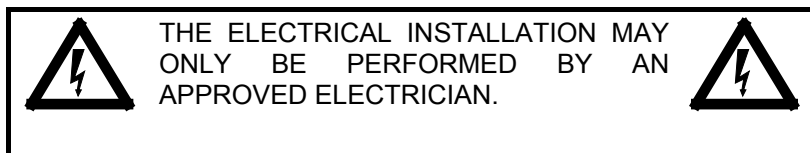


TK 5

1 ELECTRICAL SAFETY



THE TK5-CONTROL UNIT CONDUCTS DANGEROUS VOLTAGE WHEN CONNECTED TO THE MAINS POWER SUPPLY.

WHEN IN OPERATION, THE TK5-CONTROL UNIT MUST BE EARTHED VIA A GROUND CONDUCTOR CONNECTED TO THE **PE** MASS TERMINAL.

THE TK5-CONTROL UNIT CAN STILL BE UNDER OUTSIDE VOLTAGE EVEN WHEN IT IS SWITCHED OFF.

BEFORE STARTING WORK, CHECK THAT THE TK5-CONTROL UNIT IS NOT UNDER VOLTAGE BY MEASURING THE MAINS POWER CONNECTION TERMINALS WITH A VOLTMETER.

Warning symbols

For your own safety, please pay particular attention to the instructions marked with the symbols below:



Dangerous voltage



General warning

2 NOTES ON THE EMVG ACT

The CE-mark which has been applied refers to the German EMVG Act of 9/11/1992 concerning electro-magnetic compatibility (EMC).

The TK5-control unit must be installed by personnel trained in the requirements of EMC.

The TK5-control unit is compliant to the following standards / normed documents:

1. EN 50081-1
2. EN 50082-2

Providing the precautions detailed below are taken, the TK5-control unit may be deployed:

- in the home, businesses, trade premises and in small firms
- in industrial applications

Precautions to be taken:
(as detailed in the circuit diagram in the Annex)

- All control lines must be screened and laid on one side of the control unit.
- The line which connects the TK5-control unit and the drive must be screened and laid double-sided.

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4 FOREWORD

These instructions apply solely to TK5-control units.

It is essential that these instructions have been read and understood before starting installation and commissioning work.

The limit values stipulated in the technical data must be complied with when the control unit is deployed.

The guarantee given for the manufacturer's drives/machines does not include defects which are caused by misuse or false operation of this control unit.

The instructions are sub-divided into different chapters as detailed in the table of contents.

Please read chapter 1 "Electrical safety" and chapter 2 "Notes on the EMVG Act" before starting work with the TK5-control unit.

It is essential that the operator is familiar with the contents of these instructions before using the drive/machine or before making works-specific adjustments and settings.

In case you have any questions concerning the TK5-control unit, please contact the manufacturer directly.

The manufacturer reserves the right to make changes to products without giving prior notice.

5 INTENDED USE

The TK5-control unit is designed for operating oscillation equipment with the manufacturer's magnetic drives of type JD connected to an AC power system.

The TK5-control unit allows the amplitude of such equipment to be infinitely adjusted - virtually from 0 to the maximum.

6 METHOD OF WORKING

Using the supplied potentiometer or an external 0/ - 20 mA or a voltage signal 0 – 10 V DC as the source of the target value, the amplitude can be infinitely adjusted, and thus also the conveying performance of magnetic oscillation equipment within determined limits (minimum and maximum values).

The target value signal which has been set arrives at a smooth start-up and linearisation stage and is subsequently compared to the actual value signal. The actual value signal here is the voltage output by the control unit to the drive. The differential signal (control deviation) is passed to a controller, thereby generating the actuating signal for controlling the phase angle. The actuating signal determines the point in time at which the thyristor triggers.

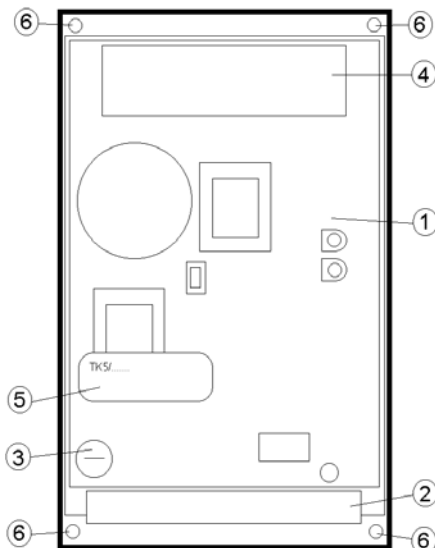
For the purpose of galvanic separation, the triggering pulses are fed to the thyristor via an optocoupler. Triggering takes place within the positive sinusoidal half-wave. The phase angle in the sinusoidal half-wave controls the electrical power made up of voltage and current which is fed to the oscillation system.

Fluctuations of $\pm 10\%$ in the mains voltage are thus compensated to approx. $\pm 2\%$ whilst the amplitude remains more or less constant.

7 INSTALLATION

7.1 DESIGN

The main components of the TK5-control unit are shown below:

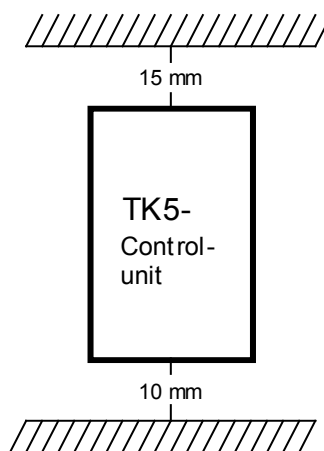


- 1 Plexi-glass cover
- 2 Connecting terminals for mains power/drive/control signals (removable)
- 3 Semi-conductor fuse
- 4 Thyristor with cooling element
- 5 Rating plate
- 6 Mounting holes

7.2 NOTES ON INSTALLATION

Cooling:

The TK5-control unit is cooled by natural convection. In order to ensure a sufficient flow of air, the unit should be installed in the vertical position allowing for the minimum spacings stated in the figure opposite. The cooling air should be as clean as possible and not contain aggressive substances. If the cooling air contains dust, the cooling surfaces must be cleaned regularly.



Fastening:

The TK5-control unit can be fastened to a normal profile rail using a rapid-fastening rail clip.

7.3 CABLING

Dimensions of power and drive cables:

A cable length of 150 m between the control unit and the drive has been foreseen. If the distance is greater, the cable cross section must be increased accordingly.

Type of control unit	Pre-fuse [A, delayed action]	Cross-section of power and drive cables ¹⁾ [mm ²]
TK 5 /...	10	1.5

¹⁾ Observe the local regulations for earthing and cables.

NOTE: The German EMVG Act states that the cable between the control unit and the drive must be screened. The sheath must have a large area on both sides and be laid short to protective conductor potential.

Control cables:

The control cables must be screened. We recommend sheathed, multi-strand, flexible cables with a conductor cross-section of 0.5 / 0.75 mm² for the control lines.

NOTE: Connect the cable sheath one-sided on the TK5-control unit to the protective conductor potential. Arrange control cables so that there is at least 0.5m spacing to the drive cable to prevent interference.

7.4 CONNECTIONS

1,5mm² is the cable cross-section able to be connected to both terminal strips.

Please refer to the circuit diagram in the Annex or to the note packed in with the control unit for the connection assignment of the power, drive and control cables.

NOTE: If the target value potentiometer is used, please ensure that the connections are made in the correct sequence.

7.5 PARTICULARITIES

7.5.1 Controller release

The TK5-control unit is equipped with an input for releasing the controller (control terminals 14/15).

The controller is blocked when the terminals are open. The drive is at standstill.

The controller is released when the terminals are bridged. The drive vibrates.



If the drive is switched off via controller release, the mains power is not cut off to connection terminals 3/4.

If the technical process requires the drive to be switched on and off frequently, then "controller release" should be used instead of line-side switching. The control unit remains connected to the mains voltage in this case.

7.5.2 Output-side switching

Switching in the output is only admissible when the control unit is switched off (line-side or via controller release). Switches or fuses with the corresponding maximum loading then need to be deployed.

The V-fuse unit (see chapter "Auxiliary devices") must be used when switching between the control unit and the drive. It must remain on the drive when the control unit is switched off.

7.5.3 Switching the target value signal

If switching is to take place in the target value lines, then relays with gold contacts or hermetically encapsulated relays should be used due to the low switching voltage ($U \leq 10V$, $I \leq 20mA$). In the case of mA signals, ensure that the load resistor is built into the TK5-control unit.

7.5.4 Coarse/fine current applications

A target value specification for coarse/fine current can be enabled for dosing and weighing applications. If a potentiometer is used for specifying the target value, a second potentiometer is required (-> order separately). The first potentiometer then specifies the target value for coarse current and the second specifies the target value for fine current. An example circuit is shown in the circuit diagram in the Annex. Terminals 26/27 then serve solely as support terminals for the sliders, and are thus not used on the control unit. An external target value signal (mA or V) can likewise be used for the aforesaid applications. For example, a signal of 2V corresponds to the fine current value and 8V to the coarse current value.

7.5.5 Manual/automatic application

Manual/automatic application is understood to mean that the actual target value (->automatic) comes from an external source (controller / PLC as mA or V). A target value can be supplied from a manual potentiometer instead of the automatic target value from the control unit by switching over (-> manual). An example circuit is shown in the Annex "circuit diagram".

The S3 selector switch (target value source) must then be set to the automatic target value signal.

7.5.6 Applications with multiple drives

If more than one drive is to be connected to the control unit, this is possible in the majority of cases by simply switching the drives in parallel. The admissible nominal current for the control unit may then not be overshoot. In certain applications it is necessary to run the individual drives via separating diodes (see chapter "Auxiliary devices"). Please consult the manufacturer.

8 COMMISSIONING

8.1 CHECKS BEFORE TURNING ON THE MAINS VOLTAGE

The TK5-control unit is set in the manufacturer's works to the oscillation equipment supplied and can therefore be deployed without needing any further adjustments. An exception to this is if the notice plate on the control unit refers to a resetting.



The setting trimmer Umin / Umax and the S1 selector switch in the TK5-control unit may not be altered.

Should it be necessary to make settings other than those delivered, please read the chapter "Adjustment/reconfiguration".

Check the following points before switching on the mains power supply:

1. The control unit must be connected to the associated oscillation equipment.
2. The specifications made on the control unit's rating plate must agree with those for the drive. It is especially important that the control unit's output frequency agrees with the oscillation frequency of the drive.
3. The nominal mains power voltage must lie within the voltage range stated on the rating plate (entered under "V" on the rating plate).
4. The control unit must be earthed via the PE terminal.
5. Action must be taken to comply with the EMVG Act (see chapter 2)
6. The mains power cable must be connected to terminals 1/2/PE.
7. The drive cable must be connected to terminals 3/4/PE.
8. The appropriate target value transmitter must be connected (see the type designation on the rating plate and the explanation of the type code in the Annex)
9. Set the target value transmitter to minimum (0/4 mA, 0V, / target value potentiometer to 0)
10. Terminals 14/15 must be bridged if an external Controller release is not connected.
Only when an external controller release is connected:
Connect a make contact to terminals 14/15 and remove the jumper

8.2 TURNING ON THE MAINS VOLTAGE

The points listed under 8.1 must have been performed before the mains voltage is turned on.

The Mains voltage can now be switched on.



The TK5-control unit now conducts voltage which can cause fatal injuries.

The green LED above terminal 27 should now be lit.

The oscillation equipment should now operate at minimum amplitude.

The target value signal can now be slowly adjusted to maximum. Once the maximum target value has been reached, the oscillation equipment should operate at the amplitude stated in the technical documentation for the machine.



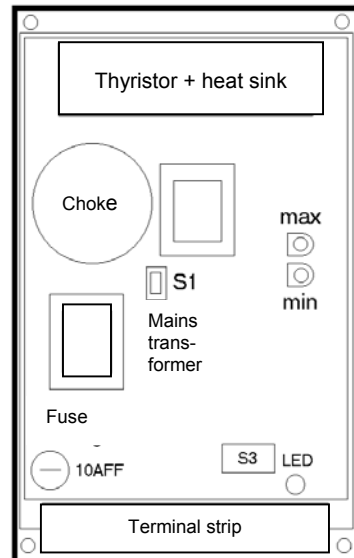
When increasing the target value signal, pay attention to the operating noise made by the oscillation equipment. If knocking sounds can be heard, turn the oscillation equipment off immediately. The equipment can be switched back on once the error has been found and rectified.

Once running smoothly, the target operating value can be set and material fed to the conveyor.

If it is necessary to make subsequent adjustments to the control unit to take account of the prevailing conditions, please refer to the chapter "Adjustment/reconfiguration".

9 ADJUSTMENT / RECONFIGURATION

9.1 POSITION OF ADJUSTING ELEMENTS AND COMPONENTS



View with the plexi-glass cover removed.

LED: Green for "voltage "on"

9.2 EXPLANATION OF ADJUSTING ELEMENTS



IMPORTANT NOTE:

Uncontrolled changes to the adjusting elements can cause the control unit to malfunction.

Before settings are changed, it is essential to read the following points through carefully.

Trimming potentiometers:

2 Trimming potentiometers are arranged on the control card.

Function of the trimming potentiometers:

U_{max}: Setting for the maximum output voltage *)

U_{min}: Setting for the minimum output voltage *)

*) Both trimmers are locked and may not be altered without consultation.

S3 selector switch (DIP switch):

There is a 4-way selector switch (S3) – a so-called DIP switch – fitted to the control card.

Each of these switches is a slide switch which are number 1-4 from left to right.

S1 slide switch:

This switch serves to adapt the mains voltage and has two positions. The switch position is locked. Changing this incorrectly can lead to the destruction of the control unit! See 9.4

9.3 ADAPTING THE TARGET VALUE SOURCE

The S3 selector switch serves to adapt the control unit to the various target value sources.



Do not touch the slide switches until the mains voltage has been switched off. The plexi-glass cover must be removed from the control unit to change their positions.

NOTE: Changing the setting of S3 does not require the trimmers Umax/Umin to be reset.

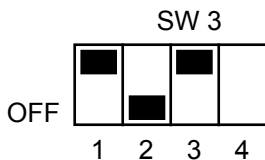
Position of SW 3 (1-3):



Target value 0...10 V via terminal 7/8 and/or target value potentiometer on 5/7



Target value 0...20 mA via terminal 7/8



Target value 4...20 mA via terminal 7/8

9.4 ADAPTING TO THE MAINS VOLTAGE

There is a slide switch (S1) on the control card to select the mains voltage.

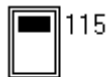


The power to the control unit **must** be switched off before switch S1 is operated. Make sure there is no voltage ! The plexi-glass cover must be removed from the control unit.



Selecting a false mains voltage will destroy the control unit.
The drive must be selected to suit the mains voltage.

NOTE: Changing the mains voltage requires the trimmers Umax/Umin to be reset. **Should only be done by the manufacturer's service department.**



Switch position for mains voltage between 100V and 120VAC.



Switch position for mains voltage between 200V and 240VAC.

9.5 CALIBRATING THE CONTROL UNIT

An amplitude measuring gauge and a TRMS voltmeter are required to calibrate the control unit. Consult with the **manufacturer's service department**.

10 MAINTENENCE

The TK5-control unit generally does not require any maintenance.

However, in particularly dusty environments regular cleaning is essential.

The drive's power draw should be measured at each service with a TRMS ammeter (real-effective value). The maximum amplitude of the oscillation equipment should also be checked (nominal values are stated in the drive documentation).

11 NOTIFYING DEFECTS

Before notifying defects to our service department, please make a note of the following data:

- Type designation of the control unit (see rating plate)
- No. of the control unit (see rating plate)
- Mains voltage (measured)
- Drive data
- Noticeable defects

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12 AUXILIARY DEVICES

The following auxiliary devices are available for the TK5-control unit:

- Fault warning unit "**H**":
Current monitor to monitor the drive current. A fault warning contact is made if a limit value is undershot because of a wire break, for example
- Target voltage source "**Q**":
Provides a constant voltage of 10V= to feed target value potentiometers
- Fuse unit "**V**":
Required to protect the drive if switching is made between the control unit and the drive.
- Separating diodes "**F**":
If more than one drive is connected to the control unit, it can be necessary to deploy this component in order to prevent mutual electrical interference
- Protective device "**N**":
Required to limit the current for explosion-protected drives. It must be connected between the control unit and the explosion-protected drive.

13 ANNEX

13.1 TECHNICAL DATA

Nominal mains voltage	115, 230 V AC (1Ph+N), switchable
Mains voltage ranges	100 - 120 V AC 200 - 240 V AC
Admissible voltage fluctuations	+ 5 %, (ref. to nominal voltage) - 10 %, (ref. to nominal voltage)
Nominal mains frequency	50/60 Hz; ± 1 %
Max. output current	5 A
Output frequency	As nominal mains frequency
Power loss P_v (W) max.	6 W
Internal voltages	$\pm 12V$ stabilised, short-circuit proof +10V stabilised, short-circuit proof for max. 2 target value potentiometers (5 K Ω)
Target value input	0/4 - 20 mA, load 250 Ω ; 0 - 10 V; selectable via DIP switch
Target value integrator	Permanently set
Target value linearisation	Permanently set
Warning lights	1 x LED; for operating voltage
Controller release	Via potential-free external make contact,

OTHER DATA

Approvals	EN 50081-1, EN 50082-2 VBG4
Semi-conductor fuse	10 AFF (superflink), 5x20mm
Cooling method	Air self-cooling
Max. installation altitude	1000 m (over 1000m consult the manufacturer)
Admissible humidity	DIN 40040 F
Protection system DIN 40050	IP 21
Operating temperature	0°C to + 45°C

Storage and transport temperature - 10°C to + 85°C

Installation position Vertical

Cont. admissible vibration level $\leq 0.5 \text{ G}$

Weight 700 g

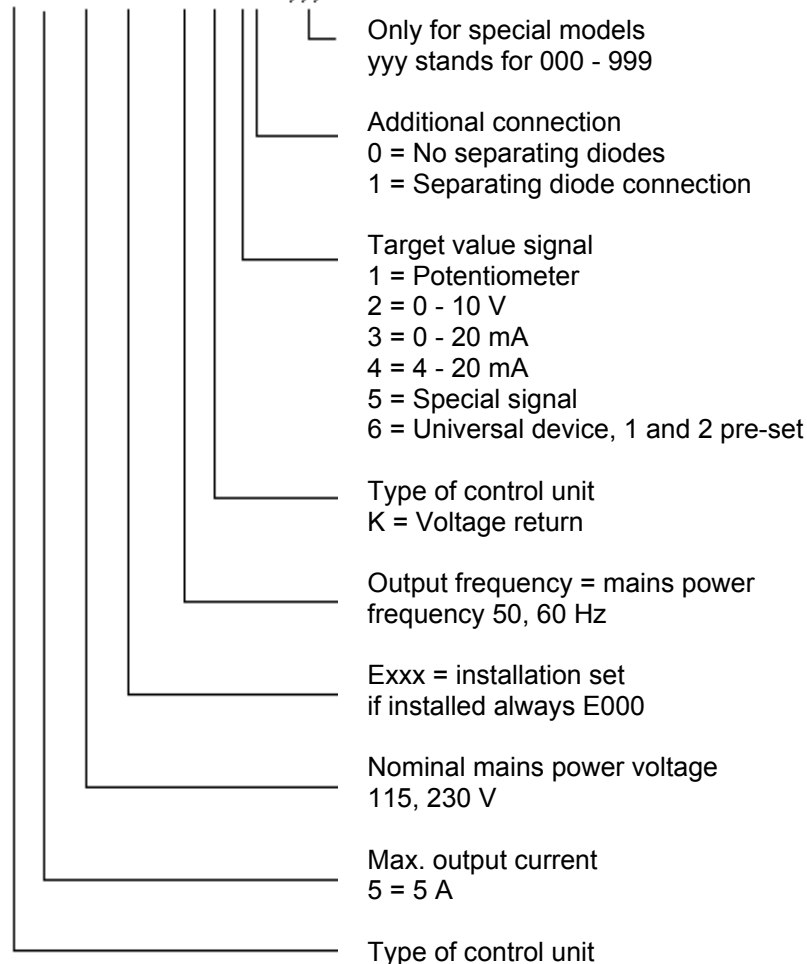
Dimensions 110

112 x 197 mm (WxD) base area
40 mm high

13.2 TYPE CODE

The designation on the rating plate of the TK5-control unit is composed as follows:

TK 5/ 230 Exxx -50 K 60 - yyy



13.3 SCOPE OF SUPPLY

The following items are supplied with the TK5-control unit:

- 1 x target value potentiometer with scale and rotary knob
- 1 x circuit diagram
- 1 x spare fuse 10A FF

13.4 FUSE



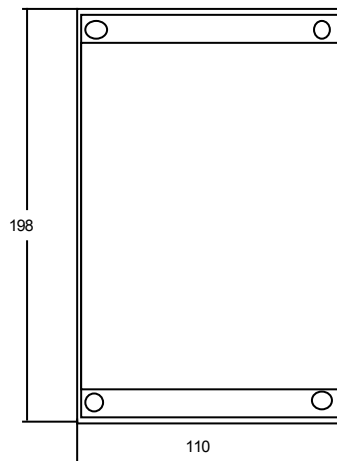
Turn off the mains power before changing the fuse

The pre-installed fuse (superflink) serves to protect the thyristor in case of a short circuit. Only use the same type when changing the fuse.

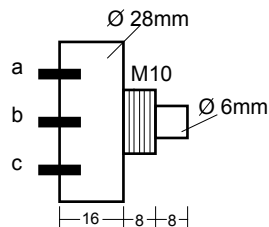
Fuse: 10 A FF (superflink) 5 x 20 mm

13.5 DIMENSIONS

TK5-control unit:



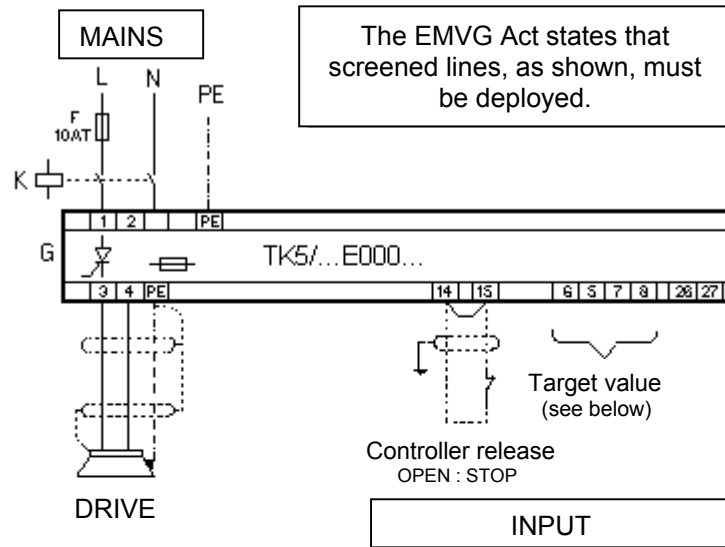
Potentiometer 5 K Ω with scale and rotary knob:



Scale : 64 x 64 mm
Centre hole: Ø 11 mm

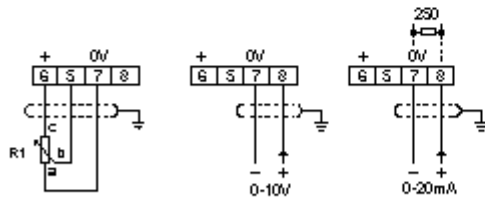
Rotary knob : Ø 36 mm
Height : 20 mm

CIRCUIT DIAGRAM

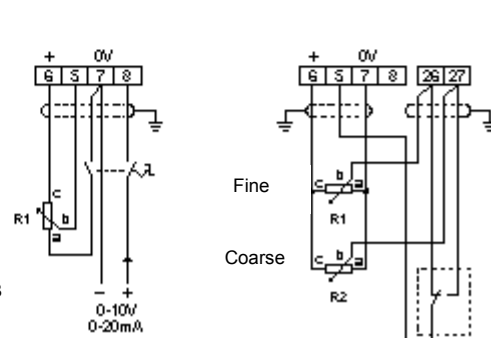


TARGET VALUE CONNECTION

POTENTIOMETER



MANUAL-AUTO SWITCHOVER



NOTES:

POTI R1: APART PROVISION WITH SCALE AND KNOB
ADMISSIBLE CABLE LENGTH 150 m

POTI R2: ORDER SEPARATELY

Customer supply