5 YEAR WARRANTY

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1. Panel meter DPF20

Counter, ratemeter and periodmeter, 96 x 48 mm (1/8 DIN)

Panel meter 96 x 48 mm (1/8 DIN) and 6 digits with 14 mm digit height, configurable with 5 impulse counter modes *(see section 1.2)*, 2 ratemeter modes *(see section 1.3)* and a 1 periodmeter mode *(see section 1.4)*.

Highly configurable, accepts all types of sensors (NPN, PNP, push-pull, Namur, inductive, pick-up, mechanical, TTL, CMOS, ...) including quadrature signals (single and bidirectional encoder signals).

Reading from 999999 to -199999 with decimal point, scalable reading with configurable multiplier factor (1 to 999999) and configurable divider factor (1 to 999999). Includes internal pull-up and pull-down resistors, configurable trigger levels, detection by rising or falling edge, excitation voltage configurable from 5 Vdc to 18 Vdc.

Options for output and control with 1, 2 and 3 relays, transistor outputs, SSR drive controls, isolated analog outputs, communications in Modbus RTU, RS-485 ASCII and RS-232. Special options with 4 and 6 relay outputs.

Independent alarms configurable as maximum or minimum, with 1 or 2 setpoints per alarm, hysteresis, independent activation and deactivation delays and control for inverted relay.

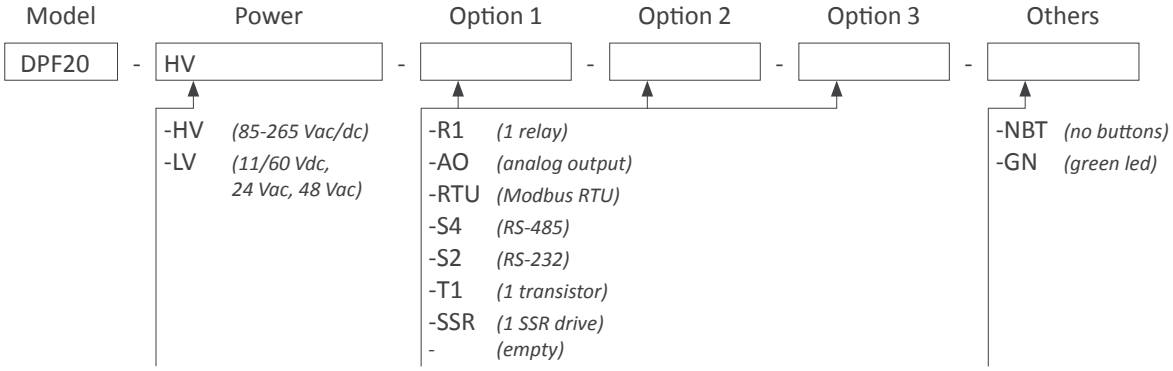
Front protection IP65. Connections by plug-in screw terminals. For industrial applications.

- '**Fast access**' menu to selected functions, accessible with key UP (▲) *(see section 1.19.12)*
- Function '**On power up**' for system protection on first 'cold' start-up or automatic reset *(see section 1.19.15)*
- Special '**FAST**' mode for fast counting applications *(see section 1.16)*
- Special '**SLOW**' mode for slow ratemeter applications (low frequency applications) *(see section 1.15)*
- Direct configuration for most usual sensor, at the '**SnSr / Auto**' menu *(see section 1.19.10)*
- Function '**Trigger Sense**' helps to detect the correct trigger level *(see section 1.13)*

Multiple display filters, memory for maximum and minimum reading, password protection, 5 brightness levels.

Index

1.1 How to order



1.2 Impulse counter modes

The instrument allows for 5 selectable impulse counter modes :

- Counter ('**cn.1**') *(see section 1.19.2)*
- Counter quadrature ('**cnq.2**') *(see section 1.19.3)*
- Counter with inhibition ('**cnI.3**') *(see section 1.19.4)*
- Counter with control add / substract ('**cnc.4**') *(see section 1.19.5)*
- Counter differential ('**cnd.5**') *(see section 1.19.6)*

Configurable up or down counting, 'reset' at rear terminals, front key and/or at alarm activation. Configurable 'Preset' value. Relay activation and deactivation delays.

Alarm functions with 'return to preset' or 'reset to 0' generate cycles of counting (instrument counts from 'preset' value to alarm value in never ending cycle). The instrument provides memory of cycles counter.

Scalable reading with configurable multiplier factor (1 to 999999) and configurable divider factor (1 to 999999). Memory retention in case or power loss. Retains configuration and last reading.

Counting frequency up to 250 KHz, in '**FAST**' mode *(see section 1.16)*.

1.3 Ratemeter modes

In ratemeter mode the reading is proportional to the measured frequency. The instrument allows for 2 selectable ratemeter modes :

- Ratemeter ('**rt.6**') *(see section 1.19.7)*
- Ratemeter quadrature ('**rtq.7**') *(see section 1.19.8)*

The ratemeter mode has a single input channel, with scalable reading. The quadrature ratemeter mode has 2 inpur channels available for detection of sense of turn when working with quadrature signals. Scalable reading with configurable multiplier factor (1 to 999999) and configurable divider factor (1 to 999999).

For low frequency applications, the '**SLOW**' mode provides the best response time for each application *(see section 1.15)*.

Maximum frequency up to 500 KHz and minimum frequency down to de 0.001 Hz (1 mHz) with '**SLOW**' mode active.

1.4 Periodmeter mode

Reading is proportional to the signal period. Scalable reading with configurable multiplier factor (1 to 999999) and configurable divider factor (1 to 999999).

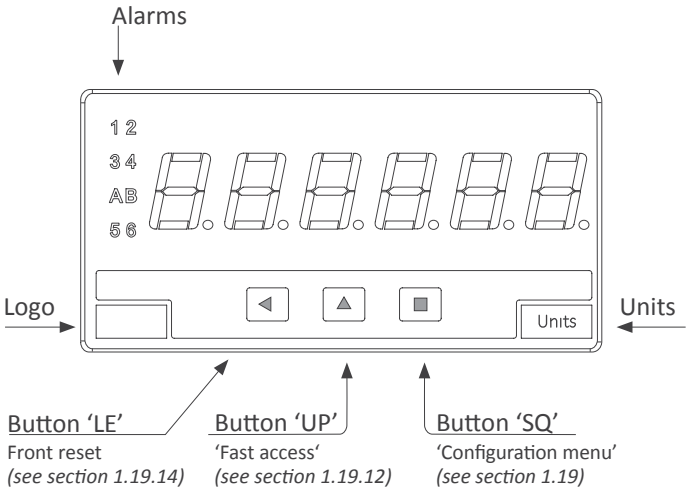
For applications with long periods (slow frequencies), the '**SLOW**' mode provides the best response time for each application *(see section 1.15)*.

1.5 Functions included

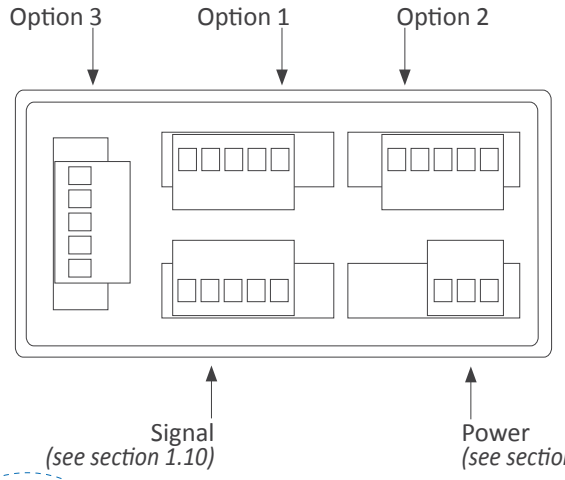
Functions included		***Section***
'Fast access'	*yes*	*1.19.12*
'SLOW' mode	*yes, for slow frequencies*	*1.15*
'FAST' mode	*yes, for fast counting*	*1.16*
Multiplier and divider	*from 1 to 999999*	*1.19.2*
Reset configurable	*yes (front, rear and linked to alarm activation)*	*1.19.14 and 1.10 and 1.19.11*
Preset	*yes*	*1.19.2*
Trigger level	*configurable*	*1.19.10*
'Trigger Sense' function	*helps to set the trigger*	*1.13*
Sensor selection	*by menu*	*1.19.10*
Cycle counter		*1.14*
Retention memory	*yes, recovers with power*	*1.11*
'On Power Up'	*yes*	*1.19.15*
Excitation voltage	*configurable*	*1.19.10*
Display filters	*recursive*	*1.19.7 and 1.19.8 and 1.19.9*
Memory	*max., min., cycles*	*1.19.12*
Password	*blocks access to configuration menu*	*1.19.19*
Alarms	*double setpoints activation delays deactivation delays hysteresis inverted relays locked alarms*	*1.19.11*
Display brightness	*5 levels*	*1.19.22*

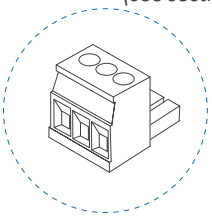
Table 1 - Functions included

1.6 Front view



1.9 Rear view

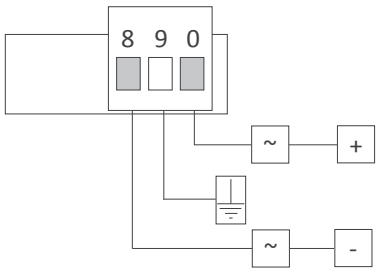




Detail of the plug-in screw terminals provided with the instrument. The instrument is provided with all terminals needed, both male and female.

1.7 Power connections

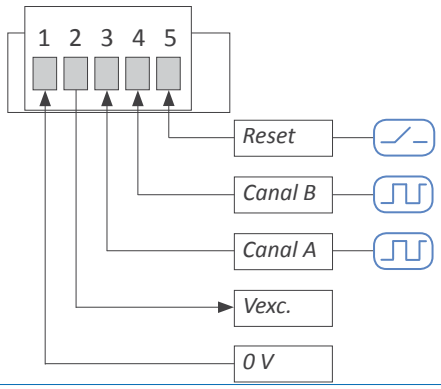
Earth connection - Although a terminal is provided for earth connection, this connection is optional. The instrument does not need earth connection for correct operation nor for compliance with the security regulations.



Fuse - To comply with security regulation 61010-1, add to the power line a protection fuse acting as disconnection element, easily accessible to the operator and identified as a protection device.

Power 'H'	fuse 250 mA time lag
Power 'L'	fuse 400 mA time lag

1.10 Signal connections



1.8 Sensor configuration and connections

Selecting one of the sensors listed at the '**SnSr**' menu entry, will configure the sensor parameters to the values indicated in the table.

The table also indicates the typical connections for each type of sensor. Parameters can be manually modified.

Connections are indicated for a single sensor connected to the channel A. For two sensors (for inhibition control, quadrature signal, etc) apply the same connection criteria also to channel B.

Note : indicated values are typical values. Check the correct specifications with your sensor datasheet and adapt the required configuration and connections as needed.

Sensor	*Connections*	*Pulls*	*Vexc.*	*Antirrebound filter*	*Trigger*
Mechanical contact	0 V channel A	*pull-up*	*no*	*100 mSec.*	*2,5 Vdc*
Namur	channel A Vexc	*pull-down*	*9 Vdc*	*no*	*3,0 Vdc*
NPN 2 wires	0 V channel A	*pull-up*	*18 Vdc*	*no*	*2,5 Vdc*
NPN 3 wires	0 V channel A Vexc	*pull-up*	*18 Vdc*	*no*	*2,5 Vdc*
PNP 2 wires	0 V channel A	*pull-down*	*18 Vdc*	*no*	*2,5 Vdc*
PNP 3 wires	0 V channel A Vexc	*pull-down*	*18 Vdc*	*no*	*2,5 Vdc*
Push-pull	0 V channel A Vexc	*no*	*18 Vdc*	*no*	*2,5 Vdc*
TTL CMOS Pick-up	0 V channel A	*no*	*5 Vdc*	*no*	*2,5 Vdc*
AC<30 Vp Inductive	0 V channel A	*no*	*no*	*no*	*0 Vdc*

Table 2 - Configuration and connections for different types of sensors.

1.11 Technical specifications

Digits
number of digits 6
led 7 segments led
color red or green
digit height 14 mm

Reading
maximum reading 999999
minimum reading -199999
decimal point configurable X.X.X.X.X.X.

overrange / underrange configurable to flash, reset or preset *(see section 1.19.16)*
display refresh 15 readings / second

memory retention yes, retains reading value in case of power loss

Signals accepted NPN, PNP, Namur, pick-up, TTL, inductive, mechanical, quadrature, ...

Max. Vdc at input ±30 Vdc
Input impedance 2K4 with pull-up or pull-down resistor
470K without pull resistor

Accuracy of the quartz ±0.01 %
Thermal drift 20 ppm / ºC

Excitation voltage configurable
output voltage +18 Vdc, +15 Vdc, +9 Vdc, +5 Vdc
maximum current 70 mA
protection yes, current limited to 70 mA

Frequencies counter modes *(see Table 3)*
ratemeter modes *(see Table 4)*
periodmeter modes *(see Table 5)*

Power
power 'H' 85 to 265 Vac/dc
power 'L' 11 to 60 Vdc and 24/48 Vac
isolation* 2500 Veff with power 'H'
1500 Veff with power 'L'
**tested for 60 sec.*
consumption <1.5 W only meter
<4.0 W meter with options

Configuration 3 buttons front keypad

Front protection IP65

Output and control options relays, analog outputs, serial communications *(see section 2)*

Mechanical
mounting panel
connections plug-in screw terminal
housing material ABS, polycarbonate (V0)
weight <150 grams
front size 96 x 48 mm (1/8 DIN)
panel cut-out 92 x 44 mm
depth from panel 91 mm (including terminals)

Temperature
operation from 0 to +50 ºC
storage from -20 to +70 ºC
warm-up time 15 minutes

Counter	*Mode*	*Frequency*	*Section*
Counter	*'FAST' mode active*	*max. 250 KHz*	*1.19.2*
	normal mode	*max. 9 KHz*	*1.19.2*
Counter + inhibition		*max. 9 KHz*	*1.19.4*
Counter + control A/S		*max. 9 KHz*	*1.19.5*
Counter differential		*max. 9 KHz*	*1.19.6*
Counter quadrature	*mode x1*	*max. 17 KHz*	*1.19.3*
	mode x2	*max. 16 KHz*	*1.19.3*
	mode x4	*max. 11 KHz*	*1.19.3*

Table 3 - Maximum input frequency for counter modes

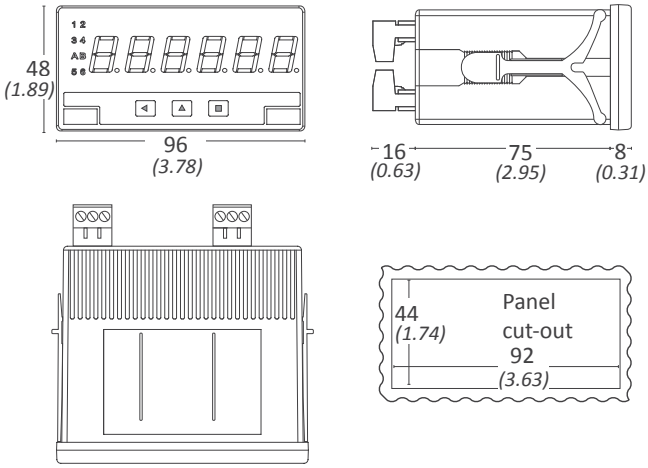
Ratemeter	*Mode*	*Frequency*	*Section*
Ratemeter	*normal mode*	*max. 500 KHz*	*1.19.7*
	'SLOW' mode active	*max. 200 Hz min. 1 mHz*	*1.19.7*
Ratemeter quadrature	*mode x1*	*max. 17 KHz*	*1.19.8*
	mode x2	*max. 16 KHz*	*1.19.8*
	mode x4	*max. 11 KHz*	*1.19.8*

Table 4 - Maximum and minimum input frequency for ratemeter modes

Periodmeter	*Mode*	*Frequency*	*Section*
Periodmeter	*normal mode*	*max. 500 KHz*	*1.19.9*
	'SLOW' mode active	*max. 200 Hz min. 1 mHz (1000 sec.)*	*1.19.9*

Table 5 - Maximum and minimum input frequency for periodmeter modes

1.12 Mechanical dimensions (mm) *(in)*

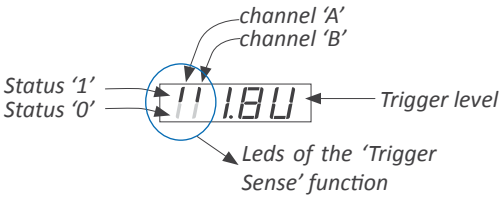


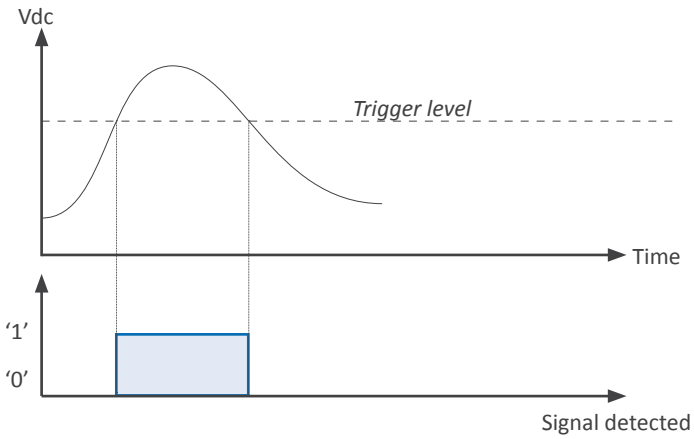
1.13 Function 'Trigger Sense'

The trigger level is automatically configured when selecting a sensor from the 'Sensor / Configuration' ('**SnSr**' / '**Auto**') menu list. The trigger level can be also manually modified from the '**SnSr**' / '**trIG**' menu entry. The selected value applies to channels 'A' and 'B' (the reset has a fixed trigger level at 2.5 Vdc).

At the '**SnSr**' / '**trIG**' menu, the instrument shows the trigger level and two vertical leds to the left. These leds inform in real time about the status ('0' or '1') of the input channels 'A' and 'B'. When the led switches between up and down position, it indicates that impulses are being detected at the input. If the instrument does not detect impulses, the led positions remain fixed.

Increase the trigger level pressing key 'UP' (▲) and decrease pressing key 'LE' (◀).

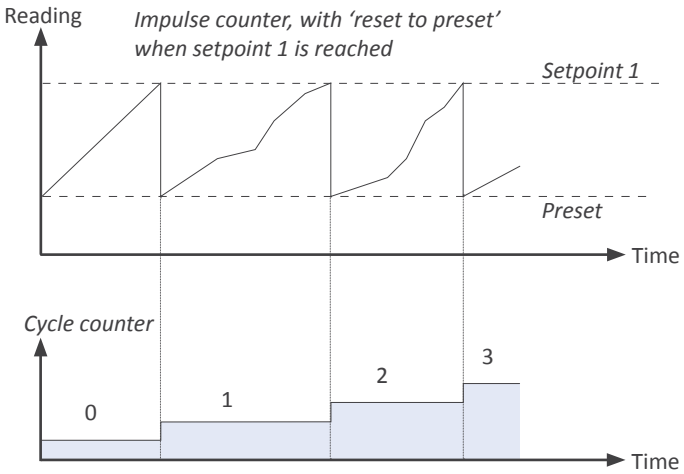




1.14 Function 'cycle counter'

The counter modes allow to activate a reset function (to '0' or to 'preset' value) when an alarm setpoint is reached. With this configuration, the instrument counts in cycles, counting from the instrument preset value up to the alarm setpoint. Each cycle is counted and accumulated into an internal memory, accessible through the 'fast access' menu (key UP (▲) *(see section 1.19.12))*.

To reset the memory of cycles, visualize the value at the 'uP' menu, then press the (▲) key and the '**rSt**' message appears. Press (■) to reset.



1.15 'SLOW' mode

Special working mode for applications with low frequency signals. Applies to ratemeter ('**rt.6**'), ratemeter quadrature ('**rtq.7**') and periodmeter ('**Prd.8**'). The '**SLOW**' mode allows to measure slow frequencies down to 1 mHz (0,001 Hz) and is functional up to 200 Hz.

The '**SLOW**' mode provides the fastest response time possible for a given application, calculating the frequency and the period based on the time between consecutive impulses.

The '**SLOW**' mode needs to define the parameter '**maximum waiting time**' to a value between 1 and 1000 seconds. If this time expires without a single impulse being received, the reading jumps to '0' (both for ratemeter and periodmeter modes). The '**GATE**' parameter is not used if '**SLOW**' mode is active.

In '**ratemeter quadrature**' ('**rtq.7**') mode, the activation of the '**SLOW**' mode calculates the frequency based on the time between consecutive impulses received on channel A, and calculates the sense of turn (clockwise or counter-clockwise) by comparing each impulse with the state of channel B. The '**edge**' parameter is fixed to a '**1--1**'. Typical application for quadrature frequency measure with two inductive sensors at low frequency.

1.16 'FAST' mode

Special working mode for counter applications with high frequency signals, up to 250 KHz. Applies only to the counter mode ('**cn.1**').

The activation of the '**FAST**' mode configures the signal detection by rising edge. The first edge detected, either rising or falling edge, after the instrument restart (power-up, or configuration change) is used for internal initialization and will not be counted as impulse.

1.17 How to operate the menus

The instrument has two menus accessible to the user :

'*Configuration menu*' (key SQ) (■)

'*Fast access*' menu (key UP) (▲)

Configuration menu

The '*configuration menu*' modifies the configuration parameters to adapt the instrument to the application needs. To access the '*configuration menu*' press for 1 second the SQ (■) key. This access can be blocked by activating the '**Password**' ('**PASS**') function. While operating the '*configuration menu*', the alarm status is 'hold' to the status they had before accessing the menu, and the output and control modules remain in '*error*' state. When leaving the '*configuration menu*', the instrument applies a system reset, followed by a brief disconnection of the alarms and the output and control modules. Functionality is then recovered.

For a detailed explanation on the '*configuration menu*' see section *1.19*, and for a full view of the '*configuration menu*' structure see section *1.20*.

'*Fast access*' menu

The '*fast access*' menu is an operator configurable menu, providing fast and direct access to the most usual functions of the instrument with a single key pad stroke. Press key UP (▲) to access this menu.

See section *1.19.12* for a list of functions eligible for '*fast access*' in this instrument. The '**Password**' ('**PASS**') function does not block access to this menu. Accessing and modifying parameters in the '*fast access*' menu does not interfere with the normal functionality of the instrument, and it does not generate any system reset when validating the changes.

Front key pad description

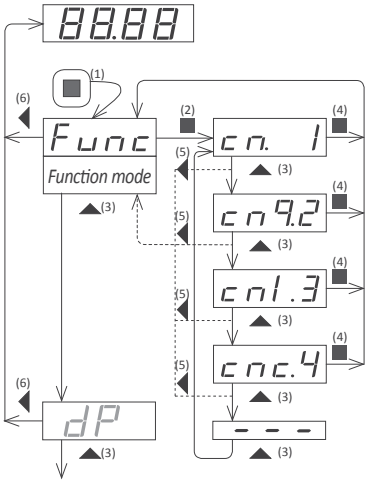
Key SQ (■) - press the SQ (■) key for 1 second to access the '*configuration menu*'. Inside the menu, the SQ (■) key functions as a 'ENTER' key. It selects and accesses the menu option currently displayed. At menus with numerical value entries, it validates the number displayed.

Key UP (▲) - the UP (▲) key gives access to the 'fast access' menu. Inside the menus, it moves vertically through the different menu options. At menus with numerical value entries, it modifies the digit selected by increasing its value to 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Key LE (◀) - inside the menus, the LE (◀) key functions as the '*ESCAPE*' key. It leaves the selected menu, and eventually, will leave the whole menu. When leaving the '*configuration menu*' with the LE (◀) key, the changed parameters are activated. At menus with numerical value entries, the LE (◀) key allows to select the active digit. To modify the value of the selected digit use the UP (▲) key.

Menu 'rollback'

After 30 seconds without interaction from the operator, the instrument will rollback and leave the '*configuration menu*' or the '*fast access*' menu. All changes will be discarded.



Example of operation inside the '*configuration menu*'.

1. The SQ (■) key enters into the 'configuration menu'.

2. The SQ (■) key enters into the '**Func**' option menu.

3. The UP (▲) key moves through the menu options.

4. The SQ (■) key selects the desired range and returns to the '**Func**' menu.

5. The LE (◀) key leaves the actual menu level and moves to the previous menu level.

6. The LE (◀) key leaves the 'configuration menu'. Changes are applied and saved at this moment.

1.18 Messages and errors

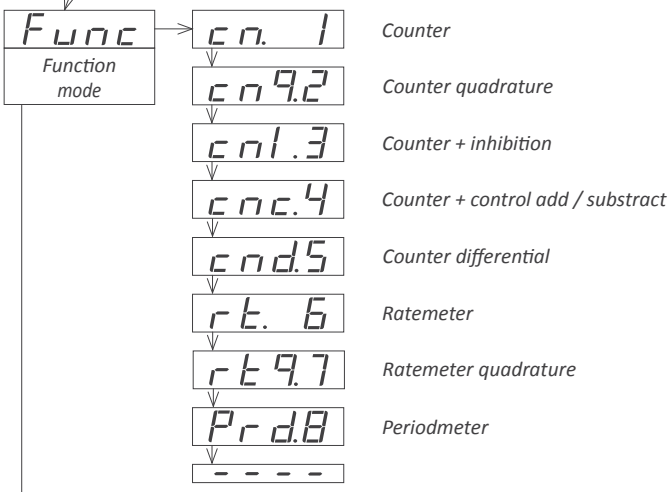
The error messages are shown on display in flash mode.

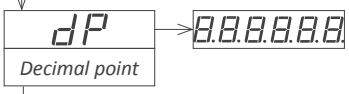
Messages and errors	
'Err.1'	incorrect password.
'Err.2'	at '**oPt.X**' menu entry. Installed module is not recognized.
'Err.8'	excitation voltage overload.
'999999'	+ flashing mode. Reading is in overrange.
'-199999'	+ flashing mode. Reading is in underrange.

Table 6 - Messages and error codes

1.19 Configuration menu

Press 'SQ' (■) for 1 second to access the '*configuration menu*'. For a description on how to operate inside the menus see section *1.17*. For a full vision of the '*configuration menu*' structure see section *1.20*.





*The next menu accesses the configuration parameters for the '**function mode**' ('**Func**') selected. Configuration parameters are slightly different for each '**function mode**'. In the next entries, all 7 possible configuration menus are explained, '**cnF.1**' to '**cnF.7**', one for each '**function mode**'.*

1.19.1 Initial set-up

To configure the initial set up of the instrument, select the function mode, the decimal point position, scale the reading and configure the mode selected and the sensor.

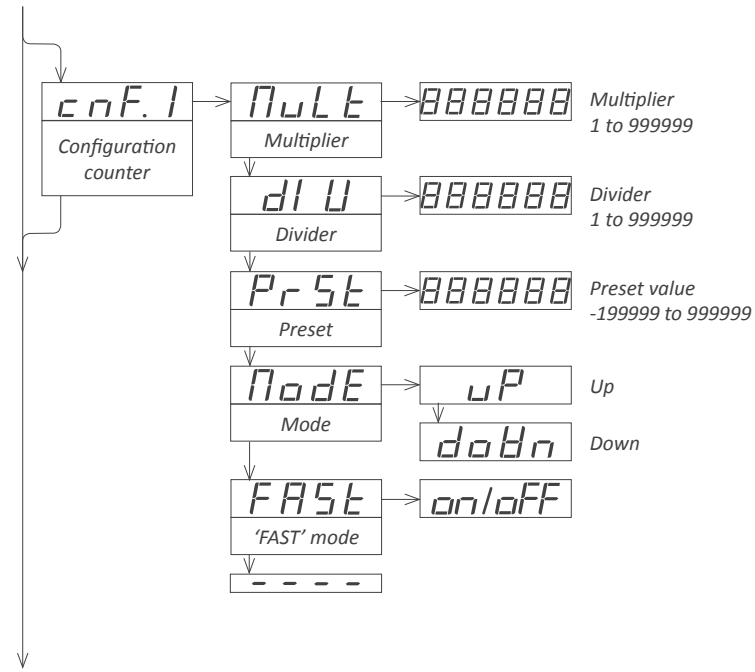
Enter the '**Function mode**' ('**Func**') menu and select the desired function, from the 5 counting modes, 2 ratemeter modes and the periodmeter mode available.

- '**Counter**' ('**cn. 1**') - normal counter mode. Impulses input at channel A. Channel B disabled.
- '**Counter quadrature**' ('**cnq.2**') - counter mode for quadrature signals. Impulses input at channel A and B, in quadrature.
- '**Counter + inhibition**' ('**cnI.3**') - counter mode with inhibition control. Impulses input at channel A. Inhibition control on channel B.
- '**Counter + control add / substract**' ('**cnc.4**') - counter mode with control for add / substract. Impulses input at channel A. Control for the add or substract function on channel B.
- '**Counter differential**' ('**cnd.5**') - counter mode with differential function. Impulses received at channel A add. Impulses received at channel B substract.
- '**Ratemeter**' ('**rt.6**') - ratemeter mode. Impulses input at channel A. Channel B disabled.
- '**Ratemeter quadrature**' ('**rtq.7**') - ratemeter mode for quadrature signals. Impulses input at channel A and B, in quadrature.
- '**Periodmeter**' ('**Prd.8**') - periodmeter mode. Impulses input at channel A. Channel B disabled.

Access the '**Decimal point**' ('**dP**') menu to select the decimal point position. Move the decimal point by pressing the 'LE' (◂) key.

Configure the function mode selected ('**cnF.2**' to '**cnF.8**'). See sections *1.19.2* to *1.19.9*.

Configure the sensor at the '**SnSr**' menu. See section *1.19.10*.

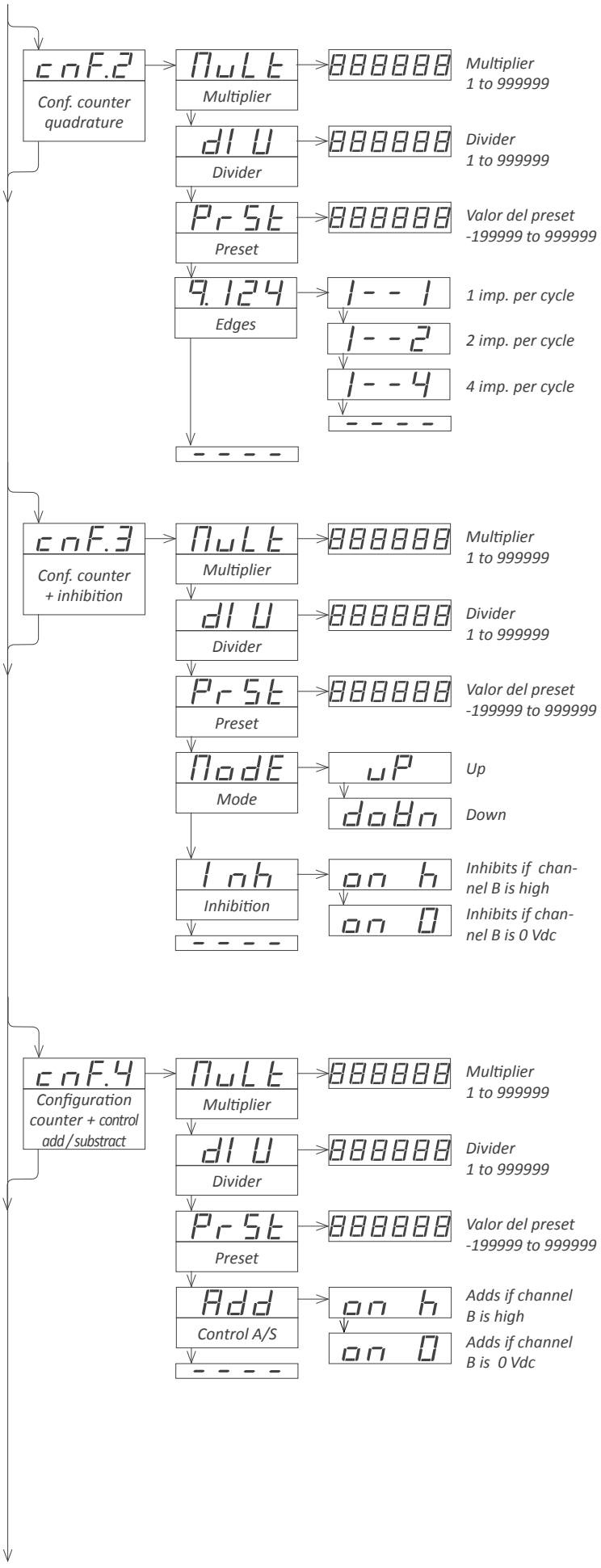


1.19.2 Configuration for 'cn.1'

Configuration menu for mode '**counter**' ('**cn.1**'). Total impulses received are multiplied by the value of the 'multiplier' ('**MuLt**') register and divided by the 'divider' ('**dIV**') register. Result is refreshed on the display.

- assign the value for parameter '**Multiplier**' ('**MuLt**') from 1 to 999999.
- assign the value for parameter '**Divider**' ('**dIV**') from 1 to 999999.
- assign the value for '**Preset**' ('**PrSt**') from -199999 to 999999. Reset activation loads on display the preset value.
- select the counting mode ('**ModE**') to '**uP**' for upwards counting (impulses received add) or '**doWn**' for downwards counting (impulses received substract).
- to activate the '**FAST**' mode ('**FASt**') select '**on**'. See section *1.16* for more information on the '**FAST**' mode.

1.19 Configuration menu (cont.)



1.19.3 Configuration for 'cnq.2'

Configuration menu for mode '**counter quadrature**' ('**cnq.2**'). Total impulses received are multiplied by the value of the 'multiplier' ('**MuLt**') register and divided by the 'divider' ('**dIV**') register. Result is refreshed on the display.

• assign the value for parameter '**Multiplier**' ('**MuLt**') from 1 to 999999.

• assign the value for parameter '**Divider**' ('**dIV**') from 1 to 999999.

• assign the value for '**Preset**' ('**PrSt**') from -199999 to 999999. Reset activation loads on display the preset value.

• select the '**edges'** to count for each quadrature cycle ('**q.124**'). Select '**1--1**' for 1 impulse per quadrature cycle. Select '**1--2**' for 2 impulses per quadrature cycle. Select '**1--4**' for 4 impulses per quadrature cycle.

1.19.4 Configuration for 'cnI.3'

Configuration menu for mode '**counter + inhibition control**' ('**cnI.3**'). Total impulses received are multiplied by the value of the 'multiplier' ('**MuLt**') register and divided by the 'divider' ('**dIV**') register. Result is refreshed on the display.

• assign the value for parameter '**Multiplier**' ('**MuLt**') from 1 to 999999.

• assign the value for parameter '**Divider**' ('**dIV**') from 1 to 999999.

• assign the value for '**Preset**' ('**PrSt**') from -199999 to 999999. Reset activation loads on display the preset value.

• select the counting mode ('**ModE**') to '**uP**' for upwards counting (impulses received add) or '**doWn**' for downwards counting (impulses received substract).

• select the activation mode for the '**inhibition**' ('**Inh**') control. Select '**on_h**' to inhibit the counting when channel B is at logical state '1'. Select '**on_0**' to inhibit the counting when channel B is at logical state '0'.

1.19.5 Configuration for 'cnc.4'

Configuration menu for mode '**counter + control add / substract**' ('**cnc.4**'). Total impulses received are multiplied by the value of the 'multiplier' ('**MuLt**') register and divided by the 'divider' ('**dIV**') register. Result is refreshed on the display.

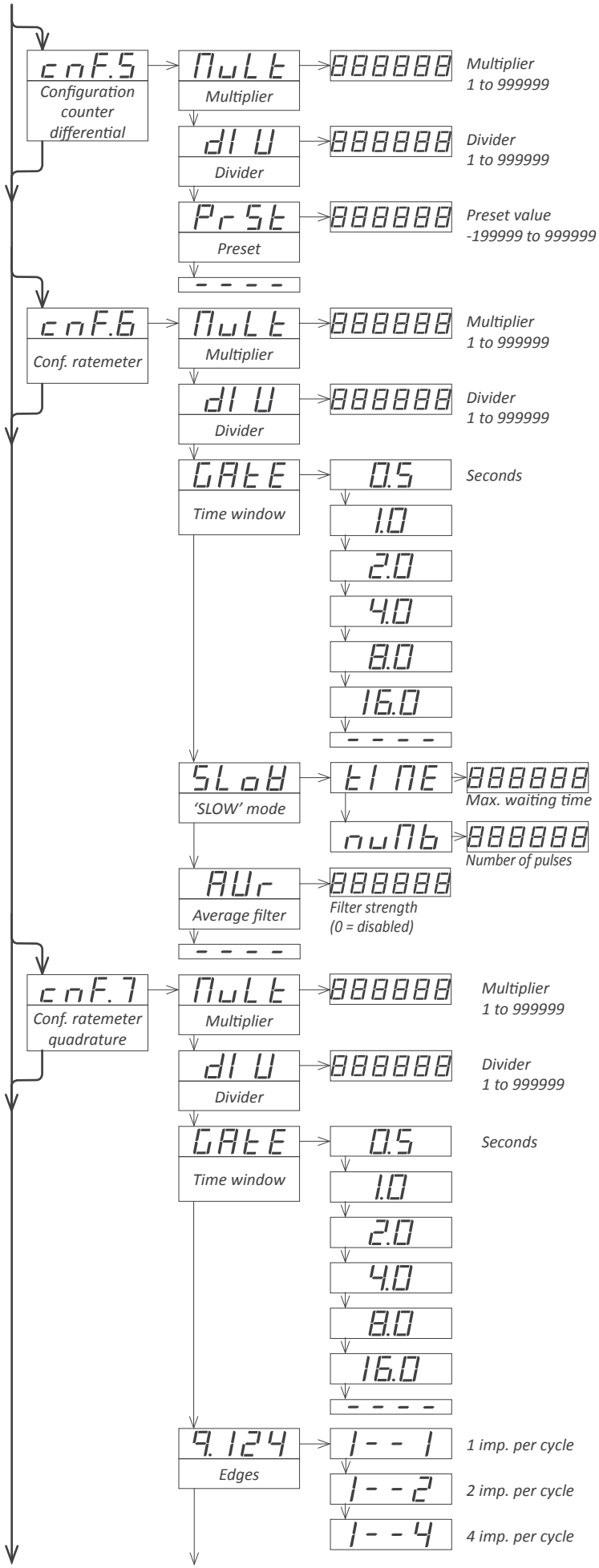
• assign the value for parameter '**Multiplier**' ('**MuLt**') from 1 to 999999.

• assign the value for parameter '**Divider**' ('**dIV**') from 1 to 999999.

• assign the value for '**Preset**' ('**PrSt**') from -199999 to 999999. Reset activation loads on display the preset value.

• select the activation mode for the '**control add / substract**' ('**Add**'). Select '**on_h**' activates the addition of impulses received on channel A when channel B is at logical state '1' (impulses on channel A substract if channel B is at logical state '0'). Select '**on_0**' activates the addition of impulses received on channel A when channel B is at logical state '0' (impulses on channel A substract if channel B is at logical state '1').

1.19 Configuration menu (cont.)



1.19.6 Configuration for 'cnd.5'

Configuration menu for mode '**counter differential**' ('**cnd.5**'). Total impulses received are multiplied by the value of the 'multiplier' ('**MuLt**') register and divided by the 'divider' ('**dIV**') register. Result is refreshed on the display.

• assign the value for parameter '**Multiplier**' ('**MuLt**') from 1 to 999999.

• assign the value for parameter '**Divider**' ('**dIV**') from 1 to 999999.

• assign the value for '**Preset**' ('**PrSt**') from -199999 to 999999. Reset activation loads on display the preset value.

Impulses received on channel A add. Impulses received on channel B substract.

1.19.7 Configuration for 'rt.6'

Configuration menu for mode '**ratemeter**' ('**rt.6**'). Frequency measured is multiplied by the value of the 'multiplier' ('**MuLt**') register and divided by the 'divider' ('**dIV**') register. Result is refreshed on the display. Measure is updated at the rate defined on the '**GATE**' register.

• assign the value for parameter '**Multiplier**' ('**MuLt**') from 1 to 999999.

• assign the value for parameter '**Divider**' ('**dIV**') from 1 to 999999.

• select the value for the '**Time window**' ('**GAtE**'). Available values are : 0.5, 1.0, 2.0, 4.0, 8.0 or 16.0 seconds. The time window defines the display refresh time. This parameter has no effect if the '**SLOW**' mode is active.

• for slow frequencies activate the '**SLoW**' parameter configuring the '**tIME**' parameter between 1 and 1000 seconds. Configure the '**nuMb**' parameter between 1 and 32 impulses. See section *1.15* for more information on the '**SLoW'** mode.

• in case of unstable signals, activate the '**average filter**' ('**AVr**') function. It activates a recursive filter on the reading. the filter is stronger for higher values, from 0.0 to 99.9.

1.19.8 Configuration for 'rtq.7'

Configuration menu for mode '**ratemeter quadrature**' ('**rtq.7**'). Frequency measured is multiplied by the value of the 'multiplier' ('**MuLt**') register and divided by the 'divider' ('**dIV**') register. Result is refreshed on the display. Measure is updated at the rate defined on the '**GATE**' register.

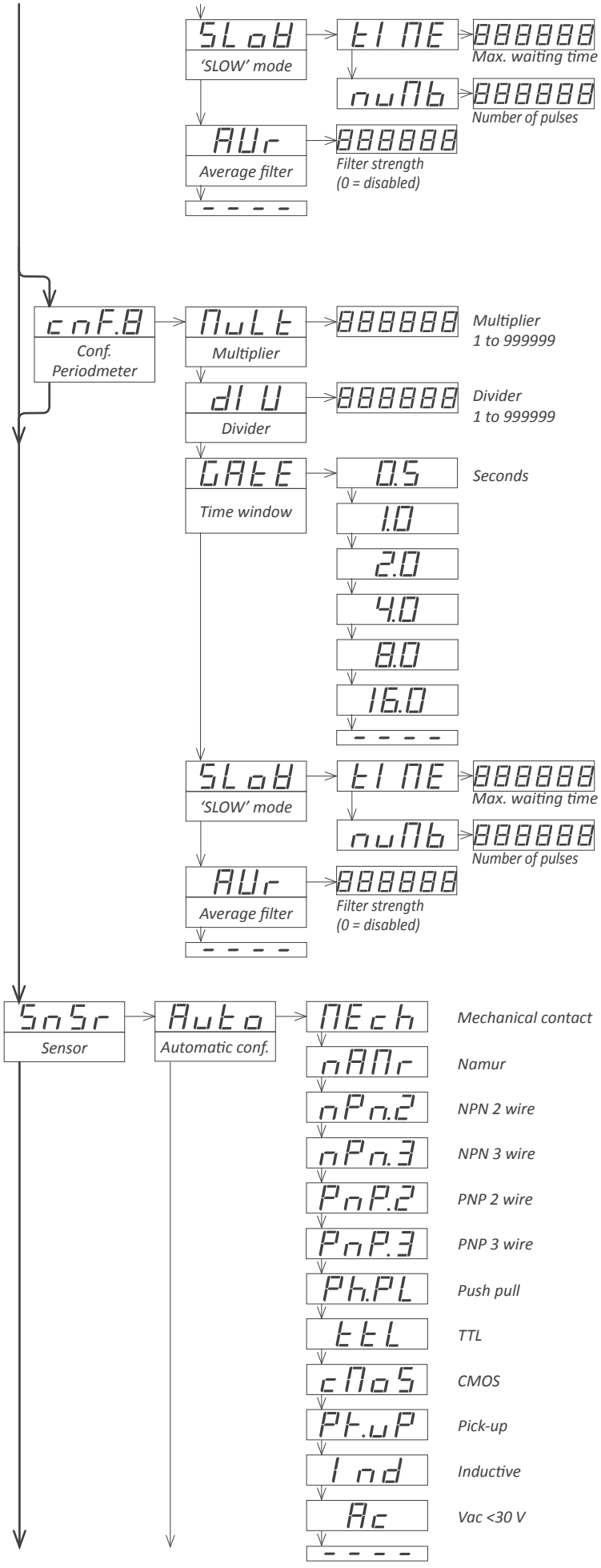
• assign the value for parameter '**Multiplier**' ('**MuLt**') from 1 to 999999.

• assign the value for parameter '**Divider**' ('**dIV**') from 1 to 999999.

• select the value for the '**Time window**' ('**GAtE**'). Available values are : 0.5, 1.0, 2.0, 4.0, 8.0 or 16.0 seconds. The time window defines the display refresh time. This parameter has no effect if the '**SLOW**' mode is active.

• select the '**edges'** to count for each quadrature cycle ('**q.124**'). Select '**1--1**' for 1 impulse per quadrature cycle. Select '**1--2**' for 2 impulses per quadrature cycle. Select '**1--4**' for 4 impulses per quadrature cycle.

1.19 Configuration menu (cont.)



• for slow frequencies activate the '**SLoW**' parameter configuring the '**tIME**' parameter between 1 and 1000 seconds. Configure the '**nuMb**' parameter between 1 and 32 impulses. See section *1.15* for more information on the '**SLoW'** mode.

• in case of unstable signals, activate the '**average filter**' ('**AVr**') function. It activates a recursive filter on the reading. the filter is stronger for higher values, from 0.0 to 99.9.

1.19.9 Configuration for 'Prd.8'

Configuration menu for mode '**periodmeter**' ('P**rd.8**'). Period measured is multiplied by the value of the 'multiplier' ('**MuLt**') register and divided by the 'divider' ('**dIV**') register. Result is refreshed on the display. Measure is updated at the rate defined on the '**GATE**' register.

• assign the value for parameter '**Multiplier**' ('**MuLt**') from 1 to 999999.

• assign the value for parameter '**Divider**' ('**dIV**') from 1 to 999999.

• select the value for the '**Time window**' ('**GAtE**'). Available values are : 0.5, 1.0, 2.0, 4.0, 8.0 or 16.0 seconds. The time window defines the display refresh time. This parameter has no effect if the '**SLOW**' mode is active.

• for long periods activate the '**SLoW**' parameter configuring the '**tIME**' parameter between 1 and 1000 seconds. Configure the '**nuMb**' parameter between 1 and 32 impulses. See section *1.15* for more information on the '**SLoW'** mode.

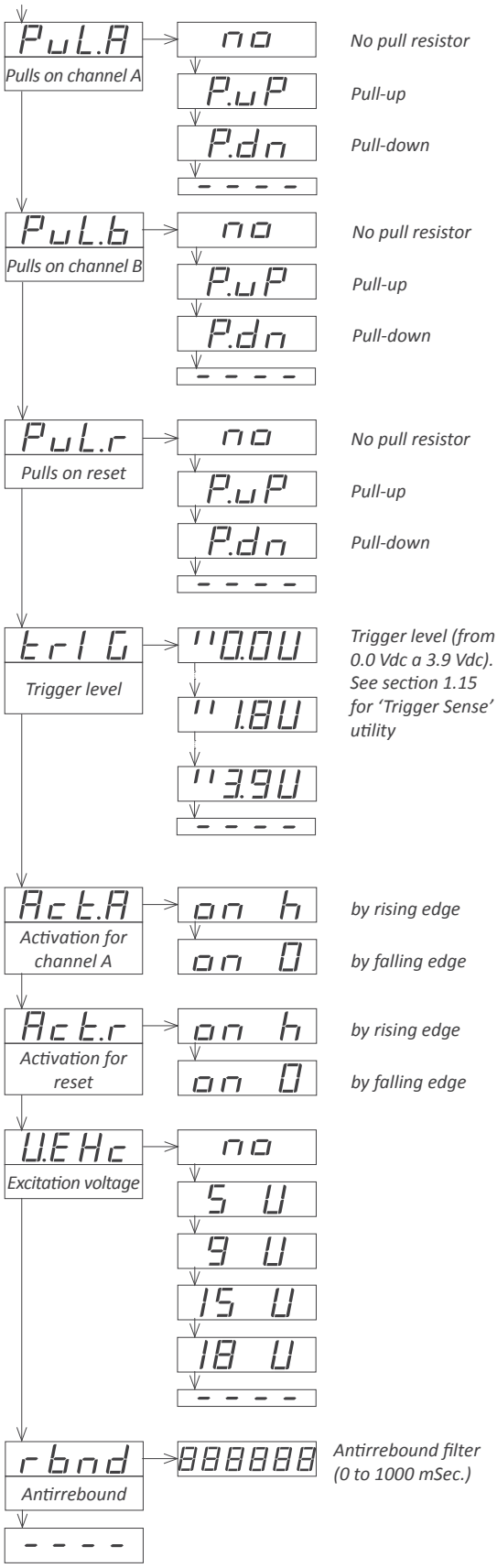
• in case of unstable signals, activate the '**average filter**' ('**AVr**') function. It activates a recursive filter on the reading. the filter is stronger for higher values, from 0.0 to 99.9.

1.19.10 Sensor configuration

The sensor configuration menu ('**SnSr**') provides configuration for the input section of the instrument, the excitation voltage and the trigger level, for accurate detection of the impulses.

• '**Automatic configuration' ('Auto') -** if a standard sensor is used, select one of the sensors provided at the '**Auto**' menu list. The instrument will automatically configure the parameters according to *Table 2 (see section 1.8)*. If this configuration does not detect impulses, manually modify the values for the parameters indicated below.

1.19 Configuration menu (cont.)



• '**Pulls on channel A**' ('**PuL.A**') - activates pull resistors at channel A. Select '**P.uP**' to activate pull-up resistors (needed for NPN sensors). Select '**P.dn**' to activate pull-down resistors (needed PNP sensors). Pull-up and pull-down selection configure the trigger level to 2,5 Vdc.

• '**Pulls on channel B**' ('**PuL.b**') - see previous menu entry 'Pulls on channel A'.

• '**Pulls on reset**' ('**PuL.r**') - see previous menu entry 'Pulls on channel A'. Trigger level for reset channel is fixed to 2,5 Vdc.

• '**trigger level**' ('**trIG**') - input signal value in Vdc at which the instrument detects impulse. Selectable between 0,0 and 3,9 Vdc. Trigger level is the same for channels A and B. Trigger level for reset channel is fixed at 2,5 Vdc. The two leds at the left of the trigger level are part of the 'Trigger Sense' utility for easy location of the proper trigger level *(see section 1.13)*.

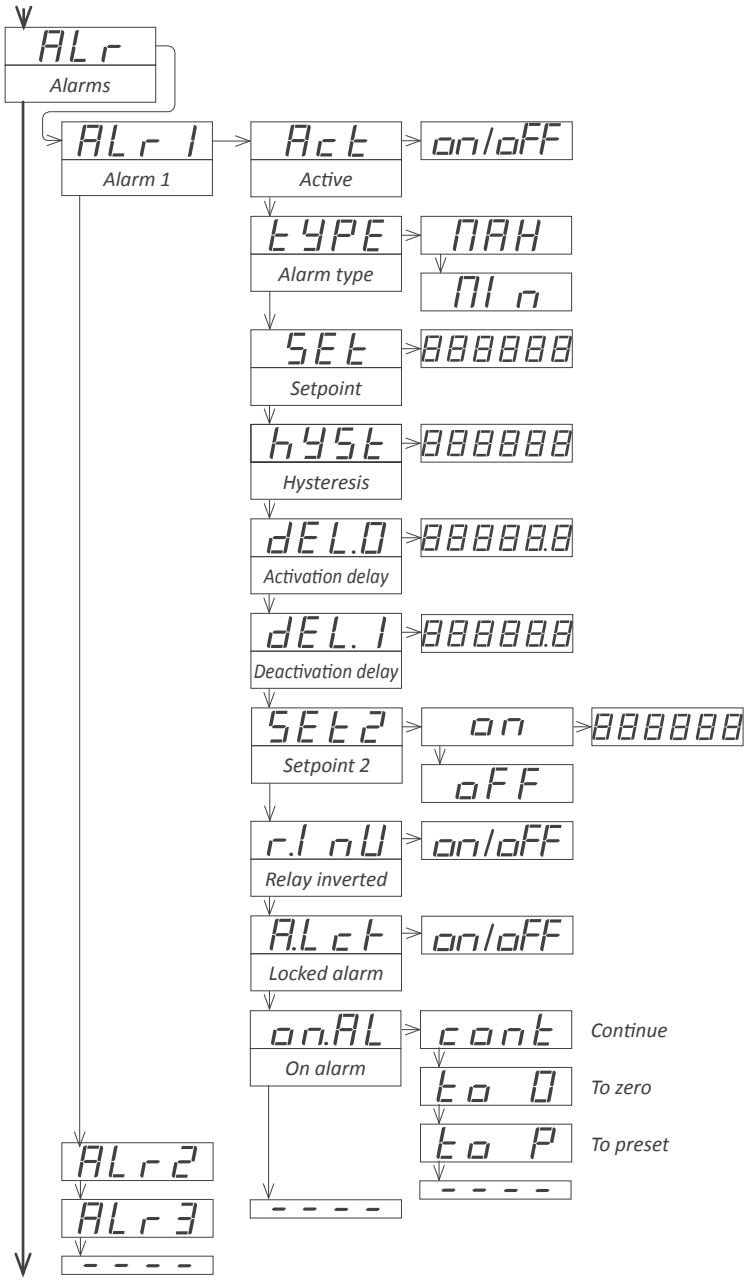
• '**Activation for channel A**' ('**Act.A**') - configures the activation of channel A by rising edge ('**on_h**') or by falling edge ('**on_0**')

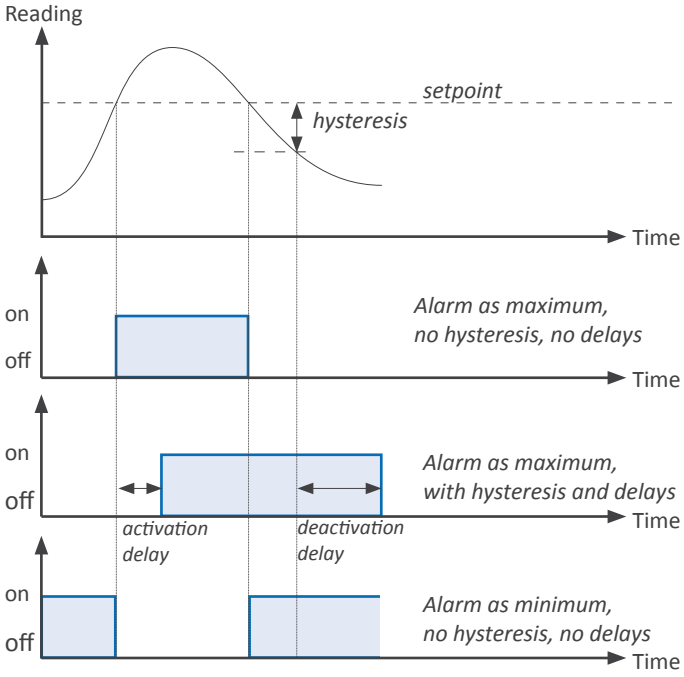
• '**Activation for reset channel**' ('**Act.r**') - configures the activation of the reset channel by rising edge ('**on_h**') or by falling edge ('**on_0**')

• '**Excitation voltage**' ('**V.EXc**') - configures the value of the excitation voltage at 5 Vdc, 9 Vdc, 15 Vdc and 18 Vdc. Select 'no' to disable the excitation voltage.

• '**Antirrebound filter**' ('**rbnd**') - the antirrebound filter blocks additional rebounds (typically from a mechanical contact sensor) from the same single impulse, preventing that a single impulse counts for more than 1. Value between 0 mSeconds and 1000 mSeconds. When an impulse is received, impulse detection is disabled for the duration of the time configured in this parameter. After time has passed, impulse detection is enabled again. Recommended value for a mechanical contact : 100 mSeconds.

1.19 Configuration menu (cont.)



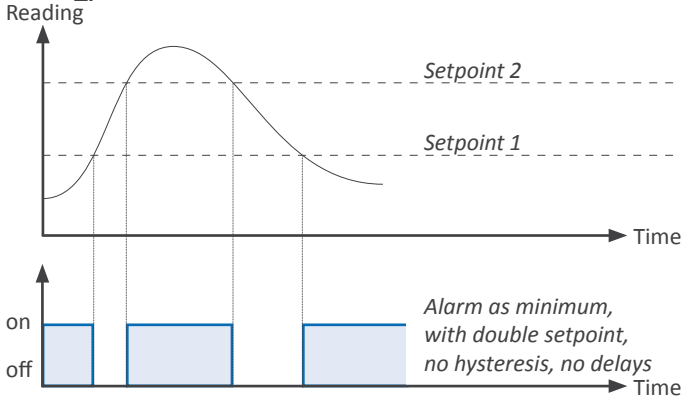


1.19.11 Alarms

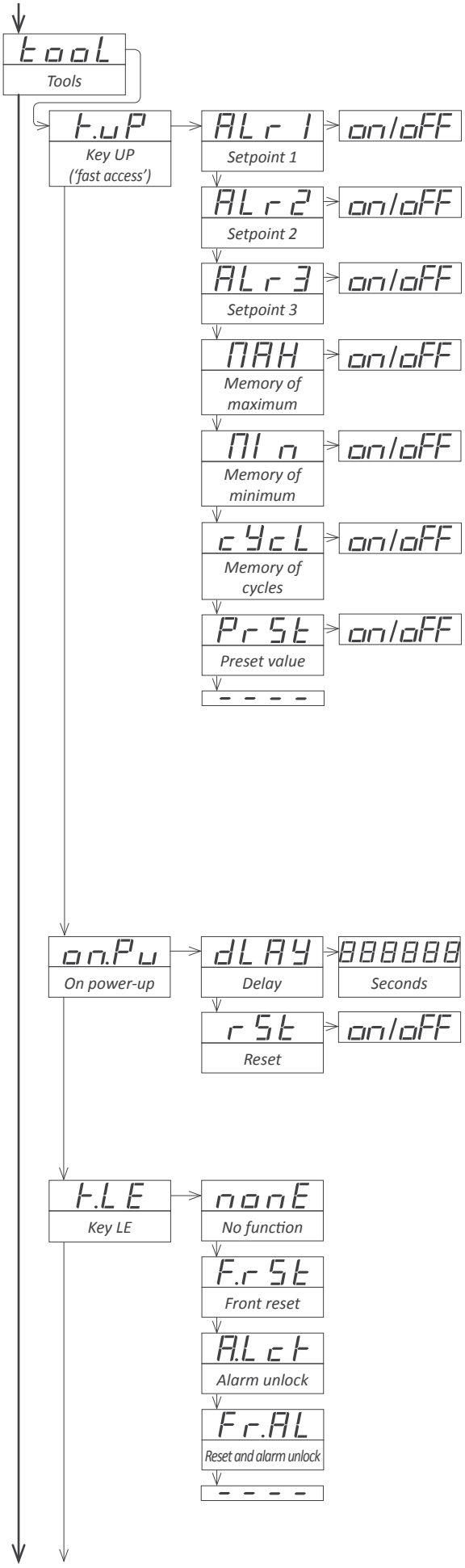
The '**Alarms**' ('**ALr**') menu configures the independent activation of up to 3 relay outputs (or transistor or SSR drive control), installed with the R1 optional modules (or T1 or SSR) *(see section 2.1)*. For outputs up to 4 and 6 relays, see special modules R2, R4 and R6 at section *2.6*. The alarm states are indicated in the front display with leds marked as '1', '2' and '3'.

To configure an alarm, enter into the alarm menu ('**ALr1**', '**ALr2**' or '**ALr3**') and configure the following parameters :

- select '**Active**' ('**Act**') to '**on**'
- at '**Alarm type**' ('**TypE**') select the alarm to act as a maximum type alarm ('**MAX**') or a minimum type alarm ('**MIn**'). The maximum type alarm (or minimum type alarm) activates when the display value is higher (or lower) than the setpoint value.
- at '**Setpoint**' ('**SEt**') enter the value for the alarm activation point. This parameter is eligible for configuration through the '*Fast access*' menu *(see section 1.19.12).*
- configure the hysteresis value at '**Hysteresis**' ('**hySt**'). The hysteresis applies to the deactivation process of the alarm. The alarm deactivates when the reading has passed the setpoint value plus the hysteresis value. Hysteresis helps to avoid repetitive switching of the alarm relays, due to fluctuating input signals around the setpoint.
- at '**Activation delay**' ('**dEL.0**') configure the delay to apply before alarm activation. The activation delay starts counting when the setpoint value is passed. Value from 0.0 to 99.9 seconds.
- at '**Deactivation delay**' ('**dEL.1**') configure the delay to apply before alarm deactivation. The deactivation delay starts counting when the setpoint value plus the hysteresis value, is passed. Value from 0.0 to 99.9 seconds.
- to work with 'windowed alarms' (see graphical example below) activate '**Setpoint 2**' ('**SEt2**') to '**on**' and then configure the desired second setpoint value. Second setpoint must always be higher in value than the first setpoint.
- the '**Relay inverted**' ('**r.Inv**') parameter inverts the normal relay connections. When set to '**on**' the relay will be active when alarm is inactive. For security applications where an inactive relay controls the shutdown of the system.
- the '**Locked alarm**' ('**A.Lck**') parameter disables the automatic deactivation of the alarm. Alarm deactivation must be performed manually, by pressing the 'LE' front button *(see section 1.19.14)*
- the '**On alarm**' ('**on.AL**') parameter assigns a predefined behaviour when alarm is activated. Select '**cont**' to continue counting. Select '**to_0**' to load '0' on displays. Select '**to_p**' to load preset value on display. Parameter '**dEL.1**' is set to 1 second when '**to_0**' or '**to_p**' are selected.



1.19 Configuration menu (cont.)



1.19.12 Fast access

The 'UP' (▲) key at the front of the instrument gives access to a list of functions configurable by the operator. See section *1.17* for an explanation on how to operate the '*fast access*' menu.

The '**Key UP (Fast access)**' ('**K.uP**') menu allows to select which functions will be accessible through the 'fast access' menu. Select '**on**' to activate each function.

• the '**Setpoint 1**' ('**ALr1**') function allows to visualize and modify the alarm 1 setpoint through the 'fast access' menu.

• the '**Setpoint 2**' ('**ALr2**') function allows to visualize and modify the alarm 2 setpoint through the 'fast access' menu.

• the '**Setpoint 3**' ('**ALr3**') function allows to visualize and modify the alarm 3 setpoint through the 'fast access' menu.

• the '**Memory of maximum**' ('**MAX**') or '**Memory of minimum**' ('**MIn**') functions allow to visualize the maximum or minimum reading value stored in memory. To reset this value, visualize the memory value at the 'fast access' menu with key UP (▲) and when message '**rSt**' is displayed, press (■) to reset.

• the '**Memory of cycles**' ('**cYcL**') function allow to visualize and reset the memory of cycles. To reset this value, visualize the memory value at the 'fast access' menu with key UP (▲) and when message '**rSt**' is displayed, press (■) to reset. The memory of cycles countes '+1' each time a reset alarm occurs ('on_AL' / 'to_0' or 'to_P') or a reset by 'overrange' / 'underrange' occurs.

• the '**Preset value**' ('**PrSt**') function allows to visualize and modify the preset value configured.

1.19.13 Super fast access

If only a single function is selected for the 'fast access' menu, pressing the the 'UP' (▲) key will shortly display the function name and then automatically jump to the function value.

1.19.15 Menu 'On Power Up'

The '**On Power Up**' ('**on.Pu**') menu configures functions to apply at start-up. It applies only to instrument restart after power loss. It does not apply to instrument restart due to change in configuration.

• parameter '**Delay**' ('**dLAy**') assigns a waiting time in seconds. The instrument waits the configured time before starting normal function. During this waiting time, the display shows all decimal points on in flash mode, all alarms are in 'oFF' state, there is no signal acquisition and there is no communications or control being performed. After the configured time is over, the instrument starts in normal function. Delay value between 0 and 200 seconds.

• the '**Reset**' ('**rSt**') parameter will execute a reset of the counter each time the instrument is restarted.

1.19.14 Menu 'Key LE'

The 'LE' (◄) key at the front of the instrument can be configured to activate a function.

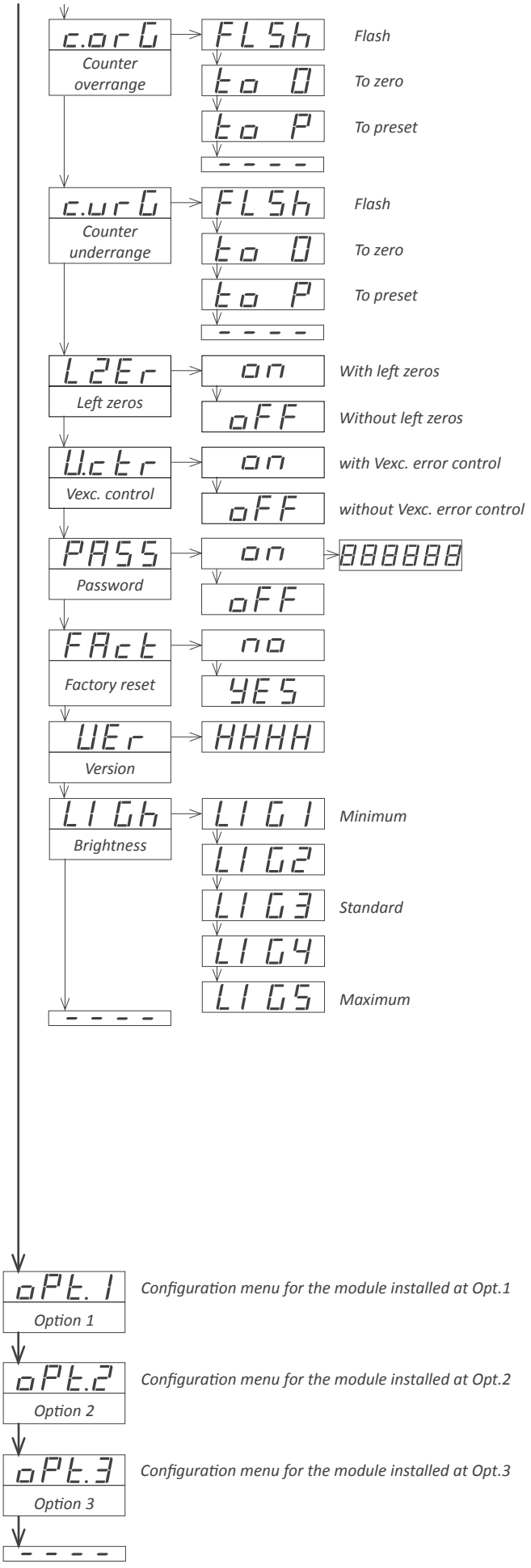
• the '**No function**' ('**nonE**') value assigns no function.

• the '**Front reset**' ('**F.rSt**') value asigns the reset funtion.

• the '**Alarm unlock**' ('**A.Lck**') value assigns the manual unlock of the alarms function, for instruments with the '**Locked alarms**' ('**A.Lck**') function activated *(see section 1.19.11)*

• the '**Reset and alarm unlock**' ('**Fr.AL**') assigns the two previous functions to the same button.

1.19 Configuration menu (cont.)



1.19.16 Menus 'Overrange / underrange'

The '**Counter overrange**' ('**c.orG**') and '**Counter underrange**' ('**c.urG**') parameters configure the behavior of the instrument when reading is higher than '9999' (overrange) or lower than '-1999' (underrange). Select '**FLSH**' to enter reading into flash mode. Select '**to_0**' to apply a reset to '0'. Select '**to_P**' to apply a reset to preset value.

1.19.17 Left zeros

The '**Left zeros**' ('**L.ZEr**') parameter controls the left zeros on or off.

1.19.18 Vexc. control

The '**Vexc control**' ('**V.ctr**') parameters enables the 'Err.8' message, when consumption requested to the excitation voltage is higher than the current the instrument can provide.

1.19.19 Function 'Password'

At the '**Password**' ('**PASS**') menu select a 6 digit code to block access to the '*configuration menu*'. Instrument configuration will not be accessible to non authorized personnel. To activate the '**Password**' select '**on**' and introduce the code.

The code will be requested when trying to access the '*configuration menu*' (key 'SQ' (■)). The '*fast access*' menu is not password protected.

1.19.20 Factory reset

At the '**Factory reset**' ('**FAct**') menu, select '**yes**' to load the default factory configuration for the instrument *(see section 1.21)*.

1.19.21 Firmware version

The '**Version**' ('**VEr**') menu informs of the current firmware version installed in the module.

1.19.22 Brightness

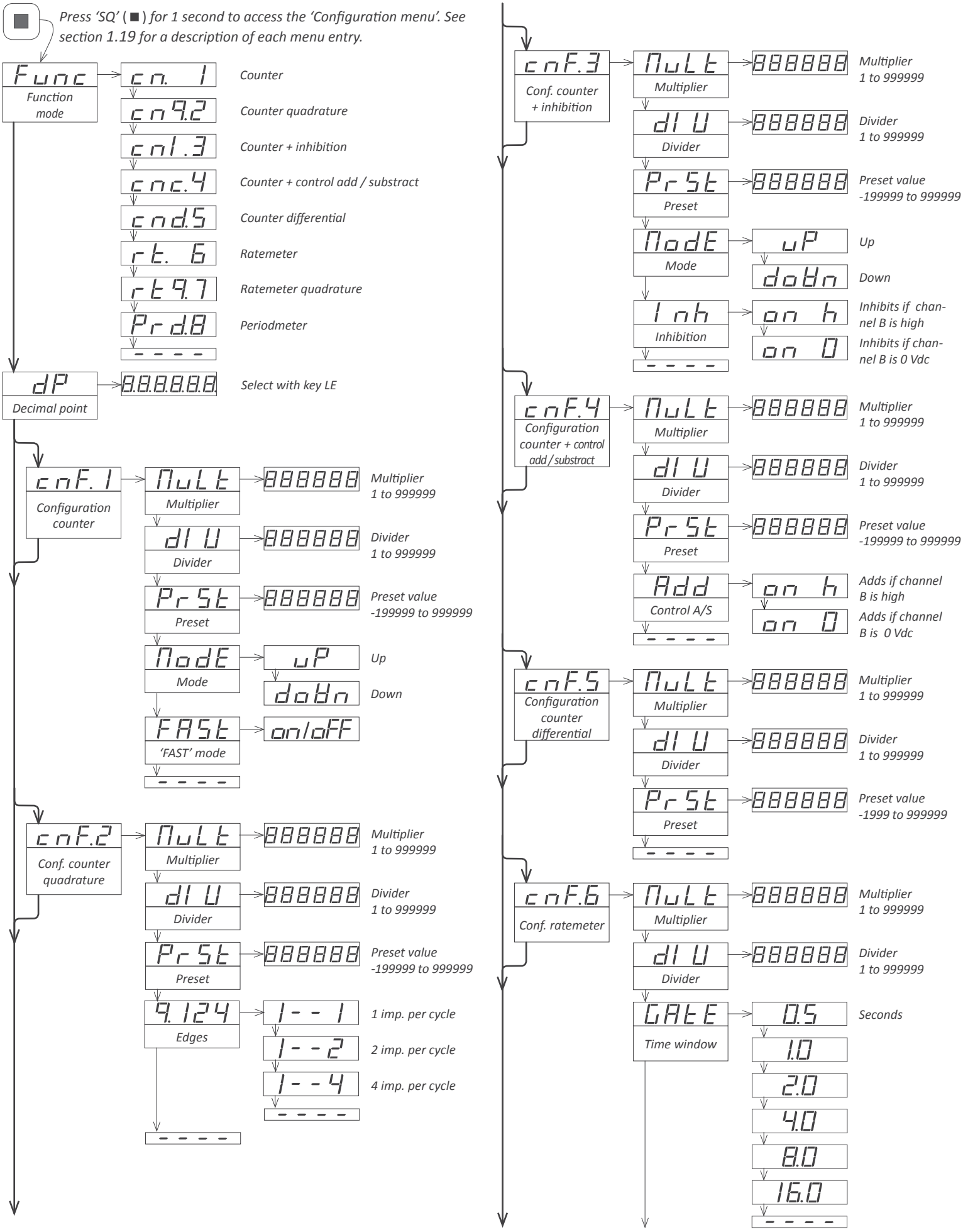
At the '**Brightness**' ('**LIGh**') menu select the light intensity for the front leds. With this function it is possible to adapt the instrument to the environment light intensity.

1.19.23 Access to optional modules

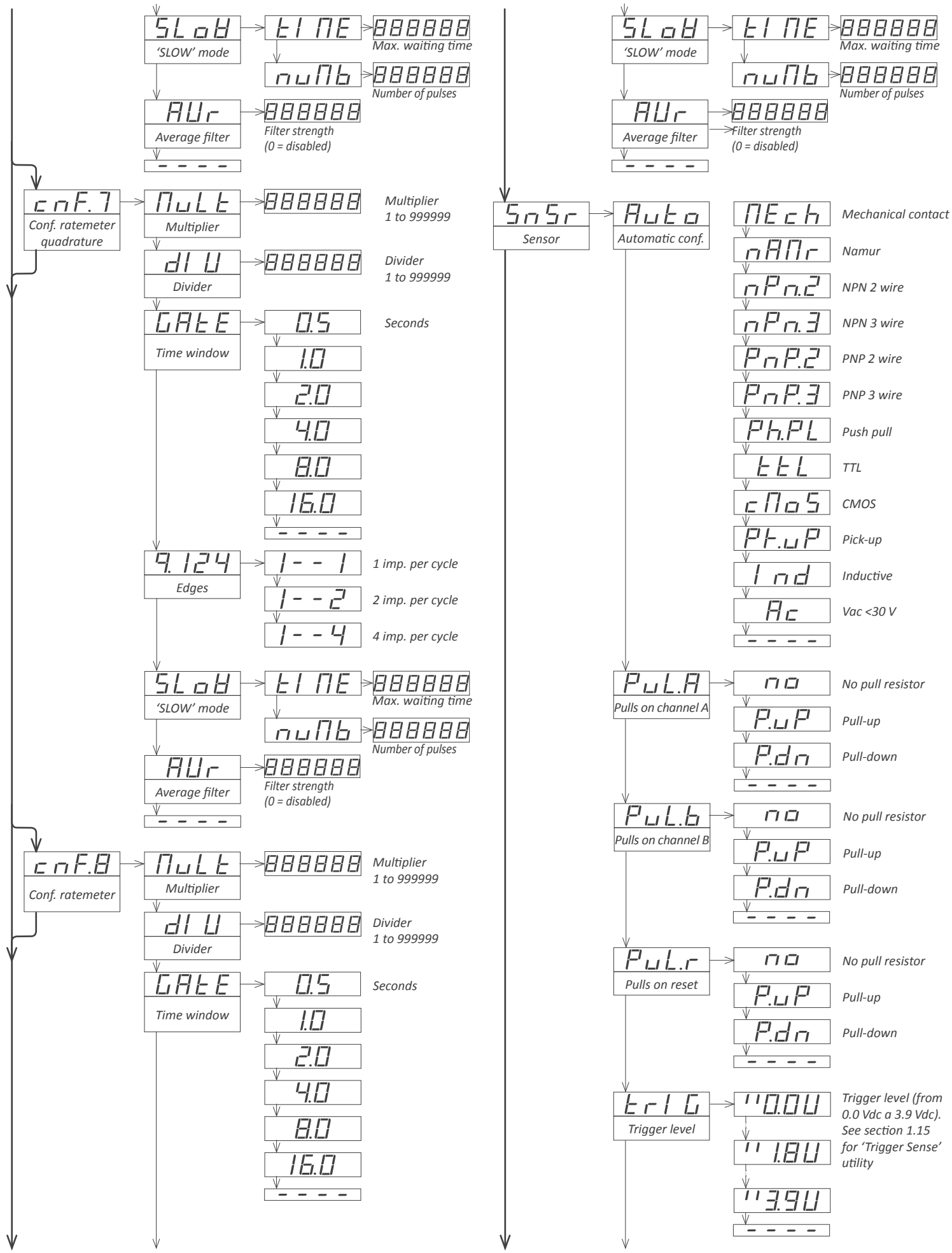
Menus '**OPt.1**', '**OPt.2**' and '**OPt.3**' give access to the '*configuration menus*' of the output and control modules installed at slots Opt.1, Opt.2 and Opt.3.

See section *2* for a list of output and control modules available for each slot. The '*configuration menu*' of each module is described at the User's Manual of each module.

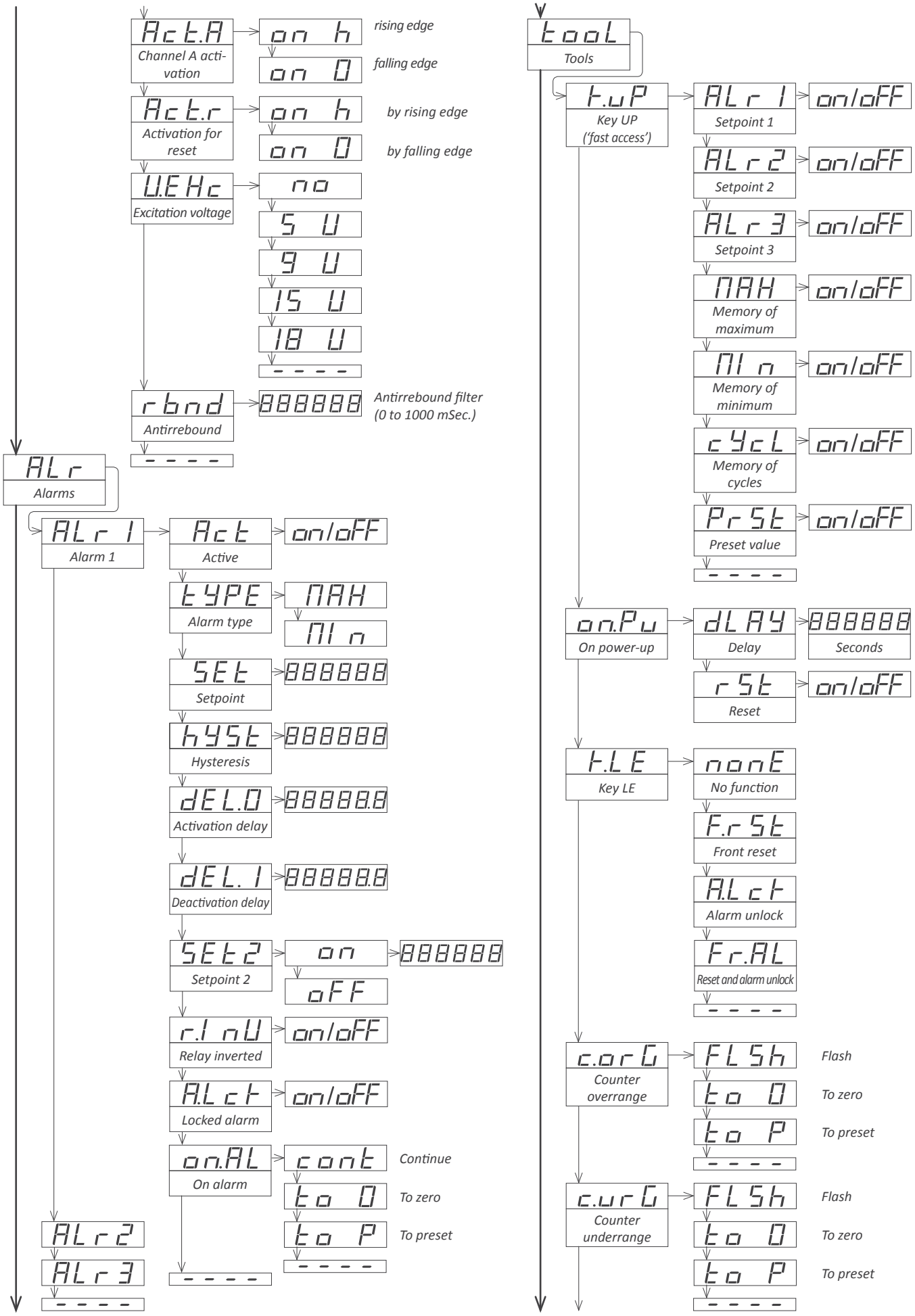
1.20 Full configuration menu



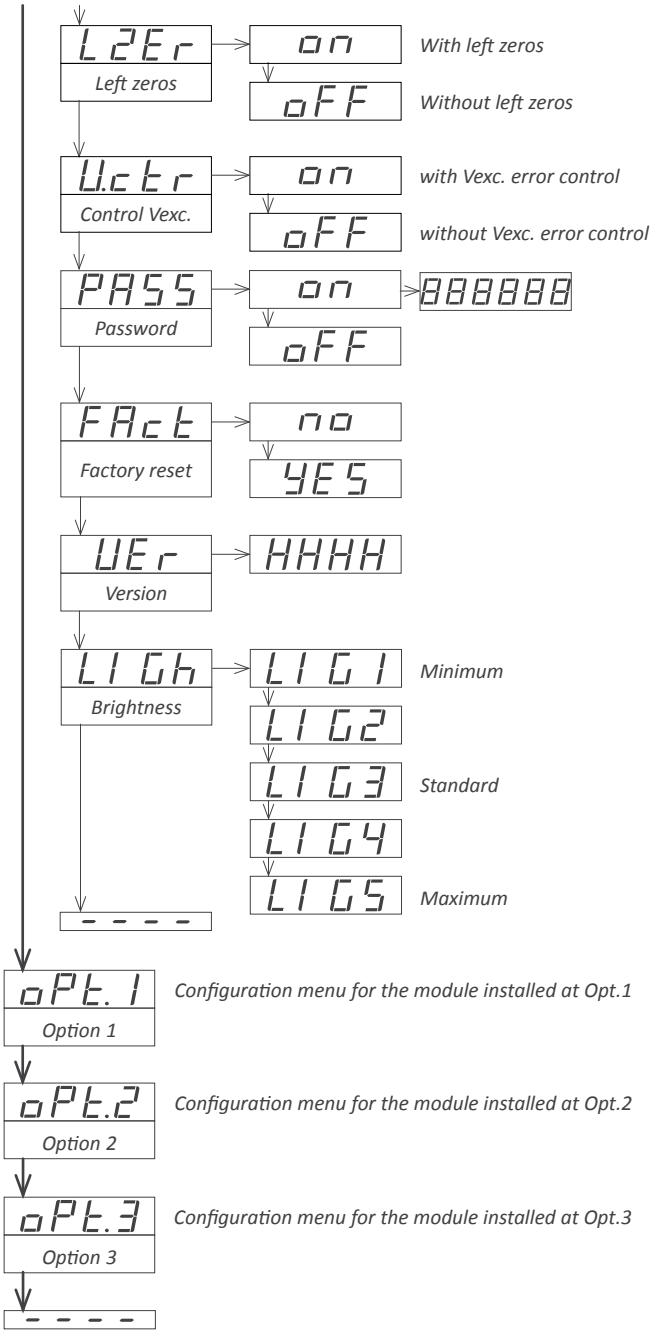
1.20 Full configuration menu (cont.)



1.20 Full configuration menu (cont.)



1.20 Full configuration menu (cont.)



1.21 Factory configuration

Function	counter (‘cn.1’)
Decimal point	no
Counter configuration	
Multiplier	x1
Divider	/1
Preset	0
Mode	up
‘FAST’	off
Sensor	
Pulls on channel A	no pull resistor
Pulls on channel B	no pull resistor
Pulls on reset	pull-up
Trigger	2,5 Vdc
Activation for channel A	on rising edge (‘on_h’)
Excitation voltage	5 Vdc
Antirrebound filter	0 mSeconds
Tools	
Fast access (Key UP)	off
‘On Power Up’	
Delay	0 seconds
Key ‘LE’	reset function
Memory of maximum	-199999
Memory of minimum	999999
Memory of cycles	0
Counter overrange	flash
Counter underrange	flash
Left zeros	off
Vexc. control	off
Password	off
Brightness	3
Alarms 1,2 and 3	
Active	off (disabled)
Type	maximum
Setpoint	1000
Hysteresis	0 counts
Activation delay	0.0 seconds
Deactivation delay	0.0 seconds
Setpoint 2	off
On Alarm	continue
Inverted relay	off
Locked alarms	off

Factory configuration for Ratemeter (‘cnF.6) and periodmeter (‘cnF.8) modes.

Multiplier	x1
Divider	/1
Time windows	0.5
‘SLOW’ mode	
tIME	0 (off)
nuMb	1
Recursive filter	0 (off)

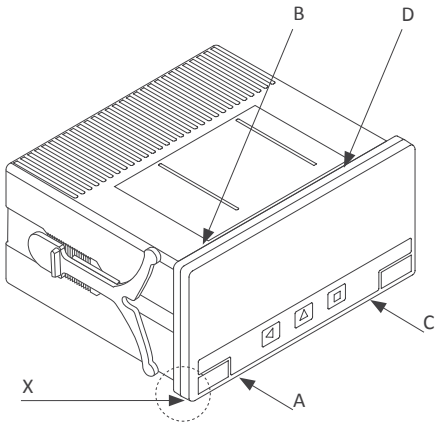
Factory configuration for output and control modules, see section *2.*

1.22 To access the instrument

To open the housing, use a flat screwdriver to free the fixation clips, if possible, in the following order : D, C, B and A. Remove the front cover. Let the inside of the instrument slide out of the housing.

To reinsert the instrument make sure that all modules are correctly connected to the pins on the display module. Place all the set into the housing, assuring that the modules correctly fit into the internal guiding slides of the housing. Once introduced, place again the front cover in front of the housing, placing first corner 'X' and then inserting clips 'A', 'B', 'C' and 'D' in this order.

See section *3* for a detailed description on how to open and close the housing.

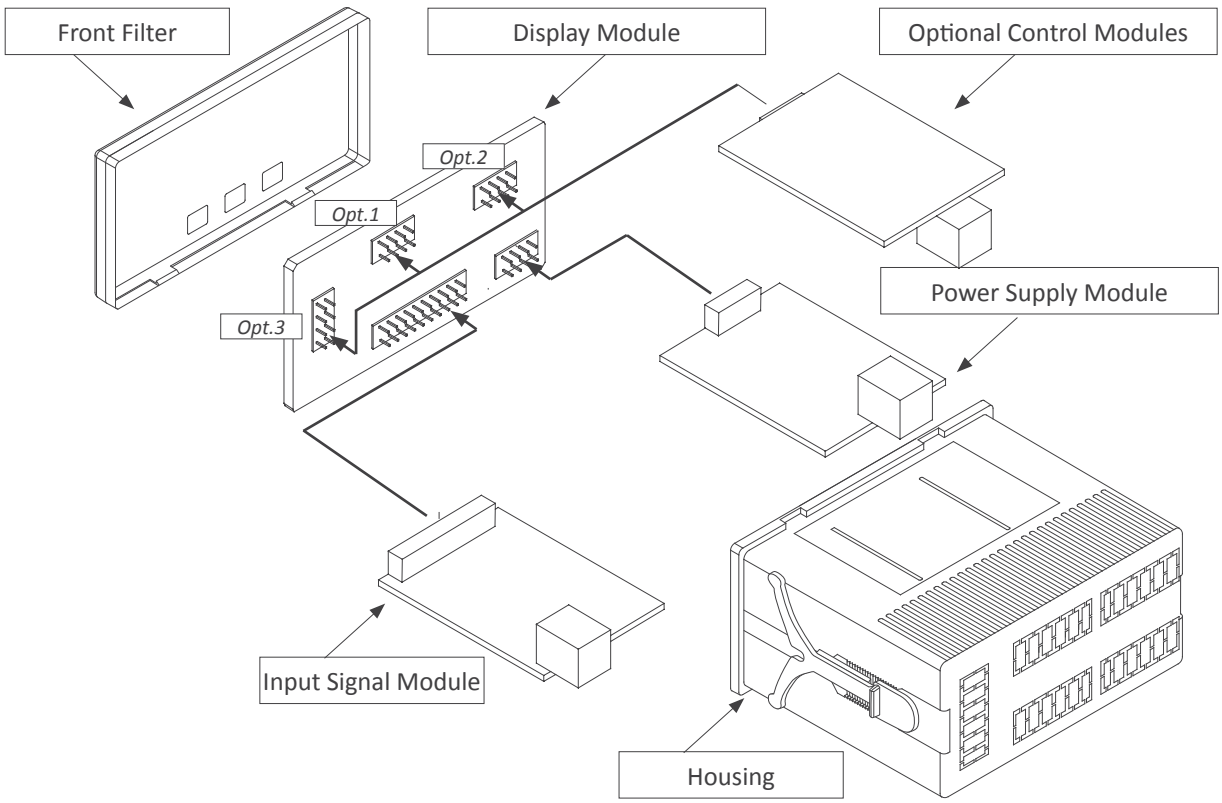


Risk of electric shock. Removing the front cover will grant access to the internal circuits. Disconnect the input signal to prevent electric shock to the operator. Operation must be performed by qualified personnel only.

Observe precautions for handling ESD (electrostatic discharge) sensitive devices

1.23 Modular system

DPF20 panel meters are designed to create a modular system. This modular system allows for addition, replacement or substitution of any of the internal modules conforming the instrument. Below is a graphic explanation for the position of each module.



1.24 Precautions on installation

Risk of electrical shock. Instrument terminals can be connected to dangerous voltage.

Instrument protected with double isolation. No earth connection required.

Instrument conforms to CE rules and regulations.

This instrument has been designed and verified conforming to the 61010-1 CE Security Regulation, for industrial applications.

Installation of this instrument must be performed by qualified personnel only. This manual contains the appropriate information for the installation. Using the instrument in ways not specified by the manufacturer may lead to a reduction of the specified protection level. Disconnect the instrument from power before starting any maintenance and / or installation action.

The instrument does not have a general switch and will start operation as soon as power is connected. The instrument does not have protection fuse, the fuse must be added during installation.

The instrument is designed to be panel mounted. An appropriate ventilation of the instrument must be assured. Do not expose the instrument to excess of humidity. Maintain clean by using a humid rag and do NOT use abrasive products such as alcohols, solvents, etc.

General recommendations for electrical installations apply, and for proper functionality we recommend : if possible, install the instrument far from electrical noise or magnetic field generators such as power relays, electrical motors, speed variators, ... If possible, do not install along the same conduits power cables (power, motor controllers, electrovalves, ...) together with signal and/or control cables.

Before proceeding to the power connection, verify that the voltage level available matches the power levels indicated in the label on the instrument.

In case of fire, disconnect the instrument from the power line, fire alarm according to local rules, disconnect the air conditioning, attack fire with carbonic snow, never with water.

1.25 CE declaration of conformity

Products DPF20

The manufacturer declares that the instruments indicated comply with the directives and rules indicated below.

Electromagnetic compatibility directive 2014/30/EU
Low voltage directive 2014/35/EU
Directive ROHS 2011/65/EU

Security rules EN-61010-1

Instrument	Fixed Permanently connected
Pollution degree	1 and 2 (without condensation)
Isolation	Double

Electromagnetic compatibility rules EN-61326-1

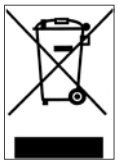
EM environment Industrial

Immunity levels

EN-61000-4-2	By contact ±4 KV	Criteria B
	By air ±8 KV	Criteria B
EN-61000-4-3		Criteria A
EN-61000-4-4	On AC power lines : ±2 KV	Criteria B
	On DC power lines : ±2 KV	Criteria B
	On signal lines : ±1 KV	Criteria B
EN-61000-4-5	Between AC power lines ±1 KV	Criteria B
	Between AC power lines and earth ±2 KV	Criteria B
	Between DC power lines ±1 KV	Criteria B
	Between DC power lines and earth ±2 KV	Criteria B
	Between signal lines and earth ±1 KV	Criteria B
EN-61000-4-6		Criteria A
EN-61000-4-8	30 A/m at 50/60 Hz	Criteria A
EN-61000-4-11	0 % 1 cycle	Criteria A
	40 % 10 cycles	Criteria A
	70 % 25 cycles	Criteria B
	0 % 250 cycles	Criteria B

Emission levels

CISPR 11	Instrument Class A, Group 1	Criteria A



According to directive 2012/19/EU, electronic equipment must be recycled in a selective and controlled way at the end of its useful life.

2. Output and control modules

2.1 Módules R1, T1 and SSR

The R1, T1 and SSR modules provides 1 relay output, 1 transistor output or 1 SSR drive output, to install in DPF20 digital panel meters, up to a maximum of 3 modules in a single meter.

Note : for more than three relays per instrument or larger relay density per module, see special modules R2, R4 and R6.

Configuration is performed from the frontal keypad of the meter, by setting the parameters at the alarms configuration menu ('ALr.1', 'ALr.2' or 'ALr.3' depending on the position the module is installed).

The menu allows to configure the setpoint, hysteresis, independent activation and deactivation delays, and a second setpoint to create alarm windows.

Modules R1, T1 and SSR are isolated against all other instrument circuits, and isolated between them.

Modules R1, T1 and SSR can be ordered pre-installed into a DPF20 digital panel meter, or standalone for delayed installation, as they do not require soldering or special configuration.

Option	**R1**
Output type	relay
Relay type	3 contact relay (NC, NO, common)
Maximum current	8 A (resistive load)
Maximum voltage	250 Vac continuous
Isolation	3500 Veff
Type of terminal	plug-in screw terminal pitch 5.08 mm
Installation allowed at	'Opt.1', 'Opt.2', ' Opt.3'

Option	**T1**
Output type	transistor
Maximum voltage	35 Vdc
Maximum current	50 mA
Isolation	3500 Veff
Type of terminal	plug-in screw terminal pitch 5.08 mm
Installation allowed at	'Opt.1', 'Opt.2', ' Opt.3'

Option	**SSR**
Output type	to control a SSR relay
Output voltage	+15 Vdc
Maximum current	45 mA
Isolation	1000 Vdc
Type of terminal	plug-in screw terminal pitch 5.08 mm
Installation allowed at	'Opt.1', 'Opt.2', ' Opt.3'

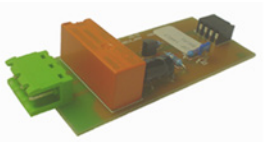
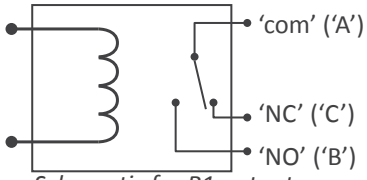
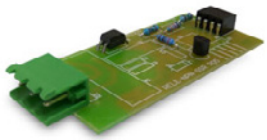
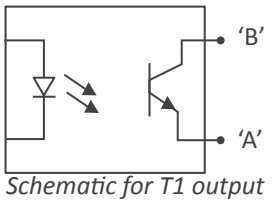
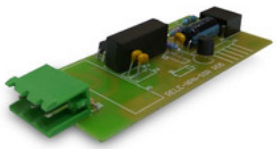
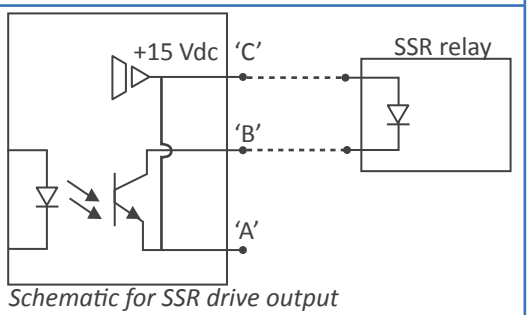
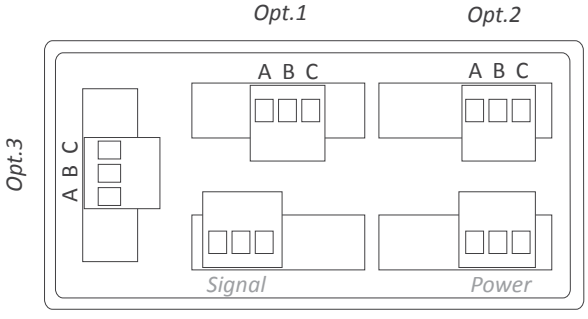
Module	*Output schematics and connections*
 *Module R1 - Relay output*	 *Schematic for R1 output*
 *Module T1 - Transistor output*	 *Schematic for T1 output*
 *Module SSR - SSR drive output*	 *Schematic for SSR drive output*

Table 7 - Connections



Rear view DPF20

2.2 Module AO

Module AO provides 1 analog output configurable as 4/20 mA or 0/10 Vdc, to install in DPF20 digital panel meters.

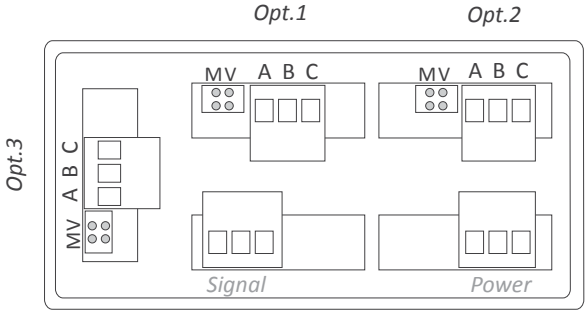
Configuration is performed from the frontal keypad of the meter, by setting the parameters at the options configuration menu ('Opt.1', 'Opt.2' or 'Opt.3' depending on the position the module is installed).

The output signal is proportional to the instrument reading, and it can be fully scaled with direct (positive) or inverted (negative) slopes. The mA output can be configured as an active loop (the instrument provides the excitation for the loop) or as a passive loop (the loop is externally powered).

Up to a maximum of 3 analog output modules can be installed in a single instrument, all outputs isolated between them and isolated from all other circuits.

Modules AO can be ordered pre-installed into a DPF20 digital panel meter, or standalone for delayed installation, as they do not require soldering or special configuration.

Option	**AO**
Output type	analog output
Output signals	4/20 mA active 4/20 mA passive 0/10 Vdc
Max. signal output Min. signal output	22 mA, 10.5 Vdc 0 mA, -50 mVdc
Scaling	related to the instruments reading direct or inverse slope
Vexc (terminal A)	+13.8 Vdc ± 0.4 Vdc (max. 25 mA) protected against short circuit
Load impedances	≤350 Ohms (in 4/20 mA active) ≤800 Ohms (in 4/20 mA passive) *(with a 24 Vdc external Vexc) (maximum 27 Vdc between terminals 'B' and 'C')* ≥10 KOhms (in 0/10 Vdc)
Accuracy (at 25 ºC)	<0.1 % FS
Thermal stability	60 ppm/ºC in mA mode 50 ppm/ºC in Vdc mode
Step response	<75 mSeconds + meter step response (0% to 99% signal)
Isolation	1000 Vdc
Warm-up	15 minutes
Type of terminal	plug-in screw terminal pitch 5.08 mm
Installation allowed at	'Opt.1', 'Opt.2', 'Opt.3'



Rear view DPF20

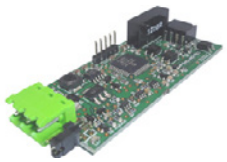
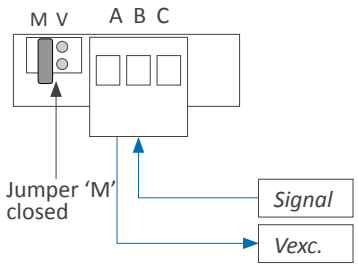
Module	*Connections*	
 *Module AO - Analog output*	Terminal A Terminal B Terminal C Jumper M Jumper V	Vexc Signal (mA or Vdc) GND closed for 'mA' closed for 'Vdc'

Table 8 - Connection terminals

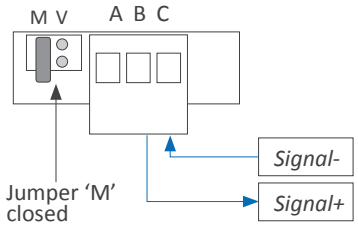
Output 4/20 mA active

The current loop is powered from the 'AO' module



Output 4/20 mA passive

The current loop is powered from an external equipment



Output 0/10 Vdc

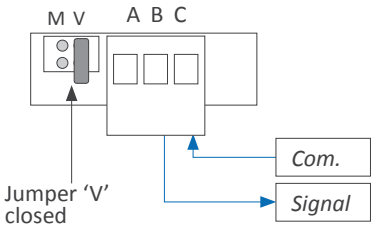


Table 9 - Connections for each output mode

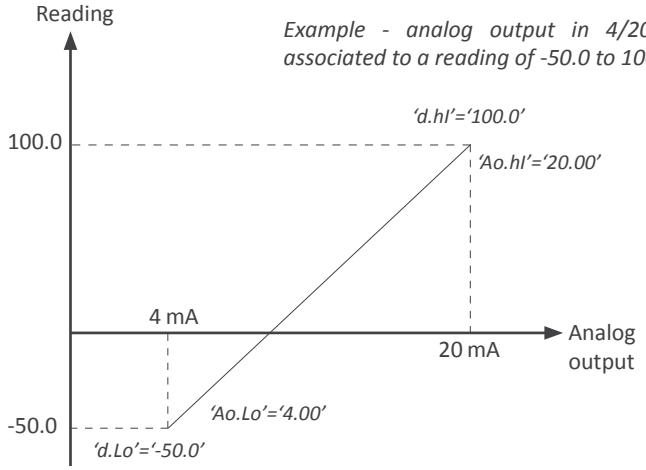
2.2.1 Configuration menu

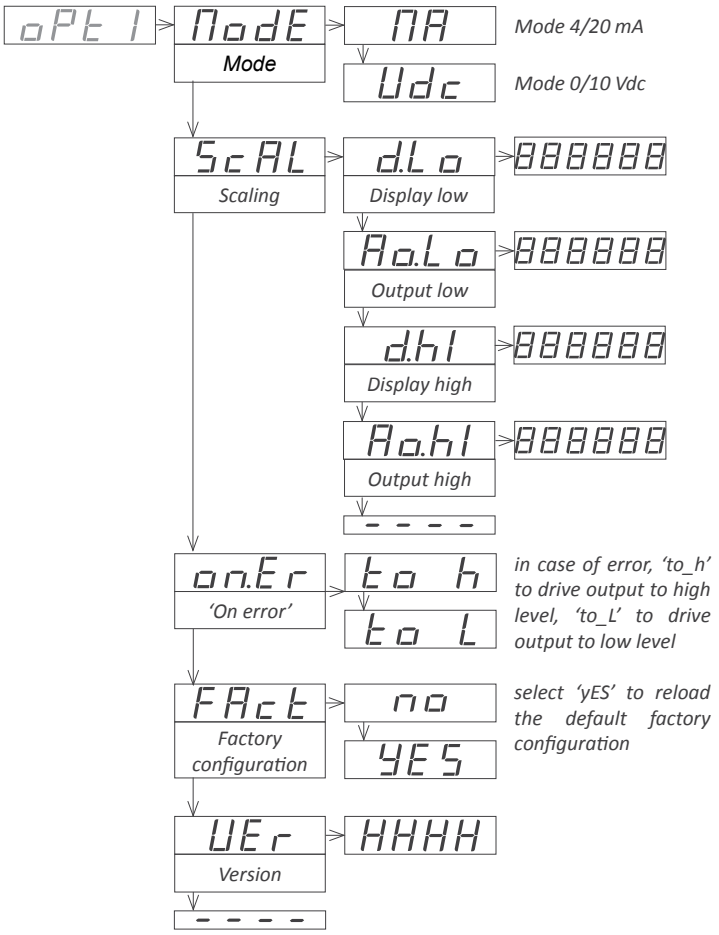
Configure at menu '**Mode**' ('**ModE**') the output signal range to '**4/20 mA**' ('**mA**') or '**0/10 Vdc**' ('**Vdc**'). Position for jumpers 'V' and 'M' must be according to the range selected.

At menu '**Scaling**' ('**ScAL**') configure the values that define the two points ('high' and 'low') of the 'signal-reading' slope:

- the lower slope point, defined by '**Display low**' ('**d.Lo**') and '**Output low**' ('**Ao.Lo**')
- the higher slope point, defined by '**Display high**' ('**d.hI**') and '**Output high**' ('**Ao.hI**')

Analog output values are shown with 'XX.XX' format, acceptable values are '0.00' to '10.00' Vdc for voltage, and '0.00' to '20.00' mA for current.





2.2.2 Error codes

'Er.34' output signal configured to value lower than 0 Vdc or 0 mA

'Er.35' output signal configured to a value higher than 10 Vdc or 20 mA

'Er.36' configured slope points are not acceptable, such as :

'd.Hi'='d.Lo'

'Ao.Hi'='Ao.Lo'

('Ao.Hi'-'Ao.Lo')>('d.Hi'-'d.Lo')

2.2.3 Factory configuration

Mode	'mA'
Scaling	
Display Low	0
Output Low	4.00 [mA]
Display High	9999
Output High	20.00 [mA]
On error	to high level('to_h')'

2.3 Module RTU

Module RTU provides 1 Modbus RTU communications port, to install in DPF20 digital panel meters. Enables protocol function '4' ('*Read Input Registers*') to access the instrument registers (reading value, alarm status, memory of maximum and minimum, setpoint values, ...).

Protocol configuration is performed from the frontal keypad of the meter, by setting the parameters at the options configuration menu ('Opt.1', 'Opt.2' or 'Opt.3' depending on the position the module is installed).

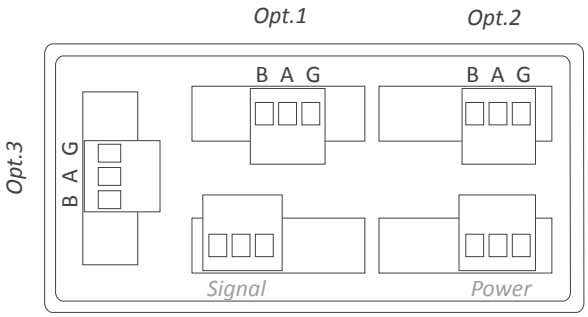
Up to a maximum of 3 RTU modules can be installed in a single instrument, all modules isolated between them and isolated from all other circuits.

Modules RTU can be ordered pre-installed into a DPF20 digital panel meter, or standalone for delayed installation, as they do not require soldering or special configuration.

Option	**RTU**
Output type	Modbus RTU communication port
Function implemented	4 (Read_Input_Registers)
Addresses	01 to 247
Exception codes	see section
Registers	see section *2.3.1*
Bus	RS-485
speed	57.6 Kbps to 600 bps
Data format	8n1 (standard), 8o1, 8n2, 8e1
bus terminator	not included
Isolation	1000 Vdc
Configuration	3 button front keypad
Temperature	operation from 0 to 50 ºC storage from -20 to +70 ºC
Factory configuration	'Address 1' 'Speed 19.2 Kbps' 'Format 8n1' 'Decimal point Auto'
Installation allowed at	'Opt.1', 'Opt.2', 'Opt.3'

Module	*Connections*	
 *Module RTU - Modbus RTU*	*Terminal B* *Terminal A* *Terminal G*	*B signal from RS-485 bus* *A signal from RS-485 bus* *GND*

Table 11 - Connection terminals



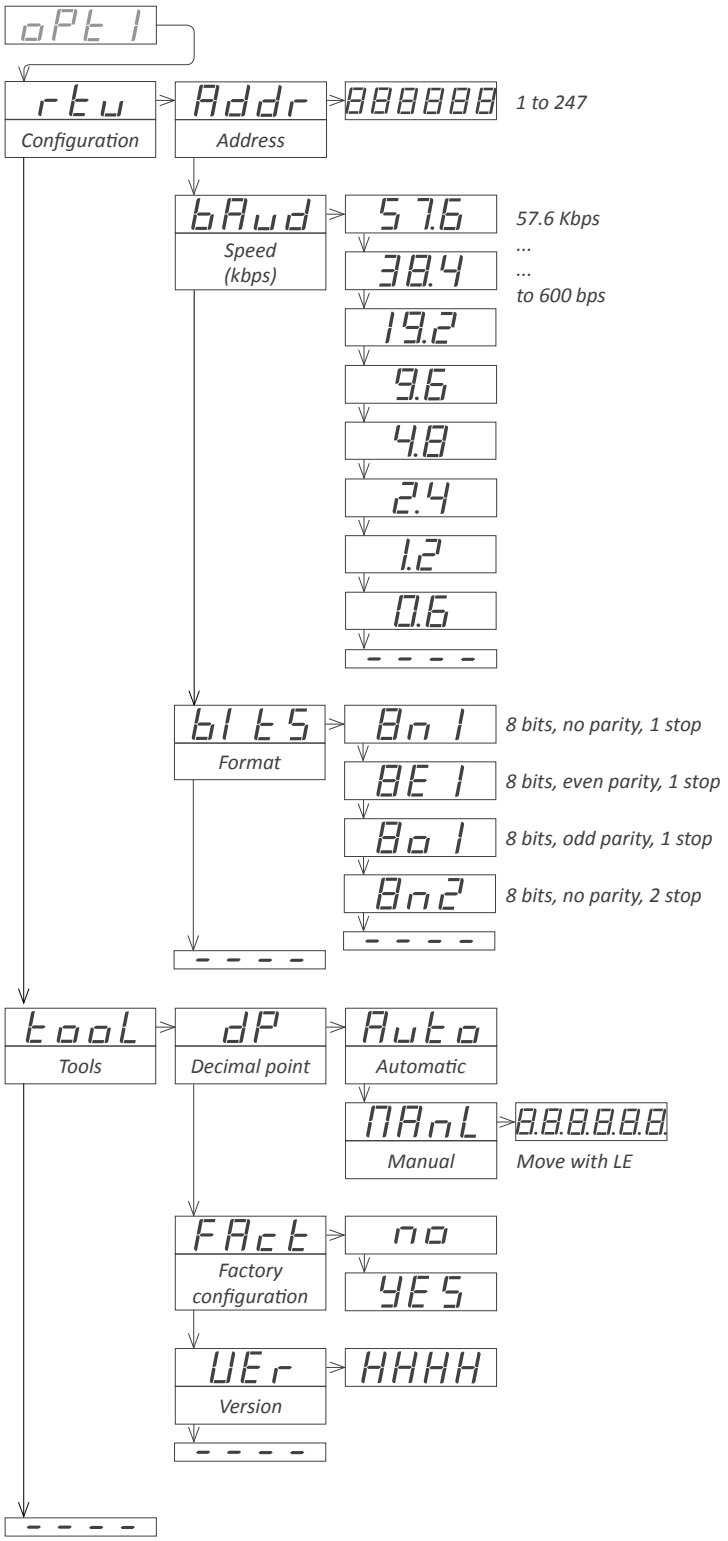
Rear view DPF20

2.3.1 Accessible registers

Register	*Name*	*Description*	*Size*	*Refresh*	*Value : Series M*	*Value : Series K and S*
0	*DISPLAY1_L*	*Display value*	*16 bits*	*same as display*	*999999 to -199999*	*9999 to -1999*
1	*DISPLAY1_H*		*16 bits*			
2	*DECIMALS1*	*Decimals on display*	*16 bits*		*0 to 6*	*0 to 4*
3	*MAXMEM_L*	*Memory of maximum*	*16 bits*	*every 30 seconds*	*999999 to -199999*	*9999 to -1999*
4	*MAXMEM_H*		*16 bits*			
5	*MINMEM_L*	*Memory of minimum*	*16 bits*		*999999 to -199999*	*9999 to -1999*
6	*MINMEM_H*		*16 bits*			
7	*SETPOINT1_L*	*Setpoint 1 value*	*16 bits*	*every 2 seconds*	*999999 to -199999*	*9999 to -1999*
8	*SETPOINT1_H*		*16 bits*			
9	*SETPOINT2_L*	*Setpoint 2 value*	*16 bits*		*999999 to -199999*	*9999 to -1999*
10	*SETPOINT2_H*		*16 bits*			
11	*SETPOINT3_L*	*Setpoint 3 value*	*16 bits*		*999999 to -199999*	*9999 to -1999**
12	*SETPOINT3_H*		*16 bits*			
13	*STATUS*	*Alarm status* *Instrument status*	*16 bits*	*same as display*	*bit 0...7 alarm status* *bit 8...16 instrument status*	
14 a 16	*Reserved*	*Reserved*	*16 x 3 bits*		*Not accessible*	*Not accessible*

Table 10 - Registers accessible via MODBUS-RTU.
All registers codified as binary numbers. Negative values are codified in two's complement.

2.3.2 Configuration menu



Configure at menu '**Configuration**' ('**rtu**'), the address value between '1' and '247' at parameter '**Address**' ('**Addr**'), bus speed in kbps at parameter '**Speed**' ('**bAud**') and data format at parameter '**Format**' ('**bItS**').

Special tools are grouped inside the '**Tools**' ('**TooL**') menu.

- the '**Decimal point**' ('**dP**') menu is provided for compatibility with ancient hardware that does not support decimal point retransmission. By default, select '**Automatic**' ('**Auto**'). If your instrument does nos transmit the decimal point position, select '**Manual**' ('**MAnL**') and fix the position of the decimal point manually.
- at the '**Factory reset**' ('**FAct**') menu, select '**yes**' to load the default factory configuration for the instrument.

the '**Version**' ('**VEr**') menu informs of the current firmware version installed in the module.

2.3.3 Exception codes

The Modbus RTU protocol defines the following scenarios when a 'Master' is sending a frame to a 'Slave':

- the 'Slave' device receives the frame correctly and replies with the requested data
- the 'Slave' devices detects a CRC error, parity error, or other. and discards the frame without generating a reply frame. The 'Master' will detect a 'TIMEOUT' condition due to the absence of reply.
- the 'Slave' device receives the frame correctly, but replies with an 'EXCEPTION_CODE' as it can not process the function or register requested.

The 'EXCEPTION_CODES' configured in the RTU module are :

Exception code	*Name*	*Description*
0	ILLEGAL_FUNCTION	*Requested function is not supported*
1	ILLEGAL_DATA_ADDRESS	*Requested register is not supported*

Table 12 - Exception codes

2.3.4 Description and example for Modbus RTU registers

Register R0 and R1 (DISPLAY1_L and DISPLAY1_H)

Contains the display value of the instrument, codified in two registers of 16 bits each. Possible values are from 999999 to -199999. Decimal point position is codified on register R2.

Example R0=FBF1 (hex) and R1=0009 (hex)
Register value = 0009 FBF1 (hex)
Reading value = 654321

Register R2 (DECIMALS1)

Contains the number of decimals of the display, codified in a single register of 16 bits. Possible values are from 0 to 6.

Example R2=0002 (hex)
Number of decimals = 2 = 6543.21

Register R3 and R4 (MAXMEM_L and MAXMEM_H)

Contains the memory of maximum reading of the instrument, codified in two registers of 16 bits each. Possible values are from 999999 to -199999. Decimal point position is codified on register R2.

Example - same example as in R0 and R1 but accessing to R3 and R4.

Register R5 and R6 (MINMEM_L and MINMEM_H)

Contains the memory of minimum reading of the instrument, codified in two registers of 16 bits each. Possible values are from 999999 to -199999. Decimal point position is codified on register R2.

Example - same example as in R0 and R1 but accessing to R5 and R6.

Register R7 and R8 (SETPOINT1_L and SETPOINT1_H)

Contains the setpoint value of alarm 1, codified in two registers of 16 bits each. Possible values are from 999999 to -199999. Decimal point position is codified on register R2.

Example - same example as in R0 and R1 but accessing to R7 and R8.

Register R9 and R10 (SETPOINT2_L and SETPOINT2_H)

Contains the setpoint value of alarm 2, codified in two registers of 16 bits each. Possible values are from 999999 to -199999. Decimal point position is codified on register R2.

Example - same example as in R0 and R1 but accessing to R9 and R10.

Register R11 and R12 (SETPOINT3_L and SETPOINT3_H)

Contains the setpoint value of alarm 3, codified in two registers of 16 bits each. Possible values are from 999999 to -199999. Decimal point position is codified on register R2.

Example - same example as in R0 and R1 but accessing to R11 and R12.

Register R13 (STATUS)

Information bit-by-bit, for the alarm status (on / off) and instrument status. See below for a description.

Bit 0	Alarm 1 status (0 = inactive, 1 = active)
Bit 1	Alarm 2 status (0 = inactive, 1 = active)
Bit 2	Alarm 3 status (0 = inactive, 1 = active)
Bit 3 a 7	Reserved
Bit 8	Display overrange
Bit 9	Display underrange
Bit 10	Lost communication with the main processor
Bit 11 to 15	Reserved

Registers R14, R15 and R16

Reserved

2.4 Module S4

Module S4 provides 1 RS-485 ASCII communications port, to install in DPF20 digital panel meters. ASCII protocol with '*master*' - '*slave*' architecture. Addressable up to 31 modules. Frames codified in representable ASCII characters (codes 32 to 255), directly visible using 'hyperterminal' or similar programs.

Instrument registers are accessible through the RS-485 ASCII port (reading value, alarm status, memory of maximum and minimum, setpoint values, ...).

Protocol configuration is performed from the frontal keypad of the meter, by setting the parameters at the options configuration menu ('Opt.1', 'Opt.2' or 'Opt.3' depending on the position the module is installed).

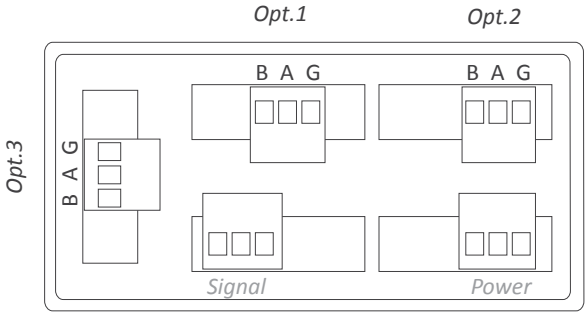
Up to a maximum of 3 S4 modules can be installed in a single instrument, all modules isolated between them and isolated from all other circuits.

Modules S4 can be ordered pre-installed into a DPF20 digital panel meter, or standalone for delayed installation, as they do not require soldering or special configuration.

Option	**S4**
Output type	RS-485 ASCII communication port
Bus	RS-485
Speed	57.6 Kbps to 600 bps
Data format	8n1 (standard), 8o1, 8n2, 8e1
Protocol	ASCII
Architecture	'master - slave'
Addresses	01 to 31
'Broadcast' address	128
Registers	see section *2.4.1*
Isolation	1000 Vdc
Configuration	3 button front keypad
Temperature	operation from 0 to 50 ºC storage from -20 to +70 ºC
Installation allowed at	'Opt.1', 'Opt.2', 'Opt.3'

Module	*Connections*	
 *Module S4 - RS-485 ASCII*	*Terminal B* *Terminal A* *Terminal G*	*B signal from RS-485 bus* *A signal from RS-485 bus* *GND*

Table 13 - Connection terminals



Rear view DPF20

2.4.1 Accessible registers

Display values (DISPLAY1, MAXMEM, MINMEM, AL1, AL2, AL3) are codified with a minimum of 6 digits (left zeros are added if necessary), polarity and decimal point.

Register	*Name*	*Description*
0	*DISPLAY1*	*Display1 value*
1	*MAXMEM*	*Memory of maximum*
2	*MINMEM*	*Memory of minimum*
3	*AL1*	*Setpoint 1 value*
4	*AL2*	*Setpoint 2 value*
5	*AL3*	*Setpoint 3 value*
6	*STATUS*	*Alarm status*

Table 14 - Accessible registers for ASCII protocol.

Register 0 - DISPLAY1
Contains the display value of the instrument, in ASCII code, including polarity (positive / negative) and decimal point.

Example 1 *R0='+' '0' '6' '5' '4' '3' '.' '2'*
Display value = 6543.2
Example 2 *R0='-' '0' '0' '0' '4' '.' '5' '2'*
Display value = -4.52

Register 1 - MAXMEM
Contains the value for memory of maximum, in ASCII code, including polarity (positive / negative) and decimal point.

Register 2 - MINMEM
Contains the value for memory of minimum, in ASCII code, including polarity (positive / negative) and decimal point.

Register 3 - AL1
Contains the value for alarm 1 setpoint, in ASCII code, including polarity (positive / negative) and decimal point.

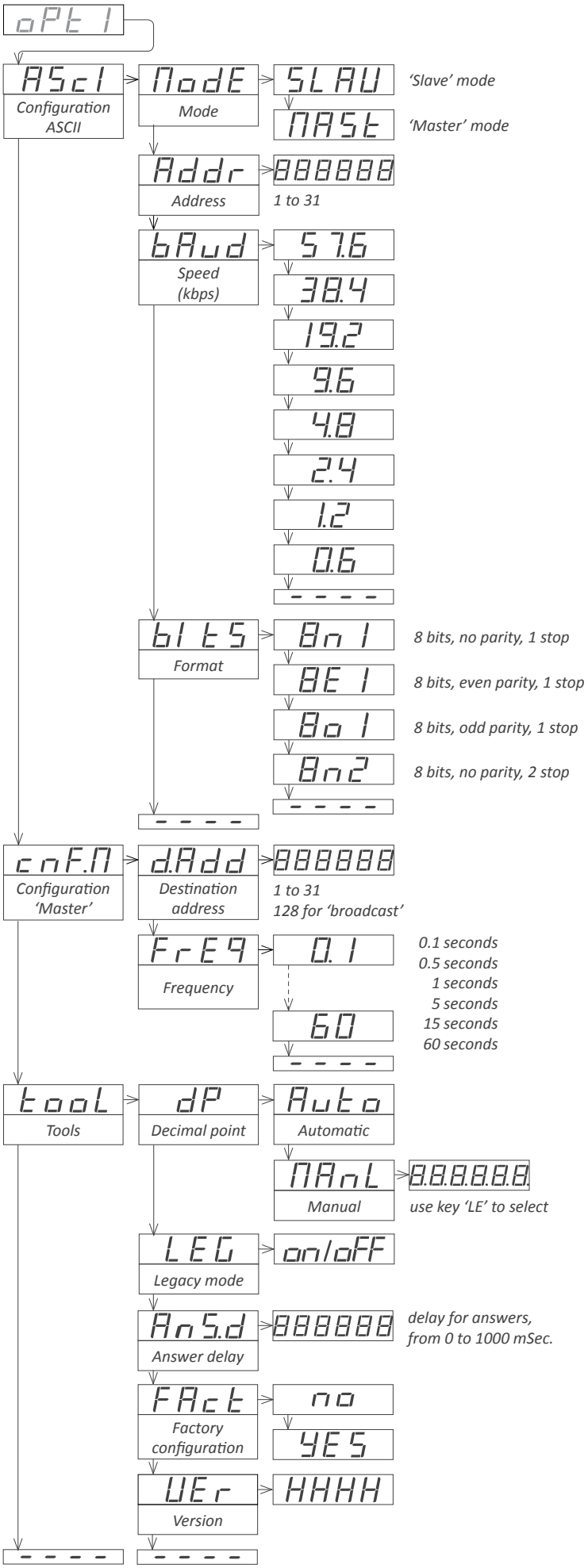
Register 4 - AL2
Contains the value for alarm 2 setpoint, in ASCII code, including polarity (positive / negative) and decimal point.

Register 5 - AL3
Contains the value for alarm 3 setpoint, in ASCII code, including polarity (positive / negative) and decimal point.

Register 6 - STATUS
Contains the alarm status (on/off).

Bit 0	Alarm 1 status (0 = inactive, 1 = active)
Bit 1	Alarm 2 status (0 = inactive, 1 = active)
Bit 2	Alarm 3 status (0 = inactive, 1 = active)
Bit 3 to 15	Reserved

2.4.2 Configuration menu



At menu '**Configuration ASCII**' ('**AScI**'), configure the instrument at parameter '**Mode**' ('**ModE**') to work as 'slave' or 'master', at parameter '**Address**' ('**Addr**') set the address value from '1' to '31', set the bus speed in kbps at parameter '**Speed**' ('**bAud**') and set the data format at parameter '**Format**' ('**bItS**').

When working as 'master', the instrument continuously transmits the display value data frame. The local module address is '0'. Configure at menu '**Configuration Master**' ('**cnF.M**') the '**Destination address**' ('**d.Add**') parameter from '1' to '31' or use value '128' for a broadcast message. At parameter '**Frequency**' ('**FrEq**') select the how often the frame with the reading value will be transmitted.

Special tools are grouped inside the '**Tools**' ('**TooL**') menu.

- the '**Decimal point**' ('**dP**') menu is provided for compatibility with ancient hardware that does not support decimal point retransmission. By default, select '**Automatic**' ('**Auto**'). If your instrument does nos transmit the decimal point position, select '**Manual**' ('**MAnL**') and fix the position of the decimal point manually.
- the '**Legacy mode**' ('**LEG'**) parameter is provided to maintain compatibility with instruments with older communication protocols. Select '**on**' to activate this mode.
- the '**Answer delay**' ('**AnS.d'**) parameter applies only to 'Slave' mode. The local module delays the answer frame. Configure for applications where the 'Master' needs additional time to switch between 'transmit' and 'receive' modes. Enter a numeric value between '0' and '1000' mSeconds.
- at the '**Factory reset**' ('**FAct**') menu, select '**yes**' to load the default factory configuration for the instrument.

the '**Version**' ('**VEr**') menu informs of the current firmware version installed in the module.

2.4.3 Factory configuration

Configuration ASCII	
Mode	Slave
Address	1
Speed ('bAud')	19.2 Kbps
Format ('bItS')	8n1
Configuration 'Master'	
Destination address	31
Frequency	0.5 seconds
Tools	
Decimal point	Auto
Legacy	Off
Answer delay	0 mSeconds

2.4.4 Frame types

The ASCII protocol defines the following frames:

• Frame 'read' ('**RD**'). Id code 36. Request data frame. The requested register is indicated into the 'REG' byte ('Header' section).

• Frame 'answer' ('**ANS**'). Id code 37. Response frame to a request data frame. The requested register is indicated into the 'REG' byte' ('Header' section). Data of the requested register is indicated into data bytes 'D0' to 'Dn' ('Data' section).

• Frame 'error' ('**ERR**'). Id code 38. Response frame to a request data frame. Indicates that an error has occurred. Error code is codified into the 'REG' byte ('Header' section).

• Frame 'ping' ('**PING**'). Id code 32. Used to confirm the existence of the remote instrument.

• Frame 'pong' ('**PONG**'). Id code 33. Response to a 'ping' frame. It confirms the existence of the remote instrument.

2.4.5 Frame structure

Header								Data				Trail	
STX	ID	RSV	FROM	TO	REG	RSV	LONG	D0	D1	...	Dn	CRC	ETX
2	x	32	x	x	x	32	n+1	[data]				x	3
0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*...*	*n+7*	*n+8*	*n+9*

Protocol frames have a structure made of 'Header', 'Data' and 'Trail'.

Section 'Header'

Contains the start byte ('STX'), the frame identifier ('ID'), the origin address ('FROM') and the destination address ('TO'), the register id ('REG') and the length ('LONG') of the 'Data' section.

Section 'Data'

Contains data for the requested register ('REG').

Section 'Trail'

Contains the 'CRC' code and the end of frame byte ('ETX').

'Real value' and 'Frame value'

To use representable ASCII values, the real values are codified before being sent into the frame. The following definitions apply :

- 'real value' is the value of the field without codification
- 'frame value' is the value of the field, codified

Field	***Description***	***Size***	***Position***	***Real value***	***Frame value***
STX	*Start of frame*	*1 byte*	*0*	*does not apply*	*2*
ID	*Frame type*	*1 byte*	*1*	*(see section 2.4.4)*	*real_value*
RSV	*Reserved*	*1 byte*	*2*	*0*	*32*
FROM	*Origin address*	*1 byte*	*3*	*0 ('Master') / 1 to 31 ('Slave')*	*32 + real_value*
TO	*Destination address*	*1 byte*	*4*	*0 ('Master') / 1 to 31 ('Slave')* *128 ('broadcast')*	*32 + real_value*
REG	*Register identification*	*1 byte*	*5*	*(see section 2.4.1)*	*32 + real_value*
RSV	*Reserved*	*1 byte*	*6*	*0*	*32*
LONG	*Length of 'Data' section*	*1 byte*	*7*	*n (between 0 and 32)*	*32 + real_value*
D0 … Dn	*Data*	*n bytes*	*8 to n+7*	*number 0 to 9* *decimal point* *polarity (+/-)*	*ASCII code of the number (48 to 57)* *ASCII code of decimal point (46)* *ASCII code of '+' (43)* *ASCII code of '-' (45)*
CRC	*CRC calculation*	*1 byte*	*n+8*	*does not apply*	*(see section 2.4.8)*
ETX	*End of frame*	*1 byte*	*n+9*	*does not apply*	*3*

Table 15 - Description of the bytes for the ASCII frame

2.4.6 Error codes

Frames 'ERR' contain within the 'REG' field, the error code. Available error codes are :

error 1	unknown register
error 2	display overrange
error 3	display underrange
error 4	CRC error
error 5	internal error

2.4.7 Frame examples

Frames 'RD' (36) and 'ANS' (37)

Example - 'Master' (address '0') requests the value of register '0' (display value) to the 'Slave' at address '28' ('RD' frame) and the 'Slave' replies to the 'Master' with a reply frame ('ANS' frame) containing the requested data (765.43).

**Instruments with 4 digits also send reading values formatted with 6 digits : value -321.5 is transmitted as -00321.5*

Header								Trail	
STX	ID	RSV	FROM	TO	REG	RSV	LONG	CRC	ETX
2	36	32	32	60	32	32	32	58	3
Start	RD	---	0	28	0	---	0	CRC	Stop

Header								Data								Trail	
STX	ID	RSV	FROM	TO	REG	RSV	LONG	D0	D1	D2	D3	D4	D5	D6	D7	CRC	ETX
2	37	32	60	32	32	32	40	43	48	55	54	53	46	52	51	15	3
Start	ANS	---	28	0	0	---	8	+0765.43								CRC	Stop

Frames 'ERR' (38)

Example - 'Slave' at address '11' replies to the 'Master' (address '0') with an error frame ('ERR' frame) indicating that the requested register number is unknown ('UNKNOWN_REGISTER', error code '1'). The error code is codified into the 'REG' byte. For a list of error code see section 2.4.6.

Header								Trail	
STX	ID	RSV	FROM	TO	REG	RSV	LONG	CRC	ETX
2	38	32	43	32	33	32	32	46	3
Start	ERR	---	11	0	1	---	0	CRC	Stop

Frames 'PING' (32) and 'PONG' (33)

Example - 'Master' (address '0') requests confirmation of existence to the 'Slave' at addrress '22' ('PING' frame) and the 'Slave' replies to the 'Master' with a 'PONG' frame.

Header								Trail	
STX	ID	RSV	FROM	TO	REG	RSV	LONG	CRC	ETX
2	32	32	32	54	32	32	32	52	3
Start	Ping	---	0	22	0	---	0	CRC	Stop

Header								Trail	
STX	ID	RSV	FROM	TO	REG	RSV	LONG	CRC	ETX
2	33	32	54	32	32	32	32	53	3
Start	Pong	---	22	0	0	---	0	CRC	Stop

2.4.8 CRC calculation

The 'frame value' for the CRC byte is calculated applying a XOR function to the 'frame value' *(see section 2.4.5)* of all bytes in sections 'Header' and 'Data', from byte '0' ('STX') to the last data byte ('Dn').

• if the calculated CRC value is lower than '32', it is normalized by applying the 'one's complement' function .

CRC0=STX ^ ID ^ RSV ^ FROM ^ TO ^ REG ^ RSV ^ LONG ^ D0 ^...^ Dn

- if (CRC0<32) -> CRC=!CRC0 (one's complement function)
- if (CRC0>31) -> CRC=CRC0

```
//example of CRC calculation in C language
int8 Calculate_CRC(int8 CRC_Position)
{
 int8 i,CRC=0;
  for(i=0;c<CRC_Position;c++)
  {
     crc=crc ^ frame[i];
  }
 if(crc<32) CRC=~CRC;
 return(CRC);
}
```

2.5 Module S2

Module S2 provides 1 RS-232 ASCII communications port, to install in DPF20 digital panel meters. Protocol specifications are the same as with module S4 *(see section 2.4)*, with only difference that the physical bus is RS-232 instead of RS-485.

S2 modules allow for point-to-point communication over RS-232 and also allow for multinode communication over RS-232 using a 'Daisy-Chain' type of connection.

Terminals RX1 and TX1 are for connection to the RS-232 bus. Terminals RX2 and TX2 are for RS-232 multinode connection. Frames received on RX1 with destination address different than the local instrument's address, will be retransmitted over the TX2 terminal. In a similar way, frames received from RX2 with destination address other than the local address, will be retransmitted over TX1 terminal.

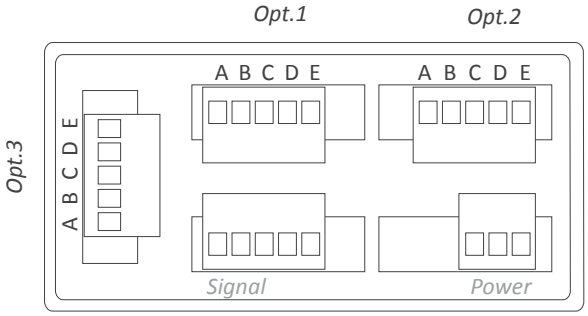
Up to a maximum of 3 S4 modules can be installed in a single instrument, all modules isolated between them and isolated from all other circuits.

Modules S2 can be ordered pre-installed into a DPF20 digital panel meter, or standalone for delayed installation, as they do not require soldering or special configuration.

Option	**S2**
Output type	RS-232 ASCII communication port
Bus	RS-232
Speed	57.6 Kbps to 600 bps
Data format	8n1 (standard), 8o1, 8n2, 8e1
Protocol	ASCII
Architecture	'master - slave'
Addresses	01 to 31
'Broadcast' address	128
Registers	see section *2.4.1*
Isolation	1000 Vdc
Configuration	3 button front keypad
Temperature	operation from 0 to 50 ºC storage from -20 to +70 ºC
Installation allowed at	'Opt.1', 'Opt.2', 'Opt.3'

Module	*Connections*	
 *Module S2 - RS-232 ASCII*	*Terminal A*	*Tx2*
	Terminal B	*Rx2*
	Terminal C	*Tx1*
	Terminal D	*Rx1*
	Terminal E	*GND*

Table 16 - Connection terminals



Rear view DPF20

2.6 Modules R2, R4 and R6

Modules R2, R4 and R6 provide 2, 4 and 6 relay outputs, to install in DPF20 digital panel meters.

Configuration is performed from the frontal keypad of the meter, by setting the parameters at the 'Opt.1' configuration menu (not from the alarm configuration menu ('ALr.1', 'ALr.2' o 'ALr.3') of the instrument).

The menu allows to configure the setpoint, hysteresis, independent activation and deactivation delays, and a second setpoint to create alarm windows.

Only 1 modules R2, R4 or R6 can be installed in a single instrument, as the are not compatible with themselves (2 modules R2 are not accepted) and are not compatible with modules R1, T1 or SSR.

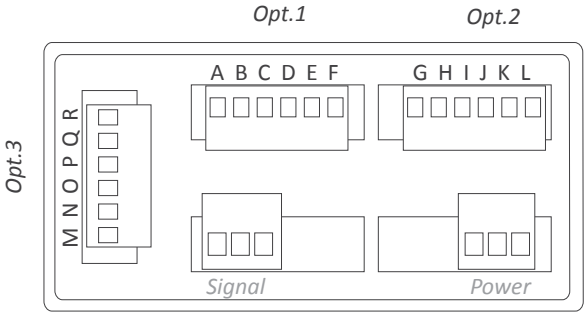
Modules R2, R4 and R6 are isolated against all other instrument circuits.

Modules R2, R4 and R6 can be ordered pre-installed into a DPF20 digital panel meter, or standalone for delayed installation, as they do not require soldering or special configuration.

Option	**R2, R4, R6**
Output type	relay (2, 4 and 6 relays)
Relay type	3 contacts (NC, NO, common)
Maximum current	6 A per relay (resistive load)
Maximum voltage*	250 Vac continuous
** terminals approved for 300 V (as per UL1059, groups B and D) and 160 V (as per VDE at CAT-III and pollution degree 3).*	
Isolation	2500 Veff
Type of terminal	plug-in screw terminal pitch 5.08 mm
Installation allowed at	'Opt.1'
Module R2	occupies Opt.1 (2 relays)
Module R4	occupies Opt.1 and Opt.2 (4 relays)
Module R6	occupies Opt.1, Opt.2 and Opt.3 (6 relays)

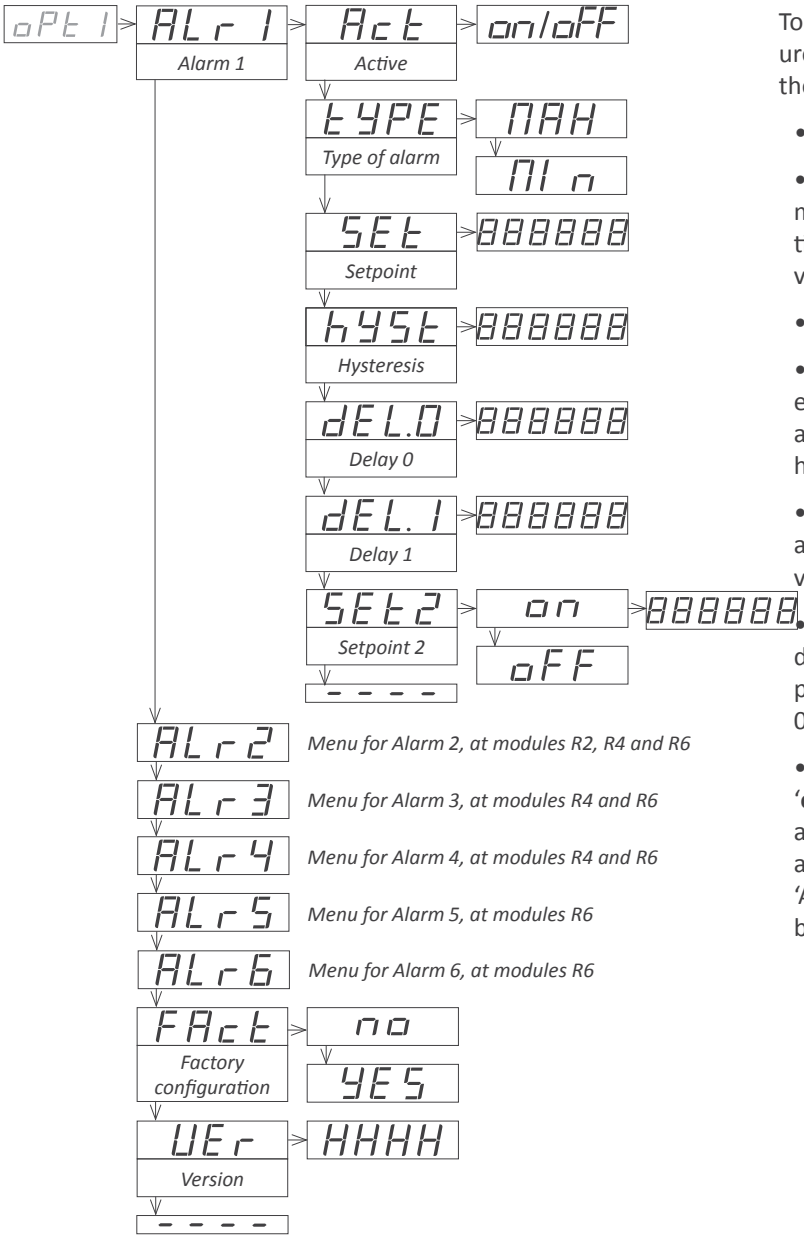
Relay	*Common*	*Normally Open (NO)*	*Normally Closed (NC)*
relay 1	*A*	*B*	*C*
relay 2	*D*	*E*	*F*
relay 3	*G*	*H*	*I*
relay 4	*J*	*K*	*L*
relay 5	*M*	*N*	*O*
relay 6	*P*	*Q*	*R*

Table 17 - Connection terminals



Rear view DPF20

2.6.1 Configuration menu



To configure alarm 1, access the '**Alarm 1**' ('**ALr1**') menu and configure the following parameters : To configure alarms 2, 3, etc, access the corresponding menu entries.

- select '**Active**' ('**Act**') to '**on**'
- at '**Alarm type**' ('**TypE**') select the maximum alarm ('**MAX**') or minimum alarm ('**MIn**'). The maximum alarm (or type alarm) activates when display value is higher (or lower) than the setpoint value.
- at '**Setpoint**' ('**SEt**') enter the alarm activation value.
- configure the hysteresis value at '**Hysteresis**' ('**hySt**'). The hysteresis applies to the deactivation process of the alarm. The alarm deactivates when the reading has passed the setpoint value plus the hysteresis value.
- at '**Delay 0**' ('**dEL.0**') assign the delay to be applied before alarm activation. The activation delay starts counting when the setpoint value is passed. Configurable from 0.0 to 99.9 seconds.
- at '**Delay 1**' ('**dEL.1**') assign the delay to be applied before alarm deactivation. The deactivation delay starts counting when the setpoint value plus the hysteresis value, is passed. Configurable from 0.0 to 99.9 seconds.
- to activate the second setpoint, activate '**Setpoint 2**' ('**SEt2**') to '**on**' and then configure the desired setpoint value. Second setpoint allows for windowed alarms. The first setpoint activates the alarm, and the second setpoint deactivates the alarm (configuration for 'Alarm as maximum' type of alarm). Second setpoint must always be higher in value than the first setpoint.

2.6.2 Factory configuration

Factory configuration for alarms 1, 2, 3, 4, 5 and 6

'Active	on'
'Type	de maxima'
'Setpoint 1	1000'
'Setpoint 2	2000'
'Setpoint 3	3000'
'Setpoint 4	4000'
'Setpoint 5	5000'
'Setpoint 6	6000'
'Hysteresis	0 counts'
'Activation delay	0.0 counts'
'Deactivation delay	0.0 seconds'
'Setpoint 2	Off'

3. How to open and close

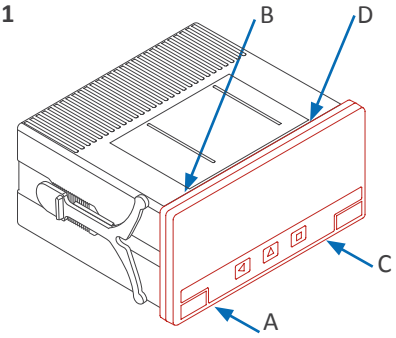
3.1 How to open the housing

A. Locate the clips

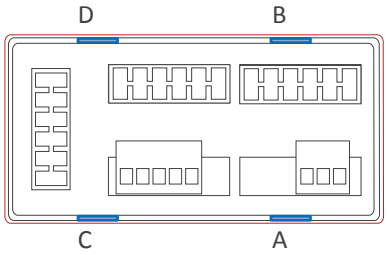
Locate the 4 clips (A B C D). Clips are covered by the front filter.

Clips can be seen when looking from the rear of the instrument, just below the front filter.

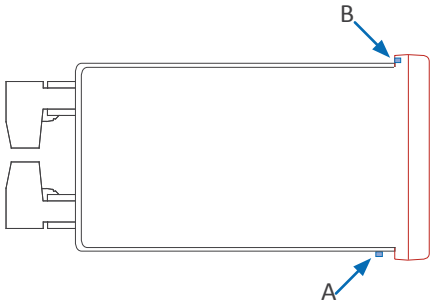
A.1



A.2



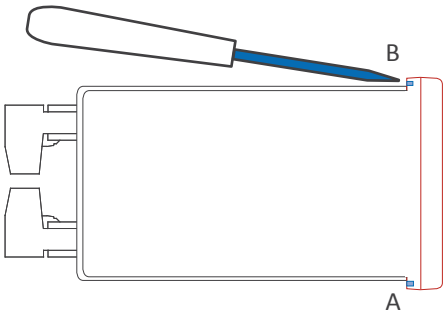
A.3



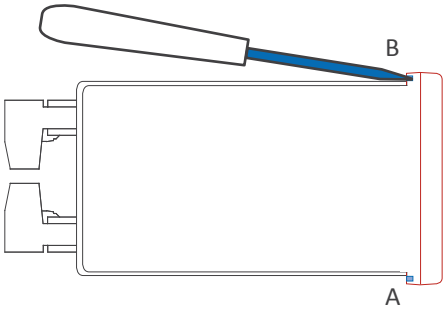
B. How to unclip one clip

Place a flat screw driver at the first clip. Insert firmly until the end of the clip space, and then turn gently the screwdriver clockwise approx. 45º (while still pushing against the clip). The front filter will 'move up' and unclip itself. Clip is unclipped when the front filter corner moves slightly to the front.

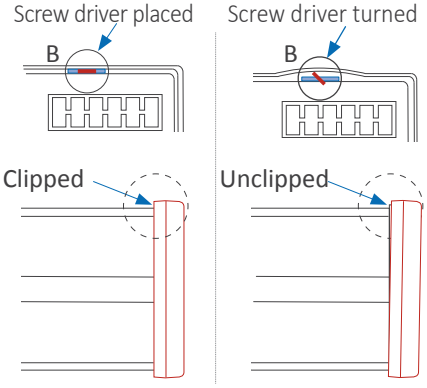
B.1



B.2



B.3

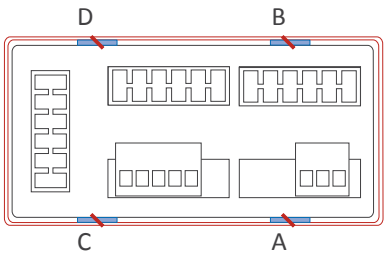


C. Repeat with all clips

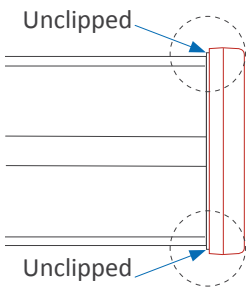
Repeat for remaining 3 clips. All 4 clips are now unclipped.

Front filter is slightly moved to the front on each corner. It can now be removed by hand.

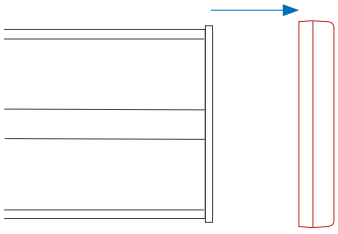
C.1



C.2



C.3

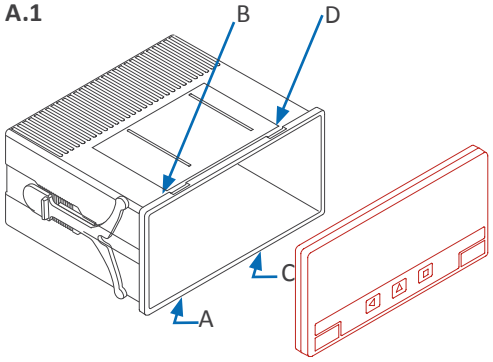


3.2 How to close the housing

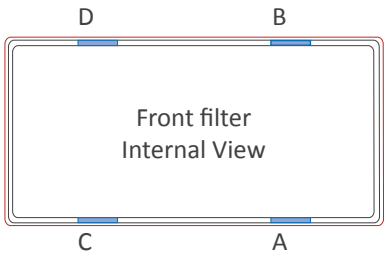
A. Locate the clips

Locate the 4 clips (A B C D) at the housing (image A.1) and the 4 matting clips at the filter (image A.2). With the instrument inside the housing, face the front filter against the housing (do not clip yet). Do not press the rear terminals with your hand, as the instrument would force the filter outwards.

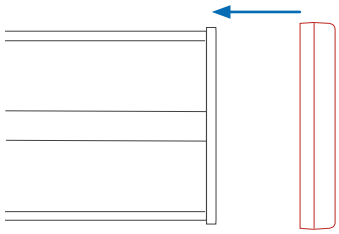
A.1



A.2



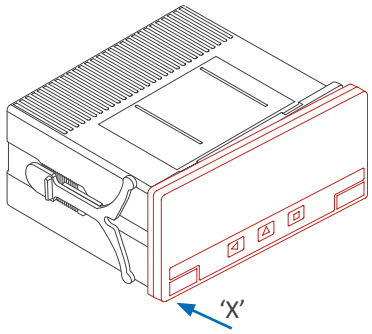
A.3



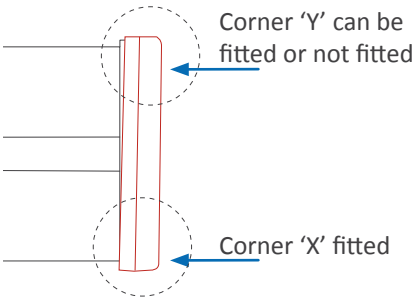
B. Fit corner ‘X’ and clip ‘A’

Fully insert corner ‘X’ into the housing. See at image B.2 that the filter is not yet clipped : only corner ‘X’ is completely fitted. Corner ‘Y’ can be also fitted or not fitted (it is not important). With corner X fitted and firmly pressed (it must remain fitted), press clip ‘A’ and it will clip (you will hear a clear ‘snap’).

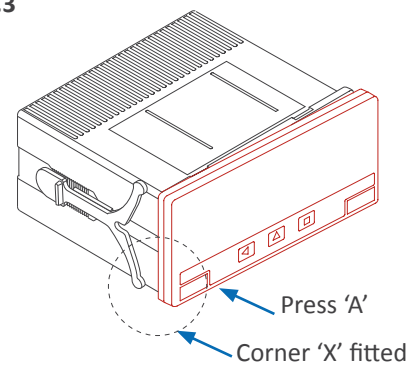
B.1



B.2



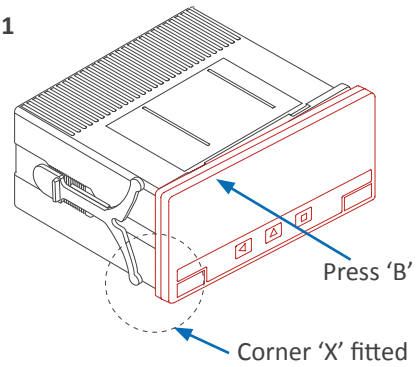
B.3



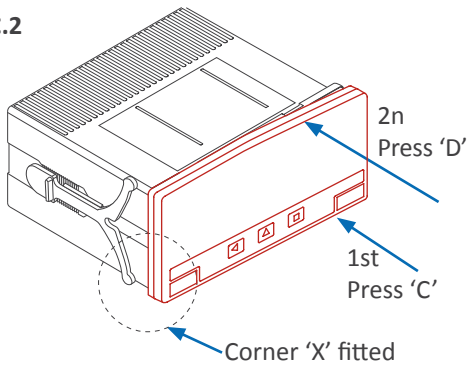
C. Clip remaining clips ‘B’, ‘C’ & ‘D’

Still press firmly corner ‘X’ until all four clips are clipped. You can release your finger from clip ‘A’ as clip ‘A’ will not unclip once it is clipped. Press on clip ‘B’ until it clips (you will hear a clear ‘snap’). Then press on clips ‘C’ and ‘D’ (you will hear a clear ‘snap’ on each case).

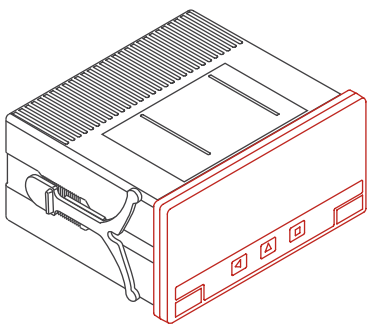
C.1



C.2



C.3



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