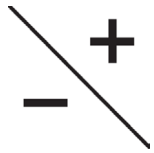
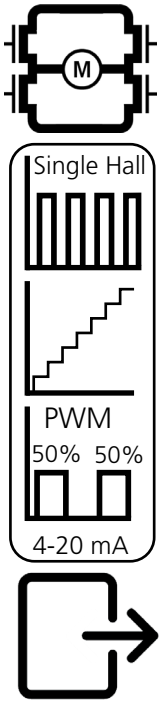
IC Advanced

Connection diagram

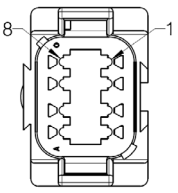
Platform 3 Deutsch



12/24 V DC +	**BROWN**	**2**
GND -	**BLUE**	**1**



Digital input	**RED**	**4**
Digital input	**BLACK**	**3**
Feedback	**VIOLET**	**6**
Signal GND	**WHITE**	**5**
Digital output	**YELLOW**	**7**
Digital output	**GREEN**	**8**



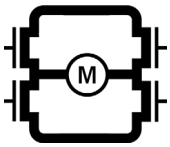
Please be aware that if the power supply is not properly connected, you might damage the actuator!

Configuration of IC Advanced is possible with the BusLink software for PC
The newest version is available online at LINAK.COM/TECHLINE

Please note: The BusLink configuration cable must be purchased separately
Item number for BusLink cable kit: 0367999 (adapter + USB2Lin)

IC Advanced

I/O specifications

Input/Output	Specification	Comments
Description	Easy-to-use interface with integrated power electronics (H-bridge). The actuator can also be equipped with an electronic circuit that gives an absolute or relative feedback signal. The version with "IC option" cannot be operated with 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 Current cut-off levels can be adjusted through BusLink
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. When configuring virtual endstop, it is not necessary to choose the position feedback. Endstop reached and virtual endstop will work even when feedback is not chosen.
Green	Endstop reached outwards	

IC Advanced

I/O specifications

Input/Output	Specification	Comments
Violet	Analogue feedback (0-10 V): Configure any high/low combination between: 0-10 V (Option G) 0.5-4.5 V (Option H) Special (Option X)	Standby power consumption: 12 V: 60 mA 24 V: 45 mA Ripple max. 200 mV Transaction delay 20 ms Linear feedback 0.5 % Max. current output. 1 mA
	Single Hall output (PNP) Movement per Single Hall count: LA14020 Actuator = 0.1 mm per count LA14040 Actuator = 0.2 mm per count Frequency: Frequency is 14-26 Hz on Single Hall output (depending on load) Higher voltage on the motor can result in shorter pulses.	Output voltage min. V_{IN} - 2 V Max. current output: 12 mA Max. 680 nF
	Digital output feedback PWM: Configure any high/low combination between: 10-90% (Option K) 20-80% (Option L) Special (Option X)	Output voltage min. V_{IN} - 2 V Frequency: 75 Hz ± 10 Hz as standard, but this can be customised. Duty cycle: Any low/high combination between 0 and 100 percent. Open collector source current max. 12 mA
	Analogue feedback (4-20 mA): Configure any high/low combination between 4-20 mA: 4-20 mA (Option J) Special (Option X)	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
	All analogue and digital feedbacks (0-10 V, PWM and 4-20 mA)	Standby power consumption: 12 V: 60 mA 24 V: 45 mA
White	Signal GND	For correct wiring of Power GND and Signal GND - please see next page

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

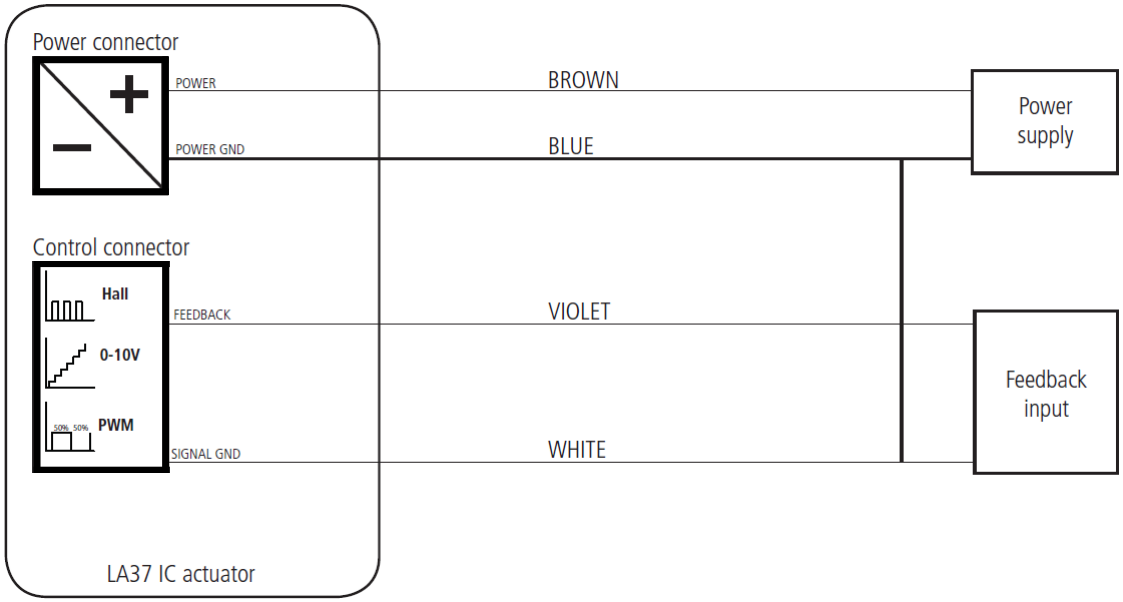
IC Advanced - Feedback and Endstop Reached

- Please note that the BusLink cables must be purchased separately from the actuator!
- Item number for BusLink cable kit: 0147999 (adaptor + USB2Lin)

- Current cut-offs should not be used as a 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.
- The actuator should activate its limit switches on a regular basis. This recommendation ensures more precise positioning.

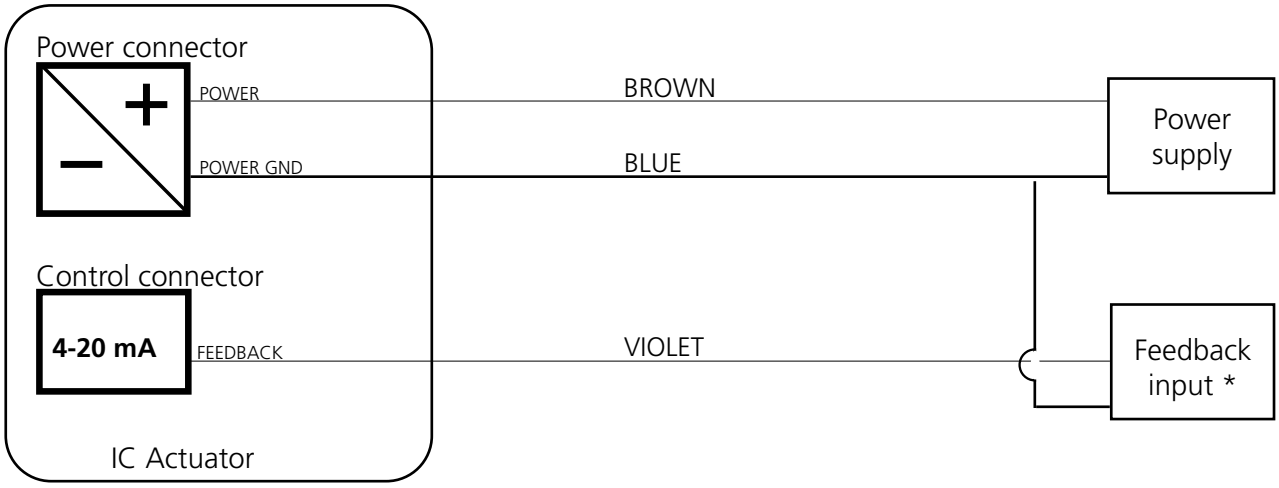
Correct Wiring of Power GND and Signal GND for IC Advanced

When using the feedback output, it is important to use the right connection setup. Attention should be paid to the two ground connections: Power GND in the Power connector and Signal GND in the Control connector. When using either 0-10 V, Hall or PWM feedback, the Signal GND must be used. For optimal accuracy, the Signal GND is connected to the Power GND as close as possible to the feedback input equipment.



Please note: This section only applies for 0-10 V, Hall and PWM feedback options.

The following connection illustration applies for 4-20 mA only:



***** Only to be used on differential input card. Do not use single ended input card.

Do NOT connect or put the White wire anywhere near GND, as this will create ground loops, disturbing the mA-signal.

IC Options Overview

	Basic	Advanced	Parallel	LIN bus	CAN bus
Control					
12 V, 24 V supply	√	√	√	√	√
H-bridge	√	√	√	√	√
Manual drive in/out	√	√	√	√	√
Endstop reached in/out	-	√	√	√	-
Soft start/stop	√	√	√	√	√
Feedback					
Voltage	√	√ *	-	-	-
Current	-	√ **	-	-	-
Single Hall	√	√	-	-	-
PWM	-	√	-	-	-
Position (mm)	-	-	-	√	√
Custom feedback type	-	√	-	-	-
Monitoring					
Temperature monitoring	√	√	√	√	√
Current cut-off	√	√	√	√	√
Ready signal	-	-	-	-	-
BusLink					
Service counter	-	√	√	√	√
Custom soft start/stop	-	√ ***	√ ***	√ ***	√***
Custom current limit -	√	√	√	√	√
Speed setting	-	√	√	√	√
Virtual endstop	-	√	√	√	√

* Configure any high/low combination between 0 - 10 V

** Configure any high/low combination between 4 - 20 mA

*** Configure any value between 0 - 30 s

Feedback Configurations Available for IC Basic, IC Advanced and Parallel

	Pre-Configured	Customised Range	Pros	Cons
None			N/A	N/A
PWM Feedback	10 – 90 % 75 Hz	0 – 100 % 75 – 150 Hz	Suitable for long distance transmission. Effectual immunity to electrical noise.	More complex processing required compared to AFV and AFC.
Single Hall*	N/A	N/A	Suitable for long distance transmission.	No position indication.
Analogue Feedback Voltage (AFV)*	0 - 10 V	Any combination, going negative or positive. E.g. 8.5 – 2.2 V over a full stroke.	High resolution. Traditional type of feedback suitable for most PLCs. Easy troubleshooting. Independent on stroke length, compared to a traditional mechanical potentiometer.	Not recommended for applications with long distance cables or environments exposed to electrical noise.
Analogue Feedback Current (AFC)	4 - 20 mA	Any combination, going negative or positive. E.g. 5.5 – 18 mA over a full stroke.	High resolution. Better immunity to long cables and differences in potentials than AFV. Provides inherent error condition detection. Independent on stroke length, compared to a traditional mechanical potentiometer.	Not suitable for signal isolation.
Endstop signal in/out**	At physical endstops. Default for IC Advanced.	Any position.	Can be set at any position over the full stroke length.	Only one endstop can be customised.

All feedback configurations are available for IC Advanced.
* IC Basic feedback configurations available: Single Hall and 0-10 V
** Parallel feedback configurations available: Endstop reached

Actuator Configurations Available for IC Basic, IC Advanced and Parallel

	Pre-Configured	Customised Range	Description
Current Limit Inwards	20 A for both current limit directions. (When the current outputs are at zero, it means that they are at maximum value 20 A). Be aware: When the actuator comes with current cut-off limits that are factory pre-configured for certain values, the pre-configured values will be the new maximum level of current cut-off. This means that if the current cut-off limits are pre-configured to 14 A, it will not be possible to change the current limits through BusLink to go higher than 14 A.	Recommended range: 4 A to 20 A If the temperature drops below 0°C, all current limits will automatically increase to approximately 30 A, independent of the pre-configured value.	The actuator's unloaded current consumption is very close to 4 A, and if the current cut-off is customised below 4 A, there is a risk that the actuator will not start. The inwards and outwards current limits can be configured separately and do not have to need the same value.
Current Limit Outwards			
Max. Speed Inwards/ Outwards	100% equal to full performance. Please note: for Parallel actuators, the full performance equals 80% of the max. speed.	Lowest recommended speed at full load: 60% It is possible to reduce the speed below 60%, but this is dependable on load, power supply, and the environment.	The speed is based on a PWM principle, meaning that 100% equals the voltage output of the power supply in use, and not the actual speed.
Virtual Endstop Inwards	0 mm for both virtual endstop directions. (When the virtual endstops are at zero, it means that they are not in use).	It is only possible to run the actuator with one virtual endstop, either inwards or outwards.	The virtual endstop positions are based on Hall sensor technology, meaning that the positioning needs to be initialised from time to time. One of the physical endstops must be available for initialisation.
Virtual Endstop Outwards			

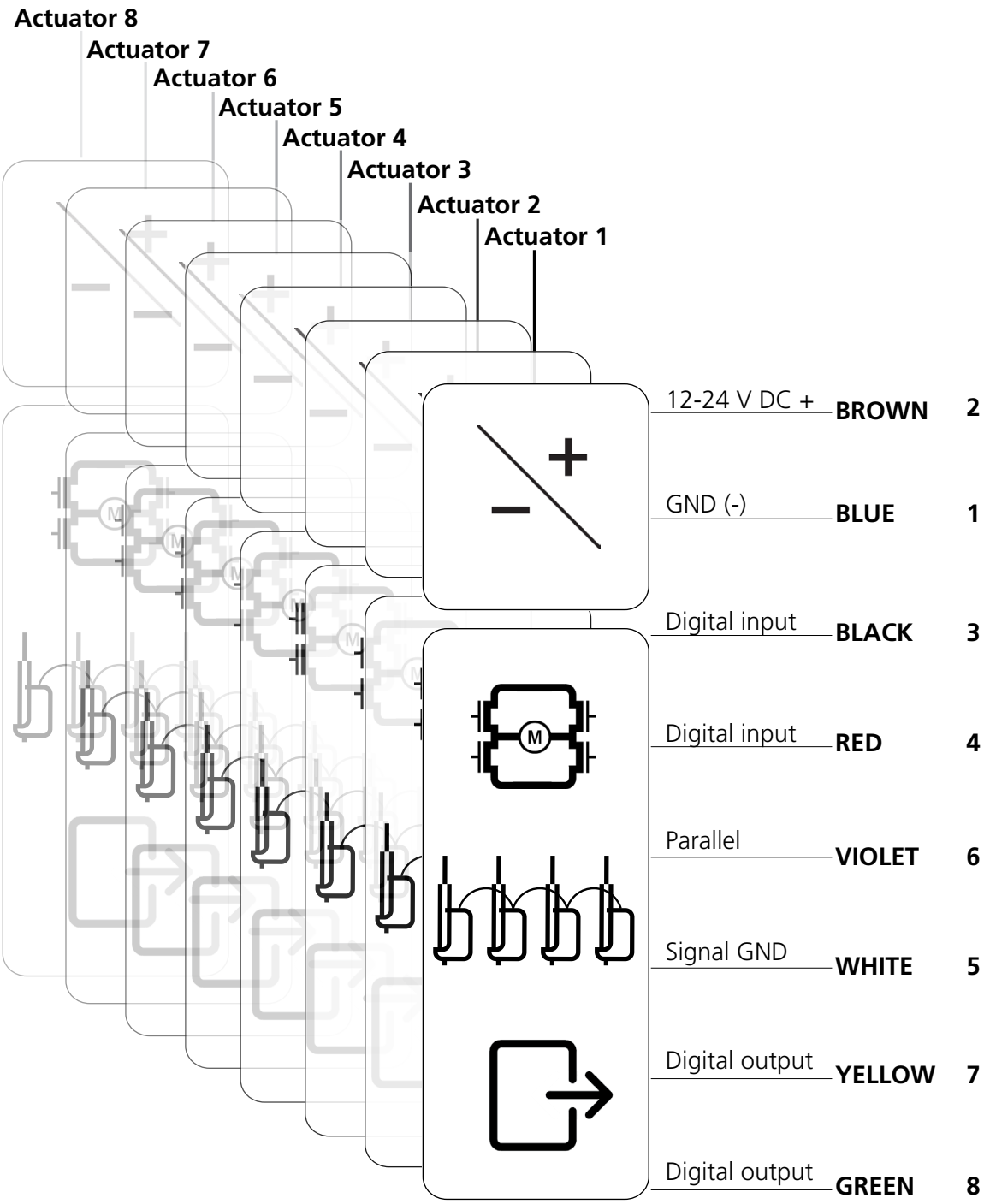
Actuator Configurations Available for IC Basic, IC Advanced and Parallel

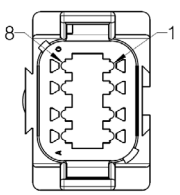
	Pre-Configured	Customised Range	Description
Soft Stop Inwards	0.3 seconds for both soft stop directions.	0.3 seconds to 30 seconds 0 seconds can be chosen for hard stop.	It is not possible to configure values between 0.01 seconds to 0.29 seconds. This is due to the back-EMF from the motor (increasing the voltage). Be aware that the soft stop value equals the deacceleration time after stop command.
Soft Stop Outwards			
Soft Start Inwards	0.3 seconds for both soft start directions.	0 seconds to 30 seconds	Be aware that the soft start value equals the acceleration time after start command. To avoid stress on the actuator, it is not recommended to use 0 seconds for soft start, due to higher inrush current.
Soft Start Outwards			

Parallel

Connection diagram

Platform 3 Deutsch



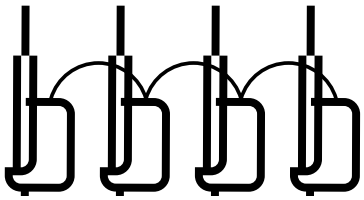


Please be aware that if the power supply is not properly connected, you might damage the actuator!

The Green and Yellow wires from parallel connected actuators must NOT be interconnected

Parallel

I/O specifications

Input/Output	Specification	Comments
Description	Parallel drive of up to 8 actuators. A Master actuator with an integrated H-bridge controller controls up to 7 Slave actuators. The version with "IC option" cannot be operated with PWM (power supply).	
Brown	Connect Brown to positive 12-24 V DC + (VCC) Typical values at max. load: 12 V ± 20% 24 V ± 10% 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! The parallel actuators can run on one OR separate power supplies. Power supply GND (-) is electrically connected to the housing. Current cut-off levels can be adjusted through BusLink (only one actuator at a time for parallel).
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 It does not matter where the in/out signals are applied. You can either choose to connect the signal cable to one actuator OR you can choose to connect the signal cable to each actuator on the line. Either way this will ensure parallel drive
Black	Retracts the actuator	

Parallel

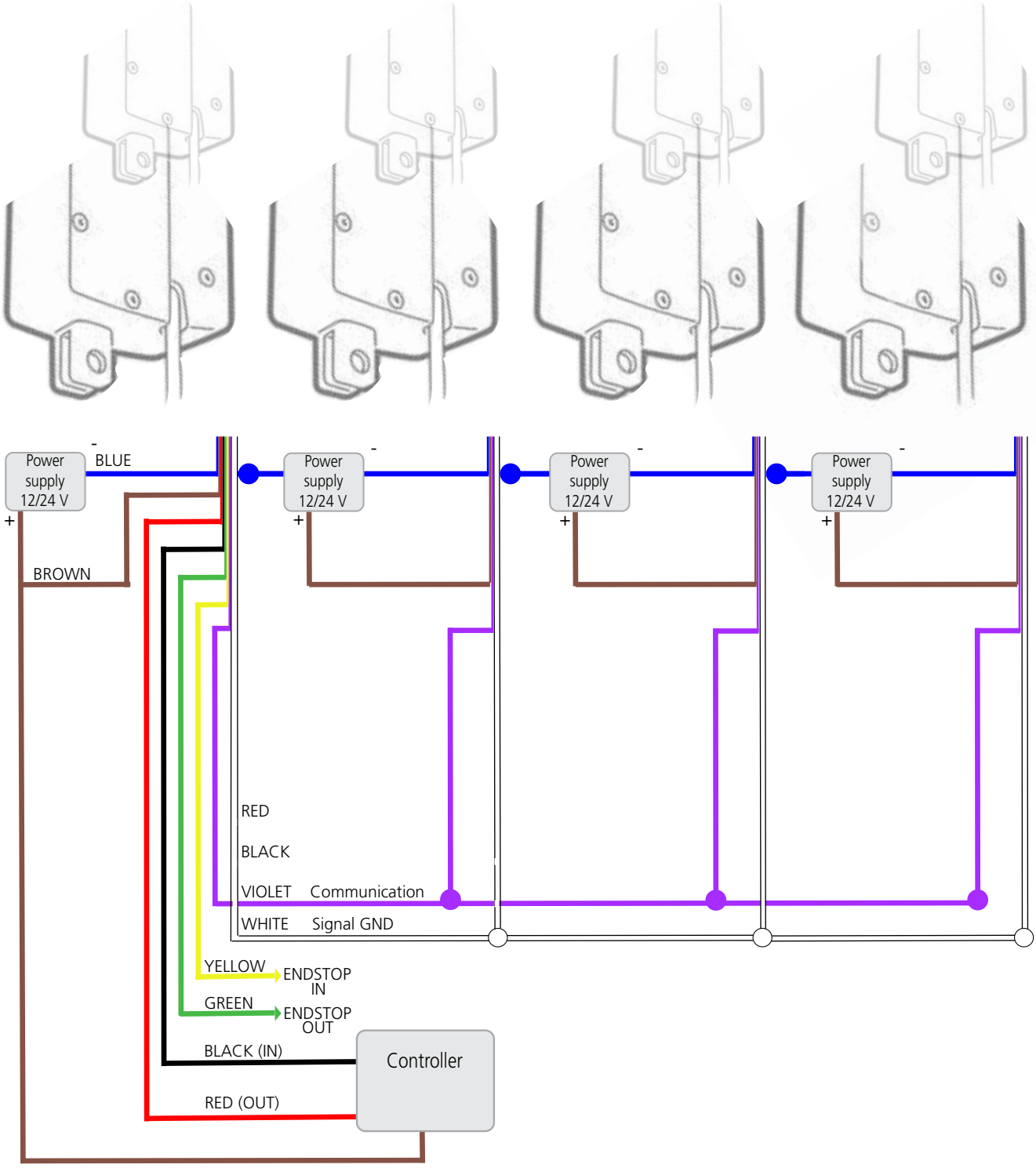
I/O specifications

Yellow	Endstop reached inwards	Output voltage min. V_{IN} - 2 V Source current max. 100 mA Endstop reached are NOT potential free. Endstop reached can be configured with BusLink software according to any position needed.
Green	Endstop reached outwards	
Violet	Internal communication: Violet cords must be connected together	Standby power consumption: 12 V: 60 mA 24 V: 45 mA No feedback available during parallel drive
White	Signal GND: White cords must be connected together	

- 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.

The Parallel System

The Parallel Drive-function will support a number of actuators working jointly.



- It is both possible to run parallel with a single power supply or to run each actuator with separate power supplies.
- Only standard power and signal cables are available for parallel.
- If separate power supplies are used, they must have the same potential, and the power supply GND (Blue wires) must be connected.

BusLink Software Tool and the Parallel System

The BusLink software tool is available for parallel and can be used for Configuration, Manual Run and Diagnostics (service counter)

The BusLink software can be downloaded here.

For more information and easy set-up of BusLink, please follow this link to view the Quick Guide for BusLink.

Please note that the BusLink cables must be purchased separately from the actuator! Item number for BusLink cable kit: 0367999

Only through the BusLink software tool is it possible to state if the system is Parallel or Non-critical Parallel. Via this tool it is also possible to reconfigure the whole system from one system to the other.

The Parallel system

- The system does not have to run on one main power supply only – it can be supplied by individual supplies corresponding to the number of actuators in the system. Please respect the actuator specifications regarding voltage level and current consumption!
- It does not matter where the IN/OUT signal is applied.
- When all actuators are connected, a Master will automatically be chosen. E.g. with 5 actuators in one system there will be 1 Master and 4 Slaves. The Master can control up to 7 Slaves
- If an overload occurs, the running of the actuators will be stopped and blocked in that direction until an activation in the opposite direction has been made, or the system has been re-powered
- Before entering BusLink mode, all actuators must be disconnected. It is only possible to configure one actuator at a time through BusLink
- When changing the actuator configuration, it is important that all actuators in the system have the same configuration before the system starts running. Otherwise, the actuators will not run
- Actuators will be pre-programmed from our production as 2, 3, 4, 5 etc. parallel systems. Through BusLink it will be possible to add or remove actuators to/from the system
- In case an actuator drops off the line due to e.g. a damaged signal cable, the parallel system will stop immediately.
- In case one of the actuators is broken, the system will not move; not even after re-powering. The broken actuator needs to be replaced before the system can run again. The system will only run when it is complete or configured to a Non-critical Parallel system via the BusLink software tool.

Only for Non-Critical Parallel Systems

- The Non-Critical Parallel system offers auto-detection for every single power up if a new actuator is added to the line (system)
- To add or remove actuators from the system, the system needs to be shut down and powered up again. Please be aware, that after re-powering, the system will not detect if an actuator is missing!
- If adding a new actuator to the system, be aware that the actuator needs to have the same configuration (Non-Critical Parallel) as the existing ones; this can be done via the BusLink software tool.

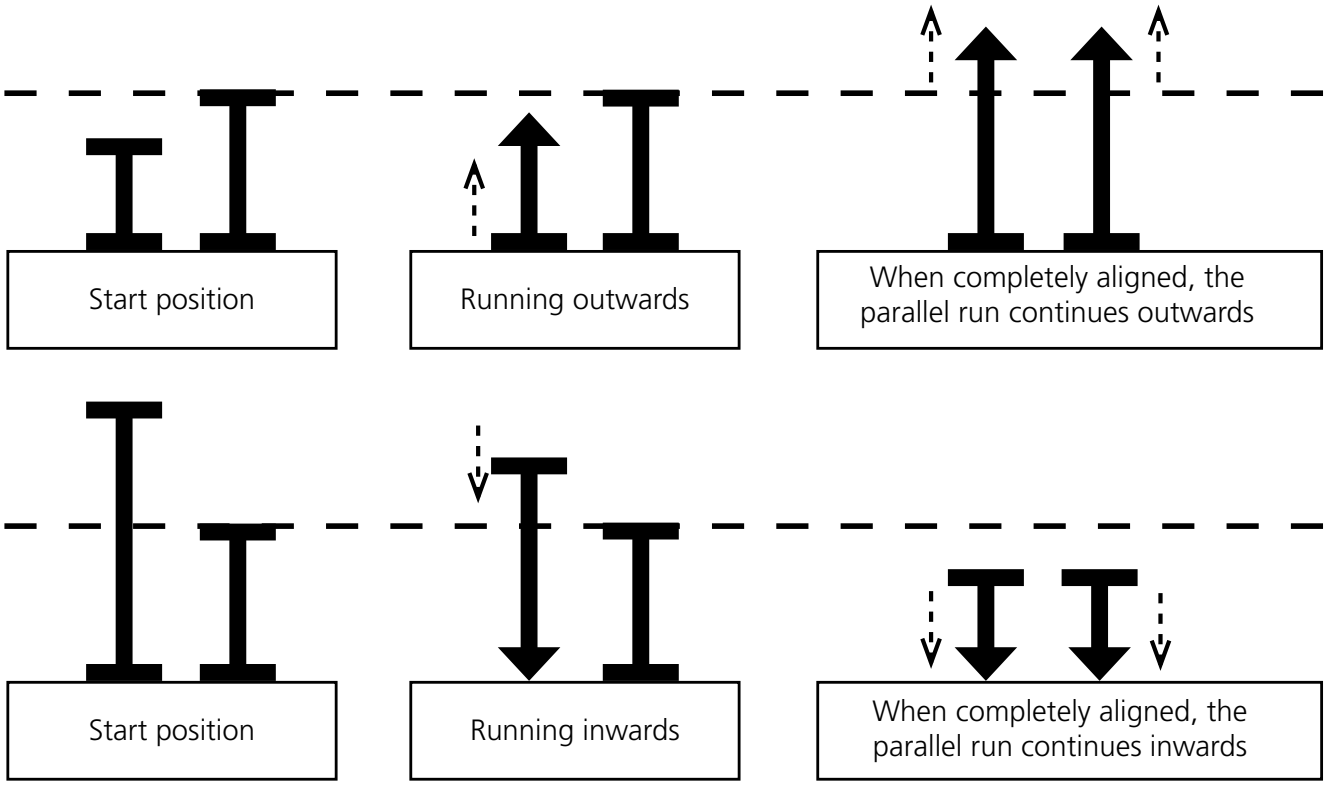
System Monitoring for Parallel

If one of the actuators has one of the following error conditions, the actuator will immediately STOP:

- H-Bridge fault
- Out of the temperature range (High duty cycle protection)
- Overcurrent (Current cut-off if one or all actuators go in mechanical block)
- SMPS fault
- Endstop reached signal fault switch
- Hall sensor failure
- Position lost
- Overvoltage

Alignment of the Parallel Actuator System

If the actuators are not in parallel when starting up, the next movement will run in the following manner:



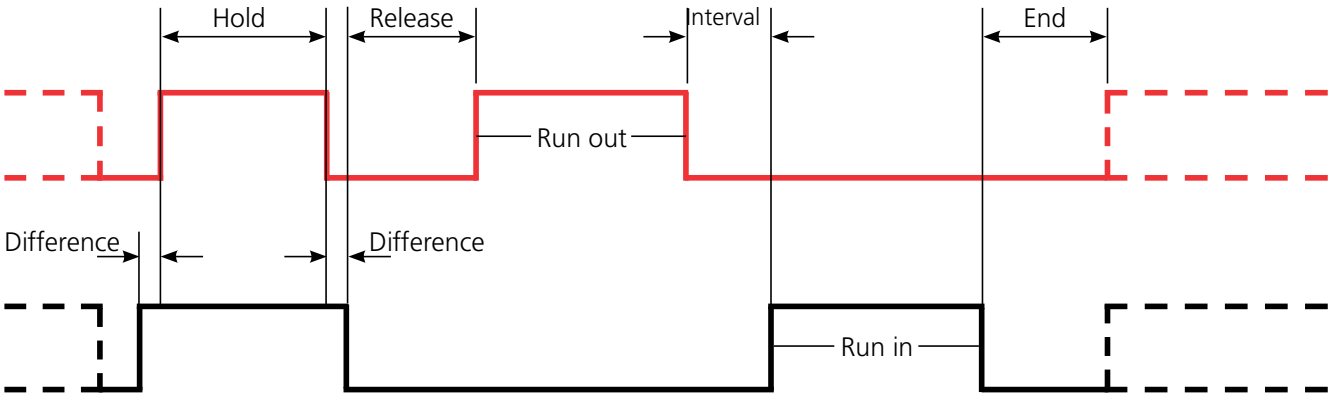
IC - Parallel Manual Service Mode

With the Parallel Manual Service mode it is possible to drive one or more parallel actuators separately, using the Red and Black wire from each actuator.

An example: if there are 4 actuators in the system and one is removed, the remaining 3 actuators will still be operational simultaneously - so long as they are connected via the Violet and White wires, and given that 'Parallel manual service mode' is activated on at least one of them.

For activation of 'Parallel manual service mode' please follow the instructions below:

Step	Procedure	Min.	Max.
First step	Power up all remaining actuators in the system	-	-
Hold	Put power on the Red and Black wires for 10-30 seconds	10 seconds	30 seconds
Difference	The Red and Black wires must all be connected to the power supply within 0.5 seconds	0 seconds	0.5 seconds
Release	Disconnect both wires and wait 0.5-2 seconds before the next step	0.5 seconds	2 seconds
Extend/Retract	Now choose either to extend or retract the actuator: To extend the actuator: Connect only the Red wire(s) to the power supply To retract the actuator: Connect only the Black wire(s) to the power supply	-	-
Interval	Switch between running in/out as much as needed, without exceeding the 2.0 seconds interval between disconnecting/connecting the Red and Black wires	-	2 seconds
End	To exit the Parallel Manual Mode, disconnect the Red and Black wires for more than 2.0 seconds	2 seconds	-

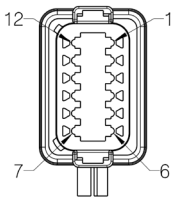


I/O Basic

Connection diagram

Platform B

		Deutsch
12-24 V DC +	**BROWN**	**11**
GND -	**BLUE**	**12**
Digital input	**RED**	**8**
Digital input	**BLACK**	**7**
Digital output	**YELLOW**	**5**
Digital output	**GREEN**	**6**
Analogue output + or Digital input	**ORANGE** Not used	**2**
Analogue output - or Digital input	**LIGHT BLUE** Not used	**9**
Parallel	**VIOLET** Not used	**4**
Parallel GND	**WHITE** Not used	**3**
Bluetooth® Antenna	**GREY**	**1**



Not used*: The I/O Basic actuator can be upgraded to I/O Full if more functionality is needed - even after purchase. Connect the actuator to Actuator Connect™ via Bluetooth® or a USB adapter cable (must be purchased separately), and request an unlock key from your local LINAK office.

I/O Basic

I/O specifications

Input/Output	Specification	Comments
Description	I/O is a universal industrial interface developed by LINAK®. I/O is a common term used to describe inputs and outputs As part of the IC (Integrated Controller) range, the I/O interface offers a range of digital and analogue in- and outputs. It can be deployed through all industries.	
Brown	12-24 V DC + (VCC) Current limits: 12 V: 8 A 24 V: 5 A	Note: Do not swap the power supply polarity on the Brown and Blue wires! The PCB is coupled to the housing through a capacitor. Current limit levels can be adjusted through Actuator Connect™.
Blue	Connect Blue to negative - (GND)	
Red	Extends the actuator - Standard run	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 - Standard run	
Yellow	Digital position output - Endstop reached (inwards)	Digital outputs: The digital output is active high - Output voltage min. V_{IN} - 2 V - Source current max. 100 mA
Green	Digital position output - Endstop reached (outwards)	
Orange	Not to be used	Actuator can be upgraded to Full version - wire is then used as either an analogue output or digital input.
Light Blue	Not to be used	Actuator can be upgraded to Full version - wire is then used as either an analogue output or digital input.
Purple	Not to be used	Actuator can be upgraded to Full version - wire is then used as parallel communication
White	Not to be used	Actuator can be upgraded to Full version - wire is then used as parallel common GND
Grey	Antenna for Bluetooth®	The Grey wire is used to strengthen the Bluetooth signal, allowing a stable wireless connection and has no functionality during operation.

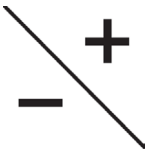
Find more information about the I/O actuators in the I/O user manual
The newest version is available online at LINAK.COM/TECHLINE

I/O Customised or Full

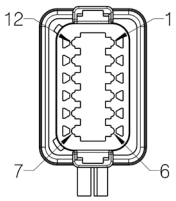
Connection diagram

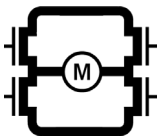
Platform C
Platform F

Deutsch

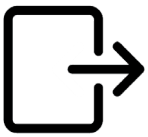


12-24 V DC +	**BROWN**	**11**
GND -	**BLUE**	**12**

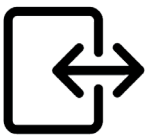




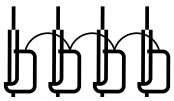
Digital input	**RED**	**8**
Digital input	**BLACK**	**7**



Digital output	**YELLOW**	**5**
Digital output	**GREEN**	**6**



Analogue output + or Digital input	**ORANGE** Not used or customisable*	**2**
Analogue output - or Digital input	**LIGHT BLUE** Not used or customisable*	**9**



Parallel	**VIOLET** Not used or customisable*	**4**
Parallel GND	**WHITE** Not used or customisable*	**3**

Bluetooth® Antenna	**GREY**	**1**

*Customisable: The I/O Customised actuator is configured based on customer needs - for detailed information about wire functionality, please see the auto-generated data sheet
(type in J-number from product label)
The I/O Full actuator is configured like an I/O Basic from factory, but with full access to all features. Connect the actuator to Actuator Connect™ via Bluetooth® or a USB adapter cable (must be purchased separately), to enable and configure various features.

**If 'endstop reached' is not used, a 6-pin connector can be chosen, where the alternative pins are used.

I/O Customised or Full

I/O specifications

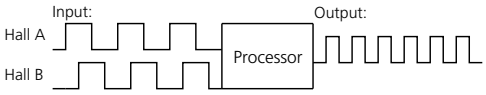
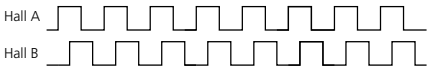
Input/Output	Specification	Comments
Description	I/O is a universal industrial interface developed by LINAK®. I/O is a common term used to describe inputs and outputs As part of the IC (Integrated Controller) range, the I/O interface offers a range of flexible digital and analogue in- and outputs. It can be deployed through all industries.	
Brown	12-24 V DC + (VCC) Current limits: 12 V: 8 A 24 V: 5 A	Note: Do not swap the power supply polarity on the Brown and Blue wires! The PCB is coupled to the housing through a capacitor. Current limit levels can be adjusted through Actuator Connect™.
Blue	Connect Blue to negative - (GND)	
Red	Extends the actuator features*: - Standard run (Default for Full version) - Impulse run - Servo (+) - Proportional (+)	For digital inputs, standard run and impulse run: 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 features*: - Standard run (Default for Full version) - Impulse run - Servo (-) - Proportional (-)	

* Customisable: The I/O Customised actuator is configured based on customer needs - for detailed information about wire functionality, please see the auto-generated data sheet (type in J-number from product label).

The I/O Full actuator is configured like an I/O Basic from factory, but with full access to all features. Connect the actuator to Actuator Connect™ via Bluetooth® or a USB adapter cable (must be purchased separately), to enable and configure various features.

I/O Customised or Full

I/O specifications

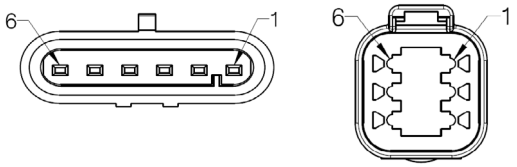
Input/Output	Specification	Comments
Yellow	Digital position output features*: - Endstop reached (inwards) (Default for Full version) - Endstop zone reached (inwards) - Target position reached - Single Hall XOR - Dual Hall (A) - Actuator running - Constantly high - Constantly low	Digital outputs: The digital outputs are either active high or active low, depending on the preferred signal type. - Output voltage min. V_{IN} - 2 V - Source current max. 100 mA
Green	Digital position output features*: - Endstop reached (outwards) (Default for Full version) - Endstop zone reached (outwards) - Target position reached - Single Hall XOR - Dual Hall (B) - Actuator running - Constantly high - Constantly low - Error codes	Single Hall XOR:  Dual Hall: 
Orange	Analogue output or Digital input feature*: - Analogue feedback (+) - Predefined position 1 - Run condition	Customisable or not used (Default for Full version)
Light Blue	Analogue output or Digital input features*: - Analogue feedback (-) - Predefined position 2	Customisable or not used (Default for Full version)
Violet	Parallel communication*	Customisable or not used (Default for Full version) The Parallel drive function will support up to 8 actuators running simultaneously. It is possible to run parallel with a main power supply or separate power supplies
White	Parallel common GND	Only to be connected to other Parallel GND and only in parallel systems
Grey	Antenna for Bluetooth®	The Grey wire is used to strengthen the Bluetooth signal, allowing a stable wireless connection and has no functionality during operation.

CAN bus (J1939)

Connection diagram

Platform 7		AMP	Deutsch
12/24 V DC +	**BROWN**	**2**	**2**
GND -	**BLUE**	**1**	**1**
Digital input HW Addressing pin 2	**RED**	**4**	**4**
Digital input HW Addressing pin 1	**BLACK**	**3**	**3**
CAN_H	**YELLOW**	**5**	**5**
CAN_L	**GREEN**	**6**	**6**
Data	**VIOLET**		
Data GND HW Addressing pin 3	**WHITE**		

Service-Interface



The BusLink software tool is available for CAN bus actuators and can be used for:

Diagnostics, manual run and configuration

The newest version is available online at LINAK.COM/TECHLINE

Please note: The BusLink configuration cable must be purchased separately

Item number for BusLink cable kit: 0367997 (adapter + USB2Lin)

CAN bus (J1939)

I/O specifications

<table>
<tr><th>Input/Output</th><th>Specification</th><th>Comments</th></tr>
<tr><td>Description</td><td>Compatible with the SAE J1939 standard. Uses CAN messages to command movement, setting parameters and to deliver feedback from the actuator.
Actuator identification is provided using standard J1939 address claim or fixed addresses.</td><td>CAN SAE J1939</td></tr>
<tr><td rowspan="6">Brown</td><td>Connect Brown to positive
12-24 V DC + (VCC)</td><td rowspan="6">Note:
Do not change the power supply polarity on the Brown and Blue wires!
Power supply GND (-) is electrically connected to the housing.
Current limit levels can be adjusted through BusLink.</td></tr>
<tr><td>
<table>
<tr><th>Vsup</th><th>Vmin</th><th>Vmax</th><th>With</th></tr>
<tr><td rowspan="2">12 V</td><td>10.5 V</td><td>16 V</td><td>Motor running</td></tr>
<tr><td>6 V</td><td>39 V</td><td>Motor not running
- CAN communication possible</td></tr>
<tr><td rowspan="2">24 V</td><td>18 V</td><td>32 V</td><td>Motor running</td></tr>
<tr><td>10 V</td><td>39 V</td><td>Motor not running
- CAN communication possible</td></tr>
</table>
</td></tr>
<tr><td>Typical values at max. load:
12 V ± 20%: 5 A
24 V ± 10%: 2.5 A

Current cut-off:
12 V: 8 A
24 V: 5 A</td></tr>
<tr><td>Blue</td><td>Connect Blue to negative
12-24 V DC - (GND)</td></tr>
<tr><td>Red</td><td>Extends the actuator</td><td rowspan="2">The signal becomes active at:
> 67% of V_{IN}
The signal becomes inactive at:
< 33% of V_{IN}
Input current: 10 mA</td></tr>
<tr><td>Black</td><td>Retracts the actuator</td></tr>
</table>

* J1939-15 refers to Twisted Pair and Shielded cables.
The standard/default cables delivered with CAN actuators do not comply with this.

BusLink cables must be purchased separately from the actuator!

Find more information about the CAN bus actuators in the CAN bus user manual

CAN bus (J1939)

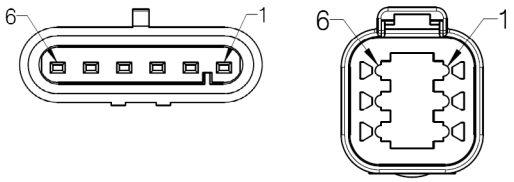
I/O specifications

Yellow	CAN_H	LA14IO with CAN bus does not contain the 120 Ω terminal resistor. The physical layer is in accordance with J1939-15.* Speed: Baudrate: 250 kbps Max. bus length: 40 meters Max. stub length: 3 meters Max. node count: 10 (can be extended to 30 under certain circumstances) Wiring: Unshielded twisted pair Cable impedance: 120 Ω (±10%)
Green	CAN_L	
Violet	Service interface	Only BusLink can be used as service interface. Use the Green adapter cable
White	Service interface GND	

CANopen

Connection diagram

Platform 8		AMP	Deutsch
12/24 V DC +	**BROWN**	**2**	**2**
GND -	**BLUE**	**1**	**1**
Digital input	**RED**	**4**	**4**
Digital input	**BLACK**	**3**	**3**
CAN_H	**YELLOW**	**5**	**5**
CAN_L	**GREEN**	**6**	**6**
Data	**VIOLET**		
Data GND	**WHITE**		



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

The BusLink software tool is available for CAN bus actuators and can be used for:
Diagnostics, manual run and configuration

The newest version is available online at **LINAK.COM**/TECHLINE

Please note: The BusLink configuration cable must be purchased separately
Item number for BusLink cable kit: 0367997 (adapter + USB2Lin)

CANopen

I/O specifications

<table>
<tr><th>Input/Output</th><th colspan="4">Specification</th><th>Comments</th></tr>
<tr><td>Description</td><td colspan="4">Compatible with the CiA 301 standard.
Uses CANopen messages to command movement, setting parameters and to deliver feedback from the actuator.
Actuator identification is provided using standard CiA 301 address claim or fixed addresses</td><td rowspan="2">CANopen</td></tr>
<tr><td rowspan="7">Brown</td><td colspan="4">Connect Brown to positive.
12-24 V DC + (VCC)</td><td rowspan="8">Note:
Do not change the power supply polarity on the Brown and Blue wires!
Power supply GND (-) is electrically connected to the housing
Current limit levels can be adjusted through BusLink</td></tr>
<tr><td>Vsup</td><td>Vmin</td><td>Vmax</td><td>With</td></tr>
<tr><td rowspan="2">12 V</td><td>10.5 V</td><td>16 V</td><td>Motor running</td></tr>
<tr><td>6 V</td><td>39 V</td><td>Motor not running
CAN communication possible</td></tr>
<tr><td rowspan="2">24 V</td><td>18 V</td><td>32 V</td><td>Motor running</td></tr>
<tr><td>10 V</td><td>39 V</td><td>Motor not running
CAN communication possible</td></tr>
<tr><td colspan="4">Typical values at max. load:
12 V ± 20%: 5 A
24 V ± 10%: 2.5 A

Current cut-off:
12 V: 8 A
24 V: 5 A</td></tr>
<tr><td>Blue</td><td colspan="4">Connect Blue to negative
12-24 V DC - (GND)</td></tr>
<tr><td>Red</td><td colspan="4">Extends the actuator</td><td rowspan="2">The signal becomes active at:
> 67% of V_{IN}
The signal becomes inactive at:
< 33% of V_{IN}
Input current: 10 mA</td></tr>
<tr><td>Black</td><td colspan="4">Retracts the actuator</td></tr>
</table>

CANopen

I/O specifications

Yellow	CAN_H	CANopen assumes a physical layer according to ISO 11898-2. Speed: Autobaud up to 250 kbps (Prototypes: 125 kbps) Max. bus length at 125 kbps: 500 m Max. bus length at 250 kbps: 250 m Max. bus length at 500 kbps: 100 m Max. stub length at 125 kbps: 22 m Max. stub length at 250 kbps: 11 m Max. stub length at 500 kbps: 5.5 m Max. node count: 127 Wiring: Unshielded twisted pair Cable impedance: 120 Ω (±10%)
Green	CAN_L	
Violet	Service interface	Only BusLink can be used as service interface. Use the Green adapter cable
White	Service interface GND	

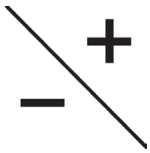
CiA 301 refers to Twisted Pair and Shielded cables. The standard/default cables delivered with the CANopen enabled actuator do not comply with this.

LIN bus

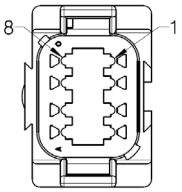
Connection diagram

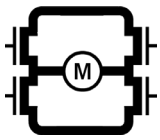
Platform 6

Deutsch

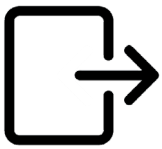


24 V DC +	**BROWN**	**2**
GND -	**BLUE**	**1**





Digital input	**RED**	**4**
Digital input	**BLACK**	**3**



Digital output	**YELLOW**	**7**
Digital output	**GREEN**	**8**

Communication	**VIOLET**	**6**
Communication GND	**WHITE**	**5**

LIN bus

I/O specifications

Input/Output	Specification	Comments
Description	Each LINAK® actuator with LIN bus interface has the ability to act as LIN bus follower node in the LIN bus cluster. The LIN bus is able to provide feedback information about piston position, including if endstop is reached, error information, system identification data and actual current at runtime. It is also possible to send input commands to the system and invoke actuator movement based on direction.	LOCAL INTERCONNECT NETWORK
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: 12 V: 8 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. Current limit levels can be adjusted through BusLink.
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	LIN communication	Used for LIN communication and as service interface. Only BusLink can be used as service interface. Use blue adapter cable (item no. 0147999)
White	Communication GND	

Troubleshooting

Symptom	Possible Cause	Action
Motor runs, but spindle does not move	Gearing system or spindle damaged.	Please contact LINAK®.
No motor sound or movement of piston rod	The actuator is not properly connected to the power supply.	Check the connection to the power supply or the external control unit (if any).
	Customer fuse burned.	Check the fuse.
	Cable damaged.	Change the cable.
	For IC Advanced only: Wrongly connected.	For IC Advanced only: Please make sure that the power supply polarity is properly connected, otherwise you might damage the actuator. Check the wire connection on the internal control unit.
Excessive power consumption	Misalignment or overload in the application.	Align or reduce the load.
		Try running the actuator without a load.
Actuator cannot lift full load or motor runs too slowly	Misalignment or overload in the application.	Align or reduce the load.
		Try running the actuator without a load.
	Insufficient power supply.	Check the power supply.
	For IC Advanced only: Internal current limit reached. Actuator speed is too low.	For IC Advanced only: Connect the actuator to BusLink and check the existing parameters.

Troubleshooting

Symptom	Possible Cause	Action
No signal or incorrect feedback output	Cable damaged.	Change the cable.
	Wrongly connected.	Check the wiring.
	Signal is constantly high/low.	Run the actuator to fully extended and retracted positions.
	Feedback output overloaded.	Reduce the load according to your chosen feedback type.
	For IC Advanced only: Incorrect feedback output/level.	For IC Advanced only: Connect the actuator to BusLink and check for correct feedback option.
Actuator runs in smaller steps	Insufficient power supply.	Check the power supply.
	Load is higher than specified.	Reduce the load.
	For IC Advanced only: Internal safety procedure activated.	For IC Advanced only: Connect the actuator to BusLink and check the following: - Reason for last stop (page 53) - Current cut-off levels in both directions.
Actuator cannot hold the chosen load	Load is higher than specified.	Reduce the load.

For further assistance, please contact your local LINAK® supplier.

Troubleshooting for Parallel

Symptom	Possible Cause	Action
Actuators do not move	The actuators are not properly connected to the power supply.	Check the connection to the power supply or the external control unit (if any) Please make sure that the power supply polarity is properly connected, otherwise you might damage the actuator Please see Non-Critical info below.
	Wrong number of actuators in the system.	Check if the number of actuators in the system matches the number that was ordered.
	Communication wires are not properly connected.	Check the Parallel Communication wires for all actuators.
	Signals Run In/Run Out are not properly connected.	Check the wire connection on the internal control unit.
	Position lost.	Disconnect all cables, connect the actuator(s) to BusLink one at a time and check the following: - Reason for last stop (page 53)
		After everything is connected, put power on all actuators at the same time. Then wait 10 seconds before the Run In/Run Out signals are activated.
		If this does not work, initiate the Parallel Manual Service Mode (page 48)
Actuators cannot lift full load	Insufficient power supply.	Check the power supply while the actuator is running.
	Overload in application.	Reduce the load.
		Connect actuator(s) to BusLink one at a time and check the following: - Type of chosen Parallel System - Reason for last stop (page 53) - Current cut-off levels in both directions Please see Non-Critical info below.
		After everything is connected, put power on all actuators at the same time. Then wait 10 seconds before the Run In/Run Out Signals are activated.

Only for Non-Critical Parallel:

Even if not all of the actuators are connected, the connected actuators will run after re-powering. Find more information on page 41.

Troubleshooting for Parallel

Symptom	Possible Cause	Action
Actuators run in smaller steps before stop	Insufficient power supply.	Check the power supply while the actuator is running.
		Connect the actuator(s) to BusLink one at a time and check the following: - Reason for last stop (page 53) - Current cut-off levels in both directions
		After everything is connected, put power on all actuators at the same time. Then wait 10 seconds before the Run In/Run Out Signals are activated.
Signal cable damaged or removed under operation	All actuators stop in the same position.	The signal and power cables MUST be re-connected to all actuators. Ensure that no actuator is missing in the system. Otherwise, the system will not work, even after re-powering.
		After everything is connected, put power on all actuators at the same time. Then wait 10 seconds before the Run In/Run Out Signals are activated.

BusLink Service Counter - Reason for Last Stop

Possible Cause	Action/Info
H-bridge error Internal SMPS error	Please contact your local LINAK® supplier for further instructions.
Overcurrent	The actuator(s) cannot continue in the same direction. Reactivation is needed in the opposite direction.
Endstop reached error	Please contact your local LINAK supplier
Hall error	The actuator(s) stop. When seeing Hall error, the actuator goes into 'position lost', and the whole system will need initialisation. Find more info on the initialisation procedure below.
Out of range temperature for ambient location Out of range temperature at FET location The above can be due to high environment temperature or high duty cycle	The error causes the actuator(s) to stop. After elimination of the error (cooling down) and reactivation of the movement, the actuator(s) will move normally. This may not be used for stopping the actuator(s).
Overvoltage	When detecting overvoltage, the actuator(s) stop. The actuator(s) remain stopped until the error condition is removed. To remove the error condition, the voltage level must be below 38 V, and the Run In/Run Out Signals must be removed before the next movement.
Undervoltage	When detecting undervoltage, the actuator(s) stop. The actuator(s) remain stopped until the error condition is removed. To remove the error condition, the voltage level must be above 8 V, and the Run In/Run Out Signals must be removed before the next movement.

Initialisation Procedure

To initialise the actuator(s), move each actuator into the fully extended and fully retracted position. Either initialise the actuators one at a time through BusLink, or use the Parallel Manual Service mode.

In case the initialisation does not solve the issue, please contact your local LINAK supplier.

For more information and easy set-up, please view the Quick Guide for BusLink.

Specifications

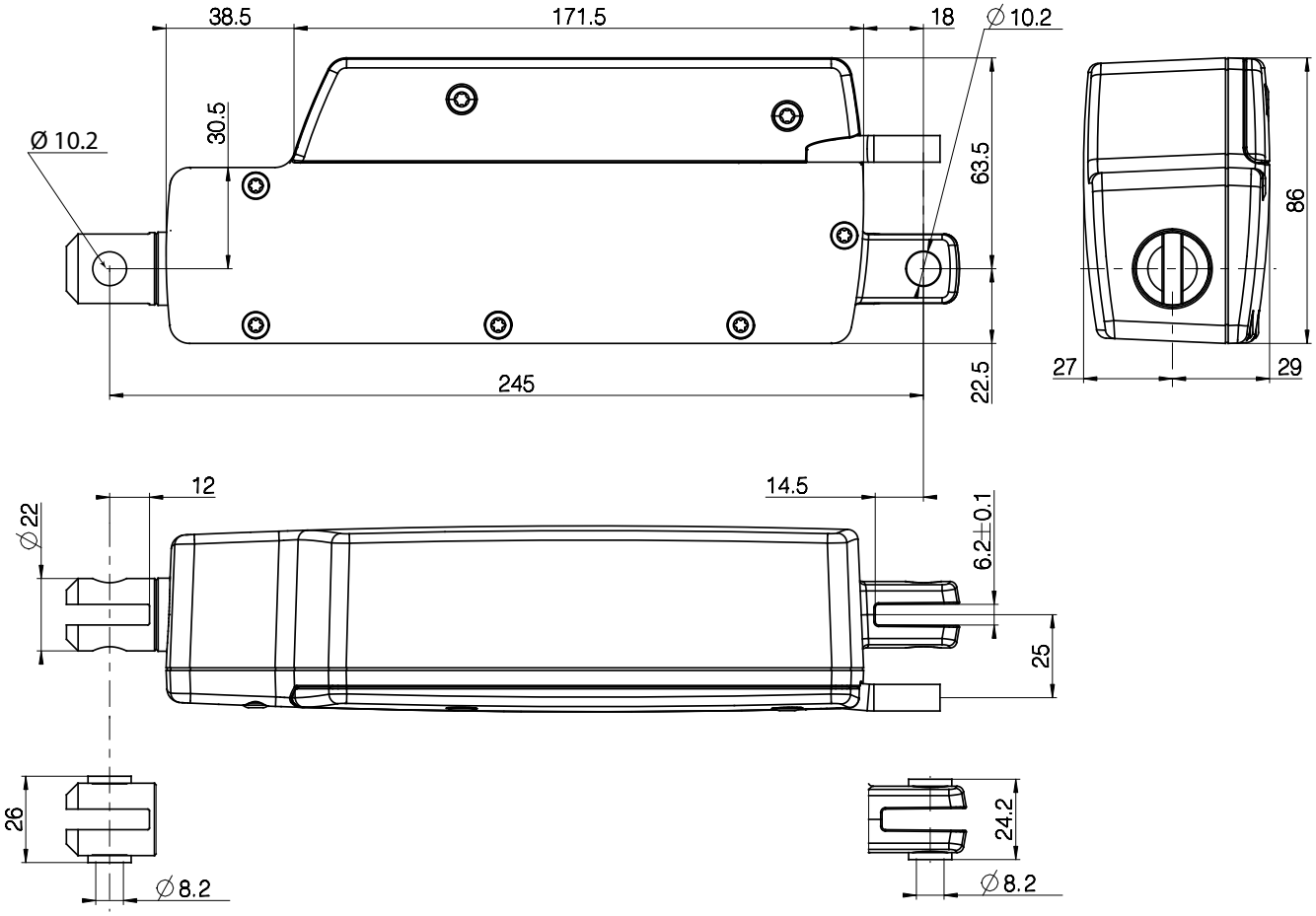
Motor:	Permanent magnet motor 12 or 24 V
Cable:	Motor: 8 x 18 AWG PVC cable
Housing:	The housing is made of casted aluminium, coated for outdoor use and harsh conditions
Spindle Part:	Inner tube: Stainless steel AISI304/SS2333 Acme spindle: Trapezoidal spindle with high efficiency
Temperature Range:	- 40 °C to + 85 °CFor IECEx/ATEX: - 25 °C to + 65 °C - 40 °F to + 185 °F - 13 °F to + 149 °F Full performance + 5 °C to + 40 °C
End Play:	2 mm maximum
Weather Protection:	Rated IP66 for outdoor use. Furthermore, the actuator can be washed down with a high-pressure cleaner (IP69K)
Compatibility:	The LA14IO IC is compatible with SMPS-T160. For combination possibilities, please see the User Manual for SMPS-T160

Usage

- Duty cycle at 750 N and 2 mm pitch is max. 20 % (4 min. drive and 16 min. rest)
  Duty cycle at 300 N and 4 mm pitch is max. 40 % (8 min. drive and 12 min. rest)
  The duty cycles are valid for operation within an ambient temperature of +5 °C to +40 °C
- Storage Temperature: -55 °C to + 105 °C
- Noise Level: With standard motor: 50-53 dB (A)
  With fast motor: 58-63 dB (A)
  Measuring method DS/EN ISO 3743-1 (actuator not loaded)

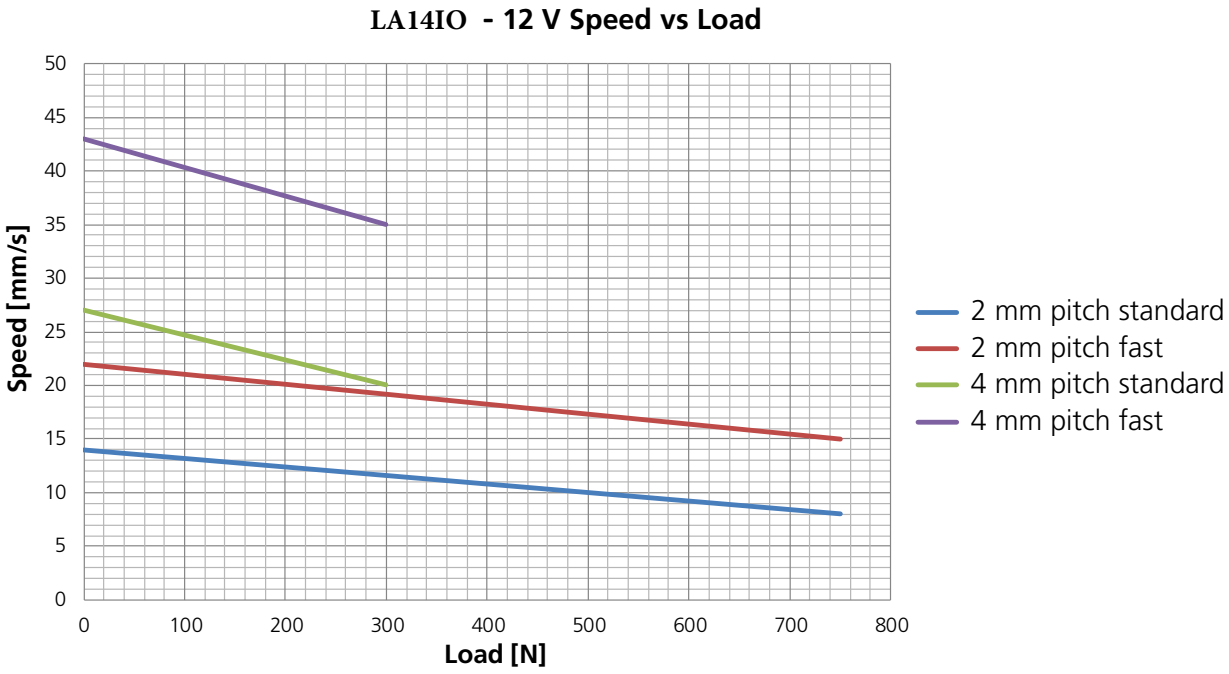
Actuator Dimensions

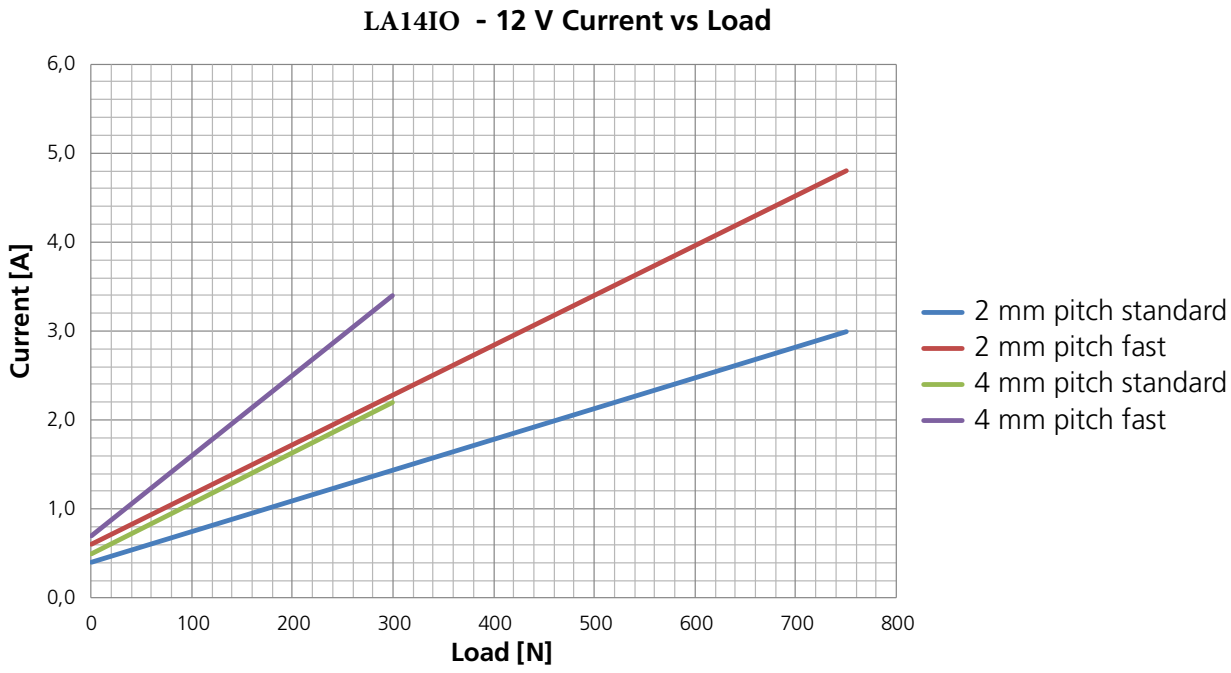
TECHLINE® LA14IO



Speed and Current Curves - 12 V

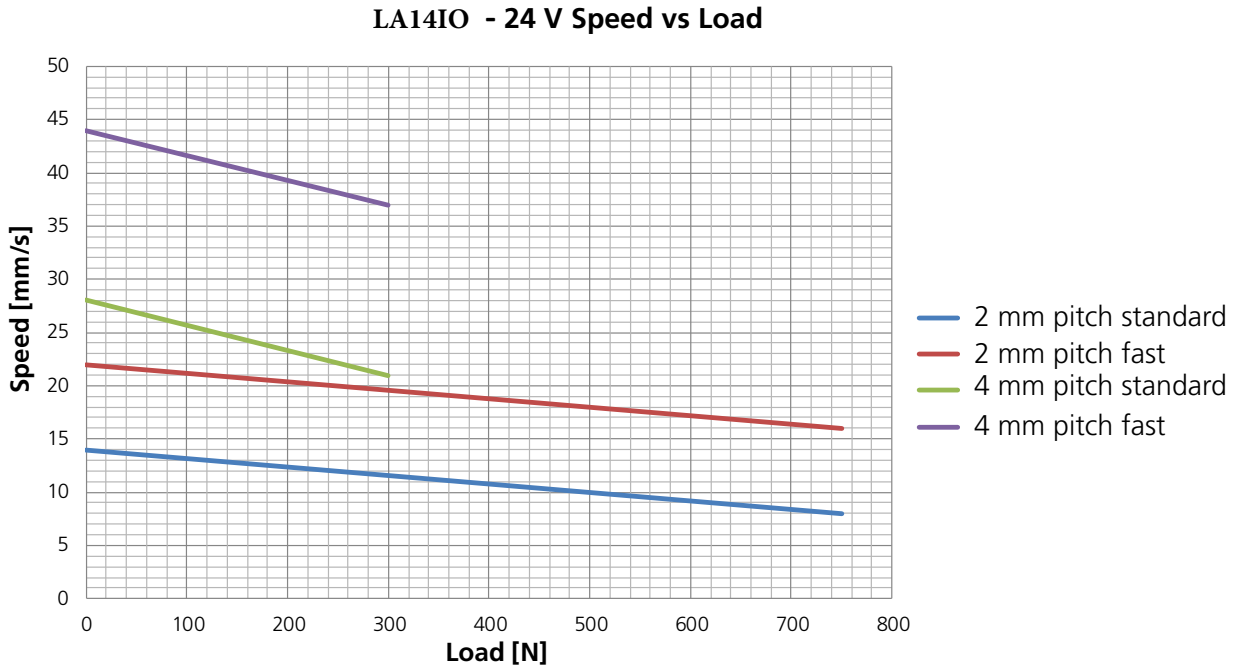
The charts below contain typical values, which are made with a stable power supply and an ambient temperature of 20 °C.

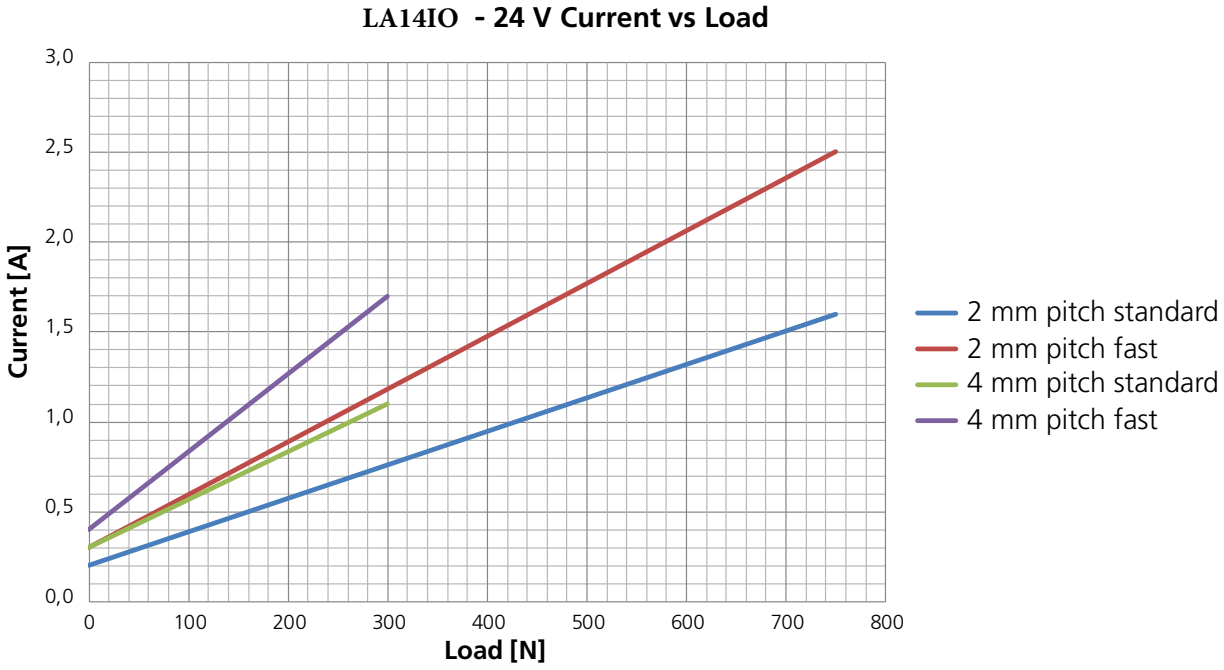




Speed and Current Curves - 24 V

The charts below contain typical values, which are made with a stable power supply and an ambient temperature of 20 °C.





Test of Conducted and Radiated Emission (EMC)

All TECHLINE® actuators have been tested in accordance with EN55011 class B (2007) (CISPR 11). A 1 m cable has been used in the test set-up.

Actuator without H-bridge

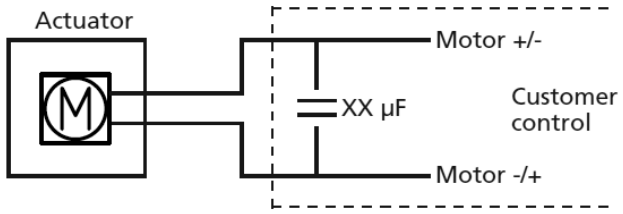
1) For normal operation the following is valid:

- Radiated emission requirements are met.
- Conducted emission requirements are met. However, to meet with these requirements, a capacitor has been mounted across the motor wires outside the actuator, and tests have then been made with this capacitor. Capacitor values for some of the TECHLINE actuators can be found in the scheme below.

To comply with EN55011 class B (2007), a capacitor must be added across the motor wires, or the connected control box must have similar/better filtering. The actuator is not delivered with a built-in capacitor, because then it would not be possible to PWM the motor for those who would want to do that.

Please view the scheme below for the correct choice of capacitor for the actuator in question.

Product	Capacitor value
LA14IO	4.7 µF



2) For systems/operations that use PWM-control, it is up to the customer to test and meet the requirements.

Actuator with H-Bridge

1) For normal operation with soft start/stop the following is valid:

- The actuator has been tested when operating with constant 80% PWM.
- Radiated emission requirements are met.
- Conducted emission requirements are met.

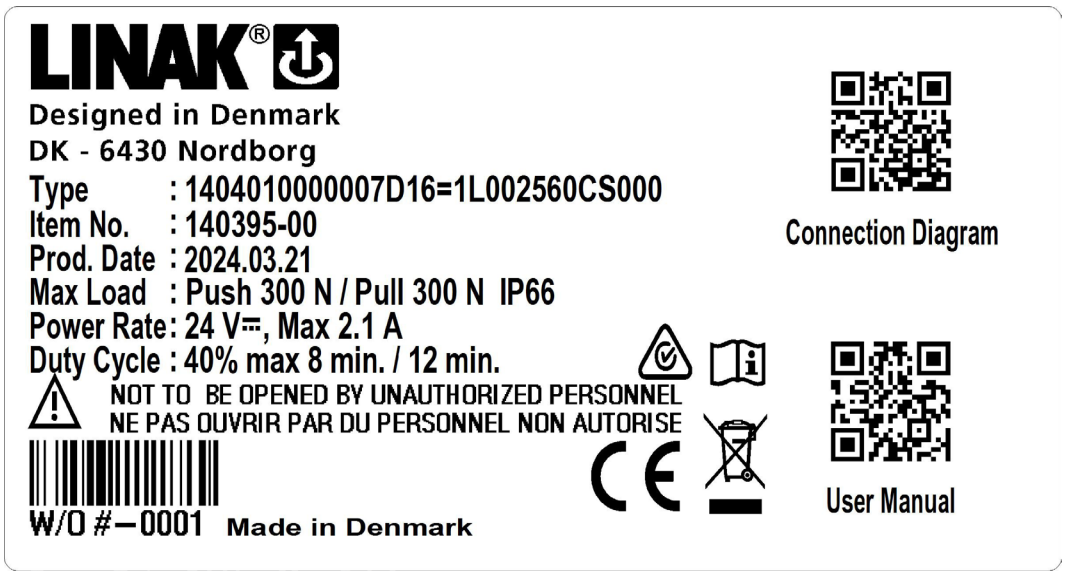
2) For systems with LINAK® PWM regulation (among other things parallel operation and speed regulation) the following is valid:

- Radiated emission requirements are met.
- Conducted emission requirements are met.

3) Speed regulation:

- If the speed is regulated below a nominal speed of 80% (80% PWM), it is necessary to mount a filter in order to comply with the conducted emission requirements. For systems/operations that are speed regulated, it is up to the customer to test and meet the requirements.

Label for LA14IO



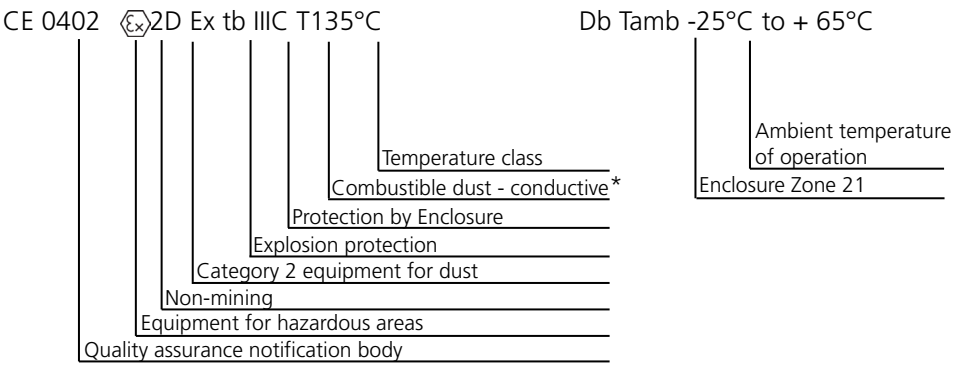
1. **Type: 1402013000000A06-11002450CS000**
   Describes the basic functionality of the product.
2. **Item no.: J90075**
   Sales and ordering code.
3. **Prod. Date: YYYY.MM.DD**
   Production date describes when the product has been produced. This date is the reference for warranty claims.
4. **Max Load: Push 750 N / Pull 750 N IP66**
   Describes the maximum load that the product can be exposed to in compression and tension.
   This line also contains a reference to the product's IP protection degree.
5. **Power Rate: 12 V DC / Max. 2.4 Amp**
   Input voltage for the product and maximum current consumption.
6. **Duty Cycle: 20%, Max. 4 min. / 16. min.**
   The duty cycle defines the maximum period during operation without interruption. After operation, a pause must be observed. It is important that the operator follows the instructions of the duty cycle; otherwise, a possible overload may result in reduced product life/errors.
7. **W/O #1234567-0001**
   The LINAK® work order followed by a unique sequential identification number.

IECEx/ATEX Certified (optional)

LA14IO can be ordered in an Ex certified version designed for installation in dust filled atmospheres, such as grain handling facilities, cement plants, saw mills, or other dusty surroundings.

Please note: The 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. Certified according to EN60079-0:2012 and EN60079-31:2014.



* Not a source of ignition in normal operation or when subjected to faults that may be expected, though not on a regular basis.

IECEx/ATEX Certified (optional)

Please note the following when choosing an IECEx/ATEX solution:

- Temperature range: - 25° C to +65° C depending on duty cycle.
  Full performance from +5° C to +40° C.
- Since the signal and power cables are not UV resistant they need to be shielded against UV light, e.g. day light or light from luminaries.
- No changes are to be made on the actuator after delivery, e.g. changing the back fixture or replacing cables. Otherwise the IECEx/ATEX approval will not be valid.

Only IECEx/ATEX approved cables are to be used, in order to comply with the IECEx/ATEX approvals.

Only special educated LINAK® employees should change or mount IECE/ATEX approved cables.

It is crucial that the tightness is verified before the actuator is powered up.

IECEx/ATEX cable item numbers

LA14IO IECEx/ATEX cable item no.	Length (mm) outside the actuator
0147006 - 850	790
0147006 - 1600	1540
0147006 - 5100	5040

Special conditions for use as stated in the certificates:

1. The duty cycle is max. 20% (4 min continuous drive and 16 min rest).
2. Ambient temperature area is specified to -25°C... + 65°C
3. The power supply cable is of special design fulfilling IP 6X ingress protection. The cable can be delivered in different lengths. Only cables delivered by LINAK A/S shall be mounted.
4. The connection between the actuator and the rest of the machine/device shall be conductive, and furthermore the application shall be grounded in order to remove any Electro Static Discharge. This counts for both of the actuator's fixation points (Back Fixture and Piston Rod Eye).
5. The cable is not UV-resistant and shall be protected from direct sunlight.
6. The supply shall be protected by a fuse according to the electrical data.
7. The Linear Actuator has to be installed in such a way, that highly effective potential electrostatic charges are prevented. The cleaning of the Linear Actuator shall be done only with a damp cloth.