RNA
We handle it.

Operating Instructions

Controllers
for belt drives

EBC 10
EBC 10 S

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Declaration of Conformity

According to the Low-Voltage Directive 2014/35/EU
and Electromagnetic Compatibility Directive 2014/30/EU

We hereby declare that the product meets the following requirements:

Low-Voltage Directive 2014/35/EC
Electromagnetic Compatibility Directive 2014/30/EU

Applied harmonised standards: DIN EN 60204 T1
EN 61439-1

Remarks:

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1. Technical data

1.1. Functional description

Controller for operation of variable-speed drives with a ratio of 1:4. The device supplies DC drives with permanent excitation or shunt field from the mains. It controls the armature voltage. The mains cord and motor cable are hardwired to the aluminium casing. The pilot devices are installed on the front panel. The integrated overcurrent protection device faults out the system with a time delay. This condition is visually indicated on the front panel.
An internal motor current sensing feature (I x R compensation) provides sufficient constance of the set belt speed in varying load conditions.
Minimum and maximum output voltage, U_{min}, U_{max}, acceleration and deceleration rates T_{UP}, T_{DOWN}, maximum motor current I_{max} and the influence of I x R compensation are all steplessly adjustable on the PCB. The drive can be started and stopped at no-load via additional wiring with floating contact, or via a 24V DC signal. A floating transistor output is provided for integration with other control system components.
The EBC 10 S model controller has a plug-in connection for the motor cable.

1.2. EC conformity

The controller is compliant with following standards:

- EC Low-Voltage Directive 2014/35/EU
- Electromagnetic Compatibility Directive 2014/30/EU

The applicable standards are specified in the Declaration of Conformity.

1.3. Technical data

Mains supply	230 Volts ± 10%, 50/60 Hz
Armature voltage range	0...180 Volt DC
Max. armature current	3 Amps DC
Overcurrent release: Operate delay Restart	 approx. 3 mm Switching off supply
Status messages	NPN transistor 30V, 0.1A
Radio interference suppressed	acc. to EMC directive
Degree of protection	IP 54
Dimensions excluding fastening and pilot devices	90 x 175 x 117 (W x H x L)
Ambient temperature	0°-45°C
External enabling signal	Via floating contact or 24V DC signal (see above)
Status output	Optocoupler (max. 30V DC 100mA

2. Safety directives

Be sure to read and understand all safety information. Compliance with safety information will help to preserve valuable materials and equipment and prevent health issues.
Make sure that all persons working with this controller are familiar with all safety directives and observe them fully.
The device described here is a controller for operation of RNA belt drives. Observe the limits indicated in the technical specification.

Notice!
This hand symbol identifies useful tips for operation of the controller.

Attention!
This warning triangle indicates safety notices. Failure to comply with such warnings may result in serious injury or even death!

Any work on electrical equipment of the machine/system shall be carried out exclusively by a professional electrician, or by instructed persons working under the direction and supervision of a professional electrician, according to electrotechnical rules!

Observe all safety and hazard notes and signs local to the equipment!

Inspect/check the electrical equipment of the machine/system periodically. Remedy defects such as loose connections or damaged cables at once.

Prior to start-up make sure that the protective earth conductor is connected and in proper condition. Make the PE conductor test with approved test devices only.

3. Notes on start-up

Make sure that following points are checked prior to making connection to power supply and switching on the controller:

- Is the controller casing properly closed with all screws tightened?
- Are all plug hooks engaged / firmly screwed in place?
- Are all cables and glands in proper condition?
- Is operation for the INTENDED USE made sure?
- Does the supply voltage specified on the controller match the local supply system?

Only if you can clearly answer all the above questions with "Yes" should the controller be put into operation.

At delivery of a belt conveyor / hopper, all parameters on its controller have been factory-set. In case the controller is replaced later on, take care to adjust these parameters to the existing drive. Figure 1 shows the locations of the adjustment potentiometers

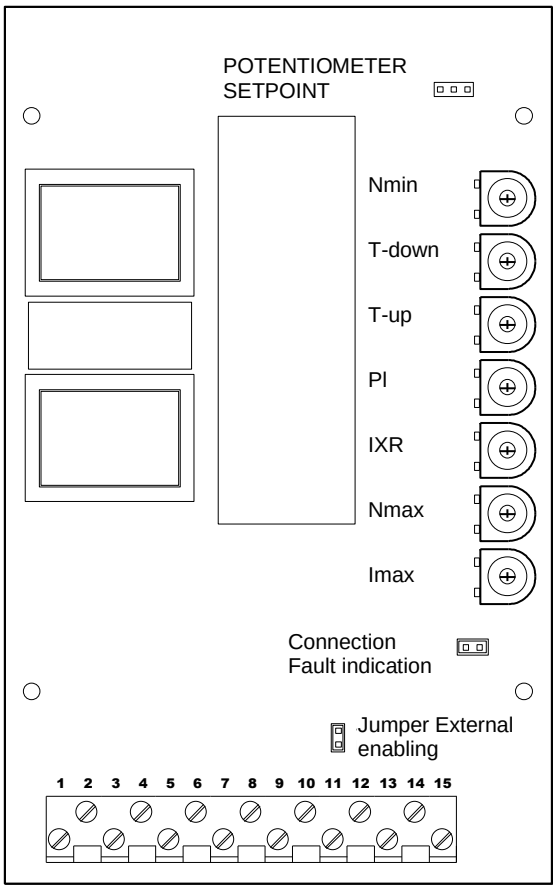


Fig. 1: Locations of the adjustment potentiometers on the printed circuit board.

Setting the minimum speed.

Operating time of deceleration rate
Range 0.1 - 8 sec.
Operating time of acceleration rate
Range 0.1 - 10 sec.

Control response of the voltage regulator.

Speed stabilization, compensation
of different conveyor loads.

Setting the maximum speed.

Setting the maximum armature current.

Before starting any service works for which the controller has to be opened:
Switch off the device and pull the mains plug!
Be sure to observe all safety information. Danger to life!

3.1. Setting the maximum speed

Take care to make this setting with a tachometer, you will find the nominal r.p.m. on the rating plate of the motor. The magnitude of the armature voltage is only a limited indicator for motor speed, since the motor speed also depends on the field voltage which results from the magnitude of the local mains voltage. If it is not possible to measure the revolutions directly at the motor shaft, you can do so at the belt conveyor shaft. The speed reduction ratio required for conversion is indicated on the gear unit.

3.2. Setting the minimum speed

The minimum speed must not be less than ¼ of the maximum speed, else sufficient cooling of the drive motor is no longer guaranteed. The smallest permissible speed results from the maximum speed as shown on the rating plate of the motor.

3.3. Setting the maximum armature current.

The correct setting of the armature current guarantees the full useful life of the drive and a minimum wear of the carbon brushes. The measurement requires a measuring device for TRUE ROOT MEAN SQUARE (TRUE RMS) measurements. Clip-on measuring instruments are usually not suited for this task. Measuring the current in the mains supply line is permissible considering the field current.
The current limit is calculated as follows: Motor nominal current / form factor. You will find the nominal current of the motor on the rating plate, the form factor normally is 1.4. For a motor nominal current of 3 amps, the current limit is 3 / 1.4 = 2.15 amps.
The form factor improves to factor 1.1, if a restrictor is integrated into the armature circuit. In this case the current limit is 3 / 1.1 = 2.73 amps.

3.4. Setting the acceleration and deceleration times

The adjustable acceleration and deceleration rates permit the adjustment of the drive to the respective application. Thus you can accelerate heavy loads to the desired conveyor speed desired without overloading the drive. Parts that are fragile or tip over easily must be accelerated/decelerated in guided manner.

3.5. Setting the IxR compensation

Note that the standard drives are operated without tacho-generator. However the set speed is to remain as stable as possible, therefore the controller is equipped with a compensation feature. With rising
armature current the setpoint automatically increases. The degree of this increase determines the setting of the trimming potentiometer for I x R compensation. The optimum setting depends on the dynamics of the feeder. Take care to adjust the trimming potentiometer until the drive keeps speed in varying load conditions. If the speed increases at rising load, the influence of the compensation is too high and must be reduced.

3.6. Setting the control response

The position of the PI trimming potentiometer determines the intervention into dynamic feedback loop of the PI controller. If it is correctly adjusted and acceleration and deceleration times are set to a minimum, the drive steadily runs up to, and remains at, the selected speed after power on or presence of the external enabling signal. If the intervention is too big, the speed changes cyclically after run-up. If the intervention is too small, the drive overshoots, i.e. after starting it first accelerates to a higher speed than selected and only then picks up the right speed.

3.7. Enabling the function by external components

In the standard setting of the controller the drive starts as soon as the power supply is switched on. If you want the controller to work in Start - Stop operation without disconnecting it from the mains supply, open the controller in accordance with the following description while observing the safety information above. Replace the blanking plug in the side of the casing by a size PG 9 strain-relieved cable gland to feed through the cable for the enabling signal. There are two ways of enabling:

Enabling via a contact
This simple inexpensive solution means that a contact enables the controller by closing and the drive starts working. The connection is made at terminals 10 and 11, after removing the factory-fitted jumper. Be sure to consider the following points:

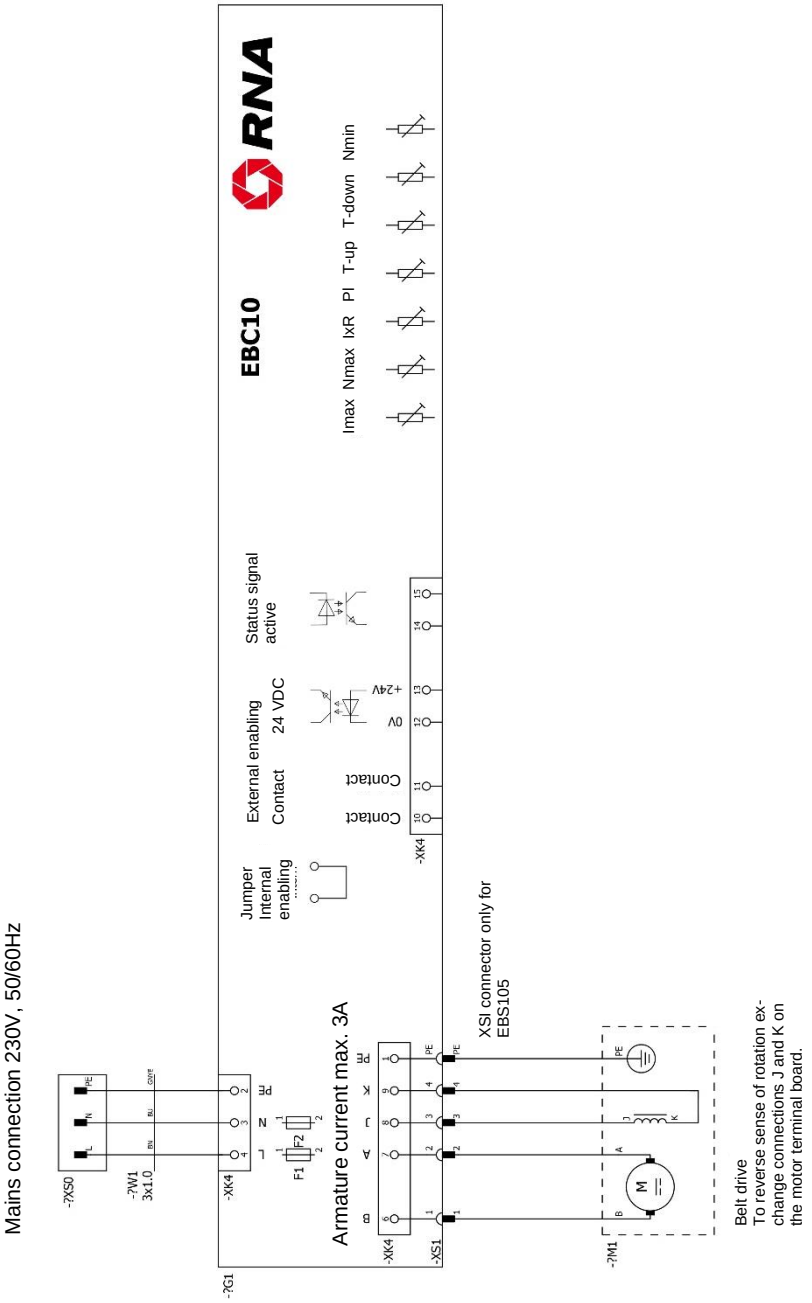
- Mains voltage is present at this connection! Take care to observe cable type and colour, isolation instructions and that the contact of course has to be floating.
- Be sure that the cable is shielded. The shield must be connected to the protective earth conductor on the controller side.
- The cable length must not exceed 5 meters.
- Avoid routing this cable in the immediate vicinity of high-energy switching devices or strong interference fields.

Enabling via voltage signal.
Terminals 10 and 11 must be jumpered, be sure to remove the ENABLE jumber from the board. Use terminals 12 and 13 to connect the enabling signal. The drive starts as soon as a signal between 10 and 30 volt of direct current is available with the correct polarity. The input is protected against polarity reversal. Use an optocoupler in the controller to make the input floating, permitting the installation of non-shielded cables of almost any length. Here too, take care to avoid high-energy interferences.

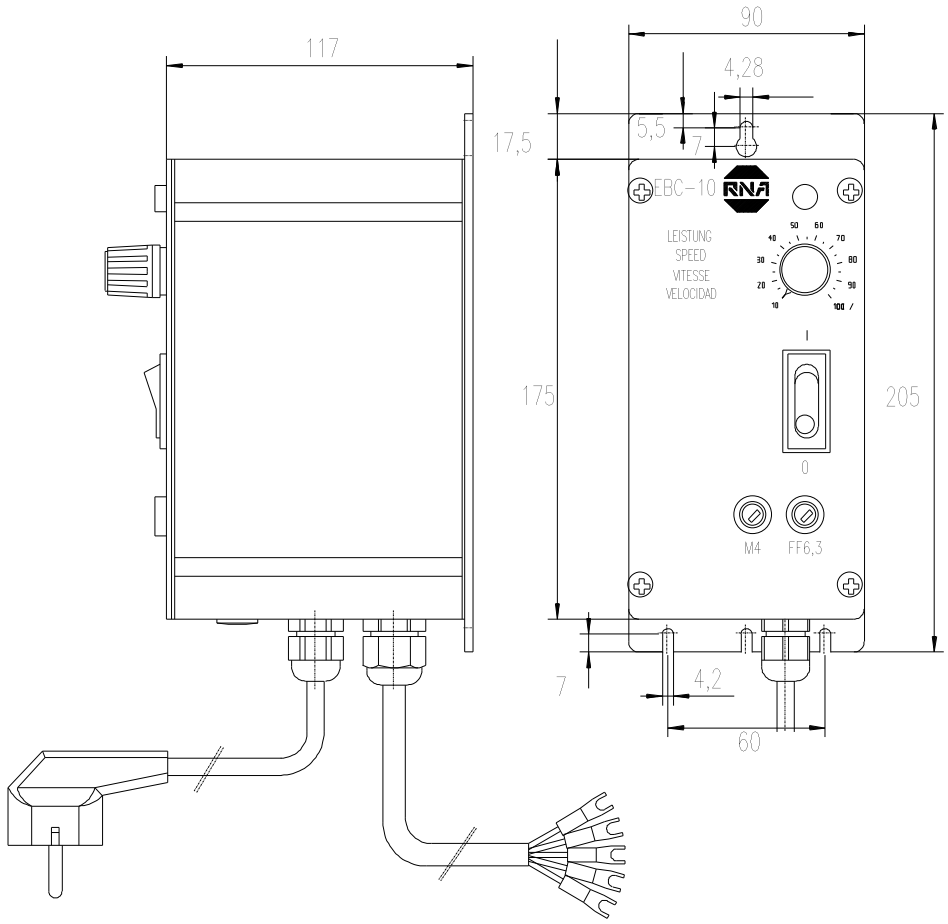
3.8. Status output

The status output provides a floating transistor circuit which is active whenever the controller is connected to mains supply and switched on and the drive is working. The transistor is NPN-doped and switches voltages up to 30 volt DC with a maximum current of 100 mA. To ensure the most universal use possible, we have decided against installing any suppressor circuit. The user has to exercise due diligence here.

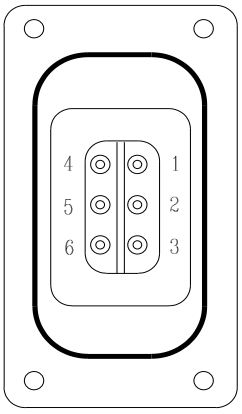
4. Connection diagram



5. View and dimensions



6. Connector pin assignment of the plug for EBC 10 S



Plug pin	Line	Motor connection
1	No. 1	A1
2	No. 2	A2
3	No. 3	F1
4	No. 4	F2
5	N.C.	
6	N.C.	
PE	green/yellow	PE

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