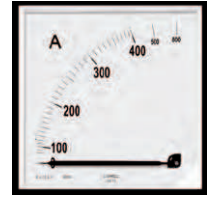


ANALOG PANEL METERS

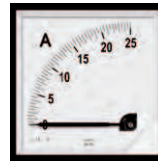
Type



Moving-iron meters

	EB16	EA16	EA17	EA19	EA12
Measuring ranges: - current: · direct · through a transformer (on request, with twice or six-times overload) - voltage: · direct · through a transformer		100 mA ... 25 A xA x/5 A; xA/1 A		100 mA ... 100 A xA x/5 A; xA x/1A	
Frequency of measured value	40...45...65...72 Hz				
Protection rating	IP52	IP50 (on request IP65)			IP50 (on request IP54)
Climate version	normal or tropical		normal, tropical or similar to marine		
External dimensions	53 x 90 mm	48 x 48 mm	72 x 72 mm	96 x 96 mm	144 x 144 mm

Type



Moving-coil meters with rectifiers

	MA17P	MA19P	MA12P
Measuring ranges (direct): - current: - voltage:	400 mA...1 A (30...1000...10 000 Hz) 1 A...6 A (49...50...51 Hz)		400 mA...1 A (30...1000...10 000 Hz)
	6mV...1,5 V (49...50...51 Hz) 2,5V...600V (30...1000...10 000 Hz)		2,5 V...600 V (30...1000...10 000 Hz)
Protection rating	IP50 (IP65 on request)		IP50 (IP54 on request)
Climate version	normal, tropical or similar to marine		
External dimensions	72 x 72 mm	96 x 96 mm	144 x 144 mm

Type



3-phase voltmeters

	EP27	EP29
Voltage measuring ranges: - direct phase-to-phase: - through a transformer:	500 V	
	xV/100 V; xV/110 V	
Frequency	40...45...65...72 Hz	
Protection rating	IP50	
Climate version	normal, tropical or similar to marine	
External dimensions	72 x 72 mm	96 x 96 mm

Type



Power meter

	PA39
Power measuring ranges	50W...1000 MW or 50 var...1000 Mvar
Frequency	50 Hz, 60 Hz or 400 Hz
Protection rating	IP50 (on request IP65)
Climate version	normal, tropical or similar to marine
External dimensions	96 x 96 mm

Type



Moving-coil meters

	MB16	MA16	MA17	MA19	MA12
Measuring ranges: - current: - direct measurement - indirect measurement (through the shunt) - voltage: - direct measurement		40 μ A...25 A 1 A...15 kA		100 μ A...25 A 1 A...15 kA	
Protection rating	IP52		IP50 (on request IP65)		IP50 (on request IP54)
Climate version	normal or tropical		normal, tropical or similar to marine		
Rated operational conditions: - ambient temperature: - relative air humidity			5...23...55°C 25...85%		
External dimensions	53 x 90 mm	48 x 48 mm	72 x 72 mm	96 x 96 mm	144 x 144 mm

Type



Max demand ammeters - Bimetalic or Bimetalic and moving-iron

	BA27	BA39	BE27	BE39
Measuring ranges: - bimetalic element: - direct measurement - indirect measurement (through a transformers) - moving-iron element: - direct measurement - indirect (through a transformer)		0...1.2 A or 0...6 A 0...1.2(x) A x/1 A or 0...1,2(x) A x/5 A		0...1.2 A or 0...6 A 1.2(x) A x/1 A or 1.2(x) A x/5 A 0...1/2 A or 0...5/10 A 0...2(x) A x/1 A or 0...2(x) A x/5 A
Protection rating	IP50			
Climate version	normal, tropical or similar to marine			
External dimensions	72 x 72 mm	96 x 96 mm	72 x 72 mm	96 x 96 mm

Type



Power factor and frequency meters

	FA39	FA32	CA37	CA39	CA32
Measuring ranges	0.5 _{Cap} ...1...0.5 _{IND} 0.8 _{Cap} ...1...0.2 _{IND} 0.85 _{Cap} ...1...0.85 _{IND} 0 _{IND} ...1		Class 0,5: 45...55 Hz; 45...65 Hz; 55...65 Hz; 360...440 Hz; Class 0,2: 48...52 Hz; 58...62 Hz; 140...160 Hz; 180...220 Hz; 380...420 Hz		
Frequency	45...50...60...65 Hz		-		
Protection rating	IP50 (IP65 on request)	IP50 (IP54 on request)	IP50 (IP65 on request)		IP50 (IP54 on request)
Climate version	normal, tropical or similar to marine				
External dimensions	96 x 96 mm	144 x 144 mm	72 x 72 mm	96 x 96 mm	144 x 144 mm

EP29

Fig. 158 Direct connection

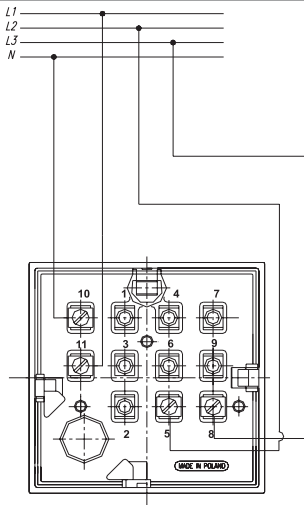
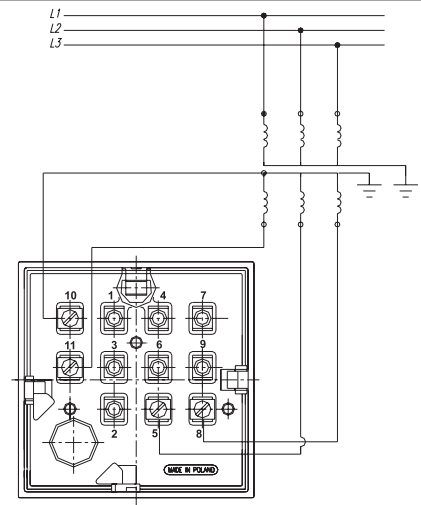


Fig. 159 Connection with voltage transformers



PA39

Fig. 160 Measurement of active power in a single-phase network

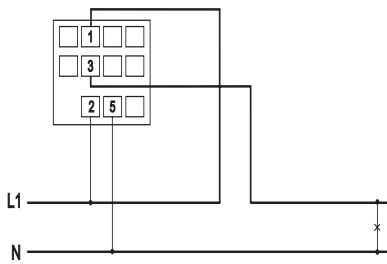


Fig. 161 Measurement of active power in a three-phase three-wire symmetrically loaded network

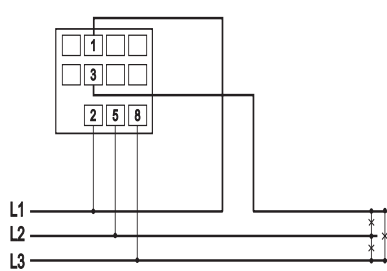


Fig. 162 Measurement of active power in a three-phase three-wire asymmetrically loaded network

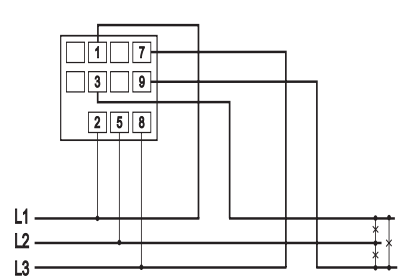


Fig. 163 Measurement of active power in a three-phase four-wire symmetrically loaded network

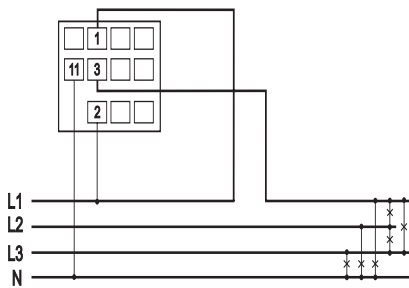


Fig. 164 Measurement of active power in a three-phase four-wire asymmetrically loaded network

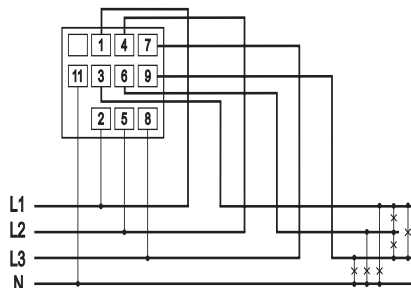


Fig. 165 Measurement of reactive power in a three-phase three-wire symmetrically loaded network

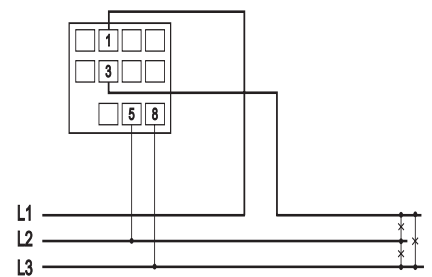


Fig. 166 Measurement of reactive power in a three-phase three-wire asymmetrically loaded network

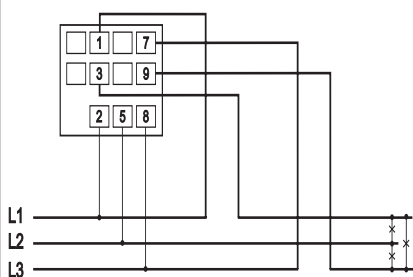


Fig. 167 Measurement of reactive power in a three-phase four-wire symmetrically loaded network

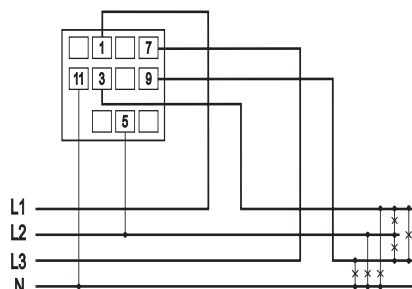
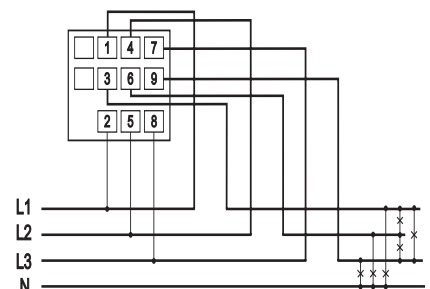


Fig. 168 Measurement of reactive power in a three-phase four-wire asymmetrically loaded network



FA39

Fig. 170 Power factor meter connected directly to a single-phase network.

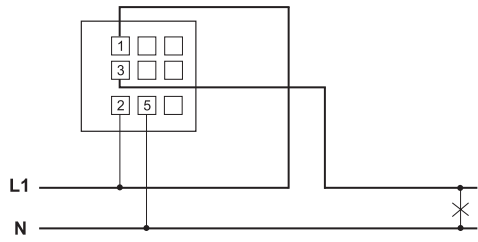


Fig. 171 Power factor meter connected directly to a three-phase symmetrically loaded network.

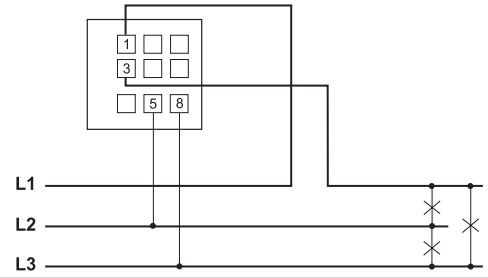


Fig. 172 Power factor meter connected through a current transformer to a single-phase network.

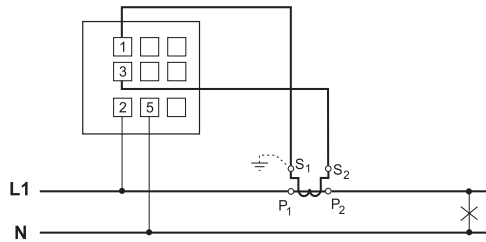


Fig. 173 Power factor meter connected through a current transformer to a three-phase symmetrically loaded network.

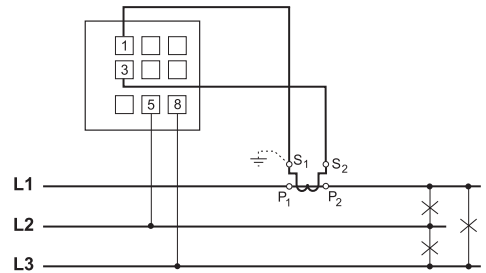


Fig. 174 Power factor meter connected through a current and voltage transformers to a single-phase network.

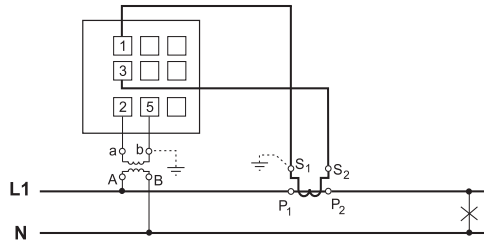
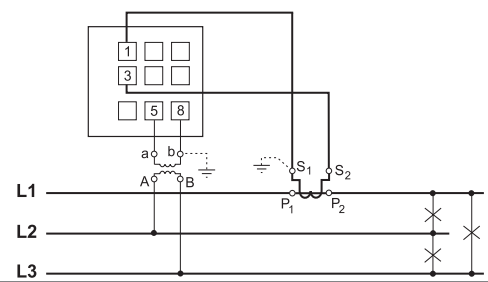


Fig. 175 Power factor meter connected through a current and voltage transformers to a three-phase symmetrically loaded network.



FA32

Fig. 176 Power factor meter connected directly to a single-phase network.

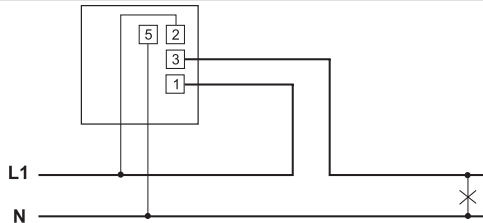


Fig. 177 Power factor meter connected directly to a three-phase symmetrically loaded network.

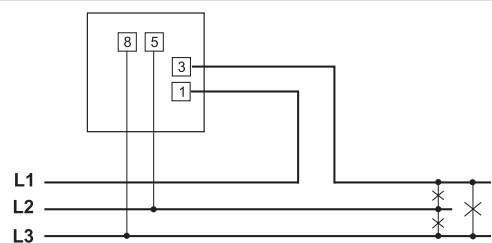


Fig. 178 Power factor meter connected through a current transformer to a single-phase network.

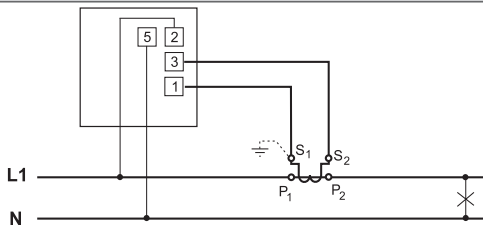


Fig. 179 Power factor meter connected through a current transformer to a three-phase symmetrically loaded network.

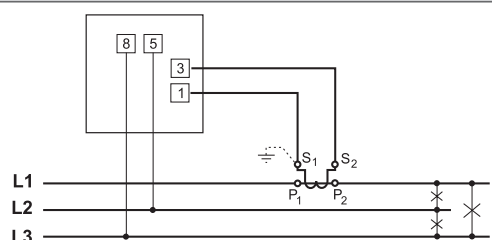


Fig. 180 Power factor meter connected through a current and voltage transformers to a single-phase network.

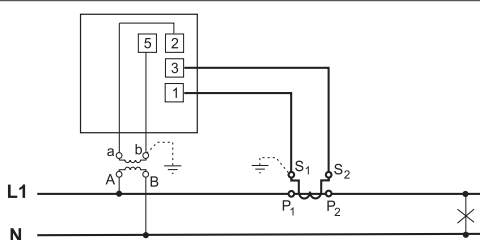
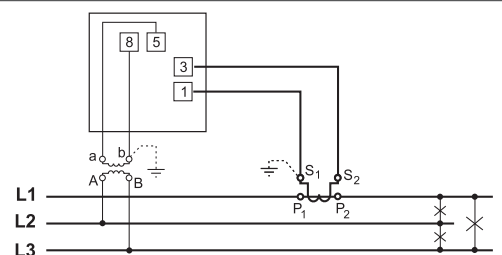


Fig. 181 Power factor meter connected through a current and voltage transformers to a three-phase symmetrically loaded network.



ORDERING CODES

D.C. Ammeters and D.C. Voltmeters EA and EB

Please, specify in the order:

- name and meter type
- measuring range
- overload value – only for current ranges
- data of measuring transformers – if the meter is foreseen to co-operate with transformers
- working position
- meter climate version - only for tropical versions or similar to marine
- extra requirements if necessary.

Ordering example: voltmeter of EA17 type, 500 V range, direct measurement, vertical 90° working position, scale consistent to the range, without extra requirements.

D.C. and A.C. Ammeters and Voltmeters MA, MB

Please, specify in the order:

- name and meter type
- measuring range
- zero position or data of the shunt – if the meter is foreseen to co-operate with an interchangeable shunt
- working position
- meter climate version - only for tropical versions or similar to marine
- extra requirements if necessary

Ordering example: ammeter of MA16 type, 40 A range, to co-operate with shunt of B2 40 A/60 mV type, vertical 90° working position, scale consistent to the range, without extra requirements. If the shunt has to be delivered with the meter, one must place it in the order as a separate item, e.g. shunt B2 40 A/60 mV.

One must order the shunt separately.

When ordering meters for a.c. current or voltage, add „with rectifier“ to the meter name.

A.C. VOLTMETERS EP

Please, specify in the order:

- name and meter type
- measuring range
- data of measuring transformers – if the meter is foreseen to co-operate with transformers
- working position
- meter climate version - only for tropical versions or similar to marine
- extra requirements if necessary.

Ordering example: voltmeter of EP27 type, 500 V range, direct measurement, vertical 90° working position, scale according to the range, without extra requirements.

DEFAULT PARAMETERS

- climate version: normal
- protection grade: IP50 (IP52 for EB16/MB16)
- working position: 90°
- scale according to the measuring range
- without an inspection certificate and extra requirements

MEASUREMENT

POWER METERS PA39

TABLE 81. POWER METER PA39

PA39 -		X	X	X	X	X	X	XX	X
Kind of measured power and measuring element:									
measurement of active power in 1-phase network	A								
measurement of active power in a 3-phase network, 3-wire balanced network	B								
measurement of active power in a 3-phase network, 3-wire unbalanced network	C								
measurement of active power in a 3-phase network, 4-wire balanced network	D								
measurement of active power in a 3-phase network, 4-wire unbalanced network	E								
measurement of reactive power in a 3-phase network, 3-wire balanced network	F								
measurement of reactive power in a 3-phase network, 3-wire unbalanced network	G								
measurement of reactive power in a 3-phase network, 4-wire balanced network	H								
measurement of reactive power in a 3-phase network, 4-wire unbalanced network	K								
Input voltage:									
write in the range code Un from the table 82		X							
Frequency of the input voltage:									
50 Hz	0								
60 Hz	1								
400 Hz	2								
Input current:									
write in the range code In from the table 82								X	
Power flow direction:									
unidirectional, zero on the left side of the scale	0								
bidirectional, zero in the middle side of the scale	1								
Work position:									
write in the position code from the table 85									X
Version:									
standard	00								
custom-made	XX								
Acceptance tests:									
without extra requirements	8								
with an extra quality inspection certificate	7								
other requirements	X								

TABLE 82

Single phase active power 100 √3	Un Code																				
	T	U	A	V	W	B	C	D	E	F	G	H	I	K	L	M	N	P	R	S	
	50	100	200	250	400	400	600	800	1.2	5	10	15	25	30	50	80	100	200	400	800	
3-phase 3-wire active power, symmetrically loaded					230	400	500	690	3000	6000	10000	15000	20000	30000	40000	60000	110000	220000	400000	800000	
3-phase 3-wire active power, asymmetrically loaded																					
3-phase 4-wire active power, symmetrically loaded					133	230	280	400	3000	6000	10000	15000	20000	30000	40000	60000	110000	220000	400000	800000	
3-phase 4-wire active power, asymmetrically loaded					230	400	500	690	3000	6000	10000	15000	20000	30000	40000	60000	110000	220000	400000	800000	
3-phase 3-wire reactive power, symmetrically loaded					230	400	500	690	3000	6000	10000	15000	20000	30000	40000	60000	110000	220000	400000	800000	
3-phase 3-wire reactive power, asymmetrically loaded																					
3-phase 4-wire reactive power, symmetrically loaded					133	230	280	400	3000	6000	10000	15000	20000	30000	40000	60000	110000	220000	400000	800000	
3-phase 4-wire reactive power, asymmetrically loaded					230	400	500	690	3000	6000	10000	15000	20000	30000	40000	60000	110000	220000	400000	800000	

MAX DEMAND AMMETERS BA AND BE

TABLE 83. BIMETALLIC METERS BA27, BE27, BA39, BE39

BA27, BE27, BA39, BE39 -		X	X	XXXX	X	X	X	X
Version:								
standard, to fix in a panel		1						
direct fixing on the transformer (only BA27)		2						
custom-made version ¹⁾		X						
Climatic categories:								
standard version			N					
tropical version			T					
custom-made version ²⁾			X					
Ranges:								
acc. to the table 84 (write the code, e.g.: F205)				XXXX				
Setting time of the bimetallic element:								
15 minutes					0			
8 minutes						2		
Working position:								
acc. to the table 85							X	
Signs on the dial and markings:								
dial with a standard scale (consistent to the range)								0
dial execution acc. to the order ³⁾								X
Acceptance tests:								
without extra requirements								8
with an extra quality inspection certificate								7
other requirements ³⁾								X

1) - the code number is established by the manufacturer

2), 3) - all extra requirements must be agreed with the manufacturer

TABLE 85

Work position	Code			
	EB16	MB16	MA16 EA16	other meters
c3, $\alpha = 90^\circ$	A	A	A	0
c1, $\alpha = 0^\circ$		B	B	A
c2, $\alpha = 15^\circ$			C	B
c2, $\alpha = 30^\circ$			D	C
c2, $\alpha = 45^\circ$			E	D
c2, $\alpha = 60^\circ$			F	E
c2, $\alpha = 75^\circ$			G	F
c4, $\alpha = 105^\circ$			H	H
c4, $\alpha = 120^\circ$			I	I

POWER FACTOR METERS FA

TABLE 86. POWER FACTOR METERS FA39 AND FA32

FA39 and FA32 -		X	X	X	XX	X	XX	X
Measurement of power factor in:								
1-phase system		1						
3-phase system, in a 3-phase balanced network		3						
Measuring range:								
0.5 cap...1...0.5 ind			A					
0.8 cap ...1...0.2 ind			B					
0.85 cap ...1...0.85 ind			C					
0 _{cap} ...1			D					
Input current:								
1 A					1			
5 A						5		
Input voltage:								
60 V (only for measurement in a 1-phase system)							01	
100 V							02	
110 V							03	
230 V							04	
400 V							05	
415 V (only for measurement in a 3-phase system)							06	
440 V (only for measurement in a 3-phase system)							07	
500 V (only for measurement in a 3-phase system)							08	
on request - after agreeing with the manufacturer							XX	
Working position:								
acc. to the table 85						X		
Version:								
standard								00
custom-made*								XX
Acceptance tests:								
without extra requirements								8
with an extra quality inspection certificate								7
other requirements*								X

* - after agreeing with the manufacturer

TABLE 84

CODE RANGE	RANGE DESCRIPTION (MEASURING RANGE)	CODE RANGE	RANGE DESCRIPTION (MEASURING RANGE)
F201	1.2 A	F366	1920 A 1.6k/1
F205	6 A	F4	1.2 XA X/5
F3	1.2X A X/1	F405	6 A 5/5
F301	1.2 A 1/1	F406	7.2 A 6/5
F305	6 A 5/1	F407	12 A 10/5
F306	7.2 A 6/1	F408	18 A 15/5
F307	12 A 10/1	F409	24 A 20/5
F308	18 A 15/1	F411	36 A 30/5
F309	24 A 20/1	F412	48 A 40/5
F311	36 A 30/1	F413	60 A 50/5
F312	48 A 40/1	F414	72 A 60/5
F313	60 A 50/1	F415	96 A 80/5
F314	72 A 60/1	F416	120 A 100/5
F315	96 A 80/1	F417	180 A 150/5
F316	120 A 100/1	F418	240 A 200/5
F317	180 A 150/1	F420	360 A 300/5
F318	240 A 200/1	F421	480 A 400/5
F320	360 A 300/1	F422	600 A 500/5
F321	480 A 400/1	F423	720 A 600/5
F322	600 A 500/1	F424	960 A 800/5
F323	720 A 600/1	F450	1200 A 1k/5
F324	960 A 800/1	F451	1800 A 1.5k/5
F350	1200 A 1k/1	F452	2400 A 2k/5
F351	1800 A 1.5k/1	F454	3600 A 3k/5
F352	2400 A 2k/1	F455	4800 A 4k/5
F354	3600 A 3k/1	F456	6000 A 5k/5
F355	4800 A 4k/1	F457	7200 A 6k/5
F356	6000 A 5k/1	F459	12000 A 10k/5
F357	7200 A 6k/1	F465	1440 A 1.2k/5
F359	12000 A 10k/1	F466	1920 A 1.6k/5
F365	1440 A 1.2k/1		

FREQUENCY METERS CA

TABLE 87. FREQUENCY METERS CA32, CA37, CA39

CA32, CA37, CA39 -		X	X	X	XX	X
Frequency range:						
45...55 Hz		1				
45...65 Hz		2				
48...52 Hz		3				
55...65 Hz		4				
58...62 Hz		5				
140...160 Hz		6				
180...220 Hz		7				
360...440 Hz		8				
380...420 Hz		9				
Range voltage:						
60 V			1			
100 V			2			
110 V			3			
230 V			4			
400 V			5			
415 V			6			
440 V			7			
500 V			8			
690 V			9			
Working position:						
acc. to the table 85						
Version:						
standard						
custom-made*						
Acceptance tests:						
without extra requirements						
with an extra quality inspection certificate						
other requirements*						

* - after agreeing with the manufacturer