

Instruction Manual

EPX HiVac Series Dry Vacuum Pumps




Description	EPX	EPX TWIN
	Item Number	Item Number
EPX180L	A419-41-xxx	A419-61-xxx
EPX180N	A419-42-xxx	A419-62-xxx
EPX180N	A419-48-xxx	A419-68-xxx
EPX180LE	A419-43-xxx	A419-63-xxx
EPX180NE	A419-44-xxx	A419-64-xxx
EPX500L	A419-51-xxx	A419-71-xxx
EPX500N	A419-52-xxx	A419-72-xxx
EPX500LE	A419-53-xxx	A419-73-xxx
EPX500NE	A419-54-xxx	A419-74-xxx

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Material Declaration

In accordance with the requirements of the Chinese regulatory requirement on the Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products Order No. 32 (also known as 'China RoHS2') and SJ/T 11364 Marking for the Restricted Use of Hazardous Substances in Electronic and Electrical Products:

Product	Product Labels	Meaning
All iH models All iGX models All GX models All EPX models Tool Interface (MicroTIM) (if fitted)		This product contains hazardous substances in at least one of the homogeneous materials used which are above the limit requirement in GB/T 26572 as detailed in the declaration table below. These parts can safely be used for the environmental protection use period as indicated.

材料成分声明 Materials Content Declaration

部件名称 Part name	有害物质 Hazardous Substances					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr VI)	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
机壳 Enclosure	X	O	O	O	O	O
电机 (泵和机械增压泵) Motors (pump and mechanical booster)	X	O	O	O	O	O
泵和增压泵 Pump and booster	X	O	O	O	O	O
电子元件和控件 Electronics and Controls	X	O	X	O	O	O
冷却系统 Cooling system	X	O	O	O	O	O
吹扫系统 Purge system	X	O	O	O	O	O
机台接口 Tool Interface	X	O	O	O	O	O
<p>O: 表示该有害物质在该部件的所有均质材料中的含量低于 GB/T 26572 标准规定的限量要求。 O: Indicates that the hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.</p> <p>X: 表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T26572 标准规定的限量要求。 X: Indicates that the hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T26572.</p>						

NOTE: These products are EU RoHS compliant, the following Exemptions apply:

- 6(b) Lead as an alloying element in aluminium containing up to 0.4% by weight
- 6(c) Copper alloy containing up to 4% lead by weight
- 7(a) Lead in high melting temperature type solder (i.e. lead based alloys containing 85% by or more)
- 7(b) Lead in solders for servers, storage and storage array systems, network infrastructure equipment for switching, signalling, transmission, and network management for telecommunications
- (c) I Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound
- 7(c) II Lead in dielectric ceramic in capacitors for a rated voltage of 125 V AC or 250 V DC or higher
- 8(b) Cadmium and its compounds in electrical contacts
- 15 Lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages
- 34 Lead in cermet-based trimmer potentiometer elements

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1 Introduction

1.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for the Edwards EPX dry pumping system. The pump must be used as specified in this manual. Read this manual before installing and operating the pump.

Important safety information is highlighted as WARNING and CAUTION instructions; these instructions must be obeyed. The use of WARNINGS and CAUTIONS is defined below.



WARNING

Warnings are given where failure to observe the instruction could result in injury or death to people. The actual symbol shown varies according to the hazard.

CAUTION

Cautions are given where failure to observe the instruction could result in damage to the equipment, associated equipment and/or process.

The units used throughout this manual conform to the SI international system of units of measurement.

The following warning labels are on the pump and are used throughout the product documentation.



Warning

An appropriate safety instruction should be followed.



Warning - Maximum angle between paired slings.



Warning - Dangerous Voltage

Indicates hazards arising from dangerous voltages.



Warning - Heavy object

Indicates the potential hazard arising from a heavy object.



Warning - Hot surfaces

Indicates that the marked item may be hot and should not be touched without taking precautions.



Protective earth (ground).

To identify any terminal intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth (ground electrode).



Warning - Moving parts present.

Indicates the potential risk of physical injury and requires allowing time for rotating parts to stop and power isolation.

Introduction



Warning - use protective equipment.

Indicates that appropriate protective equipment must be used.



Radio Frequency RF earth (ground).

The following warnings only appear in this manual:



Warning - Risk of explosion

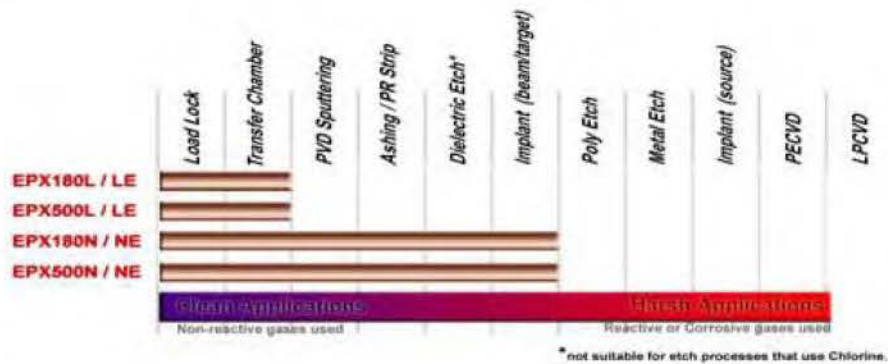
Indicates the potential risk of explosion.



Warning - pressurised.

Safety Data Sheets for chemicals supplied by Edwards can be obtained by contacting Edwards, or at www.edwardsvacuum.com.

Figure 1 - Process compatibility chart



1.2 Description



WARNING

Edwards take no responsibility for damage or injury caused by improper use of the equipment.



WARNING

The EPX pump must only be used for applications shown in Figure 1. Incorrect use of the EPX pump could invalidate the warranty. Contact the local Edwards representative if unsure whether the EPX pump is appropriate for the application.

The EPX pump should not be used to pump explosive mixtures or pyrophoric gases.

CAUTION

EPX pumps are not suitable for pumping Xenon.

The EPX pump system operates at pressures between atmospheric and ultimate vacuum, with no lubricating or sealing fluid in the pumping chamber. This ensures a clean pumping system without back-migration of oil or fluid into the system being evacuated.

Between 1 bar and 0.2 mbar, the EPX Twin pump offers a significant pumping performance advantage over the standard EPX pump. As such, the EPX Twin pump is ideal for use on load lock applications, rapid cycling applications, and so forth.

The stator of the pump and the enclosed motor are cooled by an integrated water cooling circuit. The EPX pump is therefore suitable for applications in cleanroom environments where fan cooling is unacceptable. The cooling water supply and return pipelines are connected to the pump by water connectors (customer specified) (Figure 2, items 4 and 9). Cooling water must be provided commensurate with environmental conditions (humidity and temperature) such that the dewpoint is not reached. Refer to Table 9 for the water supply specifications.

Refer to Figure 2 and 4. The pump incorporates an EMC supply filter and an inverter drive, which provides and controls the electrical supply to the pump motor. LEDs on the front cover identify the status of the EPX pump: (refer to Figure 4, items 2, 3, 4, and 5 and Table 1). Motor speed depends on the pressure at the pump inlet. When the pump is started with the inlet pressure at or close to atmospheric pressure, the motor accelerates to a speed which is limited by the current which can be supplied by the inverter drive. As the pressure at the inlet is reduced, the motor speed increases, until it eventually reaches its preset maximum speed. If the pressure at the inlet increases, the motor will slow down again.

The EPX pump is supported by four vibration isolators (Figure 2, item 7).

Pump protection sensors automatically shut down the pump if a fault condition arises: refer to Section 1.3.

The EPX pump is available in a number of different variants. The nomenclature is arranged to help identify which variants are suitable for which applications, and which method of control is required for the pump. The four base variants are described in more detail below:

1.2.1 The EPX L

This pump is for use on clean duty applications pumping inert gas mixtures, such as loadlock, whereby control is provided by the process tool interface. (Refer to Figure 2).

1.2.2 The EPX LE

This pump is for use on clean duty applications such as loadlock, and is augmented with an End User Controller (EUC). The End User Controller enables local control for stand-alone use as well as the ability to connect to a fab-wide network for remote control and monitoring. A Pump Display Terminal (PDT) may also be used with the End User Controller to facilitate local control. (Refer to Figure 5).

1.2.3 The EPX N

This is fitted with a gas module that supplies nitrogen purge gas to the shaft seal and pump mechanism areas to provide dilution of process gases for the light duty applications specified in Figure 1. (Refer to Figure 5, Table 5 and Section 3.6 for further information).

1.2.4 The EPX NE

This system is a light process application pump with network and local control capability through the EUC as described in Section 1.2.2. (Refer to Figure 5).

The four base variants, the L, LE, N and NE are also available in two capacities, 180 m³/hr (letter designation prefixed with 180 for example EPX180LE) and 500 m³/hr (letter designation prefixed with 500 for example EPX500N).

The EPX pump can also be specified as either 200/208 V or 400 V compatible and a choice of either 1/4 inch BSP, 3/8 inch BSP, 9/16 inch BSP quick connect water fittings or no quick connects.

The EPX pump is fitted with a Tool Interface Module (TIM), which allows 'plug and play' connection with all major process tools. This communication includes control and monitoring of the EPX by the tool for example Run, Stop, Alarm.

A number of different tool interface options (TIMs) can be specified when the pump is first ordered: SPI, C3, TEL, E73, MCM or HIT.

Note: The LE and NE versions of the EPX pump can be operated via the end user controller and so do not require a TIM for operation.

The illustrations throughout this manual show the E73 variant of the TIM.

1.3 Pump protection sensors



WARNING

For EPX N-series pumps, if the pump has been fitted with a C3 or E73 tool interface, there is no provision for warnings, generated by the pump, to be passed onto the tool. The installer must fit suitable monitoring equipment to check the nitrogen purge flow, as detailed in Section 3.



WARNING

For EPX N-series pumps, the nitrogen purge flow switch in the Gas Module is set to 12 slm. The flow switch provides an indication that a flow in excess of 12 slm is present, but gives no guarantee that there is sufficient flow to meet the process requirements. The flow switch is not a guaranteed safety interlock.



WARNING

When the pump protection sensor operates, only the electrical supply of the pump motor is switched off; the EPX is not isolated from the electrical supply.

A thermal snap-switch located within the pump, monitors the temperature of the body of the EPX pump. When the temperature of the body exceeds a preset limit, the snap-switch operates, generating an alarm and causing the pump to stop.

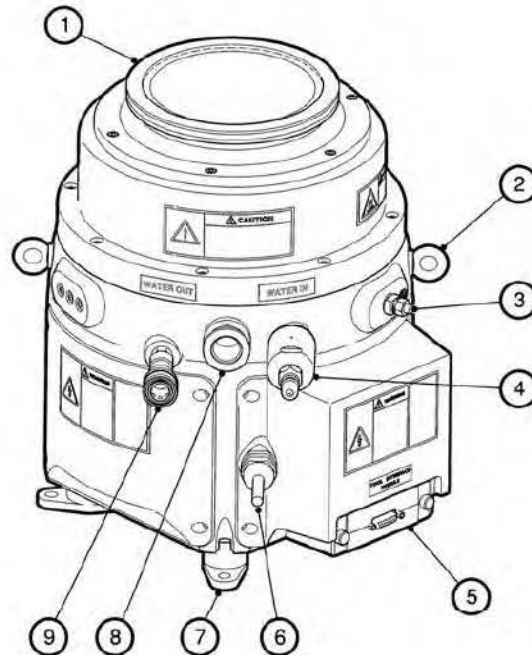
When the EPX pump is automatically shut down by a pump protection sensor, the Alarm LED is lit (Figure 4, item 5).

On the EPX N series of pumps, a nitrogen purge flow switch is fitted to the Gas Module to monitor the total purge flow to the pump. If the purge flow drops below 12 slm, the warning LED on the front panel (or EUC if fitted), will light (Figure 4, item 4). The pump will continue to run.

1.4 LED status indicators

Refer to Table 1 and Figure 4.

Figure 2 - The EPX L dry vacuum pump



dcs/6031/001

1. Pump inlet
2. Lifting eyebolt (two positions)
3. Protective earth stud (M8)
4. Cooling water inlet
5. TIM
6. Mains supply cable
7. Vibration isolator (four positions)
8. Exhaust
9. Cooling water outlet

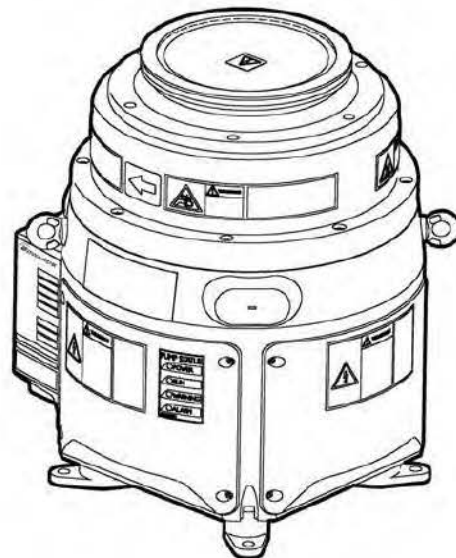


Figure 3 - EPX twin 180L installation details - position of additional exhaust port for EPX twin variants

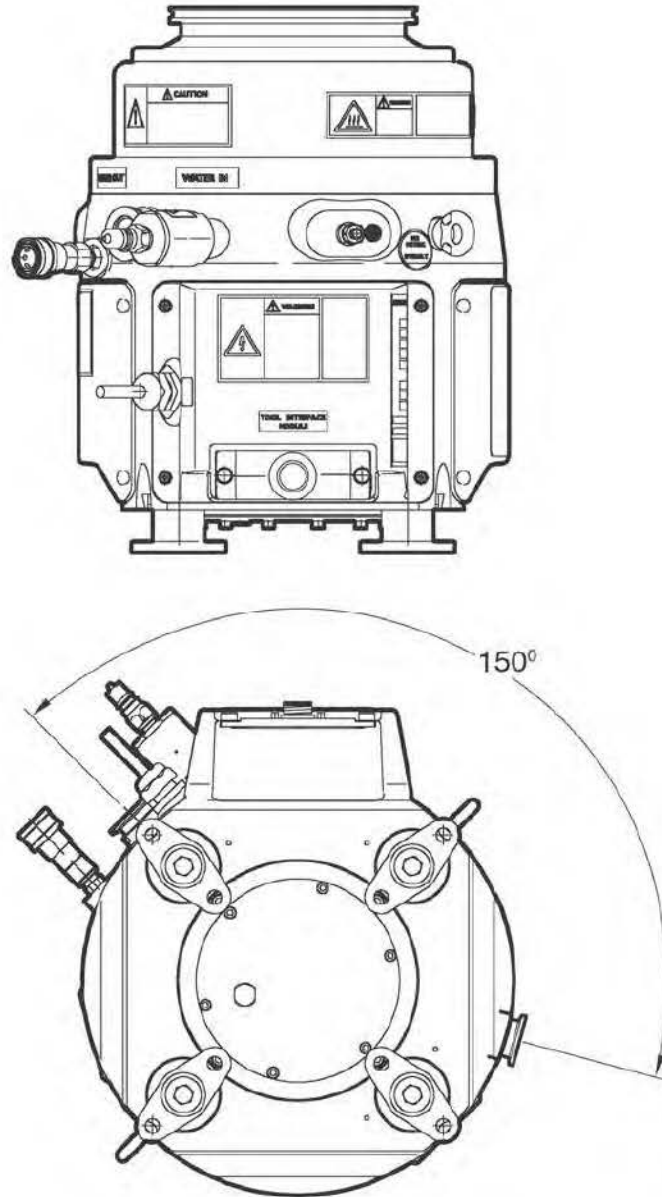


Table 1 - LEDs on the EPX pumps

LEDs/button items	Reference data
Power LED (Figure 4, item 2)	This green LED indicates that mains power is supplied to the EPX pump.
Run LED (Figure 4, item 3)	This green LED is lit when the EPX pump has started and is operating. This LED will flash when the pump is operating in idle mode.
Warning LED (Figure 4, item 4)	Operational with EPX-N series of pumps only. Amber LED will illuminate in a 'Low Flow' condition.
Alarm LED (Figure 4, item 5)	This red LED is lit when the EPX pump has been automatically shut down because a pump protection sensor has operated (Refer to Section 1.3), or because the inverter drive has failed.

Table 2 - Connections

Connection items	Reference data
Cooling water inlet and outlet (Figure 2, items 4 and 9)	Used to connect cooling water supply and return pipelines to the EPX pump: refer to Section 3.8.
Electrical supply cable (Figure 2, item 6)	Used to connect external electrical supply to the EPX pump: refer to Section 3.9 and 3.10.
TIM (Figure 2, item 5)	Used to connect the control equipment to the EPX pump, which allows operational control of the pump: refer to Section 3.11.
Protective Earth (ground) stud (Figure 2, item 3)	Use this to earth (ground) the EPX pump: refer to Section 3.10.

Figure 4 - EPX L labels (refer to Table 3)

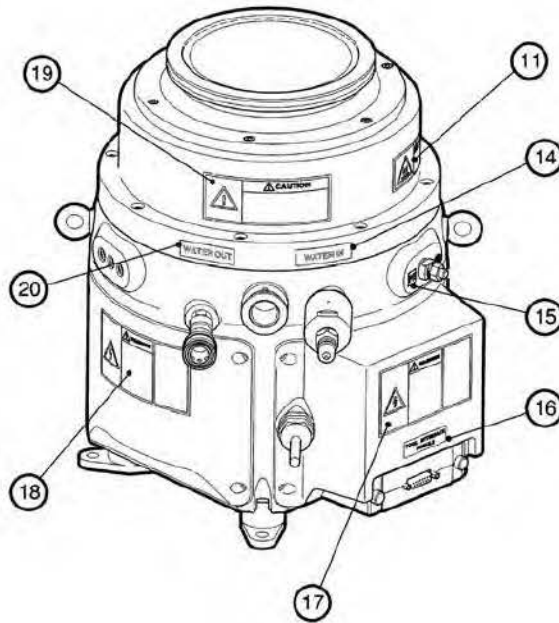
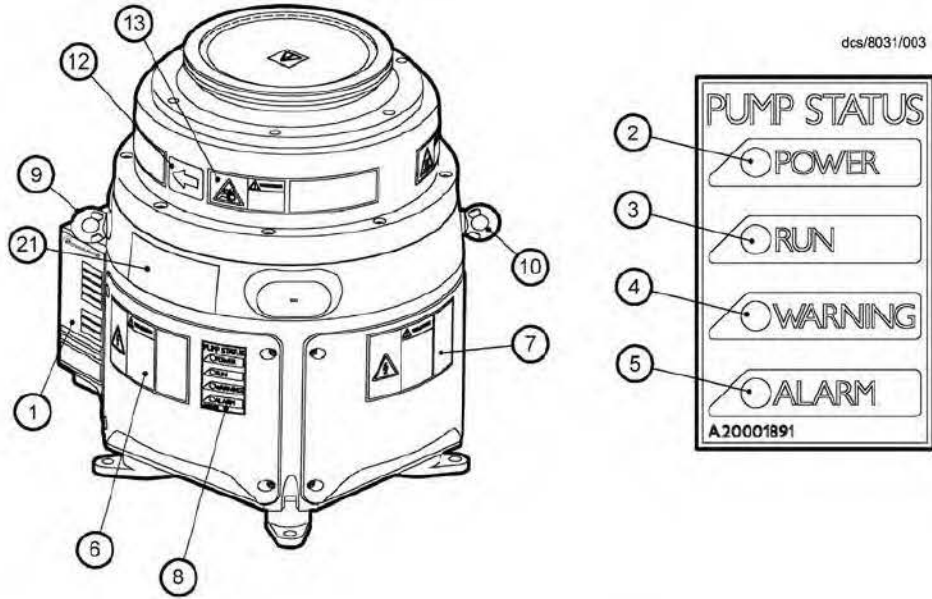


Table 3 - EPX L pump labelling information (Refer to Figure 4)

Number	Label Name	Description
1	Pump details	This provides specific information about the pump including: pump type; code number; serial number; pump weight; year of manufacture; and name and address of the manufacturer. It also includes electrical supply requirements, and compliance marks.
2	Power	The power LED. See Table 1 for details.
3	Run	The run LED. See Table 1 for details.
4	Warning	The warning LED. See Table 1 for details.
5	Alarm	The alarm LED. See Table 1 for details.
6	Warning - risk of electric shock	Do not remove cover until 4 minutes after disconnection of the power.
7	Warning - risk of electric shock	Do not remove cover until 4 minutes after disconnection of the power.
8	Status LED label	Status LED label.
9 and 10	Lifting point	The pump must be lifted using the eyebolts on the pump and suitable lifting equipment.
11	Warning - risk of high temperature	Surface temperatures can exceed 65 °C during pump operation.
12	Direction of rotation	Arrow shows the correct direction of rotation of the rotor.
13	Warning - danger of injury from rotating parts	Turn off and lock-out all power prior to servicing.
14	Water in	The cooling water supply pipeline connects to the pump at this location.
15	Protective earth stud	This equipment must have a second protective earth. See Section 3.10.
16	Pump interface	Tool Interface Module (TIM) fits in this position. The pump may be controlled through this. See Section 3.11.
17	Warning - risk of electric shock	Do not remove cover until 4 minutes after disconnection of the power.
18	Warning - risk of electric shock	Do not remove cover until 4 minutes after disconnection of the power.
19	Warning - thermal shock	If the pump has overheated or the cooling water has failed, connecting cooling water to a hot pump will cause severe damage to the pump. Always allow the pump to cool for at least 20 minutes before connecting cooling water.
20	Water out	The cooling water return pipeline connects to the pump at this location.
21	Product label	Product name.

Figure 5 - EPX E dry pump

dcs/8031/004

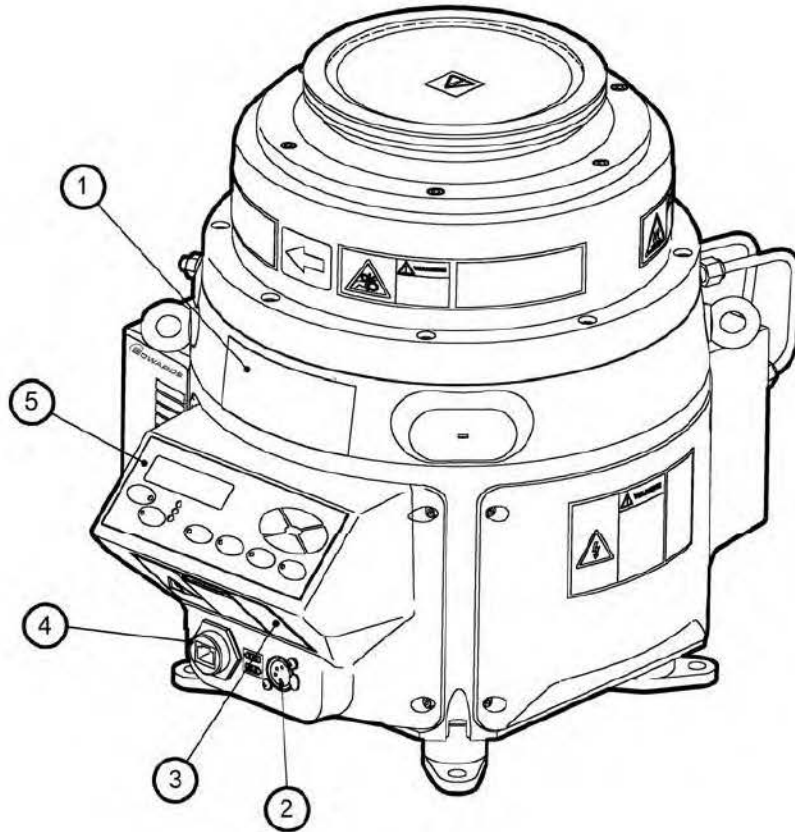


Table 4 - EPX E (Refer to Figure 5)

Number	Description
1	Label - Product name.
2	XLR Connector - This may be used to connect a fab-wide network to allow remote monitoring and control of the EPX Dry Pump.
3	Label - Warning do not remove cover until 4 minutes after disconnecting power from the pump.
4	RJ12 Connector - This is used to connect the optional, external, PDT to the EPX Dry Pump.
5	End User Controller accessory - The End User Controller has an on-board display and keypad that allows local control of the EPX Dry Pump. Refer to Section 1.8 and 4 for the operation of this.

Figure 6 - EPX N series dry pump

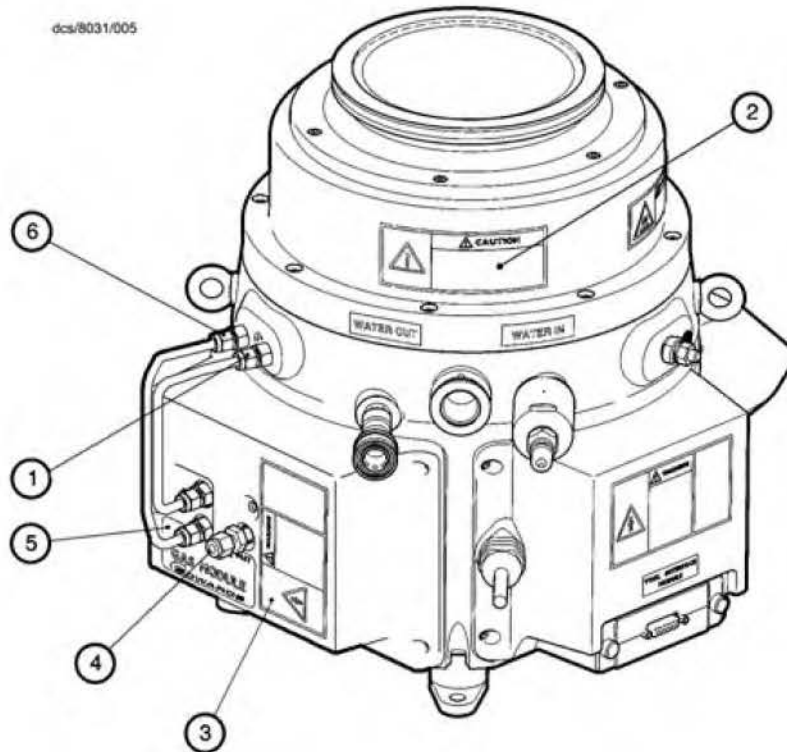
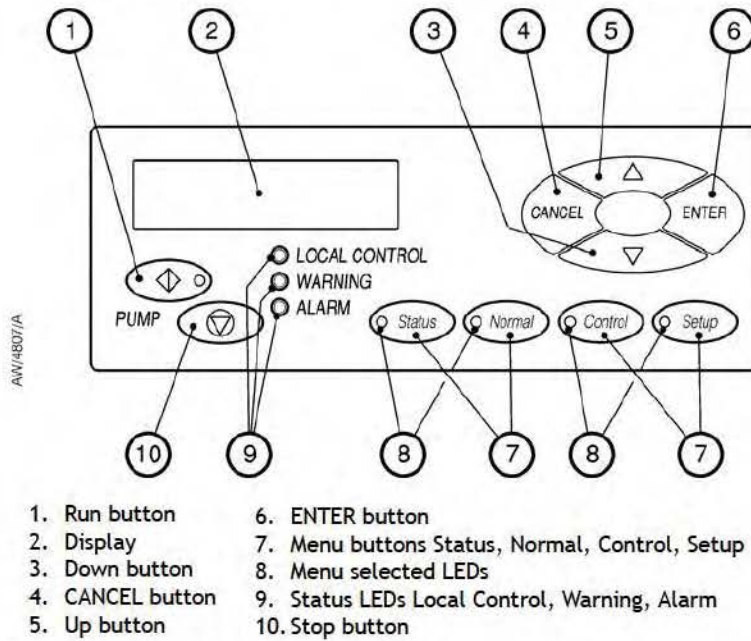


Table 5 - EPX N (refer to Figure 6)

Number	Description
1	Pipe fitting - Nitrogen supply to the seal purge.
2	Label - Warning; If the pump has overheated or the cooling water has failed, connecting cooling water to a hot pump will cause severe damage to the pump. Always allow the pump to cool for at least 20 minutes before connecting the cooling water.
3	Label - Warning; do not remove cover until 4 minutes after disconnecting power from the pump.
4	Gas supply fitting - Connect the gas supply to this connection. This compression fitting accepts 1/4 inch (6.35 mm) diameter tube. Ensure that the tube used is suitable for the application.
5	Label - Gas Module identifier.
6	Pipe fitting - Nitrogen supply to the gas ballast.

Figure 7 - End User Controller (EUC) display



1.5 Connections

Refer to Table 2 and Figure 4.

1.6 Control and monitoring

The EPX L and N series of pumps cannot be manually operated; they must be controlled and monitored by external control equipment, which must be connected to the EPX pump through the TIM (Figure 2, item 5).

The EPX E series of pumps can be manually operated using the EUC local display and keypad, or remotely using a PDT, if fitted; it can also be controlled and monitored over the network, which connects to the EPX pump through the Network connector (Figure 5, item 2). When the EPX 'E' series of pumps is controlled via the TIM, the EUC simply monitors the status of the pump.

The EPX pump is compatible with Fabworks 32.

1.7 EPX pump labels

Refer to Table 3 and Figure 4.

1.8 End user controller

The End User Controller (EUC) allows manual control of the EPX pump and also displays the pump status. Refer to Figure 7 which shows the front panel of the EUC display.

Use the run button (Figure 7, item 1) to start the EPX pump. The run button has an LED which is on when the EPX pump is running. Use the stop button (Figure 7, item 10) to stop the pump.

The display (Figure 7, item 2) shows two lines of text; each line is 16 characters long. In normal operation, the Normal display is shown; the Normal display has two pages, and each has two lines. Each page of the Normal display shows the status of one or more EPX EUC sensors or internal clocks and counters. As supplied, the first page of Normal display shows the pump serial number and pump current. It is possible to change the information shown on the Normal display.

At any time, press one of the four menu buttons (Figure 7, item 7) to select a new menu. Then use the up (Figure 7, item 5), down (Figure 7, item 3), ENTER (Figure 7, item 6) and CANCEL (Figure 7, item 4) buttons to move through the menu. The appropriate menu selected LED (Figure 7, item 8) is on when the corresponding menu is in use.

Use the menu (Figure 7, item 7), up (Figure 7, item 5), down (Figure 7, item 3), CANCEL (Figure 7, item 4) and ENTER (Figure 7, item 6) buttons as described below. Refer to Section 4 for a full definition of the menu structures and the display formats.

Status: Press this button to select the Status menu. This menu displays the current pump status.

Normal: Press this button to select the Normal display.

Control: Press this button to select the Control menu, then take control or release control of the pumping system (refer to Section 4).

Setup: Press this button to select the Setup menu. In this menu it is possible to display parameters (such as the pressure units used when pressures are displayed).

Enter (6): Use this button to select a currently displayed menu option or to enter a currently displayed parameter.

Cancel (4): Use this button to cancel the currently displayed menu or option and return to the previous menu or option.

Up (5)/Down (3): Use these buttons to move up or down menu options or to increase or decrease a displayed parameter.

The status LEDs (Figure 7, item 9) show the current status of the EPX system.

Alarm: This LED shows when an alarm condition exists.

Warning: This LED shows when a warning condition exists.

Local control: This LED is on when the EUC has control of the EPX system.

The ALARM and WARNING LEDs flash when the corresponding alarm or warning condition first occurs. When acknowledging the condition, the corresponding LED goes on permanently. For most alarms and warnings, if the condition clears (that is, the fault which caused the condition is no longer present), the corresponding LED goes off once the condition has been acknowledged.

1.9 Green mode operation

The green mode function reduces power consumption of the system while idle. Green mode is activated by use of the Active Utility Control (AUC) input if available on the version of MicroTim being used, see Table 13. Once in green mode, the run LED will flash. The EPX speed will reduce to 33.3% (6000rpm). The green mode speed is not configurable. Green mode cannot be activated using the end user controller.

2 Technical data

2.1 General

Table 6 - General

	EPX180	EPX500
Dimensions	Refer to Figure 12, 13, 14, and 15	
Mass:		
EPX L	43.5 kg	45.2 kg
EPX N	45.5 kg	47.2 kg
EPX LE	44.6 kg	46.3 kg
EPX NE	46.6 kg	48.3 kg
Inlet	ISO63	ISO160
Inlet fittings (not supplied)	One ISO63 centring ring. 4 Claw clamps	One ISO160 centring ring. 8 Claw clamps
Outlet	NW25	
Ambient operating temperature range	5 to 40 °C, 41 to 104 °F	
Maximum ambient operating humidity	90% RH non-condensing	
Noise level	<56 dB(A)	
Vibration	<0.25 g	
Maximum operating tilt angle	5°	
Handling	The pump must not be laid on its side or inverted Topple angle >15°	
Maximum exhaust pressure	<1200 mbar absolute	
Minimum exhaust pressure	>500 mbar absolute	
Lubricating oil	The EPX pump has a sealed lubricating oil system. For health and safety information, refer to the Material Safety Data Sheet for Fomblin 6/6: MSDS No. P120-01-015.	
Ingress protection	IP44 (with inlet and exhaust connected) (E-series pumps are rated to IP40)	

2.2 Performance

Table 7 - Performance

	EPX180	EPX500
Warm-up time (to nominal performance)	30 minutes	
Peak pumping speed	Average peak pumping speed 175 m ³ hr ⁻¹ 106.0 cfm	500 m ³ hr ⁻¹ 294.3 cfm
Average ultimate vacuum* †	<1 x 10 ⁻⁴ mbar, <1 x 10 ⁻² Pa, <7.5 x 10 ⁻⁵ Torr	<1 x 10 ⁻⁶ mbar, <1 x 10 ⁻⁴ Pa, <7.5 x 10 ⁻⁷ Torr
Maximum leak rate	1 x 10 ⁻⁵ mbar l s ⁻¹ , 1 x 10 ⁻³ Pa l s ⁻¹ , 2.1 x 10 ⁻⁸ atm ft ³ min ⁻¹	

* The time taken to reach ultimate vacuum is dependent upon vacuum system cleanliness and foreline conductance.

† Average values are the mean value taken from a sample of typical production units.

2.3 Electrical data

Table 8 - Electrical data

Electrical items	Reference data
Electrical supply	200/208 V, 50/60 Hz, 400 V 50/60 Hz 3-phase
Voltage tolerance	±10%
Electrical power	
Maximum Power	3.0 kW
Nominal Power at Ultimate (EPX)	
L-variant	1.4 kW
N-variant	1.6 kW
Nominal Power at Ultimate (EPX twin)	
L-variant	2.30 kW
N-variant	2.55 kW
Fuse/ isolator rating *	
200 V	17.5 A current limiting time delay Class CC fuse, rated 600 V
400 V	10 A current limiting time delay Class CC fuse, rated 600 V
Installation (overvoltage) category	Class II
Pollution degree	2
Minimum protective earth (ground) cable rating	32 A
Electrical supply interface	Per customer specification
Power cable	4 core terminated with 2.5 mm ² bootlace ferrules
TIM	
Parallel pump interface	As per TIM interface supplied (refer to Section 3.11)
Nominal voltage rating	24 V
Shut-down thermal snap-switch	
Opening temperature	70 °C, 158 °F
Closing temperature	59 °C, 138 °F

* Maximum recommended fuse rating; requires a multipole isolator with a minimum contact gap of 3 mm.
 The mains disconnect device AIC (Amperes Interrupting Capacity) must be rated to at least 10 000 A.
 See clause 13 of SEMI S2 - 0200 and SEMI S8 for further details.

Note: Install to local, national and regional electrical requirements/codes.

2.4 Cooling water supply

Table 9 - Cooling water supply

Cooling water items	Reference data
Maximum supply pressure	7 barg, 7×10^5 Pa, 100 psig
Minimum required pressure differential across supply and return	2 bar, 2×10^5 Pa, 30 psi
Maximum supply temperature	35 °C
Minimum supply temperature	15 °C
Maximum particle size in supply	0.03 mm ² , 4.6×10^{-5} inch ²
Typical heat removed from EPX pump	1.3 kW, 5118 btu h ⁻¹
Minimum water flow rate	2 l min ⁻¹ , 31.7 US gallons h ⁻¹
Connectors	
Inlet	Per customer specification
Outlet	Per customer specification

2.5 Nitrogen purge system (EPX N series pumps)

Table 10 - Nitrogen supply

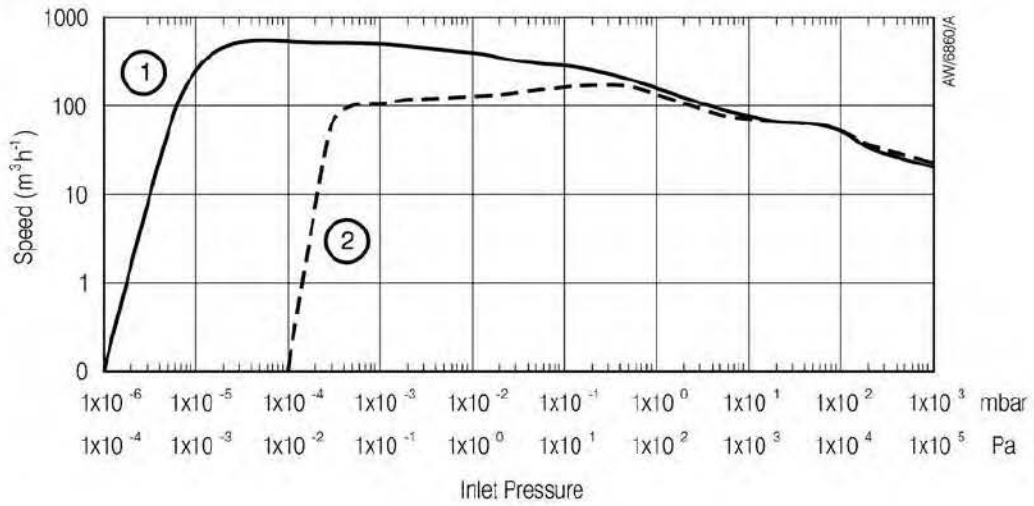
Gas Module Items	Reference Data
Nitrogen supply interface	1/4 inch (6.35 mm) tube
Maximum supply pressure	7 barg, 7×10^5 Pa, 100 psig
Minimum supply pressure	3.0 barg, 3×10^5 Pa, 45 psig
Minimum purity	0.9995
Typical nitrogen purge flow at a supply pressure of 3.0 barg	25 slm (17 slm gas ballast)

2.6 Materials in contact with process gases

Table 11 - Materials in contact with process gas

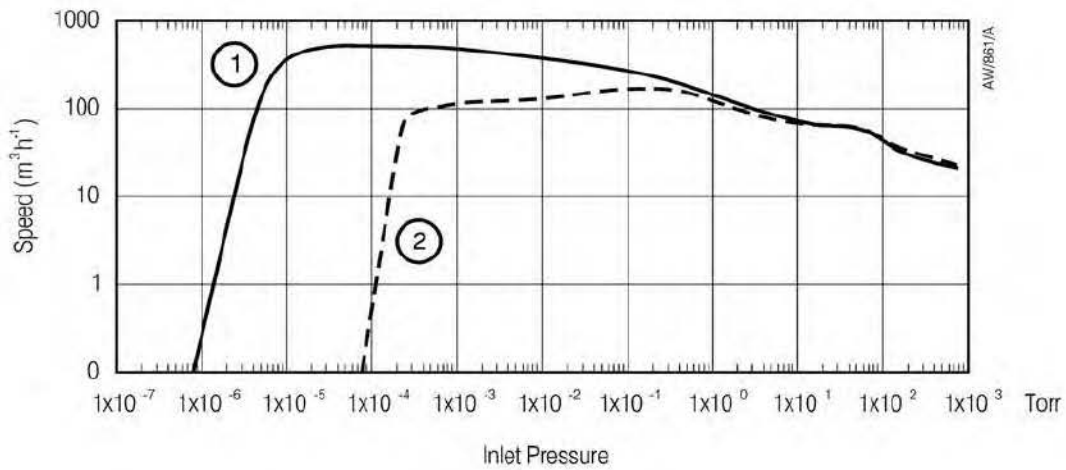
Material items	Reference data
Pump body	Hard anodised aluminium
Pump rotor	Hard anodised aluminium
Internal shaft seals	PTFE coated aluminium
O-rings	Viton fluoroelastomer
Pump shaft	Carbon steel
Gas module nitrogen components	Stainless steel, hard anodised aluminium and viton

Figure 8 - Speed curve (mbar - Pa)



- 1. EPX500
- 2. EPX180

Figure 9 - Speed curve (Torr)



- 1. EPX500
- 2. EPX180

Steady state speed curves showing the performance difference between the standard EPX 'L' and EPX TWIN 'L' variant.

Figure 10 - Speed curve (mbar - Pa) EPX and EPX Twin

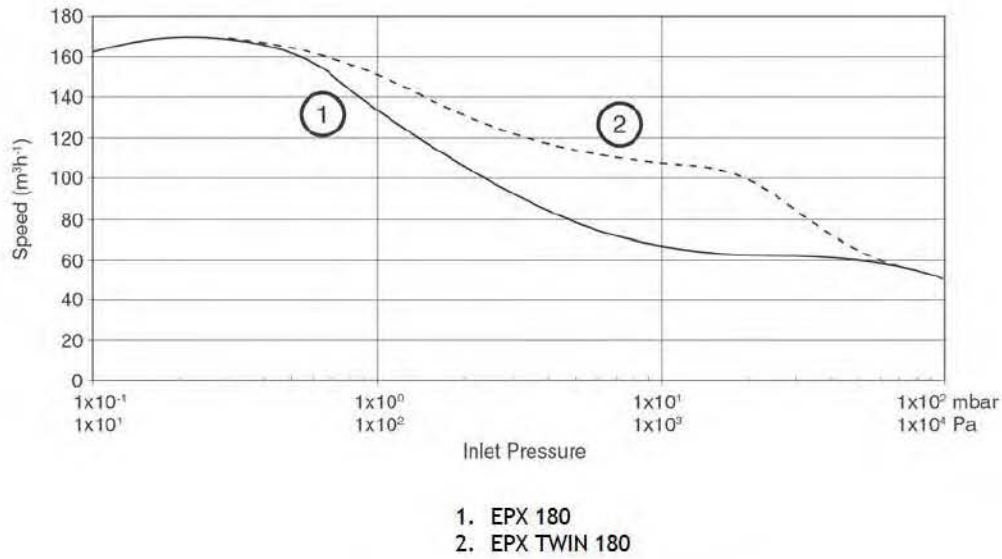


Figure 11 - Speed curve (Torr) EPX and EPX Twin

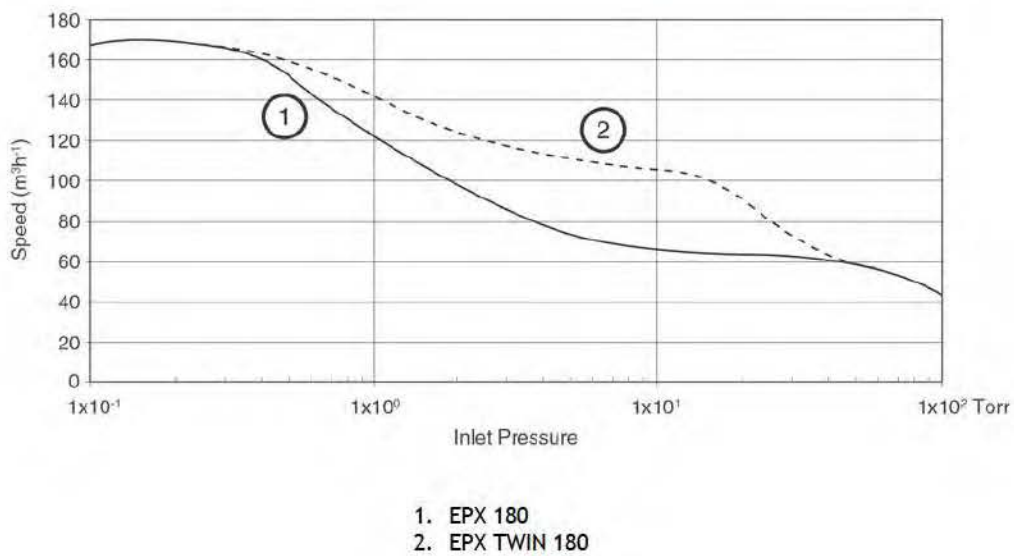
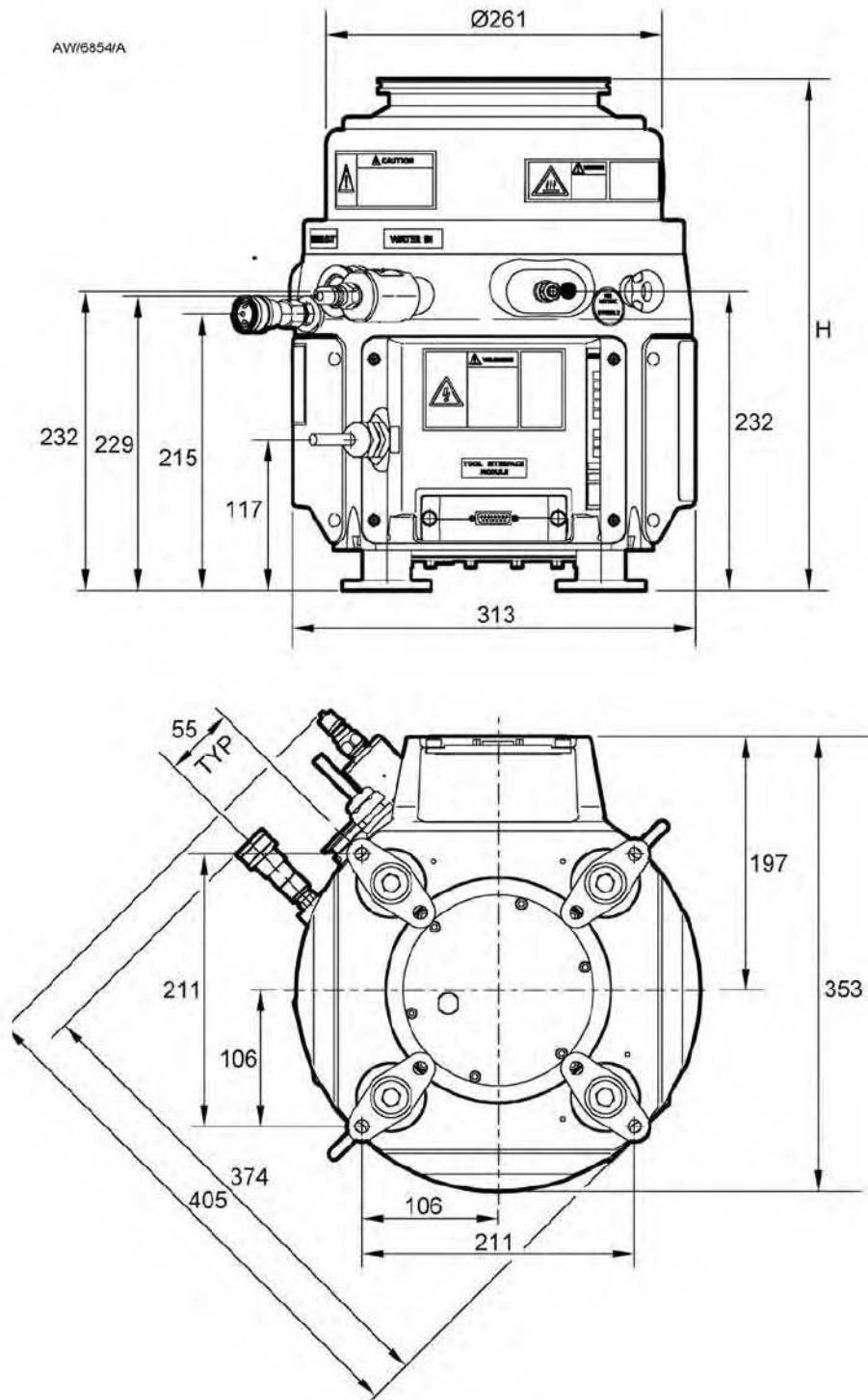


Figure 12 - EPX L installation dimensions (EPX500L shown)



H = 388 (EPX180)
H = 397 (EPX500)

Figure 13 - EPX LE installation dimensions (EPX500LE shown)

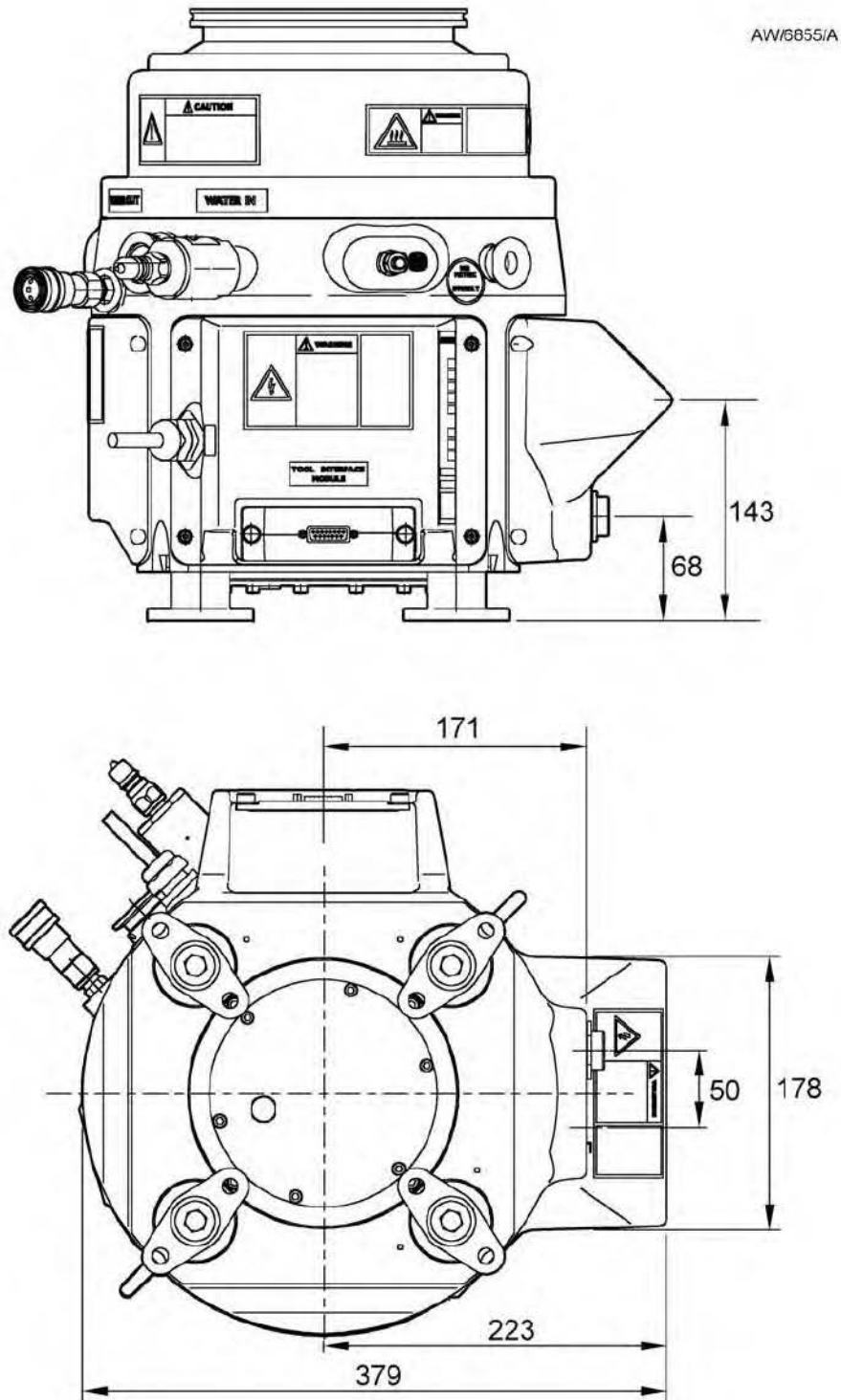


Figure 14 - EPX N installation dimensions (EPX500N shown)

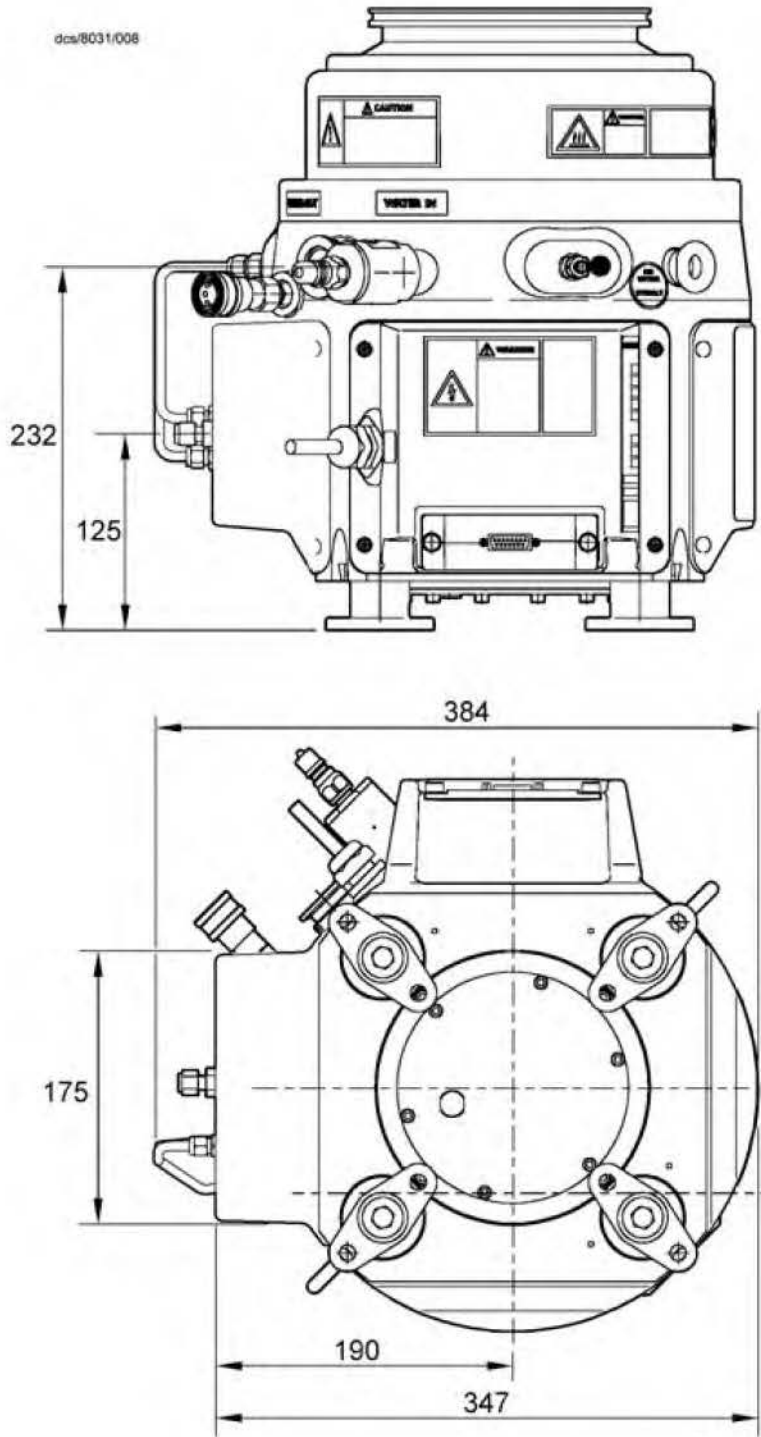


Figure 15 - EPX NE installation dimensions (EPX500NE shown)

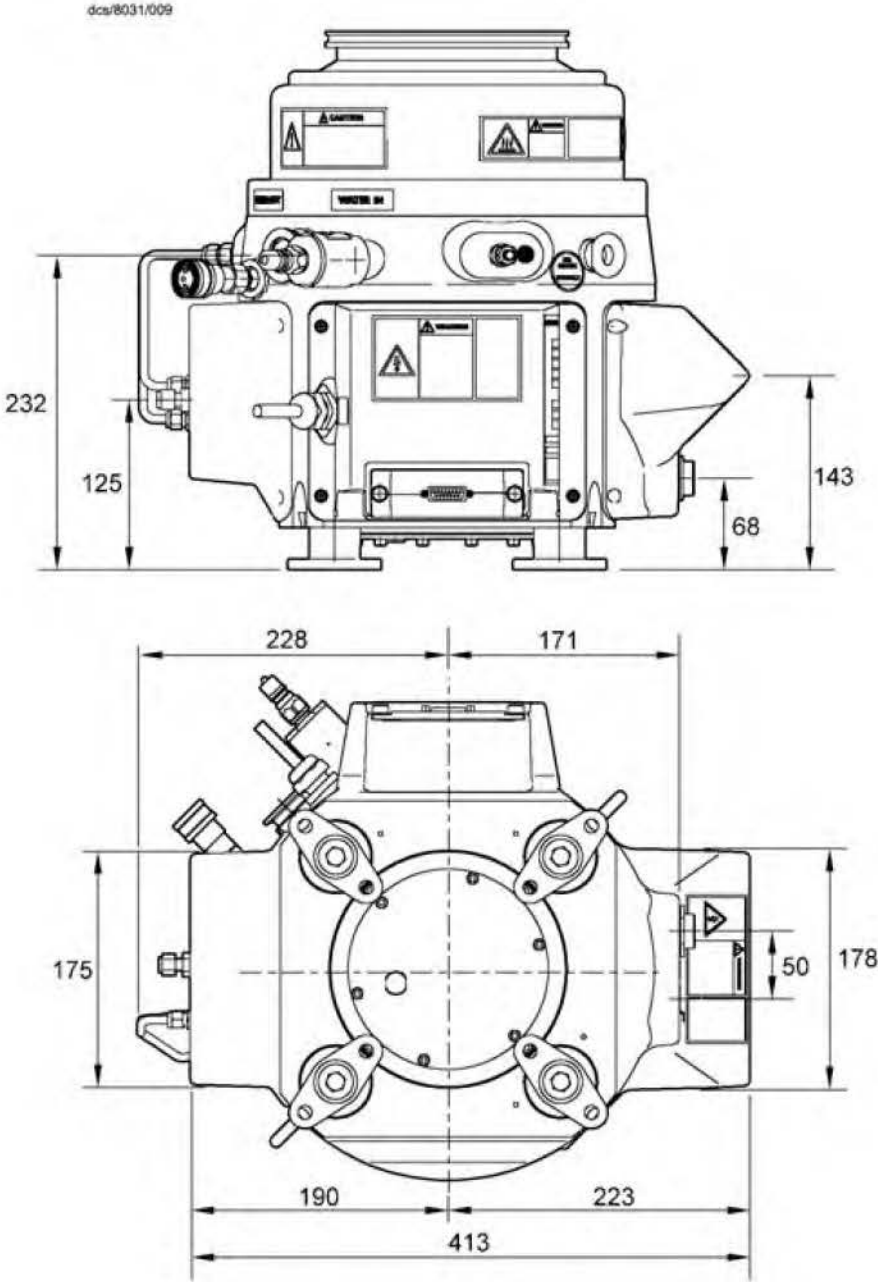
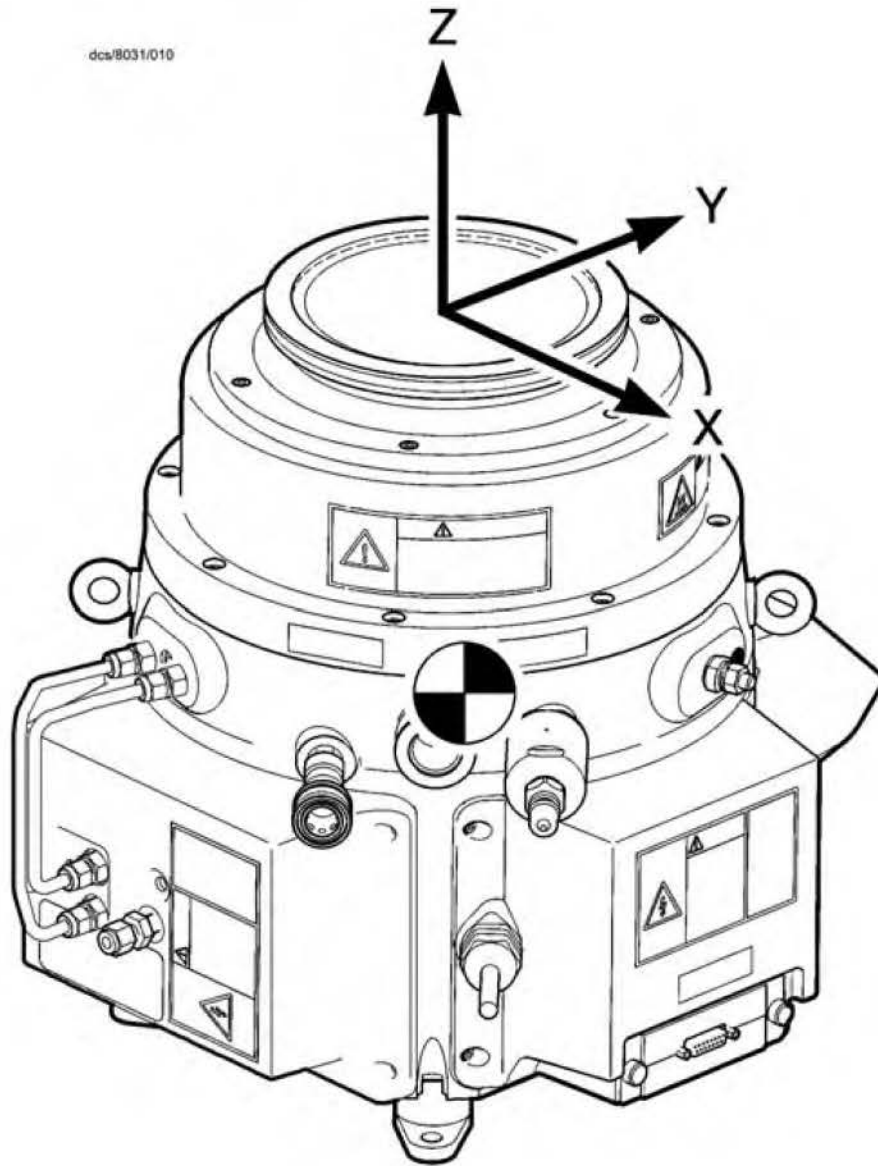
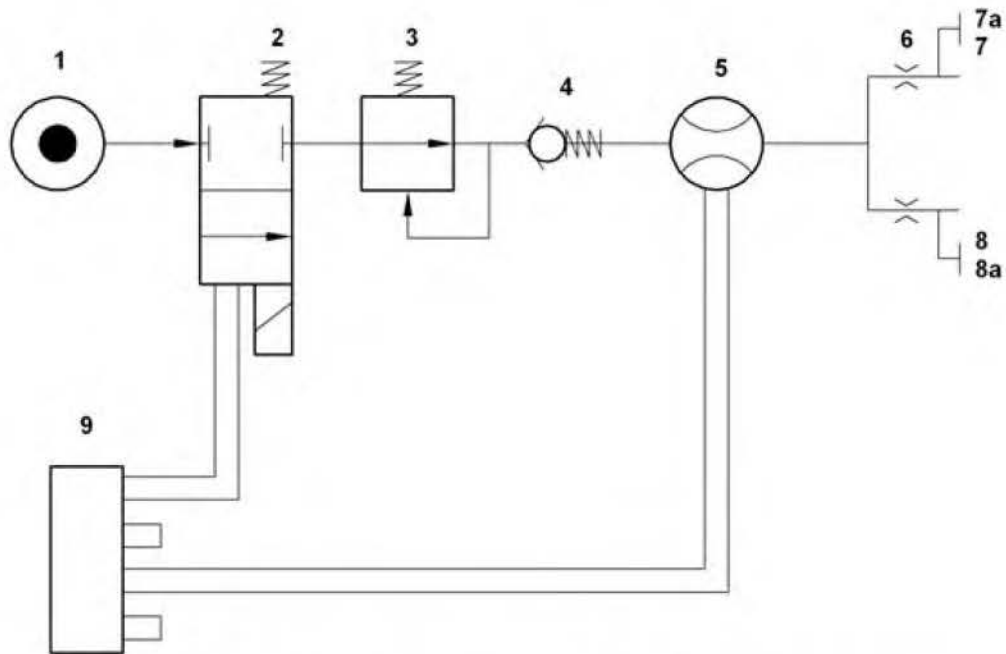


Figure 16 - Location of the pump centre of gravity from centre of the top of the inlet flange



Pump	X'Axis	Y'Axis	Z'Axis
EPX500L	2.23	-3.08	-202.69
EPX500LE	2.21	-1.38	-203.22
EPX500N	-0.69	-13.91	-205.89
EPX500NE	-0.69	-12.24	-206.36
EPX180L	2.50	-3.15	-196.39
EPX180LE	2.47	-1.42	-196.90
EPX180N	-0.51	-14.20	-199.47
EPX180NE	-0.51	-12.49	-199.93

Figure 17 - Gas module schematic



- | | |
|-----------------------------|--|
| 1. Supply port | 7. Gas ballast port |
| 2. Solenoid valve | 7a. Alternative ballast port (unused) |
| 3. Fixed pressure regulator | 8. Seal purge port |
| 4. Check valve | 8a. Alternative seal purge port (unused) |
| 5. Flow switch | 9. Connector |
| 6. Fixed flow restrictors | |

dcsf8031/021

3 Installation

3.1 Safety



WARNING

Obey the safety instructions in this section and take note of appropriate precautions. Failure to observe these instructions may result in injury to people and damage to equipment.



WARNING

The system should not be operated with any of the side covers removed.



WARNING

Do not expose any part of the human body to vacuum as it can cause injury.

CAUTION

Cooling water must be provided commensurate with environmental conditions (humidity and temperature) such that the dew point is not reached.

- Ensure that the EPX pump is suitable for the application. The EPX L series of pumps are designed for semiconductor loadlock or transfer pumping applications, or clean general vacuum applications. The EPX N series of pumps are designed for the light-duty applications detailed in Figure 1. Contact Edwards or the supplier if the EPX pump is used on other applications. Incorrect use of the EPX pump may invalidate the warranty.
- Ensure compliance with all local and national safety requirements during installation.
- Ensure that the installation technician is familiar with the safety procedures which relate to the products pumped. Wear the appropriate safety clothing if contact with contaminated components is anticipated. Dismantle and clean contaminated foreline components inside a fume cupboard. The EPX pump should not be dismantled under any circumstances.
- Vent and purge the process system before starting installation work.
- Disconnect the other components in the process system from the electrical supply so that they cannot be operated accidentally.

Further details are available from the Edwards publication 'Vacuum pump and Vacuum System Safety', part no. P300-20-200.

3.2 Unpack and inspect



WARNING

Heavy objects can cause muscle strain or back injury. Use suitable lifting equipment to move the pump. Refer to Section 2 for the pump mass.

**WARNING**

Ensure that M12 metric eyebolts are fitted to the EPX pump as per Figure 2, item 2 when lifting the pump. Do not handle the pump using the gas module pipework.

1. Use suitable lifting equipment attached to the lifting bolts (Figure 2, item 2) to move the EPX pump into a convenient position, then remove any protective packaging and covers.
2. Inspect the pump. If the pump is damaged, notify the supplier and carrier in writing within three days; state the Item Number of the EPX pump together with the order number and supplier's invoice number. Retain all packing materials for inspection. Do not use the pump if it is damaged.

Note: A 'tip and tell' indicator is fitted to the EPX pump packaging to indicate any damage or mishandling during shipment. If the indicator shows that the EPX pump has been tilted or mishandled during shipment, do not use the pump. Please contact the local Edwards representative for advice.

3. If the EPX pump is not to be used immediately, replace the packing materials. Store the EPX pump in suitable conditions as described in Section 7.

3.3 Securing the EPX pump

**WARNING**

Heavy objects can cause muscle strain or back injury. Use suitable lifting equipment to move the pump. Refer to Section 2 for the pump mass.

**WARNING**

For safety reasons, ensure that any frame mounted to the pump is securely fixed to the building structure or the assembly complies with clause 7.3 (stability) of EN61010-1. Secure the EPX pump in its operating location. If not and the pump fails during operation, movement of the pump may damage equipment and injure people.

**WARNING**

In operation the surfaces on the top half of the pump can exceed 65 °C; in certain fault conditions these surfaces can exceed 105 °C. If the pump is to be installed in a location where the surfaces of the pump could be touched easily then the pump should be installed with adequate guarding.

1. Use suitable lifting equipment attached to the lifting bolts (Figure 2, item 2) to move the EPX pump into its required operating position. When installed, the EPX pump must be level: refer to Section 2.1.
2. Fit a suitable M8 bolt, nut and washer through the exposed fixing hole in each of the vibration isolators (4 bolts in total) (Figure 2, item 7), to secure the EPX pump to the floor, or to a frame; the floor or the frame must be able to withstand a reaction torque of at least 1000 Nm (738 lbf ft), applied rotationally about the vertical axis of the pump for at least 10 ms.

Note: The weight of the pump is evenly distributed across each of the vibration isolators. The position of the centre of gravity is given in Figure 16.

3.4 Connect the inlet to the process system



WARNING

Install the pump in the vacuum system before connecting the pump to the electrical supply. If not, the pump may operate during installation and cause injury to people and damage to the surrounding equipment.



WARNING

Do not remove the Inlet screen from the pump. Do not operate the pump with the Inlet exposed.



WARNING

The pump must be able to be isolated from the atmosphere and process system if dangerous substances have been pumped or produced.

When connecting the pump to the process system:

CAUTION

The vacuum system and foreline assembly **MUST NOT** be supported by the EPX Pump. The foreline assembly should be supported by the vacuum system and connected to the EPX pump inlet by a flexible connection to reduce vibration and stress in the system pipelines.

CAUTION

Use a flexible connection in the pipeline from the process system to the pump to reduce vibration and stress in the system pipelines.

- To get the best pumping speed, ensure that the pipeline which connects the process system to the pump is as short as possible and has an internal diameter not less than the pump inlet.
- Do not allow debris to get into the pump during installation. Ensure that debris (such as weld slag) cannot get into the pump during operation.
- If necessary, contact Edwards or the supplier for advice on inlet isolation valves or other components suitable for the application and system design.

The EPX180 and EPX500 pumps are supplied with a clear plastic protective cap on the inlet flange. The cap prevents debris entering the pump during transit and protects the inlet flange from scratches.

The plastic cap must be removed prior to installation and operation of the pump.

Connect the inlet flange to a foreline or inlet reducing adapter, using an Edwards centring O-ring and claw clamps (Refer to Section 2.1 for details of fittings).

A centring O-ring must be used to seal the inlet flange and retain the inlet screen.

3.5 Connect the outlet to the exhaust extraction system



WARNING

Do not touch the pump exhaust whilst the pump is running since the temperature of these parts can cause burns. Pump exhaust will remain hot after pump has stopped.



WARNING

Pipe the exhaust to a suitable treatment plant to prevent the discharge of dangerous gases or vapours to the surrounding atmosphere.

CAUTION

Do not incorporate check valves or one-way valves in the exhaust pipeline. If so, the EPX pump will not operate correctly and may be damaged.

CAUTION

Install an outlet catchpot to prevent the drainage of condensate back into the pump. If not, condensate which drains back into the pump may damage it or cause it to seize.

CAUTION

It is essential that on the EPX Twin pump, both exhaust ports are connected to a suitable exhaust system.

Note: If the exhaust extraction system is unrestricted, and so cannot be sealed for leak test purposes, leak test the system (refer to Section 3.7) before connecting the pump outlet.

Remove the blanking plugs from the outlet(s) (Figure 2, item 8 [there are two outlets on the EPX Twin]), use a suitable clamp and seals to connect the outlet(s) to the exhaust pipeline. Take note of the following when connecting the exhaust pipeline:

- If the exhaust pipeline incorporates any shut-off valves, the operation of the pump must be prevented when any of the valves are closed (that is, the pipeline is restricted or blocked). If the EPX (Twin) pump operates when the pipeline is restricted or blocked, the pump will not operate correctly and may be severely damaged.
- A check valve should not be incorporated in the exhaust line of the EPX (Twin) pump. If so, the EPX (Twin) pump may not operate properly and may become damaged. If an exhaust check valve is unavoidable, then ensure the pump is at atmospheric pressure (for example, by use of a foreline purge) before starting the pump. This applies to all EPX (Twin) pump variants.
- Incorporate flexible bellows in the exhaust pipeline to reduce the transmission of vibration and to prevent the loading of coupling joints. If flexible bellows are used, ensure that the bellows used have a maximum pressure rating which is greater than the highest pressure that can be generated in the system, and which can withstand the maximum temperatures that can be generated by the process conditions, for example, braided flexible bellows may be used for this purpose.
- The exhaust pipeline must be a minimum diameter of NW25 throughout.

3.6 Nitrogen purge (EPX N series pumps)



WARNING

The EPX pump should not be used to pump pyrophoric gases or explosive mixtures.



WARNING

Dilute flammable gases to less than 25% of the LEL (Lower Explosive Limit) before the pump inlet. The responsibility for ensuring the correct dilution of the pumped gas lies with the operator.



WARNING

The flow switch is set to 12 slm and therefore provides an indication that a flow in excess of 12 slm is present, but gives no guarantee that there is sufficient flow to prevent condensation or to provide sufficient dilution of the process gas to safe levels.



WARNING

The flow switch is not a guaranteed interlock. To ensure dilution of the process gas to safe levels, the system installer must fit appropriate interlocked hardware to ensure correct nitrogen purge flow and monitoring.

The following instructions apply to EPX N series pumps. They are not applicable to EPX L series pumps.

A 1/4 inch compression fitting is provided on the pump, marked 'N₂ Inlet'. Connect the nitrogen purge supply to the nitrogen purge inlet connection using 1/4 inch OD tube, (refer to [Figure 6](#), item 4).

Ensure that the nitrogen supply is stable to guarantee that the nitrogen purge flow is maintained. The nitrogen purge gas should comply with the specifications detailed in [Table 10](#).

3.7 Leak test the system



WARNING

Leak test the system and seal any leaks found to prevent the leakage of dangerous substances out of the system and leakage of air into the system.

Note: If the exhaust extraction system is unrestricted, and so cannot be sealed for leak test purposes, leak test the system before connecting to the pump outlet.

Leak test the system, then seal any leaks found. Substances which leak from the system may be dangerous to people, and there may be a danger of explosion if air leaks into the system.

As supplied, the leak rate of the EPX pump is tested to be less than 1×10^{-5} mbar l s⁻¹ (1×10^{-3} Pa l s⁻¹, 2.1×10^{-8} atm ft³ min⁻¹). The required leak rate for the system will depend on the safety and process requirements.

3.8 Connect the cooling water supply



WARNING

In products supplied with quick-release water connectors, a water expansion valve is installed between the connector and the pump. This is to prevent over-pressurisation of the water circuit in the event that the pump is incorrectly operated with water supply disconnected. When using or maintaining this pump **DO NOT REMOVE THE WATER EXPANSION VALVE**.



WARNING

A release of water under pressure constitutes a significant safety hazard. The water supply should be provided with an isolator in accordance with SEMI S2-0200 Lockout/Tagout requirements.

CAUTION

Do not operate the pump without connecting the water supply and return lines, as permanent damage may be caused to the equipment.

CAUTION

Appropriate filtration must be provided to ensure that the water supply quality is in accordance with [Table 9](#).

CAUTION

Cooling water must be provided commensurate with environmental conditions (humidity and temperature) such that the dew point is not reached.

CAUTION

To prevent damage to the pump in the event of cooling water supply failure or a blockage in the pump, Edwards recommends incorporating a suitable flow switch in the cooling water return pipelines. The outputs of the flow switch can be connected to the control equipment to shut down the pump if the cooling water flow through the pump gets too low.

Connect the cooling water supply as follows:

1. If the pump has been supplied with quick-release connectors, fit a suitable female quick-release connector to the cooling water supply line, and a suitable male quick-release connector to the cooling water return line (refer to [Section 2](#)).
2. Refer to [Figure 2](#). Remove the yellow blanking-caps from the cooling water inlet ([Figure 2](#), item 4) and outlet ([Figure 2](#), item 9).
3. Fit the male quick-release connector on the cooling water return pipeline to the cooling water outlet ([Figure 2](#), item 9).
4. Fit the female quick-release connector on the cooling water supply pipeline to the cooling water inlet ([Figure 2](#), item 4).
5. Turn on the cooling water supply.
6. Inspect the water hoses, pipelines and connection to make sure that there are no leaks.
7. Turn off the water supply whilst the remainder of the installation procedure is completed.

Take note of the following when connecting the cooling water supply and return pipelines:

- Route and secure cables, hoses and pipe-work neatly during installation to avoid possible risk of trips.
- Wipe up any water spilt during installation to avoid possible risk of slips.
- Each EPX pump must be connected to an independent water circuit not in series with each other or other equipment.
- The cooling water supply should have a lock out/tagout facility in accordance with SEMI S2-0200 clause 17.4.
- Edwards recommends incorporating a suitable ball-type flow indicator in the water return pipeline, to provide a visual indication of cooling water flow through the EPX pump.
- Edwards recommends incorporating a suitable filter in the water supply pipeline, if the water supply contains particulates. (For the cooling water supply specification refer to Section 2.4).

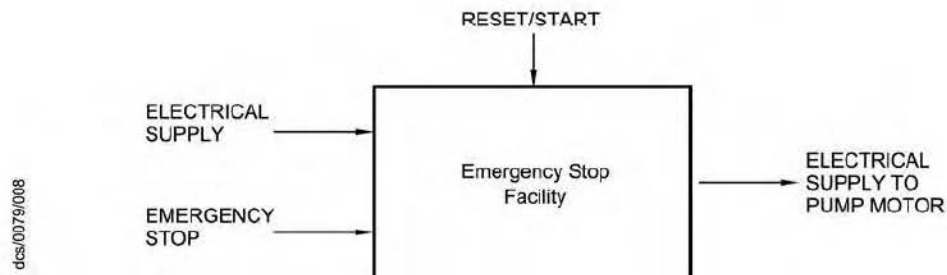
To conserve resources we recommend that the return water is cooled and re-circulated.

3.9 Connect to the emergency stop circuit

Refer to Figure 18. The pump must be connected to an emergency stop facility, which should be located near to the pump. The operation of the emergency stop function should immediately disconnect power from the pump when the emergency stop control is operated. Returning the emergency stop control to its normal operating position should not result in power being re-applied to the pump; a separate start or reset control should be used for this.

The emergency stop control must be compliant with clause 12 of SEMI S2-0200.

Figure 18 - Schematic diagram of emergency stop facility



3.10 Connect the EPX pump to the electrical supply



WARNING

Ensure that the electrical installation of the pumping system conforms with local, regional, and national electrical codes and safety requirements. It must be connected to an appropriately protected electrical supply and earth (ground) point.



WARNING

Connect the electrical supply to the EPX pump through a suitable fuse/ isolator rated as specified in Section 2.3.



WARNING

Do not operate the EPX pump unless it is correctly earthed (grounded) using the protective earth stud (Figure 2, item 3).



WARNING

Ensure that the electrical supply and connectors are rated for the voltage of the pump as marked on the rating label attached to the mains inlet cover.



WARNING

There are no user serviceable parts within the EPX pump. Metal covers must not be removed from the pump; to do so may cause damage to the pump and injury to personnel and would invalidate the declaration of conformity and the warranty. Qualified Edwards service personnel should allow 4 minutes after the isolation of power before removing any covers.

Use the following procedure to connect the EPX pump to the electrical supply:

1. Use a suitable earth (ground) cable to connect the M8 protective earth (ground) stud (Figure 2, item 3) on the EPX pump to a suitable earth (ground) point: refer to Section 2.3 for the cable rating.
2. If an electrical supply plug is not fitted:
 - Connect the four core electrical supply cable to earth (green/yellow) and three phases (1, 2, 3 respectively) by direct connection to a suitable control box with a means of isolation, and by means of a suitably IP rated four pin connector.

Notes: 1. If connecting the electrical supply to the EPX pump through ELCB relays, it must be suitable for the protection of equipment with a d.c. component in the fault current, and suitable for short duration switch-on surges, and for high leakage currents (for example, type B, according to prEN50178).

2. If using a plug to connect the EPX pump to the mains disconnect device, provide Lockout/Tagout in conformance with the requirements of SEMI S2-0200 Section 17.

The mains disconnect device should conform with all the following statements:

- The mains disconnect device must be provided by the user and should be in a location satisfying the requirements of SEMI S8 where it is readily accessible.
- The mains disconnect device should not be located where there is any risk of personnel tripping on cables, being obstructed or exposed to other hazards.
- The mains disconnect device should be marked as a disconnection device.
- The mains disconnect device must be connected between the source of supply and the main power cable entering the EPX pump.

- The mains disconnect device must have a lockout/tagout facility of the type specified in Section 17 of SEMI S2-0200.
- The mains disconnect device must be rated at a minimum of 10,000 AIC.

3.11 Connect to the control equipment



WARNING

Tool interface control signals are for control purposes only and should not be relied upon for safety critical functions.

CAUTION

Do not connect voltages greater than 30 V to the EPX interface control. If so, the interface control will not comply with the low voltage safety directive and the equipment may be damaged.

The pump may be connected to the control equipment through the Tool Interface Module (TIM) connector. The TIM is supplied with a protective plastic cap fitted. Remove the cap before connecting the mating connector. Several different tool interfaces are available. The label next to the tool connector identifies which TIM is fitted, refer to Table 12 to identify the tool connectors and mating tool connector kits available (not supplied with the pump).

Table 12 - Tool connectors and mating tool connector kits

Identification	Part Number	Tool Side Connector	Tool Connector Kit
SPI	D373-60-310	CPC 16/17 Socket	D374-20-801
MCM	D373-60-320	CPC 16/17 Socket	D374-22-802
TEL	D373-60-330	25w D Type Socket	D374-20-802
E73	D373-60-340	15w D Type Plug	D374-20-803
LAM	D373-60-350	25w D Type Plug	D374-22-801
C3	D373-60-360	9w D Type Socket	D374-21-803
HIT	D373-60-370	37w D Type Socket	D374-21-804

Note: Plug/Socket designation refers to the pins of the connector.

3.11.1 Inputs

Refer to Table 13 for a definition of the input signals to the pump system.

Table 13 - Tool input signals to the pump system

Function	Signal Type	Pins	Operation
Pump On/Off	Voltage input	SPI - 1 and 2 MCM - 1 and 2 LAM - 10 and 23 C3 - 2 and 6	Pump runs when voltage applied.
	Volt-free contact input	MCM - 5 and 6 TEL - 1 and 14 E73 - 1 and 9 HIT - 7 and 26 (or HIT - 1 and 20)	Pump runs when contact closed.
Green mode	Voltage input	SPI - 5 and 6 MCM - 15 and 16 LAM - 11 and 24 C3 - 1 and 6	Pump(s) set to green mode when voltage applied.
	Volt-free contact input	MCM - 13 and 14 TEL - 2 and 15 E73 - 2 and 8 HIT - 3 and 22	Pump(s) set to green mode when contact closed.

- Notes:**
1. Volt free contacts sensed at 24 V / 5 mA, these inputs should not be linked together.
 2. Voltage inputs accept AC or DC voltage (except SPI pins 15 and 16), between 15 V and 24 V selects the input as active, below 5 V selects inactive.
 3. To ensure correct pump operation, at least 10 seconds must be allowed between successive operations of the input signals.

3.11.2 Outputs

Table 14 defines the Output signals from the pump system, all signals are volt free contacts.

Table 14 - Output signals from the pump system

Function	Pins	Operation
Pump running	SPI - 3 and 4 MCM - 3 and 4 TEL - 8 and 20 E73 - 3 and 11 LAM - 2 and 15 C3 - 5 and 9 HIT - 19 and 37 HIT - 12 and 30	Closed when pump running
Warning	SPI - 7 and 8 MCM - 7 and 8 TEL - 9 and 21 E73 - 5 and 13 C3 - 4 and 8 HIT - 14 and 32	Closed at all times (no warnings are available on the EPX pump).

Table 14 - Output signals from the pump system (continued)

Function	Pins	Operation
Alarm	SPI - 9 and 10 MCM - 9 and 10 TEL - 10 and 22 E73 - 6 and 14 LAM - 1 and 14 C3 - 3 and 7 HIT - 15 and 33	Closed when no alarm condition exists on the drive inverter. See Section 4.3 and 4.4 for more information.
Gas flow warning	SPI - 11 and 12 MCM - 11 and 12 TEL - 11 and 23 LAM - 3 and 16 HIT - 16 and 34	Closed when gas purge flow warning does not exist (closed if no gas module is present).
Pump status/Final Valve	SPI - 13 and 14	Closed when pump running and gas purge flow warning does not exist.
Remote/Local control status	E73 - 7 and 15	Closed when remote control is available through the tool interface.

- Notes:**
1. Volt free contacts are rated at 24 V, 1 A.
 2. All pump status outputs are maintained through a power loss of up to 1 second.
 3. All status contacts open if power is removed.

4 End User Controller (EUC) and Pump Display Terminal (PDT) menus

4.1 Introduction

The display and the control buttons used on both the EUC and the PDT are shown in [Figure 7](#).

The menu structure is shown in [Table 15](#). Note that if a particular system component or accessory is not fitted, the corresponding menu option is shown as 'NP' (not present).

Menus used and the display messages shown on the EUC and PDT are described in the menu diagrams in [Figure 19](#) to [28](#). The following symbols and conventions are used in the menu diagrams:



These are flow lines. Arrows on the lines show the direction of flow through a menu.



This symbol is used to connect different menus and shows the starting point (or continuation point) of a menu.



This symbol is used for the ENTER and CANCEL buttons and the four menu buttons: Normal, Status, Control and Setup.



This symbol is used for the up (↑) and down (↓) buttons and for the on (⬆) and off (⬇) buttons.



This symbol is used for the two-line display on the PDT.



This symbol is a submenu box; a submenu is a series of menu steps which are used in a number of different menus or used in different parts of one menu. Completion of the menu returns to the previous menu.



This symbol shows additional text which is not part of the menu, but which further describes the operation of the menu.

4.2 General operation

When first switching on the EPX system, the Normal display is shown: refer to Figure 22. Press the On or Off button, or any of the four menu buttons to exit the current menu and enter the corresponding new menu. Figure 19 shows this menu control logic.

Note that if a warning or alarm is displayed, the orange or red LED will flash until the warning or alarm is acknowledged by pressing the <ENTER> button. Once acknowledged the LED will remain continuously lit. If a gas flow warning is generated by low flow and then the gas flow is restored, the orange warning LED will flash until the warning is acknowledged and will then go out.

4.3 The CANCEL button

Press the CANCEL button at any time during menu operation. For this reason, the use of the CANCEL button has not been shown on all of the menu diagrams, but specific uses are shown where there is no other obvious way to cancel the current menu option and enter the previous menu option. In general, when the CANCEL button is pressed, the current menu option is cancelled and the previous menu option is displayed. Other specific uses of the CANCEL button are as follows:

- In the Switch On and Switch Off menus (Figure 20 and 21), when pressing CANCEL, the menu is exited and the display reverts to that which was displayed before On or Off was pressed.
- In the Status menu (Figure 23), when pressing CANCEL, the display shows the first two status parameters (the defaults are EPX current consumption and power consumption).
- When entering the password for the setup menu (Figure 25), if CANCEL is pressed before entering the value, the menu moves back to entry of the previous digit of the password.

4.4 Display text and variable text

In the menu diagrams in Figure 19 to 28, text shown without chevron brackets in the two-line display symbol is the actual text that will be shown on the display. In this text, the 'Δ' symbol is used to show where a digit will be shown; the value of the digit depends on the sensor data or information entered into the system.

Text enclosed in chevron brackets (for example, <status>) defines variable text; what is shown on the display depends on the menu or the EPX system and data entered by the user. The following variable text markers are used on the menu diagrams:

<status>

Text message giving status of the selected parameter.

<serial number>

This specifies the serial number. The serial number is a number which can be used to identify the EPX system in the installation.

<parameter>

This is a previously selected parameter or menu option.

<message>

This specifies a warning, alarm or advisory message.

4.5 Wrap-around

When using the up and down buttons to change a digit or character on the display, the digit or character will 'wrap-around' between its minimum and maximum values. For example, when entering a password digit, if the digit is '0' and the down button is pressed, the digit will change to '9'; if the digit is '9' and the up button pressed, the digit will change to '0'.

4.6 Timeout

After entering a menu (other than the Normal menu), if a button is not pressed for five minutes, the EUC or PDT will automatically exit the current menu and enter the Normal menu. This facility (known as timeout) is available so that if the setup menu is entered and then EPX system is accidentally left unattended, the menu is exited to prevent unauthorized use of the menu options.

4.7 Menu structure

The display and the control buttons are shown in Figure 7.

The menu structure is shown in Table 15. Note that if a particular system component or accessory is not fitted, the corresponding menu option is shown as 'NP' (not present).

Table 15 - EUC and PDT menu structure

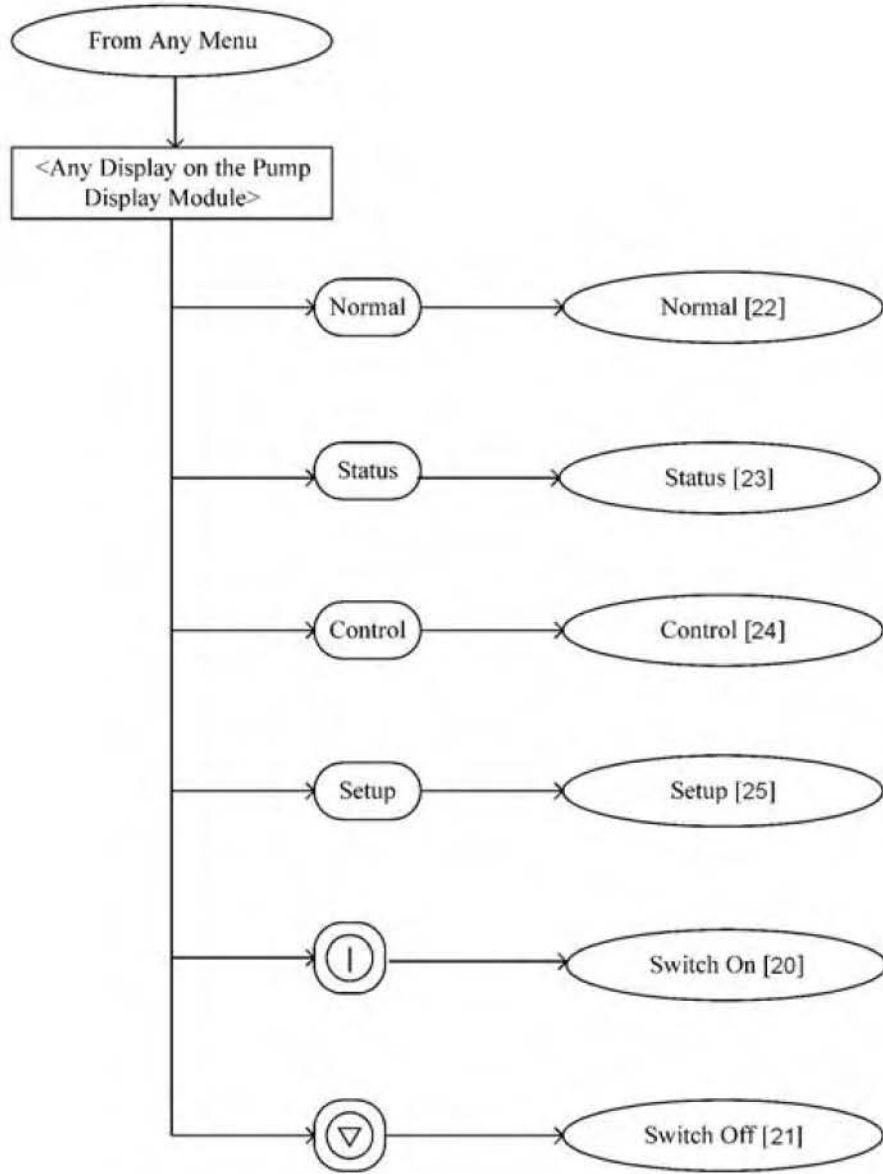
Menu	Figure
PDT menu logic	19
Switch on	20
Switch off	21
Normal (default) Menu	22
Status Menu	23
Control Menu	24
Setup Menu	25
Software Version	26
Select Units Menu	27
Select Line Menu	28
Service Menu	Service Personnel only
Serial Number	Service Personnel only
Time/Date	Service Personnel only

4.8 Example

Here is an example of how to interpret the menu diagrams. The following procedure describes how to change the parameters displayed on the normal display.

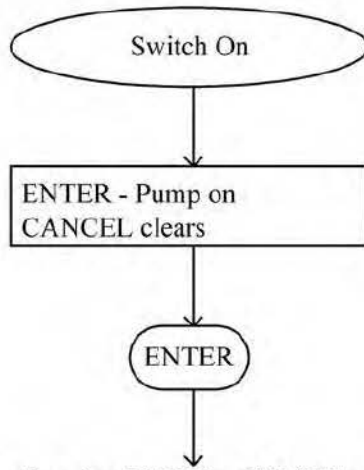
1. Press the Setup button to enter the Setup menu (Figure 25).
2. Use the up and down buttons to change the first digit of the setup password to the correct value, then press the ENTER button.
3. Use the up and down buttons to change the second digit of the setup password to the correct value, then press the ENTER button.
4. Use the up and down buttons to change the third digit of the setup password to the correct value, then press the ENTER button.
5. If the correct password has been entered, the display will then show 'SETUP MENU' on the top line and the software version on the bottom line. (Figure 26).
6. Press the down button or the up button twice; the display will then show 'SETUP MENU' on the top line and Normal display on the bottom line.
7. Press the ENTER button; the display will then show 'SELECT LINE' on the top line and 'Top Page 1' on the bottom line (refer to Figure 28).
8. Press the ENTER button; the display will then show 'SELECT PARAMETER' on the top line and the currently selected parameter on the bottom line.
9. Press the up or down buttons to change the parameter displayed to the required parameter, then press the ENTER button. The top line of the Normal Display will now display the parameter that was selected.


Figure 19 - EUC and PDT menu logic



04-8031011

Figure 20 - Switch on menu



 Local control is required before the pump can be switched on.

dcs/8031/012


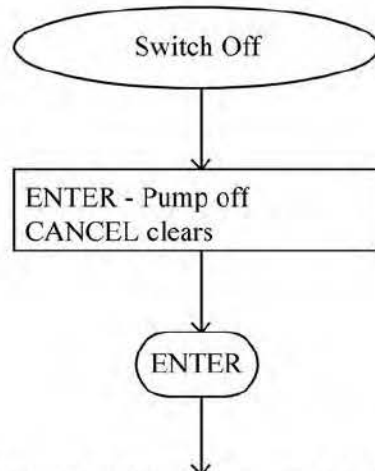

Pressing ENTER or CANCEL causes the display to return to that which was being displayed before the  button was pressed.

Figure 21 - Switch off menu



 Local control is required before the pump can be switched off.

dcs/8031/013


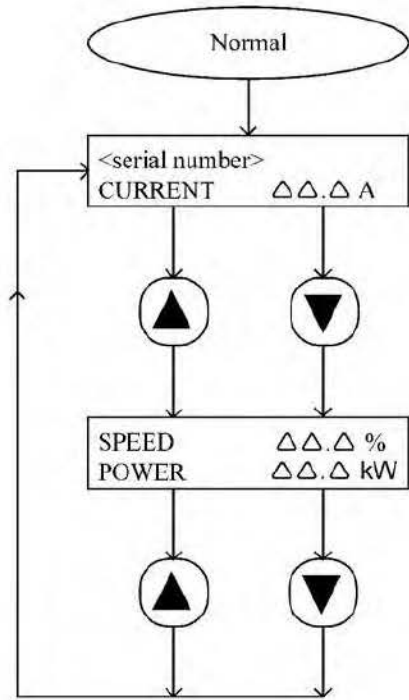
Pressing ENTER or CANCEL causes the display to return to that which was being displayed before the  button was pressed.

Figure 22 - Normal menu

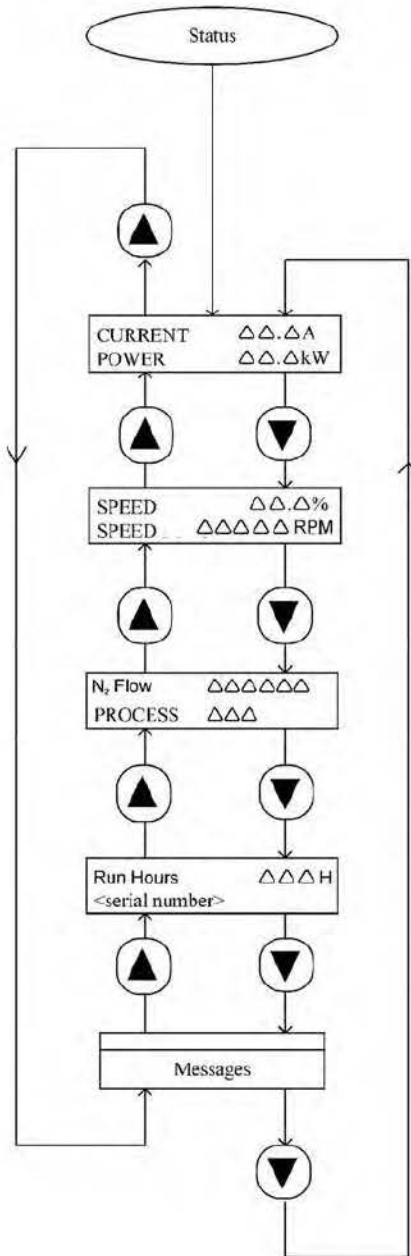


☞ <Serial Number> is set up in the Serial Number Menu [only accessible by service personnel]

☞ To change the parameters that are displayed in the Normal Display use the Normal Display option in the Setup menu [25].

Idem 8031/014

Figure 23 - Status menu



Speed can be displayed in Hz instead of RPM. This can be done using the Select Units Menu [27].

<serial number> is set up in the Serial number menu [only accessible by Service Personnel]

If there are warnings or alarms present, they are displayed. Otherwise this sub-routine is skipped.

DCS/R031/015

Figure 24 - Control menu

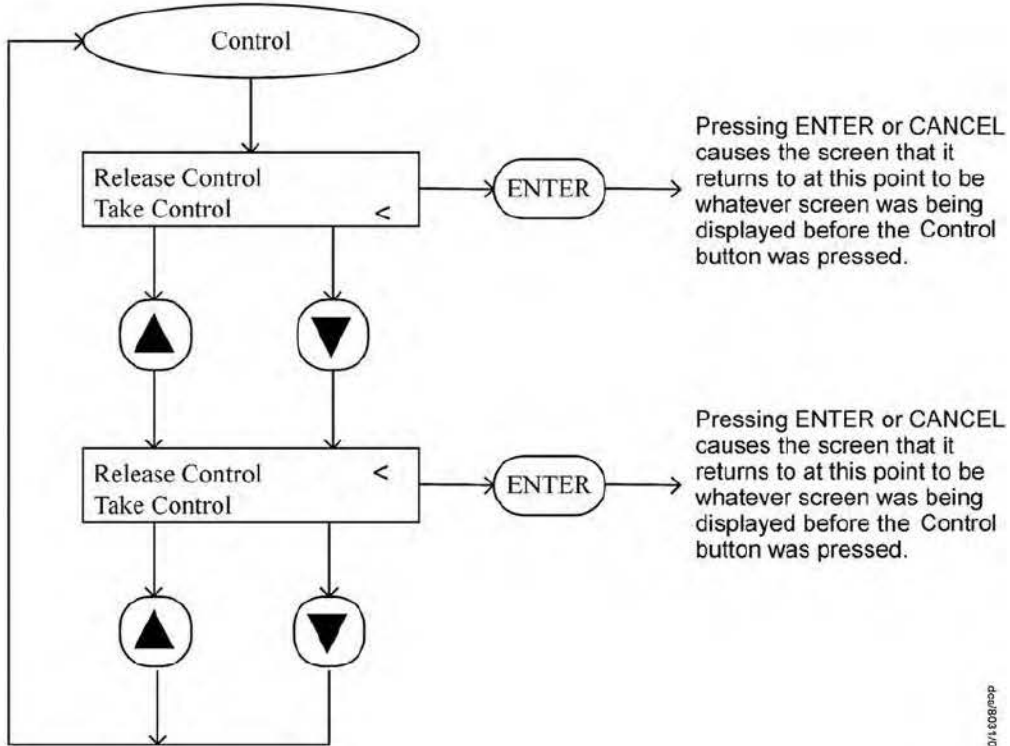
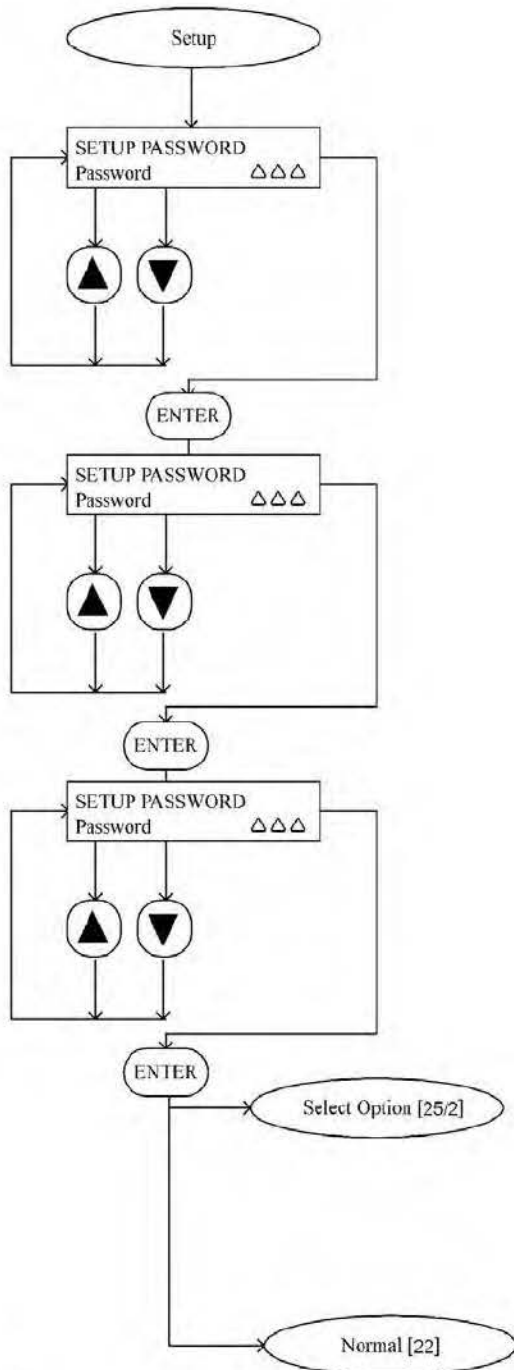


Figure 25 - Setup menu (sheet 1 of 2)



- Use the up and down buttons to increase or decrease the first digit of the password.

Press ENTER when the digit has been entered correctly.

Press CANCEL to go back to Normal Display [22].
- Use the up and down buttons to increase or decrease the second digit of the password.

Press ENTER when the digit has been entered correctly.

Press CANCEL to go back to the first digit of the password.
- Use the up and down buttons to increase or decrease the third digit of the password.

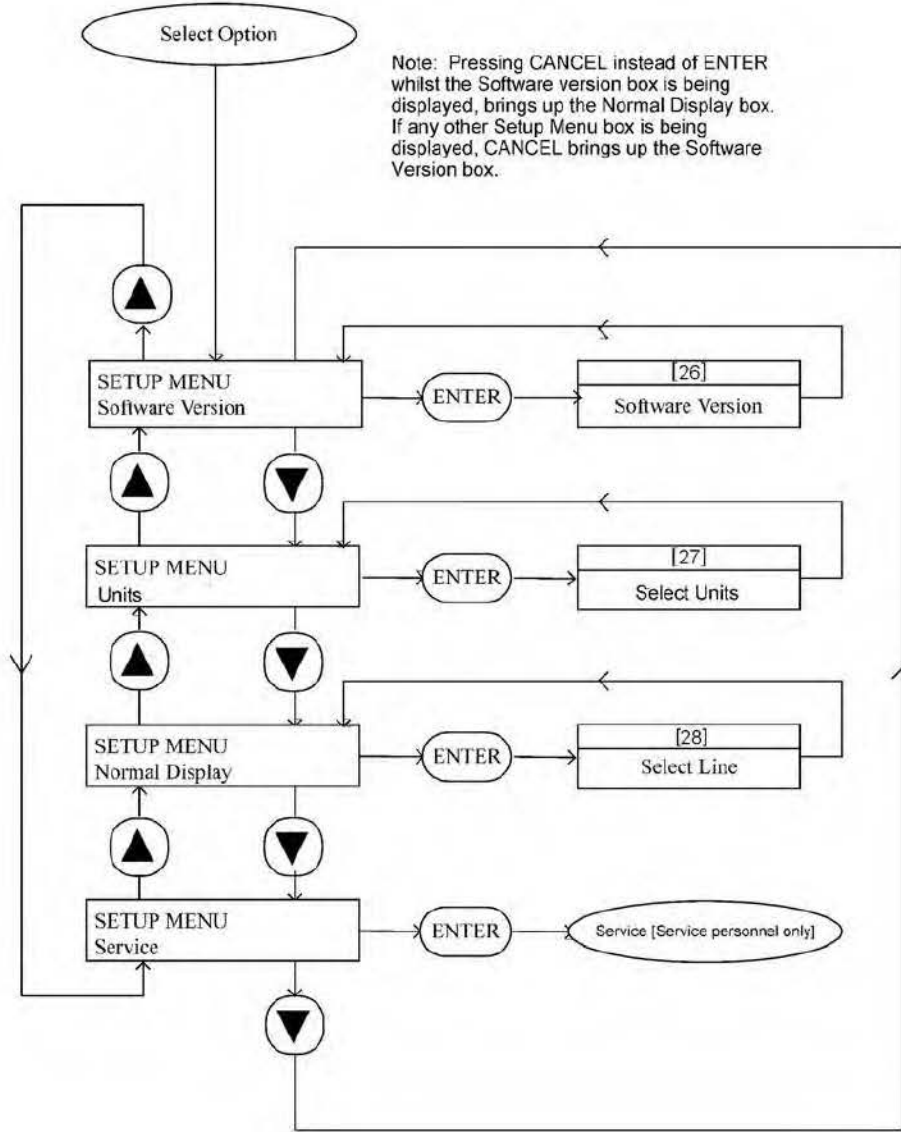
Press ENTER when the digit has been entered correctly.

Press CANCEL to go back to the second digit of the password.
- If the setup password has been entered then continue to the Setup menu.

If the service password has been entered, continue and select the service menu option.
- If password is incorrect then revert to normal display.

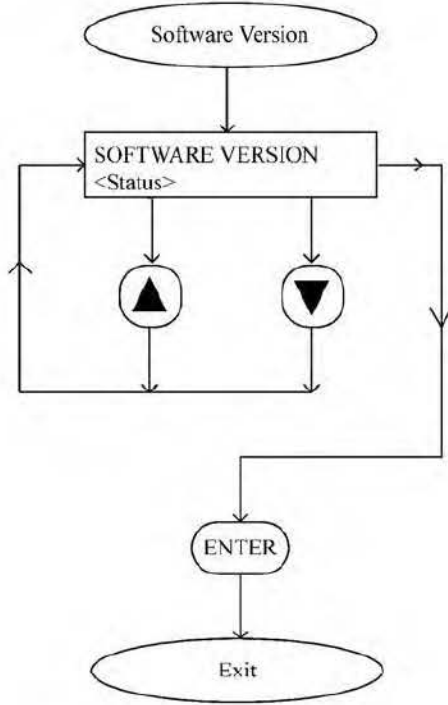
des:8031017


Figure 25 - Setup menu (sheet 2 of 2)




DCS/8031/01/18

Figure 26 - Software version



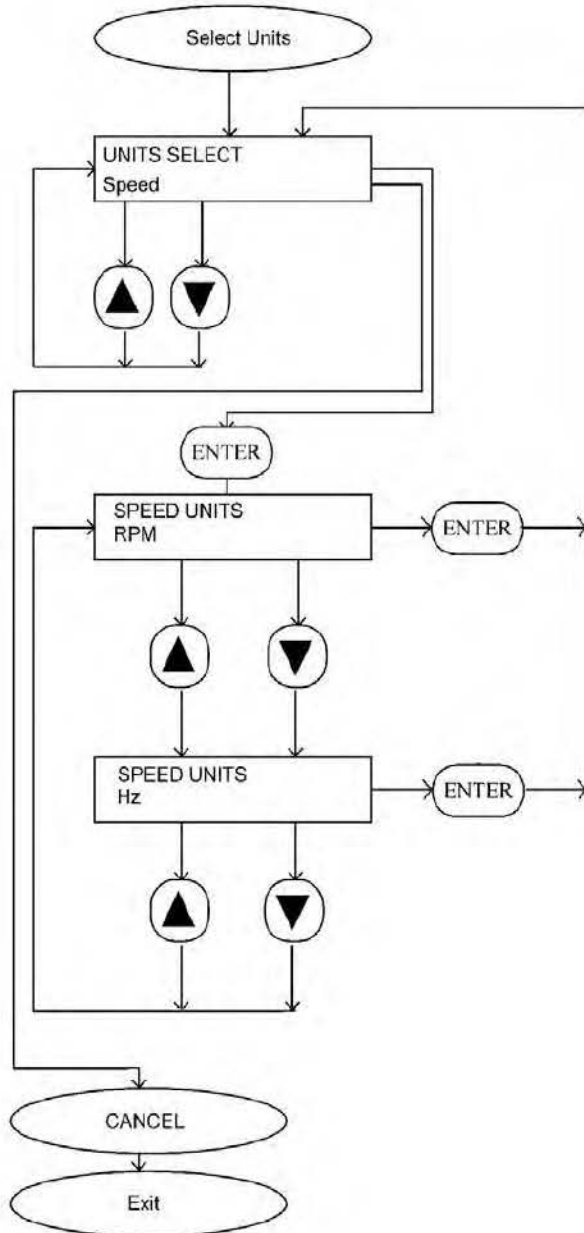
 <status> displays the software version number

 Press ENTER or CANCEL to return to the setup menu [25].

dcu/803 1/0/19

Figure 27 - Select units menu

des/031/023

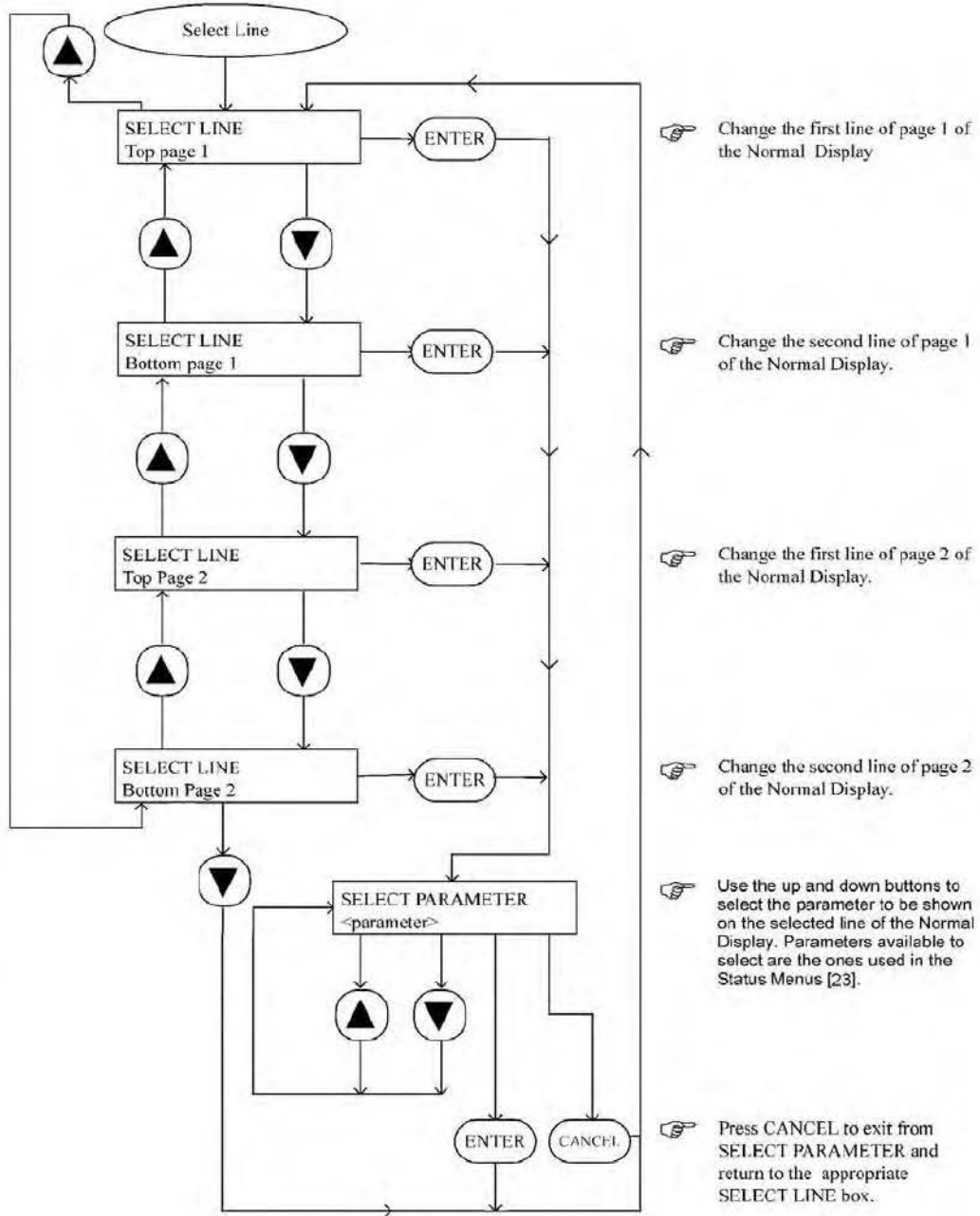


☞ Pressing ENTER will make the Speed be displayed in RPM on the status menu [23].

☞ Pressing ENTER will make the Speed be displayed in Hz on the Status Menu [23].

NOTE: Pressing CANCEL instead of ENTER in either of these two cases, will return you to the [UNITS SELECT Speed] screen without changing the units being used for displaying speed.

Figure 28 - Select line menu



DCS/8031/022

5 Operation

5.1 Introduction



WARNING

Do not operate the pump when the exhaust pipeline is restricted or blocked. If so, the EPX pump can generate pressures up to 16 bar (1.6×10^6 Pa) and be damaged.



WARNING

Inlet and exhaust temperatures can exceed 65 °C in extreme operating conditions.



WARNING

The EPX N series of pumps must be purged for 30 minutes with the nitrogen purge gas flowing before pumping process gas. This must be done with the pump running to allow it to warm up to its full operating temperature.



WARNING

There are no user serviceable parts within the EPX pump. Metal covers must not be removed from the pump; to do so may cause damage to the pump and injury to personnel and would invalidate the declaration of conformity and the warranty. Qualified Edwards service personnel should allow 4 minutes after the isolation of power before removing any covers.

CAUTION

The flow switch is set to 12 slm and therefore provides an indication that a flow in excess of 12 slm is present, but gives no guarantee that there is sufficient flow to prevent condensation or to provide sufficient dilution of the process gas to ensure pump reliability.

The flow switch is not a guaranteed interlock. To ensure correct, reliable operation of the pump the system installer should fit appropriate, interlocked hardware to ensure correct nitrogen purge flow and monitoring.

CAUTION

If the electrical supply to the EPX pump fails for up to one second, the pump will continue to run once the power is returned.

CAUTION

If the electrical supply to the EPX pump fails for only a few seconds, the pump will continue to operate normally provided the run signal on the interface is maintained.

5.2 Flammable and toxic gases (EPX N series pumps)



WARNING

The EPX pump should not be used to pump pyrophoric gases or explosive mixtures.



WARNING

Dilute flammable gases to less than 25% of the LEL (lower explosive limit) before the pump inlet. The responsibility for ensuring the correct dilution of the pumped gas lies with the operator.



WARNING

For flammable and toxic gases, the EPX pump must be fitted in an extracted enclosure (not supplied), and the extract must be monitored. In order for the pump to comply with Semi S2-0200 extracted enclosures are required.

The nitrogen purge flows on the EPX N series of pumps are preset at the factory.

The approximate nitrogen purge flows for a given supply pressure are given in Table 10.

Flammable gases must be diluted to less than 25% of the LEL. Pyrophoric gases and explosive mixtures should not be pumped using the EPX pump. The installer must ensure that suitable safety mechanisms are in place to ensure that dilution is carried out to safe levels.

5.3 Start-up



WARNING

Do not operate the pump when the exhaust pipeline is restricted or blocked. If so, the EPX pump can generate pressures up to 16 bar (1.6×10^6 Pa) and be damaged.



WARNING

Ensure that it is safe to start the system. If not (and, for example, maintenance is being performed on components downstream of the system), injury to people could result.

1. Check the protective earth connection to the pump.
2. Check that the power and control connectors from the pump are connected.
3. Switch on the cooling water supply and check that there are no leaks. If there are any leaks, switch off the cooling water supply, seal the leaks, then switch on the cooling water supply and check for leaks again. Repeat this process until the system is leak-tight.
4. Switch on the electrical supply to the EPX pump, and check that the Power LED (Figure 4, item 2) goes on; if the Power LED does not go on, refer to Section 6.6.
5. Check that the exhaust-extraction system is not restricted, and that any valves in the exhaust-extraction system are open.
6. Use the control equipment to set the pump run signal to the interface connector (refer to Section 3.11) and check that the Run LED (Figure 4, item 3) goes on, and that the pump running status output closes. If the Run LED does not go on, or if the pump running status output remains open, refer to Section 6.6.

5.4 Manual shut-down



WARNING

Do not remove the inlet connection until the pump has been allowed to stop rotating and the power has been isolated.

CAUTION

The pump can take up to three minutes to completely stop.

CAUTION

EPX N pumps must be purged for 30 minutes with nitrogen before the run signal is removed.

Use the following procedure to shut down the pump.

Use the control equipment to remove the run signal to the pump (refer to Section 3.11). The Run LED (Figure 4, item 3) will then go off, and the pump running status output signal will open.

Note: After removing the run signal, the pump should be allowed to come to a stop before the run signal is re-applied. If the run signal is removed for more than 1 second and then re-applied before the pump has stopped, the pump will run down to a stop before restarting automatically. This is a function of the control architecture of the pump.

When removing the pump, follow the instructions given in Section 7.

5.5 Status and fault indications

During normal operation, only the Power and Run LEDs (Figure 4, items 2 and 3) should be on, and the pump running, pump warning and pump alarm status outputs should be closed. If either or both of the other LEDs (Figure 4, items 4 and 5) go on, or if either or both of the pump warning and pump alarm status output signals are open, refer to Section 6.6.

5.6 Unplanned shutdown and alarms



WARNING

In the event of an unplanned shutdown the pump should not be restarted unless the cause is identified and rectified. If this is not the case, seal the inlet and exhaust of the pump and call a Edwards representative.

The EPX will automatically shutdown when a pump protection sensor operates (refer to Section 1.3), or should the inverter drive fail. When the EPX automatically shuts down, the Alarm LED (Figure 4, item 5) is illuminated, and the pump alarm status output signal opens.

If the EPX pump goes into an Alarm state, power to the pump must be completely switched off and then re-applied in order for the alarm to clear. The pump fault must be identified and rectified before power is re-applied.

If there is an unplanned shutdown, ensure that the cause of the shutdown is identified and rectified before the pump is restarted. If in doubt, please call an Edwards representative.

6 Maintenance



WARNING

There are no user serviceable parts within the EPX. There is no requirement to remove the covers from the pump during normal operation. Removing the covers could cause injury to people or damage to equipment.



WARNING

Toxic, flammable and corrosive chemicals may be present within the pump enclosure. Ensure that the appropriate Personal Protective Equipment (PPE) is worn when carrying out any maintenance tasks.



WARNING

Apply an external purge for a period of 30 minutes before disconnecting the EPX pump from the system when used on applications with the potential for hazardous process by-product or gas to dwell within the pump body. The nitrogen supply should be locked and tagged out prior to removal.



WARNING

There are no user serviceable parts within the EPX pump. Metal covers must not be removed from the pump; to do so may cause damage to the pump and injury to personnel and would invalidate the declaration of conformity and the warranty. Qualified Edwards service personnel should allow 4 minutes after the isolation of power before removing any covers.

Purge the pump for 30 minutes with nitrogen before removing the power.

- There are no user serviceable parts in the EPX pump mechanism, electric motor or electrical controls. Attempting to remove the pump rotor, separate the motor from the pump or remove electrical covers can cause injury to people or damage to equipment.
- It is recommended that all maintenance and service operations are carried out by qualified Edwards Service Personnel, excepting:
- Connection and inspection of pipelines and connections to foreline and exhaust. Routine external cleaning. Connection and disconnection to electrical power. Connection and disconnection of electrical signals.

6.1 Safety



WARNING

Obey the safety instructions given below and take note of appropriate precautions. If not, injury to people and damage to equipment can occur.



WARNING

Do not touch or inhale the thermal breakdown products of fluorinated materials which may be present if the EPX pump has overheated to 260 °C (500 °F) and above. These breakdown products are very dangerous. The pump may have overheated if it was misused, if it malfunctioned, or if it was in a fire. Edwards Material Safety Data Sheets for the fluorinated materials used in the EPX pump are available on request: contact the supplier or Edwards. MSDS: Mechanical Pump Oil - Fomblin 6/6 Series P120-01-015, O-rings - Viton P120-04-015.

CAUTION

In the event of a pump seizure, dust is generated as a result of contact between the rotating and static surfaces. This dust may contain aluminium sulphate in low concentrations and may be accompanied by a slightly sulphurous smell.

When working on a pump which may have seized, the use of gloves, eye protection and a paper face mask is recommended.

- Allow the EPX pump to cool to ambient temperature before starting maintenance work.
- Wipe up any spilt water during maintenance so as to avoid possible risk of slips.
- Isolate the EPX pump and other components in the process system from the electrical supply so that they cannot be operated accidentally.
- Lockout/Tagout the nitrogen supply and water supply.
- Do not reuse O-rings.
- Protect sealing-faces from damage.
- If the pump needs to be removed, follow the instructions given in [Section 7.1](#).
- If disconnecting the inlet from the process system, leak-test the system after maintenance work is complete and seal any leaks found to prevent leakage of dangerous substances out of the system and leakage of air into the system: refer to [Section 3.7](#).
- The inverter drive contains capacitors which store electrical energy after the pump has been shut down. Wait at least four minutes after the pump has been shut down before starting any work on the electrical system of the EPX pump.
- The pump covers should not be removed as the pump contains sensitive electronic components. None of the components in the pump are user serviceable.

6.2 Maintenance plan

The plan shown in [Table 16](#) details the maintenance operations we recommend to maintain the EPX pump in normal operation. Instructions for each operation are given in the section shown.

6.3 Inspect the pipelines and connections

1. Inspect all cooling water pipelines and connections; check that they are not corroded or damaged. Replace any of the pipelines and connections that are corroded or damaged. Check that all cooling water connections are secure. Tighten any connections that are loose.
2. Inspect all electrical cables; check that they are not damaged and have not overheated. Replace any cables that are damaged or have overheated. Check that all electrical connections are secure. Tighten any connections that are loose.
3. Inspect all process and exhaust pipelines; check that they are not corroded or damaged. Replace any pipelines that are corroded or damaged. Check that all process and exhaust connections are secure. Tighten any connections that are loose.

6.4 Cleaning the pump

CAUTION

Do not use cleaning materials based on strong alkalis, aggressive or chlorinated solvents.

CAUTION

Do not use cleaning materials containing abrasives.

Inspect the pump annually (or as part of any scheduled preventative maintenance schedule) and, if necessary, wipe the outside clean with a soft lint free cloth and a proprietary cleaning material based on demineralised water or isopropanol.

6.5 Service the EPX pump

The service interval for the EPX series of dry pumps is shown in Table 16. Major service is outside the scope of this manual and must be carried out by qualified Edwards Service personnel: contact the supplier or Edwards to arrange a major service.

For removal of the pump for maintenance refer to Section 7.

Table 16 - Maintenance plan

Operation	Frequency	Refer to Section
Inspect the pipelines and connections	Annually or as part of a preventative maintenance schedule	6.3
Cleaning the pump	Annually or as part of a preventative maintenance schedule	6.4
Service the EPX L/LE pump Service the EPX N/NE pump Service the EPX TWIN pump (all variants)	Pump service requirements are largely determined by the pump's operating environment and application. Service intervals range from 2 to 5 years. Please contact the local Edwards service representative for further advice on a suitable maintenance schedule.	6.5

- * Main factors that will affect the service intervals of the EPX pump are:
 - *The ambient temperature in which the pump runs* - Higher ambient temperatures will result in shorter service intervals (refer to Table 6 for the ambient operating temperature range)
 - *The temperature and flow rate of the cooling water delivered to the pump* - higher water temperatures and a lower flow rates will result in shorter service intervals (refer to Table 9 for cooling water supply details)
 - *Rapidity of cycling* - rapid cycling applications will result in shorter service intervals
 - *Application* - processes that require a Nitrogen purge (EPX N-series pumps) will typically result in shorter service intervals

6.6 Fault finding

Refer to Table 17 and 18 for fault finding.

Table 17 - Fault finding

Symptom	Check	Action
The Power LED does not illuminate when the electricity supply is switched on	Is the electrical supply correctly connected?	Ensure that the electrical supply is correctly connected to the EPX pump; refer to Section 3.9 and 3.10.
The Run LED does not illuminate, or the pump running status output signal is open, when the start signal is set	Is the EPX pump incorrectly connected to the control equipment?	Ensure that the connections between the control equipment and the interface connector are correct; refer to Section 3.11
The pump alarm status output signal is open and the Alarm LED is off	Is the pump incorrectly connected to the control equipment?	Ensure that the connections between the control equipment and the interface connector are correct to Section 3.11.
The pump alarm status output signal is open and the Alarm LED is illuminated	Has the cooling water supply failed?	Allow the EPX pump to cool down for at least 20 minutes. Ensure that the cooling water supply is correctly connected to the EPX pump, and is switched on and meets the flow and pressure requirements of Section 2.4. Restart the pump.
A whistling sound is heard as the pump decelerates	Has the run signal been removed and then re-applied before the pump has stopped?	Removal and re-application of the run signal may cause a low volume noise, but it is not harmful to the pump. It is recommended that the pump be allowed to come to a halt before the run signal is re-applied.
The pump warning status output signal is open and the warning LED is illuminated	Is nitrogen gas flowing?	Check nitrogen purge gas is flowing into the gas module. If gas is flowing and the warning does not clear, contact the nearest Edwards service centre.
Other		Contact the nearest Edwards service centre.

Table 18 - EPX EUC alarms and warnings

Message on PDT	Description	Action
ALARM 101 Watchdog Reset	EUC controller fault.	Cycle power off and on. If fault still present, contact Edwards representative
ALARM 101 STOP ACTIVATED	The emergency trip circuit has triggered, and the inverter is disabled.	Reset the emergency stop circuit. Allow the pump to stop completely. Restart the pump.
WARNING 101 POWER INTERRUPT	A power loss of more than half a second has occurred. This warning is shown as the power is removed.	Restore power. Restart the pump.
WARNING 113 PCA FAULT	General Input/Output fault on EUC.	Cycle the power off and on. If fault still present, contact Edwards representative.
WARNING 312 CURRENT HIGH	Inverter has indicated over-current.	Monitor the pump. If the problem persists, stop the pump, remove power and contact Edwards representative.
ALARM 501 PUMP TEMP HIGH	Inverter has received a Pump Thermal Overload input.	Remove power to the pump. Check that cooling water flow rate is at least 2 l/min and other services are correctly supplied. Allow the pump to cool down completely. Restart the pump. If the problem persists, contact Edwards representative.
WARNING 3501 N ₂ FLOW LOW	Nitrogen flow low; need to check gas supply.	Check the nitrogen flow rate to the pump. Ensure that supply exceeds 17 slm. If problem persists, contact Edwards representative.
ALARM 7001 INVERTER STOPPED	Inverter running signal has not been received for more than 20 seconds whilst the pump should be running. Usually caused by a dip in the 3-phase supply.	Remove power. Check that the power supply is at full strength. Apply power and restart the pump. If the problem persists, contact Edwards representative.
ALARM 17601 INVERTER FAULT	Inverter has indicated a major fault/trip condition across the serial link.	Remove power to the pump. Check that cooling water flow rate is at least 2 l/min and other services are correctly supplied. Allow the pump to cool down completely. Restart the pump. If the problem persists, contact Edwards representative.
ALARM 17601 NO RUN SIGNAL	Inverter has not indicated 'Running' across the serial link when commanded 'On'. This will occur after a thermal trip if the pump has not been allowed to cool for long enough.	Remove power to the pump. Check that cooling water flow rate is at least 2 l/min and other services are correctly supplied. Check exhaust line is not blocked and pump inlet is clear. Allow the pump to cool down completely. Restart the pump. If the problem persists, contact Edwards representative.
WARNING 17601 INVERTER FAULT	Inverter has indicated a minor fault/trip condition across the serial link.	Remove power to the pump. Check that cooling water flow rate is at least 2 l/min and other services are correctly supplied. Allow the pump to cool down completely. Restart the pump. If the problem persists, contact Edwards representative.
WARNING 17613 INVERTER FAULT	Lost communication with inverter.	No action is required unless the pump is stopped, in which case, remove the power to the pump (for example, by operating the EMS circuit).

7 Storage and disposal



WARNING

Lockout/tagout process delivery and the electrical and nitrogen purge supplies to the pump before the pump is disconnected from the system.



WARNING

Inlet and exhaust temperatures can exceed 65 °C in a fault condition.

CAUTION

In the event of a pump seizure, dust is generated as a result of contact between the rotating and static surfaces. This dust may contain aluminium sulphate in low concentrations and may be accompanied by a slightly sulphurous smell.

It is recommended that when dealing with a pump which may have seized the use of gloves, eye protection and a paper face mask.

7.1 Storage

When the pump is disconnected from the vacuum system, avoid contact with, or inhalation of any gases or particulates that may still be present in the pump.

Store the pump as follows:

1. Ensure that the EPX has been shut down as described in Section 5, then disconnect the pump from the electrical supply.
2. Allow the pump to cool for approximately 30 minutes before disconnecting the water to the pump. Drain the water from the cooling circuit. Place a suitable container under the water outlet connector connection (Figure 2, item 9) and connect a suitable connector along with a short length of hose for a drain. Fit an airline (maximum pressure 100 psi) to a second spare connector and connect it to the pump water inlet connector connection (Figure 2, item 4). Blow the water out of the cooling circuit then remove the drain fittings.
3. Disconnect the pump inlet (Figure 2, item 1) and pump exhaust (Figure 2, item 8) from the system.
4. Fit blanking caps to the pump inlet (Figure 2, item 1) and pump exhaust (Figure 2, item 8).
5. Store the pump in clean dry conditions until required.
6. When required for use, prepare and install the pump as described in Section 3 of this manual.

7.2 Disposal

Do not dispose of the EPX pump. Return the pump to Edwards (UK) in suitable packaging, following the return of Edwards equipment forms at the rear of this manual.

The majority of the EPX packaging is made from recycled and/or recyclable materials. Contact Edwards for further details.

Take particular care with the following:

- Fluoroelastomers which may have decomposed as the result of being subjected to high temperatures.
- Components which have been contaminated with dangerous process substances. Contaminated components must be disposed of in accordance with local legislative requirements. Any remaining materials mentioned in Section 2.6, with the exception of O-rings, may be recycled.

8 Service, spares and accessories

8.1 Introduction

Edwards products, spares and accessories are available from Edwards companies in Belgium, Brazil, China, France, Germany, Israel, Italy, Japan, Korea, Singapore, United Kingdom, U.S.A and a world-wide network of distributors. The majority of these centres employ Service Engineers who have undergone comprehensive Edwards training courses.

Order spare parts and accessories from the nearest Edwards company or distributor. When ordering, state for each part required:

- Model and Item Number of the equipment
- Serial number
- Item Number and description of part

8.2 Service

Edwards products are supported by a worldwide network of Edwards Service Centres. Each Service Centre offers a wide range of options including: equipment decontamination; service exchange; repair; rebuild and testing to factory specifications. Equipment which has been serviced, repaired or rebuilt is returned with a full warranty.

The local Service Centre can also provide Edwards engineers to support on-site maintenance, service or repair of the equipment.

For more information about service options, contact the nearest Service Centre or other Edwards company.

Table 19 - Accessory kits

Kit Type	Item Number	Use
Upgrade kit	A41900826	IPX100/100A/CNET to EPX180 Products
Upgrade kit	A41900827	IPX180/CNET to EPX180 Products
Upgrade kit	A41900833	IPX180/CNET to EPX180 Products
Upgrade kit	A54100023	IPX100/100A/CNET to iXL120 Products
Upgrade kit	A54100024	IPX180/CNET to iXL120 Products
Protection box accessory:		Provides supply protection and configurable EMO/EMS circuits.
200/208 V a.c., 50/60 Hz	D37330000	
400 V a.c., 50/60 Hz	D37331000	
Pump display terminal (PDT)	D37272000	Allows remote operation via the End User Controller.

Return the equipment or components for service

Before you send your equipment to us for service or for any other reason, you must send us a completed Declaration of Contamination of Vacuum Equipment and Components - Form HS2. The HS2 form tells us if any substances found in the equipment are hazardous, which is important for the safety of our employees and all other people involved in the service of your equipment. The hazard information also lets us select the correct procedures to service your equipment.

We provide instructions for completing the form in the Declaration of Contamination of Vacuum equipment and Components - Procedure HS1.

If you are returning a vacuum pump, note the following:

- If a pump is configured to suit the application, make a record of the configuration before returning the pump. All replacement pumps will be supplied with default factory settings.
- Do not return a pump with accessories fitted. Remove all accessories and retain them for future use.
- The instruction in the returns procedure to drain all fluids does not apply to the lubricant in pump oil reservoirs.

Download the latest documents from www.edwardsvacuum.com/HSForms/, follow the procedure in HS1, fill in the electronic HS2 form, print it, sign it, and return the signed copy to Edwards.

Note: *If we do not receive a completed HS2 form, we will not accept the return of the equipment.*