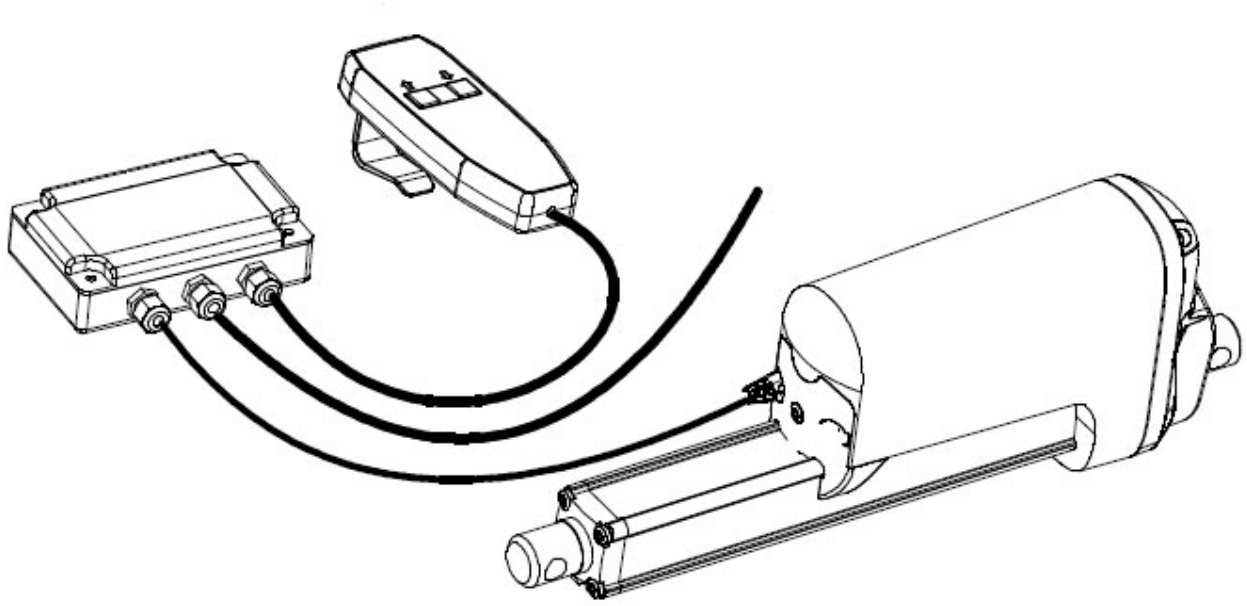
TECH-system
Type 288

For single actuator operation

Instructions for installation and use



Introduction

Dear User,
Thank you for choosing an actuator system from LINAK®. LINAK systems consist of hi-tech products based on many years of experience in the development and manufacture of actuators, electric control boxes, control systems and chargers.

TECH-systems comprise LINAK actuators and a motor control unit developed and produced by third party manufacturers. The function and operational reliability of TECH-systems have been tried and tested in a wide range of situations. In addition we continuously improve our products and systems so as to accommodate customer requirements.

This instruction manual describes how to install and maintain your TECH-system. We are sure that your TECH-system will provide you with many years of problem-free operation.

Before our products leave the factory, they are subjected to comprehensive function and quality tests. In the unlikely event that you experience problems with your systems, please call
LINAK Danmark A/S on +45 86803611.

LINAK provides a warranty on all its products and systems. However, this warranty is issued on condition that the product is used in accordance with the specifications, that maintenance is performed correctly, and that any repairs are carried out at a workshop that is authorised to repair LINAK products.

Any alterations to the installation and use of LINAK systems may affect their operability and durability. The products must not be opened by unauthorised persons.

LINAK Danmark A/S
Mønstedsvej 9
DK-8600 Silkeborg

Important information

Important information about LINAK products is presented under the following headers:

Warning! Failure to comply with these instructions may result in accidents leading to serious personal injury.

NB Failure to comply with these instructions may result in damage to or destruction of the product.

Warranty

The LINAK warranty covers manufacturing faults in the products, calculated from the date of production. For additional information about the warranty period, contact LINAK Danmark A/S. The warranty is limited to the value of the LINAK product.
The LINAK warranty is only valid if the system is unopened and has been used correctly. The control box and control unit must not be subjected to violent handling as this will void the warranty.

Safety instructions

Please read the following safety information carefully. Everyone who is to connect, install or use the system must have been given the necessary information and must have access to this instruction manual.

LINAK recommends that the actuator is used for push applications rather than pull applications.

It is essential that everyone who is to connect, assemble or operate the systems receives the necessary information and has access to this instruction manual.

Before fitting, removal or troubleshooting:

- Stop the actuator.
- Disconnect the power supply and remove the mains plug from the socket.
- Relieve the actuator of any load that may be released during the work.

Before start-up:

- Make sure that the system has been installed as described in this instruction manual.
- Make sure that the voltage to the motor controller is correct before connecting the system to the power supply.
- System connection. The individual parts must be connected before the motor control unit is connected to mains power.

During operation:

- If the motor controller emits unusual sounds or smells, disconnect the mains current and any external batteries.
- Make sure that the cables are not damaged.
- Disconnect the mains cable to mobile equipment before moving same.
- The products are suitable for use both indoors and outdoors. However, you should check that individual products have the appropriate IP rating class. (see product label)

Classification:

The equipment is *not* suitable for use in the immediate vicinity of a flammable, anaesthetic mixture involving air, oxygen or laughing gas (nitrous oxide).

Environmental conditions

Operating:	
Temperature Relative humidity Atmospheric pressure	+5°C to +40°C 20% to 90% @ 30°C – not condensing 700 to 1060 hPa
Storage:	
Temperature Relative humidity Atmospheric pressure	-10°C bis +50°C 20% to 90% @ 30°C – not condensing 700 to 1060 hPa

Warning!
The following applies if the actuator is used in an pull application that carries a risk of personal injury:
The manufacturer of the application is responsible for implementing suitable safety measures to prevent the risk of personal injury in the event of actuator failure.

Warning!
Please note that in all applications in which an actuator is to be involved, steps must be taken to prevent personal injury – such as the risk of crushing fingers.

Warning!
The plastic components in the system cannot withstand the effects of cutting oil.

Table of contents.

Technical data
The TECH-system type 288 consists of: a motor control unit, an actuator and a control unit. Four versions of the motor control unit are available, with and without power supply. Nine different actuator types are available, as well as four different standard LINAK control units.

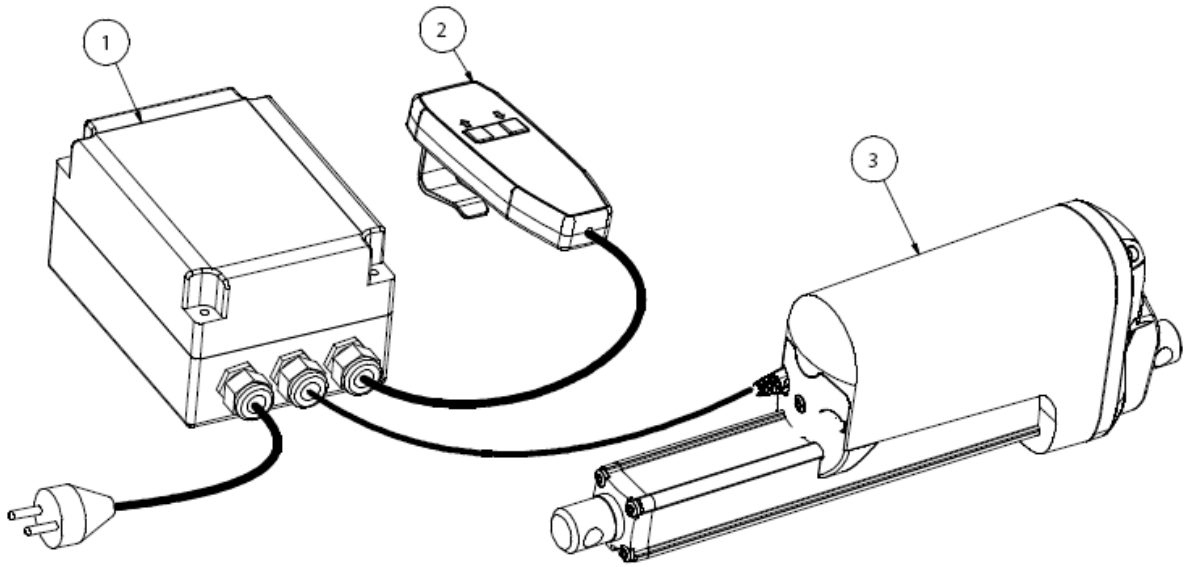
Description of the system

The TECH-system type 288 is an actuator system comprising a single LINAK actuator which uses a specially designed motor control unit to ensure an operationally reliable system. The TECH-system type 288 has been specially developed for industrial purposes requiring more precise positioning. The motor control unit makes it possible to reduce the speed of the actuator at any point in the cycle, simply by activating a push button or on a signal from a PLC. Using the TR-EM-236 portable serial interface handset, the speed (Speed 2) can be pre-set in the interval from 0-100% (by means of a push button).

The FORWARD and BACKWARD commands can be received in continuous or impulse signal mode. In continuous mode, the actuator continue to operate for as long as the command signal is activated. In impulse mode, only a single impulse is required to start and stop the movement of the actuator.

External stop switches may be connected to the motor control unit and it is therefore possible to use the externally fitted end-stop switches on, for example, LA36 and LA30LS.

The motor control unit can be configured to perform a variety of functions if it is connected to the TR-EM-236 programming interface. For example, it is possible to adjust acceleration/deceleration time, limit stroke length, etc.
The TECH-System type 288 is compatible with a range of different LINAK actuators.



Motor control unit: (pos.1)

Type designation:	EM-288
Actuator connection:	1 actuator
Actuator power limit:	15 A duty cycle 100% 30 A at start
Actuator voltage:	24 V DC
Supply voltage to PCB:	10–35 V DC ripped voltage
Power limit, setting:	0.1 - 20 A:
Ramp times (start/stop):	0-5 seconds
PWM frequency:	2 kHz
Controller input (Speed 2):	0 - 5 V = 0 - 100% speed
Controller inputs:	4 - 30 V = ON / 0 - 1 V = OFF
Input impedance:	10 kohm
Operating temperature (Ta):	+5°C to +40°C

Four versions of the motor control unit are available:

1.	Separate PCB:	Order no.: **TR-EM-288**
2.	PCB fitted in box:	Order no.: **TR-EM-288-H**
3.	PCM mounted on DIN rail for panel mounting	Order no.: **TR-EM-288-R**
4.	PCB fitted in box with power supply:	Order no.: **TR-EM-288-T-230**

Actuator (pos.3)

The system is compatible with the following LINAK actuators: All without feedback:

- Actuator LA12
- Actuator LA23
- Actuator LA28
- Actuator LA30
- Actuator LA31
- Actuator LA32
- Actuator LA34
- Actuator LA35
- Actuator LA36

(see the appropriate product data sheets for additional information)

Control Unit: (pos.2)

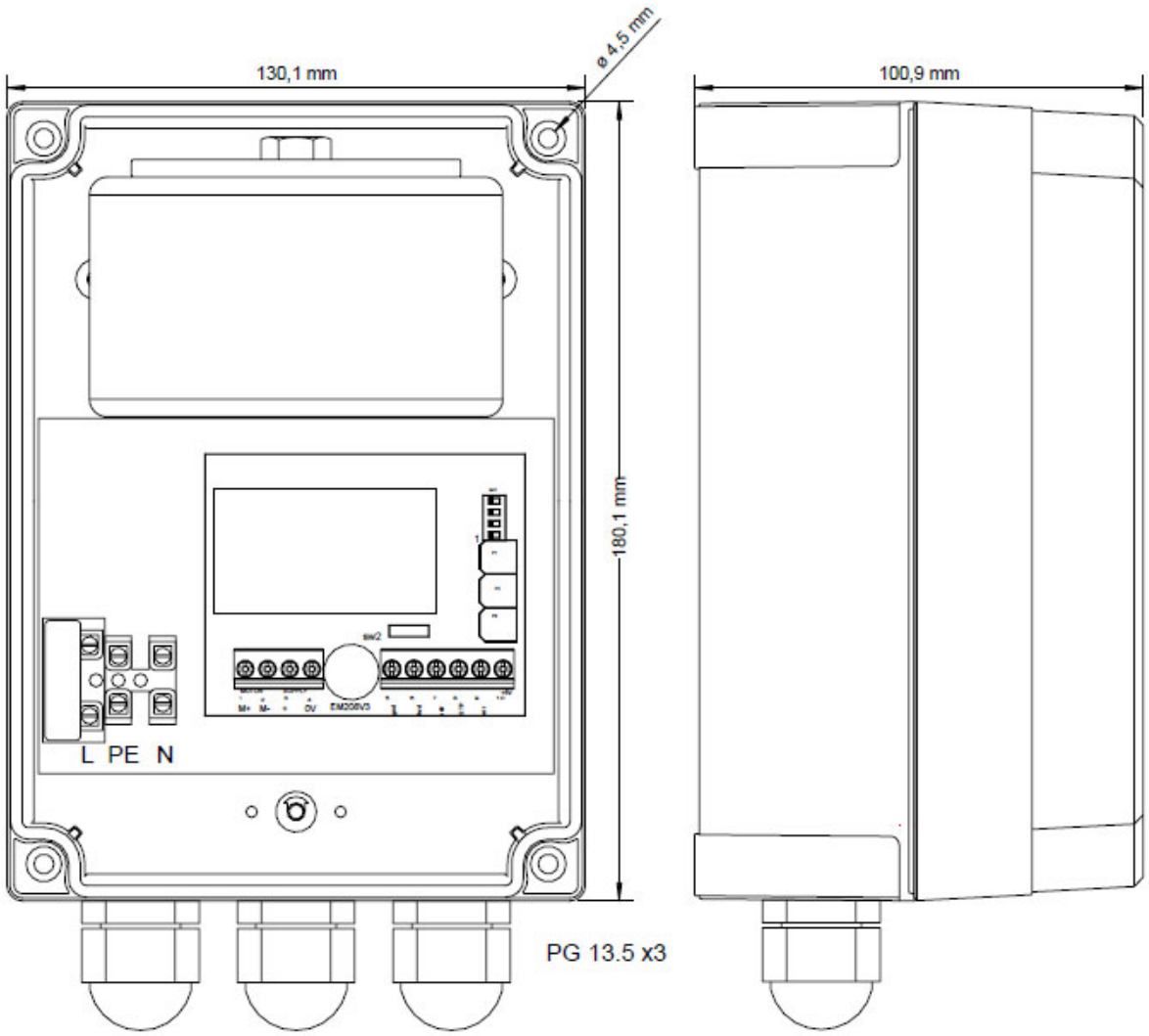
The system is compatible with the following LINAK control units

• Desk-mounted operation, type DP1E:	Order no.: **DP1E00-000006**
• Desk-mounted operation, type TP1:	Order no.: **TP1010+00**
• Hand-held type HB41:	Order no.: **HB41000-000009**
• Rocker switch for integration:	Order no.: **TR-1939.3314-00**

Other types of control units can also be used.

Dimensions

The TR-EM-288 motor control unit fitted in a plastic box with integrated power supply
Weight: 2.4 kg

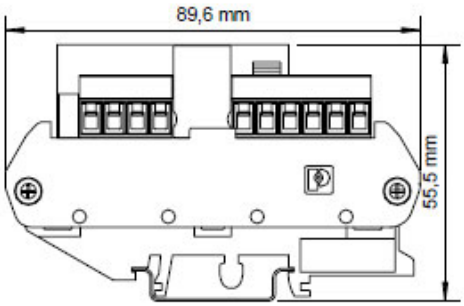


TR-EM-288 for mounting on DIN rail
for integrating into an electrical panel

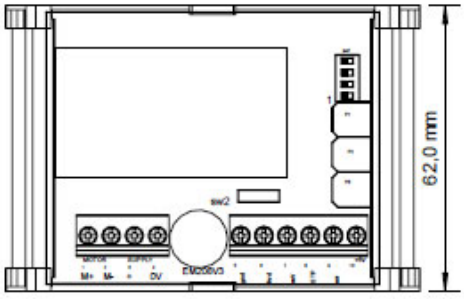
Weight: 200 g

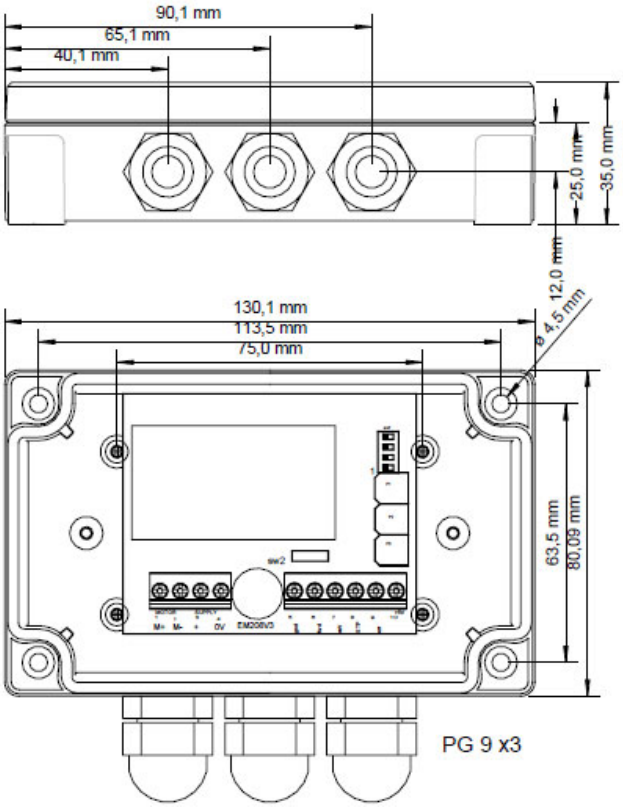
TR-EM-288 mounted in plastic housing without power supply

Weight: 300 g

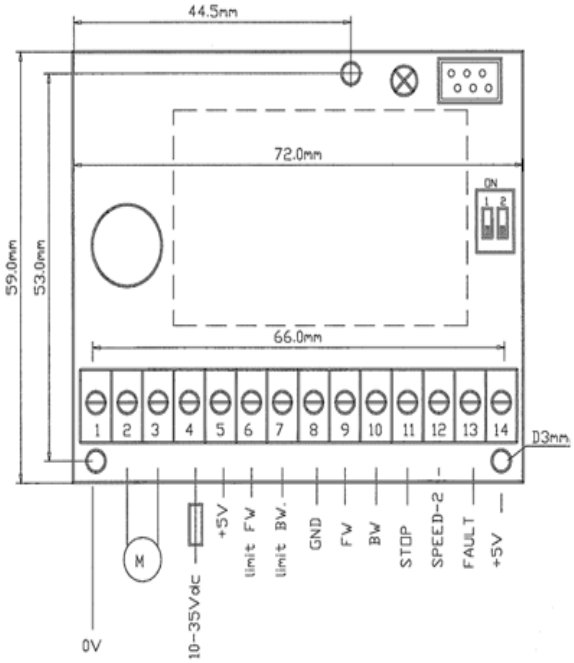


Fits to 35 mm DIN-rail or C-rail.





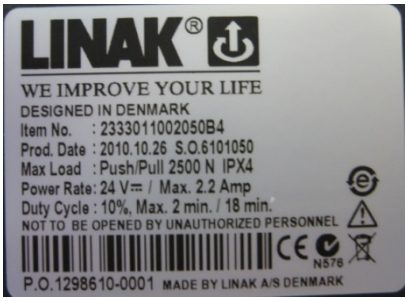
Motor control unit TR-EM-288 as separate PCB



Data plate and labelling

Data plate on TR-EM-288 control unit:

Data plate on actuator LA23



Incorporation of partly completed machinery

LINAK WE IMPROVE YOUR LIFE

Declaration of incorporation
of partly completed Machinery

Directive 2006/42/EC Annex II B

The signatory Manufacturer and authorised to compile the relevant technical documentation for partly completed Machinery and in response to a reasoned request by the national authorities transmit the relevant information:

LINAK Danmark A/S
Mønstedsvej 9
DK-8600 Silkeborg

Declares that the partly completed machinery:

Discription:	Linear Actuator system for single Actuator operating
Name:	TECH-system
Type:	**288**

Consisting of:

LINAK Actuator type:	**LA12 or LA23 or LA28 or LA30 or LA31 or LA32 or LA34 or LA35 or LA36 or LA37**
Motor controller unit:	**TR-EM-288**
Operating unit:	**HB40 or TP01 or DP1**

comply with the following parts of the essential health and safety requirements of the Directive 2006/42/EC Annex I:

1.2.1-safety and reliability of the control system; 1.2.2-control device; 1.2.3-starting; 1.2.4.1-stopping; 1.2.6-faliure of the power system; 1.3.2-risk of brake-up during operation; 1.3.7-risks related moving parts; 1.3.8-choice of protection against risks arising moving parts.

comply with the requirements of the following EN Standards:

EN 13849-1:2008 SRP/CS Cat. B, PL = b og SRESW PL = b

comply with the requirements of the following EC Directives:

- Electromagnetic compability 2004/108/EC

The partly completed Machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive 2006/42/EC and other relevant Directives, where appropriate.

Date 5/2 - 2015 Silkeborg

Name and signature

Technical chief

Thomas Skovbjerg Petersen

Thomas Skovbjerg

Connection and installation
Screw terminals are used to connect the TR-EM-288 motor control unit. A general description of the individual terminals is presented below.

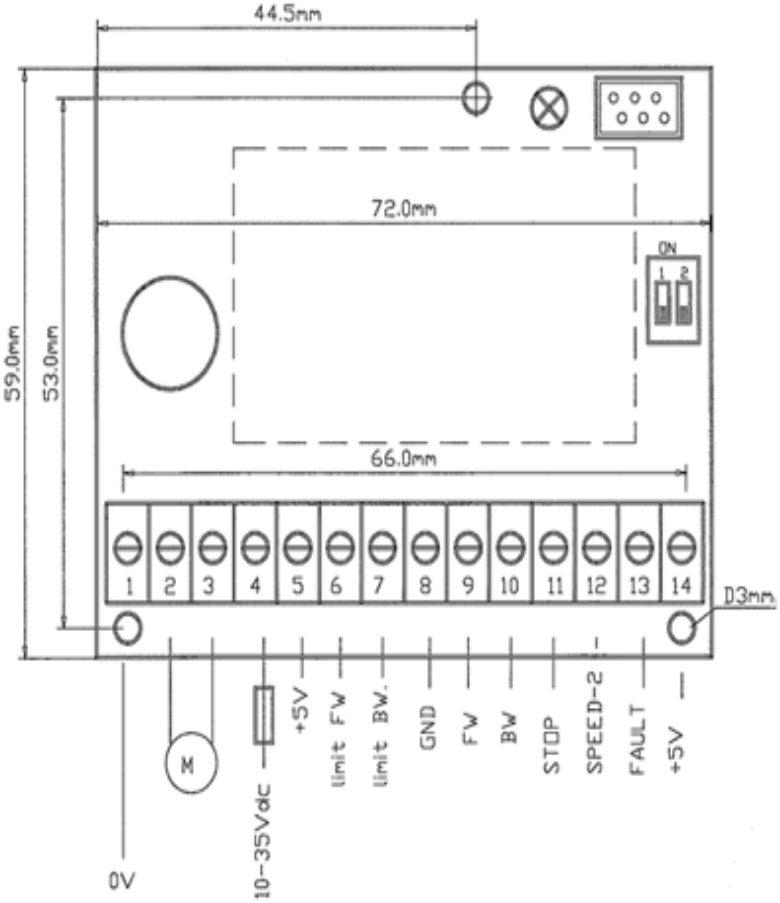
Fitting the motor control unit

Four versions of the TR-EM-288 motor control unit are available:

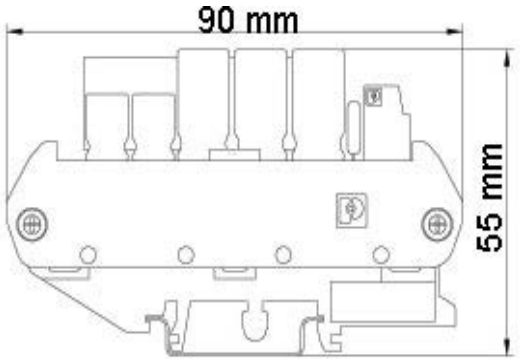
1. Separate PCB: Order no.: **TR-EM-288**
2. PCB fitted in box: Order no.: **TR-EM-288-H**
3. PCM mounted on DIN rail for panel mounting Order no.: **TR-EM-288-R**
4. PCB fitted in box with power supply: Order no.: **TR-EM-288-T-230**

Separate PCB – TR-EM-288

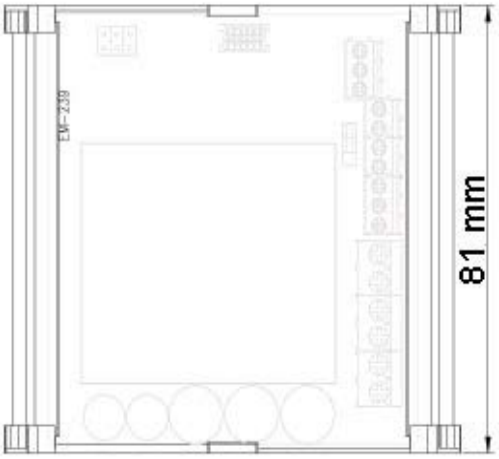
The PCB is fitted using three ø3 mm screws and connected to an external power supply.
The height of the PCB is approx. 25 mm.



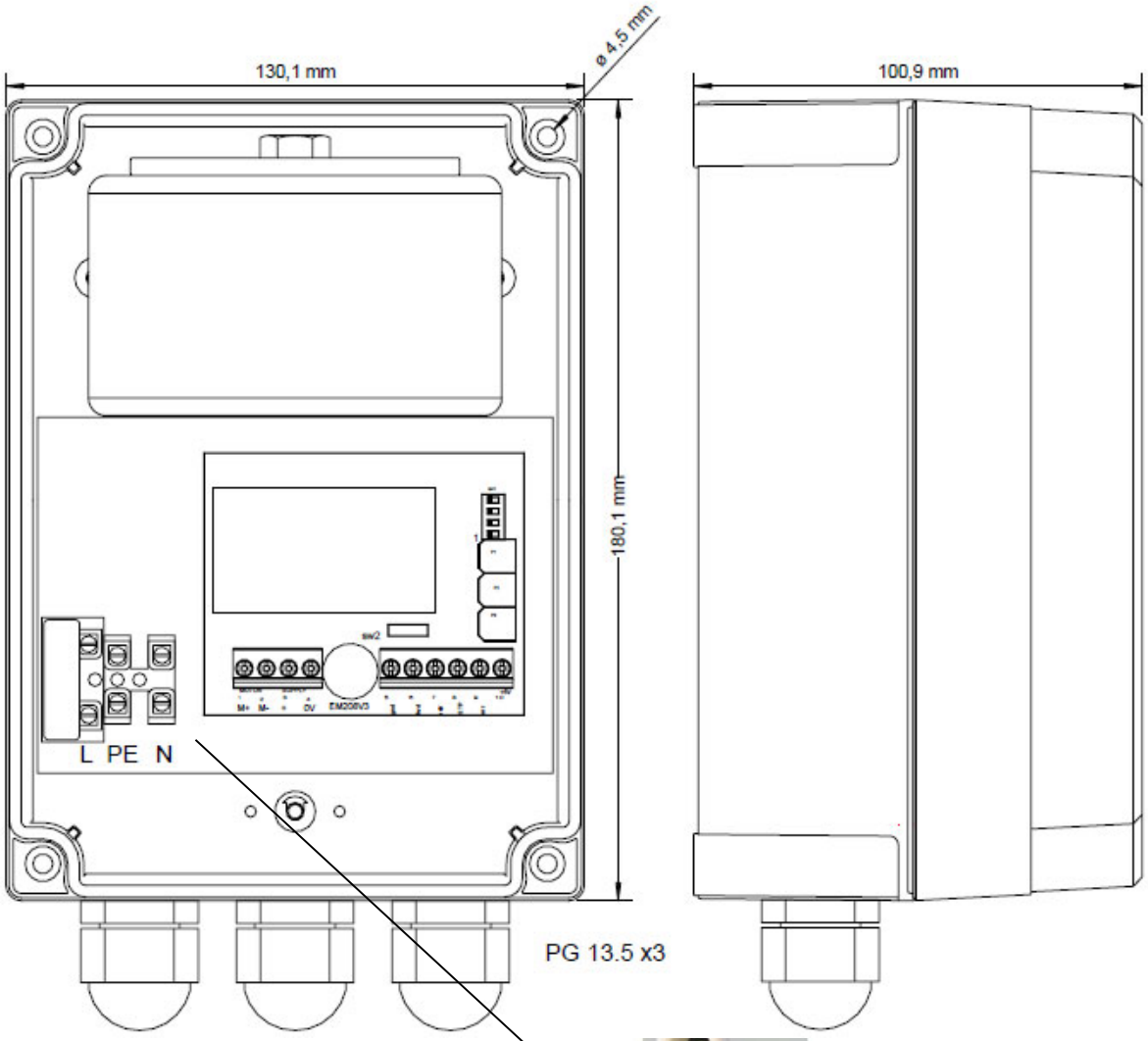
PCB fitted on DIN rail for panel installation - **TR-EM-288-R**
The PCB is mounted on a DIN rail and connected to an external power supply.

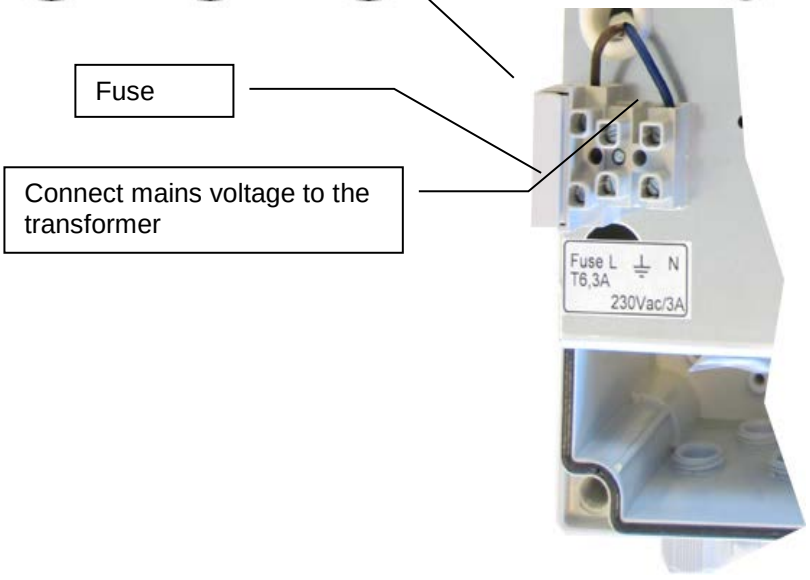


Fits to 35 mm DIN-rail or C-rail.



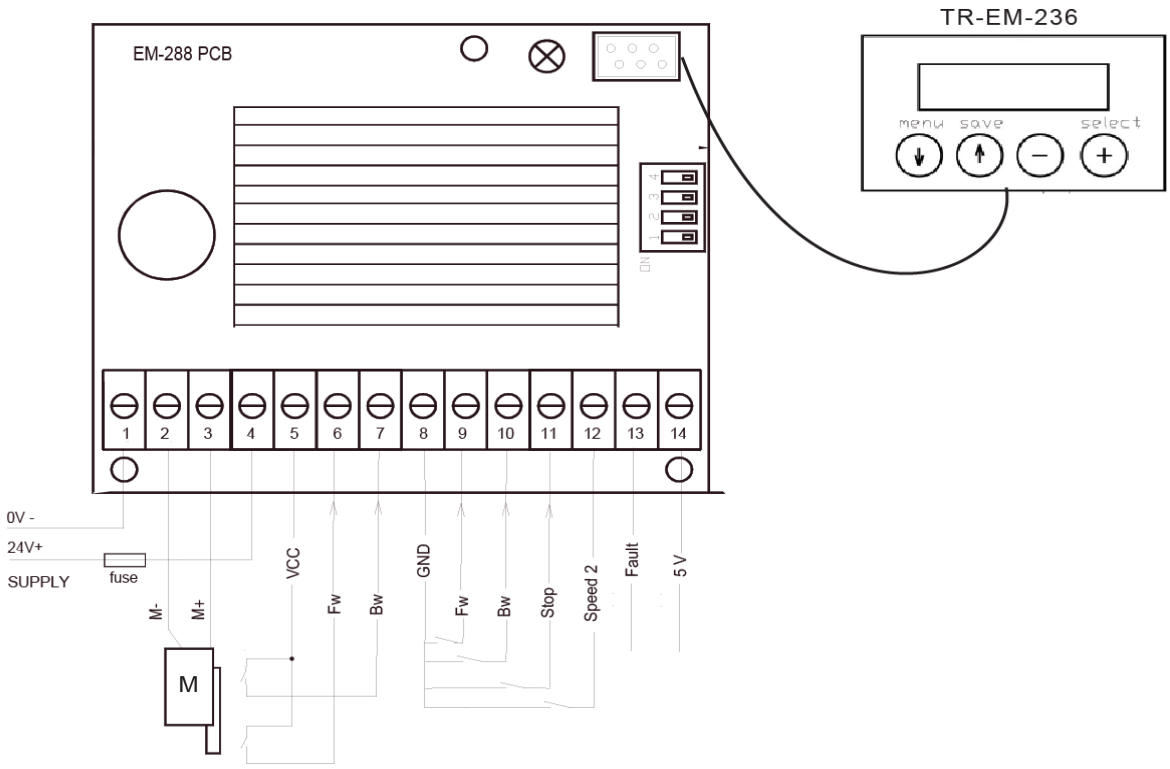
PCB fitted in box with internal power supply – TR-EM-288-T-230
The box is fitted using four screws and the power supply unit is connected to mains voltage as shown below.





Connection of the motor control unit

List of terminals on the motor control unit. TR-EM-288



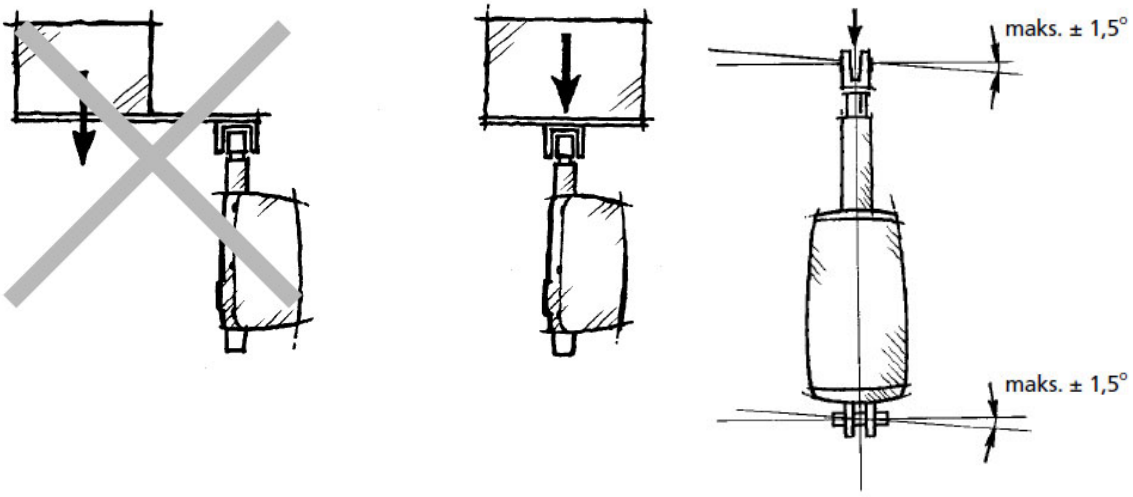
Terminal 1:	Supply voltage (- gnd)
Terminal 2:	Voltage to motor on actuator (blue conductor) (-24 V DC)
Terminal 3:	Voltage to motor on actuator (brown conductor) (+24 V DC)
Terminal 4:	Supply voltage (+ 10 - 35 V DC) filtered max. 20% ripple.
Terminal 5:	VCC
Terminal 6:	External end-stop switch (FORWARD):
Terminal 7:	External end-stop switch (BACKWARD):
Terminal 8:	GND
Terminal 9:	If terminals 9 + 8 are connected, the actuators run FORWARD
Terminal 10:	If terminals 10 + 8 are connected, the actuators run BACKWARD
Terminal 11:	Stop (terminals 8 + 11)
Terminal 12:	Speed 2 (terminals 8 + 12) are activated simultaneously for running FORWARD/BACKWARD respectively
Terminal 13:	Error input/output
Terminal 14:	5 V output.

Installing the actuators

When installing actuators, it is important to make sure that the actuators can move freely along their full stroke length, without being limited by the mechanical design. It is also important to ensure that the application is not subjected to uneven twisting and traction, nor to unevenly distributed load.

NB The actuator must only be secured using the piston rod eye and back fixture – never the outer tube of the spindle or the motor housing.

For additional information, please refer to the data sheet for the actuator in question.

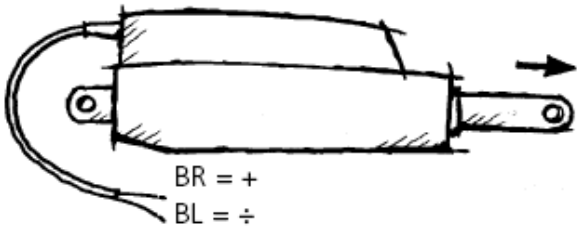


Connection of LINAK actuators

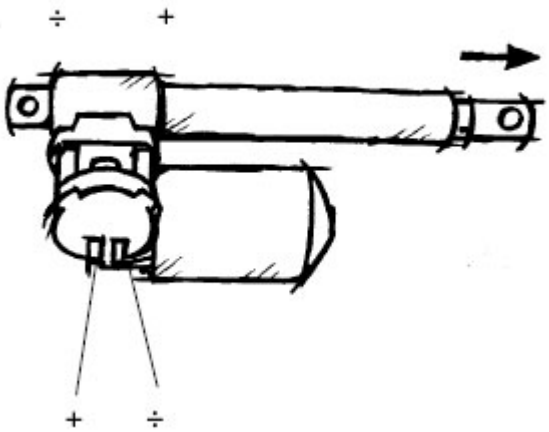
The majority of LINAK actuators are supplied as standard with a pre-fitted cable, and the actuators are also fitted with different types of plugs depending on which control box has been selected for control operations. For operation with TR-EM-288, actuators are typically supplied without plugs.

NB Motor control parameters must be set to match the actuator in question. (see parameter list below)

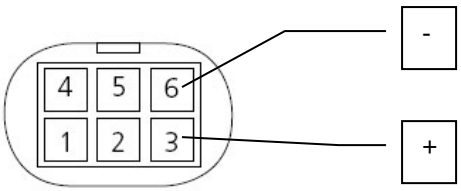
LA12 / LA31 / LA32 / LA34 / LA35 / LA36



LA30



LA23 minifit plug



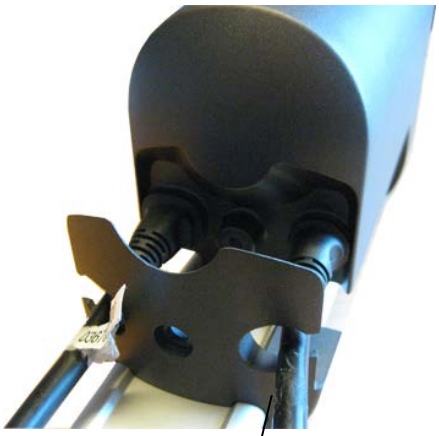
The new generation of actuators is fitted with minifit plugs in the motor housing, and thus supplied without fitted cables. In contrast to the cable types mentioned above, the supply and signal conductors have now been separated and are thus in individual cables.

LA35

Motor cable
Order no.: 0367002-1500

Signal cable *not used*

LA36



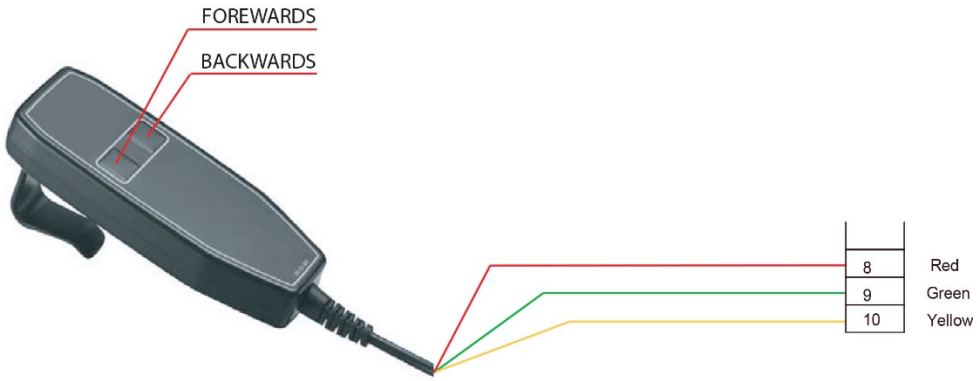
Signal cable *not used*

LA23

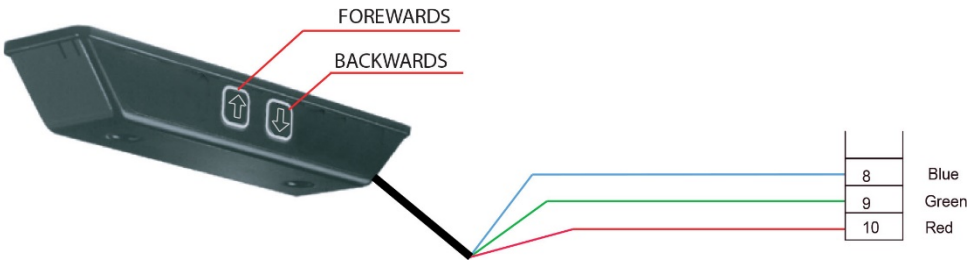
Motor cable
Order no.: 0237008-0750-A

Connection diagram for LINAK control units

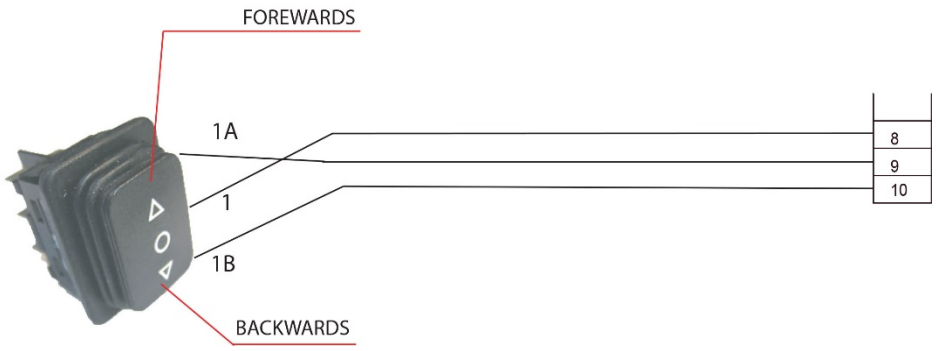
HB41



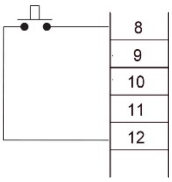
DP1E + TP1E



Rocker switch

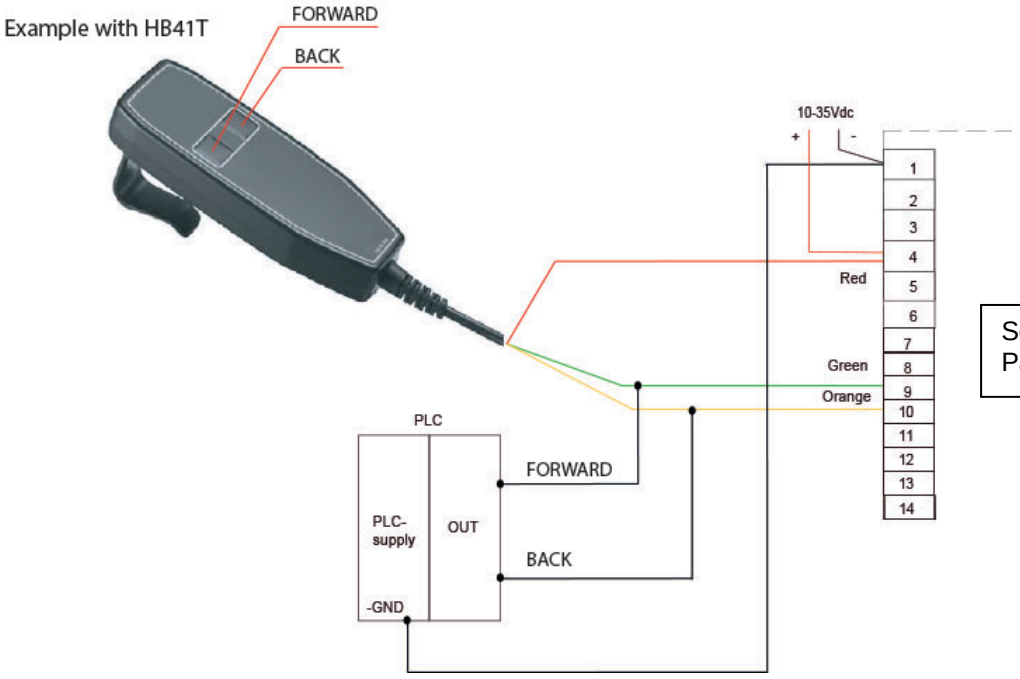


Speed 2



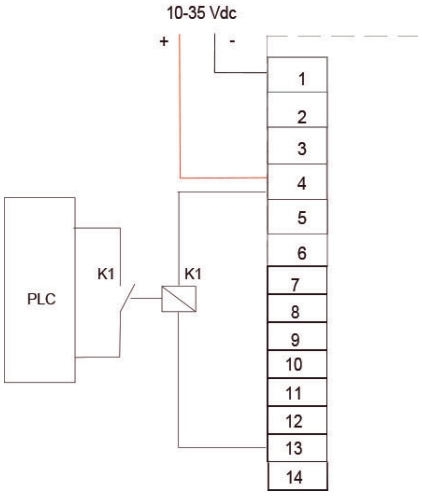
Connection diagram for PLC and manual Control unit

(Cable length on the manual control unit above 5 m)



Settings:
Parameter 3 = 0

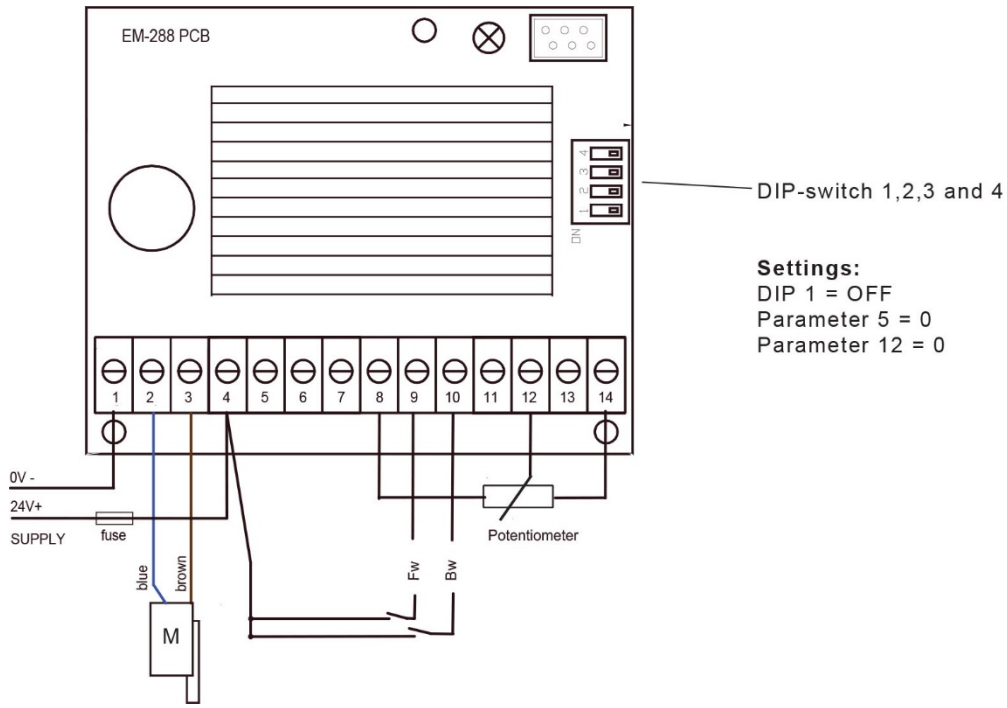
Connection diagram for relais for Fault OUT on PLC



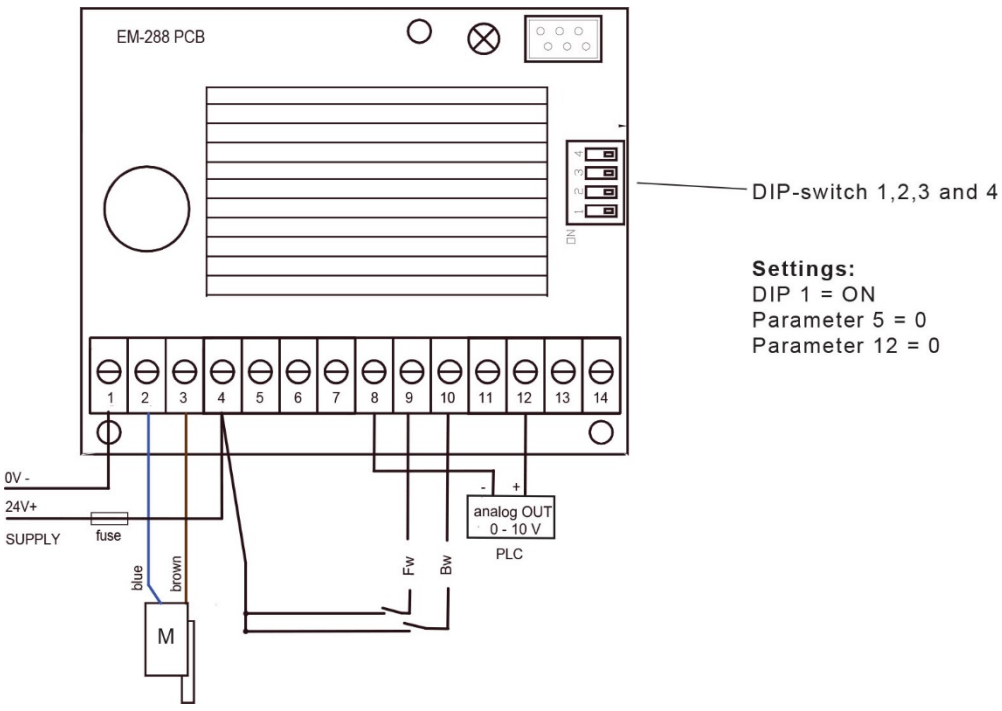
Speed control

The TR-EM-288 alows to control the speed of the actuator in 3 different ways, by potentiometer or by the use of an external signal from a PLC (0-10V or 0-20 mA)

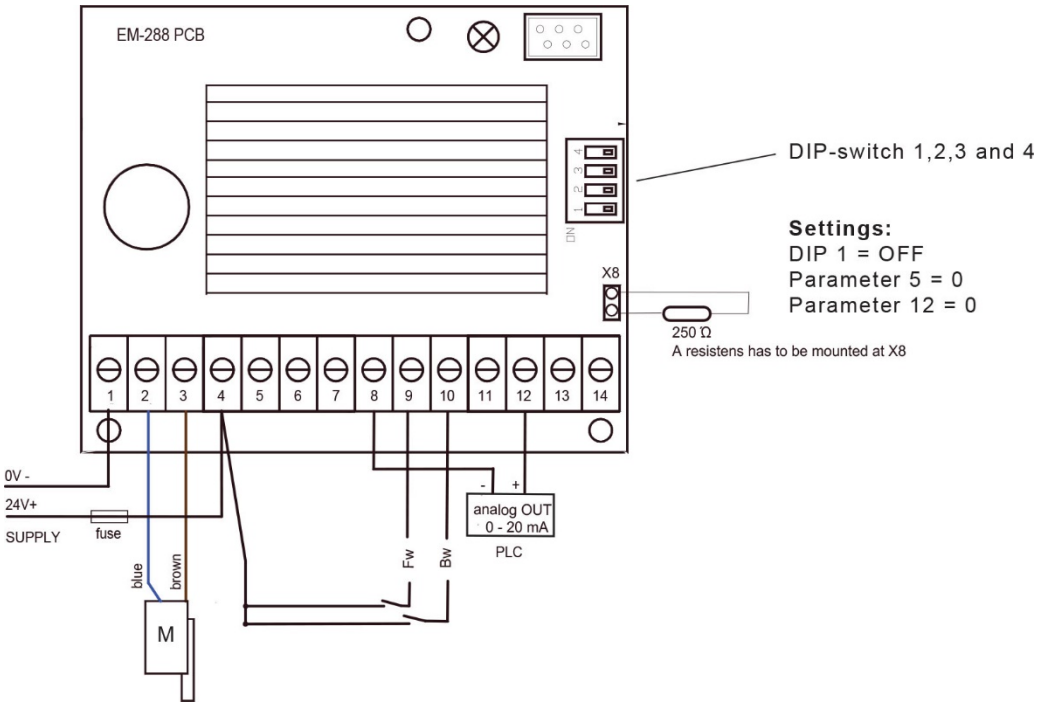
Speed control using potentiometer



Speed control using 0-10V signal



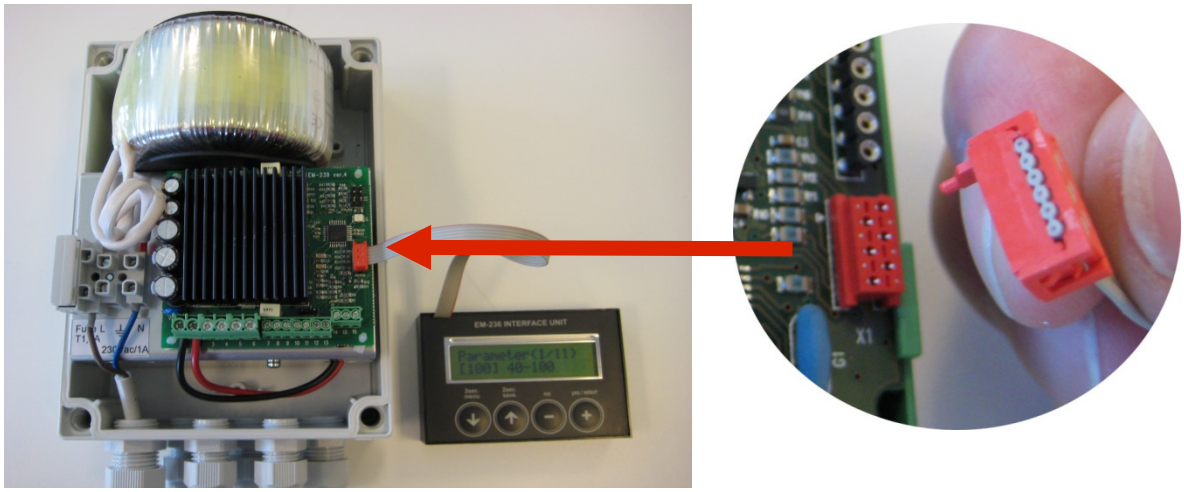
Speed control using 0-20 mA signal



Parameter settings

As standard, the TR-EM-288 motor control unit has 17 parameters that can be set to match the individual application. To change these parameters, portable serial interface handset TR-EM-236 must be connected to the motor control unit.

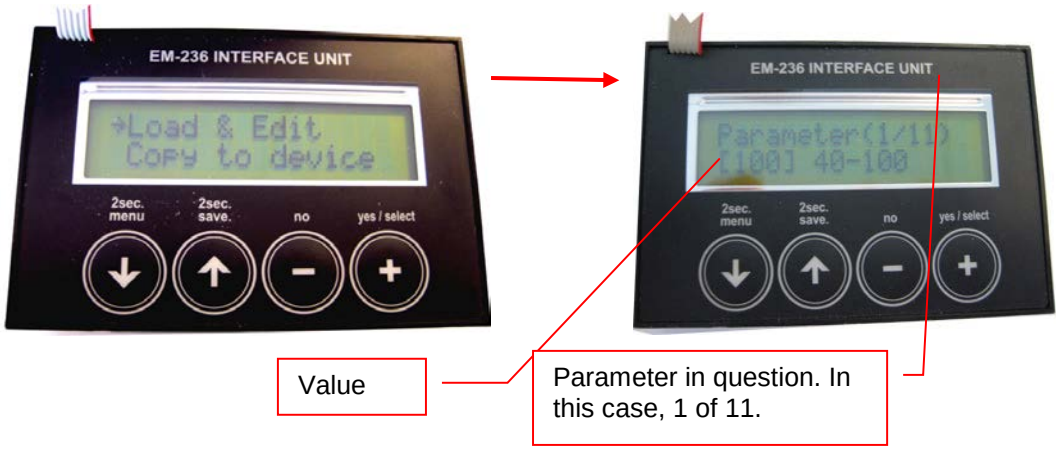
NB To use the TR-EM-236 portable serial interface handset, the control unit must first be connected to a power supply.



Portable serial interface handset TR-EM-236

Press ARROW DOWN for 2 seconds to call up the main menu on the handset. In the main menu, use ARROW UP or ARROW DOWN to select the menu item required. To open the menu in question, click the + (plus) button.

To alter the parameter values, select the *"Load & Edit"* menu item



Use the arrow keys to select the parameter you wish to alter. The parameter selected is shown in the display as <1 / 11>, which means parameter 1 of 11. The value is presented in square brackets [ ] and can be changed by pressing the plus or minus buttons

Once you have made the changes you require, save the new configuration by pressing ARROW UP for at least 2 seconds.

Parameters
The following parameters can be adjusted as required or desired:

Operating mode: You can choose between continuous and impulse mode.
Start conditions: Set the direction the actuators are to run after ERROR
Input type: Type designation of inputs.
Speed 1: Set speed 1:
Speed 2: Set speed 2:
Power limit, FORWARD: Set max. permitted power when running FORWARD
Power limit, BACKWARD: Set max. permitted power when running BACKWARD
Switch combination: Select the combination that will disconnect the control unit.
Delay before disconnection: Set the max. time limit until the control unit disconnects.
Combination of error outputs: Select combination of error outputs.
Voltage overload limit: Set max. voltage limit at which the unit will disconnect
Load equalisation: This parameter is used to optimise low speed and start torque.
Time-out: Time-out (not used)
Reset: Reset of start and timer
Start ramp: Set ramp time, Start
Stop ramp: Set ramp time, Stop
Kick-start: Kick-start (not used)

Parameter settings (basic setting)

Parameter	LA12	LA23	LA28	LA30	LA31	LA32	LA34	LA35	LA36
1	0	0	0	0	0	0	0	0	0
2	1	1	1	1	1	1	1	1	1
3	1	1	1	1	1	1	1	1	1
4	100	100	100	100	100	100	100	100	100
5	50	50	50	50	50	50	50	50	50
6	20	20	50	70	50	50	70	50	100
7	20	20	50	70	50	50	70	50	100
8	1	1	1	1	1	1	1	1	1
9	20	20	20	20	20	20	20	20	20
10	1	1	1	1	1	1	1	1	1
11	35	35	35	35	35	35	35	35	35
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	10	10	10	10	10	10	10	10	10
16	10	10	10	10	10	10	10	10	10
17	0	0	0	0	0	0	0	0	0

Explanation of parameters

The following section presents a more detailed explanation of the individual parameters. To set the parameters, enter a number in the display.

NB LINAK´s recommended parameters are presented in { } after each description below.

1

Operating mode:

This parameter defines how the system is operated/controlled. E.g. for manual operation, where the actuators are only to run for as long as the control buttons are activated, select mode 0.
The following options are available:

0 = continuous
1 = impulse
{0}

2

Start conditions:

This parameter is used to define whether the control unit is to restart the actuators in both directions, or only in the opposite direction after having cut out on account of current limit or a stop command.
The following options are available:

0 = both directions in the event of current limit and STOP
1 = Opposite direction only in the event of current limit
2 = Opposite direction only in the event of STOP
3 = Opposite direction only in the event of current limit and STOP
{1}

3

Input type:

This parameter makes it possible to choose between different types used for inputs. The following options are available:

0 = control unit PNP and external signal PNP
1 = control unit NPN and external signal PNP
2 = control unit PNP and external signal NPN
3 = control unit NPN and external signal NPN
{0}

LINAK systems usually use type PNP/PNP.

4

Speed 1:

This parameter makes it possible to set actuator operating speed. The speed is stated in %. Max. speed = 100%.
The following options are available:

0 – 100 *{100}*

5

Speed 2:

This parameter makes it possible to set actuator speed 2. The speed is stated in %. Max. speed = 100%. The following options are available:

0 – 100 *{50}*

6

Power limit, Forward: This parameter is used to state the max. permitted power consumption for the actuator when moving forward. The power limit is measured in Amp. From 0.1 – 20 A.
The following options are available:

1 - **200** *{see parameter list for the actuator in question}*

7

Power limit, Backward: This parameter is used to state the max. permitted power consumption for the actuator connected when moving backward. The power limit is measured in Amp. From 0.1 – 20 A.
The following options are available:

1 - **200** *{see parameter list for the actuator in question}*

8

Switch combination: Select the combination that will disconnect the control unit.
The following options are available:

0 = current limit protection disconnected, zero current switch cut off
1 = disconnect only in the event of current limit
2 = disconnect only in the event of zero current
3 = disconnect in the event of both current limit and zero current
{1}

9

Power delay: This parameter is used to define the time that may elapse between the power limit being reached and the control unit cutting out on account of current limit. The delay is measured in milliseconds from 0-255 ms.
The following options are available:

0 to **255** *{20}*

10

Combination of error outputs: Select combination of error outputs. This parameter is used to define the combination of error outputs from the control unit.
The following options are available:

output

0 = disconnection in the event of both current limit and zero current does not trigger an error output signal
1 = only disconnection in the event of current limit triggers an error signal
2 = only disconnection in the event of zero current triggers an error output signal
3 = disconnection of both current limit and zero current triggers an error output signal.
{1}

11

Voltage overload limit: *This parameter is used to define a max. permitted voltage that the motor control unit may supply to the actuator when it is heavily loaded*. The control unit can set in the range 15 - 40 V
The following options are available:

15 - 40 *{35}*

12

Load equalisation:

This parameter is used to optimise low speed and start torque. If equalisation is too high, actuator operation will be unstable. Run the motor at low speed (30%) and increase equalisation very gradually until the motor control unit begins to operate in an unstable way. Then reduce the value by about 10%.

The following options are available:

0-255 *{0}*

13

Time-out:

The following options are available:

0-255 (0 = deactivated) *{0}*

14

Reset:

This parameter is used to reset the start counter and timer Reset the counter as follows:
Set this parameter to **1** and press *Save.* Then set the parameter again to **0**.

The following options are available:

0 - 1 *{0}*

15

Start ramp:

This parameter is used to define a start ramp for a soft start. Ramp time is measured in seconds from 0 – 5.0 s.
The following options are available:

0 to **500** *{10}*

16

Stop ramp:

This parameter is used to define a start ramp for a soft stop. Ramp time is measured in seconds from 0 – 5.0 s.
The following options are available:

0 to **500** *{10}*

17

Kick-start:

The following options are available:

0 to **200** *{0}*

Start/operation:
Before starting to use the system, it is important that all parameters have been set correctly according to the specifications for the actuator in question. (see page 22)

Appropriate use:

- The system is *only* intended and designed for use as a component part in machinery or equipment used in an industrial environment.
- After fitting, test the system to check that it functions correctly.
- The application must be allowed free movement along the full stroke length of the actuator.
- Bolts attached to the actuator's piston rod eye and back fixture must be secure.
- Ensure that the system is connected to the correct voltage.

Inappropriate use:

- Duty cycle must *not* exceed 10%: max. 2 min. operation followed by an 18-minute pause
- The actuator must *not* bear a load in excess of the max. load stated on the data plate.
- The actuator must *not* bear a transverse load.
- The actuator must *not* be subjected to knocks and violent jolts.
- The actuator must *not* be connected to a different voltage than the voltage stated on the data plate.
- The control box and power supply must not be covered.
- The equipment is *not* suitable for use in the vicinity of flammable, anaesthetic mixtures of air, oxygen or nitrous oxide (laughing gas).
- The system is *not* suitable for applications which can be described as:
- medical devices
- equipment for use in the offshore industry (ATEX)
- aircraft
- nuclear power plant
- The system must *not* be used until it is incorporated into the end product.

Maintenance

- Clean the surface of the systems at appropriate intervals to remove dust and dirt, and check for signs of damage and breakage.
- Check all connections, cables, housing and connectors, and check that the system functions correctly.
- With the exception of motor control units with PCB or those prepared for mounting in an electrical panel, the control boxes are sealed and maintenance-free.
- Check all connections, cables, housing and contacts.
- For actuators with sealing class IPX6 rating and better: If cleaned using water, these units should only be washed when the piston rod (spindle) is fully extended.

Reading monitoring values

Using a TR-EM-236 programming interface, it is possible to read the current values for the system. Five values can be displayed.

In the main menu, use ARROW DOWN to select the *"Monitor Values" menu*.

Explanation of monitoring values

1 Current, actuator 0- 20 A = (0 - 200)
2 PWM level (%) 0 - 100% = (0 - 100)
3 Timer displays no. of operating hours (max. 65,535 hours)
4 Start counter displays no. of starts (max. 65,535)
5 Secondary counter secondary counter for start counter

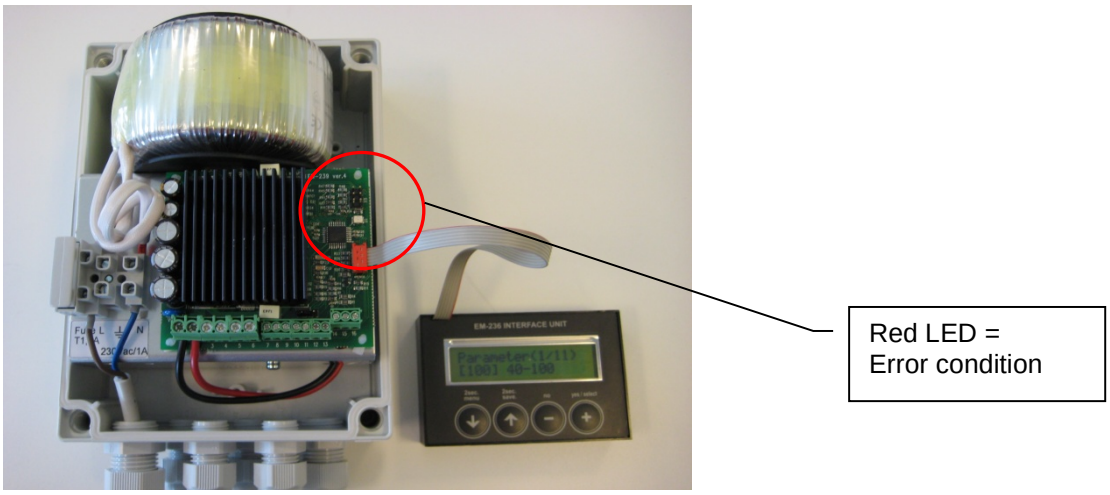
Troubleshooting

Mechanical parts:

Actuators/lifting columns Symptom	Possible cause	Action
No motor sound or movement of piston rod	- The actuator is not connnected to the control box - Blown fuse in the control box - Cable damaged	- Connect the actuator to the control box - Fuse must be changed - Send actuator for repair
Excessive electricity Consumption		- Send actuator for repair
Motor runs but spindle does not move	- Gear wheel or spindle damaged	- Send actuator for repair
Actuator cannot lift full load	- Clutch is worn - Motor is damaged	- Send actuator for repair
Motor sound but no movement of piston rod		- Send actuator for repair
No signal from Reed or Hall switch		- Send actuator for repair
Motor runs and quick release does not function or is noisy	- Declutching arm turns less than approx. 75°	- Adjust cable
Piston rod will only move inwards and not outwards	- Safety nut has operated	- Send actuator for repair
Motor runs too slowly or does not give full force	- Insufficient power supply - Voltage drop in cable	- Increase power supply - Thicker cable

Electronic parts:

If an error occurs, the actuators will stop operating and the error condition will be indicated by a red LED on the PCB. The LED is visible when the control unit cover is removed.



Reading errors

In the event of an error, the red LED will flash. The flashes mean the following:

1. power connected:	one flash
2. power limit is reached:	LED lights up
3. disconnected due to current limit:	rapid flashing
4. disconnected due to zero current:	one long flash - short pause...
5. voltage overload:	four flashes - pause...
6. overheating:	short flash - long pause...
7. time out:	three short flashes + one long flash...
8. error input:	two short flashes + one long flash...

To reset errors

All errors are reset when the actuators are restarted.

Key to symbols

NB None of the products carries all of the symbols described here.

Type B equipment, as per EN 60601-1

IPXX — Protection against contact/foreign matter (first character) and water (second character) as per EN60529

Class 2 equipment

For indoor use

Safety isolating

Protective earth

Alternating Current

Direct current

Attention, consult accompanying documents

Lock function

Release function

Charge indicator

Safety switch/enable button

Demko approval

Fimko approval

APPROVAL V94265 — Australian approval mark

APPROVAL NO.:97122 — Australian approval mark

Recognised - Component Mark

Canadian Recognised - Component Mark

Recognised Component Mark for Canada and the United States

T-Mark

RW-Tüv approval

TÜVRheinland

TÜV Product Service

ETL

C-ETL

CS95145V

LGA

UL Listing Mark

C-UL Listing Mark

C-UL US Listing Mark

UL Listing Mark

File E97199 — UL file number

File E175209 — UL file number

File E151104 — UL file number

CSA

PSE-Mark

Product with a thermofuse

For indoor use (House).

Safety isolating transformer.

Electronics scrap

Equipment Kl.2 (Double square)

Patient part of type B (Mand)

Patient part of type BF

Earth protective

KL.1 — Equipment class1.

Earth

CE Mark

C-TICK

Disposal of LINAK products

To dispose of LINAK products, start by sorting them into different categories for recycling or incineration. We recommend that you dismantle your product as fully as possible for disposal, and that you reuse the parts. Sorting categories may include:
metal, plastic, cables, combustible material and material for recycling. It is possible to subdivide within some of these categories. For example, “metal” can be subdivided into steel and aluminium, while “plastic” can be divided into ABS and PP. As an example of sorting, the table below illustrates the various categories under which the LINAK components are to be sorted.

Product	Component	Recycling group
Actuator:	Spindle and motor Plastic housing Cable	Metal scrap Plastic recycling or combustion Cable scrap or combustion
Control box:	PC-board Plastic housing Cable Transformer Batteries	Electronics scrap Plastic recycling or combustion Cable scrap or combustion Metal scrap Recoverable resources
Control:	Plastic housing Cable PC-board	Plastic recycling or combustion Cable scrap or combustion Electronics scrap