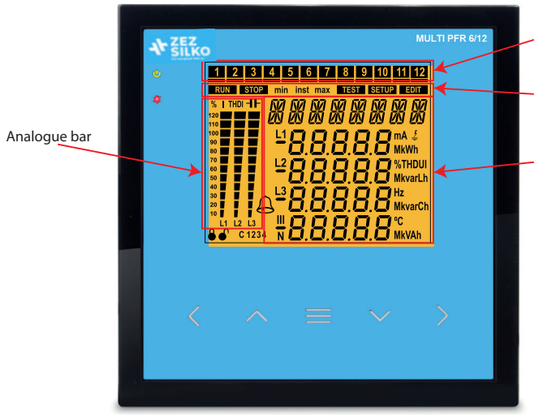

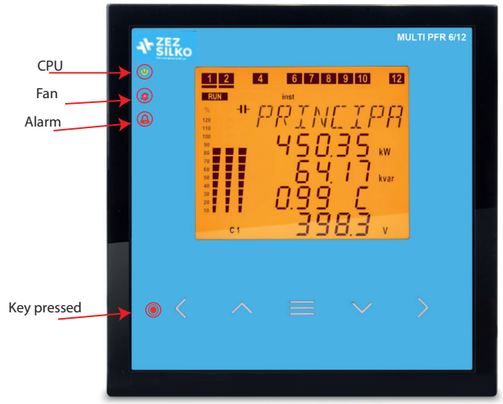

MULTI PFR 6 / MULTI PFR 12

REACTIVE ENERGY CONTROLLER

PROGRAMATION GUIDE

The **MULTI PFR 6 / MULTI PFR 12** controller measures the power grid cosine and controls capacitor connection and disconnection in order to correct it. It also calculates and displays the main electrical parameters of balanced or unbalanced single-phase and three-phase networks.

This manual is a **MULTI PFR 6 / MULTI PFR 12** programation guide.
For further information, please download the full manual from the ZEZ SILKO web site:
www.zez-silko.com

ZEZ SILKO

Keyboard functions

Measuring displays

Key	Short keystroke	Long keystroke (3s)
∧	Previous screen	-
∨	Next screen	-
<	Display of minimum value	Erase of minimum value
>	Display of maximum value	Erase of maximum value
≡	Next parameter	Setup menu
∨ ∧	**Very Long keystroke (10 s):** Enter Test screens	

Displays configuration and testing, **check mode**

Key	Short keystroke	Long keystroke (3s)
∧	Previous screen	**Test:** Manual connects the displayed transformer
∨	Next screen	**Test:**Manual disconnects the displayed transformer
<	Display of minimum value	-
>	Display of maximum value	-
≡	Next parameter	**Test:** Cancel the AutoTest
∨ ∧	**Very Long keystroke (10 s):** Enter Test screens	

Displays configuration and testing, **edit mode**

Key	Short keystroke
∧	Increases the digit value or shows the next option
∨	Reduces the digit value or shows the previous option
>	Skips to the next digit
<	Skips to the previous digit
≡	Enter/ Output edit mode

Display Indicators

Key	
RUN	The unit is in measurement and regulation mode
STOP	The unit does not measure or regulate
SETUP	Indicates that you are in the setup menu
TEST	Indicates that you are in the test menu.
EDIT	Indicates that, within the setup menu, you are in edit mode

Calculating the C/K Factor

Calculating the C/K factor

Relation of the current transformer (CT)

It= CT primary current

$$K=\frac{It}{5}$$

Ic= The smallest transformer current

$$I_C = \frac{Q}{\sqrt{3}.V}$$

Calculating the C/K

$$C/K = \frac{I_C}{K}$$

Example: Relation of the TC= 500/5

1st transformer: 60 kvar; 400V

1. $K = 500/5 = 100$
2. $I_C = \frac{60000}{\sqrt{3}\cdot 400}$
3. $C/K = \frac{86,7}{100} = \mathbf{0,867}$

Table C/K Factor

Ratio (Ip / Is)	Power of the smallest stage at 400 V (kvar)													
	2.5	5.0	7.5	10.0	12.5	15.0	20.0	25.0	30.0	40.0	50.0	60.0	75.0	80.0
150/5	0.12	0.24	0.36	0.48	0.60	0.72	0.96							
200/5	0.09	0.18	0.27	0.36	0.45	0.54	0.72	0.90						
250/5	0.07	0.14	0.22	0.29	0.36	0.43	0.58	0.72	0.87					
300/5	0.06	0.12	0.18	0.24	0.30	0.36	0.48	0.60	0.72	0.96				
400/5	0.05	0.09	0.14	0.18	0.23	0.24	0.36	0.48	0.58	0.72	0.87			
500/5		0.07	0.11	0.14	0.18	0.22	0.29	0.36	0.45	0.54	0.72	0.87		
600/5		0.06	0.09	0.12	0.15	0.18	0.24	0.30	0.36	0.48	0.60	0.72	0.90	0.96
800/5			0.07	0.09	0.11	0.14	0.18	0.23	0.27	0.36	0.45	0.54	0.68	0.72
1000/5			0.05	0.07	0.09	0.11	0.14	0.18	0.22	0.29	0.36	0.43	0.54	0.57
1500/5				0.05	0.06	0.07	0.10	0.12	0.14	0.19	0.24	0.29	0.36	0.38
2000/5						0.05	0.07	0.09	0.11	0.14	0.18	0.22	0.27	0.28
2500/5							0.06	0.07	0.09	0.12	0.14	0.17	0.22	0.23
3000/5							0.05	0.06	0.07	0.10	0.12	0.14	0.18	0.19
4000/5									0.05	0.07	0.09	0.11	0.14	0.14

For other voltages or conditions not included in the table, the value of C/K can be obtained by means of a simple calculation.

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Access the setup menu

Measuring display

Long keystroke (3s)

(short keystrokes)

Password Secuency

(correct password)

Configuration display:

Setting of values and options in the configuration displays

Key	Short keystroke
^	Increases the digit value or shows the next option
v	Reduces the digit value or shows the next option
<	Skips to the previous digit
>	Skips to the next digit
≡	Enter/ Output edit mode

Access Measuring display

Any configuration display

Long keystroke (3s) (or if we don't play any key for 5 mins)

Simulation data — Display showing: - Measurement of cos ϕ - Reactive power phase - Steps to connect

Long keystroke (3s) (or if we don't play any key for 5 mins)

Start regulation — Makes the connection of the previously mentioned steps in the simulation display

Plug&Play — (short keystroke) — OFF ^ START — **Help to automatically configure the basic parameters for regulation. These parameters can be set manually in the setup displays.**

(short keystroke) — ***Validate*** (short keystroke)

Current tranformation ratio — (short keystroke) — Set the value of primary and secondary current transformer. *See Setting of values* — **Primary maximum value: 9999. Primary minimum value: 1. Secundary posibles values : 1 ó 5.**

(short keystroke) — ***Validate*** (short keystroke)

Target Cos ϕ — (short keystroke) — Set 1st cos ϕ target. *See Setting of values Check the full manual to activate rest of cos ϕ via digital inputs (optional).* — **Value between 0.8 inductive (L) y 0.8 capacitive (C).** ** Recomendation: cos ϕ = 1*

(short keystroke) — ***Validate*** (short keystroke)

Conection and reclosingn time — (short keystroke) — Set the time,in cycles,of computer actions *See Setting of values* — **"t.on" is the minimal time,in cycles, between the conection or disconection of two steps. "t. rec" is the minimal time,in cycles, between the conection or disconection of same step.** *Recomendation *: t.on = 10 t.rec = 50 ("t.rec" must be 5 times greater than "t.on")*

(short keystroke) — ***Validate*** (short keystroke)

Conection type — (short keystroke) — Select the connection type of installation. *See Setting of values* — **- 3U3C, 3 voltages (with or without neutral) and 3 currents - 3U1C, 3 voltages (with or without neutral) and 1 current - 2U1C, 2 voltages (between phases) and 1 curent.**

(short keystroke) — ***Validate*** (short keystroke)

Phase conection — (short keystroke) — Select the correct phase sequence. *See Setting of values* — **- If you select the connection with 1 current (3U1C ó 2U1C) you can select one of the 6 posibles phases shown in the manual. - If you select the connection with 3 currents (3u3C) each current is associated with the voltage and current direction indicated. d : direct. i : invers.**

(short keystroke) — ***Validate*** (short keystroke)

Num. stages — (short keystroke) — Select the number of stages, number of relay outputs . *See Setting of values* — **We can set up 6 or 12 outputs according to model.**

(short keystroke) — ***Validate*** (short keystroke)

Program — (short keystroke) — Set the steps sequency with different powers *See Setting of values* — **Example: Programe 1.1.1.1, all the steps have the same power as the first . Programe 1.2.4.4, the 2nd step have doble power and the rest, four times more that 1st.**

(short keystroke) — ***Validate*** (short keystroke)

C/K factor — (short keystroke) — Filter by category reactive current supplied to smaller step, measurement in the secondary of the current transformer . *See Setting of values* — **See section for calculating C/K Factor**

(short keystroke) — ***Validate*** (short keystroke)

Advanced Setup — (short keystroke) — Access advanced configuration displays, following basic configuration displays *See Setting of values* — **For advanced setup check the manual .**

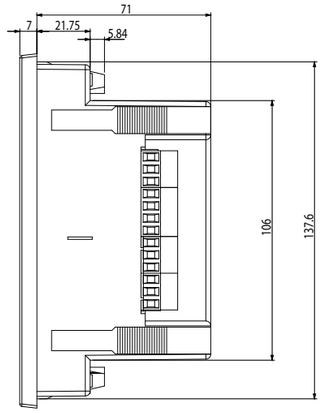
(short keystroke) — ***Validate*** (short keystroke)

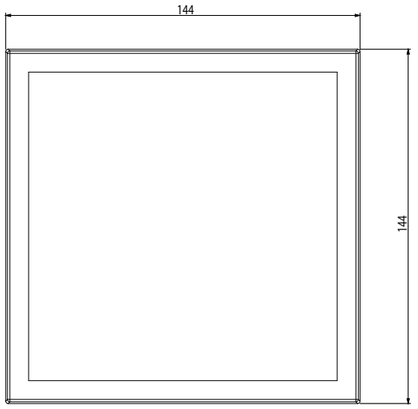
**** Recommended values by ZEZ SILKO, check the particularity of the own instalation, legislations and regulations in each country.***

MULTI PFR 6 / MULTI PFR 12

REACTIVE ENERGY CONTROLLER

Dimensions





This manual is a **MULTI PFR 6 / MULTI PFR 12** installation guide. For further information, please download the full manual from the **ZEZ SILKO** web site: www.zez-silko.com.

IMPORTANT!

The unit must be disconnected from its power supply sources (power supply and measurement) before undertaking any installation, repair or handling operations on the unit's connections. Contact the after-sales service if you suspect that there is an operational fault in the unit. The unit has been designed for easy replacement in case of malfunction.

The manufacturer of the unit is not responsible for any damage resulting from failure by the user or installer to heed the warnings and/or recommendations set out in this manual, nor for damage resulting from the use of non-original products or accessories or those made by other manufacturers.

1. DESCRIPTION

MULTI PFR 6 / MULTI PFR 12 is a unit that measures the network's cosine parameters and controls capacitor connection and disconnection to correct it. It also calculates and displays the main electrical parameters of balanced or unbalanced single and three-phase networks. The measurement is taken in RMS, with four AC voltage inputs and three current inputs.

There are 2 versions of the unit, depending on the number of output relays:

- ✓ **MULTI PFR 6,** with six output relays.
- ✓ **MULTI PFR 12,** with twelve output relays.

2. INSTALLATION

The unit will be installed on a panel ($138^{+0.8}$ x $138^{+0.8}$ mm panel drill hole, in compliance with DIN 43700). All the connections are located inside the electric panel.

IMPORTANT!

Take into account that when the device is connected, the terminals may be hazardous to the touch, and opening the covers or removing elements may provide access to parts that are dangerous to the touch. Do not use the device until it is fully installed

¡DANGER!

The **MULTI PFR 6 / MULTI PFR 12** is connected to units with capacitors that remain charged even after the voltagehas been disconnected. **Wait at least 5 minutes** after the unit is disconnected before handling its internal components to avoid the risk of electric shock. **Any manipulation or use of the unit other than that specified by the manufacturer may compromiseuser safety.**

The unit must be connected to a power circuit that is protected with gl (IEC 269) or M type fuses with a rating of 0.5 to 2 A. It must be fitted with a circuit breaker or equivalent device, in order to be able to disconnect the unit from the power supply network.
The power and voltage measuring circuit must be connected with cables that have a minimum cross-section of 1.5 mm^2.

1 or 3 external current transformers (CT) need to be installed in order to measure current. Usually, the transformation ratio of these CTs is In/5 A, where the In must be at least 1.5 times greater than the total maximum load current.

The secondary cables of the current transformers (CT) must have a minimum cross-section of 2.5 mm2. If the distance between the CTs and the unit is over 25 m, this cross-section must be increased by 1 mm2 for every 10 m.

The current transformers (CTs) must be installed at the power line connection point through which the entire load current circulates, and where more compensation is needed for the capacitor load currents.

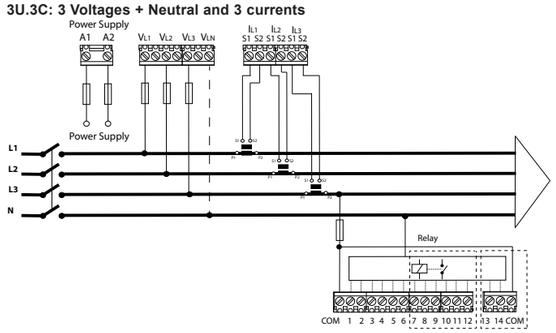
Technical features

AC Power supply	MULTI PFR 6	MULTI PFR 12
Rated voltage	100 ... 520 V ~	100 ... 520 V ~
Frequency	50 ... 60 Hz	
Maximum Consumption	10 ... 16 VA	13 ... 20 VA
Installation category	CAT III 300V	
Voltage measurement circuit		
Rated voltage (Un)	230 V F-N / Ph-N, 400 V F-F/ Ph-Ph	
Voltage measurement margin	20...300 V F-N / Ph-N , 35...520 V F-F/ Ph-Ph	
Frequency measurement margin	45 ... 65 Hz	
Input impedance	660 kΩ	
Min. voltage measurement (Vstart)	20 V F-N / Ph-N, 35 V F-F/ Ph-Ph	
Installation category	CAT III 300V	
Current measurement circuit		
Rated current (In)	.../5A o .../1A	
Current measurement margin	1...120% Un	
Min. current measurement (Istart)	50 mA	
Leakage current measurement circuit		
By differential transformer (500 turns)		
Secondary rated current	3 mA	
Current measurement margin	10 mA ... 1.5 A	
Min. current measurement (Istart)	10 mA	
Measurement accuracy	**EN 61557-12**	
Voltage measurement	0.5% ± 1 digit	
Current measurement	0.5% ± 1 digit	
Active power measurement	0.5% ± 2 digits	
Reactive power measurement	1% ± 2 digits	
Active energy measurement	1 Class	
Reactive energy measurement	2 Class	
Digital outputs		
Quantity	2	
Type	NPN	
Maximum voltage	24 V ⎓	
Maximum current	50 mA	
	MULTI PFR 6	**MULTI PFR 12**
Quantity	6 outputs 1 fan 1 alarm	12 outputs 1 v fan 1 alarm
Max. voltage open contacts	1kV	
Max. current	1 A	
Maximum switching power	2500 VA	
Electrical life (250V CA/ 5A)	$30x10^3$ ciclos	
Mechanical life	$5x10^6$ ciclos	
Digital input		
Quantity	2	
Type	Potential free contact	
Insulation	optoisolated	
Communications		
Bus	RS-485	
Protocol	Modbus RTU	
Baud rate	9600-19200	
Stop bits	1-2	
Parity	without - even - odd	
User interface		
Display	LCD Custom COG	
Keyboard	Capacitive, 5 keys	
LED	4 LED	
Environmental features		
Operating temperature	-10ºC... +55ºC	
Storage temperature	-20ºC ... +70ºC	
Relative humidity (non-condensing)	5 ... 95%	
Maximum altitude	2000 m	
Protection degree	IP31 Front panel: IP51	
Mechanical features		
Dimensions	144x144x78 mm	
Weight	575 gr	
Enclosure	Self-extinguishing V0 plastic	
Attachment	Panel	
Standars		
EN 61010:2010, EN 61000-6-2:2005, EN 61000-6-4:2005.		

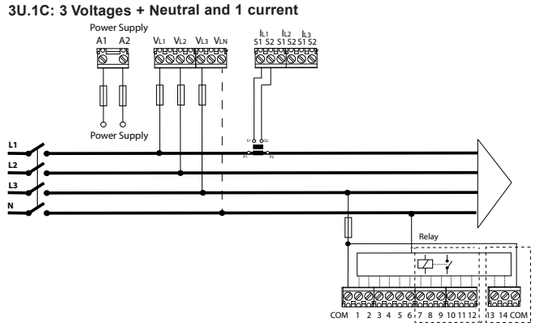
Note : Unit images are for illustrative purposes only and may differ from the actual unit.

Connections

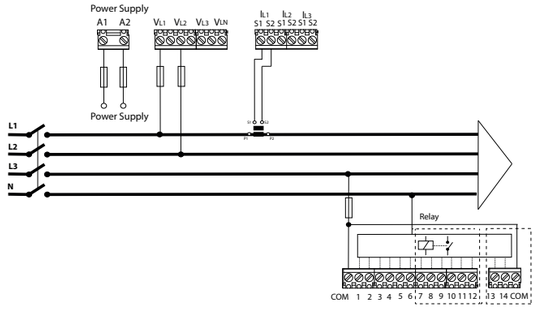
3U.3C: 3 Voltages + Neutral and 3 currents



3U.1C: 3 Voltages + Neutral and 1 current

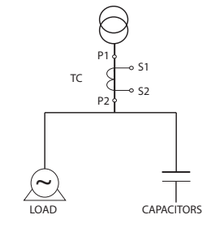
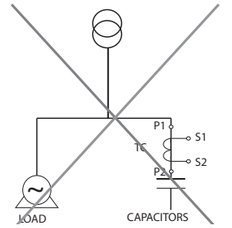
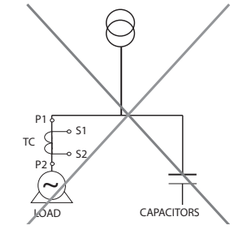


2U.1C: 2 Voltages and 1 current

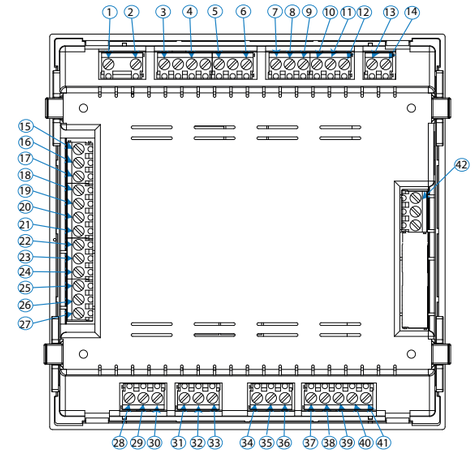


Terminal connections designations			
1,2	**A1, A2**, Auxiliary power supply	24	**9**, 9 Relay output (**MULTI PFR 12**)
3	V_{L1}, L1 Voltage input	25	**10**, 10 Relay output (**MULTI PFR 12**)
4	V_{L2}, L2 Voltage input	26	**11**, 11 Relay output (**MULTI PFR 12**)
5	V_{L3}, L3 Voltage input	27	**12**, 12 Relay output (**MULTI PFR 12**)
6	V_{LN}, Neutral voltage input	28	**A(+)**, RS485
7	**S1**, L1 Current input	29	**B(-)**, RS485
8	**S2**, L1 Current input	30	**S**, GND for RS485
9	**S1**, L2 Current input	31	**1**, 1 Digital Input
10	**S2**, L2 Current input	32	**2**, 2 Digital Input
11	**S1**, EL3 Current input	33	**C**, Common digital inputs
12	**S2**, L3 Current input	34	**1**, 1 Digital output
13	**S1**, Leakage current input	35	**2**, 2 Digital output
14	**S2**, Leakage current input	36	**C**, Common digital outputs
15	**COM**, Common relay output	37	Fan relay output
16	**1**, 1 Relay output	38	Fan relay output
17	**2**, 2 Relay output	39	**NC**, Alarm relay output
18	**3**, 3 Relay output	40	**C**, Alarm relay output
19	**4**, 4 Relay output	41	**NO**, Alarm relay output
20	**5**, 5 Relay output	42	**COM**, Common relay output
21	**6**, 6 Relay output		
22	**7**, 7 Relay output (**MULTI PFR 12**)		
23	**8**, 8 Relay output (**MULTI PFR 12**)		

Current Transformers connection (CT)

OK	NOK	
		
The current transformers (CT) must measure the current together with the capacitors plus the loads **If it does not work, make sure that the CTs are not short circuited.**	If the CTs are connected in this position, NONE OF THE CAPACITORS WILL BE CONNECTED, even if there are inductive loads. **The unit does not compensate.**	If the CTs are connected in this position ALL THE CAPACITORS WILL BE CONNECTED, but they will not be disconnected if the load drops. **Risk of over-compensation in the network with no load.**

Key	
^	**Short keystroke:**
	Previous screen
v	**Short keystroke:**
	Next screen
<	**Short keystroke:**
	Display of minimum value
	Long keystroke (3 s):
	Erase of minimum value
>	**Short keystroke:**
	Display of maximum value
	Long keystroke (3 s):
	Erase of maximum value
≡	**Short keystroke:**
	Next parameter
	Long keystroke (3 s):
	Setup menu
v ^	**Very Long keystroke (10 s):**
	Enter Test screens



ZEZ SILKO, s.r.o.
Pod Černým lesem 683
564 01 Žamberk
Česká republika
tel.: +420 465 673 111
e-mail: zez@zez-silko.cz
www.zez-silko.cz

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