Lexium™ Cobot

Hardware Guide

Original instructions

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www.se.com

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 Lexium Cobot safely and properly.

Follow the instructions within this manual to help:

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

Validity Note

This document has been updated for the release of EcoStruxure™ Cobot Expert V1.7.

The characteristics that are described in the present document, as well as those described in the documents included in the Related Documents section below, can be found 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/.

Related Documents

Title of Documentation	Reference Number
EcoStruxure™ Cobot Expert User Guide	EIO0000004780 (EN)
Cybersecurity Guidelines for EcoStruxure Machine Expert, Modicon and PacDrive Controllers and Associated Equipment, User Guide	EIO0000004242 (EN)
Cybersecurity Best Practices	CS-Best-Practices-2019-340 (EN)

Trademarks

QR Code is a registered trademark of DENSO WAVE INCORPORATED in Japan and other countries.

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.
- After switching off the Lexium Cobot make sure to maintain a waiting time of at least 10 seconds for discharge of the DC bus.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.
- Operate electrical components only with a connected protective ground (earth) cable.
- Verify the secure connection of the protective ground (earth) cable to the electrical devices so that connection complies with the wiring 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.
- Ensure that the power cables are correctly connected and connectors are locked in place during the operation time of the system.

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.
- Apply all measures from the hazard and risk analysis before putting the system in service.

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

⚠WARNING

LOSS OF CONTROL

- Perform a Failure Mode and Effects Analysis (FMEA), or equivalent risk analysis, of your application, and apply preventive and detective controls before implementation.
- Provide a fallback state for undesired control events or sequences.
- Provide separate or redundant control paths wherever required.
- Supply appropriate parameters, particularly for limits.
- Review the implications of transmission delays and take actions to mitigate them.
- Review the implications of communication link interruptions and take actions to mitigate them.
- Provide independent paths for control functions (for example, emergency stop, over-limit conditions, and error conditions) according to your risk assessment, and applicable codes and regulations.
- Apply local accident prevention and safety regulations and guidelines.[1]
- Test each implementation of a system for proper operation before placing it 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.

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.

Standard	Description
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.
EN ISO 10218-1:2011	Robots and robotic devices- Safety requirements for industrial robots - Part 1: Robots
EN ISO 10218-2:2011	Robots and robotic devices- Safety requirements for industrial robots - Part 2: Robot systems and integration
ISO/TS 15066:2016-02	Robots and robotic devices - Collaborative robots
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive
2014/53/EU	Radio Emission Directive
IEC 62443	Industrial communication networks - Network and system security

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.

Figures

Unless otherwise stated, the different types and variants of the Lexium Cobot are represented in the figures by the type LXMRL03••000.

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 values in parentheses are rounded and are for reference only.

Hazard Information

What's in This Chapter

Proper Use

Overview

This section contains information regarding the operation of the Lexium Cobot. Qualified personnel, page 14, working with the Lexium Cobot, must read and observe this information.

Installation and Intended Use

The Lexium Cobot is intended to be integrated into a manufacturing line and/or assembled with other components to build up a machine or process in an industrial environment for civilian end use cases. The Lexium Cobot is either an open type Lexium Cobot that is intended to be installed into an enclosure to provide access protection, or a collaborative operation product where a purposely designed Lexium Cobot system and an operator work within a collaborative workspace.

The Lexium Cobot is intended for usage in the following cases:

- Loading and unloading
- Packaging
- Case erecting
- Picking and placing
- Palletizing
- Assembling
- Inspecting
- Machine tending
- Material working
- Gluing and Bonding
- Polishing
- Soldering

The Lexium Cobot is equipped with safety-related functions, page 78, which are purposely designed for collaborative operation, when the Lexium Cobot Arm operates without fences and/or together with an operator.

In the context of Lexium Cobot, the following terms apply:

- Coexistence:

  Operators and robots work simultaneously or with a time lag in close proximity but have separate workspaces and do not work towards a common goal. There is no direct contact between operators and robots.

- Cooperation:

  Operators and robots work at different times in the same workspace to achieve a common goal. There is no direct interaction between operators and robots.

- Collaboration:

  Operators and robots work simultaneously in the same workspace to achieve a common goal, such as the assembly of a product. There is direct interaction between the operator and the robot.

Collaborative operation is only intended for non-hazardous applications, where the complete application, including tool, work piece, obstacles and other machines is without any significant hazards according to the risk assessment of the specific application.

⚠WARNING

PERSONAL INJURY

Do not use the Lexium Cobot in a collaborative setting if the application could potentially cause injuries according to your risk analysis.

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

Any other use is not an intended use.

Provide for Protective Measures

Before installing the Lexium Cobot, 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 Lexium Cobot integration into the machine such as (non exhaustive list):

- Directive 2006/42/EC on machinery
- Directive EMC 2014/30/EU
- Standard ISO 10218-1 Robots and Robotic devices - Safety requirements for industrial Robots - Part 1: Robots
- Standard ISO 10218-2 Robots and Robotic devices - Safety requirements for industrial Robots - Part 2: Robot systems and integration
- Standard ISO 13849-1 Safety of machinery - Safety related parts of control systems - Part 1: General Principles for Design
- Standard ISO/TS 15066 Robots and Robotic devices - Collaborative Robots
- Standard ISO 13857 Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs
- Standard ISO 14120 Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards
- Standard EN ISO 13854 Safety of machinery - Minimum gaps to avoid crushing of parts of the human body
- Standard ISO 13855 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 NFPA 70 National Electric Code
- Standard UL 1740 Standard for Robots and Robotic Equipment Equipment
- Standard UL 2011 Standard for Factory Automation Equipment

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Use appropriate protective devices (functional safety devices) in compliance with local and national standards.
- Ensure that a risk assessment is conducted and respected according to EN/ISO 12100 during the design of your machine.
- Apply all measures from the hazard and risk analysis before putting the system in operation for the first time.

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

If circumstances arise that affect the safety or cause changes to the operating behavior of the Lexium Cobot, then immediately shut down the Lexium Cobot 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 Lexium Cobot in the manner intended and described in this documentation, and other documentation concerning any other associated equipment.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software, firmware and hardware components approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.
- Validate and test your system every time you have applied safety-related or non-safety-related changes to your application program or modified the physical hardware configuration.

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

Misuse

The Lexium Cobot 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
- Floating systems
- Medical, life critical or life support systems
- Domestic appliances
- Underground
- Highly saline environments (refer to *Technical Data*, page 32 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

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 process in which the Lexium Cobot is installed is in accordance to the applicable local regulations and standards.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Only use the components in accordance with the installation conditions described in this documentation and other supporting documentation and standards.

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

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 Lexium Cobot control system, its installation and operation, as well as the construction of the machine/process 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 Lexium Cobot 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.
- After switching off the Lexium Cobot make sure to maintain a waiting time of at least 10 seconds for discharge of the DC bus.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.
- Operate electrical components only with a connected protective ground (earth) cable.
- Verify the secure connection of the protective ground (earth) cable to the electrical devices so that connection complies with the wiring 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.
- Ensure that the power cables are correctly connected and connectors are locked in place during the operation time of the system.

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

NOTE: The following standardized "dangerous voltage" alert symbol is attached to the Lexium Cobot Arm and the Lexium Cobot Controller.

Emergency Stop

The Lexium Cobot is equipped with internal holding brakes on every joint. The Lexium Cobot is not equipped with other external brakes. An emergency stop switch to engage the internal holding brakes of the Lexium Cobot Arm is provided by the Control Stick. In case the Control Stick is not available to the operator of the Lexium Cobot, ensure that an external emergency stop is connected and operational. For more information of connecting an external emergency stop switch, refer to Emergency Stop Safety Functions, page 81.

⚠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 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.

Assembly and Handling

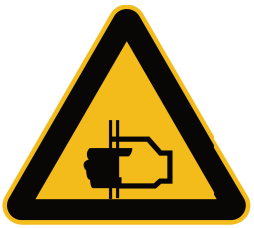
⚠WARNING

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.

NOTE: The following hand pinching alert symbol is attached to the front door of the Lexium Cobot Controller.



Installation

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Ensure that the Lexium Cobot Arm and the end-effector are properly attached to one another.
- Set the correct installation settings for the Lexium Cobot Arm installation position, the payload mounted on the Tool Center Point (TCP), the TCP offset and the functional safety settings.

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 end-effector, and shifts in the center of gravity of the moving parts contribute to the total energy of the forces generated.

Each joint of the Lexium Cobot Arm has an internal holding brake. In case of power loss, the brake engages automatically to prevent the Lexium Cobot Arm from falling down.

Depending on the functional description of the Lexium Cobot operation, dedicated adjustments can be made by the software to be in accordance with the protection goals.

The functional 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

- Define the clearance distance to the collaboration zone of operation of the Lexium Cobot Arm to be within the mechanical limits such that the operational staff do not have access to, nor can be enclosed between, the Lexium Cobot Arm user-defined collaboration zone and the mechanical limits of operation.
- Ensure that movement of the Lexium Cobot Arm is in accordance to the user-defined limits as soon as a person enters the collaboration zone of operation.
- All barriers, protective doors, contact mats, light barriers, visual protection system, and other protective equipment must be connected, configured correctly and enabled whenever the robot mechanics are under power.
- The Lexium Cobot Arm must always be considered active even though the Lexium Cobot Arm has reached an intermediate stop position waiting for a run command.

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 Assessment, page 65.

⚠WARNING

INAPPROPRIATE SAFETY FUNCTIONS

Ensure each safety function is checked by parameters and procedure before putting the system in operation for the first time.

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

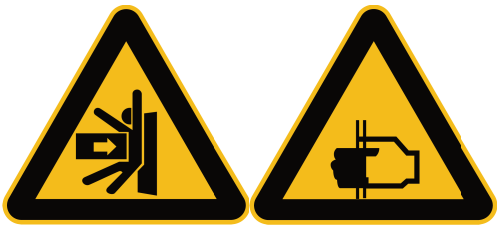
NOTICE

INSUFFICIENT WORKING SPACE

Make sure the Lexium Cobot Arm has sufficient space to operate freely.

Failure to follow these instructions can result in equipment damage.

NOTE: The following impact hazard and hand pinching alert symbols are attached to Lexium Cobot Arm.



Heat Dissipation

The Lexium Cobot surface and the housing of the Lexium Cobot Controller are parts of the heat dissipation concept of the system. For this reason, the surfaces and the inlet/outlet grill must be kept clean and free of any coating or paint.

NOTICE

INOPERABLE EQUIPMENT

- Keep the surface and housing clean.
- Do not apply coating or painting to the surface and housing nor anything that would affect the heat dissipation properties of the Lexium Cobot Arm and the Lexium Cobot Controller.
- Do not cover the inlet and outlet grill of the Lexium Cobot Controller.

Failure to follow these instructions can result in equipment damage.

Hazardous Movements

There can be different sources of hazardous movements:

- No or incorrect calibration of the Lexium Cobot
- Wiring or cabling errors
- Errors in the application program
- Component errors
- Error in the measured value and signal transmitter
- Incorrect installation settings (for example, Lexium Cobot mounting angle, weight in TCP, TCP offset, safety-related configuration)
- Combination of the Lexium Cobot with other equipment or integration into a machine or process

NOTE: Provide for personal safety by primary equipment monitoring or measures. Do not rely only on the internal monitoring of the Lexium Cobot system. 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 outside of the collaboration zone of operation with, for example, protective fencing, mesh guards, protective coverings, light barriers or visual protection systems.
- Dimension the protective devices properly and do not remove or modify them.
- Connect safety-related devices only to the dedicated safety-related inputs and outputs of the system.
- Do not make any modifications that can degrade, incapacitate, or in any way invalidate protection devices.
- Ensure that movement of the Lexium Cobot is in accordance to the user-defined limits as soon as a person enters the collaboration 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.
- Validate the collision protection settings before start-up and during maintenance periods.
- Prevent unintentional start-up by disconnecting the power connection of the Lexium Cobot system using the emergency stop circuit or using an appropriate lock-out tag-out sequence.
- Ensure to load the correct installation file along with the program.
- 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.

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

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Carefully install the wiring in accordance with EMC standards.
- Do not operate the Lexium Cobot with undetermined settings and data.
- Perform comprehensive commissioning tests that include verification of configuration settings and data that determine position and movement.
- Do not operate the Lexium Cobot by a higher payload than it is rated.

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.
- Ensure that operators are clearly warned of any potentially excessive noise emissions.

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

NOTE: Attach an alert symbol, such as depicted here, where it can easily be seen in the area where the Lexium Cobot is installed.

Emissions

Lubricant emissions on the Lexium Cobot Arm may be an indication of a damaged joint.

NOTICE

INOPERABLE EQUIPMENT INDICATED BY LUBRICANT EMISSIONS

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

Failure to follow these instructions can result in equipment damage.

Hanging Loads

The Lexium Cobot Arm is capable of suspending heavy loads.

⚠WARNING

FALLING LOADS

- Do not stand under hanging loads.
- Ensure that the Lexium Cobot Arm is properly bolted on the mounting surface.
- Ensure that the permissible payload is properly bolted on the Lexium Cobot Arm tool flange.

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 (end-effector 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 EQUIPMENT OPERATION

- Do not drill into or modify the Lexium Cobot Arm and joints.
- Do not drill into or modify the Lexium Cobot Controller.
- Do not modify the cable set.

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 an enclosure (see UL 1740).

NOTE: Take appropriate safety-related measures concerning the specific use before operating the Lexium Cobot Arm.

⚠WARNING

SAGGING OF THE LEXIUM COBOT ARM

- Ensure that the release of the internal holding brakes poses no subsequent risks in the zone of operation.
- Support the mechanic of the Lexium Cobot before releasing the holding brakes on joint 1, joint 2, and joint 3.

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

If you have to move the Lexium Cobot Arm manually, there are two options possible:

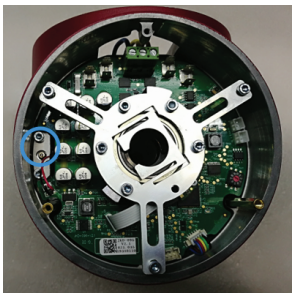
- Manual forcing of the mechanics (only available for joint 1, joint 2, and joint 3)
- Manual release of the holding brakes

NOTE: Moving the Lexium Cobot Arm manually is intended only in emergency cases.

Option 1: Manual forcing of the mechanics (only available for joint 1, joint 2, and joint 3)

Step	Action
1	Put the robot into a torque-free state.
2	Manually hold the robot in position.
3	Manually move the robot. **NOTE:** The brakes on each joint are equipped by a friction clutch. A greater force (> 300 Nm (2655.23 lbf-in)) is necessary because the friction clutch may pose resistance to movement.

Option 2: Manual release of the holding brakes

Step	Action
1	Disable and close the Lexium Cobot Controller.
2	Remove the lid from the joint.
3	Press the core of the electromagnet. 
4	Move the single joint to the target position.

For detailed information, refer to the technical specification of the Mechanical and Electrical Data, page 33.

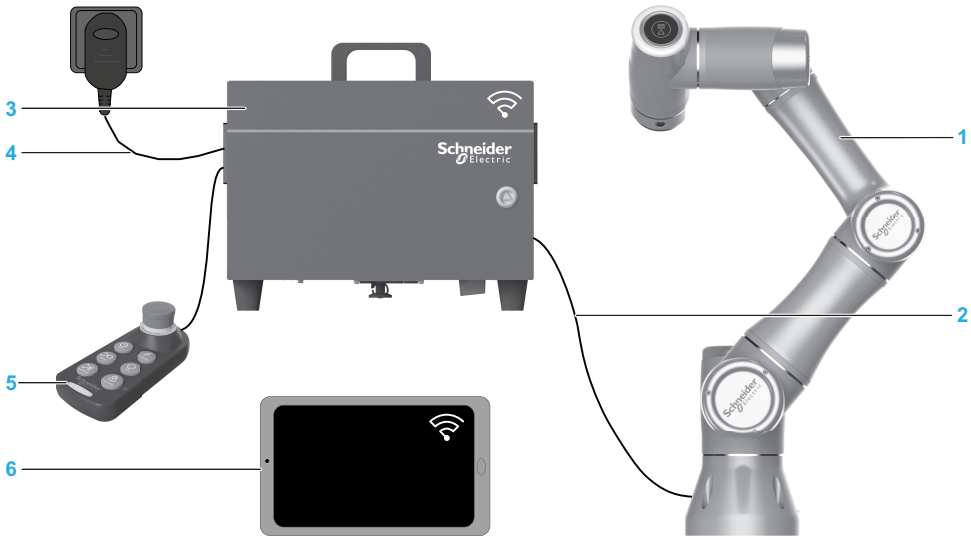
System Overview

What's in This Chapter

System Architecture

Overview

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



1 Lexium Cobot Arm

2 Lexium Cobot Arm connection cable

3 Lexium Cobot Controller

4 Lexium Cobot Controller 220 V power supply cable

5 Lexium Cobot Control Stick

6 EcoStruxure Cobot Expert on Android or Windows device (refer to WiFi Connection Considerations, page 23)

NOTE: To help keep your Schneider Electric products protected, refer to the *Cybersecurity Best Practices* and *Cybersecurity Guidelines* provided on the Schneider Electric website.

WiFi Connection Considerations

EcoStruxure Cobot Expert can optionally be used through a WiFi connection between Android or Windows devices and the Lexium Cobot Controller. The WiFi between these devices uses, and can radiate, radio frequency energy.

Since the frequencies used by 802.11a, 802.11b, 802.11g, 802.11n, and 802.16e wireless LAN devices may not yet be harmonized in all countries, 802.11a, 802.11b, 802.11g, 802.11n, and 802.16e products are designed for use only in specific countries and are not allowed to be operated in countries other than those of designated use.

As a user of these products, you are responsible for ensuring that the products are used only in the countries for which they were intended and for verifying that they are configured with the correct selection of frequency and channel for the country of use.

NOTICE
RADIO FREQUENCY INTERFERENCE Do not operate the EcoStruxure Cobot Expert with the WiFi wireless LAN connection in non-designated countries. **Failure to follow these instructions can result in equipment damage.**

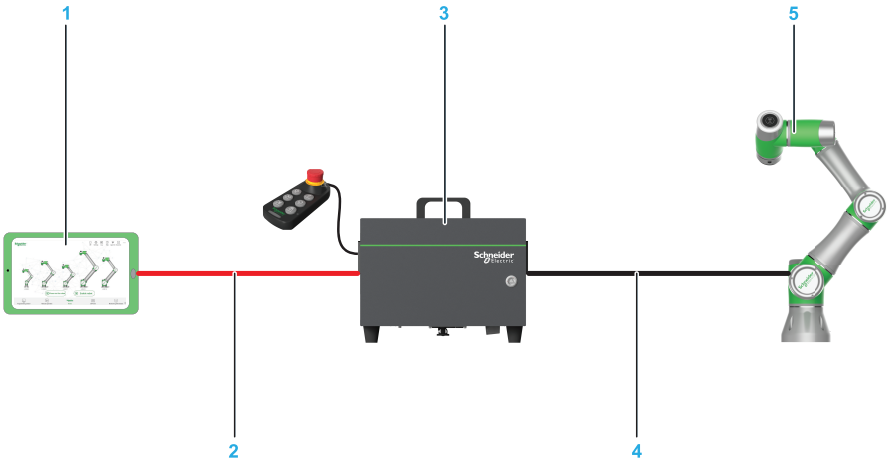
Designated countries are those for which the Lexium Cobot has been approved by the local administrative authority and to which the certification of that authority has been obtained. To determine the countries for which certification has been obtained, consult the product page of the Lexium Cobot on www.se.com.

In addition, some countries recognize the certification authority of other countries. To determine if this is your case, contact the local authorities in the country of interest.

Product Overview

System Requirements

The following figure presents an example of a system setup for one Lexium Cobot. At a minimum, this is the equipment required to achieve performances described in this guide.



Number	Device name	Device type	Description
1	Operator terminal (not included)	–	Device used to program and set the Lexium Cobot (Android or Windows device). Refer to Operator Terminal, page 26.
2	WiFi connection or direct connection by Ethernet network cable (not included)	–	The operator terminal can be connected by WiFi or using a direct connection by network cable to the Ethernet port of the Lexium Cobot Controller. Refer to WiFi Connection Considerations, page 23, for more information concerning the use of a wireless connection.
3	Lexium Cobot Controller and Control Stick	LXMRL03C1000	The Lexium Cobot Controller provides different kinds of interfaces. A Control Stick is connected for specific operations (for example, teaching, maintenance, commissioning) and provides an emergency stop for the Lexium Cobot system.
4	Connection Cable	included in Lexium Cobot Arm	The length of the connection cable is 6 m (19.7 ft). The cable is pre-mounted on the Lexium Cobot Arm and equipped with a specific connector to interface with the Lexium Cobot Controller.
5	Lexium Cobot Arm	LXMRL03S0000	The Lexium Cobot Arm is intended to achieve designated movements. On the opposite side of the tool flange a ring indicator shows the status of the Lexium Cobot operation and can be used to interact with the Lexium Cobot.

Operator Terminal

The following table presents minimum system requirements for the operator terminal.

NOTE: EcoStruxure Cobot Expert is intended to be used either on Android or Windows devices.

Terminal type	Android device	Windows device
Operating System	Android 8.0	Windows 10 64 bit
Processor	Kirin 659 or Snapdragon 660	Intel Core i3
Storage capacity	32 GB	32 GB
System memory	4 GB	4 GB
Screen size / graphics	8.0 inches	Intel HD Graphics 4000
Network	WiFi standard: 802.11 b/g/n	WiFi standard 802.11 b/g/n or cable bound network card

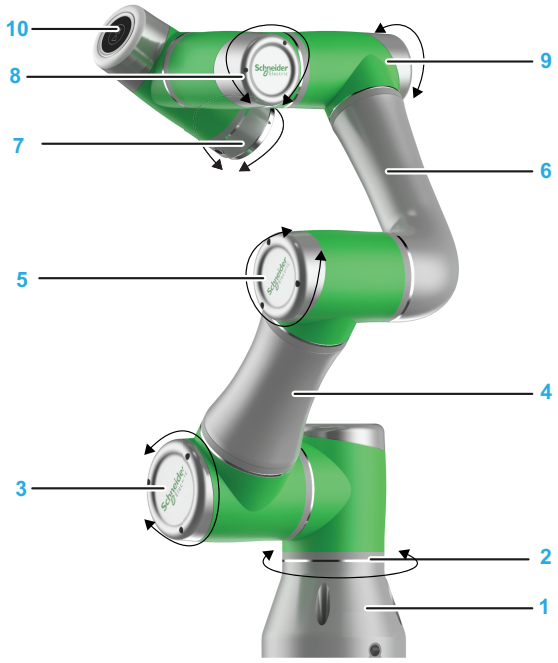
NOTE: Refer to WiFi Connection Considerations, page 23, for more information concerning the use of a wireless connection.

Components Overview

The Lexium Cobot Arm consists of six rotation joints, a lower tube between joint 2 and joint 3 and an upper tube between joint 3 and joint 4. The base is intended to mount the Lexium Cobot Arm to a mounting surface, and the tool flange is intended to mount the customer end-effector.

At the opposite side of the tool flange an illuminated ring indicates the state of the Lexium Cobot Arm. In addition, in total two buttons are located on joint 6 for teaching and dragging the Lexium Cobot Arm. Close to the tool flange, an M8 connector interface can be used to control inputs and outputs on the end-effector.

An I/O interface cable equipped with an 8-pole M8 connector on one end is included with the Lexium Cobot Arm for various applications.



1 Base	**6** Upper tube
2 Joint 1	**7** Joint 6 / tool flange
3 Joint 2	**8** Joint 5
4 Lower tube	**9** Joint 4
5 Joint 3	**10** Illuminated ring

The Lexium Cobot Controller provides:

- Power supply for the Lexium Cobot Arm
- Interface to connect the Control Stick
- Interface to operator terminal either via cable or WiFi connection

  NOTE: Refer to WiFi Connection Considerations, page 23, for more information concerning the use of a wireless connection.
- Interfaces to several inputs and outputs of different kinds

A Control Stick is included in the scope of delivery of the Lexium Cobot Controller, which can be used for various operations. After commissioning is completed, the Control Stick is intended to control the Lexium Cobot Arm.

Characteristics of the Lexium Cobot

The Lexium Cobot provides the following features:

- Rounded-edge design
- High positioning repeatability
- Integrated safety functions
- Collision protection
- Free-drive and teaching
- Intuitive programming
- Integration to EcoStruxure architecture

Functional Safety Features of Lexium Cobot

The Lexium Cobot features the following functions:

- Safety-related monitored stop
- Hand guiding
- Speed and separation monitoring
- Power and force limiting

For detailed information about the functional safety features, refer to the chapter Functional Safety, page 78

Commercial Reference

Example of a type code for the Lexium Cobot Arm:

Character position	1	2	3	4	5	6	7	8	9	10	11	12
Example	L	X	M	R	L	0	3	S	0	0	0	0

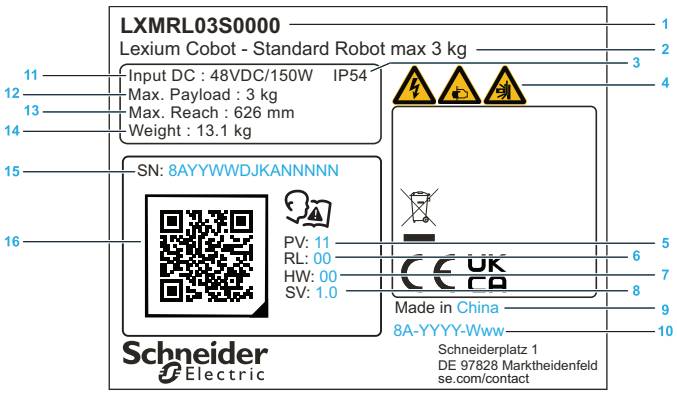
Description of the commercial reference structure with reference to the example stated above:

Character position	Example	Item	Meaning
1…3	LXM	Family	Lexium
4, 5	RL	Robot/product type	Robot Collaborative
6, 7	03	Payload	03 = maximum payload 3 kg
8, 9	S0	Variant	S0 = Standard Robot Collaborative C1 = Lexium Cobot Controller
10...12	000	Miscellaneous	••• = Reserved

If you have questions concerning the commercial reference, contact your local Schneider Electric service representative.

Type Plate

Description of the Lexium Cobot Arm Type Plate



1 Commercial reference*

2 Name

3 Ingress of Protection

4 Warning labels

5 Product version

6 Release version

7 Hardware version

8 Software version

9 Country of origin

10 Date of manufacturing

11 Input power

12 Maximum payload

13 Radius of the working space

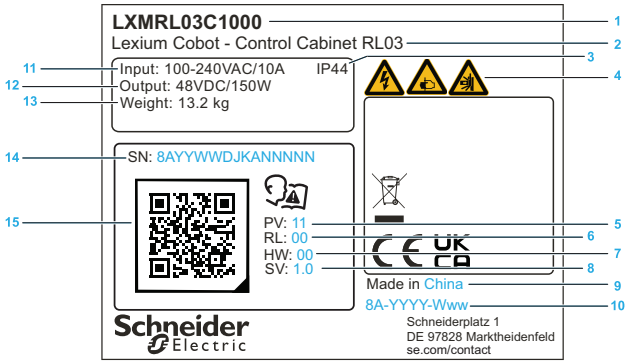
14 Weight of the Lexium Cobot Arm

15 Serial number

16 QR code on commercial reference and serial number

* For detailed information about the meaning of the particular digits, refer to Commercial Reference, page 29.

Description of the Lexium Cobot Controller Type Plate



1 Commercial reference*

2 Name

3 Ingress of Protection

4 Warning labels

5 Product version

6 Release version

7 Hardware version

8 Software version

9 Country of origin

10 Date of manufacturing

11 Input power

12 Output power

13 Weight of the Lexium Cobot Controller

14 Serial number

15 QR code on commercial reference and serial number

* For detailed information about the meaning of the particular digits, refer to Commercial Reference, page 29.

Technical Data

What's in This Chapter

Ambient Conditions

Procedure	Parameter	Unit	Value
Operation	Ambient temperature	°C (°F)	0...50 (32...122)
	Condensation	–	prohibited
	Formation of ice	–	prohibited
	Relative humidity	%	0...90
	Vibration according to IEC 60721–3–3	m/s² (ft/s²)	20 (65.62)
Transport	Ambient temperature	°C (°F)	-10...50 (14...122)(1)
	Condensation	–	prohibited
	Precipitation	–	prohibited
	Formation of ice	–	prohibited
	Other liquid	–	prohibited
	Wetness	–	prohibited
	Relative humidity	%	20...80
Long-term storage in transport packaging	Ambient temperature	°C (°F)	-10...50 (14...122)(1)
	Condensation	–	prohibited
	Precipitation	–	prohibited
	Formation of ice	–	prohibited
	Other liquid	–	prohibited
	Relative humidity	%	20...80
	Maximum storage period	months	12
(1) Limit rapid temperature change to maximum 10 °C per hour.			

For further information about transport and storage conditions, refer to Transport and Storage, page 69.

Mechanical and Electrical Data

Mechanical and Electrical Data of the Lexium Cobot Arm

Category	Parameter		Unit	LXMRL03S000
General data	Maximum payload		kg (lb)	3 (6.6)
	Maximum velocity on the tool flange		m/s (ft/s)	1.5 (4.9)
	Number of axes		–	6
	Position repeatability (ISO 9283)		mm (in)	Position: ± 0.03 (0.0011)
	Programming		–	Graphical drag and drop
	Operator terminal		–	Android or Windows device
Electrical data	Supply voltage by Lexium Cobot Controller		V dc	48
	Tool flange inputs/outputs (TIO) by M8 connector interface		–	Digital inputs: 2 [1)] Digital outputs: 2 [1)] Analog inputs: 2 [1)]
	Tool flange inputs/outputs (TIO) power		V dc	24
	Tool flange inputs/outputs (TIO) size		–	M8 connector
	Minimum bending radius of connector cable from Lexium Cobot Controller to the Lexium Cobot Arm		mm (in)	Fixed installation: 55 (2.17) Movable installation: 88 (3.46)
Mechanical data	Mounting position		-	No pre-defined mounting position
	Pollution degree IEC 60664-1		-	2
	Overvoltage category IEC 60664-1		-	II
	Ingress of protection		-	IP54
	Joint 1	Working range	°	±270
		Working range with restrictions[2)]	°	±360
		Maximum speed	°/s	180
	Joint 2	Working range	°	-85...+265
		Maximum speed	°/s	180
	Joint 3	Working range	°	±175
		Maximum speed	°/s	180
	Joint 4	Working range	°	-85...+265
		Maximum speed	°/s	220
	Joint 5	Working range	°	±270
		Working range with restrictions[2)]	°	±360
		Maximum speed	°/s	220
	Joint 6	Working range	°	±270
		Working range with restrictions[2)]	°	±360
		Maximum speed	°/s	220

Category	Parameter	Unit	LXMRL03S000
Working space	Radius	mm (in)	626 (24.6)
	Base diameter	mm (in)	129 (5.1)
Weight	–	kg (lb)	approximately 13 (28.7)
Noise level	–	dB(A)	< 58
Material	External casing	–	Aluminum alloy, POM, PC, silicone

1) For detailed information on the tool flange input and output characteristics, refer to Electrical Connections of the Lexium Cobot Arm, page 45.

2) Extended working range is possible with restrictions on lifetime. If required, contact your local Schneider Electric service representative.

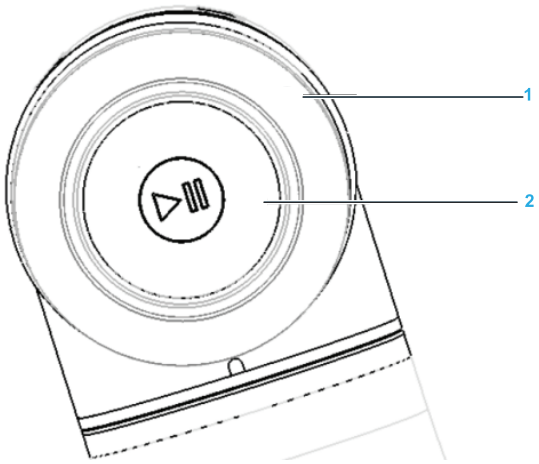
Lexium Cobot Arm Tool Flange Details

Lexium Cobot Arm Tool Flange Opposite Side

On the opposite side of the Lexium Cobot Arm tool flange an illuminated ring and a **play/pause** button are provided.

The **play/pause** button could be either used for hand guiding operation or for stopping or resuming the automatic operation. In manual mode the Lexium Cobot can be hand guided by holding down the **play/pause** button. In automatic mode the Lexium Cobot can be stopped for a pause by pressing the **play/pause** button. Press the **play/pause** button again to return to automatic operation.

The illuminated ring indicates the state of the Lexium Cobot. The following table presents the meaning of the illumination:



1 Illuminated ring

2 Play/pause button

Illumination	Lexium Cobot Arm status
Blue	Power on
Green	Enabled/operating
Red	Detected error
Yellow	Hand-guided mode
Flashing yellow	Pause

⚠WARNING

CRUSHING, SHEARING, CUTTING AND IMPACT INJURY

Ensure that using the **play/pause** button poses no subsequent risks in the zone of operation of the Lexium Cobot Arm.

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

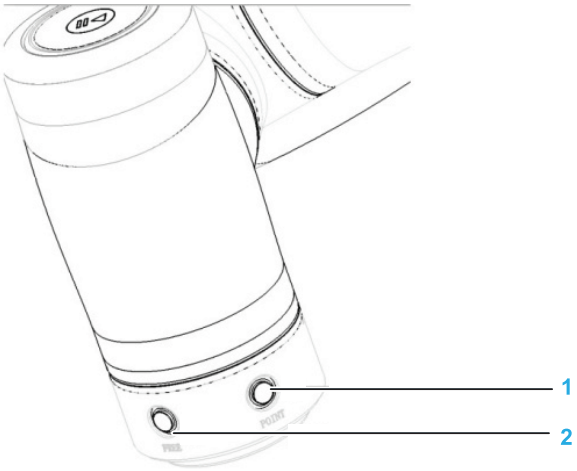
Lexium Cobot Arm Tool Flange Buttons and Interface

Two buttons and an M8 connector interface are located close to the tool flange on joint 6.

The **FREE** button is used for hand guiding. If the button is held down, the Lexium Cobot is in the hand-guided mode. When the button is released, the Lexium Cobot returns to its previous mode of operation.

The **POINT** button can be used to record the positions of the Tool Center Point (TCP). If the button is pressed, the TCP position is stored as a new path point in the EcoStruxure Cobot Expert tab **Programming**.

The M8 connector interface can be used to control inputs and outputs on the end-effector. The inputs and outputs are directly connected to the Lexium Cobot Controller. For further information on electrical connection, refer to the chapter Electrical Connections of the Lexium Cobot Arm, page 45.



1: **POINT** button

2: **FREE** button, engages the hand-guided mode

⚠WARNING

CRUSHING, SHEARING, CUTTING AND IMPACT INJURY

- Ensure that using the **play/pause**, **POINT**, and **FREE** buttons poses no subsequent risks in the zone of operation of the Lexium Cobot Arm.
- Verify that determined settings are properly set (for example, end-effector and TCP settings) for storing the correct new path point.

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

Mechanical and Electrical Data of the Lexium Cobot Controller

Category	Parameter	Unit	LXMRL03C1000
General data	Communication	-	TCP/IP, Modbus TCP, Modbus RTU
	Size (W x H x D)	mm (in)	410 x 308 x 235 (16.14 x 12.13 x 9.25)
Electrical data	I/O ports	-	Digital inputs: 16 [1)]
		-	Digital outputs: 16 [1)]
		-	Analog inputs/outputs: 2 [1)]
	I/O power	V	24
	Power consumption for a typical pick & place cycle with 3 kg (6.6 lb)	kW (hp)	0.15 (0.201)
	Power at 50/60 Hz	V ac	100 ... 240
	Pre-fuse mains power	A	10
Mechanical data	Ingress of protection	-	IP44
Weight	–	kg (lb)	13 (28.7)
Material	External casing	-	Sheet steel
[1)] For detailed information on the Lexium Cobot Controller input and output characteristics, refer to Electrical Connections of the Lexium Cobot Controller, page 49.			

WiFi Function Specification

Parameter	Unit	LXMRL03C1000
Standard	–	802.11 b/g/n
Operating frequency	MHz	2,400...2,483.5
Bandwidth	MHz	20 / 40
RF Output Power Limit	dBm	20 [1)]
[1)] Alternatively: 100 mW (e.i.r.p = equivalent isotropically radiated power)		

Refer to WiFi Connection Considerations, page 23, for more information concerning the use of a wireless connection.

Lexium Cobot Control Stick Details

Overview

After commissioning is completed, the Control Stick is used to control the Lexium Cobot Arm. The Control Stick can be used for various operations, described in the following table.

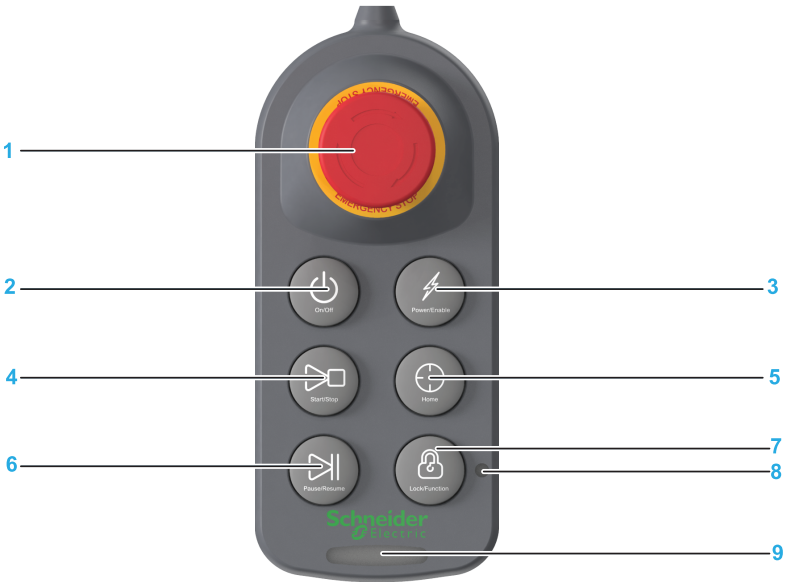
NOTE: After powering on the Lexium Cobot Controller initialize the Control Stick by pressing any button.

⚠WARNING

CRUSHING, SHEARING, CUTTING AND IMPACT INJURY

Ensure that either a hard-wired emergency stop button, or the Control Stick, is located in accordance with the appropriate local standards for emergency stops while the Lexium Cobot Arm is in operation.

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



Number	Icon	Description	Meaning
1	–	**EMERGENCY STOP**	Emergency stop button to engage the internal holding brakes of the Lexium Cobot Arm.
2	⏻	**On/Off**	• To power on the Lexium Cobot Controller, press the **On/Off** button for 1 second. **Result:** The Lexium Cobot Controller confirms powering on by an acoustic signal and is booting up. • To power off the Lexium Cobot Controller, press the **On/Off** button for 3 seconds. **Result:** The Lexium Cobot Controller confirms powering off by a pulsing acoustic signal and turns the Lexium Cobot Controller off.

Number	Icon	Description	Meaning
3		**Power/Enable**	• To power on the Lexium Cobot Arm, press the **Power/Enable** button. **Result:** The indicator light of the Lexium Cobot Arm turns blue. • To power off the Lexium Cobot Arm, first disable the Lexium Cobot Arm (see below), then press the **Power/Enable** button. **Result:** The indicator light of the Lexium Cobot Arm turns off. • To enable the Lexium Cobot Arm, when the Lexium Cobot Arm is powered on, press the **Lock/Function** button and the **Power/Enable** button at the same time. **Result:** The indicator light of the Lexium Cobot Arm turns green. • To disable the Lexium Cobot Arm, when the Lexium Cobot Arm is enabled, press the **Lock/Function** button and the **Power/Enable** button at the same time. **Result:** The indicator light of the Lexium Cobot Arm turns blue.
4		**Start/Stop**	• To start the program: after the program is implemented and loaded during commissioning, press the **Start/Stop** button. **Result:** The program starts after the Lexium Cobot Arm has moved to the initial position of program. • To stop the program: When the loaded program is running, press the **Start/Stop** button. **Result:** The program is stopped according to a category 2 stop.
5		**Home**	To return the Lexium Cobot Arm to the home position: when the Lexium Cobot Arm is enabled, press the **Home** button until the Lexium Cobot Arm has fully returned to the Home position. **Result:** When the Lexium Cobot Arm has returned to the Home position, the lock indicator (**8**) illuminates blue. **NOTE:** If you release the **Home** button prior to the Lexium Cobot Arm assuming the home position, the Lexium Cobot Arm stops according to a category 2 stop, and the lock indicator (**8**) does not illuminate.
6		**Pause/Resume**	• To pause the loaded program: when the Lexium Cobot Arm is in automatic movement, press the **Pause/Resume** button. **Result**: The Lexium Cobot Arm comes to a stop according to a category 2 stop. • To resume the program: when the Lexium Cobot Arm is paused, press the **Pause/Resume** button. **Result**: The program restarts from the point where it was previously paused and takes into account the final position of the Lexium Cobot Arm resulting from the pause command.
7		**Lock/Function**	• To lock the Control Stick, press the **Lock/Function** button for 3 seconds. **Result:** When the Control Stick is locked, the lock indicator (**8**) illuminates orange. In this case, the Control Stick buttons are disabled except for **Lock/Function**, **On/Off** and **EMERGENCY STOP**. The Lexium Cobot Arm can only be controlled by the EcoStruxure Cobot Expert. • To unlock the Control Stick, press the **Lock/Function** button for 3 seconds. **Result:** When the Control Stick is unlocked, the lock indicator (**8**) is off. The Control Stick buttons can be used. The Lexium Cobot Arm can only be controlled by the Control Stick. The EcoStruxure Cobot Expert interface is locked by a gray Control Stick window. • Combined option: **Lock/Function** button is also intended to be used for combined options by pressing it together with the **Power/Enable** button.

Number	Icon	Description	Meaning
8	-	Lock indicator	• Orange illumination indicates that the Control Stick is locked. • No illumination indicates that the Control Stick is unlocked. • Blue illumination indicates the arrival at the Home position.
9	-	Status indicator	• Yellow illumination lights up during starting up and shutting down the Lexium Cobot Controller and when the pause mode is activated. • Blue illumination indicates that the Lexium Cobot Controller has finished starting up. The illumination remains blue when you power on the Lexium Cobot Arm. • Red illumination indicates a detected error. • Green illumination indicates that the Lexium Cobot system is operational and the Lexium Cobot Arm is powered on and enabled. **NOTE:** Right after switching on the system the status indicator runs a short sequence of different colors for a few seconds as an embedded self test of the Lexium Cobot Control stick.

NOTICE

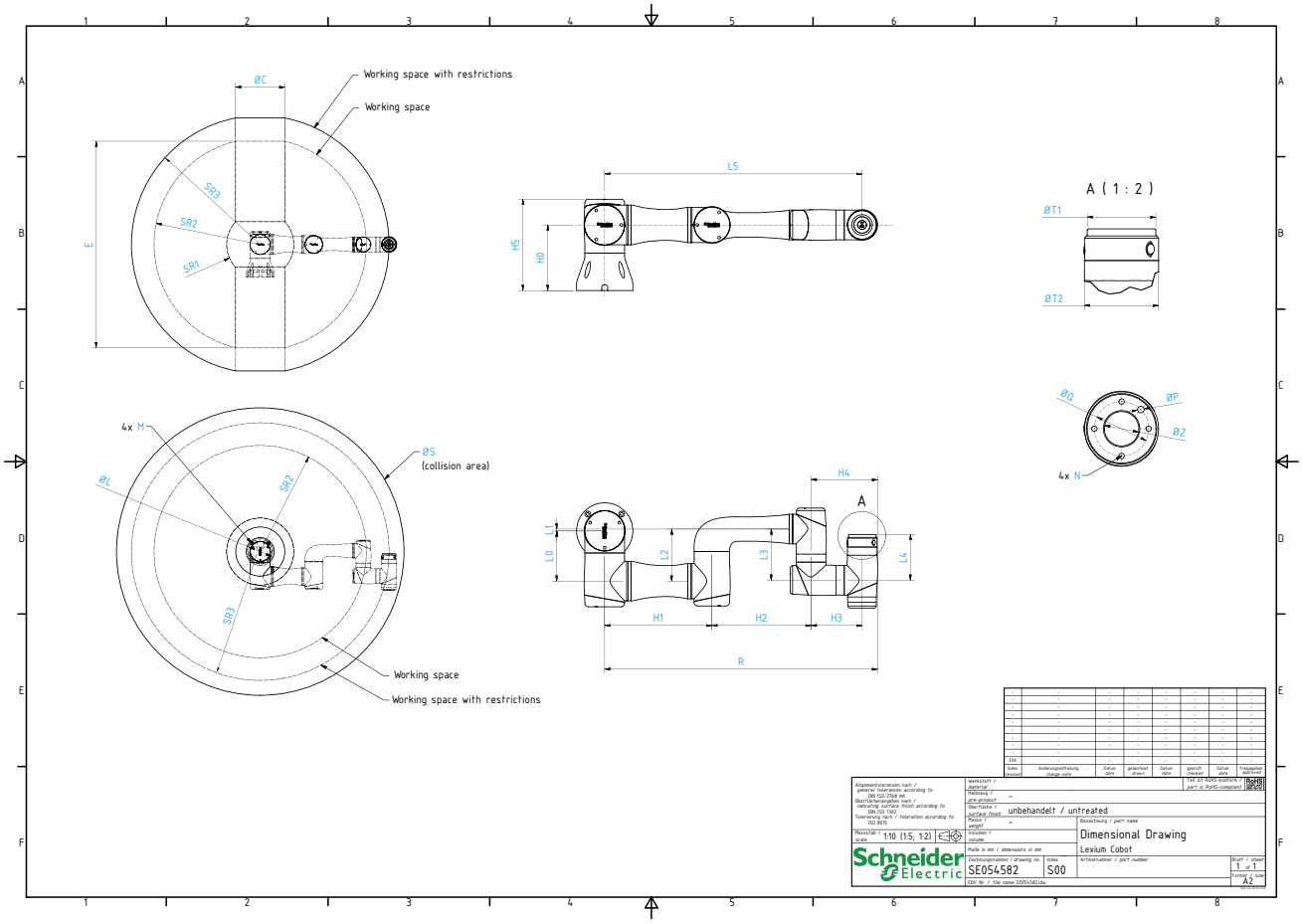
INOPERABLE EQUIPMENT

Do not use the **EMERGENCY STOP** button on the Control Stick for purposes other than stopping the Lexium Cobot Arm in hazardous situations.

Failure to follow these instructions can result in equipment damage.

Dimensional Drawings

Dimensional Drawing of Lexium Cobot Arm



The possible working space of the Lexium Cobot Arm is represented as a flattened sphere. The flattenings exist above and below the Lexium Cobot Arm within a cylinder of 226 mm (8.9 in) diameter around the base (joint 1).

NOTE: Due to the physical combination of the Lexium Cobot Arm by joints and tubes between the joints a slow movement at the FCP (flange center point) might cause fast rotation speeds at the connected joints. Especially, when the FCP is entering or passing the inner cylindrical restricted area (represented in the graphic above), you must consider these specific conditions and respect this in your application.

NOTICE
INOPERABLE EQUIPMENT Align the working space required by the application with the mounting position in such a way that the movements within the above mentioned cylindrical restricted area are avoided. **Failure to follow these instructions can result in equipment damage.**

The Lexium Cobot Arm is able to position the TCP in any desired direction in the working space, without any restriction on translation and rotation of the tool flange. In the extended working space with restrictions, the Lexium Cobot Arm is able to position the TCP, with restriction on rotation of the tool flange.

Dimension	Description	Unit	LXMRL03••000
R	Working space radius: joint 2 ... joint 6 outer ring	mm (in)	626.5 (24.7)
H0	Distance height: base ... joint 2	mm (in)	150.55 (5.93)
H1	Distance height: joint 2 ... joint 3	mm (in)	246 (9.69)
H2	Distance height: joint 3 ... joint 4/5	mm (in)	228 (8.98)
H3	Distance height: joint 4/5 ... joint 6	mm (in)	117.5 (4.63)
L0	Distance length: base ... joint 2	mm (in)	115 (4.53)
L1	Distance length: base ... joint 4	mm (in)	4.5 (0.18)
L2	Distance length: joint 3 ... joint 4	mm (in)	119.5 (4.70)
L3	Distance length: joint 4 ... joint 5	mm (in)	117.5 (4.63)
L4	Distance length: joint 6 ... tool flange	mm (in)	105 (4.13)
L5	Distance length joint 2 ... joint 6 FCP (flange center point)	mm (in)	626 (24.6)
SR1	Working space for P point: Inner sphere radius	mm (in)	154.2 (6.07)
SR2	Working space for P point: Outer sphere radius	mm (in)	487.28 (18.04)
SR3	Working space with restrictions	mm (in)	626 (24.6)
ØC	Restricted area: Inner cylinder diameter	mm (in)	226 (8.90)
H4	Distance height: joint 4/5 ... joint 6 outer ring	mm (in)	152.5 (6.00)
E	Working space height	mm (in)	948 (37.322)
ØQ	Pitch circle diameter	mm (in)	50 (1.97)
ØP	Pin hole	mm (in)	6 + 0.012 / 0 (0.24 + 0.0005 / 0)
	Pin hole depth	mm (in)	10 (0.39)

Dimension	Description	Unit	LXMRL03••000
ØZ	Centering hole	mm (in)	31.5 +0.025 / 0 (1.24 + 0.001 / 0)
	Centering hole depth	mm (in)	6.5 (0.26)
N	Threaded hole	-	M6
	Threaded hole depth	mm (in)	7 0.28
	Tightening torque	Nm (lbf*in)	11 (97)
ØT1	Centering outside	mm (in)	63 0 / - 0.030 (2.48 0 / - 0.001
	Centering outside depth	mm (in)	5.5 (0.22)
ØT2	Tool flange shaft	mm (in)	68 (2.68)
	Tool flange depth	mm (in)	29 (1.14)
ØS	Collision area diameter	mm (in)	1320 (51.97)
ØL	Bolt circle diameter	mm (in)	110 (4.33)
M	Counterbore hole inner	mm (in)	6.6 (0.26)
	Counterbore hole outside	mm (in)	13 (0.51)
	Tightening torque	Nm (lbf*in)	11 (97)
H5	Height Base	mm (in)	210 (8.27)

Dimensional Drawing of the Lexium Cobot Controller

Dimension	Description	Unit	LXMRL03C1000
L	Length	mm (in)	410 (16.14)
H	Height	mm (in)	310 (12.20)
W	Width	mm (in)	295 (11.61)

Electrical Connections

Electrical Connections of the Lexium Cobot Arm

Supply Connection

The supply connection cable is included in the scope of delivery and one terminal side is pre-mounted on the Lexium Cobot Arm, in a usual length of 6 m (19.7 ft). On the other terminal side, the supply connection cable is equipped with a connector to interface with the Lexium Cobot Controller.

End-Effector M8 Connector Interface

The M8 connector interface located at the side of the tool flange is used to control outputs and inputs on the end effector. Besides a DC power supply the following signals are provided by default by the interface:

- Digital inputs: 2
- Digital outputs: 2
- Analog inputs: 2

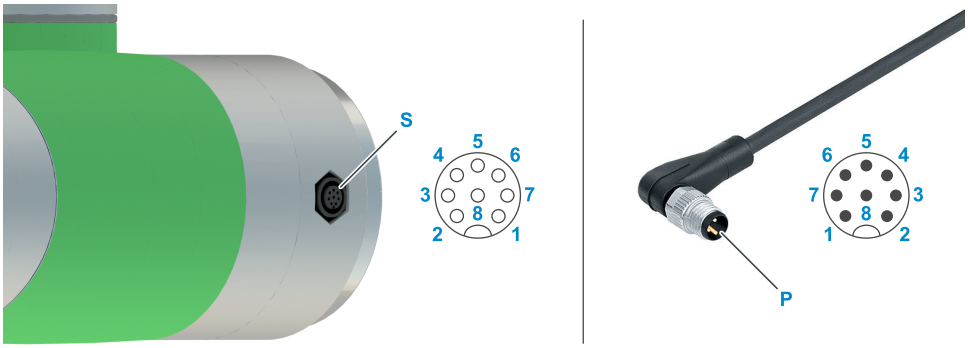
In addition, the analog inputs and the digital outputs can be configured in EcoStruxure Cobot Expert to operate as RS485 network. For details on the configuration of the end-effector interface, refer to the chapter *Terminal IO* in the *EcoStruxure Cobot Expert User Guide*.

Characteristic	**End-Effector interface**
Digital Inputs	
Number of digital inputs	2 inputs (TDI1, TDI2)
Pins on interface	2, 3
Input type	Type 1
Logic type	Source or sink (configurable by application)
Rated input voltage	24 V dc
High signal	7...24 V dc
Low signal	0...4 V dc
Digital Outputs	
Number of digital outputs	2 outputs (TDO1, TDO2)
Pins on interface	4, 5
Output type	Type 1
Logic type	Source or sink (configurable by application), TDO1 and TDO2 can be used together as RS485 channel 1
Rated output voltage	24 V dc
Maximum output current	1.0 A per output **NOTE:** Verify that the total current of the end-effector interface is not exceeded.
Analog Inputs	
Number of analog inputs	2 inputs (TAI1, TAI2)
Pins on interface	6, 7
Input type	Voltage
Input range	0...10 V dc
Logic type	Source, TAI1 and TAI2 can be used together as RS485 channel 2

Characteristic	End-Effector interface
Power Supply	
Number of power supplies	1 common supply for the interface connector
Pins on interface	1, 8
Rated output voltage available for end-effector	Disabled, 12 or 24 V dc (configurable by application)
Maximum output current	1.0 A

For connecting external sensors and actuators at the end-effector, you can use pre-wired cables equipped with an 8-pole M8 plug-type connector. For questions regarding applicable extension cables, contact your local Schneider Electric representative.

The following figure presents the socket-type M8 connector (**S**) at the Lexium Cobot Arm flange and the delivered extension cable equipped with an 8-pole M8 plug-type connector (**P**) with a length of 400 mm (15.7 in) and open ended (reference LXMRL00YY011).



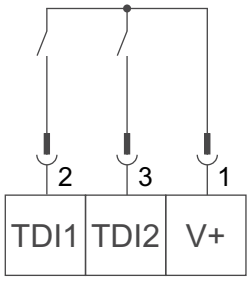
S Socket-type connector

P Plug-type connector

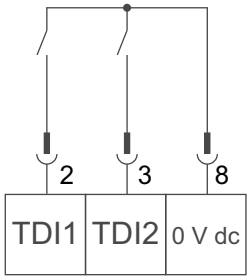
Pin	Label	Wire color	Dedication	Description
1	V+	red	Power supply	Positive supply potential, 12 or 24 V dc or disabled, configurable by application
2	TDI1	blue	Digital input	Digital input 1, sink or source configurable by application
3	TDI2	green	Digital input	Digital input 2, sink or source configurable by application
4	TDO1	yellow	Digital output RS485 channel	Digital output 1, sink or source configurable by application, also configurable as RS485 channel 1
5	TDO2	pink	Digital output RS485 channel	Digital output 2, sink or source configurable by application, also configurable as RS485 channel 1
6	TAI1	brown	Analog input RS485 channel	Analog input 1, also configurable as RS485 channel 2 by application
7	TAI2	white	Analog input RS485 channel	Analog input 2, also configurable as RS485 channel 2 by application
8	0V	grey	Power supply	Negative reference potential for V+ supply

Digital Inputs

The following figure presents the sink wiring of the controller digital inputs. Sink or source can be configured on the digital input settings by the application.

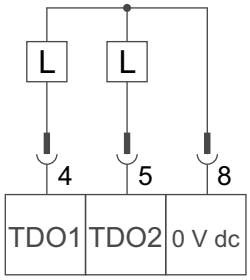


The following figure presents the source wiring of the controller digital inputs. Sink or source can be configured on the digital input settings by the application.

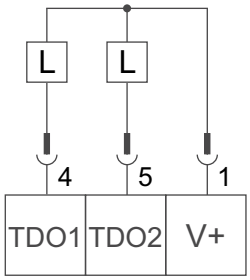


Digital Outputs

The following figure presents the source wiring of the outputs. Sink or source can be configured on the digital output settings by the application.

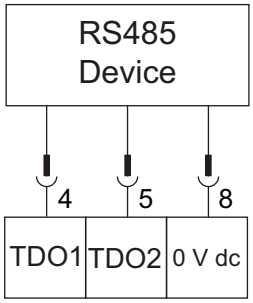


The following figure presents the sink wiring of the outputs. Sink or source can be configured on the digital output settings by the application.

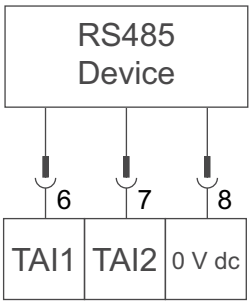


RS485 Communication

The following figure presents the wiring of the RS485 channel 1. RS485 communication can be configured on the digital output settings by the application.

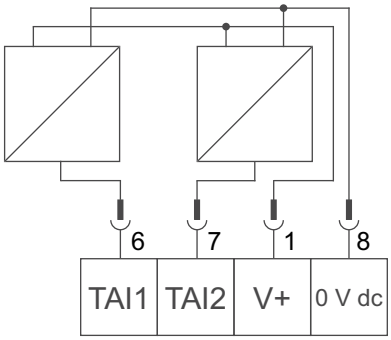


The following figure presents the wiring of the RS485 channel 2. RS485 communication can be configured on the analog input settings by the application.



Analog Inputs

The following figure presents an example of an analog input wiring.

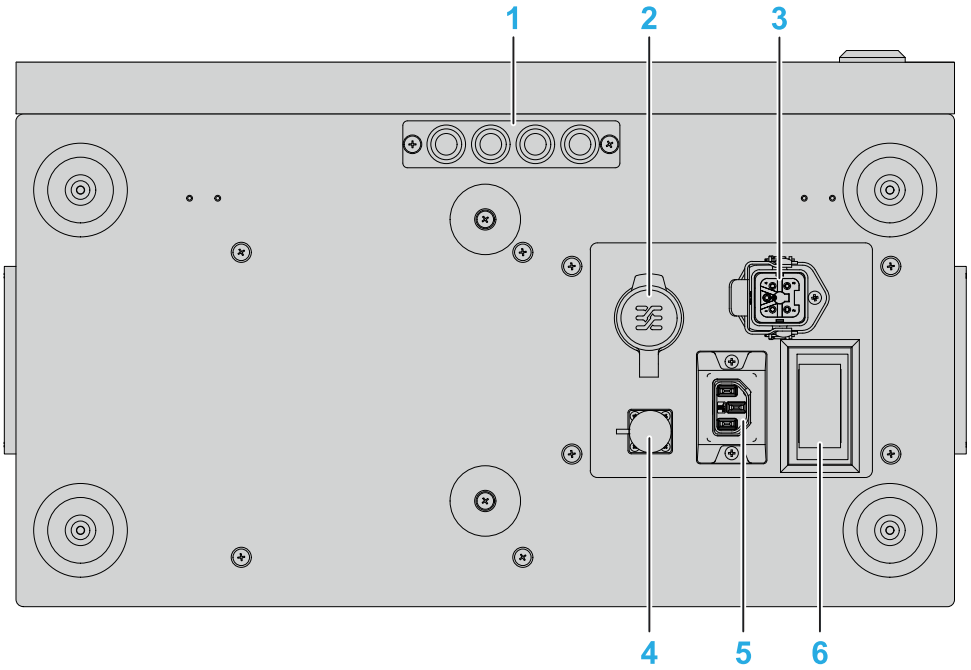


Electrical Connections of the Lexium Cobot Controller

Bottom Panel of the Lexium Cobot Controller

The bottom panel of the Lexium Cobot Controller provides the following interfaces:

- Cable entry cutout for feeding the input and output connections to the front panel of the Lexium Cobot Controller
- Connection for operator terminal via Ethernet cable or connection to local network
- Connection to the Control Stick
- Power supply connection to the Lexium Cobot Arm
- Power supply connection for Lexium Cobot Controller with corresponding power switch



Number	Index	Description
1	-	Cable inlet
2	CN13	Ethernet port
3	CN14	Lexium Cobot Arm interface connector
4	CN12	Control Stick interface connector
5	CN11	Power supply connector
6	S11	Power switch

The Control Stick supply connection cable is pre-mounted on one terminal side to the Control Stick, with a length of 6 m (19.7 ft). On the other terminal side, the supply connection cable is equipped with a connector to interface on CN12 with the Lexium Cobot Controller.

The power supply interface CN11 is equipped with a power switch S11 and an integrated fuse. The power switch is intended to be used for disconnecting the power supply of the Lexium Cobot Controller. The fuse definition is done by 10 A slow-blow at 250 V ac at factory delivery.

> **NOTE:** Ensure that the power switch is only used when the Lexium Cobot Arm is powered off. See the Control Stick description for **Power/Enable**, page 38.

The power cord (length of 2 m (6.6 ft)) delivered with the Lexium Cobot Controller can be used with each power outlet socket which fulfills the following requirement:

- Mains circuit breaker (maximum 16 A)
- Connection to protective earth (ground)
- Outlet protected by properly sized residual current circuit breaker

Supply the devices in the environment of the Lexium Cobot Arm from the same power supply with a mains disconnector.

Front Panel of the Lexium Cobot Controller

The Lexium Cobot Controller provides various possibilities to integrate the Lexium Cobot into a complete machine environment and to interact with equipment and other periphery placed outside the Lexium Cobot Controller.

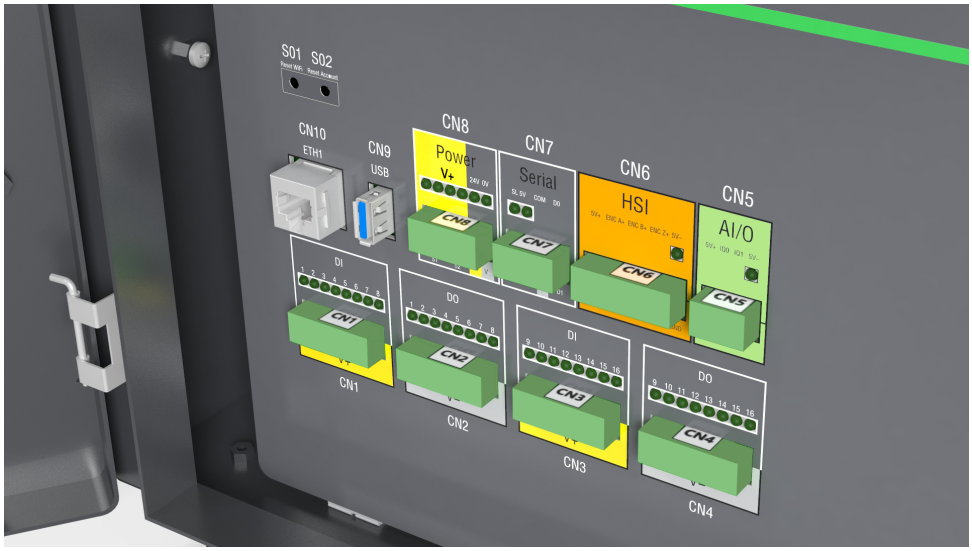
- 16 digital inputs (CN1 and CN3)
- 16 digital outputs (CN2 and CN4)
- 2 configurable analog interfaces (CN5)
- 1 encoder interface (CN6)
- 1 RS485 serial line interface (CN7)
- Lexium Cobot Controller Remote On/Off (CN7)
- Control power supply (CN8)
- Safety function interface (CN8)

Characteristics	**Controller interface**
Digital Inputs	
Number of digital inputs	16 inputs (CN1: DI1…DI8, CN3: DI9…DI15)
Pins on interface	1…8 (for details, refer to Digital Inputs, page 54)
Input type	Type 1
Logic type	Source
Rated input voltage	24 V dc
High signal	15…30 V dc
Low signal	-3…5 V dc
Digital Outputs	
Number of digital outputs	16 outputs (CN2: DO1…DO8, CN4: DO9…DO15)
Pins on interface	1…8 (for details, refer to Digital Outputs, page 54)
Output type	Type 1
Logic type	Source
Rated output voltage	24 V dc
Maximum output current	1 A per output **NOTE:** Verify that the total current of the Lexium Cobot Controller is not exceeded.
Analog Inputs / Outputs	
Number of analog inputs / outputs	2 inputs / outputs (CN5: IQ01, IQ12)
Pins on interface	2, 3 (for details, refer to Analog Inputs and Outputs, page 54)
Input type (while configured as input)	Voltage or current
Input range (while configured as input)	0…10 V dc (configured as voltage input) 4…20 mA (configured as current input)
Output type (while configured as outut)	Voltage or current

Characteristics	Controller interface
Output range (while configured as output)	0…10 V dc (configured as voltage output) 0…20 mA (configured as current output)
Power Supply for Analog Inputs / Outputs	
Number of power supplies	1 supply with 2 terminals (CN5: 5VA)
Pins on interface	1, 4 (for details refer to Analog Inputs and Outputs, page 54)
Rated output voltage	5 V dc
Maximum output current (if configured as an output)	100 mA
Digital Encoder Interface	
Number of digital Encoder interfaces	1 encoder interface (CN6: ENC A+, ENC A-, ENC A+, ENC B+, ENC B-, ENC Z+, ENC Z-) 2 terminals for each track
Pins on interface	For details, refer to Digital Encoder Interface, page 55
Interface type	TTL
Power Supply for Digital Encoder Interface	
Number of power supplies	1 supply with 2 terminals (CN6: 5V+)
Pins on interface	1, 8 (for details, refer to Digital Encoder Interface, page 55)
Rated output voltage	5 V dc
Maximum output current	100 mA
Remote On / Off Control	
Number of Remote On inputs	1 input (CN7: R-ON)
Pins on interface	6 (for details, refer to Remote On and Off, page 56)
Number of Remote Off inputs	1 input (CN7: R-OFF)
Pins on interface	7 (for details, refer to Remote On and Off, page 56)
High signal	3…24 V dc
Low signal	0…1 V dc
RS485 Communication	
Number of RS485 serial lines	1 serial line (CN7: D0, D1, COM)
Pins on interface	3, 4, 5, 9, 10 (for details, refer to RS485 Communication, page 56)
Power Supply for Remote On / Off or RS485 Communication	
Number of power supplies	1 supply with 2 terminals (CN7: VSB)
Pins on interface	1, 2
Rated output voltage	5 V dc
Maximum output current	100 mA
Emergency Stop Input	
Number of emergency stop inputs	2 emergency stop inputs (CN8: S11, S12)
Pins on interface	7, 8 (for details, refer to External Emergency Stop, page 57)
High signal	4.5…24 V dc
Low signal	0…4 V dc
Protective Stop Input	

Characteristics	Controller interface
Number of protective stop inputs	2 protective stop inputs (CN8: S21, S22)
Pins on interface	9, 10 (for details, refer to External Protective Stop, page 58)
High signal	4.5…24 V dc
Low signal	0…4 V dc
24 V dc Internal Power Supply	
Number of power supplies	1 power supply (CN8: 24V, 0V)
Pins on interface	5, 6 (for details, refer to 24 V dc Power Supply, page 57)
Rated output voltage	24 V dc
Maximum output current	1.5 A

The following figure presents the front panel of the Lexium Cobot Controller.



NOTE: Respective backgrounds of the terminals are marked by yellow (V+) and grey (V-) color. Terminals marked by V+ are connected to the internal 24 V dc power supply of the Lexium Cobot Controller, terminals V- are connected to the internal 0 V dc potential.

Index	Name	Pin	Label	Description
CN1	DI Digital Input	1...8	DI1...DI8	First group of digital inputs, inputs 1..8, positive logic (sink), input is active high.
		9...16	V+	24 V dc supply for the digital inputs 1...8.
CN2	DO Digital Output	1...8	DO1...DO8	First group of digital outputs, outputs 1...8, positive logic (source).
		9...16	V-	0 V dc for the digital outputs 1...8.
CN3	DI Digital Input	1...8	DI9...DI16	Second group of digital inputs, inputs 9...16, positive logic (sink), input is active high.
		9...16	V+	24 V dc supply for digital inputs 9...16.
CN4	DO Digital Output	1...8	DO9...O16	Second group of digital outputs, outputs 9...16, positive logic (source).
		9...16	V-	0 V dc for the digital outputs 9...16.

Index	Name	Pin	Label	Description
CN5	AI/AO Analog Input/Output	1, 4	5VA	Analog power supply 5 V dc output, 100 mA maximum.
		2	IQ0	First analog input and output. Usage as input or output depends on the configuration in the application program. For details, refer to *I/O Panel* in the *EcoStruxure Cobot Expert User Guide*.
		3	IQ1	Second analog input and output. Usage as input or output depends on the configuration in the application program. For details, refer to *I/O Panel* in the *EcoStruxure Cobot Expert User Guide*.
		5...8	GND	Grounding potential dedicated to analog interface.
CN6	ENC 5V Encoder	1, 8	5V+	5 V dc power supply dedicated to incremental encoder usage.
		2, 3	ENC A+	Incremental signal A+ of the encoder, positive potential.
		4, 5	ENC B+	Incremental signal B+ of the encoder, positive potential.
		6, 7	ENC Z+	Incremental signal Z+ of the encoder, positive potential.
		9, 16	GND	Grounding potential dedicated to encoder.
		10, 11	ENC A-	Incremental signal A- of the encoder, negative potential.
		12, 13	ENC B-	Incremental signal B- of the encoder, negative potential.
		14, 15	ENC Z-	Incremental signal Z- of the encoder, negative potential.
CN7	Serial RS485 Serial line, Remote On/Off	1, 2	VSB	5 V dc power supply with 100 mA maximum, can be used for remote power on / power off or to supply low current devices via RS485 serial line.
		3	COM	Common grounding for RS485 communication.
		4, 5	D1	D1 channel for RS485 communication.
		6	R-ON	Remote power-on signal input, high level (5...24 V dc) is valid
		7	R-OFF	Remote shutdown signal input, high level (5...24 V dc) is valid
		8	V-	0 V dc potential for power supply.
		9, 10	D0	D0 channel for RS485 communication.
CN8	Power Control power supply, Safety functions	1...4, 11	V+	24 V dc supply used for various connectors on the Lexium Cobot Controller front panel. At factory delivery, pins 5 and 11 are connected by an external jumper and V+ provides the internal 24 V+ potential.
		5	24V	Internal 24 V dc power supply provided by the Lexium Cobot Controller.
		6	0V	Internal 0 V dc reference potential for 24 V dc power supply provided by the Lexium Cobot Controller.
		7	S11	Emergency stop function input 1, the factory default is V+.
		8	S12	Emergency stop function input 2, the factory default is V+.
		9	S21	The protective stop function input 1, the factory default is V+.
		10	S22	The protective stop function input 2, the factory default is V+.
		12	V-	0 V dc supply used for various connectors on the Lexium Cobot Controller front panel. By factory delivery pins 6 and 12 are connected by an external jumper and V- provides the internal 0 V dc potential.
CN9	–	–	USB	USB 3.0 connector, reserved for manufacturer use.
CN10	–	–	Ethernet	Ethernet interface, reserved for manufacturer use.
S01	Reset WiFi	–	–	–
S02	Reset Account	–	–	–

NOTE: The CN8 connector pins dedicated to safety functions are provided by factory delivery with at V+ potential. Hence, the safety functions are active but not controlled by periphery of the application (for example, E-Stop push buttons or others). For a proper integration of safety functions, refer to the chapter Functional Safety, page 78

⚠WARNING

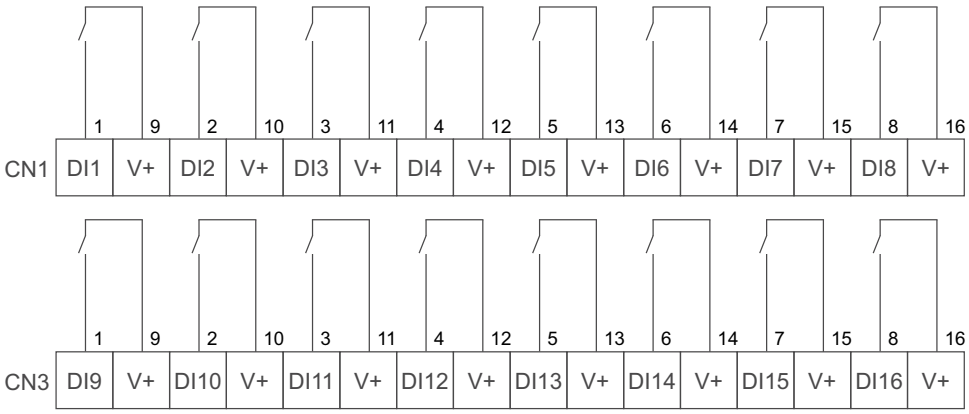
UNINTENDED EQUIPMENT OPERATION

- Ensure that the hazard and risk analysis is conducted and respected according to EN/ISO 12100 during the design of your machine.
- Apply all measures from the hazard and risk analysis before putting the system in service.

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

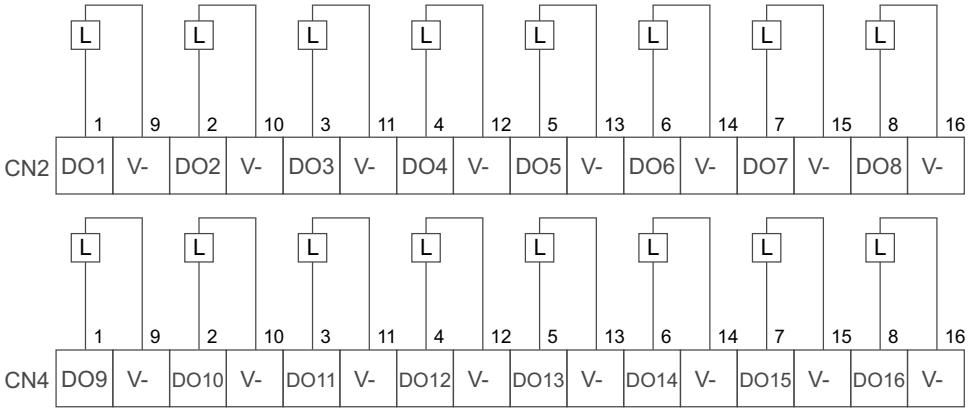
Digital Inputs

The following figure presents the sink wiring of the digital inputs at the Lexium Cobot Controller (CN1 and CN3).



Digital Outputs

The following figure presents the source wiring of the digital outputs at the Lexium Cobot Controller (CN2 and CN4).



Analog Inputs and Outputs

The Lexium Cobot Controller provides the connection of two analog signals.

Depending on the configuration of the application, the analog interface can be configured as analog input or analog output. The analog inputs or outputs are not isolated from the Lexium Cobot Controller.

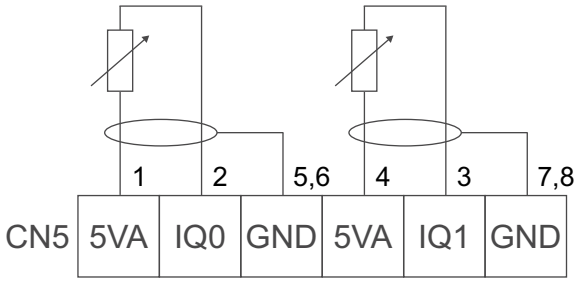
In case the signal is configured as input, use the following configuration: 4...20 mA, 0...10 V dc

In case the signal is configured as output, use the following configuration: 0...20 mA, 0...10 V dc

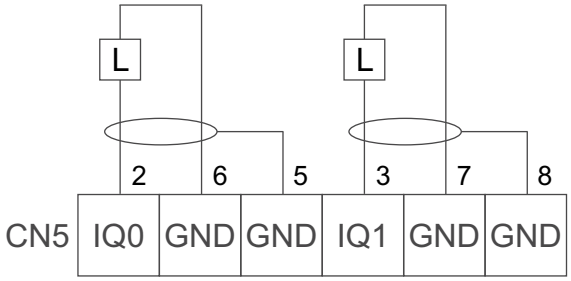
NOTE: For reducing and avoiding disturbances on analog signals consider the following measures:

- Use shielded cables and ground to potential on CN5
- Use twisted pair cables
- Use the same ground for the Lexium Cobot Controller and the connected equipment

The following figure presents the wiring of the analog inputs at the Lexium Cobot Controller (CN5) for a variable resistor, based on the internal 5 V dc power supply for analog signals.



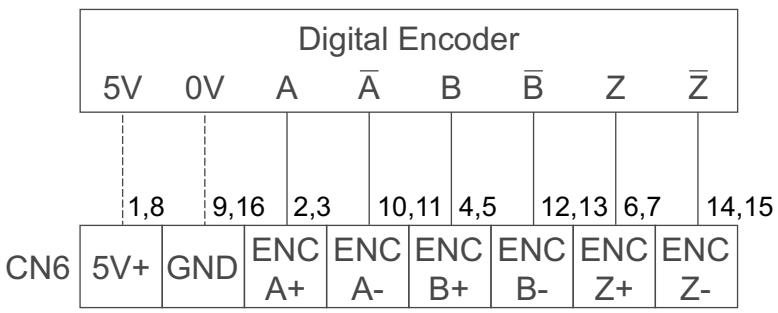
The following figure presents the wiring of the analog outputs at the Lexium Cobot Controller (CN5).



Digital Encoder Interface

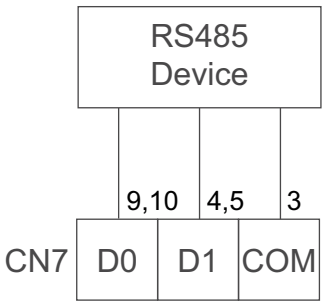
The Lexium Cobot Controller provides the connection of a digital encoder. If the digital encoder does not require more than 100 mA, the encoder can also be supplied with a 5 V dc power supply using the same connector.

The following figure presents the wiring of a digital encoder at the Lexium Cobot Controller (CN6).



RS485 Communication

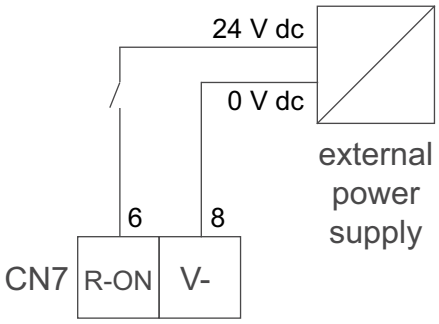
The following figure presents the wiring of the RS485 communication to an external device at the Lexium Cobot Controller (CN7).



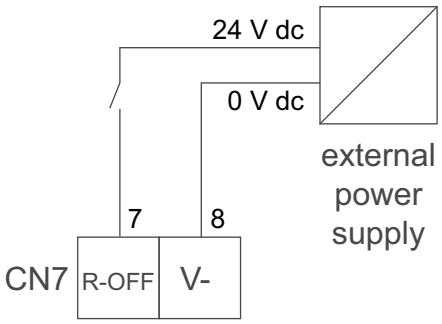
Remote On and Off

The Lexium Cobot Controller can be powered on and off remotely. Remote on and off requires an external power supply (5...24 V dc), where V- (terminal 8 on CN7) and 0 V dc of the external power supply are connected.

The following figure presents the wiring of the remote powering-on function at the Lexium Cobot Controller (CN7).



The following figure presents the wiring of the remote powering-off function at the Lexium Cobot Controller (CN7).



⚠WARNING

UNINTENDED EQUIPMENT OPERATION

Ensure that the R-ON and the R-OFF pins are not powered simultaneously.

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

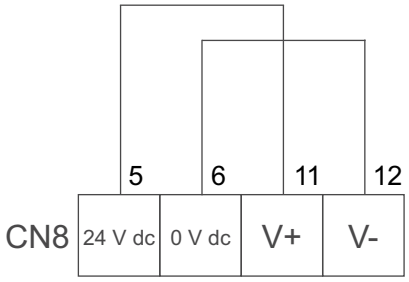
In order to avoid that both pins are simultaneously at 24 V dc, use an SPDT switch to alternate the closed circuit between the two pins R-ON and R_OFF.

24 V dc Power Supply

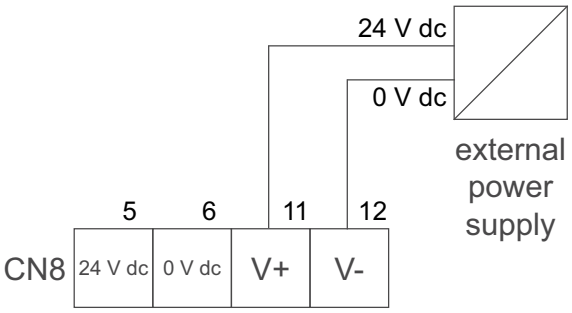
The Lexium Cobot Controller provides the connection of the central power supply for the digital inputs and outputs on pins 11 and 12 (CN8).

The Lexium Cobot Controller provides an internal 24 V dc power supply which can be used to supply the digital inputs and outputs of the front panel. In addition, it is also possible to connect an external 24 V dc power supply. In delivery condition, the internal power supply is active with the jumpers in place.

The following figure presents the wiring of the internal power supply.



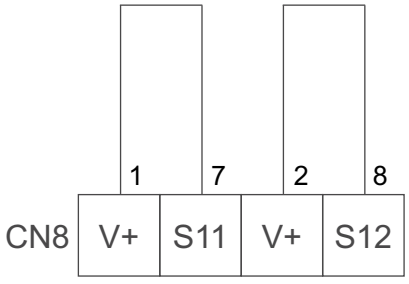
The following figure presents the wiring of the external power supply.



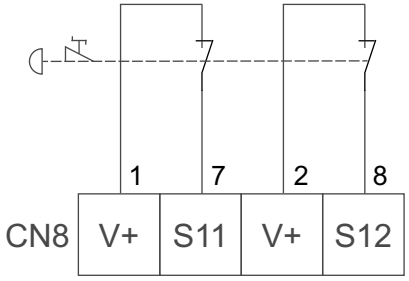
External Emergency Stop

The Lexium Cobot Control Stick is equipped with a built-in emergency stop push button. To also connect an external emergency stop signal, the Lexium Cobot Controller provides the connection of dedicated terminals (CN8).

The following figure presents the default wiring of the external emergency stop inputs in delivery condition.



The following figure presents the wiring of an external emergency stop.



⚠WARNING

UNINTENDED EQUIPMENT OPERATION

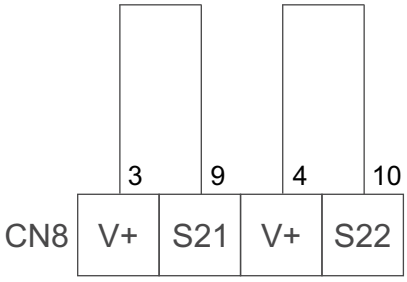
- Ensure that the cable for the external emergency stop switch is carried out by a separate and protected cable routing.
- Ensure that safety-related equipment is connected to dedicated safety-related terminals (CN8) only.

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

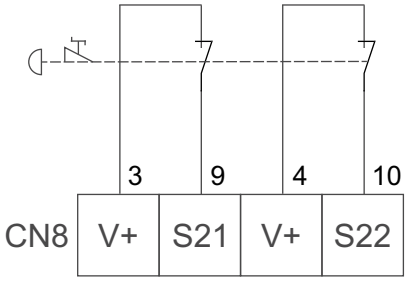
External Protective Stop

The Lexium Cobot Controller provides the connection of dedicated terminals to additionally connect an external protective stop signal (CN8).

The following figure presents the default wiring of the external protective stop inputs in delivery condition.



The following figure presents the default wiring of an external protective stop device.



⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Ensure that the cable for the external protective stop switch is carried out by a separate and protected cable routing.
- Ensure that safety-related equipment is connected to dedicated safety-related terminals (CN8) only.

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

Emergency Stop and Protective Stop

Additionally to the Lexium Cobot Control Stick, the safety functions emergency stop and protective stop can be realized by connecting external emergency stop and protective stop switches on connector CN8 of the Lexium Cobot Controller. With factory delivery, jumpers are installed to operate the device without external switches.

Physical installation of external stop switches (for example, safety-related door switches, safety-related light curtains or others) extends the dedicated function for emergency stop / protective stop without replacing or disabling the same functionality of the Lexium Cobot Control stick. No configuration in the software needs to be applied, the enhancement is active by correct installation according to the explaining figures above.

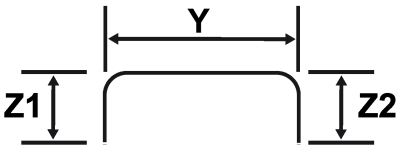
The table below outlines the mode of action for emergency stop and the protective stop and its consequence on the equipment.

	Emergency stop switch(1)	**Protective stop switch(2)**
Lexium Cobot stops moving	Yes	Yes
Joint motor status	Stop	Enable
Lexium Cobot power supply	OFF	ON
Program execution status	Terminated	Pause
Brake	Closed	Open
(1) Represents stop category 0. For further information, refer to Run-On Motions of the Lexium Cobot Arm for Risk Assessment, page 65.		
(2) Represents stop category 1. For further information, refer to Run-On Motions of the Lexium Cobot Arm for Risk Assessment, page 65.		

Performance Data

Typical Cycle Time

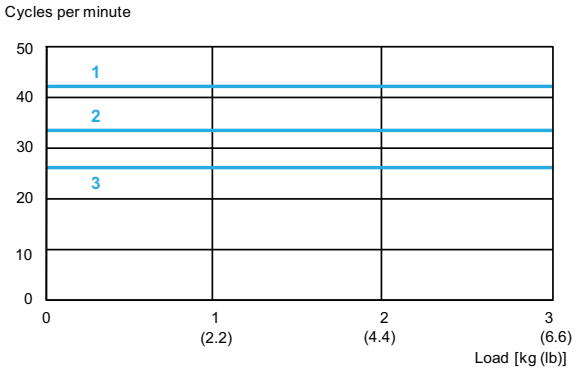
Lexium Cobot Arm Path (pick-place-pick):



Cycle Times of Lexium Cobot Arm LXMRL03••000

The following measurements are performed at an ambient temperature of 20 °C (68 °F) with a Lexium Cobot Controller and EcoStruxure Cobot Expert.

Path Z1 x Y x Z2 in mm (in)	Load [kg (lb)]	Cycle times [s](1)	Cycles per minute
15 x 200 x 15 (0.59 x 7.9 x 0.59)	Any permitted load	1.43	42
25 x 305 x 25 (0.98 x 12 x 0.98)		1.76	34
70 x 400 x 70 (2.76 x 15.75 x 2.76)		2.30	26
(1) Cycle times include the back and forth motion.			



1 path: 15 x 200 x 15 mm (0.59 x 7.9 x 0.59 in)

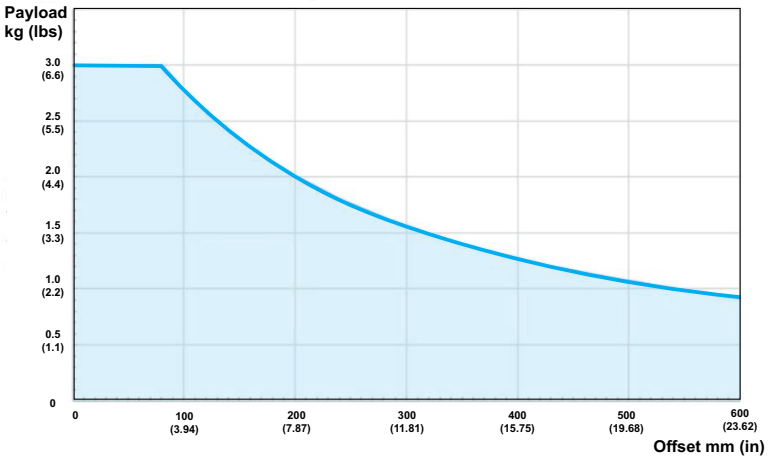
2 path: 25 x 305 x 25 mm (0.98 x 12 x 0.98 in)

3 path: 70 x 400 x 70 mm (2.76 x 15.75 x 2.76 in)

Load Capacity of Lexium Cobot Arm

Overview

The loading capacity of the Lexium Cobot Arm depends on the offset between Lexium Cobot Arm FCP (flange center point) and the mass center point of the additional end-customer payload. Limit values must comply with the maximum permissible payload shown in the following diagram.



Design of the Mounting Surface

System Requirements

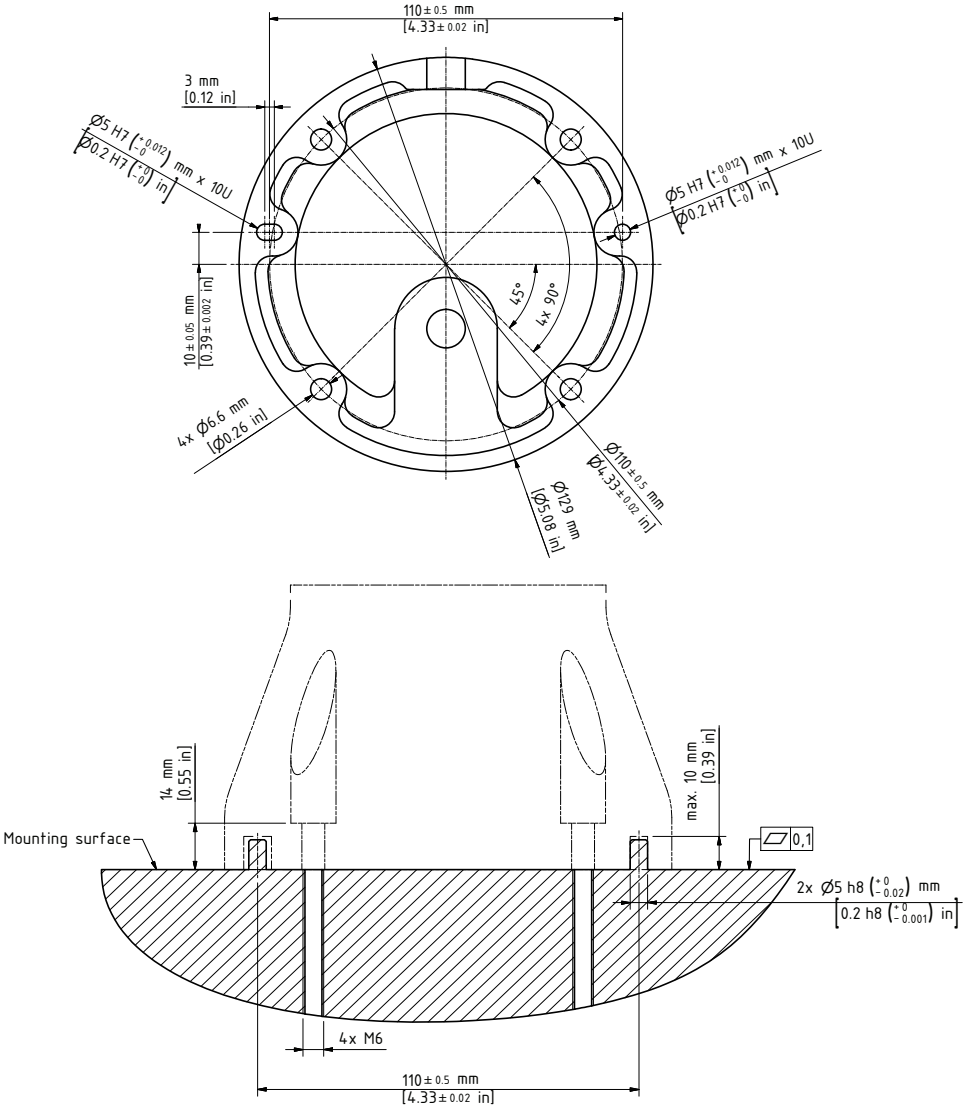
Lexium Cobot Arm

Lexium Cobot Arm is intended to be mounted on a sturdy mounting surface. The surface must not only withstand the constant force and torque 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.

Note the weight and torque to be taken up by the mounting surface during normal operation:

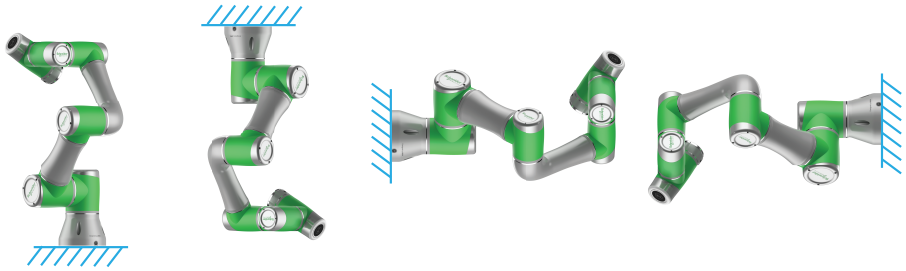
Parameter	Value
Static load	65.5 kg (5 * weight of Lexium Cobot Arm)
Dynamic torque	90 Nm (10 * maximum torque of base joint)

NOTE: Make sure bolt lengths (minimum screwing depth) and material of the installation surface meet the requirement of the minimum torque noted above.



The Lexium Cobot Arm is intended to be mounted in various installation positions as ground, ceiling or wall mounting. Adapt the location and position respectively to the installation position during initial start up.

Examples of mounting positions:



In case the Lexium Cobot Arm is mounted on a moving platform (for example, linear axis or moving platform), high acceleration of the moving ground base might be interpreted by the Lexium Cobot Arm as a collision.

NOTE: Verify that the acceleration of the moving system causes no unexpected stopping of Lexium Cobot Arm.

Lexium Cobot Controller

The Lexium Cobot Controller is intended to be placed on a plane surface. Ensure that a clearance of 100 mm (3.9 in) on each side of the Lexium Cobot Controller is respected for sufficient airflow.

NOTICE
INOPERABLE EQUIPMENT Ensure sufficient airflow for the Lexium Cobot Controller. **Failure to follow these instructions can result in equipment damage.**

Control Stick

The Control Stick is equipped with a magnet on the back side and can be placed on a wall or on the Lexium Cobot Controller.

Interference Contours

When designing the system, ensure that the Lexium Cobot Arm has sufficient freedom of movement. Take into account the required space for the movement of the respective Lexium Cobot Arm type and associated equipment.

For further information, refer to the respective dimensional drawing in Mechanical and Electrical Data, page 33.

Run-On Motions of the Lexium Cobot Arm for Risk Assessment

Overview

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

⚠WARNING

BREAKDOWN OF THE INTERNAL JOINT HOLDING BRAKE

- Take into account a possible breakdown of the internal joint holding brake during your risk assessment.
- Take into account that the internal joint holding brake of the Lexium Cobot Arm 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 may 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 assessment.

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

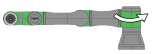
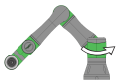
Stop Function Categories

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

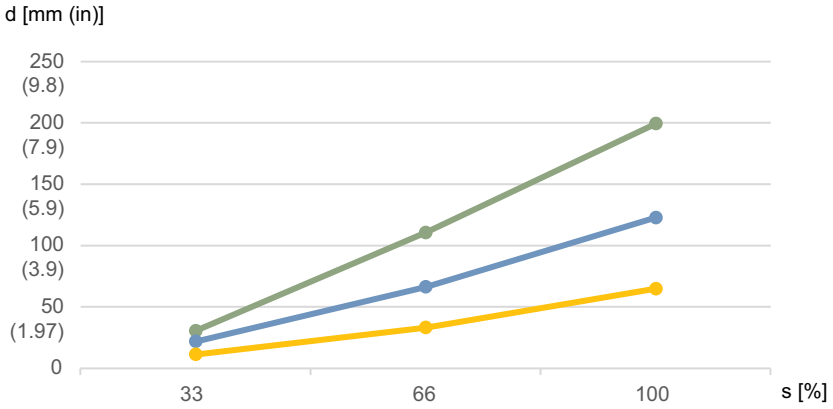
Stop function category	Definition	Corresponds to
0	Stopping by immediate removal of power to the actuators (for example, an uncontrolled stop).	An uncontrolled stop (stopping of motion by removing electrical power to the actuators).
1	A controlled stop with power available to the actuators to achieve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

Run-On Path of LXMRL03S0000 Joint 1

The following graphics present the run-on path and stopping time for joint 1 for three different joint speeds and Lexium Cobot Arm poses.

Graph color	**Green**	**Blue**	**Yellow**
Arm extension	100 %	66 %	33 %
Representation			

Run-on path for stop category 1:

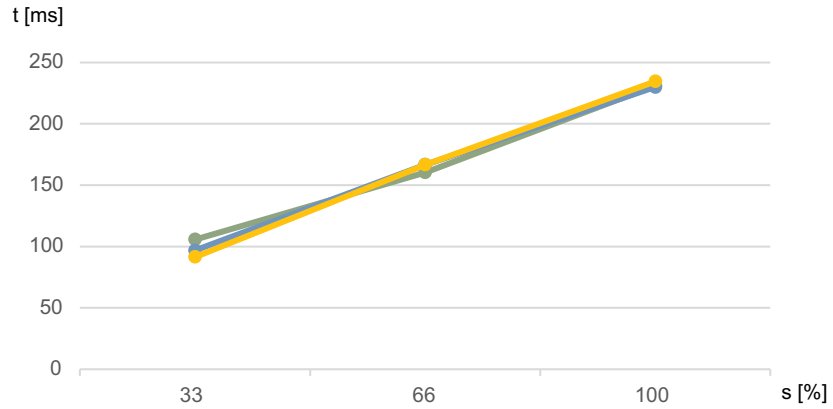


d Run-on path distance

s Joint speed

For further information, refer to IEC 60204-1.

Stopping time for stop category 1:

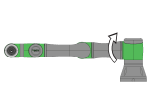
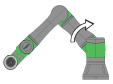


t Stopping time

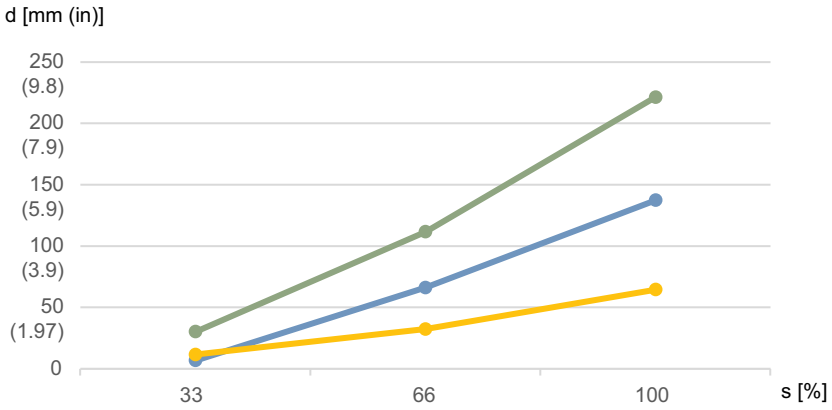
s Joint speed

Run-On Path of LXMRL03S0000 Joint 2

The following graphs present the run-on path and stopping time for joint 2 for three different joint speeds and Lexium Cobot Arm poses.

Graph color	Green	Blue	Yellow
Arm extension	100 %	66 %	33 %
Representation			

Run-on path for stop category 1:

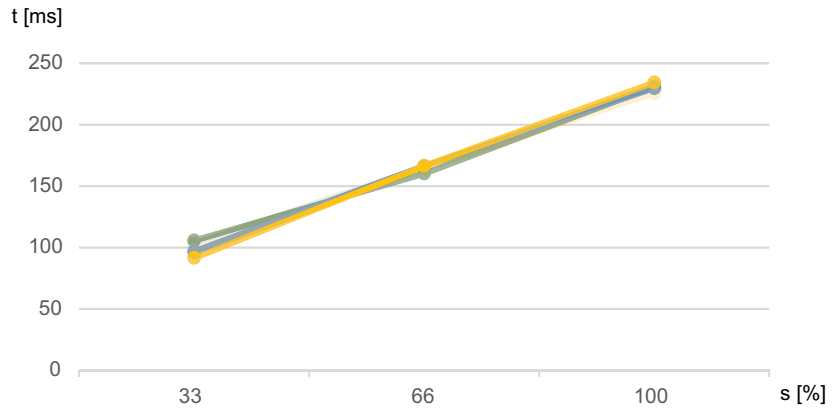


d Run-on path distance

s Joint speed

For further information, refer to IEC 60204-1.

Stopping time for stop category 1:

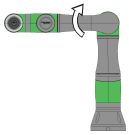
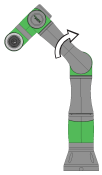


t Stopping time

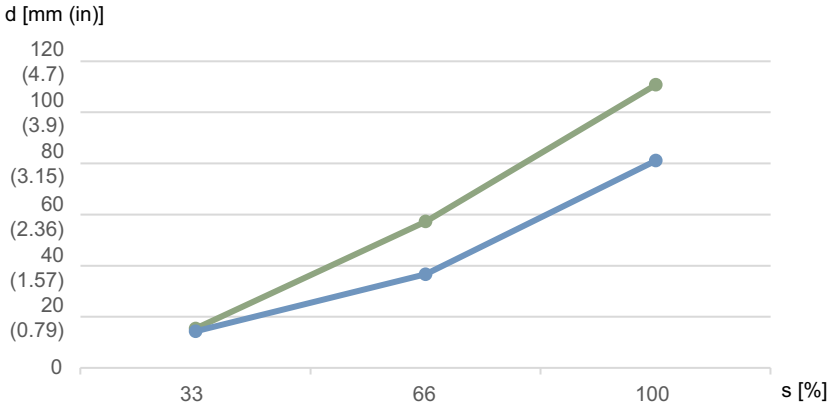
s Joint speed

Run-On Path of LXMRL03S0000 Joint 3

The following graphs present the run-on path and stopping time for joint 3 for two different joint speeds and Lexium Cobot Arm poses.

Graph color	**Green**	**Blue**
Arm extension	100 %	66 %
Representation		

Run-on path for stop category 1:

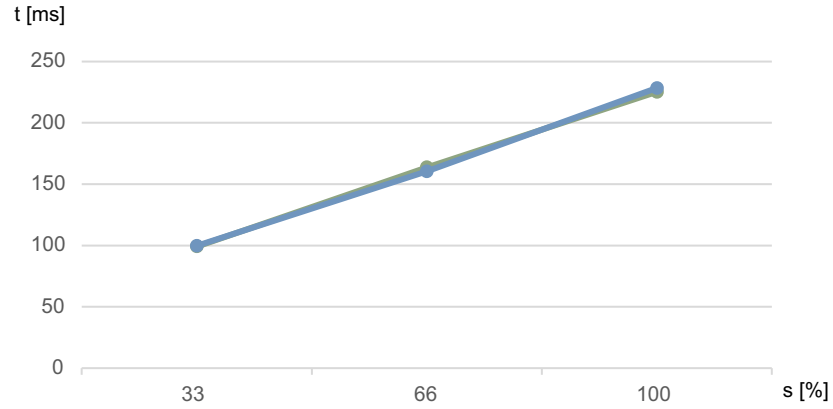


d Run-on path distance

s Joint speed

For further information, refer to IEC 60204-1.

Stopping time for stop category 1:



t Stopping time

s Joint speed

Transport and Commissioning

What's in This Chapter

Transport and Unpacking

Transport and Storage

Transport Conditions

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

NOTICE
INOPERABLE EQUIPMENT Handle the Lexium Cobot Arm and the Lexium Cobot Controller with care. **Failure to follow these instructions can result in equipment damage.**

The Lexium Cobot Arm is preassembled before transport.

> **NOTE:** Before unpacking and installing the Lexium Cobot Arm, ensure that the lifting capacity of the lifting devices is sufficient to lift the Lexium Cobot Arm. You can find the total weight of your equipment on the packaging or in the transport documents.

For detailed information about transport conditions, refer to Ambient Conditions, page 32.

Storage

The Lexium Cobot Arm and the Lexium Cobot Controller 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 Lexium Cobot Arm and the Lexium Cobot Controller.

NOTICE
INOPERABLE EQUIPMENT Store the Lexium Cobot Arm and the Lexium Cobot Controller in a sheltered and dry place. **Failure to follow these instructions can result in equipment damage.**

For detailed information about storage conditions, refer to Ambient Conditions, page 32.

Unpacking

Overview

The following figure presents the packaging of the Lexium Cobot Arm and the Lexium Cobot Controller.

1 Outer carton box of the Lexium Cobot Arm and the Lexium Cobot Controller

Preparing the Lexium Cobot Arm and the Lexium Cobot Controller for Installation

Step	Action
1	Open the outer carton on the top side.
2	Lift up and remove the upper inner packaging part.
3	Inspect the Lexium Cobot Arm and the Lexium Cobot Controller for transport damage. **NOTE:** You will find the power supply connection cable inside the Lexium Cobot Controller.

NOTE: In case of transport damages, contact your local Schneider Electric service representative.

For information on the disposal of the packaging, refer to Disposal, page 122.

Mechanical Installation

Information About Installation

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

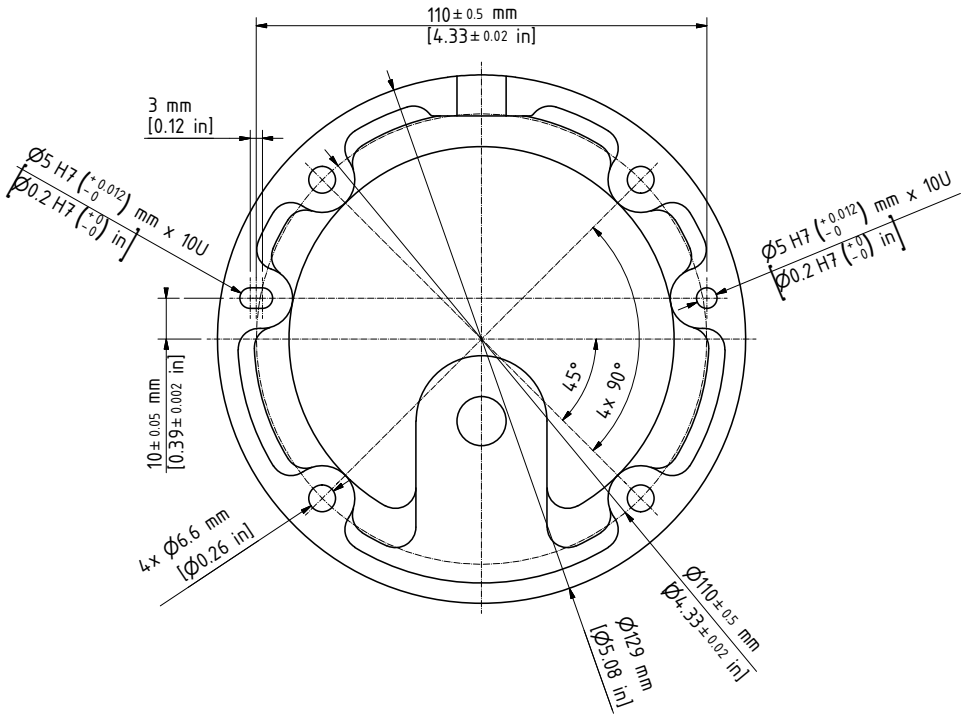
- Injuries and material damage
- Incorrect installation and programming of components
- Incorrect operation of components
- Use of non-authorized cables or modified components

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

Mounting the Lexium Cobot Arm

Overview

The following figure presents the installation dimensions of LXMRL03S0000 Lexium Cobot Arm base.



Mount the Lexium Cobot Arm in such a way that enough space is allowed from any obstacle to provide sufficient working space. Working space should be defined as the maximum path until the hardware safety system limits, as well as the additional run-on paths are reached.

⚠WARNING

CRUSHING, SHEARING, CUTTING AND IMPACT INJURY

- Define the working space required by the application to account for the maximum possible travel path of Lexium Cobot Arm in such a way that collisions can be avoided.
- Define the clearance distance to the zone of operation of the Lexium Cobot Arm so the operational staff cannot be enclosed in the robot mechanics zone of operation.

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

Mounting the Lexium Cobot Arm

Step	Action
1	Use a lifting device when necessary for lifting up the Lexium Cobot Arm out of the transport packaging. **NOTE:** Lift both tubes of the Lexium Cobot Arm at the same time when moving it from the packaging to the installation position.
2	Place the Lexium Cobot Arm on the mounting surface and hold it in place while completing step 3.
3	Fasten the Lexium Cobot Arm base to the mounting surface by using the four through holes (Ø 6.6 mm). For additional fixing, centering pins can be added (Ø 5 mm). Tightening torque and size (LXMRL03S0000): • Bolt size: M6 • Tightening torque: 15 Nm (132.8 lbf-in) **NOTE:** Property class of the screws: 12.9 or greater.

Electrical Installation

Cabling the Lexium Cobot

Overview

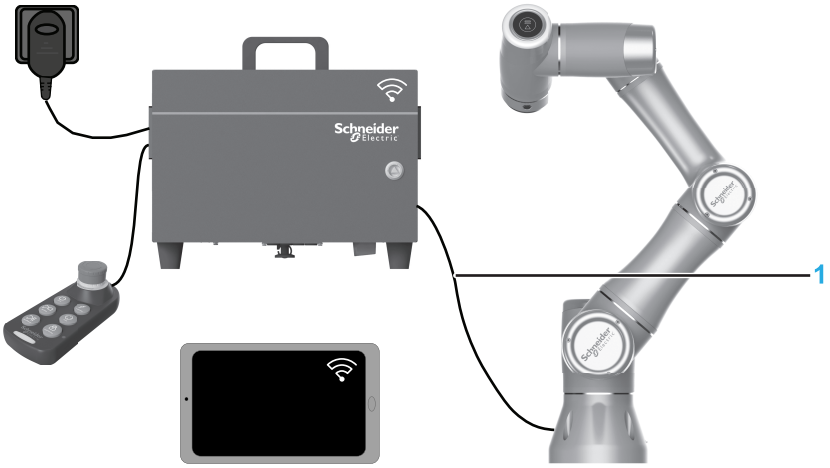
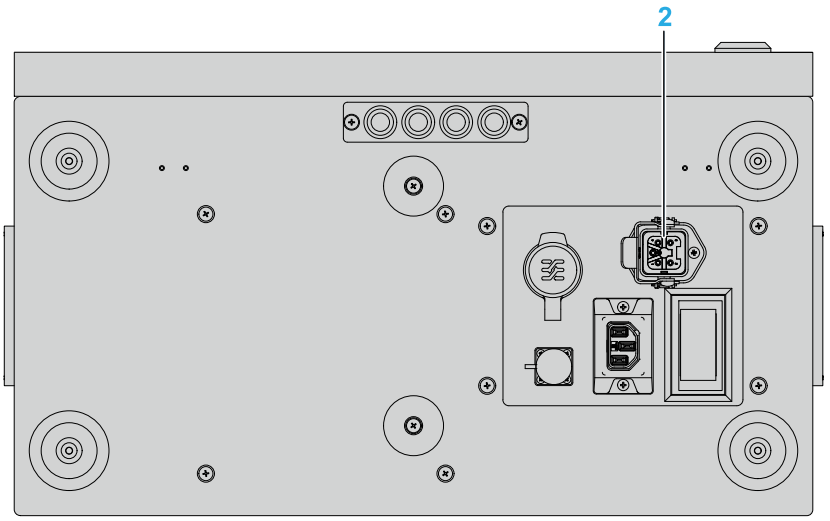
Verify the correct routing and fastening of the cables to help prevent any collision of cables and moving parts.

⚠⚠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 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 cable.
- Ensure that all power cables are correctly connected in and connectors are locked in place during the entire operation time of the system.

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

Step	Action
1	Feed the supply connection cable (1) to the bottom panel of the Lexium Cobot Controller. 
2	Connect the CN14 connector (2) and lock the bracket. 

⚠⚠DANGER

ELECTRIC SHOCK

Verify that the input power of the Lexium Cobot Controller is protected with an RCD (Residual Current Device).

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

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use hardware components approved by Schneider Electric for use with this equipment.
- Do not extend or modify the cable set.
- Verify that all cables are connected correctly before the Lexium Cobot Controller is powered.
- Verify the connections for tight fit.

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

Reducing Risks Around the Lexium Cobot Arm

Risks

A direct or indirect physical contact relationship exists when an interaction between the operator and the Lexium Cobot exists. Operators must have sufficient self-protection awareness when contacting, and integrators need to carefully consider the use conditions when using the Lexium Cobot. The following are possible hazardous situations:

- The Lexium Cobot dropping during handling
- The loosening of the Lexium Cobot fixing screw
- Finger pinching and collision injury during the operation
- Operation with an unrepaired, or otherwise unmaintained Lexium Cobot
- The use of a sharp end-effector or tool connection
- Operation in a toxic or corrosive environment

Emergency Stop

When an emergency occurs, press the emergency stop button to stop all movement of the Lexium Cobot immediately. Note that an emergency stop button does not constitute a risk reduction measure. It is considered as a secondary protective device.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Use appropriate protective devices (functional safety devices) in compliance with local and national standards.
- 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.
- Apply all measures from the hazard and risk analysis before putting the system in service.
- Install and operate the device only in the intended environment considering the residual risks.
- Do not disassemble, repair, or modify this equipment.

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

External Functional Safety Devices

Install external safety-related devices in accordance to local regulations and standards.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Use appropriate protective devices (functional safety devices) in compliance with local and national standards.
- 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.
- Apply all measures from the hazard and risk analysis before putting the system in service.
- Install and operate the device only in the intended environment considering the residual risks.
- Do not disassemble, repair, or modify this equipment.

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

Functional Safety

General Information

The Lexium Cobot provides 27 safety functions (SF) that have been designed and tested for functional safety in accordance with the following standards:

- IEC 60204-1
- ISO 13849-1

These safety functions are gathered in 8 groups:

- Emergency Stop Safety Functions, page 81
- Protective Stop Safety Functions, page 84
- Hand Guiding Safety Functions, page 87
- Speed Monitoring (Reduced Mode) Safety Functions, page 89
- Torque and Power Limitations Safety Functions, page 92
- Collision Protection Safety Functions, page 94
- Position Monitoring Safety Functions, page 97
- Motion Status Safety Functions, page 99

The following table provides an overview of the safety functions per group. For detailed information on the specific reaction sequence, the defined safe state, and the stopping time, refer to the description of the respective group of safety functions.

Group of safety function	Safety Function	Description
Emergency stop	SF1 – Emergency Stop Button on the Control Stick	Pressing the emergency stop pushbutton on the Control Stick results in an emergency stop.
	SF2 – External Emergency Stop Button	Pressing the external emergency stop pushbutton connected to CN8 results in an emergency stop.
	SF15 – Additional Emergency Stop Input	Pressing the external emergency stop pusbutton connected to the digital inputs (configurable by software) results in an emergency stop.
	SF19 – Emergency Stop Button State (Digital Output)	Digital output (configurable by software) with a low state when the emergency stop button on the Control Stick is pressed.
	SF20 – Emergency Stop State (Digital Output)	Digital output (configurable by software) with a low state when the emergency stop state is active.
Protective stop	SF3 – External Protective Stop	Pressing the external protective stop pushbutton connected to CN8 results in a protective stop.
	SF16 – Additional Protective Stop Input	Pressing the external protective stop pushbutton connected to the digital inputs (configurable by software) results in a protective stop.
	SF17 – Protective Stop Reset Input	If configured, this function enables manual resetting of the protective stop by the rising edge on the digital inputs (configurable by software).
	SF21 – Protective Stop State (Digital Output)	Digital output (configurable by software) with a low state if the protective stop is active.
Hand guiding	SF13 – TCP Speed Limit in Hand Guiding	Dragging speed of the TCP during hand–guided mode is limited to 250 mm/s.
	SF27 – 3-Position Enable Switch Input	Optional 3-position enable switch inputs for manual modes (hand guiding and jogging). The Lexium Cobot Arm is stopped as soon as the signal is low.

Group of safety function	Safety Function	Description
Speed monitoring (Reduced Mode)	SF5 – Joint Speed Limit	Exceeding a Joint Speed Limit results in a defined safe state. Each joint can have its own limit.
	SF9 – TCP Speed Limit	Exceeding TCP speed limit results in a defined safe state.
	SF18 – Reduced Mode Input	Reduced mode with pre-defined motion values can be activated via digital inputs (configurable by software).
	SF24 – In Reduced Mode (Digital Output)	Configurable digital output with a low state if the reduced mode is active.
	SF25 – Not in Reduced Mode (Digital Output)	Configurable digital output with a low state if the reduced mode is not active.
Torque and power limitations	SF6 – Joint Torque Limit	Exceeding a joint torque limit results in a defined safe state.[1]
	SF7 – Joint Power Limit	Exceeding the joint power limit results in a defined safe state.[1]
	SF8 – Robot Power Limit	Exceeding the power limit of the Lexium Cobot Arm results in a defined safe state.
Collision protection	SF12 – TCP Position Mismatch Limit	Exceeding the position mismatch limit is handled as collision detection and results in a defined safe state.[1]
	SF14 – Collision Protection	Collision is monitored by various feedback parameters. Collision detection results in a defined safe state.
	SF26 – TCP Force Limit	Exceeding the TCP force limit is handled as collision detection and results in a defined safe state.
Position monitoring	SF4 – Joint Position Limit	Exceeding the joint position limit results in a defined safe state. Each joint can have its own limit.
	SF10 – Tool Orientation Limit	Optionally, the tool orientation limit can be configured. Exceeding the limit results in a defined safe state.
	SF11 – Safety Planes	Optionally, safety planes (TCP Position Limit) can be configured. Exceeding the limit results in a defined safe state.
Motion status	SF22 – Robot in Motion (Digital Output)	Digital output (configurable by software) with a low state if the Lexium Cobot Arm is moving.
	SF23 – Robot Not Stopping (Digital Output)	Digital output (configurable by software) with a low state if the Lexium Cobot Arm is moving and not stopping. The output signal is high if the Lexium Cobot Arm is decelerated to stop and stays high while the Lexium Cobot Arm is at standstill.
1 This limit is a factory setting that cannot be modified. It considers the internal parameters of the joints.		

Process for Minimizing Risks Associated with the Lexium Cobot

General

The goal of designing machines safely is to protect people. The risk associated with electrically controlled robots comes chiefly from moving machine parts and electricity itself. Only you, the user, machine builder, or system integrator can be aware of all the conditions and factors realized in the design of your application for the robot. Therefore, only you can determine the collaborative robotic equipment and the related safeties and interlocks which can be properly used, and validate such usage.

Hazard and Risk Analysis

Based on the system configuration and utilization, a hazard and risk analysis must be carried out for the system (for example, according to ISO 12100 or ISO 13849-1). The results of this analysis must be considered when designing the system, and subsequently applying safety-related equipment and safety-related functions. The results of your analysis may deviate from any application examples contained in the present or related documentation. For example, additional safety components may be required. In principle, the results from the hazard and risk analysis have priority.

⚠WARNING

NON-CONFORMANCE TO SAFETY FUNCTION REQUIREMENTS

- Specify the requirements and/or measures to be implemented in the risk analysis you perform.
- Verify that your safety-related application complies to applicable local regulations and standards.
- Make certain that appropriate procedures and measures (according to applicable sector standards) have been established to help avoid hazardous situations when operating the robot.
- Use appropriate safety interlocks where personnel and/or equipment hazards exist.
- Validate the overall safety-related function and thoroughly test the application.

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

The ISO 13849-1 Safety of machinery - Safety-related parts of control systems - Part 1: General principle for design describes an iterative process for the selection and design of safety-related parts of controllers to reduce the risk to the system to a reasonable degree: To perform risk assessment and risk minimization according to ISO 12100, proceed as follows:

1. Defining the boundary of the system.
2. Identifying risks associated with the system.
3. Assessing risks.
4. Evaluating risks.
5. Minimizing risks by:
    - Intrinsically safe design
    - Protective devices
    - User information (see ISO 12100)

Additional information is available on www.se.com.

Emergency Stop Safety Functions

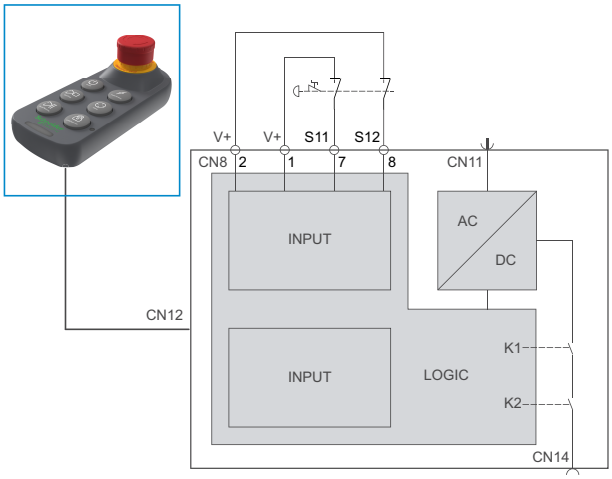
Functional Description

The Lexium Cobot system provides the following options to implement an emergency stop:

- Emergency stop pushbutton on the Lexium Cobot Control Stick (SF1).
- External emergency stop safety-related device (for example, pushbuttons, light curtains, safety-related mats or other such device) connected to CN8 (pin S11 and S12) at the Lexium Cobot Controller (SF2).
- Additional emergency stop safety-related device connected to a two-channel safety-related digital input at the Lexium Cobot Controller, if configured in EcoStruxure Cobot Expert (SF15).

Connected emergency stops can be used together. When one of the emergency stops is requested, the Lexium Cobot system stops the Lexium Cobot Arm motion, engages the internal brake, and powers off the Lexium Cobot Arm after a maximum stopping time of 250 ms (stop category 1 in accordance with IEC 60204-1). The executed program of the Lexium Cobot system is stopped and terminated.

NOTE: The emergency stop functions take priority over other safety-related functions.

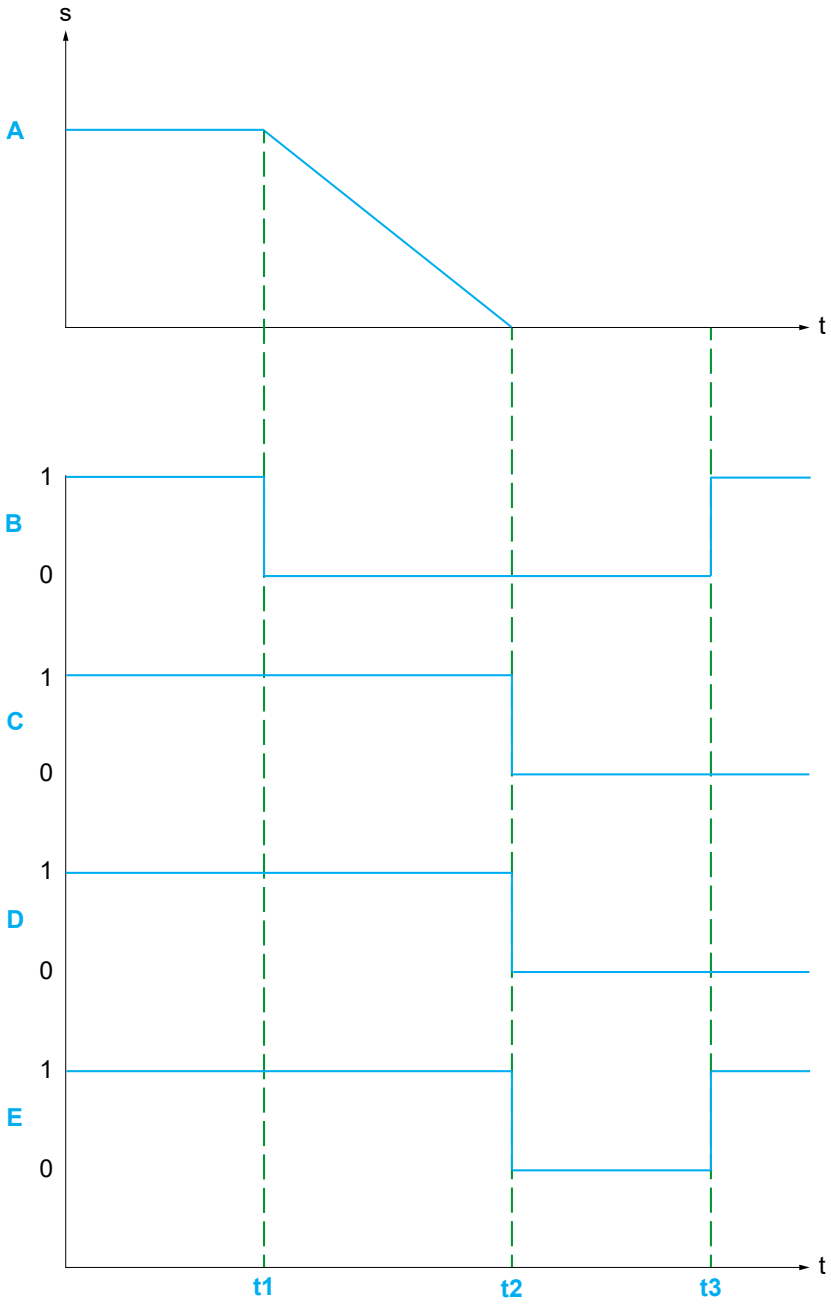


The Lexium Cobot Controller can also control other systems with the following safety-related outputs:

- Lexium Cobot Control Stick emergency stop pushbutton state two-channel safety-related digital output, if configured in EcoStruxure Cobot Expert (SF19).
- Emergency stop state of the Lexium Cobot system two-channel safety-related digital output, if configured in EcoStruxure Cobot Expert (SF20).

For example, the status of one Lexium Cobot system can be connected to another Lexium Cobot system to synchronize the emergency stop status.

The following graphic presents the emergency stop sequence.



s Motion speed

t Time

A Lexium Cobot Arm motion speed

B Emergency stop input signal

C Lexium Cobot Arm is disabled (0) or enabled (1)

D Lexium Cobot Arm is powered off (0) or powered on (1)

E SF19 and SF20 (SF19 only if the emergency stop is triggered by SF1)

t1 Emergency stop pushbutton is pressed

t2 Maximum stopping time of 250 ms

t3 Emergency stop pushbutton is released

Diagnostic

The Lexium Cobot Controller monitors the status of the safety-related inputs. If inconsistent signals are detected, the Lexium Cobot system performs a category 1 stop with a maximum stopping time of 250 ms. After this time, the Lexium Cobot Arm is powered off. The corresponding diagnostic messages are displayed in EcoStruxure Cobot Expert.

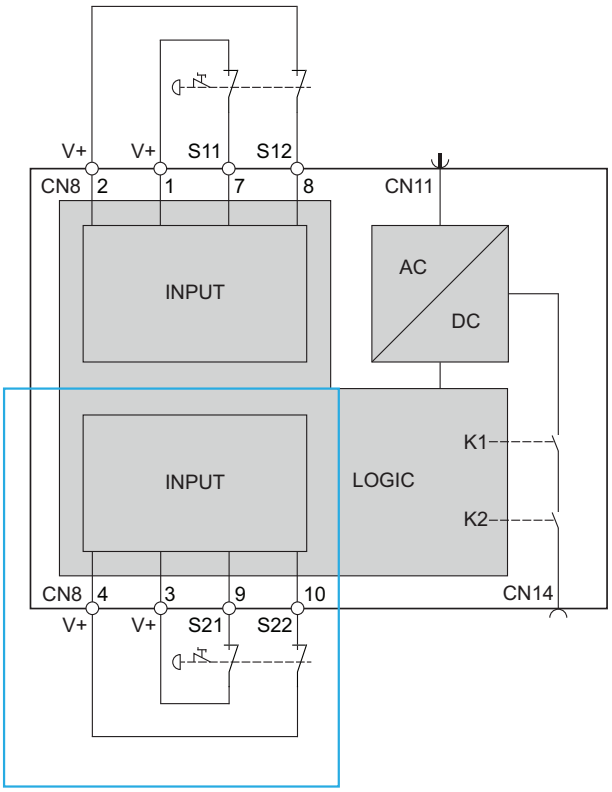
Protective Stop Safety Functions

Functional Description

The Lexium Cobot system provides the following options to implement a protective stop:

- Connecting a suitable safety-related external device to CN8 (pin S21 and S22) at the Lexium Cobot Controller (SF3).
- Connecting a suitable safety-related external device to a two-channel safety-related digital input at the Lexium Cobot Controller, if configured in EcoStruxure Cobot Expert (SF16).

Connected protective stops can be used together. If a protective stop is requested, the Lexium Cobot system stops the Lexium Cobot Arm motion. The Lexium Cobot Arm remains enabled and keeps the position (stop category 2 in accordance with IEC 60204-1 with a maximum response time of 350 ms). The executed program of the Lexium Cobot system is paused.

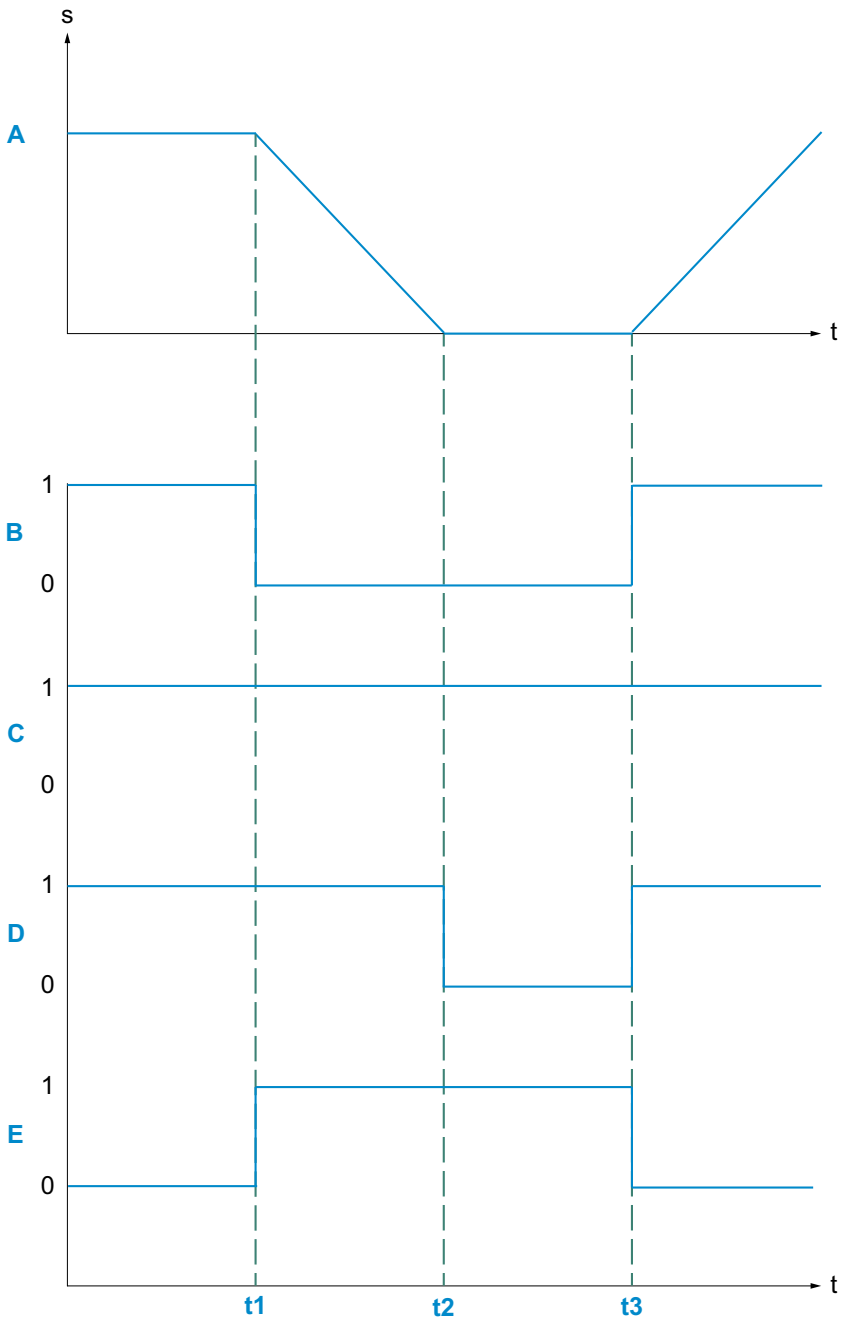


The Lexium Cobot Controller can also control other systems with the following safety-related output:

Protective stop of the Lexium Cobot system two-channel safety-related digital output, if configured in EcoStruxure Cobot Expert (SF21).

For example, the status of one Lexium Cobot system can be connected to another Lexium Cobot system to synchronize the protective stop status.

The following graphic presents the default protective stop sequence with automatic reset.



s Motion speed

t Time

A Lexium Cobot Arm motion speed

B Protective stop input signal

C Lexium Cobot Arm powered on and enabled

D Output of SF21

E Program paused

t1 Protective stop pushbutton is pressed

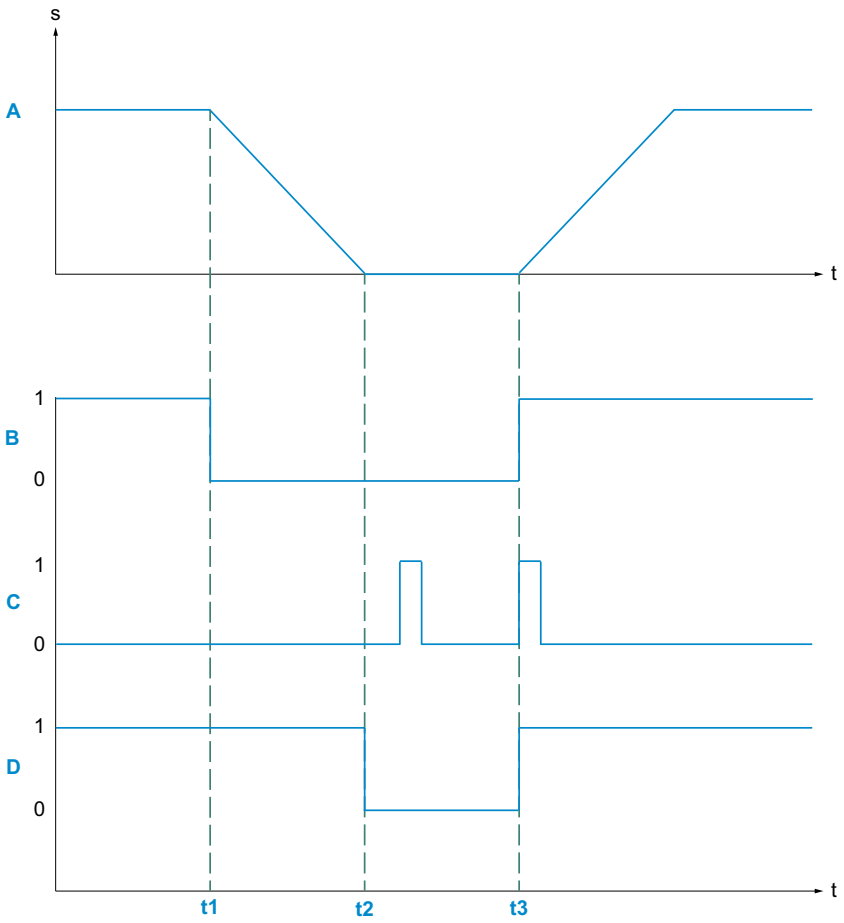
t2 Maximum stopping time of 350 ms

t3 Protective stop pushbutton is released

The protective stop is set to auto-reset by default. Alternatively, manual reset is possible using the following two-channel safety-related input:

Protective stop reset two-channel safety-related digital input at the Lexium Cobot Controller, if configured by EcoStruxure Cobot Expert (SF17). Reset is requested by the rising edge signal.

The following graphic presents the protective stop sequence with manual reset configured.



s Motion speed

t Time

A Lexium Cobot Arm motion speed

B Protective stop input signal

C Protective stop manual reset input signal

D Output of SF21

t1 Protective stop pushbutton is pressed

t2 Maximum stopping time of 350 ms

t3 Protective stop pushbutton is released

Diagnostic

The Lexium Cobot Controller monitors the status of the safety-related inputs. If inconsistent signals are detected, the Lexium Cobot system performs a category 2 stop. If the arm is still moving after the stopping time, a category 2 stop is performed as a fallback. The corresponding diagnostic messages are displayed in EcoStruxure Cobot Expert.

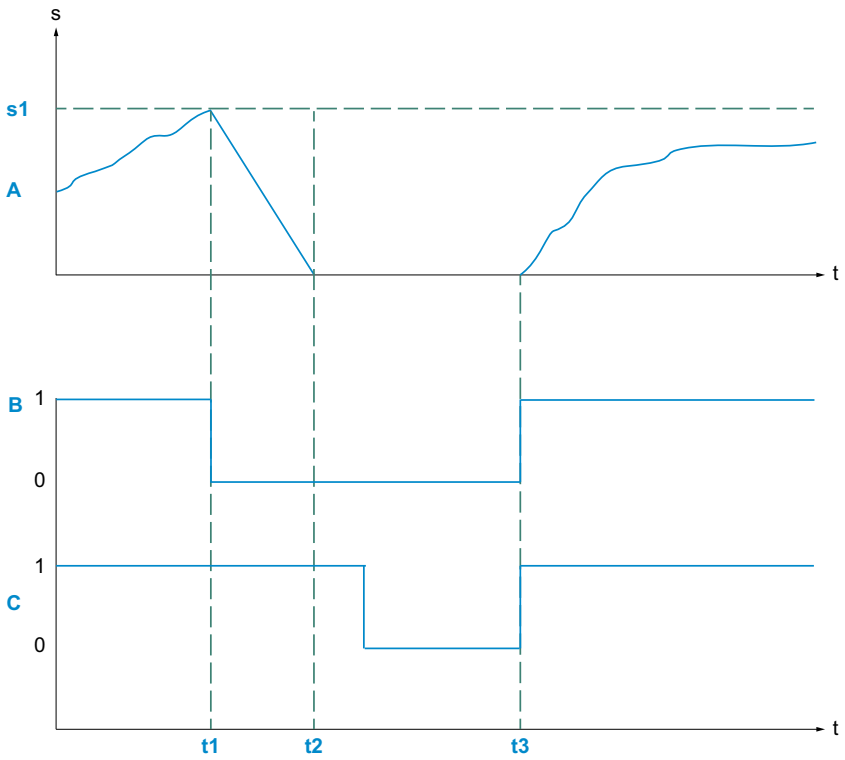
Hand Guiding Safety Functions

Functional Description

The hand-guided mode for the Lexium Cobot Arm can be activated by holding the **FREE** button or the **play/pause** button, both of which are located at the tool flange. If configured in EcoStruxure Cobot Expert, an external 3-position enable switch can be connected to a two-channel safety-related digital input (SF27).

The Lexium Cobot Arm is operating with a maximum linear TCP speed limit of 250 mm/s during hand-guiding (SF13). If the TCP speed limit is exceeded, or the signal of the 3-position enable switch is low, the system stops the Lexium Cobot Arm motion and the Lexium Cobot Arm keeps the position (category 2 stop in accordance with IEC 60204-1 with a maximum response time of 350 ms).

The following graphic presents the hand-guided mode sequence for SF13.



s Motion speed

t Time

A Lexium Cobot Arm motion speed

B Hand-guided mode is inactive (0) or active (1)

C FREE or **play/pause** button signal (1 = pressed, 0 = released)

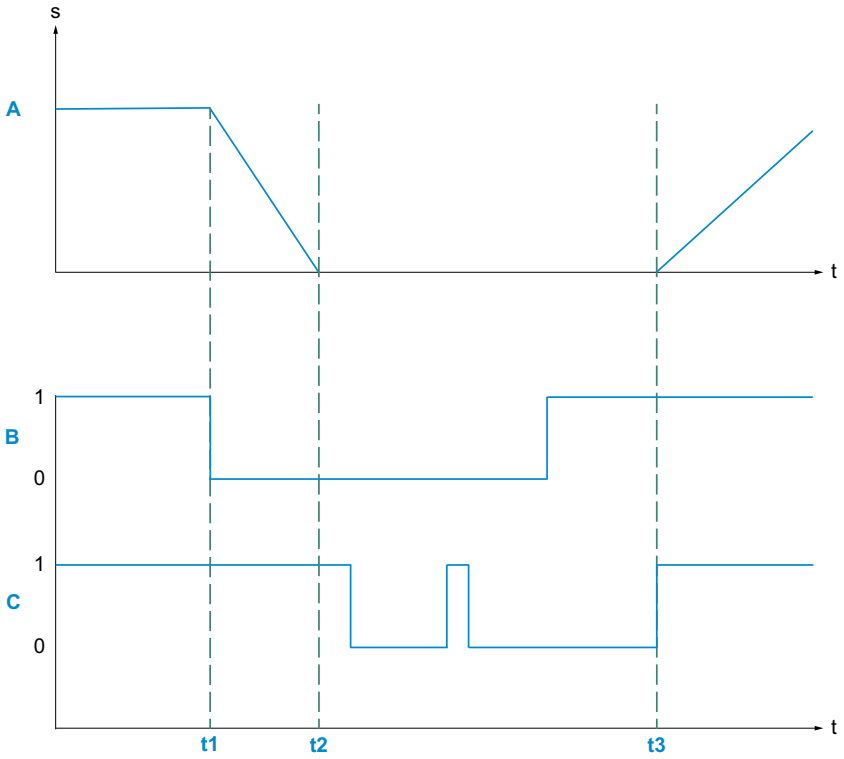
s1 TCP speed limit of 250 mm/s

t1 TCP speed limit exceeded

t2 Maximum stopping time of 350 mm/s

t3 FREE or **play/pause** button is pressed again

The following graphic presents the hand-guided mode sequence for SF27.



s Motion speed

t Time

A Lexium Cobot Arm motion speed

B 3-position enable switch input

C **FREE** or **play/pause** button signal (1 = pressed, 0 = released)

t1 3-position enable switch signal is low

t2 Maximum stopping time of 350 mm/s

t3 **FREE** or **play/pause** button is pressed again

Diagnostic

The Lexium Cobot Controller monitors the state of the safety-related inputs. If inconsistent signals are detected, the Lexium Cobot system performs a category 2 stop. The corresponding diagnostic messages are displayed in EcoStruxure Cobot Expert.

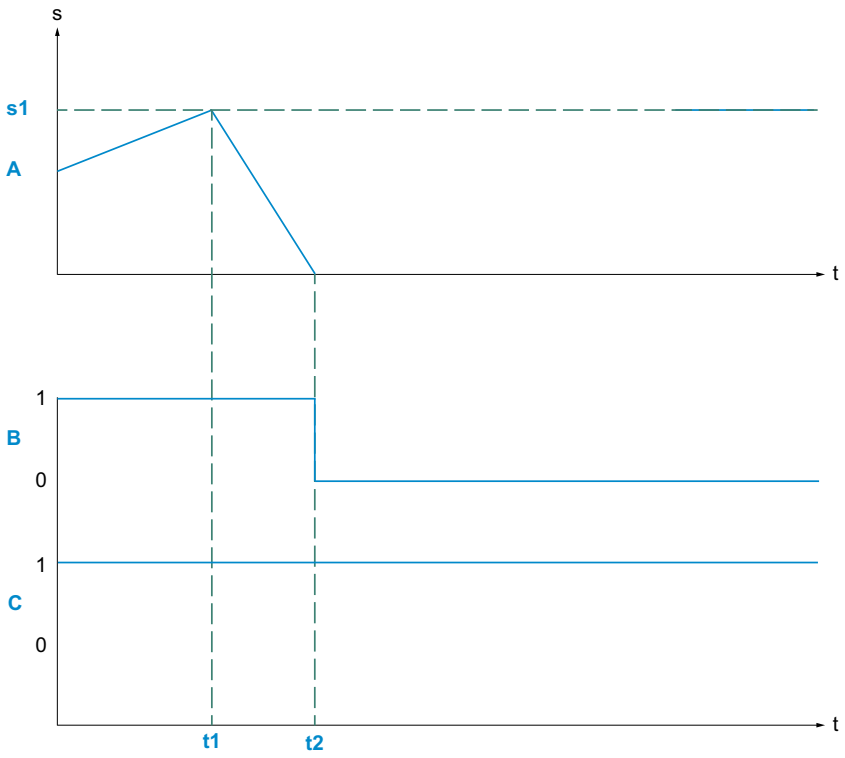
Speed Monitoring (Reduced Mode) Safety Functions

Functional Description

The Lexium Cobot system monitors the angular speed of each joint (SF5) and the linear speed of the TCP (SF9) of the Lexium Cobot Arm during operation. If the configured limits are exceeded, the Lexium Cobot system stops the Lexium Cobot Arm motion, engages the internal brake and removes power from the Lexium Cobot Arm joints after a maximum stopping time of 250 ms (category 1 stop in accordance with IEC 60204-1). The Lexium Cobot Arm remains powered but is disabled.

These limits must be configured in EcoStruxure Cobot Expert. For detailed information on configuring the joint speed limit and the TCP speed limit, refer to the chapter *Safety Setting* in the *EcoStruxure Cobot Expert User Guide*.

The following graphic presents the speed monitoring sequence.



s Motion speed

t Time

A Lexium Cobot Arm joint / TCP speed

B Lexium Cobot Arm is disabled (0) or enabled (1)

C Lexium Cobot Arm is powered off (0) or powered on (1)

s1 Joint speed limit / TCP speed limit

t1 Joint speed limit or TCP speed limit exceeded

t2 Maximum stopping time of 250 ms

The Lexium Cobot also provides a pre-defined reduced mode with the following reduced values:

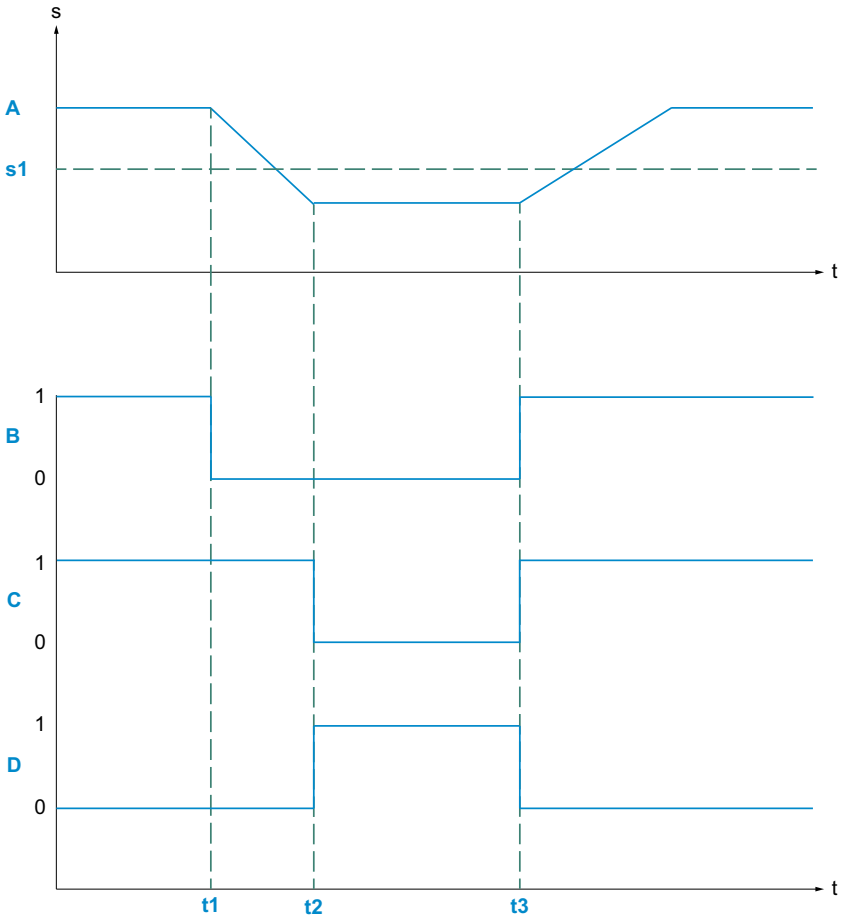
Commercial reference	Limit	Value	Unit
LXMRL03S0000	Maximum TCP speed	250 (0.82)	mm/s (ft/s)
	Maximum Lexium Cobot Arm speed	250 (0.82)	mm/s (ft/s)
	Momentum	0.8	kg*m/s
	Power	35	W

NOTE: The Lexium Cobot Arm adjusts its motion parameters to the momentum and the power limits. However, the resulting speed does not exceed 250 mm/s. If the actual values are equal to or smaller than the reduced values, they are retained.

The reduced mode of Lexium Cobot system can be activated by a low signal on any configured two-channel safety-related digital input on the Lexium Cobot Controller (SF18). If needed, the status of the reduced mode can be provided by a configured two-channel safety-related output, as *In Reduced Mode* (SF24) or *Not In Reduced Mode* (SF25).

NOTE: The deceleration is performed with a configured deceleration for the program sequence.

The following graphic presents the speed monitoring sequence in reduced mode.



s Motion speed

t Time

A Lexium Cobot Arm motion speed

B Reduced Mode input signal

C In Reduced Mode output signal

D Not In Reduced Mode output signal

s1 TCP / Lexium Cobot Arm speed limit

t1 Reduced mode is activated

t2 Reduced mode is reached

t3 Reduced mode is deactivated

Diagnostic

The Lexium Cobot Controller monitors the speed. If the Lexium Cobot Arm exceeds the configured TCP and joint speed limits, the Lexium Cobot system performs a category 1 stop.

The state of the safety-related inputs is monitored. If inconsistent signals are detected, the Lexium Cobot Arm switches into reduced mode. The corresponding diagnostic messages are displayed in EcoStruxure Cobot Expert.

Torque and Power Limitations Safety Functions

Functional Description

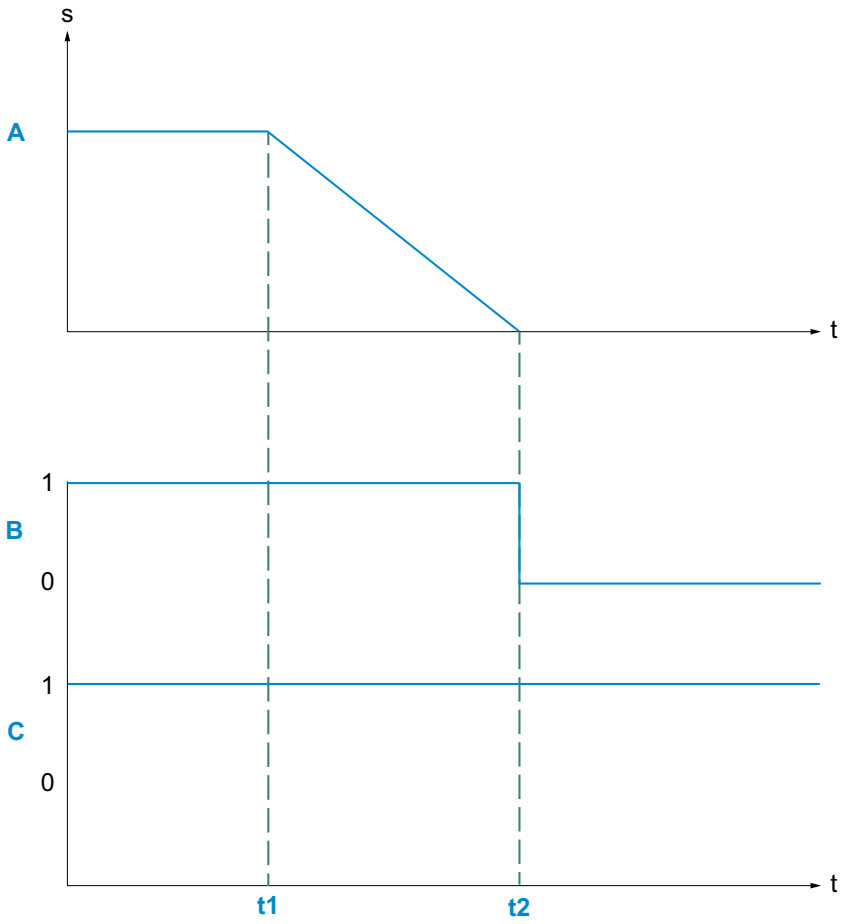
The Lexium Cobot system monitors the power of the Lexium Cobot Arm and can limit it if necessary. The robot power limit is used to limit the total motion power (SF8). This limit must be configured in EcoStruxure Cobot Expert. For detailed information on configuring the robot power limit, refer to the chapter *Collision Protection* in the *EcoStruxure Cobot Expert User Guide*.

The Lexium Cobot system also has several safety functions to help protect the Lexium Cobot Arm from equipment damage. These functions are not accessible for users (it is a factory setting that considers the capacity of the joint). These functions monitor the following parameters and trigger a defined safe state if the safety limits are exceeded:

- Joint Torque Limit for each joint (SF6)
- Joint Power Limit for each joint (SF7)

If any of the limits is exceeded, the Lexium Cobot system stops the Lexium Cobot Arm motion, engages the internal brake, and removes power from the Lexium Cobot Arm joints after a maximum stopping time of 250 ms (category 1 stop in accordance with IEC 60204-1). The Lexium Cobot Arm remains powered but is disabled.

The following graphic presents the sequence of force and power limits.



s Motion speed

t Time

A Lexium Cobot Arm motion speed

B Lexium Cobot Arm is disabled (0) or enabled (1)

C Lexium Cobot Arm is powered off (0) or powered on (1)

t1 Robot power limit, joint torque limit, or joint power limit exceeded

t2 Maximum stopping time of 250 ms

Diagnostic

The Lexium Cobot Controller monitors the power and torque parameters of the Lexium Cobot Arm. If the Lexium Cobot Arm exceeds the joint torque, joint power and configured robot power limits, the Lexium Cobot system performs a category 1 stop.

Collision Protection Safety Functions

Functional Description

The Lexium Cobot system provides the following options to detect collisions of the Lexium Cobot Arm:

- Collision is monitored by various feedback parameters of the joints (SF14).
- The Lexium Cobot Controller estimates the TCP force via joint angles and joint torques. If the TCP force exceeds the configured limit, the system detects a collision (SF26).
- The Lexium Cobot system monitors the position deviation of every joint (SF12).

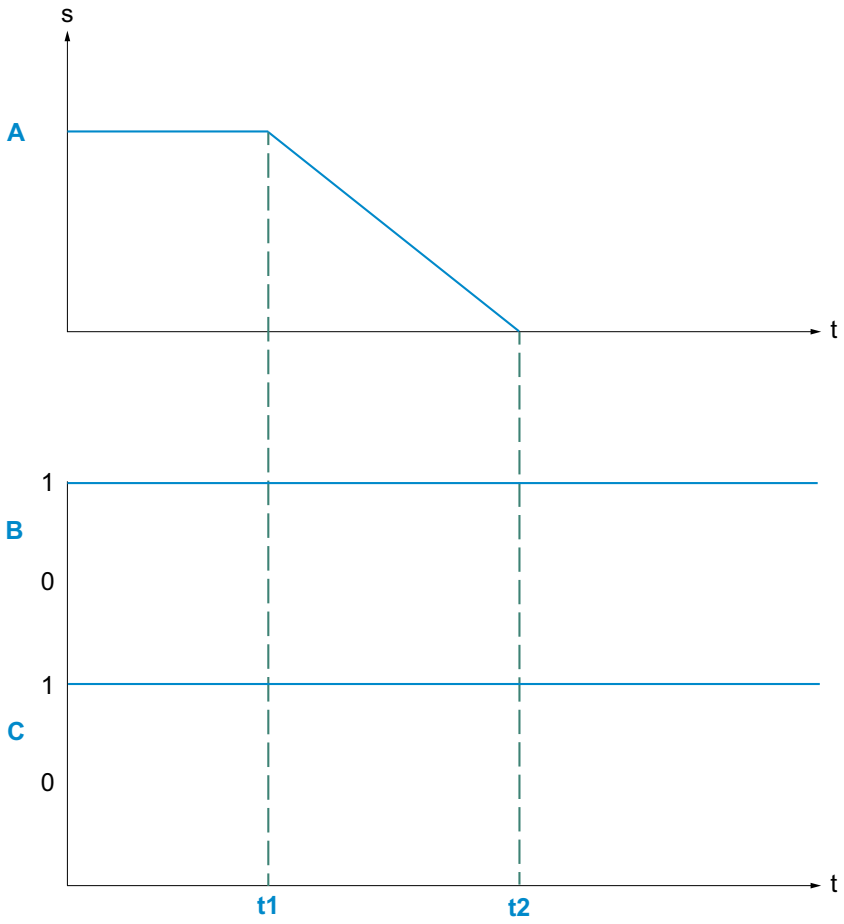
The collision sensitivity (SF14 and SF26) must be configured in EcoStruxure Cobot Expert. For detailed information on configuring the collision protection settings, refer to the chapter *Collision Protection* in the *EcoStruxure Cobot Expert User Guide*.

NOTE: The appropriate configuration of collision detection for your specific application depends on your risk assessment.

If a collision is detected, the Lexium Cobot system stops the Lexium Cobot Arm motion. The Lexium Cobot Arm remains enabled and keeps the position (category 2 stop in accordance with IEC 60204-1 with a maximum response time of 350 ms). The executed program of the Lexium Cobot system is paused.

NOTE: The post-collision procedure can be configured to **Program terminated and rebound**. In this configuration, the Lexium Cobot Arm performs a short backward movement and the program being executed is stopped and terminated. For further information on the post-collision procedure and its configuration, refer to the chapter *Collision Protection* in the *EcoStruxure Cobot Expert User Guide*.

The following graphic presents the collision protection sequence.



s Motion speed

t Time

A Lexium Cobot Arm motion speed

B Lexium Cobot Arm is disabled (0) or enabled (1)

C Lexium Cobot Arm is powered off (0) or powered on (1)

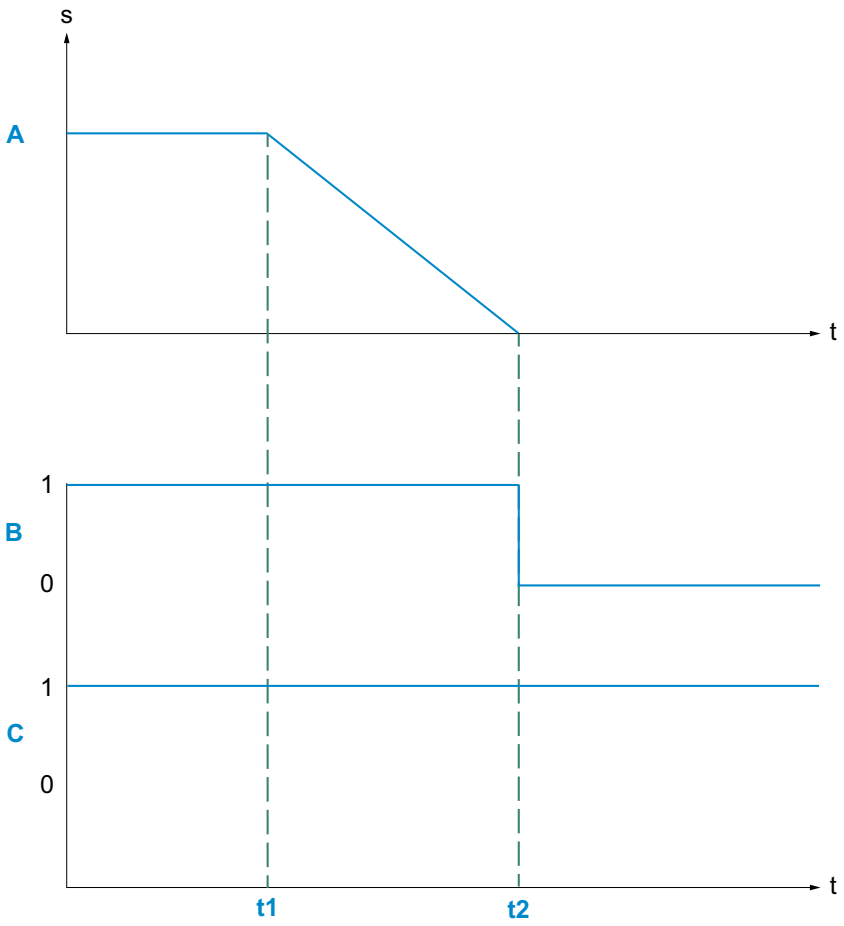
t1 Collision detected

t2 Maximum stopping time of 350 ms

The Lexium Cobot system monitors the position of each joint in real time (SF12). If the position deviation exceeds the internal limit, the Lexium Cobot system stops the Lexium Cobot Arm motion, engages the internal brake, and removes power from the Lexium Cobot Arm joints after a maximum stopping time of 250 ms (category 1 stop in accordance with IEC 60204-1). The Lexium Cobot Arm remains powered but is disabled.

NOTE: The internal position deviation limit is a factory setting that cannot be modified. It considers the internal parameters of the joints.

The following graphic presents the collision protection sequence triggered by position deviation.



s Motion speed

t Time

A Lexium Cobot Arm motion speed

B Lexium Cobot Arm is disabled (0) or enabled (1)

C Lexium Cobot Arm powered off (0) or powered on (1)

t1 Collision triggered by position deviation

t2 Maximum stopping time of 250 ms

Diagnostic

The Lexium Cobot Controller monitors different parameters of the Lexium Cobot Arm to detect a collision. If a collision is detected, the Lexium Cobot system performs a category 2 stop.

If the position deviation limit is exceeded, even if no collision is detected, the system performs a category 1 stop.

Position Monitoring Safety Functions

Functional Description

The Lexium Cobot system provides the following options to limit the Lexium Cobot Arm motion:

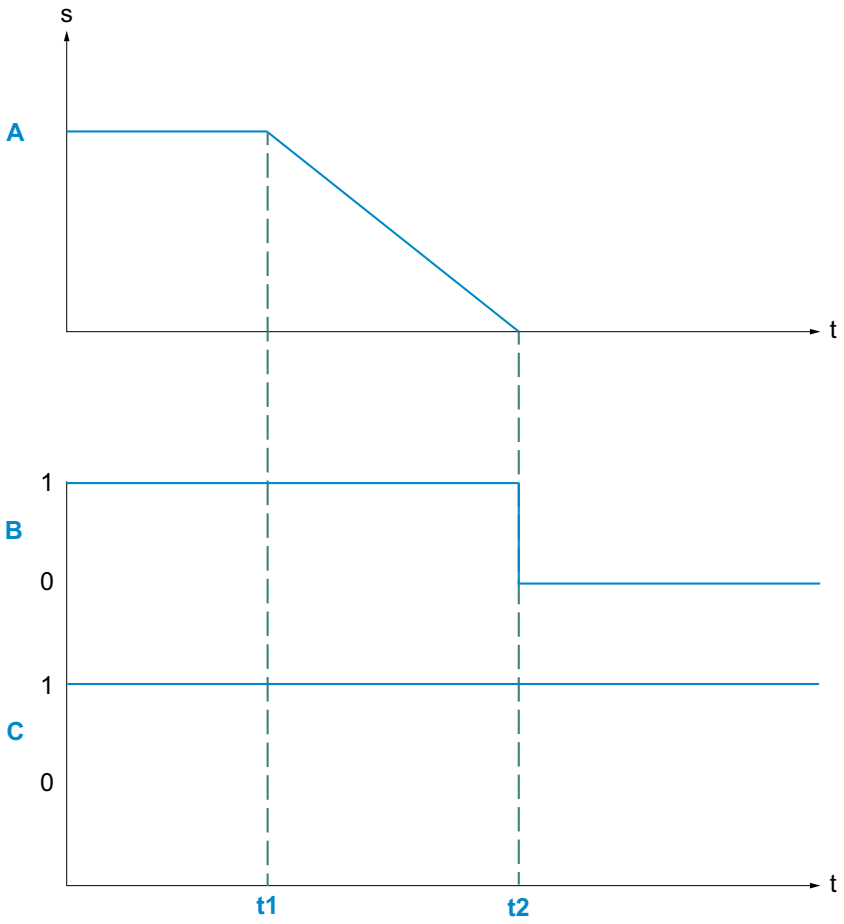
- Reducing the permitted movement (position) range for each joint (SF4)
- Limiting the permitted orientation of the tool (SF10)
- Limiting the position in space by setting safety planes (SF11)

The different position monitoring functions can be combined. These functions must be configured in the EcoStruxure Cobot Expert. For detailed information on configuring the joint position limit, tool orientation limit, and TCP position limit (safety planes), refer to the chapter *Safety Setting* in the *EcoStruxure Cobot Expert User Guide*.

If the Lexium Cobot Arm exceeds one or more of the limits, the Lexium Cobot system stops the Lexium Cobot Arm motion, engages the internal brakes, and removes power from the Lexium Cobot Arm joints after a maximum stopping time of 250 ms (category 1 stop in accordance with IEC 60204-1). The Lexium Cobot Arm remains powered but is disabled.

NOTE: For safety planes, the response can be changed in EcoStruxure Cobot Expert to either Protective Stop (category 2 stop, refer to Protective Stop Safety Functions, page 84) or Reduced Mode (refer to Speed Monitoring (Reduced Mode) Safety Functions, page 89).

The following graphic presents the position monitoring sequence.



s Motion speed

t Time

A Lexium Cobot Arm motion speed

B Lexium Cobot Arm is disabled (0) or enabled (1)

C Lexium Cobot Arm powered off (0) or powered on (1)

t1 Position limit exceeded

t2 Maximum stopping time of 250 ms

Diagnostic

The Lexium Cobot Controller monitors the joint position, TCP position, and tool orientation. If the defined limits are exceeded, the Lexium Cobot system performs a category 1 stop.

Motion Status Safety Functions

Functional Description

The Lexium Cobot system provides the following options for monitoring the Lexium Cobot Arm motion:

- Robot in Motion status two-channel safety-related digital output, if configured in EcoStruxure Cobot Expert (SF22).

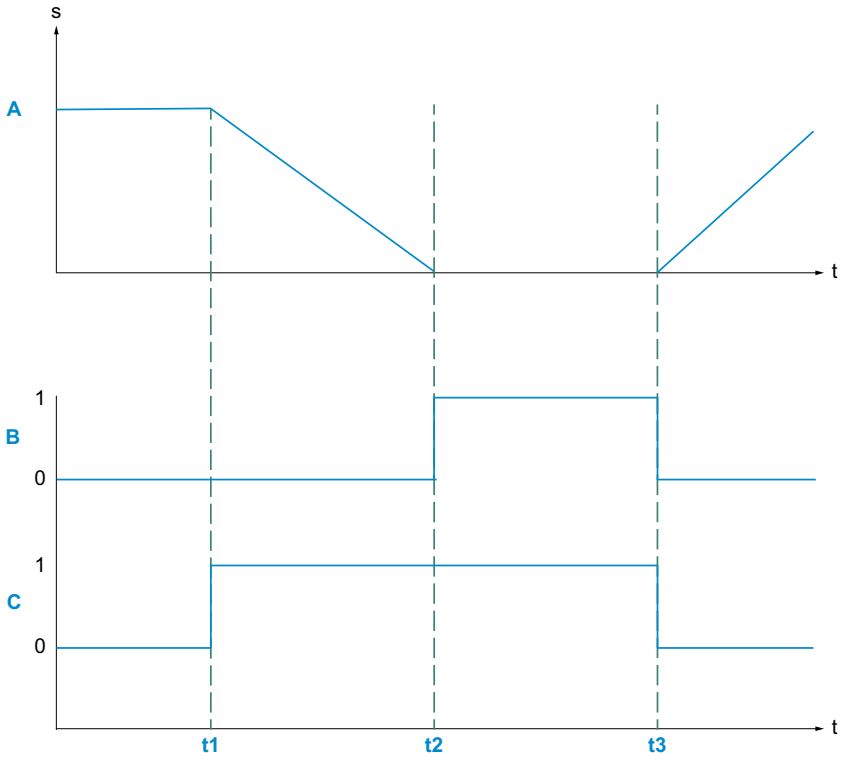
  This output is FALSE (low) when the Lexium Cobot Arm is moving.

- Robot Not Stopping status two-channel safety-related digital output, if configured in EcoStruxure Cobot Expert (SF23).

  This output is FALSE (low) when the Lexium Cobot Arm is moving and not stopping (standstill or in the process of stopping).

  The output signal is TRUE (high) if the Lexium Cobot Arm is decelerated to stop and stays TRUE (high) while the Lexium Cobot Arm is at standstill.

The following graphic presents the logic of the outputs.



For detailed information on these outputs, refer to the following graphic:

s Motion speed

t Time

A Lexium Cobot Arm motion speed

B Robot In Motion signal

C Robot Not Stopping signal

t1 Emergency stop or protective stop is requested and the Lexium Cobot Arm decelerates

t2 Maximum stopping time

t3 Lexium Cobot Arm is moving again

Safety-Related Key Data

The designated safety functions have been designed and tested for functional safety according to the following standards:

- IEC 60204-1
- ISO 13849-1

According to the above listed standards, the values for the Lexium Cobot safety functions are as follows.

Group of safety functions	Safety function	Maximum stopping time / safety stop distance	MTTFd in years	Common cause failure (CCF)
Emergency stop	SF1 – Emergency Stop Button on the Control Stick	250 ms / 250 mm	92.43	95
	SF2 – External Emergency Stop Button			
	SF15 – Additional Emergency Stop Input			
	SF19 – Emergency Stop Button State (Digital Output)	n/a	90.68	
	SF20 – Emergency Stop State (Digital Output)			
Protective stop	SF3 – External Protective Stop	350 ms / 350 mm	69.50	95
	SF16 – Additional Protective Stop Input			
	SF17 – Protective Stop Reset Input	n/a		
	SF21 – Protective Stop State (Digital Output)		68.83	
Hand guiding	SF13 – TCP Speed Limit in Hand Guiding	350 ms / 350 mm	36.80	75
	SF27 – 3-Position Enable Switch Input		69.50	95
Speed monitoring (Reduced Mode)	SF5 – Joint Speed Limit	250 ms / 250 mm	75.46	95
	SF9 – TCP Speed Limit		36.80	75
	SF18 – Reduced Mode Input	n/a	69.50	95
	SF24 – In Reduced Mode (Digital Output)	100 ms / n/a	41.83	95
	SF25 – Not in Reduced Mode (Digital Output)			
Torque and power limitations	SF6 – Joint Torque Limit	250 ms / 250 mm	77.47	75
	SF7 – Joint Power Limit			
	SF8 – Robot Power Limit		39.81	
Collision protection	SF12 – TCP Position Mismatch Limit	250 ms / 250 mm	36.80	75
	SF14 – Collision Protection	350 ms / 350 mm		
	SF26 – TCP Force Limit		31.14	
Position monitoring	SF4 – Joint Position Limit	250 ms / 250 mm	75.46	95
	SF10 – Tool Orientation Limit		36.80	75
	SF11 – Safety Planes			

Group of safety functions	Safety function	Maximum stopping time / safety stop distance	MTTFd in years	Common cause failure (CCF)
Motion status	SF22 – Robot in Motion (Digital Output)	100 ms / n/a	41.83	95
	SF23 – Robot Not Stopping (Digital Output)			
n/a not applicable				

Initial Start-Up

Powering on the Lexium Cobot Controller

The Lexium Cobot Controller can be powered on via the Control Stick.

To power on the Lexium Cobot Controller via the Control Stick, press the **On/Off** button on the Control Stick.

Powering on the Lexium Cobot Arm

There are two options to power on the Lexium Cobot Arm:

- Powering on via Control Stick
- Powering on via EcoStruxure Cobot Expert software

To power on the Lexium Cobot Arm via the Control Stick, proceed as follows:

Step	Action
1	Press the **Power/Enable** button on the Control Stick to power on the Lexium Cobot Arm. **Result:** Lexium Cobot Arm illuminated ring changes to blue illumination (Lexium Cobot status: Power ON).
2	Hold the **Lock/Function** button on the Control Stick while you press the **Power/Enable** button to enable the Lexium Cobot Arm. **Result:** Lexium Cobot Arm illuminated ring changes to green illumination (Lexium Cobot status: Enabled).
3	Press the **Lock/Function** button on the Control Stick for 3 seconds to unlock the Control Stick **Result:** The lock indicator on the Control Stick is off.

You can also power on the Lexium Cobot Arm via EcoStruxure Cobot Expert. For further Information, refer to the chapter *Starting Up the Lexium Cobot System* in the *EcoStruxure Cobot Expert User Guide*.

Setting the Monitoring

Software Limits for Working Space

For the definition of application-specific software limits, refer to the EcoStruxure Cobot Expert User Guide.

Testing the Additional Protective Devices

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

Verifying the Monitoring

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

Start-Up

Overview

When the Lexium Cobot is operated for the first time, there is a risk of unintended equipment operation caused by possible wiring errors, improper mounting and fastening, or unsuitable parameters.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Verify that the Lexium Cobot is properly and firmly fastened.
- Take all necessary measures to ensure that the moving parts of the Lexium Cobot Arm 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 obstacle-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 Lexium Cobot Arm power supply is disabled unintentionally, for example as a result of power outage, errors or functions, the Lexium Cobot Arm 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.

⚠WARNING

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 Heat Dissipation, page 18.

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

Commissioning Procedure

Step	Action
1	Comply with the instructions provided in this manual.
2	Verify that the load conforms to the specified payloads for the Lexium Cobot Arm before operating.

Step	Action
3	Assign the Lexium Cobot Controller and Lexium Cobot Arm in EcoStruxure Cobot Expert.
4	Configure the installation setting of the Lexium Cobot Arm. For further Information, refer to the chapter *Installation Settings* in the *EcoStruxure Cobot Expert User Guide*.
5	Verify the calibration and position and direction of the joints.
6	Verify the orientation of the world coordinate system in the manual operation interface. For further Information, refer to the chapter *Manual Operation Interface* in the *EcoStruxure Cobot Expert User Guide*. **NOTE:** The world coordinate system depends on the mounting position.
7	Configure the collision protection settings in accordance to the safety-related requirements of your application. For further information on the configuration, refer to the chapter *Collision Protection* in the *EcoStruxure Cobot Expert User Guide*.
8	Perform initial tests at reduced velocity and verify the functionality of the Lexium Cobot Arm.
9	Verify that the operating condition of set cycles is lower than 80% of the total cycle time. **NOTE:** For a total cycle time of 10 seconds take care of maximum 8 seconds cycle running time and 2 seconds waiting period. If you exceed the duty cycle proportion of 80%, you may reduce the lifetime of the gearboxes of the Lexium Cobot joints.
10	Optionally, configure the home position for the **Home** button operation of the Control Stick. For further information on the Control Stick operations, refer to Lexium Cobot Control Stick Details, page 38, and for the configuration of the home position, refer to the chapter *Robot Pose* in the *EcoStruxure Cobot Expert User Guide*.
11	In case of using several Lexium Cobot systems, optionally assign unique names for the devices for easier identification. For further information, refer to the chapter *Initial Settings* in the *EcoStruxure Cobot Expert User Guide*.

Starting the Default Program

There are two options for automatically starting the program set as default on the Lexium Cobot Arm:

- Starting via Control Stick
- Starting via EcoStruxure Cobot Expert software

To start the default program via the Control Stick press the **Start/Stop** button on the Control Stick.

For further information on starting and setting the default program via EcoStruxure Cobot Expert, refer to the chapter *Default Program* in the *EcoStruxure Cobot Expert User Guide*.

Mounting the Payload

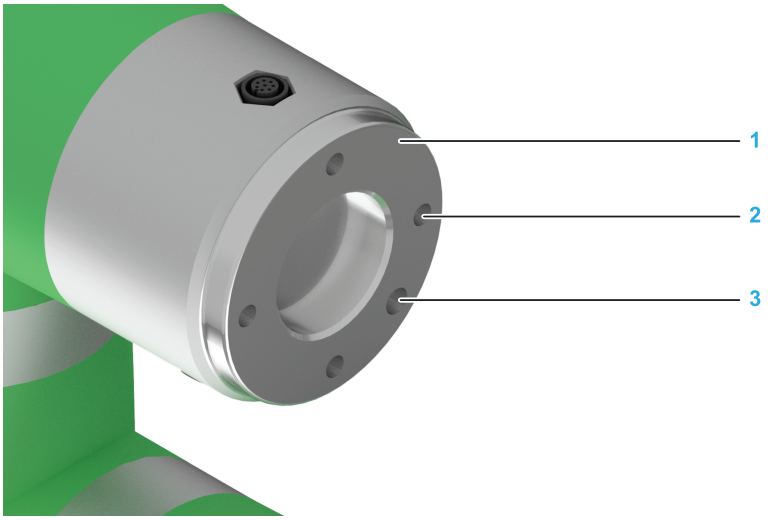
Mounting the End-Effector

Prerequisites

Observe the following prerequisites to help avoid incorrect operation of the Lexium Cobot:

- Verify that the load conforms to the specified payloads for the Lexium Cobot Arm before operating.
- Limit the maximum payload of the motor in accordance with the maximum load capacity of the Lexium Cobot Arm. For further information, refer to Load Capacity of Lexium Cobot Arm, page 61.

Mounting the End-Effector

Step	Action
1	Fasten the end-effector to the mounting points provided for this purpose on the Lexium Cobot Arm tool flange (1): • Pitch circle diameter 50 mm (1.97 in): 4x M6 (2), tightening torque: 11 Nm (97 lbf-in), strength class of the screw: at least 8.8 or A2-70 • Pitch circle diameter 50 mm (1.97 in): 1x fitting hole diameter 6 H7 (3)  For further information on the flange dimensions, refer to Dimensional Drawing of Lexium Cobot Arm, page 41.
2	Calibrate the end-effector in EcoStruxure Cobot Expert, if this has not yet been done during initial start-up. For further information on calibrating the end-effector, refer to the chapter *TCP Settings* in the *EcoStruxure Cobot Expert User Guide*.
3	Set the payload in EcoStruxure Cobot Expert. For further information, refer to the chapter *Load Setting* in the *EcoStruxure Cobot Expert User Guide*. **NOTE:** Observe the permissible weights and distances that results in load capacity of the Lexium Cobot Arm.

Supply of the End-Effector

Feeding the Media to the End-Effector

Step	Action
1	Feed in the media line from cables, hoses, and other media, via the base to the joints and tubes. **NOTE:** Verify that the additional loads on the joints and tubes are as small as possible, to help avoid damage to the Lexium Cobot Arm due to dynamic forces. Verify that attaching additional media guide fasteners to joints and tubes does not damage the Lexium Cobot Arm.
2	Feed the media lines from the joints and tubes of the Lexium Cobot Arm to the tool flange. **NOTE:** Verify the correct routing and fastening of the media line to help prevent any collision of cables, hoses, other media and moving parts.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- Joints and tubes must not be damaged by attaching additional media guide fasteners.
- Distribute loads to joints and tubes in a way that minimizes the rotational forces on the Lexium Cobot Arm.

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

Optional Equipment

What's in This Chapter

Lexium Cobot Controller Power Supply Cable

Some applications require a specific power supply cable for Lexium Cobot Controller in accordance with local requirements. For such applications, you can apply the available power supply cables for the markets in the USA, China, Great Britain, India and South Korea (sold seperately).

Country	Item reference
USA	LXMRL00YYCUS
China	LXMRL00YYCCN
Great Britain	LXMRL00YYCGB
India	LXMRL00YYCIN
South Korea	LXMRL00YYCKR

Add-on Handheld for Tablet

Add-on Presence Control Device for 3-Position Enabling

Some applications require additional functionalities in regards of enhanced safety functions as 3-position enabling control unit. For such applications, you can apply the Lexium Cobot Arm add-on presence control device for 3-position enabling.

Maintenance and Repair

What's in This Chapter

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 connection cable.

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

Insufficient 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.

Maintenance Schedule

Intervals	Action
Every 150 hours of operation or weekly	Visually inspect the Lexium Cobot system and verify for any damage or loose or missing moving parts.
	Verify the inlet and outlet filter of the Lexium Cobot Controller for any dirt or blockage.
	Verify the Lexium Cobot Controller and the Lexium Cobot Arm for exceptional heat dissipation and noise emission.
	Verify that the Lexium Cobot Arm keeps the position while powering on and off the Lexium Cobot Arm.
Every 1,000 hours of operation or every three months	Verify the connections for tight fit.
	Clean the Lexium Cobot mechanics.
	Verify that the exposed bolts on the outside of the Lexium Cobot Arm are tightened with the correct torque, including mounting of end effector at tool flange.
	Verify the Lexium Cobot Arm for leakages at the joints.
Annually	Verify the brake function during operation.
Every 20,000 hours of operation	Visually inspect the Lexium Cobot Arm and verify for any damage and whether it still fits your application needs and replace it if necessary.

NOTICE

INOPERABLE EQUIPMENT / REDUCTION OF LIFETIME

- Use a soft cloth to remove dust or process residue from the Lexium Cobot Arm.
- Do not blow off dust or process residue from the Lexium Cobot Arm using air blowers, compressed air or similar equipment.
- Do not clean the Lexium Cobot Controller inlet and outlet filters while installed using air blowers, compressed air, vacuum cleaners or similar equipment.

Failure to follow these instructions can result in equipment damage.

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 Lexium Cobot heats up significantly when subjected to heavy loads and/or high performance.

⚠WARNING

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 Heat Dissipation, page 18.

Filter Cleaning and Replacement

Step	Action
1	Power off the Lexium Cobot Controller.
2	Remove the nut from the filter housings and remove the filters.
3	Clean the dust adhering to the filter by blowing it out in the opposing direction to the airflow while installed. **NOTE:** When there is dirt, apply warm water or a neutral detergent. If it still cannot be cleaned, it should be replaced.
4	Installation should be carried out in the reverse order of removal.

NOTE: When cleaning with warm water or a neutral detergent, it should be fully dried before re-installation.

NOTICE

INOPERABLE EQUIPMENT AND REDUCTION OF SERVICE LIFE

Do not clean the inlet and outlet filters of the Lexium Cobot Controller with air blowers, compressed air, vacuum cleaners or similar equipment while they are installed.

Failure to follow these instructions can result in equipment damage.

Verification of Mechanical Position

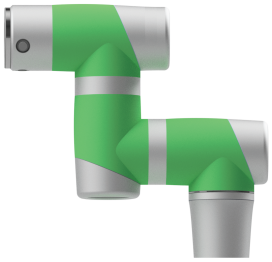
The mechanical position of each of the joints needs to be identical to the measures represented by the software in the Lexium Cobot Controller. The recalibration of a joint is necessary in the following cases:

- Replacement of joints
- Over-twisting of joints.

NOTE: For replacement and calibration of joints, contact your local Schneider Electric service representative.

To verify that the mechanical position of the joint matches with its representation in the software, each axis needs to be moved in a specific position. The following description explains how the zero position for each joint should be achieved.

Figure	Description
	Zero position of joint 1: Align joint 1 parallel to the electrical connector and turn it counterclockwise by 90°.
	Zero position of joint 2 and 3: • Follow the instruction for zero position of joint 1. • Move the upper and the lower tube of the Lexium Cobot Arm so that they form a straight line and align joint 3 at a vertical angle with the upper tube. The angle between the installation mounting surface and this straight line (upper and lower tube) is 90°.

	Zero position of joint 4 and 5: • Follow the instruction for zero position of joints 1 to 3. • Bring the joint 5 to the 12 o'clock position and align joints 4 and 6 horizontally respectively parallel to the installation mounting surface.
	Zero position of joint 6: • Follow the instruction for zero position of joints 1 to 5. • Move the tool flange I/O connector of joint 6 in 12 o'clock position. The four tapped holes dedicated to the end-effector mounting need to be aligned in the 3, 6, 9 and 12 o'clock position.

Replacement Equipment and Accessories

What's in This Chapter

Replacement Equipment Inventory

Overview

Keeping a stock of the components helps ensure the availability of your Lexium Cobot. 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 Lexium Cobot type plate:

Parameter	Example value	Position on type plate
Item name	Lexium Cobot - Standard Robot max 3kg	First line
Item reference (type code)	LXMRL03S0000	second line
Hardware revision	00	HW

Replacement Equipment Stock

Replacement Equipment for the Lexium Cobot Arm

This following table presents the replacement equipment for the Lexium Cobot Arm.

Item description and content	Representation	Item reference	To be used for
End-effector M8 connection cable, length 400 mm (15.7 in)		LXMRL00YY011 Only available via service department. For further information contact your local Schneider Electric service representative	LXMRL03S0000

Replacement Equipment for the Lexium Cobot Controller

This following table presents the replacement equipment for the Lexium Cobot Controller.

Item description and content	Representation	Item reference	To be used for
Control Stick		LXMRL00YY013 Only available via service department. For further information contact your local Schneider Electric service representative	LXMRL03C1000
Power supply cable, 2 m (79 in)	–	LXMRL00YY009 Only available via service department. For further information contact your local Schneider Electric service representative	LXMRL03C1000

Troubleshooting

What's in This Chapter

Troubleshooting

Overview

Issue	Probable cause	Solution
Lexium Cobot is not reachable via EcoStruxure Cobot Expert.	Lexium Cobot Controller is powered off.	Power on the Lexium Cobot Controller.
	Blocked by firewall.	Verify the firewall settings.
	Not connected to the WiFi of the Lexium Cobot Controller.	Connect to the WiFi of the Lexium Cobot Controller.
	Not connected to the Lexium Cobot Controller via ethernet cable.	Verify the connection and functionality of the cable.
	Incorrect IP address.	Configure the IP settings accordingly.
Lexium Cobot Arm could not be enabled.	Joint x: self-learning overcurrent. Mechanical blocking of joint x.	Release the brake of joint x. Contact your local Schneider Electric service representative
	Emergency stop is pressed.	Release the emergency stop button.
Lexium Cobot Arm is not powering on.	The simulation mode is active.	Switch to the physical Lexium Cobot.
	Emergency stop is pressed.	Release the emergency stop button.
Emergency stop	Emergency stop is pressed.	Release the emergency stop button.
	No Control Stick connected.	Connect the Control Stick properly.
Default program is not executed.	Default program is not selected.	Select a default program in EcoStruxure Cobot Expert.
Home pose is not as intended.	Home pose has not been adjusted on initial start-up.	Adjust the home pose in EcoStruxure Cobot Expert.
Login to Lexium Cobot Controller via EcoStruxure Cobot Expert is not possible.	Time period of the certificate is not valid.	Verify the date and time setting and adjust if necessary.

Appendices

What’s in This Part

Further Information About the Manufacturer

What's in This Chapter

Contact Addresses

Schneider Electric Automation GmbH

Schneiderplatz 1

97828 Marktheidenfeld, Germany

Phone: +49 9391 603 5000

Internet: www.se.com

Other Contacts

See the homepage for additional contact addresses:

Contact Center | Schneider Electric Global (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

What's in This Chapter

Disposal

Information on the Disposal of Schneider Electric Products

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

NOTE: The components consist of different materials which can be recycled 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.

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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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