

# NIVAPRESS

## Hydrostatic level transmitters



SGE-25.SMART  
SGE-25S.SMART  
SGE-25  
SGE-25S  
SGE-25C  
SGE-16

## INSTRUCTIONS MANUAL

**BAMO** MESURES

22, Rue de la Voie des Bans - Z.I. de la Gare - 95100 ARGENTEUIL

Tél : (+33) 01 30 25 83 20 - Web : [www.bamo.fr](http://www.bamo.fr)

Fax : (+33) 01 34 10 16 05 - E-mail : [info@bamo.fr](mailto:info@bamo.fr)

Hydrostatic level transmitters  
**NIVAPRESS SGE-...**

26-02-2010

590 M1 03 A

**MES**

**590-03/1**

## Symbols in use



**Warning** to proceed strictly in accordance with the information contained in the documentation in order to ensure the safety and full functionality of the device.



Information particularly useful during installation and operation of the device.



Information particularly useful during installation and operation of a type Ex device.



Pressure transmitters should be discarded in accordance with the WEEE Directive (2002/96 /WE) in matter of used electric and electronic equipment.

## **BASIC REQUIREMENTS AND SAFE USE**



**The manufacturer will not be liable for damage resulting from incorrect installation, failure to maintain the device in a suitable technical condition, or use of the device other than for its intended purpose.**

Installation should be carried out by qualified staff having the required authorizations to install electrical and pressure-measuring devices. **All European and local rules for electrical instruments must be respected.** The installer is responsible for performing the installation in accordance with these instructions and with the electromagnetic compatibility and safety regulations and standards applicable to the type of installation. **Respect all recommendations, for installation and mounting of Ex devices, from standards EN60079-14 and EN60079 CENELEC.**

**The device may only be operated under the conditions specified in the operating instructions.** The device should be configured appropriately for the purpose for which it is to be used. Incorrect configuration may cause erroneous functioning, leading to damage to the device or an accident.

**The device must be disconnected from all sources of power during installation and maintenance work.** If a device is not functioning correctly, disconnect it and send it for repair to the manufacturer or to a firm authorized by the manufacturer.



In order to minimize the risk of malfunction and associated risks to staff, the device is not to be installed or used in particularly unfavourable conditions, where the following dangers occur:

- Possibility of mechanical impacts, excessive shocks and vibration;
- Excessive temperature fluctuation, exposure to direct sunlight;
- Condensation of water vapour, dust, icing.

**1. Introduction**

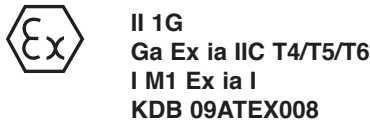
1.1 This “Appendix Ex.03” **applies only** to smart level probes SGE-25.SMART, SGE-25S.SMART, SGE-25C.SMART in **Ex versions**, marked on the rating plate as shown in 2.2 and denoted Ex in the Product Certificate.

1.2 The appendix contains supplementary information relating to the Ex versions of the SGE-25.SMART, SGE-25S.SMART, SGE-25C.SMART probes. During installation and use of Ex probes reference should be made to DTR.SG...04 in conjunction with “Appendix Ex.03”.

**2. Use of probes in danger zones**

2.1 The probes are produced in accordance with the requirements of the following standards: EN 60079-0:2006, EN 50303:2004, EN 60079-26:2007, EN 60079-11:2007

2.2 The probes may operate in areas where there is a risk of explosion, in accordance with the rating of the explosion protection design:



**3. Identifying marks**

The above mentioned probes in Ex-version, must have a rating plate containing the information specified in paragraph 4 of DTR. SG...04, and also at least the following:

- CE mark and number of notified unit: 1453 (GIG KDB), mark
- Designation of explosion protection design, certificate number,
- Values of parameters such as  $U_i$ ,  $I_i$ ,  $C_i$ ,
- Year of manufacture

**4. User information**

Together with the probes ordered, the user will receive: User’s Manual numbered DTR.SG...04 with Appendix Ex, and also the Product Certificate.

**5. Permitted input parameters of the SGE-25.SMART, SGE-25S.SMART, SGE-25C.SMART probes (based on data from the KDB 09ATEX008 certificate and certification documentation)**

- Permitted input parameters for power supply with a linear characteristic.  
 $U_i = 28V DC$   $I_i = 0.1A$
- Permitted input parameters for power supply with a “rectangular” characteristic and trapezoidal characteristic  
 $U_i = 24V DC$   $I_i = 0.1A$   
 Input inductance and capacity:  $C_i = 10nF$ ,  $L_i = 1.0mH$   
 $P_i$  for all type of power supply, see table below.

$P_i$ [W]	$T_p$ [°C]	Temperature class
1,5	56	T6
	71	T5
	80	T4, group I
1,4	57	T6
	72	T5
	80	T4, group I
1,3	59	T6
	74	T5
	80	T4, group I

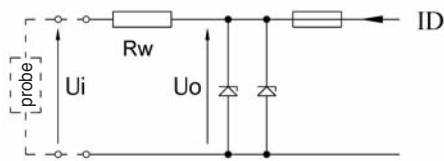
$P_i$ [W]	$T_p$ [°C]	Temperature class
1,2	61	T6
	76	T5
	80	T4, group I
0,9	66	T6
	80	T5, T4, group I
0,6	70	T6
	80	T5, T4, group I

$T_m$ : temperature of measuring medium       $T_a$ : ambient temperature       $T_p = T_m$  for  $T_m > T_a$        $T_p =$  for  $T_m < T_a$

## 6. Supply examples

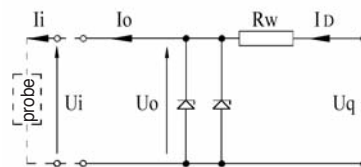
**Fig.1:** Power supply from a source with linear characteristic

Power supply with a "linear" characteristic may be e.g. a typical barrier with parameters:  
 $U_0=28\text{ V}$     $I_0=0.093\text{ A}$     $R_w=300\text{ W}$ .



**Fig.2:** Power supply from a source with trapezoidal characteristic

Example:  $U_0 = 28\text{ V}$     $I_0 = 0,08\text{A}$



$$\text{If } U_0 < 1/2 U_q \text{ then } U_q = \frac{4P_o}{I_0} \quad R_w = \frac{U_q}{I_0} \quad P_o = \frac{U_0(U_q - U_0)}{R_w}$$

### For power supply with rectangular characteristic:

The supply of power from a source with a rectangular characteristic means that the voltage of the Ex power supply remains constant until current limitation activates.

The protection level of power supplies with a "rectangular" characteristic is normally "ib".

The probe powered from such a supply is also a Ex device with protection level "ib".

### Example of practical provision of power supply with a rectangular characteristic:

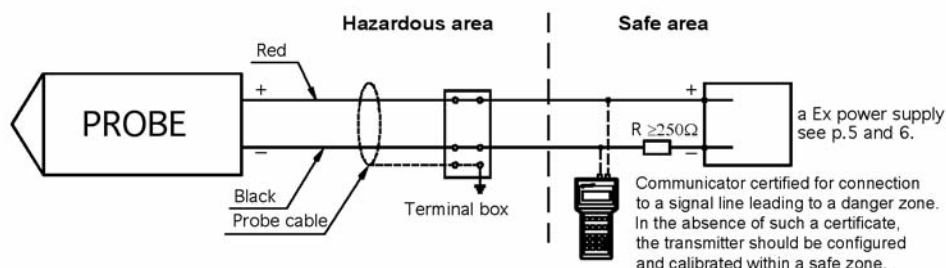
Use a stabilized power supply with  $U_0=24\text{ V}$  with protection.

### 6.1. The protection level

The probe is Ex device with protection level "ia" when the powered circuit has protection level "ia".

The probe is Ex device with protection level "ib" when the powered circuit has protection level "ib".

**Fig.3:** SGE-25.SMART, SGE-25S.SMART, SGE-25C.SMART probes in Ex version – connection method



Devices in the measuring loop of the probe should be connected in accordance with Intrinsic safety and explosion protection standards.



It is not permitted to repair or otherwise interfere with the probe's electrical circuits in any way. Damage and possible repair may be assessed only by the manufacturer or another authorized party.

**1. Introduction**

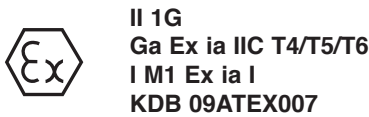
1.1 This “Appendix Ex.04” **applies only** to smart level probes **SGE-25, SGE-25C and SGE-25S in Ex versions**, marked on the rating plate as shown in 2.2 and denoted Ex in the Product Certificate.

1.2 The appendix contains supplementary information relative to the Ex versions of the SGE-25, SGE-25C, SGE-25S probes. During installation and use of Ex probes reference should be made to DTR.SG...04 in conjunction with “Appendix Ex.04”.

**2. Use of SGE-25, SGE-25C and SGE-25S probes in danger zones**

2.1 The probes SGE-25, SGE-25S are produced in accordance with the requirements of the following standards: EN 60079 0:2006, EN 50303:2004, EN 60079-26:2007, EN 60079-11:2007

2.2 The probes may operate in areas where there is a risk of explosion, in accordance with the rating of the explosion protection design:



**3. Identifying marks**

The above mentioned probes in Ex-version , must have a rating plate containing the information specified in paragraph 4 of DTR. SG...04, and also at least the following:

- CE mark and number of notified unit: 1453 (GIG KDB), mark
- Designation of explosion protection design, certificate number,
- Values of parameters such as Ui, li, Ci,
- Year of manufacture

**4. User information**

Together with the probes ordered, the user will receive: User’s Manual numbered DTR.SG...04 with Appendix Ex.04, and also the Product Certificate.

**5. Permitted input parameters of the SGE-25, SGE-25S, SGE-25C probes (based on data from the KDB 09ATEX007 certificates, and certification documentation)**

- Permitted input parameters for power supply with a linear characteristic.  
 Ui = 28V DC li = 0.1A
  - Permitted input parameters for power supply with a “rectangular” characteristic and trapezoidal characteristic  
 Ui = 24V DC li = 0.1A
- Input inductance and capacity: Ci = 30nF, Li = 750 μH  
 Pi for all type of power supply, see table below.

Pi [W]	Tp [°C]	Temperature class
1,8	53	T6
	68	T5
	75	T4, group I
1,6	56	T6
	71	T5
	75	T4, group I

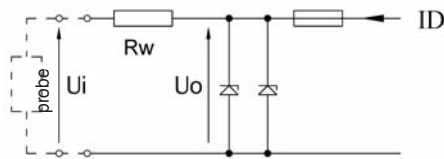
Pi [W]	Tp [°C]	Temperature class
1,3	60	T6
	75	T5, T4, group I
1,0	65	T6
	75	T5, T4, group I
0,7	69	T6
	75	T5, T4, group I

Tm: temperature of measuring medium      Ta: ambient temperature      Tp = Tm for Tm > Ta      Tp = for Tm < Ta

## 6. Supply examples

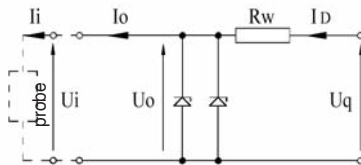
**Fig.1:** Power supply from a source with linear characteristic

Power supply with a “linear” characteristic may be e.g. a typical barrier with parameters:  
 $U_0=28\text{ V}$     $I_0=0.093\text{ A}$     $R_w=300\ \Omega$



**Fig.2:** Power supply from a source with trapezoidal characteristic

Example:  $U_0 = 28\text{ V}$     $I_0 = 0,08\text{A}$



$$\text{If } U_0 < 1/2 U_q \text{ then } U_q = \frac{4P_0}{I_0} \quad R_w = \frac{U_q}{I_0} \quad P_0 = \frac{U_0(U_q - U_0)}{R_w}$$

### For power supply with rectangular characteristic:

The supply of power from a source with a rectangular characteristic means that the voltage of the Ex power supply remains constant until current limitation activates.

The protection level of power supplies with a “rectangular” characteristic is normally “ib”.

The probe powered from such a supply is also a Ex device with protection level “ib”.

### Example of practical provision of power supply with a rectangular characteristic:

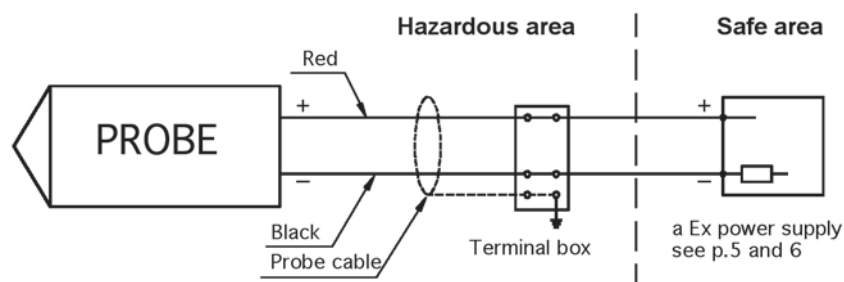
Use a stabilized power supply with  $U_0=24\text{V}$  with protection level “ib” and current limited to  $I_0 = 50\text{mA}$

### 6.1. The protection level

The probe is Ex device with protection level “ia” when the powered circuit has protection level “ia”.

The probe is Ex device with protection level “ib” when the powered circuit has protection level “ib”.

**Fig.3:** SGE–25, SGE–25S, SGE–25C probes in Ex version – connection method



Devices in the measuring loop of the probe should be connected in accordance with Intrinsic safety and explosion protection standards.



It is not permitted to repair or otherwise interfere with the probe’s electrical circuits in any way. Damage and possible repair may be assessed only by the manufacturer or another authorized party.

**SMART LEVEL PROBES  
SGE-25.SMART, SGE-25S.SMART**

**HYDROSTATIC LEVEL PROBES  
SGE-25, SGE-25S, SGE-16**

**USER'S MANUAL**

I. Appendix Ex.03

II. Appendix Ex.04

III. Contents

- § 1. Introduction
- § 2. User materials
- § 3. Applications and main features
- § 4. Identifying marks. Ordering procedure
- § 5. Technical data
- § 6. Technical description
- § 7. Place of installation
- § 8. Installation and Connection
- § 9. Settings and Regulation
- § 10. Inspections, Repairs and Spare Parts
- § 11. Packing, Storage and Transport
- § 12. Guarantee
- § 13. Additional Information
- § 14. Figures

Fig.1. SGE-25.SMART and SGE-25S.SMART probes – dimensions

Fig.2. SGE-25.SMART and SGE-25S.SMART probes – connection method

Fig.3. SGE-25, SGE-16, SG-25C and SGE-25S probes – dimensions  
and connection method

Fig.4. Version Ex avec câble gainé PTFE.

§ 15. **Appendix 1**

Testing of excess voltage protection elements (Not applicable to Ex version)  
*(ne concerne pas les versions Ex)*

Fig.5a. Testing the Transil diode connected between the wires

Fig.5b. Testing the plasma surge arresters

## 1. Introduction

1.1 This manual is intended for users of SGE-25.SMART, SGE-25S.SMART, SGE-25, SGE-25S, SGE-25C and SGE-16 hydrostatic level probes containing the data and guidelines necessary to understand the functioning of the probes and how to operate them. It includes essential recommendations concerning installation and use, as well as emergency procedures.



1.2 The SGE-25, SGE-25S and SGE-25SMART, SGE-25S.SMART are also made in Ex version. Additional data on the probes in Ex version is contained in the appendix designated „DTR.SG...04(ENG). Appendix.Ex.04” or DTR.SG...04 (ENG. Appendix.Ex.03”. During installation and use of the probes in Ex version, reference should be made to DTR.SG...04 in conjunction with Appendix Ex.



1.3 The level probes: SGE -25, SGE -25S, SGE -25C, SGE -25SMART, SGE -25S.SMART in realization for sea uses are complied with "Det Norske Veritas" (DNV) Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas Offshore Standards. Certificate No. A -11311 for application in following Location Classes: Temperature C, Humidity: B, Vibrations: B, EMC: B, Enclosure: D.

## 2. Matériels

Les transmetteurs sont livrés en emballage simple ou multiple. Chaque sonde est accompagnée de son certificat qui est aussi le bon de garantie. Les manuels d'utilisation sont fournis en quantité suffisante.

## 3. Applications of probes

The SGE-25.SMART, SGE-25S.SMART, SGE-25, SGE-25S, SGE-25C and SGE-16 probes are designed to measure the depth of liquid in wells, swimming pools, watercourses, boreholes etc.

The SGE-25S.SMART and SGE-25S probes are also designed for the measurement of levels of liquid waste and of dense or viscous.

The SGE-16 probe, due to its small diameter, is designed for the measurement of water levels in wells and boreholes, wherever it is necessary to insert probes into pipes of small diameter for which it is impossible to use the SGE-25. The probes convert an input pressure (being a measure of the level of the medium) into a standard 4-20 mA signal transmitted in a two-wire system (probes SGE-25, SGE-16, SGE-25C, SGE-25S) and a digital communication signal in the „HART” system (probes SGE-25.SMART, SGE-25S.SMART), or in special versions into a 0-10V signal transmitted in a three-wire system (applicable only to the SGE-25, SGE-25S, SGE-25C models). Probes fitted with cables with an additional PTFE shield may be used with food products and with reactive substances.

## 4. Identifying, Marks, Ordering, Procedure

### 4.1 Identifying marks on a rating plate

Every probe carries a rating plate containing at least the following information: CE mark, numbers of notified institutions and designations of certificates obtained, name of manufacturer, type, factory number, basic range, output signal, power supply voltage.

### 4.2 Ordering procedure

See the commercial data sheet.

## 5. Technical data

### 5.1 Technical data. SGE-25.SMART and SGE-25S.SMART probes

#### 5.1.1 SGE-25.SMART, SGE-25S.SMART . Measuring Ranges

Model	Standard range	Measuring limits	Minimal set range	Origine shift	Overpressure limit (without hysteresis)
SGE-25.SMART	0...10 m H <sub>2</sub> O	-1 and 11,5 m H <sub>2</sub> O	0,8 m H <sub>2</sub> O	0...10 m H <sub>2</sub> O	100 m H <sub>2</sub> O
SGE-25S.SMART	0...100 m H <sub>2</sub> O	-5 and 115 m H <sub>2</sub> O	8 m H <sub>2</sub> O	0...100 m H <sub>2</sub> O	700 m H <sub>2</sub> O

#### 5.1.2 SGE-25.SMART Metrological parameters

Accuracy:	$\pm 0.1$ % for the standard range $\pm 0.3$ % for the minimal set range
Long term stability:	$\pm 0.1$ % (FSO) for 2 years
Temperature error:	$\pm 0.08$ % (FSO) / 10 °C $\pm 0.2$ % for the whole temperature compensation range
Temperature compensation range:	-10 ... +80 °C
Error due to supply voltage changes:	0.002% (FSO) / 1V



### 5.1.3 SGE-25S.SMART. Metrological parameters

Accuracy	≤ ± 0.16 % for the standard range
≤ ± 0.4 % for the minimal set range	
Temperature error:	< ± 0.08 % (FSO) / 10 °C
	< ± 0.2 % for the whole temperature compensation range
Temperature compensation range:	-10 ... +80° C
Error due to supply voltage changes:	0.002 % (FSO) / 1 V

### 5.1.4 SGE-25.SMART, SGE-25S.SMART. Electrical parameters

<b>Power supply for standard models:</b>	<b>10,5...36 V DC</b>
<b>Power supply for Ex-version:</b>	<b>see "Appendix Ex.03"</b>
Output signal:	4...20 mA or 20...4 mA, two wire technique
Load resistance:	$R[\Omega] \leq \frac{U_{sup} [V] - 10,5 V}{0,02 A} \times 0,85$
Communication:	Communication takes place via a 4...20 mA signal using a specialized equipment (see § 9).
Resistance required for communication:	250...1100 Ω
Min. supply voltage for specified load resistance $R_L[\Omega]$ :	$U_{min.}[V] = \frac{R_L [\Omega] \times 0,02 A}{0,85} + 10,5 V$
Damping of the sensing module:	0.3 s
Damping added electronically:	0...30 s
Voltage for insulation testing:	500 V ac or 750 V dc
Excess voltage protection:	see. § 10.2.3.

### 5.1.5 SGE-25.SMART and SGE-25S.SMART . Permitted Environmental Conditions

Process temperature limit: -30...+80 °C for 0...10 m H<sub>2</sub>O / -30...+50 °C for the basic range 0...100 m H<sub>2</sub>O  
**Maximum process temperature for Ex-version, see "Appendix Ex.03"**



**The medium must not be allowed to freeze in the immediate vicinity of the probe.**

### 5.2 Technical Parameters of the SGE-25

Any measuring range:	1 ... 500 m H <sub>2</sub> O for normal version 1 ... 100 m H <sub>2</sub> O for Ex version
Recommended standard ranges:	4, 10, 20, 50, 100 m H <sub>2</sub> O

	Measuring ranges		
	1 m H <sub>2</sub> O	4 m H <sub>2</sub> O	0 ... 10 m H <sub>2</sub> O / 0...500 m H <sub>2</sub> O
Overpressure limit ( <i>without hysteresis</i> )	40 x range	25 x range	10 x range ( <i>maximum of 700 m H<sub>2</sub>O</i> )
Accuracy	0,6%	0,3 %	0,2 %
Temperature error	Typically 0,3 % / 10 °C Maximum 0,4 % / 10 °C		Typically 0,2% / 10 °C Maximum 0,3% / 10 °C

#### Special version with increased accuracy

(SGE-25 level probe, measuring range 0..10 m H<sub>2</sub>O, accuracy 0.1%, total error 0.3% between 0...25 °C)

Hysteresis, repeatability:	0,05%
Long term stability:	0,1% or 1 cm H <sub>2</sub> O for 1 year
Temperature compensation range:	0...25 °C for standard models -10...+70 °C for special version
Process temperature limit:	-25...50 °C for ranges > 20m H <sub>2</sub> O -25...75 °C for ranges ≤ 20m H <sub>2</sub> O

**Maximum process temperature for Ex-version: see "Appendix Ex.04."**



**The medium must not be allowed to freeze in the immediate vicinity of the probe.**

### 5.3. Technical Parameters of the SGE-25S

Any measuring range: 2...20 m H<sub>2</sub>O for normal and Ex-version.  
 Recommended standard ranges: 2, 4, 10 m H<sub>2</sub>O

	Measuring ranges		
	2 m H <sub>2</sub> O	4 m H <sub>2</sub> O	0 ... 10 m H <sub>2</sub> O / 0...20 m H <sub>2</sub> O
Overpressure limit ( <i>without hysteresis</i> )	20 x range	20 x range	10 x range
Accuracy	1,5%	1 %	0,5 %
Temperature error of zero	Typicaly 0,4 % / 10 °C Maximum 0,6 % / 10 °C		Typicaly 0,2% / 10 °C Maximum 0,3% / 10 °C
Temperature error of span	Typicaly 0,3 % / 10 °C Maximum 0,4 % / 10 °C		Typicaly 0,2% / 10 °C Maximum 0,3% / 10 °C

Hysteresis, repeatability: 0,05%  
 Temperature compensation range: 0...25 °C for standard model  
 Process temperature limit: -25...+75 °C



**Maximum process temperature for Ex-version: see “Appendix Ex.04”.**

**The medium must not be allowed to freeze in the immediate vicinity of the probe.**

### 5.4 Technical Parameters of the SGE-16

Measuring ranges: 10, 20, 50, 100 m H<sub>2</sub>O  
 Accuracy: 0.5 %  
 Hysteresis, repeatability: 0.05 %  
 Overpressure limit (without hysteresis): 2 x range  
 Process temperature limit: 0...50 °C  
 Temperature compensation range: 0...25 °C

### 5.5 Technical Parameters of the SGE-25C

Measuring ranges: 0...2; 0...4; 0...10 m H<sub>2</sub>O  
 Accuracy: 1 %  
 Hysteresis, repeatability: 0,05 %  
 Overpressure limit (without hysteresis): 10 x range  
 Temperature error of zero: 0.6 % / 10 °C  
 Temperature error of span: 0.4 % / 10 °C  
 Process temperature limit: -25...75 °C  
 Temperature compensation range: 0...25 °C

### 5.6 Electrical parameters for SGE-25, SGE-16, SGE-25S, SGE-25C

Output signal: 4-20 mA, two wire technique  
 Special version 0-10V, three wire technique  
 Load resistance:  
 (for current output)  $R[\Omega] \leq \frac{U_{sup} [V] - 10,5 V}{0,02 A}$   
 Load resistance  
 (for voltage output)  $R[\Omega] \geq 5 k\Omega$   
 Power supply for normal-version: 10,5 ... 36 V DC (for 4...20 mA output)  
 15 ... 30 V DC (for 0 ...10V output)  
**Power supply for Ex-version: See “Appendix Ex.03”**  
 Error due to supply voltage changes 0,005 % / 1 V

### 5.7 Construction Materials (for whole probes)

Diaphragm: Stainless steel 316L for SGE-16, SGE-25S, SGE-25S.SMART  
 Hastelloy C276 for SGE-25, SGE-25.SMART, SGE-25C  
 Sensing module: Stainless steel 316L  
 Casing for electronic parts: Stainless Steel 316L  
 Liquid filling of sensing module: Silicone oil  
 Cable shield: PUR (polyurethane)  
 Additional cable shield: PTFE (factory option)

## 5.8. Ingress Protection rating

All models are IP68

## 6. Technical description

### 6.1. Principles of operation

The hydrostatic level probes work by converting changes in the resistance of a piezo-resistive bridge, while are proportional to the pressure (of a hydrostatic column of liquid), into a standard current output signal. The active sensing device is a silicon diaphragm with in diffused piezo-resistors. The (non-uniformized) electrical signal obtained from the piezo-resistive bridge is proportional to the input pressure (depth) and is converted by the elec-tronic circuit into an output signal.

### 6.2. Construction

**6.2.1** The probes are in the shape of a hermetically closed stem, containing the active sensing device with silicon and sealing diaphragm, as well as a plate with the electronic components. The SGE-25S.SMART and SGE-25S probes are additionally fitted with a diaphragm seal enabling depth measurements to be carried out on dense media and media with suspended materials and impurities, such as waste liquids (fig. 1, 3). The output signal is sent through a special cable with a capillary used to connect the negative side of the measuring diaphragm to the atmosphere. All metal parts of the probes are made of stainless steel 316 L, and Hastelloy C276 (see § 5.7.); the cable has a polyurethane shield.

**6.2.2** Special versions of the probes can be produced with cables shielded by an additional PTFE layer. The shield covers the parts of the cable while is immersed in the medium being measured, as well as a necessary additional segment. The PTFE shield (in Ex version) is additionally equipped with a stainless steel cord conducting electrostatic charges (see fig. 4.).

**6.2.3** The probes are fitted with elements ensuring excess voltage protection: „transil” diodes between the wires, and plasma surge arresters between the wires and the casing. (The plasma surge arresters are not included in Ex versions.)

### 6.3 Electronic circuit of the probes

Electronic circuit can be produced in two versions.

#### 6.3.1 The digital version (SGE-25.SMART,SGE-25S.SMART probes).

The electronic circuit changes the signal from the sensing module into digital signal and input to a microprocessor, which controls the probe's operation. Using data input during the production process, the processor processes the conversion curve, adjusts for thermal errors and carries out linearization. After processing, the digital signal is again converted into an analogue 4-20mA current signal, with a superimposed digital communication signal. For communication with the probe via the signal line a special communicator KAP is necessary.

#### 6.3.2 The analog version (SGE-25, SGE-25S, SGE-25C and SGE-16 probes).

The electronic circuit changes the signal from the sensing module into an output signal 4...20 mA.

The electronic circuit is equipped in protective elements assured Intrinsic safety and resistance on electric impulse.

The electronics board is hermetically flooded hardenable silicone resin in the stainless steel casing.

## 7. Place of installation

**7.1.** The level probes may be installed in places where liquid levels are measured in wells, swimming pools, tanks, boreholes etc. The probe is immersed in the medium being measured. A special cable extends above the level of the medium; this can be connected directly to another device or to a terminal box.

### 7.2. High and Low Ambient Temperatures and Medium Temperatures

When measuring liquids whose solidification point is above the ambient temperature, the medium should not be allowed to freeze around the probe, this applies in particular to water in the case of open-air installations. For maximum medium temperatures see § 5.



Data for versions Ex in accordance with Appendix Ex.03, Appendix Ex.04.

## 8. Installation and connection

### 8.1 Mechanical Installation

The probe can be suspended from the power supply cable, but where there is a danger that it may catch on protruding elements it is recommended that the probe be suspended on a steel cable using the supporting handle (not applicable to SGE-16). If the cable is to be exposed to current or turbulence, it should be installed in a protective tube, e.g. one made from PVC.



**Before to immerse the probe: take off the securing cover (diaphragm protection) on models SGE-25S, SGE-25S.SMART, SGE-25C.**



**8.2.** The probe with an additional PTFE shield may be suspended on a steel cable or on an internal cable (do not catch the PTFE cable shielded).

The probe in Ex-version with a cord for earthing may be suspended on a steel cable using the lifting handle.

### 8.3. Electrical connection

The method of making electrical connections is shown in figure 2, 3 (for Ex version in figure 3 „Appendix Ex”).

If the transmission line leads to remote premises via the open air, it is recommended that a terminal box, be fitted (BP101 or BPS102), in order to connect the probe's cable to the remaining section of the transmission line. The box should have an IP65 ingress protection rating, and but should not be so airtight as to prevent the probe's active sensing device from “breathing” via a capillary embedded in the cable.

The opening of the capillary should not be allowed to become dirty, and water should not be allowed to enter the capillary. Where the transmission line is very long, it is recommended that the section leading from the end of the probe cable be made from twisted pair cable, and it is desirable that entry points to other devices be fitted with excess voltage protection (BPS102). The cable of the probe and the remaining section of the transmission line should be protected from mechanical damage.

## 9. Settings and adjustments

**9.1.** The SGE-25, SGE-16, SG-25C and SGE-25S are factory set to the range stated in the order. The user does not have access to the “zero” and “range” potentiometers. Setting may be adjusted by the manufacturer only.

**9.2.** In SGE-25.SMART, SGE-25S.SMART probes with smart electronic, user can make e.g. set „zero” and measurement ranges.

### **9.3. SGE-25.SMART, SGE-25S.SMART. Measurement ranges. Definitions.**

**9.3.1.** The maximum range of level, while the probe can measure is called „basic range” (for specifications of “ basic range” see § 5.1.1.). The width of the basic range is the difference between the upper and lower limits of the basic range. The internal characteristic conversion curve for the basic range is coded in the probe's memory (reference curve used when making any adjustments which affect the probe's output signal).

**9.3.2.** The set range is the range whose lower end-point corresponds to an output current of 4mA and whose upper end-point corresponds to a current of 20mA (or 20mA and 4mA respectively when the conversion curve inverted). The set range may cover the whole of the basic range or only a part of it. The width of the set range is the difference between the upper and lower limits of the set range. The probe may be set to any range within the basic range of level values, subject the restrictions set out in the table in § 5.1.1.

### **9.4. Configuration and Calibration**

The SGE-25.SMART, SGE-25S.SMART probes has features which enable metrological and identification parameters to be set andaltered.

**The configurable metrological parameters affecting the probe's output signal include the following:**

- a) unit in which the measured level is expressed on the display
- b) upper end-point of the set range
- c) lower end-point of the set range
- d) time instant
- e) type of characteristic curve: linear or specific

Parameters which cannot be altered include the following:

- f) upper limit of the basic range
- g) lower limit of the basic range
- h) minimum set range

**9.4.2.** Other identification parameters, without effect on the output signal, include: device address, device code, factory identification code, factory device code, number of preambles (3 to 20), UCS, TSD, program version, electronics version, flags, factory number, label tag, description tag, date tag, message, record number, sensing module number. The process of setting these parameters listed in 9.4.1 and 9.4.2 is called "Configuration".

**9.4.3.** It is possible to adjust the probe's zero point, for example to compensate for deviation resulting from a change in position of installation. The probes may also be calibrated, by taking readings with the input pressure controlled using a standard device. This process and zero-point adjustment are called "Calibration".

**9.4.4.** Configuration and Calibration of the probe are carried out using a KAP communicator, certain Hart communicators or a PC with Hart/RS232 converter and Raport-01 software. A description of the functions of the KAP communicator is contained in KAP Communicator Operating Manual, and information on the Hart/RS232 converter can be found on the Hart/RS232/01 Converter information sheet.



A list of Hart protocol commands implemented for SGE-25.SMART, SGE-25S.SMART probes is contained in the HART IO operating instructions.

## 10. Inspections, repairs and spare parts

### 10.1. Regular inspections

**10.1.1** Regular inspections should be carried out in accordance with the regulations to which the user subject. An inspection should be made of the external condition of the probe, during which:

- Check that there are no signs of mechanical damage in the form of impact marks or dents.
- Check the condition of the cable, which should not show signs of wearing, bending or fraying of the external coating.
- Check the condition of the packing gland.

Every two years or in accordance with regulations applicable to the user, check the zero point (4mA).

#### **10.1.2** Check the "zero point" (SGE-25, SGE-25S, SGE-25C)

Bring the probe up above the surface of the liquid and read the output current. In case of excessive deviation of the zero reading, return the probe to the manufacturer for adjustment of the conversion curve or adjust the zero point of a device used in conjunction with the probe (e.g. monitor, regulator, and controller).

**10.1.3** Check the "zero point" SGE-25.SMART, SGE-25S.SMART see 10.1.2.

### **10.2. Additional Inspections**

**10.2.1** If the probe is installed in a place where it might have been subject to mechanical damage, wearing cable covering, excess pressure, hydraulic impulses, sedimentation, crystallization or erosion of the diaphragm, or excess electrical voltage, inspections should be made as necessary. Check the state of the diaphragm and cable, clean the diaphragm, and check the zero point.

#### **10.2.2** Faults in the Transmission Line

If there is no current in the line or the value of the current is random, check the transmission line, the connections with the terminal adapters, connectors etc. If the transmission line is in good order, check whether the probe is functioning correctly.

#### **10.2.3** Effects of Excess Voltage

In case of a large surge of excess voltage between the wires of the line, the safety diode may sustain damage due to a low-resistance short circuit (a diode damaged in this way still provides protection to the probe's circuits).

Symptoms of damage:

- When the probe is connected to the power supply, the value of the current exceeds 20 mA, and the voltage on the probe is of an order of several hundred mV (in extreme cases a particularly strong surge may cause circuits or wires inside the probe to burn out; the current is then 0 mA and there is full voltage in the output circuit).
- when the probe is not connected to a power supply, the resistance of the probe should be measured; this is approximately 10  $\Omega$  and is equal to the value of the limiting resistors + resistance of the damaged diode.

Damage to the gas-filled spark gap (Plasma surge arresters) is much less likely than damage to the diode, and may lead to a short circuit or a lowering of the resistance of the spark gap. For additional information on how to test the safety devices, see figure. 5a, 5b.

#### 10.2.4 Damage Caused by Overpressure

Another possible reason for malfunctioning of the probe is damage caused by overpressure, which may result from such factors as:

- a) freezing of the medium,
- b) dynamic effects of a strong current of liquid on the diaphragm seal while the probe is being washed (applies mainly to the SGE-25S, SGE-25S.SMART model).
- c) Striking or scraping of the diaphragm with a hard object, such as a screwdriver.

If excess pressure on the probe has caused damage to the silicon or sealing diaphragm, the probe can no longer be used. Symptoms of such damage are generally such that the output current falls below 4 mA or rises above 20 mA, and the probe fails to react to input pressure.

#### 10.2.5 Cleaning the Diaphragm Seal

Impurities which have accumulated on the diaphragm during operation should not be removed by mechanical means such as scraping, scrubbing etc., as this may cause damage. The only permitted method is to dissolve the impurities, possibly aiding their removal with a light brush. Sedimentation on the diaphragm may affect the conversion curve. Examples of ways of cleaning the diaphragms:

- a) In the case of boiler scale on and around the diaphragm, the lower part of the probe including the diaphragm should be immersed for approximately 20 minutes, for example in a 10% solution of Kamix, which is available from the manufacturer.
- b) Deposits of petroleum-derived substances should be softened and rinsed off with a solvent of detergent
- c) Deposits of organic substances or food products (juice, syrup etc.) should be softened in warm water up to 85° C, or in detergent in the case of fats.



**After removing sedimentation, parts which have come into contact with the solvent substance should be thoroughly rinsed, and the health and safety regulations relating to the chemical in question should be adhered to.**

**Do not use substances which might cause corrosion of the diaphragm seal.**

#### 10.3. Spare Parts

The following parts of the probe can be replaced when worn or damaged: cable, seals on the packing gland.

The cable may be replaced by the manufacturer only.

## 11. Packing, Storage and Transport

#### 11.1. Packing, Transport

The probes should be packed in such a way as to protect them from damage during transportation, in single or multiple packs. The cable should be rolled into a loop \_ 300 mm in diameter, secured so as to prevent the coils from moving relative to each other and the whole from moving within the package. Avoid breakage to the cable at the point where it enters the packing gland. Packing should take place in closed rooms, where the air temperature is not lower than +15°C, relative humidity does not exceed 85%. Land, sea or air transport may be used, provided that direct action of atmospheric effects is prevented.

#### 11.2. Storage

The probes should be stored in multiple packs in covered rooms, free of vapours and reactive substances, with an air temperature between +5°C and +40°C and relative humidity not greater than 85%.

## 12. Guarantee

The manufacturer guarantees the proper functioning of the probes SGE-25.SMART, SGE-25S.SMART, SGE-25, SGE-16, SGE-25C for a period of 24 months starting from the date of purchase (probe SGE-25S for a period of 12 months), as well as servicing carried out under the guarantee and following the guarantee period.

## 13. Additional information

#### Related standards:

**PN-EN 60529:2003:** Ingress protection rating of casing (IP code)

**PN-EN61010-1:** Safety requirements for automated electrical measuring devices and laboratory devices. General requirements.

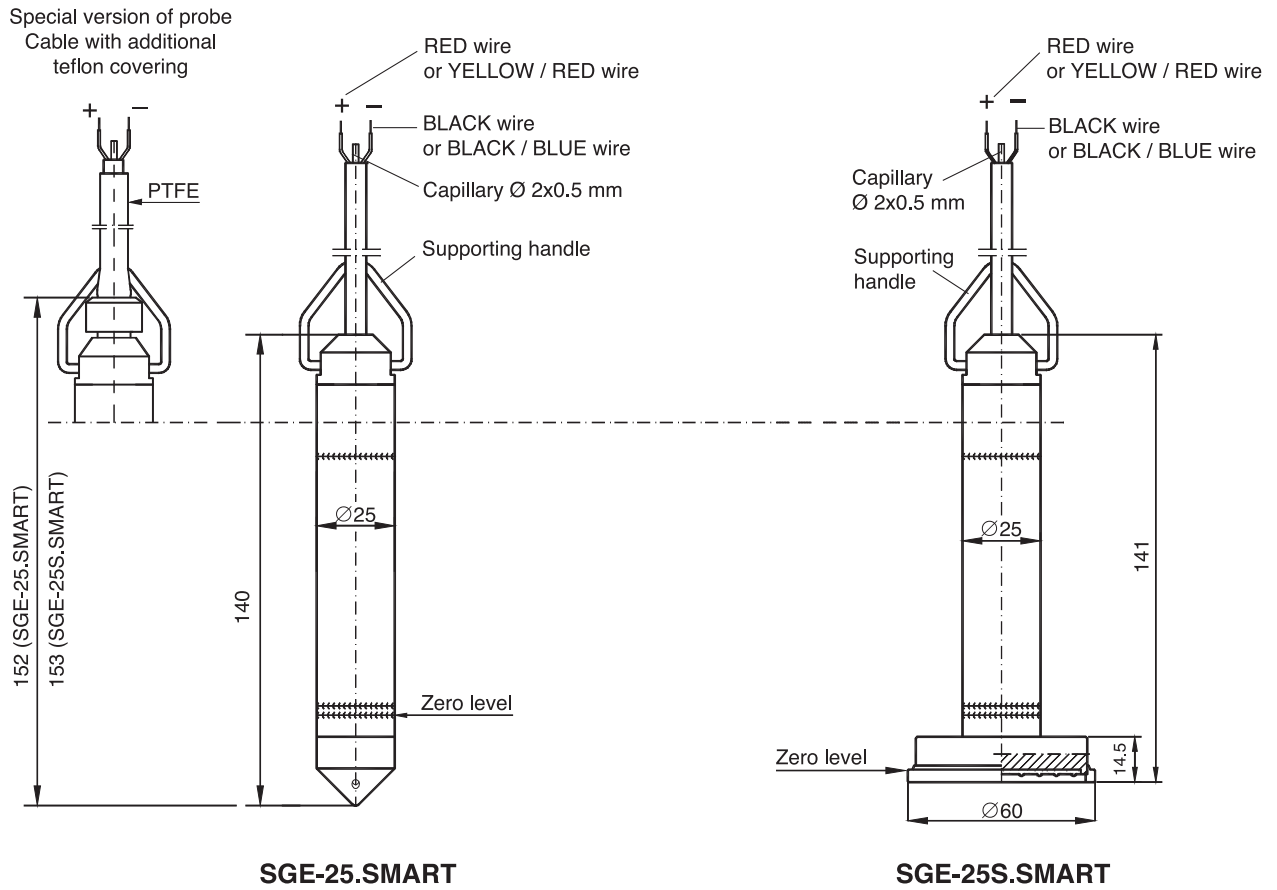


Figure 1 SGE-25.SMART and SGE-25S.SMART probes – dimension

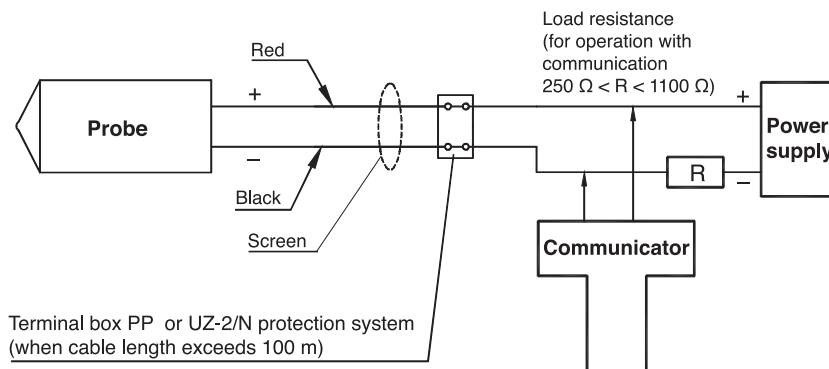
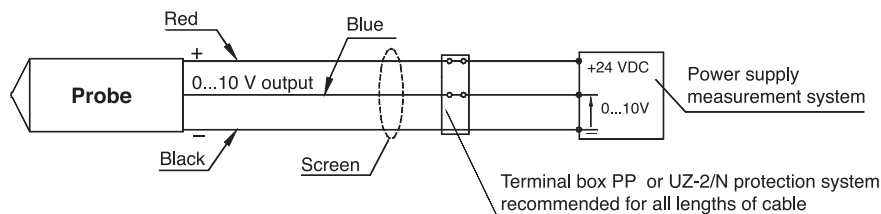
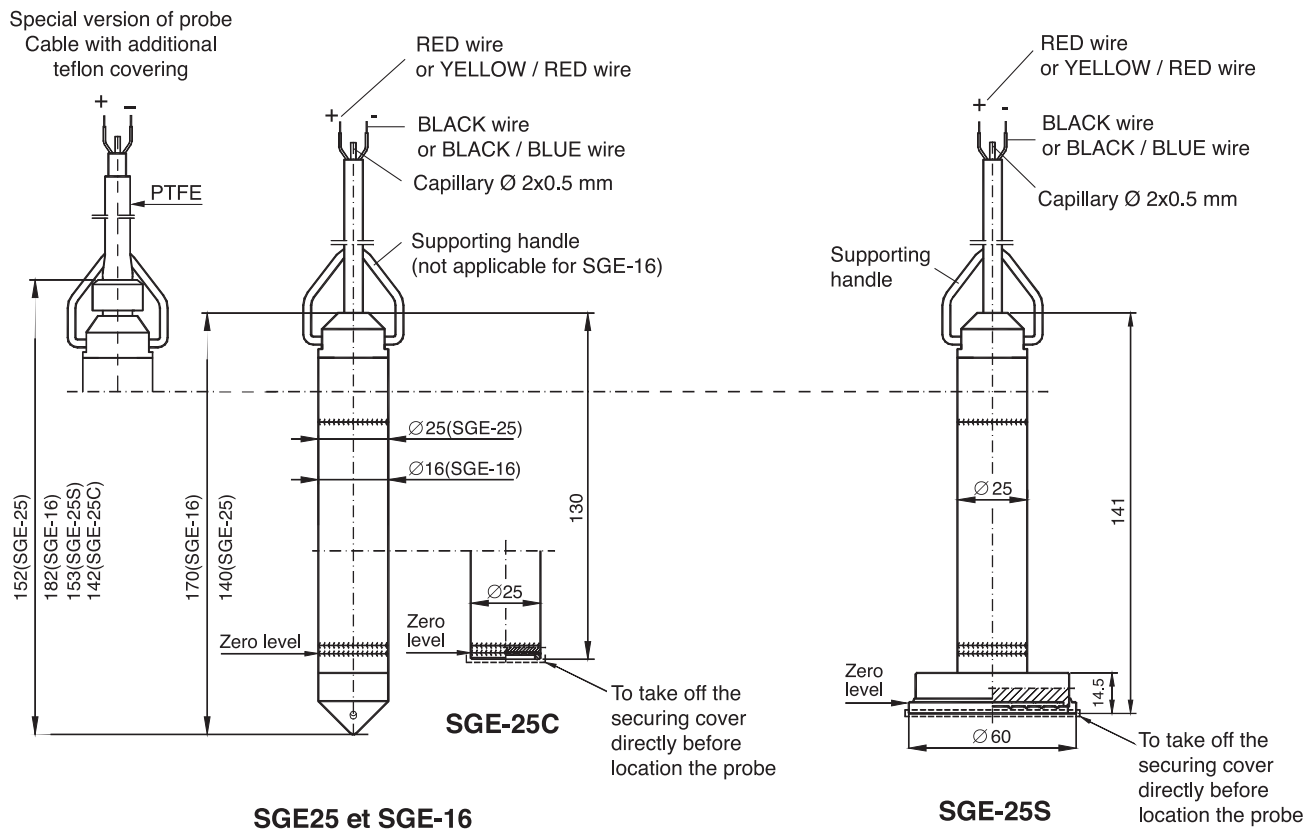
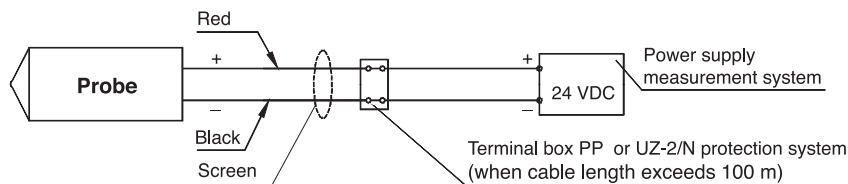


Figure 2 SGE-25.SMART and SGE-25S.SMART probes – connection method



Connection of SGE-25, SGE-25S and SGE-25C in three wire-system (0...10 V output signal)  
**Not applicable to EX version**



Connection of SGE-25, SGE-16, SGE-25C and SGE-25S in two wire-system (4...20 mA output signal)  
**Not applicable to EX version**

**Figure 3. SGE-25, SGE-16, SGE-25C and SGE-25S probes – dimensions and connection method**



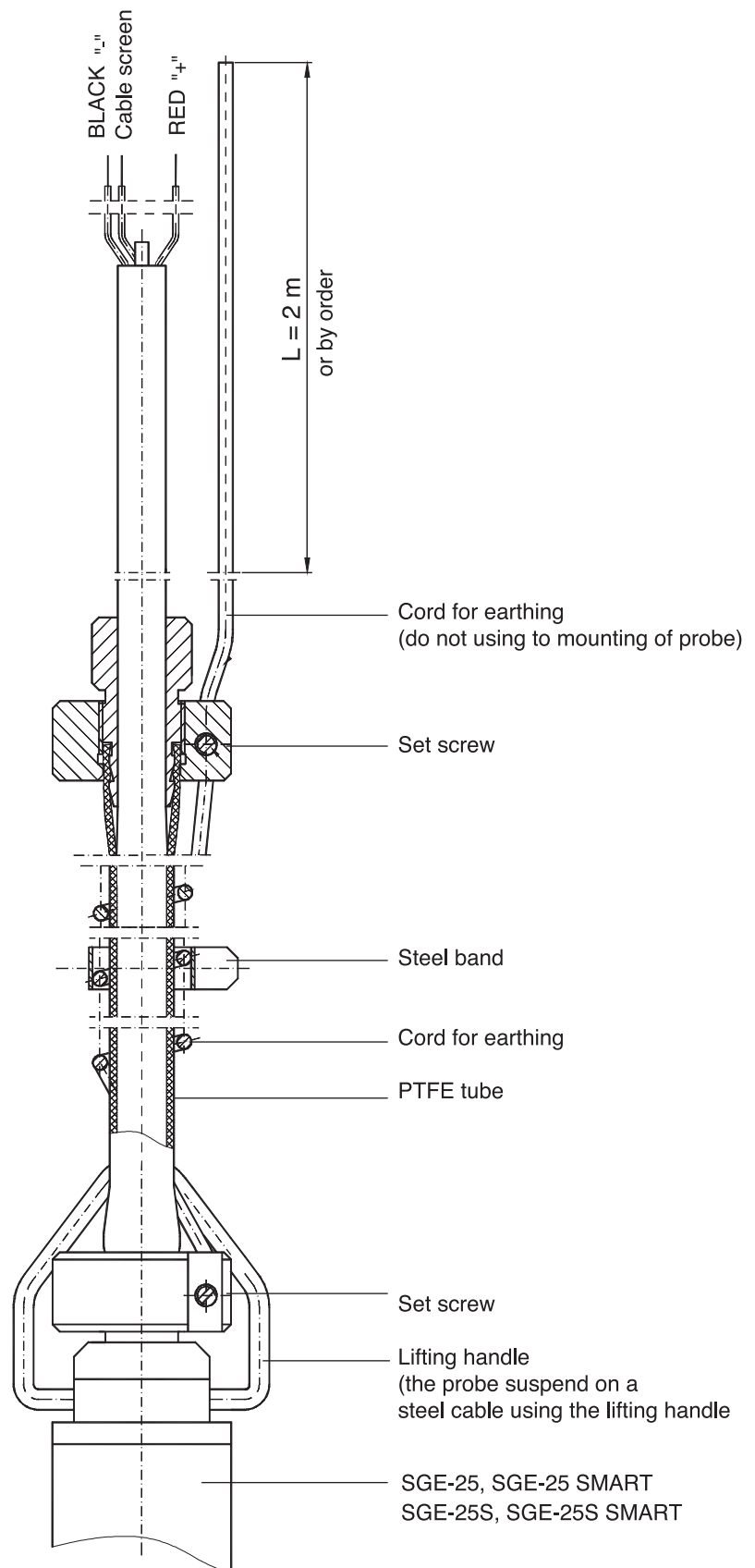


Figure 4. The probe in Ex-version with shielded PTFE cable

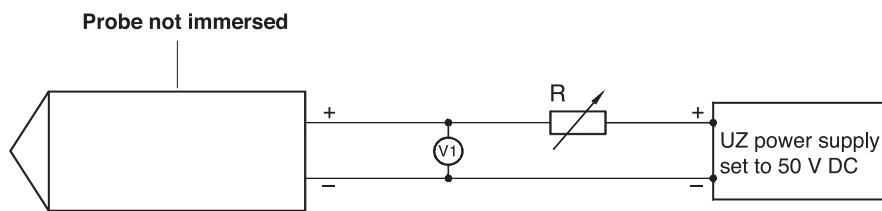
*(Not applicable to Ex version)*

Figure 5a. Testing the Transil diode connected between the wires

*(Not applicable to Ex version)*

a) The results for an undamaged diode should be as follows:

$R = 600 \Omega$  |  $UZ = 24 \text{ V DC}$  | Line current = 4mA

$R = 2 \text{ k}\Omega$  |  $UZ = 50 \text{ V DC}$  | line current raised by approx. 1.5 mA to 5.5 mA for Voltage  $V1 = 37... 41 \text{ V}$

b) Results indicating damage to the diode:

$R = 600 \Omega$  |  $UZ = 24 \text{ V DC}$  | Line current = 40 mA

Voltage  $V1 = 0,5 \text{ V}$

or when resistance is measured on the probe cable:  $R=11 \Omega$  |

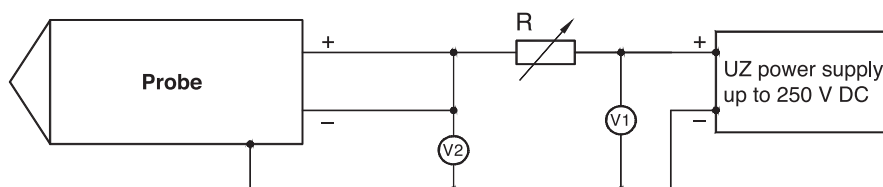


Figure 5b. Testing the Plasma surge arresters

*(Not applicable to Ex version)*

The Plasma surge arrester is working correctly if:

a) The resistance between the shorted wires of the probe and the casing at a test voltage of approx. 50 V is  $\geq 0.5 \text{ G}\Omega$ .

b) When UZ is increased gradually, the sparking voltage should be approximately 90 250 V depending on the type of device (attention should be paid to the value of  $U2$ , which at the moment of ignition will fall to 20 V – a reading of  $U1$  taken at this point gives the ignition voltage).

If the protective elements do not pass the above tests, the probe should be returned to the manufacturer for repair.