EtherCAT CiA402 Profile Interface

Manual

Documentation of the EtherCAT CiA402 Interface of the following Drives:

- **C1250-MI-XC-0S/1S**
- **C1251-MI-XC-2S**

Table of Contents

1 System overview

EtherCAT is the open real-time Ethernet network originally developed by Beckhoff. The LinMot act as Slave in this network and is implemented with the standard ASIC ET1100 from Beckhoff. With the CiA402 Protocol it is possible to use the drive profile functionality over the EtherCAT bus.

For further information on the EtherCAT fieldbus please visit:
http://www.ethercat.org/

1.1 References

All user manuals are distributed with the LinMot-Talk software the newest versions can be downloaded from the LinMot homepage in the download section.

Ref	Title	Doc Reference	Source
1	User Manual Motion Control SW	0185-1093-E_6V8	www.linmot.com
2	LinMot Drive Configuration over Fieldbus Interfaces SG5--SG7	0185-1074-E_1V7	www.linmot.com
3	Safety Manual 2S Products	0185-1174-E	www.linmot.com

1.2 Connecting In and Out

Attention: In the EtherCAT the cabling is directed due topology support, so In and Out is different! The real time Ethernet RJ45 connector X17 is the input and the real time RJ45 connector X18 is the output.

X17/P1
PLC/Master

C1250
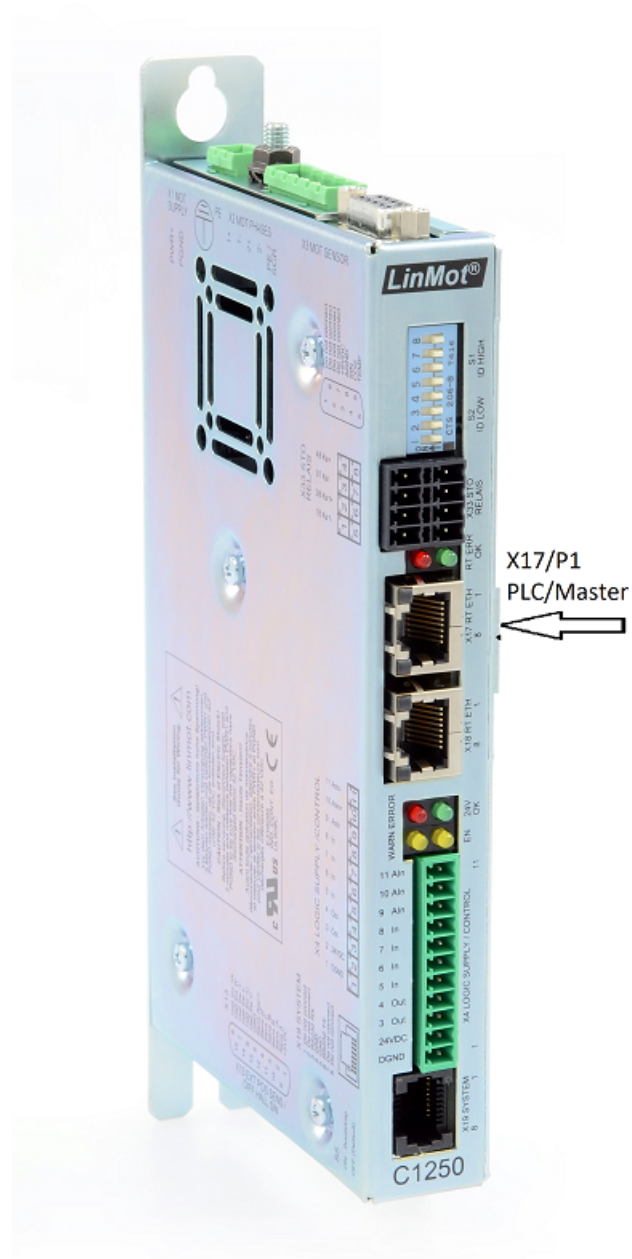
2 Setup in the PLC

In the following steps the integration of a LinMot EtherCAT Sercos Servo Drive in the PLC is described. In the example a Beckhoff master PLC is used. The easiest way is the online configuration when the device is connected to the EtherCAT network.

2.1 Copy Device Description File

The LinMot Servo Drive is described with *.xml device description file distributed with the LinMot-Talk software. This file is only used when offline configuration is desired.

Copy this file to PLC so it can access it.

Example Source path of EtherCAT Device description file:

C:\Programme\LinMot\LinMot-Talk 6.5 Build 20160205\Firmware\Interfaces\EtherCAT\XML\NTIL_CiA402_Servos_MI_V1_0r2.xml

Example Destination path of EtherCAT Device description file:

TwinCAT 2:
C:\TwinCAT\Io\EtherCAT\ NTIL_CiA402_Servos_MI_V1_0r2.xml

TwinCAT 3:
C:\TwinCAT\3.1\Config\Io\EtherCAT\ NTIL_CiA402_Servos_MI_V1_0r2.xml

TwinCAT 3: Safety
C:\TwinCAT\3.1\Config\Io\EtherCAT\ NTIL_CiA402_Servos_FS_V1_0ra1.xml

Omron:
C:\OMRON\Sysmac Studio\IODeviceProfiles\EsiFiles\UserEsiFiles\ NTIL_CiA402_Servos_MI_V1_0r2.xml

If this is done the PLC should recognize the corresponding LinMot drives on the EtherCAT fieldbus automatically.

2.2 Scan the EtherCAT slave devices

Connect the EtherCAT LinMot CoE Servo Drive to the EtherCAT-Master and power on the signal supply. Then scan for the connected devices in the System Manager:
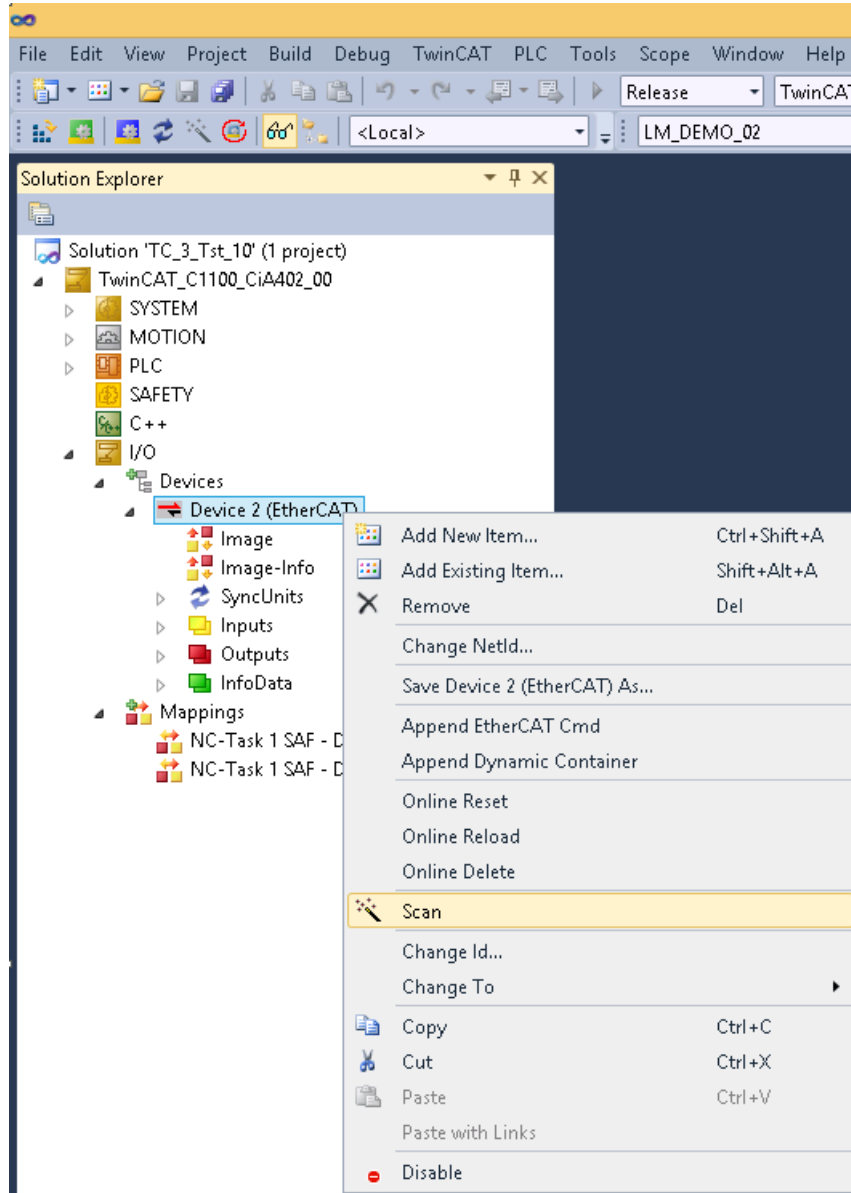
Scan for EtherCAT slave devices
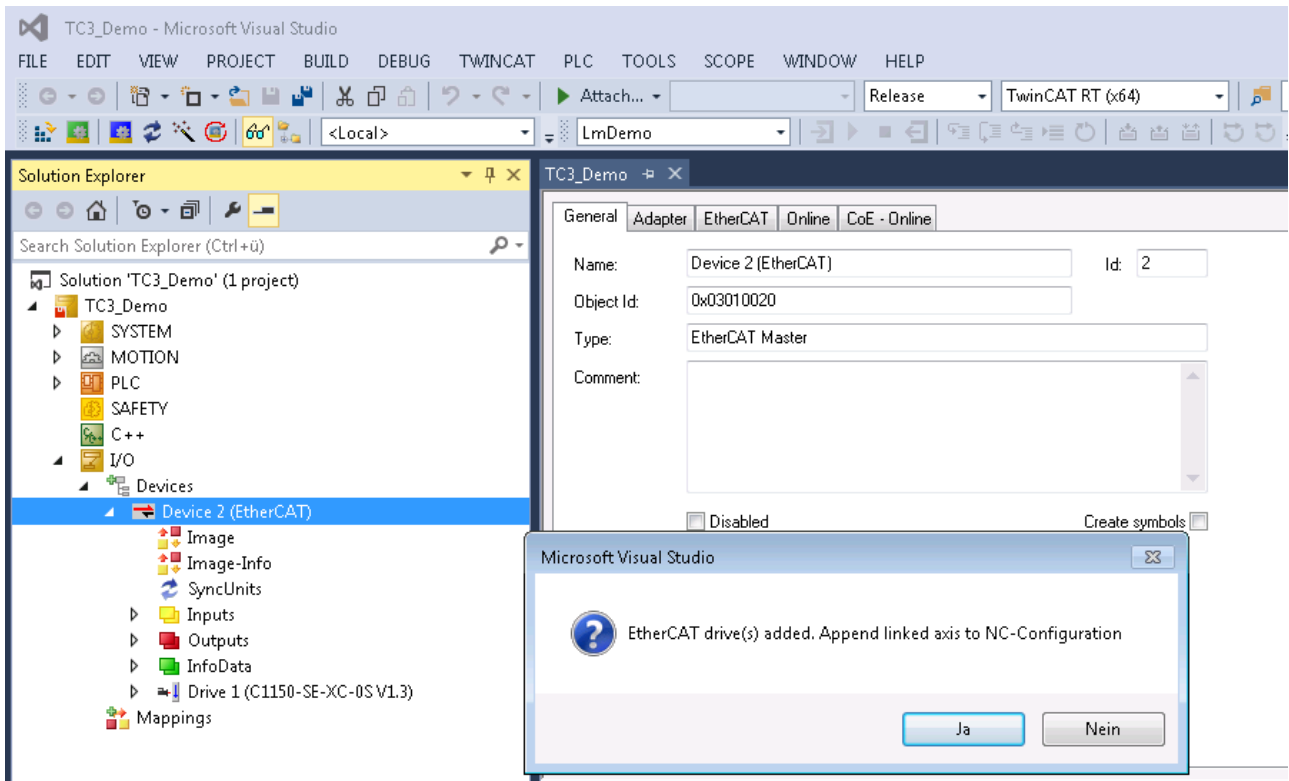
With the question Add drives to NC-configuration select yes.
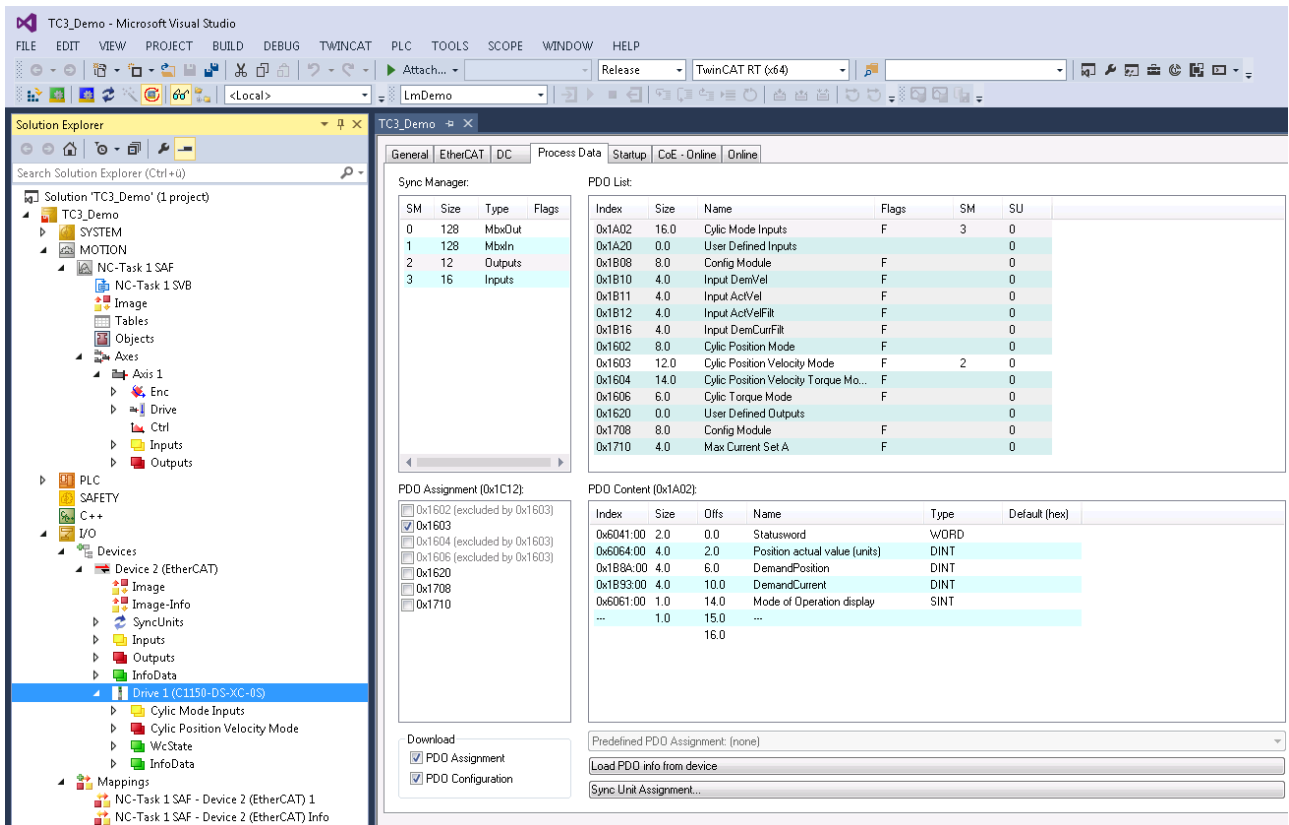
These steps add the servo drive and its NC-axis to the project.
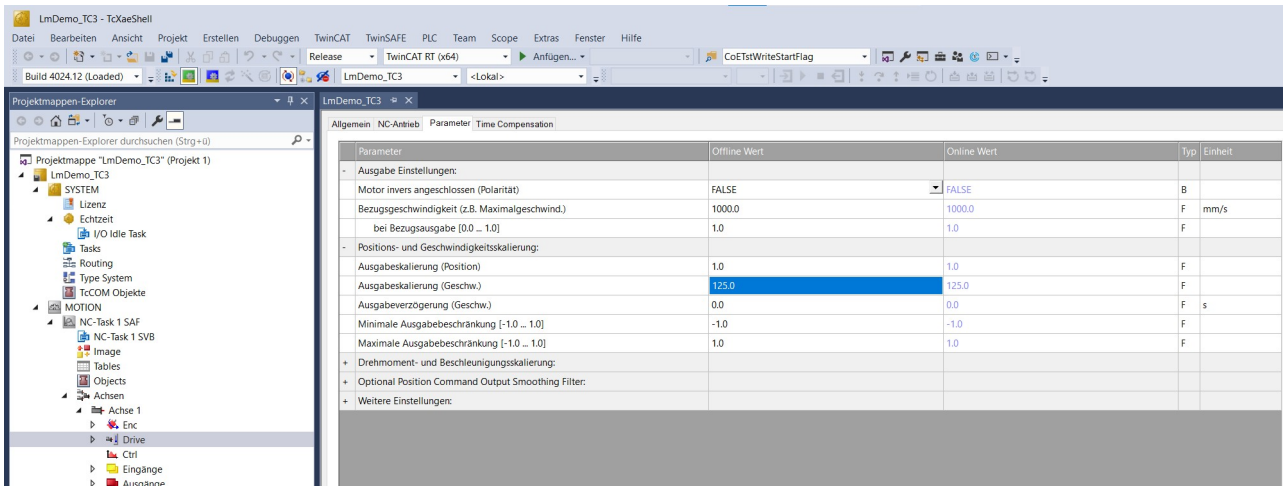
Then the velocity output scale factor has to be set to 125.0 for correct operation
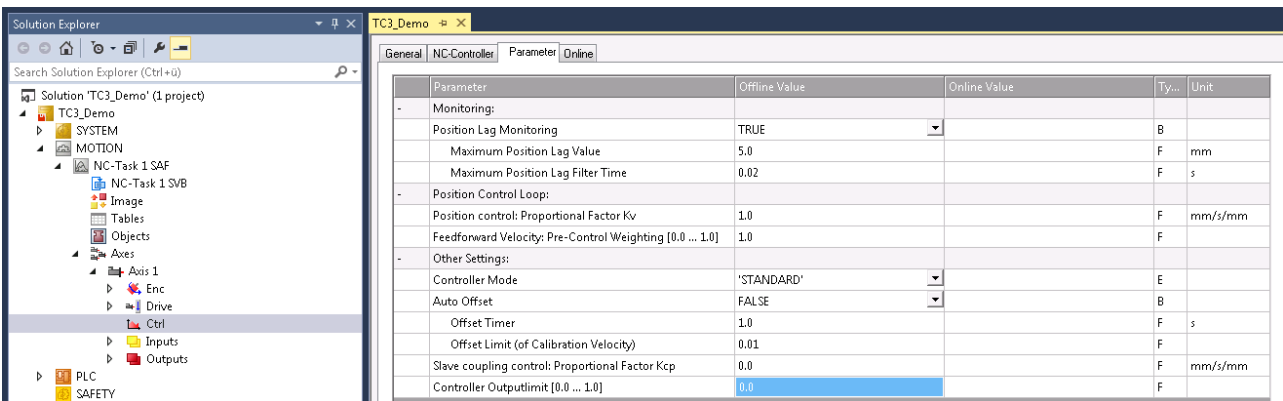
Though the position controlling is done in the drive the controller output has to be set to 0. If this is forgotten, the behaviour could be noisy. To set these NC parameters they have to be downloaded.
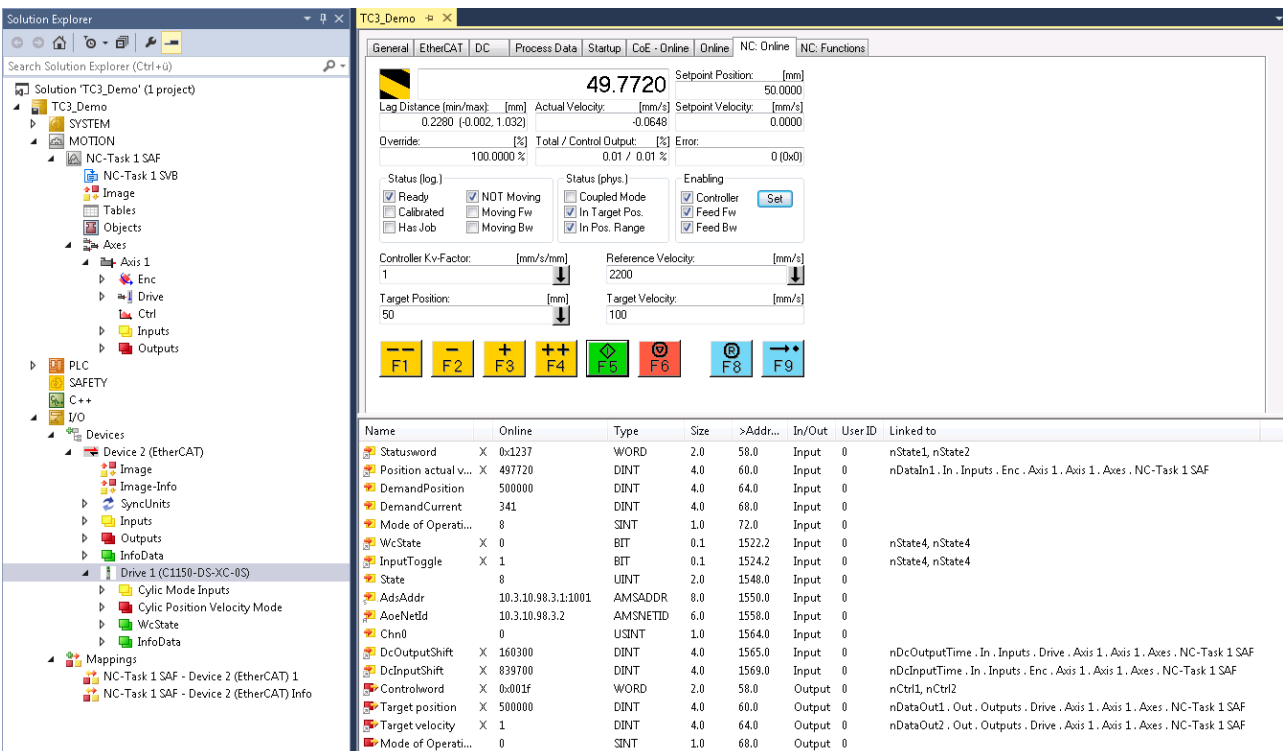
Now the servo drive can be used with system manager NC functionality when started.

3 Operation Modes

The device profile defines several modes of operation. The user will be able to activate the required function by selecting the mode of operation. They include profile position mode, homing mode, interpolated position mode, profile velocity mode, profile torque mode, velocity mode, cyclic synchronous position mode, cyclic synchronous velocity mode, and cyclic synchronous torque mode. The control word, status word and the setpoints are used mode-specific.

Object 6040h : Control Word

15					11	10	9	8	7	6			4	3	2	1	0
		ms				r	oms	h	fr		oms			eo	qs	ev	so

MSB   LSB
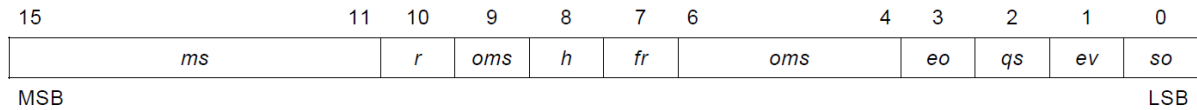
LEGEND: ms = manufacturer-specific; r = reserved; oms = operation mode specific; h = halt; fr = fault reset; eo = enable operation; qs = quick stop; ev = enable voltage; so = switch on

Object 6041h: Status Word

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ms		oms		ila	tr	rm	ms	w	sod	qs	ve	f	oe	so	rtso

MSB   LSB
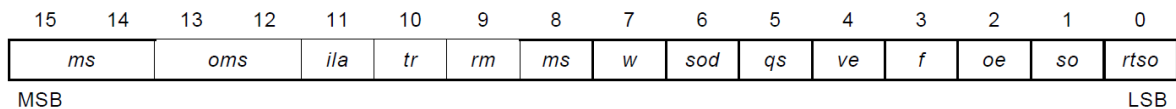
LEGEND: ms = manufacturer-specific; oms = operation mode specific; ila = internal limit active; tr = target reached; rm = remote; w = warning; sod = switch on disabled; qs = quick stop; ve = voltage enabled; f = fault; oe = operation enabled; so = switched on; rtso = ready to switch on

3.1 Profile Position Mode (OpMode 1)

A target position is applied to the trajectory generator. It is generating a position demand value for the position control loop. Please check the below figure for the details of the scales/ limits applied for position, velocity and the other inputs like acceleration, deceleration and the selection of motion profile type.

Use of Control Word

15	10	9	8	7	6	5	4	3	0
See operation modes chapter		Change on set point	Halt	See operation modes chapter	Abs/rel	Change set immediately	New setpoint	See operation modes chapter	

MSB
LSB
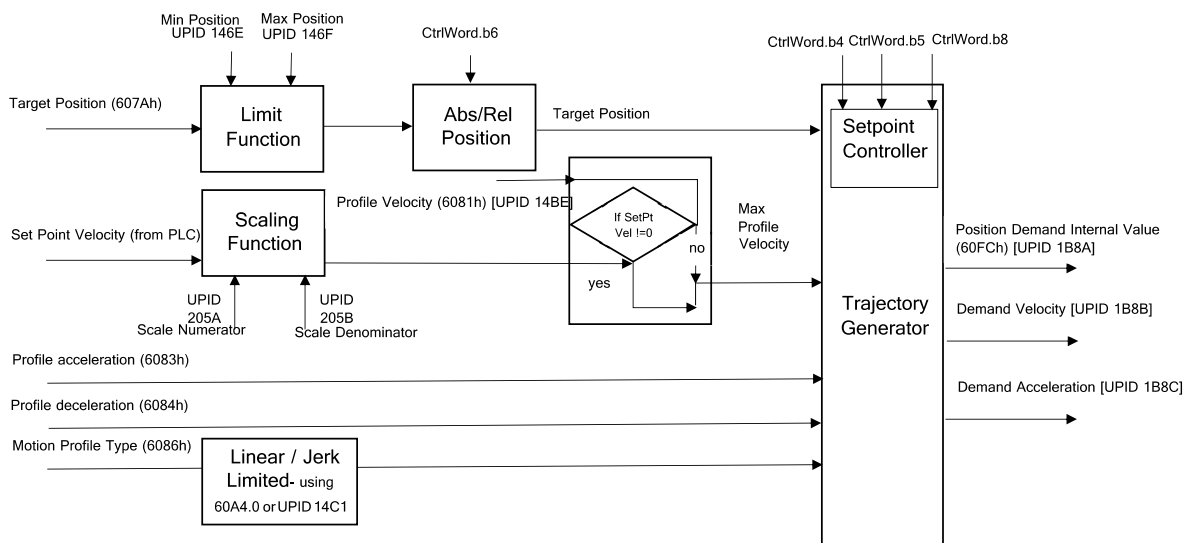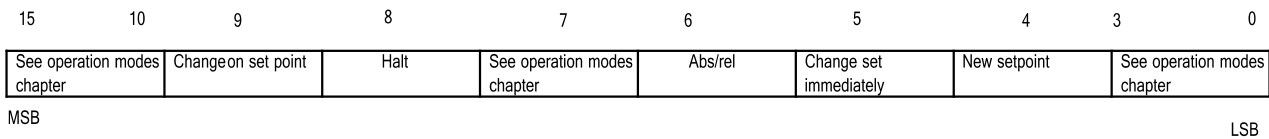
The setting of the setpoints is controlled by the control word bit 4 - *new setpoint* and control word bit 5 -*change set immediately*. When the bit 4 is 1, the new setpoint is buffered in the set point list as long as the free set-points are available in the drive device. If there is no setpoint in progress, then the new setpoint shall become active immediately. If a setpoint is in progress the new setpoint will be stored in the buffer that is free. When the *change set immediately* bit of the controlword is set to 1, a single set-point is expected. All previously loaded set-points shall be discarded.

When the control word bit 6 is 0, the absolute value is taken for target position calculation. If the control word bit 6 is 1, the relative position is taken.

When the control word bit 8 - *halt* is 1 the axis will freeze . The *not freeze* bit of the control word (UPID 1D5B) will be thereby 0. When the *halt* bit is 0, the positioning shall be executed or continued and the *not freeze* bit of the control word will be 1.

The control word bit 9 - *change on set point* is fixed to 0. A change to 1 is currently not supported.

Use of Status Word

15	14	13	12	11	10	9	0
See operation modes chapter	Following error		Set-point ack	See operation modes chapter	Target reached	See operation modes chapter	

MSB
LSB
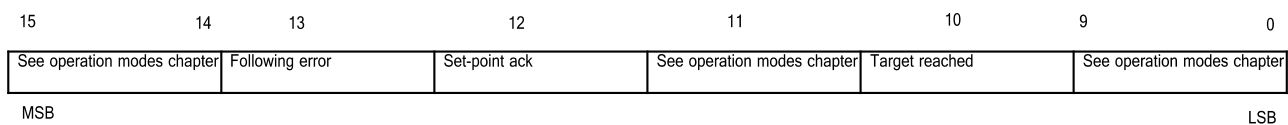
Status word bit 10 - *target reached* is implemented as the invert bit of *motion active-* MC SW status word bit 13. This bit can also be watched in UPID 1D77h. The bit 12 *set point ack* is 1 when the new setpoint is in process. *Set point ack* will be 0 when the previous setpoint is already processed.

Status word bit 13 is currently not supported.

3.2 Homing Mode (OpMode 6)

This mode describes the method by which the drive goes to home position. The different modes of homing are listed in UPID 13C4h. The homing method has to be selected using the LinMot Tool. The UPID 13C4h gives different UPID selection as seen below.

Control Word

15	9	8	7	6	5	4	3	0
See operation modes chapter		Halt	See operation modes chapter	Reserved (0)		Homing Operation Start	See operation modes chapter	

MSB   LSE

The bit 4 of control word - Homing operation start is linked to the UPID 1D61h. The bit 8 halt is not supported in this version.

Status Word

15	14	13	12	11	10	9	0
See operation modes chapter	Homingerror		Homing Attained	See operation modes chapter	Target reached		See operation modes chapter

MSB   LSB

The bit 10 of status word is 1 when the homing is interrupted or not started. When the homing is finished the bit 10 and bit 12 are high.

3.3 Cyclic Sync Position Mode (OpMode 8)

In this operation mode, it provides a target position to the drive device, which performs position control and velocity control depends on the user input to the UPID 20C0h. The behavior of the control function is influenced by the control parameters like the limit functions. The default selection of OpMode 8 in Streaming Selection - UPID 20C0h is 1 which is PV streaming.

Streaming Selection [UPID 20C0h] = 1

Target Position 607Ah → PV Streaming → Demand Velocity [UPID 1B8B]
Demand Position [UPID 1B8A]

VelScale Numerator[UPID 205A]
VelScale Denominator[UPID 205B] → Scaling Function

Setpoint Velocity from PLC
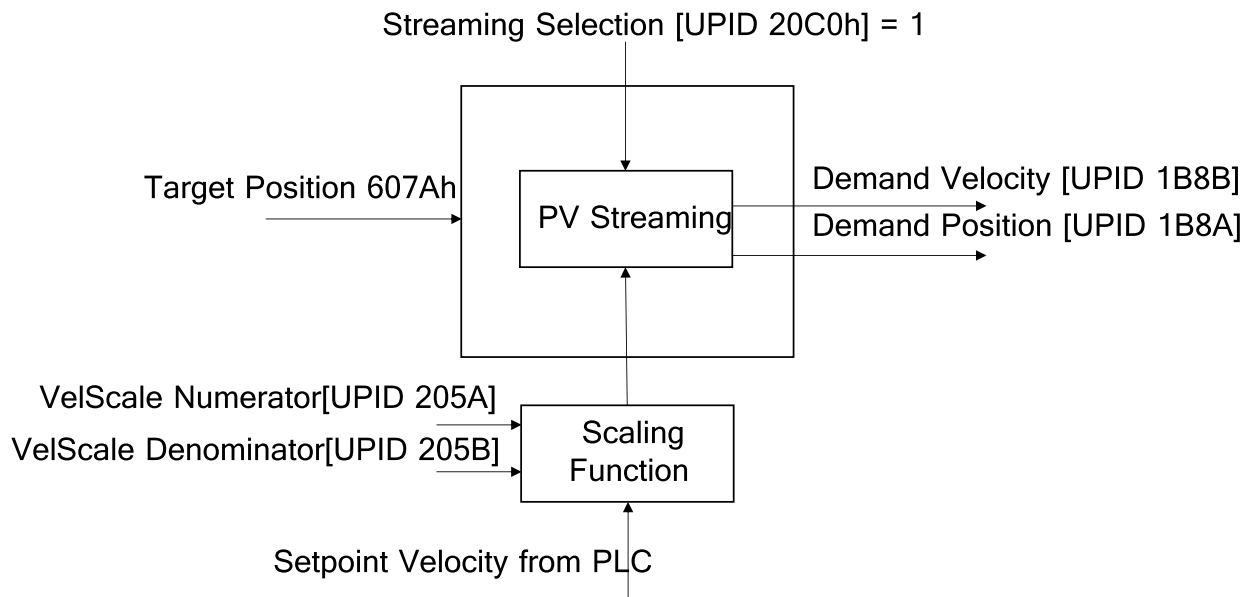
The legacy mode is P streaming which is selected by Streaming Selection - UPID 20C0h as 0. This is also supported.

Streaming Selection
[UPID 20C0h] = 0 → P Streaming → Demand Position [UPID 1B8A]

Target Position 607Ah →
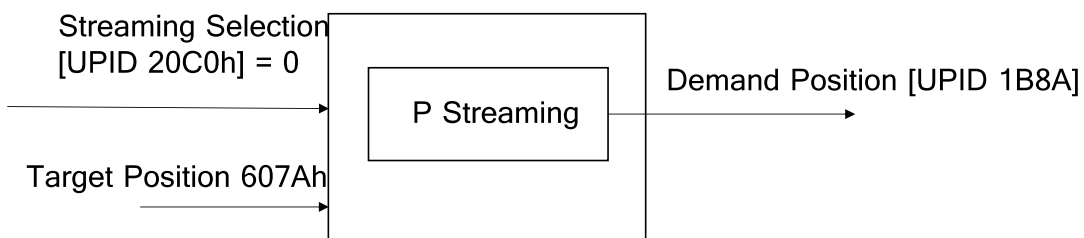
3.4 Cyclic Sync Torque Mode (OpMode 10)

In this mode, the trajectory generator will provide the target force/torque to the drive. There are 4 modes of selection based on the user input on UPID 2070h. They are current command mode, openloop force/torque control mode, closed loop force/torque control mode relative, closed loop force/torque Ctrl Mode Abs. This mode is used by the PDO 0x1604 and 0x1614.
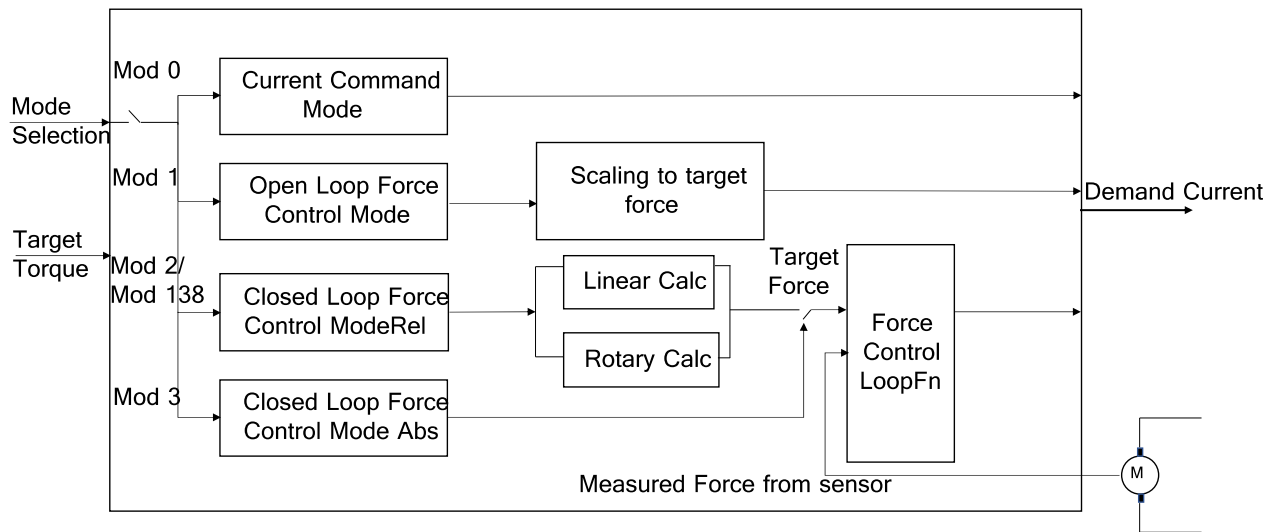
4 Process Data Object (PDO) Configuration

The cyclic process data is configured in the master and transmitted to the slave during startup. The default mapping is documented in the tables below. The inputs and outputs correspond to the PLC point of view. For a detailed description of the exchanged data and its meaning refer to [1].

For a detailed description of the PDO data refer to [1] or have a look at the TwinCAT demo program, which is included with the LinMot-Talk software.

4.1 Input PDO Modules

Overview of the predefined Input Process data objects

4.1.1 Cyclic Mode Inputs 0x1A02

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1A02	16	-	Variables	RECORD
0x6041:00	2	0	Statusword	Uint16
0x6064:00	4	2	Position actual value	Int32
0x1B8A:00	4	6	DemandPosition	Int32
0x1B93:00	4	10	DemandCurrent	Int32
0x6061:00	1	14	Mode of Operation display	Byte
	1	15	Byte Padding	Byte

This module could be used to map the inputs of an CiA402 NC axis.

4.1.2 Cyclic Mode Inputs 2 0x1A03

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1A03	14	-	Variables	RECORD
0x6041:00	2	0	Statusword	Uint16

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1A03	14	-	Variables	RECORD
0x6064:00	4	2	Position actual value	Int32
0x6062:00	4	6	DemandPosition	Int32
0x6077:00	2	10	Torque actual value	Int16
0x6061:00	1	12	Mode of Operation display	Byte
	1	13	Byte Padding	Byte

This module could be used to map the inputs of an CiA402 NC axis.
The "Torque actual value" is calculated out of the "Actual Torque/Force" (UPID: 1BBFh/1BFFh) multiplied with 5000 divided with the "Maximal Torque/Force" (UPID: 1BBEh/1BB0h).
If the Closed Loop Force Control Mode is active the measured torque/force (UPID: 1EA1h) is taken to calculate the" Actual Torque/Force".

4.1.3 Cyclic Inputs 0x1A12

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1A12	16	-	Variables	RECORD
0x6041:00	2	0	Statusword	Uint16
0x6064:00	4	2	Position actual value	Int32
0x1B8A:00	4	6	DemandPosition	Int32
0x1B93:00	4	10	DemandCurrent	Int32

This module could be used to map the inputs of an CiA402 NC axis.

4.1.4 User Defined Inputs 0x1A20

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1A20	2..32	-	Variables	RECORD
1..8			User defined Parameter/Variables accessed by UPID	

The PDO 0x1A20 could be used, to read Variables/Parameters for which no predefined PDO exists. It is possible to map 1 to 8 entries defined by its UPID in this PDO. The defined Size of the data has to match with the size, defined by the UPID.
The user can choose from the following list of CiA402 object dictionaries.

Edit Pdo Entry

Name: [   ]   OK

Index (hex): [0] [0]   Cancel

Sub Index: [0]

Data Type: USINT

Bit Lentgh: 8

From Dictionary:

```
0x603F - Error code
0x6041 - Statusword
0x6061 - Modes of operation display
0x6062 - Position demand value
0x6064 - Position actual value ( units )
0x606B - Velocity demand value
0x606C - Velocity actual value
0x6077 - Torque actual value
0x60F4 - Following error actual value
0x60FD - Digital Inputs
0x6502 - Supported Drive Modes
```

4.1.5 Config Module 0x1B08

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1B08	8	-	Variables	RECORD
0x1B09:00	2	0	Config Status Word	Uint16
0x1B0A:00	2	2	Config Index/..	Uint16
0x1B0B:00	4	4	Config Value	Word32

This module is the feedback data module of the module 1708 "Configuration Module Output".

4.1.6 Input Demvel 0x1B10

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1B10	4	-	Variables	
0x1B8B:00	4	0	DemandVelocity	Int32

The Demand Velocity is backscaled with the parameters "Velocity Scale Denominator" and "Velocity Scale Numerator".

4.1.7 Input DemCurrFilt 0x1B16

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1B16	4	-	Variables	
0x1B98:00	4	0	Demand Current Filtered	Int32

The Demand Current filtered (UPID 1B98).

4.1.8 Input ActVelFilt 0x1B11

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1B11	4	-	Variables	
0x1B8E:00	4	0	ActualVelocity	Int32

The "ActualVelocity" is backscaled with the parameters "Velocity Scale Denominator" and "Velocity Scale Numerator".

4.1.9 Input ActVelFilt 0x1B12

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1B12	4	-	Variables	
0x1BAF:00	4	0	ActualVelocityFilt	Int32

The "ActualVelocityFilt" is backscaled with the parameters "Velocity Scale Denominator" and "Velocity Scale Numerator".

4.1.10 Mon Channel 1 0x1B28

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1B28	4	-	Variables	
0x20A8:00	4	0	Mon Channel 1	Int32

The data of the variable which is defined by the parameter Channel 1 UPID.

4.1.11 Mon Channel 2 0x1B29

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1B29	4	-	Variables	
0x20A8:00	4	0	Mon Channel 2	Int32

The data of the variable which is defined by the parameter Channel 2 UPID.

4.1.12 Mon Channel 3 0x1B2A

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1B2A	4	-	Variables	
0x20A8:00	4	0	Mon Channel 3	Int32

The data of the variable which is defined by the parameter Channel 3 UPID.

4.1.13 Mon Channel 4 0x1B2B

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1B2B	4	-	Variables	
0x20A8:00	4	0	Mon Channel 4	Int32

The data of the variable which is defined by the parameter Channel 4 UPID.

4.2 Output PDO Modules

Overview of the predefined Output Process data objects

4.2.1 Cyclic Position Mode 0x1602

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1602	8	-	Variables	RECORD
0x6040:00	2	0	Controlword	Word16
0x607A:00	4	2	Target position	Int32
0x6060:00	1	6	Mode of Operation	Byte
	1	7	Byte Padding	Byte

4.2.2 Cyclic Position Velocity Mode 0x1603

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1603	12	-	Variables	RECORD
0x6040:00	2	0	Controlword	Word16
0x607A:00	4	2	Target position	Int32
0x60FF:00	4	6	Target velocity	Int32

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1603	12	-	Variables	RECORD
0x6060:00	1	10	Mode of Operation	Byte
	1	11	Byte Padding	Byte

Default input PDO mapping of 12 Bytes

4.2.3 Cyclic Position Velocity Torque Mode 0x1604

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1604	14	-	Variables	RECORD
0x6040:00	2	0	Controlword	Word16
0x607A:00	4	2	Target position	Int32
0x60FF:00	4	6	Target velocity	Int32
0x6071:00	2	10	Target torque	Int16
0x6060:00	1	12	Mode of Operation	Byte
	1	13	Byte Padding	Byte

This module can be used, if the operation mode has to be changed during run time. At the moment the cyclic postion mode (0x08), the cyclic torque mode (0xA) and the cyclic closed loop torque mode (0x8A) are supported. To change the operation mode simply change the value of "Mode of Operation" variable.

4.2.4 Cyclic Torque Mode 0x1606

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1606	6	-	Variables	RECORD
0x6040:00	2	0	Controlword	Word16
0x6071:00	2	2	Target torque	Int32
0x6060:00	1	4	Mode of Operation	Byte
	1	5	Byte Padding	Byte

4.2.5 Cyclic Position Velocity 0x1613

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1613	10	-	Variables	RECORD
0x6040:00	2	0	Controlword	Word16
0x607A:00	4	2	Target position	Int32
0x60FF:00	4	6	Target velocity	Int32

Default input PDO mapping of 10 Bytes

4.2.6 Cyclic Position Velocity Torque 0x1614

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1614	12	-	Variables	RECORD
0x6040:00	2	0	Controlword	Word16
0x607A:00	4	2	Target position	Int32
0x60FF:00	4	6	Target velocity	Int32
0x6071:00	2	10	Target torque	Int16

At the moment the cyclic postion/velocity mode (0x08), the cyclic torque mode (0xA) and the cyclic closed loop torque mode (0x8A) are supported. To select if cyclic position/velocity (default value) mode or position mode is used, use change parameter "Cyclic position mode" (UPID 20C0h).

4.2.7 User Defined Outputs 0x1620

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1620	2..32	-	Variables	RECORD
1..8			User defined Parameter/Variables accessed by UPID	

The PDO 0x1620 could be used to set Variables/Parameters for which no predefined PDO exists. It is possible to map 1 to 8 entries defined by its UPID in this PDO. Allowed are only 16 or 32 bit entries. The defined Size of the data has to match with the size defined with the UPID.
The user can choose from the following list of CiA 402 object dictionaries.

4.2.8 Config Module 0x1708

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1708	8	-	Variables	RECORD
0x1709:00	2	0	Config Control Word	Uint16
0x170A:00	2	2	Config Index/..	Uint16
0x170B:00	4	4	Config Value	Word32

With this module the LinMot drive can be completely configured. So it gives access over parameters curves command table entries and the error log. The detail functionality is described in the document [2] "Configuration over fieldbus SG5". As response module "Configuration Module Input" (0x1B08) has to be configured.

4.2.9 Max Current Set A 0x1710

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1710	4	-	Variables	
0x13A6:00	4	0	Max Current Set A	Uint32

Could be used to change the maximal current of the position controller set A, during runtime.

4.2.10 Torque/force limits 0x1711

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1711	4	-	Variables	RECORD
0x60E0:00	2	0	Positve torque/force limit 5000 = maximal torque value positive	Uint16
0x60E1:00	2	2	Negative torque/force limit 5000 = maximal torque value negative	Uint16

With this module the positive and negative torque/force value could be individually set cyclic.

4.2.11 Par Channel 1 0x1728

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1728	4	-	Variables	RECORD
0x20B0:00	4	0	Value written to parameter/variable.	Int32

With this module a parameter/variable could be directly written from the PLC the parameter/variable is defined by the parameter "Channel 1 UPID".

4.2.12 Par Channel 2 0x1729

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1729	4	-	Variables	RECORD
0x20B0:00	4	0	Value written to parameter/variable.	Int32

With this module a parameter/variable could be directly written from the PLC the parameter/variable is defined by the parameter "Channel 2 UPID".

4.2.13 Par Channel 3 0x172A

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1728	4	-	Variables	RECORD
0x20B0:00	4	0	Value written to parameter/variable.	Int32

With this module a parameter/variable could be directly written from the PLC the parameter/variable is defined by the parameter "Channel 3 UPID".

4.2.14 Par Channel 4 0x172B

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1728	4	-	Variables	RECORD
0x20B0:00	4	0	Value written to parameter/variable.	Int32

With this module a parameter/variable could be directly written from the PLC the parameter/variable is defined by the parameter "Channel 4 UPID".

4.3 Typical Startup Telegrams

Transition	Protocol	Index	Data	Comment
C <PS>	CoE	0x1C12:00	0x00 (0)	clear sm pdos (0x1C12)
C <PS>	CoE	0x1C13:00	0x00 (0)	clear sm pdos (0x1C13)
C <PS>	CoE	0x1A20:00	0x00 (0)	clear pdo 0x1A20 entries
C <PS>	CoE	0x1620:00	0x00 (0)	clear pdo 0x1620 entries
C <PS>	CoE	0x1C12:01	0x1603 (5635)	download pdo 0x1C12:01 i...
C <PS>	CoE	0x1C12:00	0x01 (1)	download pdo 0x1C12 count
C <PS>	CoE	0x1C13:01	0x1A02 (6658)	download pdo 0x1C13:01 i...
C <PS>	CoE	0x1C13:00	0x01 (1)	download pdo 0x1C13 count
A <IP, PS>	AoE	1/3	0A 03 0A 62 03 02	AoE Init Cmd (download N...

This figure shows the startup telegram list of LinMot CiA402 servo drive

4.4 Safety Process Data

The FSoE MI Drive supports all implemented safety functions and 16 bit safe position. The Safety PDU has variable length specified in the device description of the slave. Safety PDU format includes command, safety data, CRC and connection ID.
The MI drive with safety has a safety control word to request the safety functions and a safety status word to monitor the state of safety functions. The following section defines the FSoE process data in both directions.

4.4.1 Safety Inputs 0x1A40

Safety Status Word : The safety data transferred from the FSoE Master to the FSoE Slave are referred to as safeoutputs. The TxPDO shall have the configuration of the safety statusword in the first byte of the Safe data.

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1A40	11	-	Safety Input	Record
0xE600:01	1	0	FSoE Slave Command	USINT
0x6640:00	0.1	1	STO Active	Bool
0x0000:00	0.1	1	Reserved	Bool
0x0000:00	0.1	1	Reserved	Bool
0x6668:00	0.1	1	SOS Active	Bool
0x0000:00	0.1	1	Reserved	Bool
0x0000:00	0.1	1	Reserved	Bool
0x0000:00	0.1	1	Reserved	Bool
0x6632:00	0.1	2	Error Ack	Bool
0x6690:00	0.1	2	SLS_1_Active	Bool
0x6691:00	0.1	2	SLS_2_Active	Bool
0x6692:00	0.1	2	SLS_3_Active	Bool
0x6693:00	0.1	2	SLS_4_Active	Bool
0x6650:00	0.1	2	SS1 Active	Bool
0x6670:00	0.1	2	SS2 Active	Bool
0x0000:00	0.1	2	Reserved	Bool
0x6632:00	0.1	2	Error Ack State	Bool
0xE600:03	2	4	FSoE Slave CRC_0	UINT
0x23D4:00	2	6	Safe Position	INT
0xE600:04	2	8	FSoE Slave CRC_1	UINT
0xE600:02	2	10	FSoE Slave ConnectionID	UINT

Safe Position : The transmitted slave safe position is 16 bit wide. It is the part from bit 10 to bit 26 of the 32 bit safe position. The 16 bit safe position has a resolution of 0.1024 mm and a range of 6'710.8864 mm.

4.4.2 Safety Outputs 0x1640

Safety ControlWord: The safety process data transferred from the FSoE Master to the FSoE Slave are referred to as the SafeOutputs. The RxPDO shall have the configuration of the safety controlword in the first byte of the SafeOutput data.

Index	Size [Byte]	Byte Offset	Name	Data Type
0x1640	7	-	Safety Output	Record
0xE700:01	1	0	FSoE Master Command	USINT
0x6640:00	0.1	1	STO command	Bool
0x6650:00	0.1	1	SS1 command	Bool
0x6670:00	0.1	1	SS2 command	Bool
0x6668:00	0.1	1	SOS command	Bool
0x0000:00	0.1	1	Reserved	Bool
0x0000:00	0.1	1	Reserved	Bool
0x0000:00	0.1	1	Reserved	Bool
0x6632:00	0.1	2	Error Ack	Bool
0x6690:00	0.1	2	SLS_1_command	Bool
0x6691:00	0.1	2	SLS_2_command	Bool
0x6692:00	0.1	2	SLS_3_command	Bool
0x6693:00	0.1	2	SLS_4_command	Bool
0x0000:00	0.1	2	Reserved	Bool
0x0000:00	0.1	2	Reserved	Bool
0x0000:00	0.1	2	Reserved	Bool
0x0000:00	0.1	2	Reserved	Bool
0xE700:03	2	4	FSoE Master CRC_0	UINT
0xE700:02	2	6	FSoE Master ConnectionID	UINT

FSoE Master Command - FSoE command byte has the following Safety PDU command - ProcessData (0x36), Reset (0x2A), Session (0x4E), Connection (0x64), Parameter (0x52), FailSafeData (0x08).
STO Command - No STO (1) /STO active (0)
SS1 Command - No SS1 (1) /SS1 active (0)
SS2 Command - No SS2 (1) /SS2 active (0)
SOS Command - No SOS (1) /SOS active (0)
SLS Command - No SLS (1) /SLS active (0)
Error Ack - Safety Fault Buffer Fault Acknowledge (1-->0)
SLS_1_Command - No SLS1 (1) /SLS1 Active (0)
SLS_2_Command - No SLS2 (1) /SLS2 Active (0)
SLS_3_Command - No SLS3 (1) /SLS3 Active (0)
SLS_4_Command - No SLS4 (1) /SLS4 Active (0)

5 Asynchronous Configuration Protocol CoE

For configuration purpose (Parameter Handling) the standard Sercos over EtherCAT CoE-Protocol is used.

5.1 Communication CiA402 Profile Area(1000h-1FFFh)

Index	Name	Flags	Value
1000	Device type	M RO	0x00020192 (131474)
1008	Device name	M RO	C1250DSXC0S
1009	Hardware version	RO	V1RG
100A	Software version	RO	6.6 Build 20160928
1018:0	Identity	RO	> 4 <
1602:0	Cyclic Position Mode	RO	> 4 <
1603:0	Cyclic Position Velocity Mode	RO	> 5 <
1604:0	Cyclic Position Velocity Torque Mode	RO	> 6 <
1606:0	Cyclic Torque Mode	RO	> 4 <
1620:0	User Defined Outputs	RW	> 0 <
1708:0	Config Module	RO	> 3 <
1A02:0	Cyclic Mode Inputs	RO	> 6 <
1A20:0	User Defined Inputs	RW	> 0 <
1B08:0	Config Module	RO	> 3 <
1B10:0	Input DemVel	RO	> 1 <
1B11:0	Input ActVel	RO	> 1 <
1B12:0	Input ActVelFilt	RO	> 1 <
1C00:0	Sync Man Communication type	RO	> 4 <
1C12:0	Sync Manager 2 PDO Assignment	RW	> 1 <
1C13:0	Sync Manager 3 PDO Assignment	RW	> 1 <
6007	Abort connection option code	RW	0
603F	Error code	RO	100
6040	Controlword	RW P	0x0000 (0)
6041	Statusword	RO P	0x0288 (648)
6060	Mode of Operation	RW P	8
6061	Mode of Operation display	RO P	8
6062	Position demand value	RW P	0
6064	Position actual value (units)	RO P	0
607A	Target position	RW P	0
607C	Home offset	RW P	-100000
6098	Homing method	RW P	-111
6099:0	Homing speeds	RO	> 2 <
609A	Homing acceleration	RW P	0x00002710 (10000)
60FC	Position demand internal value	RW P	0
60FF	Target velocity	RW P	0

LinMot CiA402 Object Dictionary

5.1.1 Homing method Object 6098

As homing method only the Device specific values -128..-111 are supported, the object 6098 value is calculated out of the UPID 13C4 (Homing mode) value added with -128.

UPID 0x13C4 value	Object 0x6098 value	Description
0	-128	Actual Position
1	-127	Mechanical Stop Negative Search
.	.	
17	-111	No drive Homing

5.1.2 Homing speeds Object 6099

In the Linmot-drive only one homing speeds exist, therefore writing to subindex 1 or 2 of the object 6099 both changes the value of the UPID 13C8 (Homing Max Speed).

5.2 Manufacturer specific Profile Area(2000h-5FFFh)

Parameters can be modified via their UPIDs (Unique Parameter ID) via CoE. To use a UPID command, an SDO read (FB_EcCoeSdoReadEx) or write (FB_EcCoeSdoWriteEx) has to be performed on the index "2000h + UPID". The sub-index specifies the command which is performed

Sdo Service	Index	Sub-Index	Description
Read	2000h+UPID	01h	Parameter UPID read RAM value
Write	2000h+UPID	01h	Parameter UPID write RAM value
Read	2000h+UPID	02h	Parameter UPID read ROM value
Write	2000h+UPID	02h	Parameter UPID write ROM value
Read	2000h+UPID	03h	Parameter UPID read minimal value
Read	2000h+UPID	04h	Parameter UPID read maximal value
Read	2000h+UPID	05h	Parameter UPID read default value
Write	2000h+UPID	06h	Parameter UPID write RAM and ROM value
Write	2000h	07h	Parameter Default OS SW instance
Write	2000h	08h	Parameter Default MC SW instance
Write	2000h	09h	Parameter Default Intf SW instance
Write	2000h	0Ah	Parameter Default Appl SW instance
Write	2000h	0Bh	Reset device
Write	2000h	18h	Parameter Default MC SW instance with immediate response
Write	2000h	24h	Parameter Start Read UPID List
Read	2000h	25h	Parameter Read next UPID List entry
Write	2000h	26h	Parameter Start Read modified UPID List
Read	2000h	27h	Parameter Read next modified UPID List entry
Write	2000h	35h	Stop MC and Appl SW instances
Write	2000h	36h	Start MC and Appl SW instances
Write	2000h	40h	Curves copy curves from RAM to FLASH
Write	2000h	41h	Curves delete all in RAM

Sdo Service	Index	Sub-Index	Description
Write	2000h+ID	50h	Curves start write curve in RAM
Write	2000h+ID	54h	Curves write curve info block data in RAM
Write	2000h+ID	53h	Curves write curve set point data in RAM
Read	2000h+ID	60h	Curves read info and data size
Read	2000h+ID	61h	Curves read info block data
Read	2000h+ID	62h	Curves read setpoint data
Read	2000h	70h	Read error counters
Read	2000h+ID	71h	Read error code of logged entry
Read	2000h+ID	72h	Read error time low of logged entry
Read	2000h+ID	73h	Read error time high of logged entry
Read	2000h+ID	74h	Read error text stringlet 0 of error code
Read	2000h+ID	75h	Read error text stringlet 1 of error code
Read	2000h+ID	76h	Read error text stringlet 2 of error code
Read	2000h+ID	77h	Read error text stringlet 3 of error code
Read	2000h+ID	78h	Read error text stringlet 4 of error code
Read	2000h+ID	79h	Read error text stringlet 5 of error code
Read	2000h+ID	7Ah	Read error text stringlet 6 of error code
Read	2000h+ID	7Bh	Read error text stringlet 7 of error code
Write	2000h	80h	Command Table copy entries from RAM to FLASH
Write	2000h	81h	Command Table delete all entries in RAM
Write	2000h+ID	82h	Command Table delete single entry in RAM
Write	2000h+ID	83h	Command Table start write entry in RAM
Write	2000h+ID	84h	Command Table write entry data in RAM
Read	2000h+ID	85h	Command Table read entry data size
Read	2000h+ID	86h	Command Table read entry data
Read	2000h	87h	Command Table read presence list entries 0..31
Read	2000h	88h	Command Table read presence list entries 32..63
Read	2000h	89h	Command Table read presence list entries 64..95
Read	2000h	8Ah	Command Table read presence list entries 96..127
Read	2000h	8Bh	Command Table read presence list entries 128..159
Read	2000h	8Ch	Command Table read presence list entries 160..191
Read	2000h	8Dh	Command Table read presence list entries 192..223
Read	2000h	8Eh	Command Table read presence list entries 224..255

5.2.1 Parameter UPID read RAM value

Read the RAM value of the parameter specified by its UPID, and stores the result in the 4 bytes of the read_buffer.

FUNCTION_BLOCK: FB_EcCoeSdoReadEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	01h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + UPID
Input	pDstBuf	DWORD	ADR(read_buffer (4bytes))
Input	cbBufLen	UDINT	Always 4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.2 Parameter UPID write RAM value

Write the content of the write_buffer to the RAM value of the parameter specified by its UPID. The write_buffer can have an unique size of 4 bytes.

FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	01h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + UPID
Input	pSrcBuf	DWORD	ADR(write_buffer (4bytes))
Input	cbBufLen	UDINT	Always 4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.3 Parameter UPID read ROM value

Read the ROM value of the parameter specified by its UPID, and stores the result in the 4 bytes of the read_buffer.

FUNCTION_BLOCK: FB_EcCoeSdoReadEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	02h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + UPID
Input	pDstBuf	DWORD	ADR(read_buffer (4bytes))
Input	cbBufLen	UDINT	Always 4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.4 Parameter UPID write ROM value

Write the content of the write_buffer to the ROM value of the parameter specified by its UPID. The write_buffer can have an unique size of 4 bytes.

FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	02h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + UPID
Input	pSrcBuf	DWORD	ADR(write_buffer (4bytes))
Input	cbBufLen	UDINT	Always 4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.5 Parameter UPID read minimal value

Read the minimal value of the parameter specified by its UPID, and stores the result in the 4 bytes of the read_buffer.

FUNCTION_BLOCK: FB_EcCoeSdoReadEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	03h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + UPID
Input	pDstBuf	DWORD	ADR(read_buffer (4bytes))
Input	cbBufLen	UDINT	Always 4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.6 Parameter UPID read maximal value

Read the maximal value of the parameter specified by its UPID, and stores the result in the 4 bytes of the read_buffer.

FUNCTION_BLOCK: FB_EcCoeSdoReadEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	04h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + UPID
Input	pDstBuf	DWORD	ADR(read_buffer (4bytes))
Input	cbBufLen	UDINT	Always 4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.7 Parameter UPID read default value

Read the default value of the parameter specified by its UPID, and stores the result in the 4 bytes of the read_buffer.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoReadEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	05h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + UPID
Input	pDstBuf	DWORD	ADR(read_buffer (4bytes))
Input	cbBufLen	UDINT	Always 4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.8 Parameter UPID write RAM & ROM value

Write the content of the write_buffer to the RAM and ROM value of the parameter specified by its UPID. The write_buffer can have an unique size of 4 bytes.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	06h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + UPID
Input	pSrcBuf	DWORD	ADR(write_buffer (4bytes))
Input	cbBufLen	UDINT	Always 4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.9 Parameter default OS SW instance

All parameters of the OS SW instance are set to their default value. The SDO response is given when the defaulting process is finished, this can last several seconds.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	07h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.10 Parameter default MC SW instance

All parameters of the MC SW instance are set to their default value. The SDO response is given when the defaulting process is finished, this can last several seconds.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	08h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.11 Parameter default Intf SW instance

All parameters of the interface SW instance are set to their default value. The SDO response is given when the defaulting process is finished, this can last several seconds.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	09h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.12 Parameter default Appl SW instance

All parameters of the application SW instance are set to their default value. The SDO response is given when the defaulting process is finished, this can last several seconds.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	0Ah (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.13 Reset device

This service resets the device.

FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	0Bh (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.14 Parameter default MC SW instance with immediate response

All parameters of the MC SW instance are set to their default value, the SDO response is given immediate. Take into account that the defaulting process last up to 10 seconds don't take other actions before this time is elapsed.

FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	18h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.15 Start read UPID List

Specify the SW layer by its start UPID of which the UPID list will be read out. The list contains all parameters and variables of the SW layer.

FUNCTION_BLOCK FB_EcCoESdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AoE NetID
Input	nSlaveAddr	T_AmsPort	ADS Port
Input	nSubIndex	UDINT	0024h (LinMot Service ID)
Input	nIndex	UDINT	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (4bytes)) Start UPID: 0000h: OS SW layer 1000h: MC SW layer 2000h: Intf SW layer 3000h: Appl SW layer
Input	cbBufLen	UDINT	Always 4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bCompleteAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.16 Read next UPID List entry

Read the response state, UPID, address usage and ROM value of the parameter and the RAM value of the variables. The reading of the list doesn't stop at the end of a SW instance, only at the end of all instances.

FUNCTION_BLOCK FB_EcCoESdoReadEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AMS NetID
Input	nSlaveAddr	T_AmsPort	ADS Port
Input	nSubIndex	UDINT	0025h (LinMot Service ID)
Input	nIndex	UDINT	2000h
Input	pDstBuf	Struct	ADR(read_buffer (10bytes))
Input	cbBufLen	UDINT	Always 10 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bCompleteAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

Response Data Structure

Offset	Name	Type	Description
0	Res State	UINT	0x0000: No error 0x00C5: Reading not initialized 0x00C6: No UPID found (finished)
2	UPID	UINT	UPID of Parameter Or Variable
4	Value	UDINT	Value of Parameter
8	Address usage	UINT	

5.2.17 Start read modified UPID List

Specify the SW layer by its start UPID of which the UPID list will be read out. The list contains all parameters and variables of the SW layer.

FUNCTION_BLOCK FB_EcCoESdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AoE NetID
Input	nSlaveAddr	T_AmsPort	ADS Port
Input	nSubIndex	UDINT	0026h (LinMot Service ID)
Input	nIndex	UDINT	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (4bytes)) Start UPID: 0000h: OS SW layer 1000h: MC SW layer 2000h: Intf SW layer

FUNCTION_BLOCK FB_EcCoESdoWriteEx

Direction	Name	Type	Description
			3000h: Appl SW layer
Input	cbBufLen	UDINT	Always 4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bCompleteAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.18 Read next modified UPID List entry

Read the response state, UPID, address usage and ROM value of the next modified parameter. The reading of the list doesn't stop at the end of a SW instance, only at the end of all instances.

FUNCTION_BLOCK FB_EcCoESdoReadEx

Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AMS NetID
Input	nSlaveAddr	T_AmsPort	ADS Port
Input	nSubIndex	UDINT	0027h (LinMot Service ID)
Input	nIndex	UDINT	2000h
Input	pDstBuf	Struct	ADR(read_buffer (10bytes))
Input	cbBufLen	UDINT	Always 10 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bCompleteAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

Response Data Structure

Offset	Name	Type	Description
0	Res State	UINT	0x0000: No error 0x00C5: Reading not initialized 0x00C6: No UPID found (finished)
2	UPID	UINT	UPID of Parameter Or Variable
4	Value	UDINT	Value of Parameter
8	Address usage	UINT	

5.2.19 Stop MC and Application SW instances

This service stops the execution of the MC and application SW layers. This command should be used before configuring (writing to ROM values) of these instances.

FUNCTION_BLOCK: FB_EcCoeSdoWriteEx

Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	35h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.20 Start MC and Application SW instances

This service starts the execution of the MC and application SW layers. This command should be used after configuring (writing to ROM values) of these instances are finished.

FUNCTION_BLOCK: FB_EcCoeSdoWriteEx

Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	36h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.21 Curves copy curves from RAM to FLASH

This service copies the actual in the RAM defined curves to the FLASH memory, so they are available after power up. Use this command only with stopped MC SW!

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	40h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.22 Curves delete all curves in RAM

This service deletes all curves in the RAM.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	41h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.23 Curves start write curve in RAM

This service initiate the writing of a new curve in the RAM.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	50h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pSrcBuf	DWORD	ADR(write_buffer)
Input	cbBufLen	UDINT	4 bytes: • UINT: Info Data Size • UINT: Set Point Data Size
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.24 Curves write curve info block data in RAM

This service writes the curve info data block in the RAM, it has to be repeated until the whole info data block is written.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	53h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pSrcBuf	DWORD	ADR(write_buffer)
Input	cbBufLen	UDINT	4 bytes data of curve info block
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.25 Curves write curve set point data in RAM

This service writes the curve setpoint data block in the RAM, it has to be repeated until all setpoints are written.

FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	53h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pSrcBuf	DWORD	ADR(write_buffer)
Input	cbBufLen	UDINT	4 bytes of setpoint data
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.26 Curves read info and setpoint data block size in RAM

Read the status and size of the data blocks of the curve defined by its ID the data is stored in the read_buffer.

FUNCTION_BLOCK: FB_EcCoeSdoReadEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	60h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pDstBuf	DWORD	ADR(read_buffer (6bytes)) • UINT: Status • UINT: Info block size • UINT: Set point data block size
Input	cbBufLen	UDINT	6 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.27 Curves read info block data in RAM

Read the info data block of the curve defined by its ID the 4 byte result is stored together with the read status in the 6 bytes of the read_buffer. This command has to be repeated until the whole info data block is read (status = 0).

FUNCTION_BLOCK: FB_EcCoeSdoReadEx

Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	61h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pDstBuf	DWORD	ADR(read_buffer (6bytes)) • UINT: Status • DWORD: data
Input	cbBufLen	UDINT	6 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.28 Curves read set point data in RAM

Read the set point data block of the curve defined by its ID the 4 byte result is stored together with the read status in the 6 bytes of the read_buffer. This command has to be repeated until the whole set point data block is read (status = 0).

FUNCTION_BLOCK: FB_EcCoeSdoReadEx

Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	62h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pDstBuf	DWORD	ADR(read_buffer (6bytes)) • UINT: Status • DWORD: data
Input	cbBufLen	UDINT	6 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.29 Read error counters

Read the number of logged errors and total occurred errors and stores them in the read buffer.

FUNCTION_BLOCK: FB_EcCoeSdoReadEx

Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	70h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pDstBuf	DWORD	ADR(read_buffer (4bytes)) • UINT: Number of logged errors • UINT: Number of total errors
Input	cbBufLen	UDINT	4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.30 Read logged error item Code and instance

Read the error code of the specified (ID) logged error item..

FUNCTION_BLOCK: FB_EcCoeSdoReadEx

Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	71h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pDstBuf	DWORD	ADR(read_buffer (4bytes)) • UINT: Error code • UINT: Error instance
Input	cbBufLen	UDINT	4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.31 Read logged error item time low

Read the error time milisecond part of the specified (ID) logged error item.

FUNCTION_BLOCK: FB_EcCoeSdoReadEx

Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	72h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pDstBuf	DWORD	ADR(read_buffer (4bytes)) • DINT: Error time [ms]
Input	cbBufLen	UDINT	4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.32 Read logged error item time high

Read the error time hours part of the specified (ID) logged error item..

FUNCTION_BLOCK: FB_EcCoeSdoReadEx

Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	73h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pDstBuf	DWORD	ADR(read_buffer (4bytes)) • DINT: Error time [h]
Input	cbBufLen	UDINT	4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.33 Read error short text

Read the short text of an error defined by its error code, for each stringlet (4 characters) a service number 74h.. 7Bh is defined.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoReadEx			
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	74h (LinMot Sdo Service ID) + stringlet Count 0..7)
Input	nIndex	WORD	2000h + ID
Input	pDstBuf	DWORD	ADR(read_buffer (4bytes)) • 4 characters of error short text
Input	cbBufLen	UDINT	4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.34 Command Table copy entries from RAM to FLASH

This service copies the actual in the RAM defined Command Table entries to the FLASH memory so they are available after power up. Use this command only with stopped MC SW!

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	80h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.35 Command Table delete all entries in RAM

This service deletes all Command table entries in the RAM.

FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	81h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.36 Command Table delete entry in RAM

This service delete a single Command Table entry defined by its ID in the RAM.

FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	82h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pSrcBuf	DWORD	ADR(write_buffer (0 bytes))
Input	cbBufLen	UDINT	0 bytes (4 bytes also accepted)
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.37 Command Table start write entry in RAM

This service initiate the writing of a new Command Table entry in the RAM.

FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	83h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pSrcBuf	DWORD	ADR(write_buffer)
Input	cbBufLen	UDINT	4 bytes: • UDINT: Entry Data Size
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.38 Command Table write entry data in RAM

This service writes the Command Table data block in the RAM.

FUNCTION_BLOCK: FB_EcCoeSdoWriteEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	84h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pSrcBuf	DWORD	ADR(write_buffer)
Input	cbBufLen	UDINT	4 bytes of entry data
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.39 Command Table entry data size in RAM

Read the the entry size of the Command Table entry specified by its ID, and stores the result in the 6 bytes of the read_buffer.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoReadEx			
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	85h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pDstBuf	DWORD	ADR(read_buffer (6bytes)) • UINT: Status • UDINT: entry size
Input	cbBufLen	UDINT	6 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.40 Command Table read entry data in RAM

Read the entry size of the Command Table entry specified by its ID, and stores the result in the 6 bytes of the read_buffer.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoReadEx			
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	85h (LinMot Sdo Service ID)
Input	nIndex	WORD	2000h + ID
Input	pDstBuf	DWORD	ADR(read_buffer (6bytes)) • UINT: Status • UDINT: entry size
Input	cbBufLen	UDINT	6 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.2.41 Command Table read presence list

Read the Command Table entry list definied by its subindex-ID, and stores the result in the 4 bytes of the read_buffer. A zero of the corresponding bit means command table entry is present, a one means the corresponding entry doesn't exists.

Direction	Name	Type	Description
FUNCTION_BLOCK: FB_EcCoeSdoReadEx			
Direction	Name	Type	Description
Input	sNetId	T_AmsNetId	AmsNetId of master
Input	nSlaveAddr	UINT	Address of slave
Input	nSubIndex	Byte	87h + ID (LinMot Sdo Service ID) ID = 0: entries 0..31 ID = 1: entries 32..63 ID = 2: entries 64..95 ID = 3: entries 96..127 ID = 4: entries 128..159 ID = 5: entries 160..191 ID = 6: entries 192..223 ID = 7: entries 224..225
Input	nIndex	WORD	2000h
Input	pDstBuf	DWORD	ADR(read_buffer (4bytes)) - DWORD: presence list, 0 means entry exists
Input	cbBufLen	UDINT	4 bytes
Input	bExecute	BOOL	Rising edge starts writing
Input	tTimeout	TIME	Timeout value
Input	bComplAccess	BOOL	FALSE
Output	bBusy	BOOL	Indicates reading active/finished
Output	bError	BOOL	Indicates reading error
Output	nErrId	UDINT	Error ID

5.3 Safety Objects

The CoE objects includes the following safety data objects.

SDO Service	Index	SubIndex	Name	Remarks
Read	0xE600	0	FSoE Slave Frame Elements	
Read	0xE600	1	FSoE Slave Cmd	
Read	0xE600	2	FSoE Slave Connection ID	
Read	0xE600	3	FSoE Slave CRC 0	
Read	0xE600	4	FSoE Slave CRC 1	
Read	0xE700	0	FSoE Master Frame Elements	
Read	0xE700	1	FSoE Master Cmd	
Read	0xE700	2	FSoE Master Connection ID	
Read	0xE700	3	FSoE Master CRC 0	
Read	0xE901	0	FSoE Connection Communication Parameter	
Read	0xE901	1	Version	
Read	0xE901	2	Safety Address	
Read	0xE901	3	ConnectionID	
Read /Write	0xE901	4	WatchDogTime	
Read	0xE901	5	Unique Device ID	
Read	0xE901	6	Connection Type	
Read	0xE901	7	Communication Parameter Length	
Read	0xE901	8	Application Parameter Length	
Read	0xE901	9	SRA CRC	

SDO Service	Index	SubIndex	Name	Remarks
Read	0xEA00	0	FSoE Connection Diagnosis	
Read	0xEA00	1	Connection State	
Read	0xF980	0	Device Safety Address	
Read	0xF980	1	FSoE Address	
Write	0x1640	0	Safety Output	
Write	0x1640	1	FSoE Master Cmd	0xE700:01,8
Write	0x1640	2	STO Command	0x6640:00,1
Write	0x1640	3	SS1 Command	0x6650:00,1
Write	0x1640	4	SS2 Command	0x6670:00,1
Write	0x1640	5	SOS Command	0x6668:00,1
Write	0x1640	6	Reserved	0x0000:00,1
Write	0x1640	7	Reserved	0x0000:00,1
Write	0x1640	8	Reserved	0x0000:00,1
Write	0x1640	9	Error Ack	0x6632:00,1
Write	0x1640	10	SLS_1_Command	0x6690:00,1
Write	0x1640	11	SLS_2_Command	0x6691:00,1
Write	0x1640	12	SLS_3_Command	0x6692:00,1
Write	0x1640	13	SLS_4_Command	0x6693:99,1
Write	0x1640	14	Reserved	0x0000:00,1
Write	0x1640	15	Reserved	0x0000:00,1
Write	0x1640	16	Reserved	0x0000:00,1
Write	0x1640	17	Reserved	0x0000:00,1
Write	0x1640	18	FSoE Master CRC0	0xE700:03,16
Write	0x1640	19	FSoE Master ConnectionID	0xE700:02,16
Write	0x1A40	0	Safety Input	
Write	0x1A40	1	FSoE Slave Command	0xE600:01,8
Write	0x1A40	2	STO Active	0x6640:00,1
Write	0x1A40	3	Reserved	0x0000:00,1
Write	0x1A40	4	Reserved	0x0000:00,1
Write	0x1A40	5	SOS Active	0x6668:00,1
Write	0x1A40	6	Reserved	0x0000:00,1
Write	0x1A40	7	Reserved	0x0000:00,1
Write	0x1A40	8	Reserved	0x0000:00,1
Write	0x1A40	9	Error	0x6632:00,1
Write	0x1A40	10	SLS_1_Active	0x6690:00,1
Write	0x1A40	11	SLS_2_Active	0x6691:00,1
Write	0x1A40	12	SLS_3_Active	0x6692:00,1

SDO Service	Index	SubIndex	Name	Remarks
Write	0x1A40	13	SLS_4_Active	0x6693:00,1
Write	0x1A40	14	SS1 Active	0x6650:00,1
Write	0x1A40	15	SS2 Active	0x6670:00,1
Write	0x1A40	16	Reserved	0x0000:00,1
Write	0x1A40	17	Error Ack State	0x6632:00,1
Write	0x1A40	18	FSoE Slave CRC 0	0xE600:03,16
Write	0x1A40	19	Safe Position	0x23D4:00,16
Write	0x1A40	20	FSoE Slave CRC 1	0xE600:04,16
Write	0x1A40	21	FSoE Slave ConnectionID	0xE600:02,16
Read	0x23D4	0	Safe Position	
Read	0x6632	0	Error	
Read	0x6640	0	STO Command	
Read	0x6650	0	SS1 Command	
Read	0x6668	0	SOS Command	
Read	0x6670	0	SS2 Command	
Read	0x6690	0	SLS 1 Command	
Read	0x6691	0	SLS 2 Command	
Read	0x6692	0	SLS 3 Command	
Read	0x6693	0	SLS 4 Command	

5.4 Non-Safety Objects

SDO Service	Index	SubIndex	Name
Read/Write	0x6007	0	Abort connection option code
Read	0x603F	0	Error Code
Read/Write	0x6040	0	Control Word
Read	0x6041	0	Status Word
Read/Write	0x6060	0	Modes Of Operation
Read	0x6061	0	Modes Of Operation display
Read	0x6062	0	Position Demand Value
Read	0x6064	0	Position Actual Value
Read	0x606B	0	Velocity Demand Value
Read	0x606C	0	Velocity Actual Value

SDO Service	Index	SubIndex	Name
Read/Write	0x6071	0	Target Torque
Read/Write	0x6072	0	Max Torque
Read	0x6077	0	Torque Actual Value
Read/Write	0x607A	0	Target Position
Read/Write	0x607C	0	Home Offset
Read/Write	0x607F	0	Max Porfile Velocity
Read/Write	0x6081	0	Profile Velocity
Read/Write	0x6083	8	Profile Acceleration
Read/Write	0x6084	9	Profile Deceleration
Read/Write	0x6085	0	QuickStop Deceleration
Read/Write	0x6086	0	Motion Profile Type
Read/Write	0x6098	0	Homing Method
Read/Write	0x6099	0	Homing Speeds
Read/Write	0x6099	1	Speed during search for switch
Read/Write	0x6099	2	Speed during search for zero
Read/Write	0x609A	0	Homing Acceleration
Read/Write	0x60A3	0	Profile Jerk Use
Read/Write	0x60A4	0	Profile Jerk
Read/Write	0x60A4	1	Profile Jerk 1
Read/Write	0x60E0	0	Positive Torque Limit Value
Read/Write	0x60E1	0	Negative Torque Limit Value
Read	0x60F4	0	Following error actual value
Read	0x60FC	0	Position Demand Internal Value
Read	0x60FD	0	Digital Inputs
Read/Write	0x60FF	0	Target velocity
Read	0x6502	0	Supported Drive modes

6 EtherCAT CiA402 Parameters

6.1 Parameters

Attention: The EtherCAT CiA402 Interface has an additional parameter tree branch (Parameters → EtherCAT CiA402), which can be configured with the distributed LinMot-Talk software.

With these parameters, the EtherCAT interface can be enabled or disabled.
The LinMot-Talk software can be downloaded from http://www.linmot.com under the section Download, Software, LinMot Talk.

6.1.1 EtherCAT CiA402/Dis-/Enable

With the Dis-/Enable parameter the LinMot Servo Drive can be run without the Ethernet EtherCAT Interface going online. So in a first step the system can be configured and run without any bus connection.

ETHERCAT/Dis-/Enable	
Disable	Servo Drive runs without ETHERCAT.
Enable	Servo Drive runs with ETHERCAT connection.

Attention: If the ETHERCAT Interface is disabled, the integrated ETHERCAT-ASIC rests in reset state! No messages will be sent to other devices connected to the ETHERCAT-Network via the servo drive.

6.1.2 EtherCAT CiA402/Station Alias/Alias Address Source

With this parameter the station alias address source is defined.

Attention: If a station alias address is defined in the ET1100 Eeprom (could be programmed from the master over the Network), this alias address is taken.

ETHERCAT/Station Alias/Alias Address Source	
None	No station alias address is generated
ID Switches	The ID switches defines the station alias address
ID Switches + Parameter	The station alias address is build out of the ID-Switch value added with the parameter value (typ. Offset)
RT MAC	The lowest 2 bytes of the device MAC address are used as station alias address
Parameter	The Station alias address parameter value defines the Alias Address
Masked RT MAC and Parameter	The station alias address is defined by the masked parameter ored with the RT MAC masked with the inverse mask

6.1.3 EtherCAT CiA402/Station Alias/Alias Address Parameter

This is the parameter value of the station alias address.

6.1.4 EtherCAT CiA402/Station Alias/Alias Address Parameter Mask

Mask value for the parameter value of the station alias address.

6.1.5 EtherCAT CiA402/NC Configuration/Velocity Scale Numerator /Denominator

This two parameters are taken to Scale the PDO Value of "Target velocity" (Index 0x60FF) to the Drive Resolution which is [1um/s]. The Scaling factor is Velocity Scale Numerator divided by Velocity Scale Denominator.

For the Beckoff this factor could be set to 1 (as the default value is 1/1), if adapted as described chapter 2.2 in the master.

For Omron PLC's this factor is typically 0.1 → Velocity Scale Numerator = 1 and Velocity Scale Denominator = 10.

6.1.6 EtherCAT CiA402/NC Configuration/Operation Mode 10 Config

ETHERCAT/NC Configuration/Operation Mode 10 Config	
Current Command Mode	In Operation Mode 10 the current command mode is activated, the setpoint is given directly as current [mA].
Force/Torque Control Mode	In Operation Mode 10 the current command mode is activated, the setpoint is given relative, 5000 corresponds to the maximal force/torque.
Closed Loop Force/Torque Control Mode	In Operation Mode 10 the closed loop force/torque control mode is activated, the setpoint is given relative, 5000 corresponds to the maximal force/torque.
Closed Loop Force/Torque Control Mode Abs	In Operation Mode 10 the closed loop force/torque control mode is activated, the setpoint is given absolute with 0.1N resolution as Target Force (UPID 1EA0h) and 1E-6Nm resolution as target torque.

This parameter is used for the when Output PDO modules 0x1604 or 0x1614 are used.

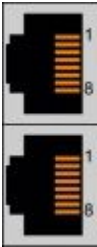### 6.1.7 EtherCAT CiA402/Connection Timeout/Timeout Behavior

With this parameter the drive behavior on an Connection timeout could be set. This parameter is also represented in the profile parameter with index 0x6007.

ETHERCAT/Conection Timeout/Timeout Behavior	
Ignore	Nothing happens if an IO timeout occurs.
Error with Disable Voltage	Drive goes to Error State and the Voltage is disabled immediately when the IO timeout occurs.
Error with Quick Stop	Drive goes to Error State before the Voltage is disabled a Quick Stop is performed, when the IO timeout occurs.
Error with Go To Pos	Drive goes to Error State before the Voltage is disabled a Go To Position is performed, when the IO timeout occurs.

7 Connecting to the EtherCAT Network

7.1 Pin Assignment of the Connectors X17-X18

The ETHERCAT connector is a standard RJ45 female connector with a pin assignment as defined by EIA/TIA T568B:

X17 – X18	ETHERCAT Connector		
	Pin	**Wire color code**	**Assignment 100BASE-TX**
	1	WHT/ORG	Rx+
	2	ORG	Rx-
	3	WHT/GRN	Tx+
	4	BLU	-
	5	WHT/BLU	-
	6	GRN	Tx-
	7	WHT/BRN	-
	8	BRN	-
	case	-	-
RJ-45	Use standard patch cables (twisted pair, S/UTP, AWG26) for wiring. This type of cable is usually referred to as a "Cat5e-Cable".		

Contact & Support

SWITZERLAND	**NTI AG**	
	Bodenaeckerstrasse 2	
	CH-8957 Spreitenbach	
	Sales and Administration:	+41 56 419 91 91
		office@linmot.com
	Tech. Support:	+41 56 544 71 00
		support@linmot.com
		http://www.linmot.com/support
	Tech. Support (Skype):	support.linmot
	Fax:	+41 56 419 91 92
	Web:	http://www.linmot.com

USA	**LinMot USA Inc.**	
	N1922 State Road 120, Unit 1	
	Lake Geneva, WI 53147	
	USA	
	Phone:	262-743-2555
	E-Mail:	usasales@linmot.com
	Web:	http://www.linmot-usa.com/

Please visit http://www.linmot.com/contact to find the distribution close to you.

Smart solutions are…

driven by

LinMot®

www.LinMot.com