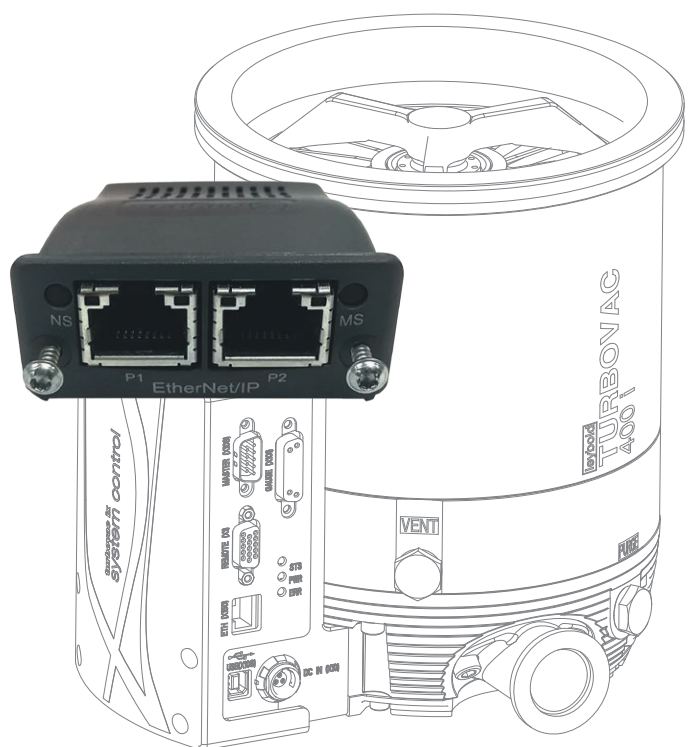


Ethernet/IP interface for TURBOVAC i/iX

Operating Instructions 300642487_002_C1



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Original installation and operating instructions.

Obligation to Provide Information

Before installing and commissioning the TURBOVAC i/iX 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 **TURBOVAC i/iX 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.

“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.

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

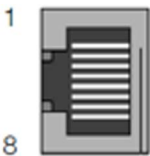
Device

profile	ODVA / CIP according to type 0xB4=180
	“Vendor specific”
class 1 connections / max.	Point-to-point, Multicast / 4
class 3 connections / max.	Point-to-point / 16

1.1 Ethernet Connector

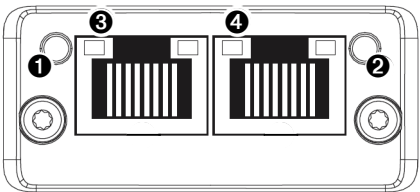
Pin numbers 13-20 on the application connector are used for fieldbus specific signals, see pin out below.

Pin	Signal
1	TD+
2	TD-
3	RD+
6	RD-
4, 5, 7, 8	connected to chassis ground over serial RC circuit
Housing	Bus Cable Shield (Shielded connector only)



View on the Ethernet/IP interface module:

LED	Item
1	Network status
2	Module status
3	Link / Activity (Port 1)
4	Link / Activity (Port 2)



Test sequences are performed on the Network and Module status LEDs during start-up.

Description

1.2 LED states during operation

Network Status LED

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

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 and, if CIP Sync is enabled, time is synchronized to a Grandmaster clock
Green, flashing	Not configured, Scanner in Idle state, or, if CIP Sync is enabled, time is synchronized to a grandmaster clock
Red	Major fault (EXCEPTION-state, FATAL error etc.)
Red, flashing	Recoverable fault(s). Module is configured, but stored parameters differ from currently used parameters.

Link/Activity LED

LED State	Description
OFF	No link, no activity
Green	Link (100 Mbit/s) established
Green, flickering	Activity (100 Mbit/s)
Yellow	Link (10 Mbit/s) established
Yellow, flickering	Activity (10 Mbit/s)

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	

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 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

Network Configuration

2.3 Ethernet/IP

The Common Industrial Protocol (CIP) makes use of abstract object modeling to describe the communications of a product. Objects are well defined sub-sets 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	1 Input / 1 Output
Warning	100	1
Failure	101	1
Analog Out	104	1
Digital Out	105	3
Service Functions	106	1
Relay Options	107	1
Discrete Input Point	108	8
Discrete Output Point	109	6
AC/DC Drive	142	1
S-Device Supervisor	148	1
S-Analog Sensor	149	4
Ethernet IP Host Object	199	1

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

Network Configuration

2.3.1 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	Vendor ID	UINT	Vendor Identification 0x9000 --> Leybold
2 (0x02)	Get	Device type	UINT	Device Type 0xB400 --> Vendor Specific
3 (0x03)	Get	Product code	UINT	0xB500 --> TURBOVAC i 350/450 0xB600 --> TURBOVAC iX 350/450 0xBF00 --> TURBOVAC i 90/250 0xC000 --> TURBOVAC iX 90/250
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; e.g. TMP 350/450 iX

Network Configuration

2.3.2 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
100 (0x64)	Input	0	Exception Status							
default predefined input connection set		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)							

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
101 (0x65)	Output	0	Quit failure	-	Standby	-	Vent Valve	Purge Valve	-	Pump On
default predefined input connection set										

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

2.3.3 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

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

Network Configuration

2.3.4 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]

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

Network Configuration

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

Network Configuration

Error code	Designation	Possible cause	Remedy
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
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.

Network Configuration

Error code	Designation	Possible cause	Remedy
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.
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.

Network Configuration

Error code	Designation	Possible cause	Remedy
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.
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.

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.

2.3.5 Analog Out

Class Code: 104 (0x68)

Analog Out (Instance 1)

Attribute ID	Access Rule	Name	Data Type	Description; actual value
1 (0x01)	Get/Set	Analog output function	UINT	Defines what function the analog-out of the I/O interface should have. 0=No function 1=Pump temperature 2=Motor current 3=Frequency 4=Input voltage
2 (0x02)	Get/Set	Upper limit for analog output	INT	Value corresponding to 10 V at the analog output
3 (0x03)	Get/Set	Lower limit for analog output	INT	Value corresponding to 0 V at the analog output

Network Configuration

2.3.6 Digital Out

Class Code: 105 (0x69)

Digital Out X201 (Instance 1)

Attribute ID	Access Rule	Name	Data Type	Description; actual value
1 (0x01)	Get/Set	Digital output function	UINT	Selects the behavior of the 24V output. 0=Always off 1=Failure 2=No failure 3=Warning 4=No warning 5=Normal operation 6=Not at normal operation 7=Pump rotates 8=Pump does not rotate 18=Fieldbus controlled 19=Always on 24=Bearing temp. dependent 25=Power outage venting 26=Start command active (Default) 27=Ready to start 28=Fan 1 29=Fan 2 30=Fan 3 31=Purge valve 1 32=Purge valve 2 33=Purge valve 3 34=Fore vacuum pump 1 35=Fore vacuum pump 2 36=Vent valve 1 37=Acceleration 38=Deceleration 40=VentValve (normally closed) 41=Power outage venting & vent valve (normally open)
2 (0x02)	Get/Set	Switch-on delay	REAL	
3 (0x03)	Get/Set	Switch-off delay	REAL	
4 (0x04)	Get/Set	Lower frequency switching threshold	UINT	
5 (0x05)	Get/Set	Upper pressure switching threshold	REAL	
6 (0x06)	Get/Set	Lower pressure switching threshold	REAL	
7 (0x07)	Get/Set	Upper current switching threshold	UINT	
8 (0x08)	Get/Set	Lower current switching threshold	UINT	
9 (0x09)	Get/Set	Lower temperature switching threshold	UINT	

Network Configuration

Digital Out X202 (Instance 2)

Attribute ID	Access Rule	Name	Data Type	Description; actual value
1 (0x01)	Get/Set	Digital output function	UINT	Selects the behavior of the 24V output. 0=Always off 1=Failure 2=No failure 3=Warning 4=No warning 5=Normal operation 6=Not at normal operation 7=Pump rotates 8=Pump does not rotate 18=Fieldbus controlled 19=Always on 24=Bearing temp. dependent 25=Power outage venting 26=Start command active (Default) 27=Ready to start 28=Fan 1 29=Fan 2 30=Fan 3 31=Purge valve 1 32=Purge valve 2 33=Purge valve 3 34=Fore vacuum pump 1 35=Fore vacuum pump 2 36=Vent valve 1 37=Acceleration 38=Deceleration 40=VentValve (normally closed) 41=Power outage venting & vent valve (normally open)
2 (0x02)	Get/Set	Switch-on delay	REAL	
3 (0x03)	Get/Set	Switch-off delay	REAL	
4 (0x04)	Get/Set	Lower frequency switching threshold	UINT	
5 (0x05)	Get/Set	Upper pressure switching threshold	REAL	
6 (0x06)	Get/Set	Lower pressure switching threshold	REAL	
7 (0x07)	Get/Set	Upper current switching threshold	UINT	
8 (0x08)	Get/Set	Lower current switching threshold	UINT	
9 (0x09)	Get/Set	Lower temperature switching threshold	UINT	

Network Configuration

Digital Out X203 (Instance 3)

Attribute ID	Access Rule	Name	Data Type	Description; actual value
1 (0x01)	Get/Set	Digital output function	UINT	Selects the behavior of the 24V output. 0=Always off 1=Failure 2=No failure 3=Warning 4=No warning 5=Normal operation 6=Not at normal operation 7=Pump rotates 8=Pump does not rotate 18=Fieldbus controlled 19=Always on 24=Bearing temp. dependent 25=Power outage venting 26=Start command active (Default) 27=Ready to start 28=Fan 1 29=Fan 2 30=Fan 3 31=Purge valve 1 32=Purge valve 2 33=Purge valve 3 34=Fore vacuum pump 1 35=Fore vacuum pump 2 36=Vent valve 1 37=Acceleration 38=Deceleration 40=VentValve (normally closed) 41=Power outage venting & vent valve (normally open)
2 (0x02)	Get/Set	Switch-on delay	REAL	
3 (0x03)	Get/Set	Switch-off delay	REAL	
4 (0x04)	Get/Set	Lower frequency switching threshold	UINT	
5 (0x05)	Get/Set	Upper pressure switching threshold	REAL	
6 (0x06)	Get/Set	Lower pressure switching threshold	REAL	
7 (0x07)	Get/Set	Upper current switching threshold	UINT	
8 (0x08)	Get/Set	Lower current switching threshold	UINT	
9 (0x09)	Get/Set	Lower temperature switching threshold	UINT	

Network Configuration

2.3.7 Service Functions

Class Code: 106 (0x6A)

Service Functions (Instance 1)

Attribute ID	Access Rule	Name	Data Type	Description; actual value
1 (0x01)	Set	Factory reset	UINT	A write command with any value Initializes the parameters to its factory defaults.
2 (0x02)	Get/Set	Bearing run-in function	UINT	The bearing run-In function will be initiated with setting to 1, 2, 4 or 8. With the next start command the pump will start a run-in proce- dure beginning with the selected phase.
3 (0x03)	Get	Bearing run-in status	UINT	1=1 st phase active 2=2 nd phase active 4=3 rd phase active 8=4 th phase active

2.3.8 Relay Options

Class Code: 107 (0x6B)

Relay Options (Instance 1)

Attribute ID	Access Rule	Name	Data Type	Description; actual value
1 (0x01)	Get/Set	Relay function normal operation	UINT	Specifies the function for normal operation relay: 0=Frequency dependent 2=Fieldbus controlled 3=Trigger current bearing temp. 4=Venting function 5=Pump at standstill 6=Start command is present 7=Ready for switch on
2 (0x02)	Get/Set	Relay function error	UINT	Specifies the function for the error relay: 0=Energised when an error is pre- sent 1=Deenergised when an error is present 2=Fieldbus controlled
3 (0x03)	Get/Set	Relay function warning	UINT	Specifies the function for the war- ning relay: 0=Energised when an warning is present 1=Deenergised when an warning is present 2=Fieldbus controlled

Network Configuration

2.3.9 Discrete Input Point Object

Class Code: 108 (0x6C))

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
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

2.3.10 Discrete Output Point Object

Class Code: 109 (0x6D)

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
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	DC Out X201 On/Off	BOOL	0 = DC Out X201 off 1 = DC Out X201 on
	9	Set	Remote Control	BOOL	Enables the remote pump control, when using the Discrete Output Point Objects Instances
105 (0x69)	3	Set	DC Out X202 On/Off	BOOL	0 = DC Out X202 off 1 = DC Out X202 on
	9	Set	Remote Control	BOOL	Enables the remote pump control, when using the Discrete Output Point Objects Instances
106 (0x6A)	3	Set	DC Out X203 On/Off	BOOL	0 = DC Out X203 off 1 = DC Out X203 on
	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

2.3.11 AC/DC Drive Object

Class Code: 142 (0x8E)

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)		
6	Get	Drive Mode	INT	2 = Closed loop mode		
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]		
15 (0x0F)	Get	Power Actual	INT	Actual drive input power [0.1 W]		
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	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
39 (0x27)	Get	Speed Status	USINT	Bit	Speed Status	Description
				0	Running	On and Speed Actual > 0
				1	At Idle	Zero current
				2	At Standby Speed	Speed Actual = Speed Standby
				3	Coasting	Zero Torque (generator mode)
				4	Stopped	Speed Actual = 0
				5	Accelerating	Speed Actual is increasing
				6	At Reference Speed	Actual = Speed Reference
7	Decelerating	Speed Actual is decreasing				

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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)
46 (0x2E)	Get	Pump operation hours	UDINT	Number of pump operation hours [0.01h]
100 (0x64)	Get	Pump operation cycles	UINT	Number of pump operation cycles
101 (0x65)	Get	Converter hours	UINT	Number of converter operating hours [0.01h]

2.3.12 S-Device Supervisor Object

Class Code: 148 (0x94)

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 converter; format example: 6416338
7	Get	Software revision level	Short String	Software revision of the turbo controller’s main firmware; format example: 21300
8	Get	Hardware revision level	Short String	Hardware revision of the turbo controller; format example: 5
9	Get	Manufacturer’s serial number	Short String	Serial number of the turbo controller; format example: 9930053826

Network Configuration

Attribute ID	Access Rule	Name	Data Type	Description; actual value
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)
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/manufactururer-specific bit 3: 0 bit 4:WARNING/device-common bit 5:WARNING/ device-specific bit 6:WARNING/ manufactururer-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)
100 (0x64)	Get	Pump Name	Short String	Name of the turbo pump
101 (0x65)	Get	Pump Catalog Number	Short String	Name of the turbo pump; format example: 30000187517
102 (0x66)	Get	Pump Serial Number	Short String	Serial number of the pump; format example: 30000187517
103 (0x67)	Get	Software Revision Level	Short String	Software revision of the turbo controller's DSP firmware; format example: 30304

** 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	0	Startup time-out	Speed Trip	0	Overspeed	0	0	CNT Failure
Turbo Pump Device Exception Detail Byte 1	0	0	0	0	Controller overheat	Bearing Overheat	Case overheat	Motor Coil Overheat
Manufacturer Exception Detail Size	0	0	0	0	0	1	1	1
Manufacturer Exception Detail Byte 0	0	0	0	0	0	0	0	0
Manufacturer Exception Detail Byte 1	0	0	0	0	Pump temp. too low	0	0	0
Manufacturer Exception Detail Byte 2	0	0	0	0	No motor current	0	0	0
Manufacturer Exception Detail Byte 3	0	0	0	0	0	0	0	0
Manufacturer Exception Detail Byte 4	0	0	0	0	0	0	0	0
Manufacturer Exception Detail Byte 5	0	0	Pump Config. Failure	0	0	0	0	Main power out of tolerances
Manufacturer Exception Detail Byte 6	0	0	0	0	0	0	0	Motor Temp. Sensor failure

Network Configuration

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	0	0	Speed Trip	0	Overspeed	Mains failure	0	0
Turbo Pump Device Exception Detail Byte 1	0	0	Bearing Fault	0	Controller overheat	Bearing Overheat	Case overheat	Motor Coil Overheat
Manufacture Exception Detail Size	0	0	0	0	0	1	1	1
Manufacturer Exception Detail Byte 0	0	0	0	0	0	0	0	0
Manufacturer Exception Detail Byte 1	0	0	0	0	Pump temp. too low	0	0	0
Manufacturer Exception Detail Byte 2	0	0	0	0	0	0	0	0
Manufacturer Exception Detail Byte 3	0	0	0	0	0	0	0	0
Manufacturer Exception Detail Byte 4	0	0	0	0	0	0	0	0
Manufacturer Exception Detail Byte 5	0	0	0	0	0	0	0	0
Manufacturer Exception Detail Byte 6	0	0	0	0	0	0	0	0

Network Configuration

2.3.13 S-Analog Sensor Object

Class Code: 149 (0x95)

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)]

Pressure Gauge (Instance 100)

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	REAL	Pressure value [mbar]
7 (0x07)	Get	Status	Byte	Alarm and Warning State of the pressure value

2.3.14 Ethernet/IP Host Object

Class Code: 199 (0xC7), Instance ID: 1

For internal use only.

Running cyclic operation

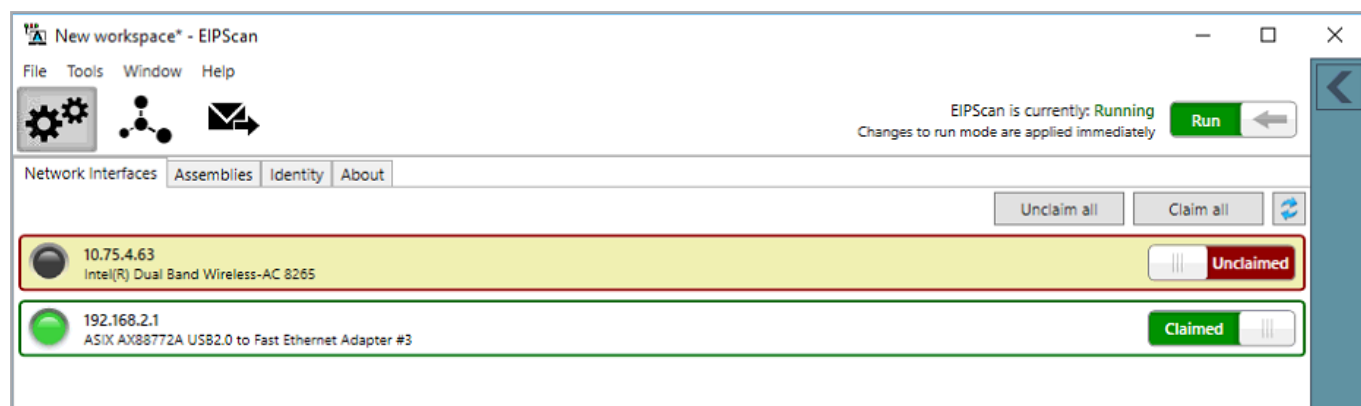
3 Example for running cyclic operation by using the EIPScan tool

The EIPScan software is sold by:

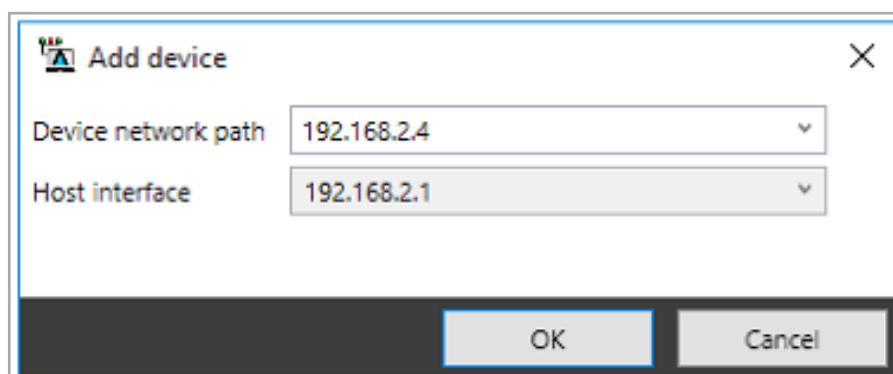
Pyramid Solutions, Inc.
30200 Telegraph Road
Suite 440
Bingham Farms, MI 48025
USA

www.pyramidsolutions.com

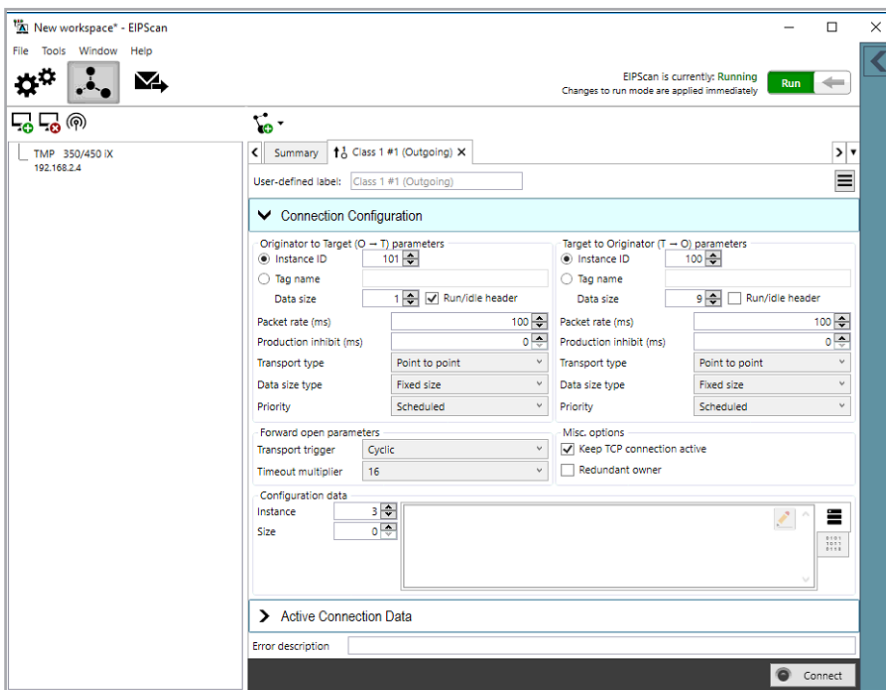
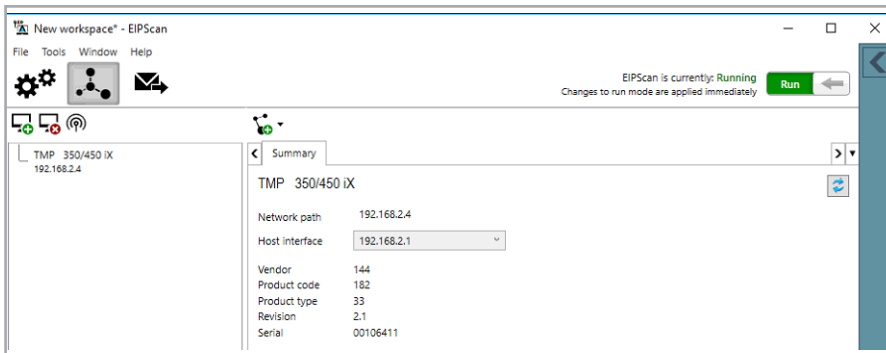
Select the Network interface where the pump is connected to.



Add the device in the “Devices and connections” panel, and enter the IP address of the device.



Running cyclic operation



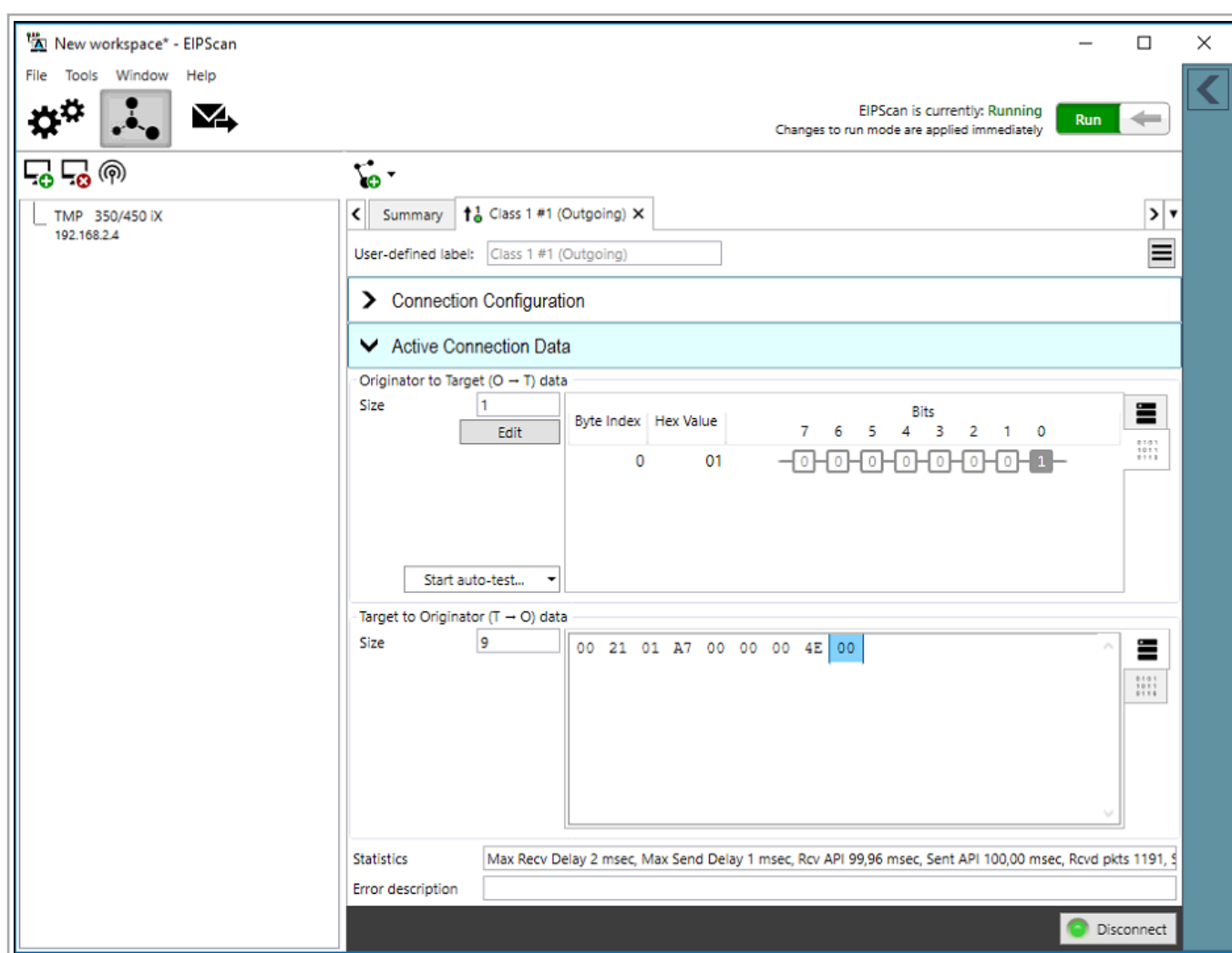
Create a Class1 connection by right key mouse click on the device you have just added. You might want to change the Target->Originator to Point to Point. Otherwise there will be a lot of broadcast messages on the network.

Running cyclic operation

Configure the size of the I/O Assembly Object instances according to the following table.

Instance Target -> Originator	Size	Instance Originator->Target	Size
100 (0x64) default	9	101 (0x65) default	1

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



[illegible]



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