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SFU 0103/0203

Schnellfrequenzumrichter
High Frequency Converters





HIGH QUALITY

100%

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GERMANY**



EXCELLENT SERVICE

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1. Introduction

Depending on its construction, the speed of a three-phase asynchronous AC motor is directly dependent on the number of poles and the frequency of the voltage network. In a 3ph/50Hz network, with a 2-pole motor, the rated speed would be $50 \text{ U/s} * 60 = 3000 \text{ rpm}$.

With synchronous motors (brushless DC), the speed is dependent on the voltage applied

Three-phase AC motors offer numerous advantages in industrial applications, such as brushless drive, no wear, favourable power/weight ratio, high speed capability, and much more. Your field of application is correspondingly diverse, e.g. for driving spindles in milling, grinding or drilling machines.

Synchronous motors have the advantage of a higher degree of efficiency (approx. 85%) compared to asynchronous motors (approx. 67%) with the disadvantage of not quite achieving the torque of an AC motor at low speeds and also not being able to achieve its high speeds. But due to the higher efficiency, the cooling requirement and also the size are smaller.

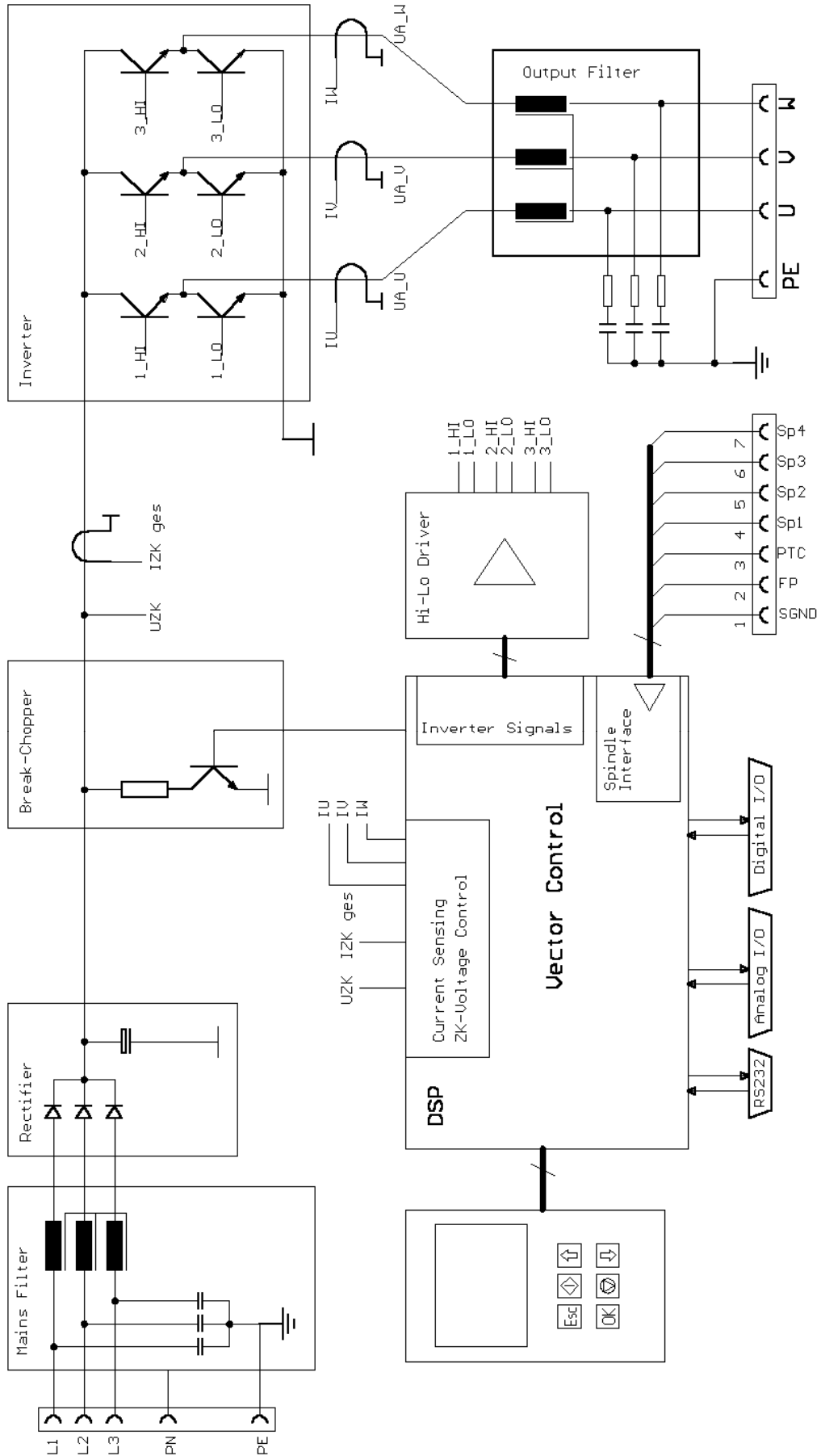
For the control of modern spindle motors, frequency converters are used which convert the rigid 50Hz network into a frequency- and voltage-variable 3-phase network. This means that three-phase motors can also be operated at much higher speeds than with pure 50Hz operation. The motors are controlled according to a special spindle characteristic up to the desired nominal speeds, accelerated in the load case efficiently regulated and if necessary controlled to a standstill.

The **SFU 0103/0203** - series frequency converter has been specially designed for use in these high frequency applications, offering excellent safety, performance and reliability, the result of years of experience in the design and construction of frequency converters, together with the use of the latest materials and the most reliable components. It can be used in many different applications and is as equally suitable for use as a replacement device in existing systems with older type series as it is in pre-planned applications as a cost-effective solution, helping to prolong the useful life of tools. In addition, both AC and brushless DC motors can be operated by this high frequency converter.

2. Description and Features

- ✓ Operation of **Asynchronous-AC** and **Synchronous-BLDC-Spindles**
- ✓ The frequency converter **SFU 0103/0203** allows **output frequencies** up to **4000 Hz / 240.000rpm** with 2-pole asynchronous-AC-motors and **1667Hz/ 100.000rpm** with synchronous-BLDC-motors.
- ✓ **Output power (300VA/S1-100% / 480VA/S1-100%)** in a compact format
- ✓ The Kernel of the **SFU-0103/0203** is a **Digital Signal Processor (DSP)**, which generates all output variables and captures signals.
- ✓ All parameters, such as current, voltage and frequency, are captured in **real time**, and adjusted depending on the load condition
- ✓ The **highest efficiency** of motors at **both low and high frequencies** is made possible.
- ✓ High level of **operational safety**. All operating states such as acceleration, operation at rated speed, and deceleration, are monitored and critical statuses are intercepted and brought under control.
- ✓ **Transparency:** The user is always informed about the current status of the inverter (LED displays) and the spindle speed (7-segment displays) on the front panel.
- ✓ **Control:** The frequency converter can be manually controlled and calibrated as required using 2 keys on the front panel.
- ✓ **Individual adaptation** to the application in hand and the spindle in use. Up to 16 different spindle characteristics can be created and stored in the memory of the frequency converter, or existing characteristics can be modified and adapted to the application.
- ✓ **Diverse control and communication possibilities.** for connection to peripheral devices to - PC , PLC (Programmable Logic Control), CNC (Computer Numeric Control).
- ✓ **Straight-forward and flexible integration** into existing systems by means of open configuration of I/O signals for control and configuration:
Control inputs: 1 analogue, 3 digital
Control outputs: 1 analogue, 5 digital (relays)
- ✓ **Galvanic separation** of all interfaces from each other and from the network / motor potential
- ✓ **Short-circuit-protected**
- ✓ **User-friendly configuration** and control using optional Windows Software "SFU-Terminal" for the PC

3. Block Diagram



4. Technical Data

Output power	0103: 300VA/S1 100%	0203: 480VA/S1 100%
Supply connection	230V, 50Hz / 115V, 60Hz switchable with rotary switch and with exchange of fuse	
Fuse	230V: 2,5AT 115V: 4,0AT	230V: 3,15AT 115V: 5,0AT
Motor connection	Desktop: 7-pin: U, V, W, PE, 2*PTC, SGND Connector: Amphenol C16-1 (6+PE) / Binder 693 (6+PE) or Hirschmann connector SSE and 19"Rack: 8-pole: U, V, W, 2*PE, Temp.sensor, FP, SGND Screw terminals 4mm ²	
Output voltage	max. 36V	max. 60V
Output current	7A, electronically limited	
Over-current	to be set up for 20s	
Output frequency	AC: 4.000Hz / 240.000 rpm DC: 1.667Hz / 100.000 rpm	
Spindle characteristics	max 16, stored internally	
Spindle sensor inputs	PTC, KTY, PT1000, speed sensor	
Control inputs	1 analogue: 0-10V	
Control inputs	3 digital: 0- 24 V	
Control outputs	1 analogue: 0-10V	
Control outputs	5 digital: relay outputs, 24VDC/1000mA, 125VAC/500mA	
Interface	RS232-9600/115kBd, USB-Mini (at desktop version, only)	
Housing dimensions W x H x D (mm)	(Desktop) 290 x 120 x 305 (SSE) 125 x 380 x 262 (19") 482 x 132 x 330 3HE / 84TE	
Weight	(Desktop) ca. 6 kg (SSE) ca. 8,5 kg (19") ca. 10 kg	
Protection	IP20	
Operating conditions	5°C ... 40°C / rel. humidity of air max. 85%	



ATTENTION

To avoid severe motor / spindle damage, verify to have correct motor / spindle characteristic selected, always!

5. Safety-Precautions and Warnings

- ✓ This device produces dangerous electrical voltages and is used for the operation of fast spinning tools. Because of their high rotational speed, it may be dangerous in case of improper handling. For this reason, only professionally trained and qualified personnel should be allowed to work with and setup this device!
- ✓ Before the first commissioning can be carried out, it should be ensured that the spindle and the tool are fixed properly, to eliminate all dangers because of uncontrolled movement of the spindle.
- ✓ Safety regulations being valid for the country where the device is used, have to be adhered to where any work is carried out on the device.
- ✓ Before the device is turned on for the first time, it should be verified, that the connected parts cannot carry out uncontrolled movements.
- ✓ The frequency converter must not be operated close to heating devices or magnets or devices generating strong magnetic fields.
- ✓ Sufficient air circulation around the converter should be ensured.
- ✓ Fluids should be prevented from intruding into the housing. If it seems to be happened, the converter has to be switched off immediately.
- ✓ The ambient air must not use aggressive, flammable or electrically conductive substances and should be as free of dust as possible.
- ✓ All repairs and maintenance on the converter and the relating accessories must be carried out by skilled personal and with powered off, only. To ensure this, the mains plug should be pulled out. In doing this, both the terms of regulations for preventing accidents and the general and national rules for mounting and safety have to be applied.
- ✓ Do not open this device while it is connected to power supply. There is danger of life! With opening this unit the period of warranty will be ended.
- ✓ All people who work with this device should be trained and instructed by their line advanced technician.



ATTENTION

Please verify that all power supply voltages are correct in polarity and value.



ATTENTION

**Please ensure to have the proper characteristic selected, always!
The operation of a spindle with a wrong characteristic may harm the spindle severely!**



ATTENTION

In case of replacing the fuses, please ensure to use types only, which are mentioned in 'Technical Data'!

6. Connections, Interfaces and Pinouts

Operational parameters and outputs:

The **SFU 0103/0203** covers all current important operational parameters and operating data. Up to 5 digital outputs can be used for signalling and 1 analogue value (0...10V) can be output at the analogue output.

Remote Control and Outputs:

3 digital inputs (0/24V) and 1 analogue inputs (0...10V) are available for remote control of the **SFU 0103/0203**.

These assignments can be freely configured. Using the optional Windows PC software **SFU-Terminal** the above assignments can be easily achieved, providing exceptional flexibility with each application.

Each operating parameter can be assigned as a signal and each control signal can be allocated the required I/O pin. In addition, the logic level (high or low active) can be individually defined.

The same assignment is also possible for the analogue measured data and control data at the analogue I/O pin.

The standard allocations of operational parameters, their outputs, control signals and inputs, are listed in the following table.

6.1 USB-Connection (USB-Mini)

For easy and comfortable access to a PC a USB interface is implemented

It is located at the back panel in version USB-Mini

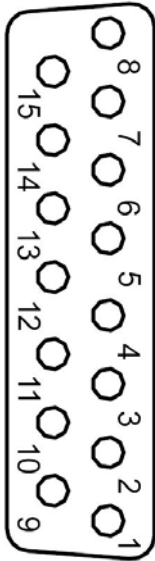
For it shares the interface with the RS232, they can be used alternatively, only

USB-Adapter

Moreover a RS232-USB Dongle is available, which fits to the Dsub-15 socket and realizes an USB-port here, too. This will be an easy solution with other housing versions, where a USB is required



6.2 Digital and Analogue I/Os (D-SUB 15 female)



Pin	Function	Description
1	common connection for relays	
2	Relay 1 (normally open)	Rotational Speed Reached
3	Relay 2 (normally closed)	Excess temperature
9	Relay 3 (normally open)	Standstill of Spindle
10	Relay 4 (normally closed)	Overload Spindle
6	Relay 5 (normally open)	Converter and Spindle Ready
4	Analogue Output	Load Value 0 ... 10V = 0 ... 100% or Duty
11	Analogue Input	duty speed
8	Ground	
12	Digital Input 1	Start / Stop
15	Digital Input 2	Interlock (Emergency Stop)
5	Digital Input 3	Reversing of Direction of Rotation
13	RxD	(RS 232)
14	TxD	(RS 232)
7	Impulse magneto resistor	Speed sensor

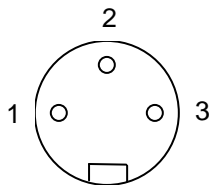
6.3 Spindle Output using standard circular connector



ATTENTION

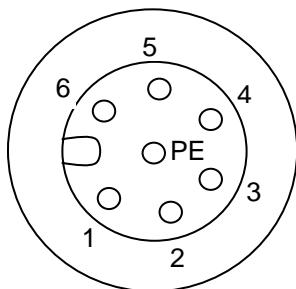
This evaluation is only possible if the spindle is equipped with a temperature sensor.

with 3-pin DIN-jack



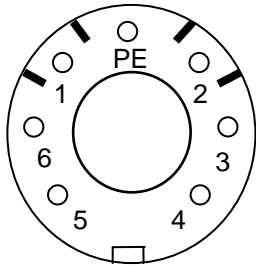
Pin	Function	Description
1	U	Spindle Phase 1
2	V	Spindle Phase 2
3	W	Spindle Phase 3

with 7-pin jack Amphenol C16 (Amphenol C16-1 / Binder 693)



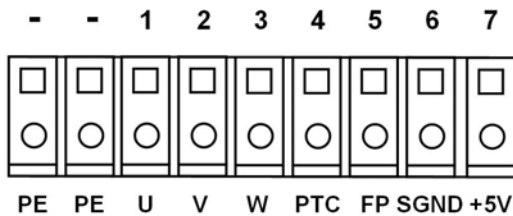
Pin	Function	Description
1	U	Spindle Phase 1
2	temp.-sensor	Temp.sensor-Signal from PTC / KTY / PT1000
3	V	Spindle Phase 2
4	FP	Hall-Sensor-Signal
5	W	Spindle Phase 3
6	SGND	Signal- GND for temp.sens.-Signal
7	PE	Protective Earth

with 7-pin jack for Jäger-Spindles (Hirschmann C164)



Pin	Function	Model +5 V Sensor
1		NC
2		U Spindel Phase 1
3		V Spindel Phase 2
4		W Spindel Phase 3
5	+ Temp.sensor	+ 5V
6		+ Hall / Speed Sensor
PE		Signal Ground Speed / Temp Signal

6.4 Spindle Connection with Screw Terminals versions SSE, 19"



Function	Description
PE	Protective Earth
PE	Protective Earth
U	Spindle Phase 1
V	Spindle Phase 2
W	Spindle Phase 3
SGND	Signal-GND for FP-and Temperaturesensor-Signals
FP	Hall-Sensor-Signal
Temperature- sensor	Temp.sens.-Signal (Spindle temperatur)
5V	auxiliary voltage for sensor

6.5 Mains supply

desktop: 3 pin. standard plug
SSE or 19": Screw terminals, 4mm²

With a rotary voltage selector it is possible, to adapt the mains supply to 230V and 115V networks.



It is important to select the appropriate mains fuse ! The required value is listed under 4.



ATTENTION:
This setting has to be carried out by qualified personal, only!
A wrong setup will cause immediate destructions of the device after power on



Control cables, supply cables and motor cables have to be run separated from each other. Shielded cables are to be preferred.

7. Functions, Commissioning, Operation

3 operational possibilities:

- ✓ Control and configuration manually via front keys
- ✓ Automatic control and configuration via PLC / IPC
- ✓ Automatic control and configuration via PC (RS232)

Setup and control of the features and functions listed below can be carried out with our setup software **SFU-Terminal**. All explanations and hints to menu functions relate to this software.



CAUTION:

The operation of a spindle with a wrong spindle characteristic may cause severe damages at spindle or converter. To avoid this, please ensure that the correct spindle characteristic is selected!

7.1 Configuration of rotational speed

The preset of revolutions per minute of the spindle can be achieved by two ways:

- ✓ **Preset manually via potentiometer at frontpanel**
In menu 'Analogue Inputs' option button 0V has to be enabled in the line of duty RPM . (no analogue input is assigned to this function)
The duty RPM is displayed on the LCD and can be changed with / (holding a key down increases the count rate). RPM can be changed during operation
- ✓ **Preset via analogue input duty RPM**
In menu 'Analogue Inputs' option button 0V has to be disabled and the function duty RPM . has to be assigned to an analogue input. Additionally a scaling has to be selected from the list box duty RPM (e.g.: 1V/10.000RPM)
The value of the duty RPM is displayed on the LCD according to the scaling and the voltage at the input. A voltage of 0V leads to a standstill and a voltage higher than 0V leads to a startup upto the desired revolution. An input voltage of 4V and a scaling as above mentioned lead to a revolution of 40.000 rpm.



Important: For this setup "PIN 11-12 Start" has to be inactive!
-> Please unclick this checkbox in the main window of SFU-Terminal

The settings have to be downloaded into the converter with the button .

7.2 Starting and Stopping the Frequency Converter

There are different methods of starting and stopping **SFU 0103/0203 AC/DC** frequency converters, due to many different requirements, as follows below:

- ✓ manually via panel keys
- ✓ Remote control via digital input
- ✓ Remote control via analogue input
- ✓ Remote control via serial interface

Before starting the converter is possible, a preset of the RPM (> 7.4) has to be done. This is necessary for all options of starting with the exception of analogue starting.

- ✓ **Manually** via panel keys
Activation of spindle start via the green **START** key.
Spindle-stop is activated by the red **STOP** key on the operator panel.
- ✓ **Remote control via digital input** Start/Stop by external PLC or CNC
Digital Input 1 is the default. To change this, click on the menu '**digital inputs**'. The correct spindle characteristic can be preset here also.

Depending on your safety regulations, you can program this individually and set high or low active signals. In general, when using SPS control, it is best to set safety cut-outs at low-active, so that the machine will stop should a cable or connector defect occurs.

- ✓ **Remotely via the analogue input**
Analogue starting will be enabled where at least one of the analogue inputs in the menu '**analogue inputs**' is selected and a valid signal at the digital input Start/Stop is present. Additionally a scaling has to be selected from list-box **duty RPM** of analogue value to RPM.
- ✓ **Remotely via the RS232** serial interface from a PC or PLC .
The speed pre-selected from the panel is taken as the required speed in this instance. Speed can be altered via commands from the RS232 interface.
- ✓ **Remote controlled** via potential-free contact to **pin11 and pin12**
Contact opened = spindle "OFF"
Contact closed = spindle "ON"
This function can be activated with checkbox **PIN11 – 12 Start** on the Main Window of the *SFU-Terminal*

A documentation of the serial commands can be ordered separately from BMR



Where one of the above options has been selected to operate the converter, only that preselected option can then be used to stop the converter! Only one of the safety functions can override the operation.

7.3 Remote Control Possibilities

The remote control for the inverter is connected via the 15-pole D-Sub control socket (13). The display (2.4) lights up whenever the inverter is remotely controlled.

Tip: A shielded cable should be used to avoid interference

REMOTE POSSIBILITIES:

- a) **Digital:** via a Start / Stop (0 / + 24V) signal at digital input 1 / pin12.
The input can be configured low or high active. The speed is selected by means of potentiometer or via a voltage at pin11-8
- b) **Analog:** with a DC voltage at the analogue input. (+) on pin11 and (-) on pin 8 (GND)
Prerequisite is a valid start signal at pin12
 $U_{in} < 0.5V$ corresponds to spindle "OFF" and $U_{in} \geq 0.5V$ corresponds to spindle "ON".
At the same time, the speed is also set in accordance with the scaling from speed to analog value. Possible is 1V / 10.000UpM or 0-10V min / max.



ATTENTION:
The DC voltage at PIN11 must not exceed 12V and should be free of interference

- c) **RS232:** via control commands via the interface Pin13 (RxD), Pin14 (TxD) and Pin8 (GND)
The documentation of the serial commands is available on request.



ATTENTION:
If an operating mode for starting the inverter has been selected from the list above, it can also only be stopped in this operating mode. This does not apply to the safety functions

Configuration Analog output

Configuration1 ● ROTATIONAL SPEED OUTPUT

With the control connector (13) Pin 4 (+) and Pin 8 (⊥) Ground (>6.1), a direct voltage is given out which corresponds to the rotational speed of the spindle axle. **1V / 10000 rpm**

Configuration 2 ● ACTIVE LOAD OUTPUT

With the control connector (13) Pin 4 (+) and Pin 8 (⊥) Ground(>6.1), a direct voltage is given out which corresponds to the load of the spindle. **0...10 V □ 0...100%**

INFORMATION:
Default of the configuration is "rotational speed output"

Emergency Shutdown

The emergency shutdown interlock can be programmed by software „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 has to be applied a voltage of 5V...30V on the control connector Pin 15 (+) and Pin 8 (\perp).

7.4 Remote-Controlled Configuration of Direction of Rotation

In menu "**digital inputs**" (SFU-Terminal) the function **RPM direction** can be linked with one digital input. This is necessary, if the direction of rotation has to be controlled via a PLC. Reversal can only take place once the spindle has come to a complete stop. If the direction pre-selection setting is changed whilst the spindle is running, the spindle will not turn in the new direction until it has been brought to a complete standstill and then restarted.

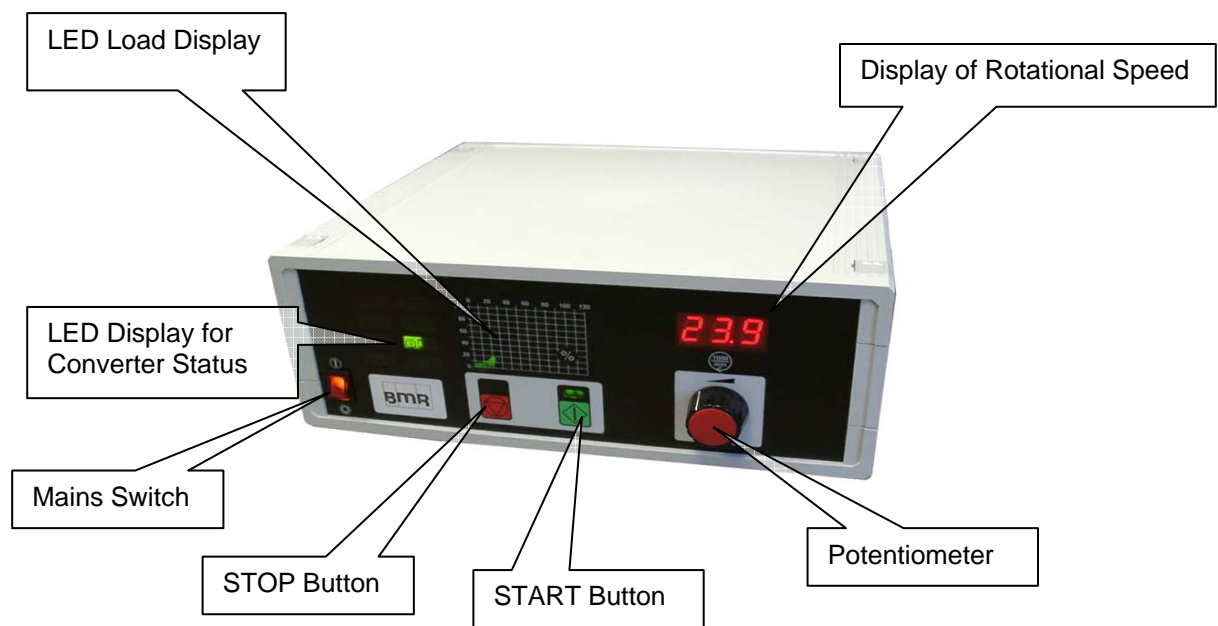
Direction of rotation

To activate the reversal of the direction of rotation, a DC voltage of + 12V ... 24V must be applied to the control connector pin 5. Pin 8 (Ground).

This function is only executed by the inverter if the spindle axis no longer turns, "Spindle standstill" (display 3.4) lights up.

If the signal is activated or deactivated while the spindle is turning, the direction of rotation does not change until the next "spindle stop".

7.5 Control via LED Front Panel



Mains Switch

After the Power-switch is "ON", the Frequency Converter starts if activated, automatically a self-test on the display. During this time all displays flashes a short time one after another. After this automatical check the converter is ready for operation. In case of a defect the corresponding display flashes.

Spindle "Start"

After pressing the „START“-button the spindle starts to come up to the rotational speed adjusted by the rotary knob (11). The acceleration time is adjusted to 10.000 rps on factory default. On request other acceleration times are possible.

Spindle "Stop"


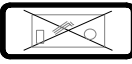

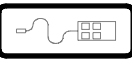
After pressing the "STOP"-button the spindle will be electronically decelerated and stopped to standstill. The deceleration time corresponds to the adjusted acceleration time. On request other acceleration times are possible. It's only possible to slow down the spindle with the „STOP“-button if the START was initiated with "START" and the remote control is **not** „ON“. By pressing power switch „OFF“ there is no electronic slow down, but the spindle runs out freely.

Digital Display of Rotational Speed

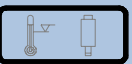
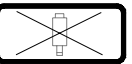
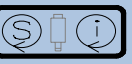
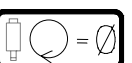
The digital display of rotational speed indicates the adjusted rotational speed by $n \times 1000$

7.6 LED-Displays

Status Display for Converter

Display	Picture	Description
(2.1)		overtemperature
(2.2)		converter is not ready for operation
(2.3)		load of converter or load of spindle higher than 100%
(2.4)		remote control "ON"

Status Display for Spindle

Display	Picture	Description
(3.1)		overtemperature
(3.2)		spindle is not ready for operation
(3.3)		rotational speed reaches "desired value" or "duty value"
(3.4)		standstill of spindle

Load Display

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

"green area" = within the admissibility

"red area" = overload

If the spindle has no defect, the load-display indicates approx. „0%“.

Overload Display

The display (2.3) is on, if the spindle was overloaded or the automatic overload switch off has tripped.

Overload Switch Off

If the spindle is running more than 20 seconds [programmable by software (1 ... 20 sec.)] with overload, an automatic switch off is carried out.

I.e. after this time the converter automatically disconnects the spindle and the displays (2.2) and (2.3) are flashing.

Another „power-up“ of the spindle can only follow if the display (2.2) is off.

The display (2.3) is off if the spindle is „powered-up“ again.

Excess Temperature of Converter

In case the converter reaches the excess temperature the display (2.1) is switched on. Delayed with 3 seconds [programmable by software (1...20 sec.)] the converter switches to „STOP“ and the display (2.2) flashes.

The spindle cannot be switched „ON“ again before the display (2.2) is off. The display (2.1) disappears by another „power-up“.

Excess Temperature of Spindle

In case the spindle reaches the excess temperature the display (3.1) is switched on. Delayed with 3 seconds [programmable by software (1...10 sec.)] the converter switches to „STOP“ and the display (3.2) flashes.

The spindle cannot be switched „ON“ before the display (3.2) disappeared. The display (3.1) disappears by another „power-up“.



ATTENTION:

This evaluation is only possible if the spindle is equipped with a temperature sensor.

Rotational Speed Reached

If the spindle reaches the preset value of the rotational speed, one of the two halves of display (3.3) is switched on.

The left half of the display with the symbol „desired value“ is on if the internal frequency of the converter corresponds to the adjusted frequency.

This evaluation happens whenever the spindle is not equipped with a magneto resistor.

The right half of the symbol „actual value“ is on if the spindle shaft reached duty desired rotational-speed. Only with spindles equipped with speed sensor

Standstill of Spindle

The display (3.4) flashes whenever the spindle shaft stands still.

The converter considers two possibilities of the evaluation:

- a) if the spindle is not equipped with a speed sensor the symbol flashes when the converter does not output a voltage (standstill converter)
- b) if the spindle is equipped with a speed sensor the symbol flashes as soon as the spindle shaft is at standstill (spindle standstill)

7.7 Setting up different Diagrams via Front Panel

To reach the setup menu for spindle characteristic first press the stop button. Then press simultaneously the start button and hold both for about 5sec. After this the actual nr, of the current spindle is displayed. Now release the buttons. Now you can increase with the start button and decrease with the stop button.

If a diagram is not valid an „E“ is displayed e.g. „E07“ in order to show that diagram nr. 7 isn't valid. A valid nr. is displayed as „07“ instead.

When approximately for 5 sec no button is pressed, the converter leaves the menu and carries out a reset and the init routine like the switch-on procedure.

If a number is not occupied, e.g. No. 7, the display shows “E07”.

If a valid number, for example No.5 is set, “05” appears.

7.8 Error message – Error numbers

With firmware versions V2.0 and higher, errors that lead to a standstill of the converter are displayed as error numbers in the display.

If there are several errors, these error numbers are displayed cyclically one after the other.

The following errors are encoded as follows:

- E30: Overload shutdown after expiry of the delay time
- E31: Converter overtemperature (shutdown after the delay time has elapsed)
- E32: Spindle overtemperature (shutdown after the delay time has elapsed)
- E33: Converter or Spindle overtemperature (shutdown after the delay time has elapsed)
- E34: Overvoltage DC link voltage
- E35: Undervoltage OFF DC link voltage
- E36: Undervoltage STOP DC link voltage
- E37: Overcurrent switch off -> Switch off the power stage
- E38: Emergency stop input locked
- E39: Defective spindle cable or without spindle (with activated Spindel test)
- E40: TimeOut serial interface
- E41: Spindle characteristic invalid or damaged
- E42: Shutdown due to excessive back energy (AC) or spindle stall (DC)
- E43: Reserved
- E44: Reserved
- E45: Encoder error

7.9 Safety functions

Hint:

All menu references that appear in the following refer to the corresponding menus in the SFU terminal.

The following events initiate a **controlled declaration** according to the specified spindle acceleration data as specified in the SFU-Terminal **spindle menu**.

- ✓ If this function is activated and the associated delay time is exceeded, it will STOP because of spindle overheating.
- ✓ Stop due to overtemperature of the converter after expiring of the associated delay time. Set in the menu "**delays**"
- ✓ Stop due to overload after expiring of the permissible delay time. The parameters for this is determined in the menu by the max-current and the max-voltage. The delay time can be set in the menu "**delays**"
- ✓ Immediate stop because of exceeding the maximum current of the converter

The following events lead to a shutdown of the amplifier. The spindle will only brake by its own load. It may take up to ten minutes for the machine to stop

- ✓ Stop due to short circuit at the spindle connection triggers PDP interrupt. Determined by internal limit values for the maximum current of the converter.
- ✓ Stop by signal at the digital unput power stage off. Set in the menu "**Digital Inputs**"
A restart can only be made by a specific stop / start sequence or with an application of a valid signal at the digital input error reset. Set in the menu "**Digital Inputs**".
The power amplifier is then switched back on after 4 seconds.



ATTENTION:

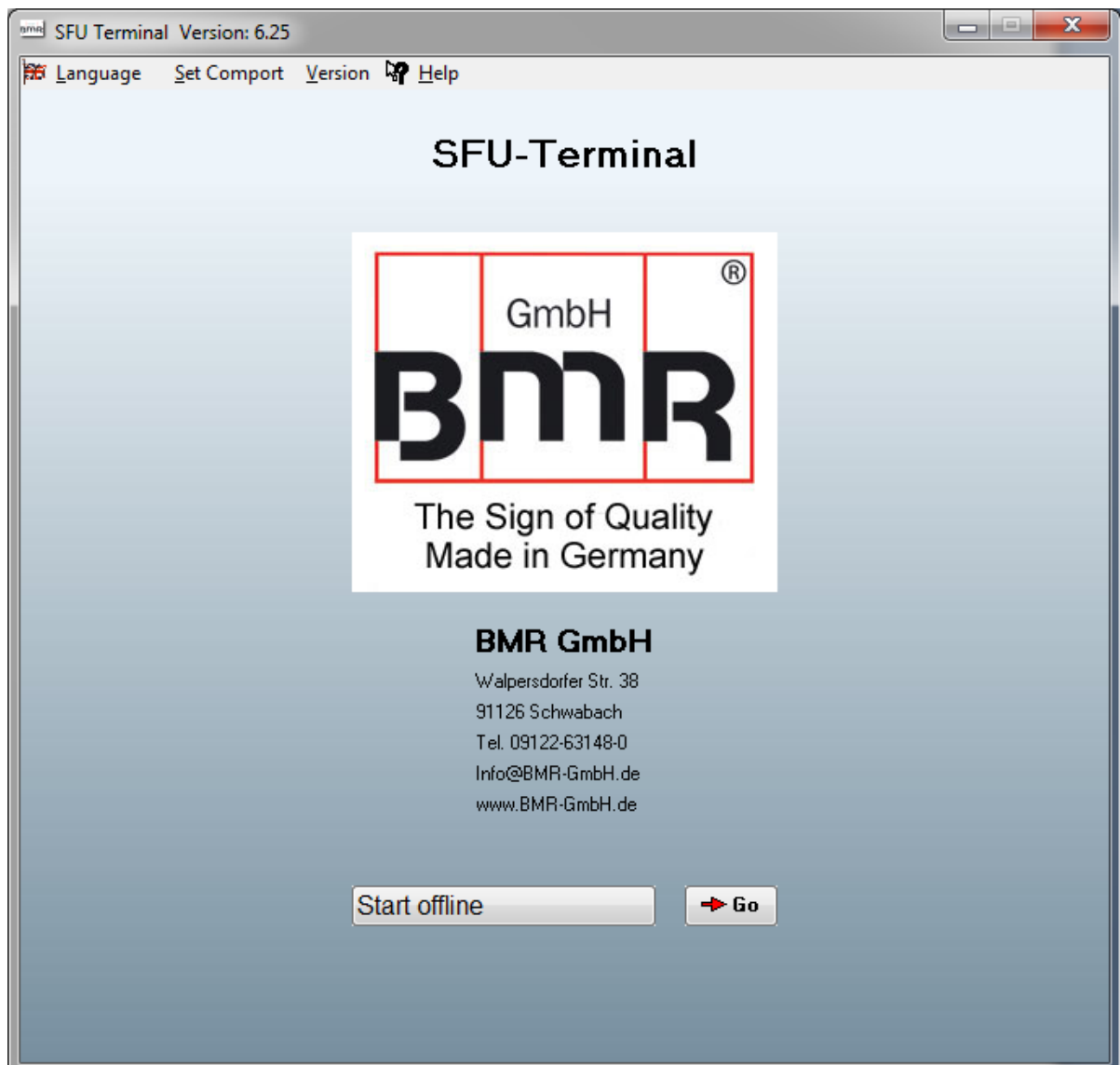
The spindle is not earthed via the converter and connector , but must be earthed via the spindle carrier!

8. Calibration and Configuration with Windows-Software

The software "*SFU-Terminal*" is an optional tool used to configure BMR frequency converters and also provides the possibility of user-friendly data display and calibration. It can be downloaded at the BMR website for free.

The procedure is as follows:

1. Start-up frequency converter and connect via RS232 interface.
2. Start-up program *SFU-Terminal.exe*
The interface is then configured automatically. A connected frequency converter is detected and all data transfer parameters are synchronised.



9. Errors, Trouble-Shooting

Error description	Help action
The converter isn't found during initialization of the Windows program	When using a laptop the voltage levels sometimes are too low. There are external boxes to boost this levels to the normalized values. Be sure to use a zero-modem cable During initialization the converter has to be turned on. Don't use cables longer than 2m
The LED shows "Spindle not ready" and "Spindle overtemperature"	Check whether the PTC in the spindle has a fault or is broken. Is the PTC connected properly ?(see chapter 9 examples) Is the spindle connected properly ? (see chapter 9 examples)
The LED shows "converter not ready"	Is overtemp. converter active (check fan...) The hardware switch has gone off- error reset via start, after release check whether spindle has blocked before re-starting the spindle. The normal current overload protection has tripped- re-start possible via start button or dig. pin eg. A dig. pin (emergency stop or power stage off) is still active- check the inputs. Check whether the right spindle diagram is chosen. When the hall sensor is active, but the hardware input is floating, error spikes prevent the spindle from starting- check the wiring of the hall sensor.
The spindle doesn't start in spite of "converter and spindle ready"	If one analogue input is released for external speed control, the spindle will start above the minimum required voltage level which corresponds to the min. speed set by the diagram. Also the dig. input Start pin has to be activated in parallel. When the green "start" LED appears, it could be that the motor cable has been put out after the self-test procedure

Error description	Help action
The LCD (LED) shows "diagram error xx"	A non-valid diagram has been set. A valid diagram can be chosen through the up/down keys, (or start and stop LED version) restart with ESC key (or autom. after 6sec)
While the spindle is running the message "real rpm reached" vanishes and "duty rpm reached" comes when approaching higher speeds.	Probably a hall sensor with an incorrect gain is used. Normal values are from 560/280 Ohms. Check the values of the hall sensor.
The LCD(LED) shows "without spindle/cable" in spite of a spindle is connected to the output. (noS in LED version)	Check the cable or plugs or screw terminals. Probably a wrong diagram is set. The self-test procedure takes the first value in the diagram for calculating the current which is needed to recognize the spindle correctly. -Check spindle type, diagram

10. EMC

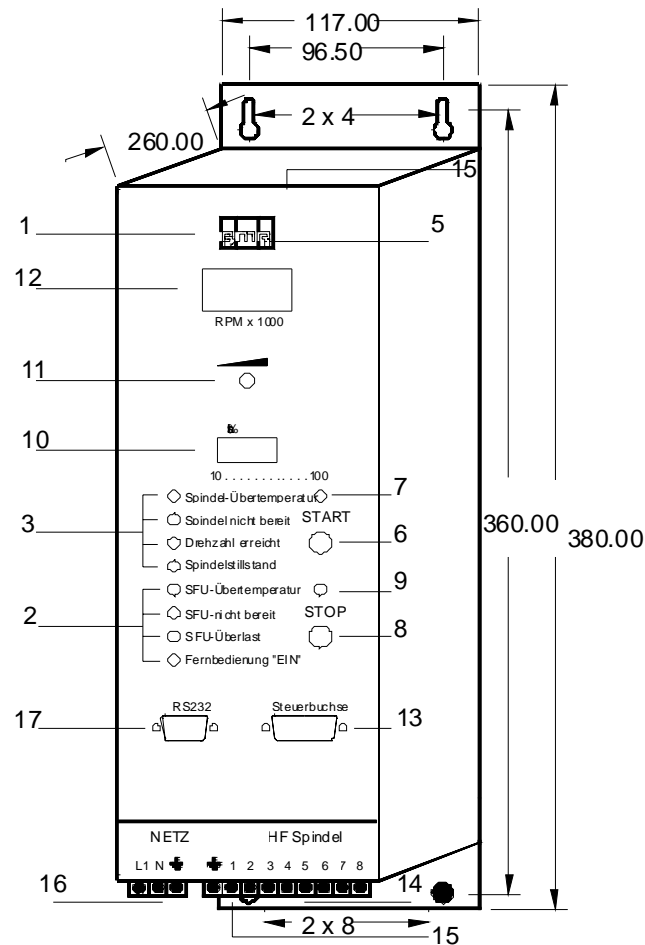
The compliance with the limit values of EMC is the responsibility of the manufacturer of the machine or device.

This device was developed for use in industrial environments. For trouble-free operation and to reduce emitted interference, the following should be observed during wiring of the equipment:

- ✓ The EMC of a machine or device is affected by all connected components (motor spindle, length and type of cables, wiring, etc..). Under certain conditions the use of additional filters can be necessary to maintain the current laws.
- ✓ The earth and shield connections of all those devices used in conjunction with the frequency converter should be as short as possible and have as large a cross-section as possible.
- ✓ Control devices used with the frequency converter (PLC, CNC, IPC, ...) should be connected to a common earth/earth terminal bar
- ✓ All connections both to and from the frequency converter should be via shielded cable.
- ✓ Supply cables, motor cables and control cables must be completely isolated from each other. Where crossing cannot be avoided, cables should be laid at 90° to each other.
- ✓ The control cable should be laid as far away as possible from the load cable.

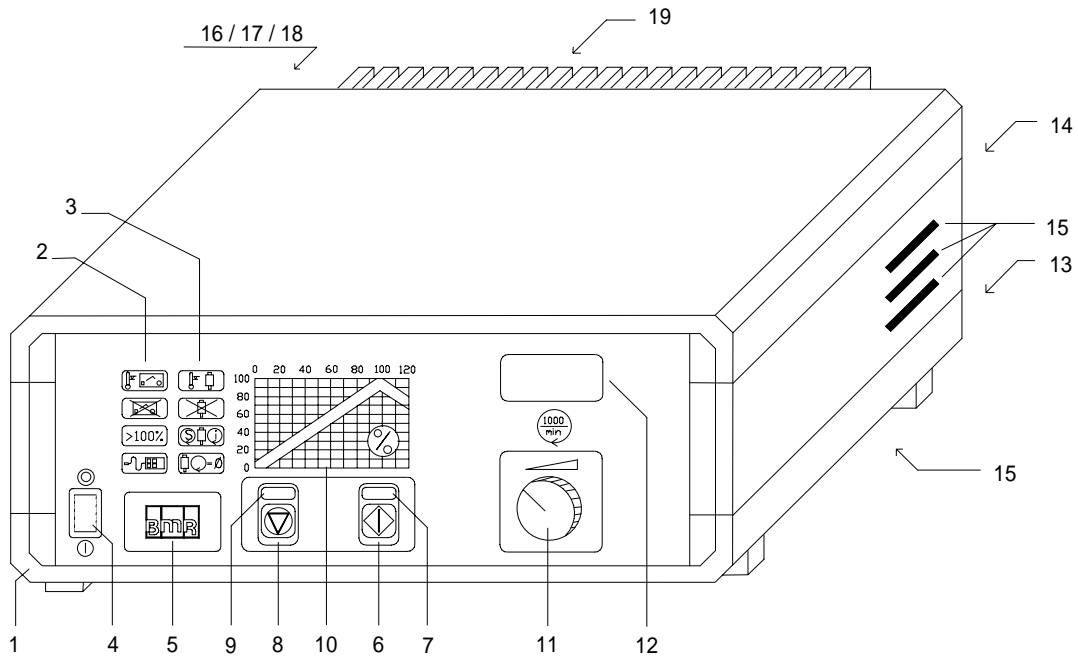
11. Housing variants

SFU 0103/0203 SSE with LED Panel or LED Display



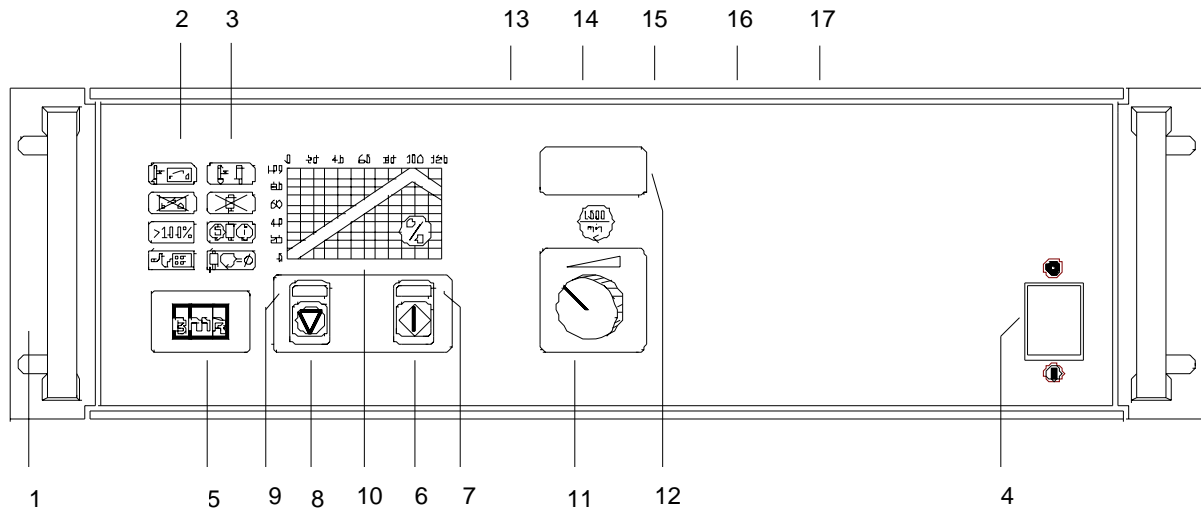
1. housing
2. LED for converter
3. LED for spindle
4. power switch
5. manufacturers logo
6. press button spindle "ON"
7. display spindle "ON"
8. press button spindle "OFF"
9. display spindle "OFF"
10. load display (load of spindle as %)
11. adjustment of rotational speed
12. digital display of rotational speed
13. control connector - 15 poles (back)
14. spindle connector - 7 poles (back)
15. vent
16. power supply (back)
17. fuse

SFU 0103/0203 (Desktop) with LED Panel or LCD Display



1. housing
2. display for changer
3. display for spindle
4. power switch
5. manufacturers logo
6. press button spindle "ON"
7. display spindle "ON"
8. press button spindle "OFF"
9. display spindle "OFF"
10. load display (load of spindle as %)
11. adjustment of rotational speed
12. digital display of rotational speed
13. control connector 15 poles (back)
14. spindle connector (back)
15. vent
16. power supply (back ----)
17. fuse (back)
18. ----
19. heat sink
20. ----

SFU 0103/0203 as 19"-Rack with LED Panel or LCD Display



1. housing
2. display for converter
3. display for spindle
4. power switch
5. manufacturers logo
6. press button spindle "ON"
7. display spindle "ON"
8. press button spindle "OFF"
9. display spindle "OFF"
10. load display (load of spindle as %)
11. adjustment of rotational speed
12. digital display of rotational speed
13. control connector - 15 poles (back)
14. spindle connector - 7 poles (back)
15. ----
16. power supply (back)
17. fuse (back)
18. ----
19. ----
20. ----

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100%	„Made in Germany“
100%	precision
100%	reliability
100%	support
100%	flexibility



**Subject to technical alterations.
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