

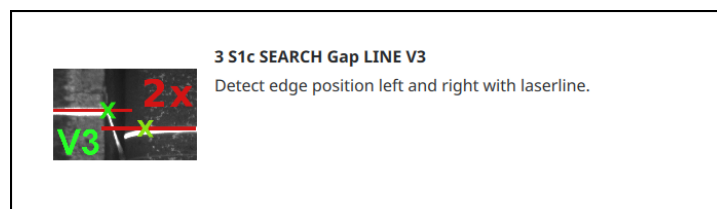
3 - S1c SEARCH Gap LINE V3

■ Description

Searches the left and right gap border out of the found laser line parts. Therefore 2 ways are possible:

- There are two clear laser line parts visible, divided by the gap. If the intensity drops under a given level the gap end position is set.
If the laser line parts are bowed at the gap end, there is a given vertical distance which is used simultaneously to detect the gap end position. Therefore a 'reference line' is calculated for each side from the found vertical laser line position, starting at the laser line ROI border up to 15% of the laser line ROI width.
If the line ends are horizontally overlapping, some calculations are made to check, if the overlap is not too big. Then the end point of the thicker blanks laser line part is used as "found gap position" and the gap width is set to zero.
- There is one through passing laser line visible with an intensity minimum in the gap.

■ Icon




■ Parameter


Filter Groups of 3 S1c SEARCH Gap LINE V2
G10 Detection 2 Lines - Line discontinuation - gap pos left/right
G11 Detection 1 Line - Preparation
G12 Detection 1 Line - Line geo minimum - gap pos center
G16 Calc Height difference
Not grouped


G10 Detection 2 Lines - Line discontinuation - gap pos left/right


Filters of


G10 Detection 2 Lines - Line discontinuation - gap pos lel


 11 Tracking Threshold 2 Lines left


 12 Y distance left Up


 13 Y distance left Down


 14 Line Tracking left


 15 Gap position left


 16 Laser line brightness left


 21 Tracking Threshold 2 Lines right

 22 Y distance right Up

 23 Y distance right Down

 24 Line Tracking right

 25 Gap position right

 26 Laser line brightness right

Attributes of

11 Tracking Threshold 2 Lines left

Number

200.000

Parameter	Comment
Number	If the filtered grey level of the laser line tracking is below this value the search stops and sets the 'found gap position' for the left gap side. [Greylevel]

Attributes of

12 Y distance left Up

Number

3.000

Attributes of

13 Y distance left Down

Number

8.000

Parameter	Comment
Number	If the vertical position of the laser line tracking is this value above / below the left side 'reference line', the search stops and sets the 'found gap position' for the left gap side. [Pixel]



Attributes of
14 Line Tracking left

Verbosity level
 None

mean x
 2

search area y
 5

mean area y
 3
 pixel

Maximum Gap Width
 5

Maximum Number of Gaps
 2

Maximum height jump
 4

Starting Point Width
 3
 Pixel

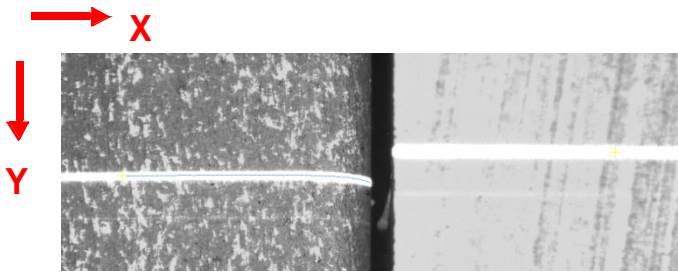
Starting Point Height
 3
 Pixel

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
mean x	Number of pixels in X direction, used for averaging the brightness in order to define the next point of the laser line. [Pixel]
search area y	This parameter defines the maximum limits for the search area in Y direction, used for searching the next tracking point. [Pixel]
mean area y	Number of pixels in Y direction, over which the "Average brightness in X direction" is averaged, in order to define the next laser line point. [Pixel]
Maximum Gap Width	Maximum allowed width of a laser line interruption: If the number of side by side laying pixels, having a lower grey scale value than the search threshold, exceeds this parameter figure, the line interrupts counter figure is raised by 1. [Pixel]
Maximum Number of Gaps	Maximum number of laser line interrupts: If the number of line interrupts per laser line becomes higher than this parameter, the line search is stopped and a line interrupt warning is released.
Maximum height jump	Maximum interrupt in Y direction: If the height jump of the laser line exceeds this parameter, the line search is stopped. [Pixel]

Starting Point Width	Width of the search area on the left laser line ROI border to find the vertical start position of the laser line. [Pixel]
Starting Point Height	Height of the search area on the left laser line ROI border to find the vertical start position of the laser line. [Pixel]

Verbosity example:

The blue line shows the found left laser line part. The two yellow crosses show the left and right side start positions for the laser line tracking.



Attributes of
15 Gap position left

Verbosity level

None

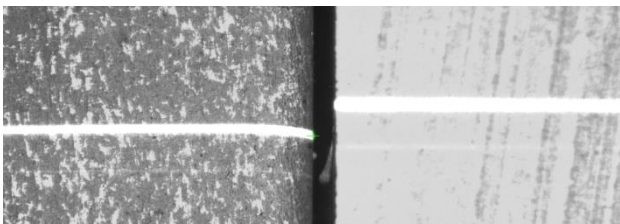
set constantXOffset

0.000

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
set constantXOffset	Shifts the found left gap position by the given number of pixels. - shift the position to the left + shift the position to the right [Pixel]

Verbosity example:

The blue cross shows the found left gap start out of the laser line tracking.





Attributes of
16 Laser line brightness left

Verbosity level

None

Height of the search area. Pixel

4

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Height of the search area	Total vertical range above and below each tracked laser line position to calculate the mean vertical intensity for that laser line point. "4" means: 2 pixel above and 2 pixel below the actual laserline position. [Pixel]

Attributes of
21 Tracking Threshold 2 Lines right

Number

200.000

Parameter	Comment
Number	If the filtered grey level of the laser line tracking is below this value the search stops and sets the 'found gap position' for the right gap side. [Greylevel]

Attributes of
22 Y distance right Up

Number

3.000

Attributes of
23 Y distance right Down

Number

8.000

Parameter	Comment
Number	If the vertical position of the laser line tracking is this value above / below the right side 'reference line', the search stops and sets the 'found gap position' for the right gap side. [Pixel]

Attributes of

24 Line Tracking right

Verboesity level

None

mean x

2

search area y

5

mean area y

3

pixel

Maximum Gap Width

5

Maximum Number of Gaps

2

Maximum height jump

4

Starting Point Width

3

Pixel

Starting Point Height

3

Pixel

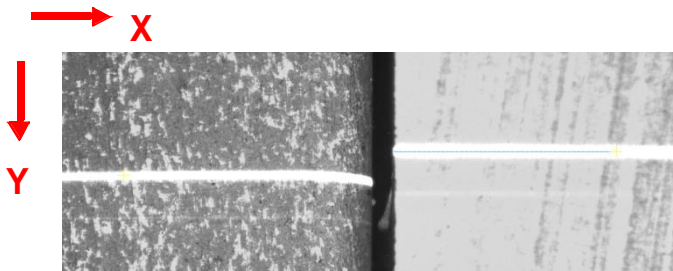
Parameter	Comment
Verboesity level	Selection of verboesity level. Larger verboesity levels offer more overlay informa-tion.
mean x	Number of pixels in X direction, used for averaging the brightness in order to define the next point of the laser line. [Pixel]
search area y	This parameter defines the maximum limits for the search area in Y direction, used for searching the next tracking point. [Pixel]
mean area y	Number of pixels in Y direction, over which the "Average brightness in X direction" is averaged, in order to define the next laser line point. [Pixel]
Maximum Gap Width	Maximum allowed width of a laser line interruption: If the number of side by side laying pixels, having a lower grey scale value than the search threshold, exceeds this parameter figure, the line interrupts counter figure is raised by 1. [Pixel]
Maximum Number of Gaps	Maximum number of laser line interrupts: If the number of line interrupts per laser line becomes higher than this para-meter, the line search is stopped and a line interrupt warning is released.
Maximum height jump	Maximum interrupt in Y direction: If the height jump of the laser line exceeds this parameter, the line search is stopped. [Pixel]





Starting Point Width	Width of the search area on the right laser line ROI border to find the vertical start position of the laser line. [Pixel]
Starting Point Height	Height of the search area on the right laser line ROI border to find the vertical start position of the laser line. [Pixel]

Verbosity example:

The blue line shows the found right laser line part. The two yellow crosses show the left and right side start positions for the laser line tracking.




Attributes of
25 Gap position right


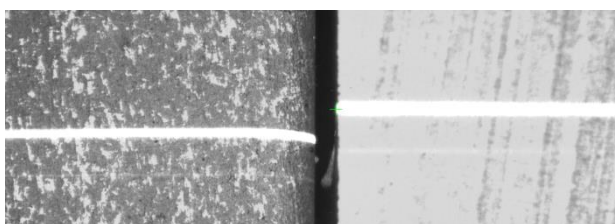
Verbosity level
 None



set constantXOffset
 0.000

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
set constantXOffset	Shifts the found right gap position by the given number of pixels. - shift the position to the left + shift the position to the right [Pixel]

Verbosity example:

The blue cross shows the found right gap start out of the laser line tracking.




Attributes of
26 Laser line brightness right


Verbosity level



None


Height of the search area. Pixel


4


Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Height of the search area	Total vertical range above and below each tracked laser line position to calculate the mean vertical intensity for that laser line point. "4" means: 2 pixel above and 2 pixel below the actual laserline position. [Pixel]


G11 Detection 1 Line - Preparation


Filters of
G11 Detection 1 Line - Preparation


 01 Line Tracking full

 02 Low pass filter laser line

 03 Close Gaps

 22 Tracking Threshold 1 Line



Attributes of
01 Line Tracking full

Verbosity level
 None

mean x
 2

search area y
 8

mean area y
 3

Maximum Gap Width
 6

Maximum Number of Gaps
 10

Maximum height jump
 5

Starting Point Width
 3

Starting Point Height
 3

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
mean x	Number of pixels in X direction, used for averaging the brightness in order to define the next point of the laser line. [Pixel]
search area y	This parameter defines the maximum limits for the search area in Y direction, used for searching the next tracking point. [Pixel]
mean area y	Number of pixels in Y direction, over which the "Average brightness in X direction" is averaged, in order to define the next laser line point. [Pixel]
Maximum Gap Width	Maximum allowed width of a laser line interruption: If the number of side by side laying pixels, having a lower grey scale value than the search threshold, exceeds this parameter figure, the line interrupts counter figure is raised by 1. [Pixel]
Maximum Number of Gaps	Maximum number of laser line interrupts: If the number of line interrupts per laser line becomes higher than this parameter, the line search is stopped and a line interrupt warning is released.
Maximum height jump	Maximum interrupt in Y direction: If the height jump of the laser line exceeds this parameter, the line search is stopped. [Pixel]

Starting Point Width	Width of the search area on the left and right laser line ROI border to find the vertical start position of the laser line. [Pixel]
Starting Point Height	Height of the search area on the left and right laser line ROI border to find the vertical start position of the laser line. [Pixel]

Attributes of
02 Low pass filter laser line

Verbosity level
None

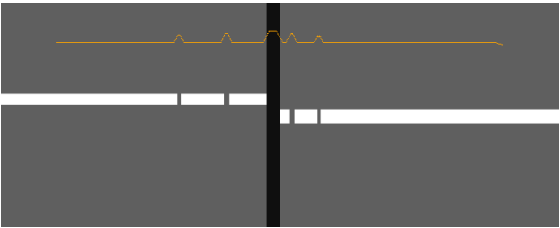
Filter length
3

N Pixel

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Filter length	During "Tracking" on the laser line, the grey scale values of the found intensity values are averaged over "Filter length" pixels. The higher the value the flatter is the intensity curve for the analysis. [Pixel]

Verbosity example:

The orange line indicates the filtered intensity on the tracked laser line with the upper image border as zero reference.





**Attributes of
03 Close Gaps**

Verbosity level
 None

Minimal segment length in X direction. NPixel
 5

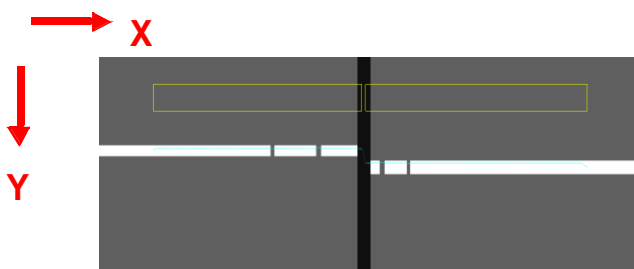
Max. jump Y NPixel
 5


Maximal interpolation length NPixel
 5

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Minimal segment length in X direction	Minimum length of the laser line piece before a gap that the gap may be closed.
Max. jump Y	A gap in the laser line shape may be closed by a direct line if the vertical difference between the two end points of the gap is smaller than 'Max. jump Y'. [Pixel]
Maximal interpolation length	A gap in the laser line shape may be closed by a direct line if the horizontal difference between the two end points of the gap is smaller than 'Maximal interpolation length'. [Pixel]

Verbosity example:

The blue line shows the laser line tracking. The yellow rectangles mark the correct found laser line parts. The gaps in the laser line parts were closed because the horizontal/vertical distance was small enough, and the two yellow rectangles mark that there was no interrupt in the laser line parts.






Attributes of
22 Tracking Threshold 1 Line




Number

Parameter	Comment
Number	<p>If there is no gap position found with "G10 Detection 2 Lines - Line discontinuation - gap pos left/right", the laser line is tracked again with this threshold to search for an intensity minimum as the 'found gap position'.</p> <p>The gap width will be zero.</p> <p>[Greylevel]</p>

G12 Detection 1 Line - Line geo minimum - gap pos center

Filters of
G12 Detection 1 Line - Line geo minimum - gap pos center



06 Position at line


Attributes of
06 Position at line


Verboesity level

None

Start X position Pixel



Max difference to 'Start X position' Pixel

Parameter	Comment
Verboesity level	Selection of verboesity level. Larger verboesity levels offer more overlay information.
Start X position	Expected gap position in the first image of the seam. [Pixel]
Max. difference to 'Start X position'	Allowed distance of the found gap position to the 'Start X position' in the first image of the seam. If the distance is bigger the gap position is replaced by the 'Start X position'. [Pixel]



G16 CALC Height difference

Filters of
G16 Calc Height difference

 01 Height Difference left
 11 Height Difference right

Attributes of
01 Height Difference left

Verbosity level
 None

Start value %
 0

End value %
 15

Attributes of
11 Height Difference right

Verbosity level
 None

Start value %
 85

End value %
 100

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Start value	Start position in the ROI for the left resp. right vertical laser line reference. [Percent]
End value	End position in the ROI for the left resp. right vertical laser line reference. [Percent]

Not grouped

Filters of
Not grouped

Tracking UpperLower

Attributes of
Tracking UpperLower

Number

Parameter	Comment
Number	Upper or lower laser line (for 2 laser line camera images): 0 = upper laser line 1 = lower laser line

■ Measured values for plotter

573	0 ... 255	Intensity Line left
574	0 ... 255	Intensity Line right
709	-xxx ... +xxx	Height difference

■ Subgraphs interface

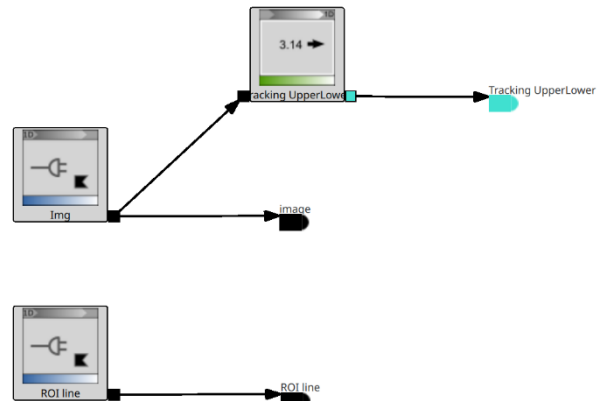
IN bridges

OUT bridges

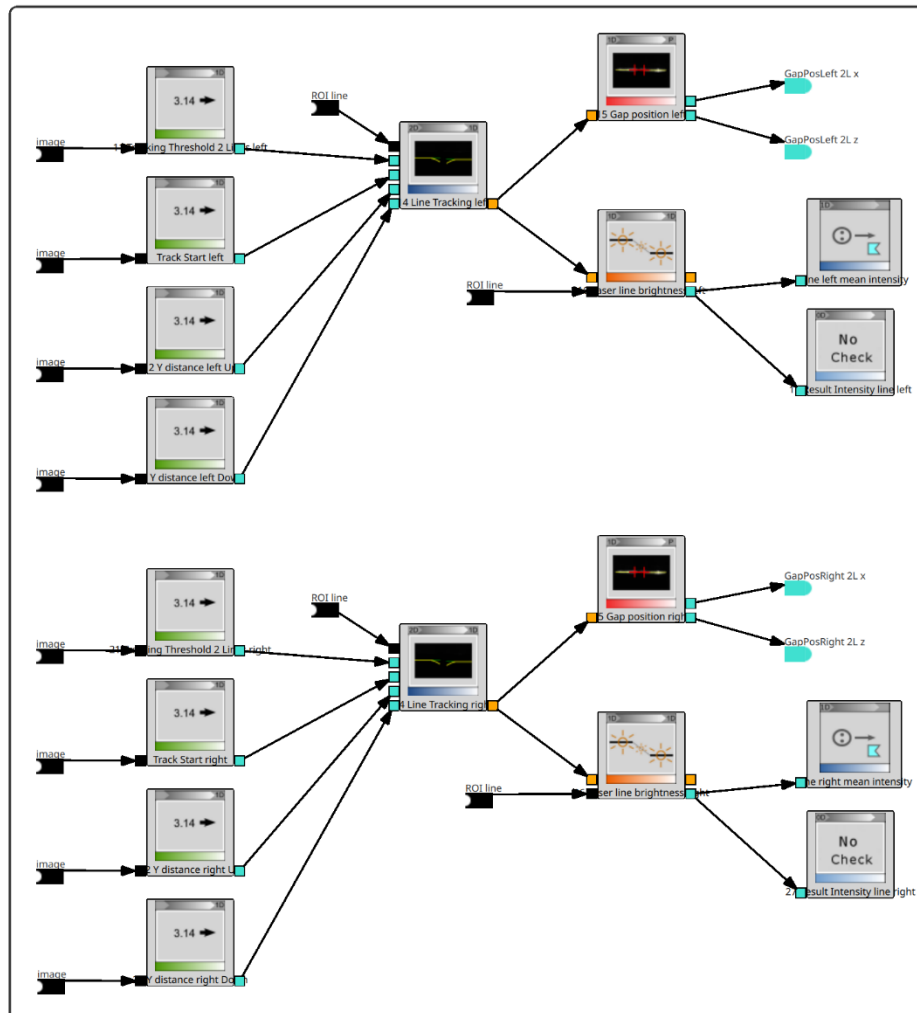
image	Img ROI line	value	Gap pos X left / right line Gap pos Y left / right line Line left / right mean intensity HeightDiff mm
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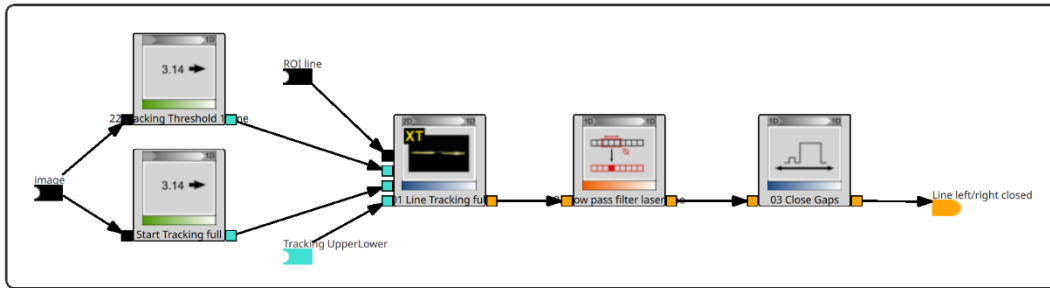
■ Graph block diagram



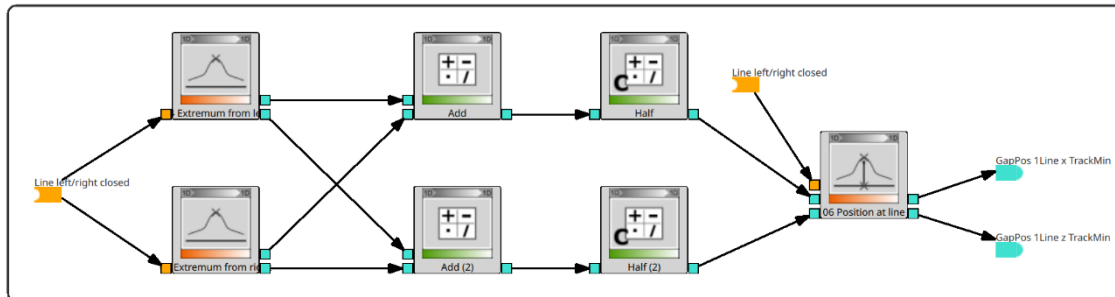
G10 Detection 2 Lines - Line discontinuation - gap pos left/right



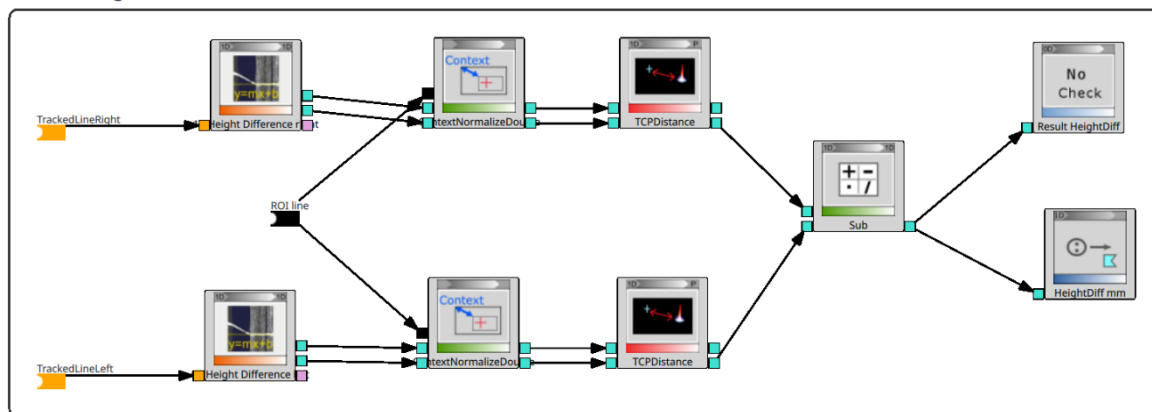
G11 Detection 1 Line - Preparation



G12 Detection 1 Line - Line geo minimum - gap pos center



G16 Calc Height difference





G15 Select Position

