
# CANopen Object Dictionary Reference

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**3805 Calle Tecate, Camarillo, CA 93012**
**Tel: (805) 389-1935, Fax: (805) 389-1165**
**http://www.a-m-c.com**

## Revision History

| Revision | Date | Description |
|---|---|---|
| Rev 1.0 | March 1, 2001 | First draft |
| Rev 1.1 | June 1, 2001 | • TPDO and RPDO have dynamic COB-ID allocation<br>• Addition of object 1014h, Emergency Object COB-ID<br>• Modified 1002h<br>• Addition of 60F9h, sub-index 2Eh and 2Fh<br>• Addition of 60FBh, sub-index 3Eh and 3Fh |
| Rev 1.2 | October 16, 2001 | • Modified 2013h, sub 03h, 04h, 05h, 06h<br>• Modified 60F9h, sub 03h<br>• Addition of 60F9h, sub 0Bh |
| Rev 1.3 | April 8, 2002 | • Minor updates on default values<br>• Addition of bits 5 and 6 to object 1002h<br>• Addition of 2012h, sub 02h<br>• Addition of 2015h, Resolver_parameters<br>• Addition of 201Eh, Target_d_axis_angle<br>• Addition of 2070h, sub 0Fh, 16h, 1Bh, 1Ch<br>• Addition of 2071h, Target_current_d<br>• Removal of 207Bh, 2083h, and 2093h (non-existent)<br>• Addition of 60F8h, sub 06h and 07h<br>• Addition of 60F9h, sub 06h<br>• Addition of Brushless AC motor data sub-indexes to object 6410h<br>• Addition of 6510h, sub 1F: shunt_regulator_voltage |
| Rev 1.4 | November 8, 2002 | • Minor updates on default values<br>• Updated object 2070h – sub03h and object 60F9h – sub01h updated for 16 or 32-bit resolution<br>• Addition of 60F9h, sub04h |
| Rev 1.5 | April 28, 2003 | • Updated object 60F9h, sub 04h, 06h, and 09h<br>• Updated object 1802h, 1803h, 1804h, 1814h, 1815h, 1816h, 1819h (sub 02h), TPDO's can be triggered by SYNC<br>• Updated object 2070h, sub 1Bh |
| Rev 1.6 | December 2003 | • Update all TPDO and RPDO objects with support of SYNC triggered messaging and mapping on TPDO26. |

# Advanced Motion Controls Digital Drives
# CANopen Object Dictionary Reference

Table of Contents

## 1. INTRODUCTION

The CAN interface of the Advanced Motion Controls' digital d rives follows the CiA DS301 communication profile and the CiA DSP402 device profile (Device Profile for Drives and Motion Control). This document supplements DS301 and DSP402, which must be purchased separately from CiA (international users and manufacture rs group).

CiA (Can in Automation e.V.) can be contacted at http://www.can-cia.org.

## 2. REFERENCES

/1/ CiA DS201…207 CAL Draft Specifications
/2/ CiA DS301 Communication Profile for Industrial Systems
/3/ CiA DSP402 Device Profile for Drives and Motion Control
/4/ CAN specification ISO 11898

## 3. CONVENTIONS & DEFINITIONS

Numbers followed by "h" are hexadecimal. Numbers followed by "b" are binary. All other numbers are decimal.

Abbreviations:

pp Profile Position Mode
pv Profile Velocity Mode
vl Velocity Mode
hm Homing Mode
ip Interpolated Position Mode
tq Profile Torque Mode
all Mandatory for all modes
ce Common Entries in the Object Dictionary
dc Device Control
pc Position Control Function

RO read only
WO write only
RW read/write

## 4. COMMUNICATION OBJECT (COB)

See /4/ for a detailed description of the CAN physical layer. A CAN communication message is formatted as follows (CAN 2.0A):

| FIELD | DESCRIPTION | NUMBER OF BITS |
|---|---|---|
| Start | Start bit | 1 |
| ID | 11-bit (CAN 2.0A) or 29-bit (CAN2.0B) identifier | 11 or 29 |
| RTR | Remote Transmission Request (typically 0) | 1 |
| CTRL | Control field | 6 |
| Data | 0…8 bytes | 0…64 |
| CRC | 16-bit Cyclic Redundancy Check | 16 |
| ACK | Acknowledge | 2 |
| EOF | End of field | 7 |
| IFS | Interframe Space | 3 |
| - | Stuff bits | Up to 19 |

Only the ID, RTR and Data fields are used directly by the application. The CAN controller sets the other fields.

The ID is formatted as follows (CAN2.0A):

Bit 0…6 Module-ID; this corresponds to the node address (bit0 = LSB)
Bit 7…10 Message type; determines the object priority (0000 corresponds to the highest priority)

## 5. COMMUNICATION MODEL

See /2/ and /3/ for a detailed description of SDO (Service Data Object) and PDO (Process Data Object). Appendix A provides a summary of the SDO communication model.

Dictionary objects are grouped according to the drive architecture described in /3/:

- PREDEFINED COMMUNICATION OBJECTS (DS301)
  - NMT services
  - SYNC object
  - TIME STAMP object
  - NODE GUARD object
  - EMERGENCY object
  - PDO object
  - SDO object

- COMMUNICATION PROFILE OBJECTS (DS301)

- DRIVE PROFILE OBJECTS (DSP402)
  - Common Objects
  - Device Control Objects
  - Factor Group Objects
  - Profile Position Mode Objects
  - Homing Mode Objects
  - Position Control Function Objects
  - Profile Velocity Mode Objects
  - Profile Torque Mode Objects

In addition, the drive supports a manufacturer specific interpolation mode (PVT Mode)

  - PVT Mode

Each group contains a description of both the standard objects and the manufacturer specific objects. A detailed description of the standard objects can be found in /2/ and /3/. This document will provide additional information if needed. Standard objects without pre-defined functionality are described in detail, as well as all manufacturer specific objects.

## 6. PREDEFINED COMMUNICATION OBJECTS

The Advanced Motion Controls' digital drives are minimum capability devices from the communication profile point of view (see /2/). They support the pre-defined master/slave connection set, defined in /2/.

- NMT Services

The following services are supported:

| SERVICE | COB-ID | CS (DECIMAL) |
|---|---|---|
| Start_Remote_Node | 0 | 01 |
| Stop_Remote_Node | 0 | 02 |
| Enter_Pre-Operational_State | 0 | 128 |
| Reset_Node | 0 | 129 |

| | | |
|---|---|---|
| Reset_Communication | 0 | 130 |

COB-ID CAN Object – Identifier
CS Command Specifier

This results in the following CAN objects (in hexadecimal):

| NMT SERVICE | COB-ID | DATA BYTES | | |
|---|---|---|---|---|
| | | 1 | 2 | 3…8 |
| Start_Remote_Node | 0 | 01h | Node-ID | - |
| Stop_Remote_Node | 0 | 02h | Node-ID | - |
| Enter_Pre-Operational_State | 0 | 80h | Node-ID | - |
| Reset_Node | 0 | 81h | Node-ID | - |
| Reset_Communication | 0 | 82h | Node-ID | - |

Node-ID Drive address (0…7Fh)

See /2/ for a detailed description.

- SYNC Object

This object is implemented per /2/.

- TIME STAMP Object

This object is implemented per /2/. An Emergency message will be sent in case of “inconsistent” Time Stamp messages. See section 9.3 for more details.

- NODEGUARD Object

Node guarding/life guarding is implemented per /2/. Also see “7. Communication Profile Objects”.

- EMERGENCY Object

This object is implemented per /2/.

- SDO Object

Implemented per /2/. See Appendix A for a summary.

- PDO Object

Implemented per /2/.

## 7. COMMUNICATION PROFILE OBJECTS

The following object descriptions follow the same format used in DS301 and DSP402. The “Access” attribute also indicates when an object can be accessed to write: ALW (always) or DIS ( in any drive state where power is disabled, see objects 6040h and 6041h). All readable (Read-only and Read-Write) objects can always be read. The objects that are stored in non-volatile memory are marked by (SNVM) in the access attribute.

- OBJECT 1000H: DEVICE_TYPE

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1000h |
| Name | Device_type |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | |
|---|---|
| Object Class | Mandatory |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 20192h |

Note: 20192h corresponds to bit17 set to 1 (servo drive) and device profile number 402.

- OBJECT 1001H: ERROR_REGISTER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1001h |
| Name | Error_register |
| Object Code | VAR |
| Data Type | Unsigned8 |

Value Description

| | |
|---|---|
| Object Class | Mandatory |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 0 |

- OBJECT 1002H: MANUFACTURER_STATUS_REGISTER

This register indicates which errors have occurred. The implementation of this object is manufacturer specific.

Object Description

| | |
|---|---|
| Index | 1002h |
| Name | Manufacturer_status_register |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | |
|---|---|
| Object Class | Optional |
| Access | RO |
| PDO Mapping | Optional |
| Value Range | Unsigned32 |
| Default Value | Drive state dependent |

Data Description:

A bit value of 1 means the specified error has occurred. The drive transitions to the fault state when an error occurs. See 6040h: controlword for fault state transition information. Most error conditions have a configurable error option code. See also object 200Fh for error reset options.

| BIT | **NAME** | **DESCRIPTION** | **ERROR OPTION CODE OBJECT** |
|---|---|---|---|
| 0 | Over voltage | Indicates an over voltage condition. | See * below |
| 1 | Under voltage | Indicates an under voltage condition. | See * below |
| 2 | Over current | Indicates an over current condition (e.g. short circuit). | See * below |
| 3 | Over temperature | Indicates an over temperature condition (from internal analog sensor). | See * below |
| 4 | Checksum Error | Indicates a memory checksum error after parameter storage to non-volatile memory | See * below |
| 5 | Board Init Error | Control board has not been initialized yet or a power board memory error occurred. | See * below |
| 6 | Excessive drive temp | Indicates an over temperature condition (from internal digital sensor). | See * below |
| 7…10 | - | Reserved | |
| 11…15 | - | Always 0 | |
| 16 | Overload | Indicates an overload condition. | 2070h, sub 20h |
| 17 | Over speed | Indicates an over-speed condition. | 60F9h, sub 29h |
| 18 | - | Not used | |
| 19 | Position following error | Indicates a position following error. | 60FBh, sub 30h |
| 20 | Velocity following error | Indicates a velocity following error. | 60F9h, sub 28h |
| 21 | Motor over temp | Indicates a motor over temperature error (hardware input). | 20C3h |
| 22 | Negative limit switch | Indicates that the negative limit switch input is active. | 60FBh, sub 33h |
| 23 | Positive limit switch | Indicates that the positive limit switch input is active. | 60FBh, sub 34h |
| 24 | Encoder error | Indicates an encoder error (integrity check). | 2027h |
| 25 | Aux encoder error | Indicates an auxiliary encoder error (if available on the drive). | 2030h |
| 26 | Hall sensor error | Indicates an invalid Hall sensor state | 201Fh |
| 27 | Negative software limit | Indicates that the negative software limit is reached | 60FBh, sub 31h |
| 28 | Positive software limit | Indicates that the positive software limit is reached | 60FBh, sub 32h |
| 29 | Velocity feedback error | Indicates a velocity feedback error (see 60F9h, sub 2Fh) | 60F9h, sub 2Eh |
| 30 | Position feedback error | Indicates a position feedback error (see 60FBh, sub 3Fh) | 60FBh, sub 3Eh |
| 31 | Communication Error | Indicates lost CAN communication | 20C8h, sub 0Fh |

* These errors are fatal errors that will cause the drive to go into a fault state and disable the power bridge immediately as they represent abnormal operating conditions (see also objects 6041h and 2000h).

- OBJECT 1008H: MANUFACTURER_DEVICE_NAME

See /2/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1008h |
| Name | Manufacturer_device_name |
| Object Code | VAR |
| Data Type | Visible string |

Value Description

| | |
|---|---|
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | - |
| Default Value | Drive model dependent |

- OBJECT 1009H: MANUFACTURER_HARDWARE_VERSION

See /2/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1009h |
| Name | Manufacturer_hardware_version |
| Object Code | VAR |
| Data Type | Visible string |

Value Description

| | |
|---|---|
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | - |
| Default Value | Drive model dependent |

- OBJECT 100AH: MANUFACTURER_SOFTWARE_VERSION

See /2/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 100Ah |
| Name | Manufacturer_software_version |
| Object Code | VAR |
| Data Type | Visible string |

Value Description

| | |
|---|---|
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |

| | |
|---|---|
| Value Range | No |
| Default Value | Drive model dependent |

- OBJECT 100BH: NODE-ID

See /2/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 100Bh |
| Name | Node-ID |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | |
|---|---|
| Object Class | Optional |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Value Range | 1-127 |
| Default Value | 1 |

The lower 7 bits contain the Node-ID. The Node-ID (CAN address) set via this object will be effective only after a Reset Communication NMT service or after power-up if the DIP-switches are set for Node-ID configuration via the CAN interface (see hardware manual).

- OBJECT 100CH: GUARD-TIME

See /2/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 100Ch |
| Name | Guard-time |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Mandatory |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | 0…65535 |
| Default Value | 0 |

- OBJECT 100DH: LIFE-TIME FACTOR

See /2/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 100Dh |
| Name | Life-time factor |
| Object Code | VAR |
| Data Type | Unsigned8 |

Value Description

| | |
|---|---|
| Object Class | Mandatory |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | 0…255 |
| Default Value | 0 |

- OBJECT 1010H: STORE_PARAMETERS

See /2/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1010h |
| Name | Store_parameters |
| Object Code | ARRAY |
| Data Type | Unsigned32 |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | Save all parameters |
| Object Class | Optional |
| Access | RW - DIS |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | - |

- OBJECT 1014H: COB-ID EMERGENCY OBJECT

See /2/ for a detailed description.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

The upper byte of this parameter can only take a value of 40h (PDO valid, no RTR allowed).

Object Description

| | |
|---|---|
| Index | 1014h |
| Name | COB-ID Emergency message |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | |
|---|---|
| Object Class | Conditional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 00000080h + Node-ID |

- OBJECT 1400H: 1ST RECEIVE PDO COMMUNICATION PARAMETER

See /2/ for a detailed description. This PDO is valid in all operating modes.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

The upper byte of this parameter can only take a value of 40h (PDO valid, no RTR allowed).

Object Description

| | |
|---|---|
| Index | 1400h |
| Name | 1st Receive PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 00000200h + Node-ID |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (immediate) |

- OBJECT 1401H: 2ND RECEIVE PDO COMMUNICATION PARAMETER

See /2/ for a detailed description. This PDO is valid in all operating modes.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

The upper byte of this parameter can only take a value of 40h (PDO always valid, no RTR allowed).

Object Description

| | |
|---|---|
| Index | 1401h |
| Name | 2nd Receive PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 00000300h + Node-ID |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (immediate) |

- OBJECT 1402H: 3RD RECEIVE PDO COMMUNICATION PARAMETER

See /2/ for a detailed description. This PDO is valid in profile position mode only.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP -switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

The upper byte of this parameter can only take a value of C0h (PDO not valid, no RTR allowed), since it is mode dependent.

Object Description

| | |
|---|---|
| Index | 1402h |
| Name | 3rd Receive PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 80000400h + Node-ID |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |

| | |
|---|---|
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (immediate) |

- OBJECT 1403H: 4TH RECEIVE PDO COMMUNICATION PARAMETER

See /2/ for a detailed description. This PDO is valid in profile velocity mode only.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

The upper byte of this parameter can only take a value of 40h (PDO not valid, no RTR allowed), since it is mode dependent.

Object Description

| | |
|---|---|
| Index | 1403h |
| Name | 4th Receive PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 0000400h + Node-ID |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (immediate) |

- OBJECT 1404H: 5TH RECEIVE PDO COMMUNICATION PARAMETER

See /2/ for a detailed description. This PDO is valid in profile torque mode only.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

The upper byte of this parameter can only take a value of 40h (PDO not valid, no RTR allowed), since it is mode dependent.

Object Description

| | |
|---|---|
| Index | 1404h |
| Name | 5th Receive PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 00000400h + Node-ID |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (immediate) |

- OBJECT 1414H: 21ST RECEIVE PDO COMMUNICATION PARAMETER

See /2/ for a detailed description. This PDO is valid in profile position mode only.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

The upper byte of this parameter can only take a value of C0h (PDO not valid, no RTR allowed), since it is mode dependent.

Object Description

| | |
|---|---|
| Index | 1414h |
| Name | 21st Receive PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |

| Data Type | PDOCommPar |
|---|---|

Value Description

| Sub-Index | 1h |
|---|---|
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 80000500h + Node-ID |

| Sub-Index | 2h |
|---|---|
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (immediate) |

- OBJECT 1415H: 22ND RECEIVE PDO COMMUNICATION PARAMETER

See /2/ for a detailed description. This PDO is valid in profile velocity mode only.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

The upper byte of this parameter can only take a value of C0h (PDO not valid, no RTR allowed), since it is mode dependent.

Object Description

| Index | 1415h |
|---|---|
| Name | 22nd Receive PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| Sub-Index | 1h |
|---|---|
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 80000500h + Node-ID |

| Sub-Index | 2h |
|---|---|

| Description | Transmission type |
|---|---|
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (immediate) |

- OBJECT 1416H: 23RD RECEIVE PDO COMMUNICATION PARAMETER

See /2/ for a detailed description. This PDO is valid in profile torque mode only.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

The upper byte of this parameter can only take a value of C0h (PDO not valid, no RTR allowed), since it is mode dependent.

Object Description

| Index | 1416h |
|---|---|
| Name | 23rd Receive PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| Sub-Index | 1h |
|---|---|
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 00000500h + Node-ID |

| Sub-Index | 2h |
|---|---|
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (immediate) |

- OBJECT 1417H: 24TH RECEIVE PDO COMMUNICATION PARAMETER

See /2/ for a detailed description. This PDO is valid in interpolated position mode (PVT mode) only.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

The upper byte of this parameter can only take a value of C0h (PDO not valid, no RTR allowed), since it is mode dependent.

Object Description

| | |
|---|---|
| Index | 1417h |
| Name | 24th Receive PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 80000500h + Node-ID |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

- OBJECT 1600H: 1ST RECEIVE PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1600h |
| Name | 1st Receive PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 1 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |

| | |
|---|---|
| Value Range | Unsigned32 |
| Default Value | 60400010h (controlword) |

- OBJECT 1601H: 2ND RECEIVE PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1601h |
| Name | 2nd Receive PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 2 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60400010h (controlword) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | PDO mapping for the 2nd application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60600008h (modes of operation) |

- OBJECT 1602H: 3RD RECEIVE PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1602h |
| Name | 3rd Receive PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 2 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60400010h (controlword) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | PDO mapping for the 2nd application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 607A0020h (target position) |

- OBJECT 1603H: 4TH RECEIVE PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1603h |
| Name | 4th Receive PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 2 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60400010h (cont rolword) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | PDO mapping for the 2nd application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60FF0020h (target velocity) |

- OBJECT 1604H: 5TH RECEIVE PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1604h |
| Name | 5th Receive PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 2 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |

| | |
|---|---|
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60400010h (controlword) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | PDO mapping for the 2nd application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60710010h (target torque) |

- OBJECT 1614H: 21ST RECEIVE PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1614h |
| Name | 21st Receive PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 1 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 607A0020h (target position) |

- OBJECT 1615H: 22ND RECEIVE PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1615h |
| Name | 22nd Receive PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 1 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |

| | |
|---|---|
| Value Range | Unsigned32 |
| Default Value | 60FF0020h (target velocity) |

- OBJECT 1616H: 23RD RECEIVE PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1616h |
| Name | 23rd Receive PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 1 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60710010h (target torque) |

- OBJECT 1617H: 24TH RECEIVE PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1617h |
| Name | 24th Receive PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 1 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60C10140h (interpolation data record) |

- OBJECT 1800H: 1ST TRANSMIT PDO COMMUNICATION PARAMETER

See /2/ and /3/ for a detailed description. This PDO is valid in all operating modes and is transmitted when :

- A bit in the statusword (6041h) or the statusword_1 (2000h) changes
- Or when a SYNC message is received (synchronous transmission)
- Or when a RTR is received (if Bit31 in sub-index 01 is set to 0).

This TPDO can be disabled by setting Bit32 in sub-index 01 to 1.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

Object Description

| | |
|---|---|
| Index | 1800h |
| Name | 1st Transmit PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 00000180h + Node-ID |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous, if a bit in the statusword (6041h) or the statusword_1 (2000h) changes |

- OBJECT 1802H: 3RD TRANSMIT PDO COMMUNICATION PARAMETER

See /2/ and /3/ for a detailed description. This PDO is valid in profile position mode and interpolated position mode only and is transmitted under the following condition (if 20C8h, sub-index 02h, bit8 = 0):

- The |actual position change| > TPDO_incremental_position_change (20C8h , sub-index 04h)
- OR after TPDO_cycle_time (20C8h, sub-index 03h) time has elapsed
- OR RTR is received (if Bit31 in sub-index 01 is set to 0)
- OR a SYNC message is received

This TPDO can be disabled by setting Bit32 in sub-index 01 to 1.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

Object Description

| | |
|---|---|
| Index | 1802h |
| Name | 3rd Transmit PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 80000280h + Node-ID (=PDO not valid, RTR allowed) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (based on position change or time elapsed, see above) |

- OBJECT 1803H: 4TH TRANSMIT PDO COMMUNICATION PARAMETER

See /2/ and /3/ for a detailed description. This PDO is valid in profile velocity mode only and is transmitted under the following condition (if 20C8h, sub-index02h, bit8 = 0):

- after TPDO_cycle_time (20C8h, sub-index 03h) time has elapsed
- OR a SYNC message is received
- OR RTR is received (if Bit31 in sub-index 01 is set to 0)

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP -switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

This TPDO can be disabled by setting Bit32 in sub-index 01 to 1.

Object Description

| | |
|---|---|
| Index | 1803h |
| Name | 4th Transmit PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 80000280h + Node-ID (=PDO not valid, RTR allowed) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (based on time elapsed, see above) |

- OBJECT 1804H: 5TH TRANSMIT PDO COMMUNICATION PARAMETER

See /2/ and /3/ for a detailed description. This PDO is valid in profile torque mode only and is transmitted under the following condition (if 20C8h, sub-index02h, bit8 = 0):

- after TPDO_cycle_time (20C8h, sub-index 03h) time has elapsed
- OR a SYNC message is received
- OR RTR is received (if Bit31 in sub-index 01 is set to 0)

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP -switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

This TPDO can be disabled by setting Bit32 in sub-index 01 to 1.

Object Description

| | |
|---|---|
| Index | 1804h |
| Name | 5th Transmit PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 80000280h + Node-ID (=PDO valid, RTR allowed) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (based on time elapsed, see above) |

- OBJECT 1814H: 21ST TRANSMIT PDO COMMUNICATION PARAMETER

See /2/ and /3/ for a detailed description. This PDO is valid in profile position mode and interpolated position mode only and is transmitted under the following condition (if 20C8h, sub-index02h, bit8 = 1):

- The |actual position change| > TPDO_incremental_position_change (20C8h , sub-index 04h)
- OR after TPDO_cycle_time (20C8h, sub-index 03h) time has elapsed
- OR a SYNC message is received
- OR RTR is received (if Bit31 in sub-index 01 is set to 0)

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

This TPDO can be disabled by setting Bit32 in sub-index 01 to 1.

Object Description

| | |
|---|---|
| Index | 1814h |
| Name | 21st Transmit PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 80000280h + Node-ID (=PDO not valid, RTR allowed) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |

| | |
|---|---|
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (based on time elapsed, see above) |

- OBJECT 1815H: 22ND TRANSMIT PDO COMMUNICATION PARAMETER

See /2/ and /3/ for a detailed description. This PDO is valid in profile velocity mode only and is transmitted under the following condition (if 20C8h, sub-index02h, bit8 = 1):

- after TPDO_cycle_time (20C8h, sub-index 03h) time has elapsed
- OR a SYNC message is received
- OR RTR is received (if Bit31 in sub-index 01 is set to 0).

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

This TPDO can be disabled by setting Bit32 in sub-index 01 to 1.

Object Description

| | |
|---|---|
| Index | 1815h |
| Name | 22nd Transmit PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 80000280h + Node-ID (=PDO not valid, RTR allowed) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (based on time elapsed, see above) |

- OBJECT 1816H: 23RD TRANSMIT PDO COMMUNICATION PARAMETER

See /2/ and /3/ for a detailed description. This PDO is valid in profile torque mode only and is transmitted under the following condition (if 20C8h, sub-index02h, bit8 = 1):

- after TPDO_cycle_time (20C8h, sub-index 03h) time has elapsed
- OR a SYNC message is received
- OR RTR is received (if Bit31 in sub-index 01 is set to 0).

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

This TPDO can be disabled by setting Bit32 in sub-index 01 to 1.

Object Description

| | |
|---|---|
| Index | 1816h |
| Name | 23rd Transmit PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 00000280h + Node-ID (=PDO valid, RTR allowed) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (based on time elapsed, see above) |

- OBJECT 1817H: 24TH TRANSMIT PDO COMMUNICATION PARAMETER

See /2/ and /3/ for a detailed description. This PDO is valid in interpolated position mode only and is transmitted under the following condition:

- Buffer_position (60C4h, sub-index 04h) has decreased to TPDO_buffer_position_limit (20C8h, sub-index 08h)
- OR a SYNC message is received

- OR RTR is received (if Bit31 in sub-index 01 is set to 0).

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter wil l automatically change to the new drive address.

This TPDO can be disabled by setting Bit32 in sub-index 01 to 1.

Object Description

| | |
|---|---|
| Index | 1817h |
| Name | 24th Transmit PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 80000380h + Node-ID (=PDO not valid, RTR allowed) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (based on buffer position, see above) |

- OBJECT 1818H: 25TH TRANSMIT PDO COMMUNICATION PARAMETER

See /2/ and /3/ for a detailed description. This PDO is valid in all operating modes and is transmitted when:

- A digital input changes state (programmable or dedicated digital inputs).
- OR a SYNC message is received
- OR RTR is received (if Bit31 in sub-index 01 is set to 0).

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP-switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

This TPDO can be disabled by setting Bit32 in sub-index 01 to 1.

Object Description

| | |
|---|---|
| Index | 1818h |
| Name | 25th Transmit PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 00000680h + Node-ID |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (based input change, see above) |

- OBJECT 1819H: 26TH TRANSMIT PDO COMMUNICATION PARAMETER

See /2/ and /3/ for a detailed description. This PDO can be mapped and is valid in all operating modes and is transmitted under the following condition:

- after TPDO_cycle_time (20C8h, sub-index 053h) time has elapsed
- OR a SYNC message is received
- OR RTR is received (if Bit31 in sub-index 01 is set to 0).

If 20C8h, sub-index 05h is set to zero, the PDO will not be sent.

The user can set the COB-ID of this PDO to any value. When the drive address is changed (via the DIP -switches or via the CAN interface), and if the lower 7 bits correspond to the drive address, then the lower 7 bits of this parameter will automatically change to the new drive address.

This TPDO can be disabled by setting Bit32 in sub -index 01 to 1.

Object Description

| | |
|---|---|
| Index | 1819h |
| Name | 26th Transmit PDO parameter |
| Object Code | RECORD |
| Number of elements | 2 |
| Data Type | PDOCommPar |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | COB-ID used by PDO |
| Object Class | Optional |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 00000480h + Node-ID |

| | |
|---|---|
| Sub-Index | 2h |
| Description | Transmission type |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned8 |
| Default Value | 254 |

| Transmission Type Value | PDO Transmission |
|---|---|
| 1…240 | Synchronous |
| 254 | Asynchronous (based on time elapsed, see above) |

- OBJECT 1A00H: 1ST TRANSMIT PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1A00h |
| Name | 1st Transmit PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 2 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60410010h (statusword) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | PDO mapping for the 2nd application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 20000010h (Statusword_1) |

- OBJECT 1A02H: 3RD TRANSMIT PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1A02h |
| Name | 3rd Transmit PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 2 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60410010h (statusword) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | PDO mapping for the 2nd application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60640020h (position actual value) |

- OBJECT 1A03H: 4TH TRANSMIT PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1A03h |
| Name | 4th Transmit PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 2 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60410010h (statusword) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | PDO mapping for the 2nd application object |
| Object Class | Optional |

| | |
|---|---|
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 606C0020h (velocity actual value) |

- OBJECT 1A04H: 5TH TRANSMIT PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1A04h |
| Name | 5th Transmit PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 2 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60410010h (statusword) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | PDO mapping for the 2nd application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60770010h (torque actual value) |

- OBJECT 1A14H: 21ST TRANSMIT PDO MAPPIN G PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1A14h |
| Name | 21st Transmit PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 1 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60640020h (position actual value) |

- OBJECT 1A15H: 22ND TRANSMIT PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1A15h |
| Name | 22nd Transmit PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 1 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 606C0020h (velocity actual value) |

- OBJECT 1A16H: 23RD TRANSMIT PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1A16h |
| Name | 23rd Transmit PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 1 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60770020h (torque actual value) |

- OBJECT 1A17H: 24TH TRANSMIT PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1A17h |
| Name | 24th Transmit PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 1 |

| | |
|---|---|
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 60C40420h (interpolation data configuration, buffer position) |

- OBJECT 1A18H: 25TH TRANSMIT PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 1A18h |
| Name | 25th Transmit PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 2 |
| Data Type | PDOMapping |

Value Description

| | |
|---|---|
| Sub-Index | 1h |
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 20A00010h (programmable digital inputs) |

| | |
|---|---|
| Sub-Index | 2h |
| Description | PDO mapping for the 2nd application object |
| Object Class | Optional |
| Access | RO |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 20040010h (dedicated digital inputs) |

- OBJECT 1A19H: 26TH TRANSMIT PDO MAPPING PARAMETER

See /2/ and /3/ for a detailed description. The overall data of mapped objects should not exceed 8 bytes. 8 Sub-indexes are provided (in case eight 8-bit objects are mapped). All mapped objects must be in a direct sequence (i.e. no empty spaces allowed).

Object Description

| | |
|---|---|
| Index | 1A19h |
| Name | 26th Transmit PDO mapping parameter |
| Object Code | ARRAY |
| Number of elements | 8 |
| Data Type | PDOMapping |

Value Description

| Sub-Index | 1h |
|---|---|
| Description | PDO mapping for the 1st application object |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 20A20110h (programmable analog input 1) |

| Sub-Index | 2h |
|---|---|
| Description | PDO mapping for the 2nd application object |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 20A20210h (programmable analog input 2) |

| Sub-Index | 3h |
|---|---|
| Description | PDO mapping for the 3rd application object |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 20A20310h (programmable analog input 3) |

| Sub-Index | 4h |
|---|---|
| Description | PDO mapping for the 4th application object |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 20A20410h (programmable analog input 4) |

| Sub-Index | 5h |
|---|---|
| Description | PDO mapping for the 5th application object |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 0 |

| Sub-Index | 6h |
|---|---|
| Description | PDO mapping for the 6th application object |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 0 |

| Sub-Index | 7h |
|---|---|
| Description | PDO mapping for the 7th application object |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |

| | |
|---|---|
| Value Range | Unsigned32 |
| Default Value | 0 |

| | |
|---|---|
| Sub-Index | 8h |
| Description | PDO mapping for the 8th application object |
| Object Class | Optional |
| Access | RW |
| PDO Mapping | No |
| Value Range | Unsigned32 |
| Default Value | 0 |

# 8. DRIVE PROFILE OBJECTS

The following object descriptions follow the same format used in DS301 and DSP402. The "Access" attribute also indicates when an object can be accessed to write: ALW (always) or DIS ( in any drive state where power is disabled, see State Machine). Read only and Read-Write objects can always be read. The objects that are stored in non -volatile memory are marked by (SNVM) in the access attribute.

## 8.1 COMMON OBJECTS

- OBJECT 6402H: MOTOR_TYPE

| | |
|---|---|
| Index | 6402h |
| Name | Motor_type |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: - |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | Possible | |
| Units | - | |
| Value Range | 0…65535 | |
| Default Value | Model dependent | |
| Substitute Value | - | |

Data Description

| VALUE | MOTOR TYPE |
|---|---|
| 7 | Squirrel Cage Induction Motor |
| 10 | Sinusoidal PM BL Motor |
| 11 | Trapezoidal PM BL Motor |
| 12 | DC Brush Type Motor |

- OBJECT 6403H: MOTOR_CATALOGUE_NUMBER

See /3/ for a detailed description.

| | |
|---|---|
| Index | 6403h |
| Name | Motor_catalogue_number |
| Object Code | VAR |
| Data Type | Visible string |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: - |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | Possible | |
| Units | - | |
| Value Range | - | |
| Default Value | AMC Default Brushless Motor | |
| Substitute Value | - | |

- OBJECT 6404H: MOTOR_MANUFACTURER

See /3/ for a detailed description.

| | |
|---|---|
| Index | 6404h |
| Name | Motor_manufacturer |
| Object Code | VAR |
| Data Type | Visible string |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: - |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | Possible | |
| Units | - | |
| Value Range | - | |
| Default Value | AMC | |
| Substitute Value | - | |

- OBJECT 6410H: MOTOR_DATA

This object contains the motor data. See /3/ for a detailed description.

| | |
|---|---|
| Index | 6410h |
| Name | Motor_data |
| Object Code | RECORD |
| Number of Elements | 64 |

Value Description:

The first set of sub-indexes is used to store brush type motor data.

| | |
|---|---|
| Sub-Index | 01h (same as 6402h) |
| Description | Motor_type |
| Object Class | Manufacturer Specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | - |
| Default Value | - |
| Substitute Value | - |
| Data Type | Integer16 |

| | | | |
|---|---|---|---|
| Sub-Index | 02h (same as 6404h) | 03h (same as 6403h) | 04h |
| Description | Motor manufacturer | Motor part number | Back-EMF constant |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | - | Volts/rad/sec |
| Value Range | - | - | - |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Visible string | Visible string | Float32 |

| Sub-Index | 05h | 06h | 07h |
|---|---|---|---|
| Description | Torque constant | Armature resistance | Armature inductance |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | Nm/A | Ohm | Henry |
| Value Range | - | - | - |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Float32 | Float32 | Float32 |

| Sub-Index | 08h | 09h | 0Ah |
|---|---|---|---|
| Description | Thermal time constant | Maximum current | Maximum speed |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | Seconds | Amperes | Revolutions per second |
| Value Range | - | - | - |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Float32 | Float32 | Float32 |

| Sub-Index | 0Bh | 0Ch | 0Dh |
|---|---|---|---|
| Description | Maximum current at maximum speed | Rated current | Inertia |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | Amperes | Amperes | $Kg.m^2$ |
| Value Range | - | - | - |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Float32 | Float32 | Float32 |

| Sub-Index | 0Eh | 19h | 1Ah |
|---|---|---|---|
| Description | Temperature sensor type | Back-EMF constant units | Torque constant units |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | - | - |
| Value Range | - | 0 = V/krpm<br>1 = V/rad/s | 0 = Nm/A<br>1 = oz-in/A<br>2 = lb-in/A |
| Default Value | 0 | 0 | 0 |
| Substitute Value | - | - | - |
| Data Type | Unsigned16 | Unsigned16 | Unsigned16 |

Data Description (for sub-index 0Eh):

| VALUE | DESCRIPTION |
|---|---|
| 0 | No sensor |
| 1 | Normally closed sensor |

| | |
|---|---|
| 2 | Normally open sensor |
| 3 | PTC sensor |
| 4 | NTC sensor |

| Sub-Index | 1Bh | 1Ch | 1Dh |
|---|---|---|---|
| Description | Armature resistance units | Armature inductance units | Thermal time constant units |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | - | - |
| Value Range | 0 = milliOhm<br>1 = Ohm | 0 = milliHenry<br>1 = Henry | 0 = minutes<br>1 = seconds<br>2 = hours |
| Default Value | 0 | 0 | 0 |
| Substitute Value | - | - | - |
| Data Type | Unsigned16 | Unsigned16 | Unsigned16 |

| Sub-Index | 1Eh | 1Fh |
|---|---|---|
| Description | Maximum speed units | Inertia units |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No |
| Units | - | - |
| Value Range | 0 = revolutions per minute<br>1 = revolutions per second<br>2 = radians per second | 0 = $kg.cm^2$<br>1 = $kg.m^2$<br>2 = $oz\text{-}in\text{-}sec^2$<br>3 = $lb\text{-}in\text{-}sec^2$ |
| Default Value | 0 | 0 |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

The following set of sub-indexes is used to store Brushless DC motor data.

| Sub-Index | 21h (same as 6402h) |
|---|---|
| Description | Motor_type |
| Object Class | Manufacturer Specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | - |
| Default Value | 10 |
| Substitute Value | - |
| Data Type | Integer16 |

| Sub-Index | 22h (same as 6404h) | 23h (same as 6403h) | 24h |
|---|---|---|---|
| Description | BLDC Motor manufacturer | BLDC Motor part number | BLDC Back-EMF constant |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | - | Volts/rad/sec |
| Value Range | - | - | - |
| Default Value | - | - | - |

| | | | |
|---|---|---|---|
| Substitute Value | - | - | - |
| Data Type | Visible string | Visible string | Float32 |

| Sub-Index | 25h | 26h | 27h |
|---|---|---|---|
| Description | BLDC Torque constant | BLDC Phase-to-Phase Resistance | BLDC Phase-to-Phase Inductance |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | Nm/A | Ohm | Henry |
| Value Range | - | - | - |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Float32 | Float32 | Float32 |

| Sub-Index | 28h | 29h | 2Ah |
|---|---|---|---|
| Description | BLDC Thermal time constant | BLDC Maximum current | BLDC Maximum speed |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | Seconds | Amperes | Revolutions per second |
| Value Range | - | - | - |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Float32 | Float32 | Float32 |

| Sub-Index | 2Bh | 2Ch | 2Dh |
|---|---|---|---|
| Description | BLDC Pole count | BLDC Rated current | BLDC Inertia |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | Amperes | $Kg.cm^2$ |
| Value Range | - | - | - |
| Default Value | 6 | - | - |
| Substitute Value | - | - | - |
| Data Type | Unsigned16 | Float32 | Float32 |

| Sub-Index | 2Eh | 39h | 3Ah |
|---|---|---|---|
| Description | BLDC Temperature sensor type | BLDC Back-EMF constant units | BLDC Torque constant units |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | - | - |
| Value Range | - | 0 = V/krpm<br>1 = V/rad/s | 0 = Nm/A<br>1 = oz-in/A<br>2 = lb-in/A |
| Default Value | 0 | 0 | 0 |
| Substitute Value | - | - | - |
| Data Type | Unsigned16 | Unsigned16 | Unsigned16 |

Data Description (for sub-index 2Eh):

| VALUE | DESCRIPTION |
|---|---|
| 0 | No sensor |
| 1 | Normally closed sensor |
| 2 | Normally open sensor |
| 3 | PTC sensor |
| 4 | NTC sensor |

| Sub-Index | 3Bh | 3Ch | 3Dh |
|---|---|---|---|
| Description | BLDC Phase-to-Phase Resistance Units | BLDC Phase-to-Phase Inductance Units | BLDC Thermal time constant units |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | - | - |
| Value Range | 0 = milliOhm<br>1 = Ohm | 0 = milliHenry<br>1 = Henry | 0 = minutes<br>1 = seconds<br>2 = hours |
| Default Value | 0 | 0 | 0 |
| Substitute Value | - | - | - |
| Data Type | Unsigned16 | Unsigned16 | Unsigned16 |

| Sub-Index | 3Eh | 3Fh |
|---|---|---|
| Description | BLDC Maximum speed units | BLDC Inertia units |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No |
| Units | - | - |
| Value Range | 0 = revolutions per minute<br>1 = revolutions per second<br>2 = radians per second | 0 = $kg.cm^2$<br>1 = $kg.m^2$<br>2 = $oz\text{-}in\text{-}sec^2$<br>3 = $lb\text{-}in\text{-}sec^2$ |
| Default Value | 0 | 0 |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

The following set of sub-indexes is used to store Brushless AC motor data.

| Sub-Index | 41h (same as 6402h) |
|---|---|
| Description | Motor_type |
| Object Class | Manufacturer Specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | - |
| Default Value | 10 |
| Substitute Value | - |
| Data Type | Integer16 |

| Sub-Index | 42h (same as 6404h) | 43h (same as 6403h) | 44h |
|---|---|---|---|
| Description | BLAC Motor manufacturer | BLAC Motor part number | BLAC Back-EMF constant |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | - | Volts/rad/sec |
| Value Range | - | - | - |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Visible string | Visible string | Float32 |

| Sub-Index | 45h | 46h | 47h |
|---|---|---|---|
| Description | BLAC Torque constant | BLAC Phase-to-Phase Resistance | BLAC Phase-to-Phase Inductance |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | Nm/A | Ohm | Henry |
| Value Range | - | - | - |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Float32 | Float32 | Float32 |

| Sub-Index | 48h | 49h | 4Ah |
|---|---|---|---|
| Description | BLAC Thermal time constant | BLAC Maximum current | BLAC Maximum speed |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | Seconds | Amperes | Revolutions per second |
| Value Range | - | - | - |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Float32 | Float32 | Float32 |

| Sub-Index | 4Bh | 4Ch | 4Dh |
|---|---|---|---|
| Description | BLAC Pole count | BLAC Rated current | BLAC Inertia |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | Amperes | $Kg.cm^2$ |
| Value Range | - | - | - |
| Default Value | 6 | - | - |
| Substitute Value | - | - | - |
| Data Type | Unsigned16 | Float32 | Float32 |

| Sub-Index | 4Eh | 4Fh | 59h | |
|---|---|---|---|---|
| Description | BLAC Temperature sensor type | BLAC Lq/Ld ratio | BLAC Back-EMF constant units | |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific | |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) | |
| PDO Mapping | No | No | No | |
| Units | - | - | - | |
| Value Range | - | - | 0 = V/krpm<br>1 = V/rad/s<br>2 = V/rev/s | 3 = $V_{rms}$/krpm<br>4 =.$V_{rms}$/rad/sec<br>5 = $V_{rms}$/rev/sec |
| Default Value | 0 | - | 0 | |
| Substitute Value | - | - | - | |
| Data Type | Unsigned16 | Float32 | Unsigned16 | |

Data Description (for sub-index 4Eh):

| VALUE | DESCRIPTION |
|---|---|
| 0 | No sensor |
| 1 | Normally closed sensor |
| 2 | Normally open sensor |
| 3 | PTC sensor |
| 4 | NTC sensor |

| Sub-Index | 5Ah | | 5Bh | 5Ch |
|---|---|---|---|---|
| Description | BLAC Torque constant units | | BLAC Phase-to-Phase Resistance Units | BLAC Phase-to-Phase Inductance Units |
| Object Class | Manufacturer Specific | | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | | No | No |
| Units | - | | - | - |
| Value Range | 0 = Nm/A<br>1 = oz-in/A<br>2 = lb-in/A | 3 = Nm/$A_{rms}$<br>4 = oz-in/$A_{rms}$<br>5 = lb-in/$A_{rms}$ | 0 = milliOhm<br>1 = Ohm | 0 = milliHenry<br>1 = Henry |
| Default Value | 0 | | 0 | 0 |
| Substitute Value | - | | - | - |
| Data Type | Unsigned16 | | Unsigned16 | Unsigned16 |

| Sub-Index | 5Dh | 5Eh | 5Fh |
|---|---|---|---|
| Description | BLAC Thermal time constant units | BLAC Maximum speed units | BLAC Inertia units |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | - | - |
| Value Range | 0 = minutes<br>1 = seconds<br>2 = hours | 0 = revolutions per minute<br>1 = revolutions per second<br>2 = radians per second | 0 = kg.$cm^2$<br>1 = kg.$m^2$<br>2 = oz-in-$sec^2$<br>3 = lb-in-$sec^2$ |
| Default Value | 0 | 0 | 0 |
| Substitute Value | - | - | - |
| Data Type | Unsigned16 | Unsigned16 | Unsigned16 |

- OBJECT 6510H: DRIVE_DATA

This object contains the drive data.

| | |
|---|---|
| Index | 6510h |
| Name | Motor_data |
| Object Code | RECORD |
| Number of Elements | 16 |

Value Description

| Sub-Index | 01h | 02h |
|---|---|---|
| Description | Maximum_DC_bus_voltage | Application_DC_bus_voltage |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RO | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | MilliVolts | Volts |
| Value Range | 0…($2^{32}$-1) | - |
| Default Value | Drive Dependent | - |
| Substitute Value | - | - |
| Data Type | Unsigned32 | Float32 |

| Sub-Index | 03h | 04h |
|---|---|---|
| Description | Under_voltage_limit | Over_voltage_limit |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RO | RO |
| PDO Mapping | No | No |
| Units | MilliVolts | MilliVolts |
| Value Range | 0…($2^{32}$-1) | 0…($2^{32}$-1) |
| Default Value | Drive Dependent | Drive Dependent |
| Substitute Value | - | - |
| Data Type | Unsigned32 | Unsigned32 |

| Sub-Index | 05h | 06h |
|---|---|---|
| Description | Programmable_under_voltage_limit | Programmable_over_voltage_limit |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | MilliVolts | MilliVolts |
| Value Range | 0…($2^{32}$-1) | 0…($2^{32}$-1) |
| Default Value | - | - |
| Substitute Value | - | - |
| Data Type | Unsigned32 | Unsigned32 |

| Sub-Index | 07h | 08h |
|---|---|---|
| Description | Drive_peak_current | Drive_continuous_current |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RO | RO |
| PDO Mapping | No | No |
| Units | milli-Amperes | milli-Amperes |
| Value Range | 0…($2^{32}$-1) | 0…($2^{32}$-1) |
| Default Value | Drive Dependent | Drive Dependent |
| Substitute Value | - | - |
| Data Type | Unsigned32 | Unsigned32 |

| Sub-Index | 09h | 0Ah |
|---|---|---|
| Description | Max_peak_current_time | Max_peak_time |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RO | RO |
| PDO Mapping | No | No |
| Units | 100 milliseconds | 100 milliseconds |
| Value Range | 0…65535 | 0…65535 |
| Default Value | Drive Dependent | Drive Dependent |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

| Sub-Index | 0Bh |
|---|---|
| Description | Reduced_drive_peak_current |
| Object Class | Manufacturer Specific |
| Access | RO |
| PDO Mapping | No |
| Units | Milli-Amperes |
| Value Range | $0…(2^{32}-1)$ |
| Default Value | Drive Dependent |
| Substitute Value | - |
| Data Type | Unsigned32 |

| Sub-Index | 0Ch | 0Dh |
|---|---|---|
| Description | Overload_temperature | Overload_temperature_flag_ON |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RO | RO |
| PDO Mapping | No | No |
| Units | 1/10 Celsius | 1/10 Celsius |
| Value Range | 0…65535 | 0…65535 |
| Default Value | Drive Dependent | Drive Dependent |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

| Sub-Index | 0Eh | 0Fh |
|---|---|---|
| Description | Overload_temperature_flag_OFF | Switching_frequency |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RO | RO or RW depending on model |
| PDO Mapping | No | No |
| Units | 1/10 Celsius | Hz |
| Value Range | 0…65535 | 0…65535 |
| Default Value | Drive Dependent | Drive Dependent |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

| Sub-Index | 1Fh |
|---|---|
| Description | Shunt_regulator_voltage |
| Object Class | Manufacturer Specific |
| Access | RW –ALW (SNVM) |
| PDO Mapping | No |
| Units | Millivolts |
| Value Range | Drive dependent |

| | |
|---|---|
| Default Value | 1.1x Application_DC_bus_voltage (sub-index 02h) |
| Substitute Value | - |
| Data Type | Unsigned32 |

- OBJECT 6502H: SUPPORTED_ DRIVE_MODES

See /3/ for a detailed description.

| | |
|---|---|
| Index | 6502h |
| Name | Supported_drive_modes |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: - |
| Access | RO | |
| PDO Mapping | Possible | |
| Units | - | |
| Value Range | $0…(2^{32}-1)$ | |
| Default Value | 1101101b | |
| Substitute Value | - | |

Data Description:

| BIT NUMBER | DESCRIPTION |
|---|---|
| 0 | Profile position mode |
| 1 | Velocity mode |
| 2 | Profile velocity mode |
| 3 | Profile torque mode |
| 4 | Reserved |
| 5 | Homing mode |
| 6 | Interpolated position mode |
| 7 - 21 | Reserved |

- OBJECT 6503H: DRIVE_CATALOGUE_NUMBER

See /3/ for a detailed description.

| | |
|---|---|
| Index | 6503h |
| Name | Drive_catalogue_number |
| Object Code | VAR |
| Data Type | Visible string |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: - |
| Access | RO | |
| PDO Mapping | Possible | |
| Units | - | |
| Value Range | - | |
| Default Value | Drive Dependent | |
| Substitute Value | - | |

- OBJECT 6504H: DRIVE_MANUFACTURER

See /3/ for a detailed description.

| | |
|---|---|
| Index | 6504h |
| Name | Drive_manufacturer |
| Object Code | VAR |
| Data Type | Visible string |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: - |
| Access | RO | |
| PDO Mapping | Possible | |
| Units | - | |
| Value Range | - | |
| Default Value | “AMC” | |
| Substitute Value | - | |

- OBJECT 2001H: USER_DEFINED_DRIVE_NAME

The user can define a drive name up to 32 characters. Each character is encoded via its equivalent ASCII code.

Object Description

| | |
|---|---|
| Index | 2001h |
| Name | User_defined_drive_name |
| Object Code | VAR |
| Data Type | Visible string |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW-ALW (SNVM) |
| PDO Mapping | No |
| Value Range | - |
| Default Value | - |

- OBJECT 2002H: USER_UNITS

This object stores the user units used in the setup and configuration software.

| | |
|---|---|
| Index | 2002h |
| Name | User_units |
| Object Code | RECORD |
| Number of Elements | 8 |

Value Description

| Sub-index | 01h | 02h |
|---|---|---|
| Description | Torque_value | Torque_label |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |

| | | |
|---|---|---|
| Units | - | - |
| Value Range | - | - |
| Default Value | - | - |
| Data Type | Float32 | Visiblestring16 |

| Sub-index | 03h | 04h |
|---|---|---|
| Description | Acceleration_value | Acceleration_label |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | - |
| Value Range | - | - |
| Default Value | - | - |
| Data Type | Float32 | Visiblestring16 |

| Sub-index | 05h | 06h |
|---|---|---|
| Description | Velocity_value | Velocity_label |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | - |
| Value Range | - | - |
| Default Value | - | - |
| Data Type | Float32 | Visiblestring16 |

| Sub-index | 07h | 08h |
|---|---|---|
| Description | Position_value | Position_label |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | - |
| Value Range | - | - |
| Default Value | - | - |
| Data Type | Float32 | Visiblestring16 |

- OBJECT 200EH: ACTIVE_NON-FATAL_ERRORS

Determines which non-fatal errors will affect the Manufacturer_Status_Register (object 1002h). The meaning of each bit is identical to object 1002h (only bits 16 through 31 are valid as the lower bits represent fatal error s, which always affect 1002h). Setting the corresponding bit to 1 means that the error will cause the corresponding bit in the Manufacturer_Status_Register to be set when the error occurs. Setting the corresponding bit to 0 means that the error will not cause the corresponding bit in the Manufacturer_Status_Register to be set when the error occurs.

Object Description

| | |
|---|---|
| Index | 200Eh |
| Name | Active_non-fatal_errors |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |

| | |
|---|---|
| Value Range | - |
| Default Value | E4FFh |

- OBJECT 200FH: ERROR_SELF_RESET

Under normal circumstances, errors are latched and need to be cleared via the controlword. The Error_Self_Reset object allows the drive to clear the error automatically in case the cause of the error has been removed. The bits in the Error_Self_Reset object correspond to the bits of 1002h: Manufacturer_status_register. Setting the bit to 1 means that the corresponding error will be cleared as soon as the cause of the error is removed (basically making them non -latched errors). Bits 0, 1, 2 and 4 (over voltage, under voltage, over current, and checksum error) are not selectable as they indicate a permanent (fatal) error condition, which cannot be cleared automatically. For example: setting bit 24 to 1 means that the encoder error will be reset when the cause of the error is removed. This means that if, after having detected an incorrect number of encoder pulses between two index pulses, the error will be cleared when the correct number of pulses is detected.

Object Description

| | |
|---|---|
| Index | 200Fh |
| Name | Error_Self_Reset |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Value Range | - |
| Default Value | 0 |

- OBJECT 2011H: COMMUTATION_SENSOR_SELECTION_CODE

This object selects the commutation sensor used with brushless motors.

| | |
|---|---|
| Index | 2011h |
| Name | Commutation_sensor_selection_code |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | None |
| Value Range | - |
| Default Value | Model dependent |

Data Description:

| VALUE | SENSOR SELECTION |
|---|---|
| 0 | None |
| 1 | Hall sensors |
| 2 | Hall sensors and encoder |

| | |
|---|---|
| 3 | Encoder only |
| 4 | Sine/cosine encoder (EnDat) |
| 5 | Sine/cosine encoder (Hyperface) |
| 6 | Resolver |

Note: consult the drive hardware manual for available commutation feedback option s.

- OBJECT 2012H: HALL_SENSOR_PARAMETERS

This object configures the Hall sensor parameters.

| | |
|---|---|
| Index | 2012h |
| Name | Hall_sensor_parameters |
| Object Code | RECORD |
| Number of Elements | 2 |

Value Description

| | |
|---|---|
| Sub-index | 01h |
| Description | Hall_sensor_commutation |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | - |
| Default Value | 18h 00h \| 0Eh 00h \| 16h 00h \| 12h 00h \| 06h 00h \| 0Ah 00h \| 02h 00h \| 18h 00h |
| Data Type | Domain 16* |

*The above object must be read via a domain download with 16 -byte data length.

| | |
|---|---|
| Sub-index | 02h |
| Description | Hall_sensor_offset |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | 2*pi/65536 degrees |
| Value Range | -32768…32767 |
| Default Value | 0 |
| Data Type | Integer16 |

Object 2012h-sub02h represents the Hall sensor offset for sinusoidal commutation.

- OBJECT 201FH: HALL_SENSOR_ERROR_OPTION_CODE

This object selects the drive activity in case the Hall sensor error counter reaches an upper limit. See also 2031h and 2032h.

| | |
|---|---|
| Index | 201Fh |
| Name | Hall_sensor_error_option_code |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |

| | |
|---|---|
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | None |
| Value Range | - |
| Default Value | 0h |

Data Description:

| VALUE | ERROR ACTIVITY |
|---|---|
| 0 | None |
| 1 | Disable voltage |
| 2 | Quick stop |
| 3 | Shutdown |
| 4 | Disable operation |
| 5 | Inhibit negative motion |
| 6 | Inhibit positive motion |

- OBJECT 2031H: HALL_SENSOR_ERROR_COUNTER

This object counts the number of Hall sensor errors. The following Hall sensor states are considered invalid (error), depending on the Hall sensor phasing:

| HALL SENSOR PHASING | INVALID STATES |
|---|---|
| 120 degrees | 1 1 1<br>0 0 0 |
| 60 degrees | 1 0 1<br>0 1 0 |

When the Hall_sensor_error_counter reaches the Hall_sensor_error_counter_limit (2032h), bit 26 in the manufacturer status register (1002h) is set to 1, and the Hall_sensor_error_option_code (201Fh) is executed.

| | |
|---|---|
| Index | 2031h |
| Name | Hall_sensor_error_counter |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW |
| PDO Mapping | No |
| Units | None |
| Value Range | 0…Hall_sensor_error_counter_limit (2032h) |
| Default Value | 0h |

- OBJECT 2032H: HALL_SENSOR_ERROR_COUNTER_LIMIT

This object sets the Hall sensor error counter limit. See also 2031h.

| | |
|---|---|
| Index | 2032h |
| Name | Hall_sensor_error_counter_limit |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | None |
| Value Range | 0…65535 |
| Default Value | 1h |

- OBJECT 2015H: RESOLVER_PARAMETERS

This object configures the resolver parameters (only applicable to drives with resolver feedback).

| | |
|---|---|
| Index | 2015h |
| Name | Resolver_parameters |
| Object Code | RECORD |
| Number of Elements | 6 |

Value Description

| | |
|---|---|
| Sub-index | 01h |
| Description | Resolver_excitation_voltage |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | 1mVrms |
| Value Range | 0…65536 |
| Default Value | 4000 |
| Data Type | Unsigned16 |

| | |
|---|---|
| Sub-index | 02h |
| Description | Resolver_excitation_frequency |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | 1 Hz |
| Value Range | 0…65536 |
| Default Value | 4883 |
| Data Type | Unsigned16 |

| | |
|---|---|
| Sub-index | 03h |
| Description | Resolver_transformation_ratio |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | 0.01 |
| Value Range | 0…65536 |
| Default Value | 50 (0.5 transformation ratio) |
| Data Type | Unsigned16 |

| | |
|---|---|
| Sub-index | 04h |
| Description | Resolver_number_of_poles |
| Object Class | Manufacturer specific |

| | |
|---|---|
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | 1 |
| Value Range | 0…65536 |
| Default Value | 2 (2-pole resolver) |
| Data Type | Unsigned16 |

| | |
|---|---|
| Sub-index | 05h |
| Description | Resolver_resolution |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | Number of increments |
| Value Range | $0…2^{32}-1$ |
| Default Value | 4096 (12-bit) |
| Data Type | Unsigned32 |

| | |
|---|---|
| Sub-index | 06h |
| Description | Resolver_position |
| Object Class | Manufacturer specific |
| Access | RO |
| PDO Mapping | No |
| Units | Resolver counts |
| Value Range | $-2^{31}…2^{31}-1$ |
| Default Value | 0 |
| Data Type | Integer32 |

- OBJECT 2013H: ENCODER_PARAMETERS

This object sets the encoder parameters.

| | |
|---|---|
| Index | 2013h |
| Name | Encoder_parameters |
| Object Code | RECORD |
| Number of Elements | 6 |

Value Description

| Sub-index | 01h | 02h |
|---|---|---|
| Description | Encoder_resolution | Reserved |
| Object Class | Manufacturer specific | Reserved |
| Access | RW – DIS (SNVM) | Reserved |
| PDO Mapping | No | Reserved |
| Units | Encoder lines | Reserved |
| Value Range | 0…1000000 | Reserved |
| Default Value | 2500 | Reserved |
| Data Type | Unsigned32 | Reserved |

| | |
|---|---|
| Sub-index | 03h |
| Description | Encoder_channel_parameters |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |

| | |
|---|---|
| Units | - |
| Value Range | - |
| Default Value | 0 |
| Data Type | Unsigned16 |

Data Description:

| BIT | DESCRIPTION |
|---|---|
| 11 | Encoder scaling |
| 12 | |
| 13 | Set to 1 to invert channel A |
| 14 | Set to 1 to invert channel B |
| 15 | Set to 1 to invert channel I |

| Bit 11 | Bit 12 | Multiplier |
|---|---|---|
| 0 | 0 | X4 |
| 0 | 1 | X2 |
| 1 | 0 | X2 |
| 1 | 1 | X1 |

| Sub-index | 04h | 05h | 06h |
|---|---|---|---|
| Description | Encoder_comp_1 | Encoder_comp_2 | Encoder_comp_3 |
| Object Class | Manufacturer specific | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW(SNVM) | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No | No |
| Units | 360/2^16 | 360/2^16 | 360/2^16 |
| Value Range | 2^14 ± 0.1*2^14 | 2^15 ± 0.1*2^14 | 2^15 + 2^14 ± 0.1*2^14 |
| Default Value | 2^14 | 2^15 | 2^15 + 2^14 |
| Data Type | Unsigned16 | Unsigned16 | Unsigned16 |

Data Description

Encoder_comp_1, 2, and 3 allow for compensation of encoder inaccuracies, which are most noticeable at very low speed. These parameters are best configured via the configuration software.

- OBJECT 2020H: ENCODER_COUNTER

This object contains the number of encoder counts. Since this object has read/write access, it can be reset to zero by the user.

| Index | 2020h |
|---|---|
| Name | Encoder_counter |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| Object Class | Manufacturer specific |
|---|---|
| Access | RW – ALW |
| PDO Mapping | No |
| Units | Encoder counts |
| Value Range | $(-2^{32})\ldots(2^{32}-1)$ |
| Default Value | 0 |

- OBJECT 2021H: ENCODER_POSITION

This object contains the number of encoder counts relative to the encoder index.

| | |
|---|---|
| Index | 2021h |
| Name | Encoder_position |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RO |
| PDO Mapping | No |
| Units | Encoder counts |
| Value Range | $(-2^{32})\ldots(2^{32}-1)$ |
| Default Value | 0 |

- OBJECT 2022H: ENCODER_INDEX_COUNTER

This object contains the number of encoder index occurrences (this is also equivalent to the absolute number of encoder turns). Since this object has read/write access, it can be reset to zero by the user.

| | |
|---|---|
| Index | 2022h |
| Name | Encoder_index_counter |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…65535 |
| Default Value | 0 |

- OBJECT 2027H: ENCODER_ERROR_OPTION_CODE

This object selects the drive activity in case the encoder error counter reaches an upper limit. See also 2023h and 2024h.

| | |
|---|---|
| Index | 2027h |
| Name | Encoder_error_option_code |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | None |
| Value Range | - |
| Default Value | 0 |

Data Description:

| VALUE | ERROR ACTIVITY |
|---|---|
| 0 | None |
| 1 | Disable voltage |
| 2 | Quick stop |
| 3 | Shutdown |
| 4 | Disable operation |
| 5 | Inhibit negative motion |
| 6 | Inhibit positive motion |

- OBJECT 2023H: ENCODER_ERROR_COUNTER

This object counts the number of encoder errors. The drive uses the encoder index channel (channel I) to perform an integrity check. When the encoder_error_counter reaches the encoder_error_counter_limit (2024h), bit 24 in the manufacturer status register (1002h) is set to 1, and the enc oder_error_option_code (2027h) is executed.

| | |
|---|---|
| Index | 2023h |
| Name | Encoder_error_counter |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW |
| PDO Mapping | No |
| Units | None |
| Value Range | 0…encoder_error_counter_limit (2024h) |
| Default Value | 0 |

- OBJECT 2024H: ENCODER_ERROR_COUNTER_LIMIT

This object sets the encoder error counter limit. See also 2023h.

| | |
|---|---|
| Index | 2024h |
| Name | Encoder_error_counter_limit |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | None |
| Value Range | 0…65535 |
| Default Value | 1 |

- OBJECT 2014H: AUXILIARY_ENCODER_PARAMETERS

This object sets the auxiliary encoder parameters.

| | |
|---|---|
| Index | 2014h |
| Name | Auxiliary_encoder_parameters |
| Object Code | RECORD |
| Number of Elements | 2 |

Value Description

| | |
|---|---|
| Sub-index | 01h |
| Description | Auxiliary_encoder_resolution |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | Encoder lines |
| Value Range | 0…1000000 |
| Default Value | 1500 |
| Data Type | Unsigned32 |

Defines the auxiliary encoder resolution in counts per encoder revolution.

| | |
|---|---|
| Sub-index | 02h |
| Description | Invert_auxiliary_encoder_input |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | - |
| Default Value | 0 |
| Data Type | Unsigned16 |

Data Description

| BIT | DESCRIPTION |
|---|---|
| 13 | Set to 1 to invert channel A |
| 14 | Set to 1 to invert channel B |
| 15 | Set to 1 to invert channel I |

- OBJECT 2028H: AUXILIARY_ENCODER_COUNTER

This object contains the number of auxiliary encoder counts. Since this object has read/write access, it can be reset to zero by the user.

| | |
|---|---|
| Index | 2028h |
| Name | Auxiliary_encoder_counter |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW |
| PDO Mapping | No |
| Units | Counts |
| Value Range | $(-2^{32})…(2^{32}-1)$ |
| Default Value | 0 |

- OBJECT 2029H: AUXILIARY_ENCODER_POSITION

This object contains the number of auxiliary encoder counts relative to the auxiliary encoder index.

| | |
|---|---|
| Index | 2029h |
| Name | Auxiliary_encoder_position |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RO |
| PDO Mapping | No |
| Units | Counts |
| Value Range | $(-2^{32})\ldots(2^{32}-1)$ |
| Default Value | 0 |

- OBJECT 202AH: AUXILIARY_ENCODER_INDEX_COUNTER

This object contains the number of auxiliary encoder index occurrences (this is also equivalent to the absolute number of auxiliary encoder turns). Since this object has read/write access, it can be reset to zero by the user.

| | |
|---|---|
| Index | 202Ah |
| Name | Auxiliary_encoder_index_counter |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…65535 |
| Default Value | 0 |

- OBJECT 2030H: AUXILIARY_ENCODER_ERROR_OPTION_CODE

This object selects the drive activity in case the auxiliary encoder error counter reaches an upper limit. See also 202Bh and 202Ch.

| | |
|---|---|
| Index | 2030h |
| Name | Auxiliary_encoder_error_option_code |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |

| | |
|---|---|
| Units | None |
| Value Range | - |
| Default Value | 0 |

Data Description:

| VALUE | ERROR ACTIVITY |
|---|---|
| 0 | None |
| 1 | Disable voltage |
| 2 | Quick stop |
| 3 | Shutdown |
| 4 | Disable operation |
| 5 | Inhibit negative motion |
| 6 | Inhibit positive motion |

- OBJECT 202BH: AUXILIARY_ENCODER_ERROR_COUNTER

This object counts the number of auxiliary encoder errors. The drive uses the auxiliary encoder index channel (cha nnel I) to perform an integrity check. When the auxiliary_encoder_error_counter reaches the auxiliary_encoder_error_counter_limit (202Ch), bit 25 in the manufacturer status register (1002h) is set to 1, and the auxiliary_encoder_error_option_code (2030h) is executed.

| | |
|---|---|
| Index | 202Bh |
| Name | Auxiliary_encoder_error_counter |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW |
| PDO Mapping | No |
| Units | None |
| Value Range | 0…auxiliary_encoder_error_counter_limit (202Ch) |
| Default Value | 0 |

- OBJECT 202CH: AUXILIARY_ENCODER_ERROR_COUNTER_LIMIT

This object sets the auxiliary encoder error counter limit. See also 202Bh.

| | |
|---|---|
| Index | 202Ch |
| Name | Auxiliary_encoder_error_counter_limit |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | None |
| Value Range | 0…65535 |
| Default Value | 0 |

- OBJECT 2040H: DIP-SWITCH_SETTINGS

This object corresponds to the DIP-switch settings (switch 1…8). ON=1, OFF=0.

| | |
|---|---|
| Index | 2040h |
| Name | DIP-Switch_settings |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RO |
| PDO Mapping | No |
| Units | None |
| Value Range | 0…65535 |
| Default Value | Switch setting dependent |

- OBJECT 20A0H: PROGRAMMABLE_DIGITAL_INPUTS

Read the level of the programmable digital inputs. See drive hardware manual for number of di gital inputs.

Object Description

| | |
|---|---|
| Index | 20A0h |
| Name | Programmable_digital_inputs |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RO |
| PDO Mapping | Possible |
| Units | None |
| Value Range | - |
| Default Value | Input dependent |

Data Description

Nth bit = programmable digital input N logic level

- OBJECT 20A1H: PROGRAMMABLE_DIGITAL_OUTPUTS

Read or write the level of the programmable digital outputs. See drive manual for nu mber of digital outputs.

Object Description

| | |
|---|---|
| Index | 20A1h |
| Name | Programmable_digital_outputs |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | Possible |
| Units | None |
| Value Range | - |
| Default Value | 0 |

Data Description

Nth bit = programmable digital output N logic level

- OBJECT 20A2H : PROGRAMMABLE_ANALOG_INPUTS

Programmable analog input values. See drive manual for number of analog in puts.

Object Description

| | |
|---|---|
| Index | 20A2h |
| Name | Programmable_analog_inputs |
| Object Code | ARRAY |
| Number of Elements | 4 |

Value Description

| | |
|---|---|
| Sub-Index | 01h…04h |
| Description | Programmable_analog_input_N (N = 1…4) |
| Object Class | Manufacturer specific |
| Access | RO |
| PDO Mapping | Possible |
| Units | See below |
| Value Range | -32768…32767 |
| Default Value | Input dependent |
| Data Type | Integer16 |

Data Description:

The sub-indexes above indicate the ADC reading for the respective analog inputs. The actual input voltages can be calculated as follows:

Voltage Input N [Volts] = (Progr_Analog_Input_N + Progr_Analog_Input_Offset_N)*20/$2^{16}$ + Input N offset [Volts]

See 20ACh for analog input offsets (Progr_Analog_Input_Offset_N). Input N offset [Volts] above is the actual offset voltage of input N.

Note: the actual resolution depends on the ADC resolution. See hardware manual.

- OBJECT 20A3H: PROGRAMMABLE_ANALOG_OUTPUTS

Programmable analog output values. See drive hardware manual for number of analog outputs.

Object Description

| | |
|---|---|
| Index | 20A3h |
| Name | Programmable_analog_outputs |
| Object Code | ARRAY |
| Number of Elements | 2 |

Value Description

| | |
|---|---|
| Sub-Index | 01h…02h |
| Description | Programmable_analog_output_N (N = 1…2) |
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | Possible |
| Units | - |
| Value Range | -32768…32767 |
| Default Value | 0 |
| Data Type | Integer16 |

Data Description:

The sub-indexes above indicate the DAC setting for the respective analog outputs. The actual output voltages can be calculated as follows:

$$\text{Voltage-Output-N[Volts]} = (\text{Progr\_Analog\_Output\_N} + \text{Progr\_Analog\_Output\_Offset\_N}) * 20/2^{16} + \text{Output-N-offset[Volts]}$$

See 20AEh for analog output offsets (Progr_Analog_Output_Offset_N). Output -N-offset [Volts] above is the actual offset voltage of output N.

Note: the actual resolution depends on the DAC resolution. See hardware manual.

- OBJECT 20A4H: PROGRAMMABLE_DIGITAL_INPUTS_POLARITY

Changes the programmable digital input polarity. See drive hardware manual for number of digital inputs.

Object Description

| | |
|---|---|
| Index | 20A4h |
| Name | Programmable_digital_inputs_polarity |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | None |
| Value Range | 0…65535 |
| Default Value | 0 |

Data Description

Nth bit = toggle programmable digital input N polarity

- OBJECT 20A5H: PROGRAMMABLE_DIGITAL_INPUTS_FUNCTION

Configures the function(s) of each programmable digital input. See drive hardware manual for number of digital inputs.

Object Description

| | |
|---|---|
| Index | 20A5h |
| Name | Programmable_digital_inputs_function |
| Object Code | ARRAY |
| Number of Elements | 32 |

Value Description

| | |
|---|---|
| Sub-Index | 01h…20h |
| Description | Programmable_digital_input_mask_N (N = 1…32) |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…65535 |
| Default Value | 0 |
| Data Type | Unsigned16 |

Data Description:

Each sub-index entry corresponds to a specific function. The bits in the mask correspond to the programmable digital inputs. A specific function can be assigned to a specific input by setting the corresponding bit to 1. It is possible to assign the same function to multiple inputs and for a single input to have multiple functions.

| SUB-INDEX | FUNCTION |
|---|---|
| 01h | Enable operation |
| 02h | Inhibit positive motion |
| 03h | Inhibit negative motion |
| 04h | Switch on |
| 05h | Disable operation |
| 06h | Shutdown |
| 07h | Disable voltage |
| 08h | Quick stop |
| 09h | Reserved |
| 0Ah | Reserved |
| 0Bh | Reserved |
| 0Ch | Reserved |
| 0Dh | Reserved |
| 0Eh | Reserved |
| 0Fh | Reserved |
| 10h | Reserved |
| 11h – 20h | None |

Example:

To assign the quick stop function to input 4, set sub-index 08h to 1000b (10h).

- OBJECT 20A8H: PROGRAMMABLE_DIGITAL_OUTPUTS_POLARITY

Changes the programmable digital output polarity. See drive hardware manual for number of digital outputs.

Object Description

| | |
|---|---|
| Index | 20A8h |
| Name | Programmable_digital_outputs_polarity |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |

| | |
|---|---|
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | None |
| Value Range | 0…65535 |
| Default Value | 0 |

Data Description

Nth bit = toggle programmable digital output N polarity

- OBJECT 20A9H: PROGRAMMABLE_DIGITAL_OUTPUTS_FUNCTION

Configures the function(s) of each programmable digital output. See drive hardware manual for number of digital outputs.

Object Description

| | |
|---|---|
| Index | 20A9h |
| Name | Programmable_digital_outputs_function |
| Object Code | ARRAY |
| Number of Elements | 32 |

Value Description

| | |
|---|---|
| Sub-Index | 01h…20h |
| Description | Programmable_digital_output_mask_N (N = 1…32) |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…65535 |
| Default Value | 0 |
| Data Type | Unsigned16 |

Data Description:

Each sub-index entry corresponds to a specific function. The bits in the mask correspond to the programmable digital outputs. A specific function can be assigned to a specific output by setting the corresponding bit to 1. It is possible to assign the same function to multiple outputs and for a single output to have multiple functions.

| SUB-INDEX | FUNCTION |
|---|---|
| 01h | Fatal error |
| 02h | Non fatal error |
| 03h | Brake disable |
| 04h | Clutch enable |
| 05h | In position |
| 06h | At speed |
| 07h | Zero speed |
| 08h | Regenerative operation |
| 09h | Over voltage |
| 0Ah | Under voltage |
| 0Bh | Over current |
| 0Ch | Over temperature |
| 0Dh | Overload |
| 0Eh | Over speed |
| 0Fh | Excessive position following error |

| | |
|---|---|
| 10h | Excessive velocity following error |
| 11h | Motor over temperature |
| 12h | Encoder error |
| 13h | Auxiliary encoder error |
| 14h | Hall sensor error |
| 15h | Negative limit switch active |
| 16h | Positive limit switch active |
| 17h | Negative software limit switch active |
| 18h | Positive software limit switch active |
| 19h – 20h | None |

Example:

To assign the In-position function to output 3, set sub-index 05h to 100b (4h).

- OBJECT 20ACH: PROGRAMMABLE_ANALOG_INPUT_PARAMETERS

Programmable analog input parameters. See drive hardware manual for number of analog inputs.

Object Description

| | |
|---|---|
| Index | 20ACh |
| Name | Programmable_analog_input_parameters |
| Object Code | ARRAY |
| Number of Elements | 4 |

Value Description

| | |
|---|---|
| Sub-Index | 01h…04h |
| Description | Programmable_Analog_Input_Offset_N (N = 1…4) |
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | $20/2^{16}$ |
| Value Range | -32768…32767 |
| Default Value | 0 |
| Data Type | Integer16 |

- OBJECT 20AEH: PROGRAMMABLE_ANALOG_OUTPUT_PARAMETERS

Object Description

| | |
|---|---|
| Index | 20AEh |
| Name | Programmable_analog_output_parameters |
| Object Code | RECORD |
| Number of Elements | 6 |

Value Description

| Sub-Index | 01h | 02h |
|---|---|---|
| Description | Function_output_1 | Offset_output_1 |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | $20/2^{16}$ Volts |
| Value Range | 0…65535 | -32768…32767 |

| | | |
|---|---|---|
| Default Value | 1 | 0 |
| Data Type | Unsigned16 | Integer16 |

| Sub-Index | 03h | 04h |
|---|---|---|
| Description | Function_output_2 | Offset_output_2 |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | $20/2^{16}$ Volts |
| Value Range | 0…65535 | -32768…32767 |
| Default Value | 1 | 0 |
| Data Type | Unsigned16 | Integer16 |

Data Description (sub-index 01h and 03h):

| VALUE | OUTPUT FUNCTION |
|---|---|
| 0 | NOT_INSTALLED |
| 1 | NOT_ASSIGNED |
| 2 | ACTUAL_VOLTAGE_A_TO_B |
| 3 | ACTUAL_VOLTAGE_B_TO_C |
| 4 | ACTUAL_VOLTAGE_C_TO_A |
| 8 | ACTUAL_VOLTAGE_Q |
| 10 | TARGET_CURR_Q |
| 12 | REFERENCE_CURR_Q |
| 14 | ACTUAL_CURR_A |
| 15 | ACTUAL_CURR_B |
| 16 | ACTUAL_CURR_C |
| 19 | ACTUAL_CURR_Q |
| 20 | TARGET_TRQ |
| 21 | DEMAND_TRQ |
| 22 | ACTUAL_TRQ |
| 23 | ACTUAL_ABS_TRQ |
| 26 | TARGET_VELOCITY |
| 27 | DEMAND_VELOCITY |
| 28 | REFERENCE_VELOCITY |
| 29 | ACTUAL_VELOCITY |
| 30 | TARGET_POSITION |
| 31 | DEMAND_POSITION |
| 32 | REFERENCE_POSITION |
| 33 | ACTUAL_POSITION |
| 34 | POWER_STAGE_TEMP |

| Sub-Index | 05h | 06h |
|---|---|---|
| Description | Scale_factor_output_1 | Scale_factor_output_2 |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | - |
| Value Range | $(-2^{32})…(2^{32}-1)$ | $(-2^{32})…(2^{32}-1)$ |
| Default Value | 65536 | 65536 |
| Data Type | Integer32 | Integer32 |

- OBJECT 20C2H: POWER_STAGE_TEMPERATURE

The “power stage temperature” object gives the drive’s output power stage temperature.

Object Description

| | |
|---|---|
| Index | 20C2h |
| Name | Power_stage_temperature |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RO |
| PDO Mapping | No |
| Units | 0.1 Kelvin |
| Value Range | 0…65535 |
| Default Value | - |

- OBJECT 20C8H: COMMUNICATION_CONTROL

This object allows configuration of CANopen specific communication features.

Object Description

| | |
|---|---|
| Index | 20C8h |
| Name | Communication_control |
| Object Code | RECORD |
| Number of Elements | 7 |

Value Description

| | |
|---|---|
| Sub-Index | 01h |
| Description | CAN_bus_bit_rate |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…65535 |
| Default Value | Drive dependent |
| Data Type | Unsigned16 |

Data Description:

| | |
|---|---|
| Sub-Index | 02h |
| Description | CANopen_protocol_options |
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…65535 |
| Default Value | 101h |
| Data Type | Unsigned16 |

Data Description:

| BIT | DESCRIPTION |
|---|---|
| 0 | SDO protocol size indication: 1 = yes ; 0 = no |
| 8 | PDO selection:<br>1 = Transmit PDO 21, 22, or 23 can be sent<br>0 = Transmit PDO 3, 4, or 5 can be sent |

| | |
|---|---|
| Sub-Index | 03h |
| Description | TPDO_cycle_time (TPDO 3-23) |
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | milliseconds |
| Value Range | 0…65535 |
| Default Value | 0 |
| Data Type | Unsigned16 |

Data Description:

Sets the cycle time of TPDO 21, 22, and 23 (or TPDO 3, 4, and 5). If the cycle time is set to 0, no PDO will be transmitted based on elapsed time.

| | |
|---|---|
| Sub-Index | 04h |
| Description | TPDO_incremental_position_change |
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | Position units |
| Value Range | $(-2^{31})$ … $(2^{31}-1)$ |
| Default Value | 7FFFFFFFh |
| Data Type | Integer32 |

Data Description:

Sets the incremental position change required to send TPDO 3 or 21 (depending on bit 8 in sub -index 02h).
A negative value means that the PDO is disabled . A value of 0 means continuous transmission.

| | |
|---|---|
| Sub-Index | 05h |
| Description | TPDO_cycle_time (TPDO 26) |
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | Milliseconds |
| Value Range | 0…65535 |
| Default Value | 0 |
| Data Type | Unsigned16 |

Data Description:

Sets the cycle time of transmit PDO 26. If the cycle time is set to 0, no PDO will be transmitted based on elapsed time.

| | |
|---|---|
| Sub-Index | 08h |
| Description | TPDO_buffer_position_limit |

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…65535 |
| Default Value | 0 |
| Data Type | Unsigned16 |

Data Description:

Sets the buffer position limit required to send TPDO 24.

| | |
|---|---|
| Sub-Index | 0Fh |
| Description | Communication error option code |
| Object Class | Manufacturer specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…65535 |
| Default Value | 0 |
| Data Type | Unsigned16 |

Data Description:

| VALUE | ERROR ACTIVITY |
|---|---|
| 0 | None |
| 1 | Disable voltage |
| 2 | Quick stop |
| 3 | Shutdown |
| 4 | Disable operation |
| 5 | Inhibit negative motion |
| 6 | Inhibit positive motion |

- OBJECT 208FH: LOAD_INERTIA

This object stores the load inertia.

| | |
|---|---|
| Index | 208Fh |
| Name | Load inertia |
| Object Code | RECORD |
| Number of Elements | 2 |

Value Description

| | |
|---|---|
| Sub-index | 01h |
| Description | Load inertia |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | no |
| Units | $Kg.m^2$ |
| Value Range | - |
| Default Value | 0 |
| Data Type | Float32 |

| | |
|---|---|
| Sub-index | 02h |
| Description | Load inertia user units |
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…3 |
| Default Value | 0 |
| Data Type | Unsigned16 |

Data Description

| VALUE | INERTIA UNITS |
|---|---|
| 0 | $Kg.cm^2$ |
| 1 | $Kg.m^2$ |
| 2 | $Oz\text{-}in\text{-}sec^2$ |
| 3 | $Lb\text{-}in\text{-}sec^2$ |

### 8.2 DEVICE CONTROL OBJECTS

- OBJECT 6040H: CONTROLWORD

See /3/ for a detailed description.

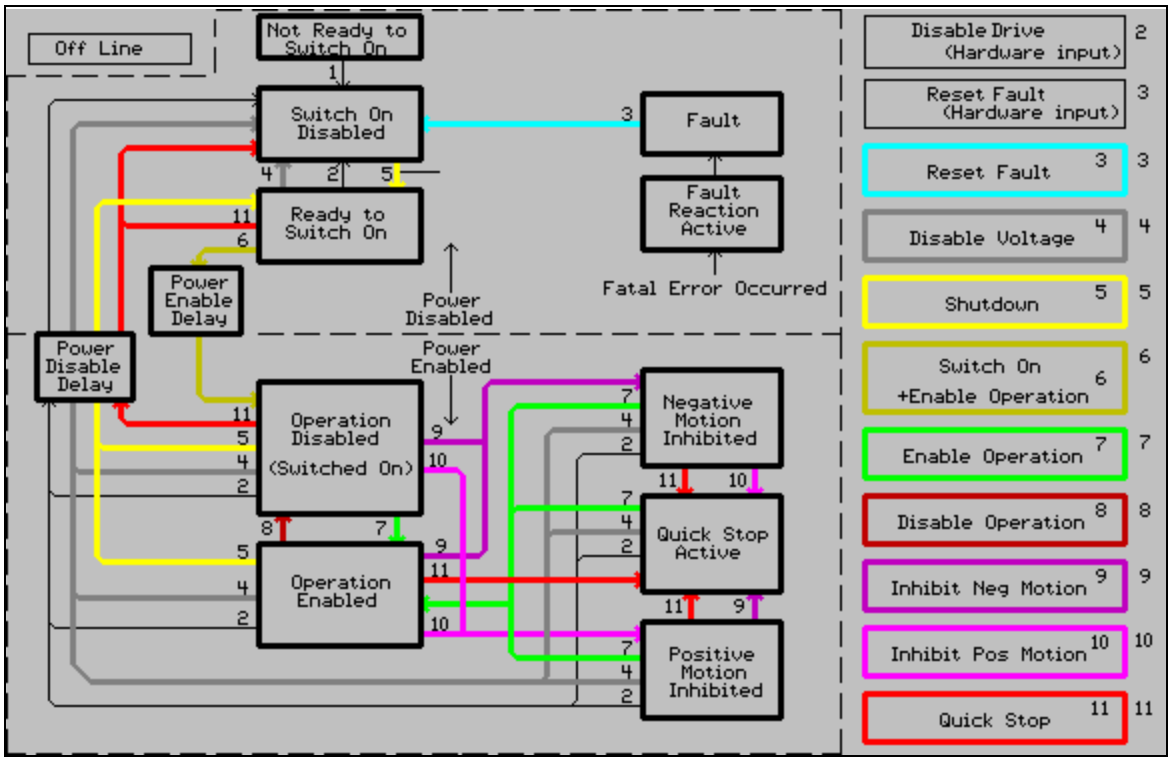
| | |
|---|---|
| Index | 6040h |
| Name | Controlword |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:all | O: - |
| Access | RW – ALW | |
| PDO Mapping | Possible | |
| Units | - | |
| Value Range | 0…65535 | |
| Default Value | State dependent | |
| Substitute Value | - | |

Data Description:

The controlword is used to control the drive internal state machine. Below is a graphical overview of the state machine:




The state changes can be made via the controlword. Certain state changes occur due to internal events (e.g. internal error). The different states (bold) and state changes (Italic) are as follows:

**Not Ready to Switch On:** Logic Supply has been applied to the drive. The drive is being initialized or is running self - test. The drive functions are disabled. Transition to **Switch On Disabled** state is automatic when drive initialization is complete.

**Switch On Disabled:** Drive initialization is complete. The indicator LED of the drive lights red or green. The drive function is disabled. If a fatal error exists, the LED lights red, and the processor e xecutes a Reset Fault command automatically. If no fatal error occurs the Drive Ready signal becomes active, and the LED lights green. Transition to the **Ready to Switch On** state is possible by a *Shut Down (5)* command, if the drive is enabled via the *Drive Enable Input (2)* (see hardware manual for Drive Enable input). Transition (5) is automatic (does not require a *Shut Down* command) if bit 13 of 20C5h: auxiliary control word is set to 1.

**Ready to Switch On:** No energy is supplied to the motor. Control loops do not work. The drive function is disabled. Transition to **Operation Disabled (Switched ON)** state is possible via the *Switch On (6)* command. The *Switch On (6)* command starts the "Power Enable Delay" process. The delay parameters can be set in 20C1h: delay _times. When the delay sequence is finished the drive goes to the **Operation Disabled (Switched On)** state. Transition back to the **Switch On Disabled** state is possible via the *Disable Voltage (4)* command, by the *Drive Enable Input (2),* or by a *Quick Stop (11)* command.

**Operation Disabled (Switched On):** The control loops are operational; power is applied to the motor. The drive function is enabled. The target signal is not processed. The motor shaft is held in position in position mode or at zero velocity in v elocity mode. No torque is applied in torque mode. Transition to the **Operation Enabled** state is possible via the *Enable Operation (7)* command. Transition back to the **Ready to Switch On** state is equally possible via the *Shut Down (5)* command. Transition back to the **Switch On Disabled** state is possible via the *Disable Voltage (4)* command, via a *Quick Stop (11)* command or via the *Drive Enable Input (2)*. Each transition goes via the "Power Disable Delay" process. The delay can be set in 20C1h: delay_times.

**Operation Enabled:** The drive function is enabled and power is supplied to the motor. Control loops are operational and target signals are processed. A *Quick Stop (11)* command transfers the drive to the **Quick Stop Active** state. Transition to the **Negative Motion Inhibited** state is possible via the *Inhibit Negative Motion (9)* command. Transition to the **Positive Motion Inhibited** state is possible via the *Inhibit Positive Motion (10)* command. Transition back to the **Ready to Switch On** state is possible via the *Shut Down (5)* command (which includes the "Power Disable Delay" process). Transition back to the **Switch On Disabled** state is possible via the *Disable Voltage (4)* command or the *Drive Enable Input (2)* (in both cases the "Power Disable Delay" process is includ ed). Transition back to the **Operation Disabled** state is possible via the *Disable Operation (8)* command.

**Quick Stop Active:** Control loops are operational; power is applied to the motor. The drive function is enabled. The motor (shaft) is brought to a stop using the Quick Stop Ramp. Target signals are not processed. The motor shaft is held in position in position mode or at zero velocity in velocity mode. No torque is applied in torque mode. Transition to the **Negative or Positive Motion Inhibited** state is possible via the *Inhibit Negative Motion (9)* or *Inhibit Positive Motion (10)* command respectively. Transition back to the **Operation Enabled** state is possible via the *Enable Operation (7)* command. Transition back to the **Switch On Disabled** state is possible via *the Disable Voltage (4)* command, or via the *Drive Enable Input (2)* (both include the "Power Disable Delay" process).

**Negative Motion Inhibited:** The drive function is enabled and power is supplied to the motor. The motor (shaft) is brought to a stop usin g the Quick Stop Ramp if motion is taking place in the negative direction (positive motion is not affected). Control loops are operational but process only positive demand signals. Transition to the **Quick Stop Active** state is possible via the *Quick Stop (11)* command. Transition back to the **Operation Enabled** state is possible via

the *Enable Operation (7)* command. Transition back to the **Switch On Disabled** state is possible via the *Disable Voltage (4)* command or via the *Drive Enable Input (2)* (both include the "Power Disable Delay" process).

**Positive Motion Inhibited:** The drive function is enabled and power is supplied to the motor. The motor (shaft) is brought to a stop using the Quick Stop Ramp if motion is taking place in the positive direction (negative motion is not affected). Control loops are operational but process only negative demand signals. Transition to the **Quick Stop Active** state is possible via the *Quick Stop (11)* command. Transition back to the **Operation Enabled** state is possible via the *Enable Operation (7)* command. Transition back to the **Switch On Disabled** state is possible via the *Disable Voltage (4)* command or via the *Drive Enable Input (2)* (both include the "Power Disable Delay" process).

**Fault Reaction Active:** A fatal error has occurred. No further action is undertaken by the drive (unlike the non-fatal errors which have an error option code for the specific error). Transition to the **Fault** state is automatic.

**Fault:** A fault has occurred and has not yet been reset. The power output stage is disabled; no energy is supplied to the motor. Transition to the **Switch On Disabled** state is possible via the *Reset Fault (3)* command.

The state machine transitions involve the following bit patterns:

| State Transition | Bit 0 | Bit 1 | Bit 2 | Bit 3 | Bit 7 | Bit 12 | Bit 13 |
|---|---|---|---|---|---|---|---|
| Reset Fault | X | X | X | X | 0→1 | X | X |
| Disable Voltage | X | 0 | X | X | 0 | X | X |
| Shutdown | 0 | 1 | 1 | X | 0 | X | X |
| Switch On | 1 | 1 | 1 | X | 0 | X | X |
| Enable Operation | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| Disable Operation | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| Inhibit Negative Motion | 1 | 1 | 1 | 1 | 0 | 1 | 0 |
| Inhibit Positive Motion | 1 | 1 | 1 | 1 | 0 | 0 | 1 |
| Quick Stop | X | 1 | 0 | X | 0 | X | X |

0 = OFF, 1 = ON, X = don't care

The remaining bits have the following functions:

| Bit | Function |
|---|---|
| 4 | Start homing (in homing/velocity mode, with the homing routine as command source) |
| 5 | |
| 6 | |
| 14 | Toggle brake output (applicable only if bit 14 in the auxiliary control word is OFF and an output is selected as a brake output) |
| 15 | Toggle clutch output (applicable only if bit 15 in the auxiliary control word is OFF and an output is selected as a clutch output) |

- OBJECT 20C4H: CONTROLWORD_INITIAL_VALUE

Initial value of the controlword upon power-up or after reset.

| Index | 20C4h |
|---|---|
| Name | Controlword_initial_value |
| Object Code | VAR |

| Data Type | Unsigned16 |
|---|---|

Value Description

| Object Class | Manufacturer Specific |
|---|---|
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…65535 |
| Default Value | 0000000010000000b |
| Substitute Value | - |

- OBJECT 20C5H: AUXILIARY_CONTROLWORD

This object is an extension of the standard controlword (6040h) and can be used to enable additional, manufacturer specific functions.

| Index | 20C5h |
|---|---|
| Name | Auxiliary_controlword |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| Object Class | Manufacturer Specific |
|---|---|
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…65535 |
| Default Value | State dependent |
| Substitute Value | - |

Data Description:

| Bit | Function |
|---|---|
| 11 | If set to 1, the transition from Positive/Negative Motion Inhibited or Quick Stop state to Operation Enabled state is not allowed. The drive must first be set to the Switch On Disabled state prior to an Enable Operation state transition. This feature avoids unexpected motion after the cause of the Positive/Negative Motion Inhibited or Quick Stop state transitions are removed. |
| 12 | 0→1 will reset the position to zero |
| 13 | If set to 1 (ON), the transition from Switch On Disabled to Ready To Switch ON is made automatically. |
| 14 | If set ON, the brake output will automatically toggle when the drive transitions between the power enabled/disabled states. The brake disable and enable delays are applied (see Delay below). |
| 15 | If set ON, the clutch output will automatically toggle when the drive transitions between the power enabled/disabled states. The clutch disable and enable delays are applied (see Delay below). |

Note: this object can be stored in non-volatile memory (see 1010h), and hence does not require a separate initial value.

- OBJECT 6041H: STATUSWORD

See /3/ for a detailed description.

| Index | 6041h |
|---|---|

| | |
|---|---|
| Name | Statusword |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:all | O: - |
| Access | RO | |
| PDO Mapping | Possible | |
| Units | - | |
| Value Range | 0…65535 | |
| Default Value | State dependent | |
| Substitute Value | - | |

Data Description:

| Bit | Description |
|---|---|
| 0 | Ready To Switch On state indicator |
| 1 | Switched On state indicator |
| 2 | Operation Enabled state indicator |
| 3 | Fault state indicator |
| 4 | Voltage Enabled state indicator |
| 5 | Quick Stop state indicator |
| 6 | Switch On Disabled state indicator |
| 7 | Warning indicator |
| 8 | Delay State |
| 9 | |
| 10 | Target Reached: set if a set point has been reached. |
| 11 | |
| 12 | Home Attained: set if homing completed successfully. |
| 13 | Homing Error: set if an error occurred during homing. |
| 14 | Capture: toggles when capture event occurs |
| 15 | |

- OBJECT 605AH: QUICK_STOP_OPTION_CODE

See /3/ for a detailed description. This object is not yet implemented.

| | |
|---|---|
| Index | 605Ah |
| Name | Quick_stop_option_code |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: all |
| Access | RW – DIS | |
| PDO Mapping | No | |
| Units | - | |
| Value Range | -32768…32767 | |
| Default Value | 6 | |
| Substitute Value | - | |

Data Description:

| VALUE | ACTION |
|---|---|
| 6 | Slow down on slow down ramp and stay in quick -stop |

- OBJECT 605BH: SHUTDOWN_OPTION_CODE

See /3/ for a detailed description. This object is not yet implemented.

| | |
|---|---|
| Index | 605Bh |
| Name | Shutdown_option_code |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: all |
| Access | RW – DIS | |
| PDO Mapping | No | |
| Units | - | |
| Value Range | -32768…32767 | |
| Default Value | 1 | |
| Substitute Value | - | |

Data Description:

| VALUE | ACTION |
|---|---|
| 1 | Slow down on slow down ramp and disable the drive function |

- OBJECT 605CH: DISABLE_OPERATION_OPTION_CODE

See /3/ for a detailed description. This object is not yet implemented.

| | |
|---|---|
| Index | 605Ch |
| Name | Disable_operation_option_code |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: all |
| Access | RW – DIS | |
| PDO Mapping | No | |
| Units | - | |
| Value Range | -32768…32767 | |
| Default Value | 1 | |
| Substitute Value | - | |

Data Description:

| VALUE | ACTION |
|---|---|
| 1 | Slow down on slow down ramp and then disabling of the drive function |

- OBJECT 6060H: MODES_OF_OPERATION

The parameter modes_of_operation sets the drive operation mode. See /3/ for additional information.

| | |
|---|---|
| Index | 6060h |
| Name | Modes_of_operation |
| Object Code | VAR |
| Data Type | Integer8 |

Value Description

| | | |
|---|---|---|
| Object Class | M:all | O: - |
| Access | WO – ALW (SNVM) | |
| PDO Mapping | Possible | |
| Units | - | |
| Value Range | -128…127 | |
| Default Value | 04h | |
| Substitute Value | - | |

Data Description:

| VALUE | OPERATION MODE | COMMAND SOURCE |
|---|---|---|
| 01h | Profile Position Mode | Index 607Ah |
| 03h | Profile Velocity Mode | Index 60FFh |
| 04h | Profile Torque Mode | Index 6071h |
| 06h (same as 9F) | Homing Mode | - |
| 07h | Interpolated Position Mode | See PVT Mode |
| 81h | Profile Torque Mode | Analog Input |
| 85h | Profile Torque Mode | Auxiliary encoder |
| 86h | Profile Torque Mode | Step and Direction |
| 87h | Profile Torque Mode | CW/CCW signals |
| 88h (same as 04h) | Profile Torque Mode | Index 6071h |
| 91h | Profile Velocity Mode | Analog Input |
| 95h | Profile Velocity Mode | Auxiliary encoder |
| 96h | Profile Velocity Mode | Step and Direction |
| 97h | Profile Velocity Mode | CW/CCW signals |
| 98h (same as 03h) | Profile Velocity Mode | Index 60FFh |
| 9Fh | Profile Velocity Mode | Homing routine |
| A1h | Profile Position Mode | Analog Input |
| A5h | Profile Position Mode | Auxiliary encoder |
| A6h | Profile Position Mode | Step and Direction |
| A7h | Profile Position Mode | CW/CCW signals |
| A8h (same as 01h) | Profile Position Mode | Index 607Ah |

- OBJECT 6061H: MODES_OF_OPERATION DISPLAY

See /3/ for a detailed description.

| | |
|---|---|
| Index | 6061h |
| Name | Modes_of_operation_display |
| Object Code | VAR |
| Data Type | Integer8 |

Value Description

| Object Class | M:all | O: - |
|---|---|---|
| Access | RO | |
| PDO Mapping | No | |
| Units | - | |
| Value Range | -128…127 | |
| Default Value | - | |
| Substitute Value | - | |

See 6060h (modes_of_operation) for data description.

- OBJECT 2000H: STATUSWORD_1

This is an extension of the standard statusword (6041h) to accommod ate extended drive functionality.

| Index | 2000h |
|---|---|
| Name | Statusword_1 |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| Object Class | Manufacturer Specific |
|---|---|
| Access | RO |
| PDO Mapping | Possible |
| Units | - |
| Value Range | 0…65535 |
| Default Value | State dependent |
| Substitute Value | - |

Data Description:

| Bit | Description |
|---|---|
| 0 | |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | Fatal Error: over current, under voltage, over voltage, over temperature, and checksum error , board init error, excessive drive temperature |
| 6 | Non Fatal Error: overload, over speed, following error, velocity following error, motor over temperature, negative limit switch, positive limit switch, encoder error, auxiliary encoder error, Hall error, negative software limit switch, positive software limit switch, and communicat ion error |
| 7 | In-position: set when target position is reached (valid in position mode only). |
| 8 | At-speed: set when target velocity is reached. |
| 9 | Zero-speed: set when velocity is zero |
| 10 | Regenerative Operation: set when drive is in regeneration mode (dyna mic braking). |
| 11 | |
| 12 | |
| 13 | Power Enabled: indicates power enable/disable per the drive state machine |
| 14 | Brake Disabled: set when brake output is disabled |
| 15 | Clutch Enabled: set when clutch output is enabled |

- OBJECT 2004H: DEDICATED_DIGITAL_INPUTS

This object indicates the status of the dedicated digital inputs (see drive hardware manual).

| | |
|---|---|
| Index | 2004h |
| Name | Dedicated_digital_inputs |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RO |
| PDO Mapping | Possible |
| Units | - |
| Value Range | 0…65535 |
| Default Value | Input dependent |
| Substitute Value | - |

Data Description:

Each bit corresponds to a specific input and is set to 1 when the input is active.

| BIT | DESCRIPTION |
|---|---|
| 0 | Drive Enable (hardware input, see hardware manual) |
| 1 | Fault Reset (hardware input, see hardware manual) |
| 2 | Negative Limit Switch Input (hardware input, see hardware manual) |
| 3 | Positive Limit Switch Input (hardware input, see hardware manual) |
| 4 | Home Switch Input (hardware input, see hardware manual) |
| 5 | Capture |
| 6 | Not used |
| 7 | Not used |
| 8 | Not used |
| 9 | Not used |
| 10 | Not Used |
| 11 | Not Used |
| 12 | Not Used |
| 13 | Hall A Input |
| 14 | Hall B Input |
| 15 | Hall C Input |

- OBJECT 2005H: DEDICATED_DIGITAL_OUTPUTS

This object indicates the status of the dedicated digital outputs (see drive hardware manual).

| | |
|---|---|
| Index | 2005h |
| Name | Dedicated_digital_outputs |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RO |
| PDO Mapping | Possible |
| Units | - |
| Value Range | 0…65535 |

| | |
|---|---|
| Default Value | 0 |
| Substitute Value | - |

Data Description:

| BIT | DESCRIPTION |
|---|---|
| 0 | Drive Ready (hardware output, see hardware manual) |
| 1 | Trigger |
| 2…15 | Not used |

- OBJECT 2006H: DEDICATED_DIGITAL_INPUTS_POLARITY

Configures the logic polarity of the dedicated digital inputs (see 2004h: dedicated_digital_inputs). The bits correspond to the bits in 2004h. Setting the corresponding bit to 1 inverts the polarity.

| | |
|---|---|
| Index | 2006h |
| Name | Dedicated_digital_inputs_polarity |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | Possible |
| Units | - |
| Value Range | 0…65535 |
| Default Value | 0 |
| Substitute Value | - |

- OBJECT 2007H: DEDICATED_DIGITAL_OUTPUTS_POLARITY

Configures the logic polarity of the dedicated digital outputs (see 2005h: dedicated_digital_outputs). The bits correspond to the bits in 2005h. Setting the corresponding bit to 1 inverts the polarity.

| | |
|---|---|
| Index | 2007h |
| Name | Dedicated_digital_outputs_polarity |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | Possible |
| Units | - |
| Value Range | 0…65535 |
| Default Value | 0 |
| Substitute Value | - |

- OBJECT 2049H: INVERT_COMMAND

This object can be used to invert the command signal. This is applicable to all operating modes and command signal sources.

| | |
|---|---|
| Index | 2049h |
| Name | Invert_command |
| Object Code | VAR |
| Data Type | Unsigned8 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…255 |
| Default Value | 0 |
| Substitute Value | - |

Data Description

| |
|---|
| 0 = do not invert command |
| 1 = invert command |

- OBJECT 20B0H: TRIGGER_AT_VALUE

This object determines the value at which the trigger output will be set. When the selected trigger signal (20B3h) reaches the trigger_at_value, the trigger output will turn on.

| | |
|---|---|
| Index | 20B0h |
| Name | Trigger_at_value |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | $(-2^{32})…(2^{32}-1)$ |
| Default Value | - |
| Substitute Value | - |

- OBJECT 20B1H: CAPTURE_VALUE

This object contains the value of the captured signal (see 20B5h). A capture event (see 20B6h) will toggle bit 14 in the statusword (which will cause a transmit PDO, see 1800h an d 1A00h).

| | |
|---|---|
| Index | 20B1h |
| Name | Capture_value |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RO |

| | |
|---|---|
| PDO Mapping | No |
| Units | - |
| Value Range | $(-2^{32})…(2^{32}-1)$ |
| Default Value | - |
| Substitute Value | - |

- OBJECT 20B3H: TRIGGER_SIGNAL

This object selects the signal that will be used to set the trigger output.

| | |
|---|---|
| Index | 20B3h |
| Name | Trigger_signal |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW |
| PDO Mapping | No |
| Units | - |
| Value Range | -32768…32767 |
| Default Value | 0 |
| Substitute Value | - |

Data Description:

| VALUE | TRIGGER SIGNAL |
|---|---|
| 0 | None |
| 1 | Actual position |
| 2 | Actual velocity |
| 3 | Actual torque |
| 4 | Reference position |
| 5 | Reference velocity |
| 6 | Reference torque |
| 7 | Demand position |
| 8 | Demand velocity |
| 9 | Demand torque |
| 10 | Target position |
| 11 | Target velocity |
| 12 | Target torque |
| 13 | Encoder counter |
| 14 | Auxiliary encoder counter |

- OBJECT 20B5H: CAPTURE_SIGNAL

This object determines which signal will be captured upon a capture event (see 20B6h).

| | |
|---|---|
| Index | 20B5h |
| Name | Capture_signal |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW |
| PDO Mapping | No |
| Units | - |
| Value Range | -32768…32767 |
| Default Value | 0 |
| Substitute Value | - |

Data Description:

| VALUE | CAPTURE SIGNAL |
|---|---|
| 0 | None |
| 1 | Actual position |
| 2 | Actual velocity |
| 3 | Actual torque |
| 4 | Reference position |
| 5 | Reference velocity |
| 6 | Reference torque |
| 7 | Demand position |
| 8 | Demand velocity |
| 9 | Demand torque |
| 10 | Target position |
| 11 | Target velocity |
| 12 | Target torque |
| 13 | Encoder counter |
| 14 | Auxiliary encoder counter |

- OBJECT 20B6H: CAPTURE_EVENT

This object determines what will constitute a capture event. Upon occurrence, the value of the capture signal (20B5h) will be written to object 20B1h. Bit 14 in the status word (6041h) will toggle.

| | |
|---|---|
| Index | 20B6h |
| Name | Capture_event |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | -32768…32767 |
| Default Value | 0 |
| Substitute Value | - |

Data Description:

| VALUE | CAPTURE EVENT |
|---|---|
| 0 | None |
| 1 | Capture input rising edge |
| 2 | Capture input falling edge |
| 3 | Capture input edge (falling or rising) |

| | |
|---|---|
| 4 | Encoder index channel |
| 5 | Auxiliary encoder index channel |

- OBJECT 20C1H: DELAY_TIMES

Configuration of the programmable time delays. See drive hardware manual for output availability.

Object Description

| | |
|---|---|
| Index | 20C1h |
| Name | Delay_times |
| Object Code | ARRAY |
| Number of Elements | 6 |

Value Description

| Sub-Index | 01h | 02h |
|---|---|---|
| Description | Power_enable_delay | Power_disable_delay |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | Milliseconds | Milliseconds |
| Value Range | 0…65535 | 0…65535 |
| Default Value | 0 | 0 |
| Data Type | Unsigned16 | Unsigned16 |

The following sub-indexes apply to the brake and clutch output functions of the programmable digital outputs.

| Sub-Index | 03h | 04h |
|---|---|---|
| Description | brake_active_delay | brake_inactive_delay |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | Milliseconds | Milliseconds |
| Value Range | 0…65535 | 0…65535 |
| Default Value | 0 | 0 |
| Data Type | Unsigned16 | Unsigned16 |

| Sub-Index | 05h | 06h |
|---|---|---|
| Description | Clutch_active_delay | Clutch_inactive_delay |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | Milliseconds | Milliseconds |
| Value Range | 0…65535 | 0…65535 |
| Default Value | 0 | 0 |
| Data Type | Unsigned16 | Unsigned16 |

Data Description:

| | |
|---|---|
| Power Enable Delay: | time delay between issuing the Switch On command and the transition to the Operation Disabled (Switched On) state. |
| Brake Disable Delay: | time delay between issuing the Switch On command and disabling the brake output. |
| Clutch Enable Delay: | time delay between issuing the Switch On command and enabling the clutch |

| | |
|---|---|
| | output. |
| Power Disable Delay: | time delay between issuing the Disable Voltage, the Shutdow n, or hardware disable command and the transition to the Ready To Switch On or Switch On Disabled state. |
| Brake Disable Delay: | time delay between issuing the Disable Voltage, the Shutdown, or a hardware disable command and enabling the brake output. |
| Clutch Enable Delay: | time delay between issuing the Disable Voltage, the Shutdown, or a hardware disable command and disabling the clutch output. |

- OBJECT 20C3H: MOTOR_OVERTEMPERATURE_OPTION_CODE

| | |
|---|---|
| Index | 20C3h |
| Name | Motor_overtemperature_option_code |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…65535 |
| Default Value | 0 |
| Substitute Value | - |

Data Description:

| VALUE | ERROR ACTIVITY |
|---|---|
| 0 | None |
| 1 | Disable voltage |
| 2 | Quick stop |
| 3 | Shutdown |
| 4 | Disable operation |
| 5 | Inhibit negative motion |
| 6 | Inhibit positive motion |

### 8.3 FACTOR GROUP OBJECTS

- OBJECT 6090H: VELOCITY_ENCODER_RESOLUTION

See /3/ for additional information.

| | |
|---|---|
| Index | 6090h |
| Name | Velocity_encoder_resolution |
| Object Code | ARRAY |
| Number of Elements | 2 |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Sub-Index | 01h | |
| Description | Encoder_increments_per_second | |
| Object Class | M:- | O: pp, pc, ip, pv, tq |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | No | |
| Units | Increments/sec | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 10000 | |
| Substitute Value | - | |

| | | |
|---|---|---|
| Sub-Index | 02h | |
| Description | Motor_revolutions_per second | |
| Object Class | M:- | O: pp, pc, ip, pv, tq |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | No | |
| Units | Revolutions/sec | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 1 | |
| Substitute Value | - | |

- OBJECT 608FH: POSITION_ENCODER_RESOLUTION

See /3/ for additional information.

| | |
|---|---|
| Index | 608Fh |
| Name | Position_encoder_resolution |
| Object Code | ARRAY |
| Number of Elements | 2 |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Sub-Index | 01h | |
| Description | Encoder_increments | |
| Object Class | M:- | O: pp, pc, ip, pv, tq |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | No | |
| Units | Increments | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 10000 | |
| Substitute Value | - | |

| | | |
|---|---|---|
| Sub-Index | 02h | |
| Description | Motor_revolutions | |
| Object Class | M:- | O: pp, pc, ip, pv, tq |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | No | |
| Units | Revolutions | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 1 | |
| Substitute Value | - | |

- OBJECT 6093H: POSITION_FACTOR

See /3/ for additional information. This index is used to convert *position units* into the drive internal position units (counts). The *position units* are used by indexes such as 607Ah, 607Ch, 607Dh, etc.

| | |
|---|---|
| Index | 6093h |
| Name | Position_factor |
| Object Code | ARRAY |
| Number of Elements | 2 |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Sub-Index | 01h | |
| Description | Numerator | |
| Object Class | M:- | O: pp, pc, ip |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | - | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 1 | |
| Substitute Value | - | |

| | | |
|---|---|---|
| Sub-Index | 02h | |
| Description | Feed_constant | |
| Object Class | M:- | O: pp, pc, ip |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | - | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 1 | |
| Substitute Value | - | |

- OBJECT 6094H: VELOCITY_ENCODER_FACTOR

See /3/ for additional information. This index is used to convert *velocity units* into the drive internal velocity units (counts/sec). The *velocity units* are used by indexes such as 607Fh, 6081h, 6099h, etc.

| | |
|---|---|
| Index | 6094h |
| Name | Velocity_encoder_factor |
| Object Code | ARRAY |
| Number of Elements | 2 |

| Data Type | Unsigned32 |
|---|---|

Value Description

| Sub-Index | 01h | |
|---|---|---|
| Description | Numerator | |
| Object Class | M:- | O: pv |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | - | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 1 | |
| Substitute Value | - | |

| Sub-Index | 02h | |
|---|---|---|
| Description | Divisor | |
| Object Class | M:- | O: pv |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | - | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 1 | |
| Substitute Value | - | |

- OBJECT 6097H: ACCELERATION_FACTOR

See /3/ for additional information. This index is used to convert *acceleration units* into the drive internal acceleration units (counts/sec/sec). The *acceleration units* are used by indexes such as 60 83h, 6084h, 609Ah, etc.

| Index | 6097h |
|---|---|
| Name | Acceleration_factor |
| Object Code | ARRAY |
| Number of Elements | 2 |
| Data Type | Unsigned32 |

Value Description

| Sub-Index | 01h | |
|---|---|---|
| Description | Numerator | |
| Object Class | M:- | O: pc, pp, ip, pv, tq |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | - | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 1 | |
| Substitute Value | - | |

| Sub-Index | 02h | |
|---|---|---|
| Description | Divisor | |
| Object Class | M:- | O: pc, pp, ip, pv, tq |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | - | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 1 | |

| | |
|---|---|
| Substitute Value | - |

- OBJECT 2079H: ANALOG_TORQUE_COMMAND_FACTOR

Configures the scale factor between the analog command voltage and the output torque. The lower Unsigned16 bits form the numerator; the upper Unsigned16 bits form the denominator.

| | |
|---|---|
| Index | 2079h |
| Name | Analog_torque_command_factor |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | $0…(2^{32}-1)$ |
| Default Value | 00010001h |
| Substitute Value | - |

- OBJECT 207AH: DIGITAL_TORQUE_COMMAND_FACTOR

Configures the scale factor between the digital torque command and the output torque. The lower Unsigned16 bits form the numerator; the upper Unsigned16 bits form the denominator.

| | |
|---|---|
| Index | 207Ah |
| Name | Digital_torque_command_factor |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | $0…(2^{32}-1)$ |
| Default Value | 00010001h |
| Substitute Value | - |

- OBJECT 2081H: ANALOG_VELOCITY_COMMAND_FACTOR

Configures the scale factor between the analog command voltage and the output velocity. The lower Unsigned32 bits form the numerator; the upper Unsigned32 bits form the denominator.

| | |
|---|---|
| Index | 2081h |
| Name | Analog_velocity_command_factor |
| Object Code | VAR |
| Data Type | Unsigned64 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…($2^{64}$-1) |
| Default Value | 100000001h |
| Substitute Value | - |

- OBJECT 2082H: DIGITAL_VELOCITY_COMMAND_FACTOR

Configures the scale factor between the digital velocity command and the output velocity. The lower Unsigned32 bits form the numerator; the upper Unsigned32 bits form the denominator.

| | |
|---|---|
| Index | 2082h |
| Name | Digital_velocity_command_factor |
| Object Code | VAR |
| Data Type | Unsigned64 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…($2^{64}$-1) |
| Default Value | 100000001h |
| Substitute Value | - |

- OBJECT 2091H: ANALOG_POSITION_COMMAND_FACTOR

Configures the scale factor between the analog command voltage and the output position. The lower Unsigned32 bits form the numerator; the upper Unsigned32 bits form the denominator.

| | |
|---|---|
| Index | 2091h |
| Name | Analog_position_command_factor |
| Object Code | VAR |
| Data Type | Unsigned64 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…($2^{64}$-1) |
| Default Value | 100000001h |
| Substitute Value | - |

- OBJECT 2092H: DIGITAL_POSITION_COMMAND_FACTOR

Configures the scale factor between the digital position command and the output position. The lower Unsigned32 bits form the numerator; the upper Unsigned32 bits form the denominator.

| | |
|---|---|
| Index | 2092h |
| Name | Digital_position_command_factor |
| Object Code | VAR |
| Data Type | Unsigned64 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | $0…(2^{64}-1)$ |
| Default Value | 100000001h |

### 8.4 PROFILE POSITION MODE OBJECTS

- OBJECT 607AH: TARGET_POSITION

See /3/ for additional information.

| | |
|---|---|
| Index | 607Ah |
| Name | Target_position |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:pp, pc, ip | O: - |
| Access | RW ALW (SNVM) | |
| PDO Mapping | Possible | |
| Units | Position units | |
| Value Range | $(-2^{31})…(2^{31}-1)$ | |
| Default Value | 0 | |
| Substitute Value | - | |

- OBJECT 607DH: SOFTWARE_POSITION_LIMIT

See /3/ for additional information.

| | |
|---|---|
| Index | 607Dh |
| Name | Software_position_limit |
| Object Code | ARRAY |
| Number of Elements | 2 |
| Data Type | Integer32 |

Value Description

| | | |
|---|---|---|
| Sub-Index | 01h | |
| Description | Min_position_limit | |
| Object Class | M:- | O: pp, pc, ip |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Position units | |
| Value Range | $(-2^{31})$…max_position limit | |
| Default Value | $-2^{31}$ | |
| Substitute Value | - | |

| | | |
|---|---|---|
| Sub-Index | 02h | |
| Description | Max_position_limit | |
| Object Class | M:- | O: pp, pc, ip |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Position units | |
| Value Range | Min_position_limit…$(2^{31}-1)$ | |
| Default Value | $2^{31}-1$ | |
| Substitute Value | - | |

- OBJECT 6086H: MOTION_PROFILE_TYPE

See /3/ for additional information.

| | |
|---|---|
| Index | 6086h |
| Name | Motion_profile_type |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:pp, pv | O: - |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | No | |
| Units | None | |
| Value Range | -32768…32767 | |
| Default Value | -1 | |
| Substitute Value | - | |

Data Description

| VALUE | PROFILE TYPE |
|---|---|
| -1 | No ramp |
| 0 | Linear ramp (trapezoidal profile) |

- OBJECT 607FH: MAXIMUM_PROFILE_VELOCITY

See /3/ for additional information.

| | |
|---|---|
| Index | 607Fh |
| Name | Maximum_profile_velocity |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Object Class | M: - | O: pp, ip, pv, tq |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Velocity units | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | ($2^{32}$-1) | |
| Substitute Value | - | |

- OBJECT 6081H: PROFILE_VELOCITY

See /3/ for additional information.

| | |
|---|---|
| Index | 6081h |
| Name | Profile_velocity |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| Object Class | M: pp, pv | O: - |
|---|---|---|
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Velocity units | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | ($2^{32}$-1) | |
| Substitute Value | - | |

- OBJECT 6083H: PROFILE_ACCELERATION

See /3/ for additional information.

| Index | 6083h |
|---|---|
| Name | Profile_acceleration |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| Object Class | M: pp, pv | O: - |
|---|---|---|
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Acceleration units | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | ($2^{32}$-1) | |
| Substitute Value | - | |

- OBJECT 6084H: PROFILE_DECELERATION

See /3/ for additional information.

| Index | 6084h |
|---|---|
| Name | Profile_deceleration |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| Object Class | M: pp, pv | O: - |
|---|---|---|
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Acceleration units | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | ($2^{32}$-1) | |
| Substitute Value | - | |

- OBJECT 6085H: QUICK_STOP_DECELERATION

See /3/ for additional information.

| Index | 6085h |
|---|---|
| Name | Quick_stop_deceleration |
| Object Code | VAR |

| Data Type | Unsigned32 |
|---|---|

Value Description

| Object Class | M: | O: pp, ip, pv, tq |
|---|---|---|
| Access | RW – ALW | |
| PDO Mapping | No | |
| Units | Acceleration units | |
| Value Range | $0…(2^{32}-1)$ | |
| Default Value | 13531 | |
| Substitute Value | - | |

### 8.5 HOMING MODE OBJECTS

- OBJECT 607CH: HOME_OFFSET

See /3/ for additional information.

| | |
|---|---|
| Index | 607Ch |
| Name | Home_offset |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: hm |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | No | |
| Units | Position units | |
| Value Range | $(-2^{31})…(2^{31}-1)$ | |
| Default Value | 0 | |
| Substitute Value | 0 | |

- OBJECT 6098H: HOMING_METHOD

See /3/ for additional information.

| | |
|---|---|
| Index | 6098h |
| Name | Homing_method |
| Object Code | VAR |
| Data Type | Integer8 |

Value Description

| | | |
|---|---|---|
| Object Class | M:hm | O: |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | None | |
| Value Range | -128…127 | |
| Default Value | 35 | |
| Substitute Value | 0 | |

- OBJECT 6099H: HOMING_SPEEDS

See /3/ for additional information.

| | |
|---|---|
| Index | 6099h |
| Name | Homing_speeds |
| Object Code | ARRAY |
| Number of Elements | 2 |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Sub-Index | 01h | |
| Description | Speed_during_search_for_switch | |
| Object Class | M:hm | O: |

| | |
|---|---|
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | Velocity units |
| Value Range | 0…($2^{32}$-1) |
| Default Value | - |
| Substitute Value | 0 |

| | | |
|---|---|---|
| Sub-Index | 02h | |
| Description | Speed_during_search_for_zero | |
| Object Class | M:hm | O: |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | No | |
| Units | Velocity units | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | - | |
| Substitute Value | 0 | |

- OBJECT 609AH: HOMING_ACCELERATION

See /3/ for additional information.

| | |
|---|---|
| Index | 609Ah |
| Name | Homing_acceleration |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: hm |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | No | |
| Units | Acceleration units | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 1000 | |
| Substitute Value | - | |

### 8.6 POSITION CONTROL FUNCTION OBJECTS

- OBJECT 6062H: POSITION_DEMAND_VALUE

See /3/ for additional information.

| | |
|---|---|
| Index | 6062h |
| Name | Position_demand_value |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: pc, pp, ip, hm, tq |
| Access | RO | |
| PDO Mapping | No | |
| Units | Position units | |
| Value Range | $(-2^{31})\ldots(2^{31}-1)$ | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 6063H: POSITION_ACTUAL_VALUE*

See /3/ for additional information.

| | |
|---|---|
| Index | 6063h |
| Name | Position_actual_value* |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: pc, pp, ip, hm, tq |
| Access | RO | |
| PDO Mapping | No | |
| Units | Counts | |
| Value Range | $(-2^{31})\ldots(2^{31}-1)$ | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 6064H: POSITION_ACTUAL_VALUE

See /3/ for additional information.

| | |
|---|---|
| Index | 6064h |
| Name | Position_actual_value |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: pc, pp, ip, hm, tq |
| Access | RO | |
| PDO Mapping | Possible | |
| Units | Position units | |

| | |
|---|---|
| Value Range | $(-2^{31})\ldots(2^{31}-1)$ |
| Default Value | - |
| Substitute Value | - |

- OBJECT 6067H: POSITION_WINDOW

See /3/ for additional information.

| | |
|---|---|
| Index | 6067h |
| Name | Position_window |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Object Class | M: - | O: pc |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Position units | |
| Value Range | $0\ldots(2^{32}-1)$ | |
| Default Value | 100 | |
| Substitute Value | - | |

- OBJECT 6068H: POSITION_WINDOW_TIME

See /3/ for additional information.

| | |
|---|---|
| Index | 6068h |
| Name | Position_window_time |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: pc |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Milliseconds | |
| Value Range | 0…65535 | |
| Default Value | 100 | |
| Substitute Value | - | |

- OBJECT 6065H: FOLLOWING_ERROR_WINDOW

See /3/ for additional information.

| | |
|---|---|
| Index | 6065h |
| Name | Following_error_window |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: pc, pp |

| | |
|---|---|
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | Position units |
| Value Range | 0…($2^{32}$-1) |
| Default Value | 5000 |
| Substitute Value | - |

- OBJECT 6066H: FOLLOWING_ERROR_TIME_OUT

See /3/ for additional information.

| | |
|---|---|
| Index | 6066h |
| Name | Following_error_time_out |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: pc, pp |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Milliseconds | |
| Value Range | 0…65535 | |
| Default Value | 100 | |
| Substitute Value | - | |

- OBJECT 60F4H: FOLLOWING_ERROR_ACTUAL_VALUE

See /3/ for additional information.

| | |
|---|---|
| Index | 60F4h |
| Name | Following_error_actual_value |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: pc, pp, ip, hm, tq |
| Access | RO | |
| PDO Mapping | No | |
| Units | Position units | |
| Value Range | (-$2^{31}$)…($2^{31}$-1) | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 60FBH: POSITION_CONTROL_PARAMETER_SET

| | |
|---|---|
| Index | 60FBh |
| Name | Position_control_parameter_set |
| Object Code | RECORD |
| Number of Elements | 18 |

Value Description

| Sub-Index | 01h | 02h | 03h |
|---|---|---|---|
| Description | Gain | Integrator time constant parameter | Feed-forward gain |
| Object Class | Manufacturer specific | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | - | - |
| Value Range | 0…65535 | 0…65535 | 0…65535 |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Unsigned16 | Unsigned16 | Unsigned16 |

| Sub-Index | 08h | 10h | 11h |
|---|---|---|---|
| Description | Demand position offset | Negative software limit switch position | Positive software limit switch position |
| Object Class | Manufacturer specific | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No | No |
| Units | Position units | Position units | Position units |
| Value Range | $(-2^{31})…(2^{31}-1)$ | $(-2^{32})$…positive software limit switch position | Negative software limit switch position…$(2^{32}-1)$ |
| Default Value | 0 | A0000000h | 5FFFFFFDh |
| Substitute Value | - | - | - |
| Data Type | Integer32 | Integer32 | Integer32 |

Note: The negative and positive software limit switches are active in all operating modes.

| Sub-Index | 20h (same as 6067h) | 21h (same as 6068h) |
|---|---|---|
| Description | Position window | Position window time |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | Position units | 1 millisecond |
| Value Range | $0…(2^{32}-1)$ | 0…65535 |
| Default Value | 100 | 100 |
| Substitute Value | - | - |
| Data Type | Unsigned32 | Unsigned16 |

| Sub-Index | 22h (same as 6065h) | 23h (same as 6066h) |
|---|---|---|
| Description | Following error window | Following error window time out |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | Position units | 1 millisecond |
| Value Range | $0…(2^{32}-1)$ | 0…65535 |
| Default Value | 5000 | 100 |
| Substitute Value | - | - |
| Data Type | Unsigned32 | Unsigned16 |

| Sub-Index | 30h | 31h | 32h |
|---|---|---|---|

| Description | Following error option code | Negative software limit switch option code | Positive software limit switch option code |
|---|---|---|---|
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | - | - |
| Value Range | 0…65535 | 0…65535 | 0…65535 |
| Default Value | 0 | 0 | 0 |
| Substitute Value | - | - | - |
| Data Type | Unsigned16 | Unsigned16 | Unsigned16 |

| Sub-Index | 33h | 34h |
|---|---|---|
| Description | Negative limit switch option code | Positive limit switch option code |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | - |
| Value Range | 0…65535 | 0…65535 |
| Default Value | 5 | 6 |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

Data Description (sub-index 30h, 31h, 32h, 33h, 34h):

| VALUE | ERROR ACTIVITY |
|---|---|
| 0 | None |
| 1 | Disable voltage |
| 2 | Quick stop |
| 3 | Shutdown |
| 4 | Disable operation |
| 5 | Inhibit negative motion |
| 6 | Inhibit positive motion |

| Sub-Index | 3Eh | 3Fh |
|---|---|---|
| Description | Position Feedback Error Option Code | Position Feedback Error Limit |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | 0.1% |
| Value Range | 0…65535 | 0…1000 |
| Default Value | 0 | 200 |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

In the case of a brushless motor with Hall sensors, the drive will automatically verify the number of encoder pulses between Hall sensor edges, to confirm the proper operation of the encoder (a missing encoder may otherwise cause a runaway condition).

Object 3Fh sets by how much the actual number of encoder pulses may differ from the theoretical number of encoder pulses (this is to accommodate for Hall sensor hysteresis). Object 3Fh selects which action must be taken in case of an error. Bit 30 in object 1002h will also be set.

It is important that the motor pole count (object 6410h, sub-index 2Bh) and the encoder position resolution (object 608Fh, sub-index 01h and 02h) are set correctly in order for this function to respond properly.

Data Description (sub-index 3Eh):

| VALUE | ERROR ACTIVITY |
|---|---|
| 0 | None |
| 1 | Disable voltage |
| 3 | Shutdown |

| | |
|---|---|
| Sub-Index | 40h |
| Description | Invert position feedback |
| Object Class | Manufacturer Specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…1 |
| Default Value | 0 |
| Substitute Value | - |
| Data Type | Unsigned16 |

Data Description:

| |
|---|
| 0 = do not invert feedback |
| 1 = invert feedback |

- OBJECT 60FCH: POSITION_DEMAND_VALUE*

See /3/ for additional information.

| | |
|---|---|
| Index | 60FCh |
| Name | Position_demand_value* |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: pc, pp, ip, hm, tq |
| Access | RO | |
| PDO Mapping | No | |
| Units | counts | |
| Value Range | $(-2^{31})…(2^{31}-1)$ | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 2090H: REFERENCE_POSITION

The reference position determines the set point of the position loop. The position error = reference position – actual position.

| | |
|---|---|
| Index | 2090h |
| Name | Reference_position |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer Specific |
| Access | RO |
| PDO Mapping | No |
| Units | Position units |
| Value Range | $(-2^{31})\ldots(2^{31}-1)$ |
| Default Value | - |

### 8.7 PROFILE VELOCITY MODE OBJECTS

- OBJECT 6069H: VELOCITY_SENSOR_ACTUAL_VALUE

See /3/ for additional information.

| | |
|---|---|
| Index | 6069h |
| Name | Velocity_sensor_actual_value |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:pv | O: - |
| Access | RO | |
| PDO Mapping | No | |
| Units | Counts/sec | |
| Value Range | $(-2^{31})\ldots(2^{31}-1)$ | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 606AH: SENSOR_SELECTION_CODE

See /3/ for additional information.

| | |
|---|---|
| Index | 606Ah |
| Name | Sensor_selection_code |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:pv | O: - |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | No | |
| Units | - | |
| Value Range | -32768…32767 | |
| Default Value | 0 | |
| Substitute Value | - | |

Data Description:

The first two values correspond to the standard DSP402 s election codes. The manufacturer specific values provide various feedback source combinations for the velocity and position loops.

| VALUE | VELOCITY FEEDBACK SOURCE | POSITION FEEDBACK SENSOR |
|---|---|---|
| 0h | Motor mounted encoder | Motor mounted encoder |
| 1h | Motor mounted encoder | Auxiliary encoder |
| FF00h | None | None |
| FF10h | Motor mounted encoder | None |
| FF11h (same as 0h) | Motor mounted encoder | Motor mounted encoder |
| FF12h (same as 1h) | Motor mounted encoder | Auxiliary encoder |
| FF15h | Motor mounted encoder | Analog input |
| FF50h | Hall sensors | None |

| | | |
|---|---|---|
| FF60h | Back-EMF | None |
| FF61h | Back-EMF | Motor mounted encoder |
| FF62h | Back-EMF | Auxiliary encoder |
| FF65h | Back-EMF | Analog input |
| FF80h | Analog input | None |
| FF81h | Analog input | Motor mounted encoder |
| FF82h | Analog input | Auxiliary encoder |
| FF85h | Analog input | Analog input |
| FFD0h | Analog input and derivator | None |
| FFD1h | Analog input and derivator | Motor mounted encoder |
| FFD2h | Analog input and derivator | Auxiliary encoder |
| FFD5h | Analog input and derivator | Analog input |

- OBJECT 606BH: VELOCITY_DEMAND_VALUE

See /3/ for additional information.

| | |
|---|---|
| Index | 606Bh |
| Name | Velocity_demand_value |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:pv | O: - |
| Access | RO | |
| PDO Mapping | No | |
| Units | Velocity units | |
| Value Range | $(-2^{31})\ldots(2^{31}-1)$ | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 606CH: VELOCITY_ACTUAL_VALUE

See /3/ for additional information.

| | |
|---|---|
| Index | 606Ch |
| Name | Velocity_actual_value |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:pv | O: - |
| Access | RO | |
| PDO Mapping | No | |
| Units | Velocity units | |
| Value Range | $(-2^{31})\ldots(2^{31}-1)$ | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 606DH: VELOCITY_WINDOW

See /3/ for additional information.

| | |
|---|---|
| Index | 606Dh |
| Name | Velocity_window |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:pv | O: - |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Velocity units | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 2000 | |
| Substitute Value | - | |

- OBJECT 606EH: VELOCITY_WINDOW_TIME

See /3/ for additional information.

| | |
|---|---|
| Index | 606Eh |
| Name | Velocity_window_time |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:pv | O: - |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | milliseconds | |
| Value Range | 0…65535 | |
| Default Value | 100 | |
| Substitute Value | - | |

- OBJECT 606FH: VELOCITY_THRESHOLD

See /3/ for additional information.

| | |
|---|---|
| Index | 606Fh |
| Name | Velocity_threshold |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:pv | O: - |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Velocity units | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 2000 | |
| Substitute Value | - | |

- OBJECT 6070H: VELOCITY_THRESHOLD_TIME

See /3/ for additional information.

| | |
|---|---|
| Index | 6070h |
| Name | Velocity_threshold_time |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:pv | O: - |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Milliseconds | |
| Value Range | 0…65535 | |
| Default Value | 100 | |
| Substitute Value | - | |

- OBJECT 60F9H: VELOCITY_CONTROL_PARAMETER_SET

| | |
|---|---|
| Index | 60F9h |
| Name | Velocity_control_parameter_set |
| Object Code | RECORD |
| Number of Elements | 25 |

Value Description

| Sub-Index | 01h | 02h | 03h |
|---|---|---|---|
| Description | Gain | Integrator time constant parameter | Derivative time constant parameter |
| Object Class | Manufacturer specific | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No | No |
| Units | - | - | - |
| Value Range | (0…$2^{16}$-1) or (0…$2^{32}$-1) depending on model | 0…65535 | 0…32767 |
| Default Value | - | - | 0 |
| Substitute Value | - | - | - |
| Data Type | Unsigned 16 or 32 depending on model | Unsigned16 | Signed16 |

| Sub-Index | 04h* | 06h* |
|---|---|---|
| Description | Derivative time constant ratio | Acceleration_feedforward |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | - |
| Value Range | 100…65535 | 0…65536 |
| Default Value | 1000 | 0 |

| | | |
|---|---|---|
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

* Implemented only in drives with sinusoidal commutation.

The derivative time constant set with sub-index 03h is complemented by a low pass filter, which cut-off frequency is set by via sub-index 04h (ratio N). The low-pass filter time constant is determined as follows:

Low-pass filter time constant = N*Derivative time constant/100

| Sub-Index | 07h | 08h | 09h |
|---|---|---|---|
| Description | Phase-to-phase Resistance | Phase-to-phase Inductance | Kt-Inertia factor |
| Object Class | Manufacturer specific | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No | No |
| Units | milliOhm | 0.01milliHenry | - |
| Value Range | 0…65535 | 0…65535 | (0…$2^{16}$-1) or (0…$2^{32}$-1) depending on model |
| Default Value | 0 | 0 | - |
| Substitute Value | - | - | - |
| Data Type | Unsigned16 | Unsigned16 | Unsigned 16 or 32 depending on model |

| Sub-Index | 0Ah | 0Bh |
|---|---|---|
| Description | Velocity_feedback_filter_time_constant | Velocity_reference_low_pass_filter |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | 100 microseconds |
| Value Range | 0…65535 | 0…65535 |
| Default Value | - | 0 |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

| Sub-Index | 10h | 11h | 1Fh |
|---|---|---|---|
| Description | Forward velocity limit | Reverse velocity limit | Demand velocity offset |
| Object Class | Manufacturer specific | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No | No |
| Units | Velocity units | Velocity units | Velocity units |
| Value Range | 0…($2^{32}$-1) | 0…($2^{32}$-1) | (-$2^{31}$)…($2^{31}$-1) |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Unsigned32 | Unsigned32 | Integer32 |

| Sub-Index | 20h | 21h | 22h (same as 606Fh) |
|---|---|---|---|
| Description | Velocity limit window | Velocity limit window time | Velocity threshold |
| Object Class | Manufacturer specific | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) | RW – ALW (SNVM) |

| PDO Mapping | No | No | No |
|---|---|---|---|
| Units | Velocity units | 1 millisecond | Velocity units |
| Value Range | 0…($2^{32}$-1) | 0…65535 | 0…($2^{32}$-1) |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Unsigned32 | Unsigned16 | Unsigned32 |

| Sub-Index | 23h (same as 6070h) | 24h (same as 606Dh) | 25h (same as 606Eh) |
|---|---|---|---|
| Description | Velocity threshold time | Velocity window | Velocity window time |
| Object Class | Manufacturer specific | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No | No |
| Units | 1 millisecond | Velocity units | 1 millisecond |
| Value Range | 0…65535 | 0…($2^{32}$-1) | 0…65535 |
| Default Value | - | - | - |
| Substitute Value | - | - | - |
| Data Type | Unsigned16 | Unsigned32 | Unsigned16 |

| Sub-Index | 26h | 27h |
|---|---|---|
| Description | Velocity error window | Velocity error window time |
| Object Class | Manufacturer specific | Manufacturer specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | Velocity units | 1 millisecond |
| Value Range | 0…($2^{32}$-1) | 0…65535 |
| Default Value | - | - |
| Substitute Value | - | - |
| Data Type | Unsigned32 | Unsigned16 |

| Sub-Index | 28h | 29h |
|---|---|---|
| Description | Velocity error option code | Velocity limit option code |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | - |
| Value Range | 0…65535 | 0…65535 |
| Default Value | 0 | 0 |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

Data Description (for sub-index 28h and 29h):

| VALUE | ERROR ACTIVITY |
|---|---|
| 0 | None |
| 1 | Disable voltage |
| 2 | Quick stop |
| 3 | Shutdown |
| 4 | Disable operation |
| 5 | Inhibit negative motion |
| 6 | Inhibit positive motion |

| Sub-Index | 2Eh | 2Fh |
|---|---|---|

| Description | Velocity Feedback Error Option Code | Velocity Feedback Error Limit |
|---|---|---|
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | 0.1% |
| Value Range | 0…65535 | 0…1000 |
| Default Value | 0 | 200 |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

In the case of a brushless motor with Hall sensors, the drive will automatically verify the number of encoder pulses between Hall sensor edges, to confirm the proper operation of the encoder (a missing encoder may otherwise cause a runaway condition).

Object 2Fh sets by how much the actual number of encoder pulses may differ from the theoretical number of encoder pulses (this is to accommodate for Hall senso r hysteresis). Object 2Fh selects which action must be taken in case of an error. Bit 29 in object 1002h will also be set.

It is important that the motor pole count (object 6410h, sub -index 2Bh) and the encoder velocity resolution (object 6090h, sub-index 01h and 02h) are set correctly in order for this function to respond properly.
Data Description (sub -index 2Eh):

| VALUE | ERROR ACTIVITY |
|---|---|
| 0 | None |
| 1 | Disable voltage |
| 3 | Shutdown |

| Sub-Index | 30h |
|---|---|
| Description | Invert velocity feedback |
| Object Class | Manufacturer Specific |
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…1 |
| Default Value | 0 |
| Substitute Value | - |
| Data Type | Unsigned16 |

Data Description:

| |
|---|
| 0 = do not invert feedback |
| 1 = invert feedback |

- OBJECT 60FFH: TARGET_VELOCITY

See /3/ for additional information.

| Index | 60FFh |
|---|---|
| Name | Target_velocity |
| Object Code | VAR |

| Data Type | Integer32 |
|---|---|

Value Description

| Object Class | M:pv | O: - |
|---|---|---|
| Access | RW – ALW (SNVM) | |
| PDO Mapping | Possible | |
| Units | Velocity units | |
| Value Range | $(-2^{31})…(2^{31}-1)$ | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 2080H: REFERENCE_VELOCITY

The reference velocity determines the set point of the velocity loop. The velocity error = reference velocity – actual velocity.

| Index | 2080h |
|---|---|
| Name | Reference_velocity |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| Object Class | Manufacturer Specific |
|---|---|
| Access | RO |
| PDO Mapping | No |
| Units | Velocity units |
| Value Range | $(-2^{31})…(2^{31}-1)$ |
| Default Value | - |

- OBJECT 2084H: VELOCITY_ERROR

This object contains the velocity error (from the velocity loop).

| Index | 2084h |
|---|---|
| Name | Velocity error |
| Object Code | VAR |
| Data Type | Integer32 |

Value Description

| Object Class | Manufacturer Specific |
|---|---|
| Access | RO |
| PDO Mapping | No |
| Units | Velocity units |
| Value Range | $(-2^{31})…(2^{31}-1)$ |
| Default Value | - |

### 8.8 Profile Torque Mode Objects

- OBJECT 6071H: TARGET_TORQUE

See /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 6071h |
| Name | Target_torque |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:tq | O: - |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | Possible | |
| Units | Per thousand of rated torque | |
| Value Range | -32768…32767 | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 6072H: MAX_TORQUE

See /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 6072h |
| Name | Max_torque |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:tq | O: - |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Per thousand of rated torque | |
| Value Range | 0…65535 | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 6074H: TORQUE_DEMAND_VALUE

See /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 6074h |
| Name | Torque_demand_value |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: tq, hm, pv, pp, ip |

| | |
|---|---|
| Access | RO |
| PDO Mapping | No |
| Units | Per thousand of rated torque |
| Value Range | -32768…32767 |
| Default Value | - |
| Substitute Value | - |

- OBJECT 6075H: MOTOR_RATED_CURRENT

See /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 6075h |
| Name | Motor_rated_current |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: tq, hm, pv, pp, ip |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | No | |
| Units | 1 mA | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | - | |
| Substitute Value | - | |

This value corresponds to the drive continuous current.

- OBJECT 6076H: MOTOR_RATED_TORQUE

See /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 6076h |
| Name | Motor_rated_torque |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: tq, hm, pv, pp, ip |
| Access | RW – DIS (SNVM) | |
| PDO Mapping | No | |
| Units | 0.001 Nm | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | 0 | |
| Substitute Value | - | |

- OBJECT 6077H: TORQUE_ACTUAL_VALUE

See /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 6077h |

| | |
|---|---|
| Name | Torque_actual_value |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: tq, hm, pv, pp, ip |
| Access | RO | |
| PDO Mapping | Possible | |
| Units | - | |
| Value Range | -32768…32767 | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 6078H: CURRENT_ACTUAL_VALUE

See /3/ for a detailed description.

| | |
|---|---|
| Index | 6078h |
| Name | Current_actual_value |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: tq, hm, pv, pp, ip |
| Access | RO | |
| PDO Mapping | No | |
| Units | Per thousand of rated current (see 6075h) | |
| Value Range | -32768…32767 | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 6079H: DC_LINK_CIRCUIT_VOLTAGE

See /3/ for a detailed description.

| | |
|---|---|
| Index | 6079h |
| Name | DC_link_circuit_voltage |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:- | O: tq, hm, pv, pp, ip |
| Access | RO | |
| PDO Mapping | No | |
| Units | 1 mV | |
| Value Range | $0…(2^{32}-1)$ | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 6087H: TORQUE_SLOPE

See /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 6087h |
| Name | Torque_slope |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | | |
|---|---|---|
| Object Class | M:tq | O: - |
| Access | RW – ALW (SNVM) | |
| PDO Mapping | No | |
| Units | Per thousand of rated torque per second | |
| Value Range | 0…($2^{32}$-1) | |
| Default Value | - | |
| Substitute Value | - | |

- OBJECT 6088H: TORQUE_PROFILE_TYPE

See /3/ for a detailed description.

Object Description

| | |
|---|---|
| Index | 6088h |
| Name | Torque_profile_type |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | | |
|---|---|---|
| Object Class | M:tq | O: - |
| Access | RW-DIS (SNVM) | |
| PDO Mapping | No | |
| Units | None | |
| Value Range | -32768…32767 | |
| Default Value | -1 | |
| Substitute Value | - | |

Data Description:

| VALUE | PROFILE TYPE |
|---|---|
| -1 | No profiling |
| 0 | Linear ramp |

- OBJECT 60F8H: TORQUE_CONTROL_PARAMETERS

This object contains the torque control parameters.

| | |
|---|---|
| Index | 60F8h |
| Name | Torque_control_parameters |
| Object Code | RECORD |
| Number of Elements | 5 |

Value Description

| Sub-Index | 01h | 02h |
|---|---|---|
| Description | Negative torque limit | Positive torque limit |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | Per thousand of rated torque | Per thousand of rated torque |
| Value Range | 0…65535 | 0…65535 |
| Default Value | - | - |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

| Sub-Index | 06h | 07h | 08h |
|---|---|---|---|
| Description | Commutation_offset | Commutation_encoder_offset | Demand torque offset |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No | No |
| Units | 2*pi/65536 electrical degrees | - | Per thousand of rated torque |
| Value Range | -32768…32768 | $0…2^{64}$-1 | -32768…32768 |
| Default Value | 0 | 100000001h | - |
| Substitute Value | - | - | - |
| Data Type | Integer16 | Unsigned64 | Integer16 |

- OBJECT 2010H: RATED_VOLTAGE

This parameter determines the units used for voltage rela ted parameters. The interface units for voltage related objects is Rated_voltage/1000

| Index | 2010h |
|---|---|
| Name | Rated_voltage |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| Object Class | Manufacturer specific |
|---|---|
| Access | RW – DIS (SNVM) |
| PDO Mapping | No |
| Units | 1 mV |
| Value Range | $0…(2^{32}-1)$ |
| Default Value | - |
| Substitute Value | - |

- OBJECT 2070H: CURRENT_CONTROL_PARAMETER_SET

This object sets the parameters used by the current control loop.

| Index | 2070h |
|---|---|
| Name | Current_control_parameter_set |
| Object Code | RECORD |

| Number of Elements | 14 |
|---|---|

Value Description

| Sub-Index | 03h | 04h |
|---|---|---|
| Description | Gain | Time constant parameter |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | - | - |
| Value Range | $(0…2^{16}-1)$ or $(0…2^{32}-1)$ depending on model | 0…65535 |
| Default Value | - | - |
| Substitute Value | - | - |
| Data Type | Unsigned16 or 32 depending on model | Unsigned16 |

| Sub-Index | 0Fh |
|---|---|
| Description | Target_current_destination |
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…1 |
| Default Value | 0 |
| Substitute Value | - |
| Data Type | Unsigned16 |

Data Description:

0 = target current is assigned to Target_current_Q
1 = target current is assigned to Target_current_D

| Sub-Index | 10h | 11h |
|---|---|---|
| Description | Motoring current limit | Regenerative current limit |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RW – ALW (SNVM) | RW – ALW (SNVM) |
| PDO Mapping | No | No |
| Units | 0.1% of rated current (see 6075h) | 0.1% of rated current (see 6075h) |
| Value Range | 0…65535 | 0…65535 |
| Default Value | - | - |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

| Sub-Index | 12h | 13h | 14h |
|---|---|---|---|
| Description | Peak_current* | Continuous_current* | peak_current_time* |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | 1 mA | 1 mA | 0.1 seconds |
| Value Range | $0…(2^{32}-1)$ | $0…(2^{32}-1)$ | 0…65535 |
| Default Value | - | - | - |
| Substitute Value | - | - | - |

| | | | |
|---|---|---|---|
| Data Type | Unsigned32 | Unsigned32 | Unsigned16 |

*Sub-index 12h, 13, 14 and 15h correspond to the application peak and continuous current as well as the peak and fold back time, as set by the user in the configuration software.

| Sub-Index | 15h | 16h | 1Bh |
|---|---|---|---|
| Description | Current_foldback_time_constant | Demagnetizing_current_limit | Invert_commutation |
| Object Class | Manufacturer Specific | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RW – DIS (SNVM) | RW – DIS (SNVM) |
| PDO Mapping | No | No | No |
| Units | 0.1 seconds | 0.1 % of rated current (see 6075h) | - |
| Value Range | 0…65535 | -32768…32767 | 0…1 |
| Default Value | - | 0 | 0 |
| Substitute Value | - | - | - |
| Data Type | Unsigned16 | Integer16 | Unsigned16 |

Object 1Bh (invert commutation) is used for sinusoidal commutation only (does not apply to trapezoidal commutation).

| Sub-Index | 1Ch | 1Fh |
|---|---|---|
| Description | Maximum_output_voltage | Actual_Current_Limit |
| Object Class | Manufacturer Specific | Manufacturer Specific |
| Access | RW – DIS (SNVM) | RO |
| PDO Mapping | No | No |
| Units | ActualBusVoltage/2/10000 | 0.1 % of rated current (see 6075h) |
| Value Range | 0…65535 | 0…65535 |
| Default Value | 10000 | - |
| Substitute Value | - | - |
| Data Type | Unsigned16 | Unsigned16 |

| Sub-Index | 20h |
|---|---|
| Description | Overload_error_option_code |
| Object Class | Manufacturer Specific |
| Access | RW – ALW (SNVM) |
| PDO Mapping | No |
| Units | - |
| Value Range | 0…65535 |
| Default Value | 0 |
| Substitute Value | - |
| Data Type | Unsigned16 |

Data Description:

An overload condition occurs when the output current is reduced due to excessive base plate temperature or internal current limiting.

| VALUE | ERROR ACTIVITY |
|---|---|
| 0 | None |
| 1 | Disable voltage |

| | |
|---|---|
| 2 | Quick stop |
| 3 | Shutdown |
| 4 | Disable operation |
| 5 | Inhibit negative motion |
| 6 | Inhibit positive motion |

- OBJECT 201EH: TARGET_D_AXIS_ANGLE

Position of the current vector with reference to phase A. Used with sinusoidal commutation only.

| | |
|---|---|
| Index | 201E h |
| Name | Target_d_axis_angle |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW ALW (SNVM) |
| PDO Mapping | No |
| Units | 2*pi/65536 electrical degrees |
| Value Range | -32768…32767 |
| Default Value | 0 |
| Substitute Value | - |

- OBJECT 2071H: TARGET_CURRENT_D

| | |
|---|---|
| Index | 2071h |
| Name | Target_current_D |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW ALW (SNVM) |
| PDO Mapping | No |
| Units | Per thousand of rated current (see 6075h) |
| Value Range | -32768…32767 |
| Default Value | 0 |
| Substitute Value | - |

- OBJECT 2074H: TARGET_CURRENT_Q

| | |
|---|---|
| Index | 2074h |
| Name | Target_current_Q |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW ALW (SNVM) |

| | |
|---|---|
| PDO Mapping | No |
| Units | Per thousand of rated current (see 6075h) |
| Value Range | -32768…32767 |
| Default Value | 0 |
| Substitute Value | - |

- OBJECT 2075H: REFERENCE_CURRENT_Q

| | |
|---|---|
| Index | 2075h |
| Name | Reference_current_Q |
| Object Code | VAR |
| Data Type | Integer16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RO |
| PDO Mapping | No |
| Units | Per thousand of rated current (see 6075h) |
| Value Range | -32768…32767 |
| Default Value | 0 |
| Substitute Value | - |

- OBJECT 2077H: REFERENCE_TORQUE

| | |
|---|---|
| Index | 2077h |
| Name | Reference_torque |
| Object Code | VAR |
| Data Type | Unsigned16 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RO |
| PDO Mapping | No |
| Units | Per thousand of rated torque |
| Value Range | -32768…32767 |
| Default Value | - |
| Substitute Value | - |

- OBJECT 2078H: RATED_TORQUE_CONSTANT

For proper operation the Rated_torque_constant must be equal to the torque constant of the motor, as specified by the motor manufacurer, in $Nm/A_{peak}$ units (not Nm/Arms).

| | |
|---|---|
| Index | 2078h |
| Name | Rated_torque_constant |
| Object Code | VAR |
| Data Type | Unsigned32 |

Value Description

| | |
|---|---|
| Object Class | Manufacturer specific |
| Access | RW – DIS (SNVM) |

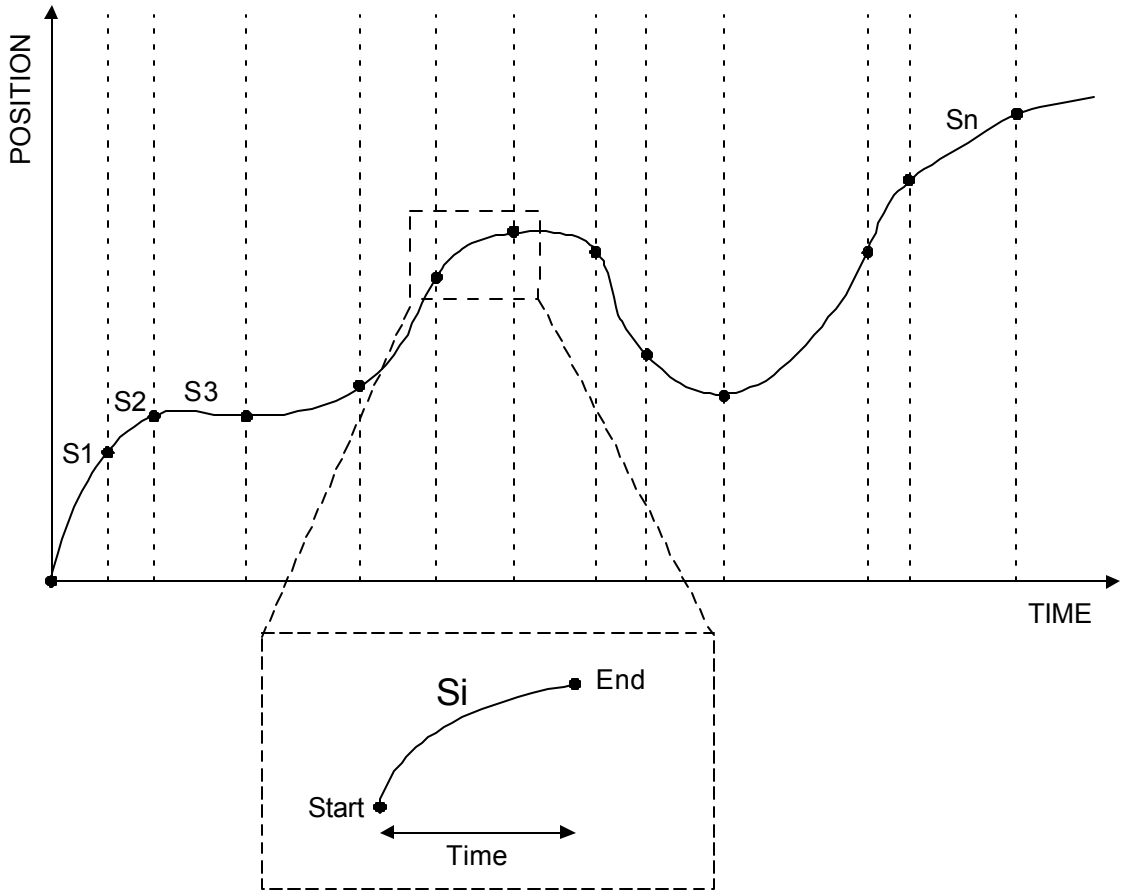
| | |
|---|---|
| PDO Mapping | No |
| Units | 0.001 Nm/A |
| Value Range | 0…($2^{32}$-1) |
| Default Value | Equal to 6410h, sub 05h, 25h or 45h depending on the motor type |
| Substitute Value | - |

# 9. PVT MODE (INTERPOLATED POSITION MODE)

## 9.1 INTRODUCTION

PVT mode is a position data-streaming mode that allows coordinated motion between multiple axes. Arbitrary position and velocity profiles can be executed on each axis . This is achieved via a so -called "PVT"-command. A "PVT" -command contains the position, velocity, and time information of profile segment end points. The servo amplifier performs a third order interpolation between segment end points. This results in a ki nd of partial trajectory generation where both host controller and servo amplifier generate a specific portion of the overall move profile trajectory. The host controller calculates position and velocity of intermittent points on the overall trajectory, wh ile the servo amplifier interpolates between these intermittent points to ensure smooth motion. The actual position loop is closed within the amplifier. This reduces the amount of commands that need to be sent from host controller to amplifier, which is cr itical in distributed control systems. The number of segments and the time duration of each segment need to be selected based upon required accuracy and network bandwidth.

An arbitrary position profile can be split in multiple consecutive segments as foll ows:




Each segment has a start point and an end point. The end point of one segment is the start point of the next segment. Each segment end point (start or end) has a position and velocity value. The segment time can be variable depending on curvature (smaller time for rapidly changing positions).

PVT mode operates through so -called PVT-commands. A PVT command is an unconfirmed message (manufacturer specific PDO). The PVT command contains segment end point position and velocity information, and segment time. A 15 level FIFO buffer alleviates host controller timing requirements. The buffer can be cleared and the buffer pointer can be re-positioned. The drive will also send the following PVT related error messages: buffer empty, buffer full, counter error, or

message length error. The Time Stamp message can be used to maintain time synchronization of nodes involved in PVT motion.

**9.2 MESSAGES**

- OBJECT: PVT

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 500h + Node-ID | P1 | P2 | P3 | V1 | V2 | V3 | T | C |

Where:

P1, P2, P3 segment end point position (24 bits, absolute position in counts, hexadecimal), P3 is the MSB, P1 is the LSB
V1, V2, V3 segment end point velocity (24 bits, in counts per second, hexadecimal), V3 is the MSB, V1 is the LSB.
T segment time duration (in milliseconds, maximum 255 (FFh) milliseconds). A value of zero is used to finish the sequence.
C integrity counter (incremental counter, starting at zero). Should wrap around after 255 (FFh). PVT commands with non-consecutive counter values will result in an error message.

Sending a broadcast message with COB -ID 500h (no data bytes required) will start motion on all axes. This command can be sent as soon as at least one PVT command has been received by the nodes involved. To en sure smooth motion, new PVT commands must be sent in a timely fashion.

Example (assuming size indication is used for SDO services) for a two -axis system with node 1 and 2:

| COB-ID | DATA | DESCRIPTION |
|---|---|---|
| 601 | 2B 40 60 00 0E 00 00 00 | Shutdown command to node 1 |
| 602 | 2B 40 60 00 0E 00 00 00 | Shutdown command to node 2 |
| 601 | 2F 60 60 00 07 00 00 00 | Interpolated position mode (PVT), node 1 |
| 602 | 2F 60 60 00 07 00 00 00 | Interpolated position mode (PVT), node 2 |
| 601 | 2B 40 60 00 0F 00 00 00 | Enable operation command to node 1 |
| 602 | 2B 40 60 00 0F 00 00 00 | Enable operation command to node 2 |
| 501 | 01 02 03 00 00 00 80 00 | First segment end point position = 30201h, end point velocity = 0h, segment time is 128 msec, node 1 |
| 501 | 02 04 06 00 00 00 FF 01 | Second segment end point position = 60402h, end point velocity = 0h, segment time is 255 msec, node 1 |
| 501 | 01 02 03 00 00 00 80 02 | Third segment end point position = 30201h, end point velocity = 0h, segment time is 128 msec, node 1 |
| 501 | XX XX XX XX XX XX 00 03 | No more segments, node 1 |
| 502 | 01 02 03 00 00 00 80 00 | First segment end point position = 30201h, end point velocity = 0h, segment time is 128 msec, node 2 |
| 502 | 02 04 06 00 00 00 FF 01 | Second segment end point position = 60402h, end point velocity = 0h, segment time is 255 msec, no de 2 |
| 502 | 01 02 03 00 00 00 80 02 | Third segment end point position = 30201h, end point velocity = 0h, segment time is 128 msec, node 2 |
| 502 | XX XX XX XX XX XX 00 03 | No more segments, node 2 |
| 500 | - | Start motion on all nodes in PVT mode |

- OBJECT 60C4H: INTE RPOLATION_DATA_CONFIGURATION

See /3/ for additional information.

| | |
|---|---|
| Index | 60C4h |
| Name | Interpolation_data_configuration |
| Object Code | RECORD |
| Number of Elements | 6 |

Value Description

| Sub-Index | 01h | 02h | 03h |
|---|---|---|---|
| Description | Maximum_buffer_size | Actual_buffer_size | Buffer_organization |
| Object Class | O: ip | O: ip | O: ip |
| Access | RO | RO | RO |
| PDO Mapping | No | No | No |
| Units | - | - | - |
| Value Range | 0…($2^{32}$-1) | 0…($2^{32}$-1) | 0…255 |
| Default Value | 15 | 15 | 0 (FIFO) |
| Substitute Value | - | - | - |
| Data Type | Unsigned32 | Unsigned32 | Unsigned8 |

| Sub-Index | 04h | 05h | 06h |
|---|---|---|---|
| Description | buffer_position | Size_of_data_record | Buffer_clear |
| Object Class | O: ip | O: ip | O: ip |
| Access | RW – ALW | RO | WO – ALW |
| PDO Mapping | No | No | No |
| Units | - | - | - |
| Value Range | 0…($2^{32}$-1) | 0…255 | 0…1 |
| Default Value | - | 8 | 0 |
| Substitute Value | - | - | - |
| Data Type | Unsigned32 | Unsigned8 | Unsigned8 |

### 9.3 ERROR MESSAGES

The drive will generate the following error messages in PVT mode: buffer empty, buffer full, counter error, or message length error. The emergency message protocol (COB-ID 80h + Node-ID, see object 1014h) is used to transmit the error message.

The emergency message data description is as follows:

| Error | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| Buffer Empty | 00 | 10 | 01 | FE | 01 | XX | XX | XX |
| Buffer Full | 00 | 10 | 01 | FE | 02 | XX | XX | XX |
| Integrity Counter | 00 | 10 | 01 | FE | 03 | desired value of counter | XX | XX |
| Message Length | 00 | 10 | 01 | FE | 04 | XX | XX | XX |
| Time Stamp Error* | 00 | 10 | 01 | FE | 05 | XX | XX | XX |

* This error message is sent when the difference between two consecutive time stamp me ssages deviates by more than 12.5% from the theoretical time difference (per the drive internal clock). The last Time Stamp message data is retained as the actual time stamp.

## APPENDIX A

# SDO Protocol

### SERVICE DATA OBJECT (SDO)

Dictionary objects can be accessed with the Service Data Object (SDO). This protocol uses 2 COB -IDs (this corresponds to confirmed messaging):

600h + Node-ID for master to slave communication (client → server)
580h + Node-ID for slave to master communication (server → client)

The SDO services uses the “multiplexed domain protocol” defined in /1/. The drive recognizes size indication or no size indication. The drive response can use size indication or no size indication (see 20C8h, sub -index 02h, bit 0)

### READ DICTIONARY OBJECT (LESS THAN 5 DATA BYTES)

The master application (SDO client) sends the following message (Domain Upload, expedited):

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 600h + Node-ID | command | Object index (LSB) | Object index (MSB) | Sub-index | 00h | 00h | 00h | 00h |

Node-ID drive address (0…7Fh)
Command 40h
Object index object dictionary index (e.g. 6040h), least significant byte first
Sub-index object dictionary index sub -index

The slave (SDO server) responds with:

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 580h + Node-ID | reply | Object index (LSB) | Object index (MSB) | Sub-index | data | | | |

Node-ID drive address (0…7Fh)
Reply No size indication: 42h
With size indication: 4Fh for 8-bit variables, 4Bh for 16-bit variables, 43h for 32-bit variables
Object index object dictionary index (e.g. 6040h), least significant byte first
Sub-index object dictionary index sub -index
Data data bytes, least significant byte first

### READ DICTIONARY OBJECT (MORE THAN 4 DATA BYTES)

If more than 4 data bytes need to be sent, the data is split in 7 byte segments.

Step 1: the master application (SDO client) sends the following message (domain upload, normal):

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 600h + Node-ID | command | object index (LSB) | Object index (MSB) | Sub-index | 00h | 00h | 00h | 00h |

Node-ID drive address (0…7Fh)
Command 40h
Object index object dictionary index, least significant byte first
Sub-index object dictionary index sub-index

The slave (SDO server) responds with:

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 580h + Node-ID | reply | object index (LSB) | Object index (MSB) | Sub-index | 00h | 00h | 00h | 00h |

Node-ID drive address (0…7Fh)
Reply No size indication: 40h
With size indication: 41h
Object index object dictionary index, least significant byte first
Sub-index object dictionary index sub-index

Step 2: the master application (SDO client) sends the following message:

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 600h + Node-ID | command | 00h | 00h | 00h | 00h | 00h | 00h | 00h |

Node-ID drive address (0…7Fh)
Command 60h + toggle_bit*10h, the toggle_bit alternates between 0 and 1, starting with 0

The slave (SDO server) responds with:

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 580h + Node-ID | reply | data | | | | | | |

Node-ID drive address (0…7Fh)
Reply toggle_bit*10h + last_segment; last_segment = 1 indicates last segment, otherwise 0
For 32 byte string, this will result in 07h
Data data bytes, least significant byte first

This process continues until the last segment is sent (last_segment = 1)

**WRITE DICTIONARY OBJECT (LESS THAN 5 DATA BYTES)**

The master application (SDO client) sends the following message (domain download, expedited):

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 600h + Node-ID | Command | Object index (LSB) | Object index (MSB) | Sub-index | data | | | |

Node-ID drive address (0…7Fh)
Command No size indication: 22h
With size indication: 2Fh for 8-bit variables, 2Bh for 16-bit variables, 23h for 32-bit variables
Object index object dictionary index (e.g. 6040h), least significant byte first
Sub-index object dictionary index sub-index
Data data bytes, least significant byte first

The slave (SDO server) responds with:

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 580h + Node-ID | reply | Object index (LSB) | Object index (MSB) | Sub-index | 00h | 00h | 00h | 00h |

Node-ID drive address (0…7Fh)
Reply 60h
Object index object dictionary index (e.g. 6040h), least significant byte first
Sub-index object dictionary index sub-index

**WRITE DICTIONARY OBJECT (MORE THAN 4 DATA BYTES)**

If more than 4 data bytes need to be sent, the data is split in 7 byte segments.

The master application (SDO client) sends the following message (domain upload, normal):

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 600h + Node-ID | command | object index (LSB) | Object index (MSB) | Sub-index | 00h | 00h | 00h | 00h |

Node-ID drive address (0…7Fh)
Command 20h
Object index object dictionary index, least significant byte first
Sub-index object dictionary index sub-index

The slave (SDO server) responds with:

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 580h + Node-ID | Reply | Object index (LSB) | Object index (MSB) | Sub-index | 00h | 00h | 00h | 00h |

Node-ID drive address (0…7Fh)
Reply 60h
Object index object dictionary index, least significant byte first
Sub-index object dictionary index sub-index

Then the master application (SDO client) sends the following message:

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 600h + Node-ID | command | data | | | | | | |

Node-ID drive address (0…7Fh)
Command toggle_bit*10h + last_segment
the toggle_bit alternates between 0 and 1, starting with 0
the last_segement = 1 indicates last segment, otherwise 0
Data data bytes, least significant byte first

Then the slave (SDO server) responds with:

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 580h + Node-ID | reply | 00h | 00h | 00h | 00h | 00h | 00h | 00h |

Node-ID drive address (0…7Fh)
Reply 20h + toggle_bit*10h

This process continues until the last segment is sent (last_segment = 1)

**ABORT TRANSFER**

When an error occurs during reading or writing an object, the slave sends an error message:

| COB ID | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 | Byte8 |
|---|---|---|---|---|---|---|---|---|
| 580h + Node-ID | command | object index (LSB) | Object index (MSB) | Sub-index | N/S | N/S | N/S | N/S |

Command 80h
Object index object dictionary index, least significant byte first
Sub-index object dictionary index sub-index
N/S Not Specified

## INDEX