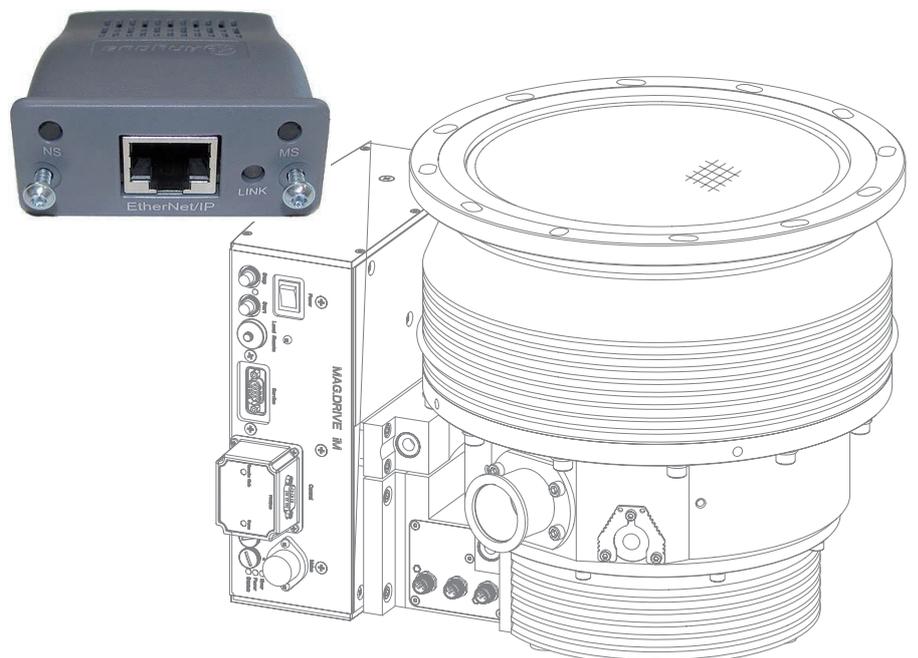


Ethernet/IP interface for MAG integra

Operating Instructions 300400153_002_C0



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Original installation and operating instructions.

Obligation to Provide Information

Before installing and commissioning the MAG integra with EtherNet/IP interface, carefully read these Operating Instructions and follow the information so as to ensure optimum and safe working right from the start.

The Leybold **MAG integra with EtherNet/IP interface** 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 Interface 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.

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

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.

NOTICE



Safety Information

Conventions used in this manual

The following conventions are used throughout this manual:

- The term 'module' is used when referring to the AnyBus-CC EtherNet/IP module
- The term 'application' is used when referring to the hardware that is connected to the Application Connector.
- Hexadecimal values are written in the format 0xNNNN, where NNNN is the hexadecimal value.
- Binary values are written in the format 0bNNNN, where NNNN is the binary value.

1 Description

The EtherNet/IP Interface integrates all functionality required to communicate on an Ethernet network.

Features / Specifications

Network

main protocol	EtherNet/IP; industrial protocol
common protocols	HTTP (HTML access); FTP (file transfer)
data rates	10 Mbps, 100 Mbps

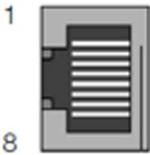
Device

profile	ODVA / CIP according to type 21h = 33d "Turbomolecular Vacuum Pump Device"
class 1 connections / max.	Point-to-point, Multicast / 4
class 3 connections / max.	Point-to-point / 16

1.1 Ethernet Connector

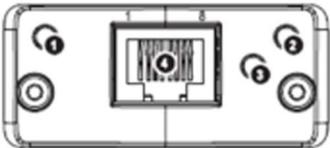
Pin numbers 13-20 on the application connector are used for fieldbus specific signals, see pin out below.

Pin	Signal
1	TX+
2	TX-
3	RX+
4	-
5	-
6	RX-
7	-
8	-
Housing	Bus Cable Shield (Shielded connector only)



View on the Ethernet/IP interface module:

#	Item
1	Network Status LED
2	Module Status LED
3	Link / Activity
4	Ethernet Interface



Description

1.2 LED states during operation

Network Status LED

LED State	Description
OFF	No power or no IP address
Green	On-line, one or more connections established (CIP Class 1 or 3)
Green, flashing	On-line, no connections established
Red	Duplicate IP address, FATAL error
Red, flashing	One or more connections timed out (CIP Class 1 or 3)

Module Status LED

Note: A test sequence is performed on this LED during startup.

LED State	Description
OFF	No power
Green	Controlled by a Scanner in Run state
Green, flashing	Not configured, or Scanner in Idle state
Red	Major fault (EXCEPTION-state, FATAL error etc.)
Red, flashing	Recoverable fault(s)

Link/Activity LED

LED State	Description
OFF	No link, no activity
Green	Link established
Green, flickering	Activity

Power up LED sequence

Duration [s]	Module Status [MS]	Network Status [NS]	Link activity [LINK]
ca. 30	Off	Off	Off
< 1	Green		
< 1	Red		
< 1	Green	Green	
< 1		Red	
ca. 3	Off	Off	

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.

Network Configuration

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 Ethernet/IP

The EtherNet/IP implementation follows as much as possible the Common Industrial Protocol (CIP) Specification, Chapter 6: Device Profiles, Part 4, 6-36 Turbomolecular Vacuum Pump Device, Type 0x21, which is also the application layer for DeviceNet and ControlNet to exchange data between bus nodes.

CIP makes use of abstract object modeling to describe the communications of a product. Objects are well defined subsets of the functionality of a device. This includes functions, called 'Services' and data variables called 'Attributes'. If more than one copy of an object is needed, each copy is called an 'Instance'.

Implemented Objects

Object Class	Class Identifier	Number of Instances
Identity	1	1
Message Router	2	1
EtherNet	3	1
I/O Assembly	4	2 Input / 5 Output
Discrete Input Point	8	9
Discrete Output Point	9	4
AC/DC Drive	42	1
S-Device Supervisor	48	1
S-Analog Sensor	49	3
Leybold Special Warning		
Leybold Special Failure		
Ethernet IP Host Object	248	?

Service Code	Name
14 (0x0E)	Get Attribute Single
16 (0x10)	Set Attribute Single

Network Configuration

2.2.1 Identity Object

Class services: Get Attribute All
 Get Attribute Single
Instance services: Get Attribute All
 Get Attribute Single
 Reset
Class Code: 1 (0x01)
Instance ID: 1 (0x01)

Attribute ID	Access Rule	Name	Data Type	Description; actual value
1 (0x01)	Get	Leybold	UINT	Vendor Identification 0x9000 --> Leybold
2 (0x02)	Get	Device type	UINT	Device Type 0x2100 --> Turbomolecular Pump
3 (0x03)	Get	Product code	UINT	0xD300 --> MAG DRIVE iM
4 (0x04)	Get	Revision Major Revision Minor Revision	STRUCT of USINT USINT	Revision of the item the Identity Object represents 02 01
5 (0x05)	Get	Status	USINT	Status of the entire device; see: Volume 1: CIP Common Specification, Chapter 5: Object Library: 5-2.2.1.5
6 (0x06)	Get	Serial Number	UDINT	Serial number of the turbo pump controller Due to the data format only the 9 least significant digits can be transmitted. For example the complete serial number: 30000815910 will be transmitted as: 0x26730C = 815910 (leading zeros are truncated).
7 (0x07)	Get	Product Name	SHORT STRING	Name of the turbo pump controller MAG.DRIVE (i)M

Network Configuration

2.2.2 I/O Assembly Object

The cyclic data exchange is done by the input and output instances selected from some predefined connection sets. For the setup of the input and output assembly "Implicit Messages" refer to the chapter: Ethernet Host Object.

Input Assembly

Class Code: 4 (0x04)
Attribute ID: 3 (0x03)

Instance ID	Type	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1 (0x01)	Input	0	Exception Status							
		1	Speed Status (see the "Speed Control Attribute and Speed Status Attribute Bit Map" below)							
		2	0	0	0	0	0	0	0	Pump On Status
100 (0x64) default predefined input connection set	Input	0	Exception Status							
		1	Speed Status (see the "Speed Control Attribute and Speed Status Attribute Bit Map" below)							
		2	0	0	0	0	General Alarm	General Warning	0	Pump On Status
		3-4	Pump Speed (revolutions per second)							
		5-6	Ignore							
		7-8	Current [1/10 Amps] (actual motor current)							

Network Configuration

2.2.3 Output Assembly

Class Code: 4 (0x04)

Attribute ID: 3 (0x03)

Instance ID	Type	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
5 (0x05)	Output	0	-	-	-	-	-	-	-	Pump On
6 (0x06)	Output	0	-	-	-	-	-	-	-	Pump On
		1	Speed Control (see the "Speed Control Attribute and Speed Status Attribute Bit Map" below)							
7 (0x07)	Output	0	-	-	-	-	-	-	-	Pump On
		1	Speed Control (see the "Speed Control Attribute and Speed Status Attribute Bit Map" below)							
		2-3	Speed target (revolutions per second)							
101 (0x65) default predefined input con- nection set	Output	0	Quit failure	-	Standby	-	Vent Valve	Purge Valve	-	Pump On
102 (0x66)	Output	0	Quit failure	-	Standby	-	Vent Valve	Purge Valve	-	Pump On
		1-2	Speed target (revolutions per second)							

Remark: Failure reset is only possible, if Pump On Bit ist set to 0

Network Configuration

Exception Status Bit Map

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)

Speed Control Attribute and Speed Status Attribute Bit Map

Bit	Speed Control	Speed Status	Status Description
0	Run request	Running	On and SpeedActual >0
1	Idle request	At Idle	Zero current
2	Standby request	At Standby Speed	SpeedActual = SpeedStandby
3	-	Coasting	Zero Torque (generator mode)
4	-	Stopped	SpeedActual = 0
5	-	Accelerating	SpeedActual is increasing
6	-	At Reference	SpeedActual = SpeedRef
		Decelerating	SpeedActual is decreasing

Network Configuration

2.2.4 Discrete Input Point Object

Class Code: 8 (0x08)

Instance ID	Attribute ID	Access Rule	Name	Data Type	Description
1 (0x01)	3	Get	Pump ON/OFF	BOOL	0 = Pump Off (or Pump On and Speed = 0) 1 = Pump On (Pump running)
100(0x64)	3	Get	Normal	BOOL	Normal Speed reached
101(0x65)	3	Get	Acceleration	BOOL	The pump increases speed
102(0x66)	3	Get	Deceleration	BOOL	The pump decreases speed
103(0x67)	3	Get	Generator Mode	BOOL	The pump is running in generator mode Mains voltage is missing
104(0x68)	3	Get	Standby	BOOL	The pump is running in standby mode
105(0x69)	3	Get	Standstill and Drive not active	BOOL	Standstill and Drive not active
106(0x6A)	3	Get	Remote Operation	BOOL	The pump is under control of EtherNet
108(0x6C)	3	Get	Standby Speed reached	BOOL	The pump is running at standby speed

Network Configuration

2.2.5 Discrete Output Point Object

Class Code: 9 (0x09)

If at least one of the DOP functions is set, the control of the pump is directed to the EtherNet.

Instance ID	Attribute ID	Access Rule	Name	Data Type	Description
1(0x01)	3	Set	Pump ON/Off	BOOL	0 = Pump off 1 = Pump on
	9	Set	Remote Control	BOOL	Enables the remote pump control, when using the Discrete Output Point Objects Instances
3(0x03)	3	Set	Purge Gas Valve	BOOL	0 = Valve closed 1 = Valve open
	9	Set	Remote Control	BOOL	Enables the remote pump control, when using the Discrete Output Point Objects Instances
101(0x65)	3	Set	Quit Failure	BOOL	0 = do not reset error condition 1 = Reset error condition Reset only possible if Pump On/Off ist set to Off
	9	Set	Remote Control	BOOL	Enables the remote pump control, when using the Discrete Output Point Objects Instances
102(0x66)	3	Set	Standby	BOOL	0 = Pump will run at target speed 1 = pump will run at standby speed
	9	Set	Remote Control	BOOL	Enables the remote pump control, when using the Discrete Output Point Objects Instances
104 (0x68)	3	Set	Vent-Valve	BOOL	0 = Valve closed 1 = Valve open
	9	Set	Remote Control	BOOL	Enables the remote pump control, when using the Discrete Output Point Objects Instances

Attention

Every control Instance (Attribute ID 9) has to be set individually; if one of the control instances is set, the control medium is EtherNet.

Network Configuration

2.2.6 AC/DC Drive Object

Class Code: 42 (0x2A)

Instance ID: 1 (0x01)

Attribute ID	Access Rule	Name	Data Type	Description; actual value																											
3	Get	AtReference	Bool	Normal Operation Status reached																											
4	Set/Get	NetRef	Bool	Request speed reference to be local or from the network 0 = Set Speed reference not EN Control 1 = Set Speed reference at EN Control Should be 0 (default)																											
5	Set/Get	NetProc	Bool	Requests process control reference to be local or from the network. 0 = Set Process not EN Control 1 = Set Process at EN Control Should be 0 (default)																											
7	Get	SpeedActual	INT	Actual Speed of the pump [RPS]																											
8	Set/Get	Speed/Ref	INT	Reference speed of the pump [RPS]																											
9	Get	Current Actual	INT	Actual motor current [0.1 ampere]																											
10 (0x0A)	Get	Current Limit	INT	Limit of the motor current [0.1 ampere]																											
16 (0x10)	Get	InputVoltage	INT	Actual value of the supply voltage [0.1 volt]																											
20 (0x14)	Get	LowSpd Limit	UINT	Low limit of the pump speed [RPS]																											
21 (0x15)	Get	HighSpd Limit	UINT	High limit of the pump speed [RPS]																											
38 (0x26)	Set	Speed Control	USINT	<table border="1"> <thead> <tr> <th>Bit</th> <th>Speed Control</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Run Request</td> <td>Starts the pump if set The last bit set wins the race</td> </tr> <tr> <td>1</td> <td>Idle</td> <td>Request Stops the pump if set The last bit set wins the race</td> </tr> <tr> <td>2</td> <td>Standby</td> <td>Run the pump at Standby Speed if set The last bit set wins the race</td> </tr> </tbody> </table>	Bit	Speed Control	Description	0	Run Request	Starts the pump if set The last bit set wins the race	1	Idle	Request Stops the pump if set The last bit set wins the race	2	Standby	Run the pump at Standby Speed if set The last bit set wins the race															
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7	Decelerating	Speed Actual is decreasing																													

Network Configuration

Attribute ID	Access Rule	Name	Data Type	Description; actual value
40 (0x28)	Get	Speed Trip Time	UINT	Maximum run up time; maximum overload time [s]. (Exceeding of this limit leads to the corresponding error message)
41 (0x29)	Get	Max Rated Speed	INT	Maximum pump speed [RPS]
43 (0x2B)	Set/Get	Speed Standby	INT	Speed setting for the Standby function [RPS]
44 (0x2C)	Get	Speed actual Data Units	UINT	Fixed value: RPS --> 0x1F0E (rotations per second)
45 (0x2D)	Get	Speed Ref Data Units	UINT	Fixed value: RPS --> 0x1F0E (rotations per second)
101 (0x65)	Get	Converter hours	UINT	Number of converter operating hours [h]

2.2.7 S-Device Supervisor Object

Class Code: 48 (0x30)

Instance ID: 1 (0x01)

Attribute ID	Access Rule	Name	Data Type	Description; actual value
3	Get	Device Type	Short String	Type of the EtherNet/IP Device; „TVP“
4	Get	SEMI Standard revision level	Short String	Revision level of the SEMI S/A Network Standard of the device; «E54-0997”
5	Get	Manufacturers name	Short String	Manufacturer of the device; «Leybold GmbH”
6	Get	Manufacture’s Model Number	Short String	Catalogue number of the turbo controller; format example: 800075V0007
7	Get	Software revision level	Short String	Software revision of the turbo controller’s main firmware; format example: 30307
8	Get	Hardware revision level	Short String	Hardware revision of the turbo controller; format example: 10202
9	Get	Manufacturer’s serial number	Short String	Serial number of the turbo controller; format example: 30000187517
10 (0x0A)	Get	Device Configuration	Short String	Reserved for future use, empty string.
11 (0x0B)	Get	Device Status	USINT	Status of the EtherNet/IP Interface Gateway and the internal data exchange: 0 = Undefined 1 = Self Testing 2 = Idle 3 = Self-Test Except 4 = Executing 5 = Abort 6 = Critical Fault 100 = Internal Serial Fault (internal data communication between EtherNet gateway and pump controller fails) 101 = Invalid Mapping Table (an error was detected in the pump controller specific parameter translation file)

Network Configuration

Attribute ID	Access Rule	Name	Data Type	Description; actual value
12 (0x0C)	Get	Exception Status	Byte	«Expanded Method» of the Exception Status Bit Map: bit 0:ALARM/device-common bit 1:ALARM/device-specific bit 2:ALARM/manufacture-specific bit 3: 0 bit 4:WARNING/device-common bit 5:WARNING/ device-specific bit 6:WARNING/ manufacture-specific bit 7:1 = Expanded Method
13 (0x0D)	Get	Exception Detail Alarm	STRUCTs Of in summary 14 bytes	A Structure of three Structures containing a bit mapped representation of the Alarm detail; 14 bytes see the table on the next page
14 (0x0E)	Get	Exception Detail Warning	STRUCTs Of in summary 14 bytes	A Structure of three Structures containing a bit mapped representation of the Warning detail; 14 bytes see the table on the next page
15 (0x0F)	Set	Alarm enable	Bool	Controls setting of Alarm bits 0 = Alarms disabled ** 1 = Alarms enabled (default)
16 (0x10)	Set	Warning enable	Bool	Controls setting of Warning bits 0 = Warnings disabled ** 1 = Warnings enabled (default)

** Currently not implemented

Network Configuration

Alarms

Data Component	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Common Exception Detail Size	0	0	0	0	0	0	1	0
Common Exception Detail Byte 0	Reserved	Real Time Fault	Reserved	Data Memory	Non Volatile Memory	Code Memory	Micro-processor	Diagnostic
Common Exception Detail Byte 1	Reserved	Reset Exception	Notify Vendor	Schedule Maint. Due	PS Input Voltage	PS Output Voltage	Reserved	PS Over Current
Turbo Pump Device Exception Detail Size	0	0	0	0	0	0	1	0
Turbo Pump Device Exception Detail Byte 0	Excess Vibration	Startup time-out	Speed Trip	0	Overspeed	Mains failure	Reserved	CNT Failure
Turbo Pump Device Exception Detail Byte 1	0	Interlocked	Bearing Fault	Cable Fault	Controller overheat	Bearing Overheat	Case overheat	Motor Coil Overheat
Manufacturer Exception Detail Size	0	0	0	0	0	0	0	0

Warnings

Data Component	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Common Exception Detail Size	0	0	0	0	0	0	1	0
Common Exception Detail Byte 0	Reserved	Real Time Fault	Reserved	Data Memory	Non Volatile Memory	Code Memory	Micro-processor	Diagnostic
Common Exception Detail Byte 1	Reserved	Reset Exception	Notify Vendor	Schedule Maint. Due	PS Input Voltage	PS Output Voltage	Reserved	PS Over Current
Turbo Pump Device Exception Detail Size	0	0	0	0	0	0	1	0
Turbo Pump Device Exception Detail Byte 0	Excess Vibration	0	Speed Trip	0	0	0	Reserved	CNT Failure
Turbo Pump Device Exception Detail Byte 1	0	Interlocked	Bearing Fault	0	Controller overheat	Bearing Overheat	Case overheat	Motor Coil Overheat
Manufacture Exception Detail Size	0	0	0	0	0	0	0	0

2.2.8 Ethernet/IP Host Object

Class Code: 248 (0xF8), Instance ID: 1

The input and output assembly implicit messages setup must be provided in two steps:

- Preparing the MAG.DRIVE internal controller setup by setting the specific Attribute ID codes.

Attribute ID	Access Rule	Name	Data Type	Description; actual value
7 (0x07)	Get/Set	Producing Instance No.	UINT16	Active predefined input connection set; selection of one of 1 / 100 Default value = 100 = (0x64)
8 (0x08)	Get/Set	Consuming Instance No.	UINT16	Active predefined output connection set; selection of one of 5 / 6 / 7 / 101 / 102 Default value = 101 = (0x65)

Note

On setting a valid Producing or Consuming Instance number the EtherNet/IP interface circuitry will perform automatically an initialization procedure, which is indicated by the same LED flashing procedure at the interface module when the MAG.DRIVE is powered on. Any invalid number will not be accepted and the initialization will not be performed.

Everytime after power on of the system the default value will be activated!

- Setup of the Ethernet/IP specific interface parameters by using the suitable setup procedure of the Ethernet/IP scanner, referring to the Instance ID codes established in step 1. See the example at the end of this manual.

Network Configuration

2.2.9 S-Analog Sensor Object

Class Code: 49 (0x31)

Motor Coil Temperature (Instance 1)

Attribute ID	Access Rule	Name	Data Type	Description; actual value
5 (0x05)	Get	Reading Valid	BOOL	Indicates that the Value attribute contains a valid value. 0 = value invalid 1 = value valid
6 (0x06)	Get	Value	INT	Actual motor coil temperature value [1/10 degrees Centigrade (Celsius)]
7 (0x07)	Get	Status	Byte	Alarm and Warning State of the motor temperature
17 (0x11)	Get	Alarm Trip Point High	INT	Motor temperature Alarm limit (determines the value above which an Alarm condition will occur) [1/10 degrees Centigrade (Celsius)]
21 (0x15)	Get	Warning Trip Point High	INT	Motor temperature Warning limit (determines the value above which an Warning condition will occur) [1/10 degrees Centigrade (Celsius)]

Bearing Temperature (Instance 3)

Attribute ID	Access Rule	Name	Data Type	Description; actual value
5 (0x05)	Get	Reading Valid	BOOL	Indicates that the Value attribute contains a valid value. 0 = value invalid 1 = value valid
6 (0x06)	Get	Value	INT	Actual bearing temperature value [1/10 degrees Centigrade (Celsius)]
7 (0x07)	Get	Status	Byte	Alarm and Warning State of the bearing temperature
17 (0x11)	Get	Alarm Trip Point High	INT	Bearing temperature Alarm limit (determines the value above which an Alarm condition will occur) [1/10 degrees Centigrade (Celsius)]
21 (0x15)	Get	Warning Trip Point High	INT	Bearing temperature Warning limit (determines the value above which an Warning condition will occur) [1/10 degrees Centigrade (Celsius)]

Network Configuration

Converter Unit Temperature (Instance 4)

Attribute ID	Access Rule	Name	Data Type	Description; actual value
5 (0x05)	Get	Reading Valid	BOOL	Indicates that the Value attribute contains a valid value. 0 = value invalid 1 = value valid
6 (0x06)	Get	Value	INT	Actual converter unit temperature value [1/10 degrees Centigrade (Celsius)]
7 (0x07)	Get	Status	Byte	Alarm and Warning State of the converter temperature
17 (0x11)	Get	Alarm Trip Point High	INT	Converter temperature Alarm limit (determines the value above which an Alarm condition will occur) [1/10 degrees Centigrade (Celsius)]
21 (0x15)	Get	Warning Trip Point High	INT	Converter temperature Warning limit (determines the value above which an Warning condition will occur) [1/10 degrees Centigrade (Celsius)]

Network Configuration

2.2.10 Warning Class

Class Code: 100 (0x64)

Instance 1

Attribute ID	Access Rule	Name	Data Type	Description; actual value
1 (0x01)	Get	Warning Bits 1	INT	See Table below
2 (0x02)	Get	Warning Bits 2	INT	See Table below
3 (0x03)	Get	Warning Bits 2	INT	See Table below

Warning Bit 1	Designation	Possible Cause	Remedy
Bit 0	Converter Power Stage Temperature too high	The cooling water flow is too low or the cooling water temperature is too high. The converter is overloaded due to too high gas load. Frequent acceleration and deceleration of the pump.	Cooling system needs to be improved. The gas load needs to be reduced. Allow converter to cool down between the cycles.
Bit 1	Converter Housing Temperature too high	The converter is overloaded due to too high gas load.	The gas load needs to be reduced.
Bit 2	Pump Motor Temperature too high	The cooling water flow is too low or the cooling water temperature is too high.	Cooling system needs to be improved
Bit 3-4	Supply Voltage too high or too low	Usage of a wrong power supply unit. Misaligned output voltage. Too high load. Voltage drop across the supply cable.	Use correct power supply. Adjust the output voltage of the power supply. Replace the power supply by a more powerful one. Increase the copper area of the cable
Bit 5	Overspeed	The frequency setpoint has been set during operation with serial interface e.g. RS232.	Provide for correct speed setting.
Bit 6	Overload	Backing pressure too high during operation. Too high amount of gas flow during operation. Parameter «Normal Operation» is not set correctly.	Reduce backing pressure or process gas flow. Check the chamber pressure during operation. Check the «normal operation» level adjustment.
Bit 7	Bearing Temperature too high	Frequent acceleration and deceleration of the pump.	Cooling system needs to be improved
Bit 8	Motor Start Locked	There was a fatal error before, which is not resettable.	When the pump is stillstanding, disconnect the pump from the power supply and reconnect it. If this behaviour is repeated by the pump, then contact the Leybold service department.
Bit 9	High load	Backing pressure too high during operation. Too high amount of gas flow during operation	Reduce backing pressure or process gas flow. Check the chamber pressure during operation.
Bit 10	Max. Number of Pump Operation Hours are reached	The recommended max. number of operating hours of the pump are reached.	Arrange a service date at Leybold for this pump.

Network Configuration

Warning Bit 1	Designation	Possible Cause	Remedy
Bit 11	Max. Number of Pump Runup Cycles are reached	The recommended max. number of start cycles of the pump are reached.	Arrange a service date at Leybold for this pump.
Bit 12	Magnetic Bearing has not lifted	There was a fatal error before, which is not resettable.	When the pump is stillstanding, disconnect the pump from the power supply and reconnect it. If this behaviour is repeated by the pump, then contact the Leybold service department
Bit 13	reserved		
Bit 14	MAG Bearing Overload 5	The magnetic bearing current for the individual axes is too high. The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.
Bit 15	MAG Bearing Overload 6	The magnetic bearing current for the individual axes is too high. The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.

Warning Bit 2	Designation	Possible Cause	Remedy
Bit 0	MAG Bearing Overload 0	The magnetic bearing current for the individual axes is too high. The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.
Bit 1	MAG Bearing Overload 1	The magnetic bearing current for the individual axes is too high. The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.
Bit 2	MAG Bearing Overload 2	The magnetic bearing current for the individual axes is too high. The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.
Bit 3	MAG Bearing Overload 3	The magnetic bearing current for the individual axes is too high. The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.
Bit 4	MAG Bearing Overload 4	The magnetic bearing current for the individual axes is too high. The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.
Bit 5	MAG Unbalance at the Upper Bearing	Deposition of material from the pumped media at the turbo rotor Due to aggressive media, abrasion at the turbo rotor.	Check the pumped media for suitability with this pump design
Bit 6	MAG Unbalance at the Lower Bearing	Deposition of material from the pumped media at the turbo rotor Due to aggressive media, abrasion at the turbo rotor.	Check the pumped media for suitability with this pump design
Bit 7	MAG Oscillation at the Axial Bearing	The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.

Network Configuration

Warning Bit 2	Designation	Possible Cause	Remedy
Bit 8	MAG Upper Radial Bearing Displacement X1	The magnetic bearing close to the high vacuum flange has been shifted radially. The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.
Bit 9	MAG Upper Radial Bearing Displacement Y1	The magnetic bearing close to the high vacuum flange has been shifted radially. The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.
Bit 10	MAG Lower Radial Bearing Displacement X2	The magnetic bearing close to the forevacuum lange has been shifted radially. The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.
Bit 11	MAG Lower Radial Bearing Displacement Y2	The magnetic bearing close to the forevacuum lange has been shifted radially. The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.
Bit 12	MAG Axial Bearing Displacement Z	The magnetic bearing has been shifted axially. The environmental vibration might be too heavy.	Reduce vibration which might affect the pump.
Bit 13	High Number of Auxiliary Bearing Impacts	The environmental vibration might be too heavy or to many shocks or impacts interfered the pump. Too many full or partial auxiliary bearing run downs affected the pump.	Reduce vibration which might affect the pump. Avoid shocks or impacts at the pump. Avoid stopping the pump by switching off the mains power. Avoid disconnecting the pump cable, when the pump is still running.
Bit 14	High Amount of Cumulated Bearing Touch Down Time	The environmental vibration might be too heavy or to many shocks or impacts interfered the pump. Too many full or partial auxiliary bearing run downs affected the pump.	Reduce vibration which might affect the pump. Avoid shocks or impacts at the pump. Avoid stopping the pump by switching off the mains power. Avoid disconnecting the pump cable, when the pump is still running.
Bit 15	High No. of Touch Down Bearing Run Downs	The number of partial or full touchdowns into the touchdown bearings is too high. The environmental vibration might be too heavy or to many shocks or impacts interfered the pump Too many full or partial auxiliary bearing run downs affected the pump.	Reduce vibration which might affect the pump. Avoid shocks or impacts at the pump. Avoid stopping the pump by switching off the mains power. Avoid disconnecting the pump cable, when the pump is still running.

Network Configuration

Warning Bit 3	Designation	Possible Cause	Remedy
Bit 0	Flange temperature above warning limit.	The Cooling water flow is too low or the cooling water temperature is too high. The Converter is overloaded due to too high gas load. Frequent acceleration and deceleration of the pump.	The cooling system needs to be improved. The gas load needs to be reduced. Allow converter to cool down between the cycles.
Bit 1	Temperature power stage bearing electronic	The Cooling water flow is too low or the cooling water temperature is too high. The Converter is overloaded due to too high gas load. Frequent acceleration and deceleration of the pump.	Improve cooling conditions. Reduce the vibration or shocks influence which might affect the pump
Bit 2	-	-	-
Bit 3	-	-	-
Bit 4	-	-	-
Bit 5	-	-	-
Bit 6	-	-	-
Bit 7	-	-	-
Bit 8	-	-	-
Bit 9	-	-	-
Bit 10	-	-	-
Bit 11	-	-	-
Bit 12	-	-	-
Bit 13	-	-	-
Bit 14	-	-	-
Bit 15	-	-	-

2.2.11 Failure Class

Class Code: 101 (0x65)

Instance 1

Attribute ID	Access Rule	Name	Data Type	Description; actual value
1 (0x01)	Get	Actual error code	INT	See Table below
2 (0x02)	Get	Error frequency	INT	Frequency when actual error occurred [xxx Hz]
3 (0x03)	Get	Error hours	INT	Pump operation hours when actual error occurred [xxx hour]

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
2	Motor temperature error	The motor temperature has exceeded the error threshold.	Forevacuum pressure too high, gas flow too high, defective fan.	Check ultimate pressure of the forevacuum pump and if required install a larger forevacuum pump. Seal off leak, check process. Replace fan. Switch water cooling on. Water cooling switched off.
3	Supply voltage failure	Intermediate circuit voltage is too low or maximum generator operating mode duration exceeded.	Mains supply voltage is too low. Mains voltage has failed.	Check voltage at the mains feed point. Remedy mains power failure.
4	Converter temperature failure	Overtemperature at the power output stage or inside the frequency converter.	Ambient temperature too high. Inadequate cooling owing to cooling water which is too warm.	Do not exceed the maximum ambient temperature of 45 °C. Improve cooling, comply with specified cooling water temperature and cooling water quantity.
5	Overload failure	Rotational speed has dropped below the minimum speed.	Forevacuum pressure is too high. Gas flow is too high.	Check ultimate of the forevacuum pump and if required install a larger forevacuum pump. Seal off leak, check process.
6	Run-up failure	Pump has not attained its normal operating frequency after the maximum run-up time has elapsed.	Forevacuum pressure is too high. Gas flow is too high.	Check ultimate pressure of the forevacuum pump and if required install a larger forevacuum pump. Seal off leak, check process.
7	Run-up time failure	Maximum permissible bearing temperature was exceeded.	Forevacuum pressure is too high. Gas flow is too high.	Check ultimate pressure of the forevacuum pump and if required install a larger forevacuum pump. Seal off leak. Check process.
9	Bearing temperature failure	Maximum permissible bearing temperature was exceeded.	Forevacuum pressure is too high. Gas flow is too high. Water cooling switched off.	Check ultimate pressure of the forevacuum pump and if required install a larger forevacuum pump. Seal off leak. Replace fan. Water cooling disabled or cooling water throughput or cooling water temperature inadequate.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
12	Orbit monitoring, level XY1	Deflection of the rotor at the radial magnetic bearing on the high vacuum side is too high.	Mechanical impacts, possibly through maintenance work. Cross influences of vibrations between several pumps. Vibration influences through external exciting. Balancing condition of the rotor insufficient due to deposits or wear.	Remove external influences. Should the error still occur inform Leybold Service; have the pump replaced.
13	Orbit monitoring, level XY2	Deflection of the rotor at the radial magnetic bearing on the forevacuum side is too high.	Mechanical impacts, possibly through maintenance work. Cross influences of vibrations between several pumps. Vibration influences through external exciting. Balancing condition of the rotor insufficient due to deposits or wear.	Remove external influences. Should the error still occur inform Leybold Service; have the pump replaced.
14	Axial orbit monitoring	Deflection of the rotor at the axial bearing is too high.	Venting gas flow is too high, mechanical impacts, possibly through maintenance work. Cross influences of vibrations between several pumps. Vibration influences through external exciting.	Remove external influences. Should the error still occur inform Leybold Service; have the pump replaced.
16	Overload duration failure	After having attained its normal operating frequency the pump was operated for a longer period of time below its normal operating frequency.	Forevacuum pressure too high. Gas flow too high.	Check ultimate pressure of the forevacuum pump and if required install a larger forevacuum pump. Seal off leak. Check process.
17	Motor current failure	Motor current below set-point current.	With start command being present: frequency converter not properly connected to the pump or damaged connector between pump and frequency converter. Internal fault within the frequency converter.	Inform Leybold Service; have connectors and if required the cable checked. Have the converter replaced.
19	Passthrough time failure	The pump did not attain its minimum speed within the maximum passthrough time.	Forevacuum pressure too high when starting the system. Seized rotor.	Reduce forevacuum pressure. Check to ensure that the rotor rotates freely.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
26	Bearing temperature sensor failure	Bearing temperature sensor is defective.	Component is defective, sensor short-circuit or interruption.	Inform Leybold Service. If required have converter respectively pump replaced.
28	Motor temperature sensor failure	Motor temperature sensor is defective.	Component is defective, sensor short-circuit or interruption.	Inform Leybold Service. If required have converter respectively pump replaced.
31	High load duration failure	Motor current has exceeded the warning threshold too long (time span defined through parameter "Overload time 2").	Forevacuum pressure is too high. Gas flow is too high.	Check ultimate pressure of the forevacuum pump and if required install a larger forevacuum pump. Seal off leak. Check process conditions.
39	Magnetic bearing start-up failure	Magnetic bearing is not able to lift the rotor properly.	Pump was shock vented. Excessively high vibrations or mechanical impacts from the system. Vibration influences between several pumps.	Refer to the pump manual for correct venting of the pump. Avoid vibrations or mechanical impacts.
43	Overspeed failure	The actual frequency exceeds the setpoint frequency.	Setpoint frequency was changed during operation via a serial interface, RS 232, for example.	Provide for correct speed setting.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
63	Internal parameter failure		There is a parameter mismatch which occurred during start-up or while saving the parameters. The pump was disconnected from its power supply while storing important system data was in progress.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
65	Internal communication failure	Failure of internal data communication with the frequency converter.	Cyclic pump communication has failed.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON.
66	Magnetic bearing current too high	Overloading of one or several magnetic bearing power output stages.	Excessively high vibrations or mechanical impacts from the system.	Reduce the level of vibrations or mechanical impacts.
67	Internal overload		Internal drive overload.	Stop the pump. Wait for standstill. Switch mains power OFF and ON again and restart the system.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
71	First time initialisation failure of the parameter list.	Interface parameter/table mapping error.	First time initialisation of the pump parameters has failed.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON.
73	Number of run-up cycles exceeded.	The registered number of start and standby cycles exceeds the maximum permissible number for safe operation.	Very high number of starts respectively much use of the standby function.	Have the pump serviced.
74	Number of operating hours exceeded.	The number of operating hours of the pump exceeds the maximum permissible number of hours for safe operation.	The number of operating hours of the system has reached the level necessary for servicing.	Have the pump serviced.
75	Failure during the initialisation of the pump data.	Failure during identification and initialisation of the pump.	Failure in frequency converter or in the pump.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
77	Too many touchdown bearing contacts were detected.	The registered number of touchdown bearing contacts exceeds the permissible alarm limit.	Due to external or internal influences of the pump the turbo rotor makes contact with the emergency bearings (touchdown bearings): mechanical impacts, possibly due to maintenance work. Vibration influences between several pumps. Vibration influences due to external exciting. Balancing condition of the rotor inadequate due to deposits or wear. Magnetic suspension is defective. Full or partial shutdown of the pump without magnetic bearing support due to mains power failure or failure in the frequency converter.	Have the pump serviced. If required check frequency converter and the connections. Check installation orientation of the pump and if required correct it. Avoid external influences (vibrations, impacts etc.). Review electric power supply and control concept.
78	Bearing contact time too long was detected.	The registered total duration of all touchdown bearing contacts exceeds the permissible alarm limit.	Due to external or internal influences of the pump the turbo rotor makes contact with the emergency bearings (touchdown bearings): mechanical impacts, possibly due to maintenance work. Vibration influences between several pumps. Vibration influences due to external exciting. Balancing condition of the rotor inadequate due to deposits or wear. Magnetic suspension is defective. Full or partial shutdown of the pump without magnetic bearing support due to mains power failure or failure in the frequency converter.	Have the pump serviced. If required check frequency converter and the connections. Check installation orientation of the pump and if required correct it. Avoid external influences (vibrations, impacts etc.). Review electric power supply and control concept.
79	Internal communication failure.	Failure of the internal data communication of the frequency converter.	Failure in the frequency converter.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
80	Invalid interface module combination.	Configuration of the interface module slots is inconsistent.	Two active Fieldbus modules were inserted, the X1 24 V PLC module has been inserted into the "Service" slot.	Correct installation of the interface modules: use control interface slot (CONTROL) with Fieldbus module (Profibus), RS 485, RS 232 or X1. Equip the service slot with a RS 232, a RS 485 or an USB module only.
81	Watchdog for monitoring of USS communication has responded.	Cyclic communication has failed for a longer period of time than defined through P 182.	Cable running to the controller was removed. Controller has interrupted communication. Interface module is defective.	Reinsert cable. Check controller. Inform Leybold Service.
82	Watchdog for monitoring Fieldbus communication has responded.	Cyclic communication has failed for a longer period of time than defined through P 925.	Cable running to the controller was removed. Controller has interrupted communication. Fieldbus interface is defective.	Reinsert cable. Check controller. Inform Leybold Service; have frequency converter replaced.
90	Setpoint speed setting higher than permissible.	Frequency setpoint is higher than the maximum value defined through parameter 45.	Incorrect setpoint entry or parameterisation of the pump is in error.	Correct setpoint entry or run a software respectively parameter update.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
200	Pump identification temperature failure	Temperature in the pump identification is too high.	Forevacuum pressure is too high. Gas flow is too high. Water cooling switched off.	Check ultimate pressure of the forevacuum pump and if required install a larger forevacuum pump. Seal off leak. Check process. Water cooling disabled or cooling water throughput or cooling water temperature inadequate.
201	Unidentifiable failure on control board	Failure affecting the control computer of the frequency converter.	External interference or hardware failure affecting the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
203	Failure during self test	Failure affecting the parameter table mapping.	External interference or hardware failure affecting the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
204	RAM area insufficient for scope functionality	Failure in the control computer of the frequency converter.	External interference or hardware failure affecting the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
206	Pump parameter failure	Failure during identification and initialisation of the pump or the frequency converter.	Failure in the frequency converter, in the pump respectively in the pump's cables.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
209	Pump initialisation failure	Failure during identification and initialisation of the pump or the frequency converter.	Failure in the frequency converter, in the pump respectively in the pump's cables.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
210	Non-cyclic data transfer to pump identification interrupted (parameter transfer)	Communication malfunction with data memory of pump identification.	Temporary EMC interference. Defective hardware.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
213	Intermediate circuit over-voltage	The power supply voltage is too high.	The frequency converter has detected an intermediate circuit voltage which is too high.	Check power supply on the mains power side.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
913	Temperature Power Stage Bearing electronic	The temperature has exceeded the error threshold.	The Cooling water flow is too low or the cooling water temperature is too high. Ambient temperature too high. Too high amplitude or force of mechanical shocks or vibration to the system.	Check cooling conditions Check ambient conditions high. Reduce the vibration or shocks influence which might affect the pump
914	Initialisation of parameter 893 was not yet run	Movement range in yM saved in the pump's memory needs to be updated.	When shifting the values this failure should no longer be able to occur.	
915	Intermediate circuit voltage is too low	Intermediate circuit voltage has dropped below the necessary value.	Unstable mains power supply. Equipment failure.	Check the mains power supply
916	Sensor alignment Channel Z	Automatic sensor alignment for channel Z resulted for parameter SGAIN and/or SOFFS values outside the range which can be typically tolerated.	Parameter changes in the pump's memory.	System needs to be recalibrated and aligned by Leybold.
917	Sensor alignment channel Y2	Automatic sensor alignment for channel Y2 resulted for parameter SGAIN and/or SOFFS in values outside the range which can be typically tolerated.	Parameter changes in the pump's memory.	System needs to be recalibrated and aligned by Leybold.
918	Sensor alignment Channel X2	Automatic sensor alignment for channel X2 resulted for parameter SGAIN and/or SOFFS in values outside the range which can be typically tolerated.	Parameter changes in the pump's memory.	System needs to be recalibrated and aligned by Leybold.
919	Sensor alignment Channel Y1	Automatic sensor alignment for channel Y1 resulted for parameter SGAIN and/or SOFFS in values outside the range which can be typically tolerated.	Parameter changes in the pump's memory.	System needs to be recalibrated and aligned by Leybold.
920	Sensor alignment Channel X1	Automatic sensor alignment for channel X1 resulted for parameter SGAIN and/or SOFFS in values outside the range which can be typically tolerated.	Parameter changes in the pump's memory.	System needs to be recalibrated and aligned by Leybold.
921	Current controller initialisation	Initialisation failure affecting the current controllers.		Re-initialisation attempt by the system by restarting.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
922	Initialisation MM module	Initialisation failure of different controller modules.		Re-initialisation attempt by the system by restarting.
923	Initialisation position task 2	Initialisation failure of software module position task 2.		Re-initialisation attempt by the system by restarting.
924	Initialisation position task 1	Initialisation failure of software module position task 1.		Re-initialisation attempt by the system by restarting.
925	Software not capable of running on the target system	Software is not capable of running on this control board.	Uploading of an incorrect software version.	Load correct software version.
926	Floating point error has occurred	The floating point unit has signalled a failure, error code in debug variable, error code floating point, message after software reset.		Re-initialisation attempt by the system by restarting.
927	System stack overflow	Not enough unoccupied memory in the system stack, message after software reset.		Re-initialisation attempt by the system by restarting.
928	User stack overflow	Not enough unoccupied memory any more.		Re-initialisation attempt by the system by restarting.
929	System stack overflow	System stack overflow, message after software reset.		Re-initialisation attempt by the system by restarting.
930	System stack underflow	System stack underflow, message after software reset.		Re-initialisation attempt by the system by restarting.
931	Word access failure	Illegal word access, message after software reset.		Re-initialisation attempt by the system by restarting.
932	Undefined operation code for protected commands	Programme was detected as incorrect and cannot be run.	Temporary problem or inadmissible changes in the flash/RAM memory.	After the system has arrived at standstill, disconnect it from the power supply to re-initialise the software.
933	Memory access error	Access to the system memory has been found to be in error.	Temporary problem or inadmissible changes in the flash/RAM memory.	After the system has arrived at standstill, disconnect it from the power supply to re-initialise the software.
934	Undefined operation code	Programme code was detected as being in error and cannot be run.	Temporary problem or inadmissible changes in the flash/RAM memory.	After the system has arrived at standstill, disconnect it from the power supply to re-initialise the software.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
935	External failure affecting the safety processors	At least one of the safety processors has detected a failure.	For further analysis the status words and control words of the processors need to be read out.	System locks the power output stage of the drive unit. Wait for the system to arrive at standstill and try to enable the system by switching the mains power off and on again.
936	The current offset and gain values deviate from the initial data.			
937	The Soffset values are outside of the defined range (initialisation).			
938	Cable parameters soffs, sgain and xgain are at their factory defaults.			
939	Cancellation during calculation of the checksum across the range of the static parameters in the pump identification.			
940	Cancellation during the calculation of the checksum across the range of the static parameters in the frequency converter.			
941	Incompatible compiling of the profile adapter version.	Interface parameter table mapping error.	Failure during software update.	If required repeat the software update, respectively check combination of software and profile adapter file.
949	Checksum error during initialisation of the equipment settings.	Failure while operating or identifying and initialising the pump.	Failure in the frequency converter, in the pump respectively in the pump's cable.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
950	Checksum error during initialisation of the autosave parameters	Failure while operating or identifying and initialising the pump.	Failure in the frequency converter, in the pump respectively in the pump's cable.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
951	Error while writing a string parameter to the fixed parameter memory.	Failure while operating or identifying and initialising the pump.	Failure in the frequency converter, in the pump respectively in the pump's cable.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
952	Failure during reading of the permanent parameter memory during the start-up phase.	Failure during operation or while identifying and initialising the pump.	Malfunction in the frequency converter, in the pump respectively in the pump's cable.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
953	Failure while writing to the fixed parameter memory.	Failure during operation or while identifying and initialising the pump.	Malfunction in the frequency converter, in the pump respectively in the pump's cable.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
955	Watchdog for monitoring the communication via Lustbus has responded.	Failure affecting the internal data communication of the frequency converter.	Malfunction in the frequency converter.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
956	Profile adapter: no opcode	Failure affecting the internal data communication of the frequency converter.	Malfunction in the frequency converter.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
957	Profile adapter: invalid opcode	Failure affecting the internal data communication of the frequency converter.	Malfunction in the frequency converter.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
958	Profile adapter: failure during reading of parameters.	Failure affecting the internal data communication of the frequency converter.	Malfunction in the frequency converter.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
959	Profile adapter: failure during writing of parameters	Failure affecting the internal data communication of the frequency converter.	Malfunction in the frequency converter.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
979	General failure during floating point calculation	Failure affecting the control computer of the frequency converter.	External interference or hardware fault of the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
980	Not enough memory for module parameters	Failure affecting the control computer of the frequency converter.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
982	Failure during initialisation of the generator mode.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
983	Failure during initialisation of the speed controller.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
984	Failure during initialisation of rotational speed calculation.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
985	Failure during initialisation of the current controller.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
986	Failure during initialisation of the controller.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
987	Internal failure of the state machine controller.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
988	Failure during initialisation of the motor protection module.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
989	Internal failure affecting the number formats.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
990	Failure during internal parameter access via KP 200. A parameter could not be read or written.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.

Network Configuration

Error code	Designation	Description	Possible cause	Remedy
991	Failure during initialisation of a parameter with its saved setting.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
992	User stack has exceeded the maximum size.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
994	Runtime error during checking of the assisting parameter	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
995	An exception was initiated.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
996	Non-identifiable parameter access level.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.
997	Runtime error during enabling of an assisting parameter.	Internal frequency converter failure.	External interference or hardware fault in the frequency converter electronics.	If required, stop the pump respectively wait for it to arrive at standstill, switch power supply voltage OFF and ON; if required have the frequency converter replaced.

Theoretically there are further error codes. Should these be displayed, please contact Leybold.

In the case of malfunctions also note the troubleshooting information provided in the Operating Instructions for the pump.

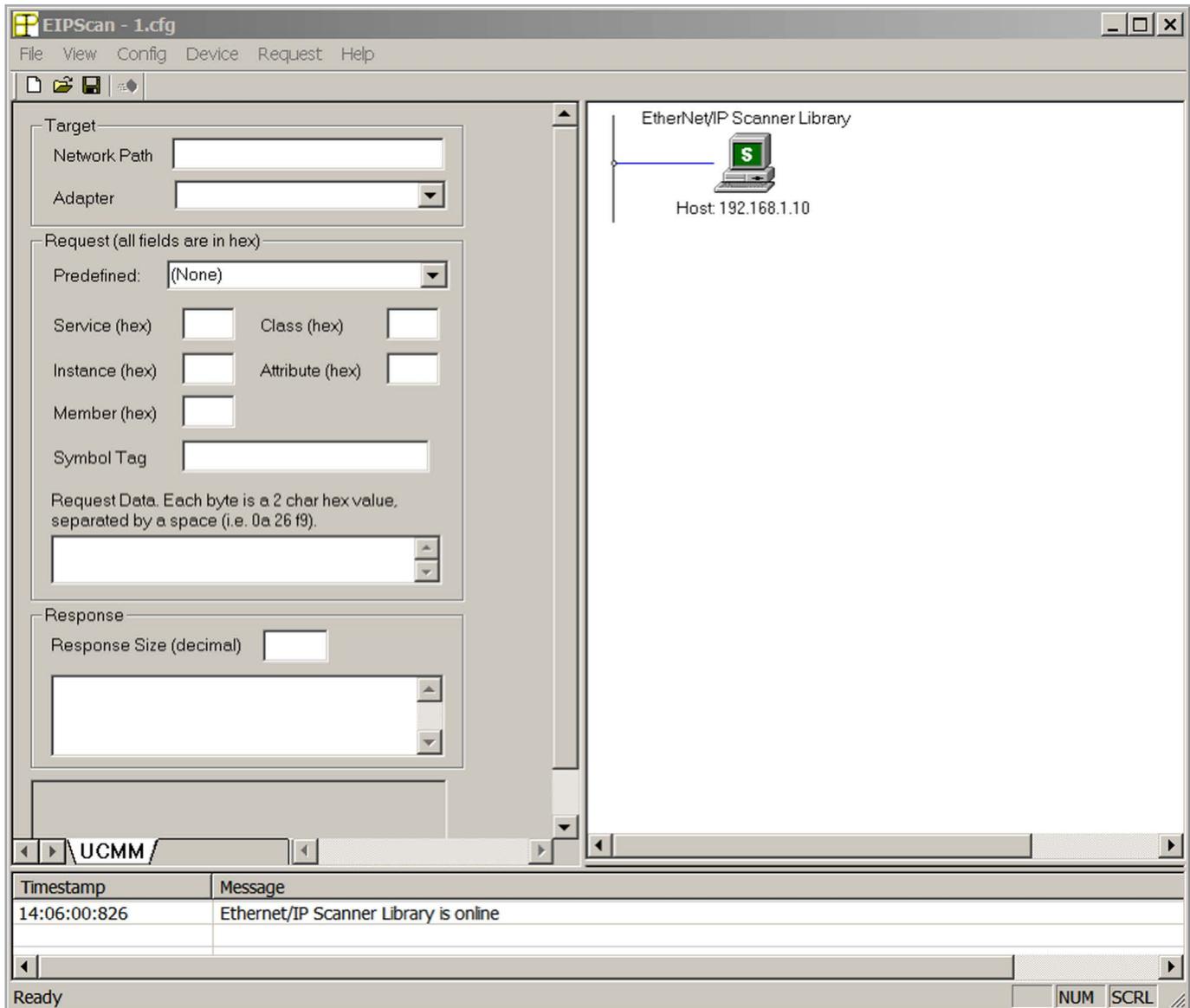
Running cyclic operation

3 Example for running cyclic operation by using the EIPScan tool

The EIPScan software is sold by:

Pyramid Solutions, Inc.
30150 Telegraph Road
Suite 200
Bingham Farms, MI 48025
USA

www.pyramidsolutions.com



Add Device (frequency converter) by right key mouse click in the Device windows.

Running cyclic operation

Fill in the valid IP address of the converter unit.

Add I/O Connection by right key mouse click on the device you just added. You might want to change the Target->Originator to Point to Point. Otherwise there will be a lot of broadcast messages on the network.

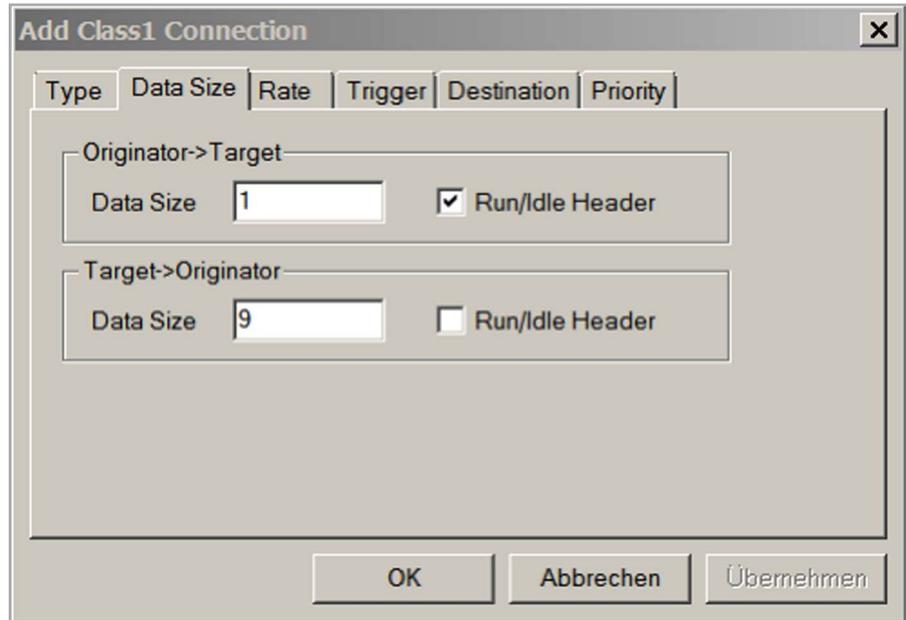
Configure the size of the I/O Assembly Object instances you wish to use.

Depending on the present I/O assemblies. in general the following value will be possible, but only a connection with the instances defined with the Ethernet/IP Host Object can be realized. If you want different instance like shown below, the setting in the Ethernet/IP Host object has to be changed first.

Instance Target -> Originator	Size	Instance Originator->Target	Size
		5	1
3	9	6	2
100 (0x64) default	9	7	4
		101 (0x65) default	1
		102 (0x66)	3
			4

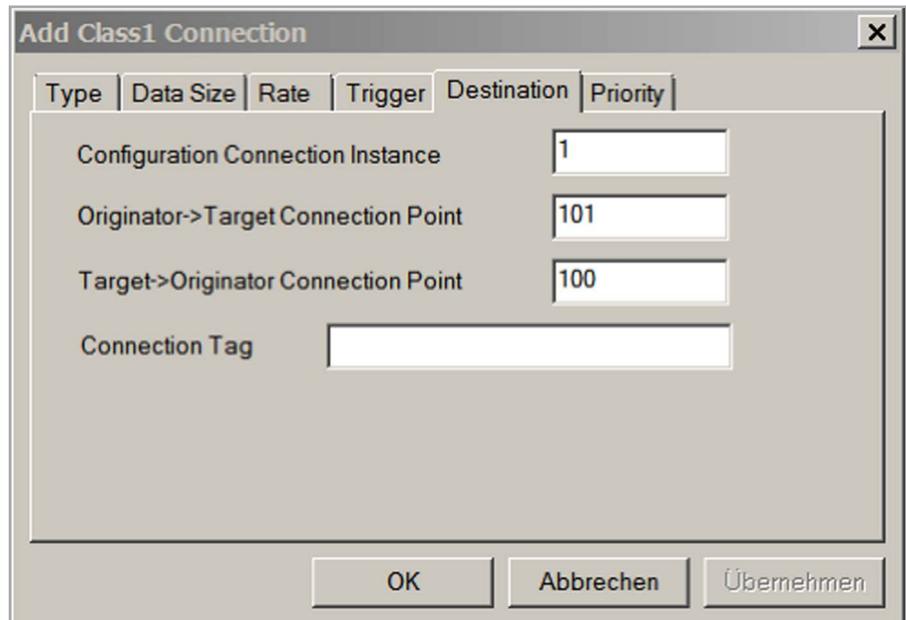
Running cyclic operation

Configure DATA SIZE



The screenshot shows a dialog box titled "Add Class1 Connection" with a close button (X) in the top right corner. The dialog has several tabs: "Type", "Data Size", "Rate", "Trigger", "Destination", and "Priority". The "Data Size" tab is selected. Inside the dialog, there are two sections: "Originator->Target" and "Target->Originator". In the "Originator->Target" section, the "Data Size" is set to 1 and the "Run/Idle Header" checkbox is checked. In the "Target->Originator" section, the "Data Size" is set to 9 and the "Run/Idle Header" checkbox is unchecked. At the bottom of the dialog, there are three buttons: "OK", "Abbrechen", and "Übernehmen".

Configure Originator and Target Instances



The screenshot shows the same "Add Class1 Connection" dialog box, but with the "Destination" tab selected. The "Data Size" tab is still visible but not active. The "Destination" tab contains four input fields: "Configuration Connection Instance" with the value 1, "Originator->Target Connection Point" with the value 101, "Target->Originator Connection Point" with the value 100, and "Connection Tag" which is currently empty. The "OK", "Abbrechen", and "Übernehmen" buttons are at the bottom.

Running cyclic operation

I/O connection is configured and running with I/O instance 100 (0x64) and 101 (0x65)

The screenshot displays the EIPScan - 1.cfg application window. The interface is divided into several sections:

- Target:** Network Path is 192.168.1.4 and Adapter is 192.168.1.10.
- Request (all fields are in hex):** Predefined is (None). Service (hex) is e, Class (hex) is f8. Instance (hex) is 1, Attribute (hex) is 8. Member (hex) is empty. Symbol Tag is empty.
- Response:** Response Size (decimal) is 2. The response field contains 65 00.
- Request Data:** A text area for entering hex data, currently empty.
- Network Diagram:** Shows an EtherNet/IP Scanner Library connected to Host 192.168.1.10. A connection instance is labeled "MAG.DRIVE ()M - Connection Instance 1, RPIs 100 / 100, Cyclic". Below this, a bus structure is shown with 16 nodes (15 to 0). Nodes 15-10 are blue with left-pointing arrows, and nodes 9-0 are green with right-pointing arrows.
- Log:** Shows a timestamp of 10:02:38... with the message "Ethernet/IP Scanner Library is online" and a timestamp of 10:03:54... with the message "Connection opened with Instance 1, Max Recv Delay 1 msec, Max Send Delay 2 msec, Rcv API 99.97 msec, Sent API 100.99 msec, Rcvd pkts 11...".
- Status Bar:** Displays "1 Class1 connections active, Max Recv Delay 1 msec, Max Send Delay 2 msec, Max Recv API 99.97, Max Send API 100.99" and a "NUM" button.

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