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1 Scope of the Operating Instructions

These Operating Instructions contain basic information. They apply in combination with the following operating instructions:

- A002 Basic Safety Instructions
- B001 Checklist for shell steam boilers
- B002 Guideline on water characteristics for steam boilers plants

For the operation of the system as a whole, the operating instructions for the individual components are binding along with the relevant statutory provisions and official requirements.

2 Use in Accordance with Regulations

The conductivity transducer must only be used in conjunction with the boiler manufacturer's evaluation unit to measure the electrical conductivity of boiler water in shell boilers (steam and hot water boilers) with a conductivity of at least 50 $\mu\text{S}/\text{cm}$.

3 Safety

Please read the Operating Instructions:

- A002 Basic Safety Instructions
- Depending on the installation situation and the location of the pressure equipment, a separate evaluation must be made if necessary of the hazard risk from external fire and from exposure to traffic, wind and earthquakes.

4 Operating and maintenance staff

Please read the Operating Instructions:

- A002 Basic Safety Instructions

5 General Risks and Accident Prevention

Please read the Operating Instructions:

- A002 Basic Safety Instructions

6 Description of Structure and Function / Description of Process

6.1 Function

NOTICE

Only the complete system, consisting of the conductivity transducer and the boiler manufacturer's appropriate evaluation unit (both of which are mandatory within the scope of delivery by the boiler manufacturer), is allowed to be used as the conductivity monitoring device or demineralisation controller (see Operating instructions K006 for demineralisation control valve), or with the quick acting blowdown valve (see Operating instructions K005 for quick acting blowdown valve).

If the evaluation unit is provided by the builder (irrespective of the type), this will invalidate the approval certification! Operating the boiler without approval certification is not permitted.

The CST 4 conductivity transducer is a compact instrument consisting of a conductivity measurement electrode, integrated temperature sensor for recording the medium temperature and a conductivity transmitter. The instrument operates according to the principle of conductometric four-electrode measurement and provides a measuring current of 4-20 mA proportional to the conductivity.

The conductivity transducer consists of two current and two voltage electrodes. A measuring current with a fixed frequency is introduced into the medium by the current electrodes. A potential gradient occurs between these electrodes. This potential gradient is picked up by the voltage electrodes and evaluated as measurement voltage.

As the electrical conductivity changes with the temperature, the electrical conductivity measurement must be referenced to a common reference temperature (25 °C) . To do so, the actual temperature of the medium is measured via a resistance-type thermometer integrated into the conductivity transducer and the electrical conductivity calculated from the measurement current and measurement voltage is subsequently converted to the reference temperature of 25 °C by means of temperature compensation.

The conductivity transducer can be used to measure the electrical conductivity in electrically conductive liquid media with a conductivity > 50 µS/cm.

The conductivity transducer is to be used in steam boilers with the evaluation unit supplied by Bosch (programmable controller or the automatic devices within the BCO/SCO boiler/system control - see the corresponding operating instructions in Index H) for the purpose of conductivity monitoring and demineralisation control in conjunction with the demineralisation control valve (see Operating instructions K006 for demineralisation control valve), or with the quick acting blow-down valve (see Operating instructions K005 for the quick acting blow-down valve).

6.2 Overview diagram

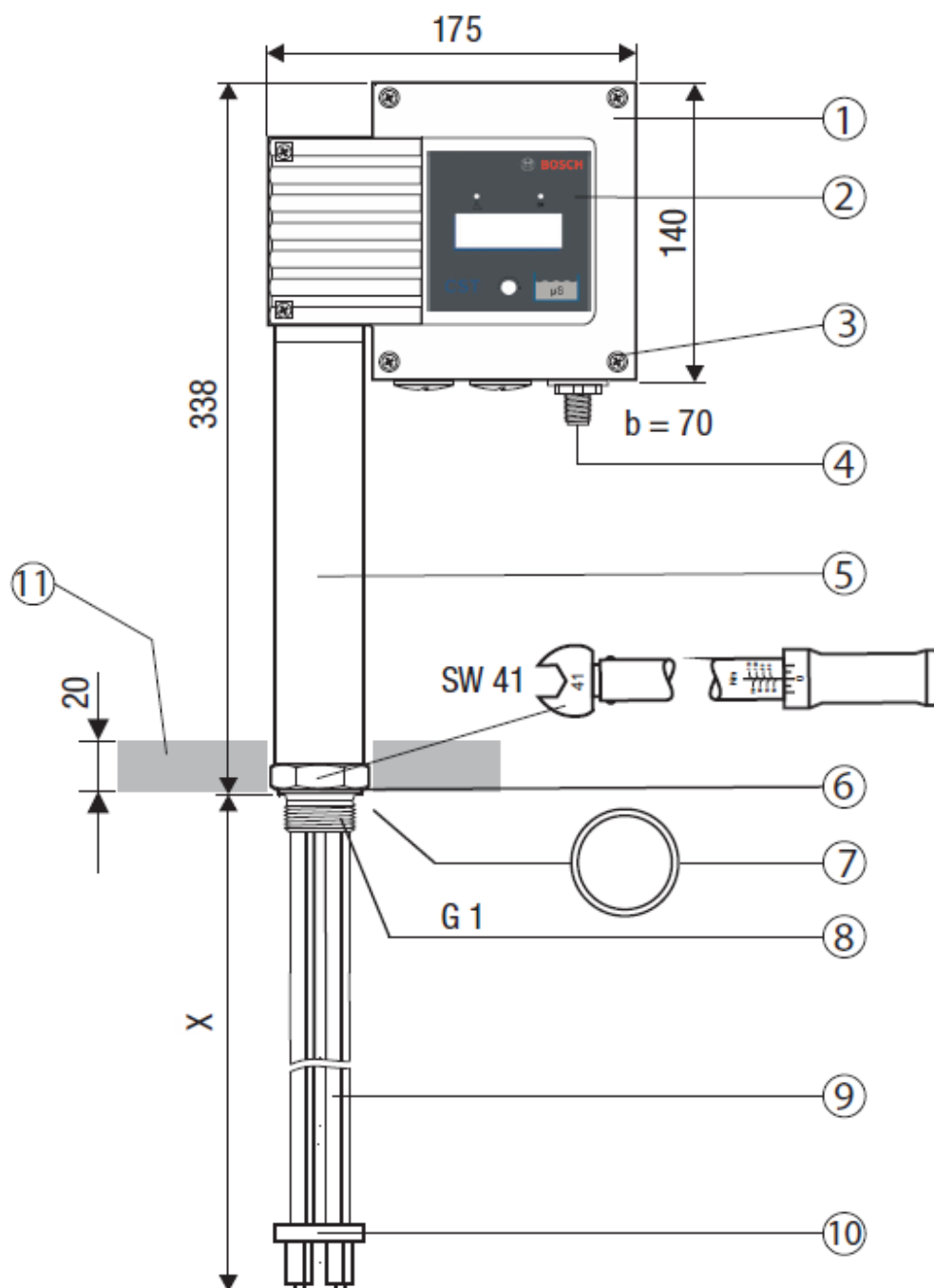


Fig. 6-1 Conductivity transducer consisting of electrode part and terminal enclosure

Conductivity transducer

Type CST 4

Legend for *Fig. 6-1 Conductivity transducer consisting of electrode part and terminal enclosure*:

Position	Description
1	Terminal enclosure (depth b = 70 mm)
2	Control panel with 4-digit LCD display, alarm LEDs and rotary transducer
3	Cover screws M4 x 16 mm
4	M12 plug, 5-pin, A-coded
5	Cover pipe
6	Sealing seat for sealing ring
7	Sealing ring: – DIN 7603, Form A, 33 x 41 x 2, material copper – Alternative: DIN 7603, form A, 33 x 41 x 2, 1.4571, X6CrNiMoTi 17-12-2
8	Electrode thread, thread G1 A, EN ISO 228-1
9	Measuring electrodes
10	Spacer (outer diameter: 30 mm)
11	Thermal insulation
X	Fitting length of electrode

7 Technical Data (Dimensions, Weight, Operating Conditions)

The rating plate of the conductivity transducer is located on the terminal enclosure of the instrument (see *Fig. 6-1 Conductivity transducer consisting of electrode part and terminal enclosure*). The production date (quarter and year) is stamped on the screw-in housing of every conductivity measurement transducer.

The serial number of the instrument appears on the type plate (below the printed bar code).

Operating pressure:	32 bar at 238 °C
Test pressure:	60 bar
Mechanical connection:	Thread G 1 A, EN ISO 228-1
Materials:	Terminal enclosure: 3.2581, G AlSi12, powder-coated Cover pipe: 1.4301, X5CrNi 18-10 Screw-in housing (electrode thread): 1.4571, X6CrNiMoTi 17-12-2 Measuring electrodes: 1.4571, X6CrNiMoTi 17-12-2 Electrode rod insulation: PTFE Spacer: PEEK
Measurement and fitting length X:	Available as standard: 180 mm or 380 mm Available on request: 300 mm, 500 mm, 600 mm, 800 mm, 1000 mm
Temperature sensor:	resistance thermometer Pt 1000 (measurement range 0-280 °C)

Conductivity transducer

Type CST 4

Cell constant C: ^{A)}	pre-programmed individually at the factory, can subsequently be adjusted (by boiler manufacturer's service department or by specialist personnel authorised by the boiler manufacturer) via rotary transducer in the control panel (setting range 0.010 – 5.000)
Electrical connection:	M12 plug, 5-pin, A-coded
Safety class:	III separated extra-low voltage (SELV)
Protection class:	IP 65 acc. to DIN EN 60529
Permissible ambient temperature:	0 - 70 °C
Supply voltage:	24 V DC +/-20 %
Power consumption:	max. 7 VA
Current consumption:	max. 0.35 A
Internal fuse:	T 2 A
Protection in the event of excess ambient temperature:	Switch-off takes place at an ambient temperature of 75 °C
Measuring cycle:	1 second
Accuracy: ¹⁾	<u>Area 1: 10 – 100 µS:</u> Measurement deviation: 2 %, non-linearity 2 % <u>Area 2: 100 – 2000 µS:</u> Measurement deviation: 2 %, non-linearity 1.5 % <u>Area 3: 2000 – 50000 µS:</u> Measurement deviation: 2 %, non-linearity 1 %
Temperature compensation:	linear, parameter "tC" adjustable (by boiler manufacturer's service department or by specialist personnel authorised by the boiler manufacturer) via rotary transducer in the control panel. Setting range: 0.00 ... 3.000 %/°C, default setting: 2.10 %/°C
Time constant T: ²⁾	Temperature: 11 seconds Conductivity: 19 seconds
Weight:	Approx. 2.1 kg

¹⁾ based on the conductivity measured without temperature compensation

²⁾ measured using the two-bath method

A) From serial number 234626 the factory default for CF can found on the measurement range sticker ("Range") on the side of the terminal housing opposite the type plate.

Conductivity measurement ranges/actual value output	Measurement ranges (µS/cm at 25 °C)	Power output (mA = µS/cm)	
Can be adjusted via rotary transducer in the control panel by the boiler manufacturer's service department or by specialist personnel authorised by the boiler manufacturer). Maximum load for the actual value output: 500 ohms.		4 mA corresponds to	20 mA corresponds to
	50 – 3000	50	3000
	50 – 5000	50	5000
	50 – 7000	50	7000
	50 - 9999	50	9999

8 Transport and Storage

8.1 General notes on transport

Measurement and control devices are sufficiently protected and packed for transport at the factory. Please note the following instructions:

- Under no circumstances should the devices be exposed to temperatures below -40 °C or above +80 °C.
- Avoid vibrations if at all possible.
- Always protect the devices from wetness and humidity effects.
- If packaging damage is noticed on delivery, the carrier should be informed of this damage. When handing over the goods, the freight carrier has to confirm in writing on the receipt that the packaging is damaged.
- Should you find any damage after unpacking the equipment, please contact the manufacturer immediately.

8.2 Interim storage

- All equipment should be stored in the original packing.
- Store in dry (humidity < 60 %), dust-free conditions.
- Temperature fluctuation in the store room < 10 K/h.
- Under no circumstances should the devices be exposed to temperatures below -40 °C or above +80 °C.

9 Assembly



The connection housing is screwed to the electrode part using a self-locking fixing nut. In front of the electrical connection, the connection housing can therefore be turned by max. +/- 180° in the direction required (cable outlet). This work must only be carried out by service personnel or specialist personnel who have been specifically authorised to carry out work of this nature by the boiler manufacturer.



If the transducer cannot be installed or removed due to collision with the platform structure or other on-site components, the terminal housing can be detached from the electrode part. In this case the transducer may only be installed or removed by the boiler manufacturer's service department or contractors specifically authorised by the boiler manufacturer to perform this work.

9.1 Special safety instructions for assembly

The measuring transducer is to be supplied from a safety power supply unit according to DIN VDE0570 / EN61558 and EN60950 (safe separation) with 24 V DC. The power supply unit is to be protected by an overcurrent protective device in accordance with DIN EN 61010-1/VDE 0411.

9.2 Installation of the measuring transducer



DANGER

Severe scalding injuries are possible. The installation of transducers is only permitted when it is guaranteed that the boiler or system in which the transducer shall be installed is unpressurized and has cooled down sufficiently.

NOTICE

The measuring electrode of the transducer must not under any circumstances be shortened.

NOTICE

The measuring chamber must be installed in such a way, that it is always immersed in the medium. A minimum clearance of 60 mm must be maintained between the measuring surface and the smoke tube or the wall of the boiler or container. Installation directly above the flame tube is not permitted. The sealing faces of the threaded port or flange cover must be processed in technically faultless manner. The terminal enclosure and cover pipe must lie outside the thermal insulation. The screw-in thread must only be sealed with the supplied sealing ring, and under no circumstances with hemp or PTFE tape.

NOTICE

Observe the mounting instructions in the Operating Instructions E023 Measurement Chamber for Conductivity Transducer when installing the conductivity transducer in a measurement chamber!

The conductivity transducer must be installed in a port (threaded nozzle or flange cover) on the boiler side. In this case the gauge point must be in the area in which the highest conductivity is anticipated. Boiler water must also be continually circulating around this area.

Tools required: Open-ended spanner SW41.

- Check sealing surfaces on threaded connectors or flange covers, clean if necessary.
- Check that the spacer is seated correctly (also see Fig. 9-2 To make this clear, the illustration on the left shows the incorrectly seated spacer and the illustration on the right shows the correctly seated spacer).

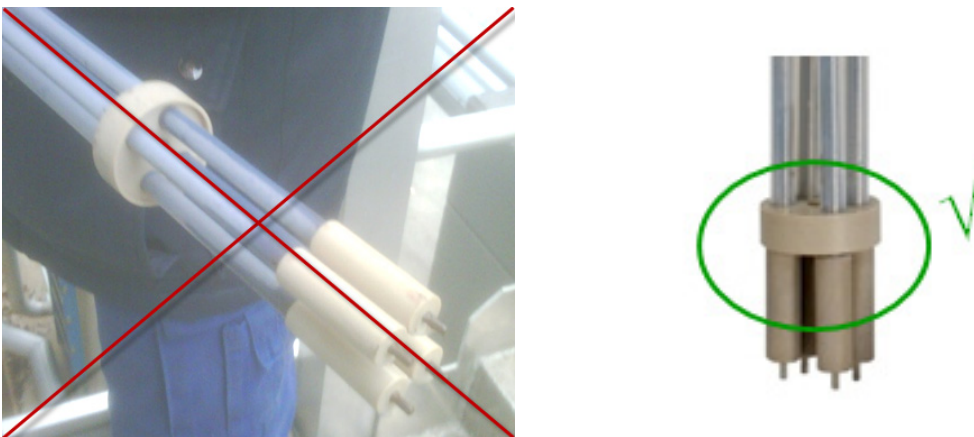


Fig. 9-2 To make this clear, the illustration on the left shows the incorrectly seated spacer and the illustration on the right shows the correctly seated spacer

- Fit the enclosed sealing ring on the seal seat of the conductivity transducer. The enclosed sealing ring DIN 7603, Form A, 33 x 41 x 2, material copper must be used. As an alternative, a sealing ring made of the material 1.4571, X6CrNiMoTi 17-12-2 can be used to achieve the required water quality (e.g. dosing of ammonia).
- Coat the screwing in thread with a small quantity of assembly paste (e.g. HT Optimol).
- Screw the conductivity transducer into the threaded nozzle or flange cover and tighten with an open-ended spanner WAF 41. The tightening torque with sealing ring DIN 7603, Form A, 33 x 41 x 2, material copper, when cold is 150 Nm (or alternatively with sealing ring DIN 7603, Form A, 33 x 41 x 2, 1.4571, X6CrNiMoTi 17-12-2, the tightening torque when cold is 250 Nm). The screw-in thread must correspond to DIN 3852 Part 2, G 1, DIN ISO 228, Form X or Y.

9.3 Removal of the measuring transducer



DANGER

When removing the measuring transducer steam or hot water may leak under high pressure. Severe scalding injuries all over the body may be the consequence! Only dismount transducers when it is guaranteed that the boiler or system containing the transducer is unpressurized and has cooled down sufficiently.



DANGER

When the conductivity transducer is hot it can inflict severe burns. The conductivity transducer is very hot when in operation. Always allow the conductivity transducer to cool down before carrying out installation and maintenance work on it. Always allow the conductivity transducer to cool down before removing it.

Tools required: Open-ended spanner SW41.

- Switch off the power supply.
- Disconnect the cable connection / M12 plug from the transducer.
- Remove the measuring transducer with the open-ended spanner SW 41.

10 Electrical Installation



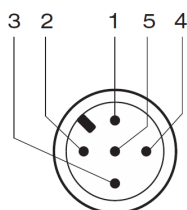
The connection housing is screwed to the electrode part using a self-locking fixing nut. In front of the electrical connection, the connection housing can therefore be turned by max. +/- 180° in the direction required (cable outlet). This work must only be carried out by service personnel or specialist personnel who have been specifically authorised to carry out work of this nature by the boiler manufacturer.

NOTICE

Only the complete system, consisting of the conductivity transducer and the boiler manufacturer's appropriate evaluation unit (both of which are mandatory within the scope of delivery by the boiler manufacturer), is allowed to be used as the conductivity monitoring device or demineralisation controller (see Operating instructions K006 for demineralisation control valve), or with the quick acting blowdown valve (see Operating instructions K005 for quick acting blowdown valve).

If the evaluation unit is provided by the builder (irrespective of the type), this will invalidate the approval certification! Operating the boiler without approval certification is not permitted.

The electrical connection with the conductivity transducer is established via the 5-pin M12 plug fitted on the transducer. The pin assignment of the plug on the conductivity transducer is shown in the figure "Pin assignment of plug". A flexible, shielded control line with a minimum cross-section of 0.75 mm² must be used as the connecting cable. The maximum cable length is limited by the maximum load (resistance) that can be operated by the power source, and can be no longer than 150 m with a cross-section of 0.75 mm² or more.



- 1 -20 mA data cable
- 2 +20 mA data cable
- 3 24 V power supply
- 4 0 V power supply
- 5 S Shield (screening)

Fig. 10-3 Pin assignment of plug

NOTICE

The cable shielding (cable between transducer and destination device - normally the terminal box on the boiler) must be connected at both ends. The shielding on the transducer side can be provided by a metal shielded mating connector, or alternatively by connecting the PIN no. 5 (S Shield (shielding)).

11 Start-up



Initial commissioning, or re-commissioning after exchanging the transducer or terminal enclosure of the transducer, may only be performed by the boiler manufacturer's service department or by contractors expressly authorised by the boiler manufacturer.

12 Operation

For normal operation, in addition to the inspections listed in the chapter "Maintenance and Care", comparison measurements must be regularly carried out (every 3 days) using samples taken at the desalting control valve (see operating instructions K006 for desalting control valve).

If deviations occur, read the chapter "Measures in the event of unusual observations and operating faults".

12.1 Function Test

For the function test, please read the Operating Instructions of the connected evaluating device:

- H009 Digital controller KS90-1
- G350 Conductivity control
- G351 Conductivity control via quick shut-off blow-down valve

12.2 User interface

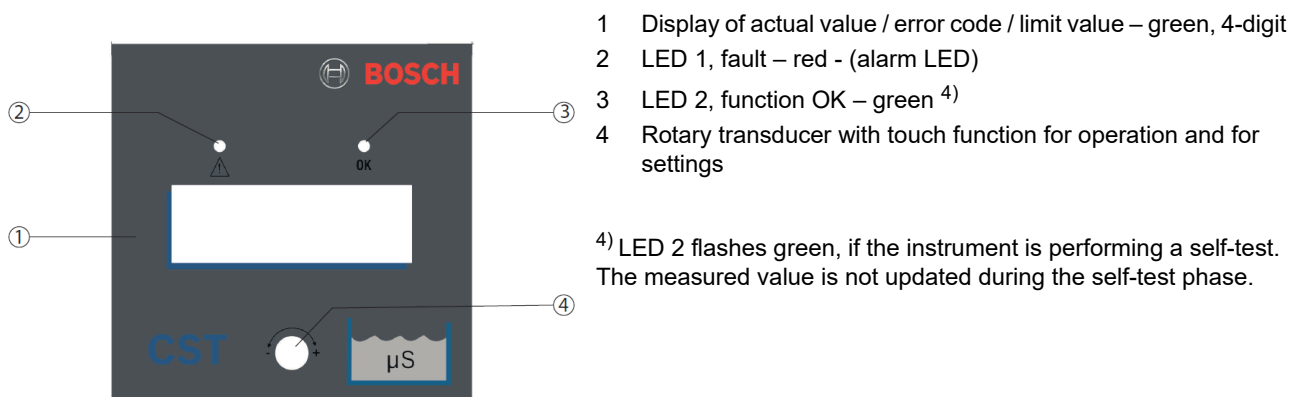


Fig. 12-4 User interface

The display shows the value measured for conductivity (4-digit) during normal operation, e.g. 1550, and converts this value according to the preset measurement range (see 12.2.1 Function of the rotary transducer – "Scout" parameter) to a current signal of 4-20 mA. Once an appropriate measurement range has been selected, plausible measurement signals can be expected as soon as the installation is complete.



Fault messages are displayed according to their priority. Messages with a higher priority are always displayed before messages with a lower priority. If several messages are pending, the individual messages are not displayed alternately.

Conductivity transducer

Type CST 4



Faults at the transducer cannot be acknowledged. When a fault is rectified, the message also disappears from the display and the transducer reverts to normal operation.

Allocation of the display and the LEDs to the relevant operating state of the transducer:

Home		
Switch on the power supply	Display: not relevant S-xx = software version t-11 = instrument type SER 3 t-12 = instrument type CST 3 t-13 = instrument type CST 4 LED 1-2: all LEDs light up (test)	The system is started and tested. The LEDs and the display are tested.
Normal operation		
The measuring tube and measuring electrode of the conductivity transducer are immersed.	Display: e.g. 1234	Indicates the current temperature-compensated conductivity (with reference to 25 °C)
	LED 1: is OFF	No faults active
	LED 2: flashes green	The instrument is performing a self-test ⁵⁾
	LED 2: lights up solid green	The self-test is complete – the instrument is OK

⁵⁾ The measured value is not updated during the self-test phase.

Response in the event of a fault (error code display) ⁶⁾		
The measuring tube and measuring electrode of the conductivity transducer are immersed or withdrawn. A fault has occurred.	Display: e.g. E005 LED 1: alarm LED lights up red	An error code is permanently displayed.
	LED 2: flashes green	The instrument is performing a self-test ⁵⁾
	LED 2: is OFF	Fault or internal error

⁶⁾ In the event of a fault or error condition, an analogue value of 0 mA is displayed.

12.2.1 Function of the rotary transducer

The rotary transducer is located on the control panel (position 4 in *Fig. 12-4 User interface*).

Step 1



Turn the rotary transducer anti-clockwise or clockwise using a screwdriver (size 2.5) until the required parameter appears in the display; the set value appears after roughly 3 seconds.

The selected parameter and corresponding current value are displayed alternately, e.g. FilT → "value" → FilT.

The following parameters are displayed consecutively when the rotary transducer is turned clockwise:

1234 → °C.in → °C.Pt → CF → tC → CAL → FilT → Sout → Unit → diSP → SGnL → InFo → PW

Legend for parameters

Conductivity transducer

Type CST 4

Position	Description	Factory setting	Adjustable range
1234	Actual value display (normal operating state, temperature-compensated, with reference to 25 °C, example)	---	---
°C.in	Display ambient temperature of the terminal enclosure	---	---
°C.Pt	Show temperature of the measuring medium	---	---
CF ^{7) 8)}	Cell constant of the electrode	pre-programmed individually at the factory	0.010 – 5,000
tC ⁹⁾	Temperature coefficient of the measuring medium	2.1 % / °C	0.0 – 3.0 % / °C
CAL	Calibration function for synchronising the display value with a comparison value (sample) by adjusting the parameter CF (via the CAL function)	---	---
FiLt ¹⁰⁾	Filter constant	25 seconds	1 – 30 seconds
Sout ¹¹⁾	Scaling of the 4-20 mA actual value output	order-specific value	20 – 6000 µS/cm
Unit ¹²⁾	Unit of display value (µS/cm or ppm)	µS/cm	µS/cm or ppm
diSP ¹³⁾	Triggering a display test	---	--
SGnL	Display signal reserve	---	0 – 100 %
InFo	Display software version and instrument type	---	---
PW	Activate/deactivate password protection	oFF	on or oFF

7) We recommend using the "CAL" function as a handy alternative to setting or re-adjusting the value CF via the rotary transducer - for more information see *12.2 User interface*.

8) Increasing the value for CF increases the value displayed.

9) Increasing the value for tC reduces the value displayed.

10) The purpose of this constant is to "smooth" the 4-20 mA actual value output of the conductivity transducer so it can be used as input for the controller. The adjustable time constant is applied to the power output and also the display of the conductivity transducer.

11) Only the upper limit of measurement range (value at 20 mA) is adjusted with the constant Sout. With 4 mA, the value remains constant at 0.5 µS/cm.

12) Conversion of µS/cm to ppm: 1 µS/cm = 0.5 ppm.

13) After starting the display test, the following digits and decimal points are displayed as a ticker text running from right to left: "... , 1,2,3,4,5,6,7,8,9,...". Check that all digits and decimal points are displayed correctly. Once started, the display test cannot be cancelled and ends with "donE".



If nothing is entered for 30 seconds, the actual value reappears automatically.

NOTICE

The parameters presented in this chapter **must only be modified by the boiler manufacturer's service department or by specialist personnel authorised by the boiler manufacturer.** The boiler manufacturer expressly prohibits any changes to the preset parameters on the part of the customer.

12.2.2 Overview of system faults / error codes

Also refer to chapter "Measures in the event of unusual observations and operating faults".

12.3 Emergency operation



Where steam boiler systems are equipped with a conductivity monitoring device, emergency operation may be triggered under some circumstances if the conductivity monitoring device fails. In this event, please contact the boiler manufacturer's service department or contractors expressly authorised by the boiler manufacturer to perform this work.

13 Shutting down



The unit may only be dismantled by specialised staff with appropriate training, who have the required specialist knowledge, and who have been authorised by the manufacturer of the system to take on this task.



WARNING

Risk of accident through escape of hot medium! Removal may only take place if the system is depressurised and cooled down.

13.1 Environmental protection



Environmentally-responsible disposal! The product must not be disposed of with other waste, and instead must be taken to the waste collection points for treatment, collection, recycling and disposal. This applies in countries where waste electrical and electronic equipment regulations apply, e.g. European guideline on old electronic and electrical appliances. These regulations define the framework for the return and recycling of electronic appliances that apply in the country concerned. As electronic devices may contain hazardous substances, they must be recycled responsibly to minimise possible damage to health and the environment. Furthermore, recycling of electronic scrap helps preserve natural resources.

If you dispose of your products in Germany, you can come to us directly as we can dispose of old appliances. Otherwise you can use the national return and collection systems and contact the relevant local authorities or your refuse disposal expert if required. The appliance must be disposed of as special waste, and not as household waste, as indicated by the crossed out bin logo on the product.

14 Measures in the event of unusual observations and operating faults

If anything unusual is observed and/or operating faults are displayed, the following table provides initial information on repair:

Observation / fault: Conductivity transducer does not work		
Cause	Repair	By whom?
Probe measuring surfaces contaminated	Clean the measuring surfaces (see chapter "Care and Maintenance")	
Power supply failed	Check the power supply, restore power	
Does not work	Check all electrical connections	
	Check terminal connections in the terminal box	
Elektronikeinsatz defekt	Exchanging the conductivity transducer	

Observation / fault: Conductivity transducer gives inaccurate results		
Cause	Repair	By whom?
Probe measuring surfaces contaminated	Clean the measuring surfaces (see chapter "Care and Maintenance")	
Conductivity displayed is higher than the measured reference value	During commissioning: increase temperature coefficient tC. During operation: reduce cell constant CF (ideally via CAL function).	
Conductivity displayed is lower than the measured reference value	During commissioning: reduce temperature coefficient tC. During operation: increase cell constant CF (ideally via CAL function).	
Different measurement ranges set at the conductivity transducer and connected evaluation unit	Set the same measurement range at the conductivity transducer and the evaluation unit	
Measurement results can no longer be changed by modifying the cell constant CF	Remove instrument and clean measuring surface	
Spacer of the electrode has moved	Attach spacer correctly (see chapter "Transducer installation")	

Conductivity transducer Type CST 4

Observation / fault: The displayed conductivity fluctuates (moisture in the area of the casing pipe of the electrode)		
Cause	Repair	By whom?
Moisture is entering the cover pipe from the outside	Check the installation location for possible water leaks from where water / water vapour could enter the conductivity transducer.	
	Check the seal of the conductivity transducer.	
	Check the insulation of the conductivity transducer.	
	Replace conductivity transducer.	
The internal seals of the electrode rods are damaged.	Replace conductivity transducer.	

Observation / fault: Extreme values for conductivity are occasionally displayed, but also reoccur sporadically		
Cause	Repair	By whom?
The electrode rods are not permanently immersed.	Check the existing assembly.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Observation / fault: "Sensor breakdown" fault message displayed at the boiler control panel; sporadic flow outlet at conductivity transducer, for a few seconds: 0 mA. Depending on the setting, this can also cause the boiler safety chain to drop out		
Cause	Repair	By whom?
The conductivity measurement has been disrupted by the intensified formation of steam voids (for example during high levels of steam extraction or peaks in output). The electrode rods are not permanently immersed in the water.	Increase in the filter constant (parameter FiLt) on the conductivity transducer	

Observation / fault: the flashing message CF.Hi appears in the display		
Cause	Repair	By whom?
The cell constant CF is impermissibly high following the calibration operation "CAL" or following manual adjustment (> 3.0).	Remove, check and clean conductivity transducer (see chapter "Care and Maintenance").	

Conductivity transducer

Type CST 4

Observation / fault: the flashing message SG.Lo appears in the display

Cause	Repair	By whom?
The measuring signal is too low and is below the defined limit (default setting: 10 %).	Remove, check and clean conductivity transducer (see chapter "Care and Maintenance"). Once reinstalled, check the signal quality by calling up the parameter "SGnL".	

Observation / fault: "quit" is displayed when executing the CAL function

Cause	Repair	By whom?
The cell constant CF calculated internally by the CAL function is outside the setting range of CF (0.010 – 5.000)	Check reference measurement (for measurement errors, reading errors,...)	
	Check the existing assembly. Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	
	Remove, check and clean conductivity transducer (see chapter "Care and Maintenance").	

Conductivity transducer

Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, error code: E.001 in display of the conductivity transducer (internal designation: LFKurzschlussErr), current output 0 mA		
Cause	Repair	By whom?
Short circuit in the electrode (electrode wires)	Check installation location. Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	
Conductivity of medium to be measured is too high (outside measurement range).	Reduce conductivity – e.g. in the case of steam generators by increasing the desalting rate or adjusting the chemical dosing.	
	Increase upper limit of measurement range (Sout parameter) at conductivity transducer and at connected evaluation unit if necessary.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	
Probe measuring surfaces contaminated	Clean the measuring surfaces (see chapter "Care and Maintenance")	

Conductivity transducer

Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, error code: E.002 in display of the conductivity transducer (internal designation: LFKabelbruchErr), current output 0 mA

Cause	Repair	By whom?
Cable break in the electrode (electrode wires)	Check the installation location and replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	
Probe measuring surfaces contaminated	Clean the measuring surfaces (see chapter "Care and Maintenance")	
Conductivity of medium to be measured is too low (outside measurement range).	When steam generators are freshly filled, add some dosing agent (sodium sulphite) to the boiler water if required.	

Observation / fault: LED 1 (alarm LED) lights up red, error code: E.003 in display of the conductivity transducer (internal designation: Ch1Ch2LFDiffErr), current output 0 mA

Cause	Repair	By whom?
Difference between redundant measurement channels of the conductivity measurement too high.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Conductivity transducer

Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, error code: E.004 in display of the conductivity transducer (internal designation: PtMinTempErr), current output 0 mA

Cause	Repair	By whom?
Minimum temperature at the Pt1000 undercut or short circuit.	Check the installation location, compare the measured temperature (parameter "°C.Pt") with the temperature at the system and replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Observation / fault: LED 1 (alarm LED) lights up red, error code: E.005 in display of the conductivity transducer (internal designation: PtMaxTempErr), current output 0 mA

Cause	Repair	By whom?
Maximum temperature at the Pt1000 undercut or cable break.	Check the installation location, compare the measured temperature (parameter "°C.Pt") with the temperature at the system and replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Conductivity transducer

Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, error code: E.006 in display of the conductivity transducer (internal designation: Ch1Ch2PtDiffErr), current output 0 mA

Cause	Repair	By whom?
Difference in relation to redundant Pt1000 measurement too high.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Observation / fault: LED 1 (alarm LED) lights up red, error code: E.007 in display of the conductivity transducer (internal designation: USIGTSTErr), current output 0 mA

Cause	Repair	By whom?
Measurement voltage test signal out-of-spec.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Conductivity transducer Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, error code: E.008 in display of the conductivity transducer (internal designation: ISIGTSTErr), current output 0 mA

Cause	Repair	By whom?
Measurement current test signal out-of-spec.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Observation / fault: LED 1 (alarm LED) lights up red, error code: E.009 in display of the conductivity transducer (internal designation: ADCTSTErr), current output 0 mA

Cause	Repair	By whom?
Measurement voltage Pt1000 test out-of-spec.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Conductivity transducer

Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, error code: E.010 in display of the conductivity transducer (internal designation: ICONErr), current output 0 mA

Cause	Repair	By whom?
Measurement current Pt1000 test out-of-spec.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Observation / fault: LED 1 (alarm LED) lights up red, error code: E.011 in display of the conductivity transducer (internal designation: ADVTSTErr), current output 0 mA

Cause	Repair	By whom?
Comparison of 12 bit / 16 bit AD converter out-of-spec.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	
Probe measuring surfaces contaminated	Clean the measuring surfaces (see chapter "Care and Maintenance")	

Conductivity transducer Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.012 in display of the conductivity transducer (internal designation: FREQTSTerr), current output 0 mA

Cause	Repair	By whom?
Frequency test signal out-of-spec.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.013 in display of the conductivity transducer (internal designation: VMessErr), current output 0 mA

Cause	Repair	By whom?
Control voltage from 4-20 mA output.	Check 4-20 mA signal output (connecting cable incorrectly connected or not connected at all, load too high, etc.). Especially check whether the current loop is open or the polarity reversed (check PIN assignment of the M12 plug and current signal with the multimeter).	
	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Conductivity transducer

Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.014 in display of the conductivity transducer (internal designation: ADSReadErr), current output 0 mA

Cause	Repair	By whom?
16-bit AD converter is not responding.	Replace the conductivity transducer.	
The internal communication of the transducer is disrupted by the influence of EMC.	Check the assembly and the installation location - particularly as regards the influence of EMC.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.015 in display of the conductivity transducer (internal designation: UnCalibErr), current output 0 mA

Cause	Repair	By whom?
Calibration invalid	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Conductivity transducer Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.017 in display of the conductivity transducer (internal designation: ENDRVErr), current output 0 mA

Cause	Repair	By whom?
Second disconnection facility of the 4 - 20 mA analogue output faulty.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.018 in display of the conductivity transducer (internal designation: V12NegErr), current output 0 mA

Cause	Repair	By whom?
System voltage -12 V out-of-spec.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Conductivity transducer

Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.019 in display of the conductivity transducer (internal designation: V6Err), current output 0 mA

Cause	Repair	By whom?
System voltage 6 V out-of-spec.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.020 in display of the conductivity transducer (internal designation: V5Err), current output 0 mA

Cause	Repair	By whom?
System voltage 5 V out-of-spec.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Conductivity transducer Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.021 in display of the conductivity transducer (internal designation: V3Err), current output 0 mA

Cause	Repair	By whom?
System voltage 3 V out-of-spec.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.022 in display of the conductivity transducer (internal designation: V1Err), current output 0 mA

Cause	Repair	By whom?
System voltage 1 V out-of-spec.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Conductivity transducer

Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.023 in display of the conductivity transducer (internal designation: V12Err), current output 0 mA

Cause	Repair	By whom?
System voltage -12 V out-of-spec.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.025 in display of the conductivity transducer (internal designation: ESG1Err), current output 0 mA

Cause	Repair	By whom?
µC fault.	Replace the conductivity transducer.	
Conductivity of medium to be measured is too low (outside measurement range).	When steam generators are freshly filled, add some dosing agent (sodium sulphite) to the boiler water if required.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Conductivity transducer

Type CST 4

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.026 in display of the conductivity transducer (internal designation: BISTErr), current output 0 mA

Cause	Repair	By whom?
µC periphery self-test fault.	Replace the conductivity transducer.	
The measuring electrode / measuring tube is not permanently immersed.	Check the existing assembly.	
	Check whether the measuring electrode / measuring tube is/was permanently immersed.	
	Check the specified minimum clearances during installation (to boiler wall / container wall / smoke tubes).	

Observation / fault: LED 1 (alarm LED) lights up red, fault code: E.027 in display of the conductivity transducer (internal designation: OvertempErr), current output 0 mA

Cause	Repair	By whom?
Board / ambient temperature > 75 °C.	Check installation location. Reduce the ambient temperature at the terminal enclosure (cool if necessary). The ambient temperature must not be higher than 70 °C.	

Observation / fault: values from t-71 to t-75 flashing in display of the conductivity transducer

Cause	Repair	By whom?
Board / ambient temperature between 71 and 75 °C.	Check installation location. Reduce the ambient temperature at the terminal enclosure (cool if necessary). The ambient temperature must not be higher than 70 °C.	

15 Care and Maintenance

The electrode rod is to be removed once a year, from a pressure-free boiler, checked for soiling and deposits and cleaned if necessary.

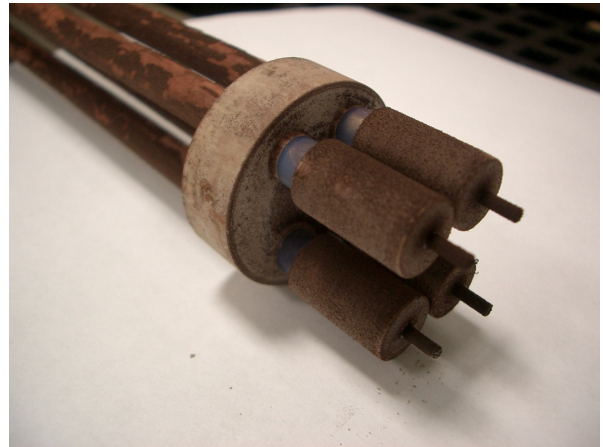
NOTICE

For the correct functioning of the probes it is vital that their measuring surfaces are not contaminated.

Examples of contaminated probes

Conductivity transducer

Type CST 4



To clean the electrode, proceed as follows (also see *Fig. 6-1 Conductivity transducer consisting of electrode part and terminal enclosure* and corresponding legend):

- Clean the measuring electrodes (position 9) and spacers (position 10).
- Wipe off loose deposits with a damp grease-free cloth. Remove stubborn deposits with a medium grain sandpaper (approx. 400).

NOTICE

Do not bend the electrode rod during cleaning and avoid hard impacts against the rod.

If the measurement medium is seriously soiled in normal operation, or if the chemical measured values for two consecutive measurements are outside the limits that are given in Operating Instructions B002/B004 (Guideline on Water Quality), this inspection or cleaning process must be carried out every three months at least.

A description of how to install and remove the conductivity transducer is provided in the chapter "Assembly"



The transducer must also only be brought back into operation by the boiler manufacturer's service department or contractors specifically authorised by the boiler manufacturer.

15.1 Replacement of safety components

To ensure high availability of the system throughout its service life, we recommend replacing the conductivity transducer (as an important item of boiler equipment) at the end of its theoretical service life:

Safety-related component	Time [a]
Conductivity transducer	10

16 Replacement Parts

For spare parts orders or spare parts inquiries, please use the special ordering and inquiries form L006 After Sales Services in Register L (Forms).