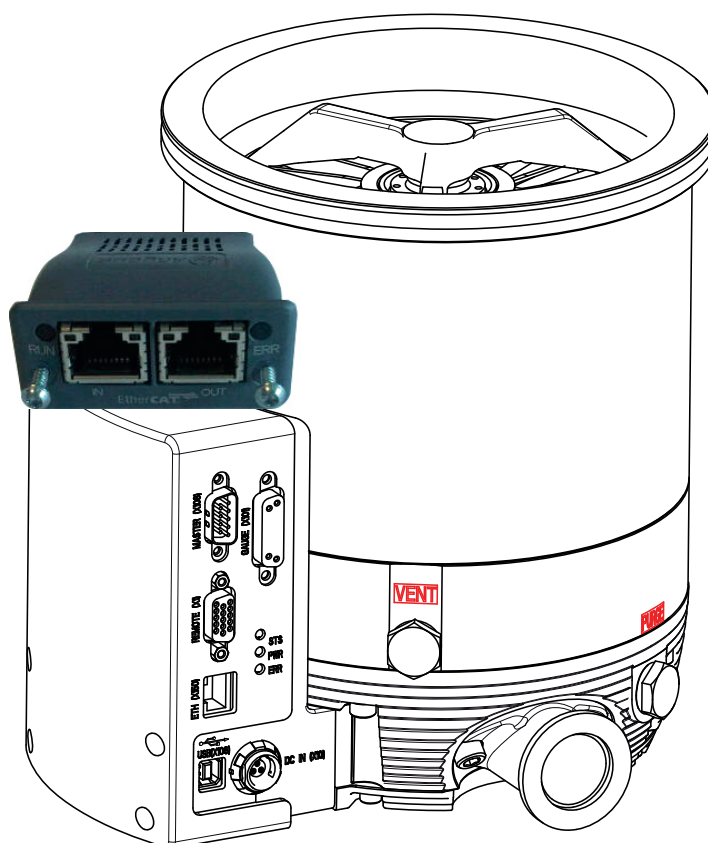


TURBOVAC i/iX

EtherCAT Interface

Operating Instructions 300687441_002_C1



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Safety Information



NOTICE



Obligation to Provide Information

Before installing and commissioning the device, carefully read these Operating Instructions and follow the information so as to ensure optimum and safe working right from the start.

The Leybold **TURBOVAC i/iX** has been designed for safe and efficient operation when used properly and in accordance with these Operating Instructions. It is the responsibility of the user to carefully read and strictly observe all safety precautions described in this section and throughout the Operating Instructions. The equipment must only be operated in the proper condition and under the conditions described in the Operating Instructions. It must be operated and maintained by trained personnel only. Consult local, state, and national agencies regarding specific requirements and regulations. Address any further safety, operation and/or maintenance questions to our nearest office.

“Trained personnel” for the operation of this pump are

- skilled workers with knowledge in the fields of mechanics, electrical engineering and vacuum technology, and
- personnel specially trained for the operation of vacuum pumps.

DANGER



DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING



WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION



CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE



NOTICE is used to notify users of installation, operation, programming or maintenance information that is important, but not hazard related.

We reserve the right to alter the design or any data given in these Operating Instructions. The illustrations are not binding.

Retain the Operating Instructions for further use.

Installation and operation of the TURBOVAC i/iX is described in Operating Instructions 300554863. Described in these Operating Instructions is only the EtherCAT interface of the TURBOVAC i/iX.

WARNING



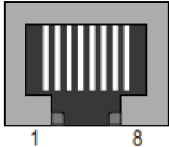
Before making any connections, deenergise the pump and wait until it no longer turns. Since in spite of this dangerous voltages can remain present, the equipment must only be opened by a trained electrician.

1 Description

EtherCAT is an open high performance Ethernet-based fieldbus system that overcomes the system limitations of other Ethernet solutions. The Ethernet packet is no longer received, then interpreted and copied as process data at every connection; instead the Ethernet frame is processed on the fly. The development goal of EtherCAT was to apply Ethernet to automation applications that require short data update times (also called cycle times) with low communication jitter (for synchronization purposes) and low hardware costs.

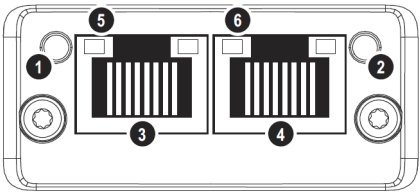
1.2 Communication connector

The EtherCAT® Option is connected to the network using a RJ45 connector. The pin assignment is shown below.

Pin	Signal	Note	EtherCAT® Connector
1	Tx+	-	
2	Tx-	-	
3	Rx+	-	
4	-	Normally left unused; to ensure signal integrity, these pins are tied together and terminated to PE via a filter circuit in the module.	
5	-		
6	Rx-	-	
7	-	Normally left unused; to ensure signal integrity, these pins are tied together and terminated to PE via a filter circuit in the module.	
8	-		

1.3 EtherCAT® Option Status LEDs

LED	Item
1	Run LED
2	Error LED
3	EtherCAT (IN port)
4	EtherCAT (OUT port)
5	Link/Activity (IN port)
6	Link/Activity (OUT port)



The flash sequences for these LEDs are defined in the corresponding ETG1300 specification for indicator labeling.

Description

RUN LED

This LED reflects the status of the EtherCAT device.

Led State	Indication	Description
Off	INIT	EtherCAT device in 'INIT'-state (or no power)
Green	OPERATIONAL	EtherCAT device in 'OPERATIONAL'-state
Green blinking	PRE-OPERATIONAL	EtherCAT device in 'PRE-OPERATIONAL'-state
Green, single flash	SAFE-OPERATIONAL	EtherCAT device in 'SAFE-OPERATIONAL'-state
Flickering	BOOT	The EtherCAT device is in 'BOOT' state
Red	(Fatal Event)	If RUN and ERR turns red, this indicates a fatal event, forcing the bus interface to a physically passive state. Contact Leybold Service.

ERR LED

This LED indicates EtherCAT communication errors etc.

Led State	Indication	Description
Off	No error	No error (or no power)
Red, blinking	Invalid configuration	State change received from master is not possible due to invalid register or object settings
Red, single flash	Unsolicited state change	Slave device application has changed the EtherCAT state autonomously
Red, double flash	Application watchdog timeout	The master doesn't update the Read Process Data within the specified time period.
Red	Application controller failure	Bus module in EXCEPTION If RUN and ERR turns red, this indicates a fatal event, forcing the bus interface to a physically passive state.
Flickering	Bootling error detected	E.g. due to firmware download failure.

Link/Activity

These LEDs indicate the EtherCAT link status and activity.

Led State	Indication	Description
Off	No link	Link not sensed (or no power)
Green	Link sensed, no activity	Link sensed, no traffic detected
Green, flickering	Link sensed, activity detected	Link sensed, traffic detected

2 Network Configuration

Before the module can be used on the network, some basic network settings must be configured.

IP address

The IP address is used to identify each node on the TCP/IP network. Therefore, each node on the network must have a unique IP address. IP addresses are written as four decimal integers (0-255) separated by periods, where each integer represents the binary value of one byte in the IP address. This is called dotted-decimal notation.

Example:

Address 10000000 00001010 00000010 00011110 is written as 128.10.2.30

Subnet Mask

The subnet mask is a 32-bit binary pattern, where a set bit allocates a bit for network/subnet ID, and a cleared bit allocates a bit for the host ID. Like the IP address, the subnet mask is commonly written in dotted-decimal notation.

Example:

To make the IP address 128.10.2.30 belong to subnet 128.10.2, the subnet mask shall be set to 255.255.255.0. Subnet Mask: 11111111 11111111 11111111 00000000 (255.255.255.0)

Special case IP addresses

The following IP addresses are reserved and should not be used:

0.x.x.x - IP address where the first byte is zero

127.x.x.x - IP address where the first byte is 127

127.x.x.0 - IP address where the last byte is zero

x.x.x.255 - IP address where the last byte is 255

2.1 Configuring the IP settings

The module offers several ways to set the IP settings (IP address, Subnet mask & Gateway address):

- DHCP
a DHCP server sets the address as user predefined or automatically
- HICP
the HMS Anybus IP Config program allows an easy adjustment of the IP settings

If DHCP is enabled, the module will attempt to retrieve the following information via DHCP:

- IP address
- Subnet mask
- Gateway address

The module supports DHCP Reboot, i.e. it will ask the DHCP server for the previous used IP address. If that address is free to use, it will be assigned to the module. If not, the module will be assigned a new IP address.

Object Dictionary

HMS IP Configuration Protocol (HICP)

HICP is an acronym for 'HMS IP Configuration Protocol', and is used by the Windows-based application program 'AnyBus IPconfig' that is able to detect HMS modules on the network and configures their IP settings. Since the protocol is based on broadcast messages, it is possible to detect and configure modules that are outside of the host's subnet.

The Anybus IPconfig tool is used to set up or change the Ethernet configuration on an HMS Ethernet 10/100 Mbit module. Start with opening the program and press SCAN. All HMS Ethernet nodes will then be listed. To change a configuration, just perform a double click on the desired node. All settings will then be available.

For more information and downloading of the latest version of the AnyBus IPconfig program look at the HMS homepage: "www.anybus.com".

2.2 Web Server

The embedded web server of the TURBOVAC i/iX provides an easy access to some important information about the pump and can be used with the common internet browsers like MS Internet Explorer, Firefox etc..

For some sites you need to log in with the following data:

User:	customer
Password:	customing

The following information can be retrieved via the internet browser:

Identity

- IP configuration
- Catalog no. of pump
- Serial no. of pump
- Software revisions

State

- Controlling the pump
- Actual state of the pump
- Actual speed, temperature, voltage and current information

Config

- Configuration of the digital and analog outputs

Service

- Operating cycles and operating hours
- Actual temperatures of converter and pump
- Warning and failure Information

2.3 Object Dictionary

The Object Dictionary consists of two sections:

The tables below give an overview of the communication objects available in the implementation of the TURBOVAC i/iX

It might be possible, that the CoE Online dictionary of the device will show additional entries or subentries which are not explained in this manual. These entries or subentries are under development and so far not fully supported.

Communication Profile Objects (DS 301)

Index (hex)	Name
1000	Device Type
1001	Error register
1003	Pre-defined error field
1008	Manufacturer Device Name
1009	Manufacturer Hardware Version
100A	Manufacturer Software Version
1011	Restore default parameters
1018	Identity Object
1600	Receive PDO Mapping
1A00	Transmit PDO Mapping
1C00	Sync Manager Communication Type
1C12	Sync Manager Rx PDO assign
1C13	Sync Manager Tx PDO assign
1C32	Output SyncManager Parameter
1C33	Input SyncManager Parameter

Manufacturer Specific Profile Objects (DS 301)

Index (hex)	Name
2002	Input Points
2003	Output Points
2004	Warnings
2005	Actual Error
2006	Error memory: Failure code
2007	Error memory: Frequency
2008	Error memory: Operation hours
2009	AC/DC Drive
200B	Temperature Bearing
200C	Temperature Motor
200D	Temperature Converter
200E	Pressure Gauge

2.4 Process Data Objects (PDO)

Cyclic data is implemented on EtherCAT networks by using „Process Data Objects“ or PDOs. Separate data objects are used for transmitting (TxPDOs) and receiving (RxPDOs) data.

2.5 Service Data Object (SDO) parameter access

The service data object (SDO) provides access to all objects in the EtherCAT object Dictionary.

CANopen over EtherCAT

3 CANopen over EtherCAT (CoE)

The CoE protocol over EtherCAT uses a modified form of the CANopen object dictionary. This is specified in the table below:

Index	Description	Sub-index	Name Subindex	Access
0x1000	Device Type	-	-	R
0x1001	Error register	-	-	R
0x1003	Pre-defined error field	0x00	Number of Elements	R
		0x01-0x05	Error 1 ... 5	R
0x1008	Manufacturer Device Name	-	-	R
0x1009	Manufacturer Hardware Version	-	-	R
0x100A	Manufacturer Software Version	-	-	R
0x1011	Restore default parameters	0x00	Number of Elements	R
		0x01	Restore all parameters	R/W
0x1018	Identity Object	0x00	Number of Elements	R
		0x01	Vendor ID	R
		0x02	Product Code	R
		0x03	Revision Number	R
		0x04	Serial Number	R
0x1600	Receive PDO Mapping	0x00	Number of elements	R
		0x01	Mapped Object 001	R
0x1A00	Transmit PDO Mapping	0x00	Number of elements	R
		0x09	Mapped Object 001 ... 009	R
0x1C00	Sync Manager Communication Type	0x00	Number of elements	R
		0x01	Channel 1	R
		0x02	Channel 2	R
		0x03	Channel 3	R
		0x04	Channel 4	R
0x1C12	Sync Manager Rx PDO assign	0x00	Number of elements	R
		0x01	PDO Mapping object index of assigned RxPDO	R
0x1C13	Sync Manager Tx PDO assign	0x00	Number of elements	R
		0x01	PDO Mapping object index of assigned TxPDO	R
0x1032	Output SyncManager Parameter	0x00	Number of elements	R
		0x01	Synchronisation Type	R/W
		0x02	Cycle Time	R/W
		0x03	Shift Time	R/W
		0x04	Synchronisation Types supported	R
		0x05	Minimum Cycle Time	R
		0x06	Calc and Copy Time	R
		0x09	Delay Time	R
		0x0C	Cycle Time Too Small	R

CANopen over EtherCAT

Index	Description	Sub-index	Name Subindex	Access
0x1033	Input SyncManager Parameter	0x00	Number of elements	R
		0x01	Synchronisation Type	R/W
		0x02	Cycle Time	R/W
		0x03	Shift Time	R/W
		0x04	Synchronisation Types supported	R
		0x05	Minimum Cycle Time	R
		0x06	Calc and Copy Time	R
		0x0C	Cycle Time Too Small	R
0x2002	Inputs points	0x00	Number of elements	R
		0x01	Pump On/Off status	R
		0x02	Normal speed reached	R
		0x03	Acceleration	R
		0x04	Deceleration	R
		0x05	Generator mode	R
		0x06	Standby mode	R
		0x07	Standstill	R
		0x08	Control via EtherCAT	R
		0x09	At standby speed	R
0x2003	Output points	0x00	Number of elements	R
		0x01	Pump On/Off command	R/W
		0x02	No function	R/W
		0x03	Quit failure command	R/W
		0x04	Standby command	R/W
		0x05	No function	R/W
		0x06	Control via Ethercat	R/W
		0x07	DC Out X201 ON/OFF	R/W
		0x08	DC Out X202 ON/OFF	R/W
		0x09	DC Out X203 ON/OFF	R/W
0x2004	Warnings	-		R
0x2005	Actual Error	0x00	Number of elements	R
		0x01	Actual error code	R
		0x02	Frequency at error	R
		0x03	Operation hours at error	R
0x2006	Error memory: Failure code	0x00	Number of elements	R
		0x01... 0x7F	Failure storage error code	R
0x2007	Error memory: Frequency	0x00	Number of elements	R
		0x01... 0x7F	Failure storage frequency at error	R
0x2008	Error memory: Operation hours	0x00	Number of elements	R
		0x01... 0x7F	Failure storage operation hours	R

CANopen over EtherCAT

Index	Description	Sub-index	Name Subindex	Access
0x2009	AC DC Drive	0x00	Number of elements	R
		0x01	At reference speed	R
		0x02	Frequency setpoint set by Network (EtherCAT) system	R/W
		0x03	Process control	R/W
		0x04	Drive mode	R
		0x05	Actual speed	R
		0x06	Speed reference	R/W
		0x07	Actual motor current	R
		0x08	Limit motor current	R
		0x09	Actual power mains side	R
		0x0A	Input voltage	R
		0x0B	Low speed limit	R
		0x0C	High speed limit	R
		0x0D	Speed control	R/W
		0x0E	Speed status	R
		0x0F	Speed trip time	R
		X010	Max. rated speed	R
		0x11	Standby speed	R/W
		0x12	Speed actual data units	R
		0x13	Speed reference data units	R
		0x14	Pump operation hours (low word)	R
		0x15	Pump operation hours (high word)	R
		0x16	Pump operation cycles	R
		0x17	Converter operation hours (low word)	R
		0x18	Converter operation hours (high word)	R
0x200B	Temperature Bearing	0x00	Number of elements	R
		0x01	Bearing temperature value	R
		0x02	Status	R
		0x03	Alarm trip point value	R
		0x04	Warning trip point value	R
0x200C	Temperature Motor	0x00	Number of elements	R
		0x01	Motor temperature value	R
		0x02	Status	R
		0x03	Alarm trip point value	R
		0x04	Warning trip point value	R
0x200D	Temperature Converter	0x00	Number of elements	R
		0x01	Converter temperature value	R
		0x02	Status	R
		0x03	Alarm trip point value	R
		0x04	Warning trip point value	R
0x200E	Pressure Gauge	0x00	Number of elements	R
		0x01	Pressure value	R

3.1 CoE object dictionary

Index (hex)	Name
0x0000 to 0x0FFF	Data type area
0x1000 to 0x1FFF	CoE communication area
0x2000 to 0x5FFF	Manufacturer specific area
0x6000 to 0x9FFF	Profile area
0xA000 to 0xFFFF	Reserved area

The object description format describes object related information such as size, range and descriptions.

Object description format

Index	Object Name		
Access	Range	Size	Unit
Default			
Description			

Index	Object Name		
Sub index 0			
Access	Range	Size/data type	Unit
Default			
Description			

Sub index 1			
Access	Range	Size/data type	Unit
Default			
Description			

Sub index ...			
Access	Range	Size/data type	Unit
Default			
Description			

Index	A signed 16-bit number. This is the index of the object dictionary entry specified in four hexadecimal characters.
Access	A value describing how the object may be accessed (RW = read/ write, RO = read-only and WO = write-only).
Size	The size of the object/sub-index in bytes
Unit	The physical unit (e.g. ms, counts per second etc.)

CoE Communication Area

4 CoE communication area

4.1 Device type object

0x1000	Device Type		
Sub index 0x00			
Access RO	Range	Data type: unsigned 32	Unit: N/A
Default	0x00000000		
Description	The device type is vendor specific. The value for this object is always 0x00000000		

4.2 Error register

0x1001	Error register		
Sub index 0x00			
Access RO	Range	Data type: unsigned 8	Unit: N/A
Default	0x00		
Description			

If the system is in operational mode, a present error typically causes the turbo pump to shut down automatically. If not longer present, the error can be reset. Bit 7 in the control byte of the output assembly can be used for a failure reset. Bit 7 in the output assembly has only an effect, if Bit 0 has the value 0. This was implemented, to avoid a continuously failure reset.

4.3 Pre-defined error field

0x1003	No. of occurred error		
Sub index 0x00			
Access RO	Range 0 to 0x00	Data type: unsigned 8	Unit: N/A
Default	0x00		
Description	The value shows the number of occurred errors (maximum last 5 errors)		
Sub index 0x01	1 st error		
Access RO	Range 0 to 0xFFFFFFFF	Data type: unsigned 32	Unit: N/A
Default	0x00000000		
Description	Regardless of the error that occurs, the value will always be 0x00001000. Object 2006 should be used for details.		
Sub index 0x02	2 nd error		
Access RO	Range 0 to 0xFFFFFFFF	Data type: unsigned 32	Unit: N/A
Default	0x00000000		
Description	Regardless of the error that occurs, the value will always be 0x00001000. Object 2006 should be used for details.		
Sub index 0x03	3 rd error		
Access RO	Range 0 to 0xFFFFFFFF	Data type: unsigned 32	Unit: N/A
Default	0x00000000		
Description	Regardless of the error that occurs, the value will always be 0x00001000. Object 2006 should be used for details.		

Sub index 0x04	4th error		
Access RO	Range 0 to 0xFFFFFFFF	Data type: unsigned 32	Unit: N/A
Default	0x00000000		
Description	Regardless of the error that occurs, the value will always be 0x00001000. Object 2006 should be used for details.		
Sub index 0x05	5th error		
Access RO	Range 0 to 0xFFFFFFFF	Data type: unsigned 32	Unit: N/A
Default	0x00000000		
Description			

4.4 Manufacturer device Name

0x1008	Manufacturer device name		
Sub index 0x00			
Access RO	Range	Data type: visible string	Unit: N/A
Default	–		
Description	Name of the device as non zero terminated string		

4.5 Manufacturer hardware Version

0x1009	Manufacturer hardware version		
Sub index 0x00			
Access RO	Range	Data type: visible string	Unit: N/A
Default	–		
Description	Hardware version of the device as non zero terminated string		

4.6 Manufacturer software Version

0x100A	Manufacturer software version		
Sub index 0x00			
Access RO	Range	Data type: visible string	Unit: N/A
Default	–		
Description	Software version of the device as non zero terminated string		

4.7 Identity object

0x1018	Identity		
Sub index 0x00			
Access	Range 0 to 0x00	Data type: unsigned 8	Unit
Default	4		
Description	Number of elements		
Sub index 0x01	Vendor ID		
Access : RO	Range N/A	Data type: unsigned 32	Unit: N/A
Default	0x00000723		
Description	This contains the EtherCAT Technology Group vendor ID		

CoE Communication Area

Sub index 0x02	Product Code		
Access : RO	Range N/A	Data type: unsigned 32	Unit: N/A
Default	0x000000B4		
Description	This has the value of the Product ID code.		
Sub index 0x03	Revision number		
Access : RO	Range N/A	Data type: unsigned 32	Unit: N/A
Default	0x00010001		
Description	Contains the option module software version number (the major version is placed in the high word of this object, and the minor version in the low word)		
Sub index 0x04	Serial number		
Access : RO	Range N/A	Data type: unsigned 32	Unit: N/A
Default	-		
Description	Contains the hardware serial number (only last 6 digits) of the turbo pump.		

4.8 RxPDO - Mapping

The mapping for the PDOs is predefined and can not be changed.

4.8.1 Output Assembly

0x1600	Receive PDO mapping							
Sub index 0x00	Number of mapped objects							
Access RO	Range			Data type: unsigned 8			Unit: N/A	
Default	1							
Description	The number of mapped objects in this PDO							
Sub index 0x01	1st mapped object							
Access : RO	Range 0 to 0xFFFFFFFF			Data type: unsigned 32			Unit: N/A	
Default	0x20D30008 control byte 1							
Description	Bits 0 to 7: Length of the mapped object in bits, e.g. a 32-bit parameter would have a length of 32 or 0x20. Bits 8 to 15: Sub-index of the mapped object. Bits 16 to 31: Index of the mapped object.							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Quit failure	–	Standby	–			–	Pump on
	Bit 0 set to 0: Function is disabled Bit 0 set to 1: Function is enabled A failure reset (Bit 7) will only be possible if Bit 0 is not set.							

4.9 TxPDO mappings

The mapping for the PDOs is predefined and can not be changed.

4.9.1 Input Assembly

0x1A00	Transmit PDO mapping 1							
Sub index 0x00	Number of mapped objects							
Access	Range			Data type: unsigned 8			Unit: N/A	
Default	9							
Description	The number of mapped objects in this PDO							
Sub index 0x01	1 st mapped object							
Access : RO	Range 0 to 0xFFFFFFFF			Data type: unsigned 32			Unit: N/A	
Default	0x20CA0008 status byte 1							
Description	Bits 0 to 7: Length of the mapped object in bits, e.g. a 32-bit parameter would have a length of 32 or 0x20. Bits 8 to 15: Sub-index of the mapped object. Bits 16 to 31: Index of the mapped object.							
Content of status byte 1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Exception status (see table above)							
Sub index 0x02	2 nd mapped object							
Access : RO	Range 0 to 0xFFFFFFFF			Data type: unsigned 32			Unit: N/A	
Default	0x20CB0008 status byte 2							
Description	Bits 0 to 7: Length of the mapped object in bits, e.g. a 32-bit parameter would have a length of 32 or 0x20. Bits 8 to 15: Sub-index of the mapped object. Bits 16 to 31: Index of the mapped object.							
Content of status byte 2	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Speed Status (see the “Speed Control Attribute and Speed Status Attribute Bit Map” above)							
Sub index 0x03	3 rd mapped object							
Access : RO	Range 0 to 0xFFFFFFFF			Data type: unsigned 32			Unit: N/A	
Default	0x20CC0008 status byte 3							
Description	Bits 0 to 7: Length of the mapped object in bits, e.g. a 32-bit parameter would have a length of 32 or 0x20. Bits 8 to 15: Sub-index of the mapped object. Bits 16 to 31: Index of the mapped object.							
Content of status byte 3	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	–	Alarm	Warning	–	Pump on
Sub index 0x04	4 th mapped object							
Access : RO	Range 0 to 0xFFFFFFFF			Data type: unsigned 32			Unit: N/A	
Default	0x20CD0010 status byte 4							
Description	Bits 0 to 7: Length of the mapped object in bits, e.g. a 32-bit parameter would have a length of 32 or 0x20. Bits 8 to 15: Sub-index of the mapped object. Bits 16 to 31: Index of the mapped object.							
Content of status byte 4	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Pump Speed (revolutions per second, low byte)							

CoE Communication Area

Sub index 0x05	5 th mapped object							
Access : RO	Range 0 to 0xFFFFFFFF			Data type: unsigned 32			Unit: N/A	
Default	0x20CD0010 status byte 5							
Description	Bits 0 to 7: Length of the mapped object in bits, e.g. a 32-bit parameter would have a length of 32 or 0x20. Bits 8 to 15: Sub-index of the mapped object. Bits 16 to 31: Index of the mapped object.							
Content of status byte 5	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Pump Speed (revolutions per second, high byte)							
Sub index 0x06	6 th mapped object							
Access : RO	Range 0 to 0xFFFFFFFF			Data type: unsigned 32			Unit: N/A	
Default	0x20CD0010 status byte 6							
Description	Bits 0 to 7: Length of the mapped object in bits, e.g. a 32-bit parameter would have a length of 32 or 0x20. Bits 8 to 15: Sub-index of the mapped object. Bits 16 to 31: Index of the mapped object.							
Content of status byte 6	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	No function							
Sub index 0x07	7 th mapped object							
Access : RO	Range 0 to 0xFFFFFFFF			Data type: unsigned 32			Unit: N/A	
Default	0x20CD0010 status byte 7							
Description	Bits 0 to 7: Length of the mapped object in bits, e.g. a 32-bit parameter would have a length of 32 or 0x20. Bits 8 to 15: Sub-index of the mapped object. Bits 16 to 31: Index of the mapped object.							
Content of status byte 7	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	No function							
Sub index 0x08	8 th mapped object							
Access : RO	Range 0 to 0xFFFFFFFF			Data type: unsigned 32			Unit: N/A	
Default	0x20CD0010 status byte 8							
Description	Bits 0 to 7: Length of the mapped object in bits, e.g. a 32-bit parameter would have a length of 32 or 0x20. Bits 8 to 15: Sub-index of the mapped object. Bits 16 to 31: Index of the mapped object.							
Content of status byte 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Current [1/10 Amps] (actual motor current, low byte)							
Sub index 0x09	9 th mapped object							
Access : RO	Range 0 to 0xFFFFFFFF			Data type: unsigned 32			Unit: N/A	
Default	0x20CD0010 status byte 9							
Description	Bits 0 to 7: Length of the mapped object in bits, e.g. a 32-bit parameter would have a length of 32 or 0x20. Bits 8 to 15: Sub-index of the mapped object. Bits 16 to 31: Index of the mapped object.							
Content of status byte 9	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Current [1/10 Amps] (actual motor current, high byte)							

4.9.1.1 Exception status

Bit	Function
0	ALARM / device – common
1	ALARM / device – specific
2	ALARM / manufacturer – specific
3	0 (reserved)
4	WARNING / device – common
5	WARNING / device – specific
6	WARNING / manufacturer – specific
7	1 (expand method)

4.9.1.2 Speed status

Bit	Speed Status	Status Description
0	Running	On and SpeedActual >0
1	Reserved	-
2	At Standby Speed	SpeedActual = SpeedStandby
3	Reserved	-
4	Stopped	SpeedActual = 0
5	Accelerating	SpeedActual is increasing
6	At Reference	SpeedActual = SpeedRef
7	Decelerating	SpeedActual is decreasing

CoE Communication Area

4.10 Sync manager

4.10.1 Sync manager configuration

The sync managers are the EtherCAT means for setting access attributes for different areas of memory and triggering or notifying the application when the memory is accessed. The following objects specify how the sync managers (and thus corresponding memory areas) are utilized by the CoE protocol.

0x1C00	Sync manager communication type		
Sub index 0x00	number of sync manager channels used		
Access: RO	Range: N/A	Data type: unsigned 8	Unit: N/A
Default	4		
Description	The number of sync manager protocols used by the CoE protocol.		
Sub index 0x01	Usage of sync manager 0		
Access : RO	Range N/A	Data type: unsigned 8	Unit: N/A
Default	1		
Description	Sync manager 0 is used by CoE as the mailbox receive channel (master to slave).		
Sub index 0x02	Usage of sync manager 1		
Access : RO	Range N/A	Data type: unsigned 8	Unit: N/A
Default	2		
Description	Sync manager 1 is used by CoE as the mailbox send channel (slave to master).		
Sub index 0x03	Usage of sync manager 2		
Access : RO	Range N/A	Data type: unsigned 8	Unit: N/A
Default	3		
Description	Sync manager 2 is used by CoE as the process data output (RxPDOx - master to slave).		
Sub index 0x04	Usage of sync manager 3		
Access : RO	Range N/A	Data type: unsigned 8	Unit: N/A
Default	4		
Description	Sync manager 3 is used by CoE as the process data input (TxPDOs - slave to master).		

4.10.2 Sync manager Rx PDO assign

0x1C12	Sync manager Rx PDO assign		
Sub index 0x00			
Access: RO	Range: 0 to 255	Data type: unsigned 8	Unit: N/A
Default	1		
Description	The number of RxPDOs assigned to this sync manager (used for process data output).		
Sub index 0x01	Usage of sync manager 0		
Access : RO	Range: 0x1600 to	Data type: unsigned 16	Unit: N/A
Default	0x1600		
Description	The object index of a RxPDO to assign to this sync manager.		

4.10.3 Sync manager Tx PDO assign

0x1C13	Sync manager Tx PDO assign		
Sub index 0x00			
Access: RO	Range: 0 to 255	Data type: unsigned 8	Unit: N/A
Default	1		
Description	The number of TxPDOs assigned to this sync manager (used for process data input).		
Sub index 0x01	Usage of sync manager 0		
Access : RO	Range: 0x1A00 to	Data type: unsigned 16	Unit: N/A
Default	0x1A00		
Description	The object index of a TxPDO to assign to this sync manager.		

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4.11 Input points, status information

0x2002	Input points		
Sub index 0x00	Number of elements		
Access: RO	Range: N/A	Data type: unsigned 8	Unit: N/A
Default	9		
Description	The number of input points.		
Sub index 0x01	Pump On/Off Status		
Access : RO	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	N/A		
Description	0 = Pump Off (or Pump On and Speed = 0) 1 = Pump On (Pump running)		
Sub index 0x02	Normal speed reached		
Access : RO	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	N/A		
Description	0 = actual speed below normal speed 1 = normal speed reached		
Sub index 0x03	Acceleration		
Access : RO	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	N/A		
Description	0 = speed is not increasing 1 = the pump speed increases		
Sub index 0x04	Deceleration		
Access : RO	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	-		
Description	0 = speed is not decreasing 1 = the pump speed decreases		
Sub index 0x05	Generator mode		
Access : RO	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	-		
Description	don't care		
Sub index 0x06	Standby mode		
Access : RO	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	-		
Description	0 = Standby mode off 1 = Standby mode on		
Sub index 0x07	Standstill		
Access : RO	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	-		
Description	1 = Standstill and drive not active		

Sub index 0x08	Control via EtherCAT		
Access : RO	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	-		
Description	1 = the pump is under control via EtherCAT		
Sub index 0x09	At standby speed		
Access : RO	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	-		
Description	0 = actual speed below or above standby speed 1 = standby speed reached		

4.12 Output points, control commands

Write access is only possible, if the status of the EtherCAT is different than Operational.

0x2003	Output points		
Sub index 0x00	Number of elements		
Access: RO	Range: N/A	Data type: unsigned 8	Unit: N/A
Default	9		
Description	The number of output points.		
Sub index 0x01	Pump On/Off command		
Access : RW	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	0x00		
Description	0 = Pump Off 1 = Pump On		
Sub index 0x02	Reserved		
Access : RW	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	0x00		
Description	-		
Sub index 0x03	Quit failure		
Access : RW	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	0x00		
Description	0 = do not reset error condition 1 = Reset error condition Reset only possible if Pump On/Off ist set to Off		
Sub index 0x04	Standby request		
Access : RW	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	0x00		
Description	0 = Pump will run at target speed 1 = pump will run at standby speed		
Sub index 0x05	Reserved		
Access : RW	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	-		
Description	-		

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Sub index 0x06	Control via EtherCAT		
Access : RW	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	0x00		
Description	Device will be controlled by Network adapter		
Sub index 0x07	DC Out X201 ON/OFF		
Access : RW	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	0x00		
Description	0 = DC out X201 on 1 = DC out X201 off		
Sub index 0x08	DC Out X202 ON/OFF		
Access : RW	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	0x00		
Description	0 = DC out X202 on 1 = DC out X202 off		
Sub index 0x09	DC Out X203 ON/OFF		
Access : RW	Range 0 to 1	Data type: unsigned 8	Unit: Bool
Default	0x00		
Description	0 = DC out X203 on 1 = DC out X203 off		

4.13 Warnings

0x2004	Warnings		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: N/A
Default	0x0000		
Description	See attached list below for details description of each bit		

Bit	Designation	Possible cause	Remedy
0	Pump temperature 1 has passed the warning threshold.	Forevacuum pressure too high.	Check the ultimate pressure of the backing pump and install a bigger backing pump if required.
1	Pump temperature 2 has passed the warning threshold.	Gas flow too high.	Seal leak, check process.
2	Pump temperature 3 has passed the warning threshold.	Fan defective.	Replace fan.
3	The minimum permissible ambient temperature is not reached.	Water cooling switched off.	Switch on water cooling.
4, 5	not used	Ambient temperature too low.	Ensure min. ambient temperature of 5 °C.
6	The actual value exceeds the set-point by more than 10 Hz.	Pump cooling too high.	Reduce water cooling.
		Frequency converter defective	Consult Leybold service.

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Bit	Designation	Possible cause	Remedy
7	Pump temperature 4 has passed the warning threshold.	Forevacuum pressure too high. Gas flow too high. Fan defective. Water cooling switched off.	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process. Replace fan. Switch on water cooling.
8 - 10	not used		
11	The pump speed has dropped under the normal operation threshold.	Forevacuum pressure too high. Gas flow too high.	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process. Replace fan. Switch on water cooling.
12	Pump temperature 5 has passed the warning threshold.	Forevacuum pressure too high.	Check the ultimate pressure of the backing pump and install a bigger backing pump if required.
13	Pump temperature 6 has passed the warning threshold.	Gas flow too high. Fan defective. Water cooling switched off.	Seal leak, check process. Replace fan. Switch on water cooling.
14	Supply voltage failure during active operation of the pump.	Intermediate circuit voltage too low. Mains voltage failure.	Check DC power supply voltage. Check mains voltage.

4.14 Errors

4.14.1 Actual Error

0x2005	Actual Error		
Sub index 0x00	Number of elements		
Access: RO	Range: N/A	Data type: unsigned 8	Unit: N/A
Default	3		
Description	The number implemented sub indexes.		
Sub index 0x01	Actual error code		
Access : RO	Range 0 to 0xFFFFFFFF	Data type: unsigned 32	Unit: N/A
Default	0x00000000		
Description	See attached list below for detail descriptions of the error code		
Sub index 0x02	Frequency at error		
Access : RO	Range 0 to 0xFFFFFFFF	Data type: unsigned 32	Unit: Hz
Default	0x00000000		
Description			
Sub index 0x03	Operation hours at error		
Access : RO	Range 0 to 0xFFFFFFFF	Data type: unsigned 32	Unit: N/A
Default	0x00000000		
Description			

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4.14.2 Error memory: Failure Code

0x2006	Error memory: Failure code		
Sub index 0x00	Number of elements		
Access: RO	Range: 0 – 127	Data type: unsigned 8	Unit: N/A
Default	127		
Description	The number implemented sub indexes.		
Sub index 0x01	Failure storage error code		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: N/A
Default	0x0000		
Description	See attached list below for detail descriptions of the error code. Index 1 stores the error code of the latest failure event. Index 127 stores the oldest one.		

Error code	Designation	Possible cause	Remedy
1	Overspeed warning. The actual frequency exceeds the setpoint by over 10 Hz.	Frequency converter defective	Contact Leybold Service.
2	Pass through time error. The pump has not reached the minimum speed after the maximum run-up time has elapsed.	Forevacuum pressure too high Gas flow too high Rotor blocked	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Check if the rotor turns freely. Contact Leybold Service if the rotor is damaged or blocked.
3	Bearing temperature too high. The maximum permissible bearing temperature was exceeded.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling
4	Short circuit error. Shortcut in motor coil or converter electronics	Hardware defective	Reset error, try to restart. If this is not possible inform Leybold Service or send in the pump.
5	Converter temperature error. Overtemperature at the power output stage or within the frequency converter	Ambient temperature too high Poor cooling	Ensure max. ambient temperature of 45°C Improve cooling
6	Run-up time error. The pump has not reached the normal operating frequency after the maximum run-up time.	Forevacuum pressure too high Gas flow too high	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process
7	Motor temperature error. The motor temperature has exceeded the error threshold.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling
61	Bearing temperature warning. The warning threshold of the bearing temperature has been exceeded.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling

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Error code	Designation	Possible cause	Remedy
83	Motor undertemperature warning. The minimum permissible motor temperature is not attained.	Ambient temperature too low Pump cooling too high	Ensure min. ambient temperature of 5°C Reduce water cooling
84	Motor temperature warning. The motor temperature has exceeded the warning threshold.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling
85	Converter overtemperature warning. The converter temperature has exceeded the warning threshold.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling
86	Pump temperature 6 warning. The pump temperature 6 has exceeded the warning threshold.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling
87	Pump temperature 6 failure. The pump temperature 6 has exceeded the failure threshold.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling
94	Pump temperature 4 warning. The pump temperature 4 has exceeded the warning threshold.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling
95	Pump temperature 4 failure. The pump temperature 4 has exceeded the failure threshold.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling
96	Pump temperature 5 warning. The pump temperature 5 has exceeded the warning threshold.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling
97	Pump temperature 5 failure. The pump temperature 5 has exceeded the failure threshold.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling
101	Overload warning. The pump speed has dropped under the normal operation threshold	Forevacuum pressure too high Gas flow too high	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process

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Error code	Designation	Possible cause	Remedy
103	Supply voltage warning. Intermediate circuit voltage too low or maximum time for generator operation was exceeded.	DC supply voltage below 24V resp. 48V Mains voltage has failed	Check the voltage at the power supply and if required set up correctly Remedy the cause for the mains power failure
106	Overload Failure . The pump speed has dropped under the minimum speed	Forevacuum pressure too high Gas flow too high	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process
111	Motor undertemperature error. The minimum permissible motor temperature is not attained.	Ambient temperature too low Pump cooling too high	Ensure min. ambient temperature of 5°C Reduce water cooling
116	Permanent overload error. The speed of the pump has dropped below the normal operation threshold and has stayed there for a longer period of time.	Forevacuum pressure too high Gas flow too high	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process
117	Motor current error. Motor current below nominal current, switchover from open loop controlled to closed loop controlled operation was not successful.	Cable fault Faulty connector	Contact Leybold Service
143	Overspeed failure. The actual frequency exceeds the setpoint frequency more than 10%.	Frequency converter defective	Contact Leybold Service
213	Supply voltage error 1. The drive circuitry was deactivated due to an over-voltage detected.	Usage of a wrong power supply unit. Misaligned output voltage	Check the voltage at the power supply and if required set up correctly
221	Checksum error 1. Checksum error during initialisation of the pump	Failure in the frequency converter Power reset during save procedure	Switch power supply off and on Restore factory settings (see parameter 1025)
225	Bearing run-in active. Bearing run-in procedure is active or passed		Wait for end of bearing break-in or disable bearing break-in function and restart the pump
227	Frequency converter collective error. Error in frequency converter	Hardware defective	Reset error, try to restart. If this is not possible inform Leybold Service or send in the pump.
228	Frequency converter collective error. Error in frequency converter	Hardware defective	Reset error, try to restart. If this is not possible inform Leybold Service or send in the pump.
229	Frequency converter collective error. Error in frequency converter	Hardware defective	Reset error, try to restart. If this is not possible inform Leybold Service or send in the pump.
230	Frequency converter collective error. Error in frequency converter	Hardware defective	Reset error, try to restart. If this is not possible inform Leybold Service or send in the pump.
231	Supply voltage error 1. The drive circuitry was deactivated due to an over-voltage detected.	Usage of a wrong power supply unit. Misaligned output voltage	Check the voltage at the power supply and if required set up correctly.
232	Supply voltage error 1. The drive circuitry was deactivated due to an under-voltage detected.	Usage of a wrong power supply unit. Misaligned output voltage	Check the voltage at the power supply and if required set up correctly.
233	Supply voltage error 1. The drive circuitry was deactivated due to an over-voltage detected.	Usage of a wrong power supply unit. Misaligned output voltage	Check the voltage at the power supply and if required set up correctly.
234	Supply voltage error 1. The drive circuitry was deactivated due to an under-voltage detected.	Usage of a wrong power supply unit. Misaligned output voltage	Check the voltage at the power supply and if required set up correctly.

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Error code	Designation	Possible cause	Remedy
235	Frequency converter collective error. Error in frequency converter	Hardware defective	Reset error, try to restart. If this is not possible inform Leybold Service or send in the pump.
236	Startup- failure. Failure during startup procedure	Pump is mechanical blocked. High Gasload.	Check if the rotor rotates freely. Reduce gasload
237	Frequency converter collective error. Error in frequency converter	Hardware defective	Reset error, try to restart. If this is not possible inform Leybold Service or send in the pump.
238	Frequency converter collective error. Error in frequency converter	Hardware defective	Reset error, try to restart. If this is not possible inform Leybold Service or send in the pump.
239	Frequency converter collective error. Error in frequency converter	Hardware defective	Reset error, try to restart. If this is not possible inform Leybold Service or send in the pump.
240	Checksum error 2. Failure while operating or initialising the pump.	Failure in the frequency converter Power reset during save procedure	Switch power supply off and on Restore factory settings (see parameter 1025)
241	Supply voltage is not 24V. The permissible supply voltage of 24V was exceeded or undershot.	Usage of a wrong power supply unit. Misaligned output voltage	Check the voltage at the power supply and if required set up correctly
242	Supply voltage is not 48V. The permissible supply voltage of 48V was exceeded or undershot.	Usage of a wrong power supply unit. Misaligned output voltage	Check the voltage at the power supply and if required set up correctly
252	Hardware plausibility error. Frequency converter and communication electronics are not from same pump.	Front end and frequency converter were interchanged.	Establish the correct hardware configuration. Reset error, try to restart. If this is not possible inform Leybold Service or send in the pump.
600	Second gauge stage not started. Although the working pressure was reached, the 2nd stage of a combined gauge did not start.	Gauge or cable defective.	Check gauge head and connection, if required replace the gauge head.
601	Gauge lost. Contact lost to a previously connected gauge.	The gauge was removed.	Reconnect the gauge.
602	No power supply at gauge. No measurement signal from the gauge.	Gauge does not get voltage. Cable defective.	Check cable.
603	No voltage at gauge output. Return signal from the gauge head output voltage is missing.	Internal power supply of the communication electronics defective.	Contact Leybold Service.
608	Filament break. The filament of the gauge is broken.	Wear	Repair or exchange gauge.
609	Pirani error. The measuring unit of the gauge is defective.	Wear	Repair or exchange gauge.
610	Communication electronics temperature warning. The interior temperature of the communication electronics has exceeded the warning limit.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling
611	Communication electronics temperature failure. The interior temperature of the communication electronics has exceeded the error limit.	Forevacuum pressure too high Gas flow too high Fan defective Water cooling switched off	Check the ultimate pressure of the backing pump and install a bigger backing pump if required. Seal leak, check process Replace fan Switch on water cooling
612	Intermediate circuit voltage warning. The intermediate circuit voltage is too high or too low.	Wrong power supply voltage	Check the voltage of the power supply and adjust it if necessary.

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4.14.3 Error memory: Frequency

0x2007	Error memory: Frequency		
Sub index 0x00	Number of elements		
Access: RO	Range: 0 – 127	Data type: unsigned 8	Unit: N/A
Default	127		
Description	The number implemented sub indexes.		
Sub index 0x01	Stored error frequency		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: Hz
Default	0x0000		
Description	Index 1 stores frequency which was present at the latest failure event. Index 127 stores the oldest one.		

4.14.4 Error memory: Operation hours

0x2008	Error memory: Operation hours		
Sub index 0x00	Number of elements		
Access: RO	Range: 0 – 127	Data type: unsigned 8	Unit: N/A
Default	127		
Description	The number implemented sub indexes.		
Sub index 0x01	Stored operation hour		
Access : RO	Range 0 to 0xFFFFFFFF	Data type: unsigned 32	Unit: 0.01h
Default	0x0000		
Description	Index 1 stores the operation hour which was present at the latest failure event. Index 127 stores the oldest one.		

4.15 AC DC Drive

0x2009	AC DC Drive		
Sub index 0x00	Number of elements		
Access: RO	Range: 0.24	Data type: unsigned 8	Unit: N/A
Default	24		
Description	The number implemented sub indexes.		
Sub index 0x01	At reference speed		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: N/A
Default	0x0000		
Description	Bit 0 will be set if the target speed is reached		
Sub index 0x02	Frequency setpoint set by Network (EtherCAT) system		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: N/A
Default	0x0000		
Description	Bit 0 will be set, if the frequency converter accept the frequency setpoint from the EtherCAT network.		
Sub index 0x03	Process control		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: N/A
Default	0x0000		
Description	Bit 0 =0 local mode of the system Bit 0 =1 cosystem will be control via EtherCAT		

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Sub index 0x04	Drive mode		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: N/A
Default	0x0002		
Description	Only value 2 (closed loop mode) is implemented		
Sub index 0x05	Actual speed		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: RPS
Default	0x0000		
Description	Value show the actual speed of the turbo pump in rotation per seconds		
Sub index 0x06	Speed reference		
Access : RW	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: RPS
Default	0x0000		
Description	Reference speed for Normal Operation.Value can be written via EtherCAT, but will not be stored in the frequency converter. Default value depends on pump size		
Sub index 0x07	Actual Motor current		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0,1A
Default	0x0000		
Description	Value of the present motor current.		
Sub index 0x08	Limit Motor current		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0,1A
Default	0x0000		
Description	Limit of the motor current. Default value depends on pumps size.		
Sub index 0x09	Actual power on mains side		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0,1W
Default	0x0000		
Description			
Sub index 0x0A	Input Voltage		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0,1V
Default	0x0000		
Description	Actual value of the supply voltage (Mains)		
Sub index 0x0B	Low speed limit		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: RPS
Default	0x0000		
Description	Low limit of the pump speed, Value in rotation per second. Default value depends on pump size		
Sub index 0x0C	High speed limit		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: RPS
Default	0x0000		
Description	High limit of the pump speed, Value in rotation per second. Default value depends on pump size.		
Sub index 0x0D	Speed Control		
Access : RW	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: N/A
Default	0x0000		
Description	Bit speed control Bit 0 = Run request, starts the pump if set Bit 1 = Idle, stops the pump if set Bit 2 = Standby, runs the pump at Standby Speed if set		

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Sub index 0x0E	Speed Status		
Access : RW	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: N/A
Default	0x0000		
Description	Bit speed status Bit 0 = Running, on and speed actual > 0 Bit 1 = Reserved Bit 2 = At standby speed, speed actual = speed standby Bit 3 = Reserved Bit 4 = Stopped, speed actual = 0 Bit 5 = Accelerating, speed actual is increasing Bit 6 = At reference speed, actual = speed reference Bit 7 = Decelerating, speed actual is decreasing		
Sub index 0x0F	Speed trip time		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: s
Default	0x0000		
Description	Maximum run up time; maximum overload time [s]. (Exceeding of this limit leads to the corresponding error message). Default value depends on pump size.		
Sub index 0x10	Max. rated speed		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: RPS
Default	0x0000		
Description	Maximum pump speed [RPS]. Default value depends on pump size.		
Sub index 0x11	Standby Speed		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: RPS
Default	0x0000		
Description	Speed setting for the Standby function [RPS]. Default value depends on pump size.		
Sub index 0x12	Speed actual Data Units		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: RPS
Default	0x1F0E		
Description	Fixed value: RPS --> 0x1F0E (rotations per second)		
Sub index 0x13	Speed reference data units		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: RPS
Default	0x1F0E		
Description	Fixed value: RPS --> 0x1F0E (rotations per second)		
Sub index 0x14	Pump operation hours (low word)		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.01h
Default	0x0000		
Description			
Sub index 0x15	Pump operation hours (high word)		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.01h
Default	0x0000		
Description			
Sub index 0x16	Pump operation cycles		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: N/A
Default	0x0000		
Description			

Sub index 0x17	Converter operation hours (low word)		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.01h
Default	-		
Description	-		
Sub index 0x18	Converter operation hours (high word)		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.01h
Default	-		
Description	-		

4.16 Temperature Bearing

0x200B	Temperature Bearing		
Sub index 0x00	Number of elements		
Access: RO	Range: N/A	Data type: unsigned 8	Unit: N/A
Default	4		
Description	The number implemented sub indexes.		
Sub index 0x01	Bearing temperature value		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.1°C
Default	0x0000		
Description	Actual bearing temperature.		
Sub index 0x02	Status		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: N/A
Default	0x0000		
Description	Bit definition Bit 0 = High alarm exception: 0 = cleared; 1 = set Bit 1 = Low alarm exception: 0 = cleared; 1 = set Bit 2 = High warning exception: 0 = cleared; 1 = set Bit 3 = Low warning exception: 0 = cleared; 1 = set Bit 4 = Reserved Bit 5 = Reserved Bit 6 = Reserved Bit 7 = Reserved		
Sub index 0x03	Alarm trip point value		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.1°C
Default	0x0000		
Description	Trigger level Alarm Setpoint in 0,10C		
Sub index 0x04	Warning trip point value		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.1°C
Default	0x0000		
Description	Trigger level Warning Setpoint in 0,10C		

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4.17 Temperature Motor

0x200C	Temperature Motor		
Sub index 0x00	Number of elements		
Access: RO	Range: N/A	Data type: unsigned 8	Unit: N/A
Default	4		
Description	The number implemented sub indexes.		
Sub index 0x01	Motor temperature value		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.1°C
Default	0x0000		
Description	Actual motor temperature.		
Sub index 0x02	Status		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: N/A
Default	0x0000		
Description	Bit definition Bit 0 = High alarm exception: 0 = cleared; 1 = set Bit 1 = Low alarm exception: 0 = cleared; 1 = set Bit 2 = High warning exception: 0 = cleared; 1 = set Bit 3 = Low warning exception: 0 = cleared; 1 = set Bit 4 = Reserved Bit 5 = Reserved Bit 6 = Reserved Bit 7 = Reserved		
Sub index 0x03	Alarm Trip Point value		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.1°C
Default	0x0000		
Description	Trigger level Alarm Setpoint in 0.1°C		
Sub index 0x04	Warning Trip Point value		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.1°C
Default	0x0000		
Description	Trigger level Warning Setpoint in 0.1°C		

4.18 Temperature Frequency Converter

0x200D	Temperature Converter		
Sub index 0x00	Number of elements		
Access: RO	Range: N/A	Data type: unsigned 8	Unit: N/A
Default	4		
Description	The number implemented sub indexes.		
Sub index 0x01	Converter temperature value		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.1°C
Default	0x0000		
Description	Actual motor temperature.		

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Sub index 0x02	Status		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: N/A
Default	0x0000		
Description	Bit definition Bit 0 = High alarm exception: 0 = cleared; 1 = set Bit 1 = Low alarm exception: 0 = cleared; 1 = set Bit 2 = High warning exception: 0 = cleared; 1 = set Bit 3 = Low warning exception: 0 = cleared; 1 = set Bit 4 = Reserved Bit 5 = Reserved Bit 6 = Reserved Bit 7 = Reserved		
Sub index 0x03	Alarm Trip Point value		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.1°C
Default	0x0000		
Description	Trigger level Alarm Setpoint in 0.1°C		
Sub index 0x04	Warning Trip Point value		
Access : RO	Range 0 to 0xFFFF	Data type: unsigned 16	Unit: 0.1°C
Default	0x0000		
Description	Trigger level Warning Setpoint in 0.1°C		

4.19 Pressure Gauge

0x200E	Pressure Gauge		
Sub index 0x00	Number of elements		
Access: RO	Range: N/A	Data type: unsigned 8	Unit: N/A
Default	1		
Description	The number implemented sub indexes.		
Sub index 0x01	Pressure value		
Access : RO	Range 0 to 0xFFFF	Data type: Real	Unit: mbar
Default	0x0000		
Description	Pressure value in mbar.		

CoE Communication Area

4.20 CoE Objects Snapshots

The following Snapshot was taken from a configuration tool from the manufacturer Beckhoff.

TwinCAT Project14

GeneralEtherCATDCProcess DataStartupCoE - OnlineOnline

Update List

☐ Auto Update☒ Single Update☐ Show Offline Data

Advanced...

Online Data

Add to Startup...

Module OD (AoE Port): 0

Index	Name	Flags	Value	Unit
1000	Device Type	RO	0x00000000 (0)	
1001	Error Register	RO	0x00 (0)	
1003:0	Pre-defined error field		> 0 <	
1008	Manufacturer Device Name	RO	TMP 350/450 iX	
1009	Manufacturer Hardware Version	RO	5	
100A	Manufacturer Software Version	RO	2.14.01	
1011:0	Restore default parameters		> 1 <	
1018:0	Identity Object		> 4 <	
1018:01	Vendor ID	RO	0x00000723 (1827)	
1018:02	Product Code	RO	0x000000B6 (182)	
1018:03	Revision Number	RO	0x00010001 (65537)	
1018:04	Serial Number	RO	0x00106411 (1074193)	
1600:0	Receive PDO Mapping		> 1 <	
1A00:0	Transmit PDO Mapping		> 9 <	
1C00:0	Sync Manager Communication Type		> 4 <	
1C12:0	Sync Manager Rx PDO assign		> 1 <	
1C13:0	Sync Manager Tx PDO assign		> 1 <	
1C32:0	Output SyncManager Parameter		> 12 <	
1C33:0	Input SyncManager Parameter		> 12 <	
2002:0	Input points		> 9 <	
2003:0	Output points		> 9 <	
2004	Warnings	RO	0x0000 (0)	
2005:0	Actual error		> 3 <	
2006:0	Error memory: Failure code		> 126 <	
2007:0	Error memory: Frequency		> 126 <	
2008:0	Error memory: Operation hours		> 63 <	
2009:0	AC DC drive		> 24 <	
200B:0	Temperature bearing		> 4 <	
200C:0	Temperature motor		> 4 <	
200D:0	Temperature converter		> 4 <	
200E	Pressure gauge	RO	0x447A0000 (1148846080)	
20CA	Exception Status	RO	0x80 (128)	
20CB	Speed Status	RO	0x12 (18)	
20CC	Statusbits	RO	0x00 (0)	
20CD	Pump speed (low byte)	RO	0x00 (0)	
20CE	Pump speed (high byte)	RO	0x00 (0)	
20CF	Reserved	RO	0x00 (0)	
20D0	Reserved	RO	0x00 (0)	
20D1	Actual motor current (low byte)	RO	0x00 (0)	
20D2	Actual motor current (high byte)	RO	0x00 (0)	
20D3	Pump control	RW	0x00 (0)	

Name	Online	Type	Size	>Addr...	In/Out	User ID
Exception Status	128	USINT	1.0	39.0	Input	0
Speed Status	18	USINT	1.0	40.0	Input	0
Statusbits	0	USINT	1.0	41.0	Input	0
Pump speed (low byte)	0	USINT	1.0	42.0	Input	0

5 XML File

The XML file serves the integration into specific tools for configuring EtherCAT interfaces.

The necessary XML file can be downloaded from the Leybold web page.



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