LUMEL

PROGRAMMABLE TRANSDUCER OF AC CURRENT AND AC VOLTAGE SIGNALS AND FREQUENCY

P21Z TYPE

USER'S MANUAL

CE

Contents

1. APPLICATION

P21Z transducers are used for converting one parameter: a.c. voltage, a.c. current or frequency into a standardized direct current signal, direct voltage signal or digital signal available through RS485 interface. The transducers are designed also to work with voltage and current transformers.

P21Z transducer may be configured with PD14 programmer. This programmer and eCon software enable users to program the following settings:

- measurement averaging time,
- converting characteristics
- value of output signal when limit value are exceeded,
- constraining output signal,
- transmission parameters of RS485.

The transducer has galvanic isolation between the individual blocks of:

- power
- measurement input,
- output and PD14 programmer.

2. TRANSDUCER SET

The transducer set includes:

- P21Z transducer	1 pc
- user's manual	1 pc
- guarantee card	1 pc
- cap for programmer socket	1 pc

3. BASIC REQUIREMENTS AND OPERATIONAL SAFETY

The operational safety of the transducer is compliant with the requirements of EN 61010-1 standard

The meaning
of the following symbol:  - Attention! Danger!

Observations Concerning the Operational Safety:

- All operations concerning transport, installation, and commissioning as well as maintenance, must be carried out by qualified, skilled personnel, and national regulations for the prevention of accidents must be observed.
- Before switching the transducer on, one must check the correctness of connections to the network.
- Before removing the transducer housing, one must switch the supply off and disconnect measuring circuits.
- The removal of the transducer housing during the guarantee contract period may cause its cancellation.
- The P21Z transducer is destined to be installed and used in industrial electromagnetic environment conditions.
- One must remember that in the building installation, a switch or a circuit-breaker should be installed. This switch should be located near the device, easy accessible by the operator, and suitably marked.

4. INSTALLATION

4.1 Mounting

P21Z transducers are designed for mounting on a 35 mm according to PN-EN 60715. Dimensions and mounting method are presented in Fig. 1.

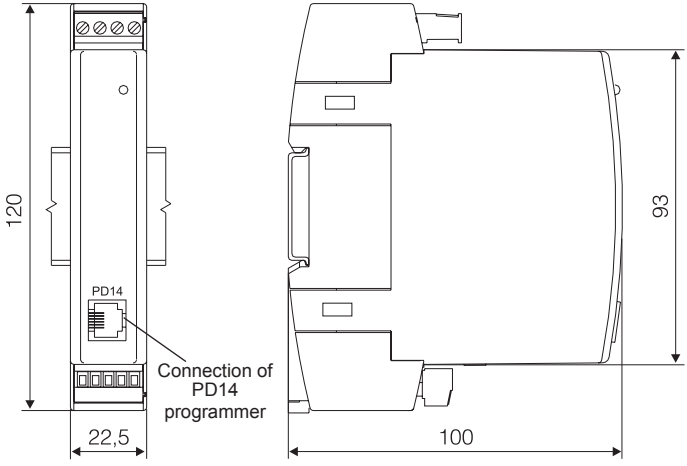
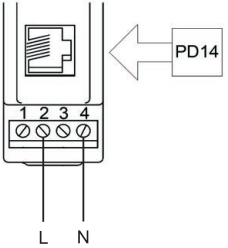


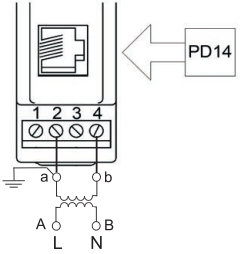
Fig 1. Dimensions and mounting of the transducer.

4.2 Diagrams of external connections

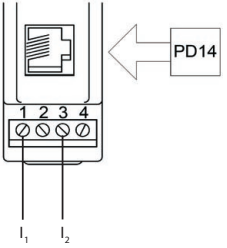
The transmitter transducer has a detachable terminal strip with screw terminals that enable user to connect external power supply and output cables with cross section up to 2.5 mm^2. Input signals shall be connected with wires of a maximum diameter of 1.5 mm^2 to fixed screw terminals.



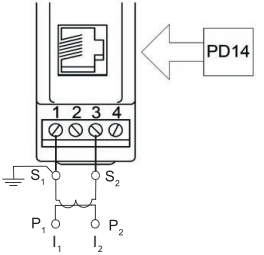
Direct measurement of voltage



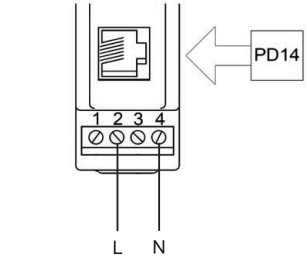
Indirect measurement with voltage transformer



Direct measurement of current



Indirect measurement with current transformer



Direct measurement of frequency

Indirect measurement of frequency with voltage transformer

Fig. 2. Electric connections of P21Z inputs.

a) analog output

b) interface RS-485

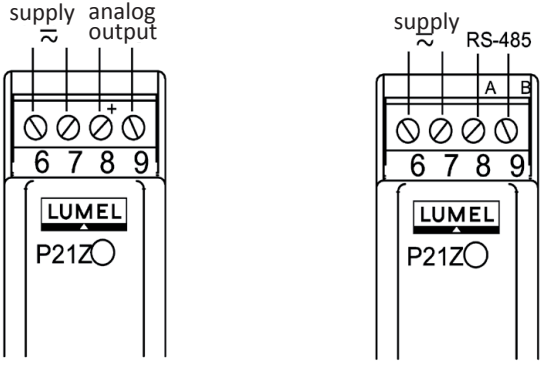
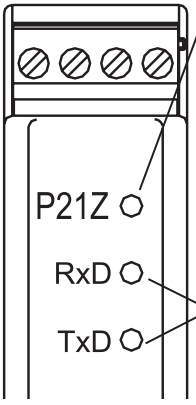


Fig. 3. Electric connections of P21Z power supply and output.

5. OPERATION

After the transducer is switched on, its Status LED should illuminate in red (transducer initialization), then it should turn green (normal operation).



Status LED of the transducer:

- when illuminated in green – normal operation;
- when illuminated in red – incorrect operational parameters; re-configure the transducer;
- when flashes in red – no calibration or damaged non-volatile memory; transduce should be returned to the manufacturer;

LEDs installed only in version with RS485 interface:

- RxD LED is on – data receipt;
- TxD LED is on – data transmission.

Fig. 4. P21Z transducer view.

Data entry into the register is confirmed by a short illumination of the Status LED in red.

Before the required number of correct measurements (according to Table 1) is achieved, the device displays arithmetic mean from the completed measurements. Subsequent measurements are added applying the walking window principle, i.e. the “oldest” measurement is deleted and replaced by the most recent one. When values outside the measuring range are measured, the device indicates it and correct measurements are counted from the beginning. Default time is set to 1s.

Table 1

Averaging time	Number of averaged measurements	Refreshing processed value (time of one measurement)
0.5 s	1	every 0.5 s
1 s	2	every 0.5 s
3 s	6	every 0.5 s
5 s	10	every 0.5 s
10 s	20	every 0.5 s
15 s	30	every 0.5 s
30 s	60	every 0.5 s
1 min	100	every 0.6 s
2 min	100	every 1.21 s
5 min	100	every 3 s
7 min	100	every 4.2 s
12 min	100	every 6 s
15 min	100	every 9.1 s

The transducer may be programmed with analog output values (values of the output register in RS-485 design) at exceeded input measurement range. The following parameters are adjustable: expected output value when lower limit is exceeded (Out-d) for values below the lower limit (In-d) and expected output value when upper limit is exceeded (Out-u) for values above the upper limit (In-u) – the values are presented in Table 3.

5.1 Transducer configuration with eCon software

Configuration of P21Z transducers is performed with eCon software available free of charge at www.lumel.com.pl. Detailed description of parameter configuration is presented in the Manual for Transducer configuration with eCon software. Transducers with RS-485 interface may be configured directly via the interface. When configuring the transducer via PD14 programmer, disconnect RS-485 interface.

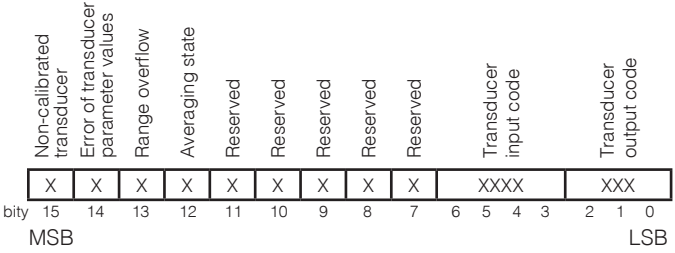
5.2 Register map (for version with RS-485)

Table 2

Register address	Operations	Range	Decription
4000	RW	0..12	Averaging time: 0 – 0.5 s; 1 – 1 s; 2- 3 s; 3 – 5 s; 4 – 10 s; 5 - 15 s; 6 - 30 s; 7 - 1 min; 8 – 2 min s; 9 - 5 min; 10 – 7 min; 11 – 12 min; 12 – 15 min;
4001	RW	0..2	Continuous output: 0 - normal work, 1 – value from register7602, 2- value from register 7603
4002	RW	0..3	Continuous output – Operation with exceeded limit values and type of measured signal: 0 – inactivated, 1 – activated,
4003	RW	1..247	Address in MODBUS network
4004	RW	0..3	Transmission mode: 0->8n2, 1->8e1,2->8o1, 3->8n1

4005	RW	0..2	Transmission mode: 0->4800, 1->9600, 2->19200
4006	RW	0, 1	Change MODBUS transmission parameters: 1 - change
4007	R	0...65535	Status
4008	R	0	reserved
4009	R	0..65535	reserved
4010	R	0..65535	reserved
4011	R	0..65535	Software version

Status register description



Bit-15 Uncalibrated transducer

0 – transducer measuring input calibrated

1 – signal of uncalibrated transducer input

Bit-14 Error of transducer parameter values

0 – transducer parameters correct

1 – signaling of an incorrect transducer parameter readout

Bit – 13 Signaling of an range overflow

0 – normal work

1 – range overflow

Bit-12 Averaging
0 – full measurement averaging time expired
1 – full measurement averaging time not expired

Bits- 11 – 7 Reserved

Bits - 6 - 3 Measuring input

Bit 6	Bit 5	Bit 4	Bit 3	Meaning
0	0	0	0	reserved
0	0	0	1	100 V a.c.
0	0	1	0	250 V a.c.
0	0	1	1	400 V a.c.
0	1	0	0	1 A a.c.
0	1	0	1	5 A a.c.
0	1	1	0	20...500 Hz

Bity-2 - 0 Output

Bit 2	Bit 1	Bit 0	Meaning
0	0	0	reserved
0	0	1	current output 0(4)…20 mA
0	1	0	current output 0(4)…20 mA
0	1	1	voltage output 0…10 V
1	0	0	RS-485

Table 3

Register address 2x16 bit	Register address 32 bit	Operations	Description
7200	7600	RW	Continuous output – lower input value (x1)
7202	7601	RW	Continuous output – upper input value (x2)
7204	7602	RW	Continuous output – lower output value (y1)
7206	7603	RW	Continuous output – upper output value (y2)
7208	7604	RW	Input lower overflow In-d
7210	7605	RW	Input upper overflow In-u
7212	7606	RW	Expected value on the output Out-d at lower overflow In-d
7214	7607	RW	Expected value on the output Out-u at upper overflow In-u
7216	7608	R	Value measured, taking into account registers 7604 and 7605 reg. 7608 = reg. 7604 if reg. 7609 ≤ register 7604 reg. 7608 = rej. 7605 if reg. 7609 ≥ register7605
7218	7609	R	Measured value
7220	7610	R	Output value

5.3 Manufacturer's parameters

Table 4

Parameter description	Range / Value	Default value *
Averaging time****	0.5 s; 1 s; 3 s; 5 s; 10 s; 15 s; 30 s; 1 min; 2 min s; 5 min; 7 min; 12 min; 15 min;	1 s
Continuous output: operation mode	normal work, minimum output, maximum output	normal work
Continuous output: transition characteristic: (x1, y1) →(x2, y2)	-999999…999999	x1 = 0 or –Un or –In; x2 = Un or In, y1 = 0 or –Un lub –In or 4; y2 = 10 or 20
Continuous output: overflow service	inactivated, activated	inactivated measure-ment **
Lower input overflow	-999999…999999	0
Upper input overflow	-999999…999999	Un or In **
Expected value on the output at lower overflow	-999999…999999	0, 4 **,1e+20***
Expected value on the output at upper overflow	-999999…999999	11 V or 24 mA or 1e+20***
Address in MODBUS network ***	1…247	1
Transmission mode ***	8n2, 8e1, 8o1, 8n1,	8n2
Baud rate ***	4800, 9600, 19200	9600

* - depending on design

**- For 4..20 mA version, overflow service is activated, minimum output value is set at 4 mA, input values: minimu and maximum are calculated according to transition data.

*** - only for version with RS-485 output

****- for transducers with the input for frequency measurement, the measurement time is always 1s, regardless the values in registers 7200 and 7600.

6. TECHNICAL DATA

Measuring ranges

INPUTS:

Measuring range for AC voltage (Un):

0..1..100…130 V a.c.
0..2.5..250…325 V a.c.
0..4..400…600 V a.c.

} input resistance > 2 MΩ

Measuring range for AC current (In):

0..0.01..1.0…1.3 A a.c. input resistance 10 mΩ ± 10 %
0..0.05..5.0…6.3 A a.c. input resistance 2 mΩ ± 10 %

Frequency measurement 20...500 Hz:
(in range of 24...480 V)) input resistance > 2 MΩ

Analog output

current 0(4)…20…24 mA
load resistance ≤ 250 Ω
voltage 0…10…11 V
load resistance ≥ 500 Ω
resolution 0.01 % of range
output response time: 200 ms

Serial interface

RS485: address 1..247
mode: 8N2, 8E1, 8O1,8N1
baud rate: 4.8, 9.6, 19.2 kbit/s
transmission protocol: Modbus RTU
response time: 200 ms

Basic conversion error (by default settings):

voltage and current:	0.2% of range in the frequency range 45...65 Hz
frequency:	0.02 % of range

Additional errors in rated operating conditions:
from ambient temperature changes (100 % of basic error/10 K)

Sustained overload: 150 % Un (in. 400V a.c.), 120 % Un (other inputs), 120 % In

Short duration overload (1 s): voltage input 2 Un (<1000 V)
current input: 10 In

Admissible peak factor: current: 2
voltage: 2

Rated operating conditions:

supply voltage	85..253 V a.c. 40..400 Hz; 90..300 V d.c. 20..40 V a.c. 40..400 Hz; 20..60 V d.c.
ambient temperature	- 20...23...60 °C
storage temperature	-25...+85 °C
humidity	< 95 % (inadmissible condensation)
work position	any

Averaging time – measurement (programmable): ≥ 0.5 s

Pre-heating time: 15 minutes

Galvanic isolation between:

- supply – meas.input: 3.2 kV d.c.
- supply – output: 2 kV d.c.
- measuring input – output: 3.2 kV d.c.

Ensured protection grade acc. to EN 60529:

- for the housing IP40
- from the terminal side IP20

Dimensions: 22.5 x 100 x 120 mm

Weight: 0.125 kg

Fixing: 35 mm rail acc. to EN 60715

Input power: < 3 VA

Electromagnetic Compatibility:

- noise immunity acc. to EN 61000-6-2
- noise emissions acc. to EN 61000-6-4

Safety requirements acc. to EN 61010 -1 standard:

– isolation between circuits: basic
– installation category III (for version 400 V – cat. II)
– pollution level 2
– maximal phase-to-earth working voltage:
  - for power supply circuit 300 V
  - for measuring input 600 V – cat. II (300 V – cat. III)
  - for programming input 50 V
  - for output 50 V
– altitude above sea level < 2000 m.

7.ORDERING CODE

Table 5

PROGRAMMABLE TRANSDUCER OF AC CURRENT AND AC VOLTAGE **P21Z** -	X	X	X	XX	X	X
Input signal:						
100 V a.c.	1					
250 V a.c.	2					
400 V a.c.	3					
1 A a.c.	4					
5 A a.c.	5					
frequency 20...500 Hz	6					
Output:						
0...20 mA		1				
4...20 mA		2				
0...10 V		3				
RS-485		4				
Supply voltage:						
85..253 V a.c. 40..400 Hz; 90..300 V d.c.			1			
20..40 V a.c. 40..400 Hz; 20..60 V d.c.			2			
Version:						
standard				00		
non-standard setti ngs				NS		
custom-made*				XX		
Language:						
Polish					P	
English					E	
other*					X	
Acceptance tests:						
without extra quality inspecti on requiremnts						0
with an extra quality inspecti on certificate						1
acc. to customer's request*						X

***** - after agreeing with the manufacturer

Order example:

The code **P21Z - 1 1 1 00 E 0** means**:**

P21Z - transducer of d.c. current or d.c. voltage signals

1 - input signal: 1...100 V a.c.

1 - output signal: 0...20 mA

1 - supply voltage: 85..253 V a.c. 40..400 Hz; 90..300 V d.c.

00 - standard version

E - English language

0 - without extra quality inspecti on requirements

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