LA14IO

User Manual

LINAK®

WE IMPROVE YOUR LIFE

Contents

Preface

Dear User,

We are delighted that you have chosen a LINAK® product.

LINAK systems are high-tech products based on many years of experience in the manufacture and development of actuators, lifting columns, desk frames, electric control boxes, controls, batteries, accessories and chargers.

This User Manual does not address the end user. It is intended as a source of information for the equipment or system manufacturer only, and it will tell you how to install, use and maintain your LINAK electronics. The manufacturer of the end product has the responsibility to provide a User Manual, where relevant safety information from this manual is passed on to the end user.

We are convinced that your LINAK product/system will give you many years of problem-free operation.

Before our products leave the factory, they undergo both function and quality testing. Should you, nevertheless, experience problems with your product/system, you are always welcome to contact your supplier.

LINAK subsidiaries and some distributors situated all over the world have authorised service centres, which are always ready to help you. Locate your local contact information on the back page.

LINAK provides a warranty on all products. (See warranty section).

This warranty, however, is subject to correct use in accordance with the specifications, maintenance being done correctly, and any repairs being carried out at a service centre, which is authorised to repair LINAK products.

Changes in installation and use of LINAK systems can affect their operation and durability. The products may only be opened by authorised personnel.

This User Manual has been written based on the present technical knowledge. LINAK reserves the right to carry out technical modifications and keeps the associated information updated.

LINAK A/S

Terms of use

LINAK® takes great care in providing accurate and up-to-date information on its products. However, the user is responsible for determining the suitability of LINAK products for a specific application.

Due to continual development, LINAK products are subject to frequent modifications and changes. LINAK reserves the rights to conduct modifications, updates, and changes without any prior notice. For the same reason, LINAK cannot guarantee the correctness and actual status of imprinted information on its products.

LINAK uses its best efforts to fulfil orders. However, for the reasons mentioned above, LINAK cannot guarantee availability of any particular product at any given time. LINAK reserves the right to discontinue the sale of any product displayed on its website or listed in its catalogues or in other written material created and produced by LINAK, LINAK subsidiaries, or LINAK affiliates.

All sales are subject to the 'Standard Terms of Sale and Delivery for LINAK A/S' available on LINAK websites.

Safety Instructions

Please read this safety information carefully.

Be aware of the following three symbols throughout the user manual:

Warning!
Failing to follow these instructions can cause accidents resulting in serious personal injury.

Recommendations
Failing to follow these instructions can result in the actuator suffering damage or being ruined.

Additional Information
Usage tips or additional information that is important in connection with the use of the actuator.

Furthermore, ensure that all staff who are to connect, mount, or use the actuator are in possession of the necessary information and that they have access to this user manual.

Persons who do not have the necessary experience or knowledge of the product/products must not use the product/products. Besides, persons with reduced physical or mental abilities must not use the product/products unless they are under surveillance or they have been thoroughly instructed in the use of the apparatus by a person who is responsible for the safety of these persons.

Moreover, children must be under surveillance to ensure that they do not play with the product.

Before you start mounting/dismounting, ensure that the following points are observed:

- The actuator is not in operation.
- The actuator is free from loads that could be released during this work.

Before you put the actuator into operation, make sure of the following:

- The actuator is correctly mounted as indicated in the relevant user instructions.
- The equipment can be freely moved over the actuator's whole working area.
- The actuator is connected to a mains electricity supply/transformer with the correct voltage, which is dimensioned and adapted to the actuator in question.
- The voltage applied matches to the voltage specified on the actuator label.
- The connection bolts can withstand the wear.
- The connection bolts are secured safely.

During operation, please be aware of the following:

- Listen for unusual sounds and watch out for uneven running. Stop the actuator immediately if anything unusual is observed.
- Do not sideload the actuator.
- Only use the actuator within the specified working limits.
- Do not step on or kick the actuator.

When the equipment is not in use:

- Switch off the mains supply in order to prevent unintentional operation.
- Check regularly for extraordinary wear.

Classification

The equipment is not suitable for use in the presence of a flammable anaesthetic mixture with air, oxygen, or nitrous oxide.

Warnings

- Do not sideload the actuator.
- When mounting the actuator in the application, ensure that the bolts are secured safely and can withstand the wear.
- If irregularities are observed, the actuator must be replaced.
- For actuators with a stroke length below 130 mm, the extended position of the mechanical endstop will always be at 130 mm. Therefore, if an actuator has a stroke of 80 mm and the endstop switch in outwards direction fails, the actuator will travel an additional 50 mm before reaching the mechanical endstop.

Recommendations

- Do not place load on the actuator housing.
- Prevent impact, blows, and any other form of stress to the housing.
- Ensure that the cable cover is mounted correctly. Use 1.5 Nm torque.
- Ensure that the duty cycle and the usage temperatures for LA14IO actuators are respected.
- Ensure that the cable cannot be squeezed, pulled, or subjected to any other stress.
- Furthermore, it will be good practice to ensure that the actuator is fully retracted in the “normal” position. If left extended, a vacuum will be formed inside the actuator, leading to a potential intake of water.
- If the actuator (without Integrated Controller) is mounted in an application where a mechanical stop prevents the endstop switches in the actuator from being activated, the actuator must be equipped with an electrical safety device (current monitoring) or external limit switch.

IECEx/ATEX

The IECEx/ATEX certified LA14IO (optional) is designed for installation in dust-filled atmospheres such as grain handling facilities, cement plants, saw mills, or in other dusty surroundings. Please note that the IECEx/ATEX approval is only for dust, and NOT for gas.

The IECEx/ATEX versions are suitable for applications in Group IIIC, Category 2D, Zone 21, and 22.

Warnings

If the following is <u>not</u> complied with, the IECEx/ATEX certification will <u>not</u> be valid:

- Actuator specifications must be complied with.
- If the actuator has no built-in current cut-off, one must be mounted.
- Only IECEx/ATEX approved cables are to be used. *
- The power supply/signal cables for the actuator must be terminated in a safe location or alternatively by use of an Ex terminal box certified for special conditions for safe use.
- Only specifically educated LINAK® employees are allowed to change or mount IECE/ATEX approved cables.
- Afterwards, it is crucial that the tightness is verified before the actuator is powered up.

Operation of the device is only valid if:

- The product is used under the conditions described in the installation - and operation instruction.
- The ambient operating temperature lies between -25°C to +65°C depending on duty cycle.
- The atmospheric conditions live up to the following standards: Pressure 80 kPa (0.8 bar) to 110 kPa (1.1 bar); and air with normal oxygen content, typically 21% v/v.
- The signal and power cables are shielded against UV light, such as daylight or light from other luminaries.
- The connection between the actuator and the rest of the machine/device is conductive, and the application is grounded in order to remove any Electro Static Discharge. This is the case for both of the actuator's fixation points (Back Fixture and Piston Rod Eye.)
  Safety and operation instructions are accessible and followed.
- It is not opened in areas with dust, and never opened by unauthorized personnel.
- No changes are made on the actuator after delivery.
- The production of IECEx/ATEX actuators require quality management systems and auditing. Therefore, only LINAK A/S is allowed to produce, modify, or repair actuators in order to sustain the approval.

This manual is part of the equipment. The manufacturer keeps the right to modify specifications without advanced notice. Keep this manual for later use.

* LA14IO IECEx/ATEX Cable Item no.	Length (mm) Outside the Actuator
0147006 - 850	790
0147006 - 1600	1540
0147006 - 5100	5040

IECEx/ATEX

General indication of risk:

Installation of the device shall be performed by trained staff only, who are familiar with the safety requirements and risks.

Check all relevant safety regulations and technical indications for the specific area of installation. Actively prevent failures to protect persons from injuries and the device from damage.

The person responsible for the system must make sure that:

- Safety and operation instructions are accessible and followed.
- Local safety regulations and standards are obeyed.
- Performance data and installation specifications are regarded.
- Safety devices are installed, and recommended maintenance is performed.
- National regulations for disposal of electrical equipment are obeyed.

Maintenance and repair:

- Repairs on the device must be carried out by persons authorised by LINAK® only.
- Only perform mounting described in this manual.

Regard all safety regulations and internal operation instructions during maintenance.

Mounting Guidelines

LINAK® linear actuators are quickly and easily mounted by slipping pins through the holes on each end of the units and into brackets on the machine frame and the load.

The mounting pins must be parallel to each other as shown in Figure 1. Pins which are not parallel to each other may cause the actuator to bend and become damaged.

The load should act along the stroke axis of the actuator, as off-centre loads may cause bending and lead to premature failure. See Figure 2.

Make sure the mounting pins are supported in both ends. Failure to do so could shorten the lifespan of the actuator. Also, avoid applying a skewed load onto the actuator.

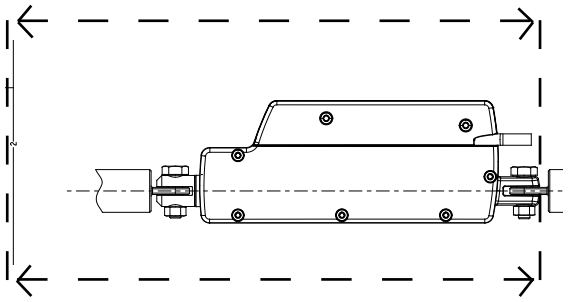


Figure 1

The actuator can rotate around the pivot point in the front and rear end. Because of this, it is of high importance that the actuator is able to move freely over the full stroke length, both during the development and daily operation. Please pay special attention to the area around the housing, where parts can be trapped and cause damage to the application and actuator.

In applications with high dynamic forces, LINAK recommends not using the fully extended or retracted position over a longer period of time, as this can damage the endstop system permanently.

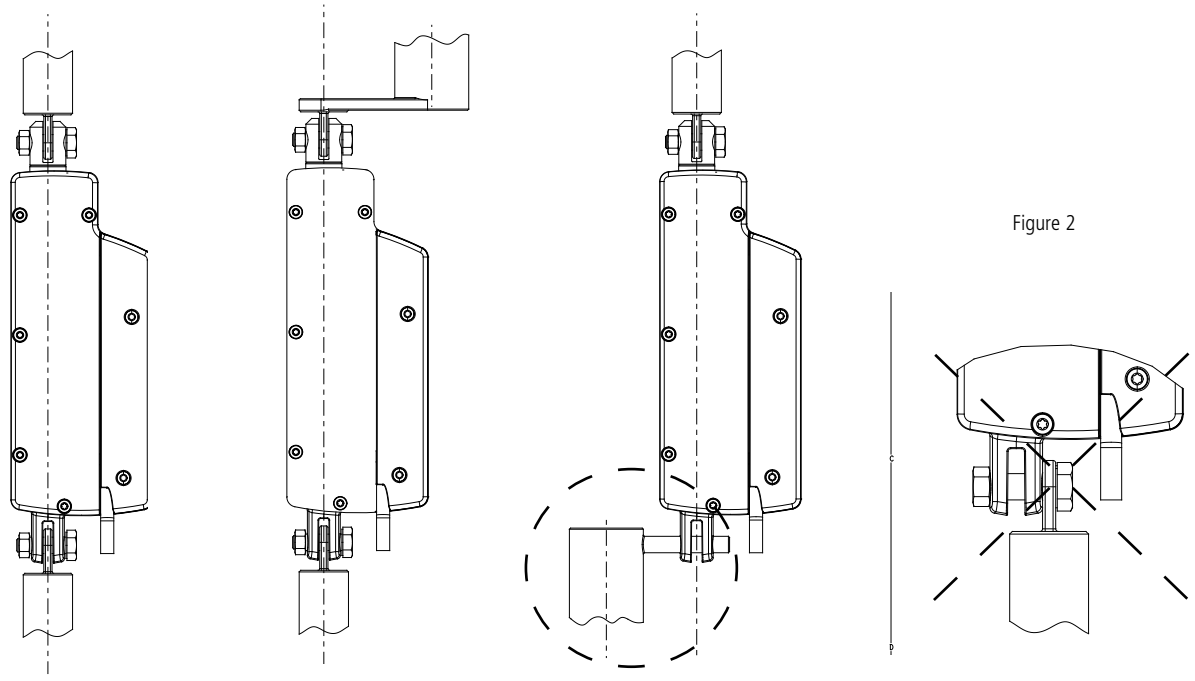


Figure 2

Right **Wrong** **Wrong** **Wrong**

Mounting Guidelines

- The mounting pins must have the correct dimension.
- The bolts and nuts must be made of a high quality steel grade (e.g. 10.8).
- No thread on the bolt inside the back fixture or the piston rod eye.
- Bolts and nuts must be protected to limit the risk of them falling out.
- When mounting the bolts for the back fixture or the piston rod eye, do not use a torque that is too high. This will stress the fixtures.

Instruction concerning the turning of the Piston Rod Eye and Inner Tube:

- When mounting and taking into use, it is not permitted to make excessive turns of the piston rod eye.
- In cases where the eye is not positioned correctly, it is permitted to first screw the eye down to its bottom position, at a maximum torque of 2 Nm (1), and thereafter turn it outwards again, at a maximum of 90 degrees (2).
- As the piston rod eye can turn freely, it is important to ensure that the eye cannot rotate if the actuator is used in a pull application. If this happens, the actuator will be pulled apart and destroyed.

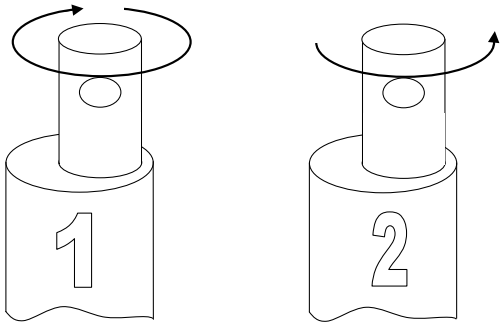


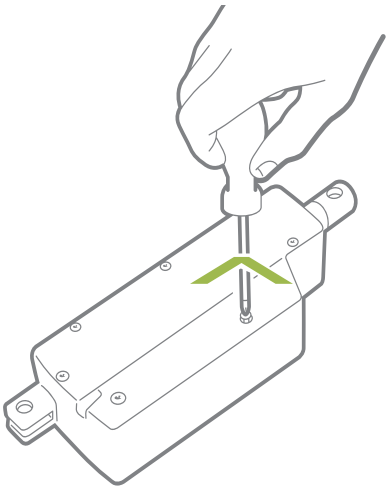
Figure 3

Warning!
If the actuator is used for pull in an application where personal injury can occur, the following is valid:
It is the application manufacturer's responsibility to incorporate a suitable safety arrangement, which will prevent personal injury from occurring, in case the actuator should fail.

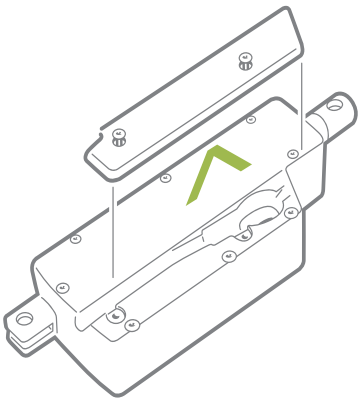
Warning!
LINAK® actuators are not designed for use within the following fields:

- Offshore installations
- Aeroplanes and other aircrafts
- Nuclear power generation

Mounting of Cables

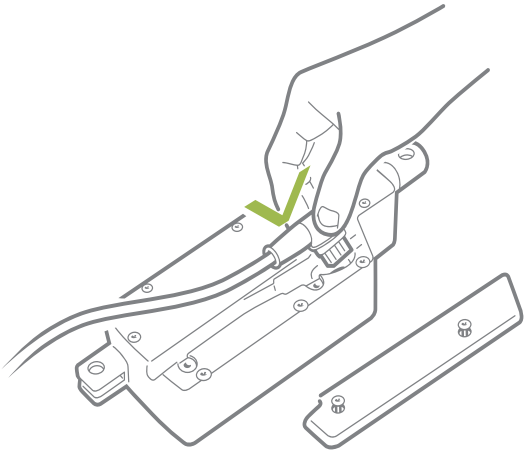


1. Unscrew the cover



2. Remove the cover

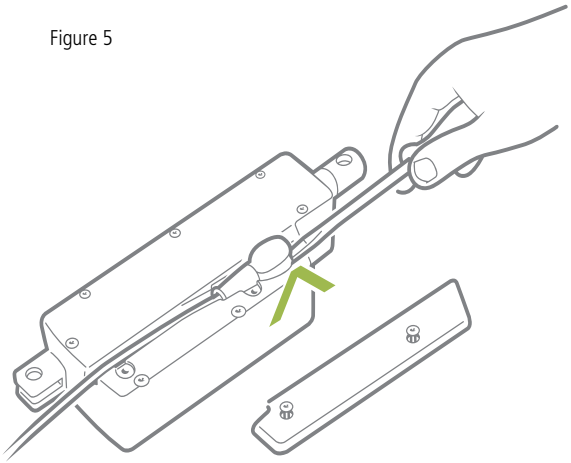
Figure 4



3. Gently plug in the cable without the use of tools

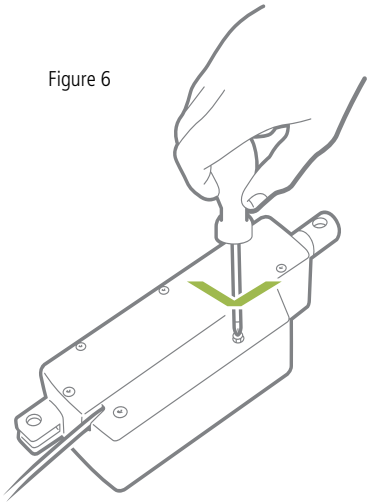
Removal of cables

Figure 5



4. Screw the cover back onto the actuator. The torque of the cover screw is approximately 1.5 Nm

Figure 6



5. Use a screwdriver to pull up the cable

- When changing the cables on a LINAK® actuator, it is important that this is done carefully, in order to protect the plugs and pins. Before the new cable is mounted, we recommend greasing the socket with Vaseline to keep the high IP protection and ensure an easy mounting. Please make sure that the plug is in the right location and fully pressed in before the cable lid is mounted.

Note that the cable should not be used for carrying the actuator.

- We recommend taking some precaution and designing the wire connection in such a way that the cable is kept inside a closed, protected area to guarantee a high IP protection.

Electrical Installation

- To ensure maximum self-locking ability, please make sure that the motor is shorted when stopped. Actuators with an Integrated Controller provide this feature, so long as the actuator is powered.
- When using soft stop on a DC-motor, a short peak of higher voltage will be sent back towards the power supply. When selecting the power supply, it is important that it does not turn off the output, when this backwards load dump occurs.

The power supply for actuators without an Integrated Controller must be monitored externally and cut off in case of current overload.

Recommended fuse for actuators without Integrated Controller

Type	Spindle pitch (mm)	Load max. Push/Pull (N)	Typical amp. at full load (A) 24 V - 12 V		Recommended fuse 24 V - 12 V	
14020xxxxxxxxA...	2	750	-	2.4	-	5
14020xxxxxxxxB...	2	750	1.3	-	2.5	-
14020xxxxxxxxC...	2	750	-	4.2	-	10
14020xxxxxxxxD...	2	750	2.5	-	6	-
14040xxxxxxxxA...	4	300	-	1.7	-	5
14040xxxxxxxxB...	4	300	0.9	-	2.5	-
14040xxxxxxxxC...	4	300	-	2.6	-	10
14040xxxxxxxxD...	4	300	1.3	-	6	-

Current Limits

Platform	Movement	12 V	24 V	48 V	Temperature
B, C, F	Outwards	8 A	5 A	N/A	Above
	Inwards	8 A	5 A	N/A	
	Reference temperature 0°C				
	Outwards	16 A	10 A	N/A	Below
	Inwards	16 A	10 A	N/A	

If the actuator's current consumption rises above the set limit, the actuator regulates and tries to keep it below the set current limit by reducing the PWM and therefore also the speed accordingly. The actuator does this continuously until the actuator stops moving (mechanically blocked) - something that is determined by monitoring the Hall feedback signal. If there are no changes to the Hall feedback signal during the set time frame, the Integrated Controller will cut power to the H-bridge motor circuit.

If the actuator is stopped due to the above-mentioned criteria, it automatically drives slightly in the opposite direction to reduce the torque in a blocking situation.

Current Cut-Offs

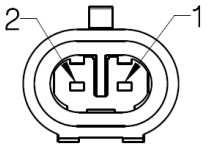
The principle behind the current cut-off measurement is an ‘above limit’ and a ‘below limit’ accumulating counter. When the time-out counter reaches a specific value the current cut-off goes into effect. The time-out value is pre-set at 200 ms.

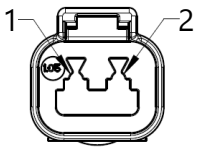
Platform	Movement	12 V	24 V	48 V	Temperature
3, 6, 7, 8	Outwards	8 A	5 A	N/A	Above
	Inwards	8 A	5 A	N/A	
	Reference temperature 0°C				
	Outwards	9 A	9 A	N/A	Below
	Inwards	9 A	9 A	N/A	

Without Feedback

Connection diagram

Platform 0		AMP	Deutsch
M	**BROWN**	**2**	**2**
	BLUE	**1**	**1**





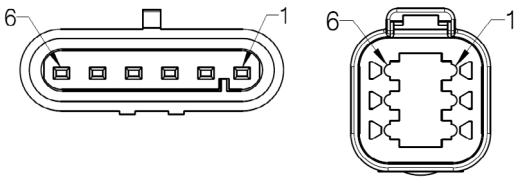
I/O specifications

Input/Output	Specification	Comments
Description	Permanent magnetic DC motor.	M
Brown	12 or 24 V DC (+/-) 12 V ± 20% 24 V ± 10% Typical values at max. load: 12 V: 5 A 24 V: 2.5 A	To extend actuator: Connect Brown to positive Connect Blue to negative To retract actuator: Connect Brown to negative Connect Blue to positive
Blue		
Red	Not to be connected	
Black	Not to be connected	
Yellow	Not to be connected	
Green	Not to be connected	
Violet	Not to be connected	
White	Not to be connected	

Endstop Reached

Connection diagram

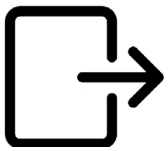
Platform 0		AMP	Deutsch
M	**BROWN**	**2**	**2**
	BLUE	**1**	**1**
Supply for feedback	**+ RED**	**4**	**4**
Digital output	**YELLOW**	**5**	**5**
Digital output	**GREEN**	**6**	**6**
Supply for feedback	**- BLACK**	**3**	**3**



If you wish to use Endstop reached, you will have to keep power on the Brown, Blue, Red and Black wires, otherwise the signal will be lost.

Endstop Reached

I/O specifications

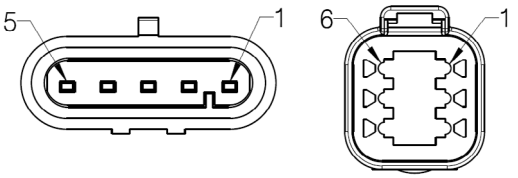
Input/Output	Specification	Comments
Description	The actuator can be equipped with electronically controlled Endstop reached out.	
Brown	12 or 24 V DC (+/-) 12 V ± 20% 24 V ± 10% Typical values at max. load: 12 V: 5 A 24 V: 2.5 A	To extend actuator: Connect Brown to positive Connect Blue to negative To retract actuator: Connect Brown to negative Connect Blue to positive
Blue		
Red	Signal power supply (+) 12-24 V DC	Current consumption: Max. 40 mA during run and pause There will be accrued a higher inrush current
Black	Signal power supply GND (-)	
Yellow	Endstop reached inwards	Output voltage min. V_{IN} - 2 V Source current max. 100 mA NOT potential free
Green	Endstop reached outwards	
Violet	Not to be connected	
White	Not to be connected	

If you wish to use the Endstop reached, you will have to keep power on the Brown, Blue, Red and Black wires, otherwise the signal will be lost.

Relative Positioning - Single Hall

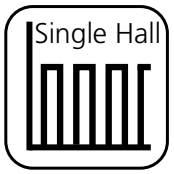
Connection diagram

Platform 0		AMP	Deutsch
M	**BROWN**	**2**	**2**
	BLUE	**1**	**1**
Supply for feedback	**+ RED**	**4**	**4**
Single Hall — Digital output	**VIOLET**	**5**	**6**
Supply for feedback	**- BLACK**	**3**	**3**



Relative Positioning - Single Hall

I/O specifications

<table>
<tr><th>Input/Output</th><th>Specification</th><th>Comments</th></tr>
<tr><td>Description</td><td>The actuator can be equipped with Single Hall that gives a relative positioning feedback signal when the actuator moves.</td><td> 
</td></tr>
<tr><td>Brown</td><td rowspan="2">12 or 24 V DC (+/-)

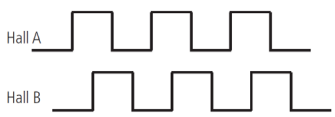
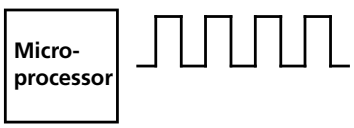
12 V ± 20%
24 V ± 10%

Typical values at max. load:
12 V: 5 A
24 V: 2.5 A</td><td rowspan="2">To extend actuator:
Connect Brown to positive
Connect Blue to negative

To retract actuator:
Connect Brown to negative
Connect Blue to positive</td></tr>
<tr><td>Blue</td></tr>
<tr><td>Red</td><td>Signal power supply (+) 12-24 V DC</td><td rowspan="2">Current consumption:

Max. 40 mA during run and pause
There will be accrued a higher inrush current</td></tr>
<tr><td>Black</td><td>Signal power supply GND (-)</td></tr>
<tr><td>Yellow</td><td colspan="2">Not to be connected</td></tr>
<tr><td>Green</td><td colspan="2">Not to be connected</td></tr>
<tr><td rowspan="2">Violet</td><td>Single Hall output (PNP)
Movement per Single Hall count:
14020: Actuator = 0.1 mm per count
14040: Actuator = 0.2 mm per count

Frequency:
Frequency is up to 14-26 Hz on Single Hall output depending on load and spindle.
Higher voltage on the motor can result in shorter pulses.</td><td>Output voltage min. V_{IN} - 2 V
Max. current output: 12 mA
Max. 680 nF

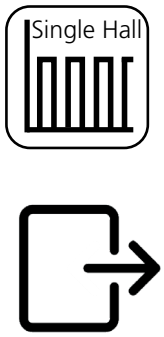
Low frequency with a high load.
Higher frequency with no load.</td></tr>
<tr><td>Input:
 
</td><td>Single Hall output:
 
</td></tr>
<tr><td>White</td><td colspan="2">Not to be connected</td></tr>
</table>

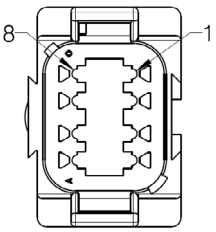
A Hall pulse consists of two Hall counts.
A Hall count occurs every time the signal changes direction, either upwards or downwards.

Relative Positioning - Single Hall and Endstop Reached

Connection diagram

Platform 0		Deutsch
	BROWN	**2**
	BLUE	**1**
Supply for feedback	**+ RED**	**4**
Digital output	**VIOLET**	**6**
Digital output	**YELLOW**	**7**
Digital output	**GREEN**	**8**
Supply for feedback	**- BLACK**	**3**





If you wish to use Endstop reached, you will have to keep power on the Brown, Blue, Red and Black wires, otherwise the signal will be lost.

Relative Positioning - Single Hall and Endstop Reached

I/O specifications

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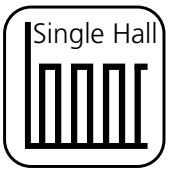
<tr><td>Description</td><td>The actuator can be equipped with Single Hall that gives a relative positioning feedback signal when the actuator moves.</td><td> 
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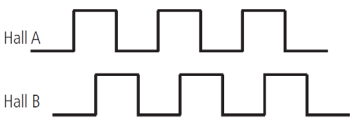
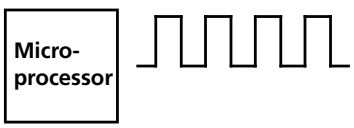
<tr><td>Black</td><td>Signal power supply GND (-)</td></tr>
<tr><td>Yellow</td><td>Endstop reached inwards</td><td rowspan="2">Output voltage min. V_{IN} - 2 V
Source current max. 100 mA
NOT potential free</td></tr>
<tr><td>Green</td><td>Endstop reached outwards</td></tr>
<tr><td rowspan="2">Violet</td><td>Single Hall output (PNP)
Movement per Single Hall count:
14020: Actuator = 0.1 mm per count
14050: Actuator = 0.2 mm per count

Frequency:
Frequency is up to 14-26 Hz on Single Hall output depending on load and spindle.
Higher voltage on the motor can result in shorter pulses.</td><td>Output voltage min. V_{IN} - 2 V
Max. current output: 12 mA
Max. 680 nF

Low frequency with a high load.
Higher frequency with no load.</td></tr>
<tr><td colspan="2">Input:
 

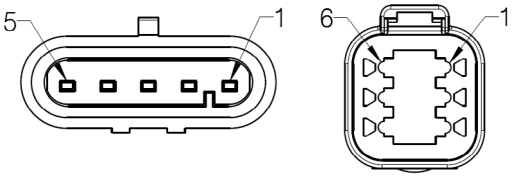
Single Hall output:
 
</td></tr>
<tr><td>White</td><td colspan="2">Not to be connected</td></tr>
</table>

A Hall pulse consists of two Hall counts.
A Hall count occurs every time the signal changes direction, either upwards or downwards.

Absolute Positioning - Analogue Feedback

Connection diagram

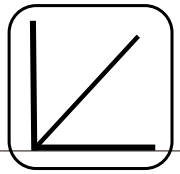
Platform 0		AMP	Deutsch
M	**BROWN**	**2**	**2**
	BLUE	**1**	**1**
Supply for feedback	**+ RED**	**4**	**4**
Analogue output	**VIOLET**	**5**	**6**
Supply for feedback	**- BLACK**	**3**	**3**



The signal power must be turned on at all times when the actuator is running, and minimum one second before it starts to run.

Absolute Positioning - Analogue Feedback

I/O specifications

<table>
<tr><th>Input/Output</th><th>Specification</th><th>Comments</th></tr>
<tr><td>Description</td><td>The actuator can be equipped with an electronic circuit that gives an analogue feedback signal when the actuator moves.</td><td>  </td></tr>
<tr><td>Brown</td><td rowspan="2">12 or 24 V DC (+/-)

12 V ± 20%
24 V ± 10%

Typical values at max. load:
12 V: 5 A
24 V: 2.5 A</td><td rowspan="2">To extend actuator:
Connect Brown to positive
Connect Blue to negative

To retract actuator:
Connect Brown to negative
Connect Blue to positive</td></tr>
<tr><td>Blue</td></tr>
<tr><td>Red</td><td>Signal power supply (+) 12-24 V DC</td><td rowspan="2">Current consumption:

Max. 60 mA during run and pause
There will be accrued a higher inrush current</td></tr>
<tr><td>Black</td><td>Signal power supply GND (-)</td></tr>
<tr><td>Yellow</td><td colspan="2">Not to be connected</td></tr>
<tr><td>Green</td><td colspan="2">Not to be connected</td></tr>
<tr><td rowspan="3">Violet</td><td>Analogue feedback

0-10 V (Option A)

0.5-4.5 V (Option B)

Special (Option F)</td><td>Tolerances +/- 0.2 V
Max. current output: 1 mA
Ripple max. 200 mV
Transaction delay 100 ms
Linear feedback 0.5 %</td></tr>
<tr><td>4-20 mA (Option C)

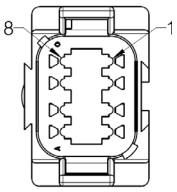
Special (Option F)</td><td>Tolerances +/- 0.2 mA
Transaction delay 20 ms
Linear feedback 0.5%
Output: Source
Serial resistance:
12 V max. 300 ohm
24 V max. 900 ohm</td></tr>
<tr><td colspan="2">For all analogue feedbacks, the actuator should activate its limit switches on a regular basis. This recommendation ensures more precise positioning.</td></tr>
<tr><td>White</td><td colspan="2">Not to be connected</td></tr>
</table>

Absolute Positioning - Analogue Feedback and Endstop Reached

Connection diagram

Platform 0 Deutsch

	BROWN	**2**
	BLUE	**1**
Supply for feedback	**+ RED**	**4**
Analogue output	**VIOLET**	**6**
Digital output	**YELLOW**	**7**
Digital output	**GREEN**	**8**
Supply for feedback	**- BLACK**	**3**

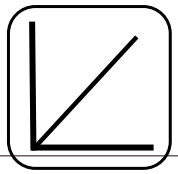


If you wish to use the endstop signals, you will have to keep power on the Brown, Blue, Red and Black wires, otherwise the signal will be lost.

The signal power must be turned on at all times when the actuator is running, and minimum one second before it starts to run.

Absolute Positioning - Analogue Feedback and Endstop Reached

I/O specifications

<table>
<tr><th>Input/Output</th><th>Specification</th><th>Comments</th></tr>
<tr><td>Description</td><td>The actuator can be equipped with an electronic circuit that gives an analogue feedback signal when the actuator moves.</td><td>  </td></tr>
<tr><td>Brown</td><td rowspan="2">12 or 24 V DC (+/-)

12 V ± 20%
24 V ± 10%

Typical values at max. load:
12 V: 5 A
24 V: 2.5 A</td><td rowspan="2">To extend actuator:
Connect Brown to positive
Connect Blue to negative

To retract actuator:
Connect Brown to negative
Connect Blue to positive</td></tr>
<tr><td>Blue</td></tr>
<tr><td>Red</td><td>Signal power supply (+) 12-24 V DC</td><td rowspan="2">Current consumption:

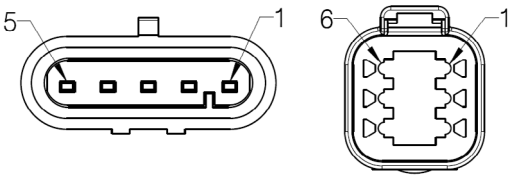
Max. 60 mA during run and pause</td></tr>
<tr><td>Black</td><td>Signal power supply GND (-)</td></tr>
<tr><td>Yellow</td><td>Endstop reached inwards</td><td rowspan="2">Output voltage min. V_{IN} - 2 V
Source current max. 100 mA
NOT potential free</td></tr>
<tr><td>Green</td><td>Endstop reached outwards</td></tr>
<tr><td rowspan="3">Violet</td><td>Analogue feedback
0-10 V (Option A)
0.5-4.5 V (Option B)
Special (Option F)</td><td>Tolerances +/- 0.2 V or V
Max. current output: 1 mA
Ripple max. 200 mV
Transaction delay 20 ms
Linear feedback 0.5 %</td></tr>
<tr><td>4-20 mA (Option C)
Special (Option F)</td><td>Tolerances +/- 0.2 mA
Transaction delay 20 ms
Linear feedback 0.5%
Output: Source
Serial resistance:
12 V max. 300 ohm
24 V max. 900 ohm</td></tr>
<tr><td colspan="2">For all analogue feedbacks, the actuator should activate its limit switches on a regular basis. This recommendation ensures more precise positioning.</td></tr>
<tr><td>White</td><td colspan="2">Not to be connected</td></tr>
</table>

For actuators with analogue feedback it is recommended to fully extract and retract the actuator on a regular basis (thereby activating the limit switches) in order to ensure precise positioning.

Absolute Positioning - PWM

Connection diagram

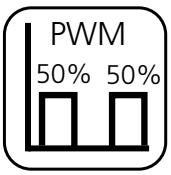
Platform 0		AMP	Deutsch
M	**BROWN**	**2**	**2**
M	**BLUE**	**1**	**1**
Supply for feedback	**+ RED**	**4**	**4**
PWM 50% 50% — Digital feedback	**VIOLET**	**5**	**6**
Supply for feedback	**- BLACK**	**3**	**3**



The signal power must be turned on at all times when the actuator is running, and minimum one second before it starts to run.

Absolute Positioning - PWM

I/O specifications

<table>
<tr><th>Input/Output</th><th>Specification</th><th>Comments</th></tr>
<tr><td>Description</td><td>The actuator can be equipped with an electronic circuit that gives a digital feedback signal when the actuator moves.</td><td> 
</td></tr>
<tr><td>Brown</td><td rowspan="2">12 or 24 V DC (+/-)

12 V ± 20%
24 V ± 10%

Typical values at max. load:
12 V: 5 A
24 V: 2.5 A</td><td rowspan="2">To extend actuator:
Connect Brown to positive
Connect Blue to negative

To retract actuator:
Connect Brown to negative
Connect Blue to positive</td></tr>
<tr><td>Blue</td></tr>
<tr><td>Red</td><td>Signal power supply (+) 12-24 V DC</td><td rowspan="2">Current consumption:

Max. 60 mA during run and pause
There will be accrued a higher inrush current</td></tr>
<tr><td>Black</td><td>Signal power supply GND (-)</td></tr>
<tr><td>Yellow</td><td colspan="2">Not to be connected</td></tr>
<tr><td>Green</td><td colspan="2">Not to be connected</td></tr>
<tr><td rowspan="2">Violet</td><td>Digital output feedback (PNP)

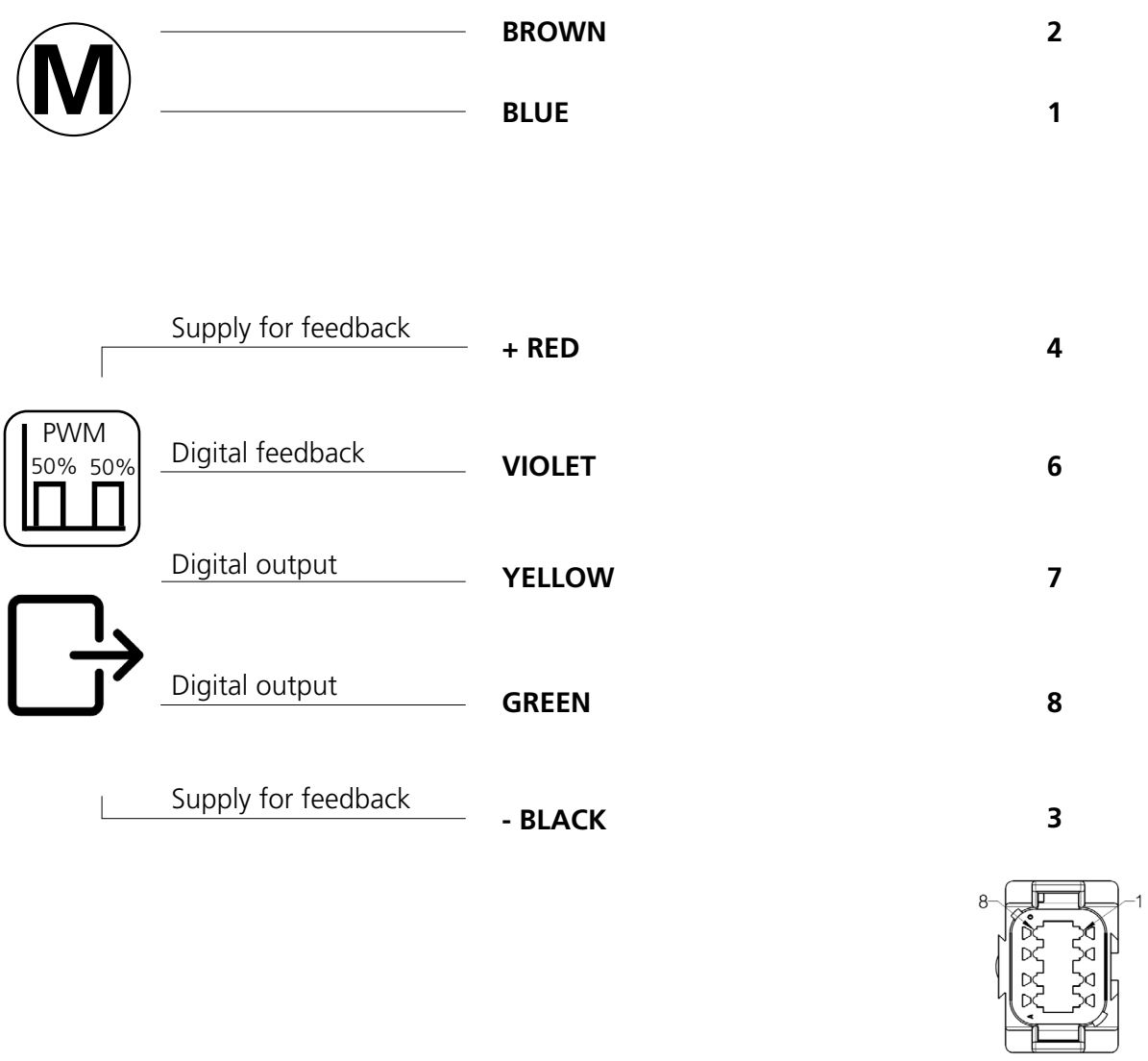
10-90% (Option D)
20-80% (Option E)
Special (Option F)</td><td>Output voltage min. V_{IN} - 2 V
Tolerances +/- 2 %
Max. current output: 12 mA</td></tr>
<tr><td colspan="2">For all analogue feedbacks, the actuator should activate its limit switches on a regular basis. This recommendation ensures more precise positioning.</td></tr>
<tr><td>White</td><td colspan="2">Not to be connected</td></tr>
</table>

For actuators with analogue feedback it is recommended to fully extract and retract the actuator on a regular basis (thereby activating the limit switches) in order to ensure precise positioning.

Absolute Positioning - PWM and Endstop Reached

Connection diagram

Platform 0 Deutsch

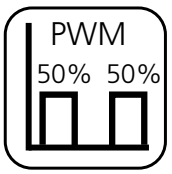


If you wish to use the endstop signals, you will have to keep power on the Brown, Blue, Red and Black wires, otherwise the signal will be lost.

The signal power must be turned on at all times when the actuator is running, and minimum one second before it starts to run.

Absolute Positioning - PWM and Endstop Reached

I/O specifications

<table>
<tr><th>Input/Output</th><th>Specification</th><th>Comments</th></tr>
<tr><td>Description</td><td>The actuator can be equipped with an electronic circuit that gives a digital feedback signal when the actuator moves.</td><td> 
</td></tr>
<tr><td>Brown</td><td rowspan="2">12 or 24 V DC (+/-)

12 V ± 20%
24 V ± 10%

Typical values at max. load:
12 V: 5 A
24 V: 2.5 A</td><td rowspan="2">To extend actuator:
Connect Brown to positive
Connect Blue to negative

To retract actuator:
Connect Brown to negative
Connect Blue to positive</td></tr>
<tr><td>Blue</td></tr>
<tr><td>Red</td><td>Signal power supply (+) 12-24 V DC</td><td rowspan="2">Current consumption:

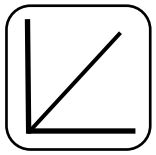
Max 60 mA during run and pause
There will be accrued a higher inrush current</td></tr>
<tr><td>Black</td><td>Signal power supply GND (-)</td></tr>
<tr><td>Yellow</td><td>Endstop reached inwards</td><td rowspan="2">Output voltage min. V_{IN} - 2 V
Source current max. 100 mA
NOT potential free</td></tr>
<tr><td>Green</td><td>Endstop reached outwards</td></tr>
<tr><td rowspan="2">Violet</td><td>Digital output feedback (PNP)

10-90% (Option D)
20-80% (Option E)
Special (Option F)</td><td>Output voltage min. V_{IN} - 2 V
Tolerances +/- 2 %
Max. current output: 12 mA</td></tr>
<tr><td colspan="2">The actuator should activate its limit switches on a regular basis. This recommendation ensures more precise positioning.</td></tr>
<tr><td>White</td><td colspan="2">Not to be connected</td></tr>
</table>

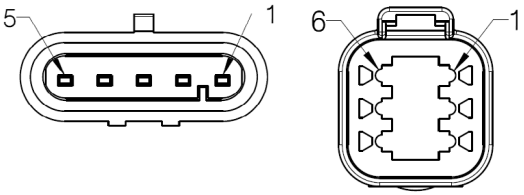
Absolute Positioning - Mechanical Potentiometer

Connection diagram

Platform 0



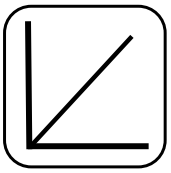
	BROWN	**2**	**2**
	BLUE	**1**	**1**
Supply for feedback	**+ RED**	**4**	**4**
+10 V or other value	**VIOLET** Analogue feedback	**5**	**6**
Supply for feedback	**- BLACK**	**3**	**3**



Absolute Positioning - Mechanical Potentiometer

I/O specifications

<table>
<tr><th>Input/Output</th><th>Specification</th><th>Comments</th></tr>
<tr><td>Description</td><td>The actuator can be equipped with a mechanical potentiometer, 10 k ohm, providing an analogue feedback signal when the actuator moves.

Bourns 0-10 kohm, 5%,
10-Turn Type: 3540 Wirewound</td><td> 
Bourns 0-10 k ohm, 5 %, 10-Turn</td></tr>
<tr><td>Brown</td><td rowspan="2">12 or 24 V DC (+/-)

12 V ± 20%
24 V ± 10%

Typical values at max. load:
12 V: 5 A
24 V: 2.5 A</td><td rowspan="2">To extend actuator:
Connect Brown to positive
Connect Blue to negative

To retract actuator:
Connect Brown to negative
Connect Blue to positive</td></tr>
<tr><td>Blue</td></tr>
<tr><td>Red</td><td>Not to be connected</td><td rowspan="2">Current consumption:

Max 60 mA during both run and pause</td></tr>
<tr><td>Black</td><td>Signal power supply GND (-)</td></tr>
<tr><td>Yellow</td><td colspan="2">Not to be connected</td></tr>
<tr><td>Green</td><td colspan="2">Not to be connected</td></tr>
<tr><td>Violet</td><td>Mechanical potentiometer output

Potentiometer feedback
Slide potentiometer, 10 k ohm
1 k ohm = 0 mm stroke
11 k ohm = 100 mm stroke
The maximum effect: 0.1 W</td><td>Linearity: ± 20%
Minimum lifetime: 15,000 cycles
Average lifetime: 40,000 cycles
Max. current output: 1 mA

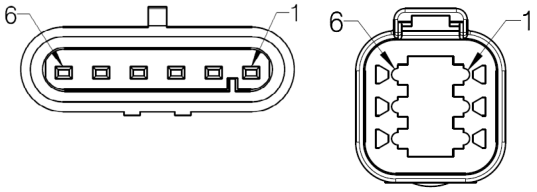
Output protection: 1 kohm protection resistor in series with the potentiometer</td></tr>
<tr><td>White</td><td colspan="2">VCC+ to POT
10 V DC or other values</td></tr>
</table>

For actuators with analogue feedback it is recommended to fully extract and retract the actuator on a regular basis (thereby activating the limit switches) in order to ensure precise positioning.

IC Basic

Connection diagram

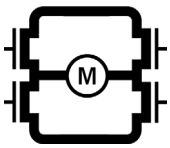
Platform 3		AMP	Deutsch
12/24 V DC +	**BROWN**	**2**	**2**
GND -	**BLUE**	**1**	**1**
Digital input	**RED**	**4**	**4**
Digital input	**BLACK**	**3**	**3**
Digital output	**YELLOW**	**5**	**5**
Digital output	**GREEN**	**6**	**6**



Please be aware that if the power supply is not properly connected, you might damage the actuator!

IC Basic

I/O specifications

Input/Output	Specification	Comments
Description	Easy-to-use interface with integrated power electronics (H-bridge). The version with "IC option" cannot be operated with a PWM power supply.	
Brown	Connect Brown to positive 12-24 V DC + (VCC) Typical values at max. load: 12 V ± 20%: 5 A 24 V ± 10%: 2.5 A Current cut-off: Standard motor: Fast motor: 12 V: 8 A 12 V: 8 A 24 V: 5 A 24 V: 5 A	Note: Do not change the power supply polarity on the Brown and Blue wires! Power supply GND (-) is electrically connected to the housing
Blue	Connect Blue to negative 12-24 V DC - (GND)	
Red	Extends the actuator	The signal becomes active at: > 67% of V_{IN} The signal becomes inactive at: < 33% of V_{IN} Input current: 10 mA
Black	Retracts the actuator	
Yellow	Endstop reached inwards	Output voltage min. V_{IN} - 2 V Source current max. 100 mA Endstop signals are NOT potential free. Endstop signals can be configured with BusLink software according to any position needed
Green	Endstop reached outwards	
Violet	Not to be connected	
White	Not to be connected	

Current cut-offs should not be used as stop function! This might damage the actuator.
Current cut-offs should only be used in emergencies!

Current cut-off limits are not proportional with the load curves of the actuator.
This means that the current cut-offs cannot be used as load indicator.

There are tolerances on the spindle, nut, gear wheels etc. and these tolerances will have an influence on the current consumption for the specific actuator.