item

Integrated Motor ST NEMA24-310-48-T1

User guide

Contents

Symbols, safety

Important information

Note! Failure to observe this safety instruction can result in material damage

Warning! Failure to observe this safety instruction is likely to result in material damage, serious injury or death

Danger! Failure to observe this safety instruction can result in material damage, serious injury or death

Caution! Failure to observe this safety instruction can result in material damage or injury

Attention! Hot surface

Device corresponds to protection class III
(operates on safety extra low voltage, SELV)

Functional earth

CE conformity marking

Observe directions for disposal

Observe directions for disposal

General safety information

The details and information in this user guide are provided for the purposes of describing the product and its assembly only. This information does not discharge users from the obligation to conduct their own assessments and checks. It is also important to bear in mind that our products are subject to a natural process of wear and ageing.

During assembly, operation and maintenance of the product, it is important to ensure that all moving elements of the overall construction are secured to prevent unintentional, inadvertent movement. Parts that can make uncontrolled movements present a risk of injury.

This guide contains important information that will enable you to use the product safely and appropriately. If this product is sold, rented out or otherwise passed on to another party, the user guide must be handed over with it. You must therefore read and follow the safety instructions set out below.

- All work must be performed with “safety first” in mind.
- Switch off the power to all relevant system parts before carrying out any work.
- Observe the regulations pertaining to accident prevention and environmental protection that apply in the country and workplace where the product is being used.
- Use only item products that are in perfect working order.
- Failure to use original spare parts will invalidate the product warranty!
- Check the product for obvious defects.
- Use the product only within the performance range described in the technical data.
- Ensure all the safety equipment associated with the product is present, properly installed and in full working order.
- Do not alter the position of safety equipment, circumvent it or render it ineffective.

Motor ST as described here corresponds to the state of the art and takes into account the general principles of safety applicable at the time this guide was published. Nevertheless, failure to observe the safety instructions and warning notices in this guide may result in personal injury and damage to property. We will assume no liability for any resulting damage or injury. We reserve the right to make changes that represent technical advances. Keep this guide in a place where it can be accessed by all users at any time. The general safety information applies to the entire lifecycle of the product.

We reserve the right to make changes that represent technical advances.

Keep this guide in a place where it can be accessed by all users at any time. Observe the directions contained in the overarching user guide for a system.

1. During transportation

Observe the handling instructions on the packaging. Until it is assembled, the product must be stored in its original packaging, protected from moisture, soiling and damage. Always transport the product in its original packaging. Use lifting and transport equipment intended for this purpose. Avoid shocks and impacts. On receipt, immediately inspect all boxes and packaging for visible damage and check the delivery against the carrier’s delivery note to ensure it is complete. Notify the supplier of any defects without delay. Avoid exposure to extreme heat or cold. Also avoid excessive storage periods (we recommend a maximum of one year under climate-controlled conditions) and check prior to installation that the product is in working order.

2. During operation

Ensure that only persons who have been authorised by the operator have access to the immediate operating area of the system. This also applies when the system is not in active use. It must not be possible to actuate moving parts unintentionally and, where possible, all moving parts should be covered. Motors can become hot, please note the warning notices.

3. During cleaning

Do not use aggressive cleaning substances. Do not use a high-pressure cleaner.

4. During maintenance and servicing work

Carry out the prescribed maintenance work at the intervals stipulated in the guide. Ensure that no fixings, connections or components can become detached or are loose. Secure moving parts during maintenance. Disconnect the device from the power supply when carrying out maintenance work.

5. During disposal

Dispose of the product in accordance with the national and international regulations that apply in your country.

Safety instructions

WARNING!

- The drive does not satisfy the functional safety requirements set out in IEC 61800-5-2.
  If necessary, these will need to be met using appropriate external measures (e.g. safety relays).
- Rotating and moving parts.
  The system operator must put in place suitable measures to protect people in line with the Machinery Directive.
- The operator must ensure that assembly and installation work is carried out to a professional standard.
- Danger of overvoltage up to 56 V. There is a risk that other elements in the power supply could be destroyed.
- In the case of vertical applications with travel distances of > 1 m, it is likely that the drive will be destroyed if the carriage falls in an uncontrolled manner. It is advisable to install a mechanical fall arrest system (e.g. self-locking axes, counterweights, electromechanical brakes).

ATTENTION! Risk of burns caused by hot surfaces.

DANGER! To ensure satisfactory system operation and optimum performance, it is essential that operators and maintenance staff familiarise themselves with the documentation.

- During positioning and operation, make sure no crushing, cutting, impact or tripping hazards can arise that affect handling and the surrounding area.
- In the event of damage to electrical components, immediately shut down the device and contact an appropriately qualified person.
- Do not use the device in rooms with a high dust content, humidity or temperature.
- Do not place any objects on the device.
- Always disconnect the power cable from the mains power by pulling the plug out of the socket and always fully uncoil the power cord before using the device.
- Check the device for corrosion, wear, cracks, deformation, etc. on a regular basis and at each startup. Only an undamaged device may be taken into service.
- The immediate vicinity of Motor ST is considered a safety zone. This safety zone must always be kept clear to prevent both damage to material and buildings and personal injury.
- Do not touch the device with damp hands.
- No liquids must ever get into the device. If this does occur, immediately disconnect the device from the power supply and contact the manufacturer.
- Never use the product close to a heat source, in the vicinity of flammable objects or products such as aerosol cans, paints or solvents.
- When leaving the device unattended for lengthy periods of time, switch it off or disconnect it from the mains power supply.
- Disconnect the device from the mains when transporting or repositioning it.
- The device must be disconnected from the mains for cleaning, maintenance and servicing.
- Motor ST must only be operated in the designated areas and in line with its performance data.
- Motor ST should be used as instructed by the manufacturer, and only for the tasks specified in the order and order confirmation.
- Planners, manufacturers, operators and users are responsible for proper and safe installation and for safe operation. Safety equipment must not be removed, circumvented or deactivated.

CAUTION! Faults may occur as a result of incorrect commissioning and could shorten the device's service life.

- Do not subject connectors to bending loads.
- To prevent crushing points, cutting points and heat accumulation, nearby objects should be kept at a minimum distance of 100 mm.
- Load values must not be exceeded.
- Changing the wiring while in operation can damage the control system.
- The controller can be disrupted by excitation voltage from the Motor.
- Voltage peaks during operation can damage the controller.
- Install suitable circuits (e.g. a decoupling capacitor) to reduce voltage peaks.
- The device contains components that are sensitive to electrostatic discharges.
- Inappropriate handling can damage the device.

Correct use

The motor must only be used in accordance with the technical data and safety requirements set out in this document. Only indoor use is permitted. Internal company requirements and the regulations that apply in the country where the product is being used must be observed. You must not make any design modifications to the product yourself. We will assume no liability for any resulting damage or injury.

Integrated Motor ST NEMA24-310-48-T1 is an electric drive designed for use with appropriate item linear technology. Only the corresponding item software can be used to program the integrated controller with an operating mode. During operation, the program sequence of the operating mode can only be controlled via the integrated digital inputs.

You may only install, operate and maintain Motor ST if:

- The product has been integrated into its surroundings in a proper and safe manner.
- You have carefully read and understood this guide.
- You are appropriately qualified.
- You are authorised to do so by your company.
- You are using only original equipment from the manufacturer.

The basic safety provisions of the following rules and regulations have been met:

- Machinery Directive 2006/42/EC (This includes compliance with the protection line of the Low Voltage Directive 2014/35/EC for "Electrical power supply" in accordance with Annex I No. 1.5.1 of the Machinery Directive)
- EMC Directive 2014/30/EC
- RoHS Directive 2011/65/EU, including the amendment to the Directive (EU 2015/863)

WARNING! Unsafe or inappropriate use of Motor ST poses a risk of serious injury.

Improper use

Improper use is defined as any use of the product for purposes other than those authorised in the user guide and under the definition of correct use. We will assume no liability for any resulting damage or injury.

The following also qualify as improper use:

- Use of power supply units that are not surge-proof up to 56 V.
- Using the same power supply for third devices that are not surge-proof up to 56 V.
- Operation without a short-circuit-resistant power supply unit and/or an upstream, slow-blowing 4 A fuse
- Operation without the protective casing
- Carrying out electric wiring or cable work when the system is live

Personnel qualifications

Assembly, commissioning, operation, disassembly and maintenance work (including servicing and care) require an adequate knowledge of mechanical and electrical engineering and an understanding of the relevant technical terminology. To ensure operational safety, these activities must therefore be carried out by someone who has appropriate training or instruction.

You may only use and maintain Motor ST if:

- Motor ST is integrated into its surroundings in a proper and safe manner; the operator is responsible for ensuring proper and safe operation
- You have carefully read and understood this guide.
- You are mentally and physically capable of doing so.
- You are authorised to do so by your organisation or employer.
- You are using only original equipment from the manufacturer.

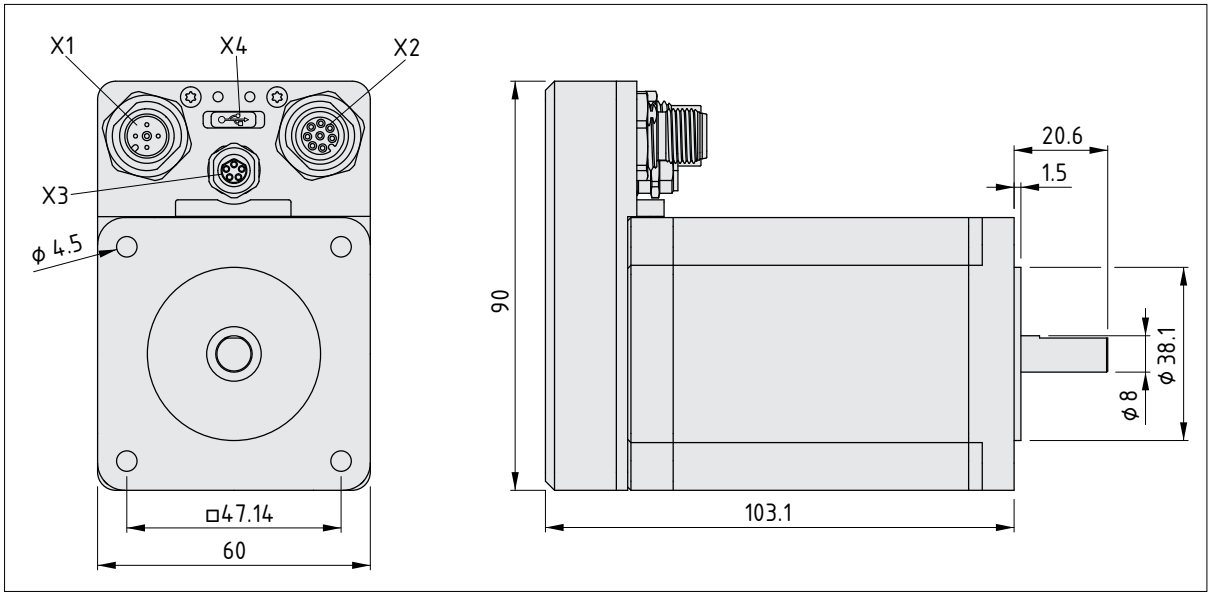
Product description, use and accessories

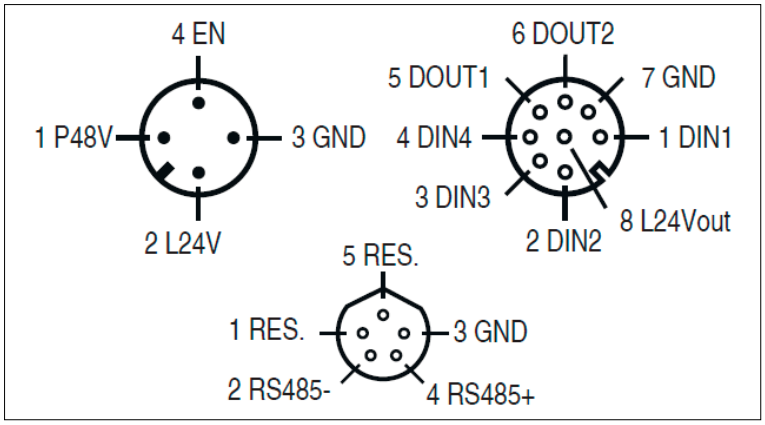
Motor ST is a mechatronic solution with a stepper motor that has a 60 mm flange dimension, a stepper motor control system (controller and driver), an integrated encoder and a metal housing for the electronics with industry-standard M12 plug-in connectors.

It is a specially designed, all-in-one device with a standard configuration that can be quickly and cost-effectively tailored to custom requirements. Motor ST can be controlled via a USB or RS485 connection. The integrated encoder can be used to identify step losses and monitor the target position. An integrated microcontroller also makes standalone operation possible. The Windows program “item MotionSoftStepper” can be used for configuration, parametrisation and programming purposes, and is available for free from the item Online Shop.

The aluminium housing fully protects the electronics from contact, keeps out splashing water and quantities of dust that could be damaging and makes it easier to perform EMC testing on your complete unit.

Operating data

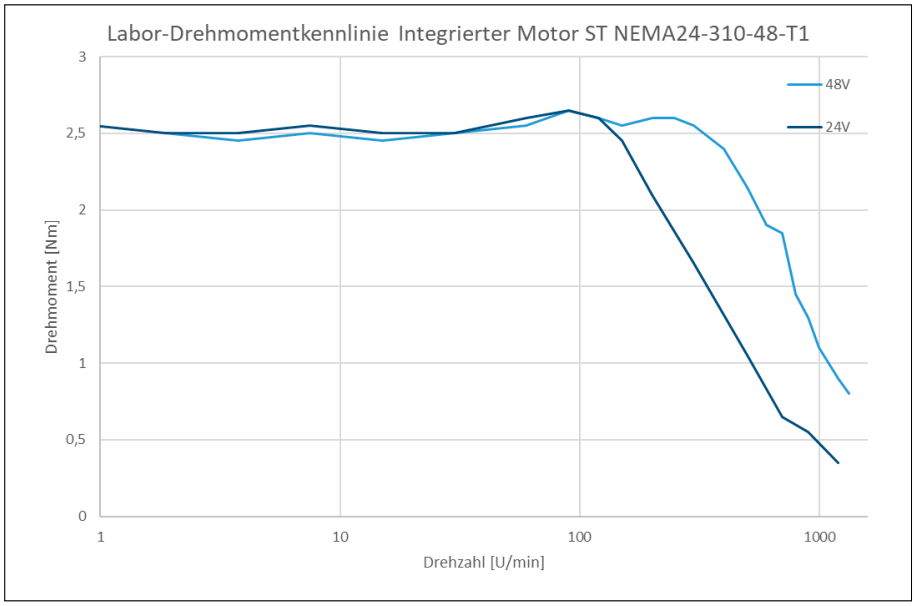




NOTE! Do not disconnect or connect connectors X1 to X3 while the system is live!

Type	Value (typical)	Value (range)	Unit	Comments
X1				M12 4P male connector, A-coded
P48V power voltage	48	16 ... 52	V	Reverse polarity protection up to 55 V
P48V current consumption	-	0 ... 2,8	A	Current consumption at 48 V
L24V logic voltage	24	16 ... 27	V	Reverse polarity protection up to 30 V
Enable EN	24	0 ... 27	V	Switching thresholds approx. L → H 13.5 V, H → L 4.9 V
X2				M12 8P female connector, A-coded
DIN[1...4]	24	0 ... 27	V	Switching thresholds approx. L → H 5.1 V, H → L 4.0 V
DOUT[1...2]	24	16 ... 27	V	PNP-switching, source: L24V logic voltage, maximum 100 mA per output, do not connect inductive loads
L24Vout logic voltage output	24	16 ... 27	V	Without short-circuit protection, maximum 500 mA, source: L24V logic voltage
X3				M8 5P female connector, B-coded
RS485+	-	-6 ... 6	V	Differential signal, non-inverting
RS485-	-	-6 ... 6	V	Differential signal, inverting, standard: 9600 Bit/s, no internal termination resistor
Ground GND	-	-	-	All the ground references of Motor ST are electrically connected.
X4				Micro USB socket
Vbus	5	4.1 ... 5.5	V	

Torque characteristic under laboratory conditions:



Status and Fault LEDs

The status LEDs provide information about the status of the motor. As soon as a Vbus connection via USB is live, the status LEDs are able to display information via the controller.

Status LED - green

Process	Way of Flashing	Meaning
Initialisation	8 Hz	Motor ST is initialising itself.
USB mode	4 Hz	Restricted access to Motor ST if only connected via USB
Restricted mode	2 Hz	Restricted access to Motor ST – DINs and DOUTs can be operated. iMST projects can be uploaded and downloaded. Motor power stage not activated, movement not possible.
Operational	1 Hz	Motor power stage activated. Movement is only possible in this status.
Error mode	0.5 Hz	Motor power stage deactivated. See “Status LED – red” table. An error can be cleared via a reset (at least 1 second) and by setting the enable input, providing the error has been resolved. Motor restarts.
Bootloader mode	3x short flashes	When booting Motor ST, the motor enters bootloader mode for approximately 5 seconds During this time, it is not permitted to initiate any serial communication with the motor.
Firmware update	2x short flashes	A firmware update is being carried out on Motor ST.

Fault LED - red

Fault	Way of Flashing	Meaning
L24V logic voltage	1x short	Logic voltage outside the valid range. Motor power stage deactivated.
P48V power voltage	2x short	Power voltage outside the valid range. Motor power stage deactivated.
Following error	3x short	Excessive deviation identified between encoder and motor shaft.
Overtemperature	4x short	Running and holding current are reduced if the controller temperature is between 85°C and 95°C. When the temperature exceeds 95°C the power stage is permanently deactivated.
Digital outputs	5x short	Digital outputs deactivated due to overload.

Regenerative protection circuit

Type	Value (typical)	Value (range)	Unit	Comments
Switch-on threshold	57		V	P48V power voltage is being short-circuited via internal braking resistance.
Maximum load duration	1	1 ... 3	s	

Environmental conditions

Type	Value (typical)	Value (range)	Unit	Comments
Operating temperature	20	-10 ... 40	°C	Non-condensing
Protection class	III			Protective extra-low voltage (PELV)
Storage temperature	-	-20 ... 70	°C	Non-condensing

Installation and commissioning

Commissioning on a PC:

- Connect up L24V logic supply and P48V power supply
- Use a micro USB cable to connect Motor ST to the PC
- Use item MotionSoftStepper (iMST) software to configure Motor ST
- To do so, create a basic configuration and parametrise the operating mode
- Upload the project to Motor ST
- Launch the project
- Initiate a homing run event (standard: rising flank at the enable input)
- Motor ST executes operating mode and can be controlled via digital inputs

NOTE! If an iMST project has been successfully uploaded to Motor ST, it will automatically be initiated from its starting point each time the device is restarted. The homing run or waiting for the homing run event is the first thing to be executed in the project.

Commissioning in the field:

- Use item MotionSoftStepper (iMST) software to configure a project
- To do so, create a basic configuration and parametrise the operating mode
- Upload the project on the PC to Motor ST via USB or RS485
- Install Motor ST in its final position in the system
- Connect up L24V logic supply and P48V power supply
- Wait 6 seconds for the boot process (Motor ST flashes 3 times quickly then 10 times very quickly)
- If the green LED flashes at 1 Hz, the motor is operational and the project is executed
- Initiate a homing run event (standard: rising flank at the enable input)
- The project runs autonomously on Motor ST
- Digital inputs control the selected operating mode

Power supply unit

The following requirements apply if a 48 V power supply unit is being used for the P48V power voltage:

- Nominal voltage: 48 V DC
- Overvoltage protection: at least 56 V
- Current: at least 4 A, peak 5.8 A

The 24 V power supply unit for the supply to the L24V logic voltage must meet the following conditions:

- Nominal voltage: 24 V DC
- Current: at least 600 mA

It is possible to use Motor ST in a purely 24 V operation mode. Both the P48V power voltage and L24V logic voltage can be supplied by one power supply unit. Current consumption increases considerably and the torque of the motor drops more quickly at high speeds. For further information, see the paragraph on the regenerative protection circuit in the "Operation" section.

CAUTION! Special care must be taken when it is possible that Motor ST could be operated in generative mode during operation. The regenerative protection circuit only activates when a threshold designed for 48 V operation is reached. This means that the P48V power voltage, L24V logic voltage and, if also connected, enable EN could rise to the activation threshold of the braking circuit in generative mode.
This would result in the destruction of Motor ST and potentially other peripherals connected to it.

CAUTION! When operating the motor with a P48V power voltage that is below 48 V (e.g. in a purely 24 V operation mode), it is important to note that – during braking processes – voltage can increase to the activation threshold of the braking circuit! All other connected devices must have sufficient dielectric strength or some other kind of protection should be put in place.

Operation

Enable

The enable input EN is a safety feature of Motor ST and prevents inadvertent movement. It is monitored at all times and is hard wired to the shutdown for the power stage. It is only when a voltage higher than the threshold is present at the enable input and there are no errors on the controller that the power stage is enabled. Only then can movement commands (including homing) be executed. If movement commands are executed without the enable voltage being present, the motor shaft will not move and a following error is generated.

INFO! If a movement is initiated when the enable input is not present, a following error will be generated!

INFO! When the enable input is switched on or off, established serial connections are broken.

Error reset via enable:

The enable input can be used to reset errors (e.g. following errors, faulty power or logic voltages, overtemperature, etc.) on the controller during operation without having to manually disconnect Motor ST from all supply voltages. The error must be resolved before the reset is carried out.

The firmware only recognises a restart as a reset when the voltage level is below the switching threshold for at least one second. The enable input must be dead for this time.

NOTE! If there has been an error in operation and the red LED is flashing, the error can be cleared by switching the enable input off and back on (it must be off for at least 1 second). When the error is reset, Motor ST restarts. Afterwards, another homing run must be carried out.

USB and RS485

Motor ST features two communications interfaces that can be used to communicate with the controller across the full range of functions (a firmware update can only be carried out via the USB interface).

The USB interface is a micro USB socket. Parts of the controller can be supplied with current via the USB cable. When the controller is being powered solely via the USB interface, it is in USB mode.

Connected cables should be no longer than 2 metres. Once Motor ST has been parametrised, the cap supplied with the motor should be reinserted to protect the USB socket during operation.

Future versions will offer an extended range of functions with RS485. At present, it is possible to parametrise Motor ST using iMST software and a USB/RS485 adapter. A USB serial adapter (such as the PremiumCord USB 2.0 to RS422 RS485 Adapter) can be used to connect the RS485 interface of Motor ST to a PC. The motor is then configured in exactly the same way as when connected via USB.

The baudrate of the RS485 connection is 9600 as standard and the serial address of Motor ST is 1 (factory setting).

INFO! When using the RS485 interface, ensure that suitable termination resistors are incorporated into the wiring.

Voltage monitoring

Motor ST monitors its own voltage inputs, both the P48V power voltage and L24V logic voltage. If the voltages are above or below the values specified in the “Electrical interfaces” table, the monitoring system can report an error.

Depending on the operating mode, undervoltages may be reported as errors. Overvoltages that last longer than 20 ms are always reported as errors. In the event of overvoltage, all movement commands are stopped and the power stages are deactivated. Motor ST goes into error mode status. The red LED can be used to see on Motor ST when a voltage is not permissible (see the “Status LED – red” table).

INFO! Voltage monitoring only takes place when the enable input is switched on.

Temperature monitoring

If the internal motor temperature exceeds the value of 85°C, the controller switches to overtemperature operating mode. Running current is reduced to 74%, provided the previously set value was higher. Holding current is also reduced to this value. Motor ST indicates this status via the red LED. This error can only be cleared by restarting Motor ST or using the enable input to perform a reset. Motor ST is not stopped or restricted in its normal operation.

The overtemperature operating mode is quit once the motor temperature drops to a value below 70°C. When the motor is returned to its normal operating mode, the current values are also restored, provided they were above 74% previously and provided the user did not change the values while the motor was in overtemperature operating mode.

If the motor temperature on the controller exceeds the value of 95°C, Motor ST is stopped and the power stages are permanently deactivated.

Various factors influence the internal motor temperature. These include the ambient temperature, heat exchange during operation, duty cycle, the set running and holding current and the load being moved. A good thermal connection at the motor’s flange is particularly important and can be achieved by using the recommended Drive Sets, for example.

Due to these heat generation factors, running currents and, in particular, holding currents should only be set as high as is necessary. Otherwise, Motor ST can overheat during operation.

INFO! Due to heat generation, only set running and holding currents as high as is necessary.

INFO! Adequate heat exchange must be ensured during operation. A good thermal connection at the motor flange is particularly important.

Regenerative protection circuit

Integrated Motor ST features an internal braking resistor to dissipate energy generated by the motor (braking process, external accelerations, etc.). When a voltage of 57 V is reached, the P48V power voltage is short-circuited via an internal braking resistor. If a larger braking process occurs, this can lead to several simultaneous errors on the controller (following error and/or P48V power voltage). Under certain circumstances, Motor ST can be restarted.

High voltages when Motor ST is in generative mode can result in the connected power supply unit being switched off.

The braking circuit is not a mechanical locking brake.

INFO! In normal operation, the braking circuit should not be active. Accelerations and loads are to be adjusted accordingly.

INFO! When operating the motor with a P48V power voltage that is below 48 V (e.g. in a purely 24 V operation mode), it is important to note that – during braking processes – voltage can increase to the activation threshold of the braking circuit! All other connected devices must have sufficient dielectric strength or some other kind of protection should be put in place.

Firmware

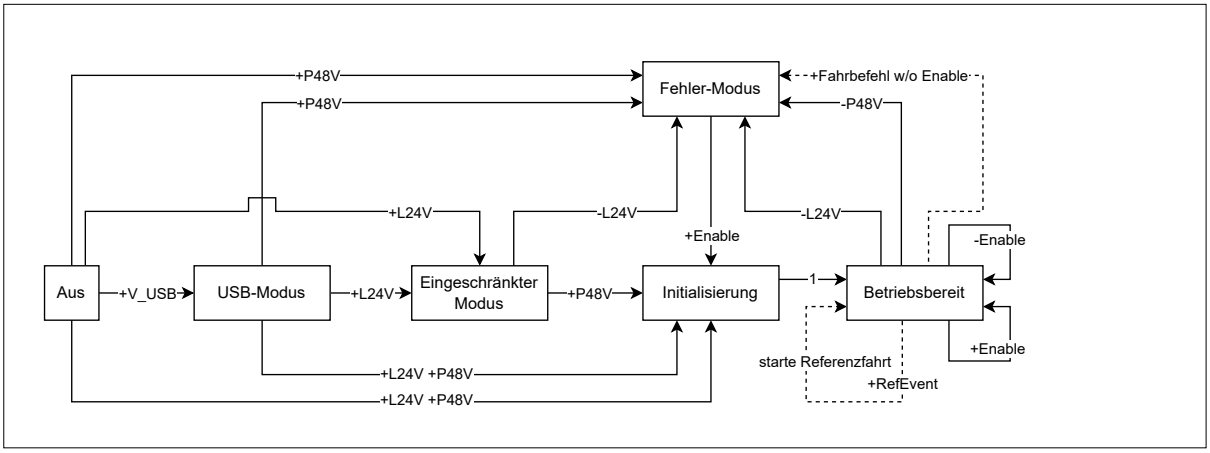
The firmware of Motor St can be described in various statuses and these are depicted in the diagram below. The firmware changes its statuses by switching various voltages and signals off and on ("+" = switch on, "-" = switch off). An arrow with a broken line depicts the switching of a signal and an arrow with a solid line depicts the switching of a voltage. Only the transitions shown have been defined. Any other signal combinations could result in undefined statuses or errors.

Fundamentally, only transitions from left to right are possible (with the exception of transitions to and from error mode). The statuses can be identified externally based on the pattern of flashing on the green LED. For further details and information about the range of functions within the statuses, see also the "Status LED – green" table.

Movement is only possible in operational status. Switching enable on or off in this status when there is no movement command will result in an error. If an iMST project is being run on Motor ST, a homing run will be needed after each restart. This is initiated by triggering the homing run event (high flank at the enable input or a high signal at one of the digital inputs, see also the iMST manual). No movement is possible without a homing run.

INFO! Movement is only possible in operational status.
Movement is only possible once a homing run, initiated by a homing run event, has been performed.

If a voltage supply that has been connected to Motor ST is removed, the motor will switch to its error mode status. When in this status, all movement commands and the motor itself are stopped and the power stage is deactivated. The precise error can be identified from outside during operation based on the red LED. To quit error mode, either disconnect all voltage supplies (L24V logic voltage, P48V power voltage and, if connected, Vbus) for at least 5 seconds, or switch the enable input on and off, ensuring it is off for at least 1 second. In the latter case, Motor ST is restarted by a software reset.



NOTE! When transitioning from error mode to initialisation mode (clear error/reset), the motor can be restarted, which results in the breaking of an established serial connection.

The following table describes the range of functions of the individual statuses:

Function	USB mode	Restricted mode	Operational	Error mode
Reading the digital inputs	✓	✓	✓	✓
Setting and reading the digital outputs	✓ Only effective when L24V applied	✓	✓	✓
Reset motor / restore factory settings	✓	✓	✓	✓
Upload and download iMST project	X	✓	✓	✓
Temperature monitoring	X	X	✓	X
Voltage monitoring	✓	✓	✓ The red LED only lights here	✓
Switching enable off and on restarts Motor ST	X	X	X	✓
Firmware update	✓	X	X	X
Execution of movement commands	X	X	✓	X

The initialisation status is just a temporary status and changes to the operational status after a few seconds.

Firmware update

A firmware update is only possible via item MotionSoftStepper (iMST) software using the USB interface. During the firmware update, the green LED repeatedly displays two brief flashes. See also the iMST manual.

NOTE! The USB connection must not be broken during the firmware update!

Troubleshooting

Fault	Cause	Solution
Serial connection via USB fails	USB cable not plugged into PC or Motor ST	Check the connection
	USB cable too long	The USB cable must be no longer than 2 metres
	USB cable damaged	Use an undamaged high-quality, unshielded USB cable
	USB driver not installed	Check whether the connected motor appears in the device manager of your PC as a COM port
Serial connection via RS485 fails	Pin assignment incorrect – cable incorrectly connected	Check pin assignment and correct connection
	No termination resistors	Fit termination resistors to the cable ends of the bus
	Cable too long and not twisted	Twist cables and connect all bus participants to the ground
	Driver for USB-RS485 adapter not installed	Check whether the connected serial adapter appears in the device manager of your PC as a COM port
"Travel to stop" homing run fails	Mechanical stresses in the system are preventing error-free free travel after stop recognition	Increase the offset of zero position. Ensure that this is in the correct direction of travel
	After stop recognition, the system tries to travel to an offset that is in the blocked direction	Reverse the sign preceding the offset of zero position
"Limit switch" or "homing switch" homing run fails	The signal voltage of the limit switches is too low	Check that the limit switches are emitting a signal voltage that is higher than the switching thresholds of the digital inputs
	The limit switches are connected to the incorrect pins of Motor ST	Check the wiring The limit switches and homing switches must be connected only to DIN3 and DIN4
	Motor ST expects normally closed instead of normally open limit switches (or the reverse)	If normally closed limit switches are used, it is important to ensure that the relevant digital inputs are valued in the inverse in the basic configuration settings of the iMST project
Motor restarts during travel	The power supply unit cannot supply adequate current and switches off, or may restart automatically, and Motor ST also restarts	Use a more powerful power supply unit

Fault	Cause	Solution
Motor won't move	Enable is not set	Apply a voltage to the enable input that is higher than the switching threshold
	Power supply not connected or emergency stop actuated	Remove emergency stop or apply a P48V power voltage of at least 16 V
	Motor is waiting for homing run event	Initiate homing run event
	Logic voltage is not connected	Apply an L24V logic voltage of at least 16 V
	Motor is waiting for a DIN event	Apply a voltage that at least meets the switching threshold to the digital input
	Load on motor shaft/carriage is too large	Reduce the load
	Running current is set too low	Increase running current via the basic configuration settings of the iMST project
	There is no project loaded on Motor ST	Upload the project to Motor ST again via iMST
	Motor shaft/carriage mechanically blocked	Check that the carriage or motor shaft can run freely on a mechanical basis and check any locking brake
	Coupling between Motor ST and the Linear Unit is not screwed firmly in place	Check the fixing of the shaft coupling
	Connected and activated limit switches are preventing travel	Switch off the power to Motor ST and move the motor shaft/carriage away from the limit switches
	Motor ST is too hot and switches off (see "Fault LED - red" table)	Allow Motor ST to cool and ensure there is adequate heat exchange when it is running (see "Temperature monitoring" section)
	Internal error in firmware (stuck in bootloader, FW not started or in incorrect state) (see "Fault LED - red" table)	Restart Motor ST, potentially update firmware using iMST
	Acceleration set too high	Reduce acceleration via the basic configuration settings of the iMST project
DOUTs cannot be activated	DOUTs connected as negative-switching (NPN). Motor ST has positive-switching (PNP) outputs	Only connect electronics to the DOUTs that can serve as a current sink for the PNP outputs of Motor ST
	Electrical load on DOUT too large (see "Fault LED - red" table)	Reset DOUT overload error by completely restarting Motor ST Increase resistive load at DOUT in order to reduce current flow (see "Electrical interfaces" table)
	Excessive capacitance or inductance connected to DOUT	Reduce capacitance and inductance at DOUT
	Logic voltage not connected or too low	Check L24V logic supply

Fault	Cause	Solution
Motor ST does not respond to DINs	Buttons or sensors incorrectly wired	Check wiring and pin assignment
	Switching thresholds of DINs not achieved	Check whether the connected electronics achieve switching thresholds of DINs during activation
	Button or sensor incorrectly connected to I/O plug	Check wiring and pin assignment
	Incorrect evaluation set in iMST (inverse, instead of non-inverse)	Check and test inverse/non-inverse evaluation of DINs in basic configuration of the iMST project
USB connection breaks down during operation	Emergency stop event restarts motor	The serial connection may be broken during an emergency stop event. Restore the connection
	Following error restarts motor	Excessively forceful braking processes generate a following error and/or a P48V power voltage error. This can result in Motor ST being restarted
	Resetting an error with the enable input restarts the motor	Resetting an error via the enable input results in Motor ST restarting. Restore the connection
Status LED on all the time	Motor ST has frozen	Disconnect all serial interfaces and restart Motor ST. Do not allow any serial communication to take place during the initialisation phase and when Motor ST is booting
	Voltage supplies are removed at the wrong time (see “Status diagram”). For example, if the logic voltage is disconnected during the initialisation phase	Only connect the power supplies in the defined sequence
	There is no FW on the motor, or the FW is not starting correctly	Perform a firmware update using iMST
Motor at standstill – following error occurs after a few minutes in operation	Following error builds up during operation until the maximum is exceeded	Reduce acceleration, reduce load, increase running current

Accessories

Article number	Product name	Comments
0.0.710.86	Linear Unit KLE 5 40x40 LR	
0.0.714.00	Linear Unit GSF 6 60 TR 12x3	
0.0.655.98	Linear Unit GSF 8 40 R10	
0.0.706.00	Linear Unit KGT 6 60 P20	
0.0.666.89	Linear Unit LRE 5 D6 60x20 ZU 40 R10	
0.0.715.29	Drive Set GSF 8 40 NEMA 24	
0.0.715.42	Drive Set ZU 5 40 D30/D12 NEMA 24	
0.0.717.14	Drive Set KLE 5 40x40 NEMA 24	
0.0.713.17	Drive Set 6 60 D30/D12 NEMA 24	
0.0.714.36	Sensor/Actuator Connection Cable 5m M8 5P, Male Connector, B-coded	Compatible with X3
0.0.714.35	Sensor/Actuator Connection Cable 5m M12 8P, Male Connector, A-coded	Compatible with X2
0.0.714.52	Sensor/Actuator Connection Cable 5m M12 4P, Female Connector, A-coded	Compatible with X1
0.0.725.68	Sensor/Actuator Connection Cable 5m M12 5P, Female Connector, A-coded	Compatible with X1
0.0.725.69	Sensor/Actuator Distributor Box M12 3P, 6 Slots, A-coded	
0.0.724.19	Connector M12 8P Male, A-coded	Compatible with X2
0.0.604.41	Proximity Switch KLE 6 60x60 - 1NC	
0.0.609.31	Proximity Switch KLE 6 60x60 - 1NO	
0.0.600.05	Proximity Switch 8 - 1NC	
0.3.001.30	Proximity Switch 8 - 1NO	
0.0.600.59	Proximity Switch KLE 8 80x80 - 1NC	
0.0.609.30	Proximity Switch KLE 8 80x80 - 1NO	
0.3.001.24	Proximity Switch M8, Plug Connection	
0.0.337.14	Proximity Switch M8	
0.0.714.39	item MotionSoftStepper	Parametrisation software

Maintenance

The device is fundamentally maintenance-free.
Opening the product housing will void any warranty claim. Only specialists with appropriate training are permitted to carry out repairs and maintenance on electrical devices.

Always disconnect the product from its power source before conducting any maintenance or repair work. Use only parts that have been approved by the manufacturer as spare parts. Inappropriate maintenance and repair work can result in injuries.

WARNING! Do not remove Motor ST from the Linear Unit until you have ensured that the payload of the driven linear drive is in a safe position (e.g. on a system that is installed vertically: when the payload is at the lower end position).

WARNING! The device must not be opened. Opening the device will invalidate the warranty. Repairs must be carried out by the manufacturer only. Please contact your distribution partner about this.

Care and cleaning

External surfaces can be cleaned carefully with suitable aids in order to remove surface dirt such as the remnants of labels. Under no circumstances can liquids of any type be permitted to get inside Motor ST.

CAUTION! Improper cleaning will damage Motor ST

Disposal

Disposal

The use of appropriate materials and easy dismantling ensure the product can be recycled. Improper disposal of the device can pollute the environment. Dispose of the product in accordance with the national regulations that apply in your country.

Environmental hazard:

Once it has reached the end of its service life, dispose of the device using the return and collection systems that are available to you. Inappropriate disposal poses a hazard to the environment.

Transport packaging:

Dispose of the packaging using the return and collection systems that are available to you.

Product development and documentation

A process of continuous product development ensures that products from item Industrietechnik GmbH always exhibit a high standard of innovation.

Consequently, there could be inconsistencies between this guide and the product you have acquired. item Industrietechnik GmbH can also not exclude the possibility of errors. We therefore ask for your understanding that the information, illustrations and descriptions provided here cannot constitute an entitlement to any claims.

You can find the latest version of this user guide at www.item24.com.

Revision history

Version	Date	Description
1.00	12 September 2024	First version of the revision history

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