

Speed controller / Synchronizing-relay SYN-6

FEATURES

The SYN-6 replaces the previously delivered SYN-3 and is with this device fully compatible within connection and function. The SYN-6 includes the following functions:

- Frequency and speed controller and
- Parallel switching relay.

The device can be expanded by a plug-in module to the AGR-1 relay with the features:

- 3-phase power measurement, unbalanced load,
- Power regulator
- Short-circuit relay
- Overcurrent relay
- Overload relay and
- Reverse power protection
- Vector surge protection
- Unbalanced load protection
- Minimum Load relay

The device gets the speed information directly from the generator voltage while operating with a synchronous generator. For operation with an asynchronous generator an input for a commercially proximity switch is available.

DESCRIPTION

The correct connection must be checked before using the relay.

2.0 Speed control for parallel switching

The speed controller is implemented as PI controller in order to ensure precise control with simple adjustments. The proportional factor is set with a front panel potentiometer. The speed control operates in the modes described in point 3.

2.1 Synchronous generator

The frequency of the generator voltage is used to control the speed of the engine.

2.2 Asynchronous generator

The speed is measured using a proximity switch (PNP, 12/24 V DC). The proximity switch must generate 1 pulse / rpm.



3.0 Synchronisation

The device regulates the frequency of the Generator, which is determined by the mains frequency plus an adjustable positive offset. The offset is determined by the adjusted maximum differential frequency, multiplied by an adjustable factor of 0 ... 90%.

Example:

$$f_{\text{Mains}} = 50.0 \text{ Hz}$$

$$\text{Setting Delta } f = 0.5 \text{ Hz}$$

$$\text{Setting Offset} = 40\%$$

The SYN-6 regulates the generator frequency to:

$$f_{\text{Gen.}} = f_{\text{Mains}} + \text{Delta } f * \text{Offset } [\%]$$

$$f_{\text{Gen.}} = 50 \text{ Hz} + 0.5 \text{ Hz} * 40/100$$

$$f_{\text{Gen.}} = 50.2 \text{ Hz}$$

This ensures that:

- for synchronization condition $f_{\text{Gen.}} < \text{Delta } f_{\text{max}}$
- Generator frequency is in beat with the mains frequency
- in the moment of parallel switching no reverse power occur.

If the offset frequency is set to = 0% the parallel switching can be delayed, since the generator may run after power-up with very small difference frequency to the mains supply.

3.1 Functional flow

The unit can be started with existing mains/generator voltage through the enable input in operation.

(Terminal 19 = GND / 20 = + 12 / 24V).

The "OK" LED signals the OK condition.

If there is no enable signal the "OK" LED flashes.

The "OK" LED and becomes permanent light after enabling and completion of the turn-on delay.

The unit can be started in the enabled status with the rising of the generator voltage alternatively. The device is disabled by turning off the enable signal after parallel switching.

The SYN6-6 regulates the generator at 50 Hz. (isolated operation) if no mains voltage is supplied and enable is set to "on". The Relay will operate again as described at 3.0 after restoring mains power.

3.2 Isolated operation

By lowering the supply voltage to values $<80\% U_{\text{Nominal}}$ the mains protection disconnects the generator from the network.

The frequency controller switches automatically to isolated operation if the mains voltage is below $<80\% U_{\text{nominal}}$.

In this mode, the frequency of the generator is regulated to the nominal frequency (50 Hz).

4. Parallel connection

The device monitors the conditions as specified by the VDN.

4.1 Synchronous generator

In this mode, the following parameters are monitored:

4.1.1 Voltage Difference

The maximum allowable difference of voltage can be adjusted via a front-face potentiometer in the range of $\pm 2 \dots \pm 10\% U_{\text{nominal}}$.

4.1.2 Frequency difference

The maximum allowable difference of frequency can be adjusted via a front-face potentiometer in the range of $0.1 \dots \pm 1.0\text{Hz}$.

4.1.3 Phase angle difference

A front-face potentiometer allows the setting of the maximum difference of phase angle in the range of $0 \dots \pm 25$ degree

The delay of the switching elements is compensated by an advance time prior reaching the synchronicity. This advance time increases by increasing of frequency difference.

4.1.4 Sync pulse

The sync pulse has a constant length of 300 ms. However, it is immediately canceled by the device if the switch-on conditions, such as power failure, exceed the default range.

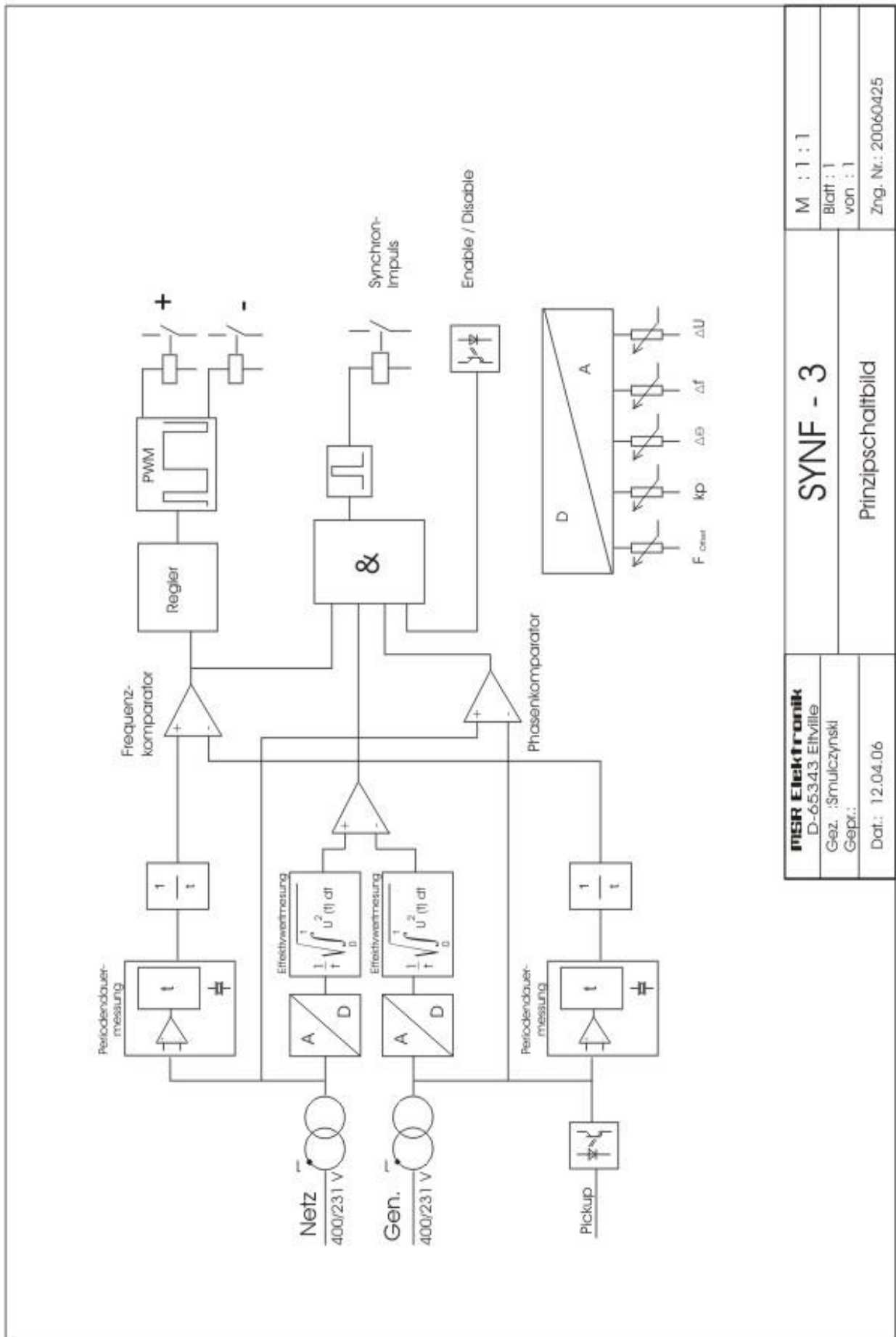
4.2 Asynchronous generator

The device detects the operation with an asynchronous generator by the incoming pulses to the input for the proximity switch. (PNP, 1 pulse / revolution, 12/24 V DC).

The inputs U_{Netz} and U_{Gen} must be connected in this mode, with reversed phase.

After starting the engine, the device generates from on a speed of 500 rpm control pulses in order to bring the generator to nominal speed.

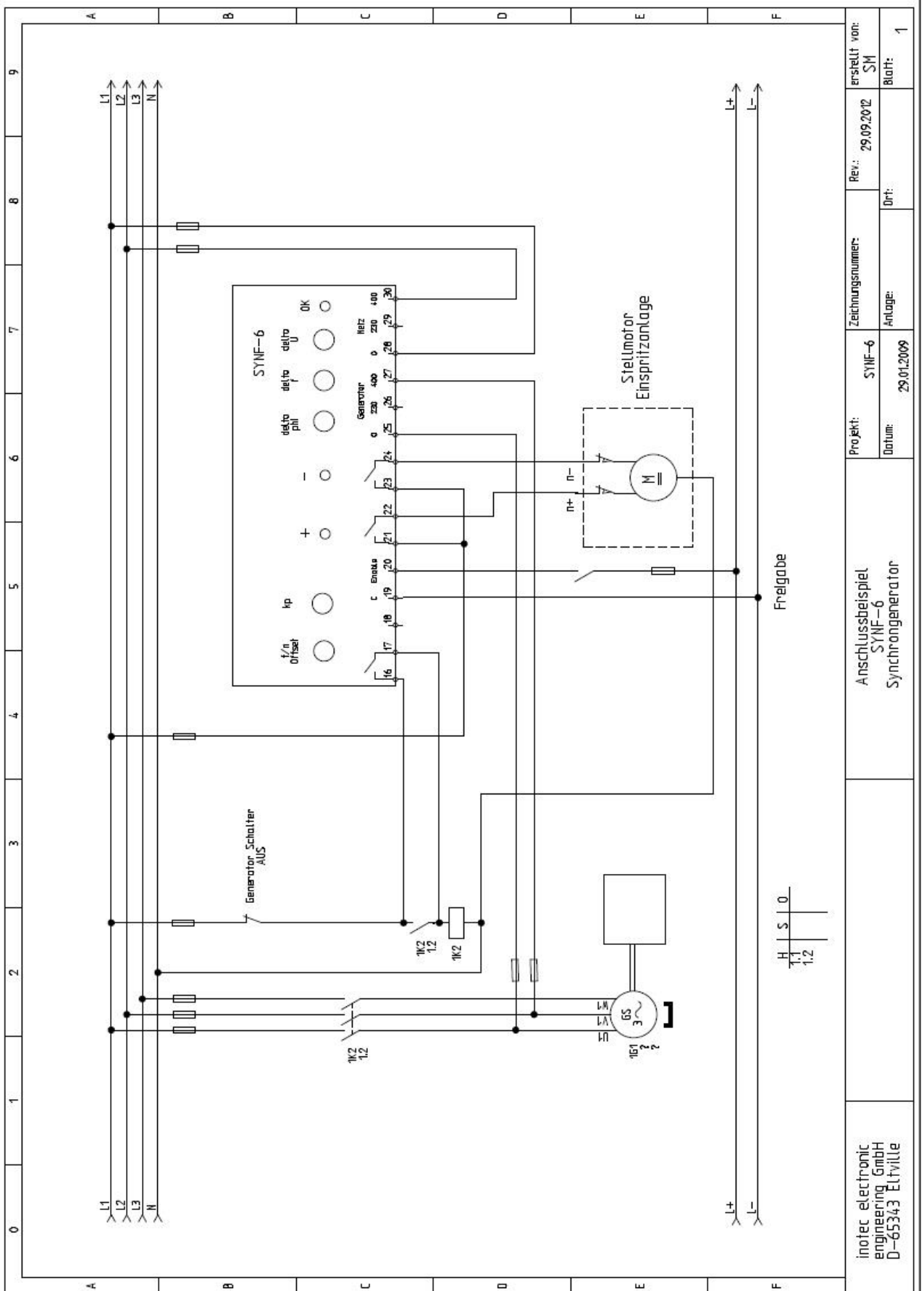
The rated speed is set at 1500 rpm. Within a range of $0.95 \dots 1.05$ of the rated speed, the "OK" LED lights up and the unit outputs synchronizing pulses See connection example.

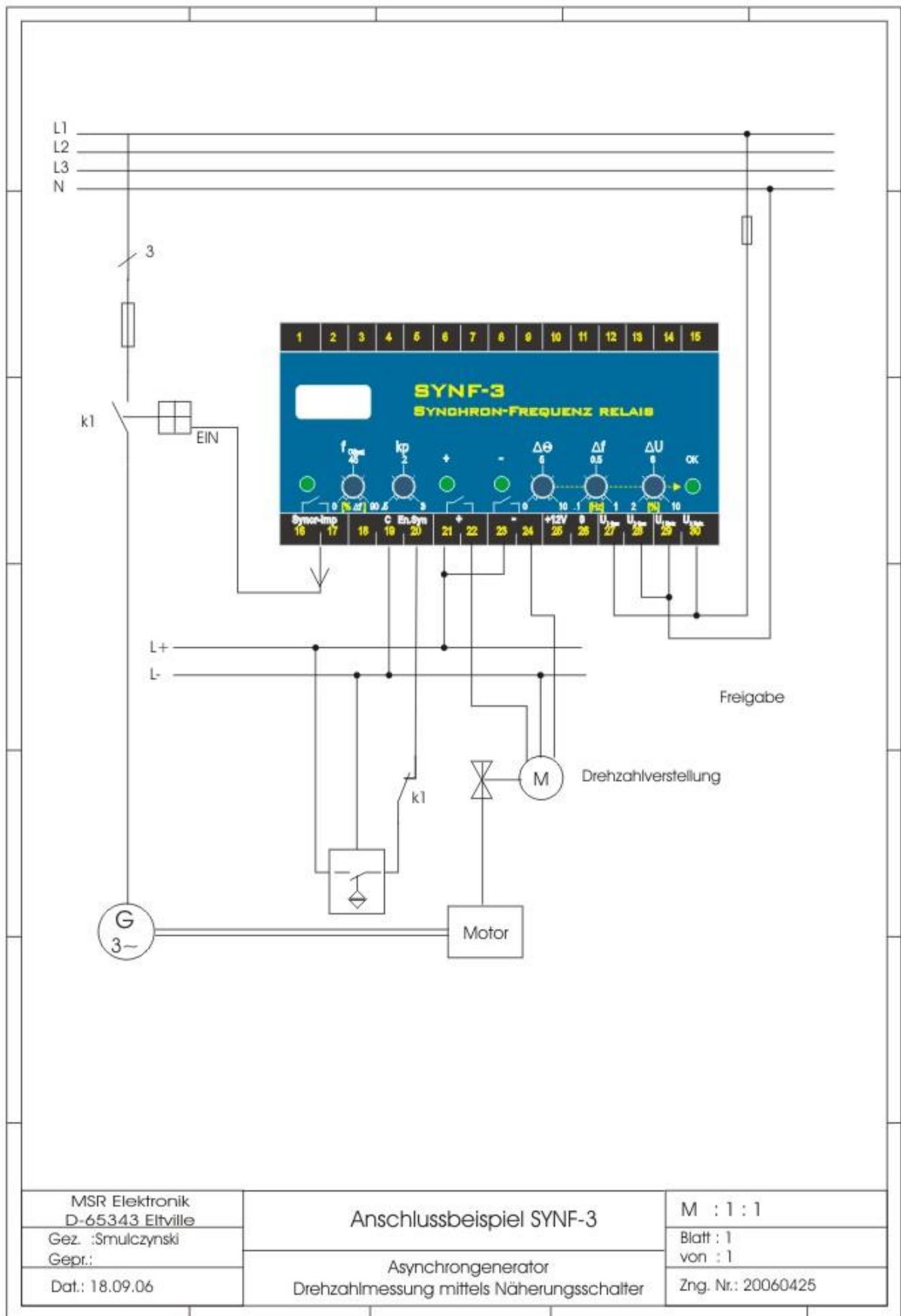


MSR Elektronik
D-65343 Eltville
Gez.: Smulczynski
Gepr.:
Dat.: 12.04.06

SYNF - 3
Prinzipschaltbild

M : 1 : 1
Blatt : 1
von : 1
Zng. Nr.: 20060425





MSR Elektronik
 D-65343 Eltville
 Gez.: Smulczynski
 Gepr.:
 Dat.: 18.09.06

Anschlussbeispiel SYNCF-3
 Asynchrongenerator
 Drehzahlmessung mittels Näherungsschalter

M : 1 : 1
 Blatt : 1
 von : 1
 Zng. Nr.: 20060425

Technical specifications

Housing	Plastic Makrolon 8020 grey, according to VDE 0100 and VBG 4
Mounting	on C-rail according DIN, Screw mounting
Dimension	L 75 x W 99,7 x H 110 (mm3)
Protection	Housing IP 40 Terminals IP 20
Housing cover	Transparent, lead sealable
Ambient temperature	-10... + 50 ° C
Auxiliary voltage	231/400 V AC (Order No: 426.203.400) 100/110 V AC (Order No: 426.203.100) (Supplied from main-/ generator voltage)
Power consumption	max. 5 VA
Voltage measurement	0... 115% $U_{nominal}$, resolution: 10 Bit TRMS measurement Accuracy 0,8% of full scale
Frequency measurement	25...200 Hz, period measurement. Resolution 0,01 Hz, accuracy 0,02 Hz
Rpm measurement	400...8000 rpm via proximity switch, Period measurement, 1 impulse/ revolution
Digital-Input	enable frequency control /synchronisation (<i>EN SYN</i>) At the same input: proximity switch for speed detection. PNP 12/24 V DC (for the control of asynchronous generators)
Adjustment	calibrated, digital potentiometer Proportional gain 0,5..3 Frequency offset (multiplier to delta f max.) 0..90%
Differential voltage	+/- 2..10% $U_{nominal}$
Differential frequency	0,1..1,0 Hz
Phase angle	+/- 0..10 degrees
Accuracy	+/- 0.1% full scale
reproducibility	+/- 0.2% full scale
Speed control	modulating controller PI characteristic Adjustable proportional factor.
Display LED	status indicators for: relay n + relay n- relay synchronous pulse delta f / delta U OK
Outputs	1 relay NO n + 1 relay NO n - 1 relay NO sync pulse All relay contacts operating current contact rating 250 VAC, 125 W
Edition	2016.01.13
Firmware version	2.2

We reserve the right of error and technical modifications