

Position mode, function drive

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Background

The X45e units are primarily design for the platform X45/X45e/X45H. Still they can be used for a lot of different applications. The units could also be used as a generic motion control for other purposes. This article explains one of these option, the positioning mode.

For deeper information please check the following manuals:

- **User documentation – Electrical System (X45e)**
- **User documentation – Parameter Setting Tool**

Also check separate Knowledge Base articles on CANopen and DeviceNet communication.

Prerequisites

Hardware

- **PC (Windows 7 or later)**
- **X45e function unit (with power cables)**
- **Parameter Setting Tool cable (X45e) or mini USB cable depending on hardware version**

Software

- **X45e – Parameter Setting Tool**

Parameter Setting Tool

The first step is to prepare the X45e function unit for the positioning mode.

Software version

The FEG_SW in the unit should be of version 59 or later. The ECO_SW should be of version 20 or later. The existing version numbers can be checked with the Parameter Setting Tool software from the **Monitor** page (**Tools** menu).

MONITOR: 12

Received data		Transmitted data			
40	00	E0	40	00	0000
<input type="radio"/> Turn to release angle 1	<input type="radio"/> Turn to wait angle 1	<input type="radio"/> DI 1	<input type="radio"/> To release angle 1	<input type="radio"/> Over current	<input type="radio"/> State waits
<input type="radio"/> Turn to release angle 2	<input type="radio"/> Turn to wait angle 2	<input type="radio"/> DI 2	<input type="radio"/> To release angle 2	<input type="radio"/> High Udc	<input type="radio"/> State waits
<input type="radio"/> Turn to receive angle 1		<input type="radio"/> DI 3	<input type="radio"/> To receive angle 1	<input type="radio"/> Low Udc	
<input type="radio"/> Turn to receive angle 2		<input type="radio"/> DI 4	<input type="radio"/> To receive angle 2	<input type="radio"/> PCB over temp	
<input type="radio"/> Turn to receive angle 3		<input type="radio"/> State	<input type="radio"/> To receive angle 3	<input type="radio"/> Reversed direction (CD)	<input type="radio"/> Locked rotor
<input type="radio"/> Reverse direction (CD)		<input checked="" type="radio"/> State 6:Idle	<input type="radio"/> Reversed direction (CD)	<input checked="" type="radio"/> Enabled drive	<input type="radio"/> To wait angle 1
<input checked="" type="radio"/> Enable drive		<input checked="" type="radio"/> State	<input checked="" type="radio"/> Enabled drive	<input type="radio"/> Errors cleared	<input type="radio"/> To wait angle 2
<input type="radio"/> Clear errors		<input checked="" type="radio"/> In position	<input type="radio"/> Errors cleared	<input type="radio"/> Internal fault	<input type="radio"/> To wait angle 2

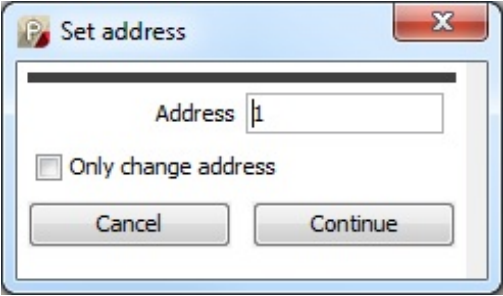
RUN TIME	2 years, 112 days, 03:48:12	CYCLE COUNT	2523702	TEMPERATURE	48
FEG SW	59	ECO SW	A20	LAST SEQUENCE	0

If they should be upgraded this is done from the menu Tools -> Activities -> **Firmware update**. The latest software versions can be downloaded from **MyFlexLink** under the **Download Area**.

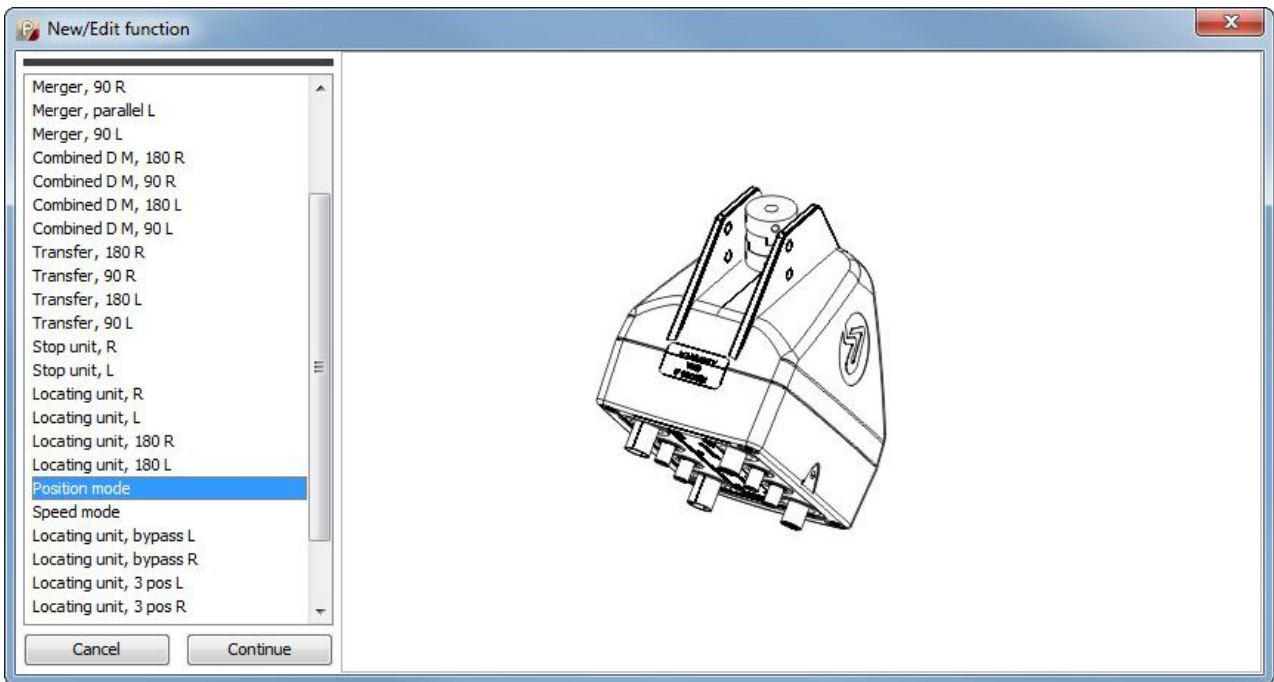
Wizard (Change Node)

When the unit is upgraded to correct software versions it could be set to a Position mode using the **Change Node** command under the **Edit** menu.

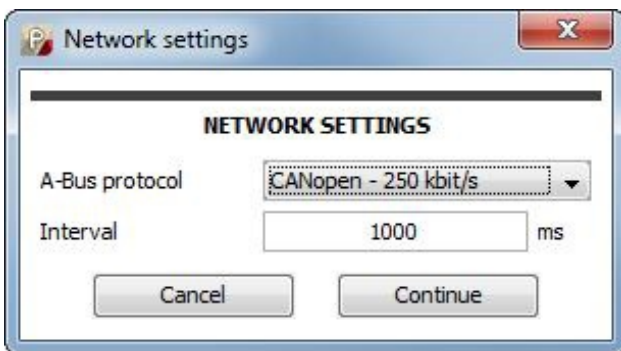
This triggers a wizard to be started. As the first step of this wizard the address of the unit could be changed.



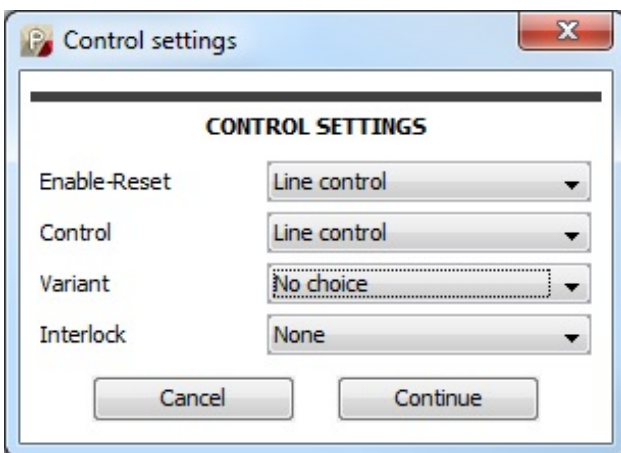
After the node address the function type has to be specified. In this case it should be set to **Position mode**. This is only valid for function motors.



The next step is to decide how the unit should interact with a line controller. For a **Position mode** type it is only possible to choose CANopen or DeviceNet.



The last step of the wizard is the control settings. The only value possible to change is the **Interlock** parameter which controls if the unit should be paused on a sensor input (DI4). This isn't very useful in the case and should be set to **None**.



When the wizard is finished all parameters are automatically written to the function unit.

Only valid settings are shown in the settings window (below).

	Config	Value	Network	
Speed setpoint 1	<input type="text" value="0"/>	<input type="text" value="60"/>	<input type="text" value="60"/>	rpm
Acceleration ramp	<input type="text" value="0"/>	<input type="text" value="300"/>	<input type="text" value="300"/>	ch/s
Deceleration ramp	<input type="text" value="0"/>	<input type="text" value="300"/>	<input type="text" value="300"/>	ch/s
Interlock delay(on)	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	ms
Interlock delay(off)	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	ms
Position absolute closest	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	°
Position absolute CCW	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	°
Position absolute CW	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	°
Position relative	<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="0"/>	°

The first three parameters are set to default values. These can easily be changed from here if they shouldn't be changed dynamically from the line controller.

The four last parameters are position mode related but they are not activated from the Parameter Setting Tool. These should be read and written from the line controller instead (see next chapter).

Calibration

If the zero position is wrong this could be changed with the **Calibration** command from the **Tools** menu under **Activites**.

Interlock

If the interlock mode is set to either 1 or 2 the digital input DI4 can stop the movement. This could be used to run to an end position.

Line control communication

The position control is a mode for the function motors only. It requires DeviceNet, CANopen, Ethernet/IP or Profinet to work (depending on hardware version). The basic idea is to get more freedom on how to control the axis to different positions (or actually angles). The line control communication can be divided into two parts. The first part is the time critical communication send repeatedly. Then there is the communication dealing with settings. This is only read or written at request. The technical terms on these communication parts differs depending on network protocol.

PDO / Cyclic communication

This is a part of the PDO communication in CANopen or the cyclic communication in DeviceNet, Ethernet/IP or Profinet. All units has to receive an **Enable** bit from the line controller. Also the reset bit can be useful to acknowledge existing alarms on the X45e unit. As a feedback there are several useful bits. Especially the alarm bits and the **InPosition** bit are important. See the user manual for more details. All these data can be monitored via the Parameter setting Tool, see the picture above showing software versions.

SDO / Acyclic communication

This is a part of the SDO communication in CANopen or the acyclic communication in DeviceNet, Ethernet/IP or Profinet. All these parameter are triggered from the line controller.

Position Absolute Closest

CANopen: Index 4000 (hex); SDO SubIndex 56 (dec)

DeviceNet: Class 70 (hex); Instance 56 (dec)

Ethernet/IP: Class 0F (hex); Attribute 1; Instance 56 (dec)

Profinet: API 0; Slot 1; Sub slot 1; Index 71 (dec)

This is a command parameter where the new position [0 ; 360°] is sent from the line controller to the function unit. The function unit will evaluate the current position and calculate the closest direction to reach its new destination.

Position Absolute Counter Clockwise

CANopen: Index 4000 (hex); SDO SubIndex 57 (dec)

DeviceNet: Class 70 (hex); Instance 57 (dec)

Ethernet/IP: Class 0F (hex); Attribute 1; Instance 57 (dec)

Profinet: API 0; Slot 1; Sub slot 1; Index 72 (dec)

This is a command parameter where the new position [0 ; 360°] is sent from the line controller to the function unit. The function unit will always move counter clockwise to reach its new destination.

Position Absolute Clockwise

CANopen: Index 4000 (hex); SDO SubIndex 58 (dec)

DeviceNet: Class 70 (hex); Instance 58 (dec)

Ethernet/IP: Class 0F (hex); Attribute 1; Instance 58 (dec)

Profinet: API 0; Slot 1; Sub slot 1; Index 73 (dec)

This is a command parameter where the new position [0 ; 360°] is sent from the line controller to the function unit. The function unit will always move clockwise to reach its new destination.

Position Relative

CANopen: Index 4000 (hex); SDO SubIndex 59 (dec)

DeviceNet: Class 70 (hex); Instance 59 (dec)

Ethernet/IP: Class 0F (hex); Attribute 1; Instance 59 (dec)

Profinet: API 0; Slot 1; Sub slot 1; Index 74 (dec)

This is a command parameter where the new distance [-32768 ; 32767°] is sent from the line controller to the function unit. The function unit can move either direction all depending on the sign of the relative distance.

Position Actual CCW

CANopen: Index 4000 (hex); SDO SubIndex 60 (dec)

DeviceNet: Class 70 (hex); Instance 60 (dec)

Ethernet/IP: Class 0F (hex); Attribute 1; Instance 60 (dec)

Profinet: API 0; Slot 1; Sub slot 1; Index 18 (dec)

This is a feedback parameter where the actual position [0 ; 360°] is sent from the function unit to the line controller.

Position Actual CW

CANopen: Index 4000 (hex); SDO SubIndex 61 (dec)

DeviceNet: Class 70 (hex); Instance 61 (dec)

Ethernet/IP: Class 0F (hex); Attribute 1; Instance 61 (dec)

Profinet: API 0; Slot 1; Sub slot 1; Index 19 (dec)

This is a feedback parameter where the actual position [0 ; 360°] is sent from the function unit to the line controller.