

Operating Instructions 12595e

Calculating Digital Tachometer PMO 2150/51 - PMO 4150/51

General Data

The digital tachometer is used to display measured quantities using appropriate sensors for frequency. The measurement procedure is the impulse counting method. The frequency is determined by the reciprocal value derived from the measured period. The number of periods used to calculate the measured value depends on the measuring cycle and input frequency. If the period of the input signal is smaller than the measurement time, the average frequency of all periods counted throughout the last measurement interval is calculated. If the frequency period is greater than the set interval, the frequency is calculated from the last measured period.

Devices with two channels (PMO 2150/PMO 4150) acquire the data simultaneously. For calculation of difference and the ratio, simultaneously acquired data of both channels are processed.

Types

PMO 2151, PMO 4151	1 channel, absolute value
PMO 2150, PMO 4150	2 channels, absolute value of both channels and calculation of difference, proportional difference and ratio

Dimensions

	Front frame w x h in mm	Depth behind panel in mm	Height of display in mm	Panel cutout w x h in mm
PMO 2150, PMO 2151	96 x 48	120	14	92 ^(+0,8) x 45 ^(+0,6)
PMO 4150, PMO 4151	144 x 72	162	20	137,2 ^(±0,5) x 66 ^(±0,5)

Technical Data

Type of Measurement (PMO 2150/PMO 4150)	Absolute value, channel A, channel B Difference A-B, Proportional difference (A-B)/B *100 and (B-A)/A*100, Ratio (A/B) and (B/A)	
Frequency input	Input mV	Input V
Frequency range	0,02...20 kHz	0,02...120 kHz
Sensitivity	50 mV...8 V _{eff} AC	3... 80 V _{eff} AC
Impedance	AC coupling, 47 kΩ	AC coupling, 100 kΩ
Power supply for sensor	8 V/15 V, 60 mA (internally programmable)	
Accuracy frequency measurement	better than 40*10 ⁻⁶ of measurement value	
Display	-19999...99999, 0..4 fixed decimal point or floating point programmable	
Display accuracy Absolute value, Difference	40*10 ⁻⁶ of measurement value ± 1 digit	

Display accuracy	±1 digit
Proportional difference, Ratio	
Measurement time	300 ms, 1 s, 2 s, 3 s average value
Digital input	
Connections	Switching contact, open collector, or 5 V-digital , Inversion programmable
Functions	programmable over display and limit values hold (Start/Stop), display test, or blanking
Operation control	Watchdog
Power supply	230 V/115 V AC ± 10% ,47...63 Hz (may be selected through internal jumpers)
Current consumption	6 VA
Ambient temperature	0...55 °C
Storage temperature	-10...+70 °C
Protection	Front to IP64 acc. to DIN 40050
Connection	Plugable terminals 1,5 mm ²
Isolation group	A acc. to VDE 0110 built-in state
Relative humidity	≤ 75% annual mean seldom and slight dew

Options

N2	Power supply 24 V AC ± 10 % 47...63 Hz, 6 VA, galvanically separated from measurement input and analog output, Test voltage 1,5 kV acc. VDE 0100, section 410
N3	Power supply 18 - 30 V DC galvanically separated from measurement input and analog output, Test voltage 1,5 kV acc. VDE 0100, section 410
I	Analog output, galvanically isolated 0(4)...20 mA, load 500 Ω, 0(2)...10 V DC, max. load 2 kΩ, Accuracy 0,1 %, 12 bit d/a transformer (resolution better 14 bit), Measurement rate/delay 30 ms, 100 ms or 100 ms with digital filter (1 pole) T _{63%} =600 ms, update rate 2,6 ms
G2	2 independent limit values, galvanically isolated switching contacts, 250 V, 1 A 50 W, n.o.c. or n.c.c., hysteresis programmable for each channel
G3	third limit value, (not available with option I) galvanically isolated switching contacts, 125 V AC/0,4 A 30 V=2 A, n.o.c. or n.c.c., hysteresis programmable
gr	green LED (indicated value)
SR85	RS 485 interface, galvanically isolated, max. 31 units, initialization 9600 baud, 8 bit, 1 Stop bit, no parity
S4	Power supply for sensor 24 V DC, 50 mA
SM	black front frame

Operation

The instrument is operated by the three keys at the front.

The keys have following functions in the measuring mode:



Function key

Pressing the F key starts the configuration procedure. During the configuration mode, at least one digit blinks. If the key is pressed again, the device returns to the measurement mode. A switch at the rear disables this key.



Scroll key

The measurement mode is selected through this key. (PMO 2150/4150 only). The number of the current measurement mode is displayed in the function display. (For number assignment please refer to function 0). This function may also be disabled under function 0, parameter A.



Enter key

When pressing Enter and Scroll simultaneously (Enter first) the device type (e.g. P2151 for PMO 2151) is displayed for 2 s. Afterwards 8.8.8.8.8.8 is displayed as long as both keys are pressed.

Status Display in the Measuring Mode

- " or " Overrange, the measured value is greater than the highest representable value or division through zero (ratio or proportional difference)
- " ur " Underrange, the measured value is smaller than the lowest representable value or division through zero (proportional difference)
- "Error" There is an error in the checksum of the calibration data; the device must be returned to the service department for calibration
- all digits blink The device was stopped through the digital input

Key Functions during Configuration:



Function key

By pressing the F key, input is interrupted or a parameter section is skipped. Edited parameters are not stored.



Scroll key

The current blinking number or decimal point are edited using this key.



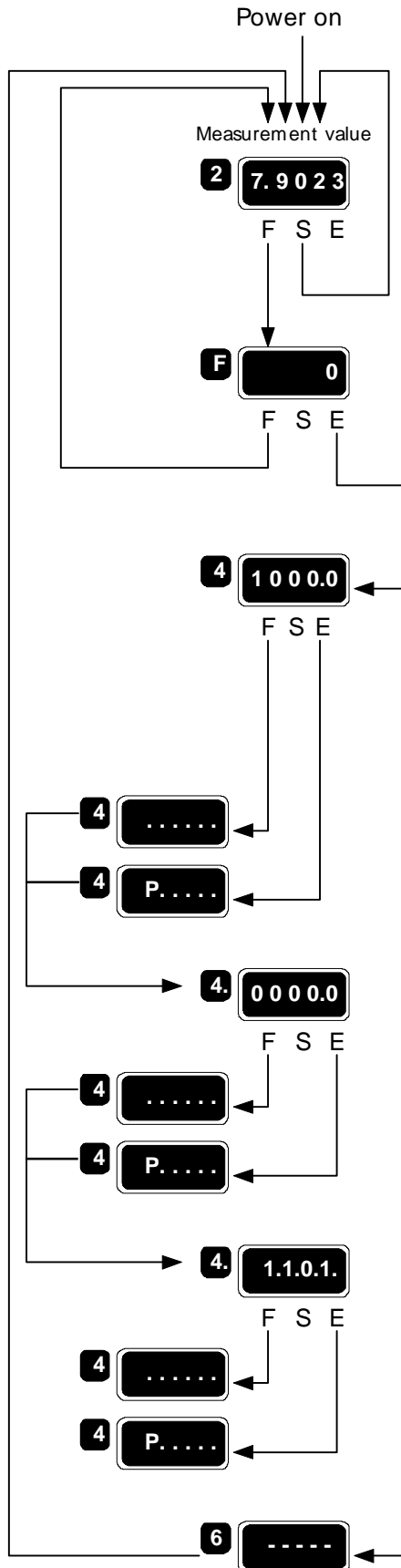
Enter key

By pressing the Enter key the blinking number or decimal point are confirmed. If not all of the digits have been edited, the next digit will blink. In any other case, the parameter input has been concluded and the values are stored in the EEPROM.

Status Display during Configuration

- "" if the input has been interrupted by pressing F
- "P" if the input has been completed and the parameter is stored in the EEPROM
- "-" if the input function has been disabled.

General View of Operation



After connecting the power the standard measurement mode as selected in the configuration is displayed

The Scroll key is used for editing the measuring mode. The number of the mode is indicated in the function display.

The F key is used to switch to configuration

The programmed function number is displayed blinking. The number may be edited using the Scroll key and confirmed with Enter. After confirming the last digit, the decimal will blink. Its position may be changed by pressing the Scroll key. Pressing Enter will confirm the input.

Function 4 has been selected. It consists of three parameters. The first parameter is indicated without a decimal point in the function display.

Numbers with floating point are programmed through the Scroll key and confirmed through Enter. After confirming the last digit, the decimal point will blink; its position may be changed through the Scroll key. Pressing Enter will confirm the input.

The input is interrupted by pressing the F key or a parameter is skipped. Edited parameters are not stored.

P in the display confirms storage in EEPROM.

The second parameter in function 4, hysteresis, is indicated by a decimal point in function 4.

The third parameter in function, 4 limit values, is indicated by the display format - several decimal points.

Function not in use or disabled.

Configuration Functions

All functions in use may be configured if the parameter disable function is switched off. (Left, rear)

Function 0

Function 0 is divided in 3 parameter blocks in which basic functions for the operation are programmed.

0 **A .1.0.1.** Parameter section A (only 2150/4150)

Standard Measuring mode (1..7)

- 1= Absolute value channel A
- 2= Absolute value channel B
- 3= Relative A/B
- 4= Relative B/A
- 5= Proportional difference $(A-B)/B * 100$
- 6= Proportional difference $(B-A)/A * 100$
- 7= Absolute difference (A-B)

Reversed polarity sign for difference measuring modes (5,6,7)

- 0= as shown above
- 1= polarity sign reversed

Changing the display of the measuring mode

- 0 = Only the standard measuring mode is displayed
- 1 = Using the Scroll key all calculation modes (1..7) are displayed, the measuring mode number is shown in the function display.

0 **b .0.1.2.** Parameter section B

Decimal point

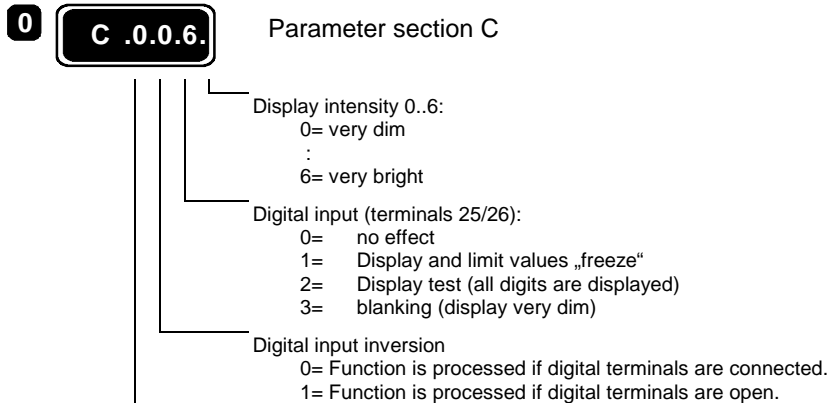
- 0= no decimal point X X X X X.
- 1= decimal point before 1. digit X X X X.X
- 2= decimal point before 2. digit X X X.X X
- 3= decimal point before 3. digit X X.X X X
- 4= decimal point before 4. digit X.X X X X

Decimal point admission

- 0= Overage (or) or underrange (ur) is indicated if measurement value cannot be indicated with the programmed decimal point.
- 1= If the measured value cannot be displayed with the programmed decimal point, the value will be reduced to a representable number. Overflow at 99999

Measuring time (0..3) for display and limit evaluation

- 0= 0,3s Measuring rate/average
- 1= 1s Measuring rate/average
- 2= 2s Measuring rate/average
- 3= 3s Measuring rate/average



Function 1 **Scaling of Channel A**

A channel is scaled by entering a frequency and the appropriate value for the display. The device automatically calculates the necessary multiplier (machine factor) from these values.

TIP: The machine factor can also be entered directly in the 2. scaling parameter if 1.0000“ is entered in the 1. parameter.

TIP: If the display is in min^{-1} and the number of poles of the sensor is known, the number of poles may be entered in the 1. parameter and „60.000“ in the second.

After selection of the scaling function the currently measured frequency blinks. The frequency may be entered into the first parameter by pressing Enter or Scroll. By pressing F, the value will not be entered. The previously entered frequency is displayed.

1 **1 2 3 4.5** Indication of the current frequency (all digits are blinking). By pressing Enter or Scroll the 1. parameter will be initialized. By pressing the F key the previously entered frequency is displayed.

1 **1 0 0 0.0** 1. parameter: frequency: 0,0100..99999 floating point

1. **1 0 0 0.0** 2. parameter: value to be indicated corresponding to frequency in parameter 1
0...99999, floating point

Function 2 **Scaling Channel B (only 2150/4150)**

The second channel is programmed as the first.

2 **1 2 3 4.5** Indication of the current frequency (all digits are blinking). By pressing Enter or Scroll the 1. parameter will be initialized. By pressing the F key the previously entered frequency is displayed.

2 **1 0 0 0.0** 1. parameter: frequency: 0,0100..99999 floating point

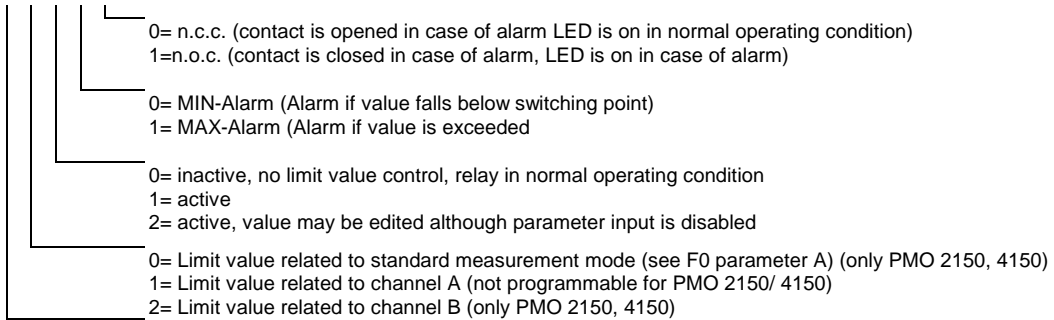
2. **1 0 0 0.0** 2. parameter: value to be indicated corresponding to frequency in parameter 1
0...99999, floating point

Function 3 1. Limit Value

3 **1 1 0 0 0** Switching point -19999 ...99999 floating point

3. **0 0 0 0 0** Switching point of hysteresis 0..99999 floating point

3 **0.1.1.1.** Type of limit value



Function 4 2. Limit Value

4 **1 0 0 0 0** Switching point -19999 ...99999 floating point

4. **0 0 0 0 0** Switching point of hysteresis 0..99999 floating point

4 **0.1.0.1.** Type of limit value - for details refer to limit value 1

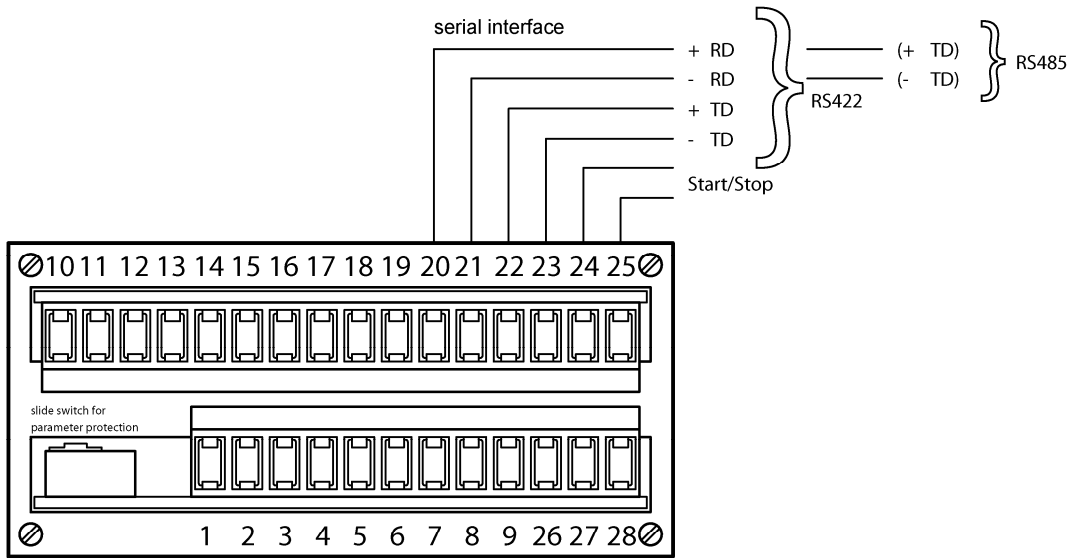
Function 5 3. Limit Value
(only available for devices with option G3, programmable without display)

5 **1 0.0 0 0** Switching point -19999 ...99999 floating point

5. **0 0.0 0 0** Switching point of hysteresis 0..99999 floating point

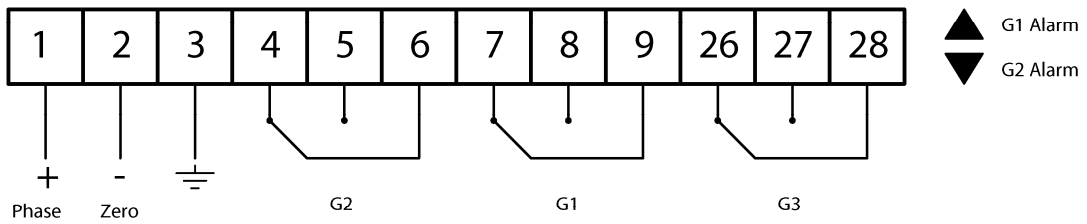
5 **0.0.0.1.** Type of limit value

Connection Diagram

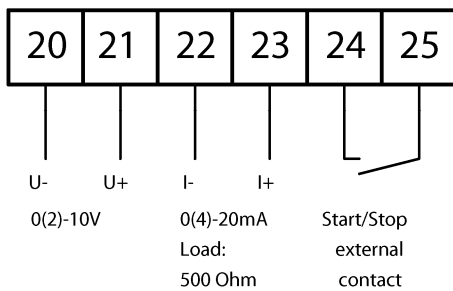


Terminals 20 -23 are used for the serial interface or analog output

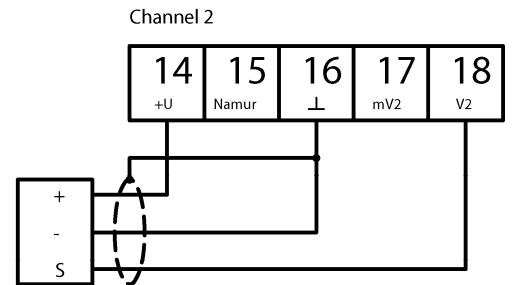
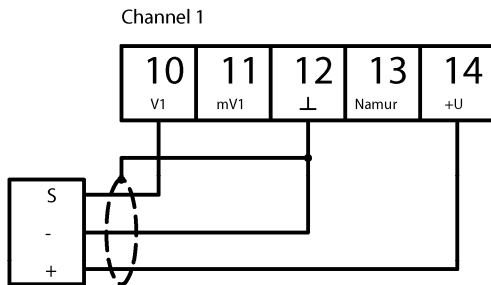
I Power Supply and Alarm Output



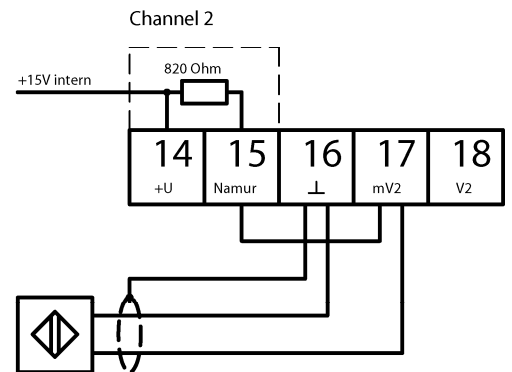
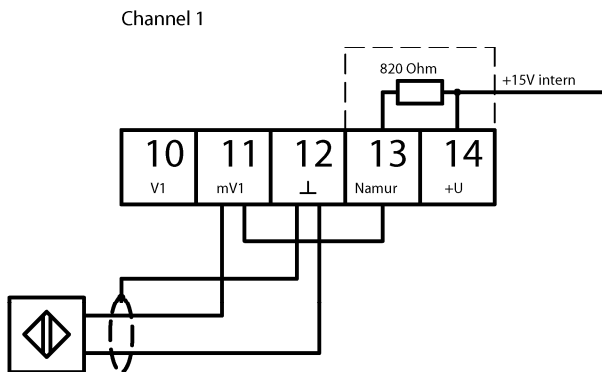
II Current and Voltage Output/ Storage



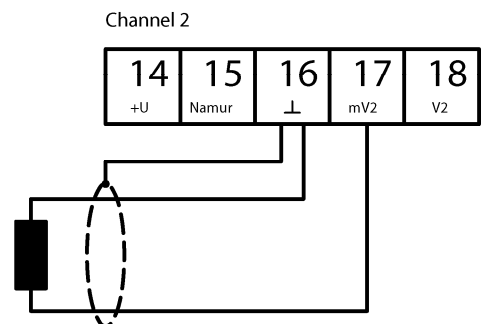
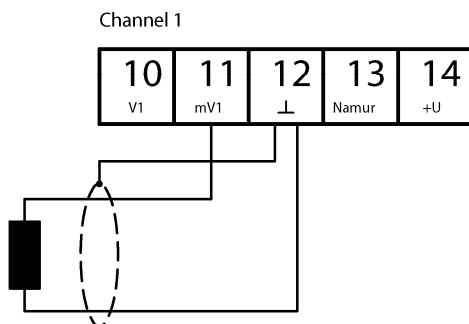
III Sensor Connections
Tachogenerators (OPT-EFD)
Sensor with Amplifier
Proximity Transducer



IV Magnetic Transducer
HF Transducer
Namur Transducer



V Electromagnetic Transducer



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