Profinet™
User Manual

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Contents

Preface

Dear User,

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

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

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

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

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

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

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

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

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

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

LINAK A/S

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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.

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

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Revision overview

Edition 2

LA14 and LA25 removed	Page 6
LA33 added	Page 6
'Option 1 - A simple parallel setup' illustration updated	Page 9
'Command examples' section updated	Page 14-17
'Process data' section added	Page 18-23
Data records, Configuration and Diagnostics removed	

Edition 1
New document

Connection diagram

Applicable for: LA33, LA36, LA37, LA76 and LA77

Power

BROWN	24/48 V DC
BLUE	GND

Control

1	Extends the actuator
2	Retracts the actuator
4*	Split power supply V DC
3	Parallel data
5	Parallel GND
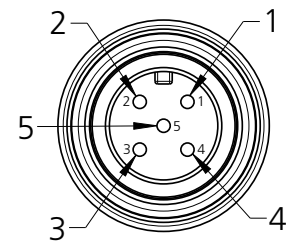
M12
A-Code

Communication

1	ETH_TX+
2	ETH_RX+
3	ETH_TX-
4	ETH_RX-
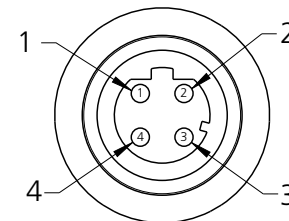
M12
D-Code

ⓘ The physical layer conforms to the IEEE 802.3-2018 standard with communication speeds of 10 Mbps and 100 Mbps, respectively. Cable length is reduced to = 100 m without repeater, as determined by IEEE 802.3-2018.

* Split power supply and motor supply (Brown), which refer to a common GND (Blue).

This approach is used to maintain power on the intelligent part of the actuator. In case the main supply is disconnected, split power supply allows e.g. that the position is maintained. The main supply may be disconnected for reasons related to safety, maintenance or installation.

👆 **Actuator Connect™ is available for Profinet™ actuators and can be used for:**

Diagnostics, manual run and configuration. The newest version is available online here.

ⓘ Connect the actuator to Actuator Connect via a USB adapter cable (must be purchased separately) to enable and configure various features.

Item number for cable kit: 0367996

Connection diagram

Applicable for: LC3 IC

Power

| BROWN | 24/48 V DC |
| BLUE | GND |

Control
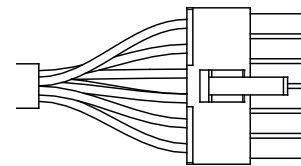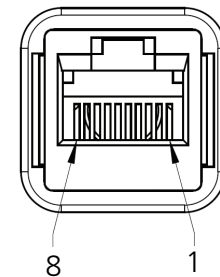
RED	Extends the actuator
BLACK	Retracts the actuator
ORANGE*	Split power supply V DC
VIOLET	Parallel data
WHITE	Parallel GND

Molex mini-fit
12-pin

Communication

1	ETH_TX+
3	ETH_RX+
2	ETH_TX-
6	ETH_RX-

8   1

RJ45

ⓘ The physical layer conforms to the IEEE 802.3-2018 standard with communication speeds of 10 Mbps and 100 Mbps, respectively. Cable length is reduced to = 100 m without repeater, as determined by IEEE 802.3-2018. The wiring conforms to the T-568A standard.

* Split power supply and motor supply (Brown), which refer to a common GND (Blue).

This approach is used to maintain power on the intelligent part of the actuator. In case the main supply is disconnected, split power supply allows e.g. that the position is maintained. The main supply may be disconnected for reasons related to safety, maintenance or installation.

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TECHLINE®
IMPROVING FLEXIBILITY

I/O specifications

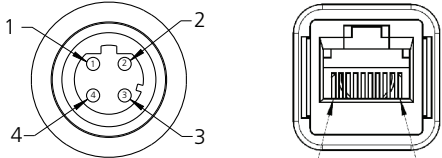| Input/Output	Specification	Comments
Description	The communication protocol conforms to the IEEE 802.3-2018 Ethernet standard with communication speeds of 10 Mbps and 100 Mbps.	**PROFINET**
Brown	Connect Brown to positive 24/48 V DC	Note: Do not change the power supply polarity on the Brown and Blue wires! Only for powering the motor driver module.
Blue	Connect Blue to negative GND	Power supply GND is electrically connected to the housing through a capacitor and resistor in parallel.

PIN out		Data cable M12 - 5-pin male OR Molex mini-fit - 12-pin	
M12	**Molex mini-fit**		
Pin 1	Red	Extends the actuator	The signal becomes active at: $V_{IN} > 67\%$ of V DC The signal becomes inactive at:
Pin 2	Black	Retracts the actuator	$V_{IN} < 33\%$ of V DC Input current: 10 mA
Pin 4	Orange	Split power supply V DC	Split power supply: 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.
Pin 3	Violet	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 5	White	Parallel GND	If separate supplies are used, they must have the same potential, and the power supply GND (Blue wires) must be connected in the common ground.

| PIN in		Data cable M12 - 4-pin female OR RJ45	
M12	**RJ45**		
Pin 1	Pin 1	ETH_TX+	
Pin 2	Pin 3	ETH_RX+	
Pin 3	Pin 2	ETH_TX-	
Pin 4	Pin 6	ETH_RX-	

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 occupying an Ethernet port connection. 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 meters to avoid communication dropouts. In a parallel system with 8 actuators this would result in signal cable lengths of <5 metres.
Check power supply	The system can be designed with either one main power supply or it can be supplied by individual supplies corresponding to the number of actuators in the system. Please respect actuator specifications regarding voltage level and current consumption! Make sure that the power supplies have a common GND and the same potential.

Option 1 - A simple parallel setup
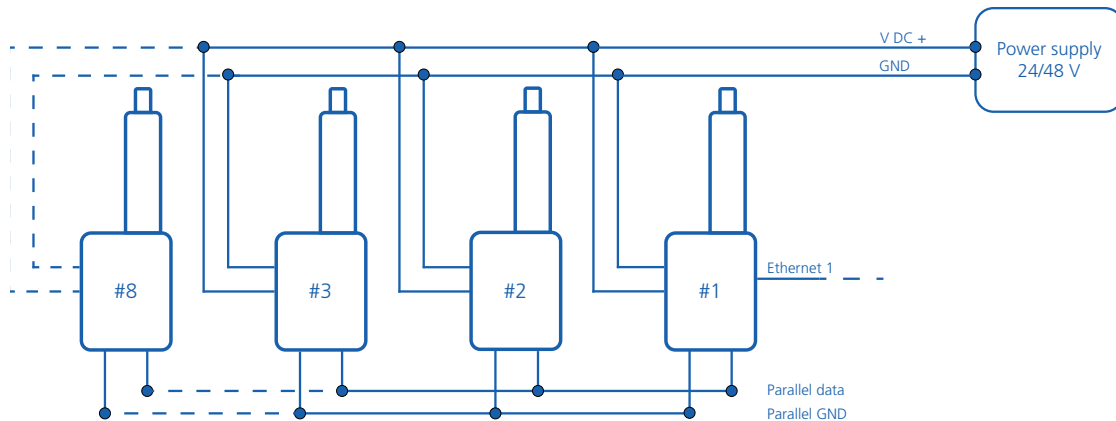
In a simple parallel setup there is only one actuator connected to the network. This actuator receives run commands and shares data with the controller. The remaining actuators in the system are only connected to internal parallel communication. This way, the internal communication ensures that the system operates in parallel and stops in case of an obstacle, or when other errors occur on one of the actuators.

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

Parallel

Option 2 - Bus communication on all actuators
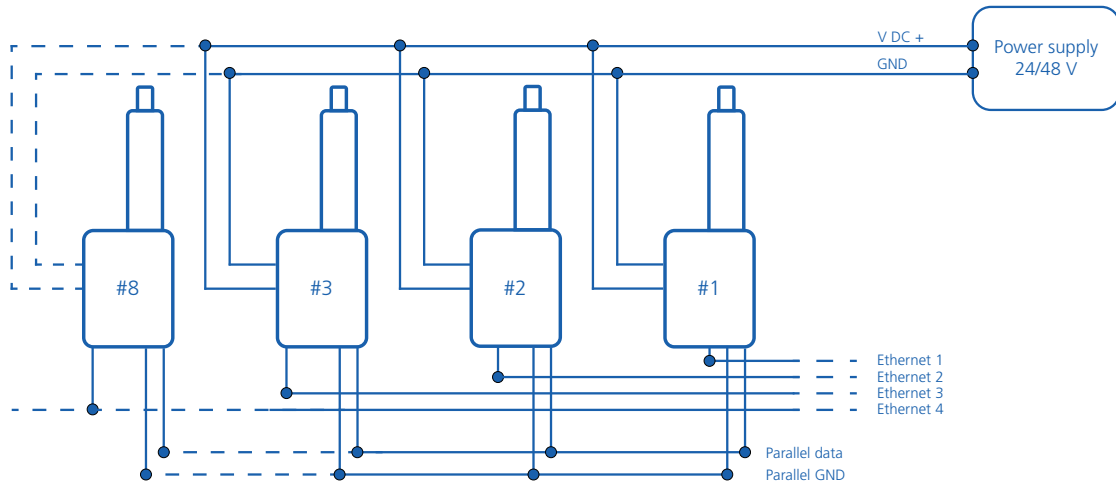
If there is a need for e.g. monitoring the real-time data of each actuator, it is possible to connect all actuators as nodes to the network. This will provide comprehensive usage data, which can be used to enhance performance in the application. Similar to option 1, this requires that all actuators are connected to internal parallel communication.

It is also possible to use two 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).

Getting started

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

The LINAK actuator is a Profinet input and output peripheral device. It is integrated into a Profinet network as a slave. This means that the actuator uses data from the master on the Profinet (output data) and also produces data for the Profinet itself (input data).

Profinet defines real-time communication for the fast transmission of process data.

Power supply

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

Supply voltage	Function	Voltage range		
		V_{IN}	V_{TYP}	V_{MAX}
24 V	Motor	18 V	24 V	32 V
	Profinet communication	10 V	24 V	39 V
48 V	Motor	36 V	48 V	58 V
	Profinet communication	10 V	48 V	60 V

For more information about wiring/connector, please see the connection diagram.

Configuration

Before being integrated into a Profinet 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 LA33, LA36, LA37, LA76 and LA77:

A separate configuration cable (item no. 0367996) is required to use Actuator Connect on a PC. This cable must be connected to the 6-pin and 9-pin connector on the actuator side. On the opposite side, power must be applied to the Brown (V DC) and Blue (GND) wires, and the USB connector must be inserted into your PC.
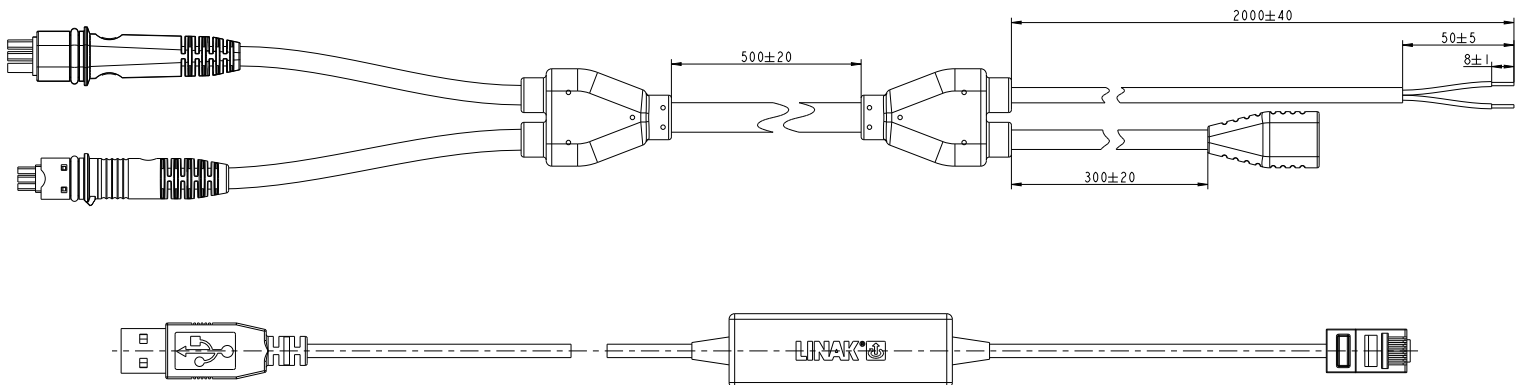
For more information about wiring/connector, please see the connection diagram.

Parameters to be verified by Actuator Connect™

Parameters	Description
Device name	Assign device name.
DHCP	DHCP is a client/server protocol that automatically provides an IP address. **If enabled: below parameters are not configurable**
IP address	Set the device IP address to a unique address in the network. 192.168.1.10 (default)
Subnet mask	Set the subnet mask. 255.255.255.0 (default)
Gateway	Set the gateway. 192.168.1.1 (default)

Setting up the controller

Common configuration softwares such as Siemens TIA Portal require a GSDML file to integrate the device into the network. Download the GSDML file at www.LINAK.com.
To be able to communicate with Profinet™ devices, they must be assigned names. The device name must comply with the standard 61158-6-10. You can always use the "Generate Profinet device name automatically" option in TIA Portal. Also, the IP address of the device must be configured in the hardware settings of the controller.

The GSDML file consists of 3 modules:

Module ID	Component	SLOT	Description
48 (0x30)	RunCommand	1	Output data cyclic
49 (0x31)	Feedback	2	Input data cyclic
50 (0x32)	Diagnostics	3	Data records

The Feedback and RunCommand modules must be assigned to an Input and Output address range, while the Configuration and Diagnostic data records are accessed with the Implicit Read/Write Function blocks. The structure of the Input and Output data are specified in the "Register overview" section.

Command examples

Before the actuator can engage movement, some general prerequisites must be fulfilled. Timing (e.g. when the actuator is still moving), environmental conditions and errors might mean that the actuator is in a state where further operation is not possible.

General run prerequisites

Step	Read/ Write	Process data*	Action
1	Write	RunCommand Byte 0 Byte 1	"Position" must be set to = 64259 [0xFB03] for 'Stop'. To prevent unintended movement, it is required to send a 'Stop' command before running the actuator.
2	Read	Feedback Byte 6 Byte 7	"Error Code" must be = 0 [0x00]
3	Read	Feedback Byte 4 Byte 5	"Status Flags" bit 2 (Overcurrent) must be = 0
4	Read	Feedback Byte 4 Byte 5	"Status Flags" bit 5 (Heartbeat needed) must be = 0
5	Read	Feedback Byte 4 Byte 5	"Status Flags" bit 6 (Actuator is running outside normal conditions) must be = 0

* Feedback = Process Data In / RunCommand = Process Data Out

Run the actuator outwards

Step	Read/ Write	Process data*	Action
1		-	Check that general run prerequisites are fulfilled.
2	Write	RunCommand Byte 2 Byte 3	"Current" must be set to a value. 0-250 [0x00-FA] = Current limit 0.25 A/bit 251 [0xFB] = Default current limit set via Actuator Connect™ 252-255 [0xFC-FF] = Reserved
3	Write	RunCommand Byte 4 Byte 5	"Speed" must be set to a value. 0-200 [0x00-FA] = Speed 0.5% /bit 201-250 [0xC9-FA] = 100% speed 251 [0xFB] = Default speed set via Actuator Connect 252-255 [0xFC-FF] = Reserved
4	Write	RunCommand Byte 6 Byte 7	"Soft Start" must be set to a value. 0-200 [0x00-FA] = Start ramp time 0.05 s/bit 251 [0xFB] = Default speed set via Actuator Connect 252-255 [0xFC-FF] = Reserved
5	Write	RunCommand Byte 8 Byte 9	"Soft Stop" must be set to a value. 0-200 [0x00-FA] = Stop ramp time 0.05 s/bit 251 [0xFB] = Default speed set via Actuator Connect 252-255 [0xFC-FF] = Reserved
6	Write	RunCommand Byte 0 Byte 1	"Position" must be set to = 64257 [0xFB01] for 'Run out.'
7**	Read	Feedback Byte 4 Byte 5	"Status Flags" bit 3 and bit 1 change to 1 to indicate that: Bit 3 = Actuator is running out Bit 1 = Endstop reached out

* Feedback = Process Data In / RunCommand = Process Data Out
** Optional

Run the actuator to target position (150 mm)

Step	Read/ Write	Process data*	Action
1		-	Check that general run prerequisites are fulfilled.
2	Write	RunCommand Byte 2 Byte 3	"Current" must be set to a value. 0-250 [0x00-FA] = Current limit 0.25 A/bit 251 [0xFB] = Default current limit set via Actuator Connect™ 252-255 [0xFC-FF] = Reserved
3	Write	RunCommand Byte 4 Byte 5	"Speed" must be set to a value. 0-200 [0x00-FA] = Speed 0.5% /bit 201-250 [0xC9-FA] = 100% speed 251 [0xFB] = Default speed set via Actuator Connect 252-255 [0xFC-FF] = Reserved
4	Write	RunCommand Byte 6 Byte 7	"Soft Start" must be set to a value. 0-200 [0x00-FA] = Start ramp time 0.05 s/bit 251 [0xFB] = Default speed set via Actuator Connect 252-255 [0xFC-FF] = Reserved
5	Write	RunCommand Byte 8 Byte 9	"Soft Stop" must be set to a value. 0-200 [0x00-FA] = Stop ramp time 0.05 s/bit 251 [0xFB] = Default speed set via Actuator Connect 252-255 [0xFC-FF] = Reserved
6	Write	RunCommand Byte 0 Byte 1	"Position" must be set to = 1500 [0x05DC] for 'Run to Target Position 150 mm'
7**	Read	Feedback Byte 4 Byte 5	"Status Flags" bit 3 or bit 4 change to 1 to indicate that either: Bit 3 = Actuator is running out Bit 1 = Actuator is running in

* Feedback = Process Data In / RunCommand = Process Data Out
** Optional

Clear error in overcurrent situation

If an overcurrent occurs, the actuator 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.

Step	Read/ Write	Process data*	Action
1	Read	Feedback Byte 4 Byte 5	Confirm that "Status Flags" bit 2 is = 1 for 'Overcurrent'
2	Write	RunCommand Byte 0 Byte 1	"Position" must be set to run in the opposite direction of the blockage Set to = 64257 [0xFB01] for 'Run out' or Set to = 64258 [0xFB02] for 'Run in'
3**	Read	Feedback Byte 4 Byte 5	"Status Flags" bits change to 1 to indicate that either: Bit 3 = Actuator is running out Bit 4 = Actuator is running in Bit 1 = Endstop reached out Bit 0 = Endstop reached in

* Feedback = Process Data In / RunCommand = Process Data Out
** Optional

Process data

When controlling the actuator from the Profinet master, it is important to understand the input and output data. The specific data is described in the tables below.

Process data out

Byte 9 [MSB]	Byte 8	Byte 7	Byte 6	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0 [LSB]
Soft stop		Soft start		Speed		Current		Position	

Module ID	Byte(s)	Command	Data type	Details	Description	Scaling
48 [0x30]	Byte 0 Byte 1	Position	UINT16	0-64255 [0x0000-FAFF]	Run to position	0.1 mm /bit
				64256 [0xFB00]	Clear Error Codes (see Module ID 49 [0x31] Byte 6 & 7)	
				64257 [0xFB01]	Run out	
				64258 [0xFB02]	Run in	
				64259 [0xFB03]	Stop	
				64260 [0xFB04]	Recovery run out	
				64261 [0xFB05]	Recovery run in	
				64262-65535 [0xFB06-FFFF]	Invalid value, actuator will not run	
	Byte 2 Byte 3	Current	UINT16	0-250 [0x00-FA]	Maximum current limit	0.25 A /bit
				251 [0xFB]	Use default current value	
				252-255 [0xFC-FF]	Invalid value, actuator will not run	
	Byte 4 Byte 5	Speed	UINT16	0-200 [0x00-C8]	Speed	0.5% /bit
				201-250 [0xC9-FA]	Use 100% speed	
				251 [0xFB]	Use default speed value	
				252-255 [0xFC-FF]	Invalid value, actuator will not run	

Process data out

Module ID	Byte(s)	Command	Data type	Details	Description	Scaling
48 [0x30]	Byte 6 Byte 7	Soft Start	UINT16	0-250 [0x00-FA]	Start ramping time	0.05 s /bit
				251 [0xFB]	Use default soft start value	
				252-255 [0xFC-FF]	Invalid value, actuator will not run	
	Byte 8 Byte 9	Soft Stop	UINT 16	0-250 [0x00-FA]	Stop ramping time	0.05 s /bit
				251 [0xFB]	Use default soft stop value	
				252-255 [0xFC-FF]	Invalid value, actuator will not run	

Process data in

Feedback 49 [0x31] SLOT 2											
Real-time cyclic data exchanged											
Byte 11	Byte 10	Byte 9	Byte 8	Byte 7	Byte 6	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0 [LSB]
AUX Input		Speed		Error Code		Status Flag		Current		Position feedback	

Module ID	Byte(s)	Status	Data type	Details	Description	Scaling
49 [0x31]	Byte 0 Byte 1	Position	UINT16	0-64255 [0x0000-FAFF]	Position of the actuator piston	0.1 mm /bit
				64256-65023 [0xFB00-FDFF]	Reserved	
				65024 [0xFE00]	Position lost	
				65025-65535 [0xFE01-FFFF]	Reserved	
	Byte 2 Byte 3	Current	UINT16	0 [0x00]	Not running	0.25 A /bit
				1-250 [0x00-FA]	Measured motor current	
				251-253 [0xFB-FD]	Reserved	
				254 [0xFE]	Fault in current measurement circuit	
				255 [0xFF]	Reserved	
	Byte 4 Byte 5	Status Flags	UINT16	b0	Endstop reached in	8-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	
				b8-b15	Reserved	
	Byte 6 Byte 7	Error Code	UINT16	0 [0x00]	No error detected	8-bit error code showing the currently active error with the highest priority only

Process data in

Module ID	Byte(s)	Status	Data type	Details	Description	Scaling
49 [0x31]	Byte 6 Byte 7	Error Code	UINT16	1 [0x01]	'Run' command overruled	
				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	
				10 [0x0A]	Internal current measurement	
				11 [0x0B]	Parallel arbitration	
				12 [0x0C]	Position not changing	
				13 [0x0D]	Position initialisation not possible	
				14 [0x0E]	Alone in parallel system	
				15 [0x0F]	Incorrect number in parallel system	
				254 [0xFE]	Other internal error (Not specified)	
				255 [0xFF]	Other external error (Not specified)	
	Byte 8 Byte 9	Speed	UINT16	0-4015 [0x0000-0FAF]	Speed of actuator piston	0.1 mm/s /bit
				4016-65535 [0x0FB0-FFFF]	Reserved	
	Byte 10 Byte 11	AUX Input	UINT16	b0-b1	Input 1 level	25% VCC /bit
				b2-b3	Input 2 level	
				b4-b15	Reserved	

Process data in (Parallel feedback)

Feedback 49 [0x31] SLOT 2							
Real-time cyclic data exchanged							
Only for parallel feedback							
Byte 19 [MSB]	Byte 18	Byte 17	Byte 16	Byte 15	Byte 14	Byte 13	Byte 12
Status Flags		Error Group		Error Source			

Module ID	Byte(s)	Status	Data type	Details	Description	Scaling
49 [0x31]	Byte 12 Byte 13 Byte 14 Byte 15	Error Source	UINT32	0 [0x00000000]	No error is active on any actuator in parallel system, or error source ID is irrelevant ("Parallel start-up" error is reported by an actuator still connected to the system)	32-bit IP address
				1-4294967295 [0x00000001-FFFFFFFF]	IP address of the actuator with highest priority error	
	Byte 16 Byte 17	Error Group	UINT16	0 [0x00]	No error detected	8-bit error code indicating the currently active error of highest priority on any actuator in the parallel system
				1 [0x01]	Current overload	
				2 [0x02]	Hardware	
				3 [0x03]	Temperature	
				4 [0x04]	Overvoltage	
				5 [0x05]	Undervoltage	
				6 [0x06]	Analogue input out of range error (N/A for bus interfaces)	
				7 [0x07]	Position not changing	
				8 [0x08]	Run signal overruled	
				9 [0x09]	Position initialisation not possible	
				10 [0x0A]	Parallel start-up	
				11 [0x0B]	Parallel running	
				12 [0x0C]	BLDC motor	

Process data in (Parallel feedback)

Module ID	Byte(s)	Status	Data type	Details	Description	Scaling
49 [0x31]	Byte 16 Byte 17	Error Group	UINT16	13 [0x0D]	Endstop switch	8-bit error code indicating the currently active error of highest priority on any actuator in the parallel system
				14 [0x0E]	Parallel communication	
				15 [0x0F]	Parallel setup stopped	
				24 [0x18]	Other error	
				25 [0x19]	Position lost	
	Byte 18 Byte 19	Status Flags	UINT16	b0	Parallel endstop reached out	Bit independent status indicators
				b1	Parallel endstop reached in	
				b2	Parallel running outside nominal conditions	
				b3-b15	Reserved	

FAQ

Problem	Cause / Solution
Why is the actuator not running despite giving it a 'Run' command?	1. Make sure that power is applied from the power supply. 2. Send a 'Clear error' 0xFB00 (64256) command before sending a 'Run' command. 3. Make sure that the configuration parameters Max. Speed 0x06, Current Limit Out 0x00 and Current Limit In 0x01 are not set to '0'.
Where can I find the latest GSDML file?	At LINAK.com
Why does the PLC show a reversed data order?	On most PLCs, the GSDML file will ensure the correct order of data input/output bytes according to the 'Process data' table. However, some controllers may reverse the data order. Please make sure the correct Most Significant Byte [MSB] and Least Significant Byte [LSB] are matching your configuration. If you experience maximum feedback data values (Position, Current and/or Speed), 0xFF (255) for byte data types and 0xFFFF (65535) for integer data types, the order is most likely reversed.
What is the highest priority process or parameter and diagnostic data?	Commonly referred to as cyclic and acyclic data. For example, current limit value in amps can be set in both cyclic and acyclic data. In this case, the lowest value determines when the actuator will stop.

Error codes

Error	Description
0	**No error detected**
	No LINAK defined error detected
1	**'Run' command overruled**
	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. VCC motor OK. 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. Consult the documentation for correct voltage levels. The error will automatically be cleared when voltage is within operating limits.
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 (N/A for bus interfaces)**
	Endstop switches are behaving unexpectedly. Example: Both endstop switches have been activated simultaneously for more than 100 ms. Perform the initialization 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	**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.

Error codes

Error	Description
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
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

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.

Parallel error codes

Error	Description
6	**Analogue input out of range (N/A for bus interfaces)** Analogue input signal is outside operating limits. Servo or Proportional. Consult the documentation for correct input signal.
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	**Run signal overruled** 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 (N/A for bus interfaces)** Endstop switches are behaving unexpectedly. Both endstop switches have been activated simultaneously for more than 100ms. Perform the initialization 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.

Parallel error codes

Error	Description
25	**Position lost** Follow the relevant initialisation procedures by running the actuators from fully retracted to fully extended. If the error persists, contact LINAK or replace the product.

Contacts

FACTORIES

Denmark - Headquarters
LINAK A/S
Phone: +45 73 15 15 15
Fax: +45 74 45 80 48
Fax (Sales): +45 73 15 16 13
Web: www.linak.com

China
LINAK (Shenzhen) Actuator Systems, Ltd.
Phone: +86 755 8610 6656
Phone: +86 755 8610 6990
Web: www.linak.cn

Slovakia
LINAK Slovakia s.r.o.
Phone: +421 51 7563 444
Web: www.linak.sk

Thailand
LINAK APAC Ltd.
Phone: +66 33 265 400
Web: www.linak.com

USA
LINAK U.S. Inc.
Americas Headquarters
Phone: +1 502 253 5595
Fax: +1 502 253 5596
Web: www.linak-us.com
            www.linak-latinamerica.com

SUBSIDIARIES

Australia
LINAK Australia Pty. Ltd
Phone: +61 3 8796 9777
Fax: +61 3 8796 9778
E-mail: sales@linak.com.au
Web: www.linak.com.au

Austria
LINAK Zweigniederlassung - Österreich (Wien)
Phone: +43 (1) 890 7446
Fax: +43 (1) 890 744615
E-mail: info@linak.de
Web: www.linak.at - www.linak.hu

Belgium
LINAK Actuator-Systems NV/SA
(Belgium & Luxembourg)
Phone: +32 (0)9 230 01 09
E-mail: beinfo@linak.be
Web: www.linak.be - www.fr.linak.be

Brazil
LINAK Do Brasil Comércio De Atuadores Ltda.
Phone: +55 (11) 2832 7070
Fax: +55 (11) 2832 7060
E-mail: info@linak.com.br
Web: www.linak.com.br

Canada
LINAK Canada Inc.
Phone: +1 502 253 5595
Fax: +1 416 255 7720
E-mail: info@linak.ca
Web: www.linak-us.com

Czech Republic
LINAK C&S s.r.o.
Phone: +42 058 174 1814
Fax: +42 058 170 2452
E-mail: info@linak.cz
Web: www.linak.cz - www.linak.sk

Denmark - International
LINAK International
Phone: +45 73 15 15 15
E-mail: info@linak.com
Web: www.linak.com

Denmark - Sales
LINAK Danmark A/S
Phone: +45 86 80 36 11
Fax: +45 86 82 90 51
E-mail: linak@linak-silkeborg.dk
Web: www.linak.dk

Finland
LINAK OY
Phone: +358 10 841 8700
E-mail: linak@linak.fi
Web: www.linak.fi

France
LINAK France E.U.R.L
Phone: +33 (0) 2 41 36 34 34
Fax: +33 (0) 2 41 36 35 00
E-mail: linak@linak.fr
Web: www.linak.fr

Germany
LINAK GmbH
Phone: +49 6043 9655 0
Fax: +49 6043 9655 60
E-mail: info@linak.de
Web: www.linak.de

India
LINAK A/S India Liaison Office
Phone: +91 120 4531797
Fax: +91 120 4786428
E-mail: info@linak.in
Web: www.linak.in

Ireland
LINAK UK Limited (Ireland)
Phone: +44 (0)121 544 2211
Fax: +44 (0)121 544 2552
            +44 (0)796 855 1606 (UK Mobile)
            +35 387 634 6554 (Rep.of Ireland Mobile)
E-mail: sales@linak.co.uk
Web: www.linak.co.uk

Italy
LINAK ITALIA S.r.l.
Phone: +39 02 48 46 33 66
Fax: +39 02 48 46 82 52
E-mail: info@linak.it
Web: www.linak.it

Japan
LINAK K.K.
Phone: 81-45-533-0802
Fax: 81-45-533-0803
E-mail: linak@linak.jp
Web: www.linak.jp

Malaysia
LINAK Actuators Sdn. Bhd.
Phone: +60 4 210 6500
Fax: +60 4 226 8901
E-mail: info@linak-asia.com
Web: www.linak.my

Netherlands
LINAK Actuator-Systems B.V.
Phone: +31 76 5 42 44 40 /
            +31 76 200 11 10
E-mail: info@linak.nl
Web: www.linak.nl

New Zealand
LINAK New Zealand Ltd
Phone: +64 9580 2071
Fax: +64 9580 2072
E-mail: nzsales@linak.com.au
Web: www.linak.com.au

Norway
LINAK Norge AS
Phone: +47 32 82 90 90
E-mail: info@linak.no
Web: www.linak.no

Poland
LINAK Polska
LINAK Danmark A/S (Spólka Akcyjna)
Phone: +48 22 295 09 70 /
            +48 22 295 09 71
E-mail: info@linak.pl
Web: www.linak.pl

Republic of Korea
LINAK Korea Ltd.
Phone: +82 2 6231 1515
Fax: +82 2 6231 1516
E-mail: info@linak.kr
Web: www.linak.kr

Slovakia
LINAK Slovakia S.R.O.
Phone: +421 51 7563 444
Web: www.linak.sk

Spain
LINAK Actuadores, S.L.u
Phone: +34 93 588 27 77
Fax: +34 93 588 27 85
E-mail: esma@linak.es
Web: www.linak.es

Sweden
LINAK Scandinavia AB
Phone: +46 8 732 20 00
Fax: +46 8 732 20 50
E-mail: info@linak.se
Web: www.linak.se

Switzerland
LINAK AG
Phone: +41 43 388 31 88
Fax: +41 43 388 31 87
E-mail: info@linak.ch
Web: www.linak.ch - www.fr.linak.ch
            www.it.linak.ch

Taiwan
LINAK (Shenzhen) Actuator systems Ltd.
Taiwan Representative office
Phone: +886 2 272 90068
Fax: +886 2 272 90096
E-mail: sales@linak.com.tw
Web: www.linak.com.tw

Turkey
LINAK İth. İhr. San. ve Tic. A.Ş.
Phone: + 90 312 4726338
Fax: + 90 312 4726635
E-mail: info@linak.com.tr
Web: www.linak.com.tr

United Kingdom
LINAK UK Limited
Phone: +44 (0)121 544 2211
Fax: +44 (0)121 544 2552
E-mail: sales@linak.co.uk
Web: www.linak.co.uk

DISTRIBUTORS

Argentina
Novotec Argentina SRL
Phone: 011-4303-8989 / 8900
Fax: 011-4032-0184
E-mail: info@novotecargentina.com
Web: www.novotecargentina.com

Colombia
MEM Ltda
Phone: +[57] (1) 334-7666
Fax: +[57] (1) 282-1684
E-mail: servicioalcliente@memltda.com.co
Web: www.mem.net.co

India
Mechatronics Control Equipments India Pvt Ltd
Phone: +91-44-28558484, 85
E-mail: bala@mechatronicscontrol.com
Web: www.mechatronicscontrol.com

Indonesia
PT. Himalaya Everest Jaya
Phone: +6 221 544 8956 /+6 221 544 8965
Fax: +6 221 619 1925
Fax (Sales): +6 221 619 4658
E-mail: hejplastic-div@centrin.net.id
Web: www.hej.co.id

Israel
NetivTech LTD
Phone: +972 55-2266-535
Fax: +972 2-9900-560
Email: info@NetivTech.com
Web: www.netivtech.com

Singapore
Servo Dynamics Pte Ltd
Phone: +65 6844 0288
Fax: +65 6844 0070
E-mail: servodynamics@servo.com.sg

South Africa
Industrial Specialised Applications CC
Phone: +27 011 466 0346
E-mail: gartht@isagroup.co.za
Web: www.isaza.co.za

United Arab Emirates
Mechatronics
Phone: +971 4 267 4311
Fax: +971 4 267 4312
E-mail: mechtron@emirates.net.ae