Operating instructions

fimotec – fischer
Montagetechnik

TSM-21 hopper call-up control for belt hoppers of type BB / BZS

Art. no.: 90.0010.60

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In your own interest:
Please read these instructions and keep them in a safe place.
Please observe and follow the safety information.

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1 General

In this manual, you will find all important information regarding the mounting, connection, setting and operation of your TSM-21 device.
In addition, you will find information as well as important warnings for your safety.
Please observe:
Devices of the TSM-21 series are specially adapted motor controls for actuating hopper systems with 230 V AC capacitor motors.

1.1 The product

- Consumer output for 230 V AC condenser motors
- Setting the parameters via DIP switches and trimmers
- All connections are designed to be pluggable.
- 2 transistor outputs 24V= are available (malfunction/hopper filling level)
- 2 sensor inputs are available
  (filling level of feeding device – level sensor and hopper filling level)
- 1 control input is available (control disable)

1.2 Guide for these instructions

Used signal words and symbols

Symbol	Signal word	Meaning
	**Danger**	Warning of potentially serious to fatal injuries. The lightning symbol warns against dangers due to electrical current.
	**Warning**	Warning of potentially minor injuries or potential damage to property.
	**Caution**	Warning of potential defects / destruction of the device.
	**Important note** **Important tip**	Here, important information or a tip is given concerning the function.

1.3 Safety-related information for the user

These instructions contain the required information for the intended use of the device described herein. They are directed toward technically qualified 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 relevant standards, regulations, accident prevention regulations and operating conditions (definition of skilled personnel according to IEC 364).

Caution:
Danger due to electric voltage.
Non-observance can lead to death, serious bodily injury or property damage.

The following safety information is for your protection, the protection of third parties as well as the protection of the device. You should therefore observe it under all circumstances.

- Disconnect the power supply before installation or dismantling work, as well as when changing a fuse or making changes to the setup.
- Observe the valid accident prevention and safety regulations for your specific application.
- Before commissioning, check whether the nominal voltage of the device agrees with the local mains voltage.
- Emergency Stop mechanisms must remain active in all operating modes. Unlocking the Emergency Stop mechanisms must not result in uncontrolled reactivation.
- The electrical connections must be covered.
- Protective conductor connections must be checked for perfect function after installation.

Operating environment

The device must not come into direct contact with water.
When changing from cold to warm environments, allow the device to temper for a few hours before putting it into operation; otherwise, damage could occur due to condensation water.
Do not install the control device near devices which generate strong electromagnetic fields. The function could be disturbed as a result.
Also avoid environments which are very hot, cold or wet.

Power supply

- Only connect the device to a grounded mains socket with a mains voltage of 95-253 V~/50 Hz or 95-253 V~/60 Hz.
- If you notice malfunctions, disconnect the device from the mains. Have the device checked by qualified, skilled personnel, and repaired if necessary.

The device

- For safety and licensing reasons (CE), it is not permitted to convert and/or modify the device without authorization.
- The device meets the valid low-voltage and EMC directive.

Operation

- The control device only functions correctly when it is correctly installed and operated. In the event of malfunctions or unclear operating states, you should check the device and remedy the malfunction (see "Error list" chapter) or have them remedied.
- To avoid the risk of injury, do not allow uninstructed personnel or other vulnerable or endangered personnel to operate the device without supervision.

Warning:
For applications requiring constant switching ON and OFF, the control input provided for this must be used.
If the load current circuit is interrupted via a switch or relay, the control device could be damaged.

If the device is switched on, the device plug must never be plugged in or unplugged The control device could be damaged.

1.4 Intended use

The device described here is an electrical piece of equipment for use in industrial systems.
It is designed to control capacitor motors.
A use other than the one described above is improper and can result in injuries as well as property damage.

(Further information about this topic can be found in the "Safety information" chapter).

2 Installation

There are 4 bores available for fastening the device on the bottom section of the housing. These are separated from the housing interior.

- Loosen the cover fastening screws
- Remove the cover
- Insert fastening screws in the channel and use these to fasten the device to a vibration-free surface.

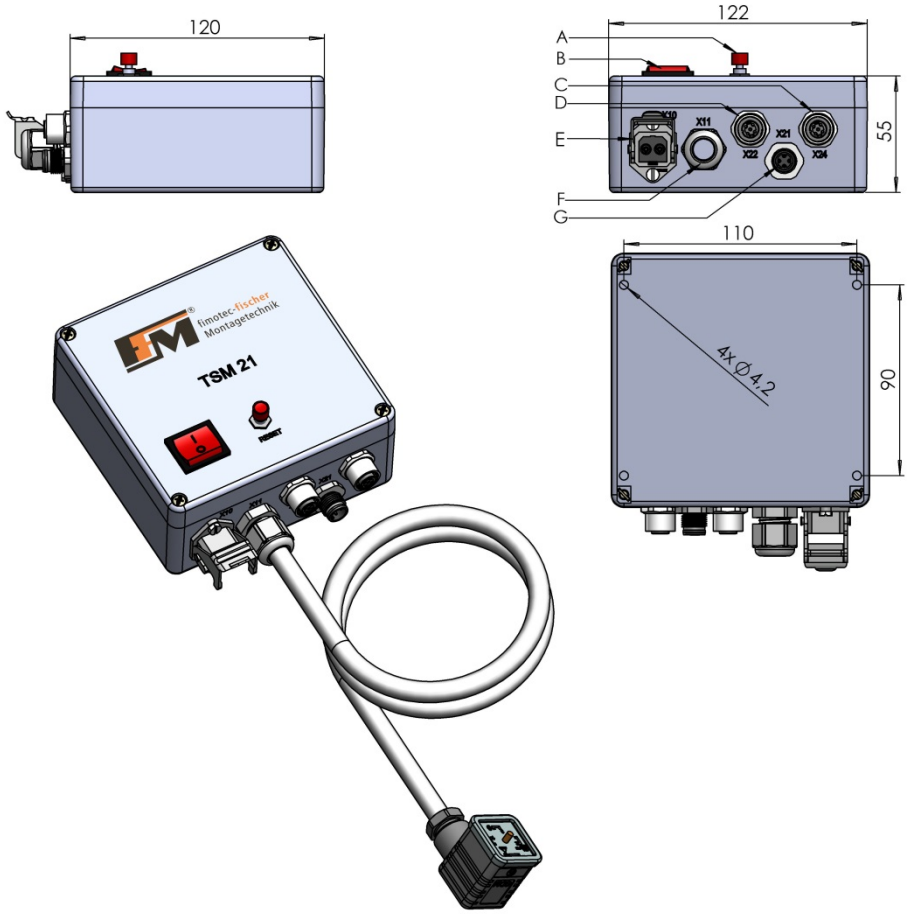
Important note
Fasten to a vibration-free surface.

Caution:
Please make sure that the cable is not pinched against the housing in the interior. Pinching can cause a short circuit and result in destruction of the device.

Warning:
Procedure for high voltage test:
- **L and N must be connected with each other.**
- **Test voltage may not be higher than 1000 V AC**
- **Every device must be tested separately**

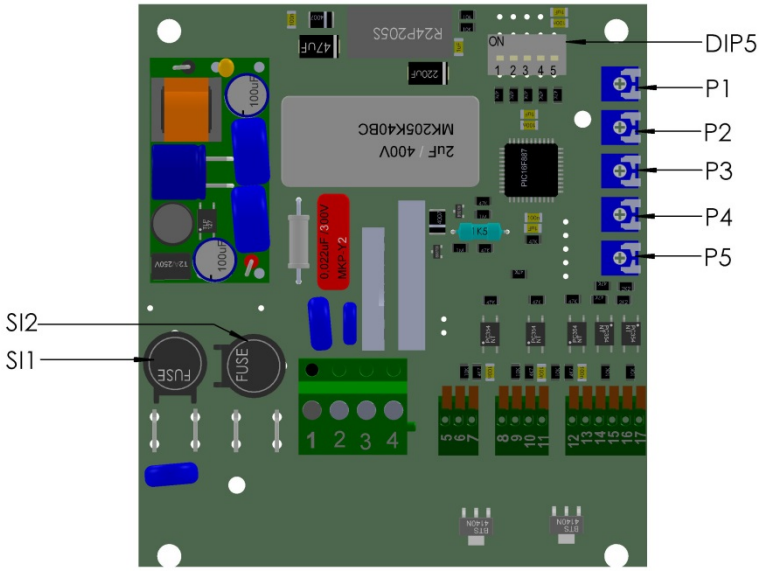
If the above criteria are not complied with, the device could be damaged and the warranty will be void.

2.1 Overview and dimensions



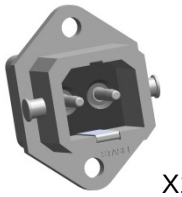
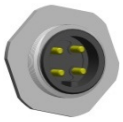
A - Reset button - Acknowledge malfunction
B - Mains switch illuminated
C - X24 - Filling level sensor + workpiece shortage
D - X21 - Controller disable
S - Mains feed
F - Load output with Hirschmann plug GDM 3016
G - X22 - Level sensor + malfunction message

2.2 Connections / operating elements of boards



Terminal 1	➔ X11	N
Terminal 2	➔ X11	L
Terminal 3	➔ X11	N condenser
Terminal 4	➔ X11	PE
Terminal 5	➔ X21	+24 V=
Terminal 6	➔ X21	Controller disable
Terminal 7	➔ X21	GND
Terminal 8	➔ RESET	GND
Terminal 9	➔ RESET	RESET button, cover
Terminal 10	➔ X22	Level sensor
Terminal 11	➔ X24	Filling level sensor
Terminal 12	➔ X24	+24 V=
Terminal 13	➔ X24	Lack of workpieces
Terminal 14	➔ X24	GND
Terminal 15	➔ X22	+24 V=
Terminal 16	➔ X22	Malfunction message
Terminal 17	➔ X22	GND
SI 1	Control electronics	200 mA slow-blow
SI 2	Load	3.15 A, slow-blow
DIP 5		Configuration settings
P1		Hopper filling level – t_{off} – (0 – 20 s)
P2		Hopper filling level – t_{on} – (0 – 20 s)
P3		Hopper belt – t_{pause} – (0.5 – 15 s)
P4		Hopper belt – t_{belt} – (0 – 45 s)
P5		Hopper belt – $t_{malfunction}$ – (35 – 180 s)

2.3 Housing connections

 X10	<u>Mains feed connection</u> Pin 1 - L Pin 2 - N PE - Protective conductor
 X11	<u>Load output connection</u> Pin 1 - N Pin 2 - L Pin 3 - N capacitor PE - PE
 X22	<u>Malfunction message/level sensor connection</u> Pin 1 - +24 V= Pin 2 - Malfunction message (formerly X23) Pin 3 - GND Pin 4 - Level sensor (formerly X22)
 X21	<u>Controller disable connection</u> Pin 1 - +24 V= Pin 2 - Not connected Pin 3 - GND Pin 4 - Controller disable (formerly X21)
 X24	<u>Workpiece shortage/filling level sensor connection</u> Pin 1 - +24 V= Pin 2 – Workpiece shortage (formerly X26) Pin 3 - GND Pin 4 - Filling level sensor (formerly X24)

3 Commissioning

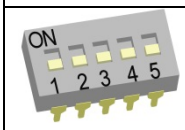
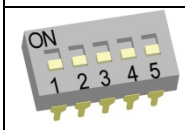
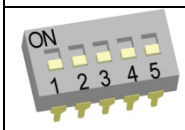
- **Before connecting the motor control, the mains voltage and frequency must be determined.**
- **If the mains voltage and mains frequency are correct, they can be connected to.**
- **The device is set via DIP switches and trimmers. These are inside of the housing.**

Operating note
- **Before switching on, check to make sure the plug connections are correct**
- **Switch on the control device with the mains switch**
- **If the device is not connected correctly, this can result in a failure or in the complete destruction of the device (and the connected load)!**

3.1 Hopper belt operation

General:
The workpiece in the area around the vibration bowl is detected via a sensor. If no workpiece is detected by the sensor, the hopper control switches the drive on for the hopper belt.

Various functions are available for the drive:

Setting via	Function	Description
	Drive mode	DIP 1 ON - Drive runs on and off in a cycle DIP 1 OFF - Drive runs constantly
	Drive Switch-on time	DIP 2 ON - Drive switch-on time 2.5 s, cyclical DIP 2 OFF - Drive switch-on time 1.0 s, cyclical
	Sensor input (Level sensor)	DIP 3 ON - Sensor input signal N.C. *inverted* DIP 3 OFF - Sensor input signal N.O. *not inverted*

	Malfunction ($t_{malfunction}$)	Trimmer P5 Switch-on delay, malfunction 35..180 s
	Switch-on delay (t_{belt})	Trimmer P4 Switch-on delay, sensor input signal (level sensor) 0..45 s
	Drive pause (t_{pause})	Trimmer P3 Pause drive (clock mode) 0.5..15s

Drive runs continuously:

The level sensor does not detect a workpiece in the subsequent machine and switches the drive on after the time t_{belt} has elapsed. The drive runs until the level sensor detects a workpiece and switches off the drive.

Drive runs cyclically:

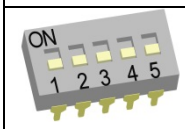
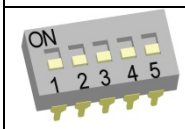
The level sensor does not detect a workpiece in the subsequent machine and switches the drive on after the time t_{belt} has elapsed. Switch-on time, drive 1.0 s or 2.5 s, pause time t_{pause} 0.5..15 s.

Malfunction:

After the switch-on delay t_{belt} has elapsed, the switch-on delay malfunction $t_{malfunction}$ starts. If the level sensor is not actuated by a workpiece, $t_{malfunction}$ runs off and the drive is switched off. The +24V= transistor output (malfunction) is actuated.
The malfunction is acknowledged with the RESET button on the front panel.

3.2 Hopper filling level check operation

General:
The filling level in the hopper can be monitored with the filling level check.

Setting via	Function	Description
	Direction of rotation	DIP 4 ON - Drive direction of rotation counterclockwise DIP 4 OFF - Drive direction of rotation clockwise
	Sensor input (filling level sensor)	DIP 5 ON - Sensor input signal N.C. *inverted* DIP 5 OFF - Sensor input signal N.O. *not inverted*
	Switch-on delay (t_{on})	Trimmer P2 Switch-on delay, filling level 0..20 s
	Switch-off delay (t_{off})	Trimmer P1 Switch-off delay, filling level 0..20 s

Switch-on delay:

The filling level in the hopper is monitored with a light barrier. If a lack of workpieces is detected by the sensor, the switch-on delay t_{on} starts. After this time elapses, the lack of workpieces output is actuated.

Switch-off delay:

Once the lack of workpieces in the hopper has been rectified, the output is reset via the adjustable switch-off delay t_{off}. The workpiece shortage output is no longer actuated.

4 Technical data

Mains connection	95 - 253 V~
Mains frequency	50 Hz / 60 Hz
Output current, load	3 A~ max.
Output voltage, load	230 V~
Protection class	IP 54 (except for mains switch)
Fuse, load	3.15 A T
Fuse, control electronics	200 mA T
Mains connection, mechanical	STASEI 2
Connection, load	800 mm cable + Hirschmann socket GDM 3016
Level sensor [E]	+24 V- / max. 50 mA / PNP Switching level HI : 6 - 24V- Switching level LO: 0 - 4V-
Controller disable [E]	+24 V- / max. 50 mA / PNP Switching level HI : 6 - 24V- Switching level LO: 0 - 4V-
Filling level sensor [E]	+24 V- / max. 50 mA / PNP Switching level HI : 6 - 24V- Switching level LO: 0 - 4V-
Malfunction [O]	+24 V- / max. 100 mA
Lack of workpieces [A]	+24 V- / max. 50 mA
Housing	ABS
Housing dimensions	(h)120 x (b)122 x (t)55 mm
Operating temperature	5...45° C
Relative humidity	Max.95 %, non-condensing

5 Error list

Danger:
Life-threatening danger due to electric current! Have repairs to the 230 V power network performed only by a qualified professional.

Problem/error	Possible cause(s)	Remedy
Device does not work	• Power failure or defective fuse • The device is defective. • Control input inverted	➢ Check the fuses. ➢ Have the device checked by a qualified professional. ➢ Check whether the control input is correctly set.
Important: Malfunctions might occur in an unfavorable electromagnetic environment.		

Caution:
Danger due to improper interventions. Do not manipulate the device. Otherwise, this can result in function failures and device defects.

6 Maintenance and cleaning

The control works maintenance-free.
The safety inspection in acc. with DIN VDE 0701-0702 is to be performed annually.

Pull out the mains plug before cleaning the housing of the device with liquids.

7 Disposal

The device must not be disposed of in the normal household waste.

Users are obligated to bring old devices to a disposal point for old electrical and electronic devices. The separate collection and proper disposal of your old devices helps to conserve natural resources and ensures recycling, which protects human health and the environment.
Information about where you can find disposal points for your old devices can be obtained from your city administration or local waste disposal facility.

8 CE conformity

The motor control device TSM-21 is marked with the CE marking and therefore meets the relevant European directives.
The company fimotec-fischer GmbH & Co. KG herewith confirms that this device complies with the following directives:
EN 61000-6-3 and EN 61000-6-2 according to EU directive 2014/30/EU "Electromagnetic compatibility"

The declaration of conformity is archived at the manufacturer.

9 Service

If you have any questions or problems, please contact the supplier directly.

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Manufacturer: fimotec-fischer GmbH & Co.KG: Tel.: 0049-7424-884-0

Note:

Please keep the following information ready, since otherwise service cannot be provided:

- Your company with address
- Your name and contact data, such as telephone number and e-mail address
- Complete designation of the device
- Serial number (FBxx-xxxx-xx or HW20xxxx)
- The direct supplier of your device or machine in which the device is integrated.

11 Accessories (not included in the scope of delivery)

Designation	Use	Article number
Connection cable	Filling level M8-3p, 3m straight St. M12	FFM_91.4214.00
Connection cable	Filling level M8-3p, 3m angled St. M12	FFM_91.4214.01
Connection cable	Filling level M8-3p, 5m straight St. M12	FFM_91.4214.02
Connection cable	Filling level M8-3p, 5m angled St. M12	FFM_91.4214.03
Connection cable	Filling level M8-4p, 3m straight St. M12	FFM_91.4214.04
Connection cable	Filling level M8-4p, 3m angled St. M12	FFM_91.4214.05
Connection cable	Filling level M8-4p, 5m straight St. M12	FFM_91.4214.06
Connection cable	Filling level M8-4p, 5m angled St. M12	FFM_91.4214.07
Connection cable	Filling level M12, 3m straight St.M12	FFM_91.4214.08
Connection cable	Filling level M12, 3m angled St.M12	FFM_91.4214.09
Connection cable	Filling level M12, 5m straight St.M12	FFM_91.4214.10
Connection cable	Filling level M12, 5m angled St.M12	FFM_91.4214.11
Connection cable	Disable betw. control devices 0.4 m	FFM_91.4214.90
Connection cable	Disable betw. control devices 3.0 m	FFM_91.4214.91
Connection cable	Disable betw. control devices 5.0 m	FFM_91.4214.92
Mains supply line	Mains supply line to TSM-11	FFM_91.4290.01