STEIEL

MICROPROCESSOR INSTRUMENTS

S508 Series

TECHNICAL MANUAL

CE

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Certified Company, according to UNI EN ISO 9001 standards

WARNINGS

This manual is dedicated to the technical personnel responsible of the installation, management and maintenance of the plants. The manufacturer assumes no responsibility for damages or malfunctions occurring after intervention by non-authorized personnel, or not compliant with the prescribed instructions.

Before performing any maintenance or repair action, ensure that the system is electrically and hydraulically insulated.

Dispose of waste material and consumables accordingly with local regulations.

The manufacturer can modify the instrument or the technical manual without advanced notice.

Warranty

All our products are warranted for a period of 12 months from the delivery date.

Warranty is not valid if all instructions of installation, maintenance and use, are not strictly followed by the user.

Local regulations and applicable standards have also to be followed.

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PACKING LIST

1) S508 Controller
2) Technical manual
3) Mounting brackets for panel installation (2 pieces)
4) Ferrites (2 pieces, part number 5062.0020)

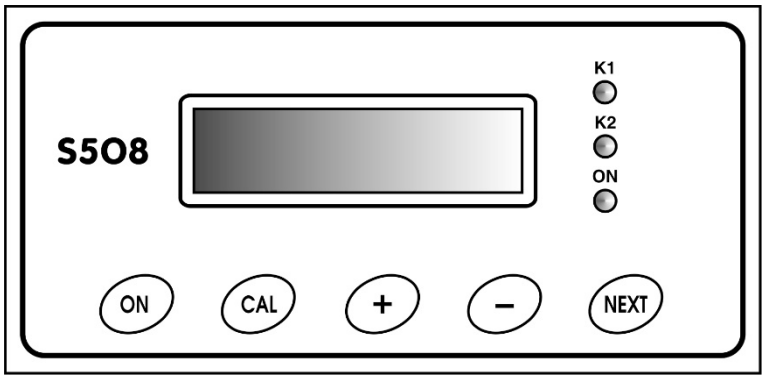
INTRODUCTION AND PRINCIPLE OF OPERATION

S508 is a series of digital, microprocessor-based instruments, designed for panel installation.
All models are equipped with two output relay (settable as set-point or alarm), one current output galvanically insulated, and one serial port for PC communication (optional software).
All outputs can be temporary disabled (for example for maintenance purpose) through the ON button.
Errors and alarms are shown directly on the display, and configuration and calibration data are stored in the non-volatile memory for at least 10 years.
The display interface language can be set by the user, choosing among the available options.

The S508 series includes several models with analogic input for the following measurement sensors:
- ✓ pH / redox electrode
- ✓ CLE11/CLE12 amperometric cell, for measures of residual chlorine (bromine and chlorine dioxide)
- ✓ Closed amperometric cell with ion-selective membrane, CAC series
- ✓ Two-electrode conductivity cell
- ✓ Turbidity cell
- ✓ Indicator with 0/4-20 mA input (standardized input)

Moreover, all models feature an input for Pt100 sensor, for temperature measurement and thermo-compensation of pH, conductivity and residual chlorine readings.

DESCRIPTION OF THE FRONT PANEL



ON key	Enable / disable all outputs (relays, pump magnet, mA output)
CAL key	Allow to enter configuration and calibration modes
[+] key	While in normal mode, show the "GAIN" value (amplification factor); in calibration mode increase the displayed value
[-] key	While in normal mode, show the "OFFSET" value (deviation from zero); in calibration mode decrease the displayed value
NEXT key	While in normal mode, toggle between main measure and temperature readings; in calibration mode exit without saving the new calibration data
LED K1	LED ON = K1 relay ON = contact closed
LED K2	LED ON = K2 relay ON = contact closed
LED ON	Light ON (fix) means instrument ON and no anomalies; blinking light indicates malfunction or outputs disabled through the ON button
Display	In normal mode shows the measurement and temperature value. If no temperature probe is connected, the value set in parameter P04 is shown within brackets.

TECHNICAL DATA

Common characteristics for all models

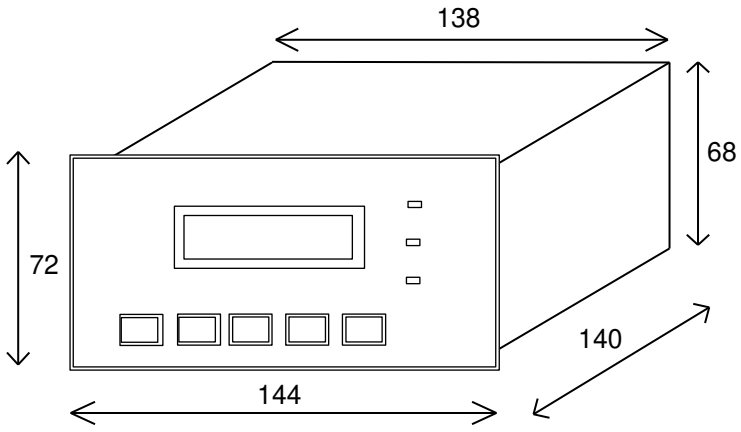
Power Supply	standard: 230 V~ ±10% 50/60 Hz upon request: 115 or 24 V~ ±10% 50/60 Hz, or 24 V-	
Power Consomption	7 VA max	
Protections	F 250 mA, 5x20 fuse	
Display	2-row, alphanumeric LCD (16 digits per row), with backlight	
Analogic Inputs	precision > 0.3% FS ; repeatability > 0.2% FS	
Temperature Input	removable, 2-pole terminal block, for connection of Pt100 sensor	
Digital Inputs	OFF/FLW input for disabling outputs; accept voltage-free contact; voltage at terminals 5V, current max 5 mA AUX additional input, available on special models	
Relay Output	2 independent outputs on removable, 5-pole terminal block; max load 250 Vac, 3 A resistive	
Current Output	0-20 or 4-20 mA (selectable through software), max load 600 Ω, err max 0.5% FS; galvanically separated	
Serial Output	RS232 port on removable, 4-pole terminal block (RS485 upon request)	
Environment	storage temperature	-20 to +60 °C
	operating temperature	-10 to +50 °C
	RH	max 90% noncondensing
Casing	for panel installation, with mounting brackets	
Materials	meter body: Noryl; front panel: polyester	
Protection Rate	IP54	
Dimensions	DIN 72 x 144 x 140 mm (including terminal blocks); drilling template 138 x 68 mm	
Weight	approx. 760 g	

Analogic Input, depending on model

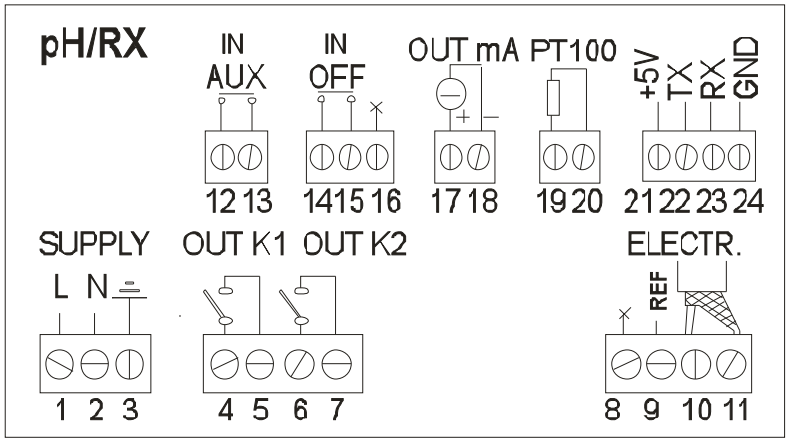
pH / ORP Input	available on removable, 4-pole terminal block (coaxial cable + reference); input impedance > 10^12 Ω
Chlorine Input	available on removable, 4-pole terminal block for CLE12 cell (copper/platinum cell + shield)
CAC Cell Input	available on removable, 4-pole terminal block (power supply + signal)
Conductivity/Resistivity	input on removable terminal block for cell with 2 electrodes + shield
Turbidity Meter Input	available on removable terminal block for CTS07 cells; ranges up to 100 or 500 FTU
Standardised Input	available on removable, 4-pole terminal block (specify input type, range and transducer power supply)

MECHANICAL DIMENSIONS

Note: all dimensions are in mm.



ELECTRICAL CONNECTIONS



For correct electrical connections always refer to the rear panel pad printing, specific for each model. The above figure represents the pH/RX model version.

The difference among different models is the input signal terminal block (pins 8 to 11), while the remaining connections are the same for all models.

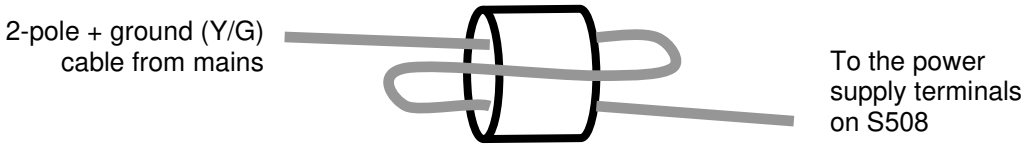
- ✓ SUPPLY: connect to these terminals (1, 2, 3) the external power supply, accordingly with voltage technical specifications indicated on the instrument label; max tolerance ±10%; connect the terminal 3 to the grounding of the electric system. The instrument is equipped with an internal protection system,, thanks to which it is not necessary to enforce any polarity in the case of DC power.
- ✓ OUT K1: relay output, voltage-free contact, terminals 4 and 5, max load 3 A and 250 Vac resistive (with 230 Vac power supply, pumps or solenoid valves up to 200 VA can be driven)
- ✓ OUT K2: relay output, voltage-free contact, terminals 6 and 7, max load 3 A and 250 Vac resistive (with 230 Vac power supply, pumps or solenoid valves up to 200 VA can be driven)
- ✓ IN AUX: additional input (terminals 12 and 13), typically used for triggering automatic cleaning cycles
- ✓ IN OFF/FLOW: digital input (terminals 14, 15, 16); when the contact is closed, outputs are disabled and the status is shown on the display; for simple contacts, use terminals 14 and 15; in case of input from 3-wire magnetic sensor (e.g. flow sensor on probe-holder), connect the input black wire to terminal 14, the negative blue wire to terminal 15, and the positive brown wire to terminal 16
- ✓ OUT mA: current output, terminals 17 (positive) and 18 (negative)
- ✓ PT100: temperature input (terminals 19 and 20), for connecting a Pt100 probe (if a sensor with cable longer than 5 meters is required, it is recommended to use a 2-wire cable + shield; connect the shield to terminal 19)
- ✓ SERIAL OUTPUT: terminals 21 (+5V), 22 (TX), 23 (RX), 24 (GND); this output can be used for connecting a PC or RW14 (tele-control system via web)
- ✓ MEASURE INPUT: terminals 8, 9, 10 and 11; for connections refer to the specific sections; the maximum cable length depends on the sensor type (20 m for pH or RX, 5 m for low conductivity measurements, 10 m for medium-high conductivity, 60 m for standardised inputs using shielded cables); perform wiring while keeping signal and power cables separated; if using cables with additional shield, connect the shield to the REF terminal (never short-circuit the grounding with REF terminal!)

Warning! Before performing any connection, check that the meter is not powered!

Notes:

- *The output relay contacts are not protected: insert a fuse or other protection system appropriate for the load.*
- *In case of inductive load, the output should be protected with appropriate system for arc and interference suppression (RC nets or varistors in AC, diodes or varistors in DC).*

For a correct functioning of the device even in bad interference conditions, it is recommended to proceed as follows:
a) insert one of the supplied ferrites on the power supply cable as shown in the below picture
b) connect the shield of the signal cable to the grounding or to the REF terminal
c) insert the second supplied ferrite on the input signal cable as shown in the below picture
d) connect RC suppressors (or similar) in parallel with the load (properly dimensioned)
e) check the correct grounding connection of the electric cabin that contains the instrument
f) if the cable connected to the current output is longer than 20 meters, use shielded cable



Ferrite (part number 5062.0020)

Make one or two turns (depending on the cable section) around the ferrite.

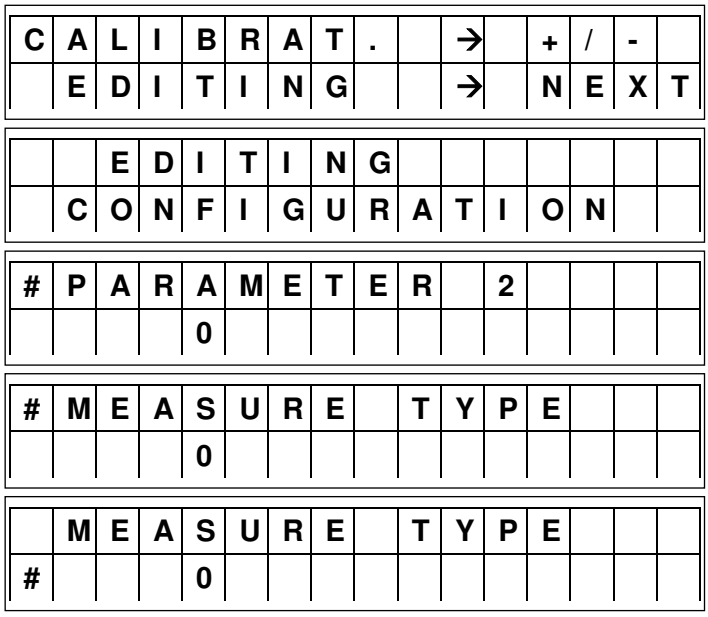
Note: *The instrument is supplied complete with two ferrites, one for the power supply cable and one for the input signal cable. In case of additional input (temperature) with cable separated from the main one, a third ferrite is needed. Contact your dealer.*

START-UP

At start-up, the microprocessor performs a quick test of the display switching on all the segments, then shows the instrument/software version code, checks the memory status, and displays error or advice codes (if present). For details, see “ERRORS” section.
After completing the start-up operations, the device enters the normal operating mode, displays main measurement and temperature, and updates accordingly the current and relay outputs.
If at start-up the [+] and [-] keys are pressed simultaneously, the device runs a simulation program: “0” is displayed and the LED ON blinks. This value simulates the measurement and can be adjusted with the [+] and [-] keys, for testing the functioning and configuration of the current and relay outputs. To exit the simulation mode, press NEXT.

CONFIGURATION

This section describes the operating procedure for configuring editable parameters from the keyboard.



1) Press and hold the CAL key for at least 2 seconds to enter configuration/calibration mode
2) Press NEXT to start the configuration
3) Release the and the display will show the first editable parameter
4) Use the [+] and [-] keys to go to the next/previous parameter, or press CAL to move the cursor on the parameter value;

   modify the value with the [+] and [-] keys
5) Press CAL to confirm the modification or

   next to proceed without saving
6) Now the display shows the next parameter
7) Proceed as explained at steps 4 and 5 for setting all the parameters
8) To exit the configuration mode, press NEXT
9) If no key is pressed, after a few seconds the instrument will automatically quit the configuration mode

LIST OF PARAMETERS

It is recommended to fill the last column with the values set for your application.

Model pH/ORP/°C/ mA / chlorine / / turbidity (default values refer to the pH range)

PAR.	Description	Min value	Max value	Default	Set value
P01	Measure type	0	2	0	
P02, P03	Reserved				
P04	Working temperature	0	100	25 °C	
P05, P06	Reserved				
P07	Working mode for K1	0	5	1	
P08	Minimum threshold for K1 (or flow time, in minutes)	-1000	2000	6.00 pH	
P09	Maximum threshold for K1 (or reading time, in minutes)	-1000	2000	6.30 pH	
P10	Energizing delay for K1 (or washing time, in minutes)	0	240	0 sec	
P11	De-energizing delay for K1 (or pause time, in minutes)	0	240	0 sec	
P12	Working mode for K2	0	6	1	
P13	Minimum threshold for K2 (or pause time, minutes)	-1000	2000	6.50 pH	
P14	Maximum threshold for K2 (or washing time, seconds)	-1000	2000	6.80 pH	
P15	Energising delay for K2 (or hold time after cleaning, seconds)	0	240	0 sec	
P16	De-energising delay for K2 (or pause time, in minutes)	0	240	0 sec	
P17	Starting delay	0	60	0 min	

PAR.	Description	Min value	Max value	Default	Set value
P18	mA output type	0	1	1	
P19	Starting value for mA output	-1000	2000	0.00 pH	
P20	Full scale value for mA output	-1000	2000	14.00 pH	
P21	Fault mA value	0.0	21.0	21.0 mA	
P22	Not used	-	-	-	
P23	Password	0	999	0	
P24	Language	0	3	0	
P25	UR/OR functioning	0	7	0	
P26	Minimum threshold for K3 alarm	-1000	4000	-1.00 pH	
P27	Maximum threshold for K3 alarm	-1000	4000	15.00 pH	
P28	Triggering delay for K3 alarm	0	240	0 min	
P29	Auto-set	0	100	0	
(P30)	Starting value meas.1 (mA model only)	-1000	2000	0	
(P31)	Full scale meas.1 (mA model only)	-1000	2000	2000	
(P32)	d.p. + m.u. meas.1 (mA model only)	0	255	0	

Conductivity meter version

PAR.	Description	Min value	Max value	Default	Set value
P01	Conductivity/resistivity meter range	0	48	23	
P02	Temp. compensation coefficient	0.00	4.00	2.00	
P03	Reference temperature	0	100	25 °C	
P04	Working temperature	0	100	25 °C	
P05, P06	Reserved	1.0	120.0	120.0	
P07	Working mode for K1	0	4	1	
P08	Minimum threshold for K1 (or flow time, in minutes)	-1000	2000	70.0 µS	
P09	Maximum threshold for K1 (or reading time, in minutes)	-1000	2000	80.0 µS	
P10	Energizing delay for K1 (or washing time, in minutes)	0	240	0 sec	
P11	De-energizing delay for K1 (or pause time, in minutes)	0	240	0 sec	
P12	Working mode for K2	0	4	1	
P13	Minimum threshold for K2 (or pause time, minutes)	-1000	2000	85.0 µS	
P14	Maximum threshold for K2 (or washing time, seconds)	-1000	2000	95.0 µS	
P15	Energising delay for K2 (or hold time after cleaning, seconds)	0	240	0 sec	
P16	De-energising delay for K2	0	240	0 sec	
P17	Starting delay	0	60	0 min	
P18	mA output type	0	1	1	
P19	Starting value for mA output	-1000	2000	00.0 µS	
P20	Full scale value for mA output	-1000	2000	199.9 µS	
P21	Fault mA value	0.0	21.0	21.0 mA	
P22	Not used	-	-	-	
P23	Password	0	999	0	
P24	Language	0	3	0	
P25	UR/OR functioning	0	7	0	
P26	Minimum threshold for K3 alarm	-1000	4000	-.50 µS	
P27	Maximum threshold for K3 alarm	-1000	4000	20.50 µS	
P28	Triggering delay for K3 alarm	0	240	0 min	
P29	Autoset	0	100	0	

MEANING OF PARAMETERS

P01 (**pH** / **ORP** / **T**) **MEASURE TYPE**

This model configured and calibrated for pH, REDOX or temperature measurements, can be set as follows: 0 = pH-meter, 1 = REDOX meter, 2 = thermometer.

P01 (**conductivity**) **CONDUCTIVITY/RESISTIVITY METER RANGE**

Set this parameter to choose the desired measurement range and cell constant:

Cell constant (K)	Range	P01	Range	P01	Range	P01	Range	P01
K = 10 cm	2 µS/cm	1	20 µS/cm	2	200 µS/cm	3	2000 µS/cm	4
K = 1 cm	20 µS/cm	6	200 µS/cm	7	2000 µS/cm	8	20 mS/cm	9
K = 0.1 cm	200 µS/cm	11	2000 µS/cm	12	20 mS/cm	13	200 mS/cm	14
K = 0.01 cm	2000µS/cm	16	20 mS/cm	17	200 mS/cm	18	2000 mS/cm	19
K = 5 cm	2 µS/cm	21	20 µS/cm	22	200 µS/cm	23	2000 µS/cm	24

If the visualization of a resistivity range is required, select the desired range:

Cell constant (K)	Range	P01	Range	P01	Range	P01	Range	P01
K = 10 cm	99.9..0.5 MΩ	25	9.99..0.05 MΩ	26	999..5 KΩ	27	99.9..0.5 KΩ	28
K = 1 cm	9.99..0.05 MΩ	30	999..5 KΩ	31	99.9..0.5 KΩ	32	9.99..0.05 KΩ	33
K = 0.1 cm	999..5 KΩ	35	99.9..0.5 KΩ	36	9.99..0.05 KΩ	37	999..5 Ω	38
K = 0.01 cm	99.9..0.5 KΩ	40	9.99..0.05 KΩ	41	999..5 Ω	42	99.9..0.5 Ω	43
K = 5 cm	99.9..0.5 MΩ	45	9.99..0.05 MΩ	46	999..5 KΩ	47	99.9..0.5 KΩ	48

Resistivity is calculated as the reciprocal of conductivity, according to the formula: R = 1/C.

To minimize the significant fluctuations of resistivity values correspondent to conductivity measurements around the beginning of the range, the resolution of resistivity measurements has been lowered to 999 points, equal to the lowest conductivity resolution (2000 points). In fact, a small fluctuation in the values of conductivity (from 0.1 to 0.3 µS / cm) would result in a fluctuation from 10.000 to 3.333 MΩ in resistivity readings.

If the parameter is set to a value not included in the above table, the instrument will not function correctly.

P01 (**mA input**) **MEASURE TYPE**

P01=0 set the analogue input at 0-20 mA.
P01=1 set the analogue input at a 4-20 mA.

P01 (**chlorine**) **MEASURE TYPE**

In the case of chlorine measurement with CAC cell and low range (1 ppm), this parameter allows to select the measurement resolution:

- P01=0 : standard range, 0.00 to 1.00 ppm (2 decimal places)
- P01=1 : sensitive range, 0.000 to 1.000 ppm (3 decimal places), option reserved to expert users and to be used only for low chlorine levels. This configuration also allows to restrict the proportional regulation up to 0.025 ppm at the 4-20 mA output.

P02 (**pH** / **ORP** / **T, mA, chlorine**) **RESERVED**

Reserved parameter, for future use.

P02 (**conductivity**) **TEMPERATURE COMPENSATION COEFFICIENT αT**

S508 perform the temperature compensation accordingly with the following equation:

$$C(t) = C(tref) * \left(1 + \frac{\alpha T}{100} * (t - tref) \right)$$

where: t = measured (or set) temperature, °C
tref = reference temperature, °C (typically set at 25°C, parameter P03)
αT = temperature compensation coefficient, %/°C (parameter P02)

Typical αT values: 1.0 to 1.6 %/°C for acid solutions
1.8 to 2.2 %/°C for alkaline solution
2.2 to 3.0 %/°C for salt solution
approx. 2.0 %/°C for water

Anyway, the αT coefficient is not constant over all the standard temperature compensation range, but only for small temperature variations (e.g. 20 to 50°C).
Set αT = 0 means disabling the temperature compensation feature.

If the αT value is unknown, it may be determined as follows:

1) set αT (P02) = 0.00 (no temperature compensation)
2) read the conductivity value of the tested liquid at the reference temperature (e.g. 25°C)
3) bring the liquid at the working temperature
4) read the conductivity value at this temperature
5) calculate the αT (P02) value with the below equation:

$$\alpha T = \frac{C(t) - C(tref)}{t - tref} \times \frac{100}{C(tref)}$$

6) set the P02 parameter with the calculated value

P03 (**pH** / **ORP** / **T, mA, chlorine**) **RESERVED**

Reserved parameter, for future use.

P03 (**conductivity**) **REFERENCE TEMPERATURE**

See description of parameter P02.

P 04 WORKING TEMPERATURE

All the S508 models are designed for measuring temperature and use this value for temperature compensation (when required). If no temperature probe is connected, the working temperature value can be manually entered. In this case the set value is displayed within brackets.

P05, P06 Reserved parameters. Do not modify!

P07 WORKING MODE OF RELAY K1

The K1 relay output cam work in 6 different modes:

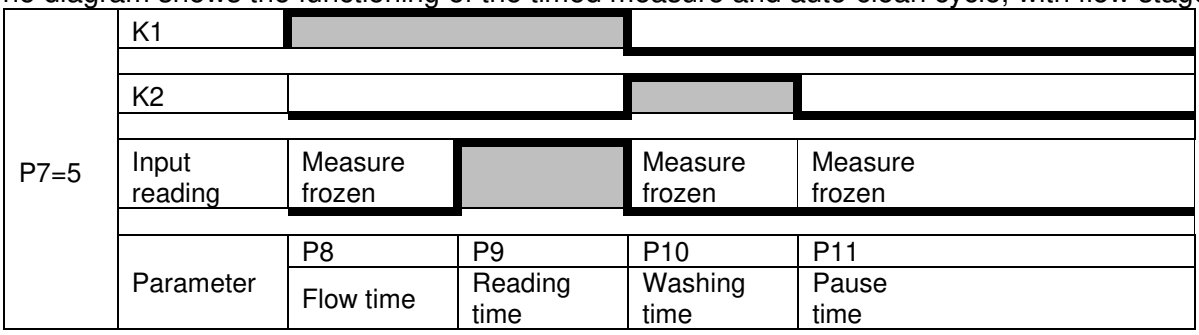
0 = Relay disabled.
1 = Contact is closed when the set thresholds are exceeded.
2 = Contact is open when the set thresholds are exceeded.
3 = Upwards proportional control (dosage increases as measurement value increases); the K1 energizing time is small (or zero) if measurement is below the minimum threshold (P08), and increases gradually up to its maximum (or always ON) when the max threshold (P09) is exceeded.
4 = Downwards proportional control (dosage decreases as measurement value increases); the K1 energizing time is at its maximum (or always ON if measurement is below the minimum threshold (P08), and decreases gradually to its minimum (or always OFF) when the max threshold (P09) is exceeded.
5 = Timed measure and auto-cleaning cycle, including flow phase. This kind of working mode allows to save sensor life when measuring aggressive liquids, by limiting the contact time to the sole reading period.
The working cycle starts with the activation of the solenoid valve connected to the relay K1, which controls the flow of the liquid to be measured towards the sensor. It then waits for a time called "flow time" (P08), which ensures that the liquid reaches the sensor. At this point the measurement is taken for a period specified (time P09). After the reading, the measure is frozen, the relay K1 de-energizes and activates the relay K2, which is connected to the solenoid valve that allows clean water (or detergent) to pass for washing the sensor. Once the washing time (P10) finishes, K2 de-energizes and the system remains frozen for the pause time (P11). Then the cycle repeats. When the system stops, the current output assumes the fault value set in parameter P21 and the contact "IN AUX" is closed (if used), by triggering a wash. If the cycle is in the flow or reading

process, that stage is stopped immediately and a wash is performed. Then the operation will remain locked until the installation is restarted with subsequent deactivation of the "IN AUX" input. All the times that regulate the timed cycle are set by the operator (see next parameters).

***Note**: When P07 is set to 5, to perform an electrochemical calibration the cycle must be stopped temporarily by holding the NEXT key for 2 seconds. The stage in process is suspended, measure is de-frozen, energized relays deactivate and the "ON" LED blinks (5 quick flashes and one 1-second pause). Once the calibration is completed, to reactivate the cycle press again the NEXT button for 2 seconds.*

***Note**: Since both relays of the unit are used for the timed cycle, control may be performed through the current output or the serial line.*

The diagram shows the functioning of the timed measure and auto-clean cycle, with flow stage:



P08 MIN THRESHOLD FOR RELAY K1

Minimum threshold value for relay K1 action.
If P07=5, this parameter allows to set the flow time (minutes).

P09 MAX THRESHOLD FOR RELAY K1

Maximum threshold value for relay K1 action.
If P07=5, this parameter allows to set the reading time (minutes).

P10 ENERGIZING DELAY FOR RELAY K1

This parameter allows to enter a delay time (in seconds) for energizing relay K1, if it is configured with working type option 1 or 2. Entering zero will skip delay and the relay is activated immediately.
If P07=5, this parameter allows to set the washing time (minutes).

P11 DE-ENERGIZING DELAY FOR RELAY K1

This parameter allows to enter a delay time (in seconds) for de-energizing relay K1, if it is configured with working type option 1 or 2. Entering zero will skip delay and the relay is de-activated immediately.
If P07=5, this parameter allows to set the pause time (minutes) between two subsequent cycles.

Some notes about proportional control

For a better understanding of proportional control, refer to the below table. Simple values are simulated:

	Upwards Proportional Control			Downwards Proportional Control		
Configuration ➔	(P07) Control type K1 = 3 (P08) Min. threshold K1 = 500 (P09) Max. threshold K1 = 700 (P10) Period = 120 seconds (P11) Min. ON-OFF time = 0 seconds			(P07) Control type K1 = 4 (P08) Min. threshold K1 = 500 (P09) Max. threshold K1 = 700 (P10) Period = 120 seconds (P11) Min. ON-OFF time = 0 seconds		
Measure	**T ON**	**T OFF**	Control	**T ON**	**T OFF**	Control
<= 500	0 sec	120 sec	0 %	120 sec	0 sec	100 %
520	12 sec	108 sec	10 %	108 sec	12 sec	90 %
540	24 sec	96 sec	20 %	96 sec	24 sec	80 %
550	30 sec	90 sec	25 %	90 sec	30 sec	75 %
600	60 sec	60 sec	50 %	60 sec	60 sec	50 %
650	90 sec	30 sec	75 %	30 sec	90 sec	25 %
>= 700	120 sec	0 sec	100 %	0 sec	120 sec	0 %

For a correct functioning, set properly the parameters, accordingly with the following prescriptions:

a) The difference between the max and min thresholds should be greater than 31 points

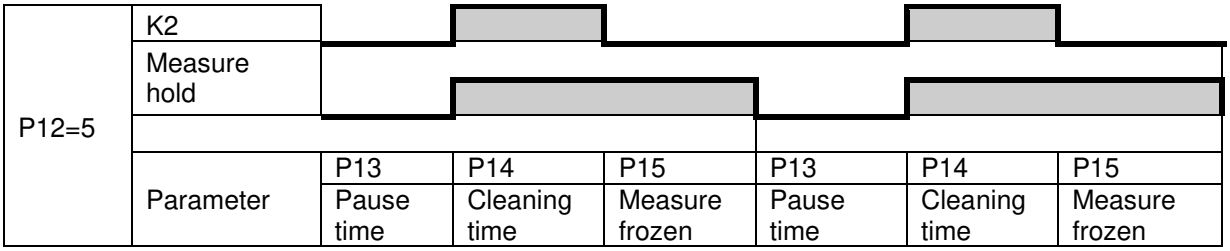
b) The minimum control time (P10 – P11) should be greater than 5 seconds
c) The period (base time) should be set accordingly with the control device (e.g. solenoid valve: 10-20 seconds; electromagnetic dosing pump: 120-360 seconds; induction motor: > 600 seconds, etc.); it is recommended to ask an expert technician for setting the minimum ON-OFF time, to avoid any damage to the controller
d) The difference between the max and minimum thresholds should be greater than 31 points, even for proportional control through current output (see parameters P19 and P20 for details)

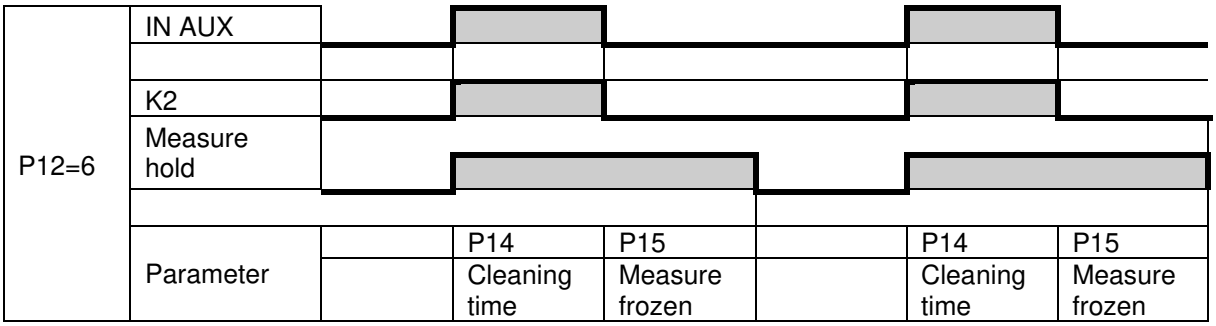
P12 WORKING MODE OF RELAY K2

The K2 relay output cam work in 7 different modes:
0 = Relay disabled.
1 = Contact is closed when the set thresholds are exceeded.
2 = Contact is open when the set thresholds are exceeded.
3 = NC (normally closed) alarm, i.e. K2 contact is closed when measurement is within the set thresholds (P12 e P13).
4 = NO (normally open) alarm, i.e. K2 contact is open when measurement is within the set thresholds (P12 e P13).
5 = Automatic cleaning cycle: at set time intervals, the instrument freezes measurement and energized relay K2 (to this relay is connected for example a solenoid valve for injecting detergent) for a set time period. The relay is, therefore, de-activated and measurement is hold till the washing cycle is in progress, then the instrument returns to normal working mode. All working times for cleaning cycle are set by the user (see following parameters for details). While the cleaning cycle is running, the "AUC" message blinks on the display.
6 = Automatic cleaning cycle synchronized with the "IN AUX" contact. The cycle is the same as described in the previous mode, but the operation is triggered by the dedicated input.

Warning! *If P07=5 (K1 configured for measure and auto-clean cycle with flow), this parameter and the following 4 ones (P12…P16) .*

The below diagrams show the functioning of the two automatic cleaning modes.





P13 MIN THRESHOLD FOR RELAY K2

Minimum threshold value for relay K2 action.
If P12=5 (cleaning cycle), this parameter is used to set the pause time (minutes) between two subsequent cleaning cycles.

P14 MIN THRESHOLD FOR RELAY K2

Maximum threshold value for relay K2 action.
If P12=5 (cleaning cycle), this parameter is used to set the cleaning time (seconds).

P15 ENERGIZING DELAY FOR RELAY K2

Energizing delay for relay K2; the value is intended in seconds for ON-OFF controller (P12=1 or 2), or in minutes for K2 configured as alarm relay (P12=3 or 4).
In case of cleaning cycle (P12=5 or 6), this parameter is used to set the time (seconds) with frozen measurement after the cleaning cycle has been completed, before returning to normal operations.

P16 DE-ENERGIZING DELAY FOR RELAY K2

De-energizing delay for relay K2; the value is intended in seconds for ON-OFF controller (P12=1 or 2), or in minutes for K2 configured as alarm relay (P12=3 or 4).

P17 STARTING DELAY

The sensor connected to the measure input may require a stabilization time before measuring reliable values, but anyway outputs are activated accordingly with readings. This parameter allows to enter a proper time delay (minutes), for waiting for sensor stabilization. Setting the parameter to zero means disabling this function.

P18 CURRENT OUTPUT TYPE

This parameter allows to choose the current output range: 0 = 0-20 mA; 1 = 4-20 mA.
***Note**: The precision for the current output refers to values greater than 0.3 mA (approx.). Note that the low values for the 0-20 mA output are quite approximate.*

P19 STARTING VALUE FOR CURRENT OUTPUT

Measure value corresponding to the starting value of the current output (0 or4 mA).

P20 FULL SCALE VALUE FOR CURRENT OUTPUT

Measure value corresponding to the full scale of the current output (20 mA).

P21 FAULT CURRENT OUTPUT

This parameter is used to enter the output current value when an error occurs (e.g. reading out of range, measurement disabled, ON key pressed, etc.).

P22 Parameter not used.

P23 PASSWORD

The user can enter a protection password to avoid intervention by non-authorized personnel.
***Warning**! If the password is forgotten, the instrument has to be sent back to the factory for a complete re-configuration!*

P24 LANGUAGE

This parameter allows to choose the menu language among the following options:
0 = Italian, 1 = English, 2 = Spanish, 3 = French.

P25 UR/OR FUNCTIONING

If the input signal is too low or too high, the instrument recognizes an out-of-range status: the display shows the related error message, K1 and K2 outputs are disabled, and the current output provides the fault mA value set through the parameter P21. This is the functioning mode recommended by the manufacturer and factory set, that corresponds to the zero value of this parameter.
For some particular application it may be requested to hide this malfunction, for example by deactivating the error message on display and/or leaving unchanged the output status. In order to enter the desired combination, note the following:

relay = value 1 ; mA output = value 2 ; error visualization = value 4.

Add the values corresponding to the desired options and enter the result for setting this parameter.
For example, if you want to see the error message and leave unchanged the relay and mA outputs status, set P25 = 1+2 = 3.

P26 MINIMUM THRESHOLD FOR K3 ALARM

The instrument internally features an alarm “virtual” relay (K3), that operates according to the user setting of parameters P26, P27 and P28. The parameter P26 allows to set the minimum threshold below which the measurement should never fall.

If measurement falls below the set minimum, this alarm occurs and simultaneously all outputs are de-activated and a fault current (value set in P21) is generated at the current output.
The display shows the message "**Alarm K3 Plant Fault**" alternating to the measurement.

P27 MAXIMUM THRESHOLD FOR K3 ALARM

The parameter P27 allows to set the maximum threshold that should never be exceeded by the measurement. If measurement exceeds the set maximum, this alarm occurs and simultaneously all outputs are de-activated and a fault current (value set in P21) is generated at the current output.
The display shows the message "**Alarm K3 Plant Fault**" alternating to the measurement.
If this alarm is not needed, simply enter a minimum threshold certainly less than the minimum possible measurement (e.g. pH = -1.00) and a maximum threshold definitely higher than the full scale value (e.g. pH = 15.00).

P28 TRIGGERING DELAY FOR K3 ALARM

This parameter is used to set a triggering delay for the K3 alarm, to avoid undesired alarms due for example to noise or small temporary fluctuations of measurement. This delay is set in minutes.

P29 AUTOSET

This parameter allows to restore the factory settings. Enter "12" and the display will show the "Autoset done!" message for 3 seconds, then the device returns to normal operating mode.

(P30) STARTING VALUE FOR MEASURE 1

This parameter is available only for model with mA input and represents the value corresponding to 0 or 4 mA, depending on the output type set. The parameter is factory set accordingly with customer indications and should not be modified!

(P31) FULL SCALE VALUE FOR MEASURE 1

This parameter is available only for model with mA input and represents the value corresponding to the full scale (20 mA). The parameter is factory set accordingly with customer indications and should not be modified!

(P32) DECIMAL POINT AND MEASURE UNIT FOR MEAS. 1

This parameter is available only for model with mA input, and is used to set the decimal point position and the measure unit, accordingly with the available options (see table) and the following formula:
P32 = (measure unit code x 8) + decimal point position

Examples:
Range 0.000 to 1.234 m ⇒
P30 = 0, P31 = 1234, P32 = (17 x 8) + 3 = 139
Range -10 to 1500 Volt ⇒
P30 = -10, P31 = 1500, P32 = (13 x 8) + 0 = 104
Range 0 to 100.0 NTU ⇒
P30 = 0, P31 = 1000, P32 = (19 x 8) + 1 = 153

The parameter is factory set accordingly with customer indications and should not be modified!

0 =		15 = BAR
1 = pH		16 = cm
2 = mV		17 = m
3 = °C		18 = FTU
4 = ppm Cl_2		19 = NTU
5 = µS/cm		20 = l/h
6 = mS/cm		21 = m^3/h
7 = %		22 = ppm O_2
8 = mA		23 = % O_2
9 = pul/min		24 = ppm ClO_2
10 = seconds		25 = Ohm
11 = minutes		26 = KOhm
12 = %/°C		27 = MOhm
13 = ppm		28 = ppm Br
14 = mBAR		

TEMPERATURE COMPENSATION

The temperature compensation (for pH, conductivity, residual chlorine and oxygen measurements) is calculated using the temperature measured through the proper input. If the input is not connected, the S508 device uses the working temperature set in the P04 parameter.

ADDITIONAL VISUALIZATIONS

Pressing the [+] and [-] keys while in normal mode, the following values are displayed:

pH meter	key [+]	gain factor (0.667 to 1.428)
	key [-]	offset, pH units at 25°C (-1.50 to 1.50)
ORP meter	key [+]	gain factor (1.000 – fix)
	key [-]	offset (-150 to 150 mV)
thermometer	key [+]	gain factor (0.900 to 1.100)
	key [-]	offset (-5.0 to +5.0°C)
conductivity meter	key [+]	gain factor (0.750 to 1.500)
	key [-]	offset (-100 to 100 points)
residual chlorine	key [+]	gain factor (0.050 ... 2.000)
	key [-]	offset (-5.00 to 5.00 μA)
std. input	key [+]	gain factor (0.500 to 2.000)
	key [-]	offset (-200 to 200 points)
CAC cell	key [+]	gain factor (0.500 to 2.000)
	key [-]	offset (-200 to 200 points)

Note: The first calibration settings are OFFSET = 0, GAIN = 1.000.

Pressing the [+] and [-] keys simultaneously, the display shows the ON-OFF time for K1 set for proportional control.

CONTROL EXAMPLES

This section includes some configuration examples of control parameters:

1) Acidification control to have approximately pH 7.40

MEASURE TYPE = 0 (pH meter)	(P01 = 0)
WORKING MODE FOR K1 = 1 (closed when thresholds are exceeded)	(P07 = 1)

It is recommended to set a narrow threshold window, e.g.:

MIN THRESHOLD = 7.30 pH	(P08 = 7.30pH)
MAX THRESHOLD = 7.50 pH	(P09 = 7.50pH)

The relay K1 starts acidification when the pH level is greater than 7.50 and de-activates as soon as the pH level falls below the 7.30 threshold.
The relay K2 can be configured as alarm:

WORKING MODE FOR K2 = 3 (NC alarm)	(P12 = 3)
MIN THRESHOLD = 6.50 pH	(P13 = 6.50pH)
MAX THRESHOLD = 8.50 pH	(P14 = 8.50pH)

2) Conductivity control of water exiting from a demineralization plant, and alarm signal (or triggering of a resin regeneration cycle) if measurement is greater than 12.00 μS/cm

CONDUCTIVITY METER TYPE = 22 (19.99 μS/cm, K=5cm)	(P01 = 22)
WORKING MODE FOR K1 = 1 (closed when thresholds are exceeded)	(P07 = 1)
MIN THRESHOLD = 12.00 μS/cm	(P08 = 12.00μS/cm)
MAX THRESHOLD = 12.00 μS/cm	(P09 = 12.00μS/cm)
ENERGIZING DELAY = 60 sec	(P10 = 60 sec)
DE-ENERGIZING DELAY = 0 sec	(P11 = 0 sec)

The relay K1 is activated (and alarm is generated or the regeneration cycle is triggered) when measured conductivity is greater than 12.00 μS/cm, and the value is kept for at least one minute (60 sec). This delay avoids erroneous actions due to instantaneous peaks or signal noise.

ERRORS

When an error is detected (including ON key pressed), the LED ON starts blinking, the mA output provides the fault current value set in P21, and the display shows the corresponding error message, as listed here below:

WARNING 1 - RELAY K1 DISABLED

No working mode has been configured for K1 output, but the instrument works normally.

WARNING 2 - RELAY K2 DISABLED

No working mode has been configured for K2 output, but the instrument works normally.

ERR. 1 PROPORTIONAL CONTROL

The maximum and minimum threshold values for K1 proportional control (P08 and P09) are too close. The K1 control will not work correctly. Enter new values for parameters P08 and P09.

ERR. 2 CURRENT OUTPUT

The maximum and minimum threshold values for the mA output (P19 and P20) are too close. The current output will not work correctly. Enter new values for parameters P19 and P20.

CALIBRATION ERROR!

The requested calibration cannot be performed. Check probe and connection cable; repeat the procedure.

OFF CONTACT LEVEL OR FLOW

The input contact at terminals 14 and 15 is closed, and the device doses not work (outputs disabled). Check the sensor connected to the contact.

HOLD MEASURE CONTACT

The input contact at terminals 14 and 15 is closed, and measurements are frozen (the device is in stand-by).

UR/OR

Under Range / Over Range: the input signal is outside (under or over) the measurement range. Check sensor and cable. When this error occurs, all the instrument outputs (relays and mA) are disabled, if not otherwise configured through parameter P25.

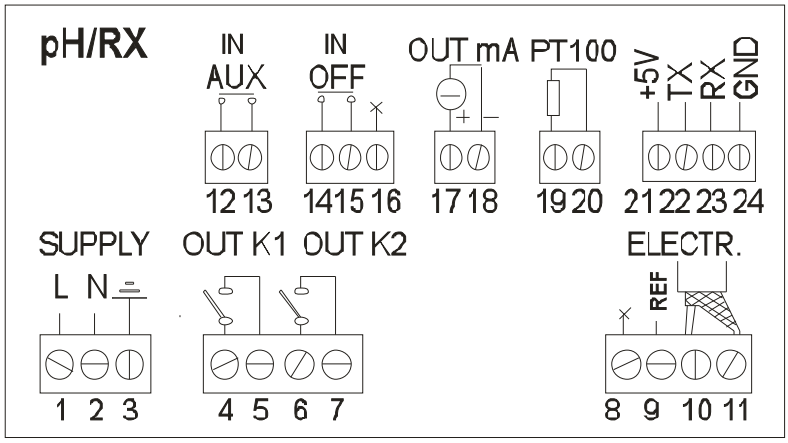
ALARM K3 - PLANT FAULT

This alarm is generated when the input signal exceeds the maximum threshold or falls below the minimum value set at parameters P26 and P27, and remains outside these limits for a time longer than the delay set in P28.

Verify the proper operation of the instrument / dosing system installation, i.e. :

a) Check measure sensor and connection cable: if damaged, exhausted or broken, they could cause a fixed reading on the display. For example, a depleted CAC cell or a dirty CLE12 cell generate a zero signal. A pH cable short-circuited or in dispersion, gives an indication around 7pH.
b) Dosing pump or dosing system: the instrument requests to dose chemical to reach the threshold, but the dosing device does not add enough product.

pH INPUT SPECIFICATIONS



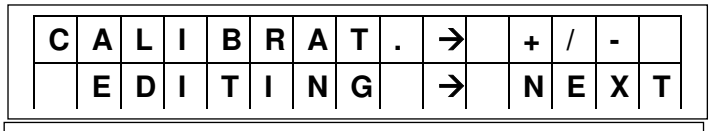
ELECTRICAL CONNECTIONS FOR pH-METER

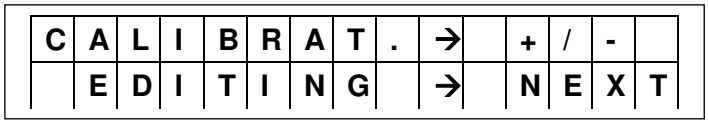
The signal comes from the electrode through a coaxial cable, with maximum recommended length of 20 meters (for longer cables, please contact the manufacturer).
The electrode input is on removable terminal block: connect the coaxial cable core to terminal 10, and the shield to terminal 11 (***Note****: remove any black conductive plastic between the core and shield of the cable*).
If two separate electrode are used for measure and reference, connect the reference electrode to terminal 9 (REF).
The Pt100 temperature sensor should be connected to terminals 19 and 20. If no sensor is connected, the instrument uses a constant temperature of 25.0°C. If a Pt100 probe is used, immerse it into the liquid to be tested, close to the electrode or anyway at the same temperature. If a 3-wire Pt100 sensor is used, connect the 2 wires of the same colour at the same terminal (the wires are internally short circuited).
Warning*! It is recommended to keep signal cables away from power cables.*

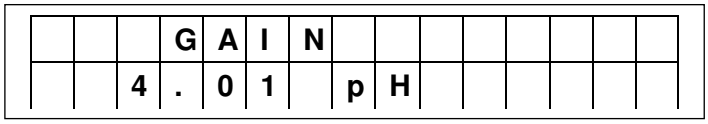
ELECTROCHEMICAL CALIBRATION OF pH-METER

Before starting this procedure, ensure to have fresh buffer solutions (not expired). If temperature compensation is used, immerse the Pt100 probe into the buffer solutions together with the measure electrode.

1) Rinse the electrode with distilled water
2) Immerse the electrode in pH 7.01 buffer solution
3) Press and hold CAL for at least 2 seconds to enter the calibration mode
4) Press [-] and the OFFSET message is displayed; release the button and the display will show the buffer pH value, automatically recognized
5) If necessary, adjust the value using the [+] or [-] key
6) Confirm calibration by pressing CAL, or press NEXT to exit without saving (the previous calibration data are kept)
7) Rinse the electrode with distilled water
8) Immerse the electrode in pH 4.01 (or pH 9.01) buffer solution
9) Press and hold CAL for at least 2 seconds to enter the calibration mode
10) Press [+] and the GAIN message is displayed; release the button and the display will show the buffer pH value, automatically recognized







11) If necessary, adjust the value using the [+] or [-] key
12) Confirm calibration by pressing CAL, or press NEXT to exit without saving (the previous calibration data are kept)

The instrument does not automatically recognizes the buffer pH values whenever:
a) The buffer solution is contaminated dirty or expired
b) The electrode is not working properly or it is exhausted
c) The electrode connection cable is damaged

Note: *If you attempt to calibrate the offset at a pH value too different from pH 7, or to calibrate the gain with a buffer solution too close to pH neutrality, the instrument shows the "CALIBRATION ERROR!" message and does not save the calibration data.*

ORP (REDOX) INPUT SPECIFICATIONS

ELECTRICAL CONNECTIONS FOR ORP METER

The signal comes from the electrode through a coaxial cable, with maximum recommended length of 20 meters (for longer cables, please contact the manufacturer).
The electrode input is on removable terminal block: connect the coaxial cable core to terminal 10, and the shield to terminal 11 (***Note****: remove any black conductive plastic between the core and shield of the cable*).
If two separate electrode are used for measure and reference, connect the reference electrode to terminal 9 (REF).
If temperature measurement is also required, connect a Pt100 temperature sensor to terminals 19 and 20. If a 3-wire Pt100 sensor is used, connect the 2 wires of the same colour at the same terminal (the wires are internally short circuited).
Warning*! It is recommended to keep signal cables away from power cables.*

ELECTROCHEMICAL CALIBRATION OF ORPMETER

Before starting the procedure, check to have a fresh calibration solution (not expired).
1) Rinse the electrode with distilled water
2) Immerse the electrode into the calibration solution (e.g. 230 mV)
3) Press and hold CAL for at least 2 seconds, to enter the calibration mode

C	**A**	**L**	**I**	**B**	**R**	**A**	**T**	**.**	**→**		**+**	/	**-**	
	E	**D**	**I**	**T**	**I**	**N**	**G**		**→**		**N**	**E**	**X**	**T**

4) Press [-] and the OFFSET message is displayed; release the button and the display will show the current measure
5) If necessary, adjust the value using the [+] or [-] key

		O	**F**	**F**	**S**	**E**	**T**							
		2	**1**	**8**		**m**	**V**							

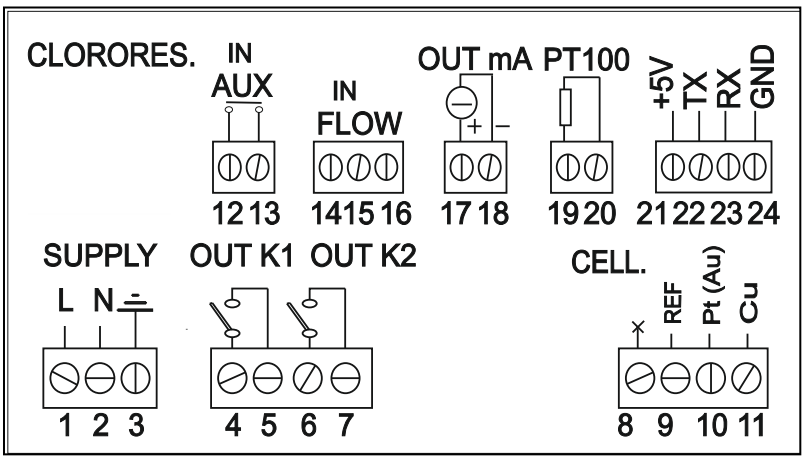
6) Confirm calibration by pressing CAL, or press NEXT to exit without saving (the previous calibration data are kept)

After performing the calibration, the meter does not display the standard solution value whenever:
a) The calibration solution is contaminated dirty or expired
b) The electrode is not working properly or it is exhausted
c) The electrode connection cable is damaged

Note: *If you attempt to calibrate the offset at a value too different from the internal one, the instrument shows the "CALIBRATION ERROR!" message and does not save the calibration data.*

Redox calibration is a single point procedure (offset)!

CHLORINE INPUT SPECIFICATIONS, WITH CLE CELL



ELECTRICAL CONNECTIONS

The signal comes from the amperometric cell through a 2-pole cable, with maximum recommended length of 5 meters (for longer cables, please contact the manufacturer).
The cell input is on removable terminal block: connect the Pt (Au) cell terminal to the device terminal 10, and the Cu cell terminal to the device terminal 11. If a shielded cable is used, connect the shield to the device terminal 9 (REF), and leave it not connected on the cell side.
If the micro-magnetic flow sensor is used, it has to be connected to the IN FLOW input: connect the input black wire to terminal 14, the negative pole (blue wire) to terminal 15 and the positive pole (brown wire) to terminal 16.

If a Pt100 sensor is used for temperature reading and compensation, connect the sensor wires to terminals 19 and 20. If a 3-wire Pt100 sensor is used, connect the 2 wires of the same colour at the same terminal (the wires are internally short circuited).
Warning! *The temperature compensation performed by the instrument is specific for amperometric cell. If using a different cell, the correct functioning is not guaranteed.*
Warning*! It is recommended to keep signal cables away from power cables.*

CALIBRATION OF RESIDUAL CHLORINE METER

To calibrate the cell, a colorimeter for measuring the chlorine concentration in aqueous solutions is needed (for example with DPD1 method). If the electrochemical calibration is also required, a carbon filter is needed. Run instrument and cell for at least 12 hours with chlorinated water, containing an average chlorine working concentration. Temperature, pH and water flow values should be constant and close to the working levels.
The cell calibration is a 2-point procedure, 0 (offset) and "gain". The input on S508 and cell polarization have been designed to achieve the electrical zero and electrochemical zero virtually coincident. In most cases only the electrical calibration of the offset is required.

- To perform the offset electrical calibration, disconnect the removable terminal block from the input. Start the procedure from step 1.
- To perform the offset electrochemical calibration, use water with the same chemical-physical characteristics of the process water, without chlorine (check with colorimetric test). Start the procedure from step 1. For water de-chlorination purpose, use a carbon filter.

1) Wait for a stable reading, close to zero
2) Press and hold CAL for at least 2 seconds to enter the calibration mode
3) Press [-] key and the "OFFSET" message is displayed, followed by the "0.00 ppm" value
4) If necessary, increase this value with the [+] key (e.g. water contains 0.10 ppm of chlorine because the filter did not perform a complete de-chlorination)

C	A	L	I	B	R	A	T	.		→		+	/	-	
	E	D	I	T	I	N	G			→		N	E	X	T

		O	F	F	S	E	T								
		0	.	0	0		p	p	m		C	l	$_2$		

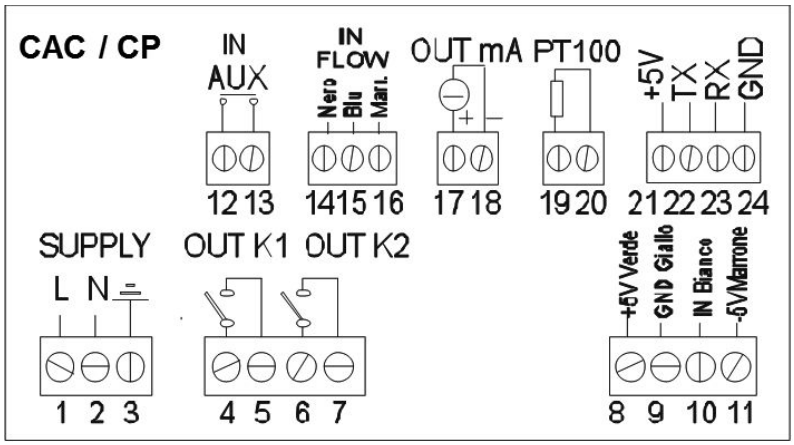
5) Press CAL to confirm the calibration, or NEXT to exit without saving
6) Flow working water (containing chlorine) through the measurement cell
7) Wait for stable reading (approx. 5 minutes)
8) With the photometer, measure the chlorine concentration in the water exiting from the probe-holder
9) Press and hold CAL for at least 2 seconds to enter the calibration mode
10) Press the [+] key and the "GAIN" message is displayed, followed by the previously measured value
11) Enter the concentration measured with the colorimeter, using the [+] and [-] keys
12) Press CAL to confirm the calibration, or NEXT to exit without saving

C	A	L	I	B	R	A	T	.		→		+	/	-	
	E	D	I	T	I	N	G			→		N	E	X	T

			G	A	I	N								
		1	.	1	2		p	p	m		C	l	$_2$	

Note: *If you attempt to calibrate using an offset value too different from the electrical zero or a gain value with a too low input signal, the instrument shows the "CALIBRATION ERROR!" message and does not save the calibration data.*

INPUT SPECIFICATIONS FOR CAC (or CP) CELL SERIES



ELECTRICAL CONNECTIONS FOR THE CELL

The signal comes from the CAC (or CP) cell through a 4-pole shielded cable, 1 m long (for longer cables, please contact the manufacturer).
Connections are made on a removable terminal block, as follows:

- terminal 8 (+5V) = green wire
- terminal 9 (GND) = yellow wire + shield
- terminal 10 (IN) = white wire
- terminal 11 (-5V) = brown wire

For a correct functioning, the cell should be mounted on a proper probe-holder (SD-CP series), supplied with a flow sensor for detecting the correct water flow to the cell. Connect this sensor to the IN FLOW input as follows: connect the input black wire to terminal 14, the negative pole (blue wire) to terminal 15 and the positive pole (brown wire) to terminal 16.

The CAC (or CP) cells are internally compensated for temperature variations. Anyway, if temperature measurement is required, connect a Pt100 sensor to terminals 19 and 20. If a 3-wire Pt100 sensor is used, connect the 2 wires of the same colour at the same terminal (the wires are internally short circuited).

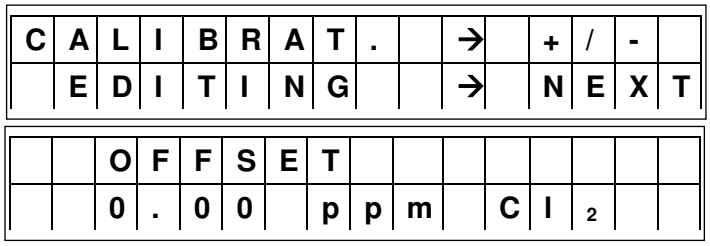
Warning*! It is recommended to keep signal cables away from power cables.*

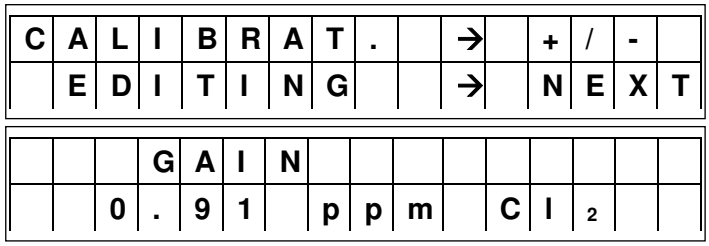
CALIBRATION OF THE CELL

To calibrate the cell, a colorimeter for measuring the chlorine concentration in aqueous solutions is needed (for example with DPD1 method). If the electrochemical calibration is also required, a carbon filter is needed.
Run instrument and cell for at least 6 hours with chlorinated water, containing an average chlorine working concentration. Temperature, pH and water flow values should be constant and close to the working levels.
The cell calibration is a 2-point procedure, 0 (offset) and "gain".
The input on S508 and cell polarization have been designed to achieve the electrical zero and electrochemical zero virtually coincident. In most cases only the electrical calibration of the offset is required.

- To perform the offset electrical calibration, disconnect the cell wires from terminals 9 and 10, and short circuit the input (pins 9 and 10). Start the procedure from step 1.
- To perform the offset electrochemical calibration, use water with the same chemical-physical characteristics of the process water, without chlorine (check with colorimetric test). Start the procedure from step 1. For water de-chlorination purpose, use a carbon filter.

1) Wait for a stable reading, close to zero
2) Press and hold CAL for at least 2 seconds to enter the calibration mode
3) Press the [-] key and the "OFFSET" message is displayed, followed by the "0.00 ppm" value
4) If necessary, increase this value with the [+] key (e.g. water contains 0.10 ppm of chlorine because the filter did not perform a complete de-chlorination)
5) Press CAL to confirm the calibration, or NEXT to exit without saving
6) Flow working water (containing chlorine) through the measurement cell
7) Wait for stable reading (approx. 5 minutes)
8) Use the colorimeter for measuring the chlorine concentration in the water exiting from the probe-holder
9) Press and hold CAL for at least 2 seconds to enter the calibration mode
10) Press the [+] key and the "GAIN" message is displayed, followed by the previously measured value
11) Enter the concentration measured with the colorimeter, using the [+] and [-] keys
12) Press CAL to confirm the calibration, or NEXT to exit without saving



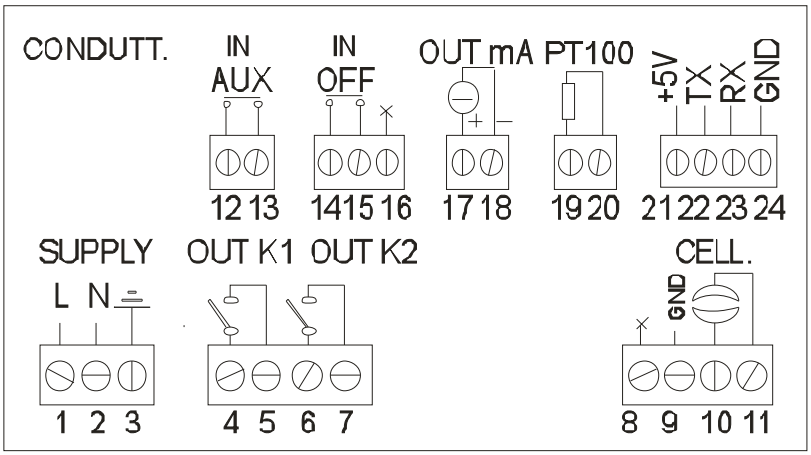


Note: *If you attempt to calibrate using an offset value too different from the electrical zero or a gain value with a too low input signal, the instrument shows the "CALIBRATION ERROR!" message and does not save the calibration data.*

CONDUCTIVITY / RESISTIVITY INPUT SPECIFICATIONS

ADDITIONAL TECHNICAL INFO

The electronic precision of the conductivity measurements is better than 1%, and the repeatability is better than 0.2% FS, without temperature compensation (resistive calibration).
The temperature compensation introduces an additional error of 0.3% FS, and is performed through the PT100 input.
The temperature sensor may be a probe separated from the conductivity cell (e.g. PT100S), or a built-in sensor (e.g. CCK5TC). For further details, refer to the technical documentation supplied with the cell.



ELECTRICAL CONNECTIONS FOR CONDUCTIVITY CELL

The signal comes from the 2-electrode cell, to be connected to terminals 10 and 11; if a shielded cable is used, connect the shield to terminal 9 (GND). In case of low conductivity measurement, it is recommended to use a shielded cable.
The Pt100 sensor input is at terminals 19 and 20. If no temperature probe is connected, the instrument uses a constant working temperature of 25.0°C. If a Pt100 probe is used, immerse it in the liquid to be tested, close to the cell or anyway at the same temperature.
To avoid interferences and measure errors due to parasitic capacity of the cable, it is recommended to use a cell connection cable as short as possible. Do not extend the supplied cable; if a longer cable is needed, please contact the manufacturer.
Warning*! It is recommended to keep signal cables away from power cables.*

ELECTRICAL CALIBRATION OF CONDUCTIVITY METER

To test the proper functioning of the instrument, connect to the cell input a resistive simulator. Set an infinite resistor value and the meter should display “0”. To calculate the resistor value to be entered for simulating a given conductivity value, use the following formula:

$$Rcell = \frac{1}{(Cond \times K)} \left(M\Omega = \frac{1}{(\mu S/cm \times cm)} \right)$$

Rcell = simulation resistor
Cond = conductivity value to be simulated
K = cell constant

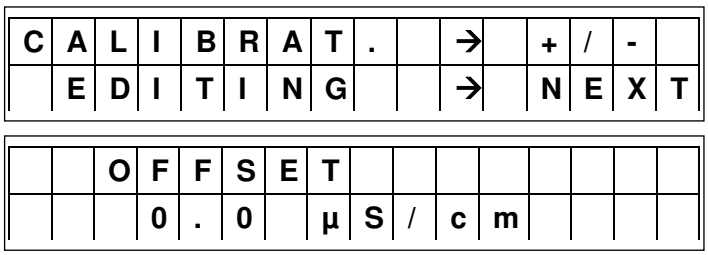
Notes:

- *To verify the correct visualization, also consider the set “gain” factor. To view the gain value, press the [+] key.*
- *The temperature should be approx. 25°C; if not, leave terminals 19 and 20 not connected.*

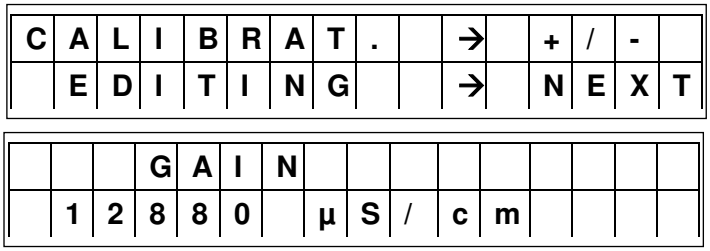
ELECTROCHEMICAL CALIBRATION OF CONDUCTIVITY METER

The electrochemical calibration allows to compensate errors due to the cell-instrument connection cable and to the mechanical error of the cell constant. If the temperature compensation feature is used, immerse the Pt100 sensor into the solution close to the cell, or anyway at the same temperature.

1) Leave the cell in air
2) Press and hold CAL for at least 2 seconds to enter the calibration mode
3) Press [-] and the "OFFSET" message is displayed, followed by the 0.0 µS/cm value



4) If necessary, adjust this value using the [+] and [-] keys; the zero value with cell in air is generally not adjusted
5) Press CAL to confirm calibration, or NEXT to exit without saving
6) Immerse the cell and the Pt100 probe (if used) into a solution at a known conductivity value; typically a KCl solution (see table here below)
7) Press and hold CAL for at least 2 seconds to enter the calibration mode



8) Press the [+] key and the "GAIN" message is displayed, followed by the previously measured value
9) If necessary, adjust this value with the [+] and [-] keys
10) Press CAL to confirm calibration, or NEXT to exit without saving

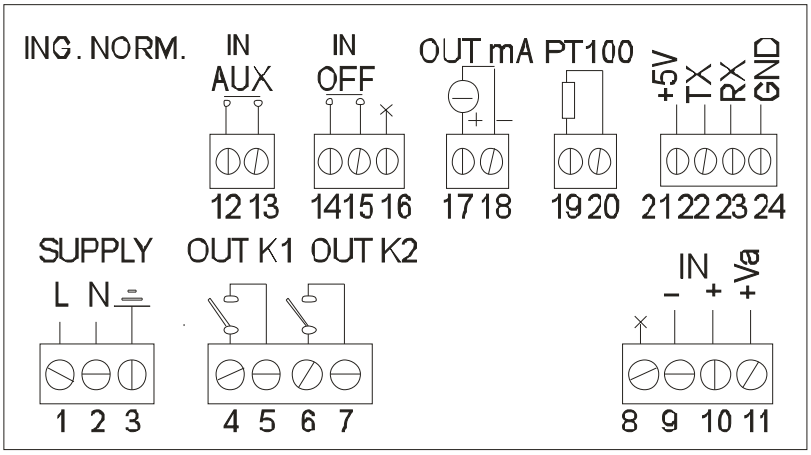
Notes:

- ✓ *If you attempt to calibrate using an offset value too different from the range minimum value or a gain value with a too low input signal, the instrument shows the "CALIBRATION ERROR!" message and does not save the calibration data.*
- ✓ *The conductivity calibration automatically calibrate the resistivity range. There is no other specific procedure for resistivity range.*

Conductivity values of KCl (potassium chloride) solutions:

Temp. (°C)	KCl 1 N (µS/cm)	KCl 0.1 N (µS/cm)	KCl 0.01 N (µS/cm)
0	65410	7150	776
5	74140	8220	896
10	83190	9330	1020
15	92540	10480	1147
16	94430	10720	1173
17	96330	10950	1199
18	98240	11190	1225
19	100160	11430	1251
20	102090	11670	1278
21	104020	11910	1305
22	105940	12150	1332
23	107890	12390	1359
24	109840	12640	1386
25	111800	12880	1413
26	113770	13130	1441
27	115740	13370	1468
28		13620	1496
29		13870	1524
30		14120	1552

STANDARDIZED INPUT SPECIFICATIONS



ELECTRICAL CONNECTIONS FOR STANDARDISED INPUT

The signal comes from the transmitter (or transducer) through a 2 or 3-pole cable, that has to be shielded if longer than 25 meters. Connections are made on removable terminal block as follows:

1. Passive transducer: terminal 9 = negative (-) input
   terminal 10 = positive (+) input
   terminal 11 = power supply positive, approx. 18 Vdc @ 20 mA
2. Active transmitter: terminal 9 = positive (+) input
   terminal 10 = negative (-) input
3. 2-wire passive transmitter: terminal 11 (power supply) = positive input (+)
   terminal 10 = negative (-) input

If a shielded cable is used, connect the cable shield to terminal 9 (S508 side) and leave it disconnected on the transmitter side.

ELECTRICAL CALIBRATION OF STANDARDIZED INPUT

Errors due to instrument (S508) and transducer are typically very small and no calibration is required. However, in case of pressure transducer converted into piezometric levels, sometimes zero and gain calibrations are needed; proceed as explained here below.

1) Set the transmitter to have the minimum range signal (e.g. 0 or 4 mA)
2) Press and hold CAL for at least 2 seconds to enter calibration mode
3) Press the [-] key and the "OFFSET" message is displayed, followed by the zero value
4) If necessary, adjust this value with the [+] and [-] keys
5) Press CAL to confirm calibration, or NEXT to exit without saving

C	A	L	I	B	R	A	T	.		→		+	/	-
	E	D	I	T	I	N	G			→		N	E	X	T

		O	F	F	S	E	T							
			0	.	0		B	A	R					

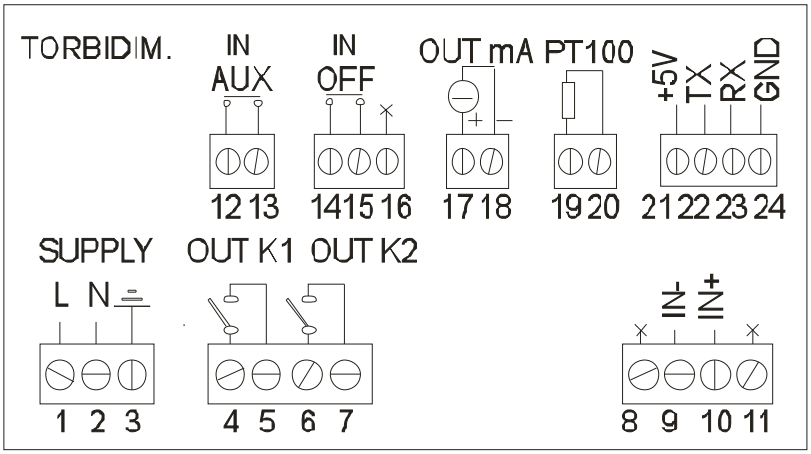
6) Set the transmitter to have the full scale signal (or a signal greater than the 70% of the range)
7) Press and hold CAL for at least 2 seconds to enter calibration mode
8) Press the [+] key and the "GAIN" message is displayed, followed by the previously measured value
9) If necessary, adjust this value with the [+] and [-] keys
10) Press CAL to confirm calibration, or NEXT to exit without saving

C	A	L	I	B	R	A	T	.		→		+	/	-
	E	D	I	T	I	N	G			→		N	E	X	T

			G	A	I	N								
		1	4	.	3		B	A	R					

Note: *If you attempt to calibrate using an offset value too different from the range minimum value or a gain value with a too low input signal, the instrument shows the "CALIBRATION ERROR!" message and does not save the calibration data.*

TURBIDITY METER SPECIFICATIONS



ELECTRICAL CONNECTIONS FOR TURBIDITY CELL

The signal comes from the CTS07 (or CTS96) cell through a 2-pole cable, that has to be shielded if longer than 25 meters.

Connections are made on removable terminal block as follows (also see instrument rear panel):

- terminal 9 (IN-), negative input = terminal (-) of the CTS07 cell
- terminal 10 (IN+), positive input = terminal (+) of the CTS07 cell

If a shielded cable is used, connect the shield to the terminal 9 on the instrument side, and leave it not connected on the cell side.

CALIBRATION OF TURBIDITY METER

Perform this procedure with maximum care, to avoid calibration errors due to dirty cell, air bubbles, foggy lenses after temperature variations, etc.

1) Introduce turbidity free water (0 FTU) into the cell
2) Press and hold CAL for at least 2 seconds to enter the calibration mode
3) Press the [-] key and the "OFFSET" message is shown, followed by the turbidity value previously displayed
4) Adjust the calibration value to zero using the [+] and [-] keys
5) Press CAL to confirm calibration, or NEXT to exit without saving
6) Empty the cell
7) Introduce the calibration solution (formazine properly diluted) into the cell; it is recommended to use a solution with turbidity value as close as possible to the instrument full scale (or greater than the 70% of the full scale, i.e. 70 to 100 FTU for the nephelometer, or 350 to 500 FTU for the turbidity meter)
8) Press and hold CAL for at least 2 seconds to enter the calibration mode
9) Press the [+] key and the "GAIN" message is shown, followed by the turbidity value previously displayed
10) Adjust the calibration value using the [+] and [-] keys
11) Press CAL to confirm calibration, or NEXT to exit without saving

C	**A**	**L**	**I**	**B**	**R**	**A**	**T**	**.**		**→**		**+**	/	**-**	
	E	**D**	**I**	**T**	**I**	**N**	**G**			**→**		**N**	**E**	**X**	**T**

		O	**F**	**F**	**S**	**E**	**T**								
		0	**0**	**0**			**F**	**T**	**U**						

C	**A**	**L**	**I**	**B**	**R**	**A**	**T**	**.**		**→**		**+**	/	**-**	
	E	**D**	**I**	**T**	**I**	**N**	**G**			**→**		**N**	**E**	**X**	**T**

			G	**A**	**I**	**N**									
		4	**1**	**4**			**F**	**T**	**U**						

Note: *If you attempt to calibrate using an offset value too different from the range minimum value or a gain value with a too low input signal, the instrument shows the "CALIBRATION ERROR!" message and does not save the calibration data.*

TEMPERATURE INPUT SPECIFICATIONS

ELECTRICAL CONNECTIONS FOR TEMPERATURE INPUT

The signal comes from a Pt100 sensor through a 2 or 3-wire cable, that has to be shielded if longer than 15 meters. Connections are made on removable terminal block, at pins 19 and 20.
If a sensor with 3-wire cable is used, connect to the same terminal the two wires of the same colour (internally short-circuited). If a shielded cable is used, connect the shield to terminal 9 (REF).

THERMOMETER CALIBRATION

The electronic calibration of the instrument and the precision class of the Pt100 sensor, ensure a maximum error of ±0.3°C @ 0°C and ±0.8°C @ 100°C (Pt100 class B, accordingly with IEC 751 std.).
Therefore, no user calibration is required.

***Note**: Factory calibration is performed with a sensor with 2 m cable. Using a probe with a cable longer than 2 meters could introduce a greater reading error.*