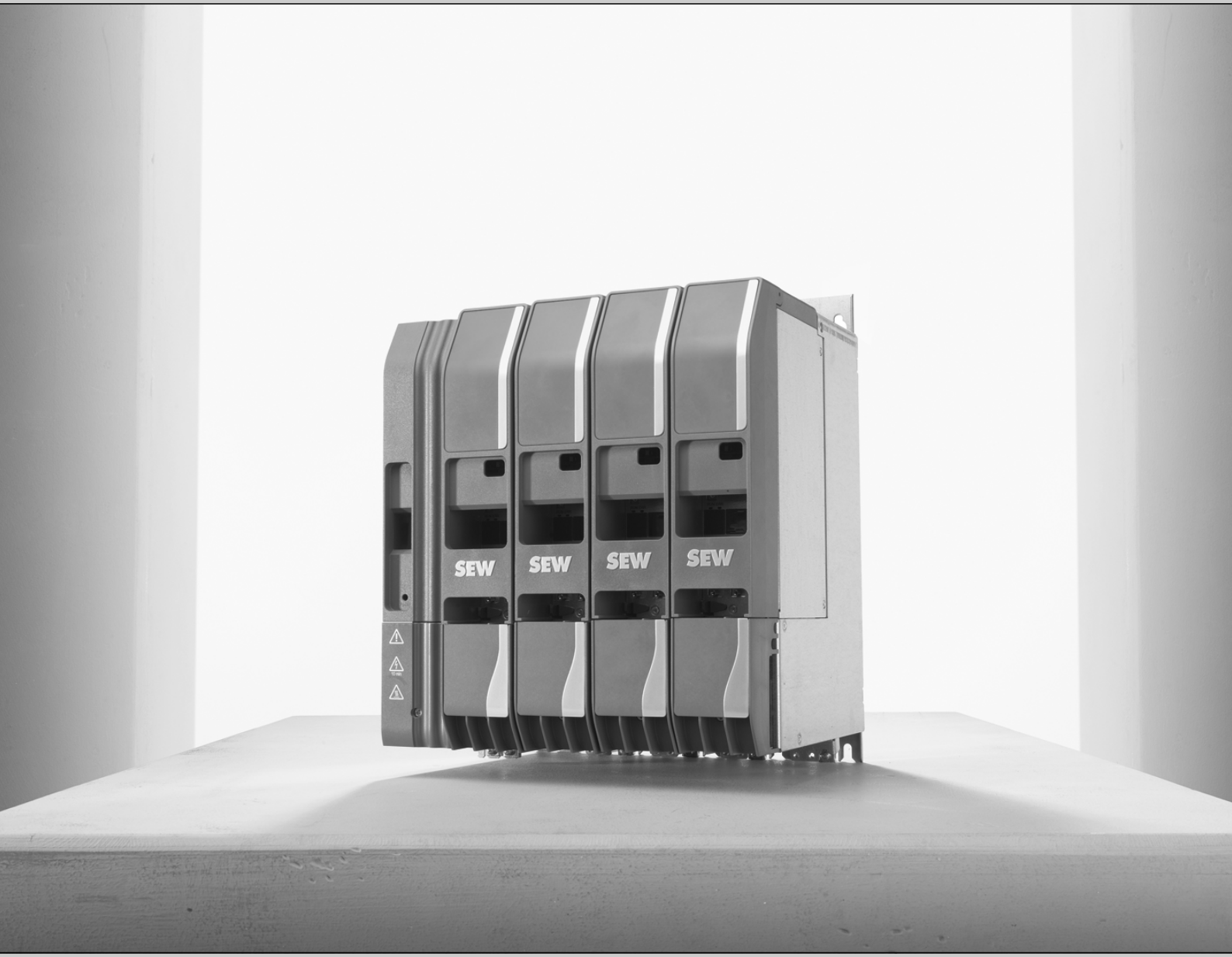
SEW EURODRIVE

Operating Instructions



Application Inverter

MOVIDRIVE® modular/system with CiA402 Device Profile

Edition 03/2019

25931873/EN

Table of contents

25931873/EN – 03/2019

25931873/EN – 03/2019

1 General information

1.1 About this documentation

The current version of the documentation is the original.

This documentation is an integral part of the product. The documentation is intended for all employees who perform work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the systems and their operation as well as persons who work on the product independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation, or if you require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

1.2.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

25931873/EN – 03/2019

Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning about suspended load

1.2.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

⚠ **SIGNAL WORD** Type and source of hazard. Possible consequence(s) if disregarded. Measure(s) to prevent the hazard.

1.3 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the product.

1.4 Content of the documentation

This documentation contains additional safety-related information and conditions for operation in safety-related applications.

1.5 Other applicable documentation

- "MOVIDRIVE® modular application inverter" operating instructions
- "MOVIDRIVE® system application inverter" operating instructions

Observe the corresponding documentation for all further components.

25931873/EN – 03/2019

1.6 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.6.1 Trademark of Beckhoff Automation GmbH

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

1.7 Copyright notice

25931873/EN – 03/2019

2 Safety notes

2.1 Preliminary information

The following general safety notes serve the purpose of preventing injury to persons and damage to property. They primarily apply to the use of products described in this documentation. If you use additional components, also observe the relevant warning and safety notes.

2.2 Duties of the user

As the user, you must ensure that the basic safety notes are observed and complied with. Make sure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it.

As the user, you must ensure that all of the work listed in the following is carried out only by qualified specialists:

- Setup and installation
- Installation and connection
- Startup
- Maintenance and repairs
- Shutdown
- Disassembly

Ensure that the persons who work on the product pay attention to the following regulations, conditions, documentation, and information:

- National and regional safety and accident prevention regulations
- Warning and safety signs on the product
- All other relevant project planning documents, installation and startup instructions, and wiring diagrams
- Do not assemble, install or operate damaged products
- All system-specific specifications and conditions

Ensure that systems in which the product is installed are equipped with additional monitoring and protection devices. Observe the applicable safety regulations and legislation governing technical work equipment and accident prevention regulations.

25931873/EN – 03/2019

2.3 Target group

Specialist for mechanical work

Any mechanical work may only be performed by adequately qualified specialists. Specialists in the context of this documentation are persons familiar with the design, mechanical installation, troubleshooting, and maintenance of the product who possess the following qualifications:

- Qualification in the mechanical area in accordance with the national regulations
- Familiarity with this documentation

Specialist for electrotechnical work

Any electrotechnical work may only be performed by electrically skilled persons with a suitable education. Electrically skilled persons in the context of this documentation are persons familiar with electrical installation, startup, troubleshooting, and maintenance of the product who possess the following qualifications:

- Qualification in the electrotechnical area in accordance with the national regulations
- Familiarity with this documentation

Additional qualification

In addition to that, these persons must be familiar with the valid safety regulations and laws, as well as with the requirements of the standards, directives, and laws specified in this documentation. The persons must have the express authorization of the company to operate, program, parameterize, label, and ground units, systems, and circuits in accordance with the standards of safety technology.

Instructed persons

All work in the areas of transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately. The purpose of the instruction is that the persons are capable of performing the required tasks and work steps in a safe and correct manner.

25931873/EN – 03/2019

2.4 Designated use

The product is intended for control cabinet installation in electrical plants or machines.

In case of installation in electrical systems or machines, startup of the product is prohibited until it is determined that the machine meets the requirements stipulated in the local laws and directives. For Europe, Machinery Directive 2006/42/EC as well as the EMC Directive 2014/30/EU apply. Observe EN 60204-1 (Safety of machinery - electrical equipment of machines). The product meets the requirements stipulated in the Low Voltage Directive 2014/35/EU.

The standards given in the declaration of conformity apply to the product.

The systems can be mobile or stationary.

The product can be used to operate the following motors in industrial and commercial systems:

- AC asynchronous motors with squirrel-cage rotor
- Permanent-field AC synchronous motors

Technical data and information on the connection conditions are provided on the nameplate and in the chapter "Technical data" in the documentation. Always comply with the data and conditions.

Unintended or improper use of the product may result in severe injury to persons and damage to property.

2.4.1 Hoist applications

To avoid danger of fatal injury due to falling hoists, observe the following points when using the product in lifting applications:

- Use mechanical protection devices.

Application in ELSM® control mode

When the inverter is operated in ELSM® control mode, using it in lifting applications is not permitted. In this control mode only applications of horizontal materials handling are permitted.

25931873/EN – 03/2019

2.5 Functional safety technology

The product must not perform any safety functions without a higher-level safety system, unless explicitly allowed by the documentation.

2.6 Transport

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If the product is damaged, it must not be assembled, installed or started up.

Observe the following notes when transporting the device:

- Ensure that the product is not subject to mechanical impact.

If necessary, use suitable, sufficiently dimensioned handling equipment.

Observe the information on climatic conditions in the chapter "Technical data" of the documentation.

2.7 Installation/assembly

Ensure that the product is installed and cooled according to the regulations in the documentation.

Protect the product from strong mechanical strain. The product and its mounting parts must never protrude into the path of persons or vehicles. Ensure that components are not deformed and insulation spaces are not changed, particularly during transportation and handling. Electric components must not be mechanically damaged or destroyed.

Observe the notes in chapter Mechanical installation in the documentation.

2.7.1 Restrictions of use

The following applications are prohibited unless the device is explicitly designed for such use:

- Use in potentially explosive atmospheres
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, and radiation
- Operation in applications with impermissibly high mechanical vibration and shock loads in excess of the regulations stipulated in EN 61800-5-1
- Use at an elevation of more than 3800 m above sea level

The product can be used at altitudes above 1000 m above sea level up to 3800 m above sea level under the following conditions:

- The reduction of the nominal output current and/or the line voltage is considered according to the data in chapter Technical data in the documentation.
- Above 2000 m above sea level, the air and creeping distances are only sufficient for overvoltage class II according to EN 60664. At altitudes above 2000 m above sea level limiting measures must be taken, which reduce the line side overvoltage from category III to category II for the entire system.
- If a protective electrical separation (in accordance with EN 61800-5-1 and EN 60204-1) is required, then implement this outside the product at altitudes of more than 2000 m above sea level.

25931873/EN – 03/2019

2.8 Electrical installation

Ensure that all of the required covers are correctly attached after carrying out the electrical installation.

Make sure that preventive measures and protection devices comply with the applicable regulations (e.g. EN 60204-1 or EN 61800-5-1).

2.8.1 Required preventive measure

Make sure that the product is correctly attached to the ground connection.

2.8.2 Stationary application

Necessary preventive measure for the product is:

Type of energy transfer	Preventive measure
Direct power supply	• Ground connection

2.8.3 Regenerative operation

The drive is operated as a generator due to the kinetic energy of the system/machine. Before opening the connection box, secure the output shaft against rotation.

2.9 Protective separation

The product meets all requirements for protective separation of power and electronics connections in accordance with EN 61800-5-1. To ensure protective separation, all connected circuits must also meet the requirements for protective separation.

25931873/EN – 03/2019

2.10 Startup/operation

Observe the safety notes in the chapters Startup and Operation in this documentation.

Make sure the connection boxes are closed and screwed before connecting the supply voltage.

Depending on the degree of protection, products may have live, uninsulated, and sometimes moving or rotating parts, as well as hot surfaces during operation.

When the device is switched on, dangerous voltages are present at all power connections as well as at any connected cables and terminals. This also applies even when the product is inhibited and the motor is at standstill.

Risk of burns due to arcing: Do not disconnect power connections during operation. Do not connect power connections during operation.

If you disconnect the product from the voltage supply, do not touch any live components or power connections because capacitors might still be charged. Observe the following minimum switch-off time:

10 minutes.

Observe the corresponding information signs on the product.

The fact that the operation LED and other display elements are no longer illuminated does not indicate that the product has been disconnected from the supply system and no longer carries any voltage.

Mechanical blocking or internal protective functions of the product can cause a motor standstill. Eliminating the cause of the problem or performing a reset may result in the drive restarting automatically. If, for safety reasons, this is not permitted for the drive-controlled machine, first disconnect the product from the supply system and then start troubleshooting.

Risk of burns: The surface temperature of the product can exceed 60 °C during operation. Do not touch the product during operation. Let the product cool down before touching it.

2.10.1 Energy storage unit

Products with a connected energy storage unit are not necessarily de-energized when they have been disconnected from the supply system. Usually, the energy storage unit stores sufficient energy to continue operation of the connected motors for a limited period of time. It is not sufficient to observe a minimum switch-off time.

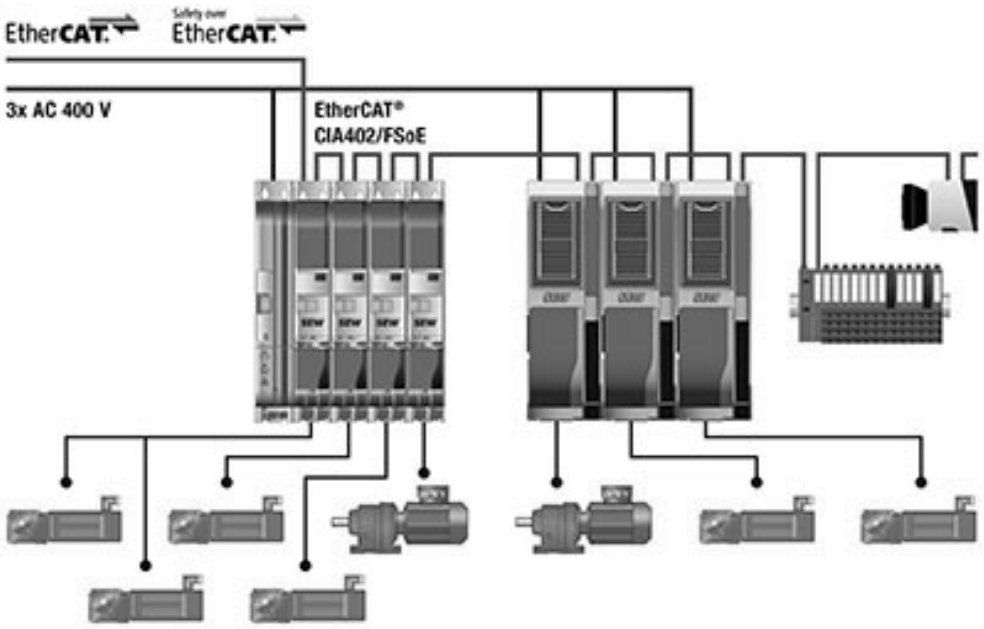
Perform a shutdown as described in the documentation in the chapter "Service" > "Shutdown".

25931873/EN – 03/2019

3 CiA402 device profile

3.1 Introduction

The CiA402 device profile for controlling inverters has established itself in plants with individual motion control functions that are calculated in the external higher-level controller.



24494793995

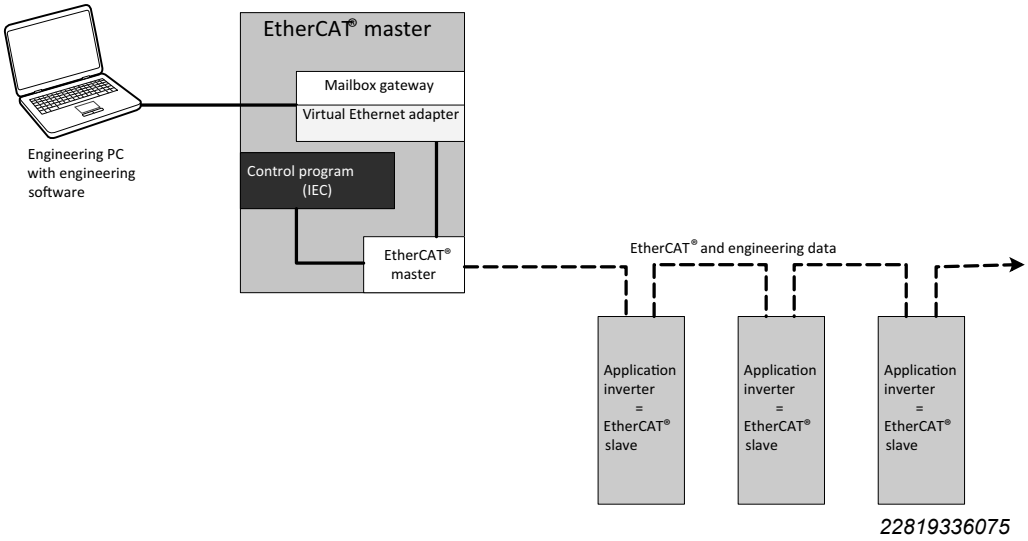
For control via CiA402, the MOVIDRIVE® modular and MOVIDRIVE® system application inverters can be directly connected to the higher-level controller using the integrated EtherCAT® interface. This means integration into the higher-level controller is particularly fast, simple, and without extensive conversion effort.

For applications with requirements on functional safety, the MOVISAFE® CS..A safety cards are currently being developed. They are controlled via the integrated inputs and outputs or via safe communication using Safety over EtherCAT® (FSoE).

CiA402 is the abbreviation for a device profile that has been defined by the organization "CAN in Automation" specifically for servo drives.

25931873/EN – 03/2019

It defines the structure of the object list and the functionalities that are assigned to the individual objects. Furthermore, it defines the state machine (states, error behavior, state transitions). Additionally, it offers manufacturer-specific functions and setting options.



This profile is primarily used for startup of a motion axis on an EtherCAT® master and facilitates the integration of the inverter due to the standardized interface.

25931873/EN – 03/2019

3.2 Object list

Index dec	Sub	Index Axis1	Index Axis2	Sub	Name	Bit coding/index default	Value	Range of values	Data type
4097	0	0x1001	0x2001	0	Error register	0: Generic error 7: Manufacturer specific			Bit field
24639	0	0x603F	0x703F	0	Error code	0x1000: CiA402 collective error	0 = No error 0x1000: Error	Min: 0 Max: 65535 Step: 1 Default: 0	Int32
24640	0	0x6040	0x7040	0	Control word	0: Switch on 1: Enable voltage 2: Quick stop 3: Enable operation 4: hm: Homing operation start 5: Operation mode specific 6: Operation mode specific 7: Fault reset 8: Halt 9: Operation mode specific 10: Reserved 11: Manufacturer specific 12: Manufacturer specific 13: Manufacturer specific 14: Manufacturer specific 15: Manufacturer specific			Bit field
24641	0	0x6041	0x7041	0	Status word	0: Ready to switch on 1: Switched on 2: Operation enabled 3: Fault reset 4: Voltage enabled 5: Quick stop 6: Switch on disabled 7: Warning 8: Manufacturer specific 9: Remote 10: pp: target reached / CSP,CSV,CST: Status toggle 11: Internal limit active 12: CSP,CSV,CST: Drive follows command value / hm: homing attained 13: hm: error 14: Manufacturer specific 15: Manufacturer specific			Bit field
24669	0	0x605D	0x705D	0	Halt option code		1: Slow down ramp	Default: 0	Enum
24672	0	0x6060	0x7060	0	Mode of operation		0: No mode assigned 1: pp 3: pv 6: hm 8: csp 9: csv 10: cst -18: Rotor position identification -19: Position hold control -25: Motor parameter measurement	Default: 0	Enum

25931873/EN – 03/2019

Index dec	Sub	Index Axis1	Index Axis2	Sub	Name	Bit coding/index default	Value	Range of values	Data type
24673	0	0x6061	0x7061	0	Mode of operation display		0: No mode assigned 1: pp 3: pv 6: hm 8: csp 9: csv 10: cst -1: Output stage inhibit -4: Manual mode -13: Stop at application limit -18: Rotor position identification -19: Position hold control -22: Output stage test -23: Brake test safety card -25: Motor parameter measurement	Default: 0	Enum
24676	0	0x6064	0x7064	0	Position actual value			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32
24677	0	0x6065	0x7065	0	Following error window			Min: -1 Max: 2147483647 Step: 1 Default: -1	Int32
24678	0	0x6066	0x7066	0	Following error timeout			Min: 0 Max: 65535 Step: 1 Default: 0	Int32
24684	0	0x606C	0x706C	0	Velocity actual value			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32
24689	0	0x6071	0x7071	0	Target torque			Min: -32768 Max: 32768 Step: 1 Default: 0	Int32
24695	0	0x6077	0x7077	0	Torque actual value			Min: -32768 Max: 32768 Step: 1 Default: 0	Int32
24698	0	0x607A	0x707A	0	Target position			Min: -32768 Max: 32768 Step: 1 Default: 0	Int32
24699	0	0x607B	0x707B	0	Position range limit: high subindex support			Min: 0 Max: 2 Step: 1 Default: 2	Int32
24699	1	0x607B	0x707B	1	Position range limit: min range limit			Min: -1073741824 Max: 1073741823 Step: 1 Default: 0	Int32
24699	2	0x607B	0x707B	2	Position range limit: min range limit			Min: -1073741824 Max: 1073741823 Step: 1 Default: 0	Int32
24700	0	0x607C	0x707C	0	Home offset			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32

25931873/EN – 03/2019

Index dec	Sub	Index Axis1	Index Axis2	Sub	Name	Bit coding/index default	Value	Range of values	Data type
24701	0	0x607D	0x707D	0	Software pos limit: high sub-index support			Min: 0 Max: 2 Step: 1 Default: 2	Int32
24701	1	0x607D	0x707D	1	Software pos limit: min pos limit			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32
24701	2	0x607D	0x707D	2	Software pos limit: max pos limit			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32
24705	0	0x6081	0x7081	0	Profile velocity			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32
24707	0	0x6083	0x7083	0	Profile acceleration			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32
24708	0	0x6084	0x7084	0	Profile deceleration			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32
24728	0	0x6098	0x7098	0	Homing method		1: Negative limit switch and index pulse 2: Positive limit switch and index pulse 10: Positive cam end and index pulse 14: Negative cam end and index pulse 17: Negative limit switch w/o index pulse 18: Positive limit switch w/o index pulse 26: Positive cam end w/o index pulse 30: Negative cam end w/o index pulse 33: Negative index pulse 37: Current position	Default: 37	UInt8
24729	0	0x6099	0x7099	0	Homing speeds: high subindex support			Min: 0 Max: 2 Step: 1 Default: 2	Int32
24729	1	0x6099	0x7099	1	Homing speeds: during search for switch			Min: 0 Max: 2147483647 Step: 1 Default: 2000000	Int32
24729	2	0x6099	0x7099	2	Homing speeds: during search for zero			Min: 0 Max: 2147483647 Step: 1 Default: 500000	Int32
24730	0	0x609A	0x709A	0	Homing accelerations			Min: 0 Max: 2147483647 Step: 1 Default: 300000	Int32
24752	0	0x60B0	0x70B0	0	Position offset			Min: -2147483647 Max: 2147483647 Step: 1 Default: 0	Int32
24753	0	0x60B1	0x70B1	0	Velocity offset			Min: 0 Max: 2147483647 Step: 1 Default: 0	Int32

25931873/EN – 03/2019

Index dec	Sub	Index Axis1	Index Axis2	Sub	Name	Bit coding/index default	Value	Range of values	Data type
24754	0	0x60B2	0x70B2	0	Torque offset			Min: -32768 Max: 32768 Step: 1 Default: 0	Int32
24760	0	0x60B8	0x70B8	0	Touch probe function	0: Touch probe 1: enable 1: Touch probe 1: continuous 2: Touch probe 1: trigger source: 0=tp input1 / 1 = 3: Touch probe 1: trigger source from 0x60D0.01 4: Touch probe 1: enable positive edge 5: Touch probe 1: enable negative edge 6: Touch probe 1: user defined 0 7: Touch probe 1: user defined 1 8: Touch probe 2: enable 9: Touch probe 2: continuous 10: Touch probe 2: trigger source: 0=tp input1 / 1 = 11: Touch probe 2: trigger source from 0x60D0.01 12: Touch probe 2: enable positive edge 13: Touch probe 2: enable negative edge 14: Touch probe 1: user defined 0 15: Touch probe 1: user defined 1		Default: 0	Bit field
24761	0	0x60B9	0x70B9	0	Touch probe status	0: Touch probe 1: enabled 1: Touch probe 1: positive edge position stored 2: Touch probe 1: negative edge position stored 8: Touch probe 2: enabled 9: Touch probe 2: positive edge position stored 10: Touch probe 10: negative edge position stored		Default: 0	
24762	0	0x60BA	0x70BA	0	Touch probe 1: positive edge			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32
24763	0	0x60BB	0x70BB	0	Touch probe 1: negative edge			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32
24764		0x60BC	0x70BC	0	Touch probe 2: positive edge			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32
24765		0x60BD	0x70BD	0	Touch probe 2: negative edge			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32
24770	0	0x60C2	0x70C2	0	Interpolation time: high sub-index support			Min: 0 Max: 2 Step: 1 Default: 2	Int32
24770	1	0x60C2	0x70C2	1	Interpolation time: interpolation time period value			Min: 0 Max: 2 Step: 1 Default: 1	Int32

25931873/EN – 03/2019

Index dec	Sub	Index Axis1	Index Axis2	Sub	Name	Bit coding/index default	Value	Range of values	Data type
24770	2	0x60C2	0x70C2	2	Interpolation time: Interpolation time index			Min: 0 Max: 2 Step: 1 Default: -3	Int32
24784	0	0x60D0	0x70D0	0	Touch probe source: high subindex support			Min: 0 Max: 2 Step: 1 Default: 2	Int32
24784	1	0x60D0	0x70D0	1	Touch probe source		0: Reserved 1: Digital Input 1 2: Digital input 2 3: Digital input 3 4: Digital input 4 5: Hardware zero impulse	Default: 0	
24789	0	0x60D5	0x70D5	0	Touch probe 1: positive edge counter			Min: 0 Max: 65535 Step: 1 Default: 0	Uint32
24790	0	0x60D6	0x70D6	0	Touch probe 1: negative edge counter			Min: 0 Max: 65535 Step: 1 Default: 0	Uint32
24791	0	0x60D7	0x70D7	0	Touch probe 2: positive edge counter			Min: 0 Max: 65535 Step: 1 Default: 0	Uint32
24792	0	0x60D8	0x70D8	0	Touch probe 2: negative edge counter			Min: 0 Max: 65535 Step: 1 Default: 0	Uint32
24803	0	0x60E3	0x70E3	0	Supported homing methods: high index support			Min: 0 Max: 10 Step: 1 Default: 10	Int32
24803	1	0x60E3	0x70E3	1	Supported homing methods	Index 0: Current position (37) Index 1: Negative limit switch and index pulse (1) Index 2: Positive limit switch and index pulse (2) Index 3: Positive cam end and index pulse (10) Index 4: Negative cam end and index pulse (14) Index 5: Negative limit switch w/o index pulse (17) Index 6: Positive limit switch w/o index pulse (18) Index 7: Positive cam end w/o index pulse (26) Index 8: Negative cam end w/o index pulse (30) Index 9: Negative index pulse (33	1: Negative limit switch and index pulse 2: Positive limit switch and index pulse 10: Positive cam end and index pulse 14: Negative cam end and index pulse 17: Negative limit switch w/o index pulse 18: Positive limit switch w/o index pulse 26: Positive cam end w/o index pulse 30: Negative cam end w/o index pulse 33: Negative index pulse 37: Current position		
24818	0	0x60F2	0x70F2	0	Positioning option code		0: Normal positioning 64: Only negative direction 128: Only in positive direction 192: Shortest way	Min: 0 Max: 10 Step: 1 Default: 0	Int32
24820	0	0x60F4	0x70F4	0	Following error actual value			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32

25931873/EN – 03/2019

Index dec	Sub	Index Axis1	Index Axis2	Sub	Name	Bit coding/index default	Value	Range of values	Data type
24829	0	0x60FD	0x70FD	0	Digital inputs; logical value	0: Negative limit switch 1: Positive limit switch 2: Home switch 3: Interlock		Default: 0	Bit field
24831	0	0x60FF	0x70FF	0	Target velocity			Min: -2147483648 Max: 2147483647 Step: 1 Default: 0	Int32
25858	0	0x6502	0x7502	0	Supported drive modes	0: Profile position mode (pp) 2: Profile velocity mode (pv) 5: Homing mode (hm) 7: Cyclic synchronous position mode (csp) 8: Cyclic synchronous velocity mode (csv) 9: Cyclic synchronous troque mode (cst)		Default: 933	Bit field

INFORMATION

Index 24770.1 0x60C2.1 can be written to the application at startup via CoE service (SdO). In this case, the cycle time need no longer be set using the MOVISUITE® engineering software.

3.3 Supported operating modes

Operating mode (Mode of operation)	Abbreviation	Value	Sub value	Category	SEW-EURODRIVE device display
Profile position mode	pp	1		CiA402	24
Profile velocity mode	pv	3		CiA402	3
Homing mode	hm	6		CiA402	11
Method					
Homing on negative index pulse			1		
Homing on positive index pulse			2		
Homing on positive cam end and index pulse			10		
Homing on negative cam end and index pulse			14		
Homing on negative limit switch without index pulse			17		
Homing on positive limit switch without index pulse			18		
Homing on positive cam end without index pulse			26		
Homing on negative cam end without index pulse			30		
Homing on negative index pulse			33		
Homing on current position			0		
Cyclic synchronous position mode	csp	8		CiA402	16
Cyclic synchronous velocity mode	csv	9		CiA402	25
Cyclic synchronous torque mode	cst	10		CiA402	17
Rotor position identification	-	-18		SEW-EURODRIVE	18
Position hold control	-	-19		SEW-EURODRIVE	19
Motor parameter measurement	-	-25		SEW-EURODRIVE	25

25931873/EN – 03/2019

3.4 System units CiA402

The user units (°, mm, degree...) must be set in the EtherCAT® master.

Internally, the application inverter calculates with the following units:

Value	Unit	Scaling
Position	inc	65536 inc/motor revolution
Speed	inc/s	65536 inc/s
Acceleration	inc/s^2	65536 inc/s^2

25931873/EN – 03/2019

3.5 Object dictionary

The "object dictionary" describes the values that are directly available in the engineering software of the EtherCAT® master for selecting the PDO image.

Inputs

Index	Name	Readable via PD
0x208E	Digital inputs actual value	Yes
0x603F	Error code	Yes
0x6041	Status word	Yes
0x6061	Modes of operation display	Yes
0x6064	Position actual value	Yes
0x606C	Velocity actual value	Yes
0x6077	Torque actual value	Yes
0x6098	Homing method	Yes
0x60B9	Touchprobe status	Yes
0x60BA	Touchprobe 1 positive edge	Yes
0x60BB	Touchprobe 1 negative edge	Yes
0x60BC	Touchprobe 2 positive edge	Yes
0x60BD	Touchprobe 2 negative edge	Yes
0x60D5	Touchprobe 1 positive edge counter	Yes
0x60D6	Touchprobe 1 negative edge counter	Yes
0x60D7	Touchprobe 2 positive edge counter	Yes
0x60D8	Touchprobe 2 negative edge counter	Yes
0x60F4	Following error actual value	Yes
0x6502	Supported drive modes	Yes

Outputs

Index	Name	Writable via PD
0x6040	Control word	Yes
0x6060	Modes of operation	Yes
0x6065	Following error window	Yes
0x6066	Following error timeout	Yes
0x6071	Target torque	Yes
0x607A	Target position	Yes
0x607C	Homing offset	Yes
0x607D:01	Software position limit [1]	Yes
0x607D:02	Software position limit [2]	Yes
0x6081	Profile velocity	Yes
0x6083	Profile acceleration	Yes
0x6084	Profile deceleration	Yes
0x609A	Homing acceleration	Yes
0x60B0	Position offset	Yes
0x60B1	Velocity offset	Yes
0x60B2	Torque offset	Yes
0x60B8	Touchprobe mode	Yes
0x60F2	Position option code	Yes
0x60FF	Target velocity	Yes

25931873/EN – 03/2019

4 Unit structure, axis system structure

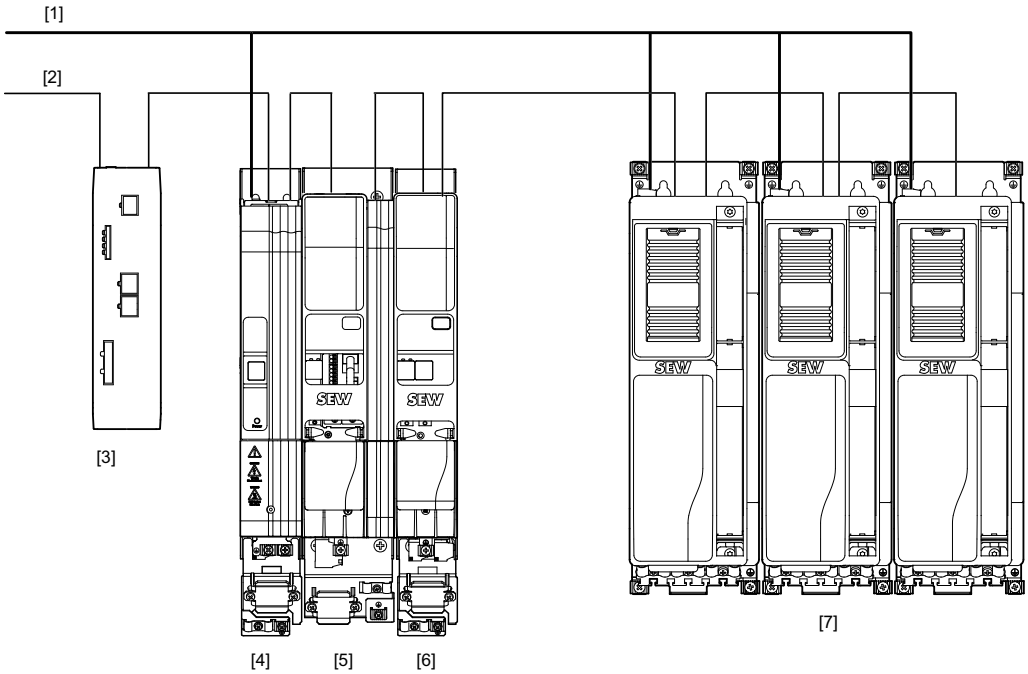
4.1 Connection variants

The MOVIDRIVE® modular and the MOVIDRIVE® system application inverters with firmware for the CiA402 device profile can be installed only in the following connection variant, as the MOVI-C® CONTROLLER currently does not support the CiA402 device profile:

- As axis system or single axis with an EtherCAT® master with motion functionality when using the CiA402 device profile.

The number of possible axis modules in an EtherCAT® network depends on the EtherCAT® master in use.

Example of an axis system:



22316149259

[1] Line voltage
[2] EtherCAT® communication
[3] EtherCAT® master
[4] MOVIDRIVE® modular power supply module MDP90A-..
[5] MOVIDRIVE® modular single-axis module MDA90A-..
[6] MOVIDRIVE® modular double-axis module MDD90A-..
[7] MOVIDRIVE® system MDX90A-..

NOTICE

Damage to the MOVIDRIVE® modular application inverter when opening the DC link (separate operation).

Separate operation of individual modules will damage the application inverter and is not permitted.

Only operate the application inverter when installed in a system as illustrated above.

For information on which cables can be used, refer to the "MOVIDRIVE® modular Application Inverters" documentation.

25931873/EN – 03/2019

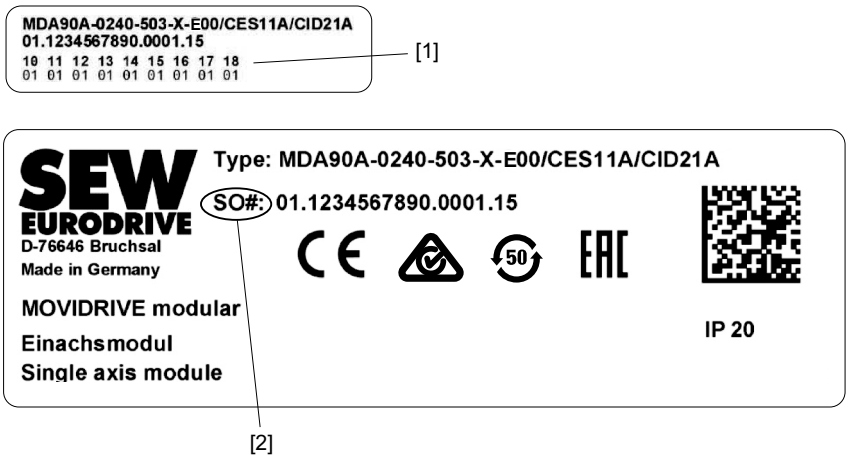
4.2 Nameplates

The application inverters with CiA402 device profile are marked externally so that they can be distinguished from standard inverters.

4.2.1 Nameplates MOVIDRIVE® modular with CiA402 device profile

Single-axis module

System nameplate

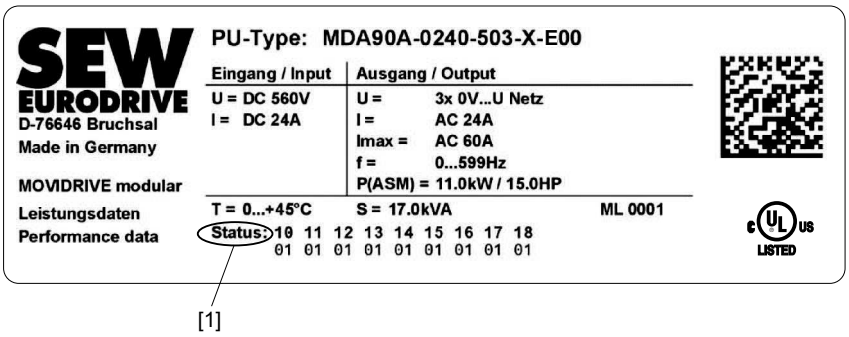


22845892107

[1] Device status

[2] Serial number

Performance data nameplate



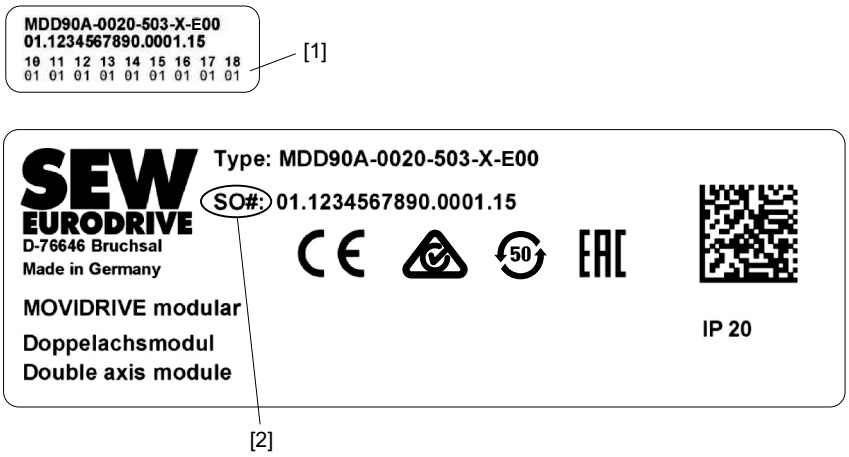
22845902347

[1] Device status

25931873/EN – 03/2019

Double-axis module

System nameplate

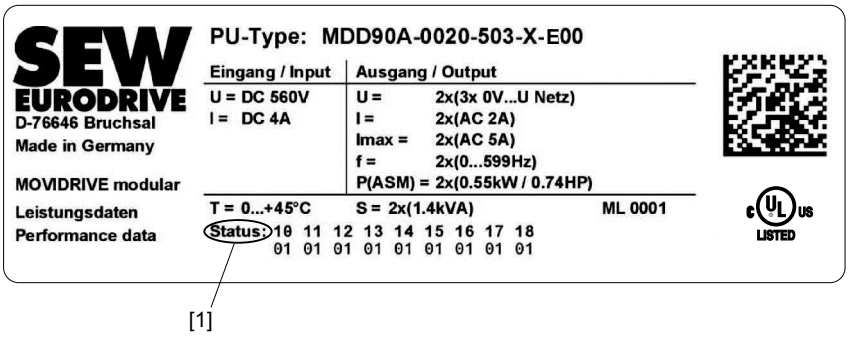


22845912587

[1] Device status

[2] Serial number

Performance data nameplate



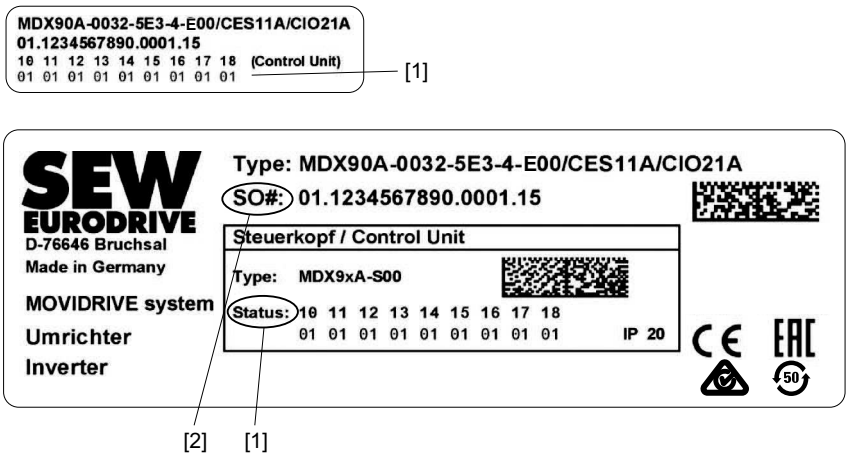
22845922827

[1] Device status

25931873/EN – 03/2019

4.2.2 Nameplates MOVIDRIVE® system with CiA402 device profile

System nameplate

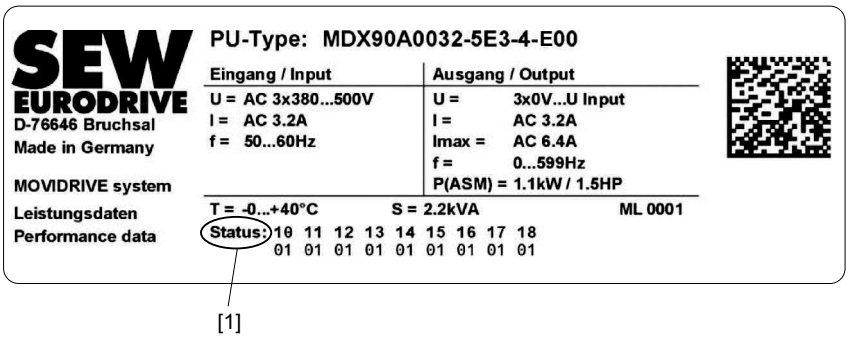


22845933067

[1] Device status

[2] Serial number

Performance data nameplate



22845939979

[1] Device status

25931873/EN – 03/2019

4.3 Type code

4.3.1 MOVIDRIVE® modular with CiA402 device profile

Example: MDA90A-0080-503-X-E00		
Product family	MD	• MD = MOVIDRIVE®
Device type	A	• A = Single-axis module • D = Double-axis module • P = Power supply module with brake chopper • M = Master module UHX45A/MDM90A
Series	90	• 90 = Standard design
Version	A	• A = Version status A
Performance class	0080	• MDA: Nominal output current – e.g. 0080 = 8 A • MDD: Nominal output current – e.g. 0020 = 2 × 2 A • MDP: Nominal power – e.g. 0100 = 10 kW
Connection voltage	5	• 5 = AC 380 – 500 V
EMC variants of the power section	0	• 0 = Basic interference suppression integrated
Connection type	3	• 3 = 3-phase connection type
Operating mode	X	• 4 = 4-quadrant operation (with brake chopper) • X = Not relevant
Device variant	E	• 0 = Not relevant • S = Control MOVI-C® CONTROLLER • C = Power supply module with integrated braking resistor and capacitor • E = Inverter with device profile CiA402
Designs	00	• 00 = Standard design • 01 = Axis module MDA90A-0640-.. in size 5
Options		• /X = MOVIDRIVE® modular without card slots The following list serves as an example: • /CES11A = Multi-encoder card • /CS..A = Safety card

25931873/EN – 03/2019

4.3.2 MOVIDRIVE® system with CiA402 device profile

Example: MDX90A-0125-5E3-X-E00		
Product family	MD	MOVIDRIVE®
Device type	X	• X = Single-axis inverter
Series	90	• 90 = Without DC 24 V switched-mode power supply • 91 = With DC 24 V switched-mode power supply
Version	A	• A = Version status of the device series
Performance class	0125	• 0125 = Nominal output current – e.g. 0125 = 12.5 A
Connection voltage	5	• 2 = AC 200 – 240 V • 5 = AC 380 – 500 V
Power section design EMC	E	• 0 = Basic interference suppression integrated • E = EMC filter limit value category C2 acc. to EN 61800-3
Connection type	3	• 3 = 3-phase connection type
Operating mode	X	• 4 = 4-quadrant operation • X = Not relevant
Device variant	E	• 0 = Not relevant • S = MOVIDRIVE® system: Control via MOVI-C® CONTROLLER • T = MOVIDRIVE® technology: Control via fieldbus • E = Inverter with device profile CiA402
Designs	00	• 00 = Standard design
Options		The following list serves as an example: • /CES11A = Multi-encoder card • /CS..A = Safety card MOVISAFE® CS..A

4.4 Device structure

For detailed information on the device structure and the design of the axis system, refer to the other applicable documentation:

- "MOVIDRIVE® modular application inverter" operating instructions
- "MOVIDRIVE® system application inverter" operating instructions

25931873/EN – 03/2019

5 Installation

For information on the electrical and mechanical installation of the basic devices and cards, as well as permitted cable types, dimension sheets, terminal assignment and wiring diagrams, refer to the other applicable documentation of the inverter in use:

- "MOVIDRIVE® modular application inverter" operating instructions
- "MOVIDRIVE® system application inverter" operating instructions

25931873/EN – 03/2019

6 Startup

6.1 General

⚠ DANGER

Uncovered power connections.

Severe or fatal injuries from electric shock.

- Install the touch guards at the modules, see chapter Covers.
- Install the closing covers according to the regulations, see chapter Covers.
- Never start up the application inverter without installed closed touch guards and closing covers.

6.1.1 Lifting applications

⚠ WARNING

Danger of fatal injury if the hoist falls.

Severe or fatal injuries.

- The application inverter is not designed for use as a safety device in lifting applications. Use monitoring systems or mechanical protection devices to ensure safety.

6.1.2 Connecting power

NOTICE

Undercutting the minimum switch-off time of the line contactor.

Irreparable damage to the application inverter or unforeseeable malfunctions.

The specified times and intervals must be observed.

- After disconnection from the supply system, observe a minimum switch-off time of 10 s.
- Do **not** turn the power of the supply system on or off **more than once per minute**.

6.1.3 Connecting cables

NOTICE

Disconnecting lines under voltage.

Irreparable damage to the application inverter or unforeseeable malfunctions.

- The following plug-in connections must always be disconnected in a de-energized state: Motor, supply system, braking resistor, brake, encoder.

25931873/EN – 03/2019

6.2 Startup requirements

The following requirements apply to startup:

- You have installed the application inverter correctly, both mechanically and electrically.
- You have configured the application inverter and connected drives correctly.
- Safety measures prevent accidental drive startup.
- Safety measures prevent danger to persons or machines.

Required hardware components:

- PC with Ethernet interface.
- Standard Ethernet cable for connection between PC and EtherCAT® master

Required software/configuration files:

- MOVISUITE® standard engineering software from SEW-EURODRIVE.
- Engineering software of the EtherCAT® master (depending on the manufacturer)
- ESI file "SEW_MOVI-C_MOVIDRIVE_CiA402.xml"
- SEW_SharedModulesDescription_CiA402_V0xxxx.xml

6.3 Validity of the ESI file

The ESI file (XML file) contains the device description and information that are essential for a successful startup of the application inverters on an EtherCAT® master.

INFORMATION

Do not edit or amend the entries in the ESI file. SEW-EURODRIVE assumes no liability for malfunctions of the inverter caused by a modified ESI file.

The following ESI file is available from SEW-EURODRIVE for connecting the drive inverters with CiA402 device profile to an EtherCAT® master:

- SEW_SharedModulesDescription_CiA402_Vxxxx.xml
- ESI file "SEW_MOVI-C_MOVIDRIVE_CiA402.xml"

You find the ESI file on the SEW-EURODRIVE website www.sew-eurodrive.com via the Online Support section under "Data & documents > Software".

This file is valid for the following inverters with CiA402 firmware:

- MOVIDRIVE® modular
- MOVIDRIVE® system

25931873/EN – 03/2019

6.4 Startup procedure

The application inverters are taken into operation using the MOVISUITE® engineering software from SEW-EURODRIVE.

15643252491

The startup is functionally divided into segments. The following steps illustrate in exemplary fashion the startup procedure for an application inverter.

Drive train segment

Drive train		Configuring drive trains.

Functions segment

Inputs/outputs		• Basic device
Setpoints		• Basic settings • PO data • CiA402
Actual values		• PI data • CiA402
Drive functions		• FCB01 Output stage inhibit • FCB02 Stop default • FCB11 Homing mode (hm) • FCB13 Stop at application limit • FCB14 Emergency stop • FCB18 Rotor position identification • FCB25 Motor measurement
Technology functions		• CiA402 Touchprobe 1 • CiA402 Touchprobe 2

25931873/EN – 03/2019

Monitoring functions		• Reference signals • Limit values • Control functions • Output stage • Power supply monitoring • Overview of fault responses

Information on the application inverter

Device data is available via the project nodes.

Device data		• Device identification • Main component • Subcomponent • Production data
Communication		• EtherCAT®
Basic settings		• Permissions • Reset device parameters • Active drive train • Standby mode • Internal data backup

25931873/EN – 03/2019

6.4.1 Checklist for startup

The following checklist lists the necessary steps for complete startup.

Step	Startup step	Finished
1	Install the motor	
2	Install the MOVI-C® component	
3	Start MOVISUITE®	
4	Start up the drive train	
5	Configure digital inputs and outputs	
6	Move the drives in manual mode	
7	Select the operating mode of the axis in the EtherCAT® master	
8	Configure the motion axis in the EtherCAT® master	
9	Compare/set the cycle time in the axis with the cycle time in the master	
10	Test the drives/application	

For inverters with CiA402 device profile, the assignment of the process data words that are necessary for controlling the axis is already predefined and created. You do not need to make any further settings on the process data interface of the axis in order to start up the application inverter.

25931873/EN – 03/2019

6.5 Manufacturer-specific operating modes

Refer to the "Object list" (→ 🗎 16) chapter for the manufacturer-specific operating modes that are available.

6.5.1 Rotor position identification

Rotor position identification is primarily used if third-party synchronous motors need to be taken into operation. The position of the rotor is determined. It corresponds to FCB18.

To select rotor position identification, select -18 via the PDO "Mode of Operation".

The display reports back a value of 18.

6.5.2 Motor parameter measurement

Motor parameter measurement is primarily used for starting up AC asynchronous motors from other manufacturers. The values of the motor (inductances and resistances) are measured. They correspond to FCB 25.

To select motor parameter measurement, select -25 via the PDO "Mode of Operation".

The display reports back a value of 25.

6.5.3 Position hold control

Drive remains in position control without brake application.

To activate position hold control, you must select -19 via the PDO "Mode of Operation".

The display reports back a value of 19.

25931873/EN – 03/2019

6.6 Startup of an EtherCAT® master using the example of Beckhoff

The following is an example of the startup using the CX2020 controller and the TwinCAT 3 engineering software from Beckhoff. The EtherCAT® is connected via the EtherCAT® expansion EK1110 from Beckhoff.

6.6.1 Installing the ESI file

- Install the ESI file in accordance with the specifications of the TwinCAT engineering software.
- Once the file has been installed properly, the device appears next to the slave stations (under "Drives") with the designation "MOVI-C MOVIDRIVE CiA402".

25931873/EN – 03/2019

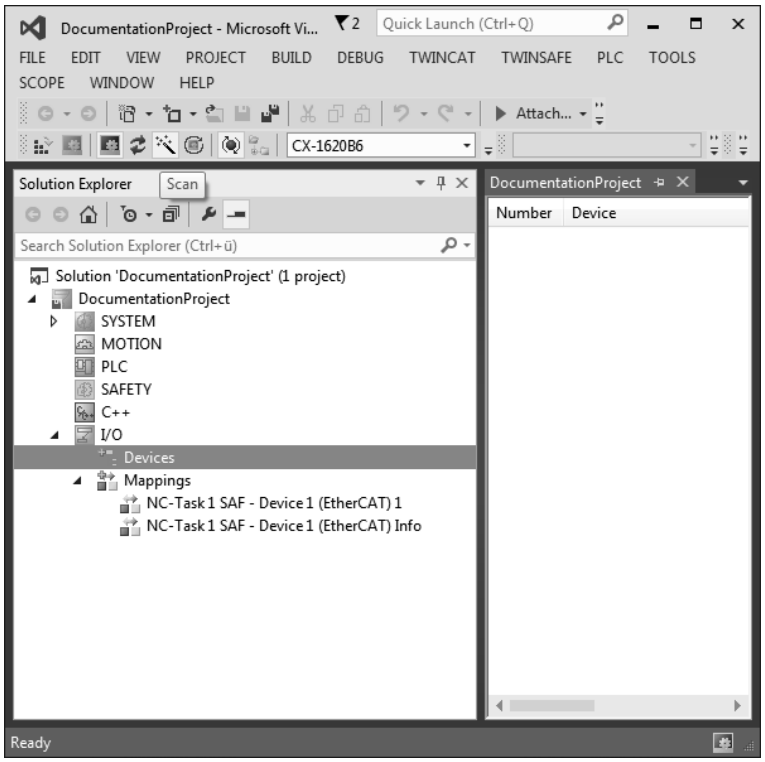
6.6.2 Creating the I/O configuration and linking the motion axis

To control the application inverters, it is necessary to create the inverters in the I/O configuration of the EtherCAT® master.

Creating the I/O configuration by scanning the network

After the connection between engineering PC and EtherCAT® master has been successfully established, ensure that the EtherCAT® master is in "Config" state. This is indicated by the "Gear wheel" icon in the lower right-hand corner of the surface. If necessary, this state can also be established via the corresponding button in the toolbar.

You must select "Devices" to scan the network. You can activate the "Scan" operating mode via the button [Magic wand] in the toolbar.

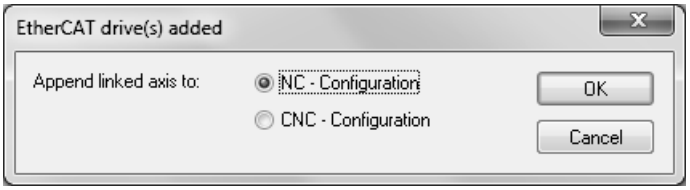


21963232651

Now, all available interfaces of the master are displayed. If required, you can deactivate all unused interfaces.

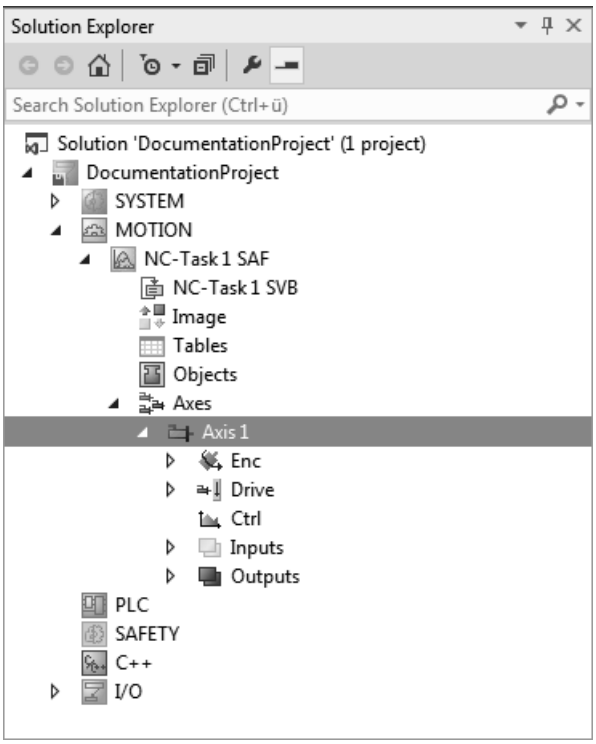
If you confirm the "Scan for Boxes" window, it is searched for devices on the interfaces that are still activated.

If a CiA402 axis is present in the EtherCAT® network, the system asks if it is to be directly linked with a motion axis.



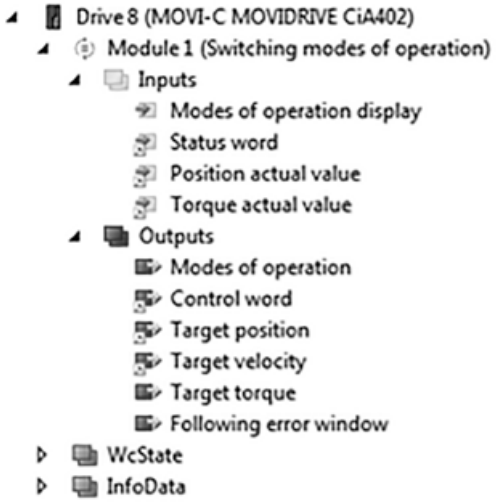
21963259403

Click [OK] and a motion task will be created under "Motion" in the project management. It includes a motion axis that has already been completely linked.



21963261835

As standard, the link between the I/O configuration and the motion axis looks as follows:



22819345163

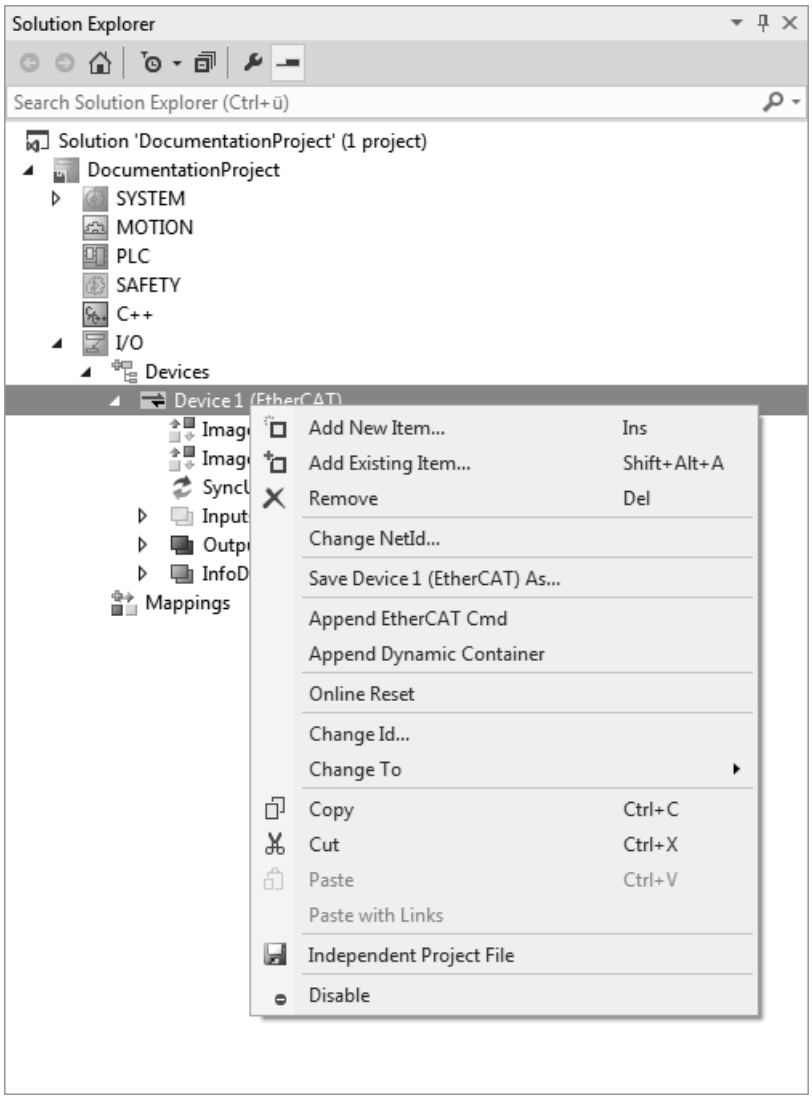
If required, a module with a specific function can also be used. These can be found in the "Slots" tab. The following options are available:

- csp
- csv
- Switching modes of operation pp/pv

As standard, the "Switching modes of operation" operating mode is selected. Here, you have the option to switch between the operating modes csp and csv because the required variables have already been linked.

Creating an offline I/O configuration

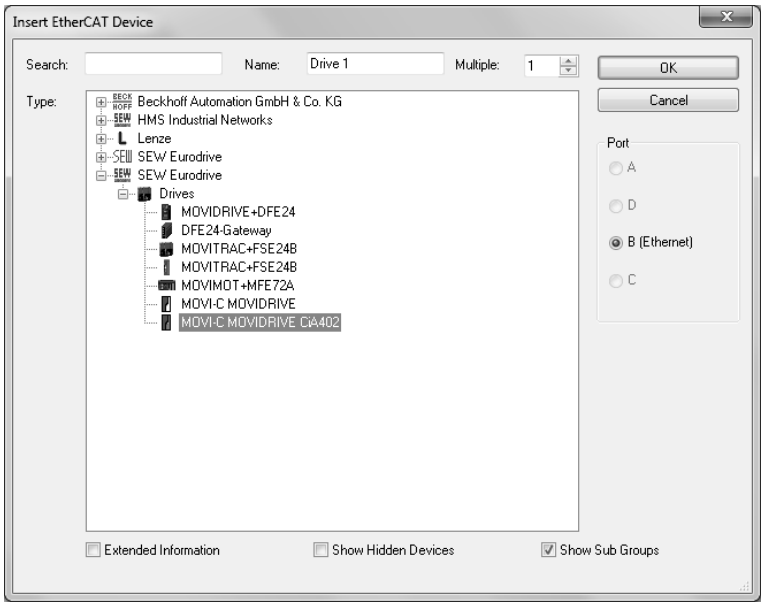
After successful installation of the ESI file, you can add the device via the menu item [Add New Item] to the I/O configuration.



23552898827

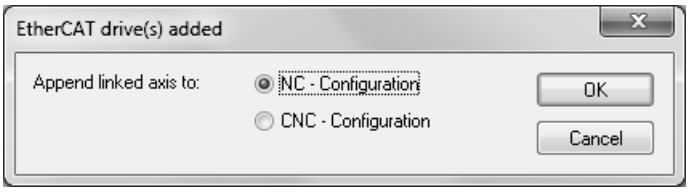
25931873/EN – 03/2019

You can find the device under the following menu item:



21963266699

Click [OK], you will be prompted whether you want to link the inverter directly with the motion axis.



21963269131

Linking an MDD double-axis module

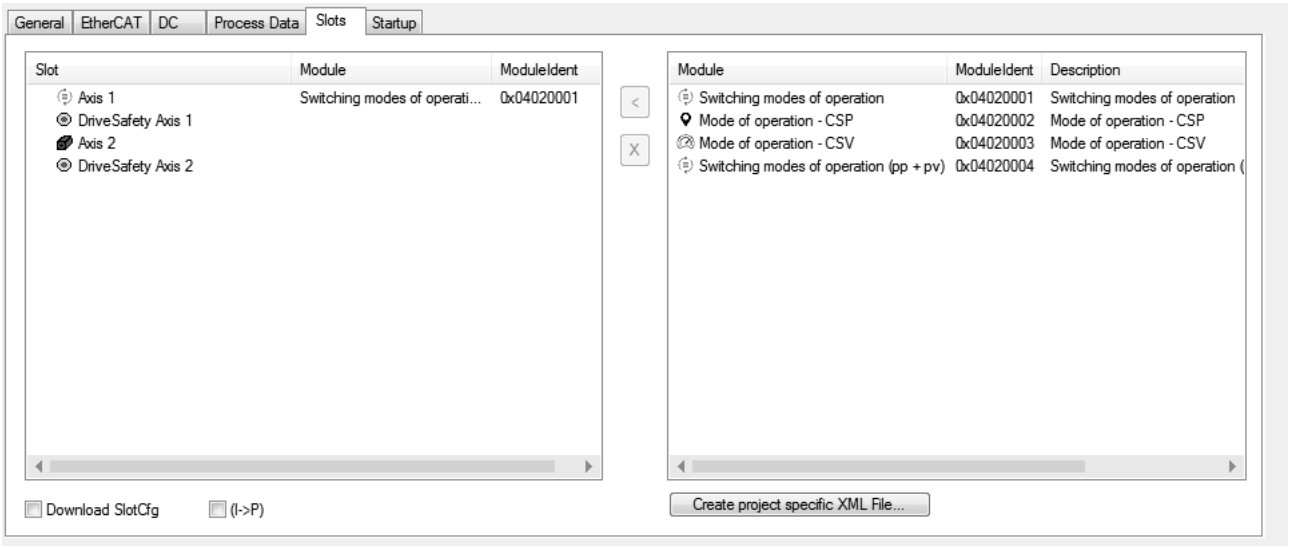
A single-axis module is created and linked depending on the TwinCAT version used during the network scan as well as during the creation of an offline I/O configuration. This is independent of whether a single-axis module or a double-axis module is physically present. This means that only one motion axis is created and linked with the I/O configuration.

If a double-axis module is present, the second axis must be created and linked manually.

Proceed as follows:

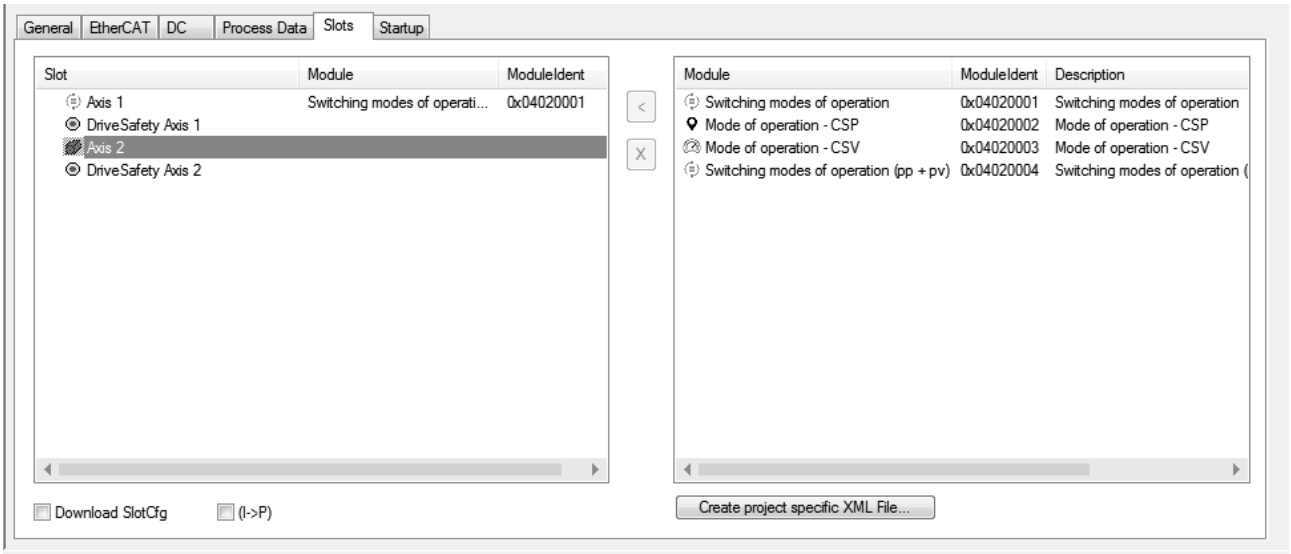
1. Set the EtherCAT® master to the operating mode "Configuration".

2. Mark the required EtherCAT® slave under "I/O" and select [Slots].



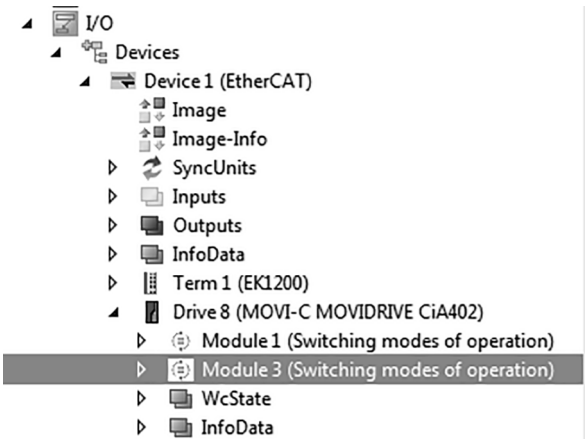
24857042955

3. Mark the "Axis 2" entry. The "Switching modes of operation" entry appears on the right hand side.



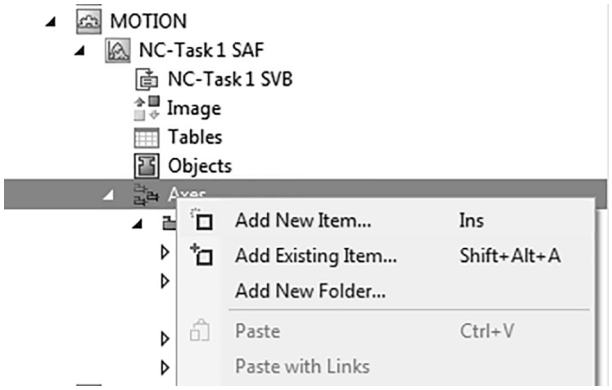
9007224111786379

4. Mark the entry on the right hand side. In the I/O configuration, the entry looks as follows:



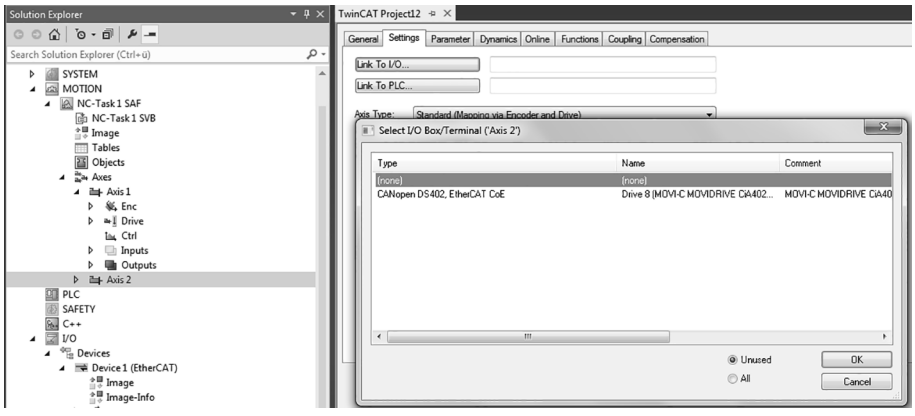
22820891915

5. To establish a link with a motion axis, you have to create the motion axis. Double click "Axis" and then [Add New Item]. Confirm the dialog box with [OK] to create a new motion axis.



22821141643

6. Select the previously created motion axis (here: Axis 2) and the [Settings] tab. Click [Link to I/O] to select the second axis of the EtherCAT® slave.



22821147659

7. The newly linked axis is then displayed here:

22821150731

INFORMATION

Depending on the version of the TwinCAT software from Beckhoff in use, the "DriveSafety Axis 1" slot must be assigned in addition to a new "Switching Modes of Operation" slot (point 4). In this way, the link of the double-axis works without any problems.

The slot configuration looks as follows:

Slot	Module	ModuleIdent
Axis 1	Switching modes of operati...	0x04020001
DriveSafety Axis 1	FSoE Safety IO 48 bit	0x04020081
Axis 2	Switching modes of operati...	0x04020001
DriveSafety Axis 2		

22822103307

25931873/EN – 03/2019

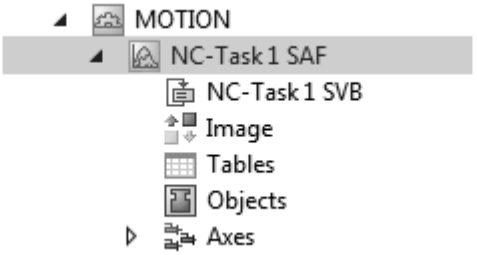
6.6.3 Setting the interpolation time

INFORMATION

The interpolation times in the EtherCAT® master and in the application inverter must match, otherwise interpolation errors occur which result in loss of control performance.

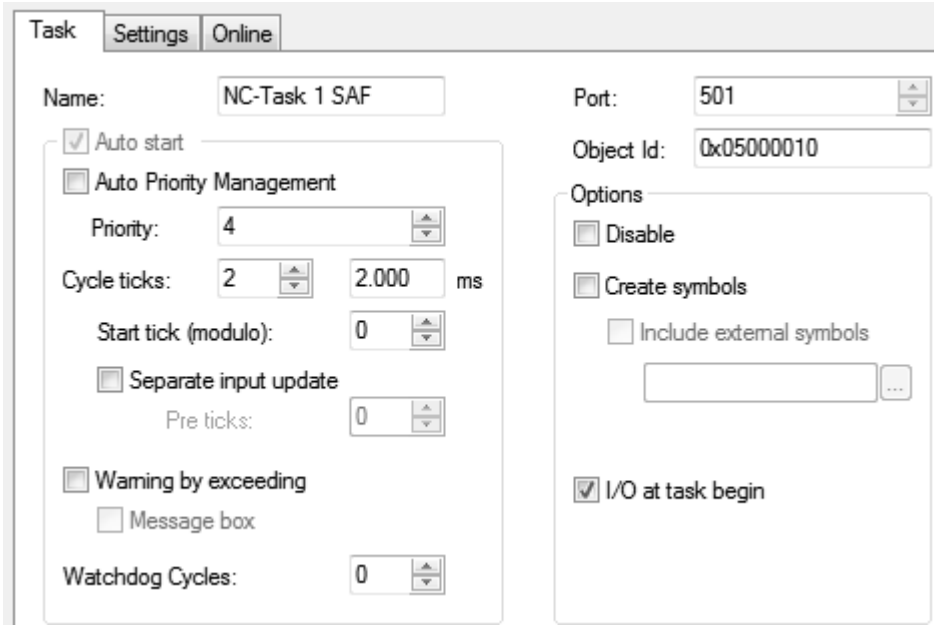
Setting the interpolation time in the EtherCAT® master

The interpolation time in the EtherCAT® master is set in the motion task. For Beckhoff, this is the "NC-Task x SAF".



24868057739

For the interpolation time, refer to the [Task] tab. The default setting for the interpolation time is 2 ms.



24868060171

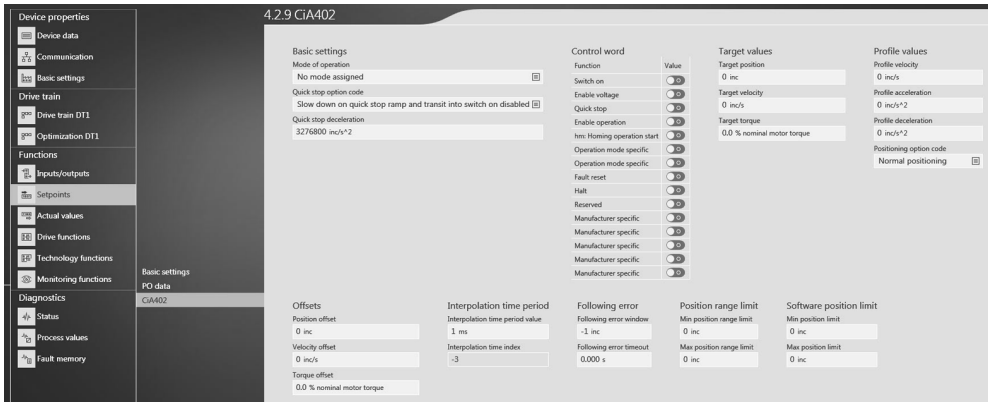
Setting the interpolation time in the application inverter

In the application inverter, you can adjust the interpolation time either in the MOVISUITE® engineering software or via the startup list of the EtherCAT® master.

1. Setting in the MOVISUITE® engineering software.

   The interpolation time is set using the MOVISUITE® engineering software under "Functions>Setpoints>CiA402".

   The "Interpolation time period value" parameter 0x60C2.1 must correspond with the set interpolation time of the motion task of the EtherCAT® master. In case of a change to an unequal value in the EtherCAT® master, you must also make this change here.



9007224122681099

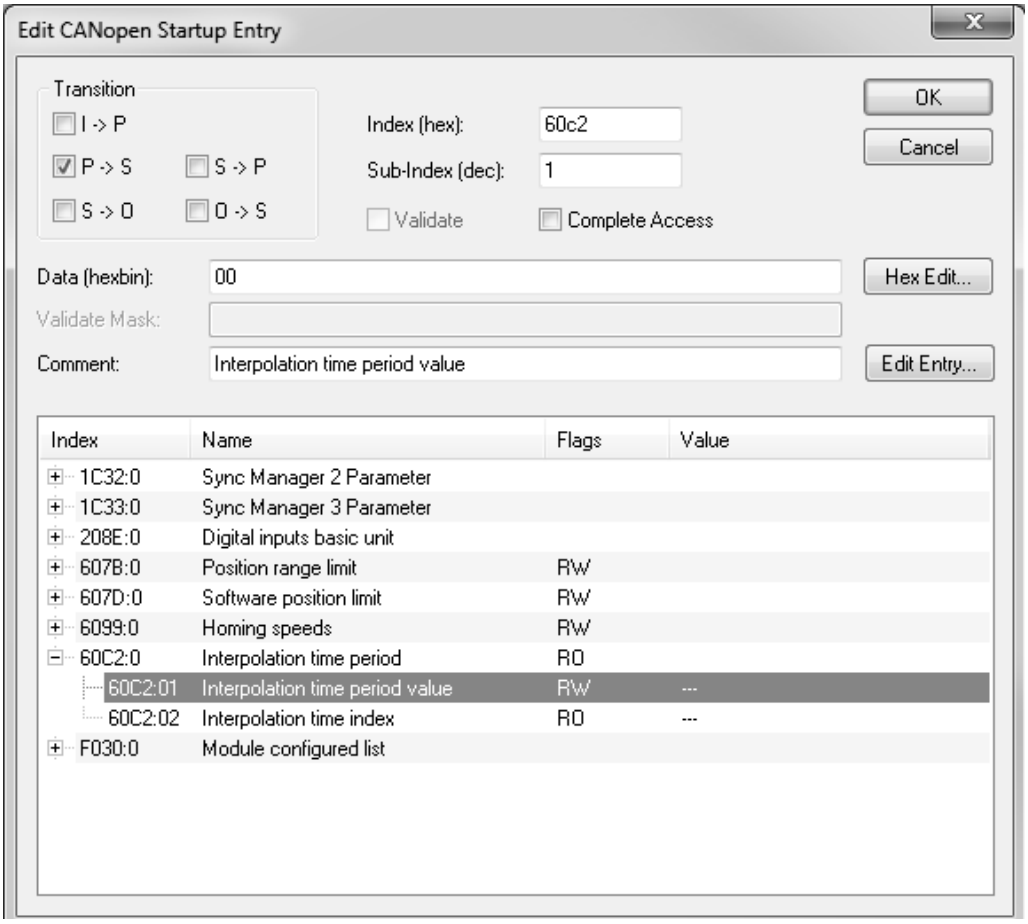
2. Setting using the startup list of the EtherCAT® master.

   During the startup phase of EtherCAT®, important parameters can be written to the application inverter via CoE (SdO) service using the startup list. Do the following to enter the interpolation time in the startup list:

   - Select the [Startup] tab
   - Click [New]

25931873/EN – 03/2019

- The following window opens:



24867937675

In the [Data] edit box, you can enter the interpolation time in the unit "ms". Click [OK] to add the value to the startup list.

6.6.4 Adjusting the PDO image

Up to 8 objects with 32 bits each can be added to the PDO image of the application inverter with the CiA402 device profile. In this way, manufacturer-specific objects can be added in addition to the required objects for the respective operating modes.

Some objects are already predefined and stored in the "Object Dictionary". However, any number of indexes of the application inverter can be added. For example, this allows for monitoring values that are changing quickly. Or further process-relevant values can be written.

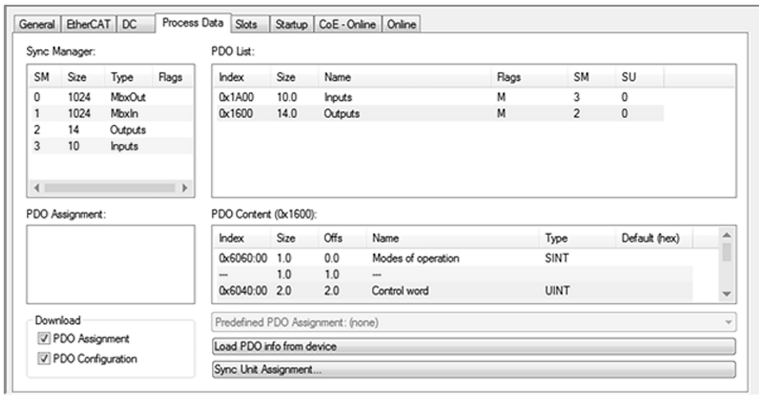
Do the following to add values to the PDO image:

1. Scan the network or create an EtherCAT® slave offline so it can be found under "I/O>Devices".

22822108299

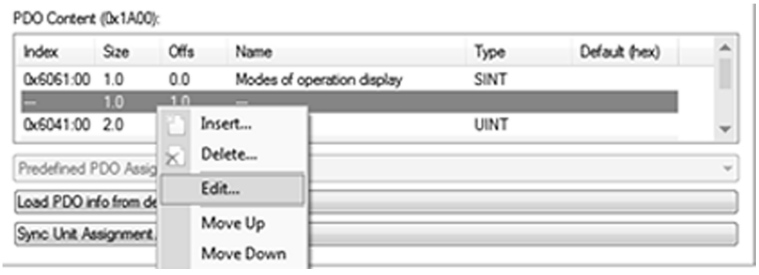
2. Double-clicking a device opens a menu window. Select the [Process data] tab.

   Select "Output" or "Input" depending on whether you want to add output or input objects.



22822111371

3. A menu that allows to add objects opens by right-clicking the [PDO Content] field.



22822204043

25931873/EN – 03/2019

Adding from the predefined object dictionary

The [Edit] menu item takes you to the content of the object dictionary. Depending on the selection, you can add the respective objects to "Input" or "Output".

Adding specific indexes from SEW-EURODRIVE

If you want to add any number of indexes to the PDO image, you must enter the corresponding "Index" and "Subindex". You are free to choose any name.

Value of the EtherCAT® slave	Name	Index decimal	Subindex	Bit length
DC link voltage	DC link voltage	8364	1	32
Absolute torque-generating current	OutputCurrent	8364	118	32

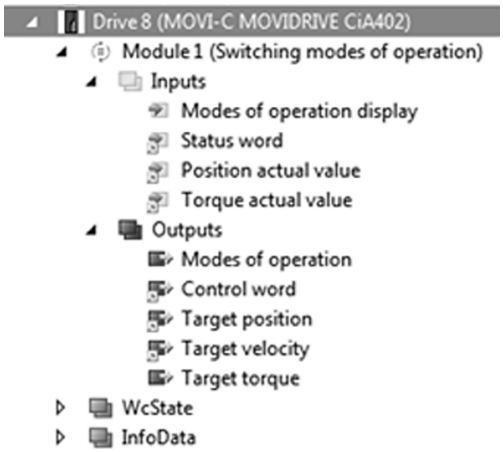
All process values of the inverter that are added to the PDO image must have a data length of 32 bits. It does not matter which data type is used.

25931873/EN – 03/2019

6.6.5 Settings for the "Cyclic synchronous position" (csp) operating mode

After the network has been scanned or after an application inverter with CiA402 device profile has been created offline, the basic links between I/O configuration and motion axis are already created in module 1.

A successfully completed motor startup is the prerequisite for operation.



22822214027

The application inverter with CiA402 device profile operates internally with 2^{16} increments per revolution as reference unit according to the CiA402 specification.

User units must be realized in the higher-level controller by the user.

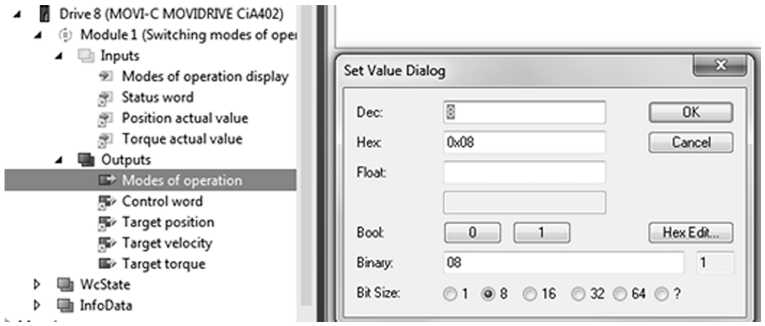
For this purpose, you must make the following settings at the motion axis:

1. Setting the unit
   - mm
   - °
   - Degree
   - s
   - ....
2. Setting the user units

   Observe the gear unit ratio. Also observe that a motor revolution is always 2^{16} increments and conform to CiA402.
3. Setting the dynamics
   - Maximum speed
   - Ramp up/down

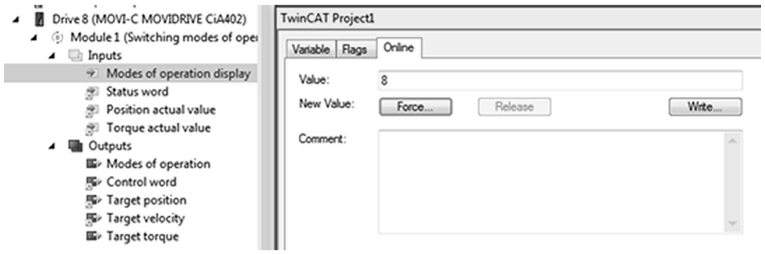
25931873/EN – 03/2019

You must select the operating mode via the PDO "Modes of operation" in addition to enabling of the axis in order to be able to select the csp operating mode. Value "8" must be written for this purpose.



22822831499

The PDO "Modes of operation display" reports back a value of "8".



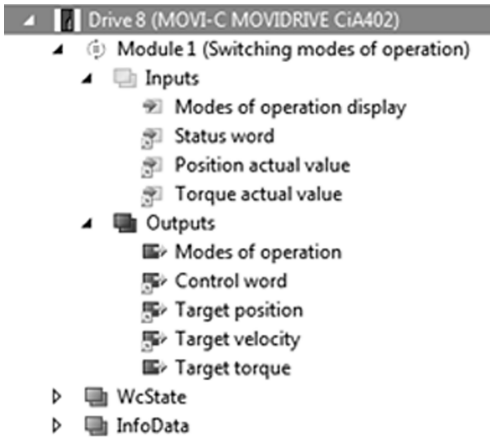
22822834571

The display of the application inverter shows a value of "16".

6.6.6 Settings for the "Cyclic synchronous velocity" (csv) operating mode

After the network has been scanned or after an application inverter with CiA402 device profile has been created offline, the basic links between I/O configuration and motion axis are already created in module 1.

A successfully completed motor startup is the prerequisite for operation.



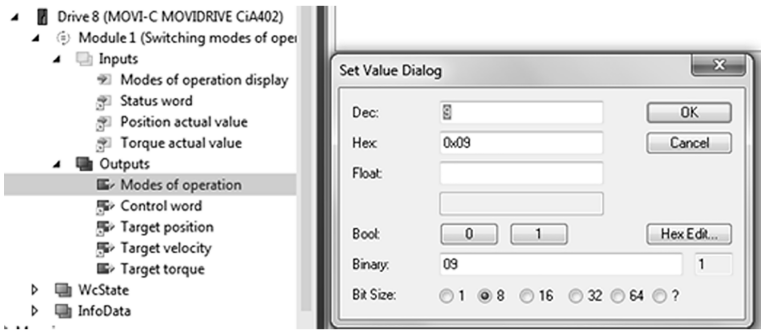
22826019723

For this purpose, you must make the following settings at the motion axis:

1. Setting the unit
   - mm
   - °
   - Degree
   - s
   - ....
2. Setting the user units

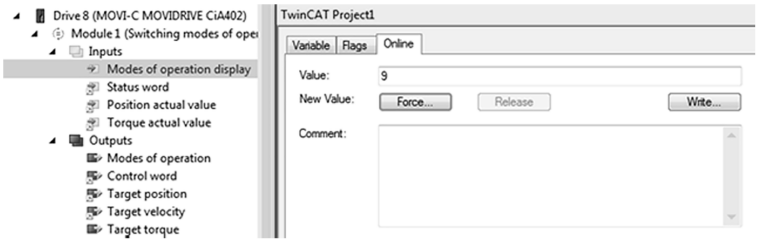
   Observe the gear unit ratio. Also observe that a motor revolution is always 2^{16} increments and conform to CiA402.
3. Setting the dynamics
   - Maximum speed
   - Ramp up/down

You must select the operating mode via the PDO "Modes of operation" in addition to enabling of the axis in order to be able to select the CSV operating mode. Value "9" must be written for this purpose.



22826023435

The PDO "Modes of operation display" reports back a value of "9".



22826026507

The display of the application inverter shows a value of "15".

25931873/EN – 03/2019

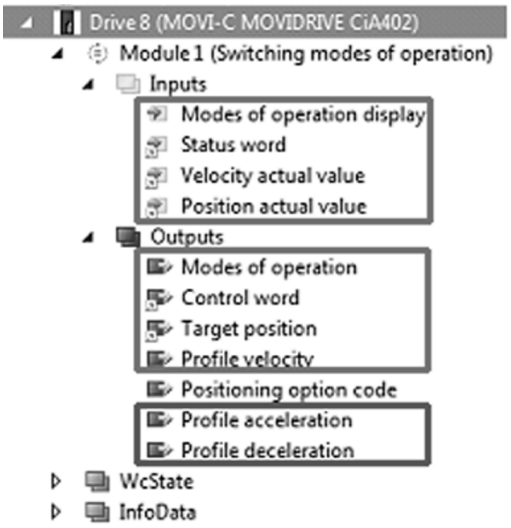
6.6.7 Settings for the "Profile position" (pp) operating mode

After the network has been scanned or after an application inverter with CiA402 device profile has been created offline, the basic links between I/O configuration and motion axis are already created in module 1 for the csp, csv and cst operating modes.

A successfully completed motor startup is the prerequisite for operation.

The "pp" operating mode can be used in two ways:

1. Manual adjustment of the PDO interface

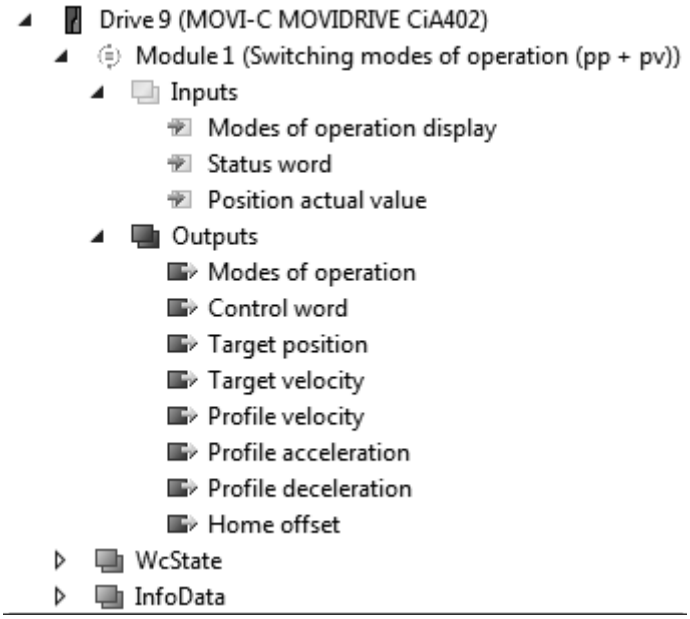


22826149387

The upper 2 markings display the minimum configuration for cyclic control of the application inverter via the PDO interface. You can change the profile values for speed, acceleration and deceleration during operation.

25931873/EN – 03/2019

2. Using the predefined module "Switching modes of operation (pp+pv)". This entry can be set via the "Slots" tab, see chapter "Creating the I/O configuration and linking the motion axis" (→ 🗎 38). The entry looks as follows:



24857969035

The application inverter with CiA402 device profile operates internally with increments (inc.) as reference unit. During motor startup, it is not possible to define user units.

The "pp" operating mode is usually used without motion axis if the TwinCAT engineering software is used so that the possible scalings do not affect the behavior of the drive inverter. Therefore, the profile values are directly specified via the PDO interface.

Bear in mind that all values must be specified in increments. The conversion factor is always 65536 inc/motor revolution.

The unit of the speed is always inc/s.

The unit of acceleration and deceleration is always inc/s^2.

Example:

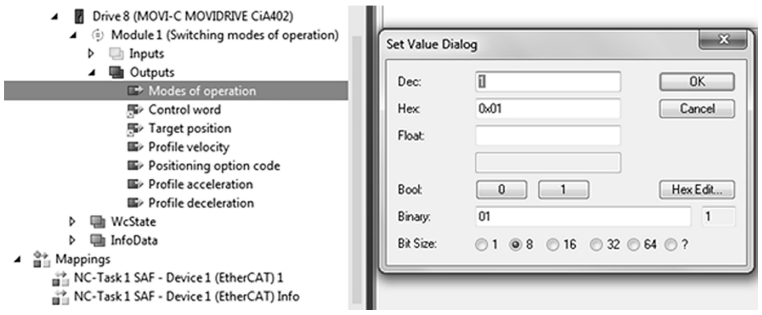
Setpoint speed: 1800 min^{-1}	30 1/s	1966080 inc./s
Deceleration/acceleration: 2 s	15 1/s^2	983040 inc/s^2

A successfully completed reference travel (homing, hm) of the drive is the basis for positioning. This information is reported back by the "homing attained" bit in the status word.

You must select the operating mode via the PDO "Modes of operation" in addition to enabling of the axis in order to be able to select the "pp" operating mode.

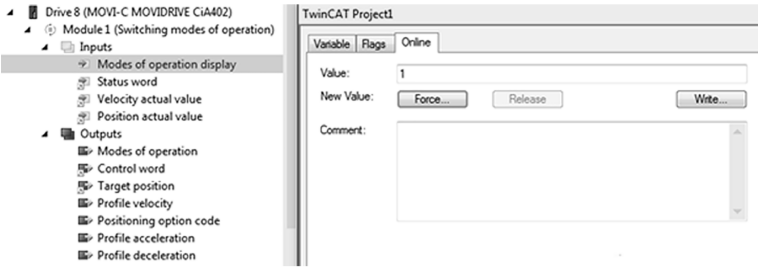
25931873/EN – 03/2019

For this purpose, enter a value of "1".



22826157067

The PDO "Modes of operation display" reports back a value of "1".



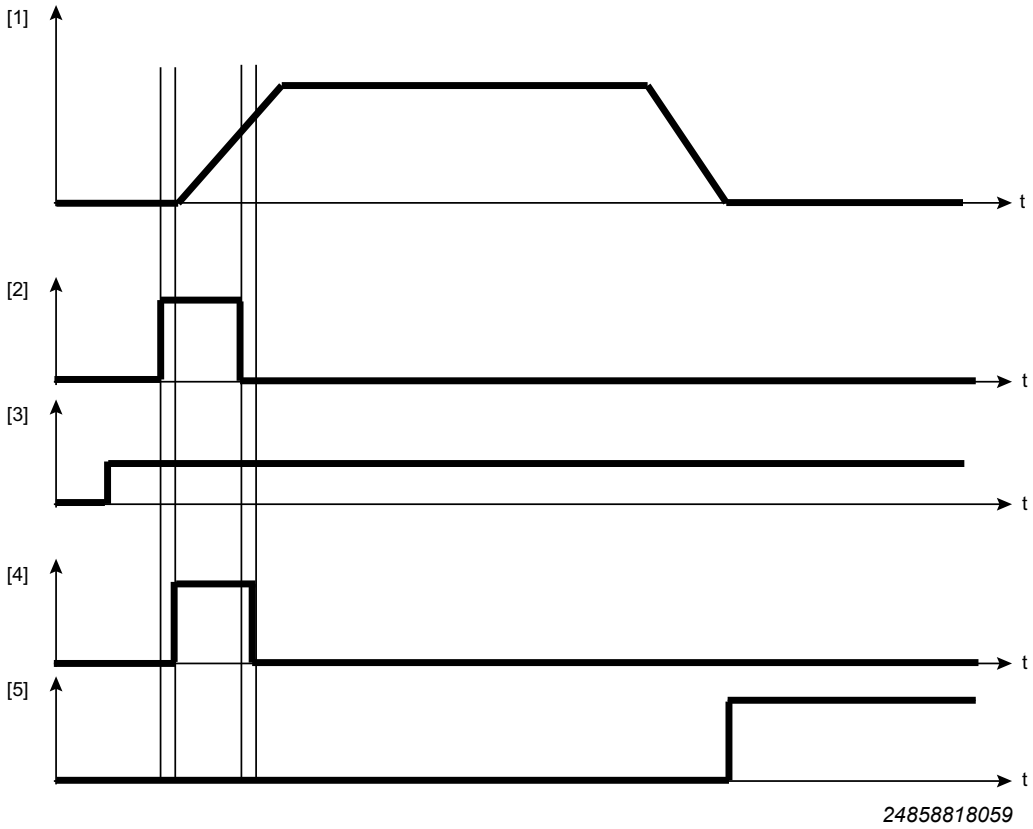
22826659339

The display of the application inverter shows a value of "24".

The "target reached" bit reports back that positioning has been successfully completed.

25931873/EN – 03/2019

A rising edge on bit 4 of the control word is necessary to accept a new position.



[1] Actual speed
[2] New setpoint (bit 4)
[3] Setpoint target position
[4] Setpoint acceptance (bit 12)
[5] Target position reached (bit 10)

Position option code	Value
Standard positioning	0
Only in negative direction	64
Only in positive direction	128
Shortest way	192

25931873/EN – 03/2019

The positioning type that can be selected via the "position option code" is only active if bits 5 and 6 of the control word are assigned. The function assignment is shown below.

Bit 6	Bit 5	Definition
0	0	Standard positioning comparable with linear axis. If the positioning limits (0x607B:2, 0x607B:1) are reached, the setpoint is automatically set to the other side of the limit. Positioning can be relative or absolute. Positioning beyond the modulo value is only possible with this bit combination.
0	1	Positioning only in negative direction: If the setpoint position is greater than the actual position, the axis moves beyond the minimum position limit (0x607B:1) to the setpoint position.
1	0	Positioning only in positive direction: If the setpoint position is smaller than the actual position, the axis moves beyond the maximum position limit (0x607B:2) to the setpoint position.
1	1	Positioning by the shortest possible route to the setpoint position. Information: If the distance between actual position and setpoint position is 180° in a 360 degrees system, the axis moves in positive direction.

25931873/EN – 03/2019

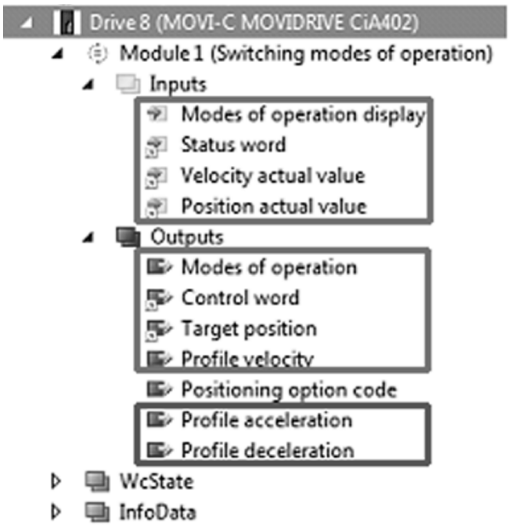
6.6.8 Settings for the "Profile velocity" (pv) operating mode

After the network has been scanned or after an application inverter with CiA402 device profile has been created offline, the basic links between I/O configuration and motion axis are already created in module 1 for the csp, csv and cst operating modes.

A successfully completed motor startup is the prerequisite for operation.

You need to adjust the PDO interface to use the "pv" operating mode.

1. Manual adjustment of the PDO interface



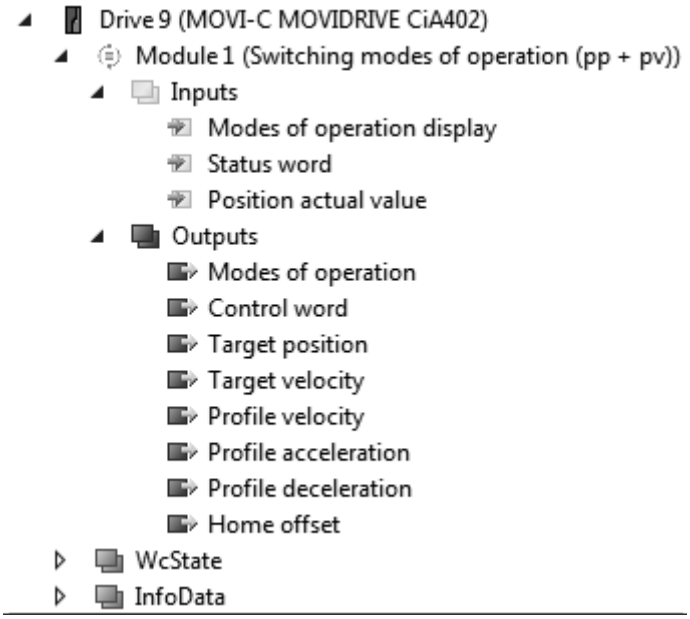
22826149387

The upper 2 markings display the minimum configuration for cyclic control of the application inverter via the PDO interface. You can change the profile values for speed, acceleration and deceleration during operation.

The lower marking shows the values for acceleration and deceleration. Alternatively, these can be also be operated acyclically via SdO services.

25931873/EN – 03/2019

2. Using the predefined module "Switching modes of operation (pp+pv)". This entry can be set via the "Slots" tab, see chapter "Creating the I/O configuration and linking the motion axis" (→ 🗎 38). The entry looks as follows:



24857969035

The application inverter with CiA402 device profile operates internally with increments (inc.) as reference unit. During motor startup, it is not possible to define user units.

The "profile velocity mode" is usually used without motion axis if the TwinCAT engineering software is used so that the possible scalings do not affect the behavior of the drive inverter. Therefore, the profile values are directly specified via the PDO interface.

Bear in mind that all values must be specified in increments. The conversion factor is always 65536 inc/motor revolution.

The unit of the speed is always inc/s.

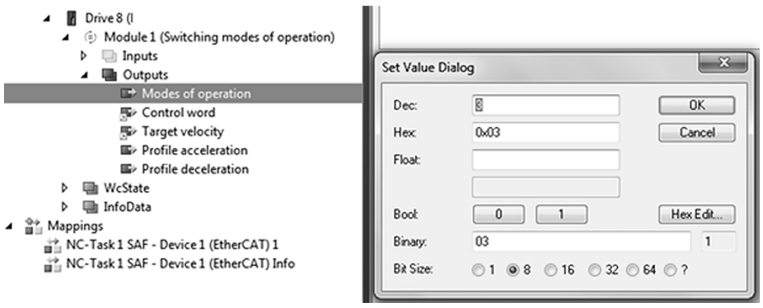
The unit of acceleration and deceleration is always inc/s^2.

Example:

Setpoint speed: 1800 min^{-1}	30 1/s	1966080 inc./s
Deceleration/acceleration: 2 s	15 1/s^2	983040 inc/s^2

You must select the operating mode via the PDO "Modes of operation" in addition to enabling of the axis in order to be able to select the "pv" operating mode.

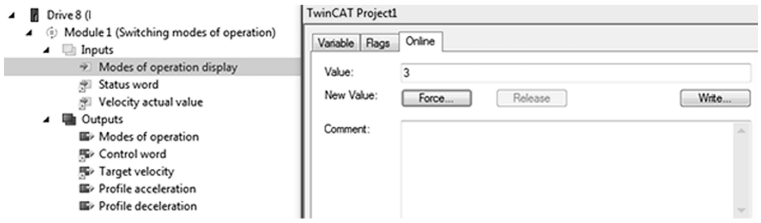
For this purpose, enter a value of "3".



22826669963

25931873/EN – 03/2019

The PDO "Modes of operation display" reports back a value of "3".



22827454731

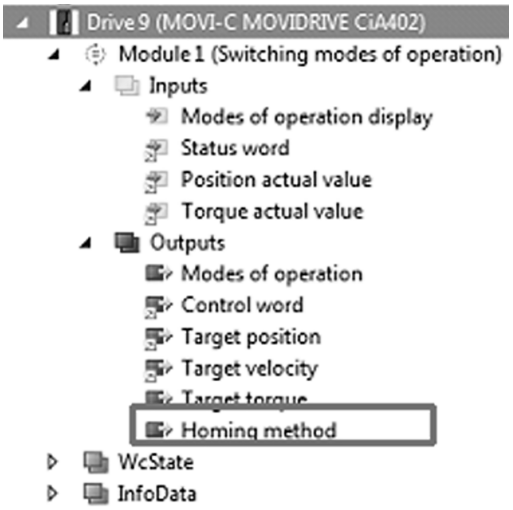
The display of the application inverter shows a value of "3".

6.6.9 Using the "Homing" (hm) operating mode

The "Homing (hm)" operating mode enables the application inverter to perform a reference travel.

Reference travel types (homing methods) that can be selected during startup either via the PDO interface, SdO parameter services or via the MOVISUITE® engineering software are supported, see chapter "Object dictionary" (→ 🗎 23) or "Supported operating modes" (→ 🗎 21).

If a selection is to be made via the PDO interface, you need to adjust it beforehand.



22827462411

The marked "Homing method" PDO entry is important.

INFORMATION

If the "Homing method" entry is used in the PDO interface, it must also be written with a value. If the reference travel type is selected in the MOVISUITE® engineering software or if it is written via a parameter access, this value will be overwritten by the value in the PDO.

A selection of the reference travel type via SdO service is performed by writing the index 24728.0 dec (0x6098/0x7098) with the corresponding value from the assignment table.

You must select the operating mode via the PDO "Modes of operation" in addition to enabling of the axis in order to be able to select the "homing" operating mode. Value "6" must be written for this purpose.

The PDO "Modes of operation display" reports back a value of "6".

The display of the application inverter shows a value of "11".

INFORMATION

If the application inverter is operated in an interpolated "Mode of operation" (csp, csv, cst), a lag error occurs in the motion axis during the reference travel with the operating mode "homing". You must reset the motion axis before you can restart the travel process (danger: Speed monitoring fault due to compensation of the lag error). The lag error does not occur with the pp and pv operating modes where the closed loop system on the application inverter is closed.

25931873/EN – 03/2019

If the "homing" operating mode and a valid method are selected, you no longer need to start the reference travel separately because the corresponding bit in the control word has already been set.

A feedback is given via the "homing attained" bit in the status word of the application inverter with CiA402 device profile.

The operating principle of the reference travel types corresponds to the reference travel types that can be selected via FCB12.

If you start a reference travel in the manual mode of MOVISUITE®, the method that is currently parameterized will be selected.

25931873/EN – 03/2019

6.7 Data management via File over EtherCAT® (FoE)

If you use the FoE service, it is possible to back-up the parameter set of the application inverter via the engineering software or via the control program on the EtherCAT® master or on the engineering PC. It is also possible to load the saved data back to the application inverter.

The following data is included in the data set:

- Motor and startup data
- Safety parameterization, if required
- Scope data, if present

This means it is possible to completely replace the device without the need for re-startup.

INFORMATION

Whether or not the FoE service can be used depends on the EtherCAT® master. For further information, refer to the manufacturer's documentation of the EtherCAT® master.

The following user interfaces are defined to prepare the application inverter for the FoE service.

	MDA/MDD axis 1	MDD axis 2
All parameters	Axis1_ParametersetComplete_mcex	Axis2_ParametersetComplete_mcex
Comparable parameter	Axis1_ParametersetRestorableOnly_mcex	Axis2_ParametersetRestorableOnly_mcex

INFORMATION

Observe the notation of the user interface.

- Observe case sensitivity

- There must not be any spaces before or after a string

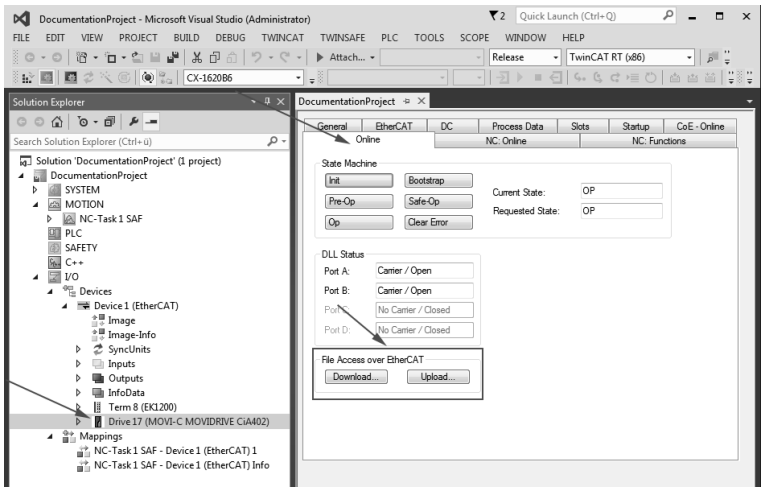
These user interfaces are required for data management via the engineering software of the EtherCAT® master as well as for data management from the control program.

25931873/EN – 03/2019

6.7.1 Data management via the engineering software of the EtherCAT® master

Data management via the engineering software is only possible in the "Operational" (OP) operating mode of the application inverter.

For this purpose, you must select the application inverter and then the [Online] tab.



22316480267

On this display, you find the "File Acces Over EtherCAT" category and the [Download] and [Upload] options.

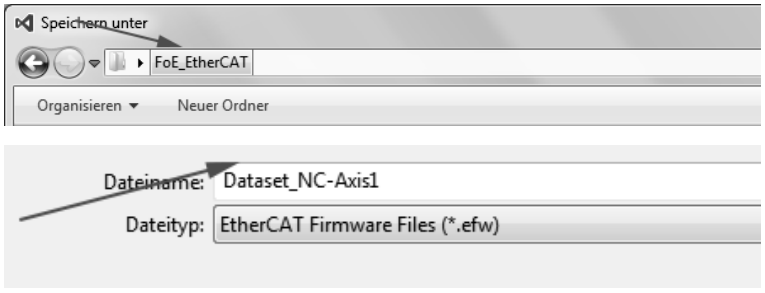
The options have the following functions:

- Upload: Stores the data set of the application inverter in a file structure of the engineering system. It is irrelevant whether a separate engineering PC or the EtherCAT® master is used as engineering platform.
- Download: Loads an already stored data set from a file structure of the engineering platform back to the application inverter.

Uploading data

Adhere to the following sequence to upload the parameters.

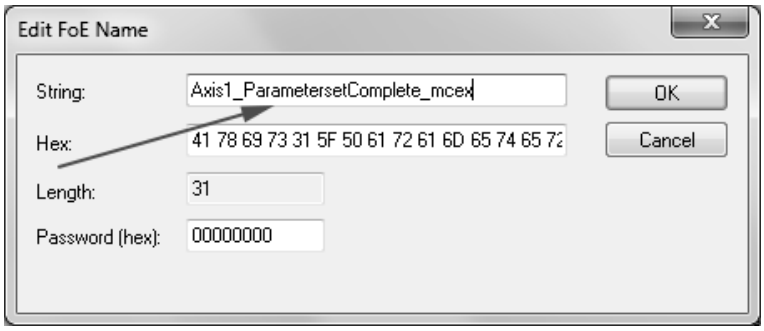
1. Select the [Upload] option
2. Select a file and choose a file name



If the data set is also used with the MOVISUITE® engineering software, the file extension ".mcex" must be used.

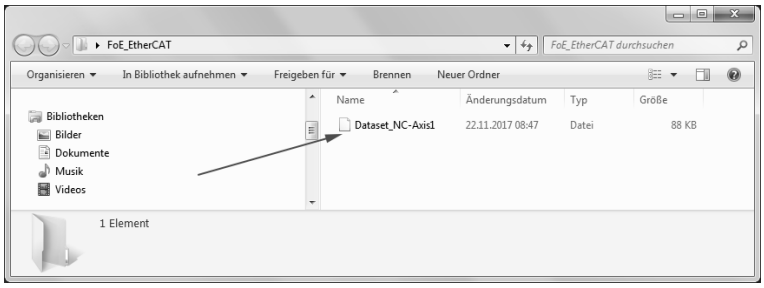
Here: Dataset_NC_Axis1.mecx

3. Confirm the transfer to the user interface with [OK]. A password is not required.



22316487563

4. The file is now available under the chosen name in the defined directory structure.



22316489995

Downloading data

For downloading data, you must adhere to the following sequence:

1. Select the [Download] option
2. Select the file system and the file
3. Transferring the user interface
4. Confirm with [OK]

25931873/EN – 03/2019

6.7.2 Data management via the PLC program

A sample function block for data management from the PLC program is provided by SEW-EURODRIVE. It is available for download from the website www.sew-eurodrive.com under "Online Support>Data & documents>Software".

More information can be found in the ReadMe file of the download package on the SEW-EURODRIVE website or in the block itself.

If you use the sample function block for FoE, the file with the file extension ".mcex" is saved and therefore it can be used with the MOVISUITE® engineering software.

25931873/EN – 03/2019

6.8 Individual parameter access

It is possible to access individual parameters of the axes. Therefore, you can read out process values or adjust parameters to the basic conditions during operation.

The parameters of the application inverter are accessed via the standard SDO READ and WRITE services in CoE (CANopen over EtherCAT®).

A sample function block for data management from the PLC program is provided by SEW-EURODRIVE. It is available for download from the website www.sew-eurodrive.com under "Online Support>Data & documents>Software".

More information can be found in the ReadMe file of the download package on the SEW-EURODRIVE website or in the block itself.

6.8.1 SDO services READ and WRITE

The user interface is displayed differently depending on the EtherCAT® master or configuration environment. However, certain sizes and information on the performance of the service are always required:

SDO-READ	Description
Slave address (16 bits)	EtherCAT® address of the inverter from which data is to be read
Index (16 bits) Subindex (8 bits)	Address in the object directory of the inverter that is to be read

SDO-WRITE	Description
Slave address (16 bits)	EtherCAT® address of the inverter to which data is to be written
Index (16 bits) Subindex (8 bits)	Address in the object directory of the inverter that is to be written
Data Data length	Structure in which the data to be written and their length is stored

For the SDO services READ and WRITE, other flags and parameters might be necessary:

- For activating the function
- For "In-process messages" or error messages
- For timeout monitoring
- For reporting errors during the performance

To use the non-cyclical parameter access, the manufacturer of the EtherCAT® master usually provides corresponding libraries and function blocks.

Depending on the EtherCAT® master, the following libraries are required:

Controller platform	Libraries	Function blocks
Beckhoff	Tc2_EtherCAT.lib (Standard.Lib; TcBase.Lib; TcSystem.Lib, TcUtilities.Lib)	Read: FB_EcCoeSdoRead
		Write: FB_EcCoeSdoWrite
	For more information on error numbers, refer to the Beckhoff InfoSys.	

25931873/EN – 03/2019

INFORMATION

With a double axis, you can access the second axis of the module via an index offset of 0x1000 (4096 dec).

6.8.2 Example: Reading a parameter in TwinCAT via EtherCAT®

The function SDO-READ is available for reading parameters. The index and subindex of the parameter to be read is necessary.

This information can be generated from the MOVISUITE® engineering software in different ways:

- Tooltip of the parameter

  Move the mouse cursor over the edit box or display field of the parameter. An information window with the index number opens. The subindex is separated by a period.

9007221217285003

- You can search for the parameter using the MOVISUITE® search function. After that, the tooltip can be used.

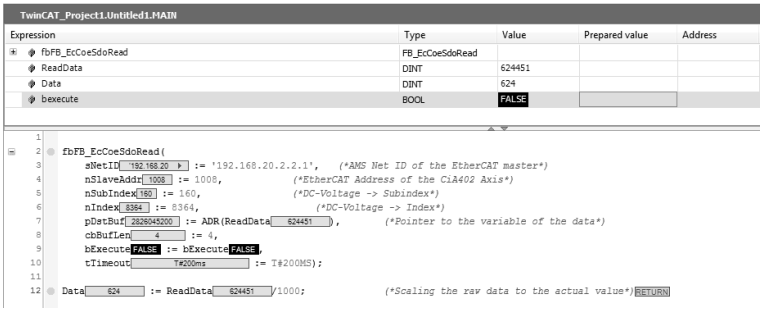
The "FB_EcCoeSdoRead" function block can be integrated into the control program of the EtherCAT® master in 2 steps:

1. Creating an instance of the function block "FB_EcCoeSdoRead"
2. Assigning the inputs of the function block:
   - sNetID: Specifying the net ID of the EtherCAT® master.
   - nSlaveAddr: EtherCAT® address of the device from which data is to be read.
   - nIndex: Specifying the index of the parameter to be read. When using a double-axis module, the index of the second axis is assigned with an offset of 0x1000 (4096 dec).
   - nSubIndex: Subindex of the parameter to be read.

- pDstBuf: Pointer to the data range in which the read parameter is to be stored.
- cbBufLen: Maximum memory size for parameters to be read in byte. For SEW-EURODRIVE, it is always 4 bytes.
- bExecute: A positive edge starts the read process.
- tTimeout: Timeout interval of the function unit.

  The output flags "bBusy" and "bError" indicate the status of the service. "nErrId" shows the error number when the "bError" flag is set if an error occurs.

  The integration in TwinCAT looks as follows:



21962546443

After a "Rising Edge" to "bExecute", you can find the current value (here: DC link voltage) in the corresponding variable. You then have to scale the variable accordingly (in the example: 1000).

6.8.3 Example: Writing a parameter in TwinCAT via EtherCAT®

The SDO-WRITE function is available for writing parameters. The index and subindex of the parameter to be written is necessary.

This information can be generated from the MOVISUITE® engineering software in different ways:

- Tooltip of the parameter

  Move the mouse cursor over the edit box or display field of the parameter. An information window with the index number opens. The subindex is separated by a period.

25931873/EN – 03/2019

9007221217289867

- You can search for the parameter using the MOVISUITE® search function. After that, the tooltip can be used.

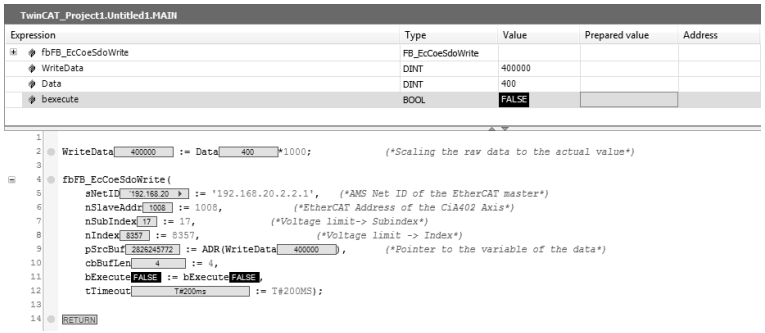
The "FB_EcCoeSdoWrite" function block can be integrated into the control program of the EtherCAT® master in 2 steps:

1. Creating an instance of the function block FB_EcCoeSdoWrite
2. Assigning the inputs of the function block:
   - sNetID: Specifying the net ID of the EtherCAT® master.
   - nSlaveAddr: EtherCAT® address of the device to which data is to be written.
   - nIndex: Index of the parameter to be written. When using a double-axis module, the index of the second axis is assigned with an offset of 0x1000 (4096 dec).
   - nSubIndex: Subindex of the parameter to be written.
   - pDstBuf: Pointer to the data range in which the values to be written are located.
   - cbBufLen: Length of data to be sent in bytes. For SEW-EURODRIVE, it is always 4 bytes.
   - bExecute: A positive edge starts the write process.
   - tTimeout: Timeout interval of the function unit.

     The output flags "bBusy" and "bError" indicate the status of the service. "nErrId" shows the error number when the "bError" flag is set if an error occurs.

     The integration in TwinCAT looks as follows:

To write the correct value, it must be scaled according to the time parameter (here: voltage limit) prior to the "Rising Edge" to "bExecute" (in the example: 1000).



21963191307

25931873/EN – 03/2019

6.9 Starting up FSoE of an FSoE master using the example of Beckhoff

6.9.1 Startup with MOVISAFE® card CS..A at FSoE master

Requirements

- The higher-level F-PLC must support the iPar CRC mechanism.
- For a successful startup, you need the "Assist CS.." parameterization tool. You can open the "Assist CS.." parameterization tool directly in the MOVISUITE® engineering tool (from MOVISUITE® version 1.2 or higher; download from www.sew-eurodrive.com).
- Additional requirements for using MOVISAFE® CS..A with FSoE fieldbus connection via EtherCAT®:
  - FSoE master.
  - TwinSAFE engineering plug-in for TwinCAT.
  - Current ESI file; available for download from www.sew-eurodrive.com.

INFORMATION

To ensure proper functioning of FSoE communcation, there must not be any error pending for non-safe EtherCAT® communication.

Bear in mind that the option of connecting a MOVISAFE® card CS..A to an FSoE master depends on the manufacturer of the FSoE master.

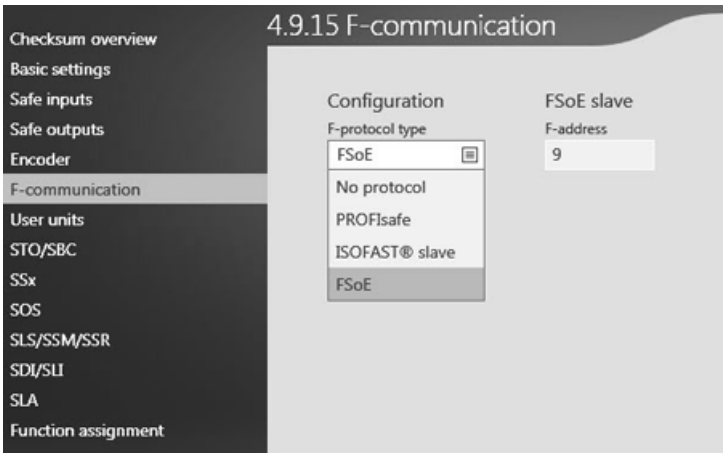
Manufacturer	Connecting FSoE slaves of third-party manufacturers
Beckhoff	Supported
OMRON	Not supported

Settings for the MOVISAFE® card CS..A

In addition to setting the parameters for the drive safety functions, the respective safety protocol and the FSoE slave F-address must also be set.

Setting the safety protocol

The MOVISAFE® card CS..A supports several safety protocols. If you want to use FSoE, you have to make this setting during startup.

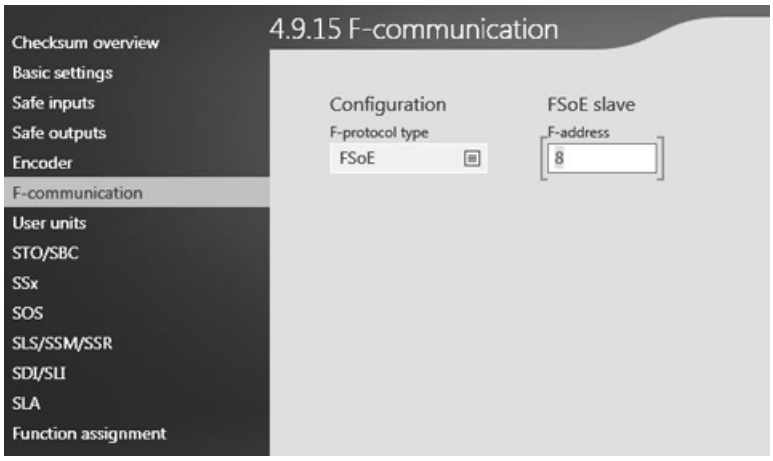


27202713099

25931873/EN – 03/2019

Setting the FSoE address

The FSoE slave F-slave address must be identical with the address set in the FSoE master. You can set the address in the menu shown below:



27202715915

The FSoE slave F-address must be unequal 0.

Settings at the FSoE master

The settings to be made at an FSoE master are shown using the example of a Beckhoff controller EL9600 and the software module TwinSAFE for TwinCAT3.

Perform the following steps in the specified order:

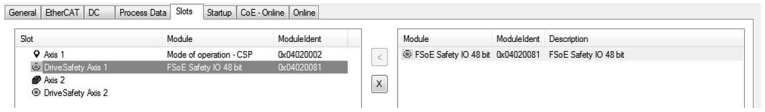
1. Create the I/O configuration by scanning the network or using offline configuration.
2. Establish the non-safe EtherCAT® communication and check it.
3. Adjust the slot configuration of the EtherCAT® slave.
4. Create the safety project and select the target system (FSoE master).
5. Create the SEW alias device.
6. Link the FSoE slave to the safety project.
7. Set the FSoE slave F-address and the IPAR CRC address.
8. Select the safety function.

25931873/EN – 03/2019

Adjusting the slot configuration of the EtherCAT® slave

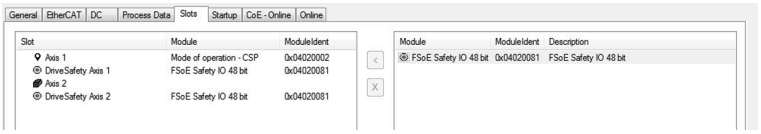
For the following devices you have to insert the FSoE module into the second slot "DriveSafety Axis1":

- MDA90A single-axis module
- Left side of an MDD90A double-axis module
- MOVIDRIVE® system MDX90A



27202821131

For an MDD90A double-axis module you have to use the fourth slot "DriveSafety Axis2":



27202823947

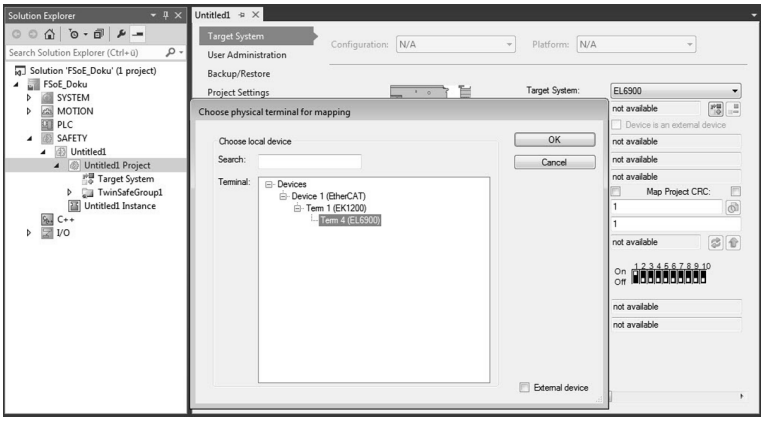
With an MDD90A double-axis module, you can use either both axis halves independently of one another or both halves simultaneously with MOVISAFE® cards CSS..A. You have to insert FSoE modules accordingly.

Following an overview of FSoE modules you can use:

Axis type	FSoE module
-E00 axis	FSoE safety I/O 48 bit (0x04020081)

Creating the safety project and selecting the target system

To being able to establish an FSoE communication, you have to link the hardware of the FSoE master with the software. You can connect the FSoE master either via the backplane bus or via the EtherCAT® network.



27202826763

The FSoE address of the master must be identical with the address of the master hardware.

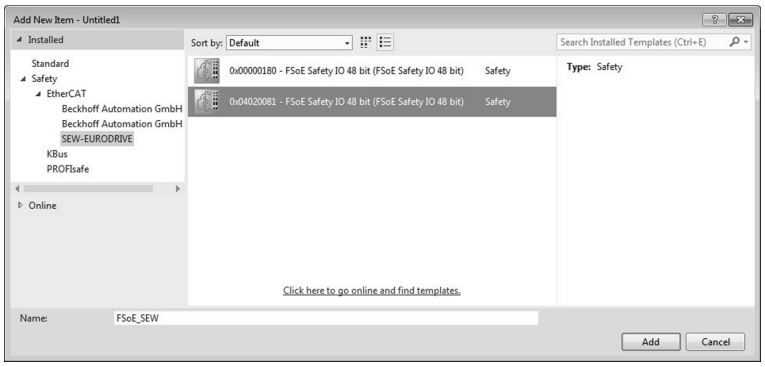
Creating an alias device

You have to create an alias device to link the FSoE slave with the safety project. This alias device is the representative of the safety slot in the FSoE master created in the I/O configuration.

The alias device is created under the "TwinSafeGroup" safety module under "Alias Devices".

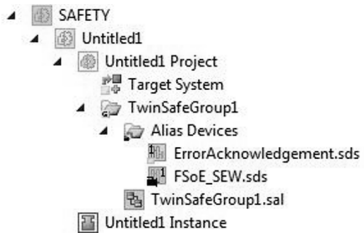
27511969035

To create the alias device, right-click "Alias Device" and select "Add New Item".



27202936075

Assign a name and click "Add". The alias device is now created.



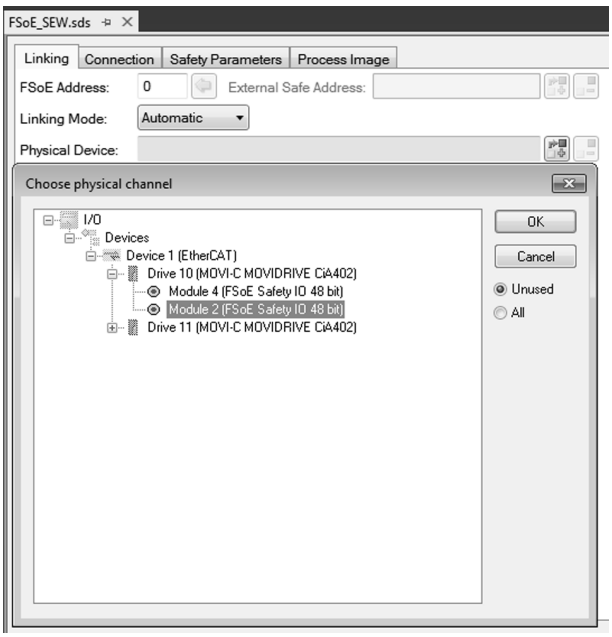
27511971851

Linking the FSoE slave with the safety project

The alias device must be linked with the slot of the "PhysicalDevices" in the I/O configuration to establish an FSoE communication.

25931873/EN – 03/2019

Use the "Linking" tab for this purpose. This is where all configured FSoE slots are indicated with the matching ID.



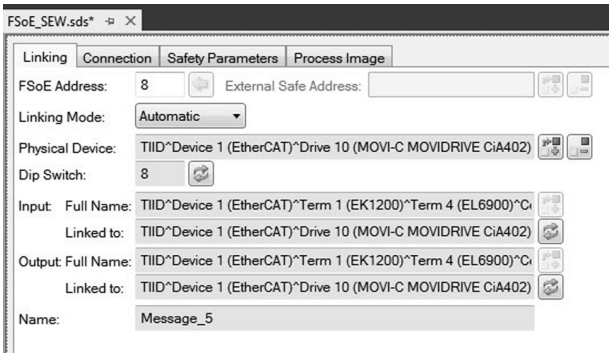
27511975435

Clicking [OK] creates the linking of the alias device with the FSoE slave.

If several FSoE modules are available, they will be displayed as selected.

Setting FSoE slave F-address and IPAR CRC

You can set the FSoE address under "FSoE Address". The FSoE address must correspond with the value for "Dip Switch" (8 in the example).

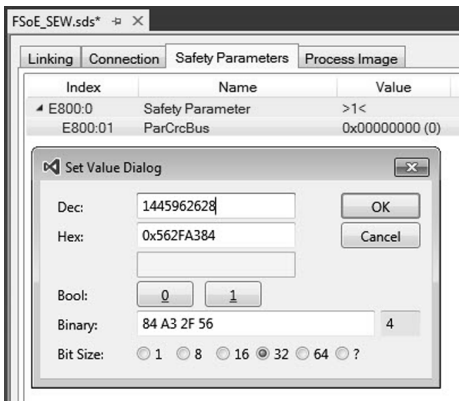


27202940811

If the system is in RUN mode, you can read the address set using "Assist CS..".

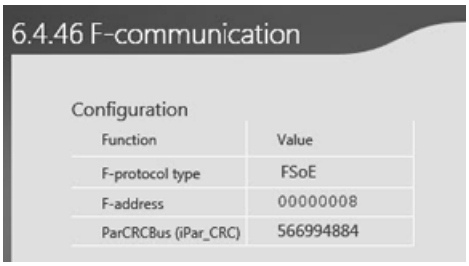
25931873/EN – 03/2019

You can set the "iPAR CRC" under "Safety Parameters". This value must correspond with the "ParCRCBus" value of the CS.. card.



27204385035

You can read the "ParCRCBus" value in the MOVISUITE® engineering software:



27204382603

Selecting the safety functions

You can read the assignment of FSoE data words and bit-wise assignment of the safety functions in the MOVISUITE® engineering software.

You have to make the linking in the safety program according to these settings.

Safety functions are always 0-active. This is why the following applies to the assignment of bits in the safety functions:

Status of monitoring	Value of process data
Monitoring active	0
Monitoring not active	1

25931873/EN – 03/2019

7 Connection to the MOVISUITE® engineering software

There are different options to establish a connection to the MOVISUITE® engineering software to start up the application inverter:

- Using the mailbox gateway of the EtherCAT® master when using the "Ethernet over EtherCAT®" (EoE/VoE) function.
- Single-axis connection via the interface adapter from SEW-EURODRIVE.
- Direct connection via EtherCAT® without EtherCAT® master for scanning all devices from SEW-EURODRIVE in the network.

The following section describes these options.

25931873/EN – 03/2019

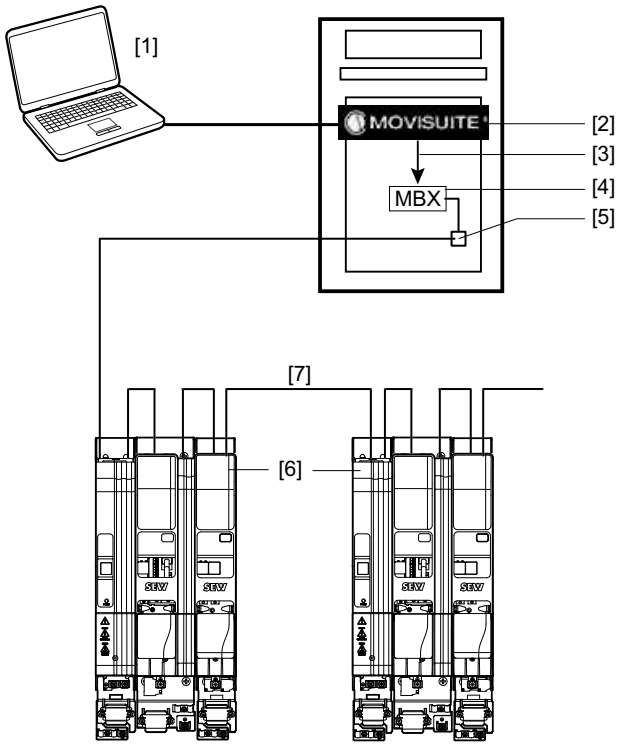
7.1 Connection via the TwinCAT mailbox gateway using the Ethernet over EtherCAT® (EoE/VoE)

The EoE mechanism is used as the basis for engineering via the mailbox gateway. The EoE protocol is converted into a VoE protocol via the mailbox gateway. In this way it can be used as the company's own data stream protocol.

The following description refers to the connection of the MOVISUITE® engineering software to a CX2020 controller from Beckhoff and TwinCAT3.

There are 2 cases that must be observed when connecting the MOVISUITE® engineering software:

1. MOVISUITE® and EtherCAT® master are installed on the same device hardware.

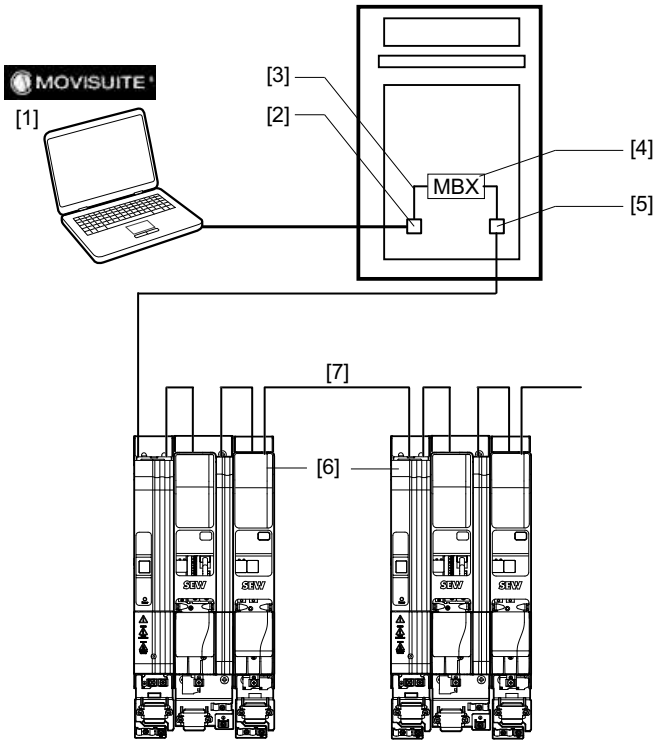


9007222010909835

[1]	PC	[5]	EtherCAT® interface
[2]	MOVISUITE® engineering software	[6]	Inverter with EtherCAT® interface
[3]	Internal IP routing via EoE	[7]	EtherCAT® (VoE)
[4]	Mailbox gateway MBX		

2. MOVISUITE® and EtherCAT® master have a different device hardware.

25931873/EN – 03/2019



9007222010912267

[1]	PC with MOVISUITE® engineering software	[5]	EtherCAT® interface
[2]	Engineering interface of the EtherCAT® master	[6]	Inverter with EtherCAT® interface
[3]	Internal IP routing	[7]	EtherCAT® (VoE)
[4]	Mailbox gateway MBX		

The description refers mainly to case 2. Settings that are relevant for case 1 are marked accordingly.

25931873/EN – 03/2019

7.1.1 Setting the PLC from Beckhoff

It is important to establish the remote connection to the controller as administrator in order to check or change the settings.

For this reason, the network interface of the engineering PC and the engineering interface of the EtherCAT® master must be located in the same network area.

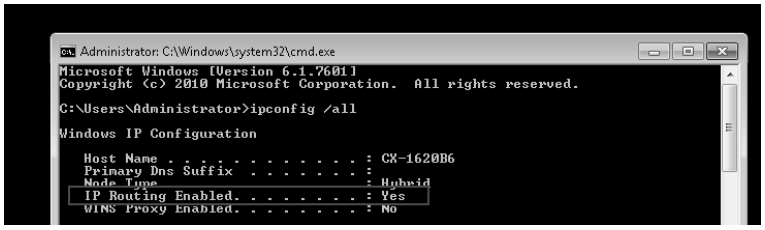
Example:

	IP address	Subnet mask	Standard gateway
Engineering PC	192.168.20.xx	255.255.255.0	Optional
EtherCAT® master	192.168.20.zz	255.255.255.0	Optional

It is important that the last octet (zz/yy) is different. You do not have to use the standard gateway.

Activating IP routing

You must open the Windows command prompt of the engineering PC and request the current settings using the "ipconfig/all" command to check whether IP routing is activated or not.

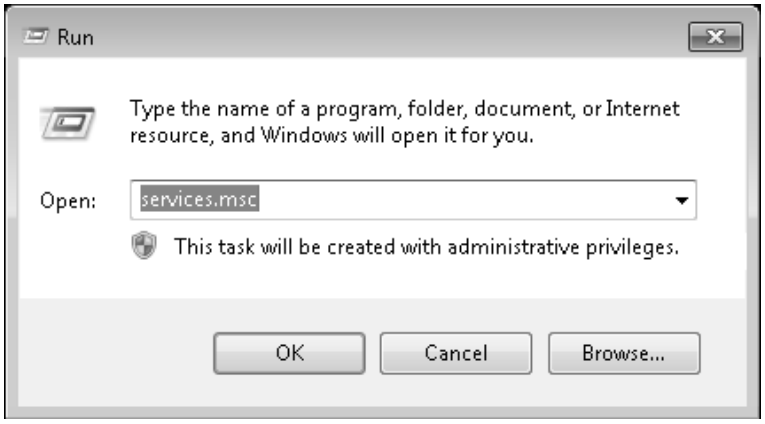


21963193739

If the IP routing is not activated (standard: deactivated), the user must activate it. The way changes are made depends on the operating system.

One option is to change routing via the general services.

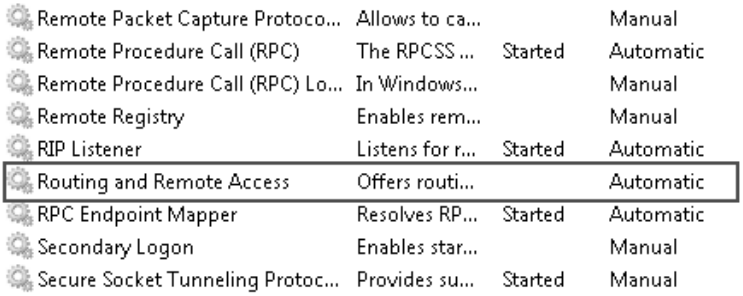
- Enter "services.msc" in the Windows function "Run" to open the services.



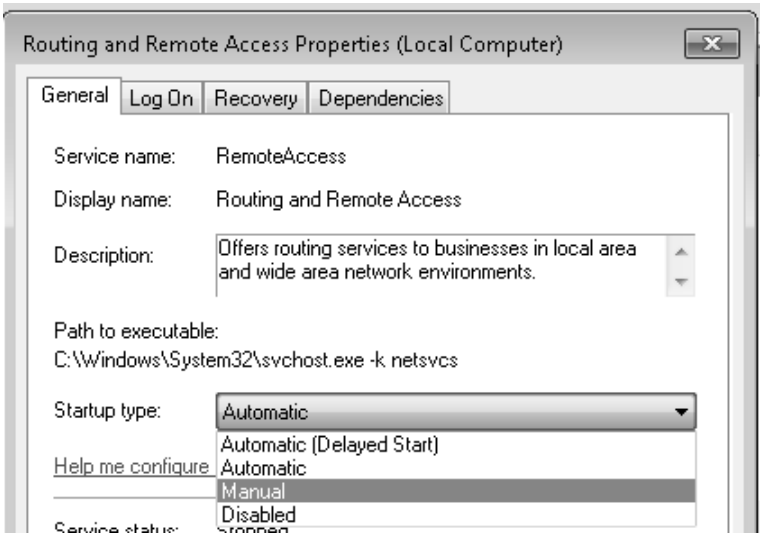
21963196171

- Open the "Routing and Remote Access" properties via the context menu (right mouse button).
- Set the startup type to "Manual".

25931873/EN – 03/2019

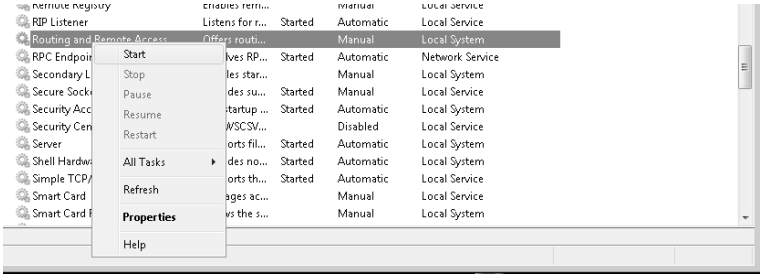


21963198603



21963201035

- Now, manually start the service.

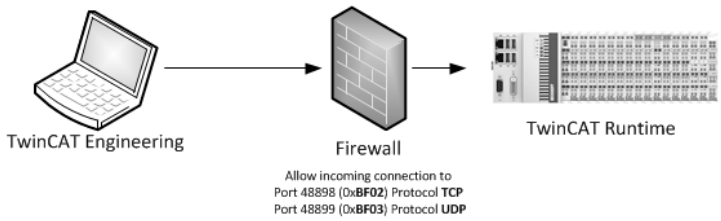


21963203467

Setting the firewall on the engineering PC

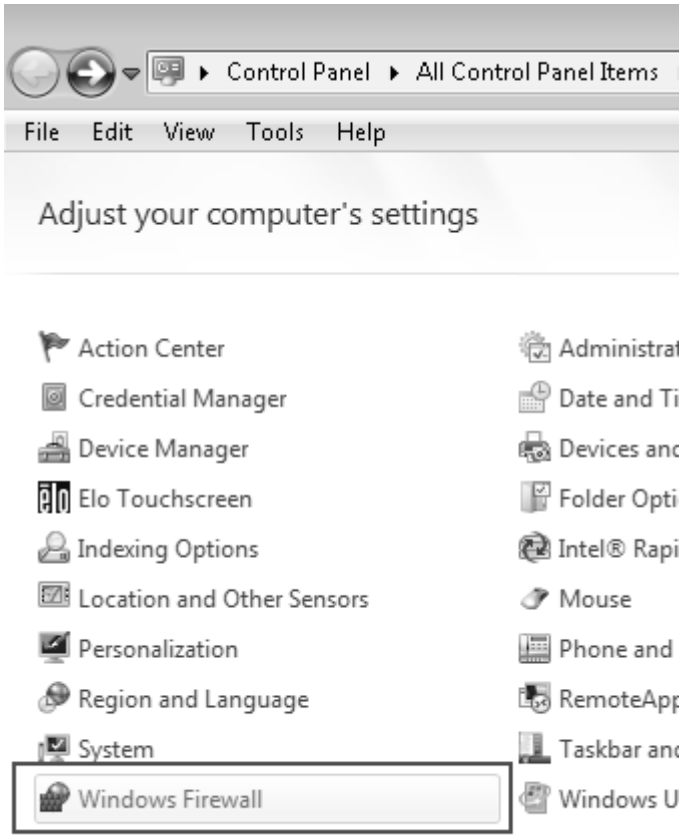
You must activate 2 ports of the firewall on the engineering PC so that routing of the MOVISUITE® data works.

- Port 48898 protocol TCP incoming
- Port 48899 protocol UDP incoming



21963215627

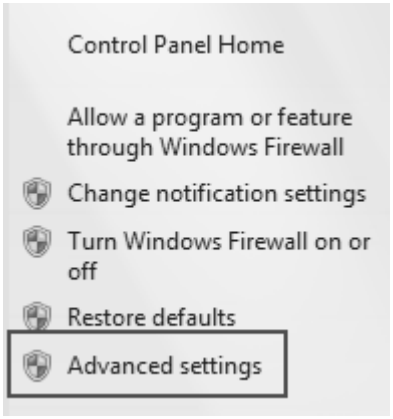
- Open the "Windows Firewall" settings via the Windows control panel.



21963218059

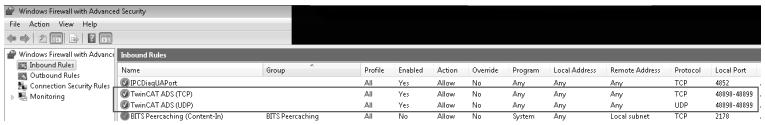
25931873/EN – 03/2019

Under "Advanced settings" you can find rules for incoming and outgoing protocols.



21963220491

- Activate both ports via the context menu.



21963222923

Setting the Ethernet adapter of the EtherCAT® master

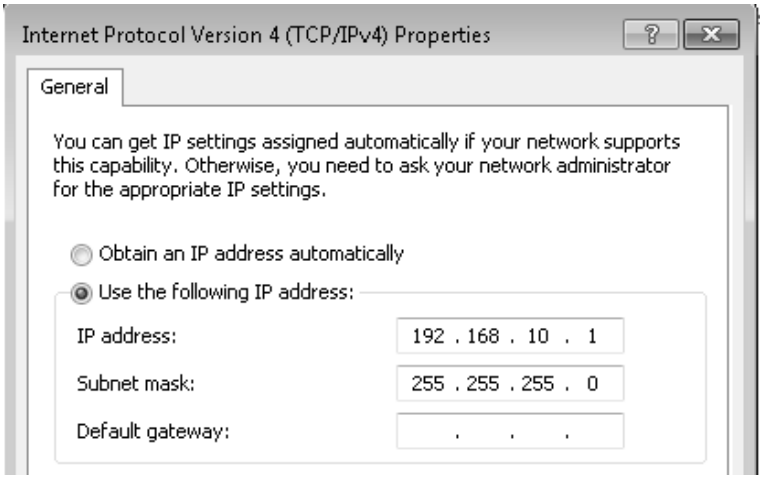
21963225355

If an EtherCAT® phase is forwarded via an EK1110 (EtherCAT® connection of Beckhoff), TwinCAT automatically creates a virtual Ethernet adapter in "RUN" operating mode (not visible in "Configuration" operating mode).

This is only possible if a working TwinCAT configuration is loaded. For this reason, you must assign an IP address to the virtual adapter that can be found in the subnet mask of the mailbox gateway.

Example:

- IP address mailbox gateway: 192.168.10.254
- IP address virtual Ethernet adapter: 192.168.10.1



21963227787

When using a real network adapter, you can also set the IP address in "Configuration" operating mode. You must observe the same criteria described for selecting a virtual adapter when selecting the IP.

21963230219

The Beckhoff PC is now enabled to route.

7.1.2 Setting the EtherCAT® mailbox gateway in the TwinCAT system

The following section describes the necessary settings in the TwinCAT system manager.

INFORMATION

Addresses with 169.x.x.x may cause problems as the address range is often used as "emergency address range" by Windows.

INFORMATION

Address ranges that are far apart may cause problems. If the last 2 octets differ from each other, it works in most cases.

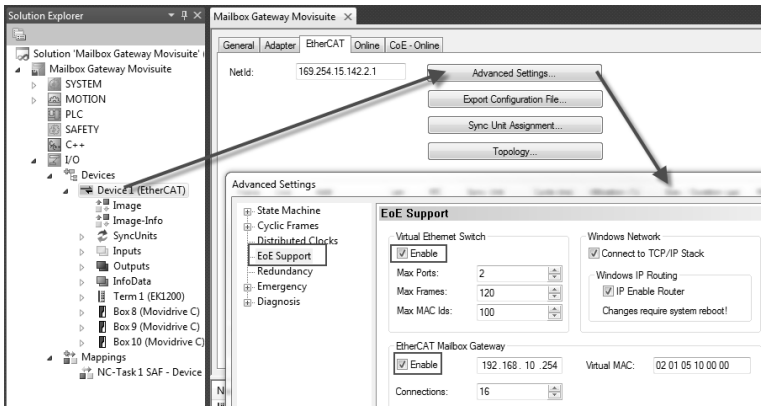
Example:

- IP address TwinCAT system (engineering port): 192.168.20.2
- IP address mailbox gateway: 192.168.x.x

Setting TwinCAT in the system manager

A correct project including I/O configuration must have been created to set TwinCAT.

The project must be in "Configuration" operating mode. If the TwinCAT system is in "RUN" operating mode, you can activate the "Configuration" operating mode in the toolbar. You must activate the EoE support under "Advanced settings" in the EtherCAT® master.



21963235083

INFORMATION

Several EtherCAT® masters can be used at the same time. If the mailbox gateway is to be used with several masters, each mailbox gateway must be assigned its own address. These addresses must differ, but they must be in the same subnet.

You must now transfer the changed configuration to the EtherCAT® master and set the TwinCAT system to the operating mode "RUN".

7.1.3 Setting the engineering PC

To be able to access the application inverters with the startup software via the mailbox gateway, you must configure a static route.

You need administrator rights.

You must open the Windows command prompt to configure a static route. In this example, the following IP addresses are assigned:

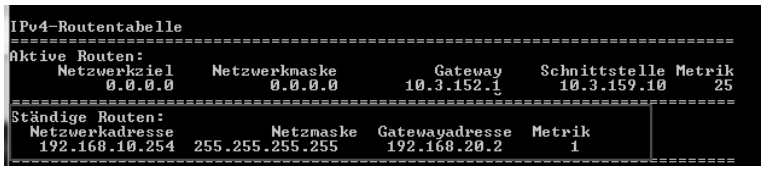
- TwinCAT system: 192.168.20.2
- Mailbox gateway: 192.168.10.254

This results in the following command line:

"route –p add 192.168.10.254 MASK 255.255.255.255 192.168.20.2"

21963237515

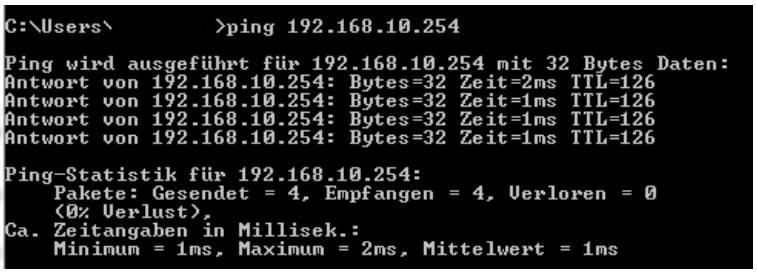
The entered route can be checked using the "route print" command.



21963239947

Testing the settings

If all settings have been made, you can test these using a PING to the mailbox gateway. Check again if the TwinCAT system is in "RUN" operating mode.



21963242379

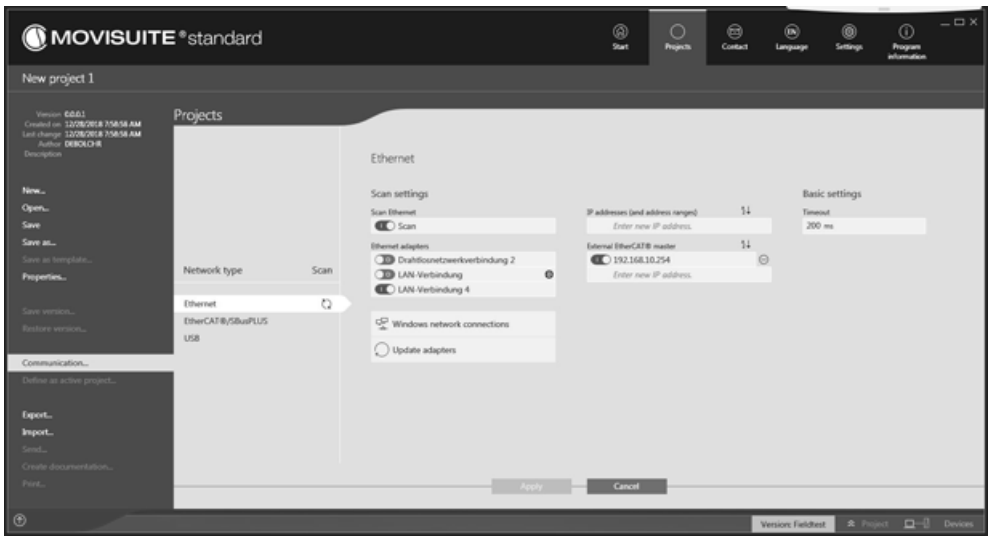
If this test is negative (ping request not answered), the mailbox gateway cannot be used in the engineering software.

25931873/EN – 03/2019

7.1.4 Setting the engineering software

When you create a new project, you must adjust the communication settings for using the mailbox gateway.

Depending on the used hardware and network topology, you may need to increase the timeout delay.



9007221217985803

If scanning worked, it will be displayed in the network view as follows.

7.1.5 Connection diagnosis

If no connection can be established via the mailbox gateway, you must request the following points:

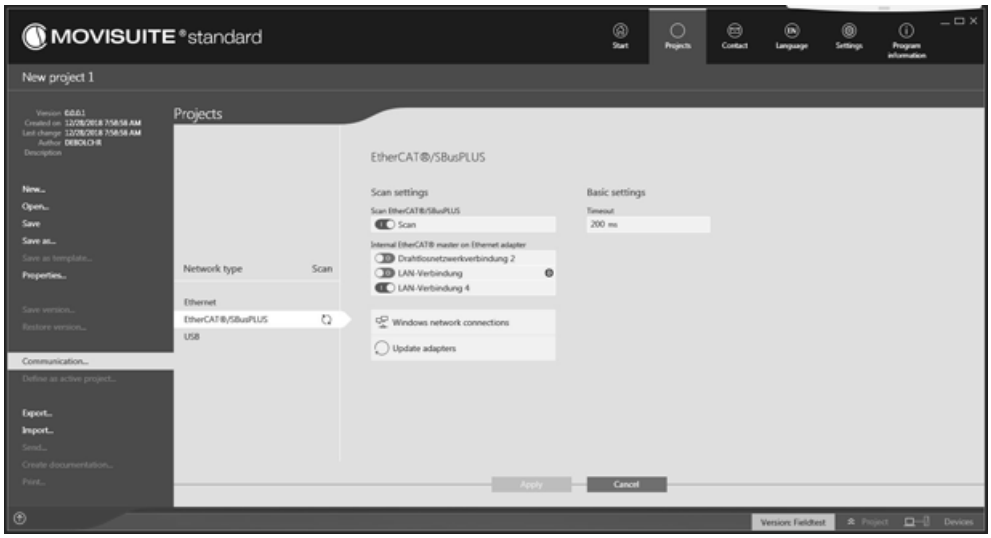
- Can the mailbox gateway be pinged from the engineering PC?
- Is the TwinCAT system in "RUN" operating mode?
- Are all connected axes in the "Operational" operating mode?
- Do the addresses of the network adapter correspond to the ones in the configured route?

If one of these questions is answered with "NO", there is an incorrect setting.

25931873/EN – 03/2019

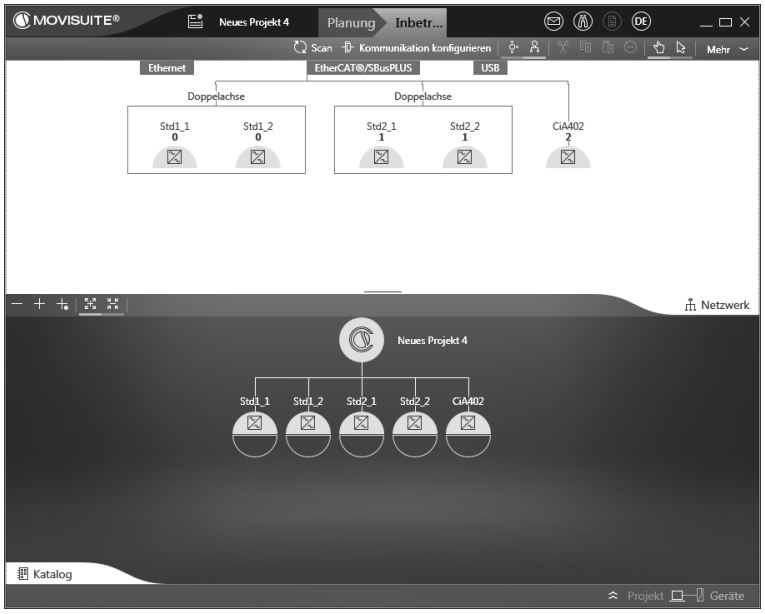
7.2 Direct connection via EtherCAT® without EtherCAT® master

Direct connection via the integrated EtherCAT® is one option to start up the complete system of application inverters without EtherCAT® master in advance.



9007221217993099

You must use the active LAN connection of the engineering PC for this purpose.



21963254539

In the figure illustrated above the axis system consists of standard axes and one CiA402 axis.

8 Appendix

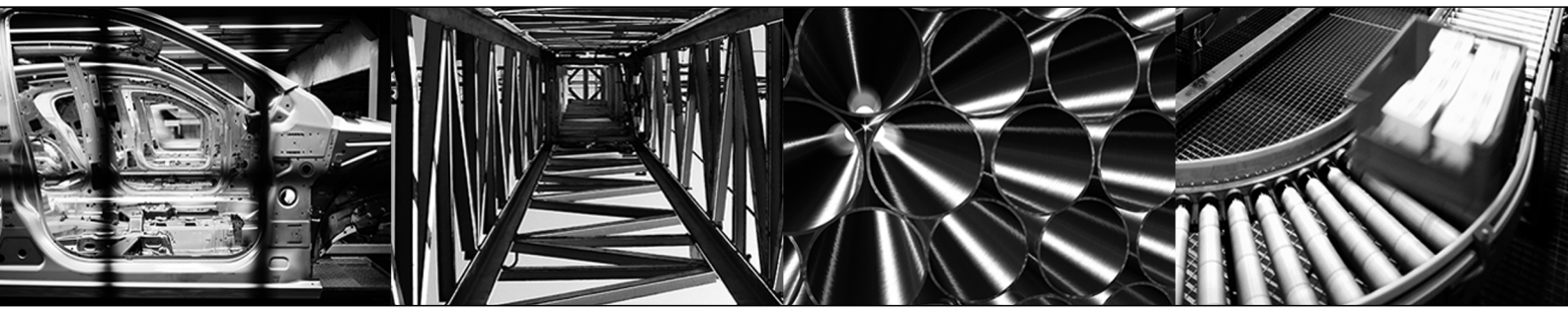
8.1 Abbreviation Key

Abbreviation	Meaning
CiA402	CiA402 is the abbreviation for a device profile that has been defined by the organization "CAN in Automation" specifically for servo drives. It defines the structure of the object list and the functionalities that are assigned to the individual objects. Furthermore, it defines the state machine (states, error behavior). Additionally, it offers manufacturer-specific functions and setting options. In addition to the CiA402 device profile, there are profiles for sensors and controllers (CiA404), linear and rotating encoders (CiA406), hydraulic valves and drives (CiA408) and input/output modules (CiA401).
CNC	Computerized Numerical Control
CoE	CAN open over EtherCAT®. This protocol is usually used for access to individual device parameters (SDO service). There is either a read or write access.
csp	Cyclic synchronous position. Synchronized position specification. The closed loop system is closed on the higher-level controller.
cst	Cyclic synchronous torque. Synchronized torque specification. The closed loop system is closed on the higher-level controller.
csv	Cyclic synchronous velocity. Synchronized speed specification. The closed loop system is closed on the higher-level controller.
DHCP	Dynamic Host Configuration Protocol. The protocol is used to manage IP addresses in a TCP/IP network and to assign them to the requesting Ethernet stations. The assignment is usually performed by a DHCP-server.
EoE	Ethernet over EtherCAT®. Is used when the mailbox gateway is used. The data streaming protocol from SEW-EURODRIVE is tunneled from the master to the slave in a VoE protocol.
ESI	The ESI file (XML file) contains the device descriptions and information that are essential for successful startup of the application inverters on an EtherCAT® master.
F-PLC	Fail-safe controller. This is where both the safety program and safe communication are processed.
FoE	File over EtherCAT®. Used to upload and download complete parameter sets via EtherCAT®. This function is normally used for data management of frequency parameters.
FSoE	FailSafe over EtherCAT®
hm	"Homing" operating mode. This operating mode allows for inverter reference travel.
iPar CRC	See ParCRCBus.
NC	Numerical control. Is usually referred to as NC axis. This axis closes the closed loop system of the drive inverter in the EtherCAT® master and generates the setpoints of speed and position.
ParCRCBus	Checksum of the safety function on the card. Is used for comparison with the F-PLC.
pp	"Profile position" operating mode.
pv	"Profile velocity" mode.
TwinCAT	Engineering software of Beckhoff.

25931873/EN – 03/2019

Abbreviation	Meaning
VoE	Vendor specific protocol over EtherCAT®. This mechanism is used to tunnel manufacturer-specific protocols into the EtherCAT®. SEW-EURODRIVE uses this option to implement engineering via the MOVISUITE® engineering software.

25931873/EN – 03/2019



SEW-EURODRIVE
Driving the world

SEW-EURODRIVE GmbH & Co KG
Ernst-Blickle-Str. 42
76646 BRUCHSAL
GERMANY
Tel. +49 7251 75-0
Fax +49 7251 75-1970
sew@sew-eurodrive.com
➞ **www.sew-eurodrive.com**