User's Manual

Can Open DSP402 attachment


BLU

INDEX

FIRMWARE VERSIONS: 12.0 / 22.0

1. INTRODUCTION

1.1 ABOUT THIS MANUAL

This manual is meant as a brief explanation of OPDE CAN OPEN DSP402. The manual contains the following chapters:

- **Revision Table** contains the history revision of the manual;
- **Introduction** provides information background about the manual;
- **CAN OPEN DSP402 Profiles** contains the DSP402 Profiles cabling instruction and general information about EtherCAT connections;

1.2 COMMON SYMBOLS AND ABBREVIATIONS

Abbreviations	Explanations
CAN	Controller Area Network
CiA	CAN in Automation
EMCY	Emergency Object or Service
OPDE	Open Drive Exp or OPDExp
OPD Explorer	OPD Explorer Supervisory Software
SDO	Service Data Object

1.3 INTENDED AUDIENCE

The manual is intended for those persons who are responsible for commissioning and using an OPDE CAN Module. The reader should have some basic knowledge of networking, electrical fundamentals, electrical wiring practices and how to work the OPDE drive and OPD Explorer.

1.4 UNIT MEASURING SYSTEM

The units of measurement used by CAN Open DSP 402 are the following:

- Positions are expressed in “ie” (encoder pulse). One mechanical motor revolution is 65536 ie (or encoder pulses);
- Speed are expressed in “ie/s”. One revolutions-per-second is 65536 ie/s;
- Accelerations are expressed in “ie/s^2”. One revolutions-per-second^2 is 65536 ie/s^2

2. CAN OPEN DSP402 PROFILES

2.1 CAN OPEN DS402 PROFILES SUPPORTED

In OPDE drive are implemented the following CAN Open DSP 402 profiles:

- **Device Control;**
- **Profile Velocity Mode;**
- **Profile Position Mode;**
- **Interpolation Position Mode;**
- **Homing Mode;**
- **Cyclic synchronous velocity mode;**
- **Cyclic synchronous position mode.**

For more information, see CiA Draft Standard Proposal 402 specifications.

2.2 DEVICE CONTROL

Device controls is a profile that define the behaviour of the control device. The master controls like the slave works with the following objects:

- Control Word;
- Status word;
- Modes of operation;
- Modes of operation display;
- Quick stop option code;
- Quick stop deceleration;

The object descriptions are in Tab. 1:

Index (hex)	Object	Type	Name	Description	PDO Mapping	Access
6040	VAR	UNSIGNED16	Control word	This object controls the Finite State Machine of DSP 402. OPD Explorer Parameter: **E100**	Yes	Reading/ writing
6041	VAR	UNSIGNED16	Status word	This object provides the status of Finite State Machine of DSP 402. OPD Explorer Parameter: **D64**	Yes	reading
6060	VAR	INTEGER8	Modes of operation	This object indicates the requested operation modes. OPDE drive supports the following modes: **1. Profile position mode;** **3. Profile velocity mode;** **6. Homing mode;** **7. Interpolation position mode;** **8. Cyclicsync position mode;** **9. Cyclic sync velocity mode.** OPD Explorer Parameter: **E01**	Yes	Reading /writing
6061	VAR	INTEGER8	Modes of operation display	This object provides the actual operation mode OPD Explorer Parameter: **D65**	Yes	reading

605A	VAR	INTEGER16	Quick stop option code	This object indicates what action is performed when the quick stop function is executed. OPDE drive supports the following codes: **Slow down on quick stop ramp and transit into Switch On Disabled;** **Slow down on quick stop ramp and stay in Quick Stop Active;** **Note:** if the inserted code is not expected, the quick stop option code executes the code 1. OPD Explorer Parameter: **E38**	No	Reading
6085	VAR	UNSIGNED32	Quick stop deceleration	This object configures the deceleration used to stop the motor when the quick stop function is activated. OPD Explorer Parameters: **E08-E09**	Yes	Reading

Tab. 1- Device Control Objects

2.2.1 SECOND SENSOR

The parameter **E51**, **pENSECONDSENS = Yes** allows to select the second sensor and close the position loop on this. There is the possibility to set a gear ratio between motor revolution and driving shaft revolution parameters **E60-E61 - pNUM_GEAR_BOX**, and parameters **E62-E63 - pDEN_GEAR_BOX**). Tab. 2 shows second sensor function parameters.

Name	Value	UM	Default	Min	Max	Description
pENSECONDSENS	No		No			E51 – Enable second sensor
pNUM_GEAR_BOX	1	Rev	1	1	2147483647	E60-E61– Gear box numerator
pDEN_GEAR_BOX	1	Rev	1	1	2147483647	E62-E63 – Gear box numerator
pENMULTICORRECT	No		No			E64 Enable correction for absolute multi-turn sensor

Tab. 2- Second sensor device control

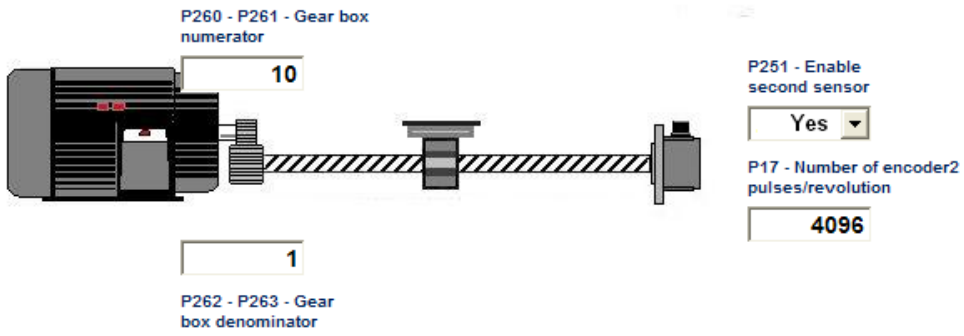

Fig. 1-Second sensor graphic interface

The example shown in Fig. 1 regards a system with a reduction ratio **10:1** between the motor shaft and the driving shaft, with a revolution of the driving shaft. The second sensor is an encoder with 4096 pulses/revolution set in the parameter **P17-ENC2_PPR**.
This parameter is located in the directory:

All Parameters > Application I/O Parameters > Input > Second Sensor

The internal software realizes a possible “correction” for incremental sensor’s which have zero pulse. In these kind of sensor when comes the zero pulse signal the position goes to zero. For the homing method’s without index pulses (metods 17---30) take place the correction when the zero pulse comes and the position doesn’t go to zero. The “correction” is allowed for both sensors (first or second).

If the second sensor is enabled, the value of position, velocity and acceleration in all the operation mode available al referred to the motor shaft side.
For example if the gear ratio is **10:1** (1 turn of the motor shaft = 10 turns of the driving shaft) and the position target **pTARGETPOS – E10 – E11** is 655360 i.e., the motor turns for 10 revolutions and the driving shaft for 1 revolution.
For each PWM period a pulses difference is calculated (delta pulses), depending on the second sensor mechanical position read. This value is reported to motor side by relationship:

$$\textit{motor side delta pulses} = \frac{\textbf{\textit{pNUM\_GEAR\_BOX E60-E61}}}{\textbf{\textit{pDEN\_GEAR\_BOX E62-E63}}} \cdot \textit{delta pulses sec. Sensor}$$

The parameter **E64- pENMULTICORRECT** (if enabled) consent to correct the overflow for absolute sensor multi-turn when the high mechanical position (number of turns) reach the maximum number of turn.
For example for ENDAT-BISS 12bit after 4095 turns high position goes to zero value, this could be a problem.

2.3 PROFILE VELOCITY MODE

The profile velocity mode covers the following sub-functions:

- Demand value input via trajectory generator;
- Velocity capture using position sensor or velocity sensor;
- Velocity control function with appropriate input and output signals;
- Monitoring of the profile velocity using a window-function;
- Monitoring of velocity actual value using a threshold.

OPDE drive supports the following Profile Velocity Mode objects (Tab. 3):

Index (hex)	Object	Type	Name	Description	PDO Mapping	Access
606C	VAR	INTEGER32	Velocity actual value	This object provides the actual velocity. OPD Explorer Parameters: **D68-D69**	Yes	Reading
606D	VAR	UNSIGNED16	Velocity window	This object indicates the configured velocity window. OPD Explorer Parameter: **E22 – E23**	Yes	Reading/ writing
606E	VAR	UNSIGNED16	Velocity window time	This object indicates the configured velocity window time. OPD Explorer Parameter: **E24**	Yes	Reading/ writing
606F	VAR	UNSIGNED32 UNSIGNED16 **	Velocity threshold	This object indicates the configured velocity threshold. OPD Explorer Parameter: **E18-E19**	Yes	Reading/ writing
6070	VAR	UNSIGNED16	Velocity threshold time	This object indicates the configured velocity threshold time. OPD Explorer Parameter: **E20**	Yes	Reading/ writing
6083	VAR	UNSIGNED32	Profile acceleration	This object indicates the configured acceleration. OPD Explorer Parameter: **E04-E05**	Yes	Reading/ writing

6084	VAR	UNSIGNED32	Profile deceleration	This object indicates the configured deceleration OPD Explorer Parameter: **E06-E07**	Yes	Reading/ writing
60FF	VAR	INTEGER32	Target velocity	This object indicates the configured target velocity. OPD Explorer Parameter: **E02-E03**	Yes	Reading/ writing

Tab. 3- Profile Velocity Mode Objects

2.4 PROFILE POSITION MODE

In profile position mode a target position is applied to the trajectory generator. The trajectory generator produces a position demand value for the position control loop.

OPDE drive supports the following Profile Position Mode objects (Tab. 4):

Index (hex)	Object	Type	Name	Description	PDO Mapping	Access
6064	VAR	INTEGER 32	Position actual value	This object provides the actual position. OPD Explorer Parameters: **D66-D67**	Yes	Reading
6065	VAR	UNSIGNED 32	Following error window	This object indicates the configured range of tolerant position values symmetrically to the position demand value. OPD Explorer Parameters: **E16 – E17**	Yes	Reading/writing
6067	VAR	UNSIGNED 32	Position window	This object indicates the configured symmetrical range of accepted positions relative to the target position. OPD Explorer Parameter: **E14-E15**	Yes	Reading/writing
606F	VAR	UNSIGNED 16	Velocity threshold	This object indicates the configured velocity threshold. OPD Explorer Parameter: **E18-E19**	Yes	Reading/writing
607A	VAR	INTEGER32	Target position	This object indicates the commanded position that the drive should move to in position profile mode. OPD Explorer Parameter: **E10-E11**	Yes	Reading/writing
607D	ARRAY	UNSIGNED 8	Highest sub-index supported (Sub-index 0)	Highest sub-index supported	No	Reading
		INTEGER 32	Min position limit (Sub-index 1)	This object indicates the maximal software position limit. OPD Explorer Parameter: **E40–E41**	Yes	Reading/writing

		INTEGER 32	Max position limit (Sub-index 2)	This object indicates the maximal software position limit. OPD Explorer Parameter: **E42-E43**	Yes	Reading/writing
6081	VAR	UNSIGNED 32	Profile velocity	This object indicates the configured velocity normally attained at the end of the acceleration ramp during a profiled motion. OPD Explorer Parameter: **E12-E13**	Yes	Reading/writing
6083	VAR	UNSIGNED 32	Profile acceleration	This object indicates the configured acceleration. OPD Explorer Parameter: **E04-E05**	Yes	Reading/writing
6084	VAR	UNSIGNED 32	Profile deceleration	This object indicates the configured deceleration OPD Explorer Parameter: **E06-E07**	Yes	Reading/writing

Tab. 4 - Profile Position Mode Objects

2.5 INTERPOLATE POSITION MODE

Interpolated position mode is used to control multiple coordinated axes or a single axis with the need for time-interpolation of set-point data. The interpolated position mode normally uses time synchronisation mechanisms for a time coordination of the related drive units (e.g. Distributed Clock in EtherCAT protocol).

OPDE drive supports the following Interpolated Position Mode objects (Tab. 5):

Index (hex)	Object	Type	Name	Description	PDO Mapping	Access
6064	VAR	INTEGER 32	Position actual value	This object provides the actual position. OPD Explorer Parameters: **D66-D67**	Yes	Reading
606F	VAR	UNSIGNED 16	Velocity threshold	This object indicates the configured velocity threshold. OPD Explorer Parameter: **E18-E19**	Yes	Reading/writing
60C1	ARRAY	UNSIGNED 8	Highest sub-index supported (Sub-index 0)	Highest sub-index supported	No	Reading
		INTEGER 32	Interpolated data – 1st set-point (Sub-index 1)	This object indicates data words, which are necessary to perform the interpolation algorithm. OPD Explorer Parameter: **E24-E25**	Yes	Reading/writing

Tab. 5 - Interpolated Position Mode Objects

2.6 HOMING MODE

Homing Mode implements the methods which a drive seeks the home position, or initial reference point (also called, the datum or zero point). There are various methods of achieving this using limit switches at the ends of travel or a home switch (zero point switch) in mid-travel, most of the methods also use the index (zero) pulse train from an incremental encoder.

OPDE drive supports the following methods:

1. ***Homing on negative limit switch and index pulse****;*
2. ***Homing on positive limit switch and index pulse****;*
3. ***Homing on positive home switch and index pulse.*** *The home position is at the left of the point where the home switch changes state;*
4. ***Homing on positive home switch and index pulse.*** *The home position is at the right of the point where the home switch changes state;*
5. ***Homing on negative home switch and index pulse.*** *The home position is at the right of the point where the home switch changes state;*
6. ***Homing on negative home switch and index pulse.*** *The home position is at the left of the point where the home switch changes state;*
7. ***Homing on home switch and index pulse with positive limit switch.*** *The home position is at the left of the point where the home switch has falling edge;*
8. ***Homing on home switch and index pulse with positive limit switch.*** *The home position is at the right of the point where the home switch has rising edge;*
9. ***Homing on home switch and index pulse with positive limit switch.*** *The home position is at the left of the point where the home switch has rising edge;*
10. ***Homing on home switch and index pulse with positive limit switch.*** *The home position is at the right of the point where the home switch has falling edge;*
11. ***Homing on home switch and index pulse with negative limit switch.*** *The home position is at the right of the point where the home switch has falling edge;*
12. ***Homing on home switch and index pulse with negative limit switch.*** *The home position is at the left of the point where the home switch has rising edge;*
13. ***Homing on home switch and index pulse with negative limit switch.*** *The home position is at the right of the point where the home switch has rising edge;*
14. ***Homing on home switch and index pulse with negative limit switch.*** *The home position is at the left of the point where the home switch has falling edge;*
17. ***Homing on negative limit switch without index pulse;***
18. ***Homing on positive limit switch without index pulse;***
19. ***Homing on positive home switch without index pulse.*** *The home position is at the left of the point where the home switch changes state;*
21. ***Homing on negative home switch without index pulse.*** *The home position is at the right of the point where the home switch changes state;*
23. ***Homing on home switch and index pulse without positive limit switch.*** *The home position is at the left of the point where the home switch has falling edge;*
26. ***Homing on home switch without index pulse with positive limit switch.*** *The home position is at the right of the point where the home switch has falling edge;*
27. ***Homing on home switch without index pulse with negative limit switch.*** *The home position is at the right of the point where the home switch has falling edge;*
30. ***Homing on home switch without index pulse with negative limit switch.*** *The home position is at the left of the point where the home switch has falling edge;*
33. ***Homing on index pulse.*** *The home position is at first index pulse found on the left;*
34. ***Homing on index pulse.*** *The home position is at first index pulse found on the right;*
35. ***Homing on index pulse.*** *The home position is the current position.*

OPDE drive supports the following Homing Mode objects (

Tab. **6**).

Index (hex)	Object	Type	Name	Description	PDO Mapping	Access
606F	VAR	UNSIGNED 16	Velocity threshold	This object indicates the configured velocity threshold. OPD Explorer Parameter: **E18-E19**	Yes	Reading/writing
607C	VAR	INTEGER 32	Home offset	This object indicates the configured difference between the zero position for the application and the machine home position. OPD Explorer Parameters: **E28-E29**	Yes	Reading/writing
6098	VAR	INTEGER 8	Homing method	This object indicates the configured homing method The supported methods are those descripted above. OPD Explorer Parameters: **E26**	Yes	Reading/writing
6099	ARRAY	UNSIGNED 8	Highest sub-index supported (Sub-index 0)	Highest sub-index supported	No	Reading
		UNSIGNED 32	Speed during search for switch (Sub-index 1)	This object indicates the configured speed during search for switch. OPD Explorer Parameter: **E30-E31**	Yes	Reading/writing
		UNSIGNED 32	Speed during search for zero (Sub-index 2)	This object indicates the configured speed during search for zero. OPD Explorer Parameter: **E32-E33**	Yes	Reading/writing
609A	VAR	UNSIGNED 32	Homing acceleration	This object indicates the configured acceleration and deceleration to be used during homing operation. OPD Explorer Parameters: **E34-E35**	Yes	Reading/writing

Tab. 6 - Homing Mode Objects

2.6.1 HOMING SWITCHES

The homing switches are implemented with the following Logic Input Functions:

- **positive limit switch** is the input logic function **I28**;
- **negative limit switch** is the input logic function **I29**;
- **home switch** is the input logic function **I30.**

For more information about input logic functions, see OPDE manual.

2.6.2 HOMING WITH TOUCH PROBE

In this method, the position is not sampled by control device, but by the **drive device** itself. When the switch is triggered, the corresponding actual position together will the switch signal shall be reported.

Index (hex)	Object	Type	Name	Description	PDO Mapping	Access
60B8	VAR	UNSIGNED 16	Touch probe function	This object indicates the configured function of touch probe. OPD Explorer Parameter: **E104**	Yes	Reading/writing
60B9	VAR	UNSIGNED 16	Touch probe status	This object indicates the status of touch probe. OPD Explorer Parameters: **E105**	Yes	Reading
60BA	VAR	INTEGER 32	Touch probe pos1 pos value	This object indicates the position values of touch probe 1 at positive edge. The value shall be given in user-defined position units. OPD Explorer Parameters: **E106-E107**	Yes	Reading
60BB	VAR	INTEGER 32	Touch probe pos1 negative value	This object indicates the position values of touch probe 1 at negative edge. The value shall be given in user-defined position units. OPD Explorer Parameters: **E108-E109**	Yes	Reading
60BC	VAR	INTEGER 32	Touch probe pos2 positive value	This object indicates the position values of touch probe 2 at positive edge. The value shall be given in user-defined position units. OPD Explorer Parameters: **E110-E111**	Yes	Reading
60BD	VAR	INTEGER 32	Touch probe pos2 negative value	This object indicates the position values of touch probe 2 at positive edge. The value shall be given in user-defined position units. OPD Explorer Parameters: **E112-E113**	Yes	Reading

Tab. 7- Touch probe objects

For touch probe function, the setting is:

bit	value	definition
0	0	Switch off touch probe 1
	1	Enable touch probe 1
1	0	Trigger first event
	1	continuous
2	0	Trigger with touch probe 1 input
	1	Trigger with zero impulse signal or position encoder
3	0	Reserved
4	0	Switch off sampling at positive edge of touch probe 1
	1	Enable sampling at positive edge of touch probe 1
5	0	Switch off sampling at negative edge of touch probe 1
	1	Enable sampling at negative edge of touch probe 1
6,7	-	User-defined
8	0	Switch off touch probe 2
	1	Enable touch probe 2
9	0	Trigger first event
	1	continuous
10	0	Trigger with touch probe 2 input

	1	Trigger with zero impulse signal or position encoder
11	0	Reserved
12	0	Switch off sampling at positive edge of touch probe 2
	1	Enable sampling at positive edge of touch probe 2
13	0	Switch off sampling at negative edge of touch probe 2
	1	Enable sampling at negative edge of touch probe 2
14,15	-	User-defined

Tab. 8- Touch probe function bits

And for touch probe status:

bit	value	definition
0	0	Touch probe 1 is switched off
	1	Touch probe 1 is enabled
1	0	Touch probe 1 no positive edge value stored
	1	Touch probe 1 positive edge value stored
2	0	Touch probe 1 no negative edge value stored
	1	Touch probe 1 negative edge value stored
3 to 5	0	Reserved
6,7	-	User-defined (e.g. for testing)
8	0	Touch probe 2 is Switched off
	1	Touch probe 2 is Enabled
9	0	Touch probe 2 no positive edge value stored
	1	Touch probe 2 positive edge value stored
10	0	Touch probe 2 no negative edge value stored
	1	Touch probe 2 negative edge value stored
11 to 13	-	Reserved
14, 15	-	User-defined (e.g. for testing)

Tab. 9- Touch probe status bits

2.7 PROFILE SYNC VELOCITY MODE

The cyclic synchronous velocity mode covers the following sub-functions:

- Demand value input
- Velocity capture using position sensor or velocity sensor
- Velocity control function with appropriate input and output signals
- Limitation of torque demand

Various sensors may be used for velocity capture. In particular, the aim is that costs are reduced and the drive power system is simplified by evaluating position and velocity using a common sensor, such as is optional using a resolver or an encoder.

The behavior of the control function is influenced by control parameters such as limit functions, which are externally applicable. The drive internal control function is not specified more precisely in this part of profile specification as it is highly manufacturer-specific, but the format and content of the control parameters are provided. The input (from the **control device** point of view) are the target velocity. The drive device may support limitation of motor speed and a quick stop function for emergency reasons. The interpolation time period defines the time period between two updates of the target velocity and shall be used for intercycle interpolation.

The **velocity actual value is** used as mandatory output to the control device.

Index (hex)	Object	Type	Name	Description	PDO Mapping	Access
605A	VAR	UNSIGNED 16	Quick stop option code	This object indicates what action is performed when the quick stop function is executed. OPDE drive supports the following codes: **Slow down on quick stop ramp and transit into Switch On Disabled;** **Slow down on quick stop ramp and stay in Quick Stop Active;** **Note:** if the inserted code is not expected, the quick stop option code executes the code 1. OPD Explorer Parameter: **E38**	No	Reading
606C	VAR	SIGNED 32	Velocity actual value	This object provides the actual velocity. OPD Explorer Parameters: **D68-D69**	Yes	Reading
606D	VAR	UNSIGNED 16	Velocity window	This object indicates the configured velocity window. OPD Explorer Parameter: **E22-E23**	Yes	Reading/writing
6085	VAR	UNSIGNED 32	Quick stop deceler ation	This object configures the deceleration used to stop the motor when the quick stop function is activated. OPD Explorer Parameters: **E08-E09**	Yes	Reading
60FF	VAR	SIGNED32	Target Velocity	This object indicates the configured target velocity. OPD Explorer Parameter: **E02-E03**	Yes	Reading/writing

Tab. 10 Profile sync velocity mode

2.8 PROFILE SYNC POSITION MODE

With this mode, the trajectory generator is located in the **control device**, not in the drive device. In cyclic synchronous manner, it provides a target position to the drive device, which performs position control,
velocity control and torque control. Optionally, additive velocity and torque values can be provided by the control system in order to allow for velocity and/or torque feedforward. Measured by sensors, the drive device may provide actual values for position, velocity and torque to the control device.
The behavior of the control function is influenced by control parameters like limit functions, which are externally applicable. The drive internal control function is not specified more precisely in this part of profile specification as it is highly manufacturer-specific, but the format and content of the control parameters are provided.

Index (hex)	Object	Type	Name	Description	PDO Mapping	Access
605A	VAR	UNSIGNED 16	Quick stop option code	This object indicates what action is performed when the quick stop function is executed. OPDE drive supports the following codes: **Slow down on quick stop ramp and transit into Switch On Disabled;** **Slow down on quick stop ramp and stay in Quick Stop Active;** **Note:** if the inserted code is not expected, the quick stop option code executes the code 1. OPD Explorer Parameter: **E38**	No	Reading
6064	VAR	INTEGER32	Position actual value	This object provides the actual position. OPD Explorer Parameters: **D66-D67**	Yes	Reading

6065	VAR	UNSIGNED 32	Following error window	This object indicates the configured range of tolerant position values symmetrically to the position demand value. OPD Explorer Parameters: **E16-E17**	Yes	Reading/ writing
607A	VAR	INTEGER32	Target position	This object indicates the commanded position that the drive should move to in position profile mode. OPD Explorer Parameter: **E10-E11**	Yes	Reading/ writing
60F4	VAR	INTEGER32	Following error actual value	This object shall provide the actual value of the following error. The value is given in user-defined position units. OPD Explorer Parameter: **d70-d71**	Yes	Reading

Tab. 11 Profile sync position mode

These parameters are available from **Dsp402_06 software release (see Errore. L'origine riferimento non è stata trovata.).

2.9 OTHER MAPPED OBJECTS

Index (hex)	Object	Type	Name	Description	PDO Mapping	Access
6075	VAR	UNSIGNED 32	Motor rated current	This object indicates the configured motor rated current. It is taken from the motor's name-plate. The value is given in mA.	Yes	Reading
6076	VAR	UNSIGNED 32	Motor rated torque	This object indicates the configured motor rated torque. It is taken from the motor's name-plate. The value is given in mNm (milli Newton metre)	Yes	Reading
6077	VAR	INTEGER16	Torque actual value	This object indicates the actual value of the torque. It corresponds to the instantaneous torque in the motor. The value is given per thousand of rated torque.	Yes	Reading
6078	VAR	INTEGER16	Current actual value	This object indicates the actual value of the current. It correspond to the current in the motor. The value is given per thousand of rated current.	Yes	Reading
6079	VAR	UNSIGNED 32	DC link circuit voltage	This object indicates the instantaneous DC link current voltage at the drive device. The value is given in mV.	Yes	Reading
60F4	VAR	INTEGER32	Following error actual value	This objects indicates the actual value of the following error. The value is given in user-defined position units. OPD Explorer Internal Value: **d70-d71**	Yes	Reading
60FD	VAR	UNSIGNED 32	Digital inputs	This object shall provide digital inputs. The object structure is: **bit 0**: Negative Limit Switch **bit 1**: Positive Limit Switch **bit 2**: Home Switch **bit 3**: Interlock **bit 4** – **bit 15**: Reserved **bit 16**: Run command (Manufacturer specific) **bit 17**: External enable (Manufacturer specific) **bit 18**: Reset alarms (Manufacturer specific) **bit 19**: Motor thermo-switch (Manufacturer specific) **bit 20**: Touch Probe 1 (Manufacturer specific) **bit 21**: Touch Probe 2 (Manufacturer specific)	Yes	Reading

2.10 ALARMS

ALARM			DESCRIPTION	CORRECTION
HEX	DEC	TYPE		
A.4.0.H	A4.0	Life guarding alarm	Master's time out	Check the correct time setting of the master
A.4.1.H	A4.1	SYNC Period too much different from theoretical value	Time difference between two sync is greater than the value set in E65	Check the correct time setting of the master
A.4.2.H	A4.2	Following error alarm	Following error (between reference and real position) is greater than maximum admitted error	Verify the drive's correct functioning, check the speed and current loop. Verify the position control. Increase, if possible, the maximum admitted error.


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