PERFORMANCE
MADE
SMARTER

Product manual
4225
Universal f/I-f/f converter



TEMPERATURE | I.S. INTERFACES | COMMUNICATION INTERFACES | MULTIFUNCTIONAL | ISOLATION | DISPLAY

No. 4225V100-UK
From serial no.: 201666001

electronics

6 Product Pillars
to meet your every need

Individually outstanding, unrivalled in combination

With our innovative, patented technologies, we make signal conditioning smarter and simpler. Our portfolio is composed of six product areas, where we offer a wide range of analog and digital devices covering over a thousand applications in industrial and factory automation. All our products comply with or surpass the highest industry standards, ensuring reliability in even the harshest of environments and have a 5-year warranty for greater peace of mind.



Temperature

Our range of temperature transmitters and sensors provides the highest level of signal integrity from the measurement point to your control system. You can convert industrial process temperature signals to analog, bus or digital communications using a highly reliable point-to-point solution with a fast response time, automatic self-calibration, sensor error detection, low drift, and top EMC performance in any environment.



I.S. Interface

We deliver the safest signals by validating our products against the toughest safety standards. Through our commitment to innovation, we have made pioneering achievements in developing I.S. interfaces with SIL 2 Full Assessment that are both efficient and cost-effective. Our comprehensive range of analog and digital intrinsically safe isolation barriers offers multifunctional inputs and outputs, making PR an easy-to-implement site standard. Our backplanes further simplify large installations and provide seamless integration to standard DCS systems.



Communication

We provide inexpensive, easy-to-use, future-ready communication interfaces that can access your PR installed base of products. All the interfaces are detachable, have a built-in display for readout of process values and diagnostics, and can be configured via push-buttons. Product specific functionality includes communication via Modbus and Bluetooth and remote access using our PR Process Supervisor (PPS) application, available for iOS and Android.



Multifunction

Our unique range of single devices covering multiple applications is easily deployable as your site standard. Having one variant that applies to a broad range of applications can reduce your installation time and training, and greatly simplify spare parts management at your facilities. Our devices are designed for long-term signal accuracy, low power consumption, immunity to electrical noise and simple programming.



Isolation

Our compact, fast, high-quality 6 mm isolators are based on microprocessor technology to provide exceptional performance and EMC-immunity for dedicated applications at a very low total cost of ownership. They can be stacked both vertically and horizontally with no air gap separation between units required.



Display

Our display range is characterized by its flexibility and stability. The devices meet nearly every demand for display readout of process signals and have universal input and power supply capabilities. They provide a real-time measurement of your process value no matter the industry and are engineered to provide a user-friendly and reliable relay of information, even in demanding environments.

Universal f/I-f/f converter 4225

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Warning



GENERAL

This device is designed for connection to hazardous electric voltages. Ignoring this warning can result in severe personal injury or mechanical damage.
To avoid the risk of electric shock and fire, the safety instructions of this guide must be observed and the guidelines followed. The specifications must not be exceeded, and the device must only be applied as described in the following.
Prior to the commissioning of the device, this installation guide must be examined carefully.
Only qualified personnel (technicians) should install this device. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Warning



HAZARD-
OUS
VOLTAGE

Until the device is fixed, do not connect hazardous voltages to the device. The following operations should only be carried out on a disconnected device and under ESD safe conditions:

General mounting, connection and disconnection of wires.
Troubleshooting the device.

Repair of the device and replacement of circuit breakers must be done by PR electronics A/S only.

Warning



CAUTION

Do not open the front plate of the device as this will cause damage to the connector for the PR 4500 communication interfaces.
This device contains no DIP-switches or jumpers.
SYSTEM 4000 must be mounted on a DIN rail according to DIN EN 60715.

Symbol identification



Triangle with an exclamation mark: Warning / demand. Potentially lethal situations. Read the manual before installation and commissioning of the device in order to avoid incidents that could lead to personal injury or mechanical damage.



The CE mark proves the compliance of the device with the essential requirements of the directives.



The double insulation symbol shows that the device is protected by double or reinforced insulation.

Safety instructions

Definitions

Hazardous voltages have been defined as the ranges: 75 to 1500 Volt DC, and 50 to 1000 Volt AC.
Technicians are qualified persons educated or trained to mount, operate, and also trouble-shoot technically correct and in accordance with safety regulations.
Operators, being familiar with the contents of this manual, adjust and operate the knobs or potentiometers during normal operation.

Receipt and unpacking

Unpack the device without damaging it and check whether the device type corresponds to the one ordered. The packing should always follow the device until this has been permanently mounted.

Environment

Avoid direct sun light, dust, high temperatures, mechanical vibrations and shock, and rain and heavy moisture. If necessary, heating in excess of the stated limits for ambient temperatures should be avoided by way of ventilation.
The device must be installed in pollution degree 2 or better.
The device is designed to be safe at least under an altitude up to 2 000 m.
The device is designed for indoor use.

Mounting

Only technicians, who are familiar with the technical terms, warnings, and instructions in the manual and who are able to follow these, should connect the device. Should there be any doubt as to the correct handling of the device, please contact your local distributor or, alternatively,

PR electronics A/S
www.prelectronics.com

Mounting and connection of the device should comply with national legislation for mounting of electric materials, i.e. wire cross section, protective fuse, and location.

Stranded wire should be installed with an insulation stripping length of 5 mm or via a suitable insulated terminal such as a bootlace ferrule.

Descriptions of input / output and supply connections are shown in the block diagram and side label.

The following apply to fixed hazardous voltages-connected devices:

The max. size of the protective fuse is 10 A and, together with a power switch, it should be easily accessible and close to the device. The power switch should be marked with a label indicating that it will switch off the voltage to the device.

Year of manufacture can be taken from the first two digits in the serial number.

UL installation requirements

Use 60/75°C copper conductors only
For use only in pollution degree 2 or better
Max. ambient temperature . . . . . 60°C
Max. wire size. . . . . AWG 26-14
UL file number E248256

Calibration and adjustment

During calibration and adjustment, the measuring and connection of external voltages must be carried out according to the specifications of this manual. The technician must use tools and instruments that are safe to use.

Normal operation

Operators are only allowed to adjust and operate devices that are safely fixed in panels, etc., thus avoiding the danger of personal injury and damage. This means there is no electrical shock hazard, and the device is easily accessible.

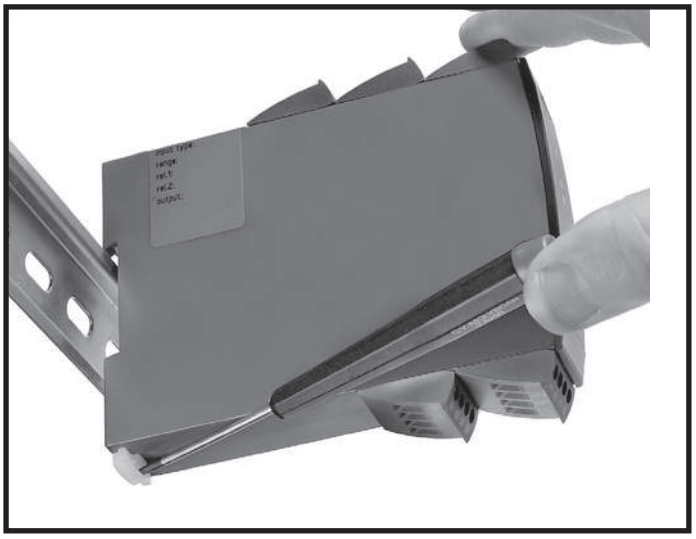
Cleaning

When disconnected, the device may be cleaned with a cloth moistened with distilled water.

Liability

To the extent the instructions in this manual are not strictly observed, the customer cannot advance a demand against PR electronics A/S that would otherwise exist according to the concluded sales agreement.

How to demount system 4000

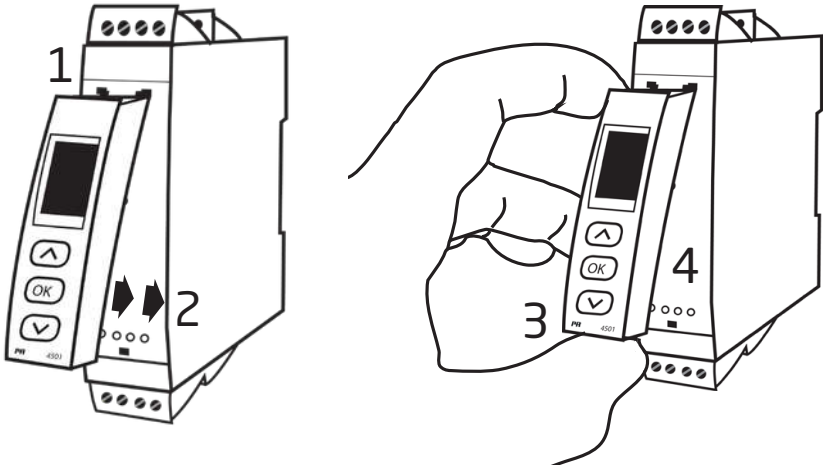


Picture 1:
The device is detached from the DIN rail by moving the bottom lock down.

Mounting / demounting the PR 4500 communication interfaces

1: Insert the tabs of the PR 4500 into the slots at the top of the device.
2: Hinge the PR 4500 down until it snaps into place.

Demounting of the PR 4500 communication interfaces
3: Push the release button on the bottom of the PR 4500 and hinge the PR 4500 out and up.
4: With the PR 4500 hinged up, remove from the slots at the top of the device.



Universal f/I-f/f converter
4225

- Front-programmable
- Input: NAMUR, NPN, PNP, Tacho, TTL & S0
- Output: Programmable bipolar mA / V, frequency or relay
- Universal power supply 21.6...253 VAC / 19.2...300 VDC

Functional highlights

- Measures frequencies up to 100 kHz.
- Active and passive current output ±23 mA / 0...23 mA.
- Buffered voltage output ±10 VDC.
- Linearization: Linear or square root function.
- 2-point process calibration.
- Programmable trigger levels -0.05...6.5 V.
- Programmable sensor supply 5...17 V.
- NAMUR sensor error detection.
- Advanced configurable input limits for increased safety.
- Digital output: NPN & PNP; 0...100 kHz with programmable logic level 5...24 V.
- Output relay with windows, setpoint and latch functionality.
- Simulation of process value during commissioning and maintenance.
- All terminals are over-voltage protected (24 VDC), polarity protected and short-circuit protected.

Technical highlights

- Accuracy < 0.06% / span.
- Temperature coefficient 0.006% / C°.
- Response time < 30 ms.
- 2.3 kVAC, 3-port galvanic isolation.
- NAMUR NE21 and NE43.

Programming

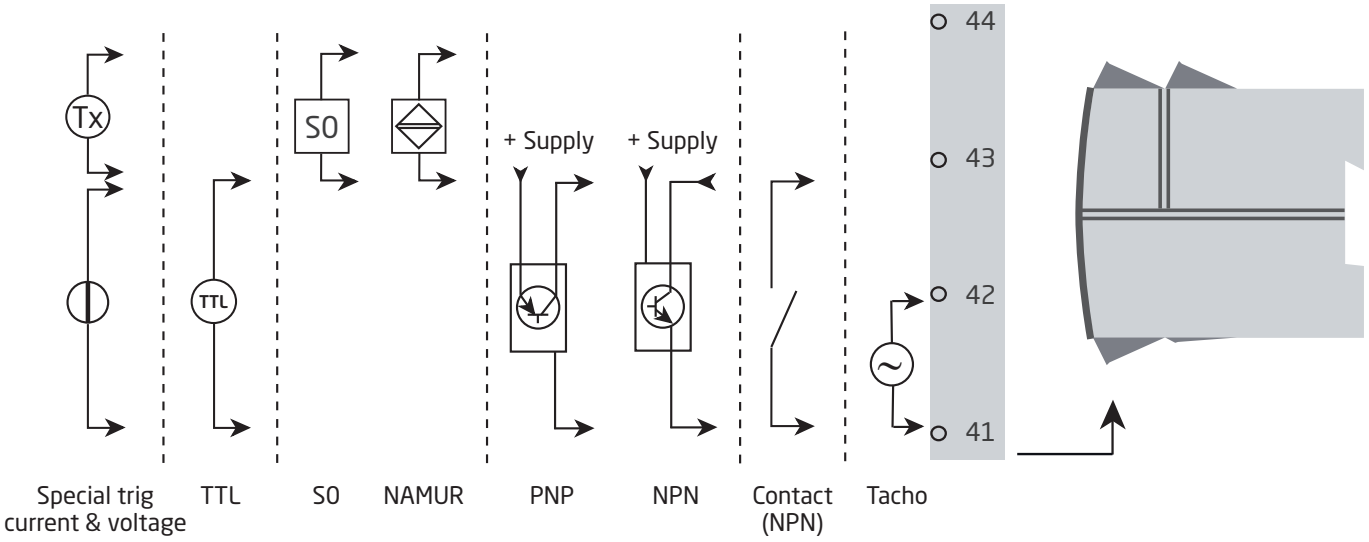
- Configuration, monitoring and diagnostics using the PR 4500 detachable communication interfaces. Product-specific functionality includes communication via Modbus and Bluetooth using our PR Process Supervisor (PPS) application, available for iOS and Android.
- All programming can be password-protected.
- Scrolling help text in 7 languages.

Mounting

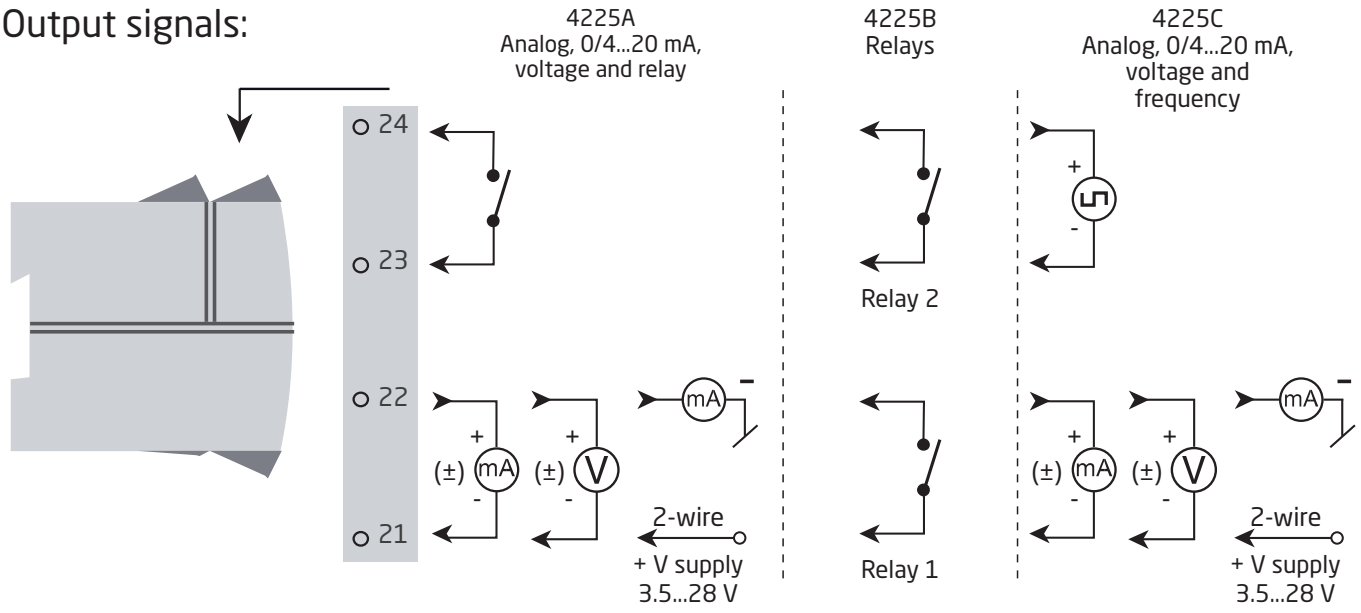
- Units can be mounted side by side, horizontally and vertically, without air gap on a standard DIN rail – even at 60°C ambient temperature.

Applications

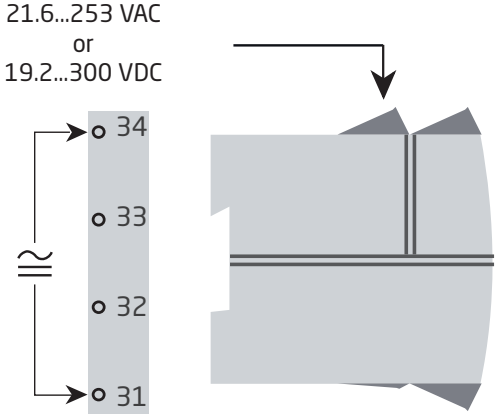
Input signals:



Output signals:

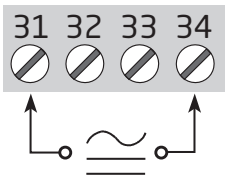


Power connection:



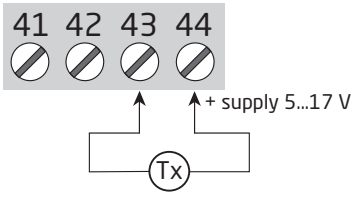
Connections

Supply

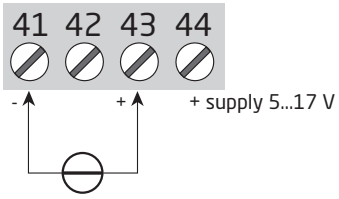


Inputs:

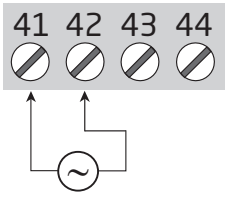
Special current



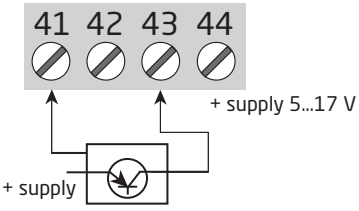
Special voltage



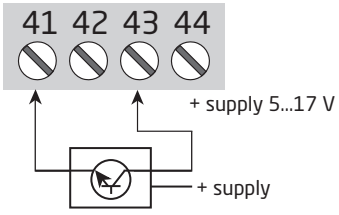
Tacho



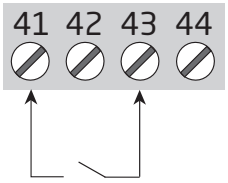
PNP



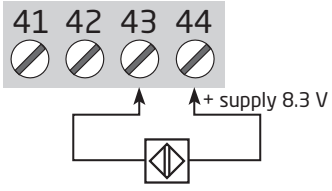
NPN



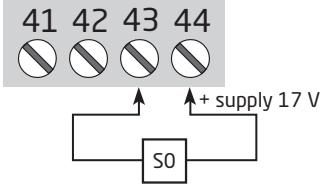
Contact (NPN)



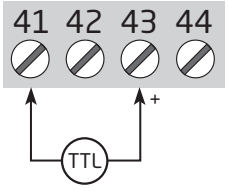
NAMUR



S0



TTL

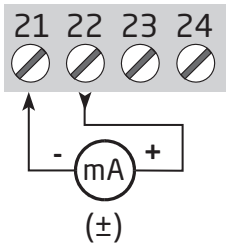


Connections

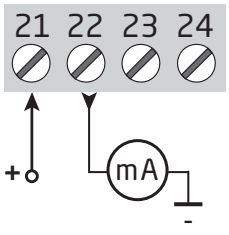
Outputs:

4225A

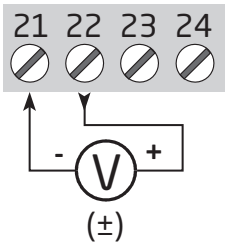
Current
(Active output)



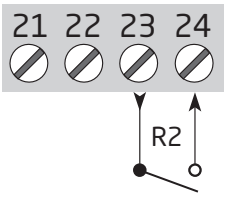
2-wire transmitter
(Passive output)



Buffered voltage

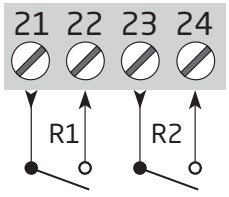


Relay



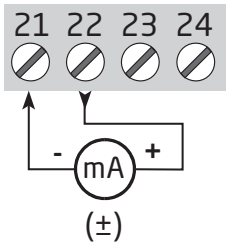
4225B

Relays

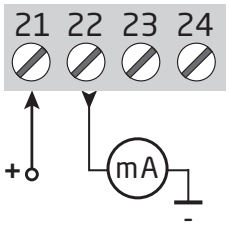


4225C

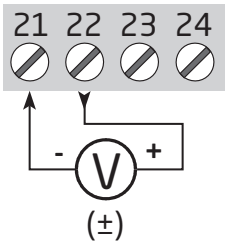
Current
(Active output)



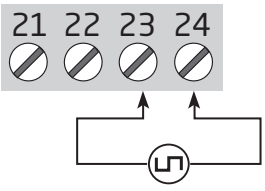
2-wire transmitter
(Passive output)



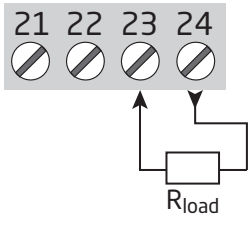
Buffered voltage



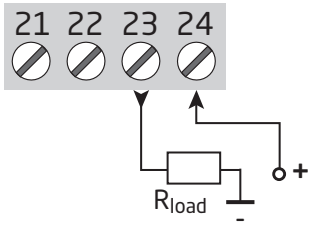
Frequency
(Push / pull)



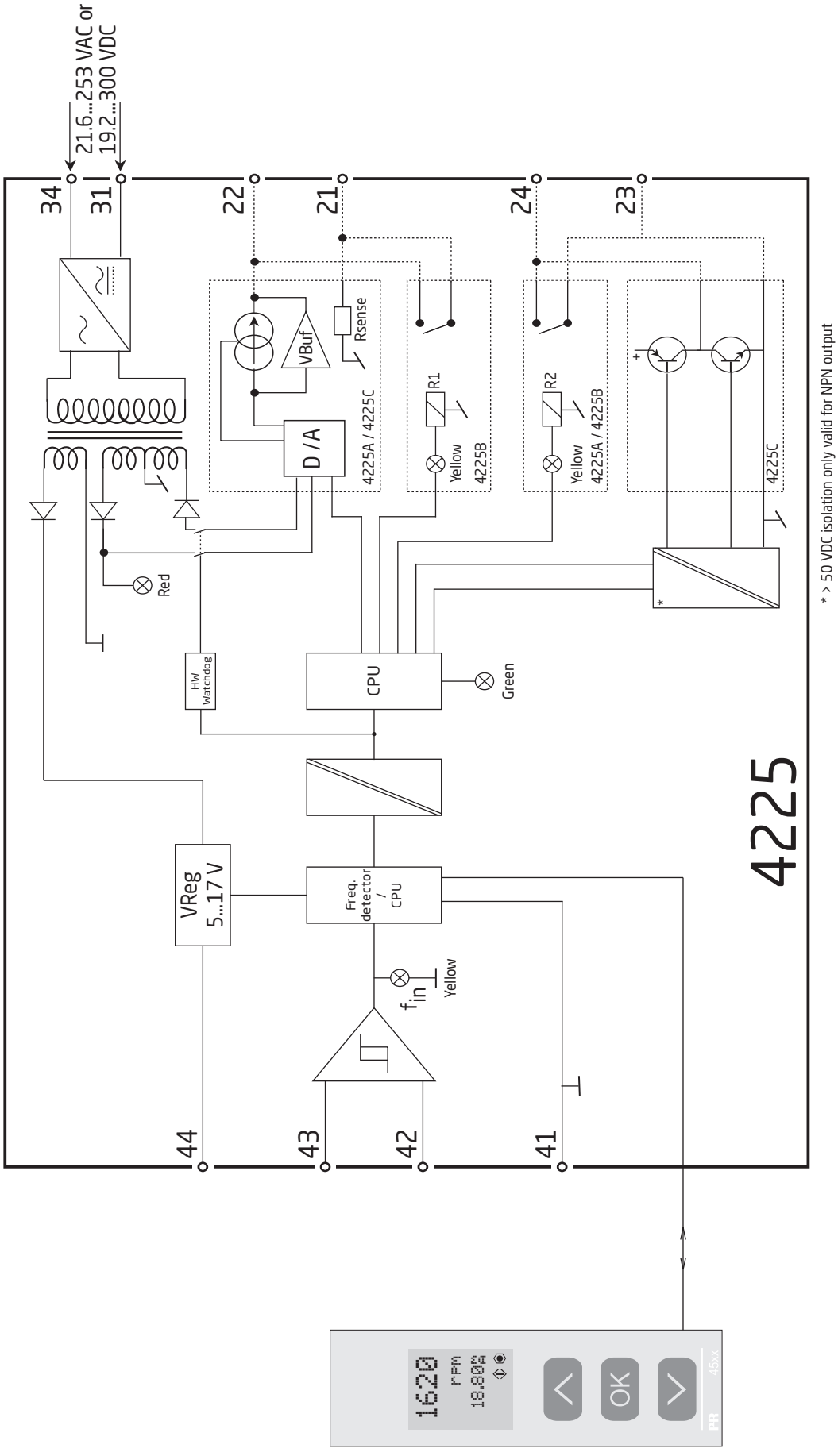
Frequency
(PNP output)



Frequency
(NPN output)



Block diagram



Specifications

Order

Type	Output	
4225	1 analog output and 1 relay	: A
	2 relays	: B
	1 analog output and 1 frequency output	: C

Accessories

4501 = Display / programming front
4511 = Modbus communication enabler
4512 = Bluetooth communication enabler

Note: The PR 4500 communication interfaces are approved and certified as an add-on component to the 4000 series of devices. All technical characteristics are valid with the PR 4500 communication interface attached.

Electrical specifications

Environmental conditions:

Operating temperature . . . . . -20°C to +60°C
Storage temperature . . . . . -20°C to +85°C
Calibration temperature . . . . . 20...28°C
Relative humidity . . . . . < 95% RH (non-cond.)
Protection degree IP20
Installation in pollution degree 2 & measurement / overvoltage category II.

Mechanical specifications:

Dimensions (HxWxD) . . . . . 109 x 23.5 x 104 mm
Dimensions (HxWxD) w/ 4501 / 451x . . . . . 109 x 23.5 x 116 / 131 mm
Weight approx., 4225A / 4225B / 4225C . . . . . 160 / 165 / 150 g
DIN rail type . . . . . DIN EN 60715 - 35 mm
Wire size . . . . . 0.13...2.08 mm^2 / AWG 26...14 stranded wire
Screw terminal torque . . . . . 0.5 Nm

Common electrical specifications:

Supply voltage, universal . . . . . 21.6...253 VAC, 50...60 Hz
or 19.2...300 VDC
Protective fuse . . . . . 400 mA SB / 250 VAC
Max. required power . . . . . ≤ 2.6 W
Max. power dissipation . . . . . ≤ 2.1 W
Isolation voltage - test . . . . . 2.3 kVAC
Isolation voltage - working
Input to any . . . . . 250 VAC (reinforced)
Relay to relay, relay to analog . . . . . < 115 VAC (reinforced), > 115 VAC (basic)
NPN to analog . . . . . Isolated > 50 VDC
Push-Pull / PNP to analog . . . . . Shared ground with analog output
Programming . . . . . PR 4500 communication interfaces
Signal dynamics, output . . . . . 18 bit
Signal / noise ratio . . . . . > 60 dB
Response time (0...90%, 100...10%) . . . . . ≤ 30 ms

Accuracy, the greater of basic and absolute values:

Input			
Type	Basic accuracy	Absolute accuracy	Temperature coefficient
Frequency input	≤ 0.0002 Hz	≤ ±0.01% of input frequency	≤ ±0.0005% / °C

Output			
Type	Basic accuracy	Absolute accuracy	Temperature coefficient
Current output	8 µA	≤ ±0.05% of span	≤ ±0.005% / 0.8 µA / °C
Voltage output	2 mV	≤ ±0.05% of span	≤ ±0.005% / 200 µV / °C
Frequency output	n.a.	≤ ±0.002% of output frequency +0.0004% of $f_{max.}$	≤ ±0.0005% / °C

EMC - immunity influence.	< ±0.5% of span
Extended EMC immunity:	
NAMUR NE 21, A criterion, burst	< ±1% of span

of span = of selected standard range

In case of digital readout of measurement value, e.g. via Modbus communication enabler interface, the input accuracy can be calculated as in example 1.

Basic accuracy$_{Input}$ = 0.0002 Hz
Absolute accuracy$_{Input}$ = 0.001%
Calibration temperature = **20...28°C**

Example 1: Digital readout via Modbus, input low 200 Hz, input high 800 Hz:

Accuracy$_{Input_low}$ = 0.01% x 200 Hz = 0.02 Hz
Accuracy$_{Input_high}$ = 0.01% x 800 Hz = 0.08 Hz

Choose the greater of Basic accuracy$_{Input}$ = 0.0002 Hz and Accuracy$_{Input_low\ /\ high}$ = 0.02 Hz / 0.08 Hz

Accuracy$_{Input_low\ /\ high}$ = 0.02 Hz / 0.08 Hz

Example 2: Analog current output, input low 1 kHz, input high 8 kHz, output span 4...20 mA = 16 mA:

Accuracy$_{Input_low}$ = 0.01% x 1000 Hz = 0.1 Hz
Accuracy$_{Input_high}$ = 0.01% x 8000 Hz = 0.8 Hz
Accuracy$_{Output}$ = 0.05% x 7000 Hz = 3.5 Hz

Total accuracy$_{Low}$ = Accuracy$_{Input_low}$ + Accuracy$_{Output}$
Total accuracy$_{Low}$ = 0.1 Hz + 3.5 Hz = 3.6 Hz

Total accuracy$_{High}$ = Accuracy$_{Input_high}$ + Accuracy$_{Output}$
Total accuracy$_{High}$ = 0.8 Hz + 3.5 Hz = 4.3 Hz

Example accuracy calculations are based on factory calibration ambient temperature, and do not take into account other potential sources of inaccuracy, e.g. power supply effect, ambient temperature fluctuation etc. which must also be considered.

Auxiliary supplies

Sensor supply limitation (terminal 44)	20 mA, 5...17 V

Input specifications

Frequency input

Frequency range	0.001 Hz to 100 kHz
Time range, time function	10 µs to 999.9 s
Max. frequency, with input filter ON	75 Hz
Min. pulse width with input filter ON	8 ms
Min. pulse width with input filter OFF	4 µs
Response time (0...90%, 100...10%)	< 30 ms

NAMUR input

Trig-level LOW	≤ 1.2 mA
Trig-level HIGH	≥ 2.1 mA
Input impedance	1 kΩ / < 1.5 nF
Breakage detection	≤ 0.1 mA
Short-circuit detection	≥ 6.9 mA
Sensor supply - pin 44, fixed	8.3 V

Tacho input

Trig-level LOW	≤ -50 mV
Trig-level HIGH	≥ +50 mV
Input impedance	100 kΩ / < 1.5 nF
Max. input voltage	80 VAC pp
Sensor supply - pin 44, programmable	5...17 V / 23 mA

NPN / PNP input

Trig-level LOW	≤ 4.0 V
Trig-level HIGH	≥ 7.0 V
Input impedance	3.48 kΩ / < 1.5 nF
Trigger edge	NPN = Neg. edge, PNP = Pos. edge.
Sensor supply - pin 44, programmable	5...17 V / 23 mA

TTL input

Trig-level LOW	≤ 0.8 V
Trig-level HIGH	≥ 2.0 V
Input impedance	≥ 100 kΩ / < 1.5 nF
Sensor supply - pin 44, programmable	5...17 V / 23 mA

S0 input

Trig-level LOW	≤ 2.2 mA
Trig-level HIGH	≥ 9.0 mA
Input impedance	758 Ω / < 1.5 nF
Sensor supply - pin 44, fixed	17 V

Special voltage input

User-programmable trig-levels	-0.05...6.50 V
*Hysteresis, min.	50 mV
Input impedance, programmable:	
High Z	≥100 kΩ / < 1.5 nF
Pull up/down	3.48 kΩ / < 1.5 nF
Programmable sensor supply - pin 44	5...17 V / 23 mA
Max. input voltage	17 V

Special current input

User-programmable trig-levels	0.0...10.0 mA
*Hysteresis, min.	0.2 mA
Input impedance	1 kΩ / < 1.5 nF
Sensor supply - pin 44, programmable	5...17 V / 23 mA
Max. input current	17 mA

* For low signal levels with input trigger level hysteresis below 100 mV / 0.1 mA it is recommended to use shielded cables with correct grounding, to avoid false triggering due to induced EMC.

Configurable input limits

Error detection	Enable / disable
Configurable input limits, low	0 Hz...min. configured input frequency
Configurable input limits, high	Max. configured input frequency...100 kHz
Hysteresis	0.5% of max. configured input frequency
Input limit low/high, error indication levels	UP, DOWN, ZERO, NONE See tables on pages 20-21

Output specifications

Current output

All standard ranges can be selected as Direct or Inverted action.

Signal range, active / passive	±23 mA / 0...23 mA
Programmable standard ranges	0...20, 4...20, S4-20, ±10 mA, ±20 mA
Load, max.	±23 mA / 600 Ω / ±13,8 VDC
External 2-wire loop supply	3.5...28 V
Response time, programmable	0...60 s
Load stability	≤ 0.001% of span / 100 Ω
Sensor error indication	0 / 3.5 / 23 mA / none
Output limitation at outside range	See tables on pages 20-21
Current limit	≤ 28 mA

Buffered voltage output

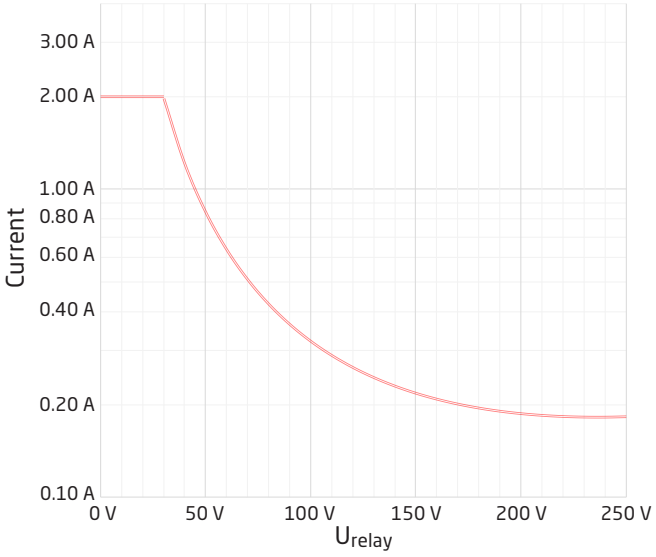
All standard ranges can be selected as Direct or Inverted action

Signal range	±11.5 VDC
Programmable standard ranges	0...5, 1...5, 0...10, 2...10, ±5, ±10 VDC
Load, min.	> 2 kΩ
Response time, programmable	0...60 s
Output limitation at outside range	See tables on pages 20-21

Relay outputs

Relay functions	Setpoint, Window, Sensor error, Latch, Power and Off
Hysteresis	0...100%
On and Off delay	0...3600 s
Power on delay	0...9999 s
NAMUR sensor error detection	Break / Make / Hold
Max. voltage	250 VAC / VDC
Max. AC current	2 A
Max. AC power	500 VA
Max. DC current, resistive load:	
@ U_{relay} ≤ 30 VDC	2 ADC
@ U_{relay} >30 VDC	[1380 x U_{relay}^{-2} x 1.0085$^{U_{relay}}$] ADC

Graphic depiction of [1380 x U_{relay}^{-2} x 1.0085$^{U_{relay}}$]:



Frequency output

Frequency range	0.001 Hz...100 kHz
Duty cycle f ≤ 500 Hz	< 90%
Programmable pulse time (f ≤ 500 Hz)	1...1000 ms
Pulse time > 500 Hz	Fixed 50%

PNP output

**I_{source} max.	30 mA
V_{out}	24 VDC ± 10%
C_{out}	10 nF
R_{out} typ.	30 Ω

NPN output

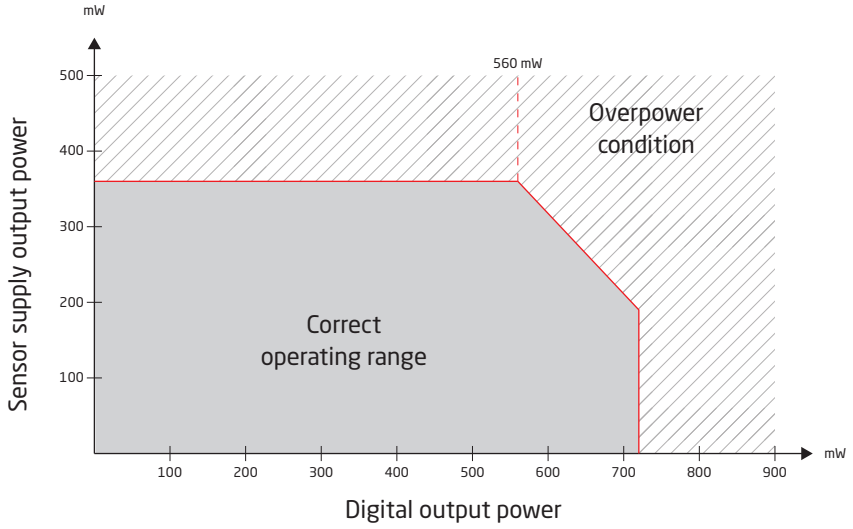
I_{sink} max.	130 mA
I_{sink} max. peak	500 mA
Voltage drop 130 mA	< 1.5 VDC
External voltage (terminal 24) max.	30 VDC
C_{out}	10 nF
R_{out} typ.	10 Ω

Push-Pull output

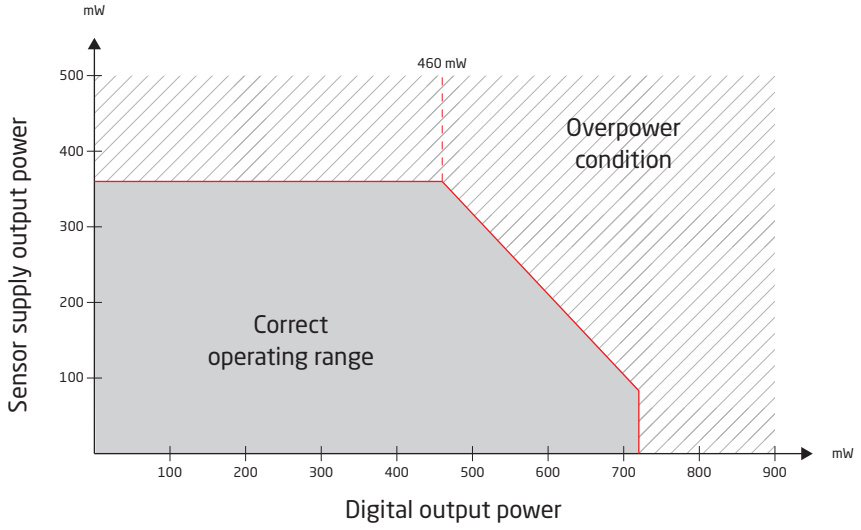
Voltage	5...24 VDC

****Power output limitations - 4225C**

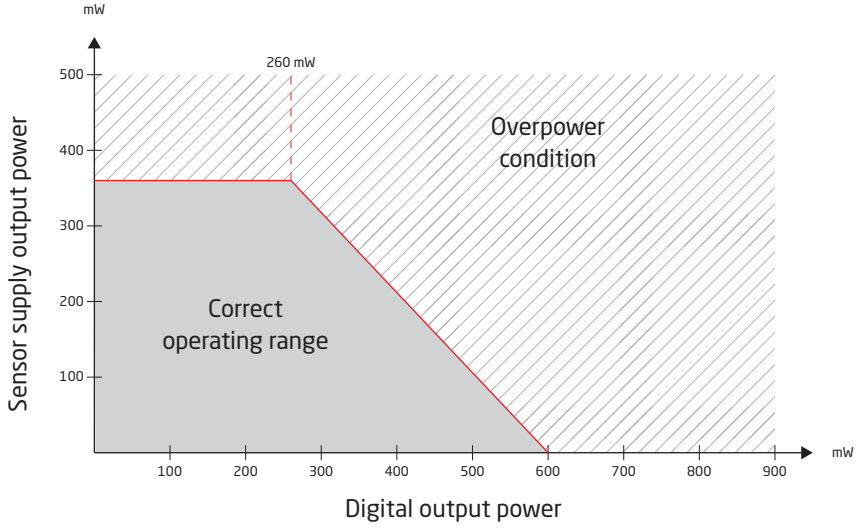
Power limitations when using buffered voltage output (4225C only)



Power limitations when using current output with 10 mA maximum output (4225C only)



Power limitations when using current output with 20 mA maximum output (4225C only)



Supported output configurations

For the 4225A/-B a concurrent and independent operation of analog output and relay is possible. For 4225C the output is either presented on the analog or frequency output. In case of 4225C being configured for analog output, the frequency output can be configured for 'relay mode'.

When both analog and frequency output is used, and frequency output is configured for PNP or push-pull, a common ground is not possible for terminal 21 and 23.

Observed authority requirements

EMC	2014/30/EU & UK SI 2016/1091
LVD	2014/35/EU & UK SI 2016/1101
RoHS	2011/65/EU & UK SI 2012/3032

Approvals

c UL us, UL 508	Pending

Programming

The 4500 communication interfaces provide complete module programming and access to a wide range of operational features that help you when using the device.
This chapter deals with the 4225 advanced features. The complete menu structure and programming options can be found in the Routing diagram section.

Configurable input error indication and input limits

Configurable input error detection

To increase system safety and integrity, you can program a high and low input error detection level. Input signals outside the low and high limits will cause the output of the device to go to the programmed error state.

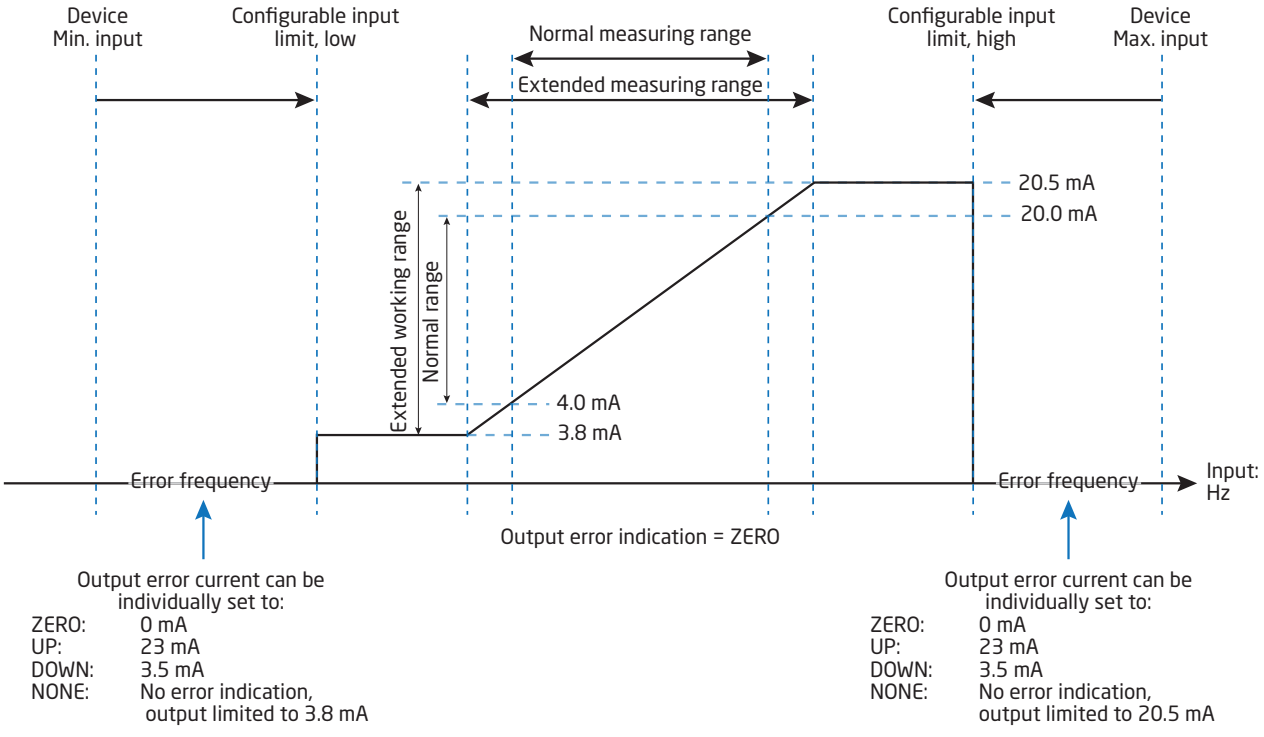
The two configurable input error detection levels can be set and enabled individually, just as it is possible to individually set the output error indication for each of the two detection levels. This allows users to differentiate process faults, broken or short input wires.

Available output error states for low and high limit: UP, DOWN, ZERO and NONE.

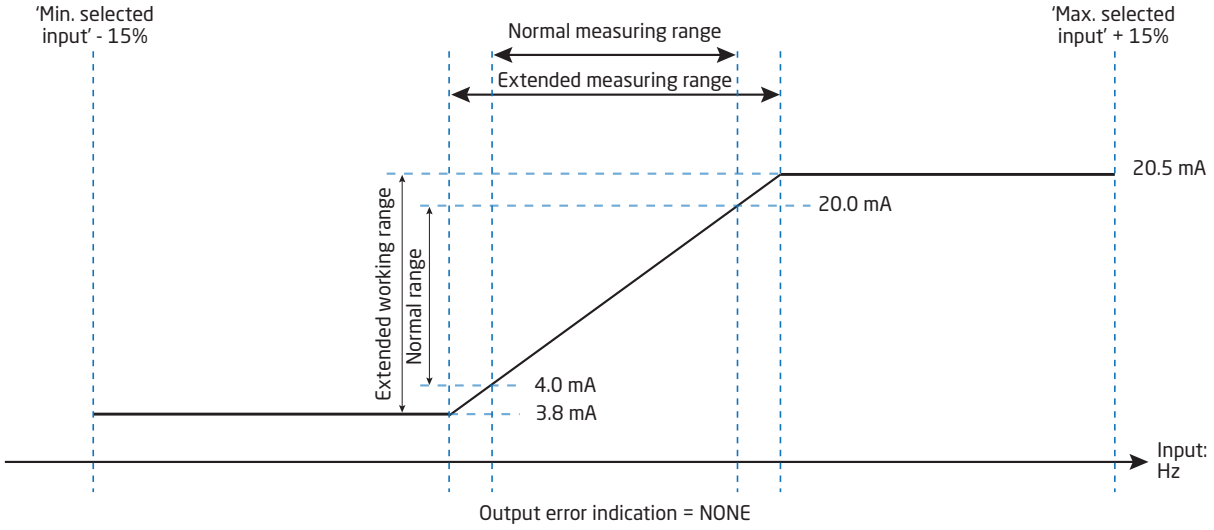
Output error indication uses the error states defined by NAMUR NE43 for a 4...20 mA output. For all other output spans equivalent output error indications are used (see tables on pages 20-21).

When input limit is enabled and error state NONE is selected, the input error is detected and presented to you on the display with IN.ER and flashing display, but not indicated on the output signal.

Example - 4...20 mA output span and both Limit high and Limit low set to ZERO



Example - Input limits disabled



Output limits and error indications - current output

	Input limit disabled		NAMUR sensor error detection / input limit enabled					
Output span	Output limit low	Output limit high	Output limit low	Output limit high	Output error indication, UP	Output error indication, DOWN	Output error indication, ZERO	Output error indication, NONE
4-20 mA	0 mA	23 mA	3.8 mA	20.5 mA	23 mA	3.5 mA	0 mA	No error indication
S4-20 mA	0 mA	23 mA	3.8 mA	20.5 mA	23 mA	3.5 mA	0 mA	No error indication
0-20 mA	0 mA	23 mA	0 mA	20.5 mA	23 mA	0 mA	0 mA	No error indication
±10 mA	-11.5 mA	11.5 mA	-10.25 mA	10.25 mA	11.5 mA	-11.5 mA	0 mA	No error indication
±20 mA	-23 mA	23 mA	-20.5 mA	20.5mA	23 mA	-23 mA	0 mA	No error indication

Output limits and error indications - voltage output

	Input limit disabled		NAMUR sensor error detection / input limit enabled					
Output span	Output limit low	Output limit high	Output limit low	Output limit high	Output error indication, UP	Output error indication, DOWN	Output error indication, ZERO	Output error indication, NONE
0-5 V	0 V	5.75 V	0 V	5.125 V	5.75 V	0 V	0 V	No error indication
1-5 V	0 V	5.75 V	0.975 V	5.125 V	5.75 V	0.875 V	0 V	No error indication
0-10 V	0 V	11.5 V	0 V	10.25 V	11.5 V	0 V	0 V	No error indication
2-10 V	0 V	11.5 V	1.95 V	10.25 V	11.5 V	1.75 V	0 V	No error indication
±5 V	-5.75 V	5.75 V	-5.125 V	5.125 V	5.75 V	-5.75 V	0 V	No error indication
±10 V	-11.5 V	11.5 V	-10.25 V	10.25 V	11.5 V	-11. 5V	0 V	No error indication

Output limits and error indications – custom frequency output, 50% duty cycle

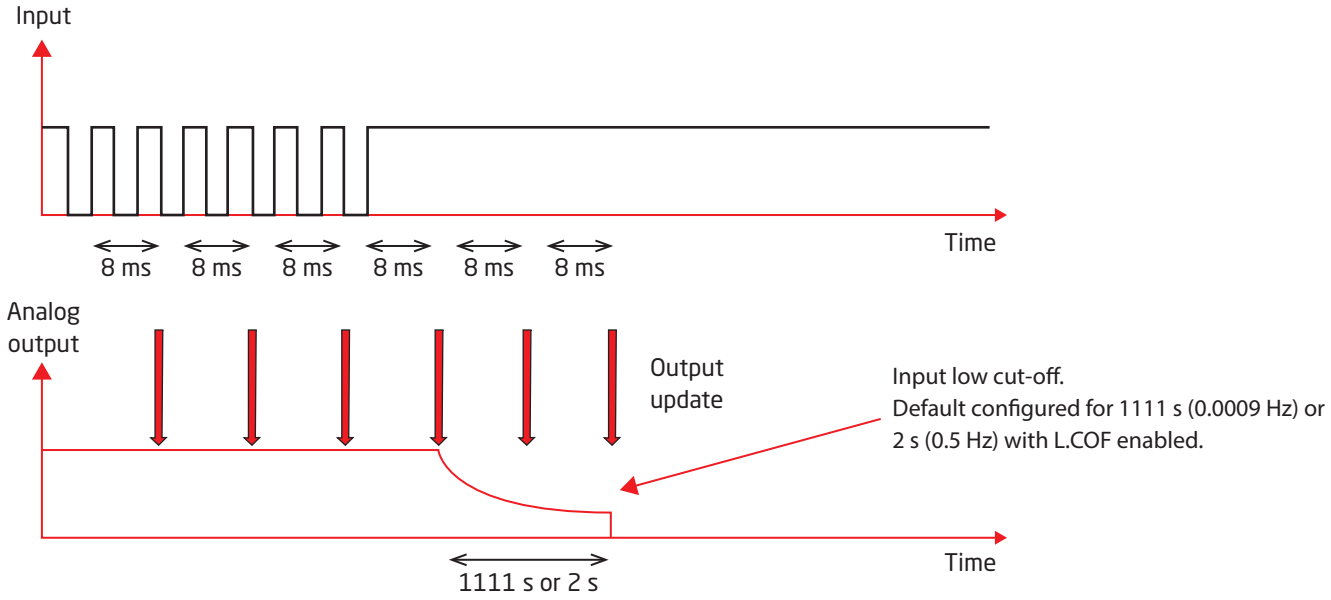
	Input limit disabled		NAMUR sensor error detection / input limit enabled			
Output span	Output limit low	Output limit high	Output limit low	Output limit high	Output error indication, UP / DOWN	Output error indication, NONE
Output low = 0	0 Hz	Output High * 700%, cap at 115 kHz	0 Hz	Output high * 102.5%	Customer configurable	No error indication
Output low > 0	0 Hz	Output High * 700%, cap at 115 kHz	Output low * 95%	Output high * 102.5%	Customer configurable	No error indication

Output limits and error indications – custom frequency output, configurable duty cycle

	Input limit disabled		NAMUR sensor error detection / input limit enabled			
Output span	Output limit low	Output limit high	Output limit low	Output limit high	Output error indication, UP / DOWN	Output error indication, NONE
Output low = 0	0 Hz	'Max Output' * 105%.	0 Hz	Output high * 102.5%	Customer configurable	No error indication
Output low > 0	0 Hz	'Max Output' * 105%.	Output low * 95%	Output high * 102.5%	Customer configurable	No error indication

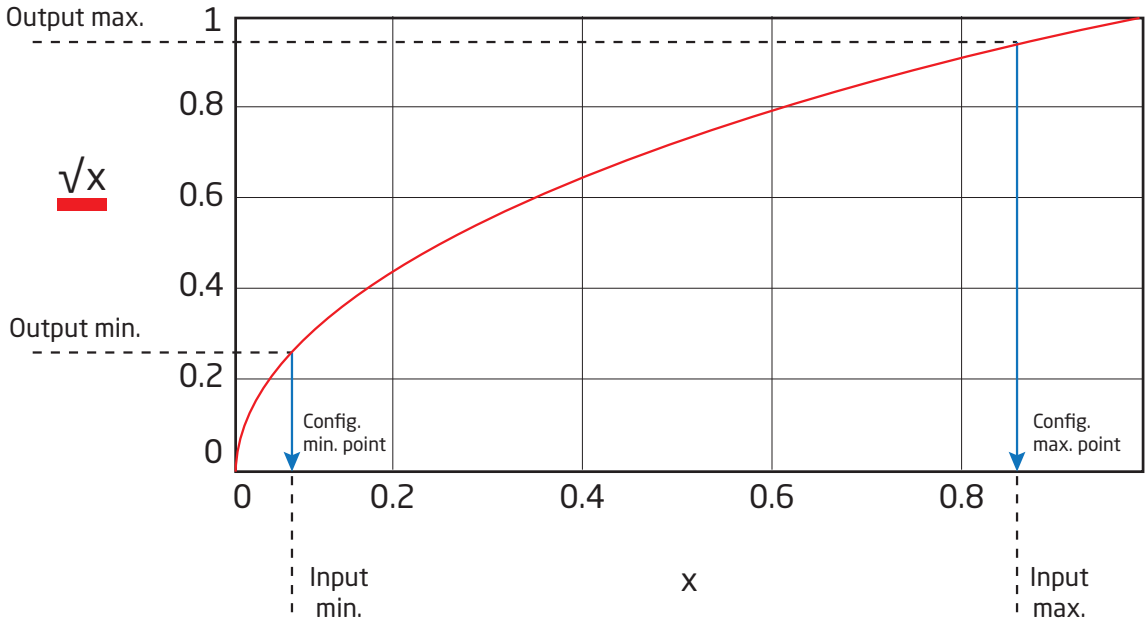
Low cut-off function

Default configured for 1111 s (0.0009 Hz) or 2 s (0.5 Hz) with L.COF enabled. Drives input to 0 Hz when Low Cut-Off time is reached.
For the frequency output of 4225C, an output low cut-off can be configured independently of the input low cut-off.
The LO.CUT point can be configured between output low and output hi frequency.



Square root function

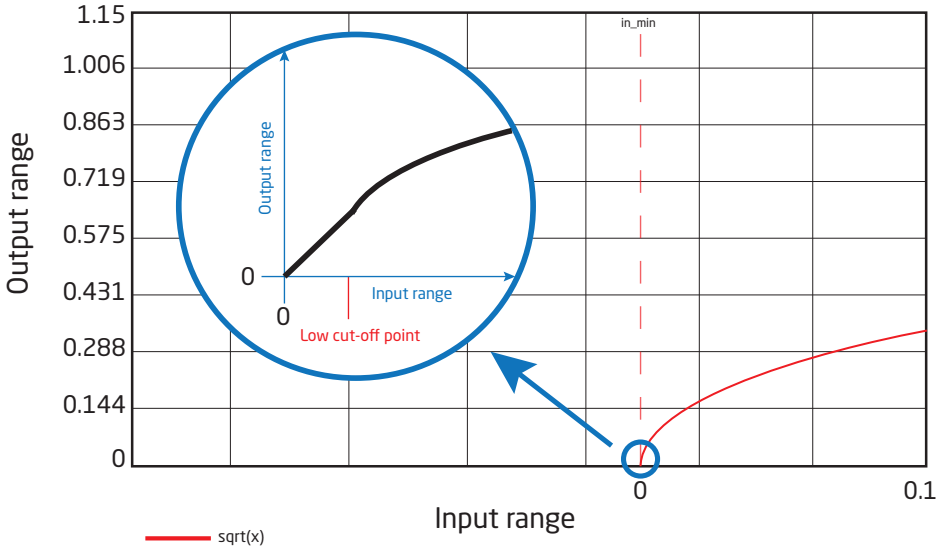
A Square root function can be applied to the input.
Scaling of the function can be done as illustrated below:



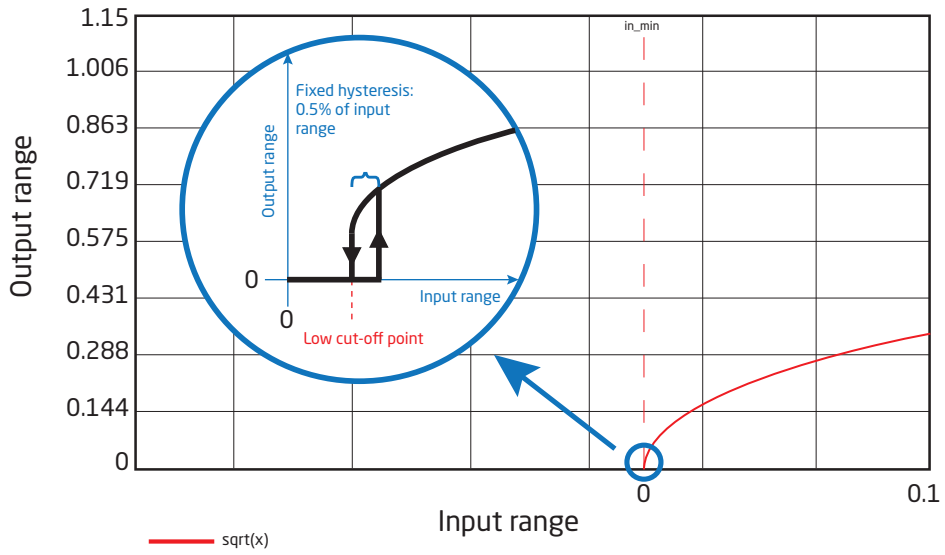
Low cut-off function:

As a part of the square root function of the 4225 it is possible to manually configure a low cut-off point. The feature is often used to suppress noise in the system.
The low cut off point defines a point where the input/output relationship either changes to a linear relationship or the output is truncated to zero. The two principles are illustrated below:

Linear cut-off:



Truncation to zero:



Configuration	Parameter	Specification	Condition
Low cut-off point	Linear cut-off	0.0 to 50.0% of selected input range	Independent of square root settings
	Truncation to zero	0.0 to 50.0% of selected input range Fixed hysteresis of 0.5% of the selected input range	

Over range / under range operation:

Configuration	Parameter	Specification	Condition
Normal square root action	Input low limit	'Minimum of selected input range'	'Square root point max.' > 'Square root point min.'
	Input high limit	'Maximum of selected input range' + 20%	
Inverted square root operation	Input low limit	'Minimum of selected input range' - 20%	'Square root point max.' < 'Square root point min.'
	Input high limit	'Maximum of selected input range'	

Relay functions

6 different settings of relay function can be selected.

Setpoint:	The device works as a single limit switch.
Window:	The relay has a window that is defined by a low and high setpoint. On both sides of the window the relay has the same status.
Error function:	The relay is activated by sensor error.
Power:	The relay is activated if power is on.
Off:	The relay is deactivated.
Latch:	The relay is latched. Valid for Setpoint, Window and Error function (advanced settings).

Note: For 4225C configured for analog output, a full relay feature set is available at the frequency output terminals, with electrical output specifications as the frequency output.

Setpoint and window configuration

Common parameters:

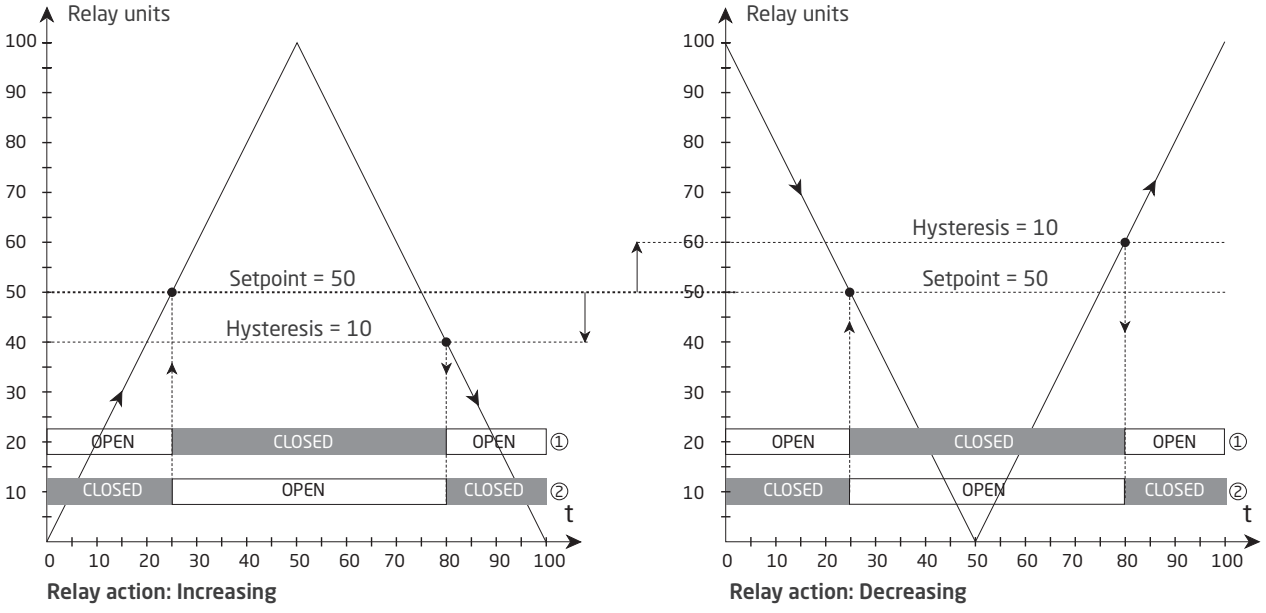
Delay:	An ON and an OFF delay can be set on both relays in the range 0...3600 s.
Hysteresis:	0.0...100.0%.

The active relay can be set as either normally open or normally closed.

The device works as a single limit switch when selecting 'setpoint' in the menu and entering the desired limit. For setpoint the relays can be set to activate on increasing or decreasing input signal.

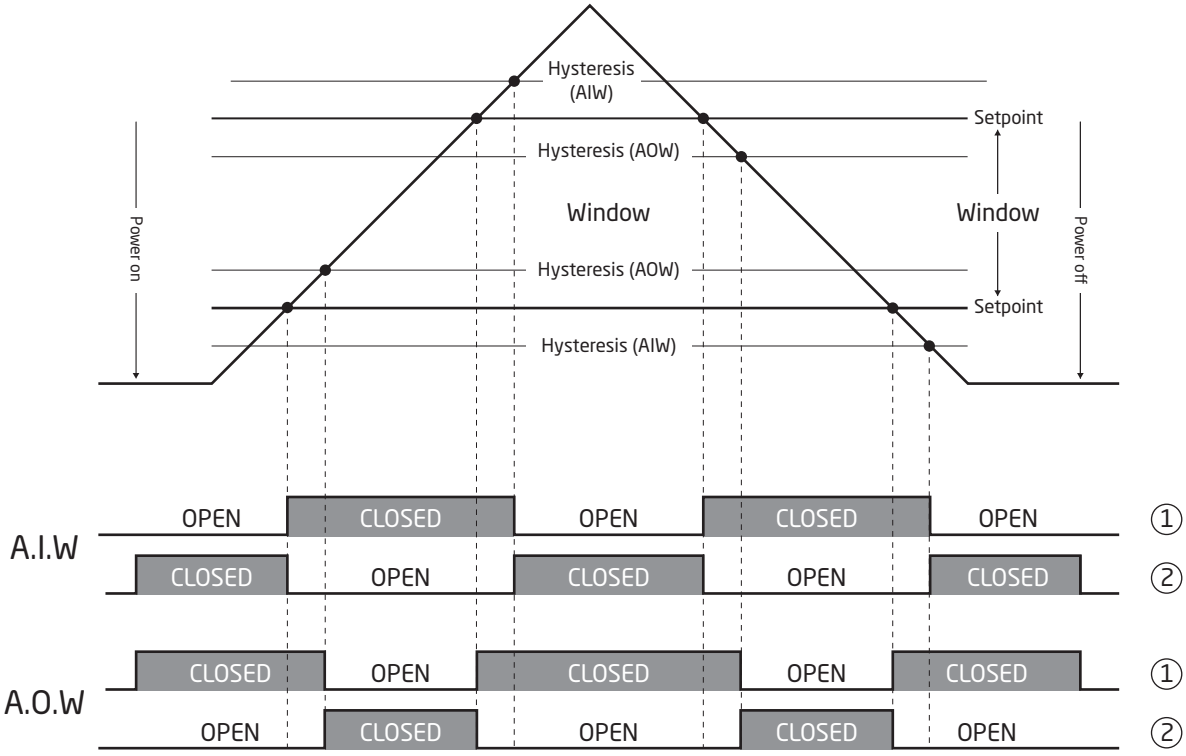
The window function is selected by choosing 'window' in the menu and defining a high and a low setpoint. The relay can be configured as active inside the window or outside the window.

Graphic depiction of relay action setpoint



① = Normal function. Relay configured for N.O.
② = Inverse function. Relay configured for N.C.

Graphic depiction of relay action window



Relay function: Active Inside Window / Active Outside Window

① = Normal function. Relay configured for N.O.
② = Inverse function. Relay configured for N.C.

Advanced settings menu

Password protection (PASS): Programming access can be blocked by assigning a password. The password is saved in the device in order to ensure a high degree of protection against unauthorized modifications to the configuration. If the configured password is not known, please contact PR electronics support - www.prelectronics.com/contact.

Memory (MEM): In the memory menu you can save the configuration of the device in the PR 4500 communication interface, and then move the PR 4500 communication interface onto another device of the same type and download the configuration in the new device.

Display setup (DISP): Here you can adjust the brightness contrast and the backlight. Setup of TAG numbers with 6 alphanumerics. Selection of functional readout in line 3 of the display - choose between readout of analog output or tag no.

Two-point process calibration (CAL): The device can be process-calibrated in 2 points to fit a given input signal. A low input signal (not necessarily 0%) is applied and the actual value is entered via the PR 4500 communication interface. Then a high signal (not necessarily 100%) is applied and the actual value is entered via the PR 4500 communication interface. If you accept to use the calibration, the device will work according to this new adjustment. If you later reject this menu point or choose another type of input signal the device will return to factory calibration. Process-calibration is cleared if you edit either of the parameters: input type, input low, input high, display low or display high. Process calibration data are not saved to the configuration repository of the PR 4500 communication interface.

Process simulation function (SIM): Simulation of process value is possible via the up and down arrows, thus controlling the output signal. The point REL.SIM allows you to activate relay/-s by means of the arrow-keys up/down. You must exit the menu by pressing OK (no time-out). The simulation function exits automatically if the PR 4500 communication interface is detached.

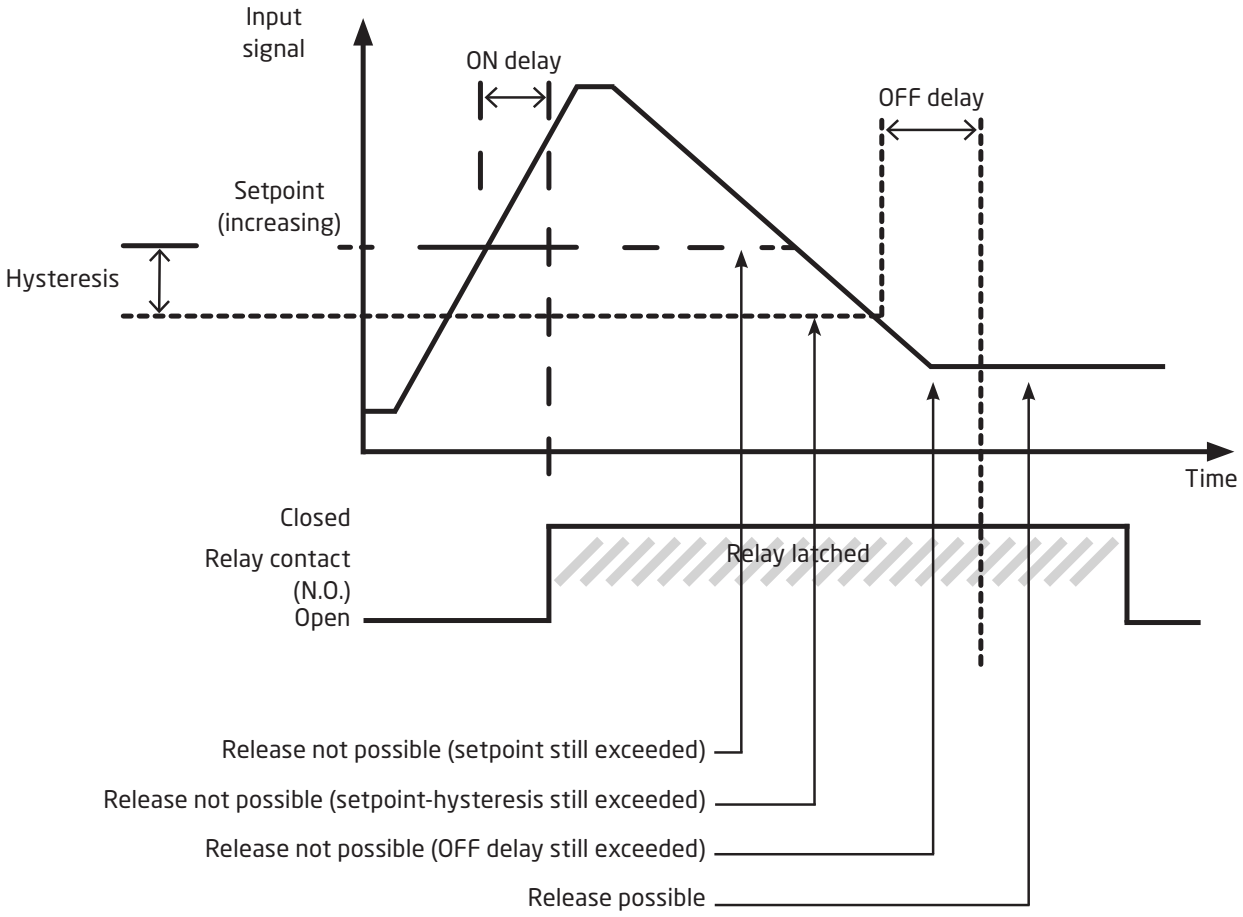
Orientation setup (ORIEN): When the device is mounted upside down the display orientation of the the PR 4500 communication interfaces can be programmed to be rotated 180 degrees and reverse the up/down button functions.

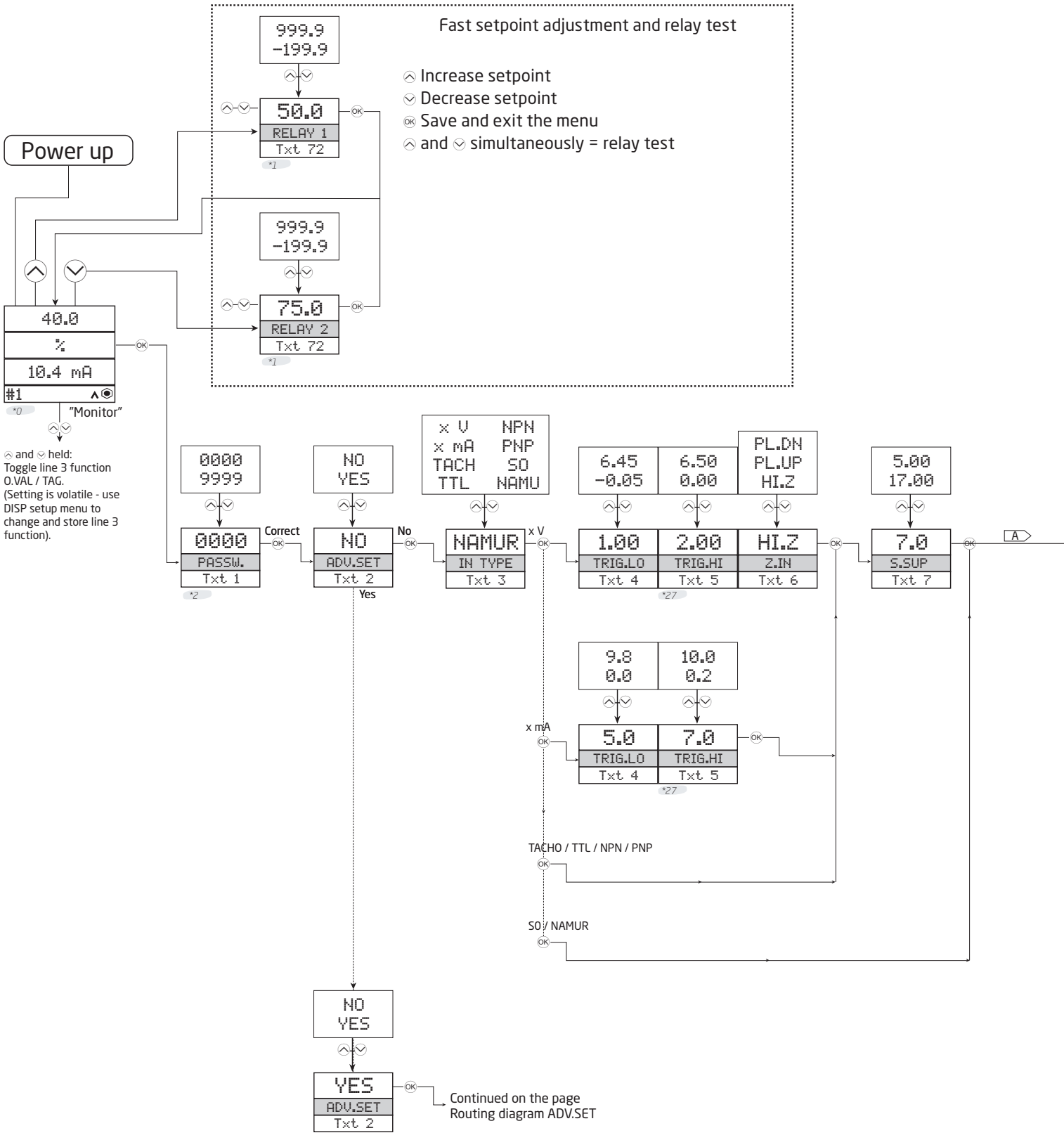
Bluetooth communication (BLUE): (available for 4512 Bluetooth communication enabler). User-configurable Bluetooth communication with the option to enable two-factor authentication. You can use Bluetooth communication with PR Process Supervisor app.

Modbus setup (MODB): (available for 4511 Modbus communication enabler). With the Modbus RTU interface you can set Modbus address, parity, stop bit, response delay and baud rate.

Latch function (LATC): The latch function can be applied for a relay when combined with the setpoint, windows or error function. The latch function will hold the relay in its active/alarm state until latch is released via the PR 4500 display. If the setpoint, window or error function demands an active relay you cannot release the latch.
If the configuration is copied from one device to another by way of the PR 4500 communication interface, the latch function must be reconfigured.

Example setpoint function with latch





*0 "Monitor" menu.
Line 1 shows the scaled process value - OK or error.
Line 2 shows the selected engineering unit.
Line 3 shows analog output or TAG no.
Line 4 shows status for communication and signal trending.

*1 If FastSet is disabled, the setpoints cannot be changed. (values are read-only)

*2 Only shown if password is enabled.

*27 TRIG.HI must be set 0.05 V or 0.2 mA greater than TRIG.LO

Routing diagram

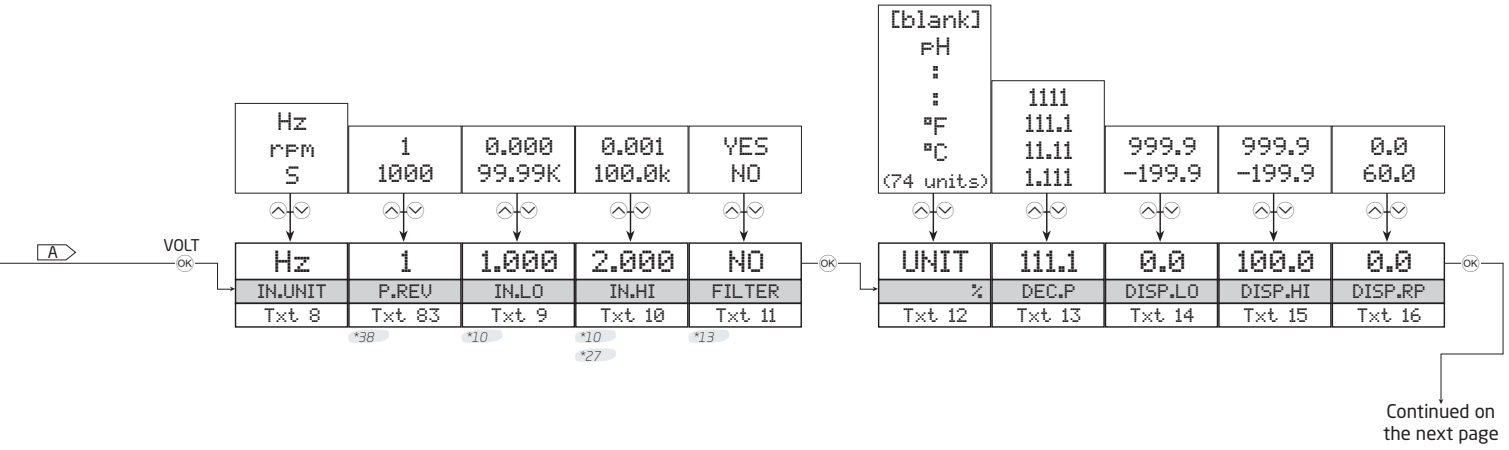
If no key is activated for 1 minute, the display will return to the "Monitor" menu without saving configuration changes.

⌃ Increase value / choose next parameter

⌄ Decrease value / choose previous parameter

OK Save the chosen value and proceed to the next menu

Hold OK Back to previous menu / return to "Monitor" menu without saving.



Selectable UNITS:

°C	min	kHz	kJ	mV
°F	m/s	mHz	Wh	ohm
K	mm/s	p/m	MWh	S
%	m/min	p/h	kWh	uS
m	m/h	p/d	W	m3/min
cm	in/s	t	GW	m3/h
mm	ips	kg	MW	l/s
um	ft/s	g	kW	l/min
ft	in/min	N	hp	l/h
in	ft/min	Pa	A	gal/min
mils	in/h	Mpa	kA	gal/h
yd	ft/h	kPa	mA	t/h
m3	m/s2	hPa	uA	mol
l	rpm	bar	V	pH
s	Hz	mbar	kV	blank

*10 Valid min. and max. input range depends on input type:

Input unit	Hz	rpm	S
Minimum value	0.000 Hz	0.000 rpm	10 µs
Maximum value	100.0 KHz	See note	999.9 s

Note: For RPM, upper limit is the lesser of 100 krpm or 60*100 krpm/P.REV

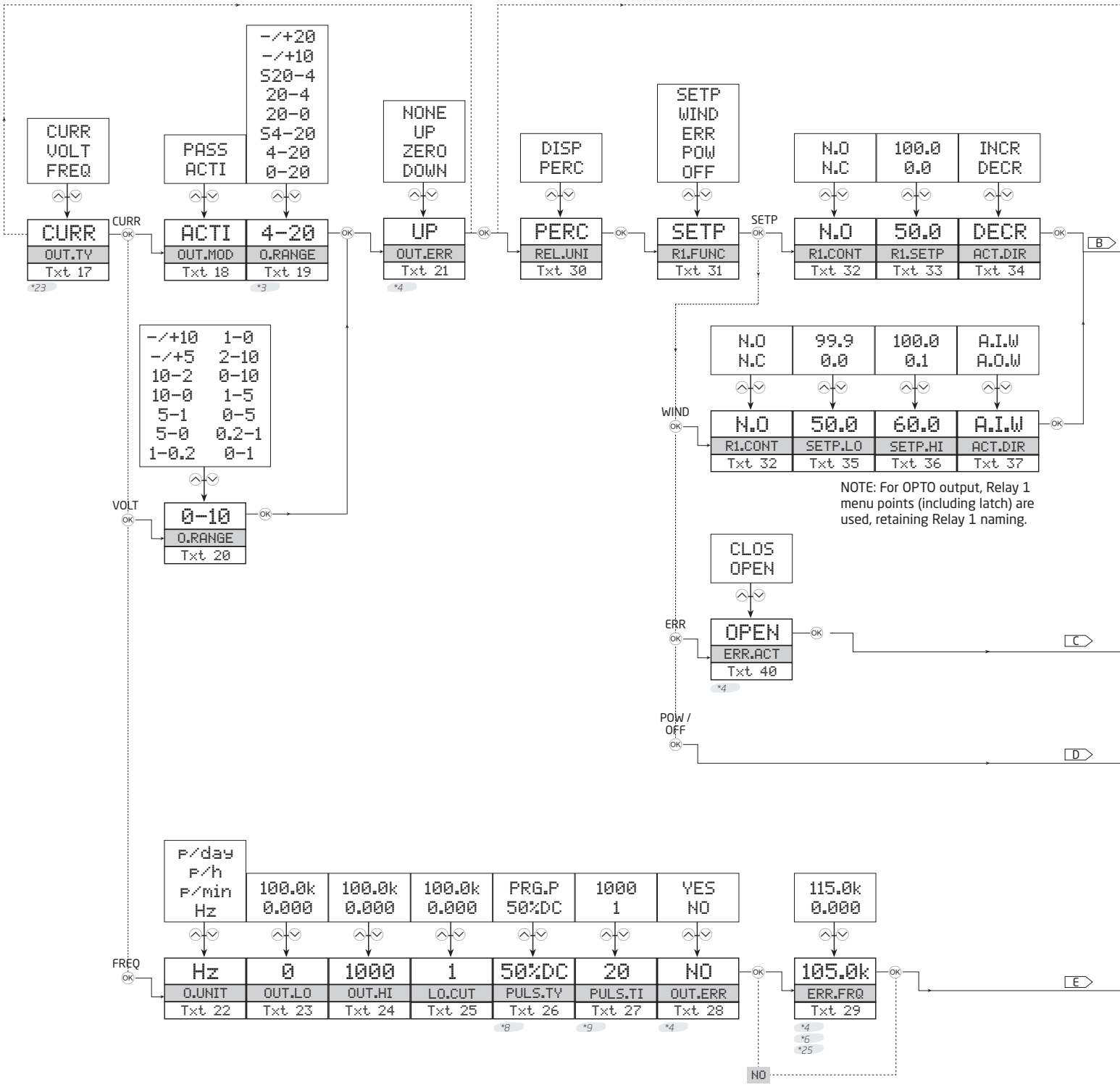
*13 Only show if both input range values conform to:

Input unit	Hz	rpm	s
Only shown if:	≤ 50 Hz	See note	≥ 0.02 s

NOTE: For rpm, condition is ≤ 3.00 krpm/P.REV

*27 TRIG.HI must be set 0.05 V or 0.2 mA greater than TRIG.LO

*38 Only shown for rpm input.



*3 If passive is selected, the values are limited to only positive span.

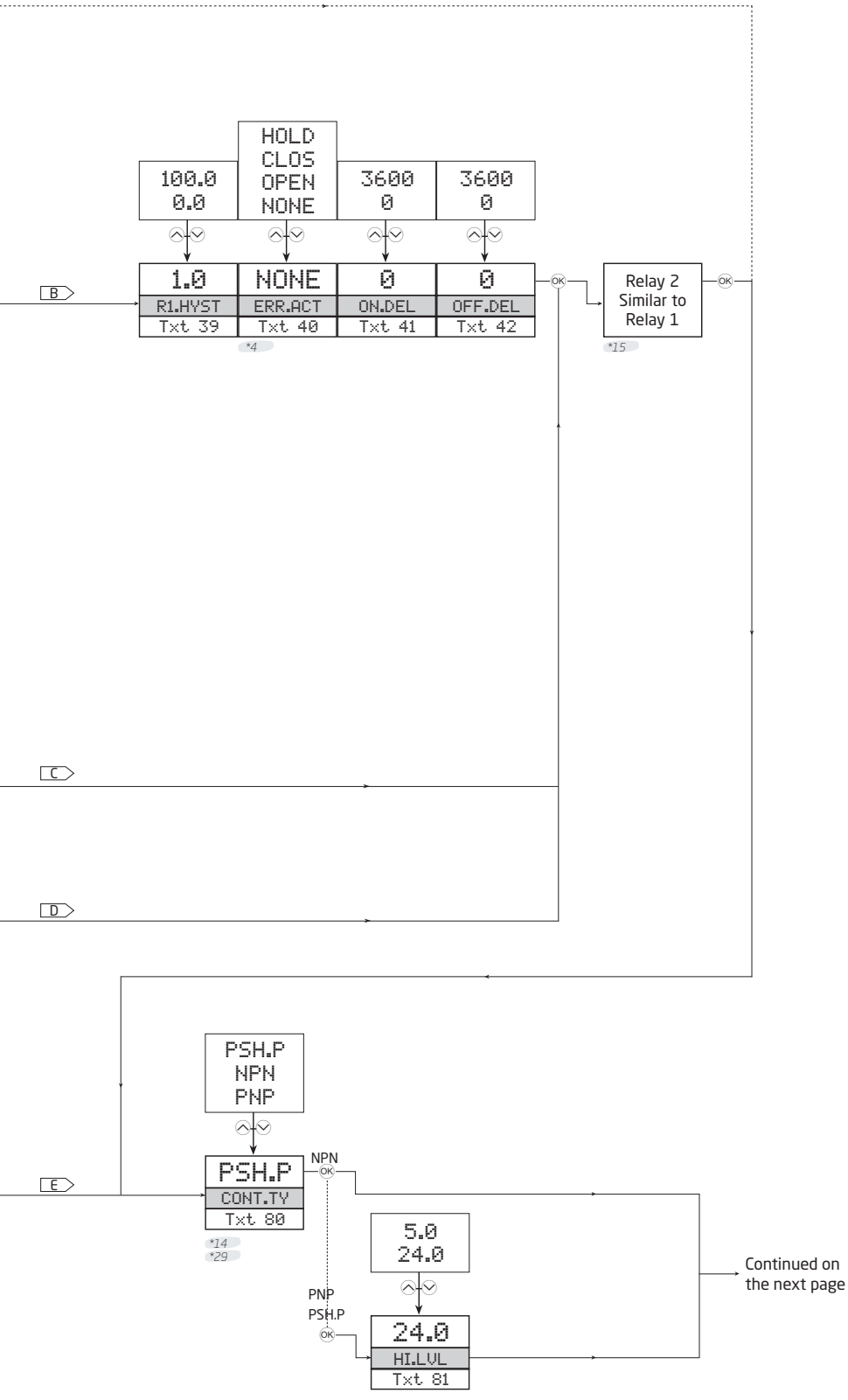
*4 Only shown if input type = NAMUR.

*8 Only shown when highest value of fmin / max <= 500 Hz or <= 30k p/min. Always shown for p/hour and p/day.

*9 Only shown if programmable pulse time is selected. Maximum value is the smallest of T_f.max*90% or 1 sec.

*23 Not shown for 4225B.

*25 If PULS.TY is set to 50%DC, high limit is: max(OUT.LO,OUT.HI)*7 (max. 115.0k). Otherwise high limit is max(OUT.LO,OUT.HI)*1.05.

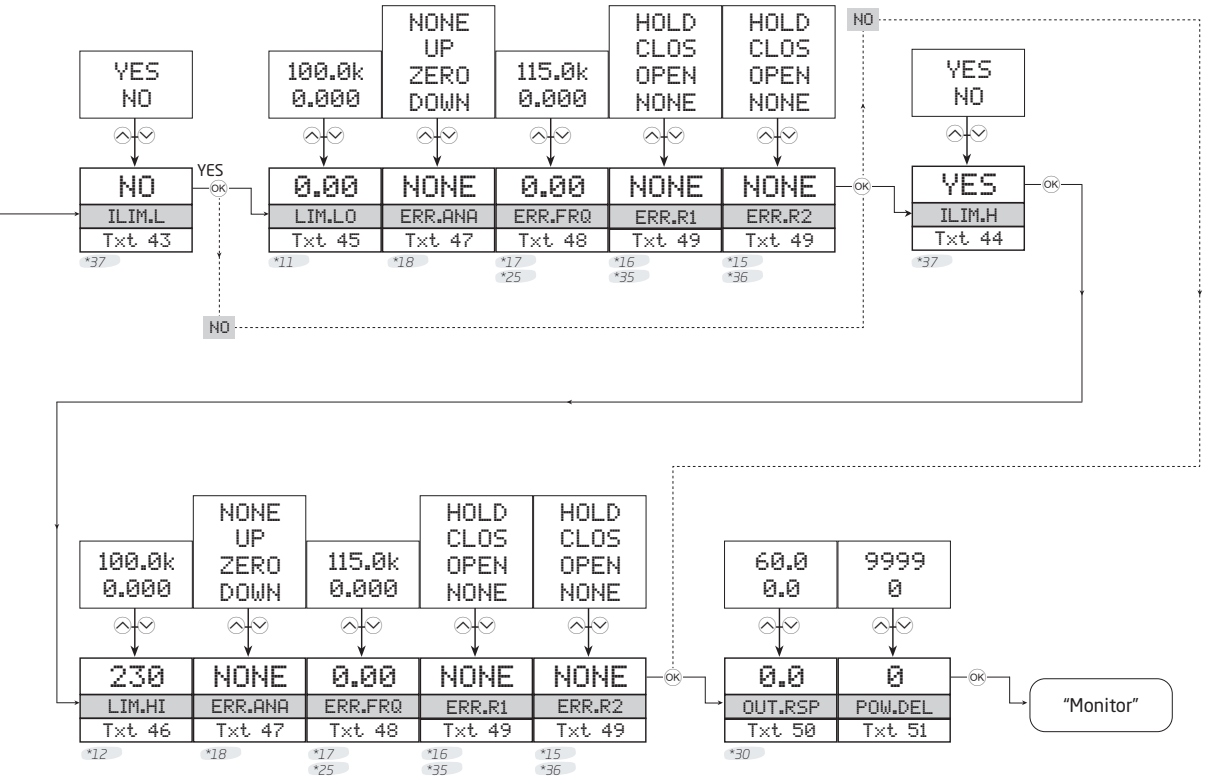


*4 Only shown if input type = NAMUR.

*14 Only shown for 4225C.

*15 Only shown for 4225B.

*29 Only shown for 4225C while OUT.TY is VOL/CURR and Relay 1 is not set to OFF.



*11 Range depends on selected input type + range:
Minimum value: - Minimum valid input value (see *10) -
Maximum value:-- Selected input range low (IN.LO) --

*12 Range depends on selected input type + range:
Minimum value: -- Selected input range high (IN.HI) --
Maximum value:- Maximum valid input value (see *10) -

*15 Only shown for 4225B.

*16 Not shown for 4225C if FREQ output is selected.

*17 Only shown if FREQ output is selected.

*18 Only shown if CURR or VOLT output is selected.

*25 If PULS.TY is set to 50%DC, high limit is:
max(OUT.LO,OUT.HI)*7 (max. 115.0k).
Otherwise high limit is max(OUT.LO,OUT.HI)*1.05.

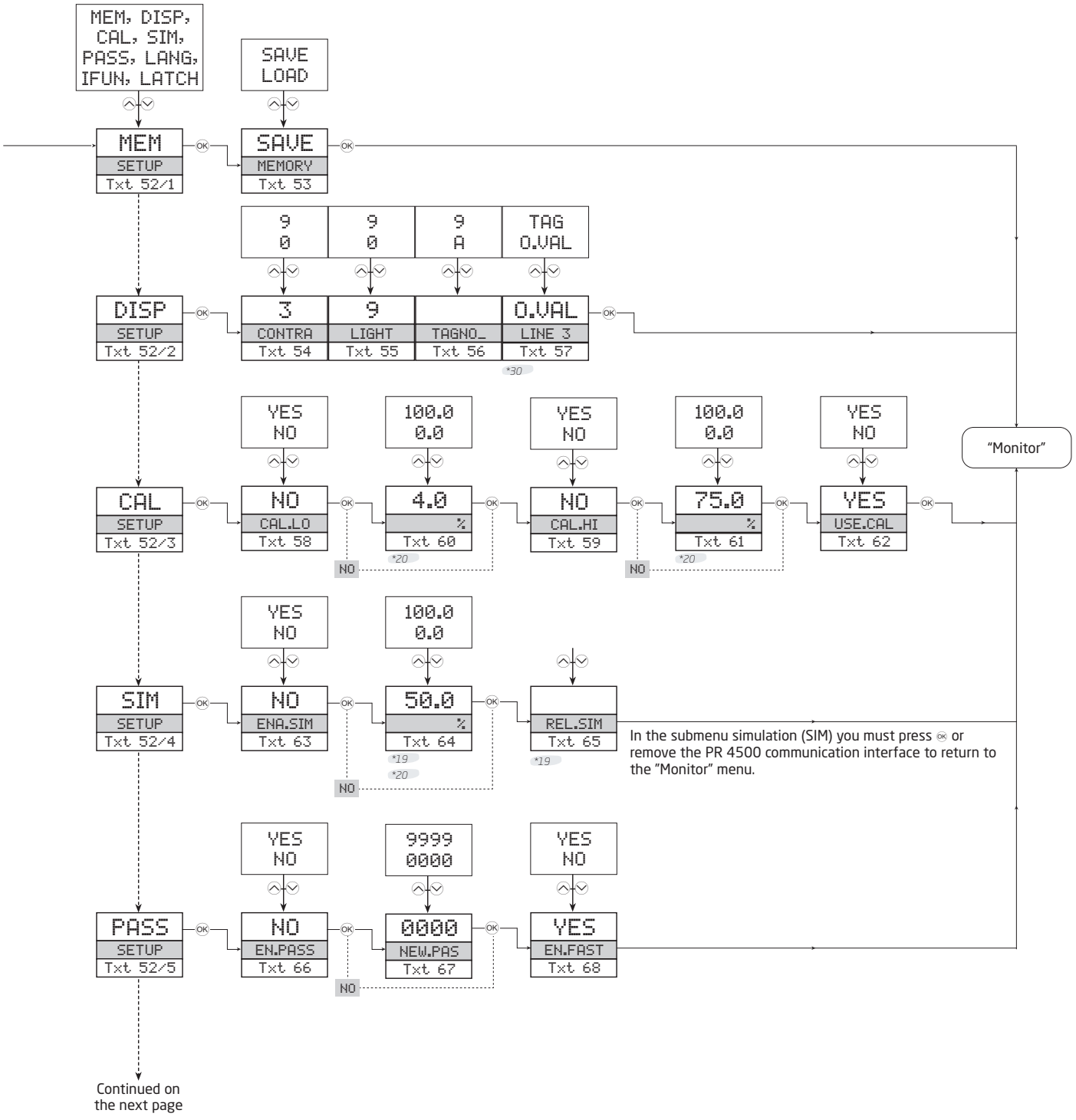
*30 Only shown for 4225A and 4225C.

*35 Not shown if R1.FUNC is set to POW or OFF.

*36 Not shown if R2.FUNC is set to POW or OFF.

*37 Not shown on 4225B, if both R1.FUNC and R2.FUNC is set to POW or OFF.

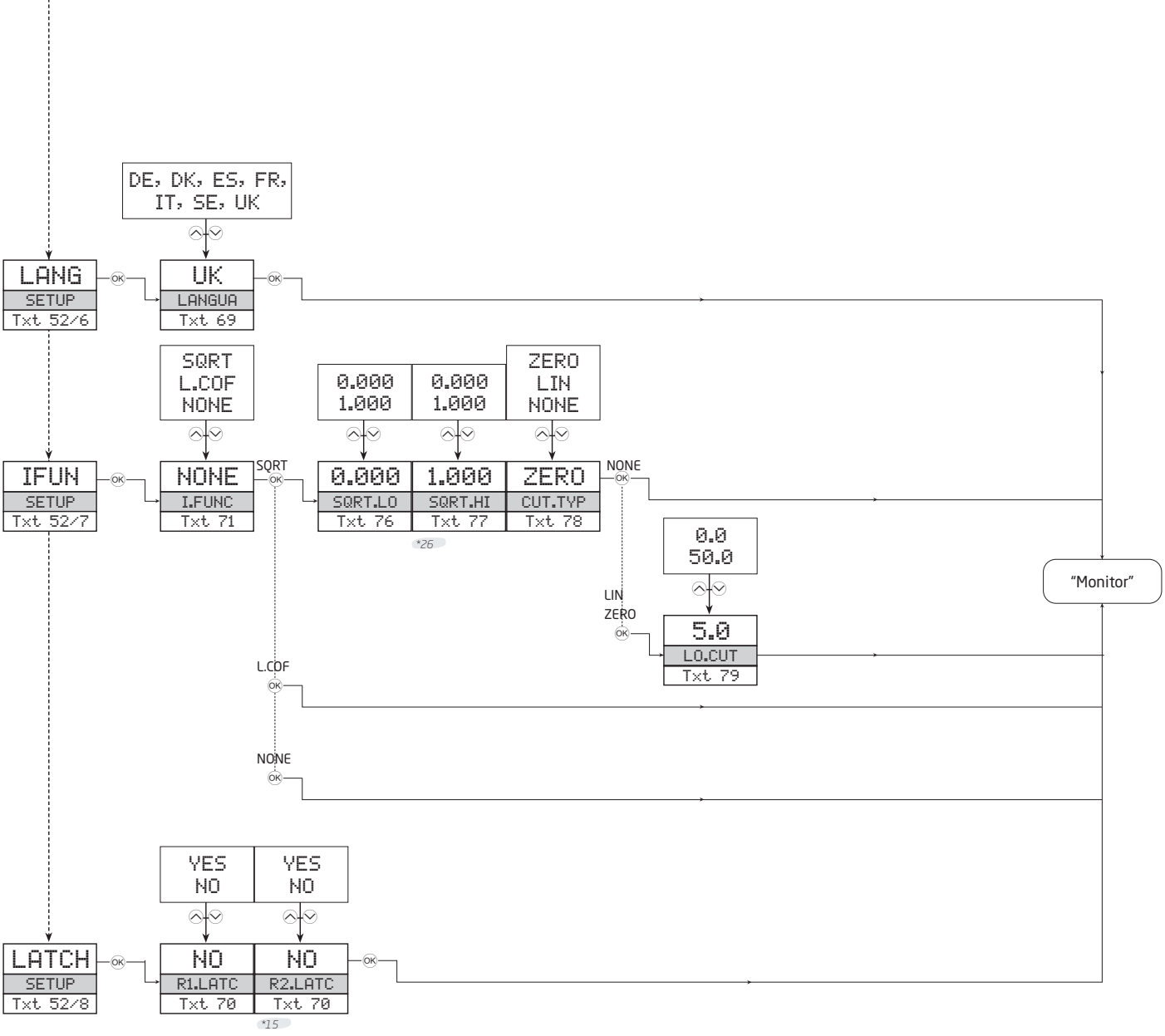
Routing diagram, advanced settings (ADV.SET)



*19 Menu timeout is disabled while this menu is displayed.

*20 Selectable range as defined by DEC.P, DISP.LO and DISP.HI.

*30 Only shown for 4225A and 4225C.



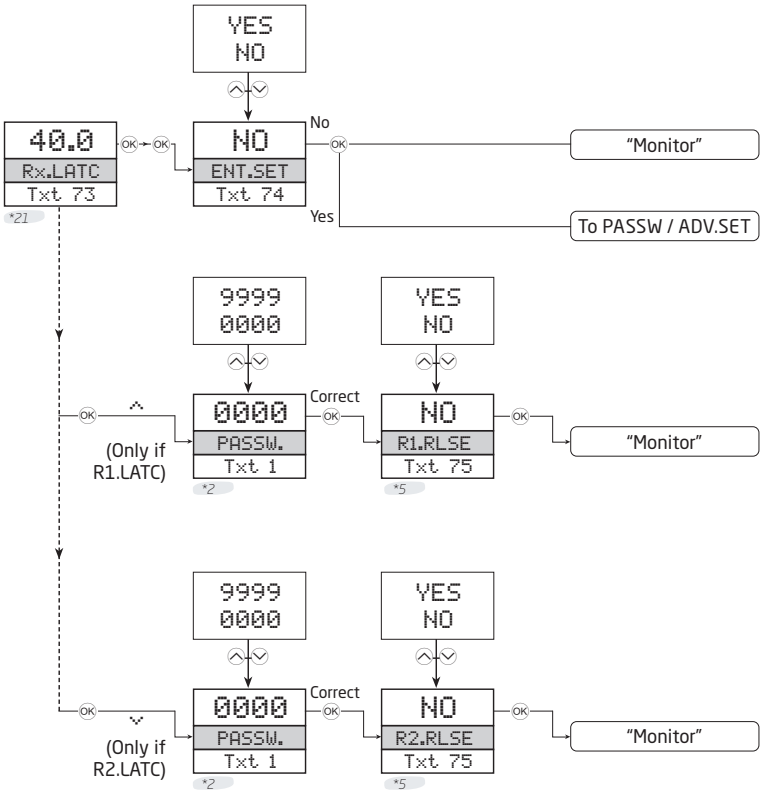
*15 Only shown for 4225B.

*26 *.HI must not be equal to corresponding *.LO.

Routing diagram, manual release of latched relays

Indication of a latched relay in monitor mode

Rx.LATC = R1.LATC or R2.LATC
or R1.LATC / R2.LATC alternating.



*2 Only shown if password is enabled.

*5 "YES" can only be selected if the reason for the latched relay is no longer present.
"NO" will not release the relay.

*21 Backlight flashes untill OK is pressed once.

Help text overview

[1] Set correct password
[2] Enter advanced setup menu?
[3] Select NAMUR sensor input
Select S0 sensor input
Select PNP sensor input (or Contact to supply)
Select NPN sensor input (or Contact to ground)
Select TTL sensor input
Select Tacho sensor input
Select custom current trigger input
Select custom voltage trigger input
[4] Set low trigger level for input signal
[5] Set high trigger level for input signal
[6] Set input high impedance (high resistance)
Enable internal pull-up on input
Enable internal pull-down on input
[7] Set sensor supply voltage
[8] Set up input for period time measurement
Set up input for rpm measurement
Set up input for frequency measurement
[9] Set input range, low
[10] Set input range, high
[11] Enable input filter (50/60 Hz low-pass / BW-limiter)
[12] Select display unit
[13] Select decimal point position
[14] Set display range, low
[15] Set display range, high
[16] Set display response time [seconds]
[17] Set up output as frequency output
Set up output as current output
Set up output as voltage output
[18] Select active output mode
Select passive output mode
[19] Select 20..-20 mA output range
Select 10..-10 mA output range
Select 20..4 mA output range with safety readback
Select 20..4 mA output range
Select 20..0 mA output range
Select -20..20 mA output range
Select -10..10 mA output range
Select 4..20 mA output range with safety readback
Select 4..20 mA output range
Select 0..20 mA output range
[20] Select 10..-10 V output range
Select 5..-5 V output range
Select 10..2 V output range
Select 10..0 V output range
Select 5..1 V output range
Select 5..0 V output range
Select -10..10 V output range
Select -5..5 V output range
Select 2..10 V output range
Select 0..10 V output range
Select 1..5 V output range
Select 0..5 V output range
[21] Select output downscale at NAMUR sensor error
Select output zero output at NAMUR sensor error
Select output upscale at NAMUR sensor error
Select no error action - output undefined - at NAMUR sensor error
[22] Select Hz as output unit
Select pulses/minute as output unit
Select pulses/hour as output unit
Select pulses/day as output unit
[23] Set output frequency for 0% input
[24] Set output frequency for 100% input
[25] Set output low cut off frequency
[26] Use 50% duty cycle output
Use programmable static pulse time
[27] Set pulse time [milliseconds]
[28] Set output at specific frequency on NAMUR sensor error?
[29] Set output frequency at NAMUR sensor error
[30] Set up relay in % of input range
Set up relay in display units
[31] Select OFF function - relay is permanently off
Select POWER function - relay indicates power status OK
Select ERROR function - relay indicates sensor error only
Select WINDOW function - relay is controlled by 2 setpoints
Select SETPOINT function - relay is controlled by 1 setpoint
[32] Select Normally Closed contact
Select Normally Open contact
[33] Set relay setpoint
[34] Activate relay on decreasing signal
Activate relay on increasing signal
[35] Set relay window setpoint, low
[36] Set relay window setpoint, high
[37] Select relay to be Active Outside Window
Select relay to be Active Inside Window
[38] - NOT USED -
[39] Set relay hysteresis
[40] Select no error action - undefined relay state - at NAMUR sensor error
Open relay contact at NAMUR sensor error
Close relay contact at NAMUR sensor error
Hold relay status at NAMUR sensor error
[41] Set relay ON delay [seconds]
[42] Set relay OFF delay [seconds]
[43] Enable configurable input limit, low
[44] Enable configurable input limit, high
[45] Set configurable input limit, low
[46] Set configurable input limit, high
[47] Select downscale at limit error
Select zero output at limit error
Select upscale at limit error
Select no error action - output undefined - at limit error
[48] Set output frequency at limit error

[49] Select no error action - undefined relay state - at limit error
Open relay contact at limit error
Close relay contact at limit error
Hold relay status at limit error
[50] Set output response time [seconds]
[51] Set output and relay power-on delay [seconds]
[52] Enter Relay Latch setup
Select Analog Input Function
Enter Language setup
Enter Password setup
Enter Simulation mode
Perform Process calibration
Enter Display setup
Perform Memory operations
[53] Load saved configuration into module
Save configuration in display front
[54] Adjust LCD contrast
[55] Adjust LCD backlight
[56] Write a 6-character device TAG
[57] Output value is shown in display line 3
Device TAG is shown in display line 3
[58] Calibrate Input low to process value?
[59] Calibrate Input high to process value?
[60] Set value for low calibration point
[61] Set value for high calibration point
[62] Use process calibration values?
[63] Enable input simulation?
[64] Set the input simulation value
[65] Relay simulation - use ⌃ and ⌄ to toggle relay 1 and 2
[66] Enable password protection?
[67] Set new password
[68] Enable Fastset functionality?
[69] Select language
[70] Enable Relay Latch function?
[71] Select no input function
Select 0.5 Hz low cut off on input. (No effect on period time input)
Select Square Root Input Function
[72] Relay setpoint - press OK to save
Relay setpoint - read only
[73] Relay is latched - press OK to acknowledge
Relay 1 is latched - press ⌃ to release
Relay 2 is latched - press ⌄ to release
Relays are latched - press ⌃ or ⌄ to release relay 1 or 2
[74] Enter setup menu? (Latched relays may release!)
[75] Release relay? (if conditions allow)
[76] Select low value of square root
[77] Select high value of square root
[78] Disable low cut-off
Set low cut-off type to linear
Set low cut-off type to zero
[79] Select low cut-off point in % of input range
[80] Select PNP open collector output
Select NPN open collector output
Select Push-Pull output
[81] Set high-level voltage on PNP / Push-Pull output
[83] Set input pulses per revolution

Operation

The 4000 series devices provide multiple features for easy user operation, and to perform efficient troubleshooting. Monitoring the operational status is easy from either the front LEDs or the PR 4500 communication interface.

Status indicators without PR 4500 communication interface

Power	Red / green LED indicates system status
f in	Yellow LED indicates an active input
Dig. out 1	Yellow LED indicates that relay 1 is energized / f output
Dig. out 2 (only 4225B)	Yellow LED indicates that relay 2 is energized

Power green flashing LED 13 Hz indicates normal operation.
Power green flashing LED 1 Hz indicates configurable input limit error.
Power steady green LED indicates internal error.
Power steady red LED indicates fatal error.

Status, error detection and signal 'out-of-range' with PR 4500 communication interface

SCROLLING ERROR MESSAGE	INDICATION Text	CONDITION	ACTION
Process and application errors			
Input error	IN.ER - flashing display	Input out of configured input limits	Check input signal value and configured input limits
Input underrange	IN.LO	Input below low cut-off	Check input signal source
Input overrange	IN.HI	Input above valid measurement range	Check input signal source
Display out of range	-1999 or 9999	Display saturation	Check configuration and input values
Analog output error	AO.ER	Error in analog output current (S4-20 mA output only)	Check wiring of analog output and recycle power *
Sensor supply overloaded	SE.OL	Sensor supply overload condition detected	Check sensor supply specifications
Sensor short circuit	SE.SH	Sensor short circuit condition	Check sensor for short circuit
Sensor wire break	SE.BR	Sensor open loop / broken wire condition	Check sensor for open loop / broken wire
Device errors			
No communication between device and the PR 4500 communication interface	NO.CO	No communication (PR 4500 <-> device)	Reattach the PR 4500 communication interface to the product. If attached, disconnect and reattach
Configuration error	CO.ER	Invalid configuration downloaded to module	Step through menu to create valid configuration **
Invalid configuration type or version	TY.ER	Configuration read from the PR 4500 has invalid type or rev. no.	Save correct device type and revision configuration to the PR 4500 communication interface **
Analog output supply error	AO.SU	Analog output supply error	Verify output configuration and output connection *
RAM error	RA.ER	Internal RAM error	Contact PR electronics *
A/D converter error	AD.ER	Internal A/D converter error	Contact PR electronics *
Internal flash error	IF.ER	Internal flash error	Contact PR electronics *
Frequency input error	FI.ER	Internal frequency circuit error	Contact PR electronics *
EEPROM Error	EE.ER	Internal EEPROM error	Contact PR electronics *
Storing of configuration failed - previous configuration used	CO. WARN	Writing configuration to internal device memory failed.	Device configuration reverts to last known valid configuration. Cycle through menu to retry writing new configuration.

!	All error indications in the display flash once per second. The help text explains the error. If the error is an input loop error, the display backlight flashes as well - this is acknowledged (stopped) by pushing the OK button.
*	Error is acknowledged by either stepping through the basic setup, or by resetting the device power. Some types of errors can only be acknowledged by resetting the device power.
**	Error is acknowledged by stepping through the basic setup.

Document history

The following list provides notes concerning revisions of this document.

Rev. ID	Date	Notes
100	2135	Initial release of the product.

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