Lexium T Robot

Hardware Guide

Original instructions

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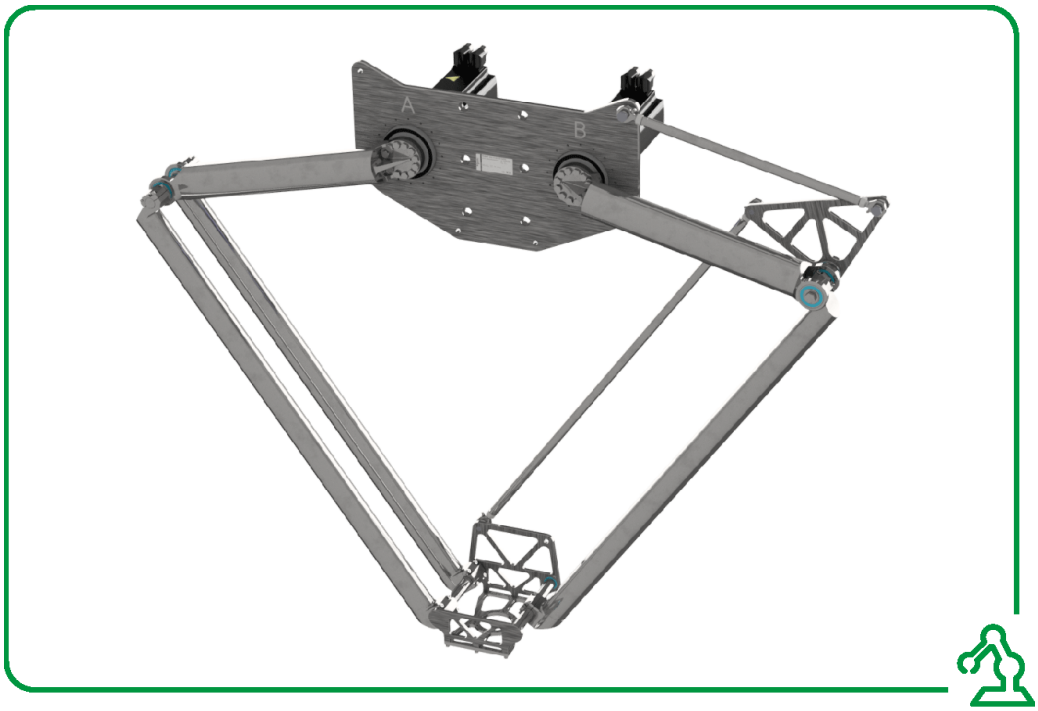

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Legal Information

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Safety Information

Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book

Document Scope

This manual is to help you use the capabilities of the robot safely and properly.

Follow the instructions within this manual to help:

- Reduce risks
- Reduce repair costs and downtime of the robot
- Increase the service life of the robot
- Increase the reliability of the robot

Validity Note

This documentation is valid for the Lexium T robot.

The technical characteristics of the devices described in the present document also appear online. To access the information online, go to the Schneider Electric home page www.se.com/ww/en/download/.

The characteristics that are described in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

For product compliance and environmental information (RoHS, REACH, PEP, EOLI, etc.), go to www.se.com/ww/en/work/support/green-premium/.

Product Related Information

The equipment described herein must be used in accordance with the application-specific risk analysis that you are to perform along with verification of all applicable standards. Pay attention in conforming to any safety information, different electrical requirements, and normative standards that would apply to your application of the information contained in the present manual and the manuals for associated equipment.

⚠⚠DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Operate electrical components only with a connected protective ground (earth) cable.
- Verify the secure connection of the protective ground (earth) cable to all electrical devices to ensure that connection complies with the connection diagram.
- Do not touch the electrical connection points of the components when the module is energized.
- Provide protection against indirect contact.
- Insulate any unused conductors on both ends of the motor cable.

Failure to follow these instructions will result in death or serious injury.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Perform a hazard and risk analysis to determine the appropriate safety integrity level, and any other safety requirements, for your specific application based on all the applicable standards.
- Ensure that the hazard and risk analysis is conducted and respected according to EN/ISO 12100 during the design of your machine.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

(1) for additional information, refer to NEMA ICS 1.1 (latest edition), “Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control” and to NEMA ICS 7.1 (latest edition), “Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems” or their equivalent governing your particular location.

Related Documents

Title of Documentation	Reference Number
MH3 Servo motor Motor Manual	0198441114042 (EN) 0198441114041 (GER)
Lexium 52 Hardware Guide	EIO0000001347 (EN) EIO0000001348 (GER)
Lexium 62 Hardware Guide	EIO0000001349 (EN) EIO0000001350 (GER)
Lexium 62 ILM Hardware Guide	EIO0000001351 (EN) EIO0000001352 (GER)
SchneiderElectricRobotics Library Guide (only available in the online help)	EIO0000002236 (EN) EIO0000002237 (GER)

You can download these technical publications and other technical information from our website at www.se.com/ww/en/download/ .

Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in this manual, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as *safety*, *safety function*, *safe state*, *fault*, *fault reset*, *malfunction*, *failure*, *error*, *error message*, *dangerous*, etc.

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2015	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
IEC 62061:2015	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2016	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 60034 series	Rotating electrical machines
IEC 61800 series	Adjustable speed electrical power drive systems
IEC 61158 series	Digital data communications for measurement and control – Fieldbus for use in industrial control systems

Finally, the term *zone of operation* may be used in conjunction with the description of specific hazards, and is defined as it is for a *hazard zone* or *danger zone* in the *Machinery Directive* (*2006/42/EC*) and *ISO 12100:2010*.

NOTE: The aforementioned standards may or may not apply to the specific products cited in the present documentation. For more information concerning the individual standards applicable to the products described herein, see the characteristics tables for those product references.

Dual Dimensions

Dimensions are indicated in metric system and U.S. customary units system. The U.S. dimensions are given in parentheses, for example 8.4 mm (0.33 in).

NOTE: The given values in parentheses are rounded and for reference only.

Figures

Unless otherwise stated, the different robot types and variants of the Lexium T robots are represented in the figures by the robot type VRKT5.

Hazard Information

Proper Use

Overview

This section contains information regarding the operation of the Lexium T robot. Qualified personnel, page 12 working with the robot must read and observe this information.

Installation

The robot is intended to be integrated into a machine or assembled with other components to build up a machine or system. The robot is an open type robot that is intended to be installed into an enclosure to provide access protection.

Provide for Protective Measures

Before installing the robot, provide appropriate protective devices in compliance with local and national standards. Do not commission components without appropriate protective devices. After installation, commissioning, or repair, test the protective devices used.

Other standards are applicable as guideline for a robot integration into the machine such as (non exhaustive list):

- Directive 2006/42/EC on machinery
- Standard ISO 10218-1:2011 Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots
- Standard ISO 10218-2:2011 Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration
- Standard ISO 13857:2008 Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs
- Standard ISO 14120:2015 Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards
- Standard EN 349:2008 Safety of machinery - Minimum gaps to avoid crushing of parts of the human body
- Standard ISO 13855:2010 Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body
- Standard NFPA 79 Electrical Standard for Industrial Machinery
- Standard UL 1740 Standard for Robots and Robotic Equipment
- Standard UL 2011 Standard for Factory Automation Equipment

Perform a risk evaluation concerning the specific use before operating the robot and take appropriate security measures.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Ensure that a risk assessment is conducted and respected according to EN/ISO 12100 during the design of your machine.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

If circumstances occur that affect the safety or cause changes to the operating behavior of the robot, then immediately shut down the robot and contact your local Schneider Electric service representative.

Use Original Equipment Only

Use only the accessories and mounting parts specified in the documentation and only third-party devices or components that have been expressly approved by Schneider Electric. Only modify the robot in the manner intended and described in this documentation, and other documentation concerning any other associated equipment.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software and hardware components approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Misuse

The robot is not suitable for the manipulation of living organisms or explosive materials, nor is it suitable for impact movement.

Incompatible Environments

The components must not be used in the following environments:

- Hazardous (explosive) atmospheres
- Mobile, movable, or floating systems
- Life support systems
- Domestic appliances
- Underground
- Highly saline environments (refer to *Technical Data*, page 24 for materials used)
- Environments with increased radioactive radiation

This equipment has been designed to operate outside of any hazardous location. Only install this equipment in zones known to be free of a hazardous atmosphere.

⚠DANGER

POTENTIAL FOR EXPLOSION

Install and use this equipment in non-hazardous locations only.

Failure to follow these instructions will result in death or serious injury.

Installation and Operating Conditions

Only use the components in accordance with the installation and operating conditions described in this documentation. The operating conditions at the installation location must be inspected and maintained in accordance with the required technical data (performance data and ambient conditions). Commissioning is prohibited until the usable machine or system in which the robot is installed is in accordance to the applicable local regulations and standards.

Qualification of Personnel

Target Audience for This Manual

This documentation is intended for users having the following knowledge:

- Advanced knowledge in mechanical engineering
- Advanced knowledge in electrical engineering
- Knowledge of the robot control system, its installation and operation, as well as the construction of the machine/application in which it is intended

Qualified Person

Aside from skills and knowledge, qualified personnel must be able to detect possible hazards that may arise from parametrization, changing parameter values and generally from mechanical, electrical, or electronic equipment. The qualified personnel must be familiar with the standards, provisions, and regulations for the prevention of industrial accidents, which they must observe when working on the drive system.

Residual Risks

Overview

Risks arising from the robot have been reduced. However a residual risk remains since the robot is moved and operated with electrical voltage and electrical currents.

If activities involve residual risks, a safety message is made at the appropriate points. This includes potential hazards that may arise, their possible consequences, and describes preventive measures to avoid the hazards.

Electrical Parts

⚠⚠DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Operate electrical components only with a connected protective ground (earth) cable.
- Verify the secure connection of the protective ground (earth) cable to all electrical devices to ensure that connection complies with the connection diagram.
- Do not touch the electrical connection points of the components when the module is energized.
- Provide protection against indirect contact.
- Insulate any unused conductors on both ends of the motor cable.

Failure to follow these instructions will result in death or serious injury.

Emergency Stop

The robot mechanics, apart from the motor, are not supplied with external brakes nor an emergency stop switch to engage any external brakes.

⚠WARNING

ENTRAPMENT BY ROBOT MECHANICS

- Provide means for ensuring that the motors can be put into a voltage-free state with any internal holding brake or external service brake released.
- Make available those means to allow one person to manually move the robot within reach of the zone of operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The opening of the motor holding brakes may cause the robot to sag.

⚠WARNING

SAGGING OF THE ROBOT

Ensure that the release of the motor brakes poses no subsequent risks in the zone of operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: Provide separation devices for all infeed energies. It must be possible to secure the separation devices in de-energized position, for example, by locking.

Assembly and Handling

⚠WARNING

CRUSHING, SHEARING, CUTTING AND HITTING DURING HANDLING

- Observe the general construction and safety regulations for handling and assembly.
- Use appropriate mounting and transport equipment and use appropriate tools.
- Prevent clamping and crushing by taking appropriate precautions.
- Cover edges and angles to protect against cutting damage.
- Wear suitable protective clothing (for example, protective goggles, protective boots, protective gloves).

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Robot Motion

Parts of the mechanics can move at high speeds. In such cases, the payload weight, additionally installed gripper, and shifts in the center of gravity of the moving parts contribute to the total energy of the forces generated.

Motion sequences can occur when operating with robot mechanics, which allow operational staff to make misjudgments. For safety considerations (according to EN ISO 13849-1), consider the controller and the brakes as non-safety-related elements. Ensure that necessary protective measures are implemented.

The safety standards and directives for the respective country where the equipment is in use define which protective measures are appropriate.

Additionally, the system engineer who is responsible for the integration of the robot mechanics must evaluate which measures have to be taken.

NOTE: The configuration of the robot mechanics, the Tool Center Point (TCP) velocity, as well as the additional payload have an effect on the total energy, which can potentially be a source of damage and injury.

⚠WARNING

CRUSHING, SHEARING, CUTTING AND IMPACT INJURY

- The robot must be operated only within an enclosure.
- Open or enter the enclosure for cleaning and maintenance purposes only.
- Design the enclosure to withstand an impact from the robot and to resist ejected parts from escaping the zone of operation.
- Design the enclosure to safely deactivate the robot as soon as a person enters the zone of operation of the robot.
- All barriers, protective doors, contact mats, light barriers, and other protective equipment, must be configured correctly and enabled whenever the robot mechanics are under power.
- Define the clearance distance to the zone of operation of the robot so the operational staff do not have access to, nor can be enclosed in, the robot mechanics zone of operation.
- Design the enclosure to account for the maximum possible travel paths of the robot; that is, the maximum path until the hardware safety system limits as well as the additional run-on paths, in case of a power interruption.

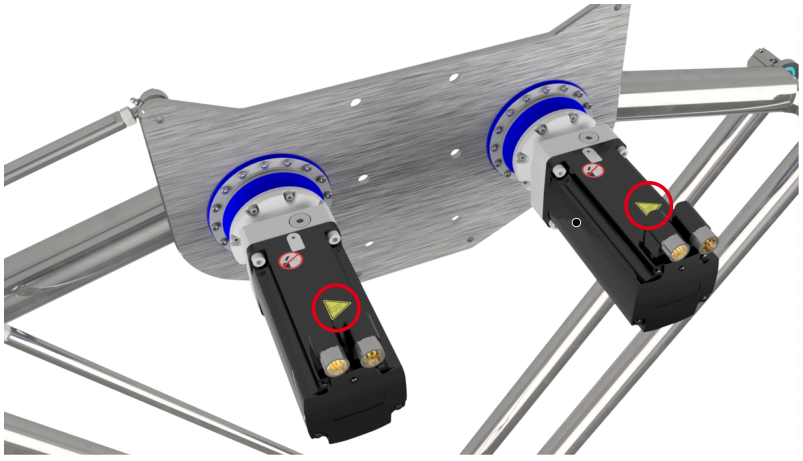
Failure to follow these instructions can result in death, serious injury, or equipment damage.

For detailed information about travel path and power loss, refer to *Run-on Motions of the* Robot *for Risk Analysis*, page 52.

Hot Surfaces

The metal surfaces of the robot may exceed 70 °C (158 °F) during operation.

The following figure presents the hot surface labels on the robot.



⚠WARNING

HOT SURFACES

- Avoid unprotected contact with hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Hazardous Movements

There can be different sources of hazardous movements:

- No or incorrect calibration of the drive
- Wiring or cabling errors
- Errors in the application program
- Component errors
- Error in the measured value and signal transmitter

NOTE: Provide for personal safety by primary equipment monitoring or measures. Do not rely only on the internal monitoring of the drive components. Adapt the monitoring or other arrangements and measures to the specific conditions of the installation in accordance with a hazard and risk analysis.

⚠DANGER

UNAVAILABLE OR INADEQUATE PROTECTION DEVICE(S)

- Prevent entry to a zone of operation with, for example, protective fencing, mesh guards, protective coverings, or light barriers.
- Dimension the protective devices properly and do not remove or modify them.
- Do not make any modifications that can degrade, incapacitate, or in any way invalidate protection devices.
- Bring the drives and the motors they control to a stop before accessing the drives or entering the zone of operation.
- Protect existing workstations and operating terminals against unauthorized operation.
- Position emergency stop switches so that they are easily accessible and can be reached quickly.
- Validate the functionality of emergency stop equipment before start-up and during maintenance periods.
- Prevent unintentional start-up by disconnecting the power connection of the drives using the emergency stop circuit or using an appropriate lock-out tag-out sequence.
- Validate the system and installation before the initial start-up.
- Avoid operating high-frequency, remote control, and radio devices close to the system electronics and their feed lines.
- Perform, if necessary, a special electromagnetic compatibility (EMC) verification of the system.

Failure to follow these instructions will result in death or serious injury.

Drive systems may perform unanticipated movements because of incorrect wiring, incorrect settings, incorrect data, or other errors.

⚠WARNING

UNINTENDED MOVEMENT OR MACHINE OPERATION

- Carefully install the wiring in accordance with EMC standards.
- Do not operate the robot with undetermined settings and data.
- Perform comprehensive commissioning tests that include verification of configuration settings and data that determine position and movement.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Noise Protection

The noise level of the mechanics depends on the basic cycle and the payload, as well as on further application-specific accessory parts. Be aware of the fact that noise emissions multiply when several mechanics are in use at the same time. If noise emissions reach a value of more than 70 dBA, wear hearing protection.

⚠CAUTION

NOISE EMISSIONS OF THE ROBOT MECHANICS

- Wear hearing protection in accordance with the locally applicable regulations.
- Attach a sign on the robot mechanics if the noise emissions reach an excessive value.

Failure to follow these instructions can result in injury or equipment damage.

NOTE: Attach the following symbol where it can easily be seen on the robot mechanics.

Emissions

Some small amounts of lubricant emissions are to be expected over time. However, excessive lubricant emissions on or at the gearbox may be an indication of a damaged robot.

NOTICE

INOPERABLE EQUIPMENT INDICATED BY GEARBOX LUBRICANT EMISSIONS

- Verify the mechanics before, during, and after use.
- Shut down the mechanics immediately if lubricant emissions appear on the robot mechanics.

Failure to follow these instructions can result in equipment damage.

Hanging Loads

The robot is capable of suspending heavy loads.

⚠WARNING

FALLING LOADS

Do not stand under hanging loads.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Attachments or Modifications

If different customer end products are transported by the robot mechanics, then the product pickup must be modified accordingly. For this reason, you can mount different product pickups (gripper mounting) to the flange. In doing so, ensure that the articulation movement is not restricted and/or that no motion errors can result from the modifications. Attachments and rebuilds must not influence the operation of the protective devices in any way and all EMERGENCY STOP buttons must be accessible and operational at all times.

⚠WARNING

UNINTENDED MACHINE OPERATION

- Do not drill into or modify the articulated arms.
- Do not modify the cable set.
- Do not modify the mounting plate.
- Do not modify the components of movable mechanics.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Options for Moving the Robot Without Drive Energy

The robot mechanics are not equipped with a security frame.

NOTE: Take appropriate security measures concerning the specific use before operating the robot.

⚠WARNING

SAGGING OF THE ROBOT

Ensure that the release of the motor brakes poses no subsequent risks in the zone of operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

If the equipment is with power, perform the following steps:

Step	Action
1	Switch the robot into a torque-free state.
2	Manually hold the robot in position.
3	Release the motor brakes. **NOTE:** The function for releasing the brakes as well as for torque-free switching of the motors is not controlled by the equipment delivered with the product reference, but must be addressed by the application.
4	Manually move the robot. **NOTE:** A greater force could be necessary because the motor and the gearbox may pose resistance to movement.
5	Engage the brakes.

If the equipment is without power, perform the following steps:

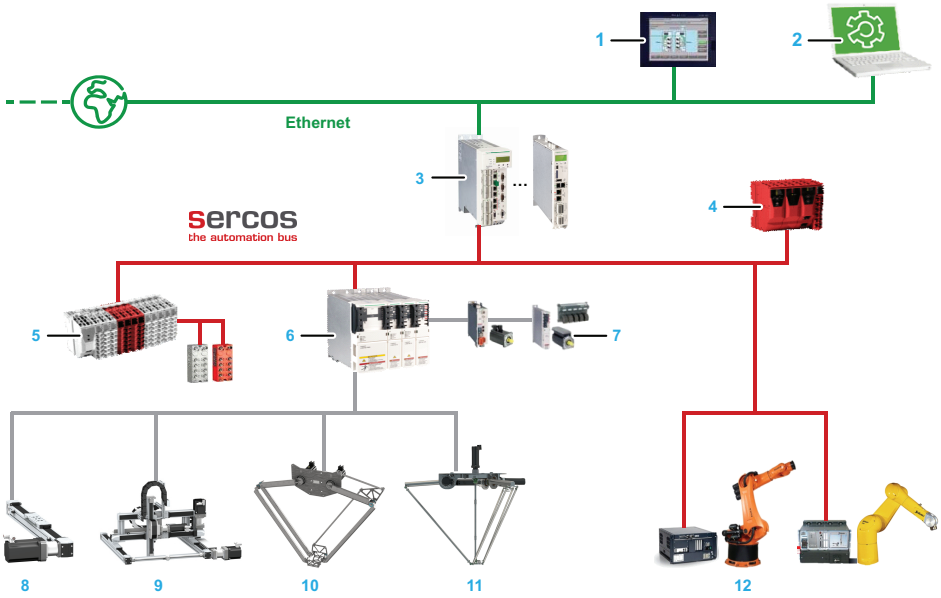
Step	Action
1	Disconnect the motor cables from the motors.
2	Apply an external 24 V supply to the appropriate connection points to release the motor brakes if necessary.
3	Release the external brakes engaged by the functional safety system of the robot.
4	Manually move the robot. **NOTE:** A greater force could be necessary because the motor and the gearbox may pose resistance to movement.
5	Remove the external current to close the brakes.
6	Reconnect the motor cables to the motor.

System Overview

System Architecture

Overview

The control system consists of several components, depending on its application. The following graphic presents an example of a PacDrive 3 system.



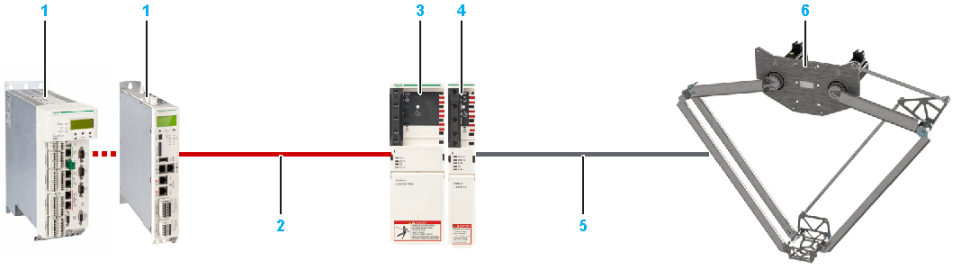
1	Magelis HMI
2	EcoStruxure Machine Expert
3	Motion Controller
4	Safety Controller
5	I/O
6	Drives
7	Motors

8	Single Axes (PAS, TAS, CAS, CAR, EAC)
9	Multi-Axis Systems (MAXH, MAXS, MAXP, MAXR)
10	Delta-2 Robots (Lexium T)
11	Delta-3 Robots (Lexium P)
12	Articulated Robots

Product Overview

System Setup

The following figure presents an example of a system setup for one Lexium T robot with MH3 motors. At a minimum, these are the equipments required to achieve performances described in this guide.



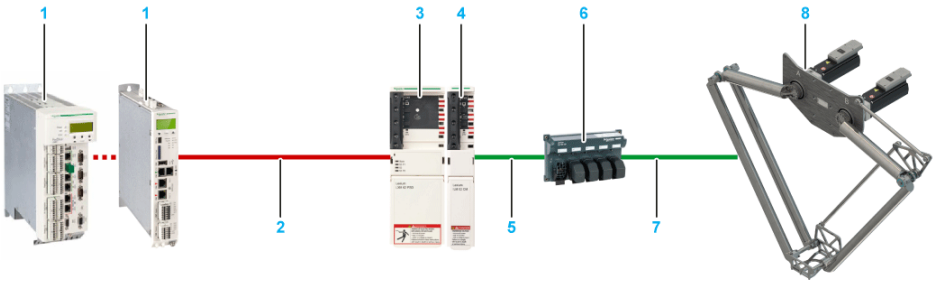
Number	Device name	Quantity	Device type	Comment
1	Controller	1	LMC•00C… LMC•01C	Logic Motion Controller
2	Sercos cable	3	VW3E5001R	Sercos cable; the cable length depends on the distance between controller and cabinet.
3	Power supply	1	LXM62PD84A11000	Lexium 62 Power Supply(3)
4	Double drive	1	Double drive(2): LXM62DD27•21000	Lexium 62 Drive Module
	Single drive	2	Single drive(2): LXM62DD27•21000	Lexium 62 Drive Module(3)
5	Motor cable for connection of drive and motor	2	VW3E1143R•••	PacDrive 3 motor cable; the cable length depends on the distance between cabinet and robot.
	Feedback cable for connection of drive and motor	2	VW3E2094R•••	
6	Lexium T robot	1	(1)	

(1) The device type depends on the robot reference and its characteristics. For further information, refer to *Type Code*, page 22.

(2) The specific variant of the Lexium drive depends on the safety requirements.

(3) Alternatively, use the Lexium LXM52, Stand-Alone Servo Drive. Quantity: 2. Device Type LXM52DD30C.

The following figure presents an example of a system setup for one Lexium T robot with ILM motors. At a minimum, these are the equipments required to achieve performances described in this guide.



Number	Device name	Quantity	Device type	Comment
1	Controller	1	LMC•00C… LMC•01C	Logic Motion Controller
2	Sercos cable	3	VW3E5001R	Sercos cable; the cable length depends on the distance between controller and cabinet.
3	Power supply	1	LXM62PD84A11000	Lexium 62 Power Supply
4	Connection module	1	ILM62CMD20A000	Lexium 62 Connection Module
5	Cable for connection of connection module and distribution box	2	VW3E1•••R•••	Hybrid cable; the cable length depends on the distance between the cabinet and the robot. Various connector plugs are available.
6	Distribution box	1	ILM62DB4A000	Lexium 62 Distribution Box
7	Cable for connection of distribution box and motor	2	VW3E1•••R•••	Hybrid cable; the cable length depends on the distance between the cabinet and the robot. Various connector plugs are available.

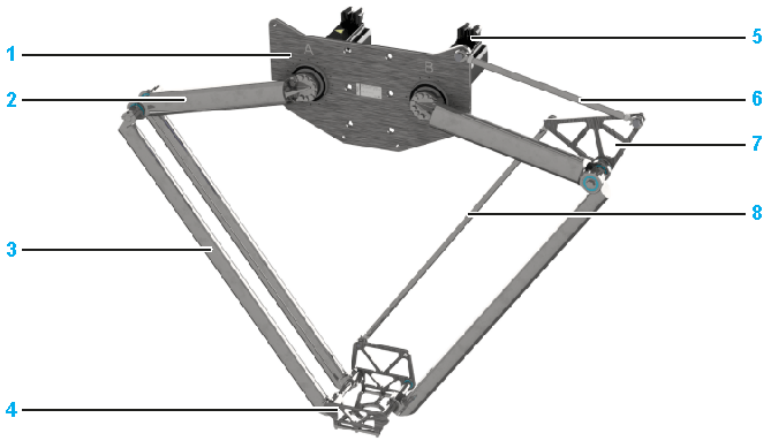
Number	Device name	Quantity	Device type	Comment
8	Lexium T robot	1	(1)	
(1) The device type depends on the robot reference and its characteristics. For further information, refer to *Type Code*, page 22.				

System Performance

System performance for a robotic application (including enough performance overhead for additional application components):

PacDrive LMC	Sercos cycle time 1 ms		Sercos cycle time 2 ms	
	Simple control (1)	Control with velocity control (1)	Simple control (1)	Control with velocity control (1)
PacDrive LMC101	2	–	2	1
PacDrive LMC106	2	–	2	1
PacDrive LMC201	2	–	2	1
PacDrive LMC212	2	–	4	1
PacDrive LMC216	2	–	4	1
PacDrive LMC400	3	1	4	2
PacDrive LMC402	8	4	8	8
PacDrive LMC600	6	2	12	4
PacDrive LMC802	11	4	22	8
(1) Number of controllable robots (two axes per robot)				

Components Overview



1	Mounting plate
2	Upper arm
3	Lower arm
4	Parallel plate

5	Motor/gearbox
6	Parallel linkage rod short
7	Lever parallel linkage
8	Parallel linkage rod long

Characteristics of the Lexium T Robots

The Lexium T robot provides the following features:

- Stainless steel Delta 2 robot equipped by an automation platform
- Few references covering large performance
- Pre-assembled and ready to connect
- No calibration at customer site
- Compact foot print
- Fast replacement of replacement equipment

Type Code

Overview

Example of a type code for the Lexium T robot:

Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Example	V	R	K	T	5	M	0	F	N	C	0	0	0	0	0

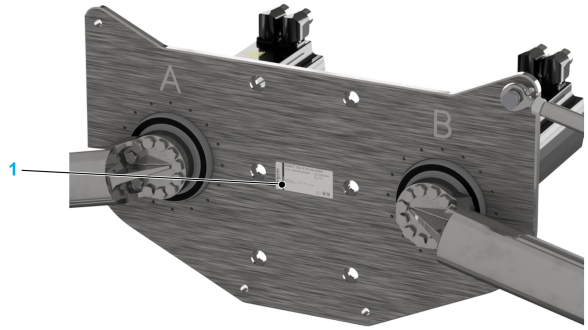
Description of the type code structure with reference to the example stated above:

Character	Example	Item	Meaning
1…3	VRK	Robot kinematics	–
4…5	T5	Robot/product type	T1 = 2-axis Delta 2 robot 600 mm (23.5 in) T2 = 2-axis Delta 2 robot 800 mm (31.5 in) T3 = 2-axis Delta 2 robot 1000 mm (39 in) T5 = 2-axis Delta 2 robot 1500 mm (59 in) TX = parts for Lexium T robots. For example: replacement equipment.
6…7	M0	Subtype	L0 = ILM motors (T2, T3, T5) M0 = MH3 motors (T1, T2, T3, T5) M1 = MH3 motors heavy duty (T2, T3, T5) WM = without motors (T2, T3, T5) YY = replacement equipment set
8	F	Option	F = fixed, no rotational axis installed C = customized version Y = replacement equipment (replacement equipment for customized editions = C)
9…10	NC	Variant	NC = normal, Compact (T1, T2, T3, T5) YY = replacement equipment
11…12	00	Revision	S00 (T1, T2, T3, T5)
13…15	000	Miscellaneous	000 = without options ••• = replacement equipment

If you have questions concerning the type code, contact your local Schneider Electric service representative.

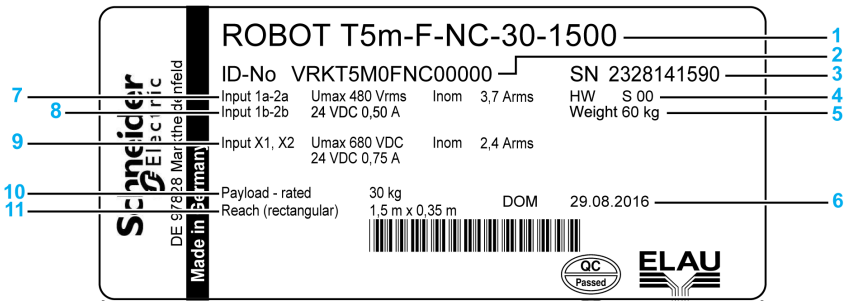
Type Plate

Position of the Type Plate



1 Type plate

Description of the Type Plate



1	Device name
2	Type code*
3	Serial number
4	Hardware code
5	Weight of the robot
6	Date of manufacture

7	Voltage and current of the MH3 motor
8	Voltage and current of the MH3 motor brakes
9	Voltage and current of all ILM motors and brakes
10	Nominal load
11	Radius of the working area

* For detailed information about the meaning of the particular characters, refer to *Type Code*, page 22.

Technical Data

Ambient Conditions

Ambient Conditions

Overview

Procedure	Parameter	Unit	Value
Operation(1)	**Classes 3K3**, **3Z12**, **3Z2**, **3B2**, **3C1**, **3M7** (according to IEC/EN 60721-3-3)		
	Ambient temperature	°C (° F)	+5…+40 (+41…+104)(2)
	Condensation	–	prohibited
	Formation of ice	–	prohibited
	Relative humidity	%	5…85
Transport	**Set of class combinations IE21** (according to IEC/EN 60721-3-2)(3)		
	Ambient temperature	°C (° F)	-20…+70 (-4…+158)
	Condensation	–	prohibited
	Precipitation	–	prohibited
	Formation of ice	–	prohibited
	Other liquid	–	prohibited
	Wetness	–	prohibited
	Relative humidity	%	< 75
Long-term storage in transport packaging	**Class 1K3** (according to IEC/EN 60721-3-1)(4)		
	Ambient temperature	°C (° F)	0…+40 °C (+32…+104 °F)
	Condensation	–	prohibited
	Precipitation	–	prohibited
	Formation of ice	–	prohibited
	Other liquid	–	prohibited
	Relative humidity	%	5…95
	Maximum storage period	years	2

(1) Installation altitude without power reduction < 1000 m (3281 ft).

(2) Power reduction for Lexium T Compact versions with ILM motors at ambient temperatures exceeding +25 °C (+77 °F). Power reduction depends on the application. If some severities of parameters deviate from the specified ambient conditions, contact your local Schneider Electric service representative for more information.

(3) All parameters conform to the specified class except for the ambient temperature and the relative humidity which is limited by other components of the system.

(4) All parameters conform to the specified class except for the ambient temperature which is limited by other components of the system.

For further information about storage conditions, refer to *Transport and Storage*, page 62.

Mechanical and Electrical Data of Lexium T Robots

Robot VRKT1•••NC

Mechanical and Electrical Data

Category	Parameter	Unit	VRKT1M0FN-C00000
General data	Rated payload	kg (lb)	1.5 (3.3)
	Maximum payload	kg (lb)	15 (33)(2)
	Maximum velocity	m/s (ft/s)	5.3 (17.4)
	Maximum acceleration(1) for 0.1 kg (0.22 lb)	m/s^2 (ft/s^2)	49 (160)
	Maximum acceleration(1) for 1.5 kg (3.3 lb)	m/s^2 (ft/s^2)	40 (131)
	Maximum acceleration(1) for over 1.5 kg (3.3 lb)	m/s^2 (ft/s^2)	(2)
	Number of axes	–	2
	Position repeatability (ISO 9283)	mm (in)	Position: 0.1 (0.0039)
Electrical data	Mains voltage - 3-phase	Vac	maximum 480(3)
	Control voltage (with brake)	Vdc	+24 (-10…+6%)
	Motor main axes	–	MH30703P02-F2200
	Power consumption for a typical pick-and-place cycle with 1.5 kg (3.3 lb)	kW (hp)	0.7 (0.94)
Mechanical data	Installation type	–	Ceiling installation
	Protection class for moving parts	–	IP64
	Basic protection class	–	IP64
	Housing type	–	Compact
Working area	Height x width	mm (in)	300 x 600 (11.8 x 23.6) 350 x 410 (13.8 x 16.2)
Weight	–	kg (lb)	36.5 (80.2)
Noise level	–	dB(A)	< 70
Material	–	–	Stainless steel, aluminum, FPM, EPDM

(1) For a load mounted centrally underneath the flange and a distance of maximum 100 mm (3.9 in) between flange and mass center of gravity.

(2) Loads are subject to restrictions that are application-specific. For more information, contact your local Schneider Electric service representative.

(3) For further information, refer to *Lexium 52 Hardware Guide* or *Lexium 62 Hardware Guide*. The maximum 480 Vac is the mains voltage of the Lexium 52 Drive or the Lexium 62 Power Supply.

Robot VRKT2•••NC

Mechanical and Electrical Data

Category	Parameter	Unit	VRKT2M0-FNC00000	VRKT2M1-FNC00000	VRKT2L0F-NC00000
General data	Rated payload	kg (lb)	10 (22)		
	Maximum payload	kg (lb)	40 (88)(2)	60 (132)(2)	40 (88)(2)
	Maximum velocity	m/s (ft/s)	5.8 (19)	5.5 (18)	5.8 (19)
	Maximum acceleration(1) for 1 kg (2.2 lb)	m/s^2 (ft/s^2)	60 (197)	37 (121)	60 (197)
	Maximum acceleration(1) for 10 kg (22 lb)	m/s^2 (ft/s^2)	53 (174)	33 (108)	53 (174)
	Maximum acceleration(1) for over 10 kg (22 lb)	m/s^2 (ft/s^2)	(2)		
	Number of axes	–	2		
	Position repeatability (ISO 9283)	mm (in)	Position: 0.1 (0.0039)		
Electrical data	Mains voltage - 3-phase	Vac	maximum 480(3)		
	Control voltage (with brake)	Vdc	+24 (-10…+6%)		+24 (-20…+25%)
	Motor main axes	–	MH31002-P02F2200	MH31003-P02F2200	ILM1003-P02F0000
	Power consumption for a typical pick-and-place cycle with 10 kg (22 lb)	kW (hp)	0.85 (1.14)		
Mechanical data	Installation type	–	Ceiling installation		
	Protection class for moving parts	–	IP64		
	Basic protection class	–	IP64		
	Housing type	–	Compact		
Working area	Height x width	mm (in)	350 x 800 (13.8 x 31.5) 440 x 500 (17.3 x 19.7)		
Weight	–	kg (lb)	56 (123)	60 (132)	64 (141)
Noise level	–	dB(A)	< 70		
Material	–	–	Stainless steel, aluminum, FPM, EPDM		

(1) For a load mounted centrally underneath the flange and a distance of maximum 100 mm (3.9 in) between flange and mass center of gravity.

(2) Loads are subject to restrictions that are application-specific. For more information, contact your local Schneider Electric service representative.

(3) For further information, refer to *Lexium 52 Hardware Guide* or *Lexium 62 Hardware Guide*. The maximum 480 Vac is the mains voltage of the Lexium 52 Drive or the Lexium 62 Power Supply.

Robot VRKT3•••NC

Mechanical and Electrical Data

Category	Parameter	Unit	VRKT3M0-FNC00000	VRKT3M1-FNC00000	VRKT3L0F-NC00000
General data	Rated payload	kg (lb)	10 (22)		
	Maximum payload	kg (lb)	35 (77)(2)	50 (110)(2)	35 (77)(2)
	Maximum velocity	m/s (ft/s)	6 (19.7)	5.8 (19)	6 (19.7)
	Maximum acceleration(1) for 1 kg (2.2 lb)	m/s^2 (ft/s^2)	62 (203)	55 (180)	62 (203)
	Maximum acceleration(1) for 10 kg (22 lb)	m/s^2 (ft/s^2)	41 (135)	38 (125)	41 (135)
	Maximum acceleration(1) for over 10 kg (22 lb)	m/s^2 (ft/s^2)	(2)		
	Number of axes	–	2		
	Position repeatability (ISO 9283)	mm (in)	Position: 0.1 (0.0039)		
Electrical data	Mains voltage - 3-phase	Vac	maximum 480(3)		
	Control voltage (with brake)	Vdc	+24 (-10…+6%)		+24 (-20…+25%)
	Motor main axes	–	MH31002-P02F2200	MH31003-P02F2200	ILM1003-P02F0000
	Power consumption for a typical pick-and-place cycle with 10 kg (22 lb)	kW (hp)	0.85 (1.14)		
Mechanical data	Installation type	–	Ceiling installation		
	Protection class for moving parts	–	IP64		
	Basic protection class	–	IP64		
	Housing type	–	Compact		
Working area	Height x width	mm (in)	380 x 1000 (15 x 39) 480 x 719 (19 x 28.3)		
Weight	–	kg (lb)	60 (132)	65 (143)	65 (143)
Noise level	–	dB(A)	< 70		
Material	–	–	Stainless steel, aluminum, FPM, EPDM		

(1) For a load mounted centrally underneath the flange and a distance of maximum 100 mm (3.9 in) between flange and mass center of gravity.

(2) Loads are subject to restrictions that are application-specific. For more information, contact your local Schneider Electric service representative.

(3) For further information, refer to *Lexium 52 Hardware Guide* or *Lexium 62 Hardware Guide*. The maximum 480 Vac is the mains voltage of the Lexium 52 Drive or the Lexium 62 Power Supply.

Robot VRKT5•••NC

Mechanical and Electrical Data

Category	Parameter	Unit	VRKT5M0-FNC00000	VRKT5M1-FNC00000	VRKT5L0F-NC00000
General data	Rated payload	kg (lb)	10 (22)		
	Maximum payload	kg (lb)	30 (66)(2)	45 (99)(2)	30 (66)(2)
	Maximum velocity	m/s (ft/s)	6.8 (22.3)	7.3 (24)	6.8 (22.3)
	Maximum acceleration(1) for 1 kg (2.2 lb)	m/s^2 (ft/s^2)	58 (190)	64 (210)	58 (190)
	Maximum acceleration(1) for 10 kg (22 lb)	m/s^2 (ft/s^2)	48 (157)	57 (187)	48 (157)
	Maximum acceleration(1) for over 10 kg (22 lb)	m/s^2 (ft/s^2)	(2)		
	Number of axes	–	2		
	Position repeatability (ISO 9283)	mm (in)	Position: 0.1 mm (0.0039 in)		
Electrical data	Mains voltage - 3-phase	Vac	maximum 480(3)		
	Control voltage (with brake)	Vdc	+24 (-10…+6%)		+24 (-20…+25%)
	Motor main axes	–	MH31002-P02F2200	MH31003-P02F2200	ILM1003-P02F0000
	Power consumption for a typical pick-and-place cycle with 10 kg (22 lb)	kW (hp)	0.85 (1.14)		
Mechanical data	Installation type	–	Ceiling installation		
	Protection class for moving parts	–	IP64		
	Basic protection class	–	IP64		
	Housing type	–	Compact		
Working area	Height x width	mm (in)	365 x 1500 (14.4 x 59) 515 x 1193 (20.3 x 47)		
Weight	–	kg (lb)	60 (132)	65 (143)	65 (143)
Noise level	–	dB(A)	< 70		
Material	–	–	Stainless steel, aluminum, FPM, EPDM		

(1) For a load mounted centrally underneath the flange and a distance of maximum 100 mm (3.9 in) between flange and mass center of gravity.

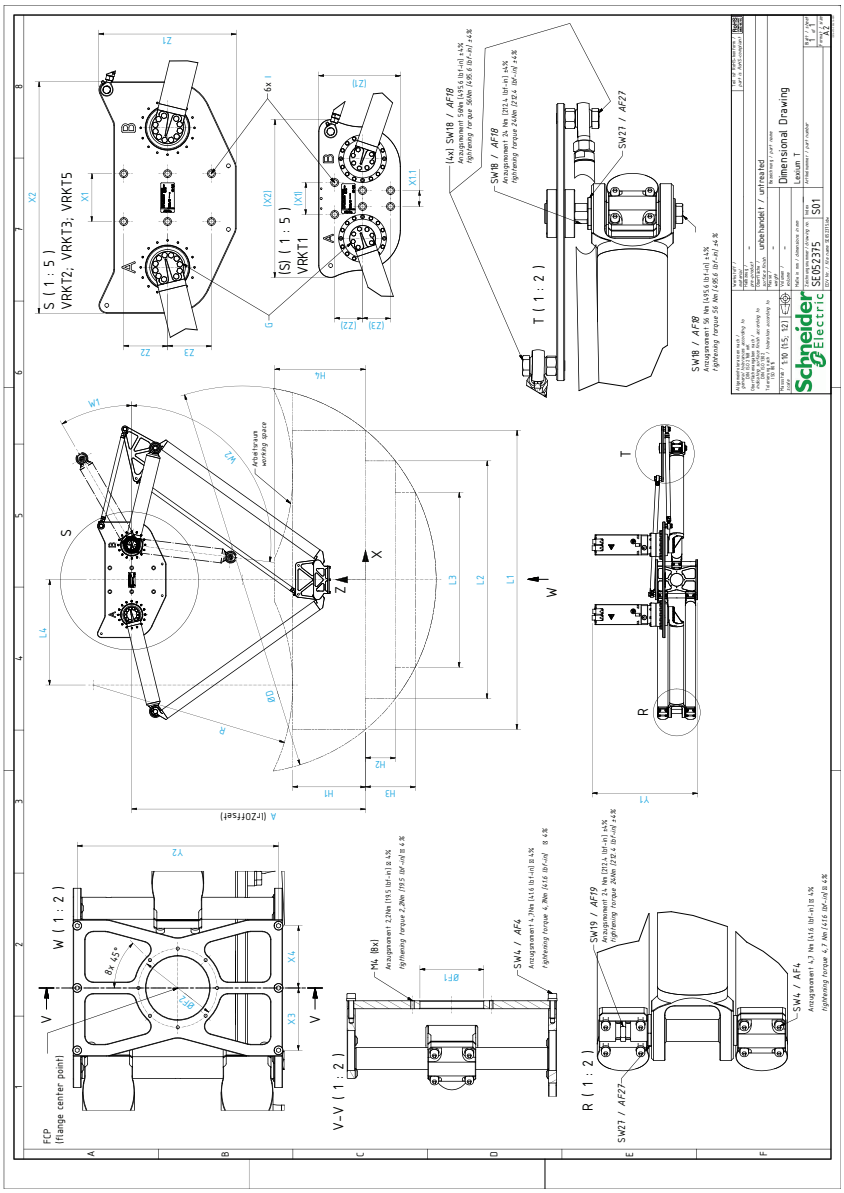
(2) Loads are subject to restrictions that are application-specific. For more information, contact your local Schneider Electric service representative.

(3) For further information, refer to *Lexium 52 Hardware Guide* or *Lexium 62 Hardware Guide*. The maximum 480 Vac is the mains voltage of the Lexium 52 Drive or the Lexium 62 Power Supply.

Dimensional Drawings

Dimensional Drawing of the Lexium T Robot

Dimensional Drawing of the Lexium T VRKT1, VRKT2, VRKT3, VRKT5 Robot



Di-men-sion	Description	Unit	Robot type									
			VRKT1-M0	VRK-T2M0	VRK-T2M1	VRK-T2L0	VRK-T3M0	VRK-T3M1	VRK-T3L0	VRK-T5M0	VRK-T5M1	VRK-T5L0
D	Working area diameter	mm (in)	1100 (43)	1290 (51)			1500 (59)			1945 (77)		
H1	Working area height	mm (in)	300 (11.8)	350 (13.8)			380 (15)			365 (14.4)		
L1	Auxiliary length 1	mm (in)	600 (23.6)	800 (31.5)			1000 (39)			1500 (59)		
H2	Auxiliary height 2	mm (in)	50 (1.97)	90 (3.54)			100 (3.9)			150 (5.9)		
L2	Auxiliary length 2	mm	412	500			719			1193		

Di-men-sion	Description	Unit	Robot type									
			VRKT1-M0	VRK-T2M0	VRK-T2M1	VRK-T2L0	VRK-T3M0	VRK-T3M1	VRK-T3L0	VRK-T5M0	VRK-T5M1	VRK-T5L0
		(in)	(16.2)	(19.7)			(28.3)			(47)		
H3	Auxiliary height 3	mm (in)	-	–			175 (6.9)			250 (9.8)		
L3	Auxiliary length 3	mm (in)	-	–			317 (12.5)			877 (34.5)		
H4	Auxiliary height 4	mm (in)	-	–						455.5 (18)		
L4	Auxiliary length 4	mm (in)	-	–						528 (20.8)		
R	Auxiliary radius	mm (in)	-	–						1000 (39)		
A	Z offset	mm (in)	872 (34.3)	877 (34.5)			980 (38.6)			1115 (44)		
W1	Angle maximum upper arm height	°	25	30								
W2	Angle minimum upper arm height	°	83	97								
Z2 / Z3	Z distance counterbore mounting plate	mm (in)	70 (2.76)	110 (4.3)								
X1	X distance counterbore mounting plate	mm (in)	80 (3.15)	120 (4.7)								
X1.1	X distance counterbore mounting plate(1)	mm (in)	40 (1.57)	-								
X3 / X4	X distance screw parallel plate	mm (in)	62.5 (2.46)									
Y2	Y distance screw parallel plate	mm (in)	202 (8)									
F1	Flange diameter parallel plate	mm (in)	64 + 0.05 + 0.02 (2.5 + 0.00197 + 0.00079)									
F2	Bolt circle diameter	mm (in)	79 (3.1)									
Z1	Z mounting space of mounting plate	mm (in)	205 (8.07)	345 (13.6)								
X2	X mounting space of mounting plate	mm (in)	396 (15.6)	581 (23)								
Y1	Y mounting space robot	mm (in)	507 (20)	497 (19.6)	529 (21)	598 (23.5)	497 (19.6)	529 (21)	598 (23.-5)	497 (19.6)	529 (21)	598 (23.5)
I	Cylinder screw size	-	M12									
	Counterbore size	mm (in)	Ø 20 x 8U (Ø 0.79 x 0.31U)									
	Tightening torque	Nm	56									

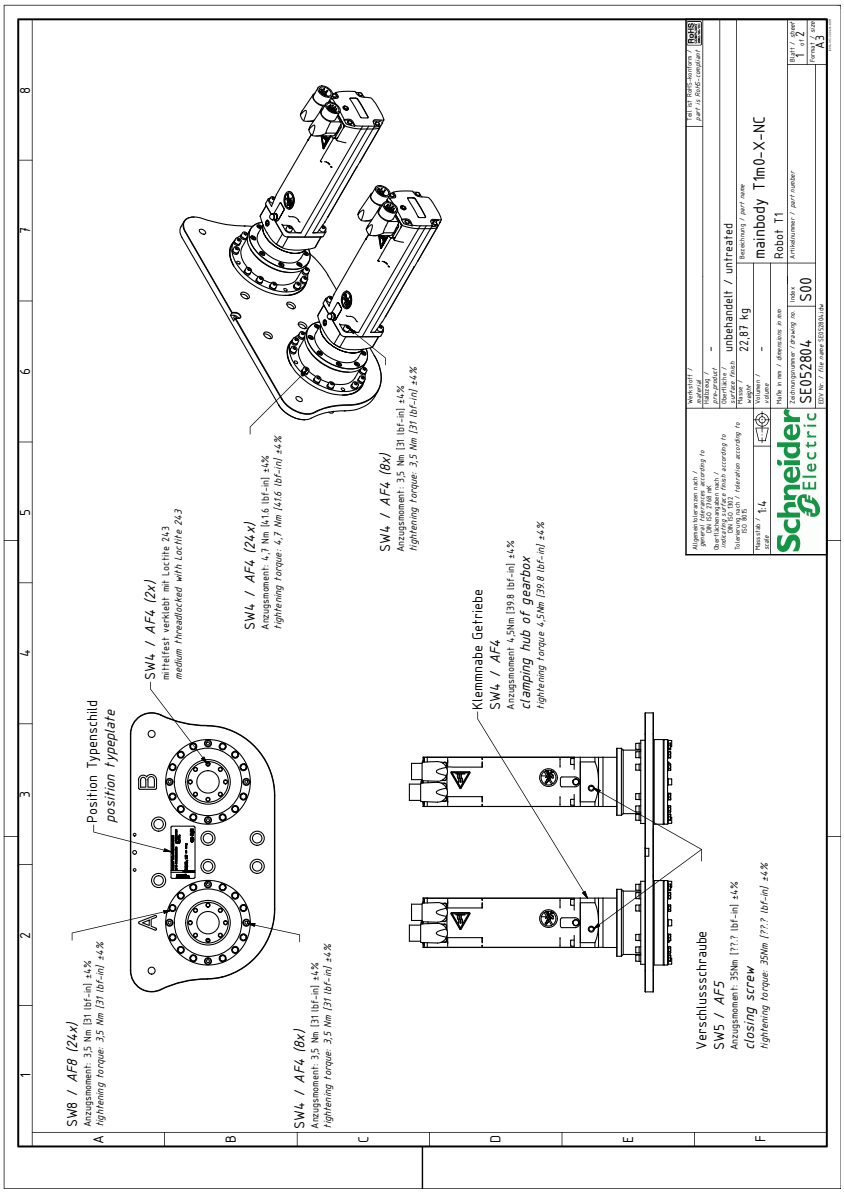
Di-men-sion	Description		Unit	Robot type									
				VRKT1-M0	**VRK-T2M0**	**VRK-T2M1**	**VRK-T2L0**	**VRK-T3M0**	**VRK-T3M1**	**VRK-T3L0**	**VRK-T5M0**	**VRK-T5M1**	**VRK-T5L0**
			(lbf-in)	(496)									
G	screw upper arm to gearbox(2)	Wrench size	mm (in)	10 (0.39)	13 (0.51)								
		Tight-ening torque	Nm (lbf-in)	14 (123.9)	22 (194.7)								
		Quanti-ty	-	14	22								

(1) for VRKT1 only

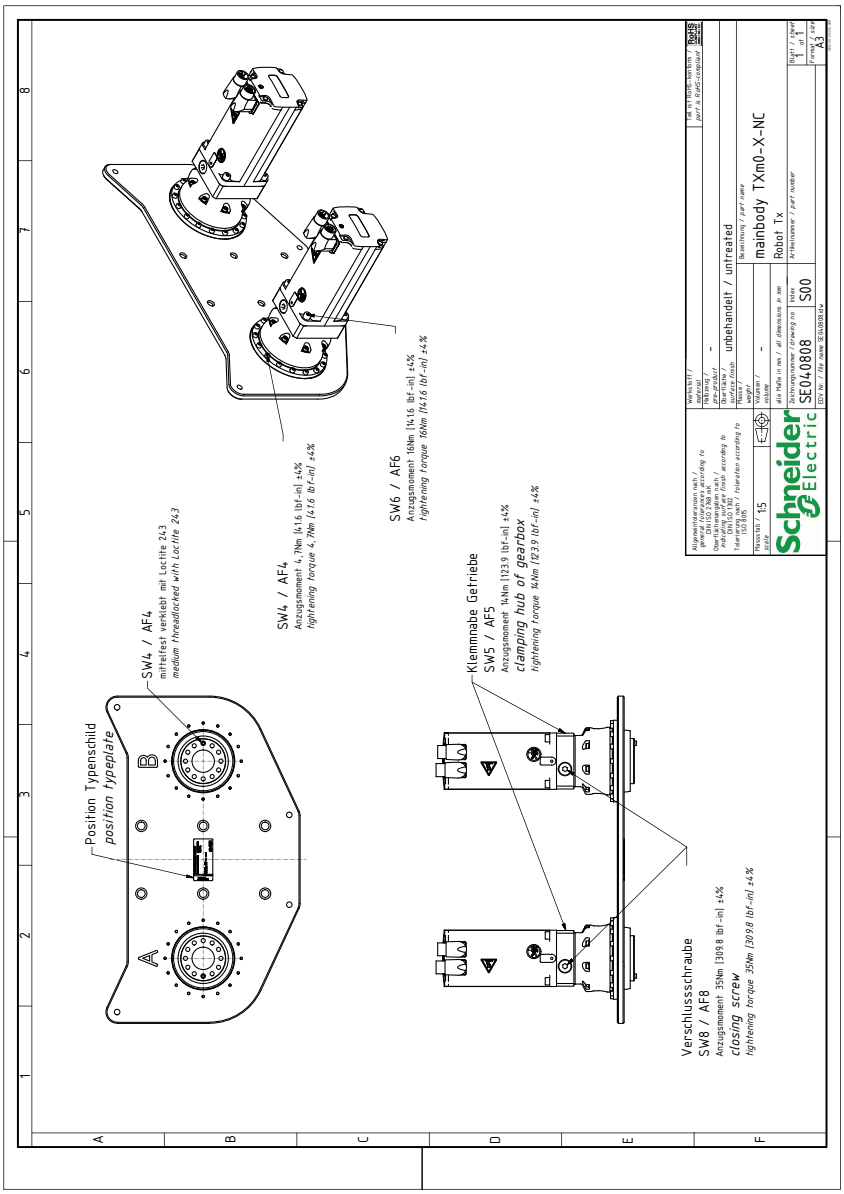
(2) Medium threadlocked with Loctite 243

Detail Drawing of the Main Body

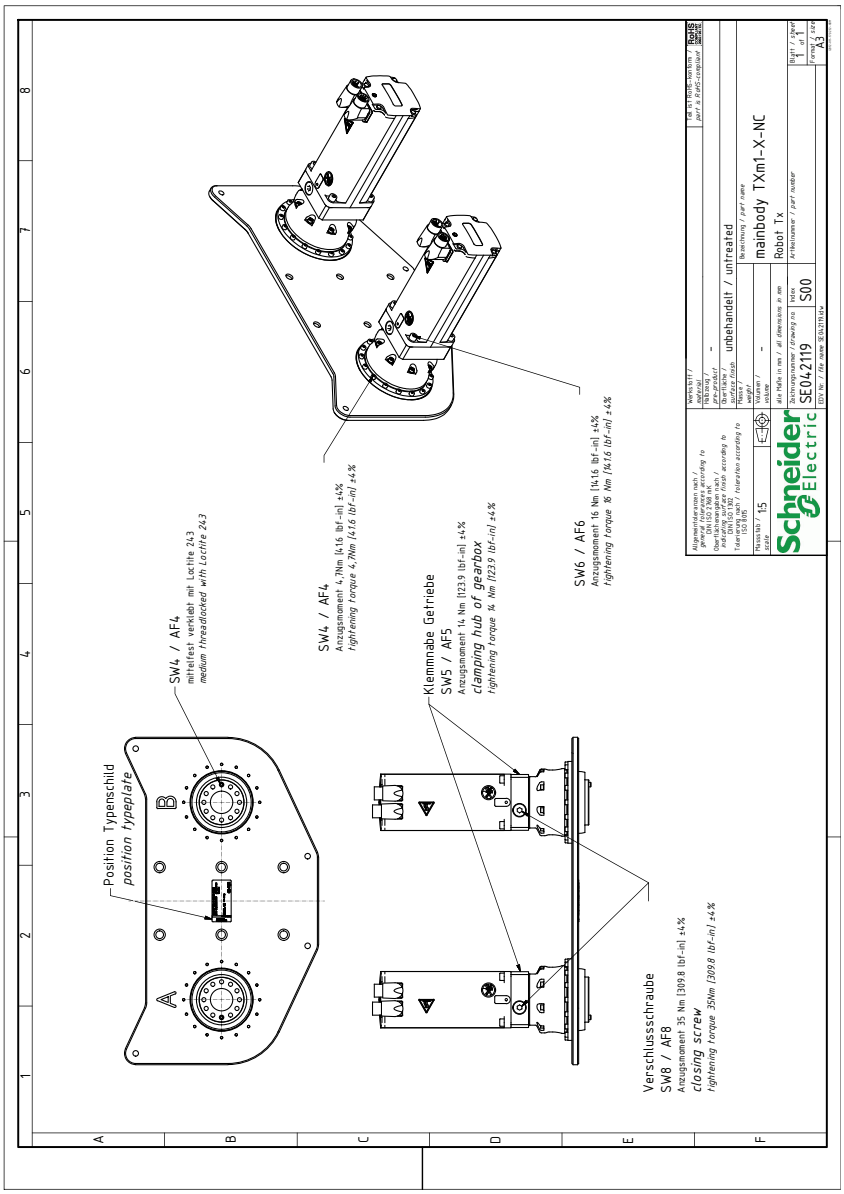
Detail Drawing of the Main Body of VRKT1M0•NC



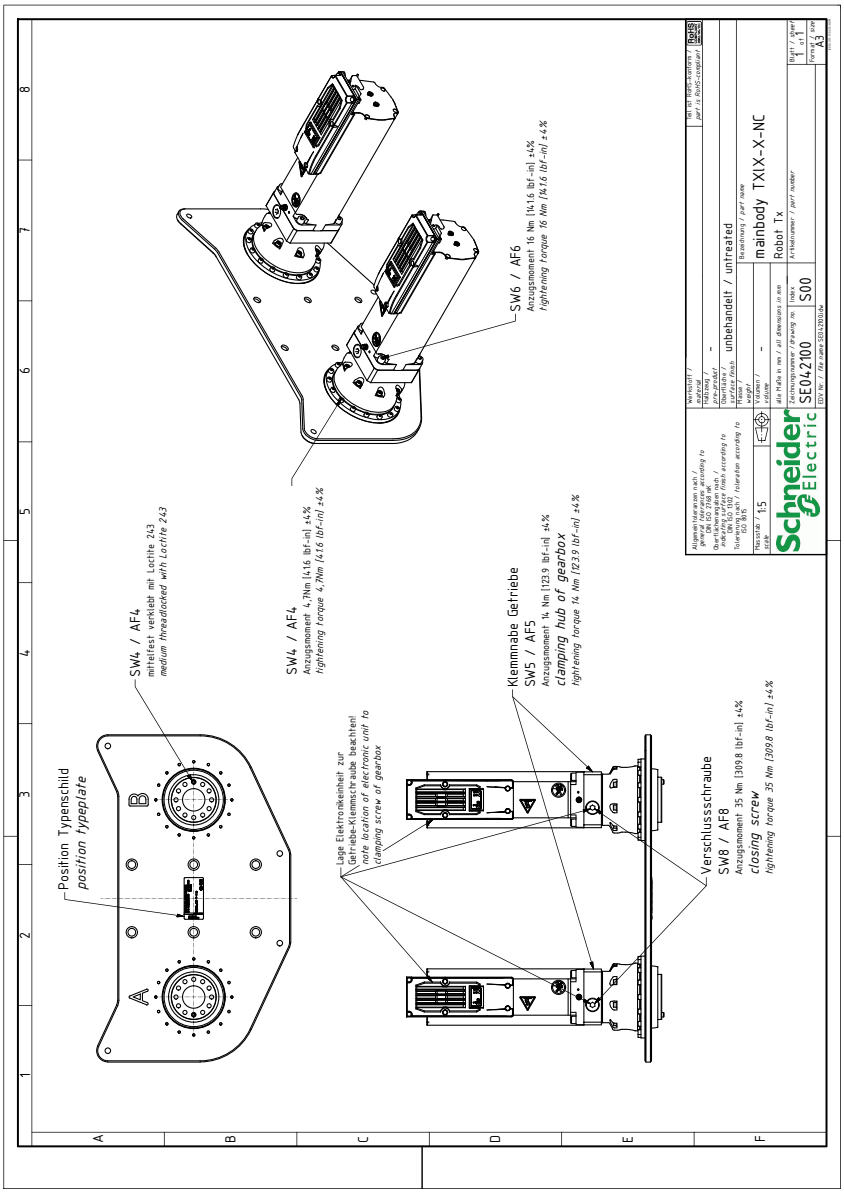
Detail Drawing of the Main Body of VRKT2M0•NC, VRKT3M0•NC, VRKT5M0•NC



Detail Drawing of the Main Body of VRKT2M1•NC, VRKT3M1•NC, VRKT5M1•NC

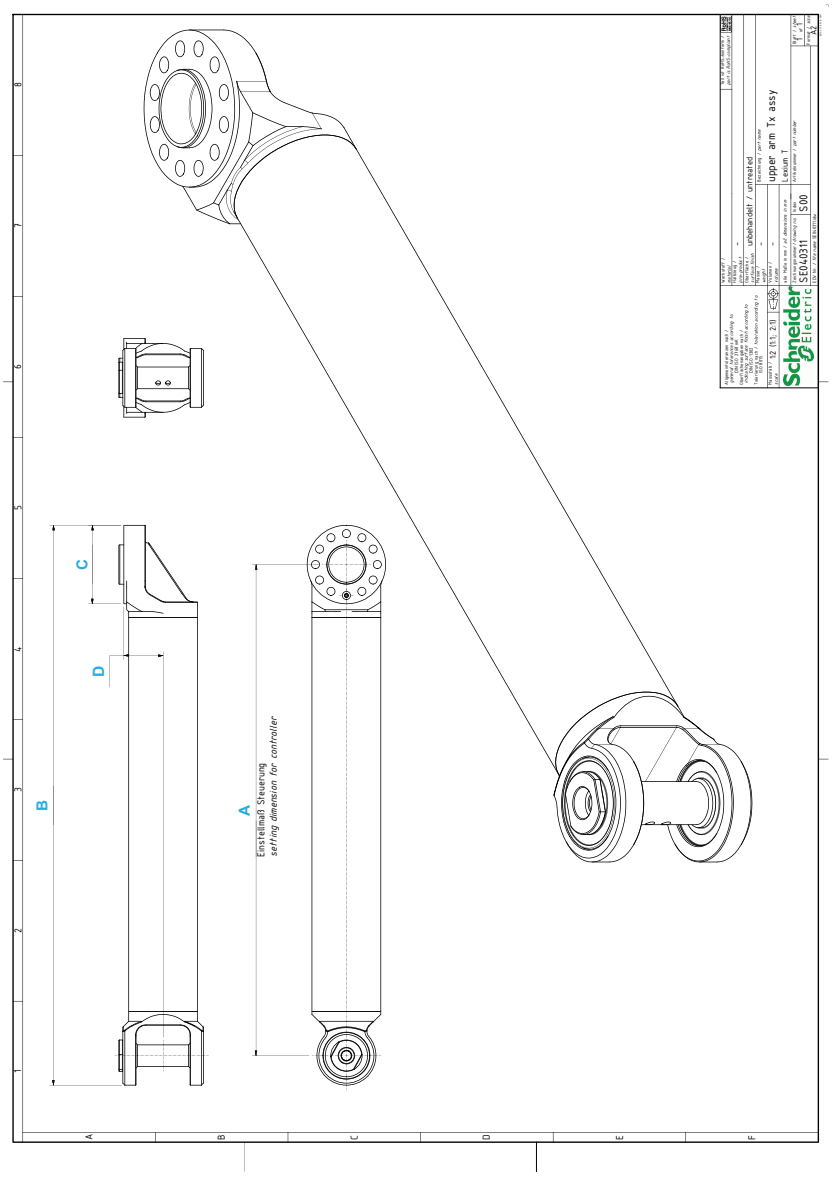


Detail Drawing of the Main Body of VRKT2L••NC, VRKT3L••NC, VRKT5L••NC



Detail Drawing of the Upper Arm

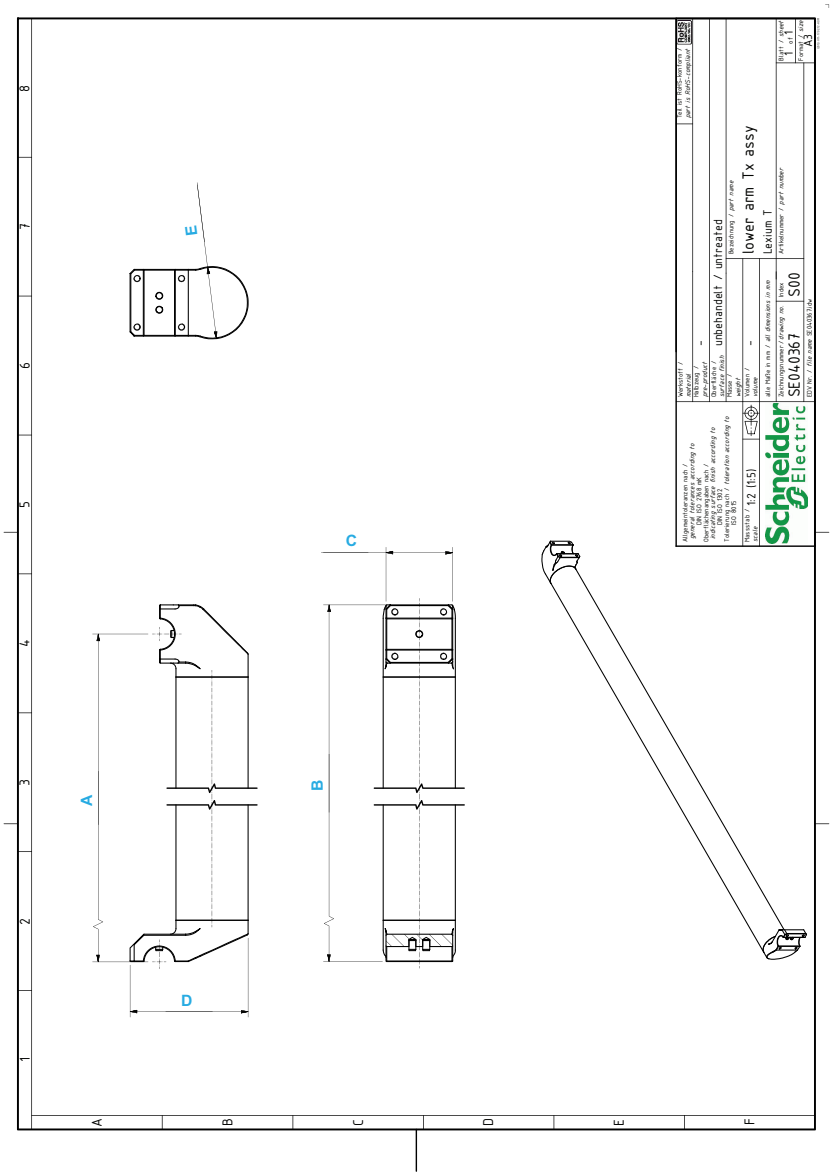
Detail Drawing of the Upper Arm of VRKT1, VRKT2, VRKT3, VRKT5



Dimension	Description	Unit	Robot type			
			VRKT1	VRKT2	VRKT3	VRKT5
A	Adjustment value for controller	mm (in)	300 (11.8)	350 (15.7)	400 (15.7)	500 (19.7)
B	Total length	mm (in)	362.5 (14.3)	420 (16.5)	470 (18.5)	570 (22.4)
C	Flange diameter	mm (in)	65 (2.56)	80 (3.15)		
D	Flange center distance	mm (in)	37 (1.46)	40 (1.57)		

Detail Drawing of the Lower Arm

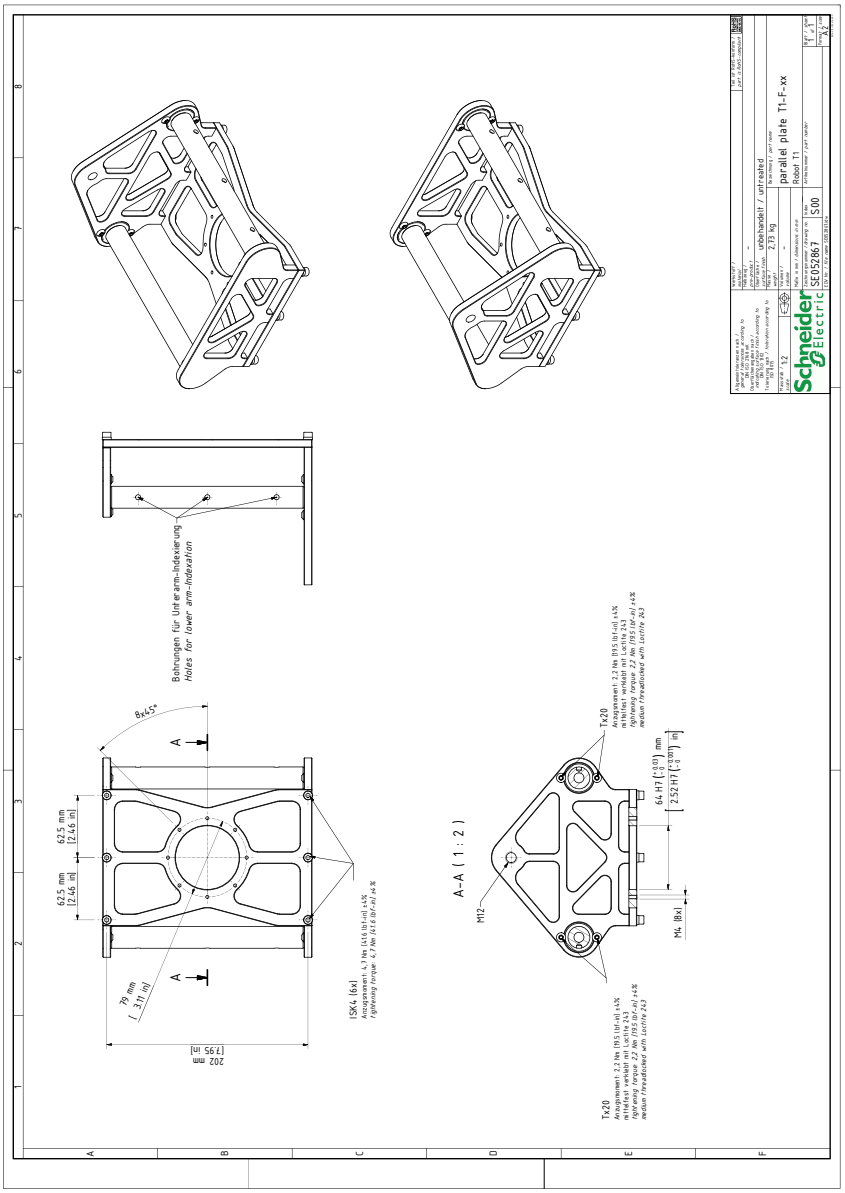
Detail Drawing of the Lower Arm of VRKT1, VRKT2L••NC, VRKT3L••NC, VRKT5L••NC



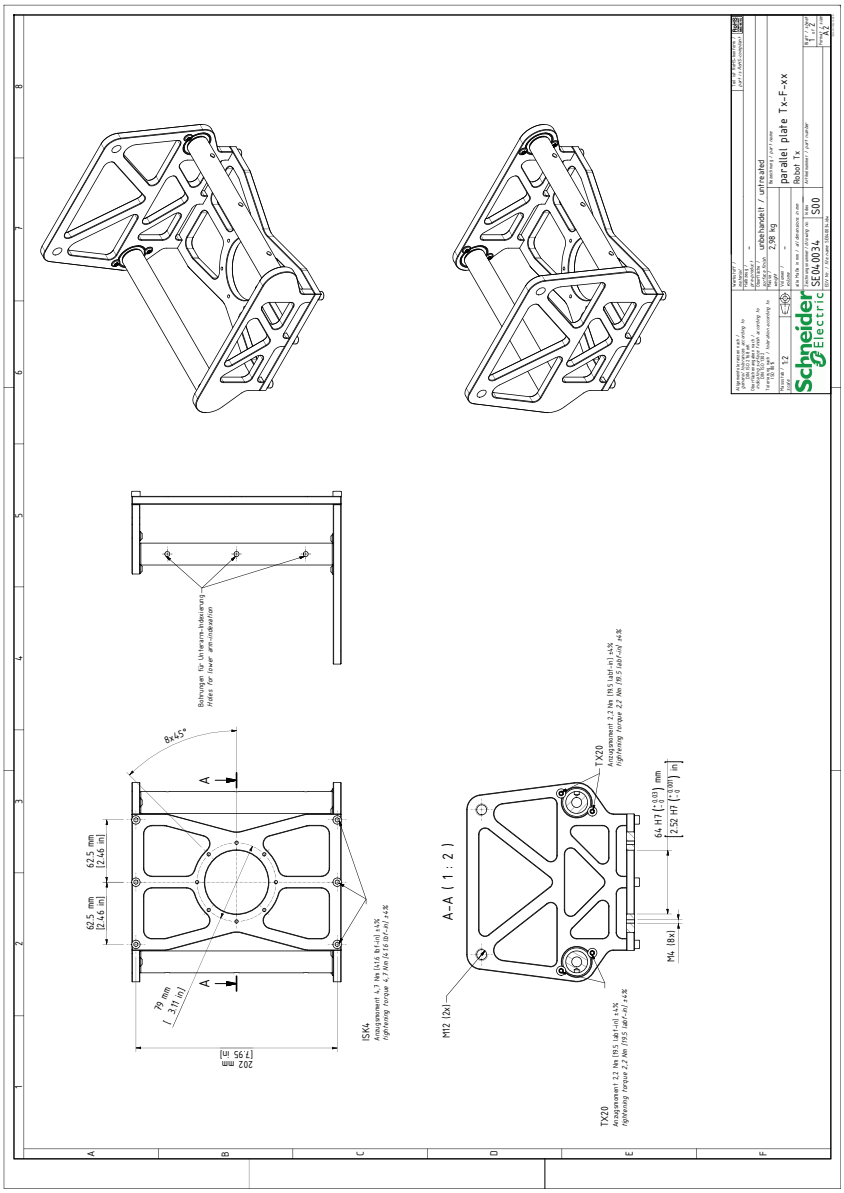
Dimension	Description	Unit	Robot type			
			VRKT1	VRKT2	VRKT3	VRKT5
A	Adjustment value for controller	mm (in)	630 (24.8)	700 (27.6)	800 (31.5)	1000 (39)
B	Total length	mm (in)	650.8 (25.6)	720.8 (28.4)	820.8 (32)	1020.8 (40)
C	Total width	mm (in)	48 (1.9)			
D	Total height	mm (in)	63 (2.48)	85 (3.35)		
E	Tube diameter	mm (in)	34 (1.34)	52 (2.05)		

Detail Drawing of the Parallel Plate

Detail Drawing of the Parallel Plate of VRKT1

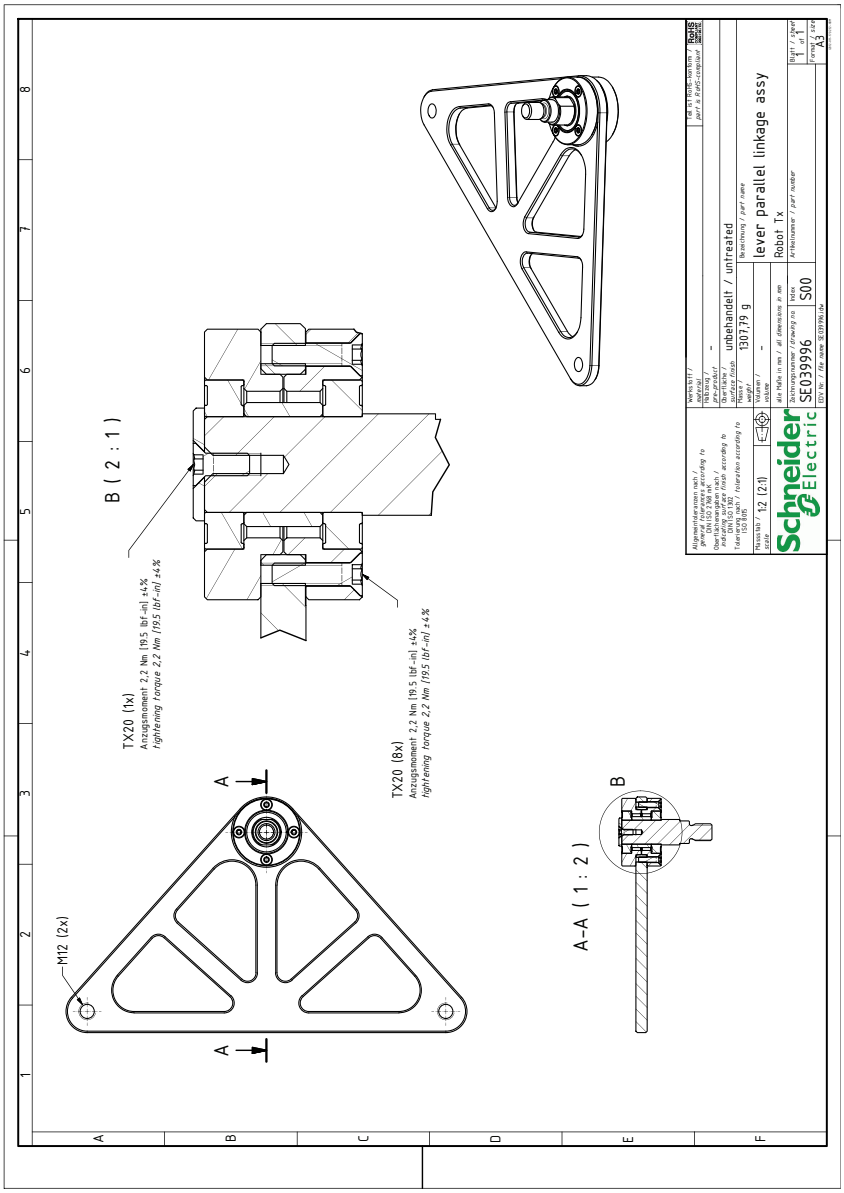


Detail Drawing of the Parallel Plate of VRKT2, VRKT3, VRKT5



Detail Drawing of the Lever Parallel Linkage

Detail Drawing of the Lever Parallel Linkage of VRKT1, VRKT2, VRKT3, VRKT5

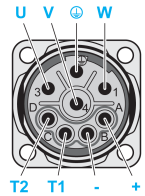


Electrical Connections

Electrical Connections

Electrical Connections of Lexium T Robots with MH3 Motors (VRKT•M)

Connection power P30 (size 1): Connection power, brake, and temperature sensor

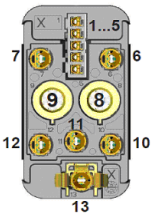
Representation	Pin	Designation	Meaning	Range
	1	W	Performance	3 x 0...480 Vac
	2	PE	Protective ground (earth) cable	–
	3	U	Performance	3 x 0...480 Vac
	4	V	Performance	3 x 0...480 Vac
	A	+	Brake	24 Vdc
	B	-	Brake	0 Vdc
	C	T1	Temperature sensor	–
	D	T2	Temperature sensor	–

Encoder Connection: Encoder SKS/SKM-36

Representation	Pin	Designation	Meaning	Range
	1	REF COS	Reference signal Cosinus	–
	2	RS 485 +	Parameter channel +	–
	3	–	–	–
	4	–	–	–
	5	SIN	Sinusoidal trace	–
	6	REF SIN	Reference signal sine	–
	7	RS 485 -	Parameter channel -	–
	8	COS	Cosine track	–
	9	–	–	–
	10	0 V	Supply Voltage	DC 0 V
	11	–	–	–
	12	U_s	Supply Voltage	DC 7...12 V

Electrical Connections of Lexium T Robots with ILM Motors (VRKT•L)

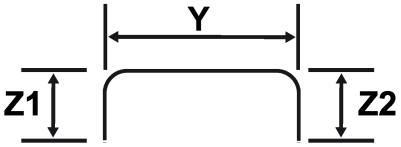
Connector Lexium 62 ILM Servo Module

Representation	Pin	Designation	Meaning
	1	IE_sig	Inverter Enable (differential signal)
	2	IE_ref	
	3	Brake	Braking signal
	4	N.C.	Not connected
	5	N.C.	Not connected
	6	24 V	Control voltage 24 V
	7	0 V	Control voltage 0 V
	8.1	Rx+	Sercos port 1 - Input (not assigned for daisy chain wiring)
	8.2	Tx-	Sercos port 1 - Output (not assigned for daisy chain wiring)
	8.3	Rx-	Sercos port 1 - Input (not assigned for daisy chain wiring)
	8.4	Tx+	Sercos port 1 - Output (not assigned for daisy chain wiring)
	9.1	Rx+	Sercos port 2 - Input (not assigned for daisy chain wiring)
	9.2	Tx-	Sercos port 2 - Output (not assigned for daisy chain wiring)
	9.3	Rx-	Sercos port 2 - Input (not assigned for daisy chain wiring)
	9.4	Tx+	Sercos port 2 - Output (not assigned for daisy chain wiring)
	10	DC -	DC bus voltage -
	11	Shield	Shielded connector
	12	DC +	DC bus voltage +
	13	PE	Protective ground (earth) cable

Performance Data

Typical Cycle Time

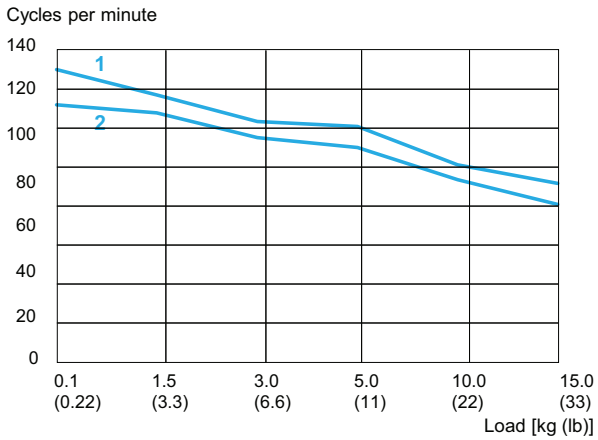
Robot Path (pick-place-pick):



Cycle Times of Robot VRKT1M0

The following measurements are performed at an ambient temperature of 20 °C (68 °F) with a PacDrive 3 and use the `SchneiderElectricRobotics` library.

Path Z1 x Y x Z2 in mm (in)	Load(2) in kg (lb)	Cycle time(1) in s	Cycles per minute
25 x 305 x 25 (1 x 12 x 1)	0.1 (0.22)	0.468	128
	1.5 (3.3)	0.512	117
	3.0 (6.6)	0.568	106
	5.0 (11)	0.580	103
	10.0 (22)	0.692	87
	15.0 (33)	0.764	79
70 x 400 x 70 (2.76 x 15.7 x 2.76)	0.1 (0.22)	0.532	113
	1.5 (3.3)	0.548	109
	3.0 (6.6)	0.608	99
	5.0 (11)	0.636	94
	10.0 (22)	0.748	80
	15.0 (33)	0.864	69
(1) Cycle times contain the back and forth motion. A position is considered as reached when the robot remains permanently in a window of +/-0.25 mm (0.0098 in) around the target position. (2) Loads up to 15 kg (33 lb). Heavier payloads upon request. If required, contact your local Schneider Electric service representative			



1 25 x 305 x 25 mm (1 x 12 x 1 in)

2 70 x 400 x 70 mm (2.76 x 15.7 x 2.76 in)

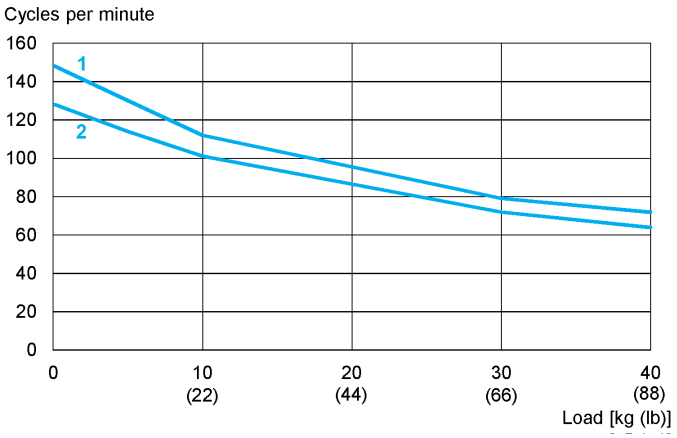
Cycle Times of Robot VRKT2M0 / VRKT2L0

The following measurements are performed at an ambient temperature of 20 °C (68 °F) with a PacDrive 3 and use the `SchneiderElectricRobotics` library.

Path Z1 x Y x Z2 in mm (in)	Load(2) in kg (lb)	Cycle time(1) in s	Cycles per minute
25 x 305 x 25 (1 x 12 x 1)	0.1 (0.22)	0.405	148
	5.0 (11)	0.462	130
	10.0 (22)	0.536	112
	30.0 (66)	0.759	79
	40.0 (88)	0.833	72
70 x 400 x 70 (2.76 x 15.7 x 2.76)	0.1 (0.22)	0.469	128
	5.0 (11)	0.526	114
	10.0 (22)	0.594	101
	30.0 (66)	0.833	72
	40.0 (88)	0.938	64

(1) Cycle times contain the back and forth motion. A position is considered as reached when the robot remains permanently in a window of +/-0.25 mm (0.0098 in) around the target position.

(2) Loads up to 40 kg (88 lb). Heavier payloads upon request. If required, contact your local Schneider Electric service representative



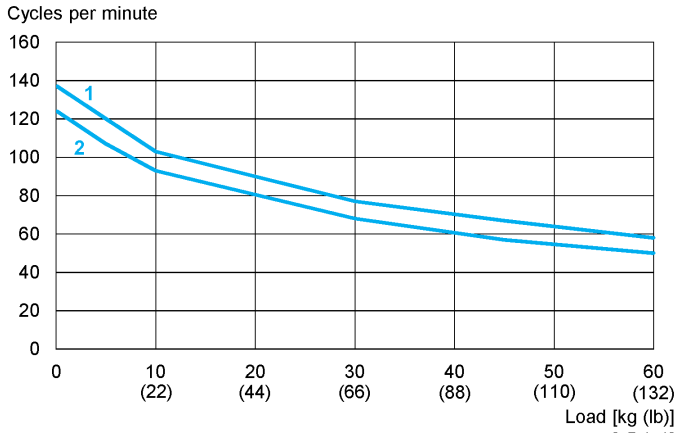
1 25 x 305 x 25 mm (1 x 12 x 1 in)

2 70 x 400 x 70 mm (2.76 x 15.7 x 2.76 in)

Cycle Times of Robot VRKT2M1

The following measurements are performed at an ambient temperature of 20 °C (68 °F) with a PacDrive 3 and use the `SchneiderElectricRobotics` library.

Path Z1 x Y x Z2 in mm (in)	Load(2) in kg (lb)	Cycle time(1) in s	Cycles per minute
25 x 305 x 25 (1 x 12 x 1)	0.1 (0.22)	0.438	137
	5.0 (11)	0.500	120
	10.0 (22)	0.583	103
	30.0 (66)	0.779	77
	45.0 (99)	0.896	67
	60.0 (132)	1.034	58
70 x 400 x 70 (2.76 x 15.7 x 2.76)	0.1 (0.22)	0.484	124
	5.0 (11)	0.560	107
	10.0 (22)	0.680	93
	30.0 (66)	0.880	68
	45.0 (99)	1.060	57
	60.0 (132)	1.200	50
(1) Cycle times contain the back and forth motion. A position is considered as reached when the robot remains permanently in a window of +/-0.25 mm (0.0098 in) around the target position. (2) Loads up to 60 kg (132 lb). Heavier payloads upon request. If required, contact your local Schneider Electric service representative.			



1 25 x 305 x 25 mm (1 x 12 x 1 in)

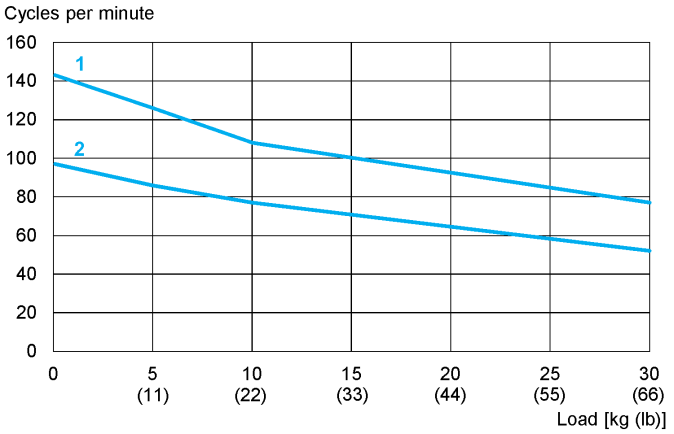
2 70 x 400 x 70 mm (2.76 x 15.7 x 2.76 in)

Cycle Times of Robot VRKT3M0 / VRKT3L0

The following measurements are performed at an ambient temperature of 20 °C (68 °F) with a PacDrive 3 and use the `SchneiderElectricRobotics` library.

Path Z1 x Y x Z2 in mm (in)	Load(2) in kg (lb)	Cycle time(1) in s	Cycles per minute
25 x 305 x 25 (1 x 12 x 1)	0.1 (0.22)	0.419	143
	5.0 (11)	0.478	126
	10.0 (22)	0.558	108
	30.0 (66)	0.778	77
70 x 400 x 70 (2.76 x 15.7 x 2.76)	0.1 (0.22)	0.479	125
	5.0 (11)	0.538	112
	10.0 (22)	0.619	97
	30.0 (66)	0.858	70

Path Z1 x Y x Z2 in mm (in)	Load(2) in kg (lb)	Cycle time(1) in s	Cycles per minute
90 x 700 x 90 (3.54 x 27.6 x 3.54)	0.1 (0.22)	0.618	97
	5.0 (11)	0.698	86
	10.0 (22)	0.778	77
	30.0 (66)	1.158	52
(1) Cycle times contain the back and forth motion. A position is considered as reached when the robot remains permanently in a window of +/-0.25 mm (0.0098 in) around the target position. (2) Loads up to 35 kg (66 lb). Heavier payloads upon request. If required, contact your local Schneider Electric service representative.			



1 25 x 305 x 25 mm (1 x 12 x 1 in)

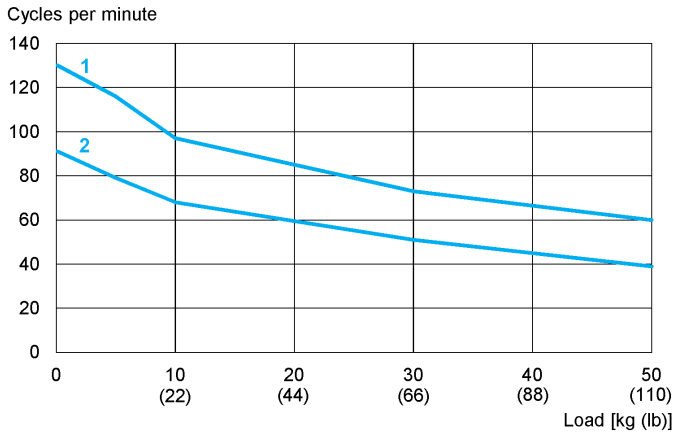
2 90 x 700 x 90 mm (3.54 x 27.6 x 3.54 in)

Cycle Times of Robot VRKT3M1

The following measurements are performed at an ambient temperature of 20 °C (68 °F) with a PacDrive 3 and use the `SchneiderElectricRobotics` library.

Path Z1 x Y x Z2 in mm (in)	Load(2) in kg (lb)	Cycle time(1) in s	Cycles per minute
25 x 305 x 25 (1 x 12 x 1)	0.1 (0.22)	0.460	130
	5.0 (11)	0.519	116
	10.0 (22)	0.619	97
	30.0 (66)	0.818	73
	50.0 (110)	0.998	60
70 x 400 x 70 (2.76 x 15.7 x 2.76)	0.1 (0.22)	0.518	116
	5.0 (11)	0.578	104
	10.0 (22)	0.738	81
	30.0 (66)	0.979	61
	50.0 (110)	1.158	52
90 x 700 x 90 (3.54 x 27.6 x 3.54)	0.1 (0.22)	0.659	91
	5.0 (11)	0.758	79
	10.0 (22)	0.878	68
	30.0 (66)	1.178	51
	50.0 (110)	1.538	39

Path Z1 x Y x Z2 in mm (in)	Load(2) in kg (lb)	Cycle time(1) in s	Cycles per minute
(1) Cycle times contain the back and forth motion. A position is considered as reached when the robot remains permanently in a window of +/-0.25 mm (0.0098 in) around the target position. (2) Loads up to 50 kg (110 lb). Heavier payloads upon request. If required, contact your local Schneider Electric service representative.			



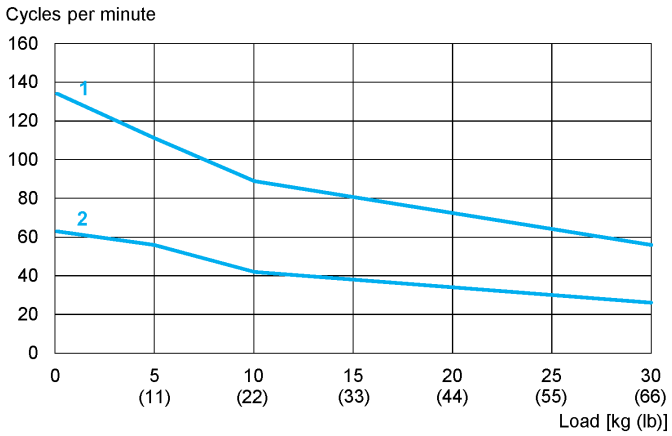
1 25 x 305 x 25 mm (1 x 12 x 1 in)

2 90 x 700 x 90 mm (3.54 x 27.6 x 3.54 in)

Cycle Times of Robot VRKT5M0 / VRKT5L0

The following measurements are performed at an ambient temperature of 20 °C (68 °F) with a PacDrive 3 and use the `SchneiderElectricRobotics` library.

Path Z1 x Y x Z2 in mm (in)	Load(2) in kg (lb)	Cycle time(1) in s	Cycles per minute
25 x 305 x 25 (1 x 12 x 1)	0.1 (0.22)	0.448	134
	5.0 (11)	0.541	111
	10.0 (22)	0.675	89
	30.0 (66)	1.077	56
70 x 400 x 70 (2.76 x 15.7 x 2.76)	0.1 (0.22)	0.555	108
	5.0 (11)	0.593	101
	10.0 (22)	0.862	70
	30.0 (66)	1.168	51
90 x 700 x 90 (3.54 x 27.6 x 3.54)	0.1 (0.22)	0.658	91
	5.0 (11)	0.798	75
	10.0 (22)	0.991	61
	30.0 (66)	1.828	33
110 x 1300 x 110 (4.3 x 51 x 4.3)	0.1 (0.22)	0.950	63
	5.0 (11)	1.076	56
	10.0 (22)	1.418	42
	30.0 (66)	2.275	26
(1) Cycle times contain the back and forth motion. A position is considered as reached when the robot remains permanently in a window of +/-0.25 mm (0.0098 in) around the target position. (2) Loads up to 30 kg (66 lb). Heavier payloads upon request. If required, contact your local Schneider Electric service representative.			



1 25 x 305 x 25 mm (1 x 12 x 1 in)

2 110 x 1300 x 110 mm (4.3 x 51 x 4.3 in)

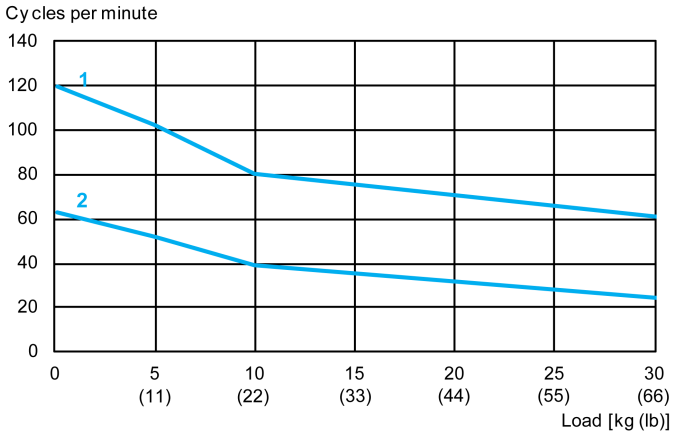
Cycle Times of Robot VRKT5M1

The following measurements are performed at an ambient temperature of 20 °C (68 °F) with a PacDrive 3 and use the `SchneiderElectricRobotics` library.

Path Z1 x Y x Z2 in mm (in)	Load(2) in kg (lb)	Cycle time(1) in s	Cycles per minute
25 x 305 x 25 (1 x 12 x 1)	0.1 (0.22)	0.501	120
	5.0 (11)	0.581	102
	10.0 (22)	0.752	80
	30.0 (66)	0.980	61
	40.0 (88)	1.102	54
70 x 400 x 70 (2.76 x 15.7 x 2.76)	0.1 (0.22)	0.594	101
	5.0 (11)	0.682	88
	10.0 (22)	0.998	60
	30.0 (66)	1.153	52
	40.0 (88)	1.253	48
90 x 700 x 90 (3.54 x 27.6 x 3.54)	0.1 (0.22)	0.751	80
	5.0 (11)	0.893	67
	10.0 (22)	1.092	55
	30.0 (66)	1.575	38
	40.0 (88)	1.875	32
110 x 1300 x 110 (4.3 x 51 x 4.3)	0.1 (0.22)	0.952	63
	5.0 (11)	1.157	52
	10.0 (22)	1.535	39
	30.0 (66)	2.504	24
	40.0 (88)	2.859	21

(1) Cycle times contain the back and forth motion. A position is considered as reached when the robot remains permanently in a window of +/-0.25 mm (0.0098 in) around the target position.

(2) Loads up to 45 kg (88 lb). Heavier payloads upon request. If required, contact your local Schneider Electric service representative



1 25 x 305 x 25 mm (1 x 12 x 1 in)

2 110 x 1300 x 110 mm (4.3 x 51 x 4.3 in)

Load Capacity Diagram

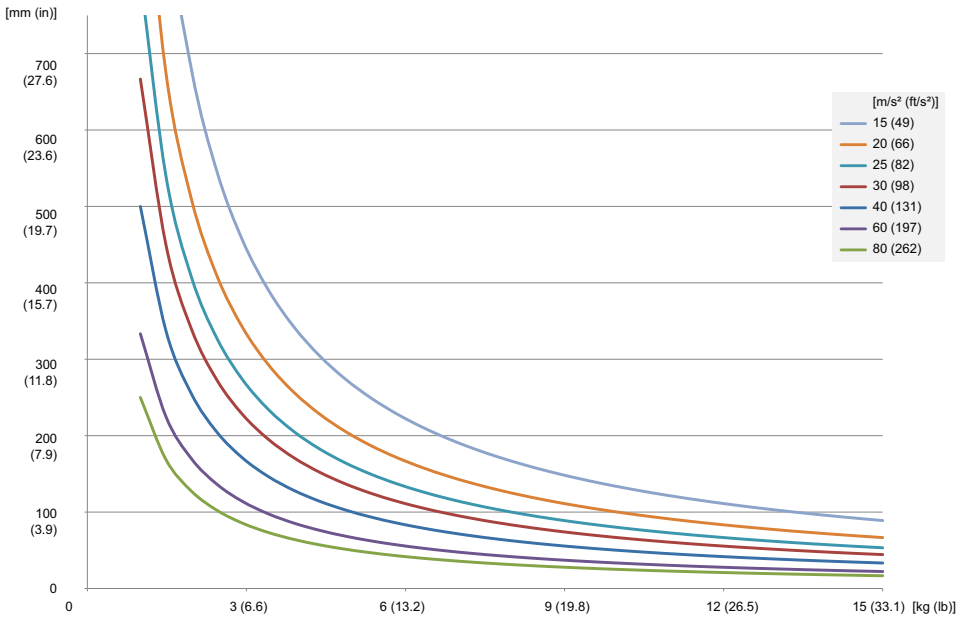
Overview

The load diagram shows the maximum permissible distance of the mass center of gravity from the Flange Center Point (FCP) for a given acceleration relative to the mass. For detailed information, refer to the respective dimensional drawing in *Mechanical and Electrical Data*, page 25.

Maximum Tilting Torque (Vertical Distance from the FCP)

The loading capacity of the Lexium T robots is limited by the maximum tilting torque at the FCP. The following diagrams show the possible vertical distance of the mass center of gravity of the payload relative to the mass and the required maximum acceleration.

VRKT1

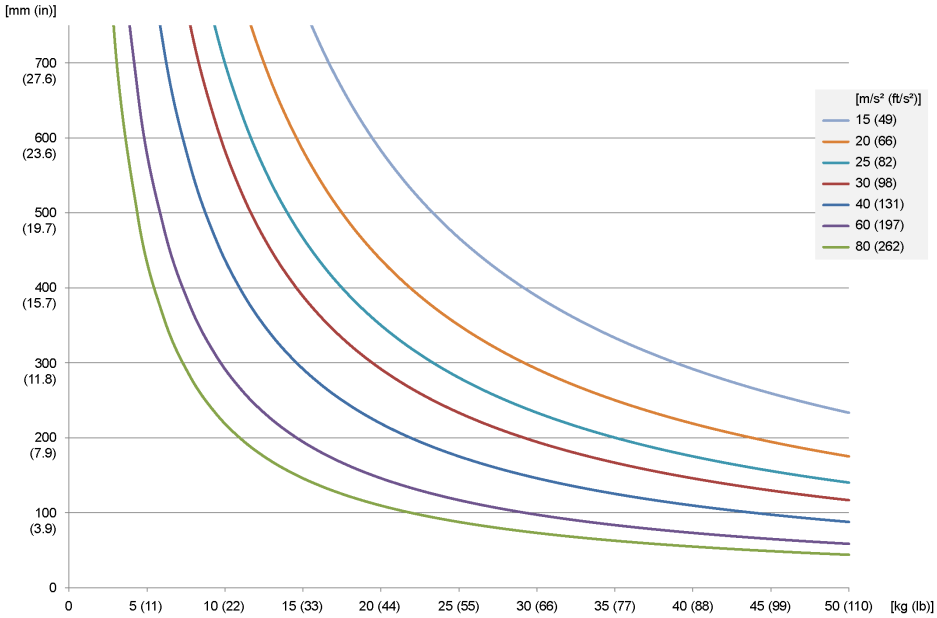


A maximum tilting torque of 20 Nm (177 lbf-in) is to be observed at the FCP:

Calculate the tilting torque with the following formula:

Tilting torque [Nm (lbf-in)] = payload [kg (lb)] x maximum acceleration [m/s² (ft/s²)] x distance from the FCP [m (in)]

VRKT2, VRKT3, VRKT5



A maximum tilting torque of 175 Nm (1549 lbf-in) is to be observed at the FCP:

Calculate the tilting torque with the following formula:

Tilting torque [Nm (lbf-in)] = payload [kg (lb)] x maximum acceleration [m/s² (ft/s²)] x distance from the FCP [m (in)]

Design of the Robot Frame

Design of the Robot Frame

System Requirements

Use the Lexium T robot for ceiling mounting. For special applications with an angularly suspended robot system, contact your local Schneider Electric service representative.

- Delta-2 robots of the Lexium T reach their highest level of performance and accuracy in the center of the working area.
- Position the robot to locate the movements to be executed as closely as possible to the center of the working space.
- When determining the suspension height of the robot, observe the overall height of the gripper (suction cup or other product pickups).
- For the design of the robot frame, account for possible varying gripper heights. Design the robot suspension in a height-adjustable manner.

The precision of the robot in the application is also determined by the frame. Deformations of the frame cause imprecisions on the Tool Center Point (TCP).

General Requirements Regarding the Frame

The frame must not only withstand the constant forces and torques stated below, but also have sufficient stiffness so that the deformations and vibrations which occur do not lead to any major deviations on the TCP. Ensure a sufficient transverse bracing in the frame.

Note the forces and torques to be taken up by the frame during normal operation:

Parameter	Value
Static load	approximately 1.2 kN (270 lbf)
Dynamic load	approximately 10 kN (2248 lbf) in any direction
Dynamic torque	approximately 10000 Nm (88507 lbf-in)

Fasten the robot with six screws of property class 8.8 or greater, or A2-70 or greater.

For further information, refer to the respective dimensional drawing in *Mechanical and Electrical Data*, page 25.

NOTE: The configuration of the robot mechanics, the TCP velocity, as well as the additional payload have an effect on the total energy, which can potentially cause damage.

⚠WARNING

CRUSHING, SHEARING, CUTTING AND IMPACT INJURY

- The robot must be operated only within an enclosure.
- Open or enter the enclosure for cleaning and maintenance purposes only.
- Design the enclosure to withstand an impact from the robot and to resist ejected parts from escaping the zone of operation.
- Design the enclosure to safely deactivate the robot as soon as a person enters the zone of operation of the robot.
- All barriers, protective doors, contact mats, light barriers, and other protective equipment, must be configured correctly and enabled whenever the robot mechanics are under power.
- Define the clearance distance to the zone of operation of the robot so the operational staff do not have access to, nor can be enclosed in, the robot mechanics zone of operation.
- Design the enclosure to account for the maximum possible travel paths of the robot; that is, the maximum path until the hardware safety system limits as well as the additional run-on paths, in case of a power interruption.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

For further information about travel path and power loss, refer to *Run-on Motions of the* Robot *for Risk Analysis*, page 52.

Interference Contours in the Enclosure

When designing the enclosure, ensure that the upper and lower arms of the robot will have sufficient freedom of movement. Take into account the required space for the movement of the respective robot type and associated equipment.

For further information, refer to the respective dimensional drawing in *Mechanical and Electrical Data*, page 25.

For detailed information about the interference areas caused by upper and lower arm motions, refer to the 3D-CAD data on the Schneider Electric homepage (www.se.com) or contact your local Schneider Electric service representative.

Run-On Motions of the Robot for Risk Analysis

Run-On Motions of the Robot for Risk Analysis

Overview

What is measured is the time from the application of a stop signal to the standstill of the robot. This measurement is carried out for various different loads and velocities (measurement according to ISO 10218-1).

⚠WARNING

BREAKDOWN OF THE INTERNAL MOTOR HOLDING BRAKE

- Do not consider the internal motor holding brake to be a functional safety device.
- Take into account a possible breakdown of the internal motor holding brake during your safety analysis.
- Take into account that the internal motor holding brake of the robot only withstands a limited number of brake operations.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

If there is a power outage of the control system, the brakes are applied and the robot mechanics leave the planned trajectory.

⚠WARNING

LEAVING THE PLANNED TRAJECTORY OF THE ROBOT MECHANICS

- Use the buffering of the 24 V supply (UPS) in order to enable a controlled stop of the mechanics, in accordance with stop category 1, by making use of the stored residual mechanical and electrical energy.
- Use a synchronous stop on the path to avoid collisions with obstacles.
- Observe the extension of the run-on path while performing your risk analysis.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

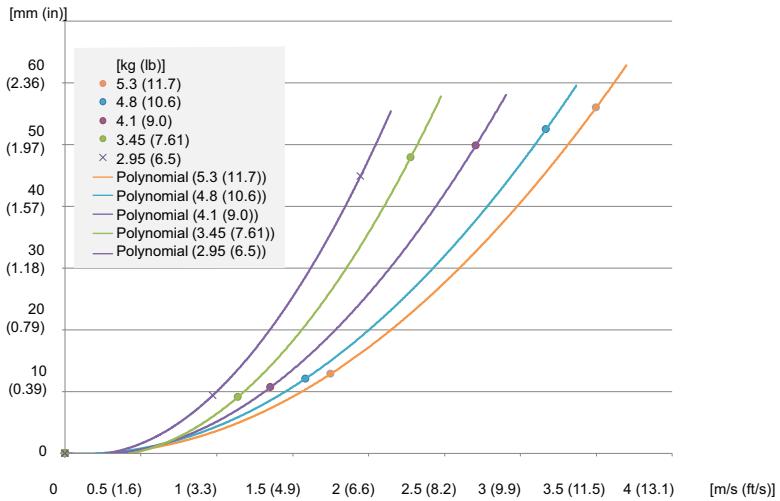
Stop Function Categories

The following table presents the stop function categories according to IEC 60204-1 that are related to the product:

Stop function category	Definition	Corresponds to
0	Stopping by immediate removal of power to the machine actuators (for example, an uncontrolled stop).	An uncontrolled stop (stopping of machine motion by removing electrical power to the machine actuators).
1	A controlled stop with power available to the machine actuators to achieve the stop and then removal of power when the stop is achieved.	An controlled stop (stopping of machine motion with power to the machine actuators maintained during the stopping process).

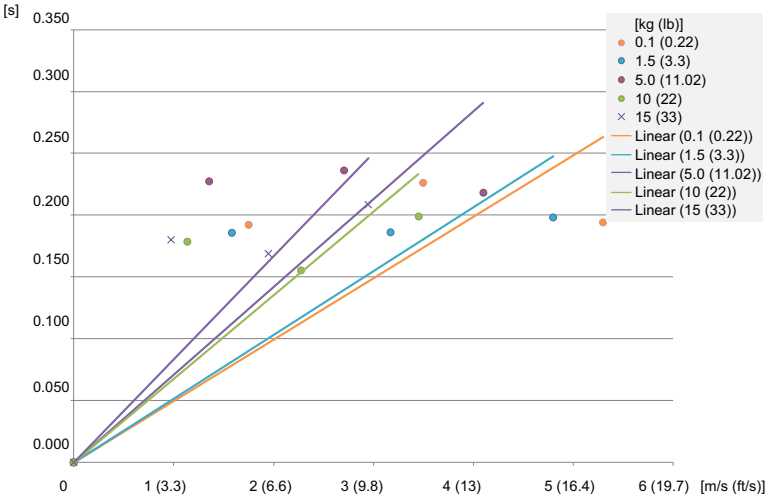
Run-On Path Robot VRKT1M0

Run-on path of the robot VRKT1M0 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

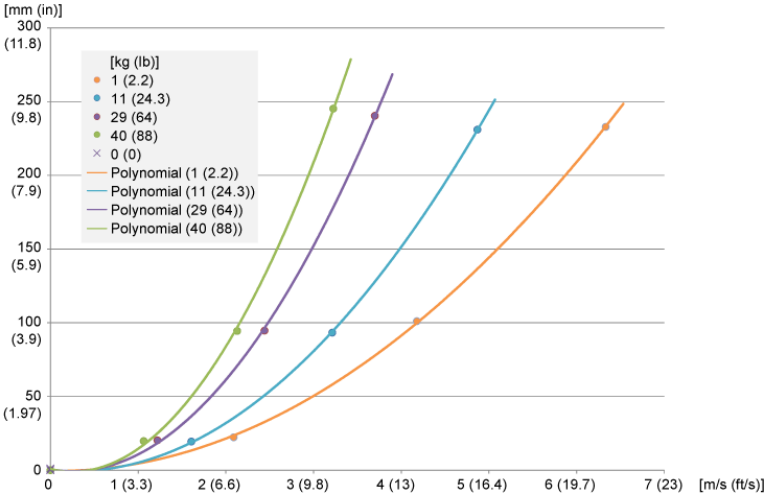
Stopping time of the robot VRKT1M0 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

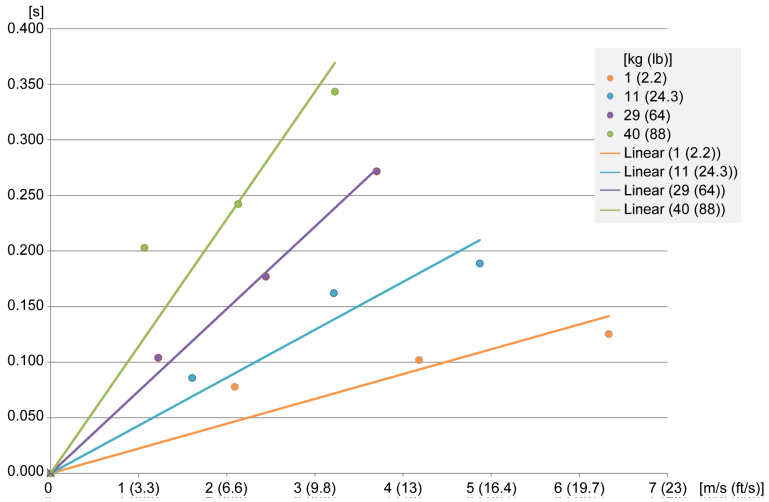
Run-On Path Robot VRKT2M0 and Robot VRKT2L0

Run-on path of the robot VRKT2M0 and the robot VRKT2L0 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

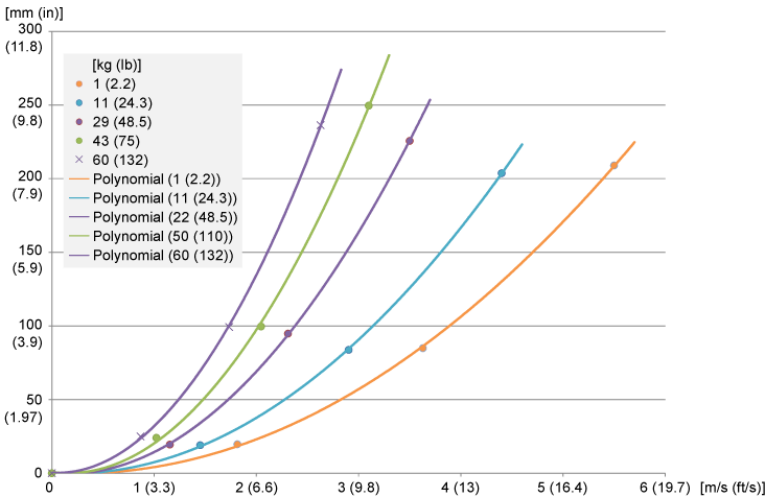
Stopping time of the robot VRKT2M0 and the robot VRKT2L0 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

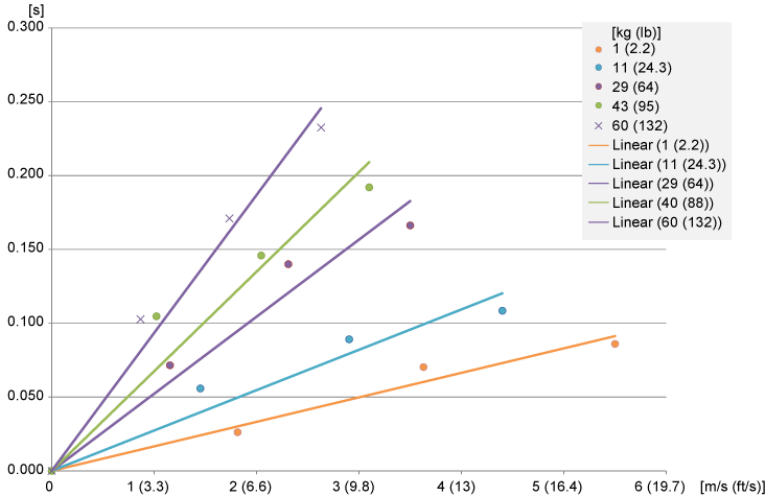
Run-On Path Robot VRKT2M1

Run-on path of the robot VRKT2M1 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

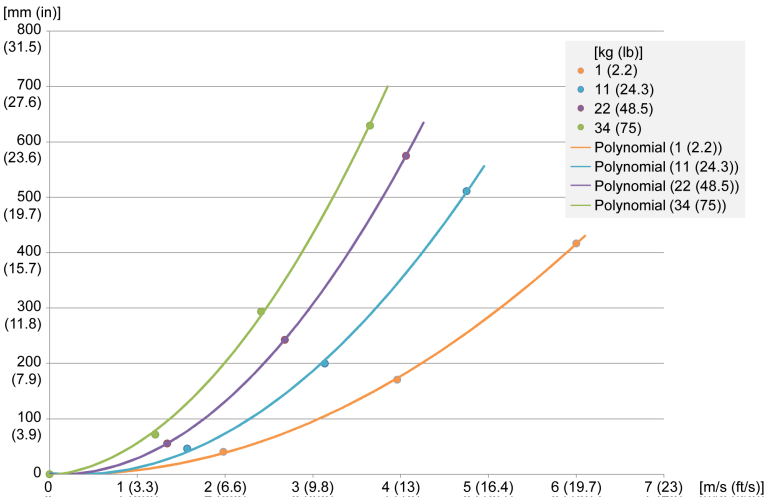
Stopping time of the robot VRKT2M1 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

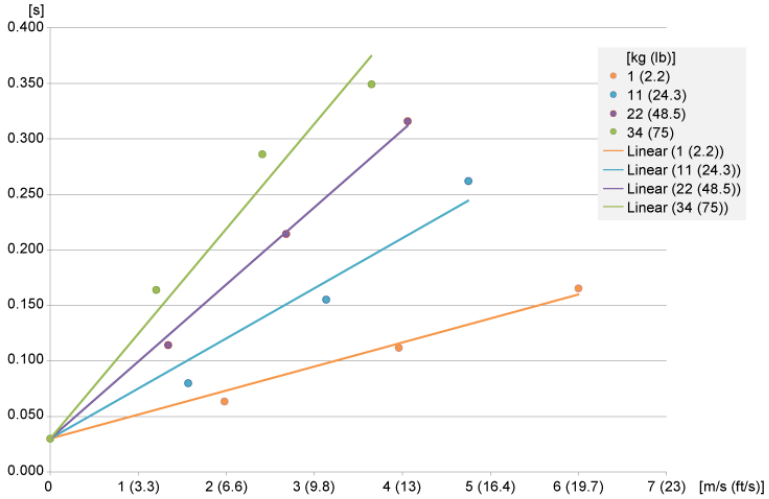
Run-On Path Robot VRKT3M0 and Robot VRKT3L0

Run-on path of the robot VRKT3M0 and the robot VRKT3L0 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

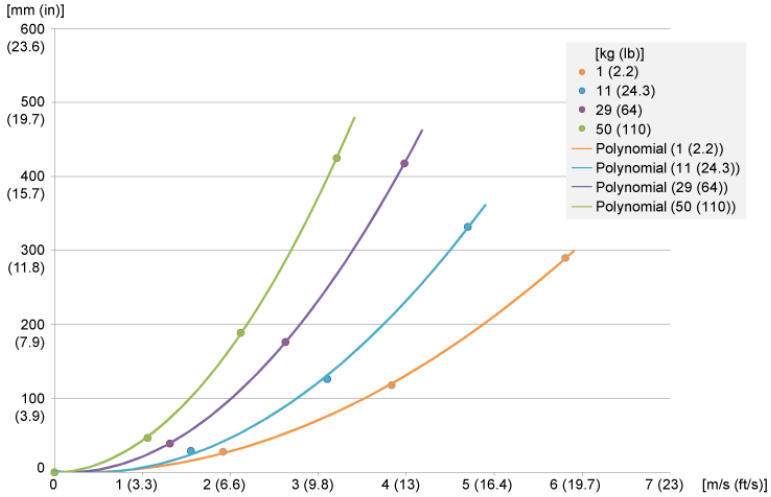
Stopping time of the robot VRKT3M0 and the robot VRKT3L0 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

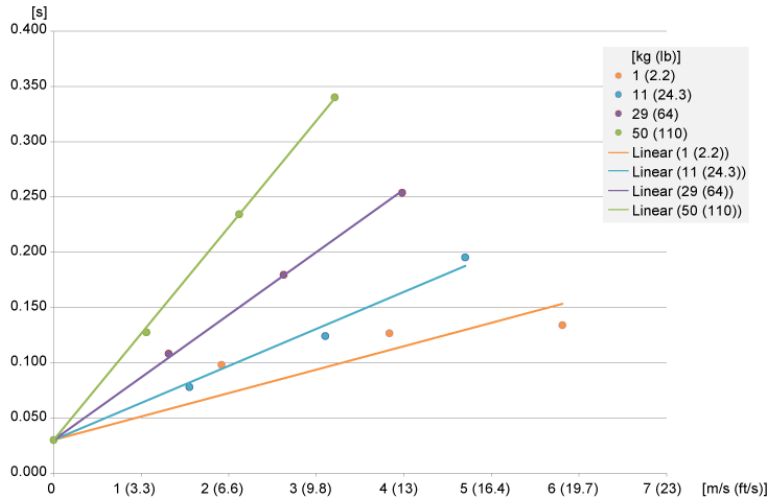
Run-On Path Robot VRKT3M1

Run-on path of the robot VRKT3M1 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

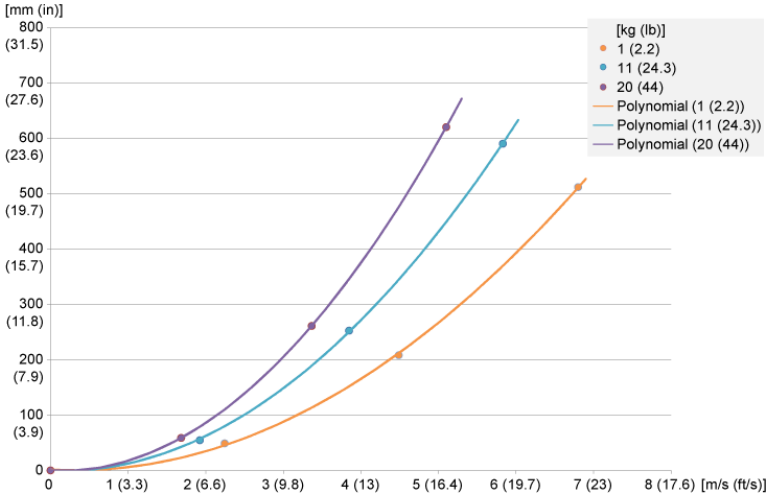
Stopping time of the robot VRKT3M1 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

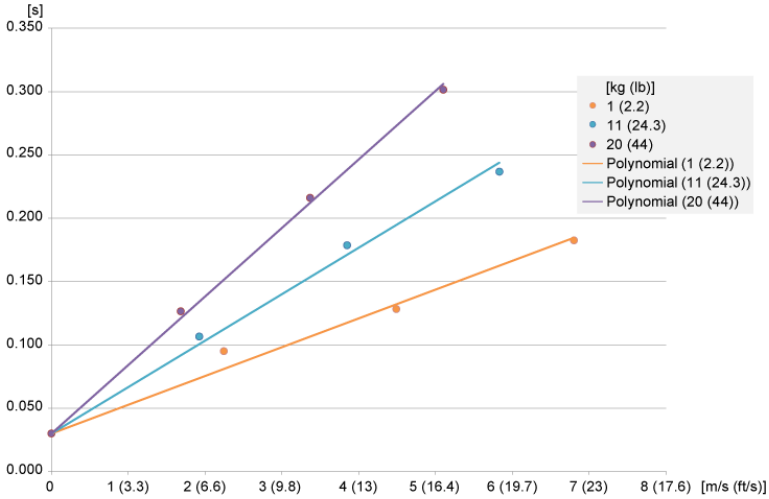
Run-On Path Robot VRKT5M0 and Robot VRKT5L0

Run-on path of the robot VRKT5M0 and the robot VRKT5L0 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

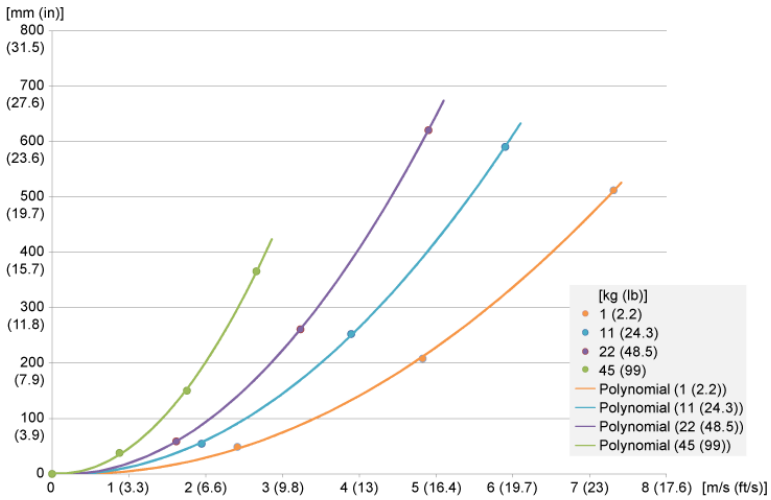
Stopping time of the robot VRKT5M0 and the robot VRKT5L0 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

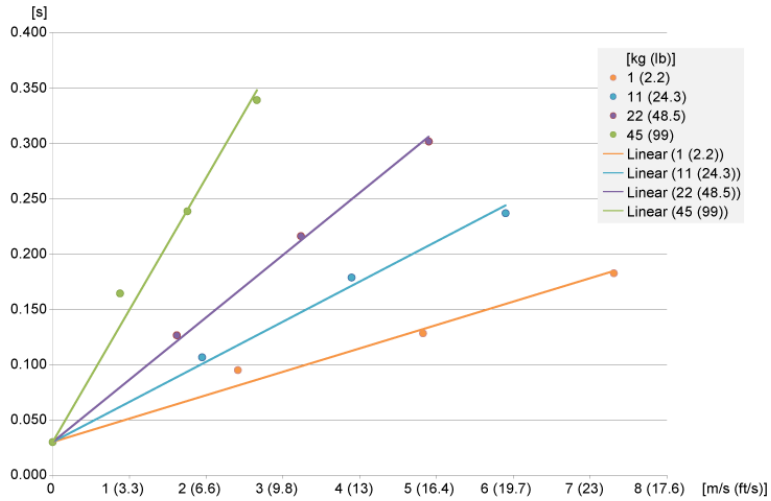
Run-On Path Robot VRKT5M1

Run-on path of the robot VRKT5M1 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

Stopping time of the robot VRKT5M1 for stop category 0:



For further information, refer to IEC 60204-1. If necessary, use the holding brake for a stop category 0.

Technical Data of the Motor and the Gearbox

Technical Data of the Motor and the Gearbox

Overview

For further information about the motor, record the motor reference on the type plate and refer to the corresponding motor manual.

For further information about the gearbox, record the gearbox reference on the type plate and refer to the corresponding gearbox manual.

Third-Party Motors

When using a third-party motor, take special care that the maximum permissible drive torque is not exceeded. Otherwise the robot could be rendered inoperable.

⚠WARNING

UNINTENDED MOVEMENTS

Observe the maximum permissible drive torque of the corresponding motor and gearbox.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The following table presents the maximum permissible torques at the respective axes.

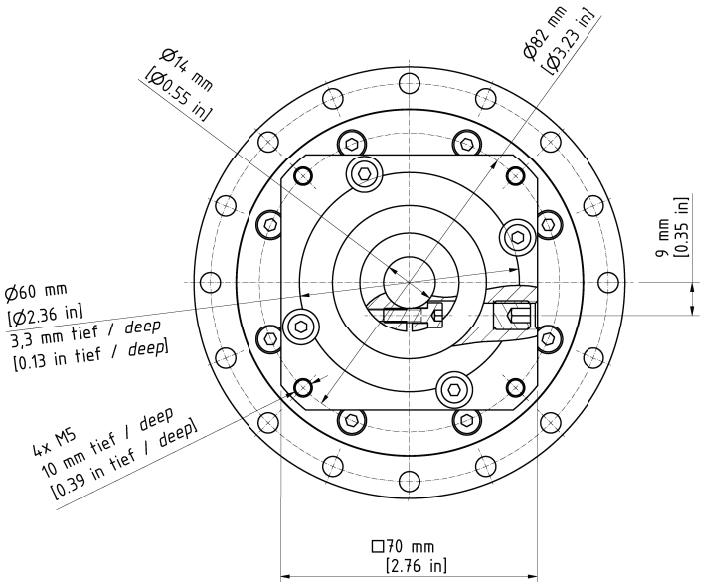
Parameter	Unit	Robot type	
		VRKT1WM	VRKT2WM VRKT3WM VRKT5WM
Maximum drive torque on the input side of the gearbox M_{max}	Nm (lbf-in)	2.5 (22.1)	9 (80)
Maximum speed on the input side of the gearbox	1/min	8000	6000

NOTE: When using a third-party motor, the protection class of the robot can deviate from that which is stated in *Mechanical and Electrical Data*, page 25. Verify that the protection class corresponds to the environments specified for the robot.

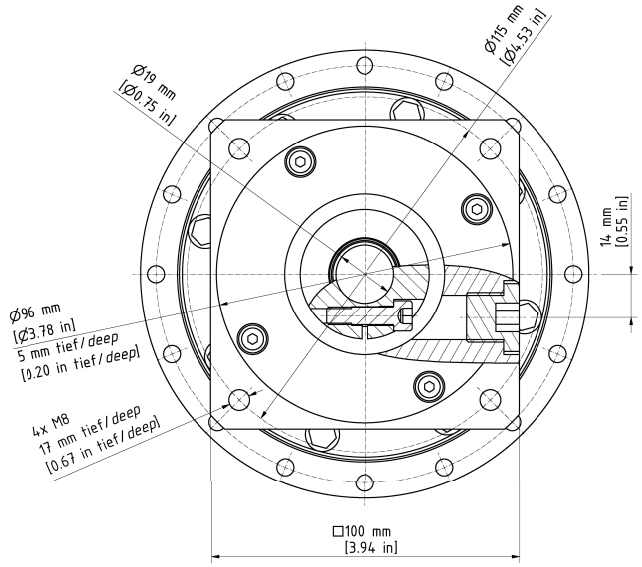
For information about mounting the motor to the gearbox, refer to the corresponding gearbox manual.

The following figure shows the dimensions of the input side of the adapter plate of the gearbox at the main axes.

VRKT1



VRKT2, VRKT3, VRKT5



Transport and Commissioning

Transport and Unpacking

Transport and Storage

Transport Conditions

The Lexium T robot must be handled with care. Shocks and impacts may damage the robot. Damage may lead to reduced running accuracy, reduced service life, or to inoperable equipment.

The robot is preassembled before transport.

NOTE: Before unpacking and installing the robot, make sure that the lifting capacity of the lifting devices (forklift truck and crane) is sufficient to lift the robot. You can find the total weight of your equipment on the container or in the transport documents.

For detailed information about transport conditions, refer to *Ambient Conditions*, page 24.

Storage

The Lexium T robot can be stored inside the packaging or unpacked. In both cases, ensure that it is stored in a sheltered and dry place. Avoid humidity which can have corrosive effects on the robot.

NOTE: When stored, the robot needs to be on a level surface.

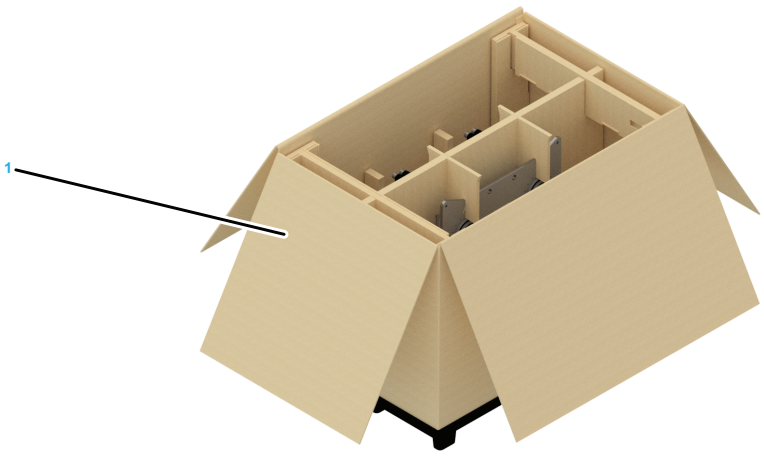
For detailed information about storage conditions, refer to *Ambient Conditions*, page 24.

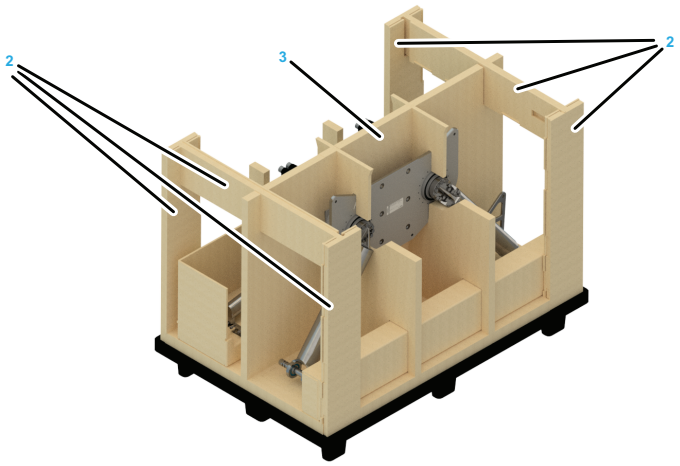
Unpacking

Overview

The following figures show the procedure to unpack and prepare the robot as an example.

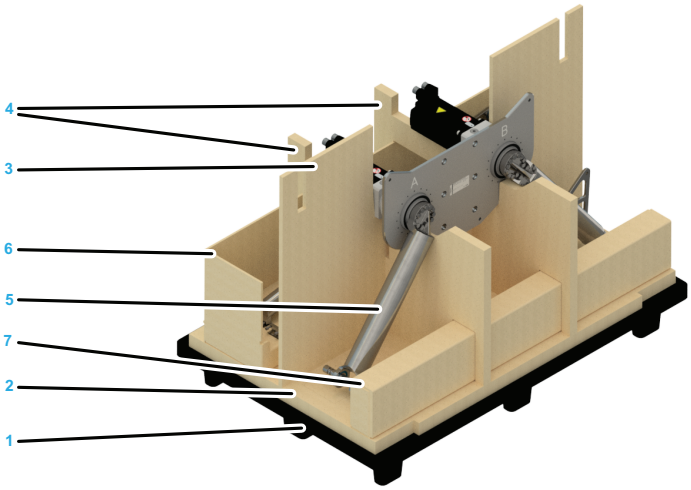
Removing the Outer Carton

Step	Action
1	Remove the lashing straps from the outer carton.
2	Open the outer carton (1) on the top side and open the corrosion protection bag (not shown in graphic). 

Step	Action
3	Lift up and remove the outer carton (1).
4	Remove the six carton corners (2) and the supporting carton (3). 

Presentation of the Robot Packaging

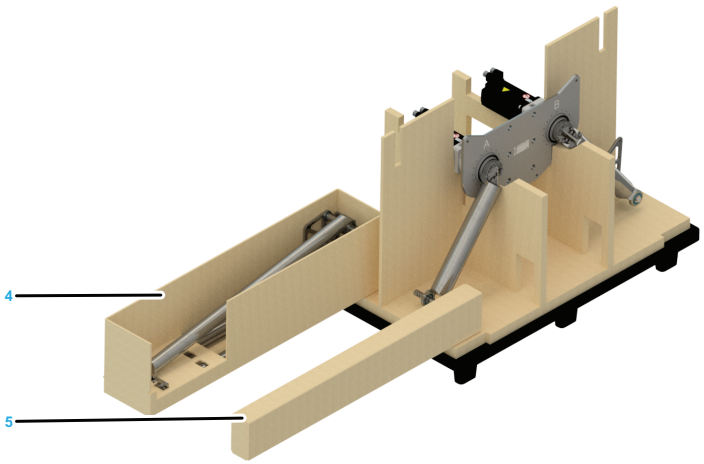
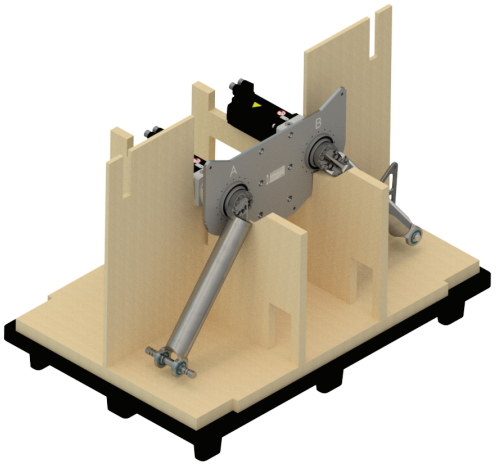
The following figure shows the packaging of robot:



1	Plastic pallet (120 x 80 cm (47 in x 31.5 in))
2	Base carton
3	cross piece carton single
4	cross piece carton double

5	Upper arms in transportation position
6	Insert carton robot arm
7	Accessories carton box

Preparing the Robot for Installation

Step	Action
1	Slide out the insert carton robot arm (4) and the accessories carton box (5) to the left or right and verify it for transport damage. 
2	Verify the robot for transport damage.
3	Open the accessories box and verify all included parts for transport damage and completeness. It must contain: • 1x parallel linkage rod long • 1x parallel linkage rod short • 3x half shell for lower arm fixing • 12x screw for half shell • 12x lock washer for half shell • 1x documentation DVD 

NOTE: In case of transport damage, contact your Schneider Electric representative.

For information about the disposal of the packaging, refer to *Disposal*, page 113.

Mechanical Installation

Information About Installation

Overview

Proceed with care during the following steps in order to help to prevent the following points:

- Injuries and material damage
- Incorrect installation and programming of components
- Incorrect operation of components
- Use of non-authorized cables or modified components

For further Information, refer to *Hazard Information*, page 10.

Mounting the Robot

Overview

There are two ways of proceeding for handling and mounting of the robot. Study both ways of proceeding and determine which one is appropriate for your environment.

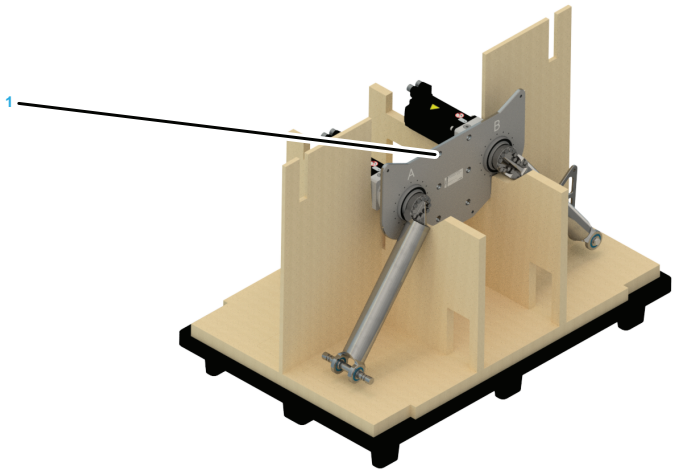
Installing by Forklift Truck

⚠WARNING

FALLING LOADS

- Drive slowly and carefully with the forklift truck.
- Do not carry out any sudden steering movements.
- Exercise care when initiating height adjustments of the forklift truck loading platform.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Step	Action
1	Using a forklift truck, lift the robot and the pallet into the enclosure. 
2	Fasten the robot to the frame using the six provided counterbores (1). Size of the counterbore: M12 Tightening torque: 56 Nm (496 lbf-in) Property class of the screws: 8.8 or greater, or A2-70 or greater 
3	Remove the cross piece cartons, the base carton and the plastic pallet from the robot.

For information about the disposal of the packaging, refer to *Disposal*, page 113.

Installing by Crane

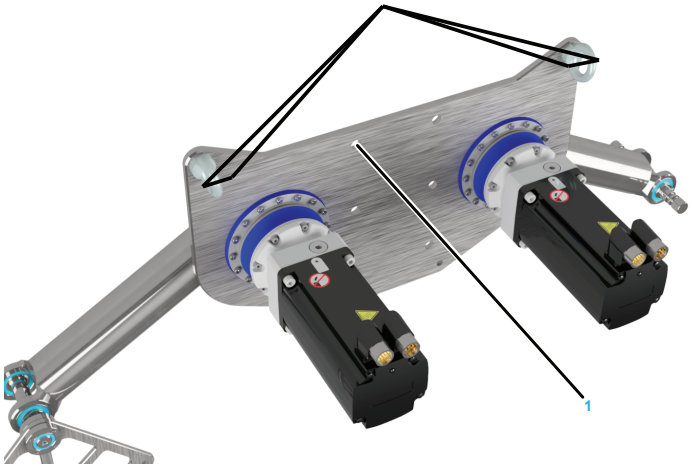
NOTE: The motors cannot carry the weight of the robot.

⚠WARNING

FALLING HEAVY LOAD

- Attach lifting lugs to the mounting plate only.
- Do not attach lifting lugs to the upper arms or the motors.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Step	Action
1	Pull two lifting lugs to the crane eyes at the mounting plate. 
2	Use the crane to carefully lift the robot into the enclosure.
3	Fasten the robot to the frame using the six provided counterbores (1). Size of the counterbore: M12 Tightening torque: 56 Nm (496 lbf-in) Property class of the screws: 8.8 or greater, or A2-70 or greater

Electrical Installation

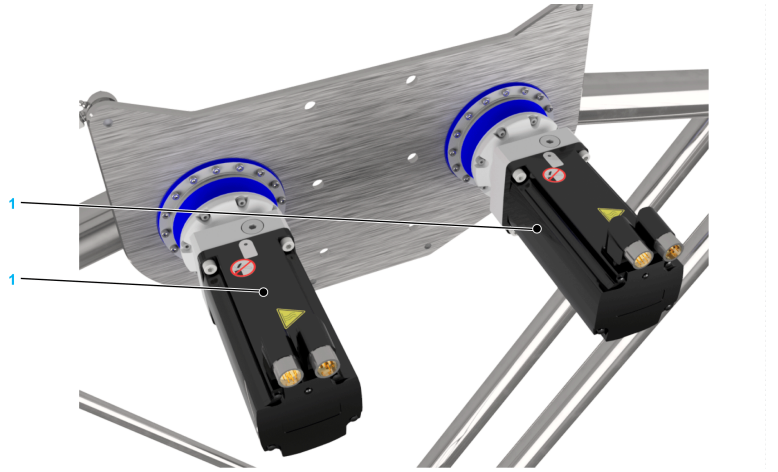
Cabling the VRKT•M••NC

Procedure Overview

Perform the following procedures to cable the robot:

- Cabling the robot, page 68
- Grounding the robot, page 68
- Reducing risks around the robot, page 69

Cabling the Robot

Step	Action
1	Feed the two encoder cables to the motors (1). 
2	Feed the two power cables to the motors (1). **NOTE:** For equipment that you are supplying that is not described in the present document, consult the documentation for those products.
3	Attach the encoder and the motor supply cables as described in the *MH3 Servo motor Motor Manual*.
4	Couple the DC buses of the servo amplifiers so that braking motors can feed back their power to the accelerating motors in the case of an on-path stop of the robot. **NOTE:** Due to the coupling of the DC buses, the existing energy suffices in many cases for an on-path stop of the robot. In case of a breakdown of the 24 Vdc supply, this measure of the feedback does not take effect.
5	Verify the correct routing and fastening of the cables to help prevent any collision of cables and moving parts.

⚠⚠DANGER

LOOSE WIRING OR CABLING CAUSES ELECTRIC SHOCK

Tighten wiring or cabling connections in conformance with the torque specifications.

Failure to follow these instructions will result in death or serious injury.

NOTICE

INCORRECT PAIRING OF MOTOR AND ENCODER CABLES

Label the motor and associated encoder cables according to their pairing.

Failure to follow these instructions can result in equipment damage.

For further information, refer to *Lexium 62 Hardware Guide* or *Lexium 52 Hardware Guide*.

Grounding the Robot

NOTE: When grounding the robot, use cables that comply with the applicable local standards, for example, cables that conform to NEC 70 / NFPA 79 in the USA.

Step	Action
1	Fasten the ground cables to the ground connections (1) of robot motors. The ground connections are marked with the following symbol:  Tightening torque: 2.9 Nm (25.7 lbf-in)  **NOTE:** • The graphic is an example for the position of the ground connection at a main axis motor. • The external protective ground connection wiring is determined by a number of variables. See the important safety information at the end of this table.
2	Verify the correct routing and fastening of the cables to help prevent any collision of cables and moving parts.

⚠⚠DANGER

ELECTRIC SHOCK DUE TO IMPROPER GROUNDING

- Ground robot components in accordance with local, regional and/or national standards and regulations at a single, central point.
- Verify that the motors are connected to the central ground.

Failure to follow these instructions will result in death or serious injury.

Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

Reducing Risks Around the Robot

Step	Action
1	Install external safety-related devices in accordance to local regulations and standards.
2	When designing the safety-related devices, assume that the robot cannot be stopped by internal logic and must be stopped by the external safety-related devices. **NOTE:** More information about the circuitry of emergency stop and additional protection elements is contained in the document *Lexium 52 Hardware Guide*, *Lexium 62 Hardware Guide*, or *Lexium 62 ILM Hardware Guide*.

Cabling the VRKT•L••NC

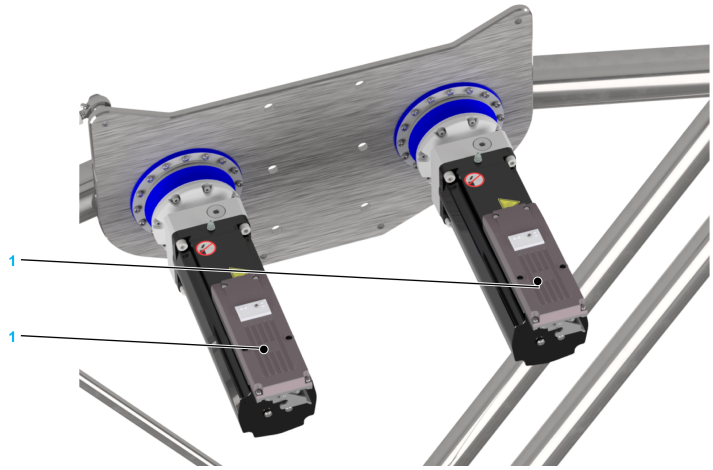
Procedure Overview

Perform the following procedures to cable the robot:

• Cabling the Robot, page 70

- Grounding the Robot, page 70
- Reducing Risks Around the Robot, page 71

Cabling the Robot

Step	Action
1	For each of the two main motors (1), feed one hybrid cable from a Distribution Box ILM62DB and connect them to the motors.  **NOTE:** For equipment that you are supplying that is not described in the present document, consult the documentation for those products.
2	Verify the correct routing and fastening of the cables to help prevent any collision of cables and moving parts.

⚠⚠DANGER

LOOSE WIRING OR CABLING CAUSES ELECTRIC SHOCK

Tighten wiring or cabling connections in conformance with the torque specifications.

Failure to follow these instructions will result in death or serious injury.

For further information, refer to *Lexium 62 Hardware Guide* or *Lexium 52 Hardware Guide*.

Grounding the Robot

NOTE: When grounding the robot, use cables that comply with the applicable local standards, for example, cables that conform to NEC 70 / NFPA 79 in the USA.

Step	Action
1	Fasten the ground cables to the ground connections (1) of the robot motors. The ground connections are marked with the following symbol:  Tightening torque: 2.9 Nm (25.7 lbf-in)  **NOTE:** • The graphic is an example for the position of the ground connection at a main axis motor. • The external protective ground connection wiring is determined by a number of variables. See the important safety information at the end of this table.
2	Verify the correct routing and fastening of the cables to help prevent any collision of cables and moving parts.

⚠⚠DANGER

ELECTRIC SHOCK DUE TO IMPROPER GROUNDING

- Ground robot components in accordance with local, regional and/or national standards and regulations at a single, central point.
- Verify that the motors are connected to the central ground.

Failure to follow these instructions will result in death or serious injury.

Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

Reducing Risks Around the Robot

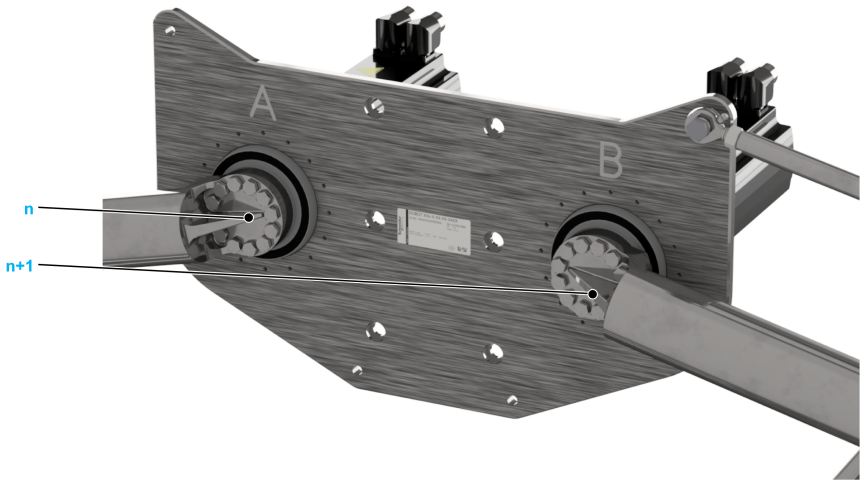
Step	Action
1	Install external safety-related devices in accordance to local regulations and standards.
2	When designing the safety-related devices, assume that the robot cannot be stopped by internal logic and must be stopped by the external safety-related devices. **NOTE:** More information about the circuitry of emergency stop and additional protection elements is contained in the document *Lexium 52 Hardware Guide*, *Lexium 62 Hardware Guide*, or *Lexium 62 ILM Hardware Guide*.

Initial Start-Up

Allocation of the Sercos Addresses

Presentation

Allocate the Sercos addresses of the servo amplifiers on the two main axes in ascending order. First allocate A and then allocate B (refer to the engraved letters on the mounting plate).



Parametrization of the Robot Mechanics

Parametrization of the Robot Mechanics by Means of the `SchneiderElectricRobotics` Library

Use the `SchneiderElectricRobotics` library for operating the Lexium T robot. The `SchneiderElectricRobotics` library facilitates the parametrization and increases the possible payload, the accuracy, and the performance of the system.

For further information about using the `SchneiderElectricRobotics` library, refer to *SchneiderElectricRobotics Library Guide* in the EcoStruxure Machine Expert online help.

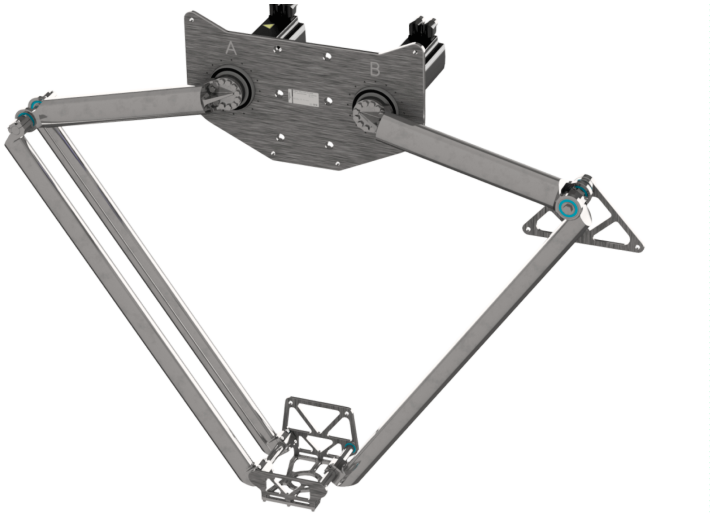
Manual Parametrization of the Robot Mechanics

Depending on the application, individual values may or must be adapted or optimized. This must be effected relative to the payload, path, permissible tracking deviation, and other relevant parameters.

Mounting the Lower Arms with Parallel Plate

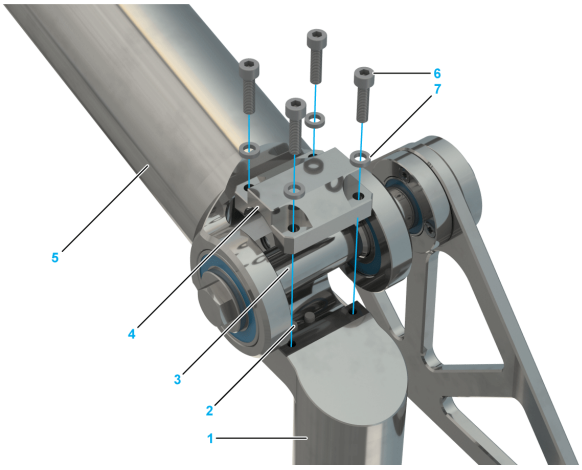
Overview

In the following procedures, the single lower arm with parallel plate is mounted to the right side and the double lower arm is mounted to the left side of the robot (see the following figure). Alternatively, you can switch the mounting sides of the single lower arm with parallel plate and the double lower arm.

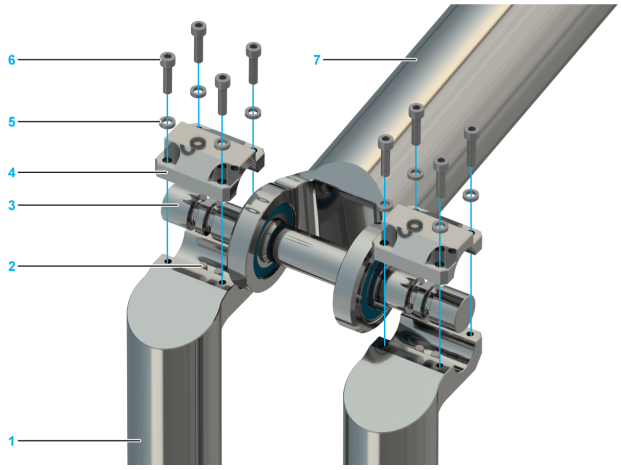
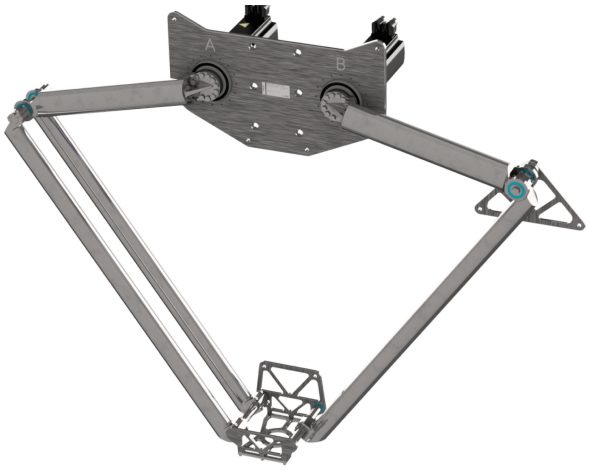


For further information on changing the mounting sides, contact your local Schneider Electric service representative.

Mounting the Single Lower Arm with Parallel Plate

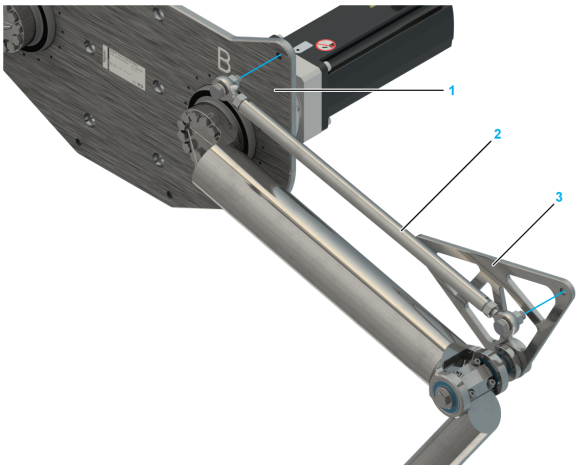
Step	Action
1	Verify that the premounted combination of the lower arms and the parallel plate shows no visible signs of transport damage. **NOTE:** If there are visible signs of transport damage, replace the parts.
2	Push the single lower arm (1) with its upper end to the mid of the upper arm (5). 
3	Verify that the two pins (2) of the lower arm are fitting correctly into the upper arm shaft (3).
4	Attach the half shell (4) to the lower arm and tighten it with four screws (6) and four lock washers (7). Tightening torque: 4.7 Nm (42 lbf-in)

Mounting Double Lower Arms with Parallel Plate

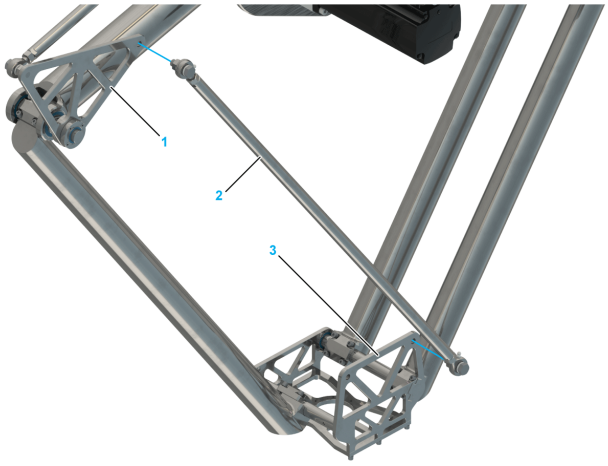
Step	Action
1	Push both lower arms (1) with their upper ends to the left and right of the upper arm (7). 
2	Verify that the two pins (2) of both lower arms are fitting correctly into the upper arm shaft (3).
3	Attach the two half shells (4) to the lower arms and tighten each one with four screws (6) and four lock washers (5). Tightening torque: 4.7 Nm (42 lbf-in)
4	Verify that the robot configuration corresponds to the following figure.  **NOTE:** Alternatively, the mounting sides of the single lower arm and the double lower arm can be switched.

Mounting the Rods for the Parallel Linkage

Mounting the Short Rod

Step	Action
1	Verify that the short rod shows no visible signs of transport damage. **NOTE:** If there are visible signs of transport damage, replace the parts.
2	Fasten one end of the short rod (2) to the mounting plate (1) and the other end to the lever parallel linkage (3). Tightening torque: 56 Nm (496 lbf-in) 
3	Verify the position of the lever parallel linkage.

Mounting the Long Rod

Step	Action
1	Verify that the long rod shows no visible signs of transport damage. **NOTE:** If there are visible signs of transport damage, replace the parts.
2	Fasten one end of the long rod (2) to the lever parallel linkage (1) and the other end to the parallel plate (3). Tightening torque: 56 Nm (496 lbf-in) 
3	Verify the position of the parallel plate.

Setting the Monitoring

Operating Library

Use the `SchneiderElectricRobotics` and `RoboticModule` library for operating the Lexium T robot.

Software Limits for Working Area

For the definition of application-specific software limits, refer to EcoStruxure Machine Expert online help.

Verifying the Brake Voltage

Verify the brake voltage as an incorrect voltage may cause premature wear of the brakes.

For further information, observe the respective operating instructions of the motors:

- VRKT•M: *MH3 Servo motor Motor Manual*
- VRKT•L: *Lexium 62 ILM Hardware Guide*

Testing the Additional Protective Devices

- Verify the emergency stop, operator protective device, and device for releasing the brakes.
- Comply with the relevant standards, and design the protective devices to stop the robot without leaving the path (Safe Stop 1 (SS1), synchronous).

For further information, refer to *Lexium 52 Hardware Guide* or *Lexium 62 Hardware Guide*.

Verifying the Monitoring

- Slowly move the robot beyond the limits of the preset working space in order to verify that this is prevented by the preset monitoring.
- Individually move the arms beyond the maximum/minimum angles in order to verify that this is prevented by the preset monitoring.

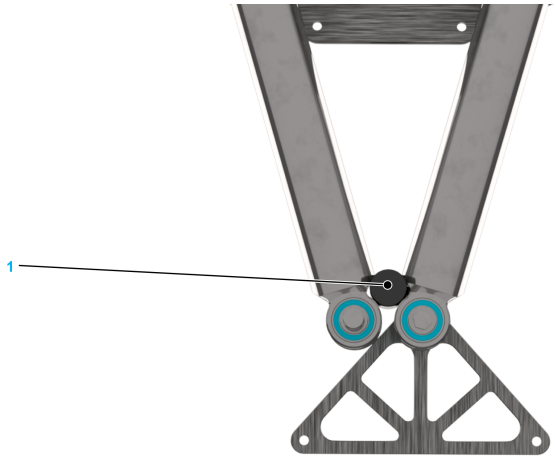
Verifying the Installation

Procedure Overview

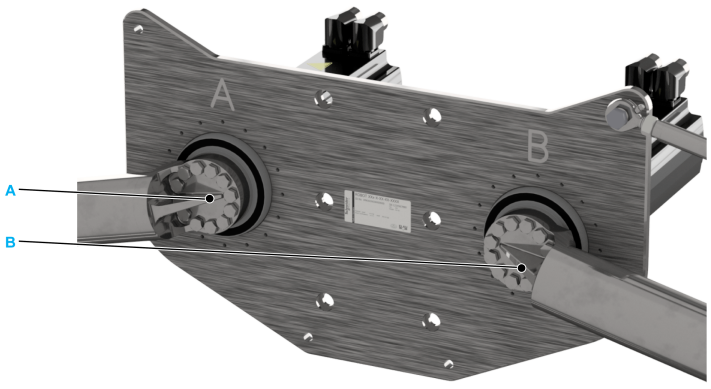
Perform the following steps to verify the installation:

- Verifying the calibration, page 77
- Verifying the motor direction of rotation, page 77
- Verifying the coordinate system of the robot, page 78

Verifying the Calibration

Step	Action
1	Mount the calibration tool (1) to one of the upper arms. 
2	Open the brakes.
3	Carefully rotate both upper arms inwards until the calibration tool has contact with both arms as shown in the figure above (calibration position).
4	Verify that the angle of both upper arms indicated is: • For VRKT1: -101.83° (+/- 0.1°) • For VRKT2: -114.31° (+/-0.1°) • For VRKT3: -110.75° (+/-0.1°) • For VRKT5: -106.12° (+/-0.1°) For further information, refer to *Calibration of the Robot Mechanics*, page 103.
5	Move the arms outwards again until they are in a horizontal position (motor position approximately 0°).

Verifying the Motor Direction of Rotation

Step	Action
1	Slowly move the upper arms in manual mode, upwards and downwards. **NOTE:** Upwards (mathematically) is a positive change of an angle and downwards (mathematically) is a negative change of an angle.
2	Verify that the direction of rotation is correct.
3	Verify that the parameterized motor moves and the motors A and B are arranged as shown in the following figure. 

For further information, refer to *Allocation of the Sercos Adresses*, page 72.

Verifying the Coordinate System of the Robot

Step	Action
1	Slowly move the robot in manual mode in the direction of an axis of the coordinate system.
2	Verify that the robot moves in a straight line in the direction of the axis.
3	Verify that the robot moves in a straight line in a positive or negative direction of the coordinate system.
4	Repeat the process for all axes of the coordinate system.

In case the robot does not move in a straight line on the path, proceed as follows:

Step	Action
1	Select the robot type when using the `SchneiderElectricRobotics` library.
2	When not using the `SchneiderElectricRobotics` library, verify the correct parameterization of the transformation and the axes.
3	Verify the calibration, page 77.
4	Verify the direction of rotation of the drives, page 77.
5	Calibrate the robot if required, page 103.

In case the robot moves along a straight line but not in the direction of the required coordinate system, proceed as follows:

Step	Action
1	Verify the definition of the coordinate system on the transformation.
2	Verify the definition of the motors in the correct sequence, page 77.

Start-Up

Overview

When the robot is operated for the first time, there is a risk of unintended equipment operation caused by possible wiring errors or unsuitable parameters.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the robot is properly fastened so it cannot come loose even during fast acceleration.
- Take all necessary measures to ensure that the moving parts of the robot cannot move in an unanticipated way.
- Verify that emergency stop equipment is operational and within reach of the zone of operation.
- Verify that the system is free and ready for the movement before starting the system.
- Run initial tests at reduced velocity.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

If the motor power supply is disabled unintentionally, for example as a result of power outage, errors or functions, the motor is no longer decelerated in a controlled way.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Verify that movements without braking effect cannot cause injuries or equipment damage.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

The metal surfaces of the robot may exceed 70 °C (158 °F) during operation.

⚠WARNING

HOT SURFACES

- Avoid unprotected contact with hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

For further information, refer to *Hot Surfaces*, page 14.

NOTE: Perform a start-up for an already configured robot when using the robot under modified operating conditions. For further information, refer to *Hazard Information*, page 10.

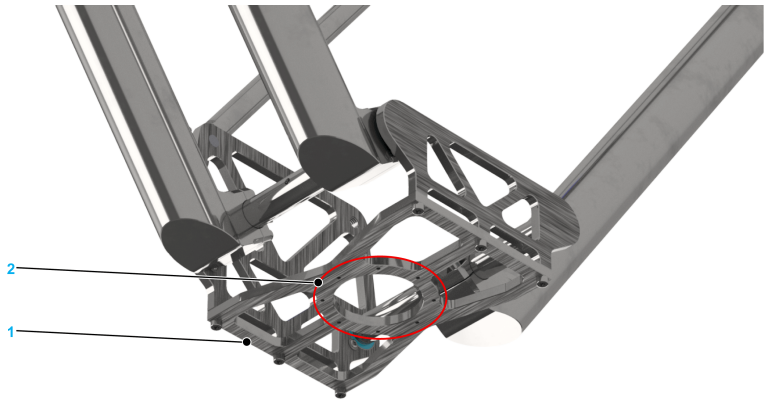
Commissioning Procedure

Step	Action
1	Verify the installation, page 76.
2	Comply with the instructions provided in the manual of the motor used and in the manual of the drives used.
3	Verify that the load conforms to the specified payloads for the robot before operating the robot.
4	Limit the maximum torque of the motor in accordance with the maximum drive torque of the robot.
5	Perform initial tests at reduced velocity.
6	Verify that the ambient conditions, page 24 conform to the appropriate specified conditions for the robot.

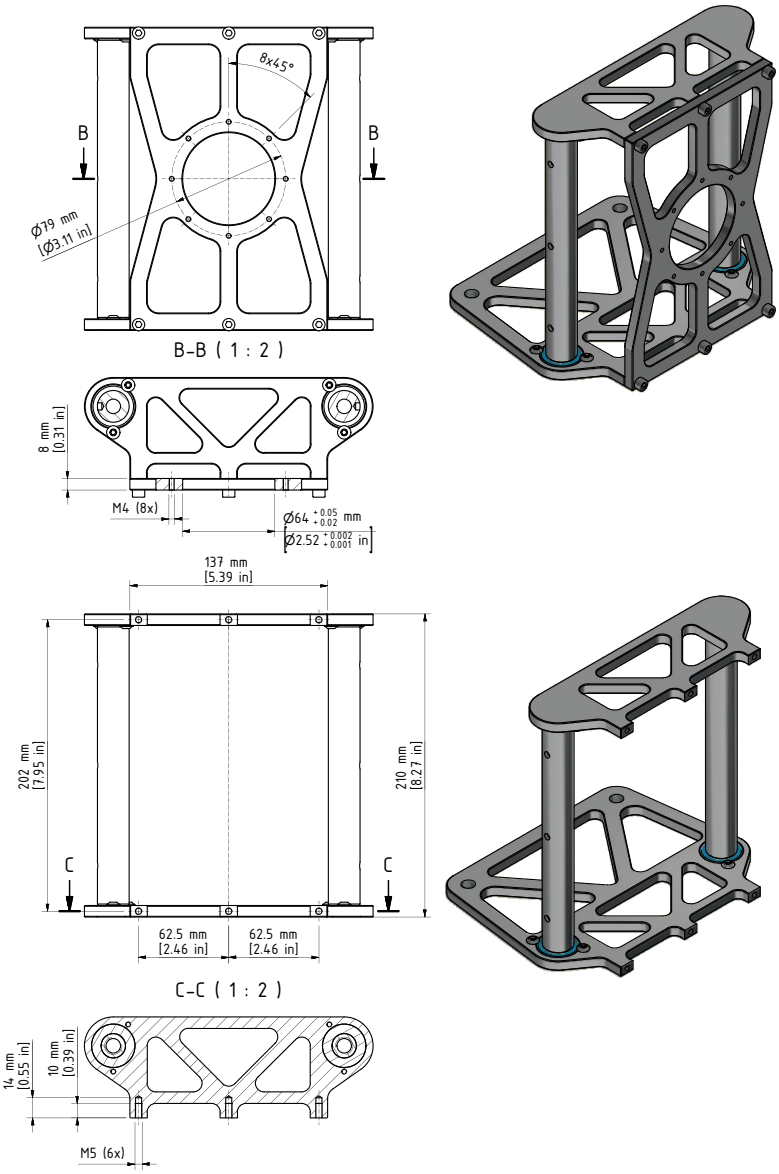
Mounting the Payload

Mounting the Gripper

Mounting the Gripper at VRKT1, VRKT2, VRKT3, VRKT5

Step	Action
1	Fasten the gripper to the mounting points provided for this purpose on the parallel plate (1): • Pitch circle diameter 79 mm (3.1 in): 8 x M4 (2), tightening torque: 2.2 Nm (19.5 lbf-in); property class of the screws 8.8 or greater or A4-80 or greater.  **NOTE:** • Observe the permissible weights and distances. For further information, refer to *Mechanical and Electrical Data*, page 25. • The maximum tilting torque at the parallel plate is 20 Nm (177 lbf–in) for VRKT1 and 175 Nm (1549 lbf-in) for VRKT2, VRKT3, VRKT5. For further information, refer to *Load Capacity Diagram*, page 49.

Flange Dimensions for Lexium T Robots

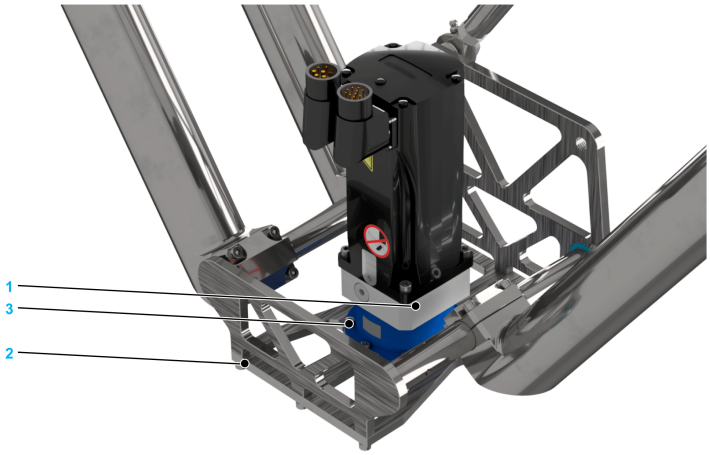


Mounting a Rotational Drive Unit

Overview

You can mount a gearbox/motor combination at the mounting points for the gripper. This unit could be used for rotating an attached gripper or drive mechanical components inside an end-effector system. The appropriate combination of motor and gearbox has to be determined according to the application specifications. The mounting flange is compatible with many commonly used gearboxes.

Mounting a Rotational Drive Unit

Step	Action
1	Fasten the gearbox (1) to the mounting points provided for this purpose on the parallel plate (2). • Pitch circle diameter 79 mm (3.1 in): 8 x M4 (3), tightening torque: 2.2 Nm (19.5 lbf-in); property class of the screws 8.8 or greater or A4-80 or greater.  **NOTE:** • Observe the permissible weights and distances. For further information, refer to *Mechanical and Electrical Data*, page 25. • The maximum tilting torque at the parallel plate is 20 Nm (177 lbf–in) for VRKT1 and 175 Nm (1549 lbf-in) for VRKT2, VRKT3, VRKT5. For further information, refer to *Load Capacity Diagram*, page 49.
2	Ground the gearbox/motor combination in accordance with local standards and regulations at a single, central point. **NOTE:** When grounding the robot, use cables that comply with the applicable local standards, for example, cables that conform to NEC 70 / NFPA 79 in the USA.

⚠⚠DANGER

ELECTRIC SHOCK DUE TO IMPROPER GROUNDING

- Ground robot components in accordance with local, regional and/or national standards and regulations at a single, central point.
- Verify that the motors are connected to the central ground.

Failure to follow these instructions will result in death or serious injury.

Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

Supply of the Gripper

Feeding the Media to the Gripper

Feed in the media line from cables, hoses, and so on, via the upper and lower arms to the parallel plate.

NOTE: Ensure that additional loads on the upper and lower arms are minimal. Distribute additional loads to different arms, if possible. As far as possible, attach the additional loads to the lower arms to avoid damage to the arms due to dynamic forces as much as possible.

NOTICE
HIGH WEAR AND/OR DAMAGED BEARINGS Distribute loads to lower arms in a way that minimizes the rotational forces on the arms. **Failure to follow these instructions can result in equipment damage.**

Maintenance and Repair

Maintenance, Repair, and Cleaning

General Information About Maintenance, Repair, and Cleaning

Overview

The use and application of the information contained herein require expertise in the design and programming of automated control systems. Only you, the user, machine builder or integrator, can be aware of all the conditions and factors present during installation and setup, operation, repair, and maintenance of the machine or process.

You must also consider any applicable standards and/or regulations with respect to grounding of all equipment. Verify compliance with any safety information, different electrical requirements, and normative standards that apply to your machine or process in the use of this equipment.

⚠⚠DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Operate electrical components only with a connected protective ground (earth) cable.
- Verify the secure connection of the protective ground (earth) cable to all electrical devices to ensure that connection complies with the connection diagram.
- Do not touch the electrical connection points of the components when the module is energized.
- Provide protection against indirect contact.
- Insulate any unused conductors on both ends of the motor cable.

Failure to follow these instructions will result in death or serious injury.

Poor maintenance can lead to premature wear, or even present potential safety hazards for production or maintenance operators.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Develop and follow a maintenance plan and associated protocols adapted to the requirements of your application and equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Servicing

In case of issues which cannot be resolved, contact your local Schneider Electric service representative with the following information:

- Type plate information (type, identification number, serial number, DOM)
- Detailed description of the issue
- Previous and associated circumstances

Maintenance Plan

Overview

The maintenance intervals may have to be adapted to the greatly varying operational hours depending on the application.

For procedures to replace the different parts, refer to *Replacing Parts*, page 91.

Maintenance Schedule

Interval	Action
Every 150 hours of operation or weekly	• Verify the robot by visual inspection for any damage or missing parts, especially moving parts and parts at risk for collisions such as grippers, upper arms, lower arms, parallel plate, or parallel linkage rods. • Replace the arms or the parallel linkage rods if these are bent or dented. • Clean the robot mechanics.
Every 1,000 hours of operation or every three months	• Verify all moving parts for bolted connections. • Verify the output shaft sealing of gearboxes for deposits of dirt and clean.
Every 3,000 hours of operation or every six months	• Verify the arm bearings and replace them if necessary. • Verify the parallel plate bearings and replace them if necessary. • Verify the bearing lever parallel linkage and replace them if necessary.
Annually	• Verify the parallel rod system and replace or lubricate the ball ends of the parallel rods with a grease gun if necessary. • Verify the brake function during operation.
Every 20,000 hours of operation	• Replace the main gearboxes and motors.
Every 40,000 hours of operation	• Replace the upper arms.
Every 1,000 emergency stop situations	• Replace the upper arms.

NOTE: The gearbox and the bearings have been lubricated for life.

Maintaining the Upper Arm Bearings

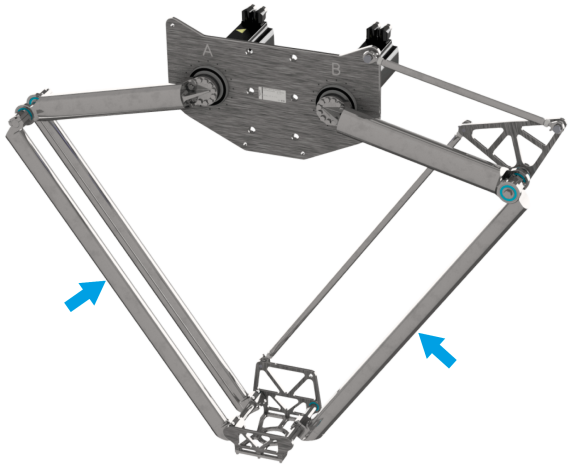
Overview

Periodically verify and replace the upper arms with mounted ball bearings in accordance with the maintenance schedule, page 85.

Small amounts of grease at the ball bearings do not constitute damage. Carefully remove deposits at the bearing seals using a lint-free cloth.

NOTICE
DAMAGED BEARINGS • Use a lint-free cloth for cleaning. • Do not clean dry deposits using compressed air. • Do not use solvents such as trichloroethylene, tetrachloromethane, or hydrocarbons nor sharp-edged objects, emery cloth, or emery paper. • Minimize the mechanical impacts when cleaning. **Failure to follow these instructions can result in equipment damage.**

Verifying the Wear of the Upper Arm Bearings

Step	Action
1	**NOTE:** Do **not** remove the robot arm for this verification. Move both upper arms in a horizontal position.
2	Verify the bearings for backlash by pushing and pulling the lower arms perpendicular to the robot working area (apply about 30 N (6.7 lbf) at the middle of the lower arm). **NOTE:** When testing, differentiate between the real backlash of the system as opposed to the resistance of the components to movement. 
3	Replace the upper arm with mounted ball bearings if the noticed backlash exceeds the needs of your application. For further information, refer to *Replacing the Upper Arms*, page 97.

Maintaining the Parallel Plate Bearings

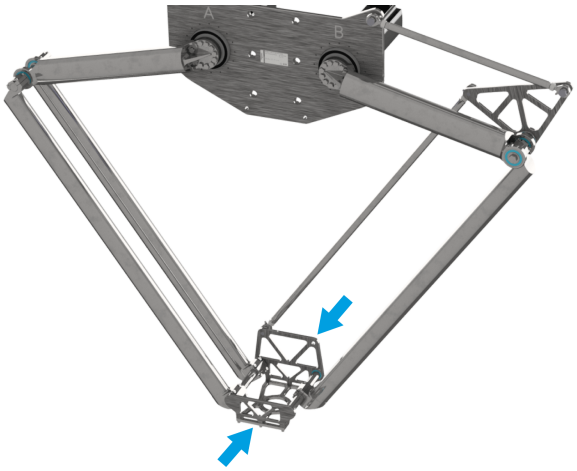
Overview

Periodically verify and replace the parallel plate bearings in accordance with the maintenance schedule, page 85.

Small amounts of grease at the ball bearings do not constitute damage. Carefully remove deposits at the bearing seals using a lint-free cloth.

NOTICE
DAMAGED BEARINGS • Use a lint-free cloth for cleaning. • Do not clean dry deposits using compressed air. • Do not use solvents such as trichloroethylene, tetrachloromethane, or hydrocarbons nor sharp-edged objects, emery cloth, or emery paper. • Minimize the mechanical impacts when cleaning. **Failure to follow these instructions can result in equipment damage.**

Verifying the Wear of the Parallel Plate Bearings

Step	Action
1	**NOTE:** Do **not** remove the robot arm for this verification. Move both upper arms in a horizontal position.
2	Verify the bearings for backlash by pushing, pulling and tilting the parallel plate (apply about 10 N (2.25 lbf) in the middle of the parallel plate). **NOTE:** When testing, differentiate between the real backlash of the system as opposed to the resistance of the components to movement. 
3	Replace the parallel plate bearings if the noticed backlash exceeds the needs of your application. For further information, refer to *Replacing the Parallel Plate Bearings*, page 94.

Maintaining the Parallel Rod System

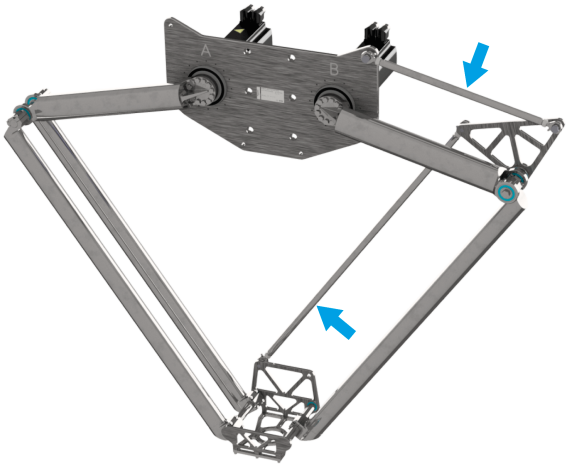
Overview

Periodically verify and replace the parallel rods in accordance with the maintenance schedule, page 85.

Small amounts of grease at the ball end bearings do not constitute damage. Carefully remove deposits at the bearing seals using a lint-free cloth.

NOTICE
DAMAGED BEARINGS • Use a lint-free cloth for cleaning. • Do not clean dry deposits using compressed air. • Do not use solvents such as trichloroethylene, tetrachloromethane, or hydrocarbons nor sharp-edged objects, emery cloth, or emery paper. • Minimize the mechanical impacts when cleaning. **Failure to follow these instructions can result in equipment damage.**

Verifying the Wear of the Parallel Rod Ball End Bearings

Step	Action
1	**NOTE:** Do **not** remove the robot arm for this verification. Move both upper arms in a horizontal position.
2	Verify the bearings for backlash by pushing and pulling both parallel rods perpendicular to the robot working plane (apply about 30 N (6.7 lbf) at the middle of the rods). **NOTE:** When testing, differentiate between the real backlash of the system as opposed to the resistance of the components to movement. 
3	Replace the parallel rod if the noticed backlash exceeds the needs of your application. For further information, refer to *Replacing the Parallel Rods*, page 96.

Lubricating the Parallel Rod System

Apply grease by using a grease gun to the grease nipple, DIN 71412 H1 (minimum size 12).

NOTE: Use aluminum-complex-soap grease, approved according to USDA H1.

Temperature range: -45…+120 °C (-49…+248 °F)

Maintaining the Motor (Optional Equipment)

Overview

For information about maintaining the motor, record the motor reference on the type plate and refer to the corresponding motor manual.

Maintaining the Gearbox

Step	Action
1	Verify the gearbox by visual inspection for leakages and deposits of dirt on the gearbox output shaft sealing periodically in accordance with the maintenance schedule, page 85.
2	Carefully remove deposits. Use lint-free cloths to clean the gearbox. **NOTE:** In case of a leakage, contact your local Schneider Electric service representative.

NOTICE

DAMAGED GEARBOXES DUE TO INAPPROPRIATE CLEANING OF THE GEARBOX

- Use lint-free cloth for cleaning.
- Do not clean dry deposits using compressed air.
- Do not use solvents; for example, trichloroethylene, tetrachloromethane, or hydrocarbons nor sharp-edged objects, emery cloth, or emery paper.
- Minimize the mechanical impacts when cleaning.

Failure to follow these instructions can result in equipment damage.

Cleaning

Overview

Care must be taken with cleaning products as some active agents may have harmful effects on plastics and stainless steel.

NOTICE

CORROSION CAUSED BY CLEANING AGENTS

- Perform a compatibility test in relation to the cleaning agent and the component affected before using a cleaning agent.
- Do not use alkaline detergent in the interior of the mechanics.
- Do not use any chloride-containing cleaning agents.
- Do not use any sulphuric acid containing detergent.

Failure to follow these instructions can result in equipment damage.

For further information about the material properties of your components, refer to *Mechanical and Electrical Data*, page 25.

NOTE: Depending on the operating conditions and requirements, cleaning may be necessary on a more frequent basis.

Cleaning the Robot

Step	Action
1	Use cleaning processes appropriate to the degree of protection, page 25 of the robot.
2	Allow the cleaning agent to act for a short time.
3	Thoroughly rinse the robot with water.
4	Clean the robot on a weekly basis in order to help to avoid that abrasions accumulate and pass into production.

Cleaning the Bearings of Moving Parts

NOTE: Particularly in the first hours of operation, a slight sweating of the bearings may occur. This is a result of the manufacturing process and does not constitute damage on the bearings.

Only clean the bearings and seals by wiping with a lint-free cloth or wash-down at low pressure. For further information, refer to *Maintaining the Upper Arm Bearings*, page 85, *Maintaining the Parallel Plate Bearings*, page 86 and *Maintaining the Parallel Rod System*, page 87.

Cleaning the Gearbox

NOTE: Particularly in the first hours of operation, a slight sweating of the gearboxes may occur. This is a result of the manufacturing process and does not constitute damage on the gearboxes.

Only clean the gearbox flanges and seals by using wiping with lint-free clothes or wash-down at low pressure. For further information, refer to *Maintaining the Gearbox*, page 89.

Repairing After Collisions

Overview

Components may be damaged as a result of a collision.

⚠WARNING

FALLING OR EJECTED PARTS

- Thoroughly inspect all components of the robot and all components attached to the robot, including the motor and the gearbox, for damage after a collision.
- Do not use the robot if any of the components are damaged or suspected to be damaged.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Verifying the Robot After a Collision

NOTICE

COLLISION OF COMPONENTS

Replace upper arms, lower arms and/or parallel rods if dents or cracks are observed or otherwise detected.

Failure to follow these instructions can result in equipment damage.

Step	Action
1	Verify the components for completeness. If any components are missing, locate the same and remove them from the surrounding machinery.
2	Replace damaged or missing components.
3	Verify the upper arms, lower arms and parallel rods for visible dents or cracks. Dents reduce the strength of the arms and may cause component breakdown.
4	Verify the calibration, page 103 by moving the upper arms to the calibration tool. **NOTE:** If the tolerance requirements for calibration are not met, replace the upper arms.
5	Verify the lower arms and the parallel rods for straightness.

Step	Action
6	Release the brakes and manually move the robot to verify the ease of operation.
7	Close the brakes and verify that there is a small backlash in the gearboxes and no cracking noises.

In case of other repairs beyond those described in the present document, contact your local Schneider Electric service representative.

Replacing Parts

Information About Replacing Parts

Overview

The use and application of the information contained herein require expertise in the design and programming of automated control systems. Only you, the user, machine builder or integrator, can be aware of all the conditions and factors present during installation and setup, operation, repair, and maintenance of the machine or process.

You must also consider any applicable standards and/or regulations with respect to grounding of all equipment. Verify compliance with any safety information, different electrical requirements, and normative standards that apply to your machine or process in the use of this equipment.

⚠⚠DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Operate electrical components only with a connected protective ground (earth) cable.
- Verify the secure connection of the protective ground (earth) cable to all electrical devices to ensure that connection complies with the connection diagram.
- Do not touch the electrical connection points of the components when the module is energized.
- Provide protection against indirect contact.
- Insulate any unused conductors on both ends of the motor cable.

Failure to follow these instructions will result in death or serious injury.

The robot heats up significantly when subjected to heavy loads and/or high performance.

The metal surfaces of the robot may exceed 70 °C (158 °F) during operation.

⚠WARNING

HOT SURFACES

- Avoid unprotected contact with hot surfaces.
- Do not allow flammable or heat-sensitive parts in the immediate vicinity of hot surfaces.
- Verify that the heat dissipation is sufficient by performing a test run under maximum load conditions.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

For further information, refer to *Hot Surfaces*, page 14.

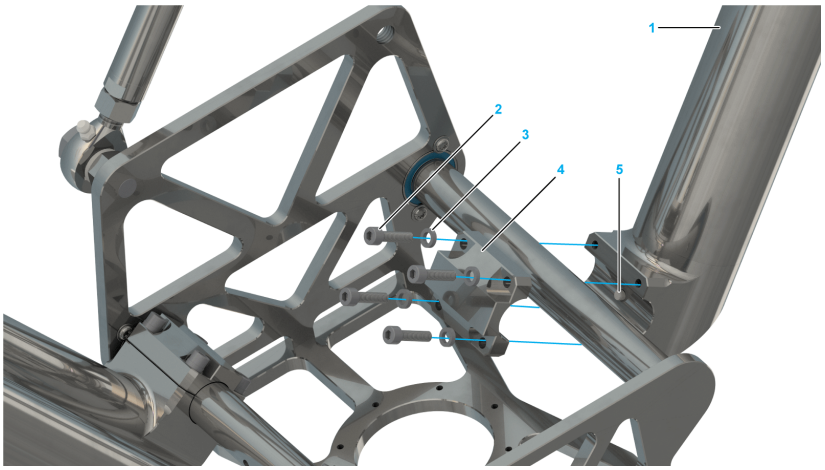
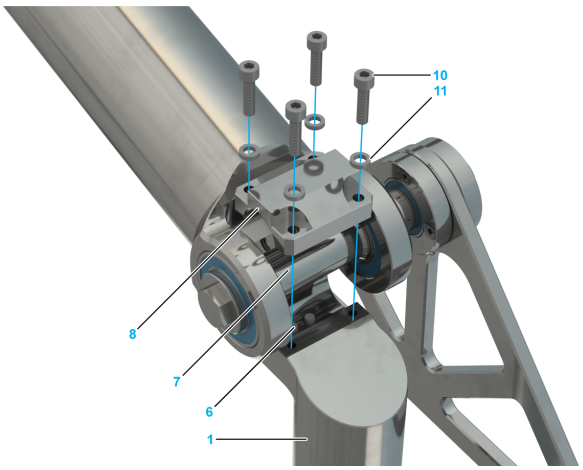
Replacing the Lower Arms

⚠WARNING

FALLING HEAVY LOAD

Secure in place the parallel plate and lower arm when loosening and removing the screws.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Step	Action
1	Carefully remove the four screws (2) and the four lock washers (3) from the lower half shell at the lower arm (1) and then remove the shell (4).  **NOTE:** Take care that the indexing bolts (5) of the lower arm are located inside the holes of the shaft of the upper arm.
2	Carefully remove the four screws (10) and the four lock washers (11) from the upper half shell (8) at the lower arm (1) and then remove the shell.  **NOTE:** Take care about the indexing bolts (6) of the lower arm.
3	Replace the lower arm and mount the shells in reverse order. For further information, refer to *Mounting the Lower Arms with Parallel Plate*, page 72.

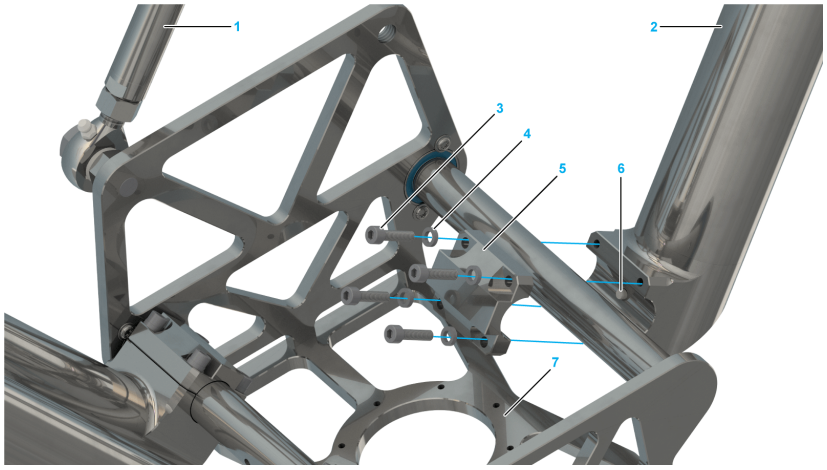
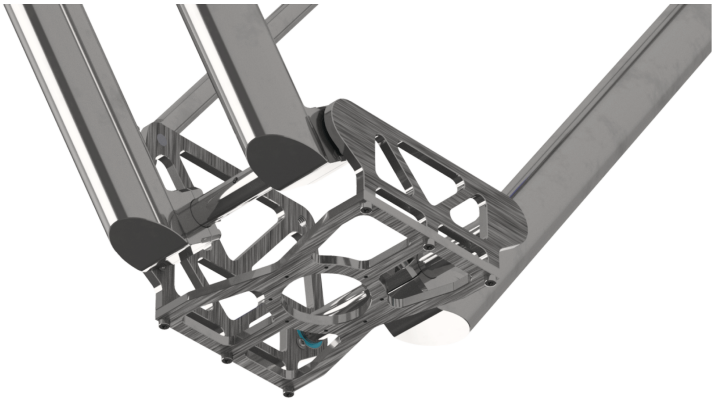
Replacing the Parallel Plate

⚠WARNING

FALLING HEAVY LOAD

Secure in place the parallel plate and lower arm when loosening and removing the screws.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Step	Action
1	Remove the long rod (1) from the parallel plate (7). 
2	Carefully remove the four screws (3) and the four lock washers (4) from the lower half shell (5) at the lower arm (2) and then remove the shell. Repeat this step for all lower arms. **NOTE:** Take care that the indexing bolts (6) of the lower arm are located inside the holes of the shaft of the upper arm.
3	Mount the new parallel plate to the lower arms. Tightening torque: 4.7 Nm (42 lbf-in) **NOTE:** Ensure that the parallel plate has the same orientation as before.
4	Mount the long rod to the parallel plate. Tightening torque: 56 Nm (496 lbf-in)
5	Slowly move the robot and verify the position of the particular articulation devices. 

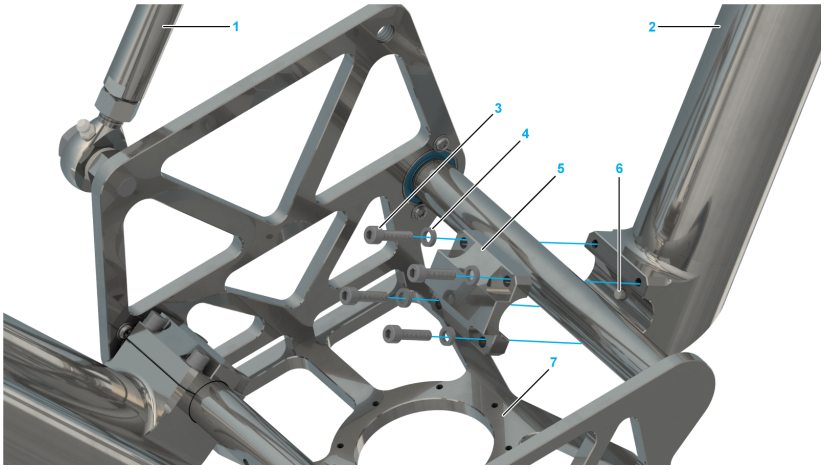
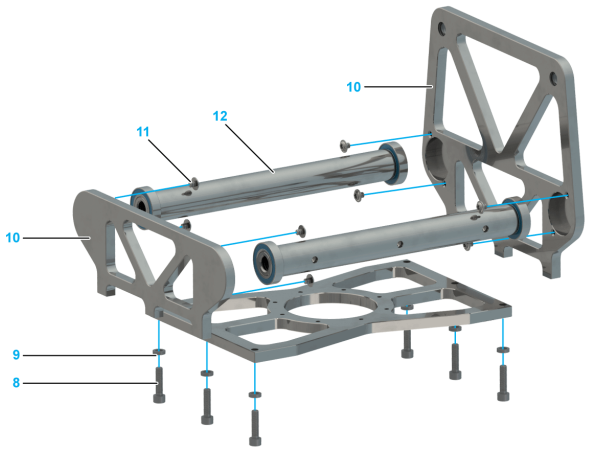
Replacing the Parallel Plate Bearings

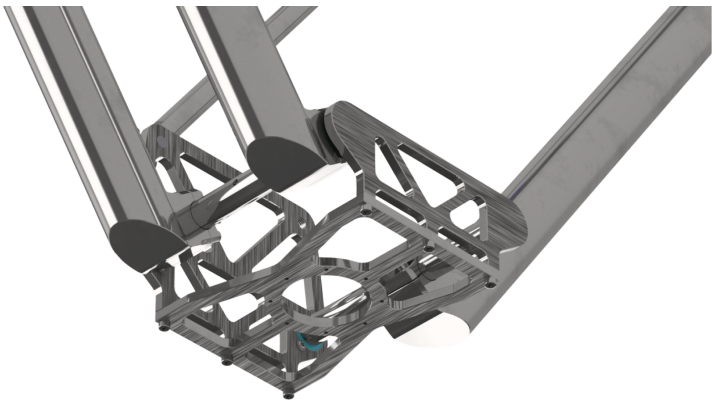
⚠WARNING

FALLING HEAVY LOAD

Secure in place the parallel plate and lower arm when loosening and removing the screws.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Step	Action
1	Remove the long rod (1) from the parallel plate (7). 
2	Carefully remove the four screws (3) and the four lock washers (4) from the lower half shell (5) at the lower arm (2) and then remove the shell. **NOTE:** Take care that the indexing bolts (6) of the lower arm are located inside the holes of the shaft of the upper arm.
3	Remove the six screws (8) and the six lock washers (9) on the bottom of the parallel plate and the eight axis fasteners (11) at the bearings. 
4	Pull off the two shafts with bearings (12) from the side plates (10).
5	Attach the two new shafts with bearings (7) to the side plates and fasten them with the eight axis fasteners. Tightening torque: 2.2 Nm (19.5 lbf-in)
6	Fasten the bottom of the parallel plate to the side plates with the six screws and the six lock washers. Tightening torque: 4.7 Nm (42 lbf-in)
7	Mount the parallel plate to the lower arms. **NOTE:** Ensure that the parallel plate has the same orientation as before.

Step	Action
8	Mount the long rod to the parallel plate. Tightening torque: 56 Nm (496 lbf-in)
9	Slowly move the robot and verify the position of the particular articulation devices. 

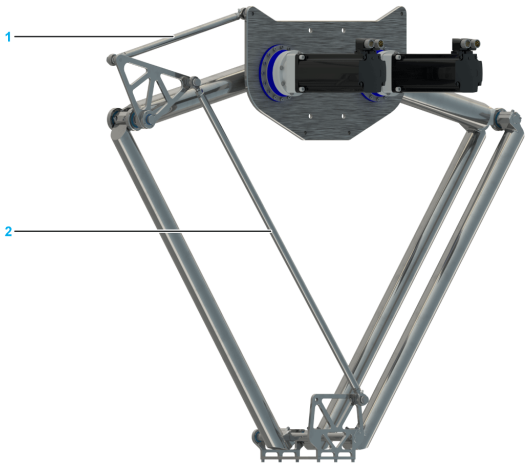
Replacing the Parallel Rods

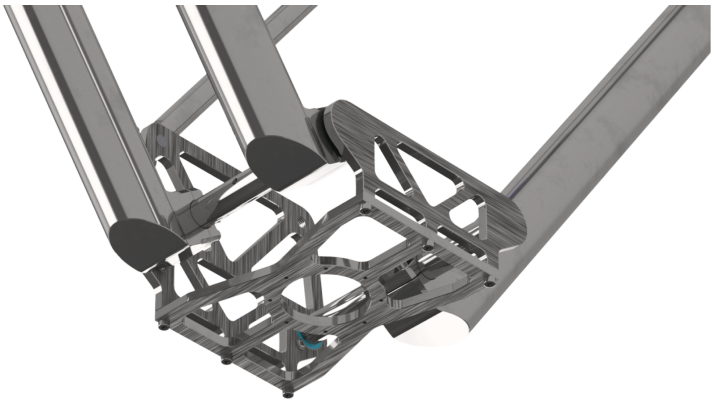
⚠WARNING

FALLING HEAVY LOAD

Secure in place the parallel plate and lower arm when loosening and removing the screws.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Step	Action
1	Remove the short rod (1). 
2	Remove the long rod (2).

Step	Action
3	Mount the new parallel rods as described in *Mounting the Rods for Parallel Linkage*, page 75.
4	Slowly move the robot and verify the position of the particular articulation devices. 

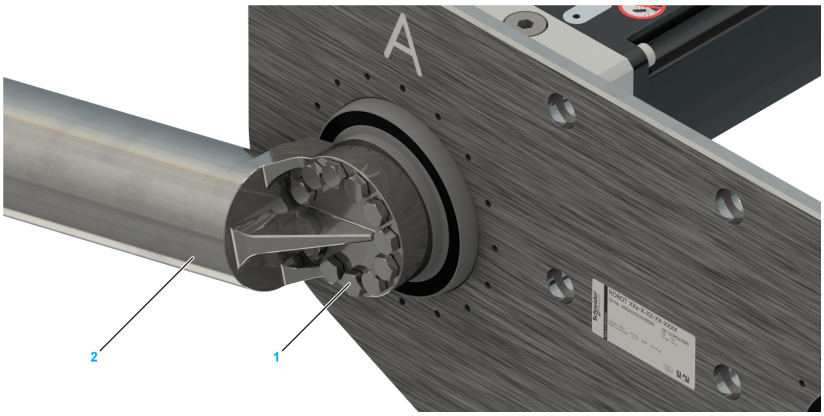
Replacing the Upper Arms

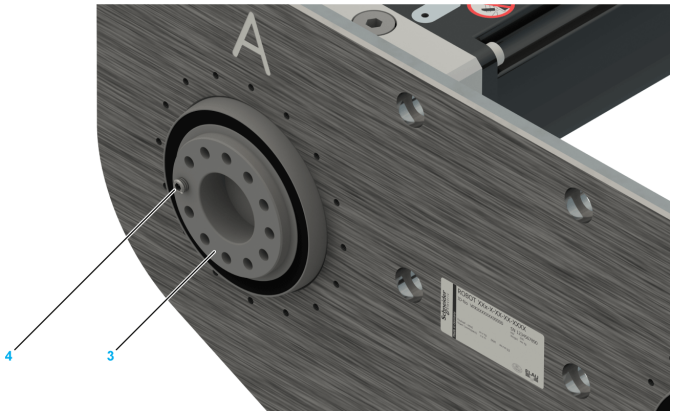
⚠WARNING

FALLING HEAVY UPPER ARM

Secure in place the upper arm when loosening and removing the bolts.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Step	Action
1	Remove the parallel rods and the lower arms with parallel plate. For further information, refer to *Replacing the Parallel Rods*, page 96 and *Replacing the Lower Arms*, page 92.
2	Remove the bolts (1) on the upper arm (2). 
3	Pull off the upper arm.

Step	Action
4	Verify whether the threaded pin (4) is in the hole of the gearbox. If there is no threaded pin, insert a new threaded pin at the position shown in the figure. **NOTE:** Verify that the threaded pin protrudes approximately 3 mm (0.118 in) 
5	Verify whether the flange surfaces of the gearbox (3) and of the upper arm are free from grease and oil. If necessary, remove grease and oil residues from the upper arm and/or the gearbox flange.
6	Attach the new upper arm to the gearbox. Tightening torque for VRKT1: 14 NM (124 lbf-in) Tightening torque for VRKT2, VRKT3, VRKT5: 22 Nm (195 lbf-in) For more information about tightening torques, bolt locking devices and installation notes, refer to the respective dimensional drawing in *Mechanical and Electrical Data*, page 25.
7	Calibrate the robot mechanics, page 103.
8	Mount the lower arms with parallel plate to the upper arms and mount the parallel rods. For further information, refer to *Mounting the Lower Arms with Parallel Plate*, page 72 and *Mounting the Rods for Parallel Linkage*, page 75.

NOTICE

INOPERABILITY OF UPPER ARM

Remove all grease and oil residues from the gearbox flange and the upper arm.

Failure to follow these instructions can result in equipment damage.

NOTICE

COLLISION OF COMPONENTS

- Only use the bolts that are prescribed by Schneider Electric.
- Perform a calibration procedure of the robot mechanics after replacement of an upper arm, motor, or gearbox.

Failure to follow these instructions can result in equipment damage.

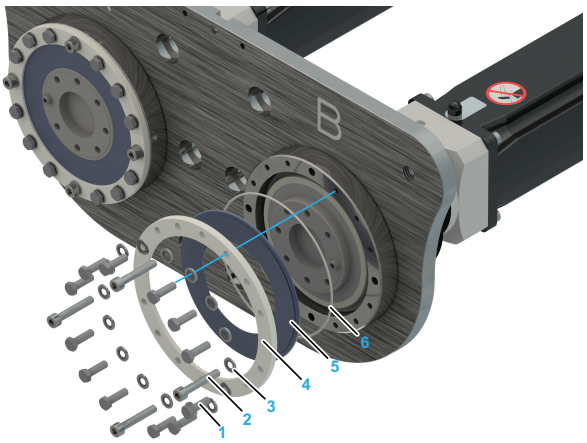
Replacing the Protector Cap

NOTICE

INSUFFICIENT PART CLEARANCE

Ensure that the protector cap does not touch the gearbox output shaft during assembly.

Failure to follow these instructions can result in equipment damage.

Step	Action
1	Remove the lower arms and the upper arms. For further information, refer to *Replacing the Lower Arms*, page 92 and *Replacing the Upper Arms*, page 97.
2	Remove the 12 hexagon screws (1), 4 socket head screws (2) and 16 sealing washers (3) and then remove the supporting ring (4), the protector cap (5), and the O-ring (6) from each of the two gearbox flanges. 
3	Insert the new O-ring to the intended bevel edge of the new protector cap.
4	Place the protector cap with the O-ring to the new supporting ring.
5	Place the entire unit over the gearbox output shaft on the robot and fasten it with the new screws and the new sealing washers. **NOTE:** Ensure that the protector cap does not come into contact with the gearbox output shaft before tightening the screws. Tightening torque: 3.5 Nm (31 lbf-in)
6	Mount the upper arms and the lower arms. For further information, refer to *Replacing the Upper Arms*, page 97 and to *Mounting the Lower Arms with Parallel Plate*, page 72.
7	*Calibrate the robot*, page 103.

Replacing the Motor or the Gearbox on the Main Axis

Overview

The use and application of the information contained herein require expertise in the design and programming of automated control systems. Only you, the user, machine builder or integrator, can be aware of all the conditions and factors present during installation and setup, operation, repair, and maintenance of the machine or process.

You must also consider any applicable standards and/or regulations with respect to grounding of all equipment. Verify compliance with any safety information, different electrical requirements, and normative standards that apply to your machine or process in the use of this equipment.

⚠⚠DANGER

ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Operate electrical components only with a connected protective ground (earth) cable.
- Verify the secure connection of the protective ground (earth) cable to all electrical devices to ensure that connection complies with the connection diagram.
- Do not touch the electrical connection points of the components when the module is energized.
- Provide protection against indirect contact.
- Insulate any unused conductors on both ends of the motor cable.

Failure to follow these instructions will result in death or serious injury.

Procedure Overview

Perform the following procedures to replace the motor or gearbox on main axis:

- Removing the motor and the gearbox, page 100
- Removing the motor from the gearbox, page 101
- Mounting the new motor and/or the new gearbox, page 101
- Cabling the new motor and the gearbox, page 102

Removing the Motor and the Gearbox

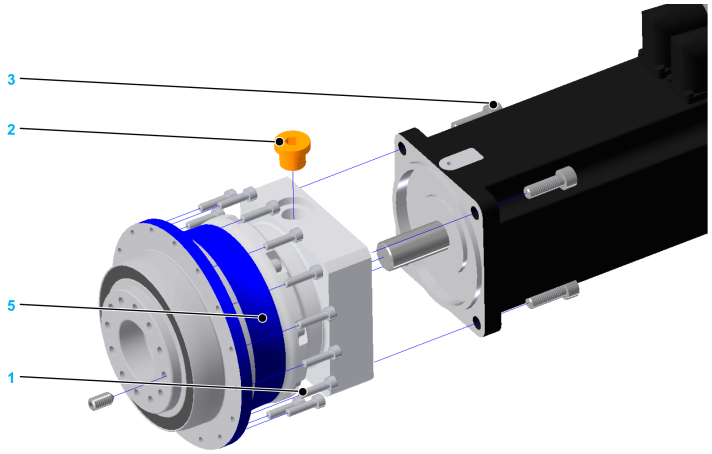
⚠WARNING

FALLING HEAVY LOAD

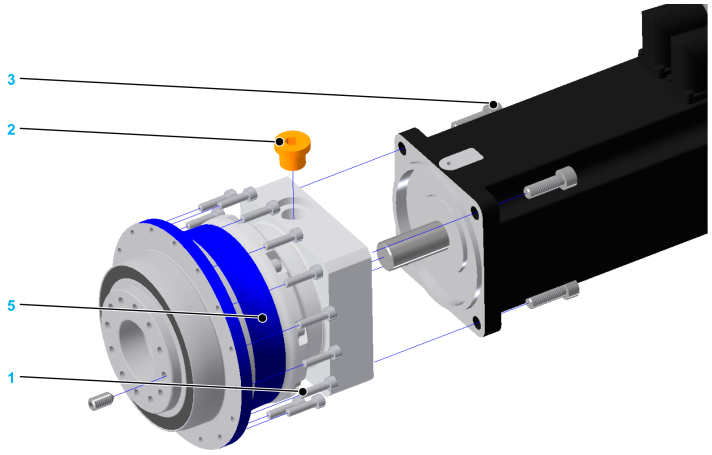
Support the motor and gearbox while removing.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Step	Action
1	Remove the upper arm as described in *Replacing the Upper Arms*, page 97.
2	• For robots with an MH3 motor (VRKT•M): Disconnect and remove the two motor supply cables. • For robots with an ILM motor (VRKT•L): Lift up the locking device slightly of the hybrid cable and then remove the cable.
3	Disconnect and remove the ground cable from the motor.

Step	Action
4	Remove the 16 bolts (1) by means of which the gearbox is bolted to the mounting plate. 
5	Carefully remove the motor and gearbox (5) from the mounting plate in rearward direction. **NOTE:** Do not tilt transmission and do not damage the alignment hole at the mounting plate.

Removing the Motor from the Gearbox

Step	Action
1	Remove the plug screw (2) on the gearbox flange. 
2	Remove the four screws (3) on the motor which connect the motor to the gearbox.
3	Carefully rotate the motor until the screw on the clamping flange appears in the aperture of the plug screw.
4	Loosen the screw in the clamping flange.
5	Carefully remove the motor from the gearbox.

Mounting the New Motor and/or the New Gearbox

NOTICE
DAMAGE TO MOTOR AND GEARBOX Only fasten motor and gearbox with all components at the same ambient temperature. **Failure to follow these instructions can result in equipment damage.**

Step	Action
1	Ensure that the gearbox and the housing are at the same temperature, as otherwise - in the case of a temperature difference - the gearbox may not fit into the aperture provided.
2	Attach the motor to the gearbox according to the specifications of the manufacturer. Tightening torques for VRKT1: • Clamping hub: 4.5 Nm (40 lbf-in) • Motor screws: 3.5 Nm (31 lbf-in) Tightening torques for VRKT2, VRKT3, VRKT5: • Clamping hub: 14 Nm (124 lbf-in) • Motor screws: 16 Nm (142 lbf-in)
3	Insert the plug screw into the gearbox flange.
4	Attach the motor/gearbox combination to the robot mounting plate in the orientation specified. Tightening torque: 4.7 Nm (42 lbf-in) For further information, refer to the respective detail drawing in *Mechanical and Electrical Data*, page 25.

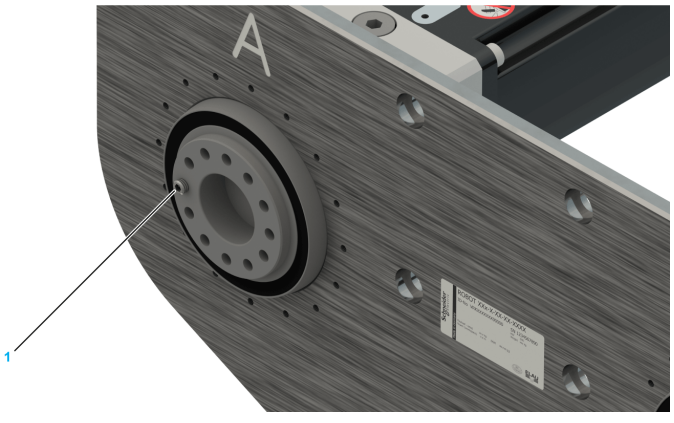
NOTICE

COLLISION OF COMPONENTS

Calibrate the robot mechanics after the replacement of an upper arm, a motor, or a gearbox.

Failure to follow these instructions can result in equipment damage.

Cabling the Motor and the Gearbox

Step	Action
1	Attach the ground strap to the motor. Tightening torque: 2.9 Nm (25.7 lbf-in) For further information about motor assembly, observe the respective operating instructions of the motors: • VRKT•M: *MH3 Servo motor Motor Manual* • VRKT•L: *Lexium 62 ILM Hardware Guide*
2	Attach the motor supply cables and lock them in position.
3	When using a new gearbox: Mount the threaded pin (1) as otherwise it may not be possible to mount the upper arm. **NOTE:** Verify that the threaded pin protrudes approximately 3 mm (0.118 in)  For further information, refer to the respective detail drawing in *Mechanical and Electrical Data*, page 25.
4	Mount the upper arm as described in *Replacing the Upper Arms*, page 97.

Step	Action
5	Calibrate the robot mechanics, page 103.
6	Mount the lower arms with parallel plate to the upper arms and mount the parallel rods. For further information, refer to *Mounting the Lower Arms with Parallel Plate*, page 72 and *Mounting the Rods for Parallel Linkage*, page 75.

NOTICE

COLLISION OF COMPONENTS

Calibrate the robot mechanics after the replacement of an upper arm, a motor, or a gearbox.

Failure to follow these instructions can result in equipment damage.

Calibration

Calibration of the Robot Mechanics

Overview

The robot has been calibrated in the factory and the data/positions of the axes can be read from the motor encoders. A further alignment is not necessary. However, in a service case, calibration via the control panel may become necessary in order to restore the intended operation.

Carry Out the Calibration

Carry out the calibration in the following cases:

- Following the replacement of a component (motor, gearbox, upper arm).
- Following deletion or overwriting of the calibration data.

Calibrating the robot mechanics must be carried out by Schneider Electric personnel or qualified personnel only, as this requires an expert level of knowledge of the PacDrive System.

For this purpose, the `SchneiderElectricRobotics` library contains an interface that has the necessary modes and parameters.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Calibrating the robot mechanics must be carried out by qualified personnel only.
- Conduct the calibration procedures exactly in the manner and in the order described in the present documentation.
- Use the `SchneiderElectricRobotics` library in conjunction with the calibration of robot mechanics.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Calibrating the Main Axes

Procedure Overview

Perform the following procedures to cable the robot:

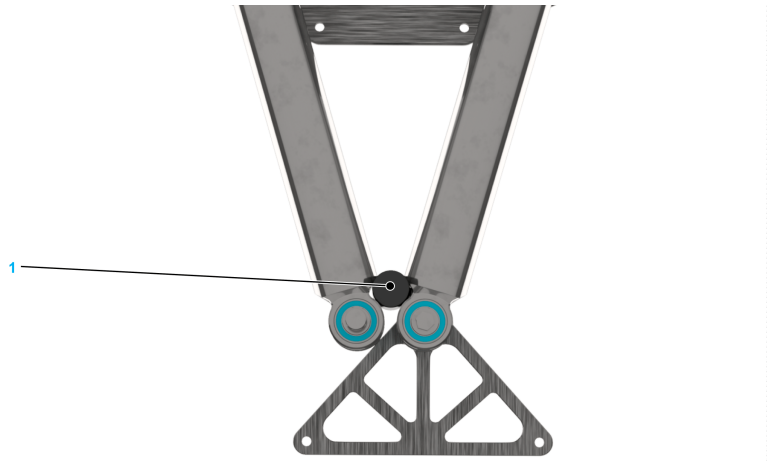
- Preparing the Robot Mechanics for a Calibration Movement, page 104

- Calibrating the Main Axes, page 104

Preparing the Robot Mechanics for a Calibration Movement

Step	Action
1	Remove the parallel rods and the lower arms with parallel plate. For further information, refer to *Replacing the Parallel Rods*, page 96 and *Replacing the Lower Arms*, page 92.
2	Mount the calibration tool to one of the robot upper arms.
3	Release the brakes.

Calibrating the Main Axes

Step	Action
1	Manually move both upper arms to the calibration position so that both arms touch the calibration tool (1). 
2	Close the brakes.
3	Calibrate the main axes. For further information, *SchneiderElectricRobotics Library Guide*, Chapter *Using SchneiderElectricRobotics, TSeries*.
4	Move upper arms to a convenient position for lower arm mounting or use the calibration mode `MoveToMountPosition` of `SchneiderElectricRobotics` library.
5	Remove the calibration tool.
6	Mount the lower arms with parallel plate to the upper arms and mount the parallel rods. For further information, refer to *Mounting the Lower Arms with Parallel Plate*, page 72 and *Mounting the Rods for Parallel Linkage*, page 75.

Replacement Equipment and Accessories

Replacement Equipment Inventory

Overview

Keeping a stock of important components helps ensure the availability of your machine. Only exchange devices with identical types to help ensure compatibility.

Indicate the following information on the replacement equipment order, which can be found on the logistic type plate, page 23:

Parameter	Example value	Position on type plate
Item name	Robot T5m-F-NC-35-1500	First line
Item reference (type code)	VRKT5M0FNC00000	ID-No
Hardware revision	S00	HW

Replacement Equipment Stock for Lexium VRKT1, VRKT2, VRKT3, VRKT5 Robots

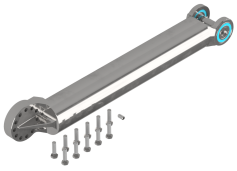
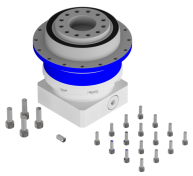
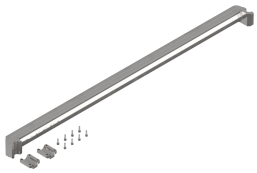
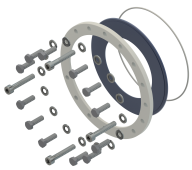
When using the Lexium VRKT1, VRKT2, VRKT3, VRKT5 robots in a production environment, consider keeping the following replacement equipment packages in stock:

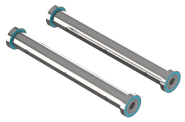
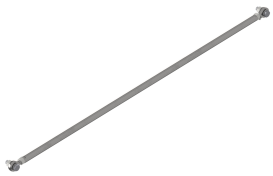
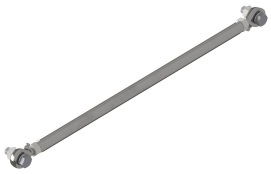
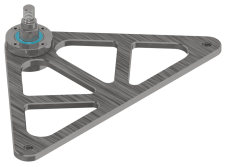
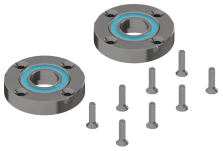
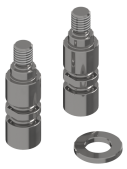
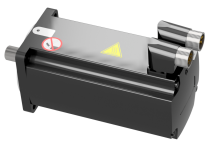
Item reference	Item name	Quantity*			
		VRKT1	VRKT2	VRKT3	VRKT5
VRKT1YYYYY00002	Upper arm with bearings	(1)**	0	0	0
VRKT2YYYYY00002		0	(1)**	0	0
VRKT3YYYYY00002		0	0	(1)**	0
VRKT5YYYYY00002		0	0	0	(1)**
VRKT1YYYYY00003	Gearbox main axis	(1)**	0	0	0
VRKTXYYYY-Y00003		0	(1)**	(1)**	(1)**
VRKT1YYYYY00004	Lower arm pair	(1)**	0	0	0
VRKT2YYYYY00004		0	(1)**	0	0
VRKT3YYYYY00004		0	0	(1)**	0
VRKT5YYYYY00004		0	0	0	(1)**
VRKTXYYYY-Y00006	Shaft parallel plate with bearings	1 (2)**	1 (2)**	1 (2)**	1 (2)**
VRKT1YYYYY00007	Parallel linkage rod long	(1)**	0	0	0
VRKT2YYYYY00007		0	(1)**	0	0
VRKT3YYYYY00007		0	0	(1)**	0
VRKT5YYYYY00007		0	0	0	(1)**
VRKT1YYYYY00008	Parallel linkage rod short	(1)**	0	0	0
VRKT2YYYYY00008		0	(1)**	0	0
VRKT3YYYYY00008		0	0	(1)**	0
VRKT5YYYYY00008		0	0	0	(1)**
VRKT1YYYYY00009	Lever parallel linkage	(1)**	0	0	0
VRKTXYYYY-Y00009		0	(1)**	(1)**	(1)**

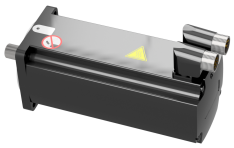
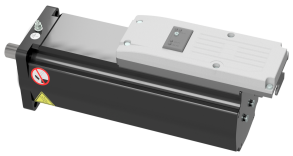
Item reference	Item name	Quantity*			
		VRKT1	VRKT2	VRKT3	VRKT5
VRKTXYYYY-Y00010	Bearing lever parallel linkage	1	1	1	1
* When using more than one robot, increase the amount accordingly. ** Only if there are increased requirements on the availability of the machine.					

Replacement Equipment of the Lexium T Robots

Replacement Equipment

Item description and content	Representation	Item reference	To be used for
Calibration tool: • 1x calibration tool		VRKTXYYYYY00001	All Lexium T robots
Upper arm with bearings and bolts: • 1x upper arm complete • 1x indexing bolt gearing • 7x screw upper arm in case of VRKT1 • 11x screw upper arm in case of VRKT2, VRKT3, VRKT5		VRKT1YYYYY00002 VRKT2YYYYY00002 VRKT3YYYYY00002 VRKT5YYYYY00002	VRKT1•••NC VRKT2•••NC VRKT3•••NC VRKT5•••NC
Main gearbox with fasteners and indexing bolt: • 1x gearbox main axis • 16x screw gearbox/mounting plate • 4x screw motor/gearbox • 1x indexing bolt gearbox		VRKT1YYYYY00003 VRKTXYYYYY00003	VRKT1•••NC VRKT2•••NC VRKT3•••NC VRKT5•••NC
Lower arm with half shells and fasteners: • 1x lower arm complete • 2x half shell • 8x screw half shell • 8x lock washer half shell		VRKT1YYYYY00004 VRKT2YYYYY00004 VRKT3YYYYY00004 VRKT5YYYYY00004	VRKT1•••NC VRKT2•••NC VRKT3•••NC VRKT5•••NC
Protector Cap for the main axes with fasteners. Set for one robot: • 2x Protector Cap • 2x supporting ring • 2x O-ring for Protector Cap • 24x socket head screw for Protector Cap • 8x hexagon screw for Protector Cap • 32x sealing washer		VRKT1YYYYY00030	VRKT1•••NC
Parallel plate with bearings and shafts: • 1x parallel plate complete		VRKT1YYYYY00005 VRKTXYYYYY00005	VRKT1•••NC VRKT2•••NC VRKT3•••NC VRKT5•••NC

Item description and content	Representation	Item reference	To be used for
Two shafts parallel plate with bearings: • 2x shaft complete with mounted bearings		VRKTXYYYYY00006	All Lexium T robots
Parallel linkage rod long with fasteners: • 1x linkage rod complete		VRKT1YYYYY00007	VRKT1•••NC
		VRKT2YYYYY00007	VRKT2•••NC
		VRKT3YYYYY00007	VRKT3•••NC
		VRKT5YYYYY00007	VRKT5•••NC
Parallel linkage rod short with fasteners: • 1x linkage rod complete		VRKT1YYYYY00008	VRKT1•••NC
		VRKT2YYYYY00008	VRKT2•••NC
		VRKT3YYYYY00008	VRKT3•••NC
		VRKT5YYYYY00008	VRKT5•••NC
Lever parallel linkage with bearings: • 1x lever with shaft and bearings		VRKT1YYYYY00009	VRKT1•••NC
		VRKTXYYYYY00009	VRKT2•••NC VRKT3•••NC VRKT5•••NC
Bearing lever parallel linkage: • 2x shell with mounted bearings • 8x screw for shell		VRKTXYYYYY00010	All Lexium T robots
Set fasteners upper arm: • 7x screw upper arm in case of VRKT1 • 11x screw upper arm in case of VRKT2, VRKT3, VRKT5		VRKT1YYYYY00011	VRKT1•••NC
		VRKTXYYYYY00011	VRKT2•••NC VRKT3•••NC VRKT5•••NC
Set of mounting shafts lower arm: • 2x mounting shaft lower arm • 1x distance ring		VRKTXYYYYY00012	All Lexium T robots
PacDrive motor for main axis, MH3: • 1x motor		MH30703P02F2200	VRKT1•••NC
		MH31002P02F2200	VRKT2M0•NC VRKT3M0•NC VRKT5M0•NC

Item description and content	Representation	Item reference	To be used for
PacDrive motor for main axis, MH3: • 1x motor		MH31003P02F2200	VRKT2M1•NC VRKT3M1•NC VRKT5M1•NC
PacDrive motor for main axis, Lexium 62 ILM: • 1x motor		ILM1003P02F0000	VRKT2L••NC VRKT3L••NC VRKT5L••NC

Troubleshooting

Troubleshooting

Overview

Malfunction	Probable cause	Solution
Trouble with components.	End of component life cycle.	Note the maintenance plan, page 85.
Rattling noise.	Screw joints came loose.	Verify and tighten the screw joints if necessary.
Oil beads up at new gearbox.	Initial oozing of the new gearbox.	Clean the gearbox dry, page 89.
Grease at new ball bearing.	Initial oozing of the new bearings.	Clean the ball bearing dry, page 89.
Extensive position deviation after motor replacement.	Robot is not calibrated.	Calibrate the robot, page 103.
	Incorrect motor replacement.	Mount the motor correctly, page 99.

Appendices

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Further Information About the Manufacturer

What's in This Chapter

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Product Training Courses 112

Contact Addresses

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97828 Marktheidenfeld, Germany

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Fax: +49 (0) 9391 / 606 4000

Internet: www.se.com

Additional Contact Information

Single Point of Contact for Customers: +49 (0) 211 / 7374 8008

See the homepage for additional contact addresses: www.se.com

Product Training Courses

Product Training Courses

Schneider Electric offers a number of product training courses.

The Schneider Electric training instructors will help you take advantage of the extensive possibilities offered by the system.

See the website (www.se.com) for further information and the seminar schedule.

Disposal

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Disposal

Information on the Disposal of Schneider Electric Products

The robot is delivered on a recyclable ISO plastic pallet. Further packaging comprises cartons and films.

NOTE: The components consist of different materials, which can be reused and must be disposed of separately. Do not return the packaging to the manufacturer.

Dispose of the packaging in accordance with the relevant local, regional or national regulations.

Dispose of the packaging at the disposal sites provided for this purpose.

Dispose of robot in accordance with the applicable local, regional or national regulations.

NOTE: The gearbox units contain lubricants whose disposal may be subject to local, regional, or national regulations apart from the packaging.

Declaration of Incorporation

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Declaration of Incorporation

Overview

Declaration of Incorporation

According to EC directive 2006/42/EC on machinery (Annex II B)
Document number / Month.Year: RBA2016001.02 / 08.2021
- Original Language -

We: Schneider Electric Automation GmbH
Subsidiary of Schneider Electric SE (FR 92500 Rueil-Malmaison)

Schneiderplatz 1
97828 Marktheidenfeld
Germany

herewith declare, that the partly completed machinery described below:

Trademark:	Schneider Electric
Product, Type, Function:	Robot
Models:	T-Series
Serial Number:	YYZZXXXXXX (YY: Year+10, e.g. 26 = 2016; ZZ: Supplier Code: XXXXXX = cont. number)

with the following references

Reference	Description
VRKT1M****00***	T1 with MH3 motor
VRKT1WM****00***	T1 without motors
VRKT2M****00***	T2 with MH3 motor
VRKT2L****00***	T2 with ILM motor
VRKT2WM***00***	T2 without motors
VRKT3M****00***	T3 with MH3 motor
VRKT3L****00**	T3 with ILM motor
VRKT3WM***00***	T3 without motors
VRKT5M****00***	T5 with MH3 motor
VRKT5L****00***	T5 with ILM motor
VRKT5WM***00***	T5 without motors

* are any letters or numbers not affecting the conformity of the product

is complying with all essential requirements of the Machinery Directive 2006/42/EC, as far as the scope of delivery allows. Additional we declare that the relevant technical documentation is compiled in accordance with part B of Annex VII.

Directive	Fulfilled Requirements	Harmonized Standard
DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on machinery, and amending Directive 95/16/EC	1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, 1.7.2	**EN ISO 10218-1:2011** Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots

We commit to transmit, in response to a reasoned request by the market surveillance authorities, relevant documents on the partly completed machinery by our documentation department. The method of transmission shall be electronic.

Name and address of the person authorised to compile the technical documentation:
Bernhard Kreitler, Schneider Electric Automation GmbH, Breslauer Straße 7, 77933 Lahr/Schwarzwald – Germany

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of Directive 2006/42/EC on Machinery, where appropriate, and until the EC Declaration of Conformity according to Annex II A is issued.

Schneider Electric Automation GmbH
Schneiderplatz 1
97828 Marktheidenfeld
Telefon: 09391 606-0

Issued at: Marktheidenfeld - Germany, 11th August 2021

i.A. Michael Schweizer
Machine Solutions - Manager Product Compliance

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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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