CANopen

User Manual

LINAK®

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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.

Revision overview

Edition C

'CANopen specifications' table updated	Page 7
Connection diagram and I/O specifications for 6- and 8-pin updated	Page 8+9
Connection diagram and I/O specifications for 9- and 12-pin updated	Page 10+11
Note regarding LA14 and LA25 (12-pin) added	Page 10
Connection diagram and I/O specifications for 18-pin updated	Page 12+13
18-pin compatibility with LA76 and LA77 removed	Page 12+25
'Connection overview' table added	Page 14
Voltages removed from illustrations	Page 15-19+21
Software version added	Page 21
'Power supply' section updated	Page 23
Actuator address: Default address changed to 32 (0x20)	Page 25
Information about LSS added	Page 25
Mention of 'Internal monitoring' section removed	Page 26
'Starting procedures' table updated	Page 29
'Clear error' table added	Page 30
TDPO corrected to TPDO	Page 31, 32, 35+38
RDPO corrected to RPDO	Page 31, 38+39
Byte 0-1 in 'Process Data In (Feedback)' updated	Page 32
Byte 3 in 'Process Data In (Feedback)' updated	Page 33
Byte 3-7 in 'Process Data In (Parallel Feedback)' updated	Page 36
'Configuration' section updated	Page 39+43
2047 corrected to 2048	Page 44
FAQ updated	Page 45
Error code 25 - Position lost description updated	Page 48
EMCY error codes updated	Page 49
'Slave' changed to 'Follower'	All over the document

Edition B

6-pin diagrams added	Page 8-9
HW Addressing pin 1 and 3 updated	Page 10-11
GND description updated	Page 11+13
'Parallel data' removed from 18-pin	Page 12+13
'Address' changed to 'Addressing pin'	Page 12+13
Pin 6 added to I/O specifications for 18-pin actuator	Page 13
'Manual run' section updated	Page 14
HW Addressing table for 6-pin added	Page 15
HW Addressing table for 9- and 12-pin updated	Page 16
HW Addressing table for 18-pin updated	Page 17
'AUX Input' section updated	Page 18
'Current limit' section added	Page 19
Parallel 'Check power supply' updated	Page 19
CANopen EDS file information added	Page 21
'Power supply' section updated	Page 22
LC3 IC added	Page 23
LA33 removed	Page 23
LA14, LA25 and 6-pin added to 'Configuration' section	Page 23-24
'Process Data Objects (PDO)' section updated	Page 29-30
'Process Data In (Feedback)' section updated	Page 31-33
'Process Data In (Parallel Feedback)' section updated	Page 34-38
EMCY error codes added	Page 35
'Reason for Last Stop' table updated	Page 42
Error codes updated	Page 42-44
Parallel error codes updated	Page 45-46

About LINAK® CANopen actuators

LINAK TECHLINE® CANopen actuators are primarily designed with focus on mobile agriculture and industrial automation. The communication protocol relies on the CiA 301 standard. The contents of this document assume that the reader is familiar with the CiA 301 standard.

In addition to full position control, the CANopen actuator is able to provide feedback information about the piston position, service data, and full diagnostics. It also provides system identification data and actual current at runtime.

CANopen specifications

This section describes the requirements of the CANopen hardware and software interface:

The physical layer is in accordance with ISO 11898-2	
Speed	50, 100, 125, 250, or 500 kbps (changeable in Actuator Connect™ or BusLink)
Max. bus length	250 metres
Max. stub length	11 metres
Max. node count	127
Wiring	Unshielded twisted pair
Cable impedance	120 Ω (±10%)

All system tests carried out are limited to consist of 3-meter cables. Non-error tolerant physical layer with the following specifications: Low-power mode is according to ISO 11898-5.

Standards

The LINAK TECHLINE CANopen offers a communication profile defined in CiA DS 301 v.4.0.2. This includes a command set for controlling the actuator in addition to feedback status.

Connection diagram

6- and 8-pin

Applicable for: LA14, LA25, LA33, LA36, and LA37

BROWN	12/24/48 V DC
BLUE	GND
RED	Extends the actuator
BLACK	Retracts the actuator
YELLOW	CAN_H
GREEN	CAN_L
VIOLET	Not to be connected
WHITE	Not to be connected

For more information, see the Connection overview.

I/O specifications

6- and 8-pin

Input/Output	Specification		Comments
Description	CANopen is compatible with the CiA 301 standard. Uses CAN messages to command movement, setting parameters and to deliver feedback from the actuator. Actuator identification is provided, using hardware and software addressing.		CANopen
Brown	12/24/48* V DC *48 V only for LA36 and LA37		Note: Do not swap the power supply polarity on the Brown and Blue wires! The PCB is coupled to the housing through a capacitor.
Blue	GND For more information, see the section 'Power supply'		
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	Manual run is disabled during CANopen bus activity. Must not be high during power-up.
Black	Retracts the actuator		
Yellow	CAN_H		Actuators with CANopen do not contain the 120 Ω terminal resistor. The physical layer is in accordance with ISO 11898-2. Speed: Autobaud up to 500 kbps
Green	CAN_L		
Violet	Not to be connected		Service interface: Use Actuator Connect™ as service tool interface.
White	Not to be connected		

Connection diagram

9- and 12-pin

Applicable for: LA14, LA25, LA21, LA33, LA36, LA37, LA73, LA76, LA77, and LC3 IC

BROWN	24/48 V DC
BLUE	GND
ORANGE	Split power supply V DC
RED	Extends the actuator HW Addressing pin 2
BLACK	Retracts the actuator HW Addressing pin 1
LIGHT BLUE	HW Addressing pin 3
YELLOW	CAN_H
GREEN	CAN_L
VIOLET	Parallel data +
WHITE	Parallel data -
GREY	Not to be connected

LA14 and LA25 (12-pin) only available with flying leads. Connections (Deutsch and AMP) only valid for 9-pin.

For more information, see the Connection overview.

I/O specifications

9- and 12-pin

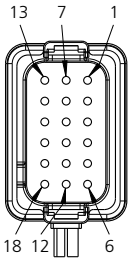
<table>
<tr><th>Input/Output</th><th colspan="2">Specification</th><th colspan="2">Comments</th></tr>
<tr><td>Description</td><td colspan="2">CANopen is compatible with the CiA 301 standard. Uses CAN messages to command movement, setting parameters and to deliver feedback from the actuator. Actuator identification is provided, using hardware and software addressing.</td><td colspan="2">CANopen</td></tr>
<tr><td>Brown</td><td colspan="2">24/48 V DC</td><td colspan="2" rowspan="2">Note: Do not swap the power supply polarity on the Brown and Blue wires!
The PCB is coupled to the housing through a capacitor.</td></tr>
<tr><td>Blue</td><td colspan="2">GND
For more information, see the section ‘Power supply’</td></tr>
<tr><td>Orange</td><td colspan="2">Split power supply V DC</td><td colspan="2">24 V DC with ≈28 mA current consumption.
48 V DC with ≈16 mA current consumption.
The split power supply uses the common GND from the power supply (Blue).
Split power supply is only for powering the communication of the integrated controller.</td></tr>
<tr><td>Red</td><td>Extends the actuator / Hardware Addressing (2)</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><td rowspan="2">Manual run:
If not connected to VCC at startup:</td><td rowspan="2">Hardware addressing:
When used for Hardware addressing, connect to VCC or open/GND.</td></tr>
<tr><td>Black</td><td>Retracts the actuator / Hardware Addressing (1)</td></tr>
<tr><td>Light Blue</td><td colspan="2">Hardware Addressing (3)</td><td colspan="2">When used for Hardware addressing, connect to VCC or open/GND.</td></tr>
<tr><td>Yellow</td><td colspan="2">CAN_H</td><td colspan="2" rowspan="2">Actuators with CANopen do not contain the 120 Ω terminal resistor. The physical layer is in accordance with ISO 11898-2.
Speed: Autobaud up to 500 kbps</td></tr>
<tr><td>Green</td><td colspan="2">CAN_L</td></tr>
<tr><td>Violet</td><td colspan="2">Parallel data +</td><td colspan="2" rowspan="2">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.</td></tr>
<tr><td>White</td><td colspan="2">Parallel data -</td></tr>
<tr><td>Grey</td><td colspan="2">Not to be connected</td><td colspan="2"></td></tr>
</table>

Connection diagram

18-pin

Applicable for: LA36 and LA37

Deutsch



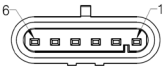
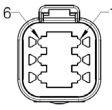
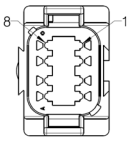
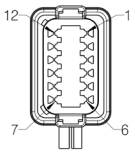
4	+ Split power supply
5	+ 12/24 V DC
6	+ 12/24 V DC
11	GND
12	GND
7	Extends the actuator
8	Retracts the actuator
10	Service port Parallel data +
13	Addressing pin 1 [LSB]
14	Addressing pin 2
15	Addressing pin 3
16	Addressing pin 4 [MSB]
17	CAN_H
18	CAN_L
1	Not to be connected
2	Not to be connected
3	Not to be connected
9	Not to be connected

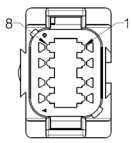
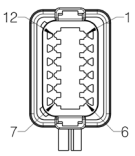
I/O specifications

18-pin

Input/Output	Specification		Comments
Description	CANopen is compatible with the CiA 301 standard. Uses CAN messages to command movement, setting parameters and to deliver feedback from the actuator. Actuator identification is provided, using hardware and software addressing.		CANopen
Pin 4	+ Split power supply		12 V DC with ≈58 mA current consumption. 24 V DC with ≈32 mA current consumption. The split power supply uses the common GND from the power supply (Blue). Split power supply is only for powering the communication of the integrated controller.
Pin 5 Pin 6	12/24 V DC For more information, see the section 'Power supply'	Both pins 5 and 6 must be used.	Note: Do not swap the power supply polarity on the Brown and Blue wires! The PCB is coupled to the housing through a capacitor.
Pin 11 Pin 12	GND Parallel data -	Both pins 11 and 12 must be used.	Common ground for motor, split power supply, service port, and internal parallel connection
Pin 7	Extends the actuator		The signal becomes active at: > 67% of V_{IN} = ON The signal becomes inactive at: < 33% of V_{IN} = OFF Input current: 10 mA
Pin 8	Retracts the actuator		
Pin 10	Service port Parallel data +		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.
Pin 13	Addressing pin 1 [LSB]		Pins 13 to 16 are dedicated for CAN ID. The four inputs can deliver 15 unique addresses. Connect to VCC or open/GND.
Pin 14	Addressing pin 2		
Pin 15	Addressing pin 3		
Pin 16	Addressing pin 4 [MSB]		
Pin 17	CAN_H		Actuators with CANopen do not contain the 120 Ω terminal resistor. The physical layer is in accordance with ISO 11898-2. Speed: Autobaud up to 500 kbps
Pin 18	CAN_L		
Pin 1	Not to be connected		Factory interface: Connecting these pins may damage the actuator
Pin 2			
Pin 3			
Pin 9			

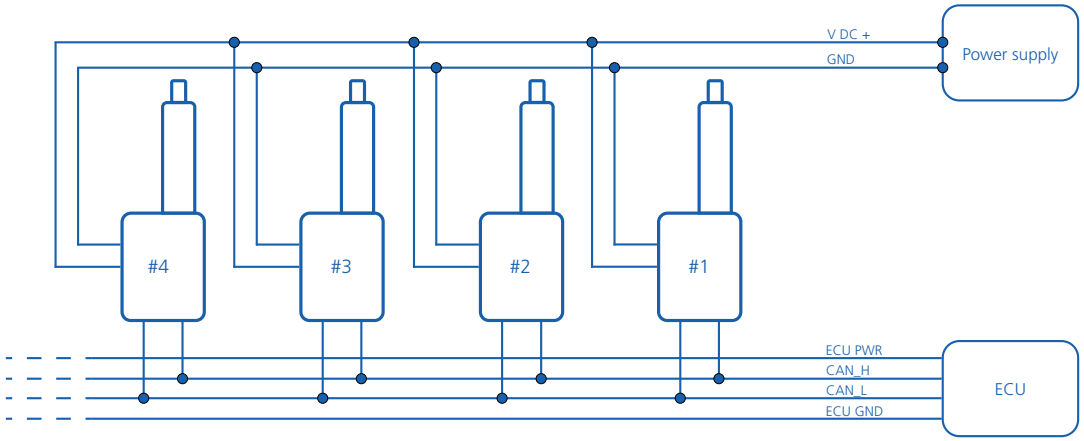
Connection overview

	LA21, LA33, LA36, LA37, LA33, LA76, LA77		LA36 6-pin		LA36 9-pin	LA14 and LA25 12-pin
	AMP	Deutsch	AMP	Deutsch	Deutsch	Deutsch
						
Wire colour						
BROWN	2		-	-	-	11
BLUE	1		-	-	-	12
RED	-		2	2	5	8
BLACK	-		1	1	4	7
YELLOW	-		5	5	2	5
GREEN	-		6	6	3	6
VIOLET	-		4	4	7	4
WHITE	-		3	3	8	3
ORANGE	-		-	-	1	2
LIGHT BLUE	-		-	-	6	9

	LA21, LA33, LA36, LA37, LA76, LA77	
	Deutsch	
		
Wire colour	Y-cable	
BROWN	2	2
BLUE	1	1
RED	4	9
BLACK	3	8
YELLOW	7	6
GREEN	8	7
VIOLET	6	5
WHITE	5	4
ORANGE	-	3
LIGHT BLUE	-	10

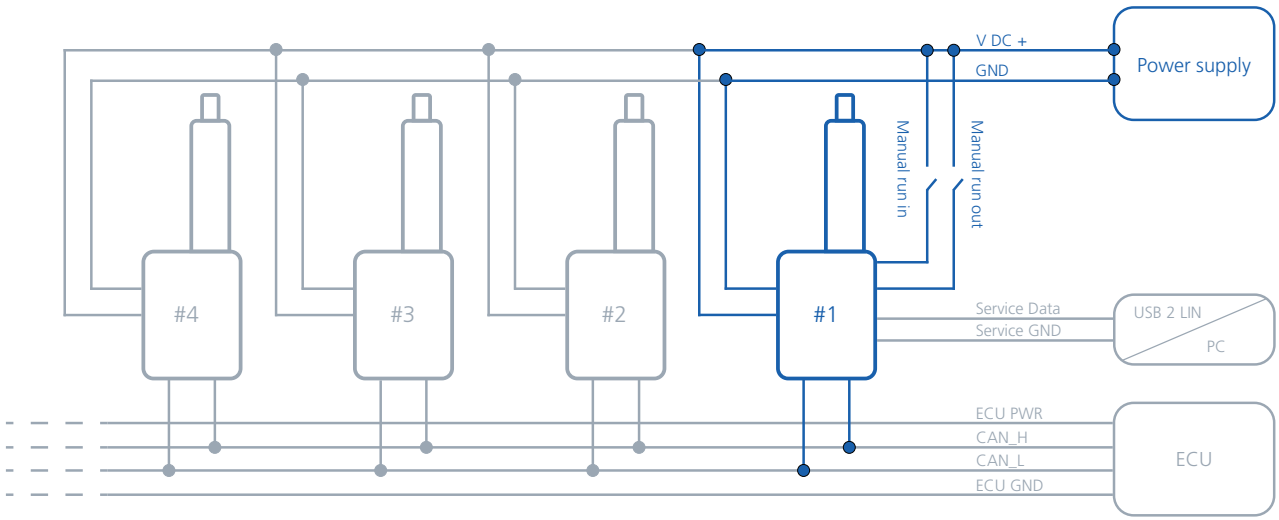
Electrical installation

ISO 11898-2 defines the Reduced Physical Layer, 500 Kbps, Unshielded Twisted Pair (UTP), and runs with separate communication and power supply wires.



Manual run

During Manual run mode where Inputs 1-3 (1-4 for 18-pin) are low or floating on power-up, the actuator will continue sending status feedback on the CAN bus. However, if other CAN devices are active on the network, Manual run mode will be disengaged. The CAN software address range 1-127 is reserved for this mode. The service interface is also accessible during Manual run mode.



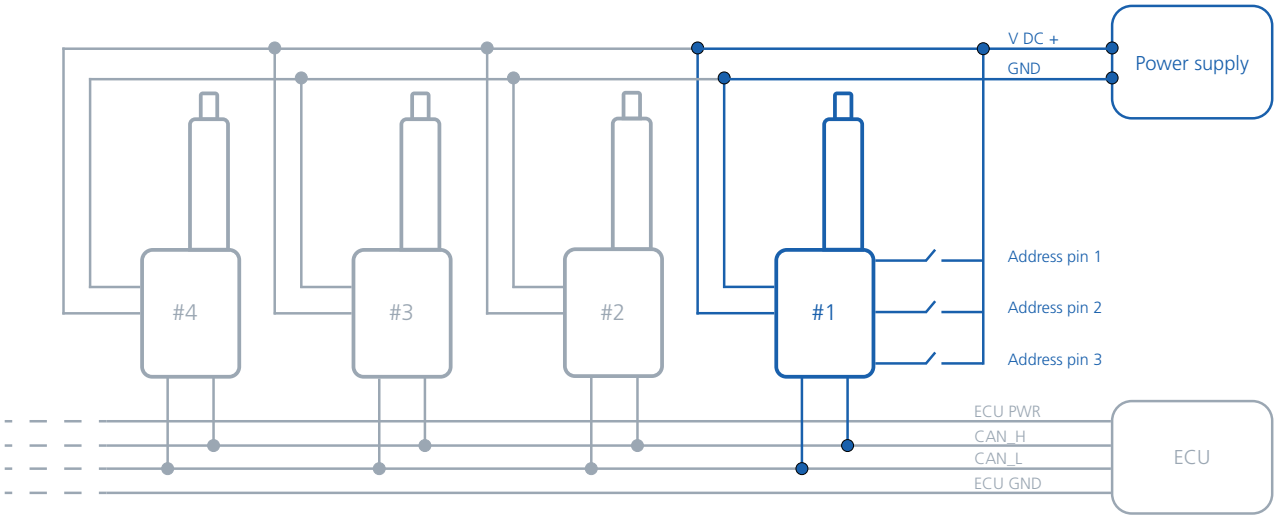
For more information about wiring colours or pin numbers, please see the Connection Diagram.

CAN hardware addressing

HW addressing determines the initial actuator address. A number of input pins, depending on the actuator model, are available for address configuration. The set configuration will be read by the actuator at power-up. If all address pins are open (not connected), the actuator will enter Manual run mode.

6-pin connector

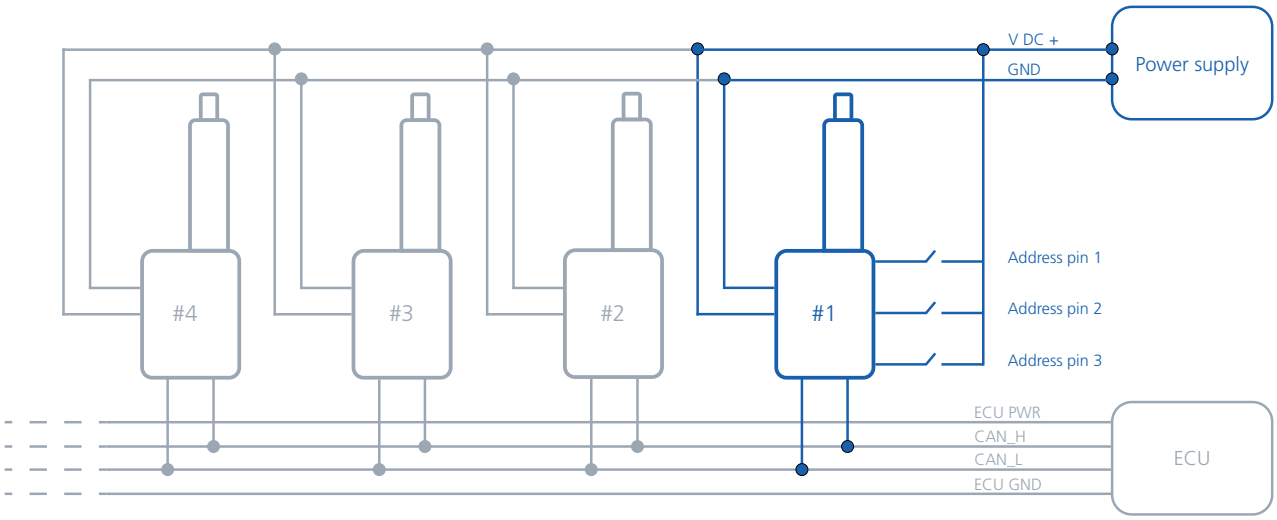
	Black	Red	White	Address
HW addressing				Node ID
HW	Pin 1 [MSB]	Pin 2	Pin 3 [LSB]	
N/A	Open	Open	Open	Manual run
1	Open	Open	High	0x01 (1)
2	Open	High	Open	0x02 (2)
3	Open	High	High	0x03 (3)
4	High	Open	Open	0x04 (4)
5	High	Open	High	0x05 (5)
6	High	High	Open	0x06 (6)
7	High	High	High	0x07 (7)



CAN hardware addressing

9- and 12-pin connector

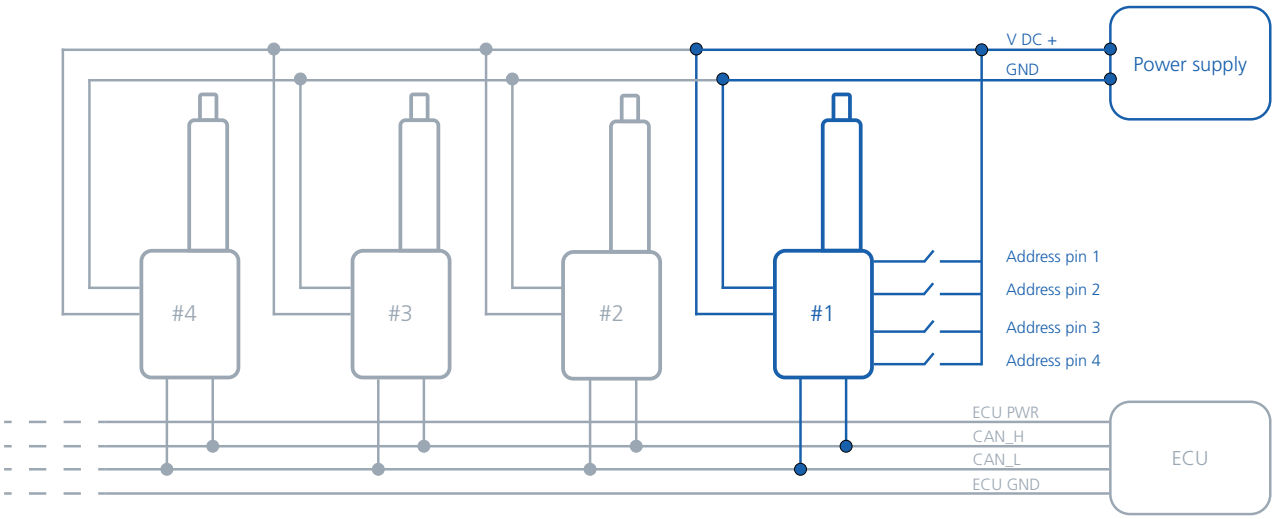
	Black	Red	Light Blue	Address
HW addressing				Node ID
HW	Pin 1 [MSB]	Pin 2	Pin 3 [LSB]	
N/A	Open	Open	Open	Manual run
1	Open	Open	High	0x01 (1)
2	Open	High	Open	0x02 (2)
3	Open	High	High	0x03 (3)
4	High	Open	Open	0x04 (4)
5	High	Open	High	0x05 (5)
6	High	High	Open	0x06 (6)
7	High	High	High	0x07 (7)



CAN hardware addressing

18-pin connector

	Pin 16	Pin 15	Pin 14	Pin 13	Address
HW addressing					Node ID
HW	Pin 4 [MSB]	Pin 3	Pin 2	Pin 1 [LSB]	
N/A	Open	Open	Open	Open	Manual run
1	Open	Open	Open	High	0x01 (1)
2	Open	Open	High	Open	0x02 (2)
3	Open	Open	High	High	0x03 (3)
4	Open	High	Open	Open	0x04 (4)
5	Open	High	Open	High	0x05 (5)
6	Open	High	High	Open	0x06 (6)
7	Open	High	High	High	0x07 (7)
8	High	Open	Open	Open	0x08 (8)
9	High	Open	Open	High	0x09 (9)
10	High	Open	High	Open	0x0A (10)
11	High	Open	High	High	0x0B (11)
12	High	High	Open	Open	0x0C (12)
13	High	High	Open	High	0x0D (13)
14	High	High	High	Open	0x0E (14)
15	High	High	High	High	0x0F (15)



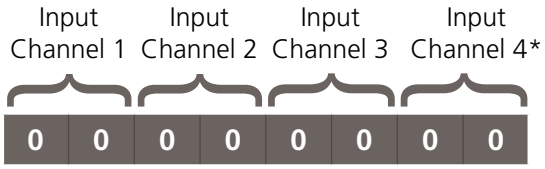
AUX input

The AUX inputs are all-purpose inputs for external devices such as buttons and sensors. Each of the three (or four) input channels consists of two bits which represent the voltage level on the input channel, thereby allowing four levels of the VCC to be expressed through a CAN bus message.

Each channel consists of two bits divided into four levels of VCC:

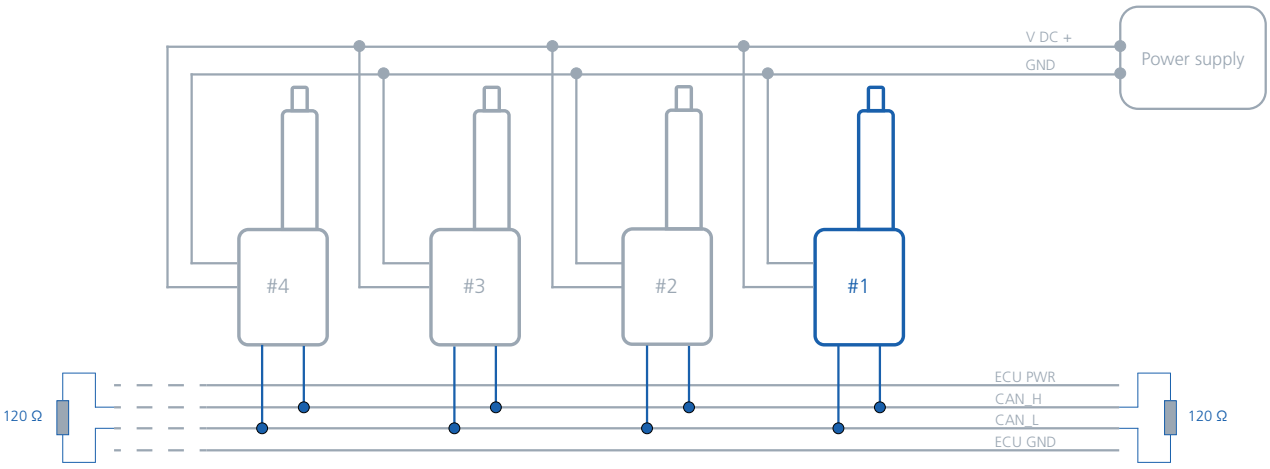
Input bits		VCC				
1	1	■	■	■	■	76-100%
1	0	■	■	■		51-75%
0	1	■	■			26-50%
0	0	■				0-25%

The three (or four) AUX inputs will be present in the last byte of Feedback Status Details of Process Data Objects (PDO).



Termination

Termination resistors of 120 Ω shall be connected according to the figure below. The actuator does not have internal termination.



* Only available for 18-pin actuators

Protection

Current limit

Current limits can be configured to avoid crushing when meeting an obstacle. These values can be adjusted according to your preferences. Use default values or fine-tune your current limits with 0.25 A/bit.

It is important to note that current limits should not be relied upon as a general stop function, as this will potentially stress the mechanics and could lead to long-term damage to the actuator.

Furthermore, current limits do not correlate directly with the actuator's load curves, meaning they should not be used as indicators of load. Various tolerances in components such as the spindle, nut, and gears can also affect the current consumption of the actuator. Operation in environments with temperatures below 0°C will also increase the current consumption. When temperature drops below 0°C, the default current limit will change to a higher value.

Actuator specific current limit values (above and below reference temp.) can be found in the respective actuator user manual or in the Actuator Connect service tool under 'Protection'.

Parallel

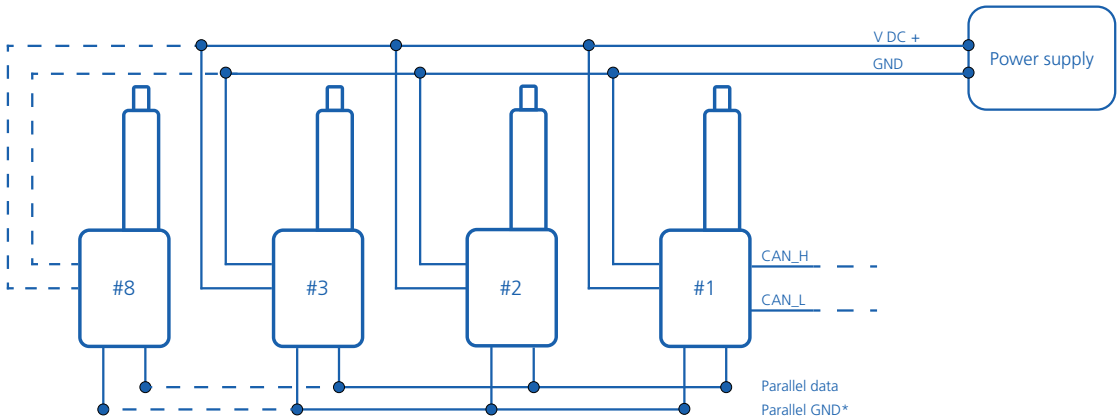
The industrial LINAK® actuators can be ordered with parallel functionality. If this feature is enabled, it is possible to run up to 8 actuators in a parallel system with just one actuator communicating CAN to the master. The system works as a critical parallel, meaning that all actuators must be present in the system and have the exact same configuration (both mechanical and software functionality).

Below is a checklist to ensure that the system operates as intended:

Action	Description
Set up parallel in Actuator Connect™	Each actuator must be configured to operate in parallel (2-8 actuators). This can be set up using the Actuator Connect™ tool. *Please note: In some cases this is pre-configured from factory.*
Wire up the system	The actuators feature internal communication for parallel synchronisation and error codes.
Check cable lengths	Keep the total length of the communication line below 40 metres to avoid communication dropouts. In a parallel system with 8 actuators this would result in signal cable lengths of <5 metres.
Check power supply	It is also possible to use two or more separate power supplies in parallel under the condition that they have the same voltage and wattage output. It is essential that all power supplies share a common ground connection (Blue wire). Please respect actuator specifications regarding voltage level and current consumption!

Parallel

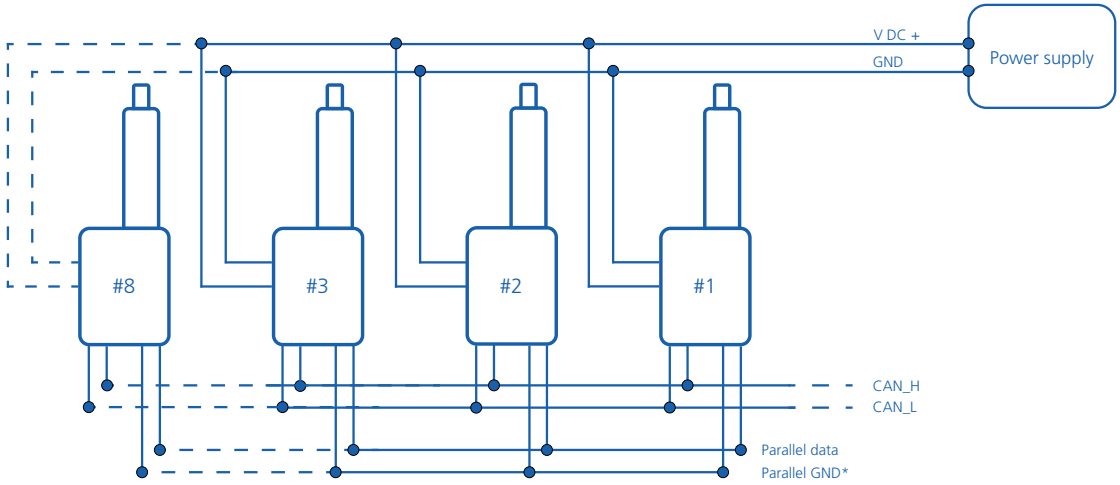
Option 1 - A simple parallel setup



In a simple parallel setup there is only one actuator connected to the BUS communication. This actuator receives run commands and shares data with the BUS controller. The remaining actuators in the system are only connected to internal parallel communication. This way, the internal communication ensures that the system operates in parallel and stops in case of an obstacle, or if an error occurs on one of the actuators.

The actuators share simple error messages with the master, which can be distributed via the BUS communication.

Option 2 - Bus communication on all actuators



If there is a need for e.g. monitoring the real-time data of each actuator, it is possible to connect all actuators as nodes to the BUS communication. This will provide comprehensive usage data, which can be used to enhance performance in the application. Similar to option 1, this requires that all actuators are connected to internal parallel communication.

It is also possible to use two or more separate power supplies in parallel under the condition that they have the same voltage and wattage output. It is essential that both power supplies share a common ground connection (Blue wire).

* The 18-pin connector uses Power GND pin 11 and 12 as Parallel GND.

Not applicable for 18-pin actuators versions prior to SW01050031V1-2.

Getting started

This section further describes how to communicate with CANopen actuators and contains examples of typical user scenarios and application solutions. All examples include references to registers which are further described in detail below.

CANopen EDS

An Electronic Data Sheet (EDS) file provides a digital description of a device's capabilities and object dictionary. It includes details such as data types, default values, and communication parameters, enabling network configuration tools to recognize and configure the device. EDS files are commonly used by PLCs and other network tools to integrate and commission CANopen devices within a system.

The LINAK_CANopen_EDS file is available for download by using the following link: LINAK_CANopen_EDS.zip

Functional overview

The LINAK® TECHLINE CANopen offers a communication profile defined in CiA DS 301 v4.0.2. This includes a command set for controlling the actuator in addition to feedback status.

- Process Data Objects (PDO)
- Service Data Objects (SDO)
- Objects with special functions for synchronisation, error alert and response:
  - Synchronisation object (SYNC)
  - Emergency object (EMCY)
- Network Management Objects (NMT) for initialisation, error monitoring and status monitoring of the device:
  - NMT commands
  - Boot-up messages
  - Heartbeat messages

Power supply

CANopen actuators are available with the following supply voltage range: 12 V, 24 V, and 48 V DC.
The accepted supply voltage range is specified for the version as shown below:

Supply voltage	Function	Voltage range			Valid for
		V_{MIN}	V_{TYP}	V_{MAX}	
12 V	Motor	10.5 V	12 V	21 V	6-pin, 8-pin, 12-pin, and 18-pin
	CAN communication*	8 V	12 V	39 V	
24 V	Motor	18 V	24 V	32 V	6-pin, 8-pin, 9-pin, 12-pin and 18-pin
	CAN communication*	10 V	24 V	39 V	
48 V	Motor	36 V	48 V	58 V	6-pin and 9-pin
	CAN communication*	10 V	48 V	60 V	

* When split power supply is used, the CANopen interface will be powered via a separate power input (split supply) from the motor, while the motor power is still used as common ground (GND). If split power supply is not used, the CANopen interface will be powered via the motor supply.

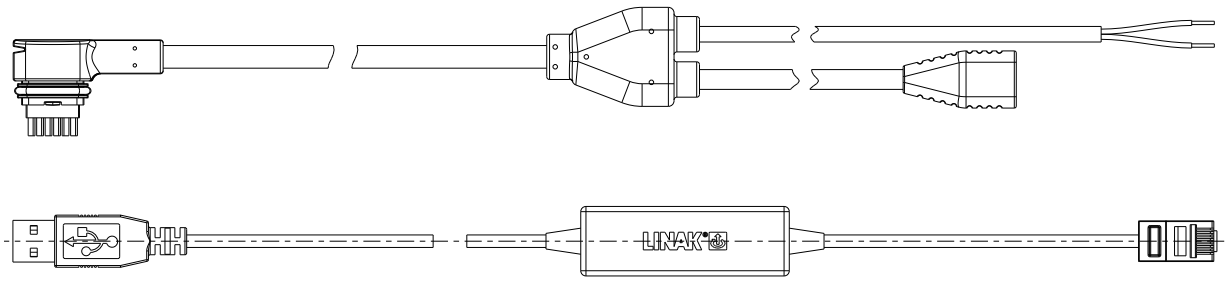
Configuration

Before being integrated into a CANopen system, a few of the actuator parameters must be checked and eventually changed. This preparation is done via the use of the configuration tool Actuator Connect™ and guarantees that the actuator is able to execute basic functionality.

Further fine-tuning may be required to fulfil system or application requirements. Via this tool it is also possible to access historical usage data and real-time monitoring.

Valid for LA14 and LA25:

A separate configuration cable kit (item no. 0257901 = straight Y-cable + USB2LIN) is required to use Actuator Connect™ on a PC. This cable must be connected to the 9-pin connector on the actuator side. On the opposite side, power must be applied to the flying leads, and the USB connector must be inserted into your PC.

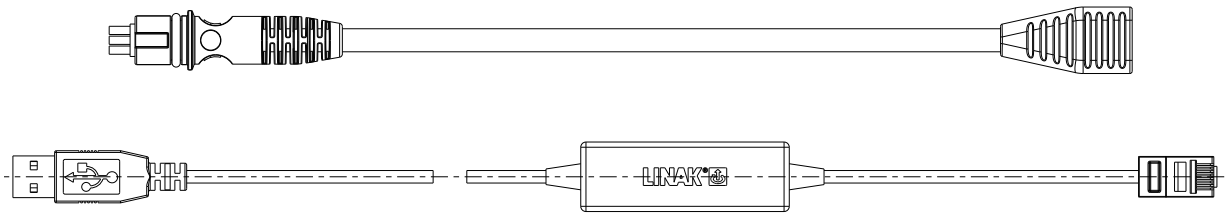


Configuration

Valid for LA36:

6-pin

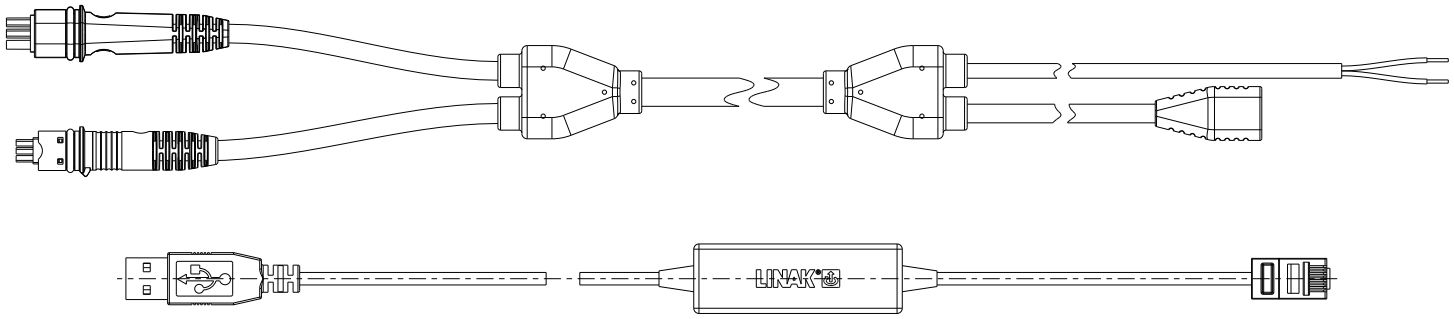
A separate configuration cable kit (item no. 367997 = USB2LIN + adapter cable) is required to use Actuator Connect™ on a PC. This cable must be connected to the 6-pin connector on the actuator side. On the opposite side, power must be applied to the flying leads, and the USB connector must be inserted into your PC.



Valid for LA21, LA33, LA36, LA37, LA73, LA76, LA77, and LC3 IC:

9-pin

A separate configuration cable kit (item no. 0367996 = straight Y-cable + USB2LIN) is required to use Actuator Connect™ on a PC. This cable must be connected to the 9-pin connector on the actuator side. On the opposite side, power must be applied to the flying leads, and the USB connector must be inserted into your PC.



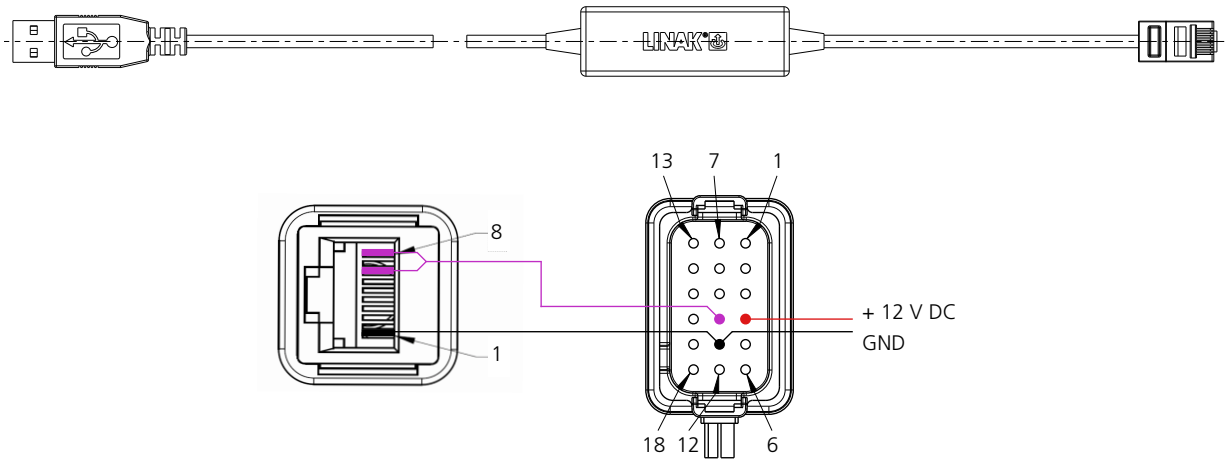
For more information about wiring/connector, please see the Connection Diagram.

Configuration

Valid for LA36 and LA37:

18-pin

A separate USB configuration cable (USB2LIN06-X) is required to use Actuator Connect™ on a PC. This cable must be connected according to the drawing below. On the opposite side, power must be applied to Red and Black on the 18-pin connector (flying leads), and the USB connector must be inserted into your PC.



Parameters to be verified by Actuator Connect™

Parameters	Description
Actuator address	Valid range: 128-247 Default address: 32 (0x20)
Bit rate	50, 100, 125, 250, 500 or Auto kbps Default bit rate: 250 kbps

Use the CiA® 305 Layer Setting Services (LSS) for CANopen node ID assignment and changing CANopen bitrate.

Command details

Run in/out

Inwards and outwards movement is performed by sending the proper identifier while the actuator is in CANopen mode. In Service mode, movement is achieved by using the LINAK® Actuator Connect PC software or by applying the proper signals to the Manual run wires. When using Manual run, a start-up delay of up to 150 ms must be expected due to safety measures.

Position

Max. min. position: Stroke length
Level setting steps: 0.1 mm

Load, ramping up and down, and specific actuator type (spindle/gear box) should be taken into account in regards to accuracy.
The Position SetPoint can be set dynamically. If the new SetPoint involves a change in running direction, the ramps will follow the pre-set ramp time.

Max. current

Applying a current limit will induce a degree of mechanical overload protection to the installation.

Max. current limit: Fixed limit*
Level setting steps: 0.25 A

* The custom current limit setting cannot overrule the fixed factory setting which ensures partial protection of the electronics and mechanics.

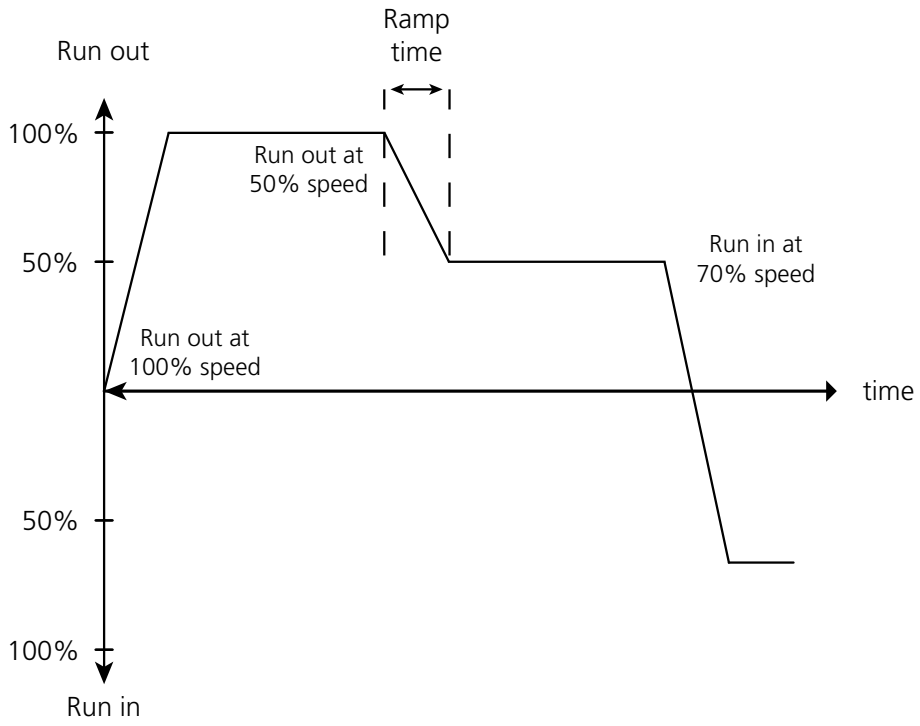
Speed control

The speed is controlled using Pulse Width Modulation (PWM).

Min. duty cycle:	0%
Max. duty cycle:	100%
Level setting steps:	0.5%

Closed loop speed control will ensure a more accurate speed. In order to obtain this, the maximum speed is reduced to approximately 80%. The actual speed will be influenced by the gear and spindle size in the actuator.

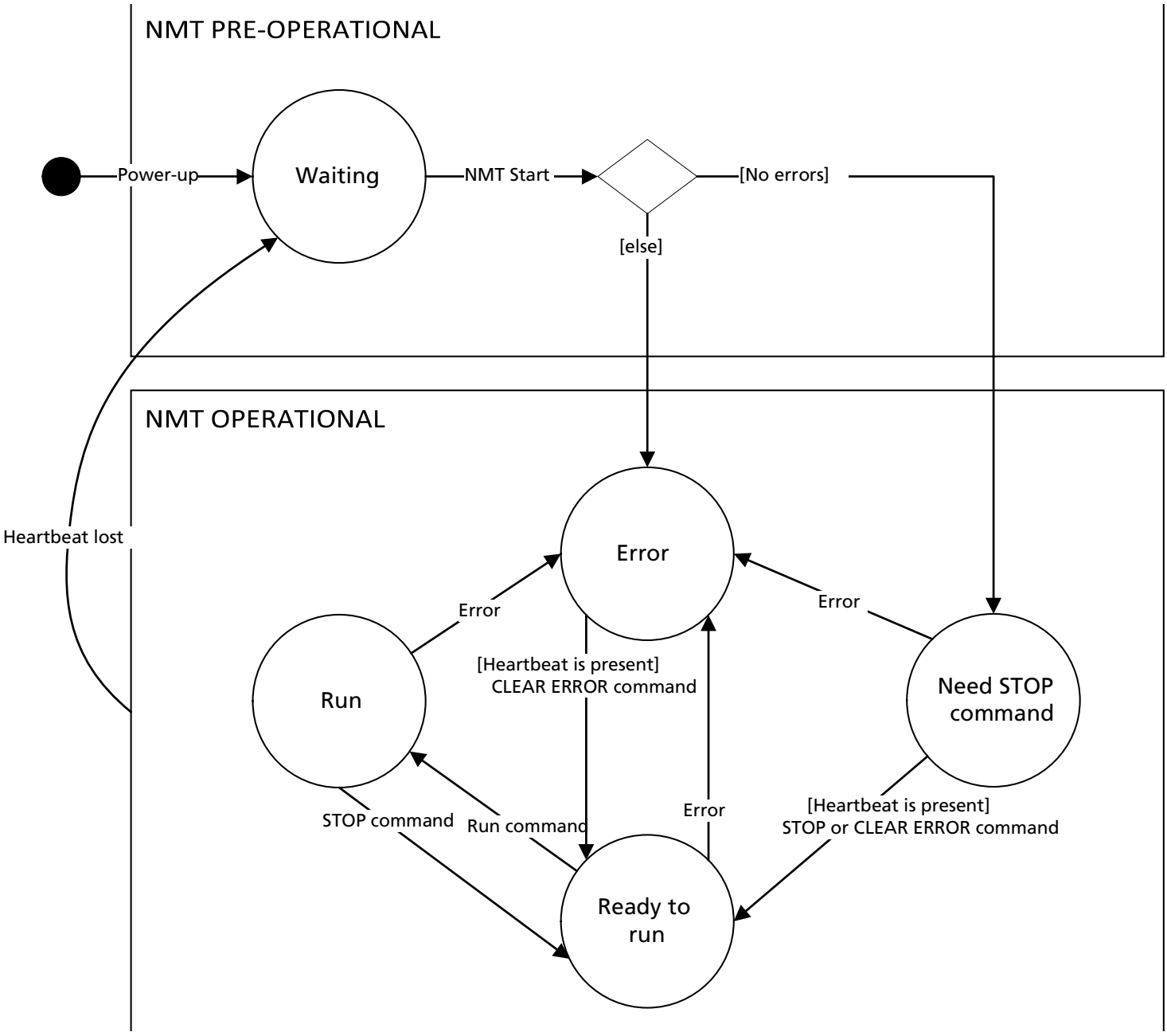
The speed setting can be changed dynamically at run time.



Start-up and running conditions

In order to run the actuator, please take the following into account:

- If the Heartbeat is not present, the actuator will not accept any PDO commands.
- Commands must be re-sent if communication is interrupted or the Heartbeat signal is missing.
- RUN IN and RUN OUT commands cannot be issued if errors are present (error code != 0).
- Heartbeat status can be read with status bit 5.
- Upon entering OPERATIONAL, actuator requires a ‘Stop’ or ‘Clear error’ command.



Starting procedures

Follow the example below to complete the startup procedures necessary for successful communication.

The CAN address in this example is in 32 (0X20).

CAN ID [hex]	Data [hex]								Description	
	0	1	2	3	4	5	6	7		
701	05								Master heartbeat. Sent every 100 ms	Startup Procedures
720	00								Actuator boot-up	
620	23	16	10	01	C8	00	01	00	Receive Service Data Objects (SDO)	
5A0	60	16	10	01	00	00	00	00	Actuator response	
000	01	20							Network Management (NMT) Start	
1A0	00	00	00	81	01	00	00	C0	Transmit Process Data Object TPD01. 'Stop' command needed.	
220	03	FB	FB	FB	FB	FB	00	00	'Stop' command.	
1A0	00	00	00	81	00	00	00	C0	Transmit PD01. Actuator at Endstop reached in [0 mm]	Running Examples
220	01	FB	FB	FB	FB	FB	00	00	'Run out' command	
1A0	1A	00	06	88	00	31	00	CO	Transmit PD01. Actuator is running out [2.6 mm]	
1A0	F7	01	00	82	00	00	00	CO	Transmit PD01. Actuator reached endstop outwards [50.3 mm]	
220	02	FB	FB	FB	FB	FB	00	00	'Run in' command	
1A0	60	00	06	90	00	32	00	C0	Transmit PD01. Actuator is running in [9.6 mm]	
1A0	00	00	00	81	00	00	00	C0	Transmit PD01. Actuator reached endstop inwards [0 mm]	

Master
Follower

To use a different CAN address than 32 (0x20), please redefine the CAN ID to suit the need.

Clear error

If an error occurs, the actuator will be stopped, and normal movement will not be possible.

Step	Read/ Write	Process Data Objects*	Action
1	R	PDI Subindex 4	Confirm that “Error Code” is not = 0
2	W	PDO Subindex 1	“Position” set to = 64256 (Clear Error Codes)
3	R	PDI Subindex 4	Confirm that “Error Code” is = 0 If “Error Code” is not = 0, then correct the error in the system and repeat step 2.

* PDI = Process Data In / PDO = Process Data Out

Process Data Objects (PDO)

The CANopen PDO (Process Data Object) is used for efficient transfer of real-time operational data across CANopen nodes.

A PDO can contain 8 bytes of data and multiple object parameter values in a single frame.

Process Data Out (Command)

Command **Receive Process Data Object 1 (RPDO1)** Real-time cyclic data exchanged							
Byte 7 [MSB]	**Byte 6**	**Byte 5**	**Byte 4**	**Byte 3**	**Byte 2**	**Byte 1**	**Byte 0 [LSB]**
Reserved		Ramp Down	Ramp Up	Speed	Current Limit	Position	

Index 0x2000						
Subindex	**Byte(s)**	**Command**	**Data type**	**Details**	**Description**	**Scaling**
1	Byte 0-1	Position	UINT16	0-64255 [0x0000-FAFF]	Run to position	0.1 mm/bit
				64256 [0xFB00]	Clear Error Code (see TPDO1 byte 4)	
				64257 [0xFB01]	Run out	
				64258 [0xFB02]	Run in	
				64259 [0xFB03]	Stop	
				642560 [0xFB04]	Recovery run out	
				64261 [0xFB05]	Recovery run in	
				64262-65535 [0xFB06-FFFF]	Invalid value Actuator will not run	
2	Byte 2	Current Limit	UINT8	0-250 [0x00-FA]	Max. current limit	0.25 A/bit
				251 [0xFB]	Default current limit	
				252-255 [0xFC-FF]	Invalid value Actuator will not run	
3	Byte 3	Speed	UINT8	0-200 [0x00-C8]	Speed	0.5% bit
				201-250 [0xC9-FA]	100% speed	
				251 [0xFB]	Default speed	
				252-255 [0xFC-FF]	Invalid value Actuator will not run	

Process Data Out (Command)

Index 0x2000						
Subindex	**Byte(s)**	**Command**	**Data type**	**Details**	**Description**	**Scaling**
4	Byte 4	Ramp Up	UINT8	0-250 [0x00-FA]	Ramp up time	0.05 s/bit
				251 [0xFB]	Default ramp up time	
				252-255 [0xFC-FF]	Invalid value Actuator will not run	
5	Byte 5	Ramp Down	UINT8	0-250 [0x00-FA]	Ramp down time	0.05 s/bit
				251 [0xFB]	Default ramp down time	
				252-255 [0xFC-FF]	Invalid value Actuator will not run	
6	Byte 6	Reserved	UINT8	Reserved	Reserved	
7	Byte 7		UINT8			

Process Data In (Feedback)

Feedback **Transmit Process Data Object 1 (TPDO1)** Real-time cyclic data exchanged							
Byte 7 [MSB]	**Byte 6**	**Byte 5**	**Byte 4**	**Byte 3**	**Byte 2**	**Byte 1**	**Byte 0 [LSB]**
AUX Inputs	Speed		Error Code	Status Flags	Current Draw	Position	

Index 0x2001						
Subindex	**Byte(s)**	**Command**	**Data type**	**Details**	**Description**	**Scaling**
1	Byte 0-1	Position	UINT16	0-64255 [0x0000-FAFF]	Position of the actuator	0.1 mm/bit
				64256-65023 [0xFB00-FDFF]	Reserved	
				65024 [0xFE00]	Position lost	
				65025-65535 [0xFE01-FFFF]	Reserved	

Process Data In (Feedback)

Index 0x2001						
Subindex	**Byte(s)**	**Command**	**Data type**	**Details**	**Description**	**Scaling**
2	Byte 2	Current Draw	UINT8	0 [0x00]	Not running	0.25 A/bit
				1-250 [0xFA]	Motor current draw	
				251-253 [0xFB-FD]	Reserved	
				254 [0xFE]	Fault in current measurement circuit	
				255 [0xFF]	Reserved	
3	Byte 3	Status Flags	UINT8	b0	Endstop reached in	Bit-independent status indicators
				b1	Endstop reached out	
				b2	Overcurrent	
				b3	Running out	
				b4	Running in	
				b5	Communication heartbeat needed	
				b6	Actuator is running outside nominal conditions	
				b7	Reserved. Always high	
4	Byte 4	Error Code*	UINT8	0 [0x00]	No error detected	8-bit error code showing the current active error code with the highest priority only
				1 [0x01]	Power on block state	
				2 [0x02]	Position sensor	
				3 [0x03]	Overvoltage	
				4 [0x04]	Undervoltage	
				5 [0x05]	Communication sync.	
				6 [0x06]	Endstop switch	
				7 [0x07]	Temperature	
				8 [0x08]	Motor controller	
				9 [0x09]	Internal power supply	

Process Data In (Feedback)

Index 0x2001						
Subindex	**Byte(s)**	**Command**	**Data type**	**Details**	**Description**	**Scaling**
4	Byte 4	Error Code*	UINT8	10 [0x0A]	Internal current measurement	8-bit error code showing the current active error code with the highest priority only
				11 [0x0B]	Parallel arbitration	
				12 [0x0C]	Position no changing	
				13 [0x0D]	Position initialisation not possible	
				14 [0x0E]	Alone in parallel system	
				15 [0x0F]	Incorrect number in parallel system	
				16 [0x10]	Hardware	
				17 [0x11]	BLDC motor	
				18 [0x12]	Parallel communication	
				19 [0x13]	Parallel running	
				20 [0x14]	Parallel setup stopped	
				254 [0xFE]	Other internal error (Not specified)	
				255 [0xFF]	Other external error (Not specified)	
5	Byte 5-6	Speed	UINT16	0-4015 [0x0000-0FAF]	Speed of the actuator	0.1 mm/s /bit
				4016-65535 [0x0FB0-FFFF]	Reserved	
6	Byte 7	AUX Inputs**	UINT8	b0-b1	Input level 1	1 bit /25%VCC
				b2-b3	Input level 2	
				b4-b5	Input level 3	
				b6-b7	Input level 4	

* See Error Code descriptions in section: Error codes
** See AUX Inputs description in section: AUX inputs

Process Data In (Parallel feedback)

Parallel feedback Transmit Process Data Object 2 (TPDO2) Real-time cyclic data exchanged							
Byte 7 [MSB]	**Byte 6**	**Byte 5**	**Byte 4**	**Byte 3**	**Byte 2**	**Byte 1**	**Byte 0 [LSB]**
Reserved					Parallel Status Flags	Parallel Error Code	Parallel Error Source

Index 0x2002						
Subindex	**Byte(s)**	**Command**	**Data type**	**Details**	**Description**	**Scaling**
1	Byte 0	Parallel Error Source	UINT8	0 [0x00]	No error detected	
				1-255 [0x01-FF]	CAN ID of actuator with the highest priority error	
2	Byte 1	Parallel Error Code*	UINT8	0 [0x00]	No error detected	8-bit error code showing the current active error code with the highest priority only
				1 [0x01]	Current overload	
				2 [0x02]	Hardware	
				3 [0x03]	Temperature	
				4 [0x04]	Overvoltage	
				5 [0x05]	Undervoltage	
				6 [0x06]	Analogue input out of range	
				7 [0x07]	Position not changing	
				8 [0x08]	Power on block state	
				9 [0x09]	Position initialisation not possible	
				10 [0x0A]	Parallel start-up	
				11 [0x0B]	Parallel running	
				12 [0x0C]	BLDC motor	

* See Parallel Error Code descriptions in section: Parallel error codes

Process Data In (Parallel feedback)

Index 0x2002						
Subindex	**Byte(s)**	**Command**	**Data type**	**Details**	**Description**	**Scaling**
2	Byte 1	Parallel Error Code*	UINT8	13 [0x0D]	Endstop switch	8-bit error code showing the current active error code with the highest priority only
				14 [0x0E]	Parallel communication	
				15 [0x0F]	Parallel setup stopped	
				24 [0x18]	Other error	
				25 [0x19]	Position lost	
3	Byte 2	Parallel Status Flags	UINT8	b0	Parallel endstop reached out	Bit-independent status indicators
				b1	Parallel endstop reached in	
				b2	Parallel is running outside nominal conditions	
				b3-b7	Reserved	
4-8	Byte 3-7	Reserved	UINT8	Reserved	Reserved. Always high	

* See Parallel Error Code descriptions in section: Parallel error codes

Service Data Objects (SDO)

The SDO (Service Data Object) allows access to read/write values of a CANopen node's object dictionary (OD) over the CAN bus.

The purpose can be to update an OD entry (SDO download) or read an entry (SDO upload), which allows for e.g. node configuration and diagnostics.

Communication profile area

Communication profile area **SDO Index 0x1000 - 0x1A01** Acyclic data exchanged						
Index [hex]	**Subindex [hex]**	**Name**	**Data Type**	**Details**	**Description**	**Access**
Device type - Reference: CiA 301 7.5.2.1						
0x1000	0x00	Device Type	UINT32			R
Error Register - Reference: CiA 301 7.5.2.2						
0x1001	0x00	Error Register				R
COB-ID SYNC - Reference: CiA 301 7.5.2.5						
0x1005	0x00	COB-ID SYNC		Default value (0x80)		R/W
Manufacturer Hardware Version - Reference: CiA 301 7.5.2.9						
0x1009	0x00	Manufacturer Hardware Version			PCBA name	R
COB-ID EMCY - Reference: CiA 301 7.5.2.17						
0x1014	0x00	COB-ID EMCY		Default value (0x80 + Node ID)		R
Inhibit Time EMCY - Reference: CiA 301 7.5.2.18						
0x1015	0x00	Inhibit Time EMCY		Default value (0)		R/W
Consumer Heartbeat Time - Reference: CiA 301 7.5.2.19						
0x1016	0x00	Number of entries		Default value (0x01)		R
	0x01	Consumer heartbeat time		Default value (0xC8)		R/W
Producer Heartbeat Time - Reference: CiA 301 7.5.2.20						
0x1017	0x00	Producer Heartbeat Time		Default value (0x00)		R/W
Identity Object - Reference: CiA 301 7.5.2.21						
0x1018	1	Vendor ID	UINT32	0x000004AA	LINAK	R
	2	Producer Code	UINT32		Software number (e.g. 1050000)	R
	3	Revision Number	UINT32		CANopen interface revision	R
	4	Serial Number	UINT32		Same as UIN	R

Communication profile area

Communication profile area SDO Index 0x1000 - 0x1A01 Acyclic data exchanged						
Index [hex]	**Subindex [hex]**	**Name**	**Data Type**	**Details**	**Description**	**Access**
SDO Server Parameter - Reference: CiA 301 7.5.2.33						
0x1200	1	COB-ID Client -> Server (RX)		Default value (0x600 + Node ID)		R
	2	COB-ID Server -> Client (TX)		Default value (0x580 + Node ID)		R
RPDO Communication Parameter see - Reference: CiA 301 7.5.2.35						
0x1400	1	0x300 + Node ID		Default value (0x200 + Node ID)		R/W
	2	0x400 + Node ID				R/W
RPDO Mapping Parameter - Reference: CiA 301 7.5.2.36						
0x1600		RPDO Mapping Parameter			1 to 1 mapping of 0x2000 (Command)	R
TPDO Communication Parameter 0 - Reference: CiA 301 7.5.2 37						
0x1800	1	COB-ID Used by TPDO	UINT32		Default value (0x180 + Node ID)	R
	2	Transmission Character	UINT8		Event-driven (Manufacturer specific)	R/W
	5	Event Timer	UINT16	250 [0xFA]	1 ms/bit	R/W
TPDO Communication Parameter 1 - Reference: CiA 301 7.5.2.37						
0x1801	1	COB-ID Used by TPDO	UINT32		Default value (0x180 + Node ID)	R
	2	Transmission Character	UINT8		Event-driven (Manufacturer specific)	R/W
	5	Event Timer	UINT16	250 [0xFA]	1 ms/bit	R/W
TPDO Mapping Parameter 0 - Reference: CiA 301 7.5.2.38						
0x1A00		TPDO Mapping Parameter 0			1 to 1 mapping of 0x2001 (Feedback)	
TPDO Mapping Parameter 1 - Reference: CiA 301 7.5.2.38						
0x1A01		TPDO Mapping Parameter 1			1 to 1 mapping of 0x2002 (Parallel Feedback)	

Manufacturer-specific profile area

Configuration

Manufacturer-specific profile area SDO Index 0x4000 Configuration - Acyclic data exchanged						
Subindex	**Parameter**	**Data type**	**Details**	**Description**	**Scaling**	**Access**
0x00	Highest sub-index reported	UINT8				R
0x01	Current Limit - Outwards	UINT8	0-255 [0x00-FF]	Works only when RPDO1 "Current Limit" is 251 [0xFB]*	0.25 A/bit	R/W
0x02	Current Limit - Inwards					
0x03	Ramp Up - Outwards	UINT16	0-65535 [0x0000-FFFF]	Works only when RPDO1 "Ramp Up" is 251 [0xFB]	1 ms/bit	AR/W
0x04	Ramp Up - Inwards					
0x05	Ramp Down - Outwards			Works only when RPDO1 "Ramp Down" is 251 [0xFB]		
0x06	Ramp Down - Inwards					
0x07	Max. Speed	UINT8	0-200 [0x00-C8]	Overrules RPDO1 "Speed"	0.5% /bit	R/W
			201-255 [0xC9-FF]		100%	
0x08	Virtual Endstop - Outwards	UINT16	0 [0x0000]	Set the Virtual Endstop Outwards Position	Disabled	R/W
			1-699 [0x0001-02BB]		Do NOT set below 70 mm*	
			700-65535 [0x02BC-FFFF]		0.1 mm/bit	
0x09	Virtual Endstop - Inwards	UINT16	0 [0x0000]	Set the Virtual Endstop Inwards Position	Disabled	R/W
			1-350 [0x0001-015E]		0.1 mm/bit	
			351-65535 [0x015F-FFFF]		Do NOT set above 35 mm**	

* Actuator must power cycle before changes apply.
** Virtual limits set in the Initialisation zone will make initialisation impossible.

Configuration

Manufacturer-specific profile area SDO Index 0x4000 Configuration - Acyclic data exchanged						
Subindex	**Parameter**	**Data type**	**Details**	**Description**	**Scaling**	**Access**
0x0A	UIN	UINT32		Unique 8-digit identification number		R
Software						
0x0B	Variant	UINT32		SW**xxxxxxx**Vx-x		R
0x0C	Version Major			SWxxxxxxxV**x**-x		
0x0D	Version Minor			SWxxxxxxxVx-**x**		
0x0E	Config. Production Order Number	UINT32		Unique 8-digit identification number		R
0x0F	Production Date			yyyymmdd		
0x10	Max. Current Seen	UINT8				
0x11	Max. FET Temperature Seen			1°C /bit - 40°		
0x12	Max. Ambient Temperature Seen					
0x13	Min. Ambient Temperature Seen					
0x14	Total Current Usage	UINT32		1 (Ampere*seconds)/bit		
0x15	Total Runtime			1 s/bit		
Number of stops due to						
0x16	Overvoltage	UINT8		Number of stops		R
0x17	FET Overtemperature					
0x18	Ambient Overtemperature					
0x19	Undervoltage					
0x1A	Hall Error					
0x1B	Endstop Switch Error					
0x1C	Default Current Limit Overloads - Out					
0x1D	Default Current Limit Overloads - In					

Configuration

Manufacturer-specific profile area SDO Index 0x4000 Configuration - Acyclic data exchanged						
Subindex	**Parameter**	**Data type**	**Details**	**Description**	**Scaling**	**Access**
Number of resettable stops due to						
0x1E	Custom Current Limit Overloads - Out	UINT8		Can be used to keep track of current overload stops from the last reset. Can only be set to 0.		R/W
0x1F	Custom Current Limit Overloads - In					
Numbers of						
0x20	Communication Errors	UINT16		Numbers of		R
0x21	Endstop Reached - Out	UINT32				
0x22	Endstop Reached - In					
0x23	Starts - Out					
0x24	Starts - In					
0x25	Total Piston Distance Travelled	UINT32		5 m/bit		R
Reason for Last Stop – ID 0: See Reason for Last Stop definitions in section below						
0x26	Reason	UINT16		Reason for stop		R
0x27	Count	UINT8		Number of stops in a row		
0x28	Powered Time	UINT32		Powered time when the last stop occurred	1 s/bit	
Reason for Last Stop – ID 1: See Reason for Last Stop definitions in section below						
0x29	Reason	UINT16		Reason for stop		R
0x2A	Count	UINT8		Number of stops in a row		
0x2B	Powered Time	UINT32		Powered time when the last stop occurred	1 s/bit	
Reason for Last Stop – ID 2: See Reason for Last Stop definitions in section below						
0x2C	Reason	UINT16		Reason for stop		R
0x2D	Count	UINT8		Number of stops in a row		
0x2E	Powered Time	UINT32		Powered time when the last stop occurred	1 s/bit	

Configuration

Manufacturer-specific profile area SDO Index 0x4000 Configuration - Acyclic data exchanged						
Subindex	**Parameter**	**Data type**	**Details**	**Description**	**Scaling**	**Access**
Reason for Last Stop – ID 3: See Reason for Last Stop definitions in section below						
0x2F	Reason	UINT16		Reason for stop		R
0x30	Count	UINT8		Number of stops in a row		
0x31	Powered Time	UINT32		Powered time when the last stop occurred	1 s/bit	
Reason for Last Stop – ID 4: See Reason for Last Stop definitions in section below						
0x32	Reason	UINT16		Reason for stop		R
0x33	Count	UINT8		Number of stops in a row		
0x34	Powered Time	UINT32		Powered time when the last stop occurred	1 s/bit	
0x35	Total Corrected Distance	UINT32		1 mm/bit		R
0x36	FET Temperature	UINT8		1°C /bit - 40°C		
0x36	Ambient Temperature					
0x37	Number of Hall Shifts at Learn	UINT16		0.1 mm/bit		
0x38	Zero Point Offset at Lean					
0x39	Production Order Number	UINT32		Unique 8-digit identification number		
LINAK Special Functions						
0x3A	Functions	UINT8	0 [0x0]	Reserved		R/W
			1 [0x1]	Restart actuator		
			2-255 [0x2-FF]	Reserved		

Configuration

Manufacturer-specific profile area SDO Index 0x4000 Configuration - Acyclic data exchanged						
Subindex	**Parameter**	**Data type**	**Details**	**Description**	**Scaling**	**Access**
CAN Addresses in Parallel System						
0x3B	Address 1	UINT32		Sorted in descending order		R
0x3C	Address 2					
0x3D	Address 3					
0x3E	Address 4					
0x3F	Address 5					
0x40	Address 6					
0x41	Address 7					
0x42	Address 8					
0x43	Powered Time	UINT32	0-100 [0x-64]	1 s/bit		R
0x44	Remaining Life	UINT8	0-100 [0x0-64	Remaining life (Counting down)	1%/bit	
			101-249 [0x65-F9]	Reserved		
			250 [0xFA]	Remaining life not supported		
			251-255 [0xFB-FF]	Reserved		

Reason for last stop definition

Reason for Last Stop	Function	Description
1	H-bridge fault	There is a hardware problem causing the system to malfunction or the gate driver to not respond correctly.
2	Overtemperature	The device or the surrounding temperature got too hot while it was running.
4	Undervoltage	The voltage dropped below the required level while it was running.
8	Overcurrent	Current consumption exceeded the limit, resulting in a time-out or an actuator stall.
16	SMPS fault	The 12 V and/or 5 V levels are not within the normal range.
32	Endstop fault	Both EOS switches were turned on at the same time while running.
64	Hall fault	One Hall sensor changed more than 10 times while the motor voltage was high, but the other sensor did not change.
256	Overvoltage	The voltage went too high while it was running, probably because of the braking.
512	Position not changing	Even though power is above the level needed for the motor to turn, the position doesn't change.
1024	HW fault	A hardware problem has occurred. Possible reasons might include issues with the gate driver, incorrect current measurements, or a malfunctioning motor sensor.
2048	Communication drop-out	The source of the request stopped, or the signal was lost.
4096	Change of interface	The actuator is connected to a more important system than the one that made the request.
4097	Parallel master detected a change in the number of connected followers	The parallel system stopped because a registered device disconnected, or a new device connected.
4098	Parallel master was stopped by a follower	A parallel master stopped running because a follower requested the master to hard stop.
4099	Parallel follower lost connection to master	A parallel follower stopped running because the connection to the master was lost.
4100	Parallel communication fault	An actuator in the parallel system stopped working because it had too many communication errors in a short time.

FAQ

Problem	Cause / Solution
Why is the actuator not running despite giving it a 'Run' command?	1. Ensure that all power requirements are met. 2. Check the Error codes and Status flag registers for indications of an abnormal state. 3. Make sure to follow the start-up procedures.
Feedback data is available but the actuator is not able to run.	Actuators are designed with a split power supply that requires separate power to the motor module and the control module. Make sure both modules are powered properly.
The master does not receive any response from the actuator.	1. Make sure that the device has the expected Node ID. 2. Ensure correct baud-rate. Node ID and baud-rate can be changed using the Actuator Connect™ service tool.
The feedback received from the actuator does not match the expected outcome.	Some controllers may reverse the byte order. Please make sure the correct Most Significant Byte [MSB] and Least Significant Byte [LSB] are matching your configuration.
Is the data order of received "Feedback" correct? or Do I have a working connection?	If you are unsure whether you have a working connection or if your data order is correct, you can look for the Status Flags byte in the feedback data. The Status Flags byte will always have a value higher than "0", because bit 7 is always "1". Typically, the byte value will be "1000 0001" Binary or "81" Decimal, indication "Endstop reached in". This value should show in byte 3 of received feedback bytes.

Error codes

All error codes apply to the entire TECHLINE® interface portfolio; some may not relate to your specific interface or product type.

Error	Description
0	**No error detected** No LINAK defined error detected.
1	**Power on block state** As a safety precaution to prevent unintentional movement at power-up, the actuator will not run until a 'Stop' command or 'Clear error' command has been sent.
2	**Position sensor** Position sensors are outside of expected operating range. Example: 10 pulses were reported on one Hall sensor and no Hall pulses on the other. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
3	**Overvoltage** Input supply voltage is above operating voltage level. Consult the documentation for correct voltage levels. The error will automatically be cleared when voltage is within operating limits.
4	**Undervoltage** Input supply voltage is below operating voltage level. The error can only be cleared by sending a 'Clear error' command once the voltage is within the acceptable range. Consult the documentation for correct voltage levels.

Error codes

Error	Description
5	**Communication sync.** Heartbeat from the master is not within the expected heartbeat interval. Consult the documentation for minimum requirements for heartbeat interval.
6	**Endstop switch** Endstop switches are behaving unexpectedly. Example: Both endstop switches have been activated simultaneously for more than 100 ms. Perform the initialisation process by running the actuator fully extended and retracted.
7	**Temperature** Internal actuator temperature is above operating limit. Consult the documentation for correct temperature levels. The error will automatically be cleared when the temperature is within operating limits.
8	**Internal motor controller** Internal motor controller hardware error. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
9	**Internal power supply** The internal power supply is behaving unexpectedly. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
10	**Internal current measurement** Internal current reference is outside the expected limits. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
11	**Parallel arbitration** Start-up parallel configuration procedure in progress.
12	**Position not changing** Internal position sensor is behaving unexpectedly and motor might stall. Please check your application for blockage or other irregularities. If the error persists, contact LINAK or replace the product.
13	**Position initialisation not possible** Internal initialisation parameters missing. Contact LINAK.
14	**Alone in parallel system** Incorrect number of actuators in parallel system.
15	**Incorrect number in parallel system** Incorrect number of actuators in parallel system or wrongly configured.
16	**Hardware** There is an internal motor controller malfunction affecting the actuator's ability to operate correctly. Contact LINAK.
17	**BLDC motor** Position sensors are outside of expected operating range. Example: 10 pulses were reported on one Hall sensor and no Hall pulses on the other. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.

Error codes

Error	Description
18	**Parallel communication** There are issues with the communication setup among the master and the follower devices. Make sure all cables are secured properly in the connectors.
19	**Parallel running** Parallel out of sync.
20	**Parallel setup stopped** The parallel master was stopped by a follower with some fault. To diagnose the specific issue, refer to the separate parallel feedback where the error codes from the followers can be read for more detailed information.
254	**Other internal error (Not specified)** Unspecified internal hardware/software error. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
255	**Other external error (Not specified)** Unspecified external hardware/software error. Please inspect your application for possible issues. Send 'Clear error' command to clear error.

Parallel error codes

All error codes apply to the entire TECHLINE® interface portfolio; some may not relate to your specific interface or product type.

Error	Description
0	**No error detected** No LINAK defined error detected.
1	**Current overload** Current draw is above allowed operating limit. Reduce load, send a 'Clear error' command, and run the actuator in the opposite direction.
2	**Hardware** Internal hardware error. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
3	**Temperature** Internal actuator temperature is above operating limit. Consult the documentation for correct temperature levels. The error will automatically be cleared when the temperature is within operating limits.
4	**Overvoltage** Input supply voltage is above operating voltage level. Consult the documentation for correct voltage levels. The error will automatically be cleared when voltage is within operating limits.
5	**Undervoltage** Input supply voltage is below operating voltage level. Consult the documentation for correct voltage levels. The error will automatically be cleared when voltage is within operating limits.
6	**Analogue input out of range** Analogue input signal is outside operating limits. Servo or Proportional. Consult the documentation for correct input signal.

Parallel error codes

Error	Description
7	**Position not changing** Internal position sensor is behaving unexpectedly and motor might stall. Please check your application for blockage or other irregularities. If the error persists, contact LINAK or replace the product.
8	**Power on block state** Communication has been overruled by a higher priority input. Communication is split into the following priorities: 1. Bus communication (CAN bus, EtherNet/IP, etc.) 2. LINAK service tool (Actuator Connect™) 3. Manual run using Red and Black wires Send a 'Clear error' command to continue.
9	**Position initialisation not possible** Internal initialisation parameters missing. Contact LINAK.
10	**Parallel start-up** Error in parallel setup. The number of connected actuators does not match your configuration. Check the configuration by using the LINAK tool Actuator Connect.
11	**Parallel running** The actuators are performing the internal setup and are not ready for operation.
12	**BLDC motor** Internal hardware error. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
13	**Endstop switch** Endstop switches are behaving unexpectedly. Both endstop switches have been activated simultaneously for more than 100 ms. Perform the initialisation process by running the actuator fully extended and retracted.
14	**Parallel communication** Error in internal parallel communication. More than 5 communication errors in 500 ms. Please check the wire connections and re-power the complete setup.
15	**Parallel setup stopped** One or more actuators cannot comply with commands and stop. Master commands 'Stop' to other actuators in the network. Send 'Clear error' command to clear error. If the error persists, check your application and wire connections and re-power your complete setup.
24	**Other error** Actuator receives an undefined error code. This can be due to outdated firmware. Send 'Clear error' command to clear error. If the error persists, contact LINAK or replace the product.
25	**Position lost** The actuator has lost track of its position. Please run the actuator completely inwards and run outwards past the area from 35-70 mm to initialise the actuator.

EMCY Error codes

EMCY Error Code	Communication Profile Area Error Class	Description
0x0000	Error reset or no error	Error reset or no error
0x3211	Voltage inside the CANopen device	Overvoltage (CiA 402 part 2 7.1 Overvoltage no. 1)
0x3221	Voltage inside the CANopen device	Undervoltage (CiA 402 part 2 7.1 Undervoltage no. 1)
0x4280	CANopen device temperature	Overtemperature
0x5080	CANopen device hardware	SMPS (5 V, 12 V or $V_{pup)}$
0x8130	Communication	Life guard error or heartbeat error (CiA 301 7.2.7.1)
0xFF00	Manufacturer-specific	Endstop reached error
0xFF01		Hall error
0xFF02		Heartbeat
0xFF03		Current measurement
0xFF04		Parallel arbitration
0xFF05		Position not changing
0xFF06		Initialisation
0xFF07		Parallel alone on bus
0xFF08		Parallel wrong number on bus
0xFF09		Hardware
0xFF0A		BLDC motor
0xFF0B		Parallel communication
0xFF0C		Parallel running
0xFF0D		Parallel setup stopped
0xFFFE		Internal error
0xFFFF		External error

CANopen certified by CiA

Certificate # **CiA202006-301V42/303-0243**

Vendor ID **00 00 04 AA**

Manufacturer Linak A/S

Device LAxxCAN

Product code: Object 1018h/02h	00100597	Revision number: Object 1018h/03h	00010000
Hardware version: Object 1009h	10LAXXCA-A-0	Software version: Object 100Ah	–

EDS LINAK_actuator.eds

File version:	1	File revision:	1
EDS version:	4.0		

Nuremberg, 10.06.2020

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