

Panel Meter PM190 PM 151



- Indicating panelmeters
- PM190 for panels
- PM151 for 19" -racks
- Standard measurement inputs 10V, 0/4...20mA
- Four relais outputs (250V/5A)

User manual

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I General

The fluorescent bar graph indicators PM190 and PM151 are fully electronic measuring value indicators.

A special feature of these instruments is the high-intensity fluorescent bar graph for the simultaneous analogue indication of the measured value and the alarm limits. A digital display which shows the exact values completes the indication.

The fluorescent bar graph indicator PM190 is designed as a panel meter, the indicator PM151 as a plug-in card for 19" racks. Apart from the dimensions and size of the bar graph, both instruments are identical in function, handling and technical data.

Standard processing signals in the ranges 0...10V, (-10V...+10V), 0...20mA, (-20mA... +20mA) or 4mA...20mA can be applied. An auxiliary voltage output of 24V / 25mA supports the connection of 2- or 3-wire measuring transducers.

The setup procedure for the instrument parameters is especially easy due to the menu prompting in the numerical display and only 2 keys on the front panel to control the instrument. This procedure is, among other things, used to set a range for the numerical measuring value and limit display. This can be useful to display the true value of the processing variable.

The user can easily recalibrate the instruments to full scale by applying a calibrating signal of 5 to 10V / 10 to 20mA.

II Technical Data

II.1 Design

Design	PM190: Compact steel case for panel mounting. Front 36mm x 144mm (w x h), mounting depth 200mm without connector, panel breakthrough according to DIN43700 33+0,6 x 138+0,8mm ² (w x h).
	PM151: Plug-in card, euro-format. Dimensions according to DIN 41494: 100 x 160mm ² . Front panel 128,4 x 25,1 mm ² (H x B, 3HE x 5TE).

II.2 Display

Analogue display	PM190: quasi-analogue, bar graph with 100 segments, length 84mm
	PM151: quasi-analogue, bar graph with 51 segments, length 50mm
Digital display	PM190: 3 digits, total range ± 1099 , display for 1000...1099: °00...°99
	PM151: 4 digits, total range ± 1099 , display for 1000...1099 w. decimal point: *00...*99
Decimal point	programmable, either 000, 0.00 or 00.0
Overrange	PM190: Special characters ^{^^} / _v v in the digital display in case of over- or underrange respectively.
	PM151: Special characters ++++/ _— in the digital display in case of over- or underrange respectively.
Value range	Display programmable for 0V or 0(4)mA and for 10V or 20mA (full scale)
Standard scale	PM190: 0 to 100, white numbers on black background
	PM151: 0 to 100, white numbers on eloxal front panel

II.3 Inputs and Outputs

Measuring inputs	1) voltage 0...10V or -10V...+10V 2) current 0...20mA or 4...20mA or -20mA...+20mA. The two inputs must not be connected simultaneously! R _i approx. 1 MOhms (volt.) or 70 Ohms (current).
Limits	2 minimum- and 2 maximum limits, programmable by front keys.
Digital outputs	One change-over relay contact per limit,

	load capacity 250V/5A (4 relays)
Auxiliary voltage	Approx. 5V/11mA for testing purposes and approx. 24V/25mA for transducer connection.
Measuring method	Dual-slope-integration, approx. 30 samples per second, resolution 13 bits
Response time	40ms at the most when a limit is exceeded
Calibration	The user can recalibrate the instrument by applying an external calibration signal or 10.00V / 20.00mA via the keys.
Configuration	All programmable parameters can be set via the 2 keys on the front panel. These parameters are stored nonvolatile.

II.4 Other Data

Auxiliary energy Voltage	see type plate: 230VAC $\pm 20\%$, 7VA, 4W, 45...400Hz 115VAC $\pm 20\%$, 7VA, 4W, 45...400Hz 24VDC $\pm 20\%$, 4W other voltages available on demand
Protection Class	I in accordance with IEC348, VDE0411
Protection System	IP20 in accordance with DIN40050 standard front panel IP30, as special design IP54
Temperature range	0...55°C
Connections	32-pin connector, DIN 41612, type F

III. Operating Instructions

III.1 Mounting

III.1.1 Mounting of Panelmeter PM190

The PM190 is an instrument with DIN dimensions. It is designed as a compact panel meter in a steel case. The front panel's dimensions are 36 mm x 144 mm (w x h), the mounting depth is 200 mm without connector, the panel break-through is 33 mm x 138 mm (w x h) in accordance with DIN43700. When using a standard connector, the mounting depth is increased by 50 mm.

The instruments can be mounted individually or in series. They are plugged into the panel and then clamped from behind using the enclosed devices.

If several devices are mounted tightly together, a good ventilation between the cases has to be provided.

III.1.2 Mounting of Panelmeter PM151

The PM151 is designed as plug-in unit for a 19" rack with a front panel according to DIN41494. The dimensions of the front panel are 128.1 mm x 25.1 mm (3hu x 5pu). The mounting depth is 160 mm. The cards can be mounted tightly together.

To avoid short circuits when inserting a card, the power supply for adjacent cards should be disabled. A good ventilation between the cards should be provided.

III.2 Auxiliary energy

The auxiliary supply of the instrument is done with 230V or 115V, 45...400Hz, or optionally 24VDC, each 20%, 4W. The voltage of the instrument is specified on the type plate. The pins of the connector vary for DC and AC supply.

The instrument complies with the protection class I in accordance with IEC348, VDE0411. The respective guide-lines for the connection have to be observed, a proper grounding must be provided.

The supply input is fused by an 0.1A/250V time-lag fuse (for 24V: 0.5A/250V time-lag). This „Mains Input“ fuse is exchangeable after opening the instrument).

III.3 Measuring Inputs

The instrument can measure currents in the range $\pm 20\text{mA}$ and voltages in the range $\pm 10\text{V}$.

Voltages are applied to the connection points „U-Input“ (positive point) and ground. The voltage input has an internal resistance of approx. 1 MOhms.

Currents are measured via the connection points „I-Input“ (positive point) and ground. The current input has an internal resistance of approx. 70 Ohms and is fused with a 0,1A time-lag fuse („20mA Input“ fuse, exchangeable after opening the instrument).

The measuring input is selectable in the menu „MOD“ via the keyboard.



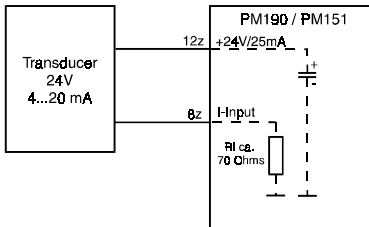
Do not connect both inputs simultaneously!

III.4 Auxiliary Voltages and Transducer Connection

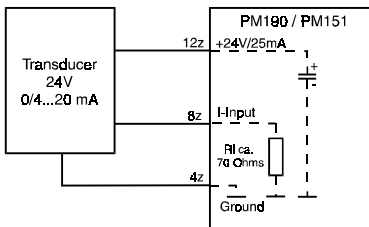
The instrument has two auxiliary voltage outputs:

- The output 5V/7mA can be used for testing purposes. When connecting it directly to the current or voltage input, the amplitude level is about half of the full scale.
- The output 24V/25mA serves as a supply voltage for an external measuring transducer with voltage or current output.

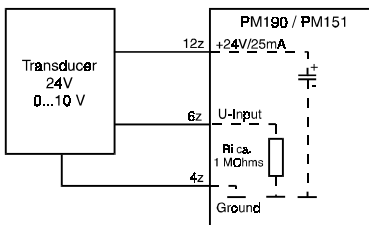
- a) Connecting a transducer with 4...20mA output:
(2-wire connection)



- b) Connecting a transducer with 0/4...20mA output:
(3-wire connection)



- c) Connecting a transducer with 0...10V output:
(3-wire connection)



III.5 Digital Limit Outputs

A relay with change-over contact is assigned to each limit. The load capacity of these contacts is 250V/5A per relay.

Normally, when no alarm is active, all relays are picked-up. A relay is released when its respective limit is passed. This mechanism (fail safe) automatically sets off an alarm when the instrument is out of order. While the instrument is switched off, all alarm contacts are closed.

III.6 Connecting External Keys

Between the connection points T1 / T2 and ground, external keys can be switched in parallel to the internal front keys. When using handy keys, an easier operating is achieved. In addition, the instrument PM190 without breakthrough for keys in the front panel would be splash proof in accordance with IP54.

III.7 Pin Assignment

On the rear panel of the instrument is a 32-pin connector, type F in accordance with DIN41612, to connect measuring and auxiliary signals.

The pin assignments of the PM190 and PM151 are equivalent.

Auxiliary supply:

See type plate for auxiliary voltage!

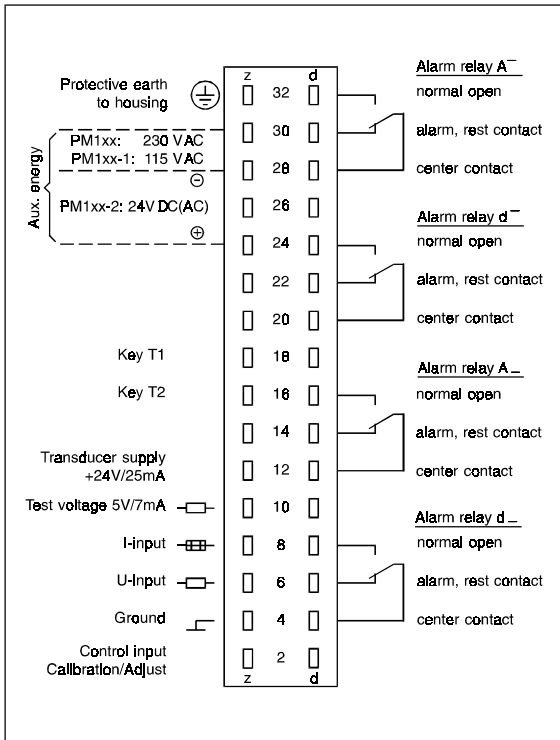
Protective conductor: connect to casing (32z)

230V, 115VAC: connect to supply a (30z) and supply b (28z)

24VDC: positive pole to supply c (24z) and negative pole to supply b (28z)



Unmarked pins must not be connected!



IV. Numerical Display

The alphanumeric display unit of the PM190 consists of a 3-digit 7-segment display (PM151: 4-digit 16-segment display). This display is used to display measuring values as well as alphanumeric identifiers for the setup of the instrument parameters.

A programmed decimal point of the PM151 needs one digit, whereas the PM190 has an additional digit for the decimal point.

Since the measuring input is of bipolar design, the measuring is generally bipolar, independent from the set mode. Thus, negative measuring values or negatively scaled values with signs can also be displayed.

Changing the display from unipolar to bipolar in the menu „MOD“ does not change the numerical display.

IV.1 Form of Representation

All negative values are displayed with a negative sign as first digit, as long as the value does not have too many digits. If the sign cannot be displayed, it can be derived from the bar graph display.

To display a range of up to 1000 on the PM190 without a loss in resolution despite the 3-digit display, the special character „°“ is used as the first digit. It is displayed when the value to be displayed exceeds 3 digits (>999). Thus, the number 1000 will be displayed as °00, so that the total range is $1099 = °99$.

The 4-digit display of the PM151 can directly display values up to 1099 if no decimal point is set. In case of a programmed decimal point, the number of available digits is reduced by 1, to display values 1000, the special character „*“ is used. When the value to be displayed is greater than 1099 or smaller than -1099, the display of the PM190 shows „^^^“ or „vvv“ respectively. For the PM151, the display would be „++++“ or „----“ respectively.

The decimal point is always fixed but can be programmed to 3 different places in the menu „POI“: 0 ; 0.0 ; 0.00. Leading zeros are not displayed.

IV.2 Display Range

The display range is determined by two constants which can be set in the menu „SCA“:

„**Scal.Lo**“ is the display value at 0V/0mA/4mA measuring value (zero point)

„**Scal.Hi**“ is the display value at 10V/20mA measuring value (full scale)

These two constants determine a straight line from which all numerical display values can be derived using linear equations:

The display value for -10V/-20mA is the upper scaling value minus twice the difference of upper and lower scaling value =
 $Scal.Hi - 2 \times (Scal.Hi - Scal.Lo) = 2 \times Scal.Lo - Scal.Hi$.

Ex.: Display at 10V: 1000, Display at 0V: +300.

Display at -10V is consequently: $2 \times (+300) - 1000 = -400$.

Display values in between are calculated by substituting the measuring value (mv.) into these linear equations:

$$\text{+/-10V: } \textit{Display ("U")} = Scal.Lo + \frac{Scal.Hi - Scal.Lo}{10V} \times mv.$$

$$\text{+/-20mA: } \textit{Display ("I0")} = Scal.Lo + \frac{Scal.Hi - Scal.Lo}{20mA} \times mv.$$

$$\text{4-20mA: } \textit{Display ("I4")} = Scal.Lo + \frac{Scal.Hi - Scal.Lo}{16mA} \times (mv. - 4mA)$$

The display value is 0 for the following values:

$$\text{+/-10V: } \textit{Display "0" for } mv. = \frac{Scal.Lo \times 10V}{Scal.Lo - Scal.Hi}$$

$$\text{+/-20mA: } \textit{Display "0" for } mv. = \frac{Scal.Lo \times 20mA}{Scal.Lo - Scal.Hi}$$

$$\text{4-20mA: } \textit{Display "0" for } mv. = \frac{Scal.Lo \times 16mA}{Scal.Lo - Scal.Hi} + 4mA$$

V Analogue Display

The analogue display unit of the PM190 consists of a fluorescent bar graph with 100 segments. The fluorescent bar graph of the PM151 is divided into 51 segments. Up to 5 different informations can be displayed simultaneously (measuring value as bar graph and up to 4 limits as single lines).

V.1 Display of Limits

The limits are displayed as single lines. If the measuring value passes one of the main alarm limits (danger), the bar graph starts to blink at a frequency of approx. 0.5Hz.

V.2 Display of Measuring Value

The measuring value is displayed as a fluorescent bar graph. In case of an alarm, this bar graph starts to blink at a frequency of approx. 0.5Hz.

V.3 Display Modes

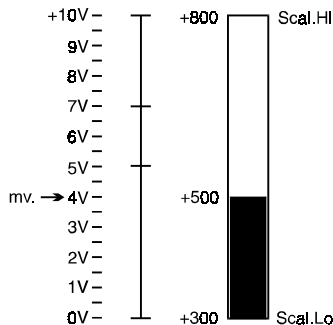
Two different display modes can be set in the menu „MOD“:

V.3.1 Unipolar Display „UNI“

In this mode, the bar graph always starts at the lowest segment, 1 to 100 (51) segments are active, depending on the measuring value. At 0V/0mA/4mA, only the lowest segment is active. For smaller values, the analogue display is completely dark, for values 10V/20mA, the whole bar is active. The number of active segments is linear:

$$= 100 (51) \times \text{measuring value} / \text{range}$$

Ex.: 0...10V measuring range
Scal.Lo = +300, Scal.Hi = +800
measuring value (mv) = +4V



V.3.2 Bipolar Display „BIP“

In this mode, the bar graph does not start at the lowest segment but at a precalculated segment somewhere in the middle of the display. This starting segment, which is the zero of the display, is determined so that the analogue display is synchronous to the numerical display. Thus, when the numerical display is 0, only one segment is active. For positive display values the bar is „going upwards“, i.e. the segments higher than the starting segment are active. For negative ones, the bar is „going downwards“.

To mark the start of the bar graph, the first (zero) segment is brighter than the other segments. For a faster detection of fluctuations of the measuring value, the two segments adjacent to the starting segment are activated even at the smallest drifts from numerical zero.

The end of the bar graph is directly synchronous with the measuring value. This means that the bar graph deflects into the lower half of the display only at negative measuring values. Thus, this display is only useful for truly bipolar input values!

Upper segment =

$$50 + mv \times 50/10V, \quad 25.5 + mv \times 25.5/10V$$

$$50 + mv \times 50/20mA, \quad 25.5 + mv \times 25.5/20mA$$

$$50 + (mv-4mA) \times 50/20mA, \quad 25.5 + (mv-4mA) \times 25.5/20mA$$

The ratio of the difference of the zero and the lower scaling value (display at -10V, -20mA) and the whole display range is the same for the numerical and the analogue display.

$$\frac{\text{zero segment}}{100 / 51 \text{ segments}} = \frac{\text{numerical zero}}{\text{display range}} = \frac{\text{Scal.Hi} - 2 \times \text{Scal.Lo}}{2 \times (\text{Scal.Hi} - \text{Scal.Lo})}$$

or (PM190)

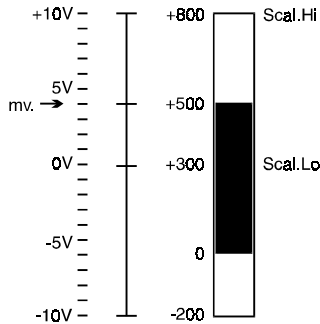
$$\text{Analogue zero} = 50 - 50 \times \frac{\text{Scal.Lo}}{\text{Scal.Hi} - \text{Scal.Lo}}$$

or (PM151)

$$\text{Analogue zero} = 25,5 - 25,5 \times \frac{\text{Scal.Lo}}{\text{Scal.Hi} - \text{Scal.Lo}}$$

Examples:

- a) For $\text{Scal.Lo} = 000$, the analogue zero is always in the middle of the display: 50th (26th) segment
- b) $\text{Scal.Hi} = 1000$, $\text{Scal.Lo} = 300$: The zero segment is at:
 PM190: $50 - 50 \times (300/(1000-300)) = 29^{\text{th}}$ segment
 PM151: 15th segment
- c) $\text{Scal.Hi} = 200$, $\text{Scal.Lo} = -300$: The zero is at:
 PM190: $50 - 50 \times (-300/(200-300)) = 80^{\text{th}}$ segment
 PM151: 41th segment
- d) $\text{Scal.Lo} = +300$, $\text{Scal.Hi} = +800$, measuring value (mv) = +4V



VI Menu-Controlled Setup

The instrument's parameters are set by using the two front keys. The setup procedure is simplified by the menu prompting in the alphanumerical display. Instead of the measuring value, identifiers and setup values are shown in the display. The indication of the measuring value and the limits is continued in the analogue display.

The specific steps of the setup procedure are visualized in the flow chart (see **back inside cover!**). The keys have the following functions:

-Key T1 (left):

This key proceeds the flow chart in a vertical direction, i.e. pressing it will activate the identifier below.

The key is also used to select a digit of a value.

-Key T2 (right):

This key proceeds the flow chart in a horizontal direction, i.e. pressing it will activate the identifier to the right.

The key is also used to change the selected digit of a value. Pressing only T2 repeatedly will proceed the complete flow chart without changing any values. This is useful for viewing the instrument parameters.

VI.1 Start and End of Setup

The setup menu is activated by pressing T1 (left key) when the normal measuring value is indicated in the numerical display. The display will then show „LIM“, the first identifier. In this menu, the limits can be set.

The setup procedure can be terminated when the display shows „End“. Pressing T2 at that point will store the selected setup nonvolatile and return to the indication of the measuring value.

VI.2 Setting values

Values are set in two steps. Since value and sign cannot be displayed simultaneously due to the limited number of digits, the sign is set at a previous identifier. T1 is used to switch between „POS“ and „NEG“.

To set a value, press T1 when it is displayed. The first digit will start to blink and can be increased by pressing T2 as often as necessary. The range for the first digit is 0 to 10 (the special character for 10 is „°“ for the PM190, see also „Numerical Display“). All values are generally entered without decimal point. The programmed decimal point will only appear when the measuring value is displayed.

Pressing T1 selects the next digit which can then be set using T2. When T1 is pressed after the third digit has been set, the value will be displayed without blinking digits again, the starting situation has been reached. To change the value again (e.g. if an error has been made during the input), press T1 again. T2 will proceed to the next parameter.

VI.3 Setting the Limits

When „LIM“ is displayed, the limits can be set. Press T2 to display the first limit. The identifiers for the limits are:

PM190,	PM151 :		
A -,	A +	: upper prealarm	(<u>A</u> lert)
d-,	D +	: upper main alarm	(<u>D</u> anger)
A_ ,	A -	: lower prealarm	(<u>A</u> lert)
d_ ,	D -	: lower main alarm	(<u>D</u> anger)

The limits can be enabled and disabled and their value can be changed (see flow chart for details). When entering a value, please make sure that it is within the scaling interval (see scaling). Values outside this range cannot be reached by the measuring value. The analogue display is updated directly after the value has been changed, i.e. the line representing the limit will move to the new position. However, the new value will not be valid before the setup procedure is left.

If only the Volt or mA values of the limits are known, the numerical value can be calculated by applying the formulas for the numerical display (IV.2) accordingly.

Ex.:

Scal.Lo = -200, Scal.Hi = +500, input 0...10V,
desired value for 3V (mv in the formula):

$$Display ("U") = Scal.Lo + \frac{Scal.Hi - Scal.Lo}{10V} \times mv.$$

$$Limit = -200 + (500-200) / 10V \times 3V = +10.$$

If the limit is set to 10 (input: +010), the relay will switch at a measuring value of 3V. The next identifier after „LIM“ is „END“. The setup can now be terminated by pressing T2 without having to set the other parameters of the instrument.

VI.4 Setup of the Hysteresis

When the identifier „HYS“ is displayed, a common hysteresis for all limits can be set in the range 0...1000. Press T2 to do so.

Significance of the hysteresis:

Using the hysteresis, the switching points of the limits shifted up or down.

For A- and d-, the alarm is activated when the displayed value is greater than or equal to the limit plus hysteresis value. The alarm is deactivated when the displayed value is smaller than or equal to the limit minus hysteresis value.

Example: limit A- = 200, hysteresis value = 2
 the alarm is activated at 202 and deactivated at 198

For A_ and d_, the alarm is activated when the displayed value is smaller than or equal to the limit minus hysteresis value. The alarm is deactivated when the displayed value is greater than or equal to the limit plus hysteresis value.

Example: limit A_ = 200, hysteresis value = 2
 the alarm is activated at 198 and deactivated at 202

The hysteresis is mainly needed to measure noisy signals.

VI.5 Selection of Measuring Range

When the identifier „MOD“ is displayed, pressing T2 will show the present measuring range. Via T1, this range can be changed. Available ranges are:

„U “ : voltage -10V...+10V, unipolar/bipolar display
„I 0“ : current -20mA...+20mA, unipolar/bipolar display
„I 4“ : current 4mA...20mA, only unipolar display

T2 accepts the indicated range. Next, the identifier for the analogue display mode is displayed. In the range „I 4“, no bipolar display for the measuring value is available since the display would be undefined between -4mA and +4mA.

In the ranges „U“ and „I 0“, T1 can be used to switch between unipolar („UNI“) and bipolar („BIP“). For details on these modes refer to „Analogue Display“.

VI.6 Setting the Scaling

When „SCA“ is displayed, the scaling of the digital display can be changed. The values of the lower scaling point „Lo.“ and the upper scaling point „Hi.“ can be set to values in the range ± 1099 .

The smaller the difference of these two values, the more inaccurate is the displayed digital value, because the whole measuring range is assigned to this difference. For details on the scaling values Scal.Lo and Scal.Hi refer to „Numerical Display“.

VI.7 Setting the Decimal Point

When „POI“ is displayed, the decimal point of the numerical display can be changed to one of these settings: „0“, „0.0“, „0.00“.

VI.8 Examples for Setup

The following examples illustrate how the flow chart can be proceeded for setting and viewing of parameters. There are additional ways to get the resulting settings.

The starting display is always the display of the measuring value.

Key T1: left key

Key T2: right key

* = press

** = state changes with each pressing of the key

Stroked (-O-) numbers: this digit is blinking

VI.8.1 Example for Limit Setup

PM190	PM151	current state / value	state / value to be set
A ⁻	A+	limit disabled	limit disabled
d ⁻	D+	limit disabled	limit value +102
A _{__}	A-	limit enabled	limit disabled
d _{__}	D-	limit value +100	limit value -100

T1	T2	display	annotations
*		LIM	setup of limits
	*	A ⁻ , A+	identifier for upper pre-alarm
	*	OFF	prealarm is disabled
	*	d ⁻ , D+	identifier for upper main-alarm
	*	OFF	alarm is disabled
**	*	ON	T1 toggles between ON and OFF
	*	POS	sign doesn't change
	*	000	setting the value
*	*	-0-00	first digit blinks to be changed
*	*	-1-00	T2 increases the digit
*	*	1-0-0	second digit blinks
*	*	10-0-	last digit blinks to be changed
	*	10-1-	T2 increases the digit
	*	10-2-	
*	*	102	no digit blinks, end
	*	A _{__} , A-	identifier for lower pre-alarm
	*	ON	alarm is disabled
**	*	OFF	T1 toggles between ON and OFF
	*	d _{__} , D-	identifier for lower main-alarm
	*	ON	limit is enabled
	*	POS	sign is positive
**	*	NEG	T1 changes the sign
	*	100	desired value already set
	*	END	end, storing of parameters
	*	mv.	return to display of measuring value

VI.8.2 Example for the Setup of Operating Parameters

Current Setup of the instrument:

Measuring mode: current measurement 0-20mA (unipolar)

Scal.Lo (at 0mA): 100, Scal.Hi (at 20mA): 900

Decimal point: no decimal point

New Setup:

Measuring mode: voltage measurement -10V to +10V (bipolar)

Scal.Lo (at 0V): -220, Scal.Hi (at +10V): 100

Decimal point: two digits after the point

T1	T2	display	annotations
		mv.	start: display of measuring value
*		LIM	setup of limits
*		END	skipping of limit setup
*		PAR	identifier for parameter setup
*		MOD	setting the measuring mode
	*	I O	present setting
*		I 4	T1 toggles the setting between:
*		U	0...20mA, 4...20mA, 0...10V
	*	UNI	present display mode
**		BIP	switching between unipolar and bipolar
	*	SCA	setting the scaling values
	*	Lo.	identifier for lower scaling value
	*	POS	sign of value
**		NEG	switching between positive and negative
	*	100	present value is displayed without decimal point
*		-1-00	start of setting, the first digit blinks
	*	-2-00	T2 increases the digit
*		2-0-0	setting of next digit
	*	2-1-0	T2 increases the digit
	*	2-2-0	
*		22-0-	the last digit blinks
*		220	no digit blinking, end
	*	Hi.	identifier for upper scaling value
	*	POS	no change of sign, it stays positive
	*	900	present value is displayed without decimal point
*		-9-00	start of setting, the first digit blinks
	*	-0-00	T2 increases the digit
	*	-1-00	desired value
*		1-0-0	press T1 until last digit blinks
*		10-0-	
*		100	end of setup
	*	POI	setting the decimal point
	*	O	displaying the active setting
*		O.O	T1 changes the decimal point
*		O.OO	two digits after point desired
	*	END	end, saving of parameters
	*	mv.	return to display of measuring value

VII Calibration

The instrument can easily be recalibrated. Due to the natural aging of components important for the precision of the instrument, this might be necessary after it has been in use for a long time. In addition, the full scale of the instrument can be adjusted to only a portion of the standard measuring scale. This portion, however, must be at least 50% of the standard (0...5V, 0...10mA, 2...10mA).

The zero point of the instrument is automatically corrected and cannot be set. In the measuring mode 4...20mA, the lower scaling value of the current input is automatically set to 1/5 of the calibration value. Consequently, when calibrating the current range to 20.00mA, the lower scaling value will correctly be set to 4.00mA.

The accuracy of the calibration source determines the accuracy of the calibration itself.

Calibration procedure:

1. Apply calibration value for the full scale of the instrument. This is normally the value 10.00V or 20.00mA respectively.

The instrument detects automatically whether the voltage measuring path or the current measuring path is to be calibrated as soon as a voltage of more than 5V or a current of more than 10mA is applied.



Current and voltage must not be applied at the same time!

Calibration via the front keys:

2. Press the key T2 and then, with a short delay, the key T1. Both keys have to be depressed for about 5 seconds. The identifier „CAL“ will blink on the display.
3. Release both keys.
4. To stop the calibration, press T1. The identifier „PAR“ will be displayed. To store the calibration value, press T2. It will be stored nonvolatile.

Calibration with external signal:

2. Connect the point T2 (16z) to ground (4z)
3. Connect the point „Calibrate“ (2z) with ground (4z). After about 5 seconds, the identifier „CAL“ will blink on the display.
4. After opening the connection between „Calibrate“ (2z) and ground (4z), the calibration value is stored nonvolatile.

5. The mode „MOD“ is automatically set to „U “ for voltage calibration and to „I 0“ for current calibration, both unipolar.
The instrument parameters are set to standard values:
Scal.Lo: 0, Scal.Hi: 1000, limits: disabled, no decimal point.
6. The currently applied calibration value is displayed as measuring value. Since it is set to the full scale and the upper scaling value is set to 1000, the display is also 1000.
7. The current and voltage path are calibrated independently.



After the calibration, all parameters are reset to their standard values (see 5.)!

VIII Interference Immunity

Due to special mechanical and electrical design measures, the PM190 has a very high interference immunity.

The instrument is in accordance with the interference immunity standard IEC801-4.

All supply and relay connections (22z...32z, 2d...32d) are insensitive to interferences up to 4kV.

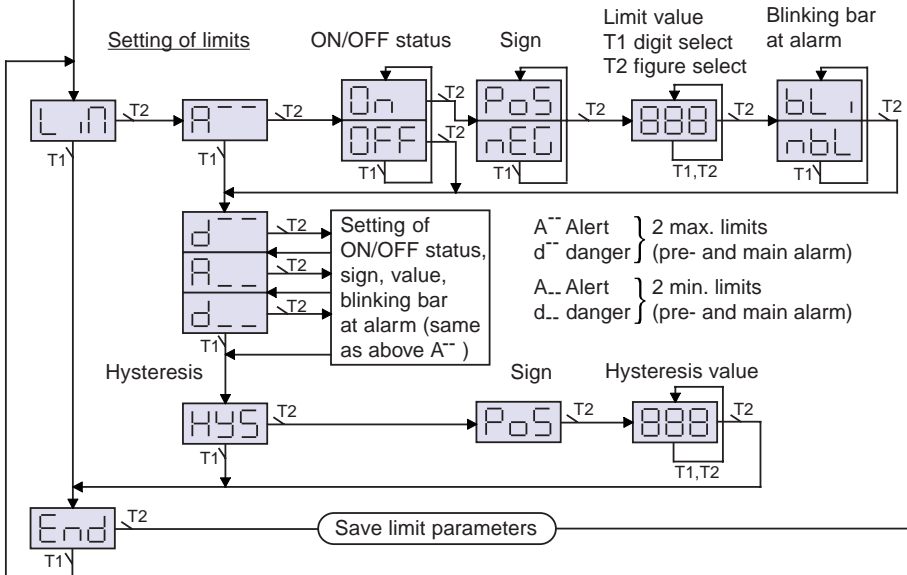
All other measuring and auxiliary connections (2z...20z) endure interferences up to 2 kV.

changes reserved

Measuring value

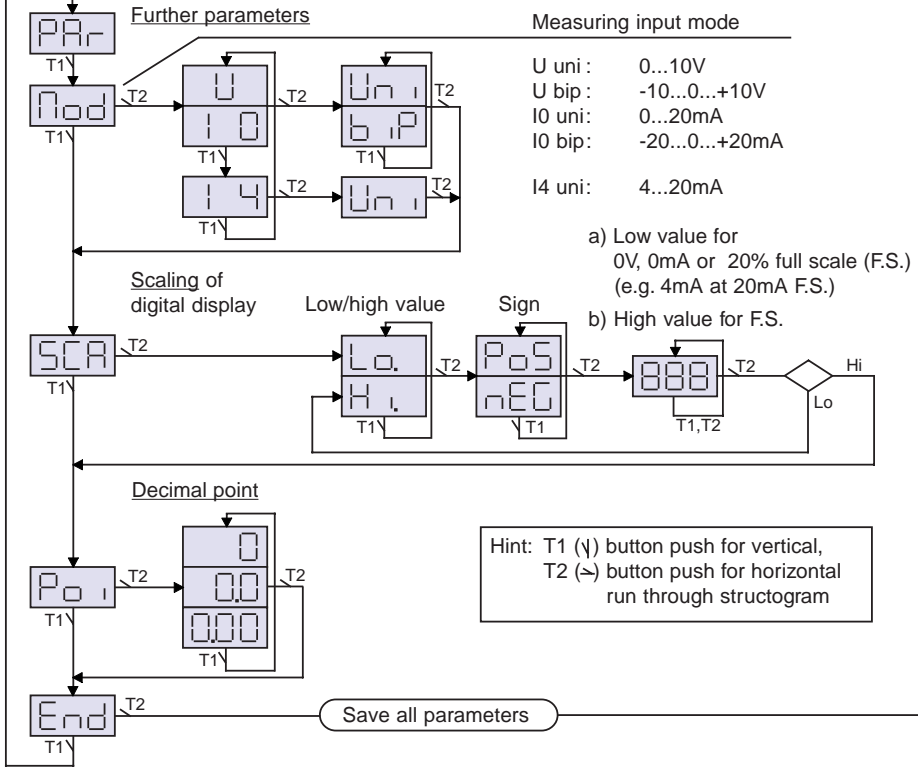
888

Measuring and Monitor Modus



A⁺ Alert } 2 max. limits
d⁺ danger } (pre- and main alarm)

A⁻ Alert } 2 min. limits
d⁻ danger } (pre- and main alarm)



Hint: T1 (↵) button push for vertical, T2 (⇒) button push for horizontal run through structogram

Subject to technical changes, especially to improve the products, at any time without prior notification.

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