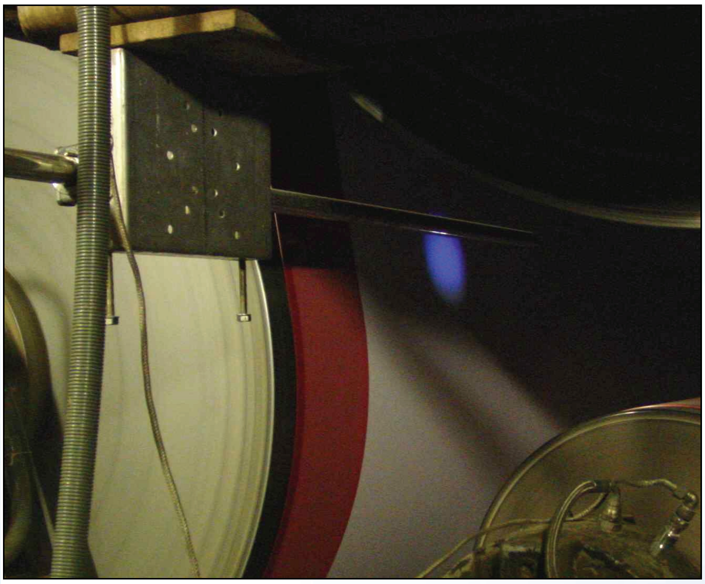
KPM
A MEMBER OF THE ABB GROUP



INSTRUCTION MANUAL

KB/6

KB/9

KB/12

Sheet Break Detector

August 2012 KB Man W41100100V5.1

This manual is applicable for KB firmware *Display FW Ver 1.12* or higher
Modifications: KPM logo changed. KB installation check list updated. Appendix 5 added. Alarm setting clarified.

1 Table of contents

2 Contact information

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3 Description

3.1 System components

KB fiber-optic sheet break detection system contains

- Sensor head installed above or under the web
- Fiber optic cable protected by the flexible conduit
- Display Unit housing the light source, detector, and the measurement computer

KB/6-9-12 from KPM is the solution to high temperature sheet break applications. The light source, detector, and electronics are isolated from the high temperature environment by a 6 m (20'), 9 m (30') or 12m (40)' fiber optic cable. While the sensor head is exposed to high temperatures, the electronics is mounted in a less hostile environment.

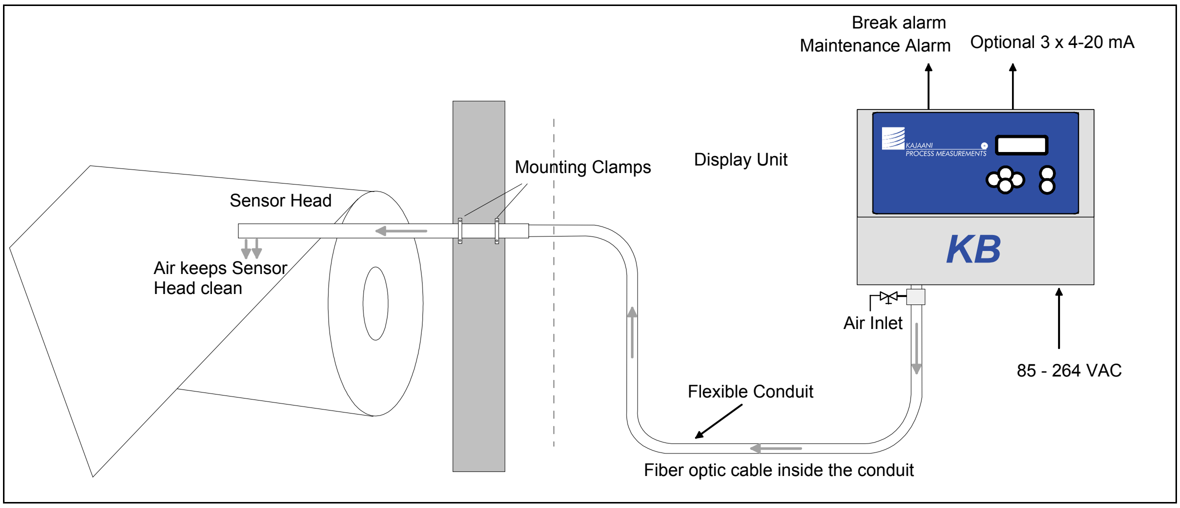


Figure 3.1. KB/6-9-12 system components

Sensor head "eye" holes are kept clean by purging instrument air through the sensor housing. Flowing air keeps the eyelet holes clean and prevent dirt or steam from contaminating the active optic surfaces. Purging air helps also to keep sensor head temperature lower in high temperature applications.
The KB requires clean instrument air at 0.5 – 3.0 bar (7 - 40 psi), the rotameter or pressure regulator can be used for easy detection of airflow.

3.2 Operating principle

The KB operates on a proven, non-contact reflection principle. The optical sensor is placed above or under the web. Applications include paper or board webs, wires or felts. Thanks to the unique RGB detection method the color of the product or the felt has no effect on the measurement reliability. The sensor is neither affected by dirt, steam or temperatures up to 180 °C (356 °F) when installed according to Kajaani Process Measurements specifications.

The optical sensor is connected through a fiber optic cable to the RGB/IR light source placed in the display unit. The RGB/IR LEDs send pulsed Red, Green, Blue, and IR light onto the web surface. The reflected light is picked up and transmitted through the fiber optic cable to the detector. All light components are analyzed for reliable break detection.

A break activates the alarm relay. The reflected light intensities are also available as optional 4-20 mA analog outputs.

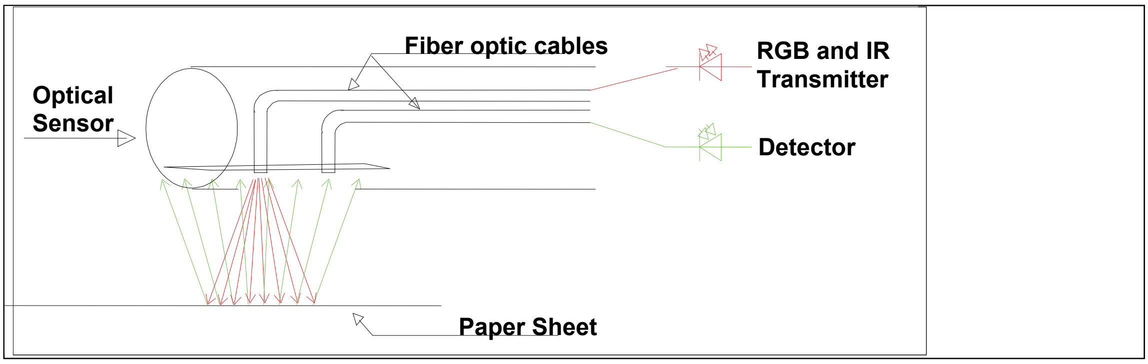


Figure 3.2. Operating principle.

The self-cleaning sensor head is a 33.7 x 1500 mm (1” x 59“) stainless steel tube with two holes serving as eyelets for the fiber optics and outlets for purge air. Continuous airflow through the stainless steel enclosure keeps positive pressure around the sensor head’s eyes and keeps the eyelets free of steam, dust or debris. The openings should be located perpendicular to the surface being monitored.

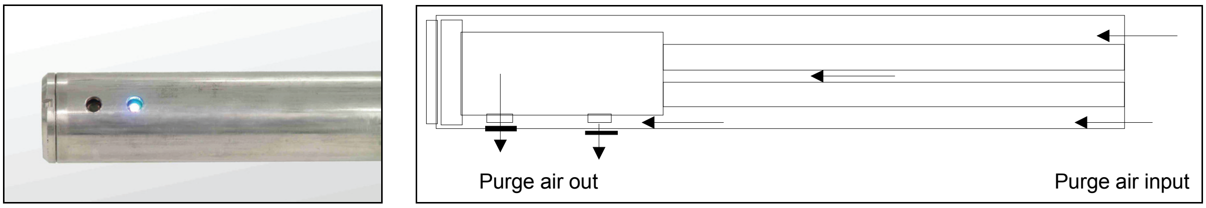


Figure 3.3. The sensor eyelets and purge air operation

4 Installation instructions

Note: Do not mount several fiber optic sensor heads side by side; a mutual interference may occur.

Infra red dryer might interference measurement also.

4.1 Delivery limits

Manufacturer supplied components:

- KB sensor head with position memory, 1 ea
- Mounting clamps, 2 ea
- Fiber optic cable (6 m/20’, 9 m/30’ or 12 m/40’), 1 ea
- Display Unit, 1 ea
- Flexible conduit for fiber optical cable protection (SS tubing, 25,4 mm/ 1” OD), 1 ea
- Option: Mounting rack
- Option: Analog Output Board

4.2 Display unit installation

Install the display unit to the wall outside the machine for easy access.

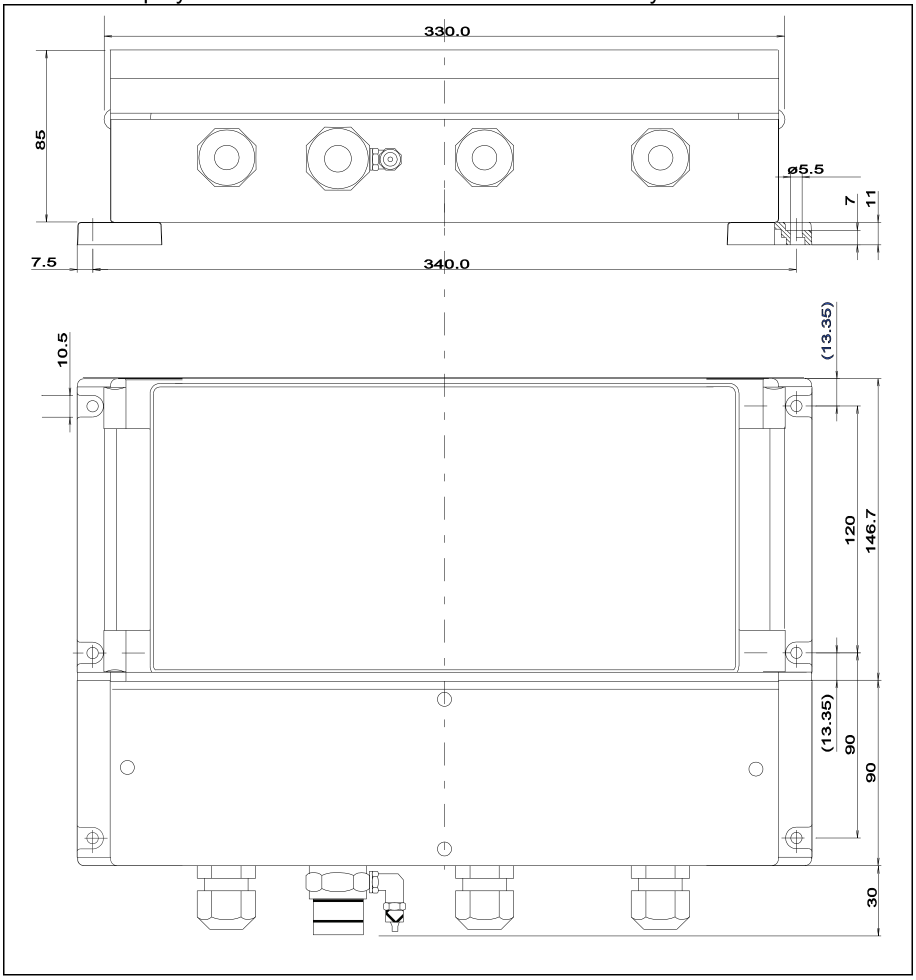


Figure 4.1. Display unit dimensions

4.3 Sensor head installation

The fiber optic cable comes mounted to the sensor tube. Feed the free fiber optic cable through the flexible conduit and connect the conduit to the sensor head. If pulled, pull the fiber optic cable from the outer jacket – **not from the connectors**. Pulling from 2 cables the maximum force is 50 Newton (11 lbf). Minimum bending radius is 50 mm (2”). The sensor should be installed about 25 cm (10”) inside from the edge of the web and 15 cm (6”) above it (standard range is 10 - 20 cm (4 - 8”)).

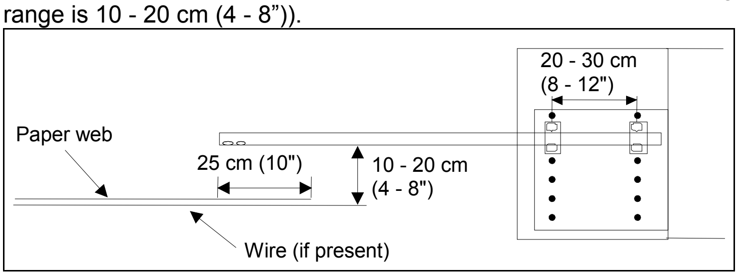


Figure 4.2. Typical installation

Install the mounting clamps or the rack (optional) on paper machine's frame or other solid mounting structure. Leave 20 - 30 cm (8 - 12") between the clamps. It is recommended to leave option to adjust clamp height so that sensor head can be positioned optimally during the start-up.

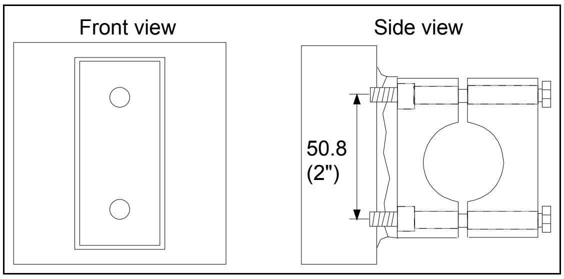


Figure 4.3.a. Mounting clamp.

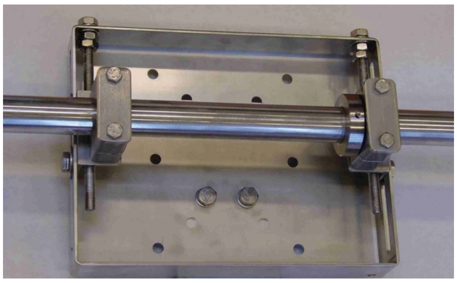


Figure 4.3.b. Mounting rack (option).

Slide the sensor tube through the mounting clamps. Rotate the eyes into a position perpendicular to the web and semi-tighten the clamps. The groove in sensor head shows the direction of light beam. Final adjustment is done with the help of the signal level display after the unit is powered up. Light beam is directed to the measured web.
Insert the pin of the position memory ring (Figure 4.4) into the hole in the clamp and tighten the stop screw. If the sensor is removed for maintenance the memory ring ensures that the sensor head is positioned exactly in the same position as before the removal.

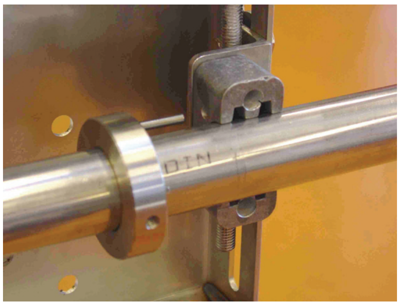


Figure 4.4. Position memory.

4.4 Fiber optic cable installation

Note: Handle fiber optic cables with care. Do not pull strongly. Remove protective caps before connecting to optic block.

Route the flexible conduit with the fiber optic cable inside it to the display unit.
1. Remove the conduit bushing from the display unit

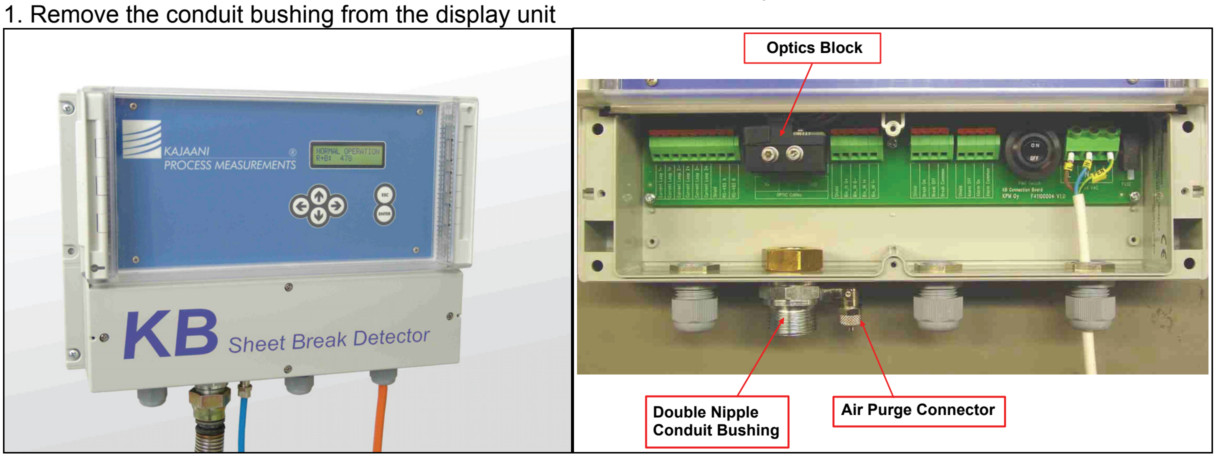
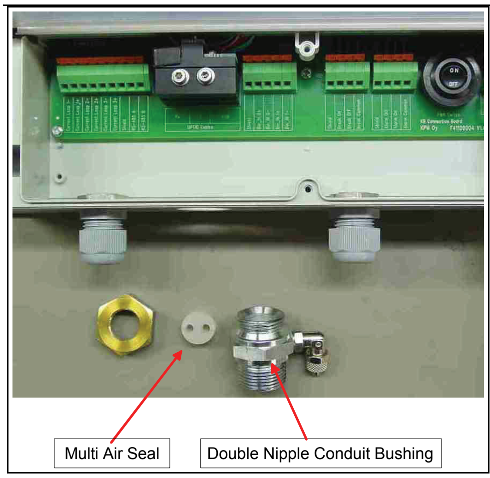
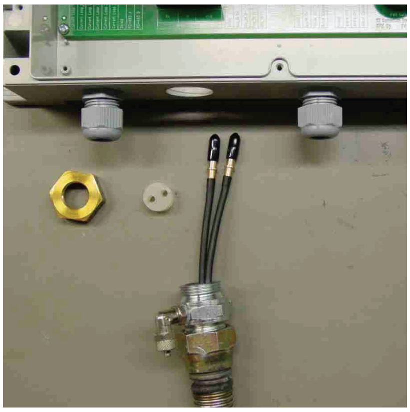


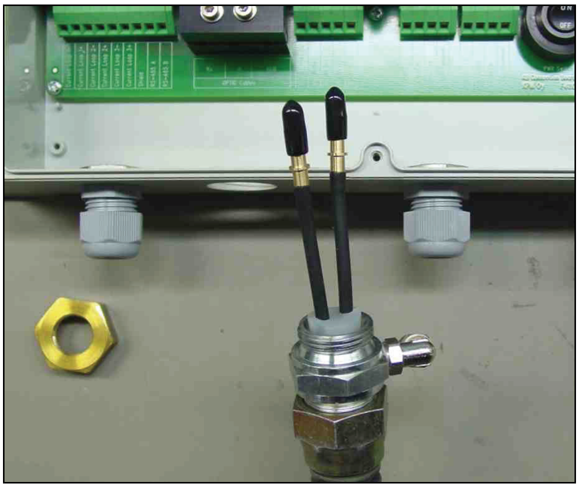
Figure 4.5. Display Unit.

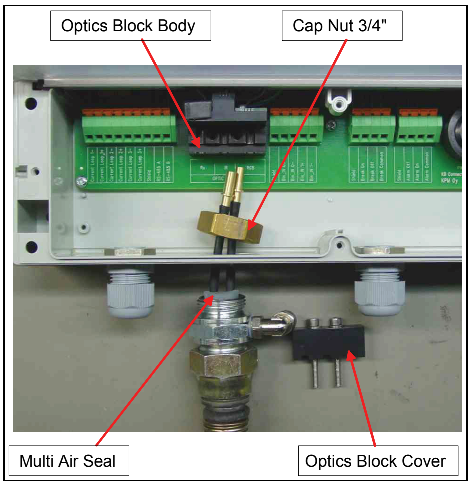


2. Guide the end of the fiber optic cable through the conduit bushing and fasten the bushing to the flexible conduit.
3. Place the multi air seal on top of the fiber optic cables



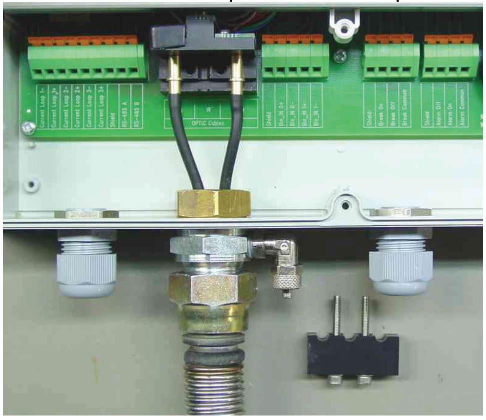
4. Insert the multi air seal inside the conduit bushing
5. Open the optics block cover, slide the cables through the bushing hole, and tighten the bushing <u>loosely</u>.

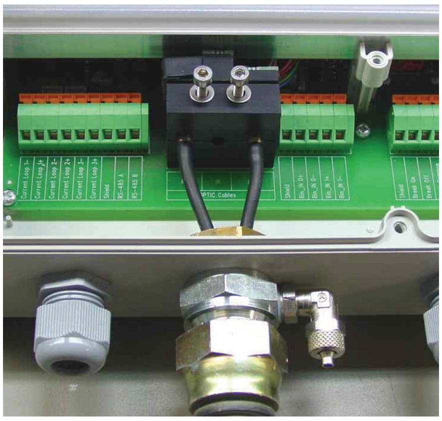




6. Insert one of the cables to the Rx slot and the other one to the RGB slot (or to IR slot if IR light is used). It does not matter which one of the cables is connected to the Rx slot.

7. Lock the cables in place with the optics block cover.





8. Fasten the optics block cover and tighten the cap nut of the cable bushing.

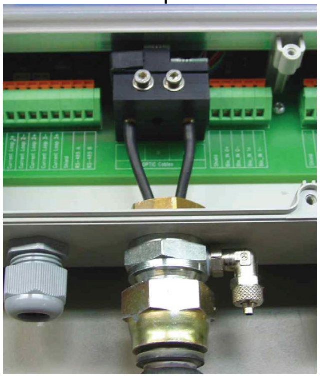


Figure 4.6. Conduit Bushing with Air Connection.

9. Connect the instrument air 0.5-3.0 bar (7-40 psi) to the air inlet connector at the end of the flexible conduit outside the display unit housing.

5 Wiring

5.1 KB/6-9-12 wiring and fiber optic cable connection

The terminals for the electrical and fiber optic cables are located under the bottom cover of the display unit. The layout of the connection board is shown in figure 5.1.

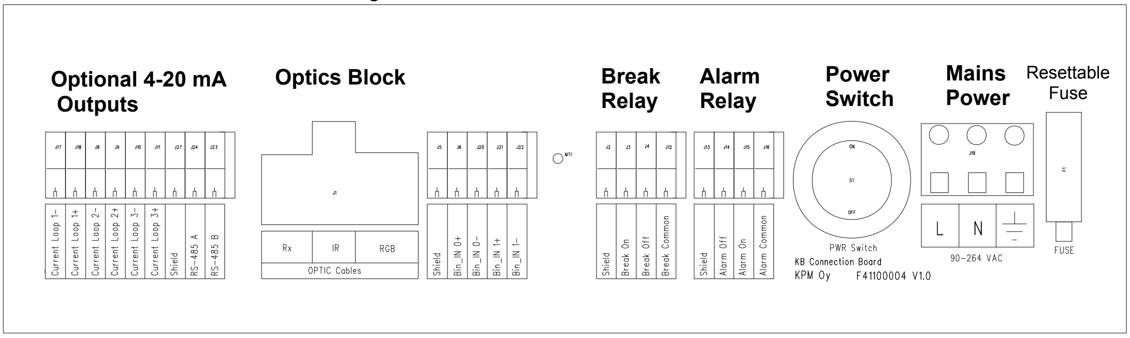


Figure 5.1. Connection Board Layout

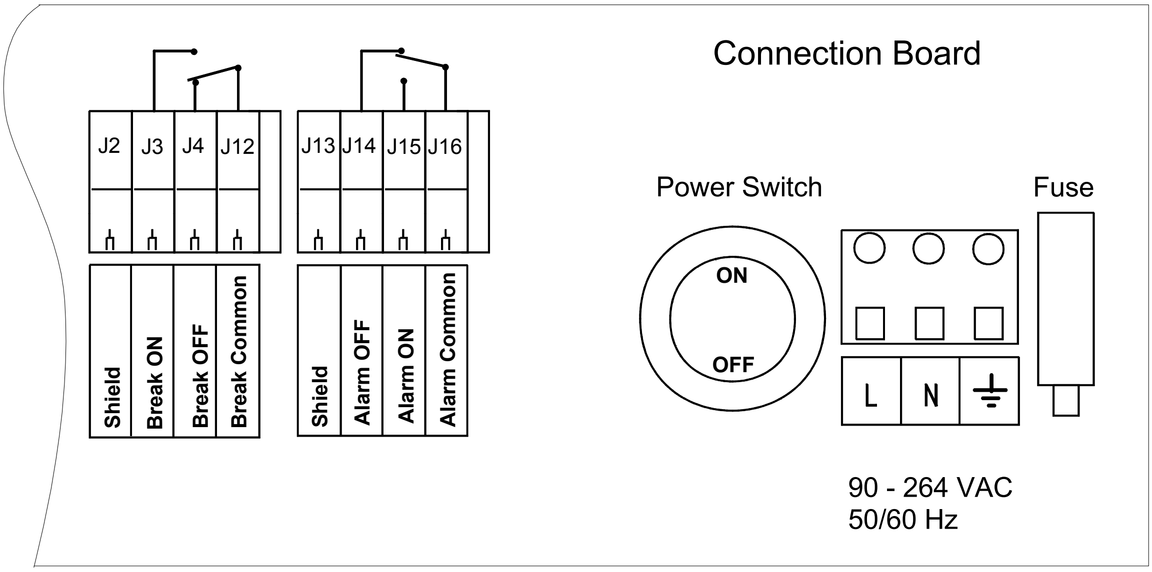


Figure 5.2. Wiring of Power Supply, Break alarm and Maintenance alarm.

Relays are dry contact types.
In normal operation Break ON relay is open and it closes during a break. In case the power is lost or turned off the Break ON relay remains open (disabled).
Break OFF works opposite.

Alarm relay OFF is normally closed. It opens in case the built-in self-diagnostics detects a failure. If power is lost or turned off the alarm relay OFF is OPEN.
Alarm ON works opposite.

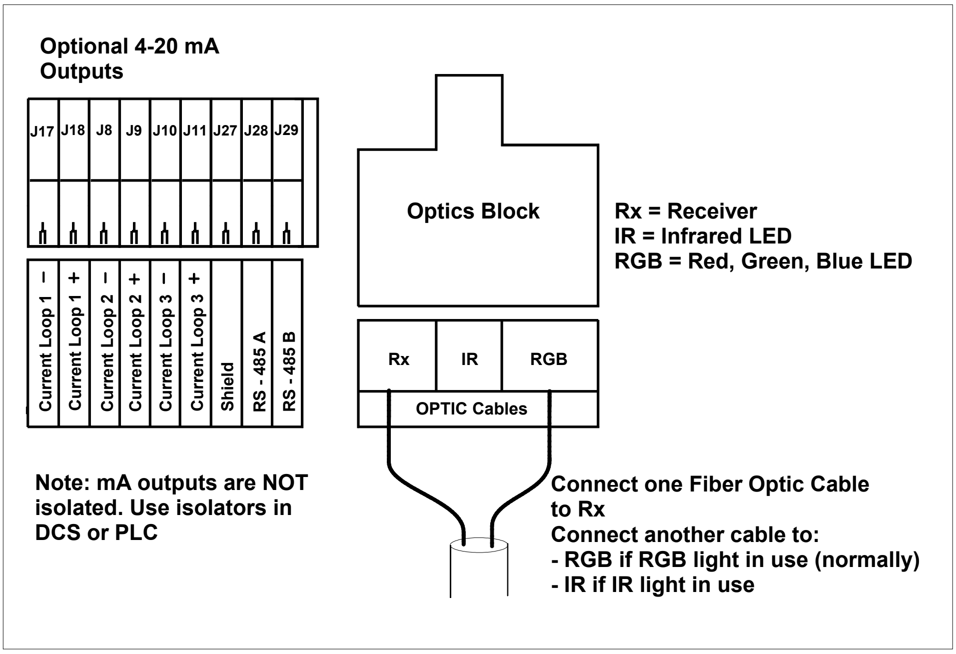


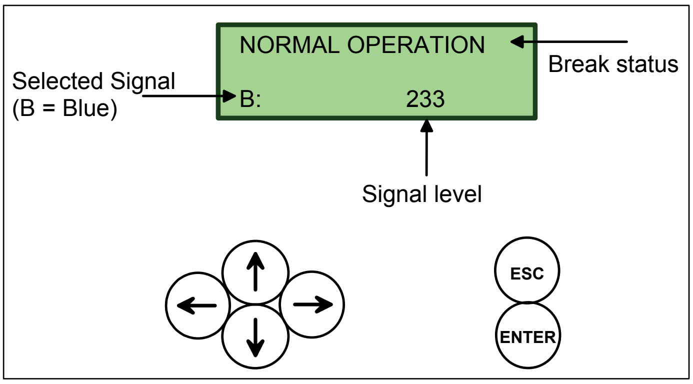
Figure 5.3. Fiber Optic Cable and optional 4-20 mA connections.

Fiber optic cable is connected to the optics block. It does not matter which one of the two cables is connected to the receiver inlet (Rx). In a normal application the another cable is connected to the RGB light source. IR light source is used in special cases such as heavy steam environment or in an application where exceptionally strong light is needed.

6 Display unit operation and configuration

6.1 Display and operating keyboard

Figure 6.1. Display and keyboard.



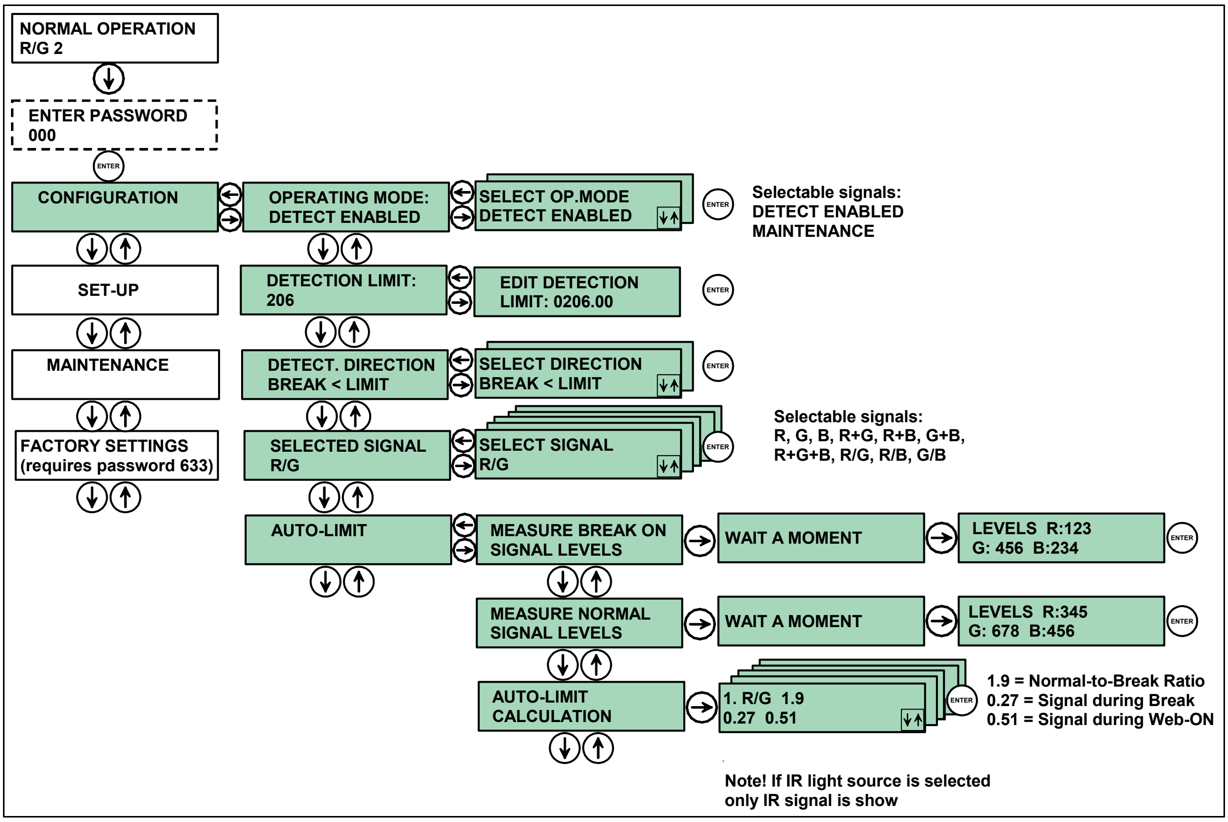
Arrow keys - used to move between menus or to adjust values.
Esc key - used to delete changes and/or return back to the previous menu.
Enter key - used to accept data and input changes.

Figure 6.2. KB Main Display and operating keyboard.

The display is 2 lines wide and 16 characters in length. The main display shows

- Break status
- Selected measurement signal for break detection
- Signal level of the selected signal

6.2 Configuration menu



Operating mode: Select "**Detect enabled**" for normal operation. For maintenance select "**Maintenance**" – it disables the break alarm relay to prevent false break alarms during the maintenance work.

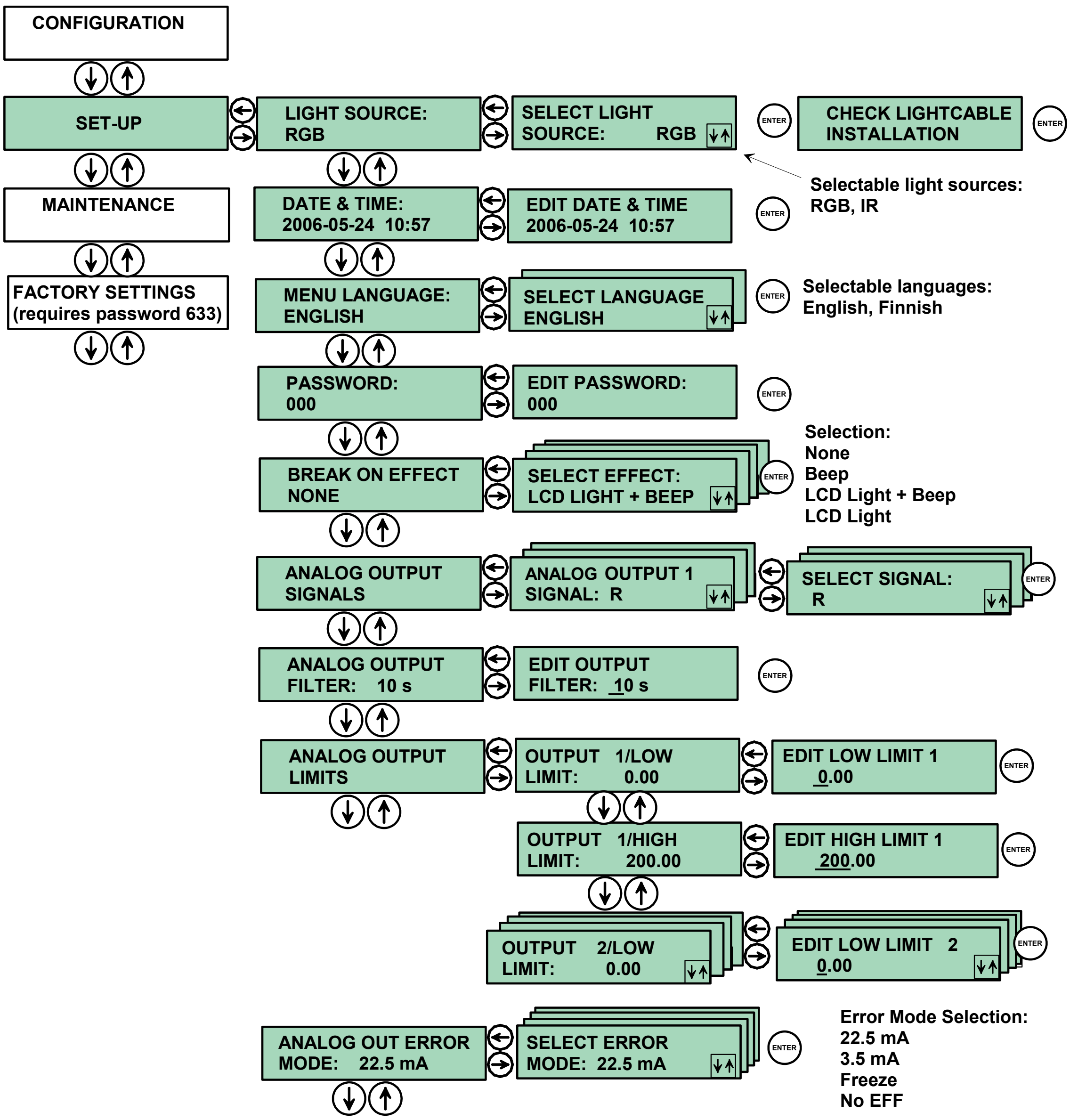
Detection limit: Setting the signal level trigger point for the break alarm.

Detect direction: Selecting if the break is alarmed when the signal level goes under or above the detection limit

Selected signal: One of the RGB-signals or combinations thereof can be selected for break alarm. The one which gives the highest difference between the web-on (NORMAL) and the web-off (BREAK) situation is selected.

Auto limit: KB records all the signal levels in web-off/web-on situations. Measure Break ON sinal leves by pressing arrow right. Store Break on signal levels in KB memory by pressing Enter after performing "Measure break on signals levels". Esc will escape without storing.
Store normal signal levels (PAPER) same way after measuring them.
Auto-limit Calculation menu KB calculates the web-on to web-off ratio (Normal-to-Break Ratio) when both cases has been stored in memory. KB also suggests the best signal and put them in ranking list. Normally the best signal is chosen for break detection having it in display and pressing Enter. Then KB sets the break alarm trigger point (= Detection Limit) to 50% of the difference between the web-on and the break-on levels for the selected signal
The unit sets also automatically the detection direction.

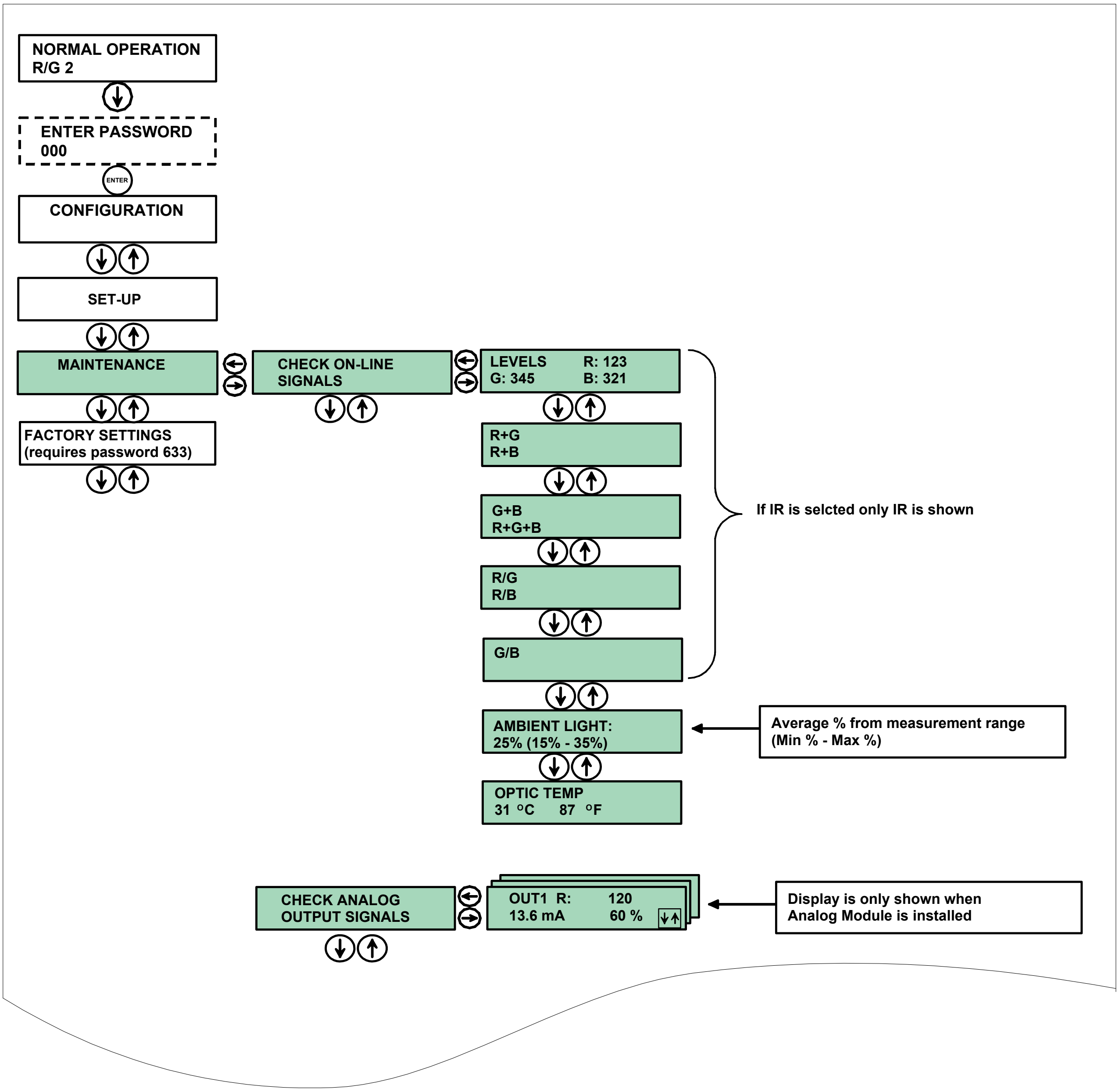
6.3 Set-up menu



Light source:	RGB (visible Red, Green, Blue) light is recommended in a normal application. IR light is used in special cases, such as heavily steamy environment and/or long measurement distance from the web.
Date & time:	Date and time for data logging
Menu language:	English and Finnish available
Password:	000 = no password. (The password 633 works always).
Break-On effect:	Selection of blinking light and/or sound effect to emphasize the break alarm.
Analog output signals:	On optional analog board there is three 4-20 mA analog outputs. Any of the RGB signals and their combinations can be selected to each output. Menu is displayed if board is installed.
Analog output filter:	Dampening of the analog signals. The selected filtering time is applied to all the 3 outputs.
Analog output limits:	Setting the signal levels which correspond to 4 mA and 20 mA for each analog output.
mA output error mode:	When the self-diagnostics finds a failure the unit sets the outputs to the selected mode. The outputs can be set to go to 22.5 or 3.5 mA, or to freeze to the last good number, or to continue to show the measured values although they may be wrong (mode none).

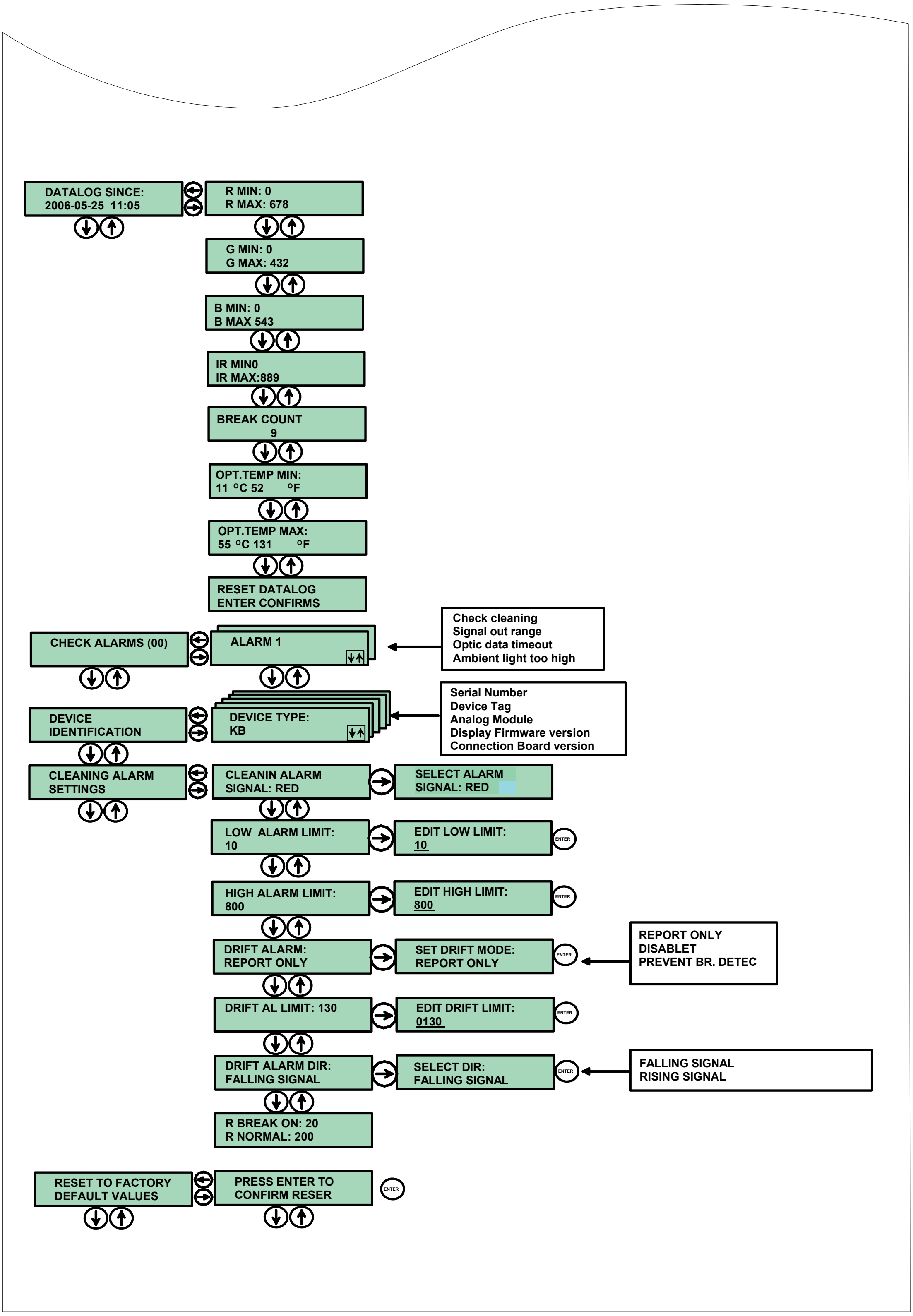
6.4 Maintenance menu

Maintenance Menu Flow Chart 1:



Check on-line signals: Measured and calculated signals can be monitored for troubleshooting purposes. Note: Ambient light should be less than 60%. When this value is higher that 60 % there is too much external light which may disturb measurement. Signal levels and Ambient light value can be adjusted by parameters TX Power and RX Gain, which are located in Factory setting menu. Smaller RX Gain value will help receiving less ambient light.
(Min %-Max % shows the occurred extremes ambient light during one measurement cycle).
Check analog output signals: Output and mA-values are shown only if the analog output board is installed.

Maintenance Menu Flow Chart 2:



Data log since: Contains measured minimum and maximum signals and monitored internal temperature data since the last reset. Please reset during start-up.

Check alarms: List of maintenance alarms, which are active at a moment. Used for troubleshooting.

Device identification: ID and version information

Cleaning alarm settings: Cleaning alarm levels will be given manually here. Please check them because default values may not suit your application.

Cleaning Alarm Signal: Select the R, G or B signal (IR in case of IR light source) which is used to monitor this alarm. Normally same signal than chosen into break detection (no combination possible).

Low Alarm limit and High Alarm limit:
If a piece of paper gets stuck on the sensor head , signal level can go very low or very high. The low and high limits are set for this case. Alarm will go on if signal goes below low limit (3 default) or over high limit (1000 default). Normally default values are OK.

Drift Alarm:
Drift alarm is used to give alarm in case measurement signal drifts, for example because of dust on top of fiber optic lens or in the opening.
There are three possibilities to use Drift Alarm

- **Report only:** In case drift is detected,
  - *Alarm Relay* is activated
  - break detection and *Break Relay* continues to operate normally.
- **Disabled:** Drift detection is not used at all
- **Prevent Br. Detec:** In case of drift is detected
  - *Alarm Relay* is activated
  - break detection and *Break Relay* <u>is **not** used</u>

  (purpose is that KB will never give false Break output)

Drift Al. Limit: Set Drift Alarm Limit manually. Set the limit about the 70% between signal level during Paper On (= *Normal)* and *Break On*.

Drift Al. Limit = **0.7*(Normal – Break On)+ Break On**

Number should be between *Paper On* and *Break Detection limit*. See figure 8.1.

Drift Alarm Dir: Select here drift measurement direction, falling signal or rising signal. Normally drift of measurement causes falling signal.

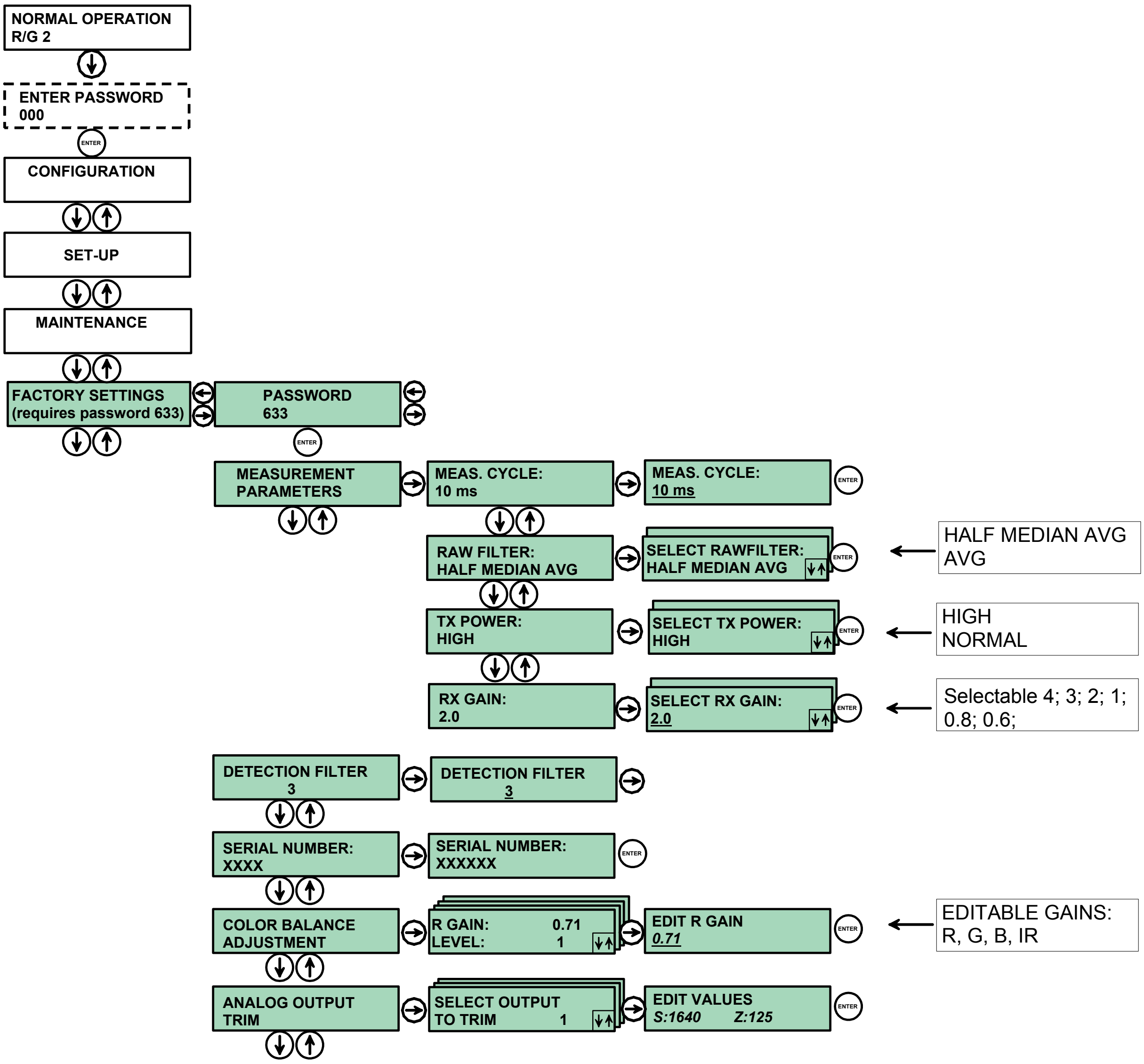
R (G, B) Break on:
R (G, B) Normal: These are stored signal values during Auto limit is performed. These are <u>only for indication</u> in this menu to help select correct alarm limits.

Reset to factory default values: Used e.g. if the settings are changed by accident. Not available at moment.

6.5 Factory Settings menu

Note! Requires always password 633.

Please contact Kajaani Process Measurement before changing these parameters.

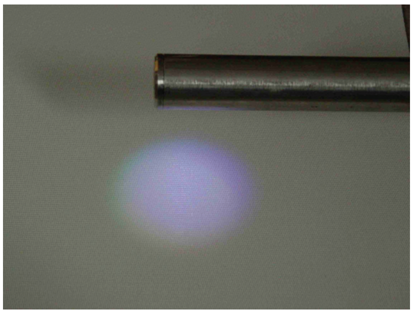


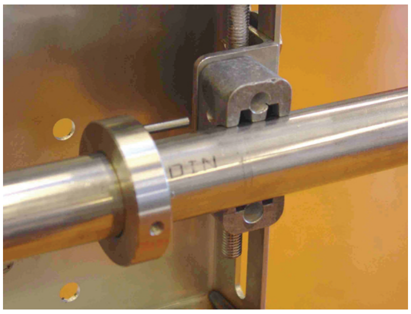
Meas. Cycle:	Number of measurement cycles for break determination. Normally 20. Can be edited
Raw Filter:	Selectable AVG average or Half Median AVG leaving lowest and highest value out
Tx Power:	Light source intensity – High or Normal, default high
Rx Gain:	Detector gain – normally 1 (selectable 4, 3, 2, 1, 0.6, 0.4). Effects directly on signal level. Can be adjusted if Ambient light is too high.
Detection Filter:	Break alarm filter – the higher the number the more meas. cycles analyzed before activating the Break ON relay. Normally 3 is used.
Serial Number:	Serial number can be edited
Color Balance Adjustment:	Individual gain adjustment of R, G, B, and IR lights
Analog output trim:	KB sends in the edit mode 4 and 20 mA in turn to the selected analog output. With S (gain) and Z (zero offset) the output can be trimmed if needed.

7 Start-up

7.1 Sensor position tuning

1. Make sure that the air purge is on.
2. Turn on the power and go to the set-up menu.
3. Select the light source. If fiber optic cable is connected to the RGB, select RGB. If connected to IR source, select IR. Default is RGB. Another fiber optic cable is always connected to Rx receiver.
4. Set date and time
5. Go to the maintenance menu/check on-line signals.
6. Rotate the sensor head until the signal levels indicated in the display unit are at their strongest (normally from 50 – 500 with paper). This is usually the perpendicular position against the web. Locate large piece of paper on the estimated place of measured sheet to simulate paper on situation to find the maximum signal level. Paper distance has effect on the signal level.
7. Check the ambient light percentage (in maintenance menu/check on-line signals). This should be below 60 % level. If the ambient light is too high reduce the light intensity in the Factory Settings menu by lower TX power. Another possibility is to reduce the receiver sensitivity Rx Gain.
8. Fasten the position memory ring.





9. Teach the unit to recognize the Break-ON conditions:
   a) Go to Auto-Limit block in the Configuration menu
   b) While the web is off (break) go to the “measure break-on signal levels” and press →. KB measures intensities of used light components (R, G, B in case of RGB or IR if in use).
   c) Press ENTER to accept and store the results. ESC will escape without storing.
   d) Repeat the intensity measurement when the web is ON. Again save the measured signal levels with ENTER.

7.2 Setting the break trigger level = Detection limit

1. Go to the Auto-Limit Calculation menu.
   KB has calculated from the above Break ON / Paper ON signals the “Normal to Break” ratio for all the light components plus 7 calculated combinations thereof. The results are sorted from the largest ratio to the smallest one.

   The display for each calculated result contains:
   - Name of signal or combination
   - “Normal to Break” ratio (paper-on signal divided by break signal)
   - Signal level during the break
   - Signal level during web-on (measuring paper)

2. Select the 1st displayed break signal and press ENTER.
   KB sets the break alarm trigger level (DETECTION LIMIT) automatically to the mid-point (50 % value) between the break-on/ paper-on levels of the selected signal.

KB selects automatically “DETECTION DIRECTION”. If the web-on signal is higher than the break-on signal the detection direction is set to BREAK < LIMIT. This is the normal situation. In some special cases the signal levels are reversed and BREAK > LIMIT is used.

The set values can be checked from the Configuration menu.

3. Set “operating mode” to “detect enabled” in Configuration menu to activate the break measurement . In the “maintenance mode” the break relay is deactivated to prevent false alarms while working on the unit.

The alarm trigger level can be manually edited in “DETECTION LIMIT” menu.

7.3 Examples

7.3.1 Open draw

AUTO-LIMIT values
No paper: R: 6, G: 7, B: 8
Paper on: R: 104, G: 121, B: 144

AUTO-LIMIT CALCULATION results: 1. B (blue light gives the highest difference), 144/8=18 (paper-to-break ratio = Normal to Break Ratio), 8 (blue level on break), 144 (blue level on paper).

KB selects blue light for break detection and sets detection limit to 76 =((144+8)/2)
KB sets the DETECT DIRECTION to BREAK < LIMIT = break relay activates as soon as B-signal drops below 76.

Alarm settings:
Cleaning Alarm Signal: Select signal which is used for break detection (B in this case)
Low Alarm Limit: Set for example 3
High Alarm Limit: Set for example 1000
Drift Alarm: Select required action of Drift Alarm, recommended *Report Only*
Drift Alarm Limit: 103 (= 0.70*(144-8)+ 8) = 70 % of range between paper on and break
Drift Alarm Direction: Falling Signal

7.3.2 Paper on red wire

AUTO-LIMIT values
No paper: R: 85, G: 24, B: 26
Paper on wire: R: 94, G: 125, B: 119

AUTO-LIMIT CALCULATION results: 1. G (green light gives the highest difference), 125/24=5.2 (paper-to-break ratio), 24 (green level on break), 125 (green level on paper).

KB selects green light for break detection and sets the trigger point to 74 (= (125+24) /2)

Alarm settings: same way as above in chapter 7.3.1
Cleaning Alarm Signal: Select signal which is used for break detection (G in this case)
Low Alarm Limit: Set for example 3
High Alarm Limit: Set for example 1000
Drift Alarm: Select required action of Drift Alarm, recommended *Report Only*
Drift Alarm Limit: 94 (= 0.70*(125-24)+24) = 70 % of range between paper on and break
Drift Alarm Direction: Falling Signal

8 Maintenance

8.1 Regular maintenance

KB does not require any regular maintenance. Built-in self-diagnostics monitors internal signals and raises alarm flag in case of a malfunction or certain signals reach alarm limits.

8.2 Alarms

Alarm name	Possible cause	Action
Check cleaning	Sensor eyelet holes blocked Fiber optic cable in the sensor getting dirty A LED of the RGB light source has failed or looses the intensity	Check that the sensor head is free of debris Check that the purge air is on and flows out from the sensor eyelet holes (pressure 0.5- 3 Bar) Clean the ends of the fiber optic cables using e.g. cotton stick wetted with alcohol containing cleaning agent Check the signal levels of all light components. If the one which is used for break detection shows low intensity select another signal (Configuration -> auto limit calculation ->signal selection).
Ambient light too high (on-line signals, ambient light ≥60%)	Sensor head too close to the web surface A shiny surface close to the sensor head A strong light beam from a near by lamp aimed at the sensor head Reflection from the web surface still too high	Move the sensor further away from the web or redirect the sensor eyelet holes slightly slantwise at the surface Redirect the sensor to avoid the disturbing reflection Move the disturbing light or redirect the sensor away from the light Reduce the Rx (light receiver) gain in the “FACTORY SETTINGS”-menu (Available gains 0.6, 0.8, 1, 2, 3, 4).
Optic data timeout	Communication between the display and connection board has jammed The flat cable connector in the connection board is loose Connection Board failure	Turn off the power and restart the unit Check that the flat cable connector is tight. Replace the connection board
Signal out of range, clean meas. probe	Piece of paper on the sensor head	Check the sensor head

The R, G or B signal (or IR if in use) is used to monitor the light intensity drift. Gradual drift can be caused e.g. by dust which is slowly building up on the fiber optics or by dirty water which gets inside the sensor head and stains the surface of the fiber optics.

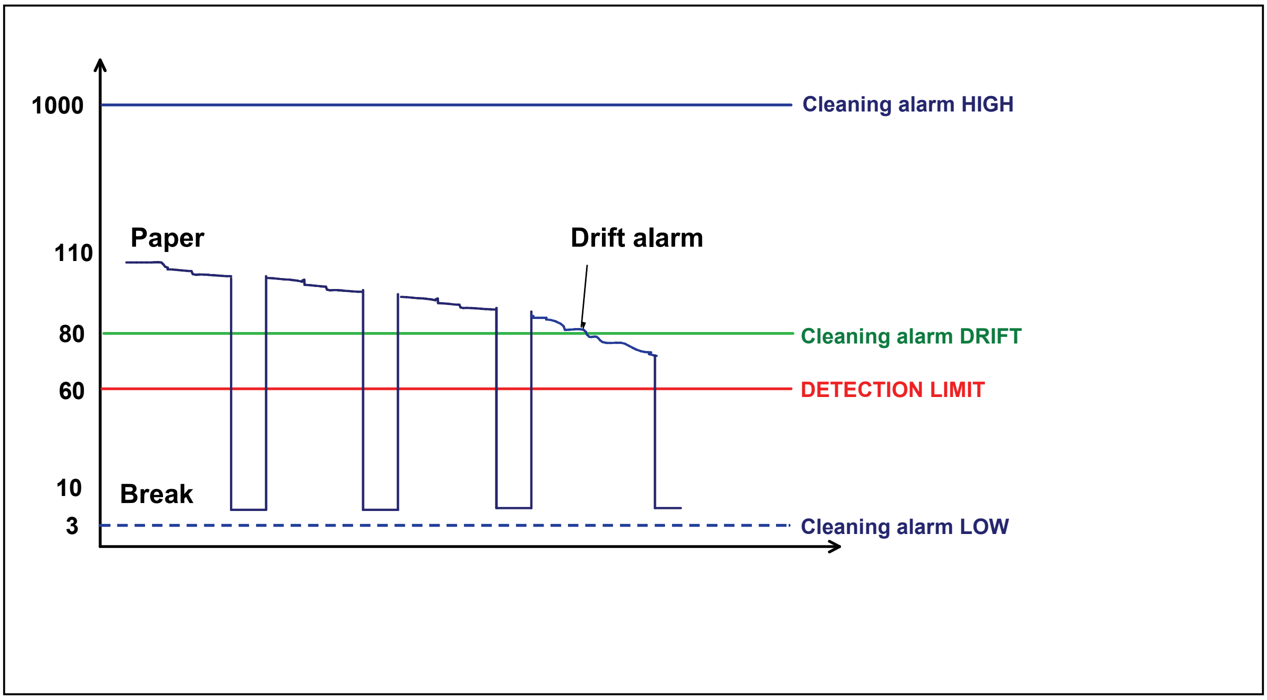


Figure 8.1. Alarm limits and break detection example.

KB alarms if signal goes above Cleaning Alarm High or below Cleaning Alarm Low. Drift Alarm goes on when signal level drops below Cleaning Alarm Drift (here limit = 80 which is 70 % from break (10) to Paper (110).
Detection limit is set to 60 (50 % value between paper and break).
KB informs break whenever signal drops below 60.

8.3 Cleaning the sensor

Fiber Optic lenses should be clean all the time. Cleaning should primarily to be done through the fiber optics opening in the sensor head. Cotton stick are the preferred means.

In case cleaning requires disassembly of the sensor head proceed as follows:

1. Release the fiber optic cable from the Display Unit and remove also the conduit bushing in order to get the cable to slide inside the conduit.
2. Remove the end plate from the sensor head by removing the two fastening screws.
3. Remove the locking ring
4. Pull the fiber-optic cable through the optical sensor housing.
5. Wipe the lenses clean with soft fabrics or paper and reinstall

6. Eyes must be centered over the holes in the pipe.

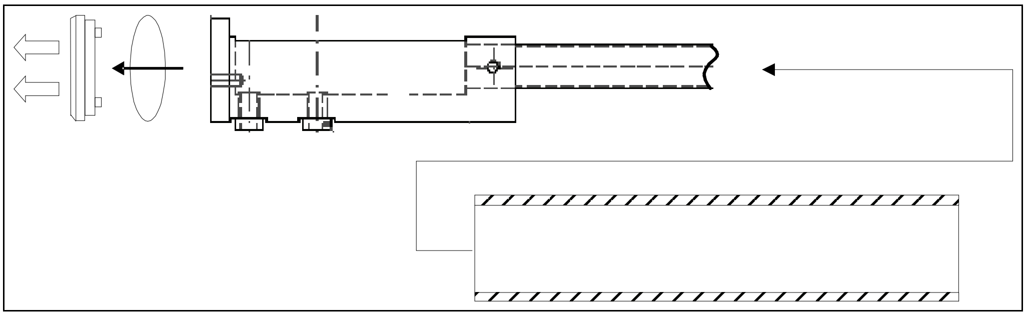


Figure 8.2. Dismantling the sensor housing.

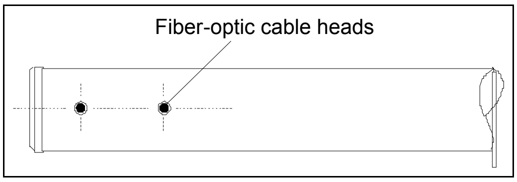


Figure 8.3. Fiber optic cable head.

Appendix 1: KB installation check list

This quick guide leads the way to install, start-up and configure necessary parameters in the normal cases. More detailed information in manual paragraph 4.

1. PREPARING INSTALLATION

- Install Fiber Optic cable inside conduit. This is easier done when temperature is cool. Please note: DO NOT PULL FIBER OPTIC CABLE STRONGLY. It may break or cut or connector may get loose
- Connect conduit to sensor tube
- Install sensor head mounting rack or mounting clamps

2. SENSOR UNIT INSTALLATION

- Check that dry clean purge air is connected (Pressure between 0.5 - 3.0 bar / 7-40 psi)
- Check that the eyelet holes are aimed at the web
- Check that the sensor distance from the web is 10 – 20 cm (4 - 8")
- Check measurement point distance to paper edge is about 30 cm (12")
- Fix position preliminary.Tuning may change this slightly.

3. DISPLAY UNIT INSTALLATION

- Check that fiber optic conduit bushing is tight
- Check that fiber optic cable is connected to the optics block
  - Other optic cable to RX
  - Another cable to RGB or IR

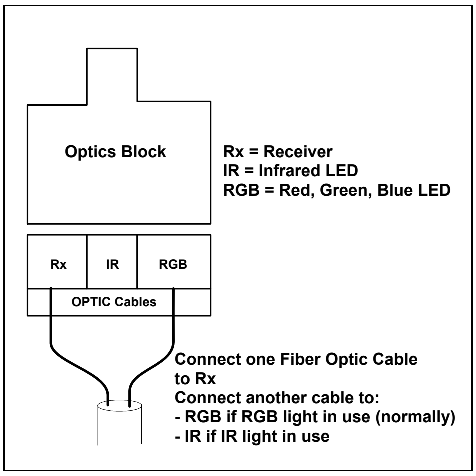


Figure 1. Fiber optic cable connection

- Check the wiring of the power supply
- Check the wiring of break signal (Fig. 2.)
- Check the wiring of alarm signal (Fig. 2.)

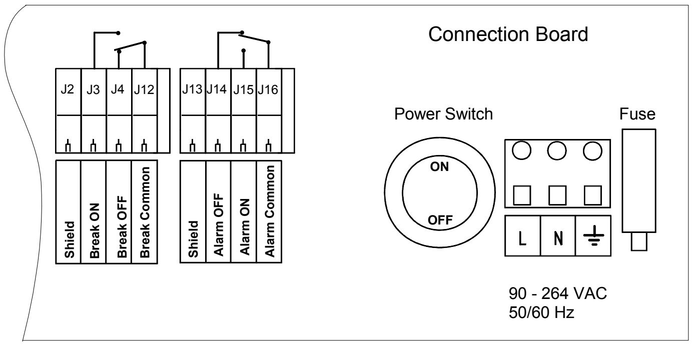


Figure 2. Wiring diagram.

3. Start-Up and Tuning

- Set unit to Maintenance mode in Configuration menu.
- Preliminary tuning can be done during installation at the actual place by simulating paper on situation with dry paper on front of sensor head. Final tuning should be always done with real paper running situation.
- Turn on the power.
- Select from the Maintenance menu "Check on-line signals".
- Turn sensor head light beam so that signal levels are on its maximum (normally 100 – 700) when simulating paper in front of sensor. Paper sheet should be close its correct position. Signal level can be adjusted with TX Power and RX gain in Factory setting menu. Ambient light should be <60 %.

- Simulate break: In Configuration menu at Auto-Limit menu perform "Measure Break On Signal Levels" while there is no paper in front of sensor (simulating break). PRESS ENTER to memorize the signals.
- Simulate paper: when paper is front of sensor close its normal position, perform "Measure Normal Signal Levels". PRESS ENTER to memorize the signals.
- Perform "Auto-Limit Calculation" to find the best break detection signal.
- Select the signal suggested by KB pressing ENTER twice.
- Activate the Break alarm relay by selecting operating mode: Detect Enabled
- Check that the position memory ring is locked

4. Final Tuning

- Final tuning should be always be done with real paper running situation and real break situation
- Select from the Configuration menu the operating mode: Maintenance (break relay deactivated)
- While the machine is running without paper perform "Measure Break On Signal Levels" in Auto-Limit menu. PRESS ENTER to memorize the signals. This can be done when Paper Machine is warm and before paper sheet is on.
- When the web (paper) is **on** perform "Measure Normal Signal Levels". PRESS ENTER.
- Perform "Auto-Limit Calculation" to find the best break detection signal.
- Select the signal suggested by KB by ENTER twice.
- Activate the Break alarm relay by selecting operating mode: Detect Enabled

Appendix 2: Spare parts

3150001	Fiber Optic Cable 6m
3150002	Fiber Optic Cable 9m
3150003	Fiber Optic Cable 12m
H41110043V1.0	End Cap
2000051	Screw (2 pcs) for end Cap
2000061	Lock Ring
H41110024V1.1	Mounting Clamp Lower (2 pcs) Please order both, lower and upper clamp complete clamp delivery
H41110033V1.0	Mounting Clamp Upper (2 pcs)
H41100102V1.0	KB Sensor Head
A41100003V1.0	KB Connection Board
A41100042V1.0	KB Display Board
A41100021V1.0	KB Analog Board (3 X 4-20 mA)

Appendix 3: KB-6-9-12 Model selection table

Type			Order Code					Description
K	B	6						
K	B	6						**KB/6 Sheet Break Detector with 6 meters (20ft) Fiber Optic Cable**
								KB Display Unit, 85...264VAC, 2 x Alarm relay outputs included
								Flexible Conduit for Fiber optic cable
			N					No Conduit
			C					Full Flexible SS316 Conduit 45mm (15') with Connectors
								Mounting Rack
				N				No adjustable mounting rack
				R				Adjustable SS316 Mounting Rack
								Analog output
					N			No Analog outputs for DCS trending (Analog outputs not needed for break alarm)
					A			3x 4-20 mA outputs for DCS trending
								KB-Connection PC Program
						N		No KB-Connection PC Program
						C		KB-Connection PC Program on CD disk
								RS485 / 232 Converter for PC program
							N	No RS485 / 232 Converter for PC program
							R	RS485 / 232 Converter for PC program, Rack mounting

Type			Order Code					Description
K	B	9						
K	B	9						**KB/9 Sheet Break Detector with 9 meters (30ft) Fiber Optic Cable**
								KB Display Unit, 85...264VAC, 2 x Alarm relay outputs included
								Flexible Conduit for Fiber optic cable
			N					No Conduit
			C					Full Flexible SS316 Conduit 45mm (15') with Connectors
								Mounting Rack
				N				No adjustable mounting rack
				R				Adjustable SS316 Mounting Rack
								Analog output
					N			No Analog outputs for DCS trending (Analog outputs not needed for break alarm)
					A			3x 4-20 mA outputs for DCS trending
								KB-Connection PC Program
						N		No KB-Connection PC Program
						C		KB-Connection PC Program on CD disk
								RS485 / 232 Converter for PC program
							N	No RS485 / 232 Converter for PC program
							R	RS485 / 232 Converter for PC program, Rack mounting

Type			Order Code					Description
K	B	12						
K	B	12						**KB/12 Sheet Break Detector with 12 meters (40ft) Fiber Optic Cable**
								KB Display Unit, 85...264VAC, 2 x Alarm relay outputs included
								Flexible Conduit for Fiber optic cable
			N					No Conduit
			C					Full Flexible SS316 Conduit 45mm (15') with Connectors
								Mounting Rack
				N				No adjustable mounting rack
				R				Adjustable SS316 Mounting Rack
								Analog output
					N			No Analog outputs for DCS trending (Analog outputs not needed for break alarm)
					A			3x 4-20 mA outputs for DCS trending
								KB-Connection PC Program
						N		No KB-Connection PC Program
						C		KB-Connection PC Program on CD disk
								RS485 / 232 Converter for PC program
							N	No RS485 / 232 Converter for PC program
							R	RS485 / 232 Converter for PC program, Rack mounting

Appendix 4: Technical specifications

Ambient temperature	Sensor head and fiber optic cable: -10 to 180 ºC (15 ºF to 356 ºF) Electronics unit: -10 to 60 ºC (15 ºF to 140 ºF)
Fiber optic cable	KB/6: 6 m (20'), KB/9: 9 m (30') or KB/12: 12m (40')
Fiber optic cable conduit	Airtight conduit 25,4 mm (1") OD, AISI 316
Installation	Sensor distance from the web 5...30 cm (2...10").
LED pulse frequency	1 kHz
Power supply	90 - 264 VAC, 50/60 Hz
Power consumption	15 W
Enclosure class	IP 66 (Nema 4X)
Purge air connection	Dry instrument air 0.5 – 3.0 bar (7 - 40 psi), 6/4 mm (1/6") connector, normal consumption 30-100l/min
Digital outputs	2 x Closing or opening contact max. 250 VAC, 2A; 220 VDC, 2 A for Break signal and Maintenance alarm
Alarm output delay	Min. 15 ms from the actual break
Analog outputs	Optional 3 pcs 4 - 20 mA max 600 ohm
PC connection	KB PC terminal for set up and monitoring as an option. RS 485 connection to PC. Optional RS 485 / RS 232 converter available for a PC
Dimensions (L x H x D) and weight	Electronics Unit 323 x 237 x 70 mm (12,7 x 9,3 x 2,8"), 3 kg (6,6 lbs) Sensor head Ø 33 mm (1") AISI 316, pipe 1500 mm (59") long, 4 kg (9 lbs)

Appendix 5: Settings / Variables

Default =D

5.1 Configuration Menu	Operating mode	Detect Enabled	Maintenance		(D= Enabled)
	Detection Limit	Limit : ______			(D= 100)
	Detection direction	Break < Limit	Break > Limit		(D= Break < Limit)
	Selected signal	R (RED)	R+G		R+G+B
		G (GREEN)	R+B	R/G	G/B
		B (BLUE)	G+B	R/B	(D= R)
	Auto limit calcul.	1. ________	Break: ________	Normal (Paper): ________	
		2. ________	Break: ________	Normal (Paper): ________	
		3. ________	Break: ________	Normal (Paper): ________	
5.2 Set-up menu	Light Source	RGB	IR		(D= RGB)
	Date & Time	Date: ___-___-____	Time: ___:___		
	Menu Language	English	Finnish		(D= English)
	Password	Code: ______	(D= 000, no password)		
	Break-On effect	**None** Beep	Blinking LCD Light+Beep		Blinking LCD Light
5.3 Maintenance menu	Check on-line signals		Levels are shown for troubleshooting		
	Ambient Light	________%	Normally < 60 %		
	Optic Temp	________ºC			
	Data log since	Date: ___-___-______			
	Rmin: ___________	Rmax: _______	IRmin: ______	IRmax: ____	
	Gmin: ___________	Gmax: _______	Break count: ____		
	Bmin: ___________	Bmax: _______			
	Optic Temp	Min: _________	Optic Temp Max: ________		
	Check alarms	1. ____________________			
		2. ____________________			
	Device identification		Serial number	_________________	
	Device Tag	_____________	Analog Module		_________
	Display version	_____________	Connection Board Version		_________
	Cleaning alarm settings				
SET MANUALLY --------→	ALARM SIGNAL:	_______________			(D= R)
	LOW ALARM LIMIT	_______________			(D= 3)
	HIGH ALARM LIMIT	_______________			(D= 1000)
SET MANUALLY --------→	DRIFT AL	Report only	Disabled		D=Prevent Br. Detect
	DRIFT ALARM LIMIT	_______________			(D=130)
	DRIFT ALARM Direction		Rising signal		D=Falling signal
	R G B	Break ON: _______	Normal (Paper): ________		
	Reset to factory default values		N/A		
5.4 Factory Settings menu	Meas.Cycle	_____ ms			(D = 20 ms)
	Raw Filter	Half Median AVG	AVG		(D = Half M. AV)
	Tx Power	HIGH	NORMAL		(D= HIGH)
	Rx Gain	4 3 2 1 0.8 0.6			(D = 1)
	Detection Filter	____ number of cycles			(D = 3)
	Serial Number	_________________			
	Color Balance Adj.	R gain : _1.0_	B gain : _1.3_	G gain : _0,60_	IR gain : _0,6_
5.5 Option Analog output					
	Check analog output signals		Anal.output are shown if analog board installed		
Analog output signals	ANALOG OUTPUT 1	Signal: R G B	Low_______	High________	
	ANALOG OUTPUT 2	Signal: R G B	Low_______	High________	
	ANALOG OUTPUT 3	Signal: R G B	Low_______	High________	
Analog output filter	Filtering time	______ s	D=10 (common for all outputs)		
	mA output error mode		None 22.5 mA	Freeze 3.5 mA	
	Analog output trim	S1 = ____ (gain)		Z1 = ____ (Zero Offset)	
		S2 = ____ (gain)		Z2 = ____ (Zero Offset)	
		S3 = ____ (gain)		Z3 = ____ (Zero Offset)	