INSTALLATION AND MAINTENANCE INSTRUCTIONS

BCS-211
TDS CONTROLLER

CONTENTS

1. GENERAL

- These instructions must be carefully read before involving products supplied by VALSTEAM ADCA ENGINEERING S.A. is undertaken.

- The installation procedure is a critical stage in a life of any device and care should be taken to avoid damage to the BCS-211 TDS controller or equipment.

Note:

- Current regional safety regulations should be taken in to account and followed, while doing the installation and maintenance work.
- Handling, installation and maintenance work must be carried out by trained personnel. A supervisor must follow and check all activities.
- For the problems that cannot be solve with the help of this instructions, please contact the supplier or the manufacturer.
- The manufacturer reserves the right to change the design and material of this product without notice.

2. APPLICATION

The BCS-211 controller is part of the dissolved solids (TDS) control system used in steam boilers. This system is composed by a SPS series conductivity probe, a BCS-211 controller, a VPC series blowdown valve and, in case of need, a process controller such as the ADCATROL UC-820, for modulating (PID) control.

The BCS-211 controller continuously measures, at the electrode rod in the measuring cell, the electrical conductivity of the boilers water which is closely related to the level of TDS. This measured value is compared with the set point of the controller. If that value exceeds the set point, the controller drives the blowdown valve using its relay (on/off) output (lighting up the “Alarm” indicator lamp). If the measured value drops below 78% of the set point, the controller relay is energized, closing the blowdown valve (the “Alarm” indicator lamp doesn't light anymore).

A modulating (PID) control may be achieved by using the BCS-211s 4…20 mA transmitter output in conjunction with a UC-820 universal process controller or PLC.

3. TRANSPORT AND STORAGE

ATTENTION

- Handling of materials should be made with adequate equipments.
- The equipments should be protected from impacts and forces during transportation and storage.
- The equipment should be stored in a dry environment.
- The manufacturer does not assume the responsibility of damaged equipments due to inappropriate handling during the transportation and storage.

4. CONTROLLER SET

ATTENTION

- When unpacking the controller, please check whether the type and version code on the data sticker corresponds to the ordered one.

5. OPERATIONAL SAFETY

ATTENTION

- All operations concerning transportation, installation, and commissioning as well as maintenance, must be carried out by qualified, skilled personnel, and national regulations for the prevention of accidents must be observed.
- Correct installation of the equipment is full responsibility of the contractor.
- Manual handling of products may present a risk of injury. You are advised to assess the risks taking into account the task, the individual, the load and the working environment.
- Before switching the controller on, one must check the correctness of all the connections to the network.
- Do not connect the controller to the network through an autotransformer.
- Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine ADCA replacement parts.
- Do not remove the nameplate, serial number or any other useful information that comes attached to the equipment.
- No changes should be made to the controller parameters/ functions apart from the ones mentioned in these instructions.
- The equipment must be used within the working limits laid down for them, otherwise they may fail (refer to nameplate and/or IS- Information Sheet).
- Avoid water contact with the electrical parts. It may damage or cause malfunctions in the equipment.
- The controller fulfils all requirements related to electromagnetic compatibility in the industrial environment.
- When connecting the supply, one must remember that a switch or a circuit-breaker should be installed in the room. This switch should be located near the device, with easy access for the operator and suitably marked as an element able of switching the controllers' power off.
- Do not touch the electrical parts, carry out wiring or any electrical related work without appropriate protection and turning off the power supply in the electrical board.
- Non-authorized removal of the casing, inappropriate use, incorrect installation or operation, create the risk of injury to personnel or controller damage.
- We recommend protective measures for applications on the outside or in adverse environments like corrosion promoting conditions (sea water, chemical vapors, etc.).

6. INSTALATION

ATTENTION

- Respect the local laws or standards involved.
- Secure with protection class in accordance with current regulations!
- Make sure the power supply is turn off in the electrical board before carrying out any wiring or electrical related work.
- The removal of the controllers casing during the guarantee contract period may cause its avoidance.

6.1. TYPICALL CONFIGURATIONS AND CONTROL TYPES FOR TDS MONITORING SYSTEMS

6.1.1. RELAY OUTPUT – ON/OFF CONTROL

DIRECT BOILER CONDUCTIVITY MEASUREMENT (USING SPS-33 PROBE)

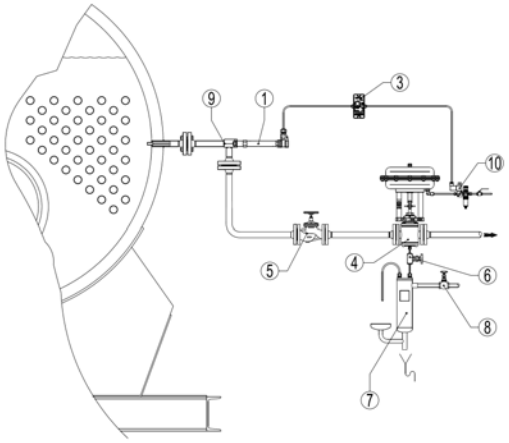

Figure 1

IN-LINE CONDUCTIVITY MEASUREMENT (USING SPS-21 PROBE)

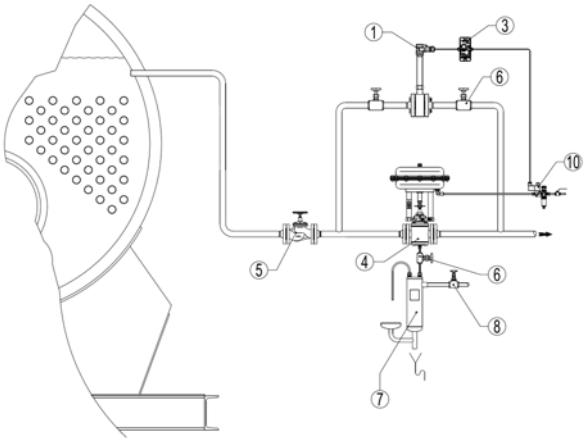

Figure 2

6.1.2. TRANSMITTER (4…20mA) OUTPUT – MODULATING PID CONTROL *

DIRECT BOILER CONDUCTIVITY MEASUREMENT (USING SPS-33 PROBE)

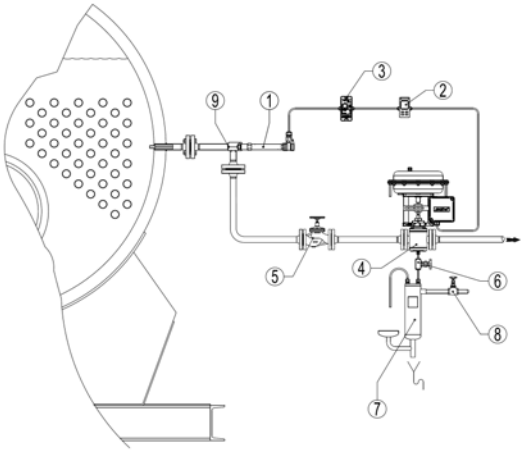

Figure 3

IN-LINE CONDUCTIVITY MEASUREMENT (USING SPS-21 PROBE)

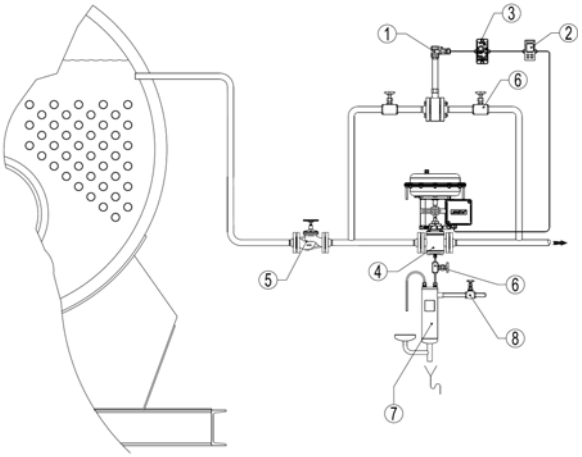

Figure 4

*** Using a process controller such as the ADCATROL UC-820.**

POSITION	DESIGNATION
1	Adcatrol SPS-33 (Fig.1 and Fig.3) and SPS-21 (Fig.2 and Fig.4)
2	Adcatrol UC-820 universal process controller
3	Adcatrol BCS-211 TDS controller
4	Adcatrol VPC-32/VPC-32S blowdown valve
5	Adca VF Bellow sealed globe valve
6	Adca NV-400 Needle valve
7	Adca SC32F/SS Sample cooler
8	Adca GV32B Bronze globe valve

9	Tee piece type F-3220
10	SV32C direct solenoid valve

6.2. CONTROLLER INSTALLATION

The overall dimensions of the BCS-211 controller are presented on Figure 5 (in millimeters).

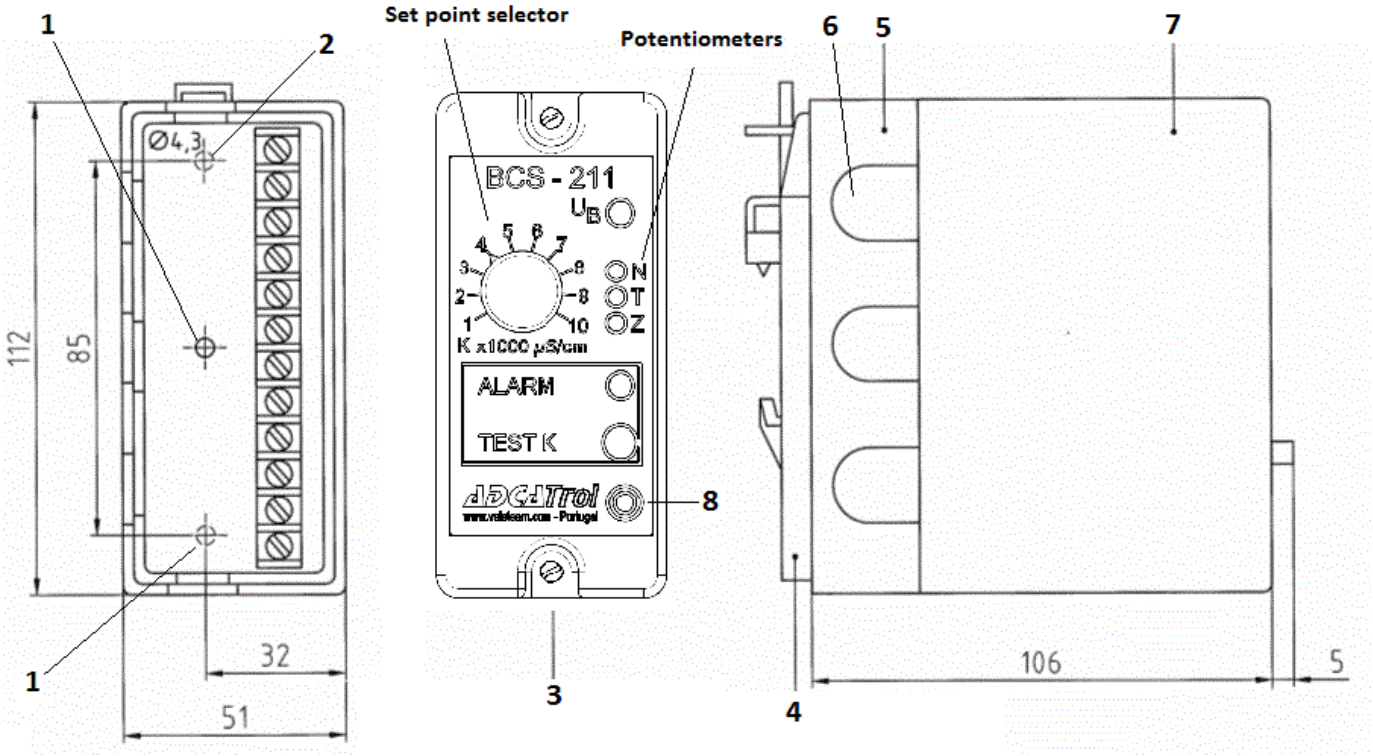

Figure 5: Controller dimensions and functions.

The controller is shipped from factory with the snap fasteners (4) for standard DIN46277 35 mm rails attached to the cable holder for quick installation.

For direct installation (e.g., to an electrical panel without a 35 mm rail) please perform the following steps:

- Release fixing screws (3) and pull the cable holder (5) from the controller (7) itself;
- Release screws (1) and remove the snap fasteners (4);
- Drill through the marked points (2) in the cable holder (5) with a ø 4.3 mm drill;
- Fix the cable holder directly to an electrical panel with two M4 screws.

6.3. ELECTRICAL CONNECTIONS

Carry out connection according to the BCS-211 wiring diagram on the back plate of the controller (7) or see below.

- Pierce or pull out the cable feed covers (6) and feed the connection cables through.
- Check the supply voltage. See name plate for allowable voltage.
- Use shielded connection line: e.g. Unitronic BUS Safety 3x0.75 up to a max. length of 20 m. (see instructions).
- Only connect shielding on the BCS-211 control unit (terminal 12).
- After electrical connection, with the device disconnected from the mains, attach the cable holder (5) to the controller (7) and tighten the fastening screws (3).
- Fit probes and connect according to the wiring diagrams shown in section 6.3.1 and 6.3.2.

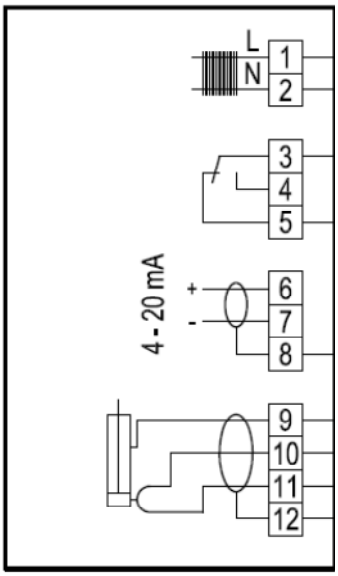

Figure 6: View of the controllers' connection strip.

ATTENTION

- A green LED (9) will turn ON when the power supply is ON.
- The electrical connections depend on the desired control type. The controller performs on/off control, working as a TDS limiter without display. However, one can simultaneously use the on/off control function of the BCS-211 and a separate digital display. This last one should be connected to the 4…20 mA transmitter output.
- For modulating PID control the BCS-211 won't work as a controller but as a conductivity transmitter. It converts the TDS µS/cm readings into an analog 4…20 mA signal which is then used as input to a PLC or a process controller such as the ADCATROL UC-820, in order to achieve this type of control.

6.3.1.RELAY OUTPUT – ON/OFF CONTROL

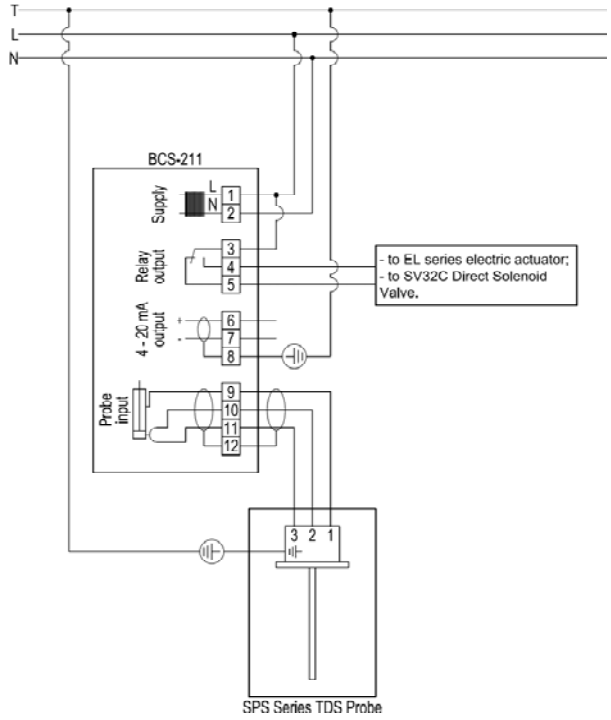

Figure 7: Wiring diagram for On/Off control.

Example 1:

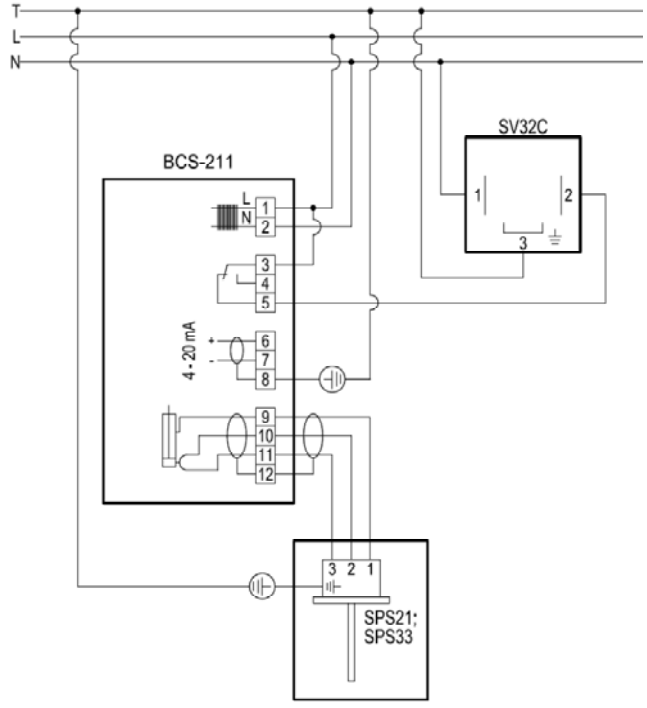

Figure 8: Wiring diagram with solenoid valve.

Example 2:

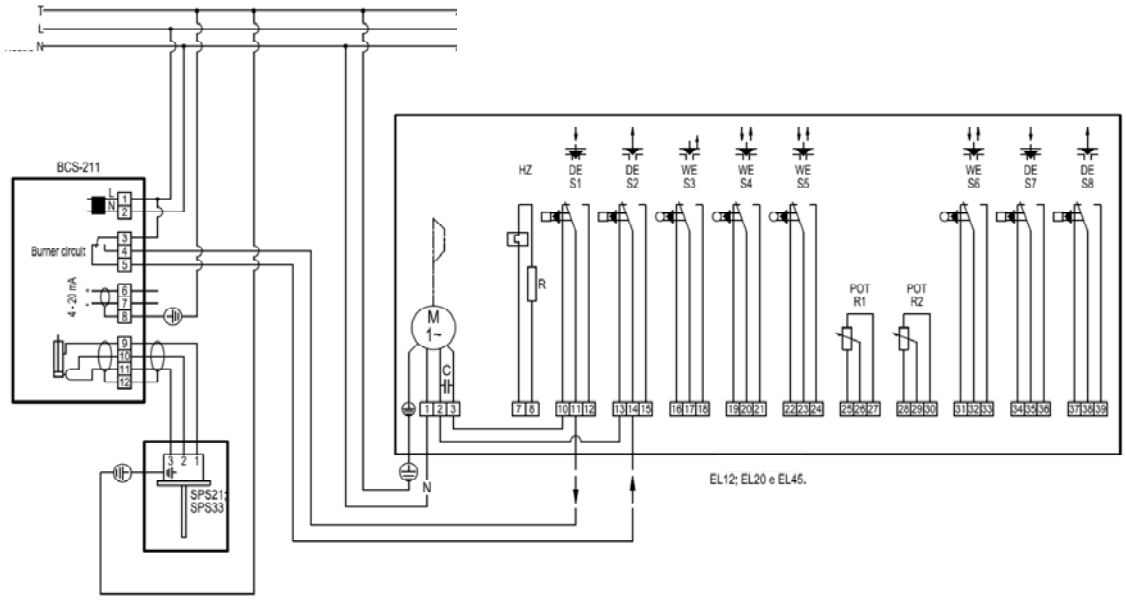

Figure 9: Wiring diagram with EL series actuator.

6.3.2. TRANSMITTER (4…20mA) OUTPUT – MODULATING PID CONTROL

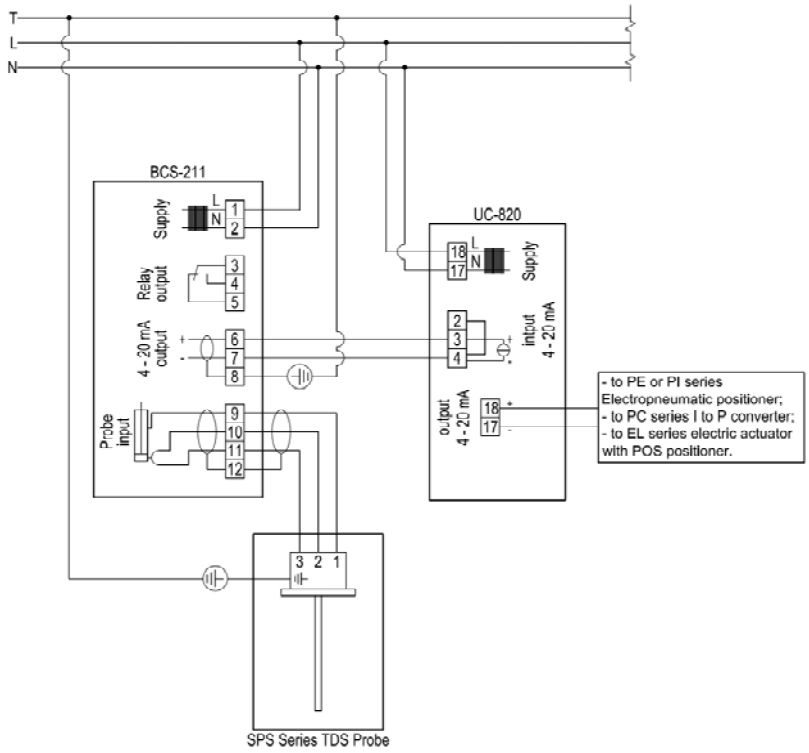

Figure 10: Wiring diagram for modulating PID control.

Please note: The ADCATROL UC-820 is sold separately. For detailed information regarding its connections, setup and configuration please consult 'IMI UC.820'.

7. CALIBRATION

ATTENTION

- Do not carry out calibration until all the assembly parts are completely fitted.
- Switch on the supply voltage, the green warning LED "UB" lights up.
- Do not remove the cable holder (5) from the controller (7) until the device has been disconnected from the mains.
- The capacity of the cable must not exceed 1.2 nF.
- To extend the contact life of the relays we recommend the use of commercial RC combinations or an appropriate varistor when using inductive consumers, (e.g. 0.1 µF/100 ohm or S07k275 varistor).
- Measuring instrument required for calibration: Multimeter (preferably digital multimeter); Conductivity meter (preferably with temperature compensation).

First step - Zero calibration

Pre-condition: The conductivity electrode measuring probe is not in contact with the water.

Depending on the electrode installation position (on the boiler body or in an external pipe) it may be necessary to lower the water level in the boiler or empty the measuring external pipe.

Connect the multimeter to the jack socket (8) Ø3.6 mm or to the terminals (6 and 7) and set a current of 4 mA with the potentiometer "N".

Please note:

- Moving the potentiometer clockwise results in larger values.
- If the value “4 mA” cannot be set - check the electrical lead for observance of the details as in the wiring diagram.

Second step - Sampling

Pre-condition:

- Boiler in operating mode and at normal operation (pressure and temperature) conditions
- Measuring probe of the dedicated measuring electrode is surrounded by boiler water.

Remove boiler water via the sampling cooler and with a conductivity measuring device **determine the conductivity “K actual” in µS/cm, in relation to 25 °C.**

Note: It is important to let some water flow through the sample cooler before taking the sample. The sample must be at 25ºC when the measurement is done.

Third step - Temperature calibration

Pre-condition:

- Boiler in operating mode
- Measuring probe of the dedicated measuring electrode is surrounded by boiler water.
- Calculate the current to be set according to the equation I = 4 + 16 x K actual [mA] / K max.

Example: K actual = 2000 µS/cm; see point 5.2 Sampling
K max. = 10000 µS/cm; see scale value [K x 1000 µS/cm] on the front of the device.
I = 4 mA + (16 mA x 2000 / 10000) = 7.2 mA

Connect the multimeter to the jack socket (8) Ø3.6 mm or to the terminals 6 and 7 and set the calculated current with the potentiometer “T”.

Please note:

- Moving the potentiometer clockwise results in smaller values.
- Up to 20 revolutions in one direction may be necessary.

If the calculated current cannot be set the factory-set cell constant on the device is to be corrected: set the calculated current via the potentiometer “Z”.
Then, carry out the calibration again as described under points 5.1, 5.2 and 5.3.
If in spite of following the above steps the calibration is not possible, the following error eliminations are to be checked again:

- Press button "Test K".

If the circuit is interrupted at the terminals of the terminal block (3 and 4), a fault in the BCS-211 is excluded.

- Check the correct fitting of the conductivity electrode according to the operating instructions and the electrical connection according to the wiring diagram.

7.1. STANDARD CONDUCTIVITY RANGES

The **BCS-211**controllers are supplied from factory with a specific range for conductivity control in boilers, not possible to change: 0 a 9999 µS/cm.

	Conductivity reference values of boiler waters
Refill deionized water	50 to 500 µS/cm
Normal operating boiler water	500 to 3000 µS/cm
Boiler water with excess of salts	3000 to 9000 µS/cm

7.2. CELL CONSTANT K

The cell constant K is associated to the conductivity probe and expresses the relationship between the distance among electrodes and their measurement surface area.

The BCS-211 is supplied from factory with a preset constant K adapted to the K of the SPS-21 and SPS-33 probes. **This cell constant is not modifiable**.

8. TDS SET POINT

The limit values for conductivity corresponding to the maximum allowable working pressure are listed in the boiler water directives in accordance with the technical rules for steam boilers TRD 611.

Set the desired limit value for the maximum conductivity taking into account the applicable directives with the set point selector (see Figure 5).

Please note: The BCS-211 controller continuously measures, at the electrode rod in the measuring cell, the electrical conductivity of the boilers water which is closely related to the level of TDS. This measured value is compared with the set point of the controller. If that value exceeds the set point, the controller drives the blowdown valve using its relay (on/off) output (lighting up the “Alarm” indicator lamp). If the measured value drops below 78% of the set point, the controller relay is energized, closing the blowdown valve (the “Alarm” indicator lamp doesn't light anymore).

9. PRODUCTS RETURNING

ATTENTION

- Information regarding any hazards and precautions to be considered because of contaminating fluids and residues or mechanical damage that may represent a health, safety or environmental risk, must be provided in writing by the distributors and costumers when returning products to Valsteam ADCA engineering.
- Health and safety data sheets regarding substances identified as hazardous or potentially hazardous must be provided with the information mention above.

ATTENTION

- **LOSS OF WARRANTY: Total or partial disregard of above instructions involves loss of any right to warranty.**