CONDUCTIVE ROD SENSORS FOR LEVEL CONTROL (NS)

In process containers and storage tanks, the level of liquids needs to be detected in order to correct any unwanted changes (evaporation or delay of the process liquid).
There are two types of approaches:

- Level adjustment, to ensure the automatic performance of process sequences (e.g., liquid dosed addition)
- Level control, in order to avoid potential hazards (vacuum or dry operation) for appliances installed in the container (heating, pumps), or to prevent process liquid overflows from the receptacle.

Rod sensors provide high safety in the control and regulation of liquid levels in a vessel.

Since these sensors are passive sensors, they must always be connected to suitable electronic modules.

The sensor operates based on the conductive principle and its operation is guaranteed only with electricity conducting liquids (conductivity >4 µS).

Any hazards of fouling or dirt in the vessel do not normally compromise the functionality of the sensors.
Possible fouling between the sensor tips can be avoided if the length difference between sensors is at least 60 mm.

With non-conductive liquids or a limited conductor power that will not allow these sensors to be used, we recommend you to use our float switches.

The level sensors is available in several builds:

- 2 to 5-rod probe for the detection of 1 to 4 levels
- with or without a built-in temperature sensor

Using suitable electronic modules, a small alternating voltage is applied to the rod of the sensors. The “electrical circuit” runs from the conductive tips of the rods, through the electricity conducting liquid to the reference electrode, the so-called ground rod.

As soon as the liquid level goes below the tip of a rod, the electric circuit is interrupted.
In electronics, these two states are known as “current flow” or “alternating current flow”.

The ground rod must be at least as long as the longest sensor rod. For a distance greater than 1000 mm between a minimum rod and a maximum rod, an additional ground probe must be provided.

In conductive metal vessels, you can give up the ground rod by connecting the ground pole directly to the vessel.
To avoid any contact between the rods, PTFE spacers are applied, at rod lengths of 300 mm.

The sensor can be supplied with the small LC (PP) or LC/L (PVDF) terminal casing and with the large BC (PP) or BC/L (PVDF) terminal casing.
The sensor can be attached to the BC or BC/L terminal block cassette using the HB (PP) or HB/L (PVDF) supports inside the vessel or in crossbars, using the EM or the HM mounting sleeve.

Sensors with an LC or LC/L terminal casing are fixed to the edge of the vessel using the HL (PP) or HL/L (PVDF) supports or in crossbars using the ML sleeve.
To ensure an optimal chemical and thermal resistance, probe rods are made of different materials.

SPECIFICATIONS OF STANDARD MATERIALS				
Code	**Rod**	**Coating**	**Temp. sensor**	**Max temp.**
K	PTFE compound	White PTFE	PFA	100°C
B	Stainless steel 1.4571	White PTFE	PFA	90°C
T	Titanium 3.7035	White PTFE	PFA	90°C

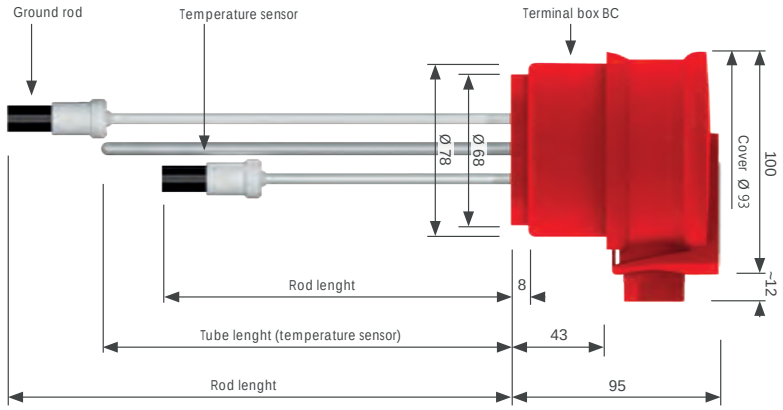
PROBES OVERVIEW

Contact points are determined by the different lengths of the rods and they can be changed later, by cutting to size; except for PTFE rods.

No. of detectable levels	1	2	3	4
Rod no.	2	3	4	5
Rod probe	NS 2	NS 3	NS 4	NS 5
Rod probe with an in-built temperature sensor PT100	NT 2	NT 3	-	-

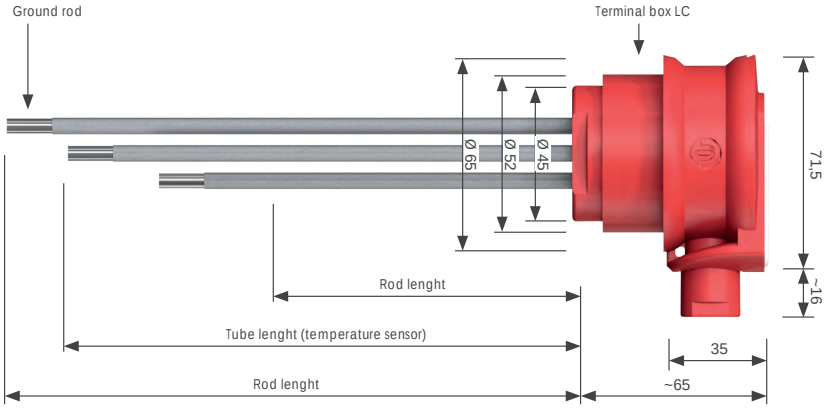
BC OUTPUT

The BC PP terminal casing is used to connect the cable and it has an IP65 protection rating (protected against water jets) according to EN 60529.
At extreme thermal stresses (>80°C) or under if subjected to highly oxidising chemical agents (e.g., chromium electrolytes or HNO3 solutions) the BC/L PVDF terminal casing should be used.
The cable can be connected by unscrewing the cover using the SB mounting key.



LC OUTPUT

The small LC PP or LC/L PVDF terminal casing is used to connect the cable and it has an IP65 protection rating (protected against water jets) according to EN 60529.
The cable can be connected by unscrewing the cover using the SL mounting key.



The sensors, in combination with suitable electronic regulators, ensure high safety in the regulation and monitoring of important process quantities.

CODING

NS - No. of rods - Lenght rods - Output type - Rod material

TABLE FOR THE SELECTION OF CONTROL ELECTRONICS AND MONITORING DEVICES

	NS 2	NS 3	NS 4	NS 5	NT 2	NT 3
Level monitoring	ETS 100	ETS 200	-	ETS 410	ETS 100	ETS 200
Temperature limitation	-	-	-	-	ETB 100	ETB 100
Level adjustment	-	ENR 200	ENR 300	-	-	ENR 200
Temperature control	-	-	-	-	MTR	MTR

ETS/ENR LEVEL ELECTRONICS FOR LIQUID LEVEL ADJUSTMENTS (ETS)

Level electronics, in combination with float switches or rod level probes, allow the adjustment and monitoring of the liquid level. ETS/ENR level electronics work according to the principle of conductive filling level measurement and are made specifically for process liquids in treatment technology of surfaces and in galvanotechnics. Sensitivity can be set gradually according to the conductivity of the process liquid. All level electronics are verified according to EN 61326 in relation to electromagnetic compatibility and comply with functional safety according to SIL 2 as per EN 61508

LEVEL MONITORING

ETS100 electronics are used for monitoring the liquid level as MIN or MAX switching contact. If the maximum required level is exceeded or the level is lower than the minimum set level, the contact switches. If the process liquid level returns to the specified limits, the contact switches again. With ETS 200 electronics, two liquid levels can be monitored in a single tank independently.

LEVEL ADJUSTMENT

The ENR300 level regulator is equipped with a switching relay output for MIN/MAX adjustment. An additional switching contact is available for monitoring another level of the minimum or maximum liquid. The ETS410 level electronic device has four discrete signal inputs and four relay outputs.
In this way, four independent levels can be detected in a single tank and, for example, can be analysed using PLC.
The electrical resistance of the signal inputs is 50V DC. If a higher electrical resistance is required (e.g. with pulsed current generators), the EVG 200 voltage ballast can be used with an electrical resistance of 200V DC. It is connected to each input of its level electronics.
Level electronics and voltage are designed for installation in the electric cabinet on a wall-to-wall mounted DIN-rail rail.

TECHNICAL FEATURES	ETS 100	ETS 200	ETS 410
Code	221.X.000100	221.X.000110	221.X.000120
Level switch points	1	2	4
Contacts (zero potential)	1 switch	2 switches	4 switches
Switching status indicator	1 led	2 led	4 led
Power supply	20...230VAC/DC	20...230VAC/DC	20...230VAC/DC
Switching voltage	< 250VAC	< 250VAC	< 60VDC
Switching current	≤ 5A	≤ 5A	≤ 2A
Test function	si	si	si

INPUT	
Switching delay	3s
Output voltage/current	0,1 ... 6V~ / < 5mA~
Response sensitivity	0,05...100kΩ (10μS...2x104μS) adjustable to 16 levels
Electrical resistance	50 VDC
MECHANICAL BUILD	
Casing material	Polyamide PA 6.6
Fire resistant box	V0 (UL94)
Mounting	on DIN bar (according to EN50022)
Dimensions	b = 22,5mm / h = 111mm / t = 115mm
Protection class	IP20 (according to EN60529)
CLIMATE STRESS	
Ambient temperature	-20 ... 60°C
Storage temperature	-40 ... 70°C
Max. air humidity	< 75% (no condensation))