedIconBorderPen, 350
- setSelectedParts, 350
- setSelectedTextColor, 351
- setTextColor, 351

QCPLineEnding, 352
- EndingStyle, 353
- QCPLineEnding, 353
- realLength, 354
- setInverted, 354
- setLength, 354
- setStyle, 354
- setWidth, 354

QCPMarginGroup, 355
- clear, 357
- elements, 357
- isEmpty, 357
- QCPMarginGroup, 356

QCPPaintBufferPixmap, 357
- clear, 358
- draw, 358
- QCPPaintBufferPixmap, 358
- reallocateBuffer, 359
- startPainting, 359

QCPPainter, 360
- begin, 361
- drawLine, 362
- makeNonCosmetic, 362
- PainterMode, 361
- QCPPainter, 361
- restore, 362
- save, 362
- setAntialiasing, 363
- setMode, 363
- setModes, 363
- setPen, 363, 364

QCPPlottableInterface1D, 365
- dataCount, 365
- dataMainKey, 366
- dataMainValue, 366
- dataPixelPosition, 366
- dataSortKey, 366
- dataValueRange, 367
- findBegin, 367
- findEnd, 367
- selectTestRect, 368
- sortKeyIsMainKey, 368

QCPPlottableLegendItem, 369
- minimumSizeHint, 370
- QCPPlottableLegendItem, 370

QCPRange, 371
- bounded, 373
- center, 373
- contains, 373
- expand, 373, 374
- expanded, 374
- maxRange, 378
- minRange, 378
- normalize, 375
- operator<<, 378
- operator*, 377
- operator*=, 375
- operator+, 377
- operator+=, 375
- operator-, 377
- operator-=, 375
- operator/, 378
- operator/=, 375
- QCPRange, 372
- sanitizedForLinScale, 376
- sanitizedForLogScale, 376
- size, 376
- validRange, 376

QCPScatterStyle, 379
- applyTo, 384

drawShape, 385
isNone, 385
isPenDefined, 385
QCPScatterStyle, 382–384
ScatterProperty, 381
ScatterShape, 382
setBrush, 386
setCustomPath, 386
setFromOther, 386
setPen, 386
setPixmap, 387
setShape, 387
setSize, 387
undefinePen, 387
QCPSelectionDecorator, 388
applyBrush, 389
applyPen, 390
copyFrom, 390
drawDecoration, 390
getFinalScatterStyle, 390
QCPSelectionDecorator, 389
setBrush, 391
setPen, 391
setScatterStyle, 391
setUsedScatterProperties, 391
QCPSelectionDecoratorBracket, 392
BracketStyle, 393
drawBracket, 393
drawDecoration, 394
QCPSelectionDecoratorBracket, 393
setBracketBrush, 394
setBracketHeight, 394
setBracketPen, 394
setBracketStyle, 394
setBracketWidth, 395
setTangentAverage, 395
setTangentToData, 395
QCPSelectionRect, 396
accepted, 397
cancel, 397
canceled, 398
changed, 398
isActive, 398
QCPSelectionRect, 397
range, 398
setBrush, 399
setPen, 399
started, 399
QCPStatisticalBox, 400
addData, 402
data, 403
drawStatisticalBox, 403
getKeyRange, 403
getValueRange, 404
QCPStatisticalBox, 402
selectTest, 404
selectTestRect, 405
setData, 405
setMedianPen, 406
setOutlierStyle, 406
setWhiskerAntialiased, 406
setWhiskerBarPen, 406
setWhiskerPen, 407
setWhiskerWidth, 407
setWidth, 407
QCPStatisticalBoxData, 408
fromSortKey, 410
mainKey, 410
mainValue, 410
QCPStatisticalBoxData, 409
sortKey, 410
sortKeyIsMainKey, 411
valueRange, 411
QCPTextElement, 411
clicked, 414
doubleClicked, 415
maximumSizeHint, 415
minimumSizeHint, 415
mouseDoubleClickEvent, 415
mousePressEvent, 416
mouseReleaseEvent, 416
QCPTextElement, 413, 414
selectTest, 416
selectionChanged, 416
setFont, 417
setSelectable, 417
setSelected, 417
setSelectedFont, 417
setSelectedTextColor, 418
setText, 418
setTextColor, 418
setTextFlags, 418
QCPVector2D, 419
distanceSquaredToLine, 421
distanceToStraightLine, 422
dot, 422
isNull, 422
length, 422
lengthSquared, 423
normalize, 423
normalized, 423
operator<<, 425
operator*=, 423
operator+=, 424
operator-=, 424
operator/=, 424
perpendicular, 424
QCPVector2D, 421
setX, 424
setY, 424
toPoint, 425
toPointF, 425
QCP, 11
AntialiasedElement, 12
ExportPen, 12
Interaction, 13

MarginSide, 13
PlottingHint, 14
ResolutionUnit, 14
SelectionRectMode, 15
SelectionType, 15
SignDomain, 16
QCustomPlot, 426
addGraph, 431
addLayer, 431
afterReplot, 432
axisClick, 432
axisDoubleClick, 432
axisRect, 433
axisRectAt, 433
axisRectCount, 433
axisRects, 434
beforeReplot, 434
clearGraphs, 434
clearItems, 434
clearPlottables, 435
currentLayer, 435
deselectAll, 435
graph, 435, 436
graphCount, 436
hasInvalidatedPaintBuffers, 436
hasItem, 436
hasPlottable, 437
item, 437
itemAt, 437
itemClick, 438
itemCount, 438
itemDoubleClick, 438
layer, 439
layerCount, 439
LayerInsertMode, 430
layoutElementAt, 440
legend, 463
legendClick, 440
legendDoubleClick, 440
mouseDoubleClick, 441
mouseMove, 441
mousePress, 441
mouseRelease, 441
mouseWheel, 442
moveLayer, 442
plotLayout, 442
plottable, 442, 443
plottableAt, 443
plottableClick, 443
plottableCount, 444
plottableDoubleClick, 444
QCustomPlot, 431
RefreshPriority, 430
removeGraph, 444, 445
removeItem, 445
removeLayer, 445
removePlottable, 446
replot, 446
rescaleAxes, 447
saveBmp, 447
saveJpg, 448
savePdf, 449
savePng, 450
saveRastered, 451
selectedAxes, 451
selectedGraphs, 451
selectedItems, 452
selectedLegends, 452
selectedPlottables, 452
selectionChangedByUser, 452
selectionRect, 453
setAntialiasedElement, 453
setAntialiasedElements, 453
setAutoAddPlottableToLegend, 454
setBackground, 454, 455
setBackgroundScaled, 455
setBackgroundScaledMode, 455
setBufferDevicePixelRatio, 456
setCurrentLayer, 456
setInteraction, 457
setInteractions, 457
setMultiSelectModifier, 458
setNoAntialiasingOnDrag, 458
setNotAntialiasedElement, 459
setNotAntialiasedElements, 459
setOpenGl, 459
setPlottingHint, 460
setPlottingHints, 460
setSelectionRect, 461
setSelectionRectMode, 461
setSelectionTolerance, 461
setViewport, 462
toPainter, 462
toPixmap, 462
xAxis, 463
xAxis2, 463
yAxis, 464
yAxis2, 464
qcpLessThanSortKey
QCPDataContainer, 199

range
QCPSelectionRect, 398
rangeChanged
QCPAxis, 71
rangeDragAxes
QCPAxisRect, 96
rangeDragAxis
QCPAxisRect, 96
rangeZoomAxes
QCPAxisRect, 96
rangeZoomAxis
QCPAxisRect, 96
rangeZoomFactor
QCPAxisRect, 97
realLength
QCPLineEnding, 354

realVisibility
QCPLayerable, 308
reallocateBuffer
QCPAbstractPaintBuffer, 39
QCPPaintBufferPixmap, 359
recalculateDataBounds
QCPColorMapData, 165
rect
QCPLayoutElement, 320
RefreshPriority
QCustomPlot, 430
remove
QCPBarsGroup, 144
QCPDataContainer, 195
QCPLayout, 313
removeAfter
QCPDataContainer, 196
removeAt
QCPLayout, 314
removeAxis
QCPAxisRect, 97
removeBefore
QCPDataContainer, 196
removeFromLegend
QCPAbstractPlottable, 48, 49
removeGraph
QCustomPlot, 444, 445
removeItem
QCPLegend, 346
QCustomPlot, 445
removeLayer
QCustomPlot, 445
removePlottable
QCustomPlot, 446
replot
QCPLayer, 302
QCustomPlot, 446
rescale
QCPAxis, 71
rescaleAxes
QCPAbstractPlottable, 49
QCustomPlot, 447
rescaleDataRange
QCPColorMap, 157
QCPColorScale, 173
rescaleKeyAxis
QCPAbstractPlottable, 49
rescaleValueAxis
QCPAbstractPlottable, 50
ResolutionUnit
QCP, 14
restore
QCPPainter, 362
right
QCPAxisRect, 97
Rohr, 465
get_kA, 465
get_querschnitt, 466
get_radius, 466
Rohrstroemung, 467
get_lambda, 468
rowColToIndex
QCPLayoutGrid, 330
rowCount
QCPLayoutGrid, 331

sanitizedForLinScale
QCPRange, 376
sanitizedForLogScale
QCPRange, 376
save
QCPPainter, 362
saveBmp
QCustomPlot, 447
saveJpg
QCustomPlot, 448
savePdf
QCustomPlot, 449
savePng
QCustomPlot, 450
saveRastered
QCustomPlot, 451
scaleRange
QCPAxis, 72
ScaleStrategy
QCPAxisTickerFixed, 114
ScaleType
QCPAxis, 67
scaleTypeChanged
QCPAxis, 72
ScatterProperty
QCPScatterStyle, 381
ScatterShape
QCPScatterStyle, 382
selectTest
QCPAbstractItem, 31
QCPAbstractLegendItem, 35
QCPAbstractPlottable, 51
QCPAbstractPlottable1D, 60
QCPAxis, 73
QCPBars, 135
QCPColorMap, 157
QCPCurve, 183
QCPErrorBars, 220
QCPFinancial, 230
QCPGraph, 244
QCPItemBracket, 257
QCPItemCurve, 261
QCPItemEllipse, 264
QCPItemLine, 268
QCPItemPixmap, 272
QCPItemRect, 283
QCPItemStraightLine, 286
QCPItemText, 290
QCPItemTracer, 296
QCPLayerable, 308
QCPLayoutElement, 320

QCPLayoutInset, 339
QCPLegend, 347
QCPStatisticalBox, 404
QCPTextElement, 416
selectTestRect
QCPAbstractPlottable1D, 61
QCPBars, 135
QCPErrorBars, 220
QCPFinancial, 231
QCPPlottableInterface1D, 368
QCPStatisticalBox, 405
selectableChanged
QCPAbstractPlottable, 50
QCPAxis, 72
SelectablePart
QCPAxis, 67
QCPLegend, 344
selected
QCPAbstractPlottable, 50
selectedAxes
QCustomPlot, 451
selectedGraphs
QCustomPlot, 451
selectedItems
QCPLegend, 347
QCustomPlot, 452
selectedLegends
QCustomPlot, 452
selectedPlottables
QCustomPlot, 452
selection
QCPAbstractPlottable, 50
selectionChanged
QCPAbstractItem, 31
QCPAbstractLegendItem, 35
QCPAbstractPlottable, 50, 51
QCPAxis, 73
QCPLegend, 347
QCPTextElement, 416
selectionChangedByUser
QCustomPlot, 452
selectionDecorator
QCPAbstractPlottable, 51
selectionRect
QCustomPlot, 453
SelectionRectMode
QCP, 15
SelectionType
QCP, 15
set
QCPDataContainer, 196, 197
set_massenstrom
Fluid, 20
set_t_ein
Fluid, 20
setAdaptiveSampling
QCPGraph, 244
setAlpha
QCPColorMapData, 165
setAntialiased
QCPLayerable, 309
setAntialiasedElement
QCustomPlot, 453
setAntialiasedElements
QCustomPlot, 453
setAntialiasedFill
QCPAbstractPlottable, 52
setAntialiasedScatters
QCPAbstractPlottable, 52
setAntialiasedSubGrid
QCPGrid, 251
setAntialiasedZeroLine
QCPGrid, 251
setAntialiasing
QCPPainter, 363
setAutoAddPlottableToLegend
QCustomPlot, 454
setAutoMargins
QCPLayoutElement, 320
setAutoSqueeze
QCPDataContainer, 197
setAxes
QCPItemPosition, 277
setAxisRect
QCPItemPosition, 277
setBackground
QCPAxisRect, 97, 98
QCustomPlot, 454, 455
setBackgroundScaled
QCPAxisRect, 98
QCustomPlot, 455
setBackgroundScaledMode
QCPAxisRect, 99
QCustomPlot, 455
setBarWidth
QCPColorScale, 174
setBarsGroup
QCPBars, 135
setBasePen
QCPAxis, 73
setBaseValue
QCPBars, 136
setBegin
QCPDataRange, 203
setBorderPen
QCPLegend, 348
setBracketBrush
QCPSelectionDecoratorBracket, 394
setBracketHeight
QCPSelectionDecoratorBracket, 394
setBracketPen
QCPSelectionDecoratorBracket, 394
setBracketStyle
QCPSelectionDecoratorBracket, 394
setBracketWidth
QCPSelectionDecoratorBracket, 395

setBrush
QCPAbstractPlottable, 53
QCPItemEllipse, 265
QCPItemRect, 283
QCPItemText, 290
QCPItemTracer, 296
QCPLegend, 348
QCPScatterStyle, 386
QCPSelectionDecorator, 391
QCPSelectionRect, 399
setBrushNegative
QCPFinancial, 231
setBrushPositive
QCPFinancial, 231
setBufferDevicePixelRatio
QCustomPlot, 456
setCell
QCPColorMapData, 166
setChannelFillGraph
QCPGraph, 244
setChartStyle
QCPFinancial, 232
setClipAxisRect
QCPAbstractItem, 31
setClipToAxisRect
QCPAbstractItem, 32
setColor
QCPItemText, 290
setColorInterpolation
QCPColorGradient, 150
setColorScale
QCPColorMap, 158
setColorStopAt
QCPColorGradient, 150
setColorStops
QCPColorGradient, 150
setColumnSpacing
QCPLayoutGrid, 331
setColumnStretchFactor
QCPLayoutGrid, 331
setColumnStretchFactors
QCPLayoutGrid, 332
setCoords
QCPItemPosition, 277
setCurrentLayer
QCustomPlot, 456
setCustomPath
QCPScatterStyle, 386
setData
QCPBars, 136
QCPColorMap, 158
QCPColorMapData, 166
QCPCurve, 184
QCPErrorBars, 221, 222
QCPFinancial, 232
QCPGraph, 245
QCPStatisticalBox, 405
setDataPlottable
QCPErrorBars, 222
setDataRange
QCPColorMap, 158
QCPColorScale, 174
setDataScaleType
QCPColorMap, 159
QCPColorScale, 174
setDateTimeFormat
QCPAxisTickerDateTime, 112
setDateTimeSpec
QCPAxisTickerDateTime, 112
setDevicePixelRatio
QCPAbstractPaintBuffer, 40
setEnd
QCPDataRange, 203
setErrorType
QCPErrorBars, 222
setFieldWidth
QCPAxisTickerTime, 128
setFillOrder
QCPLayoutGrid, 332
setFont
QCPAbstractLegendItem, 35
QCPItemText, 291
QCPLegend, 348
QCPTextElement, 417
setFractionStyle
QCPAxisTickerPi, 119
setFromOther
QCPScatterStyle, 386
setGradient
QCPColorMap, 159
QCPColorScale, 174
setGraph
QCPItemTracer, 297
setGraphKey
QCPItemTracer, 297
setHead
QCPItemCurve, 261
QCPItemLine, 269
setIconBorderPen
QCPLegend, 348
setIconSize
QCPLegend, 349
setIconTextPadding
QCPLegend, 349
setInsetAlignment
QCPLayoutInset, 339
setInsetPlacement
QCPLayoutInset, 339
setInsetRect
QCPLayoutInset, 339
setInteraction
QCustomPlot, 457
setInteractions
QCustomPlot, 457
setInterpolate
QCPColorMap, 159

setInterpolating
QCPItemTracer, 297
setInvalidated
QCPAbstractPaintBuffer, 40
setInverted
QCPLineEnding, 354
setKeyAxis
QCPAbstractPlottable, 53
setKeyRange
QCPColorMapData, 166
setKeySize
QCPColorMapData, 167
setLabel
QCPAxis, 74
QCPColorScale, 175
setLabelColor
QCPAxis, 74
setLabelFont
QCPAxis, 74
setLabelPadding
QCPAxis, 74
setLayer
QCPLayerable, 309, 310
setLength
QCPItemBracket, 257
QCPLineEnding, 354
setLevelCount
QCPColorGradient, 151
setLineStyle
QCPCurve, 185
QCPGraph, 246
setLogBase
QCPAxisTickerLog, 117
setLowerEnding
QCPAxis, 75
setMarginGroup
QCPLayoutElement, 321
setMargins
QCPLayoutElement, 321
setMaximumSize
QCPLayoutElement, 321, 322
setMedianPen
QCPStatisticalBox, 406
setMinimumMargins
QCPLayoutElement, 322
setMinimumSize
QCPLayoutElement, 322
setMode
QCPLayer, 303
QCPPainter, 363
setModes
QCPPainter, 363
setMultiSelectModifier
QCustomPlot, 458
setName
QCPAbstractPlottable, 53
setNoAntialiasingOnDrag
QCustomPlot, 458
setNotAntialiasedElement
QCustomPlot, 459
setNotAntialiasedElements
QCustomPlot, 459
setNumberFormat
QCPAxis, 75
setNumberPrecision
QCPAxis, 75
setOffset
QCPAxis, 76
setOpenGl
QCustomPlot, 459
setOuterRect
QCPLayoutElement, 323
setOutlierStyle
QCPStatisticalBox, 406
setPadding
QCPAxis, 76
QCPItemText, 291
setParentAnchor
QCPItemPosition, 278
setParentAnchorX
QCPItemPosition, 278
setParentAnchorY
QCPItemPosition, 278
setPen
QCPAbstractPlottable, 53
QCPGrid, 251
QCPItemBracket, 258
QCPItemCurve, 261
QCPItemEllipse, 265
QCPItemLine, 269
QCPItemPixmap, 272
QCPItemRect, 284
QCPItemStraightLine, 286
QCPItemText, 291
QCPItemTracer, 298
QCPPainter, 363, 364
QCPScatterStyle, 386
QCPSelectionDecorator, 391
QCPSelectionRect, 399
setPenNegative
QCPFinancial, 233
setPenPositive
QCPFinancial, 233
setPeriodic
QCPColorGradient, 151
setPeriodicity
QCPAxisTickerPi, 119
setPiSymbol
QCPAxisTickerPi, 120
setPiValue
QCPAxisTickerPi, 120
setPixelPosition
QCPItemPosition, 279
setPixmap
QCPItemPixmap, 273
QCPScatterStyle, 387

setPlottingHint
QCustomPlot, 460
setPlottingHints
QCustomPlot, 460
setPositionAlignment
QCPItemText, 291
setRange
QCPAxis, 76, 77
QCPColorMapData, 167
setRangeDrag
QCPAxisRect, 99
QCPColorScale, 175
setRangeDragAxes
QCPAxisRect, 99, 100
setRangeLower
QCPAxis, 77
setRangeReversed
QCPAxis, 77
setRangeUpper
QCPAxis, 77
setRangeZoom
QCPAxisRect, 100
QCPColorScale, 175
setRangeZoomAxes
QCPAxisRect, 101
setRangeZoomFactor
QCPAxisRect, 102
setRotation
QCPItemText, 291
setRowSpacing
QCPLayoutGrid, 332
setRowStretchFactor
QCPLayoutGrid, 333
setRowStretchFactors
QCPLayoutGrid, 333
setScaleRatio
QCPAxis, 78
setScaleStrategy
QCPAxisTickerFixed, 115
setScaleType
QCPAxis, 78
setScaled
QCPItemPixmap, 273
setScatterSkip
QCPCurve, 185
QCPGraph, 246
setScatterStyle
QCPCurve, 185
QCPGraph, 246
QCPSelectionDecorator, 391
setSelectable
QCPAbstractItem, 32
QCPAbstractLegendItem, 36
QCPAbstractPlottable, 54
QCPTextElement, 417
setSelectableParts
QCPAxis, 78
QCPLegend, 349
setSelected
QCPAbstractItem, 32
QCPAbstractLegendItem, 36
QCPTextElement, 417
setSelectedBasePen
QCPAxis, 78
setSelectedBorderPen
QCPLegend, 349
setSelectedBrush
QCPItemEllipse, 266
QCPItemRect, 284
QCPItemText, 292
QCPItemTracer, 298
QCPLegend, 350
setSelectedColor
QCPItemText, 292
setSelectedFont
QCPAbstractLegendItem, 36
QCPItemText, 292
QCPLegend, 350
QCPTextElement, 417
setSelectedIconBorderPen
QCPLegend, 350
setSelectedLabelColor
QCPAxis, 79
setSelectedLabelFont
QCPAxis, 79
setSelectedParts
QCPAxis, 79
QCPLegend, 350
setSelectedPen
QCPItemBracket, 258
QCPItemCurve, 262
QCPItemEllipse, 266
QCPItemLine, 269
QCPItemPixmap, 273
QCPItemRect, 284
QCPItemStraightLine, 287
QCPItemText, 292
QCPItemTracer, 298
setSelectedSubTickPen
QCPAxis, 79
setSelectedTextColor
QCPAbstractLegendItem, 36
QCPLegend, 351
QCPTextElement, 418
setSelectedTickLabelColor
QCPAxis, 80
setSelectedTickLabelFont
QCPAxis, 80
setSelectedTickPen
QCPAxis, 80
setSelection
QCPAbstractPlottable, 54
setSelectionDecorator
QCPAbstractPlottable, 54
setSelectionRect
QCustomPlot, 461

setSelectionRectMode
QCustomPlot, 461
setSelectionTolerance
QCustomPlot, 461
setShape
QCPScatterStyle, 387
setSize
QCPAbstractPaintBuffer, 40
QCPColorMapData, 167
QCPItemTracer, 298
QCPScatterStyle, 387
setSpacing
QCPBarsGroup, 145
setSpacingType
QCPBarsGroup, 145
setStackingGap
QCPBars, 137
setStyle
QCPItemBracket, 258
QCPItemTracer, 299
QCPLineEnding, 354
setSubGridPen
QCPGrid, 252
setSubGridVisible
QCPGrid, 252
setSubTickCount
QCPAxisTickerLog, 117
QCPAxisTickerText, 124
setSubTickLength
QCPAxis, 80
setSubTickLengthIn
QCPAxis, 81
setSubTickLengthOut
QCPAxis, 81
setSubTickPen
QCPAxis, 81
setSubTicks
QCPAxis, 81
setSymbolGap
QCPErrorBars, 223
setTail
QCPItemCurve, 262
QCPItemLine, 269
setTangentAverage
QCPSelectionDecoratorBracket, 395
setTangentToData
QCPSelectionDecoratorBracket, 395
setText
QCPItemText, 292
QCPTextElement, 418
setTextAlignment
QCPItemText, 293
setTextColor
QCPAbstractLegendItem, 37
QCPLegend, 351
QCPTextElement, 418
setTextFlags
QCPTextElement, 418
setTickCount
QCPAxisTicker, 108
setTickLabelColor
QCPAxis, 82
setTickLabelFont
QCPAxis, 82
setTickLabelPadding
QCPAxis, 83
setTickLabelRotation
QCPAxis, 83
setTickLabelSide
QCPAxis, 83
setTickLabels
QCPAxis, 83
setTickLength
QCPAxis, 83
setTickLengthIn
QCPAxis, 84
setTickLengthOut
QCPAxis, 84
setTickOrigin
QCPAxisTicker, 108
QCPAxisTickerDateTime, 112, 113
setTickPen
QCPAxis, 84
setTickStep
QCPAxisTickerFixed, 115
setTickStepStrategy
QCPAxisTicker, 108
setTicker
QCPAxis, 82
setTicks
QCPAxis, 84
QCPAxisTickerText, 124, 125
setTightBoundary
QCPColorMap, 160
setTimeFormat
QCPAxisTickerTime, 128
setTwoColored
QCPFinancial, 233
setType
QCPColorScale, 175
QCPItemPosition, 279
setTypeX
QCPItemPosition, 279
setTypeY
QCPItemPosition, 280
setUpperEnding
QCPAxis, 85
setUsedScatterProperties
QCPSelectionDecorator, 391
setValueAxis
QCPAbstractPlottable, 55
setValueRange
QCPColorMapData, 168
setValueSize
QCPColorMapData, 168
setViewport

QCustomPlot, 462
setVisible
QCPLayer, 303
QCPLayerable, 310
setWhiskerAntialiased
QCPStatisticalBox, 406
setWhiskerBarPen
QCPStatisticalBox, 406
setWhiskerPen
QCPStatisticalBox, 407
setWhiskerWidth
QCPErrorBars, 223
QCPStatisticalBox, 407
setWidth
QCPBars, 137
QCPFinancial, 234
QCPLineEnding, 354
QCPStatisticalBox, 407
setWidthType
QCPBars, 137
QCPFinancial, 234
setWrap
QCPLayoutGrid, 333
setZeroLinePen
QCPGrid, 252
setupFullAxesBox
QCPAxisRect, 102
setX
QCPVector2D, 424
setY
QCPVector2D, 424
SignDomain
QCP, 16
simplify
QCPDataSelection, 209
QCPLayout, 314
QCPLayoutGrid, 334
QCPLayoutInset, 340
size
QCPAxisRect, 102
QCPBarsGroup, 145
QCPDataContainer, 197
QCPDataRange, 203
QCPRange, 376
sizeConstraintsChanged
QCPLayout, 314
sort
QCPDataContainer, 198
sortKey
QCPBarsData, 139
QCPCurveData, 188
QCPFinancialData, 237
QCPGraphData, 249
QCPStatisticalBoxData, 410
sortKeyIsMainKey
QCPAbstractPlottable1D, 61
QCPBarsData, 140
QCPCurveData, 188
QCPErrorBars, 223
QCPFinancialData, 237
QCPGraphData, 249
QCPPlottableInterface1D, 368
QCPStatisticalBoxData, 411
SpacingType
QCPBarsGroup, 142
span
QCPDataSelection, 210
squeeze
QCPDataContainer, 198
startPainting
QCPAbstractPaintBuffer, 41
QCPPaintBufferPixmap, 359
started
QCPSelectionRect, 399

take
QCPLayout, 315
QCPLayoutGrid, 334
QCPLayoutInset, 340
takeAt
QCPLayout, 315
QCPLayoutGrid, 334
QCPLayoutInset, 340
TickStepStrategy
QCPAxisTicker, 107
ticker
QCPAxis, 85
ticks
QCPAxisTickerText, 125
timeSeriesToOhlc
QCPFinancial, 234
TimeUnit
QCPAxisTickerTime, 127
toPainter
QCustomPlot, 462
toPixmap
QCustomPlot, 462
toPoint
QCPVector2D, 425
toPointF
QCPVector2D, 425
toQCPItemPosition
QCPItemAnchor, 254
QCPItemPosition, 280
top
QCPAxisRect, 103
topLeft
QCPAxisRect, 103
topRight
QCPAxisRect, 103
TracerStyle
QCPItemTracer, 295
type
QCPItemPosition, 280

undefinePen
QCPScatterStyle, 387

update
QCPAxisRect, 103
QCPColorScale, 175
QCPLayout, 315
QCPLayoutElement, 323
updateLegendIcon
QCPColorMap, 160
UpdatePhase
QCPLayoutElement, 318
updatePosition
QCPItemTracer, 299

validRange
QCPRange, 376
valueRange
QCPBarsData, 140
QCPCurveData, 188
QCPDataContainer, 198
QCPFinancialData, 237
QCPGraphData, 249
QCPStatisticalBoxData, 411

wheelEvent
QCPAxisRect, 103
QCPColorScale, 176
QCPLayerable, 310
width
QCPAxisRect, 104
WidthType
QCPBars, 131
QCPFinancial, 228

xAxis
QCustomPlot, 463
xAxis2
QCustomPlot, 463

yAxis
QCustomPlot, 464
yAxis2
QCustomPlot, 464

zoom
QCPAxisRect, 104