

DIGEM 96 x 48 B5

A1385 Digital, Panel Mount
Measuring Instrument

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Notes and Warnings

This instrument has left the factory in flawless technical safety condition. In order to maintain this condition, as well as to assure hazard-free operation, the user must observe all notes and warnings which are contained within the operating instructions. If, due to damage, it can no longer be assumed that hazard-free operation is possible, the instrument must be removed from ser-

vice. It must be assumed that the instrument can no longer be safely operated if damage is visibly apparent. Before placing the measuring instrument into service, make sure that it has been properly equipped for the required measuring task (correct power supply, inputs and outputs). The instrument version and any possible options are identified on the serial plate. If covers are opened or parts are removed from the instrument, voltage conducting parts may be exposed. Balancing, maintenance and repair of live, open instruments may only be performed by trained personnel who are familiar with the dangers involved.

1 Applications

The easy to program DIGEM 96 x 48 B5 digital indicator is a high precision panel mount instrument with adjustable display range. The display range can even be matched to the 4 to 20 mA and 0 to 20 mA measuring ranges after it has been installed without the use of a calibrator. The measuring instrument is thus suited for applications, for which on-site adjustments to the display range are frequently required.

The instrument can optionally be provided with two limit values. Limit value violations are signalled optically by means of two LEDs at the right-hand side of the digital display. Furthermore, each limit value is assigned to a relay with a changeover contact.

The measurement input is of modular design. It can be used for the following measuring tasks depending upon the utilized measuring module:

- Direct current, 0 ... 20 mA and 4 ... 20 mA
- Direct current, 4 ... 20 mA, with power supply for 24 V / 20 mA 2-wire measuring transducer
- Temperature measurement with Pt 100
- Direct voltage from ± 60 mV to ± 200 V
- Direct current from ± 2 mA to ± 200 mA
- Alternating voltage from 0.2 V to 700 V
- Alternating current from 2 mA to 200 mA

2 Mounting

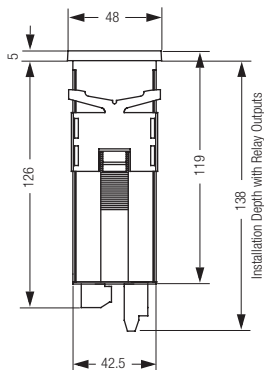
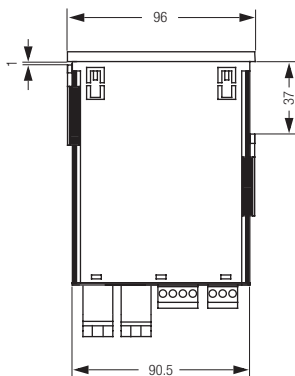
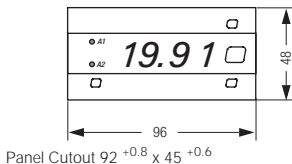
First set the measuring instrument into the panel cutout from the front without the fastening tabs. The fastening tabs are then inserted from the rear into the slots provided for this purpose at the side panels, and are squeezed against the control panel.



Attention

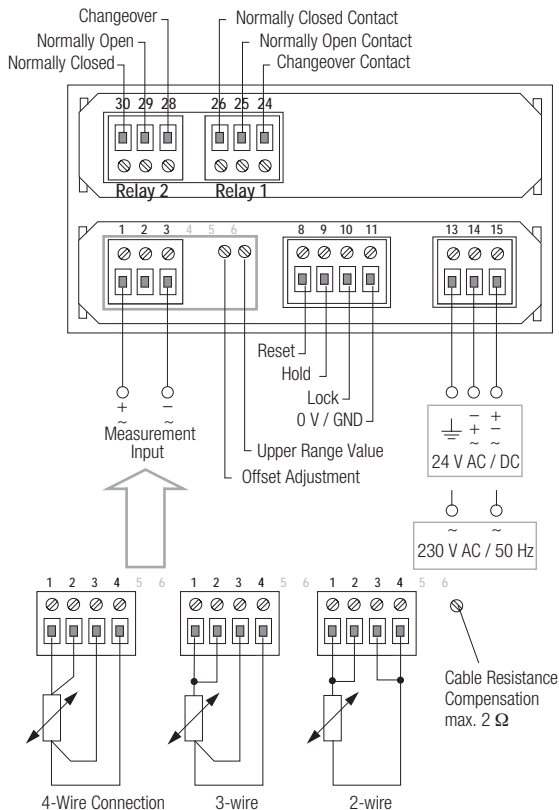
If several instruments are mounted at maximum component density, make sure that the maximum operating temperature of 50° C is not exceeded, even with internal warming.

Dimensional Drawing



All dimensions in mm

3 Terminal Connections



3.1 External Control Inputs

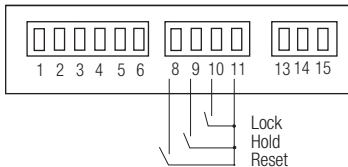


Attention

Terminals 8, 9, 10 and 11 are electrically connected to the measurement input. External switching elements must be electrically isolated from earth as required by measurement input potential.

Reset and Device Test

The entire display is darkened if a connection is established between terminals 8 and 11.



Attention: This connection causes resetting of the microprocessor.

A segment test is performed for approx. 1 second after this connection has been interrupted. The instrument returns to normal operation after the segment test has been completed.

Save Display Value to Memory (Hold)

The currently displayed value is saved to memory if a connection is established between terminals 9 and 11 during normal display operation. This has no effect on the measuring cycle.

Program Protection (Lock)

Selected parameters are protected against possible change if a connection is established between terminals 10 and 11.

4 Basic Instrument Settings

Parameter	Function	Setting Range
bri	Display brightness	0 ... 7
0 – 20 mA	Measuring range selection	
AA	Lower display range value	
AE	Upper display range value	
4 – 20 mA	Measuring range selection	
AA	Lower display range value	
AE	Upper display range value	
Pt100	Measuring range selection	
C / F	Display in degrees Celsius or Fahrenheit	C / F
2-4L / 3L	2/4-wire of 3-wire connection	2-4L / 3L
HCA	Hardware calibration	
ZEr0	Lower display range value	-1999 ... 9999
SPAn	Upper display range value	-1999 ... 9999
PCA	Software calibration	
OFSt	Offset adjustment	-1999 ... 9999
SCAL	Measurement value multiplier	-1.999 ... 9.999
dP	Decimal point	0.000 / 00.00 / 000.0
HiLo (only for instruments with limit values)	Relay switching performance	LoLo, LoHi, HiHi, HiLo
Hi-1	Switching point for limit value 1	-1999 ... 9999
Lo-2	Switching point for limit value 2	-1999 ... 9999
HYSt	Hysteresis	0 ... 100
ULoc	Secure limit values	ULoc, Loc

5 Programming

The following parameters can be set in the order in which they appear below:

- LED display brightness
- Measuring range selection
- Decimal point

The following additional parameters can also be set for instruments with limit values:

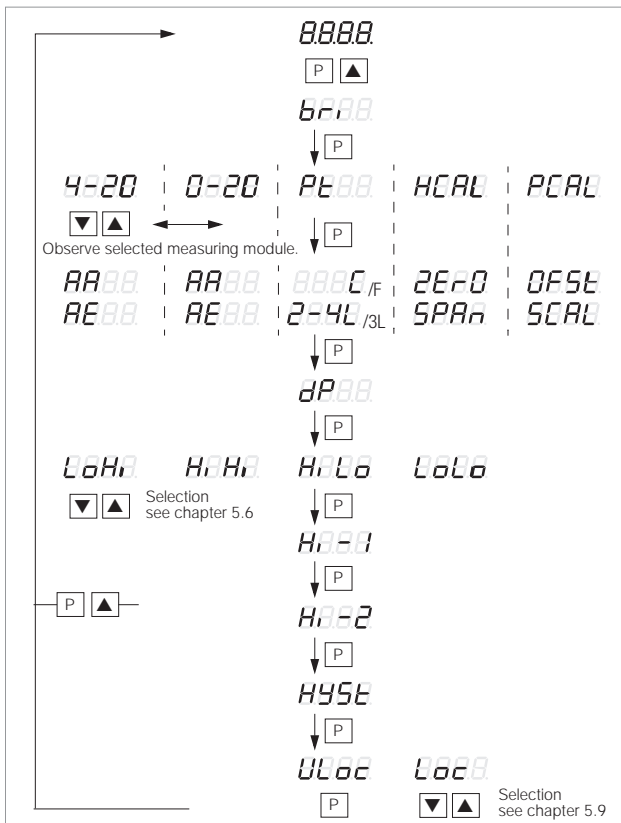
- Relay switching performance
- Switching point values
- Limit value hysteresis

Enabling Programming

In order to enable programming, program protection (Lock) must be released, i.e. contact between terminals 10 and 11 must be interrupted. If programming has not been enabled, **Loc** is displayed when the programming mode is accessed.

Programming Description

The measuring instruments are programmed at the factory as indicated on the serial plate. If programming has been enabled, the basic settings can be changed with the three keys at the front panel.



Programming Overview for Basic Instrument Settings

Press the P and ↑ keys simultaneously in order to enter the programming mode. The parameter designation and the corresponding value blink alternately. The longer the arrow key is pressed and held, the faster the value is changed. The currently displayed value is not saved until the next parameter is selected by pressing the P key.

Range matching for 0 / 4 – 20 mA and for Pt100 sensors depends upon the measuring module, and may only be selected if the corresponding measuring module is utilized (see specifications on the serial plate).

5.1 Display Brightness

Display brightness can be adjusted with the “bri” parameter. Brightness can be set within a range of 0 to 7. It is set to a default value of 5 at the factory.

5.2 Measuring Range Matching for 0 – 20 mA and 4 – 20 mA

The parameters AA and AE allow for the entry of a display range without any additional calibration.

5.3 Measuring Range Matching for Pt100 Temperature Sensor

This selection allows for the display of temperatures in either °C or °F, and determines whether 2/4-wire or 3-wire connection is used for the temperature sensor.

5.4 Measuring Range Matching with HCal (hardware calibration)

This selection allows for adjustment through the use of a calibrator. The input quantities for the lower and upper measuring range values must be applied to the measuring instrument's input during adjustment.

Apply the value which corresponds to the lower measuring range value to the measurement input. Select the ZErO parameter and enter the value which corresponds to the lower measuring range value.

Apply the value which corresponds to the upper measuring range value to the measurement input. Select the SPAn parameter and enter the value which corresponds to the upper measuring range value.

Save the selected values to memory with the P key. The measuring instrument automatically calculates offset and multiplier, and saves these values to memory.

Attention: If values which lie outside of the setting range result from the calculation of offset or multiplier, the message ErrP appears and the incorrect entry blinks (e.g. SPAn).

5.5 Measuring Range Matching with PCAL (software calibration)

Adjustment is performed without a calibrator for measuring range matching with PCAL by calculating the offset magnitude and the multiplication factor. Offset and multiplier are then set directly in digital format.

Offset Calculation (OFSt)

The offset value is the number of digits by which the display is offset from the "normal" zero point. The offset value is calculated with the following equation and does not take any possible decimal point into consideration:

$$\text{Offset} = AA - \frac{SA \times (AE - AA)}{SE - SA}$$

AA = lower display range value SA = lower signal range value (lower input range value)
AE = upper display range value SE = upper signal range value (upper input range value)

Multiplier Calculation (SCAL)

The display range is matched to the input signal range with the SCAL multiplier. The calculation is based upon the following equation:

$$\text{SCAL} = \frac{SE}{2000} \cdot \frac{(AE-AA)}{(SE-SA)}$$

Example:

Assuming the measuring instrument is configured as follows:

0 ... 10 V signal range corresponds to a display range of 0.0 ... + 100.0.

Configuration needs to be changed to the following:

2 ... 10 V signal range corresponds to a display range of - 10.0 ... + 100.0.

This results in the following:

$$\text{OFSt} = -100 - \frac{2(1000 - (-100))}{10 - 2} = -375$$

$$\text{SCAL} = \frac{10}{2000} \cdot \frac{1000 - (-100)}{10 - 2} = 0.6875$$

SA = 2 V, AA = - 100;

SE = 10 V, AE = +1000;

5.6 Relay Switching Performance

Display information depends upon selected relay switching performance, i.e. LoLo, LoHi, HiHi or HiLo.

- LoLo = Both relays for limit values 1 and 2 are active, if the measurement value is less than the selected limit values.
- LoHi = The relay for limit value 1 is active, if the measurement value is less than limit value 1. The relay for limit value 2 is active, if the measurement value exceeds limit value 2.
- HiHi = Both relays for limit values 1 and 2 are active, if the measurement value exceeds the selected limit values.
- HiLo = The relay for limit value 1 is active, if the measurement value exceeds limit value 1. The relay for limit value 2 is active, if the measurement value is less than limit value 2.

Select the required function with the \uparrow and \downarrow keys. Save values to memory with the P key.

5.7 Limit Value Switching Points

Depending upon the selected switching function, either Lo-1 and a numeric value, or Hi-1 and a numeric value blink alternately at the display.

The numeric value corresponds to limit value 1.

Select the required value with the \uparrow and \downarrow keys. Save values to memory with the P key. Depending upon the selected switching function, either Lo-2 and a numeric value, or Hi-2 and a numeric value blink alternately at the display.

The numeric value corresponds to limit value 2. Select the required value with the \uparrow and \downarrow keys. Save values to memory with the P key.

5.8 Setting Hysteresis

HYST and a numeric value blink alternately at the display.

The numeric value corresponds to the selected hysteresis in \pm format.

Select the desired hysteresis with the \uparrow and \downarrow keys. Save values to memory with the P key.

5.9 Securing the Selected Limit Values

Either Uloc or Loc is displayed.

- Uloc = The selected limit values can be changed, even if programming is protected against unauthorized or inadvertent changes by means of an external connection between terminals 10 and 11.
- Loc = The selected limit values are protected against unauthorized or inadvertent change by the program protection function. Then the limit values cannot be changed.

Select the required values with the ↑ and ↓ keys. Save values to memory with the P key. The measuring instrument saves all of the settings to memory and returns to the normal operating mode.

6 Setting the Limit Values During Operation

Limit values can only be adjusted during operation if they have not been secured during programming. Press the P and ↓ keys simultaneously in order to enter the limit value adjustment mode. Depending upon the selected switching function, either Lo-1 and a numeric value, or Hi-1 and a numeric value blink alternately at the display. The numeric value corresponds to limit value 1. Select the required value with the ↑ and ↓ keys. Save the value with the P key and proceed to the next parameter. Depending upon the selected switching function, either Lo-2 and a numeric value, or Hi-2 and a numeric value blink alternately at the display. The numeric value corresponds to limit value 2.

Select the required value with the ↑ and ↓ keys. Save value to memory with the P key. The measuring instrument saves the selected values to memory and returns to the normal operating mode.

Note: If the instrument has been secured against unauthorized or inadvertent changes to the limit values, **Loc** appears at the displays. Adjustment is not possible in this case.

7 Mean Value Generation

This parameter can only be configured if programming has been enabled. If programming has not been enabled, **Loc** appears at the display.

Press the ↑ and ↓ keys simultaneously.

FILt and a numeral blink alternately at the display.

The numeral indicates the number of measured values which are used for mean value generation.

Example: 0 = no mean value generation

2 = mean value generation with 2 measured values

Any of the following settings can be used for displayed mean values:

No mean value,

Mean value based upon 2, 4, 8, 16 or 32 measurements.

The instrument automatically selects mean value generation based upon 32 measurements for Pt100 sensors.

Display

Type	7 segment LED
Display Color	red, optionally green
Display Range	-1999 to 9999
Character Height	approx. 13.2 mm
Polarity	"-" is displayed automatically
Decimal Point	programmable
Overflow Display	- - - -

Input

Module depends on version: see serial plate

Voltage Module

Input Impedance	> 1 M Ω for measurements > 2 V > 70 k Ω for measurements < 2 V
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Current Module

Voltage Drop	max. 2 V
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Temperature Module, Pt100

Sensor Current	2 mA for Pt100
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Error Limits

For Basic Instrument

Without Modules

\pm (0.1% of rdg. + 1 digit)

DC Module

\pm (0.1% of rdg. + 2 digits)

Temperature Coefficient

< 80 ppm/K

SMRR

> 35 dB at 50 Hz

CMRR

> 120 dB with ref. to MB 200.00 mV at 50 Hz

AC Module (arithmetic)

Intrinsic Error at 45 ... 65 Hz \pm (0.2% of rdg. + 3 digits)

30 ... 1 kHz \pm (0.3% of rdg. + 5 digits)

Temperature Coefficient

\pm (0.01% + 0.01 mV) / K

TRUE RMS Module

Intrinsic Error at 45 ... 65 Hz \pm (0.2% of rdg. + 3 digits)

20 Hz ... 1 kHz \pm (0.3% of rdg. + 5 digits)

Crest Factor

6 (additional 0.5% of rdg.)

Temperature Coefficient

\pm (0.01% of rdg. + 0.01 mV) / K

rdg. = measurement value (reading)

Temperature Module, Pt100

Max. Error	± (0.4% of rdg. + 3 digits)
Temperature Coefficient	< 150 ppm / K
Offset Drift	< 0.1 digit / K

Control Inputs

Device Test (Test)	by means of floating contact
Save Display Value (Hold)	by means of floating contact
Program Protection (Lock)	by means of floating contact

Relays

Contacts	1 changeover contact each
Switching Capacity	5 A / 230 V AC, 5 A / 24 V DC
Switching Time	max. 400 ms
Switching Hysteresis	adjustable from 0 to ± 100 digits

Supply Power

	230 / 115 V AC +15% -10% or 18 V ... 36 V DC / 24 V AC ± 15%
Power Consumption	max. 2 VA

Electrical Safety

Versions	EN 911010-1.01
Protection Class	II
Overvoltage Category	II
Fouling Factor	2
Protection	EN 60529/ VDE 0470-1
Housing Front Panel	IP 54, or IP 65 if an additional seal is installed between the control panel and the instrument
Terminals	IP 20
EMC	
Interference Immunity	EN 61000-4-
Interference Emission	EN 61000-3-

Operating Voltage

DC Volt Module	300 V
AC Volt Module, 100/700V	600/700 V (protective impedance)
DC/AC Current Module	300 V
Temperature Modules	50 V

Ambient Conditions

Operating Temperature	0 ... 50° C
Storage Temperature	- 20 ... 70° C
Relative Humidity	max. 85%
Utilization Category	DIN 40040: KWG
Vibration Resistance	EN 61010-1.01

Housing

Material	plastic, ABS
Front Panel Dimensions	96 x 48 mm
Panel Cutout	92 ^{+0.8} x 45 ^{+0.6} mm
Bezel Height	5 mm
Installation Depth	without limit values: max. 126 mm plus wiring, with limit values: max. 138 mm
Weight	approx. 0.3 kg
Terminals	screw terminal blocks
Mounting	plastic mounting tabs

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