ABB motion control

Application guide
MotiFlex e180 EtherCAT

List of related manuals

Drive hardware manuals and guides	Code (English)
MotiFlex e180 Quick Installation Guide	*3AXD50000017336*
MotiFlex e180 User's Manual	*3AXD50000019946*
MotiFlex e180 Wall chart	*3AXD50000019945*
MotiFlex e180 Common DC Application Guide	*3AXD50000019947*
MotiFlex e180 CE Declaration of Conformity	*3AXD10000371048*
MotiFlex e180 STO Certificate	*3AXD10000391362*

You can find manuals and other product documents in PDF format on the Internet. See section *Document library on the Internet* on the inside of the back cover. For manuals not available in the Document library, contact your local ABB representative.

Application guide

MotiFlex e180 EtherCAT

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1

Safety

What this chapter contains

This chapter contains the safety instructions which you must obey when installing, operating and servicing the drive. If ignored, physical injury or death may follow, or damage may occur to the drive, motor or driven equipment. Read the safety instructions before you work on the unit.

Use of warnings

Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment and advise on how to avoid the danger. The following warning symbols are used in this manual:

⚠	**Electricity warning** warns of hazards from electricity which can cause physical injury and/or damage to the equipment.
⚠	**General warning** warns about conditions, other than those caused by electricity, which can result in physical injury and/or damage to the equipment.
⚠	**Electrostatic sensitive devices warning** warns of electrostatic discharge which can damage the equipment.
⚠	**Hot surface warning** warns of component surfaces that may become hot enough to cause burns if touched.

Safety in installation and maintenance

These warnings are intended for all who work on the drive, motor cable or motor.

■ Electrical safety

WARNING! Ignoring the following instructions can cause physical injury or death, or damage to the equipment.

- Only qualified electricians are allowed to install and maintain the drive!
- Be sure the system is properly earthed/grounded before applying power. Do not apply AC power before earths/grounds are connected.
- Never work on the drive, motor cable or motor when input power is applied. After disconnecting the input power, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you start working on the drive, motor or motor cable. Always ensure by measuring with a multimeter (impedance at least 1 Mohm) that:
  1. Voltage between drive input phases L1, L2 and L3 is close to 0 V.
  2. Voltage between terminals UDC+ and UDC- and the frame is close to 0 V.
  3. There is no voltage between terminals R+ and R– and the ground.
- Do not work on the control cables when power is applied to the drive or to the external control circuits. Externally supplied control circuits may cause dangerous voltages inside the drive even when the main power on the drive is switched off.
- Do not make any insulation or voltage withstand tests on the drive.
- Do not connect the drive to a voltage higher than what is marked on the type designation label. Higher voltage can activate the brake chopper and lead to brake resistor overload, or activate the overvoltage controller what can lead to motor rushing to maximum speed.
- If a drive whose varistors are not disconnected is installed on an IT power system (an ungrounded power system or a high resistance grounded [over 30 ohms] power system), the drive will be connected to earth potential through the varistors. This may cause danger or damage the drive.
- If a drive whose varistors (built-in) or mains filter (external option) are not disconnected is installed on a corner-grounded TN system, the drive will be damaged.
- Suitable for use on a circuit capable of delivering not more than the RMS symmetrical short circuit amperes listed here, at the rated maximum voltage (480 V AC):
  Horsepower: 1-60   RMS symmetrical amperes: 100,000

Note:
- The motor cable terminals on the drive are at a dangerously high voltage when the input power is on, regardless of whether the motor is running or not.

- The DC terminals (UDC+, UDC-) carry a dangerous DC voltage (over 500 V) when internally connected to the intermediate DC circuit.
- Depending on the external wiring, dangerous voltages (115 V, 220 V or 230 V) may be present on the terminals of relay outputs (NC, NO, COM).
- The Safe Torque Off function does not remove the voltage from the main and auxiliary circuits. The function is ineffective against deliberate sabotage or misuse. See page .

■ Grounding

These instructions are intended for all who are responsible for the grounding of the drive.

> **WARNING!** Ignoring the following instructions can cause physical injury or death, increased electromagnetic interference and equipment malfunction:

- Ground the drive, motor and adjoining equipment to ensure personnel safety in all circumstances, and to reduce electromagnetic emission and interference.
- Make sure that grounding conductors are adequately sized as required by safety regulations.
- In a multiple-drive installation, connect each drive separately to protective earth (PE).
- Where EMC emissions must be minimized, make a 360° high frequency grounding of cable entries in order to suppress electromagnetic disturbances. In addition, connect the cable shields to protective earth (PE) in order to meet safety regulations.

Note:
- Power cable shields are suitable for equipment grounding conductors only when adequately sized to meet safety regulations.
- Standard EN 61800-5-1 (section 4.3.5.5.2.) requires that as the normal touch current of the drive is higher than 3.5 mA AC or 10 mA DC, you must use a fixed protective earth connection and:
  - cross-section of the protective earthing conductor of at least 10 mm^2 Cu or 16 mm^2 Al, or
  - automatic disconnection of the supply in case of discontinuity of the protective earthing conductor, or
  - a second protective earthing conductor of the same cross-sectional area as the original protective earthing conductor.

■ Permanent magnet motor drives

These are additional warnings concerning permanent magnet motor drives.

⚠ **WARNING!** Ignoring the following instructions can cause physical injury or death, increased electromagnetic interference and equipment malfunction:

- Do not work on the drive when the permanent magnet motor is rotating. Also, when the supply power is switched off and the inverter is stopped, a rotating permanent magnet motor feeds power to the intermediate circuit of the drive and the supply connections become live.

- Before installation and maintenance work on the drive:
  - Stop the motor.
  - Ensure that there is no voltage on the drive power terminals according to step 1 or 2, or if possible, according to the both steps:

  1. Disconnect the motor from the drive with a safety switch or by other means. Check by measuring that there is no voltage present on the drive input or output terminals (L1, L2, L3, U1, V1, W1, UDC+, UDC-, R+, R-).

  ⚠ 2. Ensure that the motor cannot rotate during work. Make sure that no other system, like hydraulic crawling drives, is able to rotate the motor directly or through any mechanical connection like felt, nip, rope, etc. Check by measuring that there is no voltage present on the drive input or output terminals (L1, L2, L3, U1, V1, W1, UDC+, UDC-, R+, R-). Ground the drive output terminals temporarily by connecting them together as well as to the PE.

- Do not run the motor over the rated speed. Motor overspeed leads to overvoltage which may damage or explode the capacitors in the intermediate circuit of the drive.

General safety

These instructions are intended for all who install and service the drive.

⚠ **WARNING!** Ignoring the following instructions can cause physical injury or death, increased electromagnetic interference and equipment malfunction:

- Handle the unit carefully.
- Take care when lifting. Frame B models weigh approximately 4.8 kg (10.6 lb). Frame C models weigh approximately 10 kg (23 lb). Frame D models weigh approximately 17 kg (37.5 lb). Seek assistance if necessary. When carrying, do not suspend the unit from the removable front panels as they could detach and cause the unit to be dropped.
- Beware of hot surfaces. The surfaces of drive system components (such as the mains choke, DC choke, or braking resistor, if present) become hot when the system is in use, and remain hot for a while after disconnection of the electrical supply.
- Ensure that debris from drilling and grinding does not enter the drive when installing. Electrically conductive debris inside the unit may cause damage or malfunction.
- Ensure sufficient cooling.
- Do not attach the drive by riveting or welding.
- The MotiFlex e180 must be installed where the pollution degree according to EN61800-5-1 shall not exceed 2.

■ Printed circuit boards

⚠ **WARNING!** Ignoring the following instructions can cause damage to the printed circuit boards:

- Wear a grounding wrist band when handling the boards. Do not touch the boards unnecessarily. The printed circuit boards contain components sensitive to electrostatic discharge.

Safe start-up and operation

■ General safety

These warnings are intended for all who plan the operation of the drive or operate the drive.

⚠ **WARNING!** Ignoring the following instructions can cause physical injury or death, or damage to the equipment.

- Before you connect voltage to the drive, make sure that the drive covers are on. Keep the covers on during operation.
- Before adjusting the drive and putting it into service, make sure that the motor and all driven equipment are suitable for operation throughout the speed range provided by the drive. The drive can be adjusted to operate the motor at speeds above and below the speed provided by connecting the motor directly to the power line.
- Do not activate any automatic fault reset functions of the drive control program if dangerous situations can occur. When activated, these functions will reset the drive and resume operation after a fault.
- Do not control the motor with an AC contactor or disconnecting device (disconnecting means); instead, use external commands via the I/O board of the drive or a fieldbus adapter. The maximum allowed number of charging cycles of the DC capacitors (i.e. power-ups by applying power) is one per two minutes. The maximum total number of chargings is 100000 for frame sizes A and B, 50000 for frame sizes C and D.
- Make sure that any safety circuits (for example, emergency stop and Safe torque off) are validated in start-up. See chapter *Start-up* for reference of the validation instructions.
- The drive is not field repairable. Never attempt to repair a malfunctioning drive; contact your local ABB representative or Authorized Service Center for replacement.
- When operating a rotary motor with no load coupled to its shaft, remove the shaft key to prevent it flying out when the shaft rotates.
- Operating the MotiFlex e180 in torque mode with no load attached to the motor can cause the motor to accelerate rapidly to excessive speed.
- Improper operation or programming of the drive may cause violent motion of the motor and driven equipment. Be certain that unexpected motor movement will not cause injury to personnel or damage to equipment. Peak torque of several times the rated motor torque can occur during control failure.
- Violent jamming (stopping) of the motor during operation may damage the motor and drive.

• The drive can be programmed to start up and begin to turn the motor (auto-enable) immediately after an input voltage break or a fault reset.

Note:

• If an external source for start command is selected and it is ON, the drive could start immediately after an input voltage break or fault reset.

■ Network security

This product is designed to be connected to and to communicate information and data via a network interface. It is your sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be). You shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB Motion Ltd and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

2

Introduction to the manual

What this chapter contains

This chapter describes the manual.

Target audience

This manual is intended for people who wish to connect the MotiFlex e180 to an EtherCAT network. Basic information about EtherCAT connection can be found in the *MotiFlex e180 User's manual*. Read the manual before working on the drive. You are expected to know the fundamentals of electricity, wiring, electrical components and electrical schematic symbols.

The manual is written for readers worldwide. Both SI and imperial units are shown.

Contents of this manual

The manual consists of the following chapters:

- *Safety* (page 7) gives safety instructions you must follow when installing, commissioning, operating and servicing the drive.
- *Introduction to the manual* (this chapter, page 15) describes applicability, target audience, purpose and contents of this manual. It also contains a quick installation and commissioning flowchart.
- *Physical connection* (page 17) describes the operation principle, connector layout, type designation label and type designation information in short.
- *Start-up* (page 21) describes the steps for applying power to the drive, installing the Mint Machine Center software, and tuning and optimizing the motor/drive combination.

- *Fault tracing* (page 33) describes the drive's LED indicators and provides solution to common problems encountered during installation.
- *Reference* (page 41) lists object table data.

Related documents

See *List of related manuals* on page 2 (inside the front cover).

Trademarks

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TwinCAT® is a registered trademark of Beckhoff Automation GmbH.

Windows 7 and Windows 8 are registered trademarks of the Microsoft Corporation.

Mint™ and MotiFlex® are registered trademarks of Baldor, a member of the ABB group.

3

Physical connection

What this chapter contains

The chapter briefly describes how to connect the MotiFlex e180 to an EtherCAT network.

Product overview

The MotiFlex e180 is an IP20 drive module for controlling AC motors. All models support EtherCAT 'slave' operation under the control of an EtherCAT 'master' device or application.

EtherCAT ports

The E1 and E2 Ethernet ports on the top panel of the MotiFlex e180 are used for Ethernet fieldbus connections such as EtherCAT®.

Pin	Signal
1	TX+
2	TX-
3	RX+
4	(NC)
5	(NC)
6	RX-
7	(NC)
8	(NC)
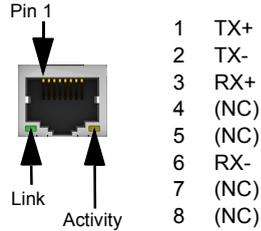
In an EtherCAT network the E1 (IN) port must be connected to the master side of the network. The E2 (OUT) port, if used, must be connected to the IN port of the next slave device in the network:

EtherCAT master

Standard CAT5e or CAT6 Ethernet cables can be used.

■ **E1 / E2: Ethernet port configuration**

The rotary switches are situated on the front panel of the MotiFlex e180. The rotary switches are read once at startup. They select the mode of operation for the Ethernet fieldbus connectors E1 and E2 on the top panel of the drive.

Set both front panel rotary HI / LO switches to 0 to select EtherCAT slave mode.

	Value	Mode
HI		
	00	**EtherCAT slave mode**
	01-EF	Ethernet POWERLINK CN mode: selected value is node ID
	F0	Reserved
LO	F1	Reserved
	F2-FF	Reserved

See *MotiFlex e180 indicators* on page for a description of the fieldbus status indicators.

4

Start-up

What this chapter contains

This chapter describes software installation and the start-up procedure of the drive.

Safety

⚠ **WARNING!** Read the *Safety* instructions on the first pages of this manual before performing any maintenance on the equipment. Ignoring the safety instructions can cause injury or death.

Introduction

Before powering the MotiFlex e180 you must connect it to the PC using an Ethernet cable and install the Mint WorkBench software on the PC. This includes a number of applications and utilities to allow you to configure, tune and program the MotiFlex e180. Mint WorkBench and other utilities can be downloaded from the SupportMe pages of *www.abbmotion.com*.

Connect the MotiFlex e180 to the PC

Connect a CAT5e or CAT 6 Ethernet cable between the PC and the MotiFlex e180 E3 Ethernet port on the front panel. Do not connect the cable to the E1 or E2 ports on the top of the drive.

⚠ **NOTE!** You cannot connect an ordinary office PC to the MotiFlex e180 without first altering the PC's Ethernet adapter configuration. See *Configure the PC Ethernet adapter* on page *22*.

Configure the PC Ethernet adapter

It is necessary to alter the PC's Ethernet adapter configuration to operate correctly with the MotiFlex e180. By default, the MotiFlex e180 has a static IP address of 192.168.0.1. This can be changed using the Configuration tool in Mint WorkBench.

⚠ **NOTE!** You cannot connect an ordinary office PC to the MotiFlex e180 without first altering the PC's Ethernet adapter configuration. However, if you have installed a second Ethernet adapter dedicated for use with the MotiFlex e180, then this adapter's configuration can be altered without affecting the PC's office Ethernet connection. A USB to Ethernet adapter is a convenient way to add a second Ethernet adapter to a PC. If you are unsure about making changes to your PC's Ethernet adapter configuration, or are prevented by user permission levels, ask your I.T. administrator to assist you.

The following explanation assumes the PC is connected directly to the MotiFlex e180, and not across an intermediate Ethernet network. If you wish to attempt the connection through an intermediate Ethernet network, then the network administrator must be consulted to ensure that the necessary IP address is allowed and is not already allocated on the network.

1. On the Windows 7 Start menu, choose Control Panel, then Network and Sharing Center. (Windows 8.1: From the Start screen, click the down arrow or swipe up to go to the Apps screen. Choose Control Panel, Network and Internet, Network and Sharing Center).
2. On the left of the window, click Change Adapter Settings. Double click the icon for the required Ethernet adapter, then click Properties.
3. Select the 'Internet Protocol Version 4 (TCP/IPv4)' entry and click Properties.
4. On the General tab, make a note of the existing settings. Click Advanced... and make a note of any existing settings. Click Cancel and then click the Alternate Configuration tab and make a note of any existing settings.
5. On the General tab, choose the 'Use the following IP address' option.
6. In the IP address box, enter an IP address, e.g. 192.168.0.241. This is the IP address that will be assigned to the Ethernet adapter.
7. In the Subnet mask box, enter 255.255.255.0 and click OK.
8. Click Close to close the Local Area Connection Properties dialogue.
9. Click Close to close the Local Area Connection Status dialogue.

Install Mint WorkBench

If you do not wish to install Mint WorkBench, the MotiFlex e180's ESI file can be downloaded using an ordinary web browser; see page 25. The Windows user account requires administrative user rights to install Mint WorkBench. To install Mint WorkBench from *www.abbmotion.com*, download the application and run it.

Enable the Ethernet adapter for Mint WorkBench

Before Mint WorkBench can use the Ethernet adapter to discover the MotiFlex e180, the adapter must be enabled in the Mint Sidebar.

1. On the Windows 7 task bar in the notification area, right-click the Mint HTTP server icon and choose Open Mint Sidebar. (Windows 8.1: On the Start screen, click the Desktop icon to access the desktop first.)

2. Click the ✕ icon to access the Settings panel. In the Discovery area, check the required local area connection then click Apply.

Start the MotiFlex e180

If you have followed the instructions in the previous sections, you should have now connected the power sources, your choice of inputs and outputs, and the Ethernet cable linking the PC to the MotiFlex e180.

■ Power on checks

See section *Drive status display* on page 37 for symbols that show if the drive has detected a fault.

1. Turn on the 24 V DC supply (if connected).

2. Turn on the AC supply, if required.

3. The drive status display shows a test sequence which normally takes approximately 15-20 seconds. The sequence ends with the ➖ symbol, or ➖. if an STO input (page 175) is not powered. Startup can take more than 1 minute after downloading new firmware.

4. To allow the Commissioning Wizard to function, the Safe Torque Off inputs (page 175) need to be powered to allow the MotiFlex e180 to be enabled.

Start Mint WorkBench

Mint WorkBench is a fully featured application for programming and controlling the MotiFlex e180. Mint WorkBench includes a comprehensive help file that contains information about every Mint keyword, how to use Mint WorkBench, and background information on motion control topics. Press F1 to display the help file. For help on using Mint WorkBench, click the red Mint WorkBench icon on the opening page.

1. On the Windows Start menu, select All Programs, ABB, Mint WorkBench, Mint WorkBench. (Windows 8.1: On the Apps screen, click the Mint WorkBench icon.)

2. In the opening dialogue box, click Start Online Project...

3. Wait until the MotiFlex e180 is listed in the Controllers found box, e.g. "*MotiFlex e180 on 192.168.0.1*".

Note: If the MotiFlex e180 is not listed, check the Ethernet cable is connected to the E3 port on the front panel of the drive, not E1 or E2 on the top panel. Check that the

MotiFlex e180 is powered correctly and the startup sequence (see *Power on checks*, above) has completed. Ensure you have enabled the Ethernet adapter for Mint WorkBench (see page 23). Click Scan to re-scan the ports. It can take up to 5 seconds for Mint WorkBench to detect the MotiFlex e180.

4. Select the MotiFlex e180 in the list.

5. Clear the Launch Commissioning Wizard check box. Commissioning is not necessary to allow communication with an EtherCAT master, although it must be completed before the MotiFlex e180 can drive a motor. Commissioning can be performed at a later time by reconnecting to the MotiFlex e180 and selecting the Launch Commissioning Wizard check box. Commissioning is described in the MotiFlex e180 User Manual (3AXD50000019946).

6. Click Select.

7. Mint WorkBench connects to the MotiFlex e180. Provided the Launch Commissioning Wizard option was cleared, Edit & Debug mode is displayed.

■ **EtherCAT tool**

The EtherCAT tool shows all information relating to the EtherCAT connection.

1. Click the EtherCAT tool icon in the Toolbox on the left of the screen.

2. Wait until data is uploaded from the MotiFlex e180.

3. The Summary tab shows basic information about the EtherCAT connection.

4. Click Save as... to create an ESI file for the MotiFlex e180. This file can be imported into your EtherCAT master.*

5. The Object Dictionary tab displays the current state of the drive's object dictionary. Press F1 to see the Mint WorkBench help file for instructions about the screen's tool bar.
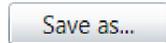
* The ESI file can also be downloaded using an ordinary web browser. See page 25.

■ **Setting the control reference source**

The control (drive) reference source must be set to allow the EtherCAT manager to take control of the MotiFlex e180. If the EtherCAT master supports configuration using the ESI file the control reference source will be set automatically. If this is not supported then there are other ways to set it:

•   Set the CONTROLREFSOURCESTARTUP parameter to '1' using the Mint WorkBench Parameters tool or the Command window (in the Edit & Debug tool) and restart the drive. This gives control to the manager each time the MotiFlex e180 starts.
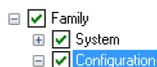
- Click the Direct button on the Mint WorkBench Motion tool bar, and select 'RT Ethernet (CiA402)' in the Axis 0 drop-down.

- Set the Control Ref. Source to 'RT Ethernet (CiA402)' on the Select Operating Mode and Source page of the Mint WorkBench Operating Mode Wizard or Commissioning Wizard.

Confirm that the reference source on all controlled nodes has been set to EtherCAT in the Mint WorkBench Operating Mode Wizard, and that the master has been configured correctly.

■ Downloading the ESI file using a web browser

It is possible to download the ESI file from the MotiFlex e180 using an ordinary web browser. Mint WorkBench or the Mint Sidebar are not required.

1. Open a web browser.

2. In the address bar, enter the IP address of the MotiFlex e180, e.g. 192.168.0.1. The drive will provide a basic information screen.

3. In the *Fieldbus description files* area, click the link to download the ESI file.

If the web browser cannot find the MotiFlex e180 it may be due to your network using an HTTP proxy, causing all requests entered in the browser to be forwarded to the proxy. Try the following browser settings:

Internet Explorer:

1. Click the cog icon 🔅 and select Internet options

2. On the Connections tab click LAN settings.

3. Select the check box 'Bypass proxy server for local addresses'.

Firefox:

1. Open the Tools > Options menu.

2. Open tab Advanced > Network and click Settings…

3. Configure proxy settings manually and add a list of drive addresses under "No Proxy for", e.g. localhost, 127.0.0.1, 192.168.0.1/24

File Access over EtherCAT (FoE)

The MotiFlex e180 supports file access over EtherCAT (FoE). This is useful if you do not wish to install Mint WorkBench to transfer files. The following file types can be uploaded and downloaded using FoE:

File type	Description	String name (fixed)
System Firmware	The .hex file containing the firmware	FIRMWARE
FPGA Firmware	The .fpga file containing the FPGA	FPGA
Mint Program	The od.bin file containing the stored parameters	MINT
Configuration file	The .mex file containing the Mint program	CONFIG

If the FoE server is inactive for more than 1 second while a file is open then the file is closed. A file can only be opened from one instance. Mint WorkBench access can fail if a FoE transfer is in progress.

■ Uploading a file from the drive using FoE in TwinCAT®

The following example shows how to use TwinCAT to upload and download files to the MotiFlex e180.

1. Check that the drive is connected to the PC via EtherCAT.

2. In the TwinCAT Solution Explorer, right-click on the Devices node and scan for devices.

3. Select the device that has EtherCAT beside its name and click OK.

4. Click Yes twice to add the drive to the NC-Configuration.

5. Click Yes twice to add the drive to the NC-Configuration.
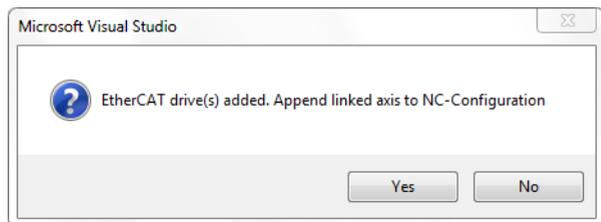
6. Click Yes to activate free run.

7. Now select the drive by double-clicking its node in the tree (double-click 'Drive 1' if the tabbed window is not displayed).
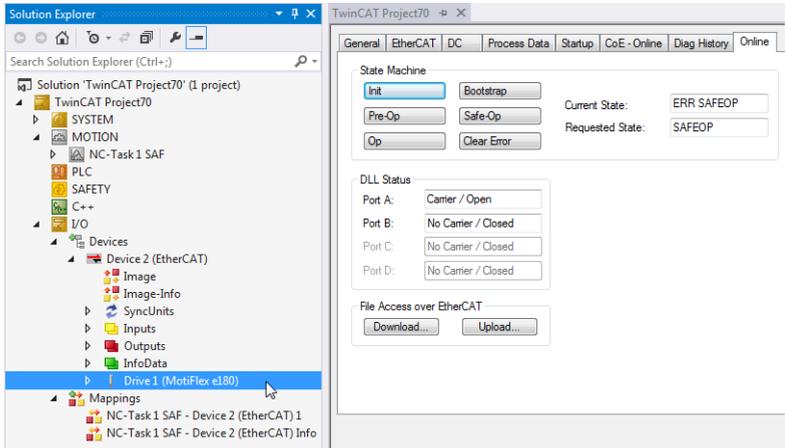
8. Activate the 'Run' mode.
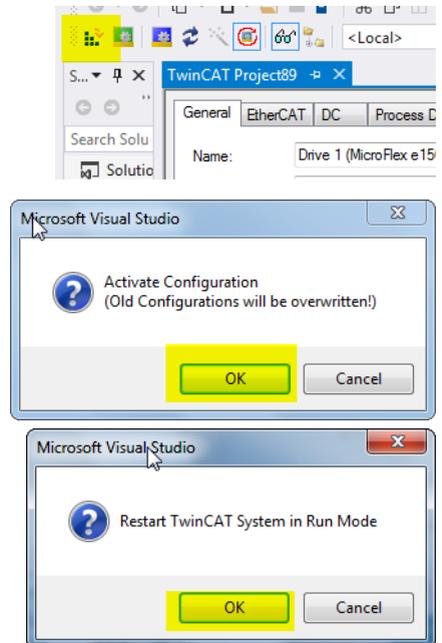
9. Under File Access over EtherCAT, click Upload… to upload one of the firmware components from the drive.
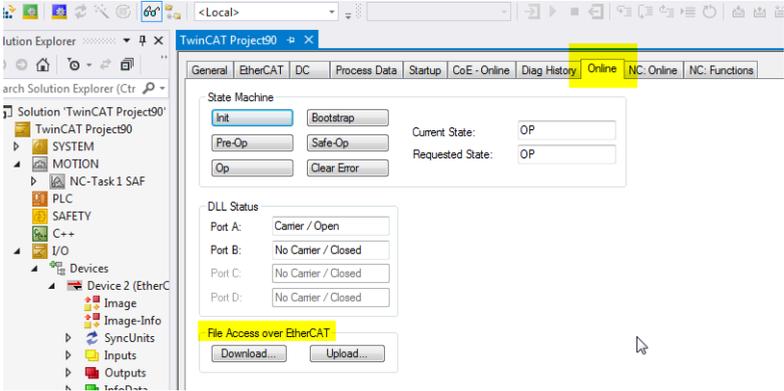
10. In this example, the file name has been customised by adding a '_123' suffix. This is acceptable as a file name, but the prefix *must* be omitted when entering the string name for the file. The entry for String in the Edit FoE Name dialogue must be one of the following:

    FIRMWARE
    FPGA
    CONFIG
    MINT
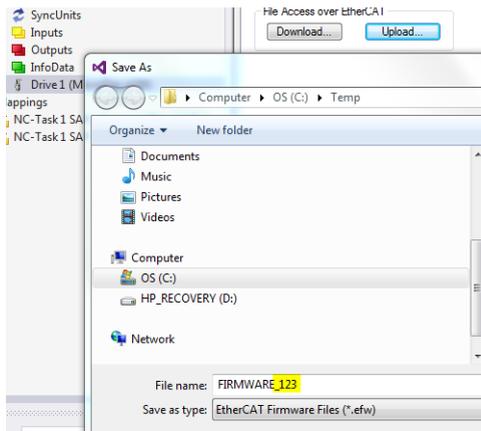
    See the table on page 26 for details.

11. Click OK to confirm the FoE Name details.

    The file will be uploaded using the FoE protocol onto your PC's hard drive. It may take a few seconds if the file is large.
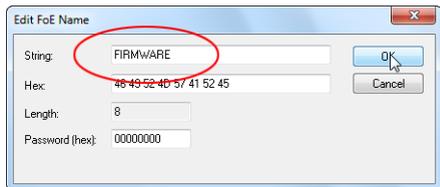
■ **Downloading a file to the drive using FoE in TwinCAT®**

1. To download a file (e.g. new firmware) to the drive, access the File Access over EtherCAT options as described in steps 1. to 8. above.

2. Click the Download… button.

3. You can open any file (e.g. a .hex firmware file) using the Open dialogue box, but the FoE name must be either FIRMWARE, FPGA, CONFIG or MINT. It may take a few seconds if the file is large.
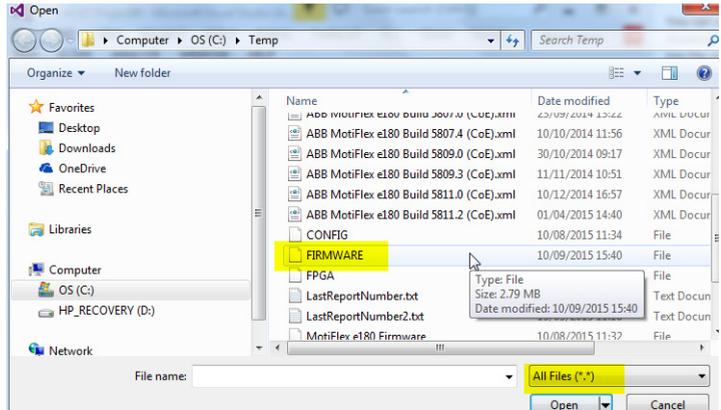
Writing object values

The drive's object dictionary contains 4 different types of objects:

- Constant objects: static values.
- Live objects: PDO mapped, cyclically updated, e.g. axis position value.
- Configuration objects: SDO device configuration during operation.
- Configuration objects *valid on reset*: most objects, applied only on reset.

Most objects are *valid on reset* because there are cases where related objects must always be written in a particular order. Applying an object before another related object could cause an error. It is not possible to define an order in the ESI or the configuration tool so the drive defines the order internally. A *valid on reset* object is not valid straight after writing, so the following procedure is required to update it.

■ Updating an object

The drive's configuration file holds the currently active object dictionary values. When Mint WorkBench's Configuration tool or EtherCAT tool is used to change the value of a *valid on reset* object, it cannot do so while the drive is operating. To change a *valid on reset* object value, the following steps are performed:

- The object is modified in RAM according to the user's changes.
- The configuration is downloaded to the drive and stored.
- The drive is reset. This causes the default values to be loaded, followed by the configuration file containing the changed object, which overwrites the default value.

In Mint WorkBench the menu command Tools, Store Drive Parameters performs the necessary steps. Alternatively the command PARAMETERSAVE can be issued from the command window.

A similar procedure must be performed when controlling the drive from an external EtherCAT manager / PLC device:

1. Write the new value to the desired object.

2. Write the value 0x65766173 [evas/save] to object 1010:01 to store the actual object value as a configuration value.

3. Set the NMT_GS_RESET_APPLICATION state. After passing through the NMT_GS_RESET_COMMUNICATION state, the drive reaches the NMT_GS_RESET_CONFIGURATION state (see page 45). At this stage the default values are loaded, followed by the configuration file, with each object being applied in a controlled order.

■ Immediate apply mode

It is possible to override the normal behavior for *valid on reset* objects to allow objects that are linked to parameters (keywords) to be written with immediate effect. This provides improved usability in PLC programs since it allows parameter access via objects. To enable immediate apply mode, set object CFG_ImmediateApply_BOOL (3004). Parameter values set while in immediate apply mode are volatile and will be reset to their default / configuration value after a reset. To save the object as a configuration value, write the value 0x65766173 [evas/save] to object 1010:01.

■ Deleting the stored configuration

Write 0x64616F6C [daol/load] to 1011:01 to delete the stored configuration and set all objects to their default values.

■ Configuration object operations

	OBJECT DICTIONARY			PARAMETER TABLE
	Default value Default value	**Configuration value** Non-volatile stored value	**Current value** Value of object in RAM; changed locally or by master	**Mint** Live value in profiler / scheduler
Set parameter			123	↓ 123
Get parameter				↑ 123
Set/Get object			↕ 123	
Set/Get object with immediate apply enabled			↕ 123	→ 123
Set/Get configuration		↕ 123		
Reset configuration	123 →	123 →	123	
Apply configuration			123 →	123
PARAMETERSAVE (write object 1010)		123 ←	123	
FACTORYDEFAULTS (write object 1011)	123 →	✗		

Further configuration

A range of Application Notes on www.abbmotion.com describe how to configure and control the drive using an EtherCAT master. The topics describe the MicroFlex e150, but the methods also apply to MotiFlex e180:

AN203 *Using TwinCAT with the MicroFlex e150* describes how to use the Beckhoff® TwinCAT® System Manager to configure a PLC or PC as the EtherCAT master.

AN205 *EtherCAT Quick Start Guide* describes how to use an ABB AC500 PLC as the EtherCAT master.

AN220 *AC500 and MicroFlex e150 - EtherCAT Homing Methods* describes how to use an ABB AC500 PLC to home the drive.

AN221 *AC500 and MicroFlex e150 - EtherCAT Fast Position Capture* describes how to use an ABB AC500 PLC to capture the drive's axis.

AN234 *Generic Drive Interface via EtherCAT for Simple Motion* describes how to use a simple ready-made drive control protocol to access the drive's NETDATA array.

AN242 *Accessing Drive Parameters via EtherCAT SDO* describes how to modify drive parameters using SDO access via an ABB AC500 PLC.

AN243 *Initialising an EtherCAT Network* describes how to use Automation Builder to detect when configured EtherCAT drives are operational on the network and ready to be accessed.

AN252 *Accessing Drive Error Data via EtherCAT* describes how to retrieve error data from the drive using an ABB AC500 PLC.

5

Fault tracing

What this chapter contains

This section explains common problems and their solutions. The LED indicators are described in *MotiFlex e180 indicators* on page 35.

■ Problem diagnosis

If you have followed all the instructions in this manual in sequence, you should have few problems installing the MotiFlex e180. If you do have a problem, read this section first.

- In Mint WorkBench, use the Error Log tool to view recent errors and then check the help file.
- If you cannot solve the problem or the problem persists, the SupportMe feature can be used.

■ SupportMe feature

The SupportMe feature is available from the Help menu, or by clicking the ⬧ button on the motion toolbar. SupportMe can be used to gather information which can then be e-mailed, saved as a text file, or copied to another application. The PC must have e-mail facilities to use the e-mail feature. If you prefer to contact ABB technical support by telephone or fax, contact details are provided on the back cover of this manual.

Have the following information ready:

- The serial number of your MotiFlex e180 (if known).
- Open the Help, SupportMe menu item in Mint WorkBench to view details about your system.
- The catalogue and specification numbers of the motor that you are using.
- A clear description of what you are trying to do, for example trying to establish communications with Mint WorkBench or trying to perform fine-tuning.
- A clear description of the symptoms that you can observe, for example the Status LED, error messages displayed in Mint WorkBench, or errors reported by the Mint error keywords `ERRORREADCODE` or `ERRORREADNEXT`.
- The type of motion generated in the motor shaft.
- A list of any parameters that you have setup, for example the motor data you entered/selected in the Commissioning Wizard, the gain settings generated during the tuning process and any gain settings you have entered yourself.

■ **Power-cycling the MotiFlex e180**

The term 'power-cycle the MotiFlex e180' is used in the Troubleshooting sections. Remove the 24 V supply, wait for the MotiFlex e180 to power down completely (the Status LED turns off), then re-apply the 24 V supply.

■ **Trace mode**

The Trace mode window shows a listing that includes the major network state transitions of the MotiFlex e180 from startup. This can be useful for determining the causes of errors.

1. In Mint WorkBench, right-click the Output window and choose Trace mode.
2. If the window does not contain enough information, right-click the window again, choose Properties, and specify a greater number of lines or columns.
3. On the Tools menu, choose Restart controller so that the Trace window can capture and display all events from startup.

MotiFlex e180 indicators

■ EtherCAT® mode

The Ethernet LEDs display the overall condition of the Ethernet interface once the startup sequence has completed. The LED codes conform to the EtherCAT Technology Group (ETG) standard at the time of production.

NET ERR (Red)	
	Off: No errors or not powered.
	Blinking: Invalid mailbox configuration in BOOT. Invalid mailbox configuration in PREOP. Invalid Sync manager configuration. Invalid output configuration. Invalid input configuration. Invalid watchdog configuration. Invalid DC Sync configuration. Invalid DC latch configuration.
	1 flash: Unspecific error. FreeRun needs 3 buffer mode. No memory. Background watchdog occurred. Invalid request state change. No valid inputs and outputs. Unknown requested state. Fatal sync error. Bootstrap not supported. No sync error. No valid firmware. PLL error. No valid inputs available. DC sync IO error. No valid output. DC sync time-out error. Synchronisation error. Invalid DC Sync cycle time. Invalid Sync manager types. DC Sync0 cycle time. Slave needs cold start. DC Sync1 cycle time. Slave needs INIT. Message box EoE error. Slave needs PREOP. Message box CoE error. Slave needs SAFEOP. Message box FoE error. Invalid input mapping. Message box SoE error. Invalid output mapping. Message box VoE error. Inconsistent settings. EEPROM no access. FreeRun not supported. EEPROM error. SyncMode not supported. Slave restarted locally.
	2 flashes: Sync manager watchdog.

NET RUN (Green)	
	Off: INITIALISATION state (or not powered).
	Blinking: PRE-OPERATIONAL state. 1 flash: SAFE-OPERATIONAL state. 3 flashes: Device identification. This state can be set from the master to locate the device.
	Continuously illuminated, not flashing: Node in OPERATIONAL state. EtherCAT is operating normally.

■ LED flash periods

The following diagram shows the definitions of the terms 'blinking', 'flashing' and 'flickering' used in the previous sections, as defined by the EtherCAT Technology Group.

LED flash timing definitions:
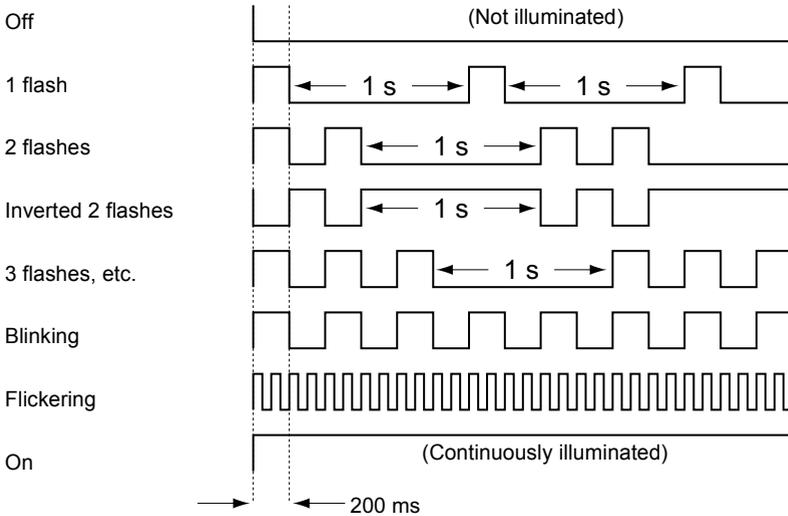
■ Drive status display

The drive status display indicates errors and general MotiFlex e180 status information. When an error occurs the drive displays a sequence starting with the symbol E, followed by the five digit error code. For example, error code 10015 is displayed:

STO error

| 1 s | 0.25 s | 0.25 s | 0.25 s | 0.25 s | 0.25 s | 0.25 s | 0.25 s | 0.25 s | 0.25 s |
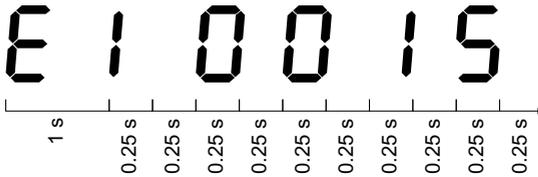
The decimal point to the right of the number also illuminates to indicate STO errors. For a complete list of error codes, open Mint WorkBench, press F1, and locate the Error Handling book. This contains topics listing the drive status display indicators and basic error codes. See also *Start the MotiFlex e180* on page 23.

The following information symbols can be displayed:

Symbol	Description
▬ •	Drive disabled, and one or both STO inputs are not powered. The drive must be enabled before operation can continue. Both STO inputs must be powered. If an optional drive enable input has been configured, it must also be powered.
▬	Drive disabled. The drive must be enabled before operation can continue. If an optional drive enable input has been configured, it must also be powered.
▬▬	Suspend active. The Mint SUSPEND command has been issued and is active. Motion ramps down to zero demand whilst active.
▬▬▬	Firmware loading (segments are illuminated sequentially). This sequence is followed by a numerical sequence representing firmware initialization stages.
A	Hold to Analogue (HTA) mode. The axis is in Hold To Analogue mode. See the Mint keyword HTA.
8	Drive enabled, but idle.
C	Cam move. A cam profile is in progress. See the Mint keyword CAM.

Symbol	Description
d	Dwell. A dwell (wait) 'move' is in progress. See the Mint keyword MOVEDWELL.
F	Flying shear. A flying shear is in progress. See the Mint keyword FLY.
ⅎ	Follow move. The drive is in follow mode. See the Mint keyword FOLLOW.
h	Homing. The drive is currently homing. See the Mint keyword HOME.
I	Incremental move. An incremental linear move is in progress. See the Mint keywords INCA and INCR.
J	Jog. The drive is jogging. See the Mint keywords JOG, JOGCOMMAND and related topics.
o	Offset move. An offset move is in progress. See the Mint keyword OFFSET.
P	Position move. A linear move is in progress. See the Mint keywords MOVEA and MOVER.
q	Torque move. The drive is in torque mode. See the Mint keywords TORQUEREF, TORQUEREFSOURCE and related commands.
r	Firmware recovery mode in operation; see *Linear switches - startup functions* on page 77.
S	Stop input active. A Mint STOP command has been issued or an optional stop input is active.
⊔	Velocity reference move. The drive is under velocity control. See the Mint keywords VELREF and related keywords.
己	Spline. A spline move is in progress. See the Mint keyword SPLINE and related keyword.

User defined symbols can be displayed using Mint keywords LED and LEDDISPLAY.

■ Power

Drive does not start when applying AC power:

- Check that the motor output phases are not short circuited. The drive trips on a motor phase short circuit and will not restart unless AC power is removed. Remove all power from the drive, correct the short circuit and restart the drive.

■ Communication

Drive status display is off:

- Check that the 24 V DC control circuit supply is correctly connected at X9, and is switched on.

Drive status display shows 'r':

- The MotiFlex e180 is in firmware recovery mode. This means that it does not boot fully, and allows Mint WorkBench to download firmware from the Choose Firmware dialogue.

Mint WorkBench fails to detect the MotiFlex e180:

- Ensure that the MotiFlex e180 is powered and the drive status display is illuminated (page 37).
- Check that the Ethernet cable is connected between the PC and MotiFlex e180. Check that the cable is connected to port E3 (on the front panel) and not port E1 or E2.
- Check that the PC's Ethernet port has been correctly configured for TCP/IP operation, and enabled for use with Mint WorkBench (see *Configure the PC Ethernet adapter* on page 22).
- Check that the correct Ethernet adapter has been selected (see *Enable the Ethernet adapter for Mint WorkBench* on page 23).
- Check that any PC firewall or security software does not prevent communication on TCP ports 5000 and 5001, and UDP port 5050. These ports are essential for communication with the MotiFlex e180.
- Try an alternative cable or different port on the PC.

■ Mint WorkBench

The Spy window does not update:

- The system refresh has been disabled. Go to the Tools, Options menu item, select the System tab and then choose a System Refresh Rate (500 ms is recommended).

Cannot communicate with the controller after downloading firmware:

- After firmware download, always power cycle the MotiFlex e180.

■ Ethernet

Cannot connect to the drive:

•   Check that the PC's Ethernet adapter has been correctly configured, as described in *Configure the PC Ethernet adapter* on page 22.

How do I configure my EtherCAT manager to operate with the MotiFlex e180?

•   An EtherCAT ESI file (.xml) that describes the drive to the EtherCAT manager can be uploaded from the controller using the Mint WorkBench EtherCAT tool. See section *EtherCAT tool* on page 24.

I cannot control the MotiFlex e180 from my EtherCAT manager

The control (drive) reference source must be set to allow the EtherCAT manager to take control of the MotiFlex e180. There are several ways to do this:

•   Set the CONTROLREFSOURCESTARTUP parameter to '1' using the Mint WorkBench Parameter viewer or Command window, and restart the drive. This gives control to the manager each time the MotiFlex e180 starts.

•   Set the Control Ref. Source to 'RT Ethernet (CiA402)' in the Mint WorkBench Operating Mode Wizard or Commissioning Wizard.

•   Click the Direct button on the Mint WorkBench Motion tool bar, and select 'RT Ethernet (CiA402)' in the Axis 0 drop-down.

•   Confirm that the reference source on all controlled nodes has been set to EtherCAT in the Mint WorkBench Operating Mode Wizard, and that the master has been configured correctly.

•   Use the Mint WorkBench Trace mode to view all state transitions that have occurred since startup (page 34).

6

Reference

What this chapter contains

This chapter contains reference information about the MotiFlex e180 EtherCAT implementation.

Introduction

The EtherCAT protocol provides deterministic communication over a standard 100 Mbit/s (100Base-TX) Fast Ethernet (IEEE 802.3u) connection. This makes it suitable for the transmission of control and feedback signals between the MotiFlex e180 and other EtherCAT enabled controllers. EtherCAT's 'CAN application layer over EtherCAT' (CoE) capability allows Mint to implement a drive protocol based on the CANopen DS 402 Device Profile for Drives and Motion Control.

The MotiFlex e180 incorporates a built-in multi-port EtherCAT slave controller, providing two ports for connection to other equipment. This allows nodes to be connected in many configurations such as a ring, star, or tree, with EtherCAT's self-terminating technology automatically detecting breaks or an intended end of line. Standard Ethernet switches can be used in EtherCAT networks.

The MotiFlex e180 has passed the formal EtherCAT conformance test, which is performed using a network with a wide range of EtherCAT devices. It has also been tested with many different types of master device to ensure interoperability, including:

- ABB AC500 PLC with EtherCAT master (CM579-ETHCAT).
- acontis technologies EC-master stack and EC-Win
- Beckhoff CX8000/9000 Embedded PC
- Beckhoff TwinCAT (soft master NC PTP)
- esd EtherCAT master
- Hilscher cifX PC card
- Konig KPA Master/Studio (v1.4.8.15)
- 3S CoDeSys v3 (Soft-PLC)

■ Supported mailbox protocols

- CoE
- FoE
- EoE

■ Synchronisation

The drive supports two synchronisation modes.

DC (distributed clock) synchronisation

DC synchronisation is preferred for all applications with multiple drives and coordinated motion, since it provides the most precise synchronisation. The DC mode compensates for the Ethernet hop delay. This means that independent of the size of the network all nodes apply the demand values at the same time.

SM (SyncManager) synchronisation

- SM synchronisation can be used for all applications with less critical timing requirements. Any network topology is converted into a daisy chain structure, so even a star topology is logically a chain. This creates a network where the hop delay is equal to the number of nodes * 500 ns. For example, a network with 30 slaves would have a delay of 15 µs between the first and last slaves. SM synchronisation is supported because not all PLCs support DC synchronisation. DC synchronisation requires the ability of the PLC to synchronise itself to the first DC capable slave on the network. The drive supports a minimum synchronisation period of 250 µs, or even multiples of 250 µs (500 µs, 1000 µs, 2000 µs, etc.) up to 32 ms.

■ Setting the control reference source

The control reference source determines from where the drive receives enabling and motion commands. The CONTROLREFSOURCE parameter must be changed to 1 (_crsRT_ETHERNET_402) to allow an EtherCAT master to control the drive, and to prevent Mint updating the control word. Normally the master sets it due to a start-up command in the installed ESI file, but there are other ways to set the control reference source:

- Use an SDO write to object 0x5002.
- Set the CONTROLREFSOURCE to 1 (_crsRT_ETHERNET_402) using the Parameters tool or Command window in Mint WorkBench.
- Set the *Control Ref. Source* item to 'RT Ethernet (CiA402)' on the Select Operating Mode and Source page of the Mint WorkBench Operating Mode Wizard.

See also *Setting the control reference source* on page 24.

■ Resetting position

The actual position value is defined as read-only, so the only way to reset the position of the drive over a fieldbus is to use the homing mode of operation:

- Change the operating mode of the drive to 'homing' by changing object 0x6060 to '6'. To check that the drive has acknowledged the change of operating mode, read object 0x6061 until it matches the value set in object 0x6060.
- Start the homing sequence by setting bit 4 in the control word object 0x6040.
- Wait for the *homing attained* or *homing error* bits 12 and 13 to be set in the status word object 0x6041. This will indicate if the homing sequence completed successfully or not.

If the homing sequence completed successfully, the actual position will have been changed to the value of HOMEOFFSET. The default is 0.

NMT state machine

The MotiFlex e180's operating states/modes are defined by an NMT state machine based upon that used by CANopen. The state machine is important because it defines the behavior of the *valid on reset* objects (see *Object dictionary* on page 46). The following diagram shows how the firmware is implemented.

NMT_GS_INITIALISING

The system is initialised and the object dictionary created during this state.

NMT_GS_RESET_APPLICATION

Reset application is used to set all manufacturer and application/drive profile specific objects (0x2000 and greater) to their power-on values.

NMT_GS_RESET_COMMUNICATION

Reset communication is used to set all communication profile specific objects (0x1000..1FFF) to their power-on values.

NMT_GS_RESET_CONFIGURATION

Reset configuration is used to apply the configuration settings. Objects that are handled during that state are marked with valid on reset. All others are valid on write.

Power-on value

The power-on value is the combination of default value and stored configuration. If the stored configuration does not contain an object value then the default value is used instead. If no configuration is present then the defaults are used for all objects.
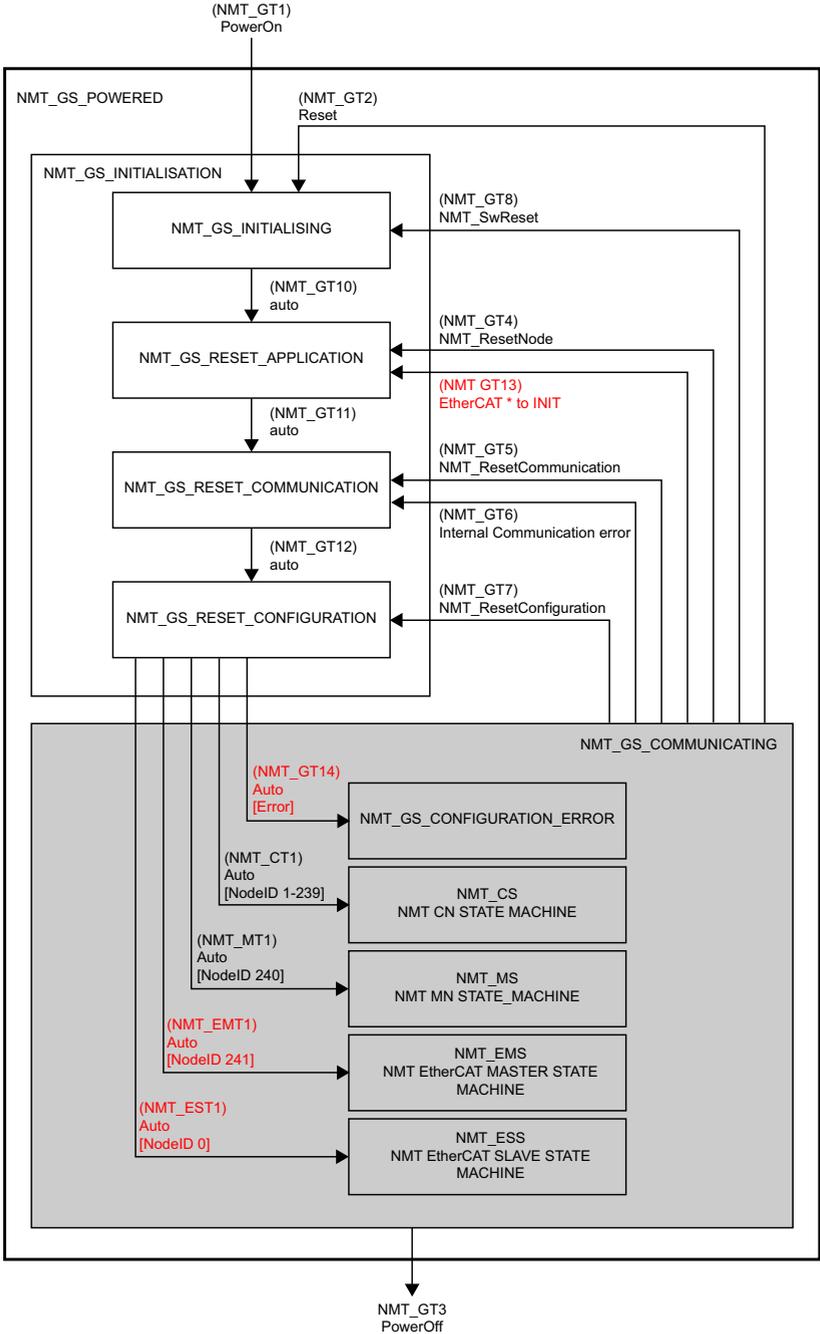
Object dictionary

The object dictionary contains 4 different types of objects:

Constant objects

Constant object contain the same value during their entire life time, for example the manufacturer device name object (1008h). The value is set once during firmware boot-up and does not change.

Live objects

Live objects allow direct access to the control loops and internal application processes. This object data can be mapped into PDOs and is usually cyclically updated (for example axis position or a digital output value).

Configuration objects

Configuration objects allow the device configuration to be changed via SDOs during drive operation.

Configuration objects valid on reset

Most of the objects are configuration objects that are valid on reset. This means they are applied during the NMT_GS_RESET_CONFIGURATION state.

See also *EtherCAT protocol objects: 1000h - 2000h* on page 49, and *Manufacturer specific objects* on page 52.

■ Error codes and detection

The following application layer (AL) status codes are supported:

AL Status Code	Description
0x002D	SYNC0 or SYNC1 generation is enabled but never received after time-out (Cycle time + Cycle time / 16)
0x002C	SYNC0 or SYNC1 generation is enabled, received and lost after time-out (Cycle time + Cycle time / 16)
0x001E	SYNC0 or SYNC1 generation is enabled; Input SM was not written during 2 SYNC pulses threshold*
0x001D	SYNC0 or SYNC1 generation is enabled; Output SM was written once but was not written during 2 SYNC pulses threshold*
0x001A	SYNC0 or SYNC1 generation is enabled; Output SM was not written once but drive is asked to go OPERATIONAL
0x0032	SYNC0 or SYNC1 generation is enabled; Internal SYNC and external SYNC PLL lost synchronisation
0x001B	SM synchronisation mode; SM was not written in configured watchdog time
0x0016	Boot-up error; Mailbox SM configuration illegal; check log for further information
0x001E	Boot-up error; Input SM configuration illegal; check log for further information
0x001D	Boot-up error; Output SM configuration illegal; check log for further information
0x0030	Boot-up error; Invalid DC configuration
0x0035	Boot-up error; Not support DC cycle time configured

*The SM threshold increments by 8 for every error and decrements by 1 for every successful operation. The threshold value is 15 to guarantee that 2 consecutive errors trigger the error.

Error detection

If the drive is in error then the fault bit (bit 3) will be set in the status word object 0x6041. The error code object 0x603F can then be queried to identify the cause of the error. Supported DS 402 error codes and their equivalent Mint/MML error codes are:

DS 402 error code	DS 402 description	Equivalent Mint/MML error code	Mint/MML description
0x2310	Continuous over current	10014	Over current
0x2350	Load level fault (I2t, thermal state)	10011	Drive Overload
0x3110	Mains over voltage	10016	Bus over voltage
0x3120	Mains under voltage	10017	Bus under voltage
0x3130	Phase failure	10029	Supply phase loss
0x4210	Excess temperature device	10019	Motor temperature input
0x4310	Excess temperature drive	30001	Drive over-temperature
0x4320	Too low temperature drive	30029	Drive under-temperature
0x5110	Supply low voltage	30000	Internal power supply loss
0x5114	U4 = manufacturer specific	10023	Encoder supply lost
0x5400	Power section	10012	Power base not ready
0x5410	Output stages	10013	Power module fault
0x5441	Contact 1 - Manufacturer specific	10010	Drive Enable Input Inactive
0x5442	Contact 2 - Manufacturer specific	10001	Forward Hardware Limit
0x5443	Contact 3 - Manufacturer specific	10002	Reverse Hardware Limit
0x5444	Contact 4 - Manufacturer specific	10033	Safe Torque Off is active
0x5445	Contact 5 - Manufacturer specific	10007	Error Input active
0x7303	Manufacturer specific error	10039	Resolver signals lost or incorrect
0x7305	Incremental sensor 1 fault	10022	Encoder signals lost
0x7310	Speed	10015	Over speed
0x7500	Communication	10026	PDO data lost
0x8400	Velocity speed controller	10006	Fatal velocity exceeded
0x8611	Following Error	10005	Following Error
0x8612	Software limits	10003/10004	Soft limit hit
0xFF00	Manufacturer specific error	10020	Phase search failed
0xFF01	Manufacturer specific error	10031	Heatsink too hot to Phase Search
0xFF02	Manufacturer specific error	10028	Encoder not ready
0xFF03	Manufacturer specific error	10018	Motor overload
0xFF04	Manufacturer specific error	30002	Production data invalid
0xFF05	Manufacturer specific error	10000	Abort
0xFF06	Manufacturer specific error	10034	Safe Torque Off hardware fault
0xFF07	Manufacturer specific error	10035	Safe Torque Off input mismatch
0xFF08	Manufacturer specific error	30009	Internal API error
0xFF09	Manufacturer specific error	10036	Encoder reading wrong
0xFF0A	Manufacturer specific error	20000	Axis has reached FolErrorWarning
0xFF0B	Manufacturer specific error	10038	Encoder battery dead

DS 402 error code	DS 402 description	Equivalent Mint/MML error code	Mint/MML description
0xFF0C	Manufacturer specific error	20004	Encoder battery low (warning)
0xFF0D	Manufacturer specific error	10040	Hiperface DSL encoder error
0xFF0E	Manufacturer specific error	10041	Output frequency over limit
0xFF0F	Manufacturer specific error	20005	Phase loss detected (warning)
0xFF10	Manufacturer specific error	20006	Motor temperature has not been read (warning)

■ Object 4144h: First Error

This object holds detailed information about the error which initially caused the drive to go into the error state (see page 61). Subsequent errors are not recorded by the object. The object's sub-indexes provide the same information as the Mint keywords ERRCODE, ERRSTRING, ERRDATA and ERRLINE, allowing the cause of the error to be identified. If the error relates to a parameter sub-indexes 6 and 7 provide the parameter family and index, as reported by the Mint keywords ERRPARAMFAMILY and ERRPARAMINDEX. These values can be used to find the parameter in the Mint WorkBench Parameters tool. Sub-indexes 5, 6 and 7 are set to -1 if no relevant data is available. Object 4144h is cleared when the drive leaves the error state as a result of a fault reset (control word bit 7) or by using a PLCopen MC_Reset function block.

Decel
Profiled deceleration rate
Parameter Family 22, Index 7
Default: 300000.0000, Min: 0.0010, Max:

■ Emergency Messages

The transmission of emergency messages is supported and is enabled by default using the diagnosis object. The transmitted emergency messages are of the type "DeviceSpecific". The error data are filled with the ICM error code. The error data is 5 bytes wide. The first bytes stays 0 and the error follows at offset 1.

■ Diagnosis Object

The diagnosis object is fed from the standard error history. Every new error is added depending on the configured filters. The object does not contain any non-volatile entries. A diagnosis history entry is constructed the following way:

• The DiagCode field depends on whether the error is assigned with a profile code:
  0000E000 - No profile code
  XXXXE800 - XXXX represents the profile code

• An entry has 2 parameters:
  STRING - Source of the message
  STRING - Error message

• Every entry references a string message in the ESI.

The ESI contains the decoding string for diagnosis history entries. An entry contains 2 strings so the decoding uses 2 string format identifier. History entries are decoded with "%s : %s" (Source : Error).

Object dictionaries

◼ EtherCAT protocol objects: 1000h - 2000h

The following objects are specific to EtherCAT communications:

Index	Sub-ind.	Object	Name	Type	Attr.	PDO mapping	Content example
1000h	0	VAR	NMT_DeviceType_U32	UINT32	CONST	No	131474
1001h	0	VAR	ERR_ErrorRegister_U8	UINT8	RO	Poss.	0
1008h	0	VAR	NMT_ManufactDevName_VS	STRING	CONST	No	MotiFlex e180
1009h	0	VAR	NMT_ManufactHwVers_VS	STRING	CONST	No	
100Ah	0	VAR	NMT_ManufactSwVers_VS	STRING	CONST	No	MotiFlex e180 Build 581.3.0 (mCard)
1010h	0	REC	NMT_StoreParam_REC	UINT8	RO	No	1
	1		NMT_StoreParam_REC.AllParam_U32	UINT32	RW	No	1
1011h	0	REC	NMT_RestoreDefParam_REC	UINT8	RO	No	1
	1		NMT_RestoreDefParam_REC.AllParam_U32	UINT32	RW	No	1
1018h	0	REC	NMT_IdentityObject_REC	UINT8	RO	No	4
	1		VendorId_U32	UINT32	CONST	No	183
	2		ProductCode_U32		CONST	No	700
	3		RevisionNo_U32		CONST	No	374603778
	4		SerialNo_U32		CONST	No	1112130069
10F3h	0	REC	DGN_DiagnosisHistory_REC	UINT8	RO	No	21
	1		MaximumMessages_U8	UINT8	RO	No	16
	2		NewestMessage_U8	UINT8	RO	No	21
	3		NewestAcknowledgedMessage_U8	UINT8	RW	No	21
	4		NewMessagesAvailable_BOOL	BOOL	RO	Poss.	False
	5		Flags_U16	UINT16	RW	No	0
	6		DiagnosisMessage_0_OSTR	OCTET_STRING	RO	No	00000...
	7		DiagnosisMessage_1_OSTR		RO	No	00000...
	8		DiagnosisMessage_2_OSTR		RO	No	00000...
	9		DiagnosisMessage_3_OSTR		RO	No	00000...
	10		DiagnosisMessage_4_OSTR		RO	No	00000...
	11		DiagnosisMessage_5_OSTR		RO	No	00000...
	12		DiagnosisMessage_6_OSTR		RO	No	00000...
	13		DiagnosisMessage_7_OSTR		RO	No	00000...
	14		DiagnosisMessage_8_OSTR		RO	No	00000...
	15		DiagnosisMessage_9_OSTR		RO	No	00000...
	16		DiagnosisMessage_10_OSTR		RO	No	00000...
	17		DiagnosisMessage_11_OSTR		RO	No	00000...
	18		DiagnosisMessage_12_OSTR		RO	No	00000...
	19		DiagnosisMessage_13_OSTR		RO	No	00000...
	20		DiagnosisMessage_14_OSTR		RO	No	00000...
	21		DiagnosisMessage_15_OSTR		RO	No	00000...
1600h	0	ARRAY	PDO_ReceiveMapping_0_AU32	UINT8	RW	No	2
	1		PDO_ReceiveMapping_0_AU32[1]	UINT32	RW	No	1614807056
	...		...		...	...	...
	254		PDO_ReceiveMapping_0_AU32[254]		RW	No	0

Index	Sub-ind.	Object	Name	Type	Attr.	PDO mapping	Content example
1A00h	0	ARRAY	PDO_TransmitMapping_0_AU32	UINT8	RW	No	2
	1		PDO_TransmitMapping_0_AU32[1]	UINT32	RW	No	1614872592
	...		...	...	...	...	...
	254		PDO_TransmitMapping_0_AU32[254]	UINT32	RW	No	0
1C00h	0	ARRAY	SM_CommunicationType_AU8	UINT8	RO	No	8
	1		SM_CommunicationType_AU8		RO	No	1
	2		SM_CommunicationType_AU8		RO	No	2
	3		SM_CommunicationType_AU8		RO	No	3
	4		SM_CommunicationType_AU8		RO	No	4
	5		SM_CommunicationType_AU8		RO	No	0
	6		SM_CommunicationType_AU8		RO	No	0
	7		SM_CommunicationType_AU8		RO	No	0
	8		SM_CommunicationType_AU8		RO	No	0
1C12h	0	ARRAY	SM_PDOAssignment_2_AU16	UINT8	RW	No	1
	1		SM_PDOAssignment_2_AU16[1]	UINT16	RW	No	0
	...		...		...	...	...
	16		SM_PDOAssignment_2_AU16[16]		RW	No	0
1C13h	0	ARRAY	SM_PDOAssignment_3_AU16	UINT8	RW	No	1
	1		SM_PDOAssignment_3_AU16[1]	UINT16	RW	No	0
	...		...		...	...	...
	16		SM_PDOAssignment_3_AU16[16]		RW	No	0
1C32h	0	REC	SM_Synchronization_2_REC	UINT8	RO	No	6
	1		SM_Synchronization_2_REC.SyncMode_U16	UINT16	RO	No	1
	2		SM_Synchronization_2_REC.CycleTime_U32	UINT32	RO	No	2000000
	3		SM_Synchronization_2_REC.ShiftTime_U32	UINT32	RO	No	0
	4		SM_Synchronization_2_REC.SyncModesSupported_U16	UINT16	RO	No	16390
	5		SM_Synchronization_2_REC.MinimumCycleTime_U32	UINT32	RO	No	250000
	6		SM_Synchronization_2_REC.MinimumDelayTime_U32	UINT32	RO	No	0
1C33h	0	REC	SM_Synchronization_3_REC	UINT8	RO	No	6
	1		SM_Synchronization_3_REC.SyncMode_U16	UINT16	RO	No	34
	2		SM_Synchronization_3_REC.CycleTime_U32	UINT32	RO	No	2000000
	3		SM_Synchronization_3_REC.ShiftTime_U32	UINT32	RO	No	0
	4		SM_Synchronization_3_REC.SyncModesSupported_U16	UINT16	RO	No	16390
	5		SM_Synchronization_3_REC.MinimumCycleTime_U32	UINT32	RO	No	250000
	6		SM_Synchronization_3_REC.MinimumDelayTime_U32	UINT32	RO	No	0

Notes

1001h: The error register gives simplified information about the fault status of the drive, for example a bit is enabled if a power fault is detected. This object is not normally used because communication fails if a power fault is detected.

1010h, 1011h: The store and restore objects are supported. They return 1 on read which means 1010h: save on command, 1011h: restore supported. 1010h must be written with 0x65766173, which is ASCII "evas". "evas" is transmitted in little endian

and appears on the network as "save". 1011h must be written with 0x64616F6C which results in "load" on the bus.

10F3h: The diagnosis history is a mapping of the Mint WorkBench error log into objects.

1600h, 1A00h: Two large PDOs are used, as for Powerlink. If the device is simpler then it makes sense to have more PDOs and switch them based on machine demands. All PDOs are described in the ESI. The drive uses a default PDO mapping for cyclic synchronous position mode.

1C00h: The SM communication type object contains read-only information about SyncManager usage. A SyncManager is a message buffer that is used to read/write PDO data.

1C12h, 1C13h: The PDO assignment objects are necessary to assign a PDO to a SyncManager. The PDO assignment decides how the data is decoded/encoded.

1C32h: The SM synchronisation objects contains the SYNC mode: Distributed Clock (DC) or Sync Manager (SM) synchronised. It also contains the configured cycle time (for DC) or measured cycle time (for SM). The drive supports distributed clock and Sync Manager synchronisation. The drive's control loops synchronize to the DC or SM. The DC cycle time must be a multiple of 250 µs and support minimum 250 µs and maximum 100 ms. If the cycle time is longer than 100 ms the drive's control loop will lose synchronisation.

■ Manufacturer specific objects

The following table lists the common manufacturer specific objects applicable to MotiFlex e180 on EtherCAT and Ethernet POWERLINK:

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
2000h	0	ARR	Comms array	UINT8	RO	No	-	Number of comms array elements
	1		Array element 1	UINT32	RW	Poss.	-	Maps to COMMSINTEGER(1) and COMMS(1)
	…		…		…	…	…	…
	100		Array element 100		RW	Poss.	-	Maps to COMMSINTEGER(100) and COMMS(100)

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
3000h	0	VAR	CFG_Identity_OSTR	OCTET_STRING	RW	No	-	Used by Mint WorkBench only.
3001h	0	VAR	SYS_Name_VS	VIS. STRING	RW	No	-	The product user name; see PRODUCTUSERNAME
3004h	0	VAR	CFG_ImmediateApply	BOOL	WO	No	-	Causes object writes to be applied to live parameters without requiring a reset. The state is not stored and is reset (disabled) at startup.
3F00h	0	ARR	NetData0	UINT8	RO	No	-	Number of network data array elements
	1		NetData element 0	INT32	WO	Poss.	-	Maps to NETINTEGER(0) and NETFLOAT(0)
	…		…		…	…	…	…
	250		NetData element 249		WO	Poss.	-	Maps to NETINTEGER(249) and NETFLOAT(249)
3F01h	0	ARR	NetData1	UINT8	RO	No	-	Number of network data array elements
	1		NetData element 250	INT32	WO	Poss.	-	Maps to NETINTEGER(250) and NETFLOAT(250)
	…		…		…	…	…	…
	250		NetData element 499		WO	Poss.	-	Maps to NETINTEGER(499) and NETFLOAT(499)
3F02h	0	ARR	NetData2	UINT8	RO	No	-	Number of network data array elements
	1		NetData element 500	INT32	WO	Poss.	-	Maps to NETINTEGER(500) and NETFLOAT(500)
	…		…		…	…	…	…
	250		NetData element 749		WO	Poss.	-	Maps to NETINTEGER(749) and NETFLOAT(749)
3F03h	0	ARR	NetData3	UINT8	RO	No	-	Number of network data array elements
	1		NetData element 750	INT32	WO	Poss.	-	Maps to NETINTEGER(750) and NETFLOAT(750)
	…		…		…	…	…	…
	250		NetData element 999		WO	Poss.	-	Maps to NETINTEGER(999) and NETFLOAT(999)

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
4001h	0	VAR	Output active level	UINT8	RO	No	-	Output active levels
	1		Output active levels - bank 0	UINT32	RW	No	-	Maps to OUTPUTACTIVELEVEL
4003h	0	VAR	Input mode	UINT8	RO	No	-	Input mode (edge / level triggering)
	1		Input mode - bank 0	UINT32	RW	No	-	Maps to INPUTMODE
4004h	0	VAR	Input active level	UINT8	RO	No	-	Input active levels (high / low)
	1		Input active levels - bank 0	UINT32	RW	No	-	Maps to INPUTACTIVELEVEL
4005h	0	VAR	Inputs negative edge triggered	UINT8	RO	No	-	Triggering on negative edge
	1		Inputs negative edge triggered - bank 0	UINT32	RW	No	-	Maps to INPUTNEGTRIGGER
4006h	0	VAR	Inputs positive edge triggered	UINT32	RO	No	-	Triggering on positive edge
	1		Inputs positive edge triggered - bank 0	UINT32	RW	No	-	Maps to INPUTPOSTRIGGER
4008h	0	ARR	Encoder type	UINT8	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT16	RW	No	-	Maps to ENCODERTYPE(0)
	2		Channel 1 (Step & Dir. inputs)		RW	No	-	Maps to ENCODERTYPE(1)
	3		Channel 2 (Master incremental encoder)		RW	No	-	Maps to ENCODERTYPE(2)
4009h	0	ARR	Encoder resolution	UINT8	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	UINT32	RW	No	-	Maps to ENCODERRESOLUTION(0)
	2		Channel 1 (Step & Dir. inputs)		RW	No	-	Maps to ENCODERRESOLUTION(1)
	3		Channel 2 (Master incremental encoder)		RW	No	-	Maps to ENCODERRESOLUTION(2)
400Ah	0	ARR	Encoder mode	UINT8	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT16	RW	No	-	Maps to ENCODERMODE(0)
	2		Channel 1 (Step & Dir. inputs)		RW	No	-	Maps to ENCODERMODE(1)
	3		Channel 2 (Master incremental encoder)		RW	No	-	Maps to ENCODERMODE(2)
400Ch	0	ARR	Encoder position	UINT8	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RW	Poss.	User units	Maps to ENCODER(0)
	2		Channel 1 (Step & Dir. inputs)		RW	Poss.	User units	Maps to ENCODER(1)
	3		Channel 2 (Master incremental encoder)		RW	Poss.	User units	Maps to ENCODER(2)
400Dh	0	ARR	Encoder velocity	UINT8	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RO	Poss.	User units	Maps to ENCODERVEL(0)
	2		Channel 1 (Step & Dir. inputs)		RO	Poss.	User units	Maps to ENCODERVEL(1)
	3		Channel 2 (Master incremental encoder)		RO	Poss.	User units	Maps to ENCODERVEL(2)
400Eh	0	ARR	Encoder Z latch	UINT8	RO	No	-	Read encoder z latch state
	1		Channel 0 (Main encoder)	INT32	RO	Poss.	user units	Maps to ENCODERZLATCH(0)
	2		Channel 1 (Step & Dir. inputs)		RO	Poss.	user units	Maps to ENCODERZLATCH(1)
	3		Channel 2 (Master incremental encoder)		RO	Poss.	user units	Maps to ENCODERZLATCH(2)

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
400Fh	0	ARR	Latch	UINT8	RO	No	-	Number of latch channels
	1		Channel 0 (Main encoder)	INT32	RO	No	user units	Maps to LATCH(0)
	2		Channel 1 (Step & Dir. inputs)		RO	No	user units	Maps to LATCH(1)
	3		Channel 2 (Master incremental encoder)		RO	No	user units	Maps to LATCH(2)
4010h	0	ARR	Latch enable	UINT8	RO	No	-	Number of latch channels
	1		Latch channel 0	UINT8	RW	Poss.	-	Maps to LATCHENABLE(0)
	2		Latch channel 1		RW	Poss.	-	Maps to LATCHENABLE(1)
	3		Latch channel 2		RW	Poss.	-	Maps to LATCHENABLE(2)
	4		Latch channel 3		RW	Poss.	-	Maps to LATCHENABLE(3)
4011h	0	ARR	Latch inhibit time	UINT8	RO	No	-	Number of latch channels
	1		Latch channel 0	INT32	RW	No	ms	Maps to LATCHINHIBITTIME(0)
	2		Latch channel 1		RW	No	ms	Maps to LATCHINHIBITTIME(1)
	3		Latch channel 2		RW	No	ms	Maps to LATCHINHIBITTIME(2)
	4		Latch channel 3		RW	No	ms	Maps to LATCHINHIBITTIME(3)
4012h	0	ARR	Latch inhibit value	UINT8	RO	No	-	Number of latch channels
	1		Latch channel 0	INT32	RW	No	-	Maps to LATCHINHIBITVALUE(0)
	2		Latch channel 1		RW	No	-	Maps to LATCHINHIBITVALUE(1)
	3		Latch channel 2		RW	No	-	Maps to LATCHINHIBITVALUE(2)
	4		Latch channel 3		RW	No	-	Maps to LATCHINHIBITVALUE(3)
4013h	0	ARR	Latch mode	UINT8	RO	No	-	Number of latch channels
	1		Latch channel 0	INT16	RW	No	-	Maps to LATCHMODE(0)
	2		Latch channel 1		RW	No	-	Maps to LATCHMODE(1)
	3		Latch channel 2		RW	No	-	Maps to LATCHMODE(2)
	4		Latch channel 3		RW	No	-	Maps to LATCHMODE(3)
4014h	0	ARR	Latch source	UINT8	RO	No	-	Number of latch channels
	1		Latch channel 0	INT16	RW	No	-	Maps to LATCHSOURCE(0)
	2		Latch channel 1		RW	No	-	Maps to LATCHSOURCE(1)
	3		Latch channel 2		RW	No	-	Maps to LATCHSOURCE(2)
	4		Latch channel 3		RW	No	-	Maps to LATCHSOURCE(3)
4015h	0	ARR	Latch source channel	UINT8	RO	No	-	Number of latch channels
	1		Latch channel 0	INT16	RW	No	-	Maps to LATCHSOURCECHANNEL(0)
	2		Latch channel 1		RW	No	-	Maps to LATCHSOURCECHANNEL(1)
	3		Latch channel 2		RW	No	-	Maps to LATCHSOURCECHANNEL(2)
	4		Latch channel 3		RW	No	-	Maps to LATCHSOURCECHANNEL(3)
4016h	0	ARR	Latch trigger channel	UINT8	RO	No	-	Number of latch channels
	1		Latch channel 0	INT16	RW	No	-	Maps to LATCHTRIGGERCHANNEL(0)
	2		Latch channel 1		RW	No	-	Maps to LATCHTRIGGERCHANNEL(1)
	3		Latch channel 2		RW	No	-	Maps to LATCHTRIGGERCHANNEL(2)
	4		Latch channel 3		RW	No	-	Maps to LATCHTRIGGERCHANNEL(3)

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
4017h	0	ARR	Latch trigger edge	UINT8	RO	No	-	Number of latch channels
	1		Latch channel 0	INT16	RW	No	-	Maps to LATCHTRIGGEREDGE(0)
	2		Latch channel 1		RW	No	-	Maps to LATCHTRIGGEREDGE(1)
	3		Latch channel 2		RW	No	-	Maps to LATCHTRIGGEREDGE(2)
	4		Latch channel 3		RW	No	-	Maps to LATCHTRIGGEREDGE(3)
4018h	0	ARR	Latch trigger mode	UINT8	RO	No	-	Number of latch channels
	1		Latch channel 0	INT16	RW	No	-	Maps to LATCHTRIGGERMODE(0)
	2		Latch channel 1		RW	No	-	Maps to LATCHTRIGGERMODE(1)
	3		Latch channel 2		RW	No	-	Maps to LATCHTRIGGERMODE(2)
	4		Latch channel 3		RW	No	-	Maps to LATCHTRIGGERMODE(3)
4019h	0	ARR	Latch value	UINT8	RO	No	-	Number of latch channels
	1		Latch channel 0	INT32	RO	Poss.	-	Maps to LATCHVALUE(0)
	2		Latch channel 1		RO	Poss.	-	Maps to LATCHVALUE(1)
	3		Latch channel 2		RO	Poss.	-	Maps to LATCHVALUE(2)
	4		Latch channel 3		RO	Poss.	-	Maps to LATCHVALUE(3)
401Ah	0	ARR	Latch state	UINT8	RO	No	-	Number of latch channels
	1		Latch channel 0	UINT8	RO	Poss.	-	Internal only
	2		Latch channel 1		RO	Poss.	-	Internal only
	3		Latch channel 2		RO	Poss.	-	Internal only
	4		Latch channel 3		RO	Poss.	-	Internal only
	2		Channel 1 (Step & Dir. inputs)		RW	No	0.01%	Maps to ABSENCODERSINGAIN(1)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	0.01%	Maps to ABSENCODERSINGAIN(2)
4020h	0	ARR	Digital inputs	UINT8	RO	No	-	Number of digital input banks
	1		Bank 0	UINT32	RO	Possible	-	Maps to INSTATE(0)
4021h	0	ARR	Digital outputs	UINT8	RO	No	-	Number of digital output banks
	1		Bank 0	UINT32	RW	Possible	-	Maps to OUT(0)
4022h	0	ARR	Analog inputs	UINT8	RO	No	-	Number of analog inputs
	1		Channel 0	INT16	RO	Possible	-	Maps to ADC(0)
	2		Channel 1		RO	Possible	-	Maps to ADC(1)
4023h	0	ARR	Analog output	UINT8	RO	No	-	Number of analog outputs
	1		Channel 0	INT16	RW	Possible	-	Maps to DAC(0)
4024h	0	ARR	Analog input gain	UINT8	RO	No		Number of analog inputs
	1		Channel 0	INT16	RW	No	0.1 % units	Maps to ADCGAIN(0)
	2		Channel 1		RW	No	0.1 % units	Maps to ADCGAIN(1)
4025h	0	ARR	Analog input offset	UINT8	RO	No	-	Number of analog inputs
	1		Channel 0	INT16	RW	No	%	Maps to ADCOFFSET(0)
	2		Channel 1		RW	No	%	Maps to ADCOFFSET(1)
4026h	0	ARR	Analog input LPF time constant	UINT8	RO	No	-	Number of analog inputs
	1		Channel 0	UINT32	RW	No	µs	Maps to ADCTIMECONSTANT(0)
	2		Channel 1		RW	No	µs	Maps to ADCTIMECONSTANT(1)
4027h	0	ARR	Analog input dead band	UINT8	RO	No	-	Number of analog inputs
	1		Channel 0	INT16	RW	No	%	Maps to ADCDEADBAND(0)
	2		Channel 1		RW	No	%	Maps to ADCDEADBAND(1)

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
4028h	0	ARR	Analog input dead band hysteresis	UINT8	RO	No	-	Number of analog inputs
	1		Channel 0	INT16	RW	No	%	Maps to ADCDEADBANDHYSTERESIS(0)
	2		Channel 1		RW	No	%	Maps to ADCDEADBANDHYSTERESIS(1)
4029h	0	ARR	Analog input dead band offset	UINT8	RO	No	-	Number of analog inputs
	1		Channel 0	INT16	RW	No	%	Maps to ADCDEADBANDOFFSET(0)
	2		Channel 1		RW	No	%	Maps to ADCDEADBANDOFFSET(1)
402Ah	0	ARR	Analog output offset	UINT8	RO	No	-	Number of analog outputs
	1		Channel 0	INT16	RW	No	%	Maps to DACOFFSET(0)
402Bh	0	ARR	Digital output mask	UINT8	RO	No	-	Digital output mask
	1		Digital output mask 0	UINT32	RO	No	-	Indicates which outputs are in use by special purpose functions (e.g. GLOBALERROROUTPUT). If an output is set in this mask it cannot be set by other means, e.g. OUT (object 4021h).
402Ch	0	ARR	Analog input mode	UINT8	RO	No	-	Number of analog inputs
	1		Channel 0	INT16	RW	No	%	Maps to ADCMODE(0)
	2		Channel 1		RW	No	%	Maps to ADCMODE(1)
4034h	0	ARR	Abs Encoder position	UINT8	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RO	Possible	counts	Maps to ABSENCODER(0)
	2		Channel 1 (Step & Direction inputs)		RO	Possible	counts	Maps to ABSENCODER(1)
	3		Channel 2 (Extra / master incremental encoder)		RO	Possible	counts	Maps to ABSENCODER(2)
4035h	0	ARR	Abs Encoder Turns	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RW	No	turns	Maps to ABSENCODERTURNS(0)
	2		Channel 1 (Step & Direction inputs)		RW	No	turns	Maps to ABSENCODERTURNS(1)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	turns	Maps to ABSENCODERTURNS(2)
4036h	0	ARR	ENC_EncoderCycleSize_AI32	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RW	No	cycles/rev	Maps to ENCODERCYCLESIZE(0)
	2		Channel 1 (Step & Direction inputs)		RW	No	cycles/rev	Maps to ENCODERCYCLESIZE(1)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	cycles/rev	Maps to ENCODERCYCLESIZE(2)
4037h	0	ARR	ENC_EncoderPreScale_AI32	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RW	No	-	Maps to ENCODERPRESCALE(0)
	2		Channel 1 (Step & Direction inputs)		RW	No	-	Maps to ENCODERPRESCALE(1)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	-	Maps to ENCODERPRESCALE(2)
403Ah	0	ARR	DOP_CompareEnable_ABOOL	ARRAY	RO	No		
	1		CompareEnable_Channel0_BOOL	BOOL	RW	No		
403Bh	0	VAR	SYS_DriveID_VS	VIS. STRING	RW	No		
403Ch	0	ARR	ENC_AbsEncoderCosOffset_AI16	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT16	RW	No	mV	Maps to ABSENCODERCOSOFFSET(0)
	2		Channel 1 (Step & Direction inputs)		RW	No	mV	Maps to ABSENCODERCOSOFFSET(1)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	mV	Maps to ABSENCODERCOSOFFSET(2)

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
403Dh	0	ARR	ENC_AbsEncoderSinGain_AI16	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT16	RW	No	0.01%	Maps to ABSENCODERSINGAIN(0)
	2		Channel 1 (Step & Direction inputs)		RW	No	0.01%	Maps to ABSENCODERSINGAIN(1)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	0.01%	Maps to ABSENCODERSINGAIN(2)
403Eh	0	ARR	ENC_AbsEncoderSinOffset_AI16	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT16	RW	No	mV	Maps to ABSENCODERSINOFFSET(0)
	2		Channel 1 (Step & Dir. inputs)		RW	No	mV	Maps to ABSENCODERSINOFFSET(1)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	mV	Maps to ABSENCODERSINOFFSET(2)
403Fh	0	ARR	ENC_EncoderOffset_AR32	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	REAL32	RW	No	user units	Maps to ENCODEROFFSET(0)
	2		Channel 1 (Step & Dir. inputs)		RW	No	user units	Maps to ENCODEROFFSET(1)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	user units	Maps to ENCODEROFFSET(2)
4040h	0	ARR	ENC_EncParamPostAlignment_AI32	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RW	No	bits	Maps to ENCODERPARAMETER(0,0)
	2		Channel 1 (Step & Dir. inputs)		RW	No	bits	Maps to ENCODERPARAMETER(1,0)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	bits	Maps to ENCODERPARAMETER(2,0)
4041h	0	ARR	ENC_EncParamPreAlignment_AI32	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RW	No	bits	Maps to ENCODERPARAMETER(0,1)
	2		Channel 1 (Step & Dir. inputs)		RW	No	bits	Maps to ENCODERPARAMETER(1,1)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	bits	Maps to ENCODERPARAMETER(2,1)
4042h	0	ARR	ENC_EncParamCRCBits_AI32	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RW	No	bits	Maps to ENCODERPARAMETER(0,2)
	2		Channel 1 (Step & Dir. inputs)		RW	No	bits	Maps to ENCODERPARAMETER(1,2)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	bits	Maps to ENCODERPARAMETER(2,2)
4043h	0	ARR	ENC_EncParamGreyCode_AI32	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RW	No	-	Maps to ENCODERPARAMETER(0,3)
	2		Channel 1 (Step & Dir. inputs)		RW	No	-	Maps to ENCODERPARAMETER(1,3)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	-	Maps to ENCODERPARAMETER(2,3)
4044h	0	ARR	ENC_EncParamSSILowRes_AI32	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RW	No	-	Maps to ENCODERPARAMETER(0,4)
	2		Channel 1 (Step & Dir. inputs)		RW	No	-	Maps to ENCODERPARAMETER(1,4)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	-	Maps to ENCODERPARAMETER(2,4)

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
4045h	0	ARR	ENC_EncParamEnDat2_2Cmd_AI32	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RW	No	-	Maps to ENCODERPARAMETER(0,5)
	2		Channel 1 (Step & Dir. inputs)		RW	No	-	Maps to ENCODERPARAMETER(1,5)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	-	Maps to ENCODERPARAMETER(2,5)
4046h	0	ARR	ENC_EncParamSSIClockFreq_AI32	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RW	No	kHz	Maps to ENCODERPARAMETER(0,6)
	2		Channel 1 (Step & Dir. inputs)		RW	No	kHz	Maps to ENCODERPARAMETER(1,6)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	kHz	Maps to ENCODERPARAMETER(2,6)
4047h	0	ARR	ENC_EncParamSSIReadInterval_AI32	ARRAY	RO	No	-	Number of encoder inputs
	1		Channel 0 (Main encoder)	INT32	RW	No	Number of 62.5 µs intervals	Maps to ENCODERPARAMETER(0,7)
	2		Channel 1 (Step & Dir. inputs)		RW	No	-	Maps to ENCODERPARAMETER(1,7)
	3		Channel 2 (Extra / master incremental encoder)		RW	No	-	Maps to ENCODERPARAMETER(2,7)
4048h	0	ARR	AOP_DACLimitMax_AI16	ARRAY	RO	No	-	Number of analog outputs
	1		Channel 0	INT16	RW	No	%	Maps to DACLIMITMAX(0)
4049h	0	ARR	AOP_DACMode_AU16	ARRAY	RO	No	-	Number of analog outputs
	1		AOP_DACMode_AU16	UINT16	RW	No	-	Maps to DACMODE(0)
404Ah	0	ARR	AIP_InputDebounce_AI16	ARRAY	RO	No	-	Number of input banks
	1		InputDebounce_Bank0_I16	INT16	RW	No	-	Maps to INPUTDEBOUNCE(0)
404Dh	0	VAR	SYS_GlobalErrorOutput_I16	INT16	RW	No	-	Maps to GLOBALERROROUTPUT
404Eh	0	ARR	ENC_EncParamSSIClockStartDelay_AI32	ARRAY	RW	No	-	Encoder parameter: SSI clock start delay
	1		Channel 0 (Main encoder)	INT32	RW	No	No. of clock periods	Maps to ENCODERPARAMETER(0,8)
	2		Channel 1 (Step & Dir. inputs)		RW	No		(Not required)
	3		Channel 2 (Extra / master incremental encoder)		RW	No		(Not required)
4050h	0	VAR	AX0_SentinelAction_I16	INT16	RW	No	-	Maps to SENTINELACTION
4051h	0	VAR	AX0_SentinelActionMode_I16	INT16	RW	No	-	Maps to SENTINELACTIONMODE
4052h	0	VAR	AX0_SentinelActionParameter_I16	INT16	RW	No	-	Maps to SENTINELACTIONPARAMETER
4053h	0	VAR	AX0_SentinelPeriod_I32	INT32	RW	No	µs	Maps to SENTINELPERIOD
4054h	0	VAR	AX0_SentinelSource_I16	INT16	RW	No	-	Maps to SENTINELSOURCE
4055h	0	VAR	AX0_SentinelSource2_I16	INT16	RW	No	-	Maps to SENTINELSOURCE2
4056h	0	VAR	AX0_SentinelSource2Parameter_I16	INT16	RW	No	-	Maps to SENTINELSOURCE2PARAMETER
4057h	0	VAR	AX0_SentinelSourceParameter_I16	INT16	RW	No	-	Maps to SENTINELSOURCEPARAMETER
4059h	0	VAR	AX0_SentinelTriggerAbsolute_BOOL	BOOL	RW	No	-	Maps to SENTINELTRIGGERABSOLUTE
405Ah	0	VAR	AX0_SentinelTriggerMode_I16	INT16	RW	No	-	Maps to SENTINETRIGGERMODE
405Bh	0	VAR	AX0_SentinelTriggerLowValueFloat_R32	REAL32	RW	No	-	Maps to SENTINELTRIGGERVALUEFLOAT

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
405Ch	0	VAR	AX0_SentinelTriggerHighValueFloat_R32	REAL32	RW	No	-	Maps to SENTINELTRIGGERVALUEFLOAT
405Dh	0	VAR	AX0_SentinelTriggerLowValueInteger_I32	INT32	RW	No	-	Maps to SENTINELTRIGGERVALUEINTEGER
405Eh	0	VAR	AX0_SentinelTriggerHighValueInteger_I32	INT32	RW	No	-	Maps to SENTINELTRIGGERVALUEINTEGER
4060h	0	ARR	ENC_EncoderFilterDepth_AI16	ARRAY	RW	No	-	Encoder filter depth
	1		Channel 0 (Main encoder)	INT16	RW	No	Number of samples	Maps to ENCODERFILTERDEPTH(0)
	2		Channel 1 (Step & Direction inputs)		RW	No		Maps to ENCODERFILTERDEPTH(1)
	3		Channel 2 (Master incremental encoder)		RW	No		Maps to ENCODERFILTERDEPTH(2)
4061h	0	ARR	ENC_EncoderFilterType_AI16	ARRAY	RW	No	-	Encoder filter type
	1		Channel 0 (Main encoder)	INT16	RW	No	-	Maps to ENCODERFILTERTYPE(0)
	2		Channel 1 (Step & Direction inputs)		RW	No	-	Maps to ENCODERFILTERTYPE(1)
	3		Channel 2 (Master incremental encoder)		RW	No	-	Maps to ENCODERFILTERTYPE(2)
4062h	0	ARR	ENC_EncoderWrap_AR32	ARRAY	RW	No	-	Encoder filter type
	1		Channel 0 (Main encoder)	REAL32	RW	No	-	Maps to ENCODERWRAP(0)
	2		Channel 1 (Step & Direction inputs)		RW	No	-	Maps to ENCODERWRAP(1)
	3		Channel 2 (Master incremental encoder)		RW	No	-	Maps to ENCODERWRAP(2)
4063h	0	ARR	ENC_EncParamExcitationFreq_AI32	ARRAY	RW	No	-	Encoder parameter: resolver excitation frequency (for MotiFlex e180 option FB-03)
	1		Channel 0 (Main encoder)	INT32	RW	No	Hz (increments of 250)	Maps to ENCODERPARAMETER(0,9)
	2		Channel 1 (Step & Direction inputs)		RW	No		(Not required)
	3		Channel 2 (Master incremental encoder)		RW	No		(Not required)
4064h	0	ARR	ENC_EncParamFaultRegister_AI32	ARRAY	RO	No	-	Encoder parameter: fault register (for MotiFlex e180 options FB-03 & FB-04)
	1		Channel 0 (Main encoder)	INT32	RO	No	-	Maps to ENCODERPARAMETER(0,10)
	2		Channel 1 (Step & Direction inputs)		RO	No		(Not required)
	3		Channel 2 (Master incremental encoder)		RO	No		(Not required)
4065h	0	ARR	ENC_EncParamFaultRegisterDisable_AI32	ARRAY	RW	No	-	Encoder parameter: fault register disable (for MotiFlex e180 options FB-03 & FB-04)
	1		Channel 0 (Main encoder)	INT32	RW	No	-	Maps to ENCODERPARAMETER(0,11)
	2		Channel 1 (Step & Direction inputs)		RW	No		(Not required)
	3		Channel 2 (Master incremental encoder)		RW	No		(Not required)
4066h	0	ARR	ENC_EncoderScale_AR32	ARRAY	RO	No	-	Encoder scale
	1		Channel 0 (Main encoder)	REAL32	RW	Poss.	User units	Maps to ENCODERSCALE(0)
	2		Channel 1 (Step & Dir. inputs)		RW	Poss.	User units	Maps to ENCODERSCALE(1)
	3		Channel 2 (Master incremental encoder)		RW	Poss.	User units	Maps to ENCODERSCALE(2)

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
4067h	0	ARR	ENC_AbsEncoderCosOffset_AI16	ARRAY	RO	No	-	Encoder scale
	1		Channel 0 (Main encoder)	INT16	RW	No	mV	Maps to ABSENCODERCOSOFFSET(0)
	2		Channel 1 (Step & Direction inputs)		RW	No	-	(Not required)
	3		Channel 2 (Master incremental encoder)		RW	No	-	(Not required)
4068h	0	ARR	ENC_AbsEncoderSinGain_AI16	ARRAY	RO	No	-	Encoder scale
	1		Channel 0 (Main encoder)	INT16	RW	No	0.01%	Maps to ABSENCODERSINGAIN(0)
	2		Channel 1 (Step & Direction inputs)		RW	No	-	(Not required)
	3		Channel 2 (Master incremental encoder)		RW	No	-	(Not required)
4100h	0	REC	Serial port	UINT8	RW	No	-	Serial port configuration (MicroFlex e150 only)
	1		Enabled	BOOL	RW	No	-	
	2		InterfaceID	UINT32	RW	No	-	
	3		Protocol		RW	No	-	
	4		Baud		RW	No	-	
	5		DataBits		RW	No	-	
	6		Parity		RW	No	-	
	7		StopBits		RW	No	-	
	8		Handshake		RW	No	-	
	9		WireMode		RW	No	-	
4110h	0	REC	NIC_Ipv4Address_0h_REC	UINT8	RO	No	-	Ethernet connection details
	1		DhcpEnabled_BOOL	BOOL	RW	No	-	Enable / disable DHCP
	2		Address_IPV4	UINT32	RW	No	-	IP address
	3		Mask_IPV4		RW	No	-	Subnet mask
	4		Gateway_IPV4		RW	No	-	Gateway IP address
4111h	0	REC	NIC_Ipv4Address_1h_REC	UINT8	RO	No	-	Ethernet connection details
	1		DhcpEnabled_BOOL	BOOL	RW	No	-	Enable / disable DHCP
	2		Address_IPV4	UINT32	RW	No	-	IP address
	3		Mask_IPV4		RW	No	-	Subnet mask
	4		Gateway_IPV4		RW	No	-	Gateway IP address
4120h	0	REC	NIC_Configuration_REC	UINT8	RO	No	-	Ethernet connection details
	1		GatewayOfInterface_U8	UINT8	RW	No	-	Internal
4121h	0	REC	MOD_ModbusTcp_REC	REC	RO	No	-	Internal
	1		Enabled_BOOL	BOOL	RW	No	-	Internal
	2		Port_U16	UINT16	RW	No	-	Internal
	3		ByteSwap_BOOL	BOOL	RW	No	-	Internal
	4		WordSwap_BOOL	BOOL	RW	No	-	Internal
4122h	0	REC	MOD_ModbusRtu_REC	REC	RO	No	-	Internal
	1		NodeAddress_U8	UINT8	RW	No	-	Internal
	2		ByteSwap_BOOL	BOOL	RW	No	-	Internal
	3		WordSwap_BOOL	BOOL	RW	No	-	Internal
	4		RxTimeoutFactor_R32	REAL32	RW	No	-	Internal
4123h	0	REC	HCP_Settings_REC	REC	RO	No	-	Internal
	1		NumberFormat_U32	UINT32	RW	No	-	Internal
	2		NodeIDv1_U8	UINT8	RW	No	-	Internal
	3		NodeIDv2_U8	UINT8	RW	No	-	Internal
4124h	0	REC	USB_UsbPort_0h_REC	REC	RO	No	-	Internal
	1		NodeID_U8	UINT8	RW	No	-	Internal

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
412Eh	0	VAR	CIP_EipEnabled_BOOL	BOOL	RW	No	-	Internal
412Fh	0	ARR	CIP_AssemblyInstance_AU8	ARRAY	RO		-	Internal
	1		AssemblyInstance_U8	UINT8	RO	No	-	Internal
	2		AssemblyInstance_U8		RO	No	-	Internal
4130h	0	ARR	CIP_Assembly_0h_AU32	ARRAY	RW	No	-	Internal
	1		EPath_U32	UINT32	RW	No	-	Internal
	2		EPath_U32		RW	No	-	Internal
	3		EPath_U32		RW	no	-	Internal
	...							
	32		EPath_U32		RW	No	-	Internal
4131h	0	ARR	CIP_Assembly_1h_AU32	ARRAY	RW	No	-	Internal
	1		EPath_U32	UINT32	RW	No	-	Internal
	2		EPath_U32		RW	No	-	Internal
	3		EPath_U32		RW	no	-	Internal
	...							
	32		EPath_U32		RW	No	-	Internal
4140h	0	REC	MVM_CycleSetup_REC	REC	RO	No	-	Internal
	1		CycleTime_U32	UINT32	RW	No	-	Internal
	2		CycleCount_U32		RW	No	-	Internal
	3		CycleLoad_U32		RW	No	-	Internal
	4		ExceedOffset_U32		RW	No	-	Internal
4141h	0	REC	MVM_EthTerminal_REC	REC	RO	No	-	Internal
	1		Enabled_BOOL	BOOL	RW	No	-	Internal
	2		Port_U16	UINT16	RW	No	-	Internal
4142h	0	VAR	EPL_SdoUdpEnabled_BOOL	BOOL	RW	No	-	Internal
4143h	0	REC	MVM_Control_REC	REC	RO	No	-	Internal
	1		MVM_Control_REC.Running_BOOL	BOOL	RO	No	-	Internal
4144h	0	REC	MML_FirstError_REC	REC	RO	No	-	Internal
	1		MML_FirstError_REC.Code_I32	UINT32	RO	No	-	Internal
	2		MML_FirstError_REC.Group_VS	VIS. STRING	RO	No	-	Internal
	3		MML_FirstError_REC.Text.VS	VIS. STRING	RO	No	-	Internal
	4		MML_FirstError_REC.Data.OSTR	OCTET_STRING	RO	No	-	Internal
	5		MML_FirstError_REC.Line_I32	INT32	RO	No	-	Internal
	6		MML_FirstError_REC.ParamFamily_I16	INT32	RO	No	-	Internal
	7		MML_FirstError_REC.ParamIndex_I16	INT32	RO	No	-	Internal
4150h	0	ARR	MTC_ServerAddress_AU32	ARRAY	RO	No	-	Internal
	1		MTC_ServerDeviceType_AU32[1]	UINT32	RW	No	-	Internal
	2		MTC_ServerDeviceType_AU32[2]		RW	No	-	Internal
	3		MTC_ServerDeviceType_AU32[3]		RW	No	-	Internal
	4		MTC_ServerDeviceType_AU32[4]		RW	No	-	Internal
	5		MTC_ServerDeviceType_AU32[5]		RW	No	-	Internal
	6		MTC_ServerDeviceType_AU32[6]		RW	No	-	Internal
	7		MTC_ServerDeviceType_AU32[7]		RW	No	-	Internal
	8		MTC_ServerDeviceType_AU32[8]		RW	No	-	Internal

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
4151h	0	ARR	MTC_ServerAddress_AIPAD	ARRAY	RO	No	-	Internal
	1		MTC_ServerAddress_AIPAD[1]	UINT32	RW	No	-	Internal
	2		MTC_ServerAddress_AIPAD[2]		RW	No	-	Internal
	3		MTC_ServerAddress_AIPAD[3]		RW	No	-	Internal
	4		MTC_ServerAddress_AIPAD[4]		RW	No	-	Internal
	5		MTC_ServerAddress_AIPAD[5]		RW	No	-	Internal
	6		MTC_ServerAddress_AIPAD[6]		RW	No	-	Internal
	7		MTC_ServerAddress_AIPAD[7]		RW	No	-	Internal
	8		MTC_ServerAddress_AIPAD[8]		RW	No	-	Internal
4152h	0	ARR	MTC_ServerPort_AU16	ARRAY	RO	No	-	Internal
	1		MTC_ServerPort_AU16[1]	UINT16	RW	No	-	Internal
	2		MTC_ServerPort_AU16[2]		RW	No	-	Internal
	3		MTC_ServerPort_AU16[3]		RW	No	-	Internal
	4		MTC_ServerPort_AU16[4]		RW	No	-	Internal
	5		MTC_ServerPort_AU16[5]		RW	No	-	Internal
	6		MTC_ServerPort_AU16[6]		RW	No	-	Internal
	7		MTC_ServerPort_AU16[7]		RW	No	-	Internal
	8		MTC_ServerPort_AU16[8]		RW	No	-	Internal
4153h	0	ARR	MTC_ServerByteSwap_ABOOL	ARRAY	RO	No	-	Internal
	1		MTC_ServerByteSwap_ABOOL[1]	BOOL	RW	No	-	Internal
	2		MTC_ServerByteSwap_ABOOL[2]		RW	No	-	Internal
	3		MTC_ServerByteSwap_ABOOL[3]		RW	No	-	Internal
	4		MTC_ServerByteSwap_ABOOL[4]		RW	No	-	Internal
	5		MTC_ServerByteSwap_ABOOL[5]		RW	No	-	Internal
	6		MTC_ServerByteSwap_ABOOL[6]		RW	No	-	Internal
	7		MTC_ServerByteSwap_ABOOL[7]		RW	No	-	Internal
	8		MTC_ServerByteSwap_ABOOL[8]		RW	No	-	Internal
4154h	0	ARR	MTC_ServerWordSwap_ABOOL	ARRAY	RO	No	-	Internal
	1		MTC_ServerWordSwap_ABOOL[1]	BOOL	RW	No	-	Internal
	2		MTC_ServerWordSwap_ABOOL[2]		RW	No	-	Internal
	3		MTC_ServerWordSwap_ABOOL[3]		RW	No	-	Internal
	4		MTC_ServerWordSwap_ABOOL[4]		RW	No	-	Internal
	5		MTC_ServerWordSwap_ABOOL[5]		RW	No	-	Internal
	6		MTC_ServerWordSwap_ABOOL[6]		RW	No	-	Internal
	7		MTC_ServerWordSwap_ABOOL[7]		RW	No	-	Internal
	8		MTC_ServerWordSwap_ABOOL[8]		RW	No	-	Internal

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
4155h	0	ARR	MTC_ServerTimeout_AU32	ARRAY	RO	No	-	Internal
	1		MTC_ServerTimeout_AU32[1]	UINT32	RW	No	-	Internal
	2		MTC_ServerTimeout_AU32[2]		RW	No	-	Internal
	3		MTC_ServerTimeout_AU32[3]		RW	No	-	Internal
	4		MTC_ServerTimeout_AU32[4]		RW	No	-	Internal
	5		MTC_ServerTimeout_AU32[5]		RW	No	-	Internal
	6		MTC_ServerTimeout_AU32[6]		RW	No	-	Internal
	7		MTC_ServerTimeout_AU32[7]		RW	No	-	Internal
	8		MTC_ServerTimeout_AU32[8]		RW	No	-	Internal
4156h	0	ARR	MTC_ReadFunction_AU8	ARRAY	RO	No	-	Internal
	1		MTC_ReadFunction_AU8[1]	UINT8	RW	No	-	Internal
	2		MTC_ReadFunction_AU8[2]		RW	No	-	Internal
	3		MTC_ReadFunction_AU8[3]		RW	No	-	Internal
	4		MTC_ReadFunction_AU8[4]		RW	No	-	Internal
	5		MTC_ReadFunction_AU8[5]		RW	No	-	Internal
	6		MTC_ReadFunction_AU8[6]		RW	No	-	Internal
	7		MTC_ReadFunction_AU8[7]		RW	No	-	Internal
	8		MTC_ReadFunction_AU8[8]		RW	No	-	Internal
4157h	0	ARR	MTC_WriteFunction_AU8	ARRAY	RO	No	-	Internal
	1		MTC_WriteFunction_AU8[1]	UINT8	RW	No	-	Internal
	2		MTC_WriteFunction_AU8[2]		RW	No	-	Internal
	3		MTC_WriteFunction_AU8[3]		RW	No	-	Internal
	4		MTC_WriteFunction_AU8[4]		RW	No	-	Internal
	5		MTC_WriteFunction_AU8[5]		RW	No	-	Internal
	6		MTC_WriteFunction_AU8[6]		RW	No	-	Internal
	7		MTC_WriteFunction_AU8[7]		RW	No	-	Internal
	8		MTC_WriteFunction_AU8[8]		RW	No	-	Internal
4160h	0	VAR	NIC_NatEnabled_BOOL	BOOL	RW	No	-	Internal
4161h	0	REC	NIC_RtStatistic_REC	REC	RO	No	-	Internal
	1		NIC_RtStatistic.IllegalChecksum_U32	UINT32	RW	No	-	Internal
	2		NIC_RtStatistic.NatSource_U32		RW	No	-	Internal
	3		NIC_RtStatistic.NatDestination_U32		RW	No	-	Internal
	4		NIC_RtStatistic.TcpChecksum_U32		RW	No	-	Internal
	5		NIC_RtStatistic.UdpChecksum_U32		RW	No	-	Internal
	6		NIC_RtStatistic.ArpProxy		RW	No	-	Internal
4162h	0	REC	NIC_Lldp_REC	REC	RO	No	-	Internal
	1		NIC_Lldp_REC.Enabled_BOOL	BOOL	RW	No	-	Internal
4163h	0	REC	NIC_Profinet_REC	REC	RO	No	-	Internal
	1		NIC_Profinet_REC.Enabled_BOOL	BOOL	RW	No	-	Internal

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
4D00h	0	REC	NIC_NatTable_00h_REC	REC	RO	No	-	Internal
	1		NIC_NatTable_00h_REC.GenAddress_IPV4	UINT32	RW	No	-	Internal
	2		NIC_NatTable_00h_REC.RteAddress_IPV4	UINT32	RW	No	-	Internal
	3		NIC_NatTable_00h_REC.Mask_IPV4	UINT32	RW	No	-	Internal
	4		NIC_NatTable_00h_REC.Valid_BOOL	BOOL	RW	No	-	Internal
4D01h	0	REC	NIC_NatTable_01h_REC	REC	RO	No	-	Internal
	1		NIC_NatTable_01h_REC.GenAddress_IPV4	UINT32	RW	No	-	Internal
	2		NIC_NatTable_01h_REC.RteAddress_IPV4	UINT32	RW	No	-	Internal
	3		NIC_NatTable_01h_REC.Mask_IPV4	UINT32	RW	No	-	Internal
	4		NIC_NatTable_01h_REC.Valid_BOOL	BOOL	RW	No	-	Internal
4D0xh	0	REC	NIC_NatTable_xxh_REC	REC	RO	No	-	(Identical NIC_NatTable objects exist in 4D02h - 4D1Fh)

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
5000h	0	VAR	AX0_Config_I16	INT16	RW	No	-	Internal
5001h	0	REC	AX0_ControlRate_REC	REC	RO	No	-	Control loop frequencies
	1		ProfilerRate_U32	UINT32	RW	No	Hz	Maps to CONTROLRATE(0,0
	2		PositionLoopRate_U32		RW	No	Hz	Maps to CONTROLRATE(0,1)
	3		VelocityLoopRate_U32		RW	No	Hz	Maps to CONTROLRATE(0,2)
5002h	0	VAR	DRV_ControlRefSource_I16	INT16	RW	Poss.	-	Maps to CONTROLREFSOURCE
5003h	0	VAR	AX0_AxisPosEncoder_I16	INT16	RW	No	-	Maps to AXISPOSENCODER
5004h	0	VAR	AX0_AxisVelEncoder_I16	INT16	RW	No	-	Maps to AXISVELENCODER
5005h	0	VAR	AX0_IdleMode_U16	UINT16	RW	No	-	Maps to IDLEMODE
5006h	0	VAR	AX0_IdleVel_U32	UINT32	RW	No	vel units	Maps to IDLELEVEL
5008h	0	VAR	AX0_HomeCreepSpeed_U32	UINT32	RW	No	vel units	Maps to HOMECREEPSPEED
5009h	0	REC	AX0_LoadParameters_REC	REC			-	Number of load parameters
	1		LoadInertia_R32	REAL32	RW	No	kg/m2 or kg	Maps to LOADDAMPING
	2		LoadDamping_R32		RW	No	Nm/rad /s or N/m/s	Maps to LOADINERTIA
500Ah	0	REC	AX0_TorqueFilter_0_REC	REC			-	Number of torque filter 0 parameters
	1		TorqueFilterType_I16	INT16	RW	No	-	Maps to TORQUEFILTERTYPE(0, 0)
	2		TorqueFilterFreq_U16	UINT16	RW	No	Hz	Maps to TORQUEFILTERFREQ(0, 0)
	3		TorqueFilterBand_U16	UINT16	RW	No	Hz	Maps to TORQUEFILTERBAND(0, 0)
	4		TorqueFilterDepth_U16	UINT16	RW	No	0.1 % units	Maps to TORQUEFILTERDEPTH(0, 0)

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
500Bh	0	REC	AX0_TorqueFilter_1_REC	REC			-	Number of torque filter 1 parameters
	1		TorqueFilterType_I16	INT16	RW	No	-	Maps to TORQUEFILTERTYPE(0, 1)
	2		TorqueFilterFreq_U16	UINT16	RW	No	Hz	Maps to TORQUEFILTERFREQ(0, 1)
	3		TorqueFilterBand_U16	UINT16	RW	No	Hz	Maps to TORQUEFILTERBAND(0, 1)
	4		TorqueFilterDepth_U16	UINT16	RW	No	0.1 % units	Maps to TORQUEFILTERDEPTH(0, 1)
500Ch	0	VAR	AX0_ErrorInputMode_I16	INT16	RW	No	-	Maps to ERRORINPUTMODE
500Dh	0	VAR	AX0_FolErrorMode_I16	INT16	RW	No	-	Maps to FOLERRORMODE
500Eh	0	VAR	AX0_LimitMode_I16	INT16	RW	No	-	Maps to LIMITMODE
500Fh	0	VAR	AX0_SoftLimitMode_I16	INT16	RW	No	-	Maps to SOFTLIMITMODE
5011h	0	VAR	AX0_VelFatalMode_I16	INT16	RW	No	-	Maps to VELFATALMODE
5013h	0	ARR	AX0_HallTable_State0_AU16	ARRAY	RO	No	-	Number of Hall states
	1		HallTable_U16	UINT16	RW	No	Sextant	Maps to HALLTABLE(0,1)
	2		HallTable_U16		RW	No	Sextant	Maps to HALLTABLE(0,2)
	3		HallTable_U16		RW	No	Sextant	Maps to HALLTABLE(0,3)
	...							
	6		HallTable_U16		RW	No	Sextant	Maps to HALLTABLE(0,6)
5014h	0	ARR	AX0_HallForwardAngle_Sextant0_AI16	ARRAY	RO	No	-	Number of Hall states
	1		HallForwardAngle_I16	INT16	RW	No	1° units	Maps to HALLFORWARDANGLE(0,1)
	2		HallForwardAngle_I16		RW	No	1° units	Maps to HALLFORWARDANGLE(0,2)
	3		HallForwardAngle_I16		RW	No	1° units	Maps to HALLFORWARDANGLE(0,3)
	...							
	6		HallForwardAngle_I16		RW	No	1° units	Maps to HALLFORWARDANGLE(0,6)
5015h	0	ARR	AX0_HallReverseAngle_Sextant0_AI16	ARRAY	RO	No	-	Number of Hall states
	1		HallReverseAngle_I16	INT16	RW	No	1° units	Maps to HALLREVERSEANGLE(0,1)
	2		HallReverseAngle_I16		RW	No	1° units	Maps to HALLREVERSEANGLE(0,2)
	3		HallReverseAngle_I16		RW	No	1° units	Maps to HALLREVERSEANGLE(0,3)
	...							
	6		HallReverseAngle_I16		RW	No	1° units	Maps to HALLREVERSEANGLE(0,6)
5016h	0	REC	AX0_PhaseSearch_REC	REC	RO	No	-	-
	1		PhaseSearchMode_U16	UINT16	RW	No	-	Maps to PHASESEARCHMODE
	2		PhaseSearchBackoff_I16	INT16	RW	No		Maps to PHASESEARCHBACKOFF
	3		PhaseSearchBandwidth_I16	INT16	RW	No	Rad/s	Maps to PHASESEARCHBANDWIDTH
	4		PhaseSearchSpeed_I16	INT16	RW	No	-	Maps to PHASESEARCHSPEED
	6		PhaseSearchTravel_I16	INT16	RW	No		Maps to PHASESEARCHTRAVEL
	7		PhaseSearchCurrent_I16	INT16	RW	No	0.1 % units	Maps to PHASESEARCHCURRENT
5022h	0	VAR	AX0_TorqueLimitNeg_I16	INT16	RW	No	0.1 % units	Maps to TORQUELIMITNEG
5023h	0	VAR	AX0_TorqueLimitPos_I16	INT16	RW	No	0.1 % units	Maps to TORQUELIMITPOS
5027h	0	ARR	AX0_CurrentMeasX_AI32	ARRAY	RO	No	-	Number of current measurement channels
	1		Drive current	INT32	RO	Poss.	mA	Maps to CURRENTMEAS(0, 0)
502Bh	0	VAR	AX0_CompareOutput_I16	INT16	RW	No	-	Maps to COMPAREOUTPUT

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
502Ch	0	REC	AX0_ComparePos_AI32	ARRAY	RO	No	-	Number of position compare channels
	1		ComparePos_Channel0_I32	INT32	RW	No	pos units	Maps to COMPAREPOS(0, 0)
	2		ComparePos_Channel1_I32		RW	No	pos units	Maps to COMPAREPOS(0, 1)
502Eh	0	VAR	AX0_ControlModeStartup_U16	UINT16	RW	No	-	Maps to CONTROLMODESTARTUP
502Fh	0	VAR	AX0_ControlRefChannel_I16	INT16	RW	No	-	Maps to CONTROLREFCHANNEL
5030h	0	VAR	AX0_ControlRefSourceStartup_U16	UINT16	RW	No	-	Maps to CONTROLREFSOURCESTARTUP
5034h	0	VAR	AX0_HomeDecel_U32	UINT32	RW	No	acc units	Maps to HOMEDECEL
5037h	0	REC	AX0_FluxControlParameters_REC	REC	RO	No	-	Number of flux control parameters
	1		KFProp_R32	REAL32	RW	No	-	Maps to KFPROP
	2		KFInt_R32		RW	No	-	Maps to KFINT
5038h	0	VAR	AX0_MotorSpecNo_VS	VIS. STRING	RW	No	-	Maps to MOTORSPECNUMBER
5039h	0	VAR	AX0_MotorFeedbackOffset_I16	INT16	RW	No	1° units	Maps to MOTORFEEDBACKOFFSET
503Bh	0	VAR	AX0_AccelScaleFactor_R32	REAL32	RW	No	-	Maps to ACCELSCALEFACTOR
503Ch	0	VAR	AX0_AccelScaleUnits_VS	VIS. STRING	RW	No	-	Maps to ACCELSCALEUNITS
503Eh	0	VAR	AX0_ControlType_I16	INT16	RW	No	-	Maps to CONTROLTYPE
503Fh	0	VAR	AX0_DriveEnableInput_I16	INT16	RW	No	-	Maps to DRIVEENABLEINPUT
5042h	0	VAR	AX0_MotorStatorLeakageInd_R32	REAL32	RW	No	mH	Maps to MOTORSTATORLEAKAGEIND
5043h	0	VAR	AX0_MotorStatorRes_R32	REAL32	RW	No	ohms	Maps to MOTORSTATORRES
5044h	0	VAR	AX0_PosOffset_R32	REAL32	RW	No	-	Maps to POSOFFSET
5045h	0	VAR	AX0_PosScaleFactor_R32	REAL32	RW	No	-	Maps to POSSCALEFACTOR
5046h	0	VAR	AX0_PosScaleUnits_VS	VIS. STRING	RW	No	-	Maps to POSSCALEUNITS
5055h	0	VAR	AX0_TorqueCompMode_I16	INT16	RW	No	-	Maps to TORQUECOMPMODE
5056h	0	VAR	AX0_TorqueCompTable_I32	INT32	RW	No	-	Maps to TORQUECOMPTABLE
5057h	0	VAR	AX0_VelScaleFactor_R32	REAL32	RW	No	-	Maps to VELSCALEFACTOR
5058h	0	VAR	AX0_VelScaleUnits_VS	VIS. STRING	RW	No	-	Maps to VELSCALEUNITS
5059h	0	VAR	AX0_VFProfile_I16	INT16	RW	No	-	Maps to VFPROFILE
505Ah	0	VAR	AX0_VFThreePointFreq_R32	REAL32	RW	No	Hz	Maps to VFTHREEPOINTFREQ
505Bh	0	VAR	AX0_VFThreePointMode_I16	INT16	RW	No	-	Maps to VFPROFILE
505Ch	0	VAR	AX0_VFThreePointVolts_R32	REAL32	RW	No	%	Maps to VFTHREEPOINTVOLTS
505Dh	0	VAR	AX0_VoltageBoost_R32	REAL32	RW	No	%	Maps to VOLTAGEBOOST
505Eh	0	VAR	AX0_AbortMode_I16	INT16	RW	No	-	Maps to ABORTMODE
505Fh	0	VAR	AX0_StopMode_I16	INT16	RW	No	-	Maps to STOPMODE
5060h	0	VAR	AX0_ProfileMode_U16	UINT16	RW	No	-	Maps to PROFILEMODE
506Ah	0	VAR	AX0_TorqueRefErrorFallTime_R32	REAL32	RW	No	ms	\<p class="Base">Maps to TORQUEREFERRORFALLTIME
506Bh	0	VAR	AX0_TorqueRefFallTime_R32	REAL32	RW	No	ms	\<p class="Base">Maps to TORQUEREFFALLTIME
506Ch	0	VAR	AX0_TorqueRefRiseTime_R32	REAL32	RW	No	ms	\<p class="Base">Maps to TORQUEREFRISETIME
506Dh	0	VAR	AX0_TorqueRefScale_R32	REAL32	RW	No	-	\<p class="Base">Maps to TORQUEREFSCALE
5200h	0	VAR	AX1_Config_I16	INT16	RW	No	-	Maps to CONFIG

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
5201h	0	REC	AX1_ControlRate_REC	REC	RO	No	-	Control loop frequencies
	1		ProfilerRate_I32	INT32	RW	No	Hz	Maps to CONTROLRATE(1,0)
	2		PositionLoopRate_I32		RW	No	Hz	Maps to CONTROLRATE(1,1)
	3		VelocityLoopRate_I32		RW	No	Hz	Maps to CONTROLRATE(1,2)
5203h	0	VAR	AX1_AxisPosEncoder_I16	INT16	RW	No	-	Maps to AXISPOSENCODER
5204h	0	VAR	AX1_AxisVelEncoder_I16	INT16	RW	No	-	Maps to AXISVELENCODER

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
603Fh	0	VAR	AX0_ErrorCode_U16	UINT16	RW	Poss.	-	Internal. See Error detection
6040h	0	VAR	AX0_ControlWord_U16	UINT16	RW	Poss.	-	Internal
6041h	0	VAR	AX0_StatusWord_U16	UINT16	RO	Poss.	-	Internal
6060h	0	VAR	AX0_ModesOfOperation_I8	INT8	RW	Poss.	-	Internal
6061h	0	VAR	AX0_ModesOfOperationDisplay_I8	INT8	RO	Poss.	-	Internal
6062h	0	VAR	AX0_PositionDemandValue_I32	INT32	RO	Poss.	-	Internal
6064h	0	VAR	AX0_ActualPosition_I32	INT32	RO	Poss.	-	Internal
6065h	0	VAR	AX0_FolErrorFatal_R32	REAL32	RW	No	-	Maps to FOLERRORFATAL
6067h	0	VAR	AX0_IdlePos_U32	UINT32	RW	No	-	Maps to IDLEPOS
6068h	0	VAR	AX0_IdleTime_U16	UINT16	RW	No	ms	Maps to IDLETIME
606Bh	0	VAR	AX0_VelocityDemandValue_I32	INT32	RO	Poss.	-	Maps to VELDEMAND
606Ch	0	VAR	AX0_ActualVelocity_I32	INT32	RO	Poss.	-	Internal
6071h	0	VAR	AX0_TargetTorque_I16	INT16	RW	Poss.	%	Internal
6073h	0	VAR	AX0_CurrentLimit_R32	REAL32	RW	No	%	Maps to CURRENTLIMIT
6075h	0	VAR	AX0_MotorRatedCurrent_R32	REAL32	RW	No	A	Maps to MOTORRATEDCURRENT
6077h	0	VAR	AX0_ActualTorque_I16	INT16	RO	Poss.	-	Internal
6078h	0	VAR	AX0_CurrentActualValue_I16	INT16	RO	Poss.	-	Internal
607Ah	0	VAR	AX0_TargetPosition_I32	INT32	RW	Poss.	-	Internal
607Ch	0	VAR	AX0_HomeRefPos_I32	INT32	RW	No	-	Maps to HOMEREFPOS
607Dh	0	ARR	AX0_SoftLimit_AI32	ARRAY	RO	No	-	Number of software position limit parameters
	1		SoftLimitForward_I32	INT32	RW	No	-	Maps to SOFTLIMITREVERSE
	2		SoftLimitReverse_I32		RW	No	-	Maps to SOFTLIMITFORWARD
607Eh	0	VAR	AX0_MotorDirection_I16	UINT8	RW	No	-	Maps to MOTORDIRECTION
607Fh	0	VAR	AX0_DriveSpeedMax_U32	UINT32	RW	No	-	Maps to DRIVESPEEDMAX
6081h	0	VAR	AX0_Speed_U32	UINT32	RW	No	-	Maps to SPEED (existing)
6083h	0	VAR	AX0_Accel_U32	UINT32	RW	No	-	Maps to ACCEL (existing)
6084h	0	VAR	AX0_Decel_U32	UINT32	RW	No	-	Maps to DECEL
6085h	0	VAR	AX0_ErrorDecel_U32	UINT32	RW	No	-	Maps to ERRORDECEL
6098h	0	VAR	AX0_HomeType_I8	INT8	RW	No	-	Maps to HOMETYPE
6099h	0	REC	AX0_HomeSpeedParameters_REC	REC	RO	No	-	Number of homing speed parameters
	1		HomeSpeed_U32	UINT32	RW	No	-	Maps to HOMESPEED
609Ah	0	VAR	AX0_HomeAccel_U32	UINT32	RW	No	-	Maps to HOMEACCEL
60A4h	0	ARR	AX0_ProfileJerk_AU32	ARRAY	RO	No	-	Number of accel/decel jerk parameters
	1		AccelJerk_U32	UINT32	RW	No	-	Maps to ACCELJERK
	2		DecelJerk_U32		RW	No	-	Maps to DECELJERK
60B8h	0	VAR	AX0_TouchProbeFunction_U16	UINT16	RW	Poss.	-	Internal

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
60B9h	0	VAR	AX0_TouchProbeStatus_U16	UINT16	RO	Poss.	-	Internal
60BAh	0	VAR	AX0_TouchProbePositionPos1_I32	INT32	RO	Poss.	-	Internal
60BBh	0	VAR	AX0_TouchProbePositionNeg1_I32	INT32	RO	Poss.	-	Internal
60BCh	0	VAR	AX0_TouchProbePositionPos2_I32	INT32	RO	Poss.	-	Internal
60BDh	0	VAR	AX0_TouchProbePositionNeg2_I32	INT32	RO	Poss.	-	Internal
60E0h	0	VAR	AX0_TorqueLimitPos_R32	REAL32	RW	No	%	Maps to TORQUELIMITPOS
60E1h	0	VAR	AX0_TorqueLimitNeg_R32	REAL32	RW	No	%	Maps to TORQUELIMITNEG
60F6h	0	REC	AX0_TorqueControlParameters_REC	REC	RO	No	-	Torque control gain terms
	1		KIProp_R32	REAL32	RW	No	-	Maps to KIPROP
	2		KIInt_R32	REAL32	RW	No	-	Maps to KIINT
	3		KITrack_I16	INT16	RW	No	-	Maps to KITRACK
	4		KITime_U32	UINT32	RW	No	-	Maps to KITIME
60F8h	0	VAR	AX0_VelFatal_I32	INT32	RW	No	-	Maps to VELFATAL
60F9h	0	REC	AX0_VelocityControlParameters_REC	REC	RO	No	-	Velocity control gain terms
	1		KVProp_R32	REAL32	RW	No	-	Maps to KVPROP
	2		KVInt_R32	REAL32	RW	No	-	Maps to KVINT
	3		KVTrack_I16	INT16	RW	No	-	Maps to KVTRACK
	4		KVTime_U32	UINT32	RW	No	-	Maps to KVTIME
60FBh	0	REC	AX0_PositionControlParameters_REC	REC	RO	No	-	Position control gain terms
	1		KProp_R32	REAL32	RW	No	-	Maps to KPROP
	2		Kint_R32	REAL32	RW	No	-	Maps to KINT
	3		Kderiv_R32	REAL32	RW	No	-	Maps to KDERIV
	4		Kvel_R32	REAL32	RW	No	-	Maps to KVEL
	5		KVelFF_R32	REAL32	RW	No	-	Maps to KVELFF
	6		Kaccel_R32	REAL32	RW	No	-	Maps to KACCEL
	7		KIntLimit_U16	UINT16	RW	No	-	Maps to KINTLIMIT
	8		KIntMode_I16	INT16	RW	No	-	Maps to KINTMODE
60FDh	0	VAR	AX0_DigitalInputs_U32	UINT32	RO	Poss.	-	Maps to IN
60FEh	0	ARR	AX0_DigitalOutputs_U32	UINT32	RW	No	-	Maps to OUT
60FFh	0	VAR	AX0_TargetVelocity_I32	INT32	RW	Poss.	-	Internal
6402h	0	VAR	AX0_MotorType_U16	UINT16	RW	No	-	Maps to MOTORTYPE
6403h	0	VAR	AX0_MotorCatalogNo_VS	VIS. STRING	RW	No	-	Maps to MOTORCATALOGNO

Index	Sub-ind.	Obj.	Name	Type	Attr.	PDO Mapping	Units	Description
6410h	0	REC	AX0_MotorParameters_REC	REC	RO	No	-	Number of motor parameters
	1		MotorLinearPolePitch_R32	UINT32	RW	No	µm	Maps to MOTORLINEARPOLEPITCH
	2		MotorPoles_I16	INT16	RW	No	-	Maps to MOTORPOLES
	3		MotorFlux_U32	UINT32	RW	No	µWb	Maps to MOTORFLUX
	6		MotorPeakCurrent_U32	UINT32	RW	No	mA	Maps to MOTORPEAKCURRENT
	7		MotorPeakDuration_U32	UINT32	RW	No	ms	Maps to MOTORPEAKDURATION
	8		MotorOverloadArea_U16	UINT16	RO	No	0.1%	Maps to MOTOROVERLOADAREA
	9		MotorOverloadMode_I16	INT16	RW	No	-	Maps to MOTOROVERLOADMODE
	11		MotorRatedFreq_U16	UINT16	RW	No	Hz	Maps to MOTORRATEDFREQ
	12		MotorRatedVolts_U32	UINT32	RW	No	mV	Maps to MOTORRATEDVOLTS
	13		MotorRatedSpeedRPM_I32	INT32	RW	No	rpm	Maps to MOTORRATEDSPEEDRPM
	14		MotorRatedSpeedMMPS_U32	UINT32	RW	No	mm/s	Maps to MOTORRATEDSPEEDMMPS
	15		MotorSpeedMaxRPM_I32	INT32	RW	No	rpm	Maps to MOTORSPEEDMAXRPM
	16		MotorSpeedMaxMMPS_U32	UINT32	RW	No	mm/s	Maps to MOTORSPEEDMAXMMPS
	17		MotorMagCurrent_U32	UINT32	RW	No	mA	Maps to MOTORMAGCURRENT
	18		MotorRotorLeakageInd_U32	UINT32	RW	No	mH	Maps to MOTORROTORLEAKAGEIND
	19		MotorRotorRes_U32	UINT32	RW	No	ohms	Maps to MOTORROTORRES
	20		MotorMagInd_U32	UINT16	RW	No	mH	Maps to MOTORMAGIND
	21		MotorBrakeEngageDelay_I16	INT16	RW	No	ms	Maps to MOTORBRAKEDELAY(0,0)
	22		MotorBrakeDisengageDelay_I16	INT16	RW	No	ms	Maps to MOTORBRAKEDELAY(0,1)
	23		MotorBrakeMode_I16	INT16	RW	No	-	Maps to MOTORBRAKEMODE
	24		MotorTemperatureMode_I16	INT16	RW	No	-	Maps to MOTORTEMPERATUREMODE
	25		MotorBrakePreDisengageDelay_I16	INT16	RW	No	ms	Maps to MOTORBRAKEDELAY(0,2)
	27		MotorPowerFactor_U16	UINT16	RW	No	0.1%	Maps to MOTORPOWERFACTOR
6502h	0	VAR	AX0_SupportedDriveModes_U32	UINT32	RO	Poss.	-	Internal
6504h	0	VAR	AX0_DriveManufacturer_VS	VIS. STRING	RW	No	-	Internal
6505h	0	VAR	AX0_HttpDriveCatalogAddress_VS	VIS. STRING	RW	No	-	Internal
6510h	0	REC	AX0_DriveParameters_REC	REC	RO	No	-	Number of drive parameters
	8		DriveOverloadMode_I16	INT16	RW	No	-	Maps to DRIVEOVERLOADMODE
	10		DriveSpeedFatal_R32	REAL32	RW	No	0.1 % units	Maps to DRIVESPEEDFATAL
	11		DriveRatedZone_I16	INT16	RW	No	-	Maps to DRIVERATINGZONE
	12		DriveEnableMode_I16	INT16	RW	No	-	Maps to DRIVEENABLEMODE
	13		DriveEnableInputMode_I16	INT16	RW	No	-	Maps to DRIVEENABLEINPUTMODE

Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to www.abb.com/searchchcannels.

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