

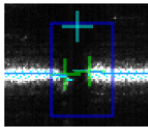


## 3 - S11 SEARCH Gap LINE GreyMin

### ■ 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 S11 SEARCH Gap LINE GreyMin

Detect edge position left and right with laserline.

### ■ Parameters

#### Filter Groups of 3 S11 SEARCH Gap LINE GreyMin



G00 SYS PARAMETER INITIAL SETUP

G04 SYS PLAUSIBILITY INITIAL SETUP

G06 offsets

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


G50 Intensity ROIs

## G00 SYS PARAMETER INITIAL SETUP

**Filters of**  
**G00 SYS PARAMETER INITIAL SETUP**

 04 ROI width of blank intensity check left/right

 20 Tracking Threshold left

 21 Tracking Threshold right

**Attributes of**  
**04 ROI width of blank intensity check left/right**

Number

Parameter	Comment
Number	The number of pixels in direction to the gap, starting at the left/right border of the laser line ROI, serving for calculating the left/right side reference brightness. [Pixel]

**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]



## G04 SYS PLAUSIBILITY INITIAL SETUP

**Filters of**  
**G04 SYS PLAUSIBILITY INITIAL SETUP**

01 Plausibility gap width max.  
 02 Plausibility heightDiff max.  
 11 Plausibility min part present intensity  
 12 Plausibility max gap intensity  
 13 Plausibility min line intensity

**Attributes of**  
**01 Plausibility gap width max.**

Number

Parameter	Comment
Number	Maximum allowed value of gap width, that the calculated value is valid. [mm]

**Attributes of**  
**02 Plausibility heightDiff max.**

Number

Parameter	Comment
Number	Maximum allowed value of mismatch, that the calculated value is valid. [mm]

**Attributes of**  
**11 Plausibility min part present intensity**

Number

Parameter	Comment
Number	Minimum mean intensity value for 'part present' check left and right. [Greylevel]


**Attributes of**  
**12 Plausibility max gap intensity**


Number


Parameter	Comment
Number	Maximum allowed intensity value in the gap. [Greylevel]



**Attributes of**  
**13 Plausibility min line intensity**




Number

Parameter	Comment
Number	Minimum intensity value for 'line present' check left and right at the line ROI border. [Greylevel]

## G06 offsets

**Filters of**  
**G06 offsets**



**01 Offset y micrometer**


**Attributes of**  
**01 Offset y micrometer**


Number

Parameter	Comment
Number	Constant offset of the found gap position. [μm]



## 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  
 — 3 (2) +

search area y  
 — 5 (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

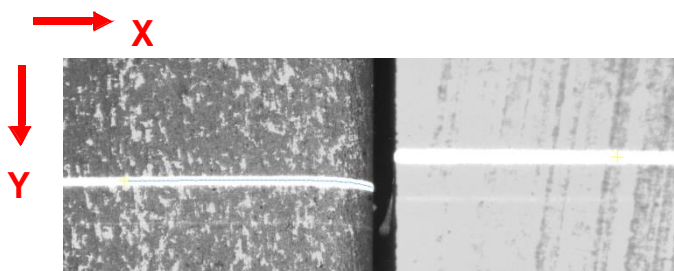
Starting Point Height  
 — 3 (10) + Pixel

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**

Verboesity level

None

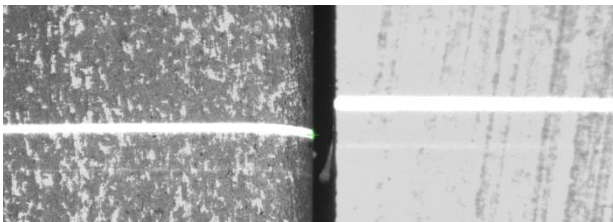
set constantXOffset


0.000

Parameter	Comment
Verboesity level	Selection of verboesity level. Larger verboesity 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]

### Verboesity example:

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




**Attributes of**  
**11 Line Tracking right**

Verbosity level

None

mean x

—

3 (2)

+

search area y

—

5 (3)

+

mean area y

—

3 (2)

+

pixel

Resolution X

—

1

+

pixel

Resolution Y

—

1

+

Maximum Gap Width

—

3

+

Maximum Number of Gaps

—

1 (2)

+

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 lower than the "Search range in Y". [Pixel]

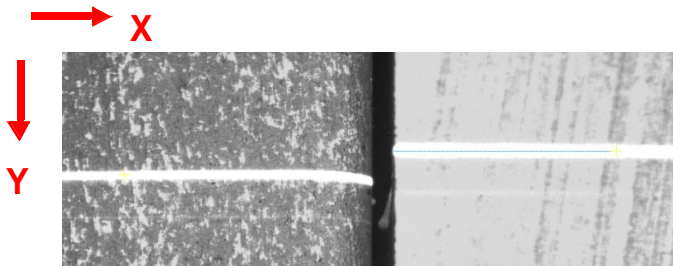






Maximum Gap Width	Maximum allowed width of a laser line interruption: If the number of side by side laying pixels, having a lower grey scale value than the search threshold, exceeds this parameter figure, the line interrupts counter figure is raised by 1. [Pixel]
Maximum Number of Gaps	Maximum number 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**


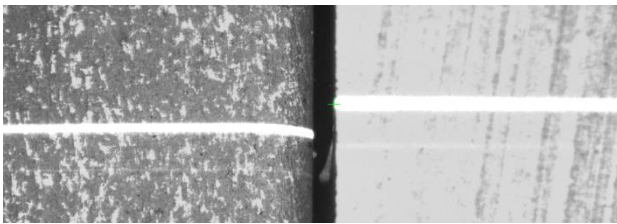
Verbosity level  
 None

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

search area y

mean area y  



pixel

Resolution X  



pixel

Resolution Y

Maximum Gap Width

Maximum Number of Gaps

Maximum height jump

Starting Point Width  



Pixel

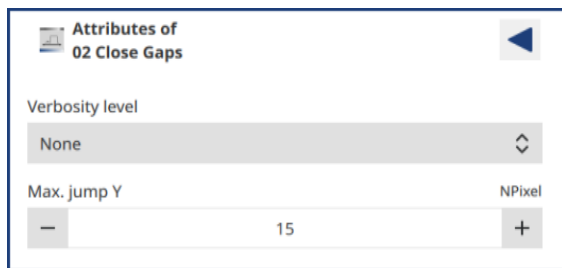
Starting Point Height  



Pixel

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]

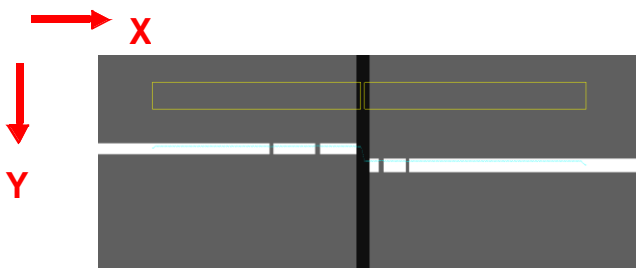
Maximum Number of Gaps	Maximum number of laser line interrupts: If the number of line interrupts per laser line becomes higher than this parameter, the line search is stopped and a line interrupt warning is released.
Maximum height jump	Maximum interrupt in Y direction: If the height jump of the laser 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]



Parameter	Comment
Verbosity level	Selection of verbosity level. Larger verbosity levels offer more overlay information.
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 are smaller than 'Max. jump Y'. [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 vertical distance was small enough, and the two yellow rectangles mark that there was no interrupt in the laser line parts.





**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 laser line start points. [Pixel]

**Attributes of**  
**04 Low pass filter laser line**

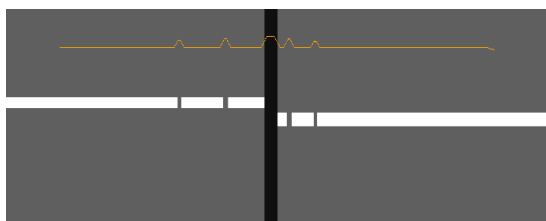
Verbosity level

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.



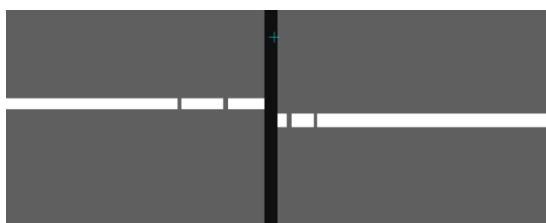

**Attributes of**  
05 Extremum minimum

Verboesity level  
None

Parameter	Comment
Verboesity level	Selection of verboesity level. Larger verboesity levels offer more overlay information.




### Verboesity example:

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



### G12 SubROI - FINE gap pos center

**Filters of**  
G12 SubROI - FINE gap pos center

 03 DynamicRoi Fine  
 05 LineFineROI w  
 06 LineFineROI h


**Attributes of**  
03 DynamicRoi Fine

Verboesity level  
None


Parameter	Comment
Verboesity level	Selection of verboesity level. Larger verboesity 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  

-

2

+

N Pixel

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.

### G50 Intensity ROIs

**Filters of**  
**G50 Intensity ROIs**

01 Intensity ROI left  
 13 Intensity ROI right  
 22 Intensity ROI Gap

**Attributes of**  
**01 Intensity ROI left**

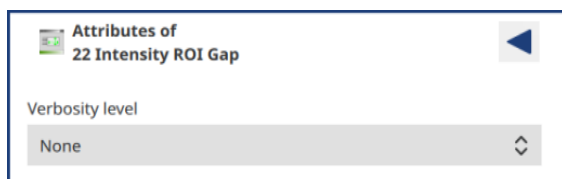
Verbosity level  
 None

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

**Attributes of**  
**13 Intensity ROI right**

Verbosity level  
 None

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



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
















#### ■ Measured values for plotter

558	0 / 1	Plausibility Intensity error
573	0 ... 255	Intensity Line left
574	0 ... 255	Intensity Line right
575	0 ... 255	Intensity Part left
576	0 ... 255	Intensity Part right
577	0 ... 255	Intensity Gap
581	0 ... xxx	TCP_x
582	0 ... xxx	TCP_y
583	0 ... xxx	HWROI_x
584	0 ... xxx	HWROI_y

#### ■ Subgraphs interface

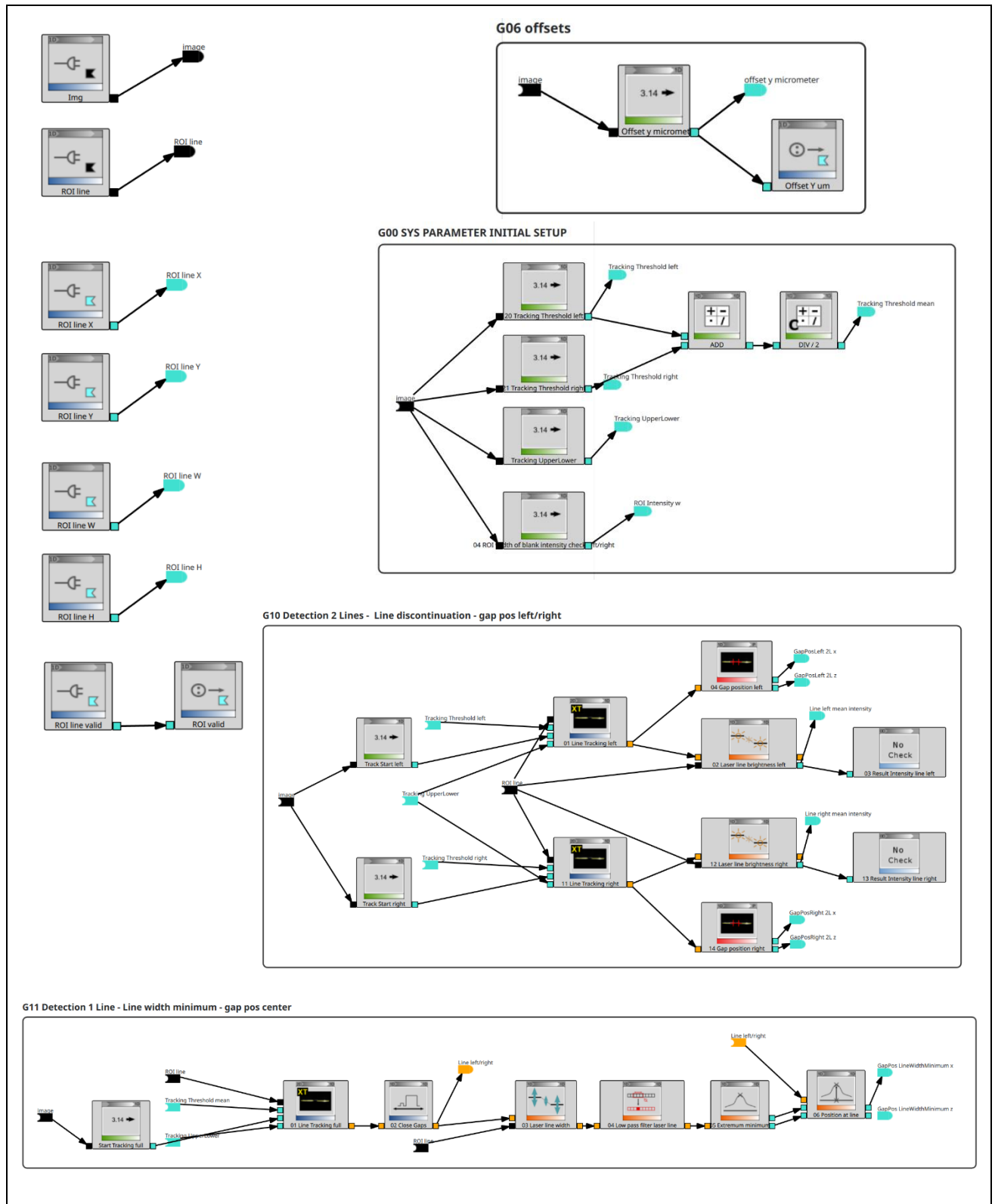
##### IN bridges

##### OUT bridges

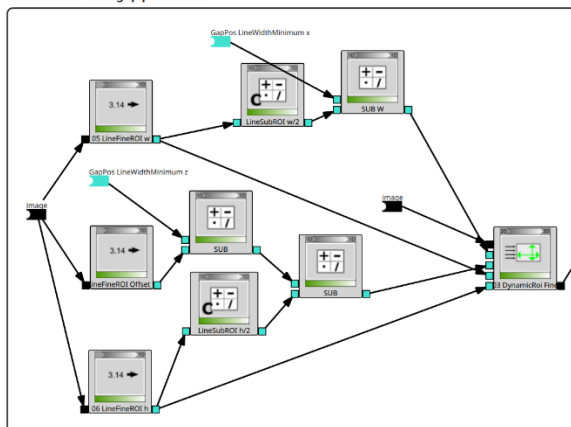
 <b>image</b>   <b>value</b>	 ROI line  ROI line   ROI line X  ROI line Y  ROI line W  ROI line H	 <b>value</b>	 Gap pos X left / right  Gap pos Y left / right  Plaus error  Offset Y um  Max gap width  Max height diff
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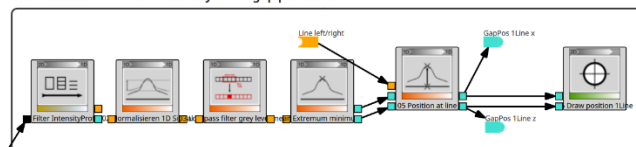
## ■ Graph block diagram



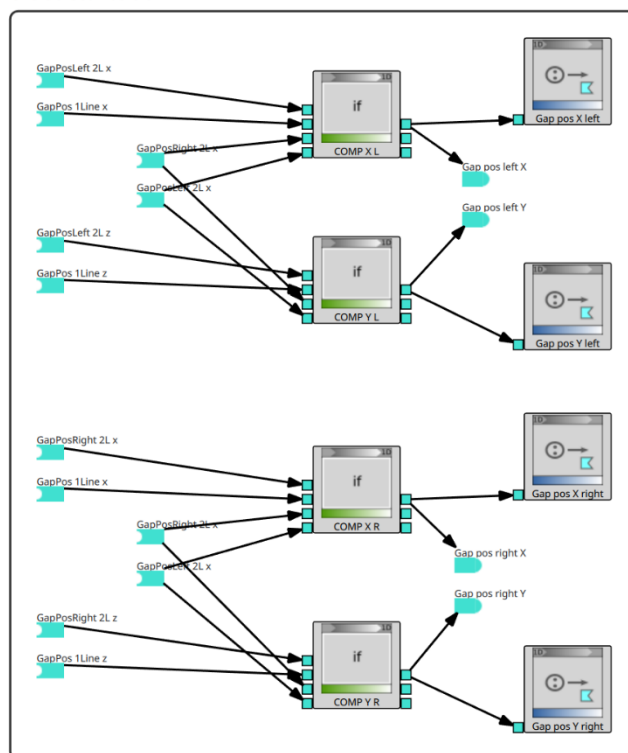
#### G12 SubROI - FINE gap pos center



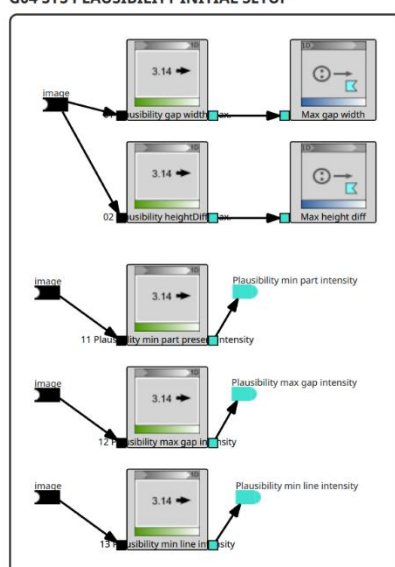
#### G13 Detection Minimum Intensity - FINE gap pos center



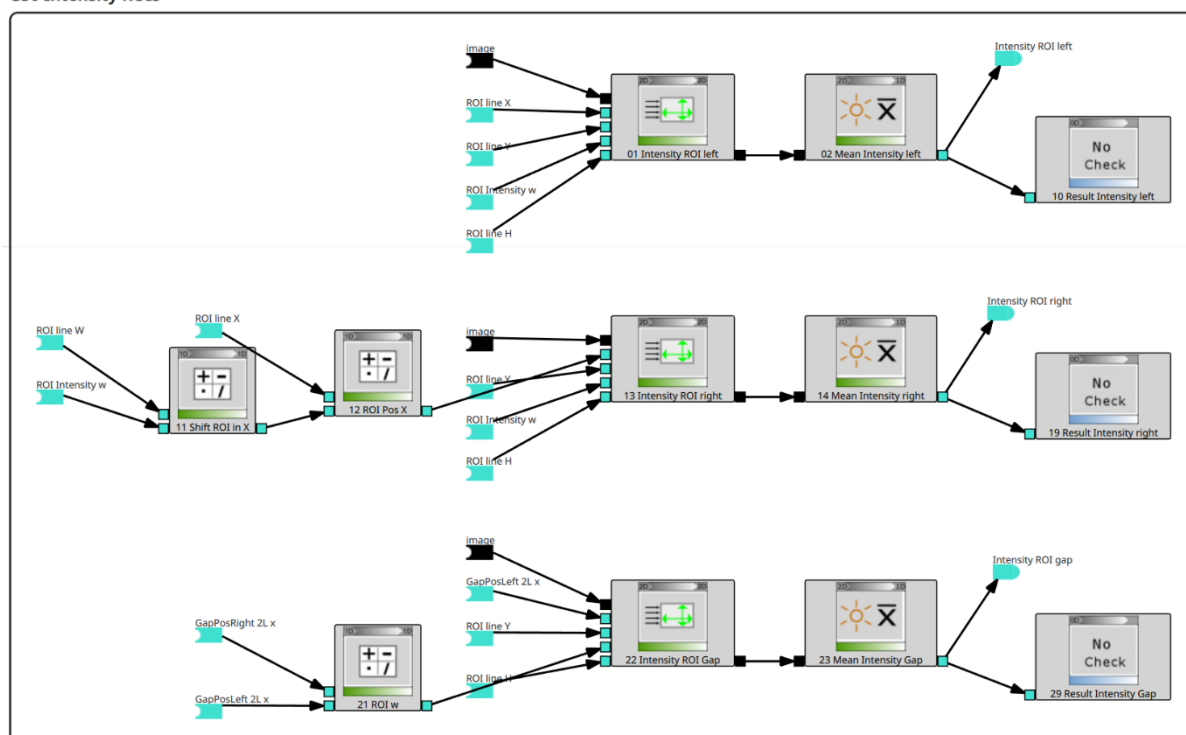
#### G15 Select Position



#### G04 SYS PLAUSIBILITY INITIAL SETUP

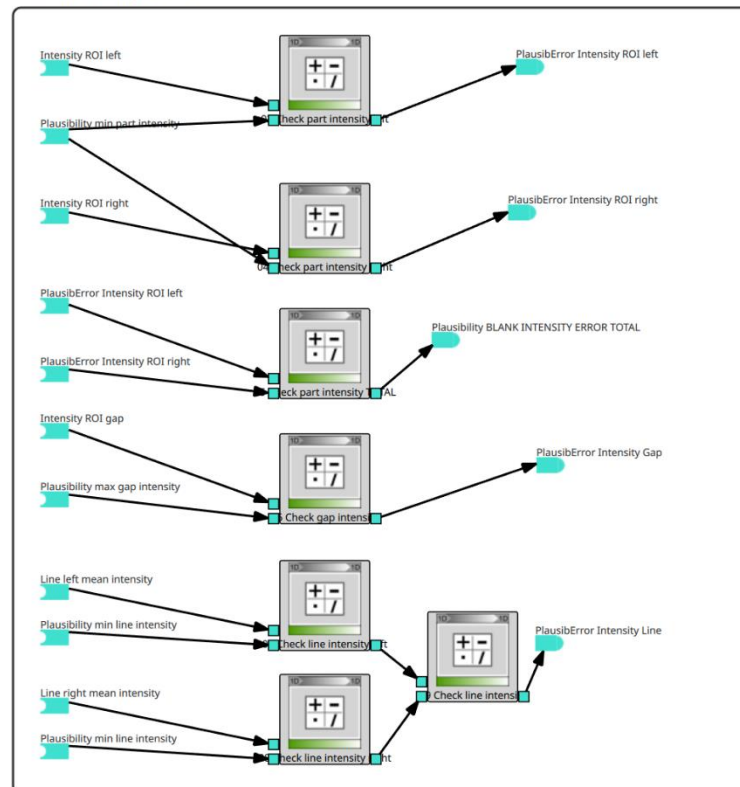


#### G50 Intensity ROIs

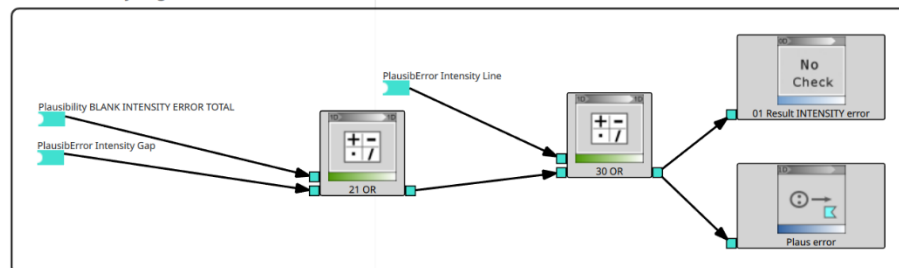




### G60 Plausibility Check



### G61 Plausibility Logic and Rank



### G70 TCP Position

