SWITCHBOARD INSTRUMENT SELECTOR GUIDE

Model Type	MCS
Case Style	4¼" Metal
Available	
Input Rating	
AC Milliamperes	X
AC Amperes	X
AC Voltage	X
DC Microamperes	X
DC Milliamperes	X
DC Amperes	X
DC Millivolts	X
DC Voltage	X
Frequency	X
AC Watts	X
AC VARS	X
Power Factor	X
AC Synchroscope	X
RPM Indicator	X
Process Indicator	X





MCS Switchboard specifications in accordance with ANSI C39.1

Accuracy: ±1.0% of full scale basic accuracy class.
Specific accuracies:
Expanded Scale Voltmeter - 0.3% of mid-scale.
Power factor meter - ±1% of fiducial value from 40-120% of rated current.
Synchroscope - ±1% of scale length.
Frequency meters - ± .15Hz @45-55Hz and 55-65Hz, ±0.08Hz 58-62Hz, ±1.3Hz @350-450Hz.
Position of use: Vertical (scale)
Full scale deflection angle: 250°, except synchroscope is 360°
Full scale length: MCS - 6.9 inches.
Scale plate: MCS platform type 2 piece scale with graduations on the outer scale; numerals and legends on the inner scale.
Case: All MCS switchboard instruments have drawn steel case with matt black powder coating.
Cover: Front cover has bezel & window made by one piece of flame retardant Polycarbonate molding with black matte finished bezel area.
Mounting studs: 1/4" x 28 thread.
Terminal studs: 10-32 thread.
Operating temperature range: 0 to 40°C (32 to 104°F).
Storage temperature range: -10 to 50°C (14 to 122°F).
Extreme temperature range: -20°C to 65°C (-4 to 149°F).
Dielectric level: 2300VAC for 1 minute between the electrical circuit and mounting studs.
Overload rating: AC & DC Ammeters – 1.2 x continuous, 10 x for 0.5 seconds, repeated 10 times with 1 minute interval.
Ac & DC Voltmeters and frequency meters – 1.2 x continuous
Response time: 3 seconds maximum

Ordering System

Key to MCS Switchboard Numbering System (See Notes)

MCS 103 01 1 XX XX 7 XXX

MCS

Digits 1, 2, & 3 Type
103, 106

Digits 4 & 5 Measured Qty.
01-DC Volts
02-AC Volts
07-Voltmeter (expanded scale)
11-DC Amps
12-DC Millivolts
13-AC Amps
15-AC voltmeter
19-Supp. Zero
21-2W1P Watts 1 EL
22-3W3P Watts 2 EL
25-4W3P Watts 3 EL
28-3W3P Vars (cross phase) 2 EL
29-4W3P Vars (cross phase) 3 EL
31-2W1P Vars 1 EL
37-Freq. Meter
40-Power Factor 3W3P & 4W3P (balanced)
41-Power Factor 2W1P
45-Synchroscope
55-DC Voltmeter (ground detector type)
62-DC Tach. Ind.
63-AC Tach. Ind,
74-4W3P Vars • (cross phase) 3 EL

Digit 6 Mechanical Features
1-Zero left, black cover
2-Zero center, black cover

Digits 7 & 8 - Elec. Rtg.
Ex: LA = 1A
LE = 2A
LS = 5A
(see note 2)

Digits 9 & 10 - Scale
Ex: FA = 0-1mA
FX = 0-5mA
(see note 2)

Digit 11 - Factory Style No.
For factory use.

Digits 12, 13 & 14-Spcl Units
When used, these denote unique models. Refer to factory for details. For Wattmeters & Varmeters, see pages 10-12.

NOTES:
1. This tabulation is not all inclusive, to be used for defining cat. nos. only
2. For watt & var cat. nos. digits 7-10 & 12-14 designate rating-cal watts-scale & legend information

How to Order - Specify the following:

1. Complete Part Number or Ordering number or;
2. Provide significant portion of catalog number with word description for differences (e.g. "Similar to MCS103111FAFA, except scale 0-100 kilovars"), or;
3. Provide word description including the following information:

Type: MCS
Rating (Input):.....Amperes AC or DC.....
Volts AC or DC.....
Frequency: 60 Hz, 50 Hz, 400 Hz.....Hz
Scale: Min. Value - Max. Value, Zero left,
Zero-center or offset zero
Legend: Specify words and/or symbols exactly
Potential Transformer Ratio: .....to 120 volts
or.....to.....volts
Current Transformer Ratio:.....to 5 amperes
or .....to .....amperes
Circuit: 2-wire/single-phase, 3-wire/3 phase.
3-phase/4-wire.....other
External Devices; phase Shifting transformers, shunts
transducers, etc .....
Other Options:.....
Special features .....

Shipping & Storage Weights

Instrument		MCS Net (lbs)	MCS Net kg)	MCS Ship (lbs)	MCS Ship kg)
DC-A/V		1.5	.70	2.4	1.1
AC	V	1.7	.79	2.7	1.2
	A	1.8	.84	2.7	1.2
WATT/ VAR	1Ø	2.8	1.3	3.6	1.7
	3Ø3W 3Ø4W	3.0	1.4	3.9	1.8
Power Factor		2.0	.95	3.0	1.4
Frequency		1.8	.82	2.7	1.2
Tachometer		1.6	.80	2.7	1.2
Synchroscope		3.9	1.8	4.8	2.2

Approximate Package Size in Inches / Centimeters

All MCS .....6x 6x 11/15x 15 x 28
Shipping .....7x 7 x 13/18 x 18 x33

Specs subject to change without notice

DC Ammeters Self-Contained

Scale and Rating	Part Number	Ordering Number
Microammeters - Zero-Left		
0-200	MCS 103 111 EAEA	1C9988
0-300	MCS 103 111 EGEG	1C9989
0-500	MCS 103 111 EMEM	1C9990
0-800	MCS 103 111 EWEW	1C9991
Milliammeters - Zero-Left		
0-1	MCS 103 111 FAFA	1C9992
0-2	MCS 103 111 FGFG	1C9993
0-5	MCS 103 111 FXFX	1C9994
0-10	MCS 103 111 GZGZ	1C9995
0-20	MCS 103 111 HFHF	1C9996
0-30	MCS 103 111 HMHM	1C9997
0-50	MCS 103 111 HYHY	1C9998
0-100	MCS 103 111 JRJR	1C9999
0-200	MCS 103 111 KAKA	1D0001
0-300	MCS 103 111 KGKG	1D0002
0-500	MCS 103 111 KMKM	1D0003
0-800	MCS 103 111 KWKW	1D0004
Milliammeters - Suppressed-Zero (No zero set unless otherwise specified)		
1-5	MCS 103 191 FY**	*TBD
4-20	MCS 103 191 HE**	*TBD
10-50	MCS 103 191 HX**	*TBD
Ammeters - Zero-Left		
0-1	MCS 103 111 LALA	1D0009
0-5	MCS 103 111 LSLS	1D0010
0-10	MCS 103 111 MTMT	1D0011
0-15	MCS 103 111 NDND	1D0012
0-20	MCS 103 111 NGNG	1D0013
0-30	MCS 103 111 NLNL	1D0014

MCS - Metal Case



DC Ammeters Shunt-Rated

Rating (Millivolts)	Scale (Amperes)	Part Number	Ordering Number
With Lead Length Compensator, Catalog Number Does Not Include Shunt or Shunt Leads			
50	**TBD	MCS 103 121 AB...	*TBD
50-0-50	**TBD	MCS 103 122 AB...	*TBD
100	**TBD	MCS 103 121 AE...	*TBD
100-0-100	**TBD	MCS 103 122 AE...	*TBD
Zero-Left for Use with 50mV Shunts and 0.05-Ohm Shunt Leads, (Standard 5-Foot Leads).			
50	0-15	MCS 103 121 CAND	1D0018
50	0-20	MCS 103 121 CANG	1D0019
50	0-30	MCS 103 121 CANL	1D0020
50	0-40	MCS 103 121 CANP	1D0021
50	0-50	MCS 103 121 CANT	1D0022
50	0-75	MCS 103 121 CAPB	1D0023
50	0-100	MCS 103 121 CAPK	1D0024
50	0-150	MCS 103 121 CAPZ	1D0025
50	0-200	MCS 103 121 CARL	1D0026
50	0-300	MCS 103 121 CARX	1D0027
50	0-400	MCS 103 121 CASC	1D0028
50	0-500	MCS 103 121 CASF	1D0029
50	0-750	MCS 103 121 CASM	1D0030
50	0-1000	MCS 103 121 CASS	1D0031
50	0-1200	MCS 103 121 CASV	1D0032
50	0-1500	MCS 103 121 CATC	1D0033
50	0-2000	MCS 103 121 CATM	1D0034
50	0-3000	MCS 103 121 CAUA	1D0035

*TBD - Scale marked in terms of shunt current. When ordering specify rating of shunt to be used, scale and legend.

**TBD - When ordering specify scale and legend.

Burden Data - AC Meters

Type	Impedance in Ohms	Dielectric withstand	Overload rating	Volt – ampere	Power Factor
For Potential circuit					
AC Voltmeter	45.5 Kohms @ 120VAC	2300VAC between electronic circuit and case for 1 minute	X1.2 continuous	< 0.8 VA @ 150V	---------
AC Wattmeter or Var meter	For 3 phase 3 wire Wattmeter 316 K ohm @ 110V For 3 Phase 3 wire Var Meter 273.4 Kohm @ 110V	2600VRMS between electronic circuit and case for 1 minute	Voltage X 2 rating for 5 second Voltage x 1.2 continuous	< 4.5VA for Voltage circuit	1.0
AC Power Factor Meter	For 1 phase PF meter 95.2 K ohm @ 110V For 3 phase PF meter 124.9Kohm @ 415V	2600VRMS between electronic circuit and case for 1 minute	Voltage X 2 rating for 5 second Voltage x 1.2 continuous	< 4.5 VA for Voltage circuit	1.0
Frequency Meter	> 1 Mohm	2300VAC between electronic circuit and case for 1 minute	---------	---------	---------
Synchroscope	TBD	TBD	TBD	TBD	TBD
For Current circuit					
AC Ammeter	0.005 ohms @ 10A	2300VAC between electronic circuit and case for 1 minute	X2 continuous, X 10 for 1 second	< 0.5 VA	---------
AC Wattmeter or Var meter	For 3 phase 3 wire Wattmeter 0.1 ohm @ 1A For 3 Phase 3 wire Var Meter 0.1ohm @ 1A	2600VRMS between electronic circuit and case for 1 minute	Current X10 rating for 5 second, Current X 1.2 continuous	< 2 VA for Current circuit	1.0
AC Power Factor Meter	For 3 phase 3 wire Wattmeter 0.1 ohm @ 1A For 3 Phase 3 wire Var Meter 0.1ohm @ 1A	2600VRMS between electronic circuit and case for 1 minute	Current X10 rating for 5 second, Current X 1.2 continuous	< 2 VA for Current circuit	1.0

*Data based on a per-element basis

Burden Data - DC Meters

DC Voltmeters

Rating (Volts)	Sensitivity (Ohms Per Volt)
50mV – 800V	1,000 ohms / volt for left zero and 2,000 ohms / volt for centre zero

Rating (mV)	Calibrated for 2-way Lead Resistance of 0.04 Ohms as standard**	Ohms Terminal Resistance ± 15%
0-50	0.04	12.50 ohm
50-0-50	0.04	25.0 ohm
0-100	0.04	25.0 ohm
100-0-100	0.04	50 ohm

DC Microammeters

Rating (uA)	Ohms Terminal Resistance ± 15%
0-200	10 Kohm
0-400	2.52 Kohm
0-500	2.5 Kohm

DC Milliammeters / Ammeter

Current Rating	Ohms Terminal Resistance ± 15%
0 - 1 mA	500 ohm
0 - 5 mA	7 ohm
0 – 15 mA	3 ohm
0 – 1 A	0.075 ohm