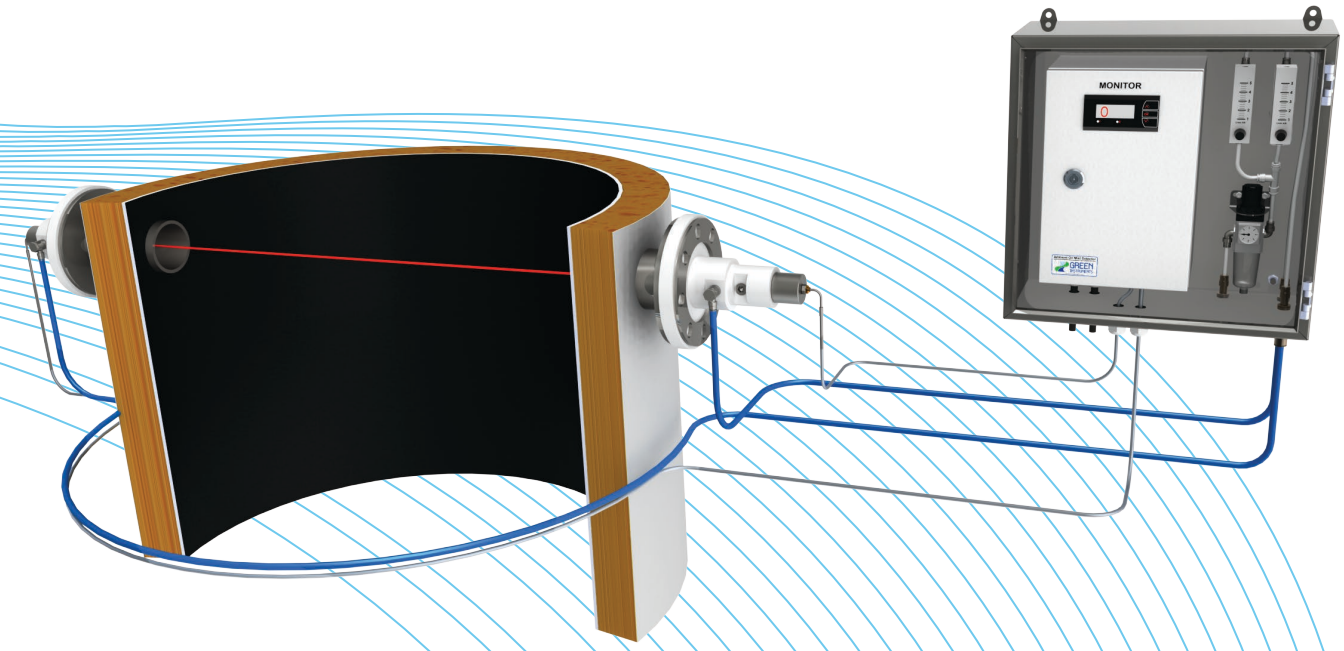
GREEN INSTRUMENTS

G1100 PTFE OPACITY MONITOR MANUAL

VERSION D2 - REVISION JAN 2015

PART NUMBER.: 01038



Lloyd's Register TYPE APPROVAL

CE

Content

1 Introduction

1.1 About this Manual

This manual contains data and instructions for the installation, operation, and maintenance of the Opacity Monitor System: G_{1100} PTFE Opacity Monitor.

The instructions are given in general terms and do not take into consideration a specific installation. As such, the instruction manual is designed for the equipment delivered by Green Instruments A/S.

The manual does not describe all possible situations, but only the most common and known situations. It cannot replace the necessary education and training of the personnel.

Should situations not described in this manual occur that cannot be solved in accordance with normal known practice and good workmanship, the operator should contact Green Instruments A/S for instructions.

These manuals do not claim to cover all details or variations in equipment or to provide for every possible contingency that may arise during installation, operation, or maintenance.

Green Instruments A/S reserves the right to minor alterations and improvements owing to developments without being obliged to enter the corresponding changes in this manual.

1.2 Inquiries and Feedback

All claims and inquiries for spares shall be addressed to Green Instruments A/S.

In all correspondence or when ordering spare parts, please state carefully the equipment type and fabrication number, which you can find on the label inside of the monitoring unit.

Green Instruments A/S appreciates all feedback and suggestions for the improvement. If you have any questions or find any errors in the manual, you are welcome to contact us at the following address

Green Instruments A/S

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DK-9700 Brønderslev

Denmark

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1.3 About the System

The G_{1100} PTFE Opacity Monitor is arranged as an opposed monitoring of the clarity of air in funnels, also called line-of-sight opacity monitor. Mist, smoke, and dust in the funnel will affect the light transmitted across a section between the two lenses.

As a standard configuration, the G_{1100} PTFE Opacity Monitor consists of the following main elements:

- 1 Monitoring unit with digital display and winterization, placed in a protection cabinet with filter regulator
- 2 optic PTFE heads
- 2 Fiber optic cables with lenses
- 1 Purge air system including 2 purge air hoses
- 1 Audit pen

The G_{1100} PTFE Opacity Monitor uses a high-power infrared light-beam. It is a single pass system where the beam of light is transmitted from the transmitter's optical fiber across the duct or funnel to the receiver's optical fiber. The optical transceiver is placed in the monitoring unit.

The beam is absorbed and scattered by the smoke, mist, dust and vapor and thus the amount of light received by the transceiver is reduced. The monitoring unit displays the opacity. It indicates 0 % if there is no opacity and 100 % if the light beam is totally blocked. The alarms will activate if the opacity exceeds the preset limits.

Please note that the G_{1100} PTFE Opacity Monitor will react to any kind of mist, smoke, dust, vapor or other obstructions intercepting the light beam. Consequently the reading of the sensor will change and possibly trigger an alarm. Depending on the application, this might be perceived as "false alarm". On the other hand, such alarms give you at the same time an indication of other malfunctions.

1.4 Specifications

Protection Cabinet with Monitoring Unit	
Power supply	standard 210–250 V AC – 50/60 Hz optional 105–130 V AC – 50/60 Hz optional 20–30 V DC
Consumption	120 VA max. with heating element in use
Ambient temperature	–45 °C – +55 °C
Output signal (linearized)	4…20 mA (4 mA ≈ 0 % — opacity 20 mA ≈ 100 %) max. 800 Ω 0…10 V DC (0 V ≈ 100 % — 10 V ≈ 0 % opacity) max. 10 mA
Dimensions / weight	H×W×D: 380 × 380 × 210 mm / 15.5 kg
Enclosure	IP 66 stainless steel box
Purge air connection	Ø 10 hose connection
Digital Display	(either as part of the Monitoring Unit or as optional Remote Digital Display)
Display	0–100 % opacity level (programmable)
Alarm delay	default 10 s (programmable 0–99 s)
Relay voltage	max. 250 V AC, max. 2A
Relay function	2 relays, volt free, freely configurable — default NC
Default alarm levels	Relay 1 at 20 % opacity and Relay 2 at 30 %
Power supply	22 … 250 V AC – 50/60 Hz or 20 … 300 VDC – 4 VA
Dimensions (only relevant if remote)	H×W×D: 48 × 96 × 120 mm panel cut: 44.5 × 91.5 mm
Fiber Optic Cables	
Optic fibers	glass fiber core in stainless steel sheathings with brass end tip
Operating temperature	max. 240 ºC at the glass fiber tip behind the lenses
Length of fibers	standard 4.5 m – optional 6.0 m, 7.5 m, or others
Optic PTFE Heads with Purge Air System	
Mounting flange	uniflange for DN 80 and 3" flange sockets on duct are to be aligned opposite of each other
Scanning distance	1 m to 3 m
PTFE heads	L×Ø: 160 × 80 mm – with purge air connector
Purge air supply	10 NLPM – i.e. 5 NLPM for each head
Purge air quality	instrument air (ISO 8573-1 Class 3)
Optional Equipment	
Audit Pens	Visualization & data logging
Alarm Annunciator for panel mounting	

GREEN INSTRUMENTS

Declaration of Conformity

As manufacturer, ***Green Instruments A/S***
Address: *Erhvervsparken 29*
DK-9700 Brønderslev
Denmark

hereby declares that the following specified equipment

Type: ***G1100 PTFE***
Name: ***Opacity Monitor***

is in conformity with the following directives:

- Directive 2006/95/EC on Low Voltage
- Directive 2004/108/EC on Electromagnetic Compatibility

The following Harmonized European Standards have been applied:

- EN 61010-1:2010: Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements
- EN 61326:2006: Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements

Brønderslev, 26 March 2014

Managing Director
Appointed by Green Instruments A/S as the responsible person for CE marking and conformity with the relevant EU directives

Figure 1: **Declaration of Conformity** (for CE marking)

1.5 Choosing the Right Alarm Levels – Opacity of Mist

The alarm levels of the G_{1100} PTFE Opacity Monitor can be adjusted to specific requirements. The variable output as well as the display of the monitoring unit states the level of opacity in percent, i.e. how much of the light beam that is transmitted across the line-of-sight does not reach the receiver. Two alarm point values are freely programmed from 0 % to 100 % to suit the actual application. Defaults are set at 20 % and 30 % opacity.

Opacity is caused by the absorption and scattering of light. Droplets and smaller particulate matters predominantly scatter the light. Larger soot and dust particles are predominantly causing absorption.

United States regulations are in most cases based on absorption and employ the Ringelmann method (published by Prof. Maximilien Ringelmann in 1898) in which a trained observer makes a visual estimate of the smoke's appearance. The Ringelmann scale is defined as follows.

Ringelmann 0	0% opacity – clear	
Ringelmann 1	20% opacity – barely visible	
Ringelmann 2	40% opacity – clearly visible	
Ringelmann 3	60% opacity – somewhat transparent	
Ringelmann 4	80% opacity – barely transparent	
Ringelmann 5	100% opacity – black	

Figure 2: The Ringelmann scale

The Ringelmann chart serves for a visual comparison of plume to the above six levels of opacity. The alternative Bacharach scale compares the darkness of spots resulting on a filter paper after percolating a given amount of fumes (using a soot pump). Both methods are not directly convertible. However, Bacharach 3 is in many cases interpreted to correspond to Ringelmann 1.

2 Installation

Read this chapter in its entirety before installing the system.

2.1 General

To avoid possible damage to the equipment or errors in the monitoring readings and alarm function, it is important to observe the following points carefully:

- The optic heads must be placed where there is low vibration. The location must be suitable for service and cleaning.
- The optic heads must be properly aligned and mounted firmly and stable.
- In case of mounting on structures with thickness of less than 6 mm, it is recommended that a doubling plate is fitted before mounting the support for the PTFE heads. Especially when fitting to rectangular ducts, attention has to be given to the sturdiness of the alignment.
- The heads and fibers must be protected against mechanical damage, e.g. the optic fibers should not dangle.
- Do not turn the optic fibers in the optic heads without first loosening the lock nuts.

Caution

Installation and operation of the G_{1100} PTFE Opacity Monitor and associated equipment must be carried out by skilled and trained personnel. Green Instruments A/S does not take any responsibility of the operation of the system and associated equipment whatsoever.

The successful and safe operation of this equipment is dependent upon proper handling, installation, operation, and maintenance.

2.1.1 Control at Delivery

Upon receipt of the G_{1100} PTFE Opacity Monitor, please inspect and confirm that the received scope of supply is in accordance with the packing list and not damaged. Any discrepancy should be reported to the supplier immediately. If any of the received parts are damaged, the shipping company should be informed and new parts made available before completing the installation.

Scope of standard supply:

- **One (1) protection cabinet with digital display and winterization, placed in a protection cabinet with filter regulator**
- **Two (2) PTFE heads – one transmitter, one receiver**
- **Two (2) fiber optic cables with lenses**
- **One (1) purge air system with purge air hoses**
- **Audit pens**
- *Remote digital display for panel mounting with two alarm relays – alarm annunciator for panel mounting (optional)*
- *Filter regulator for purge air cleaning – Blower for purge air (optional)*

2.1.2 Safety Aspects

Warning!

Follow the operating instructions! Please read the operating instructions carefully in its entirety before working on the system.

Warning!

Hazardous Voltage: Disconnect power before servicing the system. Ignoring this warning can result in severe personal injury or material damage. Observe the instructions carefully to ensure the correct connection of all power and signal leads.

Ensure that the correct AC or DC voltage is connected to the monitoring unit (see the rating marked inside the monitoring unit).

Circuit breaker!

The installation must include means of isolating electrical power by a switch or circuit breaker external to the monitoring unit and within reach of operator. It must be clearly marked.

Overload protection!

For compliance with the safety requirements IEC 61010-1 (2003), the installation must include a means of overcurrent protection to provide protection against excessive energy being drawn from the power supply system in case of a fault in the equipment.

Protective earth!

The monitoring unit must be connected to protective earth.

Installation and fault finding!

Electrical installation and fault finding on the system should only be undertaken by a suitable trained and qualified engineer.

2.1.3 Symbol identification

Caution, risk of danger

Caution, risk of electrical shock

Protective earth

The CE mark proves the compliance of the instrument with the requirements of the relevant EU directives

2.2 Standard Installation

Based on the above standard scope of supply, the G_{1100} PTFE Opacity Monitor comprises the following components:

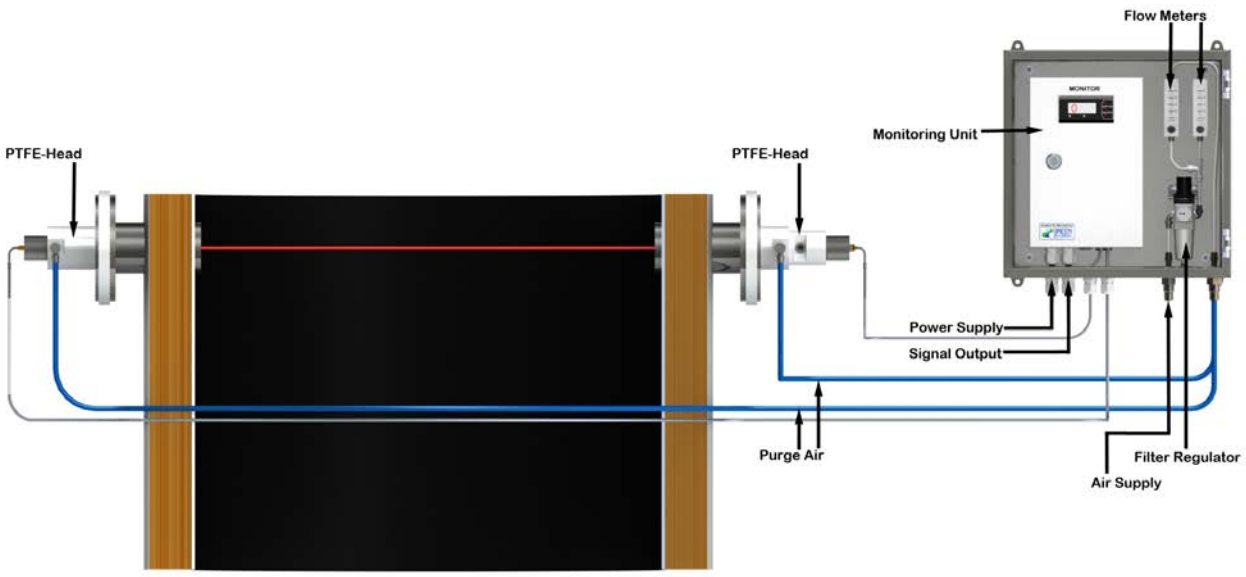


Figure 3: Standard installation of the G_{1100} Opacity Monitor

Note

The PTFE-heads are to be aligned opposite each other in such a way that the light beam from the one lens hits the other lens. Thin or otherwise unstable structure will require additional support in order to secure stable alignment.

For accurate measurement, it is important to place the optic heads in a longer straight section of the funnel or duct where there is a laminar flow. This means that there should be a distance of at least three duct diameters to the nearest upstream bend and a distance of at least one duct diameter to the nearest downstream bend.

2.2.1 Mounting of PTFE-Heads

Special attention has to be given to the alignment of the sockets, so that they are centered right opposite each other. A smaller size tube or angle bar pulled across between the two sockets may be used as guidance for the alignment. When mounting the sockets on funnel pipes or channels with wall thickness of less than 6 mm or when mounting the sockets on rectangular ducts, additional measures have to be considered in order to stabilize the installation. The system is designed for a scanning distance if 1 to 3 m between the lenses. At shorter scanning distances the focusing effect of the lenses becomes too strong and one of the lenses needs to be removed.

The two PTFE-heads (transmitter and receiver) are bolted onto the pre-fitted flange sockets on both sides of the funnel or duct and supported by means of the stainless steel support flange. The bolts shall only be tightened by hand and then turned 180°. The alignment should be checked once again. It must be possible to look across the funnel or duct and through both of the PTFE heads with the lenses removed.

2.2.2 Fiber-optic cables

The fiber-optic cables are mounted together with the lenses and the head cap onto the PTFE head. With the lens fitted, about 15 mm of the thread remain outside the optic head cap and lens.

Figure 4: Fiber-optic cable tip

The fiber optic cables are then screwed into the connectors of the optic beam module at the bottom of the monitoring unit. Due to the nature of optical fibers, the angle with which the light will exit

the fiber-optic cable may vary from cable to cable and installation. Please also be aware that turning the fiber-optic cable slightly – both in the lens and in the monitoring unit – will affect the power of the light beam and thus might influence the display of opacity.

2.2.3 Purge Air System

The purge air used for the G_{1100} PTFE Opacity Monitor must be clean and dry air (instrument air 1-2 bar pressure, approx. consumption 2×5 l/min). It is connected to the filter regulator placed in the protection cabinet. From there the purge air is connected via hoses to the PTFE-heads. The flow is controlled using the flow meters that are placed inside the cabinet for each PTFE-head.

Too much air velocity will affect the effective light path length as it blows the flue gas out of the way. Too little air flow will lead to increased fouling of the lenses. Consequently, the measurement is invalidated.

2.2.4 Monitoring Unit

The monitoring unit is installed near the optic heads allowing the connection for the fiber optic cables. The alarm monitor is integrated with the digital display in the monitoring unit.

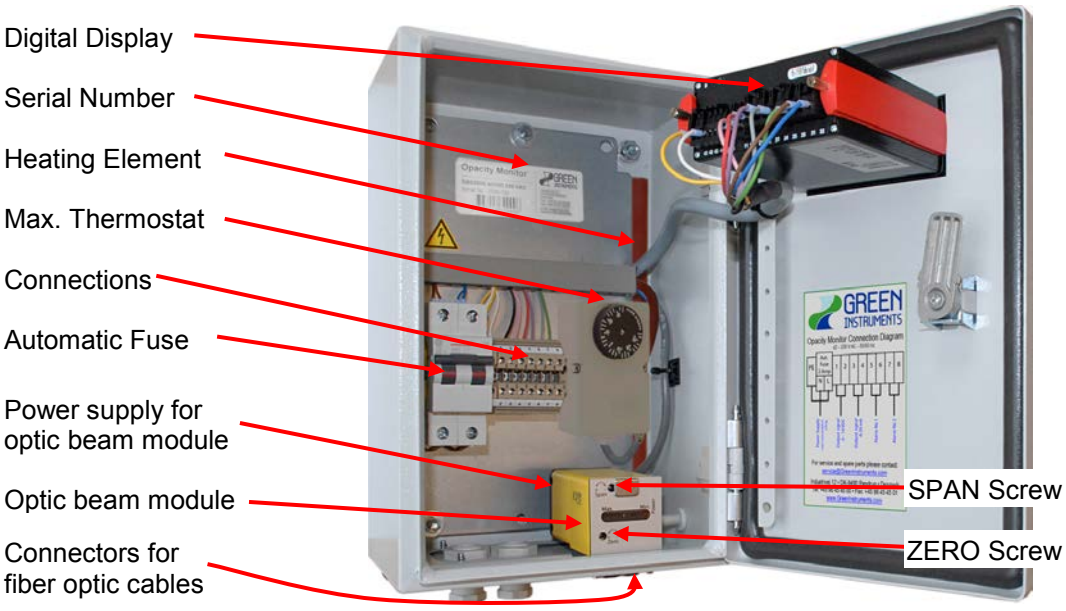


Figure 5: Monitoring Unit and its Components

2.2.5 Optional Items

The remote digital display is usually placed where indication of the current opacity level is needed. The remote digital display has the same functionality

as the digital display of the monitoring unit. The remote digital display can be combined with the alarm monitoring function as described above. For more information about the digital display, please see chapter 7.

The alarm annunciator is usually mounted in the alarm panel and connected to the alarm relays of the monitoring unit. The alarm levels are configured via the digital display of the monitoring unit.

Purge Air Blower: If the purge for the optic heads cannot be provided from an existing source, an optional purge-air blower should be installed near the PTFE heads. However, please observe the temperature rating of the blower.

The Audit Pens can be used for checking the installation and calibration. They are not suitable for carrying out the calibration itself. Calibration should be done with the absolute values of 0% and 100% opacity as described in chapter 3.

For the installation and calibration check, unscrew the plug (8 mm allen tool) on one of the optic heads. While there is no smoke or other obstacle between the lenses, insert the audit filter pen into the optic head. The filter of the audit pen must be perpendicular to the center line of the optic head. Use the flat side of the audit pen as guidance. The reading on the display should be in the range of the audit pen (+/– 2%).

If the reading on the display is not in the correct range, please check the integrity of the filter. Dirt and scratches will invalidate the filter. Please also check the direction of the filter.

2.3 Electrical connections

Power supply (as specified – see the rating marked inside the monitoring unit) for the system is connected to the automatic fuse inside the monitoring cabinet.

Monitoring instruments such as alarm panels, recorders and data loggers are usually connected to voltage output (terminals 1&2) or current output (terminals 3&4) of the monitoring unit. The location for terminals 1 to 8 can be seen in **Figure 5**.

Terminal 1 & 2: Voltage output 0–10 VDC – max. 10 mA
Terminal 3 & 4: Current output 4–20 mA – max. 800 Ω
Terminal 5 & 6: Alarm relay No. 1 (default 20% opacity, delay 5 sec., NC)
Terminal 7 & 8: Alarm relay No. 2 (default 30% opacity, delay 5 sec., NC)

Caution

After installation has been completed and the wiring has been carefully checked, the power can be switched on.

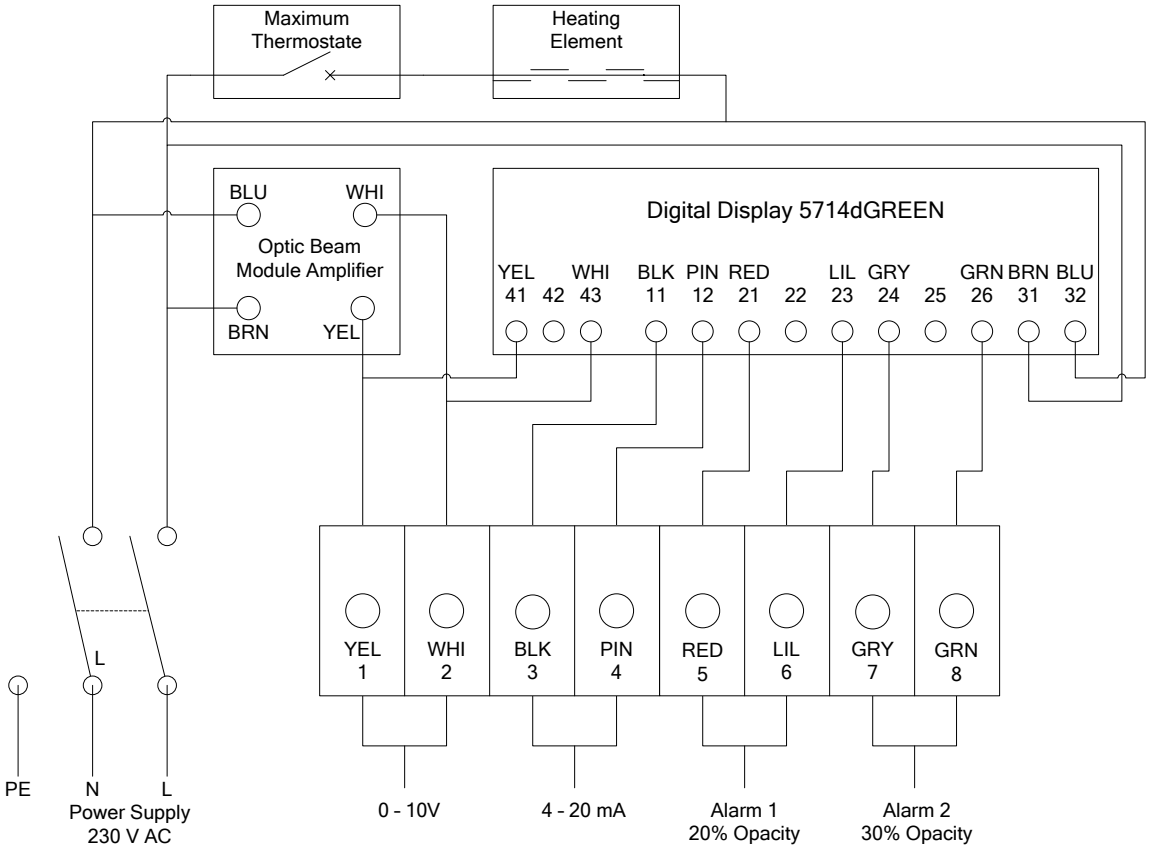


Figure 6: Connection diagram

2.4 Commissioning

Before starting the system for the first time after completing the installation, please check and confirm that the fiber optic cables, optic head cab and purge air system are installed according to the instructions, and that all the connections are secured and no leaking.

2.4.1 Start of the system and Calibration

Now you can switch on the power supply and can calibrate the system following the instructions in Section 3.

2.4.2 Purge Air System

Please adjust the instrument air flow at the flow meters that are placed inside the cabinet. The approx. consumption is 2x5 l/min.

2.4.3 Setting of Alarm Levels – Fast Set-Point Adjustment

The default alarm levels are:

	Alarm Level	Alarm Delay	Hysteresis
Relay 1	20%	5 s	2%
Relay 2	30%	5 s	2%

If you wish to change the alarm levels, please follow the following fast set-point adjustment procedure (see chapter 7 for a more detailed instruction). To enter the fast set-point adjustment press ⌃ or ⌄.

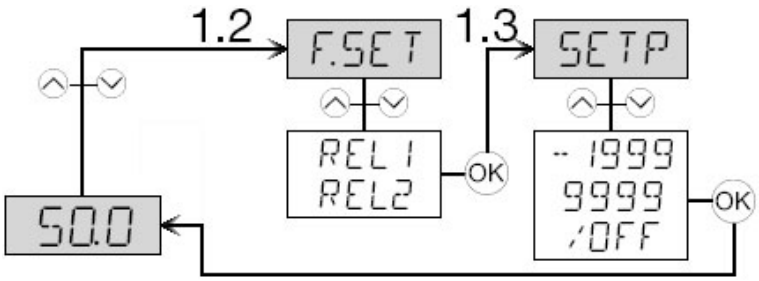


Figure 7: Fast set-point adjustment procedure

3 Calibration

Note

ZERO and SPAN are adjusted to produce the desired output swing between the lightest and darkest sensing condition.

During calibration, all possible obstruction to the infrared beam (such as mist, smoke, or dust) must be absent in the section between the optic heads. In other words, the transmission of the light must not be affected in any way.

SPAN (i.e. 100% opacity) has to be calibrated first, and then ZERO (i.e. 0% opacity). Both SPAN and ZERO are 15-turn clutched potentiometers with slotted brass elements. A small, flat-bladed screwdriver is required for adjustment.

SPAN has to be adjusted first. To adjust SPAN, remove one of the fiber optic cables completely from the monitoring unit, so the infrared beam is now interrupted. Then use a screwdriver to adjust SPAN (see Fig. 5) until the indicator displays 100% opacity. If the span calibration screw is turned too much, the display will show 101% opacity. In that case, turn the span screw **clockwise** until 100% is reached.

ZERO is adjusted by putting back the fiber optic cable. Make sure there are no obstructions to the infrared beam. Now use a screwdriver to adjust ZERO (see Fig. 5) until the indicator displays 0% opacity. If the zero calibration screw is turned too much, the display will show –1% opacity. Alarm levels would thus be triggered only at considerable higher opacity levels than shown in the display. In such a case, turn the zero screw **counterclockwise** until 0 is reached.

If it is not possible to obtain 0% opacity, check if obstructions of the light beam have occurred. If that is not the case and the 0% signal still cannot be adjusted correctly, the fiber optic cables may to be turned in the optic heads to change the light wave position of the light beam in relation to the fiber optic cable tip end. Finally, a too high signal loss can occur in the fiber-optic cables when too many

fibers are broken. The damaged cable needs to be replaced. After span and zero calibration, the linearity of the signal can be checked by inserting the audit pen into the light beam in one of the optic heads. Dismount the plug (8mm. allen tool) and insert the audit pen with the flat spot 90° angled to the centerline of the optic head. The readout shall be according to the opacity value shown on the audit pen.

4 Maintenance

Besides normal cleaning of the optical heads and lenses, the system does not require any maintenance.

Caution!

The optic heads and lenses can only be cleaned when the acid processes stop and there is no mist in the stack.

If you take out the optic head cap while there is mist in the stack, there is a risk that the acid mist will come out from the optic head hole.

We recommend that the purge air system is turned on while you are cleaning the lenses.

The optic heads are hot and can cause severe burning of personnel if not handle with care.

Please notice that the acid mist and acid deposit on the lenses can cause serious health damage to the personnel if not handle with care.

For cleaning the optical heads and lenses, please do the following steps:

- Pull optic head cap toward yourself.
- Clean the lenses with a dry soft microfiber cloth.
- Plug the lenses and optic head cap back onto the PTFE head. See section 2.2.2 for detail instructions.
- It is strongly recommended to calibrate the system after cleaning the lenses (see section 3). However, mist must not be present in the section between the optic heads during calibration, i.e. the process to be monitored must be turned off.

Cleaning intervals depend on the usual amount of mist that contaminate the lenses. The accumulation of dirt on the lenses will result in higher opacity readings and might therefore give false alarms. Please make sure to set sufficiently short cleaning intervals.

5 Trouble Shooting

Trouble-shooting should always be carried out by skilled and trained personnel. The G_{1100} PTFE Opacity Monitor is connected to hazardous electric voltages, which can cause personal injury if not handled correctly.

Trouble	Possible Cause →Action
No display at all:	→Check power supply – the power supply needs to be at correct voltage →Check fuse inside the monitoring unit
Not responding to opacity level changes	Scanning range too short (under 1 m) →remove at least one of the lenses, but observe the temperature rating of the optic fibers
Incorrect indication of opacity level	Optic head alignment has changed (e.g. due to vibration or some impact) →realign the optic heads – this can be checked by removing the lenses and looking through the duct Lens and/or optic-fiber tip contaminated with dirt → clean lenses or optic-fiber tip (use a neutral, mild detergent) Lens and/or optic-fiber might have been damaged →replace lens and/or optic-fiber Zero and/or span have drifted →recalibrate Scanning range too short (under 1 m) → remove at least one of the lenses but observe the temperature rating of the optic fibers
Incorrect alarm level	Incorrect alarm level settings →change at digital display (see ch.2.4.2)
No alarm despite opacity between the lenses	Incorrect alarm level settings →change at digital display (see ch.2.4.2) Damaged/faulty parts →replace the respective part
False alarm	Opacity is not only caused by mist but also by dust and smoke
Frequent false alarms	Asynchronous vibration of the two optic heads →stabilize the optic heads and realign
Digital display shows a fail message	Please see ch. 7.4

Trouble	Possible Cause →Action
Digital display shows "IN.HI"	Wrong input type selected in digital display configuration → the digital display in the monitoring unit needs to be configured as `IN: VOLT` and `RANG: 0--10` (see ch. 7.2 & 7.3)
Digital display shows a fail message	Please see ch. 7.4

Quick Test Procedure

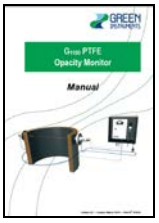
- Make sure that the general power supply and fuse are functioning properly. Then dismount the two fiber optic cables at the bottom of the monitoring unit. Please use one thumb to close the left connection of the optic beam module.
- As a result the LED indicator of optic beam module amplifier should go to maximum. If the LED indicator of the optic beam module amplifier is not illuminated, either the optic beam module amplifier is faulty, or the power supply for the optic beam module amplifier is faulty, or the general power supply, fuse and wiring are faulty.
- Then adjust the SPAN-screw until the display indicates 100% opacity (cf. ch. 3). If there is no display, the digital display or the wiring is faulty.
- After this adjustment hold your hand steadily below the connections at a distance of about 10 cm. The infrared light is reflected from on your hand and thus measured by the receiver. You can now adjust the ZERO-screw until the display shows 0%.
- The adjustment of screws has brought the optic beam module roughly into the correct range. Please remount the two fiber optic cables and carry out a proper calibration as described in ch. 3.
- If you in the course of this procedure encounter a problem, please also take the faults described above into account and please do not forget to check the alignment of the optic heads.

6 Parts List

Spare parts are not included in the standard delivery. Spare parts can be ordered when necessary. When ordering spare parts, please mention the serial number of the analyzer, which you can find on the label on the right side of the blue analyzer box.

Part No.	Part Description	the specific appearance of the part list is subject change without notice; the function however will not change	Standard Quantity in use
00434	PTFE head receiver (short) DN80 & 3" – type II (includes 3×00007)		1
00435	PTFE head transmitter (long) DN80 & 3" – type II (includes 3×00007)		1
01024	Support flange for PTFE head DN80 & 3"		2
00007	O-Rings 34×3 mm		3 in 00434 00435
00004	Optic Head Cap		2

Part No.	Part Description	the specific appearance of the part list is subject change without notice; the function however will not change	Standard Quantity in use
00016	Lens – focusing lens for scanning distance > 1.0 m		2
01041	Lens – plain glass lens for scanning distance < 1.0 m		optional
00018	Fiber optic cable L=3.6 m – T<240 °C		optional
00017	Fiber optic cable L=4.5 m – T<240 °C		2
00222	Fiber optic cable L=6.0 m – T<240 °C		optional
00372	Fiber optic cable L=7.5 m – T<240 °C		optional
00060	Audit Pen 20 % Opacity		optional
00059	Audit Pen 30 % Opacity		optional
00027	Purge Air Hose – blue (ordered per meter)		optional
01174	PTFE Purge Air Hose – white (ordered per meter)		2× 4.5 m
00403	Air Supply Filter Regulator (without couplings)		1 in 01157
00839	Flow Meter 0.5-5.0 l/m with control valve		2 in 01157
01027	Monitoring Unit G_{1100}PTFE heated 230 VAC - (incl. 01110, 00037, 00038, 00349, 00350)		1
01133	Monitoring Unit G_{1100}PTFE heated 115 VAC - (incl. 01110, 00037, 00970, 00349, 00350)		optional
01778	Monitoring Unit G_{1100}PTFE heated 24 VDC - (incl. 01110, 00037, 00318, 00349, 00350)		optional

Part No.	Part Description	the specific appearance of the part list is subject change without notice; the function however will not change	Standard Quantity in use
00349	Thermostat f. heating element.		1 in 01027 01133
01110	Digital Display 5714D Green – 22…250 VAC / 20…300 VDC		1 in 01027 01133 01778
31023	Remote Digital Display 5714D SDM – for input signal 4…20 mA		optional
00037	Optic beam module amplifier		1 in 01027 01133 01778
00038	Power supply 210-250 VAC (50/60 Hz) for optic beam module amplifier		1 in 01027
00970	Power supply 105-130 VAC (50/60 Hz) for optic beam module amplifier		1 in 01133
00318	Power supply 24 VDC for optic beam module amplifier		1 in 01778
00350	Heating element – 230V-100W		1 in 01027
01134	Heating element – 110V-100W		1 in 01133
01157	Protection cabinet insulated 38×38×21cm		1
01038	This manual		1

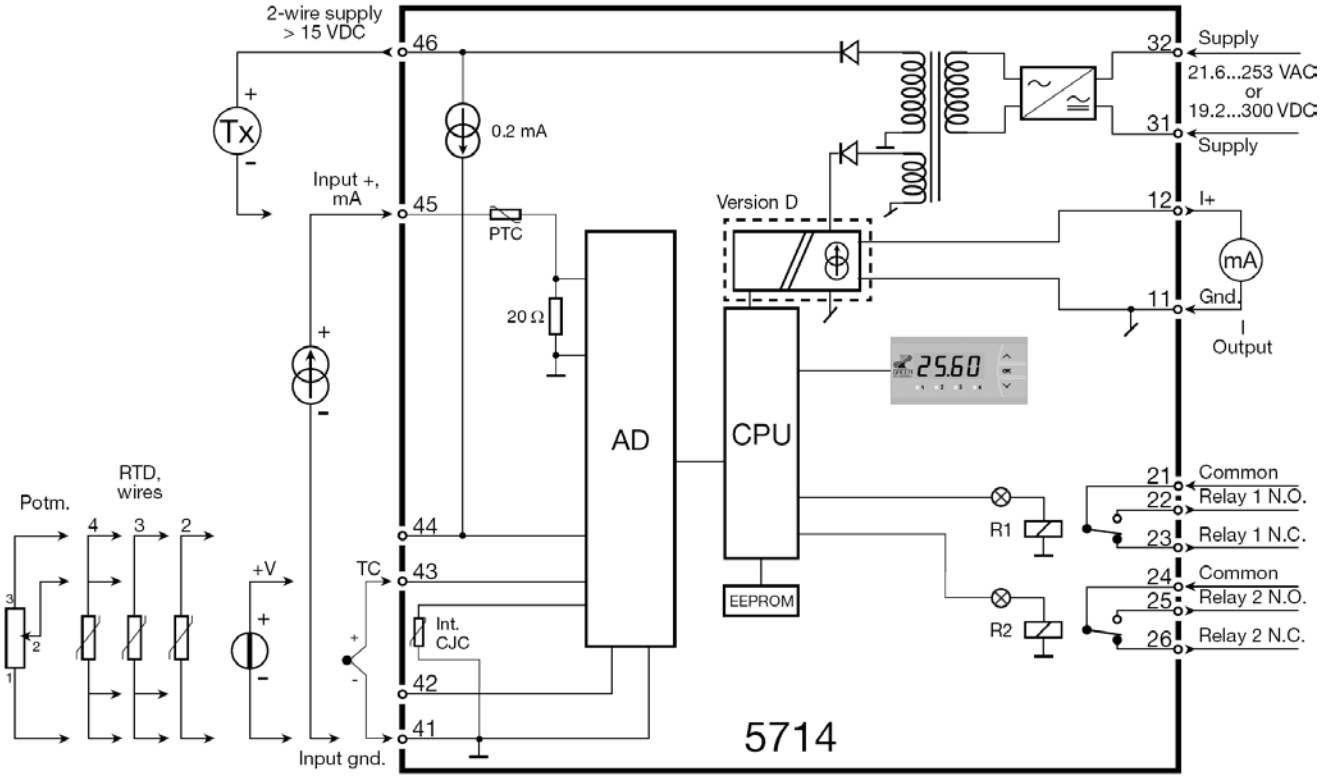
7 Digital Display

Alarm monitoring is carried out by the digital display.

7.1 Specifications of the Digital Display

Supply voltage 5714D:	21.6 ... 253 VAC 50...60 Hz or 19.2 … 300 VDC
Max. consumption	3.5 W
Isolation voltage test / operation	2.3 kVAC / 250 VAC
Temperature range	-20°C … 60°C
Response time (programmable)	1...60 s
Calibration temperature	20°C ... 28°C
Absolute accuracy	≤ ±0.1% of reading
Temperature coefficient	< 0.01% of reading / °C
EMC immunity influence	≤ ±0.5% of reading
Max. load for current output	20 mA / 800 Ω / 16 VDC
Input when standard	0…10 VDC
Input when used as remote digital display	4…20 mA
Output	20 … 4 mA
Display range	100 … 0%
Max. wire size (pin 21-32)	1 x 2.5 mm^2 stranded wire
Max. wire size (all others)	1 x 1.5 mm^2 stranded wire
Relative air humidity	< 95% RH (noncond.)
Dimensions (H×W×D)	48 × 96 × 120 mm
Panel cut-out	44.5 × 91.5 mm
Tightness (mounted in a panel)	IP65
Weight	230 g

7.2 Block Diagrams



7.3 Routing Diagram

If no keys are activated for 2 minutes, the display returns to the stage 1.0 without saving configuration changes.

- ⌃ Increase value / choose next parameter
- ⌄ Decrease value / choose previous parameter
- OK Save the chosen parameter and go to the next menu

Hold OK Back to previous menu / return to menu 1.0 without saving

Menus:

1.0 = Default state

1.1 = Only if password protected

1.2 = Only if FastSet is enabled (see chapter 2.4.2)

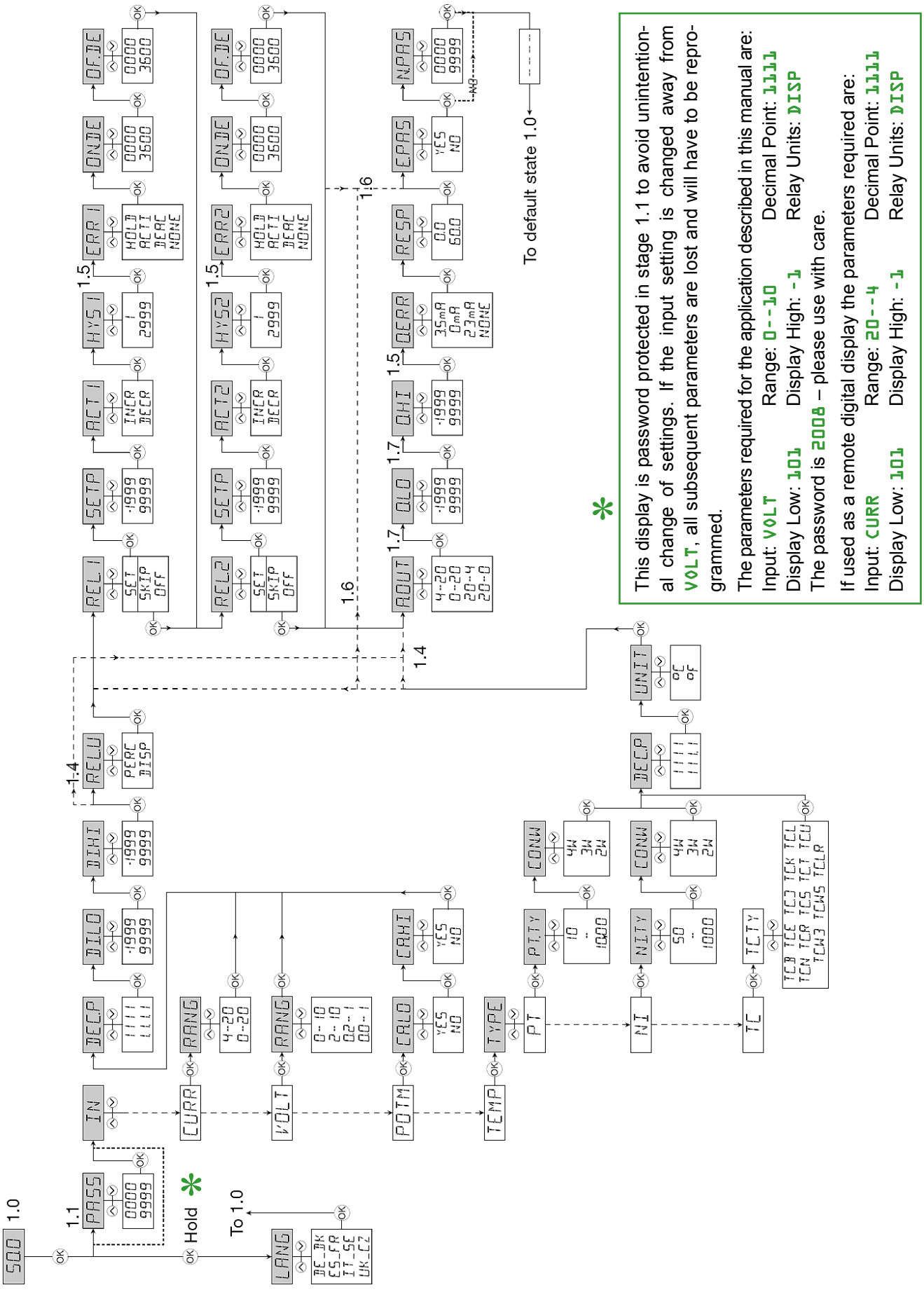
1.3 = FastSet and relay test (see chapter 2.4.2 – disabled at password 5000-9999)

1.4 = No relay outputs – Not applicable for G_{1100} PTFE

1.5 = Not applicable for G_{1100} PTFE

1.6 = No analogue outputs – Not applicable for G_{1100} PTFE

1.7 = Not applicable for G_{1100} PTFE



This display is password protected in stage 1.1 to avoid unintentional change of settings. If the input setting is changed away from **VOLT**, all subsequent parameters are lost and will have to be reprogrammed.

The parameters required for the application described in this manual are:

Input: **VOLT** Range: **0--10** Decimal Point: **1111**

Display Low: **101** Display High: **-1** Relay Units: **DISP**

The password is **2008** – please use with care.

If used as a remote digital display the parameters required are:

Input: **CURR** Range: **20--4** Decimal Point: **1111**

Display Low: **101** Display High: **-1** Relay Units: **DISP**

Caution

Please note that input signal for the digital display is voltage – VOLT.

Under Input menu (IN), do not enter menus CURR, POTM, and TEMP as they are not applicable for the G_{1100} PTFE. Trying to enter those menus could cause malfunction of the display.

7.4 Scrolling Help Texts

Display in default state xxxx

Hardware error:

SE.BR	sensor wire breakage
SE.SH	sensor short circuit
IN.HI	input overrange
IN.LO	input underrange
9.9.9.9	display overrange
-1.9.9.9	display underrange
HW.ER	hardware error
EE.ER	eeprom error — check configuration
RA.ER	ram memory error
CJ.ER	cjc sensor error

Fastset (Enabled):

F.SET

REL1	fast set menu - select relay
REL2	fast set menu - select relay

SETP

xxxx	relay setpoint - press ok to save

Fastset (Disabled):

SETP

xxxx	relay setpoint — read only

Configuration menus

LANG

DE	waehle deutschen hilfetext
DK	vaelg dansk hjaelpetekst
ES	seleccionar texto de ayuda en espanol
FR	selection texte d'aide en francais
IT	selezionare testi di aiuto italiani
SE	valj svensk hjalptext
UK	select english helptext → UK
CZ	vyber ceskou napovedu

PASS

xxxx	→	set correct password → 2008

IN

C.LIN*	text entered by user in preset
CURR	current input (relevant if remote)
VOLT	voltage input → VOLT
POTM	potentiometer input
TEMP	temperature sensor input

RANG – When current selected:

0-20	input range in mA
4-20	input range in mA (relevant if remote)

RANG – When voltage selected:

0-10	input range in volt → 0--10
2-10	input range in volt
0.0-1	input range in volt
0.2-1	input range in volt

CA.LO

YES	calibrate potentiometer low
NO	calibrate potentiometer low

CA.HI

YES	calibrate potentiometer high
NO	calibrate potentiometer high

DEC.P

1111	decimal point position → 1111
111.1	decimal point position
11.11	decimal point position
1.111	decimal point position

DI.LO

xxxx	display readout low → 101

DI.HI

xxxx	display readout high → -1

REL.U

PERC	set relay in percentage
DISP	set relay in display units → DISP

TYPE

PT	select pt sensor type
NI	select ni sensor type
TC	select tc sensor type

PT.TY

10	select pt sensor type
20	select pt sensor type
50	select pt sensor type
100	select pt sensor type
200	select pt sensor type
250	select pt sensor type
300	select pt sensor type
400	select pt sensor type
500	select pt sensor type
1000	select pt sensor type

NI.TY

50	select ni sensor type
100	select ni sensor type
120	select ni sensor type
1000	select ni sensor type

CONN – When Pt and Ni sensor selected

2W	select 2-wire sensor connection
3W	select 3-wire sensor connection
4W	select 4-wire sensor connection

TC.TY
TC. B select tc sensor type
TC. E select tc sensor type
TC. J select tc sensor type
TC. K select tc sensor type
TC. L select tc sensor type
TC. N select tc sensor type
TC. R select tc sensor type
TC. S select tc sensor type
TC. T select tc sensor type
TC. U select tc sensor type
TC.W3 select tc sensor type
TC.W5 select tc sensor type
TC.LR select tc sensor type

DEC.P – When temperature selected
1111 decimal point position
111.1 decimal point position

UNIT
°C display and relay setup in celsius
°F display and relay setup in fahrenheit

REL1
SET enter relay 1 setup
SKIP skip relay 1 setup
OFF relay 1 disabled

SETP
xxxx relay setpoint → 20

ACT1
INCR activate at increasing signal → INCR
DECR activate at decreasing signall

HYS1
xxxx relay hysteresis → 2

ERR1
HOLD hold relay at error
ACTI activate relay at error
DEAC deactivate relay at error → DEAC
NONE undefined status at error

ON.DE
xxxx relay on-delay in seconds → 5

OF.DE
xxxx relay off-delay in seconds → 5

REL2
SET enter relay 2 setup
SKIP skip relay 2 setup
OFF relay 2 disabled

SETP
xxxx relay setpoint → 30

ACT2
INCR activate at increasing signal → INCR
DECR activate at decreasing signal

HYS2
xxxx relay hysteresis → 2

ERR2
HOLD hold relay at error
ACTI activate relay at error
DEAC deactivate relay at error → DEAC
NONE undefined status at error

ON.DE
xxxx relay on-delay in seconds → 5

OF.DE
xxxx relay off-delay in seconds → 5

A.OUT
0-20 output range in mA
4-20 output range in mA
20-0 output range in mA
20-4 output range in mA → 20--4

O.LO
xxxx display value for output low

O.HI
xxxx display value for output high

O.ERR
23 mA namur ne43 upscale at error
3.5 mA namur ne43 downscale at error
0mA downscale at error
NONE undefined output at error

RESP
xxx.x analogue output response time in seconds

E.PAS
NO disable password protection
YES enable password protection → YES

N.PAS
xxxx select new password → 2008

Note

Faded helped texts are not applicable for G_{1100} PTFE Opacity Monitor. Defaults are marked with →

7.5 Configuring — Operating the Function Keys

When configuring the display, you are guided through all parameters where you can choose the settings which fit the application. For each menu, there is a scrolling help text which is automatically shown in the display. This starts after 5 seconds if no key has been activated.

Configuring is carried out by using the 3 function keys.

- ⌃ will increase the numerical value or choose the next parameter
- ⌄ will decrease the numerical value or choose the previous parameter
- OK will accept the chosen value and go to the next menu

If a function does not exist in the display, all parameters are skipped to make the configuration as simple as possible.

Once the configuration has been entered the display will show "----".

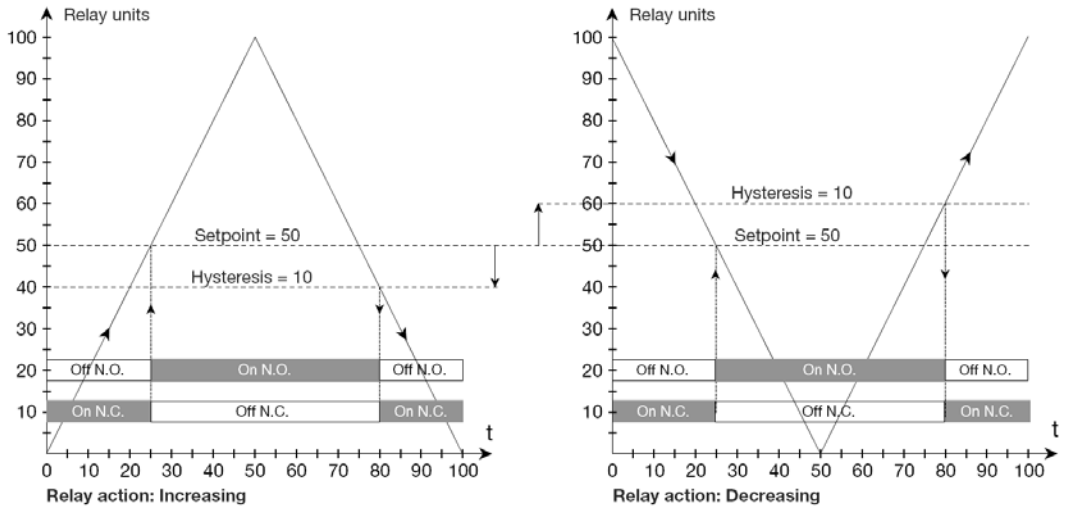
Pressing and holding OK will return to the previous menu or return to the default state (1.0) without saving the changed values or parameters.

If no key is activated for 2 minutes, the display will return to the default state (1.0) without saving the changed values or parameters.

Fast set-point adjustment and relay test: These menus allow you to change the set point without going through the whole menu. Pressing ⌃ and ⌄ simultaneously will change the state of the relay. This change is indicated by the diodes on the display. Pressing OK will save the set-point change. Holding down OK for more than 0.5 seconds will return the unit to the default state without changing the set point.

Password protection: Using a password will stop access to the menu and parameters. There are two levels of password protection. Passwords between 0000…4999 allow access to the fast set-point adjustment and relay test. (Using this password stops access to all other parts of the menu). Passwords between 5000…9999 stop access to all parts of the menu, fast set-point and relay test. (Current set point is still shown). By using the master password 2008, all configuration menus are available.

Graphic depiction of the relay function set point:



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