ATEX EH Mechanical Booster Pumps

INSTRUCTION MANUAL

edwardsvacuum.com

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Associated publications

Publication title	Publication number	Link
Vacuum Pump and Vacuum Systems safety manual	P60102708	*https://4vac.io/2vhg1m*
ATEX Instruction Manual	P60060200	*https://4vac.io/8nzqu7*

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Disclaimer

		Europe	USA	Asia	
		220-240 V 380-415 V 3 phase	230 V/460 V 3 phase	200/380 V 3 phase	
	*	50 Hz	60 Hz	50 Hz	60 Hz
Hydrocarbon					
EH250IND	SA	A30151945	A30152946	A30151934	A30152934
EH500IND	SA	A30271945	A30272946	A30271934	A30272934
EH1200IND	SA	A30590935	A30591936	A30590934	A30591934
EH2600IND	SA	A30775946‡	A30776982**	A30753934	A30754934
EH4200IND	SA	A30975946‡	A30976982**	A30975932	A30976934
PFPE					
EH250FX	SA	A30153935	A30154936	A30153934	A30154934
EH500FX	SA	A30273935	A30274936	A30273934	A30274934
EH1200FX	SA	A30592935‡	A30593936	A30592934	A30593934
EH2600FX	SA	A30753935	A30754936	A30775934	A30776934
Chemical Pumps (ATEX and Flammable)					
EH250C	FP		NRA997000**		
EH250T4	FP	NRA996000‡			
EH500C	FP		NRA999000**		
EH500T4…T3***	FP	NRA998000‡			
EH1200C	FP		A30556982†		
EH1200T4	FP	A30557900			
EH2600C	FP		A30756982**		
EH2600T3	FP	A30741935‡			
EH2600T4	FP	A30779900‡			
EH4200C	FP		A30956982**		
EH4200T3	FP	A30941935‡			
EH4200T4	FP	A30979900‡			

** SA = Safe Area, FP = Flameproof, † 460 V only, ‡ 380-415 V only*

*** 230-460 V only*

**** T4 must be used with a primary pump with a minimum value of 160 m^3h^{-1}*

Contents

List of Figures

1. Safety and compliance

For safe operation from the start, read these instructions carefully before you install or commission the equipment and keep them safe for future use. Read all the safety instructions in this section and the rest of this manual carefully and make sure that you obey these instructions.

The instruction manual is an important safety document that we often deliver digitally. It is your responsibility to keep the instruction manual available and visible while working with the equipment. Please download the digital version of the instruction manual for use on your device or print it if a device will not be available.

1.1 Definition of Warnings and Cautions

Important safety information is highlighted as warning and caution instructions which are defined as follows. Different symbols are used according to the type of hazard.

WARNING:

If you do not obey a warning, there is a risk of injury or death.

CAUTION:

If you do not obey a caution, there is a risk of minor injury, damage to equipment, related equipment or process.

NOTICE:

Information about properties or instructions for an action which, if ignored, will cause damage to the equipment.

We reserve the right to change the design and the stated data. The illustrations are not binding.

1.2 Safety symbols

The safety symbols on the products show the areas where care and attention is necessary.

The safety symbols that we use on the product or in the product documentation have the following meanings:

	**Warning/Caution** Risk of injury and/or damage to equipment. An appropriate safety instruction must be followed or a potential hazard exists.
	**Warning - Dangerous voltage** Risk of injury. Identifies possible sources of hazardous electrical shock.
	**Warning - Flammable material** Risk of fire. Identifies possible sources of flammable gases, liquids or materials.
	**Warning - Hot surfaces** Risk of injury. Identifies a surface capable of inflicting burns through contact.
	**Warning - Moving parts present** Risk of injury. Identifies moving parts that may cause injury or damage to equipment.
	**Warning - Risk of explosion** Risk of injury or damage to equipment. Identifies a situation that could result in an explosion.
	**Symbol - Protective earth** Identifies an electrical equipment earth (ground) terminal.

2. Introduction

2.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for EH mechanical booster pumps. The pumps must be used as specified in this manual. Read this manual before you install and operate the pumps.

- Safe area EH mechanical booster pumps:
  EH250FX, EH250IND EH500FX, EH500IND, EH1200FX, EH1200IND, EH2600FX, EH2600IND, EH4200FX and EH4200IND
- Chemical EH mechanical booster pumps:
  EH250C, EH500C, EH1200C, EH2600C and EH4200C
- ATEX compliant EH mechanical booster pumps:
  EH250T4, EH500T4...T3, EH1200T4, EH2600T3, EH2600T4, EH4200T3 and EH4200T4

Where appropriate, the titles EH mechanical booster pump, safe area EH mechanical booster pump, ATEX compliant EH mechanical booster pumps and chemical EH mechanical booster pump are abbreviated to the pump, safe area EH pump, ATEX compliant EH pump and chemical EH pump respectively in the remainder of this manual.

2.2 Description

2.2.1 Overview

The pumps are compact and have high pumping speeds. The pumps must be used with a suitable backing pump delivering at least 1/10th of volumetric capacity of the booster pump. The pumps can operate with a maximum continuous inlet pressure of 1000 mbar. Lower system pressures can be achieved by the use of two or more pumps in series.

On all pumps, the hydrokinetic drive/gearbox is connected to the pump outlet by a pressure equalisation passageway and forms an integral part of the vacuum system. The connecting passageway has a filter which removes debris and so prevents contamination of the lubricating oil and bearings. For an even cleaner system, evacuate the end cover/ gear cover by connecting the evacuation port (refer to *Figure: EH250FX and EH500FX pump variants* or *Figure: EH1200FX, EH2600 and EH4200 pump variants*) to the pump inlet or to an external vacuum pump.

The hydrocarbon safe area, ATEX compliant and chemical pumps use hydrocarbon oils, such as Ultragrade 20. Versions of the safe area EH pumps for use with PFPE (perfluoropolyether) oils are also available for vacuum systems in which oxygen or other reactive or corrosive gases are pumped. The pumps must not be used to pump peroxides.

All of the EH2600 and EH4200 model pumps have an after-cooler in the pump outlet, to reduce the exhaust gas and rotor temperature.

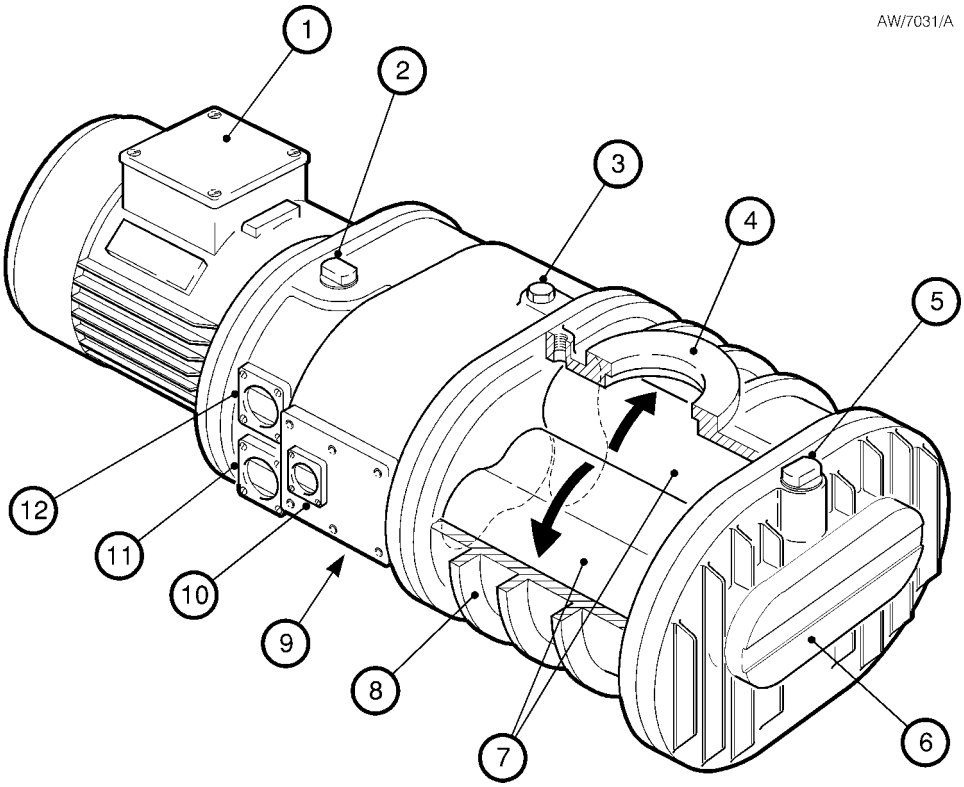
The safe area pumps are safe to handle non-flammable gases and vapours within the normal operating parameters of the pumps, as defined in this manual.

The chemical, and ATEX compliant EH pumps, when used with suitable backing pumps, are designed to pump flammable gases within the T (temperature) classification defined in the pump description (see *Temperature classification* on page 14).

In order to comply with temperature classification requirements, a chemical, and ATEX compliant EH pump must be connected to a backing pump that provides at least 1/10th of the volumetric capacity of the EH Booster.

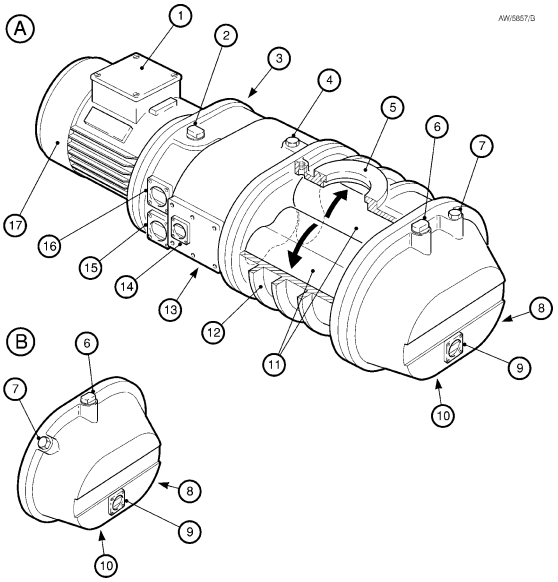
All the pumps have ISO inlet flange and outlet flange connections.

Figure 1 EH250FX and EH500FX pump variants



1. *Terminal box*
2. *Shaft seal reservoir vented oil filler plug*
3. *Hydrokinetic drive/gearbox oil filler plug*
4. *Inlet flange*
5. *External evacuation point*
6. *End cover*
7. *Rotors*
8. *Stator housing*
9. *Hydrokinetic drive/gearbox oil drain plug (under the pump)*
10. *Direction of rotation sight glass*
11. *Oil level sight glass (hydrokinetic drive/gearbox)*
12. *Oil level sight glass (shaft seal reservoir)*

Figure 2 EH1200FX, EH2600 and EH4200 pump variants



A. All EH2600 and EH4200 pumps
B. All EH1200 pumps
1. Terminal box
2. Shaft seal reservoir vented oil filler plug
3. Cooling water connection
*4. Hydrokinetic drive/gearbox oil filler plug**
5. Inlet flange
6. External evacuation point
7. Gear cover oil filler plug
8. Cooling water connection
9. Oil level sight glass (gear cover)
10. Gear cover oil drain plug (under the pump)
11. Rotors
12. Stator housing
13. Hydrokinetic drive/gearbox oil drain plug (under the pump)
14. Direction of rotation sight glass†
15. Oil level sight glass (hydrokinetic drive/ gearbox)
16. Oil level sight glass (shaft seal reservoir)
17. Motor fan cover

** Safe area EH pumps only. On the chemical, and ATEX compliant EH pumps, this is a combined hydrokinetic drive/gearbox oil filler plug and purge connector.*

† EH1200 pumps only.

2.2.2 General construction

The pumps are positive displacement roots vacuum pumps. The pump mechanism is driven by a three-phase electric motor through a hydrokinetic drive (refer to *Hydrokinetic drive* on page 12).

The safe area pumps are all installed with safe area motors. The chemical, and ATEX compliant EH pumps are all installed with flameproof motors (see *Flameproof motors* on page 12). All of the motors are air cooled.

The pump shafts and rotors are made of cast SG iron. The internal and external shaft seals are made of polytetrafluoroethylene (PTFE) or fluoroelastomer.

The pump bearings, gears and seals are lubricated by oil fed from reservoirs in the hydrokinetic drive/gearbox. A series of seals stops the oil from reaching the vacuum side of the pump. The hydrokinetic drive/gearbox is evacuated. All pumps have ISO inlet flange and outlet flange connections. Oil filler, oil drainage and external evacuation connections are provided on the hydrokinetic drive/gearbox.

The timing gears on all of the EH1200, EH2600 and EH4200 model pumps are lubricated by oil inside the gear cover. An oil filler connection is provided. The oil level can be inspected through a sight glass installed to the gear cover.

2.2.3 Principle of operation

The pump is shown in *Figure: EH250FX and EH500FX pump variants* or *Figure: EH1200FX, EH2600 and EH4200 pump variants*. The motor shaft drives one of the rotors through the hydrokinetic drive. The 1:1 gears inside the hydrokinetic drive/gearbox drive the second rotor in the opposite direction inside the stator housing. A small, accurately gauged clearance is maintained between the rotors and between each rotor and the stator wall. This clearance allows the pump to operate at high speed without mechanical wear and without the need for lubrication inside the swept volume.

2.2.4 Hydrokinetic drive

The hydrokinetic drive consists of a fluid coupling which connects the electric motor shaft to the rotor. This system is configured so that when the gas load is high, the rotational speed of the rotors is reduced. As the gas load decreases, the rotors accelerate to full speed. This allows continuous operation of the pump over the vacuum range without the risk of overloading the motor and removes the need for bypass valves and associated pipelines.

The fluid coupling is viscosity sensitive. The two versions of the pump (for hydrocarbon and PFPE oils) have fluid coupling drives which are specifically designed for the type of oil used in the pump.

2.3 Chemical and ATEX compliant EH pumps

2.3.1 Flameproof motors

For all EH250C, EH250T4, EH500C, EH500T4...T3, EH1200C, EH1200T4, EH2600C, EH2600T3, EH2600T4, EH4200C, EH4200T3 and EH4200T4:

- Pumps suitable for 50 Hz operation are installed with a flameproof motor approved to Ex db, Ex db IIB, Temperature Class T4.
- Pumps suitable for 60 Hz operation are installed with a flameproof motor approved to CSA, Division 1 area, Gas Class I Group C & D, and Dust Class II Group F & G, Temperature Class T3C.
- If the pump is operated in a IIC external environment, fit a IIC motor to the EH mechanical booster.

2.3.2 ATEX directive (2014/34/EU): Europe only

ATEX compliant EH pumps with an internal T3 or T4 temperature classification (refer to *Temperature classification* on page 14) may be used in an ATEX-compliant vacuum system only if the pumps are configured and used in accordance with the requirements

of this manual. For ATEX compliant systems using an EH booster pump in combination with an EDP dry pump, the requirements of the ATEX Instruction Manual (see 'Associated publications') must also be met.

Note:

An 'X' suffix to the EH booster ATEX classification indicates that there are special conditions for safe use of the booster.

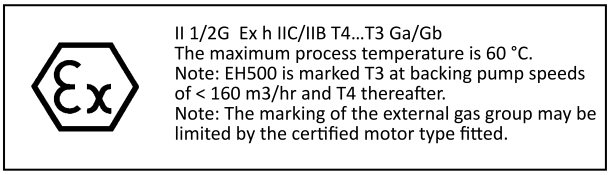
ATEX compliant systems supplied by us will be certified in accordance with the ATEX directive, and will be identified by an ATEX system rating label.

If fitting an ATEX compliant EH pump with a T3 or T4 temperature classification into an ATEX compliant vacuum system, the pump must be installed and operated in accordance with the requirements of this instruction manual. Please pay special attention to *Temperature classification* on page 14 about the temperature classification of the pump, *Hydrokinetic drive/gearbox purge* on page 14 about the hydrokinetic gearbox purge, about the requirements of constructional safety, *Abnormal operation* abnormal use, about the possible combination of EH mechanical booster with our backing pumps and *Cooling water data* about the minimum cooling water flow. A safety risk assessment must also be carried out as part of the system certification in order to make sure that the system is safe. If using a non-Edwards backing pump in combination with the EH mechanical booster, please make sure that the volumetric ratio of the backing pump is at least 1/10th of the volumetric capacity of the EH booster. If necessary, contact us for certification advice.

Note:

The EH500T4 must be used with a primary pump with a minimum 160 m^3h^{-1}.

ATEX compliant EH pumps with an internal T3 or T4 temperature classification are suitable for operation in ATEX compliant systems rated as follows:



The notations used in these ratings are as follows:

	Equipment to be used in a potentially explosive atmosphere
II	Equipment group II - non mining equipment
int or ext	Internal or External of the pump
1,2	Equipment category 1, Equipment category 2
G	Explosive atmosphere caused by gases, vapours or mists
Ex h	Explosion protection method
IIB or IIC	Gas Groups IIB or IIC
T3 or T4	Temperature Rating, T3 (200 °C) or T4 (135 °C)

T4…T3	Temperature Rating,T4 (135 °C) and T3 (200 °C), T4 has pump use restrictions.
Ga, Gb	EPL (Equipment Protection Level)

Refer to *Technical data* on page 18 of this manual for the necessary pump operating conditions. If the booster is part of an the vacuum system, refer to the ATEX Instruction Manual and to the system instruction manual for specific details of the system.

2.3.3 Temperature classification

The temperature classifications applied to the chemical and ATEX compliant EH pumps relate to the auto-ignition temperature of flammable materials that can be pumped:

- The EH500T3, EH2600T3, EH4200T3, ATEX compliant and chemical EH pumps that have a T3 classification are suitable for pumping flammable materials that have an auto-ignition temperature greater than 200 °C.
- The EH250T4, EH500T4, EH1200T4, EH2600T4 and EH4200T4 ATEX compliant pumps that have a T4 classification are suitable for pumping flammable materials that have an auto-ignition temperature greater than 135 °C.

Refer to *Technical data* on page 18 of this manual for the necessary pump operating conditions, to the ATEX Instruction Manual, and to the system manual for specific details of the system in which the pump is installed.

2.3.4 Hydrokinetic drive/gearbox purge

CAUTION: EH ATEX COMPLIANT BOOSTER

Risk of damage to equipment. When using the EH ATEX compliant booster in either our ATEX compliant system or in a customer certified ATEX vacuum pumping system, make sure that the gearbox purge is connected to the booster and the nitrogen supply is guaranteed. Please refer to *Hydrokinetic drive/gearbox nitrogen supply* on page 24 for operating conditions.

A pipeline connector is provided on the oil filler of the hydrokinetic drive/gearbox of all of the chemical and ATEX compliant EH pumps. Connecting a suitable purge gas supply to this connector will purge the hydrokinetic drive with nitrogen at positive pressure. This will purge the shaft seals and prevent the entry of corrosive or toxic vapours into the hydrokinetic drive and gear cover.

A fixed restrictor in the connector make sure that the correct amount of nitrogen is allowed to flow into the hydrokinetic drive/gearbox.

2.3.5 After-cooler

On the EH2600C, EH2600T3, EH2600T4, EH4200C, EH4200T3, EH4200T4 chemical and ATEX compliant EH pumps, the nickel-plated after-cooler is resistant to corrosive vapours which may condense on it during pump operation (depending on the application).

2.3.6 Normal operation

WARNING: PROCESS DEPOSITS

Risk of injury and damage to equipment. The ATEX compliant EH pumps rely on the principle of constructional safety to pump flammable gases and vapours safely. Process deposits (which could form due to condensation of process vapours) do not normally occur in booster pumps. However, to conform with constructional safety requirements, it is the customer's responsibility to make sure that process deposits do not occur in the ATEX compliant EH pump.

WARNING: PARTICLE INGRESS

The ATEX compliant EH pump must be protected from the ingress of particles that could cause an ignition of flammable gas or vapour in the pump. If particles could enter the ATEX compliant EH pump during system commissioning, fit a suitable inlet filter or screen that may be removed before process operation (refer to *Connect the pump inlet and outlet*). The EH4200 must always have an inlet screen installed, as the pump casing can fracture. A suitable inlet screen is shown in *Table: Spares*.

The ATEX compliant EH pumps rely on the pump's constructional safety for the safe pumping of flammable materials. In normal operation, as defined by this manual, the ATEX compliant EH pumps are safe for the pumping of 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 a potential ignition hazard.

Where there is no such risk, the ATEX compliant EH pumps can be used to pump flammable materials from gas group IIA, IIB and IIC within the normal parameter defined in this manual.

2.3.7 Abnormal operation

Misuse of the chemical and ATEX compliant EH pump as described below is strictly prohibited:

- Pumping gases with temperatures greater than the system temperature classification (see *Temperature classification* on page 14).
- Pumping hydrocarbon oxides.
- Pumping pyrophoric gases.
- Pumping gases that tend to self-decompose, or that are chemically unstable.
- Pumping peroxides or oxygen enriched atmospheres with ATEX certified pumps. For non-ATEX applications PFPE versions of the pumps can be offered for oxygen enriched atmospheres and peroxides.
- Use of the chemical and ATEX compliant EH pump with materials which have auto-ignition temperatures below the defined temperature rating of the chemical EH pump.
- Pumping of, or use of the ATEX compliant EH pump in the presence of, explosive dust atmospheres.
- Use of the ATEX compliant EH pump in ambient conditions other than those specified in *Operating and storage conditions* on page 18.

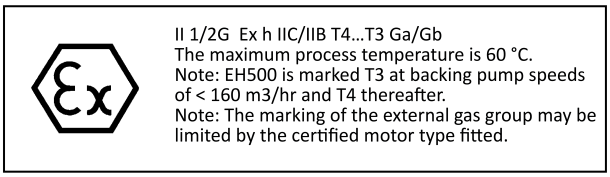
2.3.8 Electrostatic charges

Pure gas does not create electrostatic charges. There is a danger of electrostatic charges when the gas pumped contains droplets or particles.

Always make sure that the pump is earthed so there is no danger of igniting flammable gases due to electrostatic discharges.

2.3.9 ATEX certification of EH mechanical booster

The EH booster is certified under the ATEX directive and will bear the following marking:



The category of the EH booster will depend on the level of systemisation. Refer to *Category 2* on page 16 for more information. If in doubt please contact us. If the EH mechanical booster was purchased as part of our ATEX system, all the systemisation requirements to fulfil the system certification will have been implemented.

Category 2

The EH Category 2 boosters rely on constructional safety. Refer to *After-cooler* for more information.

Safety critical instrumentation for Category 2 and required SIL.

- Cooling water flow switch: In order to guarantee the temperature classification of the EH booster, install a cooling water flow switch to the cooling water outlet line of the EH1200, EH2600 and EH4200 booster. Refer to *Technical data* on page 18 for cooling water requirements. The flow switch and the associated control system must be rated SIL1 and have a HFT = 0 in accordance with EN50495.

Category 1

EH Category 1 mechanical boosters (internal certification) rely on constructional safety and control of ignition sources.

A pressure sensor/switch installed to the exhaust line of the EH booster must make sure that the booster is switched off when the exhaust pressure rises above 100 mbar. The booster is only allowed to operate when pressures inside the booster are below 100 mbar. Pump down can be done through the booster.

Safety critical instrumentation for Category 1 and required SIL.

In addition to the cooling water switch for Category 2 (Refer to *Category 2* on page 16), an exhaust pressure sensor/switch and a nitrogen pressure or flow switch on the gearbox purge line is required to achieve Category 1.

- Exhaust pressure sensor/switch: To make sure that the EH mechanical booster only operates when the pressure inside the booster is below 100 mbar. A sensor or switch is installed to the exhaust of the booster. The output from this sensor or switch must be connected to safety interlock circuit that meets the requirement of

b1 in accordance with EN80079-37 and stops the booster if the maximum pressure is exceeded.

- Nitrogen flow or pressure switch on gearbox purge line: The correct Nitrogen flow or pressure to the gearbox is required for constructional safety to prevent process gases contaminating the gearbox and/or the bearings. The output from this flow or pressure switch must be connected to a safety interlock circuit that meets the requirements of b1 in accordance with EN80079-37. If the Nitrogen supply falls below the required rate for more than 2 hours the booster will stop. The flow switch must be mechanically attached to the body of the pump to avoid leakage. Please refer to *Hydrokinetic drive/gearbox nitrogen supply* on page 24 for the required nitrogen supply pressure and flow.

3. Technical data

3.1 Operating and storage conditions

Note:

Because of the flexibility of the hydrokinetic drives, there is a wide range of backing pumps which are suitable for use with EH mechanical booster pumps. However, note the restrictions for chemical and ATEX compliant EH pump critical backing pressure given in Critical backing pressure. If necessary, contact us for advice.

Table 1 Operating and storage conditions

Parameter	Value
Ambient operating temperature range	5 °C to 40 °C
ATEX pump explosive operating range	-20 °C to 40 °C
Ambient storage temperature range	-20 °C to 80 °C
Maximum ambient operating humidity	90% RH
Protection degree (as defined by IEC 529)	IP44
Recommended backing pumps	See note above

3.2 Critical backing pressure

WARNING: CRITICAL BACKING PRESSURE

Risk of injury and damage to equipment. For ATEX compliant EH pumps not purchased as part of an approved Edwards ATEX system (which are installed with flameproof motors), the outlet pressure of the ATEX compliant EH pump must not exceed the critical backing pressure at zero flow, as specified below. If this critical pressure is exceeded, internal temperatures in the ATEX compliant EH pump may exceed the temperature classification (refer to *Temperature classification* on page 14) and render it invalid. This can result in an internal ignition of the pumped gases/ vapours.

When fitting an isolation valve between the ATEX compliant EH pump and the backing pump, valve operation must be interlocked with the operation of the ATEX compliant EH pump, so that closure of the valve results in shutdown of the ATEX compliant EH pump.

If this critical backing pressure is exceeded, the pump rotors have to do additional compressive work against the backing pressure, which can cause the rotor temperature to exceed the temperature classification limits, as there is no flow of cooling gas through the pump. The critical backing pressure at zero flow is equivalent to the ultimate pressure of the backing pump, when an isolation valve upstream of the ATEX compliant EH pump is closed.

The critical backing pressure at zero flow for the booster pump depends on the temperature classification (refer to *Temperature classification* on page 14) of the mechanical booster pump. The following critical backing pressures apply for different

temperature classifications for stand-alone boosters which have not been supplied as part of an approved ATEX system.

Table 2 Temperature classifications

Temperature classification	Critical backing pressure [mbar]
T3	40
T4	20

If the booster is used outside the critical backing pressure specified above, please contact us for advice.

The following tables show possible combinations of mechanical booster pump with EDP chemical dry pump.These systems are approved ATEX systems.

Note:

The following tables are for 50 Hz operation only.

For the mechanical booster/EDP dry pump combinations:

Table 3 EDP dry pump and EH mechanical booster pump combinations for T3

Booster pump	Dry pump			
	EDP 80	EDP 160	EDP 250	EDP 400
EH250T3	✓	✓	✓	✓
EH500T3	✓	✓	✓	✓
EH1200T3	*	✓	✓	✓
EH2600T3	*	*	✓	✓
EH4200T3	*	*	*	✓

✓*Do not require extra protection*

** Consult us for advice*

Table 4 EDP dry pump and EH mechanical booster pump combinations for T4

Booster pump	Dry pump			
	EDP 80	EDP 160	EDP 250	EDP 400
EH250T4	✓	✓	✓	✓
EH500T4	*	✓	✓	✓
EH1200T4	*	✓	✓	✓
EH2600T4	*	*	✓	✓
EH4200T4	*	*	*	✓

✓*Do not require extra protection*

** Consult us for advice*

Table 5 CXS dry pump and EH mechanical booster pump combinations for T3

Booster pump	Dry pump	
	CXS160 T3	CXS250 T3
EH500T3	✓	✓
EH1200T3	✓	✓
EH2600T3	*	✓

✓ *Do not require extra protection*

** Consult us for advice*

Table 6 CXS dry pump and EH mechanical booster pump combinations for T4

Booster pump	Dry pump	
	CXS160 T4	CXS250 T4
EH500T4	✓	*
EH1200T4	✓	✓
EH2600T4	*	✓

✓ *Do not require extra protection*

** Consult us for advice*

Table 7 EDS dry pump and EH mechanical booster pump combinations for T3

Booster pump	Dry pump	
	EDS 200	EDS 300
EH250T3	✓	✓
EH500T3	✓	✓
EH1200T3	✓	✓
EH2600T3	✓	✓
EH4200T3	*	*

✓*Do not require extra protection*

** Consult us for advice*

Table 8 EDS dry pump and EH mechanical booster pump combinations for T4

Booster pump	Dry pump	
	EDS 200	EDS 300
EH250T4	✓	✓
EH500T4	✓	✓
EH1200T4	✓	✓

Booster pump	Dry pump	
	EDS 200	EDS 300
EH2600T4	*	✓
EH4200T4	*	*

✓ *Do not require extra protection*

** Consult us for advice*

Table 9 nES oil sealed pump and EH mechanical booster combination for T3

Booster pump	Oil sealed pump					
	nES40	nES65	nES100	nES200	nES300	nES630
EH250T3	✓	✓	✓	✓	✓	✓
EH500T3	✓	✓	✓	✓	✓	✓
EH1200T3	*	*	*	✓	✓	✓
EH2600T3	*	*	*	✓	✓	✓
EH4200T3	*	*	*	*	*	✓

✓ *Do not require extra protection*

** Consult us for advice*

Table 10 nES oil sealed pump and EH mechanical booster combination for T4

Booster pump	Oil sealed pump					
	nES40	nES65	nES100	nES200	nES300	nES630
EH250T4	✓	✓	✓	✓	✓	✓
EH500T4	*	*	*	✓	✓	✓
EH1200T4	*	*	*	✓	✓	✓
EH2600T4	*	*	*	*	✓	✓
EH4200T4	*	*	*	*	*	✓

✓ *Do not require extra protection*

** Consult us for advice*

3.3 Performance

WARNING: MAXIMUM ROTATIONAL SPEED

Risk of damage to equipment. Do not exceed the maximum rotational speed. Overspeeding may lead to temperature above the T class limit and/or cause damage to the pump and motor.

Table 11 Performance data

Rotational speed:*				
50 Hz electrical supply 60 Hz electrical supply			0 to 3000 r min^{-1} 0 to 3600 r min^{-1}	
Maximum outlet pressure (see *Hydrokinetic drive* on page 12)			1000 mbar absolute, 1 x 10^5 Pa	
Pressure differential across the pump (determined by the hydrokinetic drive):				
Pump	50 Hz electrical supply		60 Hz electrical supply	
	mbar	Pa	mbar	Pa
EH250FX/ EH250IND	0 to 180	0 to 1.8 x 10^4	0 to 150	0 to 1.5 x 10^4
EH250T4	0 to 156	0 to 1.56 x 10^4	-	-
EH250C	-	-	0 to 150	0 to 1.5 x 10^4
EH500FX/ EH500IND	0 to 110	0 to 1.1 x 10^4	0 to 90	0 to 9 x 10^3
EH500T4..T3	0 to 113	0 to 1.13 x 10^4	-	-
EH500C	-	-	0 to 90	0 to 9 x 10^3
EH1200FX/ EH1200IND	0 to 90	0 to 0.9 x 10^4	0 to 75	0 to 7.5 x 10^3
EH1200C	-	-	0 to 75	0 to 7.5 x 10^3
EH1200T4	0 to 76	0 to 7.6 x 10^3	-	-
EH2600FX	0 to 80	0 to 8 x 10^3	0 to 67	0 to 6.7 x 10^3
EH2600IND	0 to 120	0 to 1.2 x 10^4	0 to 67	0 to 6.7 x 10^3
EH2600C	-	-	0 to 67	0 to 6.7 x 10^3
EH2600T3	0 to 114	0 to 1.14 x 10^4	-	-
EH2600T4	0 to 75	0 to 7.5 x 10^3	-	-
EH4200FX	0 to 60	0 to 6 x 10^3	0 to 50	0 to 5 x 10^3
EH4200IND	0 to 70	0 to 7 x 10^3	0 to 50	0 to 5 x 10^3
EH4200C	-	-	0 to 50	0 to 5 x 10^3
EH4200T3	0 to 64	0 to 6.4 x 10^3	-	-
EH4200T4	0 to 52	0 to 5.2 x 10^3	-	-

3.4 Mechanical data

*Table 12 Mechanical data**

Dimension	See *Figure: EH250FX/EH250IND dimensions* to *Figure: EH4200C/EH4200T3/EH4200T4 dimensions*
Mass (mass in parenthesis is for pumps equipped with Asian motors)	
EH250FX	69 kg (59 kg)
EH250IND	
EH250T4	94 kg
EH250C	
EH500FX	106 kg (96 kg)
EH500IND	
EH500T4..T3	127 kg
EH500C	102 kg
EH1200FX	149 kg (150 kg)
EH1200IND	
EH1200C	180 kg
EH1200T4	170 kg
EH2600FX	401 kg (398 kg)
EH2600IND	
EH2600C	450 kg
EH2600T3	473 kg
EH2600T4	
EH4200IND	481 kg (478 kg)
EH4200C	437 kg
EH4200T3	483 kg
EH4200T4	

** The mass listed in this table is only for reference. For accurate mass, check the pump nameplate.*

3.5 Electrical data

Note:

Motor data can be found on the motor rating plate and in the terminal box of the motor.

Table 13 Electrical data

Electrical supply voltage	220/240/380/415 V, 50 Hz or 208/230/460 V, 60 Hz or 200/380 V, 50/60 Hz
Number of phases	3
Full load current ratings	Refer to motor rating plate

Pump(s)	**Power**
EH250	2.2 kW
EH500	2.2 kW
EH1200	3 kW
EH2600	11 kW
EH4200	11 kW

3.6 Lubrication data

Note:

Edwards Safety Data Sheets for the oils and grease specified below are available on request.

Table 14 Lubrication data

Recommended oil type:					
Hydrocarbon pumps	Ultragrade 20				
PFPE pumps	Fomblin YVAC 16/6				
Recommended grease type *	Fomblin AR555				
Oil capacity:	All EH250	All EH500	All EH1200	All EH2600	All EH4200
Gear cover	-	-	1.25	3.5	3.5
Hydrokinetic drive/gearbox	1.5	1.5	2.4	6.5	6.5
Shaft seal reservoir	0.125	0.125	0.125	0.15	0.15

** For use with all EH250FX and EH500FX pumps.*

Note:

Use only the recommended lubrication oil.

3.7 Hydrokinetic drive/gearbox nitrogen supply

Regulated pressure* = 0.3 to 0.5 bar gauge, 3 x 10^4 to 5 x 10^4 Pa

** Only applies to the following pumps: EH250C, EH250T4, EH500C, EH500T4...T3, EH1200C, EH1200T4, EH2600C, EH2600T3, EH2600T4, EH4200C, EH4200T3 and EH4200T4.*

Note:

When monitoring the nitrogen supply to the gearbox, the output from the flow or pressure switch must be connected to a safety interlock circuit that meets the requirements of b1 in accordance with EN80079-37.

3.8 Cooling water data

Note:

1. If any EH1200, EH2600 or EH4200 model pump is used in an ATEX system, the EH pump must be operated with cooling water. This is safety critical and the system must incorporate a flow switch (connected to the cooling water outlet) which monitors the flow rate of the cooling water through the EH pump. The flow switch must be connected to the control system, which must be configured to shut down the EH pump when the cooling water flow through the EH pump is too low (see Table: Cooling water supply data: EH pumps in ATEX systems for the minimum cooling water flow rates). The output from the flow switch must be connected to a safety interlock circuit that meets the requirements of b1 in accordance with EN80079-37. Refer to the ATEX Instruction Manual for further details.

2. If an EH1200 model pump is not part of an ATEX system, the pump can be operated continuously without cooling water if the inlet pressure is kept below 5 mbar (5 x 10^2 Pa) and the pumpdown time is no longer than 10 minutes.

Table 15 Cooling water supply data: EH pumps in non-ATEX systems

Recommended cooling water flow (with inlet temperature of 20 °C)	
EH1200 pumps	3 l min^{-1}
EH2600 pumps	6 l min^{-1}
EH4200 pumps	6 l min^{-1}
Recommended cooling water supply pressure	2 to 6 bar gauge, 3 to 7 bar absolute, 3 x 10^5 to 7 x 10^5 Pa
Permissible temperature range	5 to 35 °C

Table 16 Cooling water supply data: EH pumps in ATEX systems

Recommended cooling water flow (with inlet temperature of 20 °C)	
EH1200T4	2 l min^{-1}
EH2600T3	4 l min^{-1}
EH2600T4	4 l min^{-1}
EH4200T3	4 l min^{-1}
EH4200T4	4 l min^{-1}
Recommended cooling water supply pressure	2 to 6 bar gauge, 3 to 7 bar absolute, 3 x 10^5 to 7 x 10^5 Pa
Permissible temperature range	5 to 35 °C

3.9 Noise and vibration data

Table 17 Noise and vibration data

Vibration level		< 1.8 mm s^{-1} r.m.s. in the range 10 to 1000 Hz		
Continuous A-weighted sound pressure level measured at 1 metre from the pump* :				
EH250	EH500	EH1200	EH2600	EH4200
70 dB(A)	70 dB(A)	70 dB(A)	75 dB(A)	75 dB(A)

** The noise level was measured in accordance with ISO2151 and with the pump running at < 0.1 mbar on 50 Hz supply. Running on a 60 Hz supply or at higher inlet pressures will increase the noise level.*

3.10 Connections

Table 18 Connections

	Inlet	**Outlet**
Cooling water connections:	3/8 inch BSP male	
Hydrokinetic drive/gearbox purge connection*	1/4 inch compression fitting	
Vacuum connections:		
EH250	ISO63	ISO100
EH500	ISO40	ISO63
EH1200	ISO160	ISO100
EH2600	ISO160	ISO100
EH4200	ISO250	ISO100

** Chemical and ATEX compliant pumps only.*

3.11 Materials of construction of components exposed to pumped gases

Table 19 Materials of construction

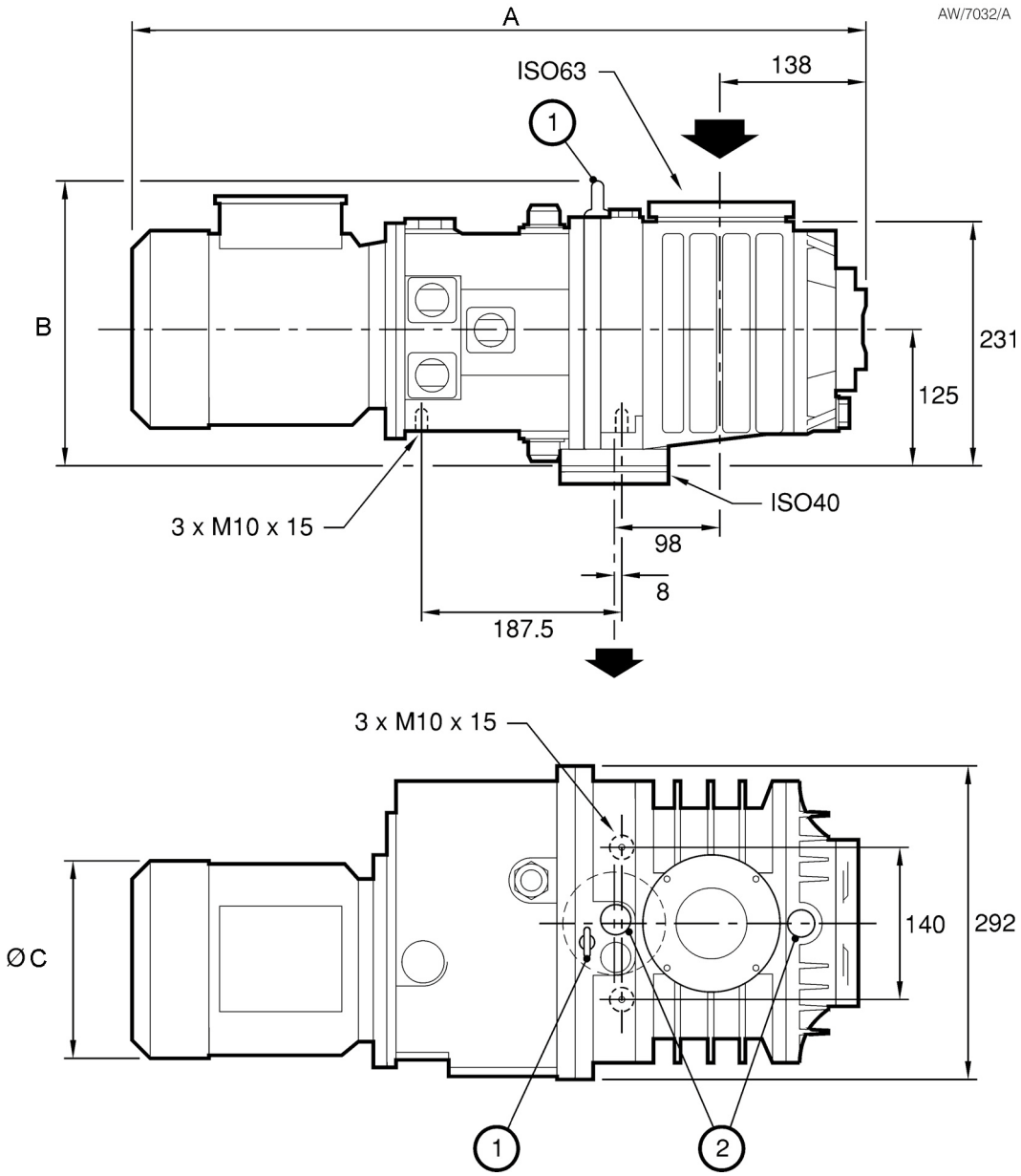
Component	Material
Stator and headplates	Grey cast iron, grade 250 (BS1452)
Rotors	SG iron, grade 420/12 (BS2789)
Hydrokinetic drive/gearbox cover	Aluminium LM25TF (BS1490)
Housing O-rings	Viton
Hydrokinetic drive/gearbox shaft seals	Viton
Internal pump shaft seals	PTFE (polytetrafluoroethylene)
Hydrokinetic drive/gearbox cooling coils	Copper/brass
EH1200, EH2600 and EH4200 after-cooler	Copper/brass
EH2600, EH4200 chemical/ATEX after-cooler	Nickel plated copper/brass
Headplate jointing compound	Loctite 518

3.12 Azide compatibility

The standard (Ind) pumps are not Azide compatible as they are installed with copper cooling coils which are exposed to process. The chemical (C/T3/T4) variants are Azide compatible.

3.13 Item numbers

Figure 3 EH250FX/EH250IND/EH250C/EH250T4 dimensions



1. *Lifting bolt*
2. *External evacuation port*

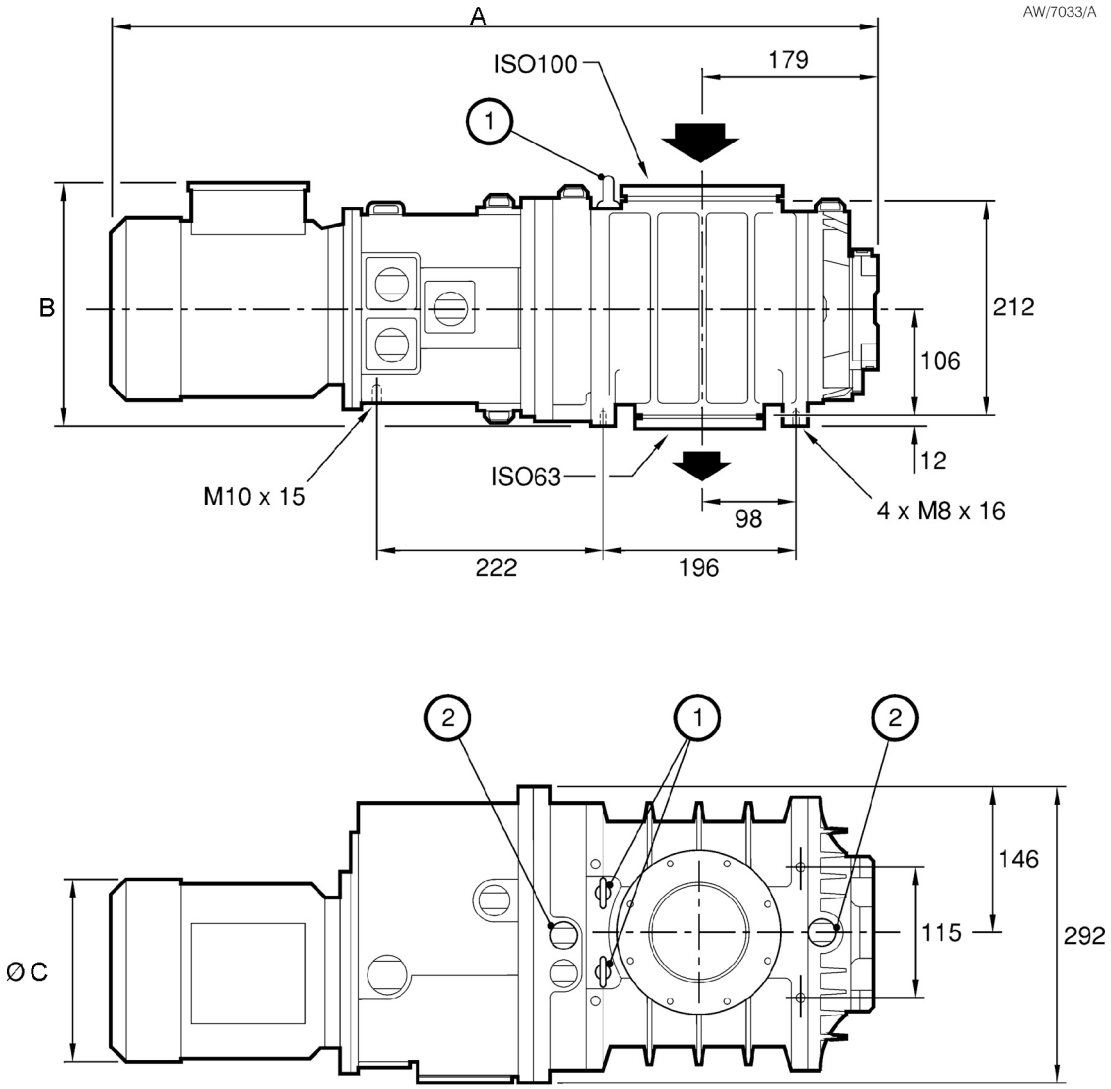
	EH250FX	EH250IND	EH250C	EH250T4
A	709 ± 5 (714 ± 5)	709 ± 5	772 ± 5	772 ± 5
B	270 ± 5	270 ± 5	270 ± 5	270 ± 5
C	177 ± 5	177 ± 5	190 ± 5	190 ± 5

- All dimensions are in mm.

- Dimension in parenthesis is for pumps equipped with Asian motors.

- For the dimensions given above, assume that Lafert is used for both the 1.5 and 2.2 KW motors and are for reference only. For accurate dimension, check the installation drawing.

Figure 4 EH500FX/EH500IND/EH500C/EH500T4...T3 dimensions



1. Lifting bolt *2. External evacuation port*

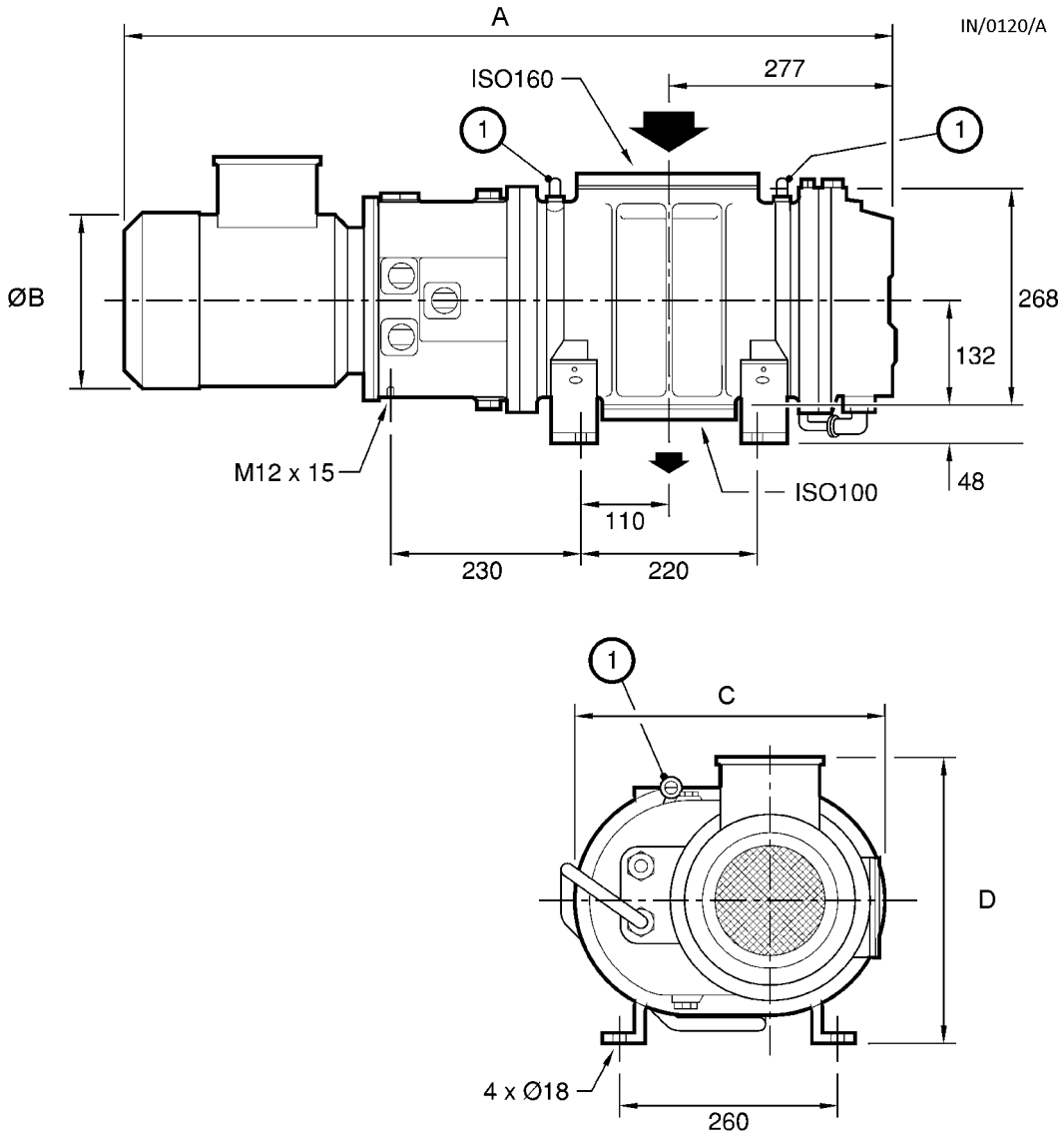
	EH500FX	EH500IND	EH500C	EH500T4...T3
A	797 ± 5 (800 ± 5)	797 ± 5	857 ± 5	857 ± 5
B	234 ± 5	252 ± 5	301 ± 5	301 ± 5
C	177 ± 5	177 ± 5	190 ± 5	190 ± 5

- All dimensions are in mm.

- Dimension in parenthesis is for pumps equipped with Asian motors.

- The dimensions are for reference only. For accurate dimension, check the installation drawing.

Figure 5 EH1200FX/EH1200IND dimensions



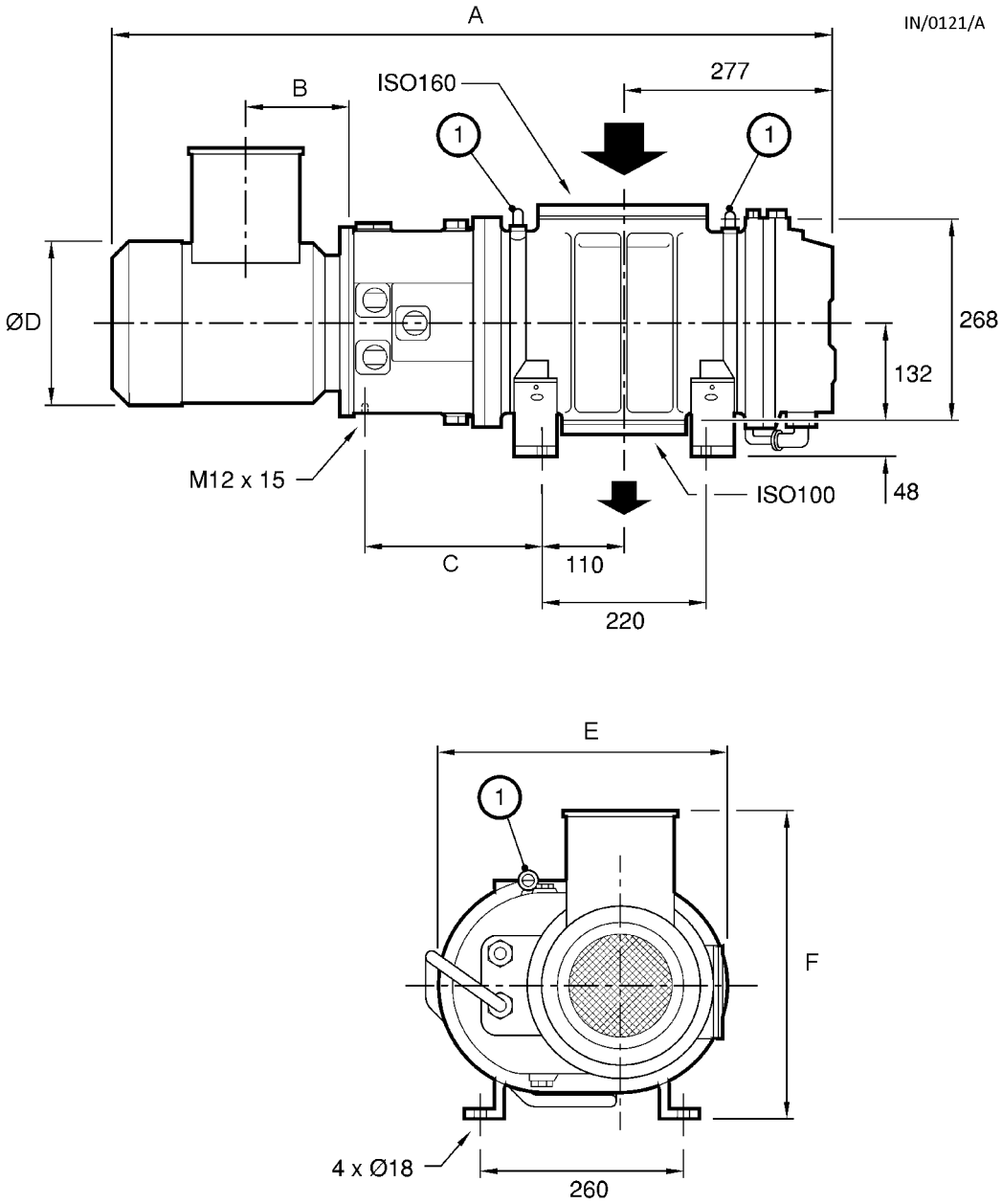
1. Lifting bolt

	EH1200FX	EH1200IND
A	953 ± 5	
B	195 ± 5	
C	380 ± 5	
D	380 ± 5	

- All dimensions are in mm.

- The dimensions are for reference only. For accurate dimension, check the installation drawing.

Figure 6 EH1200C/EH1200T3/T160/T4 dimensions



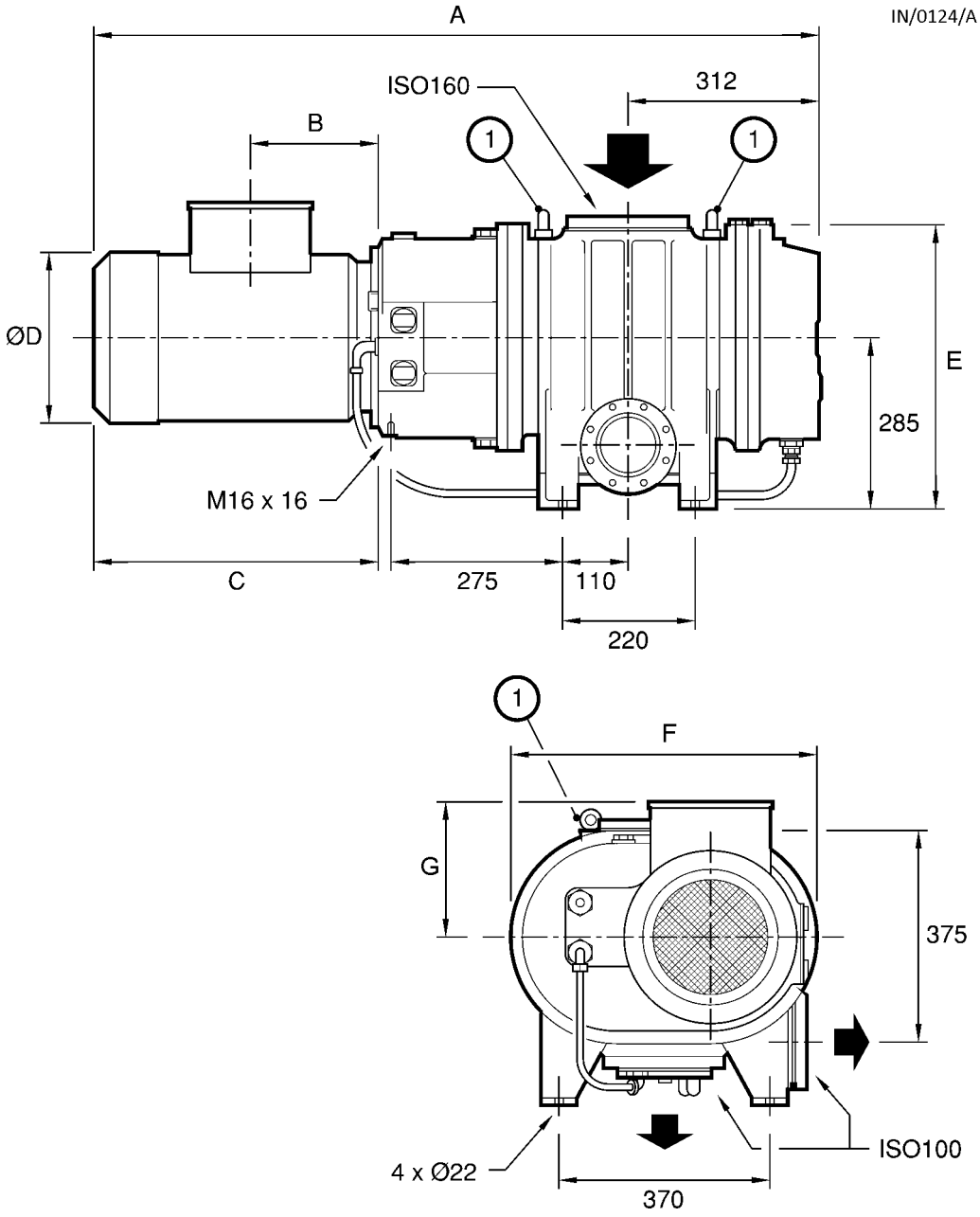
1. Lifting bolt

	EH1200C	EH1200T3/T4
A	1020 ± 5	987 ± 5
B	155 ± 5	104 ± 5
C	230 ± 5	230 ± 5
D	235 ± 5	195 ± 5
E	380 ± 5	380 ± 5
F	376 ± 5	405 ± 5

- All dimensions are in mm.

- The dimensions are for reference only. For accurate dimension, check the installation drawing.

Figure 7 EH2600FX/EH2600IND dimensions



1. Lifting bolt

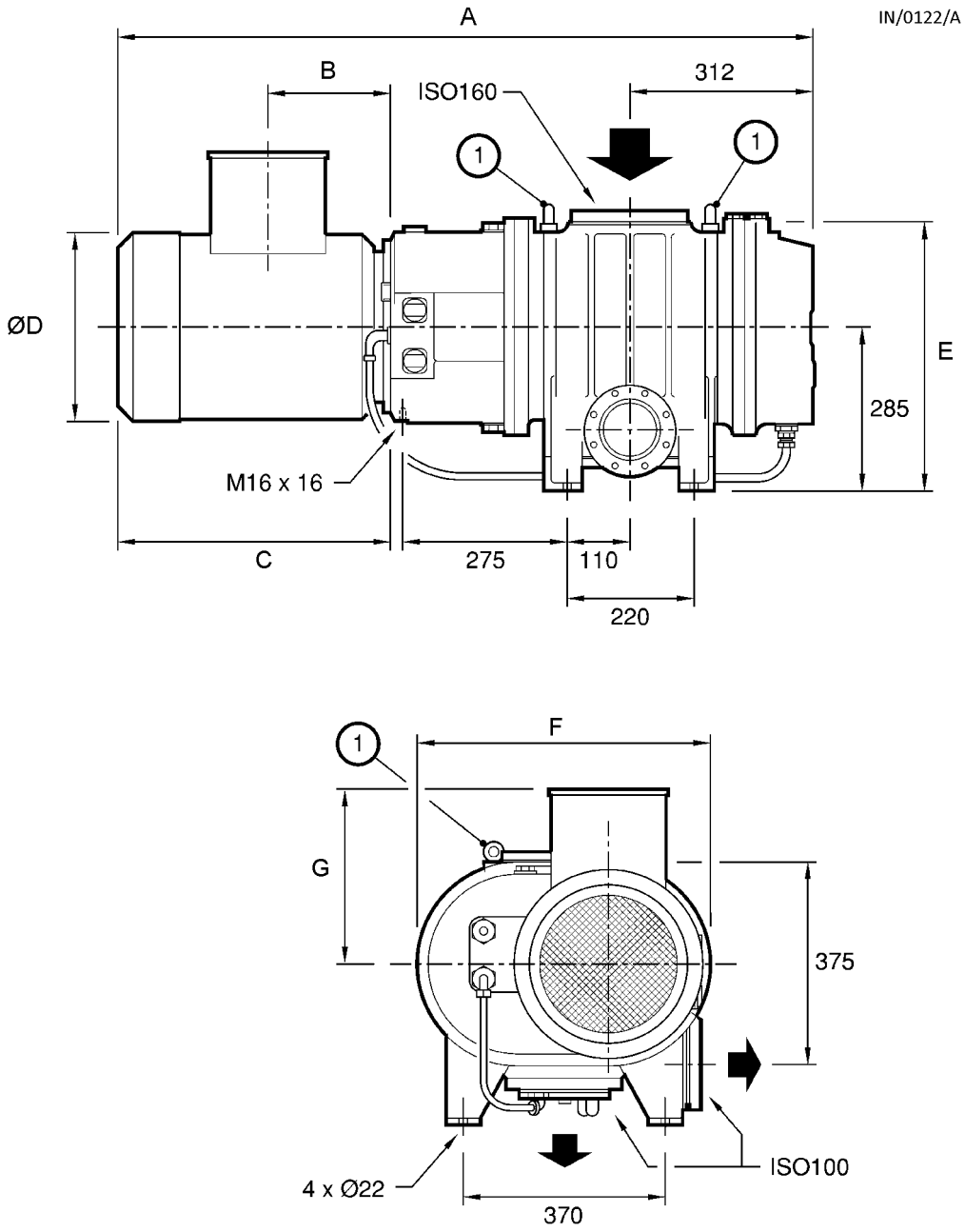
	EH2600FX	EH2600IND
A	1150 ± 5 (1156 ± 5)	1289 ± 5
B	122 ± 5	213 ± 5
C	425 ± 5	564 ± 5
D	248 ± 5	316 ± 5
E	461 ± 5	461 ± 5
F	481 ± 5	481 ± 5
G	194 ± 5	194 ± 5

- All dimensions are in mm.

- Dimension in parenthesis is for pumps equipped with Asian motors.

- The dimensions are for reference only. For accurate dimension, check the installation drawing.

Figure 8 EH2600C/EH2600T3/EH2600T4 dimensions



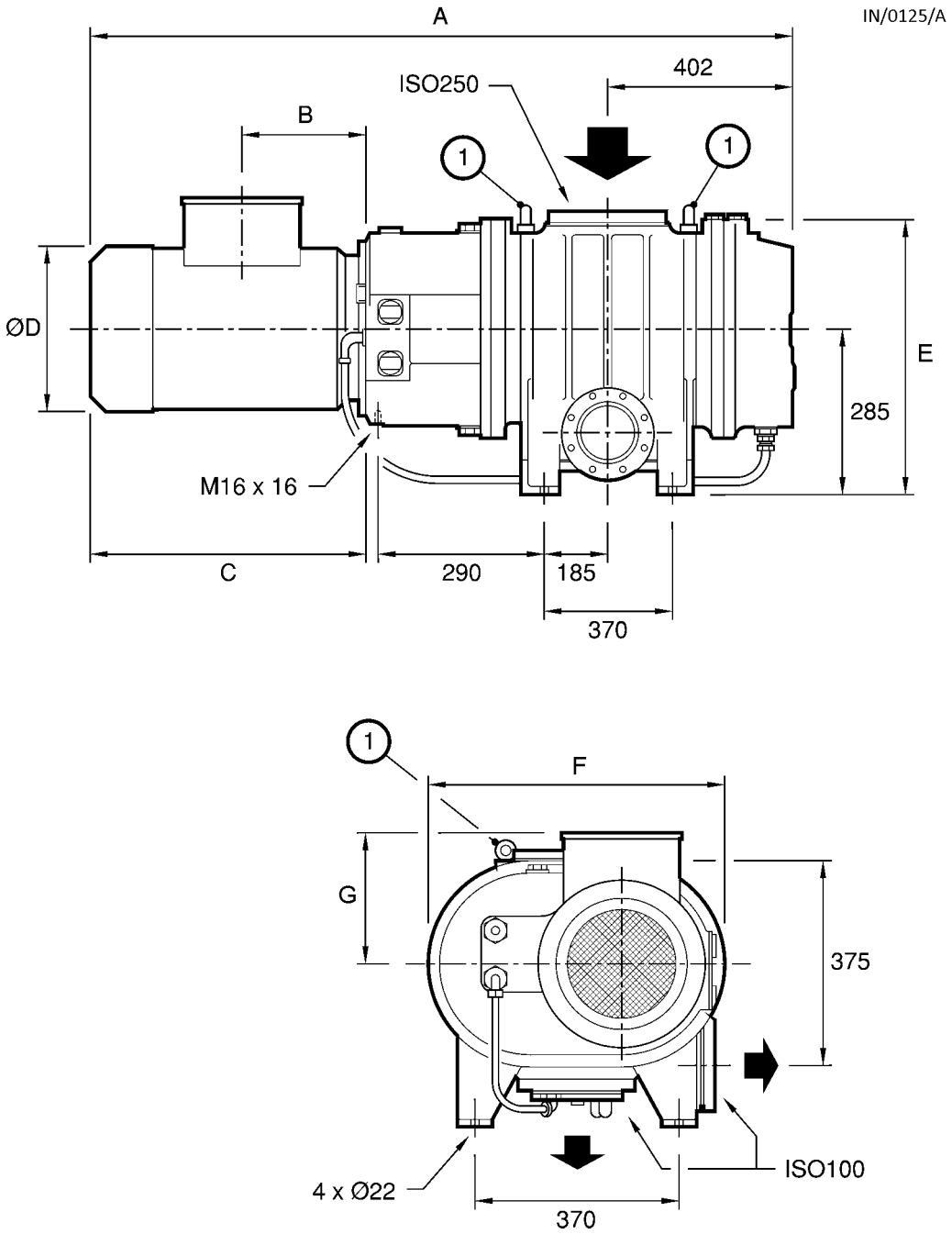
1. Lifting bolt

	EH2600C	EH2600T3/T4
A	1169 ± 5	
B	191 ± 5	
C	444 ± 5	
D	316 ± 5	
E	461 ± 5	
F	481 ± 5	
G	229 ± 5	

- All dimensions are in mm.

- The dimensions are for reference only. For accurate dimension, check the installation drawing.

Figure 9 EH4200FX/EH4200IND dimensions



1. Lifting bolt

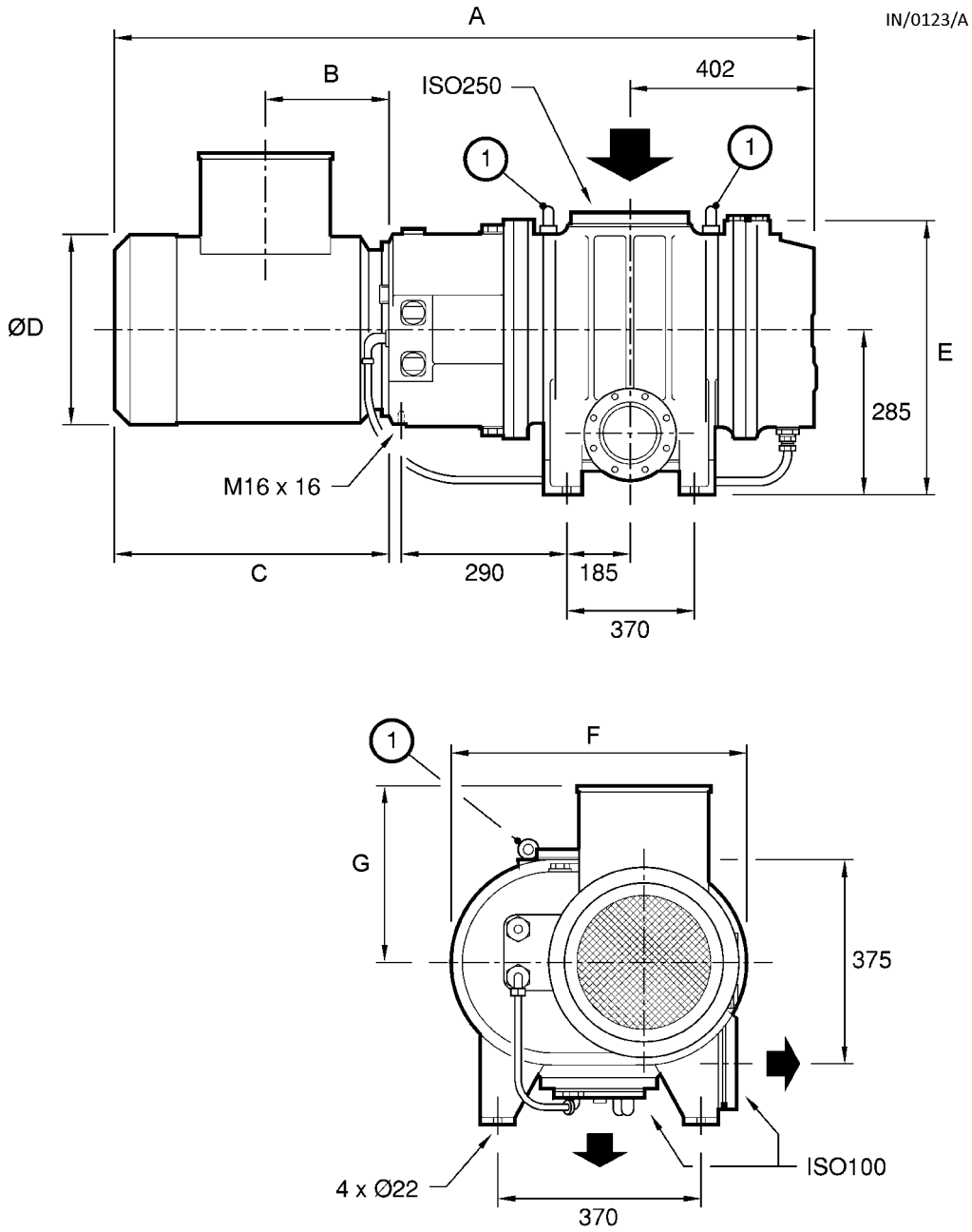
	EH4200FX	EH4200IND
A	1330 ± 5 (1336 ± 5)	1469 ± 5
B	122 ± 5	213 ± 5
C	425 ± 5	564 ± 5
D	248 ± 5	316 ± 5
E	461 ± 5	461 ± 5
F	481 ± 5	481 ± 5
G	194 ± 5	194 ± 5

- All dimensions are in mm.

- Dimension in parenthesis is for pumps equipped with Asian motors.

- The dimensions are for reference only. For accurate dimension, check the installation drawing.

Figure 10 EH4200C/EH4200T3/EH4200T4 dimensions



1. Lifting bolt

	EH4200C	EH4200T3/T4
A	1349 ± 5	
B	191 ± 5	
C	444 ± 5	
D	316 ± 5	
E	461 ± 5	
F	481 ± 5	
G	229 ± 5	

- All dimensions are in mm.

- The dimensions are for reference only. For accurate dimension, check the installation drawing.

4. Installation

4.1 Safety

- A suitably trained and supervised technician must install the pump.
- Make sure that the installation technician is familiar with the safety procedures which relate to the products pumped.
- Wear the appropriate safety clothing when coming into contact with contaminated components.
- Dismantle and clean contaminated components inside a fume cupboard.
- Refer to the Vacuum Pump and Vacuum Systems Safety Manual (publication number P40040100) before installing and using the pump to process hazardous or flammable materials.
- Vent and purge the vacuum system before starting installation work.
- Check all required components are available and are of the correct type before starting work.
- Make sure that debris does not enter the pump during installation.
- Disconnect other components in the pumping system from the electrical supply so that they cannot be operated accidentally.
- Do not reuse O-rings and seals.
- Make sure that the cooling air flow through the pump motor cooling fan cannot be obstructed.
- Make sure that all electrical cables, nitrogen 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.
- 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.

4.2 System requirements

Consider the following points when designing the pumping system:

- Use a suitable backing pump: refer to *Operating and storage conditions* on page 18 and *Critical backing pressure*.
- The 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 the system pipelines to reduce the transmission of vibration and to prevent loading of the coupling joints. When using flexible pipelines, make sure that the flexible pipelines have a maximum pressure rating that is greater than the highest pressure that can be generated in the system.
- Limit the temperature of the inlet gas to 60 °C if the system has ATEX temperature classification assigned to it.
- Make sure that the design incorporates all appropriate safety precautions if toxic, inflammable or explosive gases or particulates will be pumped.

- Purge with an inert gas when shutting down the pumping system to dilute dangerous gases to safe concentrations. Consult us or the supplier for advice.

If the pump will be installed in a new system, make sure that all preliminary pipelines have been installed and that a suitable base for the pump has been prepared before starting installation.

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

- Cooling water supply and return
- Hydrokinetic drive/gearbox purge nitrogen supply (chemical and ATEX compliant EH pumps only)
- Electrical supply
- Exhaust extraction system
- Inlet screen (if required, to prevent the ingress of debris during commissioning, refer to *Normal operation* on page 15)

4.3 Unpack and inspect

WARNING: INSTALLATION SAFETY

Use suitable lifting equipment to move the pump. Failure to do so can cause injury to people and damage to the equipment. Refer to *Mechanical data* on page 23 for the mass of the pump.

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 to remove the pump from its pallet:
   - On all pumps, attach the lifting gear to the centre pair of lifting bolts (*Figure: EH250FX and EH500FX pump variants* to *Figure: EH4200C/EH4200T3/ EH4200T4 dimensions*) on the pump.
   - All EH2600 model pumps and EH4200C, EH4200T3 and EH4200T4 pumps have centres of mass that are offset towards the motor. On these pumps, fit an additional support strap to the motor (behind the lifting bolt) to support the pump and prevent it from tilting when lifted.
4. Remove all protective covers and inspect the pump.
5. If the pump is damaged, notify the supplier and the carrier in writing within three days; state the Item Number of the pump together with the order number and the supplier's invoice number. Retain all packing materials for inspection. Do not use the pump if it is damaged.
6. If the pump will not be used immediately, refit the protective covers. Store the pump in suitable conditions as described in *Storage* on page 56.

4.4 Fill the pump with oil

WARNING: HYDROCARBON OIL TO PFPE (FOMBLIN)

Changing the oil in an pump from hydrocarbon to PFPE (Fomblin) could potentially cause a safety hazard. Fomblin EH pumps are generally used in hazardous applications which may involve the pumping of gases with high concentrations of oxygen. If hydrocarbon oil comes into contact with gases with an oxygen concentration greater than 25%, an explosion can occur.

CAUTION: OIL QUALITY

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

If converting the pump that has been used with hydrocarbon oil to use PFPE (Fomblin) oil, it is not a matter of simply flushing the pump with new PFPE oil. The pump must be returned to our Service Centre for overhaul and cleaning by our qualified service engineers. The change in oil type requires a complete strip down of the pump and thorough cleaning of all parts so that all traces of hydrocarbon oil are removed.

4.4.1 Hydrokinetic drive/gearbox

WARNING: HIGH TEMPERATURE

Risk of injury and damage to equipment. For the hydrokinetic drive of ATEX compliant EH mechanical booster pumps, make sure to only use hydrocarbon oil. Do not overfill or use incorrect oil. Overfill may lead to temperature above the T-class limits

We recommend that the hydrokinetic drive/gearbox oil level is maintained at the recommended oil level shown in *Figure: Sight glasses*, if the oil level is above or below the recommended oil level, the performance of the pump may be affected.

Do not allow the oil level to fall below the bottom of the reflector plate (*Figure: Sight glasses*) or the pump may be damaged.

1. Remove the hydrokinetic drive/gearbox oil filler plug (*Figure: EH250FX and EH500FX pump variants*).
2. Fill the hydrokinetic drive/gearbox with the recommended type of oil until the oil level reaches the recommended oil level at the top of the reflector plate in the oil level sight glass.
3. Refit the hydrokinetic drive/gearbox oil filler plug.

4.4.2 Shaft seal reservoir

CAUTION: HIGH PRESSURE

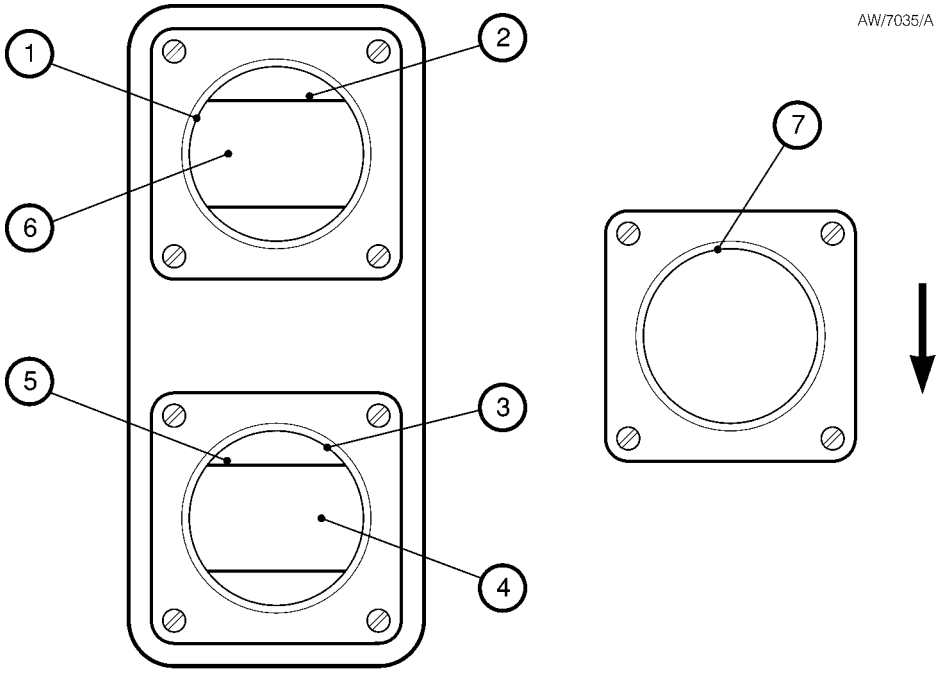
Risk of damage of equipment. Make sure that the correct vented filler plug is installed in the shaft seal reservoir. If using a non-vented plug, the reservoir will be pressurised and the oil sight glass may fracture.

We recommend filling the shaft seal reservoir so that the oil level is at the recommended oil level as shown in *Figure: Sight glasses*.

The pump can be operated as long as the oil level is above the bottom of the reflector plate. Do not allow the shaft seal oil level to fall below the bottom of the reflector plate or the pump may be damaged. Use the same oil that was used to fill the hydrokinetic drive/gearbox.

1. Remove the shaft seal reservoir vented oil filler plug (*Figure: EH250FX and EH500FX pump variants* and *Figure: EH1200FX, EH2600 and EH4200 pump variants*).
2. Fill the shaft seal reservoir with oil until the oil level is at the recommended oil level at the top of the reflector plate.
3. Refit the vented oil filler plug.

Figure 11 Sight glasses



1. *Shaft seal reservoir sight glass*
2. *Shaft seal reservoir recommended oil level*
3. *Hydrokenetic drive/gearbox sight glass*
4. *Hydrokenetic drive/gearbox reflector plate*
5. *Hydrokenetic drive/gearbox recommended oil level*
6. *Shaft seal reflector plate*
7. *Direction of rotation sight glass* (the arrow shows the correct direction)*

** Not installed to EH2600/2600IND/2600C/2600 T3/2600 T160 and EH4200/4200IND/ 4200C/ 4200 T3/4200 T160 pumps.*

4.4.3 Gear cover (all EH1200, EH2600 and EH4200 model pumps only)

Use the following procedure to fill the gear cover on all EH1200, EH2600 and EH4200 pumps. Use the same oil that was used to fill the hydrokinetic drive/gearbox and shaft seal reservoir.

1. Remove the oil filler plug on the top of the gear cover (*Figure: EH1200FX, EH2600 and EH4200 pump variants*).
2. Fill the gear cover with oil until the oil level is at the middle of the reflector plate in the gear cover oil level sight glass (*Figure: EH1200FX, EH2600 and EH4200 pump variants*).
3. Refit the oil filler plug.

4.5 Cooling water connections (all EH1200, EH2600 and EH4200 model pumps only)

Note:

Refer to Cooling water data for the cooling water requirements. Note that there are minimum flow rate and flow switch requirements specified for ATEX compliant EH pumps operated in ATEX certified systems.

Connect the cooling water supply and return lines to the 3/8 inch BSP connectors. One connector is on the rear of the hydrokinetic drive/gearbox, the other connector is on the underside of the gear cover. The supply and return lines can be connected to either of the connectors; the direction of cooling water flow is not important.

For chemical applications the cooling circuit has the following requirements:

- Run the cooling water into the coupling cover first. The reason for this is to reduce high coupling cover temperatures which occurs at high operating pressure.
- In flammable areas it is recommended to install flow switches to detect low flow conditions, cooling water failure leads to high pump temperatures which is unacceptable.
- Filter any rust in the water, if the rust is not removed it settles in the cooling coils and slowly closes off the water supply.

Refer to *Cooling water data* for the minimum cooling water flow rate required. If the danger of the condensation of gases in the booster is not process critical, always connect the supply line to the gearbox cover first.

4.6 Electrical connections

WARNING: PROTECTIVE EARTH

Risk of electric shock. Make sure that the electrical installation of the pump conforms with local and national safety requirements. It must be connected to a suitably fused and protected electrical supply with a suitable earth (ground) point.

If a chemical or ATEX compliant EH pump is used in a potentially explosive atmosphere or is used to pump a potentially explosive atmosphere, the pump must be powered by an electrical supply at the rated frequency of the pump motor. If it is not, the ATEX certification of the pump may be invalidated and the motor may overheat, creating an ignition hazard. If using a variable speed drive to operate the pump motor, contact us for advice.

4.6.1 Electrical supply configuration

Refer to the wiring instructions provided with the pump motor. Configure electrical connections according to the manufacturer's instructions.

4.6.2 Motor connections

WARNING: PROTECTIVE EARTH

Risk of electric shock. Make sure that the electrical installation of the pump conforms with local and national safety requirements. It must be connected to a suitably fused and protected electrical supply with a suitable earth (ground) point.

WARNING: ELECTRIC SHOCK

Risk of electric shock. Provide suitable strain relief on the electrical supply cable. If not, the cable (or wires in the cable) may become disconnected from the pump.

CAUTION: AUTOMATIC SHUTDOWN

Risk of damage to equipment. Connect the electrical supply to the motor so that it is automatically switched off if the backing pump stops. If not, the pump may overheat if it continues to operate when the backing pump is stopped.

CAUTION: MOTOR CONFIGURATION

Risk of damage to equipment. The motor must be correctly configured and the electrical connections must be correct for the electrical supply. If not, the motor can be damaged

Connect the supply through a contactor which has overload protection or use a controller which incorporates a contactor.

Use a contactor that has a manual reset control. If not, the pump could automatically restart after an electrical overload or an electrical supply failure.

Use a suitable multi-wire cable and a suitable cable gland to connect the electrical supply to the pump motor.

Connect the motor to the electrical supply as described in the following procedure.

1. Remove the motor terminal box cover (*Figure: EH250FX and EH500FX pump variants* and *Figure: EH1200FX, EH2600 and EH4200 pump variants*).
2. Check the electrical supply voltage and frequency. If necessary, configure the motor (that is, the terminal wires and any links) to operate with the supply voltage. Refer to the wiring instructions supplied with the pump motor.

3. Remove the plug from the cable entry hole that will be used for the electrical supply cable. Choose the most suitable hole for the application.
4. Fit a suitable cable gland to the cable entry hole. The cable gland (and adaptor, if installed) must provide a protective seal to IP44 (or higher), as defined by IEC 529. Refer to *Table: Motor cable gland hole sizes* for the cable gland hole sizes.
5. Pass the electrical supply cable through the cable gland.
6. Connect the wires of the cable to the appropriate terminals, as shown in the wiring instructions supplied with the pump motor.
7. Tighten the cable gland.
8. If this is a chemical or ATEX compliant EH pump, continue at *Connect the motor thermistors (chemical and ATEX compliant EH pumps only)* to connect the motor thermistors, otherwise refit the terminal box cover to the motor.
9. Make sure that the pump can be isolated and locked out from the electrical supply.
10. Use a suitable flame-proof cable gland to connect the electrical supply cable to the pump motor terminal box on all chemical and ATEX compliant EH pumps. If not, the installation may invalidate the certification of the system if the pump is used in an ATEX system.
11. Connect the electrical supply to the motor through a contactor which has a manual reset control.

Table 20 Motor cable gland hole sizes

Pump type	Motor frame size*	Electrical supply cable gland hole size(ISO)	Thermistors cable gland hole size (ISO)
Safe area EH pumps	90, 100	20	-
	132	25	-
	160	32	-
Chemical EH pumps and ATEX compliant	100	20	20
	160	32	20

4.6.3 Connect the motor thermistors (chemical and ATEX compliant EH pumps only)

The flame-proof motors on all chemical and ATEX compliant EH pumps incorporate thermistors.

Connect the thermistor terminals in the motor to a suitable control circuit in order to shut down the pump system if the motor temperature is too high. An example control circuit is shown in *Figure: Example control circuit* .

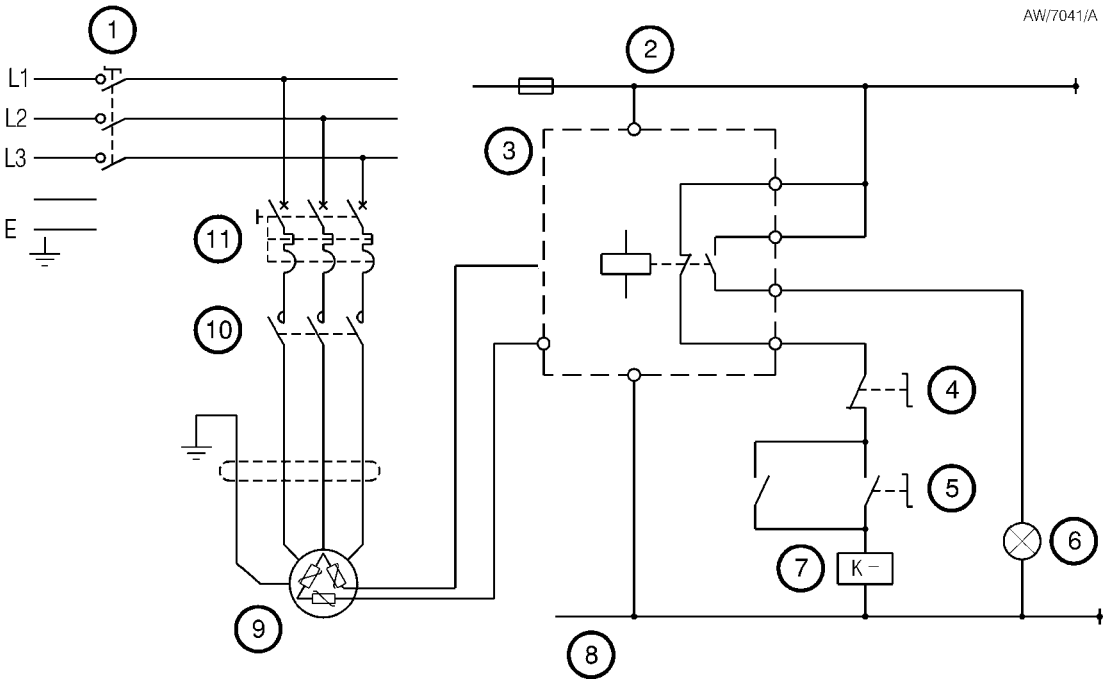
Use a suitable two-wire cable and a suitable cable gland to connect the thermistors cable (from the control circuit) to the thermistor terminals in the motor.

Use the following procedure to connect the thermistor terminals to the control circuit.

1. Remove the plug from the cable entry hole that will be used for the thermistors cable. (If there is more than one cable entry hole, choose the most suitable hole for the application).

2. Fit a suitable cable gland to the cable entry hole. The cable gland (and adaptor, if installed) must provide a protective seal to IP44 (or higher), as defined by IEC 529. Refer to *Table: Motor cable gland hole sizes* for the cable gland hole sizes.
3. Pass the thermistors cable through the cable gland.
4. Connect the two wires of the cable to the appropriate terminals, refer to the motor terminal box.
5. Tighten the cable gland.
6. Refit the terminal box cover to the motor.
7. Connect the thermistor wires to the control circuit.

Figure 12 Example control circuit



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

4.7 Check the direction of pump rotation

WARNING: ROTATING PARTS

Risk of injury and damage to equipment. Blank the inlet or connect the pump to the vacuum system before checking the direction of pump rotation. If not, there is a 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 in the reverse direction or remain stationary. 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. On all EH2600 and EH4200 model pumps, the correct direction of rotation is indicated by an arrow on the motor fan cover (*Figure: EH1200FX, EH2600 and EH4200 pump variants*). To determine the direction of rotation: watch the motor fan inside the fan cover, switch on the pump for two or three seconds, then switch the pump off.
   On all EH250FX, EH500FX and EH1200 model pumps, use the method above to determine the direction of rotation. Alternatively, the direction of rotation is also indicated by an arrow next to the direction of rotation sight glass (*Figure: EH250FX and EH500FX pump variants* and *Figure: EH1200FX, EH2600 and EH4200 pump variants*): watch the motor coupling in the sight glass (*Figure: Sight glasses*), switch on the pump for two or three seconds, then switch the pump off.
4. Check that the direction of rotation of the coupling was the same as that indicated by the rotation arrow on the motor or on the direction of rotation sight glass. If the direction of rotation was correct, continue at *Connect the hydrokinetic drive/gearbox purge nitrogen supply (chemical and ATEX compliant EH pumps only)*.
5. If the direction of rotation of the coupling was incorrect:
   - Switch off the backing pump and vent the system; isolate the pump from the electrical supply; reverse any two of the phase wires in the motor terminal box.
   - Repeat the check to make sure that the direction of rotation is now correct.

4.8 Connect the hydrokinetic drive/gearbox purge nitrogen supply (chemical and ATEX compliant EH pumps only)

WARNING: NITROGEN SUPPLY PRESSURE

Risk of injury and damage to equipment. Nitrogen supply pressure must comply with the requirements of *Hydrokinetic drive/gearbox nitrogen supply* on page 24. If it does not, the purge pipelines may become over-pressurised and may explode.

WARNING: NITROGEN PURGE SUPPLY

Risk of injury and damage to equipment. If the system incorporates an isolation valve between the chemical EH pump and the backing pump, make sure that the purge nitrogen supply is switched off when the isolation valve is closed.
If the booster pump is part of an ATEX system, connect the gearbox purge and guarantee the nitrogen supply.

Use a rigid metal (such as stainless steel) pipeline with an outside diameter of 1/4 inch for the nitrogen supply.

We recommend installing an automatically operated isolation valve in the nitrogen supply pipeline, configured so that:

- The hydrokinetic drive/gearbox purge nitrogen supply is on whenever the chemical or ATEX compliant EH pump is on.
- The hydrokinetic drive/gearbox purge nitrogen supply is off whenever the chemical or ATEX compliant EH pump is off.

If the system incorporates an isolation valve between the chemical or ATEX compliant EH pump and the backing pump, configure the system so that the purge nitrogen supply is switched off whenever the isolation valve is closed. If not, and the purge supply is left on when the isolation valve is closed, the system upstream of the isolation valve will become pressurised.

Refer to *Figure: EH1200FX, EH2600 and EH4200 pump variants* and use the following procedure to connect the purge nitrogen supply.

1. Remove the 1/4 inch blanking plug from the hydrokinetic drive/gearbox oil filler plug and purge connector.
2. Fit a suitable 1/4 inch compression fitting connector to the purge connector.
3. Fit the nitrogen supply pipeline into the compression fitting and tighten to secure the connection.

4.9 Connect the pump inlet and outlet

WARNING: PROCESS GAS LEAKAGE

Risk of injury and damage to equipment.Do not exceed the load limits on the pump inlet and outlet flanges as specified in *Figure: Flange loading limits*. If load limits are exceeded, there will be a risk of leakage of process gases from the pump, or of damage to the pump.

CAUTION: CORRECT INLET FILTER

Risk of damage to equipment. The ATEX compliant EH pumps rely on constructional safety for safe operation. If using the ATEX compliant EH pump in a process in which dust or particles could enter and damage the ATEX compliant EH pump, fit a suitable inlet filter.

CAUTION: CASING DAMAGE

Risk of damage to equipment. The EH4200 must have an inlet screen installed at all times. Ingress of large particles can cause the pump casing to fracture. A suitable inlet screen is shown in *Table: Spares*. If particles, debris or loose components could enter the pump during commissioning or running, fit a suitable inlet filter that can be removed before operating the pump on process duties.

WARNING: CRITICAL BACKING PRESSURE

Risk of explosion. If pumping flammable gases, make sure that the backing pump and exhaust extraction/abatement systems comply with the critical backing pressure requirements of *Critical backing pressure*.

Note:

- When fitting an isolation valve between a chemical or ATEX compliant EH pump and the backing pump, valve operation must be interlocked with the operation of the chemical or ATEX compliant EH pump, so that closure of the valve results in shutdown of the ATEX compliant EH pump.

Connect the inlet of the pump to the vacuum system and connect the outlet of the pump to the backing pump and exhaust extraction/abatement systems, as required.

The pump inlet and outlet connections are made with standard ISO flanges, trapped O-rings and (on the EH250FX pumps only) a co-seal.

All EH2600 and EH4200 model pumps have two alternative outlet positions: on the underside and at the side of the pump.

The pumps are configured to use the outlet at the side of the pump; the flange on the underside of the pump is blanked off. When using the outlet on the underside of the pump, remove the blanking plate and O-ring from the outlet on the underside and refit the blanking plate, with a new O-ring, over the side outlet flange.

Follow the procedure when connecting the pump to the vacuum system.

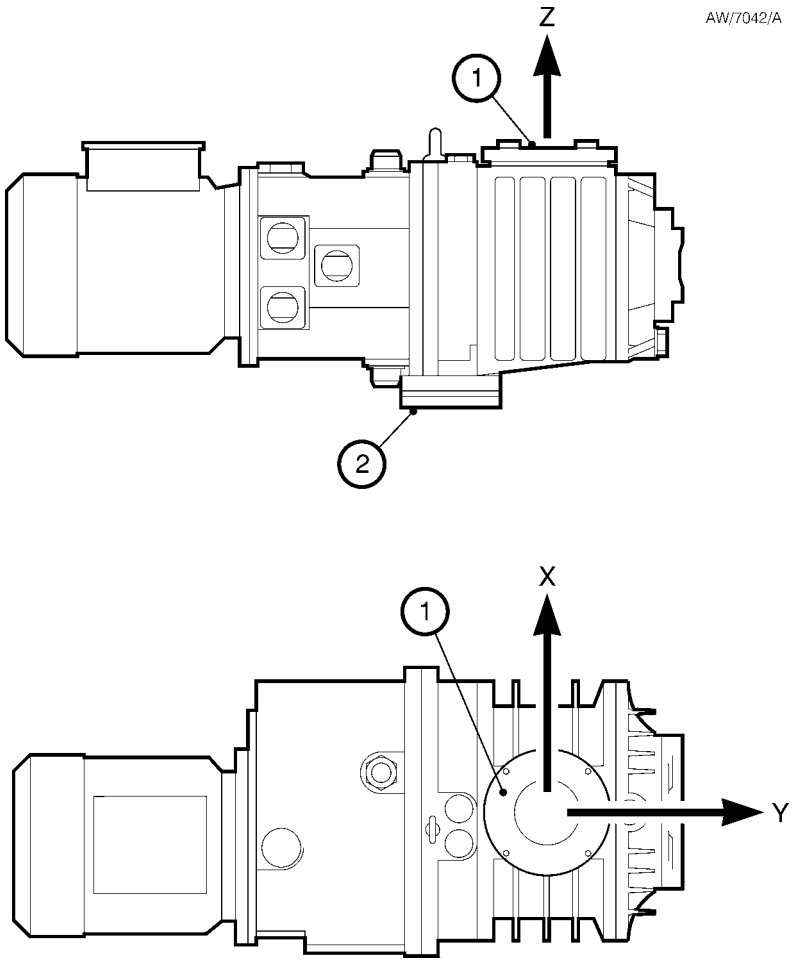
- Move the pump to the required location and make sure that it is level and secure.
- For optimum pumping speeds, make sure that the pipeline connected to the pump inlet is as short as possible and has a bore size not less than the inlet port diameter.
- Use a flexible connection in the pipeline from the vacuum system to the pump to reduce vibration and stress in the system pipelines (see *System requirements* on page 36).
- On very dusty applications, use a low impedance inlet filter to minimise abrasion in the pump.

4.10 External evacuation of hydrokinetic drive/gearbox (optional)

The hydrokinetic drive/gearbox may be evacuated using an external pump. A description of the connections required is beyond the scope of this manual.

Contact the supplier or our nearest company for advice on the use of this facility.

Figure 13 Flange loading limits



1. *Pump inlet* 2. *Pump outlet*

Note:

EH250FX pump shown. The flange loading limits apply to all the pumps.

	Pump inlet		Pump outlet	
Maximum force				
FX	± 1000 N	± 224 lbf	± 750 N	± 168 lbf
FY	± 1000 N	± 224 lbf	± 750 N	± 168 lbf
FZ	± 2000 N	± 449 lbf	± 1500 N	± 337 lbf
FR	± 2400 N	± 539 lbf	± 1800 N	± 404 lbf
Maximum moment				
MX	± 500 N m	± 112 lbf ft	300 N m	± 67 lbf ft
MY	± 500 N m	± 112 lbf ft	300 N m	± 67 lbf ft
MZ	± 500 N m	± 112 lbf ft	300 N m	± 67 lbf ft
MR	± 870 N m	± 195 lbf ft	520 N m	± 116 lbf ft

Where,

F = Force

M = Moment

R = Resultant

X = Load orientation

Y = Load orientation

Z = Load orientation

5. Operation

5.1 Operational safety

WARNING: OPERATION SAFETY

Make sure that the cooling air flow around the pump and pump motor is not restricted. If the air flow is restricted, the pump and/or motor will get hotter than normal during pump operation:

- This may result in reduced reliability or the risk of an explosion.

- If the pump is part of an ATEX system, the high operating temperature may cause the motor thermistors to shut down the system as required by the ATEX safety interlock circuit (refer to *Spares* on page 59 of the ATEX Instruction Manual).

WARNING: HOT SURFACE

Risk of burns. During operation, parts of the pump can become very hot. Do not touch the pump.

WARNING: ROTATING PARTS

Risk of injury. Do not operate the pump with the inlet or outlet open to atmosphere. Fingers or other parts of the body may get trapped and may be injured by the rotating pump mechanism.

Make sure that the cooling air flow around the pump and pump motor is not restricted. (Refer to the ambient temperature specification in *Operating and storage conditions* on page 18). Take all necessary precautions to avoid accidental contact with the pump.

5.2 Start-up procedure

5.2.1 Pre-start checks

1. Check that the pump oil levels are correct (see *Fill the pump with oil* on page 38).
2. If the pump is part of an ATEX system, make sure that the gearbox purge is connected and the nitrogen supply is on.
3. Check that the pump is correctly installed, especially after initial installation and maintenance.

5.2.2 Start-up

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

1. On all of the EH1200, EH2600 and EH4200 model pumps only:
   - Switch on the cooling water supply and check that there is an adequate flow of cooling water at the correct pressure (see *Cooling water data*).

- If the pump is part of an ATEX system, make sure that the water flow rate is adequate, and that the flow switch indicates this.
- Check the water connections for leaks.

Refer to *Cooling water data* for the cooling water requirements.

1. Close all valves to atmospheric pressure and make sure that all other openings are closed.
2. Switch on the backing pump and open the backing valve (if installed).
3. Switch on the pump.
4. Allow the pump to run for approximately fifteen minutes to achieve normal operating temperature.
5. Slowly open the pump inlet isolation valve (if installed).

5.3 Shutdown

Note:

If the pump is to be shut down for a long period or is due to be shipped on, refer to Storage on page 56 for the storage instructions.

1. Close the pump inlet isolation valve (if installed).
2. Leave the pump operating for sufficient time such that the pump is thoroughly purged of any hazardous substances.
3. Switch off the pump.
4. Open the backing pump air admittance valve (if installed) and switch off the backing pump.
5. On all of the EH1200, EH2600 and EH4200 model pumps only: turn off the cooling water supply.

6. Maintenance

6.1 Safety information

- Obey the safety instructions in this Section and take note of appropriate precautions. Failure to observe these instructions may result in injury to people and damage to equipment.
- 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.
- Make sure that the maintenance technician is familiar with the safety procedures that relate to the products processed by the pumping system.
- Wear the appropriate safety clothing when coming into contact with contaminated components.
- Dismantle and clean contaminated components inside a fume cupboard.
- Allow the pump to cool for at least three hours before starting maintenance work.
- Vent and purge the pumping system with nitrogen before starting 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 or seals.
- Dispose of components and waste oil safely (see *Disposal* on page 57).
- 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 Safety Data Sheets for fluorinated materials used in the pump are available on request: contact us or the supplier.
- Leak test the 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. Make sure that adequate precautions are taken to protect people from the effects of dangerous substances if contamination has occurred.

Table 21 Maintenance plan

Operation	Frequency	Refer to section
Check the oil level	Daily* or Weekly†	*Check the oil level* on page 52
Inspect the pump connections	Monthly	*Inspect the pump connections* on page 53
Change the pump oil	12 monthly	*Change the pump oil*

Operation	Frequency	Refer to section
Lubricate the rear bearing	12 monthly	*Lubricate the rear bearing (All EH250FX and EH500FX model pumps only)* on page 54
Overhaul the pump	6 yearly	*Overhaul the pump* on page 55

* Flammable materials pumped.

† Non-flammable materials pumped.

6.2 Maintenance plan

WARNING: MAINTENANCE SAFETY

Risk of injury or damage to equipment. Constructional safety make sure that ATEX compliant EH pumps can safely pump flammable gases. To make sure that the constructional safety of the ATEX compliant EH pump is not compromised, maintain the ATEX compliant EH pump in accordance with the schedule given in *Table: Maintenance plan* and using the procedures described in *Check the oil level* on page 52 to *Lubricate the rear bearing (All EH250FX and EH500FX model pumps only)* on page 54 in this manual. If not, there may be a risk of explosion and, if the pump is part of an ATEX certified system, the ATEX certification may be invalidated.

Table: Maintenance plan details the maintenance operations necessary to maintain 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 system requirements.

6.3 Check the oil level

CAUTION: PUMP PERFORMANCE

Risk of damage to equipment. Make sure that the correct grade of oil is used and that the oil levels in the pump are correct. If an incorrect oil is used or if an oil level is incorrect, the pump performance may be affected and the pump may be damaged, which will compromise its constructional safety.

Note:

If there is a loss of oil from the shaft seal reservoir, the shaft seal may have failed. Contact the supplier or our Service centre for advice.

Use the following procedure to check the oil level in the sight glass. Refer to *Figure: EH250FX and EH500FX pump variants* and *Figure: EH1200FX, EH2600 and EH4200 pump variants* for the location of the filler plugs and sight glasses. During normal operation, the hydrokinetic drive/gearbox sight glass (*Figure: Sight glasses*) may appear empty or show a froth because the oil is in circulation around the coupling.

1. Shut down the pump, vent it to atmospheric pressure and allow it to cool.

2. Refer to *Figure: Sight glasses*. Check the shaft seal oil level. If the oil level is below the bottom of the reflector plate, refer to *Fill the pump with oil* on page 38 and refill the shaft seal reservoir.
3. Check the hydrokinetic drive/gearbox oil level. If the oil level is below the top of the reflector plate, refer to *Fill the pump with oil* on page 38 and refill the hydrokinetic drive/gearbox oil reservoir.
4. On all EH1200, EH2600 and EH4200 model pumps only, check the gear cover oil level. If the oil level is below the middle of the reflector plate, refer to *Fill the pump with oil* on page 38 and refill the gear cover.

6.4 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.
6. Check that all the vacuum connections are secure.
7. On chemical and ATEX compliant EH pumps only:
   - Inspect the hydrokinetic drive/gearbox purge nitrogen supply pipeline for corrosion and damage.
   - Check that the pipeline connection to the hydrokinetic drive/gearbox is secure.

6.5 Change the pump oil

WARNING: FLAMMABLE GAS

Risk of explosion. Changing the oil in an pump from hydrocarbon to PFPE (Fomblin) could potentially cause a safety hazard. Fomblin EH pumps are generally used in hazardous applications which may involve the pumping of gases with high concentrations of oxygen. If hydrocarbon oil comes into contact with gases with an oxygen concentration greater than 25%, an explosion can occur.

CAUTION: INCORRECT OIL LEVEL

Risk of damage to equipment. Make sure that the correct grade of oil is used and that the oil levels in the pump are correct. If an incorrect oil is used or if an oil level is incorrect, the pump performance may be affected and the pump may be damaged, which will compromise its constructional safety.

Note:

If converting an EH pump that has been used with hydrocarbon oil to use PFPE (Fomblin) oil, it is not a matter of simply flushing the EH pump with new PFPE oil. The EH pump must be returned to our service centre for overhaul and cleaning by our qualified service engineers. The change in oil type requires a complete strip down of the EH pump and thorough cleaning of all parts so that all traces of hydrocarbon oil are removed.

Replace the pump oil as described below. Refer to *Figure: EH250FX and EH500FX pump variants* and *Figure: EH1200FX, EH2600 and EH4200 pump variants* for the location of the oil filler and drain plugs.

1. Switch off the pump, vent it to atmospheric pressure and allow it to cool.
2. Remove the hydrokinetic drive/gearbox oil filler plug.
3. Remove the hydrokinetic drive/gearbox oil drain plug from the underside of the hydrokinetic drive/gearbox and allow the oil to drain into a suitable container.
4. Remove the shaft seal vented oil filler plug. Use a suitable pump to suck the oil out of the shaft seal reservoir.
5. Refit the hydrokinetic drive/gearbox oil drain plug.
6. Refer to *Fill the pump with oil* on page 38 and fill the hydrokinetic drive/gearbox and shaft seal reservoir with oil.
7. Refit the hydrokinetic drive/gearbox oil filler plug and the shaft seal reservoir oil filler plug.
8. On all EH1200, EH2600 and EH4200 model pumps only:
   - Remove the oil filler plug on the gear cover.
   - Remove the oil drain plug from the underside of the gear cover and allow the oil to drain into a suitable container.
   - Refit the oil drain plug and refer to *Fill the pump with oil* on page 38 to refill the gear cover with oil.
   - Refit the oil filler plug.

6.6 Lubricate the rear bearing (All EH250FX and EH500FX model pumps only)

Note:

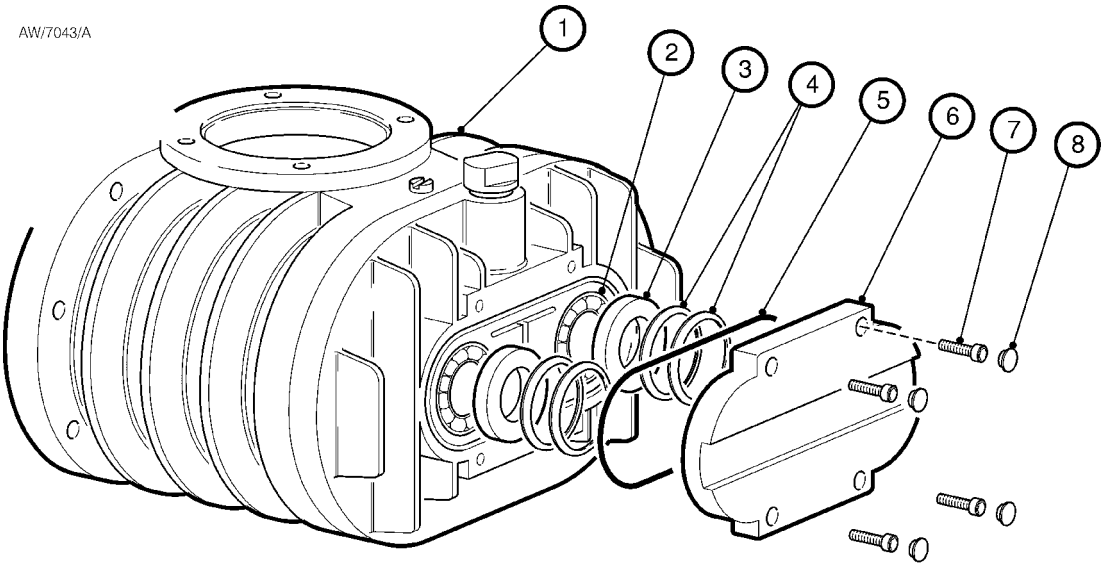
When removing the end cover, take note of the exact locations of the spacers and shims (Figure: Lubricate the rear bearing) inside the end cover. These items must be reinstalled correctly in order to make sure that the rotor clearance settings remain correct. Altering the rotor clearance settings may compromise the constructional safety of the pump and, if the pump is part of an ATEX system, may invalidate the system certification.

Use the following procedure to replace the grease in the rear bearing. Refer to *Lubrication data* on page 24 for the correct type/grade of grease.

1. Switch off the pump and isolate it from the electrical supply. Vent the pump to atmospheric pressure.
2. Refer to *Figure: Lubricate the rear bearing*. Remove the four plastic cover caps from the bearing end cover.
3. Undo and remove the socket-head screws located under the four plastic cover caps.
4. Remove the end cover and O-ring. Dispose of the O-ring safely.
5. Note the exact location of the shims and spacers inside the end cover. 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, lint free cloth or a plastic or wooden spatula to remove all visible grease from both bearings.

7. Fill the visible side of each bearing with clean grease, then lightly force the grease into the bearing.
8. Refill the visible side of each bearing with clean grease.
9. Apply a light wipe of high-vacuum grease to the new O-ring and fit into the groove in the end cover.
10. Check that the shims and spacers are correctly located in the end cover.
11. Refit the end cover and secure it with the four socket-head screws. Tighten the screws evenly and refit the plastic cover caps.
12. Leak test the system and seal any leaks found.

Figure 14 Lubricate the rear bearing



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

Note:

For all EH250FX and EH500FX model pumps only.

6.7 Overhaul the pump

The pump can only be overhauled by our service engineers. Contact us or the supplier for advice.

7. Storage

CAUTION: STORAGE CONDITION

Risk of damage to equipment. Observe the storage temperature limits stated in *Operating and storage conditions* on page 18 Storage below -30 °C will permanently damage the pump seals and lubricants.

CAUTION: PIPE BURST

Risk of damage to equipment. Make sure that the water lines are emptied if the pump will be stored below 0 °C. If not, the water in the lines will freeze and may cause the pipes to burst. If the pump is to be shipped by air, it is important that the lines are completely emptied of water.

Use the procedure below to store the pump.

1. Shut down the pump as described in *Shutdown* on page 50.
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 *Change the pump oil*.
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 *Installation* on page 36.

8. Disposal

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

Take particular care with components and waste oil which have been contaminated with dangerous process substances.

The instrument and associated cables are within the scope of the European Directive on Waste Electrical and Electronic Equipment, 2002/96/EC. We offer European customers a recycling service for the instrument/cables at the end of the product's life. Contact us for advice on how to return the instrument/cables for recycling.

9. Service and spares

9.1 Service

Our products, spares and accessories are available from our 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 centres employ Service Engineers who have undergone our comprehensive training courses.

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

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

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

The local Service Centres can also provide our engineers to support on-site maintenance, service or repair of equipment. For more information about service options, contact our nearest Service Centre or the company.

9.1.1 Return the equipment or components for service

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

If you are returning equipment note the following:

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

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

NOTICE:

If we do not receive a completed form, your equipment cannot be serviced.

9.2 Spares

CAUTION: CASING DAMAGE

Risk of damage to equipment. The EH4200 must have an inlet screen installed at all times. Ingress of large particles can cause the pump casing to fracture.

Table 22 Spares

Spare	Item number
EH pumps	
AR555 Fomblin grease (100 g tube)	H11350013
End cover O-ring	H02122091
Ultragrade 20 oil (1 l)	H11024015
Ultragrade 20 oil (4 l)	H11024013
Krytox 1514 fluid (1 kg)	H11308018
Krytox 1514 fluid (5 kg)	H11308020
EH250FX and EH500FX	
Clean and overhaul kit	A30151815
Module kit	A30151820
Shim kit	A30151825
EH250FX inlet mesh assembly 3.3 mm ISO63	C10521085
EH250FX inlet mesh assembly 3.5 mm ISO63 stainless steel	A60041029
EH500FX inlet mesh assembly 3.3 mm ISO100	C10523085
EH500FX inlet mesh assembly 3.5 mm ISO100 stainless steel	A60041569
EH1200	
Clean and overhaul kit	A30551815
Module kit	A30551820
Shim kit	A30751825
EH1200 inlet mesh assembly 3.3 mm ISO160	C10524085
EH1200 inlet mesh assembly 3.5 mm ISO160 stainless steel	A60041570
EH2600 and EH4200	
Clean and overhaul kit	A30751815
Module kit	A30751820
Shim kit	A30751825
EH2600 inlet mesh assembly 3.3 mm ISO160	C10524085
EH2600 inlet mesh assembly 3.5 mm ISO160 stainless steel	A60041570
EH4200 inlet mesh assembly 3.5 mm ISO250 stainless steel	A60041571

P200500027B

CE Declaration of Conformity

Edwards Ltd
Innovation Drive
Burgess Hill
West Sussex
RH15 9TW
UK

The following products

Safe Area Pumps – Hydrocarbon Oil

	EH250 2.2kW	EH500 2.2kW	EH1200 3kW	EH2600 11kW	EH4200 11kW
200/380 V 50 Hz	A30151934	A30271934	A30590934	A30753934	A30975934
400 V 50 Hz	A30151945	A30271945	A30590935	A30775946	A30975946
200/38 0V 60 Hz	A30152934	A30272934	A30591934	A30754934	A30976934
460 V 60 Hz	A30152946	A30272946	A30591936	A30776982	A30976982

Safe Area Pumps – PFPE Oil

	EH250 2.2kW	EH500 2.2kW	EH1200 3kW	EH2600 11kW	EH4200 11kW
200/380V 50Hz	A30153934	A30273934	A30592934	A30775934	-
400V 50Hz	A30153935	A30273935	A30592935	A30753935	NRA293000
200/380V 60Hz	A30154934	A30274934	A30593934	A30776934	-
460V 60Hz	A30154936	A30274936	A30593936	A30754936	NRA292000

Is in conformity with the relevant requirements of European CE legislation:

2006/42/EC	Machinery directive
2014/35/EU	Low voltage directive (LVD) as applicable to electrical sub-assemblies
2011/65/EU	Restriction of certain hazardous substances (RoHS) directive as amended by Delegated Directive (EU) 2015/863

Based on the relevant requirements of harmonised standards:

EN 1012-2:1996 +A1:2009	Compressors and vacuum pumps. Safety requirements. Vacuum pumps
EN 60034-1:2010	Rotating electrical machines. Rating and performance

Documentation Officer: Jelena Havelkova, Spielberk Office Centre, Holandska 10, Brno, 63900 Czech Republic,
✆: +42(0) 734 418 896, ✉: documentation@edwardsvacuum.com

This declaration, based on the requirements of the listed Directives and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: *1st November 2019*

Andries De Bock – Vice President Engineering
Industrial Vacuum Division
Qingdao

Bram Claes – General Manager
Qingdao

P20050032C

CE Declaration of Conformity

Edwards Ltd
Innovation Drive
Burgess Hill
West Sussex
RH15 9TW
UK

The following product:

ATEX EH Booster Pumps – Hydrocarbon Oil

Internal Ⓔx II 1,2 G Ex h IIC T3, T4 Ga,Gb External Ⓔx II 2 G Ex h IIB T3, T4 Gb

	EH250 2.2kW	**EH500 2.2kW**	**EH1200 3kW**	**EH2600 11kW**	**EH4200 11kW**
ATEX T3 - 400V 50Hz	-	NRA998000	-	A30741935	A30941935
ATEX T4 - 400V 50Hz	NRA996000	NRA998000	A30557900	A30779900	A30979900
Chemical EH Pumps 60Hz (Not ATEX)					
C – 460V 60Hz	NRA997000	NRA999000	A30556982	A30756982	A30956982

Is in conformity with the relevant requirements of European CE legislation:

2014/34/EU	ATEX directive on use in potentially explosive atmospheres Intertek Testing and Certification Limited, notified body no. 0359 EU-Type Examination Certificate Number: ITS12ATEX17512X Tech File Ref: TCF136
2011/65/EU	Restriction of certain hazardous substances (RoHS) directive as amended by Delegated Directive (EU) 2015/863

Based on the relevant requirements of harmonised standards:

EN 1012-2:1996 +A1:2009	Compressors and vacuum pumps. Safety requirements. Vacuum pumps
EN ISO 80079-36:2016	Explosive atmospheres – Part 36: Non-electrical equipment for explosive atmospheres. Basic method and requirements
EN ISO 80079-37:2016	Explosive atmospheres - Part 37: Non-electrical equipment for explosive atmospheres -- Non-electrical type of protection constructional safety ''c'', control of ignition sources ''b'', liquid immersion ''k''
Documentation Officer:	Jelena Havelkova, Spielberk Office Centre, Holandska 10, Brno, 63900 Czech Republic, ✆: +42(0) 734 418 896, ✉: documentation@edwardsvacuum.com

This declaration, based on the requirements of the listed Directives and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: *2021-02-01*

Andries De Bock – Vice President Engineering
Industrial Vacuum Division
Cologne

Bram Claes – General Manager
Qingdao

Additional Legislation and Compliance Information

EU RoHS Directive: Material Exemption Information

This product is compliant with the following Annex III Exemptions:

- 6(b) **Lead** as an alloying element in aluminium containing up to 0.4% by weight
- 6(c) Copper alloy containing up to 4% **lead** by weight

Article 33 Declaration

This product does contain Candidate List Substances of Very High Concern above 0.1%ww by article as clarified under the 2015 European Court of Justice ruling in case C-106/14.

- Lead (Pb) added to the Candidate List June 2018

As indicated by the applied RoHS exemption(s) above this substance is present in certain aluminium/brass components.

Additional Information

The products listed are also in scope for and comply with the requirements of the following:

2012/19/EU Directive on waste electrical and electronic equipment (WEEE)

材料成分声明

China Material Content Declaration

	有害物质 Hazardous Substances					
部件名称 Part name	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr VI)	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
铸铝及铝合金制品 Aluminium alloys	X	O	O	O	O	O
铜管管件 Brass pipe fitting	X	O	O	O	O	O
铜接头 Brass connectors	X	O	O	O	O	O
冷却系统 Cooling system	X	O	O	O	O	O

O: 表示该有害物质在该部件的所有均质材料中的含量低于 GB/T 26572 标准规定的限量要求。
O: Indicates that the hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.

X: 表示该有害物质在该部件的至少一种均质材料中的含量超出 GB/T26572 标准规定的限量要求。
X: Indicates that the hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T26572.

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