

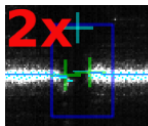


3 - S1a SEARCH Gap LINE GreyMin

■ Description

Searches the left and right gap border out of the found laser line parts. For different height blanks there is a clear gap at the blank borders. For blanks with (nearly) same thickness the algorithm tries to find either an intensity minimum in the laser line intensity shape or a v form part in the laser line shape as gap position.

■ Icon



3 S1a SEARCH Gap LINE GreyMin

Detect edge position left and right with laserline.

■ Parameters

Filter Groups of 3 S1a SEARCH Gap LINE GreyMin



G00 SYS PARAMETER INITIAL SETUP

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

G11 Detection 1 Line - Line width minimum - gap pos center


G12 SubROI - FINE gap pos center


G13 Detection Minimum Intensity - FINE gap pos center

G16 Calc Height difference

G00 SYS PARAMETER INITIAL SETUP

Filters of
G00 SYS PARAMETER INITIAL SETUP

 20 Tracking Threshold left

 21 Tracking Threshold right

Attributes of
20 Tracking Threshold left

Number

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
21 Tracking Threshold right





Number

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]



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

Filters of
G10 Detection 2 Lines - Line discontinuation - gap pos le

-  01 Line Tracking left
-  04 Gap position left
-  11 Line Tracking right
-  14 Gap position right

Attributes of
01 Line Tracking left

Verbosity level
None

mean x
— 2 +

search area y
— 7 (3) +

mean area y
— 3 (2) + pixel

Resolution X
— 1 + pixel

Resolution Y
— 1 +

Maximum Gap Width
— 3 +

Maximum Number of Gaps
— 1 +

Maximum height jump
— 8 +

Starting Point Width
— 3 + Pixel

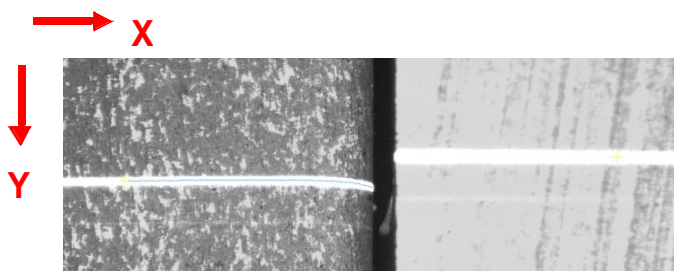
Starting Point Height
— 3 (10) + Pixel

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]
Resolution X	Resolution of the averaging range. Only every n-th pixel (n= resolution in X direction) is evaluated. [Pixel]
Resolution Y	Resolution for the averaging range. Only every n-th pixel (n= resolution in Y direction) is evaluated. This value must be selected to be lower than the "Search range in Y". [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
04 Gap position left

Verbosity level

None

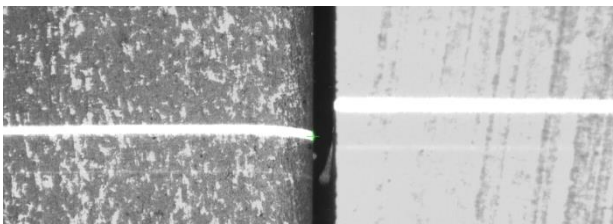
set constantXOffset



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 and shifted left gap start out of the laser line tracking.




Attributes of
11 Line Tracking right


Verboesity level

None

mean x

—

2

+

search area y

—

7 (3)

+

mean area y

—

3 (2)

+

pixel

Resolution X

—

1

+

pixel

Resolution Y

—

1

+

Maximum Gap Width

—

3

+

Maximum Number of Gaps

—

2

+

Maximum height jump

—

8

+

Starting Point Width

—

3

+

Pixel

Starting Point Height

—

3 (10)

+

Pixel

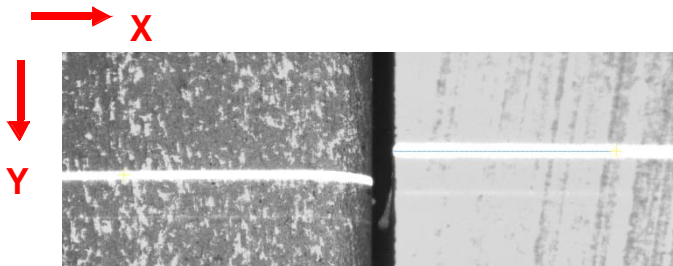
Parameter	Comment
Verboesity level	Selection of verboesity level. Larger verboesity levels offer more overlay information.
mean x	Number of pixels in X direction, used for averaging the brightness in order to define the next point of the laser line. [Pixel]
search area y	This parameter defines the maximum 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]
Resolution X	Resolution of the averaging range. Only every n-th pixel (n= resolution in X direction) is evaluated. [Pixel]
Resolution Y	Resolution for the averaging range. Only every n-th pixel (n= resolution in Y direction) is evaluated. This value must be lower than the "Search range in Y". [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 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
14 Gap position right

Verbosity level

None

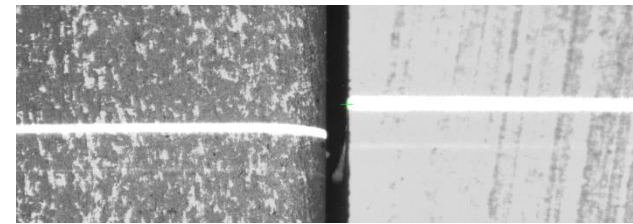
set constantXOffset

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 and shifted right gap start out of the laser line tracking.





G11 Detection 1 Line - Line width minimum - gap pos center

Filters of
G11 Detection 1 Line - Line width minimum - gap pos cer

- 01 Line Tracking full
- 02 Close Gaps
- 03 Laser line width
- 04 Low pass filter laser line
- 05 Extremum minimum

Attributes of
01 Line Tracking full

mean x

— 2 +

search area y

— 7 (3) +

mean area y pixel

— 3 (2) +

Resolution X pixel

— 1 (2) +

Resolution Y

— 1 (5) +

Maximum Gap Width

— 8 (9) +

Maximum Number of Gaps

— 4 (17) +

Maximum height jump

— 4 +

Starting Point Width Pixel

— 3 +


Starting Point Height Pixel

— 3 (10) +

Parameter	Comment
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]
Resolution X	Resolution of the averaging range. Only every n-th pixel (n= resolution in X direction) is evaluated. [Pixel]
Resolution Y	Resolution for the averaging range. Only every n-th pixel (n= resolution in Y direction) is evaluated. This value must be lower than the "Search range in Y". [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 Close Gaps**

Verbosity level
 None

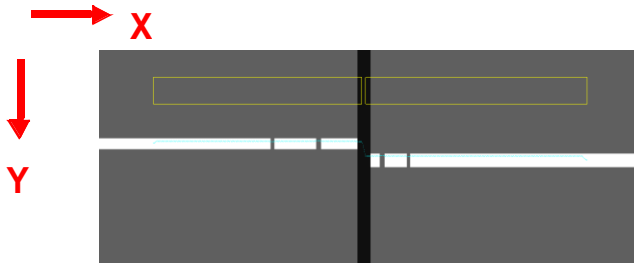
Max. jump Y
 15


NPixel

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Max. jump Y	The maximum vertical deviations to the laser line are searched out of a calculated line between the left and the right line start position. Only the maxima higher than "Max. jump Y" are taken for the edge detection. This method makes sense only with steel sheets with the same thickness. This method can be deactivated by selecting a very high parameter value (e.g. 100). [Pixel]

Verbosity example:

The blue line shows the laser line tracking. The yellow rectangles mark the correct found laser line parts. Gaps between the yellow rectangles mark position and width of a gap in the laser line tracking, that was passed over.





Attributes of
03 Laser line width

Threshold gray value

Height of the search area. Pixel

Parameter	Comment
Threshold	Minimum grey scale value from which on a point is defined to belong to the laser line. [Greylevel]
Height of the search area	Upwards and downwards laser line search area (vertical). Value = 30 means: 30 pixel upwards and also 30 pixel downwards from a straight line between the line start points. [Pixel]


Attributes of
04 Low pass filter laser line

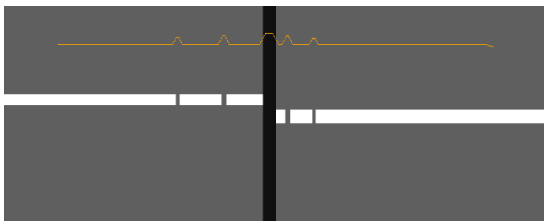
Verbosity level

Filter length 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.

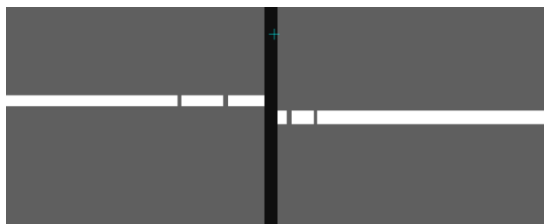




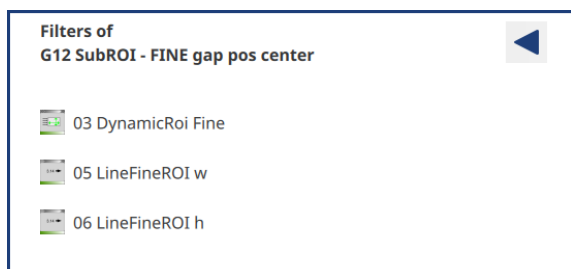
Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.

Verbosity example:

The blue cross shows the found horizontal laser line intensity minimum position.



G12 SubROI - FINE gap pos center





Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.


Attributes of
05 LineFineROI w


Number


Parameter	Comment
Number	Width of a special FineROI around the found gap position for a more precise position value recalculation. [Pixel]






Attributes of
06 LineFineROI h


Number

Parameter	Comment
Number	Height of a special FineROI around the found gap position for a more precise position value recalculation. [Pixel]

G13 Detection Minimum Intensity - FINE gap pos center

Filters of
G13 Detection Minimum Intensity - FINE gap pos center


 01 Filter IntensityProfile
 03 Low pass filter grey level mean
 04 Extremum minimum
 06 Draw position 1Line



Attributes of
01 Filter IntensityProfile

Verbosity level
 None

Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.

Attributes of
03 Low pass filter grey level mean

Verbosity level
 None



Filter length N Pixel
 - 2 +


Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Filter length	In the special FineRoi the vertically summed grey scale values are averaged over "Filter length" pixels. The higher the value the flatter is the intensity curve for the analysis. [Pixel]

Attributes of
04 Extremum minimum

Verbosity level
 None


Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.




Attributes of
06 Draw position 1Line




Verbosity level
 None
 


Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.

G16 CALC Height difference


Filters of
G16 Calc Height difference


 01 Median Moving average
 02 Cavvex



Attributes of
01 Median Moving average


Verbosity level
 None
 

Filter length
 N Pixel



40



Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Filter length	Smoothens the found laser line shape with a Median filter.



Attributes of 02 Cavvex

Verbosity level
 None

Start value
 0

End value
 15

Start value
 85

End value
 100


Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
Start value	In the laser line Roi this is horizontally the 'start point' on the the found laser line shape for the left side height reference to measure the 'height difference'. Value = 0 is the left side ROI border. Value = 100 is the right side ROI border. [Percent]
End value	In the laser line Roi this is horizontally the 'end point' on the the found laser line shape for the left side height reference to measure the 'height difference'. Value = 0 is the left side ROI border. Value = 100 is the right side ROI border. [Percent]
Start value	In the laser line Roi this is horizontally the 'start point' on the the found laser line shape for the right side height reference to measure the 'height difference'. Value = 0 is the left side ROI border. Value = 100 is the right side ROI border. [Percent]
End value	In the laser line Roi this is horizontally the 'end point' on the the found laser line shape for the right side height reference to measure the 'height difference'. Value = 0 is the left side ROI border. Value = 100 is the right side ROI border. [Percent]

■ Measured values for plotter


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

■ Subgraphs interface

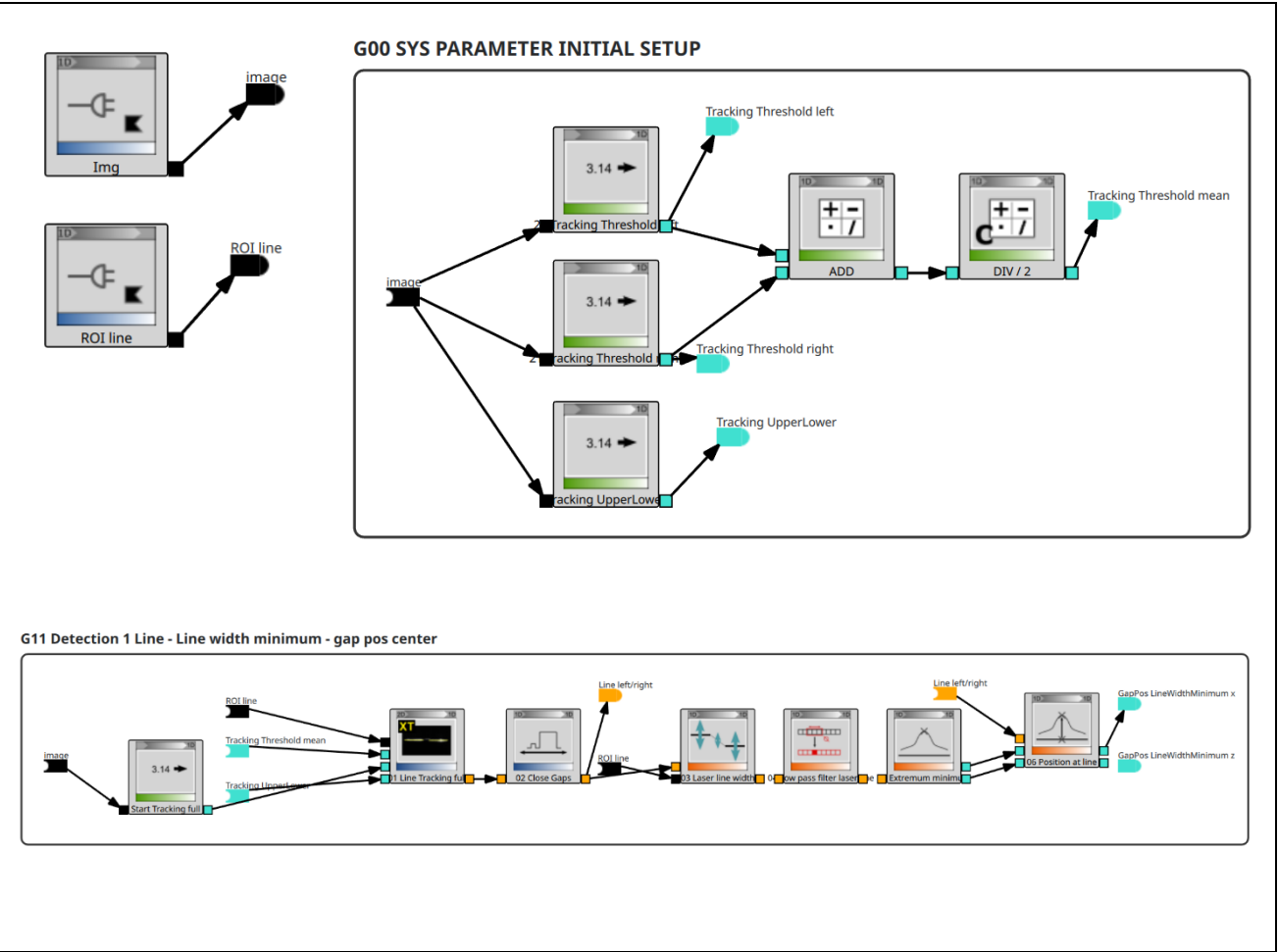
IN bridges

 image	Img ROI line
------------------------------------------------------------------------------------------------	-----------------

OUT bridges

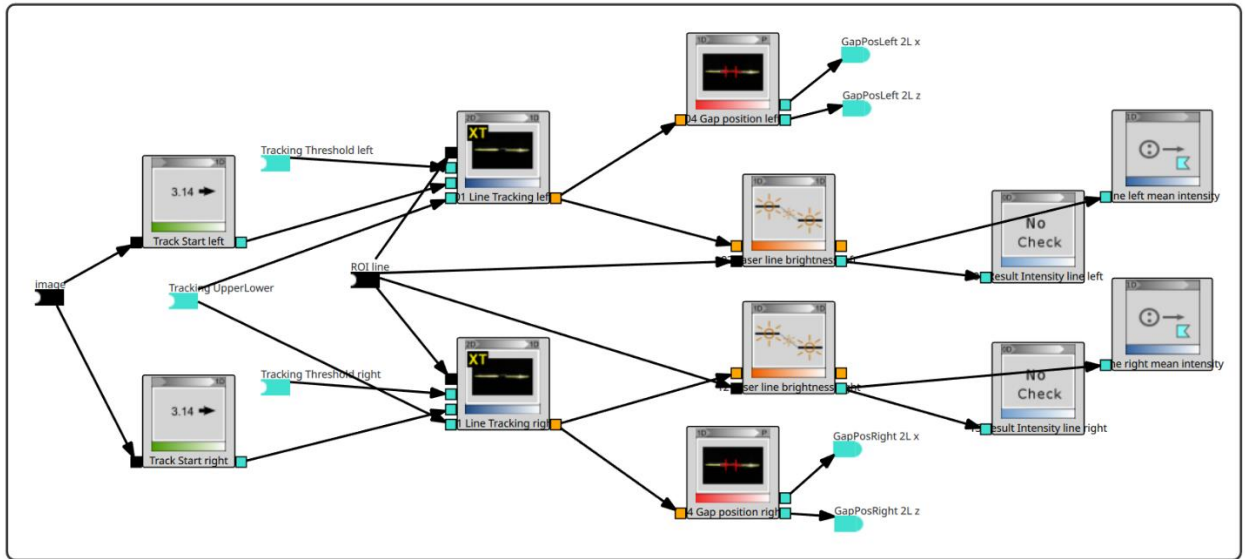
 value	Gap pos X left / right line Gap pos Y left / right line HeightDiff mm Line left / right mean intensity
------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------

■ Graph block diagram

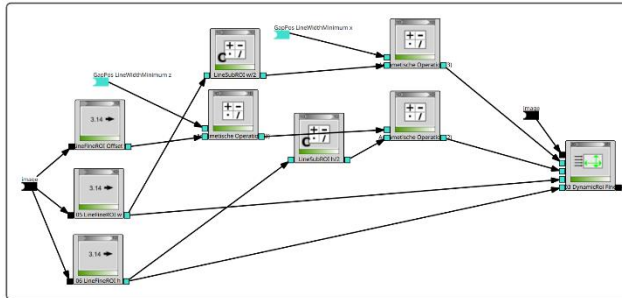




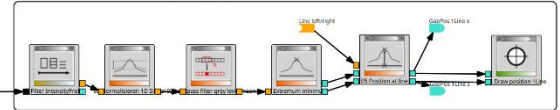
G10 Detection 2 Lines - Line discontinuation - gap pos left/right



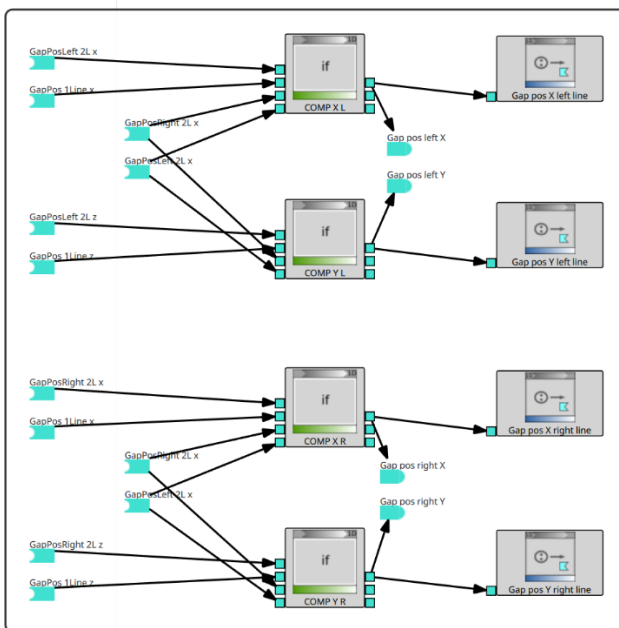
G12 SubROI - FINE gap pos center



G13 Detection Minimum Intensity - FINE gap pos center



G15 Select Position



G16 Calc Height difference

