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SINCE 1911

METRA BLANSKO

Panel instruments



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CONTENTS

	Page
Related prescriptions and standards	3
Variants of scales	4
Common technical parameters of the MP series	5
Ammeters for DC current	6
Ammeters for DC current with central zero point	8
Ammeters for AC current with rectifier	9
Voltmeters for DC voltage	10
Voltmeters for DC voltage with central zero point	11
Voltmeters for AC voltage with semiconductor rectifier	12
Speedometers	12
Ordering of panel instruments	15
Dimensional sketches	16
High-voltage dividers – with guard	22

STANDARDS

SCALES AND INDICATORS

Indicators have got blade terminals, scales have got rough and fine indexing

SAFETY PRESCRIPTIONS

Measuring instruments comply with the standards ČSN EN 61010-1.

CLASS OF ACCURACY

Measuring instrument comply with requirements of the standard ČSN EN 60051-1. Until otherwise specified, the accuracy class is 1.5, marked on the scale

WORKING TEMPERATURE RANGE

These measuring instruments operates by convenient way at ambient temperature range -40°C to $+55^{\circ}\text{C}$

VIBRATIONS AND IMPACTS

During its vibration test the instrument is exposed to 5 cycles with frequency wobbling in the zone 10 - 150 - 10 Hz at the cycle amplitude 0.15 mm.

The impact test consists of 3 impacts, each in the both directions in three mutually perpendicular axes with acceleration amplitude 150 m/s^2 .

Acc. to kind of measuring system instruments are sorted like this:

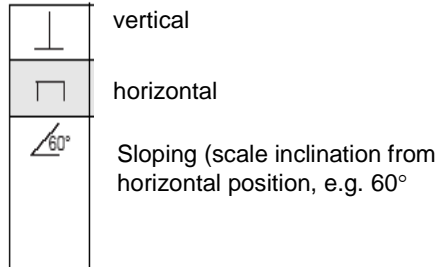
1. Series MP 40, 80 and series MP 210, 220, 230 with the magneto-electric measuring system is determined for:

- measurement of DC voltage, or current
- temperature measurement in connection with an thermo-electric cell
- measurement of AC voltage, or current, in connection with a semiconductor rectifier the instrument measures the mean value, it is calibrated in the effective value at the 50 Hz frequency sinusoidal wave; upon an extra order voltmeters calibrated at the frequency range from 40 to 1000 Hz, ammeters up to 10A at the frequency range from 40 to 100 Hz can be delivered (other frequency should be settled with manufacturer)
- measurement of speed in connection with a tacho-generator

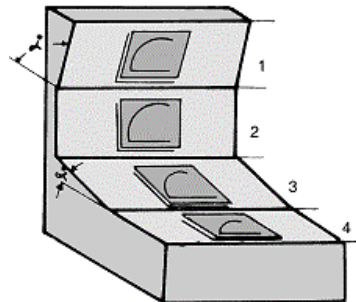
ASSEMBLY POSITION

Required assembly position is shown on the scale, whilst the admissible deviation from this position is $\pm 5^{\circ}$ and an error caused by it (together with the measurement error) must not exceed the error accordant with the instrument accuracy class.

SENSE OF POSITIONAL MARKS



Required position should be presented always, if different from vertical



1 : $\angle \infty > 90^{\circ}$ 3 : $\angle \infty < 90^{\circ}$
 2 : $\perp \infty = 90^{\circ}$ 4 : $\square \infty = 0^{\circ}$

Description

Instruments type MP 40, 80 have quadratic frontal shapes, instruments MP 210, 220, 230 have oblong shapes. Casings of panel instruments are made of self-extinguishing plastic material acc. to standard UL 94.

The magneto-electric measuring mechanism, fastened on the cylindrical tube, has got its magnetic circuit with inner permanent magnet. Lodgement of the magnetic circuit is of tip-type.

Instrument dial is white, print of scales and the pointer with blade are of black colour.

SYMBOLS OF THE INSTRUMENT SYSTEM

Applied measurement system is branded by following symbols

Symbol

	Magne toelektrický přístroj
	Magne toelektr. Přístroj s pol. usměrňovačem
	Elektromagnet. přístroj
	Uzemění
	Pozor! Viz návod k obsluze
	Střenosměrný proud
	Střídavý proud
	Střenosměrný a střídavý proud

(Magneto-electric instrument
 Magneto-electric instrument with semiconductor rectifier
 Electro-magnetic instrument
 Grounding
 Attention! See Instruction Manual
 DC current
 AC current
 DC and AC current)

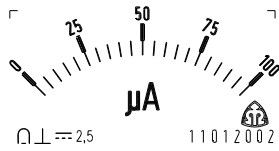
The zero position of the indicator is on the left, or in the middle, adjuster of the zero position is located on the instrument front face.

Inlets for electric connection of the instruments are available on the rear side of the casing. Instrument of series MP 40, 80 have got their inlet clamps with soldering eyes. Series MP 210, 220, 230 with a big tube has got its screw outlets, execution with a small tube is equipped with flat pins. The positive clamp is marked by +. The flat pins enable soldering of Cu conductors up to cross-section max. $0,75\text{ mm}^2$. (Soldering time max. 5 s), or connection by means of slip-on ferrules 2,8 type 7100-01.

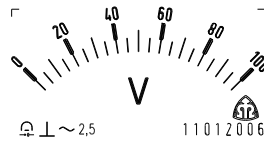
Instruments type MP 210, 220, 230 are sold in on-panel, or under-panel executions.

VARIANTS OF SCALES

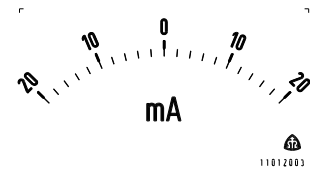
Following 9 scales can be used as examples of available variants:



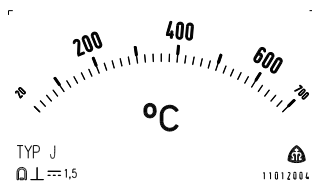
[1] Scale for magneto-electric ammeter DC



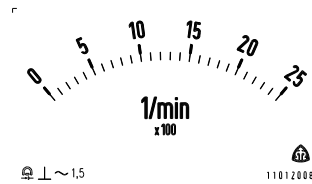
[2] Scale for magneto-electric voltmeter (measurement of AC voltage)



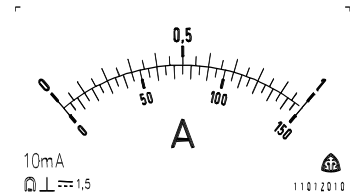
[3] Scale for magneto-electric ammeter with central zero point



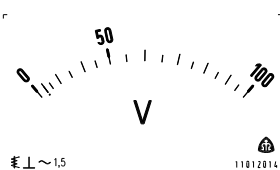
[4] Scale for thermometers



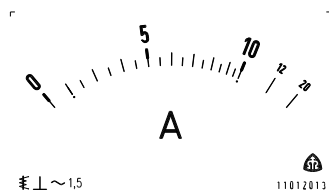
[5] Scale for speedometers



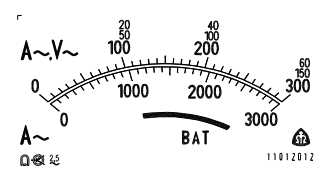
[6] Scale for ammeters with two ranges



[7] Scale for electro-magnetic voltmeter (for measurement of AC voltage)



[8] Scale for electro-magnetic ammeter



[9] Special scale for measuring instruments

Common technical parameters of series MP

Common technical data

Measuring mechanism	magneto-electric	
Thermal coefficient	10% accuracy class/K	
Safety requirements	as per ČSN EN 61010-1	
Class of instrument protection	II	
Degree of soiling	2	
Category of over-voltage in installation	MP 40, MP 210 CAT II	MP80, 220, 230 CAT III, or CAT II
Working voltage	300V	300V 600V
Testing voltage	2,3 kV _{ef} 50/60Hz	2,3kV _{ef} 3,7 kV _{ef} 50/60Hz
Overload rating	as per ČSN EN 60051-1	
Electro-magnetic compatibility	as per ČSN EN 61326 – 1 (1997) Testing requirements Table 1, criterion of operation A	
Coverage		
front face	IP 52	
inlet clamps	IP 00	
Mechanical immunity	as per ČSN EN 60068	
operational vibrations	10Hz – 55 Hz – 10Hz, oscillation amplitude 0,15 mm	
immunity against accidental impacts	18 impacts 150 m/s ²	
immunity against impacts at transport	3 x 1000 impacts 100 m/s ²	
Nominal range of application	as per ČSN EN 60051-1	
temperature	-40 to +60°C	
relative humidity	25 to 80% at 23°C	
pressure	70 to 106 kPa	
frequency of alternate variables	50Hz ± 10%~	
position	vertical ± 5%	
Climatic immunity	as per ČSN EN 60051-1	
immunity against low temperatures	-40°C	
immunity against higher temperature	+60°C	

By AC ammeters of their range 100A to 60 mA measurements in the guaranteed accuracy class can be performed, providing that the AC electric circuit has got its voltage minimally 24V. By application of these data the minimal impedance of the measuring circuit can be calculated.

For suppression of electro-magnetic interferences the inlet conductors to the instrument must be twisted with density from 8 to 10 twists/10 cm, made as Cu tinned wire of its min. cross-section 0,75 mm² for the conductor length 1m (ammeters with their shunts assembled on the instrument casing are not concerned there).

Special design of:

- range
- inner resistance
- print of dial
- middle position of pointer
- right-hand position of pointer
- blade-type pointer
- calibration at different frequency than 50Hz
- shock-proof execution
- special execution

Ammeters for DC current

	MP 40	MP 80
Class of accuracy	2,5	1,5
Pointer deviation	90°	80°
Scale length – mm	30	57,2
Front face size – mm	40x40	80x80
Weight – kg	0,035	0,2

Range	MP 40 Inner resistance Voltage drop	MP 80 Inner resistance Voltage drop
40 μ A		4600 Ω
60 μ A	4110 Ω	4700 Ω
100 μ A	3959 Ω	2200 Ω
150 μ A	1684 Ω	1490 Ω
250 μ A	1014 Ω	896 Ω
400 μ A	387 Ω	340 Ω
600 μ A	164 Ω	144 Ω
1 mA	64,5 Ω	55 Ω
1,5 mA	28,3 Ω	37 Ω
2,5 mA	14,7 Ω	14 Ω
4 mA	10,2 Ω	9.2 Ω
5 mA	7,3 Ω	3.8 Ω
6 mA	4,8 Ω	7.9 Ω
10 mA	3,3 Ω	5.6 Ω
15 mA	<3 Ω	<3 Ω
20 mA	<3 Ω	<3 Ω
25 mA	<3 Ω	<3 Ω
40 mA	<3 Ω	<3 Ω
60 mA	<3 Ω	60mv
100 mA	60mv	60mv
150 mA	60mv	60mv
250 mA	60mv	60mv
400 mA	60mv	60mv
600 mA	60mv	60mv
1 A	60mv	60mv
1,5 A	60mv	60mv
2,5 A	60mv	60mv
4 A	60mv	60mv
6 A	60mv	60mv
10 A	60mv	60mv
15 A	60mv	60mv
25 A	60mv	60mv
40 A	60mv	60mv
60 A	60mv	60mv
xA/60mV 6 Ω	60mv	60mv
xA/60mV 15 Ω	60mv	60mv
XA/150mV	150mv	150mV
4-20mA	<3 Ω	<3 Ω

Ammeters xA/60mV - 6 Ω , xA/60mV15 Ω , enable enlargement of their ranges by means of the outer exchangeable shunts from 4A to 10kA for all types. These ammeters are calibrated with connecting Cu lead 2 x 1 m, 0,75 mm² (2 x 50m). Also calibration of a different inlet resistances is possible, but up to max.1. The exchangeable shunts must be ordered extra.

Ammeters for DC current

	MP 210	MP 220	MP 230	MP 220T	MP 230T
Class of accuracy	2,5	1,5	1,5	1,5	1,5
Pointer deviation	95°	100°	100°	100°	100°
Scale length – mm	34	55	78	55	78
Front face size – mm	49,3 x 24,0	73,5x36,6	96,5 x 48,1	73,5 x 36,6	96,5 x 48,1
Weight – kg	0,05	0,08	0,11	0,11	0,14

Weight of instruments with the range 10A to 60A with a shunt on a tube > MP 220T- 0.14 kg, MP 230T- 0.18 kg

Range	MP 210 Inner resistance Voltage drop	MP 220 Inner resistance Voltage drop	MP 230 Inner resistance Voltage drop	MP 220-T Inner resistance Voltage drop	MP 230-T Inner resistance Voltage drop
40 μ A		5756 Ω	5756 Ω	5756 Ω	5756 Ω
60 μ A	4338 Ω	5995 Ω	5995 Ω	5995 Ω	5995 Ω
100 μ A	4179 Ω	3608 Ω	3608 Ω	3608 Ω	3608 Ω
150 μ A	1778 Ω	2397 Ω	2397 Ω	2397 Ω	2397 Ω
250 μ A	1069 Ω	922 Ω	922 Ω	922 Ω	922 Ω
400 μ A	408 Ω	349 Ω	349 Ω	349 Ω	349 Ω
600 μ A	173 Ω	147 Ω	147 Ω	147 Ω	147 Ω
1 mA	68 Ω	59 Ω	59 Ω	59 Ω	59 Ω
1,5 mA	29,9 Ω	40 Ω	40 Ω	40 Ω	40 Ω
2,5 mA	15,5 Ω	16 Ω	16 Ω	16 Ω	16 Ω
4 mA	10,6 Ω	12 Ω	12 Ω	12 Ω	12 Ω
5 mA	7,4 Ω	10 Ω	10 Ω	10 Ω	10 Ω
6 mA	4,9 Ω	6 Ω	6 Ω	6 Ω	6 Ω
10 mA	3,3 Ω	4 Ω	4 Ω	4 Ω	4 Ω
15 mA	<3 Ω	3 Ω	3 Ω	3 Ω	3 Ω
20 mA	<3 Ω	3 Ω	3 Ω	3 Ω	3 Ω
25 mA	<3 Ω	2 Ω	2 Ω	2 Ω	2 Ω
40 mA	<3 Ω	2 Ω	2 Ω	2 Ω	2 Ω
60 mA	<3 Ω	60mV	60mV	60mV	60mV
100 mA	60mv	60mV	60mV	60mV	60mV
150 mA	60mv	60mV	60mV	60mV	60mV
250 mA	60mv	60mV	60mV	60mV	60mV
400 mA	60mv	60mV	60mV	60mV	60mV
600 mA	60mv	60mV	60mV	60mV	60mV
1 A	60mv	60mV	60mV	60mV	60mV
1,5 A	60mv	60mV	60mV	60mV	60mV
2,5 A	60mv	60mV	60mV	60mV	60mV
4 A	60mv	60mV	60mV	60mV	60mV
6 A	60mv	60mV	60mV	60mV	60mV
10 A	60mv	60mV	60mV	60mV	60mV
15 A	60mv	60mV	60mV	60mV	60mV
25 A	60mv	60mV	60mV	60mV	60mV
40 A	60mv	60mV	60mV	60mV	60mV
60 A	60mv	60mV	60mV	60mV	60mV
XA/60mV 6 Ω	60mv	60mV	60mV	60mV	60mV
4-20mA	<3 Ω	3 Ω	3 Ω	3 Ω	3 Ω

Ammeters xA/60mV enable enlargement of their ranges by means of the outer exchangeable shunts from 4A to 10kA for all types. These ammeters are calibrated with connecting Cu lead 2 x 1 m, 0,75 mm² (2 x 50m).

Ammeters for DC current with central zero point

	MP 40	MP80	MP 210	MP 220	MP 230	MP 220T	MP 230T
Accuracy class	2,5	1,5	2,5	1,5	1,5	1,5	1,5
Pointer deviation	90°	80°	95°	100°	100°	100°	100°
Scale length – mm	30	57,2	34	55	78	55	78
Front face size – mm	40x40	80x80	49,3 x 24,0	73,5x36,6	96,5 x 48,1	73,5 x 36,6	96,5 x 48,1
Weight – kg	0,035	0,2	0,05	0,08	0,11	0,11	0,14

Range	MP 40 inner R drop U	MP 80 inner R drop U	MP 210 inner R drop U	MP 220 inner R drop U	MP 230 inner R drop U	MP 220-T inner R drop U	MP 230-T inner R drop U
±25 µA		5872Ω		5680Ω	5680Ω	5680Ω	5680Ω
±40 µA		4415Ω		5516Ω	5516Ω	5516Ω	5516Ω
±60 µA	3292Ω	3824Ω	3475Ω	3015Ω	3015Ω	3015Ω	3015Ω
±100 µA	2562Ω	1473Ω	2703Ω	1815Ω	1815Ω	1815Ω	1815Ω
±150 µA	1091Ω	746Ω	1151Ω	773Ω	773Ω	773Ω	773Ω
±250 µA	656Ω	447Ω	693Ω	463Ω	463Ω	463Ω	463Ω
±400 µA	303Ω	141Ω	320Ω	175Ω	175Ω	175Ω	175Ω
±600 µA	168Ω	74Ω	177Ω	76Ω	76Ω	76Ω	76Ω
±1 mA	33,3Ω	25Ω	35,3Ω	20Ω	20Ω	20Ω	20Ω
±1,5 mA	28,5Ω	20Ω	29,8Ω	21Ω	21Ω	21Ω	21Ω
±2,5 mA	14,5Ω	9Ω	15,1Ω	10Ω	10Ω	10Ω	10Ω
±4 mA	13,9Ω	7Ω	14,7Ω	7Ω	7Ω	7Ω	7Ω
±5 mA	9,5Ω	3Ω	9,9Ω	5Ω	5Ω	5Ω	5Ω
±6 mA	4,7Ω	3Ω	4,8Ω	5Ω	5Ω	5Ω	5Ω
±10 mA	<3Ω	3Ω	<3Ω	3Ω	3Ω	3Ω	3Ω
±15 mA	<3Ω	2Ω	<3Ω	3Ω	3Ω	3Ω	3Ω
±20 mA	<3Ω	2Ω	<3Ω	2Ω	2Ω	2Ω	2Ω
±25 mA	<3Ω	60mV	<3Ω	2Ω	2Ω	2Ω	2Ω
±40 mA	<3Ω	60mV	<3Ω	60mV	60mV	60mV	60mV
±60 mA	<3Ω	60mV	<3Ω	60mV	60mV	60mV	60mV
±100 mA	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±150 mA	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±250 mA	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±400 mA	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±600 mA	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±1 A	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±1,5 A	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±2,5 A	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±4 A	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±6 A	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±10 A	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±15 A	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±25 A	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±40 A	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±60 A	60mV	60mV	60mV	60mV	60mV	60mV	60mV
±xA/60mV 6Ω	<3Ω	60mV	<3Ω	60mV	60mV	60mV	60mV
±4-20mA	<3Ω	2Ω	<3Ω	3Ω	3Ω	3Ω	3Ω

Instruments with their small tubes Ø26 mm (MP210, MP220, MP230) are, at the ranges 1A to 6A, or (±1A to ±6A) with separated non-covered plate of accessories. The range xA/60mV, or (±xA/60mV) enable enlargement of ranges by means of exchangeable shunt restricted to 10,15,25A, or ±10, ±15, ±25A only.

Instruments with their big tubes Ø55mm (MP 220-T, MP 230-T) are, at their ranges 10A to 60A, or (±10A to ±60A) designed with the shunt on the instrument tube outer surface. The range xA/60 mV, or ±xA/60mV enable range enlargement by means of a separated exchangeable shunt (4A to 10kA)

Ammeters xA/60mV, or ±xA/60mV are calibrated with their connecting Cu line 2 x 0,2 m, cross-section 0,75mm² · i.e. max. 0,01Ω. Also a different resistance can be calibrated, but max. 1Ω. Exchangeable and restricted exchangeable shunts are not comprised into the delivery, they must be ordered extra.

Ammeters for AC current with rectifiers

	MuP40	MuP80	MuP210	MuP220	MuP230	MuP220T	MuP230T
Accuracy class	2,5	1,5	2,5	1,5	1,5	1,5	1,5
Pointer deviation	90°	80°	95°	100°	100°	100°	100°
Scale length – mm	30	57,2	34	55	78	55	78
Front face size – mm	40x40	80x80	49,3 x 24,0	73,5x36,6	96,5 x 48,1	73,5 x 36,6	96,5 x 48,1
Weight – kg	0,035	0,2	0,05	0,08	0,11	0,11	0,14

Range	MuP 40 drop U	MuP 80 drop U	MuP 210 drop U	MuP 220 drop U	MuP 230 drop U	MuP 220-T drop U	MuP 230-T drop U
100μA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
150μA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
250μA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
400μA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
600μA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
1mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
1,5 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
2,5 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
4 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
6 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
10 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
15 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
25 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
40 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
60 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
100 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
150 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
250 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
400 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
600 mA	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
1 A	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
1,5 A	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
2,5 A	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
6 A	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
10 A	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
15 A	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
25 A	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
40 A	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V
60 A	≤ 1V	≤ 0,9V	≤ 1V	≤ 1V	≤ 1V	≤ 1V	≤ 1V

Voltmeters for DC voltage

	MP 40	MP80	MP 210	MP 220	MP 230	MP 220T	MP 230T
Accuracy class	2,5	1,5	2,5	1,5	1,5	1,5	1,5
Pointer deviation	90°	80°	95°	100°	100°	100°	100°
Scale length – mm	30	57,2	34	55	78	55	78
Front face size – mm	40x40	80x80	49,3 x 24,0	73,5x36,6	96,5 x 48,1	73,5 x 36,6	96,5 x 48,1
Weight – kg	0,035	0,2	0,05	0,08	0,11	0,11	0,14

Range	MP 40 inner R	MP 80 inner R	MP 210 inner R	MP 220 inner R	MP 230 inner R	MP 220-T inner R	MP 230-T inner R
15mV		1000Ω/V		1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
25mV		1000Ω/V		1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
40mV	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
60mV	1000Ω/V	4000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
100mV	1000Ω/V	4000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
150mV	1000Ω/V	4000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
250mV	1000Ω/V	4000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
400mV	c. 1000Ω/V	4000Ω/V	c. 1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
600mV	c. 1000Ω/V	4000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
1V	c. 1000Ω/V	1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
1,5V	c. 1000Ω/V	1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
2,5V	c. 1000Ω/V	1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
4V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
6V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
10V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
15V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
25V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
40V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
60V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
100V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
150V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
250V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
400V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
600V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
xkV/10V	2000Ω/V	2000Ω/V	2000Ω/V	2000Ω/V	2000Ω/V	2000Ω/V	2000Ω/V

Voltmeters for DC voltage with central zero point

	MP 40	MP80	MP 210	MP 220	MP 230	MP 220T	MP 230T
Accuracy class	2,5	1,5	2,5	1,5	1,5	1,5	1,5
Pointer deviation	90°	80°	95°	100°	100°	100°	100°
Scale length – mm	30	57,2	34	55	78	55	78
Front face size – mm	40x40	80x80	49,3 x 24,0	73,5x36,6	96,5 x 48,1	73,5 x 36,6	96,5 x 48,1
Weight – kg	0,035	0,2	0,05	0,08	0,11	0,11	0,14

Range	MP 40 inner R	MP 80 inner R	MP 210 inner R	MP 220 inner R	MP 230 inner R	MP 220-T inner R	MP 230-T inner R
±15mV		1000Ω/V		1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
±25mV		1000Ω/V		1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
±40mV	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
±60mV	1000Ω/V	4000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
±100mV	1000Ω/V	4000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
±150mV	1000Ω/V	4000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
±250mV	1000Ω/V	4000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
±400mV	c. 1000Ω/V	4000Ω/V	c. 1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
±600mV	c. 1000Ω/V	4000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±1V	c. 1000Ω/V	1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±1,5V	c. 1000Ω/V	1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±2,5V	c. 1000Ω/V	1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±4V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±6V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±10V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±15V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±25V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±40V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±60V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±100V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±150V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±250V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±400V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±600V	c. 1000Ω/V	2000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V	c. 1000Ω/V
±xkV/10V	2000Ω/V	2000Ω/V	2000Ω/V	2000Ω/V	2000Ω/V	2000Ω/V	2000Ω/V

Voltmeters for AC voltage with semi-conductor rectifier

	MuP 40	MuP80	MuP 210	MuP 220	MuP 230	MuP 220T	MuP 230T
Accuracy class	2,5	1,5	2,5	1,5	1,5	1,5	1,5
Pointer deviation	90°	80°	95°	100°	100°	100°	100°
Scale length – mm	30	57,2	34	55	78	55	78
Front face size – mm	40x40	80x80	49,3 x 24,0	73,5x36,6	96,5 x 48,1	73,5 x 36,6	96,5 x 48,1
Weight – kg	0,035	0,2	0,05	0,08	0,11	0,11	0,14

Range	MuP 40 inner R approx.	MuP 80 inner R approx.	MuP 210 inner R approx.	MuP 220 inner R approx.	MuP 230 inner R approx.	MuP 220-T inner R approx.	MuP 230-T inner R approx.
2,5V		1000Ω/V					
4V		1000Ω/V					
6V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
10V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
15V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
25V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
40V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
60V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
100V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
150V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
250V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
400V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
600V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V
xkV/100V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V	1000Ω/V

The range xkV/100V enables enlargement of voltage ranges by means of the external measuring voltage transformer, which is not comprised into the delivery. Instruments with their tubes \varnothing 26 mm (MuP210, MuP220, MuP230) are, at all ranges, equipped with separated non-covered plate of accessories.

Speedometers

APPLICATION

These instruments are designed for remote permanent speed measurements of machines, used in industrial plants. The speedometers are usually calibrated in shaft revolutions of the measured machine. However, the scale can be calibrated even in different variables, depending on the speed, e.g. travel speed, feed speed, output, quantity etc. Therefore, the speedometers have their multilateral use.

The electric remote speedometers have got two main parts:

1. transmitter (small generator)
2. measuring instrument – speedometer

DESCRIPTION

The transmitter – small tacho-generator has got its firm winding in the circular stator and 6-pole rotor, created by the permanent magnet. Speed of the measured machine shaft are transferred mechanically on the small generator, producing AC current, whose voltage and frequency are directly proportional to the speed of the shaft, which can be then measured by voltmeters, whose scales are calibrated directly in rpm, or in meters/sec. At 1000 rpm the generator voltage is about 30V with frequency approx. 50Hz. At a higher speed, the voltage and even frequency are proportionally higher. Maximal permanent current load is 20mA, so that up to 4 instruments can be connected in parallel to one small generator. The instruments with their range 400 rpm and 600 rpm are equipped with an additional condenser for damping of the indicator vibration.

The small tacho-generators are reliable and safe in operation, because they have no commutator brushes. The are not exchangeable, therefore they must be individually calibrated with the instrument. Sense of rotation has no influence on the measurement. Resistance of the connecting line up to the value 50Ω has no influence on the measurement accuracy.

	MuP80	MuP 220	MuP 230	MuP 220T	MuP 230T
Accuracy class	1,5	1,5	1,5	1,5	1,5
Poiter deviation	80°	100°	100°	100°	100°
Scale length – mm	57,2	55	78	55	78
Front face size – mm	80x80	73,5x36,6	96,5 x 48,1	73,5 x 36,6	96,5 x 48,1
Weight – kg	0,2	0,08	0,11	0,11	0,14

Range 1/min	MuP 80	MuP 220	MuP 230	MuP 220-T	MuP 230-T
	Instr. consumption c.				
0 - 400	2,5mA	1,5mA			
0 - 600					
0 - 1000					
0 - 1500					
0 - 2000					
0 - 2500					
0 - 4000					
0 - 6000					
0 - 10000					

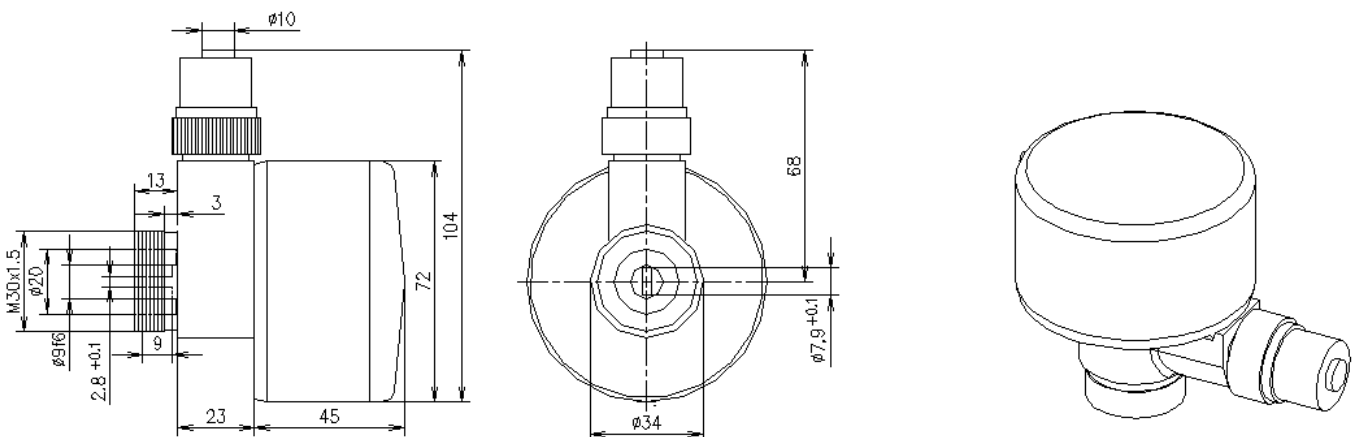
Instruments with their tube $\varnothing 26$ mm have got all their ranges with separated non-covered plate of accessories. The small tachogenerators are not comprised into the delivery.

Kinds of tachogenerators

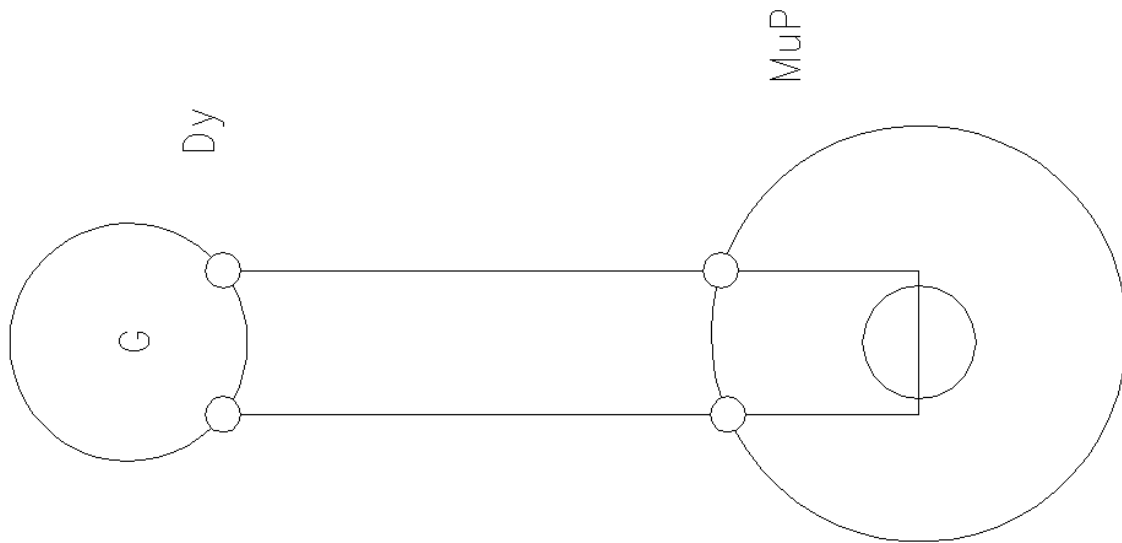
Type	Execution	Voltage at	Weight c. kg
J 13A1	With sprung coupling	50V \pm 4V	0,9

Shaft of the measured machine is connected mechanically with the tachogenerator rotor. On its output clamps the AC voltage proportional to speed will be measured. The scale of the indication instrument is calibrated directly in rpm. Tachogenerators are not exchangeable, they must be calibrated together with the indication instrument. Sense of rotation has no influence on the measurement. Resistance of the connecting line up to the value 50 Ω has no influence on the measurement accuracy.

TYP J13 A1



Interconnection scheme between the indicator and the tachogenerator



Accessories for instrument assembly

Assembly on panel

for types MP210, MP220, MP230

ORDERING OF PANEL INSTRUMENTS

FOLLOWING DATA MUST BE SPECIFIED IN AN ORDER:

- name and type of the instrument
- number of pieces
- measuring range, contingently also ratio of transformer
- shock-proof execution
- number of replaceable accessories, if required
- (replaceable, or restricted replaceable shunts, voltage dividers)
- number of accessories for assembly behind panel, or above panel
- term of delivery
- delivery destination

SPECIAL REQUIREMENTS:

- accuracy class 1,5 at instruments MP40, MP210
- working position different from vertical
- calibration at frequency different from 50Hz
- furthers symbols, or other marking of the dial
- package different from standard one
- resistance of inlets for the ammeter connection to the shunt, if different from 0,01 Ω
- Calibration record, if required

RANGE OF DELIVERY:

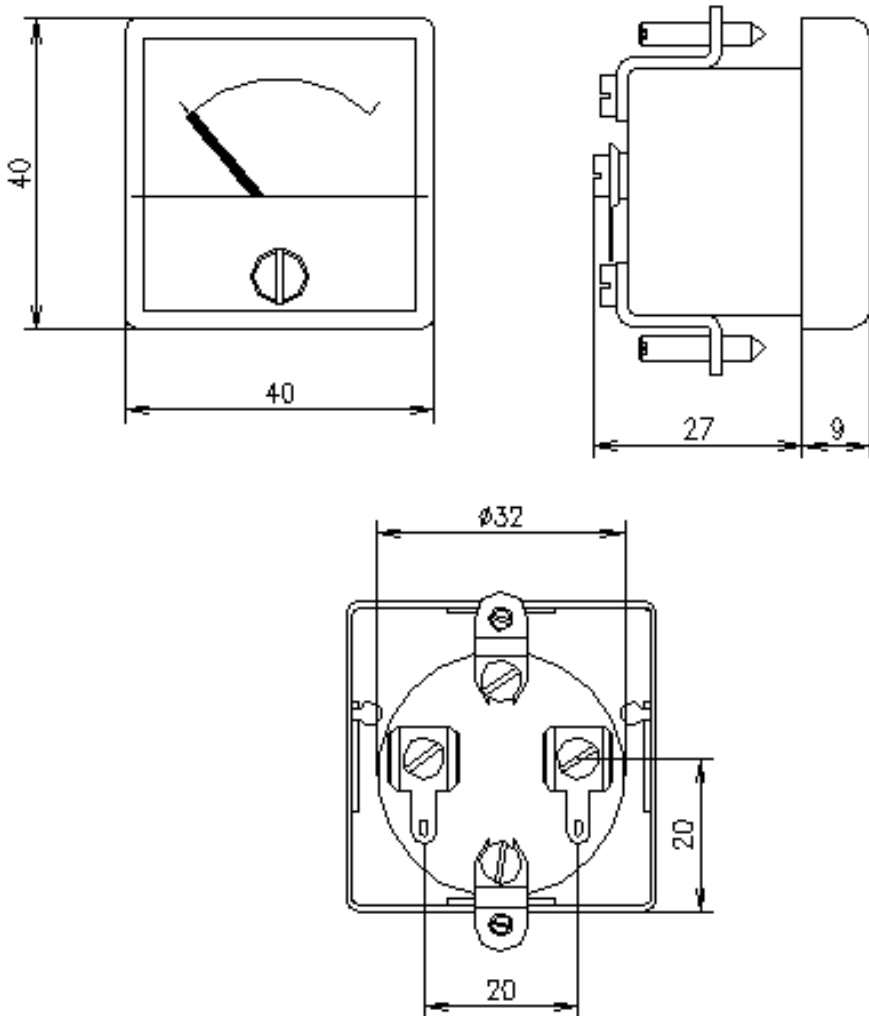
- panel instrument
- Guarantee certificate
- transporting packing
- required accessories

Contact:

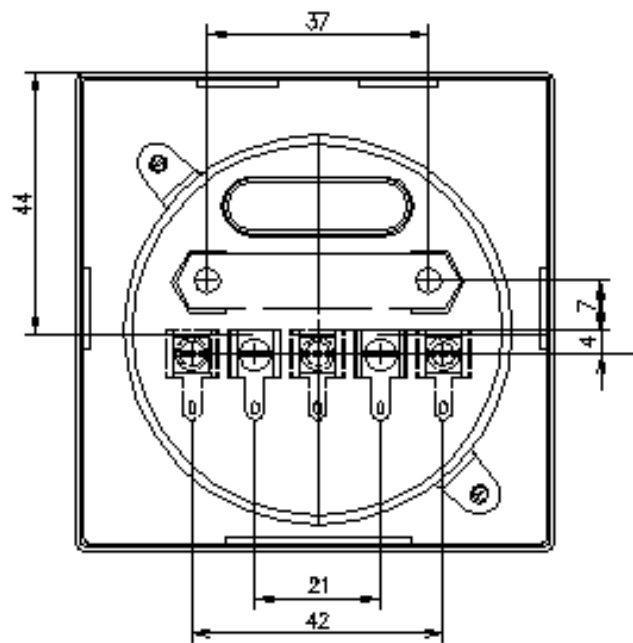
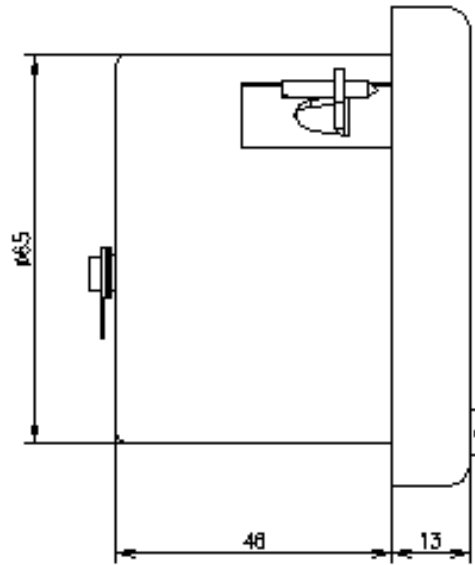
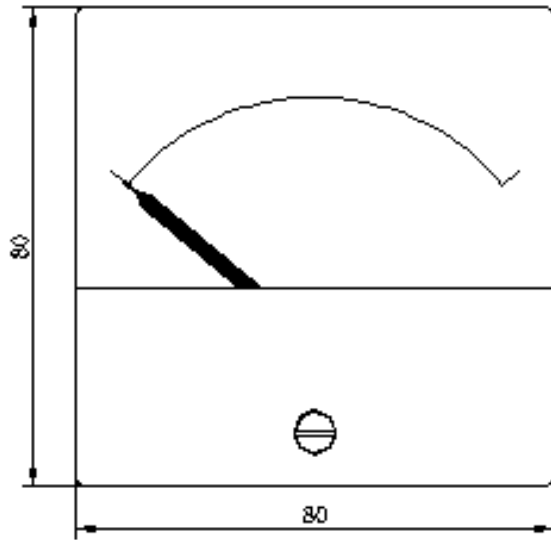
Metra Blansko
Pražská 2536/7
678 01 Blansko
e-mail: mcu@metra.cz
tel.: +420 602 410 258

DIMENSIONAL SKETCHES

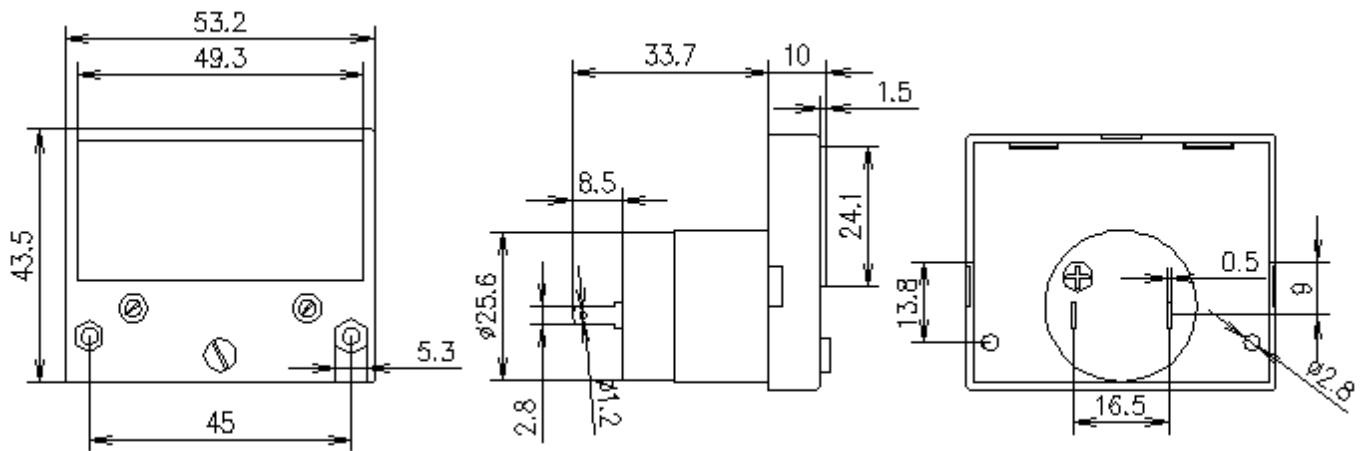
Instrument MP 40



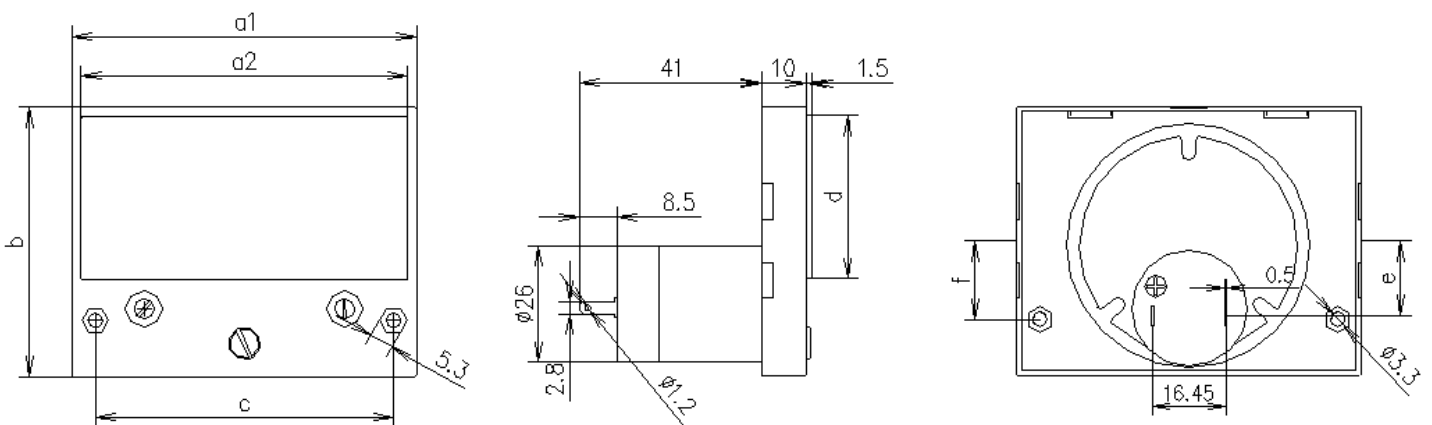
Instrument MP 80



Instrument MP 210



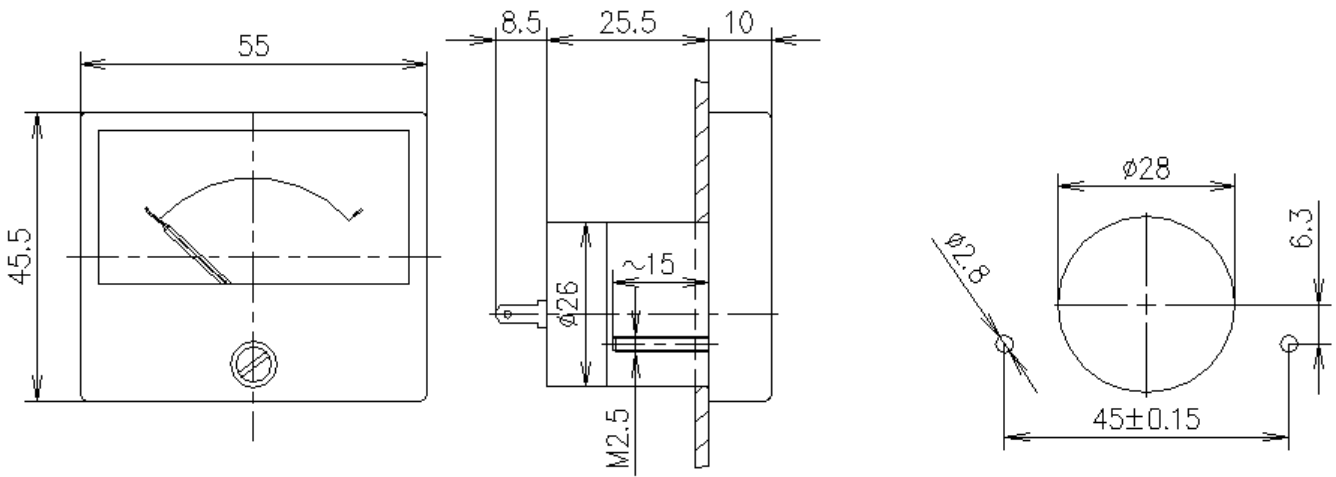
Instruments MP 220, MP 230 – tube diameter 26mm



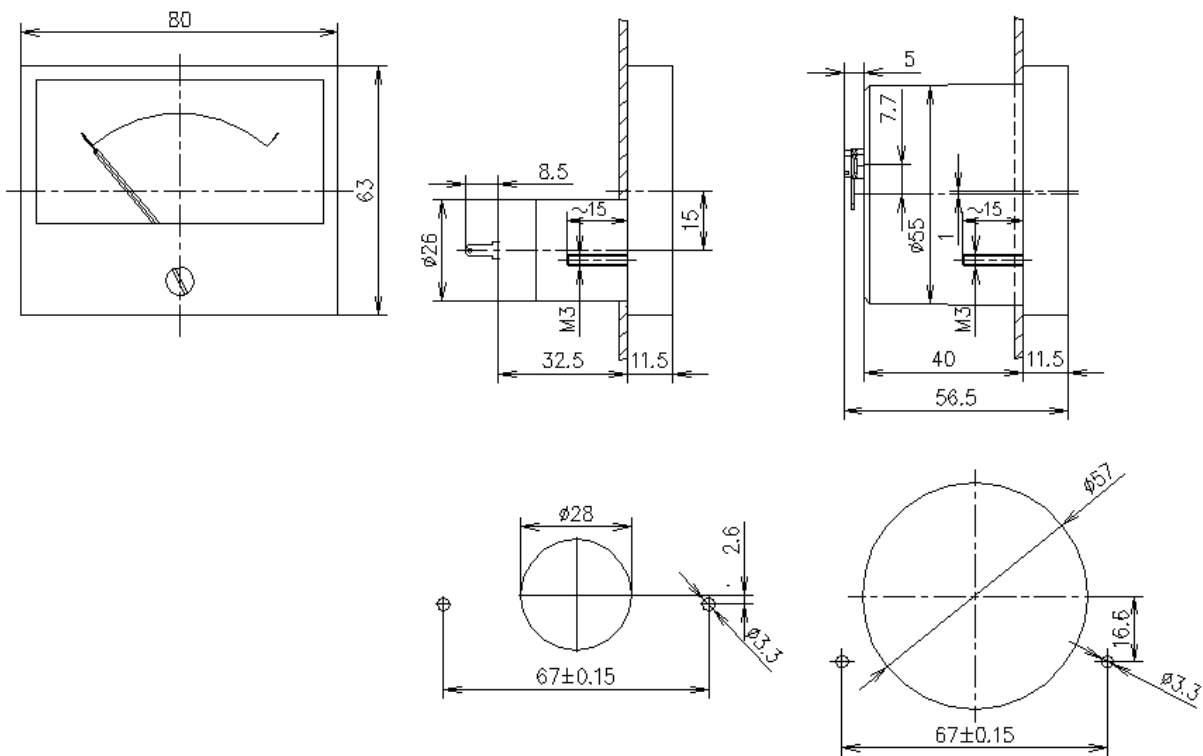
TYPE	a1	a2	b	C	d	e	f
MP 220	77,5	73,5	60,5	67	36,6	15	17,6
MP230	102,5	96,5	76,5	92	48,1	23	20,6

Execution on panel

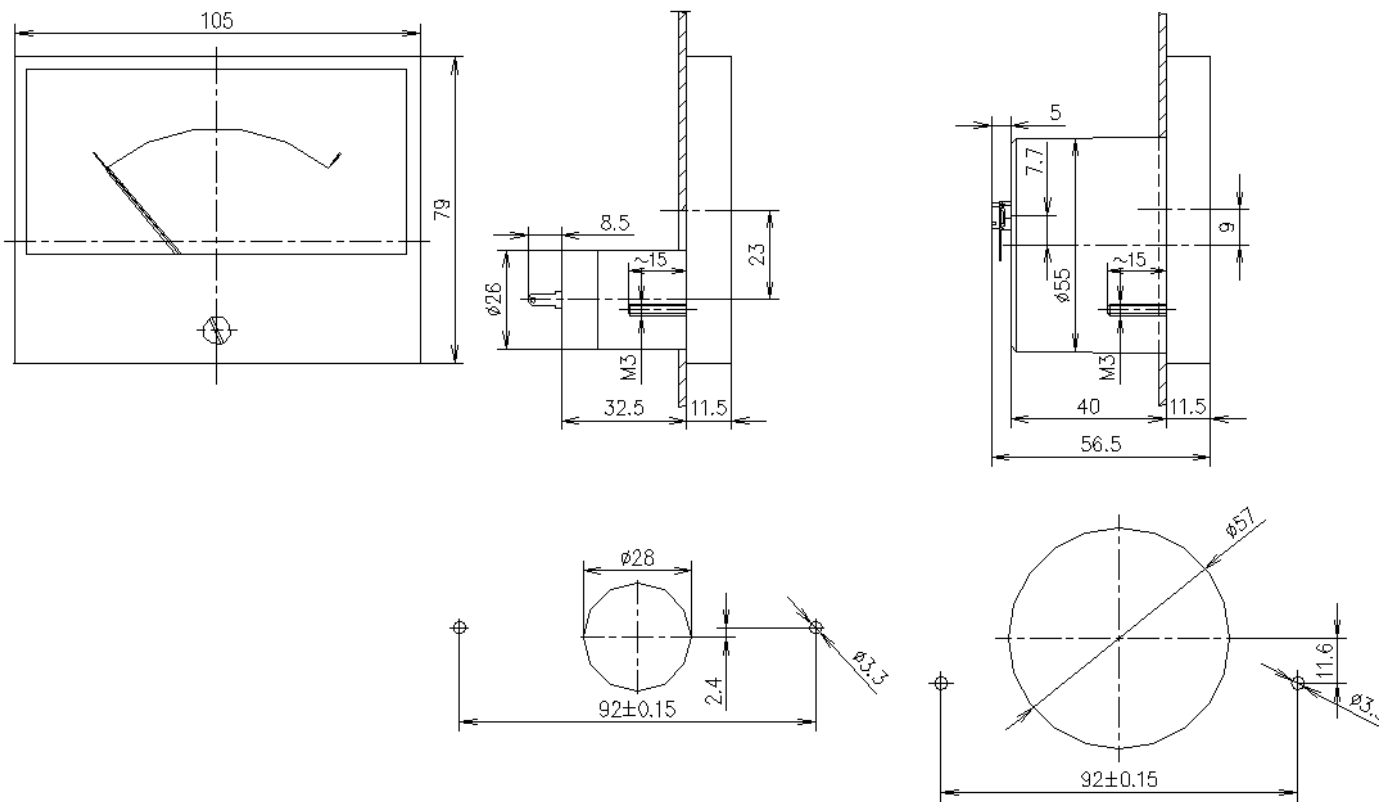
MP 210



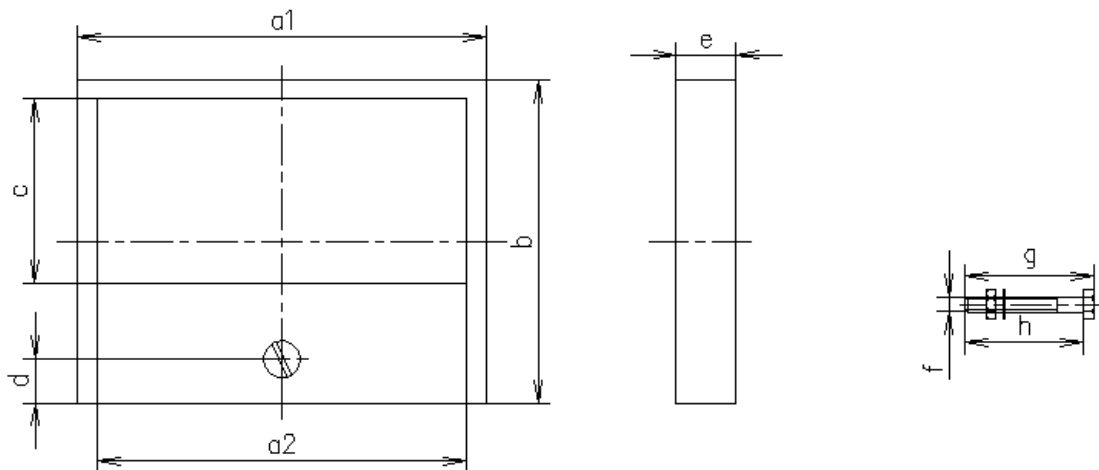
MP220



MP230



Accessories for on-panel executions



Typ	a1	a2	b	c	d	e	f	g	h
MP210	55	49,3	45,5	24,2	5,7	10	M2,5	23,5	21,5
MP220	80	73,4	63	26,8	8,5	11,2	M3	25	23
MP230	100	98,4	79	48,3	8,5	11,2	M3	25	23

HIGH-VOLTAGE DIVIDERS – with guard

– for one instrument accessories of magneto-electric voltmeters for voltage measurements up to 6kV is concerned. The voltmeter itself has got its range 10V with consumption 0,4mA, or 0,5mA (types Ma..., Mb..., MP...

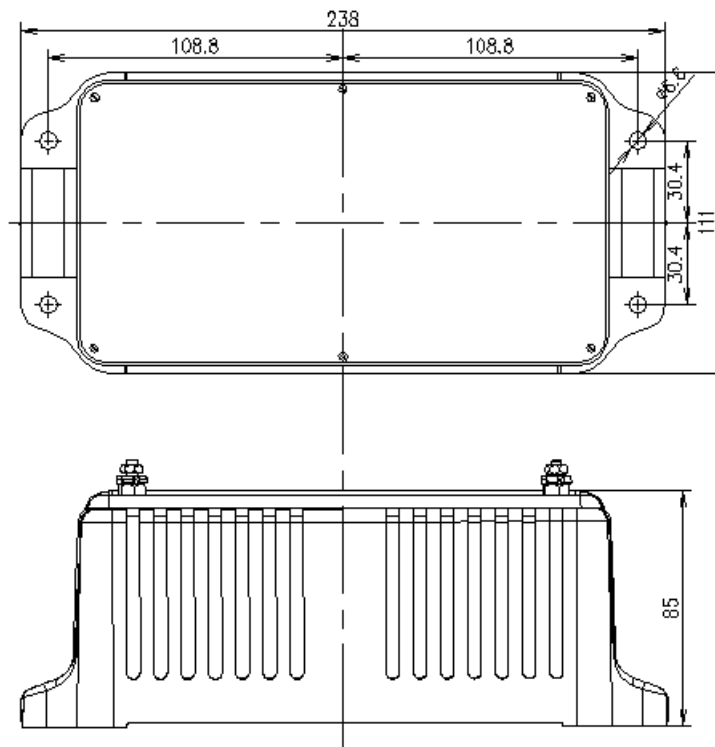


Range: 6kV
4kV
3kV
2,5kV

– for one, or two instruments for connection to the magneto-electric voltmeter with its range 10V and consumption 0,4mA

Range: 4kV

DIMENSIONAL SKETCH

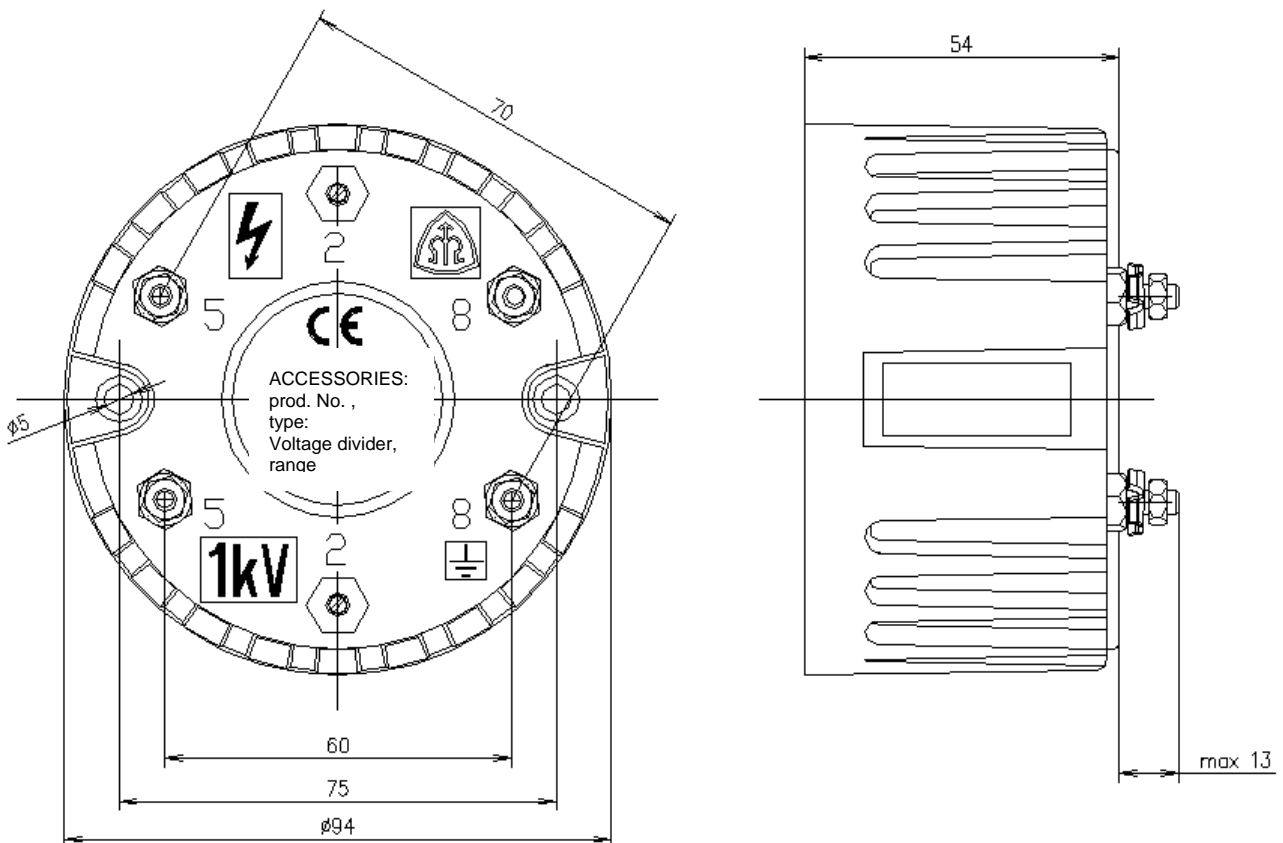


- for one instrument accessories of the magneto-electric voltmeters for measurement of voltages up to 2kV are concerned. The voltmeter itself has got its range 10V with consumption 0,4mA, or 0,5mA



Range: 2kV
 1,5kV
 1kV

DIMENSIONAL SKETCH



PRODUCTS OF METRA BLANSKO

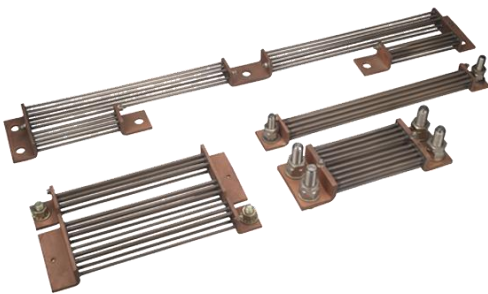
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