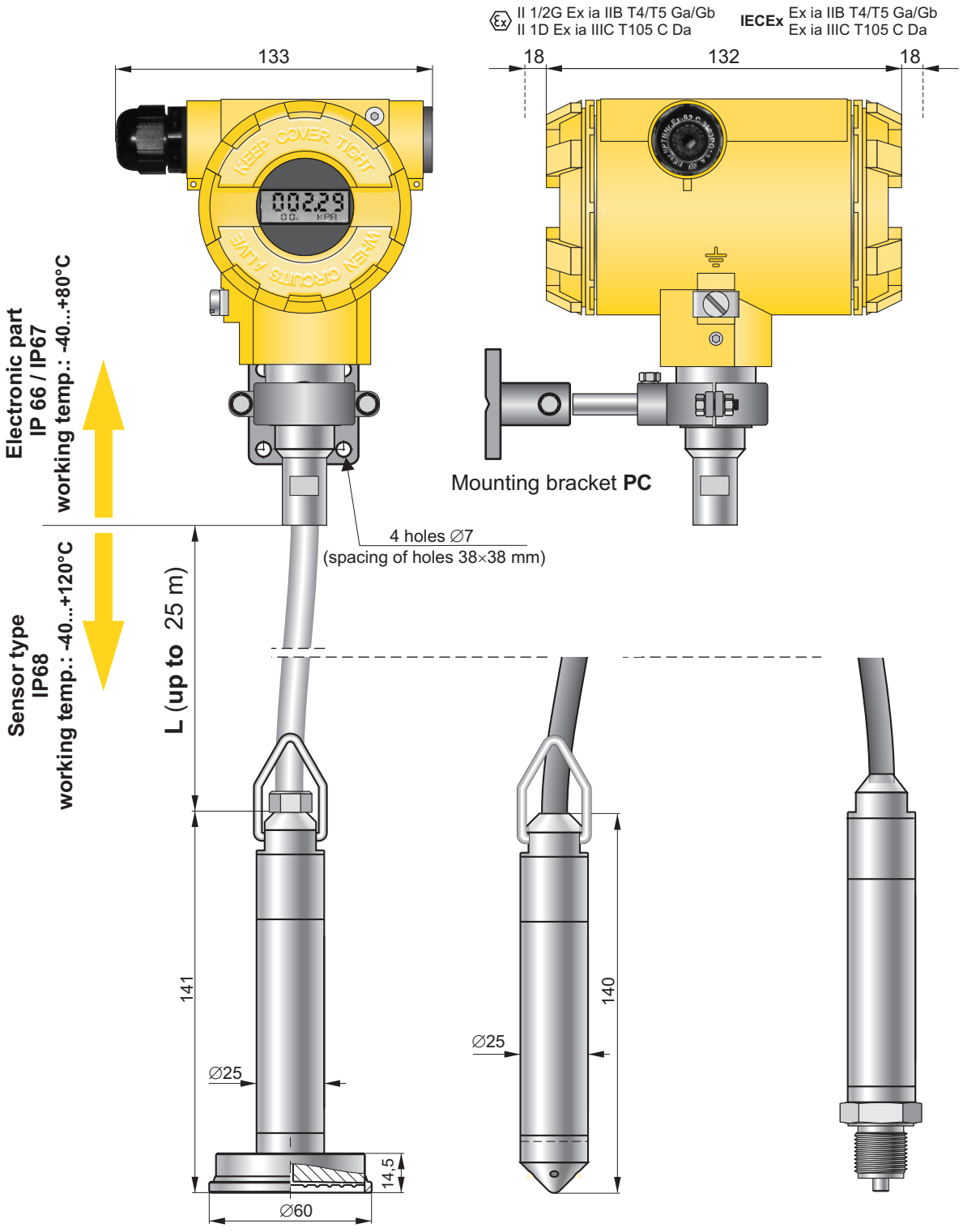
Smart level probe type APC-2000ALW/L

- ✓ **Programmable zero shift, range and damping ratio**
- ✓ **4...20 mA output signal + HART protocol**
- ✓ **Accuracy 0,16%**
- ✓ **Local display**
- ✓ **Intrinsic safety certificate (ATEX, IECEx)**



Submersible sensor type SGE-25.S

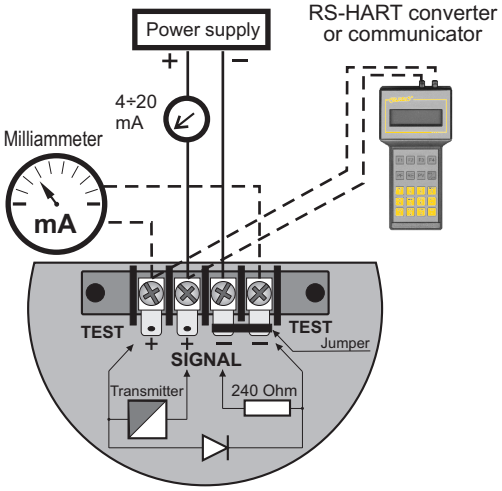
Submersible sensor type SGE-25

Thread or flange mounted sensor. *(Type of flange or thread has to be selected).*

APC-2000ALW/L function:

- ☑ 4…20 mA output signal + HART protocol,
- ☑ Possibilities of the adjusting both zero point and of the start and end of the measuring range, characteristic ete.with the display panel keys,
- ☑ Configurable display 5 digits with illumination (working temperature range –40…+85°C)

Electrical diagrams



Application

The APC-2000ALW/L level probe is applicable to measure liquid levels in tanks, deep wells or piezometers.

The APC-2000ALW/L probe is applicable to measure levels of liquids containing contaminants or suspensions. A typical use for this probe is the measurement of levels of liquid waste in intermediate pumping stations, fermentation chambers, settling tanks etc. Because in submersible part of level probe is mounted only measuring sensor level probe can be use for measurement hot liquids max. 120°C.

Configuration

The following metrological parameters can be configured:

- The units of pressure;
- Start and end-points of set range;
- damping time constant;
- inverted characteristic (output signal 20 ÷ 4 mA).

Communication

The communication standard for data interchange with the probe is the Hart protocol.

Communication with the probe is carried out with:

- KAP-03 communicator
- Raport 2 software or other Hart communication devices.

Measuring range

No	Nominal range (FSO)	Min. set range	Overpressure limit
1	0...20 m H_2O	2 m H_2O	0...200 m H_2O
2	0...10 m H_2O	1 m H_2O	0...100 m H_2O
3	0...2,5 m H_2O	0,5 m H_2O	0...25 m H_2O

**other measuring ranges on request*

Technical data*

Metrological parameters

Accuracy ≤±0,16%

Long-term stability
≤0,16% for 2 years

Thermal error
< ±0,1% (FSO) / 10°C
max. ±0,4% (FSO) in the whole compensation range

Thermal compensation range -25...100°C
-40...80°C special version

Output actualization time 0,5 s

Additional electronic damping 0...60 s

Error due to supply voltage changes 0,002% (FSO) / V

* more information about technical data available in user's manual.

Electrical parameters

Power supply 12...55 VDC
10…55 VDC (special version)

Additional voltage drop when display illumination switched on 3 V

Output signal 4...20 mA 2-wires + Hart protocol

Resistance required for communication min. 240 Ω

Load resistance

$$R[\Omega] = \frac{U_{ZAS}[V] - 12V\,*}{0{,}0225A}$$

* – 15 V when display illumination switched on

Operating conditions

Operating temperature range (ambient temp.) -40...85°C

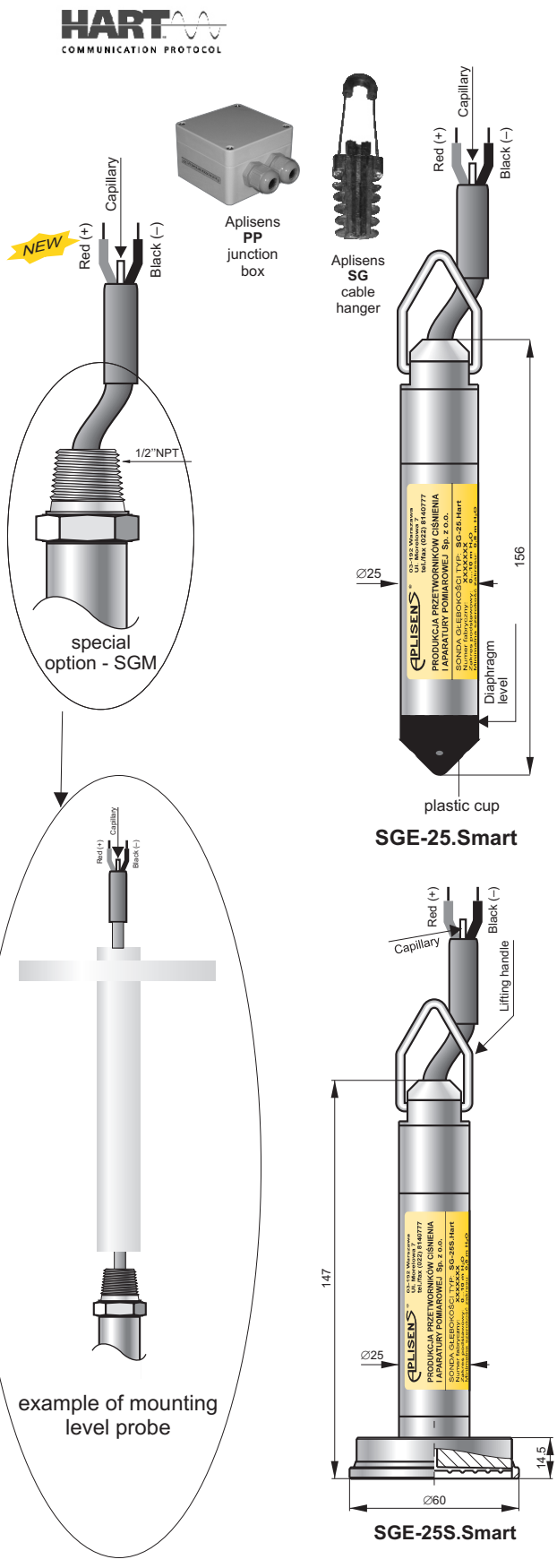
Medium temperature range:
Version with polyurethane cable -40...80°C
Version with PTFE shield -40...100°C

Ordering code

Model	Code	Description
APC-2000ALW/L		Smart level probe
Sensor type	/SGE-25…… /SGE-25S…… /SGE-25S.Titanium……	
Versions, certificates	/Exia……	II 1/2G Ex ia IIB T4/T5 Ga/Gb II 1D Ex ia IIIC T105 C Da IECEx Ex ia IIB T4/T5/T6 Ga/Gb Ex ia I Ma
	/-40…80°C……	Compensation range -40...80°C
	/Teflon……	Teflon cable shielding (T=…m)
Nominal measuring range	0…2,5 m H2O 0…10 m H2O 0…20 mH2O	Range: 0…2,5 m H2O; 0…10 m H2O; 0…20 mH2O Min. set range: 0,5 m H2O; 1 m H2O; 2 m H2O
Measuring set range	/…÷… [required units]	Calibrated range in relation to 4mA and 20mA output
Cable	L=…m	Cable length (max. 25m)
Accessories	/PC /F	Mounting bracket Flange type connection*

**sensor with thread or flange process connection. Avaliable are all process connections offered in Aplisens S.A.: M., G1/2" , 1/2"NPT, CG1", CM30, CG1/2" and all flange connections acc. to chapter III in product catalogue*

Smart level probes
SGE-25.Smart and SGE-25S.Smart



- ✓ **Programmable zero shift, range and damping ratio**
- ✓ **4...20 mA output signal + HART protocol**
- ✓ **Accuracy 0.1%**
- ✓ **Integrated internal overvoltage protection circuit**
- ✓ **ATEX Intrinsic safety** II 1G Ex ia IIC T4/T5/T6 Ga; II 1G Ex ia IIB T4/T5/T6 Ga (only for level probe with teflon cabel); I M1 Ex ia I Ma
- ✓ **Titanium version (SGE-25S.Smart)**
- ✓ **Marine certificate DNV**

Application

The SGE-25.Smart level probe is applicable to measure liquid levels in tanks, deep wells or piezometers.

The SGE-25S.Smart probe is applicable to measure levels of liquids containing contaminants or suspensions. A typical use for this probe is the measurement of levels of liquid waste in intermediate pumping stations, fermentation chambers, settling tanks etc.

Principles of operation, construction

The probe measures liquid levels, basing on a simple relationship between the height of the liquid column and the resulting hydrostatic pressure. The pressure measurement is carried out on the level of the separating diaphragm of the immersed probe and is related to atmospheric pressure through a capillary in the cable.

The active sensing element is a piezoresistant silicon sensor separated from the medium by an isolating diaphragm. The electronic amplifier, which works in combination with the sensor, is additionally equipped with an overvoltage protection circuit, which protects the probe from damage caused by induced interference from atmospheric discharges or from associated heavy current engineering appliances.

Configuration

The following metrological parameters can be configured:

- ♦ The units of pressure;
- ♦ Start and end-points of set range;
- ♦ damping time constant;
- ♦ inverted characteristic (output signal 20 ÷ 4 mA).

Calibration

It is possible to calibrate the probe in relation to a model pressure.

Communication

The communication standard for data interchange with the probe is the Hart protocol.

Communication with the probe is carried out with:

- – a KAP-03 communicator,
- – some other Hart type communicators,
- – a PC using an HART/USB/Bluetooth converter and RAPORT 2 configuration software.

The data interchange with the probe also enables the users to:

- ♦ identify the probe;
- ♦ read the currently measured hydrostatic pressure value, output current and percentage of measuring range.

Installation, method of use

When lowered to the reference level, the probe may either hang freely on the cable or lie on the bottom of the tank. The cable with the capillary can be extended using a standard signal cable. For the cable connection a special Aplisens **SG** cable hanger is recommended. The cable connection should be situated in a non-hermetically sealed box (the internal pressure inside the box should be equal to the atmospheric pressure), preventing water or other contaminants from getting into the capillary. The Aplisens **PP** junction box is recommended For systems with long signal transmission lines, it is recommended the using of an additional Aplisens UZ-2 overvoltage protection circuit in the form of a wall-mounted box which allows the cables connection. When the probe cable is being wound up, the minimum winding diameter should be 30cm and the cable should be protected from mechanical damage.

If there is a possibility of turbulence in the tank (for example, because of the mixer operating mixers or a turbulent inflow), the probe should be installed inside a screening tube (e.g. made of PVC). The line hooked on the lifting handle can simplify the operation of the probe pulling out. Cleaning the probe diaphragm by mechanical means is strictly prohibited.

Measuring ranges

No.	Nominal measuring range (FSO)	Minimum set range	Overpressure limit (without hysteresis)
1	0…1,5 m H_2O	0,15 m H_2O	15 m H_2O
2	0…10 m H_2O	0,8 m H_2O	100 m H_2O
3	0…100 m H_2O [1)]	8 m H_2O	700 m H_2O

[1)] Range available only is SGE-25.Smart

Technical data

Metrological parameters

Accuracy ≤ ±0,1% for nominal range
SGE-25.Smart ≤ ±0,3% for range 0...10% FSO

Long term stability ≤ 0,1% (FSO) for 2 years

Accuracy ≤ ±0,16% for nominal range
SGE-25S.Smart ≤ ±0,4% for range 0...10% FSO

Thermal error < ±0,08% (FSO) / 10°C
max ±0,25% in the whole compensation temp. range

For the SGE-25S.Smart probe the use of a diaphragm seal causes an additional absolute zero error, related to changes in the medium temperature, of up to 80 Pa / 10°C

Thermal compensation range -25...80°C

Time Constant 0,3 s

Additional electronic damping 0...30 s

Error due to supply voltage changes 0,002% (FSO) / V

Special versions:

- ◊ **Ex** – ATEX Intrinsic safety
- ◊ **Teflon** – Teflon cable shielding
- ◊ **SGM**- version with thread on packing gland
- ◊ **Titanium** – titanium wetted parts
- ◊ **MR** – Marine certificate DNV
- ◊ **1,5 m H_2O** – Probe for nominal range 0…1.5 m H_2O (Accuracy 0.16%)

Electrical parameters

Power supply 7,5...55 VDC (Ex 7,5...28 VDC)

Output signal 4...20 mA (two wire transmission)

Load resistance $R[\Omega] \leq \frac{U_{sup}[V] - 7{,}5V}{0{,}0225A}$

Resistance required for communication >240 Ω

Operating conditions

Medium temperature range
-30...80°C for basic range 0...10 m H_2O
-30...50°C for basic range 0...100 m H_2O

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

Degree of protection IP68

Material of casing and diaphragm SS316L (for SGE-25 Smart diaphragm Hastelloy)
Titanium – special version (only SGE-25S.Smart)

Cable shield POLYURETHANE

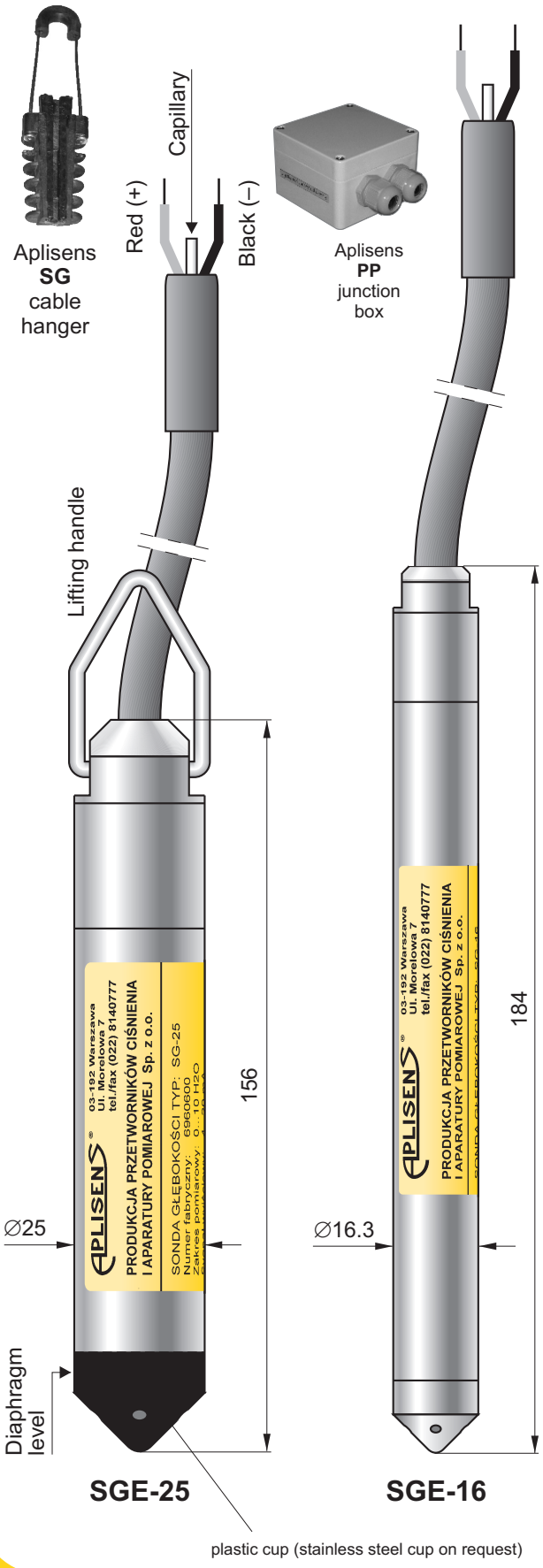
Ordering procedure

Model	Code		Description	
SGE-25.Smart SGE-25S.Smart			Smart level probe	
Versions, certificates	/Exia……		Ⅱ 1G Ex ia IIC T4/T5/T6 Ga/Gb I M1 Ex ia I Ma	
			Ⅱ 1G Ex ia IIB T4/T5/T6 Ga/Gb I M1 Ex ia I Ma	Version with Teflon cable shielding
	/Teflon……		Teflon cable shielding (T=…m)	
	/SGM……		Version with thread on packing gland	
	/Titanium……		Titanium wetted parts	
	/MR……		Marine certificate (DNV)	
Nominal measuring range			Range	Min. set range
	0…1,5 m H2O		0…1,5 m H2O	0,15 m H2O
	0…10 m H2O		0…10 m H2O	0,8 m H2O
	0…100 mH2O		0…100 mH2O	8 m H2O
Measuring set range	/…÷… [required units]		Calibrated range in relation to 4mA and 20mA output	
Cable	L=…m		Cable length	
Accessories		/SG	Cable hanger	
		/PP	Junction box	

Example: SGE-25.Smart probe, Teflon cable shielding, nominal measuring range 0 ÷ 10 m H_2O, set range 0 ÷ 3,25 m H_2O, cable 10 m

SGE-25.Smart / Teflon / 0 ÷ 10 m H_2O / 0 ÷ 3,25 m H_2O / L = 10 m

Hydrostatic level probes SGE-25 and SGE-16



- ✓ **Any measurement range from 1 up to 500 m H_2O**
- ✓ **Integrated internal overvoltage protection circuit**
- ✓ **ATEX Intrinsic safety** Ex II 1G Ex ia IIC T4/T5/T6 Ga I M1 Ex ia I Ma
- ✓ **Marine certificate DNV**

Application

The SGE-25 hydrostatic level probe is applicable to measure liquid levels in tanks, deep wells or piezometers.

The SGE-16 probe is a specialized device designed to measure water levels in narrow diameter piezometers or wells.

Principles of operation, construction

The probe measures liquid levels, basing on a simple relationship between the height of the liquid column and the resulting hydrostatic pressure. The pressure measurement is carried out on the level of the separating diaphragm of the immersed probe and is related to atmospheric pressure through a capillary in the cable.

The active sensing element is a piezoresistant silicon sensor separated from the medium by an isolating diaphragm. The electronic amplifier, which works in combination with the sensor, and is meant to standardize the signal, is additionally equipped with an overvoltage protection circuit, which protects the probe from damage caused by induced interference from atmospheric discharges or from associated heavy current engineering appliances.

Installation, method of use

When lowered to the reference level, the probe may either hang freely on the cable or lie on the bottom of the tank. The cable with the capillary can be extended using a standard signal cable. For the cable connection a special Aplisens **SG** cable hanger is recommended. The cable connection should be situated in a non-hermetically sealed box (the internal pressure inside the box should be equal to the atmospheric pressure), preventing water or other contaminants from getting into the capillary. The Aplisens **PP** junction box is recommended For systems with long signal transmission lines, it is recommended the using of an additional Aplisens UZ-2 overvoltage protection circuit in the form of a wall-mounted box which allows the cables connection. When the probe cable is being wound up, the minimum winding diameter should be 30cm and the cable should be protected from mechanical damage.

If there is a possibility of turbulence in the tank (for example, because of the mixer operating mixers or a turbulent inflow), the probe should be installed inside a screening tube (e.g. made of PVC). If the probe is to be lowered deeper than 100m, the cable should be hanged at steel lifting rope. Cleaning the probe diaphragm by mechanical means is strictly prohibited.

Technical data for the SGE-25 level probe

Measuring range
Any measuring range 1 ÷ 500 m H_2O (the standard ranges: 4, 10, 25, 60, 100 m H_2O are recommended)

	Measuring Range		
	1 m H_2O	**4 m H_2O**	**0...10 m H_2O ÷ 500 m H_2O**
Overpressure Limit (repeatable – without hysteresis)	40 × range	25 × range	10× range (max. 700 m H_2O)
Accuracy % FSO acc. to IEC 60770	0,6%	0,3%	0,2%
Accuracy % FSO acc. to BFSL	0,3%	0,15%	0,1%
Thermal error	Typical 0,3% / 10°C max 0,4% / 10°C		Typical 0,2% / 10°C max 0,3% / 10°C

Long term stability 0,1% or 1 cm H_2O for 1 year
Hysteresis, repeatability 0,05%
Thermal compensation range 0 ÷ 25°C – standard,
-10 ÷ 70°C – special version
Medium temperature range -25 ÷ 40°C – standard,
-25 ÷ 75°C – special version,
-25 ÷ 50°C – for Ex version
CAUTION: The medium must not be allowed to freeze in the immediate vicinity of the probe

Technical data for the SGE-16 level probe

Measurement ranges 10 ÷ 100 m H_2O
Overpressure limit 10 × range
(repeatable – without hysteresis)
Accuracy 0,5%
Hysteresis, repeatability 0,05%
Thermal compensation range 0 ÷ 25°C
Process temperature limit 0 ÷ 40°C

Electrical parameters (applicable to both probes)

Output signal, power supply:

no	Signal type	Power supply	Available in models
1	4 ÷ 20mA	8…36 VDC 10,5…36 VDC (TR version)	SGE-25/…
2	4 ÷ 20mA	9…28 VDC 10,5…28 VDC (TR version)	SGE-25/Exia/…
3	0 ÷ 10V	13…30 VDC	SGE-25/….
4	0 ÷ 3,3V	4,1…14,1 VDC	SGE-25/….
5	0 ÷ 5V 0,5 ÷ 4,5 V	8…14,1 VDC	SGE-25/….
6	4 ÷ 20mA	10,5…36 VDC	SGE-16/….
7	0 ÷ 3,3 V	3,6…4,5 VDC	SGE-16/….

Load resistance (for current output) $R[\Omega] \leq \frac{U_{sup}[V] - 8V}{0{,}02A}$

Load resistance (for supply output) $R \geq 20k\Omega$

Error due to supply voltage changes 0,005% / V

Degree of protection IP68
Material of casing (applicable to both probes) 00H17N14M2 (SS316L)
Material of diaphragm
SGE-25 Hastelloy C276
SGE-16 SS316L
Cable shield (applicable to both probes) POLYURETHANE

Special versions, certificates (not applicable to SGE-16)
- ◊ **Teflon** – Teflon cable shielding
- ◊ **Ex** – Atex Intrinsic safety
- ◊ **-10 ÷ 70°C** – extended thermal compensation range
- ◊ **MR** – Marine certification DNV
- ◊ **TR** – Response time <30ms
- ◊ **Pt100** – Probe with Pt100 sensor (applicable also to SGE-16)

Ordering procedure

SGE-25 /___/___/___/ L = ... m

Special versions:
Teflon, Ex ia, -10 ÷ 70°C,
MR, TR, Pt100
Measuring range
Output signal: (1-5)
Cable length

SGE-16 /___ /___/___/ L = ... m

Special version:
Pt100
Measuring range
Output signal: (6 or 7)
Cable length

Fitting accessories if required: **SG** cable hanger, **PP** junction box

Example 1: SGE-25 level probe / Ex ia version, extended temperature compensation range / measuring range 0 ÷ 2.5 m of fuel oil with density ρ = 0.83 g/cm^3 / cable length 6 m

SGE-25 / Ex ia / -10 ÷ 70°C / 0 ÷ 2.5 m (ρ = 0,83) / L = 6 m