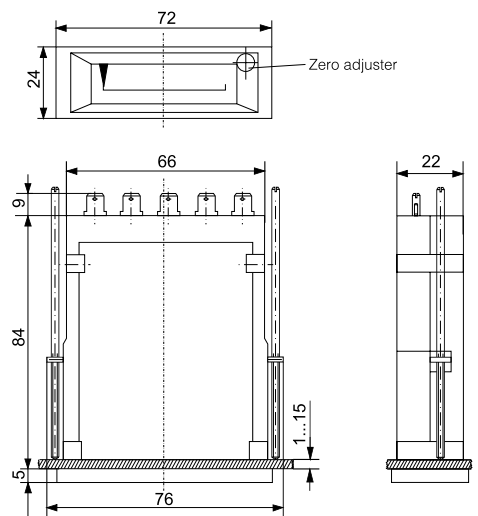


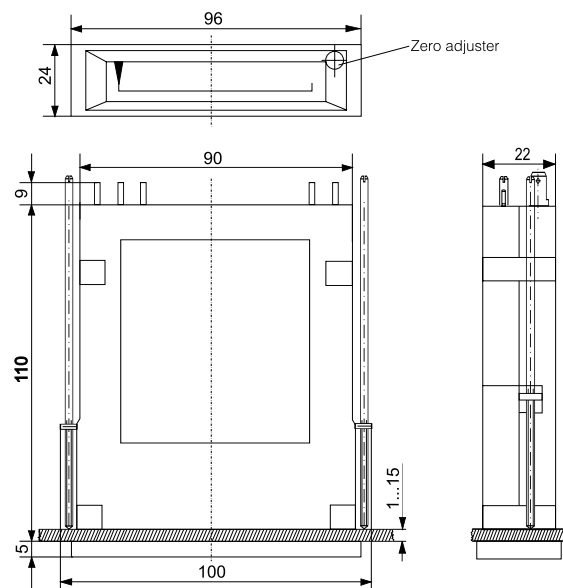
# SLIM EDGEWISE MOVING-COIL METERS MA1, MA2 TYPES (AMMETERS AND VOLTMETERS)



## METER EXTERNAL DIMENSIONS



MA1 meter



MA2 meter

## APPLICATION

MA1, MA2 meters are intended for measuring DC currents and DC voltages or other physical magnitudes converted into direct current signals. Meters with built-in rectifier can be used for measuring AC currents and AC voltages.

Rectifier meters measure arithmetical mean value and they are such calibrated that they indicate the RMS value at sinusoidal curve shape. The measurement of non-sinusoidal AC quantities results in additional errors. They are designed to minimize panel space requirements. Flat cases permit the stacking of meters for a wide range of applications.

## TECHNICAL DATA

<b>Accuracy class</b>	1,5
<b>Frequency of the measured quantity for rectifier meters</b>	30...1000...10 000 Hz
<b>Measuring ranges</b>	see tables 1 and 2
<b>Drop voltages on meter terminals or internal resistance</b>	see tables 1 and 2
<b>Supplying voltage influence</b>	0.5%
<b>Insulation proof voltage</b>	2 kV
<b>Protection degree:</b>	
- case	IP 40
- terminals	IP 00
<b>Case material</b>	thermoplastic
<b>Meter glass material</b>	thermoplastic (polymethacrylate)

**DC current and DC voltage**
**Table 1**

Frontal frame dimensions [mm]				72 × 24				96 × 24			
Scale length [mm]				42				60			
Weight [kg]				0,1				0,15			
Types				MA1				MA2			
d.c. current				d.c. voltage							
Meter Type	Measuring range	Zero on the side of the scale	Zero in the middle of the scale	Meter Type	Measuring range	Zero on the side of the scale	Zero in the middle of the scale				
		Internal resistance or voltage drop				Internal resistance					
MA1, MA2	60 μA	6600 Ω	2570 Ω	MA1, MA2	60 mV	1 000 Ω/V					
	100 μA	2570 Ω	940 Ω		100 mV	1 000 Ω/V					
	150 μA	940 Ω	340 Ω		150 mV	1 000 Ω/V					
	250 μA	340 Ω	99 Ω		250 mV	1 000 Ω/V					
	400 μA	280 Ω	46 Ω		400 mV	1 000 Ω/V					
	600 μA	96 Ω	20,2 Ω		600 mV	1 000 Ω/V					
	1 mA	45 Ω	16,0 Ω		1 V	1 000 Ω/V					
	1,5 mA	20,2 Ω	3,6 Ω		1,5 V	1 000 Ω/V					
	2,5 mA	10,3 Ω	2,9 Ω		2,5 V	1 000 Ω/V					
	4 mA	3,5 Ω	1,9 Ω		4 V	1 000 Ω/V					
	4...20 mA	1,2 Ω	–		6 V	1 000 Ω/V					
	5 mA	2,1 Ω	1,5 Ω		10 V	1 000 Ω/V					
	6 mA	2,1 Ω	1,5 Ω		15 V	1 000 Ω/V					
	10 mA	1,5 Ω	1,2 Ω		25 V	1 000 Ω/V					
	15 mA	1,2 Ω	1,2 Ω		40 V	1 000 Ω/V					
	20 mA	1,2 Ω	1,2 Ω		60 V	1 000 Ω/V					
	25 mA	1,2 Ω	1,2 Ω		100 V	1 000 Ω/V					
	40 mA	40 mV			150 V	1 000 Ω/V					
	60 mA	40 mV			250 V	1 000 Ω/V					
	100 mA	40 mV			400 V	1 000 Ω/V					
150 mA	40 mV		600 V	1 000 Ω/V							
250 mA	40 mV										
400 mA	40 mV										
600 mA	40 mV										
1 A	40 mV										
1,5 A	40 mV										
2,5 A	40 mV										
4 A	40 mV										
1 A to 15 kA, with external shunt B2 60 mV <sup>1)</sup>											

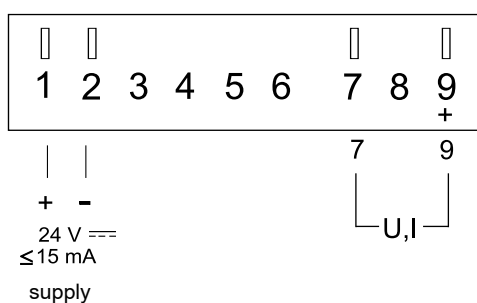
1) After agreeing with the manufacturer, shunts can be execute with following rated drop voltage: 50, 75, 100, or 150 mV. The resistance of conductors linking the meter with a shunt: 0.035 Ω. Further particulars on shunts are contained in the ANALOG PANEL METERS catalogue.

## AC current and AC voltage

Table 2

Frontal frame dimensions [mm]			72 × 24			96 × 24		
Scale length [mm]			42			60		
Weight [kg]			0,1			0,15		
Types			MA1			MA2		
a.c. current						a.c. voltage		
Meter Type	Measuring range	Voltage drop	Meter Type	Measuring range	Internal resistance			
MA1, MA2	250 $\mu$ A	0,55 V	MA1, MA2	2,5 V	1 000 $\Omega/V$			
	400 $\mu$ A	0,6 V		4 V	1 000 $\Omega/V$			
	600 $\mu$ A	1,5 V		6 V	1 000 $\Omega/V$			
	1 mA	1,5 V		10 V	1 000 $\Omega/V$			
	1,5 mA	1,5 V		15 V	1 000 $\Omega/V$			
	2,5 mA	1,5 V		25 V	1 000 $\Omega/V$			
	4 mA	1,5 V		40 V	1 000 $\Omega/V$			
	6 mA	1,5 V		60 V	1 000 $\Omega/V$			
	10 mA	1,5 V		100 V	1 000 $\Omega/V$			
	15 mA	1,5 V		150 V	1 000 $\Omega/V$			
	25 mA	1,5 V		250 V	1 000 $\Omega/V$			
	40 mA	1,5 V		400 V	1 000 $\Omega/V$			
	60 mA	1,5 V		600 V	1 000 $\Omega/V$			
	100 mA	1,5 V						
	150 mA	1,5 V						
	250 mA	1,5 V						
400 mA	1,5 V							
600 mA	1,5 V							

## CONNECTION DIAGRAM



## ACCESSORIES

- Holders fastening the meter to the panel 2 pcs
- Zero adjuster 1 pc
- Connection plug top piece 2... 4 pcs
- Service manual 1 pc
- On request: interchangeable shunts B2...B7

## ORDERING PROCEDURE:

In the order, one must specify: name and type of meter, measuring range, shunt data if the meter is foreseen to co-operate with an interchangeable shunt, working position and eventual additional requirements. One must order interchangeable shunts separately. When ordering meters for measuring AC current or AC voltage one must add to the meter name: „rectifier” (rectifier meter).

**Example of order:** MA1 ammeter, 40 A, to 60 mV shunt, c2 30°, scale 0... 100%. If the shunt is to be delivered with the meter one must specify it separately in the order. e.g. B2/60 mV - 40 A (ordering procedure for shunts - see catalogue of interchangeable shunts - page 87).