



Short Reference Guide FB10, FB11, FB12

Frequency converter for elevators

Version 8.5

Software version > 2.07

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## Preface

This documentation describes the following converter models:

FB10, FB11, FB12

It contains important information about:

- Equipment configuration
- Connection
- Control system
- Operation
- Starting
- Ancillary equipment
- Service

Disclaimer:

The information contained in this document specifies the properties of the products. However, these specifications do not represent a guarantee of said properties. We reserve the right to make technical changes.

## Explanation of symbols used

The symbols shown below are used to warn users against specific risks. Please follow these instructions and precautions and make sure other users are aware of them as well.



**Caution – General hazard area**  
**Information for safe operation of the device**

- Wherever you see a checkmark this indicates that you are supposed to check something, or read a summary.

## Copyright

The copyright for this user manual is owned by **Brunner & Fecher Regelungstechnik GmbH, Aschaffenburg**. It is not permitted to duplicate or distribute the user manual, nor use it without due authority for commercial gain or disclose it to third parties, neither in full nor in part. Any violations are punishable and will render the offending party liable to pay compensation.

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Subject to technical changes.



**We would like to inform you that this manual applies only to the individual device, and not to the overall system.**

## Safety information for the user

This manual contains the information required for proper use of the described products. It is intended to be used by technical qualified staff.

The term 'qualified staff' covers persons who, due to their education, experience and vocational training, as well as due to their knowledge of the relevant standards, regulations and accident prevention laws, have been authorized by the persons/company responsible for operation of the plant to perform the relevant duties which are required, and who in doing so can recognize and avoid potential hazards (refer also to the German definitions of qualified staff in accordance with VDE 105 or IEC 364).

### Hazard warnings

The following details are provided for the personal safety of the operating staff and also for the safety of the described products and all devices connected to them.

**Always disconnect the device from the mains before carrying out any work on it. Then wait at least 5 minutes for the capacitors in the DC link circuit to discharge, so that the residual voltage is less than 65 V. It is then safe to work on the device.**



#### **Danger!**

**High voltage**

**Failure to comply with these warnings may result in death, serious injury or material damage.**

**Work on or with the equipment must only be performed by qualified personnel who have received suitable training and who have been authorized to carry out the work by the operator.**

- Disconnect the power supply before any installation or removal work, before changing fuses and before making any changes to the machinery.
  - Always follow the accident prevention rules which apply in each specific case.
  - Before using the device for the first time, make sure that the rated voltage matches the local mains supply voltage.
  - Emergency stop devices must work in all operating modes. The process of releasing the emergency stop switch must not result in an uncontrolled restart of the machine.
- **Electrical connections must be covered!**
  - **PE connections must be checked after installation to make sure that they are working properly!**

**We do not claim that this list of safety rules is necessarily complete.**

### Proper use

The devices described in this manual are electrical components for use in industrial plants. They are designed for the control of elevators.

## 1 Checking the installation

Before taking the equipment into operation, make sure that all of the points in the following checklist are worked through:

Point	Description	Done
1	The device must be connected in accordance with the connection diagram. It is imperative that the main contactor is connected between the mains supply and the converters L11, L21, L31. The main contactor must be locked via the M-C relay.	
2	All connections (cables and plugs) must be made and checked.	
3	Both ends of the shielding for the motor cable and the brake resistance cable must be screwed to the intended metal attachment points/brackets at the frequency converter and at the motor or brake resistor in such a way that wide contact is made.	
4	Shielded cables must always be used for the incremental encoder. The pulse encoder shielding must be connected to PE at both ends.	
5	The connections of the device must be checked against the type plate of the frequency converter with respect to the following criteria: mains voltage, rated motor current ( $I_{\text{converter}} > I_{\text{motor}}$ ), control voltage, brake resistance, mains fuses and rotary encoder.	
6	The frequency converter should preferably be operated without an earth leakage circuit breaker. The integrated mains filter always allows a certain amount of leakage current to flow to earth, and this could cause the earth leakage circuit breaker to trip. If the installation of an earth leakage circuit breaker is unavoidable, make sure that you use one which is specially designed for frequency converter operation.	
7	All contactors must be connected via R-C combinations or overvoltage protection.	
8	On old machines, replace heavy handwheels with ones made of plastic or aluminium.	
9	The control cabinet must be vented.	

## 2 Menus and parameters

### 2.1 Meaning of the keys

The keys are used in the same way for all menus.

#### UP and DOWN arrow keys:

- Selection of the main menu
- Selection of the submenu
- Change parameters (as digits) or switch ON/OFF

#### ENTER key:

- Change from main menu to submenu
- Change to the "change mode" of a submenu
- Transfer a changed parameter to the memory

#### QUIT key:

- Change from "change mode" to a submenu
- Change from submenu to main menu
- Change to a different area of the menu with the aid of the selection menu

**When changing parameters, you must always use the ENTER key to save the changes. If you press the QUIT key the system will continue to use the original values.**

## 2.2 Menu structure

There are three menu areas which can be chosen with the aid of the selection menu. To do this, press and hold the QUIT key and then press another key to choose the desired area of the menu.

- QUIT + DOWN = MENU: This is the area in which all system-specific data are adjusted.
- QUIT + UP = MONITOR: Here you can read off all relevant operating data.
- QUIT + ENTER = ERROR: In this area, the last 49 errors are displayed with all relevant additional information with the aid of an error memory.

## 2.3 Start menu

In the start menu you can observe the current run status and all applied commands and relay outputs.

Display:

Brunner & Fecher FB12	
30.06.2009	09:20
Status:	0>V3
▼ 0 3	NFH3XP

Status	Meaning
-----	Converter ready
MAG	Motor is being magnetized
0>V3	Motor accelerates to V3
V3	Motor runs at speed V3
V3>V0	Motor decelerate to leveling speed V0
V0	Motor drives with leveling speed V0
V0>0	Motor decelerates to standstill
STOP	Brakes are applied; electrical holding
▼	Command direction down
0	Command leveling speed V0
3	Command final speed V3
N	Relay mains/ready
F	Relay B-C brake contactor
H	Relay M-C main contactor
3	Relay V<0.3m/s
X	Relay Vx
P	Relay Vp

## 2.4 Monitor menu

### Monitor 1:

- Display of the current motor current
- Display of the current motor voltage
- Display of the DC link voltage

### Monitor 2:

- Display of the current rotational speed
- Display of the current motor frequency
- Display of the current motor slip

### Monitor 3:

- Display of mains-operated hours
- Display of the number of operating hours
- Display of the trip counter

### Monitor 4:

- Display of the current heat sink temperature
- Display of the minimum and maximum values for the heat sink temperature

### Monitor 5:

- Display for brake contactor monitoring; FB10 / FB12 only

### 3 Commissioning

#### 3.1 Settings for asynchronous motors with an incremental encoder

Menu	Setting	Description
<b>DRIVE Motor encoder</b>	-Asynchronous-	
<b>DRIVE Feedback pulses</b>	50 - 10000	No. of encoder pulses. Refer to the encoder.
<b>DRIVE Type plate Rated speed</b>	150 - 3000 rpm	Refer to the rated speed on the motor type plate. (Caution: rated motor speed, not synchronous speed). If the rated rotational speed is not stamped on the plate, refer to the rated motor speeds table.
<b>DRIVE Type plate Rated frequency</b>	10-90 Hz	Refer to the rated frequency on the motor type plate.
<b>DRIVE Type plate Rated current</b>	1.0 – 120.0 A	Refer to the rated current on the motor type plate.
<b>DRIVE Type plate Power factor (cos phi)</b>	0.65 – 0.95	Refer to the power factor (cos phi) on the motor type plate. If the power factor (cos phi) is not stamped on the plate, refer to the rated motor speeds table.
<b>DRIVE Gearbox transmission ratio</b>	1:1 - 1:90	Refer to the transmission ratio on the gearbox type plate.
<b>DRIVE Gearbox driving disc diameter</b>	100 - 2000 mm	Refer to the driving disc diameter on the gearbox.
<b>DRIVE Suspension</b>	1:1 - 1:4	Refer to the cable suspension / cabin.

The converter will switch off with errors if the drive parameters are incorrectly set. All other parameters should be initially left at their preselected values.

Table of rated motor speeds.

Motor without stamped rated speed or power factor (cos phi)

Motor power (kW)	Rated speed Single-speed motor (rpm) 4-pole/6-pole	Rated speed Two-speed motor (rpm) 4-pole/6-pole	Power factor (cos phi) Single-speed motor	Power factor (cos phi) Two-speed motor
5.5	1380/900	1340/880	0.84	0.72
7.5	1390/910	1350/890	0.86	0.74
11	1400/920	1360/900	0.88	0.76
15	1410/930	1370/910	0.90	0.78
18	1420/940	1380/920	0.92	0.80
22	1430/950	1390/930	0.93	0.82
30	1440/960	1400/940	0.94	0.84

The above values are approximate.

### 3.2 Settings for asynchronous motors without an incremental encoder (open loop)

Menu	Setting	Description
<b>DRIVE</b> <b>Motor encoder</b>	-Async. open loop-	
<b>DRIVE</b> <b>Type plate</b> <b>Rated speed</b>	150 - 3000 rpm	Refer to the rated speed on the motor type plate. (Caution: rated motor speed, not synchronous speed). If the rated rotational speed is not stamped on the plate, refer to the rated motor speeds table.
<b>DRIVE</b> <b>Type plate</b> <b>Rated frequency</b>	10 - 90 Hz	Refer to the rated frequency on the motor type plate.
<b>DRIVE</b> <b>Type plate</b> <b>Rated current</b>	1.0 – 40.0 A	Refer to the rated current on the motor type plate.
<b>DRIVE</b> <b>Type plate</b> <b>Power factor (cos phi)</b>	0.65 – 0.95	Refer to the power factor (cos phi) on the motor type plate. If the power factor (cos phi) is not stamped on the plate, refer to the rated motor speeds table.
<b>DRIVE</b> <b>Gearbox transmission</b> <b>ratio</b>	1:1 - 1:90	Refer to the transmission ratio on the gearbox type plate.
<b>DRIVE</b> <b>Gearbox driving disc</b> <b>diameter</b>	100 - 5000 mm	Refer to the driving disc diameter on the gearbox.
<b>DRIVE</b> <b>Suspension</b>	1:1 - 1:6	Refer to the cable suspension / cabin.
<b>START / STOP</b> <b>Boost</b>	0 - 100 %	Set the boost high enough so that the drive moves off in the load direction. The current must not exceed the rated motor current at low rotation speeds. Refer to MONITOR 1: Mot. current

The converter will switch off with errors if the drive parameters are incorrectly set. All other parameters should be initially left at their preselected values.

### 3.3 Settings for synchronous motors with EnDat or SINCOS encoder

Menu	Setting	Description
<b>DRIVE</b> <b>Motor encoder</b>	-Sync. EnDat- -Sync. SinCos-	
<b>DRIVE</b> <b>Feedback pulses</b>	2048	No. of encoder pulses. Refer to the encoder.
<b>DRIVE</b> <b>Synchronous pole</b> <b>position</b>	0 - 360	Where fitted, refer to the pole position/offset angle on the motor type plate.
<b>DRIVE</b> <b>Type plate</b> <b>No. of pole pairs</b>	1 - 30	Where fitted, refer to the no. of pole pairs on the motor type plate.
<b>DRIVE</b> <b>Type plate</b> <b>Rated current</b>	1.0 – 120.0 A	Refer to the rated current on the motor type plate.
<b>DRIVE</b> <b>Type plate</b> <b>Rated voltage</b>	200 - 400 V	Refer to the rated voltage on the motor type plate.
<b>DRIVE</b> <b>Gearbox transmission</b> <b>ratio</b>	1:1 - 1:90	Refer to the transmission ratio on the gearbox type plate. If gearless: 1:1
<b>DRIVE</b> <b>wheel diameter</b>	100 - 2000 mm	Refer to the driving disc diameter on the gearbox.
<b>DRIVE</b> <b>Suspension</b>	1:1 - 1:4	Refer to the cable suspension / cabin.

If the pole position/offset angle is not known then a test run will need to be performed. Here, the number of pulses, pole position and number of pole pairs are determined. The ropes must be loose for this.

Menu	Input	Description
<b>DRIVE</b> <b>!Test run!</b> <b>Perform</b>	Yes	Calculation of: No. of encoder pulses Pole position (offset) No. of pole pairs
<b>DRIVE</b> <b>!Test run!</b> <b>Cables loose</b>	Yes	The cables must be loose, and the motor must turn freely.

Give auxiliary command and leave it switched on. The duration of the test run will depend on the number of pole pairs.

Display:

Ws: xxxx	I: xxxx
Wi: xxxx	U: xxxx
N: xxxx	P: x d: x

Ws: Target angle 0-3000

Wi: Actual angle 0-3000

N: Rotational speed 0-xxxx UpM

I: Motor current

U: Motor voltage

P: No. of pole pairs

d: Direction of rotation 0 or 1

Once the converter has determined all of the parameters, "Reset commands" is displayed in the menu. Only now can the commands be reset.

The test run should be repeated three times, and the same pole position should be displayed each time.

The converter will switch off with errors if the drive parameters are incorrectly set.

All other parameters should be initially left at their preselected values.

### 3.4 First run with the auxiliary function

Menu: **SPEED inspection Vi**

Enter approx. 0.3 m/s as the required inspection speed.

Press Vi/auxiliary to start.

Fault(s)	Remedy
Fault 13 – direction of rotation	Menu DRIVE – Pulse input – change A-B to B-A
Motor running in the wrong direction	Menu DRIVE – Electric rotary field – change 'right-handed' to 'left-handed'
Drive rocking	Menu CONTROLLER PARAMETERS – increase attenuation values

### 3.5 Start-up delay

Drive starts up against the closed brake: Menu **START/STOP – Start-up delay** – increase the setting. Recommended values:

Asynchronous motor: 350 ms

Synchronous motor: 600 ms

Auto: Start-up delay is automatically adjusted once the first pulse of the rotational speed encoder is detected.

### 3.6 Normal run

Set the end speed in the menu **SPEED V3 or V1 or V2** to the required speed. Note which speed is actuated by the controller (V1, V2 or V3).

The selected travelling speed (m/s) should correspond to the rated rotational speed (rpm) of the motor.

Start a normal run. During entry into the stop, the drive should run for at least one second with the leveling speed V0. If this is not the case, correct the deceleration points.

### 3.7 Stopping accuracy

The stopping accuracy is adjusted in the menu **START/STOP – Braking distance V0>0** in mm. The distance is measured from the leveling switch to the floor.

If the lift still overruns or stops too soon, then correct the leveling switch or the braking distance V0>0. Then, approach all of the stops in the system from both directions. In the event of any inaccuracies, correct the leveling switches at the affected stops. If the drive stops with a jolt, reduce the speed V0. If the drive takes too long to run into the stop, increase the speed V0.

### 3.8 Optimizing the braking distance:

The leveling time can be reduced to the optimum amount via the converter. To do this, change the corresponding speed to **–test run–** in the menu **SPEED CURVE – deceler. Dist.**. Which of the available braking distance optimizations should be chosen depends on the speed preselection which is used during a normal run. Afterwards a normal run is performed. After successful completion of the run, the deceleration distance optimization parameter is set to ON. On future runs, the deceleration point of the controller is ignored, and the system waits for a time delay before responding. The entry distance is reduced to a minimum.

### 3.9 Ride comfort

If there is a jerk during the transition from acceleration to constant-speed running, this can be corrected by changing the **jerk acceleration** in the **SPEED CURVE** menu. The smaller the value entered here, the softer the rounding. The same applies analogously to the transition from constant-speed running to the deceleration phase via the parameter **jerk deceleration**.

In the event of vibrations or motor noises, increase **attenuation** in the **CONTROL PARAMETERS** menu. The attenuation is divided into five areas: start-up, acceleration, running, deceleration and entry. A attenuation parameter is assigned to each of these sub-areas. By increasing the relevant attenuation parameter, vibrations can be selectively compensated for. Do not set the attenuation too high, as otherwise the drive will overshoot/rock.

### 3.10 Emergency evacuation / batteries

Emergency evacuation is possible with a battery or UPS.

With a 120V battery it is possible to drive against the load, for smaller battery (60V) only in load direction. With the option “automatic direction” the cabin moves always to the easier direction.

Menu	Setting	Deskription
<b>INTERFACE Input Vb</b>	- battery operation -	Input Vb for battery operation.
<b>Interface evacuation -battery voltage-</b>	80 - 400 Vdc	Setting of battery voltage. 120V With battery 120V 325V With UPS 230Vac
<b>Interface evacuation -auto direction-</b>	on off	Automatic load measuring and travel to the easier direction.
<b>Interface evacuation -test speed-</b>	0,010-0,050 m/s	If the load can not be measured during the brake open, it will be tested with this speed.
<b>Interface prog. relay</b>	-dir change-	shows the lift controller the change of direction

Schematic time chart: see schematic diagram FB10 battery in appendix

## 4 Description of errors

### 4.1 LED displays

Above the display there is a green and a red LED.

#### Green LED

Betrieb/Operation: This LED is always on while the power supply is connected to the converter.

#### Red LED

Störung/Error: This LED lights up continuously during every error message until no more commands are present and the cause of the error is no longer present.

Red LED is on:

- During acceleration in load direction: replace heavy handwheel with plastic handwheel.
- If heavy handwheel cannot be replaced: Menu SPEED CURVE – reduce –acceleration- to approx. 0.4 m/s<sup>2</sup> and reduce –acceleration jolt- to approx. 0.25m/s<sup>3</sup>.
- During deceleration: menu SPEED CURVE – reduce –deceleration- and -deceleration jolt- parameters.
- During constant travel: check motor and gearbox parameters in DRIVE. Final Speed (V3) is set too high.

### 4.2 Error memory

In the error memory the last 49 errors can be read out.

Button QUIT + ENTER

Example

ERROR MEMORY
xxx
Error saved

Display: Number of errors

ENTER key

ERROR MEMORY
001: ERROR 15
Encoder failure
18.06. 12:31:34

Display: Error type with date and time

ENTER key

15: 0>V0 0000UPM
180.0A 280V 42°C
10.2Hz UZK: 561V
▼ 0 NFH3X

Display:

- Error type: 15 (encoder failure)
- Status: 0>V0 (acceleration 0 to V0)
- Motor speed: 0000RPM
- Motor current: 180.0A
- Motor voltage: 280V
- Heat sink temperature: 42°C
- Out put frequency: 10.2Hz
- DC link voltage: 561V
- Commands: DOWN + V0
- Relays

### 4.3 Display messages

Errors are indicated by error messages in plain text in the display. The message disappears only after cause has been remedied and/or after changing the incorrect setting and/or restarting.

ERROR	Description
<b>01: Overcurrent - HW</b>	<p>Hardware current monitoring tripped</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Check parameter in menu "DRIVE"</li> <li><input checked="" type="checkbox"/> Drive is blocked, brake does not open</li> <li><input checked="" type="checkbox"/> Encoder signals not OK; check encoder connection and encoder coupling; shielding of encoder wire must be connected on both sides</li> <li><input checked="" type="checkbox"/> Rated motor current must be equal to or less than the converter current (check type plate on motor and converter)</li> <li><input checked="" type="checkbox"/> Increase parameter in menu "CONTROL PARAMETER attenuation"</li> <li><input checked="" type="checkbox"/> Short-circuit at motor output U, V, W</li> <li><input checked="" type="checkbox"/> Check motor star/delta connection</li> <li><input checked="" type="checkbox"/> Braking resistor short-circuit</li> <li><input checked="" type="checkbox"/> The impedance of the braking resistor is too low</li> <li><input checked="" type="checkbox"/> Short to earth in the wiring to the braking resistor or in the braking resistor</li> </ul>
<b>03: Overcurrent - SW</b>	<p>Software current monitoring tripped</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Check parameter in menu "DRIVE"</li> <li><input checked="" type="checkbox"/> Drive is blocked, brake does not open</li> <li><input checked="" type="checkbox"/> Encoder signals not OK; check encoder connection and encoder coupling; shielding of encoder wire must be connected on both sides</li> <li><input checked="" type="checkbox"/> Rated motor current must be equal to or less than the converter current (check type plate on motor and converter)</li> <li><input checked="" type="checkbox"/> Increase parameter in menu "CONTROL PARAMETER attenuation"</li> <li><input checked="" type="checkbox"/> Short-circuit at motor output U, V, W</li> <li><input checked="" type="checkbox"/> Check motor star/delta connection</li> </ul>
<b>04: Temperature IGBT</b>	<p>Power transistors and/or heat sink of converter getting too hot</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> The ambient temperature in the switch cabinet must not exceed 45°C!</li> <li><input checked="" type="checkbox"/> Check the converter current while running empty in the DOWN direction: The rated current of the converter must not be exceeded during final speed!</li> </ul>
<b>05: DC overvoltage</b>	<p>DC link voltage is too high</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Check the rated voltage on converter type plate; the specifications must be the same as the mains supply</li> <li><input checked="" type="checkbox"/> The braking resistor is not connected or incorrectly dimensioned; check the converter type plate.</li> <li><input checked="" type="checkbox"/> SPEED CURVE deceleration/deceleration jolt is too high. Recommended values: 0.8 ...1.3 m/s<sup>2</sup> (3)</li> </ul>
<b>06: DC undervoltage</b>	<p>DC link voltage is to low</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety circuit / main contactor opened during travel</li> <li><input checked="" type="checkbox"/> Check the rated voltage on converter type plate; the specifications must be the same as the mains supply</li> <li><input checked="" type="checkbox"/> Voltage on L1 and L2 is too low</li> </ul>
<b>07: DC precharge</b>	<p>5 seconds after switching on the mains the DC link voltage is too low.</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Check the rated voltage on converter type plate; the specifications must be the same as the mains supply</li> <li><input checked="" type="checkbox"/> Short-circuit to earth in the wiring to the braking resistor or in the braking resistor</li> </ul>
<b>08: MC start</b>	<p>After set travel commandos the main contactor does not contact.</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety circuit is not closed</li> <li><input checked="" type="checkbox"/> Check the wiring of the control of the main contactor. After setting of the relay "M.C." the main contactor must switch on immediately.</li> <li><input checked="" type="checkbox"/> At least one phase in the mains of converter is missing (L11, L21, L31)</li> </ul>

ERROR	Description
<b>09: MC run</b>	During travel the main contactor de-energizes <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Safety circuit de-energizes during run</li> <li><input checked="" type="checkbox"/> Main contactor must still be held for at least 0.5 sec. after reaching standstill.</li> <li><input checked="" type="checkbox"/> Check the wiring for activation of the main contactor: as long as the "Main contactor" output relay of the converter is closed, the main contactor needs to be activated.</li> <li><input checked="" type="checkbox"/> At least one phase in the main supply to the converter is missing (L11, L21, L31).</li> </ul>
<b>10: no release</b>	Release "Direction UP" or "Direction DOWN" has disappeared during run or before end of braking. <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Check the commands and release signals as per the run diagram.</li> <li><input checked="" type="checkbox"/> Safety circuit drops during run</li> </ul>
<b>11: release UP+DOWN</b>	Release "Direction UP" and "Direction DOWN" are applied simultaneously. <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Check the commandos and release signals as per the run diagram.</li> </ul>
<b>12: Motor temperature</b>	Motor PTC resistor monitoring tripped <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Motor PTC resistor is not properly connected to converter terminals 13, 14.</li> <li><input checked="" type="checkbox"/> If the motor PTC resistor is monitored by an external monitoring device, then the converter terminals 13, 14 must be connected.</li> <li><input checked="" type="checkbox"/> Motor is really too hot! Check the motor current while running empty in the DOWN direction: the rated current of the motor must not be exceeded during final speed!</li> </ul>
<b>13: wrong direction</b>	Motor rotates in the wrong direction <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Change the parameter in the menu "DRIVE – pulse input" from A-B to B-A.</li> <li><input checked="" type="checkbox"/> Check the encoder connection and encoder coupling.</li> </ul>
<b>14: variance</b>	Motor speed cannot follow the set speed curve. <p>Possibility A: Message while starting or during a run</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Compare the pulse number setting in the menu "DRIVE – feedback system pulses" with the encoder pulses per revolution and correct if necessary.</li> <li><input checked="" type="checkbox"/> Check the type plate of the motor and gearbox against the parameters in the "DRIVE" menu.</li> <li><input checked="" type="checkbox"/> Check the encoder connection and encoder coupling.</li> <li><input checked="" type="checkbox"/> Converter or motor is under-dimensioned. Compare type plate of motor and converter</li> <li><input checked="" type="checkbox"/> Mains voltage is too low</li> </ul> <p>Possibility B: Message during deceleration</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Check braking resistor</li> <li><input checked="" type="checkbox"/> Braking distance is too short; decrease deceleration and deceleration jolt in menu "SPEED CURVE "</li> </ul> <p>Possibility C: Message during stop</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Main contactor or mechanical brake is switched off too soon; The mechanical brake must only be applied when the lift is at a standstill! Main contactor must remain energized for approx. 0.5 seconds after reaching a standstill.</li> <li><input checked="" type="checkbox"/> Reduce speed V1</li> </ul>

ERROR	Description
<b>15: encoder failure</b>	<p>The converter does not recognize the signals from the encoder.</p> <p>Possibility A: Motor not starting up</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Mechanical brake not opening</li> <li><input checked="" type="checkbox"/> Cable between motor and converter interrupted</li> <li><input checked="" type="checkbox"/> Star point of the motor winding is missing</li> <li><input checked="" type="checkbox"/> Wrong parameter setting in DRIVE -Rated speed-</li> </ul> <p>Possibility B: Motor starts and converter switches off after 0.5 seconds</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> No encoder pulses on at least one encoder track on the rotary encoder</li> <li><input checked="" type="checkbox"/> Check the encoder</li> <li><input checked="" type="checkbox"/> Check the encoder connection and encoder coupling</li> </ul>
<b>18: EEPROM check</b>	<ul style="list-style-type: none"> <li> The parameters are wrong in the EEPROM.</li> <li><input checked="" type="checkbox"/> Please contact our the Service department.</li> </ul>
<b>19: repeat error</b>	<ul style="list-style-type: none"> <li> A particular error has occurred three times in succession. (The setting which defines which errors are to be responded to can only be set up in the factory at Brunner &amp; Fecher Regelungstechnik and must therefore be specified when ordering. If necessary consult the Service department!)</li> <li><input checked="" type="checkbox"/> Disconnect the regulator for 10sec from mains and then restart.</li> </ul>
<b>20: brake monitoring</b>	<ul style="list-style-type: none"> <li> (Option in synchronous operation) The mechanical brake did not open and/or closed during a run.</li> <li><input checked="" type="checkbox"/> Check the mechanical brake / wiring and the brake contactor</li> </ul>
<b>22: quick start</b>	<ul style="list-style-type: none"> <li> Quick start is active and a rotational speed of 0 is held for more than 17 sec. or the drive has moved by more than 7mm at a rotational speed of 0.</li> <li><input checked="" type="checkbox"/> Check the Control Quick Start function</li> </ul>
<b>24: module protection</b>	<ul style="list-style-type: none"> <li> Protects the IGBT module against damage. Full module output current on low frequency</li> <li><input checked="" type="checkbox"/> Check motor parameters, encoder and mechanical brake</li> </ul>

#### 4.4 Software update

A software update is required in certain special cases.

To perform the update, you will need the following:

- Laptop or PC
- Program: FB10-update-xx and enclosed instructions. This is available free of charge from Brunner & Fecher Regelungstechnik GmbH.

#### 5 Maintenance and spare parts

##### Maintenance

The converters in the series FB11 and FB12 are generally maintenance-free. Since the electronic components which are used offer long-term stability and are not subject to wear, maintenance is limited to regular inspections of the connecting terminals to check that they are securely seated and of the relay contacts at the output for burn-up.

Furthermore, in order to avoid leakage currents and arcing, any dust deposits on the printed circuit boards and the heat sink must be removed.

If you require assistance from our Service department, please contact us under the following numbers:

Service: +49 (0)6021 4535427  
 Fax: +49 (0)6021 4535428  
 E-mail: info@BF-Regelungstechnik.de

## 6 Appendix

### 6.1 Relay outputs

Six relays with potential-free NO contacts are available as outputs. The contact workload is 24 V DC to 250 V AC with an Ohmic load of 1000 mA .

Pin	Relay output	Meaning	Description of function
1 & 2	Operation	Ready signal for control	After applying the power supply voltage to the pins L1 and L2 on the circuit board, the relay contactor closes provided there are no faults. It opens if a fault occurs.
3 & 4	B-C	Control of the brake contactor	The relay switches the contactor for the mechanical brake. It is activated when the direction and speed commands are applied with a delay of 500 ms. Switches off if the rotational speed ZERO is reached, the direction command is deleted or in the event of a fault.
5 & 6	M-C	Control of the main contactors	When the commands direction and speed are applied, the relay activates the main contactors. When the rotational speed ZERO is reached the relay switches off after a delay of 500 ms.
7 & 8	V03	Control for entry with open door	Switches off if the speed of the cabin exceeds 0.3 m/s and is activated if the speed falls below 0.3 m/s. The speed threshold is adjustable. The relay can be used for entry with the door opened.
9 & 10	Vx	Freely programmable speed relay	Freely user-programmable relay with the following possible functions: A) $V < V_x$ speed threshold B) Controller temperature B) Motor temperature C) Overload E) External fan afterrun F) Short-circuit contactor C) Pre-charging
11 & 12	F.P.	Freely programmable relay	

### 6.2 Terminal connection motor thermistor

13 & 14	Motor-thermistor	Drop off converter if motor gets too hot after end of travel.
15	PE	Shielding for thermistor wire.

### 6.3 Digital inputs

All control voltage inputs are isolated via optocouplers and are designed for 24 V DC/100mA. The connection is made via a 12-pole terminal strip. When using an external control voltage, this voltage must be stabilized.

Pin	Input	Meaning	Description of function
16			Electromagnetic shielding for the command cable
17		Control voltage +24VDC	+24V- output; max. 100mA
18	<b>OV DC</b>	Control voltage ground	0V potential of the control voltage
19	<b>UP</b>	Choice of direction	The converter is activated through the drive command and the direction command. The direction command may be switched off after the main contactor is opened. In an inspection run the commands have to be deleted at the same time. Also used for the controller release.
20	<b>DOWN</b>	Choice of direction	
21	<b>Vi</b>	Inspection speed 10 to 1500 rpm	Separate adjustable speed for inspection runs and for return runs. Switched on and off together with the direction command by the controller.
22	<b>Vn</b>	Adjustment speed 0.5 to 100 rpm	Is used for re-leveling of the cabin to allow for cable stretching and load conditions in the cabin. Connect Vn and the direction command only.
23	<b>V0</b>	Entry speed 1 to 300 rpm	Switched on during start-up and switched off when the levelling switch is reached. Converter control remains active until standstill and holds the cabin electrically until the mechanical brake is applied.
24	<b>V1</b>	Interim speed 10 to 3000 rpm	There are three different running speeds available which can be used for different gaps between floors.
25	<b>V2</b>	Final speed 10 to 3000 rpm	
26	<b>V3</b>	Final speed 10 to 3000 rpm (programmable)	Emergency evacuation / battery operation Monitoring of the mechanical brake Quick start
27	<b>Vb</b>	Programmable input	Direct entry off Release

#### 6.4 Terminal connection Encoder

pin	function / assignment	encoder +10 to 30V DC HTL- level	encoder + 5V DC TTL- level RS422
28	shielding – PE	shielding	shielding
29	Encoder trace A	trace A	trace A
30	Encoder trace B	trace B	trace B
31	voltage +12V DC	+U	
32	voltage 0 V DC / GND		GND / 0V
33	voltage -12V DC	GND / 0V	
34	voltage + 5V DC		+U
35	Encoder trace A inverted		trace A/
36	Encoder trace B inverted		Spur B/

Important: Do not connect encoder out put signal N or 0

#### 6.5 Pin connection encoder with Sub-D plug

Option board FB10-Sub-D-standart or FB10-Sub-D-THY (also for FB12, FB11)

Sub-D/ Pin	5V TTL- level Standard	5V TTL- level THY (Thyssen)
1	A (K1)	A (K1)
2	B (K2)	A/ (K1/)
3	n.c.	B (K2)
4	+5Vdc	B/ (K2/)
5	GND / 0V	n.c.
6	A/ (K1/)	n.c.
7	B/ (K2/)	GND / 0V
8	n.c.	GND / 0V
9	GND / 0V	+5Vdc

#### 6.6 Pin connection SSI or EnDat feedback with Sub-D15 plug

Option board FB10-SSI/EnDat (also for FB12, FB11)

pin/Sub-D	assignment	pin/Sub-D	assignment
1	DATA+	9	CLK– (clock)
2	DATA -	10	CLK+ (clock)
3	+5V Sensor	11	0V GND Sensor
4	+5V DC	12	A – (Sin-incremental)
5	OV GND	13	A + (Sin-incremental)
6	n.c.	14	B + (Cos- incremental)
7	B – (Cos-incremental)	15	n.c.
8	n.c.	Case	Shield/earth

### 6.7 Pin connection SSI or EnDat feedback with screw connection

Option board FB10-SSI/EnDat Schraub/Screw

terminal	color code Heidenhain	assignment	terminal	color code heidenhain	assignment
51	gray	DATA+	56	white/green white	0V GND
52	pink	DATA -	57	green/black	A+
53	purple	CLOCK+	58	yellow/black	A-
54	yellow	CLOCK -	59	blue/black	B+
55	brown/green white	+5V dc	60	red/black	B-

terminal	assignment
28	Shield/earth

Connect shield to terminal 28 of encoder terminals

### 6.8 Pin connection Sin/Cos feedback with HD-15 plug

Option board FB10-SINCOS (also for FB12, FB11)

pin/Sub-D	assignment	pin/Sub-D	assignment
1	C – (Sin/Cos encoder)	9	B + (Cos- incremental)
2	D – (Sin/Cos encoder)	10	n.c.
3	A – (Sin-incremental)	11	n.c.
4	B – (Cos- incremental)	12	+5V DC
5	n.c.	13	OV GND
6	C + (Sin/Cos encoder)	14	n.c.
7	D + (Sin/Cos encoder)	15	n.c.
8	A + (Sin- incremental)	Case	Shield/earth

### 6.9 Pin connection for RS485 (DCP) with DSC digital shaft copy Sub-D 15 plug

Option board FB10-RS485 (also for FB12)

pin/Sub-D	assignment	pin/Sub-D	assignment
1	n.c.	6	A Incremental to lift control
2	DATA + (data channel)	7	B Incremental to lift control
3	DATA – (data channel)	8	24V (0V on MPK)
4	n.c.	9	n.c.
5	n.c.	shield	Ground/ PE

### 6.10 Terminal connection for brake monitoring and DSC digital shaft copy

Option board FB10-EI (also for FB12)

All control voltage inputs are isolated via optocouplers and laid out for 24V DC/ 10mA. The connection is made via an 8-pole terminal strip.

If an external control voltage is used, it must be stabilized.

This optional board is required for monitoring of the brakes on synchronous motors.

For digital shaft copying, an incremental signal (A/B signal 24V) is provided for the control. The division of the A/B signal can be adjusted in the Interface menu.

Terminal	Input	Meaning	Description
40	0V DC	Ground command voltage	0V command voltage
41	E1	Brake contact	Brake monitoring
42	E2	Brake contact	Brake monitoring
43	E3	Brake contact	Brake monitoring
44	E4	Brake contact	Brake monitoring
45	24V DC	24V	24V for A/B signal
46	A	A Signal	Incremental signal
47	B	B Signal	Incremental signal

### 6.10 List of Parameters

SPEED			
Adjustment speed	Vn		rpm
Inspection speed	Vi		rpm
run in speed	V0		rpm
interim speed	V1		rpm
final speed	V2		rpm
final speed	V3		rpm
SPEED CURVE			
acceleration			m/s <sup>2</sup>
jerk-acceleration			m/s <sup>3</sup>
deceleration			m/s <sup>2</sup>
jerk-deceleration			m/s <sup>3</sup>
braking distance V1 optimizing		<input type="checkbox"/> on <input type="checkbox"/> off	
braking distance V2 optimizing		<input type="checkbox"/> on <input type="checkbox"/> off	
braking distance V3 optimizing		<input type="checkbox"/> on <input type="checkbox"/> off	
START / STOP			
start-up delay			ms
		<input type="checkbox"/> normal <input type="checkbox"/> auto <input type="checkbox"/> pole pos.	
brake distance V0>0			mm
direct approach	<input type="checkbox"/> off <input type="checkbox"/> on <input type="checkbox"/> with out V0	V1: V2: V3:	mm mm mm
regulator override start DC rate	(synchronous)		%
regulator override start P-I values	(synchronous)		%
regulator override time	(synchronous)		ms
Boost	(open loop)		%
Slip	(open loop)		%
DRIVE			
drive system		<input type="checkbox"/> asynchronous <input type="checkbox"/> open loop <input type="checkbox"/> sync. EnDat <input type="checkbox"/> sync. Resolver <input type="checkbox"/> sync. SSI <input type="checkbox"/> sync. SinCos	
feedback system pulses			
SSI – resolution	(synchronous SSI)		bit

pulse input	<input type="checkbox"/> A-B <input type="checkbox"/> B-A	
rotation field	<input type="checkbox"/> right <input type="checkbox"/> left	
synchronous angle (synchronous)		°
name plate nominal speed		rpm
name plate pole pairs (synchronous)		
name plate nominal frequency		Hz
name plate nominal current		A
name plate cosine phi		
Name plate motor nom. Volt. (synchronous)		V
winch transmission	1:	
winch driving wheel		mm
suspension	1:	

**INTERFACES**

relay V03		m/s																												
relay Vx		m/s																												
programmable relay	<input type="checkbox"/> V>Vx <input type="checkbox"/> contr. Temperature <input type="checkbox"/> motor temperature <input type="checkbox"/> over load <input type="checkbox"/> external fan <input type="checkbox"/> short circuit contactor <input type="checkbox"/> pre loading																													
programmable input Vb	<table border="0"> <tr> <td>V2</td> <td>V3</td> <td>Vb</td> <td></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>battery operation</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>brake control open</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>brake control close</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>quick start</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>direct approach off</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>release</td> </tr> </table>	V2	V3	Vb		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	battery operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	brake control open	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	brake control close	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	quick start	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	direct approach off	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	release	
V2	V3	Vb																												
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	battery operation																											
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	brake control open																											
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	brake control close																											
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	quick start																											
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	direct approach off																											
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	release																											

**OPERATION PARAMETERS**

password		
Date/ time		
software version		
display language	<input type="checkbox"/> german <input type="checkbox"/> english <input type="checkbox"/> turkish	

**CONTROL PARAMETERS**

attenuation start		%
attenuation acceleration		%
attenuation travel		%
attenuation deceleration		%
attenuation run in		%
speedcontrol P coeff.		%
speedcontrol I coeff.		%
speedcontrol coefficient		ms
speedcontrol dynamic		%