cosφ controller CPR-1.7

FEATURES

The cosine phi controller CPR 1.5 is used for voltage regulation for fine synchronization and cosine phi regulation of mains parallel operating synchronous generators and includes the following functions:

- Voltage regulator
- cosφ regulator
- Set point value setting via
  - analogue input 4..20 mA
  - Front panel potentiometer
- Quasi continuous controller
  +/- step
- Continuous controller
  Analog output 0 ... 20 mA / 4... 20 mA
- Data Interface

DESCRIPTION

2.1 Voltage Regulation

The voltage regulation is put into operation by applying the enable signal at terminal "En U" (terminal 4) and "EN n" (terminal 6). If the generator is in the range of the nominal voltage (+/- 15%) the output relays start to clock pulses for fine adjustment of the generator voltage to the mains voltage. In this case the analog output is the control variable as a continuous +/- 20 mA control signal. Bridging terminal 16,17 activates the internal shunt of 500 Ohm to realize an output signal of +/- 10 V.

End of range and offset of the analog output can be set via front panel potentiometers. The gain of the analog signal can be inverted to adapt the controller to various AVR. The analog output is galvanically isolated.

2.2 cosine φ Regulation

After parallel switching (terminal 6, "N n" = 0 V) and coming up power output of the generator, the unit switches to the cosφ regulation mode.

In this mode the relay outputs (U +, U-) work as a quasi-continuous control step regulator. (Pulse-pause modulation, PPM).
The analog output is the control variable as a continuous +/- 20 mA control signal. Bridging terminal 16,17 activates the internal shunt of 500 Ohm to realize an output signal of +/- 10 V.
The setpoint can be adjusted via a front panel potentiometer or via the analog input 4..20 mA. The switchover is automatic when the analogue input signal increases 3 mA.
The analog output has PI control characteristics. The parameters kp and ki may be set with front-side potentiometer.

The rate of change of the analog output can be adjusted with the potentiometer ΔI/Δt, in the range of 0.5 ... 20 mA / s.

3.1 Operating sequence

The unit can be started with existing mains / generator voltage through the enable input (Terminal 5=“GND“ / 4=„EN U“, 6=„En n“ = +12/24 V).

Voltage regulation for synchronization and power factor control operate in this mode

Alternatively, the operation of the device can be started with activated enable and the delivery of power of the generator.

If the device is used to power factor control only, voltage control is deactivated by leaving the connections of the enable input "EN n" unconnected.

4.0 Data interface

The device has a serial data interface. Via the interface IF-1, the device can be connected to the RS232 port of a PC.

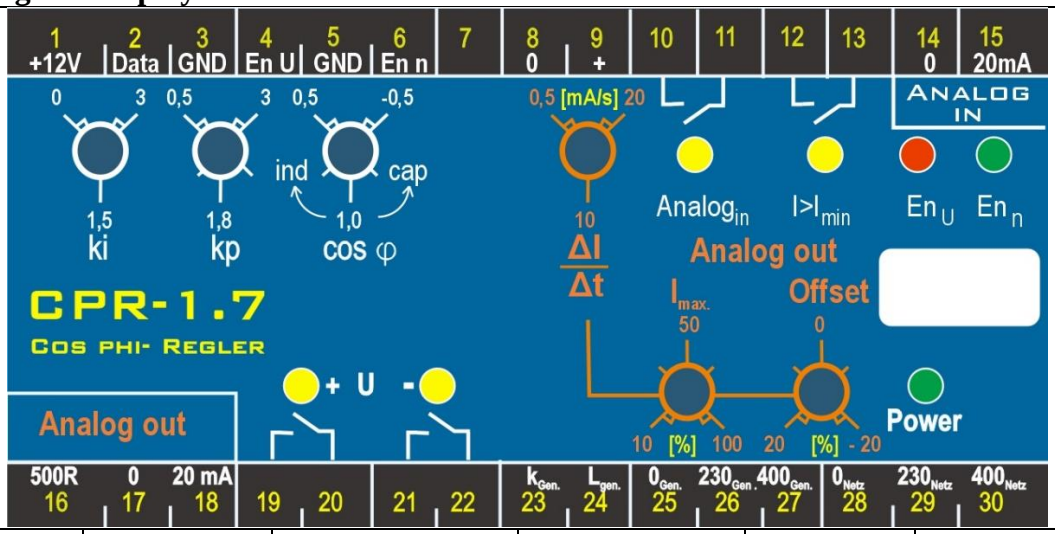
The measured data from the power supply and generator, and the set values of the front potentiometers are outputted to the data interface.

4.1 Parameterization

Adjustment and configuring of the device is possible via a standard terminal program and the RS232 interface “IF-1”.

This allows to adapt the device to customer-specific requirements.

Operating and display elements Front



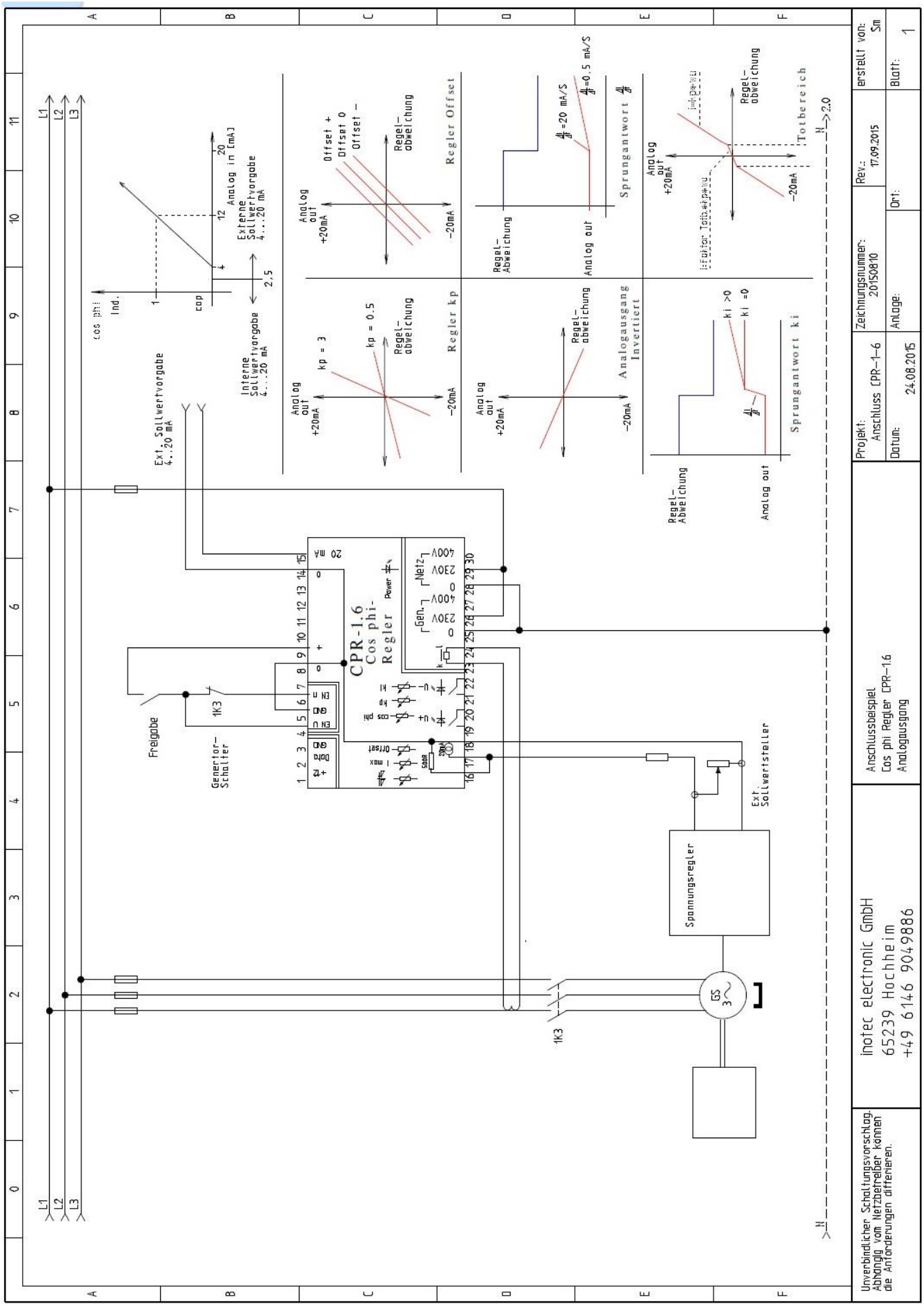
Element	Name	Description	Range of value	Factory settig	Function
Potentiometer	K_p	Gain / Proportional factor	0,5…3,0	1,8	Proportional factor analog output
Potentiometer	K_i	Gain / I-proportion	0…3,0	0	I-proportion analogue output
Potentiometer	cos φ	Setpoint setting internal	0,5 cap…1…0.5 ind.	0,95 ind.	Setpoint setting
Potentiometer	ΔI/Δt	rate of change analogue output	0,5…20 mA/s	10 mA/s	Allows matching to the controlled system
Potentiometer	$I_{max.}$	Maximum output current +/-20mA analogue output	10..100%	100%	limitation of output current
Potentiometer	Offset	Offset analogue output	-20%...0…+20 %	0	Allows matching to the controlled system
LED	$I > I_{min}$	cos φ evaluation is possible	6%....400% I_{Nenn}	-	Indicator cos φ regulation is possible
LED	En_n	Regulator works in voltage mode	Function depends on enable signals terminals [4,6]	-	Indicator operating mode
LED	En_U	Regulator works in cos φ mode	Function depends on enable signals terminals [4,6]	-	Indicator operating mode
LED	$Analog_{in}$	external setpoint active $Analogue_{in}$ > 2,5 mA			Indicator external setpoint

4.0 Technische Daten

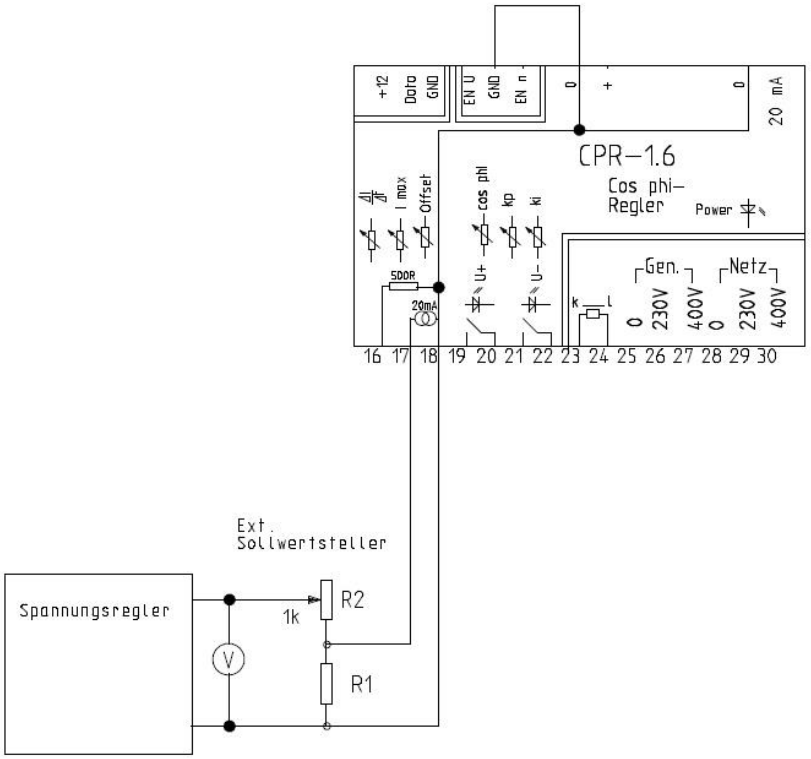
Housing	Housing plastic Makrolon 8020 grey according to VDE 0100 and VBG 4
Mounting	on C-rail according to DIN / screw mount
Dimensions	L 75 mm x W 99.7 mm x H 110 mm
Protection	Housing IP 40 Terminals IP20
Housing cover	Transparent, lead sealable
Ambient temperature	-10... + 50 ° C
Auxiliary voltage	231/400 V AC (Order No: 428.203.400) 100/110 V AC (Order Nr:428.203.100) (From mains-/ generator supply)
Consumption	max. 5 VA
Measurement	0... 115% $U_{Nominal,}$ Resolution: 10 Bit True RMS measurement, 10 measurements / sec, accuracy 0.8% full scale 0... 180 % $I_{Nominal}$ (maximum 10A, 20 sec), Resolution: 10 Bit True RMS measurement, 10 measurements / sec, accuracy 1.5 % full scale. Phase shift between U and I -179°…+179 ° el. Accuracy +/- 1° el. (0,4 A < $I_{Generator}$ < 15 A) Frequency: 25...200 Hz, period measurement. Resolution 0,01 Hz, accuracy 0,02 Hz 4..(12)…20 mA DC setpoint, resolution 10 Bit. According to cos phi 0,5 capacitive … 1 … 0,5 inductive
Digital-input	Enable voltage regulation / enable cos φ regulation (En U, En n)
Setting	**Via calibrated digital potentiometer** - Cos φ - 0,5...1…+0,5 - Gain Kp analogue output: 0,5..3 - Gain Ki analogue output: 0..3 - Rate of change of the analog output 0,5 … 20 mA / sec. - Accuracy +/- 0,1 % (full scale) -Reproducibility over the entire adjustment range +/- 0.2% **Via analogue Potentiometer** - I maximum (output +/- 20 mA) 10...100% - Offset I (output +/- 20mA) -20…0...20%
Voltage regulator/ cos φ regulator	Modulating controller PI characteristic, relay NO +/- pulse-pause modulation PPM). Proportional PI-regulator output +/- 20mA, +/- 10V. Slope of the analogue signal can be inverted (x -1), see 5.0 cos φ- Regulation in the range of 6…300 % $I_{Nominal}$
Indicator	LED indicator for: Relay U- / U + Enable n, Enable U, I > I_{min} , $Analogue_{in}$
Outputs	1 Relay NO U+ 1 Relay NO U- 1 Relay NO Analogue $_{in}$ > 2,5 mA, 1 Relay NO I > $I_{minimum}$ 1 Analogue output +/-20 mA (maximum 500Ohm), resolution10 Bit Maximum Load: 250 V AC, 125 W, 25 VA **1 Data interface** (9600 Baud, 8 Bit, No Parity, 1 Stop Bit) All relays operating current contact
Firmwareversion	3.15
Date	06.10.2015

We reserve the right of error and technical modifications.

6.0 Connection



6.1 Connection



$\Delta U = +/- I_{max} \times R1$

$\Delta U = +/- 100\ mV \quad @ \ (R1=10R, I_{max}=50\%)$