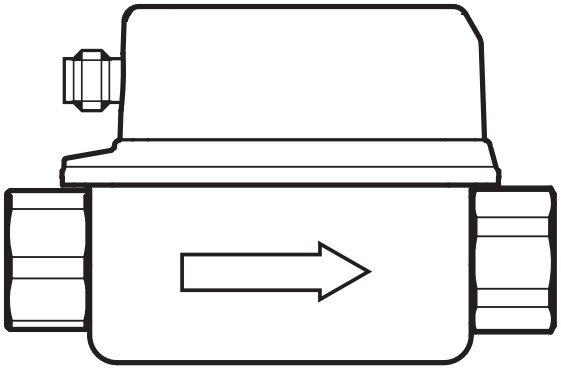
prosense®

CE

Operating instructions
Vortex flow meter

VFS50-5-1001
VFS50-10-1001
VFS75-26-1001

80286262 / 00 06 / 2019



by Automationdirect.com

Contents

1 Preliminary note

1.1 Symbols used

▶ Instructions

> Reaction, result

[…] Designation of pushbuttons, buttons or indications

→ Cross-reference

Important note
Non-compliance can result in malfunction or interference.

Information
Supplementary note.

1.2 Warning signs used

⚠ CAUTION

Warning of personal injury.
Slight reversible injuries may result.

2 Safety instructions

- The device described is a subcomponent for integration into a system.
  - The manufacturer is responsible for the safety of the system.
  - The system manufacturer undertakes to perform a risk assessment and to create a documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the manufacturer of the system.
- Read this document before setting up the product and keep it during the entire service life.
- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.
- Only use the product for its intended purpose (→ Functions and features).
- Only use the product for permissible media (→ Technical data).
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, operation and maintenance of the unit must be carried out by qualified personnel authorised by the machine operator.
- Protect units and cables against damage.

⚠ CAUTION

For medium temperatures above 50 °C (122 °F) some parts of the housing can heat up to over 65 °C (149 °F). Risk of burns.

- ▶ In this case do not touch the unit.
- ▶ Protect the housing against contact with flammable substances and unintentional contact.
- ▶ Do not press the pushbuttons manually; instead use another object (e.g. ballpoint pen).

3 Functions and features

The unit monitors water-based fluids (water, deionized water, cooling water).

It detects the two process categories volumetric flow rate and medium temperature.

Pressure Equipment Directive (PED):
The units comply with the Pressure Equipment Directive and are designed and manufactured for group 2 fluids in accordance with the sound engineering practice.

4 Function

- The unit detects the volumetric flow rate based on the Vortex measuring principle.
- The unit displays the current flow and temperature. It generates 2 output signals according to the parameter setting:

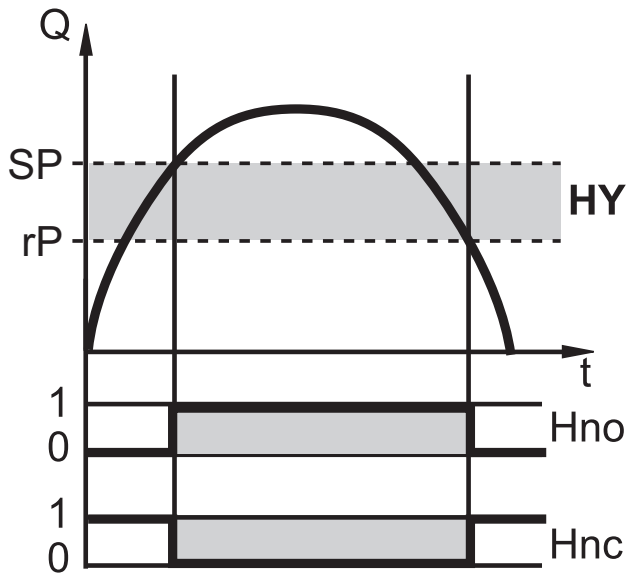
  OUT1: 2 selection options
  - switching signal for volumetric flow rate limit value
  - frequency signal for volumetric flow rate

  OUT2: 4 selection options
  - switching signal for volumetric flow rate limit value
  - switching signal for temperature limit value
  - frequency signal for volumetric flow rate
  - frequency signal for temperature

4.1 Switching output

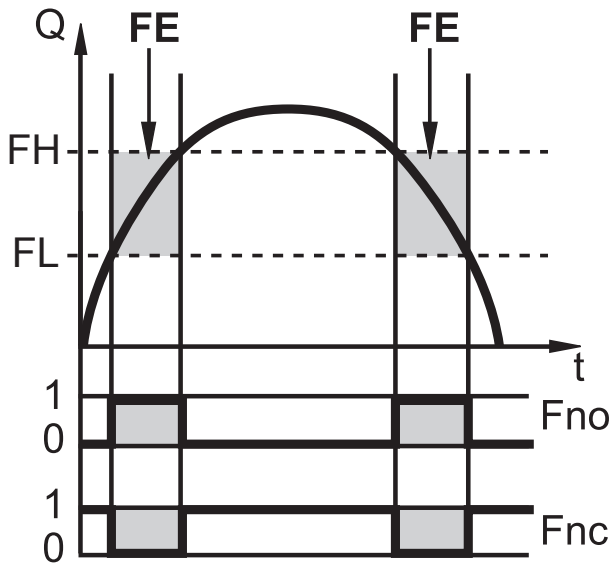
OUTx changes its switching status if it is above or below the set switching limits (flow or temperature). Hysteresis or window function can be selected. Example of volumetric flow monitoring:

Hysteresis function



SP = set point
rP = reset point
HY = hysteresis
Hno = hysteresis NO (normally open)
Hnc = hysteresis NC (normally closed)

Window function



SP = upper limit
rP = lower limit
FE = window
Fno = window NO (normally open)
Fnc = window NC (normally closed)

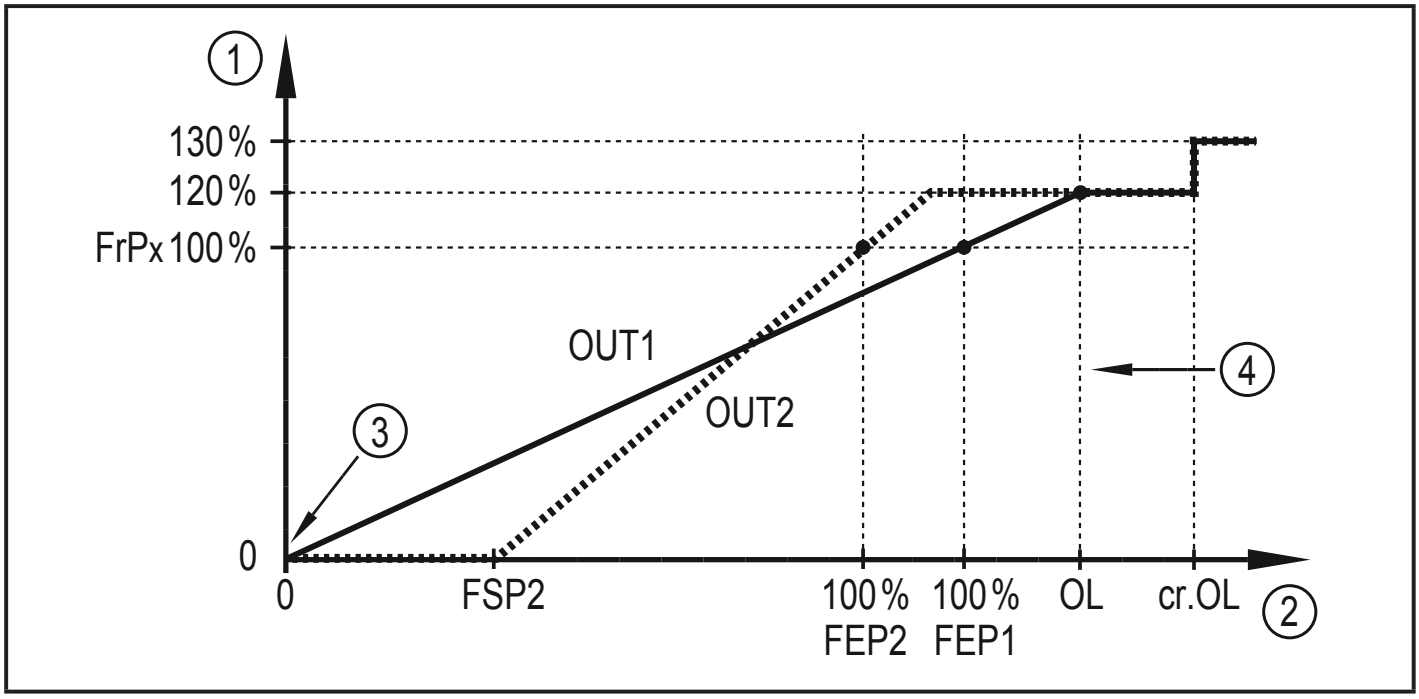
When the hysteresis function is set, the set point [SPx] is defined first and then the reset point [rPx] which must have a lower value. If only the set point is changed, the reset point remains constant.

When set to the window function, the upper limit [SPx] and the lower limit [rPx] have a fixed hysteresis of 0.25 % of the final value of the measuring range. This keeps the switching status of the output stable if the flow rate varies slightly.

4.2 Frequency output

The unit provides a frequency signal that is proportional to the volumetric flow quantity and the medium temperature.

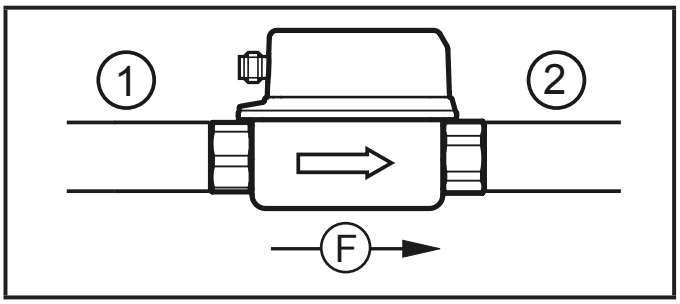
Up to the limit value set under [FEPx] (for OUT2 = TEMP: between the limit values set under [FSP2] and [FEP2]) the frequency signal is between 0 Hz and the frequency value set under [FrPx].



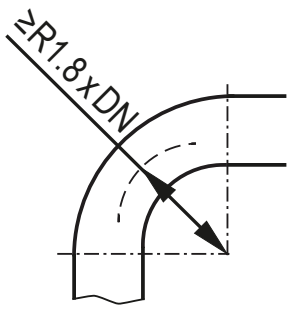
① Frequency signal in Hz
② Volumetric flow quantity or temperature
③ The device is in the error state (FOU = OFF) or the process value transmitted in an analogue way is below the display range or the current flow is 0.
④ The unit is in the error state (FOU = ON)

5 Installation

- ▶ Flow in the direction of the arrow. Observe the installation direction.
- ▶ Make sure that pipe and sensor have the same internal diameter.
- ▶ Avoid deposits, accumulated gas and air in the pipe system. Install the unit so that the measuring pipe is always completely filled with medium.
- ▶ Install in front of or in a rising pipe.
- ▶ Recommended tightening torque: 30 Nm
- ▶ Avoid disturbances on the inlet and outlet side. To do so, provide for the following inlet and outlet pipe lengths:



DN = nominal width of the pipe
R = radius

Disturbance	Inlet pipe length (1)	Outlet pipe length (2)
Non-ideal bend	≥ 5 x DN	≥ 1 x DN
Ideal bend 	≥ 0.5 x DN	
Multiple bends (2 x 90°)	≥ 15 x DN	
Reduction of internal pipe diameter	≥ 15 x DN	≥ 15 x DN
Valve or pump	≥ 25 x DN	

▶ Mount the unit in a way that no mechanical forces are exerted on the pipe. To do so, use angle brackets if required.

- For direct installation fix the unit on the surface utilizing the four corner holes on the underside of the unit. Mounting holes are 3.6 mm in diameter with a 57 mm x 16.5 mm on center pattern. Maximum insertion depth in the housing is 5.5 mm. Use self-tapping M4 DIN 7500 screws. Center holes are not usable due to risk of damaging sensor.

▶ Avoid the following installation positions:

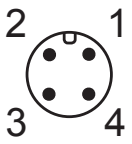
- Directly in front of a falling pipe.
- In a falling pipe.
- At the highest point of the pipe system, when the pipe is open.
- Directly before the outlet of the pipe.
- On the suction side of a pump.

6 Electrical connection

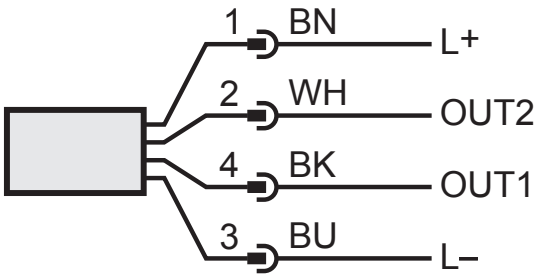
The unit must be connected by a qualified electrician.
The national and international regulations for the installation of electrical equipment must be adhered to.
Voltage supply according to EN 50178, SELV, PELV.

▶ Disconnect power.

▶ Connect the unit as follows:



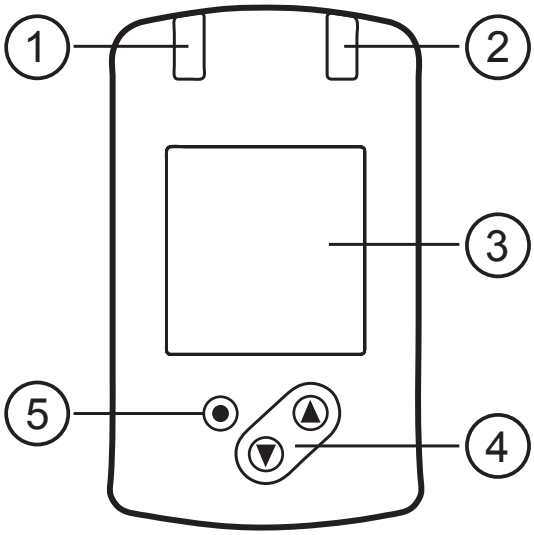
BK: black
BN: brown
BU: blue
WH: white



Colors to DIN EN 60947-5-2

Pin 1	L+
Pin 3	L-
Pin 4 (OUT1)	• Switching signal: limit values for volumetric flow • Frequency signal for volumetric flow rate
Pin 2 (OUT2)	• Switching signal: limit values for volumetric flow • Switching signal: limit values for temperature • Frequency signal for volumetric flow rate • Frequency signal for temperature

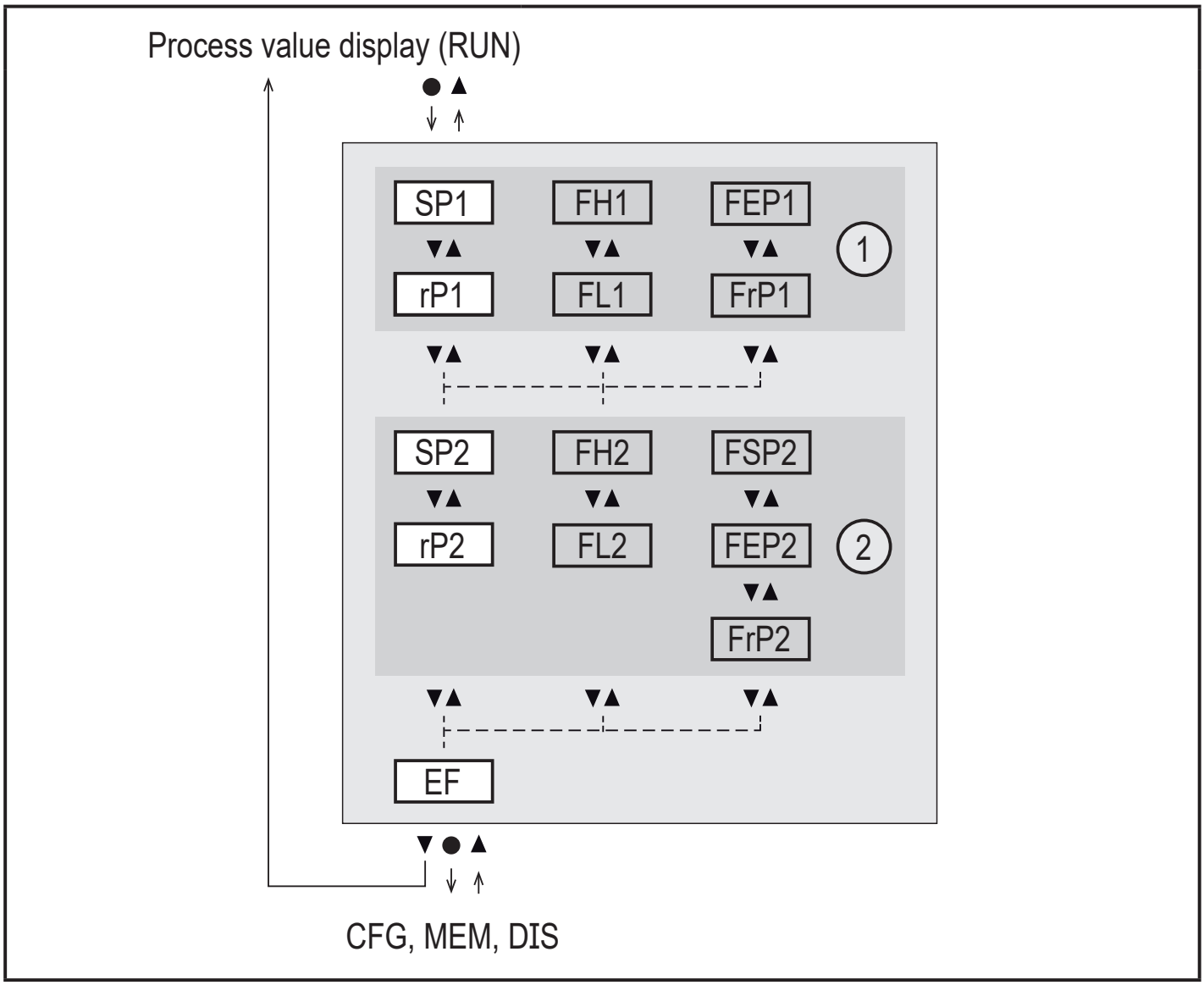
7 Operating and display elements



1 and 2: switching status LEDs
• LED 1 = switching status OUT1 (lights when output 1 is switched) • LED 2 = switching status OUT2 (lights when output 2 is switched)
3: TFT display
• Display of current process values (volumetric flow rate, temperature) • Display of the parameters and parameter values
4: Buttons [▲] and [▼]
• Select parameters • Change parameter values (hold button pressed) • Change of the process value display in the normal operating mode (Run mode) • Locking / unlocking (press buttons simultaneously > 10 seconds)
5: Button [●] = Enter
• Change from RUN mode to the main menu • Change to setting mode • Acknowledgement of the set parameter value

8 Menu

8.1 Main menu



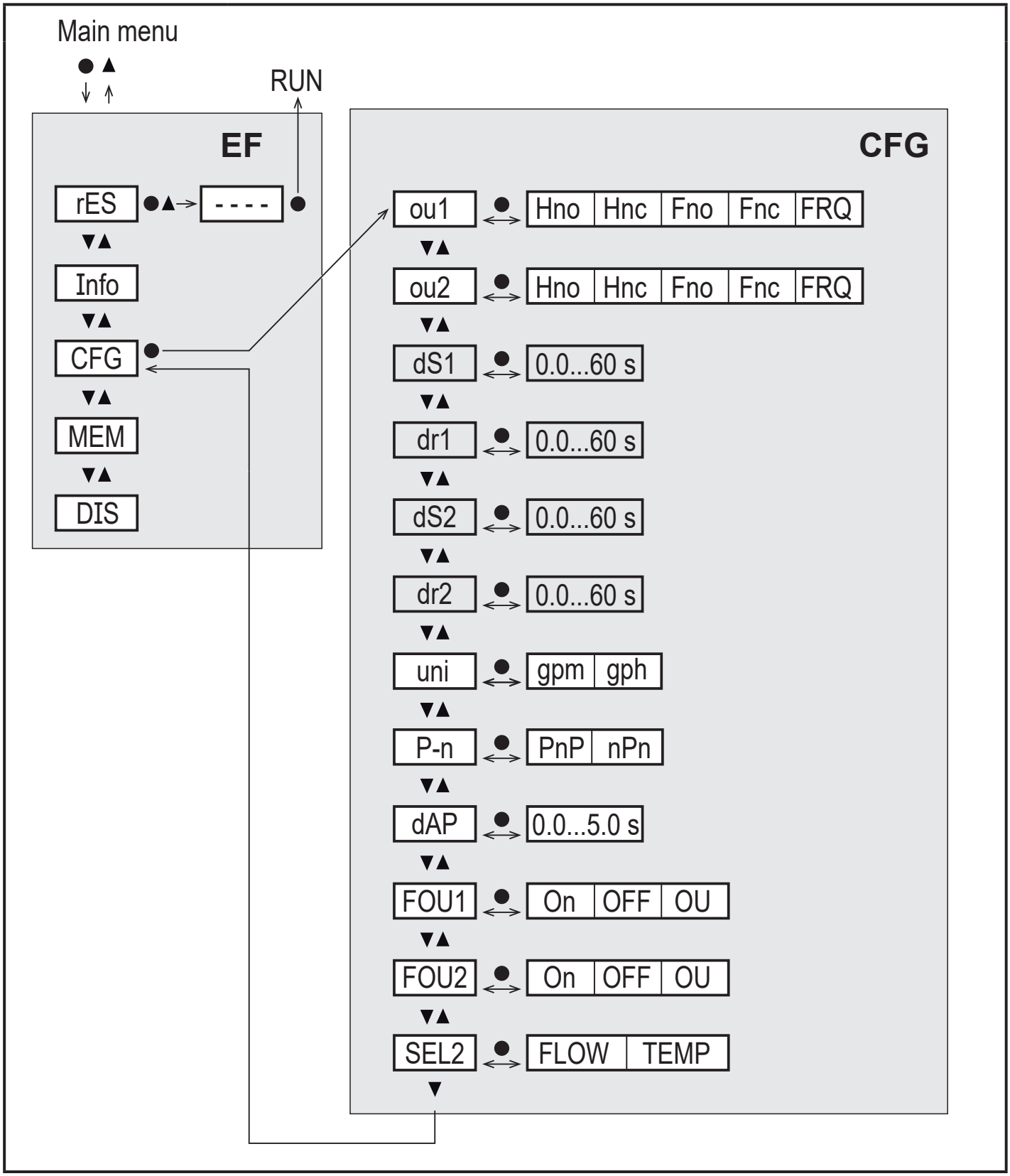
1: Output functions ou1 (→ 8.2.1)
2: Output functions ou2 (→ 8.2.1)

The parameters are only displayed when selected at ou1 / ou2.

8.1.1 Explanation main menu

Switching output with hysteresis function	
SP1	Set point 1 = upper limit value at which OUT1 switches.
rP1	Reset point 1 = lower limit value at which OUT1 switches off.
SP2	Set point 2 = upper limit value at which OUT2 switches.
rP2	Reset point 2 = lower limit value at which OUT2 switches off.
Switching output with window function	
FH1	Set point 1 = upper limit value at which OUT1 switches.
FL1	Reset point 1 = lower limit value at which OUT1 switches.
FH2	Set point 2 = upper limit value at which OUT2 switches.
FL2	Reset point 2 = lower limit value at which OUT2 switches.
Frequency output	
FEP1	Process value end point on OUT1.
FrP1	Frequency at process value end point (FEP1) on OUT1.
FSP2	Process value start point on OUT2 (only if SEL2 = TEMP).
FEP2	Process value end point on OUT2.
FrP2	Frequency at process value end point (FEP2) on OUT2.
Extended functions	
EF	Opening of the lower menu level.

8.2 Extended functions – basic settings



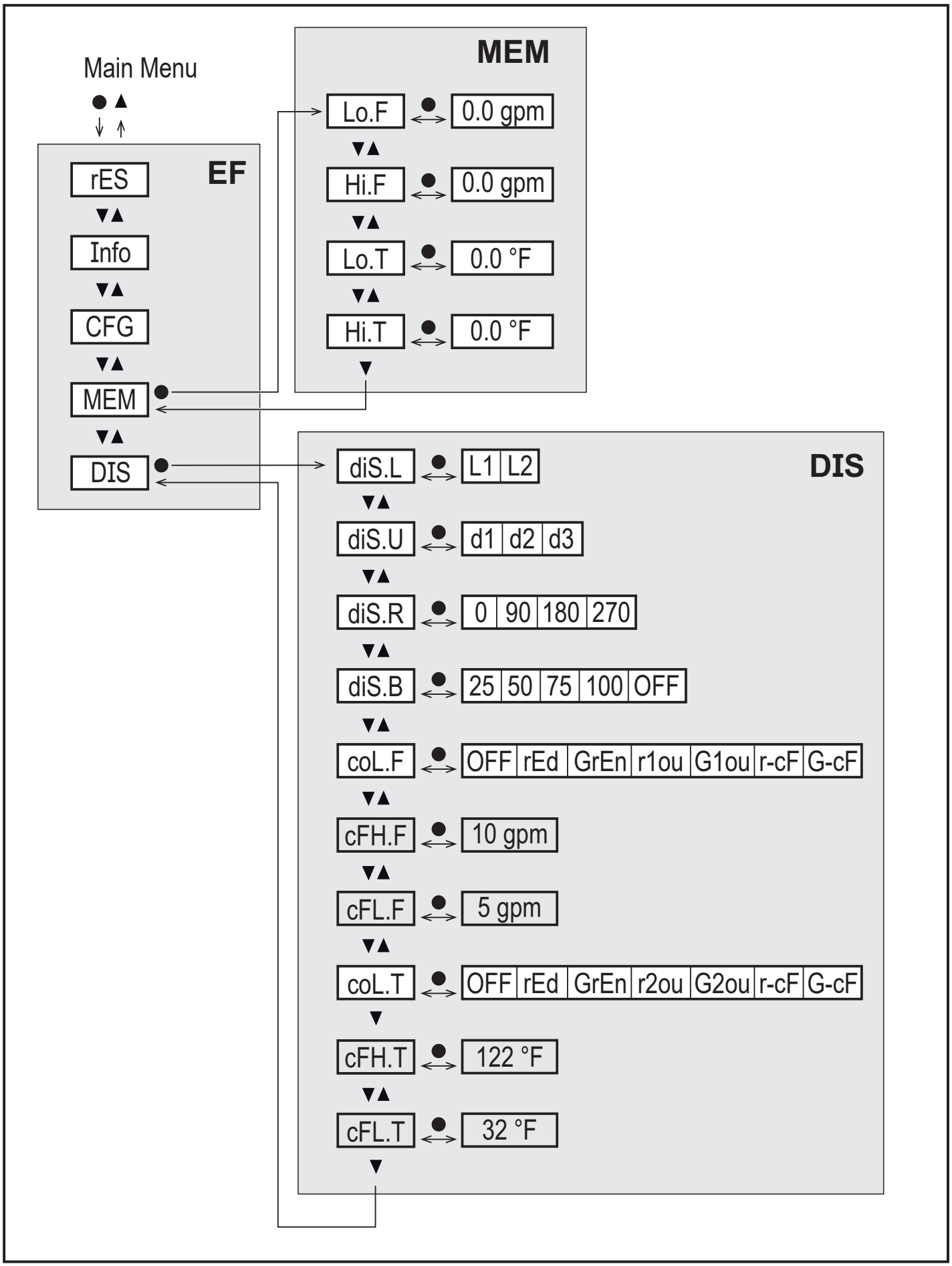
The parameters are only displayed when oux = Hno, Hnc, Fno, Fnc.

rES	Restoring the factory settings
Info	Device information
CFG	Submenu basic settings
MEM	Submenu min/max memory
DIS	Submenu display settings

8.2.1 Explanation basic settings (CFG)

ou1	Output function OUT1 • Flow: Hno, Hnc, Fno, Fnc, FRQ	
ou2	Output function OUT2 • Flow: Hno, Hnc, Fno, Fnc, FRQ • Temperature: Hno, Hnc, Fno, Fnc, FRQ	
Hno	Hysteresis function normally open	
Hnc	Hysteresis function normally closed	
Fno	Window function normally open	
Fnc	Window function normally closed	
FRQ	Frequency output	
dS1	Switching delay on OUT1 in seconds	Only in case of oux = Hno, Hnc, Fno, Fnc
dr1	Switch-off delay on OUT1 in seconds	
dS2	Switching delay on OUT2 in seconds	
dr2	Switch-off delay on OUT2 in seconds	
uni	Standard unit of measurement for volumetric flow rate	
P-n	Output logic: pnp / npn	
dAP	Measured value damping in seconds (only for volumetric flow rate)	
FOU1	Behavior of output OUT1 in case of an error	
FOU2	Behavior of output OUT2 in case of an error	
SEL2	Standard measured variable for evaluation by OUT2: Volumetric flow rate or medium temperature	

8.3 Extended functions – min / max memory – display



The parameters are only displayed when selected r-cF or G-cF.

8.3.1 Explanation min/max memory (MEM)

Lo.F	Minimum value of the flow measured in the process
Hi.F	Maximum value of the flow measured in the process
Lo.T	Minimum value of the temperature measured in the process
Hi.T	Maximum value of the temperature measured in the process

8.3.2 Explanation display function (DIS)

diS.L	Standard layout of the display(L1: flow or L2: flow and temperature)	
diS.U	Update rate of display	
diS.R	Display rotation	
diS.B	Display brightness	
coL.F	Color configuration volumetric flow rate	
coL.T	Color configuration temperature	
OFF	No color change	
rEd	Process value always red, irrespective of the output function	
GrEn	Process value always green, irrespective of the output function	
r1ou / r2ou	Process value red in case of switched output OUT1 / OUT2	
G1ou / G2ou	Process value green in case of switched output OUT1 / OUT2	
r-cF	Display red if measured value between limit values cFL...cFH, irrespective of the output function	
G-cF	Display green if measured value between limit values cFL...cFH, irrespective of the output function	
cFH.F	Upper limit value for color change flow	Only if r-cF or G-cF is selected.
cFL.F	Lower limit value for color change flow	
cFH.T	Upper limit value for color change temperature	
cFL.T	Lower limit value for color change temperature	

9 Parameter setting

Parameters can be set before installation and set-up of the unit or during operation.

If you change parameters during operation, this will influence the function of the plant.

▶ Ensure that there will be no malfunctions in your plant.

During parameter setting the unit remains in the operating mode. It continues to monitor with the existing parameter until the parameter setting has been completed.

9.1 Parameter setting in general

1. Change from RUN mode to the main menu	[●]
2. Selection of the requested parameter	[▲] or [▼]
3. Change to setting mode	[●]
4. Modification of the parameter value	[▲] or [▼] > 1 s
5. Acknowledgement of the set parameter value	[●]
6. Return to the RUN mode	> 30 seconds (timeout) or press [▲] + [▼] simultaneously until the RUN mode is reached.

10 Troubleshooting

Display	Type	Description
[Err]	Error	Unit faulty / malfunction
Off	Error	Supply voltage too low or setting diS.B = OFF
[PArA]	Error	Parameter setting outside the valid range
[cr.UL]	Error	Measured value smaller than -30 %, critically low temperature
[cr.OL]	Error	Measured value greater than 130 %, critical excess flow / temperature
[🔒 Locked via key]	Warning	Setting pushbuttons on the unit locked, parameter change rejected.

Display	Type	Description
[UL]	Warning	Below the detection zone: Measured value lower than -20 % of the final value of the measuring range.
[OL]	Warning	Detection zone exceeded: Measured value greater than 120 % of the final value of the measuring range.
[SC1]	Warning	Switching status LED for OUT1 flashing: OUT1 short circuit.
[SC2]	Warning	Switching status LED for OUT2 flashing: short circuit OUT2.
[SC]	Warning	Switching status LEDs for OUT1 and OUT2 flashing: Short circuit in both outputs.

11 Factory setting

Parameter		Factory setting	User setting
SP1	(FLOW)	**20 % ***	
rP1	(FLOW)	**18.5 % ***	
FH1	(FLOW)	**20 % ***	
FL1	(FLOW)	**18.5 % ***	
FEP1	(FLOW)	**100 % ***	
FrP1	(FLOW)	**100 Hz**	
SP2	(FLOW, TEMP)	**40 % ***	
rP2	(FLOW, TEMP)	**38.5 % ***	
FH2	(FLOW, TEMP)	**40 % ***	
FL2	(FLOW, TEMP)	**38.5 % ***	
FSP2	(TEMP)	**0 % ***	
FEP2	(FLOW, TEMP)	**100 % ***	
FrP2	(FLOW, TEMP)	**100 Hz**	
ou1	(FLOW)	**Hno**	
ou2	(FLOW, TEMP)	**Hno**	
FOU1	(FLOW)	**OFF**	
FOU2	(FLOW, TEMP)	**OFF**	

Parameter		Factory setting	User setting
SEL2	(FLOW, TEMP)	**FLOW**	
col.F	(FLOW)	**OFF**	
col.T	(TEMP)	**OFF**	
dS1		**0 s**	
dR1		**0 s**	
dS2		**0 s**	
dR2		**0 s**	
uni		**gpm**	
P-n		**PnP**	
dAP		**0.6 s**	
diS.L		**L2**	
diS.U		**d2**	
diS.R		**0**	
diS.B		**75 %**	
cFH.F		**MEW**	
cFL.F		**MAW**	
cFH.T		**MEW**	
cFL.T		**MAW**	

MEW = final value of the measuring range
MAW = initial value of the measuring range

* The percentage values refer to the final value of the measuring range.