

# Instruction Manual

*EH Mechanical Booster Pumps*

L160-7960011-00-V  
T960203



**EDWARDS**

**EDWARDS HIGH VACUUM INTERNATIONAL**

One Edwards Park  
301 Ballardvale Street  
Wilmington, MA 01887

Phone: 1-800-848-9800 Fax: 508-657-6546

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#### RETURN OF EDWARDS EQUIPMENT

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## Associated publications

Publication title	Publication Number
Vacuum pump and vacuum system safety	P300-20-000



# 1 INTRODUCTION

## 1.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for the Edwards EH250, EH500A, EH1200, EH2600 and EH4200 Mechanical Booster Pumps. The Item Numbers for the products are listed in Section 2.7. You must use your pump as specified in this manual.

Read this manual before you install and operate your pump. Important safety information is highlighted as WARNING and CAUTION instructions; you must obey these instructions. 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.

### CAUTION

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

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

## 1.2 Description

### 1.2.1 General

Edwards EH Mechanical Booster Pumps are compact and have high pumping speeds. You must use the EH Mechanical Booster Pump with a suitable backing pump. The EH Mechanical Booster Pumps can operate with a maximum continuous inlet pressure of 1000 mbar. Low system pressures can be achieved by using two or more mechanical booster pumps in series.

The pump coupling-cover is connected to the pump outlet and forms an integral part of the vacuum system. The connecting lines have a filter which removes debris and so prevents contamination of the lubricating oil and bearings. For an even cleaner system, the coupling-cover and bearings can be evacuated by connection to the pump-inlet or to an external vacuum pump.

Two versions of the EH pumps are available. The standard versions use mineral oil, such as Edwards No. 16. Versions for use with PFPE (perfluoropolyether) oils are also available for vacuum systems in which oxygen or other reactive or corrosive gases are pumped. All pumps have ISO inlet-flange and outlet-flange connections.

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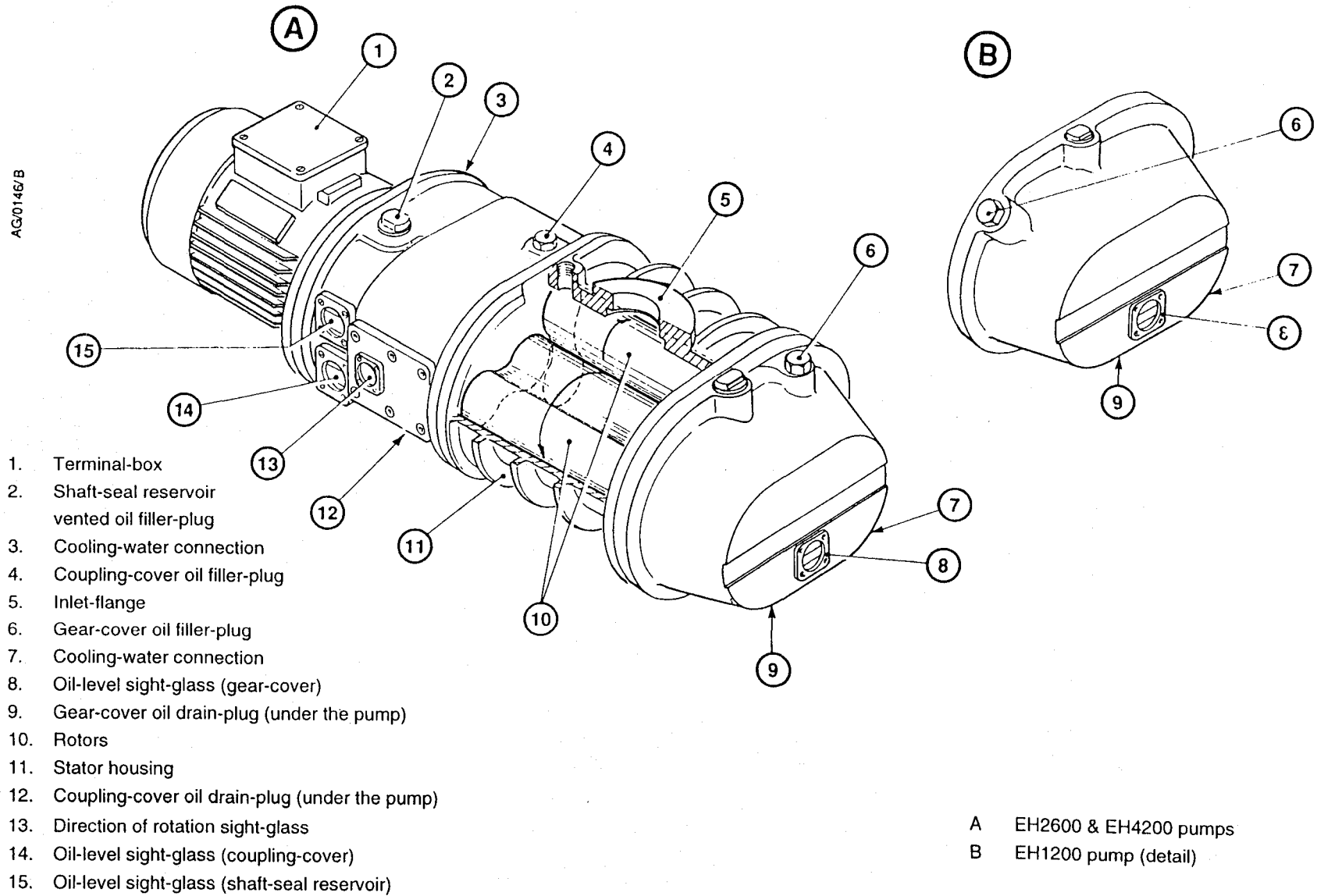


Figure 2 - EH1200/2600/4200 Mechanical Booster Pumps (part cut-away)

## 2 TECHNICAL DATA

### 2.1 General

Overall dimensions	See Figures 3 to 6
Mass	
EH250	61 kg
EH500A	74 kg
EH1200	149 kg
EH2600	308 kg
EH4200	400 kg
Ambient operating temperature range	5 to 40 °C (see Note 1 below)
Storage temperature range	-10 to 80 °C
Maximum operating humidity	90% RH
Protection degree (as defined by IEC 529)	IP44
Recommended cooling-water flow (with inlet temperature of 20 °C)	
EH1200	120 lh <sup>-1</sup> (see Note 2 below)
EH2600	250 lh <sup>-1</sup>
EH4200	250 lh <sup>-1</sup>
Recommended cooling-water supply pressure	2 to 6 bar gauge (3 to 7 bar absolute, 3 x 10 <sup>5</sup> to 7 x 10 <sup>5</sup> Pa)
Recommended oil type	
Standard pumps	Ultragrade 20 (see Note 3 below)
PFPE pumps	Fomblin YVAC 16/6 (see Note 3 below)
Recommended grease type (for use with EH250/EH500A pumps)	Fomblin RT15 (see Note 3 below)
Oil capacity	See Table 1 below

	EH250	EH500A	EH1200	EH2600	EH4200
Gear-cover	-	-	1.4	3.5	3.5
Coupling-cover	1.7	1.7	2.6	7.3	7.3
Shaft-seal reservoir	0.26	0.26	0.5	1.5	1.5

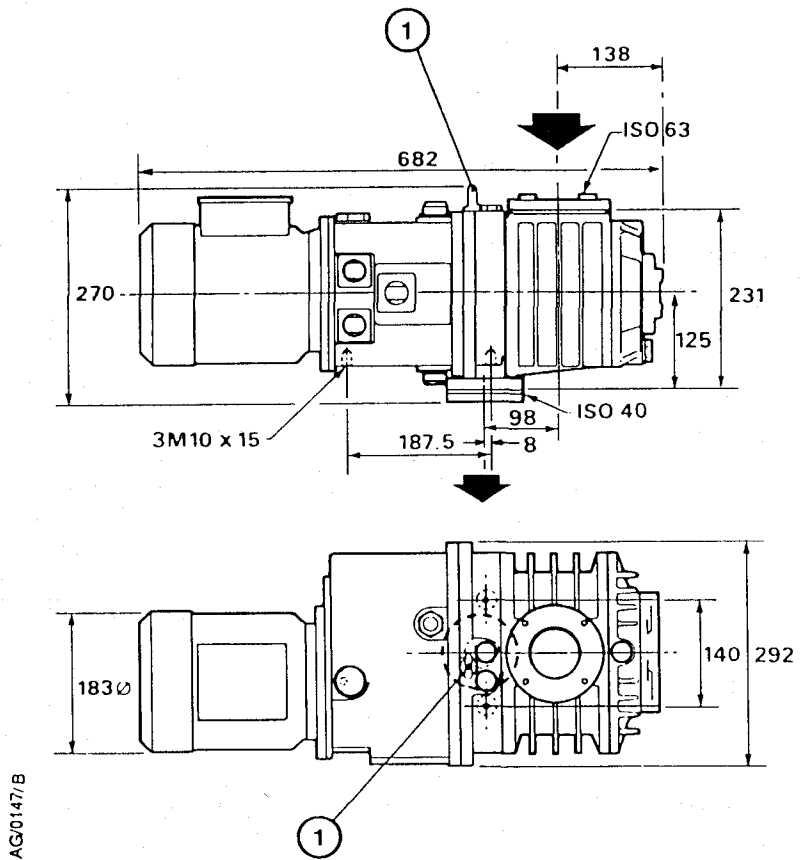
Table 1 - Lubrication capacities (litres)

Note 1: For operation outside this temperature range contact Edwards for advice. Between -30 °C and 5 °C, special precautions must be taken.

Note 2: You can operate the EH1200 continuously without cooling-water if the inlet pressure is kept below 5 mbar (5 x 10<sup>2</sup> Pa) and the pumpdown time is no longer than 10 minutes.

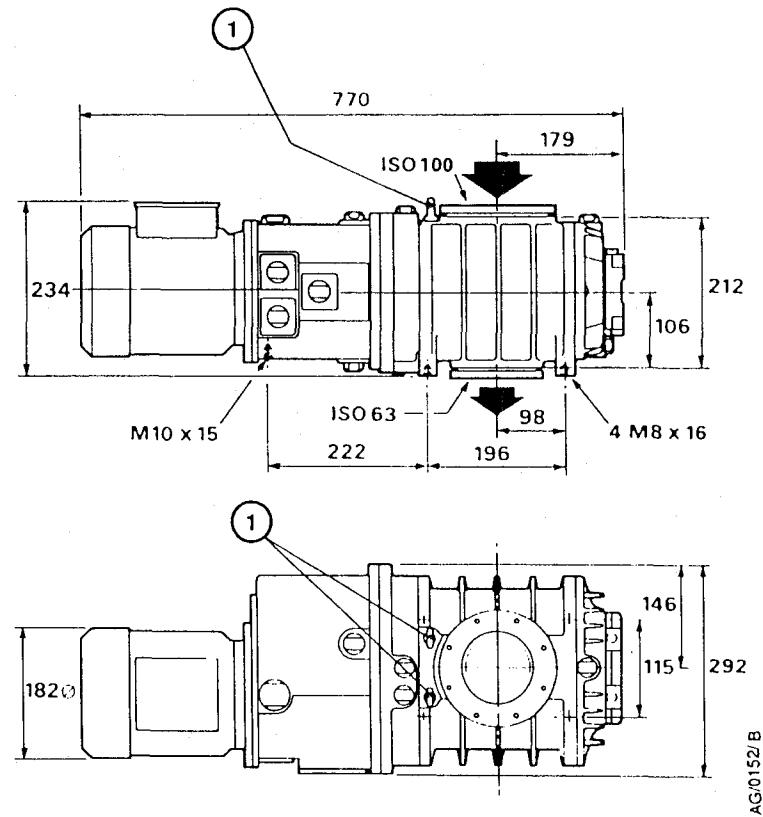
Note 3: Edwards Health and Safety Data sheets for the above oils and grease are available on request.





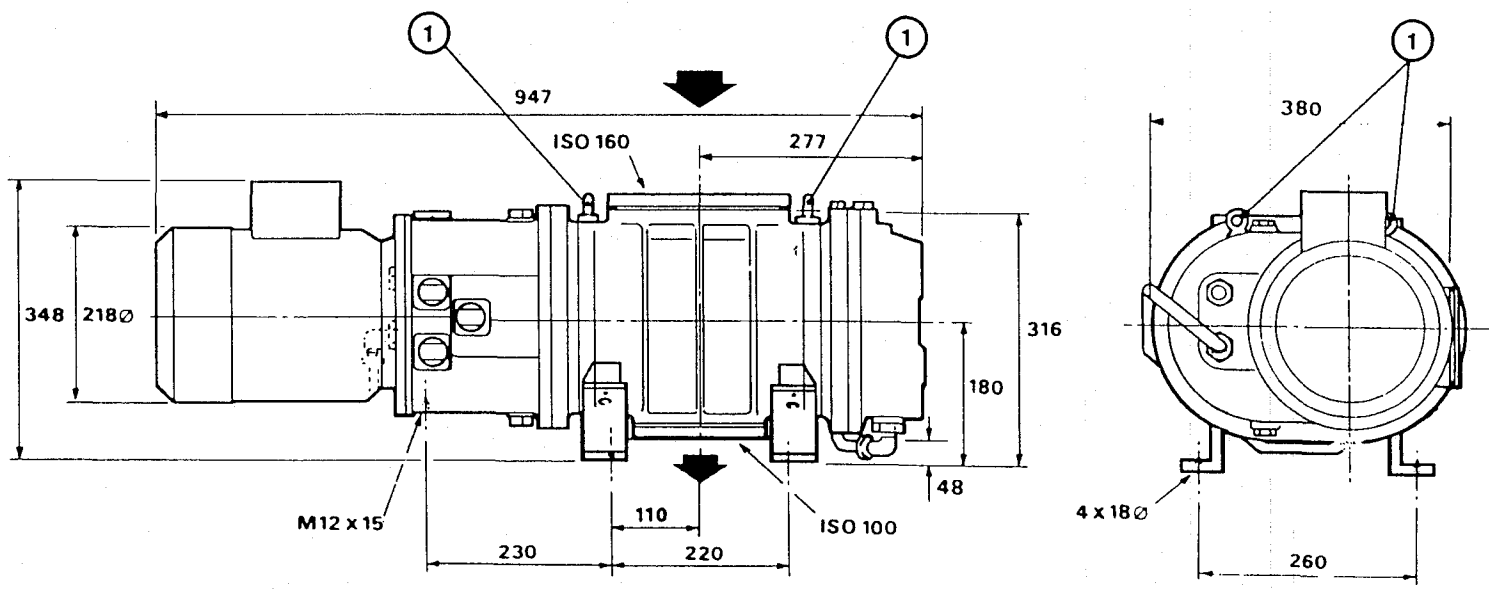
1. Lifting point

Figure 3 - EH250 dimensions (mm)



1. Lifting point

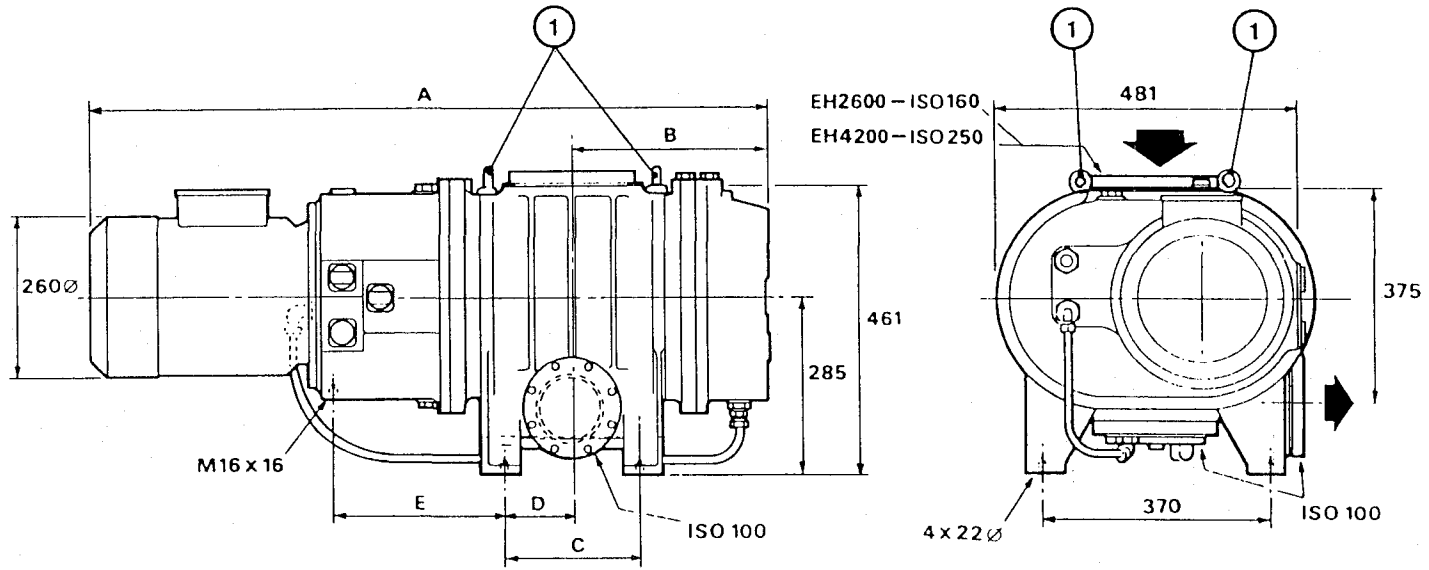
Figure 4 - EH500A dimensions (mm)



1. Lifting point

Figure 5 - EH1200 dimensions (mm)

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AG 0149/B

1. Lifting point

	A	B	C	D	E
EH2600	1093	312	220	110	275
EH4200	1273	402	370	185	290

Figure 6 - EH2600/4200 dimensions (mm)

## 2.2

### Performance

Rotational speed (50 Hz supply)	0 to 2900 r.min <sup>-1</sup>
Rotational speed (60 Hz supply)	0 to 3500 r.min <sup>-1</sup>
Total pressure (single-stage backing pump, with gas-ballast)	2 x 10 <sup>-2</sup> mbar absolute (2 Pa)
Ultimate pressure (single-stage backing pump without gas-ballast, permanent gases)	2 x 10 <sup>-3</sup> mbar absolute (2 x 10 <sup>-1</sup> Pa)
Total pressure (two-stage backing pump with gas-ballast)	1 x 10 <sup>-3</sup> mbar absolute (1 x 10 <sup>-1</sup> Pa)
Maximum outlet pressure (see Section 1.2.4)	1000 mbar absolute (1 x 10 <sup>5</sup> Pa)
Pressure differential across pump (determined by the hydrokinetic drive)	

Pump	50 Hz		60 Hz	
EH250	0 to 180 mbar	0 to 1.8 x 10 <sup>4</sup> Pa	0 to 150 mbar	0 to 1.5 x 10 <sup>4</sup> Pa
EH500A	0 to 110 mbar	0 to 1.1 x 10 <sup>4</sup> Pa	0 to 90 mbar	0 to 0.9 x 10 <sup>4</sup> Pa
EH1200	0 to 90 mbar	0 to 0.9 x 10 <sup>4</sup> Pa	0 to 75 mbar	0 to 0.75 x 10 <sup>4</sup> Pa
EH2600	0 to 80 mbar	0 to 0.8 x 10 <sup>4</sup> Pa	0 to 67 mbar	0 to 0.67 x 10 <sup>4</sup> Pa
EH4200	0 to 60 mbar	0 to 0.6 x 10 <sup>4</sup> Pa	0 to 50 mbar	0 to 0.5 x 10 <sup>4</sup> Pa

## 2.3

### Recommended backing pumps

Because of the flexibility of the hydrokinetic drive, there is a wide range of backing pumps which are suitable for use with the EH Mechanical Booster pumps. Select the backing pump which suits your process from the following list:

Pump	Recommended backing pumps
EH250	Edwards QDP40/80, E1M40/80 or E2M40/80
EH500A	Edwards QDP40/80, DP180, E1M40/80 or E2M40/80
EH1200	Edwards QDP80, DP180, E2M80/175/275
EH2600	Edwards DP180, E2M175 or E2M275
EH4200	Edwards DP180, ES7500 or E2M275

## 2.4

### Connections

#### 2.4.1 Vacuum connections

	Inlet	Outlet
EH250	ISO63	ISO40
EH500A	ISO100	ISO63
EH1200	ISO160	ISO100
EH2600	ISO160	ISO100
EH4200	ISO250	ISO100

## 2.4.2 Cooling-water connections

Inlet connection	$\frac{3}{8}$ inch BSP male
Outlet connection	$\frac{3}{8}$ inch BSP male

## 2.5 Electrical data

*Note: The motors of EH250 and EH500A pumps are supplied configured for 'low voltage' operation (240 V and lower), the motors of EH1200, EH2600 and EH4200 pumps are supplied configured for 'high voltage' operation (380 V and higher): refer to Section 3.6.*

Number of phases	3
Supply voltage	220-240 V/380-415 V at 50 Hz 208-230 V/460 V at 60 Hz
Voltage tolerance	±6%
Full load current ratings	See Table 2

Supply voltage & frequency →		208 V 60 Hz	220 V 50 Hz	230 V 60 Hz	240 V 50 Hz	380 V 50 Hz	415 V 50 Hz	460 V 60 Hz
EH250 & EH500A	Full load (A)	6.1	6.3	5.5	5.8	3.7	3.4	2.8
	Rating (kW)	1.5	1.5	1.5	1.5	1.5	1.5	1.5
EH1200	Full load (A)	11.9	11.1	10.7	10.2	6.4	5.9	5.4
	Rating (kW)	3	3	3	3	3	3	3
EH2600 & EH4200	Full load (A)	20.9	19.8	18.9	18.2	11.5	10.5	9.5
	Rating (kW)	7.5	7.5	7.5	7.5	7.5	7.5	7.5

Table 2 - Full load current ratings

## 2.6 Noise and vibration data

Continuous A-weighted sound pressure level measured  
at 1 metre from a major surface of the pump

EH250	72 dB (A)
EH500A	72 dB (A)
EH1200	76 to 77 dB (A)
EH2600	85 dB (A) (80 dB (A) with muffled fan)
EH4200	85 dB (A) (80 dB (A) with muffled fan)

Vibration

BS 4675

Class 1B grade

## 2.7 Product Item Numbers

Product Item Numbers for the different versions of the EH pumps are shown in Table 3.

	220-240 V/380-415 V 3-phase, 50 Hz		208-230 V/460 V 3-phase, 60 Hz	
	Standard	PFPE	Standard	PFPE
EH250	A301-51-935	A301-53-935	A301-52-936	A301-54-936
EH500A	A302-71-935	A302-73-935	A302-72-936	A302-74-936
EH1200	A305-90-935	A305-92-935	A305-91-936	A305-93-936
EH2600	A307-51-935	A307-53-935	A307-52-936	A307-54-936
EH4200	A309-51-935	A309-53-935	A309-52-936	A309-54-936

Table 3 - Product Item Numbers

## 3 INSTALLATION

### 3.1 Safety

#### WARNING

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

- A suitably trained and supervised technician must install your EH pump.
- Ensure that the installation technician is familiar with the safety procedures which relate to the products pumped. Wear the appropriate safety-clothing when you come into contact with contaminated components. Dismantle and clean contaminated components inside a fume-cupboard.
- Consult Edwards publication P300-20-000 (Vacuum pump and vacuum system safety) before you install and use the pump to process hazardous materials.
- Vent and purge the pumping system before you start installation work.
- Check that all the required components are available and of the correct type before you start work.
- Provide adequate access to all pump servicing points and oil-level sight-glasses.
- Disconnect the other components in the pumping system from the electrical supply so that they cannot be operated accidentally
- Do not reuse 'O' rings and Co-Seals
- Leak-test the system after installation work is complete to prevent leakage of hazardous substances out of the system and leakage of air into the system.

### 3.2 System requirements

Consider the following points when you design your pumping system:

- You must use a suitable backing pump: refer to Section 2.
- The mechanical booster pump must be mounted on a firm, level surface.
- Vacuum pipelines must be adequately supported to stop the transmission of stress to pipeline joints.
- If necessary, incorporate flexible pipelines in your system pipelines to reduce the transmission of vibration and to prevent loading of the coupling joints. If you use flexible pipelines, you must ensure that you use flexible pipelines which have a maximum pressure rating which is greater than the highest pressure that can be generated in your system.
- You must be able to isolate the pump-inlet and exhaust from the atmosphere and from your vacuum system if you will use or produce corrosive chemicals in the pump.
- Limit the maximum continuous gas heat-input to less than 200 W.

- Ensure that your design incorporates all appropriate safety precautions if toxic, inflammable or explosive gases or particulates will be pumped.
- You must be able to purge with an inert gas when you shut down the pumping system to dilute dangerous gases to safe concentrations. Consult Edwards or your supplier if you are in doubt.

If the pump is to be fitted in a new system, ensure that all preliminary pipelines have been installed and that a suitable base for the pump has been prepared before you start installation. Check that the following services and facilities are available for connection to the pump:

- Cooling-water supply and return
- Electrical supply
- Exhaust-extraction system.

Ensure that debris does not get into the pump when you install it. If the pump is to replace a pump in an existing system, purge the existing pump with nitrogen for 15 minutes before you disconnect it.

### 3.3 Unpack and inspect

Use the following procedure to unpack and inspect the pump:

1. Place the pallet in a convenient position with a fork lift truck or a pallet truck.
2. Remove all packing materials.
3. Use suitable lifting-gear attached to the lifting-eyes provided on the pump to remove the pump from its pallet. Do not try to lift the pump by hand (see Section 2 for the mass of your pump).
4. Remove all protective covers and inspect the pump. If the pump is damaged, notify your supplier and the carrier in writing within three days; state the Item Number of the pump together with your order number and your supplier's invoice number. Retain all packing materials for inspection. Do not use the pump if it is damaged.
5. If the pump is not to be used immediately, refit the protective covers. Store the pump in suitable conditions as described in Section 6.1.



## 3.4 Fill the pump with oil

### WARNING

Ensure that the correct vented filler-plug (clearly labelled) is refitted in the shaft-seal reservoir. If you use a non-vented plug, the reservoir will be pressurised, the oil seals may be damaged and the oil sight-glass may fracture.

### CAUTION

Ensure that the pump is filled with the correct amount of oil. Too much or too little oil will reduce pump performance and may damage the pump.

### 3.4.1 Coupling-cover

Fill the coupling-cover with oil as described below. Refer to Figures 1 and 2 for the location of the filler-plug and sight-glass.

1. Remove the coupling-cover oil filler-plug.
2. Fill the coupling-cover with oil until the oil-level reaches the top of the reflector plate in the oil sight-glass (see Figure 7).
3. Refit the coupling-cover oil filler-plug.

### 3.4.2 Shaft-seal reservoir

### CAUTION

The oil-level must not be lower than the top of the reflector plate in the shaft-seal sight-glass. If it is, the oil-level is too low.

*Note: Some early model pumps are fitted with an all-metal vented filler-plug (that is, there is no plastic insert in the filler-plug). On these pumps, the shaft-seal sight-glass should be full. If it is not, the oil-level is too low and you must fill the reservoir to the bottom thread of the vented filler-plug.*

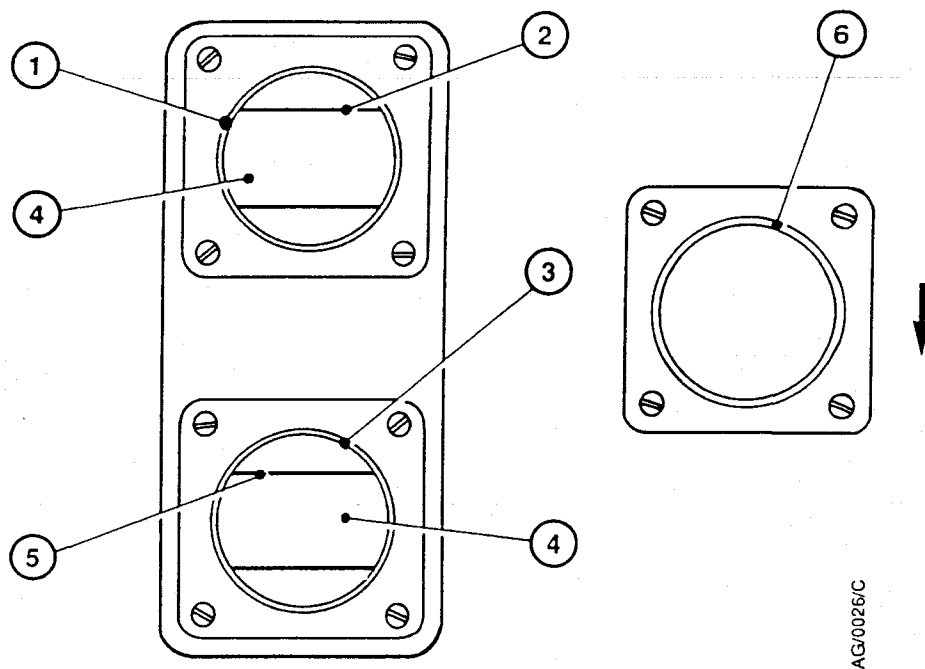
Fill the shaft-seal reservoir with oil as described below. Refer to Figures 1 and 2 for the location of the filler-plug and sight-glass.

1. Remove the shaft-seal reservoir vented filler-plug.
2. Fill the shaft-seal reservoir with oil to the top of the reflector plate in the shaft-seal sight-glass (see Figure 7). You must use the same type of oil as that used to fill the coupling-cover.
3. Refit the vented filler-plug.

### 3.4.3 Gear-cover

Fill the gear-cover on EH1200, EH2600 and EH4200 pumps as described below.

1. Remove the gear-cover filler-plug (Figure 2, item 6).
2. Fill the gear-cover with oil until the oil level is just below the top of the reflector plate in the gear-cover sight-glass (Figure 2, item 8).
3. Refit the oil filler-plug.



- |                                     |  |
|-------------------------------------|--|
| 1. Shaft-seal reservoir sight-glass | 5. Coupling-cover oil-level  |
| 2. Shaft-seal reservoir oil-level   | 6. Direction of rotation sight-glass<br>(the arrow shows the correct<br>direction of rotation) |
| 3. Coupling-cover sight-glass       |  |
| 4. Sight-glass reflector plate      |  |

Figure 7 - Sight-glasses

### 3.5 Cooling-water connections (EH1200, EH2600 and EH4200 pumps only)

*Note:* You can operate the EH1200 continuously without cooling-water if the inlet pressure is kept below 5 mbar ( $5 \times 10^2$  Pa) and the pumpdown time is no longer than 10 minutes.

Connect the cooling-water supply and return lines to the  $\frac{3}{8}$  inch BSP connectors. One connector is on the rear of the coupling-cover, the other connector is on the underside of the gear-cover. You can connect the supply and return lines to either of the connectors; the direction of cooling-water flow is not important.

Refer to Section 2 for the minimum cooling-water flow rate required. Do not allow the cooling-water supply pressure to go above the maximum pressure stated in Section 2.

### 3.6 Electrical connections

#### WARNING

The pump must be connected to an electrical earth.

#### 3.6.1 Electrical supply configuration

The motors of the EH250 and EH500A pumps are supplied configured for 'low-voltage' operation (240 V and lower).

The motors of the EH1200, EH2600 and EH4200 pumps are supplied configured for 'high-voltage' operation (380 V and higher).

Refer to Table 4 before you connect the electrical supply to the pump motor (as described in Section 3.6.2). Table 4 tells you which figure you must refer to for the electrical connections for your pump and your electrical supply.

Electrical supply voltage and frequency	Refer to Figure	
	EH250/500A	EH1200/2600/4200
208 V, 60 Hz	10	12
220 V, 50 Hz	8	8
230 V, 60 Hz	10	12
240 V, 50 Hz	8	8
380 V, 50 Hz	9	9
415 V, 50 Hz	9	9
460 V, 60 Hz	11	11

Table 4 - Electrical supply connection configurations

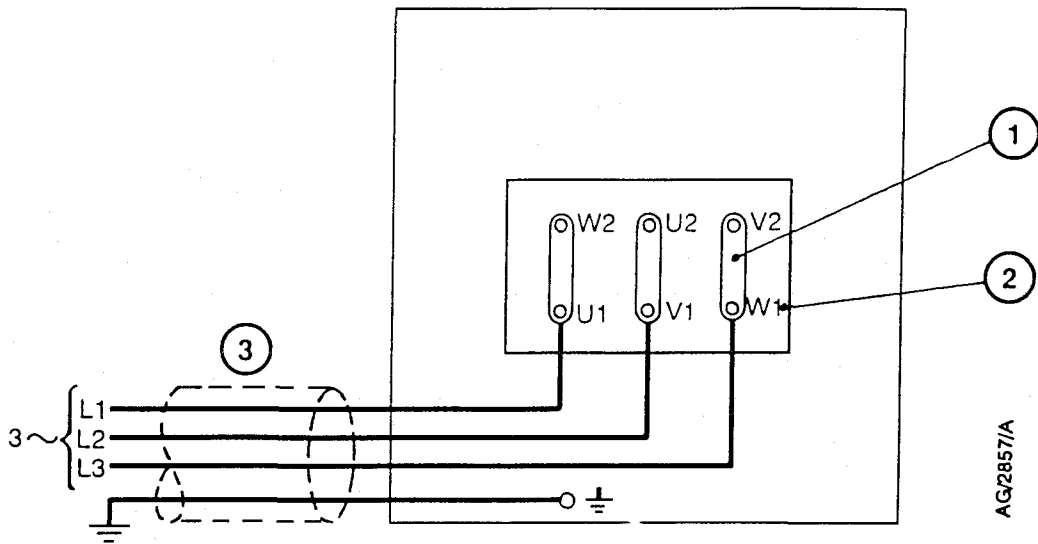
### 3.6.2 Motor connections

#### CAUTION

The motor must be correctly configured and you must make the correct electrical connections for your electrical supply. If you do not, you can damage the motor.

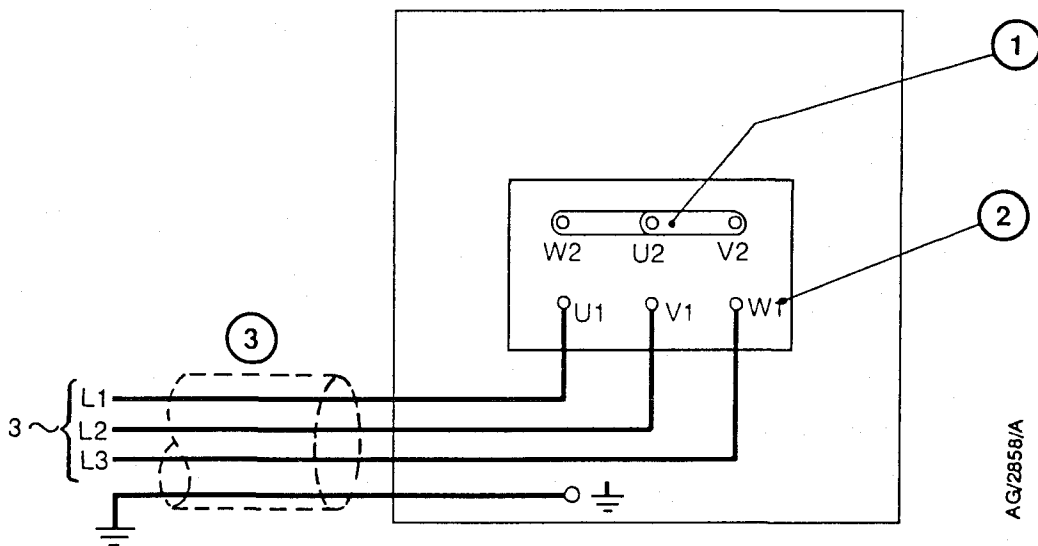
Connect the motor to the electrical supply as described below. Connect the supply through a contactor which has overload-protection or use a controller which incorporates a contactor. You must use a contactor which has a manual reset control. If you do not, the pump could automatically restart after an electrical overload or an electrical supply failure.

1. Remove the motor terminal-box cover (Figures 1 and 2, item 1).
2. Check your electrical supply voltage and frequency. If necessary, configure the motor to operate with your supply voltage (see Section 3.6.1).
3. Remove the plug from the cable-entry hole that you will use for the electrical supply cable. Choose the most suitable hole for your application.
4. Fit a suitable 20 mm cable-gland to the hole. If your cable is too large to fit through a 20 mm cable-gland, fit a 20 mm male to 25 mm female thread-adaptor to the cable-entry hole, and fit a 25 mm cable-gland to the adaptor. The cable-gland (and adaptor, if fitted) must provide a protective seal to IP44 (or higher), as defined by IEC 529.
5. Pass the electrical supply cable through the cable-gland.
6. Connect the wires of the cable to the appropriate terminals, as shown in Figures 8 to 12 (refer to Table 4).
7. Tighten the cable-gland and refit the terminal-box cover.



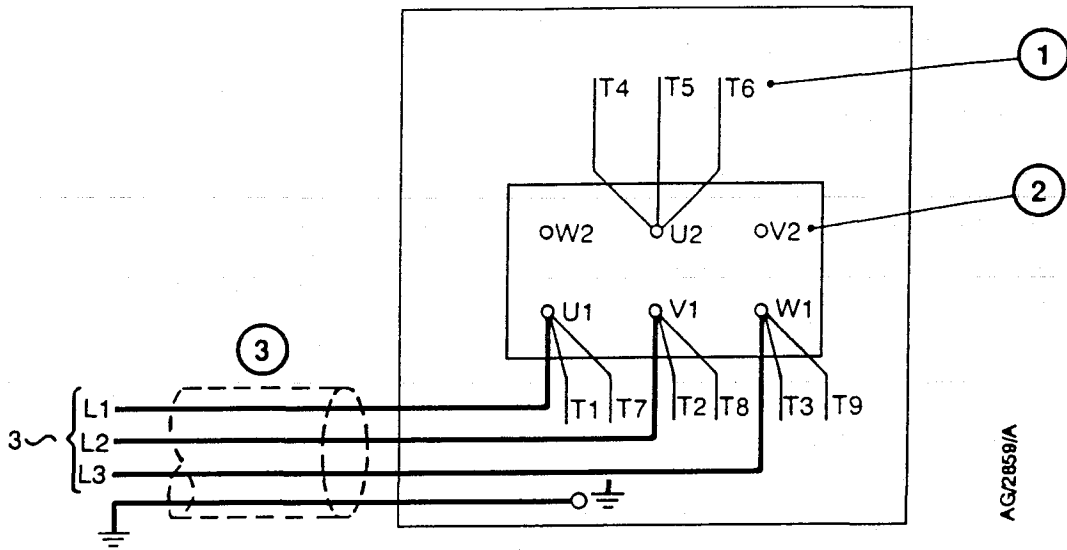
1. Links
2. Terminal markings
3. To electrical supply

Figure 8 - Electrical supply connection: EH250/500A/1200/2600/4200: 220 to 240 V, 50 Hz



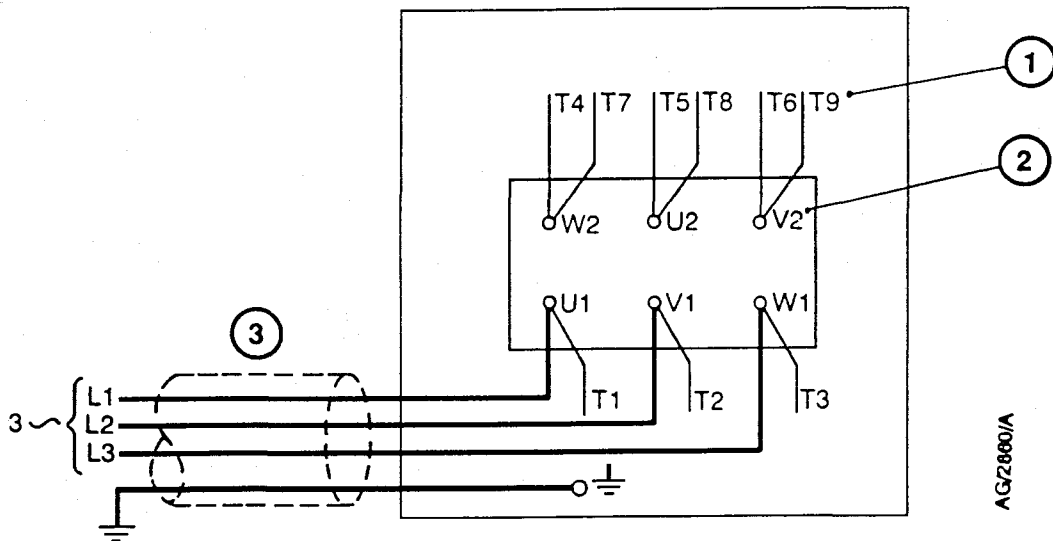
1. Links
2. Terminal markings
3. To electrical supply

Figure 9 - Electrical supply connection: EH250/500A/1200/2600/4200: 380 to 415 V, 50 Hz



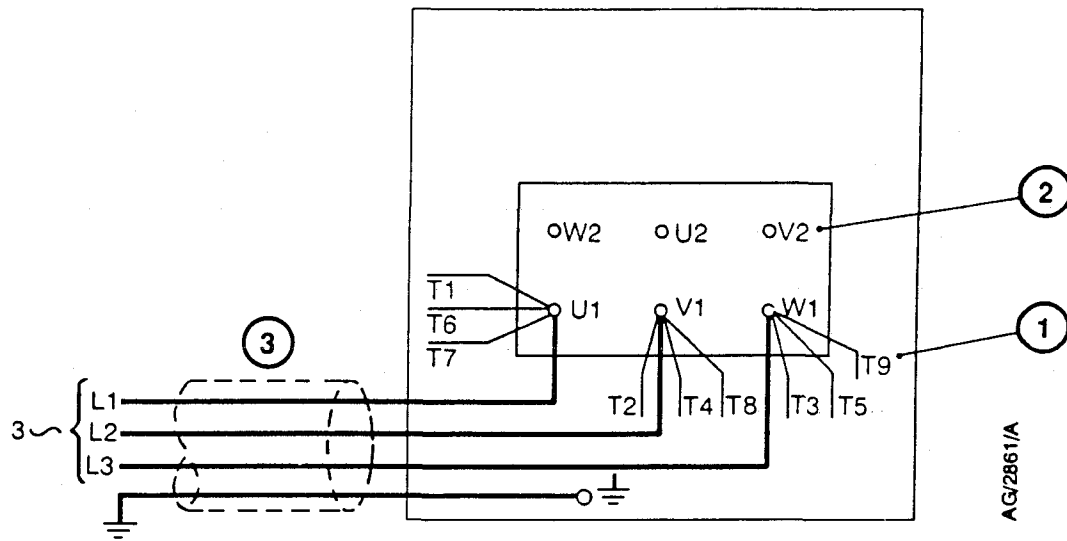
1. Motor wire markings
2. Terminal markings
3. To electrical supply

Figure 10 - Electrical supply connection: EH250/500A: 208 to 230 V, 60 Hz



1. Motor wire markings
2. Terminal markings
3. To electrical supply

Figure 11 - Electrical supply connection: EH250/500A/1200/2600/4200: 460 V, 60 Hz



1. Motor wire markings
2. Terminal markings
3. To electrical supply

Figure 12 - Electrical supply connection: EH1200/2600/4200: 208 to 230 V, 60 Hz

### 3.7 Check the pump rotation

#### WARNING

Blank the inlet or connect the pump to the vacuum system before you check the direction of pump rotation. If you do not, there is danger of objects being trapped in the rotating rotors.

It is possible for the three-phase electrical supply to the motor to be phased incorrectly. If the supply is phased incorrectly, the rotors will rotate slowly in the reverse direction or remain stationary. Look through the direction of rotation sight-glass in the coupling-cover (Figure 1, item 10 and Figure 2, item 13) to check the direction of rotation of the motor-coupling. An enlarged view of the sight-glass is shown in Figure 7. The correct direction of rotation is indicated by an arrow. Check the direction of rotation as described below.

1. Check that the pump is connected to the vacuum system or that the inlet is blanked off.
2. Connect the backing pump and switch the backing pump on.
3. Watch the motor-coupling in the sight-glass (Figure 7, item 6) and switch on the EH pump for two or three seconds.
4. Check that the direction of rotation of the coupling is the same as that indicated by the rotation arrow on the motor and shown in Figure 7.
5. If the direction of rotation of the coupling is incorrect, switch off the backing pump and isolate the EH pump from the electrical supply. Reverse any two of the phase-wires in the motor terminal-box.
6. Repeat the check to ensure that the direction of rotation is now correct.

### 3.8 Connect the pump-inlet and outlet

Pump-inlet and outlet connections are made with standard ISO flanges, Edwards trapped 'O' rings and (on the EH250 pump only) an Edwards Co-Seal.

The EH2600 and EH4200 pumps have two alternative outlet positions :

- on the underside of the pump
- at the side of the pump.

As supplied, these pumps are configured to use the outlet at the side of the pump and the flange on the underside of the pump is blanked off. If you do not wish to use the side outlet, remove the blanking-plate from the outlet on the underside of the pump and refit the blanking-plate over the side outlet-flange.



Take note of the following when you connect your EH pump to the vacuum system.

- Move the pump to the required location and ensure that it is level and secure.
- For optimum pumping speeds, ensure that the pipeline connected to the pump-inlet is as short as possible and has a bore size not less than the inlet port diameter.
- Use a flexible connection in the pipeline from the vacuum system to the pump to reduce vibration and stress in the system pipelines (see Section 3.2).
- On very dusty applications, use a low-impedance inlet-filter to minimise abrasion in the pump.

### **3.9 External evacuation of coupling-cover (optional)**

The coupling-cover may be evacuated using an external pump. A description of the connections required is beyond the scope of this manual. Contact your supplier or your nearest Edwards company for advice if you wish to use this facility.

## 4 OPERATION

### 4.1 Operational safety

#### WARNING

Do not touch any part of the pump when it is switched on. Surfaces of the pump are very hot, especially at high inlet pressures, and can cause injury to people and damage to equipment.

If you operate the EH250 or EH500A pump in an area of poor ventilation, the temperature of the coupling-cover can reach 100 °C and above. Take all necessary precautions to avoid accidental contact with the coupling-cover; if necessary, use a pump enclosure or fit a guard to the pump.

If you operate the EH1200 pump with the inlet pressure higher than 4 mbar for a long period, the stator and the coupling-cover will reach very high temperatures. Take all necessary precautions to avoid accidental contact with the stator and the coupling-cover; if necessary, use a pump enclosure or fit a guard to the pump.

### 4.2 Start-up procedure

#### 4.2.1 Pre-start checks

1. Check that the pump oil-levels are correct (see Section 3.4).
2. Check that the pump is correctly installed, especially after initial installation and maintenance.

#### 4.2.2 Start-up

Start-up the pump as described in the procedure below. This procedure assumes that the pump and the vacuum system are at atmospheric pressure.

1. On EH1200, EH2600 and EH4200 pumps only : switch on the cooling-water supply and check that there is an adequate flow of cooling-water at the correct pressure (see Section 2.1).
2. Close all valves to atmospheric pressure and ensure that all other openings are closed.
3. Switch on the backing pump and open the backing valve (if fitted).
4. Switch on the mechanical booster pump.
5. Slowly open the pump-inlet isolation-valve (if fitted).
6. Allow the pump to run for approximately fifteen minutes to achieve normal operating temperature.
7. Check the water connections for leaks.

## 4.3

### Shut-down

1. Close the pump-inlet isolation-valve (if fitted).
2. Switch off the mechanical booster pump.
3. Open the backing pump air-admittance valve (if fitted) and switch off the backing pump.
4. On EH1200, EH12600 and EH4200 pumps only : turn off the cooling-water supply.

## 5 MAINTENANCE

### 5.1 Safety

#### WARNING

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

- A suitably trained and supervised technician must maintain the pump.
- Dismantle the pump in a clean workshop environment, with the correct tools and safety facilities available.
- Ensure that the maintenance technician is familiar with the safety procedures which relate to the products pumped. Wear the appropriate safety-clothing when you come into contact with contaminated components. Dismantle and clean contaminated components inside a fume-cupboard.
- Allow the pump to cool to a safe temperature before you start maintenance work.
- Vent and purge the pumping system with nitrogen before you start maintenance work.
- Check that all the required parts are available and of the correct type before starting work.
- Isolate the pump and other components from the electrical supply so that they cannot be operated accidentally.
- Re-check the pump rotation direction if the electrical supply has been disconnected.
- Do not reuse 'O' rings and Co-Seals.
- Dispose of components and waste oil safely (see Section 5.2).
- Take care to protect sealing-faces from damage.
- Do not touch or inhale the thermal breakdown products of fluorinated materials which may be present if the pump has been overheated to 260°C and above. These breakdown products are very dangerous. Fluorinated materials in the pump may include oils, greases and seals. The pump may have overheated if it was misused, if it malfunctioned or if it was in a fire. Edwards Health and Safety Data sheets for fluorinated materials used in the pump are available on request: contact your supplier or Edwards.
- Leak-test your system after installation and maintenance to prevent leakage of dangerous substances out of the system and leakage of air into the system.

The pump will be contaminated with the process chemicals that have been pumped. Ensure that you take adequate precautions to protect people from the effects of dangerous substances if contamination has occurred.

## 5.2 Maintenance plan

Table 5 details the maintenance operations necessary to maintain EH pumps in normal use. Instructions for each operation are given in the section shown.

More frequent maintenance may be required if the pump is used to pump corrosive or abrasive gases and vapours. If necessary, adjust the maintenance plan according to your experience.

Operation	Frequency	Refer to Section
Check the oil-levels	3 monthly	5.3
Inspect the pump connections	Monthly	5.4
Change the pump oil	As required	5.5
Lubricate the rear bearing (EH250/500A pumps only)	12 monthly	5.6

Table 5 - Maintenance plan

## 5.3 Check the oil-levels

### WARNING

Ensure that the correct vented filler-plug (clearly labelled) is refitted in the shaft-seal reservoir. If you use a non-vented plug, the reservoir will be pressurised, the seals may be damaged and the oil sight-glass may fracture.

### CAUTION

Ensure that the pump is filled with the correct amount of oil. Too much or too little oil will reduce pump performance and may damage the pump.

### CAUTION

The oil-level must be above the top of the reflector plate in the shaft-seal sight-glass.  
If it is not, the oil-level is too low.

*Note: If there is a loss of oil from the shaft-seal reservoir, the shaft-seal may have failed. The shaft-seal cannot be replaced by the user. Contact your supplier or an Edwards Service Centre for advice. If you have an early model pump, refer to the note in Section 3.4.2.*

Check the oil-levels in the sight-glasses as described below. Refer to Figures 1 and 2 for the location of the filler-plugs and sight-glasses. During normal operation, the coupling-cover sight-glass (Figure 7, item 6) may appear empty or show a froth because the oil is in circulation around the coupling.

1. Switch off the pump and allow it to cool.
2. Check that the oil-level is at the top of the reflector plate in the shaft-seal sight-glass. If the oil-level is low, remove the shaft-seal vented filler-plug and pour more oil into the reservoir until the oil-level is above the reflector plate.
3. Refit the shaft-seal vented filler-plug.
4. Check that the oil-level in the coupling-cover sight-glass is at the top of the reflector plate. If the oil-level is low, remove the coupling-cover filler-plug and pour more oil into the reservoir.
5. Refit the coupling-cover filler-plug.
6. On EH2600 and EH4200 pumps only:
  - Check that the oil-level in the gear-cover sight-glass is just below the top of the reflector plate.
  - If the oil-level is low, remove the gear-cover filler-plug and pour more oil into the gear-cover until the oil-level is just below the top of the reflector plate.
  - Refit the gear-cover filler-plug.

#### **5.4 Inspect the pump connections**

1. Check that the cooling-water connections are secure.
2. Inspect the cooling-water pipelines and connections for corrosion, leaks and damage.
3. Check that the electrical connections are secure.
4. Check the electrical supply cables for damage.
5. Inspect all the vacuum pipelines for corrosion and damage. Check that all the vacuum connections are secure.

## 5.5 Change the pump oil

### WARNING

Ensure that the correct vented filler-plug (clearly labelled) is refitted in the shaft-seal reservoir. If you use a non-vented plug, the reservoir will be pressurised and the oil sight-glass may fracture.

### CAUTION

Ensure that the pump is filled with the correct amount of oil. Too much or too little oil will reduce pump performance and may damage the pump.

Replace the pump oil as described below. Refer to Figures 1 and 2 for the location of the oil-filler and drain-plugs.

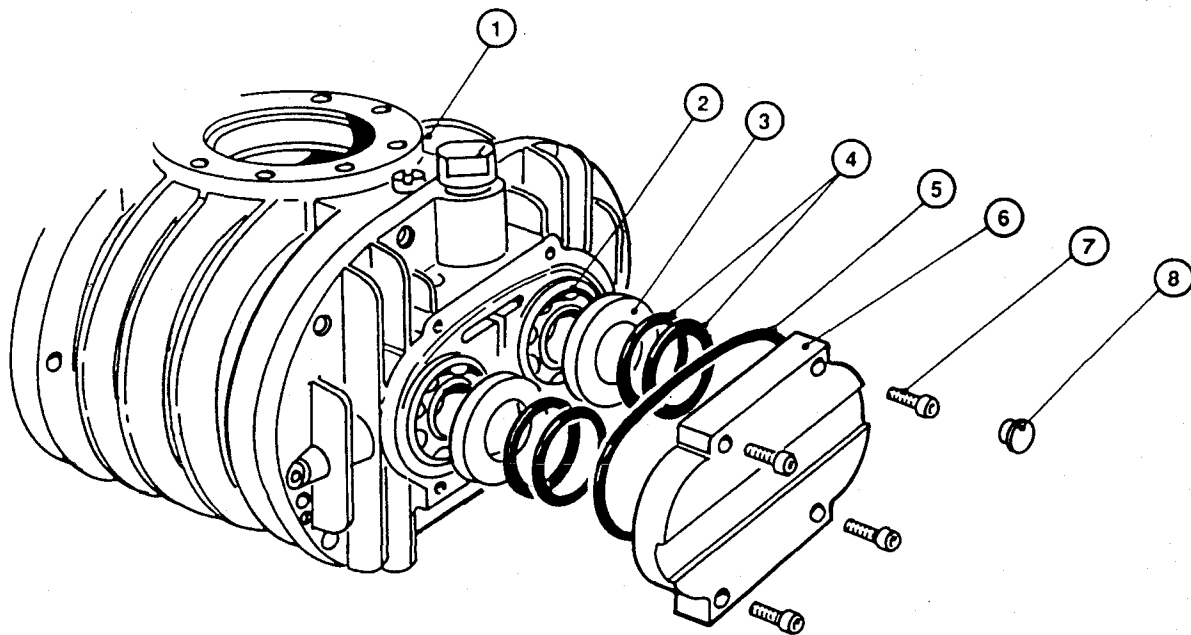
1. Switch off the pump and allow it to cool.
2. Remove the coupling-cover filler-plug.
3. Remove the drain-plug from the underside of the coupling-cover and allow the oil to drain into a suitable container.
4. Remove the shaft-seal vented filler-plug. Use a suitable pump to suck the oil out of the shaft-seal reservoir.
5. Refit the coupling-cover drain-plug and pour oil into the reservoir until the oil-level reaches the top of the reflector plate. Refit the coupling-cover filler-plug.
6. Pour oil into the shaft-seal reservoir until the oil-level reaches the top of the reflector plate in the oil-level sight-glass.
7. Refit the shaft-seal vented filler-plug.
8. On EH1200, EH2600 and EH4200 pumps only:
  - Remove the gear-cover filler-plug.
  - Remove the drain-plug from the underside of the gear-cover and allow the oil to drain into a suitable container.
  - Refit the drain-plug and pour oil into the gear-cover until the oil-level is just below the top of the reflector plate in the gear-cover sight-glass.
  - Refit the filler-plug.

## 5.6 Lubricate the rear-bearing (EH250 and EH500A pumps only)

Use the procedure below to replace the grease in the rear-bearing.

1. Switch off the pump and isolate it from the electrical supply. Vent the pump to atmospheric pressure.
2. Refer to Figure 13. Remove the four plastic cover-caps (8) from the bearing end-cover (6).
3. Undo and remove the socket-head screws (7) located under the four plastic cover-caps.
4. Remove the end-cover (6) and 'O' ring (5). Dispose of the 'O' ring safely.
5. Note the exact location of the shims (4) and spacers (3) inside the end-cover (6). Clean off all visible grease from the end-cover taking care not to misplace or damage the shims and spacers.
6. Use a soft, clean, cloth to remove all visible grease from both bearings (2).
7. Fill the visible side of each bearing (2) with clean grease, then lightly force the grease into the bearing.
8. Refill the visible side of each bearing (2) with clean grease.
9. Apply a light wipe of high-vacuum grease to the new 'O' ring (5) and fit into the groove in the end cover (6).
10. Check that the shims (4) and spacers (3) are correctly located in the end-cover (6).
11. Refit the end-cover (6) and secure it with the four socket-head screws (7). Tighten the screws evenly and refit the plastic cover-caps (8).
12. Leak test the system and seal any leaks found.





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- |              |                      |
|--------------|----------------------|
| 1. Pump-body | 5. 'O' ring          |
| 2. Bearing   | 6. Bearing cover     |
| 3. Spacer    | 7. Socket-head screw |
| 4. Shims     | 8. Cover-cap         |

Figure 13 - Lubricate the rear bearing (EH250/500A pumps only)

## 6 STORAGE AND DISPOSAL

### 6.1 Storage

**CAUTION**

Observe the storage temperature limits stated in Section 2. Storage below  $-30^{\circ}\text{C}$  will permanently damage the pump seals and lubricants.

Use the procedure below to store the pump.

1. Shut-down the pump as described in Section 4.
2. Isolate the pump from the electrical supply and disconnect it from the vacuum system.
3. Clean the pump and change the oil as described in Section 5.
4. Place protective covers over the inlet and outlet-flanges.
5. Store the pump in cool, dry conditions until required for use. When required, prepare and install the pump as described in Section 3.

### 6.2 Disposal

Dispose of the pump and any components safely in accordance with all local and national safety and environmental requirements.

Particular care must be taken with components and waste oil which have been contaminated with dangerous process substances.

## 7 SPARES AND ACCESSORIES

### 7.1 Introduction

Edwards products, spares and accessories are available from Edwards companies in Belgium, Brazil, Canada, France, Germany, Hong Kong, Italy, Japan, Korea, Switzerland, United Kingdom, U.S.A and a worldwide network of distributors. The majority of these centres employ Service Engineers who have undergone comprehensive Edwards training courses.

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

- Model and Item Number of your equipment
- Serial number
- Item Number and description of part.

### 7.2 Spares

The spare parts listed below are available for the EH Mechanical Booster Pump:

<b>Product</b>	<b>Item Number</b>
RT15 Fomblin grease (100 gm)	H113-50-003
End-cover 'O' ring	H021-22-091
Ultragrade 20 oil (1 l)	H110-24-015
Ultragrade 20 oil (4 l)	H110-24-013
Krytox 1514 fluid (1 kg)	H113-08-018
Krytox 1514 fluid (5 kg)	H113-08-020

# Return of Edwards Equipment - Declaration (Form HS2)

Return Authorisation Number: \_\_\_\_\_

You must:

- Know about all of the substances which have been used and produced in the equipment before you complete this Declaration
- Read the Procedure (HS1) on the previous page before you attempt to complete this Declaration
- Contact your supplier to obtain a Return Authorisation Number and to obtain advice if you have any questions
- Send this form to your supplier before you return your equipment

## SECTION 1 : EQUIPMENT

Equipment model \_\_\_\_\_

Serial Number \_\_\_\_\_

Has the equipment been used, tested or operated?

yes  Go to Section 2                      no  Go to Section 4

FOR SEMICONDUCTOR APPLICATIONS ONLY:

Tool Reference Number \_\_\_\_\_

Process \_\_\_\_\_

Failure Date \_\_\_\_\_

Serial Number of Replacement Pump \_\_\_\_\_

## SECTION 2 : SUBSTANCES IN CONTACT WITH THE EQUIPMENT

Are any of the substances used or produced in the equipment

- Radioactive    yes     no
- Biologically active                                    yes     no
- Dangerous to human health and safety?    yes     no

If you have answered 'no' to all of these questions, go to Section 4.

Your supplier will not accept delivery of any equipment that is contaminated with radioactive substances, unless you:

- Decontaminate the equipment
- Provide proof of decontamination

**YOU MUST CONTACT YOUR SUPPLIER FOR ADVICE BEFORE YOU RETURN SUCH EQUIPMENT**

## SECTION 3 : LIST OF SUBSTANCES IN CONTACT WITH THE EQUIPMENT

Substance name	Chemical symbol	Precautions required (for example, use protective gloves, etc.)	Action required after spillage or human contact
1			
2			
3			
4			
5			
6			

## SECTION 4 : RETURN INFORMATION

Reason for return and symptoms of malfunction: \_\_\_\_\_  
\_\_\_\_\_

If you have a warranty claim:

- who did you buy the equipment from? \_\_\_\_\_
- give the supplier's invoice number \_\_\_\_\_

## SECTION 5 : DECLARATION

Print your name: \_\_\_\_\_ Print your job title: \_\_\_\_\_

Print your organisation: \_\_\_\_\_

Print your address: \_\_\_\_\_  
\_\_\_\_\_

Telephone number: \_\_\_\_\_ Date of equipment delivery: \_\_\_\_\_

I have made reasonable enquiry and I have supplied accurate information in this Declaration. I have not withheld any information. I have followed the Return of Edwards Equipment Procedure (HS1) on the previous page.

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

# Edwards International

## EUROPE

### UNITED KINGDOM

Edwards High Vacuum International  
Manor Royal  
Crawley  
West Sussex RH10 2LW  
Tel: (01293) 528844  
Fax: (01293) 533453

### BELGIUM

Edwards  
Bergensesteenweg 709  
B1600 Sint-Pieters-Leeuw  
Tel: 2 360 3671  
Fax: 2 360 3591

### FRANCE

Edwards SA  
125 Avenue Louis Roche  
92238 Gennevilliers, Cedex  
Tel: (1) 4798 2401  
Fax: (1) 4798 4454

### GERMANY

Edwards Hochvakuum GmbH  
Postfach 1409  
D35004 Marburg  
Tel: 6420 82410  
Fax: 6420 82411

### ITALY

Edwards Alto Vuoto SpA  
Via Carpaccio 35  
20090 Trezzano Sul Naviglio  
Milano  
Tel: 2 4840 2258  
Fax: 2 4840 1638

### SWITZERLAND

Edwards (ECH)  
Postfach  
CH-4104 Oberwil-Basel  
Tel: 61 401 4344  
Fax: 61 401 4352

## AMERICAS

### USA

Edwards High Vacuum International  
One Edwards Park  
301 Ballardvale Street  
Wilmington, MA 01887  
Tel: 508 658 5410  
Fax: 508 658 7969

Edwards High Vacuum International  
Sierra Technology Center  
Building 'A' Suite 120  
3100 Alvin Devane Boulevard  
Austin, TX 78741  
Tel: 512 389 3883  
Fax: 512 389 3890

Edwards High Vacuum International  
550 Sycamore Drive  
Milpitas, CA 95035  
Tel: 408 946 4707  
Fax: 408 946 8510

### CANADA

Edwards High Vacuum  
3375 North Service Road  
Units B2/B3  
Burlington  
Ontario, L7N 3G2  
Tel: 905 336 9119  
Fax: 905 845 4924

### BRAZIL

Edwards Alto Vácuo  
Rua Bernardo Wrona, 222  
Bairro do Limão  
02710 - São Paulo - SP  
Tel: 11 858 0377  
Fax: 11 265 2766

## PACIFIC

### JAPAN

Nippon Edwards KK  
12-15 Shimomaruko 2-chome  
Ohta-Ku  
Tokyo 146  
Tel: 3 3756 4090  
Fax: 3 3756 4509

Nippon Edwards KK  
431-1 Yokata Gocha-Ku  
Mikumi-Cho  
Himeji  
Hyogo 671-01  
Tel: 792 523190  
Fax: 792 523191

Nippon Edwards KK  
Tajiri 1765-5 Kunitomi-Cho  
Higashi Morokata-gun  
Miyazaki  
Tel: 985 758901  
Fax: 985 754643

### HONG KONG

Edwards High Vacuum (Pacific)  
1308 Tower II  
World Trade Square  
123 Hoi Bun Road  
Kwun Tong, Kowloon  
Hong Kong  
Tel: 796 9111  
Fax: 796 9095

### REPUBLIC OF KOREA

Songwon Edwards Ltd  
Sun In Building  
738-41 Panpo-Dong  
Sochu Gu, Seoul  
Tel: 2 515 1811  
Fax: 2 515 1818

### TAIWAN

Zimmerman Scientific Co Ltd  
Golden Dragon Building  
8FL No. 127  
Fu-Shin South Road  
Section 1, Taipei  
Tel: 2 752 7075  
Fax: 2 771 9415



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