

Operating manual

Vibration controller FC3000 (MFS368)



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1 General information

1.1 Information on operating instructions / Legal note

About this operating manual

In this operating manual you will find all of the important information on installation, connection, setting, and operation of your FC3000 (MFS368) device. You will also receive information as well as important notes on your safety and on the non-intended use of the FC3000 (MFS368) vibration controller. The manual is intended to be read by technically qualified personnel.

Technical changes

We reserve the right to implement changes to the operating instructions due to technical developments without prior notice.

Translations

If translations are made of these operating instructions (or a part thereof), these are undertaken to the best of the available knowledge and belief. The German operating instructions are the original version. Versions in other languages are translations of the original version. No liability is accepted for errors in translation, even if the translation has been commissioned by ourselves. The original German version is the controlling document.

Copyright

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Legal note

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1.2 Meaning of signs and notices

These signs described in this chapter are only attached to the machine if IFSYS has identified a specific relevance.

1.2.1 Warning signs



General warning sign

Potential for injury or death!

Select and deploy suitable personal or technical protective equipment.

Only qualified specialists are permitted to carry out work!



Warning: Electrical voltage

Danger from electric shock when touching live parts!

Select and deploy suitable personal or technical protective equipment.

Only qualified specialists are permitted to carry out work!

1.2.2 Mandatory sign



General mandatory sign

Important note that must be observed!



Pay attention to the operating instructions

Anyone undertaking installation, commissioning, operation, repair and cleaning tasks should have read and understood this manual!



Unlock before maintenance or repair

Switch off the voltage and secure it against being switched on again.

This may only be carried out by qualified personnel!

1.2.3 Danger levels

CAUTION**Possible imminent danger**

Failure to observe this information may result in minor or slight injuries!

WARNING**Possible imminent danger**

Failure to observe this information may result in death or serious injury!

DANGER**Imminent danger**

Failure to observe this information may result in death or serious injury!

1.2.4 Other signs and indications

NOTE**Potentially harmful situation**

If a note is not observed

- disregarding a command may result in damage to the machine or to an object in the vicinity of the machine.
- disregarding a commandment can lead to unintended, possibly dangerous, situations.
- disregarding information can have unintended consequences.

**Information or tip**

Useful information or helpful hint.

**Qualified specialist personnel - Electrician**

A person with appropriate technical training, knowledge and experience so as to be able to detect and avoid hazards that may be caused by electricity (EN 50110-1:2008-09-01 section 3.2.3).

2

Safety



WARNING

Improper use of the device

Improper use of the device may result in serious personal injury or property damage due to malfunction, electric shock or fire.

- To avoid hazards due to incorrect handling, installation or maintenance, these operating instructions must be read, understood and observed in full before the control unit is put into operation.
- Ensure that all persons working with the machine are adequately trained and follow the instructions in this manual.

2.1

Personnel qualification

This descriptive document contains the information required for the proper use of the device. It is intended to be read by technically qualified personnel.

The operating company is responsible for instructing persons who carry out operation, maintenance, inspection or repair work. Instructions should be confirmed in writing.

We recommend that the operating company impresses the following points, for the respective tasks, upon these personnel prior to commissioning the vibration controller:

- Knowledge of the relevant content of the operating instructions
- Knowledge of the applicable safety and operating regulations
- Knowledge of the legal accident prevention regulations

2.2

Safety instructions

The following instructions are for the personal safety of the operating personnel



WARNING

Hazardous voltage

Death, serious injury, or damage to property due to high voltage

- Disconnect the unit from the supply voltage before assembly or disassembly work as well as when making structural changes.
- Please refer to the relevant accident prevention and work safety regulations for your particular application.
- Before commissioning, check that the rated voltage of the device matches the rated mains voltage available locally.



WARNING

Electric shock in the absence of earthing

If the protective conductor connection of devices with protection class I is missing or incorrectly connected, high voltages can be present on exposed parts and on the housing, which can lead to serious injury or death if touched.

- Ground the device in accordance with regulations.



WARNING

Electric shock from damaged devices

Improper handling can lead to damage to equipment. Damaged devices may have dangerous voltages on the housing or on exposed components, which can lead to serious injury or death if touched. Ground the device in accordance with regulations.

- Observe the limit values specified in the technical data during transport, storage and operation.
- Do not use damaged devices.



WARNING

Electric shock if the cable shield is not connected

Capacitive coupling can cause life-threatening contact voltages if the cable shields are not connected.

- Connect at least one end of cable shields and unused wires of power lines to the earthed housing.



WARNING

Arc when disconnecting a plug connection during operation

When disconnecting a plug connection during operation, an arc may occur that can lead to serious injury or death.

- Only open plug connections when the power is off.



WARNING

Injury from hot surfaces

In the event of a fault, overload and insufficient ventilation, contact may cause skin burns. The temperature of the heat sink can reach 70°C during operation

- Wait until hot surfaces have cooled down before touching them



WARNING

Influence of electromagnetic fields on active implants

Inverters generate electromagnetic fields (EMF) during operation. Electromagnetic fields can affect active implants, e.g. pacemakers. As a result, people with active implants in the immediate vicinity of an inverter are at risk.

- As the operator of a system that emits EMF, assess the individual risk to persons with active implants.



WARNING

Interruption of the power supply

The interruption and restoration of the power supply to the controller can lead to hazardous situations. In particular, the system can restart after restoration of the power supply without additional approval.

**WARNING****Unintentional or accidental change of device parameterisation**

The protective functions of the controller can be overridden by an unintentional or accidental change in the device parameterisation.

**WARNING****Illegible or missing warning signs**

Illegible or missing warning signs can lead to undetected hazards. Undetected hazards can result in accidents involving serious bodily injury or death. See chapter 4.6 "Warning signs". Missing warning labels must be replaced.

2.3**Notes on the prevention of damage to property****NOTICE****Damage to property due to incorrect output voltage**

Regardless of the input voltage, the output voltage of the inverter in the delivery state is 205 V AC. When using 110 V AC solenoids, the output voltage must be limited with the parameter: "UMax", otherwise the solenoid can be destroyed.

**NOTICE****Damage to equipment due to unsuitable screwdriving tools**

Unsuitable screwdriving tools or screwdriving methods can damage the screws of the device.

- Use screwdrivers that fit the screw head exactly.
- Tighten the screws with the torques specified in the technical documentation.

**NOTICE****Improper assembly of parts**

Unsuitable assembly tools, screwdriving methods or non-observance of the assembly instructions can lead to falling parts or devices.

3 The product - FC3000 (MFS368)

3.1 General information

The device generates an adjustable drive frequency for the vibration feeder that is independent of the mains frequency. The input-side PFC circuit ensures a constant output voltage at an input voltage of 110 V as well as 230 V. Mains voltage fluctuations have no influence on the conveying performance. In addition, the "amplitude control" operating mode in conjunction with an acceleration sensor enables a constant flow of material even when the conveyor is subject to changing loads. In this operating mode, the resonant frequency of the conveyor can also be determined and the drive frequency for the conveyor can be continuously tracked. An integrated fill level control enables the construction of a buffer circuit for material control via a PNP sensor. A 24 V DC output is available for operating a blowing air valve. The device is operated via an LCD display and programming buttons. All settings can be made via this display without opening the housing

3.2 Directives and harmonised standards

The device complies with the following standards or normative documents:

Directives

2014/30/EU	EU EMC Directive
2014/35/EU	EU Low Voltage Directive
2011/65/EU	RoHS Directive

Standards

EN 61000-6-4:2019	Electromagnetic compatibility
EN 61000-6-2:2019	
EN 62477-1:2024-09	Safety requirements for power semiconductor inverter systems and equipment

UL approval

The device has UL approval and is listed under the UL file number listed.



**IND.CONT.EQ.
E217179**

For use in NFPA 79 industrial machinery applications only.
Only cables that meet the requirements of NFPA 79 (2012 / 12.2 – 12.6) may be used for the power connections.



WARNING

Unauthorised modifications or changes to the device

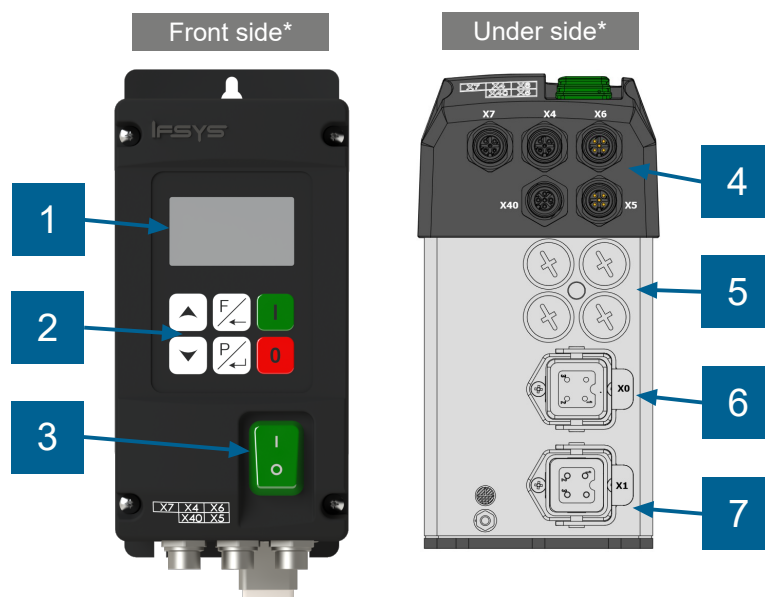
Unauthorised modifications or changes to the device will result in a loss of compliance with the aforementioned directives and standards and may result in damage to property or personal injury.

- Do not carry out any unauthorised modifications or changes to the device!

3.3 Proper use

The device described here is a piece of electrical equipment for use in industrial machinery. It is designed for controlling vibration feeders. Any other use is not proper use and can result in injury to personnel and damage to property. Observe the safety instructions! For UL Approbation: For use in NFPA 79 industrial machinery applications only.

3.4 Device view



*There are no relevant elements on the other device pages.

- | | | | |
|---|--------------------|---|---|
| 1 | Control panel | 4 | Connector plugs and sockets |
| 2 | Control buttons | 5 | Screw connections for optional connections (e.g. analogue signal) |
| 3 | Mains power switch | 6 | Mains connection |
| | | 7 | Vibrating conveyor connection |

3.5 Product specifications

- Mains voltage-independent output voltage of up to 205 V AC
- Mains frequency-independent, adjustable output frequency
- Adjustable min. and max. limits of the frequency range
- Adjustable current limit for maximum solenoid current
- Constant conveying performance, e.g. in the event of mains fluctuations
- When operating with an amplitude sensor: Control of the resonant frequency
- Status relay on/off
- Fill level control
- 24 V DC output for e.g. air valve
- Four application-specific parameter sets can be stored
- Optional fieldbus interfaces available

3.6 Current draw

The current draw specified in the technical data [► 12] is the maximum permissible current draw of the device. A higher current draw than specified here can lead to malfunctions and failure. It should be noted that the current draw is inversely proportional to the input voltage. At high input voltage, the input current is small and at low input voltage, the input current is large.

Example:

A 230 V vibratory conveyor is operated with the aid of the FC 3000 (MFS368) on a 230 V mains network. A current draw of 1 A is detected at the input of the control unit. The same 230 V vibratory conveyor is then operated on a 110 V mains network. The input voltage is only half as high as before and the current draw is therefore twice as high. This means that the current draw of the control unit in this example is 2 A on the 110 V mains.

3.7 Technical data

Protection type	IP54
Protection class	I
Input voltage	99 V - 264 V AC
Max. permissible input current	In: 2 A
Please refer to the chapter on current draw [► 12]! Failure to do so may result in malfunction and failure!	
Input frequency	50 / 60 Hz
Inrush current	$\hat{I} = 9 \text{ A}$, 20 ms
Power dissipation	max. 55 W
Output voltage	0 - 205 V +/- 5%
Output current	3 A +/- 5%
Output frequency	5Hz - 140 Hz
Recommended automatic circuit breaker	6 A B/C

RCD	Type "B"
Mains network system	TN system
Rated short-time current (I_{cn})	<10 kA
Rated short-circuit current (I_{cc})	<10 kA
Enable input	Contact / 24 V DC
Analogue setpoint	0 - +10 V DC, 0(4) - 20 mA
Air valve output	24 V, 100 mA, DC
Time-out output	
Jam sensor	24 V, PNP (100 mA DC)
Status relay	Normally open contact (24 V, 1 A)
Operating temperature	0 - +40 °C
Storage temperature	-10 - +65 °C
Rel. humidity (storage)	10 - 95% RH without condensation
Weight	approx. 2.7 kg

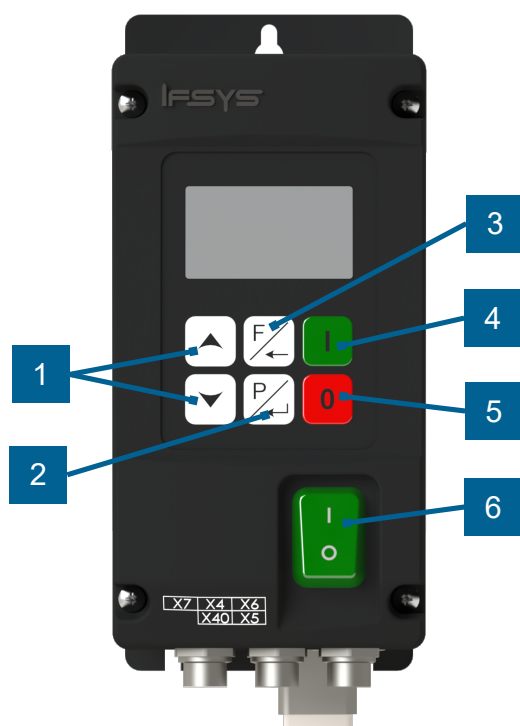


NOTICE

The device is not suitable for the use of solenoids with a power <18 VA (100 mA)!

4 Operation

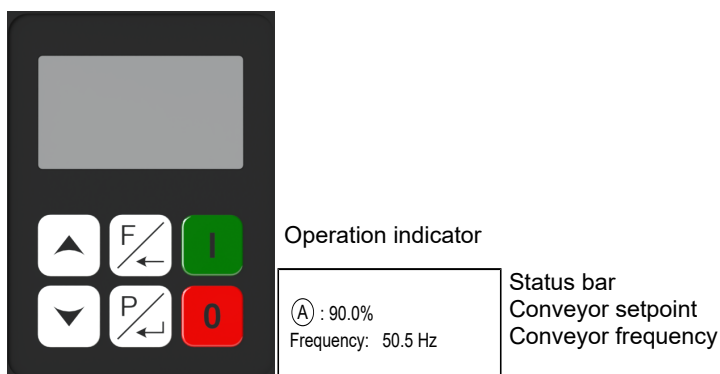
4.1 Controls



- | | |
|---|--|
| 1 | Select menu / parameter, set parameter |
| 2 | Confirm / Apply, select menu |
| 3 | Cancel / Exit |
| 4 | Start / Reset |
| 5 | Stop |
| 6 | Switching the device on/off |

4.2 Operating display

The devices are operated via the control buttons and the text/graphic display.



 Start/Reset

 Stop

"Function" symbols

 Delivery rate

 Conveyor

 Locked
(no release)

 Material jam

 Maximum limit

 Information

 Language

 Time out

Status bar symbols

 Stop button

 "Busy" when saving

 Key set

 Service released

 Mains undervoltage

 Brake operation

 Cycle operation (hopper)

 Blowing air active

 Operation via network card

 Start-up

 Run-down

Button	Function during menu movement	Function when changing value
Arrow key	Select menu item	Change values
F key	One menu level back	Cancel when entering a value
P key	Call up submenu	Accept value

4.3 Settings

Start on the home screen

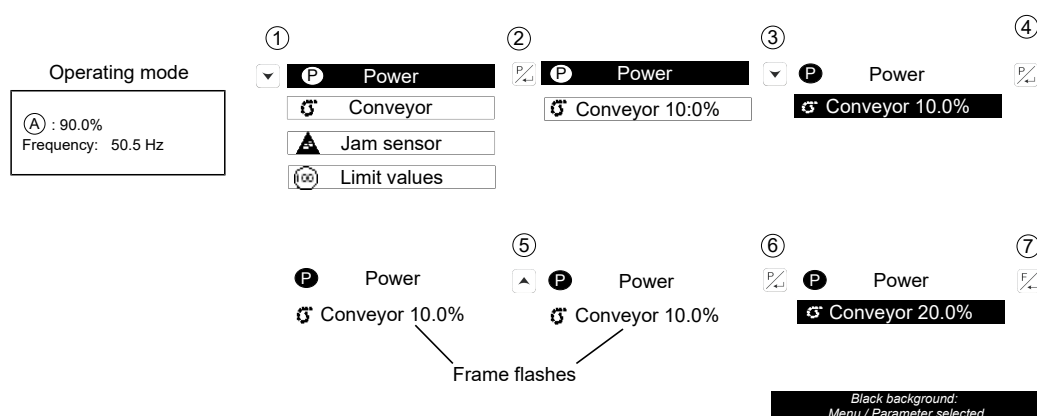
- ①  Jump from the home screen to the menu
- ②  Navigate to the desired menu item
- ③  Select menu and open submenu
- ④  Select parameter
- ⑤  Activate parameter input (editing mode)
- ⑥  Change parameter / set value
- ⑦  End parameter input, the new value is saved
- ⑧  Back to previous menu

Use shortcut menu

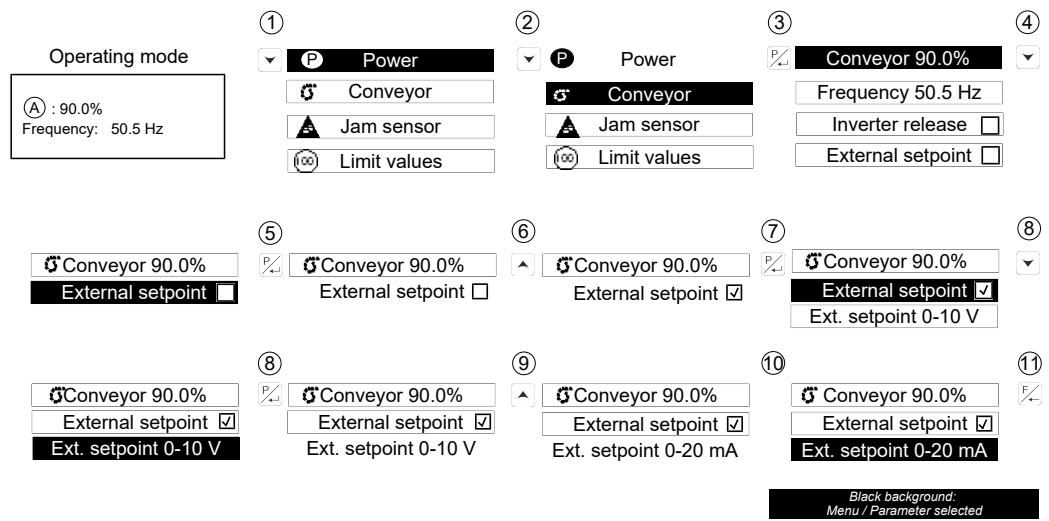
Start on the home screen

- ①  Leads to the shortcut menu (to the parameter setpoint)
- ②  Activate parameter input (editing mode)
- ③  Set parameter (setpoint)
- ④  End parameter input
- ⑤  Back to the home screen

4.4 Parameterisation example



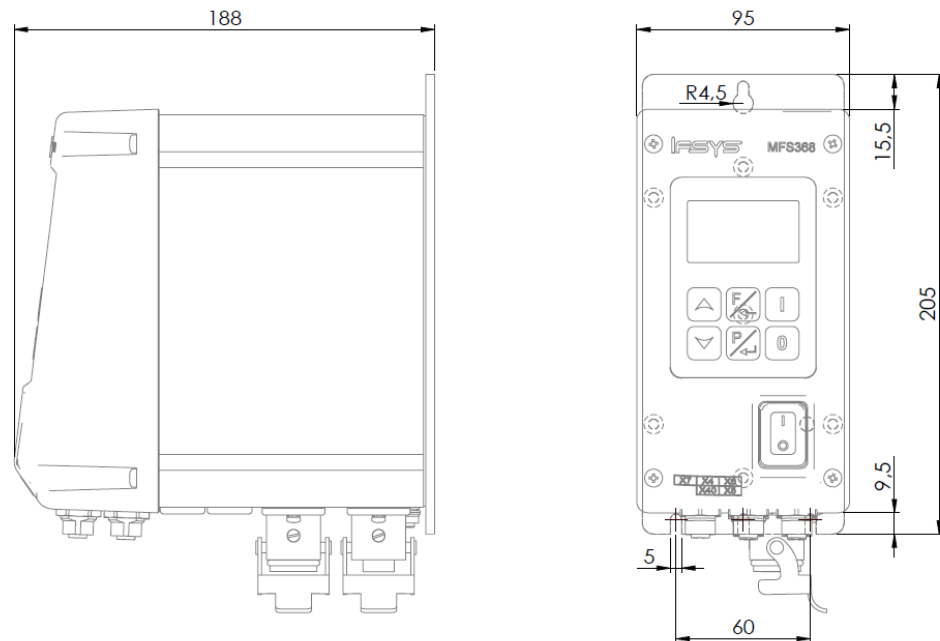
4.5 Example of external setpoint



5 Assembly, installation and commissioning

5.1 Mounting

If the vibration controller is supplied loose, the device must be mounted before commissioning, using the fastening holes provided. A hole on the top of the device and three elongated holes on the bottom of the device are available for fastening the device. These are separated from the inside of the enclosure and are accessible from the outside. The device must be mounted to a level surface, free from vibration.



NOTICE

Avoiding faults and defects

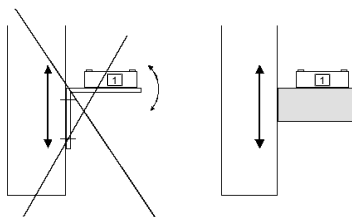
- When choosing the mounting position, note that the cable length between the vibration controller and the vibration feeder must not exceed 10 metres!
- The device must not come into direct contact with water!
- When moving it from cold to warm surroundings, allow the device to adjust to the temperature for a few hours before putting it into operation, otherwise it could be damaged by condensation.
- Do not install the vibration controller in the vicinity of devices which generate strong electromagnetic fields. This could interfere with the proper functioning of the device.
- Also avoid environments subject to extreme heat or cold or damp.

5.2 Installation of the optional acceleration sensor

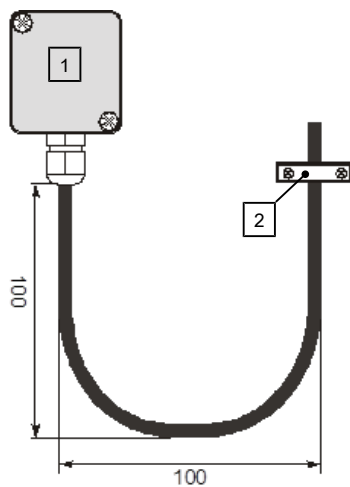


- The acceleration sensor is a device option that is installed if required. The content of this section only applies to the operation of the device with an acceleration sensor!
- In regular operation, the level of the output signal directly determines the maximum amplitude of the conveyor.

The acceleration sensor is intended to report the movement and the acceleration value of the conveyor back to the control loop of the control unit. It is therefore very important that no additional secondary vibrations caused by an imperfect mounting of the sensor are measured.

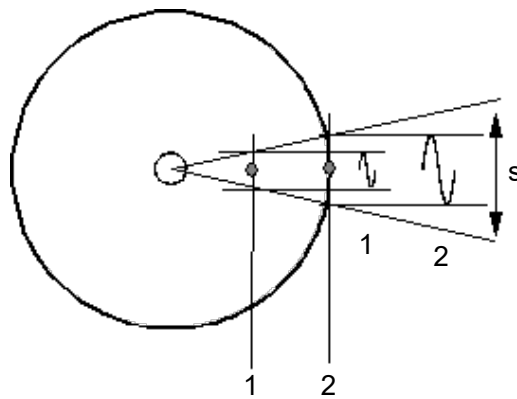


The acceleration sensor (1) should be mounted on a solid mounting block in the direction of oscillation, ideally at the same inclination as the springs of the conveyor. The mounting block must be free of natural vibrations.



To avoid damage to the sensor cable, it must be secured with a cable clamp (2).

Example spiral conveyor



In the case of spiral conveyors, it is advisable to mount as far as possible on the outer diameter so that the greatest possible vibration path is detected.

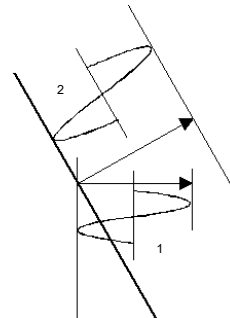
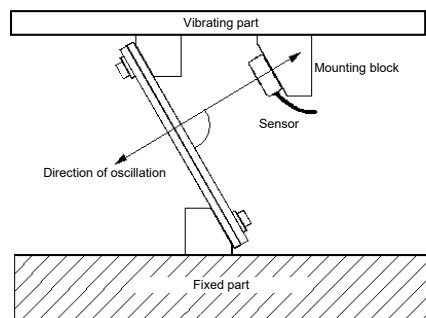
If the sensor signal is too small, the control range of the setpoint is severely restricted

s = oscillation path

Mounting point 1 = small amplitude

Mounting point 2 = large amplitude

Example of a vibrating conveyor (Vibroliner)



1. Small amplitude with vertical mounting.
2. Larger amplitude when mounted at the same angle of inclination as the springs.

The controller and the sensor attached to the conveyor form a closed control loop, whereby the signal supplied by the sensor decisively influences the control range of the setpoint. This means that the controller controls the conveyor so that the actual value (conveying performance or vibration intensity) corresponds to the specified setpoint (ideal: 100% setpoint = 100% actual value). Since the actual value is conveyor-dependent (frequency, acceleration, amplitude), and also depends on the installation location of the sensor, the modulation range usually has to be adjusted. The adjustment is made with the parameter "Max" in the "Conveyor" menu. The measured sensor signal is adjusted with the value that can be set here. In most cases, a value less than 100 must be entered so that the setpoint control range extends to 100% or is as large as possible. If no satisfactory adjustment is possible, the acceleration sensor should be mounted at a location with a larger amplitude (see spiral conveyor example). The importance of adjusting this value is shown, for example, in the timing of the controller. If the actual value signal is poorly adjusted, the conveyor may only run up very slowly when it is switched on, for example.

5.3 Electrical connection



WARNING

Injury hazard due to electrical voltage

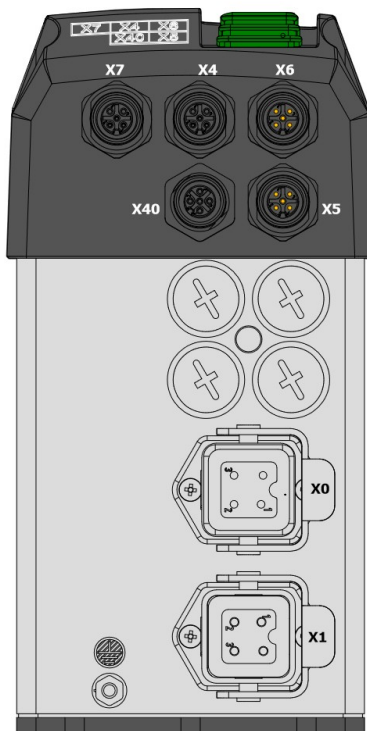
Observe the safety instructions [► 7]!



NOTICE

Before connecting the device, establish the mains voltage - and frequency. This data must be within the range of permissible values stated for the device [► 12].

5.3.1 Connections on the enclosure



X7 Output 24V Valve	1 = +24 VDC Output 3 = GND
X4 Level sensor	1 = +24 VDC 2 = nc 3 = GND 4 = +24VDC Input
X6 Release input	1 = +24 VDC 2 = nc 3 = GND 4 = +24 VDC Input
X40 Swing width sensor	1 = +24 VDC 2 = Input 3 = GND 4 = nc
X5 Status output	1 = Relay contact 13 (Max.24V, 1A) 2 = nc 3 = GND 4 = Relay contact 14 (Max.24V, 1A) 5= Timeout +24V Ausgang
X0 Mains connection 110 / 220 V, 50 / 60 Hz	1 = L 2 = N 3 = nc 4 = PE
X1 Conveyor output	1 = A1 2 = A2 3 = nc 4 = PE

5.3.2 Internal connections

5.3.2.1 Opening and closing the enclosure cover



DANGER

When opening the device, live parts may be exposed

Serious injury or death due to electrical voltage

- Before opening the device's enclosure cover, disconnect the mains input and wait at least five minutes for the capacitors to discharge!
- Observe the safety instructions [► 7]!

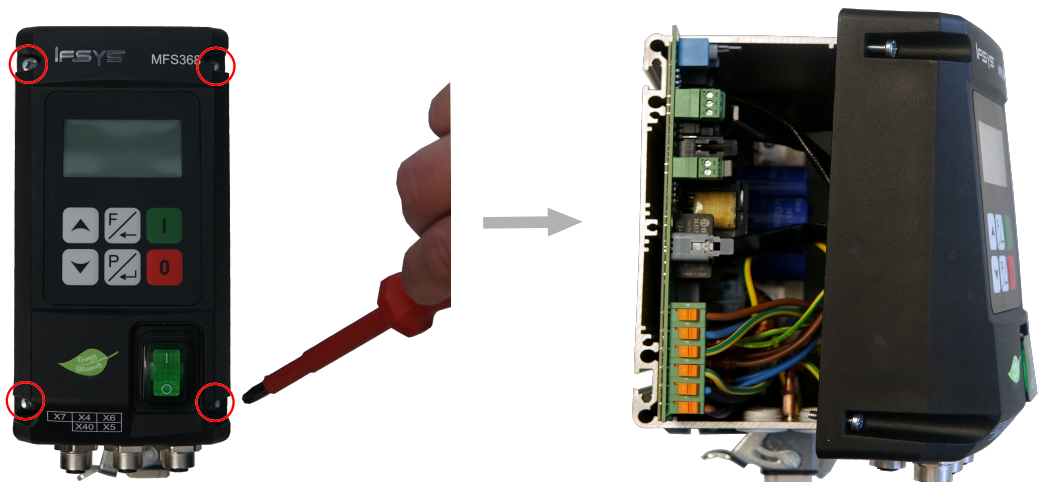


WARNING

Disconnect the device from the power supply before starting work!

Opening the cover of the enclosure

1. Using a standard Phillips screwdriver, loosen the four screws on the front of the enclosure.
2. Fold the front cover to the side.



Close the enclosure cover



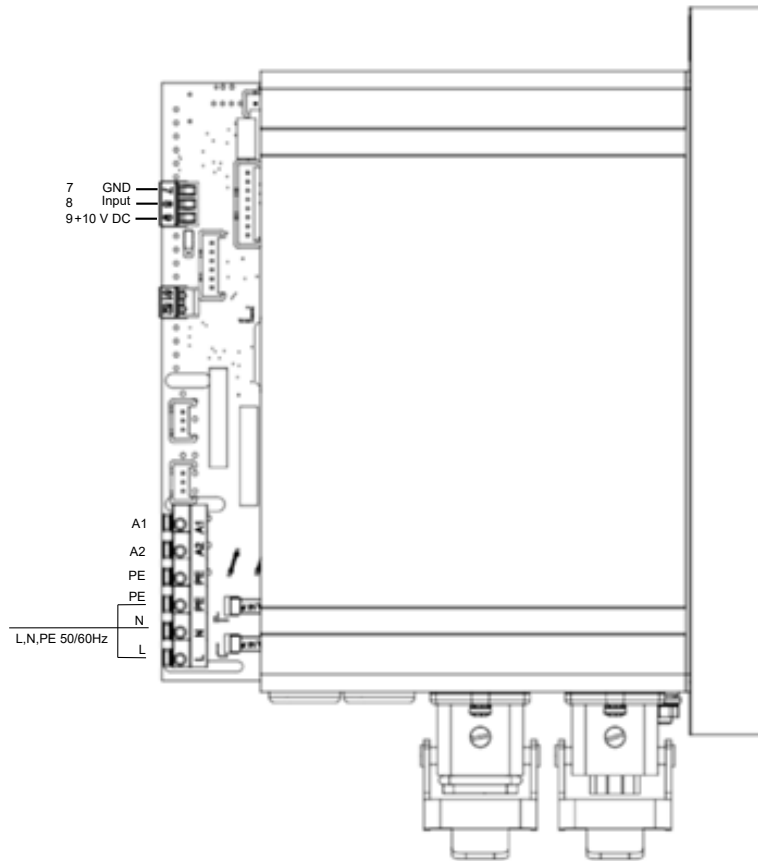
NOTICE

Damage to cables when closing the enclosure cover

- Make sure no wires can be pinched.

1. Fold the front cover onto the device.
2. To secure the cover, screw the four fastening screws into the openings provided using a standard Phillips screwdriver.

5.3.2.2 Assignment of the internal connections



Fastening torque

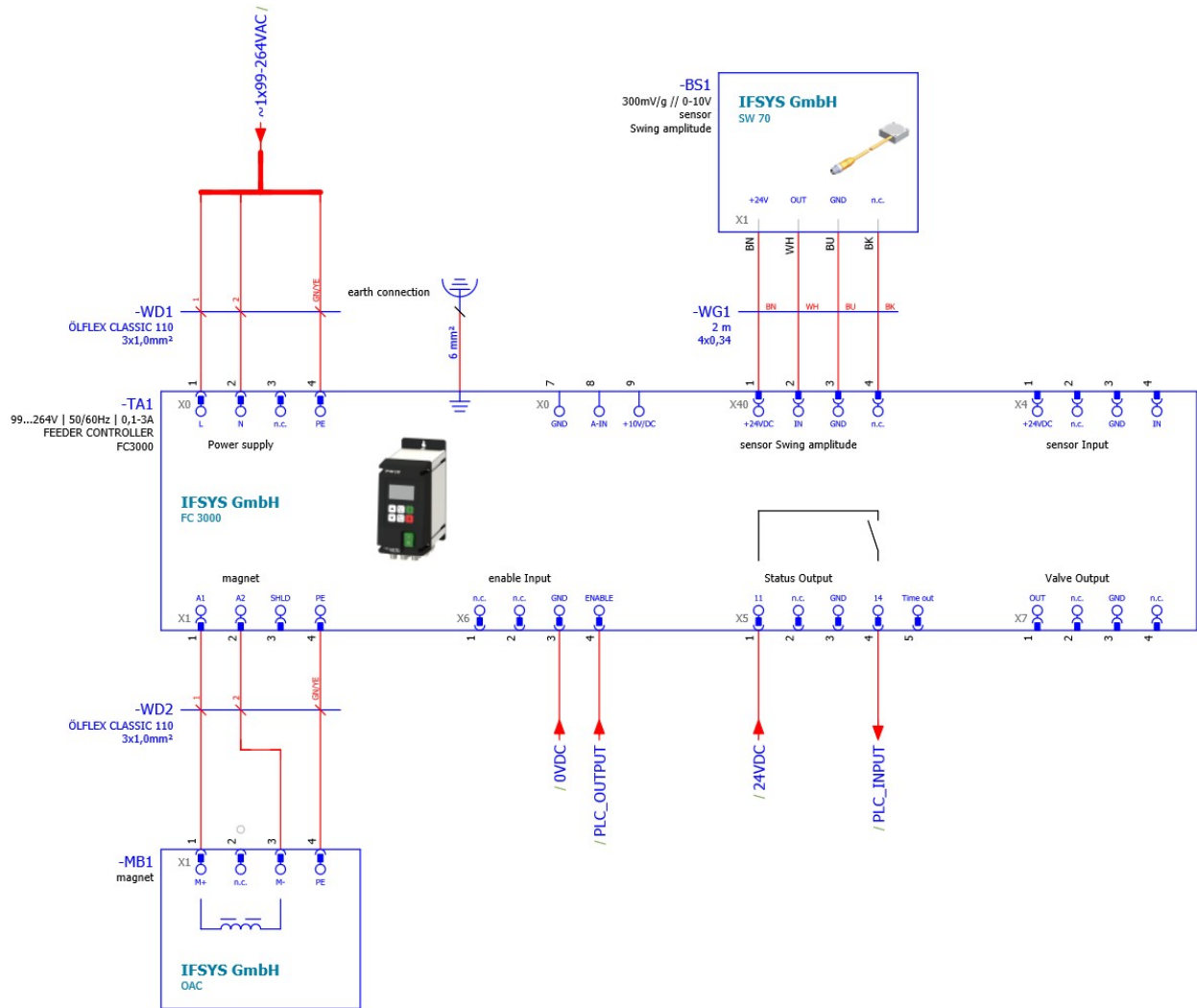
MC terminals: 0.22 – 0.25 Nm Connections: 7-9



NOTICE

To comply with EMC regulations, a shielded output cable must be laid to the conveyor, which is additionally routed through the supplied ferrite sleeve.

5.3.3 Example connection diagram



5.4 Commissioning

5.4.1 Preparatory measures

Before commissioning the device, please note the following:



NOTICE

Damage due to stop operation of the solenoid

It is possible to set the resonant frequency of the connected conveyor. Since in this case even a low setpoint specification can lead to full modulation of the conveyor, care must be taken to ensure that no damage occurs to the conveyor due to the stop operation of the solenoid. However, the range of the resonant frequency cannot be used in practice without feedback of the acceleration, since the conveyor device would not be able to be loaded or controlled.

- A certain frequency spacing must therefore be set to the resonant frequency. The frequency spacing can be both below and above the resonant frequency.



NOTICE

Destruction of solenoid, drive or vibrating conveyor

Regardless of the input voltage, the output voltage of the inverter in the delivery state is 205 V AC.

- When using 110V AC solenoids, the output voltage must be limited with the parameter setting: "UMax"!

Perform the following measures before commissioning the device:

1. Check whether the local mains voltage matches that of the device (see type plate) and whether the connected load of the conveyor is within the permissible power range. (see Technical data [► 12]).
2. Check whether the output voltage and frequency of the control unit [► 12] are compatible with the selected solenoid.
3. Connect the control unit (note the connection example [► 24]).
4. Set the setpoint to zero (see chapter Operation [► 14]).
5. Switch the release (if used) off (see chapter Operation [► 14]).

The control unit is now basically ready for operation and can be switched on (mains, release).

Resonant frequencies:

Due to the structure of the spring-mass system of the conveyor units, the system can resonate at several oscillation frequencies. The additional resonance points are at a multiple of the desired frequency. In some instances, the automatic frequency search cannot reliably detect the desired oscillation frequency; here, the frequency may have to be set manually

Storage:

After one year of storage, the internal DC link capacitors must be reconditioned. To do this, supply the device with the mains voltage for 60 minutes without a load and switch on the mains switch. If the device is stored for more than one year, the capacitors must be reconditioned by the manufacturer.

Failure to comply with the reconditioning rules can lead to the destruction of the device!

5.4.2

Working frequency of the solenoids used**NOTICE****Destruction of solenoid, drive or vibrating conveyor**

At low frequency settings, the current through the solenoid can increase.

Solenoids can be overloaded by excessive current consumption.

The vibration frequency is set incorrectly.

- When using for the first time, check the current in the magnetic circuit with an effective value meter or monitor the heat development on the magnet.
- Make sure that the solenoids are designed for the corresponding working frequency and use solenoids that are suitable for the desired vibration frequency.
- Set the vibration frequency correctly.

5.4.3

Measurement of output voltage and output current

Since the device output is an electronic inverter with pulse-width modulated switching signals, the voltage and current values cannot be measured with any conventional measuring device. Moving-iron measuring instruments are recommended for measuring these values.

5.4.4

Commissioning the controller in control mode

The control unit must be connected correctly.

If installed, the acceleration sensor must be correctly mounted and connected.

Automatic frequency search and controller operation**Initial commissioning using the example of a 50 Hz conveyor:**

Process	Settings menu and parameters	Value	Comment
Set setpoint to zero	Power \ Conveyor	0%	Avoid unintentional and uncontrolled operation of the conveyor.
Limit output frequency (only visible if the service menu is activated)	Limit values \ Min. freq.	35 Hz	Limit the minimum and maximum output frequency. Note that the minimum and maximum frequency limits exclude the multiples of the oscillation frequency in the resonant frequency search. For safe operation, it is recommended to limit the frequency range as much as possible. In this example, the minimum value is set to 35 Hz and the maximum value to 65 Hz.
	Limit values \ Max. freq.	65 Hz	
Switch on the ACC controller	Conveyor \ Acc. controller	☒	The amplitude control is activated.
Switch on AFC controller	Conveyor \ Auto Freq	☒	The frequency control is activated.

Process	Settings menu and parameters	Value	Comment
Carefully increase the setpoint	Power / conveyor	>0%	As soon as the acceleration of the conveyor generates a sufficiently large sensor signal, the inverter automatically starts the frequency search and control. Note: A setpoint that is too small can lead to an incorrect result. Attention: The steps for entering the setpoints automatically increase when the key is pressed for a longer period. Please only press the button briefly so that the steps remain small. The inverter automatically saves the last frequency found.
Set amplitude	Power / conveyor	>0%	As soon as the inverter is stable at the resonant frequency found, the desired amplitude can be set.

5.4.5 Instructions for controller operation

- For controller operation, an acceleration sensor e.g. SW70, is required, mounted on the vibration feeder.
- In control mode with sensor feedback, all vibrations detected by the sensor are processed in the control loop. External vibrations triggered by neighbouring machines, by the conveyor being in an unsafe position or by the unstable mounting of the acceleration sensor can lead to incorrect control behaviour. No external influences may act on the conveyor, especially during the frequency search!

5.4.6 Relationship between acceleration and amplitude

The sensor measures the instantaneous acceleration of the conveyor. The result is a sinusoidal output voltage from the sensor. The acceleration increases with increasing vibration frequency. The sensor output signal can therefore be greater at high frequencies and small amplitude than at low frequencies and greater amplitude.

Acceleration $a = \omega^2 s \quad \text{where} \quad \omega = 2\pi f$ Since in practice the acceleration is related to the gravitational acceleration and the useful vibration amplitude is measured in mm, the following rule of thumb applies: $a[g] = \frac{2^2 \pi^2 f^2 [\text{Hz}]^2 s_a [\text{mm}]}{9.81 \cdot 2 \cdot 10^3} = \frac{f^2 [\text{Hz}]^2 s_a [\text{mm}]}{497}$ $a[g]$ = acceleration (based on gravitational acceleration 9.81 m/s²) $s_a[\text{mm}]$ = useful vibration amplitude	Put into practice where 497 ~ 500 results in, for example: 1. Vibration frequency 50 Hz, vibration amplitude 3 mm $a = \frac{50^2 \cdot 3}{\approx 500} = 15 g$ or 2. Vibration frequency 33 Hz, vibration amplitude 5 mm $a = \frac{33^2 \cdot 5}{\approx 500} = 10.89 g$
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With a sensor output voltage of 0.3 V/g, the sensor generates a peak voltage of 4.5 V at a peak acceleration of 15 g (example 1), which corresponds to an effective value of 3.18 V.

Example 1: ➔ 15 g ➔ 4.5 V ➔ 3.18 Veff.

Example 2: ➔ 11 g ➔ 3.3 V ➔ 2.33 Veff.

Due to the very different acceleration values of the different conveyors, large differences in the feedback signals, which make it necessary to adapt the control to the maximum value.

5.4.7 Determine the resonant frequency



NOTICE

When operating at the resonant frequency, small setpoints can generate very large amplitudes!

Manual setting of the vibration frequency (operation without acceleration sensor)

The output frequency must be set with a small setpoint specification, as a large amplitude can occur when the resonant frequency is reached, even with a low output voltage. To determine the resonant frequency, an RMS current meter must be connected to the output line. Please specify a small setpoint. Then change the frequency and observe the current and the amplitude. **The resonant frequency is reached at maximum oscillation amplitude and minimum output current. For stable operation of the conveyor, it is recommended to set a distance to the determined resonant frequency of approx. 1 - 2 Hz, depending on the requirements.** This frequency spacing must be determined by the user, as different conditions prevail for different conveyors.

6 Function

6.1 Fill level control (buffer circuit)

The output is switched ON or OFF via internal, adjustable time levels ("t on" and "t off") depending on the material level measured via a material sensor. The fill level of the conveyed material thus oscillates around the position of the material sensor installed in the filling line.

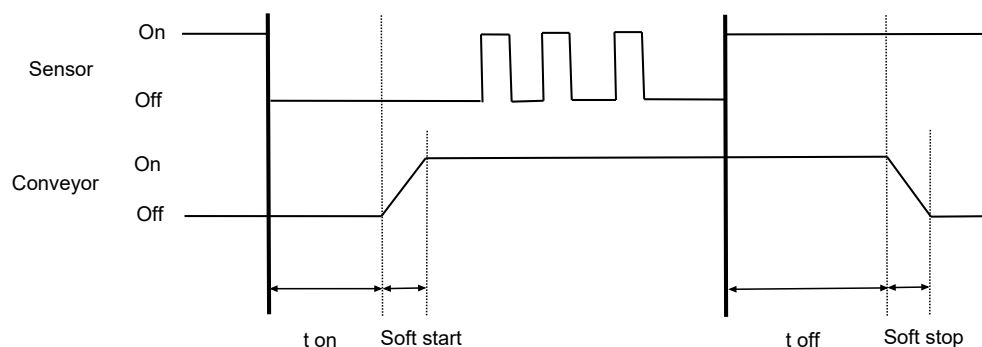
The output of the control unit is switched on when the conveyed material falls below the sensor and the set switch-on delay time has elapsed. If the conveyed material exceeds the position of the sensor, the output of the control unit is switched off after the switch-off delay has elapsed.

(Display indication: "▲full").

Gaps in the flow of conveyed material reset the time levels.

The times are always determined by the last or first part of the conveyed material. The switch-on and switch-off delay time is set in the programming menu. The expiration of the internal time levels is shown by the clock ⌚ on the display. When the conveyor is switched on, a further "Sensor time-out" time level can be started, which switches off the conveyor after an adjustable time (1 - 240 sec.) if no material parts have passed the sensor within this time.

When the conveyor is switched off, the status relay also switches off. The display then flashes "Track Timeout and Info 0001" alternately. This function is optional and must be ☒ activated in the jam sensor menu with the function "Timeout On" = .



6.2 Operation with two speeds (2nd setpoint for coarse/fine switching)

Instead of the fill level control, a coarse/fine operation can also be used. Switching to the second setpoint is done via the sensor input, which is otherwise used for fill level control. The changeover can be done with a contact or an external 24 V DC signal voltage. If a 24 V signal is applied, the system switches to the second "Fine" setpoint without a time delay. (The fill level control function is no longer required.)

6.3 Control inputs and outputs

6.3.1 Sensor input for fill level control (X4)

Sensor for monitoring the material level in a buffer line or input for switching to the second setpoint. 24 V DC (PNP).

6.3.2 Control output 24 V DC time-out (X5)

The "time-out" message is active if no material is detected by the sensor after the set time. (Adjustable with parameter "Timeout on").

6.3.3 Control output status relay (X5)

Relay contact 24 V (normally open)

The relay energises when the control unit is ready for operation - if there is no enable signal or fault message, the relay drops out.

6.3.4 Enable input (X6)

Signal voltage 24 V DC.

External control option for switching the power output on/off, e.g. for linking several devices or control by a PLC.

6.3.5 Control output 24 V DC valve (X7)

Output for a blowing air valve

"On" with conveyor start, "Off", 4 sec. after conveyor stop (factory setting).

The switch-off and switch-on time can be adjusted with the parameters "Air lead time" or "Air delay time".

6.3.6 External setpoint (internal terminal strip)

The setpoint for the flow rate can also be specified via an external reference variable 0 - 10 V DC, 0(4) - 20 mA. For an external setpoint, the parameter "External setpoint" must be activated in the "Conveyor" menu.

Set the desired minimum value using the "arrow keys". Only now switch to the external setpoint. The set value remains as a minimum at setpoint "0".

7 Settings

No.	Symbol	Menu item	Meaning	Setting range	Factory setting
1.0		Power			
1.1.		Conveyor	Delivery rate adjust	0–100%	0%
1.1.1		Fine	Fine adjustment of the setpoint (before: "Activate coarse/fine")	0–100%	0 %
2.0		Conveyor			
2.1		Frequency	Frequency adjust	5–140 Hz	25 Hz
2.2		Invert. release	Release invert.	☒ / ☐	switched off
2.3		Status ↔ ready	Switching status-ready relay (for devices with only one relay output)	☒ / ☐	switched on
2.4		External setpoint	Activation of an external setpoint	☒ / ☐	switched off
2.4.1		Setpoint	Select setpoint type: 0/2/1–10 V or 0/4–20 mA	0/2/1–10 V/ 0/4–20 mA	0–10 V
2.5		Start-up	Set start-up time (setpoint from 0% to 100%)	0–60 s	0.5 s
2.6		Run-down	Set the run-down time (setpoint from 100% to 0%)	0–60 s	0.1 s
2.7		Max.	Limit maximum delivery rate	0–100%	90%
2.8		ACC controller	Activate ACC controller (deactivation switches off automatic frequency search)	☒ / ☐	switched off
2.9		Controller settings ^{*1}		☒ / ☐	switched off
2.9.1		ACC Prp. adj. ^{*1}	Set the P-component of the ACC controller (only if the ACC controller is activated)	0.01–100	0.40
2.9.2		ACC integral ^{*1}	Set the I-component of the ACC controller (only if the ACC controller is activated)	0.01–100 s	0.15 s

No.	Symbol	Menu item	Meaning	Setting range	Factory setting
2.9.3		I Prp. adj.* ¹	P-component of the current controller adjust	0.01–100	0.40
2.9.4		I Integral* ¹	I-component of the current controller adjust	0.01–100 s	0.15 s
2.10		Auto. Freq.	Activate automatic frequency search and tracking (only if the ACC controller is activated)	☒ / ☐	switched off
2.11		Air Jet present	Air jet function activate	☒ / ☐	switched off
2.11.1		Air lead time	Blowing air lead time adjust	0–60 s	0 s
2.11.2		Air delay time	Blowing air run-on time adjust	0–60 s	4 s
2.12		Bunker cycle	Conveyor output cycles		switched off
2.12.1		On time	Set switch-on time for bunker cycle	0–60 s	15 s
2.12.2		Off time	Set switch-off time for bunker cycle	0–60 s	4 s
3.0		Jam sensor			
3.1		Coarse / fine	Activate coarse/fine switching	☒ / ☐	switched off
3.2		T-On	Switch-on delay adjust	0–60 s	5 s
3.3		T-off	Switch-off delay adjust	0–60 s	5 s
3.4		Timeout on	Activate sensor timeout	☒ / ☐	switched off
3.5		Timeout	Timeout time adjust	1–240 s	180 s
3.6		Inv. sensor	Sensor invert.	☒ / ☐	switched off
4.0		Limit values			
4.1		Actual current	Actual current Display	View only	
4.2		Limit current* ¹	Limit current adjust	5–100 %	100 %
4.3		El. breaker* ¹	Switch off output instead of output current limitation	☒ / ☐	switched on
4.4		Min. freq.* ¹	Set minimum frequency	5–140 Hz* ²	15 Hz

No.	Symbol	Menu item	Meaning	Setting range	Factory setting
4.5		Max. freq. ^{*1}	Set maximum frequency	5–140 Hz ^{*2}	60 Hz
4.6		Threshold AFC ^{*1}	Set AFC adjust	0–100 %	10 %
4.7		UMax ^{*1}	Output voltage limitation (230 V solenoid: Umax 100%, 115 V solenoid: Umax 50%)	0–100 %	100 %
5.0 Interface					
5.1		Bus operation	Activate or deactivate bus operation	☒ / ☐	switched off ^{*4}
5.2		Bus address	Internal bus address (do not change)	1–16	1
5.3		Bit rate	Internal bus bit rate (do not change)	1 Mbit/s / 500 kbit/s	1 Mbit/s
5.4		Protocol	Interface protocol (do not change)	V1.i / V2.f	V1.i
6.0		Info			
6.1			Software version Display	–	
7.0		Service			
7.1		Acknowledge error	Acknowledge error	–	Carry out
7.2		Factory settings ^{*2}	Load factory settings	–	Carry out
7.3		Parameter set	Select parameter set	1 / 2 / 3 / 4	
7.4		Save parameters	Save current parameters in the selected parameter set (only if key number 143 is activated)	–	
7.5		Load parameter set	Load and apply selected parameter set	–	Carry out
7.6		Language	Select language	DE, EN	DE
7.7		Key	Enter key number	117 / 127 / 143	
7.8		Backlight	Backlight: permanently on/off or set timeout	On / Off / 0– 120 s 999 s	
7.9		Display inverted	Invert display colours	☒ / ☐	switched off

^{*1} These menu items are only displayed if "Service" is activated.

^{*2} After loading the factory settings, check the "UMax" parameter.

Key 117: The "Restrict" entry becomes visible. This allows various menus to be hidden/shown.

Key 137: Entry "Lock". This allows even more menus to be hidden/shown.

Key 127: The "Service On" entry becomes visible. This makes further items visible in the Service menu.

Key 143: The "Save parameters" entry becomes visible.

8 Troubleshooting

Error messages

If there is an error, a message will flash in the first line of the display.

Error_2401/2402	Acc sensor error:	Acceleration sensor (ACC) not connected or defective
Error_0005	Overvoltage:	Mains input voltage too high.
Error_0002	Overload:	Output power exceeded, e.g. wrong frequency setting, magnetic air gap too large.
Error_0088	Overcurrent:	Defective solenoid, earth fault, defective cable.
Error_0001	Track timeout:	If the sensor timeout function is exceeded.
Error_0112	Control unit overheated	
Error_0087	Peak current:	Frequency setting too low for the solenoid used or frequency change too fast during setting.

Acknowledge with the menu item **Service -> Error**.

For most (not all) errors, pressing the green "I" button is sufficient.

Problem	Additional information	Possible cause
The conveyor is not running	The display shows the symbol 	The release is locked. Check the connection and the parameterisation of the release.
The conveyor is not running	The display shows the symbol 	The red "Stop" button has been pressed. Press the green "Start / Reset" button.
The conveyor is not running	The display shows a setpoint	Check that the conveyor is connected correctly.
ACC sensor error	Error message: ACC sensor error 2401/2402	Check the correct connection of the acceleration sensor.
The frequency search does not start	The display shows a fixed frequency	Automatic frequency search (AFC) is not switched on. Switch on "Auto. Freq".
The frequency search does not start	The amplitude of the conveyor is small	The sensor signal is too small. Increase the setpoint.

Problem	Additional information	Possible cause
The frequency search does not start	The amplitude of the conveyor is large	The sensor signal is too small. Check the installation location of the sensor. Check the V/g ratio of the sensor.
The frequency search stops at the limit value "Min. Freq."		The resonant frequency is below the limit value "Min. Freq". Check the setting.
The frequency search stops at the limit value "Max. Freq."		The resonant frequency is above the limit value "Max. Freq". Check the setting.
The frequency search moves away from the resonant frequency		Only during initial commissioning can the inverter initially move away from the resonant frequency. In this case, the search will reverse at the frequency limits and move back to the resonant frequency.

9

Maintenance and cleaning



WARNING

Electric shock during maintenance and cleaning

- Observe the safety instructions!
-

Maintenance

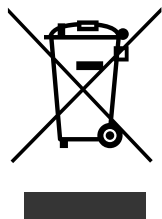
- The device is maintenance-free.
- For appliances that are not permanently installed, the safety test must be carried out annually in accordance with DIN VDE 0701-0702.

Cleaning

- The device must be cleaned when necessary.
- Before cleaning the device enclosure using liquids, switch off the mains voltage!

10

Disposal



The vibration controller may not be disposed of with normal household waste. Users are obligated to hand in used devices at a disposal point for used electrical and electronic equipment. The collection, sorted by type, and proper disposal of your used devices contributes to preserving our natural resources and ensures that they will be recycled, which protects human health and conserves the environment. You can obtain information on where you can find disposal points for your used devices from your local authority, and from local waste disposal firms.

11 Contact information



In service cases, please have the following information ready to expedite the handling of your request:

- IFSYS machine number.
You will find this on the type plate of the machine.
- Identification features of a defective component.
You will find this on any type plate or in the parts list of the assembly in which the component is installed.



In service cases, please have the following information ready to expedite the handling of your request:

- Serial number of the device.
- Number of the machine containing the device.

Service addresses

Europe and regions not mentioned below

IFSYS
Integrated Feeding Systems GmbH
Am Weißen Kreuz 5
97633 Grossbardorf
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