

# Instruction Manual

## ES65 / ES100 / ES200 / ES300 and ES630 Single Stage Rotary Vane Pumps

Description	Item Number
ES65 - ASIA 200 V (50/60 Hz) and 380 V (60 Hz) IE3	A352-47-934
ES65 - EU/USA/CHINA 380-400 V (50 Hz) and 230/460 V (60 Hz) IE3	A352-47-940
ES100 - ASIA 200 V (50/60 Hz) and 380 V (60 Hz) IE3	A352-52-934
ES100 - EU/USA/CHINA 380-400 V (50 Hz) and 230/460 V (60 Hz) IE3	A352-52-940
ES200 - ASIA 200 V (50/60 Hz) and 380 V (60 Hz) IE3	A352-57-934
ES200 - EU/USA/CHINA 380-400 V (50 Hz) and 230/460 V (60 Hz) IE3	A352-57-940
ES300 - ASIA 200 V (50/60 Hz) and 380 V (60 Hz) IE3	A352-62-934
ES300 - EU/USA/CHINA 380-400 V (50 Hz) and 230/460 V (60 Hz) IE3	A352-62-940
ES630 - ASIA 200 V (50/60 Hz) and 380 V (60 Hz) IE3	A352-67-934
ES630 - EU/USA/CHINA 380-400 V (50 Hz) and 230/460 V (60 Hz) IE3	A352-67-940

Original Instructions





# Declaration of Conformity

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

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

ES Single Stage Rotary Vane Pumps:

ES65 - ASIA 200 V (50/60 Hz) & 380 V (60 Hz) IE3	A352-47-934
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ES630 - ASIA 200 V (50/60 Hz) & 380 V (60 Hz) IE3	A352-67-934
ES630 - EU/USA/CHINA 380-400 V (50 Hz) & 230/460 V (60 Hz) IE3	A352-67-940

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

EN1012-2:1996+A1:2009	Compressors and Vacuum Pumps. Safety Requirements. Vacuum Pumps
EN60034-1:2010	Rotating electrical machines. Rating and performance
EN50581:2012	Technical Documentation for the Assessment of Electrical and Electronic Products with respect to the Restriction of Hazardous Substances

and fulfils all the relevant provisions of

2006/42/EC	Machinery Directive
2014/35/EU	Low Voltage Directive
2011/65/EU	Restriction of Certain Hazardous Substances (RoHS) Directive

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

Mr Peter Meares  
Senior Technical Support Manager, General Vacuum

19.03.2015, Burgess Hill

Date and Place

*This product has been manufactured under a quality management system certified to ISO 9001:2008*

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## Associated publications

### Publication title

### Publication number

Vacuum Pump and Vacuum Systems Safety Manual  
Ultragrade 15, 19 and 20 oils  
IT20K, IT100, IT300 and IT800 inlet traps and filters

P400-40-100  
P110-10-010  
A441-01-880

# 1 Introduction

## 1.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for the Edwards ES65, ES100, ES200, ES300 and ES630 Single Stage Rotary Vane Pumps. The pumps must be used as specified in this manual. Read this manual before installing and operating the pumps.

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



### **WARNING**

Warnings are given where failure to observe the instruction could result in injury or death to people.

---

### **CAUTION**

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

---

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

The following warning labels are on the pump:



Warning - refer to accompanying documentation.

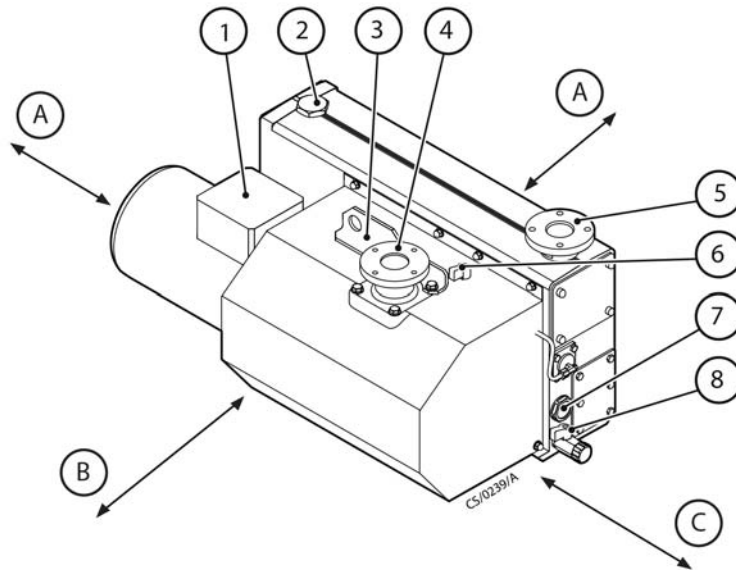


Warning - risk of electric shock.



Warning - hot surfaces.

Figure 1 - ES65 and ES100 pumps

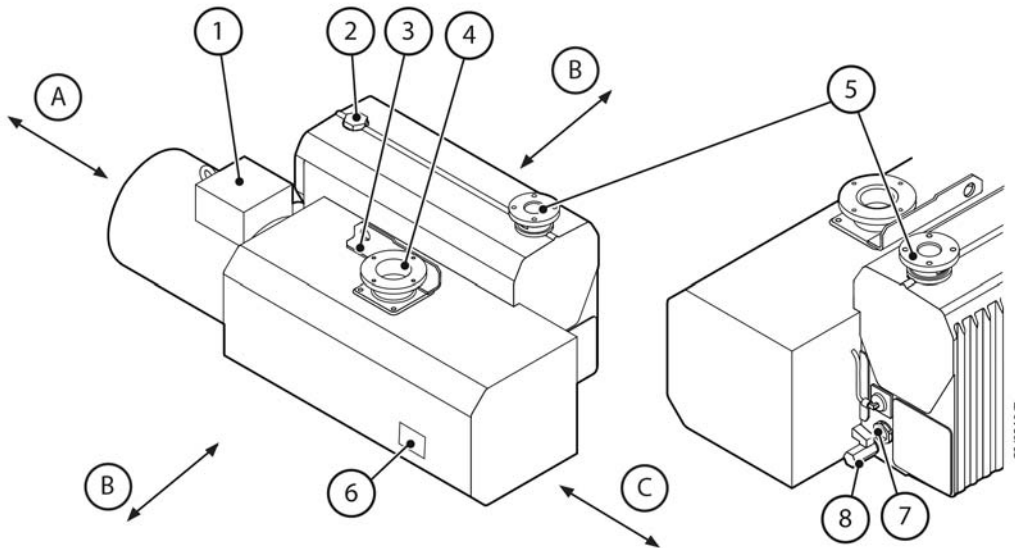


Space needed:

- A. 200 mm (Cooling)
- B. 400 mm (Maintenance access)
- C. 500 mm (Maintenance access and cooling)

- |  |                          |
|--|--------------------------|
| 1. Motor terminal box                  | 5. Exhaust               |
| 2. Oil filler plug                     | 6. Gas ballast control   |
| 3. Lifting bracket                     | 7. Oil level sight glass |
| 4. Inlet and integral non-return valve | 8. Oil drain tap         |

Figure 2 - ES200 and ES300 pumps



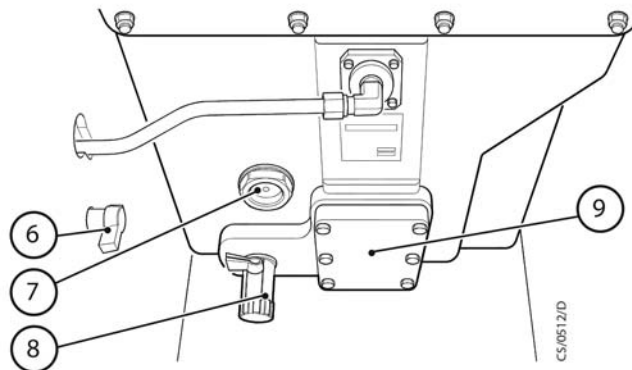
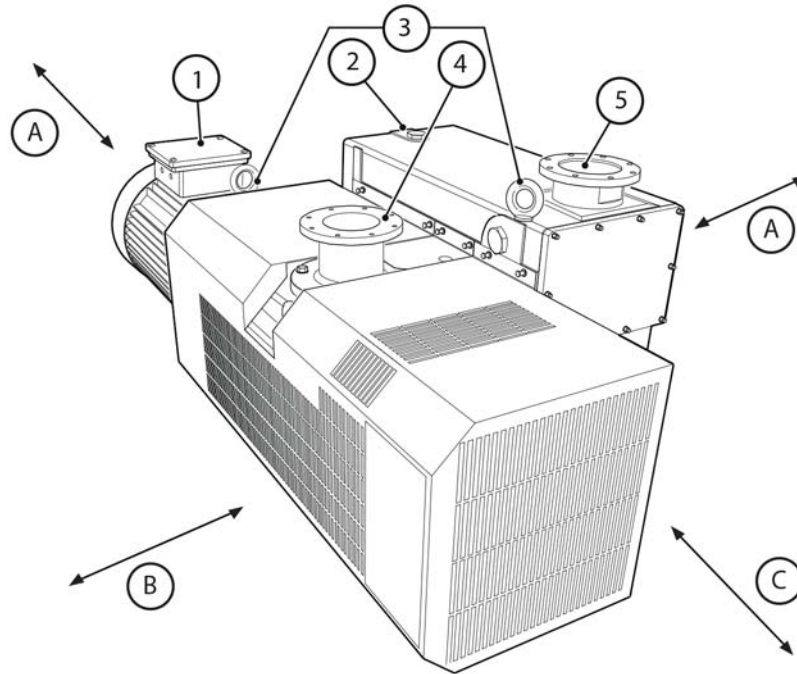
Space needed:

- A. 200 mm (Cooling)
- B. 400 mm (Maintenance access)
- C. 500 mm (Maintenance access and cooling)

- |  |                          |
|--|--------------------------|
| 1. Motor terminal box                  | 5. Exhaust               |
| 2. Oil filler plug                     | 6. Gas ballast control   |
| 3. Lifting bracket                     | 7. Oil level sight glass |
| 4. Inlet and integral non-return valve | 8. Oil drain tap         |



Figure 3 - ES630 pump



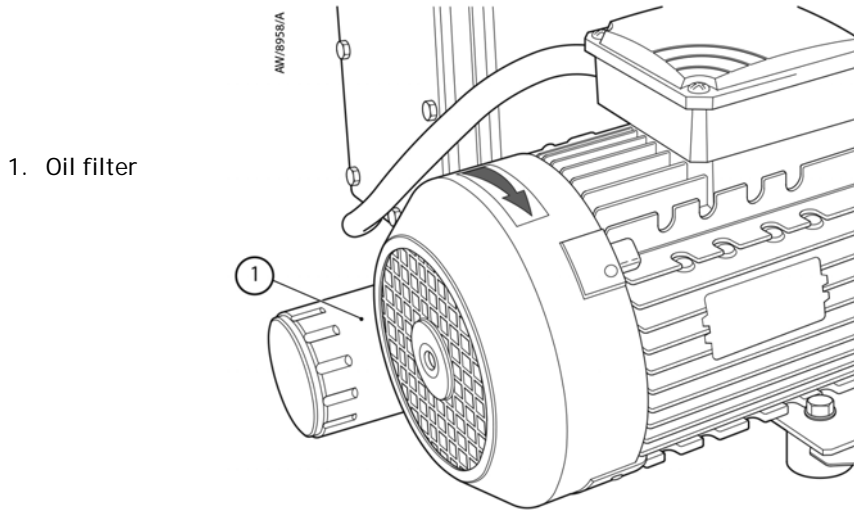
Space needed:

- A. 200 mm (Cooling)
- B. 400 mm (Maintenance access)
- C. 500 mm (Maintenance access and cooling)

- 1. Motor terminal box
- 2. Oil filler plug
- 3. Lifting bracket
- 4. Inlet and integral non-return valve
- 5. Exhaust

- 6. Gas ballast control
- 7. Oil level sight glass
- 8. Oil drain tap
- 9. Accessory plate

Figure 4 - Oil filter



## 1.2 Description

The ES range of pumps are rotary vane, oil-sealed vacuum pumps designed for reliable, long-term operation in both laboratory and industrial environments.

The pump operating range extends from atmospheric pressure to the maximum continuous vacuum rating of the pump.

### **WARNING**



These vacuum pumps are to be used for pumping non-aggressive gases containing no more than 25% oxygen. The gases must not be toxic or explosive. If the pump is to be used in an oxygen-rich environment, it must be degreased in accordance with a specific procedure and must operate with hydrocarbon-free oil.

### **WARNING**



The surface temperature of some parts of the pump can exceed 70 °C under the covers.

## 1.3 Gas ballast

To pump high-vapour loads, gas ballast is delivered into the pump to prevent condensation of the vapour carried by the pumped gases. This system reduces oil contamination and pump corrosion caused by condensed vapour from the pumped gases.

Air or an inert gas can be introduced into the low-vacuum stage of the pump through the gas ballast inlet. A filter is fitted in the gas ballast system to prevent the entry of dust into the pump.

For manual control, use the gas ballast control (Figures 1, 2, and 3, item 6). If this inlet is open to the atmosphere, then:

- With the gas ballast control open, when the pump is switched off, the pressure inside the pump will rise to atmospheric pressure.
- With the gas ballast control closed, when the pump is switched off, vacuum will slowly rise inside the pump.

## 2 Technical data

### 2.1 Operating and storage conditions

Ambient temperature range (operation)	12 °C to 40 °C
Normal surface temperature of the pump	Can exceed 70 °C under covers
Maximum humidity (operation)	90%
Ambient temperature range (storage)	-30 °C to 70 °C

### 2.2 Performance

		ES65	ES100	ES200	ES300	ES630
Maximum displacement						
50 Hz electrical supply	m <sup>3</sup> h	64.3	96	198	293	635
60 Hz electrical supply	m <sup>3</sup> h	77.2	115	240	354	769
Maximum speed - Pneurop						
50 Hz electrical supply	m <sup>3</sup> h	59	90	190	275	575
60 Hz electrical supply	m <sup>3</sup> h	70	105	225	320	674
At 1mb inlet pressure (50 Hz)	m <sup>3</sup> h	40	52	134	171	308
At 1mb inlet pressure (60 Hz)	m <sup>3</sup> h	48	62	161	205	370
Motor rotational speed		Refer to rating label	Refer to rating label	Refer to rating label	Refer to rating label	Refer to rating label
50 Hz electrical supply	r.min <sup>-1</sup>					
60 Hz electrical supply	r.min <sup>-1</sup>					
Ultimate vacuum						
Without gas ballast (Total pressure)	mbar kPa	0.15 0.015	0.15 0.015	0.08 0.008	0.08 0.008	0.1 0.01
With full gas ballast	mbar kPa	1 0.1	2 0.2	1 0.1	2 0.2	1 0.1
Maximum outlet pressure (At full pump throughput)	bar gauge Pa	0.5 1.5x10 <sup>5</sup>	0.5 1.5x10 <sup>5</sup>	0.5 1.5x10 <sup>5</sup>	0.5 1.5x10 <sup>5</sup>	0.5 1.5x10 <sup>5</sup>
Maximum water vapour pumping rate						
50 Hz electrical supply	kg <sup>h</sup> <sup>-1</sup>	1.3	2.6	2.2	2.3	5.6
60 Hz electrical supply	kg <sup>h</sup> <sup>-1</sup>	1.6	4.3	2.8	3.0	8.1
Maximum gas ballast flow (Purge) regulated supply pressure 0.5 bar (7 PSI)	l/min	55	56	124	126	136

Figure 5 - ES65 dimensions (mm)

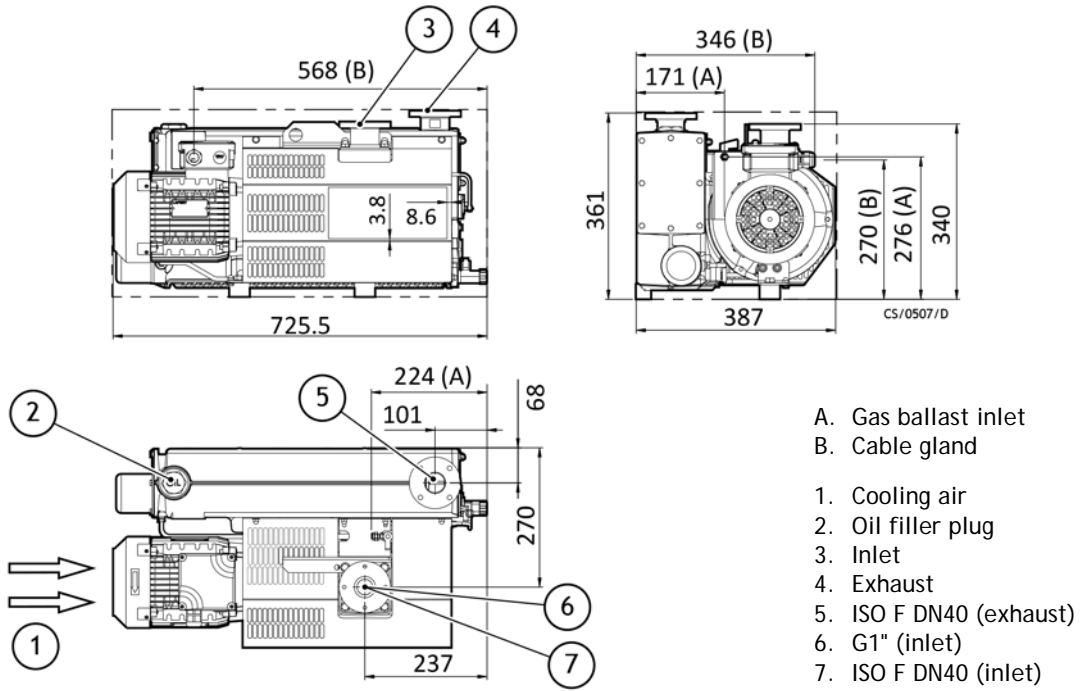


Figure 6 - ES100 dimensions (mm)

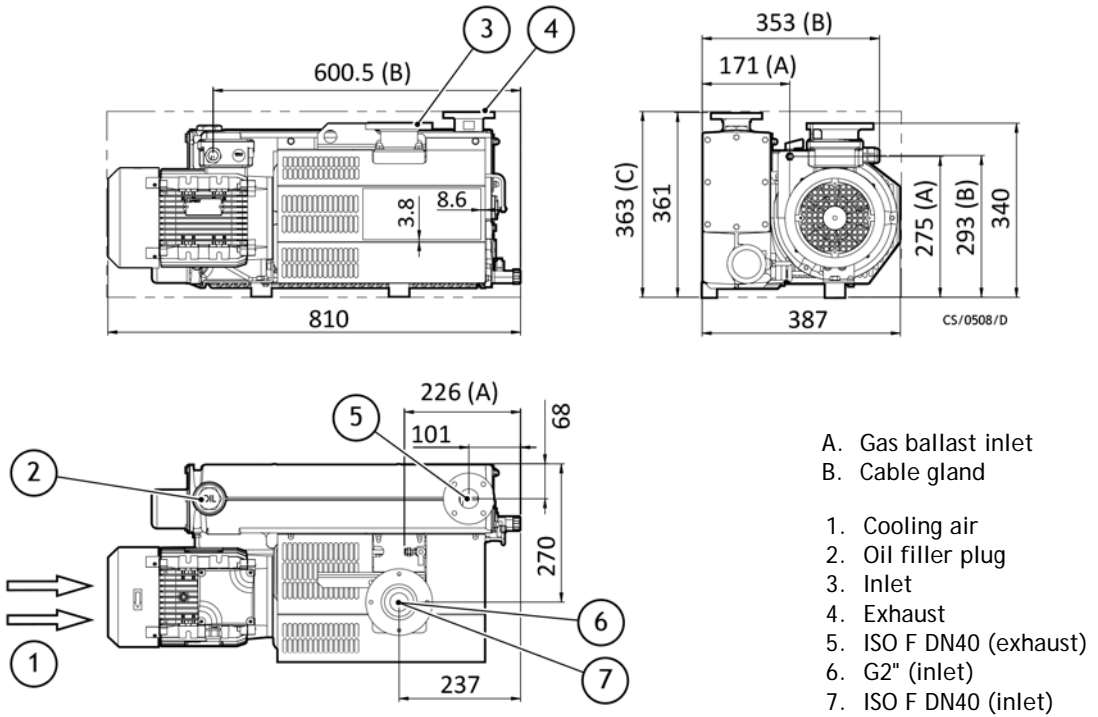
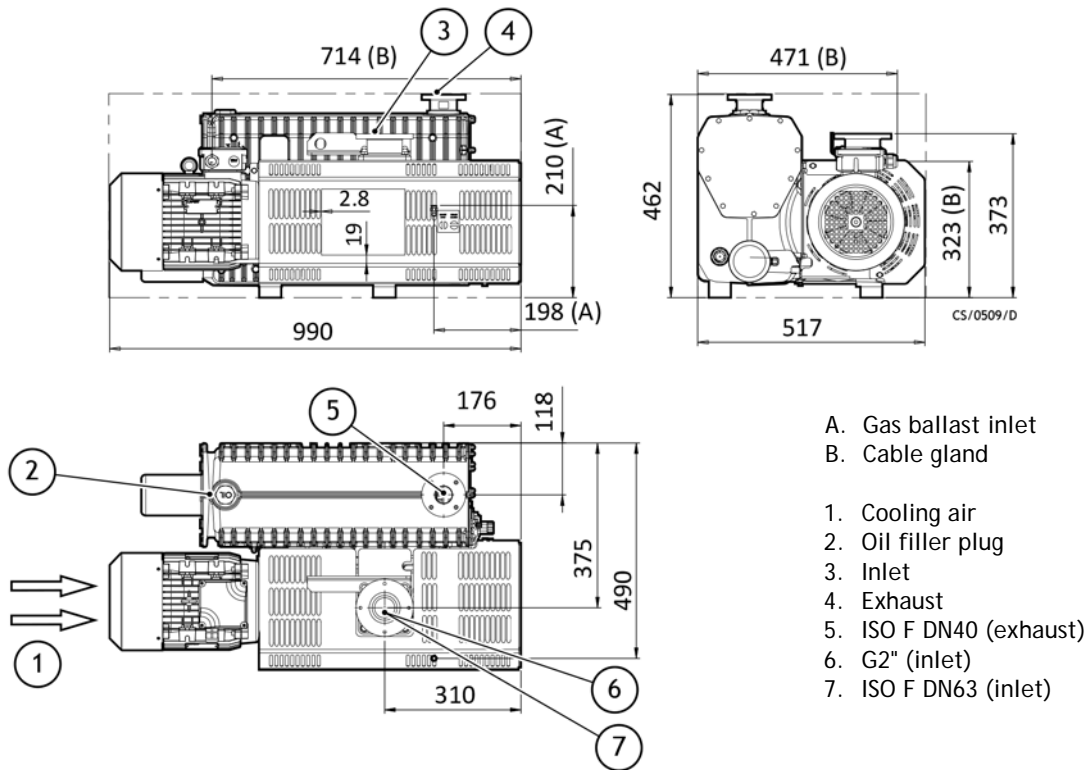
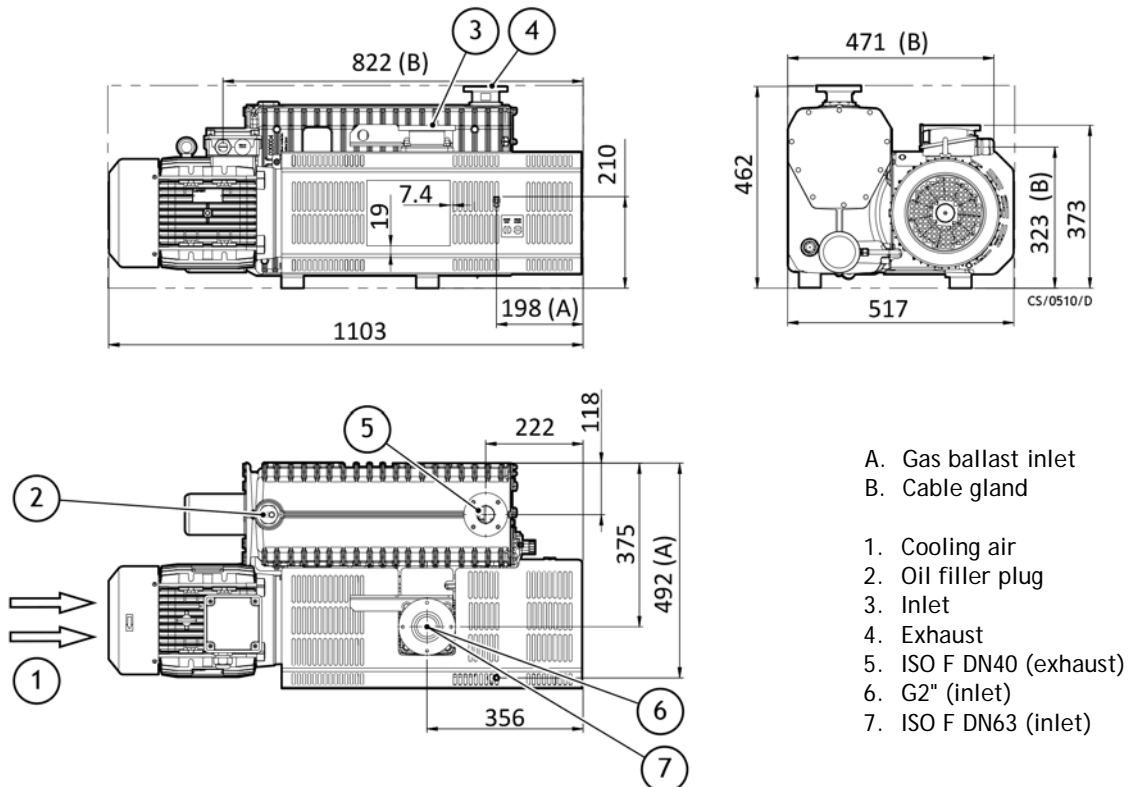


Figure 7 - ES200 dimensions (mm)



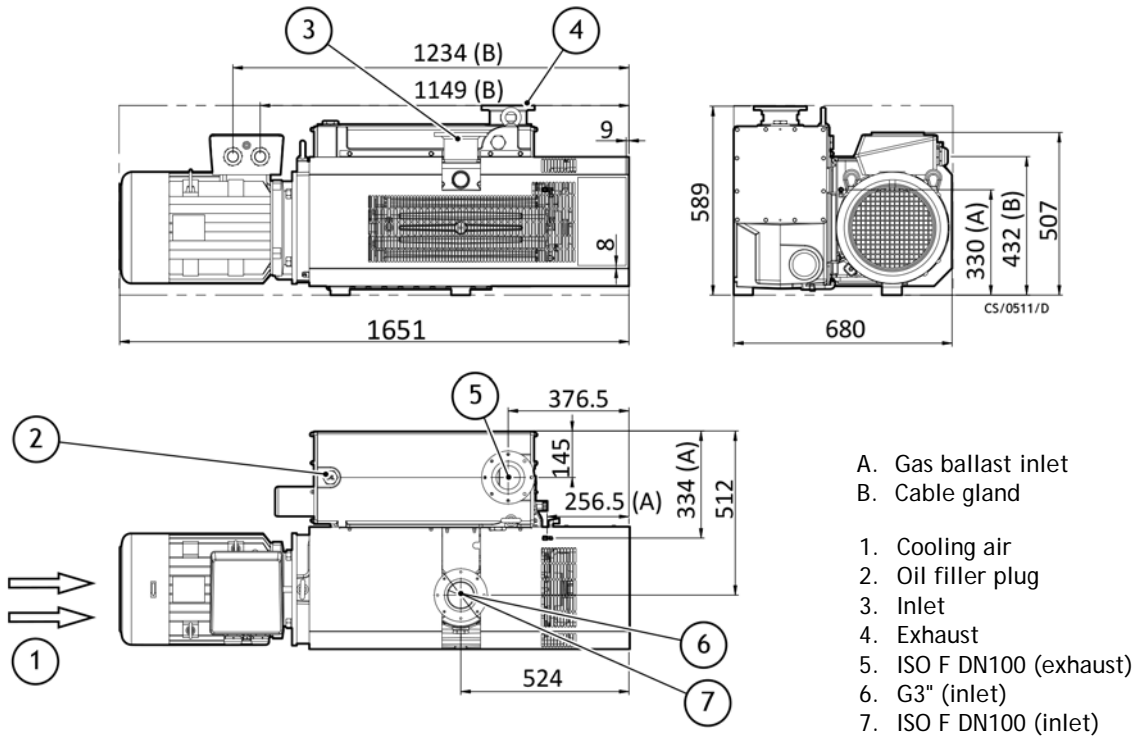
- A. Gas ballast inlet
- B. Cable gland
- 1. Cooling air
- 2. Oil filler plug
- 3. Inlet
- 4. Exhaust
- 5. ISO F DN40 (exhaust)
- 6. G2" (inlet)
- 7. ISO F DN63 (inlet)

Figure 8 - ES300 dimensions (mm)



- A. Gas ballast inlet
- B. Cable gland
- 1. Cooling air
- 2. Oil filler plug
- 3. Inlet
- 4. Exhaust
- 5. ISO F DN40 (exhaust)
- 6. G2" (inlet)
- 7. ISO F DN63 (inlet)

Figure 9 - ES630 dimensions (mm)



- A. Gas ballast inlet
- B. Cable gland
- 1. Cooling air
- 2. Oil filler plug
- 3. Inlet
- 4. Exhaust
- 5. ISO F DN100 (exhaust)
- 6. G3" (inlet)
- 7. ISO F DN100 (inlet)

### 2.3 Mechanical data

	ES65	ES100	ES200	ES300	ES630
Pump inlet port					
Inlet flange	ISO40	ISO63	ISO63	ISO63	ISO100
Inlet thread	1" BSP	2" BSP	2" BSP	2" BSP	3" BSP
Exhaust port					
Exhaust flange	ISO40	ISO40	ISO40	ISO40	ISO100
Exhaust thread (flange removed)	1.5" BSP	1.5" BSP	2" BSP	2" BSP	3" BSP
Noise level at 1 metre (dB(A))					
50 Hz electrical supply	64	65	67	69	75
60 Hz electrical supply	66	67	69	71	77
Maximum mass (kg)	77	94	163	185	516
Vibration Severity <i>(Measured at the inlet port to ISO 2372)</i>	Class 1C for ES pumps (measured at ultimate pressure)				

## 2.4 Electrical data: three-phase motors

For motor wiring information, refer to the wiring diagram supplied in the motor terminal box. Dual-voltage motors can be configured to operate with either the high-range or low-range electrical supply.

Edwards supplies dual-voltage motors pre-set to the highest of the selectable voltages.

For motor current information, refer to the motor rating plate.

	Nominal supply (V)	Frequency (Hz)	Power (kW)
ES65	200	50/60	1.5/1.8
	380	60	1.8
	380-400	50	1.5
	230/460	60	1.8
ES100	200	50/60	2.3/3.0
	380	60	3.0
	380-400	50	2.3
	230/460	60	3.0
ES200	200	50/60	4.5/5.6
	380	60	5.6
	380-400	50	4.5
	230/460	60	5.6
ES300	200	50/60	6.0/7.5
	380	60	7.5
	380-400	50	6.0
	230/460	60	7.5
ES630	200	50/60	12.5/15.0
	380	60	15.0
	380-400	50	12.5
	230/460	60	15.0

## 2.5 Lubrication data

Recommended oil

Edwards Ultragrade 20

*Note:* A Safety Data Sheet is available on request for the recommended oil.

	ES65	ES100	ES200	ES300	ES630
Oil operating level, after draining (litres)	4	4	5	5	14

Refer also to Section 3.5.2 and 3.5.3.

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## 3 Installation

### 3.1 Safety



#### **WARNING**

Edwards recommends that the pumps are not used to pump hazardous substances.



#### **WARNING**

Prevent any part of the human body coming into contact with the vacuum.

Ensure that the pump is suitable for the application. If there is any doubt, refer to the Edwards guidelines in the Vacuum Pump and Vacuum Systems Safety manual. (See Associated Publications at the end of the contents list).

Obey the safety instructions listed below when installing the pump, especially when connecting the pump into an existing system. Details of specific safety precautions are given at the appropriate point in the instructions.

- The installation of the pump must be performed by a suitably trained and supervised technician.
- Wear appropriate safety clothing when coming into contact with contaminated components.
- Vent and purge the vacuum system before starting installation work.
- Ensure that the installation technician is familiar with the safety procedures which relate to the pump oil and the products handled by the pumping system. Take suitable precautions to avoid the inhalation of oil mist and excessive skin contact with pump oil as prolonged exposure can be harmful.
- It is recommended to protect the pump motor with a magneto-thermal circuit breaker. Select the rating of the circuit breaker with respect to the current indicated on the motor.
- Disconnect other components in the pumping system from the electrical supply so that they cannot be operated accidentally.

### 3.2 System design considerations

Consider the following points when designing the pumping system.

- Use a suitable valve to isolate the pump from the vacuum system to allow the pump to warm up before pumping condensable vapours or to maintain vacuum when the pump is switched off.
- Avoid high levels of heat input to the pump from the process gases, otherwise the pump may overheat and seize.
- If the pump is used in a high ambient temperature environment and has a high gas throughput, the temperature of the pump body may exceed 70 °C. Fit suitable guards to prevent contact with hot surfaces.
- Make sure that the exhaust pipeline cannot become blocked. If the system has an exhaust isolation valve, make sure that the pump cannot operate with the valve closed.

### 3.3 Unpack and inspect

Remove all packing materials, remove the pump from its packing box, remove the protective covers from the inlet and outlet ports and inspect the pump. 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 the packing materials for inspection. Do not use the pump if it is damaged.

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

### 3.4 Locate the pump



#### WARNING

Use suitable lifting equipment to move the pump. The mass of the pumps is between 75 kg and 506 kg.

Attach suitable mechanical lifting equipment to the lifting eyes on the pump.

The pump will only function correctly if installed on a level surface. Provide a firm, level platform for the pump. Locate the pump so that the oil level sight glass is visible and the oil filler plug, oil drain tap, disposable oil filter and gas ballast control are accessible. Ensure there is sufficient clearance for maintenance access. Refer to [Figures 1, 2 and 3](#).

If the pump will be located inside an enclosure, make sure that there is adequate ventilation around the pump. Refer to [Figures 1, 2 and 3](#) for the recommended space.

Ensure that the location of the pump and the intended routing of connecting parts, i.e. process line, exhaust line and power cables, will not present any tripping or other physical hazards.

The pumps have four rubber mounts with tapped holes in the base. It is recommended that the tapped holes are used to mount the pump on a base frame.

### 3.5 Fill the pump with oil

#### 3.5.1 Recommended pump oil

It is recommended to use the Edwards oil specified in [Section 2.5](#) of this manual. The ultimate vacuum of the pump with other oils may be higher than the ultimate vacuum with the recommended oil. However, note that other oils may contain polymers which may be degraded during use so that they become thinner. Other oils, therefore, must be changed more frequently than Edwards oils. If necessary, adjust the maintenance schedule according to experience.

#### 3.5.2 ES65, ES100 and ES630 oil filling procedure

Fill the pump with oil as described below.

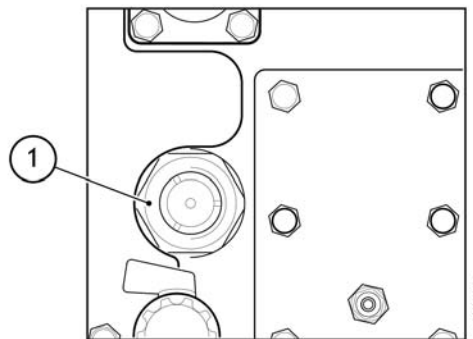
1. Remove the oil filler plug ([Figures 1, 2, and 3](#), item 2).
2. Pour oil into the pump until the oil level reaches the middle of the oil level sight glass ([Figures 1, 2, and 3](#), item 7) situated at the bottom of the pump.
3. After the pump has been running for a few minutes, recheck the oil level. If the oil level is now below the middle of the oil level sight glass ([Figure 10](#), item 1), switch the pump off and pour more oil into the pump as required.
4. Refit the oil filler plug. Tighten the plug firmly but do not over-tighten.

### 3.5.3 ES200 and ES300 oil filling procedure

Fill the pump with oil as described below.

1. Remove the oil filler plug (Figure 2, item 2).
2. Pour oil into the pump until the oil level reaches the middle of the oil level sight glass (3) situated at the bottom of the pump.
3. After the pump has been running for a few minutes, recheck the oil level. If the oil level is now below the middle of the oil level sight glass (Figure 10, item 1), switch the pump off and pour more oil into the pump as required.
4. Refit the oil filler plug. Tighten the plug firmly but do not over-tighten.

Figure 10 - Oil sight glass



1. Oil level sight glass

## 3.6 Electrical installation

### 3.6.1 Connect the pump to the electrical supply



#### **WARNING**

Ensure that the electrical installation of the pump motor conforms with local and national safety requirements. It must be connected to a suitably fused and protected electrical supply and a suitable earth point.

#### **CAUTION**

If the pump motor can be used with more than one voltage range, ensure that the motor is configured for the available electrical supply voltage. If not, the motor may be damaged.

Edwards recommends connecting the electrical supply to the motor through a starter or circuit breaker having thermal over-current protection that can be adjusted to suit the full load current ratings shown on the motor rating plate. The fuse ratings must be calculated by a qualified electrician. The supplier of the thermal over-current protection device may specify fuse ratings to ensure correct operation of the over-current protection device. Ensure that the fuse is suitable for the starting currents given on the motor rating plate.

1. Remove the cover from the motor terminal box.
2. Check the electrical supply voltage and frequency. If necessary, configure the motor to operate with the electrical supply. For motor wiring information, refer to the wiring diagram supplied in the motor terminal box.
3. Remove the plugs from the cable entry hole that will be used for the electrical supply cable.

4. The cable gland is supplied with the motor. After the supply cable is fitted, the cable gland must be a protective seal to the standard of IP55 in IEC 529 or better.
5. Pass the motor electrical supply cable through the cable gland.
6. Connect the cable to the terminals as shown in the wiring diagram supplied in the motor terminal box.

### 3.6.2 Check the direction of rotation

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#### *CAUTION*

Ensure that the pump motor rotates in the correct direction. If it does not, the pump and the vacuum system can become pressurised.

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1. Watch the motor cooling fan through the motor fan cover.
2. Switch on the electrical supply to the motor for a few seconds and switch off.
3. Check that the motor cooling fan rotates in the direction shown by the arrow on the motor mounting fan cowl. If the direction of rotation is incorrect:
  - Isolate the pump from the electrical supply.
  - Remove the terminal box cover and swap wires L1 and L3. Refer to the wiring diagram supplied in the motor terminal box.
  - Refit the cover to the terminal box.
  - Connect the pump to the electrical supply.
  - Check the direction of rotation again.

## 3.7 Connect the pump inlet to the vacuum system

Connect the vacuum system to the inlet port (Figures 1, 2, and 3, item 4). Use standard fittings when connecting the pump.

Take note of the following information when connecting the pump to the vacuum system. Refer to Section 7.4 for details of the accessories mentioned below.

- For optimum pumping speeds, ensure that the pipeline connected to the inlet port is as short as possible and has an internal diameter not less than the inlet port diameter.
- Support the vacuum pipelines to prevent loading of the coupling joints.
- If necessary, incorporate flexible bellows in the system pipelines to reduce the transmission of vibration and to prevent loading of coupling joints. If using flexible bellows, ensure that the bellows have a maximum pressure rating that is greater than the highest pressure that can be generated in the system. Flexible bellows must be used if the pump is mounted on vibration isolators. Edwards recommends the use of Edwards flexible bellows.
- Use a suitable inlet catchpot if pumping condensable vapours or for very dusty applications.
- Ensure that sealing surfaces are clean and scratch free.
- Customer should leak check assembly before use.
- Although the pump has a spring-activated inlet valve, if the process needs to be protected, a separate inlet valve should be fitted.

### 3.8 Connect the pump outlet to the vacuum system



#### **WARNING**

Connect the pump outlet to a suitable exhaust line to prevent the discharge of dangerous gases and vapours to the surrounding atmosphere. Use a catchpot to prevent the drainage of contaminated condensate back into the pump.

Connect the pump outlet port to the system exhaust line or to the system exhaust treatment plant using standard fittings to connect to the relevant adaptor.

Take note of the following information before connecting to the pump outlet. Refer to [Section 7.4](#) for details of the accessories mentioned below.

- The exhaust system must be configured so that the maximum pressure at the pump outlet does not exceed 0.5 bar gauge (1.5 bar absolute,  $1.5 \times 10^5$  Pa) at full pump throughput.

### 3.9 Gas ballast inlet connection

The gas ballast can be supplied by either opening the gas ballast valve to atmosphere or connecting to an inert gas supply.

The gas ballast is operated by the gas ballast control valve ([Figures 1, 2, and 3](#), item 6). Adjust the gas ballast control to regulate the flow rate of the gas ballast supply.

For more information about the use of gas ballast, refer to [Sections 1.3, 2.2 and 4.1](#).

### 3.10 Leak test the system

Leak test the system after installing the pump. Seal any leaks found to prevent leakage of substances out of the system and leakage of air into the system.

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## 4 Operation

### 4.1 Gas ballast control

Use the gas ballast control (Figures 1, 2, and 3, item 6) to change the amount of air (or inert gas) introduced into the pump. Use of the gas ballast will prevent the condensation of vapours in the pump. The condensed vapours would contaminate the oil.

Turn the gas ballast control clockwise to close. Use the gas ballast control fully closed:

- to achieve ultimate vacuum
- to pump dry gases.

Turn the gas ballast control anticlockwise (90 degree movement) to open. Use the gas ballast control fully open:

- to pump high concentrations of condensable vapour
- to decontaminate the oil.

When operating the pump with the gas ballast control open, there is an increased rate of oil loss from the pump.

### 4.2 Start up procedure



#### **WARNING**

Do not block the pump outlet or allow the outlet pressure to rise above 1.5 bar absolute. If the outlet is blocked or the pressure rises, the oil box may fracture and may cause injury to people nearby.

If the oil is contaminated, or if the pump temperature is below 12 °C, or if the supply voltage is more than 10% below the lowest voltage specified for the motor, the pump may operate at reduced speed for a few minutes.

1. Switch on the electrical supply to the pump.
2. Check that the oil level in the sight glass drops slightly (3 to 5 mm) after start up. This shows that the pump has primed with oil.
3. If the pump fails to prime, operate the pump with the inlet open to atmosphere for approximately 30 seconds, then isolate the inlet and check that the oil level drops 3-5 mm.
4. Edwards recommend strongly to limit starting of the pump to no more than 5 or 6 per hour. If the process requires it, utilisation of an inlet valve and to let the pump run continuously is recommended.

### 4.3 To achieve ultimate vacuum

If the pump does not achieve the performance specified in Section 2, make sure that this is not due to the system design before contacting the supplier or Edwards for advice. In particular, the vapour pressure of all materials used in the vacuum system, including pump oil, must be much lower than the specified ultimate vacuum of the pump. Refer to Section 5.12.2 for a list of possible causes for failure to achieve the specified performance. The most common causes are:

- The pressure measurement technique or gauge head is unsuitable or the gauge head is faulty.
- An oil other than the recommended oil was used and the vapour pressure of the oil is higher than the specified ultimate vacuum of the pump.

Use the following procedure to achieve ultimate vacuum:

1. Isolate the pump from the vacuum system.
2. Turn the gas ballast control fully anticlockwise (fully open) and operate the pump for at least 1 hour (or overnight) to thoroughly purge the oil of contaminants.
3. Close the gas ballast control.
4. Open the vacuum system isolation valve and pump down to ultimate vacuum.

#### 4.4 To pump condensable vapours

Use gas ballast when there is a high proportion of condensable vapours in the process gases.

1. Close the vacuum system isolation valve.
2. Turn the gas ballast control fully anticlockwise (fully open) and operate the pump for 30 minutes to warm the oil. This will help to prevent vapour condensation in the pump.
3. Open the vacuum system isolation valve and continue to operate the pump with the gas ballast control open.

After pumping condensable vapours, the oil can be decontaminated (if necessary) using the procedure in [Section 4.5](#).

#### 4.5 To decontaminate the oil

Look at the condition of the oil in the sight glass ([Figure 10](#), item 1). The oil in the pump should be clear. If the oil is cloudy or discoloured:

1. Close the vacuum system isolation valve.
2. Turn the gas ballast control fully anticlockwise.
3. Operate the pump until the oil is clear.
4. Change the oil if it remains mid-brown in colour.

#### 4.6 Unattended operation

The pump is designed for unattended operation under the normal operating conditions specified in [Section 2](#). However, Edwards recommends checking the pump at a regular interval of not more than 14 days. Check the pump more frequently if pumping high volumes of gas or if operating the pump with the gas ballast control open.

#### 4.7 Shut down

Edwards recommends decontaminating the oil before shutting down the pump. Decontamination of the oil will prevent damage to the pump by the contaminants in the oil.

1. Refer to [Section 4.5](#) and decontaminate the oil, as required.
2. Close the vacuum system isolation valve (if not already closed).
3. Turn the gas ballast control fully clockwise to close.
4. Switch off the electrical supply to the pump.

#### 4.8 Long-term shut down

If the pump will be out of service for a long period of time (more than 3 months) or will not be put into service until a later date, do not drain the oil.

Blank openings with protective caps and store the pump in a dry place. The pump must not be stored in a place that is damp and/or subject to large temperature variations.



## 5 Maintenance

### 5.1 Safety



#### **WARNING**

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

- A suitably trained and supervised technician must maintain the pump.
- Ensure that the maintenance technician is familiar with the safety procedures that relate to the pump oil and 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.
- Do not reuse O-rings or seals.
- Allow the pump to cool for at least 3 hours before starting maintenance work.
- Isolate the pump and other components from the electrical supply so that they cannot be operated accidentally.
- After maintenance has been completed, recheck the direction of pump rotation if the electrical supply has been disconnected.
- Check all required components are available and are of the correct type before starting work.
- Leak test the system after installation is complete and seal any leaks found to prevent leakage of hazardous substances out of the system and leakage of air into the system.
- Protect sealing faces from damage.
- The pump and the pump oil will be contaminated with the process chemicals that have been pumped during operation. Ensure that the pump is decontaminated before maintenance and take adequate precautions to protect people from the effects of dangerous substances if contamination has occurred.
- Ensure all guarding is in place and secure before restarting pump.
- The pump must be drained before shipping.

### 5.2 Maintenance plan

The plan shown in [Table 1](#) details the routine maintenance operations necessary to maintain the pump in normal use. Instructions for each operation are given in the section shown.

More frequent maintenance may be required if the pump is used with gas ballast or to pump corrosive or abrasive gases and vapours. Adjust the maintenance plan as necessary.

When maintaining the pump, use Edwards spares and maintenance kits. The kits contain all components necessary to complete maintenance operations successfully. The item numbers of the spares and kits are given in [Section 7](#).

Examine the condition of any external accessories, filters or traps (if fitted). Refer to the instructions supplied with the accessories for maintenance procedures.

Table 1 - Maintenance plan

Task	Harsh duty	Light duty
	<ul style="list-style-type: none"> <li>• 20% time at ultimate pressure</li> <li>• 80% pumping down (roughing)</li> <li>• Continuous at inlet pressures above 100 mbar</li> </ul>	<ul style="list-style-type: none"> <li>• 80% time at ultimate pressure</li> <li>• 20% pumping down</li> <li>• Continuously running below 100 mbar</li> </ul>
Check the oil level	Weekly	Weekly
Clean the motor fan cover	6 months	Yearly
Replace oil	6 months	Yearly
Test the motor condition	Yearly	Yearly
Minor service	6 months	Yearly
Major service	Yearly	Every 2 years

Table 2 - ES65 minor service kit (A35245990)

Edwards Part Number	Description	Quantity
A13027010	Gas ballast filter	1
A30343010	Oil separating cartridge	1
A30343011	Oil separating cartridge with O-ring	1
A50074001	Oil Filter	1
C27159015	Gas ballast valve gasket	1
C27159016	Oil separator plate gasket	1
E08741015	Inlet valve shutter	1
H02124224	Inlet valve O-ring	1
H02124225	Gas ballast O-ring	1
H02124229	Oil plug O-ring	1
H02124232	Gas ballast O-ring	2
H02124234	Cartridge O-ring	1

Table 3 - ES65 major service kit (A35245995)

Edwards Part Number	Description	Quantity
A13204001	Automatic drain float	1
A20402170	Rotary blade ES65	3
A26410013	Front intermediate ring	1
A26410014	End intermediate ring	1
A26410015	Self lubricating ring	2
A26501090	Rubber foot	2
A26501091	Rubber foot	2
B27158050	Automatic drain seal	1
E10041010	Radial shaft seal	2
H02124223	Shaft end O-ring	1
H02124225	Oil circulating pipe O-ring	4
H02124230	Inlet valve O-ring	1
H02124232	Automatic drain O-ring	1
H02124233	Plate O-ring	2
H02124235	Shaft front O-ring	1

Table 4 - ES100 minor service kit (A35245990)

Edwards Part Number	Description	Quantity
A13027010	Gas ballast filter	1
A30343010	Oil separating cartridge	1
A30343011	Oil separating cartridge with O-ring	1
A50074001	Oil Filter	1
C27159015	Gas ballast valve gasket	1
C27159016	Oil separator plate gasket	1
E08741015	Inlet valve shutter	1
H02124224	Inlet valve O-ring	1
H02124225	Gas ballast O-ring	1
H02124229	Oil plug O-ring	1
H02124232	Gas ballast O-ring	2
H02124234	Cartridge O-ring	1

Table 5 - ES100 major service kit (A35250995)

Edwards Part Number	Description	Quantity
A13204001	Automatic drain float	1
A20402171	Rotary blade ES100	3
A26410013	Front intermediate ring	1
A26410014	End intermediate ring	1
A26410015	Self lubricating ring	2
A26501090	Rubber foot	2
A26501091	Rubber foot	2
B27158050	Automatic drain seal	1
E10041010	Radial shaft seal	2
H02124223	Shaft end O-ring	1
H02124225	Oil circulating pipe O-ring	4
H02124230	Inlet valve O-ring	1
H02124232	Automatic drain O-ring	1
H02124233	Plate O-ring	2
H02124235	Shaft front O-ring	1

Table 6 - ES200 minor service kit (A35255990)

Edwards Part Number	Description	Quantity
A13027011	Gas ballast filter	1
A30343010	Oil separating cartridge	1
A30343011	Oil separating cartridge with O-ring	2
A50074002	Oil Filter	1
C27159017	Gas ballast valve gasket	1
E08741016	Inlet valve shutter	1
H02124220	Inlet valve O-ring	1
H02124226	Oil separator plate O-ring	1
H02124228	Gas ballast O-ring	1
H02124229	Oil plug O-ring	1
H02124234	Cartridge O-ring	1

Table 7 - ES200 major service kit (A35255995)

Edwards Part Number	Description	Quantity
A13204001	Automatic drain float	1
A20402172	Rotary blade ES200	3
A20405040	Needle bearing	2
A20405041	Needle bearing	2
A26410011	Front intermediate ring	1
A26410012	End intermediate ring	1
A26501092	Rubber foot	2
A26501093	Rubber foot	2
B27158050	Automatic drain seal	1
E10041010	Radial shaft seal	2
H02124221	Lantern O-ring	1
H02124222	Shaft end O-ring	1
H02124225	Oil circulating pipe O-ring	2
H02124227	Oil circulating pipe O-ring	1
H02124231	Shaft front O-ring	1
H02124232	Automatic drain O-ring	1
H02124234	Inlet valve O-ring	1

**Table 8 - ES300 minor service kit (A35260990)**

Edwards Part Number	Description	Quantity
A13027011	Gas ballast filter	1
A30343010	Oil separating cartridge	1
A30343011	Oil separating cartridge with O-ring	3
A50074002	Oil Filter	1
C27159017	Gas ballast valve gasket	1
E08741016	Inlet valve shutter	1
H02124220	Inlet valve O-ring	1
H02124226	Oil separator plate O-ring	1
H02124228	Gas ballast O-ring	1
H02124229	Oil plug O-ring	1
H02124234	Cartridge O-ring	1

**Table 9 - ES300 major service kit (A35260995)**

Edwards Part Number	Description	Quantity
A13204001	Automatic drain float	1
A20402173	Rotary blade ES300	3
A20405040	Needle bearing	2
A20405041	Needle bearing	2
A26410011	Front intermediate ring	1
A26410012	End intermediate ring	1
A26501092	Rubber foot	2
A26501093	Rubber foot	2
B27158050	Automatic drain seal	1
E10041010	Radial shaft seal	2
H02124221	Lantern O-ring	1
H02124222	Shaft end O-ring	1
H02124225	Oil circulating pipe O-ring	2
H02124227	Oil circulating pipe O-ring	1
H02124231	Shaft front O-ring	1
H02124232	Automatic drain O-ring	1
H02124234	Inlet valve O-ring	1

Table 10 - ES630 minor service kit (A35265990)

Edwards Part Number	Description	Quantity
A13027012	Gas ballast filter	1
A30343010	Oil separating cartridge	1
A30343011	Oil separating cartridge with O-ring	6
A50074002	Oil Filter	1
C27159018	Gas ballast valve gasket	1
E08741017	Inlet valve shutter	1
H02124229	Oil plug O-ring	1
H02124234	Cartridge O-ring	1
H02124236	Oil separator plate O-ring	1
H02124236	Gas ballast O-ring	2
H02124237	Inlet valve O-ring	1

Table 11 - ES630 major service kit (A35265995)

Edwards Part Number	Description	Quantity
A13204001	Automatic drain float	1
A20402174	Rotary blade ES630	3
A20405042	Needle bearing	2
A20405043	Bearing ring	2
A26410016	Front intermediate ring	1
A26410017	End intermediate ring	1
A26501094	Rubber foot	2
A26501095	Rubber foot	2
B27158050	Automatic drain seal	1
E10041012	Radial shaft seal	2
H02124232	Automatic drain O-ring	1
H02124238	Plate O-ring	2
H02124239	Intermediate ring O-ring	2

### 5.3 Check the oil level

**Note:** If required, the oil level can be checked while the pump is operating, however switch off the pump and isolate the pump and other components in the pumping system from the electrical supply before pouring oil into the pump.

1. Check that the oil level is in the middle of the sight glass (Figure 10, item 1).
2. If the oil level is below the middle of the sight glass, remove the oil filler plug (Figures 1, 2, and 3, item 2) and pour more oil into the reservoir until the oil reaches the middle of the sight glass. If the oil level goes above the middle of the sight glass, open the oil drain tap (Figures 1, 2, and 3, item 8) and drain the excess oil from the pump.
3. Refit the oil filler plug.
4. If the oil is contaminated, drain and refill the pump with clean oil as described in Section 5.4. Change the oil if the colour is mid-brown.

## 5.4 Replace the oil

1. Operate the pump for approximately ten minutes to warm the oil, then switch off the pump. This lowers the viscosity of the oil and enables it to be drained from the pump more easily.
2. Isolate the pump from the electrical supply and disconnect it from the vacuum system.
3. Remove the oil filler plug (Figures 1, 2, and 3, item 2).
4. Place a suitable container under the oil drain tap (Figures 1, 2, and 3, item 8).
5. Open the drain tap and allow the oil to drain into the container.
6. If the oil drained from the pump is contaminated, pour clean oil into the filler hole and allow it to drain out of the pump. Repeat this step until the oil reservoir in the pump has been thoroughly cleaned.
7. Close the drain tap.
8. Using a suitable container filled with clean oil, pour the oil into the filler hole until the oil level reaches the middle of the sight glass (Figure 10).
9. Allow a few minutes for the oil to drain into the pump. If necessary, add more oil.
10. Refit the filler plug.
11. Replace the oil filter (see maintenance manual).
12. Replace the gas ballast filter (see maintenance manual).
13. Reconnect the pump to the vacuum system.
14. Reconnect the electrical supply to the pump.

## 5.5 Changing the oil filter - (part of minor service)

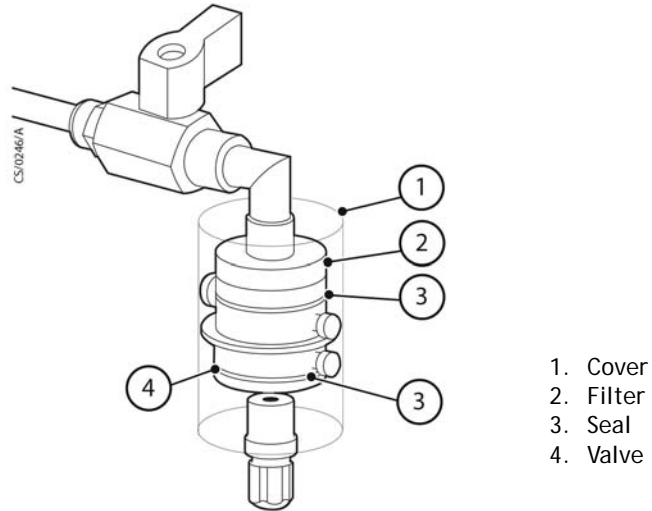
During every draining, change the oil filter cartridge located at the bottom of the oil box and the O-ring located below the filler plug.

## 5.6 Oil separating mist filters (cartridge) - (part of minor service)

The length of time at which the separating cartridge gets contaminated depends on the quantity of impurities taken in. The cartridges are not reusable. Refer to Table 1 for recommended change intervals. Adjust the replacement frequency as required to suit the pumping application.

### 5.7 Replace the gas ballast filter - (part of minor service)

Figure 11 - Gas ballast filter, ES65/ES100/ES630

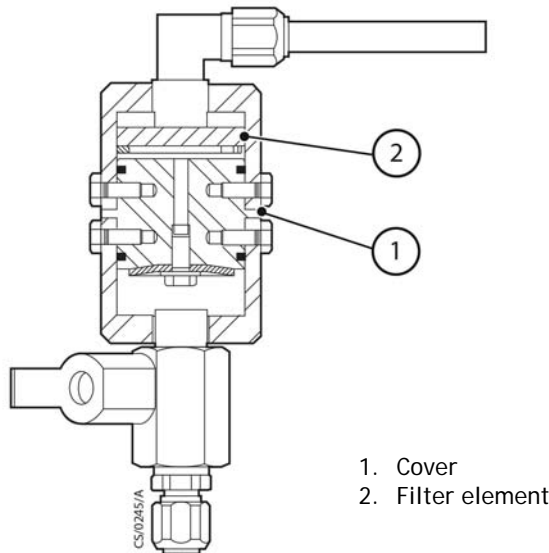


For the ES65 and ES100:

1. Remove the cover (Figure 11, item1) and replace the filter (2), the two seals (3) and the valve (4).
2. Replace the foam filter placed on the polymer tube.

For the ES630, remove the cover (1) and replace the filter element (2).

Figure 12 - Gas ballast filter, ES200/ES300



For the ES200 and ES300:

1. Remove the cover (Figure 12, item1) and replace the filter element (2).
2. Replace the foam filter placed on the polymer tube.



## 5.8 Clean the motor fan cover

Keep the motor fan cover clean. The pump may overheat if the air flow over the motor is restricted.

1. Isolate the pump from the electrical supply.
2. Use a dry cloth and a brush to remove dirt and deposits from the fan cover.
3. Reconnect the electrical supply to the pump.

## 5.9 Clean and overhaul the pump - (part of major service)

Clean and overhaul the pump as described in the instructions supplied with the major service kit (Table 12).

## 5.10 Test the motor condition

Test the earth continuity and the insulation resistance of the pump motor in accordance with local regulations for periodic testing of electrical equipment. Edwards recommends that the earth continuity is less than 0.1 ohm and the insulation resistance is greater than 10 Mohm. If the motor fails these tests, replace the motor.

## 5.11 Fit new blades - (part of major service)

Fit new blades to the pump as described in the instructions supplied with the major service kit (Table 12).

## 5.12 Basic fault finding

A list of fault conditions and their possible causes is provided here to assist in fault finding. If unable to rectify a fault when using this guide, call the nearest Edwards Service Centre for help.

### 5.12.1 The pump has failed to start

- The electrical supply fuse is blown.
- The electrical supply voltage does not match the motor.
- The outlet pipeline or the outlet filter (if fitted) is blocked.
- The oil temperature is below 12 °C.
- The oil is too viscous.
- The oil is contaminated.
- The pump has seized after long storage or lack of oil.
- The pump has been left to stand after contaminants have been pumped and has seized.
- The motor is faulty.

### 5.12.2 The pump fails to achieve its specified performance (failure to reach ultimate vacuum)

- The measuring technique or gauge is unsuitable.
- The pump is filled with the wrong type of oil.
- There is a leak in the vacuum system.
- The gas ballast control is set incorrectly.
- The oil level is low.
- The oil is contaminated.
- Vacuum fittings are dirty or damaged.
- The pump has not warmed up.
- The pump has failed to prime.
- The motor is rotating in the wrong direction.

### 5.12.3 The pump is noisy

- The motor bearings are worn.
- The oil is contaminated with solid particles.
- The motor coupling is loose.
- A blade is worn or deformed.
- The fan is touching another part or the cover is touching a lubrication pipe.

### 5.12.4 The pump is too hot

- The ambient temperature is too high.
- The electrical supply voltage is too high.
- The outlet filter or the outlet pipeline is restricted.
- The oil level is too low.
- The pump is filled with the wrong type of oil.
- The oil is contaminated.
- The process gas is too hot or the throughput is too high.
- The oil cooler needs cleaning (ES200, ES300 and ES600 pumps only).

### 5.12.5 The vacuum is not fully maintained after the pump is switched off

- The gas ballast control is open.
- O-ring is damaged or missing.
- Shaft seals are damaged.
- The exhaust valve is damaged.

### 5.12.6 The pumping speed is poor

- The connecting pipelines are too small in diameter.
- The connecting pipelines are too long.
- The inlet filter is blocked.
- The pump is not suitable for the application.
- The inlet intake screen is clogged.
- The optional inlet filter is restricted.
- The oil separating cartridge is clogged.

### 5.12.7 There is an external oil leak

- The oil pump shaft seal is worn or damaged.
- There is an oil leak from the gas ballast control.
- There is an oil leak from the drain tap.
- There is an oil leak from the oil filter O-ring.

### 5.12.8 The motor cuts out

- Mains power supply voltage or frequency is incompatible with motor characteristics.
- Check the circuit breaker setting.
- Check the electrical connections.
- The oil is too viscous or the room temperature is too low.
- A pressure rise in the exhaust pipework.
- The oil separating cartridge is clogged.
- The pump exhaust line is restricted or blocked.

### 5.12.9 Pump emits fumes at exhaust or oil consumption is high

- The separating cartridge is installed incorrectly.
- The separating cartridge is broken or burst.
- The automatic trap for re-injecting oil is blocked or its float is filled with oil.
- The oil filler cap not properly tightened.
- The pump is overheating.
- The pump is filled with the wrong type of oil.

### 5.12.10 Oil back-streams to vacuum chamber

- The integrated inlet valve is faulty.
- The gas ballast is open.

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## 6 Storage and disposal

### 6.1 Storage

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#### CAUTION

Observe the storage temperature limits stated in [Section 2](#). Storage below -30 °C will permanently damage the pump seals.

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*Note:* If a new pump will be stored in conditions of high humidity, remove the pump from its cardboard packaging box. Dispose of the box (refer to [Section 6.2](#)).

Use the following procedure to store the pump.

1. Shut down the pump as described in [Section 4.7](#) and [Section 4.8](#).
2. Isolate the pump from the electrical supply.
3. Purge the vacuum system and the pump with dry nitrogen and disconnect the pump from the vacuum system.
4. Replace the oil as described in [Section 5.4](#).
5. Place and secure protective covers over the inlet and outlet ports.
6. Store the pump in cool, dry conditions until required for use. When required, prepare and install the pump as described in [Section 3](#). If the pump has been stored for more than a year, before installing the pump, clean and overhaul it as described in the instruction supplied with the clean and overhaul kit.

### 6.2 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.

Do not incinerate fluoroelastomer seals and O-rings.

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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, China, France, Germany, Israel, Italy, Japan, Korea, Singapore, United Kingdom, U.S.A and a world-wide network of distributors. The majority of these centres employ Service Engineers who have undergone comprehensive Edwards training courses.

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

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

### 7.2 Service

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

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

### 7.3 Spares

The following maintenance kits contain all the parts needed to maintain the pump.

Table 12 - Maintenance kits

Pump	Kit description	Item number
ES65 / ES100	Minor service kit	A352-45-990
ES200	Minor service kit	A352-55-990
ES300	Minor service kit	A352-60-990
ES630	Minor service kit	A352-65-990
ES65	Major service kit	A352-45-995
ES100	Major service kit	A352-50-995
ES200	Major service kit	A352-55-995
ES300	Major service kit	A352-60-995
ES630	Major service kit	A352-65-995

Please refer to the following maintenance manuals for spares identification:

- A352-01-855 for ES65/100
- A352-02-855 for ES200/300
- A352-03-855 for ES630

## 7.4 Accessories

Three types of accessories are available for the ES pumps.

Table 13 - Accessories function

Accessory	Function	Customer Connection
Oil level sensor	Open circuit when oil level is low	Unterminated conductors
120 °C sensor	Open circuit when temperature exceeds 120 °C	Terminals
PT100 temp sensor	Resistance temperature sensor	Unterminated conductors

Table 14 presents a summary of the oil level and temperature sensors available for ES pumps. Detailed fitting instructions are provided below.

Table 14 - Oil level and temperature sensors

	Oil level sensor	Oil level sensor and 120 °C sensor	Oil level sensor and PT100	PT100 temperature sensor
ES65/100	A352-66-810	A352-66-811	A352-66-812	A352-66-813
ES200/ES300	A352-77-810	A352-77-811	A352-77-812	A352-77-813
ES630	A352-88-810	A352-88-811	A352-88-812	A352-88-813



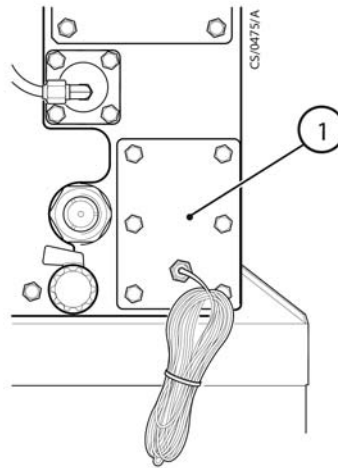
### 7.4.1 Oil level sensor (ES65/ES100)

**Product**

ES65/ES100 oil level sensor

**Item Number**

A352-66-810

**Figure 13 - ES65/ES100 oil level sensor**

1. Oil level sensor

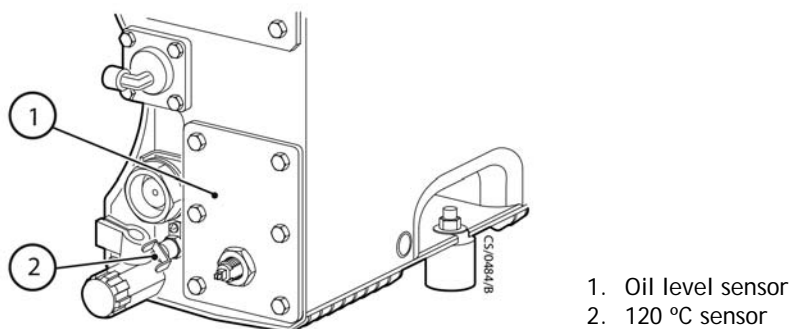
Fitting Instructions (refer also to [Table 13](#)).

1. Drain oil from pump.
2. Remove the blank plate and seal.
3. Clean the area where the oil level sensor ([Figure 13](#), item 1) will be fitted.
4. Carry out a visual check on the sealing face of both the pump and the oil level sensor (1).
5. Secure using fixings provided.

### 7.4.2 Oil level sensor and 120 °C sensor (ES65/ES100)

Product	Item Number
ES65/ES100 oil level and 120 °C sensor	A352-66-811

Figure 14 - ES65/ES100 oil level sensor and 120 °C sensor



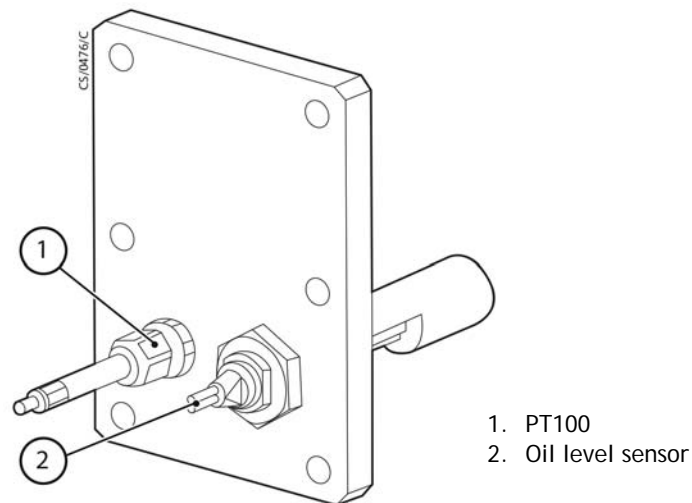
Fitting Instructions (refer also to [Table 13](#)).

1. Drain oil from pump.
2. Remove the blank plate and seal.
3. Clean the area where the oil level sensor ([Figure 14](#), item 1) will be fitted.
4. Carry out a visual check on the sealing face of both the pump and the oil level sensor (1).
5. Secure the oil level sensor (1) using fixings provided.
6. Secure the 120 °C sensor (2) using fixings provided.

### 7.4.3 Oil level sensor and PT100 (ES65/ES100)

Product	Item Number
ES65/ES100 oil level sensor and PT100	A352-66-812

Figure 15 - ES65/ES100 oil level sensor and PT100



Fitting Instructions (refer also to [Table 13](#)):

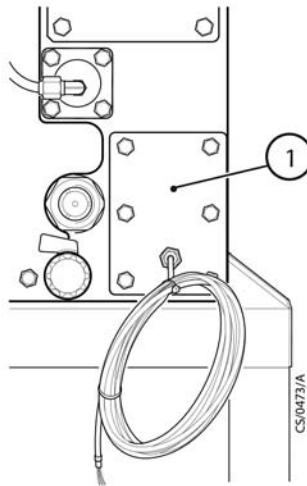
**Note:** *Figure 15 shows the oil level sensor and PT100. See [Figure 13](#) or [Figure 14](#) to see where this part locates.*

1. Drain oil from pump.
2. Remove the blank plate and seal.
3. Clean the area where the oil level sensor and PT100 ([Figure 15](#)) will be fitted.
4. Carry out a visual check on the sealing face of both the pump and the oil level sensor.
5. Secure using fixings provided.

#### 7.4.4 PT100 temperature sensor (ES65/ES100)

Product	Item Number
ES65/ES100 PT100 temperature sensor	A352-66-813

Figure 16 - ES65 / ES100 PT100 temperature sensor



1. PT100 temperature sensor

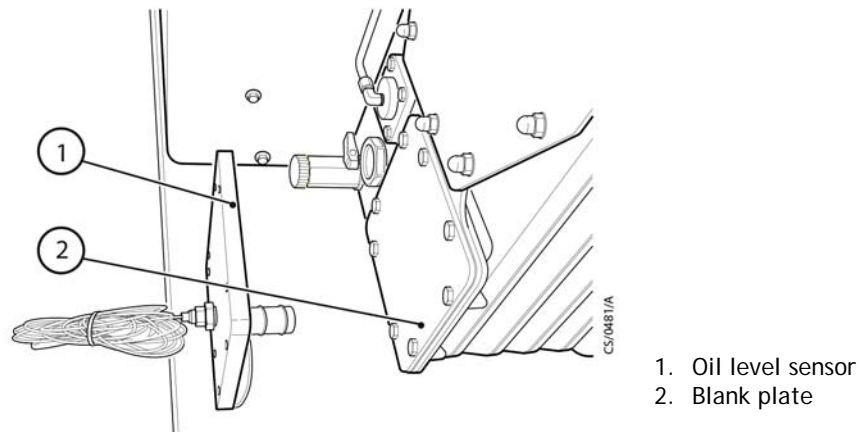
Fitting Instructions (refer also to [Table 13](#)):

1. Drain oil from pump.
2. Remove the blank plate and seal.
3. Clean the area where the PT100 temperature sensor ([Figure 16](#), item 1) will be fitted.
4. Carry out a visual check on the sealing face of both the pump and the PT100 temperature sensor.
5. Secure using fixings provided.

### 7.4.5 Oil level sensor (ES200/ES300)

Product	Item Number
ES200/ES300 oil level sensor	A352-77-810

Figure 17 - ES200/ S300 oil level sensor



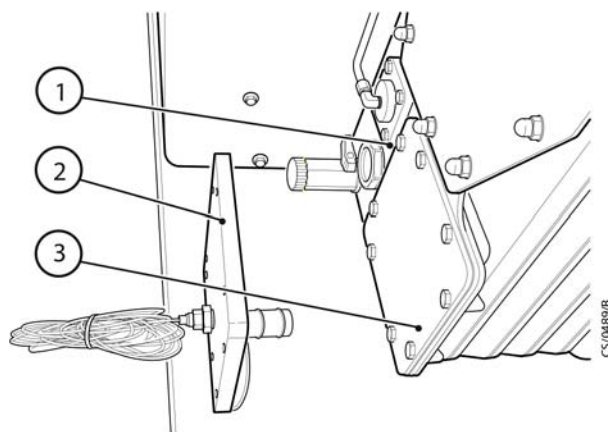
Fitting Instructions (refer also to [Table 13](#)):

1. Drain oil from pump.
2. Remove the blank plate ([Figure 17](#), item 2) and O-ring.
3. Clean the area where the oil level sensor (1) will be fitted.
4. Carry out a visual check on the sealing face of both the pump and the oil level sensor.
5. Secure using fixings provided.

### 7.4.6 Oil level sensor and 120 °C sensor (ES200/ES300)

Product	Item Number
ES200/ES300 oil level and 120 °C sensor	A352-77-811

Figure 18 - ES200/ES300 oil level and 120 °C sensor



1. 120 °C sensor
2. Oil level sensor
3. Blank plate

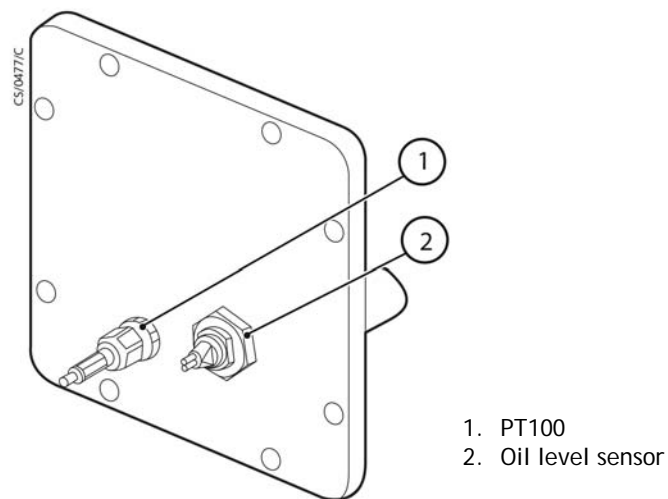
Fitting Instructions (refer also to [Table 13](#)):

1. Drain oil from pump.
2. Remove the blank plate ([Section 18](#), item 3) and O-ring.
3. Clean the area where the oil level sensor (2) and 120 °C sensor (1) will be fitted.
4. Carry out a visual check on the sealing face of both the pump and the oil level sensor (2).
5. Secure using fixings provided.

### 7.4.7 Oil level sensor and PT100 (ES200 / ES300)

Product	Item Number
ES200/ES300 oil level sensor and PT100	A352-77-812

Figure 19 - ES200/ES300 oil level sensor and PT100



Fitting Instructions (refer also to [Table 13](#)):

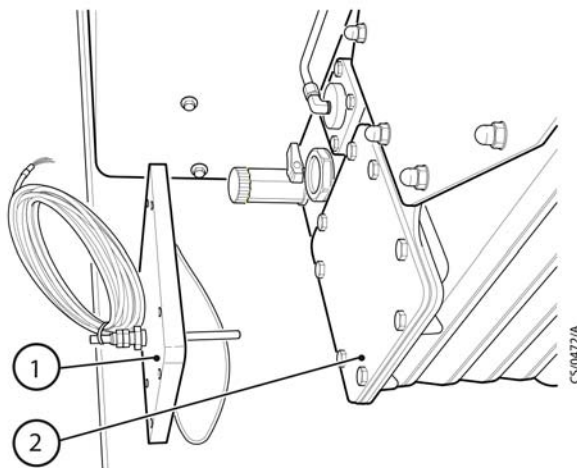
**Note:** *Figure 19 shows the oil level sensor and PT100. See [Figure 18](#) to see where this part locates.*

1. Drain oil from pump.
2. Remove the blank plate and seal.
3. Clean the area where oil level sensor and PT100 ([Figure 19](#)) will be fitted.
4. Carry out a visual check on the sealing face of both the pump and the oil level sensor.
5. Secure using fixings provided.

### 7.4.8 PT100 temperature sensor (ES200/ES300)

Product	Item Number
ES200/ES300 PT100 temperature sensor	A352-77-813

Figure 20 - ES200/ES300 PT100 temperature sensor



1. PT100 temperature sensor
2. Blank plate

Fitting Instructions (refer also to [Table 13](#)):

1. Drain oil from pump.
2. Remove the blank plate ([Figure 20](#), item 2) and O-ring.
3. Clean the area where the PT100 temperature sensor (1) will be fitted.
4. Carry out a visual check on the sealing face of both the pump and the PT100 temperature sensor.
5. Secure using fixings provided.

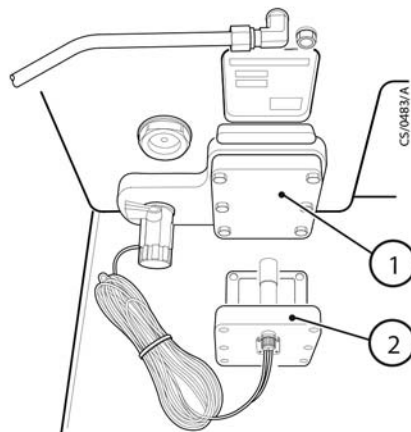


### 7.4.9 Oil level sensor (ES630)

Product  
ES630 oil level sensor

Item Number  
A352-88-810

Figure 21 - ES630 oil level sensor



1. Blank plate
2. Oil level sensor

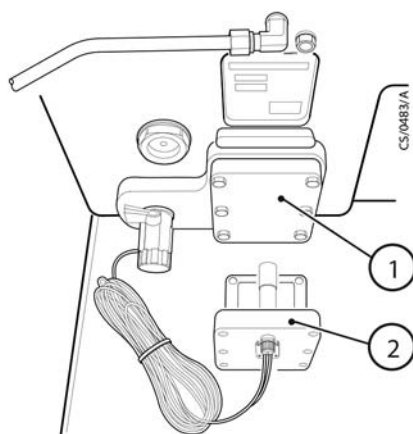
Fitting Instructions (refer also to Table 13):

1. Drain oil from pump.
2. Remove the blank plate (Figure 21, item 1) and O-ring.
3. Clean the area where the oil level sensor (2) will be fitted.
4. Carry out a visual check on the sealing face of both the pump and the oil level sensor.
5. Secure using fixings provided.

### 7.4.10 Oil level sensor and 120 °C sensor (ES630)

Product	Item Number
ES630 oil level and 120 °C sensor	A352-88-811

Figure 22 - ES630 oil level sensor and 120 °C sensor



1. Blank plate
2. Oil level sensor and 120 °C sensor

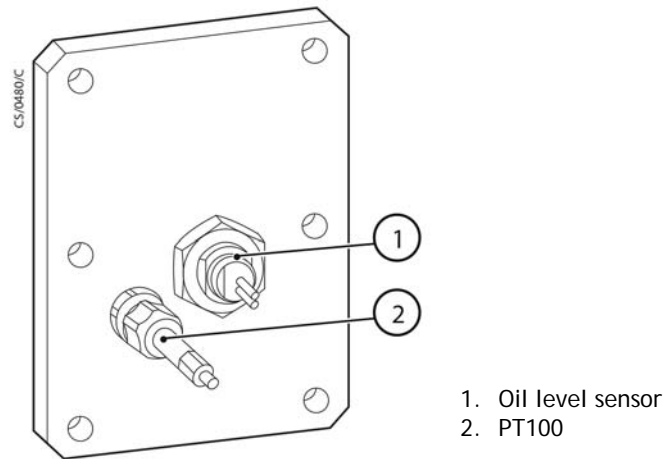
Fitting Instructions (refer also to [Table 13](#)):

1. Drain oil from pump.
2. Remove the blank plate ([Figure 22](#), item 1) and seal.
3. Clean the area where the oil level sensor (2) will be fitted.
4. Fit the 120 °C sensor to the face of the oil level sensor (2) using fixings provided.
5. Carry out a visual check on the sealing face of both the pump and the oil level sensor.
6. Secure using fixings provided.

### 7.4.11 Oil level sensor and PT100 (ES630)

<p><b>Product</b> ES630 oil level sensor and PT100</p>	<p><b>Item Number</b> A352-88-812</p>
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Figure 23 - ES630 oil level sensor and PT100



Fitting Instructions (refer also to [Table 13](#)):

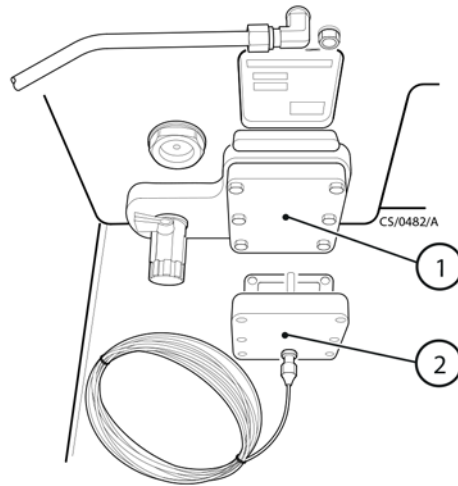
**Note:** *Figure 23 shows the oil level sensor and PT100. See [Figure 22](#) to see where this part locates.*

1. Drain oil from pump.
2. Remove the blank plate and seal.
3. Clean the area where oil level sensor and PT100 ([Figure 23](#)) will be fitted.
4. Carry out a visual check on the sealing face of both the pump and the oil level sensor.
5. Secure using fixings provided.

### 7.4.12 PT100 temperature sensor (ES630)

Product	Item Number
ES630 PT100 temperature sensor	A352-88-813

Figure 24 - ES630 PT100 temperature sensor



- 1. Blank plate
- 2. PT100 temperature sensor

Fitting Instructions (refer also to [Table 13](#)).

1. Drain oil from pump.
2. Remove the blank plate ([Figure 24](#), item 1) and seal.
3. Clean the area where the PT100 temperature sensor (2) will be fitted.
4. Carry out a visual check on the sealing face of both the pump and the PT100 temperature sensor.
5. Secure using fixings provided.

### 7.4.13 ITO100 Inlet Catchpot

The ITO Inlet Catchpot is used on vacuum processes where large quantities of vapour are produced. The catchpot traps liquid that would otherwise condense in the pipelines and drain towards the pump. The catchpot is also suitable for use on vacuum processes where froth or spray can go into the pump.

The mixture of gas and liquid droplets enters the inlet of the catchpot. The liquid collects in the base of the body and the gas passes through the outlet into the pump.

The level of the trapped liquid can be viewed through the sight glass ([Figure 25](#), item 1). Drain the trapped liquid from the catchpot through the drain plug (2).

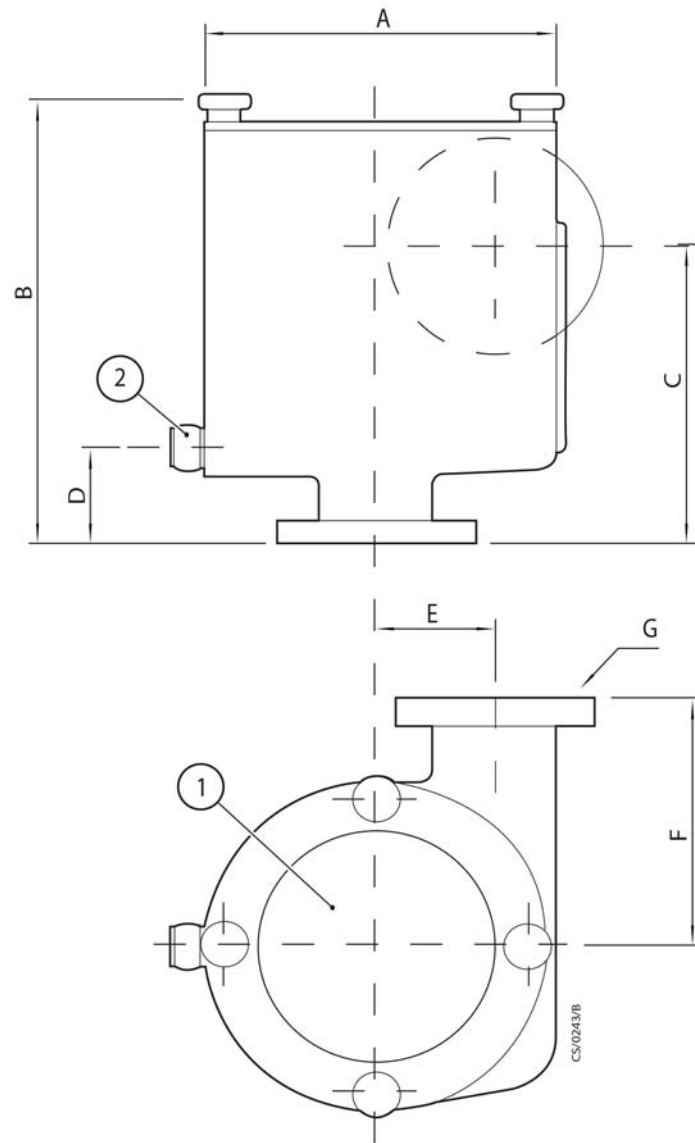
Product	Item Number
ITO100 inlet catchpot	A441-02-000

### 7.4.14 ITO300 Inlet Catchpot

Description as in [Section 7.4.13](#).

Product	Item Number
ITO300 inlet catchpot	A441-03-000

Figure 25 - ITO inlet catchpot



- 1. Sight glass
- 2. Drain plug

Dimensions	A	B	C	D	E	F	G
ITO100	227	251	182	62	92	145	ISO40
ITO300	227	308	210	62	80	165	ISO80
ITO800	285	456	315	81	97	200	ISO100

	ITO100	IT0300	IT0800
Flange size (inlet and outlet)	ISO40	ISO63	ISO100
Mass (kg)	6.8	8	19.5
Capacity (litres)	5.47	7.87	9.5

#### 7.4.15 ITO800 inlet catchpot

Description as in Section 7.4.13.

Product	Item Number
ITO800 inlet catchpot	A441-04-000

#### 7.4.16 ITM 100 high-capacity inlet dust filter

The ITM high-capacity inlet dust filter is used for applications that require fast pumpdown with high loads of dust and grit, which would rapidly clog the equivalent ITF inlet dust filter element.

The dust filter operates in a similar way to the catchpot described in Section 7.4.13. In addition, the pumped gas passes through the high-capacity dust filter element (Figure 26, item 8).

The filter material is stainless steel mesh which can be made wet with oil for greater dust adhesion in those applications where the oil sealed vacuum pumps that can tolerate oil carryover are used, e.g., oil sealed rotary vane or piston type pumps. The filter should not be oil wetted when using oil free dry pumps.

Product	Item Number
ITM100 inlet dust filter	A443-02-000

#### 7.4.17 ITM 300 high-capacity inlet dust filter

Description as in Section 7.4.16.

Product	Item Number
ITM300 inlet dust filter	A443-03-000

#### 7.4.18 ITM 800 high-capacity inlet dust filter

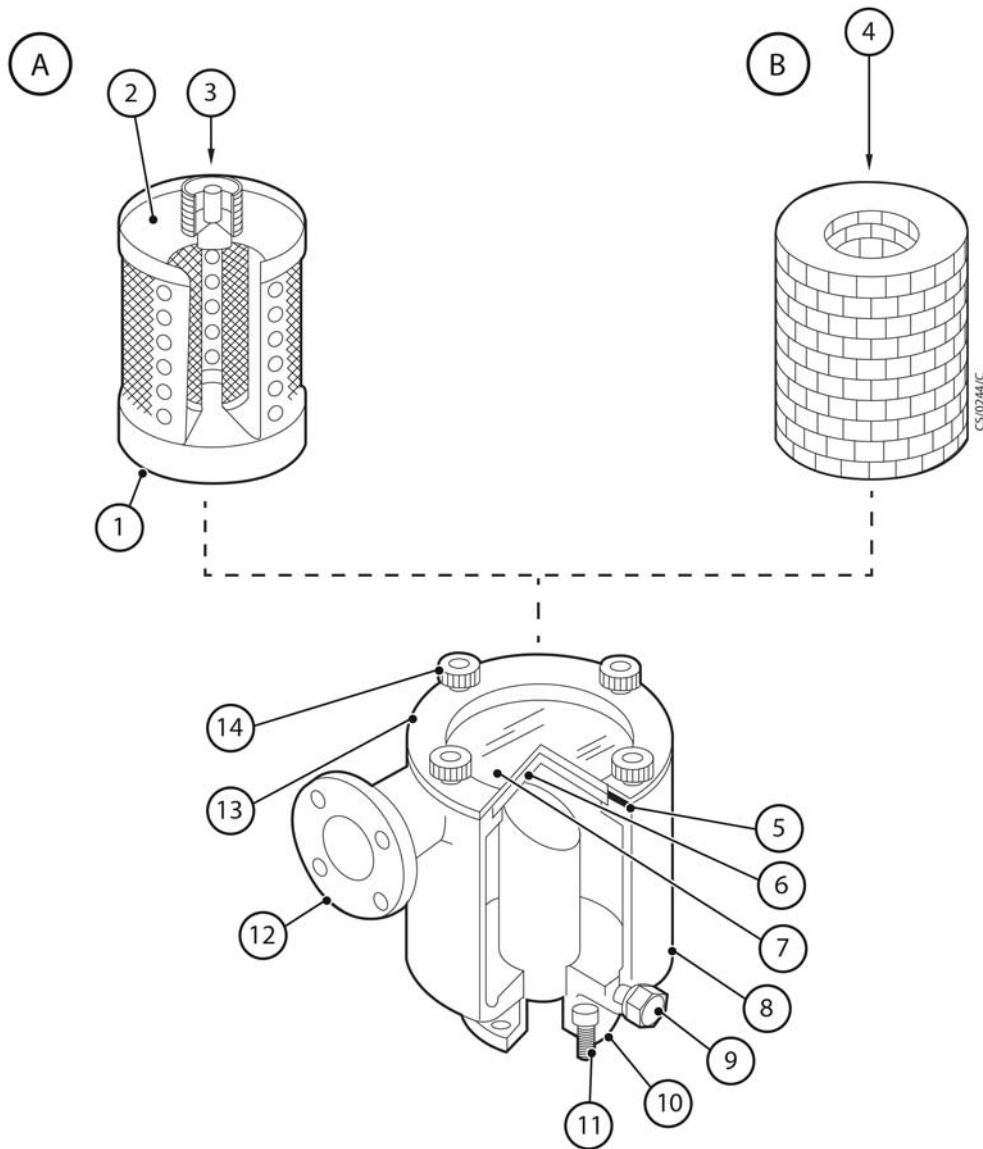
Description as in Section 7.4.16.

Product	Item Number
ITM800 inlet dust filter	A443-04-000

#### 7.4.19 Inlet and exhaust connectors - available to fit to existing systems

Product	Item Number
1 ¼" BSPP female x 1" BSPP male	A259-18-100
1 ¼" BSPP female x 1 ½" BSPP male	A259-18-101
1 ¼" BSPP female x 2" BSPP male	A259-18-102
1" BSPP male to 1" NPTP female	A259-18-103
1 ½" BSPP male to 1 ½" NPTP female	A259-18-104
2" BSPP male to 2" NPTP female	A259-18-105

Figure 26 - ITM inlet dust filters



- A. Inlet chemical trap
- B. Inlet dust filter

- 1. Inner cover
- 2. Chemical trap basket assembly
- 3. Not used
- 4. Dust filter element
- 5. Dust filter locating spacer
- 6. Top gasket
- 7. Dust filter bottom gasket
- 8. High-capacity dust filter element
- 9. Hand wheel
- 10. Bezel
- 11. Gasket
- 12. Sight glass cover

- 13. Sight glass
- 14. Trap body
- 15. Drain plug
- 16. Outlet port
- 17. Outlet flange fixing screws
- 18. Not used
- 19. Not used
- 20. Not used
- 21. Not used
- 22. Inlet port
- 23. Chemical trap bottom gasket

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