

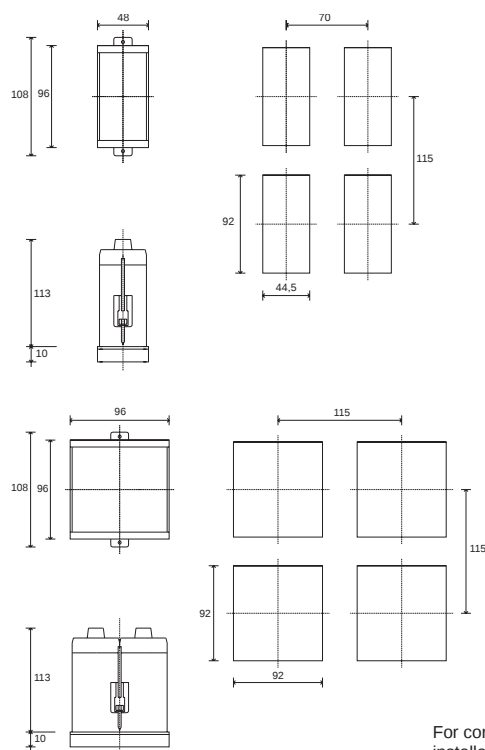
## INSTALLATION AND OPERATION MANUAL

SOFTWARE VERSION 3.2x  
code 80080D / Edition 13 - 03/08



### 1 • INSTALLATION

#### • Dimensions and cut-out; panel mounting



For correct and safe installation, follow the instructions and observe the warnings contained in this manual.

#### Panel mounting:

To fix the unit, insert the brackets provided into the seats on either side of the case. To mount two or more units side by side, respect the cut-out dimensions shown in the drawing. To obtain IP65 faceplate protection level, remove the device from the box, apply the gasket (supplied) with adhesive to the front edge of the box, and then reinsert the device.

**CE MARKING:** EMC conformity (electromagnetic compatibility) with EEC Directive 89/336/CEE with reference to the generic Standard EN61000-6-2 (immunity in industrial environments) and EN50081-1 (emission in residential environments). BT (low voltage) conformity respecting the Directive 73/23/CEE modified by the Directive 93/68. Limitations: model 1800 conforms to Standard EN55011 for emissions radiated in industrial environment.

**MAINTENANCE:** Repairs must be done only by trained and specialized personnel. Cut power to the device before accessing internal parts.

Do not clean the case with hydrocarbon-based solvents (Petrol, Trichlorethylene, etc.). Use of these solvents can reduce the mechanical reliability of the device. Use a cloth dampened in ethyl alcohol or water to clean the external plastic case.

**SERVICE:** GEFRA has a service department. The warranty excludes defects caused by any use not conforming to these instructions.

### 2 • TECHNICAL SPECIFICATIONS

|                                                                                     |                                                                                                 |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Display                                                                             | 2 x 4 digits, green, height: 10 and 7 mm (1600V); 20 and 13 mm (1800V)                          |
| Keys                                                                                | 5 mechanical keys (*, Man/Aut, INC, DEC, F)                                                     |
| Accuracy                                                                            | 0.2% full scale at 25°C room temperature                                                        |
| Main input                                                                          | TC, RTD (Pt100 - JPT100), PTC, 50mV, Ri ≥ 1MΩ; 10V, Ri ≥ 10KΩ; 20mA, Ri = 50Ω                   |
| Thermocouples                                                                       | IEC 584-1 (J, K, R, S, T, B, E, N, Ni-Ni18Mo, L NiCr-CuNi)                                      |
| Cold junction error                                                                 | 0.1° / °C                                                                                       |
| RTD type (scale configurable within indicated range, with or without decimal point) | DIN 43760 (Pt100, JPT100)                                                                       |
| PTC type (on request)                                                               | 990Ω, 25°C                                                                                      |
| Max line resistance for RTD                                                         | 20Ω                                                                                             |
| Safety                                                                              | detection of short-circuit or opening of probes, LBA alarm, HB alarm                            |
| °C / °F selection                                                                   | configurable from faceplate                                                                     |
| Linear scale ranges                                                                 | -1999 to 9999 with configurable decimal point position                                          |
| Controls                                                                            | PID, Self-tuning, on-off                                                                        |
| pb / dt / di                                                                        | 0.0 ... 999.9% / 0.00 ... 99.99min / 0.00 ... 99.99min                                          |
| Action                                                                              | Heat / Cool                                                                                     |
| Control outputs                                                                     | on / off, pwm, Open / Close                                                                     |
| Cycle time                                                                          | 0.1 ... 200 sec                                                                                 |
| Main output type                                                                    | Relay, Logic, Continuous (optional)                                                             |
| Softstart                                                                           | 0.0 ... 500.0 min                                                                               |
| Maximum power limit heat / cool                                                     | 0.0 ... 100.0 %                                                                                 |
| Fault power setting                                                                 | -100.0 ... 100.0 %                                                                              |
| Automatic blanking                                                                  | Optional exclusion, displays PV value                                                           |
| Configurable alarms                                                                 | 3 configurable alarms type: max, min, symmetrical, absolute or relative, LBA, HB                |
| Alarm masking                                                                       | - exclusion during warm up<br>- latching reset from faceplate or external contact               |
| Type of relay contact                                                               | NO (NC), 5A, 250V, cosφ = 1                                                                     |
| Logic output for static relays                                                      | 11Vdc, Rout = 220Ω (6V/20mA)                                                                    |
| (option) remote Setpoint or Amperometric input                                      | 0 ... 10V, 2 ... 10V, Ri ≥ 1MΩ<br>0 ... 20mA, 4 ... 20mA, Ri = 5Ω                               |
| Feedback input                                                                      | Potentiometer > 500Ω, TA 50mAac, 50/60Hz, Ri = 1.5Ω, isolation 1500V                            |
| Potentiometer valve position                                                        |                                                                                                 |
| CT scale range                                                                      | configurable from 0, ..., 100.0A                                                                |
| Transmitter power supply (optional)                                                 | filtered 10 / 24Vdc, max 30mA<br>short-circuit protection, isolation 1500V                      |
| Analogue retransmission signal (opt)                                                | 10V / 20mA, isolation 1500V                                                                     |
| Logic inputs (optional)                                                             | 24V NPN, 4.5mA; 24V PNP, 3.6mA<br>isolation 1500V                                               |
| Serial interface (optional)                                                         | CL; RS422/485; RS232; isolation 1500V                                                           |
| Baud rate                                                                           | 1200 ... 19200                                                                                  |
| Protocol                                                                            | GEFRAN / MODBUS                                                                                 |
| Power supply (switching type)                                                       | (std) 100 ... 240Vac/dc ±10%; 50/60Hz, 12VA max<br>(opt.) 20...27Vac/dc ±10%; 50/60Hz, 12VA max |
| Faceplate protection                                                                | IP65                                                                                            |
| Working / Storage temperature range                                                 | 0...50°C / -20...70°C                                                                           |
| Relative humidity                                                                   | 20 ... 85% non-condensing                                                                       |
| Environmental conditions of use                                                     | for internal use only, altitude up to 2000m                                                     |
| Installation                                                                        | Panel, plug-in from front                                                                       |
| Weight                                                                              | 400g (1600V), 600g (1800V) for the complete version                                             |

EMC conformity has been tested with the following connections

| FUNCTION                    | CABLE TYPE                      | LENGTH |
|-----------------------------|---------------------------------|--------|
| Power supply cable          | 1 mm <sup>2</sup>               | 1 m    |
| Relay output cable          | 1 mm <sup>2</sup>               | 3.5 m  |
| Digital communication wires | 0.35 mm <sup>2</sup>            | 3.5 m  |
| C.T. connection cable       | 1.5 mm <sup>2</sup>             | 3.5 m  |
| TC input                    | 0.8 mm <sup>2</sup> compensated | 5 m    |
| Pt100 input                 | 1 mm <sup>2</sup>               | 3 m    |

### 3 • DESCRIPTION OF FACEPLATE

**Function indicators**  
Indicates modes of operation  
MAN = OFF (Automatic control)  
MAN = ON (Manual control)  
AUX = OFF (IN1 = OFF - local Setpoint 1)  
AUX = ON (IN1 = ON - local Setpoint 2)  
REM = OFF (local Setpoint)  
REM = ON (remote Setpoint)

**"Raise" and "Lower" key**  
Press to increment (decrement) any numerical parameter \*\*  
Increment (decrement) speed is proportional to time key stays pressed \*\*  
The operation is not cyclic: once the maximum (minimum) value of a field is reached, the value will not change even if the key remains pressed.



**Indication of output states**  
OUT 1 (Open); OUT 2 (Close);  
OUT 3 (AL 1); OUT 4 (HB)

**PV Display:** Indication of process variable  
Error Indication: LO, HI, Sbr, Err  
**LO**= the value of process variable is < di LO\_S  
**HI**= the value of process variable is > di HI\_S  
**Sbr**= faulty sensor or input values higher than max. limits  
**Err**= PT100 third wire opened for PT100, PTC or input values lower than min. limits (i.e.: TC wrong connection)

**SV display:** Indication of setpoint

**Function key**  
Gives access to the various configuration phases \*\*  
Confirms change of set parameters and browses next or previous parameter (if Auto/Man key is pressed)

**Automatic/Manual adjustment selection**  
Active only when PV display visualises the process variable

### 4 • CONNECTIONS

#### • Power Supply

~ (12) **Standard:**  
100...240Vac/Vdc  $\pm 10\%$   
PWR  
~ (13) **Optional:**  
20...27Vac/Vdc  $\pm 10\%$   
50/60Hz

#### • Outputs

|          |                                                                         |                                                                               |        |                 |
|----------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------|-----------------|
| +W2 (33) | User configurable generic output                                        | User configurable generic output                                              | (11) - | Out4 (AL2 / HB) |
| +W1 (32) | - analogue output isolated to 1500V (0 ... 10V, 0 ... 20mA, 4 ... 20mA) | - 5A/250Vac relay, $\cos\phi=1$<br>- 11Vdc logic, Rout=220 $\Omega$ (6V/20mA) | (10) + |                 |
| 0V (31)  |                                                                         |                                                                               |        |                 |

#### • Outputs

|              |             |                                                                               |
|--------------|-------------|-------------------------------------------------------------------------------|
| Out1 (Open)  | (-) NC (14) | User configurable generic output                                              |
|              | C (15)      |                                                                               |
|              | (+) NO (16) |                                                                               |
| Out2 (Close) | (-) NC (17) | - 5A/250Vac relay, $\cos\phi=1$<br>- 11Vdc logic, Rout=220 $\Omega$ (6V/20mA) |
|              | C (18)      |                                                                               |
|              | (+) NO (19) |                                                                               |
| Out3 (AL1)   | (-) NC (20) |                                                                               |
|              | C (21)      |                                                                               |
|              | (+) NO (22) |                                                                               |

#### • Transmitter supply

Transmitter supply isolated 1500V  
10/24Vdc, max. 30mA short-circuit protection  
(9) + Vt  
(5) GND

#### • Digital inputs

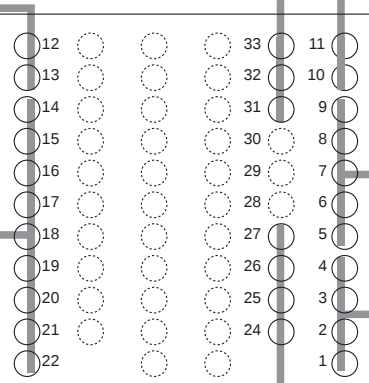
Digital inputs isolated 1500V  
- NPN 24V, 4,5mA  
- PNP 24V, 3,6mA (12V, 1,2mA)  
(8) IN2  
(7) IN1  
(5) COM

#### • Auxiliary input

Auxiliary input isolated 1500V  
Current transformer 50mAac; 1,5 $\Omega$ ; 50/60Hz  
Remote setpoint 0...20mA, 4...20mA, 5 $\Omega$ , 0...1V, 0...10V, > 1M $\Omega$   
Potentiometer > 500 $\Omega$   
(9) +Vt +10V  
(6) ~ +  
(5) GND -  
Pot

#### • Serial line

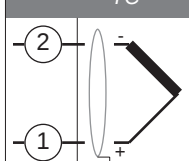
Configurable serial line isolated to 1500V  
RS422/485 or RS232  
(27) - Tx  
(26) +  
(25) - Rx  
(24) +  
Passive current loop (max. 1200 baud) (optional R60 special)  
A (Data +)  
B (Data -)  
GND  
Rx  
Tx  
RS485 2-wires  
RS232



#### • Inputs

Available thermocouples: J, K, R, S, T, B, E, N, Ni-Ni18Mo, L NiCr-CuNi  
- Observe polarities  
- For extensions, use the correct compensating cable for the type of TC used

#### • TC



#### • Linear (V)

Linear input in dc voltage 0...50mV, 10...50mV, 0...10V, 2...10V  
(2) -  
(1) +

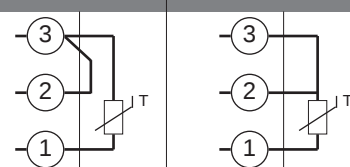
#### • Linear (I)

Linear input in dc current 0...20mA, 4...20mA  
(4) -  
(2) -  
(1) +

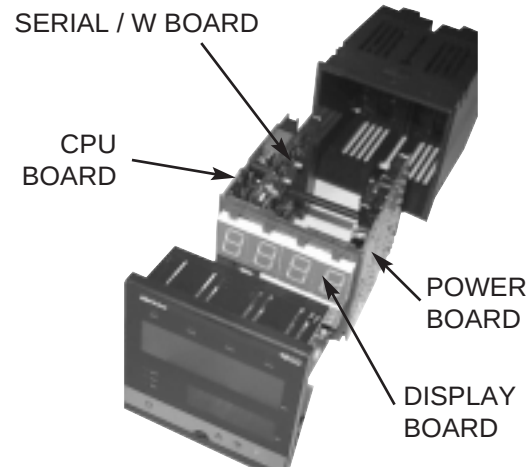
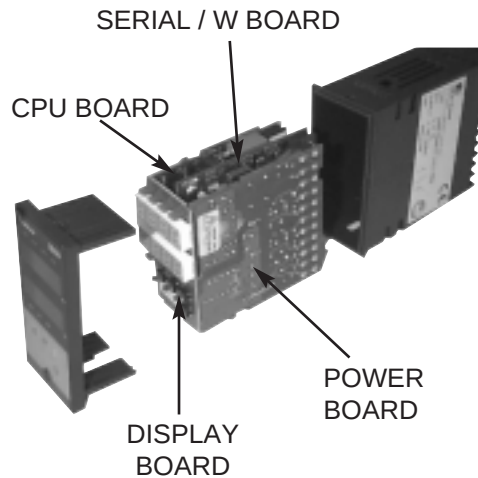
#### • Pt100 2 wires o PTC

Use wires of adequate diameter (min. 1mm<sup>2</sup>)  
PT100, JPT100, PTC  
(3) -  
(2) -  
(1) +

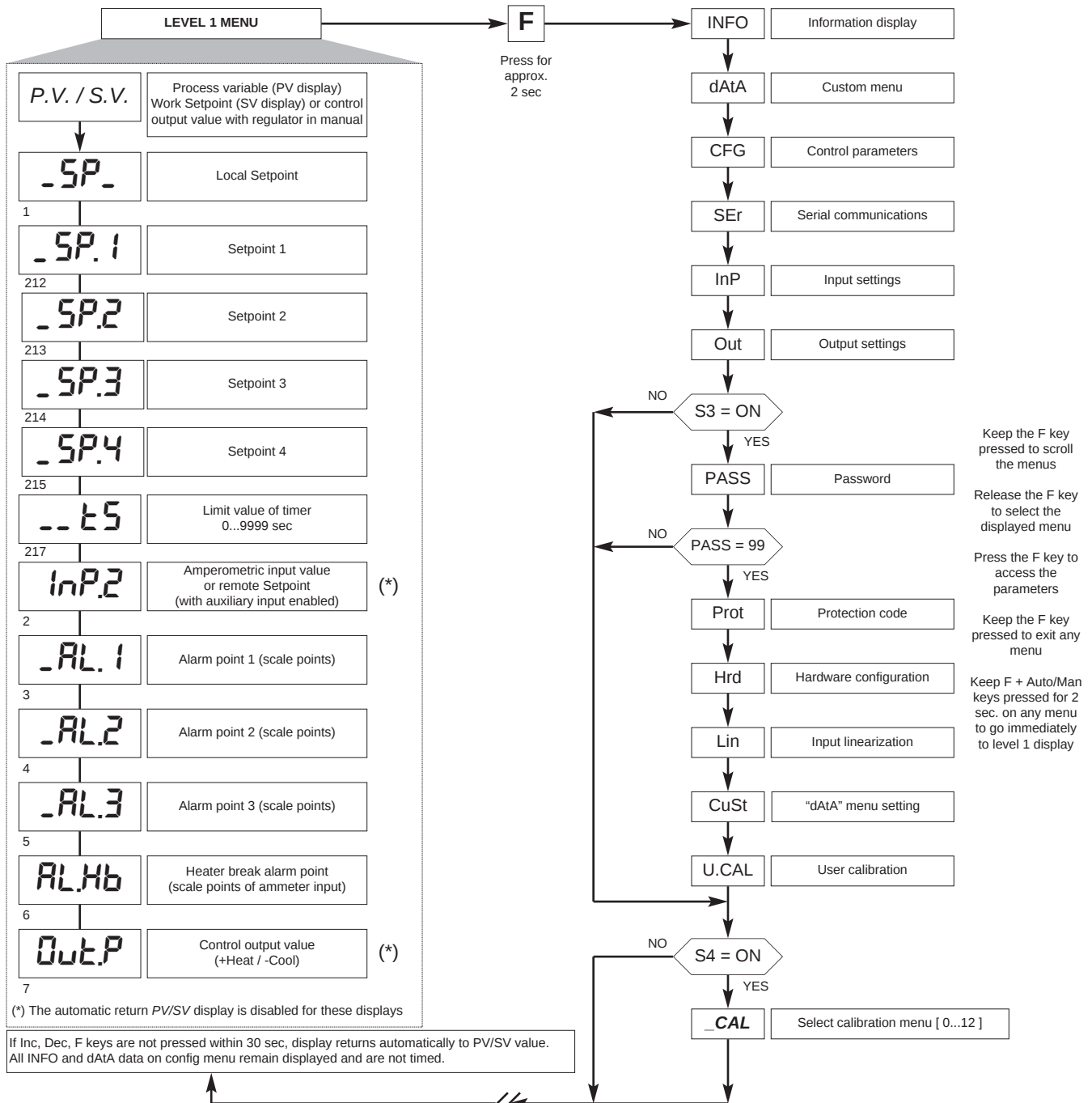
#### • Pt100 3 wires

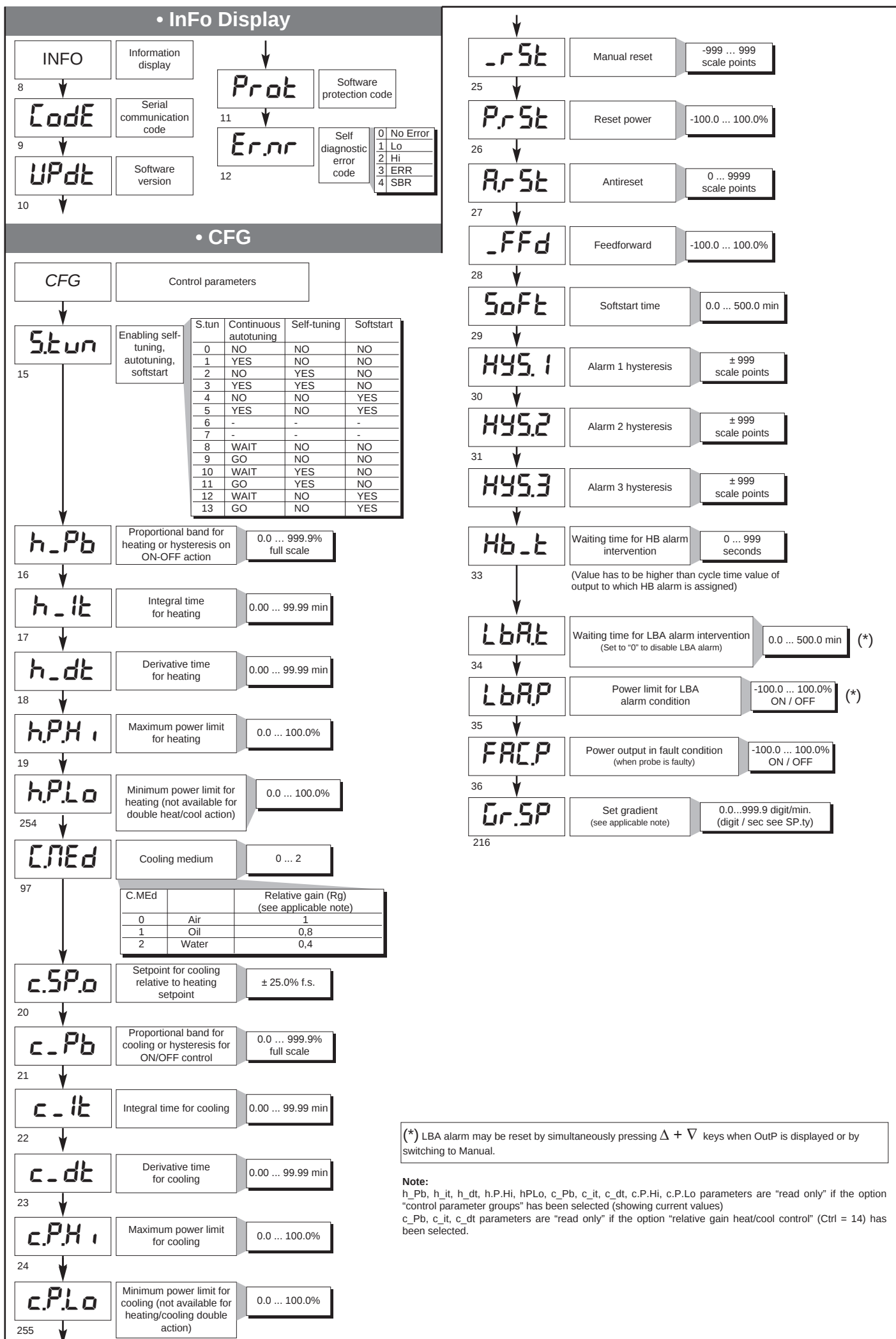


## Device structure: identification of boards

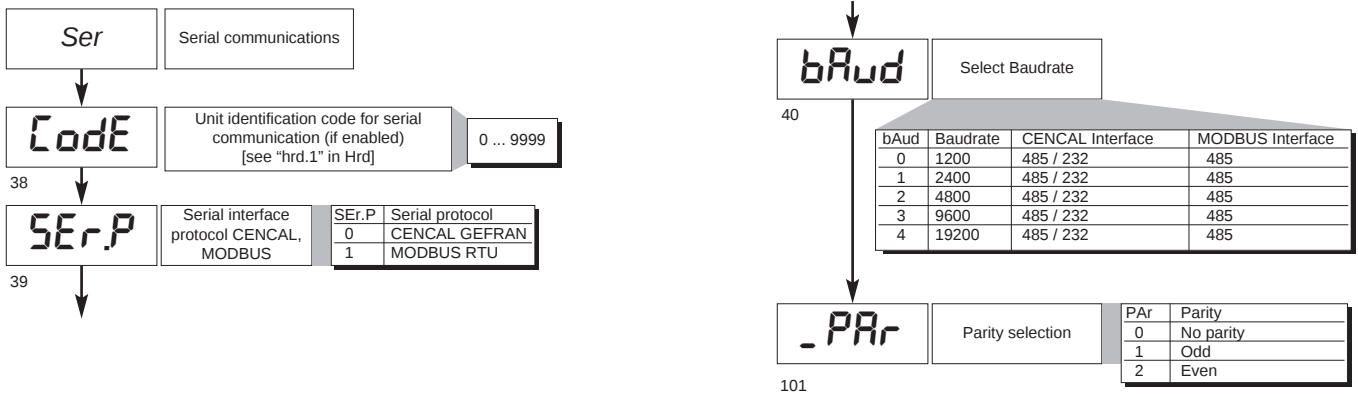


## 5 • PROGRAMMING and CONFIGURATION

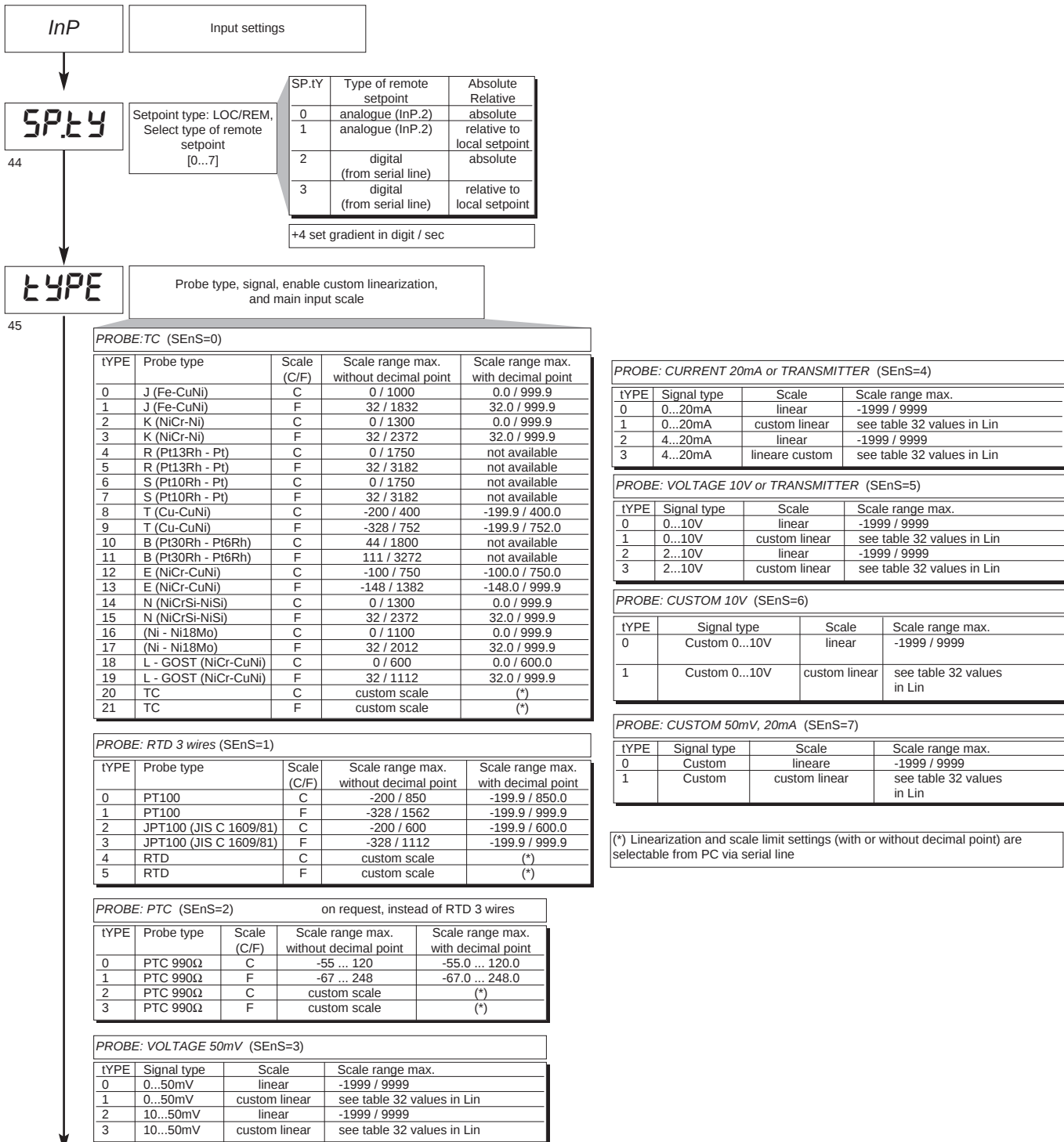


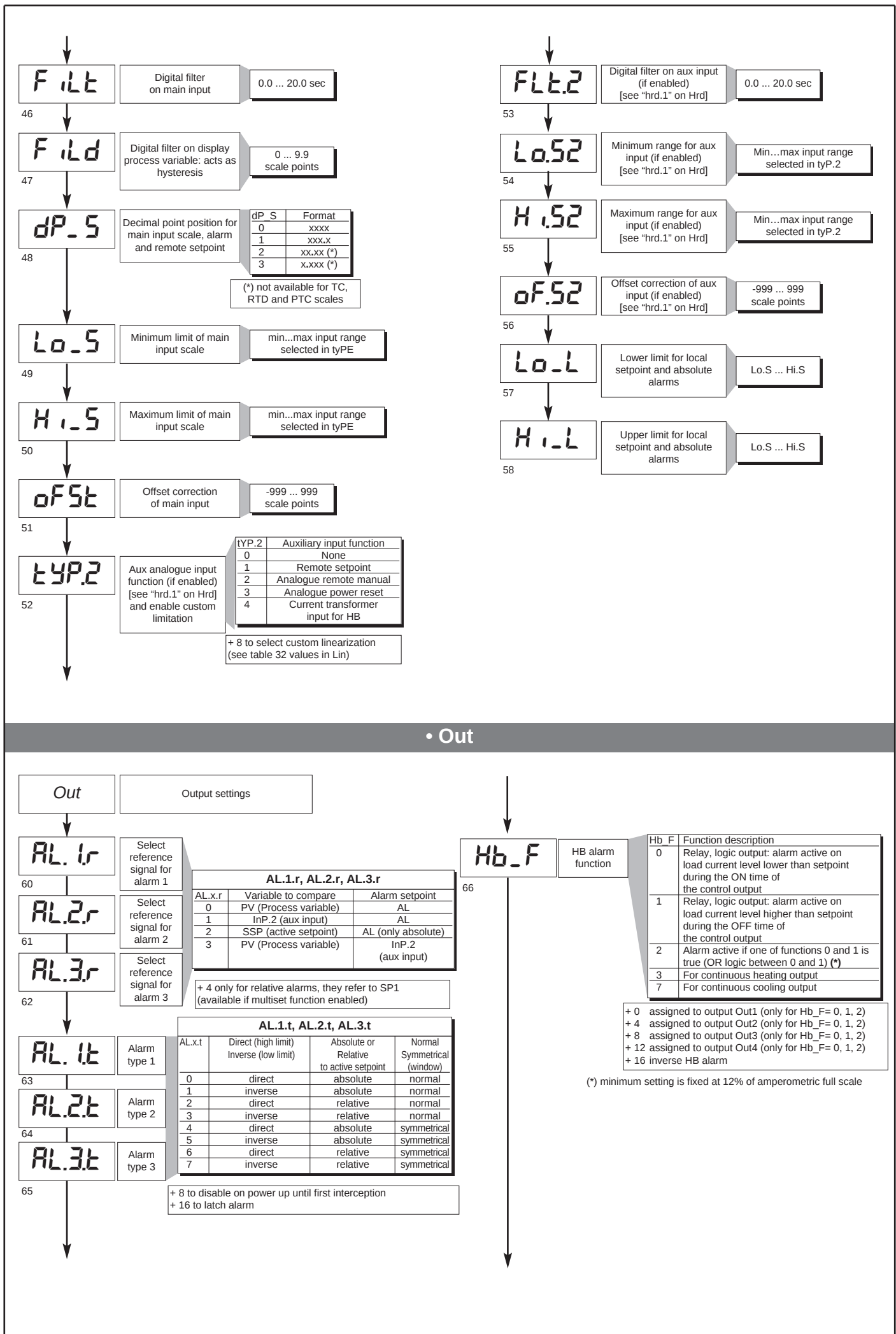


## • Ser



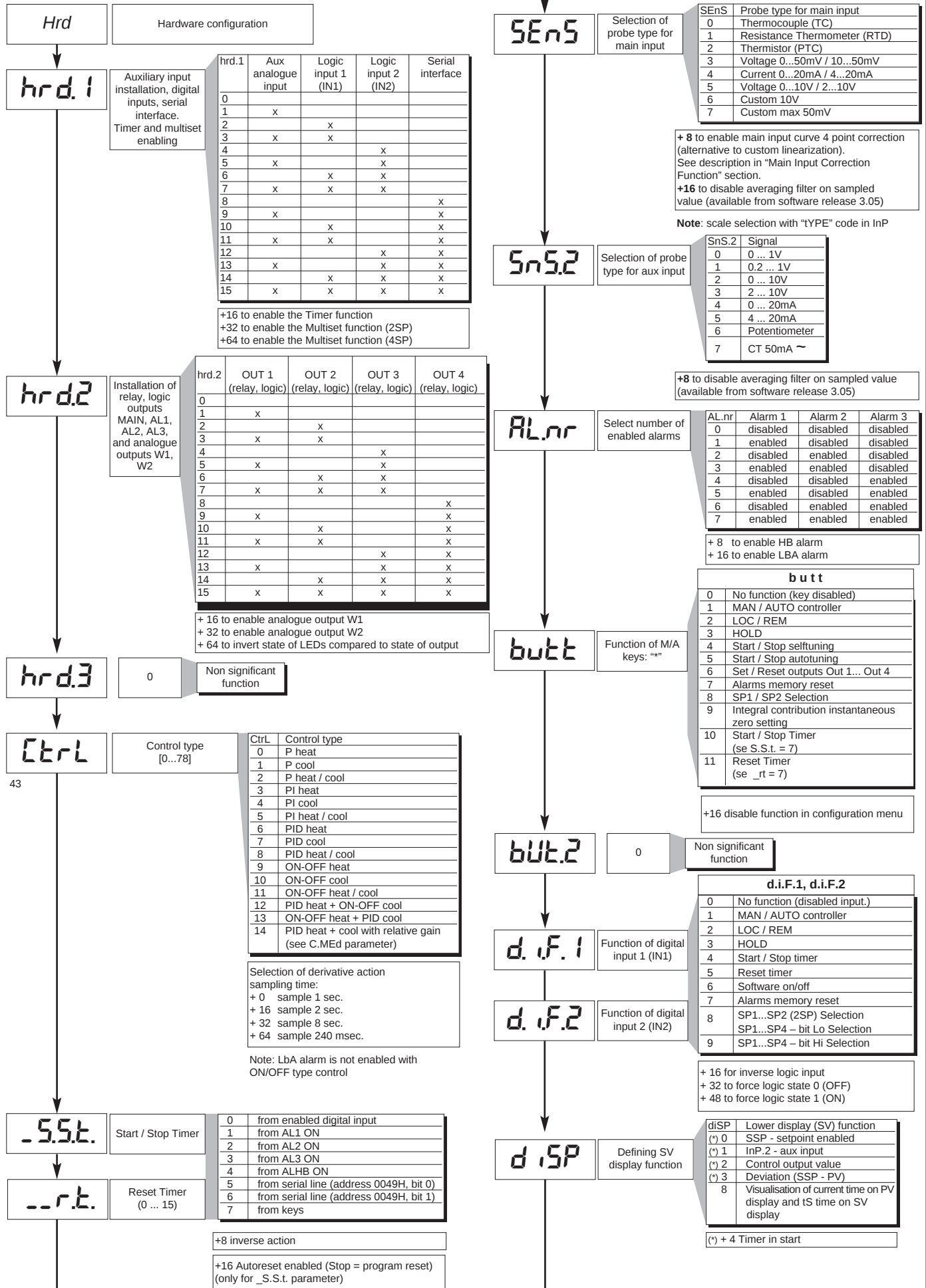
## • InP

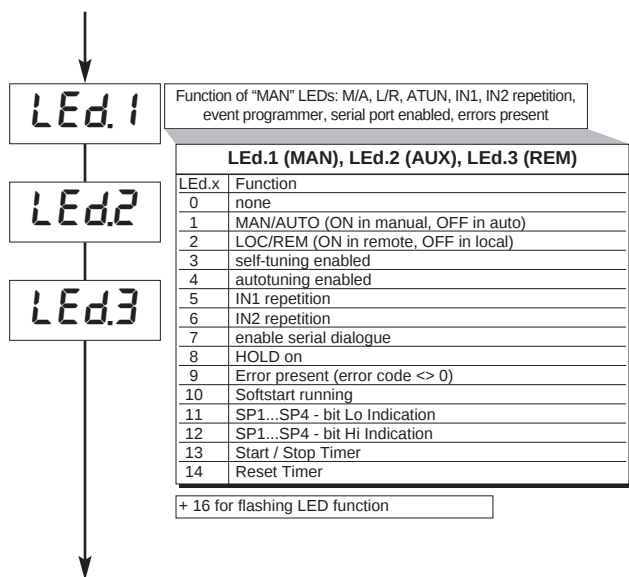




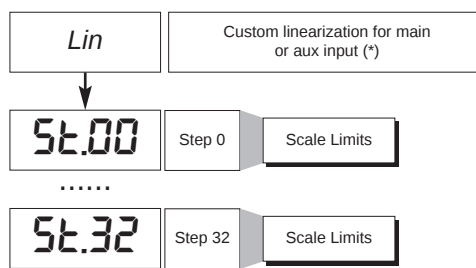


## • Hrd



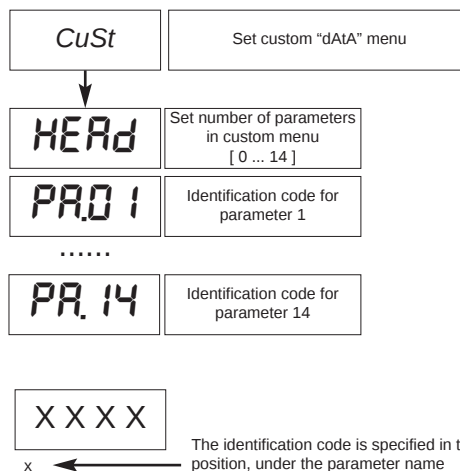


## • Lin

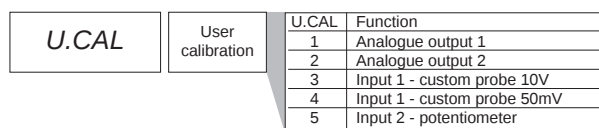


(\*) Not available for :  
 enabled input correction function (SenS + 8)  
 TC custom input type (SenS = 0; tyPE = 20, 21)  
 RTD custom input type (SenS = 1; tyPE = 4, 5)  
 PTC custom input (SEnS = 2 ; tyPE = 2, 3)

## • CuSt

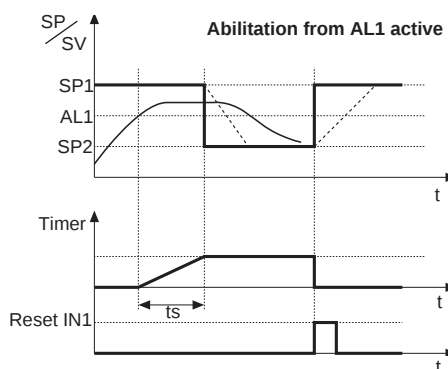
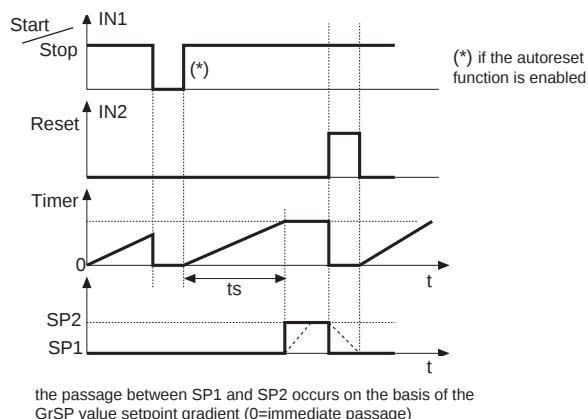


## • U.CAL



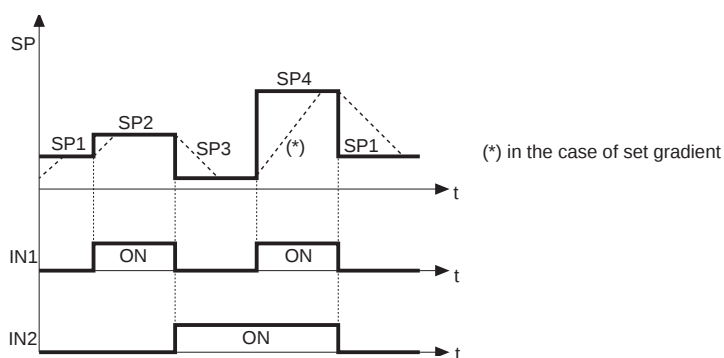
## 6 • TIMER + 2 SET POINT, TIMER FUNCTION

The timer functionality is enabled in **Hrd** configuration in **hrd.1** parameter setting the code +16 or +48 to activate the selection of two set points. In the case of enabling, parameters **\_S.S.t.** (start/stop timer) and **\_r.t.** (reset timer) define the functioning modality. The intervention threshold of the tS timer can be set at level 1 of programming with bottom of scale 9999 sec. The enabling to the timer, as also the reset condition, can occur due to external contact or alarm conditions (AL1, AL2, AL3, ALHb). The reset function, always active on the status, zero sets the value of the timer and keeps it blocked even if the start is present. In the absence of enabling (stop) the autoreset condition can be active for which the timer zero sets at each stop. It is possible to make the timer visible on the SV display during the active counting phase as specified by the diSP parameter. On reaching the preset time (tS), it is possible to activate a relay of the four available or select set point 2.

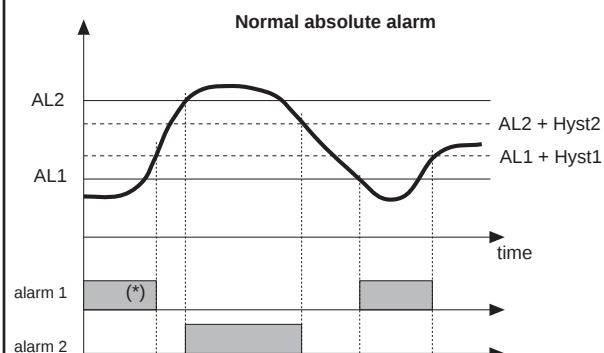


## 7 • MULTiset FUNCTION, SET GRADIENT

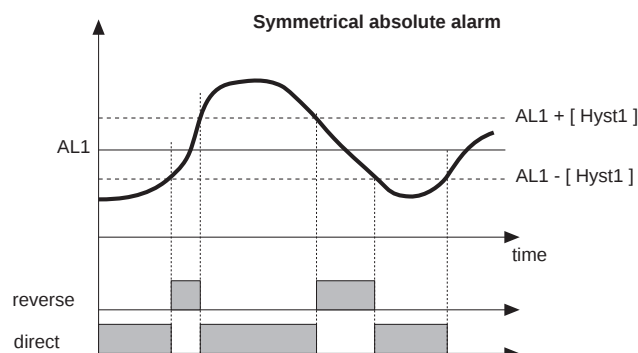
The function is enabled in **Hrd** configuration in the parameter **hrd.1** setting code +64. It allows the setting of 4 set points which can be selected by means of combinations of digital inputs (IN1, IN2). The selection between set point 1 and set point 2 can also be carried out by means of front key. It is possible to visualise the selection between set point 1 / 2 using leds. SET GRADIENT: if set  $\neq 0$ , when switching on and during the auto/man passage the set point is assumed to be equal to PV, with gradient set it reaches the local set or that selected. Every set variation is subject to gradient. The set gradient is inhibited on switching on when the self tuning is enabled. If the set gradient is set  $\neq 0$ , this is active even on local setpoint variations, which can be set only in the relative SP menu. The adjustment setpoint reaches the value set with a speed defined by the gradient.



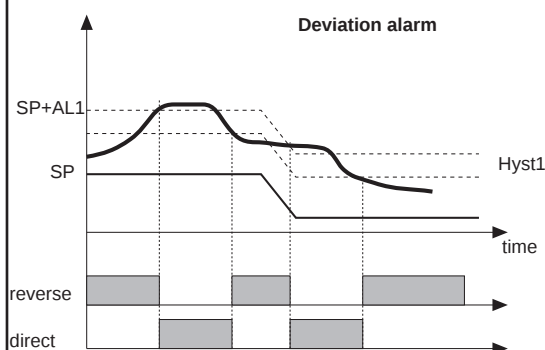
## 8 • ALARMS



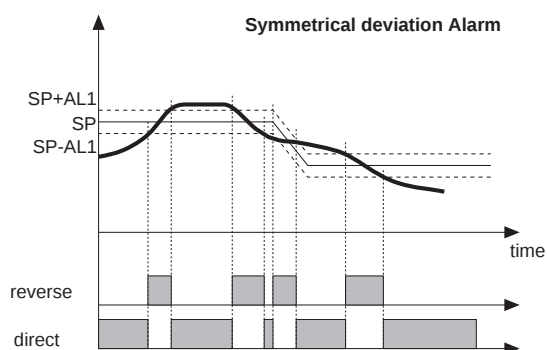
For  $AL1$  = reverse absolute alarm (low) with positive Hyst1,  $AL1\ t = 1$   
 (\*) = OFF if disabled on power-up  
 For  $AL2$  = direct absolute alarm (high) with negative Hyst2,  $AL2\ t = 0$



For  $AL1$  = symmetrical Lo absolute alarm with Hyst1,  $AL1\ t = 5$   
 For  $AL1$  = symmetrical Hi absolute alarm with Hyst1,  $AL1\ t = 4$



For  $AL1$  = Lo deviation alarm with negative Hyst 1,  $AL1\ t = 3$   
 For  $AL1$  = Hi deviation alarm with negative Hyst 1,  $AL1\ t = 2$



For  $AL1$  = Symmetrical Lo deviation alarm with Hyst 1,  $AL1\ t = 7$   
 For  $AL1$  = Symmetrical Hi deviation alarm with Hyst 1,  $AL1\ t = 6$

## HB ALARM

This type of alarm requires use of a current transformer input (CT).

It can indicate variations of load current measured through transformer input in the range (Lo.S2 ... HI.S2).

It is enabled by means of configuration code (Hrd, AL.nr); in this case the alarm setpoint is expressed as HB scale points.

The alarm function and the assigned control output are selected through parameter Hb\_F ("Out" phase).

The alarm setpoint is AL.Hb.

The direct HB alarm trips if current transformer input falls below the setpoint for Hb\_t seconds of ON time for the selected output.

The HB alarm can be activated only with ON times exceeding 0.4 seconds.

The HB alarm monitors load current even during the OFF period of the cycle time of the selected output.

The HB alarm will trip if measured current exceeds 12% of the CT input full scale for Hb\_t seconds when the output is in OFF state.

The alarm is reset automatically when alarm conditions have been cleared.

If AL.Hb is set at = 0, both types of HB alarm are disabled and the assigned relay is de-energized.

The load current reading is displayed by selecting InP2 (level 1).

NOTE: ON/OFF times refer to the cycle time set for the selected output.

Alarm Hb\_F = 3 (7), for analog output is ON when the load current is lower than the alarm setpoint; the alarm is disabled if the heating (cooling) output is lower than 2%.

## LBA ALARM

This alarm detects an interruption in the control loop caused by a possible short-circuited probe, inverted probe connections or broken load.

If enabled (AL.nr), the alarm trips if the variable does not increase when heating (reduce when cooling) at maximum power for a set time (LbA.t).

The value of the variable is enabled only outside the proportional band; when the alarm is ON, power is limited to value (LbA.P).

The alarm condition resets as soon as temperature increases for heating (or reduces for cooling), or by simultaneously pressing the "▽" and "△" keys in Out.P of level 1.

The LBA function is disabled if LbA.t = 0.

## 9 • SOFT-START

This function (if enabled) partializes power in proportion to the time elapsed since power-up compared to the preset time 0.0 ... 500.0 min ("SoFt" parameter, CFG). Soft-start is an alternative to self-tuning and is activated each time the unit is powered up. The soft-start function is reset by switching to Manual control.

## 10 • CONTROL ACTIONS

### *Proportional Action:*

action in which contribution to output is proportional to deviation at input (deviation = difference between controlled variable and setpoint).

### *Derivative Action:*

action in which contribution to output is proportional to rate of variation input deviation.

### *Integral Action:*

action in which contribution to output is proportional to integral of time of input deviation.

### **Influence of Proportional, Derivative and Integral actions on response of process under control**

\* An increase in P.B. reduces oscillations but increases deviation.

\* A reduction in P.B. reduces the deviation but provokes oscillations of the controlled variable (the system tends to be unstable if P.B. value is too low).

\* An increase in Derivative Action corresponds to an increase in Derivative Time, reduces deviation and prevents oscillation up to a critical value of Derivative Time, beyond which deviation increases and prolonged oscillations occur.

\* An increase in Integral Action corresponds to a reduction in Integral Time, and tends to eliminate deviation between the controlled variable and the setpoint when the system is running at rated speed.

If the Integral Time value is too long (Weak integral action), deviation between the controlled variable and the setpoint may persist.

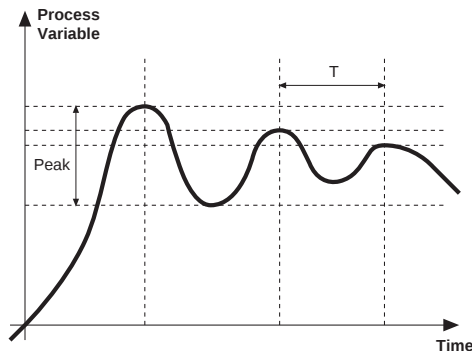
Contact GEFTRAN for more information on control actions.

## 11 • MANUAL TUNING

A) Enter the setpoint at its working value.

B) Set the proportional band at 0.1% (with on-off type setting).

C) Switch to automatic and observe the behavior of the variable. It will be similar to that in the figure:



D) The PID parameters are calculated as follows: Proportional band

$$\text{P.B.} = \frac{\text{Peak}}{(\text{V max} - \text{V min})} \times 100$$

(V max - V min) is the scale range.

Integral time:  $It = 1.5 \times T$

Derivative time:  $dt = It/4$

E) Switch the unit to manual, set the calculated parameters. Return to PID action by setting the appropriate relay output cycle time, and switch back to Automatic.

F) If possible, to optimize parameters, change the setpoint and check temporary response. If an oscillation persists, increase the proportional band. If the response is too slow, reduce it.

## 12 • SOFTWARE ON / OFF SWITCHING FUNCTION

**How to switch the unit OFF:** hold down the "F" and "Raise" keys simultaneously for 5 seconds to deactivate the unit, which will go to the OFF state while keeping the line supply connected and keeping the process value displayed. The SV display is OFF.

All outputs (alarms and controls) are OFF (logic level 0, relays de-energized) and all unit functions are disabled except the switch-on function and digital communication.

**How to switch the unit ON:** hold down the "F" key for 5 seconds and the unit will switch OFF to ON. If there is a power failure during the OFF state, the unit will remain in OFF state at the next power-up (ON/OFF state is memorized).

The function is normally enabled, but can be disabled by setting the parameter Prot = Prot +16. This function can be assigned to a digital input (d.i.F.1 or d.i.F.2) and excludes deactivation from the keyboard.

## 13 • SELF-TUNING

The function works for single output systems (heating or cooling).

The self-tuning action calculates optimum control parameter values during process startup.

The variable (for example, temperature) must be that assumed at zero power (room temperature).

The controller supplies maximum power until an intermediate value between starting value and setpoint is reached, after which it zeros power. PID parameters are calculated by measuring overshoot and the time needed to reach peak. When calculations are finished, the system disables automatically and the control proceeds until the setpoint is reached.

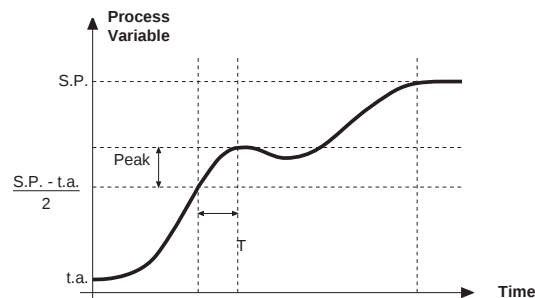
### How to activate self-tuning:

#### A. Activation at switch-on

1. Switch program to STOP
2. Adjust setpoint to required value
3. Enable self-tuning by setting **Stun** parameter to 2 (CFG menu)
4. Switch unit off
5. Make sure that temperature is approximately room temperature
6. Switch the unit on

#### B. Activation from keyboard

1. Make sure that M/A key is enabled for Start/Stop self-tuning function (**butt** code = 4 Hrd menu)
2. Switch program to STOP
3. Adjust temperature to approximately room temperature
4. Adjust setpoint to required value
5. Press M/A key to activate self-tuning (Attention: self-tuning will be disabled if the key is pressed again).



The procedure runs automatically until finished, when the new PID parameters are stored: proportional band, integral and derivative times calculated for the active action (heating or cooling). In case of double action (heating or cooling), parameters for the opposite action are calculated by maintaining the initial ratio between parameters (ex.:  $CPb = HPb * K$ ; where  $K = CPb / HPb$  when self-tuning starts). When finished, the Stun code is automatically cancelled.

#### Notes:

- The procedure interrupts when the setpoint value is exceeded. In this case, the **Stun** code is not cancelled.
- It is good practice to enable one of the configurable LEDs to signal self-tuning status. By setting one of LED1, LED2, LED3 = 3 (or 19) on the Hrd menu, the corresponding LED will be on (or flashing) when self-tuning is active.
- For the programmer model, the program is in STOP if self-tuning is activated when the unit is switched on.

## 14 • AUTO-TUNING

PID parameters cannot be set if the self-tuning function is enabled.

The function can be one of two types: permanent or one-shot.

The first continuously measures system oscillations to find the optimum PID values to reduce such oscillations.

It does not engage if the oscillations drop below 1.0% of the proportional band.

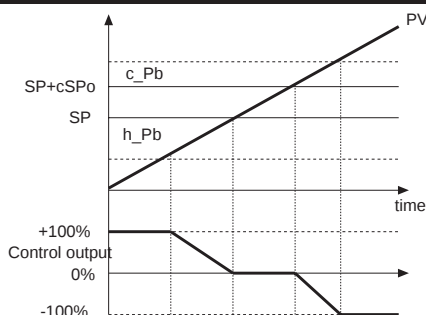
It is interrupted if the setpoint is changed, and is automatically resumed when the setpoint stabilizes.

The calculated parameters are not stored.

If the unit is switched off, the controller reverts to the values set before self-tuning was enabled.

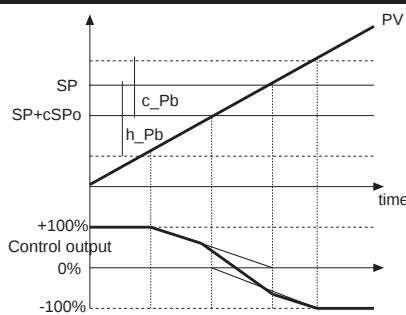
One-shot self-tuning is useful for calculating values around a setpoint. It produces a variation of 10% of current power at the output and examines the effect of the overshoot over time. These parameters are stored and replace those previously set. After this disturbance, the controller resumes control at the setpoint using the new parameters. The parameter activated in CFG is accepted only if the control power is between 20 and 80%.

## 15 • CONTROL OUTPUT



Control output with proportional action only if proportional heating band is separated from proportional cooling band.

PV = Process Value  
SP+cSPo = Cooling Setpoint  
c\_Pb = Proportional cooling band



Control output with proportional action only if proportional heating band overlaps proportional cooling band.

SP = Heating Setpoint  
h\_Pb = Proportional heating band

## Heating/Cooling control with relative gain

In this control mode (enabled with CtrlL = 14 parameter) the type of cooling has to be specified.

Cooling PID parameters are therefore calculated based on heating parameters according to the specified ratio.

(for example: c.MEd = 1 (oil),  $H\_Pb = 10$ ,  $H\_dt = 1$ ,  $H\_It = 4$  implies:  $C\_Pb = 12,5$ ,  $C\_dt = 1$ ,  $C\_It = 4$ )

We advise you to apply the following values when setting output cycle times:

- Air T Cool Cycle = 10 sec.
- Oil T Cool Cycle = 4 sec.
- Water T Cool Cycle = 2 sec.

NB.: Cooling parameters **cannot be modified** in this mode.

## 16 • MAIN INPUT CORRECTION FUNCTION

This function is enabled by setting "Sens" +8 code ("Hrd" menu).

The scale can be reversed if this function is applied to linear scales (50mv, 10V, 20mA, Pot).

The offset function ("oFt" parameter on "InP" menu) remains enabled.

B1 always greater than A1;

Example:

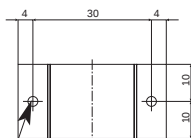
LoS = 0, HiS = 400, oFt = 0

A1 = St00 = 50, B1 = St01 = 350 (B1-A1 = 300, greater than 25% of 800)

The graph shows the relationship between Input (X-axis) and Indication (Y-axis). The solid line represents the 'Without correction' scenario, and the dashed line represents the 'With correction' scenario. The dashed line is consistently below the solid line, indicating a lower indication for the same input after correction.

| Input | Indication (Without correction) | Indication (With correction) |
|-------|---------------------------------|------------------------------|
| 50    | 120                             | 120                          |
| 200   | 170                             | 170                          |
| 350   | 220                             | 220                          |
| 400   | 400                             | 400                          |

## • CURRENT TRANSFORMER



Technical drawing of a mechanical part with dimensions and a section line. The part is shown in two views: a front view (left) and a side view (right). The front view shows a rectangular part with a total width of 48 and a total height of 20. The top edge has a width of 27, with 5.5 units on each side. The bottom edge has a width of 38, with 8 units on each side. There are two circular features on the top edge, each with a diameter of 10. A section line is drawn through the part, with the letter 'h' indicating the direction of the section.

(nominal primary current). The peculiar characteristic of these transformers is the high number of secondary turns. This provides a very low secondary current, suitable for an electronic measurement circuit. The secondary current may be detected as voltage on a resistor.

| CODE       | Ip / Is    | Ø Secondary Wire | n                       | OUTPUTS | Ru   | Vu    | ACCURACY |
|------------|------------|------------------|-------------------------|---------|------|-------|----------|
| TA/152 025 | 25 / 0.05A | 0.16 mm          | n <sub>1:2</sub> = 500  | 1 - 2   | 40 Ω | 2 Vac | 2.0 %    |
| TA/152 050 | 50 / 0.05A | 0.18 mm          | n <sub>1:2</sub> = 1000 | 1 - 2   | 80 Ω | 4 Vac | 1.0 %    |

|             |                            |
|-------------|----------------------------|
| COD. 330200 | IN = 50Aac<br>OUT = 50mAac |
| COD. 330201 | IN = 25Aac<br>OUT = 50mAac |

## A black and white photograph of a cable assembly. On the left, there is a small, rectangular connector with a multi-pin interface. A cable extends from this connector, loops around, and then connects to a larger, rectangular module on the right. The module has a dark, possibly black, front face and a lighter-colored side panel with some text and a small circular feature. The entire assembly is set against a plain white background.

The digital communication connection must be executed with unit ON and inputs/outputs not connected.

|                 |                                  |
|-----------------|----------------------------------|
| WSK - 0 - 0 - 0 | Interface Cable +<br>CD Winstrum |
|-----------------|----------------------------------|

## ORDER CODE

| MODEL |      |
|-------|------|
| 1600  | 1600 |
| 1800  | 1800 |

| POWER SUPPLY |                 |
|--------------|-----------------|
| 0            | 20...27Vac/dc   |
| 1            | 100...240Vac/dc |

| DIGITAL COMMUNICATIONS |                 |
|------------------------|-----------------|
| 0                      | None            |
| 2                      | RS 485 / RS 232 |

| AUXILIARY INPUTS INSPR, INTA / LOGIC IN1, IN2 / TRANSMITTER SUPPLY |                                                                                      |
|--------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 00                                                                 | None                                                                                 |
| 01                                                                 | IN1, IN2 NPN/PNP                                                                     |
| 03                                                                 | Trasmitter Supply 10 V/24V                                                           |
| 04                                                                 | IN1, IN2 NPN/ PNP + Trasmitter Supply 10 V/24V                                       |
| 06                                                                 | IN SPR (0...1V) + Trasmitter Supply 10 V/24V                                         |
| 07                                                                 | IN SPR (0...10V) / IN Potentiometer # + Trasmitter Supply 10 V/24V                   |
| 08                                                                 | IN SPR (0/4...20mA) + Trasmitter Supply 10 V/24V                                     |
| 09                                                                 | IN TA (5050mAac) + Trasmitter Supply 10 V/24V                                        |
| 10                                                                 | IN1, IN2 NPN/PNP IN SPR (0...10V) + Trasmitter Supply 10V/24V                        |
| 11                                                                 | IN1, IN2 NPN/PNP IN SPR (0...10V) / IN Potentiometer # + Trasmitter Supply 10V / 24V |
| 12                                                                 | IN1, IN2 NPN/PNP IN SPR (0/4...20mA) + Trasmitter Supply 10 V/24V                    |
| 13                                                                 | IN1, IN2 NPN/PNP IN TA (50mAac) + Trasmitter Supply 10V/24V                          |
| 33                                                                 | IN SPR (0...1V)                                                                      |
| 34                                                                 | IN SPR (0...10V) / Potentiometer #                                                   |
| 35                                                                 | IN SPR (0/4...20mA)                                                                  |
| 36                                                                 | IN TA (50mAac)                                                                       |

| OUTPUTS 1,2,3,4 (R/D)                     |      |
|-------------------------------------------|------|
| Out1 (D) + Out2 (R) + Out3 (R)            | DRR0 |
| Out1 (D) + Out2 (R) + Out3 (R) + Out4 (R) | DRRR |
| Out1 (D) + Out2 (R) + Out3 (R) + Out4 (D) | DRRD |
| Out1 (R) + Out2 (R) + Out3 (R)            | RRR0 |
| Out1 (R) + Out2 (R) + Out3 (R) + Out4 (R) | RRRR |
| Out1 (R) + Out2 (R) + Out3 (R) + Out4 (D) | RRRD |

| OUTPUTS 5, 6                                   |    |
|------------------------------------------------|----|
| None                                           | 00 |
| OUT 5 (W1) 0...10V                             | V0 |
| OUT 5 (W1) 0/4...20mA                          | I0 |
| OUT 5 (W1) 0...10V<br>OUT 6 (W2) 0...10V       | VV |
| OUT 5 (W1) 0/4...20mA<br>OUT 6 (W2) 0...10V    | IV |
| OUT 5 (W1) 0/4...20mA<br>OUT 6 (W2) 0/4...20mA | II |

# Potentiometer input requires 10V Trasmitter Supply  
Make specific calibration request for PTC input.

Kindly contact GEFRA for information on available codes.

## • WARNINGS



**WARNING:** this symbol indicates danger.  
It is placed near the power supply circuit and near high-voltage relay contacts.

**Read the following warnings before installing, connecting or using the device:**

- follow instructions precisely when connecting the device.
- always use cables that are suitable for the voltage and current levels indicated in the technical specifications.
- the device has no ON/OFF switch: it switches on immediately when power is turned on. For safety reasons, devices permanently connected to the power supply require a two-phase disconnecting switch with proper marking. Such switch must be located near the device and must be easily reachable by the user. A single switch can control several units.
- if the device is connected to electrically NON-ISOLATED equipment (e.g. thermocouples), a grounding wire must be applied to assure that this connection is not made directly through the machine structure.
- if the device is used in applications where there is risk of injury to persons and/or damage to machines or materials, it **MUST** be used with auxiliary alarm units. You should be able to check the correct operation of such units during normal operation of the device.
- before using the device, the user must check that all device parameters are correctly set in order to avoid injury to persons and/or damage to property.
- the device must **NOT** be used in inflammable or explosive environments. It may be connected to units operating in such environments only by means of suitable interfaces in conformity to local safety regulations.
- the device contains components that are sensitive to static electrical discharges. Therefore, take appropriate precautions when handling electronic circuit boards in order to prevent permanent damage to these components.

**Installation:** installation category II, pollution level 2, double isolation

- power supply lines must be separated from device input and output lines; always check that the supply voltage matches the voltage indicated on the device label.
- install the instrumentation separately from the relays and power switching devices
- do not install high-power remote switches, contactors, relays, thyristor power units (particularly if "phase angle" type), motors, etc... in the same cabinet.
- avoid dust, humidity, corrosive gases and heat sources.
- do not close the ventilation holes; working temperature must be in the range of 0...50°C.

If the device has faston terminals, they must be protected and isolated; if the device has screw terminals, wires should be attached at least in pairs.

• **Power:** supplied from a disconnecting switch with fuse for the device section; path of wires from switch to devices should be as straight as possible; the same supply should not be used to power relays, contactors, solenoid valves, etc.; if the voltage waveform is strongly distorted by thyristor switching units or by electric motors, it is recommended that an isolation transformer be used only for the devices, connecting the screen to ground; it is important for the electrical system to have a good ground connection; voltage between neutral and ground must not exceed 1V and resistance must be less than 60hm; if the supply voltage is highly variable, use a voltage stabilizer for the device; use line filters in the vicinity of high frequency generators or arc welders; power supply lines must be separated from device input and output lines; always check that the supply voltage matches the voltage indicated on the device label.

• **Input and output connections:** external connected circuits must have double insulation; to connect analog inputs (TC, RTD) you have to: physically separate input wiring from power supply wiring, from output wiring, and from power connections; use twisted and screened cables, with screen connected to ground at only one point; to connect adjustment and alarm outputs (contactors, solenoid valves, motors, fans, etc.), install RC groups (resistor and capacitor in series) in parallel with inductive loads that work in AC (*Note: all capacitors must conform to VDE standards (class x2) and support at least 220 VAC. Resistors must be at least 2W*); fit a 1N4007 diode in parallel with the coil of inductive loads that operate in DC.

**GEFRAN spa will not be held liable for any injury to persons and/or damage to property deriving from tampering, from any incorrect or erroneous use, or from any use not conforming to the device specifications.**

### PONTICELLI PER CONFIGURAZIONE JUMPERS FOR CONFIGURATION BRÜCKEN FÜR KONFIGURATION

### PONTS ÉTAÏN POUR CONFIGURATION PUENTES PARA CONFIGURACIÓN PONTES PARA CONFIGURAÇÃO

SCHEDA POWER 90/260 (44995)4 e POWER 10/30 (45115)1  
POWER BOARD 90/260 (44995)4 and POWER 10/30 (45115)1  
NETZTEIL-KARTE 90/260 (44995)4 und POWER 10/30 (45115)1  
CARTE ALIMENTATION 90/260 (44995)4 et POWER 10/30 (45115)1  
FICHA ALIMENTACIÓN 90/260 (44995)4 y POWER 10/30 (45115)1  
PLACA DE ALIMENTAÇÃO 90/260 (44995)4 e POWER 10/30 (45115)1

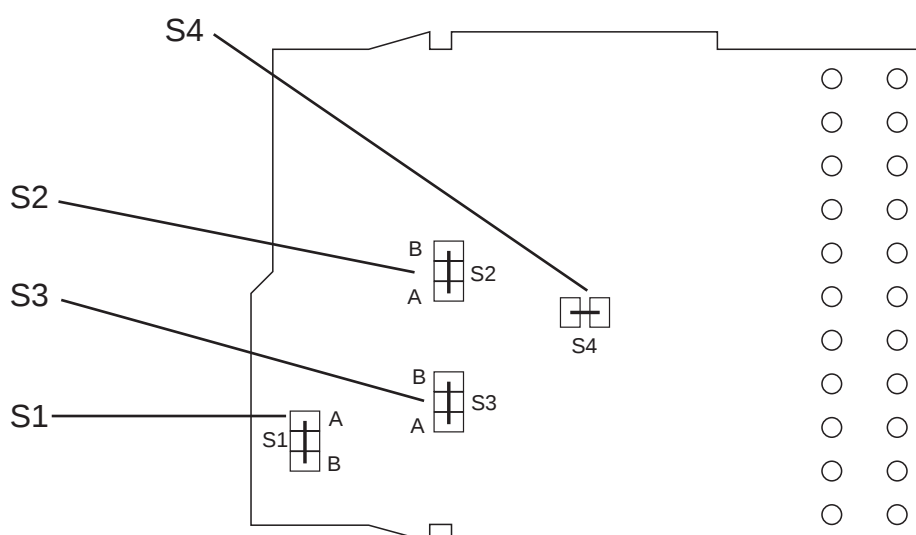
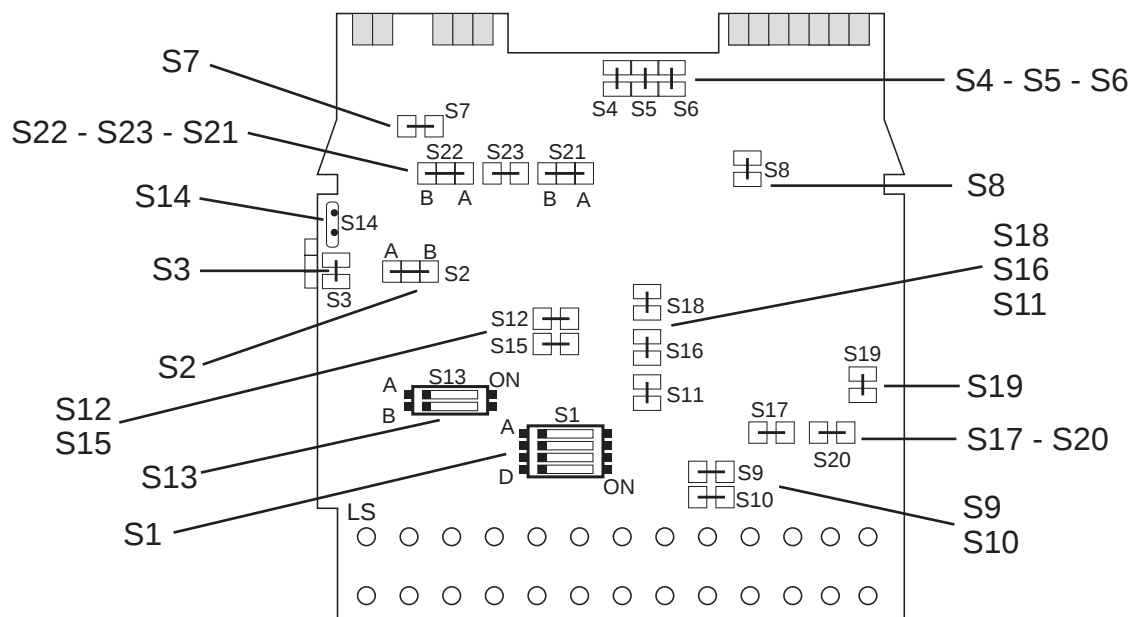


Fig. 1

| TIPO USCITA<br>OUTPUT TYPE<br>AUSGANGSTYP<br>TYPE SORTIE<br>TIPO DE SALIDA<br>TIPO DE SAÍDA                                                                                                             | S2                                                                                           | S3                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Relè diseccitato power ON<br>Relay OFF at power ON<br>Relais angezogen = Kontakt geöffnet<br>Relais désexcité mise en marche<br>Relé desexcitado con "power ON"<br>Relé não excitado com alimentação ON | (posizione A)<br>(position A)<br>(Stellung A)<br>(position A)<br>(posición A)<br>(posição A) | (posizione A)<br>(position A)<br>(Stellung A)<br>(position A)<br>(posición A)<br>(posição A) |
| Relè eccitato power ON<br>Relay ON at power ON<br>Relais angezogen = Kontakt geschlossen<br>Relais excité mise en marche<br>Relé excitado con "power ON"<br>Relé excitado com alimentação ON            | (posizione B)<br>(position B)<br>(Stellung B)<br>(position B)<br>(posición B)<br>(posição B) | (posizione B)<br>(position B)<br>(Stellung B)<br>(position B)<br>(posición B)<br>(posição B) |



SCHEDA CPU  
CPU BOARD  
CPU-KARTE  
CARTE CPU  
FICHA CPU  
PLACA CPU

Fig. 2

| DESCRIZIONE<br>DESCRIPTION<br>BESCHREIBUNG                                                                                              | PONTICELLI<br>JUMPERS<br>BRÜCKEN                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Abilitazione configurazione (stagno)<br>Enable configuration (Tin)<br>Freigabe der Konfiguration (Lötzinn)                              | S3 (chiuso)<br>S3 (closed)<br>S3 (geschlossen)                                            |
| Abilitazione configurazione (jumper)<br>Enable configuration (jumper)<br>Freigabe der Konfiguration (jumper)                            | S14 (chiuso) *<br>S14 (closed) *<br>S14 (geschlossen) *                                   |
| Abilitazione calibrazione<br>Enable calibration<br>Freigabe der Kalibration                                                             | S4 (chiuso)<br>S4 (closed)<br>S4 (geschlossen)                                            |
| Abilitazione autoconfigurazione istantanea<br>Enable instantaneous self-configuration<br>Freigabe sofortige automatische Konfigurierung | S8 (assieme a S3+S4) (chiusi)<br>S8 (with S3+S4) (closed)<br>S8 (mit S3+S4) (geschlossen) |
| Non utilizzato<br>Not used<br>Nicht verwendet                                                                                           | S7<br>S7<br>S7                                                                            |
| Abilitazione sonda PTC<br>Enable PTC probe<br>Freigabe Fühler PTC                                                                       | S17 (aperto)<br>S17 (open)<br>S17 (geöffnet)                                              |
| Abilitazione sonda PT100 (standard)<br>Enable PT100 probe (standard)<br>Freigabe Fühler PT100 (standard)                                | S17 (chiuso)<br>S17 (closed)<br>S17 (geschlossen)                                         |
| HB.F = 0, 1, 2<br>HB.F = 0, 1, 2<br>HB.F = 0, 1, 2                                                                                      | S18 (chiuso)<br>S18 (closed)<br>S18 (geschlossen)                                         |
| HB.F = 3, 7<br>HB.F = 3, 7<br>HB.F = 3, 7                                                                                               | S18 (aperto)<br>S18 (open)<br>S18 (geöffnet)                                              |
| Non utilizzato<br>Not used<br>Nicht verwendet                                                                                           | S21<br>S21<br>S21                                                                         |
| Non utilizzato<br>Not used<br>Nicht verwendet                                                                                           | S22<br>S22<br>S22                                                                         |
| Non utilizzato<br>Not used<br>Nicht verwendet                                                                                           | S23<br>S23<br>S23                                                                         |
| OUT4 relè diseccitato power ON<br>OUT4 relay OFF at power ON<br>Ausgang 4; Relais angezogen = Kontakt geöffnet                          | S2 (posizione A)<br>S2 (position A)<br>S2 (Stellung A)                                    |
| OUT4 relè eccitato power ON<br>OUT4 relay ON at power ON<br>Ausgang 4; Relais angezogen = Kontakt geschlossen                           | S2 (posizione B)<br>S2 (position B)<br>S2 (Stellung B)                                    |

(\*) LC

| DESCRIPTION<br>DESCRIPCIÓN<br>DESCRIÇÃO                                                                                                | PONTS ÉTAİN<br>PUENTES<br>PONTES                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Validation configuration (Etanche)<br>Habilitación configuración (Estaño)<br>Habilitação da configuração (Estanho)                     | S3 (fermée)<br>S3 (cerrado)<br>S3 (fechado)                                         |
| Validation configuration (jumper)<br>Habilitación configuración (jumper)<br>Habilitação da configuração (jumper)                       | S14 (fermée) *<br>S14 (cerrado) *<br>S14 (fechado) *                                |
| Validation étalonnage<br>Habilitación calibración<br>Habilitação da calibração                                                         | S4 (fermée)<br>S4 (cerrado)<br>S4 (fechado)                                         |
| Validation autoconfiguration instantanée<br>Habilitación autoconfiguración instantánea<br>Habilitação da auto-configuração instantânea | S8 (avec S3+S4) (fermées)<br>S8 (con S3+S4) (cerrados)<br>S8 (com S3+S4) (fechados) |
| Non utilisé<br>No utilizado<br>Não utilizado                                                                                           | S7<br>S7<br>S7                                                                      |
| Validation capteur PTC<br>Habilitación sonda PTC<br>Habilitação para sonda PTC                                                         | S13 (ouverte)<br>S13 (abierto)<br>S13 (aberto)                                      |
| Validation capteur PT100 (standard)<br>Habilitación sonda P100 (standard)<br>Habilitação para sonda PT100 (standard)                   | S13 (fermée)<br>S13 (cerrado)<br>S13 (fechado)                                      |
| HB.F = 0, 1, 2<br>HB.F = 0, 1, 2<br>HB.F = 0, 1, 2                                                                                     | S18 ( fermée)<br>S18 ( cerrado)<br>S18 ( fechado)                                   |
| HB.F = 3, 7<br>HB.F = 3, 7<br>HB.F = 3, 7                                                                                              | S18 ( ouverte)<br>S18 ( abierto)<br>S18 ( aberto)                                   |
| Non utilisé<br>No utilizado<br>Não utilizado                                                                                           | S21<br>S21<br>S21                                                                   |
| Non utilisé<br>No utilizado<br>Não utilizado                                                                                           | S22<br>S22<br>S22                                                                   |
| Non utilisé<br>No utilizado<br>Não utilizado                                                                                           | S23<br>S23<br>S23                                                                   |
| OUT4 relais désexcité mise en marche<br>OUT4 relé desexcitado con "power ON"<br>OUT4 relé não excitado com alimentação ON              | S2 (position A)<br>S2 (posición A)<br>S2 (posição A)                                |
| OUT4 relais excité mise en marche<br>OUT4 relé excitado con "power ON"<br>OUT4 relé excitado com alimentação ON                        | S2 (position B)<br>S2 (posición B)<br>S2 (posição B)                                |

(\*) LC

INGRESSO TA/SPR (PONTI A STAGNO)  
CT/SPR INPUT (TIN JUMPERS)  
STROMWANDLER-EINGANG / SPR (LÖTBRÜCKEN)  
ENTRÉE TA/SPR (PONTS ÉTANCHES)  
ENTRADA TA/SPR (PUENTES DE ESTAÑO)  
ENTRADA TA/SPR (PONTES COM ESTANHO)

|                                                              | S9                                                                   | S10                                                                  | S11                                                                  | S12                                                                  | S15                                                                  | S16                                                                  |
|--------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|
| INGRESSO<br>INPUT<br>EINGANG<br>ENTRÉE<br>ENTRADA<br>ENTRADA | PONTICELLI<br>JUMPERS<br>BRÜCKEN<br>PONTS ÉTAİN<br>PUENTES<br>PONTES | PONTICELLI<br>JUMPERS<br>BRÜCKEN<br>PONTS ÉTAİN<br>PUENTES<br>PONTES | PONTICELLI<br>JUMPERS<br>BRÜCKEN<br>PONTS ÉTAİN<br>PUENTES<br>PONTES | PONTICELLI<br>JUMPERS<br>BRÜCKEN<br>PONTS ÉTAİN<br>PUENTES<br>PONTES | PONTICELLI<br>JUMPERS<br>BRÜCKEN<br>PONTS ÉTAİN<br>PUENTES<br>PONTES | PONTICELLI<br>JUMPERS<br>BRÜCKEN<br>PONTS ÉTAİN<br>PUENTES<br>PONTES |
| SPR 0...1V                                                   | OFF                                                                  | OFF                                                                  | OFF                                                                  | OFF                                                                  | ON                                                                   | ON                                                                   |
| SPR 0...10V / Pot.                                           | OFF                                                                  | OFF                                                                  | ON                                                                   | OFF                                                                  | ON                                                                   | OFF                                                                  |
| SPR 0/4...20mA                                               | ON                                                                   | OFF                                                                  | OFF                                                                  | OFF                                                                  | ON                                                                   | OFF                                                                  |
| TA 50mA                                                      | ON                                                                   | ON                                                                   | OFF                                                                  | ON                                                                   | OFF                                                                  | OFF                                                                  |

INGRESSI DIGITALI (DIP SWITCH S1)  
DIGITAL INPUTS (DIP SWITCH S1)  
DIGITALE EINGÄNGE (DIP SWITCH S1)  
ENTRÉES NUMÉRIQUES (DIP SWITCH S1)  
ENTRADAS DIGITALES (DIP SWITCH S1)  
ENTRADAS DIGITAIS (DIP SWITCH S1)

| INGRESSI / TIPO<br>INPUTS / TYPE<br>EINGÄNGE / TYP<br>ENTRÉES / TYPE<br>ENTRADAS / TIPO<br>ENTRADAS / TIPOS                | NPN     | PNP     |
|----------------------------------------------------------------------------------------------------------------------------|---------|---------|
| INGRESSO DIGITALE 2<br>DIGITAL INPUT 2<br>DIGITALEINGANG 2<br>ENTRÉE NUMÉRIQUE 2<br>ENTRADA DIGITAL 2<br>ENTRADA DIGITAL 2 | C = OFF | C = ON  |
| INGRESSO DIGITALE 2<br>DIGITAL INPUT 2<br>DIGITALEINGANG 2<br>ENTRÉE NUMÉRIQUE 2<br>ENTRADA DIGITAL 2<br>ENTRADA DIGITAL 2 | D = ON  | D = OFF |
| INGRESSO DIGITALE 1<br>DIGITAL INPUT 1<br>DIGITALEINGANG 1<br>ENTRÉE NUMÉRIQUE 1<br>ENTRADA DIGITAL 1<br>ENTRADA DIGITAL 1 | A = OFF | A = ON  |
| INGRESSO DIGITALE 1<br>DIGITAL INPUT 1<br>DIGITALEINGANG 1<br>ENTRÉE NUMÉRIQUE 1<br>ENTRADA DIGITAL 1<br>ENTRADA DIGITAL 1 | B = ON  | B = OFF |

USCITA ALIMENTAZIONE TRASMETTITORE (DIP SWITCHES S13)  
TRANSMITTER SUPPLY OUTPUT (DIP SWITCHES S13)  
AUSGANG FÜR SENSORSPEISUNG (DIP SWITCHES S13)  
SORTIE DE ALIMENTATION POUR TRANSMETTEUR (DIP SWITCHES S13)  
SALIDA DE ALIMENTACIÓN PARA TRANSMISOR (DIP SWITCHES S13)  
SAÍDA DE ALIMENTAÇÃO PARA TRANSMISSOR (DIP SWITCHES S13)

|                                                                                   |        |         |
|-----------------------------------------------------------------------------------|--------|---------|
| USCITA 10V<br>OUTPUT 10V<br>AUSGANGS 10V<br>SORTIE 10V<br>SALIDA 10V<br>SAÍDA 10V | B = ON | A = OFF |
| USCITA 24V<br>OUTPUT 24V<br>AUSGANGS 24V<br>SORTIE 24V<br>SALIDA 24V<br>SAÍDA 24V | A = ON | B = OFF |

SCHEDA OUT SERIALE / OUT W  
 SERIAL OUT BOARD / OUT W  
 SERIELLER AUSGÄNGE / OUT W  
 CARTE OUT SÉRIE / OUT W  
 FICHA OUT SERIE / OUT W  
 PLACA DE COMUNICAÇÃO DIGITAL / OUT W

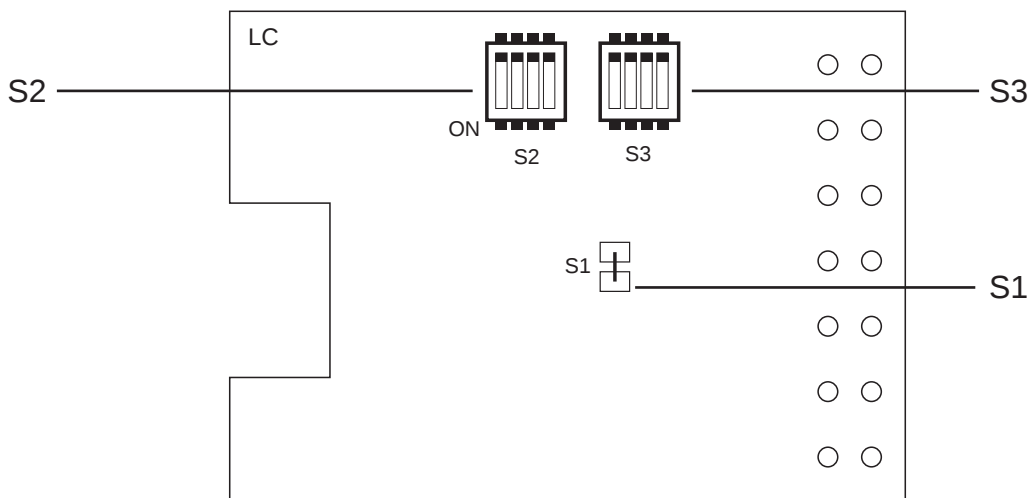


Fig. 3

USCITA ANALOGICA 1 (DIP SWITCHES S2)  
 ANALOGUE OUTPUT 1 (DIP SWITCHES S2)  
 ANALOGER AUSGANG 1 (DIP SWITCHES S2)  
 SORTIE ANALOGIQUE 1 (DIP SWITCHES S2)  
 SALIDA ANALÓGICA 1 (DIP SWITCHES S2)  
 SAÍDA ANALÓGICA 1 (DIP SWITCHES S2)

| USCITA ANALOGICA<br>ANALOGUE OUTPUT<br>ANALOGER AUSGANG<br>SORTIE ANALOGIQUE<br>SALIDA ANALÓGICA<br>SAÍDA ANALÓGICA | S2 (ON) | S2 (OFF) |
|---------------------------------------------------------------------------------------------------------------------|---------|----------|
| 0/4...20mA                                                                                                          | 1       | 2-3-4    |
| 0...10V                                                                                                             | 2-4     | 1-3      |

USCITA ANALOGICA 2 (DIP SWITCHES S3)  
 ANALOGUE OUTPUT 2 (DIP SWITCHES S3)  
 ANALOGER AUSGANG 2 (DIP SWITCHES S3)  
 SORTIE ANALOGIQUE 2 (DIP SWITCHES S3)  
 SALIDA ANALÓGICA 2 (DIP SWITCHES S3)  
 SAÍDA ANALÓGICA 2 (DIP SWITCHES S3)

| USCITA ANALOGICA<br>ANALOGUE OUTPUT<br>ANALOGER AUSGANG<br>SORTIE ANALOGIQUE<br>SALIDA ANALÓGICA<br>SAÍDA ANALÓGICA | S3 (ON) | S3 (OFF) |
|---------------------------------------------------------------------------------------------------------------------|---------|----------|
| 0/4...20mA                                                                                                          | 1       | 2-3-4    |
| 0...10V                                                                                                             | 2-4     | 1-3      |