

# Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



## Contents

1	Application Details.....	3
1.1	Scope .....	3
1.2	Specifications.....	4
2	General Application Overview.....	5
2.1	Configuration of the database location.....	5
2.2	Running the application .....	6
2.3	Selection of the desired table .....	6
2.4	Save and cancel modifications in the table view .....	8
2.5	Get foreign key details .....	10
2.6	Save and cancel changes in the detail view .....	11
2.7	Add and delete buttons.....	13
2.8	Input validation .....	15
2.9	Filtering.....	17
2.10	Exception Messages .....	18
2.11	Logging .....	19
3	Application Structure and Classes.....	20
3.1	DataAccess.....	20
3.1.1	ModelContext.cs.....	20
3.2	Models.....	20
3.2.1	Models.....	20
3.2.2	ExtendedModels.....	20
3.2.3	Interfaces.....	20
3.3	UI .....	20
3.3.1	Repository.....	20
3.3.2	Interfaces.....	20
3.3.3	Implementations .....	20
3.4	Converters .....	20
3.5	Events .....	21
3.5.1	OpenDetailViewEvent .....	21
3.5.2	OpenTableViewEvent .....	21
3.5.3	StatusChangedEvent.....	21

## Config Tool – Manual

Revision: **00**  
Revision date: **29-Aug-2021**

Project ref.: **NA**  
Machine number: **NA**



3.6	ViewModels.....	21
3.6.1	DetailViewModels .....	22
3.6.2	Services.....	22
3.6.3	TableViewModels.....	22
3.6.4	NavigationViewModels .....	22
3.6.5	MainviewModel.....	22
3.7	Views .....	22
3.7.1	DetailViews.....	22
3.7.2	Services.....	23
3.7.3	TableViews.....	23
3.7.4	NavigationView.....	23
3.7.5	Mainview .....	23
3.8	Wrappers and input validation.....	23
3.9	App.xaml.cs .....	24
3.10	Appsettings.(development).json .....	25
4	Error Handling .....	25
5	Improvements .....	25
6	Known Bugs .....	26

## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



### Document history

Issue	Date	Description of change	Author
00	29-Aug-2021	First revision of the document	ADBX

## 1 Application Details

### 1.1 Scope

The goal of this tool is to make a user interface on top of the MC5 database. It should make the data more accessible and more human readable in order to boost the productivity and to automate as much as possible. In addition to this, extra functionality can also be added such as input validation and custom rules.

The tool will be used to maintain the MC5 configuration in an easy and controlled manner.

For the development of the tool, the scope was divided into several subtasks:

#### 0. Reading data from database

1. Using existing dll of MC5

#### 1. Writing data to database

1. Using existing dll of MC5

#### 0. Visualizing data

1. Wpf
2. Visualize all key tables for PLC developers (Plctags, Datablock, Text, TextLanguage, Engineering, Equipment, Recipe, Tooling, Ecm, Event)  
One window per table.
3. Research on the best control to use (DataGrid, items control, ...)
4. Display linked tables/foreign key tables
  - a. Display key information (e.g., tag name)
  - b. Show detail of tag when clicked on
  - c. Return button or easily switch between detail and normal
  - d. Evaluate layout with colleagues

#### 1. Data editing

1. Edit, cancel and save button for each table
2. Fields must be editable when clicked.  
Standard fields must be normal textboxes, foreign key fields must be combo boxes.
3. When the cancel button is clicked, the modifications must be undone.
4. Modifications are saved to the database when clicking the save button and the script must be exported.

#### 0. Simplify editing

1. Copying data
2. Auto complete for new records (fill in id, default values, ...)
3. Bulk operations

**Commented [BJ1]:** Doel/scope van de applicatie toevoegen  
How to start hoofdstuk toevoegen, wat moet je doen om een database te zien editeren

# Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



4. Check this with colleagues.

## 1. Data validation

1. Custom validation rules:  
Check whether data may be used (is tag already used, PARXX, EVTXX) See SQL statements task force
2. Database level validation:  
Unique keys, data type, ...
3. Block the save procedure when data is incorrect and inform the user for each error.

## 1.2 Specifications

**Framework:** .NET 5

**IDE:** Visual Studio 2019

**Application Type:** WPF

**Database:** Firebird 3.0

**Database Interaction:**

- Entity Framework Core (5.0.4)
- Entity Framework Core Firebird (8.0.0-alpha3)

**Used Patterns:**

- MVVM pattern
- Repository pattern
- Dependency injection
- Reflection
- Generics

**Dependencies**

- Prism (8.0.0)<sup>1</sup>
- Serilog (2.10.0)<sup>2</sup>
- MCS Models for Firebird 3.0 database

Commented [BJ2]: Versienummer toevoegen

Commented [BJ3]: Database type en versie toevoegen

<sup>1</sup> <https://prismlibrary.com/index.html>

<sup>2</sup> <https://serilog.net/>

## Config Tool – Manual

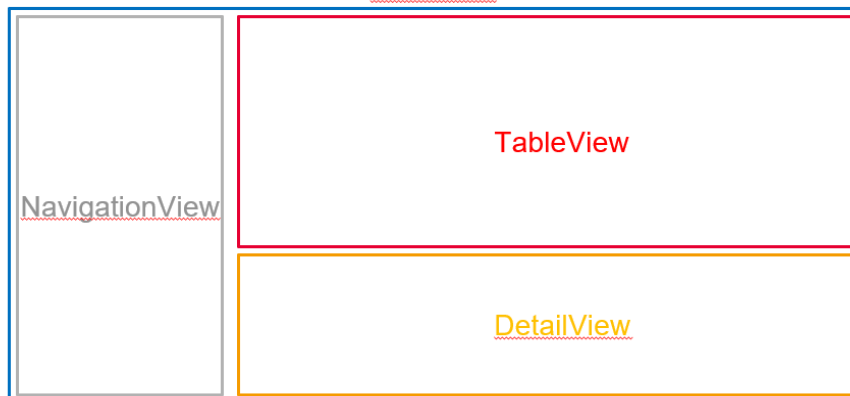
Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA

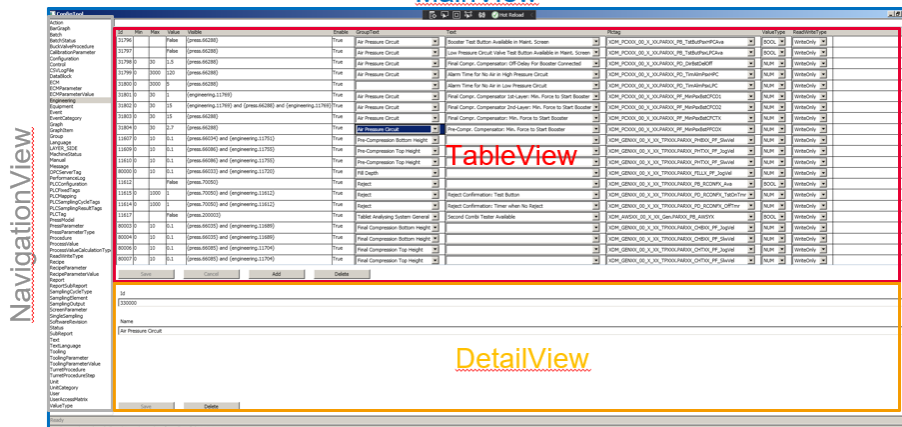


## 2 General Application Overview

### MainView



### MainView



### 2.1 Configuration of the database location

Before running the application, the location of the database has to be specified in the appsettings.(development).json file, which can be found in the following directory:

C:\Users\gea.halle.cn\Source\Repos\ConfigTool\ConfigTool.UI\bin\Debug\net5.0-windows

The json file is just a text file and can be opened with notepad++. The file contains a connection string with the details to locate and to open the database.

```
{
  "ConnectionStrings": {
    "ConfigToolDatabase": "Server=localhost;Database=C:\\Users\\gea.halle.cn\\Source\\Repos\\ConfigTool\\Config\\CONF IOTool.FDB;user id=SYSDBA;password=SYSDBA;character set=UTF8;Dialect=3"
  }
}
```

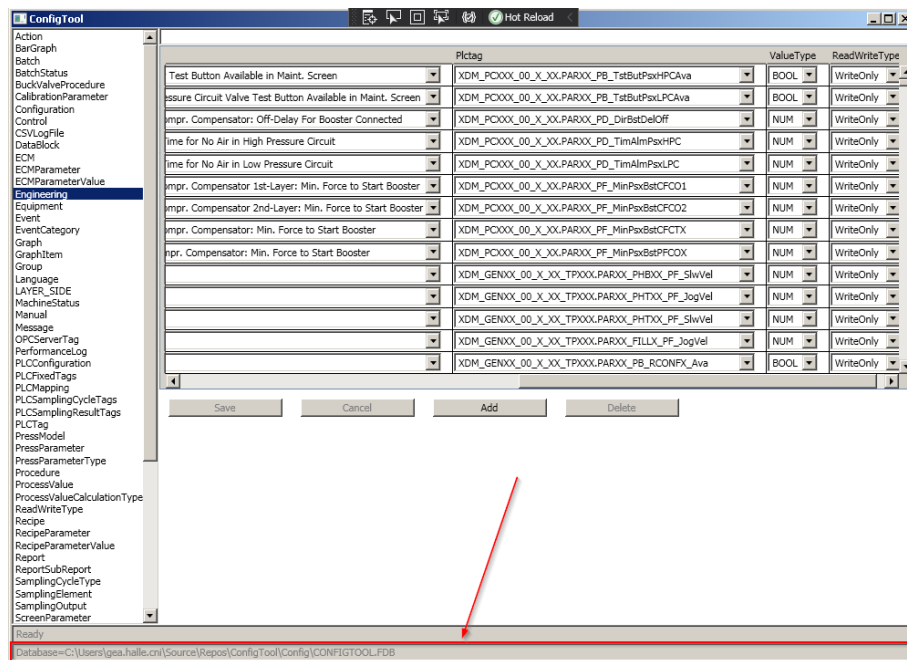
## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



The database location will be visualized in the tool at the bottom of the screen.



### 2.2 Running the application

Run the application with the following executable.

C:\Users\gea.halle.cni\Source\Repos\ConfigTool\ConfigTool.UI\bin\Debug\net5.0-windows\ConfigTool.UI.exe

! Make sure to use a database which is compliant with the tool, as described in \$ '5 Improvements'

### 2.3 Selection of the desired table

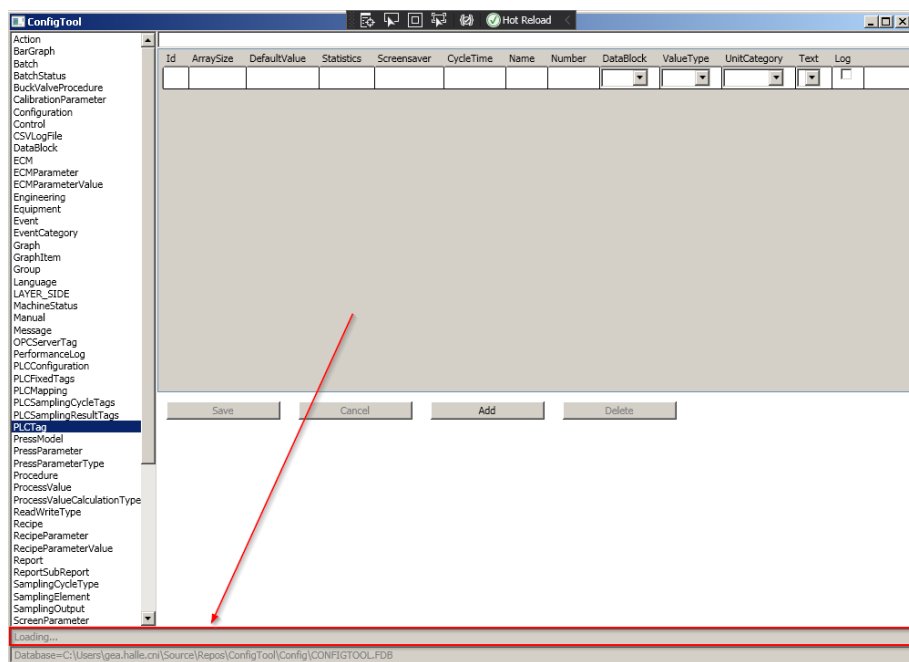
Select the table in the navigation view that you would like to visualize. The table is then visualized in the table view, where the tags can be modified.

Opening larger tables can take some time. Keep an eye on the status bar to know if the application is ready or busy loading the values.

## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



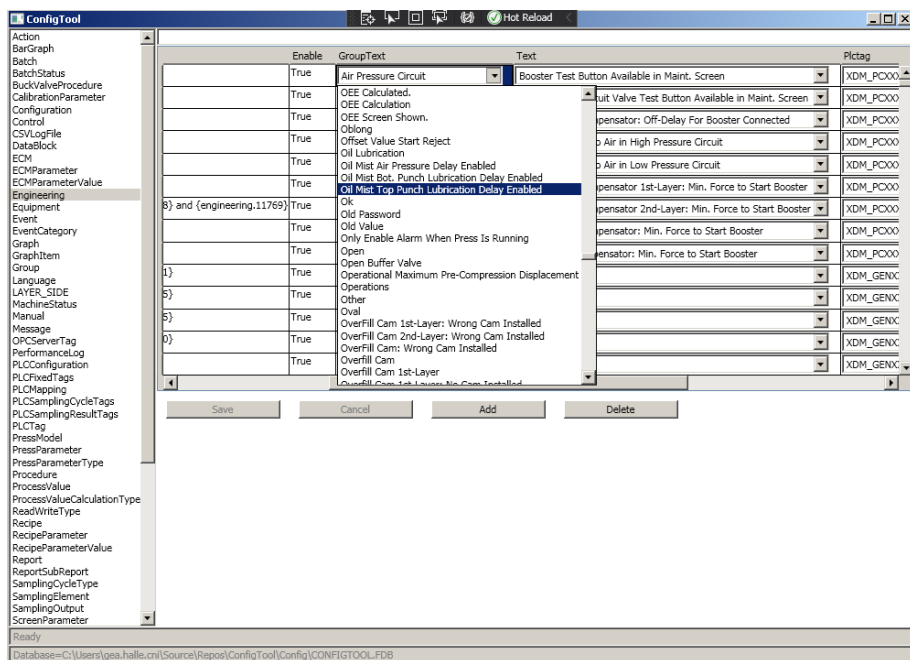
Non-foreign key columns can be modified straight away by double clicking on the cell.

Foreign key columns are visualized with clear text in combo boxes. The combo boxes contain all the possible values of the linked table and can be modified by selecting another value in the combo box. In the background the right foreign key value will be linked in the database.

## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



### 2.4 Save and cancel modifications in the table view

When a cell is modified, the save and cancel buttons will become enabled.

When the **save** button is activated, all modifications will be applied to the database.

When the **cancel** button is activated, all modifications will be deleted and the previous values will be visible again.



## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



The screenshot shows the Config Tool interface. On the left is a navigation pane with a tree view containing various categories like Action, Batch, Configuration, Control, CSVLogFile, DataBlock, EOM, EOMParameter, Equipment, Event, EventCategory, Graph, GraphItem, Group, Language, LAYER\_SIDE, MachineStatus, Manual, Message, OPCServerTag, PerformanceLog, PLCConfiguration, PLCFixedTags, PLCMapping, PLCSamplingCycleTags, PLCSamplingResultTags, PLCTag, PressModel, PressParameter, PressParameterType, Procedure, ProcessValue, ProcessValueCalculationType, ReadWriteType, Recipe, RecipeParameter, RecipeParameterValue, Report, ReportSubReport, SamplingCycleType, SamplingElement, SamplingOutput, and ScreenParameter. The main area displays a table with columns: Id, Min, Max, Value, Visible, Enable, and GroupText. The table contains 17 rows of data. At the bottom of the table are buttons for Save, Cancel, Add, and Delete. The Save and Cancel buttons are highlighted with a red rectangle. The status bar at the bottom indicates 'Ready' and the database path: 'Database=C:\Users\gea.halle.nl\Source\Repos\ConfigTool\Config\CONFIGTOOL.FDB'.

Id	Min	Max	Value	Visible	Enable	GroupText
25401			True	{press.66062} and {screen.13}	TRUE	Dust Extraction 2nd-Layer
27901			True	{engineering.11731} and {screen.13}	TRUE	Automated Adjustment Compr. 1st-Lay
27902	0	100	45	{engineering.11731} and {screen.13} and {equipment.27901}	TRUE	Automated Adjustment Compr. 1st-Lay
27903	0	10	0.65	{engineering.11731} and {screen.13} and {equipment.27901}	TRUE	Automated Adjustment Compr. 1st-Lay
2750			False	{press.200001} and {equipment.24001}	TRUE	Tablet Analysing System
29000			False	{press.66033} and {screen.14} and {engineering.81240}	TRUE	Fill Depth
29001	0	10	0.5	{press.66033} and {screen.14} and {engineering.81240} and {equipment.29000}	TRUE	Fill Depth
29002	0	100	1	{press.66033} and {screen.14} and {engineering.81240} and {equipment.29000}	TRUE	Fill Depth
2712			False	{press.66040} and {screen.13} and {engineering.81241}	TRUE	Fill Depth 1st-Layer
2713	0	10	0.5	{press.66040} and {screen.13} and {engineering.81241} and {equipment.2712}	TRUE	Fill Depth 1st-Layer
2714	0	100	1	{press.66040} and {screen.13} and {engineering.81241} and {equipment.2712}	TRUE	Fill Depth 1st-Layer
2715			False	{press.66042} and {screen.13} and {engineering.81242}	TRUE	Fill Depth 2nd-Layer
2716	0	10	0.5	{press.66042} and {screen.13} and {engineering.81242} and {equipment.2715}	TRUE	Fill Depth 2nd-Layer
2717	0	100	1	{press.66042} and {screen.13} and {engineering.81242} and {equipment.2715}	TRUE	Fill Depth 2nd-Layer

When changes are made and another table is selected in the navigation view, a message will pop-up to ask you whether you would like to navigate away and lose all your modifications, or to abort the navigation so you could continue and/or save your work.

## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



The screenshot shows the Config Tool application window. On the left is a tree view of configuration categories. The main area displays a table with columns: Id, Min, Max, Value, Visible, Enable, and GroupText. A modal dialog box is open over the table, displaying the message "You've made changes. Navigate away?" with "OK" and "Cancel" buttons. Below the dialog are buttons for "Save", "Cancel", "Add", and "Delete".

Id	Min	Max	Value	Visible	Enable	GroupText
25401			True	{press.66062} and {screen.13}	TRUE	Dust Extraction 2nd-Layer
27901			True	{engineering.11731} and {screen.13}	TRUE	Automated Adjustment Compr. 1st-Lay
27902	0	100	45	{engineering.11731} and {screen.13} and {equipment.27901}	TRUE	Automated Adjustment Compr. 1st-Lay
27903	0	10	0.65	{engineering.11731} and {screen.13} and {equipment.27901}	TRUE	Automated Adjustment Compr. 1st-Lay
2750			False	{press.200001} and {equipment.24001}	TRUE	Tablet Analysing System
29000			False	{press.66033} and {screen.14} and {engineering.81240}	TRUE	Fill Depth
29001	0	10	0.5	{press.66033} and {screen.14} and {engineering.81240} and {equipment.29000}	TRUE	Fill Depth
29002	0	100	1	{press.66033} and {screen.14} and {engineering.81240} and {equipment.29000}	TRUE	Fill Depth
2712			False	{press.66040} and {screen.13} and {engineering.81241}	TRUE	Fill Depth 1st-Layer
2713	0	10	0.5	{press.66040} and {screen.13} and {engineering.81241} and {equipment.2712}	TRUE	Fill Depth 1st-Layer
2714	0	100		{engineering.81241} and {equipment.2712}	TRUE	Fill Depth 1st-Layer
2715				{engineering.81242}	TRUE	Fill Depth 2nd-Layer
2716	0	10		{engineering.81242} and {equipment.2715}	TRUE	Fill Depth 2nd-Layer
2717	0	100		{engineering.81242} and {equipment.2715}	TRUE	Fill Depth 2nd-Layer

### 2.5 Get foreign key details

By selecting a foreign key column, the linked tag will be visualized in the detail view.

All records, except for the primary key, can directly be modified in the detail view. Be aware that these changes will be applicable in all tables where this foreign key value is used.

## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

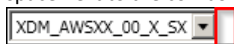
Project ref.: NA  
Machine number: NA



The screenshot shows the Config Tool application. On the left is a tree view with categories like Action, Batch, Configuration, etc. The main area contains a table with columns: Name, Number, DataBlock, ValueType, UnitCategory, and Text. A red box highlights the 'DataBlock' column for the first row, which contains 'XDM\_AWSXX\_00\_X\_SX'. Below the table, there are buttons for 'Save', 'Cancel', 'Add', and 'Delete'. A red arrow points from the 'Save' button to the 'Id' field in the detail view below. The detail view has fields for 'Id', 'Name', 'Number', 'Enable', and 'Save/Delete' buttons. The 'Name' field contains 'XDM\_AWSXX\_00\_X\_SX' and the 'Number' field contains 'DB213'.

Name	Number	DataBlock	ValueType	UnitCategory	Text
AWSXX.CTRXX_XX_MaxTst.IB_Stt	DBX0.0	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	Moxa Relay But
AWSXX.CTRXX_XX_MaxTst.IB_Stp	DBX0.1	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
AWSXX.CTRXX_XX_MaxTst.QB_Sta	DBX0.2	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
AWSXX.CTRXX_XX_MaxTst.QB_Ena	DBX0.3	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
AWSXX.CTRXX_XX_MaxTst.QB_Vis	DBX0.4	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
AWSXX.HMDXX_XX_TagBox_Bey.VF_Act	DBD2	XDM_AWSXX_00_X_SX	REAL	Unit_NoUnitNoDecimals	AWS/Combi Test
AWSXX.HMDXX_XX_TagBox_Bey.VF_test	DBD10	XDM_AWSXX_00_X_SX	REAL	Unit_NoUnitNoDecimals	AWS/Combi Test
AWSXX.HMDXX_XX_TagBox_Bey.VF_Max	DBD14	XDM_AWSXX_00_X_SX	REAL	Unit_NoUnitNoDecimals	
AWSXX.HMDXX_XX_TagBox_Bey.VF_Min	DBD18	XDM_AWSXX_00_X_SX	REAL	Unit_NoUnitNoDecimals	
AWSXX.HMDXX_XX_TagBox_Bey.VF_Sta	DBW22	XDM_AWSXX_00_X_SX	INT	Unit_NoUnitNoDecimals	
AWSXX.HMDXX_XX_TagBox_Bey.VF_Chg	DBX24.0	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
AWSXX.HMDXX_XX_TagBox_Bey.VB_ChgEna	DBX24.1	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
AWSXX.HMDXX_XX_TagBox_Bey.VB_Stp	DBX24.2	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
AWSXX.HMDXX_XX_TagBox_Bey.VB_KeyPadOpn	DBX24.3	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
AWSXX.HMDXX_XX_TagBox_Bey.VB_JogPosMov	DBX24.4	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
AWSXX.HMDXX_XX_TagBox_Bey.VB_JogNegMov	DBX24.5	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	

When you only want to see the details of the tag without the combo box to open, click on the small space next to the combo box. This allows quick navigation between the foreign keys.



### 2.6 Save and cancel changes in the detail view

When a cell is modified, the save button will become enabled.

When the **save** button is activated, all modifications will be applied to the database.

Unfortunately, there is no cancel button yet in the detail view, at this moment the work around is to select another cell in the table view. Like in the table view you will get a message dialog with the question if you would like to proceed to navigate away and undo your changes or to abort the navigation.

## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



ConfigTool

Hot Reload

name	Number	DataBlock	ValueType	UnitCategory	Text
WSXX.CTRXX_XX_MoxTst_IB_Stt	DBX0.0	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	Moxa Relay Button
WSXX.CTRXX_XX_MoxTst_IB_Stp	DBX0.1	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
WSXX.CTRXX_XX_MoxTst_QB_Sta	DBX0.2	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
WSXX.CTRXX_XX_MoxTst_QB_Ena	DBX0.3	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
WSXX.CTRXX_XX_MoxTst_QB_Vis	DBX0.4	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
WSXX.HMDXX_XX_TagBox_Bay_VF_Act	DB02	XDM_AWSXX_00_X_SX	REAL	Unit_NoUnitNoDecimals	AWS/Combi Tester Analyse Busy
WSXX.HMDXX_XX_TagBox_Bay_VF_test	DB010	XDM_AWSXX_00_X_SX	REAL	Unit_NoUnitNoDecimals	AWS/Combi Tester Analyse Busy
WSXX.HMDXX_XX_TagBox_Bay_VF_Max	DB014	XDM_AWSXX_00_X_SX	REAL	Unit_NoUnitNoDecimals	
WSXX.HMDXX_XX_TagBox_Bay_VF_Min	DB018	XDM_AWSXX_00_X_SX	REAL	Unit_NoUnitNoDecimals	
WSXX.HMDXX_XX_TagBox_Bay_SF_Sta	DBW22	XDM_AWSXX_00_X_SX	INT	Unit_NoUnitNoDecimals	
WSXX.HMDXX_XX_TagBox_Bay_UB_Chg	DBX24.0	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
WSXX.HMDXX_XX_TagBox_Bay_UB_ChgEna	DBX24.1	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
WSXX.HMDXX_XX_TagBox_Bay_UB_Stp	DBX24.2	XDM_AWSXX_00_X_SX	BOOL	Unit_NoUnitNoDecimals	
WSXX.HMDXX_XX_TagBox_Bay_UI			BOOL	Unit_NoUnitNoDecimals	
WSXX.HMDXX_XX_TagBox_Bay_UI			BOOL	Unit_NoUnitNoDecimals	
WSXX.HMDXX_XX_TagBox_Bay_UI			BOOL	Unit_NoUnitNoDecimals	

You've made changes. Navigate away?

OK Cancel

Save Delete

Id

1

Name

XDM\_AWSXX\_00\_X\_Sxdf

Number

DB213

Enable

☒

Save Delete

Ready

Database=C:\Users\gea.halle.cn\Source\Repos\ConfigTool\Config\CONFIGTOOL.FDB

Config Tool – Manual

Revision: 00	Project ref.: NA
Revision date: 29-Aug-2021	Machine number: NA



2.7 Add and delete buttons

The add button in the table view will add a new tag to the current table with the next free id.

Action

BarGraph

Batch

BatchStatus

BuckValveProcedure

CalibrationParameter

Configuration

Control

CSLogFile

DataBlock

ECM

ECMParameter

ECMParameterValue

Engineering

Equipment

Event

EventCategory

Graph

GraphItem

Group

Language

LAYER\_SIDE

MachineStatus

Manual

Message

OPCServerTag

PerformanceLog

PLCConfiguration

PLCFixedTags

PLCMapping

PLCSamplingCycleTags

PLCSamplingResultTags

PLCTag

PressModel

PressParameter

PressParameterType

Procedure

ProcessValue

ProcessValueCalculationType

ReadWriteType

Recipe

RecipeParameter

RecipeParameterValue

Report

ReportSubReport

SamplingCycleType

SamplingElement

SamplingOutput

ScreenParameter

SingleSampling

SoftwareRevision

Status

SubReport

Text

TextLabel

Tooling

ToolingParameter

ToolingParameterValue

TurnetProcedure

TurnetProcedureStep

Unit

UnitCategory

User

Id	ArraySize	DefaultValue	Statistics	Screensaver	CycleTime	Name	Number	DataBlock	ValueType	UnitCategory
1	1	False	False	False	0	AWSSX.CTRXX_XX_MoxTst_IB_St	DBX0.0	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
2	1	False	False	False	0	AWSSX.CTRXX_XX_MoxTst_IB_Stp	DBX0.1	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
3	1	False	False	False	600	AWSSX.CTRXX_XX_MoxTst_QB_Sta	DBX0.2	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
4	1	False	False	False	600	AWSSX.CTRXX_XX_MoxTst_QB_Ena	DBX0.3	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
5	1	False	False	False	600	AWSSX.CTRXX_XX_MoxTst_QB_Vis	DBX0.4	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
6	1	0	False	False	600	AWSSX.HMDXX_XX_TagBox_Boj_VF_Act	DBD2	XDM_AWSSX_00_X_SX	REAL	Unit_NoUnitNoDecimals
8	1	0	False	False	0	AWSSX.HMDXX_XX_TagBox_Boj_VF_Test	DBD10	XDM_AWSSX_00_X_SX	REAL	Unit_NoUnitNoDecimals
9	1	0	False	False	600	AWSSX.HMDXX_XX_TagBox_Boj_VF_Max	DBD14	XDM_AWSSX_00_X_SX	REAL	Unit_NoUnitNoDecimals
10	1	0	False	False	600	AWSSX.HMDXX_XX_TagBox_Boj_VF_Min	DBD18	XDM_AWSSX_00_X_SX	REAL	Unit_NoUnitNoDecimals
11	1	0	False	False	600	AWSSX.HMDXX_XX_TagBox_Boj_SL_Sta	DBW22	XDM_AWSSX_00_X_SX	INT	Unit_NoUnitNoDecimals
12	1	False	False	False	0	AWSSX.HMDXX_XX_TagBox_Boj_VF_Chg	DBX24.0	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
13	1	False	False	False	600	AWSSX.HMDXX_XX_TagBox_Boj_VF_ChgEna	DBX24.1	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
14	1	False	False	False	0	AWSSX.HMDXX_XX_TagBox_Boj_VF_Stp	DBX24.2	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
15	1	False	False	False	0	AWSSX.HMDXX_XX_TagBox_Boj_KeyRedOpn	DBX24.3	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
16	1	False	False	False	0	AWSSX.HMDXX_XX_TagBox_Boj_VF_JogPosHov	DBX24.4	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
17	1	False	False	False	0	AWSSX.HMDXX_XX_TagBox_Boj_VF_JogPosHov	DBX24.5	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
18	1	False	False	False	0	AWSSX.HMDXX_XX_TagBox_Boj_VF_JogPosChk	DBX24.6	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
19	1	False	False	False	0	AWSSX.HMDXX_XX_TagBox_Boj_VF_JogNegChk	DBX24.7	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals
20	1	False	False	False	600	AWSSX.HMDXX_XX_TagBox_Boj_VF_JogPosEna	DBX25.0	XDM_AWSSX_00_X_SX	BOOL	Unit_NoUnitNoDecimals

Save

Cancel

Add

Delete

Id

72554

Name

Number

ArraySize

0

DefaultValue

Database=C:\Users\gea.halle.cn\Source\repos\ConfigTool\Config\CONFIGTOOL.FDB

All non-foreign key values can immediately be filled in.  
Only when the save button is clicked, this tag is created in the database.  
The foreign key values can then be filled in, in the table view.

# Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



ConfigTool

72554

Id	ArraySize	DefaultValue	Statistics	Screensaver	CycleTime	Name	Number	DataBlock	ValueType	InitCat
72554	0				0	blabla		TBD	TBD	

Save Cancel Add Delete

Id: 72554

Name: blabla

Number:

ArraySize: 0

DefaultValue:

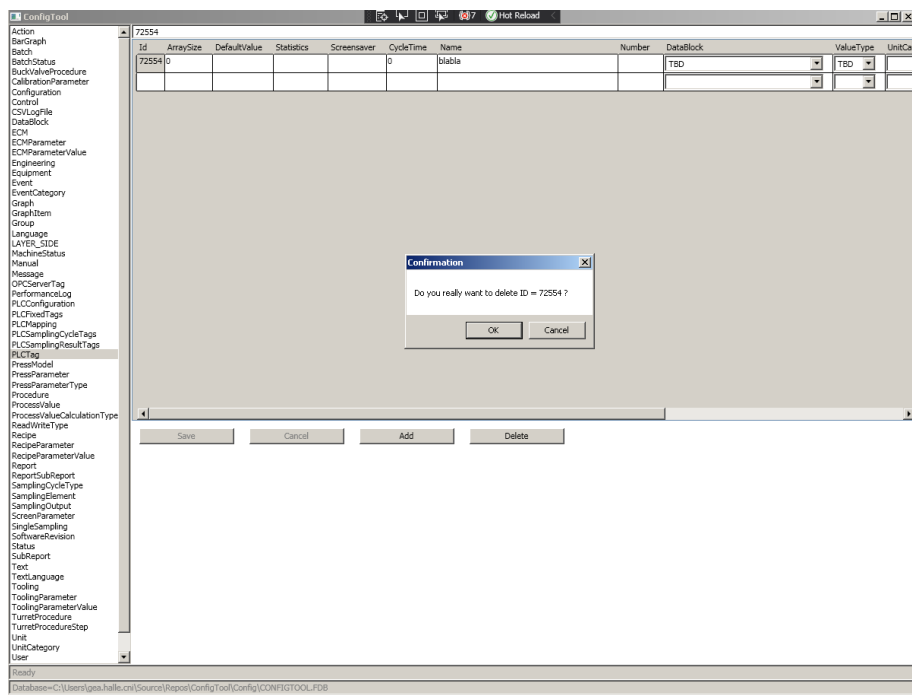
Database=C:\Users\gea.halle.cn\Source\Report\ConfigTool\Config\CONFIGTOOL.FDB

When the delete button is clicked, the selected record will be deleted. For safety reasons, a confirmation message box will be shown.

## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



### 2.8 Input validation

One of the requirements of the tool was to foresee the possibility of input validation. The foundation has already been laid in the current version of the tool and can easily be expanded in the future.

With database annotations input validation can be done on database level. Custom based rules can also be enforced. More details on this topic can be found in paragraph “3.8 Wrappers and input validation”

When the entry does not comply with the imposed rules, the input is marked in red and the error message is shown below the input field.

For test purposes, a custom rule is imposed requiring that the name is not equal to “Test”.

Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



Action

BarGraph

Batch

BatchStatus

BuckValveProcedure

CalibrationParameter

Configuration

Control

CSILogFile

Datablock

ECH

ECHParameter

ECHParameterValue

Engineering

Equipment

Event

EventCategory

Graph

GraphItem

Group

Language

LAYER\_SIDE

MechanicStatus

Manual

Message

OPCServerTag

PerformanceLog

PLCConfiguration

PLCFixedTags

PLCMapping

PLCSamplingCycleTags

PLCSamplingResultTags

PLCTag

PressModel

PressParameter

PressParameterType

Procedure

ProcessValue

ProcessValueCalculationType

ReadWriteType

Recipe

RecipeParameter

RecipeParameterValue

Report

ReportSubReport

SamplingCycleType

SamplingElement

SamplingOutput

ScreenParameter

SingleSampling

SoftwareRevision

Status

SubReport

Text

TextLanguage

Tooling

ToolingParameter

ToolingParameterValue

TurnProcedure

TurnProcedureStep

Unit

UnitCategory

User

Id	Min	Max	Value	Visible	Enable	GroupText	Text
31796			False	(press.66288)	True	Air Pressure Circuit	Booster Test Button Available in Maint. Screen
31797			False	(press.66288)	True	Air Pressure Circuit	Low Pressure Circuit Valve Test Button Available in Main
31798	0	30	1.5	(press.66288)	True	Air Pressure Circuit	Final Compr. Compensator: Off-Delay For Booster Conne
31799	0	3000	120	(press.66288)	True	Air Pressure Circuit	Alarm Time for No Air in High Pressure Circuit
31800	0	3000	5	(press.66288)	True	Air Pressure Circuit	Alarm Time for No Air in Low Pressure Circuit
31801	0	30	1	(engineering.11769)	True	Air Pressure Circuit	Final Compr. Compensator 1st-Layer: Min. Force to Start
31802	0	30	15	(engineering.11769) and (press.66288) and (engineering.11769)	True	Air Pressure Circuit	Final Compr. Compensator 2nd-Layer: Min. Force to Star
31803	0	30	15	(press.66288)	True	Air Pressure Circuit	Final Compr. Compensator: Min. Force to Start Booster
31804	0	30	2.7	(press.66288)	True	Air Pressure Circuit	Pre-Compr. Compensator: Min. Force to Start Booster
11607	0	10	0.1	(press.66034) and (engineering.11751)	True	Pre-Compression Bottom Height	
11609	0	10	0.1	(press.66086) and (engineering.11755)	True	Pre-Compression Top Height	
11610	0	10	0.1	(press.66086) and (engineering.11755)	True	Pre-Compression Top Height	
80000	0	10	0.1	(press.66033) and (engineering.11720)	True	Fill Depth	
11612			False	(press.70050)	True	Reject	
11615	0	1000	1	(press.70050) and (engineering.11612)	True	Reject	Reject Confirmation: Test Button
11614	0	1000	1	(press.70050) and (engineering.11612)	True	Reject	Reject Confirmation: Timer when No Reject
11617			False	(press.200003)	True	Tablet Analysing System General	Second Combi Tester Available
80003	0	10	0.1	(press.66033) and (engineering.11689)	True	Final Compression Bottom Height	
80004	0	10	0.1	(press.66033) and (engineering.11689)	True	Final Compression Bottom Height	

Save

Cancel

Add

Delete

Id

330000

Name

Test is not a valid Text.

Save

Delete

Ready

Database=C:\Users\gea.hello\src\Source\Report\ConfigTool\Config\CONFIGTOOL.FDB



## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



In the table view the error message is shown when you hover over the highlighted error.

The screenshot shows the Config Tool application window. On the left is a tree view with categories like Action, BarGraph, Batch, etc. The main area is a table with the following data:

Id	Min	Max	Value	Visible	Enable	GroupText
31796			False	{press.66288}	True	Air Pressure C
31797			False	{press.66288}	True	Air Pressure C
31798	0	30	1.5	{press.66288}	True	Air Pressure C
31799	0	3000	test	{press.66288}	True	Air Pressure C
31800	0	3000	5	{engineering.11769}	True	Air Pressure C
31801	0	30	1	{engineering.11769}	True	Air Pressure C
31802	0	30	15	{engineering.11769} and {press.66288} and {engineering.11769}	True	Air Pressure C
31803	0	30	15	{press.66288}	True	Air Pressure C
31804	0	30	2.7	{press.66288}	True	Air Pressure C
11607	0	10	0.1	{press.66034} and {engineering.11751}	True	Pre-Compress
11609	0	10	0.1	{press.66086} and {engineering.11755}	True	Pre-Compress
11610	0	10	0.1	{press.66086} and {engineering.11755}	True	Pre-Compress
80000	0	10	0.1	{press.66033} and {engineering.11720}	True	Fill Depth

At the bottom of the window, there are buttons for Save, Cancel, Add, and Delete. The status bar at the very bottom shows the database path: Database=C:\Users\gea.halle.cn\Source\Repos\ConfigTool\Config\CONFIGTOOL.FDB.

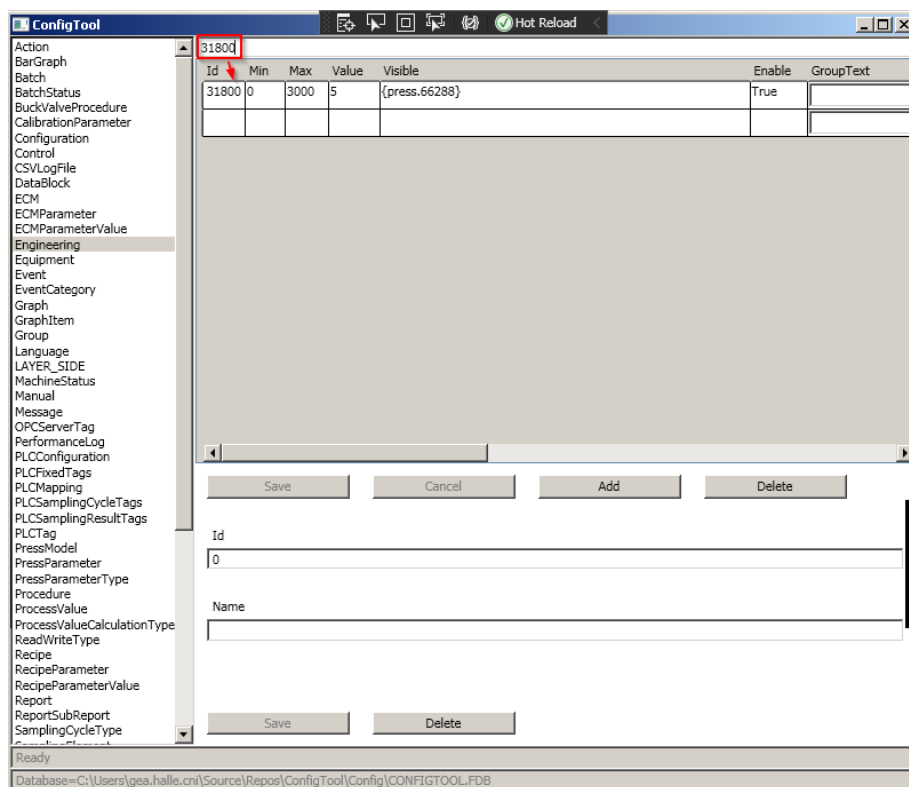
### 2.9 Filtering

The upper text box acts as a filtering box. Each column of the table view will be filtered with the input value.

## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



### 2.10 Exception Messages

When an operation results in errors, the user is informed with an error message.

For example, when you delete a tag in the detail view that is used as a foreign key in (an) other table(s), a violation of the foreign key constraint will be triggered.

The same will happen when you add a tag, with a name that already exists, to a table with a unique constraint enforced on the name column. In this case a unique constraint violation is triggered.

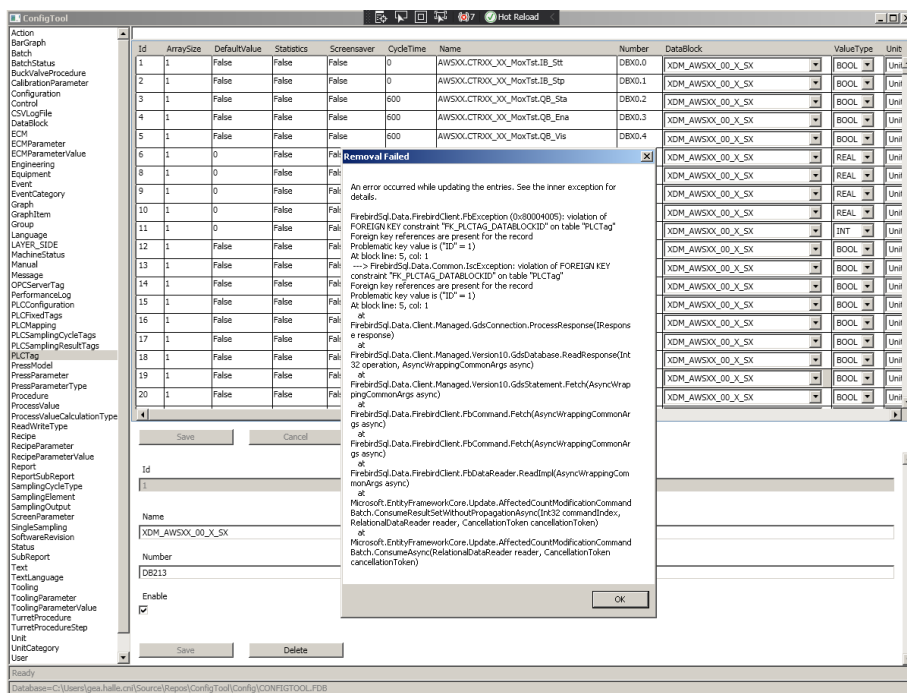
In these situations, an error message will inform the user and the operation is cancelled.

More information on this topic can be found in paragraph “4 Error Handling”

## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

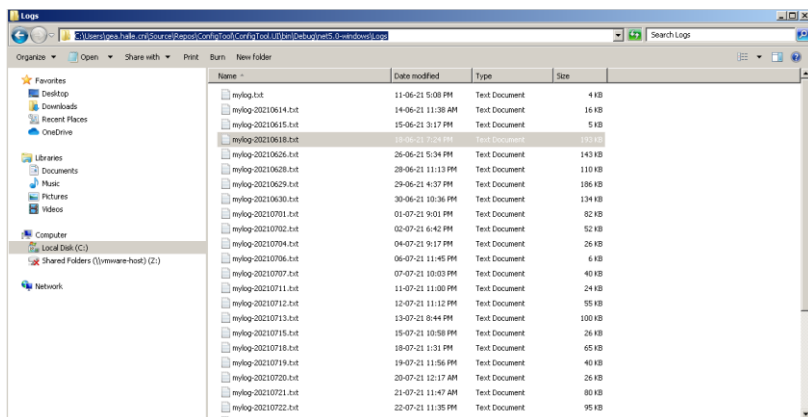
Project ref.: NA  
Machine number: NA



### 2.11 Logging

All executed SQL-statements are logged in a text file to be able to save these modifications for that specific revision. The log file and location folder can be configured as described in \$ "3.9 App.xml.cs". Afterwards, the SQL-statements can be executed in a DBMS, like DBeaver.

C:\Users\gea.halle.cn\Source\Repos\ConfigTool\ConfigTool.UI\bin\Debug\net5.0-windows\Logs



## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



### 3 Application Structure and Classes

#### 3.1 DataAccess

##### 3.1.1 ModelContext.cs

Datacontext with all tables and table properties defined with fluent api.

#### 3.2 Models

##### 3.2.1 Models

Each table of the database is represented by a model class.

##### 3.2.2 ExtendedModels

##### 3.2.3 Interfaces

Each model must inherit from IEntity<TId> to define the type of the primary key.  
This was necessary to be able to make other classes generic.

#### 3.3 UI

##### 3.3.1 Repository

For each table in the database, represented with a model in code, a repository class exists.  
The repository class contains all the methods to query the database.

The repository pattern is used together with dependency injection to have a lot of flexibility between different implementations.

Eg.: if in the future sql-server would be preferred over Firebird, only the implementation class should be modified to sql specific code. The rest of the application can remain untouched.

##### 3.3.2 Interfaces

The interfaces contain all the methods that need to be implemented, when this is inherited.  
Since dependency injection is used with constructor injection, these interfaces are necessary.

##### 3.3.3 Implementations

The implementation classes contain the implementation of the inherited methods of the interfaces.

#### 3.4 Converters

In the MVVM pattern, views are linked to their viewmodel properties by databinding.  
When updating the UI, the property is updated and vice versa. This data binding is simple when the datatypes of the sending and receiving properties are equal. A value converter is used when the datatypes of sending and receiving properties are different.

In this tool the converter is used to get the necessary data of the selected cell in the table view with the datatype of DataGridCellInfo to the datatype of TableItem.

All TableViews must have this Converter which inherits from  
SelectedCellToColumnNameConverterBase.

Commented [BJ4]: Typo

Commented [BJ5]: Typo

## Config Tool – Manual

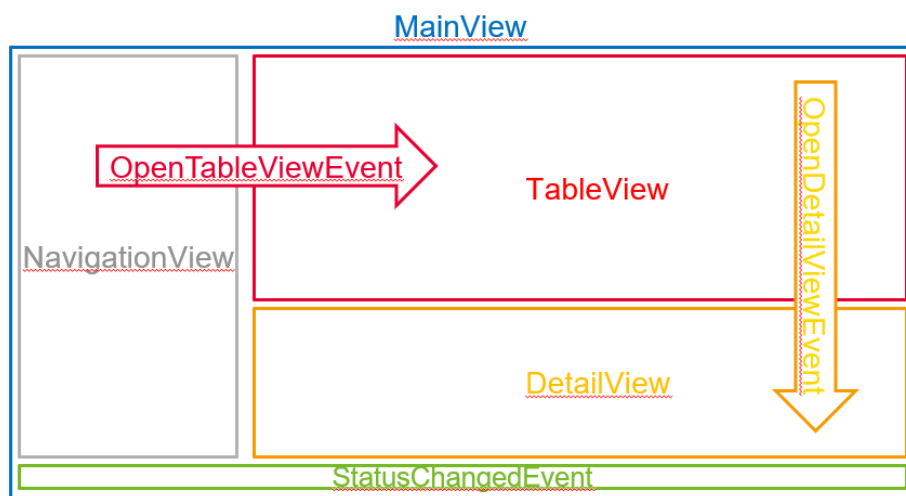
Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



### 3.5 Events

To preserve the strength of the MVVM architecture, allowing to create a loosely coupled application, the view models communicate with each other by events. By making use of the event aggregator of the Prism library<sup>3</sup>, publishers and subscribers can communicate through events without having a direct reference to each other.



#### 3.5.1 OpenDetailViewEvent

When a foreign key column is selected in the table view (publisher), an event is triggered with the id of the tag to visualize in the detail view (subscriber).

#### 3.5.2 OpenTableViewEvent

When a table is selected in the navigation view (publisher), an event is triggered with the table name to visualize in the table view (subscriber).

#### 3.5.3 StatusChangedEvent

This event is used to update the status bar in the main view (subscriber) from any other view (publisher)

### 3.6 ViewModels

In the Model-View-ViewModel (MVVM) pattern each view is linked to its viewmodel with the data context property. The viewmodel contains the business logic.

<sup>3</sup> <https://prismlibrary.com/docs/event-aggregator.html>

## Config Tool – Manual

Revision: 00  
Revision date: 29-Aug-2021

Project ref.: NA  
Machine number: NA



### MainView - MainViewModel



#### 3.6.1 DetailViewModels

Every table that is used as a foreign key in other tables, must have a detail viewmodel.

#### 3.6.2 Services

The RangeObservableCollection is implemented to increase the performance when loading data to the combo boxes. This class inherits from the standard observable collection but only hits the OnCollectionChanged method when the entire data is loaded to the combobox instead of updating the view each time a tag is added to the combobox.

#### 3.6.3 TableViewModels

Every table of the navigation view that needs to be visualized or to be made editable, must have a table view model.

#### 3.6.4 NavigationViewModels

The navigation view has its corresponding navigation viewmodel.

#### 3.6.5 MainviewModel

Depending on the selected table in the navigation view, the correct table viewmodel datatype will be linked to the table viewmodel property, which will trigger the corresponding table view.

When a foreign key column is selected in the table view, the correct detail viewmodel datatype will be linked to the detail viewmodel property, which will trigger the corresponding detail view.

### 3.7 Views

#### 3.7.1 DetailViews

When a foreign key column is selected in the table view, the foreign key data is visualized in its detail view.

Therefore every table that is used as a foreign key in other tables, must have a detail view.

## Config Tool – Manual

Revision: 00	Project ref.: NA
Revision date: 29-Aug-2021	Machine number: NA



### 3.7.2 Services

The message boxes to the user are also implemented as an interface to allow dependency injection with different implementations. In this way the message boxes can be mocked during unit testing.

### 3.7.3 TableViews

The selected table in the navigation view is visualized in its table view. Therefore, every table of the navigation view that needs to be visualized or to be made editable, must have a table view.

### 3.7.4 NavigationView

The navigation view contains all the tables of the database.

### 3.7.5 Mainview

The mainview contains all other subviews/usercontrols: navigation view, table view, detail view.

These subviews are defined as contentcontrols which allows to connect the correct view at runtime, depending on the received viewmodel.

Unfortunately, every time a new view with a corresponding viewmodel is added to the application, this information needs to be added to the mainview since xaml doesn't support generic types.

## 3.8 Wrappers and input validation

The wrapper classes inherit from the ModelWrapper class and contains the data validation functionalities. It is implemented as a wrapper class, as it adds new functionality to the models.

The **validation** is done in two parts:

1. ValidateDataAnnotations  
The input data will be validated against the table field properties, that are defined with data annotations in the model classes.
2. ValidateCustomErrors  
The input data is validated against custom rules.  
These custom rules can be specified in each wrapper classes, by overwriting the ValidateProperty method of the inherited ModelWrapper Class.

When the input data conflicts with above validation rules, the cell is highlighted in red and the error message is displayed below the cell.

## Config Tool – Manual

Revision: **00**  
Revision date: **29-Aug-2021**

Project ref.: **NA**  
Machine number: **NA**



### 3.9 App.xaml.cs

This class is used at startup of the application, will build the project and will boot up the main window.

- ConfigureServices
  - o Creates the **IoC container** to allow dependency injection. Every class that is injected by constructor injection, must be declared in this method. Here you define which implementation is used for a specific interface. This adds a lot of flexibility for future modifications with no impact on other code. It also allows TDD with faking and mocking patterns.
  - o Defines the **database connection** with its connection string
- ConfigureLogging
 

Sets up the **logging** to an external text file, located on the defined custom path.

In this application the serilog library is used to setup logging and can easily be configured:

- o Output format
- o Different log levels can be configured on application or on namespace level (debug, information, warning, ...).



## Config Tool – Manual

Revision: <b>00</b>	Project ref.: <b>NA</b>
Revision date: <b>29-Aug-2021</b>	Machine number: <b>NA</b>



- Log medium (console, external file, ...)
- Filters

In the ConfigTool the logging is mainly used to get access to the executed SQL statements and to save them for the current revision.

### 3.10 Appsettings.(development).json

In this Jason file, the connection string to the database is defined. When your application is starting up in development mode, the values specified in the 'appsettings.development.json' will overwrite the values that are also specified in the 'appsettings.json' file.

In this way you can specify different connection strings for a production, development, ... environment.

## 4 Error Handling

The application is foreseen of the necessary error handling to inform the user and to avoid crashes. The visualization of the errors to the user is done via the message dialog.

Be aware that database errors are directly visualized to the user, without prior filtering, and can therefore contain application critic information. Since the application is for internal use only, this is not a problem.

## 5 Improvements

**! Database modifications necessary to get the tool working:**

Each tabel should have a default value:

- For **unitcategory**, the default value is id = 42 (noUnitNodecimal) and not id = 0  
=> each pldtag must have at least unitcategoryid = 42 and the column property in the database should be configured NOT NULL
- For **TextLanguage** textId = 0 must be added with empty text  
INSERT INTO "TextLanguage" (ID, "TextID", "LanguageID", "Text")  
VALUES(20150,0,1,"");
- For **ValueType** Id = 0 must be added with the value of 'To Be Decided' aka TBD.  
INSERT INTO "ValueType" (ID, "Name", "Remarks") VALUES (0, 'TBD', NULL);
- Follow the naming conventions for every table in the database and align with the database model in code, otherwise you always have to make hybrid code instead of generic code
  - TagId column should be PlctagId
  - ECMPParameter -> EcmParameter since the model also uses small letters
  - ...
- Optimize filtering -> now filter is triggered when property changed, would be better to filter only after 'enter' is clicked.  
I did not immediately find how to do this in the "MVVM" architecture.
- Filter per column

## Config Tool – Manual

Revision:	00	Project ref.:	NA
Revision date:	29-Aug-2021	Machine number:	NA



### 6 Known Bugs

- When the application is started via the Configtool.UI.exe and when you open the engineering table, the executable crashes. This does not happen when you start the application in visual studio
- Filter on text in engineering table gives exception, some texts are null while these should be id = 0 => "empty"
- The complete detailview of the TextLanguage table should be implemented and work with the textId, because of this reason, currently the creation of a new textId is not correct.
- Sometimes you first need to scroll in the table view before the save button will become enabled after a modification. It seems that sometimes the application need some kind of refresh.