MCPS 36

Motor Control Power Supply

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ISO 9001 Certificate

Innovation in Surface Spectroscopy and Microscopy Systems
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Chapter 1
Introduction

Welcome to the user manual for the SPECS MCPS 36. This is a power supply for Schneider Electric ILS1 integrated drives for CANopen. This manual describes how to set up and use stepper motors supplied with SPECS equipment.

This chapter explains briefly how to use the manual and points you toward further sources of information.

Most importantly, it contains safety notices that you should read before operating the equipment.

1.1 About
The manual is divided into the following chapters:
Chapter 2 contains the setup procedures to get the equipment ready for use.
Chapter 3 describes the software used to operate stepper motors.
Chapter 4 has an overview of the handset that allows you to control the software remotely from the computer.
Chapter 5 provides specifications and background technical information about the equipment.

1.2 Information
Stepper motors are used in conjunction with other SPECS equipment. You should read the appropriate manuals before using the motor control.

For further details about the stepper motors themselves, refer to the Lexium Integrated Drive manual.

For further advice and assistance, please also contact SPECS support:
Tel. +49 30 46 78 24-0
email: support@specs.com
If you need to return this SPECS product for repair, service or upgrade, please first contact SPECS support. We will provide you with an RMA as well as details for correct packaging and shipment of the instrument. This will ensure safe transportation and speedy processing.

### 1.3 Safety

The document "Safety Instructions" is contained with this instrument. This contains important warnings and procedures that you should adopt when using SPECS equipment.

In addition to the advice in the safety instructions, warnings and cautions are included in this manual at appropriate places. Please observe these warnings for your own safety and to ensure reliable operation of the equipment.

**Caution!**
If a motor is set to operate while the equipment is unattended, make sure to fit safety guards and include warning signs.

**Caution!**
Make sure that the movement does not cause collision with other items on the chamber. Always check movements carefully before including them in automated procedures.
SPECS does not accept responsibility for damage caused by incorrect or careless operation!

If you need to return the instrument to SPECS for repair, please fill out the declaration at the end of this manual, if necessary.
Chapter 2
Installation

This chapter describes the steps required to set up stepper motors ready for use on SPECS systems. In addition to electrical connections, you also need to establish a network connection for computer control.

An overview of the motor is shown in Figure 1, including all connections made directly to the motor. Limit switches are an option, and may be absent in your configuration.

Figure 1: Stepper motor on a manipulator axis
Each motor is labeled with a number. When installing the motors, it is essential that you fit the motor to the correct location on the equipment. The identity of the motor is stored in the software configuration.

Caution!
Failure to install motors at their correct locations will cause unexpected operation and possibly damage equipment.

2.1 Mechanical Connection
For initial installation or after each bakeout, you need to fit the motor onto the equipment. This involves screwing the motor case onto the equipment, then connecting the mechanical drive.

Each instrument has a bearing that is connected to the motor. A hole in the instrument frame provides access to the screw that clamps the bearing to the motor drive shaft. Before mounting the motor, you should make sure that the screw is accessible through the hole. The screw has an Allen head—the size depends on the instrument.

To fit the motor onto equipment:
1. If necessary, set the correct position of the equipment. For example, center the manipulator table or set the shutter position.
2. Screw the motor assembly into place on the equipment.
3. Using the hole provided, tighten the allen key bolt. This clamps the motor drive to the equipment.
4. Fix the motor to the instrument using four M4 bolts.

It is probably necessary to recalibrate the software after fitting the motor. This is described in "Calibration" on page 6.

2.2 Electrical Connections
Figure 3 shows the connections required for setting up the motor control. Please note the following points:
- The end of the CAN chain must be fitted with a terminator.
- If a second MPH 6 is used, the CAN connection on the MPH 6 is not used. CAN communication is provided from the last motor on the first MPH 6 hub.
- Each MPH 6 can power up to six motors. The diagram below shows the general scheme for connection; additional motors are connected in a similar way.
2.3 Limit Switches

Limit switches provide a physical end to the movement of the motor. Two limit switches can be connected—one corresponds to a limit in the positive step direction, the other in the negative step direction. The connections on the motor are shown in Figure 3. The use of limit switches is optional. For most purposes, a software setting that limits the travel of the motors is sufficient.

Figure 3: Electrical connections

**Figure 4: Limit switch connections**

- **NO (normally open)**
- **NC (normally closed)**
- **COM (common)**
2.4 Network Connection
The MCPS 36 is controlled over an ethernet/LAN connection.

In order to protect your equipment and experiment, we strongly recommend that you create a separate local network for your equipment to exclude any possibility of unauthorized access to your equipment.

**Note:** For more detail, you should contact your local system administrator for advice on setting up the connections. SPECS can also provide you with advice on setting up the system.

Most importantly, your computer needs a dedicated ethernet card for the new network. This can either be an internal card or a USB–ethernet converter. The computer will communicate with the equipment using this card, while any other connections, e.g., to the internet, will be made with a different ethernet connection.

There are two ways of connecting the computer:
- For a single instrument, an ethernet crossover cable connected directly to the instrument is sufficient.
- If you have a number of instruments or other computers on a dedicated LAN, a connection to a hub or switch allows you to communicate with all of them.

The diagram below shows these two connection schemes.

![Diagram of network connections]

Figure 5: Schemes for network connections

See also "Setting the IP Address" on page 17 in case you need to change the preset IP address.

2.5 Calibration
After fitting the motor, you should calibrate the software.

**Note:** The following description assumes you are already familiar with using the Manipulator Device Control in SpecsLab Prodigy. Please see "Software Control" on page 9 for a full description of the software and in particular, "Editing the System Settings" on page 11.

To calibrate the software to the motor position:
1. Start SpecsLab Prodigy and connect to the Manipulator DeviceControl.
2. Click \(\text{expand}^{\downarrow}\) until the Device Control is expanded to show the step positions, as seen in the screenshot below.
3. Select a motor.
4. Click **Unlock**. The values in the selected motor will turn black, indicating that they can be edited; all other values remain grayed out.

<table>
<thead>
<tr>
<th>Axis</th>
<th>Unit</th>
<th>Speed</th>
<th>Min</th>
<th>Max</th>
<th>Offset Steps</th>
<th>Raw Steps</th>
<th>LS-</th>
<th>LS+</th>
<th>IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>mm</td>
<td>0.50</td>
<td>-15.00</td>
<td>15.00</td>
<td>1301433</td>
<td>1301442</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>y</td>
<td>mm</td>
<td>1.00</td>
<td>-15.00</td>
<td>15.00</td>
<td>1035161</td>
<td>1035165</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>z</td>
<td>mm</td>
<td>10.00</td>
<td>0.00</td>
<td>500.00</td>
<td>70168414</td>
<td>74116714</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>polar</td>
<td>deg</td>
<td>15.00</td>
<td>-1.82</td>
<td>358.18</td>
<td>33380728</td>
<td>33357058</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 6: Setting an offset position for calibration

5. In the offset field, enter the current position of the motor. For example, if the equipment is in a reference (or "zero") position, enter 0.00. If there is a measurement scale (e.g. for a manipulator Z axis), enter the number shown on the scale.
6. Click the **As Offset At** button.
7. Click **Store**. The value is saved for the motor.
8. Click **Lock** to prevent further adjustments to the motor settings.

Repeat the procedure for other motors as necessary.

### 2.6 Bakeout

The motors cannot be baked out. Always remove motors and cables before bakeout. Please see "Mechanical Connection" on page 4 for more details. Remember to unscrew the bearing from the motor drive shaft before removing the motor.
Chapter 3
Software Control

The Manipulator Device Control in SpecsLab Prodigy allows you to set the position of one or more stepper motors. It can store predefined positions that can be recalled.

The following topics are covered:
- Setting the position.
- Managing lists of positions.
- Editing system settings.
- Saving positions.
- Using positions in experiments.
- Changing the IP address.

Before using the Manipulator Device Control, you need to make a connection:
- Click Control. There will be a pause while the connection is made. On establishing the connection, the Device Control frame turns blue. If you have configured the device as part of an experiment in the Experiment Editor, the Device Control is already connected.
Clicking the Disconnect button breaks contact with the instrument. All controls are inactive. There are two buttons, ▲ and ▼, which collapse and expand the Device Control respectively.

### 3.1 Setting Motor Positions

When setting the motor positions, you can either define an absolute position or relative values. For continuous rotation axes, you have the additional option of setting the axis into rotation, rather than just specifying an angle.

In order to set the position, you need to expand the window from its initial appearance:

- Click the ▼ button. The window will expand to show the move settings and the list configuration. The highlighted section in the screenshot below shows the controls used to move the manipulator.

![Manipulator window](image)

**Figure 7: Setting a position**

**Absolute Positions**

Moving to an absolute position involves entering exact coordinates for the motor position.

When moving over a long distance, it is best to only move one motor at a time, so that you know the exact path the equipment is moving, thereby avoiding potential collisions with other equipment in the chamber. For this reason, you can select which motors are to be moved.

To move a motor to an absolute position:
1. Enter a value in one of the Destination fields for the desired motor. The box to the left of the value will be checked when you enter a value.
2. Optionally, enter values in other Destination fields for other motors.
3. Make sure that the option boxes are only checked for the motors that you want to move.
4. Click Move Absolute. The manipulator will move the designated motors to the position you set.

**Relative Positions**
In addition to setting the absolute position, you can move a motor by a distance relative to its current position. For example, using this feature, you can move a manipulator in steps. This is useful e.g. for sample alignment or for moving the sample a certain distance between measurements.

To move the motor by a relative distance:
1. Enter a value in a Move relative field for one of the motors.
2. Optionally, enter values in the Move relative fields for other motors.
3. Click Move Relative. The motors will move by the amount specified in the Move relative field(s).

Each time you click Move Relative, the motor will move by the specified amount.

**Continuous Rotation**
If you have an instrument with a continuous rotation axis, all such axes will be listed in the Continuous Rotation section. While the axis is rotating, you can set the position of the other motors as usual.

To continuously rotate an axis:
1. Enter a speed for the continuous rotation axis in degrees per second.
2. Click Rotate. The selected axis will start to turn. The button will change its name to Stop Rotate.
3. Click Stop Rotate to halt the rotation.

**Note:** Pressing Stop will stop the movement of all motors.

### 3.2 Editing the System Settings
The system settings contain the basic configuration for the motor. As well as a zero setting, there are maximum and minimum positions for each axis that you can set according to the mechanical limits of your equipment. A further group of settings allows more fundamental adjustments to the motor operating parameters.

**Note:** Aside from recalibrating motors after fitting, editing the system settings is generally performed by SPECS engineers. Do not change any of the settings without prior discussion with SPECS support.

Note the following points about the procedure for editing system settings:
- All settings are locked so that you cannot edit them accidentally.
- When you unlock settings, you can only edit one motor at a time.
- Settings are stored in the MS Windows registry. After clicking the Store button, your settings are saved; the old values are irretrievably lost.
- Stored settings are always raw step numbers—values such as Min and Max are translated from the units into raw step values for storage.
- Unsaved settings can be reverted to their registry values by clicking the Discard button.
Caution!
Do not change any system settings unless you know what you are doing!
Incorrect settings will lead to unexpected behavior. Furthermore, the original configuration may be lost.

To edit the system settings:
1. Click \(\text{▶}\) until the Device Control expands to show the settings shown in the screenshot below.
2. Select a motor.
3. Click Unlock. The values in the selected motor will turn black, indicating that they can be edited; all other values remain grayed out.

**Note:** If you decide not to make any changes, you should click Lock to protect the settings.

<table>
<thead>
<tr>
<th>Axis</th>
<th>Unit</th>
<th>Speed</th>
<th>Min</th>
<th>Max</th>
<th>Offset Steps</th>
<th>Raw Steps</th>
<th>LS−</th>
<th>LS+</th>
<th>IO</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>mm</td>
<td>0.50</td>
<td>-15.00</td>
<td>15.00</td>
<td>1301433</td>
<td>1301442</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>y</td>
<td>mm</td>
<td>1.00</td>
<td>-15.00</td>
<td>15.00</td>
<td>1035161</td>
<td>1035165</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>z</td>
<td>mm</td>
<td>10.00</td>
<td>0.00</td>
<td>500.00</td>
<td>70168414</td>
<td>74116714</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>polar</td>
<td>deg</td>
<td>15.00</td>
<td>-1.82</td>
<td>358.18</td>
<td>33380728</td>
<td>33357058</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 8:** System settings

4. Double-click a parameter to edit it:
   - **Speed**—sets the motor speed in units/s.
   - **Min**—sets the minimum position of the motor. Continuous rotation axes have the setting n.a. and cannot be edited.
   - **Max**—sets the maximum position of the motor. Continuous rotation axes have the setting n.a. and cannot be edited.
   - **Offset**—the number of steps in the motor for the zero position of the motor.
   - **Raw Steps**—the current motor position.

**Note:** There are also status indicators for the limit switches (LS−, LS+) and the stop switch (IO). These have the color codes: Green = Not Active; Red = Active; Gray = Disabled.

5. An alternative way to set parameter values is to use the following buttons:
   - **As Offset**—takes the current position of the motor (i.e. the Raw Steps value) and sets this as the new zero point for the motor. When you change this value, the Min and Max values will also change, as they are calculated relative to the offset. The "real" raw step values for Min and Max (stored in the MS Windows registry) do not change with this action.
   - **As Min**—takes the current position of the motor (in the top pane) and sets it as the Min value.
   - **As Max**—takes the current position of the motor (in the top pane) and sets it as the Max value.

6. If you have any doubt about the settings you have entered, click Discard and reenter the values.
7. Click Store to accept your changes and save the values for the motor in the registry. This will also lock the axis settings.
By clicking ◀ until the Device Control is expanded to its maximum extent, you can also see the settings to control motor operating characteristics such as the load current and acceleration. Setting these properties works in a similar way to the other settings described above. The buttons below the settings have the following actions:

- **Set**—Applies the value to the motor. The setting will be lost if you remove the communication or power connections to the motor.
- **Save Permanently**—Saves the setting in the EPROM of the motor.

<table>
<thead>
<tr>
<th>Axis</th>
<th>Standby [%]</th>
<th>Load Current [%]</th>
<th>Acc. Current [%]</th>
<th>Acceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>5</td>
<td>100</td>
<td>100</td>
<td>598</td>
</tr>
<tr>
<td>y</td>
<td>5</td>
<td>100</td>
<td>100</td>
<td>598</td>
</tr>
<tr>
<td>z</td>
<td>5</td>
<td>100</td>
<td>100</td>
<td>598</td>
</tr>
<tr>
<td>polar</td>
<td>5</td>
<td>100</td>
<td>100</td>
<td>598</td>
</tr>
</tbody>
</table>

Figure 9: Further system settings

### 3.3 Managing Position Settings and Lists

Manipulator Control allows you to store positions in a list and retrieve them at any time. By saving the list, you can easily recall settings at a later date.

**Note:** If you want to use the motor as part of an experiment (i.e. by adding the device to schedule in the Experiment Editor), you need to define a position that can be used in the experiment.

The highlighted section in the screenshot below shows a list of positions and the controls for managing lists.

**Adding Positions to a List**

To add a new point to the current list:

1. Click the Add Position button. A new line will appear in the position list, showing the name and the settings of all motors.

<table>
<thead>
<tr>
<th>Position Set</th>
<th>x</th>
<th>y</th>
<th>rot</th>
<th>phi</th>
</tr>
</thead>
<tbody>
<tr>
<td>new position set</td>
<td>2.70 mm</td>
<td>2.40 mm</td>
<td>55.20 °</td>
<td>0.00 °</td>
</tr>
</tbody>
</table>

Figure 10: Adding a new position

2. Double-click the name in the Position set column. Enter a name for the position.
3. To add further positions to the list, move the manipulator to a new position and click Add Position.

**Retrieving Positions from a List**

To move the motor to a position in the list:
1. Select the desired position in the list. A radio button indicates the selected position.
2. Click Move To Position. The motor settings in the list will be transferred to the Destination fields in the table in the top pane. At the same time, the motor will start to move to the destination.

Caution!
The motors start to move as soon as you click Move To Position—there is no confirmation dialog.

<table>
<thead>
<tr>
<th>Axis</th>
<th>Position</th>
<th>Destination</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>0.000 mm</td>
<td>□</td>
<td>0.000 mm</td>
</tr>
<tr>
<td>y</td>
<td>0.000 mm</td>
<td>□</td>
<td>0.000 mm</td>
</tr>
<tr>
<td>rot</td>
<td>0.00 °</td>
<td>□</td>
<td>0.00 °</td>
</tr>
<tr>
<td>phi</td>
<td>0.00 °</td>
<td>□</td>
<td>0.00 °</td>
</tr>
</tbody>
</table>

Continuous Rotation | Speed | Rotate
phi | 0.00 °/s | rotate

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double-click fields in table</td>
<td>The selected field becomes active; you can then enter a new name or axis setting.</td>
</tr>
<tr>
<td>Click Overwrite Position</td>
<td>Similar to Add Position. The current motor positions overwrite those in the selected list item.</td>
</tr>
<tr>
<td>Click Delete</td>
<td>Removes the selected position from the list. A dialog will appear asking you to confirm the delete.</td>
</tr>
<tr>
<td>Click Move Entry Up</td>
<td>These buttons move the selected position up and down in the list. This is useful if you want to export a list of manipulator positions—you can set the positions a suitable order.</td>
</tr>
</tbody>
</table>

Table 1: Controls for editing lists

Figure 11: Using preset positions

Editing Lists
There are a number of options for editing lists. The table below summarizes your options.

Note: For most of these actions, you need to first select the item in the list. A radio button shows the currently selected list item.
You can save parameter sets in configuration files by clicking the **Save** and load them at a later date. This works in the same way as other template and configuration files in SpecsLab Prodigy.

**Note:** The default location for configuration files is `settings/[Device Name]` in the SpecsLab2 installation directory. The drop-down list shows all configuration files in this directory. It also allows you to select previously loaded files, if these were stored in different locations; these are removed from the list after restarting the program.

**Exporting Lists**

You can export lists as a text file. In this way, Manipulator Control is useful for preparing position lists.

Exported lists have the following structure:

- A header describing the file. All comment lines start with a `#`.
- The name of the point is included on its own line as a comment.
- Following is a line containing the points for each axis setting. The values are comma-separated.

The following example shows a file containing three position settings for a 4-axis manipulator.

```plaintext
#SPECS position list file
# Pos1
2.50,2.00,55.96,20.00
# Pos2
2.40,2.00,55.96,20.00
# Pos3
2.30,2.00,55.96,20.00
```

To export a list:

1. Click **Export**. A file browser will open.
2. Select a location and filename and click **Save**. The file is saved without an extension.
3.4 Position Files

You can save a position setting and recall it later. These files are XML files containing the values of all parameters in the device control.

To save a position setting:

1. Click the icon in the toolbar of the device control. A Save dialog will open.
2. Enter a name and select a location for the configuration file. Note that when loading position files, Manipulator Control only checks the default location.

To load an existing configuration:

- Click <none> and select a file from the list. If you have saved the position file in a different directory, you can select <Load> from the list and browse to the position file. Once loaded, all parameters are shown in the device control.

3.5 Setting Motor Positions in an Experiment

You can include the Manipulator device in an experiment in SpecsLab Prodigy. Positions saved in a position file are then set at the start of the experiment.

To set motor settings in an experiment:

1. In the settings for an Electron Spectroscopy experiment, click the appropriate manipulator device, e.g. Manipulator: Position. The device will be added to the settings for the experiment.
2. Select a position file for the device. The motor settings will be displayed in the device. When you run the experiment, the motors will be moved to these positions before measurement starts.

![Position file](image)

**Figure 13:** Including motor settings in an experiment

### 3.6 Setting the IP Address

The IP address of the MCPS 36 is preset at the factory and the setting is configured in Manipulator Control.

**Changing the IP address of the MCPS 36**

You can change this setting using the ARMIN Config tool. Before starting the procedure, you need to find an appropriate IP address that you are able to reach from your subnet. Your IT administrator will be able to help.

To set the IP address of the MCPS 36:

1. Select **Start** > **SPECS** > **ARMIN Config**.
2. Enter a new IP address in the field provided.
3. Click **Change IP**.
4. Within 60 seconds, reset the MCPS 36 by switching it off and switching it back on again.
5. Check the status window to see the old IP address and a message with the new IP address.
6. You can check that the new IP address is active:
   - Click **Read Info**.
   - Within 60 seconds, reset the MCPS 36 by switching it off and switching it back on again.
   - Check the system information in the Configuration pane to confirm the IP address.

**Changing the IP address in the software configuration**

After changing the IP address of the MCPS 36, you need to change the registry settings so that Manipulator Control can communicate with the power supply.

**Caution!**

Before editing the registry, you should always create a system restore point. This allows you to recover the previous configuration. Please consult your system administrator or Microsoft Windows documentation if necessary.

To set the IP address for Manipulator Control:
1. Select **Start/ Run** and run the program **regedit**.
2. Locate the key `HKEY_LOCAL_MACHINE\SOFTWARE\SPECS\Devices\[Server Name]\Communication`.
3. Edit the IP entry.
Chapter 4
Manual Operation

For manual operation, there is a handset which allows you to control motors remotely from the computer. You can therefore stand next to the chamber and control the motors while observing their motion. Note the following points about using the handset:

- Manipulator Control needs to be running on the computer.
- The handset needs to be connected to the computer by USB.

Caution!
If the handset USB connection is removed during operation, the motor will continue with its last command before the connection was broken. In other words, if you start moving the motor, then remove the USB connection, the motor will carry on moving.

Note: The maximum length of the USB cable is 5 m, according to the standard USB specification. For longer connections, you can use an active USB cable.

The following section contains an overview of the controls on the handset and describes how to move motors. Carving manipulators have a different set of controls—this handset is described in a different section.

As an option, there is an emergency shut-off switch that can stop all motors.

4.1 Normal Handset Configuration
Handsets are configured individually to each application, with the buttons labeled accordingly. The top two rows of buttons on the handset allow you to select a motor:

- Top row—Servers. A server is a logically ordered set of motors. Generally, all motors on an instrument will be grouped together to a server, so that you can control one instrument at a time with the handset. Servers are defined in the software configuration.
Second row—Motor selection. Each button is labeled with the identity of the motor it selects. Figure 14 shows the axis labels for a 5-axis manipulator as an example.

![Motor control handset](image)

**Figure 14: Motor control handset**

To move a motor using the handset:
1. Select a server, i.e. the instrument you want to control. If you only have one server, these buttons are disabled.
2. Press a button to select a motor.
3. Turn the jog wheel to move the selected motor. The motor stops moving when the wheel returns to the zero position. The wheel has seven speed settings in each direction—the further it is turned, the faster.

The other features on the handset have the following functions:
- Reset—Unselects the server and motor (i.e. no motor is active).
- Limit—Frees control after a limit switch is reached. On reaching a limit, control is locked. Pressing this button will move the selected motor a few steps back from the limit.
- Stop—Halts any movement in case of emergency.

### 4.2 Handset for Carving Manipulators
There is a special button layout for the Carving manipulator. The axis buttons are labeled as follows:
- X—X-axis control
- Y—Y-axis control
- Z—Z-axis control
- θ—Polar angle
- φ—Azimuthal angle
- $\theta$—Tilt angle

To move a motor using the handset:
1. Press a button to select a motor.
2. Turn the jog wheel to move the selected motor. The motor stops moving when the wheel returns to the zero position. The wheel has seven speed settings in each direction—the further it is turned, the faster.

The other features on the handset have the following functions:
- Reset—Unselects the server and motor (i.e. no motor is active).
- Limit—Frees control after a limit switch is reached. On reaching a limit, control is locked. Pressing this button will move the selected motor a few steps back from the limit.
- Stop—Halts any movement in case of emergency.

4.3 Emergency Shut-Off Switch
An emergency shut-off switch is available as an optional extra. When you press this switch, all power from the MCPS 36 to the motors is cut. Therefore, all motors will stop instantly.

To switch off power to all motors in an emergency:
- Press the red button marked EMERGENCY STOP.

To reset the switch to continue normal operation:
- Twist the red button clockwise. It will pop outwards. You can also see a green band on the button stem, when viewing from the side.

Figure 15: Front panel of the emergency shut-off switch
Chapter 5
Technical Details

This chapter contains technical details and specifications for the MCPS 36 and MPH 6. These are a power supply and distribution hub, respectively.

Control electronics for the motor are built into each individual motor. For details about the motor, please refer to the Lexium Integrated Drive manual supplied as part of the delivery.

5.1 Overview of Power Supply Controls and Connections
The MCPS 36 contains two 36 V DC powers supplies as well as an ethernet–CAN converter. The following sections describe the features on the front and rear panels.

5.1.1 Front Panel
The front panel of the MCPS 36 contains the following features:

- Power on/off switch.
- 36 V DC LEDs. There are two 36 V power supplies in the MCPS 36—these LEDs show the status.
- Ventilation grilles.

Figure 16: Front panel of the MCPS 36

5.1.2 Rear Panel
Figure 17 shows the rear panel of the MCPS 36. The features are described below.
36 V DC
There are two outputs available, each capable of driving up to six motors. Output 1 and Output 2 are connected to Input on the MPH 6.

The Emergency Switch connector is for the optional emergency shut-off switch. When the emergency shut-off switch is pressed, all current to the MPH 6 is immediately stopped. If a switch is not present, this connector needs to be terminated with a bridge connector. The diagram below shows the connections in the bridge plug.

Note: If an emergency switch is fitted, the ESS also needs to be terminated with a bridging plug.

Communication
The Communication section contains two connections:

- Ethernet. This is a standard RJ45 network connector. You can connect the MCPS 36 directly to a computer (using a crossover ethernet cable) or to a switch on a LAN. Please see "Network Connection" on page 6 for details about the network connection.

- CAN. Motors are controlled using the CANopen protocol. This socket should be connected to the Communication plug on the MPH 6. The MPH 6 is then connected to motor 1; subsequent motors are daisy-chained. The end of the CAN chain needs to be fitted with a terminator.

Mains power
The MCPS 36 has the following power requirements:

- 100…240 VAC
- 50…60 Hz

There are two circuit breakers for protection on the live and neutral power lines. These trip at a current of 16 A.

5.2 Motor Power Hub
MPH 6 distributes power for up to six motors. It is a passive device that accepts power from the MCPS 36 and supplies the power to the output sockets.
Input
This is connected to either Output 1 or Output 2 on the MCPS 36.

Communication
The connector on the right side (male) is connected to the MCPS 36. The female connector is connected to the CAN plug on the motor.

Note: The end of the CAN chain needs to be fitted with a terminator.

When using a second MPH 6, the Communication connectors are not used. The CAN chain continues between the motors.

Output
There are six power outputs for the motors. Each motor has its own fuse for protection: Fuse type T4A (time delay/slow blow).
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