

EWELLIX

A Schaeffler Company

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

LIFTKIT-YA-601 LIFTKIT-YA-630

YASKAWA

PLUG & PLAY KIT



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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.

⚠ 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.

1.3 LIFTKIT designations

LIFTKIT contains a lifting column, a controller and additional accessories enabling easy integration with YASKAWA 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

				L I F T K I T - [] - [] - [] 0 0 - []			
Robot							
YA	YASKAWA						
Stroke							
	Stroke	Retracted length	Extended length				
500 ¹⁾	500 mm	525 mm ²⁾	1 025 mm				
600	600 mm	575 mm	1 175 mm				
700 ¹⁾	700 mm	625 mm ²⁾	1 325 mm				
800	800 mm	675 mm	1 475 mm				
900 ¹⁾	900 mm	725 mm ²⁾	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	for YASKAWA cobot HC10, GP4, GP7 and GP8						
630	for YASKAWA cobot HC20 and HC30						

¹⁾ 630 version is only available in 500, 700, 900 mm stroke; for other stroke please contact Ewellix

²⁾ For version 630 add 55 mm for assembly retracted length with plates

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 [12.1 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.

When using the LIFTKIT-YA-630 with the HC20 or HC30, the robot should be retracted as much as possible while the Telescopic Lift is in motion due to the limitation of an 840 Nm bending moment during motion. This means the TCP (Tool Center Point) of the robot should be positioned at 1000 mm from the center lifting column during motion only. The robot can be deployed to any position when the lifting column is not moving.

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 YASKAWA 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 YASKAWA safety I/O connection to operate. Activation of the YASKAWA emergency stop will trigger a stop of the LIFTKIT's SCU controller and the SBOX.
- Stopping or failure of the YASKAWA 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 YASKAWA 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 injury or death or property damage.
 - For LIFTKIT 630 misalignment of the 3 lifting columns could cause overloading.

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 for LIFTKIT-YA-601

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 YASKAWA robot attachment plate
- 1 bottom mounting plate
- 8 M10x40 screws for mounting plates **(1)**
- 4 screws M6x20 for YASKAWA robot **(2)**
- 2 pins Ø 8x20 to align YASKAWA 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



3.2 System requirements for LIFTKIT-YA-601

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

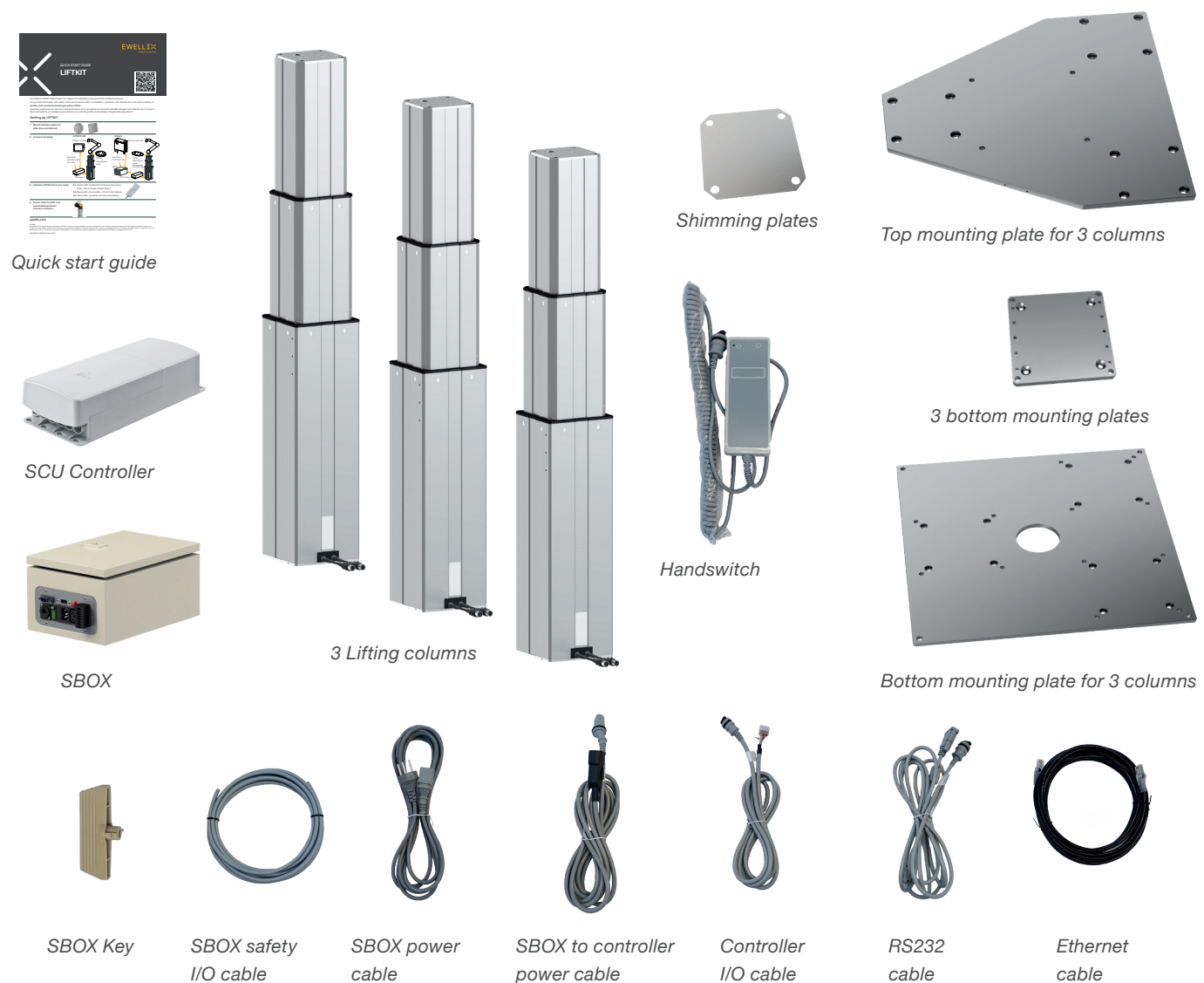
- Robot compatibility: HC10, GP4, GP7 and GP8 (except GP8L)
- YASWAKA controller: YRC 1000 micro
- User interface: Smart pendant and standard pendant
- Power input (max) depending on the SCU power version chosen:
 - 120 VAC / 6,5 A
 - 230 VAC / 3,3 A

3.3 Scope of delivery for LIFTKIT-YA-630

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

- 3 Lifting column
- 1 Control unit SCU 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 YASKAWA robot attachment top plate for HC20 and HC30
- 3 bottom mounting plates for pillars
- 1 bottom mounting plate for 3 pillars
- 12 M10x30 bolts for mounting the top plate to the pillars
- bolts for the robot top plate
- 4 M10x45 bolts for fixing the bottom plate to the customer base
- 12 M10x40 bolts for mounting the bottom plate to the pillars
- 4 M16x35 bolts to secure the HC20/30 to the top plate
- 6 fixation pins for alignment
- 12 washers
- 12 M10x30 bolts for fixing the pillars with already mounted plates to the bottom plate
- 5 shimming plates
- 1 Quick start guide
- 1 SBOX
- 1 SBOX key
- 1 SBOX I/O safety cable
- 1 SBOX to SCU power cable
- 1 ethernet cable
- SBOX mounting attachments

Figure 2



3.4 System requirements for LIFTKIT-YA-630

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

- Robot compatibility: HC20, HC30 and GP8L
- YASWAKA controller: YRC 1000 micro
- User interface: Smart pendant and standard pendant
- Power input (max) depending on the SCU power version chosen:
 - 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 Mechanical setup for LIFTKIT-YA-601

Refer to the numbers in section [3.1 Scope of delivery for LIFTKIT-YA-601](#), and in the **figure 2** for the preparation of the lifting column:

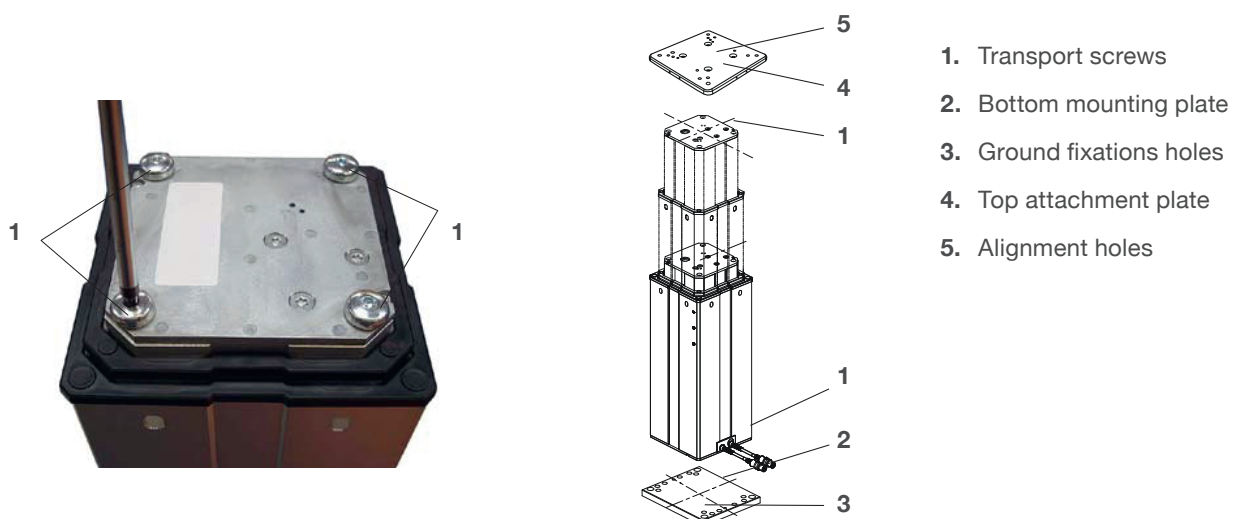
1. Take the lifting column out of the box.
2. Loosen and remove 4 transport screws (1) at the bottom of the lifting column.
3. Attach the bottom mounting plate (2) using 4 M10x40 screws on the outer guiding of the lifting column. Ensure a tightening torque of 40 Nm on these screws.
4. Fix the bottom (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 YASKAWA attachment plate (4) using 4 M10x40 screws on the inner guiding tube.

Figure 3



4.3 Assembly instruction for LIFTKIT-YA-630

LIFTKIT-YA-630 will be received on a pallet box with dimensions 120/80/59 cm (see **figure 4**).

Figure 4

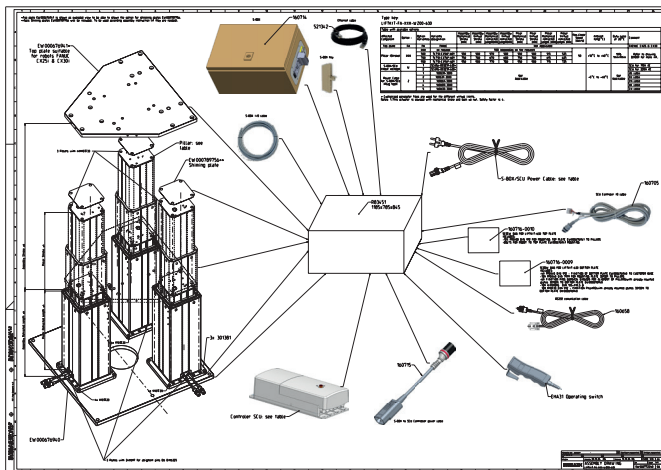
Example of packaging of LIFTKIT-YA-630



The package contains:

- 3 Lifting columns
- 3 Small bottom plates with drawing number 301381
- 1 SCU controller unit
- 1 SBOX
- 1 Cable box with cables incl. also operating switch.
- 2 Screw bags
- Refer to assembly drawings for LIFTKIT-YA-630 (see **figure 5**)

Figure 5



4.3.1 Unpackaging the components

Step 1

Take out the 3 lifting columns, the 3 small bottom plates 301381 and the screw bag for bottom plate 160716-0009 (see **figure 6**).

Figure 6



Step 2

Unpackage the 3 lifting columns, the 3 small bottom plates 301381 and the screw bag for bottom plate 160716-0009 (see **figure 7**)

Figure 7



4.3.2 Mounting the bottom plate:

Orientation: Ensure the LIFTKIT is installed in a horizontal orientation.

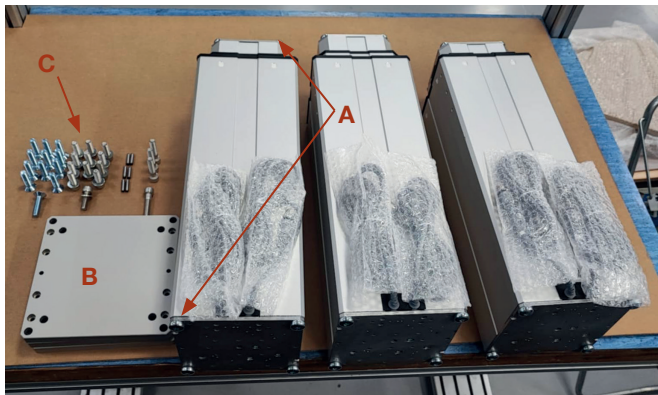
Surface Requirements: The installation surface must be fixed and stable, capable of supporting both the weight of the LIFTKIT and its maximum load.

Operational Manual: Refer to the operational manual for detailed installation procedures and safety guidelines.

Step 3

Unscrew the M10 bolts used for transportation (A) and mount plates 301381 (B) to the pillars via M10×40 DIN7991 bolts (C) (see **figure 8**).

Figure 8



Ensure 40 Nm tightening torque to mount the plates 301381 (B) via using the M10×40 DIN7991 bolts (C).

Expected results are shown in **figure 9**.

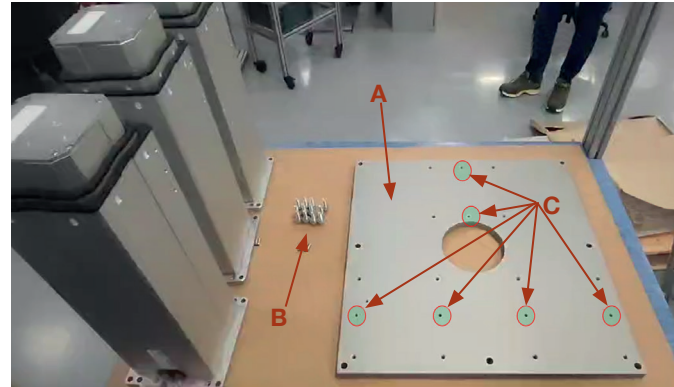
Figure 9



Step 4

Unpack the big bottom plate EW000676940 (A) and place alignment pins Ø6 (B) on the correct positions (C) (see **figure 10**).

Figure 10



Step 5

Mount the 3 lifting columns on the bottom plate EW000676940

Since the alignment pins Ø6×24 DIN6325 (A) are placed (see **figure 11**), the lifting columns can be aligned with the pins via the alignment Ø6H7 holes (B) on the small bottom plates 301381 (see **figure 12**).

Figure 11

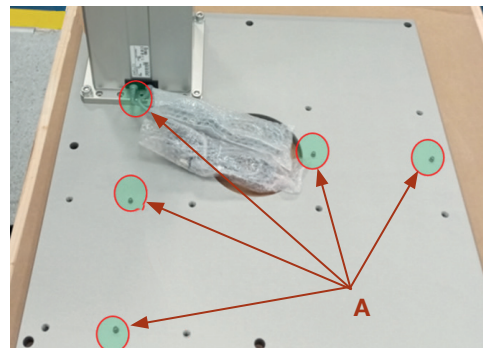
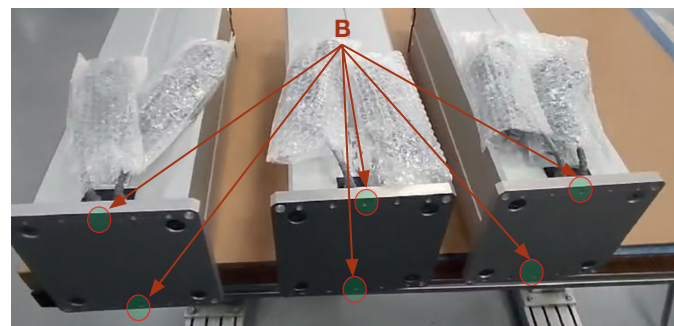


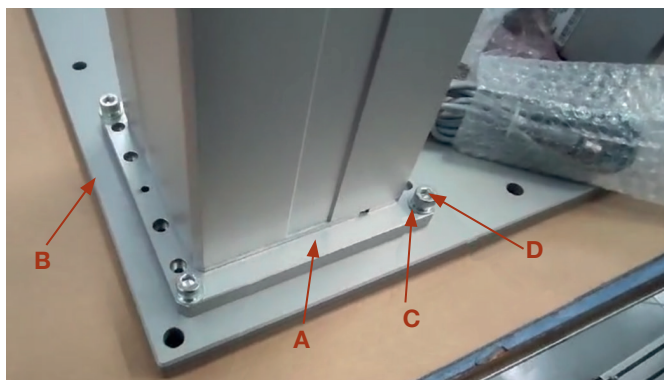
Figure 12



The pillars can be mounted with the cables towards outside or on 180° (see **figure 12**)

Ensure 40 Nm tightening torque to mount the plates 301381 (A) towards bottom plate EW000676940 (B) via using washers DIN125-A10,5 (C) and M10×30 DIN912 bolts (D) (see figure 13).

Figure 13



Expected results are shown in figure 14.

Figure 14



Step 6

Connect the cables of the SCU and Pillars according to the SCU Brief instructions for initialization and complete the initialization following these four steps:

1. Press both handswitch buttons simultaneously until the controller beeps.
2. Press the down button until the three lifting columns stop at the bottom end stop, indicated by a beep.
3. Press the up button until the three lifting columns stop at the upper end stop, indicated by a beep.
4. Screw the robot onto the top plate.

Step 7

Measuring the height difference of the pillars and shimming process if needed.

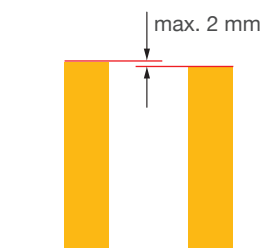
- After the initialization is completed go to the lowest position of the LIFTKIT by using the operating switch
- Then by using a measuring tape the height difference must be measured.
- Proposal for the measurement is to use the shimming plates EW000789756 (incl. 5pcs) (A) and measuring tape included into the package (B) to perform the measurement. Refer to the video with the proposal for measuring.

Figure 15



The max allowed difference into the pillar's height is 2 mm as shown in figure 16.

Figure 16



Ensure that the height difference of the pillars do not exceed 2 mm. The shimming plates EW000789756 with thickness of 1 mm can be used.

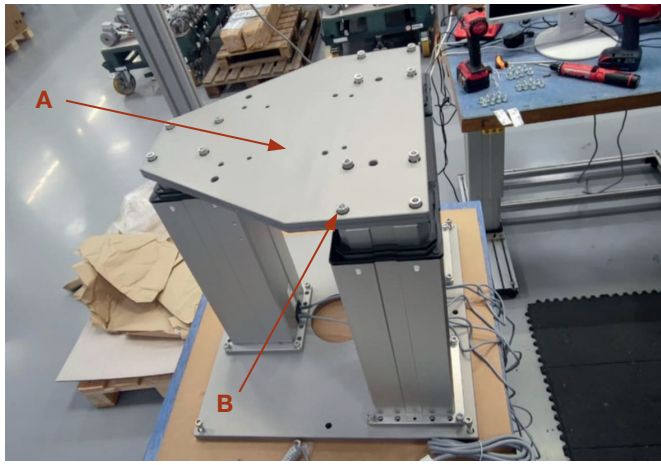
4.3.3 Mounting the top plate

Step 8

After the initialization is completed and the height difference is measured and if needed shimmed via EW000789756 the next step is mounting the top plate EW000676941.

Ensure 40 Nm tightening torque to mount the plates EW000676941 (A) towards lifting columns via using M10X30 DIN912 bolts (B) which bolts are part of the screw bag for top plate 160716-0010 (see **figure 17**).

Figure 17



4.3.4 Mounting the robot to top plate EW000676941

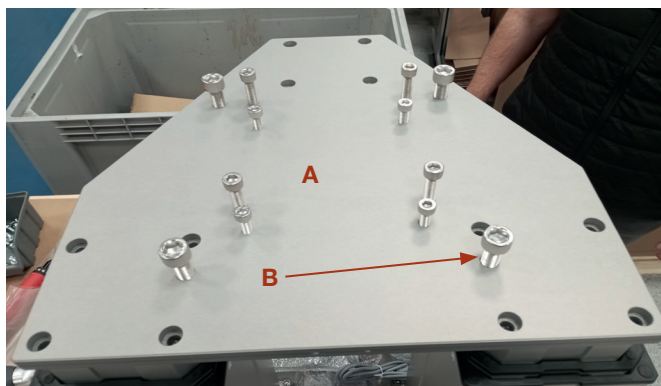
Step 9

Ensure correct tightening torque to mount the robot to plate EW000676941 (A) via using the recommended bolts from robot manufacturers. Ewellix proposals for bolts are shown in figure 18.

For YASKAWA HC20 and HC30 robot must be use 4xM16x35 DIN912 bolts (B).

Bolts are part of the screw bag for top plate 160716-0010.

Figure 18



5. Initialization and robot installation

5.1 Initialization of LIFTKIT-YA-601 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 19**. 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 20**, 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

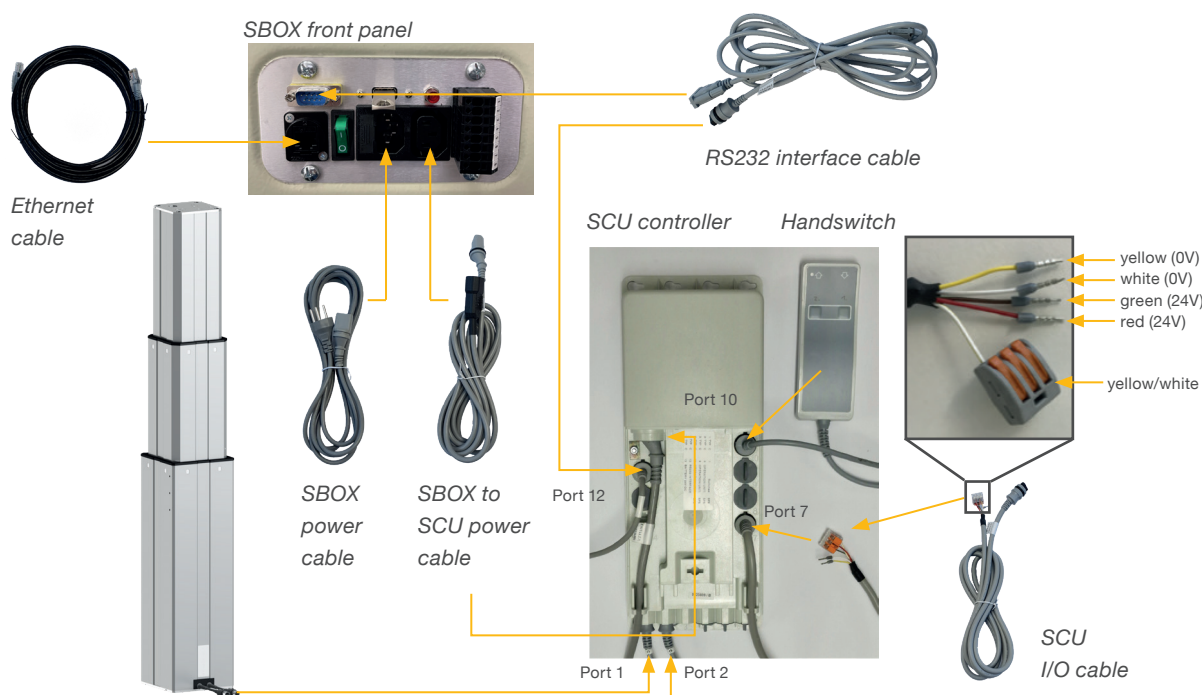
The identified end positions are used as virtual limits, which will be approached by soft ramps. After successful initialization the lifting column will move at full speed and full force. If it does not reach its full stroke or continues to beep, then repeat the initialization procedure again.

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 19



5.2 Initialization of LIFTKIT-YA-630 and robot installation

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

1. Connect all LIFTKIT components as shown in **figure 21**. It is recommended to perform the initialization without the robot mounted on the column. The three lifting columns must be plugged into ports 1 to 6 of the SCU, as shown in **figure 21**.
2. Override of the emergency stop link. Short-circuit the three wires with the provided clamp as shown in **figure 20**, 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. Using the handswitch and buttons, move the columns downwards until all lifting columns hit the end position. The SCU controller will beep.
5. Using the handswitch and buttons, move all the lifting columns upwards to the top position until all three lifting columns hit the end position. The SCU controller will beep.

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 20

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

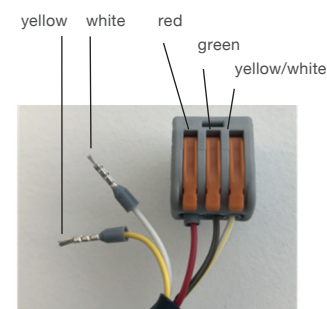
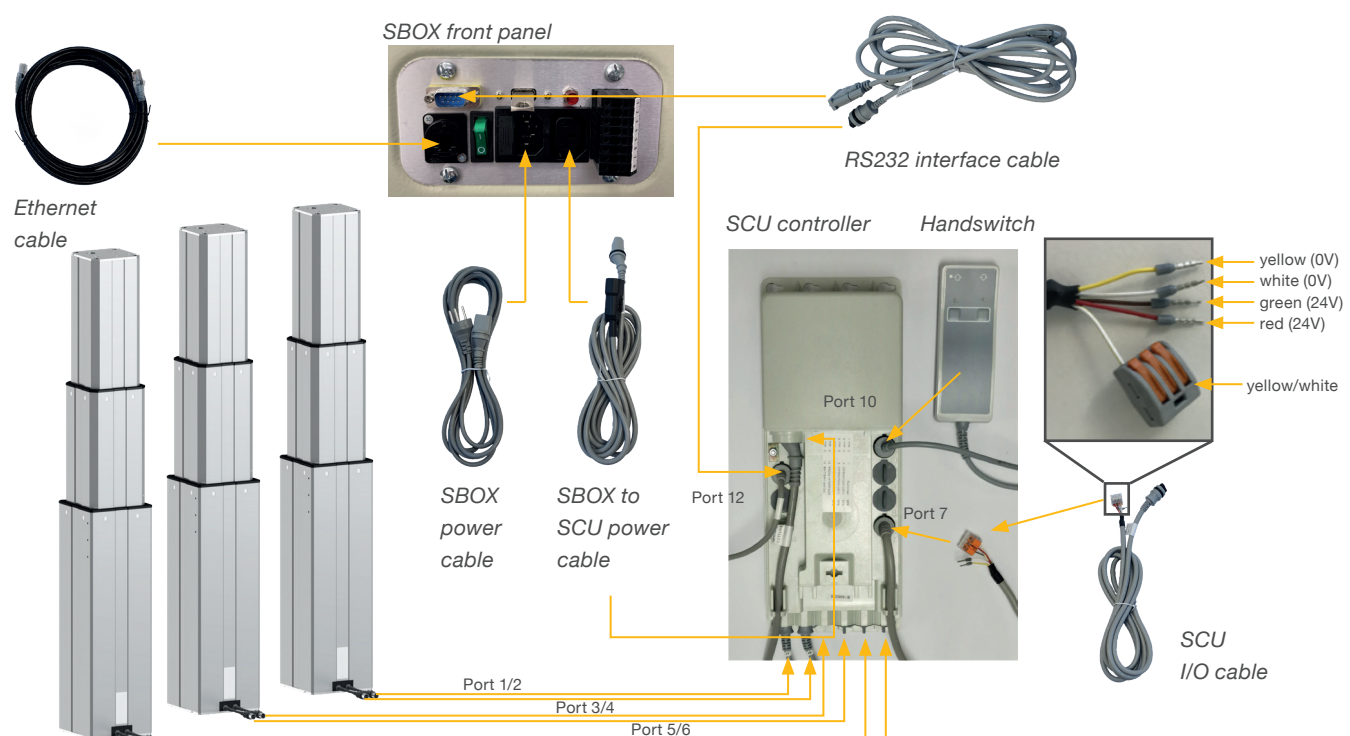


Figure 21



6. Hardware connection SBOX for LIFTKIT-YA-601 and LIFTKIT-YA-630

6.1 Hardware connection SBOX

The SBOX is used to interface with the SCU and the robot controller. **Figure 23** gives a view on the front panel of the SBOX, whereas **figure 22** gives a detailed look on the electrical connections for the safety relays.

Figure 22



- 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

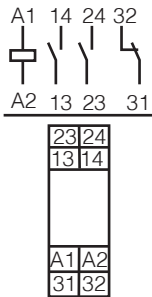
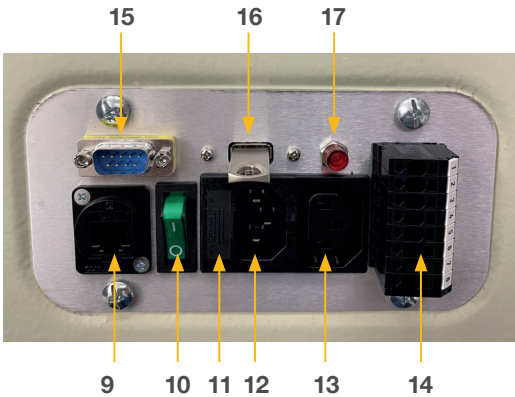


Figure 23

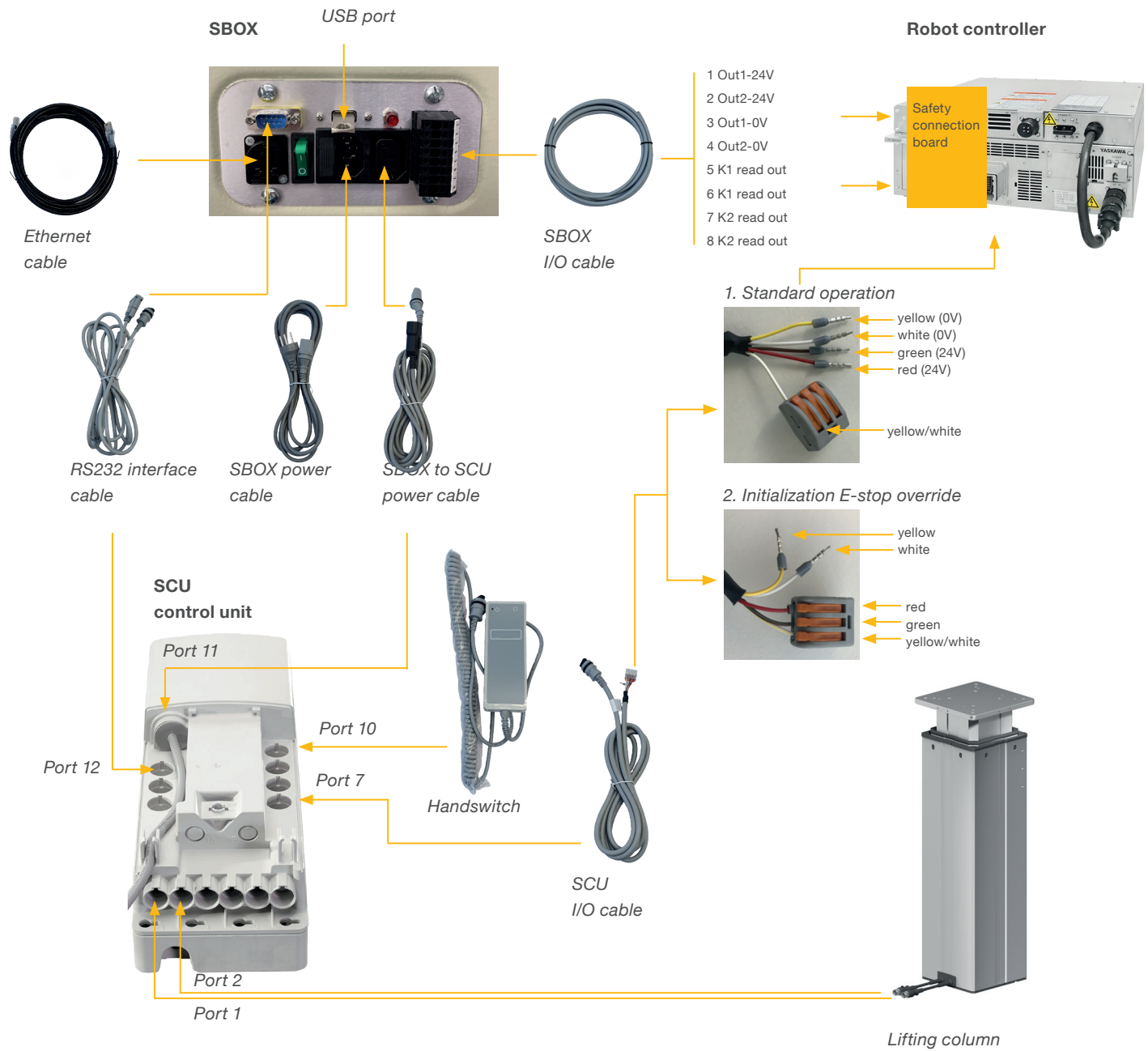


- 13. Power Out
- 14. I/O connector
- 15. RS232 connector
- 16. USB port
- 17. Relays status light (if On relays are powered)

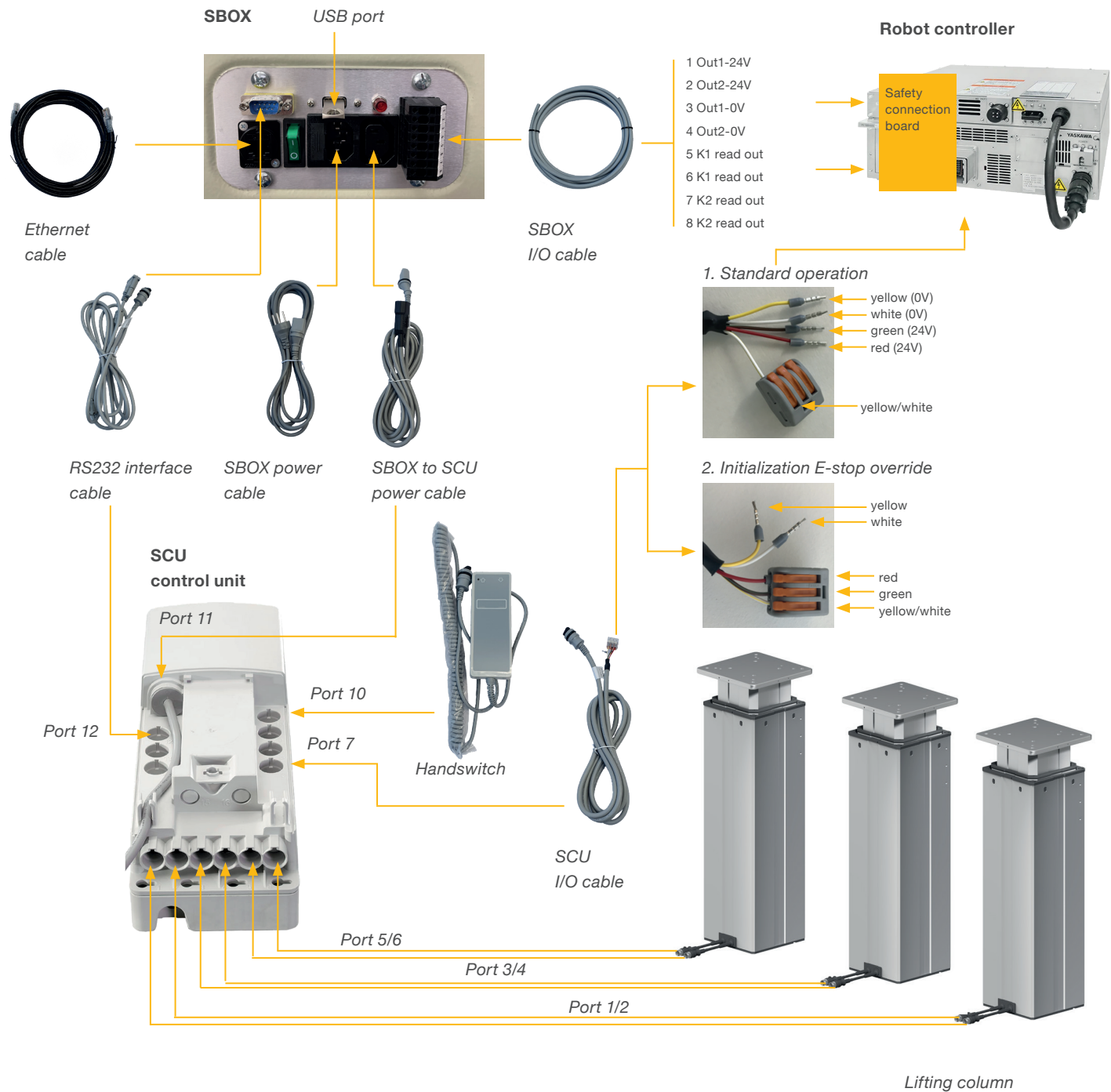
6.2 Safety connection

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 22**.

6.3 LIFTKIT-YA-601 connection setup



6.4 LIFTKIT-YA-630 connection setup



7. Software instructions for Ewellix LIFTKIT extension for YASKAWA robot

7.1 Introduction

The purpose of this document is to describe the steps required to configure the Ewellix LIFTKIT extension for the YASKAWA robot. The goal of the Ewellix LIFTKIT extension is to integrate the Ewellix lifting column into the YASKAWA robot in order to extend the robot's range of motion. The integration includes the control of Ewellix LIFTKIT via Smart Pendant / Standard Pendant.

Currently plugin is built for robots that use YRC1000micro controllers.

7.2 Extension installation

LIFTKIT extension is packed inside of .yip (Yaskawa installation package) file in format:

ewellix_liftkit_vX_X.X.yip (for Smart Pendant)

ewellix_liftkit_standard_vX.X.X.zip (for Standard Pendant)

That page can be reached either by the link [Software updates → LIFTKIT](#) or by scanning the QR code below

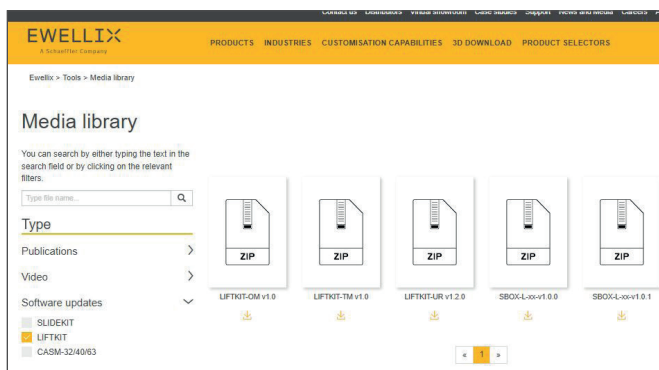
Follow the next steps to install the extension.



QR code to the Ewellix Media library.

Figure 24

Media library with downloadable plugins



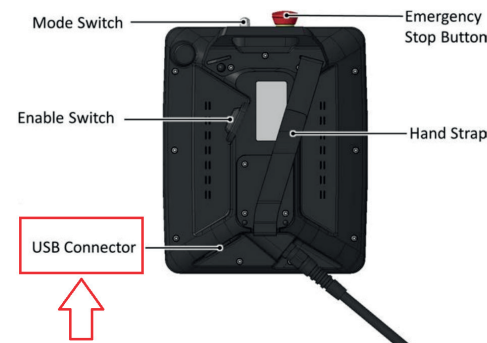
Supporting videos are available on the Ewellix website as well and can be reached under the following [Link](#).

7.2.1 Insert USB into Smart Pendant / Standard Pendant

1. Plug the USB (on which Ewellix Liftkit .yip file is stored) inside a Smart Pendant / Standard Pendant, see **figure 25**

Figure 25

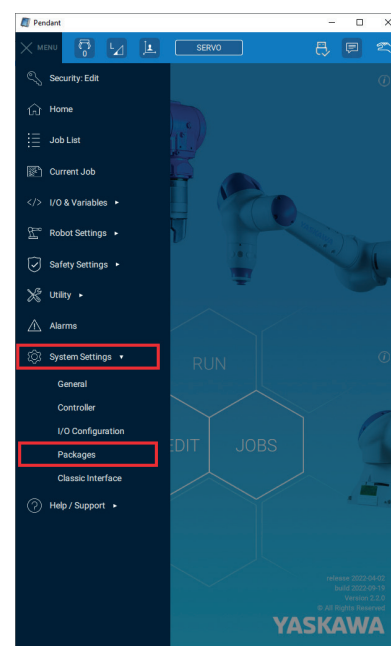
USB connector on Smart Pendant



7.2.2 Install the extension

Navigate to System Settings → Packages as depicted below, see **figure 26**

Figure 26

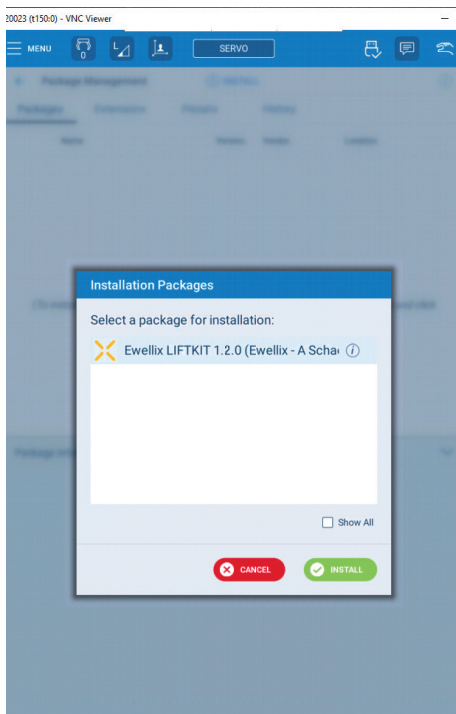


Navigation to Package installation page

On Package page, press “INSTALL” button which is placed on top, see figure 27

Figure 27

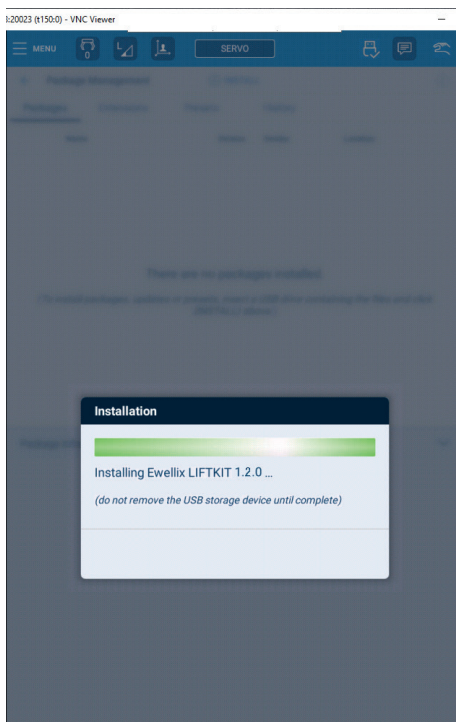
Press Install button



In the shown dialog, find Ewellix LIFTKIT Package, see figure 28

Figure 28

Extension is installing



7.2.3 Check if the extension installed correctly

After restarting the controller, validate that extension is installed correctly.

Ewellix extension consist of the following 4 parts:

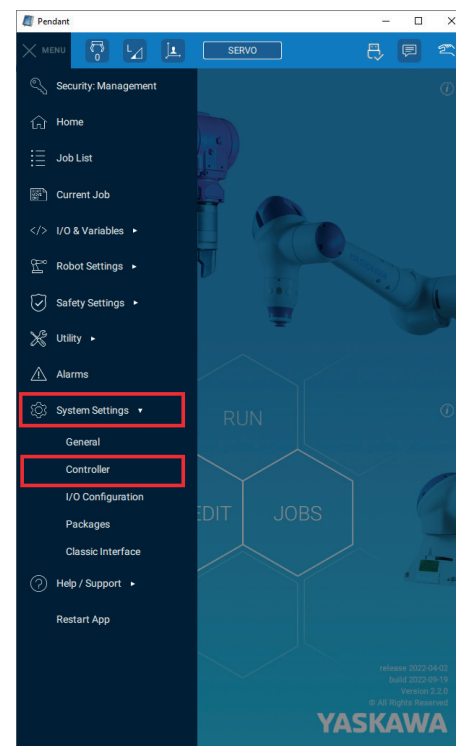
- 1.MOTOPLUS applicaiton
- 2.INFORM - JOBS
- 3.GUI-Extension
- 4.Global variables

Validate MOTOPLUS application

Navigate to System Settings → Controller as depicted below, see figure 29

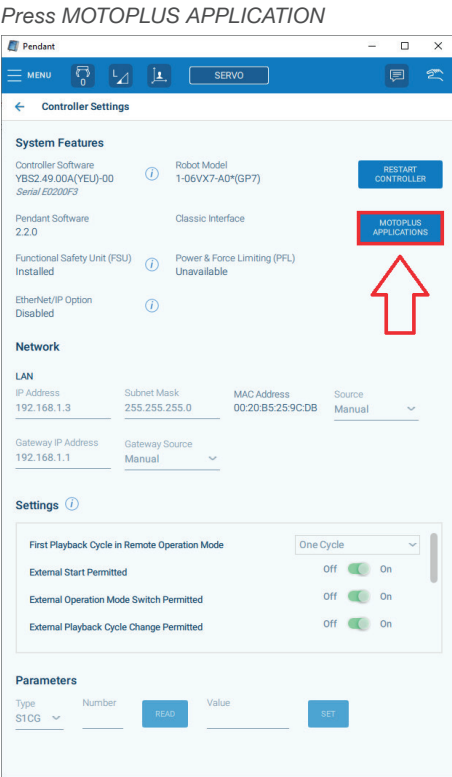
Figure 29

Navigation to Controller Settings



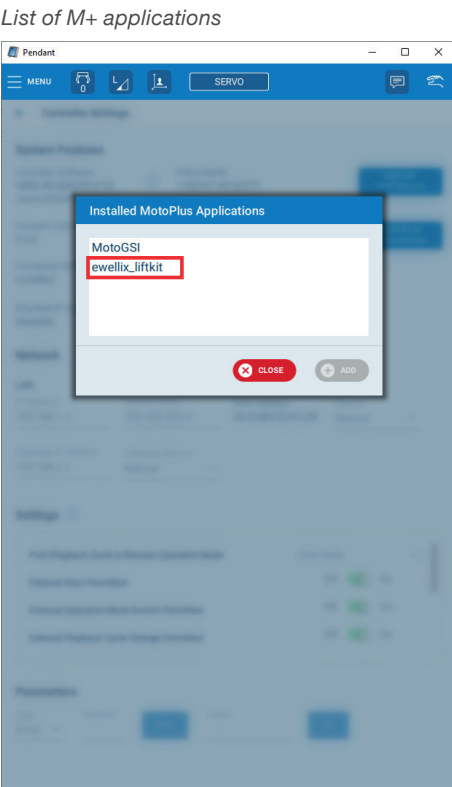
Press on MOTOPLUS APPLICATION button in top right corner, see figure 30

Figure 30



Newly created Ewellix Liftkit M+ application should be visible, see figure 31

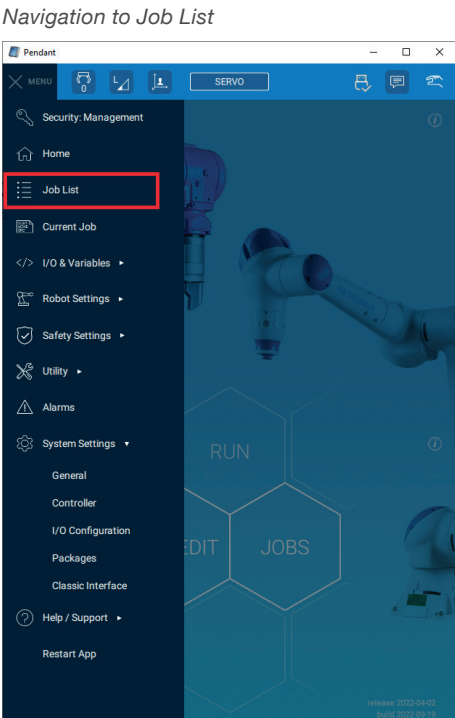
Figure 31



Validate INFORM JOBS

Navigate to Job List, see figure 32

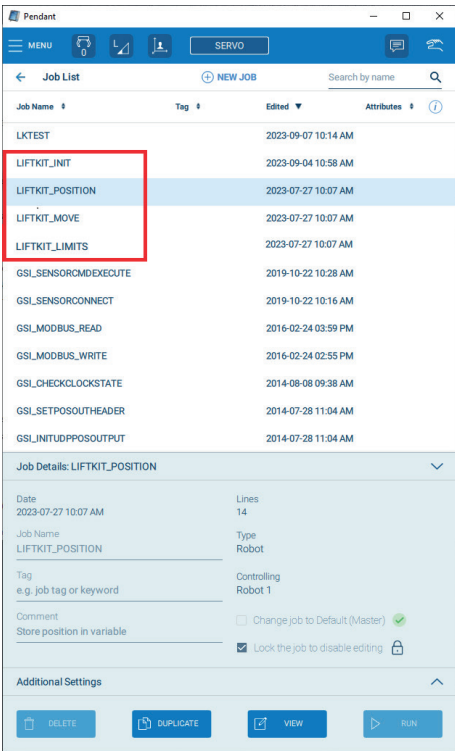
Figure 32



On the newly opened page, following Jobs should be present: LIFTKIT_MOVE, LIFTKIT_POSITION, LIFTKIT_INIT, LIFTKIT_LIMITS.

Figure 33

Ewellix Jobs



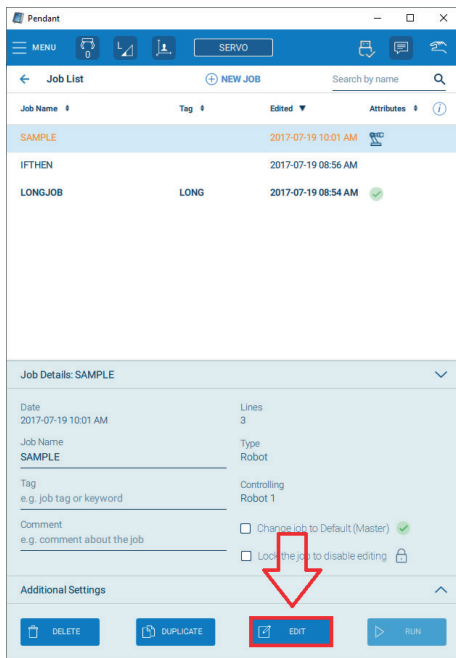
Validate Extension

Navigate to Jobs List as shown on **figure 34** Navigation to Job List.

Select an already existing Job (should not be a LIFTKIT Job) and press EDIT.

Figure 34

Press on Edit Job



On the opened page, the LIFTKIT extension should be visible in the bottom navigation bar. If LIFTKIT is not visible, scroll the bar to the left, see **figure 35**.

Figure 35

LIFTKIT bottom navigation bar



Figure 36

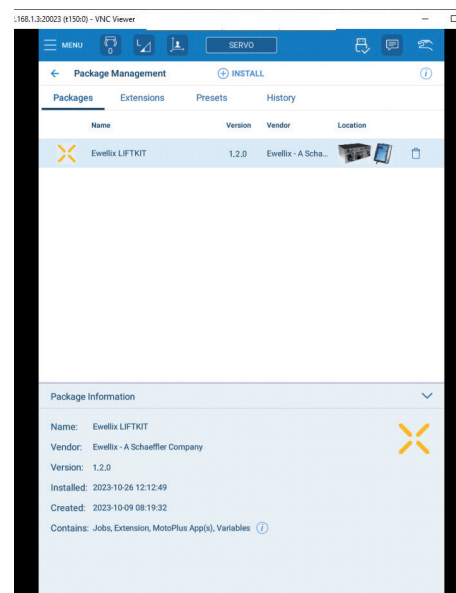
Installed Extension



Installed Extension could also be found in Package Manager. Navigate to System Settings → Packages as shown on **figure 26**. Then switch to Extensions tab. Select Ewellix LIFTKIT Extension. Under Extension Information, Status should show the current status of installed extension, see **figure 37**.

Figure 37

Extension status



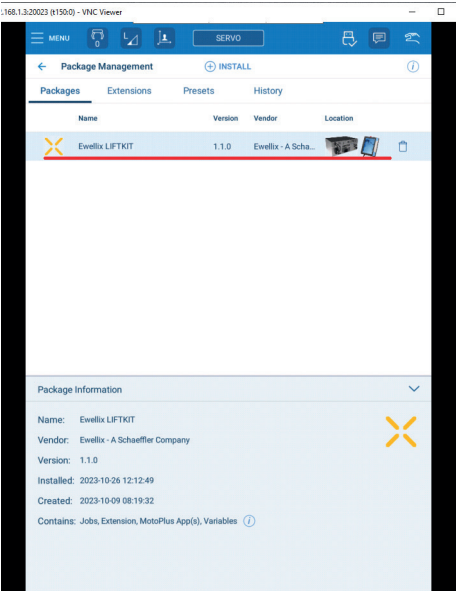
7.2.4 Uninstall package

To uninstall the existing Ewellix LIFTKIT package navigate to System Settings → Packages as shown on figure 26.

Ewellix LIFTKIT package should be listed in Packages menu, see figure 38.

Figure 38

Package list



Press on recycle icon which is placed to the next Smart Pendant icon, see figure 39.

Figure 39

Press on recycle icon

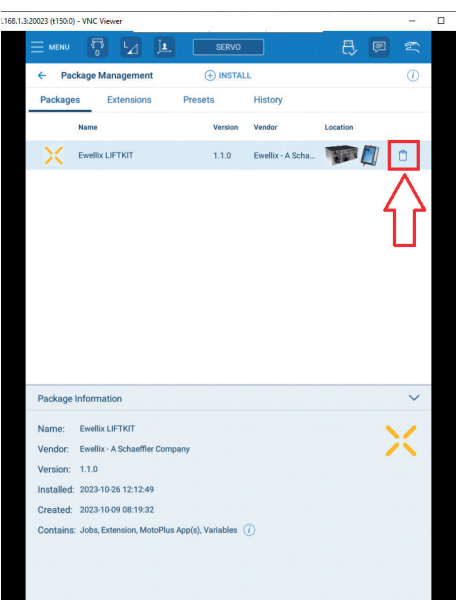
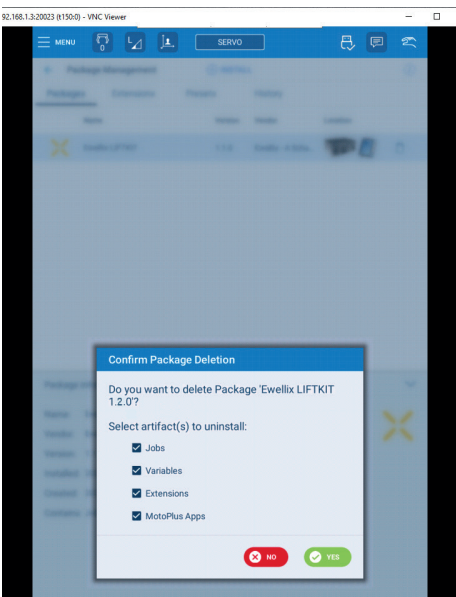


Figure 40

Uninstall package



After confirming uninstallation, the package will be uninstalled shortly.

Delete Extension

To delete Extension manually, navigate to Extensions tab in Package management menu. Press on recycle bin on the right side of the Ewellix LIFTKIT Extension.

Figure 41

Delete Extension

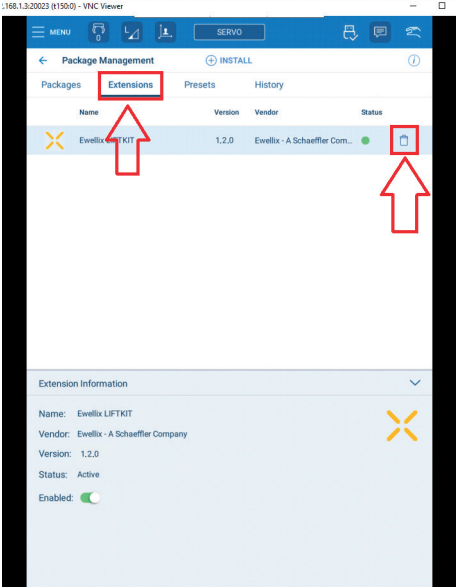
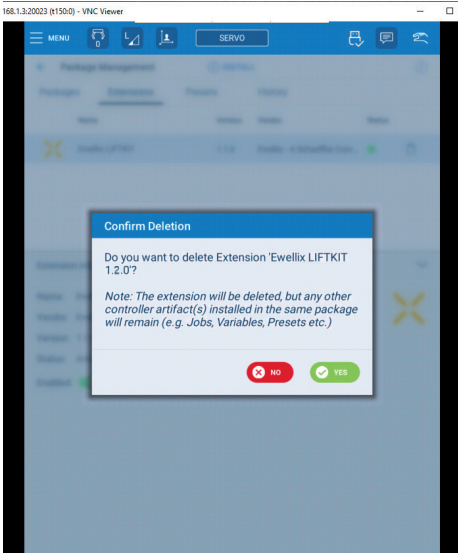


Figure 42

Confirm deletion of Extension

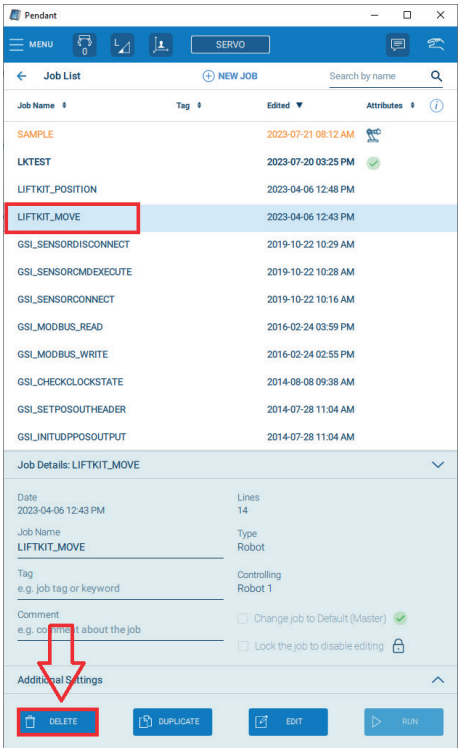


Delete Jobs

Navigate to Job list. Select a job which should be deleted (LIFTKIT_MOVE, LIFTKIT_POSITION or LIFTKIT_INIT) Lock the job to disable editing and press on Delete button as shown below, see figure 43

Figure 43

Delete job

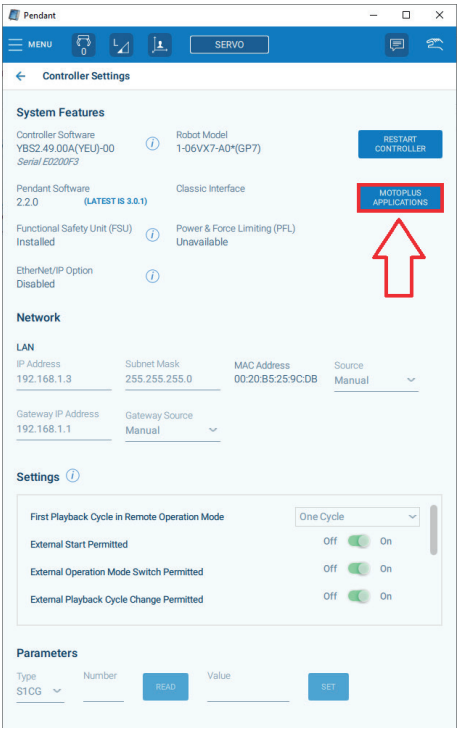


7.2.5 Delete M+ application

Navigate to System Settings → Controller. On newly opened page press MOTOPPLUS APPLICATIONS, see figure 44.

Figure 44

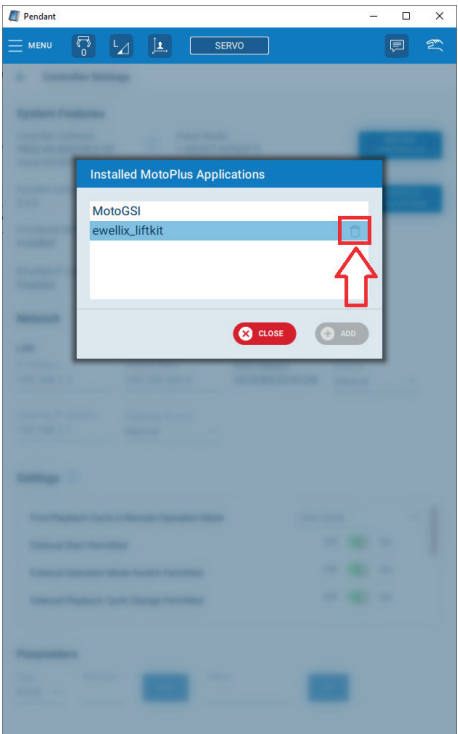
Open list of M+ applications



Select ewellix_liftkit M+ and press delete, see figure 45

Figure 45

Delete M+ application



7.3 Establish connection between Robot and SBOX

To establish a connection between Robot controller and SBOX please follow these 2 steps:

1. Connect the RJ45 cable of the SBOX to the robot controller
2. Default IP address of SBOX is "192.168.1.100". Specify IP Address and port on LIFTKIT Extension page

7.3.1 Plug the RJ45 cable from the SBOX into the Robot controller

Figure 46

SBOX Ethernet port

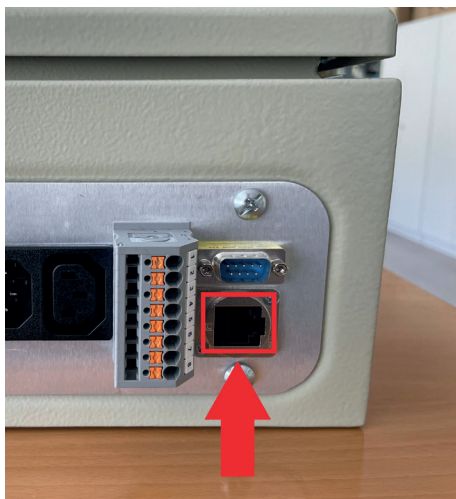


Figure 47

YRC1000 Ethernet port



7.3.2 Specify IP Address and port on LIFTKIT Configuration page

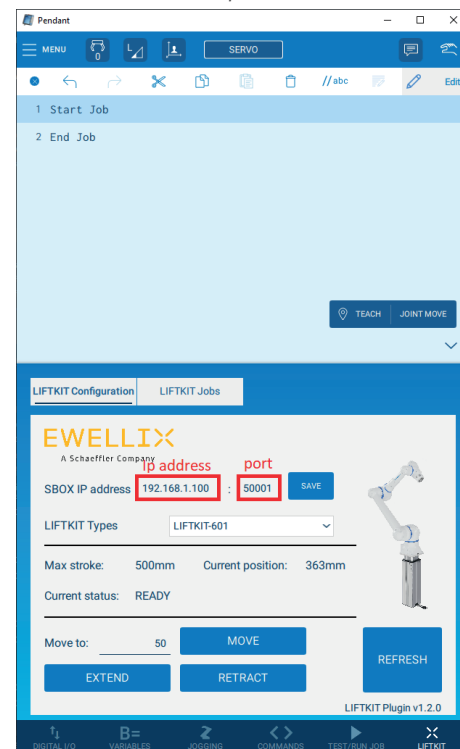
Navigate to LIFTKIT Configuration page as depicted on **figure 35** "LIFTKIT bottom navigation bar". In newly opened tab, insert the IP address and port of SBOX Service.

NOTE

SBOX has predefined IP address which is "192.168.1.100" SBOX Service is running on port 50001.

Figure 48

Insert IP address and port



When valid IP address and port are entered, press "SAVE" button, next to textfields. If equipment is wired correctly and valid values are entered, configuration page should be similar as shown on picture above.

Global variables that are used for SBOX IP address and SBOX port can be found in following path:

Menu → I/O & Variables → Variables

In Double tab, find SBOX port, see **figure 49**

Figure 49

SBOX port global variable

No.	Value	Name
D075	0	
D076	0	
D077	50001	LK: SBOX port
D078	0	
D079	0	
D080	0	
D081	0	
D082	0	
D083	0	
D084	0	
D085	0	
D086	0	
D087	0	
D088	0	
D089	0	
D090	0	
D091	0	
D092	0	
D093	0	
D094	0	
D095	0	

When validated port is saved successfully, navigate to String tab and find IP address of the SBOX, see **figure 50**

Figure 50

SBOX IP address global variable

No.	Value	Name
S074		
S075	192.168.1.100	LK: SBOX IP
S076		LK: Outcome str
S077	LIFTKIT-601	LK: type
S078		
S079		
S080		
S081		
S082		
S083		
S084		
S085		
S086		
S087		
S088		
S089		
S090		
S091		
S092		
S093		
S094		
S095		

CAUTION

SBOX IP address and SBOX port variables should not be changed manually.

- IP Address and port are using named global variables. Names of the variables are assigned at Extension installation. If names get deleted, extension will not be able to communicate with Ewellix equipment.

Variable names should not be deleted

- The number of variables which are used to store either SBOX IP address or SBOX port should be fixed. When the number of variables is changed manually, extension will not behave correctly.

Variable number should not be changed

7.3.3 LIFTKIT Configuration

Before configuring LIFTKIT, please follow the chapter 7.3. Establish connection between Robot and SBOX". To configure the LIFTKIT navigate to LIFTKIT Configuration page as depicted on **figure 35** "LIFTKIT bottom navigation bar". The first time connection is established between SBOX and robot controller, configuration page should look as shown on **figure 51**.

Figure 51

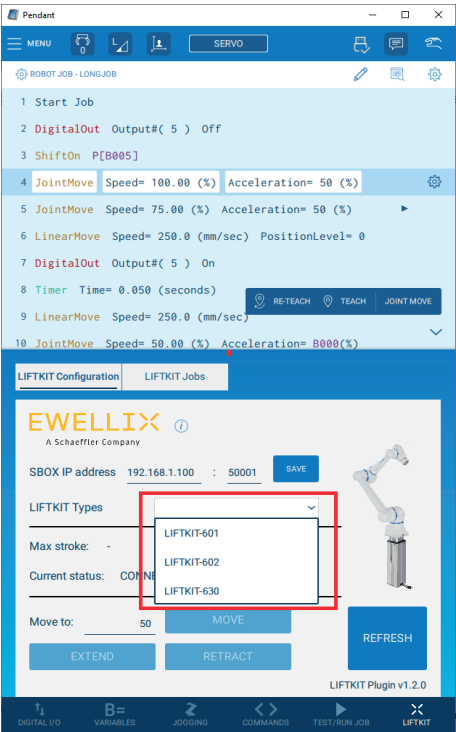
LIFTKIT type is not set



Set a LIFTKIT type by choosing one of the types from LIFTKIT Types dropdown menu.

Figure 52

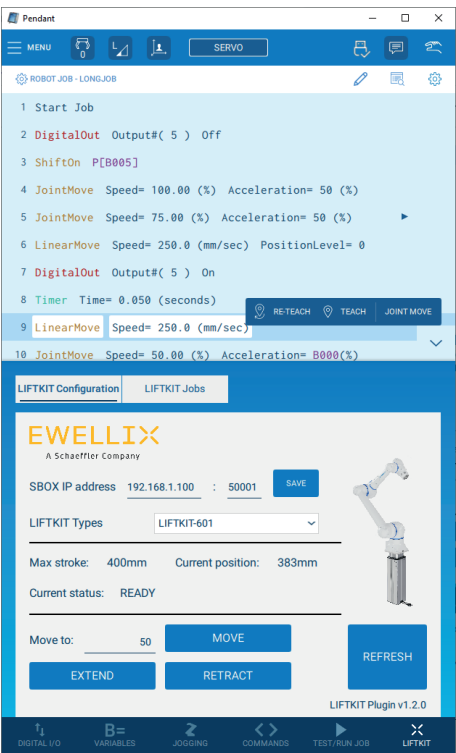
Choose Liftkit type



Depending of the equipment, different type will be required. After choosing valid LIFTKIT type, wait 4 seconds for data to be obtained, see figure 53.

Figure 53

Valid type is selected



In case invalid LIFTKIT type is chosen, current status show value "CONNECTED, PILLAR NOT VALID". The page will look as shown below, see figure 54.

Figure 54

Invalid type is selected

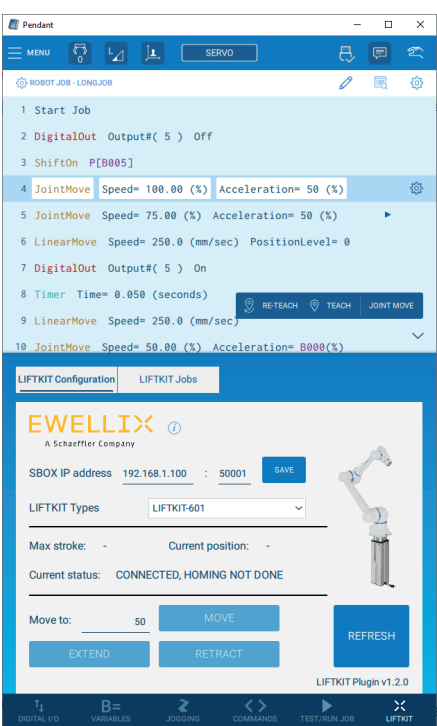


In case LIFTKIT is used for the first time, customer shall perform the homing in order for LIFTKIT to obtain its limits of movement. If homing is not done, configuration page will look as shown below, see figure 55.

Select LIFTKIT-YA 601 if used with Yaskawa cobot HC10. Select LIFTKIT-YA 630 if used with YASKAWA cobot HC20 & HC30.

Figure 55

Homing is not done

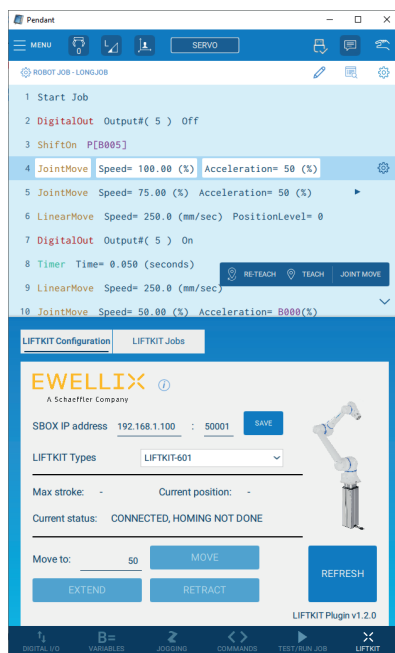


7.3.4 Extend/Retract buttons

Configuration page also consists of 2 buttons for extending/retracting the LIFTKIT. While user holds Extend or Retract button, LIFTKIT will move accordingly. When buttons are released, LIFTKIT stops the movement. When Extend/Retract button is held, all other buttons are disabled, current status changes from “READY” to “MOVING” and position starts changing accordingly, see **figure 56**.

Figure 56

Extend button held



When button is released all buttons are enabled again and status should become “READY” again.

When user presses Retract button, it behaves same as Extend, but Liftkit moves in opposite direction. **figure 57**.

Retract button held



If current LIFTKIT position is equal to 0, Retract button is disabled.

If current LIFTKIT position is equal to max stroke, Extend button is disabled.

7.3.5 Move button

“Move” button on Configuration page is used to move LIFTKIT to exact position specified in text field next to “Move to” label. While user holds Move button, LIFTKIT will move to the position specified in text field. When button is released, LIFTKIT stops the movement. while button is held, all other buttons are disabled, Status changes from “READY” to “MOVING” and position starts changing.

Figure 58

Move button

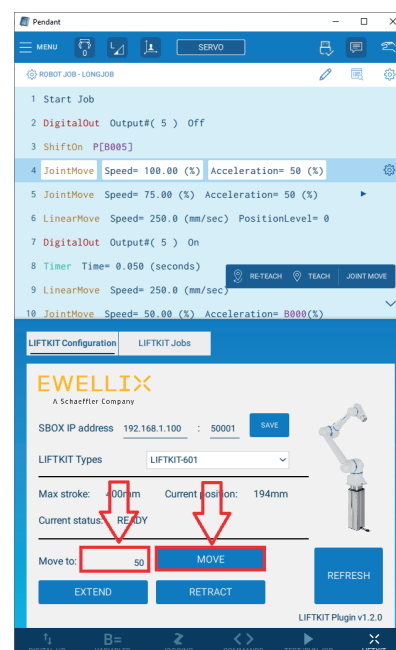


Figure 59

Hold MOVE button



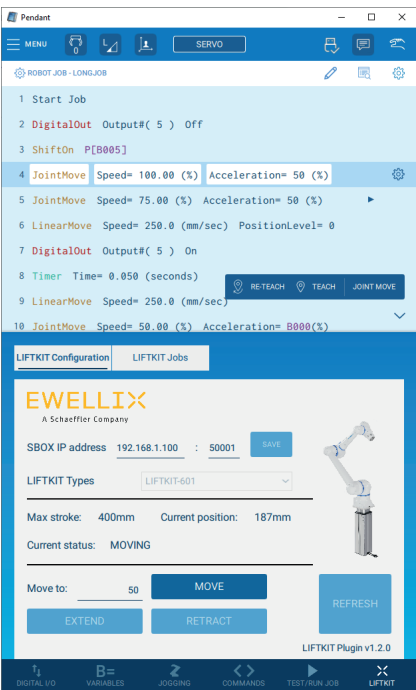
7.3.6 Refresh button

The refresh button next to Retract button is used to refresh the data on the User Interface. **User interface data is not continously pulled from the SBOX**, to pull new data from SBOX, press REFRESH button.

When button is pressed all elements gets disabled until new values are read.

Figure 60

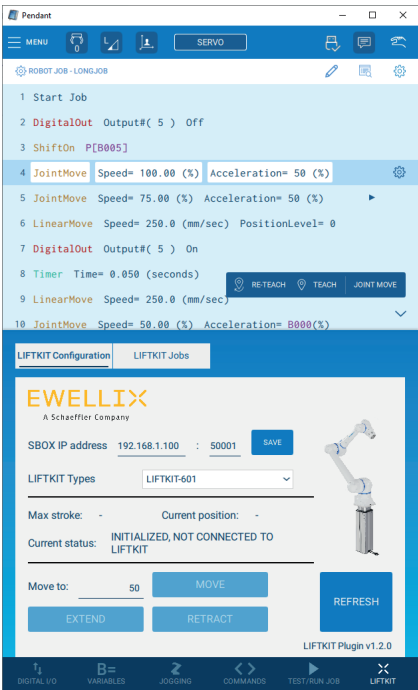
Refresh button pressed



Before initiating a movement with buttons, it is recommended that user first presses Refresh button. Since the LIFTKIT Configuration page just shows last snapshot of the Liftkit state, it could be outdated (LIFTKIT could be on different height or Liftkit could be in state in which movement is not possible).

Figure 61

SBOX not connected to LIFTKIT



As shown in the picture above, moving LIFTKIT with buttons is not possible in “INITIALIZED, NOT CONNECTED TO LIFTKIT” state. To fix the problem, connect LIFTKIT to the SBOX. When LIFTKIT and SBOX are connected again, User interface will be updated by pressing Refresh button.

7.3.7 Max stroke

Max stroke represents the maximum length that LIFTKIT can extend to. Maximum stroke is shown on configuration page, see **figure 62**

Figure 62

Maximum stroke



7.3.8 Current position

Current position represents the position where LIFTKIT is currently at. Current position is shown on LIFTKIT Configuration page, see **figure 63**.

Figure 63

Current position



7.3.9 Current status

Current status represents the state in which LIFTKIT is currently in. LIFTKIT have predefined number of states. Some states has additional “cause” part which provides more information about the state.

Brief description of all statuses and causes is shown below.

Table 2

Status	Cause	Description
READY		LIFTKITpillar is ready for movement
MOVING		LIFTKIT pillar is moving
INITIALIZED	NOT CONNECTED TO THE LIFTKIT	LIFTKIT is not connected to the SBOX
CONNECTED	PILLAR IS NOT VALID	Wrong LIFTKIT type is chosen
CONNECTED	TYPE IS NOT SET	LIFTKIT type is not set
CONNECTED	HOMING NOT DONE	Homing is not done
NOT CONNECTED	INVALID IP ADDRESS FORMAT	Entered IP address is not in valid IPv4 format
NOT CONNECTED	GLOBAL VARIABLE DOES NOT EXIST LK	SBOX IP or LK: SBOX port variable does not exist
NOT CONNECTED SBOX	COMMUNICATION ERROR	Connection to SBOX is not possible

Figure 64

Current status



7.4 Jobs

Ewellix LIFTKIT plugin consists of following jobs:

Table 3

JOB name	Arguments	Description
LIFTKIT_MOVE(arg1)	arg1: INTEGER → Desired position in mm where Liftkit should move to.	LIFTKIT moves to the position specified in argument.
LIFTKIT_MOVE(l_arg1)	l_arg1: INTEGER variable → Global integer variable in which desired position is stored	LIFTKIT moves to the position specified in argument.
LIFTKIT_POSITION(arg1)	arg1: INTEGER → Global integer variable in which current position should be written.	LIFTKIT's current position will be written in integer global variable which is specified as argument.
LIFTKIT_INIT(arg1, arg2, arg3)	arg1 :String → SBOX IP address arg2 :String → SBOX Service port arg3 :String → LIFTKIT type	Initializes LIFTKIT. Set SBOX IP address, SBOX port and LIFTKIT type.
LIFTKIT_LIMITS(arg1, arg2) arg1	arg1 :INTEGER → Virtual lower limit	arg2 :INTEGER → Virtual upper limit Sets LIFTKIT virtual limits

The implementation of each job can be found in Job list.

Figure 65

Edit LIFTKIT_MOVE job

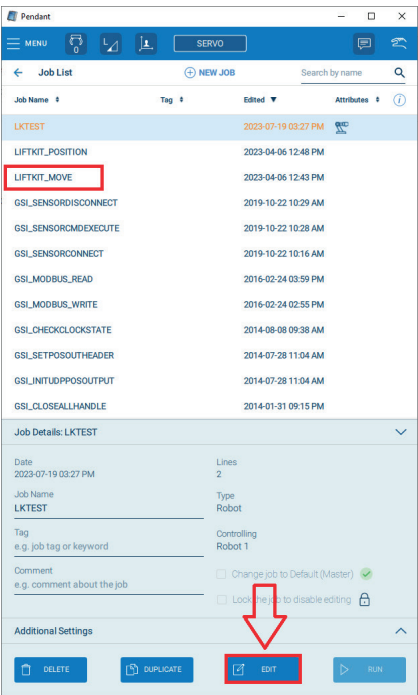
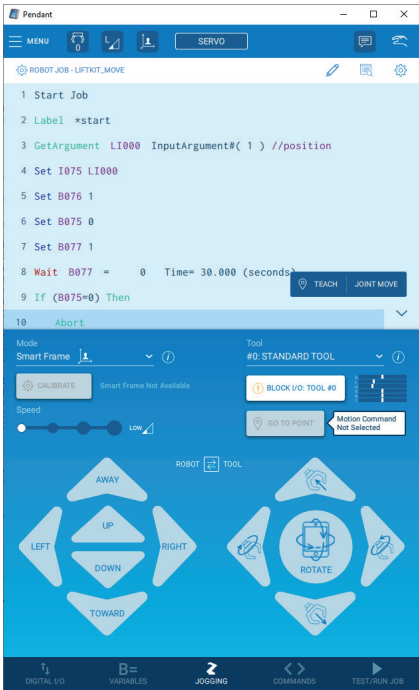


Figure 66

LIFTKIT_MOVE job source code



CAUTION

Existing Ewellix LIFTKIT jobs should not be edited/changed

All jobs (except for LIFTKIT INIT) can be added to the current Job by navigating to LIFTKIT Jobs tab in extension.

Figure 67

LIFTKIT Jobs tab



7.4.1 LIFTKIT MOVE job

LIFTKIT MOVE job is used to move LIFTKIT pillar on the specified position.

Pressing LIFTKIT MOVE button will add LIFTKIT_MOVE job on current job with default argument specified in textbox next to the button, see figure 68

Figure 68

Add LIFTKIT MOVE job



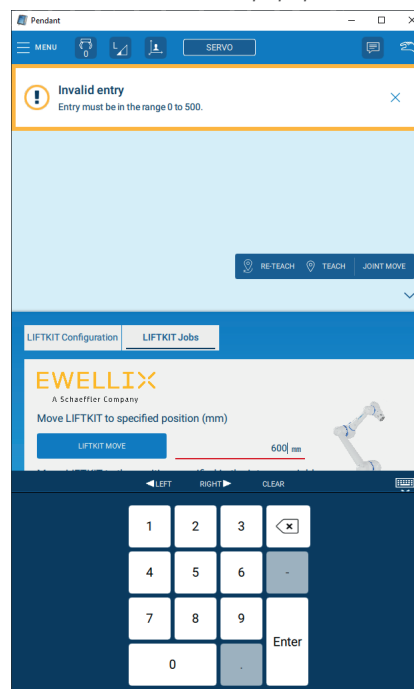
The argument provided should be between virtual limits. If the entered value is not between limits, following popup appears.

NOTE

The upper limit is equal to the maximum stroke by default (can be checked on the Configuration page). The lower limit value is equal to 0 by default.

Figure 69

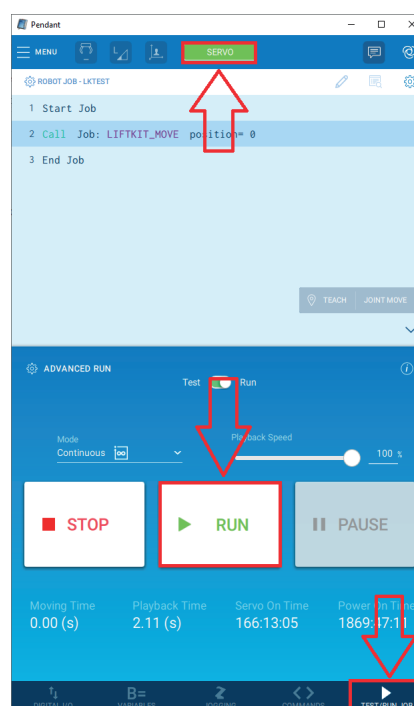
Position not inside limits popup



When job is added to the current job, start the execution of a job by pressing on "TEST/RUN JOB tab" and then "Run" button (Servo button on top should be turned green), see figure 70.

Figure 70

Start LIFTKIT MOVE job



When program is started, LIFTKIT will move to the position specified as LIFTKIT MOVE argument. When movement is finished "Position reached" is written in S076 string variable.

Figure 71

Position reached outcome

The screenshot shows the 'Pendent' application interface. At the top, there is a header bar with a 'SERVO' button and a 'Variables' section. The 'Variables' section has a table with columns: 'No.', 'Value', 'Name', and 'Position'. The variable 'Position reached' is highlighted with a red box. The table also includes a checkbox for 'Display only named' and a search icon.

No.	Value	Name	Position
S873			
S874			
S875	192.168.1.110	LK: SBOX IP	
S876	Position reached	LK: Outcome str	
S877	LIFTKIT-001	LK: type	
S878			
S879			
S880			
S881			
S882			
S883			
S884			
S885			
S886			
S887			
S888			
S889			
S890			
S891			
S892			
S893			
S894			

All LIFTKIT MOVE outcomes are shown in chapter 7.4.2 **LIFTKIT MOVE outcomes.**

Jobs can be paused/stopped. If a program is stopped during the movement of the LIFTKIT , LIFTKIT will stop its movement. If the program is continued, LIFTKIT will also continue its movement.

Figure 72

Pause & stop job execution

Pendant

Running Job

Starting running LKTEST from line number 2.

```

3 Call Job: LIFTKIT_MOVE position= 0
4 End Job

```

TEACH **JOINT MOVE**

Test **Run**

STOP **RUN** **PAUSE**

PLAYBACK SPEED

Moving Time 0.00 (s) **Playback Time** 2.79 (s) **Servo On Time** 166:18:18 **Power On Time** 1869:54:26

7.4.2 LIFTKIT MOVE outcomes

The outcome of last movement is written in String and Byte variable. Each movement outcome is shown in S076. Each movement outcome have its code which is written in B078. Possible outcomes and its codes are listed below

Table 4

Job outcome	Job outcome code	Description
Program started	10	LIFTKIT MOVE job is started and running
Position reached	11	Position successfully reached
PAUSED/STOPPED program	12	LIFTKIT MOVE job is paused, stoped or safety was triggered
Small delta height	20	Difference between current position and desired position is <= 6. Minimum movement shold be higher than 6 mm.
Position not between limits	21	Desired position is not between virtual limits. Lower limit should be 0, upper limit should be max stroke
Connect to SBOX error	40	Connection to SBOX Service could not be established
Failed to reach position	30	Movement started but position could not be reached
Move to position error	30	Movement is not possible

NOTE

Same String and Byte variables are used to store outcomes of all LIFTKIT jobs

7.4.3 LIFTKIT MOVE (IVAR) job

LIFTKIT MOVE (IVAR) button on LIFTKIT Jobs page is used to add LIFTKIT MOVE job in current job.

The difference between LIFTKIT MOVE and LIFTKIT MOVE (IVAR) buttons is that LIFTKIT MOVE (IVAR) is adding LIFTKIT MOVE job with predefined Integer variable as parameter. Default integer variable is specified in text field next to the LIFTKIT MOVE (IVAR) button. When integer variable is changed, label next to it also changes to match the corresponding integer variable.

Figure 73

Add LIFTKIT MOVE job by pressing LIFTKIT MOVE (IVAR)

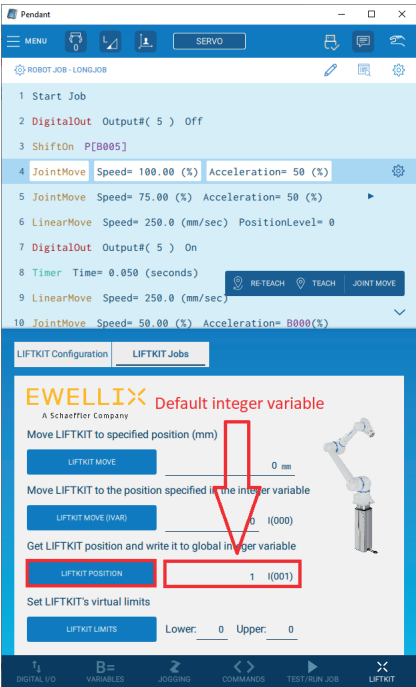
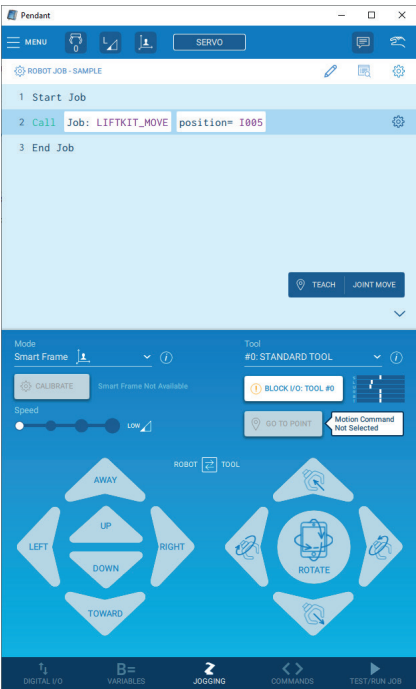


Figure 74

Add LIFTKIT MOVE job by pressing LIFTKIT MOVE (IVAR)



NOTE

Argument passed to LIFTKIT MOVE should not exceed the maximum integer variable number.

When Job is started, LIFTKIT moves to the position stored in specified Integer variable.

Since LIFTKIT MOVE (IVAR) is calling the same job as LIFTKIT MOVE (just with different argument type) - it has the same behavior as LIFTKIT MOVE (described in chapter 7.4.1 LIFTKIT MOVE)

7.4.4 LIFTKIT POSITION job

LIFTKIT POSITION job is used to obtain the current position of LIFTKIT and write it in specified integer variable.

Pressing LIFTKIT POSITION button will add LIFTKIT_POSITION job on current job with default argument specified in textbox next to the button. When integer variable is changed, label next to it also changes to match the corresponding integer variable.

Figure 75

Add LIFTKIT POSITION job

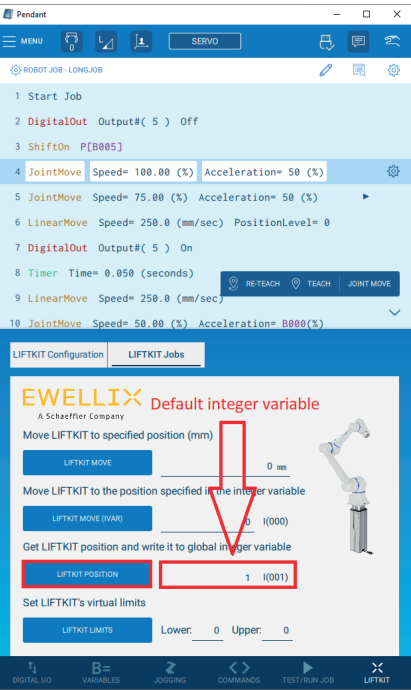


Figure 76

Added LIFTKIT POSITION job

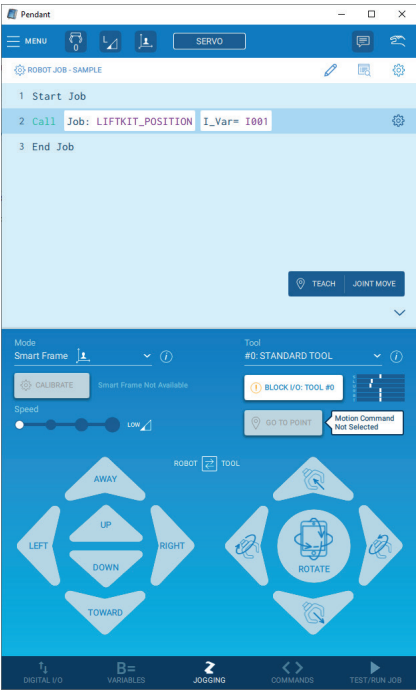


Figure 78

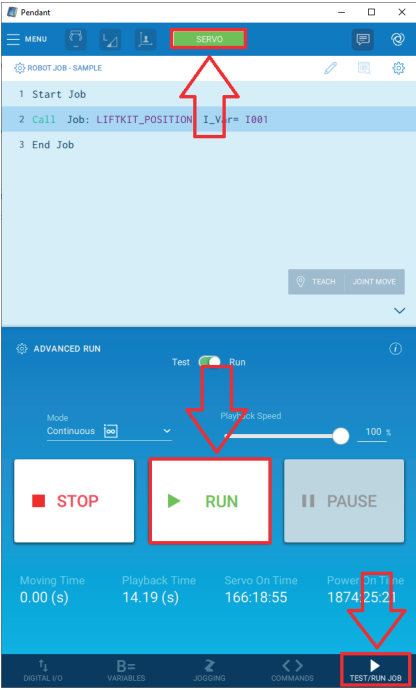
Liftkit current position obtained

Variables			
Byte	Integer	Double	Real String Position
No. ▲	Value	Name	Display only named 🔍
I000	0		
I001	233		
I002	0		
I003	0		
I004	0		
I005	0		
I006	0		
I007	0		
I008	0		
I009	0		
I010	0		
I011	0		
I012	0		
I013	0		
I014	0		
I015	0		
I016	0		
I017	0		
I018	0		
I019	0		
I020	0		
I021	0		

When program is started, LIFTKIT's current position is written in Integer variable specified as argument. In this case the LIFTKIT's current position is written in I001.

Figure 77

Start LIFTKIT POSITION job



7.4.5 LIFTKIT LIMITS job

LIFTKIT LIMITS job is used to set virtual limits of LIFTKIT.

Virtual limits are used to define and control the boundaries of the LIFTKIT's range of motion. Virtual limits range from zero to the maximum stroke.

Upper limit is maximum limit that LIFTKIT can extend to. Upper limit cannot be greater than max stroke (Max stroke is shown on Configuration page and is stored in I078 LK: Max stroke).

Lower limit is minimum limit that LIFTKIT can retract to. Lower limit cannot be lower than 0.

By default lower limit is equal to 0 and upper limit is equal to max stroke.

Adding LIFTKIT_LIMITS job on Smart Pendant is shown below:

Figure 79

Add LIFTKIT LIMITS job



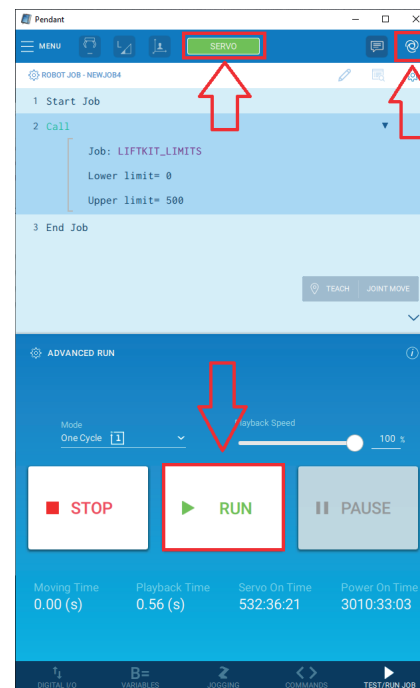
Fill arguments with appropriate values.

Virtual lower limit

Virtual upper limit

Figure 80

Start LIFTKIT LIMITS JOB



If LIFTKIT LIMITS job is successfully executed, new virtual limits are set.

To validate if limits are successfully set check the value of B078, If value is equal to 15, that means LIFTKIT LIMITS is successfully executed.

New limits are stored in:

I076 → Upper Limit

I077 → Lower limit

7.4.6 LIFTKIT POSITION outcomes

As specified above LIFTKIT POSITION writes position to specified Integer variable. In addition, LIFTKIT POSITION also writes the outcome to String/Byte variable which contains additional informations.

When error occurs during LIFTKIT POSITION job, -100 is written in specified Integer variable. Additionally, the reason is written in S076 (LK: Outcome str) and B076 (LK: Outcome code).

Outcome str - S076	Outcome code - B078	Description
Position successfully obtained	14	Position is successfully written in specified Integer variable
SBOX communication error	43	Connection to SBOX could not be established
SBOX communication error	40	Connection to SBOX Service (Stargate) could not be established
Invalid type	23	Position cannot be obtained because invalid type is chosen

7.4.7 LIFTKIT INIT job

LIFTKIT INIT job is used to initialize the data needed to start operating LIFTKIT.

LIFTKIT INIT does following actions:

- 1. Set SBOX IP address in S075
- 2. Set SBOX Service port in D077
- 3. Set LIFTKIT type
- 4. Set lower limit to 0
- 5. Set upper limit to be equal to max stroke

Primary LIFTKIT INIT job is used by Standard Pendant customers to set following fields:

- 1. SBOX IP address
- 2. SBOX Service port
- 3. LIFTKIT type

Normally SBOX IP address, SBOX Service port and LIFTKIT type are set from Configuration page, but Standard Pendant does not have Configuration page.

Adding LIFTKIT_INIT on Smart Pendant (although it is not indented to use on Smart Pendant) is shown below:

Figure 81

Add Call Command

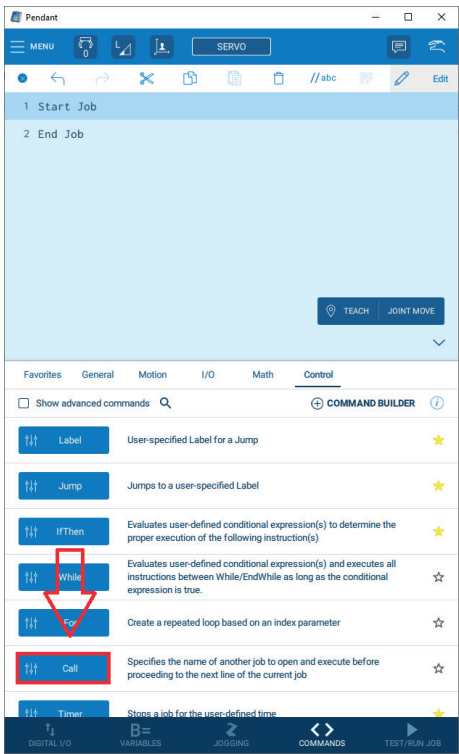
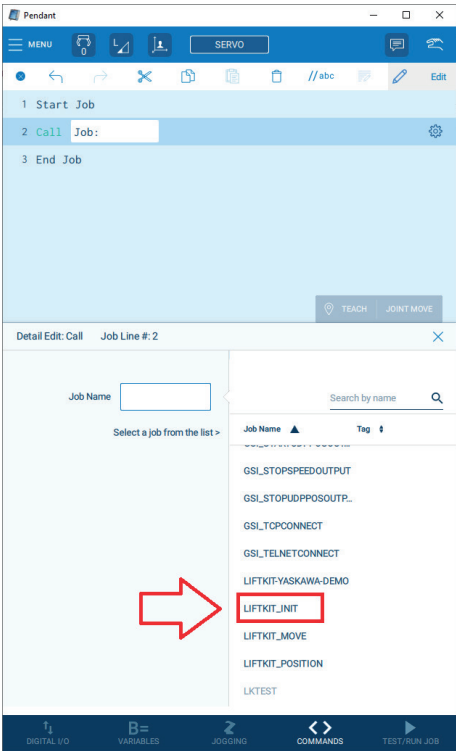


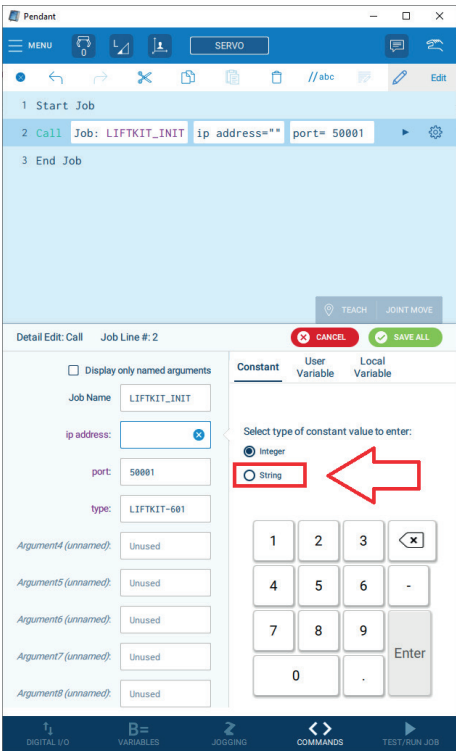
Figure 82
Select LIFTKIT_INIT job



In newly opened page, for Ip address and type, select String as a parameter type; for port select Integer as a parameter type.

Figure 83

Select appropriate parameter type



Fill all parameters with appropriate values.

Default values are:

- Ip address: 192.168.1.100,
- port: 50001,
- LIFTKIT type differs based on the SCU (LIFTKIT-601, LIFTKIT-602, LIFTKIT-630).

Figure 84

Fill the parameters

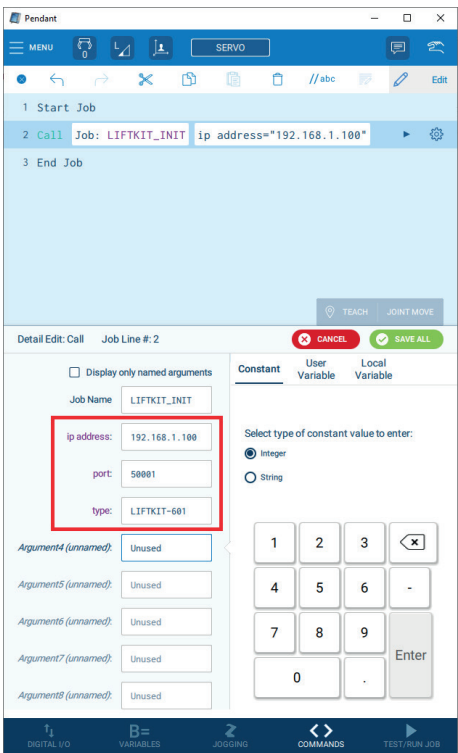
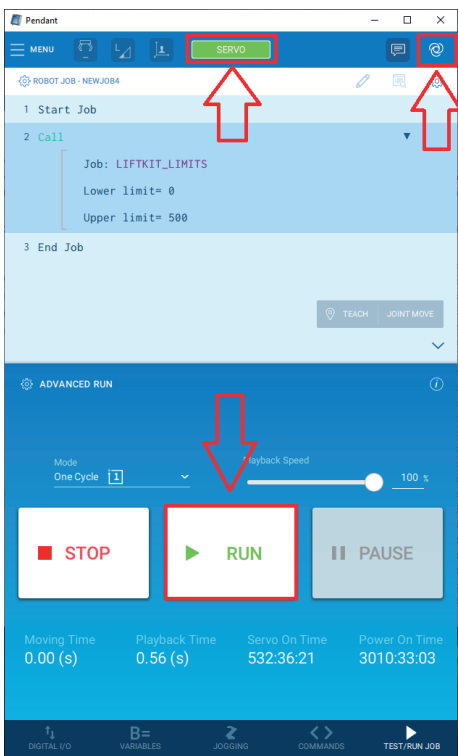


Figure 85

Start LIFTKIT INIT JOB



LIFTKIT_INIT job could take a few seconds for its execution.

If LIFTKIT_INIT successfully finishes execution, LIFTKIT should be ready to operate. If any problem occurs during initialization of LIFTKIT, JOB is NOT ABORTED.

LIFTKIT INIT job stores following variables:

String variables:

Variable number	Variable name	Description
S075	LK: SBOX IP	Ip address takes the value passed as first argument to LIFTKIT_INIT
S076	LK: Outcome str	Outcome of LIFTKIT_INIT All outcomes can be found in chapter "7.4.6 LIFTKIT INIT outcomes"
S077	LK: Type	Newly set type, the value passed as third argument to LIFTKIT_INIT

Integer variables:

Variable number	Variable name	Description
I076	LK: Upper limit	Upper limit takes the value equal to Max stroke
I077	LK: Lower limit	Lower limit takes the value 0
I078	LK: Max stroke	Max stroke is read from SBOX

Byte variables:

Variable number	Variable name	Description
B078	LK: Outcome code	Outcome of LIFTKIT_INIT All outcomes can be found in chapter "7.4.6. LIFTKIT INIT outcomes"

Double variables:

Variable number	Variable name	Description
D077	LK: SBOX port	Port takes the value passed as third argument to LIFTKIT_INIT

7.4.8 LIFTKIT INIT outcomes

LIFTKIT INIT has a defined number of outcomes. All outcomes are stored in String variable and Byte variable.

S076	B078	Description
Ready for movement	13	LIFTKIT INIT was successful and LIFTKIT is ready to operate
Wrong type	22	Type that was passed does not exist
Invalid type	23	Type exists, but it is not a valid Type for the SCU
Homing not done	25	LIFTKIT Homing is not done
Connect to SBOX error	40	Connection to SBOX could not be established
LK not connected	41	LIFTKIT is not connected to the SBOX
LK connection lost	42	A valid connection was interrupted during the execution of job.
SBOX communication error	43	Connection to SBOX Service could not be established.

NOTE

Same String and Byte variables are used to write outcome of LIFTKIT MOVE job. Refer to chapter Extension manual | 5.1.1. LIFTKIT MOVE outcomes for all outcomes that occurs during LIFTKIT MOVE job.

7.5 Variables used by the Extension

Communication between different layers in the extension is done by using global variables. Ewellix extension has the predefined number of variables that are used.

The list of all variables used by the plugin is shown below.

CAUTION

Ewellix LIFTKIT Extension currently has reserved variables 75-79 for all types (B,I,D,R,S,POS). All variables are READONLY, hence name and value should not be changed. Changing either name or value of Ewellix LIFTKIT variables can lead to errors.

Variable type	Variable number	Variable name	Description
Byte	75	LK: M+ outcome	This variable is used to inform a JOB about M+ execution status.
Byte	76	LK: JOB id	Each JOB have unique identifier. The identifier is written in this variable. Based on this variable M+ knows which JOB is executing
Byte	77	LK: M+/Job trigger	Signal that is triggering the execution of M+ functions
Byte	78	LK: Outcome Code	Movement outcome status code
Integer	75	LK: M+ arg	Argument passed from JOB to M+
Integer	76	LK: Upper limit	Virtual upper limit
Integer	77	LK: Lower limit	Virtual lower limit
Integer	78	LK: Max stroke	Maximum stroke
Double	77	LK: SBOX port	Port of SBOX Service
String	75	LK: SBOX ip address	IP address of SBOX Service
String	76	LK: Movement outcome	Outcome of the last executed movement
String	77	LK: Type	LIFTKIT type set with LIFTKIT_INIT job

8. Standard Pendant usage

This chapter provides guidance on how to start using LIFTKIT with Standard Pendant. As specified earlier YASKAWA robot can be operated with 2 Pendants.

1. Standard Pendant - older version of pendant
2. Smart Pendant - Newer, user-friendly pendant

So far in this manual only Smart Pendant was covered.

The Standard Pendant does not support GUI extension pages (Configuration and Jobs page). The Standard pendant is also not compatible with yip files.

The next chapter will describe how to install Ewellix LIFTKIT Extension on a Standard Pendant.

8.1 Install Extension on Standard Pendant

The installation consists of importing M+ application and jobs into controller via USB. USB should be plugged in Standard Pendant USB connector.

8.1.1 Install M+ application

Place M+ .out file in root folder on USB and plug USB in Standard Pendant USB connector.

To install M+ application change Start Mode to MAINTANCE by pressing on:

SYSTEM INFO → CPU RESET

Navigate to CPU RESET

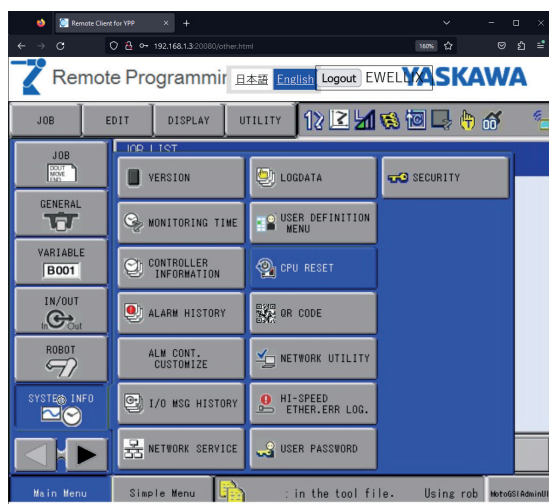


Figure 86

On the newly opened page, change Start mode from ONLINE MODE to MAINTENANCE MODE and press RESET.

Figure 87

Change mode to Maintenance

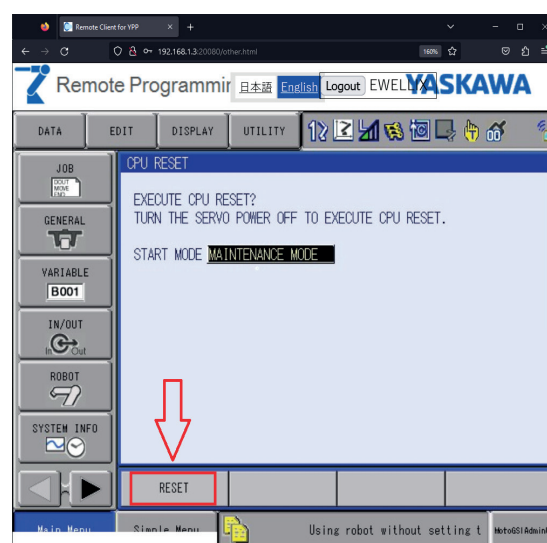
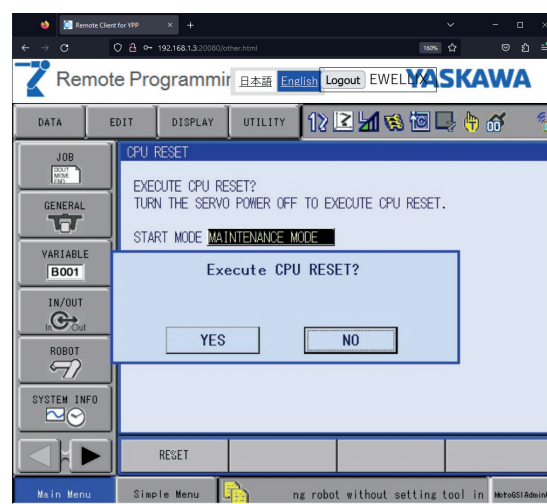


Figure 88

Reset controller



The Controller will be rebooted in Maintenance mode.

Navigate to: MotoPlus APL. → LOAD(USER APPLICATION).

Figure 89

Navigate to Load M+

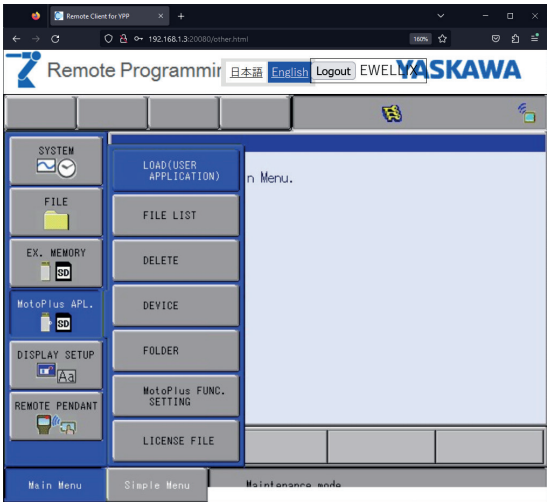


Figure 91

List of M+

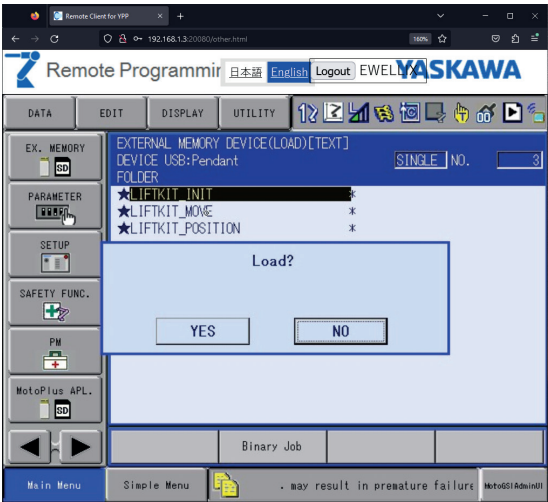
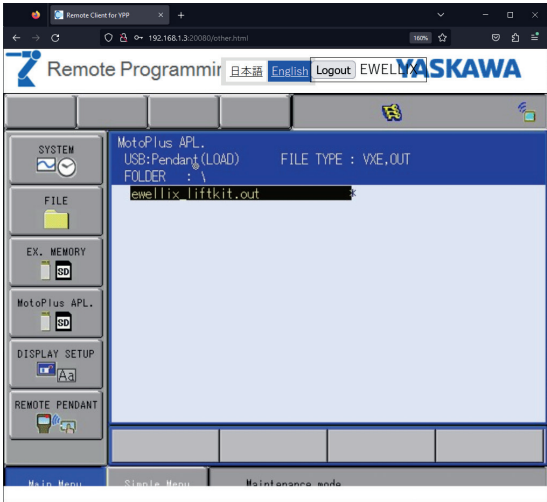


Figure 90

List of M+ apps

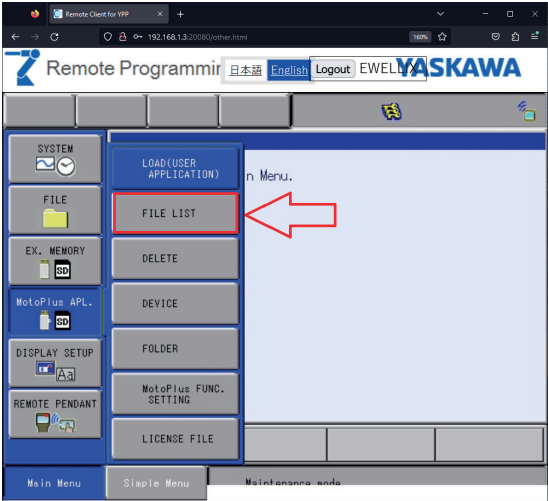


After pressing YES, restart the controller. When the controller is booted up again, navigate to:

MotoPlus API → FILE LIST to verify that M+ is installed correctly.

Figure 92

Navigate to File List



Hover over the “ewellix_liftkit.out” M+ by pressing SELECT on keyboard. Then press SELECT again so that the star appears on the left side of the text. When star appears, press ENTER to load M+.

Figure 93

File List

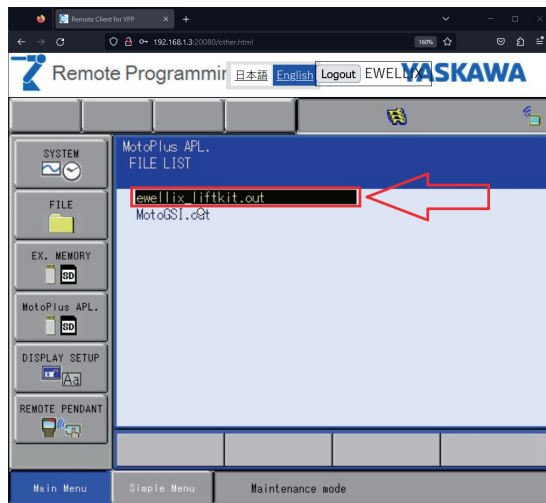
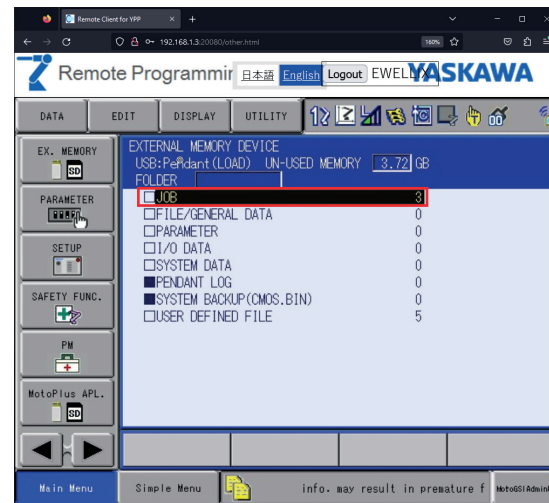


Figure 95

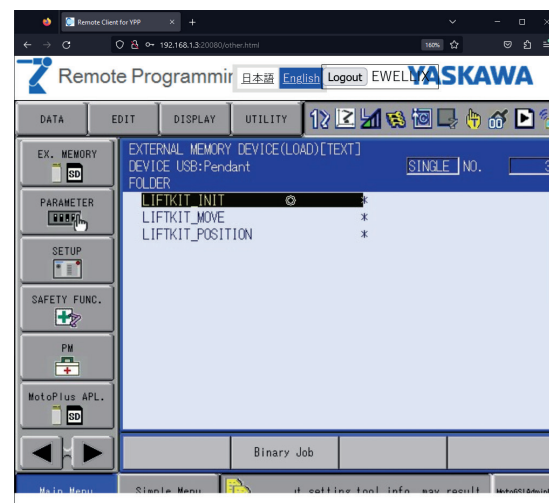
Select JOB list



When the JOBS checkbox is selected, new page with all jobs is opened: LIFTKIT_MOVE, LIFTKIT_POSITION, LIFTKIT_INIT, LIFTKIT LIMITS.

Figure 96

External JOB list



Press SELECT + SELECT for each job so that the star appears on the left side. When all jobs have an asterisk, press ENTER.

8.1.2 Install JOBS

In order to install JOBS, controller needs to be in ONLINE MODE. Normally when controller is rebooted it is rebooted in ONLINE MODE (if not specified differently in SYSTEM INFO □ CPU RESET).

Place JOBS files in root folder on USB and plug USB in Standard Pendant USB connector.

Navigate to: EX. MEMORY → LOAD.

Figure 94

Navigate to load JOBS

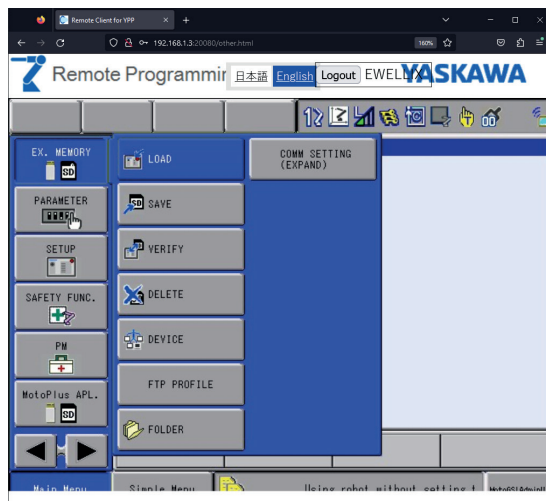
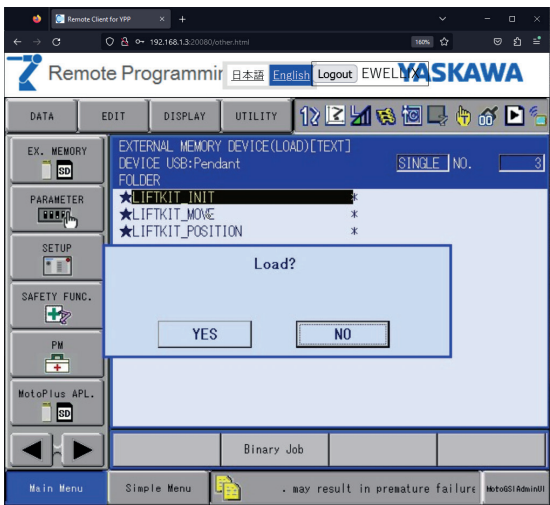


Figure 97

Load JOBS



The JOBS should be loaded and ready for execution.
To validate that JOBS are loaded correctly, navigate to: JOB → SELECT JOB.

Figure 98

Navigate to JOB list

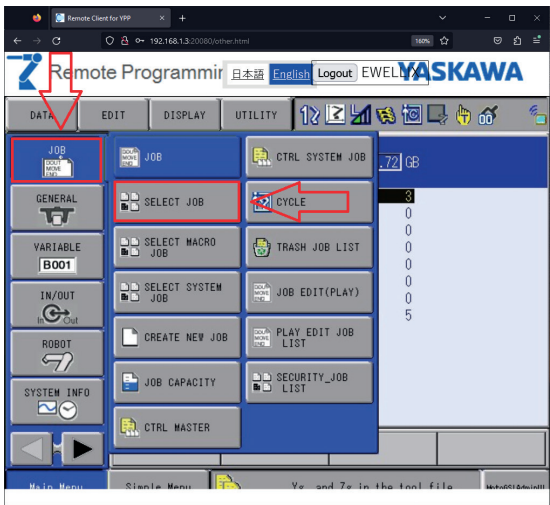
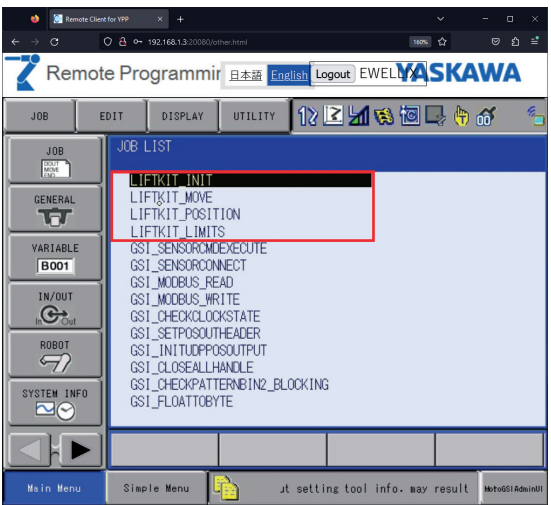


Figure 99

JOB list



8.2 Initialize global variable names

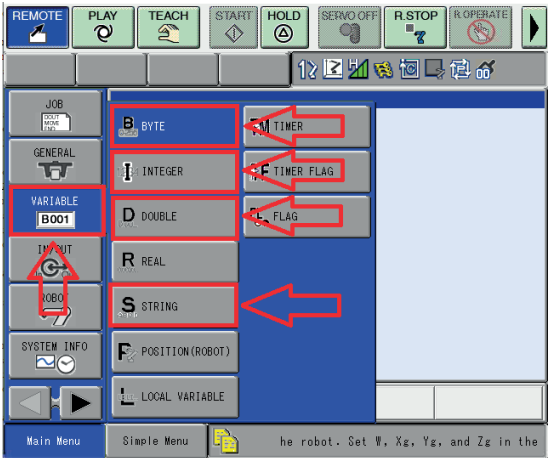
Several global variables are actively used by the plugin. Naming variables is done through installation of .yip on Smart Pendant. For Standard Pendant initialization of the variable names is done manually.

NOTE
Global variable names are used for UI Extensions. Since Standard Pendant does not support UI Extensions, naming variables is optional.

List of all variables and names can be found in this chapter:
v1.2.0 Extension manual | 6. Variables used by the Extension
Variable names must match predefined variable numbers.
Perform following steps in order to give all variables appropriate names:
1. Navigate to VARIABLES and select variable types which needs to be changed

Figure 100

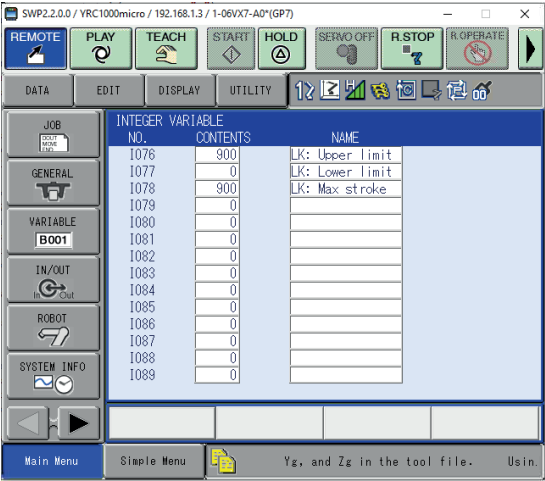
INTEGER, BYTE, DOUBLE, STRING



2. Integer variable names:

Figure 101

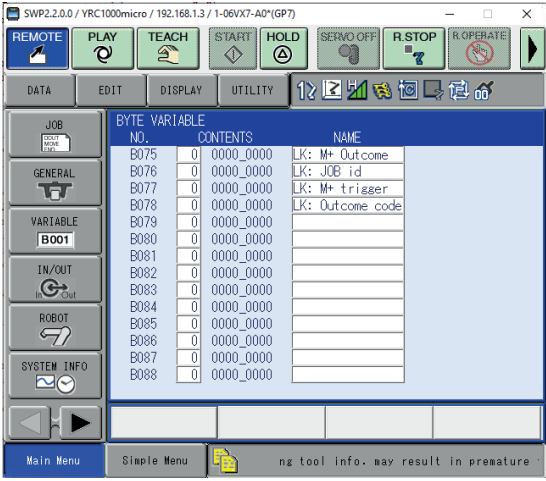
Integer variable names



4. Double variable names:

Figure 103

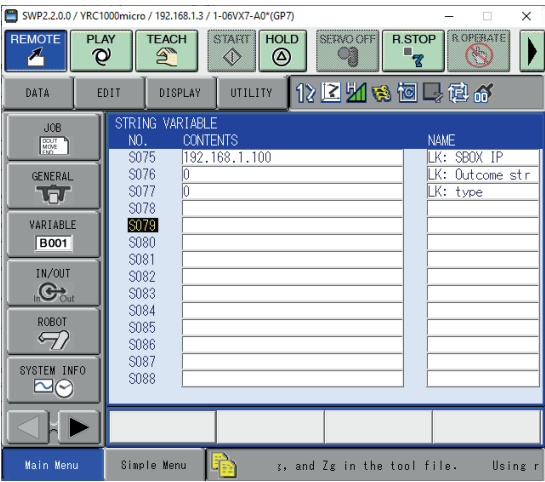
Double variable names



3. Byte variable names:

Figure 102

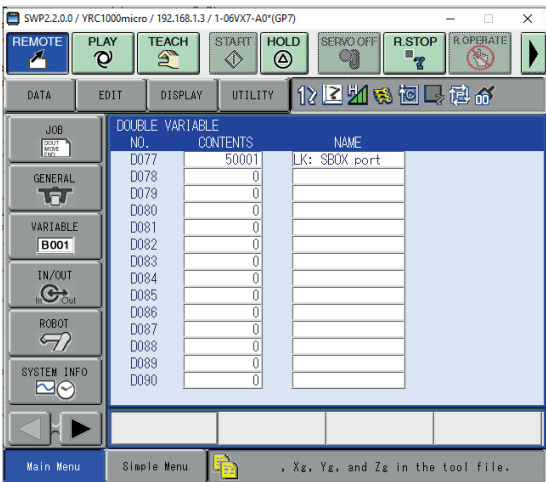
Byte variable names



5. String variable names:

Figure 104

String variable names



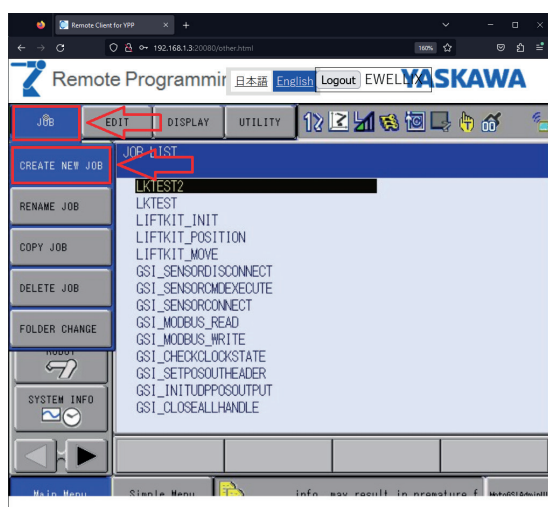
8.3 Execute LIFTKIT_INIT on Standard Pendant

The LIFTKIT_INIT job is mainly used by Standard Pendant and, it provides a way to configure LIFTKIT without the need of GUI Extension.

Create a new JOB in which LIFTKIT_INIT will be called. To do so, navigate to JOBS \square SELECT JOB. On the newly opened page, select JOB tab and press on CREATE NEW JOB.

Figure 105

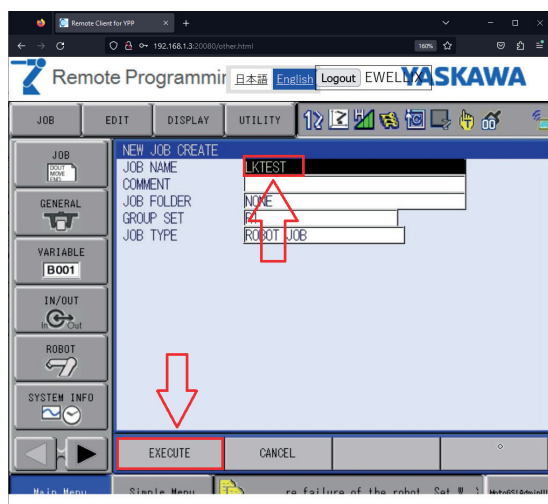
Select - create new JOB



Enter the JOB name and press Execute.

Figure 106

Add name and create JOB



On the newly opened page, press the INFORM LIST button which is placed on Standard Pendant. A new navigation bar should appear on the right side of the page. Navigate to CONTROL \rightarrow CALL.

Figure 107

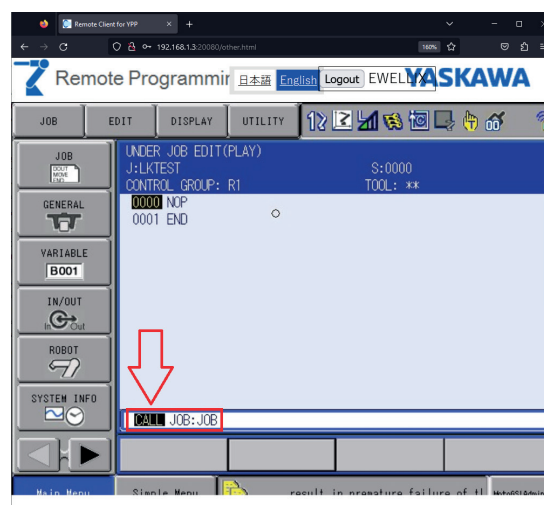
Insert CALL command



The CALL command will appear on bottom of the page.

Figure 108

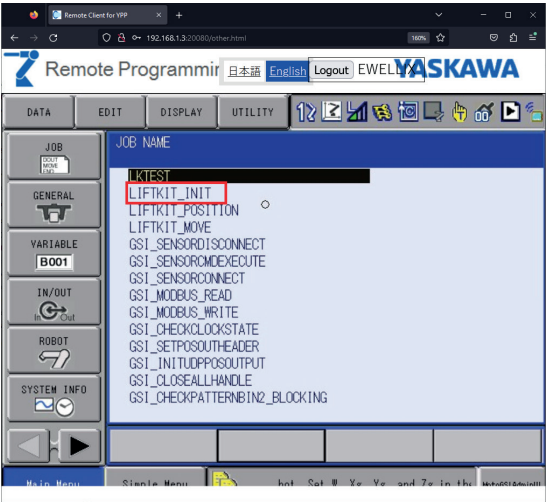
Hover CALL command



When CALL is hovered, press ENTER and select LIFTKIT_INIT job.

Figure 109

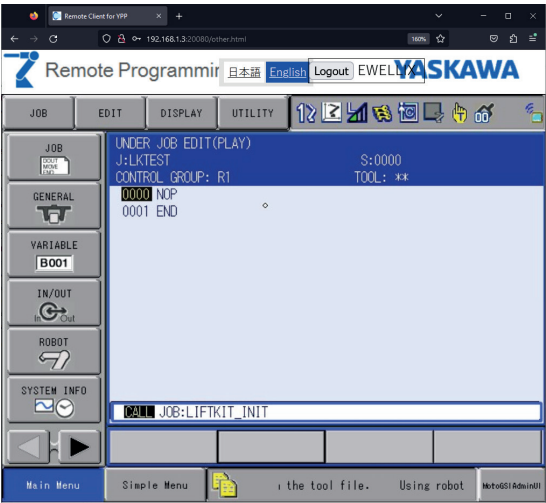
Select LIFTKIT_INIT job



Now the bottom text field will be "CALL JOB:LIFTKIT_INIT".

Figure 110

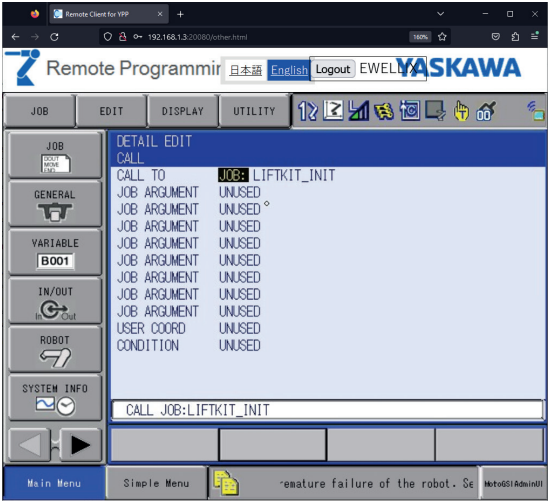
Hover CALL job



Hover Call and press SELECT, a list of JOB arguments will be displayed. Configure each argument as shown below.

Figure 111

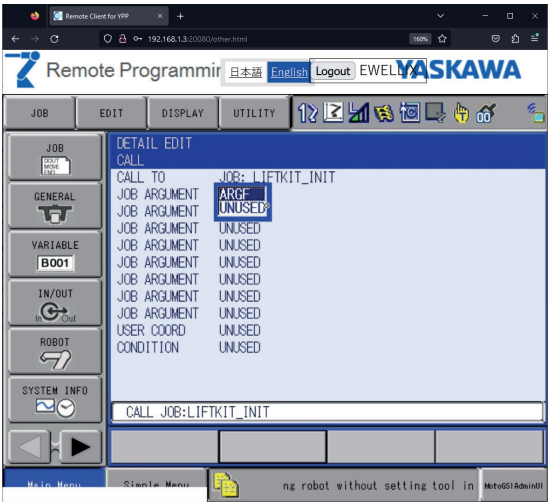
List of LIFTKIT_INIT arguments



Select the first argument and press SELECT → ARGF + SELECT.

Figure 112

Set first argument



To configure the first argument, press on the arrow on the right side of the dropdown menu. In expanded dropdown menu select "STRING".

Figure 113

Configure first argument

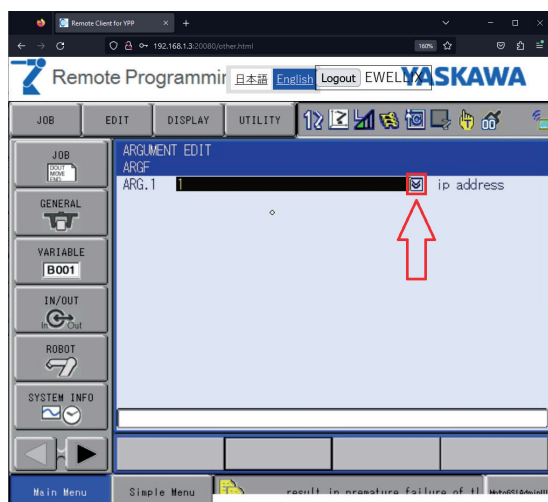
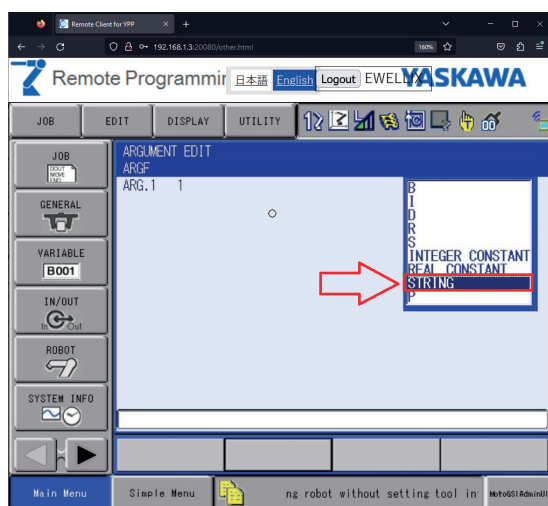


Figure 114

Change type of argument



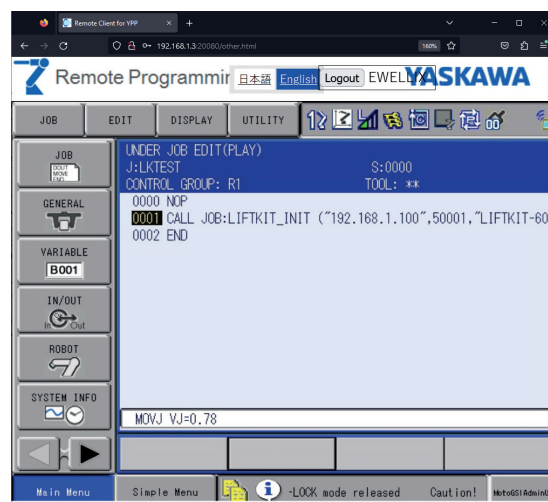
When the type is chosen, press text box and enter valid IP address of the SBOX (by default it is 192.168.1.100).

Save the Argument by pressing ENTER.

- The second argument is SBOX port. Follow the previous steps to configure SBOX port argument but select the "INTEGER CONSTANT" type instead of "STRING" type.
- Third argument is the LIFTKIT type. Follow the previous steps to configure the LIFTKIT type. The type should be passed as a string (eg LIFTKIT-601, LIFTKIT-602, LIFTKIT-630). Refer to the customer manual to confirm the type for the current SCU

Figure 115

Start JOB



LIFTKIT_INIT is ready to be started. In order to start job execute following instructions:

Change mode to automatic by turning the key in top left corner of the pendant. Turn servo on by pressing Servo on Ready button. Press green button which is placed on top side of Standard Pendant.

LIFTKIT INIT should take a few seconds to execute. When the execution of the JOB is finished, check the global variables S076 and B078. If there are no errors, S076 will have the value "Ready for movement" and B078 will have the value 13.

Figure 116

Navigate to String and Byte variables

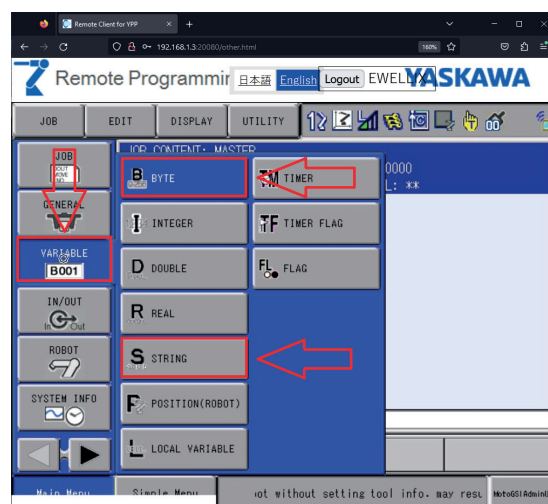


Figure 117

String variable result

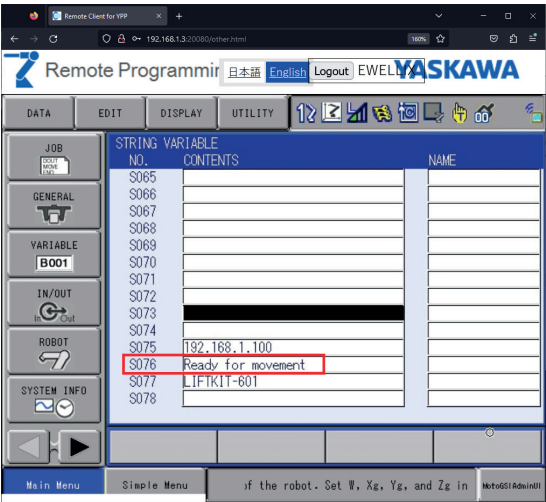
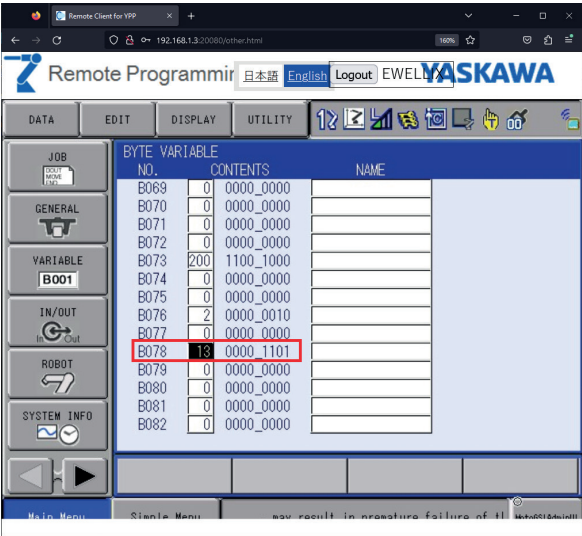


Figure 118

Byte variable result

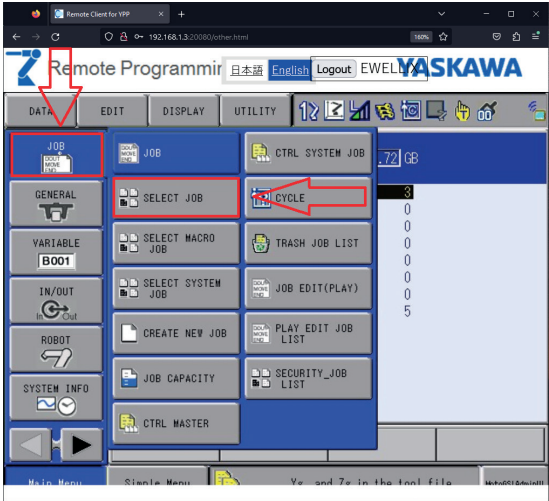


8.4 Delete Extension on Standard Pendant

To delete JOBS navigate to JOB → JOB LIST.

Figure 119

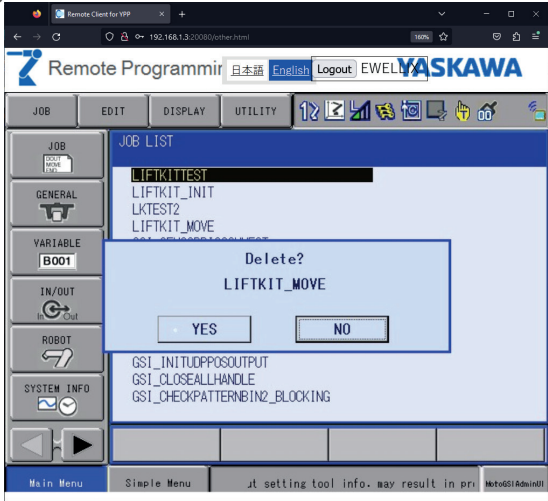
Navigate to JOB lis



Navigate to on any LIFTKIT job and, press DELETE + ENTER.

Figure 120

Delete JOB



Repeat the steps for each LIFTKIT job.

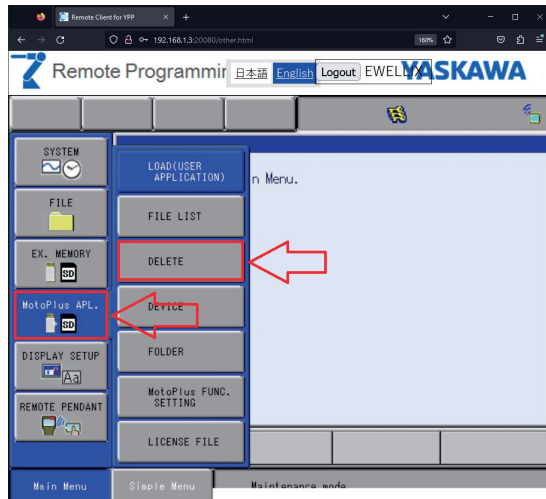
Delete M+ by changing the mode to maintenance as shown in figures: **figure 87**, **figure 88**, **figure 89**.

After changing startup state, reboot controller.

When controller is booted, navigate to: MotoPlus API. →
DELETE.

Figure 121

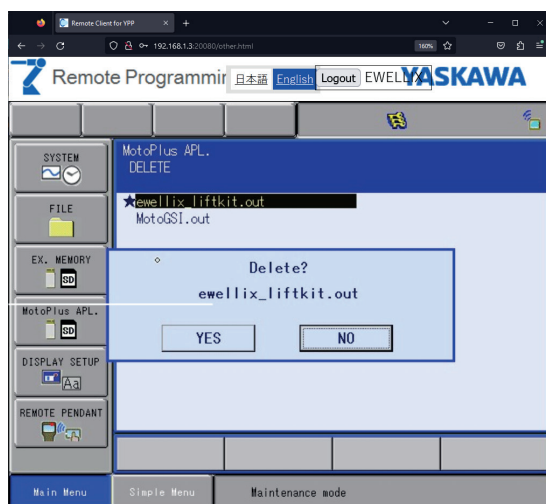
Navigate to Delete M+



Chose ewellix_liftkit, press SELECT + SELECT + ENTER. On new modal press YES.

Figure 122

Delete M+



Reboot controller.

9. Safety

SBOX is equipped with safety relays which cut the power of the LIFTKIT's SCU. When the relays are dropped LIFTKIT stops its movement and movement cannot be started again.

While Safety is triggered, Liftkits Current status is "INITIALIZED, NOT CONNECTED TO THE LIFTKIT".

Robots Safety outputs should be wired to the SBOX Safety inputs.

For more information about SBOX safety measurements refer to [\[LIFTKIT-0S\]](#)

CAUTION

In case the safety output of the robot is not correctly wired to the safety inputs of the SBOX and one of the safety inputs is triggered (e.g. safety fence is open), LIFTKIT will programmatically stop moving, but it is **not a safety measurement and should not be considered as a safe state according the norms.**

While safety input is triggered, program is in pause mode and proper alarm is shown. With correct wiring, LIFTKIT SCU will be powered off.

When safety input is released again (eg. safety fence is closed), LIFTKIT SCU will be powered on again in up to 15 seconds. After alarms are reset and LIFTKIT SCU is powered, movement is possible again.

In certain cases, after safety event, when program is continued before LIFTKIT SCU powers on, it waits up to 15 seconds for LIFTKIT to become READY. If LIFTKIT does not become READY in 15 seconds, the program is ABORTED.

10. 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 HC10, GP4, GP7 and GP8 (except GP8L), HC20, HC30 robots
- YASKAWA approved products
- Software control integrated with YASKAWA Plug&Play Extension for easy motion programming

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.

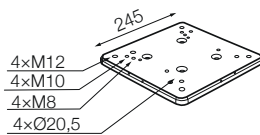


Technical data

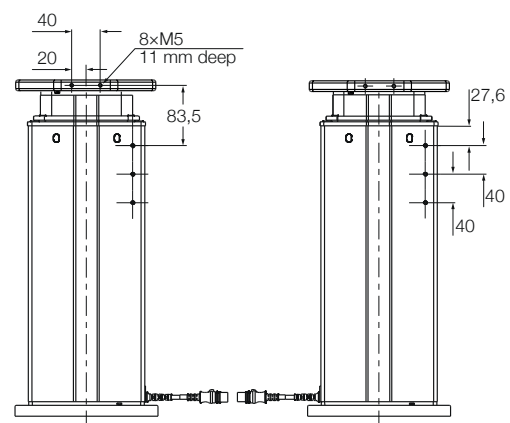
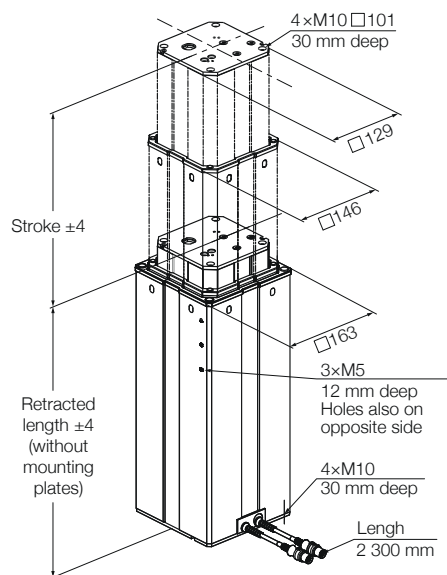
	Unit	LIFTKIT-YA-601	LIFTKIT-YA-630
Column type	-	TLT	TLT
Performance Data			
Max. push load	N	1 500	2 500
Max. pull load	N	0	0
Max. dynamic moment	Nm	210	1 000
Max. static moment	Nm	3 000	7 000
Max. linear speed	mm/s	80	55
Duty cycle	-	10% (20% at 500 N)	10%
Mechanical Data			
Screw type	-	Acme screw	Acme screw
Stroke range	mm	500 - 1 400	500 - 900
Retracted length (only lifting column)	mm	Stroke/2 + 275	Stroke/2 + 275
Weight @ 0 mm stroke	kg	21	105
Δ weight per 500 mm stroke	kg	1,7	5,1
Robots compatibility	-	HC10, GP4, GP7 and GP8 (except GP8L)	HC20 and HC30
Cable management	-	Threads on column and interface plate to attach 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	120 VAC / 6.5 A 230 VAC / 3.3 A
Input frequency	Hz	50-60	50-60
Input Fuse	A	10	10
I/O voltage	-	24 VDC	24 VDC
I/O current	-	max. 10 A not protected	max. 10 A not protected
Emergency stop	-	STO up to PLe, Cat.4	STO up to PLe, Cat.4
Communication			
Control interface	-	YASKAWA YRC 1000 micron	YASKAWA YRC 1000 micro
Positioning, repeatability	mm	± 1	± 1
Accessible positions	-	any	any
Feedback	-	Position & Status	Position & Status
Soft start and stop	-	Implemented for smooth operation	Implemented for smooth operation
Software control	-	YASKAWA Extension	YASKAWA Extension
Environment			
Type of protection	-	IP40	IP40
Ambient temperature	°C	+10 to +40	+10 to +40
Max. humidity	%	85	85
Vibration	-	Stationary industrial environment	Stationary industrial environment

Dimensional drawing LIFTKIT-YA-601 compatible with HC10, GP4, GP7 and GP8

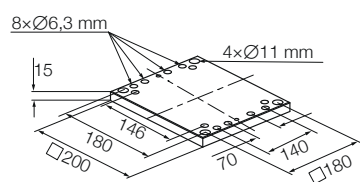
Robot attachment plate



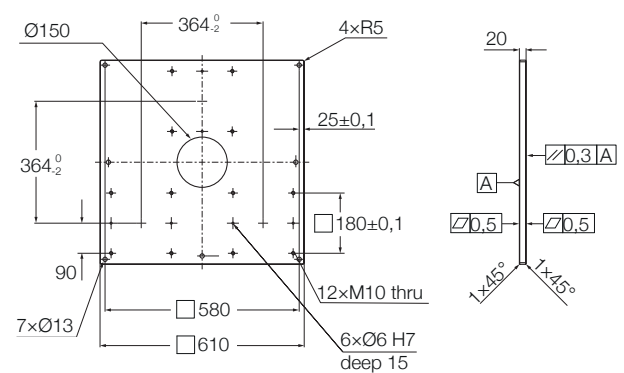
TLT lifting column



Bottom fixation plate



TLT lifting columns

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11. 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 YASKAWA 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 YASKAWA robot and the LIFTKIT-YA	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 YASKAWA 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 position out of virtual limit	Set target position within virtual limit range or adapt virtual limit range
The column stops before reaching its target position	Control unit cuts off 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

11.1 Introduction

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

11.1.1 Prerequisites

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

- YASKAWA environment
- Stargate and LIFTKIT architecture
- Plugin functionality (Plugin Manual)

11.2 Resolving know jobs errors

Errors that occur during the execution of jobs LIFTKIT MOVE, LIFTKIT POSITION, LIFTKIT INIT) will be stored in global variables.

11.2.1 LIFTKIT MOVE Job

Errors that occur during the execution of LIFTKIT MOVE job are shown in two variables:

1. S075 Error description - STRING variable
2. B078 Outcome status code - BYTE decimal variable

SBOX communication error (Outcome code 40)

Issue: Connection to SBOX Service could not be established

Possible causes:

- SBOX Service is not running
- SBOX Service is running but connection was not successful
- Another Client is already connected to the SBOX Service
- SBOX/RPI is powered off
- Ethernet connection between robot and SBOX is broken
- SBOX cannot be pinged

Solution(s):

- Restart SBOX Service. (Power off/on SBOX)
- Check hardware connection with the SBOX/RPI
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX)

SBOX communication error (Outcome code 43)

Issue: Connection to SBOX Service could not be established

Possible causes:

- SBOX Service is not running
- SBOX Service is running but connection was not successful
- Another Client is already connected to the SBOX Service
- SBOX/RPI is powered off
- Ethernet connection between robot and SBOX is broken
- SBOX cannot be pinged.

Solution(s):

- Restart SBOX Service. (Power off/on SBOX)
- Check hardware connection with the SBOX/RPI
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX)

Small delta height (Outcome code 20)

Issue: Movement too small

Possible causes:

- Difference between current position and desired position is less than 7

Solution(s):

- Increase/decrease desired position

Position not between limits (Outcome code 21)

Issue: Chosen position is not between virtual limits

Possible causes:

- Entered value is less than lower limit or higher than upper limit

Solution(s):

- Lower limit is equal to 0 by default. Upper limit is equal to max stroke by default. Change desired position to be between limits
- If lower limit is not equal to 0 or Upper limit is not equal to max stroke, contact support

Invalid type error (Outcome code 23)

Issue: Movement cannot be executed because chosen type is not correct

Possible causes:

- Invalid LIFTKIT type chosen

Solution(s):

- Change LIFTKIT type on Configuration page, by changing value in LIFTKIT types drop-down
- Change LIFTKIT type by running LIFTKIT INIT job

Homing not done (Outcome code 25)

Issue: Movement cannot be executed because initial homing is not done

Possible causes:

- Initial LIFTKIT Homing is not done

Solution(s):

- Contact support for guidance on how to do homing

LK not connected (Outcome code 41)

Issue: Movement cannot be executed because LIFTKIT does not have valid connection to SBOX

Possible causes:

- SCU is powered off
- Connection between SBOX/RPI and SCU is lost
- Hardware problems with LIFTKIT

Solution(s):

- Check hardware connection between SBOX/RPI and SCU
- Check if SCU is powered on
- Contact support

Limits are not set (Outcome code 26)

Issue: Movement cannot be executed because limits are not set

Possible causes:

- New LIFTKIT type is chosen but limits are not set

Solution(s):

- Change type on Configuration page
- Change type by running LIFTKIT INIT job.

Move to position error (Outcome code 30)

Issue: LIFTKIT cannot move

Possible causes:

- Unexpected error, should not happen

Solution(s):

- Restart Job
- Check hardware connection with the SBOX/RPI
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX)

Failed to reach position (Outcome code 30)

Issue: LIFTKIT started movement but could not finish it

Possible causes:

- SBOX/RPI is disconnected from the SCU during movement
- SCU is powered off during movement
- SBOX/RPI is powered off during movement
- 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
- Restart SBOX/RPI
- Contact support

Type is not set (Outcome code 24)

Issue: Movement cannot be executed because LIFTKIT type is not set

Possible causes:

- LIFTKIT Type is not configured

Solution(s):

- Check manual for the correct LIFTKIT Type
- Set LIFTKIT Type on Configuration page
- Set LIFTKIT Type by using LIFTKIT INIT job

11.2.2 LIFTKIT POSITION Job

When error occurs during the execution of LIFTKIT INIT, value -100 is written in Integer variable specified by user.

Errors that occur during the execution of LIFTKIT MOVE job are shown in two variables:

1. S075 Error description - STRING variable
2. B078 Outcome status code - BYTE decimal variable

Connect to SBOX Service error (Outcome code 40)

Issue: Connection to SBOX Service could not be established

Possible causes:

- SBOX Service is not running,
- SBOX Service is running but connection was not successful
- Another Client is already connected to the SBOX Service
- SBOX/RPI is powered off,
- Ethernet connection between robot and SBOX is broken
- SBOX cannot be pinged

Solution(s):

- Restart SBOX Service. (Power off/on SBOX)
- Check hardware connection with the SBOX/RPI
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX)

SBOX not accessible (Outcome code 43)

Issue: Connection to SBOX Service could not be established

Possible causes:

- SBOX Service is not running
- SBOX Service is running but connection was not successful
- Another Client is already connected to the SBOX Service
- SBOX/RPI is powered off
- Ethernet connection between robot and SBOX is broken
- SBOX cannot be pinged.

Solution(s):

- Restart SBOX Service. (Power off/on SBOX)
- Check hardware connection with the SBOX/RPI
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX)

Invalid type error (Outcome code 23)

Issue: Position cannot be obtained because chosen type is not correct

Possible causes:

- Invalid LIFTKIT type chosen

Solution(s):

- Change LIFTKIT type on Configuration page, by changing value in LIFTKIT types dropdown
- Change LIFTKIT type by running LIFTKIT INIT job

Homing not done (Outcome code 25)

Issue: Position cannot be obtained because initial homing is not done

Possible causes:

- Initial LIFTKIT Homing is not done

Solution(s):

- Contact support for guidance on how to do homing

LK not connected (Outcome code 41)

Issue: Position cannot be obtained because LIFTKIT does not have valid connection to SBOX

Possible causes:

- SCU is powered off
- Connection between SBOX/RPI and SCU is lost
- Hardware problems with LIFTKIT

Solution(s):

- Check hardware connection between SBOX/RPI and SCU
- Check if SCU is powered on
- Contact support

Limits are not set (Outcome code 26)

Issue: Position cannot be obtained because limits are not set

Possible causes:

- New LIFTKIT type is chosen but limits are not set

Solution(s):

- Change type on Configuration page,
- Change type by running LIFTKIT INIT job

Failed to obtain valid position (Outcome code 32)

Issue: Position cannot be obtained

Possible causes:

- Unexpected error, should not happen

Solution(s):

- Restart Job
- Check hardware connection with the SBOX/RPI
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX)

11.2.3 LIFTKIT INIT job

Errors that occur during the execution of LIFTKIT INIT job are shown in two variables:

- S076 Error description - STRING variable
- B078 Outcome status code - BYTE decimal variable

Connect to SBOX Service error (Outcome code 40)

Issue: Connection to SBOX Service could not be established

Possible causes:

- SBOX Service is not running
- SBOX Service is running but connection was not successful
- Another Client is already connected to the SBOX Service

Solution(s):

- Restart SBOX Service. (Power off/on SBOX).

SBOX not accessible (Outcome code 43)

Issue:

SBOX is not accessible

Possible causes:

- SBOX/RPI is powered off
- Ethernet connection between robot and SBOX is broken
- SBOX cannot be pinged

Solution(s):

- Check hardware connection with the SBOX/RPI
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX).

Wrong type (Outcome code 22)

Issue: Type that was passed does not exist

Possible causes:

- hird argument of LIFTKIT INIT is not a valid type. Type does not exist at all

Solution(s):

- Check Customer manual to see what the type of the SCU is

Invalid type (Outcome code 23)

Issue: Type exists, but it is not a valid Type for the SCU

Possible causes:

- Entered type exists, but it is not correct type for current SCU

Solution(s):

- Check Customer manual to see what the type of the SCU is

Homing not done (Outcome code 31)

Issue: LIFTKIT did not do the homing

Possible causes:

- LIFTKIT needs to do the homing in order to be operable

Solution(s):

- Check Customer manual / contact support personal to get information on how to do the homing

LK not connected (Outcome code 41)

Issue: LIFTKIT does not have valid connection to SBOX

Possible causes:

- SCU is powered off
- Connection between SBOX/RPI and SCU is lost,
- Hardware problems with LIFTKIT

Solution(s):

- Check hardware connection between SBOX/RPI and SCU,
- Check if SCU is powered on,
- Contact support.

LK connection lost (Outcome code 42)

Issue: When LIFTKIT INIT job was called, connection to LIFTKIT was valid. But during execution of LIFTKIT INIT at one point of time connection was lost.

Possible causes:

- SBOX/RPI is powered off during the execution of LIFTKIT INIT
- Ethernet connection between robot and SBOX is broken during the execution of LIFTKIT INIT
- SCU is powered off during the execution of LIFTKIT INIT
- Connection between SBOX/RPI and SCU is lost during the execution of LIFTKIT INIT

Solution(s):

- Check hardware connection between SCU and SBOX/RPI
- Check if SCU is powered on
- Check if SBOX/RPI is powered on
- Restart SBOX/RPI
- Contact support.

11.2.4 LIFTKIT LIMITS job

Errors that occur during the execution of LIFTKIT LIMITS job are shown in two variables:

- S075 Error description - STRING variable,
- B078 Outcome status code - BYTE decimal variable.

Connect to SBOX Service error (Outcome code 40)

Issue: Connection to SBOX Service could not be established

Possible causes:

- SBOX Service is not running
- SBOX Service is running but connection was not successful
- Another Client is already connected to the SBOX Service
- SBOX/RPI is powered off
- Ethernet connection between robot and SBOX is broken
- SBOX cannot be pinged

Solution(s):

- Restart SBOX Service. (Power off/on SBOX)
- Check hardware connection with the SBOX/RPI
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX)

SBOX not accessible (Outcome code 43)

Issue: Connection to SBOX Service (Stargate) could not be established

Possible causes:

- SBOX Service is not running
- SBOX Service is running but connection was not successful
- Another Client is already connected to the SBOX Service
- SBOX/RPI is powered off
- Ethernet connection between robot and SBOX is broken
- SBOX cannot be pinged.

Solution(s):

- Restart SBOX Service. (Power off/on SBOX)
- Check hardware connection with the SBOX/RPI
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX)

Invalid type (Outcome code 23)

Issue: Type exists, but it is not a valid Type for the SCU

Possible causes:

- Entered type exists, but it is not correct type for current SCU

Solution(s):

- Check Customer manual to see what the type of the SCU is

Homing not done (Outcome code 31)

Issue: LIFTKIT did not do the homing

Possible causes:

- LIFTKIT needs to do the homing in order to be operable

Solution(s):

- Check Customer manual / contact support personal to get information on how to do the homing

ILK not connected (Outcome code 41)

Issue: LIFTKIT does not have valid connection to SBOX

Possible causes:

- SCU is powered off
- Connection between SBOX/RPI and SCU is lost
- Hardware problems with LIFTKIT

Solution(s):

- Check hardware connection between SBOX/RPI and SCU
- Check if SCU is powered on
- Contact support

LK connection lost (Outcome code 42)

Issue: When LIFTKIT LIMITS job was called, connection to LIFTKIT was valid. But during execution of LIFTKIT LIMITS at one point of time connection was lost.

Possible causes:

- SBOX/RPI is powered off during the execution of LIFTKIT LIMITS
- Ethernet connection between robot and SBOX is broken during the execution of LIFTKIT LIMITS
- SCU is powered off during the execution of LIFTKIT LIMITS
- Connection between SBOX/RPI and SCU is lost during the execution of LIFTKIT LIMITS

Solution(s):

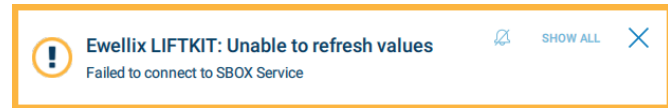
- Check hardware connection between SCU and SBOX/RPI
- Check if SCU is powered on
- Check if SBOX/RPI is powered on
- Restart SBOX/RPI
- Contact support

11.3 Resolving alarms

11.3.1 Configuration page Alarms

Figure 123

Unavailable to refresh values



Issue: Unavailable to obtain data from SBOX Service when SAVE or REFRESH buttons are pressed.

Possible causes:

- Wrong SBOX IP address is entered in Configuration page textfield
- Wrong SBOX port is entered in Configuration page textfield
- SBOX/RPI is powered off
- Ethernet connection between robot and SBOX is broken
- Another Client is already connected to the SBOX Service

Solution(s):

- In SBOX IP address textfield enter following IP address: 192.168.1.100. Specified IP address is predefined, but it can be changed. If IP address is changed, contact support
- In SBOX port enter following port: 50001. Specified port is predefined and it cannot be changed
- Check hardware connection with the SBOX/RPI
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX)

Max stroke / Virtual limits variables could not be found

Figure 124

Max stroke or Virtual limits variable could not be found



Issue: Virtual limits and max stroke could not be stored in variables.

Possible causes:

- Max stroke variable is deleted
- Upper limit variable is deleted
- Lower limit variable is deleted
- Invalid LIFTKIT type is selected

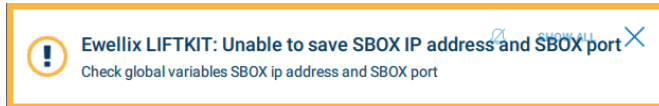
Solution(s):

- Check Integer global variables I076 - Upper limit, I077 - Lower limit, I078 - Max stroke. If one of the three does not exist, add it
- Chose appropriate LIFTKIT type

Unable to save SBOX IP address or SBOX port

Figure 125

Unable to save SBOX IP address and SBOX port



Issue: Unable to save IP address or port when pressing on “SAVE” button

Possible causes:

- SBOX ip address variable is deleted
- SBOX port variable is deleted

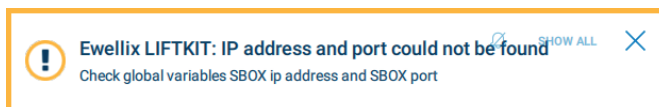
Solution(s):

- Check String global variable S075 - SBOX ip address and Byte variable B078 - SBOX port. If one of the two does not exist, add it.

IP address and port could not be found

Figure 126

IP address and port could not be found



Issue: SBOX IP address and SBOX port variable does not exist on robot boot

Possible causes:

- SBOX IP address variable is deleted
- SBOX port variable is deleted

Solution(s):

- Check String global variable S075 - SBOX IP address and Byte variable D078 - SBOX port. If one of the two does not exist, add it

Unavailable to read Position/Status

Figure 127

Failed to read Position

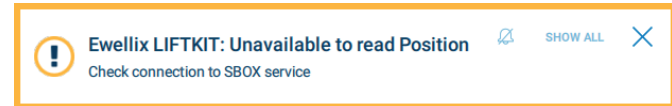
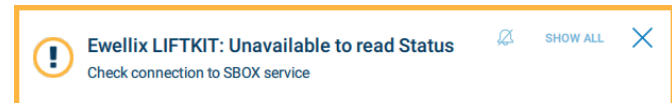


Figure 128

Failed to read Status



Issue: Status and position could not be read from SBOX Service

Possible causes:

- SBOX/RPI is powered off
- Ethernet connection between robot and SBOX is broken
- Another Client is already connected to the SBOX Service
- Wrong SBOX IP address or SBOX port are entered

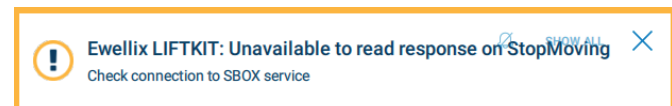
Solution(s):

- Check hardware connection with the SBOX/RPI
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX)
- In SBOX IP address textfield enter following IP address: 192.168.1.100
- In SBOX port enter following port: 50001

Unavailable to read response on StopMoving

Figure 129

Unavailable to read response on StopMoving



Issue: Button is released and Stop moving might not have an effect

Possible causes:

- SBOX/RPI is powered off when button is released,
- Ethernet connection between robot and SBOX is broken when button is released

Solution(s):

- Check hardware connection with the SBOX/RPI
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX)

Small Delta height

Figure 130

Small Delta height



Issue: Requested movement is less than 7 mm. Minimum LIFTKIT movement should be at least 7 mm

Possible causes:

- User pressed EXTEND button when current position is: $[upperLimit-7] > x > [upperLimit]$
- User pressed RETRACT button when current position is: $[lowerLimit] < x < [lowerLimit+7]$
- User pressed MOVE TO button when delta between desired position and current position is 6 or less

Solution(s):

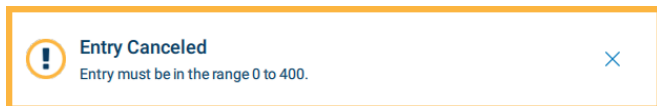
- Adjust LIFTKIT movement so that difference between desired position and current position is higher than 6

11.3.2 Jobs page

Invalid Entry

Figure 131

Invalid Entry



Issue: Invalid number entered in one of the text field

Possible causes:

- In LIFTKIT MOVE text field entered value is higher than Upper limit (max stroke)
- In LIFTKIT MOVE (IVAR) entered value is higher than 499
- In LIFTKIT POSITION entered value is higher than 499

Solution(s):

- Enter valid values inside a text field

11.3.3 Configuration page Statuses

NOT CONNECTED, INVALID IP ADDRESS FORMAT Status code

Figure 132

NOT CONNECTED, INVALID IP ADDRESS FORMAT



Issue: IP address is entered in wrong format

Possible causes:

- Wrong SBOX IP address is entered

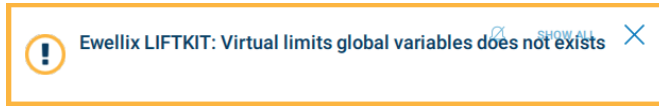
Solution(s):

- Enter IP address in following format: <number>.<number>.<number>.<number> where <number> is a placeholder for integer number value. Valid IP address example: 192.168.1.100

NOT CONNECTED, GLOBAL VARIABLES NOT EXIST Status code

Figure 133

NOT CONNECTED, GLOBAL VARIABLES NOT EXIST



Issue: : Global variables not exist

Possible causes:

- There isn't "LK: SBOX IP" variable name at String S75 global variable
- There isn't "LK: SBOX port" variable name at Double D78 global variable

Solution(s):

- Yaskawa LIFTKIT plugin reinstallation
- Create "LK: SBOX IP" variable at String S75 global variable
- Create "LK: SBOX port" variable at Double D78 global variable

NOT CONNECTED, SBOX COMMUNICATION ERROR Status code

Figure 134

NOT CONNECTED, SBOX COMMUNICATION ERROR



Issue: Connection with SBOX is not established

Possible causes:

- Wrong SBOX port is entered
- SBOX/RPI is powered off
- Ethernet connection between robot and SBOX is broken
- SBOX cannot be pinged
- SBOX Service is not running
- SBOX Service is running but connection was not successful
- Another Client is already connected to the SBOX Service

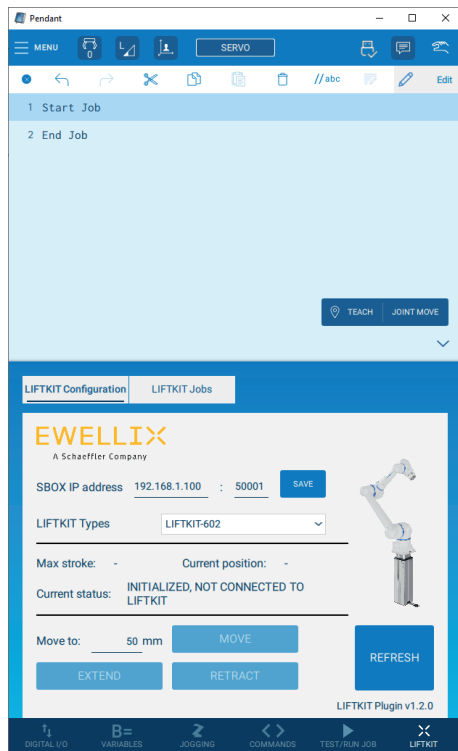
Solution(s):

- Check hardware connection with the SBOX/RP
- Check SBOX IP address and port
- Check if SBOX/RPI is powered on
- Restart SBOX Service. (Power off/on SBOX)

INITIALIZED, NOT CONNECTED TO LIFTKIT Status code

Figure 135

INITIALIZED, NOT CONNECTED TO LIFTKIT



Issue: Connection between SBOX and LIFTKIT is not established

Possible causes:

- SCU is powered off
- Connection between SBOX/RPI and SCU is lost
- Hardware problems with LIFTKIT.

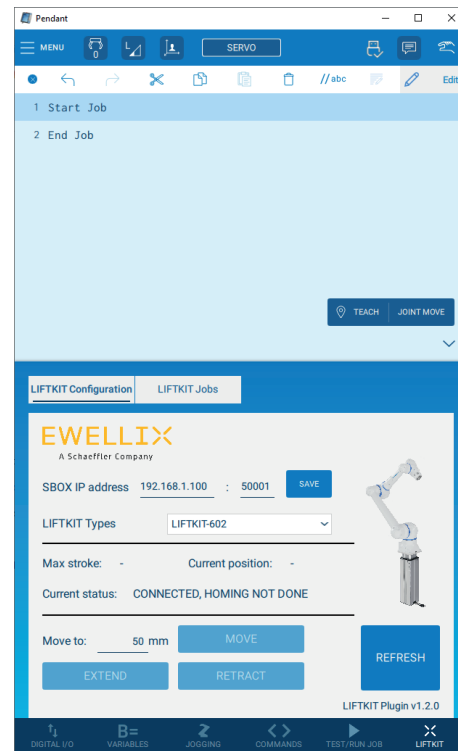
Solution(s):

- Check hardware connection between SBOX/RPI and SCU
- Check if SCU is powered on
- Contact support

CONNECTED, HOMING NOT DONE Status code

Figure 136

CONNECTED, HOMING NOT DONE



Issue: LIFTKIT did not do the homing

Possible causes:

- LIFTKIT needs to do the homing in order to be operable

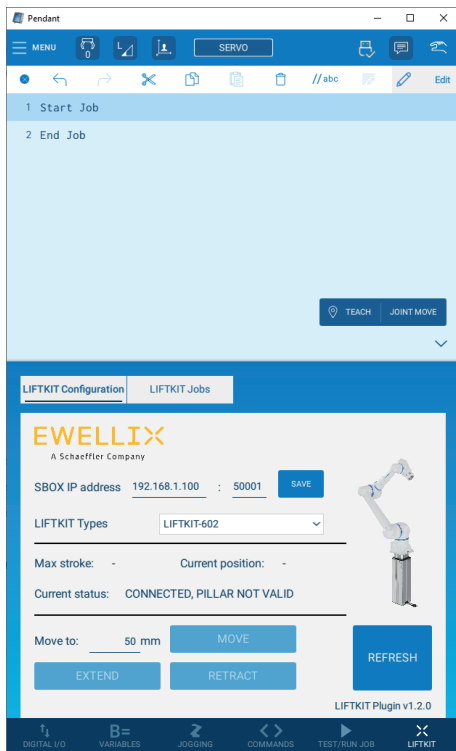
Solution(s):

- Check Customer manual / contact support personal to get information on how to do the homing

CONNECTED, PILLAR NOT VALID Status code

Figure 137

CONNECTED, PILLAR NOT VALID



Issue: Invalid type is selected

Possible causes:

- Entered type exists, but it is not correct type for current SCU

Solution(s):

- Check Customer manual to see what is the type of SCU
- Change type on LIFTKIT Types dropdown

CONNECTED, TYPE NOT SET Status code

Figure 138

CONNECTED, TYPE NOT SET



Issue: Type is not set

Possible causes:

- Type is not set

Solution(s):

- Choose type from LIFTKIT Types dropdown

11.3.4 Jobs page Alarms

Invalid Entry

Figure 139

Invalid Entry



Issue: Invalid number entered in one of the text fields

Possible causes:

- In LIFTKIT MOVE text field entered value is higher than Upper limit (max stroke)
- In LIFTKIT MOVE (IVAR) text field entered value is higher than 499
- In LIFTKIT POSITION text field entered value is higher than 499

Solution(s):

- Enter valid values inside a text fields

12. Appendix

⚠ WARNING

This is the extract of the SCU manual chapter **Safety**. For more information please see [SCU operating manual PUB TC-08005](#).

12.1 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.

12.2 Use

12.2.1 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 1 060 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 100 000 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.

12.2.2 Unintended Use

Any use other than 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.

12.2.3 Essential performance

Supply electromechanical actuators / pillars by command.

12.3 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.

12.3.1 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.

12.4 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.

12.4.1 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.

12.5 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.

12.5.1 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 be 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 be 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 shock 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.

12.5.2 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.

12.6 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.

12.7 Safeguard against restart

To secure the SCU control unit against unintentional restart:

1. 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 re-starting 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.


12.8 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.

12.8.1 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.

12.8.2 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

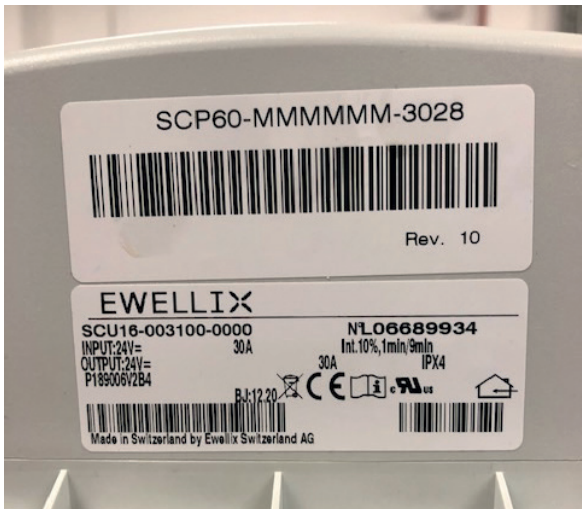
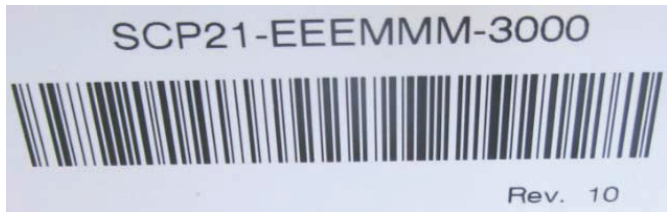


Figure 68

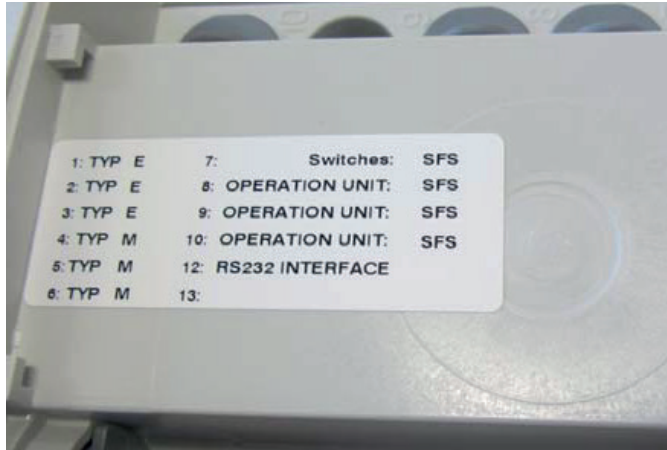
Example “Smart Control Parameter” (SCP-Label)



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.

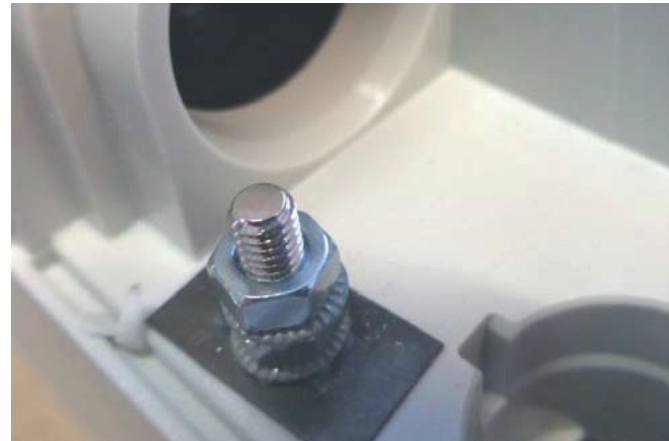
If the actuator does not have signals to indicate operation, depending on the application, it is recommended to have an operational signal installed in the application.

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.

12.9 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.

12.9.1 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.

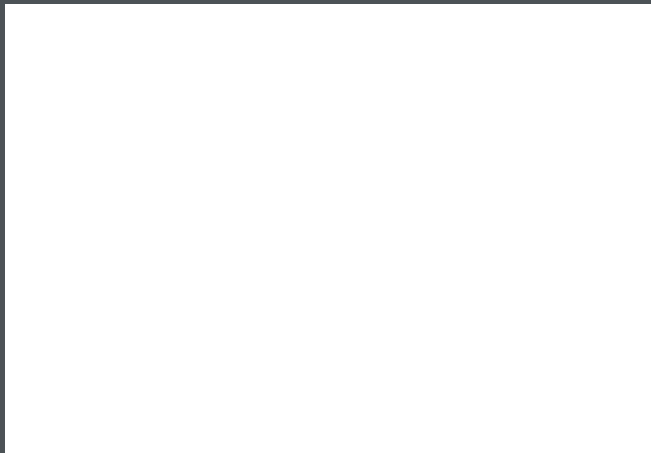
List of cables, length of cables, accessories

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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PUB TC-08057-1-EN-April 2025

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