

1-phase and symmetrical 3-phase power monitoring

Phase angle monitoring

Analogue, pulse or relay outputs

Galvanic separation, supply - input - output

DC supply or AC supply voltages up to 400 VAC

Made in accordance with the CE and EMC regulations



PPV10 is a programmable multirange converter / isolation amplifier with 1- and 3-phase voltage input, one current input and current, voltage, pulse or relay outputs.

The unit has a number of programmable input functions:

Monitoring of phase angle or power consumption on single phase AC or DC loads.

Monitoring of phase angle or power consumption on symmetrical 3-phase loads.

The unit is supplied with 2 voltage range and 3 current range inputs, in order to achieve the highest possible accuracy.

The unit can operate between 20 and 750 V input voltage and 150 mA to 6 A input current. If the metering current exceeds 6 A, you can use an external current transformer, and in this way it is also possible to monitor very big loads.

The supply voltage for the unit is separated from the metering signal, this is particularly interesting, if there is a big variation of the metering voltages.

You can select between 2 different output configurations:

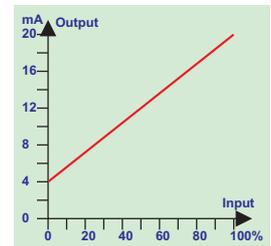
- Type A is supplied with analogue current output, programmable between 0 and 20 mA and analogue voltage output, programmable between -10 and +10 V.
- Type B has the same outputs as type A, but in addition it is also supplied with pulse output, programmable to a maximum frequency of 10 kHz.

The unit is supplied with 2 trimming potentiometers, which can be used to fine-adjust the metering range, if the unit is used with analogue outputs. In either case the potentiometers can be disabled, if adjustment is not required.

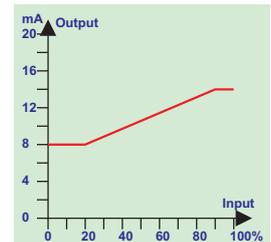
If you want, you can order the unit with specific metering ranges, or you can program it yourself, by means of the C-mac programming software for PC and a small interface to connect between the PC and the module.

All parameters in the converter are programmable within the specified limitations (min. and max. input and output levels), giving the following possibilities:

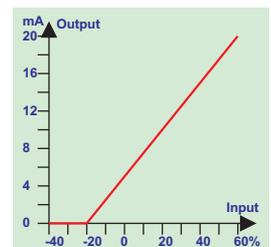
- **Basic converter (0 to defined input range and standard output range, 0-20 mA, 4-20 mA or 0-10 V).**



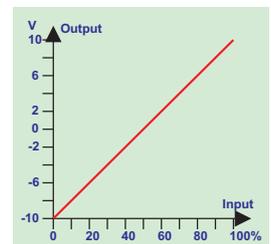
- **Converter with input and/or output offset, e.g. 200 to 800 W input and 8 to 15 mA output.**



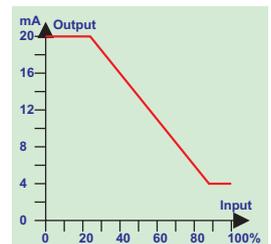
- **Bidirectional input range (phase angle), e.g. -50 to +40 deg.**



- **Bidirectional output range (only voltage output), e.g. -10 to +10 V.**



- **Inverted function with or without offset, e.g. 300 to 200 W input and 4-20 mA output.**



PPV10 connections:

Supply voltage.

terminal 15 and 16

Inputs.

- 1: voltage input, phase 1, $V_{in} > 75 \text{ V}$
- 2: voltage input, phase 1, $V_{in} < 75 \text{ V}$
- 3: voltage input, phase 2, $V_{in} > 75 \text{ V}$
- 4: voltage input, phase 2, $V_{in} < 75 \text{ V}$
- 5: voltage input / phase 3,
and load current, input
- 6: load current, output, $I_{max} = 6 \text{ A}$
- 7: load current, output, $I_{max} = 3 \text{ A}$
- 8: load current, output, $I_{max} = 0,9 \text{ A}$

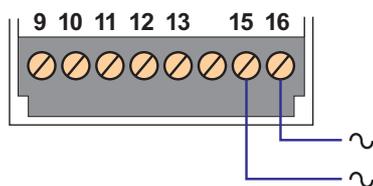
Outputs, type PPV10-A and PPV10-B.

- 9: output, common
- 10: current output
- 11: voltage output
- 12: pulse output only(type PPV10-B)

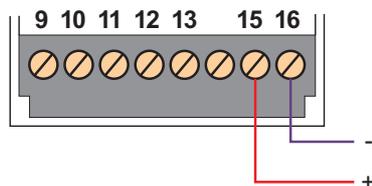


Connection examples:

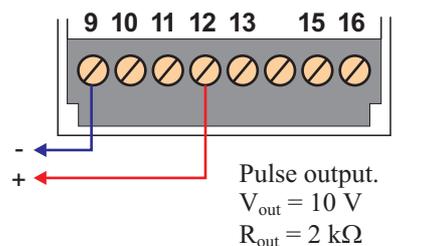
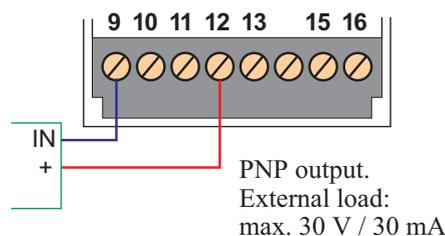
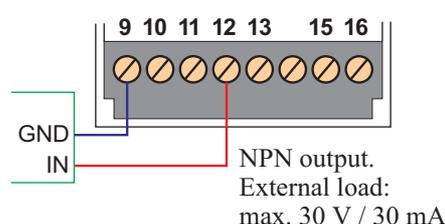
Supply voltage, AC



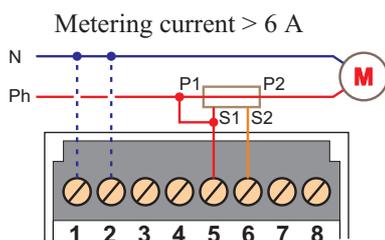
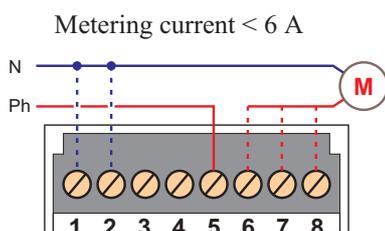
Supply voltage, DC



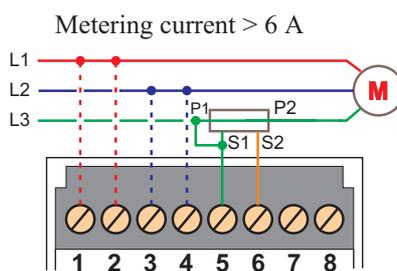
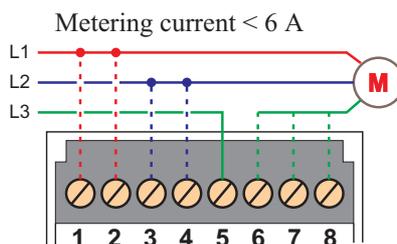
Pulse outputs only(type PPV10-B):



Inputs, 1-phase metering:

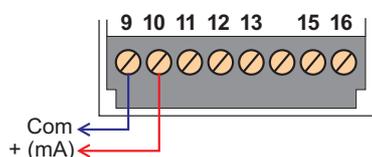


Inputs, 3-phase metering:



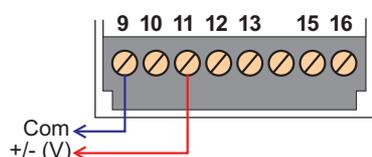
Analogue current output:

Programmable ranges between 0 and 20 mA

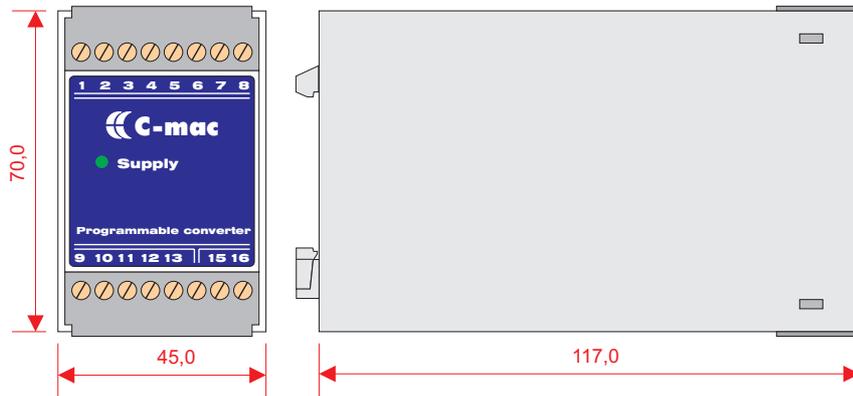


Analogue voltage output:

Programmable ranges between -10 og +10 V



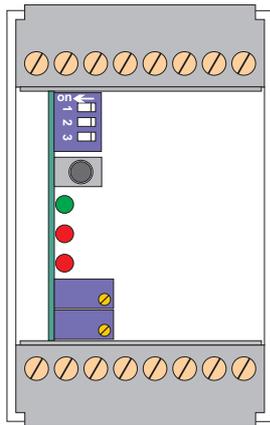
Mechanical dimensions:



Materials:

Housing base:	CYCOLOY C2100, grey
Frontplate:	CYCOLOY C2100, grey
Terminal cover:	CYCOLOY C2100, black
Terminals:	nickel plated brass
Screws:	nickel plated iron
Weight:	350 g

Programming connections and adjustments:



Programming connector CON.

Connects to the PC via C-mac interface cable.

The interface unit is internally battery powered, which means it is not necessary to connect any external supply voltage to the PPV unit during programming.

Function selector switch DS.

- 1 OFF: Normal mode
- 1 ON: Programming mode
- 2 OFF: Disable P1 adjustment
- 2 ON: Enable P1 adjustment
- 3 OFF: Disable P2 adjustment
- 3 ON: Enable P2 adjustment

Potentiometers P1 and P2.

PPV10-A and PPV10-B:

- P1 = Offset fine adjust +/- 5%
- P2 = Span fine adjust +/- 5%

PPV10 programming.

It is possible to program and reprogram the unit at any time, no matter if the supply voltage is connected or not. If the program is modified while the unit is installed and in operation, all input signal conversions are disabled and the output will not update as long as DS 1 is ON. Programming of the unit is made by following the instructions in the C-mac programming software. The unit starts with the modified program as soon as DS 1 is switched back to OFF position.

Fine adjustments with potentiometer 1 and 2.

In order to avoid unwanted modifications of the programmed ranges and to ensure a good temperature stability it is only possible to fine-adjust the programmed metering ranges if you use the following procedure:

When you have a known and stable input signal, you set switch 2 or 3 ON, for P1 or P2 adjustment, respectively. When the switch has been activated for minimum 2 seconds, the supply LED extinguishes and the output signal changes to the value, which corresponds to the actual position of the potentiometer. Now you adjust the output signal to the wanted value, and then you set the switch back in OFF position. The modified range is now programmed, and the power LED is ON again. If you want to adjust the ranges again, you set the switch back in ON position, wait for the LED to extinguish, adjust on the potentiometer, and set the switch back in OFF position.

Please notice, that it is only possible to adjust on one of the potentiometers at a time, i.e. you cannot set both switch 2 and 3 ON simultaneously.

Reset to the programmed settings.

If you have fine-adjusted the programmed ranges, and you want to reset to the original settings, you use the following procedure: Set switch 2 or 3 ON, depending on which of the ranges you want to reset. Wait for the supply LED to extinguish. Set switch 1 ON, and reset switch 2 or 3 to OFF position. Set switch 1 OFF again. Now the selected range has been reset, and you can repeat the procedure on the other range, if you want.

Technical data:

Supply voltage AC:	24, 115, 230 and 400 VAC +/- 10%
Supply frequency:	40-70 Hz
Supply voltage DC:	12-50 VDC
Isolation voltages:	Supply - internal electronics: 3,75 kV Input - output: 2.5 kV
Power consumption:	6 VA
Operation temp.:	-20°C to +60°C
Humidity:	0-90% RH, non condensing
Temp. coefficient:	< 0.003% /°C

EMC data.

Emission:	EN 50 081 - 1
Immunity:	EN 50 082 - 2
Safety:	EN 60 730 - 1

Approvals. The module is produced in accordance with CE and high voltage regulations.

Speed and accuracy.

Conversion speed:	in - out delay: 300 msec
Accuracy:	better than 0,2%, except at 6 A range at $I_{in} > 5$ A: accuracy better than 1%
Linearity:	better than 0.02%
Resolution:	Between 0,037% and 0,1%, dependent on the programmed metering range. If the unit is programmed with input and/or output offset, the resolution will be reduced proportionally. In either case the actual resolution is informed, when the unit is programmed.

Indications:

Yellow LED: Steady light = supply ON
Flashing = programming mode

Outputs.

Current output:	Terminals 9-10, programmable from 0 to 20 mA. Max. external load: 500 Ω
Voltage output:	Terminals 9-11, programmable from -10 to +10 V. Min. external load: 1000 Ω
Pulse output:	Terminals 9-12, programmable NPN, PNP or active output. NPN and PNP: Max. external voltage: 30 VDC Max. load: 30 mA Active output: $V_{out} = 10$ V $R_{out} = 2$ k Ω Min. load resistance: 10 k Ω

Out of range: If the input signal is above or below the specified range, the output signal can move up to 5% above or below the specified output range. If wanted, this function can be disabled.

Inputs.

Single phase voltage input:

Terminals 1-5:	max. voltage 750 VAC or DC
Terminals 2-5:	max voltage 75 VAC or DC min. voltage range 20 V

3-phase voltage input:

Terminals 1-3-5:	max. voltage 3 x 750 VAC
Terminals 2-4-5:	max. voltage 3 x 75 VAC min. voltage range 3 x 20 V

Current shunt:

Terminals 5-6:	$R_{in} = 10$ m Ω , max. current 6 A max. inrush current (20 sec): 20 A
Terminals 5-7:	$R_{in} = 20$ m Ω , max. current 3 A max. inrush current (20 sec): 20 A
Terminals 5-8:	$R_{in} = 50$ m Ω , max. current 0.9 A max. inrush current (20 sec): 10 A min. current range: 150 mA

Programming.

When you are programming the unit you must define the current range, the voltage range and the wanted output range in power, phase angle or $\cos \varphi$, and the programming software will then inform about the actual resolution. If the output is programmed to indicate the power consumption, the resolution is informed for $\cos \varphi = 1$. With a smaller $\cos \varphi$, the resolution is reduced proportionally. If you use the module in connection with an external current transformer, you must also define the current ratio (i.e. 100/5), and the programming software will then include this ratio in the power calculation.

Panel mounting:

If several units are placed beside each other, there must be minimum 5 mm space between the units.

Ordering guide.

1. Basic units without range programming.

PPV10-x-yyy

x = **Output configuration.**

A: Current and voltage output
B: Current, voltage and pulse output

yyy = Supply voltage.

024 = 24 VAC
115 = 115 VAC
230 = 230 VAC
400 = 400 VAC 712 = 12-50 VDC

2. Converters included range programming.

When the modules are ordered with programmed ranges, the same ordering numbers are used to specify the basic unit, but in addition, the wanted ranges must be specified, as shown on the examples below:

e.g. 1: PPV10-A-230 V_{in} : 3 x 400 VAC, I_{in} : 5 A,
CT: 200/5 P_{in} : 0-100 kW, I_{out} : 4-20 mA

e.g. 2: PPV10-B-024 V_{in} : 230 VAC, I_{in} : 200 mA,
 P_{in} : 0-50 W I_{out} : 0-10 V Pulse out: NPN,
0-5000 p.p.h., pulse width 100 msec.