

Instruction Manual

HV8000 Booster Pumps



Description	Item Number
HV8000 VF 400V 3PH 50HZ 18.5KW BOOSTER	A311-01-935
HV8000 VF 460V 3PH 60HZ 25HP BOOSTER	A311-01-936
HV8000 VF BARESHAFT BOOSTER	A311-01-985
HV8000 HF 400V 3PH 50HZ 18.5KW BOOSTER	A311-02-935
HV8000 HF 460V 3PH 60HZ 25HP BOOSTER	A311-02-936
HV8000 HF BARESHAFT BOOSTER	A311-02-985



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Declaration of Conformity

We, Edwards,
Crawley Business Quarter,
Manor Royal,
Crawley,
West Sussex, RH10 9LW, UK

declare under our sole responsibility, as manufacturer and person within the EU authorised to assemble the technical file, that the product(s)

HV8000 VF 400V 3PH 50HZ 18.5KW BOOSTER	A31101935
HV8000 VF 460V 3PH 60HZ 25HP BOOSTER	A31101936
HV8000 HF 400V 3PH 50HZ 18.5KW BOOSTER	A31102935
HV8000 HF 460V 3PH 60HZ 25HP BOOSTER	A31102936

to which this declaration relates is in conformity with the following standard(s) or other normative document(s)

EN1012-2:1996, A1: 2009	Compressors and Vacuum Pumps. Safety Requirements. Vacuum Pumps
EN60034-1: 2004	Rotating electrical machines. Rating and performance
EN50581:2012	Technical Documentation for the Assessment of Electrical and Electronic Products with respect to the Restriction of Hazardous Substances

and fulfils all the relevant provisions of

2006/42/EC	Machinery Directive
2006/95/EC	Low Voltage Directive
2004/108/EC	Electromagnetic Compatibility (EMC) Directive
2011/65/EU*	Restriction of Certain Hazardous Substances (RoHS) Directive

* i. e. The product(s) contain less than - 0.1wt% for hexavalent chromium, lead, mercury, PBB and PBDE; 0.01wt% for cadmium - in homogeneous materials (subject to the exemptions allowed by the Directive). The RoHS Directive does not legally apply to industrial vacuum equipment until July 2019 (July 2017 for instruments).

Note: This declaration covers all product serial numbers from the date this Declaration was signed onwards.

Mr Peter Meares - GV Technical Support Manager

14.03.2013, Burgess Hill

Date and Place

This product has been manufactured under a quality system registered to ISO9001



Declaration of Incorporation

We, Edwards,
Manor Royal,
Crawley,
West Sussex RH10 9LW, UK

declare under our sole responsibility that the machine(s)

<i>Description</i>	<i>Item number</i>
HV8000 Vertical Flow Vacuum Booster Pump - Bareshaft	A31101985
HV8000 Horizontal Flow Vacuum Booster Pump - Bareshaft	A31102985

to which this declaration relates is intended to be incorporated into other equipment and not to function independently. The machine(s) is in conformity with the following standard(s) or other normative document(s)

EN1012-2:1996, A1:2009	Compressor and Vacuum Pumps. Safety Requirements. Vacuum Pumps
------------------------	---

The machine(s) must not be put into service until the equipment into which it is incorporated has been brought into conformity with the following provisions of the Machinery Directive, 2006/42/EC.

Peter Meares
Product Support Manager - Industrial and Chemical

22.03.2012 Burgess Hill

Date and place

This product has been manufactured under a quality system registered to ISO9001

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Associated publications

Publication title

Publication number

Vacuum pump and vacuum system safety - chemical and industrial vacuum systems

P400-40-100

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1 Introduction

1.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for the Edwards HV8000 Booster Pumps, abbreviated to 'HV8000 pumps' or 'pumps' in the remainder of this manual. You must use the pumps as specified in this manual.

Read this manual before you install the 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 following symbols may be fitted to the pump or associated equipment:



Warning - refer to accompanying documentation.



Warning - hot surfaces.



Ear defenders must be worn.



Protective earth (ground).

The identification and rating plate (Figure 1, item 2) provides specific details about the pump, including its Part and Serial Numbers and the date and place of its manufacture.

The units used throughout this manual conform to the SI international system of units of measurement. Equivalent values in US imperial units are also included.

1.2 Description

Refer to [Figure 1](#). The HV8000 pumps are positive displacement pumps. They must be used with a suitable backing pump or pumps: refer to [Table 2](#).

The HV8000 pumps are available in two versions:

- 'VF' (Vertical Flow) pumps which provide for a vertical gas flow through the pump.
- 'HF' (Horizontal Flow) pumps which provide for a horizontal gas flow through the pump.

The HV8000 pumps can be supplied in 'bareshaft' form without any motor or fitted with either an 18.5 kW 400 V 50 Hz IEC motor or a 25 hp 460 V 60 Hz NEMA motor.

HV8000 VF and HF pumps with motors are supplied with the motor mounted via a bell-housing and connected through a direct drive coupling: refer to [Figure 3](#) and [5](#).

If your pump is supplied as a bareshaft pump, you may connect your own coupling or belt drive system (refer to [Section 3.7](#)) to the drive shaft of the pump in order to operate the pump. The maximum power rating and maximum pump speed must not exceed the values shown in [Table 2](#).

Alternately, two motor mounting kits are available to enable customers to fit their own motors. The first kit is suitable for use with motors to an IEC specification not exceeding 18.5 kW with a 160 Frame size and FF300 flange. The second kit is suitable for use with motors to a NEMA specification not exceeding 25 hp with a 284TS Frame size and a D type flange. These kits include the appropriate bell-housing, coupling and fixings.

For specific applications, bareshaft pumps may be fitted with motors of higher power ratings than those given above and controlled through a Variable Frequency Drive (VFD). Customers must consult with Edwards Applications Group for information relating to such applications.

Refer to [Section 2.11](#) for the Item Numbers of the different pump versions.

1.3 Principle of operation

Refer to [Figure 1](#). The HV8000 pumps are positive displacement pumps, which incorporate two contra-rotating twin-lobe rotors:

- One of the rotors is driven by the drive shaft (18).
- The other rotor is maintained in the correct phase relation by timing gears.

During operation, the inlet gas stream to be pumped enters the pump at the inlet (4).

As the two contra-rotating rotors turn, the inlet gas is trapped in the chambers which form between the rotors and the pump-body, and is eventually forced out of the pump at the outlet (14).

The timing gears and the bearings on the rotors and drive shaft are lubricated by oil in the drive end cover (7) and the non-drive end cover (17).

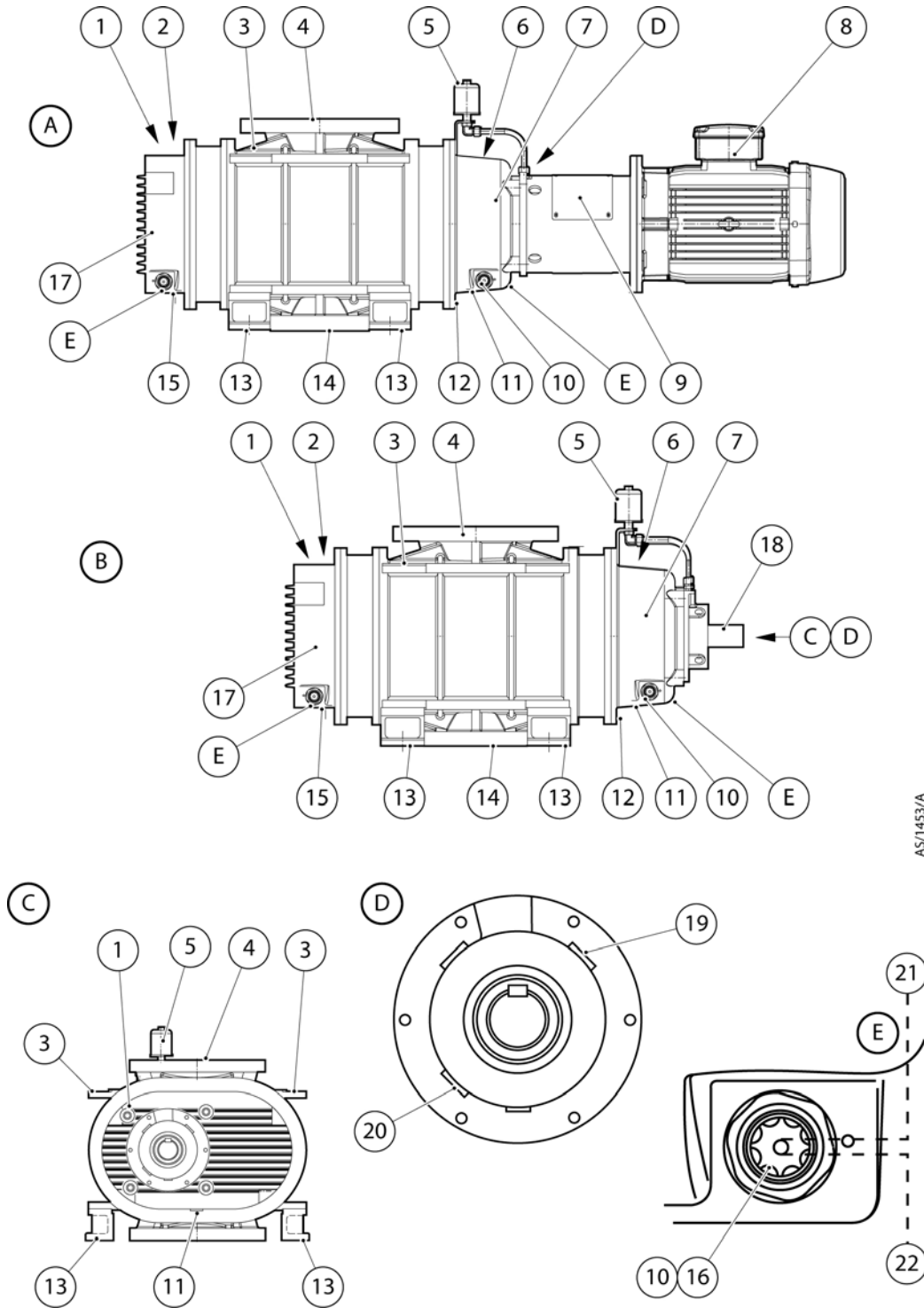
The mechanical shaft seals and the external lip seals are provided with oil from the shaft-seals oil reservoir (5). This provides a barrier seal between the compression chamber (rotor housing) and the external atmosphere.

Figure 1 - Components of the HV8000 pump: key

- | | |
|---|---|
| 1. Oil filler plug (non-drive end cover) | 13. Mounting feet |
| 2. Identification and rating plate | 14. Outlet |
| 3. Lifting bolts | 15. Non-drive end oil drain plug |
| 4. Inlet | 16. Oil-level sight-glass (non-drive end cover) |
| 5. Shaft-seals oil reservoir | 17. Non-drive end cover |
| 6. Oil filler plug (drive end cover) | 18. Drive shaft |
| 7. Drive-end cover | 19. Cooling-water outlet |
| 8. Motor | 20. Cooling-water inlet |
| 9. Direct drive coupling | 21. Maximum oil level |
| 10. Oil-level sight-glass (drive end cover) | 22. Minimum oil level |
| 11. Drive end oil drain plug | |
| 12. Earth (ground) stud | |
-
- A. Side view: HV8000VF pump with motor
 - B. Side view: bareshaft HV8000VF pump
 - C. End view: bareshaft HV8000VF pump
 - D. Cooling-water connections
 - E. Oil-level sight-glasses

Note: Refer to [Figure 2 to 5](#) for the mounting feet configurations of the pumps.

Figure 1 - Components of the HV8000 pump



1.4 Application

The safe area HV8000 pumps are safe to handle non-flammable gases and vapours within the normal operating parameters of the pumps, as defined in this manual.

The materials of construction of the pumps are specified in [Section 2.10](#). Before you use the pump, you must ensure that these materials are compatible with the gases and vapours which you will pump or which may exist in the external atmosphere.

You must ensure that your pump is suitable for your application. If you have any doubts as to the suitability of the pump for your application, contact your supplier or Edwards for advice.

1.5 Normal operation



WARNING

A booster must always be used in conjunction with a backing pump - never attempt to operate it alone.



WARNING

The booster pumps have dry pump mechanisms that are designed to run with small clearances between rotors and stator. You must protect your pump from the ingress of dust or particles that could cause damage.

In normal operation, as defined by this manual, the boosters are safe for the pumping of non flammable materials where there is no risk that the build-up of process deposits could reduce the operating clearances of the pump mechanism and so cause damage.

A mesh screen is provided as standard on the inlet side of the pump. This should remain in place during installation and commissioning to reduce the risk of damage owing to the ingress of gross debris.

The inlet screen must be left in place during normal process operation although it will reduce the pumping speed of the pump by about 15%.

1.6 Abnormal operation



WARNING

Misuse of the booster as described below is strictly prohibited.

- Pumping flammable gases.
- Pumping hydrocarbon oxides.
- Pumping pyrophoric gases.
- Pumping gases that tend to self-decompose, or that are chemically unstable.
- Pumping peroxides or oxygen enriched atmospheres.
- Pumping of, or use in the presence of, explosive dust atmospheres.
- Use in ambient conditions other than those specified in [Section 2.1](#).

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2 Technical data

2.1 Operating and storage conditions

Note: For operation between -20 °C and 5 °C (-4 and 41 °F), we recommend that the HV8000 pump is operated continuously except when shut-down is necessary for maintenance purposes. Note also the cooling-water requirements given in Section 2.4.

There is a wide range of backing pumps which are suitable for use with the HV8000 pumps. If necessary, contact Edwards for advice.

Table 1 - Operating and storage conditions

Ambient operating temperature range	-20 to 40 °C, -4 to 104 °F
Ambient storage temperature range	-20 to 80 °C, -4 to 176 °F
Maximum ambient operating humidity	90%
Maximum operating altitude	3000 m, 9842 ft
Protection degree (as defined by IEC 529)	IP44
Recommended backing pumps	See Note above

2.2 Critical backing pressure



WARNING

If you fit an isolation valve between the HV8000 pump and the backing pump, you must interlock the operation of the valve with the operation of the HV8000 pump, so that closure of the valve results in shut-down of the HV8000 pump.

2.3 Performance

Table 2 - Performance data: safe area HV8000 pumps

	HV8000 (50 Hz)	HV8000 (60 Hz)
Maximum rotational speed	3000 r min ⁻¹ 3000 r.p.m.	3600 r min ⁻¹ 3600 r.p.m.
Minimum rotational speed (for correct pump lubrication)	440 r min ⁻¹ 440 r.p.m.	440 r min ⁻¹ 440 r.p.m.
Displacement (swept volume)	7200 m ³ h ⁻¹ 4241 cfm	8640 m ³ h ⁻¹ 5089 cfm
Maximum backing pressure for DoL (direct on line) starting	6 mbar 6 x 10 ² Pa 0.087 psi	7 mbar 7 x 10 ² Pa 0.1 psi
Minimum backing pumping speed at the pump outlet	400 m ³ h ⁻¹ 236 cfm	600 m ³ h ⁻¹ 353 cfm
Critical backing pressure at the pump outlet*	68 mbar 6.8 x 10 ³ Pa 0.99 psi	67 mbar 6.7 x 10 ³ Pa 0.97 psi

Table 2 - Performance data: safe area HV8000 pumps (continued)

	HV8000 (50 Hz)	HV8000 (60 Hz)
Maximum pressure rise (between HV8000 pump inlet and outlet)	190 mbar 1.9 x 10 ³ Pa 2.75 psi	120 mbar 1.2 x 10 ³ Pa 1.74 psi
Maximum motor power for a directly (bell housing) mounted motor	18.5 kW 25 hp	18.5 kW 25 hp
Maximum inlet gas temperature	60 °C 140 °F	60 °C 140 °F
Maximum outlet gas temperature	300 °C 572 °F	300 °C 572 °F
Maximum gas temperature rise (between HV8000 inlet and outlet)	240 °C 464 °F	240 °C 464 °F

* On a pump used with DoL (Direct On Line) starting, this is the critical backing pressure at which the pump must be shut down (see Section 2.2). This is not applicable to pumps operated with inverters (See Section 1.2).

2.4 Cooling-water supply

Table 3 - Cooling-water supply data

Maximum supply pressure	3 bar gauge, 3 x 10 ⁵ Pa, 44 psi
Maximum supply temperature	35 °C, 95 °F
Minimum cooling-water flow rate	15 l min ⁻¹ , 3.96 US gal min ⁻¹

2.5 Mechanical data

Table 4 - Mechanical data

Dimensions	See Figure 2 to 5		
Mass	Bareshaft	With 50 Hz motor	With 60 Hz motor
HV8000VF	570 kg, 1257 lb	700 kg, 1543 lb	745 kg, 1642 lb
HV8000HF	570 kg, 1257 lb	700 kg, 1543 lb	745 kg, 1642 lb

2.6 Lubrication data

Table 5 - Lubrication data

Recommended oil	Mobil SHC 629		
Oil capacities	Shaft-seals oil reservoir	Drive end cover	Non-drive end cover
HV8000VF	0.2 litres, 0.05 US gal	3.5 litres, 0.92 US gal	4.6 litres, 1.21 US gal
HV8000HF	0.2 litres, 0.05 US gal	2.0 litres, 0.63 US gal	2.3 litres, 0.61 US gal

2.7 Electrical data (HV8000 pumps with motors only)

Refer to the Motor Instruction Manual supplied with your pump and to the motor rating plate and terminal box for details of the electrical supply voltage and frequency, of the full load current rating, and of the connection procedures for the motor fitted to your HV8000 pump.

Ensure that the electrical installation of your HV8000 pump conforms with your local and national safety requirements, refer to [Section 3.8](#).

Table 6 - Nominal electrical data (refer to Motor Instruction Manual supplied for full details)

		Power	No of poles	Voltage	Frequency	Frame size	Flange type
HV8000 Vertical flow	A31101935	18.5 kW	2-pole	400 V	50 Hz	160L	FF300
HV8000 Horizontal flow	A31102935	18.5 kW	2-pole	400 V	50 Hz	160L	FF300
HV8000 Vertical flow	A31101936	25 hp	2-pole	460 V	60 Hz	284TS	D
HV8000 Horizontal flow	A31102936	25 hp	2-pole	460 V	50 Hz	284TS	D

2.8 Connections

Table 7 - Connections data

Process inlet/outlet HV8000 pumps	PN20/DN250 (ANSI 10 inch)
Cooling-water inlet/outlet	Rp 1/2 inch ISO 7-1 (1/2 inch BSP cylindrical internal thread)

2.9 Noise and vibration data

Note: The noise and vibration data values given below are maximum values. The actual values will depend on the installation and the operating conditions.

Table 8 - Noise and vibration data

	HV8000
Noise level	82 dB(A)*
Vibration level	4 mm s ⁻¹ 0.16 inch s ⁻¹

* The noise level was measured in accordance with ISO2151 and with the pump running at ultimate pressure. Running at higher inlet pressures will increase the noise level.

The rotors are balanced to G2.5 and have ventilated end caps fitted.

2.10 Materials of construction

Table 9 - Construction materials data

Body, casing and headplates	EN GJL 300 grey cast iron
Rotor	EN GJL 200 grey cast iron
Shaft	Carbon steel
Bearings	100Cr6 steel
Mechanical shaft seal	Silicon carbide
O-ring seal	Flouroelastomer

2.11 Item numbers

Table 10 - Item numbers

Product description	Part No.
HV8000IND VF 380-415 V 3-phase 50 Hz 18.5 kW	A31101935
HV8000IND VF 440-460 V 3-phase 60 Hz 25 hp	A31101936
HV8000IND VF bareshaft	A31101985
HV8000IND HF 380-415 V 3-phase 50 Hz 18.5 kW	A31102935
HV8000IND HF 440-460 V 3-phase 60 Hz 25 hp	A31102936
HV8000IND HF bareshaft	A31102985
Accessories Order No.	
HV8000 motor mounting kit IEC	A31101002
HV8000 motor mounting kit NEMA	A31101006

Figure 2 - HV8000 VF dimensions: mm (inch)

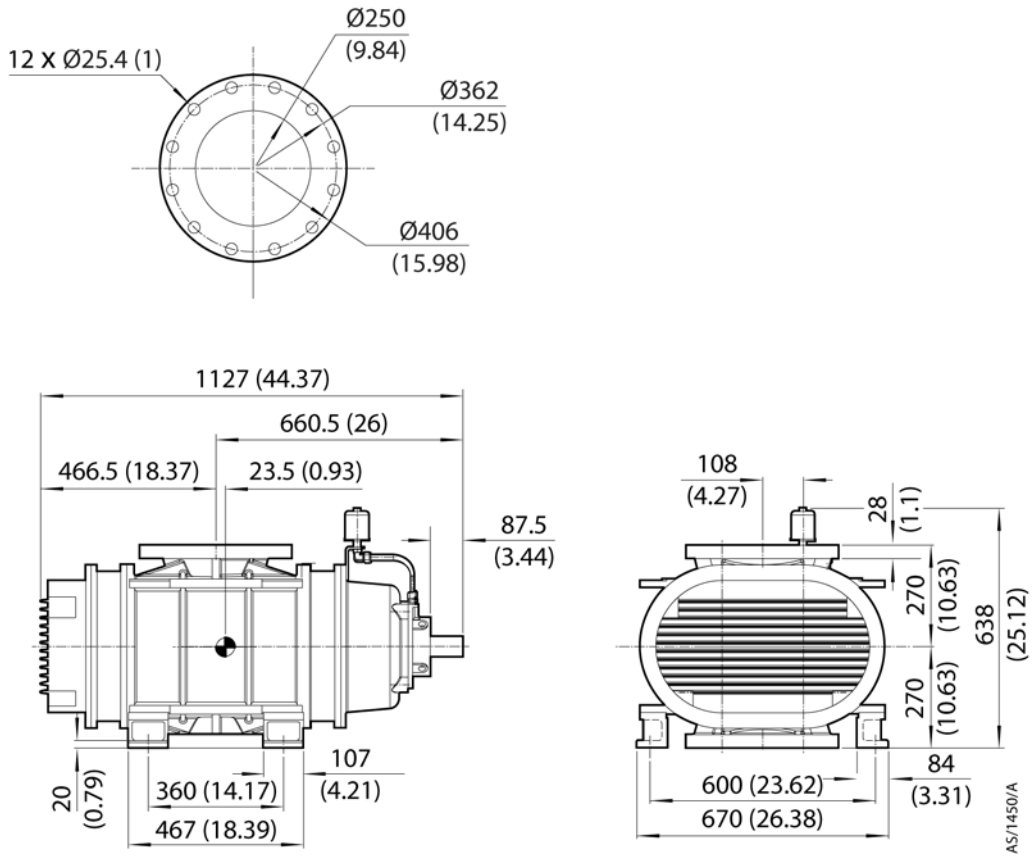
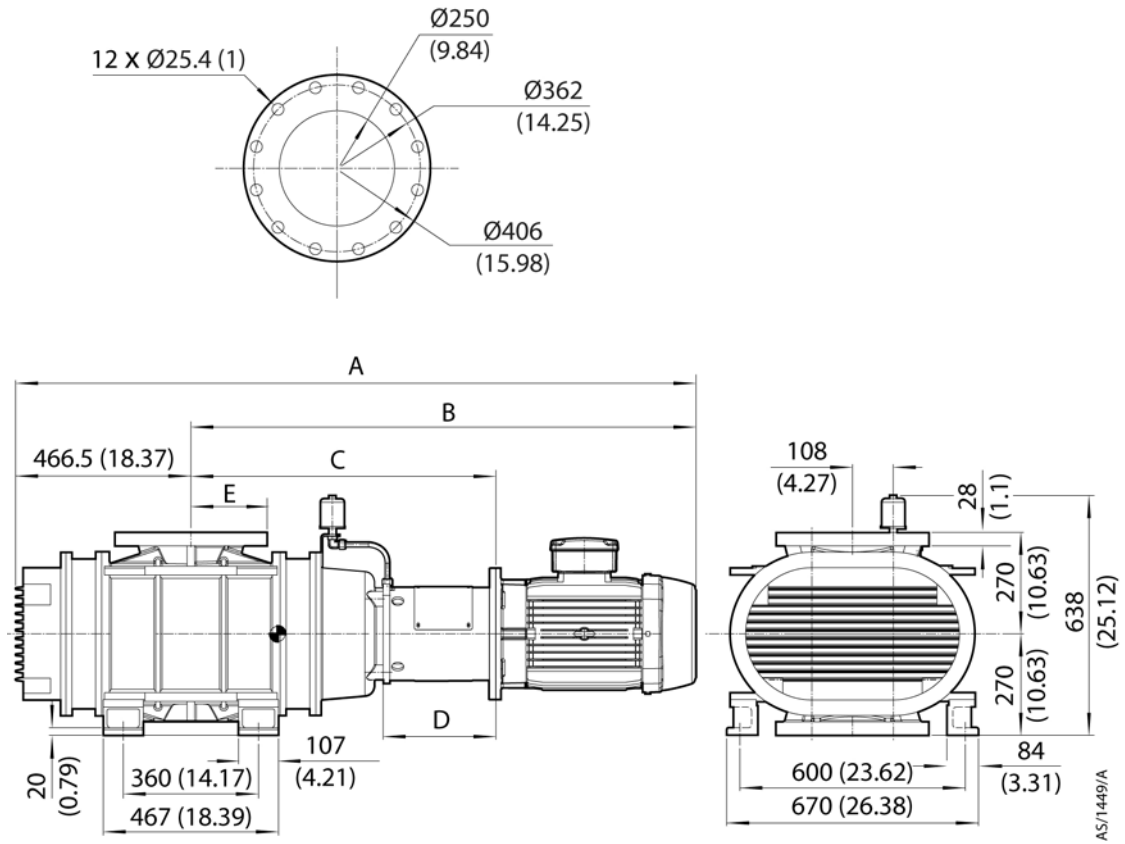


Figure 3 - HV8000 VF with motor dimensions: mm (inch)



	Part Number	A	B	C	D	E
HV8K 50 Hz Safe Area	A31101935	1810 (71.2)	1339.5 (52.74)	812.5 (32)	301 (11.85)	231 (9.09)
HV8K 60 Hz Safe Area	A31101936	1832 (72.1)	1447.5 (56.9)	804.5 (31.67)	293 (11.54)	257 (10.12)

Figure 4 - HV8000 HF dimensions: mm (inch)

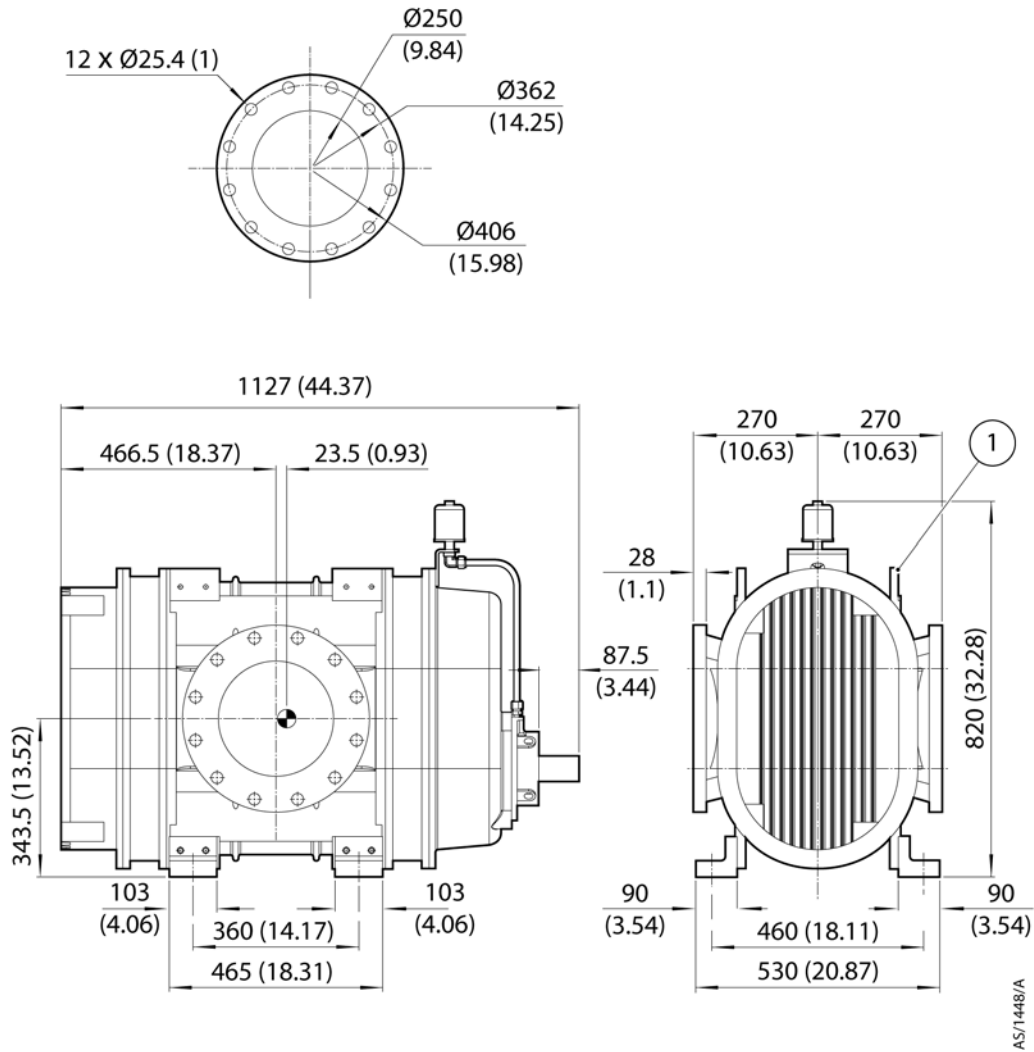
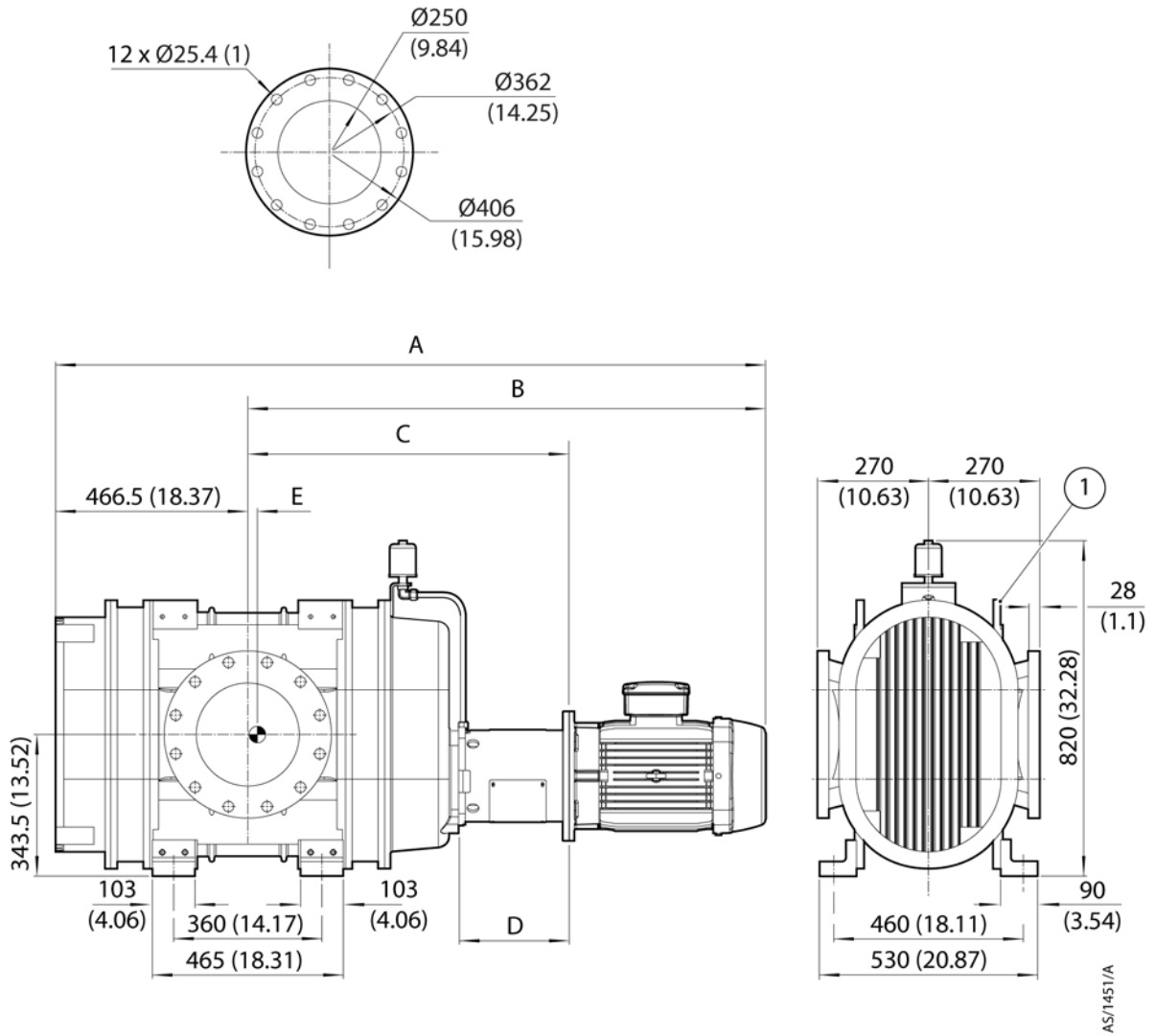


Figure 5 - HV8000 HF with motor dimensions: mm (inch)



	Part Number	A	B	C	D	E
HV8K 50 Hz Safe Area	A31102935	1810 (71.2)	1339.5 (52.74)	812.5 (32)	301 (11.85)	231 (9.09)
HV8K 60 Hz Safe Area	A31102936	1832 (72.1)	1447.5 (56.9)	804.5 (31.67)	293 (11.54)	257 (10.12)

3 Installation

CAUTION

Edwards will accept no liability or warranty claims if your installation includes any modifications or additions to the pump without the prior written approval of Edwards, or if the pump is incorrectly installed.

3.1 Installation safety



WARNING

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

- A suitably trained and supervised technician must install your HV8000 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 P400-40-100 (Vacuum pump and vacuum system safety - chemical and industrial systems) before you install and use the HV8000 pump.
- Vent and purge the pumping system before you start installation work.
- Ensure that debris does not get into the HV8000 pump or the system pipelines when you install it.
- 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.
- On pumps with a motor, ensure that the cooling-air flow through the pump-motor cooling-fan cannot be obstructed.
- Ensure that all electrical cables, purge gas pipelines and cooling-water pipelines are safely positioned, secured and routed, so that they do not present a trip hazard.
- Provide adequate access to all pump servicing points and oil-level sight-glasses.
- Check that all of the required components and tools are available and of the correct type before you start to install the pump.
- Leak-test the system after installation work is complete and seal any leaks found 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 2.1](#), [2.2](#) and [2.3](#).
- The HV8000 pump must be mounted on a firm, level surface.
- Vacuum pipelines must be adequately supported to stop the transmission of stress to pipeline joints.
- You must limit the temperature of the inlet gas to that given in [Table 2](#).
- 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 are suitable for vacuum operation and which have a maximum pressure rating which is greater than the highest pressure that can be generated in your system.
- The pump is noisy during operation (see [Section 2.9](#)). You must either install the pump in an acoustic enclosure, or ensure that people wear suitable protective equipment (such as ear defenders) when they are close to the operating pump.
- 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 HV8000 pump is to be fitted in a new system, ensure that all preliminary pipelines have been installed and that a suitable base for the HV8000 pump has been prepared before you start installation.

Check that the following services and facilities are available for connection to the HV8000 pump:

- Cooling-water supply and return.
- Electrical supply
- Exhaust-extraction system.
- Inlet-screen, refer to [Section 1.5](#).

3.3 Unpack and inspect



WARNING

Use suitable lifting equipment to move the pump. If you do not, you can injure yourself or damage the pump. Refer to [Section 2.5](#) for the mass of the pump.

1. Use a suitable fork-lift truck or pallet truck to move the pump, on its pallet, close to where you will install it.
2. Remove all packing materials.
3. Use suitable lifting-gear to remove the HV8000 pump from its pallet:
 - On bareshaft HV8000 pumps, attach the lifting-gear to the four lifting brackets ([Figure 1](#) item 3).
 - On HV8000 pumps with motors, attach the lifting-gear to the rear-most pair of lifting brackets on the HV8000 pump ([Figure 1](#) item 3). Note that the centre of mass is offset towards the motor, and you must fit additional support strap(s) to the motor to support the pump, and prevent it from tilting when you lift it.

Do not try to lift the HV8000 pump by hand (see [Section 2.5](#) for the mass of your pump).

Table 11 - Checklist of items

Quantity	Description	Check (✓)
1	HV8000 pump	<input type="checkbox"/>
*	Lubrication oil	<input type="checkbox"/>
1	Motor manual†	<input type="checkbox"/>

* If you have ordered oil, you will receive sufficient quantity of oil to fill the pump: see Section 2.6.

† Supplied with HV8000 pumps with motors only.

- 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.
- Check that you have received the items listed in Table 11. If any item is missing, notify your supplier in writing within three days
- Look at the pump rating and identification plate (Figure 1, item 2) and check that the pump is suitable for use in your system. If the pump is not suitable, contact your Supplier or Edwards.

If the pump is not to be used immediately, replace the protective covers and store the pump in suitable conditions, as described in Section 6.1.

3.4 Locate the pump



WARNING

Use suitable lifting equipment to move the pump. If you do not, you can injure yourself or damage the pump. Refer to Section 2.5 for the mass of the pump.

You must ensure that when the pump is in its required operating location, all of the mounting feet (on the pump or base frame) are flat on the mounting platform to within 0.2 mm m⁻¹ (0.0026 inch ft⁻¹).

Use the following procedure to locate the HV8000 pump:

- Use suitable lifting equipment to move the HV8000 pump into its required operating location: use the appropriate method for your pump, as described in Section 3.3.
- Fit suitable bolts through the fixing holes in the mounting feet, to secure the pump in position. Refer to Figure 2 to 5 for fixing details.
- Disconnect the lifting equipment from the pump.

3.5 Fill the pump with oil



WARNING

Ensure that the correct grade of oil is used and that the oil-levels in the HV8000 pump are correct. If an incorrect oil is used or if an oil-level is incorrect, pump performance may be affected and the pump may be damaged, which will compromise its constructional safety and invalidate its certification.

3.5.1 Fill the drive end cover

Refer to [Figure 1](#). We recommend that the oil-level in the drive end cover is maintained between the minimum and maximum level marks on the oil-level sight-glass (10): see detail E.

If the oil-level is above the maximum mark, the performance of the HV8000 pump may be affected. If the oil-level is below the minimum mark, the performance of the HV8000 pump may be affected or the pump may be damaged.

1. Refer to [Figure 1](#), detail A or B. Remove the oil filler-plug (6) from the filler port on the top of the drive end cover.
2. Pour new oil of the correct type (see [Section 2.6](#)) through the filler port and into the end cover until the oil-level reaches the maximum level mark (detail E, item 21). If the oil level goes above the maximum level mark, drain oil from the pump until the level is correct: refer to [Section 5.7](#).
3. Refit the oil filler-plug (6) to the filler port on the top of the drive end cover.

3.5.2 Fill the non-drive end cover

Refer to [Figure 1](#). We recommend that the oil-level in the non-drive end cover is maintained between the minimum and maximum level marks on the oil-level sight-glass (16): see detail E.

If the oil-level is above the maximum mark, the performance of the HV8000 pump may be affected. If the oil-level is below the minimum mark, the performance of the HV8000 pump may be affected or the pump may be damaged.

1. Refer to [Figure 1](#), detail A or B. Remove the oil filler-plug (1) from the filler port on the top of the non-drive end cover.
2. Pour new oil of the correct type (see [Section 2.6](#)) through the filler port and into the end cover until the oil-level reaches the maximum level mark (detail E, item 21). If the oil level goes above the maximum level mark, drain oil from the pump until the level is correct: refer to [Section 5.7](#).
3. Refit the oil filler-plug (1) to the filler port on the top of the non-drive end cover.

3.5.3 Fill the shaft-seals oil reservoir

1. Refer to [Figure 1](#), detail A or B. Open the vented oil filler-plug at the top of the shaft-seals oil reservoir (5).
2. Pour new oil of the correct type (see [Section 2.6](#)) through the filler port and into the reservoir until the oil-level reaches the top of the reservoir. Do not over-fill the reservoir; if you do, take care to mop up and dispose of any excess oil.
3. Close the vented oil filler-plug at the top of the shaft-seals oil reservoir (5).

3.6 Connect the cooling-water pipelines

Note: Refer to [Section 2.4](#) for the cooling-water requirements. Note that there are minimum flow rate requirements specified.

Connect your cooling-water pipelines as follows:

1. Refer to [Figure 1](#) detail D. Connect the cooling-water supply pipeline to the cooling-water inlet (20).
2. Connect the cooling-water return pipeline to the cooling-water outlet (19).

Refer to [Section 2.4](#) 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 2.4](#).

3.7 Fit the drive/transmission (bareshaft HV8000 pumps only)



WARNING

Ensure that the drive/transmission is suitable for use with your pump/system.



WARNING

You must fit suitable guards to protect people from rotating/moving parts.

CAUTION

Your drive and transmission system design must ensure that the maximum pump rotational speeds specified in [Section 2.3](#) cannot be exceeded, otherwise the pump will be damaged, or may not operate correctly.

If you are using one of the motor mounting kits, then continue at [Section 3.7.1](#)

You must use a suitable coupling or a belt drive and transmission system to connect your drive to bareshaft HV8000 pumps.

Your drive and transmission system design must ensure that the maximum radial loadings on the pump drive shaft are less than those specified in [Table 12](#). On a belt drive system, ensure that the pulley fitted to the drive shaft has a diameter larger than the minimum diameter specified in [Table 13](#).

Connect the components of the drive and transmission system to the pump drive shaft (see [Figure 2](#) and [4](#)) as described in the manufacturer’s instructions supplied with the components.

After you have connected the drive/transmission, continue at [Section 3.10](#), to check for correct direction of rotation of the HV8000 pump.

Table 12 - Maximum drive shaft radial loadings

Pump model	Maximum radial loading at end of drive shaft	Maximum radial loading at middle of drive shaft
HV8000	2978 N, 669 lbf	3752 N, 843 lbf

Table 13 - Minimum drive shaft pulley diameters: mm (inch)

Pump model	Drive shaft pulley diameter
HV8000	100, (3.94)

3.7.1 Fitting the bell-housing, coupling and motor

Ensure that you have all the necessary parts and tools available before commencing this task.

Ensure that all components are clean and free from any dirt and debris.



WARNING

Note that the motors weigh in excess of 150 kg. They must only be lifted using appropriate lifting gear in accordance with any local and national regulations.



WARNING

Note that the bell-housing weighs approximately 20 kg. It must only be lifted in accordance with any local and national regulations.

It is recommended that you check the fit of the bell-housing flanges to the pump and (separately) to the motor before proceeding to the full installation. This may be done by taking suitable measurements or by physically offering the bell-housing to the pump and to the motor. Note that the square flange of the bell-housing fits to the pump and the round flange fits to the motor.

If fitted and after isolating the supply and draining, remove the cooling water inlet and outlet pipes and fittings from the mechanical seal housing.

Remove the two guards from the bell-housing.

Note that one of the four fixing holes on the square flange of the bell-housing is offset from the pitch circle diameter of the other three holes, and lightly mark the position of this hole. Lightly mark the matching threaded offset fixing hole on the pump and ensure that these two are aligned with each other by rotating the bell-housing to the correct orientation. Check that one of the cut-outs in the square flange aligns with the position of the vertical supply pipe from the oil reservoir to the mechanical seal housing.

Fit the two centering pieces to the pump, one in the previously marked offset hole and the other to the diametrically opposite mounting hole. Fit the bell-housing to the pump using the M16 bolts, washers and spring washers provided. Ensure that the centering pieces fully locate in the mating holes in the flange.

Tighten the fixing bolts to a torque of 100 Nm (74 lbf ft).

Fit the cooling water inlet and outlet fittings and pipes to the mechanical seal housing. Note that these fit through two of the 32 mm diameter holes in the cylindrical section of the bell-housing. It is recommended that, at this stage of the assembly, you test these fittings to ensure that they are leak tight.

Refer to [Figure 6](#) and [7](#). Note that one of the hubs of the coupling has been bored to suit the pump drive shaft diameter and the other to suit the motor shaft diameter. Check that the fixing set screws are in position in the coupling hubs and that they do not protrude into the hub bores.

Fit the shaft key to the pump drive shaft and slide the appropriate coupling hub onto the shaft ensuring that it locates on the key. Do not fix the coupling hub in position at this time. Slide the outer holding ring of the coupling over the coupling hub.

Fit the shaft key to the motor shaft and slide the other coupling hub onto the shaft ensuring that it locates on the key. Lightly tighten the hub fixing set screw so that the hub does not fall off the shaft during the following operations.

Using suitable lifting gear, fix the motor to the bell-housing which has previously been fixed to the pump.

Ensure that the protruding annular ring on the motor flange locates correctly and fully into the matching recess on the bell-housing flange. Secure the motor to the bell housing using the nuts, bolts, washers and spring washers supplied. Tighten the bolts to 150 Nm (110 lbf ft).

Working through the access ports in the bell-housing, loosen the coupling hub fitted to the motor shaft. Slide the two coupling hubs on their shafts to a position where the teeth on the two hubs are separated by 2.5 mm \pm 1 mm and each hub is equidistantly positioned relative to the end of the shaft on which it is mounted.

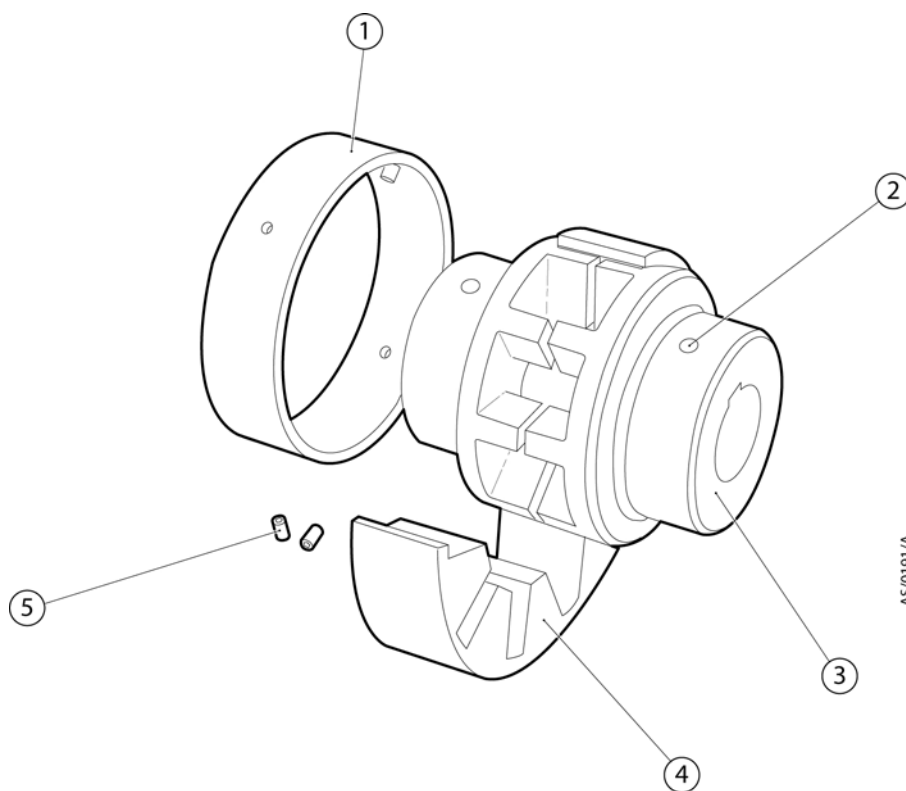
When the coupling hubs are correctly positioned, apply a suitable thread locking compound to each of the hub fixing set screws and tighten fully.

Install the coupling insert. Move the holding ring over the coupling insert, aligning the marked reference line on the holding ring over the groove on the outside of the coupling insert. Once positioned, screw in the holding ring set screws and tighten.

Re-fit the two covers over the access ports and secure in position.

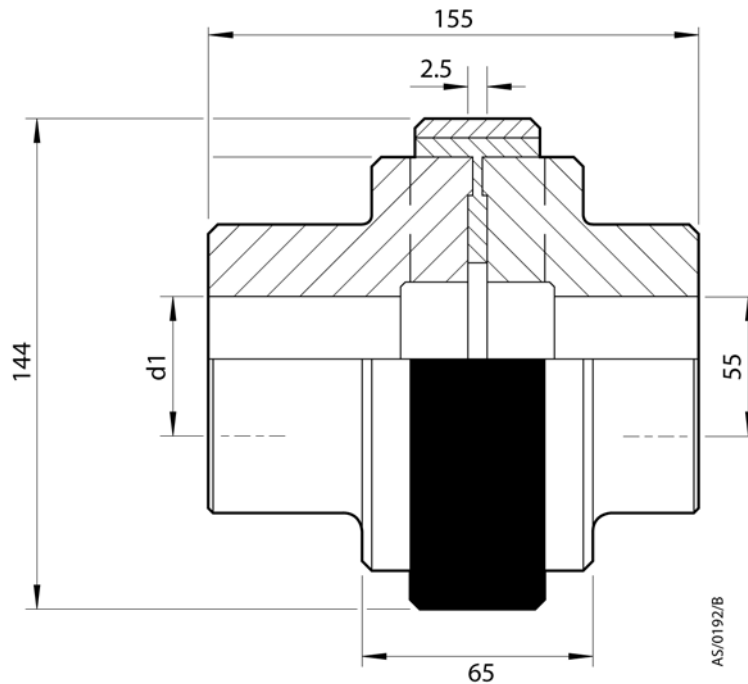
Note the centre of gravity position of the assembly as shown on [Figure 3](#) or [5](#). If the c of g lies outside the pump mounting feet closest to the motor and/or outside of any pallet, frame or other support on which it is mounted, then make sure that the assembly is suitably and securely fixed prior to removing the motor lifting gear. Remove the motor lifting gear.

Figure 6 - Coupling components



1. Holding ring
2. Hub fixing set screw
3. Coupling hubs
4. Coupling insert
5. Holding ring set screws

Figure 7 - Coupling dimensions



Dimension d1 is to suit motor shaft

Note: The 2.5 mm dimension is between teeth not hubs.

3.8 Motor electrical connections (HV8000 pumps with motors only)



WARNING

Obey the safety instructions given below when you make the electrical connections. If you do not, you can cause injury to people.

- Ensure that the electrical installation of the HV8000 pump conforms with your local and national safety requirements. It must be connected to a suitably rated fused and protected electrical supply and a suitable earth (ground) point.

3.8.1 Introduction

Use the procedures in the following sections to connect the electrical supply to the motor.

Refer to the Motor Instruction Manual supplied with your pump and to the motor rating plate and terminal box for details of the electrical supply voltage and frequency, of the full load current rating, and of the connection procedures for the motor fitted to your HV8000 pump.

If you have provided your own motor, connect in accordance with the instructions which have been provided with the motor.

However, it is recommended that you read [Section 3.8.2 to 3.8.4](#) inclusive and take appropriate note of any relevant information.

3.8.2 Connect the electrical supply



WARNING

Obey the safety instructions given below when you make the electrical connections. If you do not, you can cause injury to people or damage to the pump/motor.

- You must provide suitable strain relief on the electrical supply cable. If you do not, the cable (or wires in the cable) may become disconnected from the pump and there may be a risk of injury or death by electric shock.
- Connect the electrical supply to the motor through a contactor which has a manual reset control.
- Connect the electrical supply to the motor so that it is automatically switched off if the backing pump stops. If you do not, the HV8000 pump may overheat if it continues to operate when the backing pump is stopped.
- You must be able to isolate and lock out the electrical supply from the HV8000 pump.
- The motor must be correctly configured (where necessary) and you must make the correct electrical connections for your electrical supply. If you do not, you can damage the motor.

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 HV8000 pump could automatically restart after an electrical overload or an electrical supply failure.

You must use a suitable multi-wire cable and a suitable cable-gland to connect your electrical supply to the pump motor. The cable-gland (and adaptor, if fitted) must provide a protective seal to IP44 (or higher), as defined by IEC 529. Refer to the Motor Manual supplied with your HV8000 pump for the sizes of the electrical supply cable-gland holes in the motor.

Connect the motor to the electrical supply as described in the Motor Manual supplied with your pump and to the motor rating plate and terminal box.

3.8.3 Connect the motor thermistors (if fitted)

You must connect the thermistor terminals in the motor to a suitable control circuit, to shut down the HV8000 pump system if the motor temperature is too high. An example control circuit is shown in [Figure 8](#).

You must use a suitable two-wire cable and a suitable cable-gland to connect the thermistors cable (from your control circuit) to the thermistor terminals in the motor. The cable-gland (and adaptor, if fitted) must provide a protective seal to IP44 (or higher), as defined by IEC 529. Refer to the Motor Manual supplied with your HV8000 pump for the sizes of the thermistor cable-gland holes in the motor.

Make the thermistor connections in the motor as described in the Motor Manual supplied.

3.8.4 Connect the motor thermostats (if fitted)

You must connect the thermostat terminals in the motor to a suitable control circuit, to shut down the HV8000 pump system if the motor temperature is too high. An example control circuit is shown in [Figure 8](#).

You must use a suitable two-wire cable and a suitable cable-gland to connect the thermostats cable (from your control circuit) to the thermostat terminals in the motor. The cable-gland (and adaptor, if fitted) must provide a protective seal to IP44 (or higher), as defined by IEC 529. Refer to the Motor Manual supplied with your HV8000 pump for the sizes of the thermostat cable-gland holes in the motor.

Make the thermostat connections in the motor as described in the Motor Manual supplied.

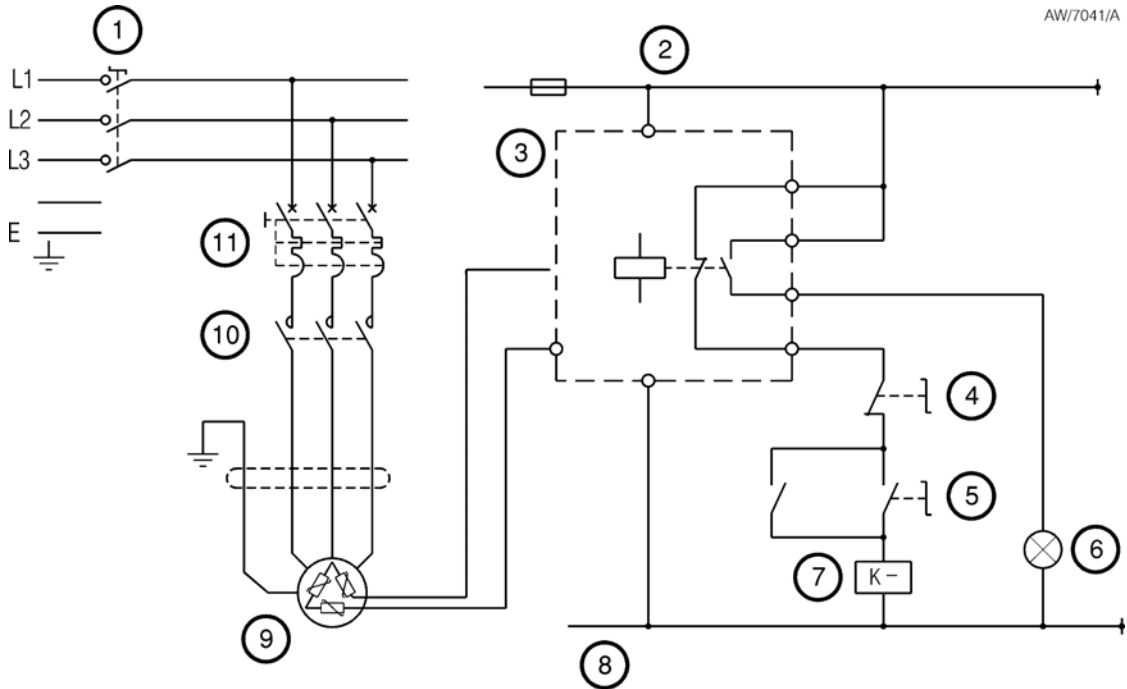
3.9 Earth (ground) connection

Refer to Figure 1 for the location of the earth (ground) stud on HV8000 pumps.

Note that:

- We recommend that you connect the earth (ground) stud to a suitable factory/plant earth (ground).

Figure 8 - Example electrical control circuit



- | | |
|--------------------------------|---------------------|
| 1. Electrical supply isolator | 7. Pump contactor |
| 2. +ve control side | 8. 0 V control side |
| 3. Thermistor/thermostat relay | 9. Pump motor |
| 4. Stop switch | 10. Contactor |
| 5. Start switch | 11. Circuit breaker |
| 6. Fault indicator lamp | |

3.10 Check the direction of rotation



WARNING

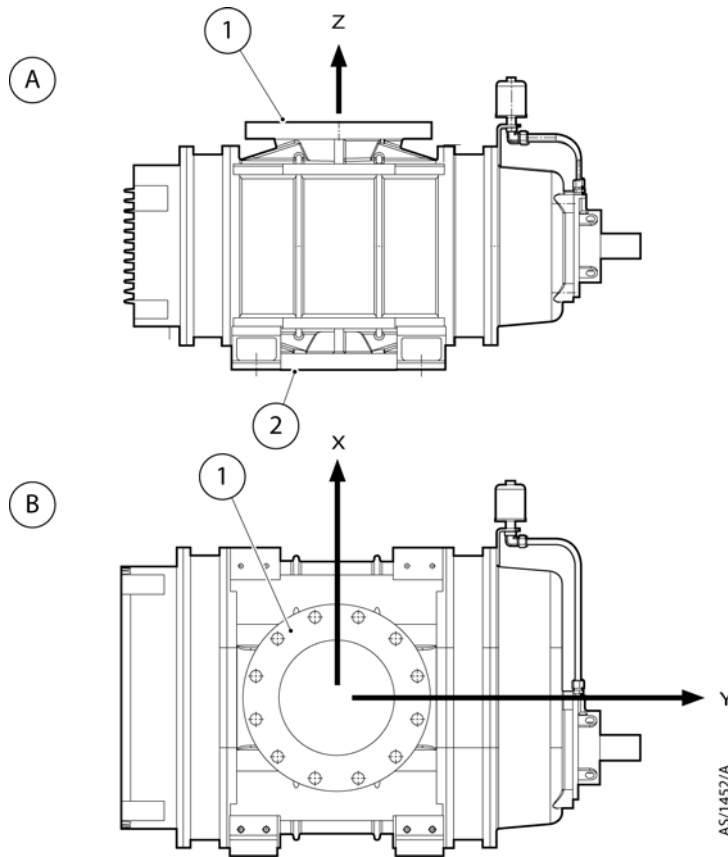
Obey the safety instructions given below. If you do not, you can cause injury to people or damage to the pump/motor.

- Blank the inlet or connect the HV8000 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 pump rotors.
- Ensure that you do not come into contact with the shaft, the coupling/belt or the drive system when you operate the pump. If you do, you may be injured by the rotating components.

After you have connected the drive/transmission or connected the electrical supply to the pump motor, check the direction of rotation of the pump as follows:

1. If necessary (that is, to make it easier to see the pump drive shaft), temporarily remove any guard over the drive coupling or belt (if fitted).
2. Refer to [Figure 1](#). Watch the pump drive shaft (18) or the coupling (9) while you start up the pump (refer to [Section 4.2](#)), then shut down the pump (refer to [Section 4.3](#)) after two seconds or so.
3. Check that the pump drive shaft (18) or coupling (9) rotated correctly in the expected direction.
4. If the direction of rotation was incorrect:
 - If you have installed a bareshaft pump, check the installation of the drive and transmission system and reconfigure as appropriate.
 - If you have installed an HV8000 pump with a motor, isolate the external electrical supply, then reverse any two of the phase wires in the motor terminal-box: refer to the Motor Manual supplied with your HV8000 pump.
 - Perform the direction of rotation check from [Step 2](#) again, to ensure that the pump now rotates in the correct direction.
5. If you have removed a guard over the drive coupling or belt (as in [Step 1](#) above), refit the guard.

Figure 9 - Inlet/outlet flange loading limits



- A. Side view
- B. Plan view
- 1. Inlet/outlet flange
- 2. Outlet/inlet flange
- F Force
- M Moment
- R Resultant
- X Load orientation
- Y Load orientation
- Z Load orientation

Note: HV8000 VF pump shown. The same flange loading limits apply to all HV8000 pumps.

Maximum force (on both inlet and outlet flanges)		
FX	± 100 N	± 22.5 lbf
FY	± 100 N	± 22.5 lbf
FZ	± 200 N	± 45.0 lbf
FR	± 245 N	± 55.1 lbf
Maximum moment (on both inlet and outlet flanges)		
MX	± 50 N m	± 36.9 lbf ft
MY	± 50 N m	± 36.9 lbf ft
MZ	± 50 N m	± 36.9 lbf ft
MR	± 87 N m	± 64.2 lbf ft

3.11 Connect the pump-inlet and outlet



WARNING

Obey the safety instructions given below. If you do not, you can cause injury to people or damage to the pump.

- Do not exceed the load limits on the pump-inlet and outlet flanges as specified in [Figure 9](#). If you do, there will be a risk of leakage of process gases from the HV8000 pump, or of damage to the HV8000 pump.
- If you fit an isolation valve between the HV8000 pump and the backing pump, you must interlock the operation of the valve with the operation of the HV8000 pump, so that closure of the valve results in shut-down of the HV8000 pump.
- Ensure that your backing pump and exhaust-extraction/abatement systems comply with the critical backing pressure requirements of [Section 2.2](#) and [2.3](#).

You must connect the inlet of the HV8000 pump to your vacuum system, and connect the outlet of the HV8000 pump to your backing pump and exhaust-extraction/abatement systems, as required.

Refer to [Section 2.8](#) for the inlet and outlet flange connection details.

Take note of the following when you connect your HV8000 pump to the vacuum system.

- Use suitable gaskets/seals to make the inlet and outlet connections.
- Use the correct number and size of bolts to secure the inlet and outlet flanges: refer to [Figure 2](#) to [5](#).
- 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 HV8000 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 HV8000 pump.

3.12 Commission the HV8000 pump

After you have installed the HV8000 pump, use the following procedure to commission it and prepare it for subsequent operation:

1. Ensure that any isolation valves in the pump inlet and outlet pipelines are in the correct 'open' positions.
2. Ensure that any other components in the system pipelines (such as filters) have been correctly installed and configured for operation.
3. Start up the HV8000 pump: refer to [Section 4.2](#).
4. Operate the HV8000 pump, with no gas load, for at least 15 minutes. During this time:
 - Monitor the external surfaces of the pump and check for 'hot spots' (that is, areas which are unusually hot).
 - If any hot spots persist at the end of the 15 minutes, contact your supplier or Edwards for advice.
5. Continue to operate the pump with a representative gas load, and check that the pump operates correctly and provides the required performance.

If necessary, refer to [Section 5.9](#) if any fault conditions occur.

6. Shut down the HV8000 pump: refer to [Section 4.3](#).

The pump is now ready for normal operation when required.

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4 Operation

CAUTION

Edwards will accept no liability or warranty claims if your pump is used on applications or in a way prohibited in this manual, or not specified in this manual.

4.1 Operational safety



WARNING

Obey the safety instructions and precautions listed below. If you do not, there may be a risk of injury or death to people, or damage to the pump.



WARNING

Ensure that the cooling-air flow around the pump motor is not restricted. If the air flow is restricted, the motor will get hotter than normal during pump operation. This may result in reduced reliability and/or damage and/or the risk of the thermistors/thermostats, if fitted and connected, to shut down the system.

- Do not expose any part of your body to vacuum. If you do, you may be injured.
- Do not operate the pump with the pump inlet or outlet ports open to the atmosphere. If you do, your fingers or other parts of your body or clothing may get trapped, and you may be injured by the rotating mechanisms in the pump.
- During operation, parts of the HV8000 pump can become very hot. Ensure that you do not touch the pump.
- Do not operate the pump with any guards removed from the pump drive shaft, the coupling/belt or the drive system (where fitted). If you do, your fingers or other parts of your body or clothing may get trapped, and you may be injured by the rotating components.
- Never disconnect any of the connecting pipelines (for example, the pipeline connected to the inlet) when the pump is operating.
- Do not attempt to use the HV8000 pump to pump liquids. The HV8000 pumps are not designed for this application.
- Where necessary (for example, if you have not fitted an acoustic enclosure), wear suitable ear defenders. The pump can be noisy during operation (refer to [Section 2.9](#)).

4.2 Start-up

4.2.1 Pre-start checks



WARNING

Ensure that the correct grade of oil is used and that the oil-levels in the HV8000 pump are correct. If an incorrect oil is used or if an oil-level is incorrect, pump performance may be affected and the pump may be damaged.

1. Check that the oil-levels are correct (refer to [Section 3.5](#)) and that the oil filler-plugs are tightened.
2. Check that there are no visible oil or water leaks. If there are any leaks, contact your supplier or Edwards for advice.
3. Check that the HV8000 pump is correctly installed, especially after initial installation and maintenance.

4.2.2 Start-up

1. Ensure that any isolation valves in the pump inlet and outlet pipelines are in the correct positions.
2. Switch on the cooling-water supply:
 - Check that there is an adequate flow of cooling-water at the correct pressure (see [Section 2.4](#)).
 - Check the water connections for leaks.
 - Close the backing pump air-admittance valve (if fitted).
3. Switch on the backing pump and open the backing valve (if fitted).
4. Switch on the motor electrical supply or engage your drive and transmission system to start the HV8000 pump:
 - With DoL starting, you must only start the HV8000 pump when the backing pressure is below the maximum backing pressure for DoL starting: see [Table 2](#). Otherwise, the pump may overheat.
5. Allow the HV8000 pump to run for approximately fifteen minutes to achieve normal operating temperature.
6. Slowly open the pump-inlet isolation-valve (if fitted).

You can now use the pump as required in your application.

4.3 Shut-down

1. Close the pump-inlet isolation-valve (if fitted).
2. Leave the HV8000 pump operating for sufficient time such that the pump is thoroughly purged of any hazardous substances.
3. Switch off the motor electrical supply or disengage the drive and transmission system to stop the HV8000 pump.
4. Open the backing pump air-admittance valve (if fitted) and switch off the backing pump.
5. Switch off the cooling-water supply.

5 Maintenance

5.1 Safety information



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. Obey your local and national safety requirements.
- Ensure that the maintenance technician is familiar with the safety procedures which relate to the gases pumped/compressed by the system in which the pump is installed.
- Allow the pump to cool to a safe temperature before you start maintenance work.
- Isolate the HV8000 pump from the electrical supply/drive system so that it cannot be operated accidentally.
- Recheck the pump rotation direction (see [Section 3.10](#)) if the motor electrical supply or drive and transmission system has been disconnected and then reconnected.
- Take care to protect inlet/outlet port sealing faces from damage.
- Do not reuse seals/gaskets if they are damaged.
- Check the leak tightness of the system connections after maintenance work is complete if you have connected or disconnected the pump inlet or outlet joints. The leak tightness of the system connections must be in accordance with the requirements of your applications.

The HV8000 pump will be contaminated with the process gases 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

The plan in [Table 14](#) details the maintenance operations necessary to maintain the HV8000 pump in normal operation. Instructions for each operation are given in the section shown.

More frequent maintenance may be required if the HV8000 pump is used to pump corrosive or abrasive gases and vapours. If necessary, adjust the maintenance plan according to your experience.

When you maintain the pump, use Edwards spares: refer to [Section 7.3](#).

Table 14 - Maintenance plan

Operation	Frequency	Refer to Section
Check the shaft-seals reservoir oil-level	Daily	5.3
Inspect the oil-level sight-glasses	Weekly	5.4
Check the end-cover oil-levels	Daily/Weekly [*]	5.5
Inspect the system installation	Monthly	5.6
Change the oil	200/8000 hourly [†]	5.7
Overhaul the pump	3 Yearly	5.8
Maintain the motor [‡]	‡	‡

^{*} Check the oil-levels daily during the first week of operation, and weekly thereafter.

[†] Change the oil after the first 200 hours of operation, and every 8000 hours thereafter.

[‡] Maintain the motor in accordance with the Motor Manual supplied.

5.3 Check the shaft-seals reservoir oil-level



WARNING

Ensure that the correct grade of oil is used and that the oil-level in the reservoir is correct. If an incorrect oil is used or if the oil-level is incorrect, pump performance may be affected and the pump may be damaged.

Note: You can fill the shaft-seals reservoir while the pump is operating.

1. Refer to [Figure 1](#), detail A or B. Look at the level of oil in the shaft-seals oil reservoir (5). If the oil-level is too low, continue at [Step 2](#) to fill the reservoir.
2. Remove the vented oil filler-plug from the top of the shaft-seals oil reservoir (5).
3. Pour new oil of the correct type (see [Section 2.6](#)) through the filler port and into the reservoir until the oil-level reaches the top of the reservoir. Do not over-fill the reservoir; if you do, take care to mop up and dispose of any excess oil.
4. Refit the vented oil filler-plug to the top of the shaft-seals oil reservoir (5).

5.4 Inspect the oil-level sight-glasses

1. Refer to [Figure 1](#). Look at the oil-level sight-glass (10) on the drive end cover (7):
 - If the sight-glass is dirty, use a suitable cloth to wipe it clean.
 - If the sight-glass is damaged (that is, scratched, cracked or corroded), or if there are signs of oil leakage from the sight-glass, you must replace it: contact your supplier or Edwards.
2. Look at the oil-level sight-glass (16) on the non-drive end cover (17):
 - If the sight-glass is dirty, use a suitable cloth to wipe it clean.
 - If the sight-glass is damaged (that is, scratched, cracked or corroded), or if there are signs of oil leakage from the sight-glass, you must replace it: contact your supplier or Edwards.

5.5 Check the end cover oil level



WARNING

The end covers will be under vacuum. To remove an oil filler-plug, undo it slowly until the vent hole is visible, allow the pressure in the end-cover to rise to atmospheric pressure, then fully undo and remove the oil filler-plug. If you do not, hot oil may be ejected from the end cover and cause injury.



WARNING

Ensure that the correct grade of oil is used and that the oil-levels in the HV8000 pump are correct. If an incorrect oil is used or if an oil-level is incorrect, pump performance may be affected and the pump may be damaged.

5.5.1 Drive end cover

1. Refer to [Figure 1](#), detail E. Look at the oil level in the sight-glass (10) on the drive end cover (7):
 - If the oil-level is between the minimum and maximum marks (22, 21), continue at [Section 5.5.2](#) to check the oil-level in the non-drive end cover.
 - If the oil level is below the minimum level mark (22), continue at [Step 2](#) to add more oil.
 - If the oil level is above the maximum level mark (21), drain oil from the pump until the level is correct: refer to [Section 5.7](#).
2. If the pump is operating, shut the pump down (refer to [Section 4.3](#)) and allow the pump to cool to a safe temperature.
3. Refer to detail A or B. Carefully remove the oil filler-plug (6) from the filler port on the top of the drive end cover (7): refer to the Warning at the start of [Section 5.5](#).
4. Pour new oil of the correct type (see [Section 2.6](#)) through the filler port and into the end cover until the oil-level reaches the maximum level mark (detail E, item 21). If the oil level goes above the maximum level mark, drain oil from the pump until the level is correct: refer to [Section 5.7](#).
5. Refit the oil filler-plug (6) to the filler port on the top of the drive end cover (7).
6. Continue at [Section 5.5.2](#) to check the oil-level in the non-drive end cover.

5.5.2 Non-drive end cover

1. Refer to [Figure 1](#), detail E. Look at the oil level in the sight-glass (16) on the non-drive end cover (17):
 - If the oil level is below the minimum level mark (22), continue at [Step 2](#) to add more oil.
 - If the oil level is above the maximum level mark (21), drain oil from the pump until the level is correct: refer to [Section 5.7](#).
2. If the pump is operating, shut the pump down (refer to [Section 4.3](#)) and allow the pump to cool to a safe temperature.
3. Refer to detail A or B. Carefully remove the oil filler-plug (1) from the filler port on the top of the non-drive end cover (17): refer to the Warning at the start of [Section 5.5](#).
4. Pour new oil of the correct type (see [Section 2.6](#)) through the filler port and into the end cover until the oil-level reaches the maximum level mark (detail E, item 21). If the oil level goes above the maximum level mark, drain oil from the pump until the level is correct: refer to [Section 5.7](#).
5. Refit the oil filler-plug (1) to the filler port on the top of the non-drive end cover (17).

5.6 Inspect the system installation

Note: Where possible, we recommend that you investigate the cause of any damage or corrosion, and implement corrective measures to prevent any future damage of components.

Use the following procedure to inspect the system connections:

1. Inspect all of the system pipelines and connections and check that they are not damaged or corroded and that they are sufficiently leak-tight. Repair or replace any damaged or corroded component and seal any leak found.
2. If you have installed a drive/transmission system, inspect the drive/transmission system and adjust, repair or replace as necessary: refer to the manufacturer's instructions supplied with your drive/transmission system.
3. Inspect all of the cooling-water pipelines and connections and check that they are not damaged or corroded and that they do not leak. Repair or replace any damaged or corroded component and seal any leak found.
4. Inspect all of the electrical cables; check that they are not damaged and have not overheated. Replace any cables that are damaged or have overheated. Check that all of the electrical connections are secure; tighten any loose connections.

5.7 Change the oil



WARNING

The end covers will be under vacuum. To remove an oil filler-plug, undo it slowly until the vent hole is visible, allow the pressure in the end-cover to rise to atmospheric pressure, then fully undo and remove the oil filler-plug. If you do not, hot oil may be ejected from the end cover and cause injury.



WARNING

Ensure that you do not come into contact with the used pump oil. The end-cover oil may be hot and can cause injury.

5.7.1 Drive end cover

1. Refer to [Figure 1](#) detail A or B. Carefully remove the oil filler-plug (6) from the filler port on the top of the drive end cover (7): refer to the Warning at the start of [Section 5.7](#).
2. Refer to detail A. Place a suitable container under the drain plug (11) on the drive end cover (7). The container must have a maximum capacity as specified in [Table 5](#).
3. Remove the oil drain plug (11) from the end cover, and allow the oil to drain from the end cover into the container.
4. Refit the oil drain plug (11) to the drive end cover (7).
5. Dispose of the oil: refer to [Section 6.2](#).
6. Fill the drive end cover with new oil of the correct type and grade: refer to [Section 5.5.1](#).

5.7.2 Non-drive end cover

1. Refer to [Figure 1](#) detail A or B. Carefully remove the oil filler-plug (1) from the filler port on the top of the non-drive end cover (17): refer to the Warning at the start of [Section 5.7](#).
2. Refer to detail A. Place a suitable container under the drain plug (15) on the non-drive end cover (17). The container must have a maximum capacity as specified in [Table 5](#).
3. Remove the oil drain plug (15) from the end cover, and allow the oil to drain from the end cover into the container.
4. Refit the oil drain plug (15) to the non-drive end cover (17).
5. Dispose of the oil: refer to [Section 6.2](#).
6. Fill the non-drive end cover with new oil of the correct type and grade: refer to [Section 5.5.2](#).

5.8 Overhaul the pump

The HV8000 pump must be regularly overhauled, as specified in [Table 14](#). As part of the overhaul, the bearings in the pump must be replaced. The pump seals and the motor coupling insert should also be replaced.

If you have a safe area HV8000 pump, we recommend that you contact your supplier or Edwards to arrange for an overhaul of the pump, unless you are specifically approved and authorised to perform this work yourself.

5.9 Fault finding

A guide to fault conditions and their possible causes is provided in [Table 15](#) to assist you in basic fault finding.

If you are unable to rectify a fault when you use this guide, call your supplier or your nearest Edwards Service Centre for advice.

Note: *If you have been approved to carry out strip-down, repair and reassembly of your pump, refer to the Service Manual supplied separately for detailed procedures.*

Table 15 - Fault finding

Symptom	Check	Actions
The pump will not start, or seizes during operation.	<p>Has the pump been overloaded?</p> <p>Has debris or foreign material entered the pump?</p> <p>Is the motor or drive/transmission system faulty?</p> <p>Has the pump casing been distorted?</p>	<p>Check the required operating conditions and specified performance of the pump (see Section 2).</p> <p>Strip down, clean and repair the pump as necessary.</p> <p>Check that your motor or drive and transmission system is operating correctly, and that it is correctly fitted to the pump: refer to the Motor Manual supplied and to Section 3.7.</p> <p>Check that the pump is installed on a level surface (see Section 3.2), and that the maximum loadings on the inlet/outlet flanges have not been exceeded (see Section 3.11).</p> <p>Rectify any problem found, then:</p> <p>Check the pump casing for distortion. If the casing is distorted, contact your supplier or Edwards for advice.</p> <p>If the casing is not distorted, check the rotor clearances. Contact your supplier or Edwards for advice.</p>
The pump is noisy during operation.	<p>Are the rotors touching, or are the rotors striking the pump casing?</p> <p>Is gear backlash excessive?</p> <p>Are the gear and/or bearing clearances incorrect?</p> <p>Are the rotors unbalanced?</p>	<p>Check the rotor clearances and rotor-compression chamber clearances. Contact your supplier or Edwards for advice.</p> <p>Check the gears and replace if necessary.</p> <p>Check the clearances. Contact your supplier or Edwards for advice.</p> <p>Contact your supplier or Edwards for advice</p>

Table 15 - Fault finding (continued)

Symptom	Check	Actions
The pump overheats.	<p>Is the inlet filter blocked?</p> <p>Is the differential pressure across the pump too high?</p> <p>Is an oil level too high, or has the incorrect grade of oil been used?</p> <p>Are the rotor or rotor/casing clearances incorrect?</p> <p>Has the cooling-water supply failed or is the supply inadequate?</p>	<p>Clean or replace the filter.</p> <p>Check that your system design complies with the requirements of Section 3.2, and that the pump is suitable for use in your application.</p> <p>Check the oil levels (refer to Section 5.5) or drain the pump and fill with the correct grade of oil (refer to Section 5.7).</p> <p>Contact your supplier or Edwards for advice.</p> <p>Check that the cooling-water supply pipelines are correctly connected to the pump (see Section 3.6) and that the supply complies with the requirements of Section 2.4.</p>
There is oil in the gas stream from the pump.	<p>Is an oil level too high?</p> <p>Have the shaft seals failed?</p>	<p>Check the oil levels and if necessary drain oil from the pump: refer to Section 5.5.</p> <p>Replace the shaft seals.</p>
Oil leaks from the drive shaft.	Have the lip seals failed?	Inspect the lip seals and replace if necessary.
Oil leaks from between the casing and an end-cover.	Has the casing/end-cover seal failed?	Replace the seal.
Oil leaks from a sight-glass.	<p>Is the sight-glass loose?</p> <p>Has the seal failed, or is the glass cracked?</p>	<p>Tighten the securing bolts.</p> <p>Replace the seal and/or sight-glass as necessary.</p>
The shaft-seals oil reservoir is empty.	<p>Has the reservoir been filled with oil?</p> <p>Are there oil leaks at the shaft end?</p>	<p>Fill the reservoir with oil as described in Section 5.3.</p> <p>Replace the lip seal.</p> <p>If there are no oil leaks at the shaft end, replace the mechanical shaft seals and lip seal.</p>
There is a low volume flow through the pump.	<p>Is the inlet filter blocked?</p> <p>Is the inlet pressure too low?</p> <p>Is the pump worn or damaged?</p> <p>Is the pump unsuitable for your application?</p>	<p>Clean or replace the filter.</p> <p>Check the inlet pipeline for a blockage, closed valve or other restriction.</p> <p>Contact your supplier or Edwards for advice.</p> <p>If necessary, redesign your system to comply with the capabilities of the pump, or fit a different pump which provides the necessary performance.</p>

Table 15 - Fault finding (continued)

Symptom	Check	Actions
Absorbed power is too high.	<p>Has debris or foreign material entered the pump?</p> <p>Is the inlet filter blocked?</p> <p>Is the pump unsuitable for your application?</p> <p>Is the motor or drive/transmission system faulty?</p>	<p>Strip down, clean and repair the pump as necessary.</p> <p>Clean or replace the filter.</p> <p>If necessary, redesign your system to comply with the capabilities of the pump, or fit a different pump which provides the necessary performance.</p> <p>Check that your motor or drive and transmission system is operating correctly, and that it is correctly fitted to the pump: refer to the Motor Manual supplied and to Section 3.7.</p>
The pump cannot reach its specified ultimate vacuum pressure.	<p>Is there a leak in the inlet pipeline?</p> <p>Is the pump leaking?</p> <p>Has the incorrect oil been used?</p> <p>Is the pump worn or damaged?</p>	<p>Check the inlet pipeline for any valves open to atmosphere, or for leaking connections.</p> <p>Check that all of the oil filler plugs are fitted and are tight, and that the inlet/outlet flange connections are secure and do not leak.</p> <p>Drain the pump and refill with the correct oil: refer to Section 5.7.</p> <p>Contact your supplier or Edwards for advice.</p>
-	-	<p>If you have made the checks/actions as described above and you still cannot identify the cause of a fault, or if you cannot rectify a fault, contact your supplier or Edwards for advice.</p>

6 Storage and disposal

6.1 Storage

CAUTION

If you will store the pump in temperatures close to, or below, 0 °C (32 °F), you must drain the cooling-water from the pump, or add a suitable anti-freeze to the pump.

6.1.1 Preparation

1. Shut down the pump as described in [Section 4.3](#).
2. If necessary, disconnect the electrical supply from the pump motor (refer to the Motor Manual supplied with your HV8000 pump) or disconnect the drive and transmission system from the pump drive shaft (refer to the manufacturer's instructions supplied with your transmission system and/or to [Section 3.7.1](#)).
3. If necessary, purge your system and the HV8000 pump with dry air, and disconnect the pump from your system pipelines.
4. Disconnect your cooling-water supply pipelines from the pump.
5. Place and secure protective covers over the pump inlet, outlet and services connections.
6. If required, use suitable lifting equipment to move the pump to its storage area: refer to [Section 3.3](#).
7. If you will store the pump for longer than six weeks, refer to the requirements in [Section 6.1.2](#).
8. Store the pump in clean, dry conditions in a well-ventilated place that is free from vibration or shocks.

6.1.2 Long-term storage

If the pump is to be stored for longer than six weeks:

1. Drain the oil from the drive end and non-drive end covers: refer to [Section 5.7](#).
2. Fill the drive end and non-drive end covers with a suitable protective oil (see [Table 16](#)): use the method in [Section 5.5](#).
3. Turn the pump drive shaft by hand through three or four revolutions, to turn the pump and prevent seizure.
4. Spray a suitable protective oil (see [Table 16](#)) through the inlet and into the pump.
5. If required, spray a suitable protective oil (see [Table 16](#)) on the outer surfaces of the pump, to inhibit corrosion.

During storage, every 14 days or less, turn the pump drive shaft by hand through a quarter of a revolution, to turn the pump and prevent seizure or degradation of the bearings.

When required for use after storage:

1. Drain the protective oil from the drive end and non-drive end covers, then fill the end covers with new oil: refer to [Section 5.7](#).
2. Use a suitable cleaning solution (such as alcohol or white spirit) to clean the rotors:
 - Moisten a suitable clean, lint-free cloth with the cleaning solution.
 - Clean the rotors which are visible through the inlet port.
 - Turn the pump drive shaft as necessary to access the other rotors.

3. Prepare and install the pump as described in Section 3.

Table 16 - Suitable protective oils

External components	Internal components
Rust Ban 324 (Esso)	Mobilarma 523/524 (Mobil)
V Product 9703 (Shell)	Esso Lub MZ 20E/20 (Esso)
Tecrex 39 (Mobil)	Ensis Motor Oil 20 (Shell)

6.2 Disposal

WARNING



Ensure that you wear the appropriate Personal Protective Equipment (PPE) when you handle contaminated oil or contaminated components.

Safely dispose of the pump, used oil, cleaning materials, and any components in accordance with all local and national safety and environmental requirements.

The pump may be dis-assembled and the majority of it may be recycled.

Take particular care with the following:

- Used oil that has been contaminated with dangerous substances.
- Cleaning materials that have been contaminated with dangerous substances.
- Components that have been contaminated with dangerous substances.

7 Service and spares

7.1 Introduction

Edwards products, spares and accessories are available from Edwards companies in Belgium, Brazil, China, France, Germany, Israel, Italy, Japan, Korea, Singapore, United Kingdom, USA and a world-wide network of distributors. The majority of these 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, please state for each part required:

- Model and Item Number of your equipment
- Serial number (if any)
- Item Number and description of the part

7.2 Service

Edwards products are supported by a world-wide 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.

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

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

7.3 Spares

The spares available for the HV8000 pumps are shown in [Table 17](#).

Spares kits have been structured such that they are progressive in nature up to and including kit A31101806. It is our recommendation that in order to maximise the benefit of any replacement, then one should also replace the items defined in the spares kits with lower part numbers than that of the kit required for the defined task.

For example, when changing the gears, we would recommend that you should also change the mechanical seal (with the shaft sleeve) and the O-rings.

Thus, in addition to kit A31101804, one would also require kits A31101803 and A31101801.

It is also permitted to change the bearings without simultaneously changing the gears. One will require kits A31101805, A31101803 and A31101801 to carry out this task.

Note: *Kit A31101802 has been provisioned for use when one wishes to change the mechanical seal without changing the shaft sleeve at the same time.*

Kits with part numbers of A31101807 and higher may be used in isolation.

Table 17 - Spares and maintenance kits

Spares	Part No.
Gear box oil 4 litre Mobil SHC 629	H11023011
HV8000 set of O-rings spare	A31101801
HV8000 mechanical seal kit spare	A31101802
HV8000 mechanical seal + sleeve kit spare	A31101803
HV8000 gear set spare	A31101804
HV8000 bearings kit spare	A31101805
HV8000 rotors kit spare	A31101806
HV8000 oil reservoir spare	A31101807
HV8000 sight glass spare	A31101808
Motor coupling insert spare	A70573758