

# STATIC FREQUENCY CONVERTER

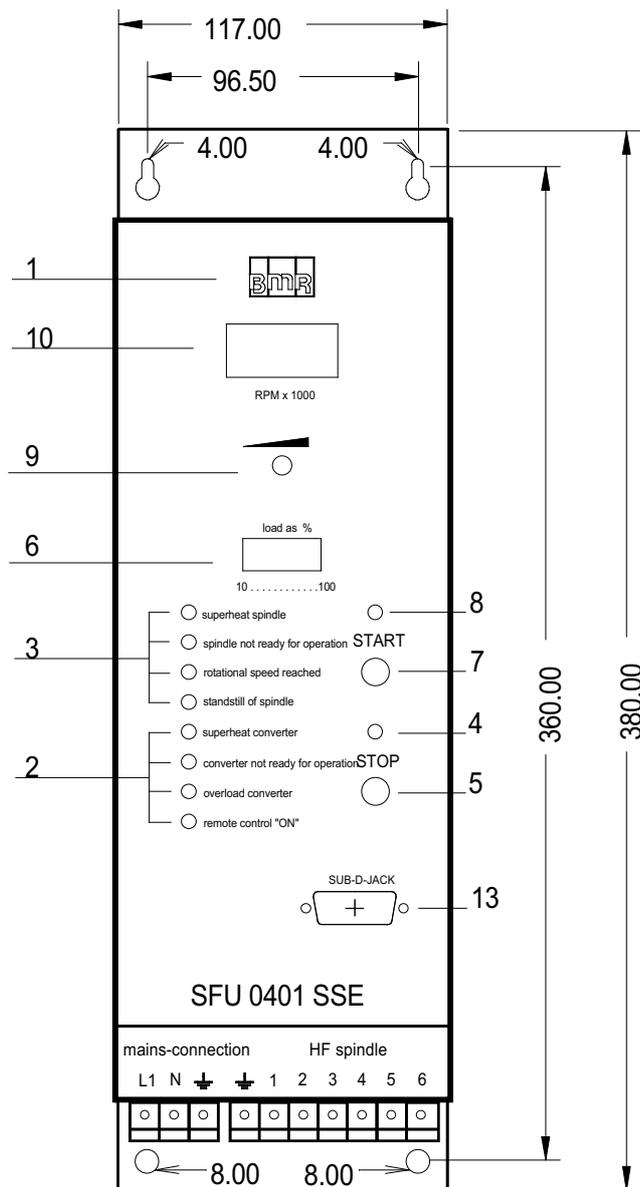
## SFU 0401 / 0401P SSE

### Technical Data

- ◆ microcontroller: supervision, controlling and closed-loopcontrol
- ◆ mains voltage: 230 V AC 50 / 60 Hz
- ◆ protection: 2 x T 15 A / 250 V
- ◆ max. power consumption: 2,6 K VA / Version **P** : 3,6 K VA
- ◆ max. spindle shaft output <sup>(1)</sup> : 1,6 K VA / Version **P** : 2,6 K VA
- ◆ output voltage: 3 x 0 ... 220 V
- ◆ maximum output current: I max. 8 A / Version **P** : 11,5 A
- ◆ frequency range: 83...1.000 Hz  $\cong$  5000...60.000 rpm  
Other frequencies are programmable by software  
(max.2.000 Hz  $\cong$  120.000 rpm)
  
- ◆ the 3 phases are short-circuit protected by an electronic current limitation
- ◆ programming and remote-controlling by a serial interface (RS 232)
- ◆ field bus-interface (interbus-S or profibus) is in development
- ◆ the characteristic data of the spindle are able to individually set parameter values, thus usable for different spindles of different spindle producers (by BMR set parameter values)
- ◆ characteristic-curves are able to be stored in Data-files. (BMR takes in the characteristics of the spindles)
  
- ◆ re-check of spindle-standstill after power-up the supply voltage; if needed electronic brake till standstill of spindle. The re-check of spindle-standstill works also with spindles without a magnetoresistor
- ◆ automatically detection of cable-disruption for the 3 phases of the spindle after power-up of the supply-voltage
- ◆ fulfilment of all electromagnetic prescriptions within industrial area
- ◆ weight: approx. 8 kg
- ◆ measurements: approx. 117 \* 380 \* 270 mm (w\*h\*d)

<sup>(1)</sup> depending on spindledata

## Elements for operation and connection



*front view of control cubicle configuration*

- |  |   |
|--|---|
| 1. manufacturers emblem                | 9. adjustment for rotational speed  |
| 2. display for converter               | 10. digital display of rotational speed,<br>respectively different error messages |
| 3. display for spindle                 | 11.   |
| 4. display spindle „OFF“               | 12.   |
| 5. press button spindle „OFF“          | 13. control connector 15-poles SUB-D-JACK (in the back)                           |
| 6. load display (load of spindle in %) | 14. connector for spindle 7-poles pressure clamp (underside)                      |
| 7. press button spindle „ON“           | 15. connector for mains-connection 3-poles pressure clamp<br>(underside)          |
| 8. display spindle „ON“                |   |

# Operating Instructions

## GENERAL

This Static Frequency Converters includes a microcontroller, which controls, supervises and regulates all functions, such as analogue and digital interfaces, evaluations, data inputs, respectively effective transmission-parameters; which can also be changed by software.

## POWER SWITCH

After the Power-button is switched "ON"; the Static Frequency Converter starts an automatically check for about 8 seconds. During this time all displays flash a short time one after another. After this automatical check the converter is ready for operation. In case of defect the corresponding display flashes.

The automatical check contains the check for detection of cable-disruption, spindle standstill etc.

## SPINDLE "START"

After pressing the „START“-button the spindle starts to come up to the rotational speed adjusted by the rotary knob (9). The coming-up speed is adjusted to 10.000 rps by the manufacturer. On request the coming-up speed can be changed.

## SPINDLE "STOP"

After pressing the "STOP"-button the spindle will be electronically stopped to stand still. The braking time corresponds to the adjusted coming-up speed.

It's only possible to slow down the spindle with the „STOP“-button if the remote control is **not** „ON“

By pressing power switch „OFF“ there is no electronic slow down, but the spindle runs out by itself.

## DIGITAL DISPLAY FOR ROTATIONAL SPEED

The digital display of rotational speed indicates the adjusted rotational speed.

## DISPLAY FOR CONVERTER

Display (5)	LED „red“	= converter superheat
Display (6)	LED „red“	= converter is not ready for operation
Display (7)	LED „red“	= load of converter or load of spindle higher than 100%
Display (8)	LED „green“	= remote control „ON“

## DISPLAY FOR SPINDLE

Display (5)	LED „red“	= spindle superheat
Display (6)	LED „red“	= spindle is not ready for operation
Display (7)	LED „green“	= rotational speed reaches „desired value“ or „actual value“, respectively"
Display (8)	LED „green“	= standstill of spindle

## ERROR MESSAGES (seven-segment display)

	= cable disruption phase 1
	= cable disruption phase 2
	= cable disruption phase 3
	= no spindle
	= final stage powered down due overcurrent

## **LOAD DISPLAY**

The load display indicates the present load of spindle in %.

If the spindle is not loaded and no defect exists, the load-display indicates approx. „0%“.

## **OVERLOAD DISPLAY**

The display (7) always flashes, when the spindle was overloaded or the interruption for overload responded.

## **OVERLOAD POWER CUT**

If the spindle is running more than 10 seconds [programmable by software (1...10 sec.)] in overload an interruption for overload will follow.

I.e. after this time the converter automatically disconnects the spindle and the displays (6) and (7) are flashing.

Another „power-up“ of the spindle can only follow if the display (7) disappears.

The display (7) disappears if the spindle is „powered-up“ again.

## **EXCESS TEMPERATURE OF CONVERTER**

When the converter reached the excess temperature the display (5) flashes.

Delayed with 3 seconds. [programmable by software (1...10 sec.)] the converter switches to „STOP“ and the display (6) flashes.

The spindle cannot be switched „ON“ before the display (5) disappeared.

The display (5) disappears by another „power-up“.

## EXCESS TEMPERATURE OF SPINDLE

When the spindle reached the excess temperature the display (1) flashes.

Delayed with 3 seconds. [programmable by software (1...10 sec.)] the converter switches to „STOP“ and the display (2) flashes.

The spindle cannot be switched „ON“ before the display (2) disappeared.

The display (1) disappears by another „power-up“.

**ATTENTION:** This evaluation is only possible if the spindle is equipped with a temperature sensor.  
(Option after arrangements)

## REMOTE CONTROL

The remote control of the converter is connected via the 15-poles SUB-D-JACK (13)

The display (8) flashes whenever the converter is remote controlled.

### POSSIBILITIES OF REMOTE CONTROLLING:

- a; Via a potentialfree contact to pin 11 and pin 12 the spindle can be respectively switched „ON“ or „OFF“

contact open                      = spindle „OFF“  
contact closed                    = spindle „ON“

- b; Installing of a direct voltage (+) on pin 11 and (⊥) on pin 8  
I. e. with this possibility the rotational speed can be adjusted.

1 V / 10000 rpm

< 0,5V meets spindle "OFF"  
≥ 0,5V meets spindle „ON“ 5000 rpm.

**ATTENTION:** The direct voltage must not transgress 12V and should be free of interfering voltages.

- c; Via the serial interface (RS 232) pin 13 RxD, pin 14 TxD and pin 8 (⊥)  
**Coding of the control commands can be requested by demand !**

## ROTATIONAL SPEED REACHED

If the spindle reached the preset rotational speed, the display (3) flashes.

The converter considers two possibilities of the evaluation:

- a; when the spindle is not equipped with a magnetoresistor, the symbol flashes if the internal frequency of the converter corresponds to the adjusted frequency.
- b; when the spindle is equipped with a magnetoresistor the symbol flashes only if the spindle axle reached the adjusted rotational-speed in fact (actual evaluation).

Attention: This is only possible if the spindle is equipped with a magnetoresistor

## STANDSTILL OF SPINDLE

The display (4) flashes whenever the spindle axle stands still.

The converter considers two possibilities of the evaluation:

- a; if the spindle is not equipped with a magnetoresistor the symbol flashes when the converter stopped giving out no more frequency (standstill of converter)
- b; if the spindle is equipped with a magnetoresistor the symbol flashes not before the spindle-axle is standing still.

## CONFIGURATION → ROTATIONAL SPEED OUTPUT

With the control connector (13) pin 4 (+) and pin 8 (⊥) ground, a direct voltage is given out which corresponds to the rotational speed of the spindle axle.

1V / 10000 rpm

Attention: This is only possible if the spindle is equipped with a magnetoresistor

## CONFIGURATION → ACTIVE LOAD OUTPUT

With the control connector (13) pin 4 (+) and pin 8 (⊥) ground, a direct voltage is given out which corresponds to the load of the spindle.

$$0...12\text{ V} \triangleq 0...120\%$$

<b>INFORMATION:</b> Standard for delivery is the configuration „rotational speed output“!
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## EMERGENCY SHUTDOWN INTERLOCK

The emergency shutdown interlock can be programmed by software to „active“ or „inactive“.

Programming „inactive“ is insignificant, whereas with a „active“ programming a primary stop-command can be given. This means that the converter cannot be started again neither by the „Start-button“ nor by the remote-control and that the spindle will be controlled slowed down.

To abolish the command „shutdown-interlock“ there must be injected a voltage of 5V...30V on the control connector (13) pin 15 (+) and pin (8) (⊥).

## OPTION: REVERSING DIRECTION OF ROTATION ( 0401DRU )

To arrange the reversing direction of rotation, apply a direct-voltage Of +12V...24V on Pin 5 of the Control-Cennector (13).  
[Pin 8 (⊥) Ground]

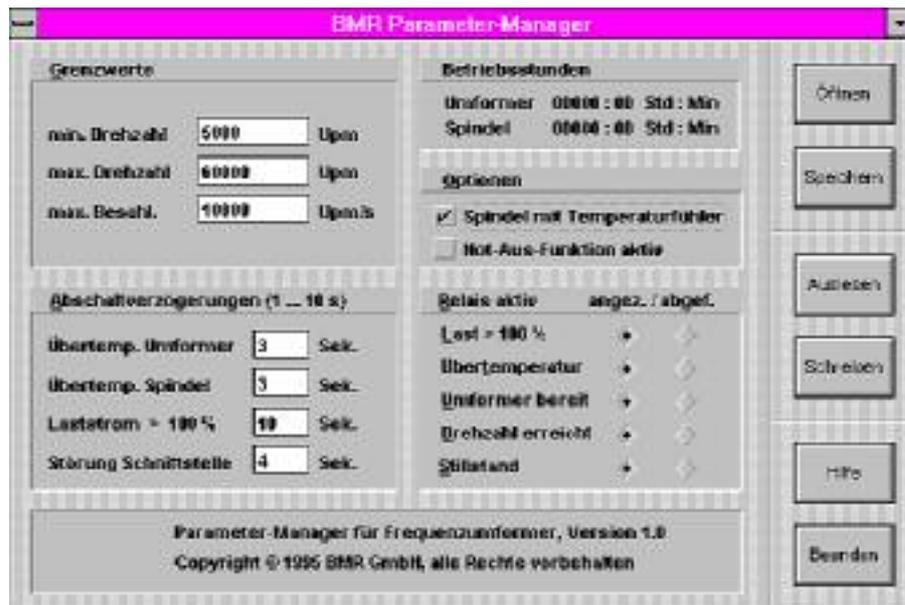
This function is only possible, if the spindle-axle stands still.  
[display (8) flashes].

If you arrange or disable the signal during the spindle rotates, the Direction or rotation will be changed after the next “standstill of Spindle”.

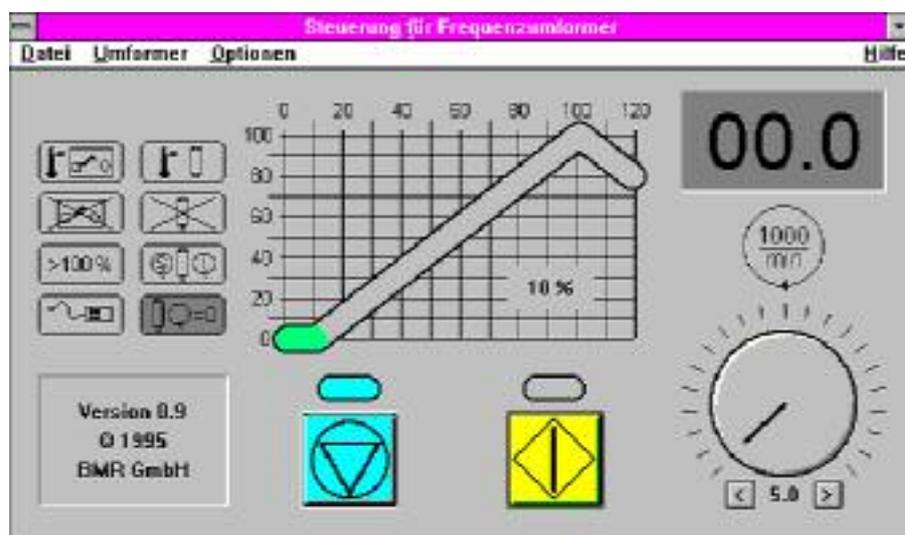
<b>INFORMATION:</b> Pin 5 ist hierbei nur für dieses Signal verwendbar!
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## SPECIAL ACCESSORIES (optional)

- a; BMR Parameter-Manager (menu program for MS-Windows®)  
This program can change the differently effective transmission parameters and is also able to read the operating hours.



- b; Controlling for the converter (menu program for MS-Windows®)  
The converter can be controlled and supervised with this program.

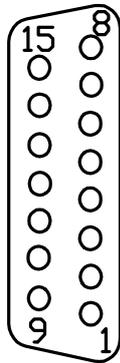


## CONNECTION

**ATTENTION:** All works for connection are only allowed, if the Master switch is switched „OFF“ (zero position) and if the power cable is interrupted.

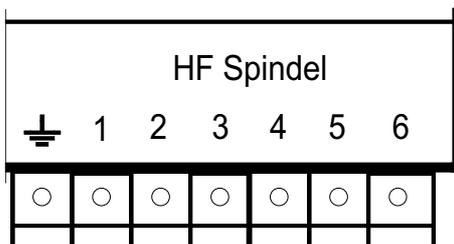
Please note the plan of connection, because a wrong connection can lead to a defect of the converter.

### Control Connector (13) 15 poles SUB-D-JACK



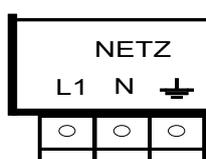
- pin 1 = common connection for relay
- pin 2 = make contact by reaching rotational speed (desired value / active value)
- pin 3 = break contact by superheat (converter or spindle)
- pin 9 = make contact by standstill ( desired value / active value)
- pin 10 = break contact by load >100%
- pin 6 = make contact by „converter ready“
- pin 4 = dependent on configuration of the converter:  
DC Out-active value spindle 1V / 10000 Upm  
DC Out-active power 0...12V  $\cong$  0...120%
- pin 11 = DC SCHEDULED- In (1V / 10000 rpm)
- pin 12 = DC SCHEDULED- Out (potentiometer front panel)
- pin 8 = ( $\perp$ ) ground
- pin 7 = impulse magnetoresistor
- pin 5 = +5 V 40mA (for example fiberotic)  
0...24V Input for Option **DRU**
- pin 13 = RxD (RS 232)
- pin 14 = TxD (RS 232)
- pin 15 = emergency shutdown interlock

### pressure clamp (14) 7-poles for spindle connection



- pin = chassis ground
- pin 1 = R
- pin 2 = S 3 phases for spindle
- pin 3 = T
- pin 4 = + PTC
- pin 5 = + magnetoresistor
- pin 6 = ( $\perp$ ) Ground for magnetoresistor and PTC

### pressure clamp (15) 3-poles for mains-connection



- Pin L1
  - Pin N
  - Pin chassis ground
- } mains-connection

Technical changes reserved.