DS 96/24 Digital indicator

Operating manual 42/33-77 EN Rev. 03

Subject to technical changes.

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Scope of delivery

Digital indicator DS 96/24
Fastening elements as specified in the order
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Important Instructions They must be absolutely be read and obeyed

Correct and safe operation of the Digital Indicator DS 96/24 calls for appropriate transportation and storage, expert installation and commissioning as well as correct operation and meticulous maintenance.

This apparatus has been designed and tested in accordance with DIN VDE 0411, Part 1 (based on IEC Publication 348), "Safety Requirements for Electronic Measuring Apparatus", and has been supplied in a safe condition. The safety instructions in this Operating Manual bearing the headline "Caution" must be observed in order to retain the apparatus in a safe condition and to ensure safe operation.

The industrial standards and regulations (e.g. DIN, DIN VDE, VDI) referred to in this Operating Manual are applicable in the Federal Republic of Germany. When using this device outside the German Federal jurisdiction, the relevant specifications, standards and regulations applicable in the country where the device is used must be observed.

Should the information in this Operating Manual prove to be insufficient for any reason, please consult your Technical Branch Office, or a branch or representative of Hartmann & Braun.

Application and brief description

The digital indicator DS 96/24 is designed for measuring direct currents and direct voltages.

It is used primarily to display process engineering variables which are present as transmitter signals 0...20 mA or 4...20 mA. The lower-range and upper-range values of the input signals can be assigned arbitrarily to the numerical display of the device.

The DS 96/24 has been designed for installation in all customary rack and mosaic systems. By virtue of its small constructional height it presents an optimal space-saving solution, particularly if little space is available. The indicator features a 10 mm tall 7-segment display, hence legibility is ensured even from a far distance.

Having removed the front cover, the upper-range display value can be adjusted between 0...100 % and the lower-range display value within the limits ± 25 %.

If the input signal is present as a direct current the measuring range can be switched from 0...20 mA to 4...20 mA and vice versa by using a solder link.

Accordingly, the DS 96/24 offers the user tremendous flexibility when making adaptions to the measuring tasks on site.

1 Installation

1.1 Mounting

2 clamping screws are used for mounting the device in the **panel.** To mount, slide the case from the front through the panel cutout. Afterwards, fit the clamping screws into the recesses on the side panels and, using a suitable screw driver tighten them on the panel rear (see Fig. 1).

Mounting orientation is as desired.

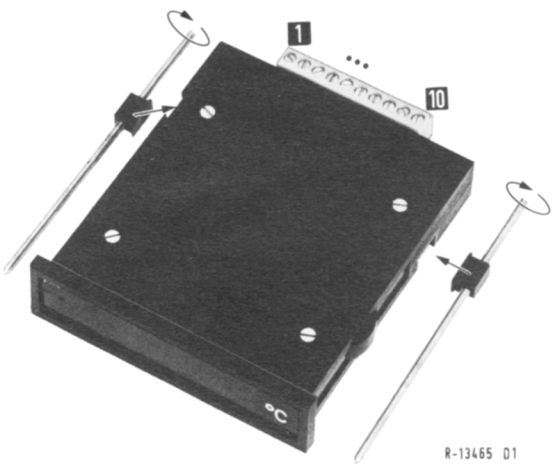

Fig. 1 Mounting in the panel with clamping screws

Please consult the dimensional drawing (see Fig. 2) for the dimensions of the panel cutout needed.

The adapter frame must be fitted (Fig. 3) before mounting the device in a DIN panel cutout.

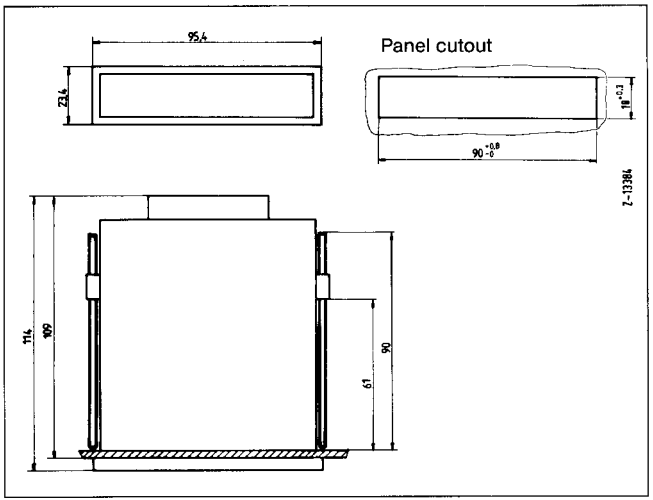

Fig. 2 (Dimensions in mm)

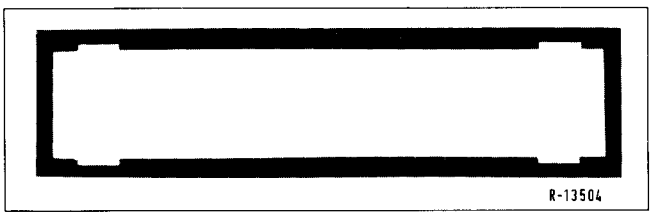

Fig. 3 Adapter frame

1.2 Connection

The power supply and measuring leads are connected to the screw terminals (for wire cross-sections up to 1.5 mm^2) on the device rear panel. Fig. 4 illustrates the terminal layout.

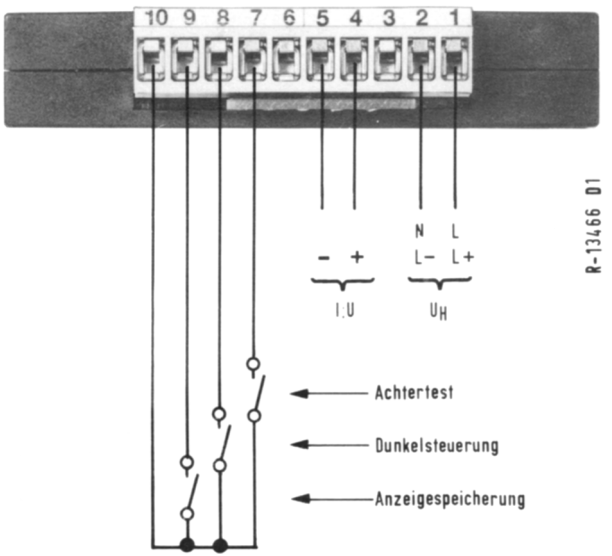

Fig. 4 Terminal layout

2 Commissioning

2.1 Changing the display range

Once the front panel is removed all the potentiometers needed for changing the display can be operated through holes on the left-hand side of the display circuit board (Fig. 5).

Potentiometer R40:
Adjustment of the lower-range display value
Potentiometer R25:
Coarse adjustment of the upper-range display value
Potentiometer R24:
Vernier adjustment of the upper-range display value

The **upper-range** display value can be adjusted over the entire numerical range.

The **lower-range** display value set at the factory can be adapted by at least ± 25 %. In the event of displacements below 400 digits, the lower-range value can be adjusted by at least ± 100 digits.

Example

Display range ordered		Adjustment limits
Lower-range value	400 °C	± 25 % = 300...500 °C
Upper-range value	1200 °C	Lower-range value:...1999 °C

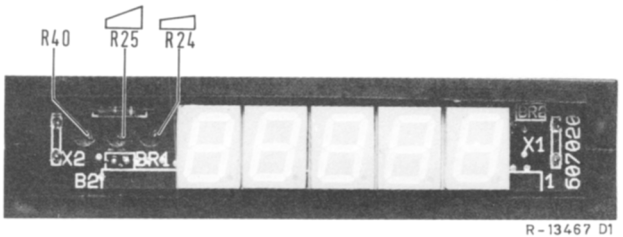

Fig. 5 Changing the display range with potentiometers

2.2 Changing the decimal point

Internal setting of the decimal point

The decimal point position set at the factory can be changed by resoldering a link on the wiring-track side of the motherboard.

Fig. 6 below illustrates the connection between the desired decimal point position and the corresponding position of the solder link.

External changeover of the decimal point position (option)

For this purpose, the motherboard is routed through the device rear panel and features soldering pads for connecting the leads which are routed to the external change-over switches (Fig. 6, right).

Before performing soldering tasks, the terminal block above the circuit board section is removed (insert a screw driver into the gap between the rear panel and terminal block and press out the terminal block).

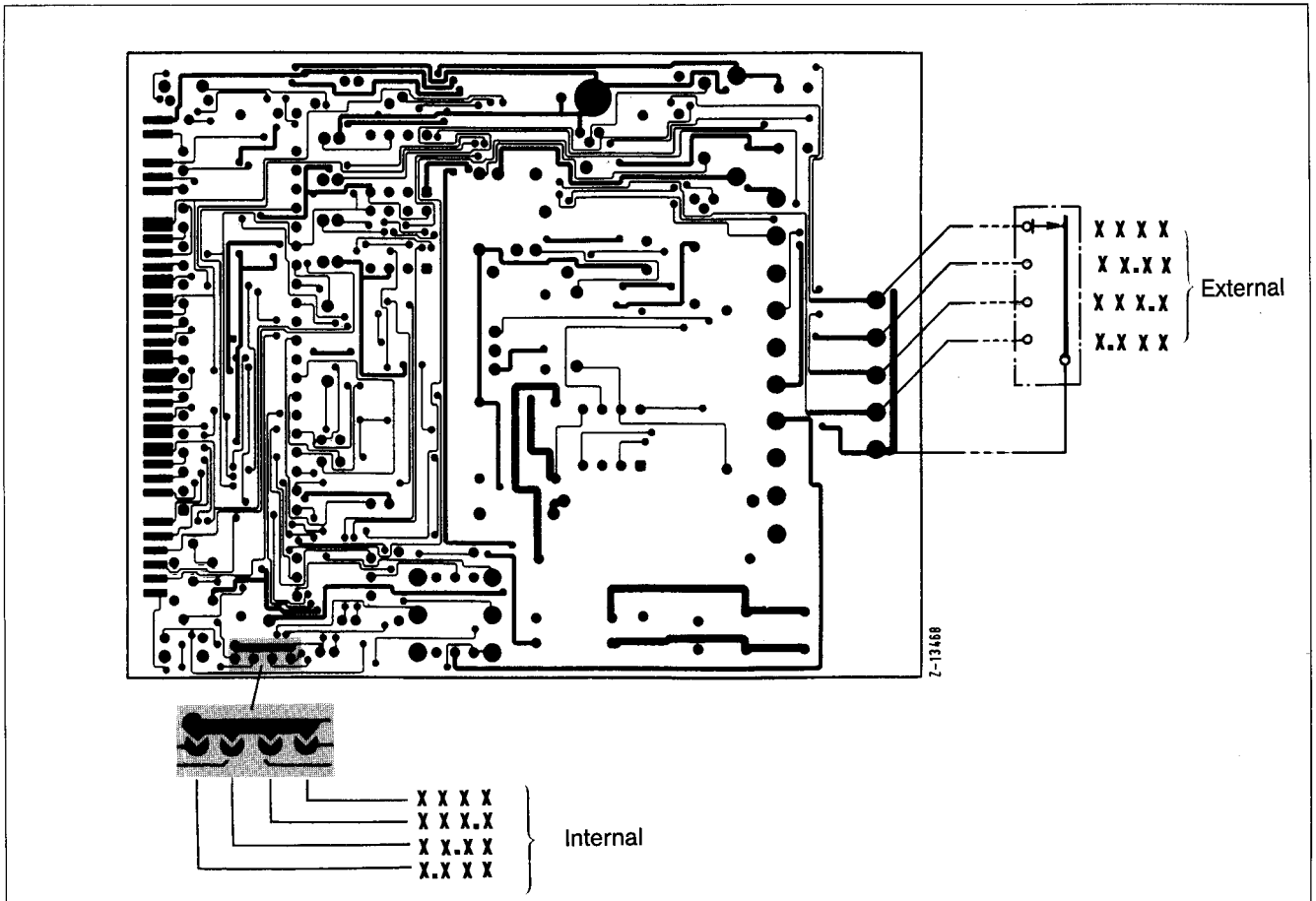

Fig. 6 Changing the decimal point external / internal

2.3 Changing the measuring range from 0...20 mA to 4...20 mA and vice versa

Jumper BR4 must be opened or closed as shown in Fig. 7 in order to carry out this change. The jumper is situated on the left, beside the display unit. To begin with, the front frame with cover must be pulled forward.

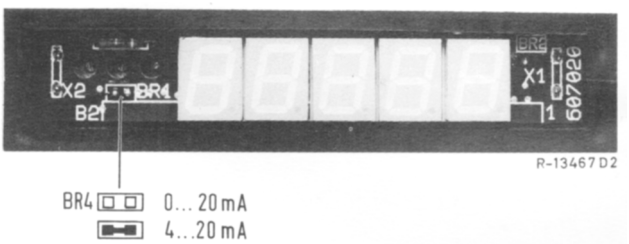

Fig. 7 Changing the measuring range

2.4 Displacing the zero

The magnitude of the zero displacements is determined with resistors R38 and R39. The resistance values for a positive zero displacement can be obtained directly from the table. For negative displacements, interchange the values specified for R38 and R39.

Both resistors are located on the motherboard (see Fig. 8) and can only be reached after opening the device.

Opening the device:

The front panel must first be removed before opening. Loosen the 4 cross-head screws on the device upper side (rating plate). The top half of the case can then be removed and the motherboard is exposed.

Zero displacement (Lower-range value) in digits	R38	R39
+ 100	24.3 kΩ	27.4 kΩ
+ 200	22.6 kΩ	28.7 kΩ
+ 300	21.0 kΩ	30.1 kΩ
+ 400	19.1 kΩ	30.9 kΩ
+ 500	13.7 kΩ	25.5 kΩ
+ 600	10.5 kΩ	22.5 kΩ
+ 700	8.06 kΩ	20.0 kΩ
+ 800	6.34 kΩ	18.4 kΩ
+ 900	4.75 kΩ	16.5 kΩ
+ 1000	3.65 kΩ	15.8 kΩ
+ 1100	2.61 kΩ	14.7 kΩ
+ 1200	1.78 kΩ	14.0 kΩ
+ 1300	1.00 kΩ	13.3 kΩ
+ 1400	464	13.9 kΩ
+ 1500	Jumper	12.7 kΩ
+ 1600	Jumper	12.7 kΩ
+ 1700	Jumper	12.7 kΩ
+ 1800	Jumper	12.7 kΩ
+ 1900	Jumper	12.7 kΩ

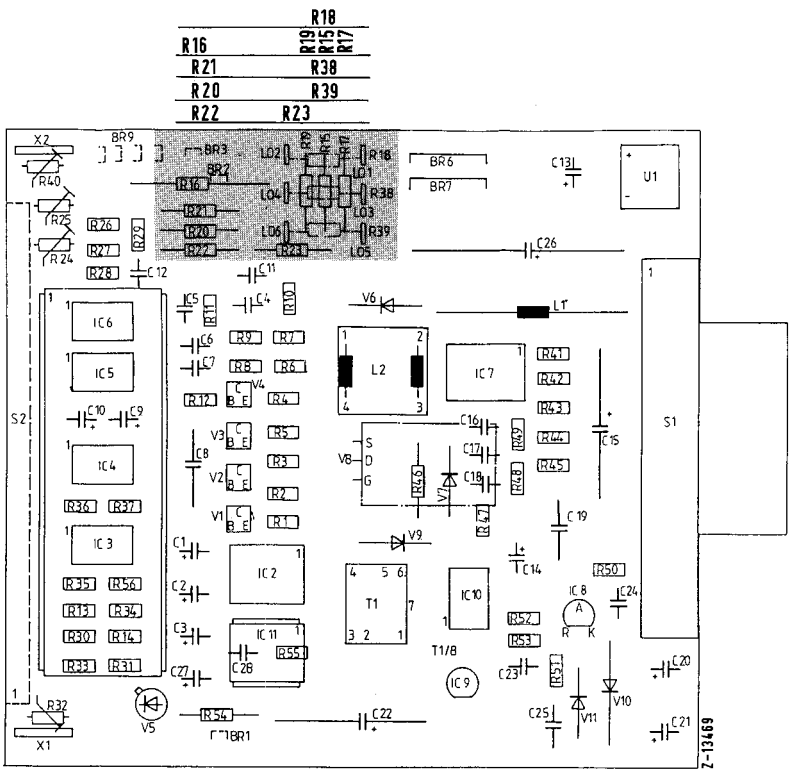

Fig. 8 Motherboard, component side

2.5 Modifying the measured variable

The table below shows the different complement used for current and voltage measuring devices:

Components	Voltage	Current
R15	Jumper	1 MΩ
R16	Measuring-range dependent	Measuring-range dependent
R17	2 kΩ	–
R18	Alignment	–
R19	267 Ω	–
R20	15.4 kΩ	100 kΩ
R21	10 kΩ	–
R22	3.74 kΩ	88.7 kΩ
R23	10 kΩ	715 kΩ

Resistors R15...R23 are situated on the motherboard (see Fig. 8) and can only be reached after opening the device. Please consult the preceding section for opening instructions.

In **current measuring devices** R16 functions as a current shunt and is calculated according to the following formula:

$$\text{R16 (in Ohms)} = \frac{\text{Upper-range display value (in digits)}}{\text{Measuring-range upper value (in mA)}}$$

Example:

If an input signal 0...15 mA is to be displayed as a numerical value of 000...1000 digits, a value of 66.67 Ω is obtained for R16. The upper-range display value can now be adjusted additionally with R24 and R25 (adjustable from the front panel) over the entire range 000...1999 digits.

R15 with R16 form the input voltage divider for **voltmeters.**

$$\text{R16 (in Ohms)} = \frac{1}{\frac{0.00000715 \cdot \text{Measuring-range upper value mV)}}{\text{Display upper value (in digits)}} - 0.000011}$$

If the ratio of the upper-range value to the display value is less than 1.54 the above formula does not produce any meaningful result.

Example:

An input signal between 0...5 V is to be displayed as a numerical value 000...1200 digits.

R16 is calculated

$$\frac{1}{\frac{0.00000715 \cdot 5000}{1200} - 0.000011} = 53200\ \Omega.$$

Here, too, the upper-range value can be additionally adjusted over the entire display range of 000...1999 digits.

3 Maintenance

3.1 Functional check

The device must be connected to the power supply to perform the following tests.

Segment test

If terminals 7 and 10 are connected -1888 must appear on the display. The decimal points are not activated.

Blanking out

The display is blanked out by connecting terminals 8 and 10. This is also the case with activated segment test. The device continues operating internally.

Display storage

This function is activated by connecting terminals 9 and 10. The last value measured is preserved on the display. The device continues operation in the normal measuring mode after severing the connection.

3.2 Servicing

The device does not require servicing

Faults and unusual loads

Whenever it is likely that protection has been impaired, the apparatus shall be made inoperative and be secured against any unintended operation.

It must be assumed that the protection has been impaired when

- the apparatus has visible signs of damage;
- the apparatus no longer functions.

Appendix

Technical Data

Measurement data

Measuring principle
Integrated, Dual-Slope principle

Scanning rate
4 measurements/second

Input signals
DC; 0...20 mA or 0 ... 2 V. See Data Sheet 30-2.11 EN for other signals

Numerical display
$\pm$ 1999 digits

Input resistance
1 MΩ with 0 ... 2 V
100 Ω with 0 ... 20 mA

Deviation (23 °C)
$\pm$ 0.05 % of measured value $\pm$ 1 digit

Temperature coefficient
0.01 % / °C of measured value

Noise rejection
SMR > 40 dB (50 Hz)
CMR < 100 dB (0/50 Hz)

Overload protection
100 V (rms) with $U_e > 2$ V
5 (rms) with $U_e \leqq 2$ V

Display data

Display
Red LED, numerical height 10 mm

Decimal point
Can be changed internally via solder link or externally via change-over switch (option)

Sign
Automatically minus

Overflow display
Blanking out of the last digits: The 1000th digit, decimal point and fixed zero (option) are preserved

Control inputs

Segment test
Display of **–1888;** decimal points are not displayed

Blanking out (option)
Entire display is blanked out, also for segment test

Display storage (option)
Storage of the last measured value on the display; internally the device continues operation in the normal scanning mode

Climatic capabilities

Application class
KWF (DIN 40040)

Ambient temperature
0 ... + 50 °C

Transportation and storage temperature
– 40...+ 75 °C

Relative humidity
≦ 75 % annual average, no condensation

Power supply

Direct voltage
5 V ± 5 %; not electrically isolated; no protection against incorrect polarity
24 V (18 ... 32 V); electrically isolated from signal input; protected against incorrect polarity

Alternating voltage
24 V ± 10 %; 48 ... 62 Hz; electrically isolated from signal input

Power consumption
Approx. 0.8 W with 5 V DC
Approx. 2.8 W with 24 V DC
Approx. 2.8 VA with 24 V AC

Test voltage
500 V for power supply 24 V AC or DC

Electrical connections

Version
10-pole plug-in block with screw terminals up to max. 1.5 mm^2

Construction

Case
Plastic 96 mm x 24 mm, to DIN 43 700, depth 100 mm, suitable for installation in panel (DIN), rack and mosaic systems

Insulation group
C, to DIN VDE 0100

Degree of protection
Case IP 50; terminals IP 20

Mounting
Expanded spring, engaging spring, mounting gate valves or clamping screws

Weight
Approx. 0.25 kg

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