English

JOHANNES HÜBNER GIESSEN
ideas and solutions

Operating and assembly manual

Frequency - voltage converter
Type: FVC 10 B

Frequency - voltage converter with voltage converter
Type: FVC 10 B + DC2415

Read the operating and assembly manual before assembly, before starting installation and before completing all other work!
Keep for future reference!

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This document may contain errors. We reserve the right to make technical changes.

Table of contents

1 General information

1.1 Information on the operating and assembly manual

This operating and assembly manual provides important information for using the frequency - voltage converter. It must be read carefully before beginning any work and observed.

Furthermore, local accident prevention regulations and general safety regulations applicable in the area where the frequency - voltage converter is used must be observed.

1.2 Scope of delivery

The frequency - voltage converter and the operating and assembly manual belong to the scope of delivery.

1.3 Explanation of symbols

Warning information is designated in this operating and assembly manual using symbols. Information is proceeded by signal words which express the extent of the danger involved. Always comply with these notices, and use caution to avoid accidents, personal injury and property damage.

WARNING!

Indicates a potentially hazardous situation that could lead to death or severe injury if it is not avoided.

CAUTION!

Indicates a potentially hazardous situation that could lead to minor or slight injuries if it is not avoided.

CAUTION!

Indicates a potentially hazardous situation that could lead to property damage if it is not avoided.

NOTE!

Emphasises useful tips and recommendations, and provides information useful for efficient, smooth operation.

DANGER!
Mortal danger due to electric current!

Indicates a life-threatening situation caused by electric current. Failure to observe the safety information may result in serious injuries or death. Work may only be carried out by an electrician.

1.4 Warranty and liability

Only the “General Terms and Conditions” of Johannes Hübner Fabrik elektrischer Maschinen GmbH apply. These will be provided to the operator at the latest when the order is confirmed or when the contract is concluded. All warranty and liability claims for personal injury and property damage are excluded, and the operator's operating permit will be null and void if one or more of the following apply:

- Failure to observe the operating and assembly manual.
- Improper use of the frequency - voltage converter.
- Incorrect assembly, installation and commissioning of the frequency - voltage converter.
- Operating the transmission system despite technical defects.
- Independently carrying out mechanical or electrical modifications to the frequency - voltage converter.
- Independently carrying out repairs.
- Catastrophes due to external interference or force majeure.
- Use of non-qualified personnel.
- Opening the frequency - voltage converter.

1.5 Organisational measures

- The operating and assembly manual must always be stored easily within reach in the area where the frequency - voltage converter is used.
- In addition to the operating and assembly manual, general statutory and other binding regulations on accident prevention and environmental protection must be observed. Operators must be trained on these regulations.
- Applicable national, local, and system-specific provisions and requirements must be observed.
- The operator is obligated to inform personnel of special operating considerations and requirements.
- The type plate and any prohibitions or notice signs adhered to the frequency - voltage converter must always be legible.
- Repairs may only be carried out by the manufacturer, or by an agency or individual authorised by the manufacturer.

1.6 Copyright protection

NOTE!

Content information, texts, drawings, images, and other illustrations are copyright protected and subject to industrial property rights. Copying of any kind not associated with use of the frequency - voltage converter is prohibited without a written declaration from the manufacturer. Violations will result in claims for damages.

1.7 Warranty provisions

Warranty provisions are outlined in the manufacturer's General Delivery Conditions.

1.8 Customer service

Contact persons are available by phone, fax, or e-mail for technical questions. See the manufacturer’s address on page 2.

2 Basic safety information

DANGER!

This section provides an overview of all significant safety aspects necessary to protect personnel and ensure safe, fault-free operation of the frequency - voltage converter. Failure to observe this information may result in significant danger.

2.1 Responsibility of the operator

The frequency - voltage converter is used in commercial areas. The operator of the frequency - voltage converter, therefore, is subject to statutory occupational safety requirements and the safety, accident prevention and environmental regulations applicable to the areas in which the frequency - voltage converter is used.

2.2 Selecting and qualifying personnel; basic obligations

- All work with the frequency - voltage converter may be carried out only by qualified personnel. Qualified personnel are personnel with the training, experience, and instruction, as well as expertise on relevant standards, specifications, accident prevention regulations and operating circumstances necessary to carry out the required work, and who have been authorised to do so by the persons responsible for the safety of the system. They are able to identify and avoid potential hazards.
- In addition, please see standards VDE 0105-100 and IEC 364 for the definition of “qualified personnel” (reference, e.g. Beuth Verlag GmbH, VDE-Verlag GmbH)
- Responsibilities for assembly, installation, commissioning and operation must be clearly defined. Personnel who are receiving instruction or training must be supervised.

2.3 Proper use

The frequency - voltage converter is designed for converting the output signals of the rotary encoders type FG 4 ... to FG 14 ... into a DC voltage or current that is proportional to the speed and dependent on the direction of rotation.

The maximum frequency end value is 200 kHz. The converter is characterised in particular by the following features:

- Microprocessor controlled
- Can be set by the user
- High linearity
- Frequency range 0 ... 200 kHz

The output signals of the 0° and 90° encoder tracks and the corresponding inverted signals are cleared of in-phase interference pulses in the input stage and converted back to square-wave pulses. A microprocessor then carries out a comparison with a quartz-stable time base. Using 4 coding switches, the user has the possibility to set the end speed and number of pulses of the rotary encoder within the ranges of 1 min^{-1} to 9999 min^{-1} and 1 ... 9999 pulses/revolution. The value resulting from the input frequency and the settings of the coding switches is converted in a D/A converter and fed to the analogue outputs. The direction of rotation and standstill are fed to the corresponding outputs of the connector strip and are also indicated by LEDs on the front panel.

The basic version of the FVC 10 B is equipped with a speed-proportional voltage output 0 ... ±10 V.

Optionally, either an additional voltage output 0 ... ±10 V, or a current output 0 ... ±20 mA, or a current output independent of the direction of rotation +4 ... +20 mA can be provided.

After the switch-on test routine has been completed, the FVC 10 B provides an output signal (approx. +15V) to indicate that it is ready. Up to this point, the analogue output signals correspond to zero speed.

It is possible to restart the FVC 10 B via a reset input using a central RESET signal with a 0V level present in the downstream system.

Proper use also includes:

- observing all information in this operating and assembly manual.
- observing type plates and any prohibition or information signs.
- observing the operating manual of the machine or system manufacturer.
- operating the frequency - voltage converter within the limits stipulated in the technical data.
- not engaging in improper use.

2.4 Improper use

	**Warning:** This device is not intended for use in residential areas and cannot ensure adequate protection of radio reception in such environments.

	**WARNING**! Danger of death, physical injury and property damage due to improper use of the frequency - voltage converter! In particular, the following uses are prohibited: ● Use in environments with an explosive atmosphere. ● Use in environments with radioactive radiation. ● Use on ships. ● Use for medical purposes.

2.5 Safety information

WARNING! ATTENTION! NOTE!

Destruction, damage or impact to the function of the frequency - voltage converter!

- Only complete wiring work and only connect or disconnect electrical connections when powered down.
- Review any potential hazards due to interactions with other systems and devices currently installed in the surrounding area, or which are to be installed. The user is responsible for taking relevant measures.
- The power supply must be secured with a fuse appropriate for the diameter of the intake line.
- Cables used must be suitable for the temperature range.
- A defective frequency - voltage converter may not be operated.
- Opening the frequency - voltage converter is prohibited.
- The type plates specify the technical properties of the frequency - voltage converter. If a type plate is no longer legible, or if a type plate is missing entirely, the frequency - voltage converter may not be operated. Contact Hübner Service (see page 2).

NOTE!
Disposal:

If the frequency - voltage converter needs to be disposed after its service life, applicable national regulations must be observed.

3 Assembly

3.1 Safety information

WARNING!

- Assembly and disassembly may only be carried out by qualified personnel. Observe the safety information in section 2.
- In general, the requirements and acceptance conditions for the system as a whole must be observed.

The FVC 10B (module housing with clamp fastening for 35 mm DIN mounting rail) is equipped with a double-row 24-pole PHOENIX COMBICON pin header (type: MDSTB 2.5/12-G1-5.08).

3.2 Basic regulations

WARNING!

- Power and signal lines must be installed separately.
- Observe the manufacturer's information when installing converters, shielding on power lines between the frequency converter and motor.
- Ensure the energy supply is sufficient for the application.

3.3 Electrical connection

The cables for the encoder signal (A3 - A6) and the analogue output (B9 - B12) must be shielded cables.
The cable length to the rotary encoder may be 100m. For all other connections, maximum 3m is permitted.

Wiring must be carried out according to the wiring diagram.

For an output voltage dependent on the direction of rotation (±10V), inputs A and B must be connected including the inverted signals. For unipolar operation, the wiring is carried out in accordance with the wiring diagrams on page 12.

3.4 Replacement of the frequency - voltage converter

When replacing the frequency - voltage converter, observe the following points:

- The new frequency - voltage converter must have the same item no. (ID) as the old one.
- When recommissioning the replaced frequency - voltage converter, a secure test run must be completed first to ensure it functions correctly.

4 Technical data

4.1 Type plate

The following image shows an example of a type plate.

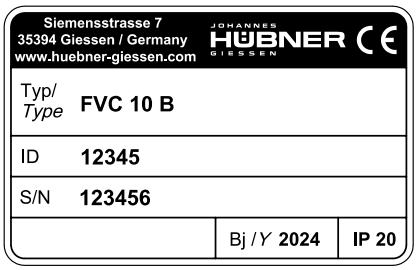


Fig. 4-1: Type plate (example)

The type plate is located on the side of the housing.
Type plate information:

- Manufacturer
- Type, year of construction
- CE mark
- Serial number (S/N)
- Protective class (IP)
- ID number

4.2 FVC 10 B electrical and mechanical data

Model	Module housing
Dimensions	W = 45 mm x H = 118 mm x D = 136 mm
Plug connector	PHOENIX COMBICON Front-MSTB2.5/...-ST-5.08
Supply voltage	±15 VDC, ±5%
Idling power consumption	approx. +160 mA, -40mA
Ambient air temperature	0°C … +60°C
Incremental encoder interface	
Electrical inputs	Signal tracks 0°, 90° each with inverted signal
Signal level	HTL differential
Max. frequency	200 kHz

The FVC 10 B is categorised in Group 1 and Class A in accordance with EN 55011 and is only intended for use in an industrial environment.

4.3 Wiring diagram EL 411

A1	+15V	Versorgungsspannung	supply voltage
A2	0V	GND	GND
A3	n	Eingang 0°	input 0°
A4	nG	Eingang 0° invers bzw.GND	input 0° inverse or GND
A5	90	Eingang 90°	input 90°
A6	90G	Eingang 90° invers bzw.GND	input 90° inverse or GND
A7	Reset	Eingang Reset L	input reset L
A8	0V	GND	GND
A9	Active	Ausgang Aktiv H	output active H
A10	Left	Ausgang Linkslauf H	output counter-clockwise H
A11	Stop	Ausgang Stillstand H	output standstill H
A12	Right	Ausgang Rechtslauf H	output clockwise H
B1	-15V	Versorgungsspannung	supply voltage
B2	0V	GND	GND
B3..B8	-	-	-
B9	Ua1	Ausgangsspannung Ua1	output voltage Ua1
B10	0V	GND	GND
B11	Ua2/Ia	Ausgang Ua2 bzw. Ia	output Ua2 or Ia
B12	0V	GND	GND

4.4 FVC 10 B + DC 2415 electrical and mechanical data

Model	Double module housing
Dimensions	W = 90 mm x H = 118 mm x D = 136 mm
Plug connector	PHOENIX COMBICON Front-MSTB2.5/...-ST-5.08
Supply voltage	24 VDC, ±10%
Idling power consumption	approx. 200mA
Ambient air temperature	0°C … +60°C
Incremental encoder interface	
Electrical inputs	Signal tracks 0°, 90°
Signal level	HTL differential
Max. frequency	200 kHz

The DC2415 voltage converter is housed in another module housing, which is screw connected to that of the FVC10B.
Wiring with the FVC10B is carried out at the factory in accordance with wiring diagram EL411A.

4.5 Wiring diagram EL 411A

C1	+24V	Versorgungsspannung Eingang	Input supply voltage
C2	0V	GND	GND
C3	+15V	Versorgungsspannung Ausgang	output supply voltage
C4	0V	GND	GND
C5	-15V	Versorgungsspannung Ausgang	output supply voltage
C6	Rel1a	POWER ERROR Öffner max. 50V/100mA	POWER ERROR N/C max. 50V/100 mA
C7	Rel1b		
C8	Rel2a	OVERFLOW ERROR Öffner max. 50V/100mA	OVERFLOW ERROR N/C max. 50V/100 mA
C9	Rel2b		
C10	R	Eingang Rechtslauf	input cw
C11	-		
C12	L	Eingang Linkslauf	input ccw

4.6 Configuration

The maximum occurring speed is set with the switch group SW1 to SW4. If this speed is exceeded by more than 10%, both direction of rotation LEDs light up and the analogue output voltage remains at the maximum output voltage of +11V or -11V (+22mA or -22mA) corresponding to the direction of rotation until the current speed falls below this limit value again.
If exceeded, the two output signals LEFT and RIGHT are at +15V (OVERDRIVE INDICATOR).
The switch group SW5 to SW8 is used to set the number of pulses/revolution associated with the frequency inverter.
The new switch values of the FVC 10 B are read in when the supply voltage is switched on or a reset is performed.

Attention!

The highest permissible values for this are:

$$\frac{\text{Impulszahl} * \text{max. Drehzahl}}{60} \geq 128$$

The lowest permissible values for this are

$$\frac{\text{Impulszahl} * \text{max. Drehzahl}}{60000} \leq 200$$

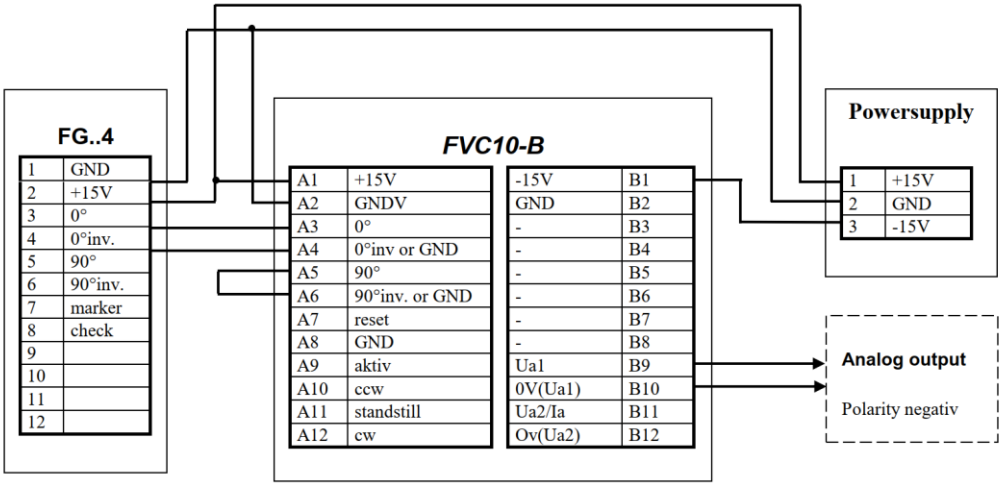
This corresponds to a range of processable maximum input frequencies from 128 Hz to 200 kHz.

Values that are set too high or too low are not accepted.
The LEDs on the front panel flash.

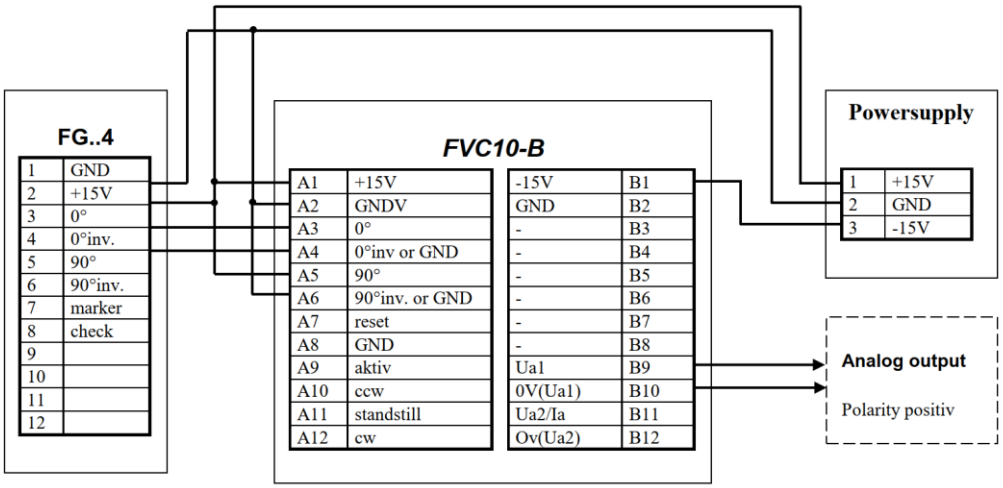
Repeat the setting procedure with the correct values.

Anschlußplan / *Connection sheme*
FG..4 - FVC10B for unipolar output voltage

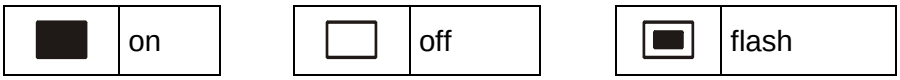
Negative Ausgangsspannung / *Negative output voltage*



***Positive Ausgangsspannung* / Positive output voltage**



4.7 Operating statuses and displays



4.7.1 FVC 10 B

+V

	No voltage
	Voltage OK

R, S, L

R	S	L	Operating status
			No voltage
1x	1x	1x	Self-test
			Clockwise rotation of encoder shaft
			Counter-clockwise rotation of encoder shaft
			Standstill
			Speed limit exceeded
			Invalid configuration

4.7.2 DC 2415

+V

	No voltage
	+15V OK

-V

	No voltage
	-15V OK

5 Transportation, packaging and storage

5.1 Transportation safety information

!	**CAUTION!** **Property damage due to improper transportation!** These symbols and information on the packaging must be observed: Do not throw, danger of breakage. Protect against wetness

5.2 Incoming goods controlling

The delivery must be checked promptly for transportation damage and to ensure it is complete upon receipt.
If there is transportation damage, the carrier must be informed directly upon delivery (take photos as evidence).

5.3 Packaging (disposal)

Packaging will not be taken back and must be disposed of according to applicable statutory specifications and local regulations.

5.4 Storing packages (devices)

	**Protect against wetness!** Protect packages against wetness, store in a dry and dust-free location.

In case of long storage times (> 6 months), we recommend packaging the devices in protective packaging (with desiccants).

5.5 Returning equipment (repair/goodwill/warranty)

Devices that have come into contact with radioactive radiation or materials will not be taken back.
Devices that have come into contact with biological or chemical substances that could be hazardous to health must be decontaminated before they are returned.
A clearance certificate must be enclosed.

5.6 Disposal

The manufacturer is not obligated to take back the devices.
The frequency - voltage converter must be treated as special electronic waste and must be disposed of according to specific national law.
Local municipal authorities or speciality disposal companies can provide information on environmentally-appropriate disposal.