

“ADCATROL” TDS BLOWDOWN CONTROL VALVES VPC Series

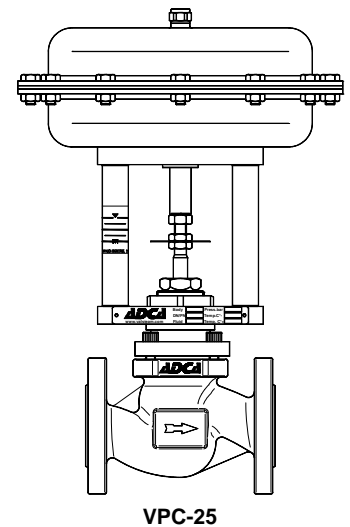
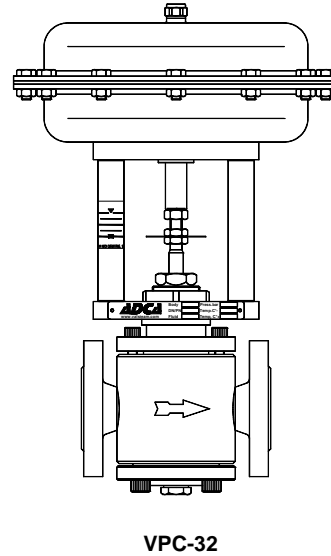
DESCRIPTION

The Adcatrol VPC series control valves are specially designed for the blowdown of steam boilers in order to control the TDS concentration in combination with a TDS controller (BCS) and probe (SPS series). These valves can also be used for any application where high pressure drop and low flow rates are present.

MAIN FEATURES

Single seated, two way, direct action valve.
Valve top flange permanently attached to the body, removal is unnecessary for replacing the actuator.
Metal to metal hardened sealing as standard.

- OPTIONS:** Pneumatic or electric actuators
Air filter regulator
- USE:** Saturated and superheated steam
Hot and superheated water
- AVAILABLE MODELS:** VPC-32-Fabricated steel construction
VPC-25-Cast steel
- VALVE SIZES:** DN15,20,25 and 40
- CONNECTIONS:** Flanged EN 1092-1
ANSI Class 150 and 300 lbs
(Only for VPC-32)
- PNEUMATIC ACTUATORS:** PA-205, PA-280.
- ACTUATOR CONN:** ¼” NPT-F
CONTROL SIGNAL: 0,4 – 2 bar
ELECTRIC ACT.: Consult catalogue IS EL20.00 E and IS ELR21.00 E



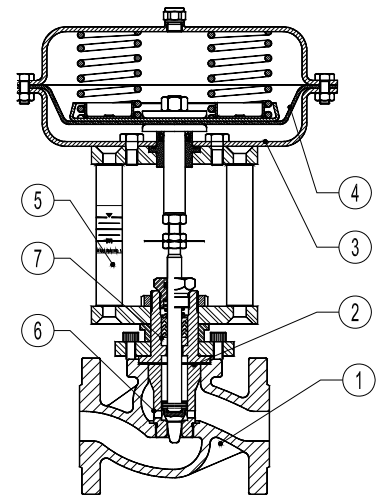
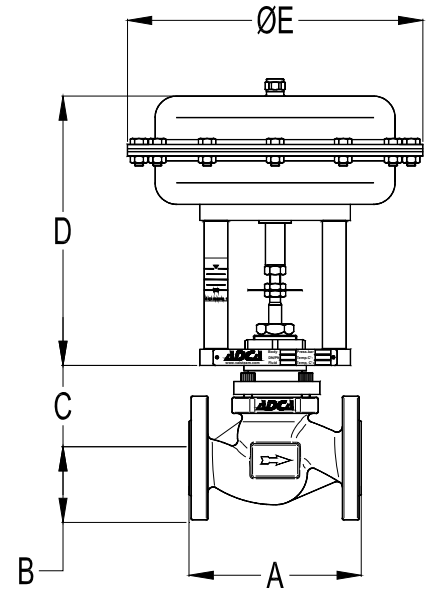
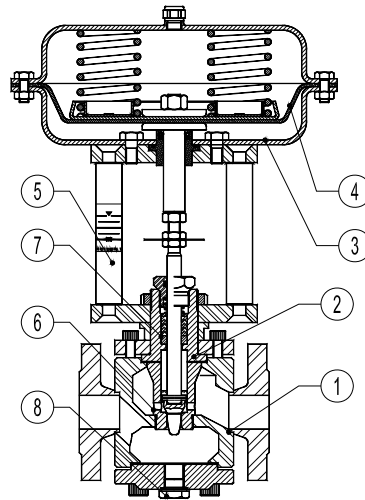
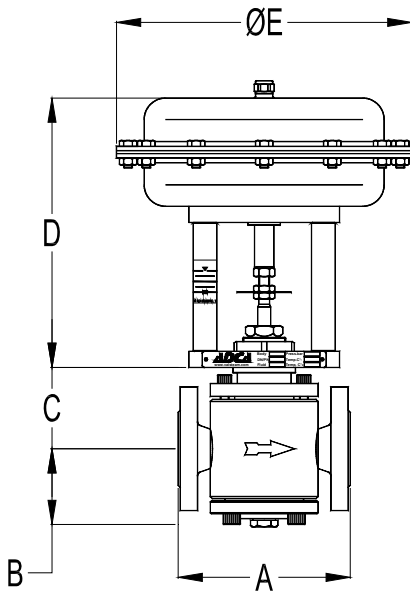
- MAX.AIR SUPPLY:** 3,5 bar
AMBIENT TEMPERATURE: -20°C ... +70°C
STEM SEALING: PTFE/GR V-Rings-220°C
(Standard bonnet)
Graphite – 300°C
(Extended bonnet)
- PLUG TYPES:** Linear (PL)
- PORT:** Reduced or microflow

HOW TO SELECT: Never size the valve according to the pipe diameter in which it has to be fitted, but according to the required actual flow. Refer to the valve calculation data sheet or consult the factory.

VALVE LIM. CONDITIONS VPC 32		VALVE LIM. CONDITIONS VPC 25	
PRESSURE/TEMPERATURE		PRESSURE/TEMPERATURE	
40 bar	-10/50°C	40 bar	-10/50°C
33,3 bar	200 °C	30,2 bar	200 °C
30,4 bar	250 °C	25,8 bar	300 °C
27,6 bar	300 °C	24 bar	350 °C

Maximum temperature limited to the valve packing selected

CE MARKING (PED - European Directive 97/23/EC)	
PN 40	Category
DN15 to DN25	SEP - art. 3, paragraph3
DN40	1 (CE Marked)



DIMENSIONS - VALVE BODY VPC-32					
DN	A (mm)	B (mm)	C (mm) BONNET		
			STANDARD	FINNED	EXTENDED
15	150	71	75	140	140
20	150	71	75	140	140
25	160	71	75	140	140
40	200	82	96	163	163

DIMENSIONS - VALVE BODY VPC-25					
DN	A (mm)	B (mm)	C (mm) BONNET		
			STANDARD	FINNED	EXTENDED
15	130	48	85	150	150
20	150	53	85	150	150
25	160	58	90	170	170
40	200	75	115	195	195

DIMENSIONS PNEUMATIC ACTUATOR		
Type	ø E (mm)	D (mm)
		DN15-DN50 DA/RA
PA-205	210	235
PA-280	275	240

MATERIALS			
POS.	DESIGNATION	VPC 32	VPC 25
1	Valve Body	S355 J2 G3 / 1.0570	ASTM A216WCB / 1.0619 GP240GH / 1.0619
2	Bonnet	CF8 / 1.4308	CF8 / 1.4308
3	* Actuator (Steel)	S235JRG2 / 1.0038	S235JrG2 / 1.0038
	* Actuator (St. steel)	AISI304 / 1.4301	AISI304 / 1.4301
4	Diaphragm	NBR70	NBR 70
5	Yoke (steel)	C45E / 1.1191	C45E / 1.1191
	Yoke (st. steel)	AISI304 / 1.4301	AISI304 / 1.4301
6	Valve plug	Hardened St. Steel	Hardened St. Steel
7	Standard packing	Graphite	Graphite
8	Sample take off	AISI304 / 1.4301	-

* Electric actuator : see IS EL20.00 E

Kvs VALUES FOR ADCATROL CONTROL VALVES VPC					
SEAT D. mm	VALVE STROKE mm	VALVE SIZES			
		DN15	DN20	DN25	DN40
4A	20	0,1	—	—	—
4B		0,25	—	—	—
4C		0,5	—	—	—
8A		1	1	—	—
8B		1,7	1,7	—	—
12A		2,1	2,5	3	—
12B		2,7	3,7	4	—
15A		3,8	4,7	5,8	6,8
20A			5,1	6,3	9,3
25A				9,4	14,6

Letters after the Kvs are for codification purposes only.

MAX. PERM.PRESS.DROP IN bar - N.C.(fluid to open) - Reverse action actuator (air signal to open)					
ACTUATOR	CONTROL SIGNAL	SIZES			
		DN15	DN20	DN25	DN40
PA-205	0,4 ÷ 2 bar	18	15	12	8
PA-280	0,4 ÷ 2 bar	45	40	35	25

Special spring pressure drops available on request.
The pressure drop values must be used within the body rating limits.
For electric actuator selection please consult catalogue IS EL.20.00 E or our technical department.
For conversion $Kvs = Cv(US) \times 0,855$

CALCULATING THE AMOUNT OF BOILER BLOWDOWN

The boiler blowdown system design depends on the amount of boiler water which has to be blown down. This amount depends on:

(Rs)-Recommended boiler water TDS in ppm (parts per million) or $\mu s/cm$. Usually recommended by the boiler manufacturer or water treatment specialist.

(Fs)-Feed water TDS (same units) .Sample for analysis must be taken from fresh water feed tank or feed water line. Do not use a sample of the make-up feed water otherwise wrong figures can be obtained.

(Q)-Steam boiler maximum flow rate in Kgs/h

(Br)- The blow down rate or amount of water to be discharged in Kgs/h can be obtained using the following formula:

$$Br = Q \cdot Fs / Rs - Fs$$

Example:

Boiler pressure: 12 bar

Q - Boiler capacity: 12 000 Kg/h

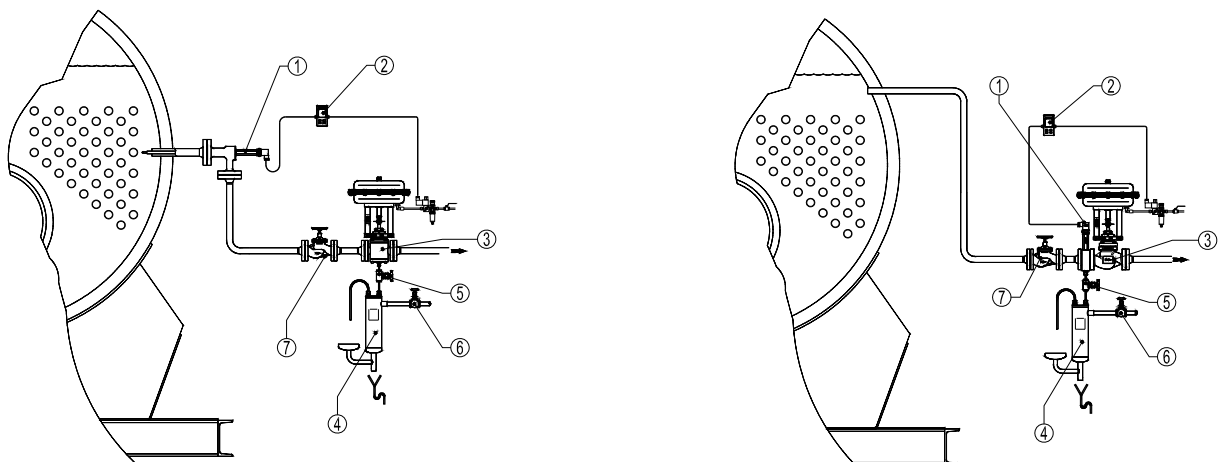
Fs - Conductivity of feed water: 100 $\mu s/cm$

Rs - Recommended boiler water TDS 3000 $\mu s/cm$

$$Br = 12000 \cdot 100 / 3000 - 100; Br = 413,8 \text{ Kgs/h}$$

Using the formula available in IS PV10.00 E, it is now possible to determine the necessary Kv valve value and select the right valve size (IS VPC.50 E).

TYPICAL INSTALLATION





ORDERING CODES VPC										
VALVE CODES		VPC	25.							.X.
Group Designation										
Blowdown control valves, two way, straight body		VPC								
Valve Model										
ASTM A216 WCB body, stainless steel trim			25.							
Steel body, stainless steel trim			32.							
Stem Sealing										
PTFE/GR-V-Rings / Standard bonnet							1			
Virgin PTFE V-Rings / Standard bonnet							2			
Graphite / Standard bonnet							3			
Graphite / Finned bonnet							4			
Valve Plug										
PL (linear) - Stellite							8			
Seat Diameter										
4 A									1	
4 B									2	
4 C									3	
8 A									4	
8 B									5	
12 A									7	
12 B									8	
15 A									10	
20 A									13	
25 A									16	
Pipe Connection										
Flanged EN1092-2 PN16										L
Flanged EN1092-1 PN40										N
Flanged ANSI B16.5 300#										V
Size										
DN15										15
DN20										20
...										
Actuator										(1)
Extras (3)										E
ACTUATOR CODES (pneumatic)		P.								
Group Designation										
Multi-spring , pneumatic linear actuator		P.								
Actuator Size										
205									1	
280									3	
340 A - From DN15 to DN50									5	
435 A - From DN15 to DN50									7	
Actuator										
Reverse Action									R	
Actuator Construction										
Steel construction (painted) - standard										(2)
Stainless steel construction										I
Control Signal										
0,4 - 2 bar (6/30 psi)										30

→ To be introduced on ".X.", if supplied in combination with the valve.

REMARKS:
 (1)- Indicate actuator type.
 (2)- Omitted if the standard actuator is selected.
 (3)- To be used only when a non-standard combination valve is supplied.
 ADCATROL control valves are identified by a serial number on a nameplate, located on the actuator yoke.
 Always order spares by using that serial number. If the valve has non-standard extras the serial number has also an E (extras).

TDS CONTROLLERS FOR STEAM GENERATORS (Automatic purge of dissolved solids) BCS-210

DESCRIPTION

Adcatrol BCS controllers are part of the dissolved solids (TDS) control systems of steam boilers water.

The complete system is formed by a special conductivity probe SPS series, BCS-210 controller (with display and ATC) and a VPC blowdown valve.

The system measures the conductivity of the water based on the type of steam generator. When it exceeds a predefined value, drives the blow-down valve by ON/OFF or time proportional control with the purpose of maintaining the water in an optimum TDS value.

The controllers can be configured by means of RS-485 Modbus communication, from a supervisory system of the boiler total control such as, low level safety, continuous level control, mud purge, temperature, etc.



MAIN FEATURES

Maintains the TDS level at optimum value reducing the purges to the minimum.

One TDS blow-down relay output and one alarm relay output

Power supply 85...265 Vac (others in option)

RS-485 Modbus communication.

The controllers can work in two ways according with the type of steam generator, probe used or system design.

When the probe is installed in the pipe (Fig.1) the controller drives the blow-down valve with a pre-programmed cadence, opening the valve 10 sec. and closing it during 30 min. (configurable). As the water circulates the system detects when the TDS is over the preset value. The valve remains open until the TDS reaches the predefined minimum value, closing when it reaches a suitable value.

In case of direct installation in the boiler (Fig.2), when the dissolved solids reaches the value set at 3000 $\mu\text{S}/\text{cm}^{-1}$ (adjustable), a relay activates the blow-down valve in a proportional time until the TDS concentration goes below 2800 $\mu\text{S}/\text{cm}^{-1}$.

It is provided with one alarm relay outputs activated by maximum (to 5000 $\mu\text{S}/\text{cm}^{-1}$) and by minimum (to 1000 $\mu\text{S}/\text{cm}^{-1}$), giving a stop signal to the boiler when the limits are exceeded, in case of some abnormality in the control system.

The control values, alarms, valve activation and alert status can be supervised from a remote PC or PLC by the RS-485 Modbus communication port included as standard.

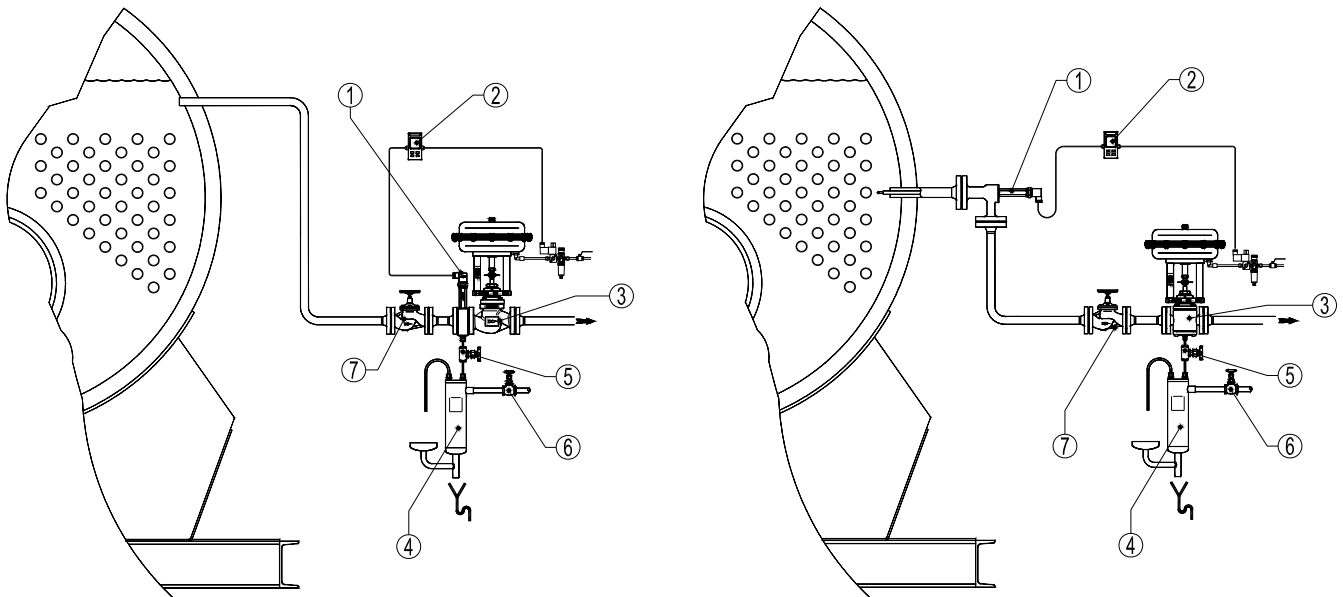


Fig. 1

Fig. 2

Note: Sensor chamber is rotated 90° for catalogue only.

Pos.	Designation
1	Adcatrol TDS Probes SPS-20 (Fig.1) and SPS-32 (Fig.2)
2	Adcatrol BCS-210 TDS controller
3	Adcatrol VPC-25(Fig.1) and VPC-32 (Fig.2)blowdown valve
4	Adca SC32FSS Sample cooler
5	Adca NV-400 Needle valve
6	Adca GV32B Bronze globe valve
7	Adca VF Bellow sealed globe valve

SPECIFICATIONS

TDS CONTROLLER BCS-210

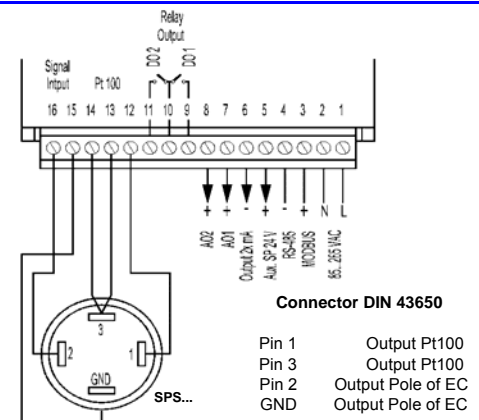
Input EC	SPS probes
Input ATC	Pt100 (Pt1000 as option)
Operating range	100 µS/cm-1 to 10000 µS/cm-1
Temperature compensation	Automatic ATC
Purge time	Configurable from 1 to 60 sec.
Pause time	Configurable from 1 to 100 min.
Blow-down output	Relay DO1 3 A 250 V
High-Low alarm	Relay DO2 1 A 250 V
Analog outputs	4-20mA EC and Temp.(Option)

COMMON FEATURES

Power supply	85 to 265 Vac (3,5 VA)
Dimensions	48 x 96 x 110 mm
Communication	RS-485 Modbus
Weight	0,38 kg

WIRING DIAGRAM

EXAMPLE OF CONNECTION CONTROLLER BCS-210



1	-----	Power supply 85...265 V ac/dc
2	-----	optional: 12 or 24 V ac/dc
3	+	RS-485 Modbus RTU communication
4	-	
5	+	Auxiliary power supply 24 Vdc 40 mA
6	-	Common to 24 Vdc and AO1 - AO2 outputs (option)
7	+	AO1 Analog output 4-20 mA of Conduct. (option)
8	+	AO2 Analog output 4-20 mA of Temp. (option)
9	o	DO1 Blow-down output of TDS. SPST Relay
10	o	Common
11	o	DO2 Hi and Lo Limit output of EC. SPST Relay
12	o	
13	o	ATC by Pt100 input (Pt1000 in option)
14	o	
15	Without Polarity	Performing input for sensors of:
16		2-poles Conductivity EC probes

**TDS CONDUCTIVITY PROBE
IN-LINE CONDUCTIVITY MEASUREMENT
(Two-pole cells with ATC Pt 100)
SPS-20**

DESCRIPTION

The ADCATROL SPS-20 conductivity probe is used to measure the conductivity (TDS) of the superheated water of boilers or condensate.

The probe is used in conjunction with the ADCATROL BCS controller and VPC valve series.

Two-pole cells for conductivity measurement of water in steam generators or boilers.

It is provided with Pt100 sensor for ATC temperature compensation in order to obtain an accurate reading of conductivity while operating with controllers provided with ATC input such as BCS-210 series.

The water contains impurities in form of dissolved solids and solid in suspension whose concentration increases when it is vaporized. Water treatment can reduce impurities to a certain level but it does not eliminate them completely and in certain conditions it might even increase them. As steam starts to be produced, the concentration of total solid in suspension (TDS) increases in the boiler's water. In case the TDS concentration is too high, dissolved salts concentration will be increased. This effect can contaminate the steam and cause damage to the system due to corrosion and salts incrustation of on thermal transference surfaces, (among other problems).

This high concentration is harmful and it is not acceptable in applications where steam is used for treatment of food, drinks and sterilization processes.

In order to limit the concentration of TDS to a suitable level a certain amount of the water of the boiler must be periodically eliminated (purge action) and replace by treated water.

SPS-20 probe together with BCS controller has been developed to purge all types of steam generators based on the measurement of TDS in the water of boiler. It activates the purge valve with a controlled cadence to avoid that an excess of purges generate energy losses and high consumption of treated water.



MAIN FEATURES

- Cell constant K=2
- Range 100 $\mu\text{S/cm-1}$ to 10000 $\mu\text{S/cm-1}$
- Two-pole electrodes in SS316L
- Body in SS316 and PFA (PEEK in option)
- Pressure 25 BAR (max. 32 bar)
- Temperature 200 °C (max. 240 °C)
- Temperature compensation (ATC) by Pt100 (optional Pt1000)
- Calibration by buffers in the controller
- Compact design for piping installation
- Process connection DIN 43650 (IEC 4440)
- Resistance to vibrations: max. 5 G RMS
- Protected against aggressive environments

OPTIONS: Flanged or threaded probe chambers

USE: Superheated boiler water and condensate

AVAILABLE MODELS: SPS-20

SIZES: DN 3/8" and DN 1/2"

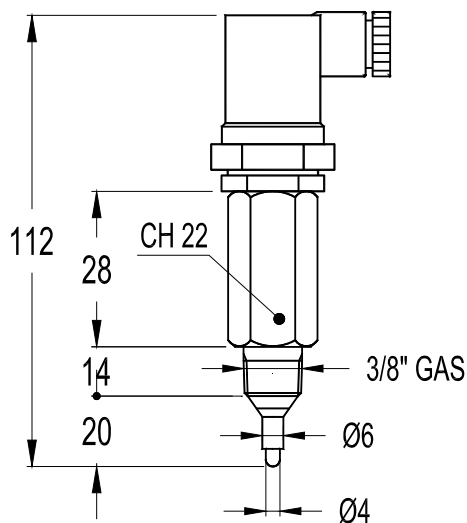
CONNECTIONS: Screwed ISO 7/1 RP (BS21)
ANSI B1.20.1 (NPT)

INSTALLATION: Horizontal or vertical installation

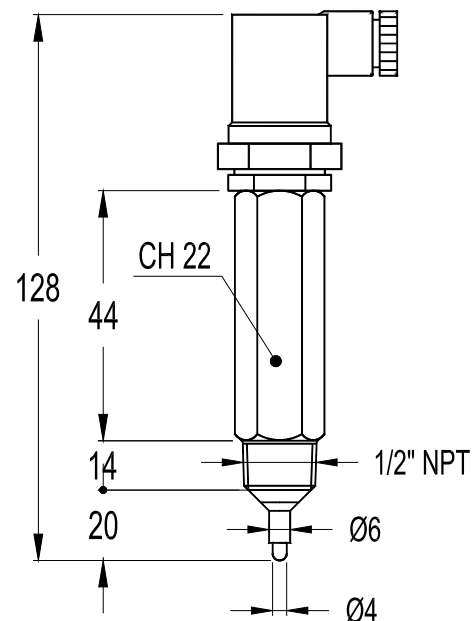
ORDER REQUIREMENTS : SPS-20 probe for TDS with Pt100 sensor for measurements up to 10000 $\mu\text{S}/\text{cm}^{-1}$, process connection 3/8" GAS or 1/2" NPT.

LIMITING CONDITIONS	
Maximum boiler pressure	32 bar
Maximum temperature	240 °C
Maximum ambient temperature	80 °C
Minimum distance from boiler tubes	20 mm
Maximum cable length (from probe to controller)	20 to 30 m
Minimum conductivity	100 μS
Protection rating	IP65

MATERIALS	
DESIGNATION	MATERIAL
Body	AISI 316L / 1.4404
EC electrodes	AISI 316L / 1.4404
Insulation	FPA (PEEK on request)



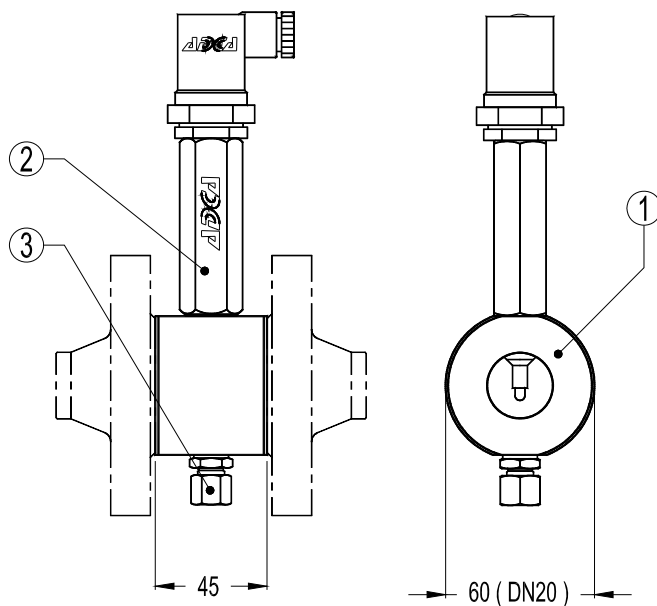
WEIGHT: 0,12 Kg



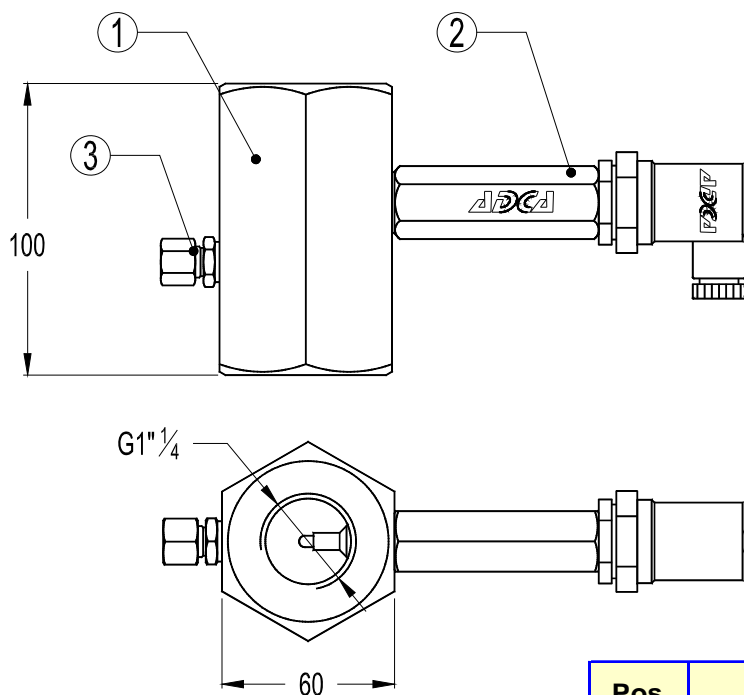
WEIGHT: 0,16 Kg

INSTALLATION: Can be fit into a "T" connection or into our standard chamber providing that the probe is always in contact with the water.
Any metallic parts near the probe must be at a minimum of 20mm from the central end pole.

TYPE F-2020 FLANGED SENSOR CHAMBER (SANDWICHED DESIGN)

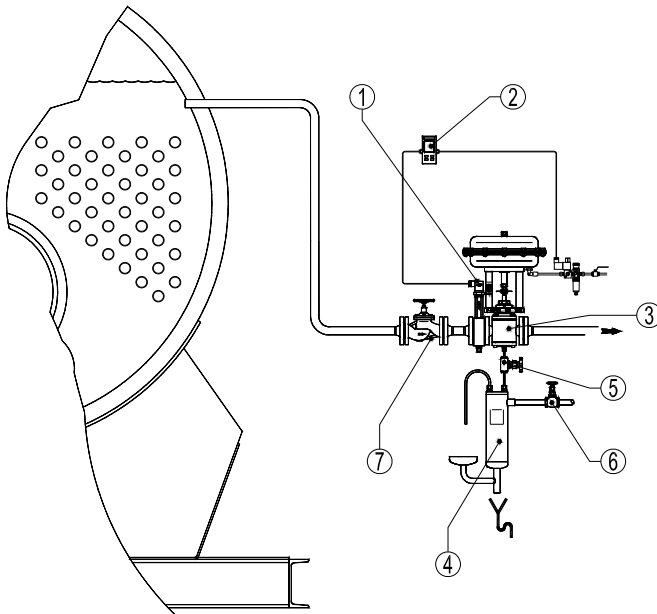


TYPE T-2032 THREADED SENSOR CHAMBER



Pos.	Designation
1	Sensor chamber
2	SPS-20 Conductivity probe
3	Compression fitting for sample collection (optional)

TYPICAL INSTALLATION FIRETUBE BOILER AND PNEUMATIC ACTUATED VALVE



OPERATION

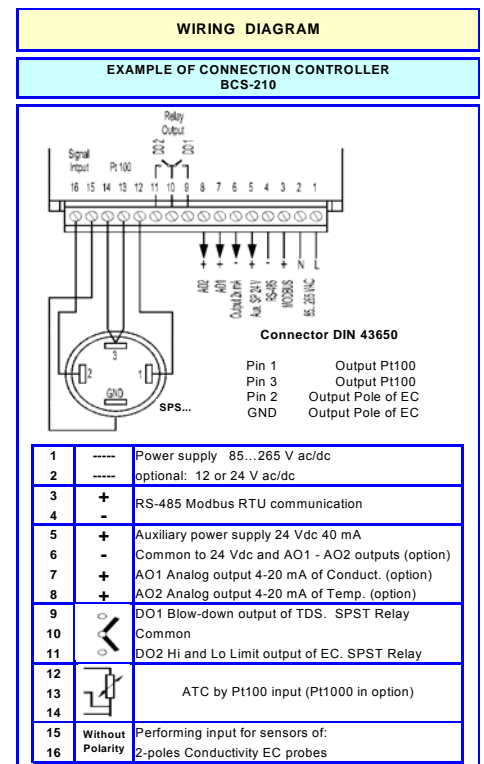
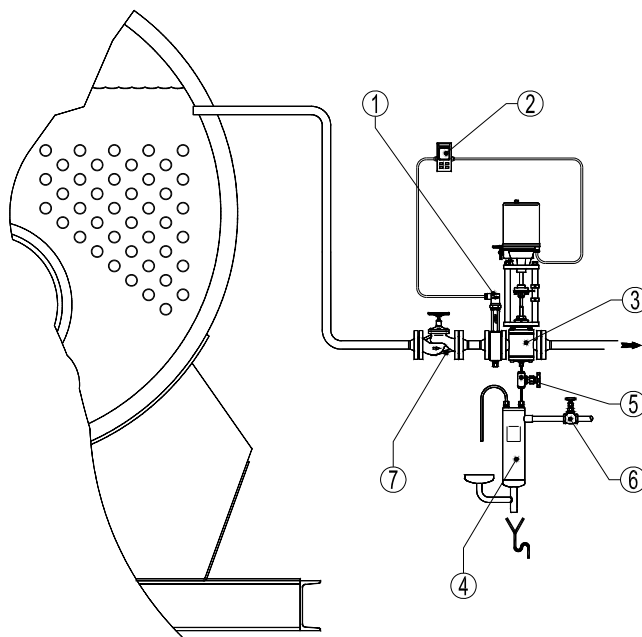
The VPC blowdown valve is programmed to open periodically in order to purge a certain amount of water. The BCS controller will then measure the electrical conductivity of boiler water (closed related to the TDS) and compare it with the set point selected in the controller. It close the valve after the purge if the measured value is lower, or it will keep the valve open until the measured value stay below the set point, if it is higher.

To avoid energy waste due to boiler stand-by or low load, it is recommended to relate the system operation to the burner firing.

It is also recommended to install a heat recovery system (flash vessel, heat exchanger, etc) before connecting the wasted water to the BEX.

Pos.	Designation
1	Adcatrol SPS-20 TDS probe with chamber
2	Adcatrol BSC-210 TDS controller
3	Adcatrol VPC-32 Blowdown valve
4	Adca SC32SS Sample cooler
5	Adca NV-400 Needle valve
6	GV32B Bronze globe valve
7	Adca VF Bellow sealed globe valve

TYPICAL INSTALLATION FIRETUBE BOILER AND ELECTRIC ACTUATED VALVE

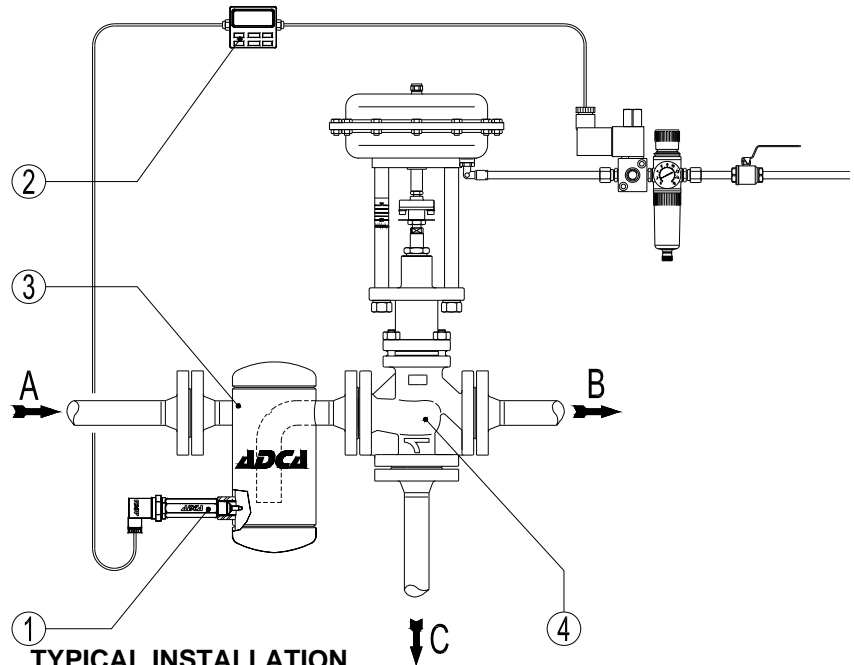


Note: Sensor chamber is rotated 90° for catalogue only.

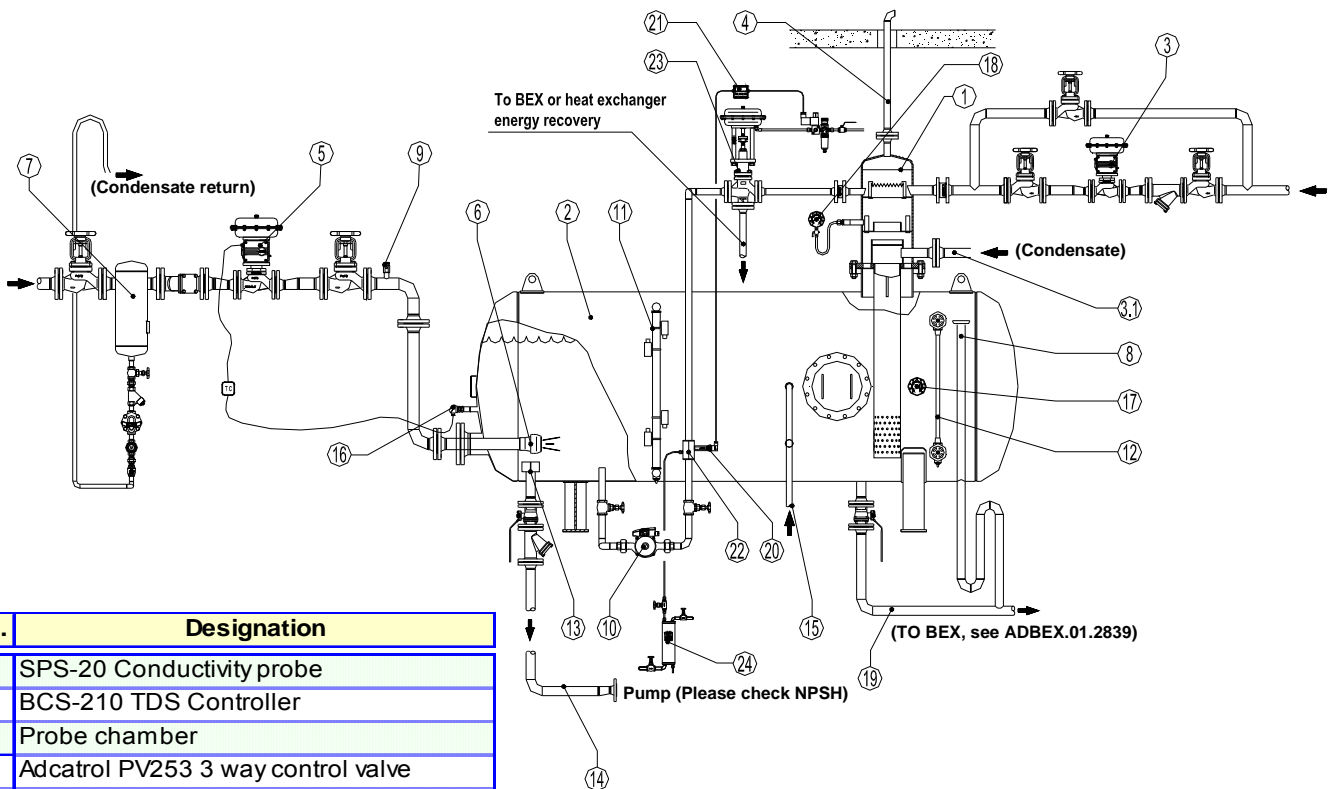
**TYPICAL INSTALLATION
WATER TUBE COIL BOILER – PROBE INSTALLED IN THE CONDENSATE RETURN LINE**

OPERATION

The BCS controller (2) is programmed to continuously measure (1) the electrical conductivity of boiler return condensate (closed related to the TDS) and, compare it with the set point selected in the controller, it will invert the flow of the three way valve (4) from B to C if the measured value is higher, or keep the valve flow from A to B until the measured value exceed the set point .
The chamber (3) guaranties that the probe (1) is always in contact with the measured medium (condensate).
It is recommended to install a heat recovery system (flash vessel, heat exchanger, etc) before connecting the wasted condensate (C) to the BEX.



**TYPICAL INSTALLATION
WATER TUBE COIL BOILER – PROBE INSTALLED IN THE RECIRCULATING PIPE**



Pos.	Designation
20	SPS-20 Conductivity probe
21	BCS-210 TDS Controller
22	Probe chamber
23	Adcatrol PV253 3 way control valve
24	SC32 Sample cooler system

Complete description: ADADGV.06.3676

OPERATION

Similar to the previous one but in this case the pump (10) is recirculating the make-up water across the probe (22).

**TDS CONDUCTIVITY PROBE
DIRECT BOILER CONDUCTIVITY MEASUREMENT
(Two-pole cells with ATC Pt 100)
SPS-32**

DESCRIPTION

The ADCATROL SPS-32 conductivity probe is used to measure the conductivity (TDS) of the superheated water of boilers or condensate.

The probe is used in conjunction with the ADCATROL BCS controller and VPC valve series.

Two-pole cells for conductivity measurement of water in steam generators or boilers.

It is provided with Pt100 sensor for ATC temperature compensation in order to obtain an accurate reading of conductivity while operating with controllers provided with ATC input such as BCS-210 series.

The water contains impurities in form of dissolved solids and solid in suspension whose concentration increases when it is vaporized. Water treatment can reduce impurities to a certain level but it does not eliminate them completely and in certain conditions it might even increase them. As steam starts to be produced, the concentration of total solid in suspension (TDS) increases in the boiler's water. In case the TDS concentration is too high, dissolved salts concentration will be increased. This effect can contaminate the steam and cause damage to the system due to corrosion and salts incrustation of on thermal transference surfaces, (among other problems).

This high concentration is harmful and it is not acceptable in applications where steam is used for treatment of food, drinks and sterilization processes.

In order to limit the concentration of TDS to a suitable level a certain amount of the water of the boiler must be periodically eliminated (purge action) and replace by treated water.

SPS-32 probe together with BCS controller has been developed to purge all types of steam generators based on the measurement of TDS in the water of boiler. It activates the purge valve with a controlled cadence to avoid that an excess of purges generate energy losses and high consumption of treated water.



MAIN FEATURES

- Cell constant K=2
- Range 100 $\mu\text{S}/\text{cm}^{-1}$ to 10000 $\mu\text{S}/\text{cm}^{-1}$
- Two-pole electrodes in SS316L
- Body in SS316 and PFA (PEEK in option)
- Pressure 25 BAR (max. 32 bar)
- Temperature 200 °C (max. 240 °C)
- Temperature compensation (ATC) by Pt100 (optional Pt1000)
- Calibration by buffers in the controller
- Design for direct mounting in the boiler
- Process connection DIN 43650 (IEC 4440)
- Resistance to vibrations: max. 5 G RMS
- Protected against aggressive environments

OPTIONS: Connection Tee for boiler and blowdown valve connection

USE: Superheated boiler water and condensate

AVAILABLE MODELS: SPS-32

SIZES: DN 1/2"

CONNECTIONS: Screwed ISO 7/1 RP (BS21)
ANSI B1.20.1 (NPT)

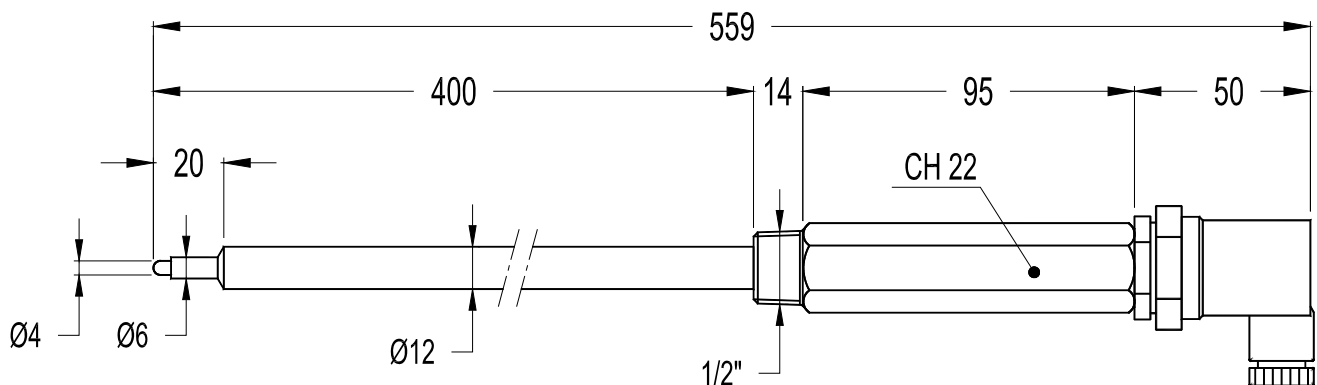
INSTALLATION: Horizontal or vertical installation

ORDER REQUIREMENTS : SPS-32 probe for TDS with PT100 sensor for measurements up to 10000 $\mu\text{S}/\text{cm}^{-1}$ process connection 1/2" GAS, or 1/2" NPT

LIMITING CONDITIONS	
Maximum boiler pressure	32 bar
Maximum temperature	240 °C
Maximum ambient temperature	80 °C
Minimum distance from boiler tubes	20 mm
Maximum cable length (from probe to controller)	20 to 30 m
Minimum conductivity	100 μS
Protection rating	IP65

MATERIALS	
DESIGNATION	MATERIAL
Body	AISI 316L / 1.4404
EC electrodes	AISI 316L / 1.4404
Insulation	FPA (PEEK on request)

DIMENSIONS :

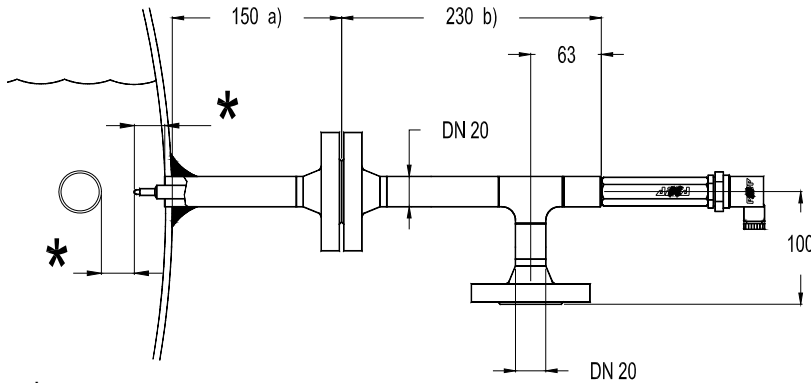


WEIGHT: 0,51 Kg

INSTALLATION: Directly to the boiler, in the way that the probe is always in contact with the water.
Any metallic parts near the probe must be at a minimum of 20mm from the central end pole.

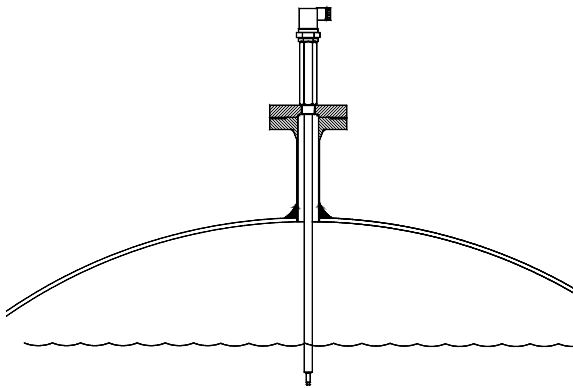
INSTALLATION EXAMPLES:

Horizontal installation with a Tee piece type F-3220

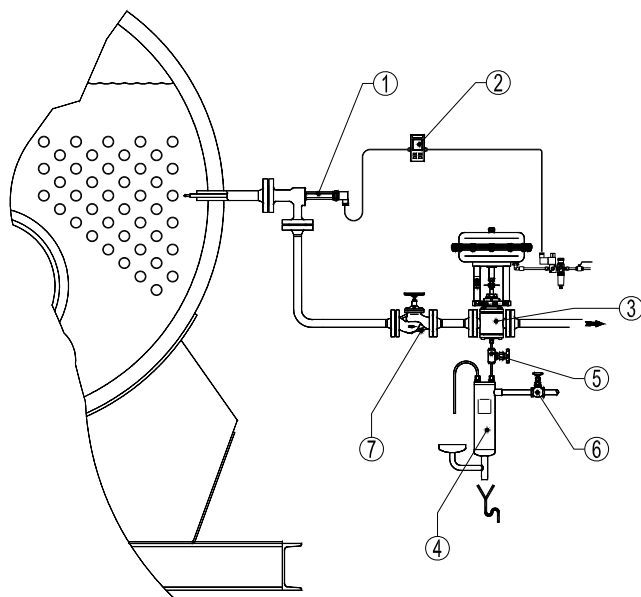


* 20 mm , minimum ; a) + b) ≤ 380 mm

Vertical installation on a boiler standpipe with a probe flange

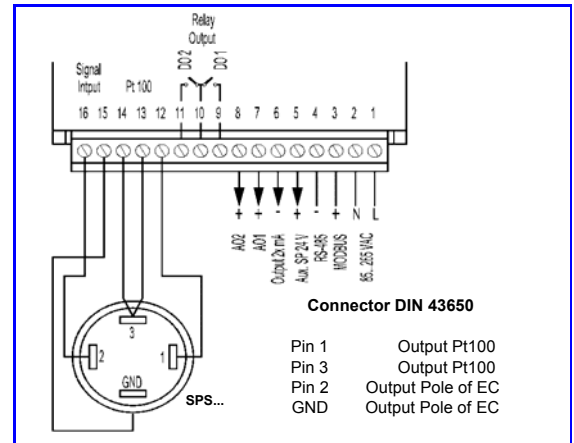


TYPICAL INSTALLATION



WIRING DIAGRAM

EXAMPLE OF CONNECTION CONTROLLER BCS-210



Pin	Symbol	Description
1	---	Power supply 85...265 V ac/dc
2	---	optional: 12 or 24 V ac/dc
3	+	RS-485 Modbus RTU communication
4	-	
5	+	Auxiliary power supply 24 Vdc 40 mA
6	-	Common to 24 Vdc and AO1 - AO2 outputs (option)
7	+	AO1 Analog output 4-20 mA of Conduct. (option)
8	+	AO2 Analog output 4-20 mA of Temp. (option)
9	○	DO1 Blow-down output of TDS. SPST Relay Common
10	○	
11	○	DO2 Hi and Lo Limit output of EC. SPST Relay
12	□	ATC by Pt100 input (Pt1000 in option)
13	□	
14	□	
15	Without Polarity	Performing input for sensors of:
16	Without Polarity	2-poles Conductivity EC probes

Position	Designation
1	Adcatrol SPS-32 TDS probe
2	Adcatrol BSC-210 TDS controller
3	Adcatrol VPC-32 Blowdown valve
4	Adca SC32SS Sample cooler
5	Adca NV-400 Needle valve
6	GV32B Bronze globe valve
7	Adca VF Bellow sealed globe valve

OPERATION

The BCS controller (2) is programmed to continuously measure the electrical conductivity (1) of boiler water (closed related to the TDS) and compare it with the set point selected in the controller. It will open the blowdown valve (3) if the measured value is higher, or keep the valve closed until the measured value exceeds the set point.

It is recommended to install a heat recovery system (flash vessel, heat exchanger, etc) before connecting the wasted water to the BEX.