EWELLIX

A Schaeffler Company

INSTALLATION, OPERATION AND
MAINTENANCE MANUAL

LIFTKIT-FA

FANUC

Contents

⚠ **WARNING**

Please read this manual before installing, operating or maintaining this lifting column. Failure to follow safety precautions and instructions could cause lifting column failure and result in serious injury, death or property damage. Keep this manual nearby for future reference.

1. General information

1.1 Information in this manual

This manual provides important information on how to work with the actuator (also called device or drive) safely and efficiently.

The manual is part of the device, must always be kept in the device's direct proximity and should be available for personnel to read at any time. All personnel working with the device must read and understand this manual before starting any work. Strict compliance with all specified safety notes and instructions is a basic requirement for safety at work.

Moreover, the accident prevention guidelines and general safety regulations applicable at the place of use of the device must also be complied with.

For a better representation of the circumstance of use, the illustrations used are not necessarily to scale and may vary from the actual design of the device.

1.2 Explanation of symbols and signal words

Safety precautions

Safety precautions are identified by symbols and signal words as shown to the right. The signal words indicate the severity of the hazard and the chance it could occur.

Follow these safety precautions and act cautiously in order to avoid accidents, personal injury and damage to property.

These installation instructions describe the setup and operation of LIFTKIT, a vertical lifting axis for collaborative robots.

Warning label

The box contains hazardous voltage. Disconnect the power before opening the box.

Do not touch or change any wiring inside the box, except it is stated in this manual.

⚠ **DANGER**

Indicates a dangerous situation, which will lead to death or serious personal injury, if the precautionary measures are ignored.

⚠ **WARNING**

Indicates a dangerous situation, which can lead to minor or moderate injury or property damage, if the precautionary measures are ignored.

⚠ **CAUTION**

Indicates a dangerous situation, which can lead to minor or moderate injury the precautionary measures are ignored.

NOTICE

Indicates information considered important, but not hazard-related (e.g. messages relating to property damage).

NOTE

Emphasizes useful hints and recommendations as well as information for efficient and trouble-free operation.

1.3 LIFTKIT designations

LIFTKIT contains a lifting column, a controller and additional accessories enabling easy integration with FANUC CRX robots. According to the chosen LIFTKIT typekey, different configurations are available (**see Ordering key**).

1.4 Related documents

This instruction manual does not replace the operating manuals of the included products, but adds additional instructions relevant to the setup and operation of the LIFTKIT related to robots.

For general information and safety instructions please refer to installation, operation and maintenance manuals available at **www.ewellix.com/en/support/media-library** about:

• TC-08023-EN-May 2020 THG-TLG-TLT operating manual

• TC-08005-EN-March 2020 SCU operating manual

1.5 Target audience

This manual is intended for qualified technical personnel who install and use LIFTKIT in their application. This manual and the corresponding operating manuals should be kept available for reference at all times.

Qualified personnel is able to carry out assigned work and to recognize and prevent possible dangers self-reliantly due to its professional training, knowledge and experience as well as profound knowledge of applicable regulations.

Ordering key

`LIFTKIT - ☐☐ - ☐☐☐ - ☐☐ 0 0 - ☐☐☐`
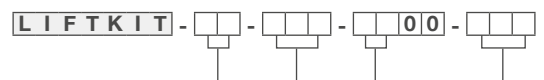
Robot

FA	FANUC

Stroke

	Stroke	Retracted length	Extended length
500	500 mm	525 mm	1 025 mm
600	600 mm	575 mm	1 175 mm
700	700 mm	625 mm	1 325 mm
800	800 mm	675 mm	1 475 mm
900	900 mm	725 mm	1 625 mm
A00	1 000 mm	775 mm	1 775 mm
B00	1 100 mm	825 mm	1 925 mm
C00	1 200 mm	875 mm	2 075 mm
D00	1 300 mm	925 mm	2 225 mm
E00	1 400 mm	975 mm	2 375 mm

Electrical options

11	120 V AC / US cable
22	230 V AC / EU cable
23	230 V AC / CN cable
24	230 V AC / UK cable
25	230 V AC / CH cable

Column type

601	TLT

2. Safety

This section provides safety aspects supplementary to the safety aspects described in the relevant operating manuals of the included devices. Failure to comply with the guidelines and safety instructions contained in this manual may result in serious hazards that could cause possible serious injury or death, or damage to the device or equipment.

The listed safety aspects must be reviewed and taken into account in the final application risk assessment prior to the use of LIFTKIT.

For more information on safety, see chapter 10 Appendix, 10.1 Safety SCU control unit.

2.1 Intended use

LIFTKIT has been designed and built for the intended use as described in the operating manual of the column, with additional intended use defined as:

• Lift a robot in push-configuration up to the specified force.

Any use that extends beyond the intended use or a use different than the one described above is deemed misuse.

Any type of claims resulting from damage caused by misuse are excluded.

2.2 Safety elements

The LIFTKIT has a range of safety elements built in to allow its integration into a robot application, including safety relays certified according ISO 13849-1, allowing Safe Torque Off (STO) up to PLe, Cat. 4.

2.3 Safety mechanisms

The following measures have been integrated in LIFTKIT to reduce the risk of harm or damage:

• The individual components have been designed and UL certified according to IEC 60601-1 – Safety of medical devices. The SBOX has been designed according to EN ISO 13849.

• The column has an integrated mechanical brake that prevents back-driving of the column in case of power loss or motor failure.

• A backup nut is installed to prevent a sudden collapse of the column in case of failure or wear of the nut.

• Pinching risk between the tube sections of the column and the FANUC attachment plate is minimized. In retracted position, the minimum gap is 40 mm.

• The LIFTKIT's SCU controller and the SBOX have to be connected to the FANUC safety I/O connection to operate. Activation of the FANUC emergency stop will trigger a stop of the LIFTKIT's SCU controller and the SBOX.

• Stopping or failure of the FANUC software triggers a stop signal to the LIFTKIT's controller.

2.4 Application notes

The following application notes have to be followed:

• Integration with an emergency-stop is required for its intended use.

• Install emergency stop functions for the column and integrate them into the safety chain of the complete system prior to operating LIFTKIT.

• The emergency stop function has to be connected in such a way that a disruption of the power supply or the activation of the power supply after a power disruption cannot cause a hazardous situation for persons and objects.

• The emergency-stop systems must always be freely accessible.

To integrate LIFTKIT into a functional safety system with a STO safe condition, the SBOX has to be connected to the FANUC safety I/O.

2.5 Potential risks

The following risks during LIFTKIT operation have to be considered in an application specific risk assessment:

- The column does not detect an impact automatically and does not stop movement upon impact. This can lead to:

  - Crushing of a person or an object in the path of the column, causing serious injury or death or property damage.

  - Dynamic impact to a person or an object causing serious injury or death or property damage.

- It is possible that the column movement does not stop at the desired position

  - Movement of the robot can occur at a different position than intended, causing significant serious injury or death or property damage.

2.6 E-Stop setup and behavior

The LIFTKIT has two e-stop mechanisms. One is integrated into the SBOX, the other directly into the SCU controller. The SCU controller mechanism is software controlled and is much faster, but only the SBOX mechanism guarantees a STO up to PLe, Cat.4. It is recommended to integrate both mechanisms into the safety system. The **table 1** compares both E-Stop mechanisms.

Table 1

E-Stop mechanism	Performance level ISO 13489-1	Stop distance	Stop time
SCU	Not rated	18 mm	200 ms
SBOX	Up to PLe, Cat. 4	28 mm	750 ms

3. LIFTKIT components

3.1 Scope of delivery

The following enumerated parts are delivered and are depicted in **figure 1**:

- 1 Lifting column TLT
- 1 Control unit SCU16/56/96
- 1 SBOX power cable EU/US/CH/CN
- 1 RS232 interface cable M/0133976
- 1 SCU I/O cable M/0133975
- 1 EHA31 operating handswitch
- 1 FANUC robot attachment plate

- 1 bottom mounting plate
- 8 M10x40 screws for mounting plates **(1)**
- 4 screws M6x20 for FANUC robot **(2)**
- 2 pins Ø 8x20 to align FANUC robot **(3)**
- Quick start guide
- 1 SBOX
- 1 SBOX key
- 1 SBOX I/O cable
- 1 SBOX to SCU power cable
- 1 Ethernet cable
- SBOX mounting attachments

Figure 1

Scope of delivery

Quick start guide

Control unit SCU

SBOX

Lifting column TLT

FANUC robot attachment plate

Bottom mounting plate

Fanuc Plug-in included
Teach pendant not included

EHA31 operating handswitch

(1) (2) (3)
Screws and pins

SBOX Key

SBOX I/O cable

SBOX power cable

SBOX to SCU power cable

SCU I/O cable

RS232 interface cable

Ethernet cable

3.2 System requirements

The system requirements for the controller and the software are as follows:

- Robot compatibility: CRX-5*i*A, CRX-10*i*A, CRX-10*i*A/L, CRX-20*i*A/L

- FANUC controller: R-30*i*B Mini Plus with software option "R648 Socket messaging"

- User interface: Tablet TP

- Power input (max) depending on the SCU power version chosen:

  - 24 VDC / 30 A

  - 120 VAC / 6,5 A

  - 230 VAC / 3,3 A

4. Mechanical installation

4.1 Tools required

The following tools are required for the mechanical installation:

• Hex key size 5 and 6

• Screw driver 2 mm

4.2 LIFTKIT mechanical setup

Refer to the numbers in section 3.1 Scope of delivery, and in the **figure 2** for the preparation of the lifting column:

1. Take the lifting column out of the box.

2. Loosen and remove 4 transport screws (**1**) at the bottom of the lifting column.

3. Attach the bottom mounting plate (**2**) using 4 M10x40 screws on the outer guiding of the lifting column. Ensure a tightening torque of 40 Nm on these screws.

4. Fix the bottom (**2**) plate securely to the ground or a frame using at least four ground fixation holes on the plate (**3**). It is recommended to maintain the outer aluminium profile of the LIFTKIT to increase its stability.

> **NOTE**
>
> Alternatively, if mounting to a SLIDEKIT, remove the robot attachment plate from the SLIDEKIT and attach the LIFTKIT bottom plate with 8x M6 screws to the SLIDEKIT attachment plate.

5. Loosen and remove 4 transport screws (**1**) at the top of the lifting column.

6. Attach the top FANUC attachment plate (**4**) using 4 M10x40 screws on the inner guiding tube.

Figure 2

Close up of transport screws (left) and the TLT (right)

1. Transport screws
2. Bottom mounting plate
3. Ground fixations holes
4. Top attachment plate
5. Alignment holes
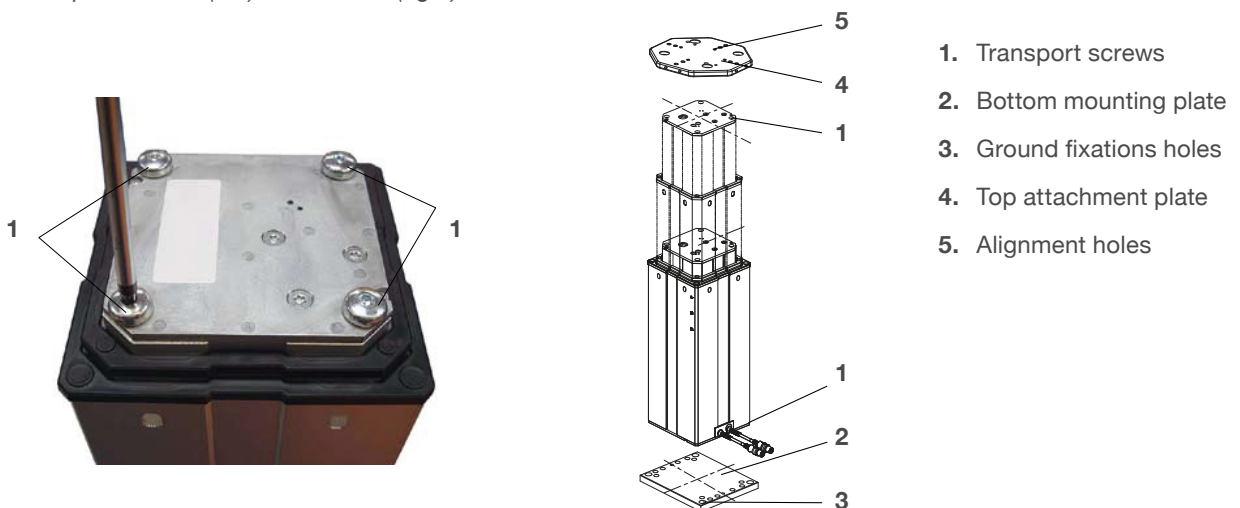
5. Initialization of LIFTKIT and robot installation

LIFTKIT must be initialized before its first operation. For this, follow the steps below:

1. Connect the LIFTKIT like the following **figure 3**. It is recommended to do the initialization without the robot mounted on the column. The lifting column has to be plugged into port 1 and 2 of the SCU.
2. Override of the emergency stop link. Short-circuit the three wires with the provided clamp as shown in **figure 4**, in order to override the emergency stop link.
3. Press both handswitch buttons simultaneously for about 5 seconds, until the SCU rattles and beeps. Now the column will run at 50% speed and force.
4. With the help of the handswitch and the buttons move the column downwards until it hits the end position. The SCU controller beeps.
5. With the help of the handswitch and the buttons move the column upwards to the top position until it hits the end position. The SCU controller beeps.
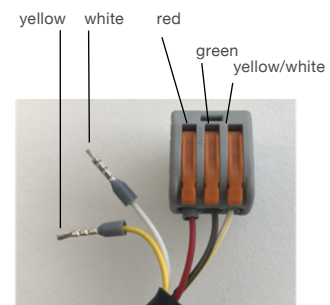
> **NOTE**
>
> The identified end positions are used as virtual limits, which will be approached by soft ramps. After successful initialization the lifting column will move at full speed and full force. If it does not reach its full stroke or continues to beep, then repeat the initialization procedure again.

> **NOTE**
>
> If the system connections are changed, a new initialization may be required.

6. If required, insert the 2 alignment pins on the top plate and press them in (or use a plastic hammer).
7. Align the robot with the alignment pins and fix the robot base with the four screws provided.
8. Undo the temporary emergency stop override from step 2.

Figure 4

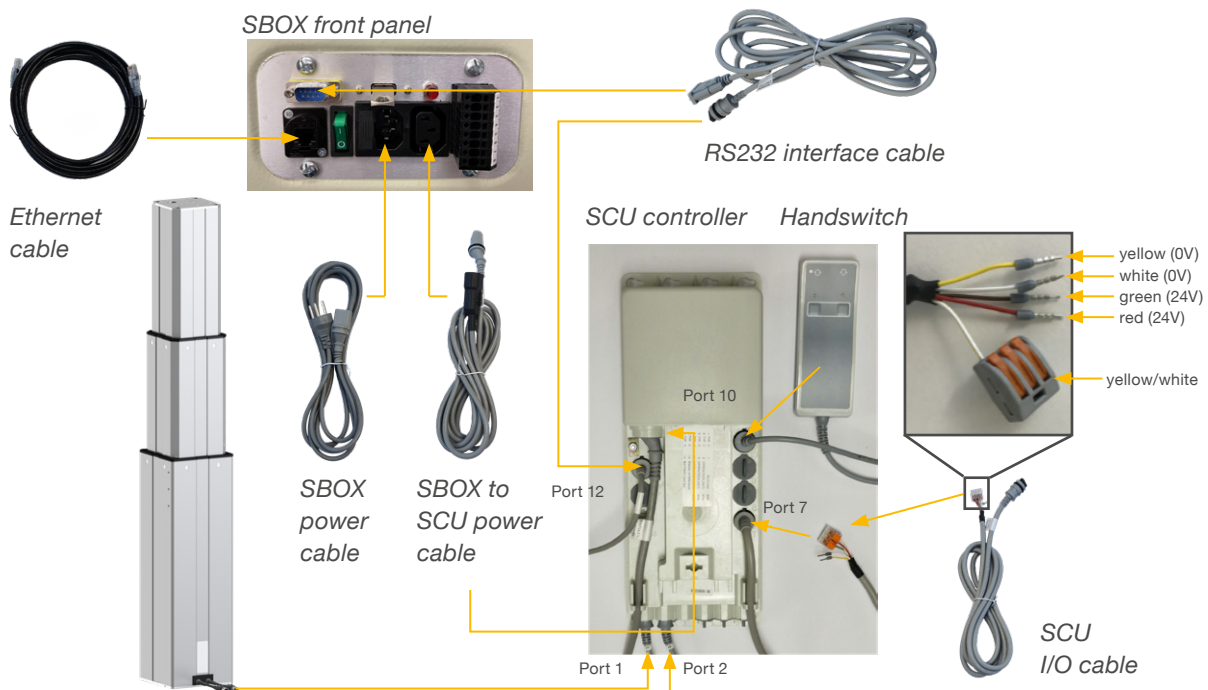*Zoom on the safety I/O cable to override emergency stop link with provided clamp*

yellow   white   red   green   yellow/white

Figure 3

Digital I/O clamp in robot controller

SBOX front panel

RS232 interface cable

Ethernet cable

SCU controller   Handswitch

yellow (0V)
white (0V)
green (24V)
red (24V)

yellow/white

SBOX power cable

SBOX to SCU power cable

Port 10

Port 12

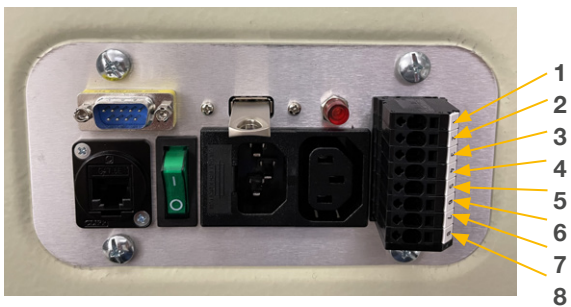Port 7

Port 1   Port 2

SCU I/O cable

6. Hardware connection SBOX

6.1 Hardware connection SBOX

The SBOX is used to interface with the SCU and the robot controller. **Figure 6** gives a view on the front panel of the SBOX, whereas **figure 5** gives a detailed look on the electrical connections for the safety relays.

Figure 5

Figure 6

1. K1.A1 ▯ 24V for safety relay #1
2. K2.A1 ▯ 24V for safety relay #2
3. K1.A2 ▯ 0V for safety relay #1
4. K2.A2 ▯ 0V for safety relay #2
5. K1.31 ▯ read out for relay #1
6. K1.32 ▯ read out for relay #1
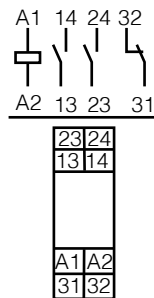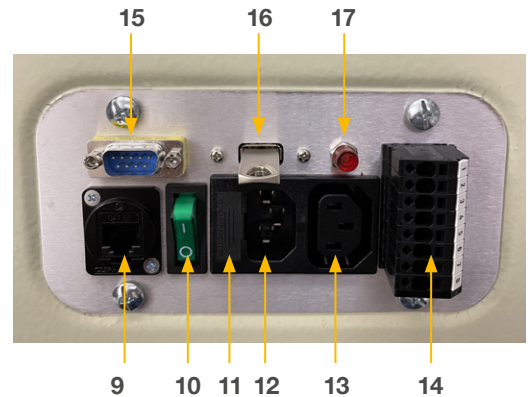7. K2.31 ▯ read out for relay #2
8. K2.32 ▯ read out for relay #2
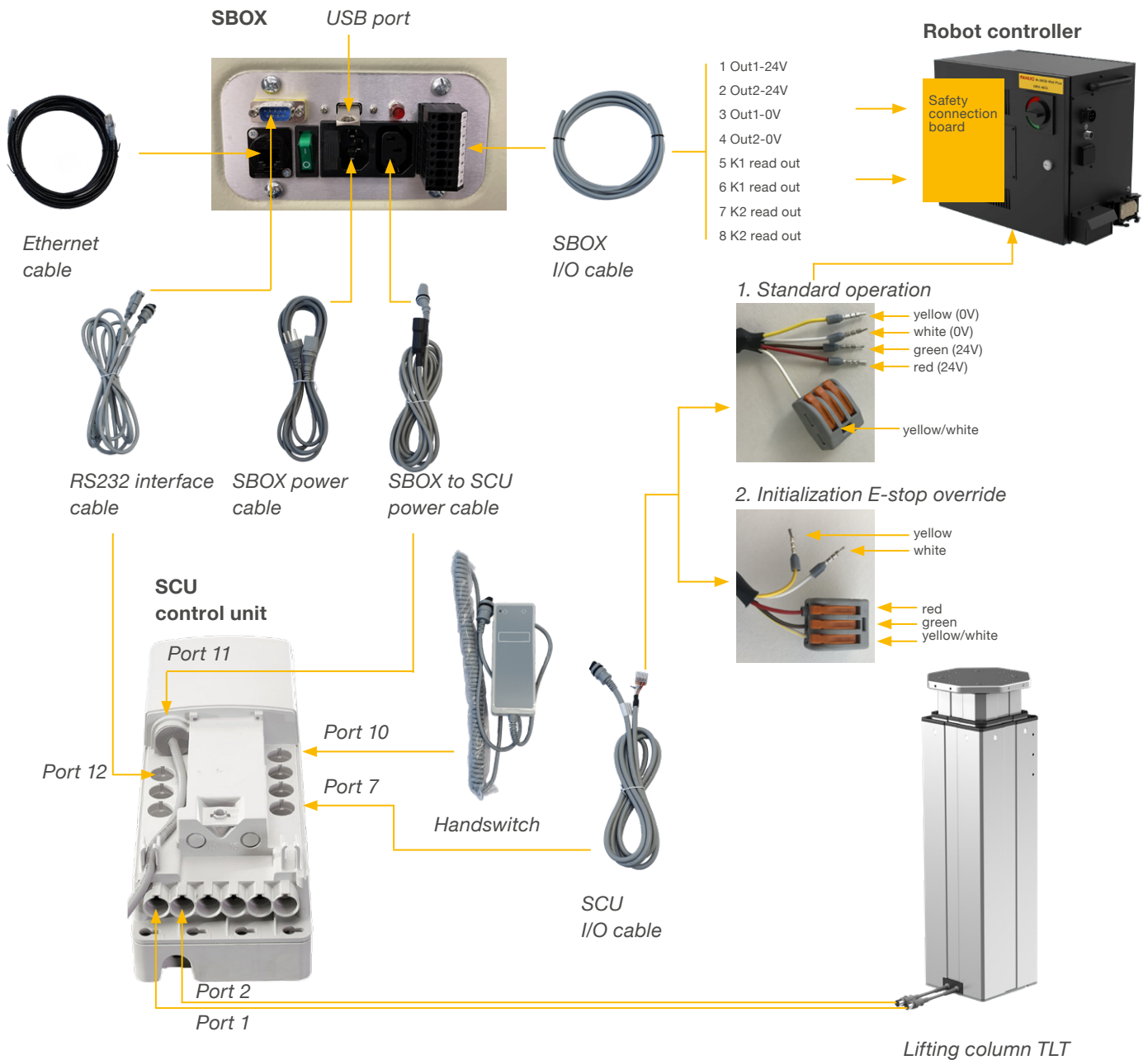

9. Ethernet connector
10. On/Off switch
11. Fuse
12. Power In
13. Power Out
14. I/O connector
15. RS232 connector
16. USB port
17. Relays status light (if On relays are powered)

6.2 Safety connection

The SBOX has two integrated safety relays with forcibly guided contacts. Their coil and feedback contacts are wired directly to the I/O connector and is shown in **figure 5**.

6.3 LIFTKIT connection setup

SBOX   *USB port*

1 Out1-24V
2 Out2-24V
3 Out1-0V
4 Out2-0V
5 K1 read out
6 K1 read out
7 K2 read out
8 K2 read out

Robot controller

Safety connection board

Ethernet cable

SBOX I/O cable

1. Standard operation

yellow (0V)
white (0V)
green (24V)
red (24V)

yellow/white

RS232 interface cable   *SBOX power cable*   *SBOX to SCU power cable*

2. Initialization E-stop override

yellow
white

red
green
yellow/white

SCU control unit

Port 11

Port 10

Port 12

Port 7

Handswitch

Port 2

Port 1

SCU I/O cable

Lifting column TLT

6.4 FANUC Safety connection board

In order to allow a safety compliant Safe Torque Off, the safety relays built in the SBOX need to be connected to the safety outputs of the FANUC controller.

See **table 2** for a recommended connection diagram.

WARNING

For more details, go to **Chapter 2.5.1. External Emergency Stop Output** in the **FANUC R-30iBMini Plus controller maintenance manual**.

Table 2

PIN	SBOX	FANUC controller
1	OUT1 connected to	ESPB11 ESPB1 connected to 24V*
2	OUT2 connected to	ESPB21** ESPB2 connected to 24V*
3	OUT1 connected to	0V*
4	OUT2 connected to	0V*

*Available from the FANUC terminal conversion module
** ESPB12 on the terminal conversion module board

7. Software instructions for Ewellix LIFTKIT component for FANUC CRX robot

7.1 Introduction

The purpose of this section is to describe the configuration steps of the Ewellix LIFTKIT in the FANUC environment. This includes the control of the LIFTKIT from the FANUC robot.

7.2 Plugin Installation

This section provides installation instructions of the Ewellix LIFTKIT plugin in the FANUC Tablet TP environment. The plugin has an .ipl format and is named Ewellix Liftkit vX.Y.Z.ipl. We recommend using the latest available plugin version from the Ewellix website. The download path with possible LIFTKIT checkbox is shown in **figure 7**.
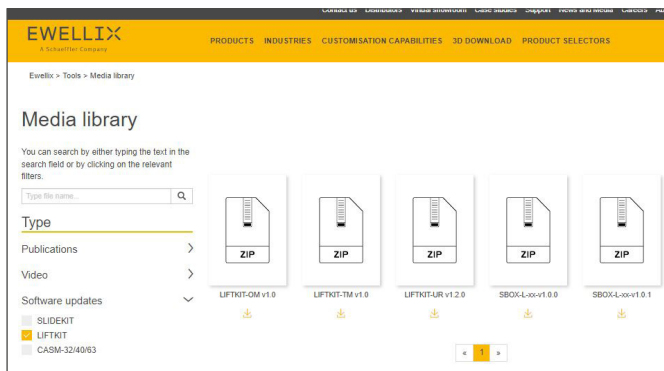
That page can be reached either by the link **www.ewellix. com/en/support/media-library** ☐ **Software updates** ☐ **LIFTKIT** or by scanning the QR code below.

QR code to the Ewellix Media library.

Figure 7

Media library with downloadable plugins

Supporting videos are available on the Ewellix website as well and can be reached under the following URL:

www.ewellix.com/en/products/7th-axis-for-robot/liftkit/liftkit-fa

NOTE

The default master code for the FANUC controller is 1111.

7.2.1 Plugin Installation on FANUC CRX robot

1. Download the latest plugin version (.ipl format file) to a USB memory stick.

2. Insert the USB memory stick into the R-30*i*B Mini Plus controller's USB port as shown in **figure 8**.
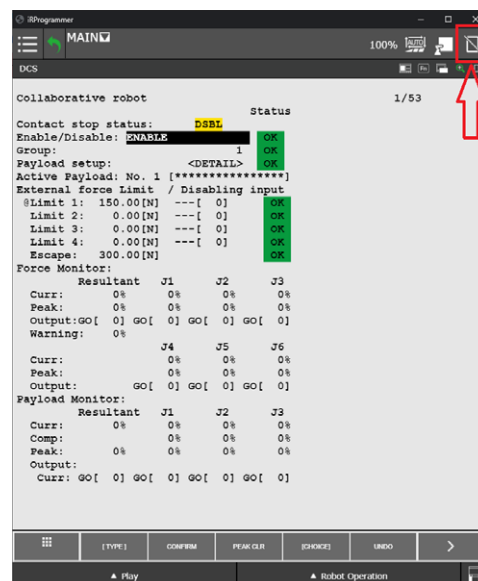
Figure 8

USB memory stick attached to controller

3. Put the tablet teach pendant to online mode as shown in **figure 9**.
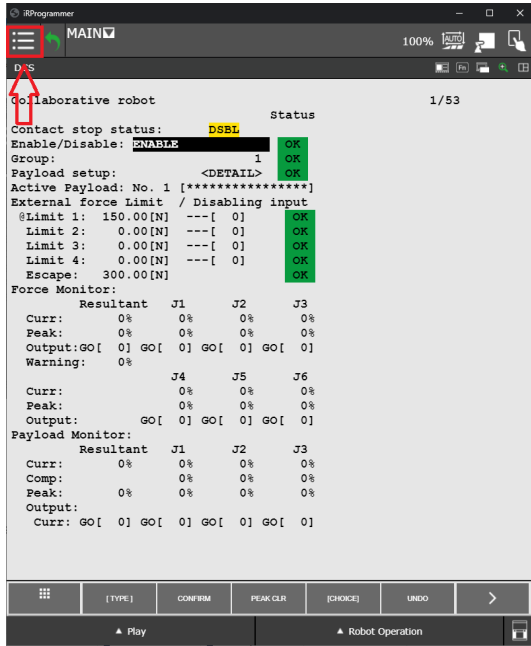
Figure 9

Putting Tablet TP to online mode

Open the hamburger menu by clicking the menu icon on the upper left corner as depicted on **figure 10.**
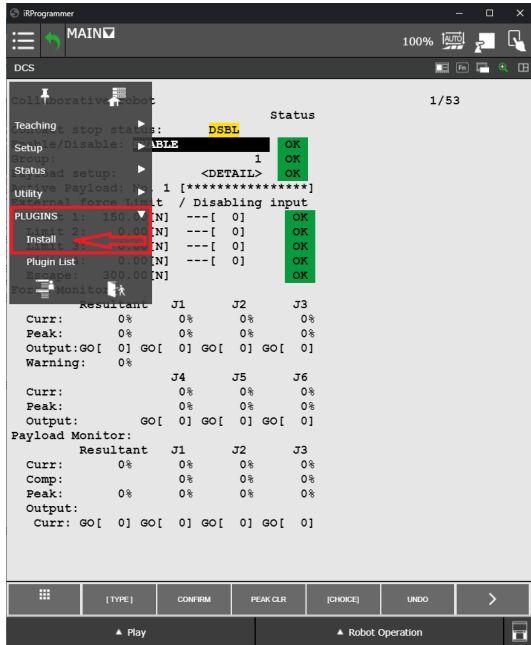
Figure 10

Open Main menu

Expand the **PLUGINS** menu, and click on the **Install** option as depicted on **figure 11.**
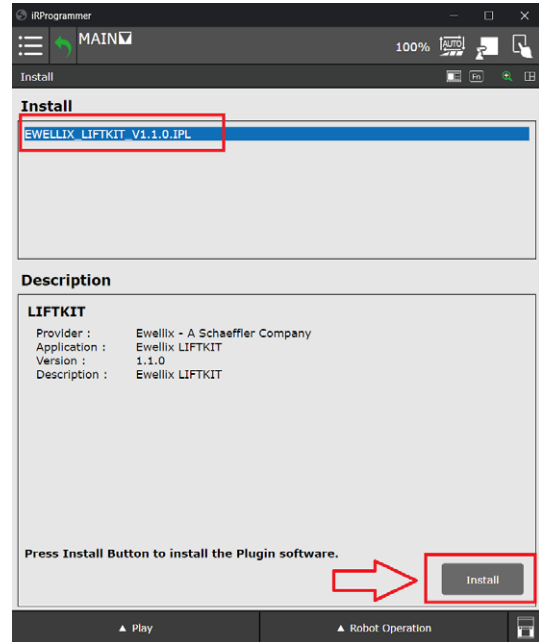
Figure 11

Open Plugin Install menu

The **Install** window lists the available plugins from the USB memory stick.

Select the Ewellix LIFTKIT plugin and click the **Install** button as shown in **figure 12**.
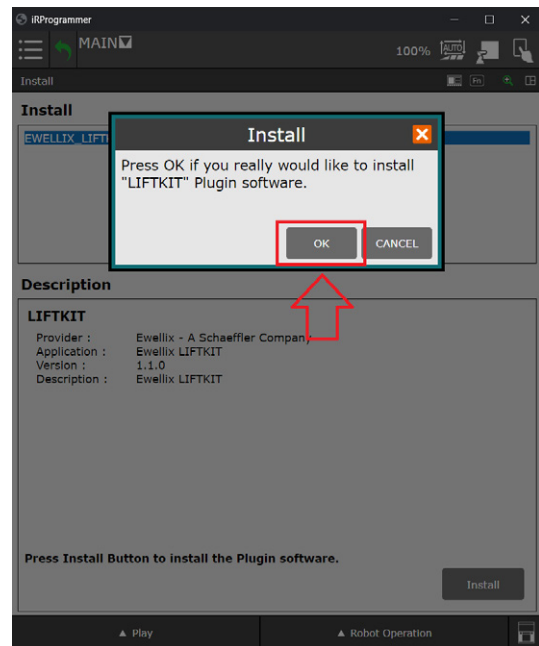
Figure 12

Plugin Install page

A confirmation dialog box will popup. Confirm the plugin installation as shown in **figure 13**.

Figure 13

Plugin install confirmation

After the Ewellix LIFTKIT plugin installation has been confirmed, please power cycle the robot controller as depicted on **figure 14**.
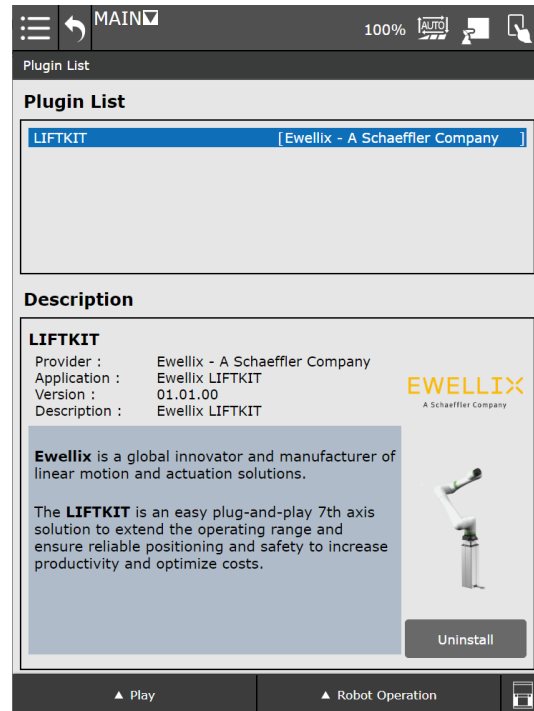
Figure 14

Controller restart information

After the restart of the robot controller, the Ewellix LIFTKIT plugin is ready to be used.

7.2.2 Plugin uninstallation

If necessary the Ewellix LIFTKIT plugin can be uninstalled. Open the Main menu, expand the **PLUGINS** menu and click on the **Plugin List**, as depicted on **figure 15**.

Figure 15

Opening Plugin List

A list of installed plugins will be shown on **figure 16**.
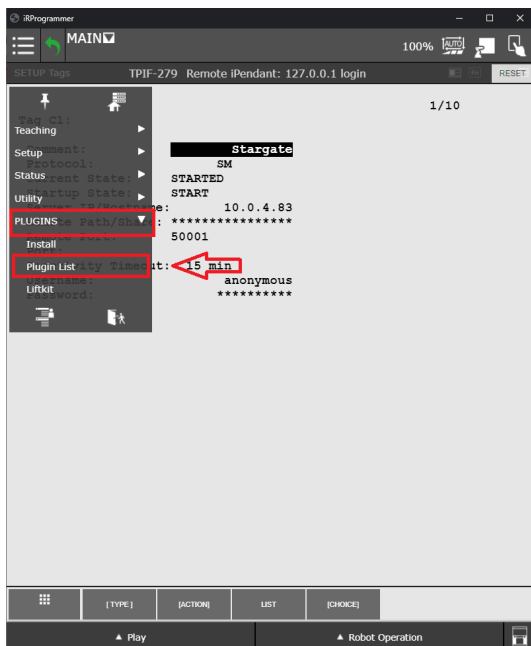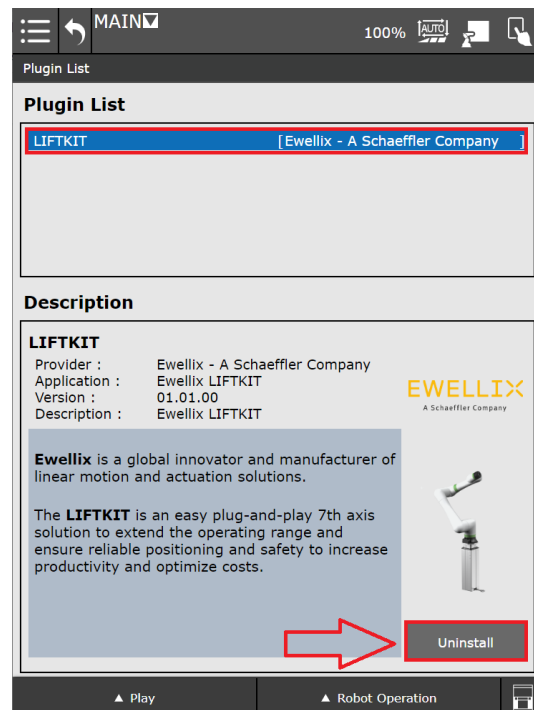
Figure 16

Plugin List page

Select the plugin you want to uninstall, and click on **Uninstall** button, as depicted on **figure 17**.
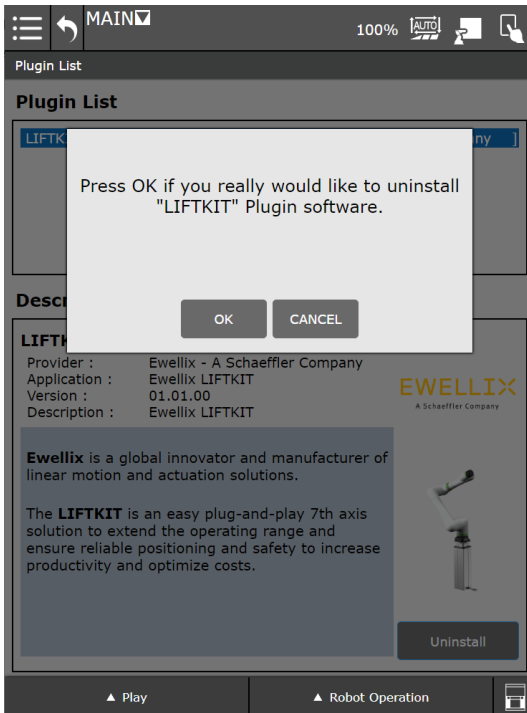
Figure 17

Uninstal Plugin

A confirmation dialog will popup. Click on OK button to confirm uninstallation, as depicted on **figure 18**.

Figure 18

Plugin uninstall confirmation

NOTE

The LIFTKIT can also be used in the ROBOGUIDE simulation software, for more information contact your Ewellix representative.

7.3 SBOX IP address setting

The SBOX uses a static IP address. The default address is 192.168.1.100.

If you need to set a different IP address, please follow the steps listed below:

1. Create a file called "ip_changer.conf" on your PC. We recommend to use the freeware Notepad++ or similar.

2. Insert the following content:
   static ip_address=192.168.1.100/24
   static routers=192.168.1.1
   static domain_name_servers=192.168.1.1

3. Change the addresses to your needs. Make sure that the "/24" stays behind the static IP address.

4. Make all characters visible (see **figure 19**).

Figure 19

Show all characters
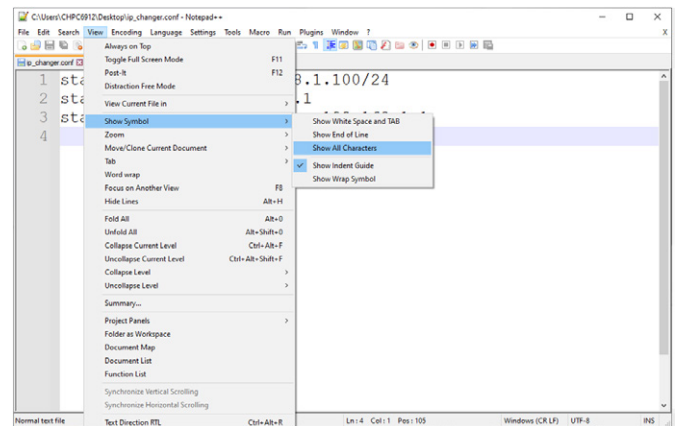
5. Convert the End Of Line into Unix (LF) (see **figure 20**).

Figure 20

EOL conversion to UNIX (LF) format

6. Save the file on a USB memory stick previously formatted in FAT32.

If you have a SBOX with an external USB port please continue with these steps:

7. Switch off the SBOX with the switch and make sure the light is no longer on.
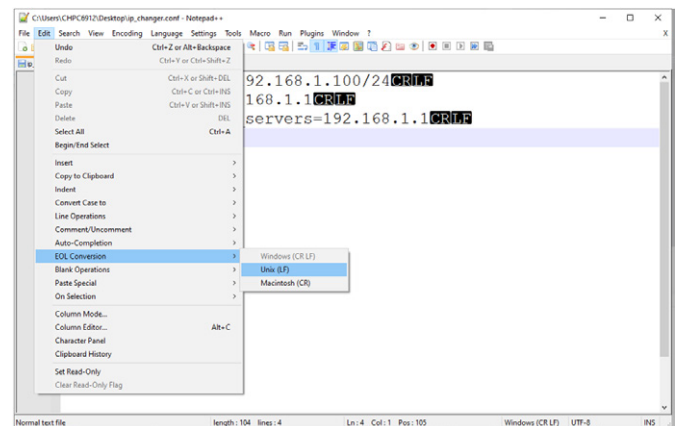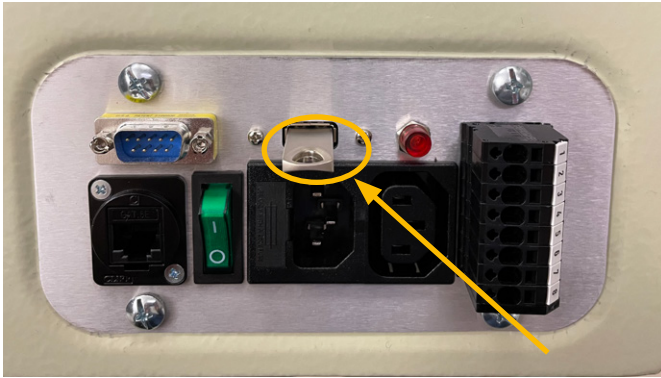
8. Insert the USB memory stick into external USB port (see **figure 21**).

Figure 21

Front view on SBOX with external USB port

9. Switch on the SBOX with the switch and make sure the light is on.

10. Wait for 5 minutes.

11. Switch off the SBOX with the switch and make sure the light is no longer on.

12. Remove the USB memory stick from the USB port.

13. Switch on the SBOX with the switch and make sure the light is on.

14. The following empty file will be created on the USB memory stick to confirm the IP address change has been successful:

> *update_ip_address_successfull_from_"Name of the USB Stick"*

If you have a SBOX without an external USB port please continue from step 15:

15. Remove all cables attached to the SBOX.

16. Open the SBOX with the provided key.

17. Insert the USB memory stick into any available USB port of the SBOX controller (see **figure 22**).

Figure 22

Inside view on SBOX without external USB port

18. Close the SBOX.

19. Plug in the power cable into the SBOX.

20. Switch on the SBOX.

21. Wait for 5 Minutes.

22. Switch off the SBOX.

23. Remove all cables from the SBOX.

24. Open the SBOX.

25. Remove the USB memory stick.

26. Close the SBOX.

27. Connect all cables.

28. The following empty file will be created on the USBmemory stick to confirm the IP address change has been successful:

> *update_ip_address_successfull_from_"Name of the USB Stick"*

7.4 Establish connection between robot controller and SBOX

To connect the robot controller and the SBOX, please follow these 5 steps:

1 Plug the RJ45 ethernet cable from the SBOX into the top ethernet port inside the robot controller as depicted in **figure 23**.

2. Specify the IP address on the teach pendant that will be reserved for the SBOX.

3. Define the Client tag.

4. If necessary, set a specific IP address for the SBOX. Refer to section 7.3 SBOX IP address setting.

5. Turn on the SBOX.

Figure 23

Ethernet cable position
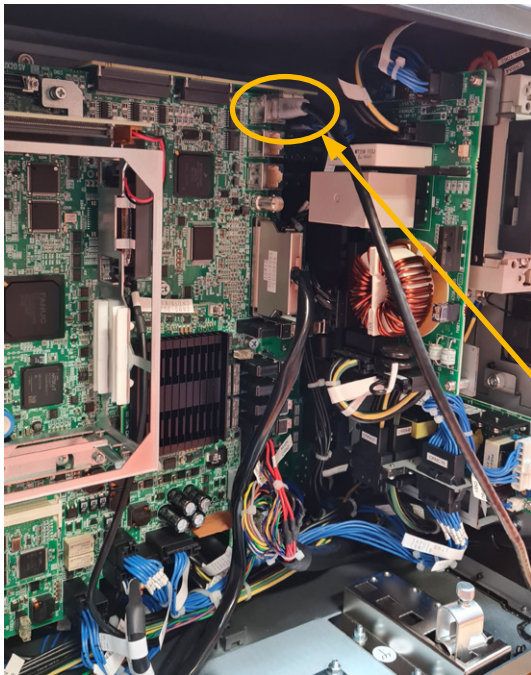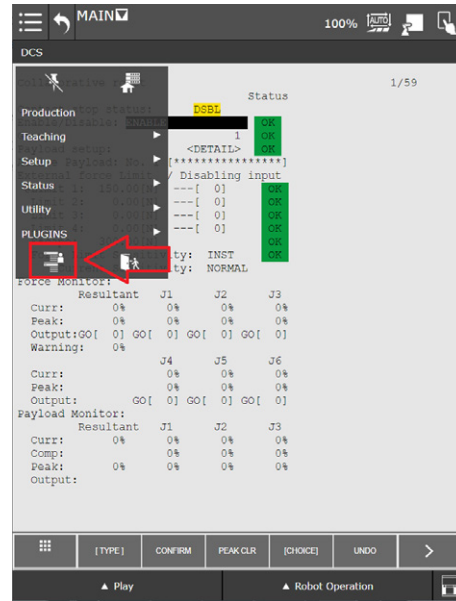

7.4.1 Specify the SBOX IP Address on teach pendant

To connect the SBOX and the robot controller, the IP address needs to be specified manually.

Open the advanced menu by clicking on the **Advanced Menu** button in the bottom left corner (see **figure 24**).

Figure 24

Advanced Menu button

The advanced menu appears as shown on **figure 25**.

Figure 25

Advanced Menu
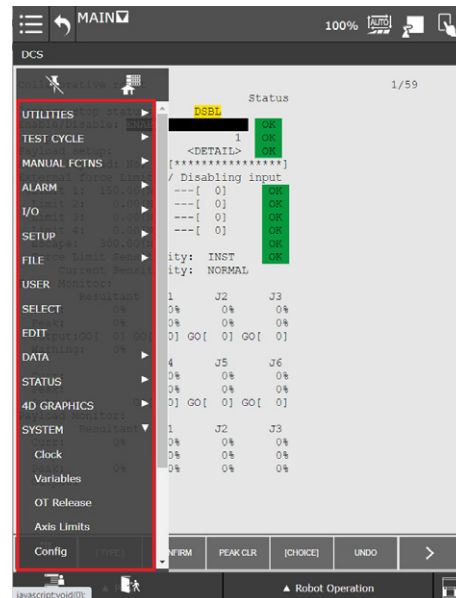
Open the SETUP menu and click on **Host Comm**, as depicted on **figure 26**.

Figure 26

Host Communication
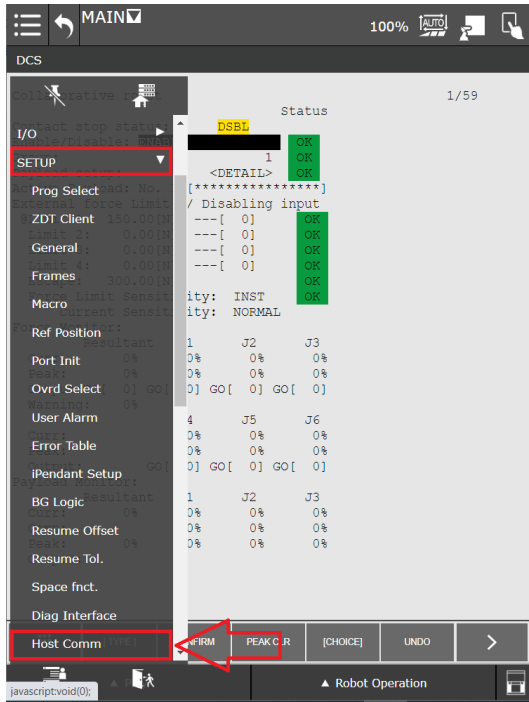
The page shown in **figure 27** will open. Then click on the **[Detail]** button.

Figure 27

Protocols Setup

The TCP/IP Network configuration on the robot is shown.

Under **Host Name (LOCAL)** choose the first unspecified spot and give it a name.

For the specified Host Name choose the IP Address that will be used to connect to the SBOX (IP address is set to 192.168.1.100 in the factory) as depicted on **figure 28**.

Figure 28

Host Name and IP Address
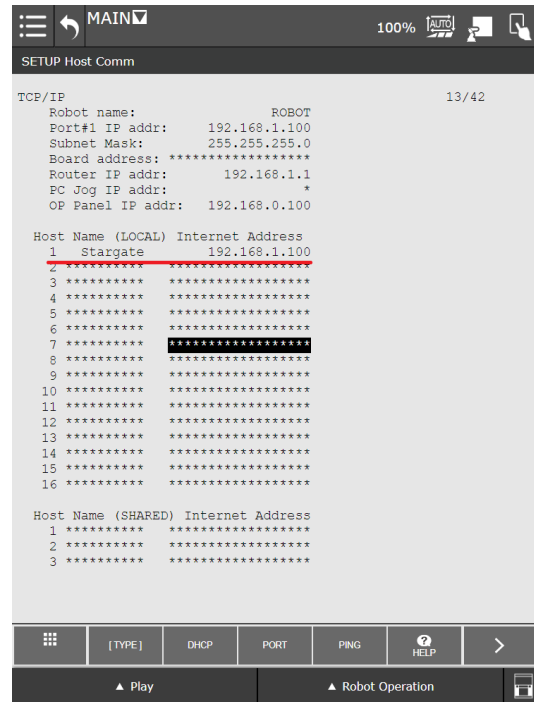
After a reboot of the robot controller and the SBOX select the defined host name and press **PING** as depicted in **figure 28**. A message "Ping *IP address* succeeded" confirms the network connection between the robot and the SBOX.

NOTICE

The IP addresses specified in the SBOX and by the teach pendant have be the same to enable communication.

7.4.2 Define Client tag

To connect the robot and the SBOX a client tag must be defined. The client tag represents an endpoint to which the plugin (or any program from FANUC system) can connect to.

To define the client tag on the teach pendant, open the **SETUP** menu and click on **Host Comm** (see **figure 29**).

Figure 29

Host Communication
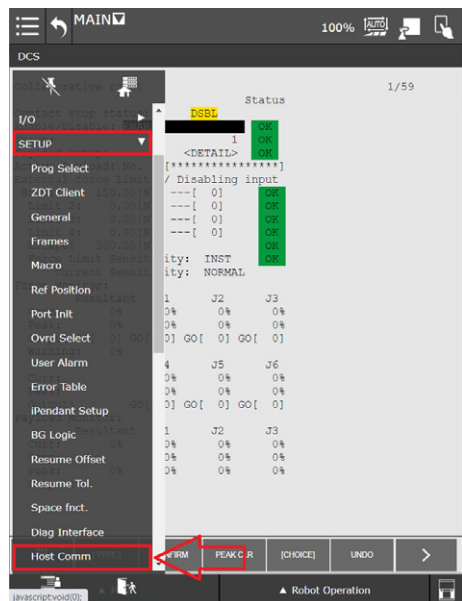
A page will open (see **figure 30**). Click on **[SHOW]** button and select the second option from the popup menu - **2 Clients**.

Figure 30

Setup Clients
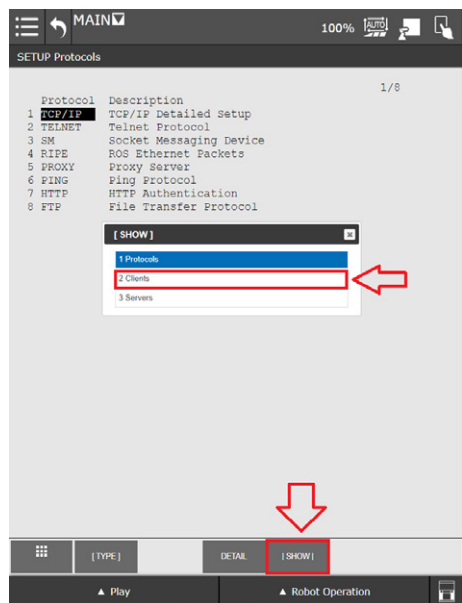
A new page opens with all possible client tags (see **figure 31**).

A maximum of 8 client tags can be used on the FANUC robot. One needs to be dedicated to the LIFTKIT plugin. If there are no free client tags, one must be freed up for the LIFTKIT.

Figure 31

Client tags
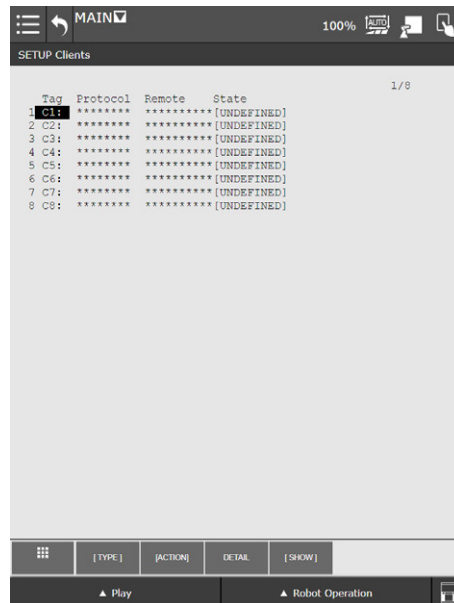
To define the client tag for the LIFTKIT plugin, double click on the desired client tag and a page will open as shown on **figure 32**.

Figure 32

Client tag C1

To add a client's tag comment double click on **Comment**, and enter a name in the text field and press the Enter on keyboard (see **figure 33**).

Figure 33

Client tag comment
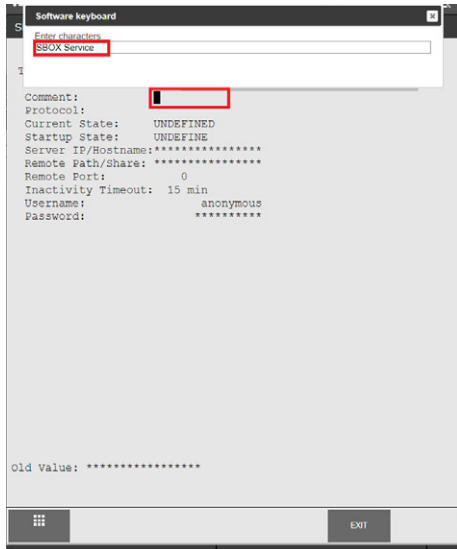
To set the protocol to SM (socket messaging) press on **Protocol**, then press **[Choice]** and then choose **1 SM** like shown in **figure 34**.

Figure 34

Set SM Protocol
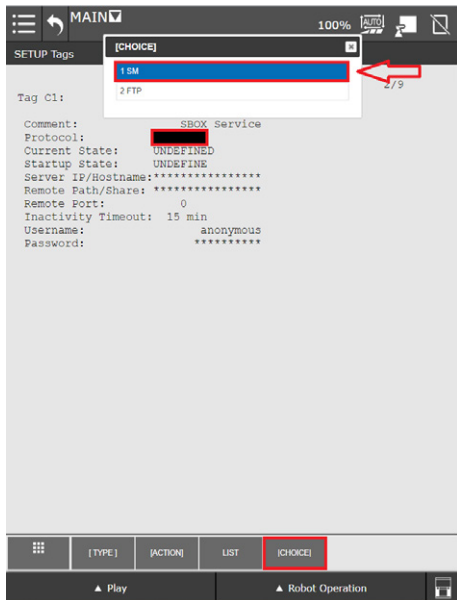
To set the startup state of the client tag, double click on **Startup State**, and select the option **3 Start** in the popup windows (see **figure 35**).

Figure 35

Client tag startup state
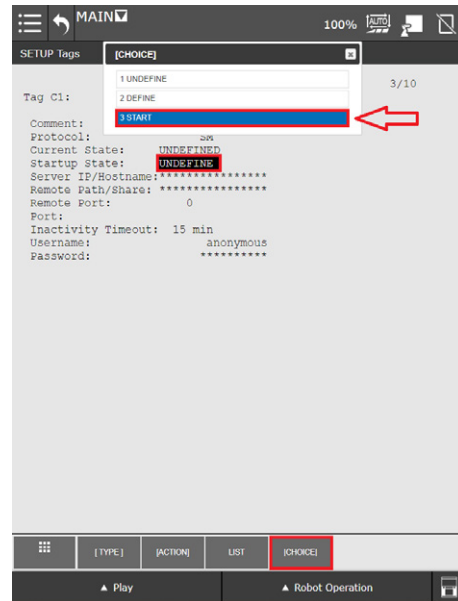
> **NOTE**
>
> Use the bottom right button to activate an on-screen software keyboard.

To set the IP address, double click on **Server IP/Hostname**, and enter the IP address/hostname of the SBOX previously specified (refer to section 7.4.1 Specify the SBOX IP Address on teach pendant that will be reserved for SBOX) (see **figure 36**).

Figure 36

Server IP-Hostname
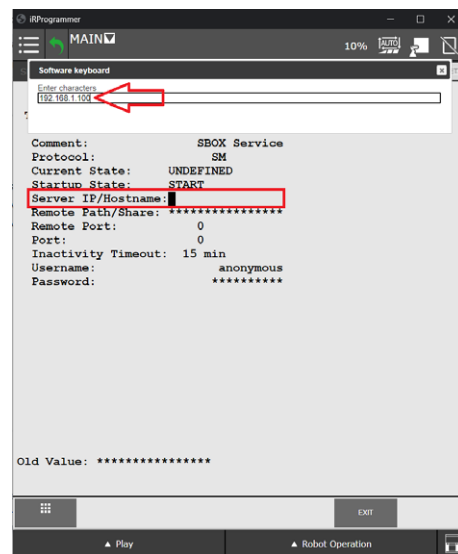
To set the port double click on **Remote Port** and enter 50001, as depicted on **figure 37**.

> **NOTE**
> SBOX listens only on port 50001.

> **NOTE**
> The SBOX only accepts communication with one client at a time. A reboot of the SBOX is mandatory if the communication is not closed properly.

Figure 37

Client tag port
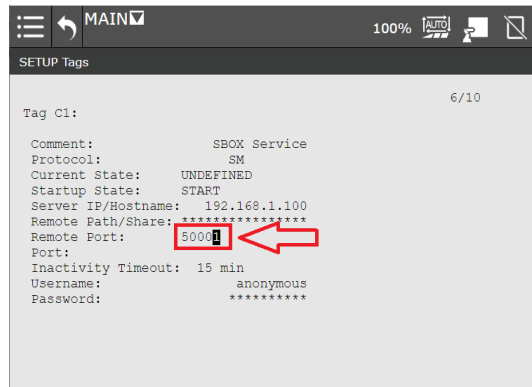
Once the Remote Port is set, restart the robot controller.

After restart, check if the client tag is started. Open **Main** menu, enable **Advanced** menu, expand **SETUP** menu, and open the **Host Comm** page. From page click on **[SHOW]** button and select **2 Clients** from popup menu. When the list of client tags is shown double click on the one which you defined (see **figure 38**).

The **Current State** changed to **STARTED**.

Figure 38

Client tag state

With this confirmation, the Client tag for the SBOX is ready and can be used after a final reboot of the robot controller together with the SBOX.

7.5 LIFTKIT configuration

To configure the LIFTKIT, in the **Main** menu, open the LIFTKIT plugin configuration page, expand the **PLUGINS** menu and click on LIFTKIT as depicted on **figure 39**.

Figure 39

Opening LIFTKIT configuration page
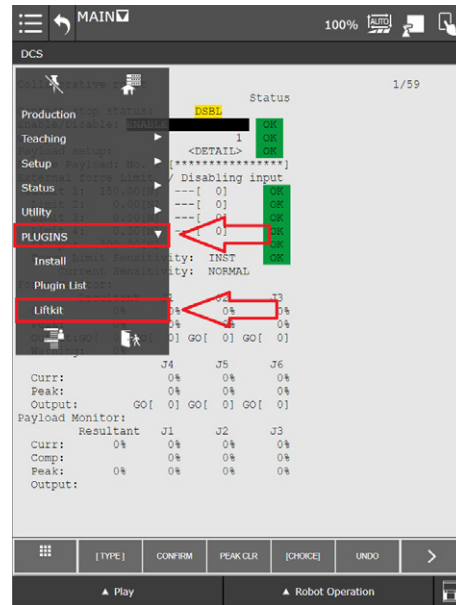
The LIFTKIT configuration page appears as depicted on **figure 40**.

Figure 40

LIFTKIT Configuration page
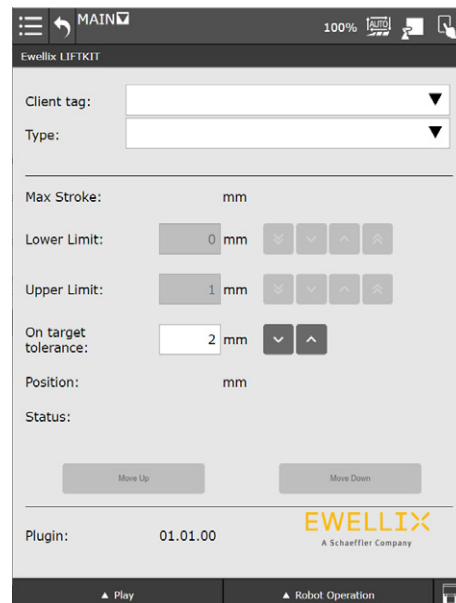
Click on the **Client tag** drop down menu and select the client tag set for the for LIFTKIT. If the wrong client tag is selected, the LIFTKIT plugin will not work.

If the LIFTKIT configuration has not been done, the message depicted in **figure 41** appears.

Figure 41

Choose Client tag for the first time
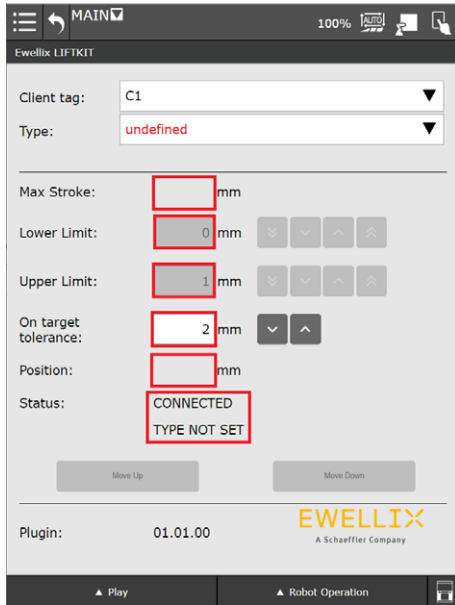
If the wrong LIFTKIT type is selected, none of LIFTKIT data will be displayed and the page will look as depicted on **figure 42**.

Figure 42

Wrong LIFTKIT type selected
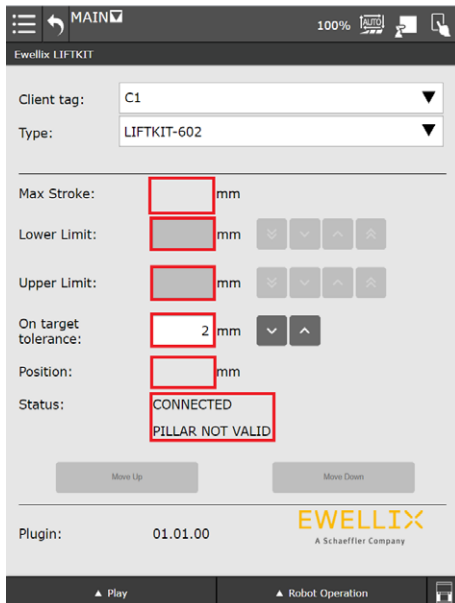
To configure the LIFTKIT, click on the **Type** drop down menu, and select the appropriate LIFTKIT type. Upon selection of the proper LIFTKIT type, the LIFTKIT plugin will read the maximum stroke, upper and lower limits, current position and status as depicted on **figure 43**.

Figure 43

Correct LIFTKIT type selected
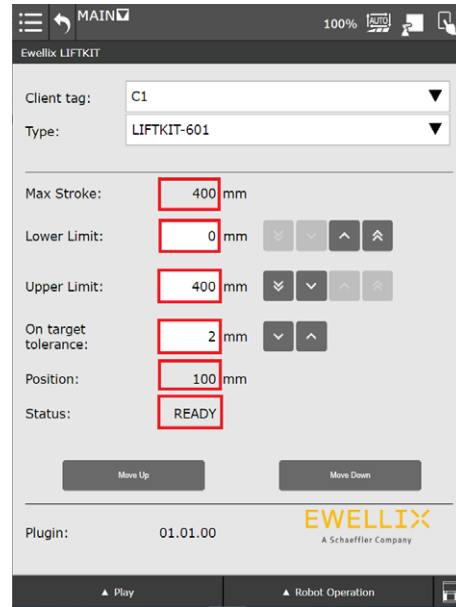
Lower and **Upper Limits** can be changed, as long as the values set are in range between 0 and **Max Stroke** (in this case 400). If the specified value is out of this range an error dialog will be shown with the appropriate message.

The **On target tolerance** textbox presents the tolerance that is used in the instruction **LIFTKIT on Target**, which is described in section 7.6.3 LIFTKIT instructions with registers

WARNING
• The LIFTKIT will move to the required target position within its positioning tolerance range. See product datasheet. • LIFTKIT movement increments shall be at least 10 mm in any direction for the LIFTKIT to move.

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7.6 LIFTKIT instructions

The LIFTKIT plugin has dedicated instructions which can be used in a program:

- LIFTKIT Move
- LIFTKIT Move From Register
- LIFTKIT Get Status
- LIFTKIT Get Position
- LIFTKIT On Target

These instructions are available in the Programming palette on the teach pendant.

Open the Teaching Editor by opening the **Main** menu, and click on **Home button**, as depicted on **figure 44**.

Figure 44

Opening Teaching Editor
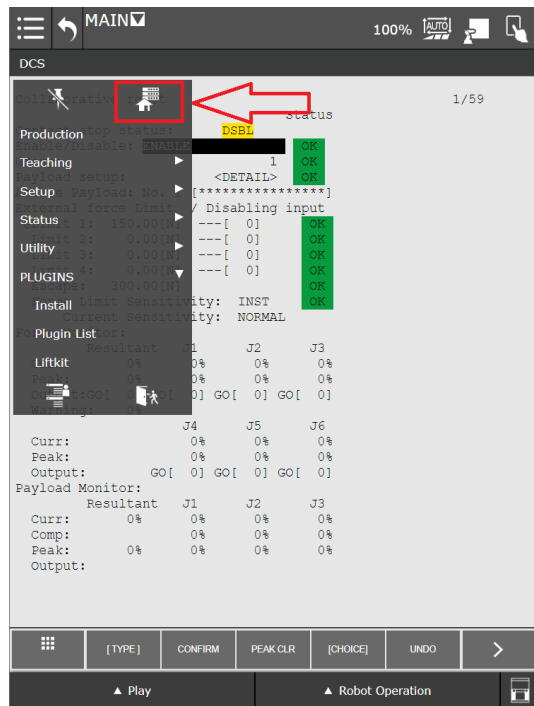
The teaching Editor page will open as depicted on **figure 45**.

Figure 45

Teaching Editor page
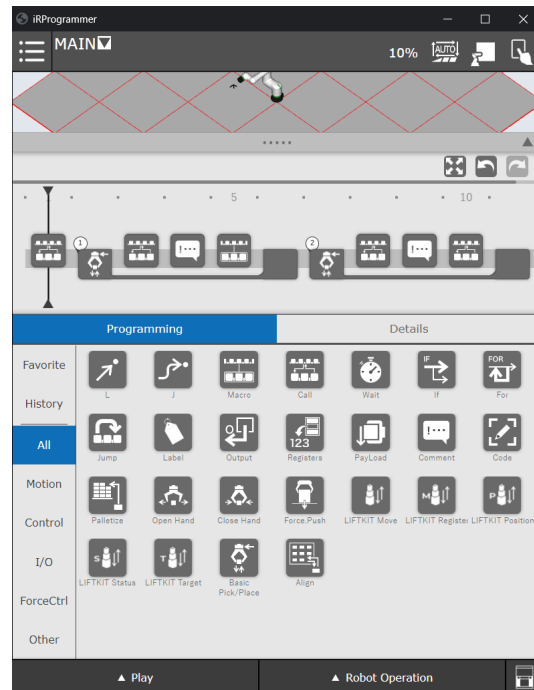
7.6.1 Create a new program

Create a new program by opening the **Main** menu, and click on **Select Program**, as depicted on **figure 46**.

Figure 46

Opening Select Program
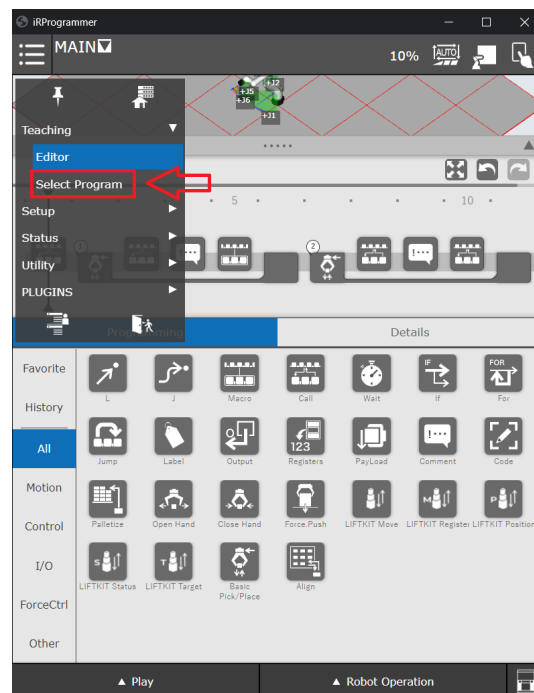
The selected program page will be shown as depicted on **figure 47**.

Figure 47

Program Select page

To create a new program click the **New** button. Enter the program name and confirm with **OK** as depicted on **figure 48**.

Figure 48

Entering program name

Cilck **OK** on the **Edit Attribute** window as shown in **figure 49**.

Figure 49

Program attribute dialog
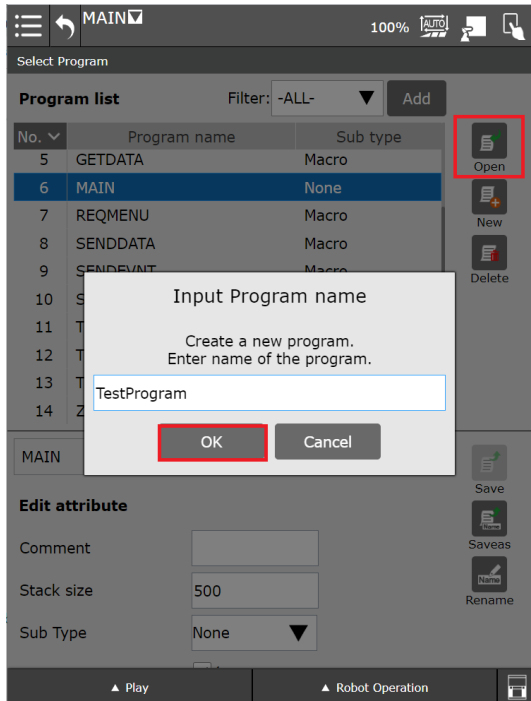
The program editor with the program timeline opens as shown in **figure 50**.

Figure 50

Program editor with newly created program
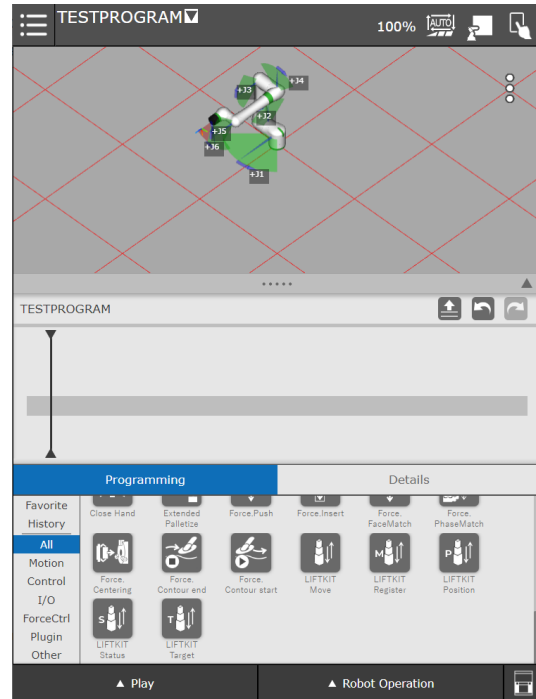
7.6.2 Basic LIFTKIT instruction MOVE

The **LIFTKIT Move** instruction can be added, by drag and drop to the program timeline, as depicted on **figure 51**.

Adding LIFTKIT Move to program timeline

By clicking on the **LIFTKIT Move** instruction in the timeline, the **LIFTKIT Move** detail page will open, as depicted on **figure 52**.

Figure 52

LIFTKIT Move instruction
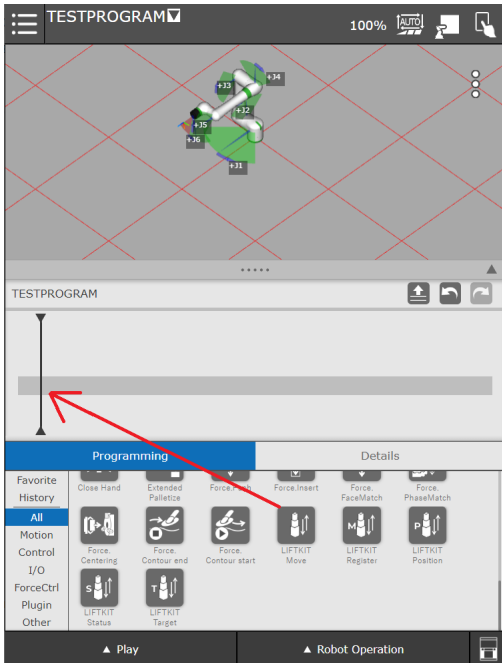
The LIFTKIT current position, lower limit, upper limit and status are visible in the **Details** submenu. On the left side of the page, there is a text field to specify the position where LIFTKIT will move. The position must be between the lower and upper limits range.

After the instruction has been added to the program's timeline, the program can be executed.

7.6.3 LIFTKIT instructions with registers

The LIFTKIT plugin also consists of instructions that are reading/writing values from/to registers. The following instructions are using registers:

- LIFTKIT Move From Register
- LIFTKIT Get Position
- LIFTKIT Get Status
- LIFTKIT On Target

LIFTKIT Move from Register

The **Desired position** register holds the value where the LIFTKIT moves to. Setting the register value is shown below in **figure 53**.

Figure 53

LIFTKIT Move from Register instruction

The LIFTKIT target position should be stored in the **Desired position** register (in this case R[1]). Any error during this movement will be stored in the **Feedback** string register (in this case SR[1]). Setting the register value is shown on **figure 54** and **55**.

Figure 54

Registers location
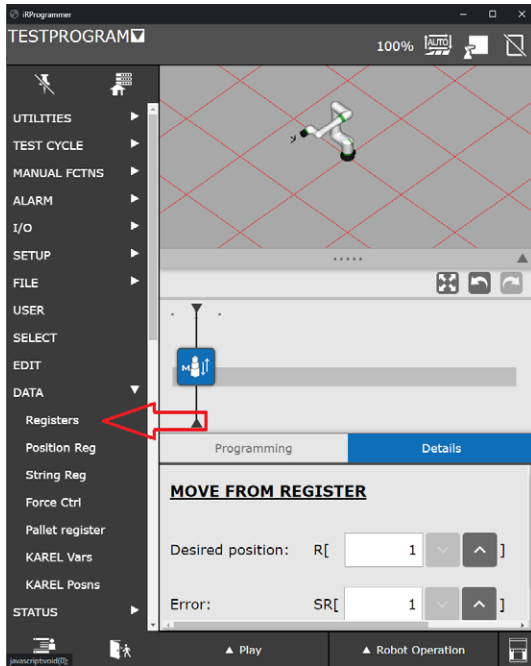
The individual registers can be annotated with a specific comment and the desired value. This is shown in **figure 55**.

Figure 55

Set description and value of registers
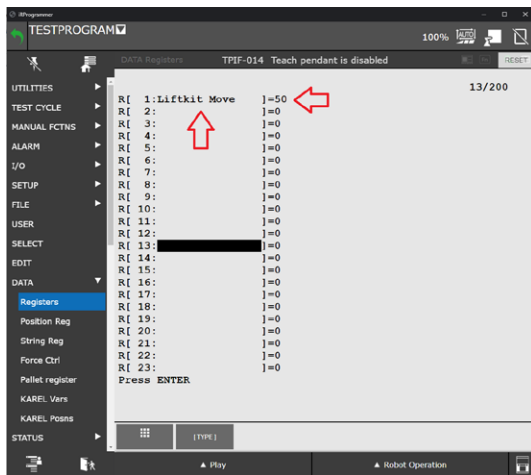
The movement has to be an increment of at least 6 mm. If The LIFTKIT movement is less than 6 mm, the Program is continued.

When the LIFTKIT Move From Register instruction is added to the pallet and the program is started, the LIFTKIT will move to the target position specified in the register (in this example R[1]). If an error appears while the LIFTKIT is moving, it will be stored in the string register as shown on **figure 56**. If no error appears, the value of the specified string register (in this example SR[1]) will be **NO ERROR**.

CAUTION

The robot offers a limited number of registers.
If the **Desired position** register number is higher than the maximum supported register number then the error **READ REGISTER ERROR** will be written in the specified **Error** string register. The program is aborted.
If the **Error** string register number is higher than the maximum supported string register number, the instruction will be executed successfully, but the output will not be written in any string register.

Figure 56

Error string registers location
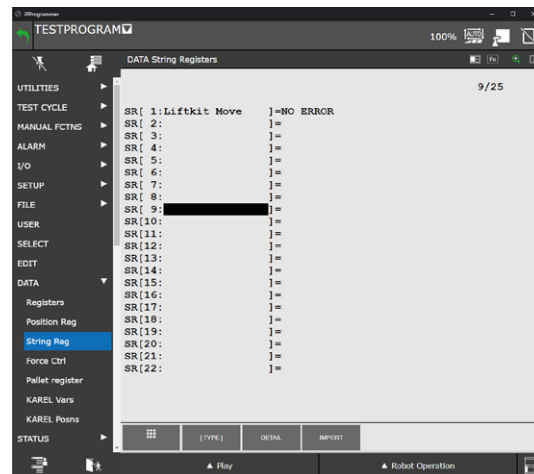
The following **table 3** gives an overview of all the possible fedback strings and their possible reasons.

Table 3

Feedback	Reason
NO ERROR	No error occurred
SMALL DELTA HEIGHT	Movement is less than 6 mm
CONNECT TO SBOX Service ERROR	SBOX Service is not responding
READ CLIENT TAG ERROR	Reading client tag is not possible
MOVE TO ABSOLUTE POSITION ERROR	Movement is not possible
FAILED TO REACH POSITION	Problem occurred during LIFTKIT movement
TIMEOUT ERROR	Timeout exceeded
HEIGHT NOT BETWEEN LIMITS	Desired position is not between limits

LIFTKIT Get Position

The LIFTKIT Get Position obtains the LIFTKIT position from the SBOX and stores the value in the specified string register (see **figure 57**).

LIFTKIT Get Position instruction

CAUTION

The robot offers a limited number of registers.
If the **Position register** number is higher than the maximum register number, the instruction will be performed successfully, without writing any feedback in the register.

LIFTKIT Get Status

The LIFTKIT Get Status instruction obtains the LIFTKIT Status and LIFTKIT Cause from the SBOX and stores them in the specified string registers (see **figure 58**).

LIFTKIT Get Status instruction

The **Get Status** command can return string messages as well. They are all summarized in **table 4**.

Status	Cause	Reason
READY		LIFTKIT is ready to move
MOVING		LIFTKIT is moving
INITIALIZED	NOT CONNECTED TO THE LIFTKIT	LIFTKIT is not connected to the SBOX
CONNECTED	LIFTING COLUMN IS NOT VALID	Wrong LIFTKIT type is chosen
CONNECTED	HOMING NOT DONE	Homing is not done
INSTRUCTION ERROR	CONNECT TO SBOX Service ERROR	Connection to SBOX Service is not possible
INSTRUCTION ERROR	READ CLIENT TAG ERROR	Reading client tag is not possible
INSTRUCTION ERROR	TIMEOUT ERROR	Timeout exceeded

CAUTION

The robot offers a limited number of registers.
If the Status String register number is higher than the maximum String register number, the instruction will be performed successfully, without writing the Status in the register.
If the Cause String register number is higher than the maximum String register number, the instruction will be performed successfully, without writing the Cause in the register.

LIFTKIT On Target

The LIFTKIT On Target instruction checks if LIFTKIT reached the position specified in the register and stores the feedback in the Feedback Register. The tolerance on the Configuration page is added/substracted when checking if the LIFTKIT is on target (see **figure 59**).

Figure 59

LIFTKIT on Target instruction
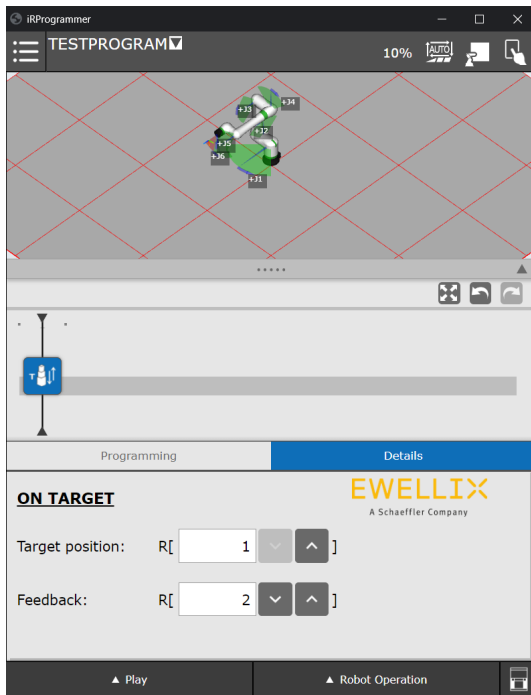
The robot offers a limited number of registers.
If Target position register number is higher than the maximum register number "-1" will be written in the specified Feeedback register. The program is aborted.
If the **Feedback register** number is higher than the maximum register number, the instruction will be performed successfully, but the output will not be stored in any register.

7.6.4 Start program (run instruction palette)

To run the instructions added to the palette, it is necessary to reset the alarms as shown on **figure 60**.

Figure 60

Reset alarms
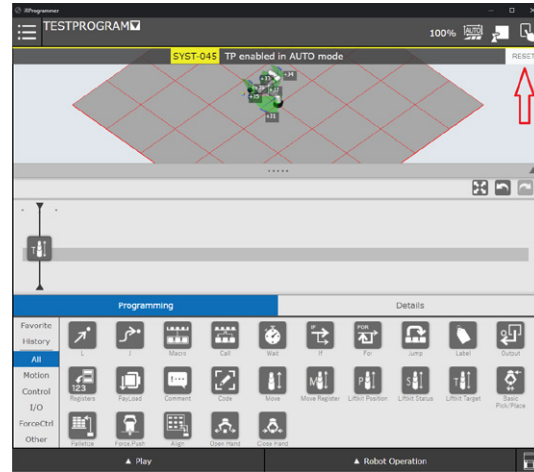
When alarms are closed, and all instructions are added to the palette, press **Play** in the bottom left corner (see **figure 61**).

Figure 61

Press Play button
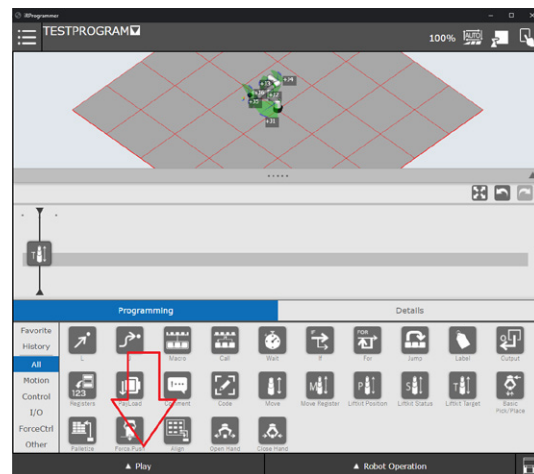
7.7 Latest Log

It is possible to see the latest logs by navigating to **USER** submenu as showed below in **figure 62**.

Figure 62

User submenu
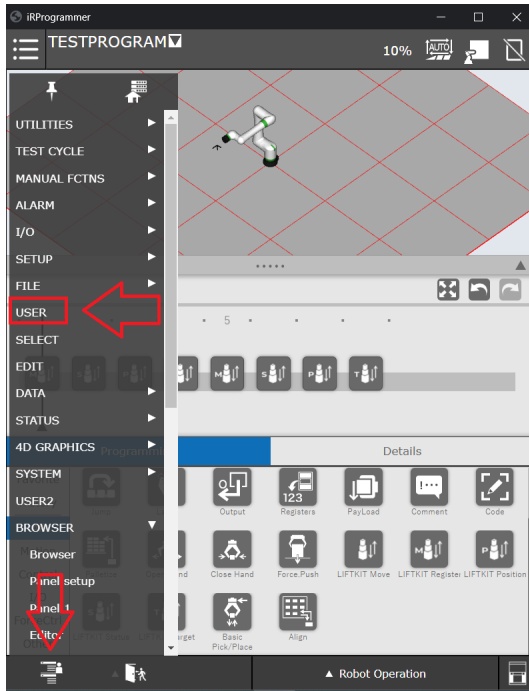
During testing it is possible to see the latest logs of the KAREL programs in the USER submenu. For example, if the SBOX Service is not running and the **Move** instruction is started, the text as shown in **figure 63** will be written to the USER logs window

Figure 63

User logs window
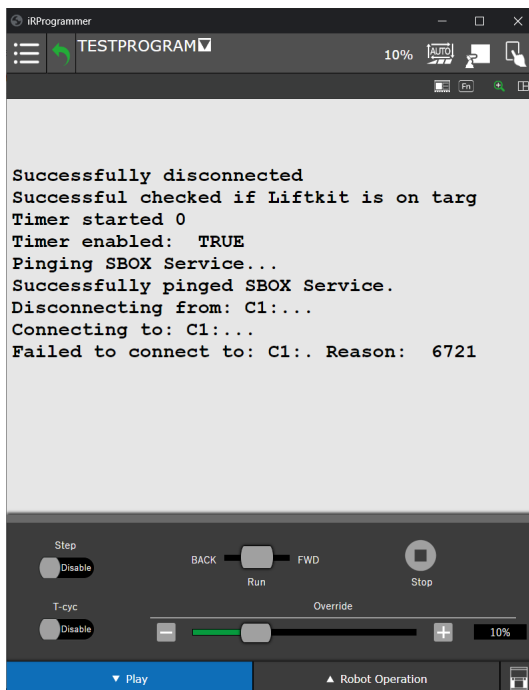
The logs can also be monitored while the LIFTKIT is moving (see **figure 64**).

Figure 64

User logs window
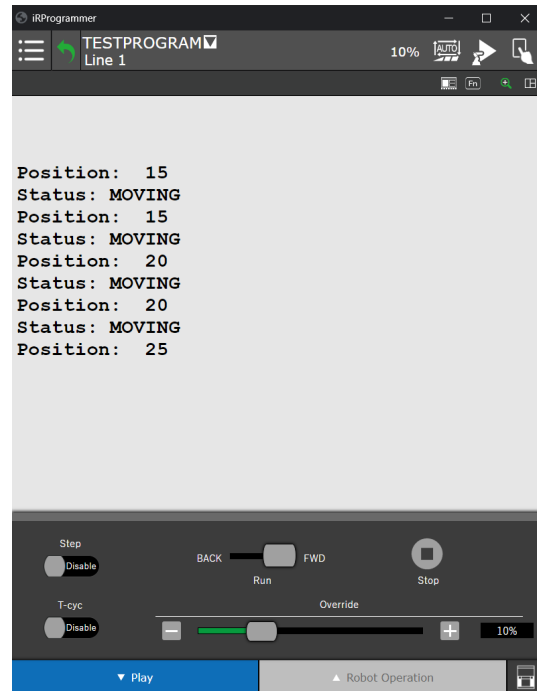
NOTE

The logs are only temporary (not stored anywhere), when the controller is restarted or when some other action is initialized that uses the USER logs, then the previous logs are overwritten.

When Play is pressed, the menu appears on the bottom of the page.

If the Tablet teach pendant is ON, sliding the Slidebar to the right for some period of time will start instruction palette (see **figure 65**).

Figure 65

Start program when Tablet TP is ON
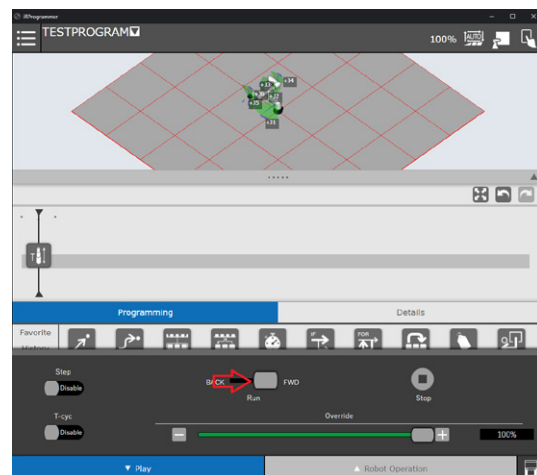
If the tablet teach pendant is OFF then pressing **Play** button will start the instruction palette (see **figure 66**).

Figure 66

Start program when Tablet TP is OFF
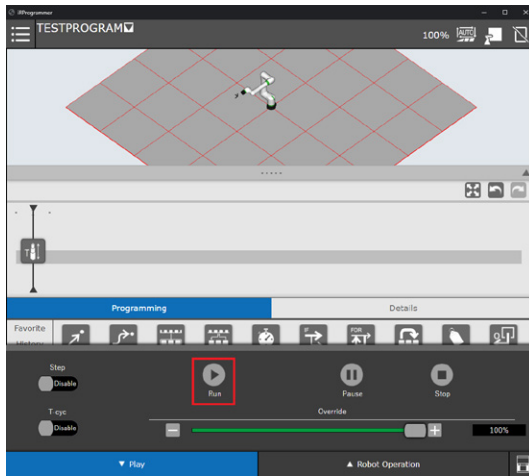
7.8 TP program code

The instruction palette is a visual presentation of the TP program. Each instruction represents a KAREL program which could be called by coding. The following **table 5** gives an overview how all KAREL programs are called.

Table 5

Instruction		Code	Arguments
Liftkit Move		IPL_EWLX_LIFTKIT_MOVE_WRAPP(arg1)	arg1 ☐ Desired position in mm
Liftkit Move from Register		IPL_EWLX_LIFTKIT_MOVE_R_WRAPP(arg1, arg2)	arg1 ☐ Number of Register in which desired position is written arg2 ☐ Number of String Register in which movement feedback is written
Liftkit Get Position		IPL_EWLX_LIFTKIT_POSITION_R(arg1)	arg1 ☐ Number of Register in which position is written
Liftkit Get Status		IPL_EWLX_LIFTKIT_STATUS_R(arg1, arg2)	arg1 ☐ Number of String Register in which Status is written arg2 ☐ Number of String Register in which Cause is written
Liftkit on Target		IPL_EWLX_TARGET_POSITION_R(arg1, arg2)	arg1 ☐ Number of Register with position where Liftkit previously moved to arg2 ☐ Number of Register in which feedback is written

8. Specifications

Operating range extension

- Vertical lifting of the cobot by up to 1 400 mm with compact retracted height

- Robust column design for industrial use, vibration free motion and virtually maintenance free

Plug-and-play solution

- Hardware interface compatible with CRX-5*i*A, CRX-10*i*A, CRX-10*i*A/L, CRX-20*i*A/L robots

- FANUC CRX-ready product

- Software control integrated with FANUC CRX plugin for easy motion programming

- Requires the installation of the FANUC R648 Socket messaging option

Cost savings and higher productivity

Cobots combined with Ewellix LIFTKIT provide a cost-effective solution to upgrade an existing assembly shop, moving from a manual handled to a fully automatized line.

Technical data

	Unit	LIFTKIT-FA-601
Column type	-	TLT
Performance Data		
Max. push load	N	1 500
Max. pull load	N	0
Max. dynamic moment	Nm	210
Max. static moment	Nm	3 000
Max. linear speed	mm/s	80
Duty cycle	-	10% (20% at 500N)
Mechanical Data		
Screw type	-	Acme screw
Stroke range	mm	500 - 1 400
Retracted length (software controlled)	mm	Stroke/2 + 275
Weight @ 0 mm stroke	kg	21
Δ weight per 500 mm stroke	kg	1,7
Robots compatibility	-	CRX-5*i*A, CRX-10*i*A, CRX-10*i*A/L, CRX-20*i*A/L
Cable management	-	Threads on column and interface plate to attach cable management
Electrical		
Input Voltage/Current	-	120 VAC / 6,5 A 230 VAC / 3,3 A
Input frequency	Hz	50-60
Input Fuse	A	10
I/O voltage	-	24 VDC
I/O current	-	max. 10 A not protected
Emergency stop	-	STO up to PLe, Cat.4
Communication		
Control interface	-	FANUC CRX with R648 Socket messaging
Positioning, repeatability	mm	± 1
Accessible positions	-	any
Feedback	-	Position & Status
Soft start and stop	-	Implemented for smooth operation
Software control	-	FANUC CRX plugin
Environment		
Type of protection	-	IP40
Ambient temperature	°C	+10 to +40
Max. humidity	%	85
Vibration	-	Stationary industrial environment

Dimensional drawing

TLT lifting column

Robot attachment plate

196   196
15
4×M8
4×M8
4×M6

TLT Column

4×M10□101
30 mm deep
□129
Stroke ±4
□146
□163
3×M5
12 mm deep
Holes also on
opposite side
Retracted
length ±4
(without
mounting
plates)
4×M10
30 mm deep
Length
2 300 mm

40
20
8×M5
11 mm deep
83,5
27,6
40
40

Bottom mounting plate

8×Ø6,3 mm
4×Ø11 mm
15
146
180
□200
70   140
□180

Control unit SCU

365
87
360
13,5
75
141
75
50,5
5,2
340

SBOX

46,2   30,9   27,3
260
300
4 - Ø 8,5
(Control Unit
Mount Hole)
160   150   200

RS232
(SCU)
Digital IO
TCP-IP
(cobot)
Power switch
Power Out (SCU)
Fuse
Power In
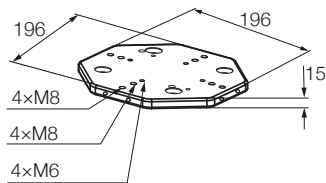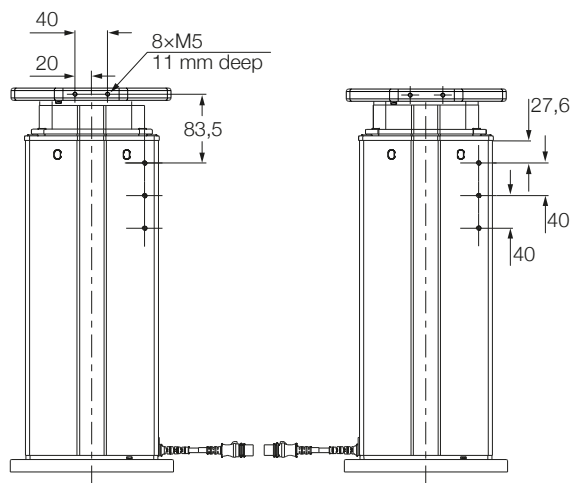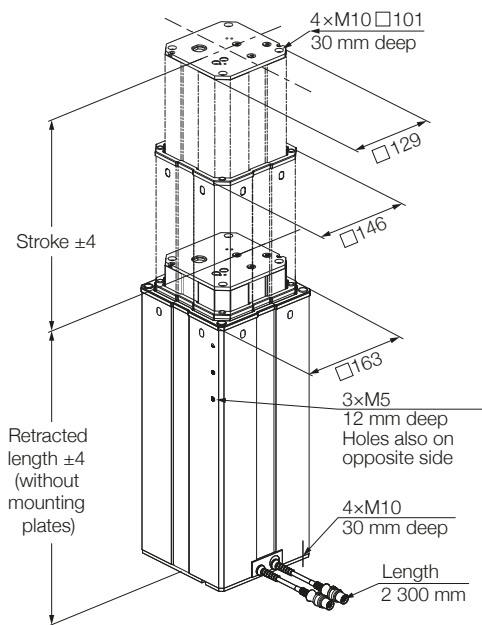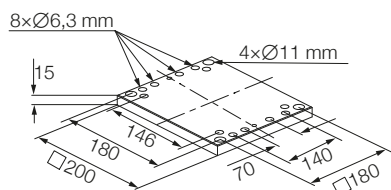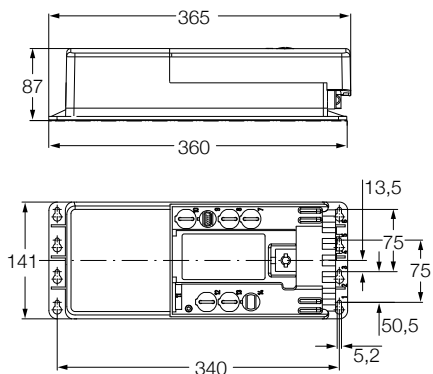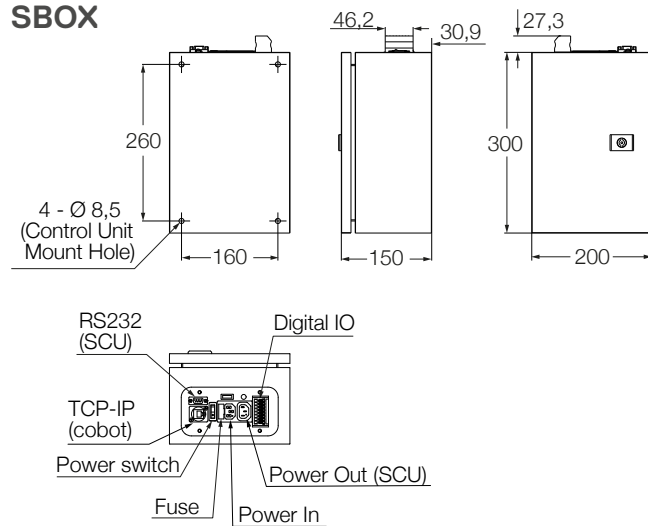
9. Troubleshooting

Malfunction	Possible cause	What to do
The LIFTKIT does not move	Control unit not operational	Check if the green light on the side of the control unit is on
		Ensure that the RS232 cable is securely connected to the control unit and the SBOX
		Ensure that the safety relays from the SBOX are connected to the terminal conversion module in the FANUC controller
		Emergency stop must be released
		Shunt SCU I/O cable (see **figure 4**) or connect to safety PLC
	Robot not running	Turn on robot
	Obstacle in stroke area of the column	Remove all obstacles in the stroke area
	Motor has stopped due to high temperature	Observe duty cycle in technical specification. Wait 20 minutes and try again
	No communication between the CRX robot and the LIFTKIT-FA	Check the client tag setting and the IP address set in the SBOX and in the client tag are the same
		Check all cable connections and re-start the robot controller
		Ensure the "R648 socket messaging" is installed and activated on the FANUC controller
	Motor cables are plugged in wrong control unit ports	Ensure motor cables are plugged into port 1 and port 2 in the control unit
	Electrical connection is defective	Check cables including the ethernet cable connection and continuity
	Target postion out of virtual limit	Set target postion within vitual limit range or adapt virtual limit range
The column stops before reaching its target position	Control unit cuts of power	We recommend to bring the center of gravity of the robot towards the center of the lifting column
	Obstacle in the stroke area of the device	Remove all obstacles in the stroke area
The column moves at half the speed and the SCU controller beeps	Controller is not initialized	Perform initialization procedure described in this manual
LIFTKIT reaches target position and popup appears	On target tolerance is set too low	Increase the on target tolerance, we recommend 2 mm

9.1 Introduction

This Troubleshooting Guide is intended to provide guidance to the Liftkit Plugin end users in the detection and correction of programming issues within ROBUGUIDE program. It may also be useful to Ewellix support engineers who supports this project (application).

9.1.1 Prerequisites

Liftkit plugin end-users and Ewellix support engineers must have the knowledge of:

- ROBOGUIDE Environment

- Stargate and Liftkit arhitecture

- Plugin functionality (Plugin manual)

9.2 Resolving know instruction errors

When error appears while running the instruction, it will be written inside a certain register specified on the UI.

9.2.1 Move From Register Instruction Errors

Error while running Move From Register instruction will be written inside Error register specified on the UI.

Read client tag error

`SR[ 1:Liftkit Move      ]=READ CLIENT TAG ERROR`

Issue: Client tag is not defined

Possible causes:

- Client tag is not chosen

Solution(s):

- Refer to (Plugin manual) to set up Client Tag

`SR[ 1:Liftkit Move      ]=READ CLIENT TAG ERROR`

Connect to Stargate error

Issue: Program cannot connect to the Stargate

Possible causes:

- There is no hardware connection to the SBOX/RPI,

- SBOX/RPI is powered off

- Another Client is already connected to the Stargate

- Wrong Client tag selected

- Client Tag is not defined properly

Solution(s):

- Check hardware connection with the SBOX/RPI

- Check if SBOX/RPI is powered on

- Refer to (Plugin manual) to set up Client Tag

- Restart Stargate Service (Power off/on SBOX)***

*** When hardware connection to the Stargate is lost and established again, software connection to the Stargate might not be able to be established again. In that scenario, restart Stargate Service is required

Move to absolute position error

Issue: Program cannot fulfil Move To Absolute Position

Possible causes:

`SR[ 1:Liftkit Move      ]=MOVE TO ABSOLUTE POSITION ERROR`

- SBOX don't have hardware connection to the SCU (Liftkit Status is INITIALIZED)

- SCU is powered off

- Liftkit type is not chosen

- Invalid Liftkit type is chosen

- Homing not done

- Hardware problems with Liftkit

Solution(s):

- Check hardware connection between SCU and SBOX

- Check if SCU is plugged

- Chose correct Liftkit type on Config page

- Do the homing

- Contact support

Height not between limits error

Issue: Liftkit cannot move to the specified position

`SR[ 1:Liftkit Move      ]=HEIGHT NOT BETWEEN LIMITS ERROR`

Possible causes:

- Height entered in specified Position Register is not between Limits.

Solution(s):

- Check Liftkit limits on Configuration page and enter appropriate value in specified Position Register

Timeout error

Issue: Program exited to prevent infinite loop

`SR[ 1:Liftkit Move      ]=TIMEOUT ERROR`

Possible causes:

- Another client is connected to the Stargate Service***

- Connection to the Stargate Service is lost while Liftkit is performing its movement for at least 15 seconds

Solution(s):

- Check hardware connection to the SBOX/RPI

- Check if SBOX/RPI is powered on

- Restart Stargate Service

*** When another client is connected to the Stargate Service, new client might still be able to connect to the Stargate. In that case, sending request to the Stargate will not return response and TIMEOUT ERROR will be trigered.

Failed to reach position error

Issue: Liftkit did not reach the specified position

Possible causes:

- SBOX/RPI is disconnected from the SCU during Liftkits movement

```
SR[ 1:Liftkit Move    ]=FAILED TO REACT POSITION ERROR
```

- SCU is powered off during Liftkits movement

- SBOX/RPI is powered off

- Hardware problems with Liftkit

- Solution(s):

- Check hardware connection between SBOX/RPI and SCU

- Check if SCU is powered on

- Check if SBOX/RPI is powered on

- Contact support

Read register error

Issue: Desired position register number is invalid

Possible causes:

- Robot controller have predefined number of registers that can be used. For desired position user entered value that

```
SR[ 1:Liftkit Move    ]=READ REGISTER ERROR
```

is not inside boundaries

Solution(s):

- Check minimum and maximum register numbers which could be found in "Registers" tab. Correct Desired position register number

Small delta height

```
SR[ 1:Liftkit Move    ]=SMALL DELTA HEIGHT
```

Issue: Movement is too small

Possible causes:

- Liftkits current position and desired position difference is 6 or less

Solution(s):

- Liftkit movement should be 7mm or more

9.2.2 Get Position Instruction Errors

When error appears while running Get Position instruction, value of the specified Position Register will be set to -100.

Possible causes:

- Client tag is not chosen

- Wrong Client tag selected

- Client Tag is not defined properly

- There is no hardware connection to the SBOX/RPI, or it's

```
R[  2:Liftkit position]=-100
```

broken

- SBOX/RPI is powered off

- Another Client is already connected to the Stargate

- Socket messaging is not enabled on ROBOGUIDE Environment

- SCU is powered off

- Connection between SBOX/RPI and SCU is lost

- Hardware problems with Liftkit

Solution(s):

- Check hardware connection with the SBOX/RPI

- Check if SBOX/RPI is powered on

- Check if SCU is powered on

- Check connection between SCU and SBOX/RPI

- Refer to (7.4.2 Define Client tag) to set up Client Tag

- Refer to (7.4.2 Define Client tag) to set up Socket messaging

- Restart Stargate Service (Power off/on SBOX)***

- Contact support

*** When hardware connection to the Stargate is lost and established again, software connection to the Stargate might not be able to be established again. In that scenario, restart Stargate Service is required.

9.2.3 Get Status Instruction Errors

When error appears while running Get Status instruction, specified Status String Register will be set to INSTRUCTION ERROR and specified Cause String Register will have the description of the error that appeared.

```
SR[ 2:Liftkit Status ]=INSTRUCTION ERROR
SR[ 3:Liftkit Cause  ]=READ CLIENT TAG ERROR
```

Read client tag error

Issue: Client tag is not defined

Possible causes:

- Client tag not chosen

Solution(s):

- Refer to (7.4.2 Define Client tag) to set up Client Tag

Connect to Stargate error

```
SR[ 2:Liftkit Status ]=INSTRUCTION ERROR
SR[ 3:Liftkit Cause  ]=CONNECT TO SBOX Service ERROR
```

Issue: Program cannot connect to the Stargate

Possible causes:

• There is no hardware connection to the SBOX/RPI, or it's broken

• SBOX/RPI is powered off

• Another Client is already connected to the Stargate

• Wrong Client tag selected

• Client Tag is not defined properly

Solution(s):

• Check hardware connection with the Stargate

• Check if SBOX/RPI is powered on

• Refer to (Plugin manual) to set up Client Tag

• Restart Stargate Service (Power off/on SBOX)***

*** When hardware connection to the Stargate is lost and established again, software connection to the Stargate might not be able to be established again. In that scenario, restart Stargate Service is required

Timeout error

Issue: Instruction could not be finished in 15 seconds.

Possible causes:

• Another client is connected to the Stargate Service***
Solution(s):

•Restart Stargate Service (Power off/on SBOX)

*** When another client is connected to the Stargate Service, new client might still be able to connect to the Stargate. In that case, sending request to the Stargate will not return response and TIMEOUT ERROR will be trigered.

9.2.4 Liftkit On Target Instruction Errors

```
R[  3:Target feedback ]=-1
```

When error appears while running Liftkit On Target instruction, value of the specified Feedback Register will be set to -1.

Possible causes:

• Client tag is not chosen

• Wrong Client tag selected

• Client Tag is not defined properly

• There is no hardware connection to the SBOX/RPI, or it's broken

• SBOX/RPI is powered off

• Another Client is already connected to the Stargate

• SCU is powered off

• Connection between SBOX and SCU is lost

• Hardware problems with Liftkit

Solution(s):

• Check hardware connection with the SBOX/RPI

• Check if SBOX/RPI is powered on

• Check if SCU is powered on

• Check connection between SCU and SBOX

• Refer to ([7.4.2 Define Client tag](#)) to set up Client Tag

• Restart Stargate Service (Power off/on SBOX)***

• Contact support

*** When hardware connection to the Stargate is lost and established again, software connection to the Stargate might not be able to be established again. In that scenario, restart Stargate Service is required

9.3 Plugin UI Status Codes

9.3.1 Status and Position are left blank

Figure 67

Issue: Status and Position cannot be obtained.

Possible causes:

• There is no hardware connection to the SBOX/RPI, or it's broken

• SBOX/RPI is powered off
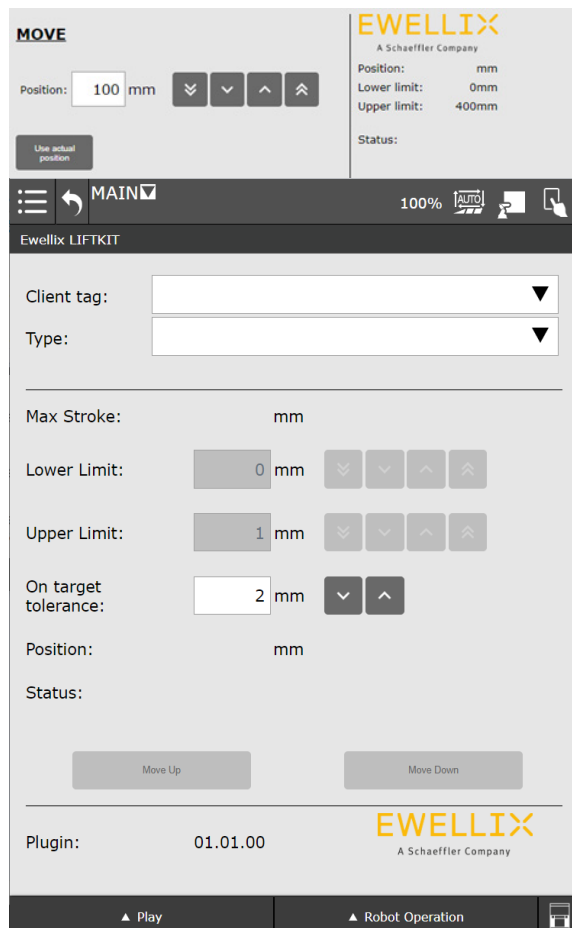
- Another Client is already connected to the Stargate Solution(s):

- Check hardware connection with the Stargate

- Check if SBOX/RPI is powered on

- Restart Stargate Service (Power off/on SBOX)

9.3.2 Status is INITIALIZED

Figure 68

Issue: Stargate returned Status INITIALIZED

Possible causes:

- SCU is unplugged

- Connection between SBOX and SCU is lost

- Safety is triggered (E-stop, safety fence, contact stop, etc.)
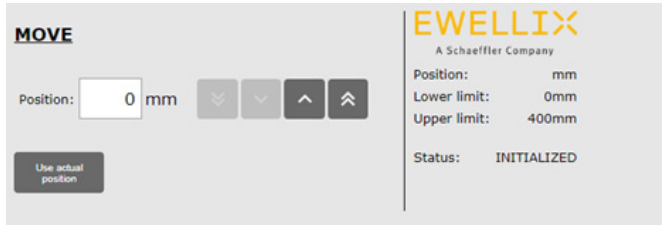
- Hardware problems with Liftkit

Solution(s):

- Check if SCU is plugged in

- Check connection between SCU and SBOX

- Release safety and wait up to 15 seconds

- Contact support

9.3.3 Status is CONNECTED

Figure 69

Issue: Stargate returned Status CONNECTED.

Possible causes:

- Liftkit type is not set

- Invalid Liftkit type choosen

- Homing is not done

Solution(s):

- Choose correct Liftkit type on Config page

- Do the homing

9.3.4 Position and limits have the value -1

Figure 70
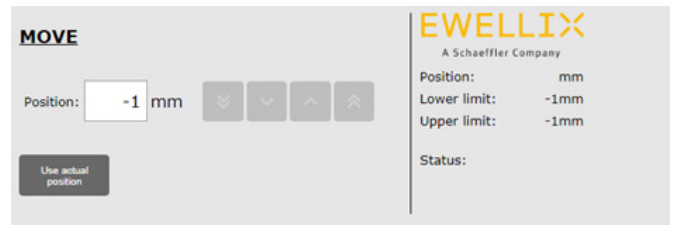
Issue: There was a problem during loading Configuration page, and limits could not be obtained

Possible causes:

- There is no hardware connection to the SBOX/RPI, or it's broken when loading Config page

- SBOX/RPI is powered off when loading Config page

- Another Client is already connected to the Stargate when loading Config page

- Homing was not done when loading Config page

- Wront type is selected

- Values are not fully obtained on Config page

Solution(s):

- Fix connection issue and load Config page again

- Do the homing and load Config page again

- Chose valid Liftkit type

- Load configuration page and wait until all values are read and showned

9.3.5 Invalid position/Limits/tolerance entered

Figure 71
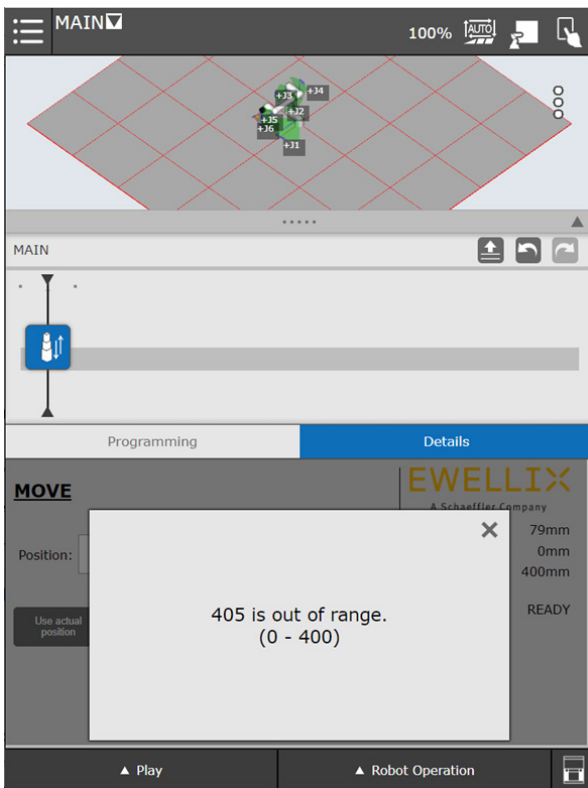
Figure 72

Figure 73
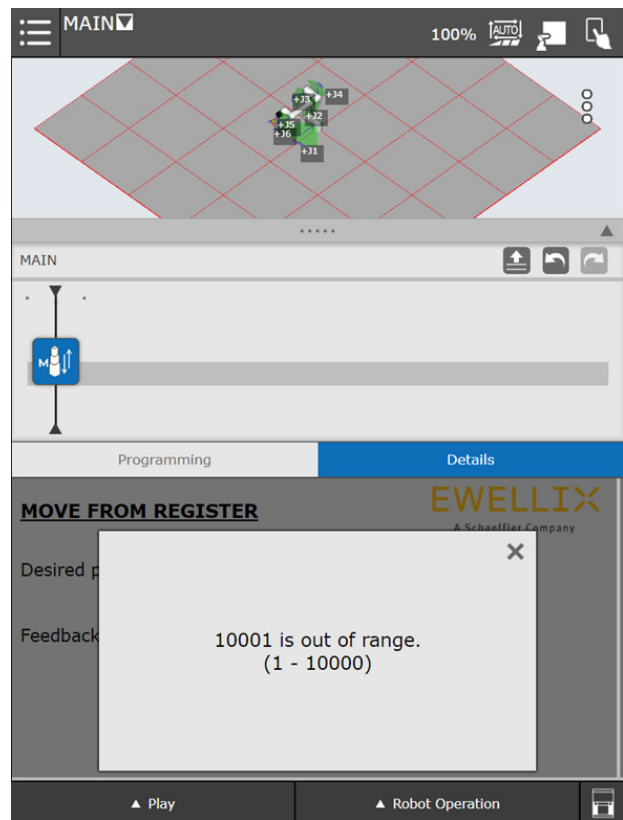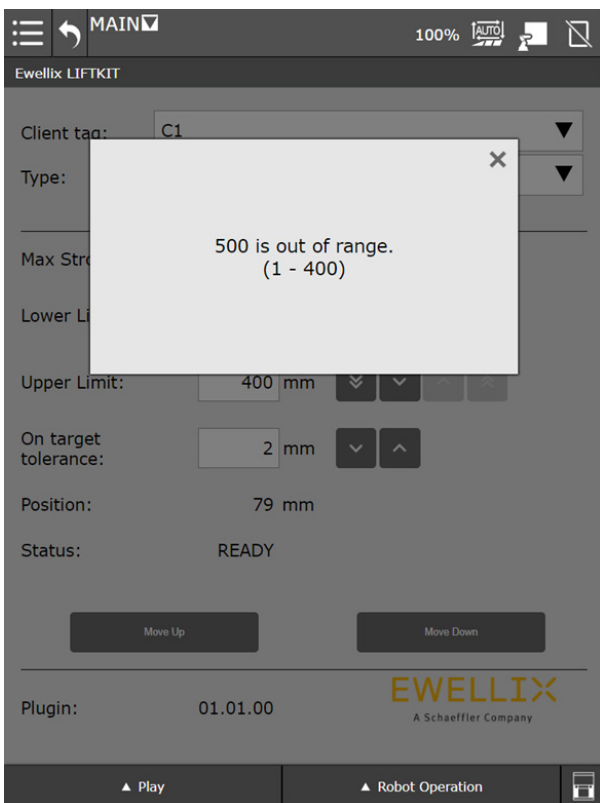
Issue: Value entered in textbox is not between specified limits

Possible causes:

• Value entered in textbox is not between specified limits

Solution(s):

• Check text in popup dialog and change the value accordingly

10. Appendix

10.1 Safety SCU control unit

This section provides an overview of important safety aspects of installing, operating and maintaining this device.

Disregarding this manual and safety regulations specified therein may result in considerable danger and possible serious injury or death or damage to device or equipment.

The SCU control unit was designed and build in accordance with the latest technical standards and accepted rules.

EU-Conformity is documented with the technical documentation.

10.2 Use

10.2.1 Intended Use

The SCU control unit was designed and built in accordance with the latest technical standards and accepted safety rules.

The intended purpose is described in these instructions.

The authorized use of the SCU control unit is:

"Control up to six actuators for push- or pull loads".

NOTICE

The control unit can only be parametrized for the actuators of Ewellix. Please contact customer services to find out which actuators are approved for the SCU!

NOTE

For the operations data, please see IL-06008-Control units catalogue.

If you use the SCU control unit for any use other that cited, the manufacturer cannot be held the responsibility for defect or damage resulting from this.

It is only intended for interior use and is implemented in medical devices as well as in industrial and construction technology.

Range of environmental conditions:

• Ambient temperature: 5 to 40 °C

• Relative humidity : 5 to 85%

• Atmospheric pressure: 700 hPa to 1060 hPa

• Use and operate at an altitude of 3000 m (MOPP)

• Overvoltage category II

• Pollution degree classification 2.

Product life time

The SCU control unit is designed for a service life of 10 years or at least 100000 cycles of operation per channel.

User groups

The organization and implementation of the operation manual takes into account the different user groups

To ensure safety, we place requirements on the users of the SCU control unit that must be adhered to under all circumstances. Only persons who meet the requirements are entitled to use the SCU control unit.

We refer to all persons who operate, use, commission the control unit, process it further or pass it on for further processing as user groups. As the requirements of these user groups strongly depend on their role, we distinguish between the following user groups:

The **operating authority** is the contractual partner of the person doing the further processing or the reseller. They can impose legal conditions on the operating authority when purchasing the control unit. The operating authority ensures that the user is instructed in the authorized use of the equipment.

The **processor** is the contractual partner of the reseller or the manufacturer. He assembles the control unit into a total device. He is authorized by the manufacturer of the SCU control unit to use the control unit in accordance with the regulations and has the necessary expert knowledge.

The **technician** has the professional technical training to implement the SCU control unit according to its authorized use. Apart from the chapter on Safety, he is also familiar with the chapter on Special operating modes. He will find the required technical data in the **Appendix** (see SCU operating manual PUB TC-08005.)

The **reseller** forwards the machine. Every other person who uses the SCU control unit we define as an **operator**. The operator must have read the Safety chapter in this manual before using the machine. Moreover, he must be instructed about the normal operation by the operating authority.

Types of operation

The SCU control unit is exclusively intended for intermittent operation.

Danger zones

We differentiate between two danger zones that must be observed, depending on user role.

The danger zone covering **persons** includes, aside from the actual user, third persons as well (other personnel, visitors, patients etc.) In case of injury, the operating authority is responsible.

The danger zone **device** comes under the user group Executor and Technician and covers the SCU control unit and all the mounted-on elements.

10.2.2 Unintended Use

Any use other that the intended use, or modifications to the device without the manufacturer's written agreement, or operation beyond the technical limits, is considered unauthorized.

See technical operating limits in the technical data of IL-06008-Control units catalogue and on the label of the SCU.

> **NOTE**
>
> Any unauthorized use of the device can cause personal injury and property damage. Always adhere to the instructions given in this manual.

The SCU control unit is suitable only for internal use and must not be subjected to weathering, strong UV radiation or explosive atmospheric media. Specific application exemptions are:

- Flammable anesthetic mixture with air

- Flammable anesthetic mixture with oxygen or nitrous oxide

- Increased radiation.

> **⚠ WARNING**
>
> **Risk from misuse.**
> Any utilization of this device beyond its intended purpose may lead to potentially hazardous situations.
> Therefore:
> - Strictly adhere to all safety precautions and instructions in this operating manual.
> - Do not make this device subject to weather conditions, strong UV rays, corrosive or explosive air media as well as other aggressive media.
> - Do not modify, retool or change the structural design or individual components of the actuator.
> - Never use the device outside of the technical application and operational limits.

10.2.3 Essential performance

Supply electromechanical actuators / pillars by command.

10.3 Responsibility of the owner and processor

The device is designed for commercial applications by its owner or processor. The processor is the contracting partner of the reseller or the manufacturer. The processor installs the device in a complete system (application).

The owner or processor of the system is therefore subject to the requirements of the Occupational Health and Safety Act. In addition to the safety instructions in this manual, the owner or processor must do the following concerning these safety and accident prevention guidelines and environmental protection regulations applicable to the site of the system's installation:

- Inform themselves of applicable industrial safety regulations. They must also determine additional hazards that arise due to the specific working conditions prevailing at the site where the device is installed using risk assessment. The risk assessment must be implemented in the form of work instructions for device operation.

- Confirm that the work instructions created for the system, including the device satisfy current legal requirements and must alter the instructions accordingly.

- Clearly regulate and specify the responsibilities for installation, operation, maintenance, and cleaning.

- Ensure that all employees who deal with the device have read and understood this manual.

- Provide personnel with the required protective equipment.

- Provide training for personnel at regular intervals and inform personnel of the hazards.

In addition, the owner or processors must ensure that the device is in adequate working condition. They must do the following:

- Ensure that the maintenance intervals described in these instructions are complied with.

- Have all safety devices inspected regularly for function and completeness.

10.3.1 Areas of responsibility

Different areas of responsibility, corresponding to the different user groups, arise.

The Operating Authority has the responsibility for the danger zone covering persons and ensures that only authorized and instructed users work with the SCU control unit. He or she is responsible for the following:

- Determining the persons who may use the SCU control unit (authorized persons).

- Instruction of the users.

- Complying with all relevant legal conditions and regulations.

NOTICE

The Operating Authority may only authorize such persons for using the SCU control unit, who conform to the requirements for the user roles.

The **processor** is responsible for:

- Generation of a CE-conformant operation manual of the device in which the SCU control unit has been integrated.

- Adherence to the safety regulations in accordance with this operating manual.

The **technician** is responsible for:

- Observing the manufacturer's instructions and the safe-set-up of interfaces with other equipment.

- Installation and use of the SCU control unit in accordance with its intended purpose-conformant use.

- Installation of optional modules and connecting cables.

The **reseller** is responsible for:

- Passing on this operating manual and the SCU control unit to the executor.

- Passing on of a CE-conformant operating manual and the device in which the SCU control unit has been integrated to the Operating Authority.

The **operator** is responsible for:

- Ensures that nobody is endangered owing to the operation of the SCU control unit.

- Operation of the SCU control unit in normal operation.

- Immediate and appropriate reaction to malfunctions.

10.4 Personnel requirements

⚠ WARNING

Improper installation, operation and maintenance can result in serious injury, death or property damage.
Use only qualified, instructed, or trained personnel (as described below) who have read, understand and follow these instructions.

10.4.1 Qualifications

The following qualifications are specified for different areas of activity listed in this manual:

- **An instructed person (operator)**: Instructed by the customer in an orientation session on the assigned tasks and possible dangers arising from in case of improper behavior.

- **Qualified personnel:** Based on their professional training, know-how and experience as well as knowledge of the applicable standards and regulations are able to independently perform assigned work activities and to detect and avoid possible dangers.

- **Professional electrician**: Based on his/her professional training, know-how and experience as well as knowledge of the applicable standards and regulations is able to independently perform work on electrical systems and to detect and avoid possible dangers.
  In addition, the professional electrician has been trained for the special location where he/she works and knows the relevant standards and regulations.

Only persons who can be expected to perform their tasks reliably are permitted as personnel. Persons whose reaction capabilities are impaired, e.g. through the use of drugs, alcohol or medication for example, are not permitted.

10.5 Specific dangers

The manufacturer has constructively, and with protective measures, minimized the effects of existing hazards. Pay attention to the residual hazards and potential countermeasures described and the warnings in the following chapters.

10.5.1 Residual hazards to people, objects and property

Keep in mind the following residual dangers and the possible countermeasures in handling the SCU control unit.

> ⚠ **DANGER**

Danger to life caused by electric current.
Touching conductive parts causes a direct danger to life. Damage to insulation or individual components can cause danger to life.
Therefore:
• In the event of damage to insulation, switch off the power supply immediately and have the defective parts repaired.
• Work on the electrical system must he carried out only by skilled electricians.
• De-energize the machine for all work on the electrical system.
• Before maintenance, cleaning or repair work, switch off the power supply and perform lockout procedures so it cannot he turned on again.
• Do not bridge fuses or make them ineffective. When changing fuses, make sure you use the correct amperage.
• Keep moisture away from conductive parts. If you do not, this can cause short circuit.

> ⚠ **WARNING**

Electrical shack hazard
Check the mains voltage corresponds to the nominal values on the product label.
• Ensure that power cables cannot become pinched or damaged.
• Warning regarding electrical shock owing to damaged plugs or damaged network cables. Never touch a damaged network plug or a damaged network cable when the SCU control unit is running, since the SCU control unit is supplied with 120 VAC or 230 VAC.
• Ensure, before you pull a defective plug out of the plug socket, that the SCU control unit is disconnected from the power supply.

> ⚠ **WARNING**

Unintended, uncontrollable movement
• Due to a defect of a component, an uncontrollable movement of the connected actuator[s] can occur.
• In worst case RAM or ROM failure can lead to a false or auto motion. This kind of failure has a low failure probability and it occurs in such a way that a motion is started.
• If the button of the hand switch sticks when releasing it and the user doesn't press the button for the opposite direction then an auto motion occurs.

> ⚠ **WARNING**

Specific dangers during cleaning or washing the control unit SCU
The control units are designed to comply with IPX4.
The cleaning or washing with water including chemical additives must be pH-neutral. Excessively acidic or alkaline washing water can destroy metal and plastic components of the control unit. Manually and mechanically operated high-pressure steam cleaners must not be used. Only isopropyl alcohol cleaning agent may be used for disinfecting by manual wiping.
A SCU control unit must never be washed in a washing machine or other equipment. The control unit would be destroyed by the penetration of liquid.
The plastic housing must be checked periodically (every six months) for mechanical damage (cracks).

> ⚠ **WARNING**

Injury due to cracks and related openings in the housing of the actuator and/or its accessories:
If the housing is damaged due to stock, breakage or heavy wear, stop using the device and follow the dismantling instructions.

> ⚠ **CAUTION**

Please be aware of damage to people or property as the result of incorrect operation. Incorrect operation can endanger people in the danger zone or objects.
• Before pressing a button on the operating device, ensure that you press the right button.
• Take appropriate measures to ensure that the operating device cannot be operated.

> ⚠ **CAUTION**

No function is considered as a safe condition.

> ⚠ **CAUTION**

The SCU control unit is only suitable for interior applications and must not be subjected to weathering, strong UV radiation or corrosive or explosive air.
The SCU control unit may only be operated when the safety protective cover is mounted.

> ⚠ **CAUTION**

Failure of the control unit due to interruption to the mains power or an electronic defect should not pose any hazard to the patient, to the operator or to the servicing personnel.
Ewellix actuators should be operated in accordance with the application specified on the type label.
The nominal data for the actuators and the control unit must be verified at the same time of installation. The ratings on the data should not be exceeded. If this information is disregarded, the actuator and the control unit will be damaged irreparably. Risk of personal injury remains.

> ⚠ **CAUTION**

Any overload on the control unit will trip a temperature switch in the mains transformer. After cooling of the transformer, the thermal protector will reset, so the control unit SCU is ready again to control the actuators.

⚠ **CAUTION**

Electric shock hazard
Take care about damage to the SCU from water sprays. The control unit SCU is splash-proofed according to IPX4. Prevent the SCU from being subjected to water sprays or hosing during the operation time.

NOTICE

Prolonged overload will result in irreparable damage to the control unit.

10.5.2 Specific dangers SCU with batteries

Replacement batteries should only be ordered from Ewellix, since they are a special type. The old batteries must be properly disposed of. The user's maintenance personnel must be given instructions by the ultimate manufacturer on opening and closing the battery compartment lid and on replacing the batteries.

⚠ **WARNING**

If unintended movements can cause serious injury, additional protective means must be installed to stop or avoid such movements.

⚠ **WARNING**

Disconnection from the mains power supply will not prevent movement of the actuators in case of an electric defect while batteries are connected.

10.6 Safety equipment

⚠ **WARNING**

Danger due to malfunctioning safety equipment
For safe operation, be sure all safety equipment is in good working order.
Therefore:
• Always check functionality of safety equipment according to the maintenance plan.
• Never disengage safety equipment.
• Safety equipment may never be by-passed or modified.

Integration in an emergency-stop system required (for certain applications)

⚠ **WARNING**

Electric shock hazard
The SCU control unit do not have an on/off switch. If required to be switched off, for example in an emergency, the control unit must be disconnected from the power supply. Only this measure will de-energize the control units. Applications where the control units are built in must provide an emergency stop switch or isolation from the power supply on all poles. Additional protective means might be necessary in case of battery options.

The device is only intended for installation into an application or system. It does not have its own operating control elements and does not have an independent emergency-stop-function. Install the device so that it is part of an emergency shut-off system and can be stopped if necessary.

The emergency shut-off system has to be connected in such a way that a disruption of the power supply or the reactivation of the power supply after a power disruption cannot cause a hazardous situation for persons and objects.

The emergency shut-off systems must always be freely accessible.

10.7 Safeguard against restart

To secure the SCU control unit against unintentional restart:

4. Pull the power line plug off the control unit from the main supply.

⚠ **DANGER**

Life-threatening situation through unauthorized restart
For work in hazard zones, there is a risk that the power supply is turned on without prior authorization. This presents a life-threatening situation for people in the hazard zone.
Therefore:
• Follow the information concerning the safeguarding against restarting of the power supply in the chapters of **SCU operating manual PUB TC-08005.**
• Always follow the process to safeguard against a restart as described below.

Protect the SCU control unit against restart:

1. Pull the power line plug out of the power outlet.

2. In case the SCU control unit is equipped with a battery, ensure to remove the battery.

10.8 Modification & Information of device

> **⚠ WARNING**
>
> To avoid hazardous situations and to ensure optimal performance, do not make any changes or modifications to the device unless they have been specifically authorized by Ewellix.

10.8.1 Warning labels

For SCU control units no special warning labels are applied.

> **⚠ WARNING**
>
> **Danger of injury because of illegible symbols**
> Over the course of time stickers and decals may become dirty or illegible for various reasons.
> Therefore:
> • Keep any safety, warning and operation related decals in legible condition at all times.
> • Replace damaged decals or stickers immediately.

10.8.2 Information labels & lights

Labels

On the back side of the SCU control unit are two labels (see **figure 67**):

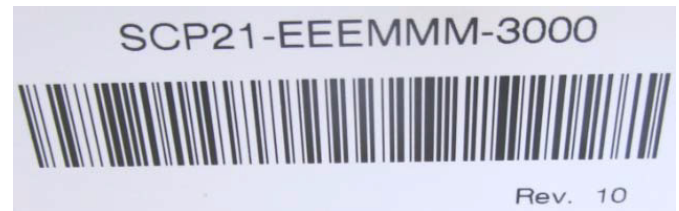• Type label

• Software parameter label (see **figure 68**).

Figure 67

Location of type label and SCU parameter label
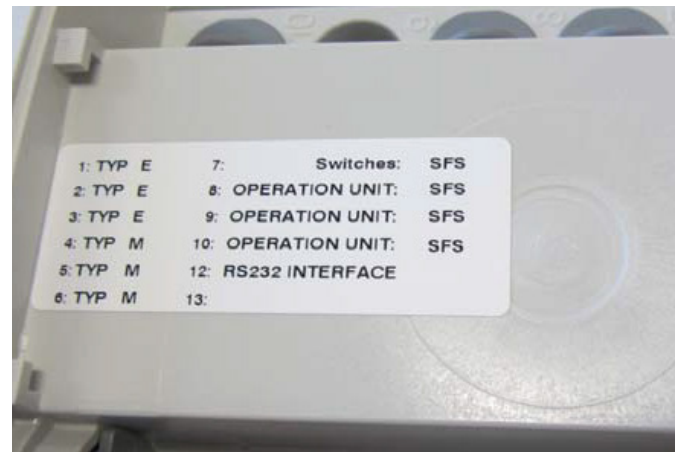

Figure 68

Example "Smart Control Parameter" (SCP-Label)

An additional label (inside, under the case cover, see **figure 69**) shows the socket pin assignment inputs / outputs (linear actuators, telescopic pillars, switches, operating elements, battery, etc.)

Figure 69

Example SCU socket pin assignment

For detailed information about the SCP-label (see **figure 68**) and the corresponding description label of the SCU sockets (see **figure 69**) contact Ewellix business support!

Power indicator light

The indicator light secures the visualization of the readiness of the control unit SCU (see **figure 70**).

> **NOTICE**
>
> The SCU control unit is equipped with a green indicator light LED to indicate ready for normal use.

Figure 70

Power indicator light

In addition to that a LED on the connected operating element (ex. hand switch) shows the status of the functionality and the status about the SCU and the connected actuators and gives (optional) information about the loading capacity of a used battery.

> ⚠ **CAUTION**
>
> **Push-to-run operation (recommended):**
> The connected actuators, pillars operate as long as the button on the hand switch is pressed. A green pilot lamp indicates the actuation. The relevant function (up/down) is determined and triggered by the button actuation.
> If the actuator does not have signals to indicate operation, depending on the application, it is recommended to have an operational signal installed in the application.

Protective Earth, metal pin

The SCU control units SCU5 & SCU9 are defined as class I devices. These models are connected to PE (protection earth) on side of main supply. This PE is also connected to the metal pin next to the main supply connector (see **figure 71**) on the SCU. This bolt pin can also be used to connect the final application to ground (PE) with a protection earth conductor (green/yellow).

Figure 71

Protective earth, metal pin

At this pin there is a possibility to connect other devices from the applications to earth ground. This can also help in case of improvements with EMC measurements.

> **NOTE**
>
> Take care! The maximum torque for the 6 edge screw is 0,8 Nm.

10.9 Manufacturer's declaration of EMC compliance

This section is only mandatory, if the devices are approved and attended for use in medical applications or environment (according IEC60601-1-2 ed. 4) This chapter shows the results and potential about EMC issues.

10.9.1 Instructions for use

Professional healthcare facility environment

Physician offices, dental offices, clinics, limited care facilities, freestanding surgical centers, freestanding birthing centers, multiple treatment facilities, hospitals (emergency rooms, PATIENT rooms, intensive care, surgery rooms, except near HF SURGICAL EQUIPMENT, an MR system outside a RF shielded room of an ME SYSTEM for magnetic resonance imaging).

Essential performance

The essential performance about the SCU control unit is „supply of electro-mechanic actuators and pillars on command". The risk management (Document L5678,0002) identifies the functions about safety of these control units. All features or functions are performed properly. Unacceptable risks for patients, operators or others are performed and assessed to prevent or reduce harm. The follow points identify and describe the EMC-risks about the SCU control unit according the EMC-measurements:

Warning against the stacking of equipment

⚠ **WARNING**

Stacked with other equipment
Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.

List of cables, length of cables, accessories

⚠ **WARNING**

Use of accessories, transducers and cables
The use of accessories, transducers and tables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.
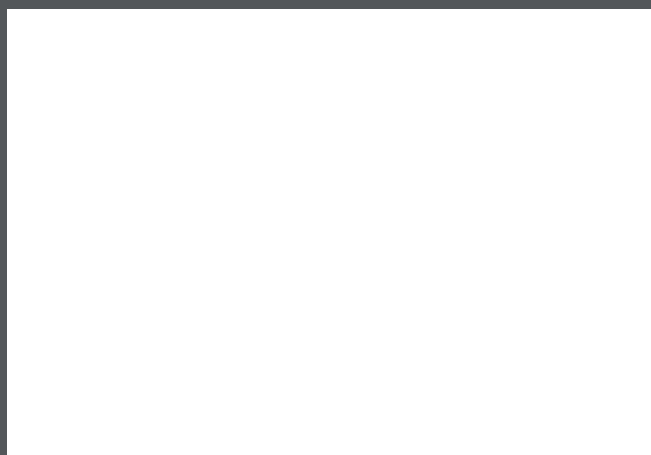
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