POWER TRANSDUCERS FOR THREE-WIRE AND FOUR-WIRE NETWORKS WITH UNBALANCED LOADS

P33P, P33B, P34P, P34B

APPLICATION

These transducers (P3XX) are destined for a continuous power conversion in three-phase electrical networks with unbalanced load into a standard current or voltage a.c. signal.
Input circuits, output circuits and the supply are galvanically separated (transformer separation).
The range of conversion frequency enables the correct power measurement of distorted currents and voltages (up to the 25 th harmonic).
These transducers are applied in industrial conditions and can be mounted in any position.
Housings are made of a self-extinguishing plastics and adapted to fixing on a 35 mm rail acc. to EN 60715 standard.

Application of respective types:
P33P - for measurement of active power in 3-phase 3-wire systems,
P33B - for measurement of reactive power in 3-phase 3-wire systems,
P34P - for measurement of active power in 3-phase 4-wire systems,
P34B - for measurement of reactive power in 3-phase 4-wire systems,

Transducers of P3XX series are offered in two basic options:
P3XX-1 - *Programmed by the manufacturer*. With the programmed input power range in accordance with the execution code (the input power range is selected from the standard series of types - see table 1).
P3XX-2 - *Programmable*. With the possibility to program the change of the input power range in the interval : Pn-10%...Pn, (where Pn -nominal power calculated for nominal values of voltage and current inputs) and parameter parts of output signal.
The modification of tranducers parameters is possible by means of a PC computer through the PD13 programmer.

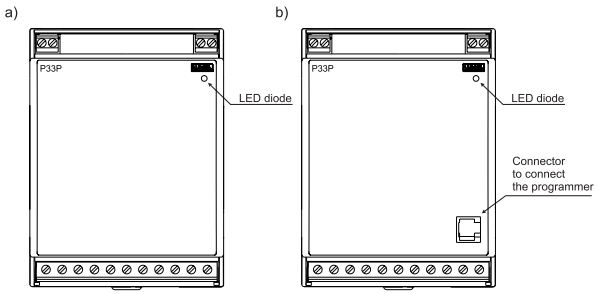

Fig.1 View of the programmer depending on the execution: a/ P3XX-1, b/ PXX-2

TECHNICAL DATA

Basic parameters:

- input current		1 A (X/1 A), 5 A (X/5 A)
- input voltage	phase:	100/√3 V (X/(100/√3V), 230 V, 400 V,
	phase-to-phase:	100 V (X/100 V), 400 V, 690 V,
- output signals		5 mA, 20 mA, 4-20 mA, 10 V
- accuracy class		0.5
- load resistance of the output:		
current, to 5 mA		≤ 2000 Ω
current, to 20 mA		≤ 500 Ω
voltage, to 10 V		≥ 500 Ω
- power consumption in the circuit:		
voltage measurement		≤ 0.6 VA
current measurement		≤ 0.3 VA
supply		≤ 4 VA
- transducer preheating time 15 min.		
- set-up time of the output signal (10/90%)		≤ 0.5 s
- limitation of the output current		30 mA ±10%

Reference and rated operating conditions:

- ambient temperature	-10...+23...+55°C
- supply (standard)	230 V, -15%, +10%, 50/60 Hz
- current frequency/input voltage frequency	45...65...1250 Hz
- input voltage	0...0.1...1.2 Un
- input current	0...0.01...1.2 In
- power factor (cosφ)	-1...0...1
- peak factor of the measured current	≤ 3
- peak factor of the measured voltage	≤ 2
- relative humidity	0...45...75...95% (no condensation)
- external magnetic field	0...40...400 A/m
- working position	any
Storage temperature	-25...+85°C

Additional errors caused by influence of:

- frequency of the input quantity	< 0.5 accuracy class
- ambient temperature	< 0.5 accuracy/10 K
- external magnetic field	< 0.5 accuracy class

Overload capacity of inputs:

Voltage:	
- short duration (10 s)	1.5·Un
- sustained	1.2·Un
Current:	
- short duration (3 s)	10·In
- sustained	1.2·In

Ensured protection degree:

- through the housing	IP 50
- at the terminal side	IP 20
Dimensions	90 x 120 x 100 mm
Weight	0.41 kg
Fixing	on a 35 mm rail, acc. to EN 60715

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Conformity with standard requirements

Service security requirements:

- requirements and testings: acc. to EN 61010-1
- insulation ensured by the housing: double
- insulation between circuits: basic
- installation category: III
- pollution level: 2
- maximal phase-to-earth working voltage: 600 V a.c.

Electromagnetic compatibility:

- immunity: acc.to EN 61000-6-2
- emission: acc. to EN 61000-6-4

INSTALLATION

P3XX transducers are designed to be installed on a 35 mm rail acc. to EN 60715 standard.
Overall dimensions and the fixing way are shown on the fig.2.

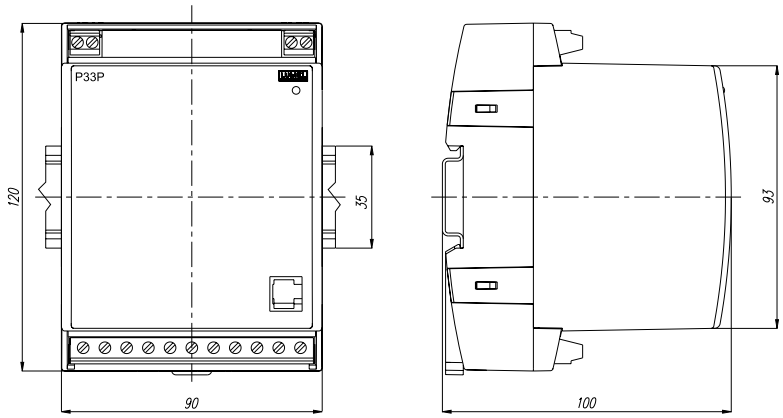


Fig.2 Overall dimensions and fixing way of the transducer

Table 1

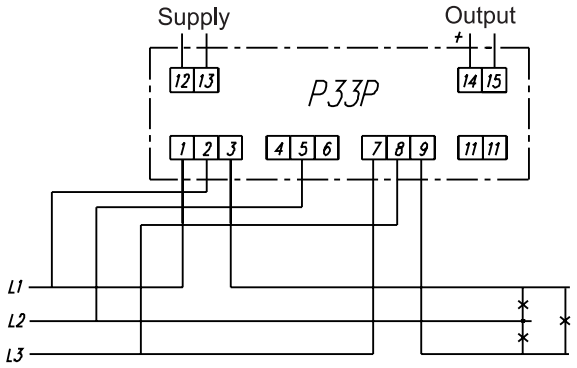
Un [V]																		
	3-phase 3-wire active power		3P	100	400	690	3000/100	6000/100	10000/100	15000/100	20000/100	30000/100	40000/100	60000/100	110000/100	220000/100	400000/100
	3-phase 3-wire reactive power		3B														
	3-phase 4-wire active power		4P	100/√3	230	400	3000/100/√3	6000/100/√3	10000/100/√3	15000/100/√3	20000/100/√3	30000/100/√3	40000/100/√3	60000/100/√3	110000/100/√3	220000/100/√3	400000/100/√3
	3-phase 4-wire reactive power		4B														

In/x	Code In		Power unit	Kod Un													
	x=5	x=1		A	G	I	K	L	M	N	P	R	S	T	U	V	W
1	–	A1	W,var	170	690	1,2	5	10	17	25	34	50	69	100	190	380	690
5; 5/x	B5	B1		800	3,4	6	25	50	80	120	170	250	340	500	950	1,9	3,4
10/x	C5	C1	kW; kvar	1,7	6,9	12	50	100	170	250	340	500	690	1	1,9	3,8	6,9
15/x	D5	D1		2,5	10	18	75	150	250	380	500	750	1	1,5	2,7	5,7	10
20/x	E5	E1		3,4	13	24	100	200	340	500	690	1	1,3	2	3,8	7,5	13
30/x	F5	F1		5	20	36	150	300	500	750	1	1,5	2	3	5,7	11	20
50/x	G5	G1		8	34	60	250	500	860	1,2	1,7	2,5	3,4	5	9,5	19	34
75/x	H5	H1		12	50	90	300	750	1,2	1,9	2,5	3,8	5	7,5	14	28	50
100/x	I5	I1		17	69	120	500	1	1,7	2,5	3,4	5	6,9	10	19	38	69
150/x	J5	J1		25	100	180	750	1,5	2,5	3,8	5	7,5	10	15	28	57	100
200/x	K5	K1		34	130	240	1	2	3,4	5	6,9	10	13	20	38	75	130
300/x	L5	L1		50	200	360	1,5	3	5	7,5	10	15	20	30	57	110	200
400/x	M5	M1		69	270	480	2	4	6,9	10	13	20	27	40	75	150	270
600/x	N5	N1		100	400	720	3	6	10	15	20	25	40	60	110	220	400
800/x	P5	P1		130	550	960	4	8	13	20	27	40	55	80	150	300	550
1000/x	R5	R1		170	690	1,2	5	10	17	25	34	50	69	100	190	380	690
1200/x	S5	S1		200	800	1,4	6	12	20	30	40	60	80	120	220	450	800
1500/x	T5	T1		250	1	1,8	7,5	15	25	38	50	75	100	150	280	570	1000
2000/x	U5	U1		340	1,3	2,4	10	20	34	50	69	100	130	200	380	750	
3000/x	V5	V1		500	2	3,6	15	30	50	75	100	150	200	300	570	1100	
4000/x	W5	W1		690	2,7	4,8	20	40	69	100	130	200	270	400	750		
6000/x	X5	X1	MW; Mvar	1	4	7,2	30	60	100	150	200	300	400	600	1100		
10000/x	Y5	Y1		1,7	6,9	12	50	100	170	200	340	400	690	1000			
20000/x	Z5	Z1		3,4	13	24	100	200	340	500	690	1000	1300				

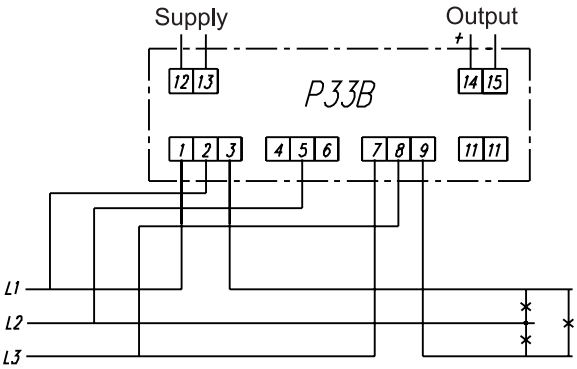
CONNECTION DIAGRAMS

P3XX transducers have three screw or self-locking (on order) terminal strips enabling the connection of 2.5 mm^2 cross-section conductors.
- connection of measuring signals (1...11 terminals),
- supply (12 and 13 terminals),
- output of the measuring signal (14 and 15 terminals).

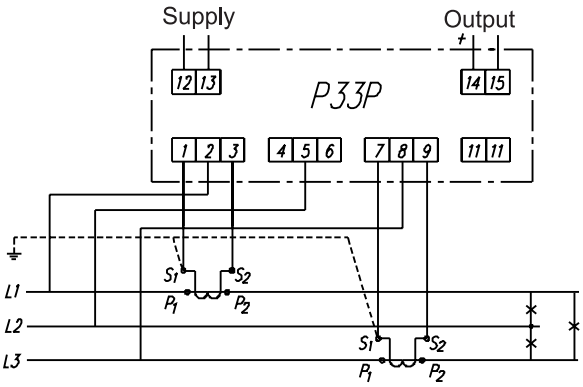
Fig. 3...6 show the connection way of external circuits depending on the transducer type and kind of the network. The connection diagram is also placed on the transducer housing.



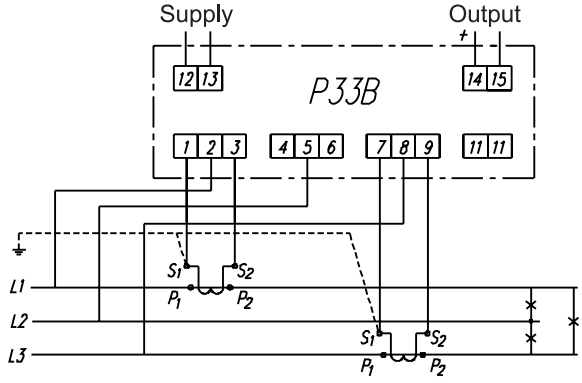
a/ Direct measurement of active power in 3-phase 3-wire network at unbalanced load



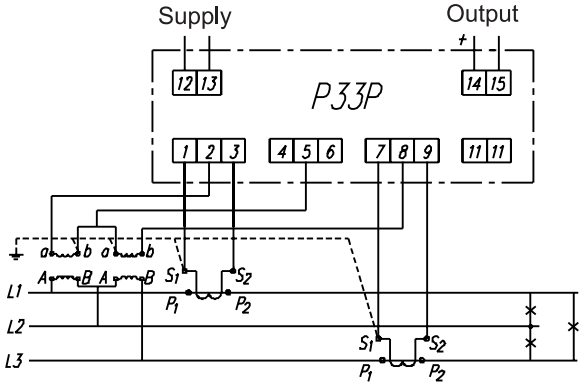
a/ Direct measurement of reactive power in 3-phase 3-wire network at unbalanced load



b/ Indirect measurement of active power in 3-phase 3-wire network with current transformers at unbalanced load

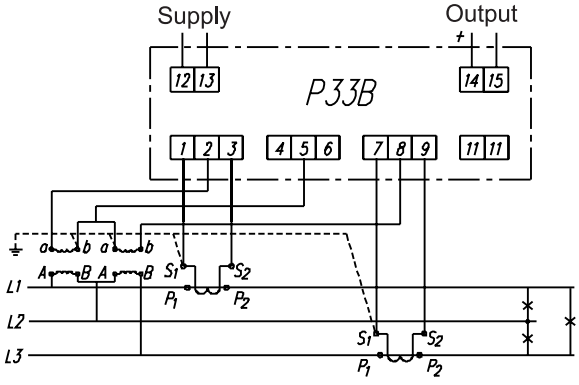


b/ Indirect measurement of reactive power in 3-phase 3-wire network with current transformers at unbalanced load



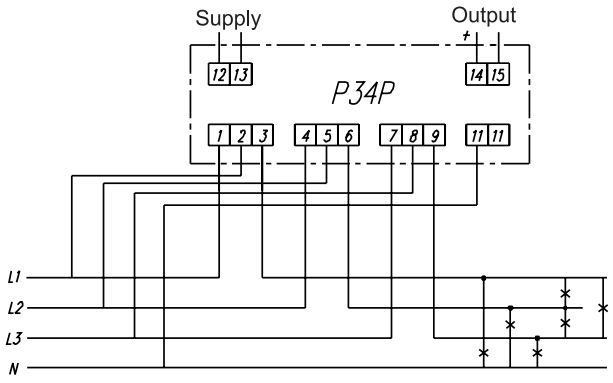
c/ Indirect measurement of active power in 3-phase 3-wire network with current and voltage transformers at unbalanced load

Fig. 3 Connection way of active power transducers in 3-phase 3-wire networks (3P3W)

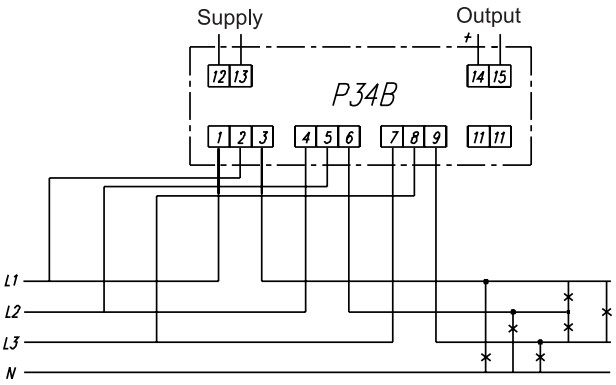


c/ Indirect measurement of reactive power in 3-phase 3-wire network with current and voltage transformers at unbalanced load

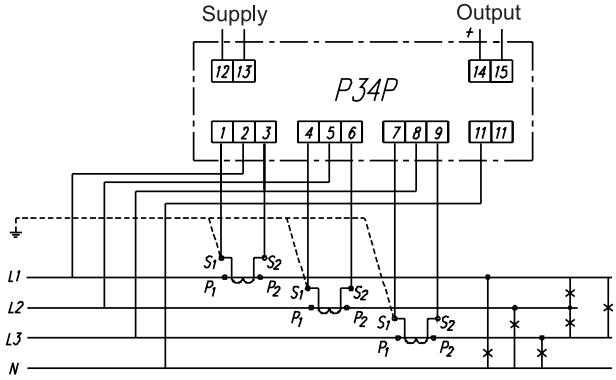
Fig. 4 Connection way of reactive power transducers in 3-phase 3-wire networks (3P3W)



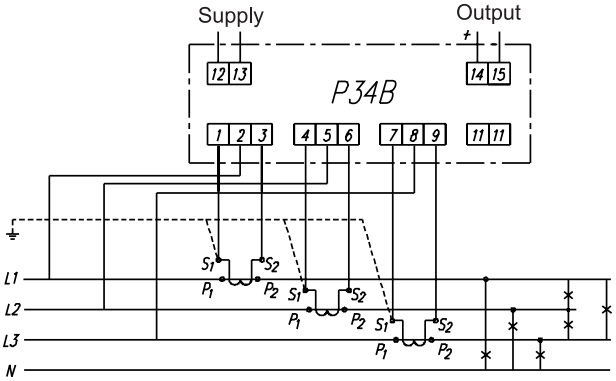
a/ Direct measurement of active power in 3-phase 4-wire network at unbalanced load



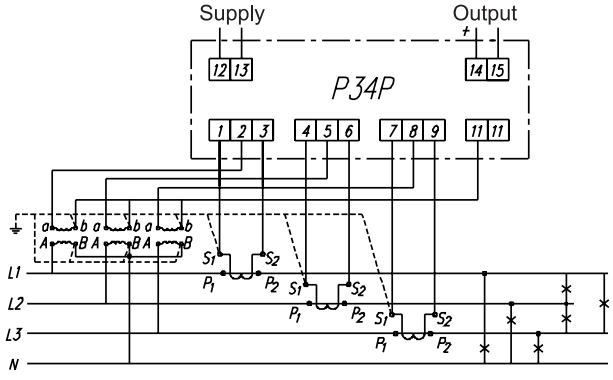
a/ Direct measurement of reactive power in 3-phase 4-wire network at unbalanced load



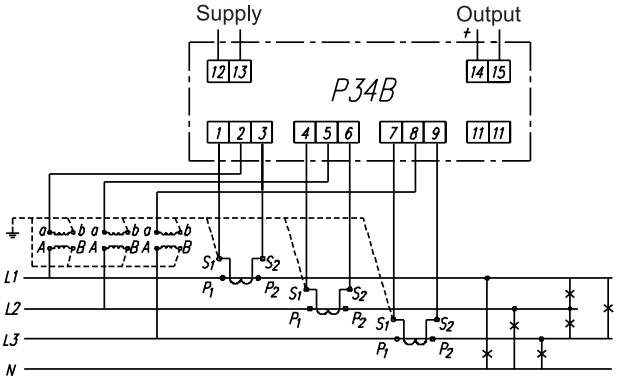
b/ Indirect measurement of active power in 3-phase 4-wire network with current transformers at unbalanced load



b/ Indirect measurement of reactive power in 3-phase 4-wire network with current transformers at unbalanced load



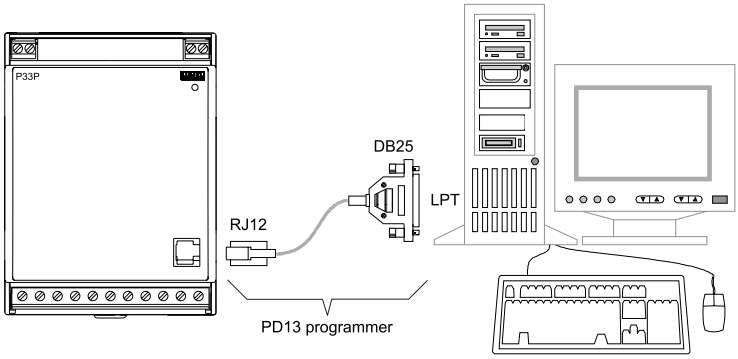
c/ Indirect measurement of active power in 3-phase 4-wire network with current and voltage transformers at unbalanced load



c/ Indirect measurement of reactive power in 3-phase 4-wire network with current and voltage transformers at unbalanced load

Fig. 5 Connection way of active power transducers in 3-phase 4-wire networks (3P4W)

Fig. 6 Connection way of reactive power transducers in 3-phase 4-wire networks (3P4W)



CHANGE OF P3XX-2 TRANSDUCER PARAMETERS

The modification of P3XX-2 transducer parameters is possible by means of the PD3 programmer and annexed software (if ordered).
The way of the P3XX-2 transducer connection to the computer is shown on the Fig. 7.
The description of the programming process is enclosed in the interactive software being in the PD3 programmer set.

Fig.7 Connection way of the P3XX-2 transducer to the computer.

ORDERING CODES

Ordering codes and ordering way of P3XX transducers

Table 2

PROGRAMMABLE TRANSDUCER P3	XX	X	XX	X	X	X	X	XX	X

Type of transducer:
- measurement of active power in 3-phase 3-wire network (3P3W) 3P
- measurement of reactive power in 3-phase 3-wire network (3P3W) 3B
- measurement of active power in 3-phase 4-wire network (3P4W) 4P
- measurement of reactive power in 3-phase 4-wire network (3P4W) 4B

Version:
- programmed by the manufacturer 1
- programmable* 2

Input current:
- programmed by the manufacturer A1
  (write the range code from the table 1) ...
  Z5
- programmable on the range 1 A 01
- programmable on the range 5 A 05
- on order** XX

Input voltage:
- programmed by the manufacturer ..... A
  (write the range code from the table 1) ...
  W
- programmable: 3P4W/3P3W***
  on the range 57.7/100 V 1
  on the range 230/400 V 2
  on the range 400/690 V 3
- on order** X

Output signal:

0 - 5 mA,	Rload = 0...2000 Ω	1
0 -20 mA,	Rload = 0...500 Ω	2
4 -20 mA,	Rload = 0...500 Ω	3
0 -10 V,	Rload = ≥ 500 Ω	4
-5...0...+5 mA,	Rload = 0...2000 Ω	5
-20...0...+20 mA,	Rload = 0...500 Ω	6
-10...0...10 V,	Rload = ≥ 500 Ω	7
on order**		X

Supply voltage:
230 V, -15%, +10%, 50/60 Hz 1
on order** X

Kind of terminals:
socket - screw plug 1
on order X

Version:
standard 00
custom-made XX

Acceptance tests:
without a extra quality inspection certificate 0
with an extra quality inspection certificate 1
acc. to user's agreement X

* The transducer has a programmed upper value of the measured power range.
** Each custom-made version must be defined with the manufacturer.
*** Depending on network configuration: the value of the phase voltage in the 3P4W system or the value of the phase-to-phase voltage in the 3P3W system (without neutral wire).

CODING EXAMPLE

P33P-1-A1-G-1-1-1-00-0

P33P - transducer for measurement of active power in 3-phase 3-wire network (3P3W)
1 - programmed by the manufacturer on 0...600 W range
A1 - input current: 1 A
G - phase-to-phase voltage: 400 V
1 - output signal: 0.5 mA
1 - supply voltage: 230 V a.c. (50/60 Hz)
1 - kind of terminals: socket-screw plug
00 - standard version
0 - without an extra quality inspection certificate

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