

# PA39

## PANEL POWER METER



### APPLICATION

The PA39 power meter is a moving-coil meter with a built-in measuring transducer. It is destined to measure active or reactive power in a.c. power networks. The measured power is indicated by a magnetoelectric (moving-coil) measuring system.

These meters are delivered in following versions:

- for measuring the active power in single-phase systems,
- for measuring the active or reactive power in three-phase three-wire or four-wire symmetrically or asymmetrically loaded systems,
- with the zero graduation on the left side of the scale for measuring the unidirectional power flow,
- with the zero graduation in the middle of the scale for measuring the bidirectional power flow.

### TECHNICAL DATA

<b>Measuring ranges acc. the series</b>	1, 1.2, 1.5, 2, 2.5, 3, 4, 5, 6, 7.5, 8, or the decimal multiplication of one of these numbers
<b>Input voltage</b>	100 $\sqrt{3}$ (x/100/ $\sqrt{3}$ ), 100 (x/100), 133, 230, 280, 400, 500, 690 V
<b>Input current</b>	1 A (x/1 A) or 5 A (x/5 A)
<b>Active power factor</b>	$\cos\varphi: 1 \dots 0.5_{ind}$
<b>Reactive power factor</b>	$\sin\varphi: 1 \dots 0.5_{ind}$
<b>Accuracy class</b>	1.5
<b>Rated operating conditions:</b>	
- ambient temperature	-10...23...55°C
- relative humidity	≤ 75%
- frequency of the input quantities	acc. order (table 2)
- working position	acc. order ± 5° (table 3)
- external magnetic field	≤ 400 A/m
<b>Additional errors</b>	acc. EN 60051-1 standard
<b>Power consumption:</b>	
- voltage circuit	≤ 4.3 VA
- current circuit	≤ 0.2 VA

### Protection Grade acc. to EN60529

- front protection grade: IP 52
- terminal protection: IP00

**Housing material** thermoplastic, self-extinguishing plastic (UL 94V-O)

**Glass material** glass (in standard) anti-reflective glass on request

### Electromagnetic compatibility:

- emission acc. EN 61000-6-4 standard
- immunity acc. EN 61000-6-2 standard

The meter fulfils CE mark requirements.

### Safety requirements acc. EN 61010-1:

- installation category III
- level of pollution 2
- working voltage in relation to the earth 660 V a.c.

**Weight** 650-750 g

### ACCESSORIES

We deliver with the meter:

- screw holders ..... 2 pcs

### CHOICE OF MEASURING RANGE

1. Calculate the power from the formulas:

$P = U_n \times I_n$  for single-phase networks

$P = \sqrt{3} \times U_n \times I_n$  for three-phase networks

where:

$U_n$  - network rated voltage:

- for three-phase networks - phase-to-phase voltage,
- when connected through transformers-primary rated voltage.

$I_n$  - rated current:

- 5 A or 1 A,
- when connected through transformers-primary rated voltage.

2. Round the calculated power value to the nearest value from the given sequence of numbers for the measuring range.

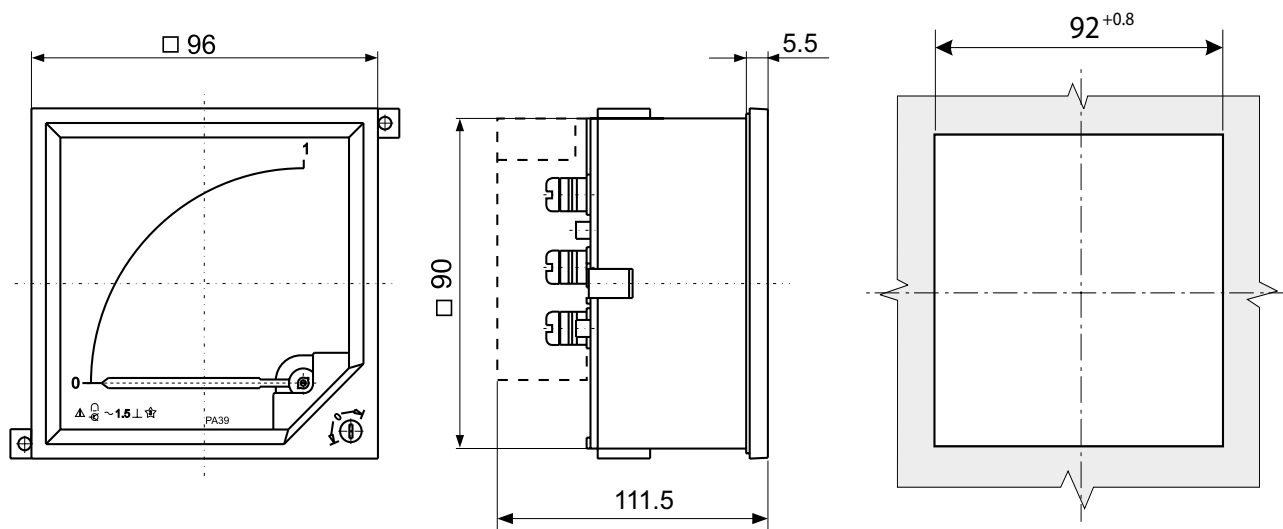
3. Example of measuring range choice.

Three-phase network; rated values of transformers: 15 000/100 V and 400/5 A

$P = \sqrt{3} \times 15\,000\text{ V} \times 400\text{ A} = 10,39\text{ MW (Mvar)}$

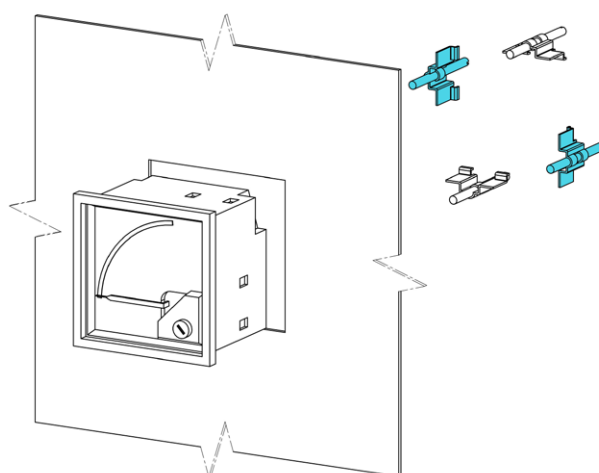
Selected measuring range: 10 MW (Mvar)

## EXTERNAL DIMENSIONS



**Fig 1. External dimensions of PA39 meter.**

## WAY OF THE METER FIXATION ON THE PANEL



**Fig. 2. Fixing of meters PA39 in the panel.**

**Included are two screw holders which should be fixed on arbitrary, opposite case corners**

## MEASURING RANGES

Table 3

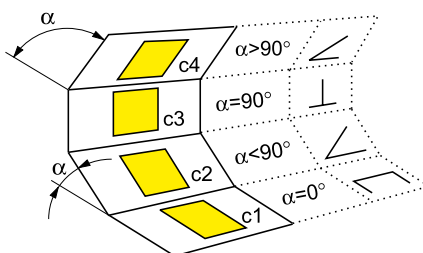
Un [V]	Single phase active power	A	$\frac{100}{\sqrt{3}}$	100	230	280	400																		
	3-phase 3-wire active power symmetrically loaded	B								230	400	500	690	$\frac{3000}{100}$	$\frac{6000}{100}$	$\frac{10000}{100}$	$\frac{15000}{100}$	$\frac{20000}{100}$	$\frac{30000}{100}$	$\frac{40000}{100}$	$\frac{60000}{100}$	$\frac{110000}{100}$	$\frac{220000}{100}$	$\frac{400000}{100}$	
	3-phase 3-wire active power asymmetrically loaded	C																							
	3-phase 4-wire active power symmetrically loaded	D								133	230	280	400	$\frac{3000}{100\sqrt{3}}$	$\frac{6000}{100\sqrt{3}}$	$\frac{10000}{100\sqrt{3}}$	$\frac{15000}{100\sqrt{3}}$	$\frac{20000}{100\sqrt{3}}$	$\frac{30000}{100\sqrt{3}}$	$\frac{40000}{100\sqrt{3}}$	$\frac{60000}{100\sqrt{3}}$	$\frac{110000}{100\sqrt{3}}$	$\frac{220000}{100\sqrt{3}}$	$\frac{400000}{100\sqrt{3}}$	
	3-phase 4-wire active power asymmetrically loaded	E								133	230	280	400	$\frac{3000}{100\sqrt{3}}$	$\frac{6000}{100\sqrt{3}}$	$\frac{10000}{100\sqrt{3}}$	$\frac{15000}{100\sqrt{3}}$	$\frac{20000}{100\sqrt{3}}$	$\frac{30000}{100\sqrt{3}}$	$\frac{40000}{100\sqrt{3}}$	$\frac{60000}{100\sqrt{3}}$	$\frac{110000}{100\sqrt{3}}$	$\frac{220000}{100\sqrt{3}}$	$\frac{400000}{100\sqrt{3}}$	
	3-phase 3-wire reactive power symmetrically loaded	F								230	400	500	690	$\frac{3000}{100}$	$\frac{6000}{100}$	$\frac{10000}{100}$	$\frac{15000}{100}$	$\frac{20000}{100}$	$\frac{30000}{100}$	$\frac{40000}{100}$	$\frac{60000}{100}$	$\frac{110000}{100}$	$\frac{220000}{100}$	$\frac{400000}{100}$	
	3-phase 3-wire reactive power asymmetrically loaded	G																							
	3-phase 4-wire reactive power symmetrically loaded	H								133	230	280	400	$\frac{3000}{100\sqrt{3}}$	$\frac{6000}{100\sqrt{3}}$	$\frac{10000}{100\sqrt{3}}$	$\frac{15000}{100\sqrt{3}}$	$\frac{20000}{100\sqrt{3}}$	$\frac{30000}{100\sqrt{3}}$	$\frac{40000}{100\sqrt{3}}$	$\frac{60000}{100\sqrt{3}}$	$\frac{110000}{100\sqrt{3}}$	$\frac{220000}{100\sqrt{3}}$	$\frac{400000}{100\sqrt{3}}$	
	3-phase 4-wire reactive power, asymmetrically loaded	K								133	230	280	400	$\frac{3000}{100\sqrt{3}}$	$\frac{6000}{100\sqrt{3}}$	$\frac{10000}{100\sqrt{3}}$	$\frac{15000}{100\sqrt{3}}$	$\frac{20000}{100\sqrt{3}}$	$\frac{30000}{100\sqrt{3}}$	$\frac{40000}{100\sqrt{3}}$	$\frac{60000}{100\sqrt{3}}$	$\frac{110000}{100\sqrt{3}}$	$\frac{220000}{100\sqrt{3}}$	$\frac{400000}{100\sqrt{3}}$	
	In/x	IN Code x=5 x=1	Power unit	Un Code																					
T				U	A	V	W	B	C	D	E	F	G	H	I	K	L	M	N	P	R	S			
1	-	A1	50	100	200	250	400	400	600	800	1.2	5	10	15	25	30	50	80	100	200	400	800			
5; 5/x	B5	B1	250	500	1	1.2	2	2	3	4	6	25	50	60	120	150	250	400	500	1	2	4			
10/x	C5	C1	500	1	2	2.5	4	4	6	8	12	50	100	150	250	300	500	800	1	2	4	8			
15/x	D5	D1	800	1.5	3	4	6	8	10	12	15	80	150	250	400	500	800	1.2	1.5	2.5	5	12			
20/x	E5	E1	1.2	2	4	6	8	8	12	15	20	100	200	300	500	600	1	1.5	2	4	8	15			
30/x	F5	F1	1.5	3	6	8	12	12	20	25	30	150	300	500	800	1	1.5	2	3	5	10	20			
50/x	G5	G1						20	30	40	50	250	500	800	1.2	1.5	2.5	4	5	10	20	40			
75/x	H5	H1						30	50	60	80	400	800	1.2	2	2.5	4	5	8	15	25	50			
100/x	I5	I1						40	60	80	100	500	1	1.5	2.5	3	5	8	10	20	40	80			
150/x	J5	J1						60	100	120	150	800	1.5	2.5	4	5	8	12	15	25	50	120			
200/x	K5	K1						80	120	150	200	1	2	3	5	6	10	15	20	40	80	150			
300/x	L5	L1						120	200	250	300	1.5	3	5	8	10	15	20	30	50	100	200			
400/x	M5	M1						150	250	300	400	2	4	6	10	12	20	30	40	80	150	300			
600/x	N5	N1						200	400	500	600	3	6	10	15	20	30	40	60	100	200	400			
800/x	P5	P1						300	500	600	800	4	8	12	20	25	40	60	80	150	300	600			
1000/x	R5	R1						400	600	800	1	5	10	15	25	30	50	80	100	200	400	800			
1200/x	S5	S1						500	800	1	1.2	6	12	20	30	40	60	100	120	250	500	1000			
1500/x	T5	T1						600	1	1.2	1.5	8	15	25	40	50	80	120	150	300	600				
2000/x	U5	U1						800	1.2	1.5	2	10	20	30	50	60	100	150	200	400	800				
3000/x	V5	V1						1.2	2	2.5	3	15	30	50	80	100	150	200	300	600	1000				
4000/x	W5	W1						1.5	2.5	3	20	20	40	60	100	120	200	300	400	800					
6000/x	X5	X1						2	4	5	6	30	60	100	150	200	300	400	600	1000					
10000/x	Y5	Y1						4	6	8	10	50	100	150	250	300	500	800	1000						
20000/x	Z5	Z1						8	12	15	20	100	200	300	500	600	1000								

Table 3

Table 2

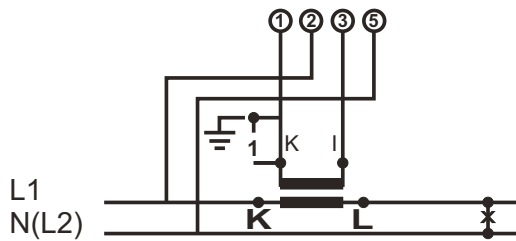
Input voltage frequency fn (Hz)	Codes
50	0
60	1

### OPERATING POSITIONS

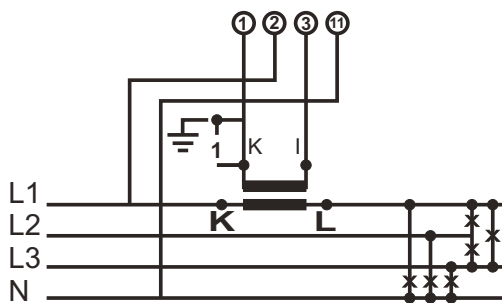


Code	Position
A	c1 $\alpha = 0^\circ$
B	c2 $\alpha = 15^\circ$
C	c2 $\alpha = 30^\circ$
D	c2 $\alpha = 45^\circ$
E	c2 $\alpha = 60^\circ$
F	c2 $\alpha = 75^\circ$
O	c3 $\alpha = 90^\circ$
H	c4 $\alpha = 105^\circ$
I	c4 $\alpha = 120^\circ$

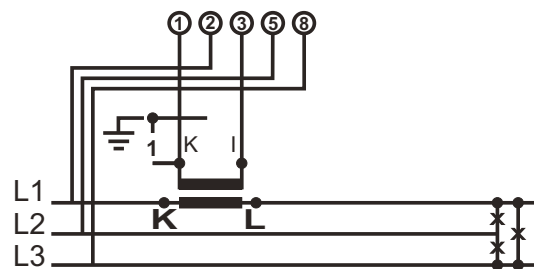
## ELECTRICAL CONNECTIONS



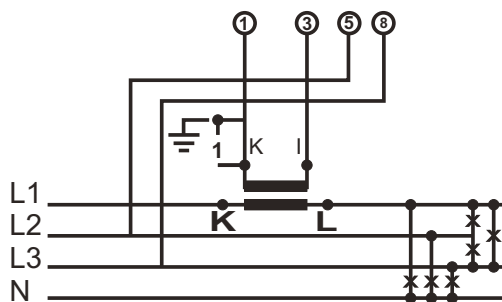
Active/reactive power measurement  
in single phase AC network



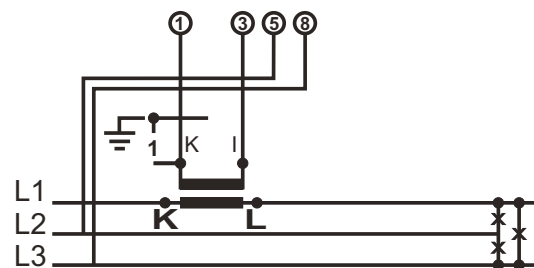
Active power measurement  
in 3-phase, 4-wire network  
balanced load



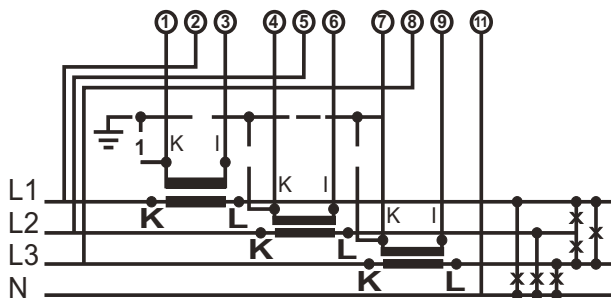
Active power measurement  
in 3-phase, 3-wire network  
balanced load



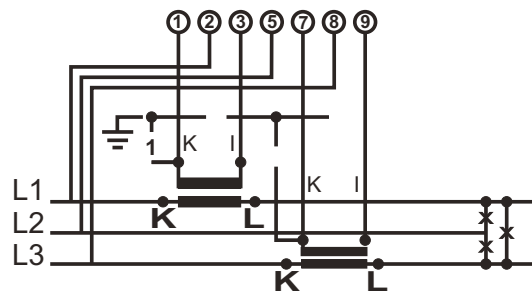
Reactive power measurement  
in 3-phase, 4-wire network  
balanced load



Reactive power measurement  
in 3-phase, 3-wire network  
balanced load



Active/reactive power measurement  
in 3-phase, 4-wire network  
unbalanced load



Active/reactive power measurement  
in 3-phase, 3-wire network  
unbalanced load

## ORDERING CODES

Table 4

PANEL POWER METER - PA39	X	X	X	XX	X	X	XX	X
<b>Kind of measured power and measuring system:</b>								
Measurement of active power in a single-phase network.....	A							
Measurement of active power in a 3-phase 3-wire symmetrically loaded network .....	B							
Measurement of active power in a 3-phase 3-wire asymmetrically loaded network .....	C							
Measurement of active power in a 3-phase 4-wire symmetrically loaded network .....	D							
Measurement of active power in a 3-phase 4-wire asymmetrically loaded network .....	E							
Measurement of reactive power in a 3-phase 3-wire symmetrically loaded network .....	F							
Measurement of reactive power in a 3-phase 3-wire asymmetrically loaded network .....	G							
Measurement of reactive power in a 3-phase 4-wire symmetrically loaded network .....	H							
Measurement of reactive power in a 3-phase 4-wire asymmetrically loaded network .....	K							
<b>Input voltage</b>								
write in the Un range code from the table 3.....	X							
<b>Frequency of the input voltage</b>								
write in the frequency code from the table 1 .....	X							
<b>Input current</b>								
write in the In range code from the table 3 .....				XX				
<b>Flow direction of the power</b>								
- unidirectional, zero on the left side of the scale .....								0
- bidirectional, zero in the middle of the scale .....								1
<b>Working position</b>								
write in the working position from the table 2 .....								X
<b>Versions:</b>								
with an additional adjustable pointer.....								03
catalogue .....								00
custom-made <sup>1)</sup> .....								XX
<b>Acceptance tests:</b>								
without additional requirements.....								8
with a quality inspection certificate .....								7
other requirements <sup>2)</sup> .....								X

<sup>1)</sup>The ordering code is given by the manufacturer after agreement.

<sup>2)</sup>The number code is given acc. customer's agreement.

## ORDERING WAY

In any order one must specify the name and the ordering code of the power meter using the tables: 1, 2, 3, and 4.

**Order example: PA39 HF0L500008**, means:

**H** - Reactive PA39 power meter adapted to a three-phase four-wire symmetrically loaded network.

**F** - Network rated voltage: 3000 V (from table 3).

**0** - Frequency of the input voltage: 50 Hz (from table 1).

**L5** - Network rated current: 300 A (from table 3).

**0** - Unidirectional power flow.

**0** - Working position: C3, vertical (from table 2).

**00** - Catalogue version.

**8** - without additional requirements concerning acceptance tests.

This power meter is destined to co-operate with **300 A/5 A** transformers and a **3000 V/100/√3 V** voltage transformers.

**Note:** concerning casing protection grade IP. When ordering, please precise the required grade option: **IP50** or **IP65**

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