Capacitive electrode based electronic level controller

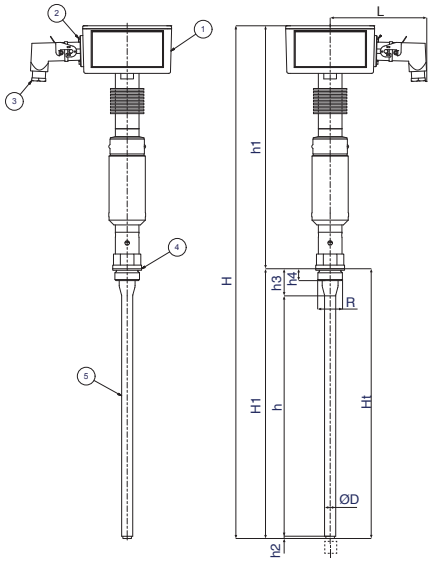
EN ASME/MNPT

This device, when combined with a motorised valve, ensures the continuous control and display of the level, with a high andlow level alarm for; steam and hot water boilers, autoclaves, pre-heaters, pressured vessels, condensation and feedwater tanks, processing, etc.
Applicable to steam boilers in accordance with TRD-602, TRD-604 (24/72 hours) and EN-12953 Part 6 (24 hours).
In accordance with the requirements of the pressure equipment directive 2014/68/EU.
EC controller verification certified by: TÜV Rheinland Industrie Service GmbH, Notified Body for Pressure Equipment ID-No. 0035.
Type (Module B) EC examination report nº DP B EPR 0535132965 certified by: TÜV Rheinland Ibérica ICT, S.A.
Conforms to the low voltage directive 73/23/CE version 93/68/CE.
According to the electromagnetic compatibility directive 2004/108/CE.

Specifications

— The design of the electrodes is technically perfect, achieving total steam-proofing with several sealing points.
— Simple construction eliminating mechanical moving parts, so they require minimum maintenance.
— Materials carefully selected for their resistance to wear, temperature and corrosion.
— Given their solid construction, the electrodes can work under critical pressure and temperature conditions.
— Very easy to connect and adjust for the control points. Since it is a fixed installation it makes any kind of handling much more difficult.
— High level of reliability and safety which allows them, in steam boilers, to work without permanent surveillance.
— By removing unnecessary support equipment and by installing the electrodes directly into the boiler, it achieves a completely maintenance-free control system, with the resulting cash savings.
— Centralised control and possibility of performing complex controls and adjustments.
— All the control units and electrodes are strictly tested and checked.
— Each one of the components is given a serial number, registered and controlled. If requested beforehand, the equipment will come with the certificates for materials, casting and trials.

Direct current electrode. EAC-1.



Description of the electrode

The electrode is a measurement probe that must be handled with extreme care. Avoid any knocks, in particular against the measurement area, which could damage the seal points.
All connections and start-up procedures must be carried out without opening the box (1). Any evidence of unauthorised tampering with the box (1) will void the guarantee.

Operating principle

The electronic level control device is based on the principle of capacitive level.
The rod of the capacitive electrode and the wall of the measurement recipient constitute a condenser. The dielectric medium is air or the corresponding product.
In electrically conductive products, the condenser is comprised of the product and the electrode, the insulating covering of which acts as a dielectric. The capacity of the condenser therefore depends on the level in the electrode. This capacity is measured by applying a high frequency constant voltage to the electrodes.
The high frequency current passing through the condenser is proportional to the capacity. This current is transformed into a signal proportional to the level and equivalent to 4÷20 mA, which later activates an electric element.

Technical information

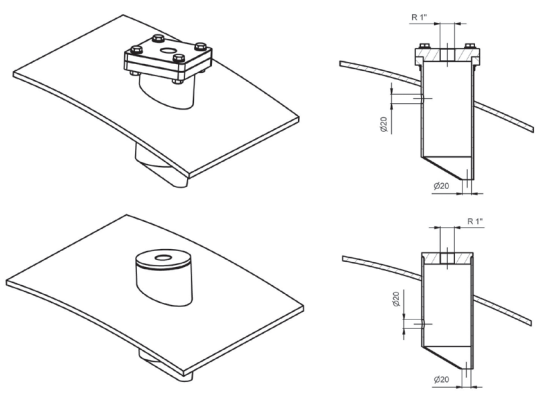
R		1”
CONNECTIONS		Male cylindrical Whitworth Gas Thread ISO 228/1 (DIN-259) NPT thread ASME/ANSI B1.20.1 via adapter. 1” F-GAS to 1” or 11/4” M-NPT
OPERATING CONDITIONS	PRESSURE IN bar	32
	MAXIMUM TEMPERATURE IN ºC	238
MAXIMUM ADMISSIBLE ROOM TEMPERATURE IN ºC		70
DEGREE OF PROTECTION		IP-65 as per EN-60529
PROTECTION AGAINST OVERHEATING IN ºC		102
MINIMUM REQUIRED CONDUCTIVITY IN µS/cm IN WATER AT	25º C	0,5
	238º C	20

EFFECTIVE FIELD OF MEASUREMENT h	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
R	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"
H	694	794	894	994	1094	1194	1294	1394	1494	1594	1694	1794	1894
H^1	365	465	565	665	765	865	965	1065	1165	1265	1365	1465	1565
h^1	329	329	329	329	329	329	329	329	329	329	329	329	329
h^2	26	26	26	26	26	26	26	26	26	26	26	26	26
h^3	31	31	31	31	31	31	31	31	31	31	31	31	31
h^4(1)	16	16	16	16	16	16	16	16	16	16	16	16	16
Ht 238°C	373	477	583	688	794	899	1004	1110	1214	1319	1423	1528	1636
D	15	15	15	15	15	15	15	15	15	15	15	15	15
L	129	129	129	129	129	129	129	129	129	129	129	129	129
WEIGHT IN kgs.	0,85	0,90	0,95	1,01	1,07	1,12	1,18	1,23	1,28	1,34	1,39	1,45	1,50
CODE 2104.276-	71001	71002	71003	71004	71005	71006	71007	71008	71009	71010	71011	71012	71013

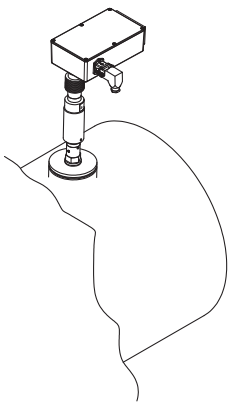
(1) With NPT adapter, h4=43 mm.

Installing the capacitive electrode

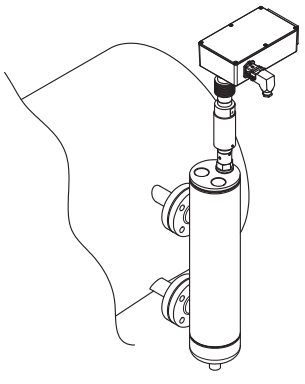
Danger!: Make absolutely sure that the connection area is free of pressure and is cold before proceeding with the assembly of the capacitive electrode.
Before installing the capacitive electrode, clean the measurement coating (5) with the aid of a clean, slightly damp cloth. The measurement coating (5) must be completely free of any oil or grease. After placing the washer (4) in position, screw the capacitive electrode home manually and then tighten with a spanner to a torque of 160 Nm.



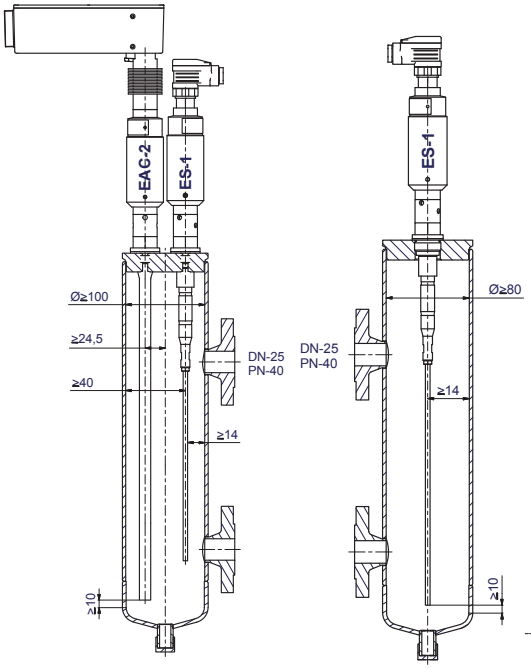
Examples of unions. Interior of the boiler body.



Examples of installation on the boiler body.



Examples of installation on a collector.



Warning!: Only stainless steel washers (4) should be used.
Use a new washer (4) for each assembly operation.
The upper part of the hexagon must not be embedded in the boiler insulation.

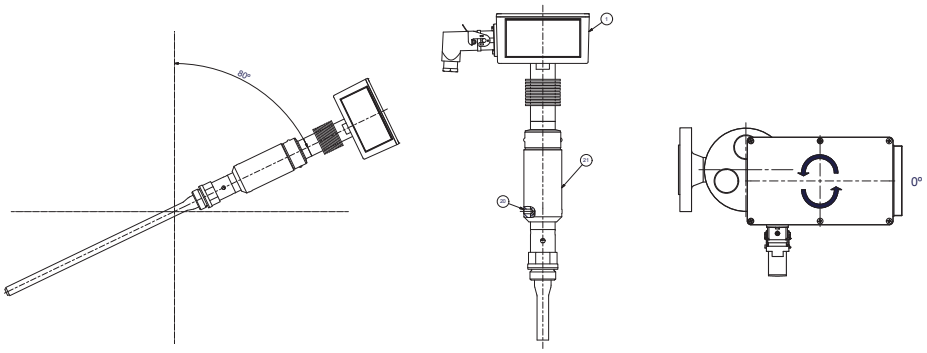
The capacitive electrode may be installed either vertically or inclined, with the measurement coating (5) facing downward. The inclined position should not exceed 80º from the vertical.

The measurement coating (5) must be absolutely parallel to the metal wall of the recipient, collector, baffle or metal rod that acts as a condenser.

If the EAC-1 capacitive electrode is to be assembled on a collector with VYC Mod. 176 connection electrodes combined with EN-1 level or ES-1 safety electrodes, remove the heads of the latter so as not to hamper assembly or dismantling of the EAC-1 capacitive electrode.

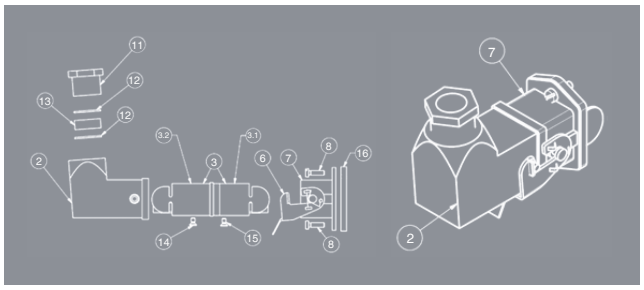
Collector connection for electrodes Mod. 176 is valid up to an effective measurement field of h = 400 mm (See catalogue Mod. 176).

The box (1) may be turned through 360º. Loosen the bolts (20), position the box (1) as desired by turning the protective tube (21) and re-tighten the bolts (20). We recommend proceeding with extreme care in order to note any unlikely abnormality in the internal connections.

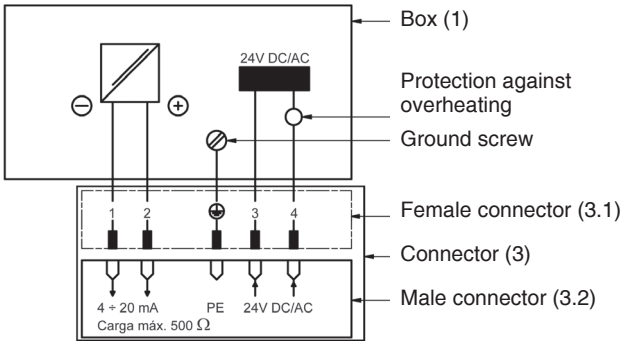


Connecting the electrode

The power supply to the electrode should be 24 V DC/AC via a safety power supply, in compliance with EN-61558 and EN-60950, duly protected against current surges according to EN-61010.



Electrical connection	Connection box for 5-pole electric cable, each conductor with a cross section of 0,75 mm2.
Maximum cable length	50m.
Power supply voltage	24 V DC/AC
Power consumption	5 VA
Output	4÷20 mA in proportion to the fill level, without voltage, maximum load 500 ý.



Turn the locking lever (6) and loosen the screw (14), take out the connector body (2). You will then have access to the interior.
To simplify connection, the connector (3) may be unplugged from both male (3.2) and female (3.1) sides.
Run the wire through the gland nut (11), the gland ring (12) and the seal (13). Set the ends at No. 1, 2, 3, and 4, and the fifth to earth (⏚). Tighten the gland nut (11). Select the right position for the connector body (2) and lock it into the support (7). Fasten it using screw (14) and locking lever (6).

Warning!: During the assembly process, make sure that the washers (16) and (17) remain in their original position. If not, position them correctly.
Important!: The screen should always be placed in the RAC-1, 2 or 3 direct current regulator.

Starting the unit
De todos es conocido que el politetrafluoretileno (PTFE) se dilata bajo alta temperatura. Efectuar un chequeo de cada electrodo capacitativo a la puesta en marcha y después de cualquier manipulación. Únicamente un resultado satisfactorio permite instalar los electrodos capacitativos en la caldera y poner esta en funcionamiento.

Adjusting the measurement range: High and low point
Before starting the unit for the first time, make absolutely sure that all electrical connections have been made as indicated in the wiring diagram and check that the power supply voltage is the same as that appearing on the identification plate.

7.1. Adjust the low measurement point (4 mA corresponds to 0%).

1. Use the feed pump to fill the steam generator or tank with liquid up to the lowest measurement point. From this point on, we refer only to a generator, but the procedure is the same for any other compatible piece of equipment.
In steam generators the lowest measurement point corresponds to a water level that shows approximately 1 cm on the glass of the level indicator. This point is below the minimum water level in the generator and so this level must be exceeded for the burner to start.

2. Set the generator to the working pressure on the manometer. As the water heats it expands and the level rises. Once the working pressure is reached, use the drain cock to adjust the water level to the lowest measurement point.

3. Disconnect the burner and use the bleed valve to reduce the water level to 1 cm on the glass of the level indicator. This point is 0% or the minimum adjustment level.

4. Remove the plug (17) and use a screwdriver to turn the potentiometer (18) until the output signal is 4 mA or the RAC- regulator shows 0%. The low measurement point is now adjusted.

Maintenance
We recommend exhaustive cleaning of the capacitive electrode according to the working conditions. The recommended interval between cleanings should not exceed 6 months.
To remove the capacitive electrode, we must first cut off the power supply and separate the male connector (3.2) from the female connector (3.1), proceeding as in point 5.

Danger!: Make absolutely certain that the connection area is free of pressure and is cold before proceeding to dismantle the capacitive electrode.

Troubleshooting
Any leak around the washer (4) can usually be resolved by tightening it. If this does not solve the problem, replace the washer (4) with a new one.

Transport and storage
All our products are suitably packed for complete protection during transport to any destination.
Store the devices in their original packaging,
Do not expose electronic level control devices to temperatures below –40º C or above +80º C.
Avoid all knocks and vibrations.
Protect electronic level control devices against humidity and its effects. (Humidity < 60%).
The storage site must be clean and dust free.
Prevent electronic level control devices from undergoing temperature changes of more than 10º C/hour during storage or transport.

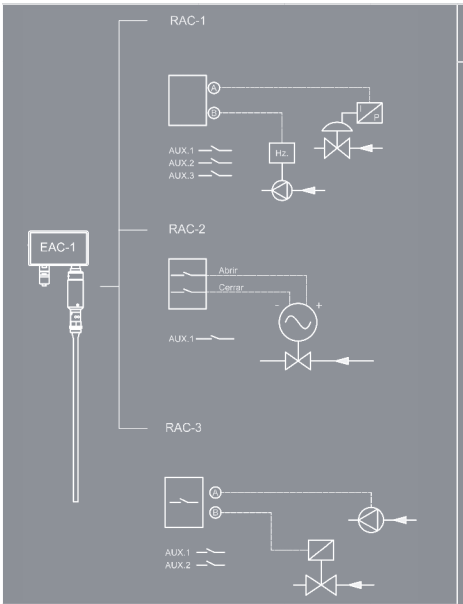
Warning!: In the event of any damage to the packaging, immediately notify the carrier in writing and request a receipt.

Direct current regulators. RAC-1. RAC-2. RAC-3.

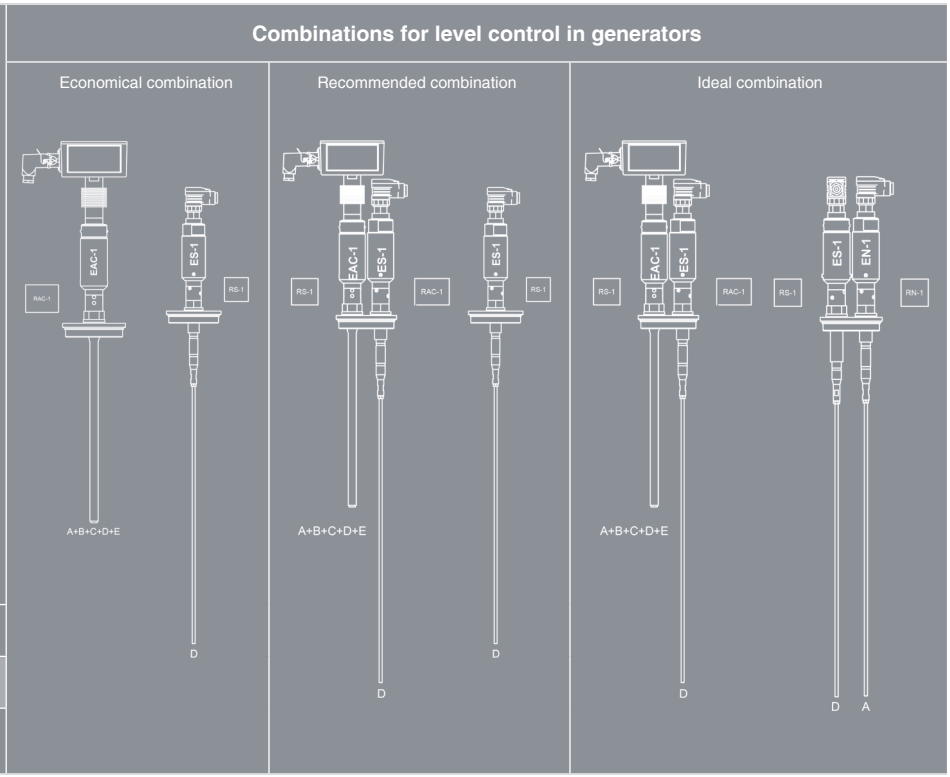
Direct current regulator. RAC-1.
PID Control output 4÷20 mA for operating a pump motor frequency control or a pneumatic valve.
Three auxiliary relays are available for additional functions.

Direct current regulator. RAC-2.
PID Control for operating a motor-driven valve.
An auxiliary relay is available for additional functions.

Direct current regulator. RAC-3.
Stop-start control for operating a feed pump or solenoid valve.
Two auxiliary relays are available for additional functions.



MODEL	RAC-1	RAC-2	RAC-3
WEIGHT IN kgs.	0,4		
CODE 2104.276-	0001	0002	0003



Functions **A- Maximum safety level.** **B- Pump stop.** **C- Pump starts.** **D- Minimum safety level.** **E- Other.**

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