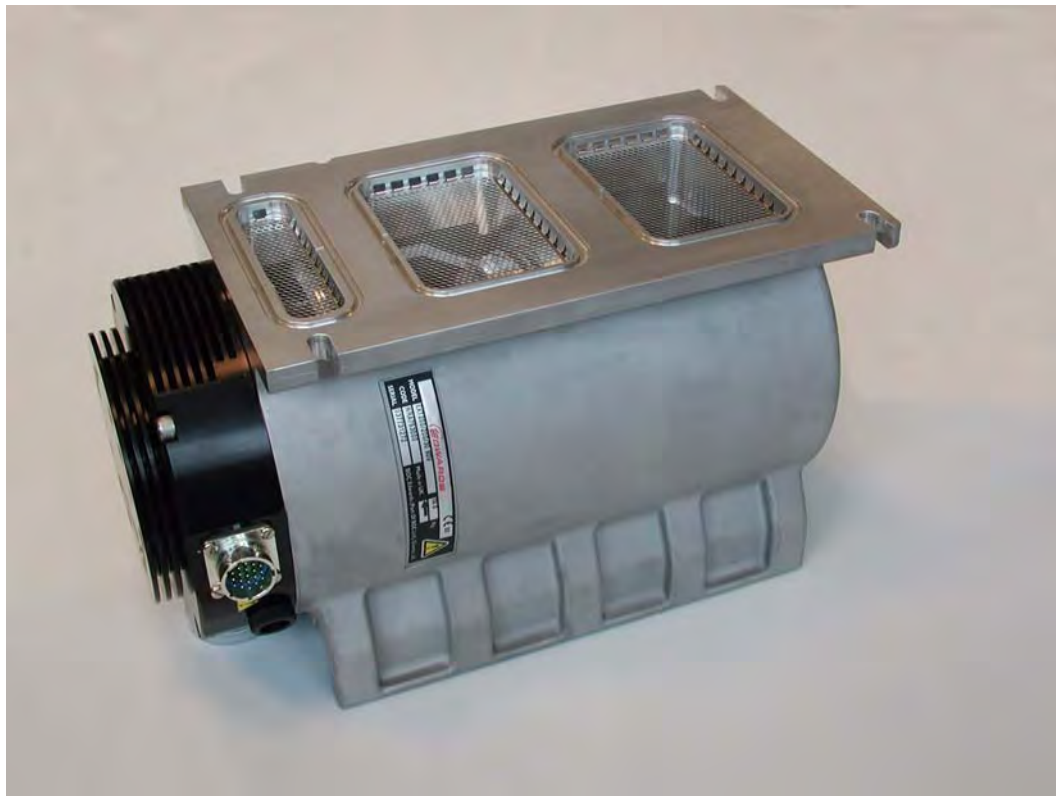


Instruction Manual

EXT200/200/30 Split Flow Compound Turbomolecular Pump



Description	Item Number
24 Volt EXT200/200/30 Compound Turbomolecular Pump	B756-11-991
80 Volt EXT200/200/30 Compound Turbomolecular Pump	B756-10-000
24 Volt EXT200/200/30 Cartridge Compound Turbomolecular Pump	B756-15-991
80 Volt EXT200/200/30 Cartridge Compound Turbomolecular Pump	B756-15-000





Declaration of Conformity

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

declare under our sole responsibility that the product(s)

B756-10-000	EXT200/200/30 80V
B756-11-000	EXT200/200/30 80V
B756-11-991	EXT200/200/30 24V
B756-15-000	EXT200/200/30 cartridge 80V [†]
B756-15-991	EXT200/200/30 cartridge 24V [†]

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

EN(ISO)12100-2: 2003	Safety of Machinery - Basic Concepts, General Principles for Design. Technical Principals.
EN1012-2: 1997	Compressors and Vacuum pumps. Safety Requirements. Vacuum Pumps.
EN61010-1: 2001*	Safety requirements for electrical equipment for measurement control and laboratory use.
EN61326: 1997 (immunity, Class B Emissions)	Electrical equipment for measurement, control and laboratory use EMC requirements.
C22.2 No 61010.1-04 [#]	Safety requirements for electrical equipment for measurement, Control and laboratory use, Part 1: General requirements
UL61010-1 (2 nd Edition) [#]	Safety requirements for electrical equipment for measurement, Control and laboratory use, Part 1: General requirements

[†] Cartridge variants are incomplete machines. They are not covered by the Machinery Safety Directive under this Declaration of Conformity, all other Directives apply.

* The pumps comply with EN61010-1 when installed in accordance with the instruction manual supplied with the pump.

[#] 80V Pumps only comply with the Canadian Standard Authority and Underwriters Laboratory when used with EXC100E, EXC100L controllers and EXDC 80V family of controllers.
24V Pumps only comply with the Canadian Standard Authority and Underwriters Laboratory when used with EXDC 24V family of controllers.

following the provisions of

2006/95/EC	Low Voltage Directive.
2004/108/EC	Electromagnetic Compatibility Directive
98/37/EC	Machinery Directive

B. D. Brewster, Technical Manager
Burgess Hill Products

14-03-2008
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 product(s)

B756-15-000	EXT200/200/30 cartridge 80V
B756-15-991	EXT200/200/30 cartridge 24V

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).

EN(ISO)12100-2: 2003	Safety of Machinery - Basic Concepts, General Principles for Design. Technical Principals
EN1012-2: 1997	Compressors 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 provisions of the Machinery Safety Directive 98/37/EC.

*B. D. Brewster, Technical Manager
Burgess Hill Products*

14-03-2008
BURGESS HILL

Date and Place

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

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For return of equipment, complete the HS Forms at the end of this manual.

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Associated publications

Publication title	Publication number
EXDC Turbomolecular Pump Drive Modules	D396-40-880 Issue C

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1 Introduction

1.1 Scope and definitions

This manual provides installation, operation, maintenance and storage instructions for the Edwards EXT200/200/30 Split Flow Compound Molecular Pump. Covering both the 24 V and 80 V variants. Please read and follow all instructions in this manual.

The EXT200/200/30 Split Flow Compound Molecular Pump is designed for use with an Edwards EXDC or EXC Controller. Read this manual and the instruction manual supplied with your controller before you attempt to install or operate the equipment. The controller manual contains details of electrical installation.

Important safety information in this manual is highlighted as WARNING and CAUTION instructions; please 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.

In accordance with the recommendations of EN61010, the following warning symbols may appear on the pump or its accessories:



Warning - refer to accompanying documentation.



Warning - risk of electric shock.



Warning - hot surfaces.

The units used throughout this manual conform to the SI international system of units of measurement. Also throughout this manual, wherever flow rates are specified, the abbreviation 'sccm' is used to mean standard $\text{cm}^3\text{min}^{-1}$: this is a flow of $1 \text{ cm}^3\text{min}^{-1}$ at an ambient temperature of 0°C and a pressure of 1013 mbar ($1.013 \times 10^5 \text{ Pa}$).

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2 Technical data

2.1 General

Table 1 - General data

General items	Reference data
Performance	Refer to Table 3
Dimensions	Refer to Figure 1
Maximum inlet-flange temperature	70 °C
Maximum magnetic field	5 mT
Installation category	EN61010 part 1, Category 1
Pollution degree	CAN/CSA, UL, EN61010 part 1
Altitude	2000 m
Humidity	10 to 90% non condensing
Electrical supply	
BXXX-XX-991	24 V d.c.
BXXX-XX-000	80 V d.c.
Equipment type	Fixed equipment, for indoor use only

2.2 Pumping media



WARNING

Vent dangerous gases and gas mixtures safely. Do not expose people to these gases.



WARNING

Do not use the EXT200/200/30 Split Flow pump to pump explosive gas mixtures as the pump is not suitable for this purpose.

CAUTION

Do not use the EXT200/200/30 Split Flow pump to pump gases containing more than 20% oxygen. If you do, the lubricant will polymerise and the pump will fail prematurely.

Note: Concentrations of gases may be modified by the compression of the pump.

The pump is designed to pump the following residual gases normally used in high-vacuum systems:

- Air
- Carbon monoxide
- Neon
- Ethane
- Methane
- Nitrogen

- Krypton
- Argon
- Propane
- Carbon dioxide
- Helium
- Hydrogen
- Butane

You can use the pump to pump oxygen and water vapour, subject to the following conditions:

- Oxygen - The oxygen concentration must be less than 20% by volume.
- Water vapour - You must ensure that vapour does not condense inside the pump.

If you wish to pump a gas not in the list above, contact your supplier for advice. If you do not contact your supplier, you may invalidate the warranty on the pump. The pumps are not suitable for pumping aggressive or corrosive gases.

2.3 Vent gas specification and vent control data

Although the pump may be vented to atmosphere, high relative humidity of the air may greatly increase the subsequent pump-down time. To reduce pump-down times you should vent the pump with dry, clean gases.

Table 2 - Vent gas and vent control data

Vent items	Reference data
Vent gas	Dry air, nitrogen, argon or other inert gases
Maximum dew point at atmospheric pressure	-22 °C
Maximum size of particulate	1 µm
Maximum concentration of oil	0.1 parts per million
Time for rotational speed to reach 50%	>15 sec

Table 3 - Technical data

Parameter	EXT200/200/30	Notes
Mass	10.62 kg	
Main inlet-flange	Rectangular	96 x 60 mm
Side inlet-flange	Rectangular	96 x 60 mm
Interstage inlet-flange	Rectangular	96 x 20 mm
Outlet-flange	DN25NW	
Vent-port	1/8 inch BSP	
Main inlet pumping speed		
N ₂ ^{* † ‡}	159 l s ⁻¹	Pb < 5 mbar (500 Pa)
He ^{* † ‡}	180 l s ⁻¹	Pb < 1 mbar (100 Pa)
H ₂ ^{* † ‡}	155 l s ⁻¹	Pb < 0.5 mbar (50 Pa)

Table 3 - Technical data (continued)

Parameter	EXT200/200/30	Notes
Side inlet pumping speed		
N ₂ ^{* † †}	217 l s ⁻¹	P _b < 5 mbar (500 Pa) P _i = 5 x 10 ⁻³ mbar (0.5 Pa)
He ^{* † †}	195 l s ⁻¹	P _b < 1 mbar (100 Pa) P _i = 5 x 10 ⁻³ mbar (0.5 Pa)
H ₂ ^{* † †}	137 l s ⁻¹	P _b < 0.5 mbar (50 Pa) P _i = 5 x 10 ⁻³ mbar (0.5 Pa)
Interstage pumping speed [†]		
N ₂ ^{* † †}	28 l s ⁻¹	P _b = 5 mbar (500 Pa) P _i = 5 x 10 ⁻¹ mbar (50 Pa)
He ^{* † †}	28 l s ⁻¹	P _b = 5 mbar (500 Pa) P _i = 5 x 10 ⁻¹ mbar (50 Pa)
H ₂ ^{* † †}	24 l s ⁻¹	P _b = 5 mbar (500 Pa) P _i = 5 x 10 ⁻¹ mbar (50 Pa)
Compression ratio from the backing port to the main inlet		
N ₂	>1 x 10 ⁷	
He	1 x 10 ⁶	
H ₂	2.8 x 10 ⁴	
Compression ratio from the side inlet to the main inlet		
N ₂	5.5 x 10 ³	
He	2.5 x 10 ²	
H ₂	5 x 10 ¹	
Maximum backing pressure ^{**}		
N ₂	12.6 mbar (1260 Pa)	
He	7.7 mbar (770 Pa)	
H ₂	2 mbar (200 Pa)	
Minimum backing pump displacement	0.6 m ³ h ⁻¹	
Maximum continuous inlet pressure - air-cooling at 35 °C ambient ^{††}		Air-cooling is beneficial to the EXDC controller
Main inlet	2 x 10 ⁻⁴ mbar (2 x 10 ⁻² Pa)	Results applicable to B756-10-000
Side inlet	2 x 10 ⁻³ mbar (2 x 10 ⁻¹ Pa)	P _b = 6.25 mbar (625 Pa)
Interstage inlet	3.5 x 10 ⁻² mbar (3.5 Pa)	
Operating attitude	Refer to Figure 5	
Nominal rotational speed	60000 r min ⁻¹	
Standby rotational speed	42000 r min ⁻¹	EXC controller only

Table 3 - Technical data (continued)

Parameter	EXT200/200/30	Notes
Starting time to 90% speed		
EXDC160	146 sec	
EXC100E	309 sec	
EXC120	248 sec	
EXC300	161 sec	
Cooling method	Forced-air	
Ambient air temperature (forced-air cooling)	0 - 35 °C	
Noise level (at 1 metre)	< 50 dB(A)	
Recommended controller	EXDC160	
EXDC160 maximum VA input	250 VA	
Quiescent power	25 W	
Recommended backing pump ^{††}	RV3	

* P_b = backing pressure,

P_i = Inlet pressure,

[†] Pumping speeds are without inlet-screen.

Inlet-screens reduce speed by approximately 10% for main and side inlets and by approximately 4% at interstage inlet.

[‡] With an E2M28 backing pump.

** Inlet pressure has risen to 10^{-3} mbar.

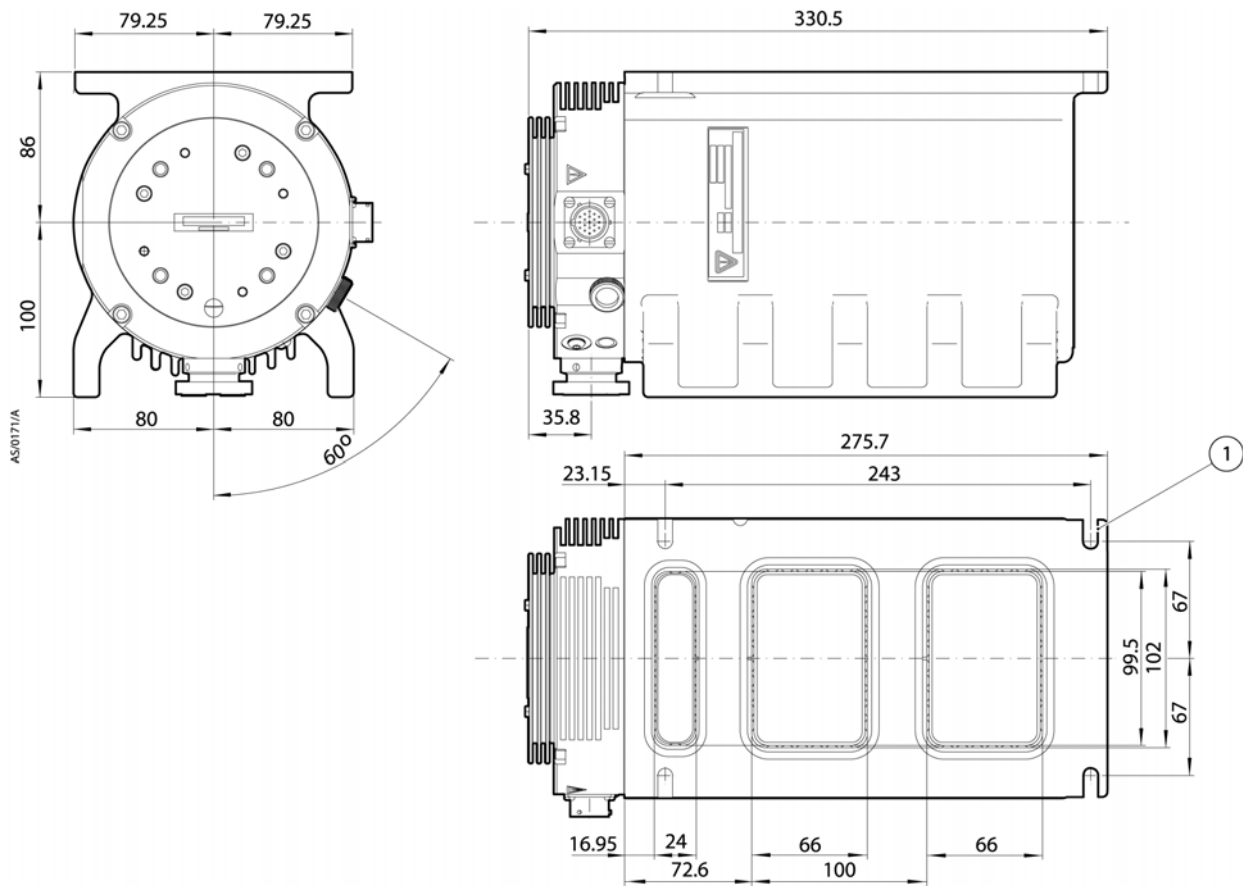
^{††} Above this pressure, rotational speed drops below nominal.

^{‡‡} A larger backing pump may be required for maximum throughput.

2.4 Materials exposed to gases pumped

The following materials and component types are exposed to the gases pumped: aluminium alloys, stainless steels, fluoroelastomer and nitrile 'O' rings, hydrocarbon lubricant, felt, rare earth magnets, silicon nitride, phenolic resin and carbon-fibre reinforced epoxy resin.

Figure 1 - Dimensions of the EXT200/200/30 split flow pump (units in mm)



1. 4 slots 8.4 mm wide

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3 Installation

3.1 Unpack and inspect

Take care when you unpack the pump to avoid excessive shocks which could damage the bearings and reduce the life of the pump. The pump is supplied with the inlet and outlet sealed to prevent entry of dust and vapour. Do not remove these seals until you are ready to install the pump on your vacuum system.

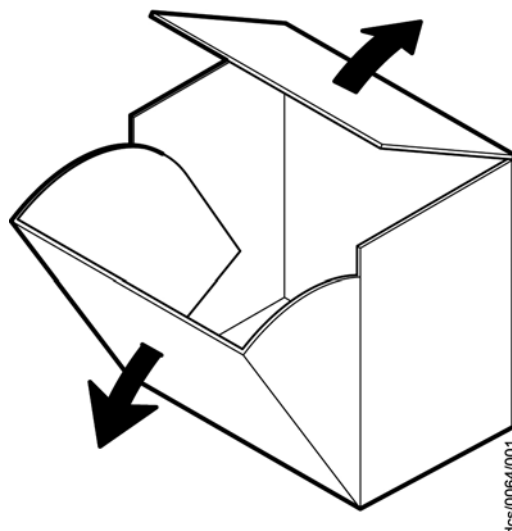
Fold down all outer cardboard packaging and check the pump. If the pump is damaged, notify your supplier and the carrier in writing within three days; state the Item Number of the pump together with your order number and your supplier's invoice number. Retain all packing materials for inspection. Do not use the pump if it is damaged.

Check that your package contains the items listed in [Table 4](#). If any of these items is missing, notify your supplier in writing within three days.

If the pump is not to be used immediately, store the pump in suitable conditions as described in [Section 6.1](#).

It is advised to retain all packing materials; for use should you return it for service.

Figure 2 - Opening procedures for packaging



3.2 Typical installation

A typical pumping system with an EXT200/200/30 pump is shown in Figure 3.*

Figure 3 - EXT200/200/30 split flow system



The accessories available for the EXT200/200/30 Split Flow pump are detailed in Section 7.4; the accessories are shown in Figure 6.

3.3 Connection to the vacuum system



WARNING

Install the pump in the vacuum system before you connect the controller to the power supply. This will ensure that the pump cannot operate and injure people during installation.



WARNING

The impeller blades on an EXT200/200/30 cartridge version are exposed at both the side inlet and main inlet of the pump. Therefore, care must be taken during unpacking and installation to avoid the ingress of foreign objects and personal injury.

Carefully remove the pump from packaging media and connect to vacuum system.

* System variants include an EXDC160 controller.

Table 4 - List of items supplied

Qty	Description	Check (✓)
1	EXT200/200/30 Split Flow Turbo Molecular pump	<input type="checkbox"/>
2	Large inlet-screen (fitted)	<input type="checkbox"/>
1	Small inlet-screen (fitted)	<input type="checkbox"/>
2	Large inlet seal ('O' ring)	<input type="checkbox"/>
1	Small inlet seal ('O' ring)	<input type="checkbox"/>
1	EXDC160 controller (fitted)*	<input type="checkbox"/>

* Only supplied with system variants.

3.3.1 Mechanical fixing



WARNING

If the pump seizes, the stored energy of the rotor can cause rapid movement of the pump, which may cause further damage and injury to people.

Ensure the EXT200/200/30 Split Flow pump is securely fixed to the vacuum system via its inlet-flange.

3.3.2 Inlet-screens (supplied fitted)



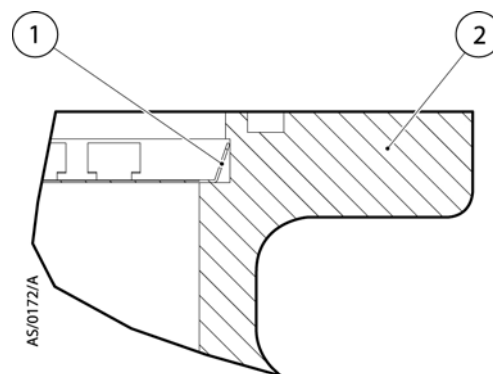
WARNING

Removal of inlet-screens will expose the risk of injury from sharp edges.

Do not remove the inlet-screens unless you can be sure that there is no danger that debris can fall into the pump.

To remove an inlet-screen carefully extract it from the inlet-flange using a bent wire hook. Once removed, a screen is not reusable. Spares are available (refer to [Section 7](#)).

Figure 4 - Correct installation of inlet-screen



1. Inlet-screen
2. Inlet-flange

3.3.3 Inlet connection and orientation

CAUTION

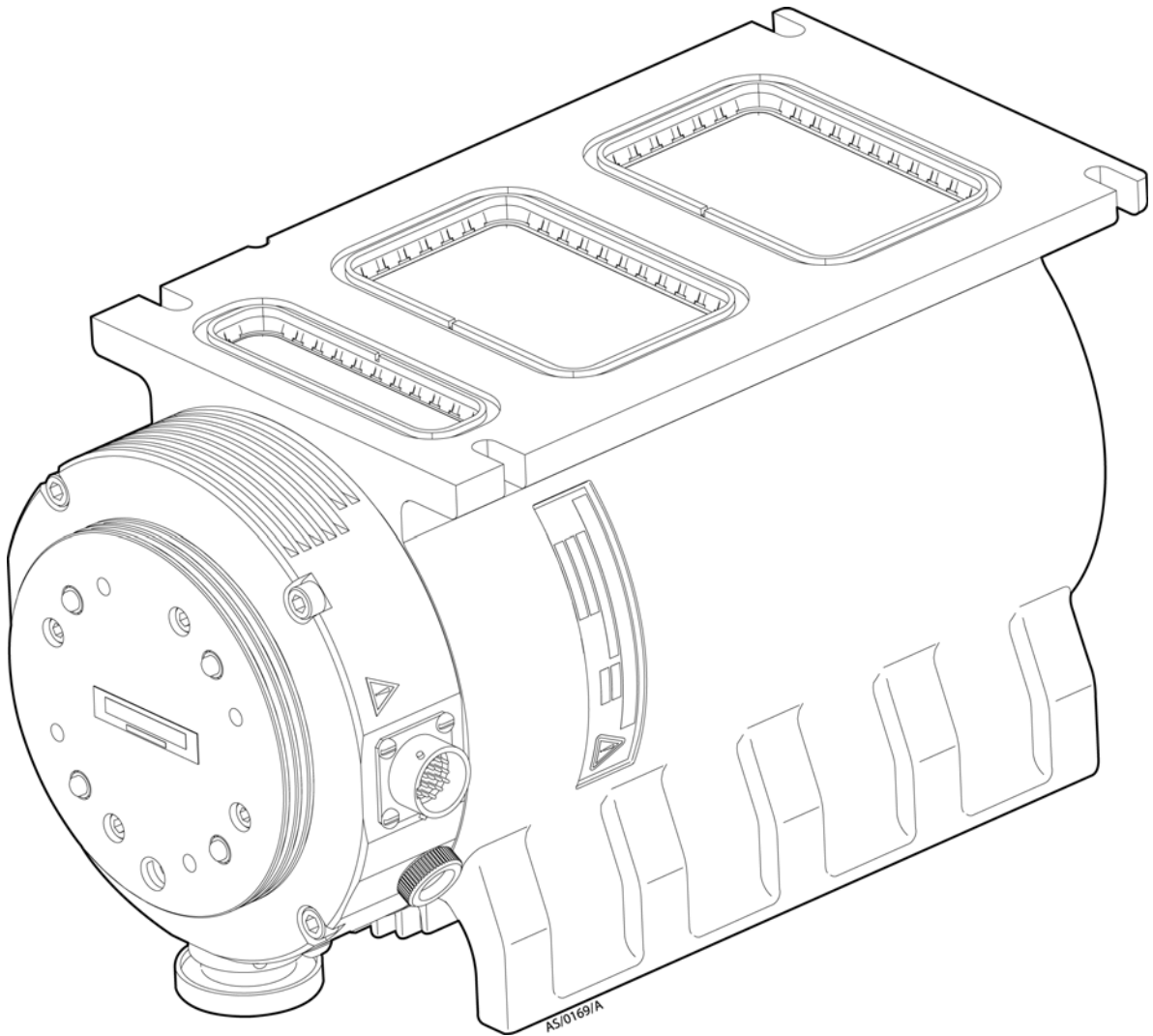
Do not invert the pump.

The pump can be mounted in any attitude range shown in Figure 5, from horizontal through to vertical and upright ($\pm 2^\circ$), although it is most commonly mounted horizontally.

Make sure that the pump's inlets and all components fitted to the pump-inlets are clean and dust-free. If the pump-inlets are not kept clean, the pump-down time may be increased.

Use the 'O' rings supplied with the pump and use four fixing bolts to connect the inlet-flange of the pump to the vacuum system.

Figure 5 - Mounting attitude of the EXT200/200/30 split flow pump



3.3.4 Backing connection

Use suitable vacuum tubing and connectors to connect the NW flange of the backing-port to your backing-pump. If necessary, use flexible pipe or bellows to reduce the transmission of vibration from the backing-pump to the EXT200/200/30 Split Flow pump.

We recommend that you use an Edwards RV backing-pump. The minimum size of the backing-pump required is given in Table 3. You may have to use a larger backing-pump if you run the pump at a high inlet pressure. The EXT200/200/30 is also suitable for use with diaphragm backing-pumps although the effect of higher backing pressure on the pump's performance and cooling requirements should be noted (refer to Table 1 and Section 3.6).

CAUTION

Do not use the EXT200/200/30 Split Flow pump with a backing pressure below 5×10^{-4} mbar (5×10^{-2} Pa). Lower backing pressures will increase the evaporation rate of the lubricating oil and so will reduce the life of the bearings.

3.4 Vent options, vent valve connection and control

To maintain the cleanliness of your vacuum system, we recommend that, whenever you switch the pump off, you vent the pump (or vacuum system) when the speed of the EXT200/200/30 Split Flow pump is between full rotational speed and 50% of full rotational speed.

At and above 50% of full rotational speed, the rotor spins fast enough to suppress any backstreaming of hydrocarbon oil from your backing pump. Venting may be accomplished by one of the following methods:

- Use a TAV5 or TAV6 solenoid vent-valve accessory (refer to Section 7) in place of the manual vent-valve.
- Use a TAV5 or TAV6 solenoid vent-valve connected to a convenient flange on your vacuum system.
- Use an alternative valve connected to your vacuum system.

However, if you manually vent the pump when it is at full rotational speed and the rate of pressure rise is too high, the pump life may be reduced. When using the manual vent valve supplied, we recommend that you either limit the vent or only open the vent-valve after the EXT200/200/30 Split Flow pump speed has fallen to 50% of full rotational speed.

Do not vent from the backing line, this may lead to contamination. If you vent into your vacuum system, select a point upstream of the pump, to prevent oil backstreaming from the backing line.

If you use the TAV5 or TAV6 vent-valve you can control it using an EXC controller, or by other methods. Table 5 gives an indication of the appropriate orifice size to be fitted to the vent valve for given vacuum system volumes in order that the vent rate is kept within the limits given in Section 4.

Table 5 - Vent-restrictor orifice diameter (with atmospheric pressure at the inlet of the vent-valve)

Vacuum system volume (l)	Orifice diameter (mm)
< 20	< 1.0
< 10	< 0.7
< 5	< 0.5
< 2	< 0.35

3.5 Electrical installation

The EXT200/200/30 Split Flow pump should be electrically bonded to earth using the connection provided. Refer to the instruction manual supplied with the controller to complete the electrical installation.

3.5.1 EXDC controllers

An EXDC controller requires connection to a suitably rated power supply. The EXDC Controller is designed to allow a pumping system to operate in a fully automatic system.

3.5.2 EXC controllers

The EXC Controller provides the electrical supply to the EXT200/200/30 Split Flow pump through the pump-to-controller cable. Connect and lock the bayonet-connectors at the ends of the cable to the mating connectors on the pump and the EXC Controller (if applicable). If the cable is disconnected at either end while the pump is operating, the EXC Controller output is switched off, which makes the cable safe.

The EXC Controller is designed to allow a pumping system to be configured in a variety of ways, from a basic manually-operated system to a fully automatic system with remote control.

3.6 Cooling

3.6.1 Introduction

CAUTION

You must cool the pump by forced-air to prevent damage to the bearing.

You must use forced-air cooling to cool the pump. You must ensure that there is an adequate supply of cooling-air to the pump.

During operation, if the temperature of any surface of the pump is higher than 45 °C, the pump is too hot and you must increase the cooling.

3.6.2 Forced-air cooling

An air-cooler accessory is available for the EXT200/200/30 pump (refer to [Section 7](#)). Fit the air-cooler as described in the instruction manual supplied with it. If you wish to use an alternative fan for air-cooling, ensure that the flow rate is above 70 m³h⁻¹ (40 cfm).

4 Operation



WARNING

Do not operate the EXT200/200/30 Split Flow pump unless it is connected to your vacuum system. If you do, the pump rotor can cause injury. The pump rotor rotates at very high speeds and the rotating blades might not be visible.

4.1 Start-up

Use the procedure below to start up a basic, manually-controlled pumping system with a manual vent-valve and an EXDC version controller. Refer to the EXDC instruction manual.

1. Ensure the manual vent-valve is closed (turn clockwise to close it).
2. Switch on the power to the air cooler.
3. Start the backing-pump.
4. When the vacuum system pressure is approximately 10 mbar or less, switch on the power supply to start the EXT200/200/30 Split Flow pump.
5. The pump will then accelerate to full operating speed. Once nominal operating speed is reached, the normal speed LED on the EXDC Controller will illuminate.

Note: Refer to the controller manual if using the EXC Controller.

4.2 Shut-down

Note: In an emergency only, open the vent-valve quickly to decelerate the pump rotor in the shortest possible time.

Use the procedure below to shut down a basic, manually-controlled pumping system with a manual vent-valve and an EXDC Controller. Refer to the EXC Controller instruction manual when using an EXC Controller.

1. Close the valve in the backing-line connecting the EXT200/200/30 Split Flow pump to the backing-pump.
2. Switch off the backing-pump.
3. Switch off the power supply to the EXT200/200/30 Split Flow pump.
4. When the EXT200/200/30 Split Flow pump rotational speed has fallen to below 50% of full rotational speed, turn the manual vent-valve anti-clockwise to open it. Ensure that the rate of pressure rise does not exceed the allowed rate of pressure rise, otherwise you can damage the pump: refer to [Section 3.4](#).

4.3 Safety interlocks and control system

The pump protection and safety interlock features are listed below. Refer to the instruction manual supplied with the controller for a full description of these features.

4.3.1 EXDC controllers

- The EXDC Controller monitors the temperature of the EXT200/200/30 Split Flow pump and the electrical power consumption of the pump. If the EXDC Controller detects excessive power consumption or temperature, the rotational speed of the pump motor is reduced until the power and temperature return to normal.

4.3.2 EXC controllers

- The EXC Controller monitors the temperature of the EXT200/200/30 Split Flow pump and the electrical power consumption of the pump. If the EXC Controller detects excessive power consumption or temperature, the rotational speed of the pump motor is reduced until the power and temperature return to normal.
- If the rotational speed is reduced to 50% of nominal speed, then power is removed (or after a user defined time delay) and the FAIL LED on the EXC Controller lights.
- If pump rotational overspeed is detected by the EXC Controller, the pump is stopped immediately and the FAIL LED on the EXC Controller lights.

If the FAIL LED lights, switch off the backing-pump immediately and vent the EXT200/200/30 Split Flow pump. Once the EXT200/200/30 Split Flow pump has stopped, rectify the cause of the failure (refer to [Section 5.4](#)), press the EXC Controller Start/Stop button to reset the Fail condition, and restart the EXT200/200/30 Split Flow pump. If the pump is hot, allow sufficient time for it to cool before you restart it.

Note: Any references to LEDs and buttons do not apply to OEM versions of the EXC controller.

5 Maintenance



WARNING

Allow the pump-rotor to stop, then disconnect the controller before you remove the pump from your vacuum system for maintenance or fault-finding procedures.

5.1 Introduction

The maintenance operations for the EXT200/200/30 Turbomolecular pump are described in the following sections. The inlet-screens and inlet-flange seals are available as spares (refer to [Section 7](#)). Fit the inlet-screens as described in [Section 3.3.2](#).

5.2 Bearing maintenance

When supplied, the pump contains sufficient lubricant to supply the bearings for life. No routine maintenance is therefore required between bearing replacements. The bearings are not user-serviceable. The bearings will need to be replaced when they reach the end of their service life. This is typically more than 20,000 hours, but may be less; this depends on the type of pumping duty on which the pump is used.

When the bearings need replacement, we recommend that you exchange your pump for a factory reconditioned replacement. Alternatively, you can send your pump to an Edwards Service Centre to have the bearings replaced.

When you return the EXT200/200/30 Split Flow pump to Edwards Service Centres please use the procedure included at the end of this manual. However, the instruction to drain all fluids does not apply to the lubricant in the EXT200/200/30 Split Flow pump oil-reservoir.

5.3 Cleaning the pump



WARNING

Clean the pump in a well-ventilated location. When you use cleaning solutions and solvents to clean the pump, observe all precautions specified by the manufacturer. Avoid inhalation of any particulates which may be present in the pump.

Use a cleaning solution which is suitable for the contaminants in the pump. You can use any organic solvent to clean the EXT200/200/30 Split Flow pump, but we recommend that you use non-CFC solvents, such as isopropanol or ethanol.

For environmental reasons, keep wastage of cleaning solutions and solvents to a minimum.

If the pump is heavily contaminated, it must be dismantled and cleaned at an Edwards Service Centre.

5.4 Fault finding

Refer to [Table 6](#) for the possible causes of faults and for the recommended actions to rectify faults. [Table 6](#) is applicable to a basic, manually controlled pumping system with an EXC Controller configured for local (manual) operation.

Note that if you use an EXDC Pump Drive Module to control the EXT200/200/30 Split Flow pump, or if you use an EXC Controller configured for remote operation to control the EXT200/200/30 Split Flow pump, some of the checks and actions in [Table 6](#) may not apply to your system. Refer to the fault finding section of the instruction manual supplied with your EXDC Pump Drive Module or EXC Controller for further fault finding information.

Table 6 - Fault finding

Symptom	Check	Action
The impeller does not rotate. After pressing start - Fail LED not lit.	<p>Is the EXC Controller power LED lit?</p> <p>Is the EXC Controller Start/Stop LED flashing?</p> <p>Is the EXC Controller first speed indication LED lit?</p>	<p>If not, check that the electrical supply is on, check that the switch at the rear of the EXC Controller is on, check the fuse in the rear of the EXC Controller.</p> <p>If all of the above are OK then the EXC Controller is faulty. Consult Edwards or your supplier.</p> <p>If so, check that the correct links are made on the EXC Controller logic interface (refer to the instruction manual supplied with the EXC Controller).</p> <p>Check that any system interlocks are correctly made (refer to the instruction manual supplied with the EXC Controller).</p> <p>Check that the pump-to-controller lead is connected.</p> <p>If you have made all of the above checks and cannot identify the cause of the fault, consult Edwards or your supplier.</p> <p>If not, the EXC Controller is faulty. If lit, then the EXT200/200/30 Split Flow pump is faulty. Consult Edwards or your supplier.</p>
The EXC Controller trips into Fail - at any speed.	Are the system interlocks correctly connected?	Ensure that the system interlocks do not open after the EXT200/200/30 Split Flow pump has started.
The EXC Controller trips into Fail during the ramp-up and before 50% speed is reached.	<p>Is the inlet pressure too high? Is the backing pressure too high?</p> <p>Is the EXT200/200/30 Split Flow pump running too hot?</p> <p>Does the rotor rotate freely?</p> <p>Is the timer set incorrectly?</p>	<p>If so, reduce the pumping load, or check for a gross leak into the system.</p> <p>If so, increase the air-cooling flow or reduce the pumping load. (Refer to Section 2 for maximum inlet pressure and Section 3 for cooling requirements). Check that external heat sources (such as system bakeout heaters) are not excessive.</p> <p>If not, the EXT200/200/30 Split Flow pump- bearings are damaged. Consult Edwards or your supplier.</p> <p>Increase the timer setting (refer to the instruction manual supplied with the EXC Controller). If the EXC Controller still trips into Fail consult Edwards or your supplier.</p>

Table 6 - Fault finding (continued)

Symptom	Check	Action
The EXC Controller trips into Fail after 50% speed has been reached - the first two speed LEDs are lit.	<p>Is the pressure too high?</p> <p>Is the EXT pump running too hot?</p> <p>Does the EXT200/200/30 pump rotor rotate freely?</p>	<p>If so, reduce the pumping load or check for a gross leak into the system.</p> <p>If the high gas load is temporary, configure the EXC Controller to delay the Fail trip on 50% speed and set an appropriate delay time (refer to the instruction manual supplied with the EXC Controller).</p> <p>If so, increase the air-cooling flow or reduce the pumping load.</p> <p>If not, the EXT200/200/30 Split Flow pump- bearings are damaged. Consult Edwards or your supplier.</p>
The EXC Controller trips into Fail - all the speed LEDs are lit.		Consult Edwards or your supplier.
System operating pressure cannot be reached.	<p>Are any of the vacuum gauges contaminated?</p> <p>Is the pumping speed insufficient (due to poor conductance between the pump and the gauge or too large a chamber)?</p> <p>Is the backing pressure > 12 mbar (1200 Pa)?</p> <p>Is the high-vacuum area of the system contaminated?</p> <p>Check the rest of your system for leaks and contamination.</p>	<p>If so, clean or replace them.</p> <p>Increase the conductance or reduce the volume.</p> <p>Check for backing line leaks. If the backing pressure is too high, you may need a larger backing pump.</p> <p>If so, clean the high-vacuum system.</p> <p>If found, clean the contaminated areas and repair the leaks.</p>
The EXT200/200/30 is very noisy or there is excessive vibration or both.	<p>Is the pump rotational speed the same as the resonant frequency of the attached system?</p> <p>Is the vibration being transmitted from the rotary pump?</p> <p>Is the noise irregular and getting progressively worse?</p> <p>Is the EXT200/200/30 pump making a constant high-pitched noise?</p>	<p>If so, change the natural frequency of your system.</p> <p>If so, fit flexible bellows or a vibration isolator in the backing line.</p> <p>If so, a bearing is defective. Consult Edwards or your supplier.</p> <p>If so, the rotor is out of balance. Consult Edwards or your supplier.</p>
None of the above.	-	Consult Edwards or your supplier.

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6 Storage and disposal

6.1 Storage

Use the following procedure to store the pump.

1. Place protective covers over the main inlet, side inlet, interstage inlet, outlet and vent ports.
2. Place the pump in its packing materials. For fastest pump-down when the pump is put back into service, seal the pump inside a plastic bag together with a suitable desiccant.
3. Store the pump in cool, dry conditions, preferably not exposed to atmospheric air until required for use. When required, prepare and install the pump as described in [Section 3](#).
4. Keep the pump upright at all times to prevent the drainage of oil from the bearing reservoir.
5. Avoid long-term storage if possible. When long-term storage is necessary, the pump should be set up and run for at least eight hours every six months.

6.2 Disposal

Dispose of the EXT200/200/30 Split Flow Turbomolecular Pump and any components and accessories safely in accordance with all local and national safety and environmental requirements.

Particular care must be taken with any components which have been contaminated with dangerous process substances.

Take appropriate action to avoid inhalation of any particulates which may be present in the pump. Do not incinerate the pump. The pump contains phenolic and fluorosilicone materials which can decompose to very dangerous substances when heated to high temperatures.

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7 Service, spares and accessories

7.1 Introduction

Edwards products, spares and accessories are available from Edwards companies in Belgium, Brazil, Canada, France, Germany, Hong Kong, Italy, Japan, Korea, United Kingdom, USA and a worldwide 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 worldwide network of Edwards Service Centres. Each Service Centre offers a wide range of options including: equipment decontamination; service exchange; repair; rebuild and testing to factory specifications. Equipment which has been serviced, repaired or rebuilt is returned with a full warranty.

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

7.3.1 Inlet-screens

Inlet-screens are fitted to your pump as supplied to prevent damage from the entry of debris into the pump. The Item Number of replacement inlet-screens is given in [Table 7](#).

7.3.2 Inlet-flange seals

The EXT200/200/30 Split Flow pump is supplied with inlet seals. The Item Number of replacement seals is given in [Table 7](#).

Table 7 - Spares

Description	Item Number
Inlet-screens	B756-10-813
Inlet-flange seals	B756-10-812

7.4 Accessories

7.4.1 Installation

The accessories available for use with the EXT200/200/30 Split Flow turbomolecular pump are described in the following sections. [Figure 6](#) shows how the accessories are fitted to an EXT200/200/30 Split Flow pump.

7.4.2 EXDC drive modules

Fit an EXDC Drive Module as an alternative to an EXC Controller and pump-to-controller cable. Refer to [Table 8](#).

7.4.3 EXC controllers

The Item Numbers of the EXC Controllers are shown in [Table 9](#).

7.4.4 Pump-to-controller cables

You must fit a pump-to-controller cable between an EXC Controller and the EXT200/200/30 Split Flow pump. A cable is not supplied with the EXT200/200/30 Pump or the EXC Controller (except EXC100L). Refer to [Table 10](#).

7.4.5 TAV vent-valve and vent-port adaptor

Two solenoid-operated vent-valves are available for system venting. The valves are 24 V d.c., normally-open, and can be driven automatically from the EXC Controller. The solenoid-valve is fitted in place of the manual-valve, or alternatively can be fitted with an adaptor (supplied with the valve) and be used with any suitable NW10 flanged port on your vacuum system. The vent-port adaptor allows the vent-port or the purge-port to be used with any suitable NW10 fitting. Refer to [Table 11](#).

7.4.6 ACX air-cooler

An ACX air-cooler can be fitted to the EXT200/200/30 Split Flow pump. However, please refer to [Section 2](#) to check the suitability of air-cooling in a particular application. Refer to [Table 12](#).

7.4.7 VRX vent-restrictor

Use a VRX fixed orifice vent-restrictor to restrict the flow of vent gas into the EXT200/200/30 Split Flow pump. Refer to [Section 3.4](#) for information on the selection of the correct VRX vent-restrictor. Refer to [Table 13](#).

Table 8 - EXDC drive modules

Drive Module	Item Number
EXDC160 24 V	D396-46-000
EXDC160 80 V	D396-41-000

Table 9 - EXC controllers

Controller	Voltage	Item Number
EXC100E	90 - 264 V a.c.	D396-20-000
EXC100L	90 - 264 V a.c.	D396-22-000
EXC120	90 - 264 V a.c.	D396-16-000
EXC300	90 - 132/180 - 264 V a.c.	D396-14-000

Table 10 - Pump-to-controller cable

Cable	Length	Item Number
Pump-to-controller	1 m	D396-18-010
Pump-to-controller	3 m	D396-18-030
Pump-to-controller	5 m	D396-18-050

Table 11 - TAV vent-valve and vent-port adaptor

Product	Item Number
TAV5 vent-valve	B580-66-010
TAV6 vent-valve	B580-66-020
NW10-1/8 inch BSP male adaptor	B580-66-011

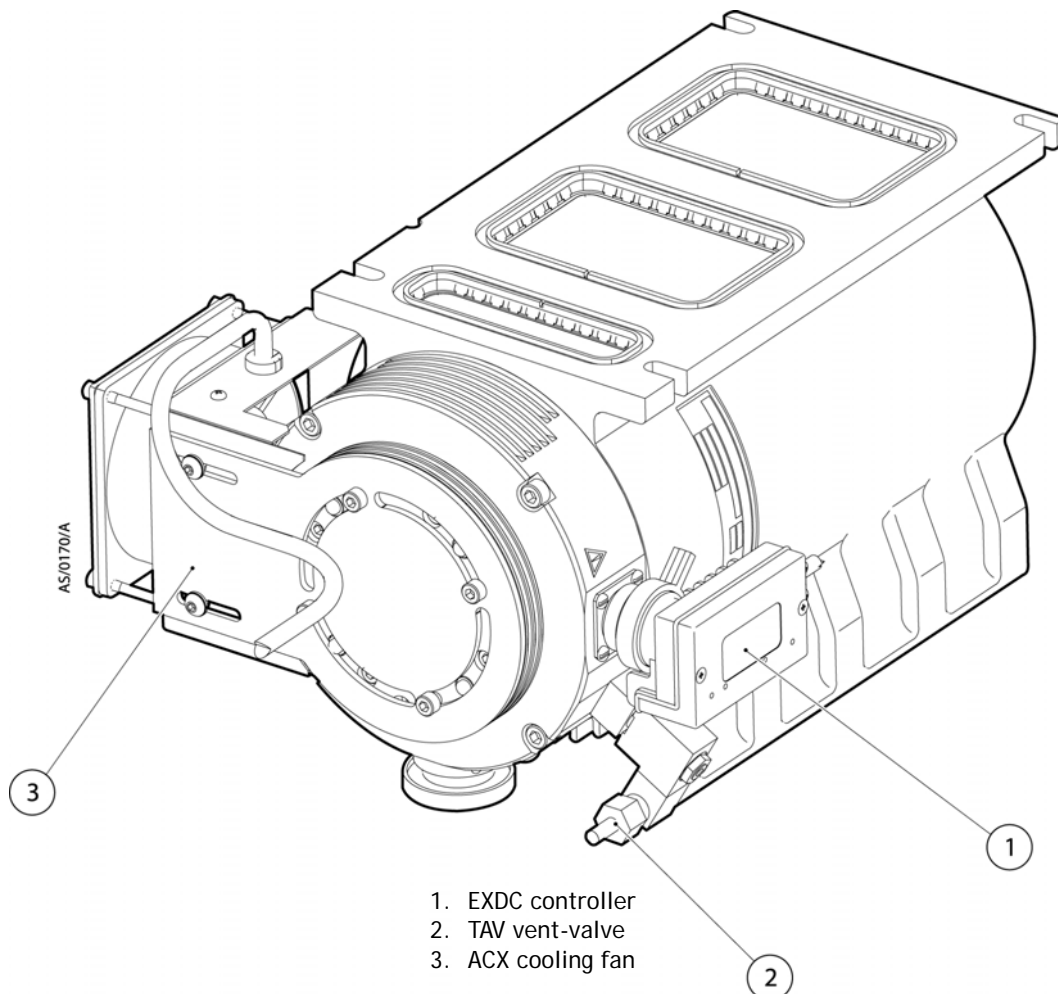
Table 12 - ACX air-cooler

Air-cooler	Item Number
ACX250H	B580-53-160

Table 13 - VRX vent-restrictor

Vent-restrictor	Orifice diameter	Item Numer
VRX10	0.1 mm	B580-66-021
VRX20	0.2 mm	B580-66-022
VRX30	0.3 mm	B580-66-023
VRX50	0.5 mm	B580-66-024
VRX70	0.7 mm	B580-66-025

Figure 6 - Installation of optional accessories



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Return of Edwards Equipment - Procedure

INTRODUCTION

Before returning your equipment, you must warn Edwards if substances you used (and produced) in the equipment can be hazardous. This information is fundamental to the safety of our Service Centre employees and will determine the procedures employed to service your equipment.

Complete the Declaration (HS2) and send it to Edwards before you dispatch the equipment. It is important to note that this declaration is for Edwards internal use only, and has no relationship to local, national or international transportation safety or environmental requirements. As the person offering the equipment for shipment, it is your responsibility to ensure compliance with applicable laws.

GUIDELINES

- Equipment is '**uncontaminated**' if it has not been used, or if it has only been used with substances that are not hazardous. Your equipment is '**contaminated**' if it has been used with any substances classified as hazardous under EU Directive 67/548/EEC (as amended) or OSHA Occupational Safety (29 CFR 1910).
- If your equipment has been used with radioactive substances, biological or infectious agents, mercury, polychlorinated biphenyls (PCB's), dioxins or sodium azide, you must decontaminate it before you return it to Edwards. You must send independent proof of decontamination (for example a certificate of analysis) to Edwards with the Declaration (HS2). Phone Edwards for advice.
- If your equipment is contaminated, you must either:
 - Remove all traces of contamination (to the satisfaction of laws governing the transportation of dangerous/hazardous substances).
 - Or, properly classify the hazard, mark, manifest and ship the equipment in accordance with applicable laws governing the shipment of hazardous materials.

Note: Some contaminated equipment may not be suitable for airfreight.

PROCEDURE

1. Contact Edwards and obtain a Return Authorisation Number for your equipment.
2. Complete the Return of Edwards Equipment - Declaration (HS2).
3. If the equipment is contaminated, you must contact your transporter to ensure that you properly classify the hazard, mark, manifest and ship the equipment, in accordance with applicable laws governing the shipment of contaminated/hazardous materials. As the person offering the equipment for shipment, it is your responsibility to ensure compliance with applicable law. **Note: Equipment contaminated with some hazardous materials, such as semiconductor by-products, may not be suitable for airfreight - contact your transporter for advice.**
4. Remove all traces of hazardous gases: pass an inert gas through the equipment and any accessories that will be returned to Edwards. Where possible, drain all fluids and lubricants from the equipment and its accessories.
5. Seal up all of the equipment's inlets and outlets (including those where accessories were attached) with blanking flanges or, for uncontaminated product, with heavy gauge tape.
6. Seal equipment in a thick polythene/polyethylene bag or sheet.
7. If the equipment is large, strap the equipment and its accessories to a wooden pallet. If the equipment is too small to be strapped to a pallet, pack it in a suitable strong box.
8. E-mail via scan, fax or post a copy of the original with signature of the Declaration (HS2) to Edwards. The Declaration must arrive before the equipment.
9. Give a copy of the Declaration (HS2) to the transporter. You must tell your transporter if the equipment is contaminated.
10. Seal the original Declaration in a suitable envelope: attach the envelope securely to the outside of the equipment package, in a clear weatherproof bag.
WRITE YOUR RETURN AUTHORISATION NUMBER CLEARLY ON THE OUTSIDE OF THE ENVELOPE OR ON THE OUTSIDE OF THE EQUIPMENT PACKAGE.

Return of Edwards Equipment - Declaration

Return Authorisation Number: _____

You must:

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

SECTION 1: EQUIPMENT

Manufacturer's Product Name _____

Manufacturer's Part Number _____

Manufacturer's Serial Number _____

Has the equipment been used, tested or operated?

YES Go to Section 2 NO Go to Section 4

IF APPLICABLE:

Tool Reference Number _____

Process _____

Failure Date _____

Serial Number of Replacement Equipment _____

SECTION 2: SUBSTANCES IN CONTACT WITH THE EQUIPMENT

Are any substances used or produced in the equipment:

- Radioactive, biological or infectious agents, mercury, poly chlorinated biphenyls (PCBs), dioxins or sodium azide? (if YES, see Note 1) YES NO
- Hazardous to human health and safety? YES NO

Note 1: Edwards will not accept delivery of any equipment that is contaminated with radioactive substances, biological/infectious agents, mercury, PCB's, dioxins or sodium azide, unless you:

- Decontaminate the equipment
- Provide proof of decontamination

YOU MUST CONTACT EDWARDS FOR ADVICE BEFORE YOU RETURN SUCH EQUIPMENT

SECTION 3: LIST OF SUBSTANCES IN CONTACT WITH THE EQUIPMENT

Substance name	Chemical Symbol	Precautions required (for example, use protective gloves, etc.)	Action required after a spill, leak or exposure

SECTION 4: RETURN INFORMATION

Reason for return and symptoms of malfunction: _____

If you have a warranty claim: • who did you buy the equipment from? _____

• give the supplier's invoice number _____

SECTION 5: DECLARATION

Print your name: _____ Print your job title: _____

Print your organisation: _____

Print your address: _____

Telephone number: _____ Date of equipment delivery: _____

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

Signed: _____ Date: _____

Note: Please print out this form, sign it and return the signed form as hard copy.

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