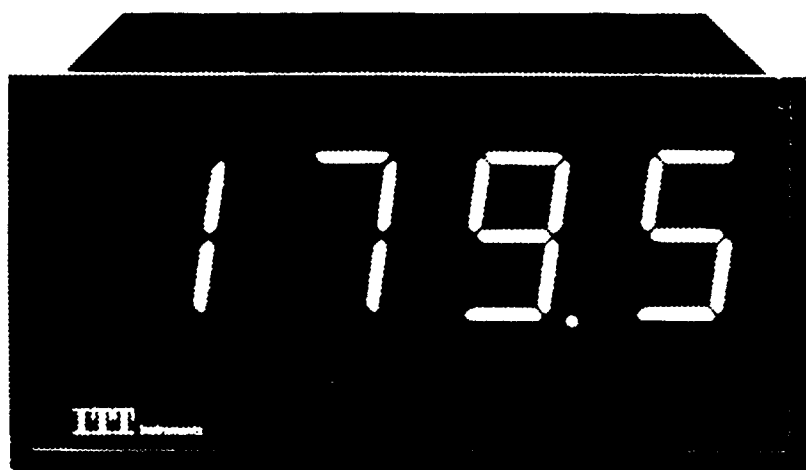


OPERATING INSTRUCTIONS



- DPM 24/2000 S
- DPM 24/2000 SN



- DPM 48/2000 SNT 13
- DPM 48/2000 SN 13
- DPM 48/2000 SNT 20
- DPM 48/2000 SN 20

ITT Instruments

TABLE OF CONTENTS

1. GENERAL DESCRIPTION/NOMENCLATURE	3
2. SAFETY INSTRUCTIONS	4
3. INSTALLATION AND CONNECTION	5
4. SELECTION OF MEASURING AND DISPLAY RANGE	10
5. DECIMAL POINT SETTING	15
6. SPECIFICATION	16
7. DIMENSION DRAWINGS	18

1. GENERAL DESCRIPTION

The **Digital Panel-Meter (DPM)** 24/2000 S, 48/2000 S are compact indicating instruments of SMD design for measurement of electrical quantities.

- Range selection by jumpers at the rear of the instrument
- 3 1/2-Digit seven segmented LED display (red), 13 or 20 mm high.
- 3 Measurements per second
- Detachable front frame with filter
- Decimal point programmable, behind filter
- Brightness adjustable, behind filter
- Indication of input overrange
- Zero shift possible by up to 25% of range
- Universal voltage power supply unit for AC and DC, or conventional power supply unit AC (transformer) optionally available

Models/Type Designations:

Model	Bezel Size (mm)	Depth mm	Power Supply	Digit Height
DPM 24/2000 S	96 × 24	80	5 V _{DC}	13 mm
DPM 24/2000 SN	96 × 24	151	Universal	13 mm
DPM 48/2000 SNT13	96 × 48	151	115 or 230 V _{AC}	13 mm
DPM 48/2000 SN13	96 × 48	151	Universal	13 mm
DPM 48/2000 SNT20	96 × 48	151	115 or 230 V _{AC}	20 mm
DPM 48/2000 SN20	96 × 48	151	Universal	20 mm

2. SAFETY INSTRUCTIONS

Whenever the instrument is to be put into operation, make sure the following instructions are complied with, in order to preclude any danger to the operator.

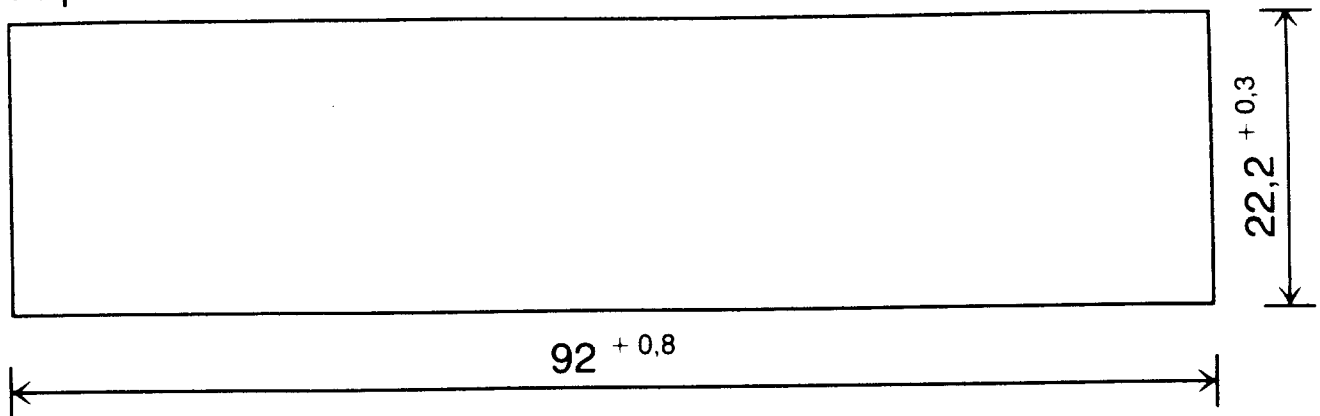
- a) Before setting the basic measuring ranges (by jumpers at the rear of the instrument), make sure the instrument is switched off.
- b) Before setting the decimal point (by jumpers behind the front filter), make sure the instrument is switched off.
- c) Prior to switching on the auxiliary voltage and connecting the measured variable, fit the safety cover at the rear of the instrument.
- d) When adjusting the instrument, make sure not to touch any live components (wire jumpers, plug connector, etc.).
- e) Should any damage or operating malfunction be detected, the instrument must be taken out of service without delay.
- f) The common regulations and the safety standards for electrical, light-current and power installations must be complied with.
- g) Neglect of the safety instructions may affect any warranty claims.

3. INSTALLATION AND CONNECTION

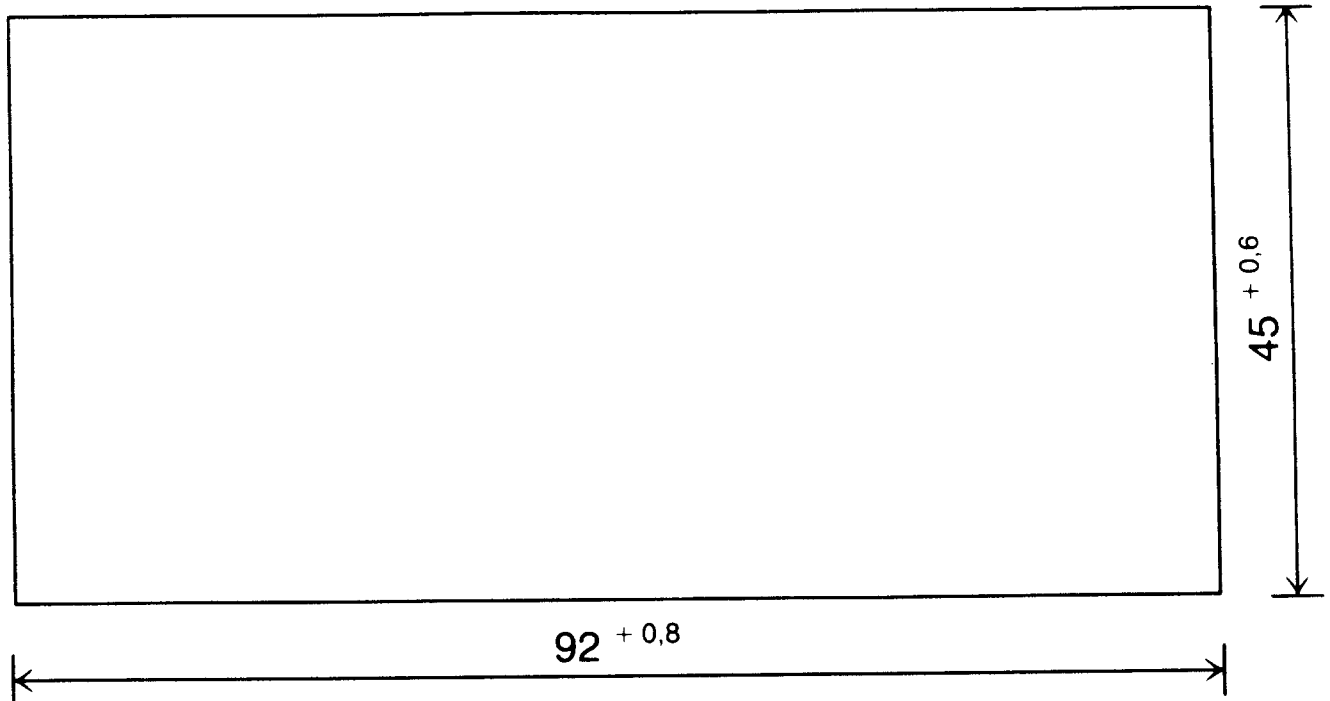
3.1. INSTALLATION

These DPMs may be installed either individually or as a stacked assembly. The instruments are inserted into the panel cutout from the front, and offer the choice of snap-in mounting or screw fixing.

Panel cutout (DPM 24/2000 S/SN):
as per DIN...



Panel cutout (DPM 48/2000 SN/SNT):
as per DIN...



Panel thickness:

For snap-in mounting: thickness up to 4 mm

Optional:

For screw fixing: thickness up to 7 mm

Mounting depths:

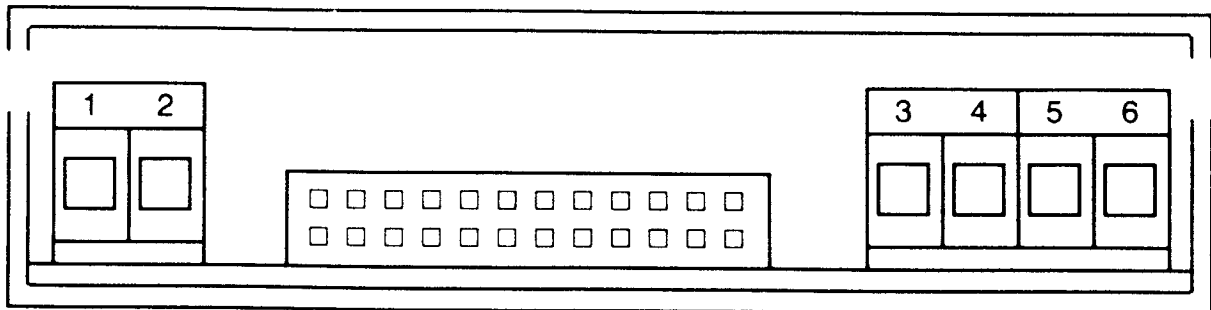
DPM 24/2000 S	80 mm
DPM 24/2000 SN	151 mm
DPM 48/2000 SNT 13	151 mm
DPM 48/2000 SN 13	151 mm
DPM 48/2000 SNT 20	151 mm
DPM 48/2000 SN 20	151 mm

Further dimensions: refer to dimension drawing or mechanical data.

3.2 CONNECTION

The instruments are connected via **plug-in screw-type terminals 1 to 6** at the rear of the instrument, according to the connection diagram on the top side of the instrument.

<input type="checkbox"/> DPM24/2000 S <input type="checkbox"/> DPM24/2000 SN <input type="checkbox"/> DPM48/2000 SN <input type="checkbox"/> 13 <input type="checkbox"/> 20 <input type="checkbox"/> DPM48/2000 SNT <input type="checkbox"/> 13 <input type="checkbox"/> 20		Made in Germany Range: _____ U_H : <input type="checkbox"/> 5 V \approx $\pm 5\%$ / 1,2 W <input type="checkbox"/> 115 V \sim } $\pm 15\%$ / 45...65 Hz / 6 VA <input type="checkbox"/> 230 V \sim } <input type="checkbox"/> { 24.... 48 V \approx $\pm 20\%$ / 2,5 W <input type="checkbox"/> { 24.... 230 V \sim +15% / -20% / 40...70 Hz				
Full-Scale = <input style="width: 50px;" type="text" value="1999"/>		Full-Scale = <input style="width: 50px;" type="text" value="1999"/>				
Auto Zero	U_{in} : 0,2 ... 0,44 V 11 0,45 ... 0,99 V 10 1 ... 1,99 V 9 2 ... 4,49 V 8 4,5 ... 9,99 V 7 10 ... 19,9 V 6 20 ... 44,9 V 5 45 ... 99,9 V 4 100 ... 199 V 3 200 ... 300 V 2	Jumper 11 10 9 8 7 6 5 4 3 2	Input Input: - +	I_{in} : 1 ... 2,24 mA 11 2,25 ... 4,99 mA 10 5 ... 9,99 mA 9 10 ... 22,4 mA 11,12 22,5 ... 49,9 mA 10,12 50 ... 99,9 mA 9,12 100 ... 224 mA 11 225 ... 300 mA 10	Jumper 11 10 9 11,12 10,12 9,12 11 10	Input Input: + + +
	\triangle \emptyset - Adj (Live Zero): + Jumper 1 \triangle					
	U_H L1 N + - <input type="checkbox"/> 1 <input type="checkbox"/> 2	1 2 3 4 5 6 7 8 9 10 11 12 <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Input -U +U -I +I ₁ +I ₂ <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6			



Type of connection:

Screw-clamping – single-core conductor 4 mm²

flexible conductor 2.5 mm²

3.2.1 POWER SUPPLY

For connection of the required auxiliary voltage U_H [terminals 1(+) and 2(-)], distinction must be made between the various types of instruments, i.e. ...S, ...SNT and ...SN.

● DPM 24/2000 S

- DC voltage: $5 V_{DC} \pm 5\%$ (4.75 V ... 5.25)
- Ripple: $\leq 50 \text{ mV}_{PP}$
- Power consumption: typ. 200 mA

As the power consumption depends to a large extent on the instantaneous readout, the supply voltage should be sufficiently stabilized.

An appropriate power supply unit for connection to 220 V_{AC} or 110 V_{AC} is available model number NG 5/300.

CAUTION: Power supply ground and measuring input ground not isolated. Max. common mode voltage: $\pm 2 \text{ V}$.

● DPM 48/2000 SNT...

Auxiliary voltage:

- AC voltage: $230 \text{ V} \pm 15\%$ / 45 ... 65 Hz / 6 VA
- or: $115 \text{ V} \pm 15\%$ / 45 ... 65 Hz / 6 VA

● DPM 24/2000 SN; 48/2000 SN...

These models are fitted with a **universal voltage power supply unit**.

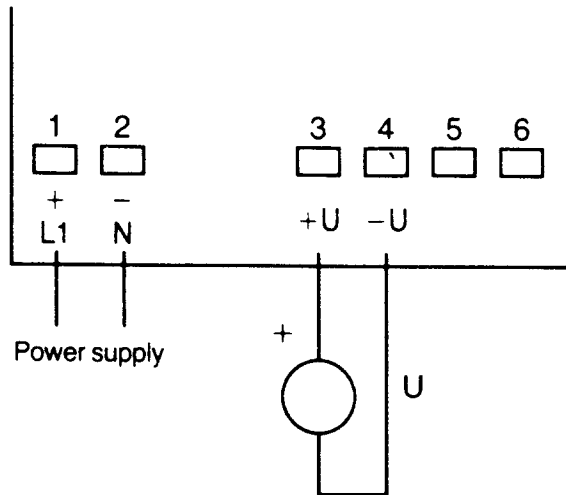
Range selection is automatic.

- DC voltage: $24 V_{DC} \dots 48 V_{DC} \pm 20\%*$
- Power consumption at 24 V: typ. 1.6 W
48 V: typ. 2.5 W
- AC voltage: $24 V_{AC} \dots 230 V_{AC} + 15\%/-20\%$,
40 ... 70 Hz
- Apparent power at 24 V_{AC} : typ. 2.5 VA
115 V_{AC} : typ. 20 VA
230 V_{AC} : typ. 40 VA

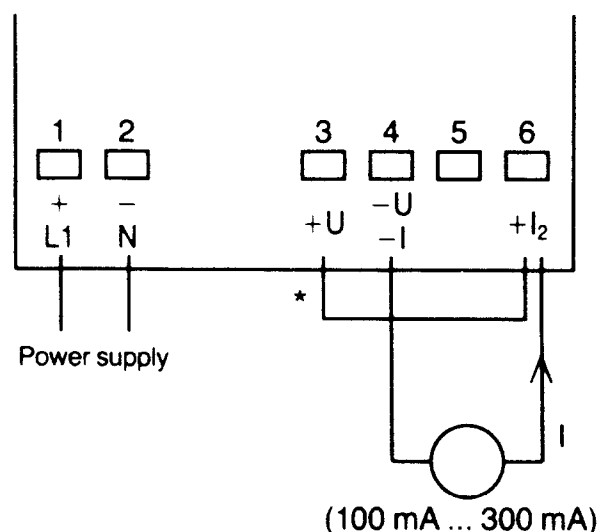
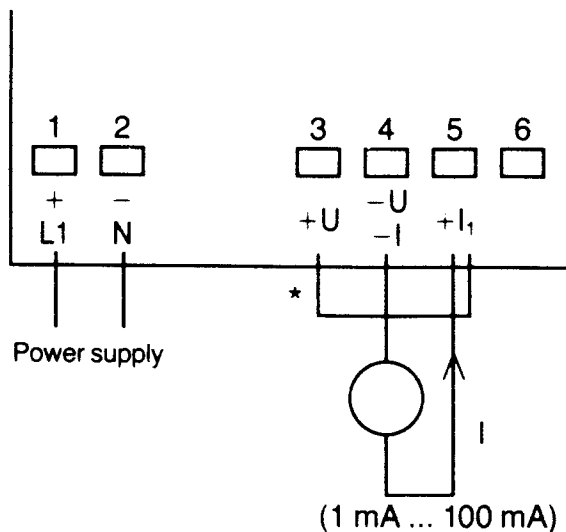
* Residual ripple: may vary within the specified voltage range.

3.2.2 MEASURING INPUTS

Voltage measurement



Current measurement



*For **current measurement**, the user has to **externally link** terminals 3 (+ U) and 5 (+ I₁), or terminals 3 (+ U) and 6 (+ I₂). This link should be as short as possible and of low resistance.

Note:

- In order to avoid errors or an unstable readout, the measuring circuits be shielded or at least twisted.
- Selection of the measuring and display range is described in section 4.

4. SELECTION OF THE MEASURING AND DISPLAY RANGE

The user needs to understand three inter-related range factors:

Display range

Signal range

Measuring range

The **display range** of the DPM instruments is

from to .

The **signal range** is the range of the measured variable which is connected to the DPM input.

A signal range occurring in a practical application is, e.g.:
0 ... 20 mA (output current range of a measuring converter).

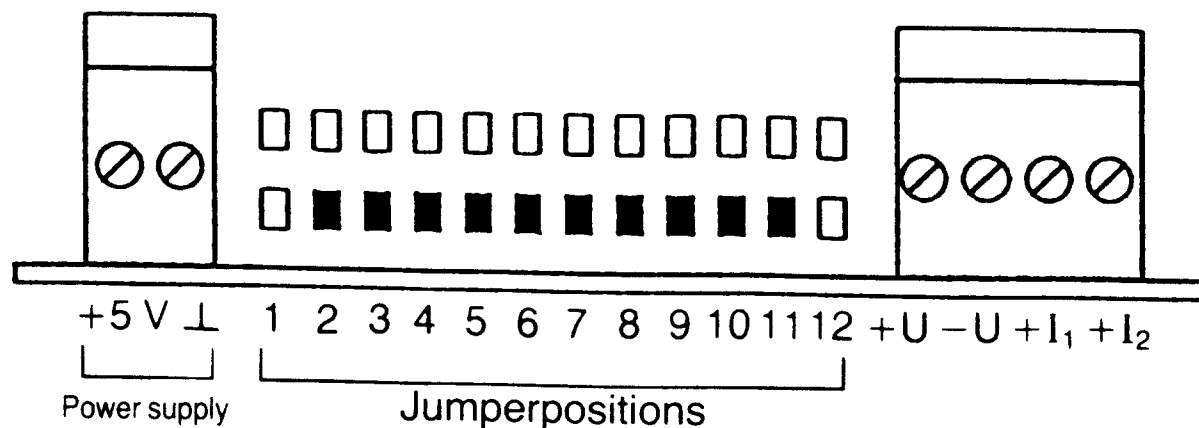
The **measuring range**, which is to be set at the DPM, results from the combination of the signal range and the actual display range desired by the user.

The measuring range is adjusted in two steps:

- Selection of basic range by means of jumper at the rear of the instrument.
- Adjustment by means of the potentiometer **Adj** (behind the front filter), using a calibrated source.

4.1 SELECTION OF THE BASIC RANGE

To set the basic range, first remove the safety cover over the pin connector at the rear of the instrument.



Note: Unused jumper links may be stored transversely in the lower positions marked in black between pins 2 and 11

To set the basic range, plug in jumpers according to the following assignment table:

Voltage / V from ... to	Jumper Position	Current / mA from ... to	Jumper Positions
0.2 ... 0.44	11	1 ... 2.24	11
0.45 ... 0.99	10	2.25 ... 4.99	10
1 ... 1.99	9	5 ... 9.99	9
2 ... 4.49	8	10 ... 22.4	11,12
4.5 ... 9.99	7	22.5 ... 49.9	10,12
10 ... 19.9	6	50 ... 99.9	9,12
20 ... 44.9	5	100 ... 224	11
45 ... 99.9	4	225 ... 300	10
100 ... 199	3		
200 ... 300	2		

4.2 ADJUSTING THE DPM RANGE

After the front cover has been removed, the potentiometer **Adj** is accessible at the left side of the display. Via **Adj**, the instrument is adjusted to the desired value using a calibrated source.

The DPM should be calibrated near to the full-scale display range, (e.g. at **1500** or **1800**) for best accuracy.

Examples:

1) A measuring converter supplies an output voltage of 0 V ... 1,5 V.

This **signal range** is to be displayed as 000 ... 1999, i.e. the desired **display range** is **000 ... 1999**.

$U_{MAX} = 1.5$ V corresponds to a full-scale value of **1999**, i.e. the **measuring range** is 1.5 V which is within the basic range of 1 ... 1.99 V.

Operation:

- Plug in jumper at position 9 (refer Page 7 and II).
- Connect 75% U_{MAX} (= 1.125 V) to the measuring-input (terminals 3 and 4) from a calibrated source.
- Adjust the display to 75% full-scale deflection (= 1500) via the potentiometer **Adj**.

2) The output signal of a measuring converter is $U_{min} = 0$ V;
 $U_{max} = 18$ V.

Desired **display range** **000 ... 1600**.

Measuring range: $M = 2000 \text{ digits} / 1600 \text{ digits} \times 18 \text{ V} = 22.50 \text{ V}$

Operation:

- Plug in jumper at position 5
- Plug in jumper for decimal point
- Apply 18 V from a calibrated source.
- Adjust the display to read 1600.

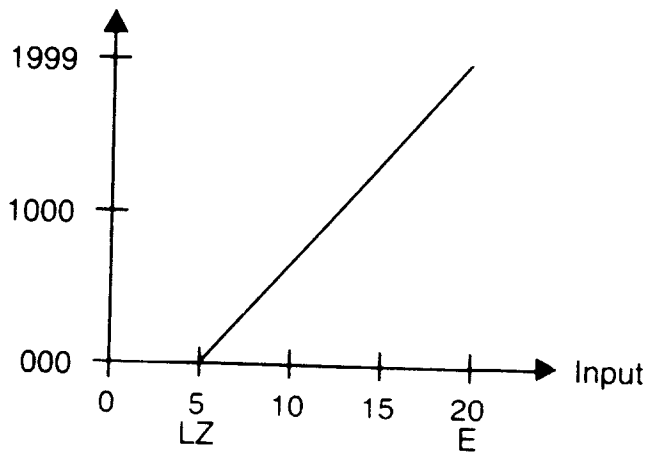
4.3 ZERO SHIFT

A zero shift is possible up to 25% of the full-scale range.

Zero shift means:

A certain positive measuring signal at the DPM input causes "000" to be displayed.

readout



Operation:

- Calculate of the measuring range M
- Adjust the DPM to give full scale readout (1999) for an input of M using the ADJ potentiometer. Eg input 75% M to display 1500 using a calibrated source.
- Plug in a jumper at position 1 to allow zero shift.
- Input the value LZ which is to be suppressed (e.g. 4 mA). Adjust the readout to **000** via the potentiometer **LZ**. The potentiometer LZ is located to the left of the potentiometer **Adj**.

Calculation of the measuring range M:

$$M = (E - LZ) \times 2000/XXXX$$

LZ = The absolute value of the measuring signal which is to give the readout **000**.

E = The absolute value of the measuring signal which is to give the readout **XXXX**.

XXXX = The desired readout for the signal input value E.

EXAMPLES

1) The output current range of a measuring converter is 4 ... 20 mA. This range is to be represented as display range 000 ... 1999.

Operation:

- Calculate the measuring range M
 $M = (20 \text{ mA} - 4 \text{ mA}) \times 2000/2000$
i.e. $M = 16 \text{ mA}$
- Plug in the jumpers 11 and 12, adjust the DPM to display full scale with a 16 mA input using **ADJ** potentiometer.
- Plug in jumper 1.
- Apply 4 mA to the measuring input.
- Adjust the readout to 000 via the potentiometer LZ.

NB: Input is terminals 4 and 5, with link between terminals 3 and 5.

2) Output voltage range of a measuring converter: 2 ... 20 V.
Desired display range: 000 ... 833

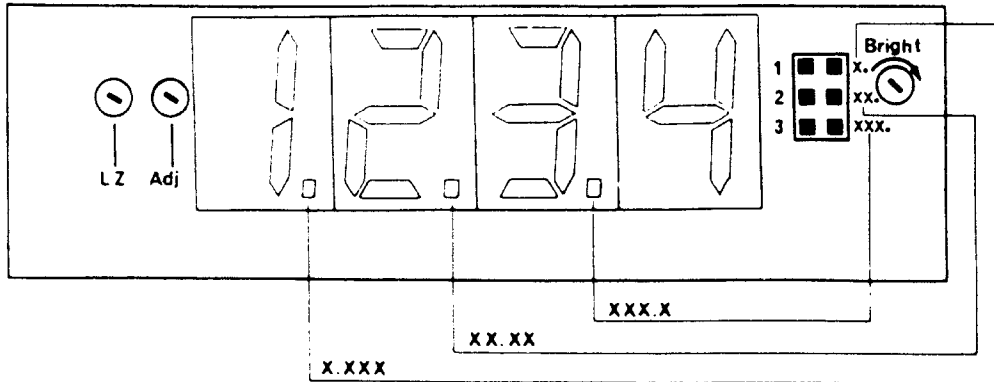
Operation:

- Calculate the measuring range M
 $M = (20 \text{ V} - 2 \text{ V}) \times 2000/833$
i.e. $M = 43.217 \text{ V}$
- Plug in a jumper at position 5, adjust the DPM to display full scale with a 43.217 V input/using **ADJ** potentiometer (terminals 3 and 4).
- Plug in a jumper at position 1.
- Apply 2 V to the measuring input (terminals 3 and 4).
- Adjust the readout to 000 via the potentiometer LZ.

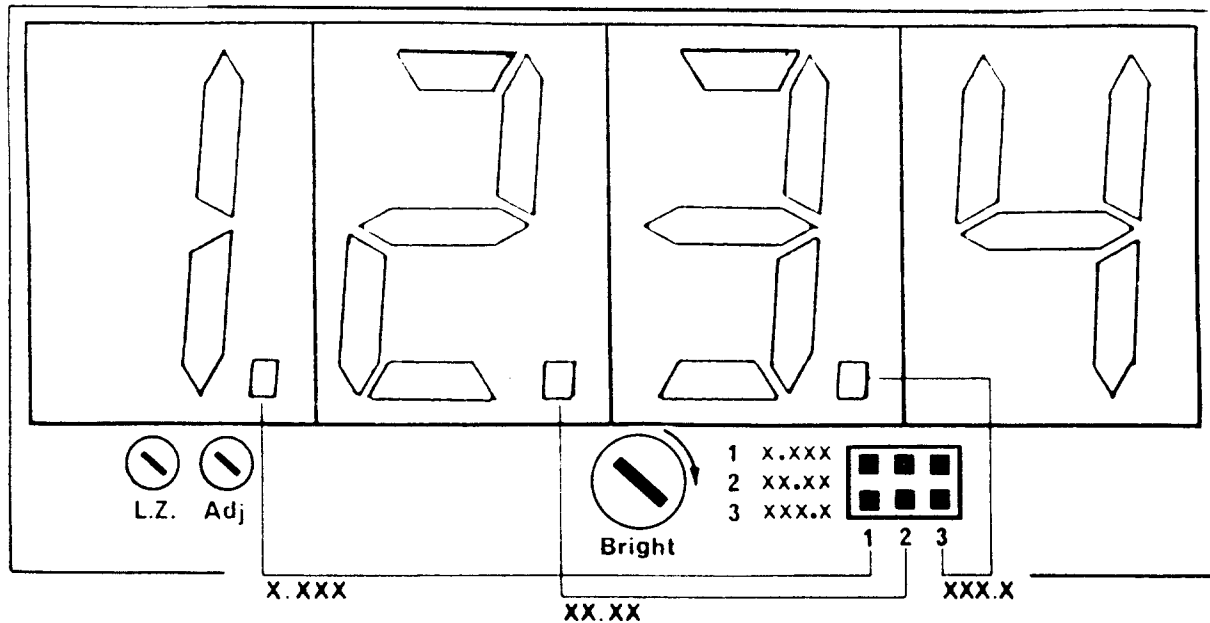
5.1. SETTING THE DECIMAL POINT

After removal of the front cover a pin connector is accessible where the decimal point can be set by means of a jumper.

DPM 24/2000 S DPM 24/2000 SN DPM 48/2000 SN (T)/13



DPM 48/2000 SN (T)-20 (20 mm high LED-Versions)



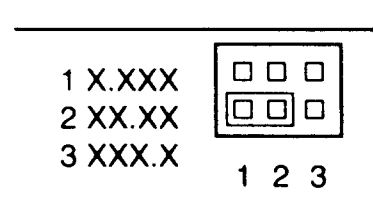
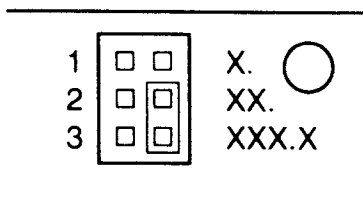
If no lighted decimal point is required, the jumper may be positioned as shown below:

DPM 48/2000 S

DPM 48/2000 SN(T)-20

DPM 24/2000 SN

DPM 48/2000 SN(T)-13



5.2. BRIGHTNESS CONTROL

The brightness of the LED display can be adjusted from 0 to 100%, after removal of the front cover, via the potentiometer provided (bright).

6. SPECIFICATION

6.1. ANALOG-TO-DIGITAL CONVERSION

Conversion type: dual slope
 Measuring rate: 3/sec.
 Integration time: 80 ms
 Zero correction: automatic

6.2. MEASURING INPUT

Max. common-mode voltage: 250 V, for SN/SNT models
 + 2 V, for S model
 NMRR: > 40 dB
 CMRR: > 100 dB
 Response time: < 500 ms

Voltage measurement:

Measuring range	0.2 V–1 V	1 V–10 V	10 V–100 V	100 V–300 V
Display range	± 2000 counts			
Max. input	400 V	400 V	400 V	400 V
Input resistance	1058 kOhm ± 1 %			

Current measurement:

Measuring range	1 mA–10 mA	10 mA–100 mA	100 mA–300 mA
Display range	± 2000 counts		
Max. input	35 mA	110 mA	350 mA
Input resistance	202 Ohm ± 1 %	20 Ohm ± 1 %	2 Ohm ± 1 %

6.3. ACCURACY

Linearity: ± 1 digit
 Display range: ± 2000 counts
 Accuracy for factory calibrated range
 (under reference conditions): 0,05 % of reading ± 2 digits
 Roll over error: ± 2 digits
 Temperature coefficient: typ. 50 ppm/°C

6.4. AUXILIARY POWER SUPPLY

6.4.1. DPM 24/2000 S

Auxiliary voltage: 5 V DC \pm 5% (4.75 V ... 5.25 V)
Power consumption: typ. 200 mA

6.4.2. POWER SUPPLY UNIT MODELS

Universal voltage power supply unit (...SN):

Auxiliary voltage: 24 V_{DC} ... 48 V_{DC} \pm 20 % and
24 V_{AC} ... 230 V_{AC} + 15 % / - 20 % /
40 ... 70 Hz

Transformer power supply unit (...SNT):

Auxiliary voltage: 230 V_{AC} \pm 15 % / 45 ... 65 Hz
or: 115 V_{AC} \pm 15 % / 45 ... 65 Hz

6.5. DISPLAY

Display: 13 mm (20mm) seven-bar segmented
LED display (red)

Symbols: *-1.8.8.8*

Decimal points: Three positions can be programmed by
jumper behind the front filter

Overrange indication: (last three digits blank)

6.6. TEMPERATURE RANGE

Storage temperature: - 40° C ... + 80° C

Service temperature: 0° C ... + 50° C

6.7. CONNECTION

2 screw-type terminals for auxiliary power

4 screw-type terminals for measuring inputs

Wire sizes: up to 4 mm² – single-core conductor
up to 2.5 mm² – flexible conductor

6.8. MECHANICAL DATA

Case: black

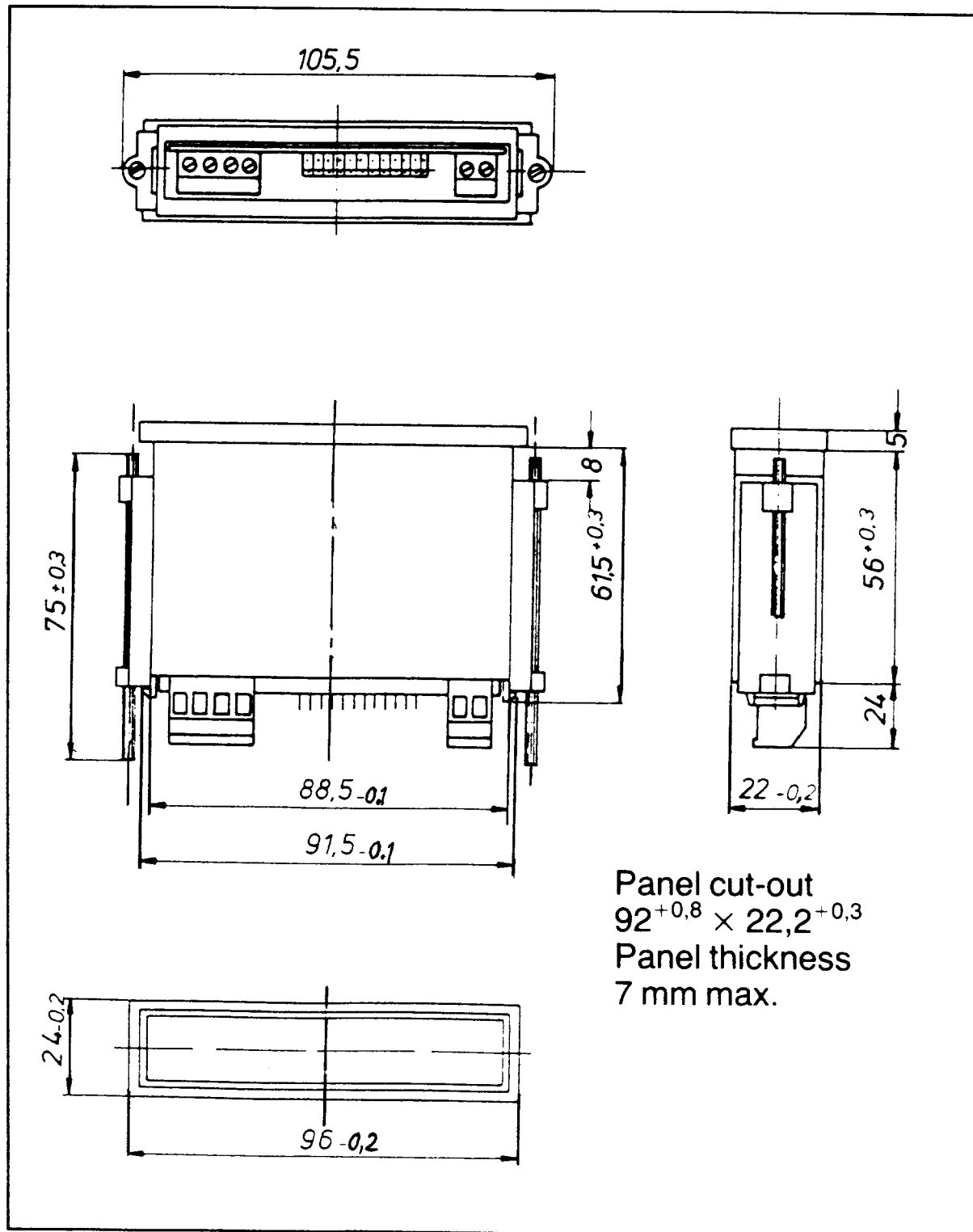
Front frame: 96 mm x 24 mm or 96 x 48 mm

Mounting depths incl. plug: 80 mm (DPM 24/2000 S)
151 mm (models with power supply
unit)

Type of enclosure: case IP 56
terminals IP 20

7.1. DIMENSION DRAWING DPM 24/2000 S

Identical for DPM 24/2000 SN, except mounting depth: 151 mm.



7.2. DIMENSION DRAWING

DPM 48/2000 SNT 13
DPM 48/2000 SNT 20
DPM 48/2000 SN 13
DPM 48/2000 SN 20

