CANopen

for ZED Servo Drive

User Manual

ORIGINAL DOCUMENT
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CANopen Vendor-ID

Vendor-ID **0513** has been registered to STXI Motion Ltd.
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1 Introduction

1.1 About This Manual

Drive functionality is configured using various commands and variables, which are communicated over the serial port or over a fieldbus.

This manual describes the implementation of CANopen communication in the ZED servo drive.

This manual is not meant to replace the CANopen specifications, or to reproduce them.

This manual is intended for skilled personnel who have been trained to work with the equipment described.

1.2 Manual Format – Object Dictionary

The CAN objects are presented and described in the following formats:

Variable and Record Objects

nnnnh – Object Name

Description	Description of the object
Object Type	Variable | Record
Data Type	Boolean Integer8 | Integer16 | Integer32 Unsigned8 | Unsigned16 | Unsigned32 Real32 | Visible_String
Access	Read/Write Read and write access Read only Read only Constant Read only access, value is constant
PDO Mapping	Yes | No
Default Value	The object's default value.
Lower Limit	The object's minimum value.
Upper Limit	The object's maximum value.
Unit	When the object value implies units of measure, these units are specified.

Array Objects

nnnnh – Object Name

Description	Description of the object
Object Type	Array
Sub-indices	The number of object sub-indices.
Sub-index	0
Description	Description of the sub-index.
Object Type	Variable | Record
Data Type	Boolean Integer8 | Integer16 | Integer32 Unsigned8 | Unsigned16 | Unsigned32 Real32 | Visible_String
Access	Read/Write Read and write access Read only Read only Constant Read only access, value is constant
PDO Mapping	Yes | No
Default Value	The default value.
Lower Limit	The minimum value.
Upper Limit	The maximum value.
Unit	When the value implies units of measure, these units are specified.

2 Fieldbus Wiring and Setup

2.1 Wiring Guidelines

To ensure proper performance, wiring must be in accordance with the following guidelines:

- Use and connect components and cables according to manufacturer specifications.
- Use the shortest cables possible.
- To reduce the effects of EMI, use twisted pairs for the following cables:
  - Power supply
  - CANopen communication
- Twisting must be maintained as close as possible to both ends of the cable.
- Shielding must be maintained at both ends of the cable.
- If connecting the power supply unit (PSU) to more than one ZED, use either a star or a bus connection, as shown in the figures below.

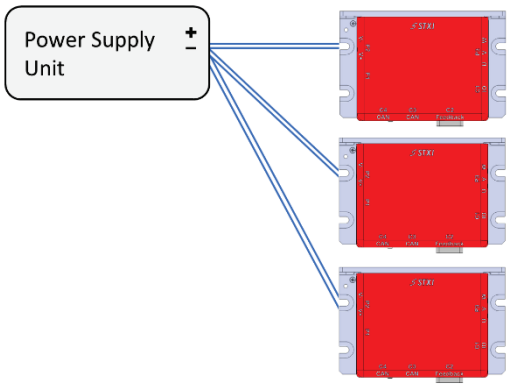


Figure 1. Star Connection

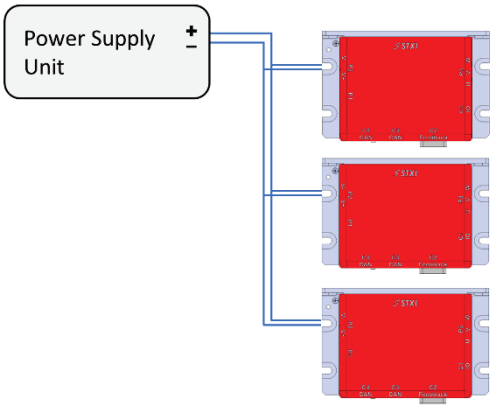


Figure 2. Bus Connection

2.2 CANopen Network Wiring

The nodes of the CANopen network are connected in series, so that the CAN cabling loops through all controllers.

1.1.1. CAN interfaces (C3, C4)

ZED interfaces C3 and C4 are RJ45 ports that serve as transmitter and receiver for drives operating on a CAN network. The have identical pinouts.

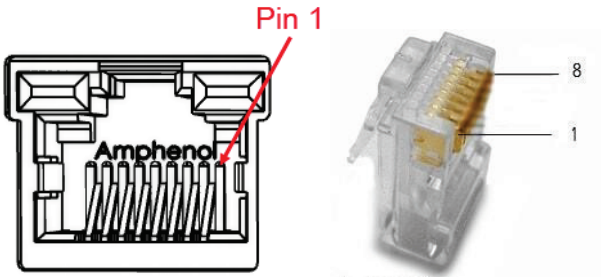


Figure 3. ZED CAN interface (C3, C4) and connector

Pin #	Signal Description
1	CAN high
2	CAN low
3	CAN ground
4	RS232 receive
5	RS232 ground
6	RS232 transmit
7	not connected
8	for manufacturer use only

1.1.2. Termination Resistor

A 120 Ω termination resistor is required at both ends of the CAN bus network between CAN_L and CAN_H. This is the responsibility of the user.

The following figure shows an example of the placement of termination resistors in a system with more than two devices.

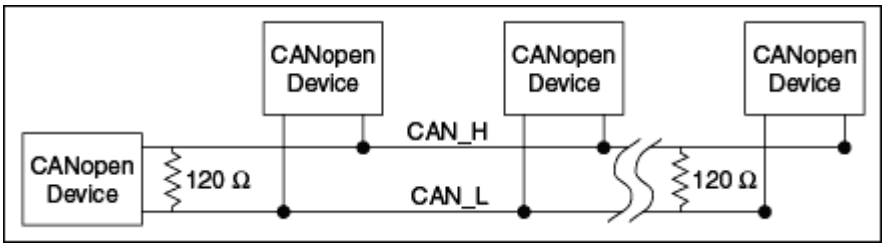


Figure 4. Placement of terminator resistors

1.1.3. Cable Connections

ZED wiring requires RJ45 Cat 5e cables.

Make the following connections:

- Connect the host to the drive on interface C4.
- Connect the next node to interface C3
- Connect a termination resistor plug to interface C4 on the last CANopen device in the network chain.

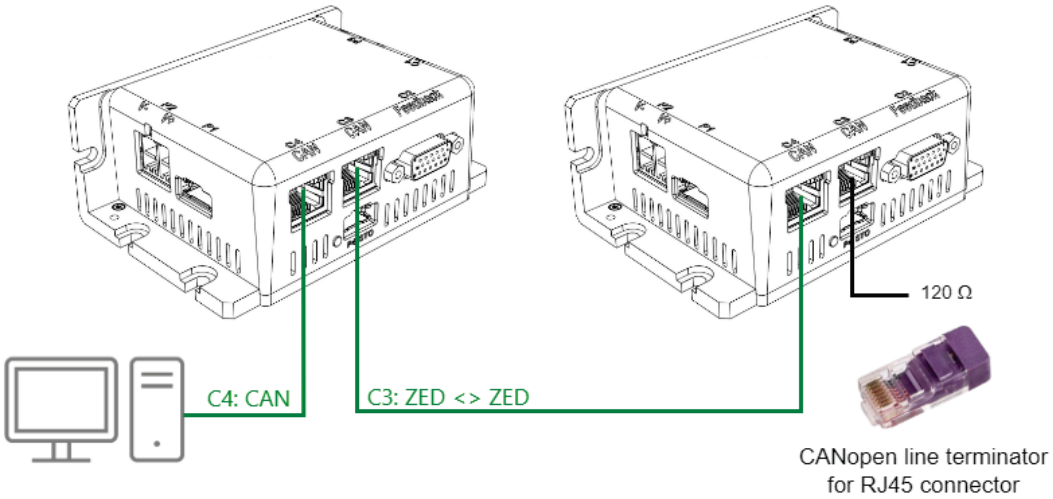


Figure 5. ZED CAN Network Configuration

2.3 Node Address in CANopen Network

Within a CANopen network, a unique node address (identification number) must be allocated to each individual CANopen device.

If only one drive is connected to the host computer, the drive address is set to 127 by default and does not need to be defined.

When using multiple drives in the same CANopen network, each drive must have a unique address.

2.4 EDS File

When setting up your system for CANopen communication, be sure the required EDS file is installed in the PLC controller or host computer.

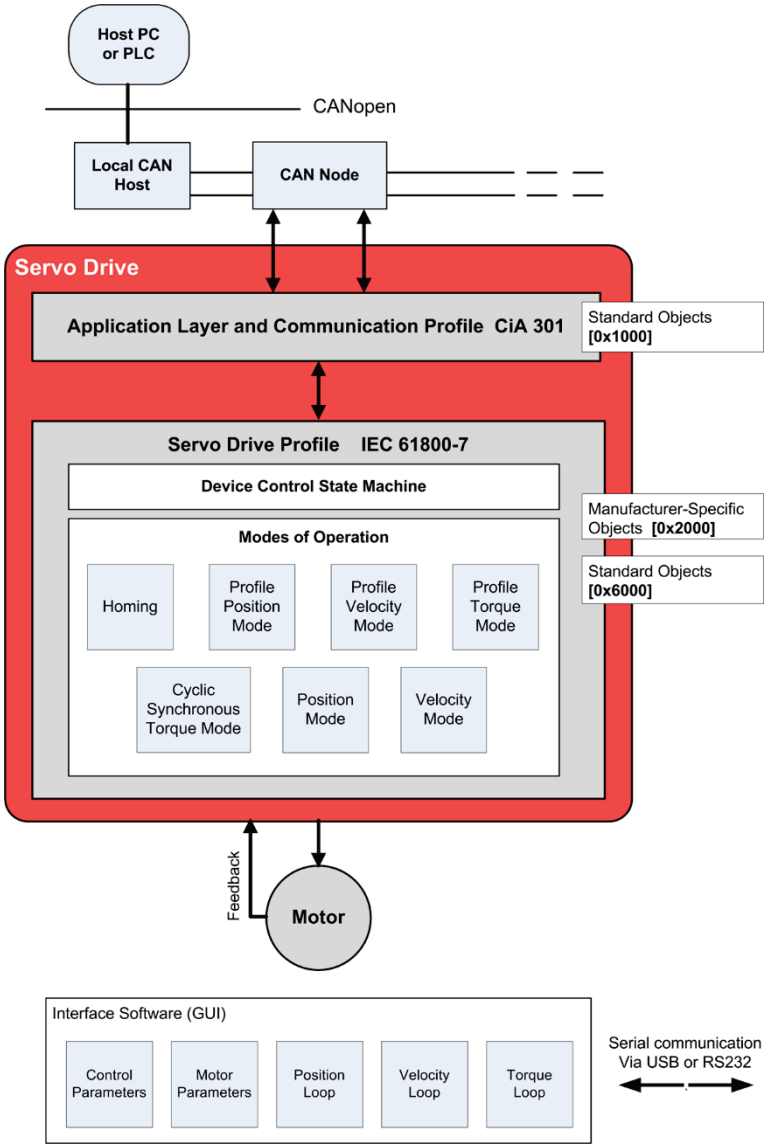
You can download the file from the STXI Motion website or contact Technical Support.

3 CANopen Operation

3.1 Device Communication

The ZED communication interface conforms to the following standards:

- CiA 301: CANopen Application Layer and Communication Profile
- IEC 61800-7-1: Interface Definition; (previously CiA 402-1: General Definitions)
- IEC 61800-7-201: Profile Type 1 (CiA 402); (previously CiA 402-2: Operation Modes and Application Data)
- IEC 61800-7-301: Mapping of Profile Type 1; (previously CiA 402-3: PDO Mapping)



Device Control: Starting and stopping of the drive and several mode-specific commands are executed by the state machine.

Modes of Operation:
The operating mode defines the behavior of the drive.

Figure 6. Communication Architecture

3.2 Communication Objects

Communication objects are used for exchanging process and service data, for process or system time synchronization, for error state supervision, and for control and monitoring of node states. These objects are defined by their structure, transmission types and their CAN identifier.

1.1.4. Service Data Communication

Service data objects (SDOs) provide direct access to object entries in the CANopen device object dictionary. As these object entries contain data of arbitrary size and data type, the SDOs are used to transfer multiple data sets (each containing an arbitrary large block of data) from a client to a server and vice versa. The client controls, via a multiplexer (index and sub-index of the object dictionary), which data set is transferred. The content of the data set is defined within the object dictionary.

In general, an SDO is transferred as a sequence of segments. Prior to transferring the segments there is an initialization phase in which client and server prepare for transferring the segments. For SDOs, it is also possible to transfer a data set of up to four bytes during the initialization phase. This mechanism is called SDO expedited transfer.

The client always initiates an SDO transfer for any type of transfer. The owner of the accessed object dictionary is the server of the SDO. Either the client or the server can take the initiative to abort the transfer of an SDO.

By means of an SDO, a peer-to-peer communication channel between two CANopen devices is established. A CANopen device supports more than one SDO. One supported Server-SDO is the default case (Default SDO).

1.1.5. Process Data Communication

Process data objects (PDOs) perform real-time data transfer. The transfer of PDOs is performed without any protocol overhead.

The PDOs correspond to objects in the object dictionary and provide the interface to the application objects. Data type and mapping of application objects into a PDO is determined by a corresponding default PDO mapping structure within the object dictionary. ZED support variable PDO mapping; therefore, the number of PDOs and the mapping of application objects into a PDO may be transmitted to a CANopen device during the configuration process, by applying the SDO services to the corresponding objects of the object dictionary.

PDOs are used for both data transmission and data reception – termed Transmit-PDO (TPDO) and Receive-PDO (RPDO), respectively. CANopen devices supporting TPDO are PDO producers, and CANopen devices supporting RPDO are called PDO consumers. ZED support both. The PDO communication parameter describes the communication capabilities of the PDO. The PDO mapping parameter contains information about the contents of the PDO.

For each PDO, a pair of communication and mapping parameters is mandatory.

Only event-triggered RPDOs are supported.

3.3 Device Control and State Machine

The power drive system finite-state automaton (PDS FSA) is a mathematical model that defines the behavior of the power drive system. Because a power drive system is required to provide local control even when the communication network is not functioning properly, the communication FSA and the PDS FSA are only loosely coupled. Figure shows how the power drive system operates remotely via the network, or locally.

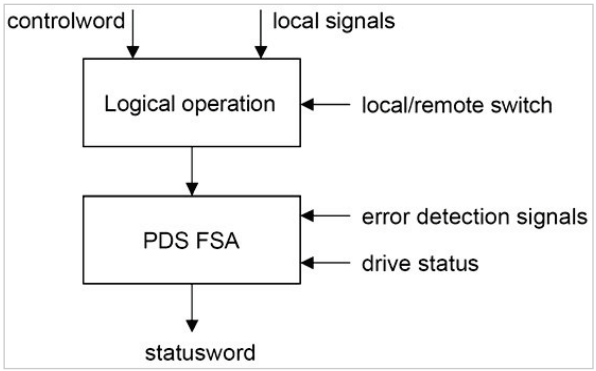


Figure 7. Remote and Local Control

The power drive system is operated by the Controlword sent by the control device via the network. The state of the power drive system is reported by the Statusword produced by the drive device. The FSA is also controlled by error detection signals.

The PDS FSA defines the power drive system status and the possible control sequence of the power drive system. A single state represents a special internal or external behavior. The state of the power drive system also determines which commands are accepted. For example, it is only possible to start a point-to-point move when the drive is in the operation enabled state.

3.4 Indicating the Operating State

After switching on, and when an operating mode is started, the power drive system goes through a number of operating states. The operating states are internally monitored and influenced by monitoring functions

The following figure illustrates the PDS FSA behavior. It takes into consideration the control of the power electronics, in accordance with user commands and internal drive faults.

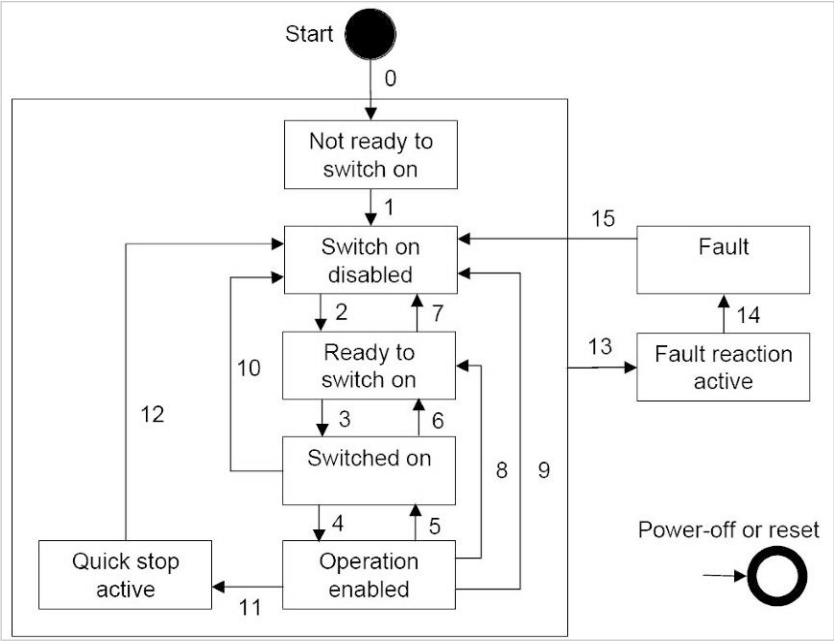


Figure 8. Power Drive System State Diagram

Notes:

Not Ready to Switch On	"Not ready to operate" received from the controller.
Switch On Disabled	Ready to operate. Can read and write parameters. Motion functionality cannot be executed.
Ready to Switch On	Ready to operate. Can read and write parameters. Motion functionality cannot be executed. Bus voltage must be switched on.
Operation Enabled	Drive power stage is enabled. No fault is present. Motion functionality can be executed.
Quick Stop Active	Drive was stopped using controlled stop. Power stage is enabled. Motion functionality cannot be executed.
Fault Reaction Active	A fault has occurred. Drive is in the process of ramping down to 0 velocity (Active Disable process).
Fault	A fault has occurred. Power stage is disabled.

Bits 0, 1, 2, 3, 5 and 6 of the parameter Statusword provide information on the operating state.

	Operating State	Bit 6: Switch On Disabled	Bit 5: Quick Stop	Bit 3: Fault	Bit 2: Operation Enabled	Bit 1: Switch On	Bit 0: Ready to Switch On
2	Not Ready To Switch On	0	X	0	0	0	0
3	Switch On Disabled	1	X	0	0	0	0
4	Ready To Switch On	0	1	0	0	0	1
5	Switched On	0	1	0	0	1	1
6	Operation Enabled	0	1	0	1	1	1
7	Quick Stop Active	0	0	0	1	1	1
8	Fault Reaction Active	0	X	1	1	1	1
9	Fault	0	X	1	0	0	0

The following table shows the bit coding of Statusword object 6041h.

Parameter Name	Bit Assignments	Data Type R/W
Statusword	Bits 0–3 = Status bits Bit 4 = Voltage enabled Bits 5–6 = Status bits Bit 7 = Warning Bit 8 = Reserved Bit 9 = Remote Bit 10 = Target reached Bit 11 = Internal limit is active Bit 12 = Operating mode-specific Bit 13 = Operating mode-specific Bit 14 = Manufacturer-specific Bit 15 = Manufacturer-specific	Unsigned16 Read only

Notes:

Bit 4 Bit 4=1 indicates whether the DC bus voltage is correct. If the voltage is missing or is too low, the device does not transition from operating state 3 to operating state 4.

Bit 7 If bit 7 (warning) of the status word is 1, it indicates the presence of a warning condition. Warning is not an error or fault (e.g., temperature limit exceeded, job refused). The status of the PDS FSA does not change. The cause of the warning may be given in the fault code parameter object (603Fh).

Bit 9 If bit 9 is set, the device carries out commands via the fieldbus. If Bit 9 is reset, the device is controlled via a different interface. In such a case, it is still possible to read or write parameters via the fieldbus.

Bit 10 Bit 10 is used for monitoring the current operating mode.

Bit 12 Bit 12 is used for monitoring the current operating mode.

Bit 13 Bit 13 only becomes 1 if an error needs to be resolved prior to further processing.

3.5 Changing the Operating State

The parameter Controlword can be used to switch between operating states.

Parameter Name	Bit Assignments	Data Type R/W
Controlword	Bit 0 = Switch On Bit 1 = Enable Voltage Bit 2 = Quick Stop Bit 3 = Enable Operation Bits 4–6 = Operating Mode specific Bit 7 = Fault Reset Bit 8 = Halt Bit 9 = Reserved Bits 10–15 = Reserved (must be 0) Changed settings become active immediately.	Unsigned16 Read only

The following table shows the bit coding of Controlword object 6040h.

Bits 0, 1, 2, 3 and 7 allow you to switch between the operating states.

Fieldbus Command	State Transitions	State Transition To	Bit 7: Fault Reset	Bit 3: Enable Operate	Bit 2: Quick Stop	Bit 1: Enable Voltage	Bit 0: Switch On
Shutdown	T2, T6, T8	4 – Ready To Switch On	X	X	1	1	0
Switch On	T3	5 – Switched On	X	X	1	1	1
Disable Voltage	T7, T9, T10, T12	3 – Switch On Disabled	X	X	X	0	X
Quick Stop	T7, T10 T11	3 – Switch On Disabled 7 – Quick Stop Active	X	X	0	1	X
Disable Operation	T5	5 – Switched On	X	0	1	1	1
Enable Operation	T4, T16	6 – Operation Enabled	X	1	1	1	1
Fault Reset	T15	3 – Switch On Disabled	0 » 1	X	X	X	X

Notes:

Bit 4—6	Bits 4 to 6 are used for the operating mode-specific settings.
Bit 8	A Halt can be triggered with bit 8=1.
Bit 9–15	Reserved.

4 Mandatory Objects

Object 1000h – Device Type

Description	This object indicates the kind of device. The lower 16 bit contains the device profile number and the upper 16 bit contains additional information.
Object Type	Variable
Data Type	Unsigned32
Access	Constant
PDO Mapping	No
Default Value	0x00420192

Object 1001h – Error Register

Description	This object has 8 bits, each for a certain error type. When an error occurs, the corresponding bit is set. **Bit Meaning** 0 generic error 1 current 2 voltage 3 temperature 4 communication error (overrun, error state) 5 device profile specific 6 reserved 7 manufacturer specific
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x00

Object 1018h – Identity

Description	This object contains the hardware version of the device.
Object Type	Record
Sub-indices	5

Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x4
Lower Limit	0x1
Upper Limit	0x4
Sub-index	1
Description	**Vendor ID**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000513 (STXI Motion Ltd. CAN vendor number)
Sub-index	2
Description	**Product Code**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x0
Sub-index	3
Description	**Revision number**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Sub-index	4
Description	**Serial Number**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No

5 Communication Objects

Object 1003h – Predefined Error Field

Description	This object provides the errors that occurred on the CANopen device and were signaled via the emergency object. In doing so it provides an error history. Writing 0 to sub-index 0 deletes the entire error history.
Object Type	Array
Sub-indices	11
Sub-index	0
Parameter Name	**Number of Errors**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x00000000
Sub-index	1
Parameter Name	**Standard Error Field**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000000
Sub-index	2
Parameter Name	**Standard Error Field**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000000
Sub-index	3
Parameter Name	**Standard Error Field**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000000

Sub-index	4
Parameter Name	**Standard Error Field**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000000
Sub-index	5
Parameter Name	**Standard Error Field**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000000
Sub-index	6
Parameter Name	**Standard Error Field**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000000
Sub-index	7
Parameter Name	**Standard Error Field**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000000
Sub-index	8
Parameter Name	**Standard Error Field**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000000

Sub-index	9
Parameter Name	**Standard Error Field**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000000
Sub-index	10
Parameter Name	**Standard Error Field**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000000

Object 1005h – COB-ID SYNC

Description	This object indicates the configured the COB-ID of the synchronization object (SYNC). It also defines whether the CANopen device generates the SYNC.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00000080

Object 1006h – Communication Cycle Period

Description	This object provides the communication cycle period. This period defines the SYNC interval.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00000000

Object 1008h – Manufacturer Device Name

Description	This object provides the name of the device as given by the manufacturer.
Object Type	Variable
Data Type	Visible string
Access	Constant
PDO Mapping	No

Object 1009h – Manufacturer Hardware Version

Description	This object provides the manufacturer hardware version description.
Object Type	Variable
Data Type	Visible string
Access	Constant
PDO Mapping	No

Object 100Ah – Manufacturer Software Version

Description	This object provides the manufacturer software version description.
Object Type	Variable
Data Type	Visible string
Access	Constant
PDO Mapping	No

Object 1010h – Store Parameter Field

Description	This object controls the saving of parameters in non-volatile memory.
Object Type	Array
Sub-indices	2

Sub-index	0
Parameter Name	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x01
Lower Limit	0x0
Upper Limit	0x7F
Sub-index	1
Parameter Name	**Save All Parameters**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
ObjFlags	0x00000001

Object 1011h – Restore Default Parameters

Description	This object serves to restore the default values of parameters according to the communication profile, device profile, and application profile.
Object Type	Array
Sub-indices	2
Sub-index	0
Parameter Name	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x1
Sub-index	1
Parameter Name	**Restore All Default Parameters**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
ObjFlags	0x00000001

Object 1014h – COB-ID EMCY

Description	This object indicates the configured COB-ID for the EMCY write service.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	$NODEID+0x80

Object 1016h – Consumer Heartbeat Time

Description	The consumer heartbeat time provides the expected heartbeat cycle times. They are higher than the corresponding producer heartbeat times configured on the CANopen device producing this heartbeat. Monitoring starts after the reception of the first heartbeat.
Object Type	Array
Sub-indices	3
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x02
Lower Limit	0x1
Upper Limit	0x7F
Sub-index	1
Description	**Consumer Heartbeat Time 1**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00000000
Lower Limit	0x0
Upper Limit	0x02FFFFFF

Sub-index	2
Description	**Consumer Heartbeat Time 2**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00000000
Lower Limit	0x0
Upper Limit	0x02FFFFFF

Object 1017h – Producer Heartbeat Time

Description	This object indicate the configured cycle time of the heartbeat
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x00000000

Object 1400h – Receive PDO Communication Parameter 1

Description	This object contains the communication parameters of the current PDO the device is able to receive.
Object Type	Record
Sub-indices	4
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x03
Lower Limit	0x02
Upper Limit	0x05

Sub-index	1
Description	**COB-ID**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	$NODEID+0x200
Lower Limit	$NODEID+0x1
Upper Limit	$NODEID+0xFFFFFFFF
Sub-index	2
Description	**Transmission Type**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0xFF
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	3
Description	**Inhibit Time**
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0000
Upper Limit	0xFFFF

Object 1401h – Receive PDO Communication Parameter 2

Description	This object contains the communication parameters of the current PDO the device is able to receive.
Object Type	Record
Sub-indices	4

Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x03
Lower Limit	0x02
Upper Limit	0x05
Sub-index	1
Description	**COB-ID**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	$NODEID+0x300
Lower Limit	$NODEID+0x1
Upper Limit	$NODEID+0xFFFFFFFF
Sub-index	2
Description	**Transmission Type**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x1
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	3
Description	**Inhibit Time**
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0000
Upper Limit	0xFFFF

Object 1402h – Receive PDO Communication Parameter 3

Description	This object contains the communication parameters of the current PDO the device is able to receive.
Object Type	Record
Sub-indices	4
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x03
Lower Limit	0x02
Upper Limit	0x05
Sub-index	1
Description	**COB-ID**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	$NODEID+0x400
Lower Limit	$NODEID+0x1
Upper Limit	$NODEID+0xFFFFFFFF
Sub-index	2
Description	**Transmission Type**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x1
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	3
Description	**Inhibit Time**
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0000
Upper Limit	0xFFFF

Object 1403h – Receive PDO Communication Parameter 4

Description	This object contains the communication parameters of the current PDO the device is able to receive.
Object Type	Record
Sub-indices	4
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x03
Lower Limit	0x02
Upper Limit	0x05
Sub-index	1
Description	**COB-ID**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	$NODEID+0x500
Lower Limit	$NODEID+0x1
Upper Limit	$NODEID+0xFFFFFFFF

Sub-index	2
Description	**Transmission Type**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x1
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	3
Description	**Inhibit Time**
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0000
Upper Limit	0xFFFF

Object 1600h – Receive PDO Mapping Parameter 1

Description	This object contains the mapping parameters for the PDOs the CANopen device is able to receive.
Object Type	Record
Sub-indices	3
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x2
Lower Limit	0x0
Upper Limit	0x40

Sub-index	1
Description	**Mapping Entry 1**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x60400010
Lower Limit	0x0
Upper Limit	0xFFFFFFFF
Sub-index	2
Description	**Mapping Entry 2**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x60600008
Lower Limit	–
Upper Limit	–

Object 1601h – Receive PDO Mapping Parameter 2

Description	This object contains the mapping parameters for the PDOs the CANopen device is able to receive.
Object Type	Record
Sub-indices	2
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x1
Lower Limit	0x0
Upper Limit	0xFF

Sub-index	1
Description	**Mapping Entry 1**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x60800020
Lower Limit	0x0
Upper Limit	0xFFFFFFFF

Object 1602h – Receive PDO Mapping Parameter 3

Description	This object contains the mapping parameters for the PDOs the CANopen device is able to receive.
Object Type	Record
Sub-indices	2
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x1
Lower Limit	0x0
Upper Limit	0xFF
Sub-index	1
Description	**Mapping Entry 1**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x60FF0020
Lower Limit	0x0
Upper Limit	0xFFFFFFFF

Object 1603h – Receive PDO Mapping Parameter 4

Description	This object contains the mapping parameters for the PDOs the CANopen device is able to receive.
Object Type	Record
Sub-indices	1
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0xFF

Object 1800h – Transmit PDO Communication Parameter 1

Description	This object contains the communication parameters of the current PDO the device is able to transmit.
Object Type	Record
Sub-indices	6
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x05
Lower Limit	0x02
Upper Limit	0x06

Sub-index	1
Description	**COB-ID**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	$NODEID+0x180
Lower Limit	$NODEID+0x1
Upper Limit	$NODEID+0xFFFFFFFF
Sub-index	2
Description	**Transmission Type**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x1
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	3
Description	**Inhibit Time**
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0000
Upper Limit	0xFFFF
Sub-index	4
Description	**Compatibility Entry**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	5
Description	**Event Timer**
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0xFF

Object 1801h – Transmit PDO Communication Parameter 2

Description	This object contains the communication parameters of the current PDO the device is able to transmit.
Object Type	Record
Sub-indices	6
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x05
Lower Limit	0x02
Upper Limit	0x06
Sub-index	1
Description	**COB-ID**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	$NODEID+0x280
Lower Limit	$NODEID+0x1
Upper Limit	$NODEID+0xFFFFFFFF

Sub-index	2
Description	**Transmission Type**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x1
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	3
Description	**Inhibit Time**
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0000
Upper Limit	0xFFFF
Sub-index	4
Description	**Compatibility Entry**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	5
Description	**Event Timer**
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0xFFFF

Object 1802h – Transmit PDO Communication Parameter 3

Description	This object contains the communication parameters of the current PDO the device is able to transmit.
Object Type	Record
Sub-indices	6
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x05
Lower Limit	0x02
Upper Limit	0x06
Sub-index	1
Description	**COB-ID**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	$NODEID+0x380
Lower Limit	$NODEID+0x1
Upper Limit	$NODEID+0xFFFFFFFF
Sub-index	2
Description	**Transmission Type**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x1
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	3
Description	**Inhibit Time**
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0000
Upper Limit	0xFFFF
Sub-index	4
Description	**Compatibility Entry**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	5
Description	**Event Timer**
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0xFFFF

Object 1803h – Transmit PDO Communication Parameter 4

Description	This object contains the communication parameters of the current PDO the device is able to transmit.
Object Type	Record
Sub-indices	6

Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x05
Lower Limit	0x02
Upper Limit	0x06
Sub-index	1
Description	**COB-ID**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	$NODEID+0x480
Lower Limit	$NODEID+0x1
Upper Limit	$NODEID+0xFFFFFFFF
Sub-index	2
Description	**Transmission Type**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x1
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	3
Description	**Inhibit Time**
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0000
Upper Limit	0xFFFF

Sub-index	4
Description	**Compatibility Entry**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	5
Description	**Event Timer**
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0xFFFF

Object 1A00h – Transmit PDO Mapping Parameter 1

Description	This object contains the mapping parameters of the current PDO the device is able to transmit.
Object Type	Record
Sub-indices	3
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x2
Lower Limit	0x0
Upper Limit	0xFF

Sub-index	1
Description	**Mapping Entry 1**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x60410010
Lower Limit	–
Upper Limit	–
Sub-index	2
Description	**Mapping Entry 2**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x60610008
Lower Limit	–
Upper Limit	–

Object 1A01h – Transmit PDO Mapping Parameter 2

Description	This object contains the mapping parameters of the current PDO the device is able to transmit.
Object Type	Record
Sub-indices	2
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x1
Lower Limit	0x0
Upper Limit	0xFF
Sub-index	1
Description	**Mapping Entry 1**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x606C0020
Lower Limit	0x0
Upper Limit	0xFFFFFFFF

Object 1A02h – Transmit PDO Mapping Parameter 3

Description	This object contains the mapping parameters of the current PDO the device is able to transmit.
Object Type	Record
Sub-indices	2

Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x1
Lower Limit	0x0
Upper Limit	0xFF
Sub-index	1
Description	**Mapping Entry 1**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Lower Limit	0x0
Default Value	0x60780010
Upper Limit	0xFFFFFFFF

Object 1A03h – Transmit PDO Mapping Parameter 4

Description	This object contains the mapping parameters of the current PDO the device is able to transmit.
Object Type	Record
Sub-indices	1
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0xFF

6 Manufacturer Specific Objects

Object 20F0h – NMT After Boot

Description	State of the CANopen device (node) after boot. If object=0, the device enters Pre-operational state. If object=1 (or any other value), device directly enters Operational state.
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1

Object 2100h – Error Code

Description	Global error code of failed parameter excess.
Object Type	Array
Sub-indices	2
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x1
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Last Command Error**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF

Object 2101h – Enable Drive

Description	This object enables and disables the drive, and stops motion.
Object Type	Array
Sub-indices	4
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x3
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Motor Enable**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	0x0
Upper Limit	0x1
ObjFlags	0x00000001
Sub-index	2
Description	**Stop Motion**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	0x0
Upper Limit	0x1
ObjFlags	0x00000001

Sub-index	3
Description	**Enable Gate Driver**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	0x0
Upper Limit	0x1
ObjFlags	0x00000001

Object 2103h – Current Command

Description	This object indicates the current command.
Object Type	Array
Sub-indices	2
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x1
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Current [A]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
ObjFlags	0x00000001

Object 2104h – Speed Command

Description	This object indicates the speed loop parameters.
Object Type	Array
Sub-indices	3
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	11 (0x0B)
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Speed [counts/second]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
ObjFlags	0x00000001
Sub-index	11
Description	**Speed [rpm]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
ObjFlags	0x00000001

Object 2105h – Position Command

Description	This object indicates the position command.
Object Type	Array
Sub-indices	4
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x3
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Position Absolute [counts]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
ObjFlags	0x00000001
Sub-index	2
Description	**Position Relative [counts]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
ObjFlags	0x00000001

Sub-index	3
Description	**Speed Position [counts/second]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
ObjFlags	0x00000001

Object 2106h – Calibration

Description	This object starts the calibration process.
Object Type	Record
Sub-indices	18
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x15
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	2
Description	**Current Offset Calibration**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0x01
ObjFlags	0x00000001

Sub-index	3
Description	**Current Offset Calibration Status**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0x38
Sub-index	4
Description	**PI Current Loop Calibration**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
ObjFlags	0x00000001
Sub-index	5
Description	**PI Current Loop Calibration Status**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00
Upper Limit	0x05

Sub-index	6
Description	**Hall Mapping Calibration**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
ObjFlags	0x00000001
Sub-index	7
Description	**Hall Mapping Calibration Status**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	x00
Lower Limit	0x00
Upper Limit	0x03
Sub-index	8
Description	**Feedback Direction Calibration**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x0
ObjFlags	0x00000001

Sub-index	9
Description	**Feedback Direction Calibration Status**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x00
Lower Limit	0xFFFFFFFD
Upper Limit	0x03
Sub-index	10
Description	**PI Speed Loop Calibration**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
ObjFlags	0x00000001
Sub-index	11
Description	**PI Speed Loop Calibration Status**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0x05

Sub-index	12
Description	**PI Position Loop Calibration**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
ObjFlags	0x00000001
Sub-index	13
Description	**PI Position Loop Calibration Status**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0x05
Sub-index	14
Description	**Absolute Encoder Electrical Angle**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
ObjFlags	0x00000001

Sub-index	15
Description	**Absolute Encoder Electrical Angle Status**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0x03
Sub-index	16
Description	**Bode Operation**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
ObjFlags	0x00000001
Sub-index	20
Description	**Analog Offset Calibration**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
ObjFlags	0x00000001

Sub-index	21
Description	**Analog Offset Calibration Status**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x1
Lower Limit	0x01
Upper Limit	0x03
ObjFlags	0x00000001

Object 2107h – Signal Generator Command

Description	Signal Generator Command
Object Type	Record
Sub-indices	8
Sub-index	0
Description	**Number of entries**
Object Type	Variable
Data Type	Unsigned 8
Access	Read only
PDO Mapping	No
Default Value	0x07
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002

Sub-index	2
Description	**Type**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0004
Lower Limit	0x0001
Upper Limit	0x0004
ObjFlags	0x00000001
Sub-index	3
Description	**Period**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	4
Description	**Count**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002

Sub-index	5
Description	**Amplitude**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	6
Description	**Offset**
Object Type	Variable
Data Type	Real32
Access	Real/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000001
Sub-index	7
Description	**Frequency [Hz]**
Object Type	Variable
Data Type	Real32
Access	Real/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000001

Object 210Ch – Brake

Description	Brake
Object Type	Array
Sub-indices	2
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x2
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	2
Description	**Power Out**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
ObjFlags	0x00000001

Object 210Fh – Bode Plot Configuration

Description	Bode plot configuration.
Object Type	Record
Sub-indices	8
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x7
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	2
Description	**Control Loop**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0x06
Sub-index	3
Description	**Frequency Start [Hz]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	4
Description	**Frequency End [Hz]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Sub-index	5
Description	**Amplitude**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	6
Description	**Number of Points per Decade (Resolution)**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0xFFF
Sub-index	7
Description	**Bode Feedback, Current, Speed or Position**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0x0002

Object 2110h – Digital Inputs Mode

Description	This object defines the input mode for inputs 1–4: 0 = Idle 1 = Positive Hardware Limit Switch 2 = Negative Hardware Limit Switch 3 = Home Switch 4 = Clear Fault Switch
Object Type	Array
Sub-indices	5

Sub-index	0
Description	**Number of entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x04
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Functionality of Input Number 1**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0x04
Sub-index	2
Description	**Functionality of Input Number 2**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0x04
Sub-index	3
Description	**Functionality of Input Number 3**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0x04

Sub-index	4
Description	**Functionality of Input Number 4**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0x04

Object 2111h – Digital Inputs Polarity

Description	This object sets the polarity of each digital input. 0 = Input is not inverted 1 = Input is inverted
Object Type	Array
Sub-indices	5
Sub-index	0
Description	**Number of entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x04
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Polarity of Input Number 1**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1

Sub-index	2
Description	**Polarity of Input Number 2**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
Sub-index	3
Description	**Polarity of Input Number 3**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
Sub-index	4
Description	**Polarity of Input Number 4**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1

Object 2118h – Commutation Feedback

Description	**Commutation feedback angle**
Object Type	Array
Sub-indices	2

Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x01
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Commutation Angle [degrees]**
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Object 2119h – Speed Feedback

Description	Speed feedback
Object Type	Array
Sub-indices	3
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x0B
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	1
Description	**Speed Feedback [encoder counts per second]**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	11
Description	**Actual Velocity [rpm]**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF

Object 211Ah – Position Feedback

Description	Position Feedback
Object Type	Array
Sub-indices	10
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x09
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	1
Description	**Actual Position of the Drive [encoder counts]**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	2
Description	**Actual Position Generated from the Hall Signals [counts]**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	3
Description	**Actual Position Generated from the Motor Feedback [counts]**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	4
Description	**External Actual Position Generated from the External Feedback [counts]**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF

Sub-index	5
Description	**Motor Feedback Index (zero pulse) Counter**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	6
Description	**External Feedback Index (zero pulse) Counter**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	7
Description	**Hall Raw Counter**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	8
Description	**Motor Feedback Raw Counter**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF

Sub-index	9
Description	**External Feedback Raw Counter**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF

Object 211Dh – Digital I/O Status

Description	Indicates the status of digital inputs and outputs.
Object Type	Array
Sub-indices	6
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x05
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Status of all digital inputs and outputs:** Bit 0 = Status of digital input 1 Bit 1 = Status of digital input 2 Bit 2 = Status of digital input 3 Bit 3 = Status of digital input 4 Bit 4 = Status of digital output 1 Bit 5 = Status of digital output 2
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	2
Description	**Status of Digital Input 1**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
Sub-index	3
Description	**Status of Digital Input 2**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
Sub-index	4
Description	**Status of Digital Input 3**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
Sub-index	5
Description	**Status of Digital Input 4**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1

Sub-index	6
Description	**Status of Digital Output 1**
Object Type	Variable
Data Type	
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
Sub-index	7
Description	**Status of Digital Output 2**
Object Type	Variable
Data Type	
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	

Object 211Eh – Current Feedback

Description	**Current Feedback**
Object Type	Array
Sub-indices	7
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x0D
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	1
Description	**IQ Actual Current [A]** This is the torque building current of the field oriented control.
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	2
Description	**ID Actual Current [A]**
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	3
Description	**Output of the Current Loop, PWM Usage [%]**
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	11
Description	**Actual Current in Winding A [A]**
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Sub-index	12
Description	**Actual Current in Winding B [A]**
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	13
Description	**Actual Current in Winding C [A]**
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Object 2120h – Temperature

Description	Temperature
Object Type	Array
Sub-indices	3
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x04
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	2
Description	**Drive Temperature [C]**
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	4
Description	**Motor Temperature [C]**
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Object 2121h – Drive Status

Description	**Drive Status**
Object Type	Record
Sub-indices	22
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x02
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000000
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF
ObjFlags	0x00000002
Sub-index	2
Description	**Drive Failures** SDO status is reflected in this sub-index. *Refer to the table below.*
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x00000000
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF

Drive Errors

Bit	Error Code*	Error Type		Error Name and Details
0	**0x7380**	**Motor**		**Hall Error**
			Description	This error occurs when an incorrect Hall sensors state is read.
			Cause	Either too many states, or read “000” or “111” (illegal states).
			Solution	Make sure the Hall sensors are properly connected, powered on, and the motor is not moving too fast for the sensors.

Bit	Error Code*	Error Type		Error Name and Details
1	**0x6310**	**Init**		**Parameters Checksum**
			Description	This error occurs if the data within the parameters flash sector is considered corrupt. This error causes all drive parameters to reset to their default values.
			Cause	The error can occur if a Save Parameters to Flash operation is taking place during a power loss of the drive. Might also be caused by saving drive parameters to the flash using 11.01.xx.yy/11.02.xx.yy firmware version but upgrading the firmware to a higher 11.07.x.yy version; these versions are not compatible with each other in terms of parameter flash data.
			Solution	Set the drive parameters to their intended values and save the data on the drive, via either a fieldbus master or the GUI. The fault can later be cleared via a Clear Faults command or a CPU reset (by means of a power cycle or a user command).
2	**0x7381**	**Motor**		**Encoder/Hall Sync**
			Description	This error occurs when the shifted angle between the Hall sensors and the incremental encoder is greater than 30°.
			Cause	▪ The motor is moving too fast, and the Hall sensors or the incremental encoder cannot work properly at that speed. ▪ Malfunctioning Hall sensors or incremental encoder.
			Solution	1. Make sure the motor is not moving too fast. 2. Make sure both the Hall sensors and the incremental encoder are working properly and powered on.
3	**0x4310**	**Motor**		**Over Temperature**
			Description	The error occurs when the ZED senses that the PCB temperature is greater than 115°C for more than 50 ms.
			Cause	Too much current is passing through the MOSFETs, and the unit cannot cool itself.
			Solution	1. Make sure the motor can move smoothly. 2. Make sure the unit is mounted properly to a heatsink. 3. If necessary, add a fan or other cooling equipment. 4. Lower the current or decrease the time that the current flows through the MOSFETs.

Bit	Error Code*	Error Type		Error Name and Details
4	**0x3210**	**Motor**		**Over Voltage**
			Description	The error occurs when the ZED senses that VMotor is greater than 65 VDC for more than 5 ms.
			Cause	VMotor rises above 65 VDC. This can be caused by high regenerative power, setting in the power supply, faulty power supply, and many more cases.
			Solution	In case the whole equipment's working properly – Contact STXI Motion.
5	**0x3220**	**Motor**	Motor	**Under Voltage**
			Description	The error occurs when the ZED senses that VMotor is less than 14 VDC for more than 60 ms.
			Cause	Attempting to draw too much current from the power supply.
			Solution	Make sure the power supply can provide the amount of current in the set VMotor.
6	**0x8180**	**Comm**		**Com Sync Loss**
			Description	This error occurs when there is no communication for more than Sync Windows Time, in seconds (command 61[4]). When Sync Windows is 0, this protection is disabled.
			Cause	Possibly caused by a malfunctioning communication adaptor or a stuck PLC/PC.
			Solution	▪ Make sure that the communication adapter is working properly, and the PLC or PC is not stuck. ▪ Increase the Sync Windows through command 61[4] or set it to 0 to disable that feature.
7	**0x8611**	**Motor**		**Position Tracking**
			Description	This error occurs when the position loop error is greater than Max Tracking Error (command 54[6]).
			Cause	▪ The motor is not moving. ▪ The intended position is too far away. ▪ Max Tracking Error is too low, or encoder resolution is too big.
			Solution	Make sure that the motor is moving, and Max Tracking Error is compatible with the encoder resolution.

Bit	Error Code*	Error Type		Error Name and Details
8	**0x5480**	**Init**		**Driver Power Init**
			Description	This error occurs when the gate diver could not be initialized and powered properly.
			Cause	When there are faults (command 33[1]) pending, the gate driver initialization will fail.
			Solution	Make sure that there are no faults before attempting to initialize the gate driver.
9	**0x5481**	**Drive**		**Driver Power C/T – Not applicable for ZED**
10	**0x5410**	**Drive**		**Driver Power Fault**
			Description	This error occurs when there is an internal fault reported from the gate driver.
			Cause	The gate driver detects an error.
			Solution	Contact STXI Motion.
11	**0x7121**	**Motor**		**Motor Stall**
			Description	This error occurs if both Motor Current is greater than Stall Current (command 53[6]) and the Motor Speed is less than Stall Speed (command 53[7]) for at least the Stall Time (command 53[7]).
			Cause	The Motor state meets the Stall conditions described above.
			Solution	Make sure the motor is moving and adjust the Stall settings for the intended protection. Set Stall Current through command 53[6] to 0 to disable that feature.
12	**0x5482**	**Motor**		**Gate Disabled – 0x5482 – Not applicable for ZED**
13	**0x5280**	**Init**	Init	**Drive OSC**
			Description	This error occurs when the MCU PLL is not locked.
			Cause	Power-up sequence fault or malfunctioning ZED.
			Solution	Power cycle the unit or contact STXI Motion.

Bit	Error Code*	Error Type		Error Name and Details
14	**0x7280**	**Init**		**Drive ADC Offset**
			Description	This error occurs when the phase's no load current is greater than the threshold.
			Cause	▪ When the unit is new, the phase's current offset value might be incorrect due to the use of the default parameters. ▪ Previous incorrect calibration of the phase's current offset.
			Solution	Do the following: 1. Set Load Manufacturer Defaults (command 63[1]). 2. Set Save Parameters to Drive (command 63[0]). 3. Reset the unit (Power cycle or through command 63[9]). 4. Calibrate the phase's current offset (command 6[1]).
15	**0x5483**	**Motor**		**Drive Short Test — Not applicable for ZED**
16	**0xFF01**	**Motor**		**STO**
			Description	This error occurs when the STO is engaged.
			Cause	STO is engaged.
			Solution	Disengage the STO.
17	**0x7382**	**Drive**		**SSI Not Ready — Not applicable for ZED**
18	**0x5484**	**Drive**		**DRV83xx Setup**
			Description	This error occurs when failing to write configuration to the gate driver.
			Cause	The gate driver is not answering or detecting a fault.
			Solution	Try to reenable the gate driver (command 1[2]).

Bit	Error Code*	Error Type		Error Name and Details
19	**0x8400**	**Motor**		**Speed Error**
			Description	This error occurs when one of the following happens: ▪ The speed loop error is greater than Max Speed Error (command 57[8]) for at least Speed Error Time (command 57[9]). ▪ When activating Stop command, the motor did not stop after Brake Time Threshold (command 56[2]) + Brake Timeout (command 56[5]) when the speed is less than Brake Speed (command 56[1]).
			Cause	▪ The motor is not moving. ▪ The intended speed is too fast. ▪ Max Speed Error is too low. ▪ The brake configuration needs adjustment.
			Solution	▪ Make sure the motor is moving, and Max Speed Error is compatible with the encoder resolution. ▪ Make sure the brake configuration is configured correctly.
20	**0x6320**	**Init**		**Param Table Rev**
			Description	This error occurs when the parameters table that is currently in use (saved to the flash) is older than the one that is used in the current firmware.
			Cause	Possibly due to a firmware upgrade (if parameter table has been changed).
			Solution	Do the following: 1. Set Save Parameters to Drive (command 63[0]). 2. Reset the unit (Power cycle or through command 63[9]).
21	**0x2214**	**Drive**		**Over Current**
			Description	The error occurs when the Iq current is greater than the peak current (command 52[2]) + hysteresis for more than 10 ms.
			Cause	This can happen when the motor is not moving, or the intended command is too high.
			Solution	Make sure the motor is moving.
22	**0x6180**	**Comm**		**CPU Overload**
			Description	This error occurs when the software routine is running for too long (like watchdog).
			Cause	Software issue.
			Solution	Contact STXI Motion.

Bit	Error Code*	Error Type		Error Name and Details
23	**0x6380**	**Init**		**Parameters Consistency**
			Description	This error occurs due to an inconsistency between related parameters. For example, Continuous Current cannot be greater than the Peak Current.
			Cause	This error occurs when trying to turn on the motor when there is a consistency issue between parameters (reported by a warning).
			Solution	Solve the consistency issue before turning on the motor.
24	**0x4280**	**Motor**		**Motor Over Temperature**
			Description	This error occurs when the ZED senses that the motor temperature is greater than Motor Max Temperature (command 51[9]) for more than 50 ms.
			Cause	Too much current is passing through the motor, and the motor cannot cool itself.
			Solution	1. Make sure that the motor can move smoothly. 2. Make sure that the motor is mounted properly to a heatsink. 3. If necessary, add a fan or other cooling equipment. 4. Lower the current or the time that the current flows through the motor.
25	**0x7180**	**Motor**		**Motor Brake Fault 1**
			Description	This error occurs when the motor brake diagnostic circuit detects a fault.
			Cause	▪ Too much current is passing through the motor brake circuit (ZED side). ▪ The motor brake is shorted to Motor Brake Ground" (interface P1, pin #4).
			Solution	▪ Operate the motor brake using an external MOSFET transistor. ▪ Make sure the motor brake is not shorted to Motor Brake Ground (interface P1, pin #4). ▪ Disable Motor Brake Diagnosis through command 12[0] by setting it to 0.

Bit	Error Code*	Error Type		Error Name and Details
26	0x7181			**Motor Brake Fault 2**
			Description	The error appears when the motor brake diagnostic circuit detects a fault and Motor Brake Fault 1 is not present.
			Cause	▪ Motor brake is not connected. ▪ The motor brake is shorted to Motor Brake VDC (interface P1, pin #3).
			Solution	▪ Make sure the motor brake is properly connected to P1. ▪ Make sure the motor brake is not shorted to Motor Brake VDC (interface P1, pin #3). ▪ Disable Motor Brake Diagnosis through command 12[0] by setting it to 0.

* Note: See Object 603Fh – Error Code.

Sub-index	3
Description	**Drive Warnings**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Sub-index	6
Description	**External Analog Input Voltage [A2D converter raw counts (0...4096)]**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Sub-index	20
Description	**Current Command Limit** 0 = Current command is not limited to continuous current due to the I2t protection. 1 = Current command is limited to continuous current due to the I2t protection.
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No

Sub-index	21
Description	**I2t Value [A]**
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Sub-index	22
Description	**I2t Value [%]**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No

Object 2132h – Motion Parameters

Description	**Motion Parameters**
Object Type	Array
Sub-indices	9
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x08
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	1
Description	**Start-up Enable** 0 = Idle 1 = Perform offset calibration upon startup 2 = Enable drive and run ADC test upon startup
Object Type	Variable
Data Type	Unsigned 32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
Sub-index	2
Description	**Operation Mode** 0 = Idle 1 = Current Control mode 2 = Speed Control mode 3 = Position Control mode 4 = Speed Position Control mode (speed control with closed position loop)
Object Type	Variable
Data Type	Unsigned 32
Access	Read/Write
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0x0006

Sub-index	3
Description	**Electrical Commutation Type** 0 = Brushed 1 = Brushless with Hall sensor 2 = Brushless with Hall sensor and incremental encoder 3 = Brushless with absolute encoder 4 = Forced commutation
Object Type	Variable
Data Type	Unsigned 32
Access	Read/Write
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0x0007
Sub-index	4
Description	**Motor Encoder Type** 0 = None 1 = Incremental encoder 1 2 = SinCos 3 = SinCos absolute 4 = Incremental encoder 2 5 = SSI 6 = Resolver
Object Type	Variable
Data Type	Unsigned 32
Access	Read/Write
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0x0008

Sub-index	5
Description	**External Encoder** 0 = None 1 = Incremental encoder 1 2 = SinCos 3 = SinCos absolute 4 = Incremental encoder 2 5 = SSI 6 = Resolver
Object Type	Variable
Data Type	Unsigned 32
Access	Read/Write
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0x0008
Sub-index	6
Description	**Command Source** 0 = Digital command source (such as fieldbus or GUI) 1 = Analog command source
Object Type	Variable
Data Type	Unsigned 32
Access	Read/Write
PDO Mapping	No
Default Value	0x0001
Lower Limit	0x0001
Upper Limit	0x0007

Sub-index	7
Description	**Speed Loop Feedback** 0 = None 1 = Hall 2 = Motor feedback 3 = External feedback
Object Type	Variable
Data Type	Unsigned 32
Access	Read/Write
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0x0004
Sub-index	8
Description	**Position Loop Feedback** 0 = None 1 = Hall 2 = Motor feedback 3 = External feedback
Object Type	Variable
Data Type	Unsigned 32
Access	Read/Write
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0x0004

Object 2133h – Motor Parameters

Description	Motor Parameters
Object Type	Array
Sub-indices	3
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x03
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	2
Description	**Pole Pair**
Object Type	Variable
Data Type	Unsigned 32
Access	Read/Write
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0xFFFF
Sub-index	3
Description	**Motion Direction** 0 = Positive direction 1 = Negative direction
Object Type	Variable
Data Type	Unsigned 32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1

Sub-index	4
Description	**Resistance [Ohm]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Sub-index	5
Description	**Inductance [Henry]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Sub-index	6
Description	**Voltage constant Kv**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Sub-index	7
Description	**Friction**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Sub-index	8
Description	**Inertia**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No

Object 2134h – Current Protection

Description	Current protection.
Object Type	Array
Sub-indices	5
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x05
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	2
Description	**Continuous Current Limit [A]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	3
Description	**Peak Current Limit [A]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Sub-index	4
Description	**Peak Time [s]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	5
Description	**PWM limit [%]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Object 2135h – Motor Limits

Description	Limiting parameters for motion commands.
Object Type	Array
Sub-indices	10
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x09
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
ObjFlags	0x00000002
Sub-index	2
Description	**Maximum speed [encoder counts per second].** Value must be positive.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	3
Description	**Minimum speed [encoder counts per second].** Value must be negative.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF

Sub-index	4
Description	**Maximum position [encoder counts]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	5
Description	**Minimum position [encoder counts]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	6
Description	**Enable Position Limit (enable sub-indices 4 and 5)** 0 = Position limits are not active 1 = Position limits are active
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
Sub-index	7
Description	**Motor Stuck Current [A]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Sub-index	8
Description	**Motor Stuck Speed [rpm]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	9
Description	**Motor Stuck Duration [s]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Object 2136h – Position Profile

Description	Settings for motion in Position Control operation mode, using the position profiler (trajectory generator). See object 2132h sub-index 2.
Object Type	Array
Sub-indices	5
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x07
Lower Limit	0x0
Upper Limit	0xFF

Sub-index	2
Description	**Profiler Mode** 0 = None 1 = PID 2 = Trapezoidal motion
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x00000000
Lower Limit	0x00000000
Upper Limit	0x00000007
Sub-index	3
Description	**Profiler Target Velocity [encoder counts per second]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	4
Description	**Profiler acceleration/deceleration [encoder counts per second^2]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF

Sub-index	7
Description	**Max Tracking Error [encoder counts]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF

Object 2138h – Stop Motion Parameters

Description	Parameters used for a stop (ramp down) sequence, such as during a disable process.
Object Type	Record
Sub-indices	9
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x08
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Brake Control** 0 = Motor without brake 1 = Motor with brake
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0x01

Sub-index	2
Description	**Speed Threshold [encoder counts per second]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	3
Description	**Time Threshold [s]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	4
Description	**Brake Engage Time [s]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	5
Description	**Brake Disengage Time [s]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Sub-index	6
Description	**Stop Timeout [s]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	7
Description	**Gate Drive Status in Stop/Disable Condition** 0 = Feature not active 1 = Enable gate drive when motor comes to a stop and disables
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
Sub-index	8
Description	**Gate Under Motor Disable** 0 = Feature not active 1 = Disable gate drive during deceleration (coasting)
Object Type	Variable
Data Type	Boolean
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1

Object 2139h – Speed Profile

Description	Settings used by the speed profiler in Speed Control operation mode. See object 2132h sub-index 2.
Object Type	Record
Sub-indices	11
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x0A
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Profiler Mode** 0 = None 1 = PID 2 = Trapezoidal motion
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0x0007
Sub-index	2
Description	**Max Speed [counts per second]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x8000000
Upper Limit	0x7FFFFFFF

Sub-index	3
Description	**Min Speed [C/S]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x8000000
Upper Limit	0x7FFFFFFF
Sub-index	4
Description	**Max Acceleration [counts per second2]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x8000000
Upper Limit	0x7FFFFFFF
Sub-index	5
Description	**Max Deceleration [counts per second2]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	No
Lower Limit	0x0
Upper Limit	0x8000000
Sub-index	6
Description	**Stop Deceleration [counts per second2]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x8000000
Upper Limit	0x7FFFFFFF

Sub-index	7
Description	**Jerk Max**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x8000000
Upper Limit	0x7FFFFFFF
Sub-index	8
Description	**Jerk Div**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x8000000
Upper Limit	0x7FFFFFFF
Sub-index	9
Description	**Max Speed Error [counts per second]**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x8000000
Upper Limit	0x7FFFFFFF
Sub-index	10
Description	**Speed Error Time [s]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	–
Upper Limit	–

Object 213Dh – Device Communication

Description	Device communication configuration.
Object Type	Array
Sub-indices	6
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x05
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x00000002
Sub-index	2
Description	**Uart Baud Rate**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0006
Lower Limit	0x0000
Upper Limit	0x0008
ObjFlags	0x00000001
Sub-index	3
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x00000002

Sub-index	4
Description	**CAN Baud Rate [kbps]** 0 = 1000 (= 1 [Mbps]) 1 = 500 2 = 250 3 = 125 4 = 100 **5 = 50**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0x0008
ObjFlags	0x00000001
Sub-index	5
Description	**Missing Sync Telegram Window [s]** After missing any sync telegram from the master for this period of time, the drive generates a Communication Sync Telegram Loss fault. A value of 0 disables this function.
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Object 213Eh – Device Parameters

Description	Information about the drive.
Object Type	Array
Sub-indices	6
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x0B
Lower Limit	0x00
Upper Limit	0x00
Sub-index	2
Description	**Serial Number**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF
ObjFlags	0x00000001
Sub-index	3
Description	**Hardware Revision**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF
ObjFlags	0x00000001

Sub-index	4
Description	**Firmware Version**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF
Sub-index	5
Description	**Bootloader Firmware Version**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Sub-index	9
Description	**CAN ID**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x7F
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF
ObjFlags	0x00000001
Sub-index	11
Description	**Firmware Sector Flash Checksum Value**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF

Object 213Fh – Save/Load Parameters

Description	Save/Load Parameters
Object Type	Array
Sub-indices	4
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x0A
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Save Parameters To Drive** Parameters are saved when this sub-index is set to 1.
Object Type	Variable
Data Type	Unsigned32
Access	Write only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x01
ObjFlags	0x00000001
Sub-index	2
Description	**Load Manufacturer Defaults** Parameters are loaded when this sub-index is set to 1.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x01
ObjFlags	0x00000001

Sub-index	A
Description	**Software Reset of the Drive CPU upon Writing 1** Software resets the drive CPU when this sub-index is set to 1.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x01
ObjFlags	0x00000001

Object 2146h – Hall Parameters

Description	Hall Sensor Feedback Parameters
Object Type	Record
Sub-indices	17
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x10
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read Only
PDO Mapping	No
Default Value	0x80000000
Lower Limit	0x7FFFFFFF
Upper Limit	0x00000002

Sub-index	2
Description	**Motor Hall Enable** 0 = Disable 1 = Enable
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF
Sub-index	3
Description	**Roll High** Upper modulo threshold of the Hall position.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x2000
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF
Sub-index	4
Description	**Roll Low** Lower modulo threshold of the Hall position.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF

Sub-index	5
Description	**Direction** 0 = Positive direction 1 = Negative direction
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
Sub-index	6
Description	**Counts Per Revolution**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF
Sub-index	7
Description	**Speed LPF Cut-off** Low pass filter cut-off frequency for generating the actual velocity out of the Hall signals [Hz].
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	10.0
Lower Limit	–
Upper Limit	–

Sub-index	8
Description	**Hall Angle 1**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000001
Sub-index	9
Description	**Hall Angle 2**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000001
Sub-index	10
Description	**Hall Angle 3**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000001

Sub-index	11
Description	**Hall Angle 4**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000001
Sub-index	12
Description	**Hall Angle 5**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000001
Sub-index	13
Description	**Hall Angle 6**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000001

Sub-index	14
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
ObjFlags	0x00000002
Sub-index	15
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
ObjFlags	0x00000002
Sub-index	16
Description	**Sample Period**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF

Object 2147h – Encoder 1 Parameters

Description	Incremental Encoder 1 Parameters
Object Type	Record
Sub-indices	16

Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x0F
Lower Limit	0x00
Upper Limit	0x0F
Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	2
Description	**Incremental Encoder 1 Enable** 0 = Disable 1 = Enable
Object Type	Variable
Data Type	Unisigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–

Sub-index	3
Description	**Roll High** Upper modulo threshold of the encoder 1 position.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x000C8000
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	4
Description	**Roll Low** Lower modulo threshold of the encoder 1 position.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	5
Description	**Direction** 0 = Positive direction 1 = Negative direction
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1

Sub-index	6
Description	**Counts Per Revolution**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x00002000
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Sub-index	7
Description	**Speed LPF** Low pass filter cut-off frequency for generating the actual velocity out of the incremental encoder 1 signals [Hz].
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	100.0
Lower Limit	–
Upper Limit	–
Sub-index	8
Description	**Index Mode**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x00
Lower Limit	0x00
Upper Limit	0x02
Sub-index	9
Description	**Index Reset**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x1
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF

Sub-index	10
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	11
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	12
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002

Sub-index	13
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
ObjFlags	0x00000002
Sub-index	14
Description	**Set Position Value**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
ObjFlags	0x00000001
Sub-index	15
Description	**Resolution SinCos**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x08
Lower Limit	0x00
Upper Limit	0x0A

Object 2149h – SSI Parameters

Description	SSI Feedback Parameters
Object Type	Array
Sub-indices	17
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x10
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	2
Description	**SSI Encoder 1 Enable** 0 = Disable 1 = Enable
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–

Sub-index	3
Description	**Roll High** Upper modulo threshold of the SSI encoder position.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
Sub-index	4
Description	**Roll Low** Lower modulo threshold of the SSI encoder position.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
Sub-index	5
Description	**Direction** 0 = Positive direction 1 = Negative direction
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–

Sub-index	6
Description	**Counts Per Revolution**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	7
Description	**LPF Cut-off** Low pass filter cut-off frequency for generating the actual velocity out of the incremental encoder 1 signals [Hz].
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
Sub-index	8
Description	**Baud Rate** Baud rate can only be selected as max. 90 MHz/4, and in general only in increments of 90 MHz/n, where n = 4…128.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–

Sub-index	9
Description	**Encoder Bits per Revolution**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
Sub-index	10
Description	**Clock Phase** SPI clocking scheme setting. For more information, contact Support.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
Sub-index	11
Description	**Clock Polarity** SPI clocking scheme setting. For more information, contact Support.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–

Sub-index	12
Description	**Tail Bits**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
Sub-index	13
Description	**Packet Delay**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
Sub-index	14
Description	**Calibrated Angle**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
Sub-index	15
Description	Head Bits
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–

Sub-index	16
Description	Sample Period
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–

Object 214Eh – Interpolation Gear

Description	Interpolation Gear
Object Type	Array
Sub-indices	4
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x04
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002

Sub-index	2
Description	**Enable External Interpolation**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
Sub-index	3
Description	**Interpolation Gear**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	4
Description	**Max Encoder - Hall Sync Error [C]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Object 2151h – Current PID

Description	Current Loop Parameters
Object Type	Record
Sub-indices	12
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x0B
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	2
Description	**Kp – Proportional Gain of the Current Loop**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Sub-index	3
Description	**Ki – Integral Gain of the Current Loop**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	4
Description	**TBD**
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	5
Description	**TBD**
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002

Sub-index	6
Description	**TBD**
Object Type	Variable
Data Type	Real32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	7
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	8
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002

Sub-index	9
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	10
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	11
Description	**Closed Loop** This entry has no meaning for the current loop.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF

Object 2152h – Speed PID

Description	Speed Loop Parameters
Object Type	Record
Sub-indices	12
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x0B
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	2
Description	**Kp – Proportional Gain of the Speed Loop**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Sub-index	3
Description	**Ki – Integral Gain of The Speed Loop**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	4
Description	**Kc (Not in use)**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
Sub-index	5
Description	**Kd (Not in use)**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
Sub-index	6
Description	**Kp Range (Not in use)**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	

Sub-index	7
Description	**Range**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
Sub-index	8
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	9
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002

Sub-index	10
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	11
Description	**Closed Loop** 0 = Disable loop 1 = Enable loop
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	

Object 2153h – Position PID

Description	Position Loop Parameters
Object Type	Array
Sub-indices	12
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x0B
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	–
Upper Limit	–
ObjFlags	0x00000002
Sub-index	2
Description	**Kp – Proportional Gain of the Position Loop**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	3
Description	**Ki – Integral Gain of the Position Loop**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	4
Description	**Kc (Not in use)**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	

Sub-index	5
Description	**Kd (Not in use)**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
Sub-index	6
Description	**Kp Range (Not in use)**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
Sub-index	7
Description	**Range**
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
Sub-index	8
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
ObjFlags	0x00000002

Sub-index	9
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
ObjFlags	0x00000002
Sub-index	10
Description	**TBD**
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
ObjFlags	0x00000002
Sub-index	11
Description	**Closed Loop** 0 = Disable loop 1 = Enable loop
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF

Object 2154h – Hall Map

Description	Hall Map
Object Type	Array
Sub-indices	7

Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x07
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**TBD**
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
ObjFlags	0x00000002
Sub-index	2
Description	**Hall Map 0**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0xFFFF
Sub-index	3
Description	**Hall Map 1**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0001
Lower Limit	0x0000
Upper Limit	0xFFFF

Sub-index	4
Description	**Hall Map 2**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0010
Lower Limit	0x0000
Upper Limit	0xFFFF
Sub-index	5
Description	**Hall Map 3**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0011
Lower Limit	0x0000
Upper Limit	0xFFFF
Sub-index	6
Description	**Hall Map 4**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0100
Lower Limit	0x0000
Upper Limit	0xFFFF
Sub-index	7
Description	**Hall Map 5**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0101
Lower Limit	0x0000
Upper Limit	0xFFFF

Object 2165h – Current IIR Filter

Description	Recursive IIR BiQuad filter coefficients. The filter is located ahead of the IQ command value and can be set depending on the filter coefficients of different kinds of filters.
Object Type	Array
Sub-indices	9
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x08
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Enable** 0 = Disable BiQuad filter 1 = Enable BiQuad filter
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0x1
ObjFlags	0x00000001
Sub-index	2
Description	**Number of Sections**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0x0003

Sub-index	3
Description	**Section 0 a[0]**
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	4
Description	**Section 0 a[1]** Coefficient 1 in the backward path of the filter, multiplied by the last output yn-1 of the recursive filter.
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	5
Description	**Section 0 a[2]** Coefficient 2 in the backward path of the filter, multiplied by the last output yn-2 of the recursive filter.
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Sub-index	6
Description	**Section 0 b[0]** Coefficient 0 in the forward path of the filter, multiplied by the current input xn of the recursive filter.
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	7
Description	**Section 0 b[1]** Coefficient 1 in the forward path of the filter, multiplied by the last input xn-1 of the recursive filter.
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–
Sub-index	8
Description	**Section 0 b[2]** Coefficient 2 in the forward path of the filter, multiplied by the second last input xn-2 of the recursive filter.
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	0.0
Lower Limit	–
Upper Limit	–

Object 216Eh – Analog Command

Description	Settings for modes of operation using an external analog input signal.
Object Type	Record
Sub-indices	8
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x07
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Ampere/Volt** Converts the analog input into a current command value for analog Torque operation mode.
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
Sub-index	2
Description	**RPM/Volt** Converts the analog input into a velocity command value for analog Velocity operation mode
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	

Sub-index	3
Description	**Counts/Volt** Converts the analog input into a position command value in encoder counts for analog Position operation mode.
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
Sub-index	4
Description	**Offset** Defines a constant offset added to the measured voltage [V].
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
Sub-index	5
Description	**Dead Zone** Defines the zone in which the measured voltage is considered zero (dead-band) [V].
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	

Sub-index	6
Description	**Direction** Changes the algebraic sign of the command voltage after the A2D conversion for changing motion direction. 0 = Maintains direction of requested motion 1 = Invert direction of requested motion
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	
Sub-index	7
Description	**LPF Cut-off** The analog input value is forwarded to a 1st order low-pass filter. This value is the cut-off frequency of that filter [Hz].
Object Type	Variable
Data Type	Real32
Access	Read/Write
PDO Mapping	No
Default Value	
Lower Limit	
Upper Limit	

7 Device Objects

Object 603Fh – Error Code

Description	This object returns the error code of the last error that occurred in the drive. See Drive Failure Register in Object 2121h – Drive Status. CAN error codes according to CiA301 and CiA402 standard, see: CiA 301 Chapter 7.2.7.1 Emergency object usage CiA 402 Part 2, Chapter 7.1: Error codes Error codes fall into the following scheme: 0xABCD A = Main group of the error code (CiA 301 standard) B = Subgroup of the error code (CiA 301 standard) C, D = Specific error code (CiA 301 and CiA 402 standards) Note: According to CiA 402, error codes between xx80h...xxFFh are manufacturer specific.
Object Type	Variable
Data Type	Unsigned16
Access	Read only
PDO Mapping	Yes
Default Value	0x0
Lower Limit	0x0
Upper Limit	0xFFFF

Object 6040h – Controlword

Description	This object sets the operating states and modes of the state machine. It is used to control the CiA-402 FSA, CiA-402 modes, and manufacturer-specific entities. This object is organized bit-wise. The bits have the following meaning: bit 0: Switch on bit 1: Enable voltage bit 2: Quick stop bit 3: Enable operation bits 4-6: Mode specific bit 7: Fault reset bit 8: Halt bit 9: Mode specific bit 10: Reserved bits 11-15: Manufacturer specific
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	Yes
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0xFFFF

Object 6041h – Statusword

Description	This object indicates the current state of the FSA, the operation mode, and manufacturer specific entities. This object is organized bit-wise. The bits have the following meaning: bit 0: Ready to switch on bit 1: Switched on bit 2: Operation enabled bit 3: Fault bit 4: Voltage enabled bit 5: Quick stop 6: Switch on disabled 7: Warning 8: Manufacturer specific 9: Remote bit 10: Target reached bit 11: Internal limit active bits 12-13: Mode specific bits14-15: Manufacturer specific
Object Type	Variable
Data Type	Unsigned16
Access	Read only
PDO Mapping	Yes
Default Value	–
Lower Limit	0x0000
Upper Limit	0xFFFF

Object 605Ah – Quick Stop Option Code

Description	Quick Stop Option Code
Object Type	Variable
Data Type	Integer16
Access	Read/Write
PDO Mapping	No
Default Value	0x0002
Lower Limit	0x8000
Upper Limit	0x0008

Object 605Dh – Halt Option Code

Description	Halt Option Code
Object Type	Variable
Data Type	Integer16
Access	Read/Write
PDO Mapping	No
Default Value	0x0001
Lower Limit	0x8000
Upper Limit	0x0004

Object 605Eh – Fault Response Option Code

Description	Fault Response Option Code
Object Type	Variable
Data Type	Integer16
Access	Read/Write
PDO Mapping	No
Default Value	0xFFFF
Lower Limit	0x8000
Upper Limit	0x0004

Object 6060h – Modes of Operation

Description	This object indicates the requested operation mode. The current operating mode can only be read in the object Modes of Operation Display (6061h). As a change of the operating mode might require some time to process, wait until the new selected mode appears in the object Modes of Operation Display. **Possible values:** 1 Profile Position mode (position controller with positioning operation) 3 Profile Velocity mode (speed controller with setpoint ramp) 4 Profile Torque mode (torque controller with setpoint ramp) 6 Homing mode (homing operation) 9 Cyclic Synchronous Velocity mode Note: Only Velocity Profile (3) and Cyclic Synchronous Velocity (9) modes have been tested.
Object Type	Variable
Data Type	Integer8
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00
Lower Limit	0x80
Upper Limit	0x0A

Object 6061h – Modes of Operation Display

Description	This object provides the actual operation mode. **Possible values:** 1 Profile Position mode (position controller with positioning operation) 3 Profile Velocity mode (speed controller with setpoint ramp) 4 Profile Torque mode (torque controller with setpoint ramp) 6 Homing mode (homing operation) 9 Cyclic Synchronous Velocity mode Note: Only Velocity Profile (3) and Cyclic Synchronous Velocity (9) modes have been tested.
Object Type	Variable
Data Type	Integer8
Access	Read only
PDO Mapping	Yes
Default Value	0x00
Lower Limit	0x80
Upper Limit	0x0A

Object 6062h – Position Demand Value

Description	This object indicates the demanded position value.
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	Yes
Default Value	0x0
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Unit	CAN user position units

Object 6064h – Position Actual Value

Description	This object provides the actual value of the position measurement device. The value is given in user-defined position units.
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	Yes
Default Value	–
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Unit	CAN user position units

Object 606Bh – Velocity Demand Value

Description	This object provides the output value of the trajectory generator.
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	Yes
Default Value	0x00000000
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Unit	CAN user velocity units

Object 606Ch – Velocity Actual Value

Description	This object provides the actual velocity value derived either from the velocity sensor or the position sensor.
Object Type	Variable
Data Type	Integer32
Access	Read only
PDO Mapping	Yes
Default Value	0x00000000
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Unit	CAN user velocity units

Object 606Dh – Velocity Window

Description	This object indicates the configured velocity window. Not yet available.
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	Yes
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0xFFFF
Unit	CAN user velocity units

Object 606Eh – Velocity Window Time

Description	This object indicates the configured velocity window time. Not yet available.
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	Yes
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0xFFFF
Unit	ms

Object 6073h – Maximum Current

Description	This object indicates the configured maximum permissible torque creating current in the motor. The value is given per thousand of rated current.
Object Type	Variable
Data Type	Unsigned16
Access	Read/Write
PDO Mapping	Yes
Default Value	0x0000
Lower Limit	0x0000
Upper Limit	0xFFFF
Unit	mA

Object 6075h – Motor Rated Current

Description	This object indicates the motor rated current. It is taken from the motor nameplate.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00000000
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF
Unit	mA

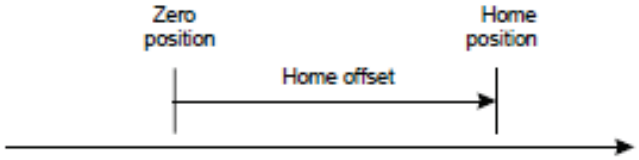
Object 6078h – Current Actual Value

Description	This object indicates the actual value of the current. It corresponds to the current in the motor. The value is given per thousand of rated current.
Object Type	Variable
Data Type	Integer16
Access	Read only
PDO Mapping	Yes
Default Value	0x0000
Lower Limit	0x8000
Upper Limit	0x7FFF
Unit	mA

Object 607Ah – Target Position

Description	This object indicates the commanded position that the drive should move to in position profile mode using the current settings of motion control parameters such as velocity, acceleration, deceleration, motion profile type, etc. The value of this object is interpreted as absolute or relative depending on the abs/rel flag in the controlword. It is given in user-defined position units and converted to position increments.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00000000
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Unit	user-defined position units

Object 607Ch – Home Offset

Description	This object indicates the configured difference between the zero position for the application and the machine home position (found during homing). During homing, the machine home position is found and once the homing is completed, the zero position is offset from the home position by adding the home offset to the home position. The zero position is calculated by following equation: zero position = home position + home offset  All subsequent absolute moves are taken relative to this new zero position. If this object is not implemented, then the home offset is regarded as zero. The value of this object is given in user-defined position units. Negative values indicate the opposite direction. The activation of a new value of the object home offset is manufacturer-specific. It is recommended to apply the new value only while the drive is in homing mode.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00000000
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Unit	user-defined position units

Object 607Eh – Polarity

Description	This object indicates if the position demand value is multiplied by 1 or -1. The polarity flag has no effect on the homing mode. The position polarity bit is used only for Profile Position (PP) mode and cyclic sync position mode (CSP). The velocity polarity bit is used only for Profile Velocity (PV) mode and Cyclic Sync Velocity mode (CSV).
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	Yes
Default Value	0x0
Lower Limit	0x0
Upper Limit	0xC0

Object 607Fh – Maximum Profile Velocity

Description	This object indicates the configured maximum velocity in either direction during a profiled motion.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x0000EA60
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF

Object 6080h – Motor Maximum Speed

Description	This object indicates the configured maximum speed for the motor in either direction. It is used to protect the motor and is taken from the motor data sheet. The value is given in rotations per minute (r/min) or user-defined velocity units. Not yet available.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x0000
Lower Limit	0x0
Upper Limit	0xFFFFFFFF

Object 6081h – Profile Velocity in Position Profile Mode

Description	This object indicates the velocity normally attained at the end of the acceleration ramp during a profiled motion, and is valid for both directions of motion. The value is given in user-defined velocity units. The velocity units can depend on the user-defined position units.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00000000
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF
Unit	user-defined velocity units

Object 6083h – Profile Acceleration

Description	This object indicates the configured acceleration.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write and mappable to RPDO
PDO Mapping	Yes
Default Value	0x00004E20
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF

Object 6084h – Profile Deceleration

Description	This object indicates the configured deceleration. If this parameter is not supported, then the profile acceleration object (6083h) value is also used for deceleration.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00004E20
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF

Object 6085h – Quick Stop Deceleration

Description	This object indicates the configured deceleration used to stop the motor when the quick stop function is activated and the quick stop code object (605Ah) is set to 2 or 6. The quick stop deceleration is also used if the fault reaction code object (605Eh) is 2 and the halt option code object (605Dh) is 2.
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00000000
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF

Object 608Fh – Position Encoder Resolution

Description	This object indicates the configured encoder increments and number of motor revolutions. The position encoder resolution is calculated by the following formula: position encoder resolution = encoder increments / motor revolutions All values are dimensionless.
Object Type	Array
Sub-indices	3
Sub-index	0
Description	**Number of entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x00000002
Lower Limit	0x00000002
Upper Limit	0x00000002
Sub-index	1
Description	**Encoder increments**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00002000
Lower Limit	0x00000001
Upper Limit	0xFFFFFFFF
Sub-index	2
Description	**Motor revolutions**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00000001
Lower Limit	0x00000001
Upper Limit	0xFFFFFFFF

Object 6090h – Velocity Encoder Resolution

Description	This object indicates the configured encoder increments per second and the motor revolutions per second. The velocity encoder resolution is calculated by the following: $\text{velocity encoder resolution} = \frac{\text{encoder} * \frac{\text{increments}}{\text{seconds}}}{\text{motor} * \frac{\text{revolutions}}{\text{seconds}}}$ Not yet available.
Object Type	Array
Sub-indices	3
Sub-index	0
Description	**Number of entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x00000002
Lower Limit	0x00000002
Upper Limit	0x00000002
Sub-index	1
Description	**Encoder increments per second**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00000001
Lower Limit	0x00000001
Upper Limit	0xFFFFFFFF
Sub-index	2
Description	**Motor revolutions per second**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00000001
Lower Limit	0x00000001
Upper Limit	0xFFFFFFFF

Object 6091h – Fieldbus Gear Ratio

Description	This object indicates the configured number of motor shaft revolutions and number of driving shaft revolutions. The gear ratio is calculated by the following formula: gear ratio = motor shaft revolutions / driving shaft revolutions All values are dimensionless.
Object Type	Array
Sub-indices	3
Sub-index	0
Description	**Number of entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x00000002
Lower Limit	0x00000002
Upper Limit	0x00000002
Sub-index	1
Description	**Motor revolutions**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00000001
Lower Limit	0x00000001
Upper Limit	0xFFFFFFFF
Sub-index	2
Description	**Shaft revolutions**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00000001
Lower Limit	0x00000001
Upper Limit	0xFFFFFFFF

Object 6092h – Feed Constant

Description	This object indicates the configured feed constant, which is the measurement distance per one revolution of the driving shaft of the gearbox. The feed constant is calculated by the following formula: feed constant = feed / driving shaft revolutions The feed is given in user-defined position units, and the driving shaft revolution is dimensionless.
Object Type	Array
Sub-indices	3
Sub-index	0
Description	**Number of entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x00000002
Lower Limit	0x00000002
Upper Limit	0x00000002
Sub-index	1
Description	**Feed (user units)**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00000001
Lower Limit	0x00000001
Upper Limit	0xFFFFFFFF
Sub-index	2
Description	**Shaft revolutions**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00000001
Lower Limit	0x00000001
Upper Limit	0xFFFFFFFF

Object 6098h – Homing Method

Description	This object indicates the configured homing method that will be used. 0 = No homing method assigned 1 = Method 1 will be used … 37 = Method 37 will be used 38 to 127 Reserved Refer to the CiA-402 standard for the detailed description of each homing method Only the following modes are supported: ▪ Mode 17 – homing on a negative limit switch without index pulse ▪ Mode 18 – homing on a positive limit switch without index pulse ▪ Mode 37 – homing on current position
Object Type	Variable
Data Type	Integer8
Access	Read/Write
PDO Mapping	No
Default Value	0x00
Lower Limit	0x80
Upper Limit	0x24

Object 6099h – Homing Speeds

Description	This object defines the speeds used during homing procedure. The values are given in user-defined velocity units.
Object Type	Array
Sub-indices	3
Sub-index	0
Description	**Number of Entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x2
Lower Limit	0x2
Upper Limit	0x2

Sub-index	1
Description	**Fast Homing Speed**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x0
Lower Limit	0x0
Upper Limit	0xFFFFFFFF
Sub-index	2
Description	**Slow Homing Speed**
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00000000
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF

Object 609Ah – Homing Acceleration

Description	This object defines the acceleration and deceleration to be used during homing operation. The value is given in user-defined acceleration unit
Object Type	Variable
Data Type	Unsigned32
Access	Read/Write
PDO Mapping	No
Default Value	0x00000000
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF
Unit	user-defined acceleration unit

Object 60C2h – Fieldbus Interpolation Time

Description	This object indicates the configured interpolation cycle time. The interpolation time period (sub-index 1) value is given in 10(interpolation time index) seconds. The interpolation time index (sub-index 2) is dimensionless. This setting is essential for operation modes (object 6060h) 8, 9 and 10, for the drive internal PLL handler and the micro interpolator. **Example:** InterpolationTimePeriod[s] = 60C2h:01 * 1060C2h:02 60C2h:01 = 0x4 = 4 60C2h:02 = 0xFD = -3 InterpolationTimePeriod[s] =4 * 10-3 = 0.004 [s] = 4 [ms]
Object Type	Array
Sub-indices	3
Sub-index	0
Description	**Number of entries**
Object Type	Variable
Data Type	Unsigned8
Access	Read only
PDO Mapping	No
Default Value	0x02
Lower Limit	0x00
Upper Limit	0xFF
Sub-index	1
Description	**Interpolation time**
Object Type	Variable
Data Type	Unsigned8
Access	Read/Write
PDO Mapping	Yes
Default Value	0x02
Lower Limit	0x00
Upper Limit	0xFF

Sub-index	2
Description	**Interpolation time index**
Object Type	Variable
Data Type	Integer8
Access	Read/Write
PDO Mapping	Yes
Default Value	0xFD
Lower Limit	0x80
Upper Limit	0x3F

Object 60C5h – Maximum Acceleration

Description	The maximum acceleration. It is used to limit the acceleration to an acceptable value in order to prevent the motor and the moved mechanics from being damaged. Not yet available.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	Yes
Default Value	0x00000000
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF

Object 60C6h – Maximum Deceleration

Description	The maximum deceleration. It is used to limit the deceleration to an acceptable value in order to prevent the motor and the moved mechanics from being damaged. Not yet available.
Object Type	Variable
Data Type	Integer32
Access	Read/Write
PDO Mapping	Yes
Default Value	–
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF

Object 60FFh – Target Velocity

Description	This object indicates the configured target velocity and is used as input for the trajectory generator.
Object Type	Variable
Data Type	Integer32
Access	Read/Write and mappable to RPDO
PDO Mapping	Yes
Default Value	0x00000000
Lower Limit	0x80000000
Upper Limit	0x7FFFFFFF
Unit	CAN user-defined velocity

Object 6502h – Supported Drive Modes

Description	This object contains information about the supported drive modes.
Object Type	Variable
Data Type	Unsigned32
Access	Read only
PDO Mapping	No
Default Value	–
Lower Limit	0x00000000
Upper Limit	0xFFFFFFFF

8 Units

8.1 Units Overview

CiA standards provide two objects for setting the gear ratio and the feed constant conversion factors, each of which has two sub-indices, as shown in the following table.

CAN Object	Description
6092h, sub-index 1	Feed Constant (numerator) – Feed user units
6092h, sub-index 2	Feed Constant (denominator) – Shaft revolutions
6091h, sub-index 1	Fieldbus Gear Ratio – Motor revolutions
6091h, sub-index 2	Fieldbus Gear Ratio – Drive shaft revolutions

You can modify the values by writing directly to the objects.

8.2 Position Unit Conversion

CAN standards define the position as [user counts / driving shaft].

User counts represents the application, such as [mm], [rad], [deg], and the driving shaft is basically the output of a gearbox.

Assuming that the position loop of the drive works with encoder-increments as a unit, the following objects are used in unit conversions:

CAN Object	Description
608Fh – Position Encoder Resolution	The configured encoder increments and number of motor revolutions. position encoder resolution = encoder increments / motor revolutions
6091h – Fieldbus Gear Ratio	The configured number of motor shaft revolutions and number of driving shaft revolutions. gear ratio = motor shaft revolutions / driving shaft revolutions
6092h – Feed Constant	The configured feed constant, which is the measurement distance per one revolution of the driving shaft of the gearbox. feed constant = feed / driving shaft revolutions

The conversion from CAN user units to internal motor encoder increments is as follows:

$$x\ [CAN\ user\ unit] = x * \frac{6091\text{h: }01}{6091\text{h: }02} * \frac{\frac{608\text{Fh: }01}{608\text{Fh: }01}}{\frac{6092\text{h: }01}{6092\text{h: }02}}\ [encoder\ increments]$$

The conversion from internal motor encoder increments to CAN user units (e.g. for representing the actual position in object 6064h) is as follows:

$$x[encoder\ increments] = \frac{x * \frac{6092\text{h}:01}{6092\text{h}:02}}{\frac{6091\text{h}:01}{6091\text{h}:02} * \frac{608\text{Fh}:01}{608\text{Fh}:01}}[CAN\ user\ unit]$$

Example

Let's assume you want to have a user unit of [mm]. The application moves 200 [mm] per gearbox revolution and the gearbox ratio is 2:1.

Furthermore, an encoder connected to the motor generates 4096 [increments/motor-rev].

The CAN object settings must be as follows:

608Fh:01 = 4096
608Fh:02 = 1

6091h:01 = 2
6091h:02 = 1

6092h:01 = 200
6092h:02 = 1

You can now issue a position command in [mm] using object 607Ah, in Profile Position mode, for example.

8.3 Velocity Unit Conversion

According to CiA standards, CAN object 60A9h represents the user-defined velocity units. If object 60A9h is not implemented, the velocity is defined as [CAN user position units / second].

Object 60A9h is not implemented in the ZED.

Example

Let's assume you want to have a user unit of [mm]. The application moves 200 [mm] per gearbox revolution and the gearbox ratio is 2:1.

Let's assume you want to use the unit [rpm], which means that 1 [rps] represents 60 [rpm]. Let's also assume there is no gearbox connected to the motor.

The CAN object settings must be as follows:

608Fh:01 = 4096
608Fh:02 = 1

6091h:01 = 1
6091h:02 = 1

6092h:01 = 60
6092h:02 = 1

You can now issue a velocity command in [rpm] using object 60FFh, in Profile Velocity mode, for example.

8.4 Acceleration/Deceleration Unit Conversion

According to CiA standards, CAN object 60AAh represents the user-defined acceleration units. If object 60AAh is not implemented, the acceleration is defined as [CAN user velocity units / second] = [CAN user position units / second2]

Object 0x60AA is not implemented in the ZED.

Example

Let's assume you want to use the unit [rpm/s], which means that 1 [rps] represents 60 [rpm]. Let's also assume there is no gearbox connected to the motor.

Furthermore, an encoder connected to the motor generates 4096 [increments / motor-rev].

The CAN object settings must be as follows:

0x608F:01 = 4096
0x608F:02 = 1

0x6091:01 = 1
0x6091:02 = 1

0x6092:01 = 60
0x6092:02 = 1

You can now set the acceleration/deceleration in unit [rpm/s] using object 6083h or 6084h, in Profile Velocity mode, for example.

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