



## Series C . C60-FL-RA

**OEM**  
APPLICATIONS  
YOUR METER !

### Flowmeter

PANEL METERS. OEM APPLICATIONS

*Digital panel flow meter, with instant and total flow readings. Accepts impulse signals NPN, PNP, pick-up (mVac), reed switch, mechanical contact, push-pull, and others. Standard 96 x 48 mm size (1/8 DIN). Scalable reading with 6 digits (999999 / -199999). Provides excitation voltage 15Vdc (@50mA). 'Fast access' function to alarm setpoint, front and rear reset for total flow, rear control to switch reading values, 'Eco' mode for low consumption, 5 levels of configurable brightness. Single universal power supply 18 to 265 Vac/dc. With 1 relay output and 4/20mA isolated analog output retransmission.*

# 1. Flowmeter C60-FL-RA

## Flowmeter for 96x48 mm panel mount

Digital panel flow meter in 96 x 48 mm size (1/8 DIN), for OEM applications. Accepts NPN, PNP, pick-up (mVac), reed switch, mechanical contact, and custom signals. Scalable reading with 6 digits up to 999999 / -199999 and configurable decimal point. Provides excitation voltage +15 Vdc (@50 mA). One alarm, configurable as maximum or minimum, with hysteresis and setpoint, controlling one relay output. Includes a 4/20 mA isolated analog output for signal retransmission.

Front protection IP65. Connections with plug-in screw terminals.

Instrument designed for industrial use, highly flexible, allows for integration in multiple applications, reduced cost and excellent quality.

- ‘Fast access’ menu at front key ‘UP’ (▲) configurable for fast access to alarm setpoint (see section 1.12).
- ‘Eco’ mode reduces power consumption (see section 1.14).
- Simplified and flexible scaling configuration (see section 1.10).
- Rear controls for reset (see section 1.11).
- Rear control to switch instant and total readings (see section 1.11).
- 5 configurable brightness levels (see section 1.17.8).

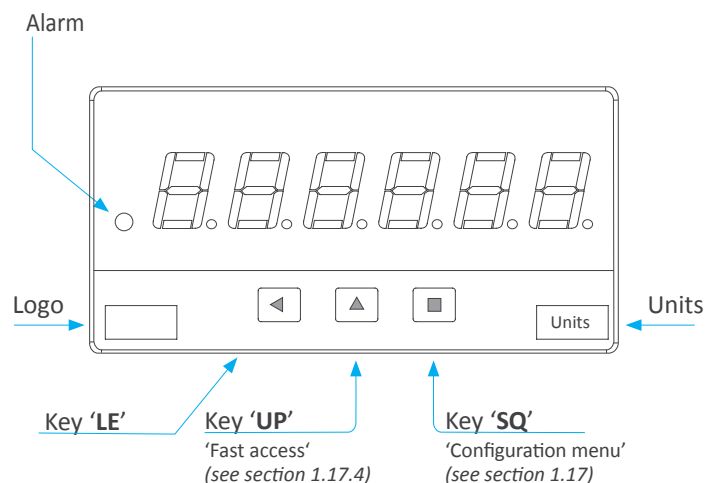
### 1.1 How to order

Series	Model	Version
C60	FL	RA

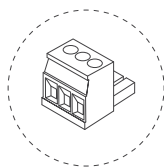
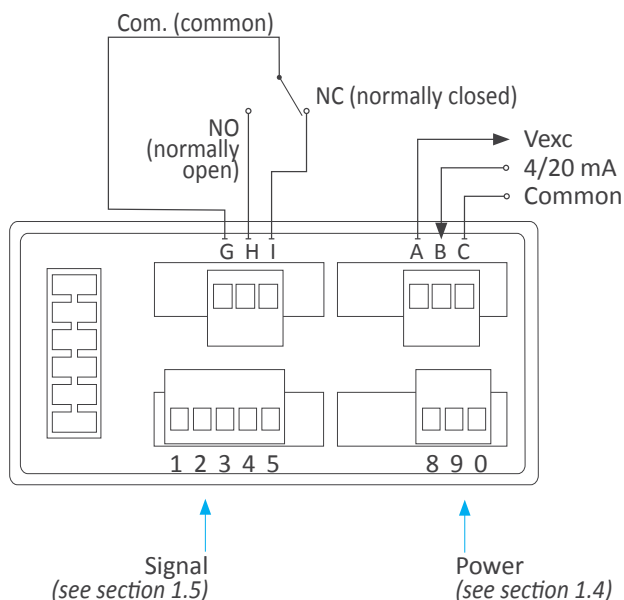
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## 1.2 Front view



## 1.3 Rear view and connections



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

### Connections for analog output

For an active 4/20 mA loop, connect terminal A ('Vexc +15 Vdc') as current output and terminal B ('Signal in mA') as return of current.

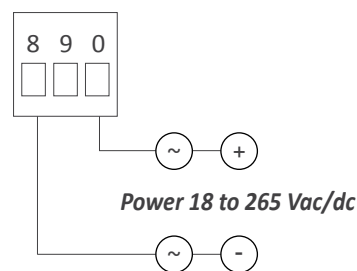
For a passive 4/20 mA loop, connect terminal B ('signal in mA') as current output and terminal C ('GND') as return of current.

## 1.4 Power connections

Earth connection - The instrument does not need earth connection for correct operation nor for compliance with security regulations.

Fuse - This instrument has not internal fuse. Conforming to security regulation 61010-1, add a protection fuse to the power line to act as disconnection element, easily accessible to the operator and identified as a protection device.

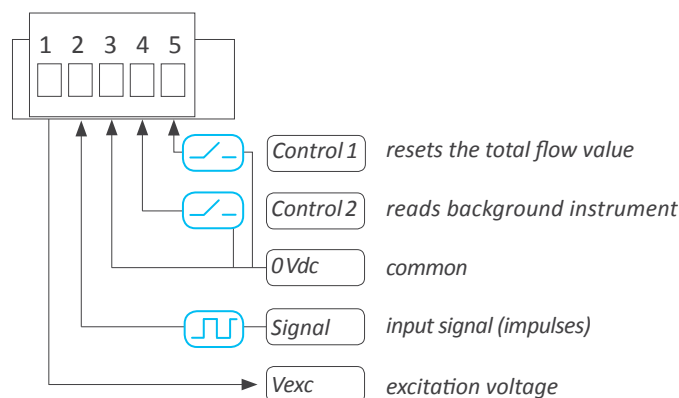
- 250 mA time-lag for power voltage > 50 Vac/dc
- 400 mA time-lag for power voltage < 50 Vac/dc



## 1.5 Signal connections and rear controls

Rear terminal to connect input signal and controls.

- Control 1 : shortcircuit terminals 'control 1' and 'common' to reset the value of the total flow counter. Reset is active while 'control 1' is active.
- Control 2 : shortcircuit terminals 'control 2' and 'common' to read on display the background instrument value (see section 1.9). Background instrument value remains on display while 'control 2' is active.
- Vexc : +15 Vdc excitation voltage is available (max. 50 mA).
- Signal : input signal terminal (impulses). See section 1.13 for different sensor configurations.
- Common : common terminal.



## 1.6 Installation and start-up

1. Connect the input signal and the power supply as indicated at sections 1.4 and 1.5.
2. Decide which will be the active instrument (see section 1.9).
3. Check the type of signal provides your flow meter, and the 'K factor' value
4. Configure the main instrument, the signal type, and the 'K factor' at the 'Instrument main configuration' ('c.Ins') configuration section (see section 1.17.1).
6. Configure the alarm (see section 1.17.2).
7. Configure the 'fast access' menu (see section 1.17.4).
8. Configure the 'key left' functions (see section 1.17.5).
9. Configure the analog output board (see section 1.17.3)).

For a configuration example, see section 1.19.

## 1.7 Technical specifications

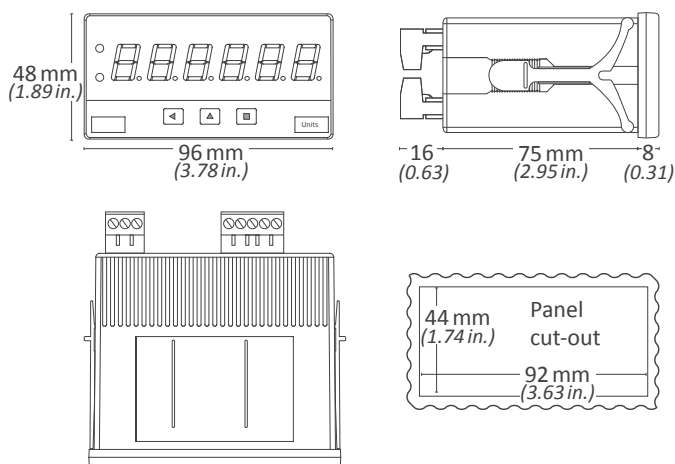
<b>Digits</b>	
number of digits	6
led	7 segments led
color	red
height	14 mm
<b>Reading</b>	
max. reading	999999
min. reading	-199999
decimal point	configurable X.X.X.X.X.X
overrange / underrange	rate reading flashes total flow configurable to flash or reset (see section 1.17.8)
display refresh	15 times / second
value refresh	each time an impulse is detected
memory retention	yes, retains values in case of power loss
<b>Signals accepted</b>	
	NPN, PNP, pick-up*, push-pull, mechanical, reed, ... (*minimum 10 mVac RMS)
<b>Max. Vdc at input</b>	
	±30 Vdc
<b>Input impedance</b>	
	4.4 KOhms with pull-up or pull-down resistor, 120 KOhms without pull resistor
<b>Accuracy of the quartz</b>	
	±0.01 %
<b>Thermal drift</b>	
	20 ppm / °C
<b>Excitation voltage</b>	
	+15 Vdc (max. 50 mA)
<b>Frequencies</b>	
maximum frequency	500 Hz
minimum frequency	1 / 'Gate' (see section 1.17.7) (0.06 Hz)
<b>Power supply</b>	
power 'U'	18 to 265 Vac/dc
isolation	1500 Veff (isolation tested for 60 seconds)
AC frequency	50/60 Hz
consumption (without 'Eco')	<2.5 W
consumption (with 'Eco')	<1.5 W
Power wires	1 mm <sup>2</sup> to 2.5 mm <sup>2</sup> (AWG17 to AWG14)
<b>Configuration</b>	
	3 front push buttons
<b>Front protection</b>	
	IP65
<b>Analog output</b>	
output signal	4/20 mA active and passive output is proportional to the reading scalable with positive and negative slopes connect terminal A (+15 Vdc) and B (mA) max. load resistance $R_L < 350$ Ohms
active output	connect terminal C (Gnd) and B (mA) max. load resistance $R_L < 700$ Ohms
passive output	
accuracy	<0.5% FS
response time	<100 mSec. + meter response time
isolation	1000 Vdc
type of terminal	plug-in screw terminal, pitch 5.08 mm
<b>Relay output</b>	
type of relay	3 contacts relay (NC, NO, common)
current maximum	8 A (resistive load)
voltage maximum*	250 Vac continuous
isolation	2500 Veff
type of terminal	plug-in screw terminal, pitch 5.08 mm
<b>Mechanical</b>	
mounting	panel
connections	plug-in screw terminals

housing material	ABS, polycarbonate (V0)
weight	<150 grams
front size	96 x 48 mm (1/8 DIN)
panel cut-out	92 x 44 mm
deep	91 mm (including terminals)
<b>Temperature</b>	
operation	from 0 to +50 °C
storage	from -20 to +70 °C
'warm-up' time	15 minutes
<b>Shipment</b>	
packaging	120 x 114 x 51 cm carton box
material included	1x instrument C60-FL-RA 1x signal terminal 1x power terminal 1x relay terminal 1x analog output terminal 1x set of units (see section 3.6) 1x 'Quick installation guide'

Table 1 | Functions included

Function	Description	Section
Fast access	to alarm setpoint	1.12
Rear controls	reset of total flow switch readings between main and secondary instruments	1.11
'Eco' mode	reduced consumption	1.14
Alarm	setpoint hysteresis set as max or min type 'on alarm' functions	1.17.2
Simplified scaling	'K factor'	1.10
Password	blocks configuration	1.17.8
Display brightness	5 levels	1.17.8

## 1.8 Mechanical dimensions (mm / inch)



## 1.9 Rate and total flow

The instrument accepts impulses from a flow meter, and can be configured to read rate and total flow. The main reading (instant or total flow, usually the rate) is configurable while the background reading (instant or total flow, usually the total flow) is accessible by controlling the state of a rear control (see section 1.11) or through the key 'LE' (◀) 'key left' functions (see section 1.17.5).

## 1.10 Scaling

Flow meter '*K factor*' (see your flowmeter datasheet) can be introduced in the main configuration section '**Instrument conf**' ('c.InS') (see section 1.17.1). There is an independent '*K factor*' parameter for the instant and total flow calculations. '*K factor*' is usually expressed in [impulses/liter] units.

### Rate meter

The instrument will adjust the resolution of the reading, according to the decimal point position selected for the rate meter.

### Total flow meter

The instrument will adjust the resolution of the reading, according to the decimal point position selected for the total flow meter.

The total flow '*reset*' function can be activated by controlling the state of a rear contact (see section 1.11) or through the front key 'LE' (◀) (see section 1.17.5).

## 1.11 Rear controls

The instrument provides two rear controls for remote activation of functions (see section 1.5) :

- '*control 1*' to read the actual value of the background instrument (see section 1.9). The value remains on display as long as '*control 1*' is active
- '*control 2*' to reset the value of the total flow counter (see section 1.9). The reset remains active as long as '*control 2*' is active. Parameter '**Reset on display**' ('rod') set to '**on**' (see section 1.17.8) forces the total flow value to be on display in order to the reset to be applied. If parameter '**Reset on display**' ('rod') set to '**off**' all reset orders will be applied, even if the total flow value is not on display

## 1.12 'Fast access' menu

The '*fast access*' menu provides the operator with a fast and direct access to alarm setpoint, without accessing the standard configuration menu. The '*fast access*' menu is accessible through the front key 'UP' (▲).

The '*fast access*' menu is configurable, and access for each function can be enabled or disabled. If only 1 function is enabled, pushing front key 'UP' (▲) directly access the function value.

To configure the '*fast access*' menu see section 1.17.4.

## 1.13 Sensor configuration

The flowmeter provides a train of impulses, and the frequency of this train of impulses is proportional to the rate. The instrument must be configured to detect the specific type of impulses provided by your flowmeter.

At the '**Instrument configuration**' ('c.InS') section (see section 1.17.1), '**Sensor**' ('SnSr') parameter, select one of the following values:

- select '**PNP signal**' ('PnP') value to activate the '*pull-down*' resistor needed for PNP signals.
- select '**NPN signal**' ('nPn') value to activate the '*pull-up*' resistor needed for NPN signals.
- select '**Pick-up**' ('PcK.P') value to activate a '*x100*' internal gain, needed for '*pick-up*' signals and signals down to 10 mVac (RMS).
- select '**Other sensors**' ('othr') value to deactivate the '*pull-up*' and '*pull down*' resistors, and deactivate the internal '*x100*' gain.

For '*push-pull*' signals select the '**Other sensors**' value.

For mechanical contact and '*reed*' contact signals, select the '**PNP**' or '**NPN**' to activate the appropriate pull resistor, depending on your contact connections.

Configurable '*antirrebound filters*' and '*trigger level*' parameters are available at the '**Advanced Sensor**' ('Ad.Sr') section of the configuration menu (see section 1.17.7).

The '*trigger level*' parameter is set by default to a value of 15 (aprox. 2 Vdc). This means that signals below 2 Vdc are considered '0', and signals above 2 Vdc are considered '1'. The '*trigger level*' value can be modified up to a value of '31' (aprox. 4 Vdc) or down to '0' (0 Vdc).

Located at the left of the '*trigger level*' value there is a vertical led, called the '*trigger sense led*'. This led will be at the '*top*' position when the input signal is detected as a '1' (above trigger level) and it will be at the '*bottom*' position when the input signal detected is a '0' (below trigger level). Use the '*trigger sense led*' to detect the best value for your trigger level. When the '*trigger sense led*' moves up and down continuously, it indicates that impulses are being detected.

## 1.14 'Eco' mode

The '*Eco*' mode reduces the consumption of the instrument down to 1.5 W. The '*Eco*' mode turns off the display, while the right decimal point remains flashing gently on and off, showing that the instrument is running on the background.

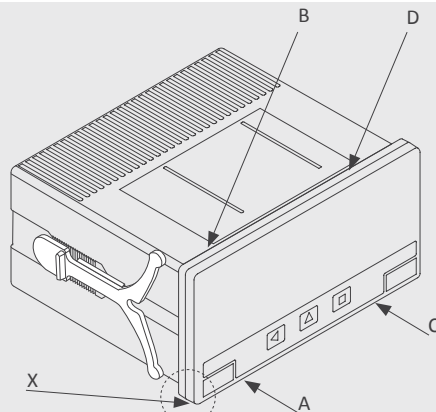
Display will turn on when an alarm activates, when the operator presses any of the front keys or when the rear controls activate. If no alarms are active, and there is no interaction from the operator, the instrument will turn off the display. The waiting time before display turns off is configurable from 5 to 255 seconds.

To configure the '*Eco*' mode see the configuration menu at '**Tools**' \ '*Eco*' (see section 1.17.8).

## 1.15 To open the instrument

To open the housing and access the internal circuits, use a flat screwdriver to unlock clips 'D', 'C', 'B' and 'A', in this order. Remove the front filter. Let the inside of the instrument slide out of the housing.

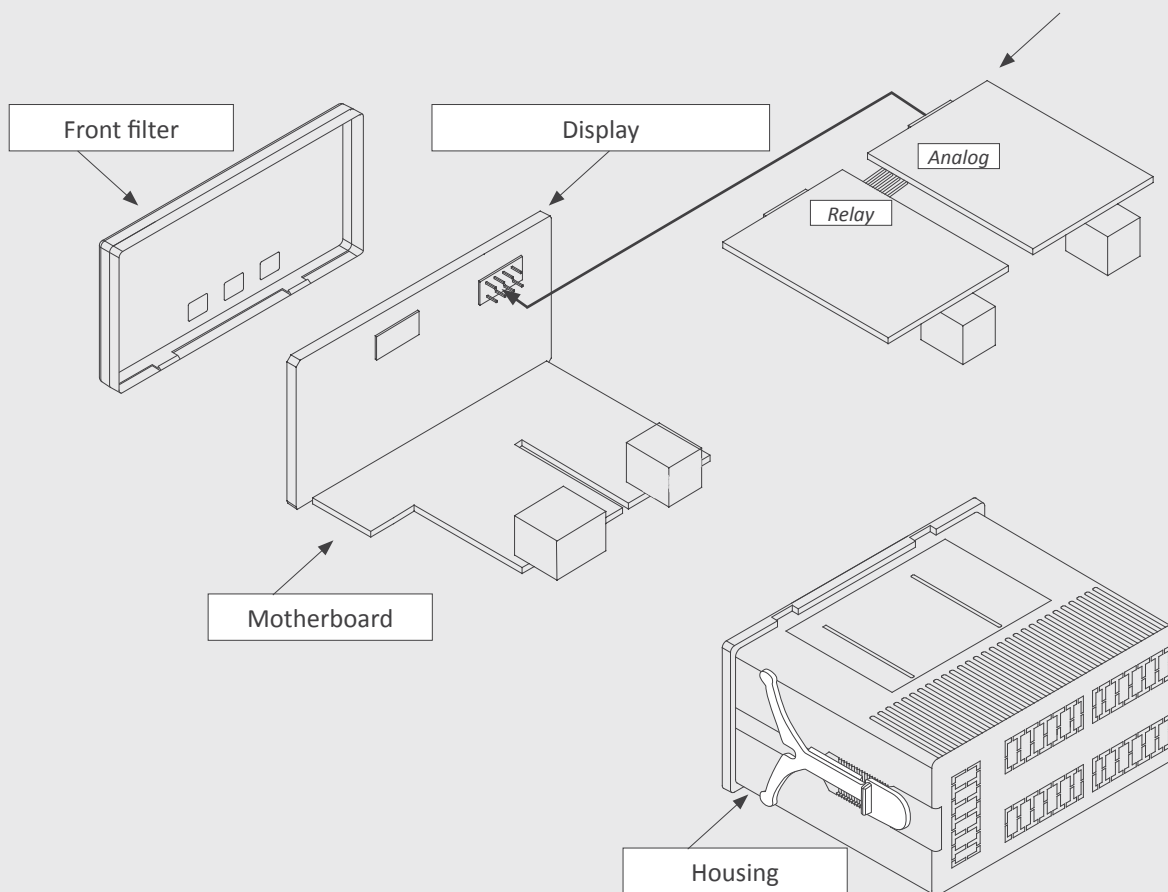
To reinsert the instrument make sure that all modules are correctly connected to the pins on the display module. Place all the set into the housing, assuring that the modules correctly fit into the internal guiding slides of the housing. Once introduced, place again the front filter at cover 'X', and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



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

*Observe precautions for handling ESD (electrostatic discharge) sensitive devices*

The internal structure of the instrument is shown in the graphic below.



## 1.16 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 1.17, and for a full view of the 'configuration menu' structure see section 1.18.

### '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 1.17.4 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

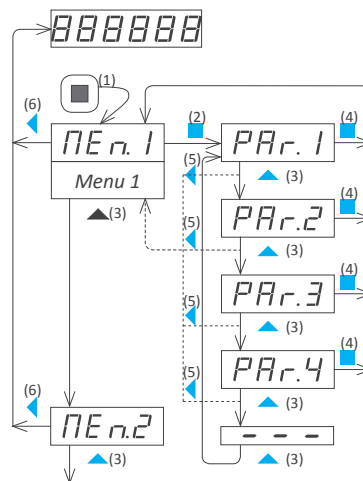
**Key 'SQ' (■)** - press the 'SQ' (■) key for 1 second to access the 'configuration menu'. Inside the menu, the 'SQ' (■) key functions as a 'ENTER' key. It selects and accesses the menu option currently displayed. At menus with numerical value entries, it validates the number displayed.

**Key 'UP' (▲)** - the 'UP' (▲) key gives access to the 'fast access' menu. Inside the menu, 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 menu, 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.



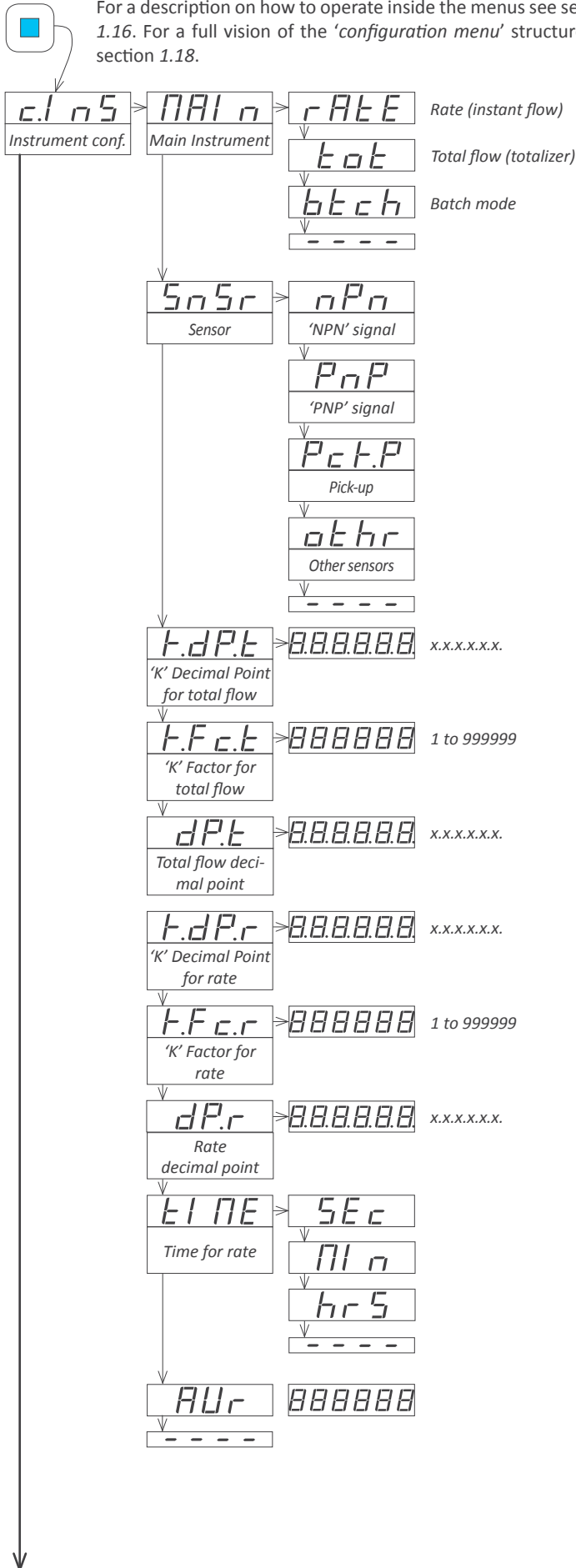
*Note: example indicated above is for information purposes only, and may not match with the actual menu entries of the instrument.*

Example of operation inside the 'configuration menu'.

1. The 'SQ' (■) key enters into the 'configuration menu'.
2. The 'SQ' (■) key enters into the 'Menu 1' option menu.
3. The 'UP' (▲) key moves through the menu parameters.
4. The 'SQ' (■) key selects the desired range and returns to the 'Menu 1' 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.

## 1.17 Configuration menu

Press 'SQ' (■) for 1 second to access the 'configuration menu'. For a description on how to operate inside the menus see section 1.16. For a full vision of the 'configuration menu' structure see section 1.18.



### 1.17.1 Instrument main configuration

At the 'Instrument conf.' ('c.Ins') menu entry, configure the basic parameters of your flow meter. Define the function for the 'main instrument', choose between rate meter ('instant flow') or total flow meter ('totalizer') (see section 1.9). The 'background instrument' is automatically configured for the non selected function. The 'main instrument' is the active instrument on display. To access the value of the 'background instrument' use key 'LE' (▲) (see section 1.17.5) or use the rear 'control1' (see section 1.11).

- at 'Main instrument' ('MAIn') select 'rAtE' to set the main instrument as rate meter ('instant flow'), and the background instrument as a total flow meter ('totalizer'). Select 'tot' to configure the main instrument as a total flow meter ('totalizer') and the background instrument as a rate meter ('instant flow'). Select 'btch' to activate the 'batch mode' (see section 1.27).

Usual flow meters provide NPN or PNP type of signal. Select the 'NPN' or 'PNP' to activate internal pull-up or pull-down resistors. For pick-up signals select the 'Pick-up' to activate internal gain. For more information on configuration parameters related to signal detection, see section 1.13'.

- at 'Sensor' ('SnSr') select 'PNP' for PNP signals (pull-up resistors needed by PNP signals are internally enabled) or select 'NPN' for NPN signals (pull-down resistors needed by NPN signals are internally enabled). Select 'PcKP' for pick-up and mVac signals. Select 'otHR' to deactivate pull-up and pull-down resistors, and the 'x100' gain

Usual flow meters provide a 'K factor' parameter. 'K factor' is a numerical value that relates impulses to volume (for example, 1.23456 impulses/liter). To enter 'K factor' value, select first the position of the decimal point for the 'K factor', then enter the 'K factor' value. There are independent 'K factor' parameters for the total flow and for the rate instruments.

- at 'K' Decimal Point for total flow' ('K.dP.t') select the decimal point position for the 'K factor' parameter for the total flow counter. By default the 'K' decimal point position is 'XX.xxxx', and 'K factor' parameter can range from '00.0001' up to '99.9999'. Place decimal point at 'X.xxxxx' for a 'K factor' parameter ranging from '0.00001' to '9.99999'.
- at 'K.Fc.t' ('K' factor for total flow') introduce the numerical value of the 'K factor', that applies to the total flow counter. Configure the number of decimal needed at the previous 'K Decimal Point for total flow' parameter.
- at 'total flow decimal point' ('dP.t') select the number of decimals to read. This is not a 'dummy' decimal point. Changing the decimal point position enables more or less resolution digits on display (see section 1.25).
- at 'K' Decimal Point for rate' ('K.dP.r') select the decimal point position for the 'K factor' parameter for the rate meter (see the previous parameter 'K.dp.t' for the total flow, for additional information)
- at 'K' factor for rate' ('K.Fc.r') introduce the numerical value of the 'K factor', that applies to the rate meter.

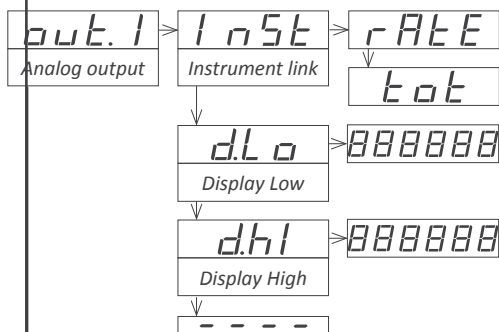
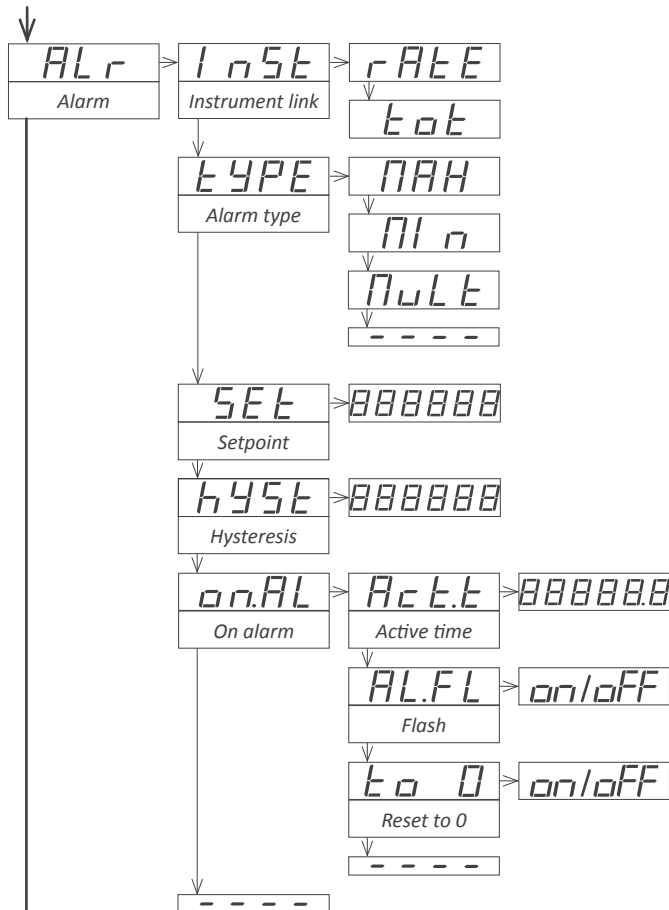
- at 'rate decimal point' ('dP.r') select the number of decimals to read. This is not a 'dummy' decimal point. Changing the decimal point position enables more or less resolution digits on display (see section 1.25).

- at 'Time for rate' ('tIME') select the time scale for the ratemeter in 'seconds', 'minutes' or 'hours'.

- at 'Average filter' ('AVr') configure the recursive filter that applies only to the rate reading. Select the strength for the recursive filter between '0' (filter disabled) and '100' (strongest value).



## 1.17 Configuration menu (cont.)



### 1.17.2 Alarms configuration

The instrument alarm is configurable from the 'ALr' menu entry. The alarm controls the activation of the relay and the activation of the front led.

The alarm must be linked either to the rate meter ('instant flow') or to the total flow meter ('totalizer'), and it activates when the reading of the instrument is higher than the setpoint (maximum alarm) or lower than the setpoint (minimum alarm).

The hysteresis applies only to alarm deactivation, and is entered in counts of display.

- at 'Instrument link' ('InSt') select 'rAtE' to link the alarm to the rate meter ('instant flow') or select 'tot' to link the alarm to the total flow meter ('totalizer').
- at 'Alarm type' ('tYPE') select alarm as a maximum type alarm ('MAX') or a minimum type alarm ('Min'). The 'multiples' ('MuLt') alarm is only available at the 'batch mode' (see section 1.27).
- at 'Setpoint' ('SEt') enter the value for the alarm activation point. This parameter is eligible for configuration through the 'Fast access' menu (see section 1.17.4).
- at 'Hysteresis' ('hYSt') configure the hysteresis value. 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.

Additionally, there are several functions that can be linked to the activation of each alarm.

At the 'On alarm' ('on.AL') menu entries configure the functions that will activate when the alarm activates. Configured functions will be applied sequentially in the order shown on this menu.

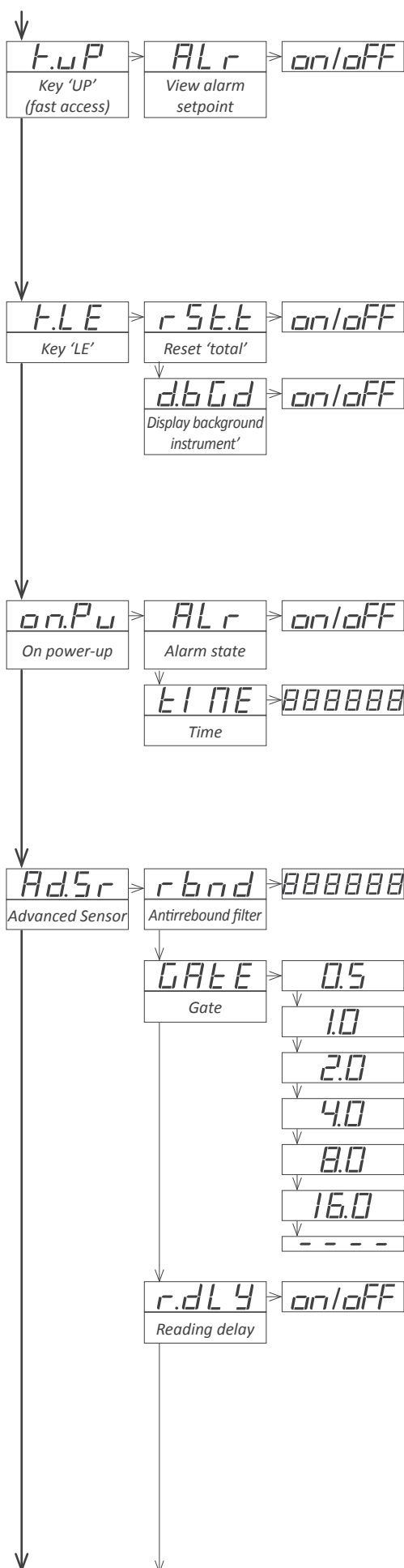
- at 'Active time' ('Act.t') configure the deactivation delay (in seconds). The alarm will remain active for, at least, the configured time. After this time, the alarm status depends on the reading and setpoint values. Value from '0.0' to '99.9' seconds. For example, assign the alarm to the total flow meter, and when reaching a value of 50.000, reset the total flow meter but maintain the alarm at least for 10 seconds to activate a remote valve.
- at 'Flash' ('AL.FL') configure 'on' to force flashing display when alarm is active (visible only if the instrument is active on display). Display flash will not apply inside the configuration menu or the 'fast access' menu.
- the 'to\_0' applies only if the instrument linked to the alarm is the total flow meter ('totalizer'). Configure to 'on' to set the instrument value to '0' when alarm activates. Applies only when alarm activates, not while alarm is active.

### 1.17.3 Analog output

At the 'Analog output' ('out.1') menu configure the 'analog output'. The analog output module provides a 4/20 mA isolated signal, proportional to either the rate value or the total flow value.

- at 'Instrument link' ('InSt') select 'rAtE' to link the rate value to the analog output or 'tot' to link the total flow value to the analog output.
- at 'Display Low' ('d.Lo') configure the reading value that is associated to the 4 mA output signal.
- at 'Display High' ('d.hi') configure the reading value that is associated to the 20 mA output signal.

## 1.17 Configuration menu (cont.)



### 1.17.4 Fast access menu

The key 'UP' (▲) at the front of the instrument gives access to a list of functions configurable by the operator. See section 1.16 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 when pressing the front key 'UP' (▲). Select 'on' to activate the function.

- the 'Setpoint' (ALr) function allows to visualize and modify the alarm setpoint value easily.

### 1.17.5 Key 'LE' functions

The front key 'LE' (◀) can be configured to activate a set of functions when pressed. Select to 'on' the functions to activate.

- function 'Reset total' (rSt.t) applies a reset to the total flow meter ('totalizer').
- function 'Display background instrument' (d.bGd) activates on display the value of the background instrument (see section 1.9), while the key is pressed.

### 1.17.6 On power-up function

Configure the alarm state when the instrument powered-up (after a power loss).

- select 'Alarm state' (ALr) to 'on' to start the instrument with the alarm active, or 'off' to activate with the alarm inactive.
- at 'Time' (time) select the number of seconds the alarm state will be forced by the power-up function. After this time, the alarm will activate or deactivate according to the alarm configuration and reading value.

### 1.17.7 Advanced sensor configuration

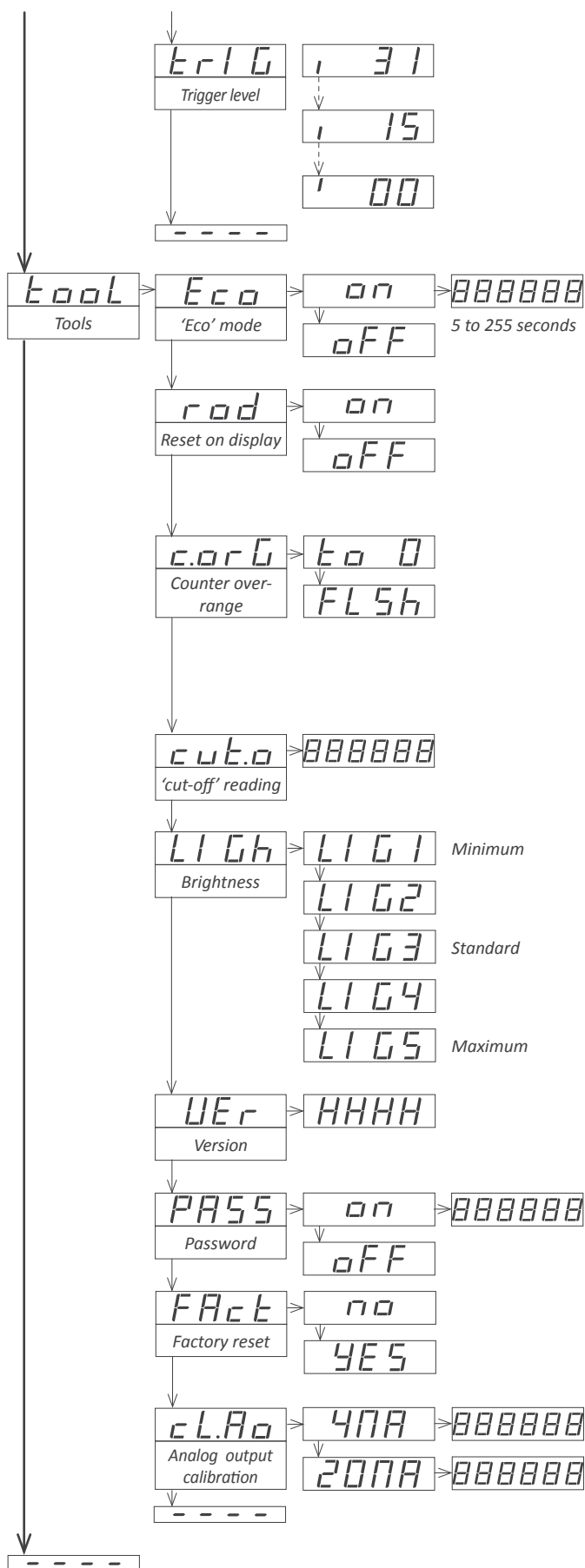
The 'Advanced Sensor' ('Ad.Sr') configuration menu includes tools to configure detection parameters, from sensors different from those listed at the 'Instrument conf.' section (see section 1.17.1).

- at 'Antirrebound filter' (rbnd) select a time in milliseconds. After a valid impulse has been detected, the detection of new impulses is disabled for the duration of the configured time. Use to prevent detection of rebounds. A 100 milliseconds value is considered a usual value to filter rebounds when using mechanical contact signals.
- at 'Gate' (GAtE) configure a time in seconds. This time applies to the rate meter ('instant flow'). The instrument recalculates the rate and total flow values each time a new impulse is detected. If the configured time has passed and no impulse has been detected, the instrument considers that the rate is '0'. Also, after the instrument start-up, the first rate measurement is updated after the configured time.

*Example : select '1.0' seconds to force the rate reading to '0' after 1 second without impulses. Also the first rate reading after a start-up of the instrument, will take 1 second, independent of the number of impulses received. After 1 second, the value will be updated with each new impulse received.*

- the 'Reading delay' ('r.dLY') parameter applies to the instant flow meter ('ratemeter') and default value is 'off'. Value 'on' modifies the standard reading update rate of the instrument (at each impulse received). The reading is now updated at the rate configured at 'Gate' parameter (each 0.5 seconds, each 1 second, etc) and the reading value is the average value for the configured time. This parameter is to be used in case of unstable, fast changing readings.

## 1.17 Configuration menu (cont.)



- at 'Trigger level' ('trIG') parameter press key 'UP' (▲) to increase the value (up to 31) or press key 'LE' (◀) to decrease (down to 0). Default value is '15'. The 'trigger sense led' on the left, indicates the actual status of the signal detected (up '1', down '0'). Empirically locate the appropriate trigger level for your signal (the 'trigger sense led' moves up and down with your signal). See section 1.13 for more information.

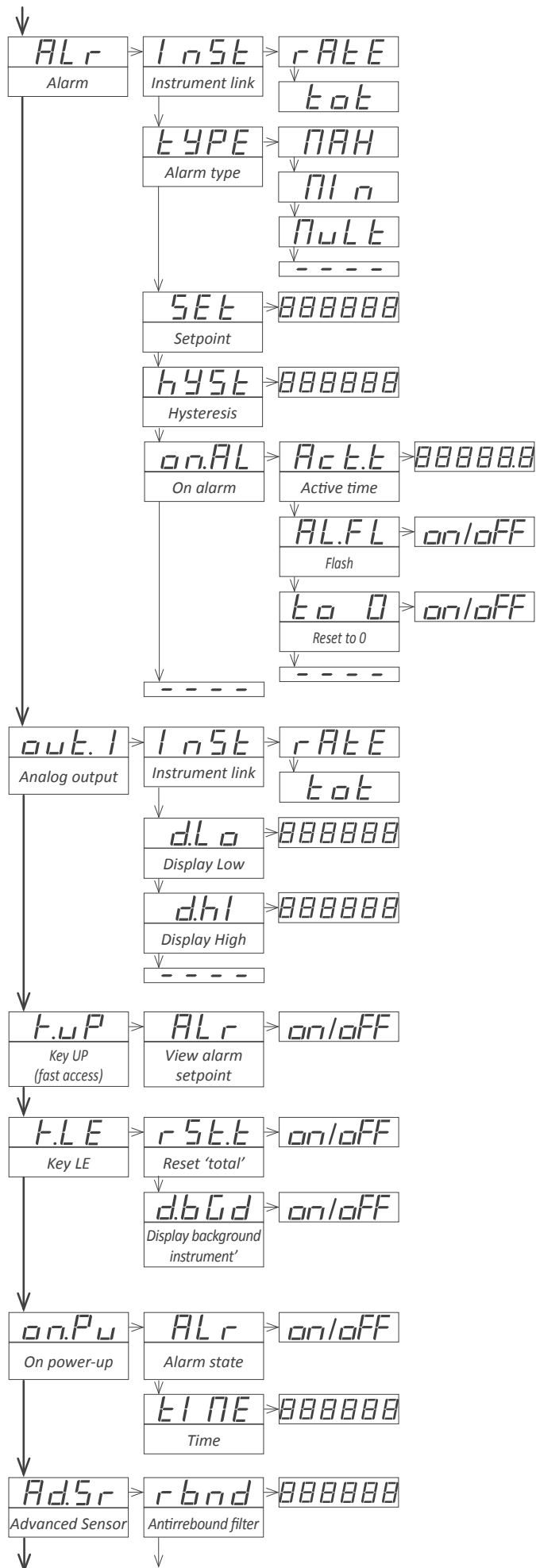
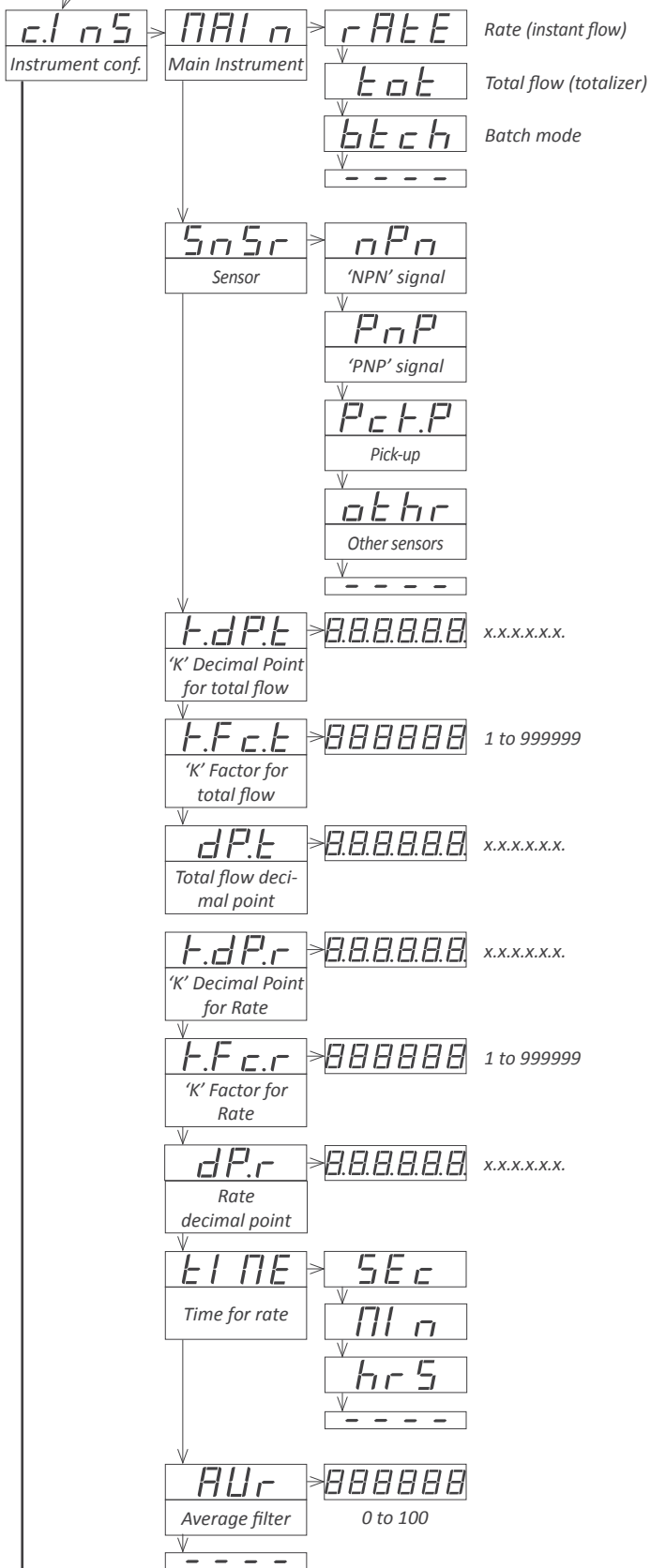
### 1.17.8 Menu 'Tools'

At the 'Tools' ('tool') menu configure several general options for the instrument.

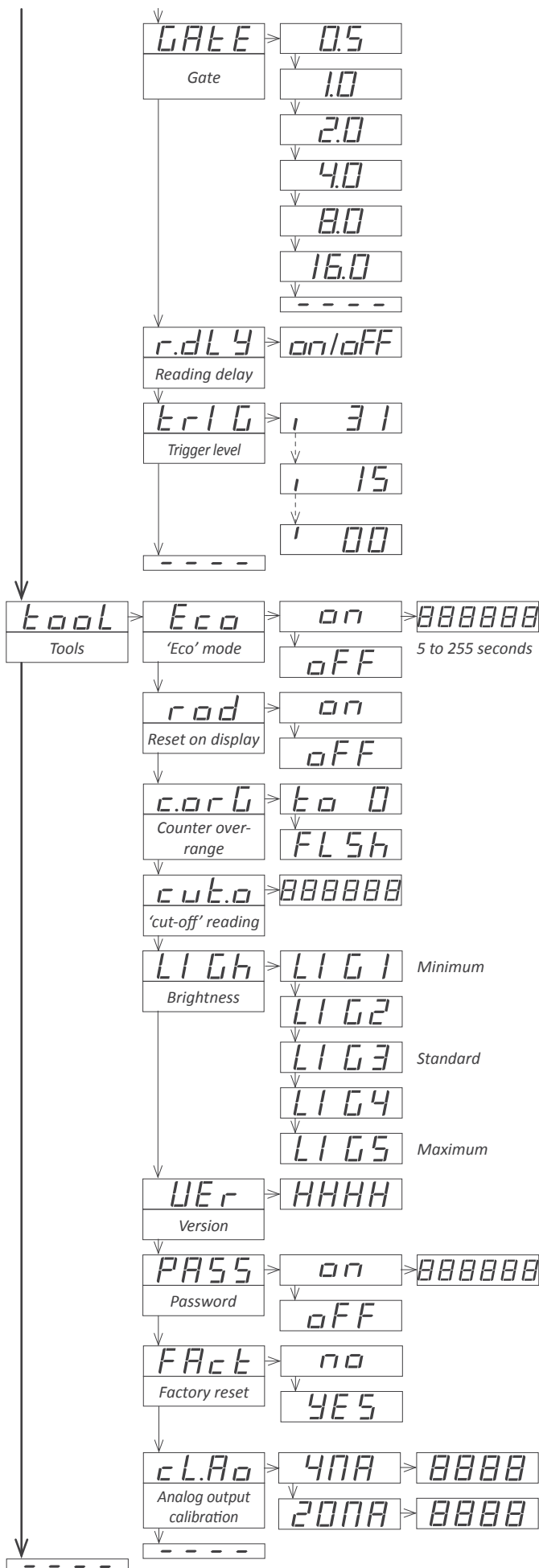
- the 'Eco mode' ('Eco') is a function to reduce consumption of the instrument, by powering off the display when display is not needed. For consumption data in 'Eco' mode see section 1.7. For more information on 'Eco' mode see section 1.14. The operation of the 'Eco' mode is explained below :
  - the waiting time until display is powered off display is configurable from '5' to '255' seconds.
  - after the configured time has passed without interaction from the operator, and the instrument is not inside 'configuration menu' or 'fast access' menu, and there are no active alarms, the display is powered off.
  - the instrument will power on the display when the alarm activates and will remain active if alarm remains active.
  - the instrument will power on the display if the operator presses any front key, or activates any of the rear terminal functions.

# 1.18 Full configuration menu

Press 'SQ' (■) for 1 second to access the 'Configuration menu'.  
See section 1.17 for a description of each menu entry.



## 1.18 Full configuration menu (cont.)



## 1.19 Configuration Example

A flow sensor is connected to a pipe which contains a flow of water. The flowmeter provides a signal proportional to the flow, in the form of 'NPN' impulses, with a 'K factor' of '1.241804' [impulses/liter].

Configure the instrument to read the rate in [liters/second] without decimal point, and the total flow accumulated in [liters] with 2 decimal points.

By default rate must be on display, and access to the total flow value will be done by activating the rear connector terminal ('control 2').

Reset of the total flow will be performed by pressing the front key left 'LE' (◀) or rear 'control 1'.

Lets configure the instrument :

### 1. Connections

- Power the instrument (see section 1.4)
- Connect the flowmeter signal to the instrument (see section 1.5)
- Connect the 'control 1' contact to switch readings (see section 1.5)

### 2. Instrument main configuration

At the 'Instrument configuration' ('c.InS') section :

- at 'Main instrument' ('MAIn') select 'rAtE'
- at 'Sensor' ('SnSr') select 'NPN'
- at "'K' Decimal point for total flow" ('K.dP.t') select 'X.xxxxx'
- at "'K' Factor for total flow" ('K.Fc.t') configure '1.24180' (the last digit '4' of the 'K factor' can not be introduced)
- at "'K' Decimal point for instant flow" ('K.dP.r') select 'X.xxxxx'
- at "'K' Factor for instant flow" ('K.Fc.r') configure '1.24180' (the last digit '4' of the 'K factor' can not be introduced)

Validate changes and exit the 'configuration menu'. At this moment, the instrument is configured and reads rate meter, in [liters/second].

- at 'Rate decimal point' ('dP.r') select "XXXXXX"
- at 'Total flow decimal point' ('dP.t') select "XXXX.xx"

Validate changes and exit the 'configuration menu'. At this moment, the instrument is configured and reads rate in [liters/second] without decimal points, and total flow in [liters], with 2 decimals. To read the total accumulated flow on display, close the rear contact 'contact 1'.

### 5. Configure 'Key Left' (◀) to reset the total flow value

At the 'Key Left' ('K.LE') section :

- at the 'Reset total' ('rSt.t') parameter, select 'on'

Validate changes and exit the configuration menu. At this moment, the total flow value will reset to '0' when the key 'LE' (◀) is pressed.

## 1.20 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.

## 1.21 Warranty

This instrument is warranted against all manufacturing defects for a period of 24 months, as requested by the European legislation. This warranty does not apply in case of misuse or accident, and the scope of the warranty is limited to repair of the instrument, not being the manufacturer responsible for additional damages or additional costs. Within the warranty period and after examination by the manufacturer, the unit will be repaired or substituted when found to be defective.

Extended warranty available at [www.fema.es/docs/4153\\_Warranty1\\_en.pdf](http://www.fema.es/docs/4153_Warranty1_en.pdf)

## 1.22 CE declaration of conformity

Manufacturer FEMA ELECTRÓNICA, S.A.  
 Altimira 14 - Pol. Ind. Santiga  
 E08210 - Barberà del Vallès  
 BARCELONA - SPAIN  
[www.fema.es](http://www.fema.es) - [info@fema.es](mailto:info@fema.es)

Products C60-FL-RA

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

ROHS directive 2011/65/EU

WEEE directive 2012/19/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

CISPR 11 Instrument Class A & Class B Group 1

Barberà del Vallès, January 2020

Xavier Juncà - Product Manager



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

The error messages are shown on display in flash mode.

## 1.23 Messages and errors

Table 2 | Messages and error codes

Text	Description
'd.udr'	display underrange ('d.udr') flashing. The instrument already displays the minimum value possible (-199999).
'd.ovr'	display overrange ('d.ovr') flashing. The instrument already displays the maximum value possible (999999).
'ALr'	alarm is active (needs 'on alarm' set to flash, and instrument associated to alarm is on display).
'Err.1'	incorrect password.
'Err.2'	changes not applied due to an error with the new 'resolution' parameter (see section 1.25).
'Err.3'	configuration of 'multiples' alarm is accepted only in 'batch mode' (see section 1.17.2).

## 1.24 Factory configuration

Instrument configuration	
Main instrument	'rAtE' (rate meter)
Sensor	NPN
'K' Decimal point for total flow	XX.xxxx
'K' Factor for total flow	01.0000
Total flow decimal point	XXXXX.x
'K' Decimal point for rate	XX.xxxx
'K' Factor for rate	01.0000
Rate decimal point	XXXXX.x
Time for rate	flow per second ('SEc')
Average filter	0
Alarm	
Instrument link	'rAtE' (rate)
Type	'MAX' alarm as maximum
Setpoint	100.0
Hysteresis	0 counts
On alarm	
Active time	0.0 (seconds)
Alarm flash	off
Reset to 0	off
Analog output	
Instrument link	'rAtE' (rate)
Display low	0
Display high	100.0
Fast access ('Key UP')	
View alarm setpoint	'on'
Key Left	
Reset	off
Display background instr.	on
Advanced Sensor	
Antirrebound filter	0
Gate	0.5 seconds
Reading delay	off
Trigger level	15
Tools	
'Eco' mode	off
Reset on display	off
Counter overrange	'to_0'
'cut-off' reading	0
Brightness	3
Password	off

## 1.25 Resolution precautions

Changing the 'Rate decimal point' ('dP.r') or 'Total flow decimal point' ('dP.t') parameters at the 'Instrument configuration' ('c.InS') menu entry, may affect the 'Setpoint' ('SEt') parameter at the 'Alarm' ('ALr') menu entry.

If increasing the resolution modifies the setpoint value to a non readable number (more than 6 digits), the instrument will display 'Err.2', and will exit the configuration discarding any changes. See 'Example 1' below.

Reducing the resolution truncates the value of the affected parameters. Lost numbers will not be recovered when increasing again the resolution. See 'Example 2' below.

**Example 1** : rate meter with resolution of 1 decimal ('X.x'), alarm linked to the ratemeter, and setpoint value set to '5750.0'. Modify resolution to 'X.xxx' (3 decimals) changes the setpoint value from '5750.0' to '5750.000'. This new value can not be represented on display (maximum 6 digits) and will activate 'Err.2'.

**Example 2** : rate meter with resolution of 3 decimals ('X.xxx') and setpoint value set to '100.532'. Modify resolution to 'X.x' (1 decimal) changes setpoint value from '100.532' to '100.5'. No error is activated. Returning from 1 decimal to 3 decimals will change setpoint from '100.5' to '100.500'. No error is activated.

## 1.26 Customer configuration data

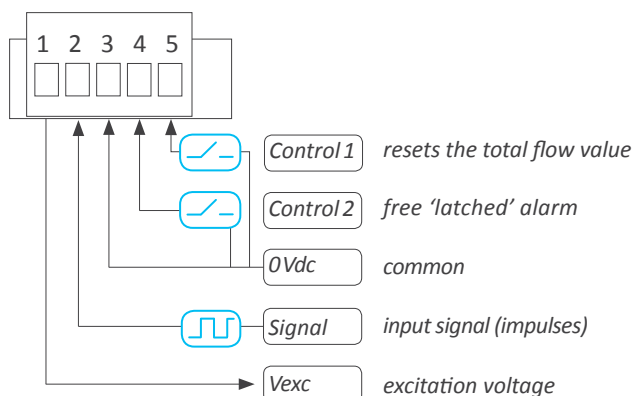
Instrument configuration	
Main instrument	_____
Sensor	_____
'K' Decimal point for total flow	_____
'K' Factor for total flow	_____
Total flow decimal point	_____
'K' Decimal point for rate	_____
'K' Factor for rate	_____
Rate decimal point	_____
Time for rate	_____
Average filter	_____
Alarm	
Instrument link	_____
Type	_____
Setpoint	_____
Hysteresis	_____
On alarm	_____
Active time	_____
Alarm flash	_____
Reset to 0	_____
Analog output	
Instrument link	_____
Display low	_____
Display high	_____
Fast access ('Key UP')	
View alarm setpoint	_____
Key Left	
Reset	_____
Display background instr.	_____
Advanced Sensor	
Antirrebound filter	_____
Gate	_____
Trigger level	_____
Tools	
'Eco' mode	_____
Reset on display	_____
Counter overrange	_____
'cut-off' reading	_____
Brightness	_____
Password	_____

## 1.27 Batch mode

The '*batch mode*' is an independent working mode of the instrument, with different connections (see section 1.27.1) and specific functionality (see section 1.27.2). The main instrument is the '*batch*' instrument and the background instrument is the '*instant flow*' meter.

### 1.27.1 Batch mode rear connections

- Control 1 : shortcircuit terminals '*control 1*' and '*common*' to reset the value of the batch counter. Reset is active while '*control 1*' is active.
- Control 2 : shortcircuit terminals '*control 2*' and '*common*' to free the '*latched*' alarm.
- Vexc : +15 Vdc excitation voltage is available (max. 50 mA).
- Signal : input signal terminal (impulses). See section 1.13 for different signal configurations.
- Common : common terminal.



### 1.27.2 Batch mode functionality

The instrument can be configured to work as batch controller.

#### Activate the '*batch mode*'

At the '**Instrument configuration**' ('**c.InS**') menu entry, at the '**Main instrument**' ('**MAIn**') parameter, select the '**batch**' ('**btch**') value to activate the '*batch mode*'.

#### How the instrument works

The '*batch mode*' counts impulses upwards, from '0' to the setpoint value (configured at the '**Alarm**' ('**ALr**') / '**Setpoint**' ('**SEt**') parameter).

The alarm is configured as a '*minimum*' alarm (alarm is active while reading is below the '*setpoint*' value). When the reading reaches the setpoint value, the alarm switches off and remains off ('*latched*') until '*control 2*' is closed.

#### How to reset reading

Close '*control 1*' rear contact to apply a reset to the reading.

When the reset is applied, the alarm switches off and remains off ('*latched*') until '*control 2*' is closed.

#### How to free the '*latched*' alarm

In '*batch mode*' the alarm is '*latched*' when it deactivates (when setpoint value is reached, or when reset is applied to the reading).

To free the '*latched*' alarm, close '*control 2*'.

#### At power up

When the instrument is powered up or recovering from a power loss, the alarm starts as indicated at the parameter '**On power-up**' ('**On Pu**') \ '**Alarm state**' ('**ALr**') (see section 1.17.6). If the alarm is configured to start in deactivated ('**off**') state, the alarm is also '*latched*'. To free the '*latched*' alarm, close '*control 2*'.

#### How to scale reading

The '*batch mode*' uses the configuration parameters of the '*total flow*' instrument. Use '**K Decimal point for total flow**' and '**K Factor for total flow**' to scale the reading value of each impulse, and use '**Total flow decimal point**' and add decimals to your reading, if needed.

#### Background instrument

The '*ratemeter*' background instrument remains active and can be accessed using the front key '**LE**' (◀) (see section 1.17.5).

#### Accumulated batch with '*multiples*' alarm

Select '**Alarm type**' ('**typeE**') as '*multiples*' ('**Mult**') alarm to accumulate the total value instead of resetting the total value at each batch.

- when the display value reaches any multiple of the setpoint value, the alarm deactivates and remains '*latched*'.
- press '*control 2*' to free the alarm. When the alarm is free :
  - the alarm activates (flow '*on*').
  - the alarm will deactivate when reading reaches the next '*multiple*' of setpoint value
  - if a display reset is applied, alarm is deactivated, '*latched*', and the next '*multiple value*' is the '*setpoint*' value

#### Example of application

Use the relay output of the instrument to control the batch feeder (relay '*on*' means the system is feeding water or similar).

When relay is active ('*on*') the system feeds the batch and the instrument counts.

When the alarm value is reached, the instrument deactivates the relay ('*off*') and the feeder stops.

Reset the display value to '0' with the '*control 1*' rear contact.

When the system is ready for another batch (new box, new package, etc) press '*control 2*' to free the '*latched*' relay. Relay activates ('*on*') and the batch feeder will feed the batch again.



## 1.27 Batch mode

### 1.27.3 Example for batch mode

Example for an application filling a tank. The engine that pumps water to the tank is connected to the relay output of the instrument. When alarm is 'on' the engine pumps water into the tank. When alarm is 'off' the engine stops pumping water.

Instrument relay connected between 'Normally open' and 'common'. When power is 'off', relay is 'open' and there is no flow.

At startup (power is 'on') the instrument starts with the alarm deactivated ('off', 'no flow') and alarm is 'latched' (alarm remains deactivated ('off', 'no flow'), independent of the reading, until 'control2' activates).

- after a power loss, the system starts with alarms deactivated ('off', 'no flow')
- after a power loss, the system remembers the last reading value.

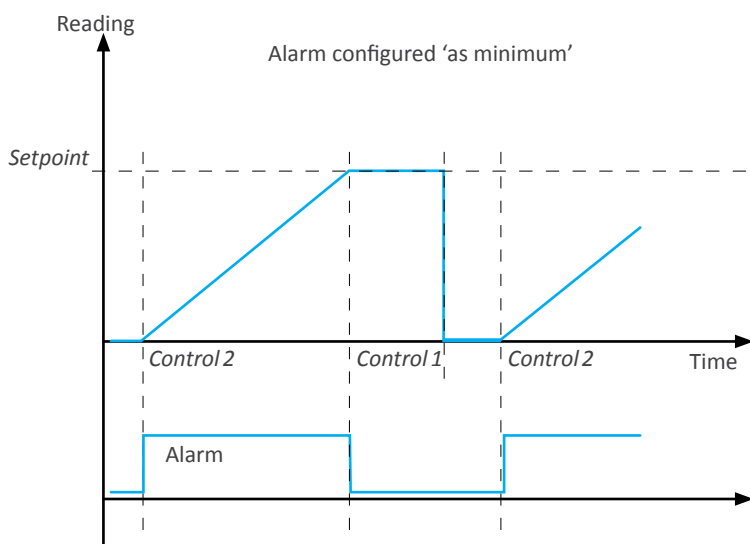
Alarm configuration : 'as minimum'. Alarm activates ('on', 'flow') when reading is below setpoint value). Alarm deactivates ('off', 'no flow') when reading reaches setpoint or is above setpoint,

Press 'control2' to free the alarm. If reading is below setpoint, alarm activates ('on', 'flow'). If reading is higher or equal to setpoint, the alarm remains deactivated ('off', 'no flow').

When reading reaches the setpoint value, the alarm deactivates ('off', 'no flow') (alarm configured 'as minimum').

Press 'control1' to reset the display value, forces the alarm to 'deactivate' ('off', 'no flow') and 'latches' the alarm. Reading is '0', alarm is deactivated ('off' and 'latched').

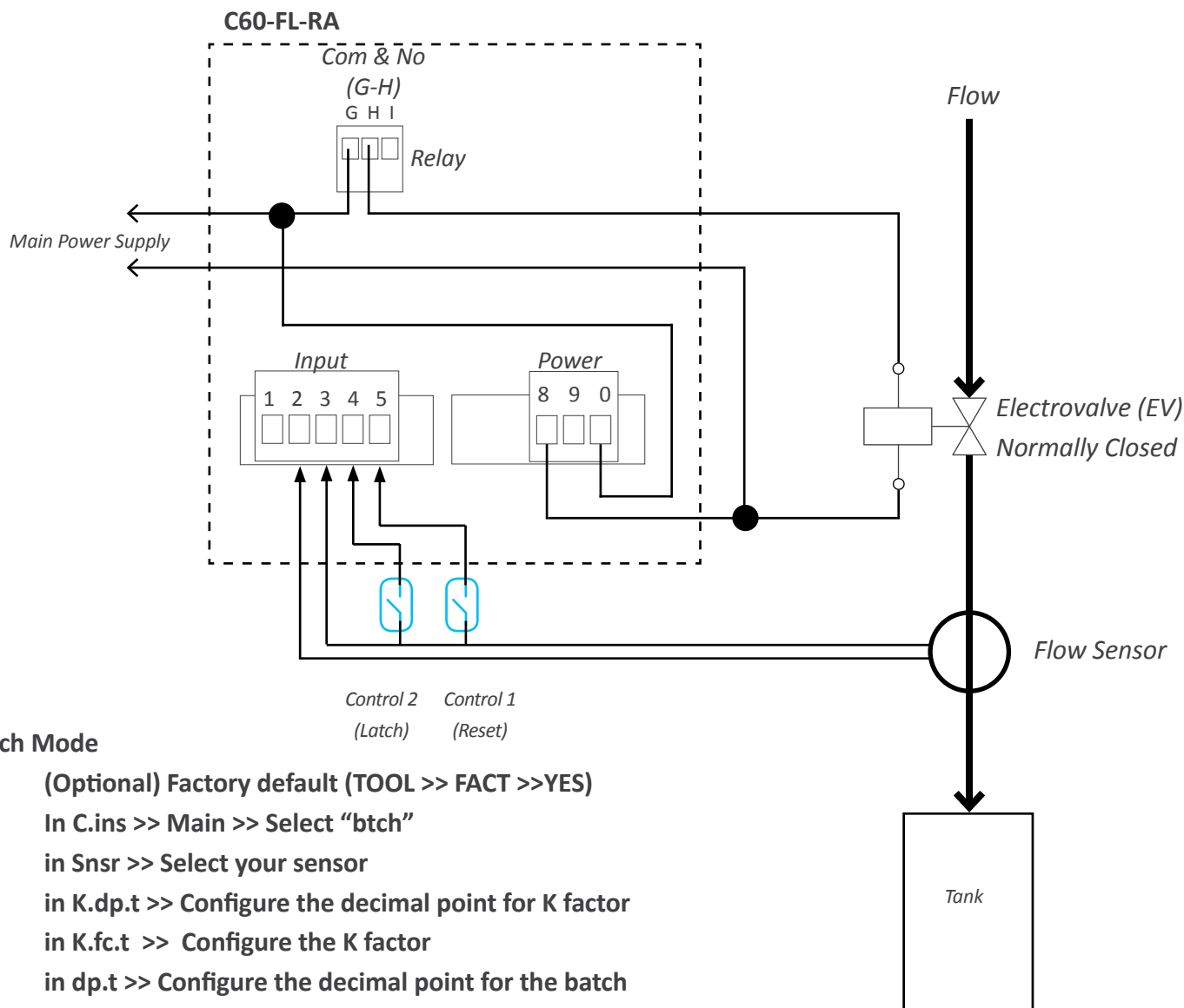
Press 'control2' to free the alarm. Because reading is '0' (below setpoint), alarm activates ('on', 'flow').



## 1.27 Batch mode

### 1.27.4 Example for Electrovalve (EV) Normally Closed and Min Alarm Type

Closed without power supply



#### Batch Mode

1. (Optional) Factory default (TOOL >> FACT >> YES)
2. In C.ins >> Main >> Select "btch"
3. in Snsr >> Select your sensor
4. in K.dp.t >> Configure the decimal point for K factor
5. in K.fc.t >> Configure the K factor
6. in dp.t >> Configure the decimal point for the batch
7. in Alr >> Type >> Select Min
8. in Alr >> Set >> Configure the value

#### - Relay Connections: G & H (Com&No)

#### Functionality:

Without power supply >> Alarm OFF >> Relay is open >> EV is closed >> Filling stopped (SAFETY CONDITION)

Power up the system >> Display show 0 >> Alarm OFF >> Relay is open and EV is closed >> Filling stopped

Close Control 1 (and Open) >> Display still show 0 >> Alarm OFF >> Relay is open and EV is closed >> Filling stopped

Close Control 2 (and Open) >> Alarm ON >> Relay is closed >> EV is open >> the filling start and the counter increases.

When the counter reach the Set value >> Alarm OFF >> Relay is open >> EV is closed >> Filling stopped

Close Control 1 (and Open) >> Display show 0 >> Alarm OFF >> Relay still open >> EV still closed >> Filling stopped

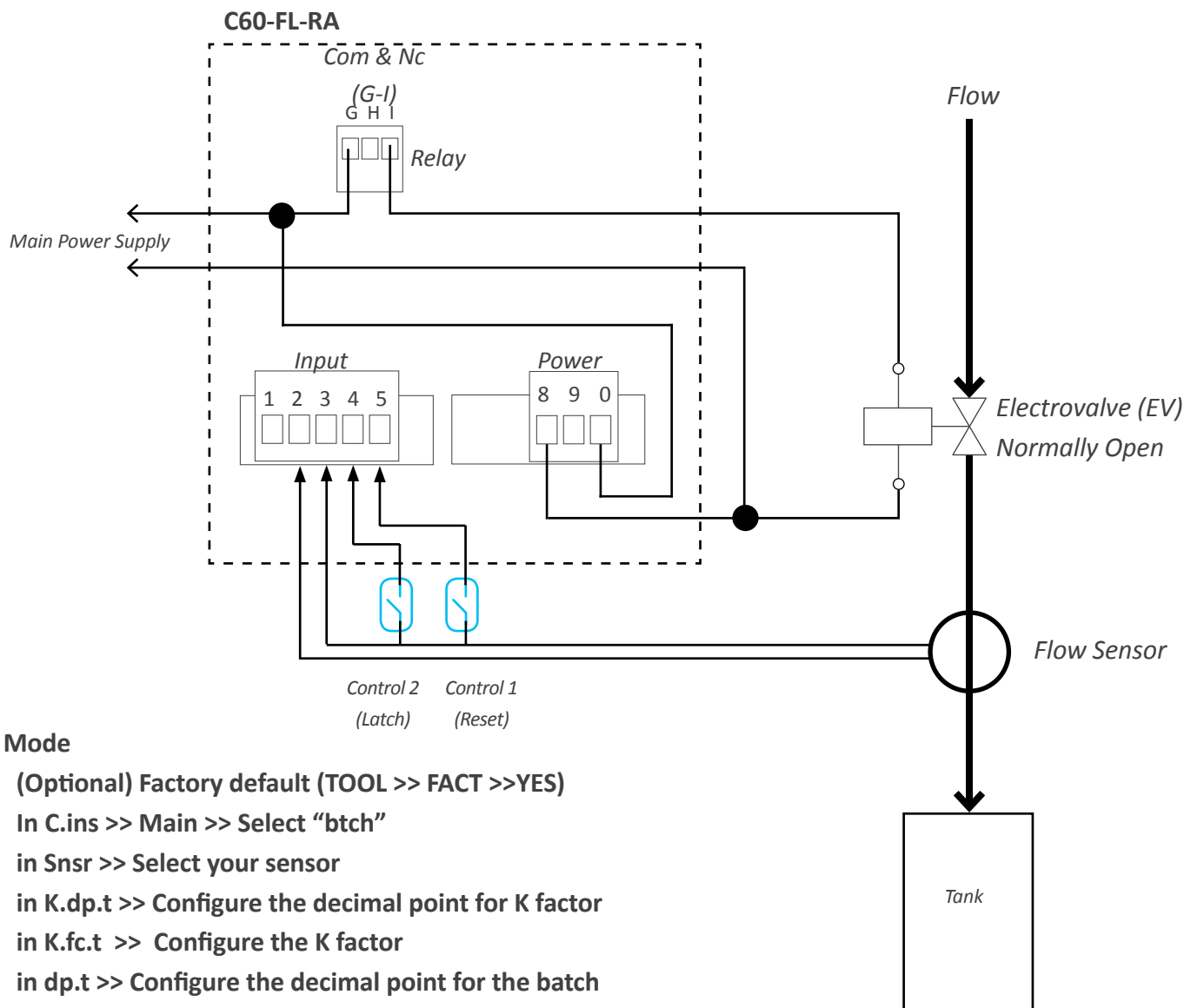
End of cycle>>>

Change the tank and Close Control 2 (and Open) to restart the filling.

## 1.27 Batch mode

### 1.27.5 Example for Electrovalve (EV) Normally Open and Min Alarm Type

Open without power supply



#### Batch Mode

1. (Optional) Factory default (TOOL >> FACT >> YES)
2. In C.ins >> Main >> Select "btch"
3. in Snsr >> Select your sensor
4. in K.dp.t >> Configure the decimal point for K factor
5. in K.fc.t >> Configure the K factor
6. in dp.t >> Configure the decimal point for the batch
7. in Alr >> Type >> Select Min
8. in Alr >> Set >> Configure the value

#### - Relay Connections: G & I (Com&NC)

#### Functionality:

Without power supply >> Alarm OFF >> Relay is closed but EV is open >> Filling start >> UNCONTROLLED >> NO SAFETY CONDITION

Power up the system >> Display show 0 >> Alarm OFF >> Relay is closed >> EV is closed >> Filling stopped

Close Control 1 (and Open) >> Display still show 0 >> Alarm OFF >> Relay is closed and EV is closed >> Filling stopped

Close Control 2 (and Open) >> Alarm ON >> Relay is open >> EV is open >> the filling start and the counter increases.

When the counter reach the Set value >> Alarm OFF >> Relay is closed >> EV is closed >> stop the filling

Close Control 1 (and Open) >>> Display show 0 >> Alarm OFF >> Relay still closed >> EV still closed >> Filling stopped

End of cycle >>>

Change the tank and Close Control 2 (and Open) to restart the filling.

# 2. Other options

## 2.1 Option NBT

Instruments without front keypad. To configure the instrument, remove the meter from the panel and remove the front filter. Internal press buttons for configuration are accessible. Optionally, request the instrument preconfigured from factory.



*Without front keypad*

## 2.2 Option 'customized'

Instruments can be adapted to your needs :

- improved technical specifications
- custom configurations
- special functions
- ...



# 3. Accessories

## 3.1 Adapter DRA-M

Adapter for DIN rail mount, for Series C



## 3.4 WME wall housing

Wall mount housing. Together with the KIP protector, offers a full IP65 protection. For Series C of panel meters.



## 3.2 Adapter KA96

Adapter 96 x 96 mm for 96 x 48 mm instruments.



## 3.5 THM benchtop housing

Benchtop housing for Series C and of panel meters. Handle with three selectable positions. Power connector with manual switch and fuse holder.



## 3.3 Protector KIP

Removable front cover for additional mechanical and IP65 front protection.



## 3.6 Set of units (included)

Set of labels 'l/seg', 'l/min', 'l/h', 'm<sup>3</sup>/s', 'm<sup>3</sup>/min', 'm<sup>3</sup>/h', 'T/s', 'T/min', 'T/h', 'gls/s', 'gls/min', 'gls/h', 'l', 'm<sup>3</sup>', 'T', 'gls', 'mm', 'cm', 'm', 'units', 'm/min', 'rpm', 'g', 'kg', 't', 'mg', 'Lb', 'N', 'kN' and empty (1 set included with each instrument)

l/seg	l/min	l/h
m <sup>3</sup> /s	m <sup>3</sup> /min	m <sup>3</sup> /h
T/s	T/min	T/h
gls/s	gls/min	gls/h
l	m <sup>3</sup>	T
gls	mm	cm
m	units	m/min
rpm	g	kg
t	mg	Lb
N	kN	



**DIGITAL PANEL METERS**  
Series Industry



**SIGNAL CONVERTERS**  
Isolated



**LARGE DISPLAYS**  
Series Industry



**PANEL METERS . SERIES OEM**  
Low Cost



**CONVERTERS . SERIES OEM**  
Low Cost



**LARGE DISPLAYS**  
Series Special



**SPECIAL INSTRUMENTS**  
Series Special



**DATA ACQUISITION**  
Series Industry



**'CUSTOMIZED' INSTRUMENTS**