



## INSTALLATION AND OPERATION MANUAL

SOFTWARE VERSION 1.0x

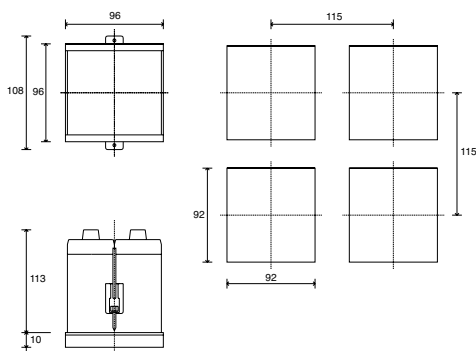
code 81766C / edition 08 - 08/2010

### 2 · TECHNICAL SPECIFICATIONS

Display	2 x 4 digit red LED's digit height 13 mm
Keys	4 mechanical keys (CAL, Raise, Lower, F)
Accuracy	0.2% f.s. at 25°C ambient temperature
Input 1	Differential input - from strain-gauge 350W (for pressure, force, etc.) sensitivity 1.5...7.5mV/V with 10V power supply; 1...5...15mV/V with 5V power supply, positive or symmetrical polarization, calibration with automatic calculation of sensitivity, sensor power interrupt signal, maximum zero imbalance for positive polarization 1/256f.s. - from potentiometer with 1.2V power supply, $\geq 50\Omega$ in current 0...20mA, 4...20mA $r_i = 50\Omega$
Resolution input 1 (function of sampling time)	Settable: >14bit, s.t. 120ms with sensor power check >13bit, s.t. 30ms (60ms with sensor power check) >12bit, s.t. 15ms (30ms with sensor power check)
Input 2	TC, RTD, PTC, NTC 60mV, 1V, 5V, 10V, $R_i \geq 500K\Omega$ , 20mA, $R_i = 50\Omega$
Resolution input 2	For linear inputs, function of settable sampling time s.t. 120msec, >14bit - 16000 divs. s.t. 60msec, >14bit - 16000 divs. s.t. 30msec, >13bit - 8000 divs. s.t. 15msec, >12bit - 4000 divs.
Thermocouples (settable scale)	J, K, R, S, T, B, E, N IEC 584-1, CEI EN 60584-1, 60584-2 L-Gost, U, G, D, C Custom linearization available on request
Cold junction error	0,1° / °C
RTD type (scale configurable within indicated range, with or without decimal point)	PT100, DIN 43760 JPT100
Max. RTD line resistance	20 $\Omega$
PTC type	990 $\Omega$ , 25°C
NTC type	1K $\Omega$ , 25°C
°C / °F selection	faceplate configurable
Linear scale ranges	-1999 to 9999 configurable decimal point position, possible 32 segment linearization
Alarms (set points)	- 3 settable alarm thresholds: absolute, relative with straight or reverse function - alarm thresholds with limits settable along entire selected scale - hysteresis settable for each alarm - freely assignable to single inputs in "OR" or "AND" - maximum intervention time equal to sampling time with digital filters excluded
Alarm masking	- exclude on power-up - latch reset from key and/or external contact - insert delay filter (DON, DBI, DOF, DPO) - set minimum intervention time
Relay contact	NO (NC), 5A, 250V, $\cos\phi = 1$
Fault settings	alarm states can be configured in probe fault condition
Logic inputs	2 inputs with no-voltage contact (24V/4.5mA)
Logic input functions	configurable among alarm memory reset, hold, flash, select max., min. peak, peak-peak
Analog retransmission (option)	10V/20mA, isolation 1500V, resolution 4000 divs
Serial interface	CL; RS422/485, RS232; Isolation 1500V
Baud rate	1200 ... 19200
Sensor/transmitter power supply for input 1 (VS)	1.2Vdc for potentiometer > 50 $\Omega$ 5Vdc, 10Vdc max. 120mA for strain-gauge
Sensor/transmitter power supply for input 1 and 2 (VT) Excludes RTD sensor for input 2	24Vdc $\pm 10\%$ , max. 50mA 15Vdc $\pm 10\%$ , max. 80mA
Power supply (switching)	(standard) 100...240Vac/dc $\pm 10\%$ , 50/60Hz, 12VA (optional) 11...27Vac/dc $\pm 10\%$ , 50/60Hz, 12VA
Fuse (inside device, not operator serviceable)	100 to 240 Vac/dc - type T - 500mA - 250V 11 to 27 Vac/dc - type T - 1,25A - 250V
Faceplate protection	IP65
Working / Storage temperatures	0 to 50°C / -20 to 70°C
Relative humidity	20 to 85%
Installation	Panel mounting, extractable from front
Weight	600g for the complete version

### 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:

Fix the device with the bracket provided before making any electrical connections. To mount two or more devices side by side, use the cut-out dimensions shown above.

**CE MARKING:** The instrument conforms to the European Directives 2004/108/CE and 2006/95/CE with reference to the generic standards: **EN 61000-6-2** (immunity in industrial environment) **EN 61000-6-3** (emission in residential environment) **EN 61010-1** (safety).

**MAINTENANCE:** Repairs must be done out 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.

EMC conformity has been tested with the following connections

FUNCTION	CABLE	LENGTH USED
Power supply cable	1 mm <sup>2</sup>	1 m
Relay output cables	1 mm <sup>2</sup>	3,5 m
Serial connection cable	0,35 mm <sup>2</sup>	3,5 m
Probe connection wires	1 mm <sup>2</sup>	3 m
TC input probe	0,8 mm <sup>2</sup> compensated	5 m
"PT100" input probe and other sensors	1 mm <sup>2</sup>	3 m

### 3 • DESCRIPTION OF FACEPLATE

#### Indication of output states:

OUT 1 (Alarm 1);  
OUT 2 (Alarm 2);  
OUT 3 (Alarm 3)

#### LED bar:

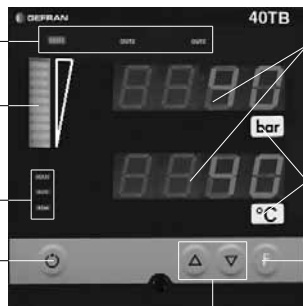
Indicates % of value assignable to process variables, to peak values as defined by parameter brG

#### Function indicators:

Signal type of functioning of instrument; can be configured as defined by parameters Ld.1; Ld.2, Ld.3, standard indicates:  
Ld.1 = calibration in progress  
Ld.2 = calibration of zero  
Ld.3 = serial dialog in progress

#### "CA" button

Lets you activate associated functions settable as defined by parameter t.CA, standard has calibration control function. Back menu function with "CA" + "F" buttons return to previous parameter on menu.



#### Display high (ds.H) - Display low (ds.L):

Indications are configurable between process variable input 1 and input 2 or units of measurement (BAR, PSI, °C, °F, rH, custom). Off-scale signal positive (HI) or negative (Lo). Indication of sensor open (br) or in short circuit (Er). For input 1, indication of interrupted sensor energizing (Eb). Display of config. and calib. messages.

Labels with engineering units

#### Function key:

Gives access to different configuration stages  
Confirms any parameter changes

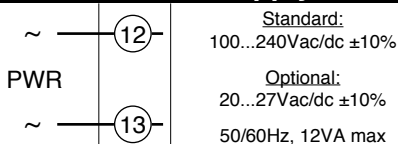
#### "Raise" and "Lower" keys:

These keys are used for any operation that requires a numerical parameter to be raised or lowered. • The speed of change is proportional to the time the key is pressed. • The operation is not cyclic: once the maximum (minimum) limit is reached, there will be no further increase (decrease) of the value, even if the key remains pressed.

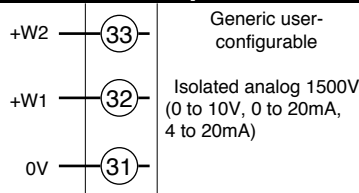
The keys can be configured to perform reset, hold, display of the peak value, etc. as determined by the 't.UP.' and 't.dn.' parameters on the 'Hrd' menu.

### 4 • CONNECTIONS

#### • Power supply

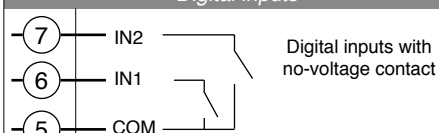


#### • Outputs

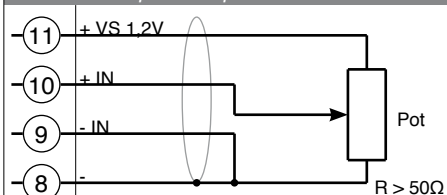


#### • Inputs

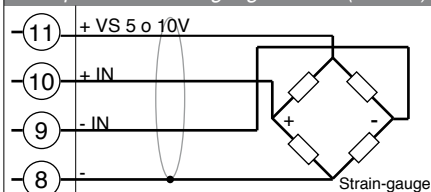
##### • Digital inputs



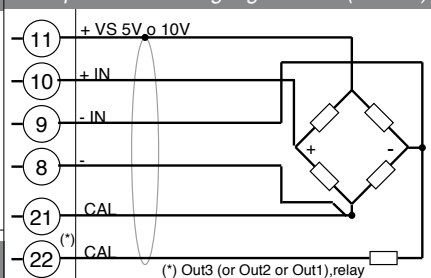
##### • Input 1 for potentiometer



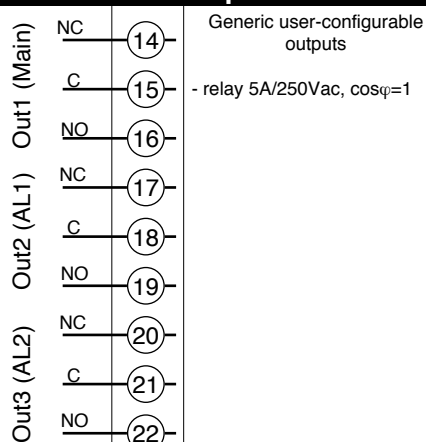
##### • Input 1 for Strain-gauge sensor (4 wires)



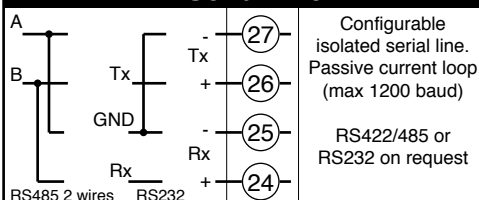
##### • Input 1 for Strain-gauge sensor (6 wires)



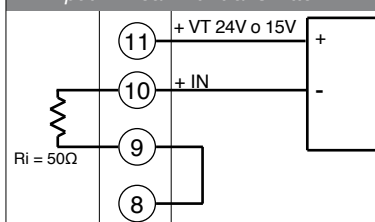
#### • Outputs



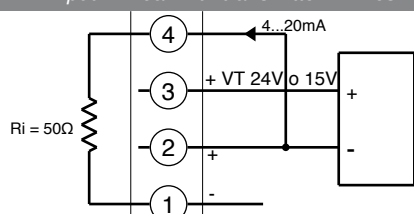
#### • Serial line



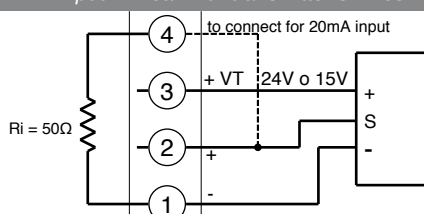
##### • Input 1 linear with transmitter 2 wires



##### • Input 2 linear with transmitter 2 wires



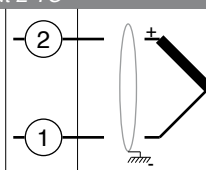
##### • Input 2 linear with transmitter 3 wires



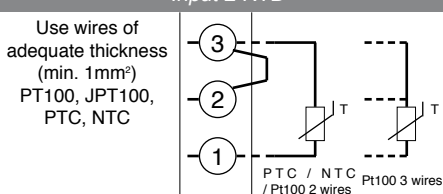
##### • Input 2 TC

Available thermocouples:  
J, K, R, S, T, B, E, N,  
L, U, G, D, C

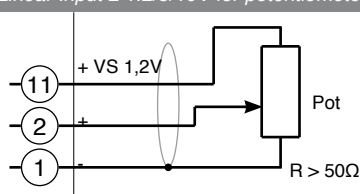
- Respect polarities  
- For extensions, use compensated cable appropriate for thermocouple.



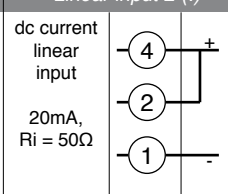
##### • Input 2 RTD



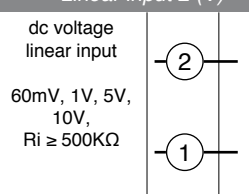
##### • Linear Input 2 1.2/5/10V for potentiometer



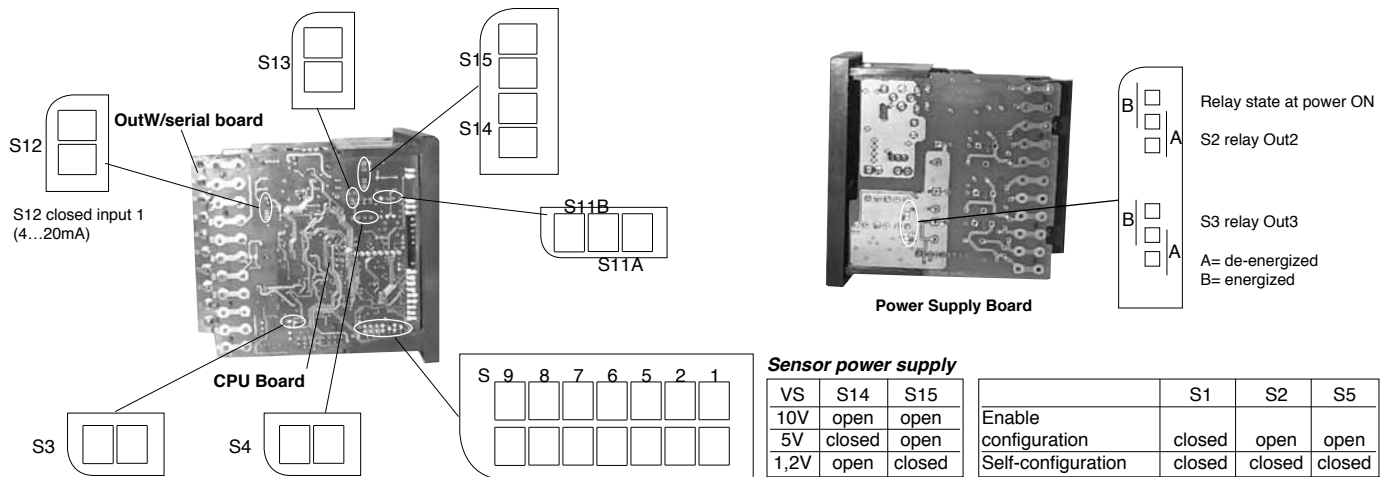
##### • Linear input 2 (I)



##### • Linear input 2 (V)



## Device structure: identification of boards

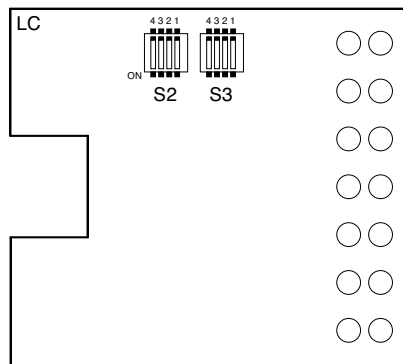


### Transmitter power supply

(only for 40TB 15 / 40TB 24 model)

VT	S13	Terminal 11	S11A	S11B	Terminal 3	S3	S4
24V	closed	VT	closed	open	VT	open	closed
15V	open	VS	open	closed	RTD	closed	open

### • OutW/serial board



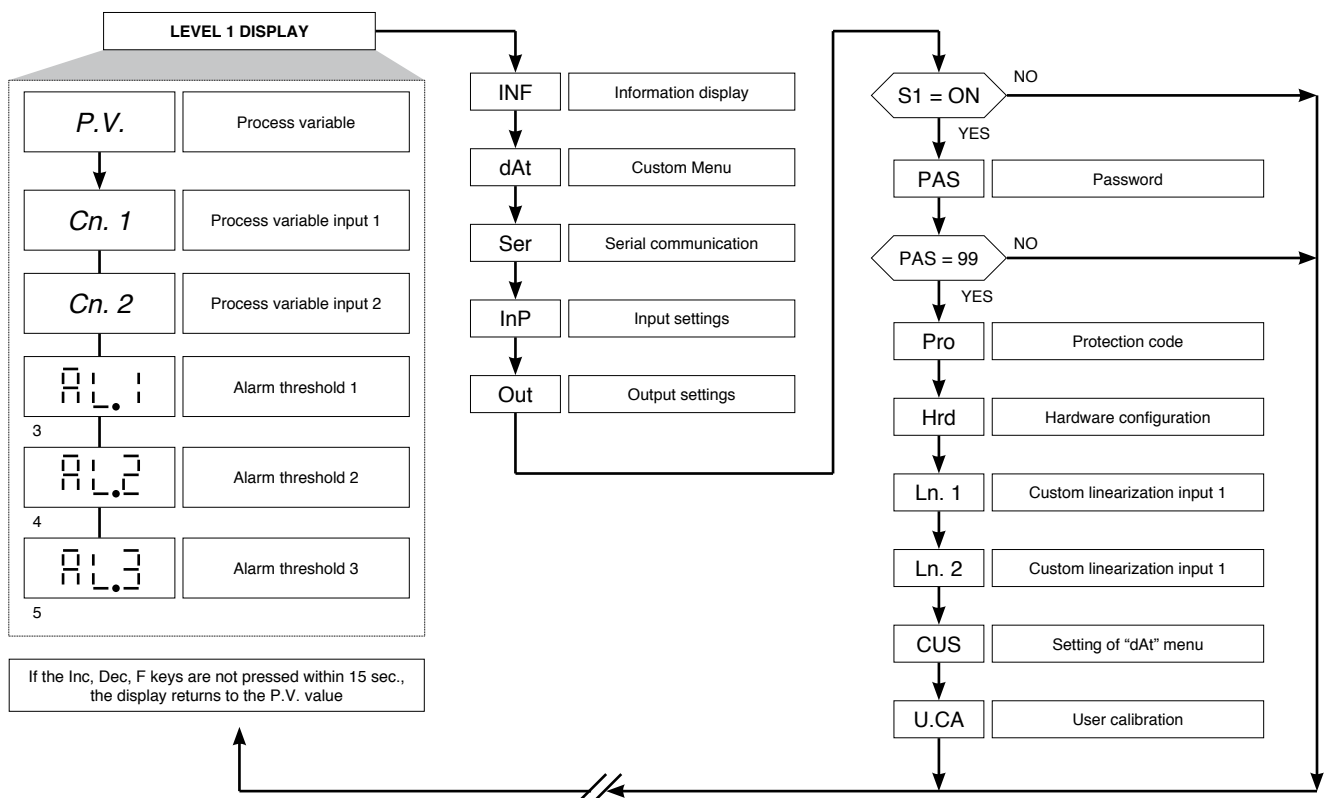
### ANALOG OUTPUT 1 Configuration

Analog output	S2 (on)	S2 (off)
0...10V	2-4	1-3
0/4...20mA	1	2-3-4

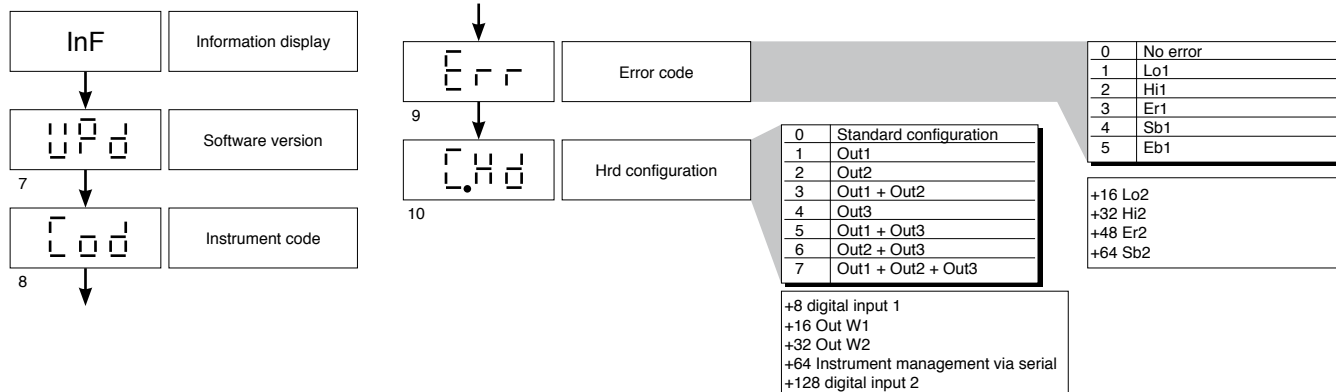
### ANALOG OUTPUT 2 Configuration

Analog output	S3 (on)	S3 (off)
0...10V	2-4	1-3
0/4...20mA	1	2-3-4

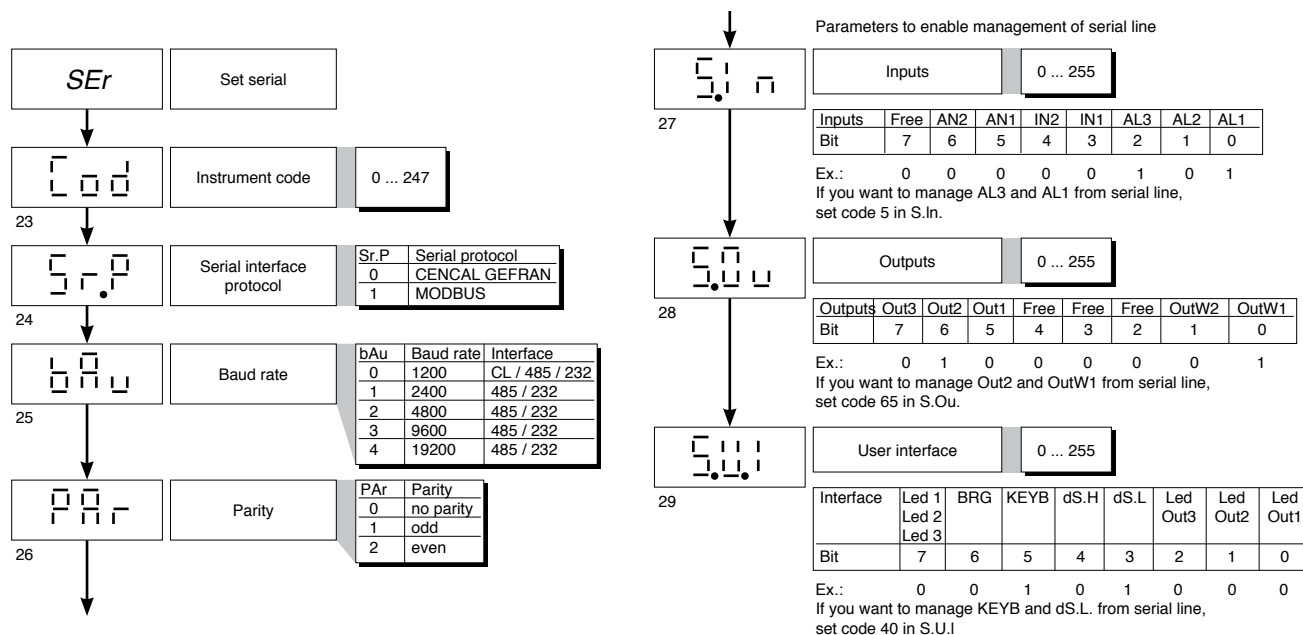
## 6 • PROGRAMMING and CONFIGURATION



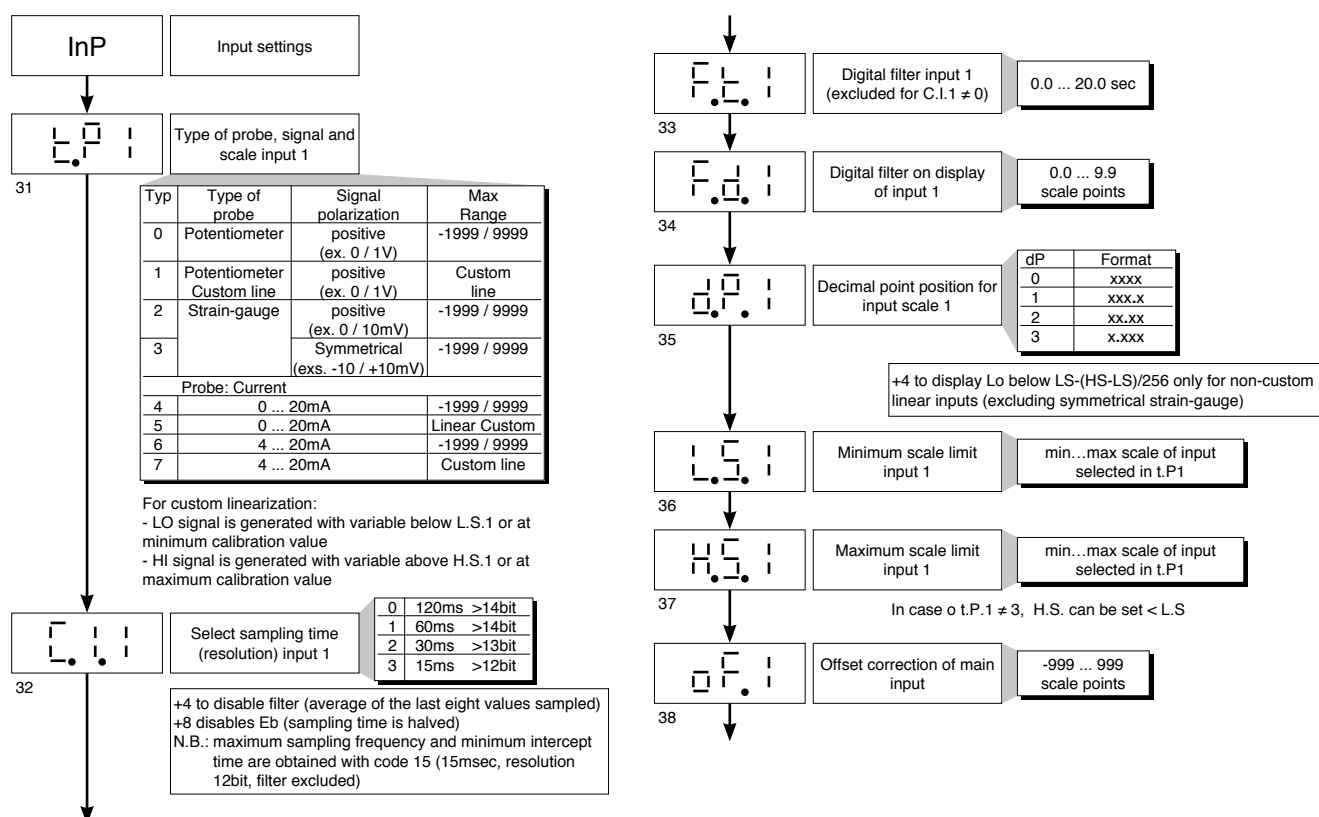
## • Information display

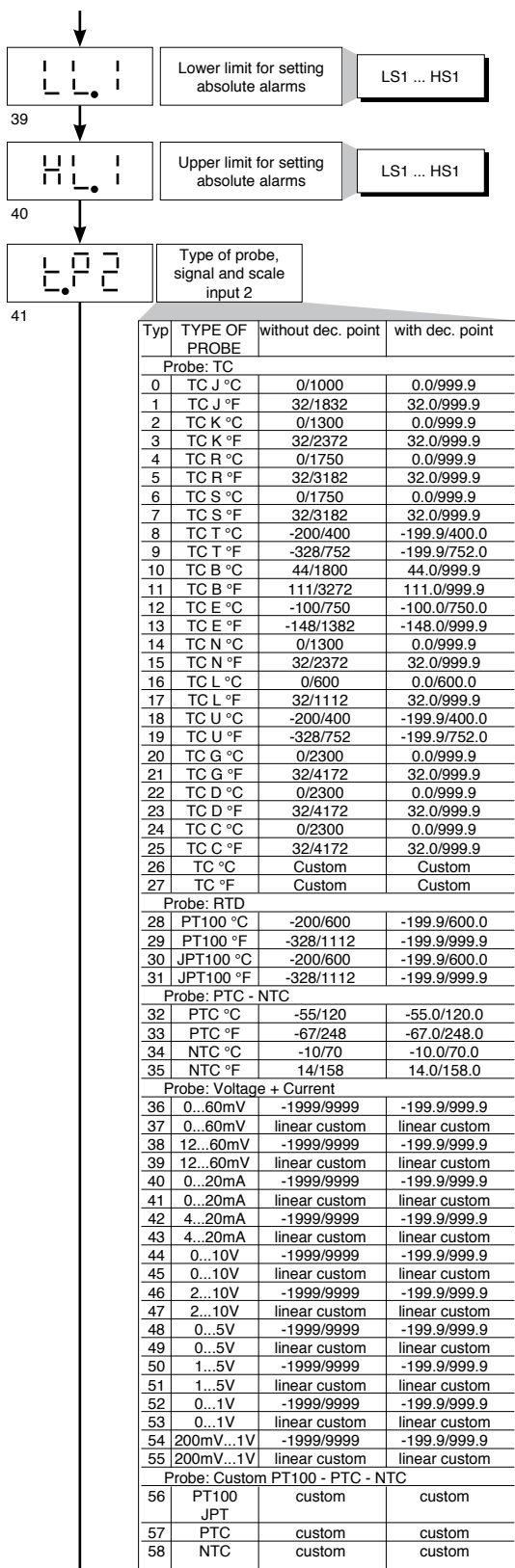


## • Serial parameters



## • Input parameters



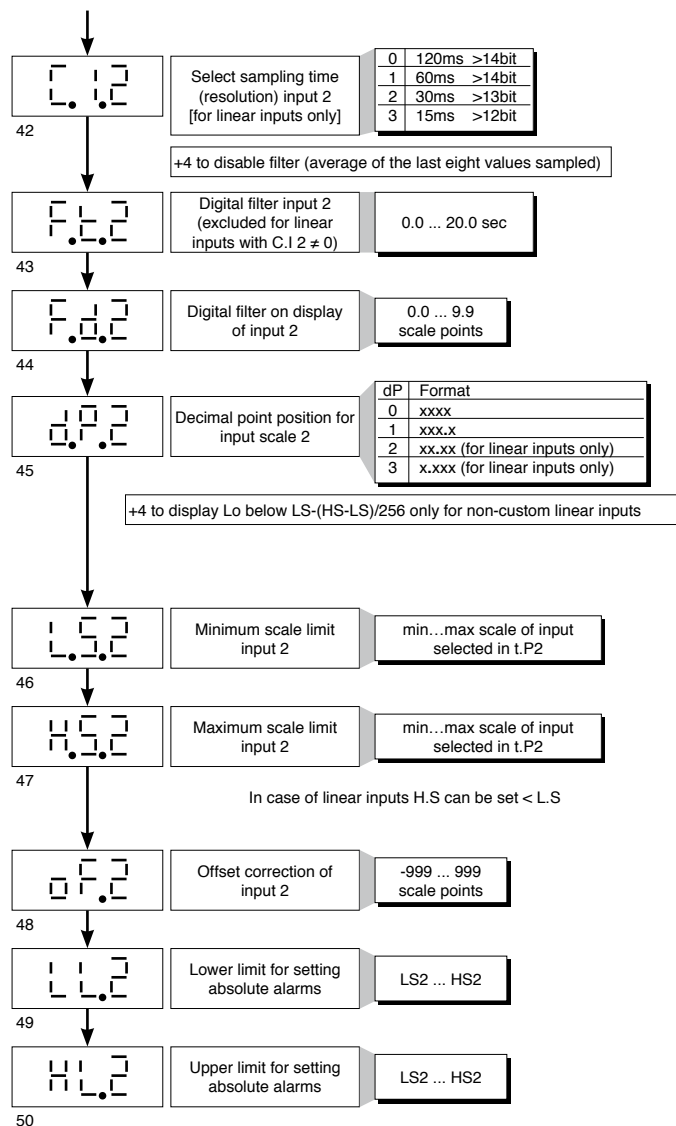


For custom linearization:  
 - LO signal is generated with variable below L.S.2 or at minimum calibration value  
 - HI signal is generated with variable above H.S.2 or at maximum calibration value

Max. non-linearity error for thermocouples (TC), resistors (PT100) and thermistors (PTC, NTC).

The error is calculated as deviation from theoretical value and is expressed as percentage of full scale (in °C).

**S, R** range 0...1750°C; error < 0.2% f.s. / range 0.0...999.9°C; error < 0.5% f.s.  
**T** range -200...400°C; error < 0.2% f.s. / range -199.9...400.0°C; error < 0.2% f.s. (t > 150°C)  
**B** range 44...1800°C; error < 0.5% f.s. (t > 300°C) / range 44.0...999.9; error < 1% f.s. (t > 300°C)  
**G** range 0...2300°C; error < 0.2% f.s. (t > 300°C) / range 0.0...999.9°C; error < 0.2% f.s. (t > 450°C)  
**D** range 0...2300°C; error < 0.2% f.s. (t > 200°C) / range 0.0...999.9°C; error < 0.2% f.s. (t > 200°C)  
**NTC** range -10...70°C; error < 0.2% f.s. / range -100.0...70.0°C; error < 0.2% f.s. (t > 70°C)  
**Tc: J, K, E, N, L, U, C** error < 0.2% f.s.  
**PT100, JPT100 and PTC** error < 0.2% f.s.



## • Output parameters

**Out** Output settings

52 Select sizes alarm 1 reference

53 Select sizes alarm 2 reference

54 Select sizes alarm 3 reference

Ax.r	Variable to compare	Reference threshold
0	Input 1	AL.i
1	Input 2	AL.i
2	Input 1	Input 2
3	Input 2	Input 1

For codes 2 and 3, d.P.1 and d.P.2 must be equal

55 Type alarm 1 only absolute

56 Type alarm 2

57 Type alarm 3

Ax.t	Direct (max.) Inverse(min.)	Absolute/Relative to previous	Normal symmetrical (window)
0	direct	absolute	normal
1	inverse	absolute	normal
2	direct	relative	normal
3	inverse	relative	normal
4	direct	absolute	symmetrical
5	inverse	absolute	symmetrical
6	direct	relative	symmetrical
7	inverse	relative	symmetrical

+8 to disable on power-up until first alarm  
+16 to memorize

58 Hysteresis alarm 1 ±999 scale points

59 Hysteresis alarm 2 ±999 scale points

60 Hysteresis alarm 3 ±999 scale points

61 Fault action (definition of state in case of broken sensors) Err. Sbr. Ebr. Action active only on alarm/s assigned to broken input

rEL	Alarm 1	Alarm 2	Alarm 3
0	OFF	OFF	OFF
1	ON	OFF	OFF
2	OFF	ON	OFF
3	ON	ON	OFF
4	OFF	OFF	ON
5	ON	OFF	ON
6	OFF	ON	ON
7	ON	ON	ON

62 Out 1 Attribution of reference signal

63 Out 2 Attribution of reference signal

64 Out 3 Attribution of reference signal

rL.x	Reference signal
0	AL.1
1	AL.2
2	AL.3
3	AL.1 OR AL.2
4	AL.1 OR AL.2 OR AL.3
5	AL.1 AND AL.2
6	AL.1 AND AL.2 AND AL.3
7	IN1
8	IN2
9	t.uP
10	t.dn
11	t.CA
12	Strain-gauge calibration
13	t.UP SET/ RESET
14	t.dn SET/ RESET
15	t.CA SET/ RESET

+16 logic level denied (only for codes 0...11)  
+32 to filter with F.O. mode (filter outputs mode) (only for codes 0...11)

65 Output filter mode

0	not active: calculated status is sent directly to relay
1	On delay (DON)
2	Delay activation from time of last deactivation
3	Off delay (DOF)
4	Delay for activation only at power-up (DPO)

+8 time base max. 99 min (default = 99 sec)

66 Delay for F.O. 0 ... 99 min or sec

67 Minimum output pulse 0 ... 99 sec

68 OutW1 Attribution of reference signal

Value	Reference signal
0	Input 1
1	Input 2
2	AL.1
3	AL.2
4	AL.3
5	Gross input 1
6	Tare input 1
7	Gross input 2
8	Tare input 2

+16 for codes 0 and 1 if respective input is in condition Erx or brx or Eb1, output assumes minimum trimming value

69 Minimum output scale for analog repetition can be > H.A.1. -1999 ... 9999

70 Maximum output scale for analog repetition 1 -1999 ... 9999

71 OutW2 Attribution of reference signal

Value	Reference signal
0	Input 1
1	Input 2
2	AL.1
3	AL.2
4	AL.3
5	Gross input 1
6	Tare input 1
7	Gross input 2
8	Tare input 2

+16 for codes 0 and 1 if respective input is in condition Erx or brx or Eb1, output assumes minimum trimming value

72 Minimum output scale for analog repetition can be > H.A.2. -1999 ... 9999

73 Maximum output scale for analog repetition 2 -1999 ... 9999

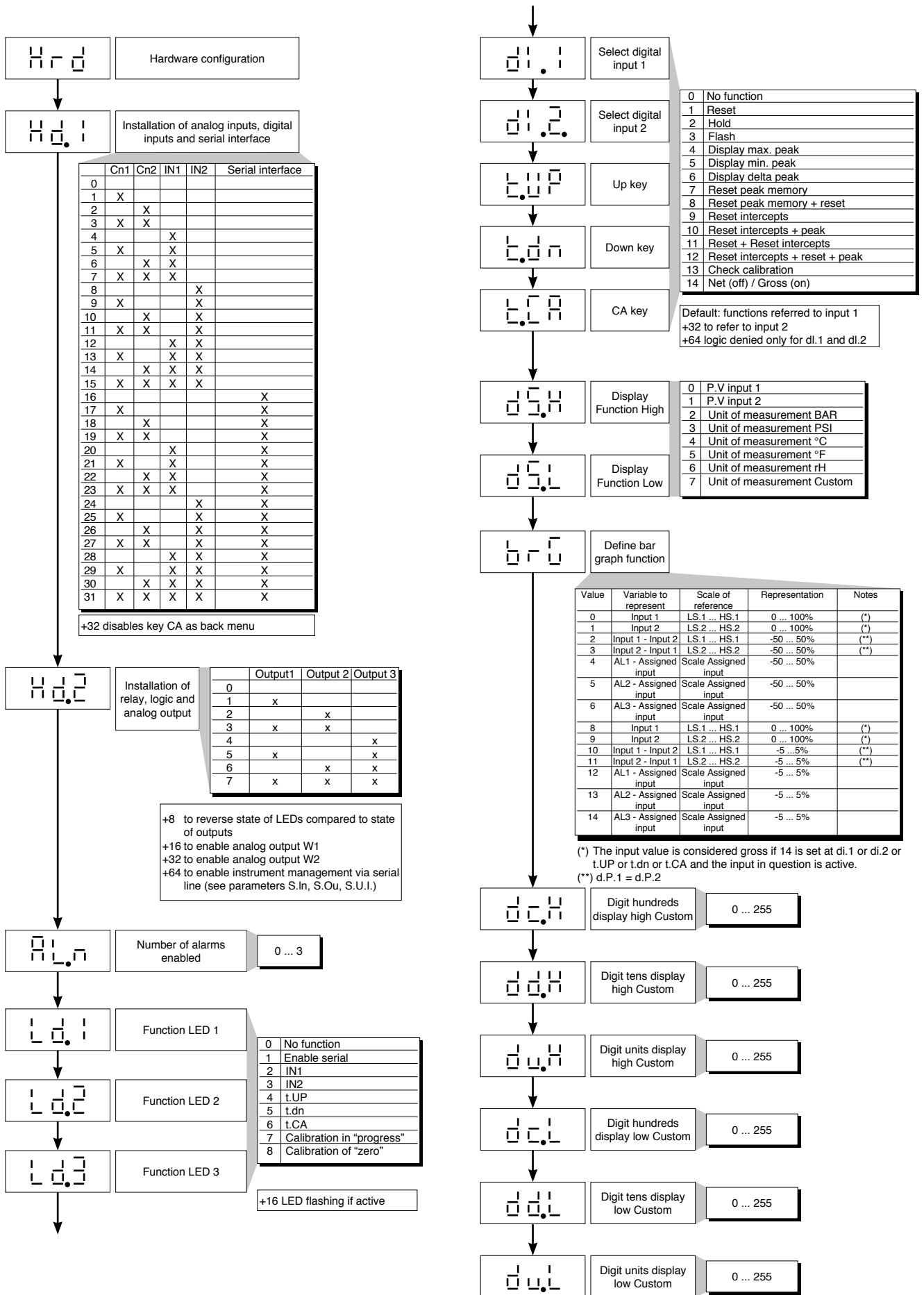
## • Protection

Pro Protection code

Value	Displayed parameters	Modifiable parameters
0	AL1-AL2-AL3	AL1-AL2-AL3
1	AL1-AL2	AL1-AL2
2	AL1	AL1
3	AL1	none

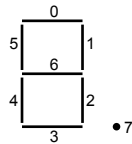
+4 to disable Inp and Out pages  
+8 to disable Ser page  
+16 to enable retention of input 1 reset memory at shutdown  
+32 to enable maintenance of reset latch at power-off (for linear inputs only)

## • Hardware configuration parameters





Ex. if you want to build character 0

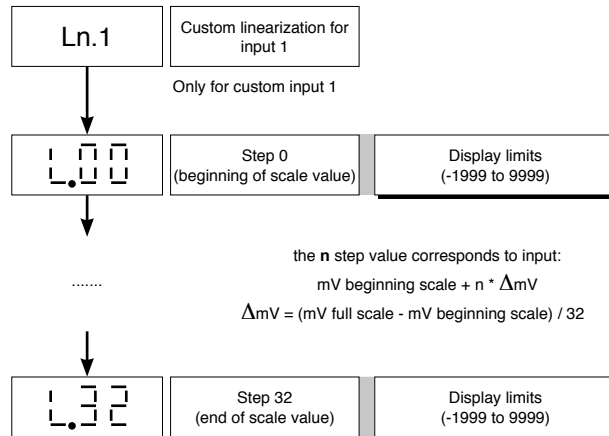


7 6 5 4 3 2 1 0  
0 = 0 0 1 1 1 1 1 1

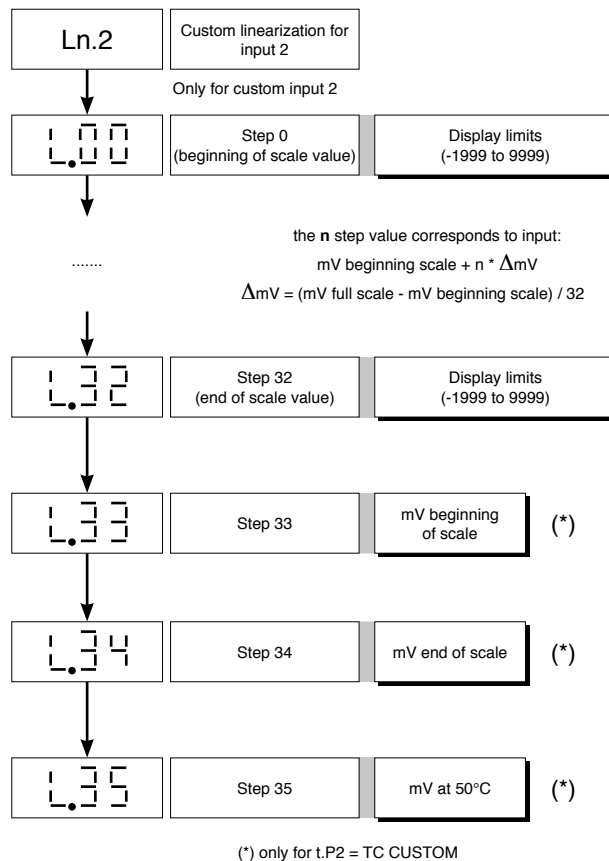
The corresponding decimal value to be set is 63.

## • Custom Linearization

### • Input 1

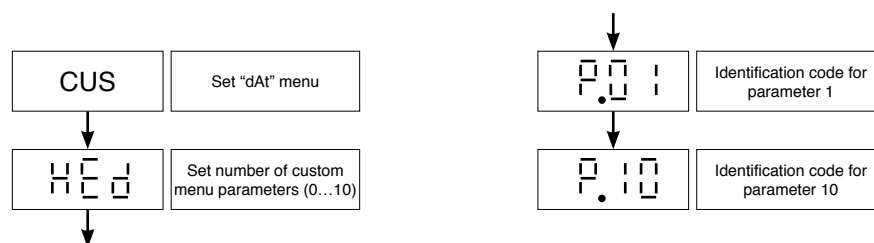


### • Input 2

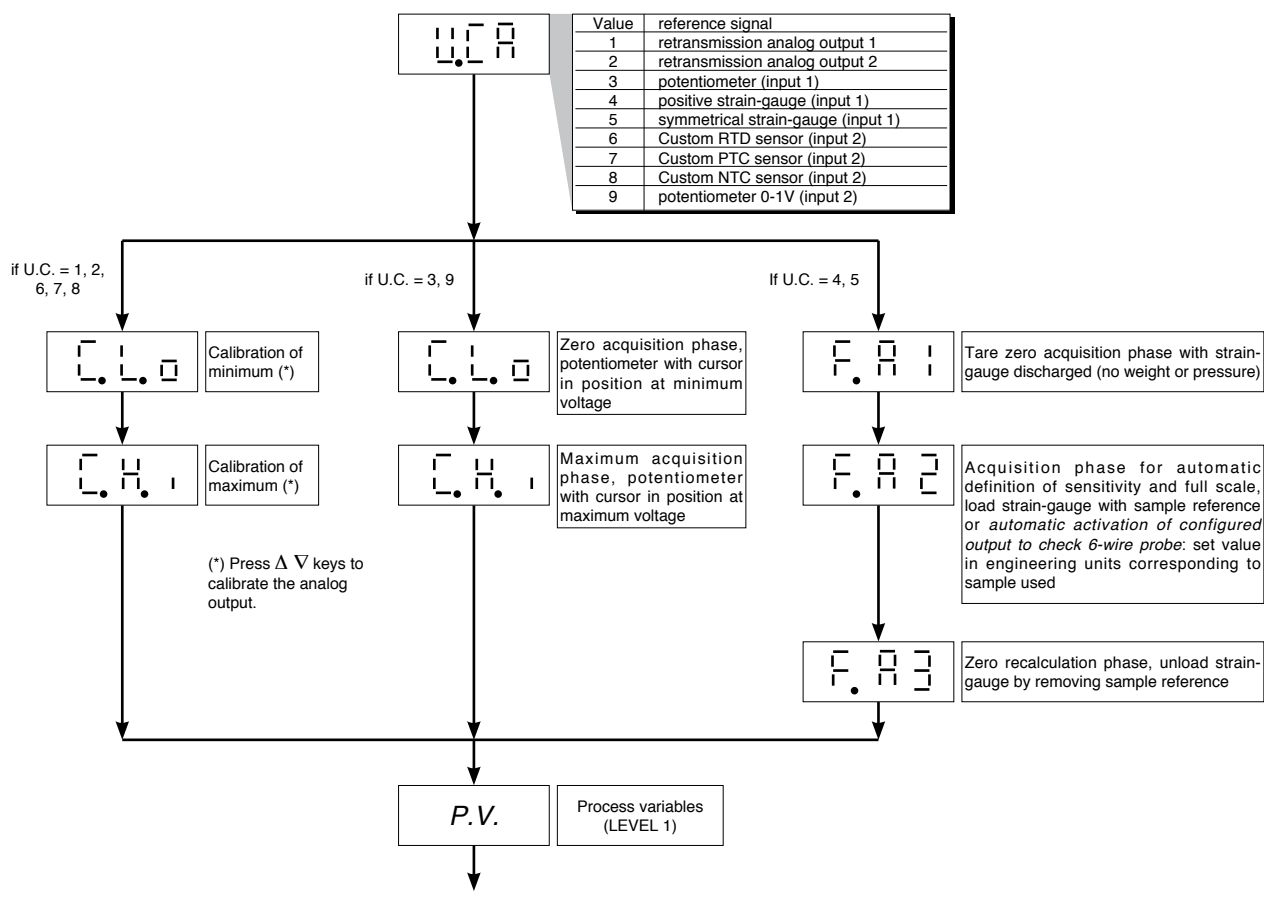




## • Configuration of custom menu



## • User calibration



## • UCA: calibration of strain-gauge

### Calibration procedure for applications with Melt pressure transducers

Connections: as per diagram (example of 6-wire strain-gauge), after having configured inputs and outputs.

1. Keep the "F" key pressed until the password "PAS" appears on the display.
2. Keep the "Raise" key pressed until "99" appears on the display.
3. Keep the "F" key pressed until "UCA" appears on the display. This is User Calibration mode. The display will alternately show "UCA" and "0".
4. Press the "Raise" key until "4 or 5" appears on the display.
5. Press the "F" key. "FA1" will appear.
6. Wait about 2 seconds and press "F", which will activate the internal relay; the transducer zero point is now calibrated. The "OUT3" LED on the front panel will light up.
7. The display will alternate "FA2" and the value of 80% of full scale of transducer pressure (previously set as value H.S.). This procedure turns on internal resistance R-Cal, which permits "full-scale" calibration of the instrument.
8. Wait about 2 seconds and press "F" to accept the value of 80% of full-scale and correct the value with the raise and lower keys. The internal relay is now off.
9. "FA3" will be seen. Wait about 2 seconds and keep the "F" key pressed until the display returns to the current value. Release the "F" key.
10. The calibration procedure is finished.

## • Eb Function

The standard device is produced with parameter C.I.1= 8,  
with sampling time of 120 msec and Eb function disabled.

The Eb function lets you detect if the probe power supply is interrupted. This function is valid for probe currents > 8mA

Example:

- probe voltage 10V  
- strain-gauge resistance 350Ω

$$\text{- current} = \frac{V}{R} = \frac{10}{350} \approx 28\text{mA}$$

or for three probes connected in parallel

- probe voltage 10V  
- strain-gauge resistance 350Ω

$$\text{- current} = \frac{V}{R} = \frac{10}{\frac{350}{3}} = \frac{30}{350} \approx 85\text{mA}$$

## • HOLD function

The input value and the intercepts are “frozen” for the interval in which the logic input is active.

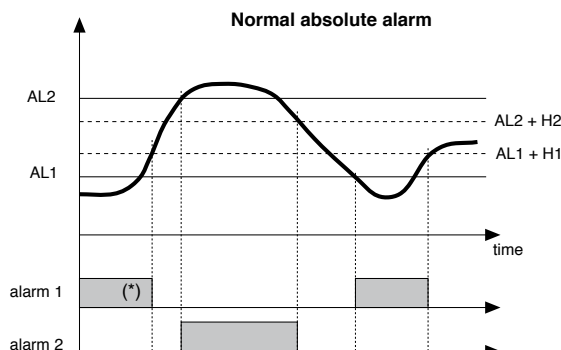
By activating the Hold input with the variable below the intercept threshold, a reset of the intercept memory causes de-energizing of all energized relays and resetting of the memory of all alarms.

## • FLASH function

The input value is changed; the state of the intercepts is not transferred to output; the outputs are “frozen.”

When the logic input becomes active, the input value is “frozen” and the outputs are updated with the calculated state of the intercepts, including those with memory. When the logic input is active the input value is “frozen” and the outputs are updated according to the calculated alarms state, including the ones latched.

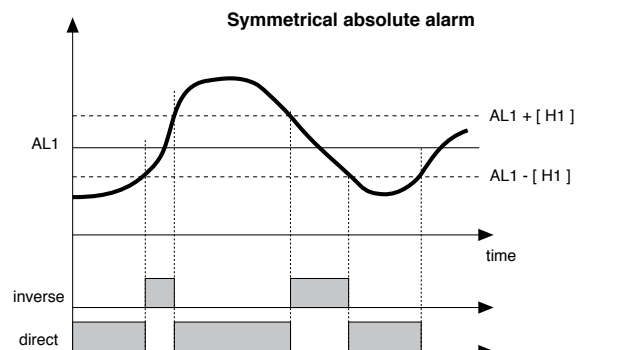
## 6 • ALARMS



For AL1 inverse absolute alarm (min.) with positive H1, A1 t = 1

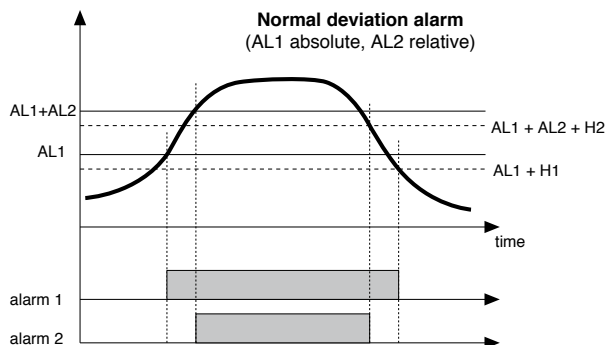
(\*) = OFF if disabling on power-on exists

For AL2 direct absolute alarm (max) with negative H2, A2 t = 0



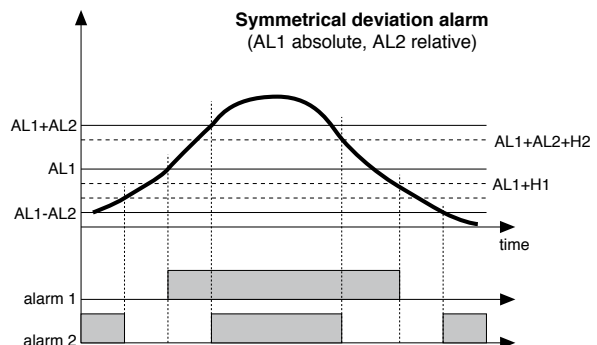
For AL1 inverse absolute, symmetrical alarm with hysteresis H1, A1 t = 5

For AL1 direct absolute, symmetrical alarm with hysteresis H1, A1 t = 4



For AL1 direct absolute alarm (max) with negative H1, A1 t = 0

For AL2 direct relative alarm (max) with negative H2, A2 t = 2

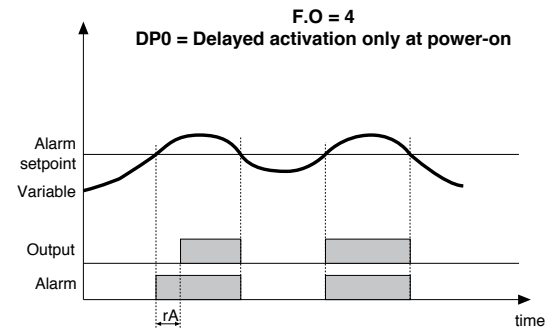
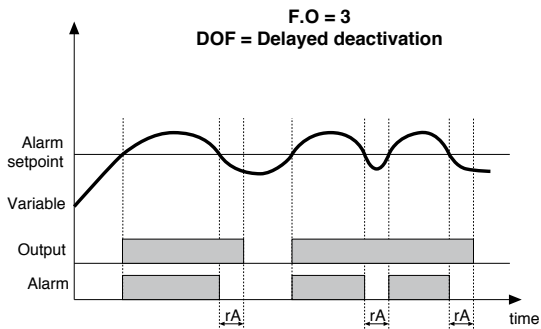
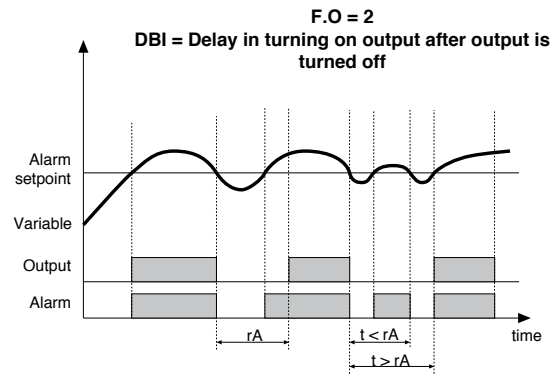
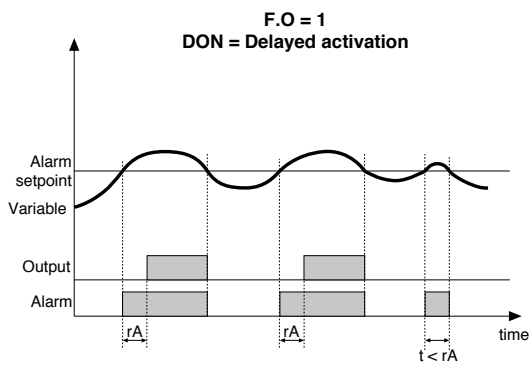


For AL1 direct absolute alarm (max) with negative H1, A1 t = 0

For AL2 symmetrical deviation alarm H2, A2 t = 6

## • Filter - outputs with reference to parameters F.O and r.A

The diagrams refer to a normal absolute alarm with hysteresis  $H = 0$



## • RS232 interface cable for configuration

96x96 format



**N.B.:** the PC configuration cable is supplied with the programming software.

**WARNING:** make the connection with the device powered and with inputs and outputs disconnected.

## • ORDER CODE

WSK-0-0-0

Cable + Software (CD)

## ORDER CODE

40 TB

☐ ☐ R R R ☐ ☐ ☐

Sensor / Transmitter power supply	
Only sensor power supply (VS) for input 1 (transmitter power supply (VT) not present)	
1Vdc (potentiometer)	0 1
5Vdc/120mA (strain-gauge)	0 5
10Vdc/120mA (strain-gauge)	1 0
Transmitter Power Supply (VT) For input 1 and input 2	
15Vdc/80mA (transmitter) (*)	1 5
24Vdc/50mA (transmitter) (*)	2 4

(\*) Input 1 is configured for input 4...20mA

Retransmitted outputs	
None	0
1 retransmitted output 20mA	1
2 retransmitted outputs 20mA	2

Power supply	
0	20...27Vac/dc
1	100...240Vac/dc

Serial communication	
0	None
2	RS 485 / RS232C

Kindly contact GEFRA for information on available codes.

## • WARNINGS



**WARNING:** this symbol indicates danger.

It is seen 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

The equipment is intended for permanent indoor installations within their own enclosure or panel mounted enclosing the rear housing and exposed terminals on the back.

- 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 60Ω; 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.**