

TURCK

Industrial
Automation

**PRESSURE
SENSOR
SERIE PS400/500**



**INSTRUCTION
MANUAL**

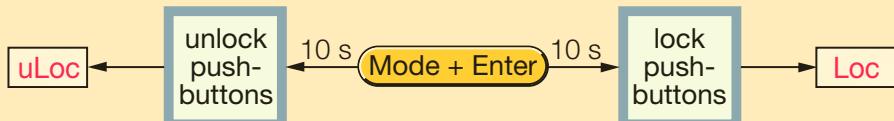
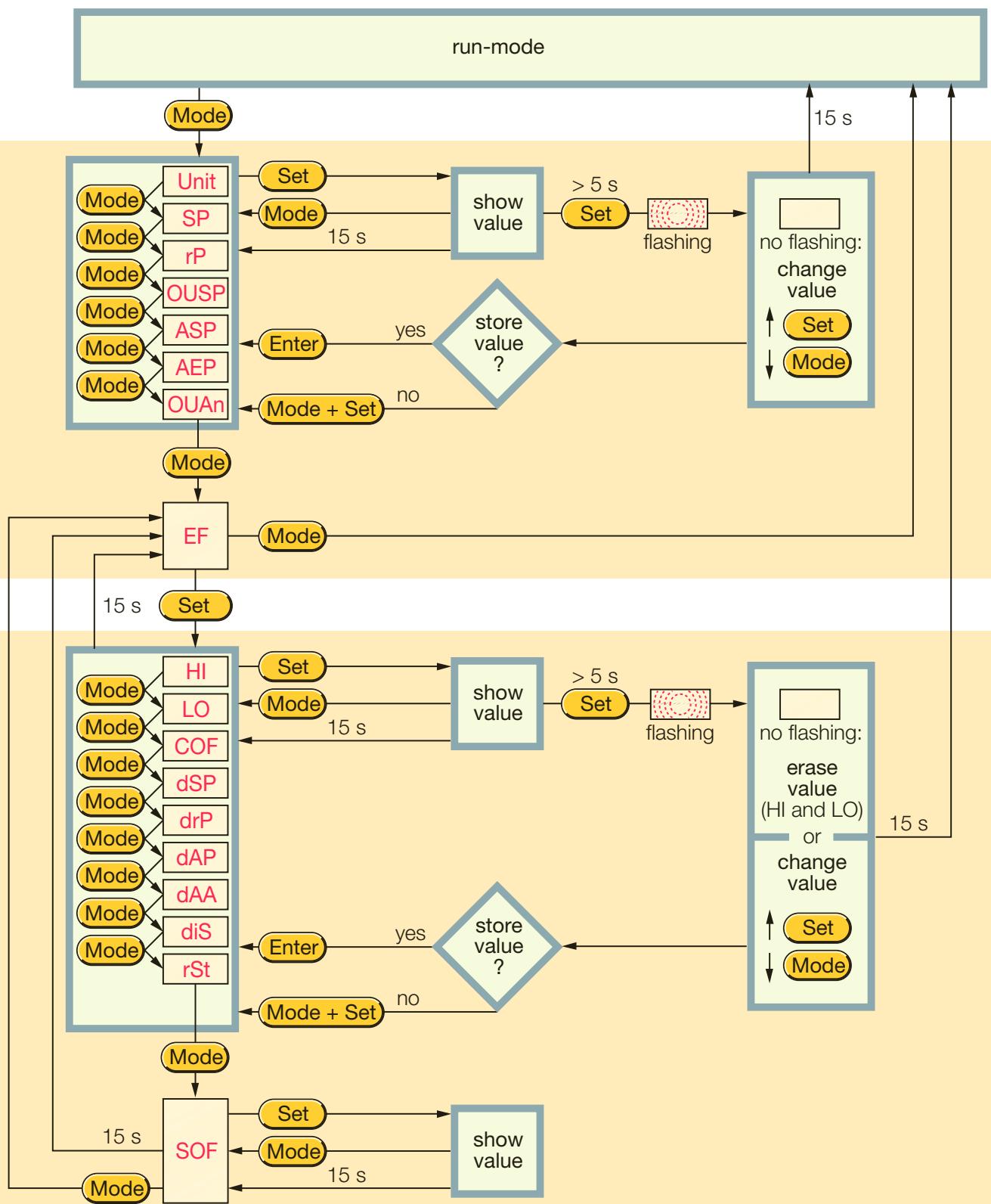
TURCK - your first choice in industrial automation

TURCK is one of the globally leading corporations in the industrial automation sector. As a full range supplier of IP67 components below the controller level, the company offers more than 13,000 sensor interface, fieldbus and connection products. TURCK's versatile product spectrum offers innovative solutions for all applications.



PS....-LIUP8X-...

PS....-LUUP8X-...

lock-function**standard functions**

PS....-LIUP8X-...
PS....-LUUP8X-...

Parameter	Explanation
Loc	inhibit/lock
uLoc	enable/unlock
Unit	Pressure unit
SP	Switch point
rP	Release position
OUSP	Switching output function
ASP	Analogue starting point
AEP	Analogue end point
OUAn	Analogue output
EF	Extended functions
HI	Max-value memory
LO	Min-value memory
COF	Offset correction
dSP	Switch point delay
drP	Release point delay
dAP	Damping of switching output
dAA	Damping of analogue output
diS	Display update
rSt	Reset to default settings
SOF	Software version

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Pressure Sensor Series PS400/PS500

1 Introduction

Dear Customer!

We would like to thank you for opting for a product from our company and would like to confirm you in your decision.

The sensors can be programmed on-site for various different applications.

In order to be able to fully utilise the wide range of functions, we kindly request you to observe the following issues:

Any person entrusted with the set-up or operation of the device, must have read and understood this operation manual, in particular all safety notes.

2 Safety information

2.1 General information

In order to ensure safe operation, the device may only be operated in accordance to the specifications stated in this operation manual. Further it is required to observe all legal and safety regulations applicable to the specific application.

This also applies to the usage of accessories.

2.2 Correct usage to the intended purpose

These devices are designed for indication and monitoring of process variables. All other forms of usage do not comply with the intended purpose.

These sensors may not be used as the sole means for prevention of dangerous machine and system conditions. Machines and systems must be constructed in such a way, that faulty states cannot lead to a dangerous situation for the operating staff (e.g. due to independent limit switches, mechanical interlocking devices, etc.).

2.3 Qualified staff

The devices may only be installed, connected, set-up and operated by qualified staff and in compliance with the technical specifications. Qualified staff is defined as persons, who are familiar with set-up, mounting, start-up and operation of this device and who possess a recognized degree or certificate of appropriate professional training.

2.4 Remaining hazards

These sensors employ state-of-the-art technology and are safe to operate. However, if they are installed and operated by unqualified staff, an element of risk remains.

In this manual the remaining risks are marked by the following symbol:



This symbol is posted where there is a risk of serious injury or death or the damage of material and property, if the warning is ignored

2.5 CE conformity

The device accords to EN 61000-4 and may only be used in industrial environments.

The conformity declaration can be downloaded from the Internet under www.turck.com

Pressure Sensor Series PS400/PS500

3 Description

The devices PS...-4... und PS...-5... are intelligent pressure sensors designed for machine engineering. They feature 3 different output types.

These are:

Two freely programmable switching outputs, or a combination of switching output and one analogue current output, or of one switching output and one analogue voltage output.

The device features an output signal scaling option and the output can be displayed in bar, psi, kPa or MPa. The analogue output can be shifted in the range of the measuring signal. Additionally it is possible to save and read MIN and MAX values. The PS...-5... style sensor can be aligned (360°) and fixed even after installation.

Type of Pressure: relative pressure

Type	Measuring range	Admiss. overpressure
PS01VR-...	-1...0 bar	3 bar
PS001R-...	0...1 bar	3 bar
PS003R-...	0...2,5 bar	7 bar
PS010R-...	0...10 bar	25 bar
PS016R-...	0...16 bar	40 bar
PS025R-...	0...25 bar	65 bar
PS040R-...	0...40 bar	100 bar
PS100R-...	0...100 bar	250 bar
PS250R-...	0...250 bar	625 bar
PS400R-...	0...400 bar	900 bar

4 Installation and set-up instructions

1. Even though the device is excellently protected against electro-magnetic interference, installation and cabling must be carried out correctly to ensure interference immunity.
2. Never route signal and control cables together with the mains cable or feeder cables of motors, cylinder coils, rectifiers etc. The cables must be routed in conductive and grounded cable conduits. This applies especially to long-distance cables, or environments in which the cables are exposed to strong radio waves from broadcasting stations.
3. Signal lines should be installed in mounting cabinets and as far away as possible from contactors, control relays, transformers and other sources of interference.
4. The housing surface may not be painted or coated, because the ventilation diaphragm could be clogged.

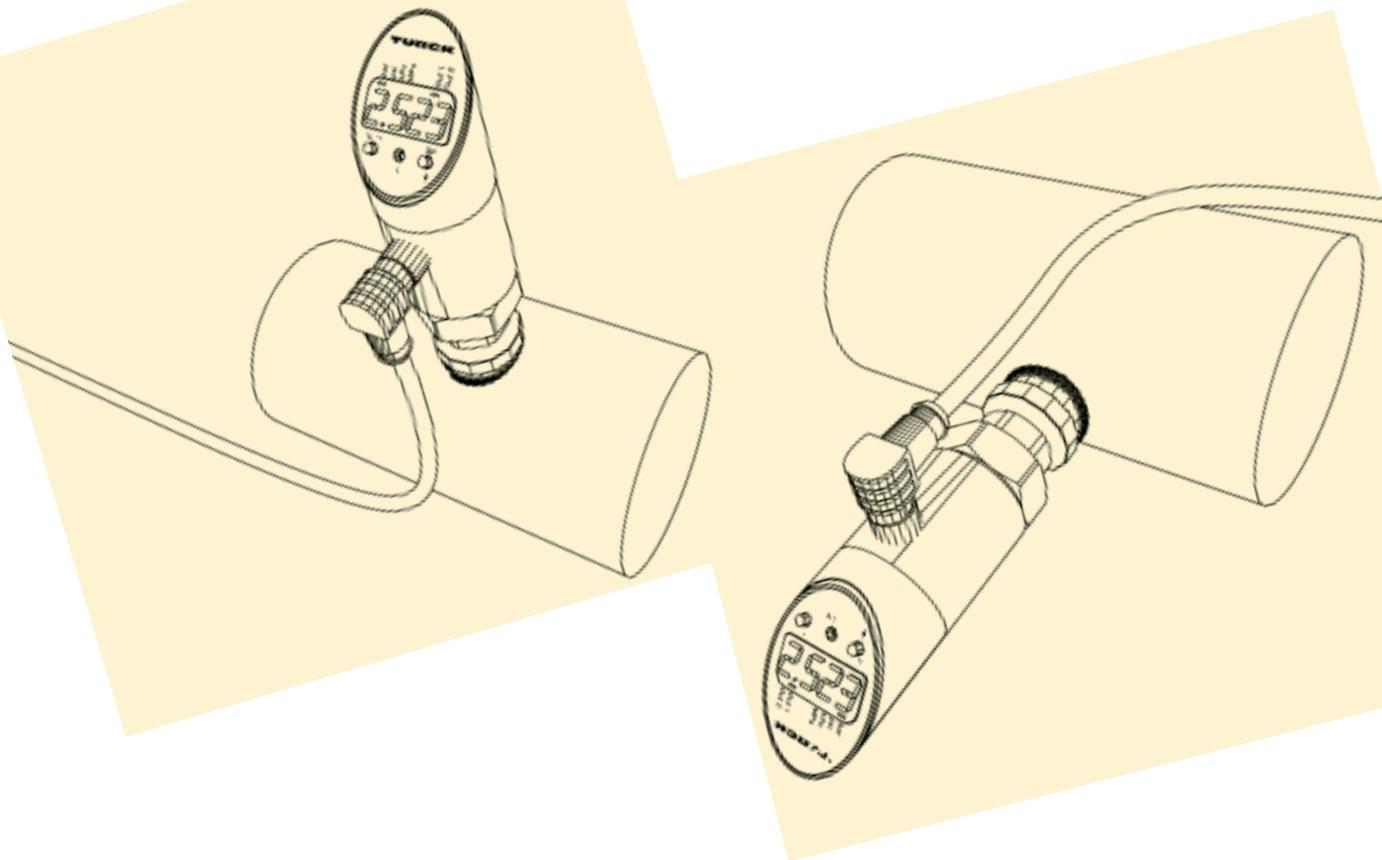
5 Mounting



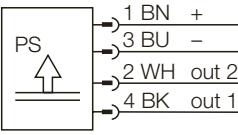
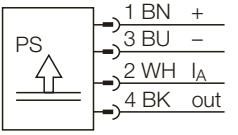
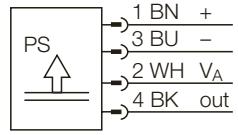
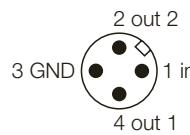
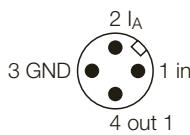
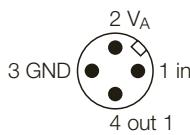
- Prior to mounting or dismantling the sensor it must be verified that the system is pressureless.
- Do not mount sensors in locations subject to high pressure pulses.
- Significant thermal changes in the sensor environment can lead to a zero shift. As a result, the measuring value displayed in a pressureless state will not accord to zero. This kind of drift can be corrected (see chapter 10.1.1, parameter **CofF**).
- The read direction of the on-site display can be rotated via software by 180° (see chapter 10.1.1, parameter **dis**).
- In the pressureless state, the housing of the PS...-5... series can be rotated by 360°.
- It is required to observe the pressure connection instructions and to use a matching counterpiece only.

Pressure Sensor Series PS400/PS500

5.1 Mounting recommendations



6 Electrical connection

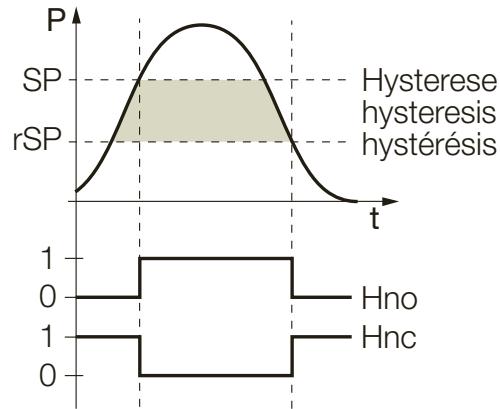
PS...-2U...	PS...-2LI...	PS...-2LU...
		
		

7 Description of the various switching functions

Hysteresis:

This function ensures a stable switching status, independent of the system-inherent pressure fluctuations and the adjusted set point.

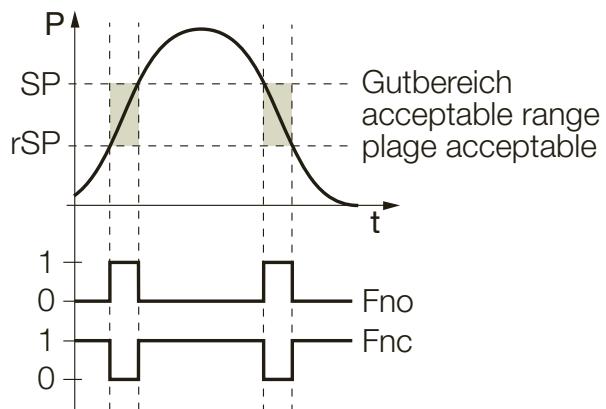
The switching range is defined by the user via a switching point (**SP**) and a release position (**rSP**).



Window:

With this function a range is determined in which the switch assumes a defined switching status.

The switching range is defined by the user via an upper window limit (**SP**) and a low window limit (**rSP**).



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8 Operating modes

Run mode – Standard operation

The sensor detects the system pressure and acts in accordance to the required switching or analogue performance, meeting the ex-factory or customer-specific parameters. The display indicates the applying system pressure, the selected unit of pressure and the status of the switching outputs.

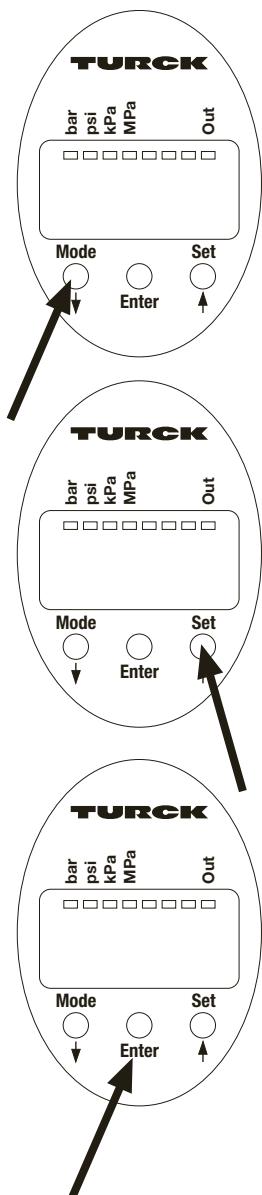
Menu mode - Parameters and associated values

Upon a push of the mode button, the display assumes the menu mode. In this mode all parameters and the associated values can be read. To view the values associated with a parameter, simply press the "Set" button for a short moment. The adjustment options can be taken from the table under point 10.

Programming mode - Adjustment of the parameter values

The programming mode is accessed via the menu mode. In this mode, all adjustable parameters can be modified. As described under the menu mode, it is possible to view the value programmed for a certain parameter via a short press of the "Set" button. In order to modify this value, the "Set" button must be pressed and held until the display stops flashing. Now it is possible to re-adjust the value via the "Set" and "Mode" button. In the programming mode, the "Set" and "Mode" button can also be used as an "UP" and "Down" button. The adjustment options can be taken from the table under point 10.

9 Indication of the parameter values and programming

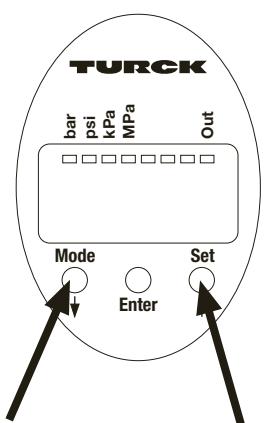


Press the "Mode" button. The display now shows the parameter "Unit". (Should "Loc" be displayed, the sensor must be enabled. For this please refer to the information provided in paragraph 9.1). You can now view the setting of the parameter "Unit" (see below) or select further parameters. To select other parameters, press the "Mode" button several times. To view the actual parameter value, simply press the "Set" button for a short moment.

If you want to alter this value, please press the "Set" button and hold it for 5 s until the shown value stops flashing. Via the \uparrow and \downarrow buttons you can now change the value.

Then press the recessed "Enter" button to save the changed value.

The new setting is consequently activated.



9.1 Locking/Unlocking (disabling/enabling)

This sensor permits inhibiting access to the menu and programming mode.

To **inhibit** access, call up the RUN mode, press and hold the "Mode" and "Set" buttons simultaneously until the display indicates **Loc**.

To **enable** access, call up the RUN mode, press and hold the "Mode" and "Set" buttons simultaneously until the display indicates **uLoc**.

Pressure Sensor Series PS400/PS500

10 Adjustable parameters and their meaning

10.1 Sensor with 2 switching outputs

Parameter	Explanation	Options	Function
Loc	Disabling the programming mode		Programming mode fully disabled/locked
ULoc	Enabling the programming mode		Programming mode enabled/unlocked (default/ex factory)
Unit	Display unit	bar psi kPa MPa	bar (LED green) psi (LED green) kPa (LED green) MPa (LED green)
SP1	Switch point 1		Upper limit value at which output 1 changes its switching status
rP1	Release point 1		Lower limit value at which output 1 changes its switching status
OU1	Function of output 1	Hno1	Hysteresis function (N/O = normally open)
		Hnc1	Hysteresis function (N/C = normally closed)
		Fno1	Window function (N/O = normally open)
		Fnc1	Window function (N/C = Öffner)
SP2	Switch point 2		Upper limit value at which output 2 changes its switching status

Parameter Explanation	Options	Function
rP2 Release point 2		Lower limit value at which output 2 changes its switching status
OU2 Function of output 2	Hno2 Hnc2 Fno2 Fnc2	Hysteresis function (N/O = normally open) Hysteresis function (N/C = normally closed) Window function (N/O = normally open) Window function (N/C = normally closed)
EF Extra menu for additional settings		If the display shows the parameter EF , the user can adjust various additional parameters in the sub-menu using the "Set" button. See 10.1.1

Pressure Sensor Series PS400/PS500

10.1.1 Additional adjustment options in the sub-menu EF

Parameter	Explanation	Option	Function
HI	Maximum value memory		The highest pressure value is stored in the non-volatile memory.
LO	Minimum value memory		The lowest pressure value is stored in the non-volatile memory.
COF	Offset correction		Significant thermal changes in the sensor environment can lead to zero shift. As a result, the measuring value displayed in a pressure-free state will not accord to zero. This drift can be corrected. Adjustment range: -5 to +5 % of the measuring span in increments of 0.1%
dSP1	Switching delay of SP1		0 / 0.1 ... 50 s in increments of 0.1 s (0 = delay time not active)
dr1	Switching delay of rP1		0 / 0.1 ... 50 s in increments of 0.1 s (0 = delay time not active)
dSP2	Switching delay of SP2		0 / 0.1...50 s in increments of 0.1 s (0 = delay time not active)

Parameter	Explanation	Option	Function
dr2	Switching delay of rP2		0 / 0.1...50 s in increments of 0.1 s (0 = delay time not active)
dAP	Damping of switching output		Short pressure peaks or high frequencies can be filtered out (0 / 0.01...4 s in increments of 0.01 s (0 = delay time not active))
diS	Measuring value update in display	50	50 ms update
		200	200 ms update
		600	600 ms update
		r50	50 ms update/ Display rotated by 180°
		r200	200 ms update/ Display rotated by 180°
		r600	600 ms update/ Display rotated by 180°
		OFF	Display is turned off and activated for 10 s by pressing the "Mode" button.
rSt			Reset to factory settings/default
SOF			Software version

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10.2 Sensor with one switching output and one analogue output

Parameter	Explanation	Options	Function
Loc	Inhibiting/locking the programming mode		Programming mode is completely inhibited.
ULoc	Enabling/unlocking		Programming mode is enabled (default).
Unit	Display unit	bar psi kPa MPa	bar (LED green) psi (LED green) kPa (LED green) MPa (LED green)
SP	Switch point		Upper limit value at which the switching output changes its switching status
rP	Release point		Lower limit value at which the switching output changes its switching status
OUSP	Function of the switching output	Hno Hnc Fno Fnc	Hysteresis function (N/O = normally open) Hysteresis function (N/C = normally closed) Window function (N/O = normally open) Window function (N/C = normally closed)
ASP	Starting point of the analogue output		Pressure value at which the analogue output has its starting point. It is set via the "Mode" and "Set" button.

Parameter	Explanation	Options	Function
AEP	End point of the analogue output		Pressure value at which the analogue output has its end point. It is set via the "Mode" and "Set" button.
OUAn	Analogue output (I) Type: PS...-LI...	4-20 0-20 20-4 20-0	rising straight line falling straight line
	Analogue output (V) Type: PS...-LU...	0-10 0-5 1-6 10-0 5-0 6-1	rising straight line falling straight line
EF	Extra menu for additional settings		If the display shows the parameter EF you can set various parameters via the "Set" button in a sub-menu. See 10.2.1

Pressure Sensor Series PS400/PS500

10.2.1 Additional settings in the sub-menu EF

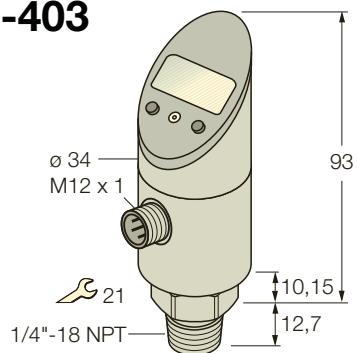
Parameter	Explanation	Options	Function
HI	Max. value memory		The highest pressure value is stored in the non-volatile memory.
LO	Min. value memory		The lowest pressure value is stored in the non-volatile memory.
COF	Offset correction		Significant thermal changes in the sensor environment can lead to zero shift. As a result, the measuring value displayed in a pressure-less state will not accord to zero. This drift can be corrected. Adjustment range: -5 to +5 % of the measuring span in increments of 0.1 %
dSP	Switching delay of SP1		0 / 0.1...50 s in increments of 0.1 s (0 = delay time is not active)
drP	Switching delay of rP1		0 / 0.1...50 s in increments of 0.1 s (0 = delay time is not active)

Parameter	Explanation	Options	Function
dAP	Damping of the switching output		Pressure peaks of short duration or high frequency can be filtered. (0 / 0.01 ... 4 s in increments of 0.01 s (0 = delay time not activated))
dAA	Damping of the analogue output		Pressure peaks of short duration or high frequency can be filtered. (0 / 0.01 ... 4 s in increments of 0.01 s (0 = delay time not activated))
diS	Update of measuring value on display	50 200 600 r50 r200 OFF	50 ms update 200 ms update 600 ms update 50 ms update/ display rotated by 180° 200 ms update/display rotated by 180° 600 ms update/ display rotated by 180° Display is turned off and activated for 10 s by pressing the "Mode" button
rSt	Reset to default		
SOF	Software version		

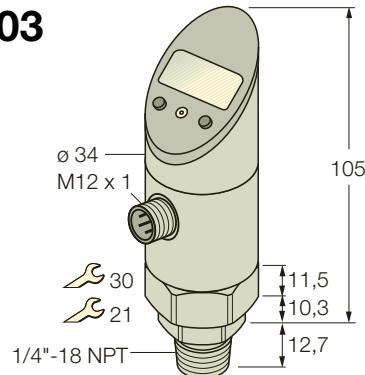
Pressure Sensor Series PS400/PS500

11 Dimension drawings of the various types

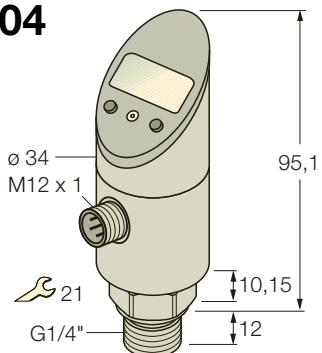
PS...-403



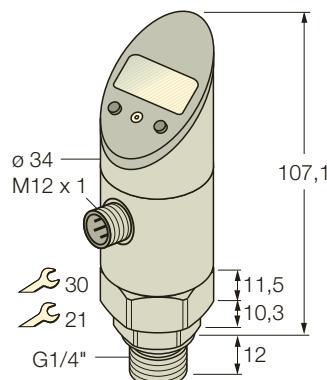
PS...-503



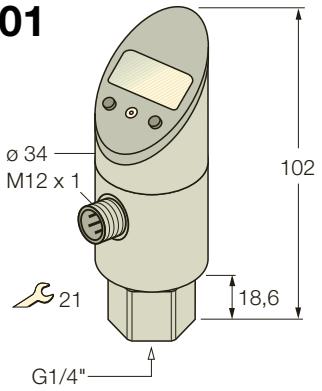
PS...-404



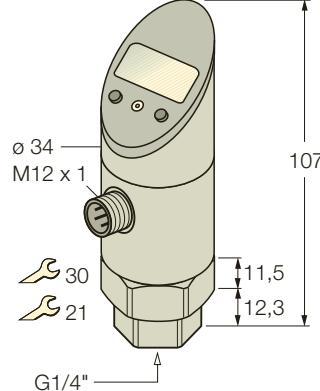
PS...-504



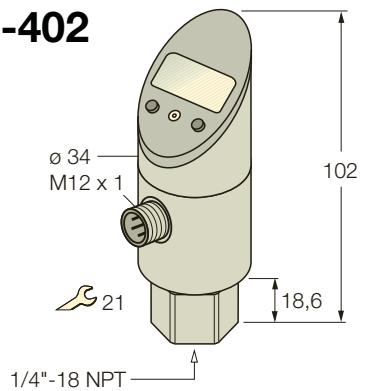
PS...-401



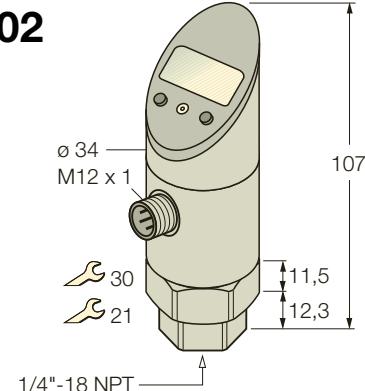
PS...-501



PS...-402



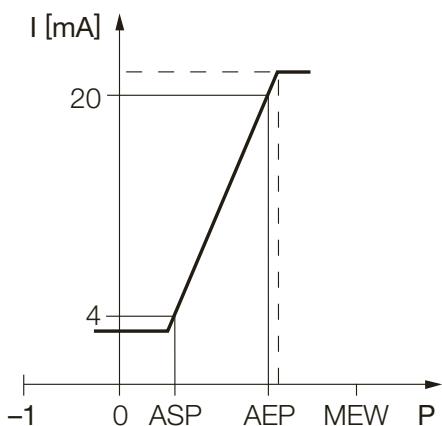
PS...-502



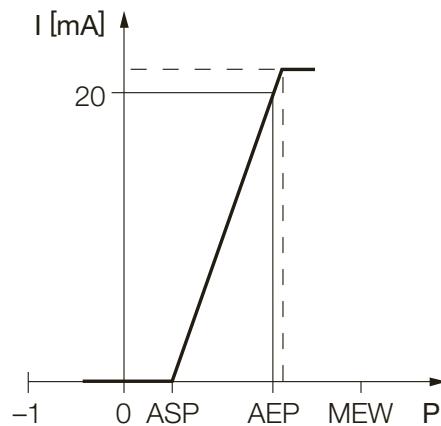
12 Typical curves of the analogue outputs

Current output

4...20 mA



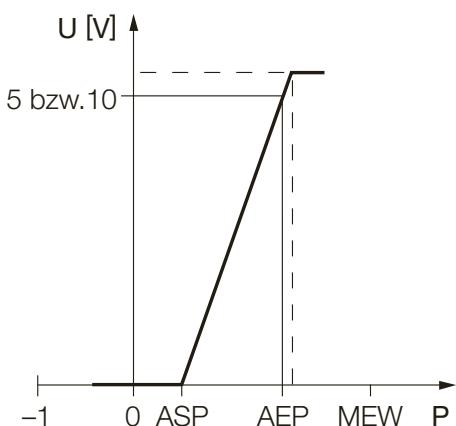
0...20 mA



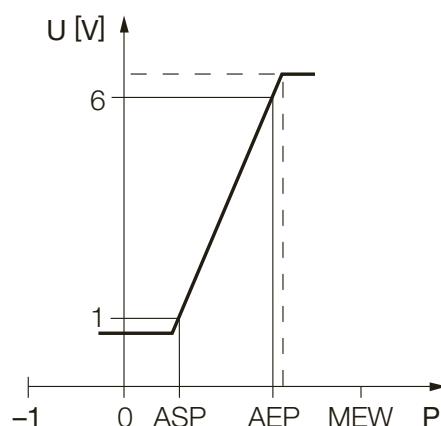
Within the defined measuring range between ASP (analogue start point) and AEP (analogue end point), the output signal is between 4 and 20 mA or alternatively between 0 and 20 mA. The ex-factory setting of the measuring range is between 0 and MEW (measuring range end value) and the default output signal is between 4 mA (ASP) and 20 mA (AEP).

Voltage output

0...5 V or 0...10 V



1...6 V



Within the defined measuring range between ASP (analogue start point) and AEP (analogue end point), the output signal is between 0 and 10 V or alternatively between 0 and 5 or 1...6 V. The ex-factory setting of the measuring range is between 0 and MEW (measuring range end value) and the default output signal is between 0 V (ASP) and 10 V (AEP).

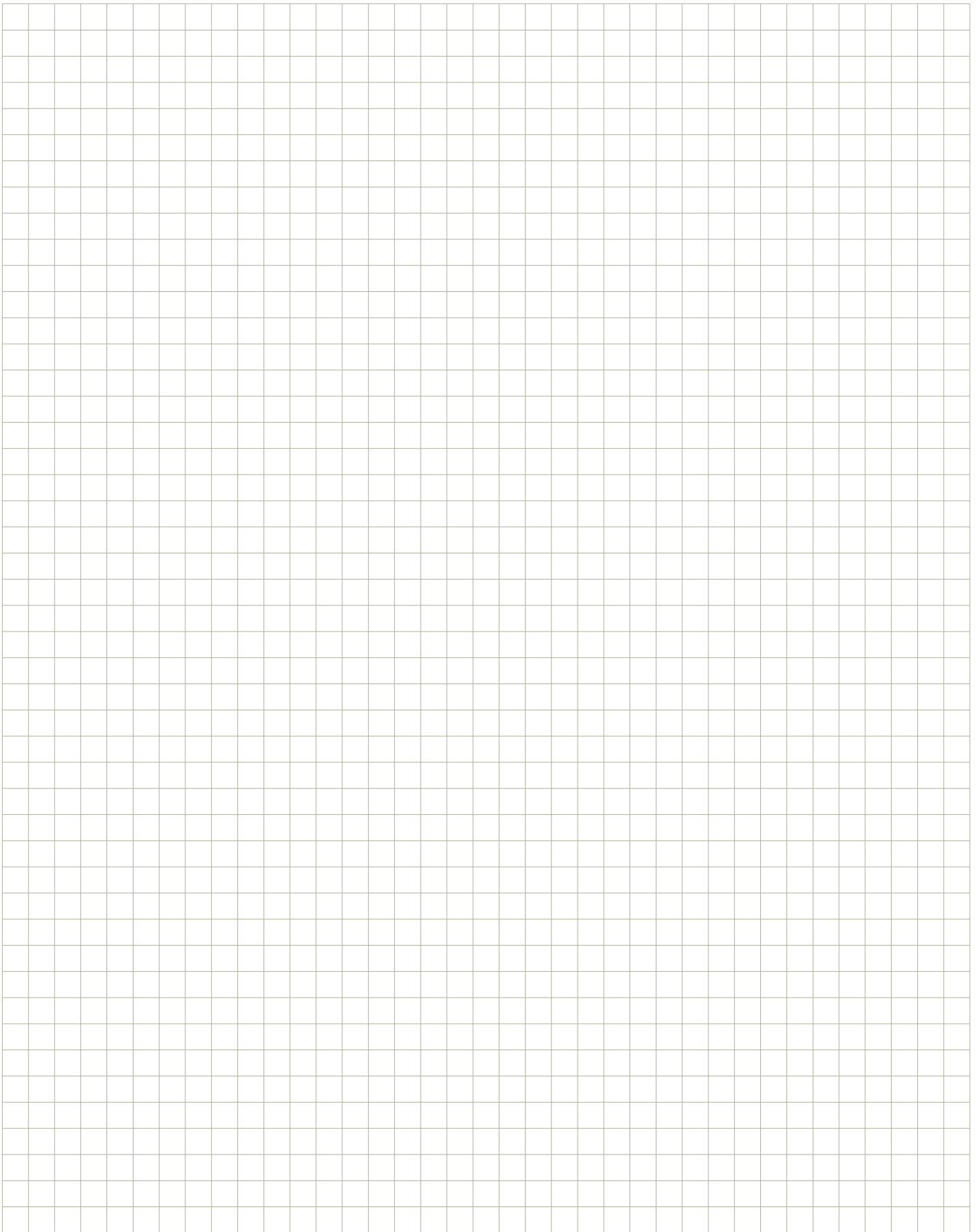
Pressure Sensor Series PS400/PS500

13 Technical Data

Type	PS...-4...	PS...-5...
Pressure range	-1...400 bar	-1...400 bar
Type of pressure	Relative pressure	Relative pressure
Outputs	2 switching outputs or 1 switching and 1 analogue output (freely configurable)	2 switching outputs or 1 switching and 1 analogue output (freely configurable)
Analogue current output	(0)4...20 mA	(0)4...20 mA
Analogue voltage output	0...5 V 0...10 V 1...6 V	0...5 V 0...10 V 1...6 V
Switch point accuracy	±0.5 %	±0.5 %
Deviation from typ. curve Non-linearity, hysteresis, repeat accuracy	±0.5 %	±0.5 %
TC ¹⁾ of zero point per 10K	±0.15 %	±0.15 %
TC ¹⁾ of span per 10K	±0.15 %	±0.15 %
Burst protection	pat. media stop	pat. media stop
Switch point clearance	≥ 3 %	≥ 3 %
Switch points	5...100 % of final value	5...100 % of final value
Release positions	2...97 % of final value	2...97 % of final value
Type of display	4-digit 7-segment display	4-digit 7-segment display
Display, invertible	yes	yes
No. of progr. buttons	3	3
Housing material	VA	VA
Pressure module	Ceramics Al ₂ O ₃	Ceramics Al ₂ O ₃
Materials with medium contact:	VA, FPDM, Ceramics Al ₂ O ₃	VA, FPDM, Ceramics Al ₂ O ₃
Sensor body, adjustable	no	360°
Medium temperature	-25...85 °C	-25...85 °C
Ambient temperature	-40...80 °C	-40...80 °C

TC¹⁾ Temperature coefficient

Type	PS...-4...	PS...-5...
Storage temperature	-40...80 °C	-40...80 °C
Operating voltage	15... 30 VDC with 2 switching outputs 18...30 VDC with analogue output SELV, PELF to EN 50178	15... 30 VDC with 2 switching outputs 18...30V DC with analogue output
No-load current I_0	≤ 50 mA	≤ 50 mA
Switching frequency	≤ 180 Hz	≤ 180 Hz
Output function	2 PNP, N.C./ N.O., progr.	2 PNP, N.C./ N.O., progr.
Voltage drop at I_e	≤ 2 V	≤ 2 V
Short-circuit protection	yes	yes
Rev. polarity protection	yes	yes
Rated operating current	0.2 A	0.2 A
Degree of protection	IP67	IP67
Protection class	III	III
EMC		
EN 61000-4-2	ESD:4 KV CD/ 8 KV AD	ESD:4 KV CD/ 8 KV AD
EN 61000-4-3	HF irradiated:15 V/m	HF irradiated:15 V/m
EN 61000-4-4	Burst: 2 KV	Burst: 2 KV
EN 61000-4-5	Surge: 500 V, 12 Ω	Surge: 500 V, 12 Ω
EN 61000-4-6	HF conducted: 10 V	HF conducted: 10 V
Pressure connection with fixing torque	AF 21 max. 50 Nm	AF 21 max. 50 Nm
Coupling nut with with fixing torque	–	SW 30 max. 35 Nm
Vibration resistance	20 x g (9...200 Hz with amplitude +/- 5 mm) to IEC 68-2-27	
Shock resistance	50 x g (11 ms) to IEC 68-2-27	50 x g (11 ms) to IEC 68-2-27
Connection	connector M12 x 1, FIXCON-compatible	



PS....-2UP8X-...

Parameter	Explanation
Loc	inhibit/lock
uLoc	enable/unlock
Unit	Unit of pressure
SP1	Switch point 1
rP1	Release position 1
OU1	Switching output function 1
SP2	Switch point 2
rP2	Release position 2
OU2	Switching output function 2
EF	Additional functions
HI	Max-value memory
LO	Min-value memory
COF	Offset correction
ds1	Switch point delay
dr1	Release point delay
ds2	Switch point delay
dr2	Release point delay
dAP	Damping of switching output
diS	Display update
rSt	Reset to default settings
SOF	Software version

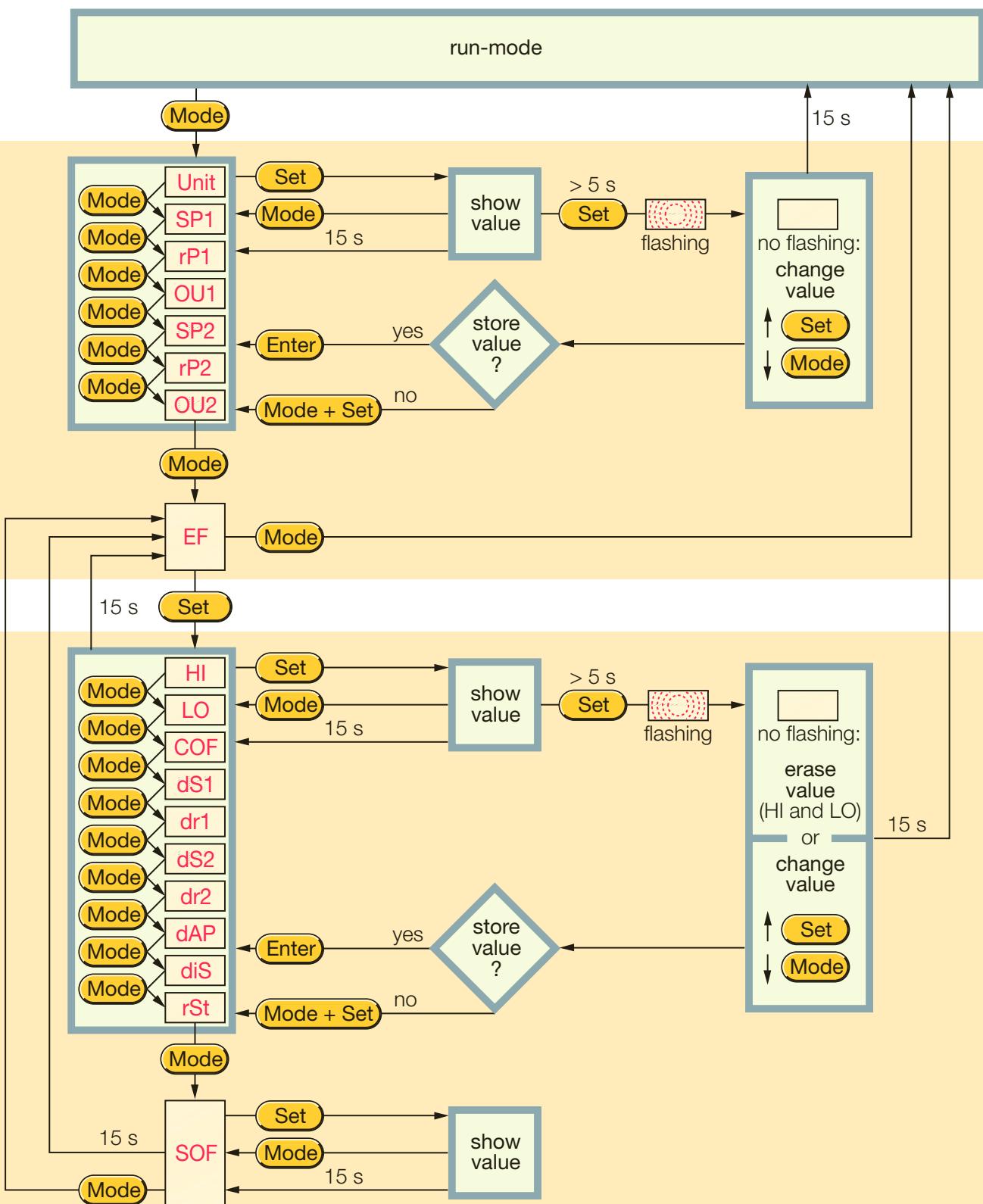
PS...-....-2UP8X-...

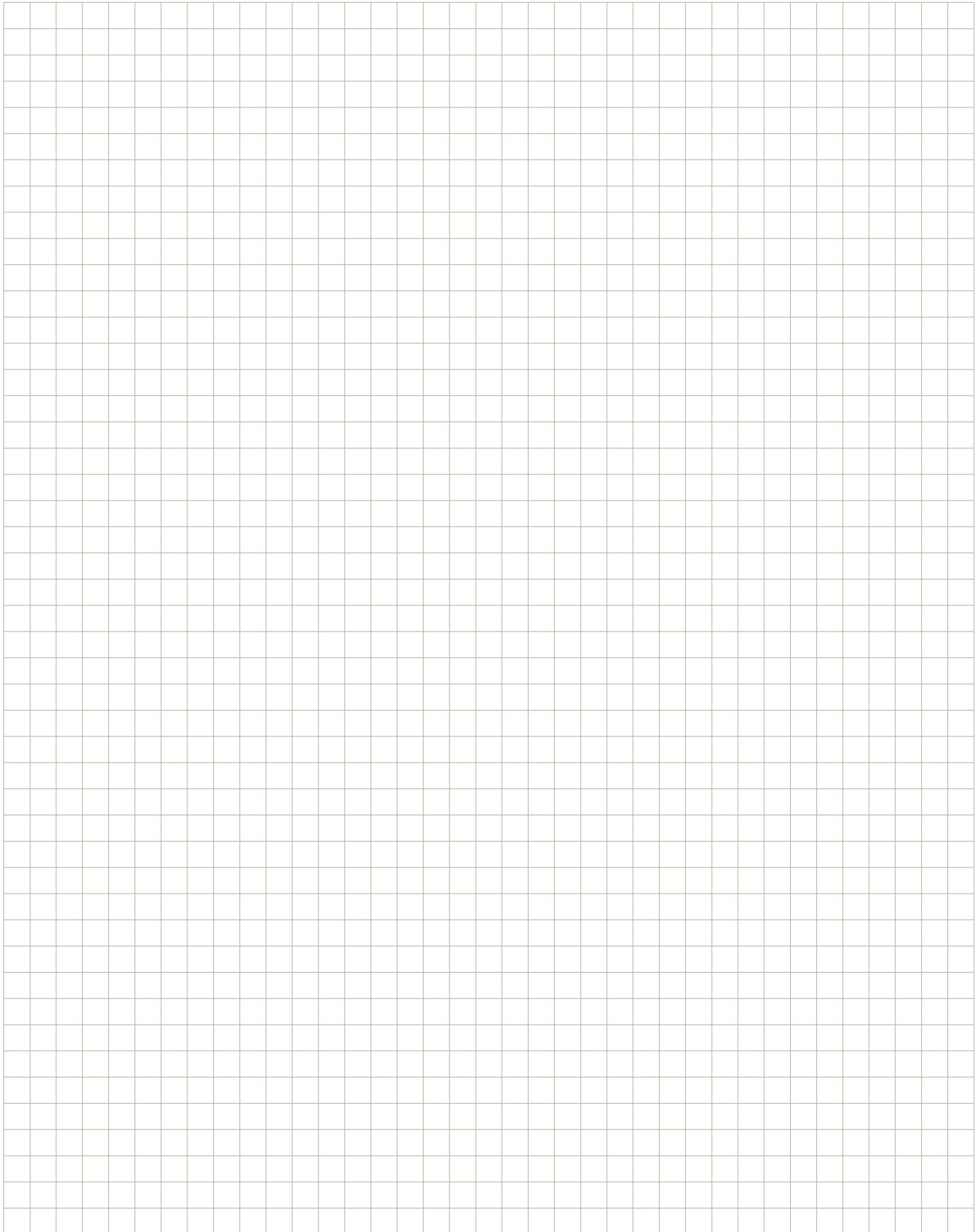
lock-function



run-mode

standard functions





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