Instructions for Installation and Maintenance

Automatic TDS Systems
T2, D2, L2 and H2

General
These instruction notes give guidelines for the installation, operation and maintenance of automatic TDS control systems T2, D2, L2 and H2.

The systems comprise of a conductivity electrode type LRG16-4, LRG17, LRG19 or ERL16-1 used with a controller LRR1-12.8 for control of an electrically actuated control valve Type MV5291.

Design and Operation
The electrode tip is positioned so that it senses the boiler water condition and can take a direct measurement of total dissolved solids (TDS). When the TDS is higher than the value set in the controller, the motorised continuous blowdown valve is motored to its adjustable high flowrate position. When the TDS drops below the value set in the controller, the valve returns to the closed position on systems T2 and D2.

On systems L2 and H2 the valve returns to its low flowrate position and on boiler shutdown the continuous blowdown valve is closed. At start-up, the valve is motored open to purge the system and to set up a flow past the electrode. At the end of a two minute time delay the system starts to control the TDS.

The system can cope with all boiler operating conditions from standby to full load and with varying feedwater qualities.
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Installation of the Electrode

General
The ring joint supplied with the electrode should be used to ensure a tight seal and electrical conductivity between the electrode and its mounting. The use of graphite sealing compound is recommended. Do not use PTFE tape as this may inculate the electrode body from earth.

The internals of the electrode terminal box housing may be dismantled and reassembled rotated by 90° or 180° to ensure that the cable gland points in the most convenient direction.

Screw clamps terminal box to electrode head.

Cover

Cable gland Pg11 for circular cables 6-10mm diameter.

Terminal box housing.

Terminal block may be rotated relative to housing.

Sealing washer. Electrode head.

Top view of terminals.

Figure 2

Electrode LRG16-4 Installed in a Tee-Piece. System T2.
The tee-piece is specially designed for installation on a side connection of the boiler so that a single 15mm (½”) or larger connection may be used both for conductivity sensing and for the take-off point for the blowdown.

Screw the 3/8” RSP LRG16-4 electrode into the tee-piece, assemble as shown in figure 3 and measure the electrode length required so that the electrode tip will not be more than 25mm shorter than the boiler standpipe and not closer than 25mm to any boiler tubes or support stays. If necessary the electrode may be cut with a fine hacksaw and should be finished as in figure 4.

Boiler

Side connection of boiler

25mm max

Tee piece Electrode LRG16-4

Tip at least 25mm from tubes

Discharge to blowdown valve. Discharge may point upwards, horizontal or downwards

Figure 3

Cut back PTFE sleeving by 12mm approx.

PTFE sleeving

Threaded electrode

Screw stainless steel tip into PTFE tip until flush then screw assembly onto threaded electrode.

PTFE tip

Figure 4

New thread M5 x 0.8

Packing pieces

Vice jaws

PTFE sleeving

Figure 5

The electrode has a small diameter (10mm) tip and 3/8” BSP connection and is therefore ideal for installation in the boiler shell through any small connection including a sampling or air-cook connection. Ensure that the final position of the electrode tip is at least 100mm below the 1st low alarm water level and at least 40mm above or at least 25mm to one side of any boiler tubes or support stays.
The electrode may be cut with a fine hacksaw.

Electrodes of length 300mm may be shortened back to 100mm without re-threading the electrode tip. Longer electrodes have only a short thread so if the electrode has to be cut, the PTFE sleeving must be cut back by 12mm as shown in figure 5 and a new thread cut (M5 x 0.8).

Take care when re-threading that the electrode does not rotate in the electrode body, otherwise the internal wiring may be damaged. In order to avoid damage to the PTFE when re-threading, clamp only on the stainless steel electrode not on the PTFE sleeving.
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Controller type LRR1-12STD with digital display
Electrically actuated continuous blowdown
Isolating valve
From side or bottom boiler connection
Conductivity sensing electrode type ERL16-1
\( \frac{1}{4} \)" BSP in flange EF1
Non-return valve type RK66
To optional sample cooler
System L2

High and Low TDS Alarms
0/4-20mA output for energy management systems
Continuous blowdown to heat recovery system, blowdown receiver or blowdown pit

Controller type LRR1-12STD with digital display
Electrically actuated Continuous blowdown valve
High pressure conductivity sensing electrode ERL16-1H in high pressure tee-piece for boiler pressures up to 64 bar (930 psi). For direct mounting in boiler shell LRG17 & LRG19 for boiler pressures up to 60 barg (870 psig) at 257°C.
Sample valve
Tee-piece and continuous blowdown valve also available butt-weld
To optional sample cooler
System H2

Electrode ERL16-1 in the Continuous Blowdown Line. System L2.
The isolating valve should be mounted as close to the boiler water take-off point as possible. The \( \frac{1}{4} \)" BSP electrode in a special mounting flange should be installed in the continuous blowdown line between the isolating valve and the continuous blowdown valve. Ensure the electrode is mounted well away from the isolating valve (approximately 3m) to prevent flash steam bubbles affecting the sensing electrode and that there is a length of flanged pipe between the electrode mounting flange and the continuous blowdown valve.
Install the mounting flange in a section of horizontal pipework with the electrode horizontal as shown in figure 7.

Electrode LRG17 or LRG19 Installed in the Boiler Shell. Electrode ERL16-1H in a High Pressure Tee-piece. System H2.
The electrodes LRG17 and LRG19 are available for installation horizontally in the boiler shell. The electrode ERL16-1H is for mounting horizontally in a high pressure tee-piece.
If installed in the boiler ensure that the final position of the electrode tip is at least 100mm below the first low alarm water level, and at least 40mm from any boiler tubes or support stays.
Assemble the ERL16-1H electrode as follows:
1. Check that the coupling sleeve is tightened onto extension tip and has been pressed into the flat on the extension tip.
2. Screw extension tip onto electrode body.
3. Using a small punch, for example, as a tommy bar to prevent rotation of the tip in the electrode body, tighten the coupling sleeve.
4. With a pair of pliers or diagonal cutters, press the end of the coupling sleeve into the flat to prevent it unscrewing.
5. Place the locking spring through the holes as shown in figure 8 and slide the PTFE insulating sleeve over the coupling sleeve and locking spring. Press the insulating sleeve firmly home until it reaches its stop.

Figure 6

Figure 7
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Commissioning the Controller

To be read in conjunction with Installation and Maintenance Instructions Data Sheet LRR 1-12 8010 for controller LRR 1-12

Before applying power to the controller, check that the voltage selector is in the correct position. Select the required range 0-999 or 0-9999 ppm or µSiemens/cm.

Take a sample of boiler water and check the TDS by your normal method.

If mode selector switch 4 is on, wait for at least two minutes after switching on the controller. With the boiler operating at normal pressure and with power on to the controller, adjust the calibrate until the TDS display reads the same as the actual boiler water TDS. Now adjust the set point until the TDS display indicates the desired setting (say 3000ppm or µSiemens/cm).

When the TDS is above the set point the open light should come on and the valve should motor to its high position. Set high and low limits to desired level.

Whenever you take a sample and measure the boiler water TDS check the value against the display. If the boiler pressure is normal and the readings differ, you may simply re-adjust the calibrate until the display indicates the actual boiler water TDS.

Where chemical dosing is well controlled and proportional to the feed rate, boiler water alkalinity should be constant and only infrequent calibration should be necessary. Should it be used, ‘Slug Dosing’ and the large alkalinity changes it causes will affect the conductivity of the boiler water.

Under these conditions some variation between the TDS display and independent TDS measurement must be expected. Other factors which can affect the displayed TDS reading include a change in boiler pressure, a large change in the type of impurities in the boiler water (due to condensate contamination, or a change in water treatment chemicals for example) or if the initial calibration was carried out well away from the desired TDS.

If scale does form on the electrode tip it is always a warning of scale formation on the boiler tubes. Investigate without delay.