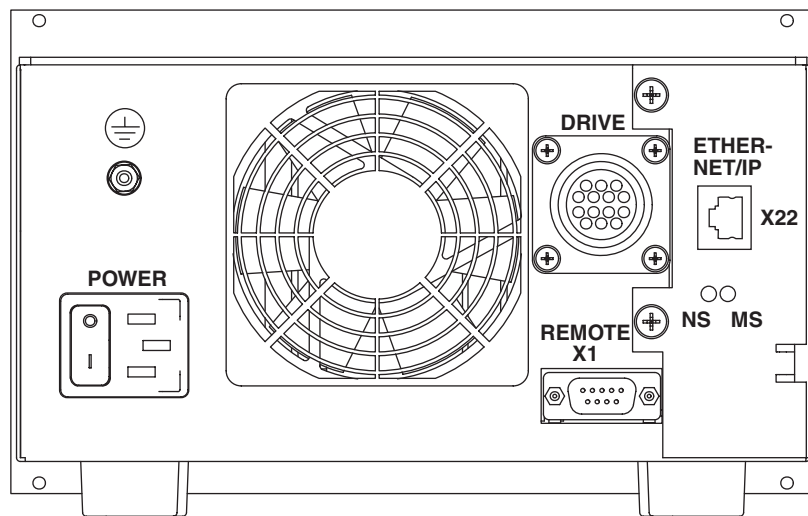


Ethernet/IP Interface for Turbo.Drive TD20 *classic*

Operating Instructions 17200056_002_00

Part No.

800075V0007



Contents

	Page
Important Safety Information	3
Conventions used in this manual	3
1 Description	4
1.1 Features	4
1.2 Ethernet Connector	4
1.3 Ethernet/IP Status Indicators	5
1.4 Security Framework and File Structure	6
1.5 System Files	7
2 Network Configuration	9
2.1 Configuring the IP settings	9
2.2 FTP Server	11
2.3 Telnet Server	11
2.4 Web Server	13
2.5 Email Client	13
2.6 Modbus/TCP	13
2.7 EtherNet/IP	14
2.7.1 Identity Object	15
2.7.2 I/O Assembly Object	16
2.7.3 Connection Object	18
2.7.4 Discrete Input Point Object	18
2.7.5 Discrete Output Point Object	19
2.7.6 AC/DC Drive Object	20
2.7.7 S-Device Supervisor Object	21
2.7.8 S-Analog Sensor Object	24
2.7.9 Vendor Specific Failure and Warning Object	25
3 Example for running the polling operation by using the EIPScan tool	26

Installation and operation of the TurboDrive TD20 *classic* frequency converter is described in Operating Instructions GA05228. Described in these Operating Instructions is only the Ethernet/IP interface of the TurboDrive TD20 *classic*.

Important Safety Information

The Oerlikon Leybold Vacuum Turbo.Drive TD20 *classic* frequency converter 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.

Warning



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

Conventions used in this manual

The following conventions are used throughout this manual:

- The term 'module' is used when referring to the AnyBus-IC EIP.
- The term 'application' is used when referring to the hardware that is connected to the Application Connector.
- Hexadecimal values are written in the format NNNNh or 0xNNNN, where NNNN is the hexadecimal value.
- Binary values are written in the format NNNNb, where NNNN is the binary value.
- 16/32 bit values are written in big endian Motorola format
- Floating point values are in the IEEE Standard 754 format

Description

1 Description

The Ethernet/IP Interface integrates all functionality required to communicate on an Ethernet network. The module features a web server and email client with Server Side Include (SSI) capabilities, allowing commands to be embedded into HTML code and Email messages, providing user friendly access to the turbo pumps parameter data.

1.1 Features

General

- 10 and 100mbit operation, Full and Half Duplex
- Security framework

Standard Control Protocol

- Ethernet/IP The interface can act as a group 2 and 3 server on an EtherNet/IP based network.
- The application layer uses as far as possible the CIP Device Profile "Turbomolecular Vacuum Pump Device"; Type 21 hex = 33 decimal.

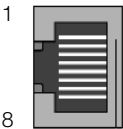
IT-Functionality

- Web server with access to some important information of the TD20 *classic*
- Telnet server featuring a command line interface similar to the MS-DOS™ environment.

1.2 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)



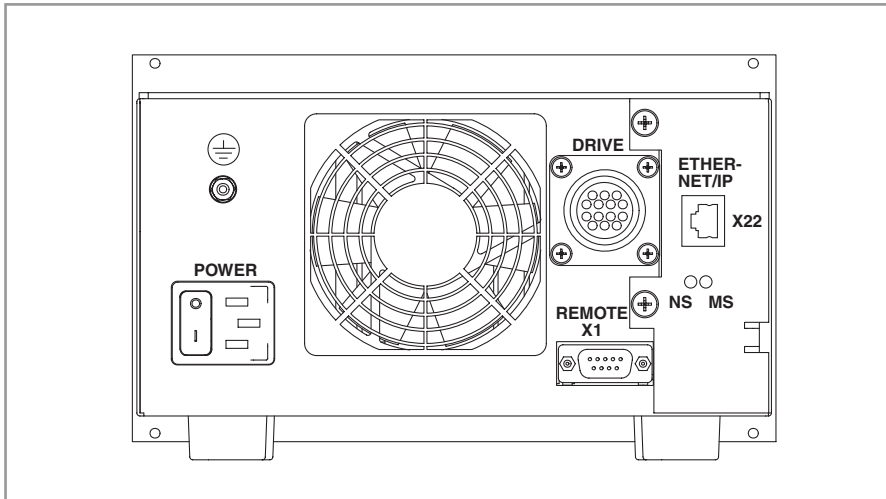


Fig. 1 Turbo.Drive TD20 *classic* with Ethernet/IP interface

1.3 Ethernet/IP Status Indicators

MS: Module Status LED (right LED)

State	Indication
OFF	Device not powered
Solid Green	Device operational
Flashing green	Device not ready or internal communication interrupted
Red	Major fault, unrecoverable
Flashing red	Minor fault, recoverable

NS: Network Status LED (left LED)

State	Indication
OFF	No power or no IP address
Green	Device has at least one established EIP connection
Flashing green	Device has no established EIP connections
Red	Duplicate IP address detected
Flashing red	One or more established EIP connections has timed out

EIP = Ethernet/IP

Power up LED Test Sequence:

Duration	Module Status (MS)	Network Status (NS)
0.25s	Green	(off)
0.25s	Red	
0.25s	Green	Green
0.25s		Red
1s		(off)
-	(Normal Operation)	(Normal Operation)

Description

1.4 Security Framework and File Structure

The access to the file system can be disabled by a password configuration file named: 'sys_pswd.cfg' located in the directory 'pswd'. By default the login name is: 'customer' and the password: 'user'. See the chapter system files below for more information about this file.

The access can either be achieved by using FTP or TELNET.

The WEB access is controlled by the configuration file named: 'sys_pswd.cfg', also located in the directory 'pswd'. By default the login name is: 'Leybold' and the password: 'TD20'. See the chapter system files below for more information about this file.

Case Sensitivity

The login name and password are case sensitive. Also filenames and directory names are case sensitive. This means the file 'Leybold.txt' is not identical to the file 'Leybold.TXT'.

Filename / Pathname length

Filenames can be a maximum of 48 characters long. Pathnames can be 256 characters in total, filename included.

Caution

The non-volatile storage area of the file system is located in FLASH memory. Each FLASH segment can only be erased approximately 1000000 times due to the nature of this type of memory.

The following operations will erase one or more FLASH segments:

- Deleting, moving or renaming a file or directory
- Writing or appending data to an existing file
- Formatting the file system

File Structure

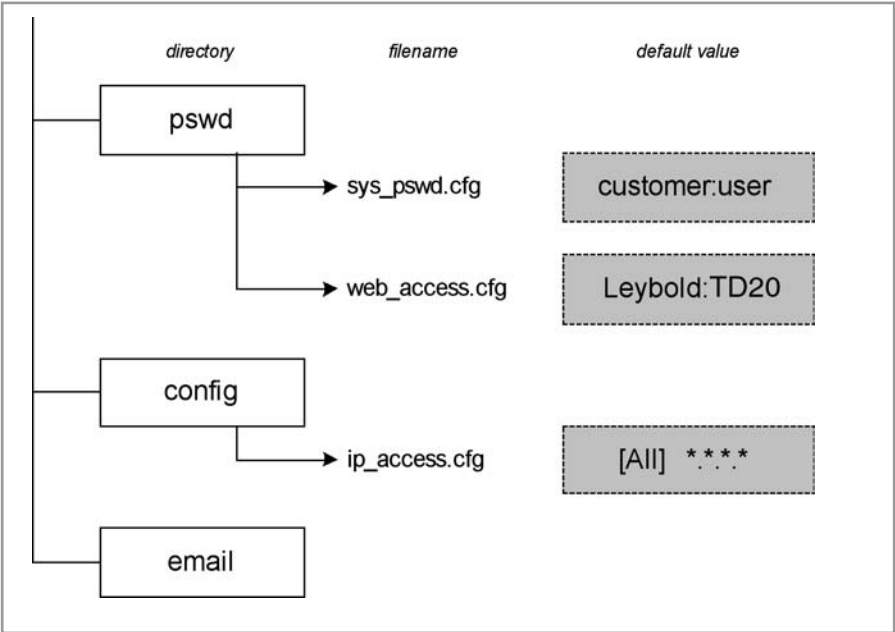


Fig. 2 File Structure

1.5 System Files

The Ethernet/IP interface in the TD20 *classic* uses these files for configuration purposes. The system files are ASCII files and can be edited with any text editor.

Generally, the TD20 *classic* has to be powered down in order for any changes in these files to have effect.

Note: It is very important to follow the exact syntax specifications for each configuration file; otherwise the module might have problems interpreting it, which can result in a faulty or non-expected behavior.

Configuration file

'ip_access.cfg'

It is possible to configure which IP addresses and what protocols that are allowed to connect to the module. This information is stored in the file 'ip_access.cfg'.

The file should contain one or several of the headers below.

[Ethernet/IP]

[Web]

[FTP]

[Telnet]

[All]

Under each header, the allowed IP addresses should be listed. The wildcard '*' can be used to allow series of IP addresses. If a protocol header is not given, the system will use the configuration listed under the header 'All'. If the 'All' header is not given, the protocol will not accept any connections.

Default:

[All]

..*

All IP addresses are accepted.

Example:

[Web]

10.10.12.* 10.10.13.*

[FTP]

10.10.12.*

[Telnet]

10.10.12.*

[All]

..*

The above example will allow any IP address beginning with 10.10.12 to access all protocols in the module. IP addresses beginning with 10.10.13 will be able to access the web server, but not the FTP and Telnet servers. The Ethernet/IP server will accept connections from any IP address.

Description

Password file

sys_pswd.cfg

The password information for FTP and Telnet is stored in the file 'sys_pswd.cfg'. These file should be placed in the directory: '\pswd\.. This directory is protected from web browser access.

The file format is the following:

User1:password1

User2:password2

User3:password3

Example: Bilbo:Hobbit

In this example, the username is 'Bilbo', and the password is 'Hobbit'. If no ':' is present, the password will be equal to the username.

Example: Username

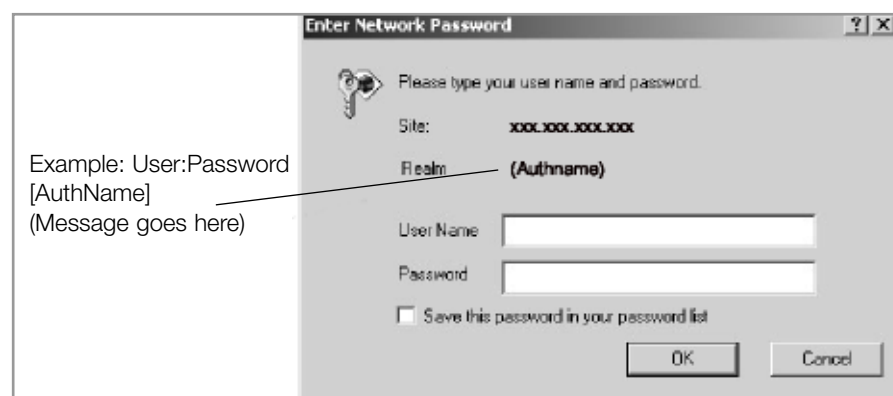
In this example, both username and password will be 'Username'

'web_accs.cfg'

To protect the TD20 *classic* from unauthorised web access, a file called 'web_access.cfg' must be placed in the directory 'pswd'. This file shall contain a list of users that are allowed to browse the TD20 *classic*.

The file format is the same as for the 'sys_pswd.cfg', except that the optional parameter 'AuthName' can be added. The value of this parameter will be presented in the login window. If it is not given, the requested file/pathname will be presented instead.

The default username is 'Leybold' and the password 'TD20'



If any errors in the format of these files is detected the user/password protection will be ignored.

Network Configuration

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 IP address is divided into three parts - net ID, subnet ID and host ID. To separate the net ID and the subnet ID from the host ID, a subnet mask is used.

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.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
- HICP
- ARP

Note: Some of these configuration methods may be overridden by others.

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

- IP address
- Subnet mask
- Gateway address

Network Configuration

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.

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 ver 1.1' 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.

Address Resolution Protocol (ARP)

The IP address can be changed during runtime using the ARP command from a PC. The new IP address will be stored in the IP configuration parameters.

The module will then use the following settings:

IP address:	Address provided using ARP Subnet mask: 255.255.255.0
Gateway:	0.0.0.0 (No gateway)
DHCP:	OFF

Below is an example on how to change the IP address from a MS DOS™ window:

```
arp -s <IP address> <MAC address> ping <IP address> arp -d <IP address>
```

The 'ARP -s' command will store the IP address and MAC address in the PC's ARP table. When the 'PING' command is executed, the PC will send this message to the module using the specified MAC address. When the module receives this message and detects that it was address with the correct MAC address but not the current IP address, it will adopt the new IP address.

(The 'ARP -d' command is optional, but it removes the static route from the PC ARP table.)

This method can be used to reconfigure modules that already has been configured, or even to reconfigure modules outside the host's subnet.

Note: As the Arp command automatically configures the subnet mask to 255.255.255.0, the first three bytes of the IP address must be the same as for the PC executing the command.

Example:

PC: 10.10.12.67

Module: 10.10.12.x (Where x is a value between 1 and 254)

2.2 FTP Server

It is possible to upload/download files to/from the file system using a standard FTP client.

2.3 Telnet Server

Through a Telnet client, the user can access the file system using a command line interface similar to MSDOS™. Depending on security settings, different parts of the file system can be accessed by the user:

General commands

admin

Syntax: admin

Provided that the user can supply a valid admin username/password combination, this command enables admin access in normal mode. Note that this command has no effect in administration mode.

help

Syntax: help [[general][diagnostic][filesystem]]

If no argument is specified, the following menu will be displayed.

General commands:

help - Help with menus

version - Display version information

exit - Exit station program

Also try 'help [general | diagnostic | filesystem]'

version

Syntax: version

This command will display version information, serial number and MAC ID of the module.

exit

Syntax: exit

This command closes the Telnet session.

Diagnostic commands

arps

Syntax: arps

Display ARP stats and table

iface

Syntax: iface

Display net interface stats

sockets

Syntax: sockets

Display socket list

Network Configuration

routes

Syntax: routes

Display IP route table

File System Operations

For commands where filenames, directory names or paths shall be given as an argument the names can be written directly or within quotes. (Filenames that include spaces must be surrounded by quotes)

It is also possible to use relative pathnames using '.', '\ ' and '..'

dir

Syntax: dir [path]

Lists the contents of a directory. If no path is given, the contents of the current directory is listed

md

Syntax: md [[path]][directory name]]

Creates a directory. If no path is given, the new directory is created in the current directory.

rd

Syntax: rd [[path]][directory name]]

Removes a directory. The directory can only be removed if it is empty.

cd

Syntax: cd [path]

Changes current directory.

format

Syntax: format

Formats the filesystem. This is a privileged command i.e. it can only be called in administration mode.

del

Syntax: del [[path]][filename]]

Deletes a file.

copy

Syntax: copy [[source path]][source file]] [[destination path]][destination file]]

This command creates a copy of the source file at a specified location.

ren

Syntax: ren [[path]][old name]] [[path]][new name]]

Renames a file or directory.

move

Syntax: move [[source path]][source file]] [[destination path]]

This command moves a file or directory from the source location to a specified destination.

Network Configuration

type

Syntax: type [[path]][filename]]

Display the contents of a file.

mkfile

Syntax: mkfile [[path]][filename]]

Creates an empty file.

append

Syntax: append [[path]][filename]] [The line to append]

Appends a line to a file.

df

Syntax: df

This command displays information about the filesystem.

2.4 Web Server

The embedded web server of the TD20 *classic* provides an easy access to some important information about the pump and the converter and can be used with the common internet browsers like MS Internet Explorer, Firefox etc..

The information accessible with the internet browser:

Identity

Catalog no. of converter

Serial no. of converter

Software and default parameter revision levels

Operation

Actual state of the pump

Actual speed

Internal voltage and motor current information

Service

Operating cycles and operating hours of converter

Actual temperatures of converter and pump housing (if supported)

Ethernet/IP device status

Warning and failure Information

2.5 Email Client

The email client is currently not available.

2.6 Modbus/TCP

The Modbus/TCP functionality is currently not available.

2.7 EtherNet/IP

The module can act as a Group 2 and 3 server on an EtherNet/IP based network. EtherNet/IP is based on the Control and Information protocol (CIP) which is also the application layer for EtherNet and ControlNet to exchange data between 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	4 Input and 4 Output
Connection	5	1 I/O and 1 Explicit
Discrete Input Point	8	5
Discrete Output Point	9	6
AC/DC Drive	42	1
S-Device Supervisor	48	1
S-Analog Sensor	49	5
S-Single Stage Controller	51	1

2.7.1 Identity Object

Class services: Get Attribute All
 Get Attribute Single

Instance services: Get Attribute All
 Get Attribute Single
 Reset

Class Code: 1 (01_{hex})

Instance ID: 1 (01_{hex})

Attribute ID	Access Rule	Name	Data/Type	Description; actual value
1 (01 _{hex})	Get	Leybold	UINT	Vendor Identification 90 00 hex → Leybold)
2 (02 _{hex})	Get	Device type	UINT	Device Type 21 00 hex → Turbomolecular Pump
3 (03 _{hex})	Get	Product Code	UINT	64 00 hex → TD_CLASSIC
4 (04 _{hex})	Get	Revision Major Revision Minor Revision	STRUCT of: USINT USINT	Revision of the item the Identity Object represents 01 01
5 (05 _{hex})	Get	Status	USINT	Status of the entire device; see: Volume 1: CIP Common Specification, Chapter 5: Object Library: 5-2.2.1.5
6 (06 _{hex})	Get	Serial Number	UDINT	Serial number of the turbo pump controller
7 (07 _{hex})	Get	Product Name	SHORT_ STRING	Name of the turbo pump controller TD_CLASSIC
8 (08 _{hex})	Get	State	USINT	Present state of the device as represented by the state transition diagram 0 = Nonexistent 1 = Device Self Testing 2 = Standby 3 = Operational 4 = Major Recoverable Fault 5 = Major Unrecoverable Fault

Ethernet/IP

2.7.2 I/O Assembly Object

Input Assembly

Class Code: 4 (04hex)

Attribute ID: 3 (03hex)

Instance ID	Type	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1 (01 _{hex}) 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	0	0	0	Pump On Status
2 (02 _{hex})	Input	0	Exception Status (see the " Exception Status Bit Map" below)							
		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
		3 - 4	Pump Speed (revolutions per second)							
3 (03 _{hex})	Input	0	Exception Status (see the " Exception Status Bit Map" below)							
		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
		3 - 4	Pump Speed [revolutions per second]							
		5 - 6	ignore							
		7 - 8	Current [1/10 Amps] (actual motor current)							
100 (64 _{hex})	Input	0	Exception Status (see the " Exception Status Bit Map" below)							
		1	Speed Status (see the "Speed Control Attribute and Speed Status Attribute Bit Map" below; implementation not completed yet)							
		2					General Alarm	General Warning	Pump On Status	
		3 ... 4	Pump speed; actual (revolutions per second)							
		5 ... 6	ignore							
		7 ... 8	Current [1/10 Amps] (actual motor current)							

selecting the predefined connection set; see: 2.7.3 Connection Object

Service Code	Name
14 (0Ehex)	Get Attribute Single

Output Assembly

Class Code: 4 (04hex)

Attribute ID: 3 (03hex)

Instance	Type	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
5 (05 _{hex}) default	Output	0	-	-	-	-	-	-	-	Pump on
6 (06 _{hex})	Output	0	-	-	-	-	-	-	-	Pump on
		1								Speed Control (see the "Speed Control Attribute and Speed Status Attribute Bit Map" below)
101 (65 _{hex})	Output	0	Quit failure	-	-	-	-	-	-	Pump on

selecting the predefined connection set; see: 2.7.3 Connection Object Services

Service Code	Name
16 (10hex)	Set Attribute Single

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 (expanded 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 (actual not selectable via EtherNet)
3	-	Coasting	Zero Torque (generator mode)
4	-	Stopped	SpeedActual = 0
5	-	Accelerating	SpeedActual is increasing
6	-	At Reference	SpeedActual = SpeedRef
7	-	Decelerating	SpeedActual is decreasing

Ethernet/IP

2.7.3 Connection Object

Class Code 5 (05_{hex})

Instance ID: 0 (00_{hex})

Attr. ID	Access Rule	Name	EtherNet Data Type	Description of Attribute
100 = 64 _{hex}	Set	Poll Produce Assembly Instance	USINT	Instance number of the assembly used to send data see also Input Assembly Connection Object and CIP documentation Connection Object 5-6
101 = 65 _{hex}	Set	Poll Consume Assembly Instance	USINT	Instance number of the assembly used to receive data see also Input Assembly Connection Object and CIP documentation Connection Object 5-6

Attribute can not be set by explicit Messaging!

2.7.4 Discrete Input Point Object

Class Code: 8 (08_{hex})

Instance ID	Attrib. ID	Access Rule	Name	Data/Type	Description
1 (01 _{hex})	3	Get	Pump On / Off	BOOL	0 = Pump Off (or Pump On and Speed = 0) 1 = Pump On (pump running)
	7	Get	Off_On Cycles	UDINT	Count value of pump start to normal sequences
100 (64 _{hex})	3	Get	Normal	BOOL	Normal speed reached
101 (65 _{hex})	3	Get	Acceleration	BOOL	The pump increases speed
102 (66 _{hex})	3	Get	Deceleration	BOOL	The pump decreases speed
103 (67 _{hex})	3	Get	Generator Mode	BOOL	The pump runs in generator mode; mains voltage is missing
105 (69 _{hex})	3	Get	Standstill	BOOL	0 = Pump rotates or drive is active 1 = Pump stopped and drive is not active
106 (6A _{hex})	3	Get	Remote Operation	BOOL	The Pump is under control of EtherNet

Services

Service Code	Name
14 (0E _{hex})	Get Attribute Single

2.7.5 Discrete Output Point Object

Class Code: 9 (09hex)

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

Any DOP needs its own enable if usage is intended.

Instance ID	Attribute ID	Access Rule	Data Type	Name	Description
1 (01hex)	3	Set	BOOL	Pump On / Off	0 = Pump Off (or Pump On and Speed = 0) 1 = Pump On AND Speed > 0
	9	Set	BOOL	Activate Pump On/Off	enables the Pump On/Off control
101 (65hex)	3	Set	BOOL	Quit Failure	0 = do not reset error condition 1 = Reset error condition
	9	Set	BOOL	Activate Quit Failure function	enables the Quit Failure function

Every control Instance (Attribute ID 9) has to be set individually; if one of the control instances is set, the control medium is EtherNet. (if none of the control instances is set, the control medium could be the keypad, X1 or the front side RS232 interface)

Attention

Service Code	Name
16 (10hex)	Set Attribute Single

Ethernet/IP

2.7.6 AC/DC Drive Object

Class Code: 42 (2Ahex)

Instance ID: 1 (01hex)

Attr ID	Access Rule	Attribute Name	Data/ Type	Description; actual value		
3	Get	AtReference	BOOL	Normal operation status		
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		
7	Get	SpeedActual	INT	Speed of the pump [RPS]		
8	Set/Get	SpeedRef	INT	Reference speed of the pump [RPS]		
9	Get	Current Actual	INT	Actual motor current [0.1 ampere]		
10 (0A _{hex})	Get	CurrentLimit	INT	Limit of the motor current [0.1 ampere]		
16 (10 _{hex})	Get	InputVoltage	INT	Actual value of the direct current link voltage		
20 (14 _{hex})	Get	LowSpd Limit	UINT	Low limit of the pump speed [RPS]		
21 (15 _{hex})	Get	HighSpd Limit	UINT	High limit of the pump speed [RPS]		
38 (26 _{hex})	Set	Speed Control	USINT	Bit	Speed Control	Description
				0	Run Request	Starts the pump if set The last bit set, bit wins the race
				1	Idle Request	Stops the pump if set The last bit set, bit wins the race
39 (27 _{hex})	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
40 (28 _{hex})	Set	Speed Trip Time	UINT	7	Decelerating	Speed Actual is decreasing
				Maximum run up time; maximum overload time. (Exceeding of this limit leads to the corresponding error message)		
				High limit of the pump speed [RPS]		
				Fixed value: RPS --> 1F0E _{hex} (rotations per second)		
				Fixed value: RPS --> 1F0E _{hex} (rotations per second)		
				Number of converter operating hours		

2.7.7 S-Device Supervisor Object

Class Code: 48 (30hex)

Instance ID: 1 (01hex)

Attr. ID	Access Rule	Name	EtherNet Data Type	Description; actual value
3	Get	Device Type	SHORT STRING	Type of the EtherNet Device; "Turbo Pump"
4	Get	SEMI Standard Revision Level	SHORT STRING	Revision level of the SEMI S/A Network Standard of the device; "E54-0997"
5	Get	Manufacturer's Name	SHORT STRING	Manufacturer of the device; "Leybold Vacuum GmbH"
6	Get	Manufacturer'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 controllers main firmware; format example: 030307
8	Get	Hardware Revision Level	SHORT STRING	Software revision of the turbo controllers main firmware; format example: 010202
9	Get	Manufacturer's Serial Number	SHORT STRING	Serial number of the turbo controller; format example: 30000187517
10 (0A _{hex})	Get	Device Configuration	SHORT STRING	Reserved for future use, empty string.
11 (0B _{hex})	Get	Device Status	USINT	Status of the EtherNet 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 (0C _{hex})	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/manufacturer-specific bit 3: 0 bit 4: WARNING/device-common bit 5: WARNING/ device-specific bit 6: WARNING/ manufacturer-specific bit 7: 1 = Expanded Method
13 (0D _{hex})	Get	Exception Detail Alarm	STRUCTs of in summary 14 bytes	A Structure of three Structures containing a bit mapped representation of the Alarm detail; see the table on the next page
14 (0E _{hex})	Get	Exception Detail Warning	STRUCTs of in summary 14 bytes	A Structure of three Structures containing a bit mapped representation of the Warning detail; see the table on page 23

Ethernet/IP

Attr. ID	Access Rule	Name	EtherNet Data Type	Description; actual value
15 (0F _{hex})	Set	Alarm Enable	BOOL	Controls setting of Alarm bits 0 = Alarms disabled 1 = Alarms enabled (default)
16 (10 _{hex})	Set	Warning Enable	BOOL	Controls setting of Warning bits 0 = Warnings disabled 1 = Warnings enabled (default)

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	Scheduled 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	reserved	Startup Timeout	Speed Trip	Over-current	Over-speed	Mains Failure	reserved	reserved
Turbo Pump Device Exception Detail Byte 1	0	Inter-locked	reserved	Cable Fault	Controller Overheat	reserved	Motor Case Overheat	reserved
Manufacturer Exception Detail Size **	0	0	0	0	0	1	1	1
Turbo Pump Device Exception Detail Byte 0	Dropped to minimal frequency	Overload time exceeded	System overloaded	Motor current high	Internal Security system activated	Internal Self test failed	Frequency Error	Emergency stop circuit activated
Turbo Pump Device Exception Detail Byte 1	reserved	reserved	Converter temperature too high	reserved	reserved	Cooling water temperature high	Pump temperature high	reserved
Turbo Pump Device Exception Detail Byte 2	Generator mode activated	Maximum frequency exceeded	Maximum power exceeded const "0"	Acceleration time exceeded	No motor current	const "0"	Internal communication failed	Communication to Turbopump failed
Turbo Pump Device Exception Detail Byte 3 & 4	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved
Turbo Pump Device Exception Detail Byte 5	reserved	reserved	reserved	reserved	reserved	Internal control temperature incorrect const "0"	Internal control voltage incorrect const "0"	Main power out of tolerances const "0"
Turbo Pump Device Exception Detail Byte 6	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved

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	Scheduled 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	reserved	Startup Timeout const "0"	Speed Trip	Over-current	Over-speed	Mains Failure	reserved	reserved
Turbo Pump Device Exception Detail Byte 1	0	Inter-locked const "0"	reserved	Cable Fault* const "0"	Controller Overheat	reserved	Motor Case Overheat	reserved
Manufacturer Exception Detail Size **	0	0	0	0	0	1	1	1
Turbo Pump Device Exception Detail Byte 0	Dropped to minimal frequency const "0"	Overload time exceeded const "0"	System over-loaded	Motor current high	Internal Security system activated	Internal Self test failed	Frequency Error const "0"	Emergency stop circuit activated const "0"
Turbo Pump Device Exception Detail Byte 1	reserved	reserved	Converter temperature too high	reserved	reserved	Cooling water temperature high	Pump temperature high	reserved
Turbo Pump Device Exception Detail Byte 2	Generator mode activated const "0"	Maximum frequency exceeded	Maximum power exceeded const "0"	Acceleration time exceeded const "0"	No motor current	const "0"	Internal communication failed	Communication to Turbopump failed
Turbo Pump Device Exception Detail Byte 3 & 4	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved
Turbo Pump Device Exception Detail Byte 5	reserved	reserved	reserved	reserved	reserved	Internal control temperature incorrect	Internal control voltage incorrect const "0"	Main power out of tolerances const "0"
Turbo Pump Device Exception Detail Byte 6	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved

Ethernet/IP

2.7.8 S-Analog Sensor Object

Class Code: 49 (31hex)

Pump Temperature (Instance 2)

(Cooling Water Temperature)

Attr. ID	Access Rule	Attribute Name	Data Type	Description of Attribute
5	Get	Reading Valid	BOOL	Indicates that the Value attribute contains a valid value. 0 = value invalid 1 = value valid
6	Get	Value	INT	Actual case temperature (cooling water) value [1/10 degrees Centigrade (Celsius)]
7	Get	Status	BYTE	Alarm and Warning State of the case temperature
17 (11 _{hex})	Get	Alarm Trip Point High	INT	Case temperature (cooling water) Alarm limit (determines the value above which an Alarm condition will occur) [1/10 degrees Centigrade (Celsius)]
21 (15 _{hex})	Get	Warning Trip Point High	INT	Case temperature (cooling water) Warning limit (determines the value above which an Warning condition will occur) [1/10 degrees Centigrade (Celsius)]

Converter Unit Temperature (Instance 4)

Attr. ID	Access Rule	Attribute Name	Data Type	Description of Attribute
5	Get	Reading Valid	BOOL	Not supported; value always = 1
6	Get	Value	INT	Actual controller unit temperature value [1/10 degrees Centigrade (Celsius)]
7	Get	Status	BYTE	Alarm and Warning State of the controller unit temperature
17 (11 _{hex})	Get	Alarm Trip Point High	INT	Not supported; value always = 0
21 (15 _{hex})	Get	Warning Trip Point High	INT	Not supported; value always = 0

2.7.9 Vendor Specific Failure and Warning Object

Class Code: 100 (64_{hex})

Instance ID: 1 (01_{hex})

Attr. ID	Access Rule	Attribute Name	Data Type	Description of Attribute
1	Get	Last Failure Code	UBYTE	Code of the last (or actual) failure
4	Get	Last Failure Frequency	UINT	Pump frequency at the occurrence of the last (or actual) failure
5	Get	Last Failure Pump Op. Hours	UDINT	No of operating hours at the occurrence of the last (or actual) failure
51 (33 _{hex})	Get	Warning Bits 1	UINT	Actual Warning Bits No 1

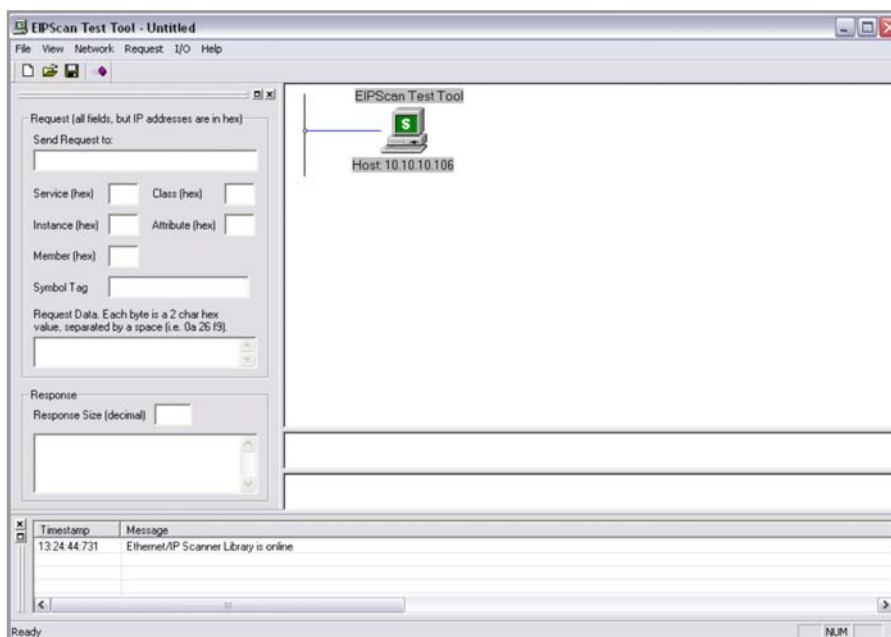
Instance ID: 2 (02_{hex})

Attr. ID	Access Rule	Attribute Name	Data Type	Description of Attribute
1	Get	Failure Code	List of 20 UBYTE	List of all stored failure codes
4	Get	Failure Frequency	List of 20 UINT	List of all stored failure frequencies
5	Get	Failure Pump Op. Hours	List of 20 UDINT	List of all stored failure pump operation hours

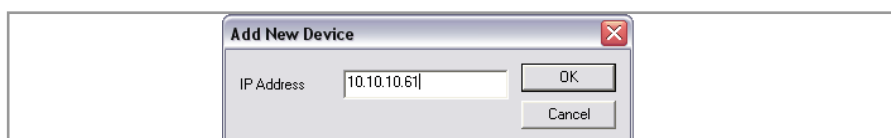
Example: EIPScan

3 Example for running the polling operation by using the EIPScan tool

Starting and Stopping is only possible if the "Discrete Output Point Object" (Attr.09, activate pump ON/Off) was switched to ON before start polling operation.



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



Fill in the valid IP address of the converter unit.

Example: EIPScan

The 'Add Connection' dialog box has tabs for Type, Data Size, Rate, Trigger, Destination, and Priority. The 'Type' tab is active, showing 'Connection Type' with radio buttons for 'Class 1' (selected) and 'Class 3'. The 'Transport Type' section has two dropdown menus: 'Originator -> Target' set to 'Point To Point' and 'Target -> Originator' set to 'Point To Point'. At the bottom are 'OK', 'Cancel', and 'Apply' buttons.

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.

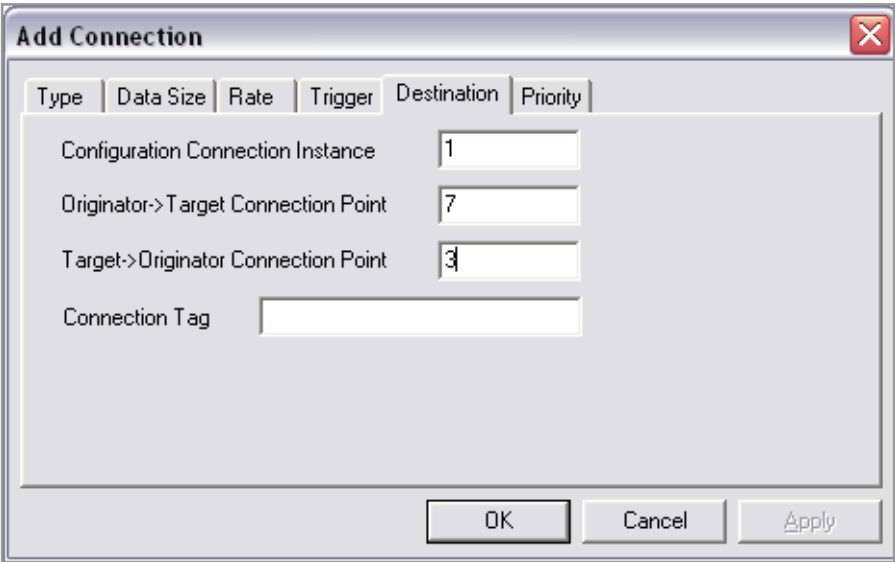
Instance (Target → Originator)	Size	Instance (Originator → Target)	Size
1	3	5	1
2	5	6	2
3	9	7	4
0x64	9	0x65	1

In this example we used Instance ID 3 and ID 7 to be connected:

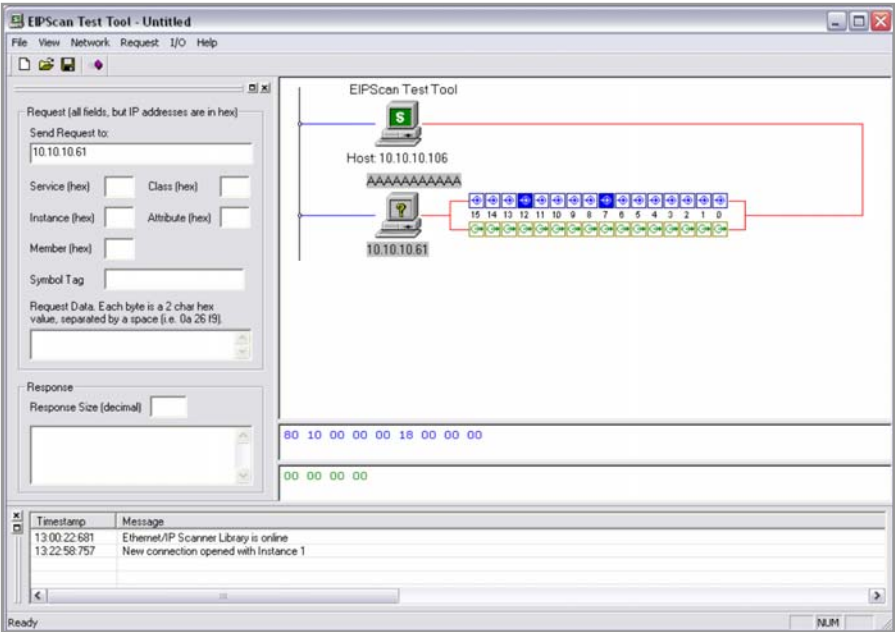
The 'Add Connection' dialog box is on the 'Data Size' tab. It shows 'Originator->Target' with a 'Data Size' of 4 and a checked 'Run/Idle Header' checkbox. Below it, 'Target->Originator' has a 'Data Size' of 9 and an unchecked 'Run/Idle Header' checkbox. 'OK', 'Cancel', and 'Apply' buttons are at the bottom.

Configure data size.

Example: EIPScan



Configure Originator and Target Instances.



I/O Connection is configured and running with I/O Instance 7 and 3.

[illegible]

Sales and Service

Germany

Oerlikon
Leybold Vacuum GmbH
Bonner Strasse 498
D-50968 Cologne
Phone: +49-(0)221-347 1234
Fax: +49-(0)221-347 1245
sales.vacuum@oerlikon.com

Oerlikon
Leybold Vacuum GmbH
Sales Area North/East
Branch Office Berlin
Buschkrugallee 33
1. Obergeschoss
D-12359 Berlin
Phone: +49-(0)30-435 609 0
Fax: +49-(0)30-435 609 10
sales.vacuum.bn@oerlikon.com

Oerlikon
Leybold Vacuum GmbH
Sales Area South/Southwest
Branch Office Munich
Sendlinger Strasse 7
D-80331 Munich
Phone: +49-(0)89-357 33 9-10
Fax: +49-(0)89-357 33 9-33
sales.vacuum.mn@oerlikon.com
service.vacuum.mn@oerlikon.com

Oerlikon
Leybold Vacuum GmbH
Sales Area West & Benelux
Bonner Strasse 498
D-50968 Cologne
Phone: +49-(0)221-347 1270
Fax: +49-(0)221-347 1291
sales.vacuum.kn@oerlikon.com

Oerlikon
Leybold Vacuum GmbH
Service Competence Center
Emil-Hoffmann-Strasse 43
D-50996 Cologne-Suerth
Phone: +49-(0)221-347 1439
Fax: +49-(0)221-347 1945
service.vacuum.kn@oerlikon.com

Oerlikon
Leybold Vacuum GmbH
Mobil Customer Service
Emil-Hoffmann-Strasse 43
D-50996 Cologne-Suerth
Phone: +49-(0)221-347 1765
Fax: +49-(0)221-347 1944
service.vacuum.kn@oerlikon.com

Oerlikon
Leybold Vacuum GmbH,
Dresden
Zur Wetterwarte 50, Haus 304
D-01109 Dresden
Service:
Phone: +49-(0)351-88 55 00
Fax: +49-(0)351-88 55 041
info.vacuum.dr@oerlikon.com

Oerlikon
Leybold Vacuum USA Inc.
5700 Mellon Road
Export, PA 15632
Phone: +1-724-327-5700
Fax: +1-724-325-3577
info.vacuum.ex@oerlikon.com

Europe

Belgium
Oerlikon
Leybold Vacuum Nederland B.V.
Belgisch bijkantoor
Leuvensesteenweg 542-9A
B-1930 Zaventem
Sales:
Phone: +32-2-711 00 83
Fax: +32-2-720 83 38
sales.vacuum.zv@oerlikon.com
Service:
Phone: +32-2-711 00 82
Fax: +32-2-720 83 38
service.vacuum.zv@oerlikon.com

France
Oerlikon
Leybold Vacuum France S.A.
7, Avenue du Québec
Z.A. Courtaboeuf 1 - B.P. 42
F-91942 Courtaboeuf Cedex
Sales and Service:
Phone: +33-1-69 82 48 00
Fax: +33-1-69 07 57 38
sales.vacuum.or@oerlikon.com

Oerlikon
Leybold Vacuum France S.A.
Valence Factory
640, Rue A. Bergès - B.P. 107
F-26501 Bourg-lès-Valence Cedex
Phone: +33-4-75 82 33 00
Fax: +33-4-75 82 92 69
info.vacuum.vc@oerlikon.com

Great Britain
Oerlikon
Leybold Vacuum UK LTD.
Unit 2
Silverglade Business Park
Leatherhead Road
UK-Chessington, Surrey KT9 2QL
Sales:
Phone: +44-13-7273 7300
Fax: +44-13-7273 7301
sales.vacuum.ln@oerlikon.com
Service:
Phone: +44-20-8971 7030
Fax: +44-20-8971 7003
service.vacuum.ln@oerlikon.com

Italy
Oerlikon
Leybold Vacuum Italia S.p.A.
8, Via Trasimeno
I-20128 Milano
Sales:
Phone: +39-02-27 22 31
Fax: +39-02-27 20 96 41
sales.vacuum.mi@oerlikon.com
Service:
Phone: +39-02-27 22 31
Fax: +39-02-27 22 32 17
service.vacuum.mi@oerlikon.com

Oerlikon
Leybold Vacuum Italia S.p.A.
Field Service Base
Z.I. Le Capanne
I-05021 Acquasparta (TR)
Phone: +39-0744-93 03 93
Fax: +39-0744-94 42 87
service.vacuum.mi@oerlikon.com

Netherlands
Oerlikon
Leybold Vacuum Nederland B.V.
Computerweg 7
NL-3542 DP Utrecht
Sales and Service:
Phone: +31-346-58 39 99
Fax: +31-346-58 39 90
sales.vacuum.ut@oerlikon.com
service.vacuum.ut@oerlikon.com

Spain
Oerlikon
Leybold Vacuum Spain, S.A.
C/ Huelva, 7
E-08940 Cornellà de Llobregat (Barcelona)
Sales:
Phone: +34-93-666 46 16
Fax: +34-93-666 43 70
sales.vacuum.ba@oerlikon.com
Service:
Phone: +34-93-666 49 51
Fax: +34-93-685 40 10

Sweden
Oerlikon
Leybold Vacuum Scandinavia AB
Box 9084
SE-40092 Göteborg
Sales and Service:
Phone: +46-31-68 84 70
Fax: +46-31-68 39 39
info.vacuum.gt@oerlikon.com
Visiting/delivery address:
Datavägen 57B
SE-43632 Askim

Switzerland
Oerlikon
Leybold Vacuum Schweiz AG
Leutschenbachstrasse 55
CH-8050 Zürich
Sales:
Phone: +41-044-308 40 50
Fax: +41-044-302 43 73
sales.vacuum.zh@oerlikon.com
Service:
Phone: +41-044-308 40 62
Fax: +41-044-308 40 60

America

USA
Oerlikon
Leybold Vacuum USA Inc.
5700 Mellon Road
Export, PA 15632
Phone: +1-724-327-5700
Fax: +1-724-325-3577
info.vacuum.ex@oerlikon.com
Sales:
Eastern & Central time zones
Phone: +1-724-327-5700
Fax: +1-724-733-1217
Pacific, Mountain, Alaskan & Hawaiian time zones
Phone: +1-480-752-9191
Fax: +1-480-752-9494
Service:
Phone: +1-724-327-5700
Fax: +1-724-733-3799

Oerlikon
Leybold Vacuum GmbH
Bonner Strasse 498
D-50968 Cologne
Phone: +49-(0)221-347 0
Fax: +49-(0)221-347 1250
info.vacuum@oerlikon.com

Asia

P.R. China
Oerlikon
Leybold Vacuum (Tianjin) International Trade Co., Ltd.
Beichen Economic Development Area (BEDA), Shanghai Road
Tianjin 300400
China
Sales and Service:
Phone: +86-22-2697 0808
Fax: +86-22-2697 4061
Fax: +86-22-2697 2017
sales.vacuum.tj@oerlikon.com

Oerlikon
Leybold Vacuum (Tianjin) Co., Ltd.
Beichen Economic Development Area (BEDA), Shanghai Road
Tianjin 300400
China
Sales and Service:
Phone: +86-22-2697 0808
Fax: +86-22-2697 4061
Fax: +86-22-2697 2017
info.vacuum.tj@oerlikon.com

Oerlikon
Leybold Vacuum (Tianjin) International Trade Co., Ltd.
Shanghai Branch:
Add: No. 33
76 Futedong San Rd.
Waigaoqiao FTZ
Shanghai 200131
China
Sales and Service:
Phone: +86-21-5064-4666
Fax: +86-21-5064-4668
info.vacuum.sh@oerlikon.com

Oerlikon
Leybold Vacuum (Tianjin)
Guangzhou Branch:
Add: G/F,#301 Building
110 Dongguangzhuang Rd.
Tianhe District
Guangzhou 510610
China
Sales:
Phone: +86-20-8723-7873
Phone: +86-20-8723-7597
Fax: +86-20-8723-7875
info.vacuum.gz@oerlikon.com

Oerlikon
Leybold Vacuum (Tianjin) International Trade Co., Ltd.
Beijing Branch:
1-908, Beijing Landmark Towers
8 North Dongsanhuan Road
Chaoyang District
Beijing 100004
China
Sales:
Phone: +86-10-6590-7622
Fax: +86-10-6590-7607

India
Oerlikon
Leybold Vacuum India Pvt Ltd.
EL-22, J Block
MDC Bhosari
Pune 411026
India
Sales:
Phone: +91-20-3061 60000
Fax: +91-20-2712 1571
sales.vacuum.pu@oerlikon.com

Japan
Oerlikon
Leybold Vacuum Japan Co., Ltd.
Head Office
Tobu A.K. Bldg. 4th Floor
23-3, Shin-Yokohama
3-chome
Kohoku-ku, Yokohama-shi
Kanagawa-ken 222-0033
Sales:
Phone: +81-45-471-3330
Fax: +81-45-471-3323

Oerlikon
Leybold Vacuum Japan Co., Ltd.
Osaka Sales Office
5-13, Kawagishi-cho
Suita-chi
Osaka-fu
Phone: +81-6-4860-2212
Fax: +81-45-471-3323

Oerlikon
Leybold Vacuum Japan Co., Ltd.
Tsukuba Technical S.C.
Tsukuba Minami Daiichi
Kogyo Danchi
21, Kasumi-no-Sato,
Ami-machi, Inashiki-gun
Ibaraki-ken, 300-0315
Service:
Phone: +81-29-889-2841
Fax: +81-29-889-2838

Korea
Oerlikon
Leybold Vacuum Korea Ltd.
#761-4, Yulkeum-ri
SungHwan-eup, Cheonan-City
Choongchung-Namdo
330-807 Korea
Sales:
Phone: +82-41-580-4420
Fax: +82-41-588-3737
Service:
Phone: +82-41-580-4415
Fax: +82-41-588-3737

Singapore
Oerlikon
Leybold Vacuum Singapore Pte Ltd.
No. 1, International Business Park,
B1-20B, The Synergy
Singapore 609917
Sales and Service:
Phone: +65-6665 2910
Fax: +65-6566 8202
sales.vacuum.sg@oerlikon.com

Taiwan
Oerlikon
Leybold Vacuum Taiwan Ltd.
No 416-1, Sec. 3
Chung-Hsin Rd., Chu-Tung
Hsin-Chu, Taiwan, R.O.C.
Sales and Service:
Phone: +886-3-500 1688
Fax: +886-3-583 3999
sales.vacuum.hc@oerlikon.com

oerlikon
leybold vacuum

www.oerlikon.com