

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 k_p and k_i may be set with front-side potentiometer.

The rate of change of the analog output can be adjusted with the potentiometer $\Delta I/\Delta t$, 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

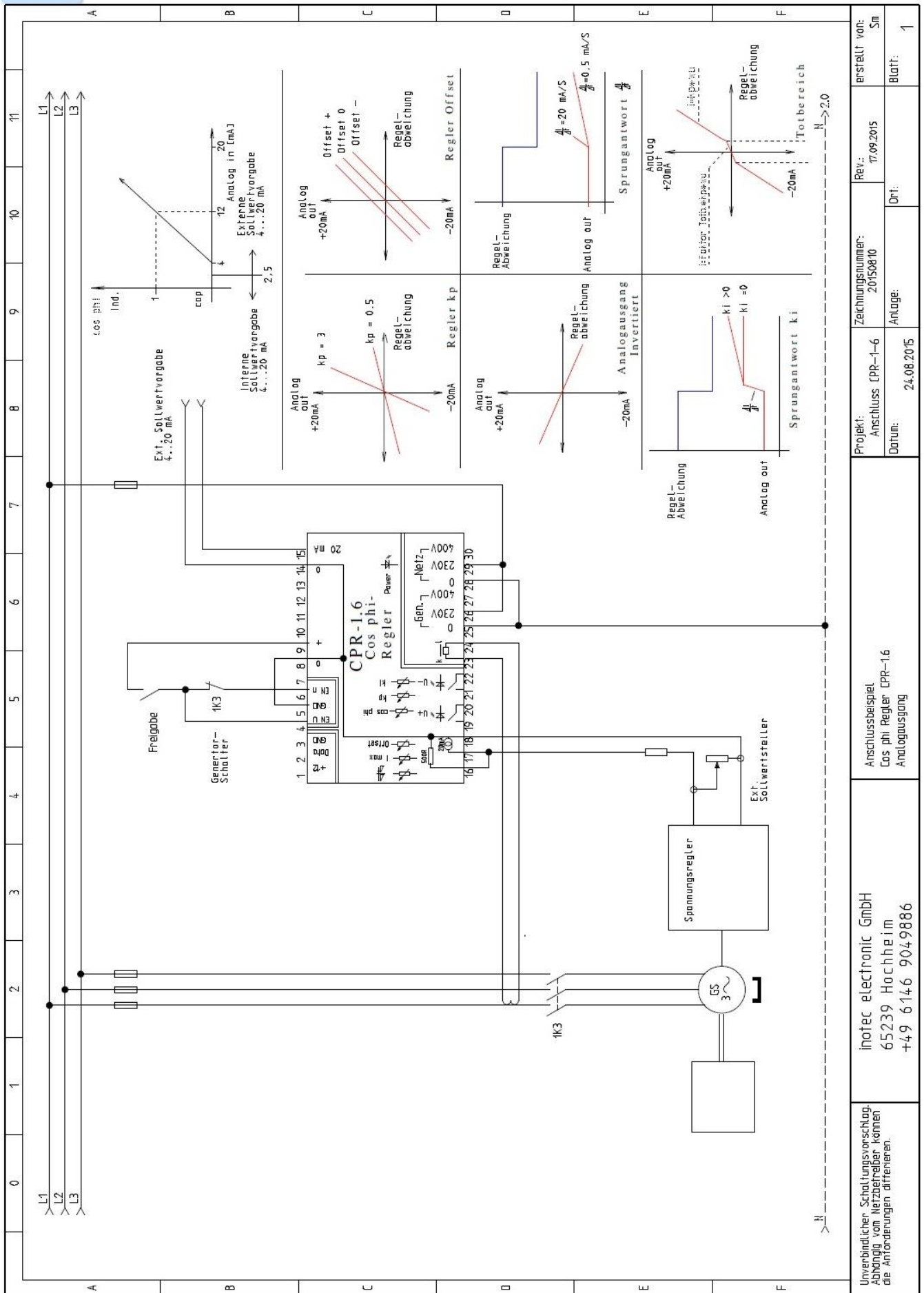
| Element | Name | Description | Range of value | Factory settig | Function |
|---------------|---------------------|--|--|----------------|---|
| Potentiometer | K_p | Gain / Proportional factor | 0,5...3,0 | 1,8 | Proportional factor analogue output |
| Potentiometer | K_i | Gain / I-proportion | 0...3,0 | 0 | I-proportion analogue output |
| Potentiometer | $\cos \varphi$ | Setpoint setting internal | 0,5 cap...1...0.5 ind. | 0,95 ind. | Setpoint setting |
| Potentiometer | $\Delta I/\Delta t$ | 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 | $I > I_{min}$ | $\cos \varphi$ evaluation is possible | 6%...400% I_{Nenn} | - | Indicator $\cos \varphi$ 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 $\cos \varphi$ mode | Function depends on enable signals terminals [4,6] | - | Indicator operating mode |
| LED | $Analog_{in}$ | external setpoint active $Analog_{in} > 2,5$ mA | | | Indicator external setpoint |

4.0 Technische Daten

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|--|--|
| 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 $i_n > 2,5$ 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 |

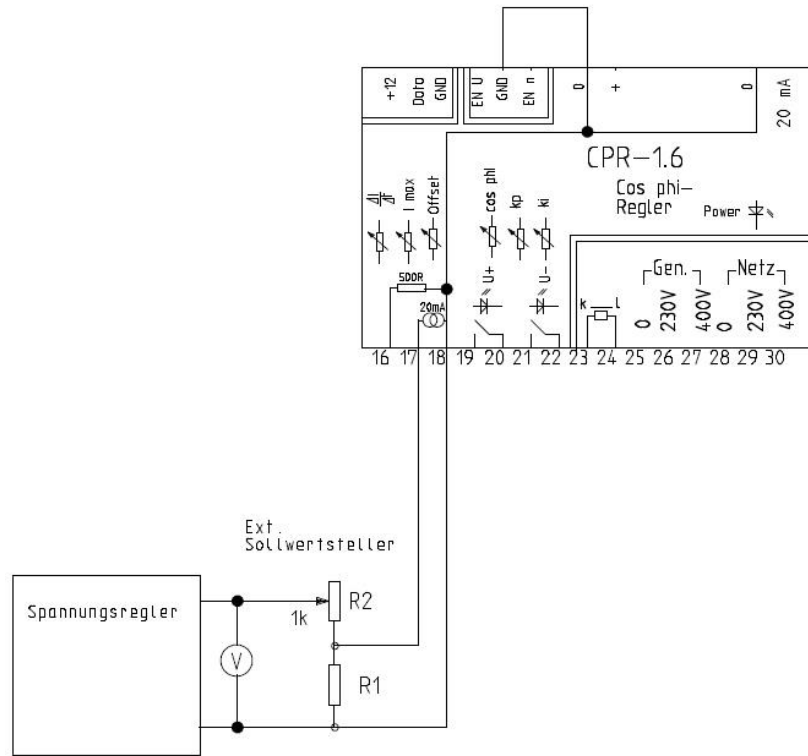
We reserve the right of error and technical modifications.

6.0 Connection



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|--|--|---|---|--|------------------------------------|
| Unverbindlicher Schaltungsvorschlag Abhängig vom Netzbetriebler können die Änderungen differieren. | inotec electronic GmbH 65239 Hochheim +49 6146 9049886 | Anschlussbeispiel Cos phi Regler CPR-16 Analogausgang | Projekt: Anschluss CPR-1-6 Datum: 24.08.2015 | Zeichnungsnummer: 20150810 Anlage: 17.09.2015 | erstellt von: Sm Blatt: 1 |
|--|--|---|---|--|------------------------------------|

6.1 Connection



$$\Delta U = \pm I_{\max} \times R1$$

$$\Delta U = \pm 100 \text{ mV} @ (R1=10R, I_{\max}=50\%)$$

