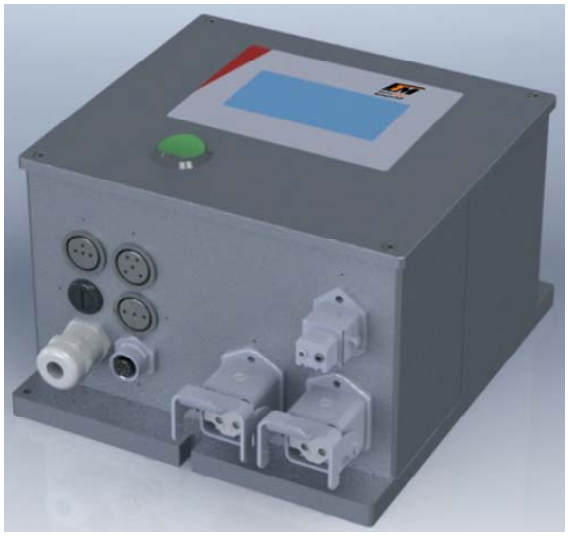
Operating instructions

fimotec – fischer
Montagetechnik

Phase-angle controller TD-16 for oscillating conveyor

Art. No.: 90.0110.54



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Information and explanations

Target group

These operating instructions will help you to use the described product safely and as intended.– **They are directed toward qualified skilled personnel*.**

Qualified personnel are people who have been authorized by persons responsible for the safety of the system to execute the required activities and are able to recognize potential dangers and avoid them based on their training, experience and instruction, as well as their knowledge of standards, regulations, accident prevention regulations and operating conditions (definition of skilled personnel according to IEC 364).

- Read these operating instructions before you install the device, use it or carry out work on it.
- Also pass on these operating instructions to other users.

Definition of the warnings and symbols

Warnings are indicated by danger symbols and signal words. The table shows what hazards and possible consequences the symbols, signal words and colours indicate.

Signal word	Definition	Consequences
⚠ GEFAHR	Directly threatening danger	Death or extremely serious injuries
⚠ WARNUNG	Dangerous situation	Potential death or extremely serious injuries
⚠ VORSICHT	Dangerous situation	Minor to moderately serious injuries
ATTENTION	Risk of property damage	Damage to the machine, its environment and the product
	Warnings can also have other warning signs: Example: Warning of electrical current! These symbols indicate the type of hazard.	

Term definitions

Term	Definition
User	Persons who use the device installed by the manufacturer in its ready-to-use version.
Screen	Designation for the image visible within the touchscreen.
Button	Designation for key fields on the touchscreen
EMC	Electromagnetic compatibility with electrical and electromagnetic influences.
Skilled personnel	Qualified personnel with the appropriate education, training and experience.
Device	Designation (in these operating instructions) for the TD-16 device.
Machine manufacturer	Persons who install the device in the intended construction (machine) and who manufacture the ready-to-use version.
Menu	Designation for the structural layout of the user interface.
Touchscreen	Touch-sensitive screen (display) with operating function.

Table of contents

1 Product overview

1.1 Scope of delivery

- TD-16 software V1.0
- Operating instructions

1.2 Device versions

The TD-16 device is a microprocessor-controlled phase-angle controller for actuating two consumers at a frequency of 50/100 Hz, 3000~ / 6000~ vibrations per minute and variable amplitude.

1.3 Properties

1.3.1 General

- Two consumer outputs
- LCD touchscreen for operation
- Mains input voltage compensation
- Type of protection IP54

1.3.2 Output data

- Consumer outputs 50 Hz/100 Hz for 3000/6000 vibrations per minute
- Power adjustable from 0% to 100% in steps of 1%.
- Min. / max. power limits.
- Soft start ramp / soft stop ramp adjustable from 0 to 10 seconds

1.3.3 Inputs

- Enable input for switching on/off without power
- Two sensor inputs with switch-on/off delays in range of 0 to 60 seconds

1.3.4 Outputs

- Operating notification relay contact 230 V AC / 1 A (changeover contact).
- Two consumer outputs for oscillating conveyor
- Actuator output +24 V DC

2 Safety information

2.1 Intended use

The TD-16 device is a piece of electrical equipment intended for use in supply mechanisms or automation systems. The device is designed for regulating and controlling oscillating conveyor systems.

The electrical components listed here are called "devices" in the industrial parlance, but are not devices which can be used or connected or machines in the sense of the "Device safety law", the "EMC law" or the "EC Machinery Directive", but components. Only when these components are integrated in the construction of the machine manufacturer is the ultimate mode of operation defined.

The machine manufacturer is responsible for making sure that the construction meets the existing legal regulations.

2.2 Basic safety information

The following warnings both serve for the personal safety of the user as well as the safety of the described products and the devices connected to them.

Non-observance can lead to death, serious bodily injury or property damage.

DANGER 	**Life-threatening danger due to electric shock!** Even after the device is put out of operation by disconnecting the voltage, there is still dangerous electrical voltage on the internal circuit parts. – Disconnect the device from the supply voltage before any intervention. – Before opening the device, wait for at least 30 seconds until the residual voltage has dissipated. – Check to make sure there is no voltage before any intervention.

- Only skilled electricians may work on electrical equipment.
- Before commissioning, make sure that the voltage supply agrees with the nominal values of the device.
- Check the electrical equipment of the machine regularly. Deficiencies, such as loose connections, damaged or scorched lines, must be fixed immediately.
- Observe the valid accident prevention and safety regulations for your application.
- In particular, observe both the general and the regional installation and safety regulations for working with dangerous voltages (e.g. EN 50178) as well as the regulations having to do with the proper use of tools and the use of personal safety equipment.
- The Emergency Stop mechanisms must remain in effect in all operating modes. Unlocking the Emergency Stop mechanisms must not result in uncontrolled reactivation.

2.2.1 Transport and storage

Problem-free and safe operation of this device require proper transport, storage, setup and installation, as well as careful operation and maintenance.

The device must be protected against mechanical impacts and vibrations during transport and storage. Protection against moisture, water and impermissible temperatures (see chapter 6 Technical data) must also be guaranteed.

3 Installation

ATTENTION	If the device is not correctly connected, this can lead to the failure or complete destruction of the device (and the connected load).

3.1 Hardware installation

The TD-16 is designed for installation outside of a control cabinet (IP54 protection).

If the device is mounted on a mounting plate made of metal, it can be installed with its entire area in contact with the plate or with spacers. If the device is mounted to a thermally non-conductive surface, it is to be mounted at a distance of at least 10 mm from its surface.

3.2 Mains connection

The mains must be connected according to the valid regulations.

It is connected via the attached Schuko "**power**" plug.

All touchable, electrically conductive housing parts must be grounded according to the valid regulations.

The connection must be made with at least a 1.0 mm² line cross-section.

3.3 Oscillating conveyor connection

This is connected via sockets "X11" and "X12".

X11 is the output for "Channel 1", X12 is the output for "Channel 2".

The pin assignments are as follows:
Pin 1 Connection for load
Pin 2 Connection for load
PE Connection for the ground protection conductor

The oscillating conveyors are connected to these connections.

3.4 Fuse protection

The fuse protection on the primary side depends on the line cross-section. However, it must be designed to have a B10 line protection switch at minimum.

The devices are also protected with internal fuses (F1, 10 A slow-blow).

Caution!:
Leakage currents against PE might occur due to EMC-related suppressor components. These are harmless, however, when an industry-standard RCD switch is used with a tripping current of 0.3 A.

4 Operation

The device is operated via a touchscreen. The corresponding function is executed by touching the respective field on the touchscreen with a finger or blunt object.

4.1 Explanation of the button and display fields

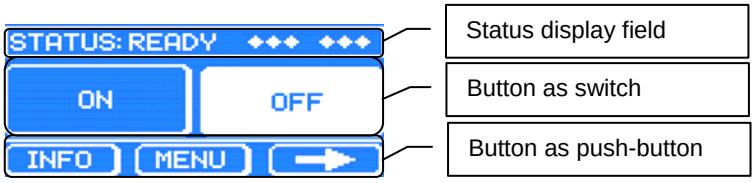


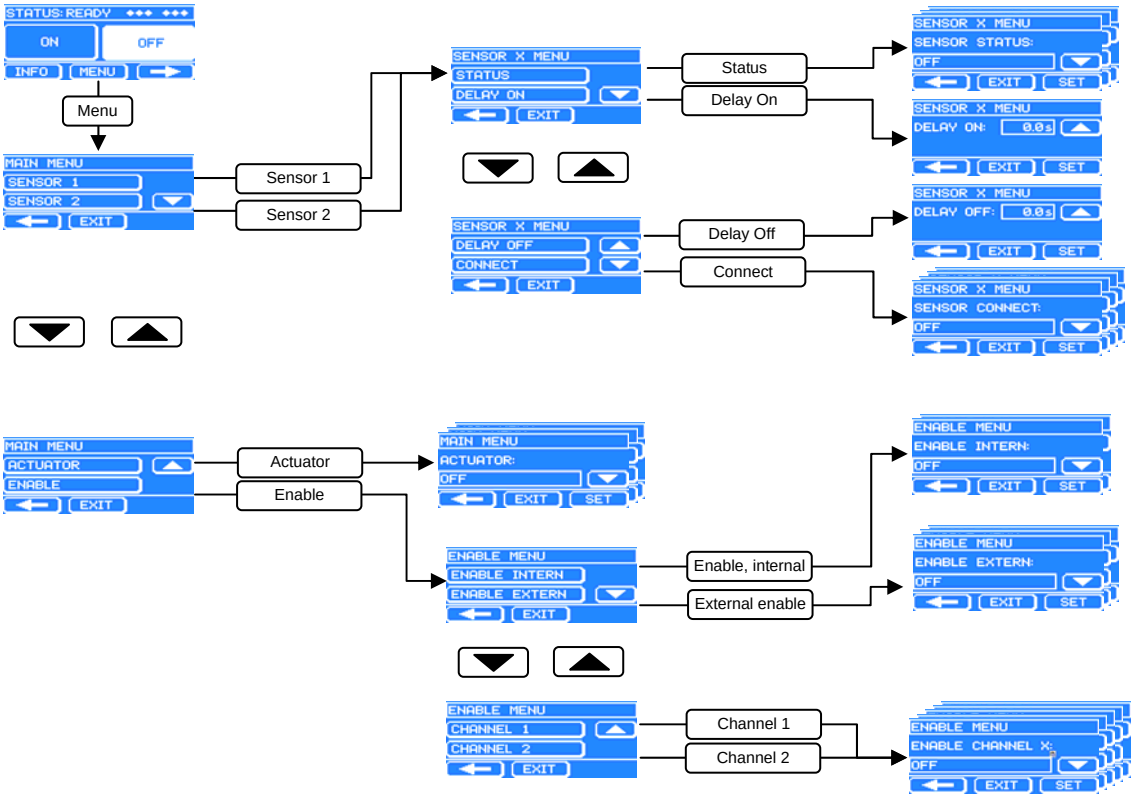
Figure 1: Screen description

Field	Definition
Status display field	In the status display field, the menu names and error messages are shown.
Button	The term "button" designates the display field on the touchscreen, via which the displayed function is controlled. **Function: Button as switch:** – If the button is not actuated as a switch, this is shown with a blue background (see "ON" button in Figure 1). – If the button is actuated as a switch, this is shown with a white background (see "OFF" button in Figure 1). The button (as switch) works with negative button pressure. That means that when the button is pushed by pressing on the touchscreen, the respective function is executed when it is released. **Function: Button as push-button:** – If the button is not actuated as a push-button, it is shown with a blue background. – If the button is actuated as a push-button, this is shown as being "pressed" (shifted back). The button (as a push-button) works with negative button pressure. This means that when the button is pressed, the respective function is only executed when the button is released again.

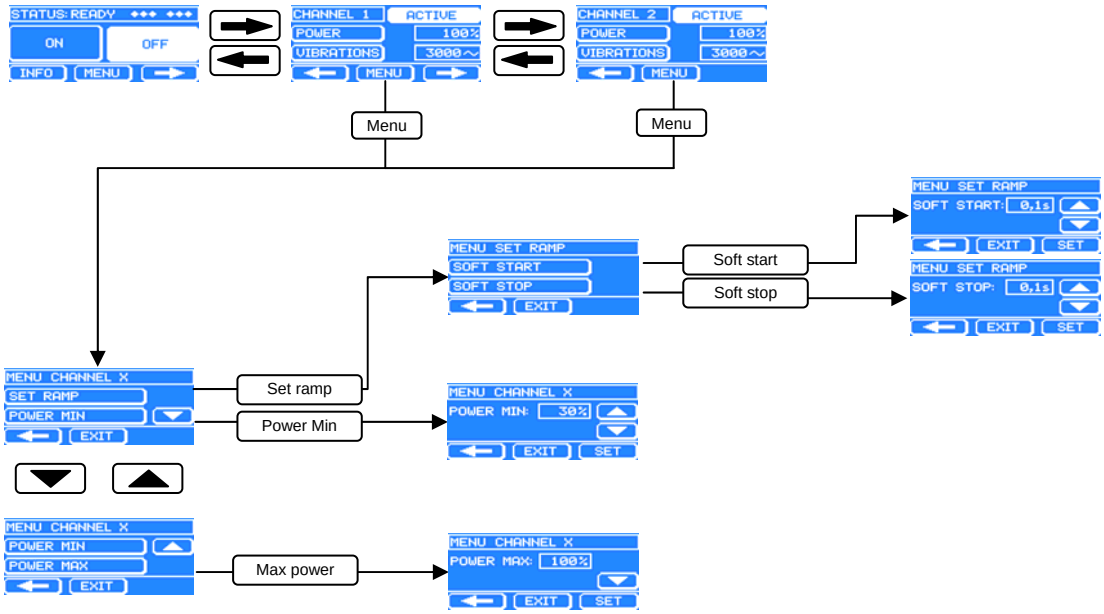
4.2 Description of the user levels

In this chapter, the different user levels will be shown and described.

4.2.1 Structure tree, main menu



Structure tree, channel menus 1 and 2



4.2.2 Starting level

On the starting level, the user can switch the TD-16 on and off. The structure of this screen is described in Table 1.

Screen display	Description
	**Status bar:** The status bar shows the status of the TD-16. *Display: Ready for operation*
	**Status bar:** The stars represent external input/output signals. ❖ External enable ❖ Sensor 1 ❖ Sensor 2 ❖ Status, channel 1 ❖ Status, channel 2 ❖ Status, actuator (actuator)
	**ON/ OFF button:** The power outputs are activated via the ON button. The power outputs are deactivated via the OFF button. **Attention:** Function is influenced by "enable" settings, see section 4.3.4 *Display: ON button not actuated, OFF button actuated*
	**INFO** button: Branching in the TD-16 information screen. **MENU** button: Branching to the main menu. ⇨ button: Branching to the user levels.

Table 1: Starting level

4.2.3 User level, channels 1, 2

The user levels channel 1 and channel 2 are identically structured.
In the following Table 2, the structure is described based on the user level channel 1.

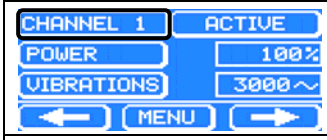
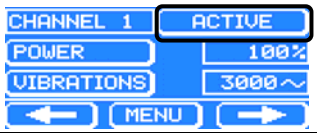
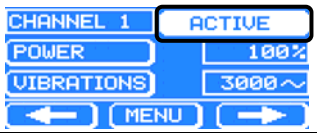
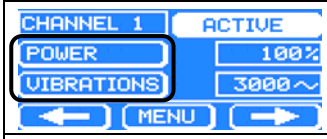
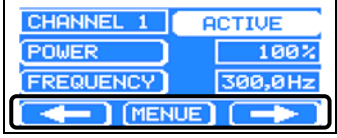
Screen display	Description
	**Display field:** Shows the name of the user level.
	**ACTIVE** button: Button for activating the channel. *Display: channel is not active*
	**ACTIVE** button: Button for activating the channel. *Display: channel is active*
	**POWER** button: Is branched to the screen for specifying the capacity. **VIBRATIONS** button: Is branched to the screen for specifying the vibrations.
	**Display fields:** **0-100 %:** Display of the current capacity in operation. Display of the current vibrations. **3000~/6000~:** Channels 1 and 2
	⇦ button: Branching to the previous level. **MENU** button: Branching to the channel menu. ⇨ button: Branching to the next level.

Table 2: Display of user levels channels 1 and 2

4.2.3.1 Capacity, nominal value specification

In this menu, the capacity can be set via the touchscreen.

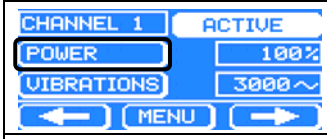
Screen display	Description
	Set the capacity: On the main screen, press the ⇨ button. – Press once to change channel 1. – Press twice to change channel 2.
	Now the screen shown on the left appears for channel 1 and 2. Call up screen for the power: Press the **POWER** button.
	To increase power: Press or hold the △ button. To reduce power: Press or hold the ▽ button. **Attention:** If the minimum capacity "POWER MIN" and the maximum capacity "POWER MAX" are limited on the channel menu, these limit values are the maximum value 100% and minimum value 0%. Then the following function applies: (POWER MIN) => Capacity <=(POWER MAX).
	Once input has been made, the value is saved by pressing the SET button and the window is closed.

Table 3: Capacity nominal value specification menu

4.2.3.2 Vibration specification

In this menu, the vibration can be set via the touchscreen.

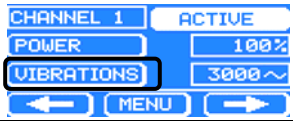
Screen display	Description
	Setting the nominal vibration: On the main screen, press the ⇨ button. – Press once to change channel 1. – Press twice to change channel 2.
	Now the screen shown on the left appears for channel 1. Call up screen for the vibrations: Press the VIBRATIONS button.
	Press the 3000 vibrations per minute "3000~" button. Press the 6000 vibrations per minute "6000~" button.
	Save nominal value: Pressing the SET button saves it. *The window will close.*

Table 4: Nominal vibrations specification menu

4.3 Menu description

4.3.1 Main menu

Screen display	Button	Screen display
	MENU	Call up the main menu: Press the MENU button.
	Sensor 1 (SENSOR 1)	For branching to sensor menu, see section 4.3.2.
	Sensor 2 (SENSOR 2)	For branching to sensor menu, see section 4.3.2.
	Actuator (ACTUATOR)	For branching to actuator menu, see section 4.3.3.
	Enable (ENABLE)	For branching to enable menu, see section 4.3.4.

Table 5: Main menu

4.3.2 Sensor menu

The two sensor menus 1 and 2 are identical. The following Table 6 shows the structure.

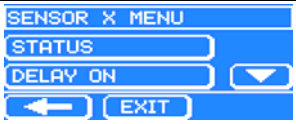
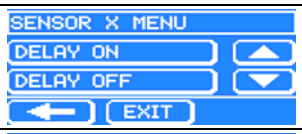
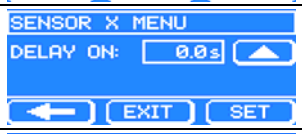
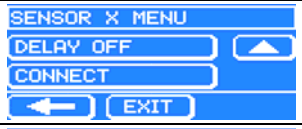
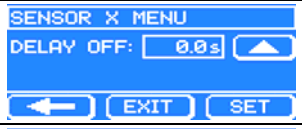
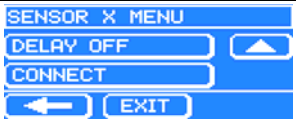
Screen display	Button	Screen display	
	MENU	Press the MENU button.	
	SENSOR 1 SENSOR 2	Press button ▽, until the desired sensor appears. Select the desired sensor	
	Status (STATUS)		Sensor input not active
			Sensor input active Switching status N.O. "normally open", active when contact closed
			Sensor input active Switching status N.C. "normally closed", active when contact open
	On delay (DELAY ON)		On delay setting *(setting range 0.0 s – 60.0 s)*
	Off delay (DELAY OFF)		Off delay setting *(setting range 0.0 s – 60.0 s)*
	Link (CONNECT)		Sensor X has a link.
			Sensor X is linked with channel 1.
			Sensor X is linked to channel 2.[*1]
			Sensor X is linked to channels 1&2.[*1]

Table 6: Sensor menu

4.3.3 Actuator menu

The following Table 7 shows the structure.

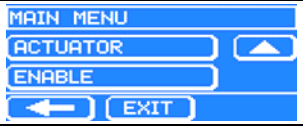
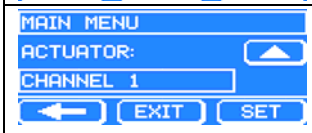
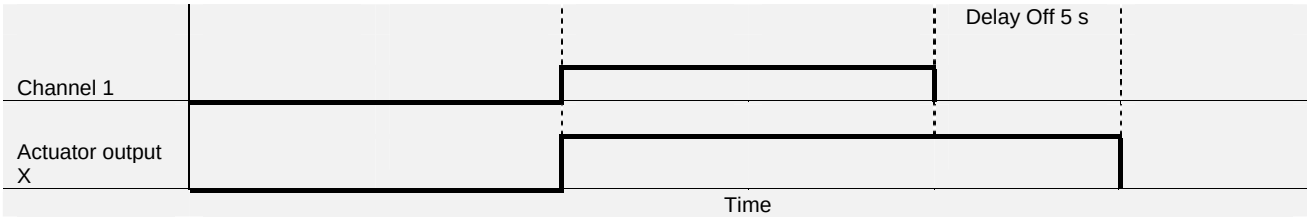
Screen display	Button	Screen display
	MENU	Press the MENU button.
	ACTUATOR	Press ▽ button until "ACTUATOR" appears. Select actuator
		 Actuator output switched off.
		 Actuator output switched on.
		 Link actuator output to channel 1. Actuator output becomes active when channel 1 is active and inactive after 5 seconds when channel 1 is switched off.

Table 7: Actuator menu

The time delay for the actuator output is as follows:

The following diagram shows the time curve of the actuator when it is linked with channel 1.



4.3.4 Enable menu

The following Table 7 shows the structure.

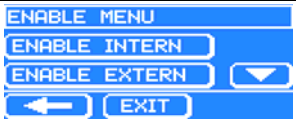
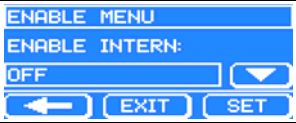
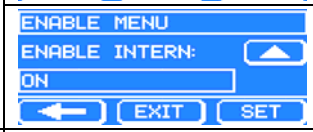
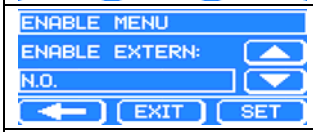
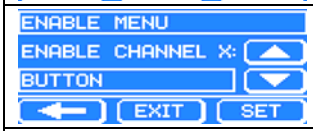
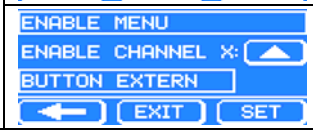
Screen display	Button	Screen display	
	MENU	Press the MENU button.	
	ENABLE	Press ▽ button until "ENABLE" appears. Select actuator	
	Internal enable (ENABLE INTERN)		Internal enable inactive.
			Internal enable active
	External enable (ENABLE EXTERN)		External enable inactive
			External enable active Switching status N.O. "normally open", active when contact closed
			External enable active Switching status N.C. "normally closed", active when contact open
	Enable channel 1 (CHANNEL 1) Enable channel 2 (CHANNEL 2)		Enable channel X inactive Power output inactive.
			Enable channel X active Power output continuous operation.
			Enable channel X active Power output is controlled via the ON/OFF button.
			Enable channel X active Power output is controlled via external signal.
			Enable channel X active Power output is controlled via the ON/OFF button and external signal.

Table 8: Enable menu

4.3.5 Channel menu (CHANNEL MENU 1 / CHANNEL MENU 2*)

The channel menus for the power output 1 (X11) and power output 2 (X12) have the same structure. The following Table 9 shows the structure.

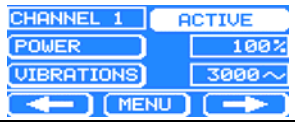
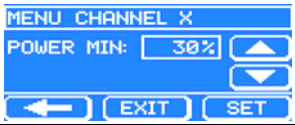
Screen display	Button	Screen display
	MENU	Press the MENU button.
	Set ramp (SET RAMP)	For branching to the ramp menu, see section 4.3.6
	Power minimal (POWER MIN)	 Setting the minimum setpoint specification for the capacity *(setting range 0-100%).*
	Power maximal (POWER MAX)	 Setting the maximum setpoint specification for the capacity *("POWER MIN" setting range 100%).*

Table 9: Channel menu

4.3.6 Ramp menu

Screen display	Button	Screen display
	Soft start ramp (SOFT START)	 Soft start ramp setting. *(setting range 0.1 s – 10.0 s).*
	Soft stop ramp (SOFT STOP)	 Soft stop ramp setting. *(setting range 0.1 s – 10.0 s).*

Table 10: Ramp menu

4.4 Error display

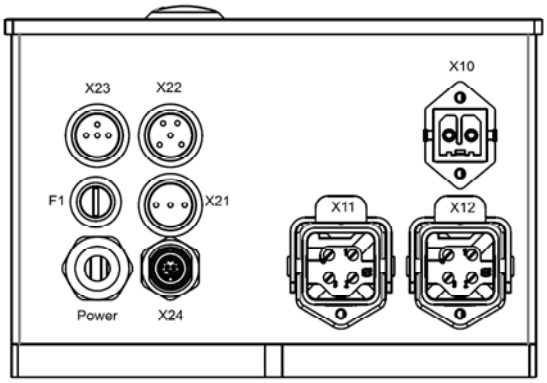
Description of the errors shown on the screen.

4.4.1 Overtemperature

Screen display	Screen description
	When the maximum permissible temperature of the TD-16 is exceeded, this is displayed on the screen. In the status bar, "STATUS: OVERHEAT" will appear.

Table 11: Overtemperature error

5 Description of the control I/Os



Plug connection	Designation	
X21	External enable/disable	1: +24 V DC 2: Enable signal
X22	Sensor 1 / Sensor 2	1: +24 V DC 2: 0 V 3: Signal, sensor 2 4: Signal, sensor 1
X23	Status output, channel 1	1: N.O. 2: changeover contact 3: N.C.
X24	Actuator output	1:+24 V DC 2: Actuator output signal 3: 0 V

5.1 Operating status

The operating output is designed as a potential-free changeover contact with a maximum loadability of 230 V AC / 6 A.

5.2 Enable input

The enable input is for switching the oscillating conveyor connected to the TD-16 on and off without power.
The enable must be designed via a potential-free contact. (e.g.: external switch)

5.3 Sensor input

The load output of the TD-16 can be switched on/off via a sensor, e.g. filling level sensor.
Via the global menu, the on and off delay times can be set within a range between 0 – 60 sec. The resolution is 0.1 seconds. In the following Figure 2, the time curve is shown graphically.
For the TD-16, there are two sensor inputs available.

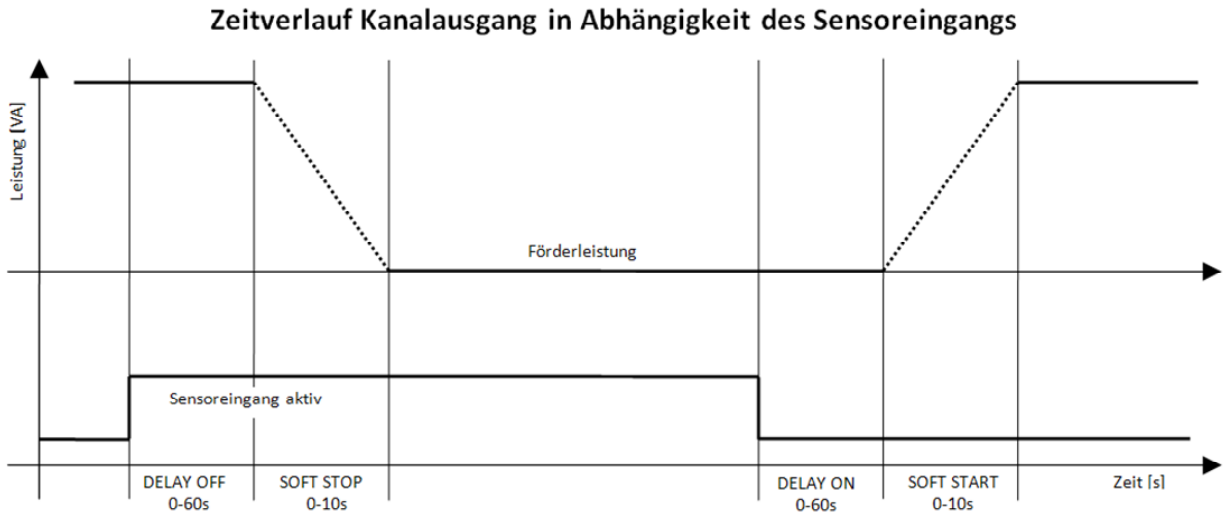


Figure 2: Time curve for load output, sensor input

Actuator output

The actuator output of the TD-16 is a digital output, which is freely selectable. See section 4.3.3 Main menu ACTUATOR.

The output has a voltage of +24 V and a load current of max. 700 mA. The output is short-circuit proof. A constant overload should be avoided, however.
0 V means that the actuator output is switched off.
+24 V means that the actuator output is switched on.

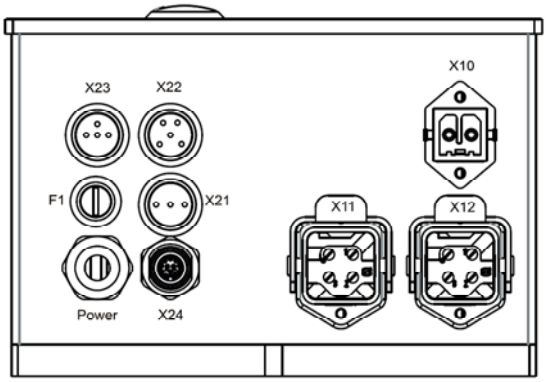
6 Technical data

Supply voltage:	230 V AC *(other voltages possible after consultation)*
Supply voltage tolerance:	± 10 %
Mains frequency:	50 Hz *(other frequencies possible after consultation)*
Output current Channel 1 (CH1) Channel 2 (CH2)	 6 A 6 A max. 10 A
Output voltage:	0 … 210 V
Enable / disable	Contact 24 V DC
Load current, sensors 1, 2:	24 V DC each, max. 100 mA loadable
Load current, actuator:	24 V DC each, max. 700 mA loadable
Status output	Potential-free changeover contact, max. 230 V AC / 6 A
Operation:	Touchscreen
Display:	LCD display, 128x64 pixels
Type of protection:	IP54
Permissible ambient temperature	5°C to 45°C
Permissible relative humidity	max. 95 %, non-condensing.
Dimensions:	approx. (h)185 mm x (w)169 mm x (d)115 mm
EMC	Interference emissions and noise immunity in acc. with **EN 61000-6-x** Noise immunity in acc. with **EN 61000-4-x** *Electrostatic discharge strength (ESD)* ***IEC / EN 61000-4-2*** *HF irradiation* ***IEC / EN 61000-4-3*** *("Burst")* ***IEC / EN 61000-4-4*** *("Surge")* ***IEC / EN 61000-4-5*** *HF current infeed* ***IEC / EN 61000-4-6*** *Voltage drop, voltage interruption* ***IEC / EN 61000-4-11***

7 Terminal assignments

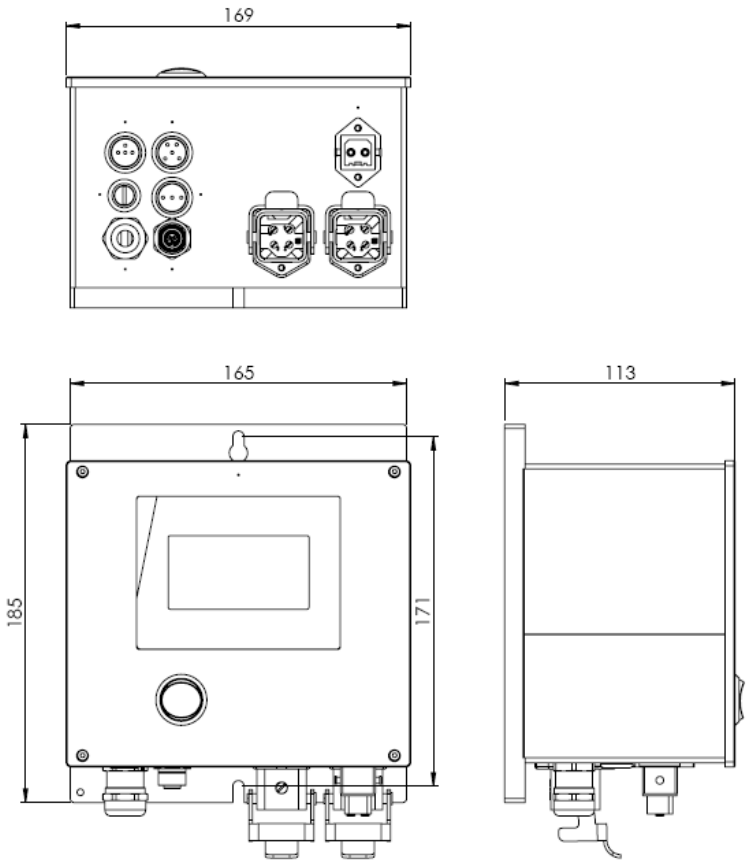
ATTENTION	If the device is not correctly connected, this can lead to the failure or complete destruction of the device (and the connected load).

7.1 Power connection assignments



Plug connection	Designation	
Power	Supply voltage	Schuko plug 230 V AC 50 Hz
X10	Mains output	1: 230 V AC 2: 0 V PE: PE
X11	Load output Channel 1	1: Load 2: Load PE: PE
X12	Load output Channel 2	1: Load 2: Load PE: PE
F1	Fuse	10 A, slow-blow

8 Dimensions



9 Maintenance and care

9.1 Regular tests

The devices are usually maintenance-free. The electrical equipment of the machines are still to be checked regularly by skilled electricians.
If it's dirty, clean the touchscreen with a conventional window cleaner and a soft, lint-free cloth.

9.2 Decommissioning and disposal

The device is to be decommissioned by skilled electrical personnel while complying with the valid safety regulations.

The packaging of the converter can be recycled. Please keep the packaging for later use.

Easily removable screw connections allow the device to be disassembled into its components. These individual components can be recycled. Please carry out disposal in agreement with the local regulations.

Problematic materials must not be thrown away in the normal waste!
Dispose of problematic materials properly, safely and in an environmentally-friendly manner.

10 Accessories and options

10.1 The plug connectors listed below are available as accessories:

Function	Slot	Article number
• Mains output connection	X10	91.3300.20
• Enable/disable connection	X21	91.3300.50
• Filling level sensor connection	X22	91.3300.40
• Operating status output connection	X23	91.3200.60

10.2 The connection lines listed below are available as accessories:

Function	Length, line	Slot	Article number
• Vibration conveyor connection	1.5 m	X11	91.4301.20
• Vibration conveyor connection	3 m	X11	91.4301.00
• Vibration conveyor connection	5 m	X11	91.4301.10
• Connection of a filling level sensor	3 m, straight plug	X22	91.4210.01
• Connection of a filling level sensor	5 m, straight plug	X22	91.4210.02
• Connection of a filling level sensor	3 m, angled plug	X22	91.4210.03
• Connection of a filling level sensor	5 m, angled plug	X22	91.4210.04
• Connection of a level sensor	3 m, angled plug	X22	91.4201.03
• Connection of a level sensor	5 m, angled plug	X22	91.4201.04
• Disable connection to a TSM-11 control	3 m	X23	91.4280.01
• Disable connection to a FSM-137 control or FS-16 / FS-18 / TD-16 control unit	3 m	X23	91.4280.02
• Disable connection to a FSM-137 control or FS-16 / FS-18 / TD-16 control unit	5 m	X23	91.4280.03
• Disable connection to a FSM-137 control or FS-16 / FS-18 / TD-16 control unit	0.3 m	X23	91.4280.04
• Connection of a sorting air valve 24 V	3 m, angled socket	X24	91.4220.03