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Portable Type instruments are Electro-dynamometer type instruments. They can be used in Single Phase, Three Phase Three wire and Three Phase Four wire systems, and are designed to be used in horizontal positions.

### Electro-dynamometer Type Meters

<b>Rated Accuracy</b>	:	$\pm 1.0\%$ of full scale value as per ISS 1248/84 between 10% to 100% of the scale for Single phase UPF Wattmeters
	:	$\pm 1.5\%$ of full scale value as per ISS 1248/84 for Three Phase Wattmeters
	:	$\pm 1.5\%$ of full scale value as per ISS 1248/84 for 0.2 P.F. (LPF) Single Phase Wattmeter
	:	$\pm 3^\circ$ (Electrical) as per ISS 1248 for Power Factor Meters
<b>Note</b>	:	All Wattmeters are calibrated at $\cos \phi = 1$ and Varmeters at $\sin \phi = 1$
	:	All Low Power Factor Watt meters are calibrated at $\cos \phi = 0.2$ lag
	:	Other voltage and current ranges can be supplied on request, subject to technical feasibility

### Portable Electro-dynamometer Watt/VAR/ Power Factor Meters

Order Code	Load	Current Coil	Potential Coil
<b>Wattmeters</b>		<b>Choose One</b>	<b>Choose One</b>
20011	Single Phase	0.5, 1, 2, 2.5, 5, 10A	150, 200, 250, 300, 500, 600V
20012	Single Phase	0.5, 1, 2, 2.5, 5, 10A	75/150V, 150/300V, 250/500V, 300/600V
20013	Single Phase	0.5, 1, 2, 2.5, 5, 10A	75/150V/300V, 125/250/500V, 150/300/600V
20014	Single Phase	1/2A, 2.5/5A, 5/10A 10/20A, 15/30A	150, 250, 300, 500, 600V
20015	Single Phase		50/100V, 75/150V, 125/250V 150/300V, 250/500V, 300/600V
20016	Single Phase	1/2A, 2.5/5A, 5/10A	75/150V/300V, 125/250/500V, 150/300/600V
20017	Single Phase	10/20A, 15/30A	75/150V/300V, 125/250/500V, 150/300/600V
20018	Low Power Factor Wattmeter Single Phase	0.5/1A, 1/2A, 2.5/5A 5/10A, 10/20A, 15/30A	62.5/125/250V, 75/150/300V, 125/250/500V 150/300/600V
20019	3 Phase 3 Wire Balanced & Unbalanced Load	0.5/1A, 1/2A, 2.5/5A 5/10A, 10/20A, 15/30A	62.5/125V, 110/440V, 125/250V, 250/500V, 300/600V
<b>Varmeters</b>			
20020	3 Phase 3 Wire Balanced & Unbalanced Load	0.5/1A, 1/2A, 2.5/5A 5/10A, 10/20A, 15/30A	62.5/125V, 110/440V, 125/250V, 250/500V, 300/600V
<b>Power Factor Meters</b>			
20021	Single Phase	0.5/1A, 1/2A, 2.5/5A, 5/10A, 10/20A	62.5/125/250V, 75/150/300V, 125/250/500V 150/300/600V
20022	3 Phase Balanced Load	1A or 5A	110V or 440V
20023	3Phase 3 Wire Balanced Load	0.5/1A, 1/2A, 2.5/5A 5/10A, 10/20A	62.5/125V, 110/440V
20024			125/250V
20025			250/500V, 300/600V

b)

Instrument  
Division**Multi-range & Multi-parameter  
(Medium Size Multi-range in Black Engineering Plastic Housing)**

Data sheet No.: PORT 3/10/11



**DESCRIPTION**


These are Moving Coil DC, Moving Coil Rectifier type AC, ammeters & voltmeters and can be used in conjunction with transducers for measurement of frequency, power factor and low power factor wattmeter. Single phase dynamometric type of instrument is used for measurement of power at UPF.

**FEATURES / ADVANTAGES:**

- ◆ Instruments with 1.0%, 1.5% accuracy class.
- ◆ Instruments with multiple scale (refer table).
- ◆ Robust housing suitable for schools, workshops, field operations for continuous use.

**ELECTRICAL SPECIFICATIONS**

MODEL	TYPE	SCALE	RANGE	ACCURACY
 PORT - MSMB - 2	MOVING COIL DC VOLT-AMMETER	Quadruple	0-0.075/15/150/600V & 0-1.5/15/75/150A (with 75mV shunt)	1.5%
 PORT - MSMB - 3	MOVING COIL DC & AC VOLTMETER	Quadruple	0-1.5 / 15 / 150 / 600V DC - 0-6 / 60 / 300 / 600V AC	1.5%
	FREQUENCY METER	Single	45-55Hz or 55-65Hz or 380-420Hz at Voltages - 62.5V/110V/220V/440V	1%
PORT SPW-LPFR	LPF (0.2PF) WATT METER 1 Phase	Tripple	110/220/440 V	
		Single/Dual	62.5V/125V to 300V/600V & 50mA/100mA to 5A/10A	0.5%

MODEL	TYPE	SCALE	* POTENTIAL COIL (V)	CURRENT COIL (A)	ACCURACY
 PORT - MSMB - 4	# WATT METER 1Ph UPF	SPSC	75, 150, 300, 600	0.5, 1, 2, 2.5, 5, 10, 15, 20	1.0%
		DPSC	75/150, 150/300, 300/600.		
		TPSC	75/150/300, 150/300/600.		
		SPDC	75, 150, 300, 600	0.5/1, 1/2, 2.5/5, 5/10, 10/20, 15/30	
		DPDC	75/150, 150/300, 300/600.		
		TPDC	75/150/300, 150/300/600.		

\* 62.5 / 125 / 250 / 500V INSTEAD OF 75 / 150 / 300 / 600V ON REQUEST.

# CENTRE ZERO WATT ON REQUEST

**MECHANICAL SPECIFICATIONS**

SIZE	LENGTH mm	WIDTH mm	HEIGHT mm	HOUSING MATERIAL	MODEL IDENTIFICATION	SCALE		WEIGHT kg. (Approx.)
						LENGTH mm (Approx.)	DIVISION no.	
1	250	190	80	Black Engineering Plastic	MSMB —	145	80 ~ 120	1.5

**Ordering information**

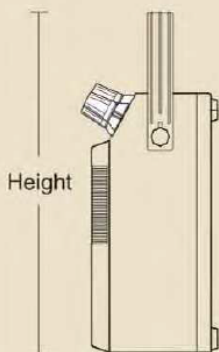
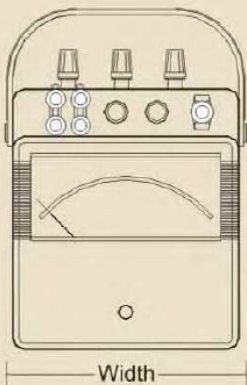
Ammeter / Voltmeter

1) Type    2) Model    3) Range    4) Scale    5) Accuracy

Frequency Meter

1) Type    2) Model    3) Range    4) Voltage    5) Accuracy

Watt / PF Meter

1) Type    2) Model, Parameter, Phase & Range  
3) Operating Voltage & PTR    4) Operating Current & CTR.

c)

Instrument  
Division1 ph/ 3ph - Power & Power Factor Meter  
(Large Size Dynamo metric in Wooden Housing)

Data sheet No.: PORT 4/10/11






**DESCRIPTION**

These are dynamometric type instruments, incorporating single element / two elements or three elements power measurement methods and specially designed to be operated in horizontal condition.

**FEATURES / ADVANTAGES:**

- ◆ Instruments with accuracy class 0.5% for 1Ph Watt, 1.5% for 3Ph, 2° for PF.
- ◆ Instruments with multiple scale available (refer table).
- ◆ Robust housing suitable for schools, workshops, field operations for continuous use.

**ELECTRICAL SPECIFICATIONS**

TYPE	MODEL	SCALE	POTENTIAL COIL (V)	CURRENT COIL (A)	ACCURACY		
WATT METER WITH LOW POWER FACTOR COS $\varphi=0.2$	# PORT LSDW - 1	SPDC DPSC TPDC	SPSC, DPSC, DPSC 75/150/300, 150/300/600	0.5/1, 1/2, 2.5/5, 5/10, 10/20	1.5%		
 WATT METER	# PORT LSDW - 2	SPSC	75, 150, 300, 600	0.5, 1, 2, 2.5, 5, 10, 20	0.5%		
		DPSC	75/150, 150/300, 300/600.				
		TPSC	75/150/300, 150/300/600.				
		SPDC	75, 150, 300, 600	0.5/1, 1/2, 2.5/5, 5/10, 10/20			
		DPDC	75/150, 150/300, 300/600.				
		TPDC	75/150/300, 150/300/600.				
 VAR METER	PORT LSDW - 3	SPSC	75, 150, 300, 600	0.5, 1, 2, 2.5, 5, 10, 20	1.5%		
		PORT LSDW - 4	SPSC			75, 150, 300, 600	
			DPDC			75/150, 150/300, 300/600.	
		PORT LSDW - 5	SPSC			75, 150, 300, 600	0.5, 1, 2, 2.5, 5, 10
			SPDC				0.5/1, 1/2, 2.5/5, 5/10, 10/20
 POWER FACTOR METER	PORT LSDW - 6	SPSC	75, 150, 300, 600	0.5, 1, 2, 2.5, 5, 10, 20	1.5%		
		PORT LSDW - 7	DPDC			75/150, 150/300, 300/600.	
			SPSC			75, 150, 300, 600	0.5, 1, 2, 2.5, 5, 10, 20
		SPDC					0.5/1, 1/2, 2.5/5, 5/10, 10/20
 POWER FACTOR METER	PORT LSDW - 8	SPSC	75, 150, 300, 600	0.5, 1, 2, 2.5, 5, 10	2°		
		DPSC	75/150, 150/300, 300/600.				
		TPSC	75/150/300, 150/300/600.				
		SPDC	75, 150, 300, 600	0.5/1, 1/2, 2.5/5, 5/10, 10/20			
		DPDC	75/150, 150/300, 300/600.				
		TPDC	75/150/300, 150/300/600.				
 POWER FACTOR METER	PORT LSDW - 9	SPSC	75, 150, 300, 600	0.5, 1, 2, 2.5, 5, 10,			

\* 62.5/125/250/500V ON REQUEST

# CENTRE ZERO WATT ON REQUEST

c)

**SELECTION OF RANGES :**

Upper limit of measuring range for meters shall be one of the following values - 1, 1.2, 1.5, 2, 2.5, 3, 4, 5, 6, 7.5, 8 or their decimal multiples.

Example for selection of proper range

1) Formula for 1Phase active power

$$P(\max) = VI \cos \phi. \text{ Where } \cos \phi = 1.$$

$$\text{If Voltage} = 500V \text{ \& Current} = 2.5A \text{ calculated power} = 500 \times 2.5 \times 1 = 1.25kW.$$

If the calculated value is 1.25kW 0 - 1.2kW or 0 - 1.25kW shall be selected as a range for power.

2) Formula for 3Phase active power with PT & CT.

$$P(\max) = \sqrt{3}VI \cos \phi \times PTR \times CTR. \text{ Where } \cos \phi = 1.$$

$$\text{If Voltage} = 110V \text{ \& Current} = 5A \text{ PTR} = 400kV/110V \text{ CTR} = 1000A/5A$$

$$\text{calculated power} = \sqrt{3} \times 110 \times 5 \times (400 \times 1000 / 110) \times (1000 / 5) = 692MW.$$

If the calculated value is 692MW 0 - 600MW or 0 - 750MW shall be selected as a range for power

Note : ■ All Wattmeters are calibrated at  $\cos \phi = 1$  and Varmeter at  $\sin \phi = 1$

■ All Low Power Factor Wattmeters are calibrated at  $\cos \phi = 0.2$  lag.

■ Voltage & Current range other than specified can be supplied on request, if feasible.

**MECHANICAL SPECIFICATIONS**

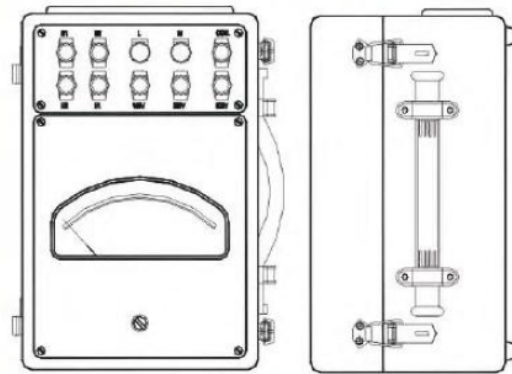


Fig. 1

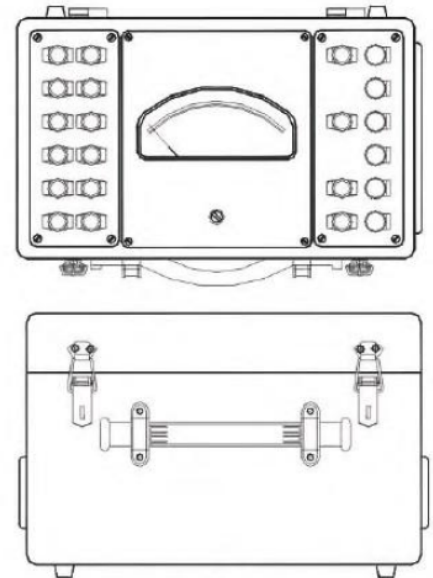


Fig. 2

SIZE	LENGTH mm	WIDTH mm	HEIGHT mm	HOUSING MATERIAL	MODEL IDENTIFICATION	SCALE		WEIGHT kg. (Approx.)
						LENGTH mm (Approx.)	DIVISION nos.	
1	300	200	155 / 190	Wooden Box	LSDW —	150	100 ~ 150	4 ~ 5
2	225	355	190 / 225	Wooden Box	LSDW —	150	100 ~ 150	5.5 ~ 7.5

**Ordering information**

1) Type 2) Model, Parameter, Phase, Range 3) Operating Voltage & PTR 4) Operating Current & CTR.



d)

# Analogue Portable Instrument

## Portable Frequency Meter



The Hz meters use a frequency-to-DC current transducer which drives a high sensitivity moving coil type indicator. It features accurate frequency measurements without noticeable influence of line voltage fluctuation (50 to 300V) or waveform distortion.

- **Principle :** Frequency sensing transducer
- **Accuracy :**  $\pm 0.5\%$  of full scale value on 45 to 65 Hz range  
 $\pm 0.5\%$  of full scale value on 0 to 100Hz range  
 $\pm 0.5\%$  of full scale value on 0 to 500Hz range
- **Scale Length :** Approx. 135mm (5-3/8")
- **Case Material :** Bakelite with glass window

Name	Frequency	Voltage	No.
Hz meter	45-65Hz	120/240V	1701
	0-100Hz	120/240V	1702
	0-500Hz	120/240V	1703

## Portable Power Factor Meter



The PF meter is used for measurement in single-phase and balanced three-phase circuits. From a phase discriminating circuits, the output of the built-in transducer produces a DC proportional to the phase between voltage and current to operate the DC indicator.

- **Principle :** Phase angle sensing transducer
- **Rated Accuracy :**  $\pm 3\%$  phase angle
- **Scale :**  
Power Factor : Lead 0 – 0.3 – 1.0 – 0.3 – 0 Lag  
Power Angle : Lead 90° – 0° – 90° Lag
- **Effective Power Factor Measuring Range :**  
Lead 0.5 – 1.0 – 0.5 Lag
- **Scale Length :** Approx. 135mm (5-3/8")
- **Frequency Influence :** Within  $\pm 1.5^\circ$  phase angle at 45 to 65Hz

Name	Current	Voltage	No.
PF (1 $\phi$ , 3 $\phi$ ) meter	0.2/1A	120V	3801
	1/5A	(Usable in the range of 60-300V)	3802
	5/25A		3803

## Portable Wattmeter



The wattmeter is electro-dynamometer type, this instrument is highly reliable, and designed for use in laboratories or factories for precision measurement of power at AC and commercial frequencies 45-65Hz.

- **Principle :** Electro-dynamometer type
- **Accuracy :**  $\pm 0.5\%$  of full scale
- **Scale Length :** Approx. 135mm (5-3/8")
- **Scale Divisions :** 120
- **Frequency Ranges :** AC 25 to 1000Hz (COS $\phi$ =1.0) (suitable for DC)  
AC 25 to 500Hz (COS $\phi$ =0.2)

Name	Range		Power Factor	No.
	Current	Voltage		
Single-Phase Wattmeter	0.2/1A	120/240V	1.0	2101
	1/5A	120/240V	1.0	2102
	2/10A	120/240V	1.0	2103
	5/25A	120/240V	1.0	2104
	5/10A	240/480V	1.0	2105
	0.5/1A	120/240V	1.0	2115
	1/2A	120/240V	1.0	2116

Special ranges are available upon request.

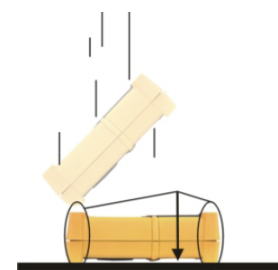
e) MS304, MS305



## MIERNIKI SERII MS

### Właściwości

- Mocna obudowa, prosty i niezwykle bezpieczny w użyciu
- Wysoka dokładność i stabilność
- Jeden przycisk do zmiany zakresu
- Bezpieczne gniazda oraz podwójna izolacja
- Elegancka i wodoodporna obudowa



### URZĄDZENIA WSTRZĄSOODPORNE

Parametry	MS 304 nr kat. 116115	MS 305 nr kat. 116116	MS 306 nr kat. 116117
Funkcje	Watomierz 1-fazowy	Watomierz 1- i 3-fazowy	Mulimetr
Zakresy	AC/DC 60-120-240-480V AC/DC 1A	AC/DC 60-120-180-240-360-480V (1-fazowo) AC/DC 60√3-120√3-180√3-240√3V (3-fazowo)	DCV 2,5V ~ 1000V (7 kroków) ACV 10V ~ 1000V (6 kroków) DCA 50uA ~ 10A (9 kroków) ACA 2,5mA ~ 10A (7 kroków) R 1Ω ~ 1KΩ (4 kroki)
Dokładność	2,5% (DC), 1% (AC)	2,5% (DC), 1%(AC 1-fazowo), 2% (AC 3-fazowo)	1,5% (DC), 2,5% (AC)
Częstotliwość pracy	0 ~ 500Hz	15 ~ 500Hz	20 ~ 400Hz
Bezpieczniki	1A / 500V	5A / 500V	1A i 10A / 500V
Akcesoria	-	-	Przewody pomiarowe para
Wymiary	170 × 165 × 55 [mm]	170 × 165 × 55 [mm]	170 × 165 × 55 [mm]
Masa	200g	200g	200g



MS 304



MS 305



MS 306

