

Instruction Manual

CDX1000 Chemical Dry Vacuum Pumps and IDX1000 and IDX1300 Industrial Dry Vacuum Pumps



Description	Item Number
CDX1000, 30 kW, 50 Hz, Flameproof with Integral Flame Arrestors	A708-01-985
CDX1000, 40 h.p., 60 Hz, Flameproof with Integral Flame Arrestors	A708-11-985
CDX1000, 30 kW, 50 Hz, Flameproof (without Flame Arrestors)	A708-02-985
CDX1000, 40 h.p., 60 Hz, Flameproof (without Flame Arrestors)	A708-12-985
IDX1000, 22 kW, 50 Hz, Safe Area	A708-03-985
IDX1000, 30 h.p., 60 Hz, Safe Area	A708-13-985
IDX1000, 30 kW, 50 Hz, Safe Area, Extended Performance	A708-04-985
IDX1000, 40 h.p., 60 Hz, Safe Area, Extended Performance	A708-14-985
IDX1300, 30 kW, DIN, Safe Area	A709-04-985
IDX1300, 40 h.p., ANSI, Safe Area	A709-14-985

Notes: The Item Numbers listed above are for bareshaft pumps without motors. However, this manual contains general information on pump motors. For detailed information on the specific motor fitted to your pump, you must refer to the Motor Instruction Manual (P600-74-000) supplied with your pump.

The CDX/IDX Pumping System Instruction Manual (P600-74-600) you will receive will define the build specification of your pump; that is, the type of motor and any accessories fitted.

If your CDX pump is part of an ATEX system, you will receive an ATEX System Instruction Manual (P600-74-500), which defines the installation, operation and maintenance requirements for ATEX compliance.





Declaration of Incorporation

We, Edwards,
Manor Royal,
Crawley,
West Sussex RH10 2LW, UK

declare under our sole responsibility that the machine(s)

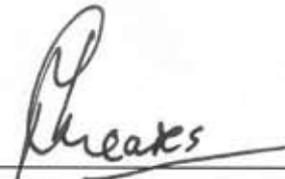
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IDX1000, 22 kW, 50 Hz, Safe Area	A708-03-985
IDX1000, 30 h.p., 60 Hz, Safe Area	A708-13-985
IDX1000, 30 kW, 50 Hz, Safe Area, Extended Performance	A708-04-985
IDX1000, 40 h.p., 60 Hz, Safe Area, Extended Performance	A708-14-985
IDX1300, 30 kW, DIN, Safe Area	A709-04-985
IDX1300, 40 h.p., ANSI, Safe Area	A709-14-985

Note: The part numbers listed above are for bare shaft pumps without motors.

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

EN1012-2 1996 Mechanical safety; 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 Directive, 98/37/EC.


P. Meares, Technical Manager

7th Aug 2007
Date and Place

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

Contents

Section	Page
1	Introduction 1
1.1	Scope and definitions 1
1.2	Description 2
1.3	Shaft-seals purge system 2
1.4	Air bleed - IDX1300 only 2
1.5	Temperature control system 2
1.6	Drive coupling operation 3
1.7	Hazardous area and safe area versions of the pump 3
1.7.1	Safe area (in relation to an external atmosphere) 3
1.7.2	Hazardous area 3
1.7.3	Pumped gases 3
1.8	Accessories 10
1.9	Normal/abnormal operation 10
1.9.1	Normal operation: CDX pumps 10
1.9.2	Normal operation: IDX pumps 10
1.9.3	Abnormal operation: CDX and IDX pumps 11
2	Technical data 13
2.1	Operating and storage conditions 13
2.2	Performance 13
2.3	Mechanical data 14
2.4	Electrical data 14
2.5	Lubrication data 15
2.6	Shaft-seals purge gas supply 15
2.7	Cooling-water supply 15
2.8	Temperature control system 16
2.9	Connections 16
2.10	Coolant 17
2.11	Materials of construction 18
3	Installation 25
3.1	Safety 25
3.2	Unpack and inspect the pump 25
3.3	Locate the pump 26
3.3.1	Introduction 26
3.3.2	Locate the pump on its mounting feet 27
3.3.3	Locate the pump without the mounting feet 27
3.4	Check the coolant level 28
3.5	Check the oil levels 28
3.5.1	Check the gearbox oil-level 28
3.5.2	Check the end-cover oil level 28
3.6	Connect the temperature sensor (CDX pumps only) 30
3.7	Connect the thermal snap-switches (IDX pumps only) 32
3.8	Pump-motor electrical connections 34
3.8.1	Introduction 34
3.8.2	Connect the electrical supply to the pump-motor 34
3.8.3	Connect the thermistor outputs 35
3.9	Connect the pump to earth (ground) 35
3.10	Check the direction of pump rotation 35
3.11	Connect the cooling-water supply 36
3.12	Connect the shaft-seals purge gas supply 36
3.13	Connect the pump inlet and outlet 37

3.13.1	Connect the pump to your process system	37
3.13.2	Connect the pump-outlet	38
3.14	Leak test the system	38
3.15	Commission the pump	38
3.15.1	Commissioning procedure	38
3.15.2	Adjust the TCV (thermostatic control-valve)	39
4	Operation	43
4.1	Operational safety	43
4.2	ATEX system control	44
4.3	Non-ATEX system control	44
4.3.1	Start the pump	44
4.3.2	Allow the pump to warm up	44
4.3.3	Shut down the pump	45
5	Maintenance	47
5.1	Safety information	47
5.2	Maintenance plan	47
5.3	Check the oil-levels	48
5.3.1	Check the gearbox oil-level	48
5.3.2	Check the end-cover oil-level	48
5.4	Check the shaft-seals purge gas supply	50
5.5	Check the coolant level and refill if necessary	50
5.5.1	Check the coolant level	50
5.5.2	Drain the coolant and refill the pump with a different coolant	51
5.6	Remove the inlet filter (if necessary)	51
5.7	Inspect the pipelines and connections	51
5.8	Change the oil and oil filters, drain the vent filters, and clean the oil-level sight-glasses	52
5.8.1	Drain the end-cover oil and clean the end-cover sight-glasses	52
5.8.2	Change the end-cover oil filter	53
5.8.3	Drain the end-cover vent filter	53
5.8.4	Fill the end-cover with new oil	53
5.8.5	Drain the gearbox oil and clean the gearbox sight-glasses	55
5.8.6	Change the gearbox oil filter	55
5.8.7	Drain the gearbox vent filter	56
5.8.8	Fill the gearbox with new oil	56
5.9	Flush the pump with cleaning solution	56
5.10	Clean the cooling system	58
5.10.1	Drain the coolant from the cooling system	59
5.10.2	Clean the cooling-water filter	59
5.10.3	Clean the heat exchanger	59
5.10.4	Clean the coolant level sight-glass	60
5.10.5	Prepare the pump for operation	60
5.11	Replace the pump-motor	60
5.11.1	Remove the pump-motor	60
5.11.2	Fit the new pump-motor	63
5.11.3	Check the direction of pump rotation	64
5.12	Replace the flexible coupling insert	64
5.13	Clear a hydraulic lock (when necessary)	65
5.14	Clean the vent adaptor	65
5.15	Change the bearings and seals	67
5.16	Clean/change the air bleed filters IDX1300 only	67
5.17	Fault finding	67
6	Storage and disposal	71
6.1	Storage	71
6.2	Disposal	71

7	Service, spares and accessories	73
7.1	Introduction	73
7.2	Service	73
7.3	Spares and maintenance kits	73
7.4	Accessories	73
	Index	75

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

Illustrations

Figure	Page	
1	The IDX Pump (Sheet 1 of 2)	4
2	The IDX1300 Pump (Sheet 1 of 2)	6
3	The CDX Pump (Sheet 1 of 2)	8
4	IDX1000 Dimensions: mm (inch)	19
5	IDX1300 Dimensions: mm (inch)	20
6	CDX Dimensions: mm (inch)	22
7	Fill the Pump with Coolant	29
8	Connect the CDX Temperature Sensor	31
9	Connect the IDX Thermal Snap-Switches	33
10	Change the Oil Filters and Clean the Oil-Level Sight-Glasses	54
11	Flush the Pump with Cleaning Solution	58
12	Clean the Cooling System - CDX/IDX1000	61
13	Clean the Cooling System - IDX1300	62
14	Pump Motor and Drive Coupling	66
15	Clean the Vent Adaptor	68
16	Air Bleed Filter Element Cleaning/Replace	68

Tables

Table	Page	
1	Operating and Storage Conditions	13
2	Performance Data	13
3	Mechanical Data	14
4	Electrical Data	14
5	Lubrication Data	15
6	Shaft-Seals Purge Gas Supply Data	15
7	Cooling-Water Supply Data	15
8	Temperature Control System Data	16
9	Connections	16
10	Possible Alternative Coolants	17
11	Construction Materials	18
12	TCV Settings	39
13	Minimum Pump Operating Temperatures (°C)	40
14	Minimum Pump Operating Temperatures (°F)	41
15	Maintenance Plan	49
16	Fault Finding	69
17	Spares and Maintenance Kits	74

Associated publications

Publication title

Publication number

Vacuum pump and vacuum system safety

P300-20-000

1 Introduction

1.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for the Edwards CDX1000 Chemical Dry Vacuum Pumps and the IDX1000 and IDX1300 Industrial Dry Vacuum Pumps. You must use the pumps as specified in this manual.

Read this manual before you install and operate the pump. Important safety information is highlighted as WARNING and CAUTION instructions; you must obey these instructions. The use of WARNINGS and CAUTIONS is defined below.



WARNING

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

CAUTION

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

The following IEC warning labels appear on the pump:



Warning - refer to accompanying documentation.



Warning - risk of electric shock.



Warning - hot surfaces.



Protective earth (ground).



Warning - Edwards offer European customers a recycling service.

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

1.2 Description

The CDX and IDX pumps are rugged, reliable dry vacuum pumps designed specifically for use in the chemical and pharmaceutical industries, and in industrial processing applications.

The CDX and IDX pumps are single stage pumps which use the screw principle, in which a pair of intermeshing, non-contacting rotors are held in correct phase relation by a pair of timing-gears. The gears and the double-row angular contact ball bearings are oil lubricated.

The double-ended design means that the bearings, seals and gearbox remain at atmospheric pressure, and that axial loading on the bearings is minimal.

1.3 Shaft-seals purge system

Refer to Figure 1, 2 and 3, detail C. The shaft-seals purge pipelines (24) deliver an air or nitrogen purge to the shaft-seals. This purge:

- Ensures that the shaft-seals are maintained at a positive pressure during pump operation.
- Prevents the entry of corrosive or toxic process vapours into the pump gearbox.
- Prevents contamination of the process gases by pump oil.
- Prevents damage to the shaft-seals by debris.

Note: Accessory kits are available to provide gas ballast, inlet and exhaust purge facilities on the pump: refer to Section 7.4.

1.4 Air bleed - IDX1300 only

CAUTION

Blockage of the air bleed intake and/or the filter element will lead to seizure of the pump.

Refer to Figure 2. The IDX1300 is fitted with a permanent atmospheric air bleed at each end of the pump.

Refer to Section 5.16 for details of how to clean/replace the filter element.

1.5 Temperature control system

Refer to Figure 1, 2 and 3. The CDX and IDX pumps have an indirect cooling system. A coolant circulation pump (driven by the vacuum pump mechanism) circulates secondary coolant, in a closed loop, through jackets around the pump body, and through oil coolers. A heat exchanger in the circuit transfers heat to the primary coolant (that is, cooling-water).

The primary coolant supply passes through a filter (Figure 12, item 20).

In operation, the pump is maintained at a constant temperature by a thermostatic control-valve (TCV, 17) which controls the supply of primary coolant (cooling-water) to the heat exchanger.

The heat exchanger has a pressure cap and a coolant overflow pipe (Figure 7, item 4). As the temperature of the pump body increases, and the secondary coolant expands, excess coolant may be discharged from this pipe.

Two positive displacement oil pumps located in the gearbox and the end-cover circulate oil (through a filter) to cool and control the temperature of the rotors, and to lubricate the bearings and gears.

The oil circulates through oil coolers (10, 22). The oil coolers are plate heat exchangers, in which heat is transferred from the oil to the secondary coolant.

Refer to [Figure 1](#). IDX pumps have a thermal snap-switch box (9) on the end cover which contains two thermal snap-switches:

- You must connect the shut-down thermal snap-switch to a suitable control circuit, in order to shut down the pump if it overheats: refer to [Section 3.7](#).
- You can connect the warning thermal snap-switch to your control equipment to provide an indication that the pump is too hot: refer to [Section 3.7](#).

Refer to [Figure 3](#). CDX pumps have a temperature sensor (9) fitted to the end cover. You must connect this sensor to a suitable control circuit, in order to shut down the pump if it overheats: refer to [Section 3.6](#).

1.6 Drive coupling operation

The pump has a flexible drive coupling which transmits the drive from the pump-motor to the pump rotors.

Refer to [Figure 14](#). A coupling hub (10) is fitted to the pump shaft (14) and a drive hub (19) is fitted to the motor shaft (4). A flexible insert (18) fits between the two hubs.

1.7 Hazardous area and safe area versions of the pump

1.7.1 Safe area (in relation to an external atmosphere)

A safe area is one where there is no possibility of a potentially explosive atmosphere existing, therefore it is not necessary to take special precautions to avoid mechanical or electrical ignition sources.

1.7.2 Hazardous area

A hazardous area (in relation to an external atmosphere) is one where there is the possibility of a potentially explosive atmosphere existing, therefore it is necessary to take special precautions to avoid mechanical or electrical ignition sources.

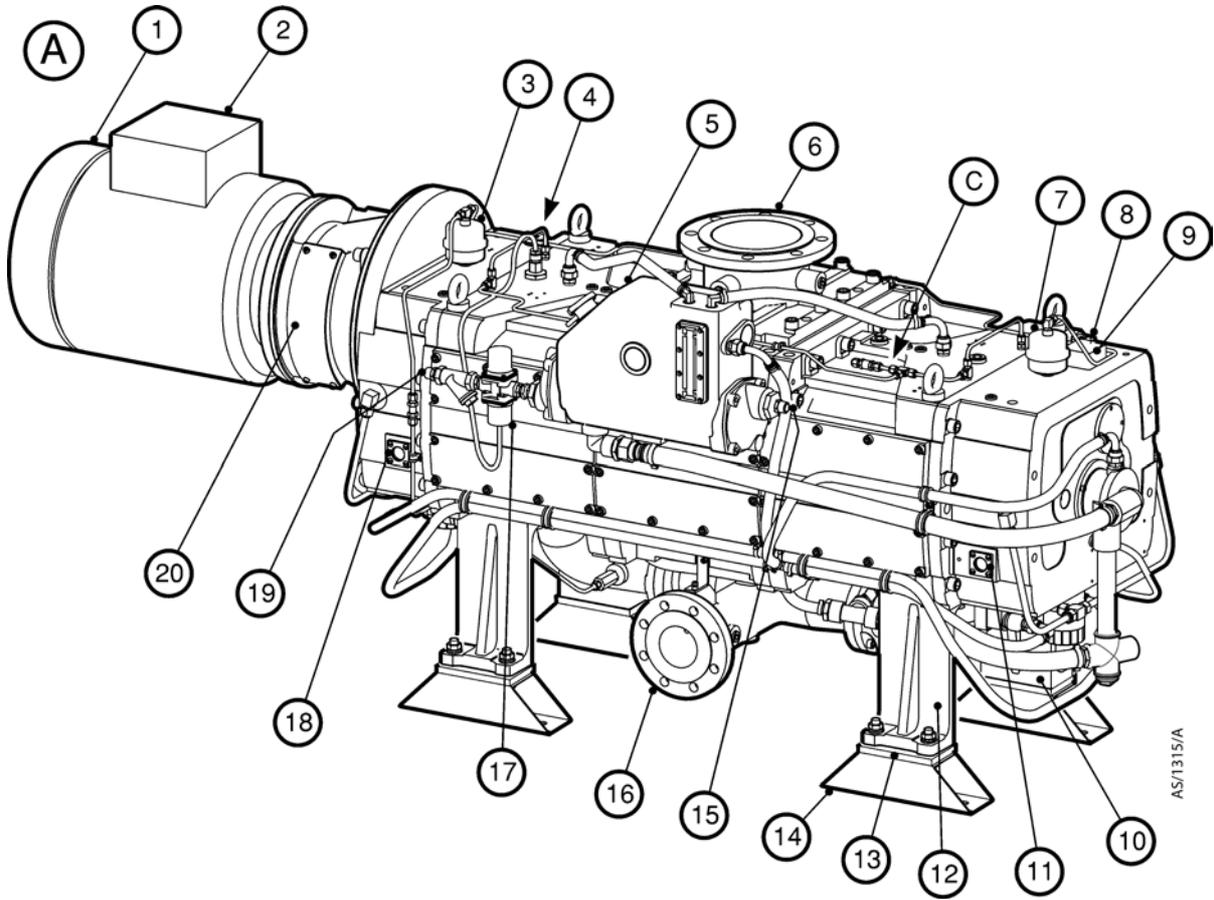
1.7.3 Pumped gases

Hazardous gases and vapours can be defined as materials that could be one or more of the following:

- Toxic
- Corrosive
- Pyrophoric
- Flammables in the flammable range
- Oxidants
- Flammables below the upper flammability limit.

Pumps that are suitable for pumping hazardous gases and vapours have a leak tightness specification of better than 10^{-3} mbar l s.

Figure 1 - The IDX Pump (Sheet 1 of 2)



AS/1315/A

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| <ul style="list-style-type: none"> 1. Pump-motor (typical) 2. Motor terminal-box (typical) 3. Gearbox vent filter 4. Gearbox oil filler-plug and bonded seal (in filler port) 5. Heat exchanger 6. Pump-inlet 7. End-cover vent filter 8. End-cover oil filler-plug and bonded seal (in filler port) 9. Thermal snap-switch box 10. End-cover oil cooler 11. End-cover oil-level sight-glass (2 off[*]) 12. Mounting brackets (4 off) 13. Mounting pads (4 off, between items 12 and 14) 14. Mounting feet (4 off, box section) | <ul style="list-style-type: none"> 15. Cooling-water outlet 16. Pump-outlet 17. TCV (thermostatic control valve) 18. Gearbox oil-level sight-glass (2 off[*]) 19. Cooling-water inlet 20. Coupling cover (2 off[*]) 21. Motor fan 22. Gearbox oil cooler 23. Lifting-bolts (4 off) 24. Shaft-seals purge pipelines 25. Shaft-seals purge inlet 26. Sight-glass bezel 27. Temperature measurement area 28. Earth (ground) stud 29. Nut (on tube fitting) 30. Vent filter body top |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

^{*} One on each side of the pump

Figure 1 - The IDX Pump (Sheet 2 of 2)

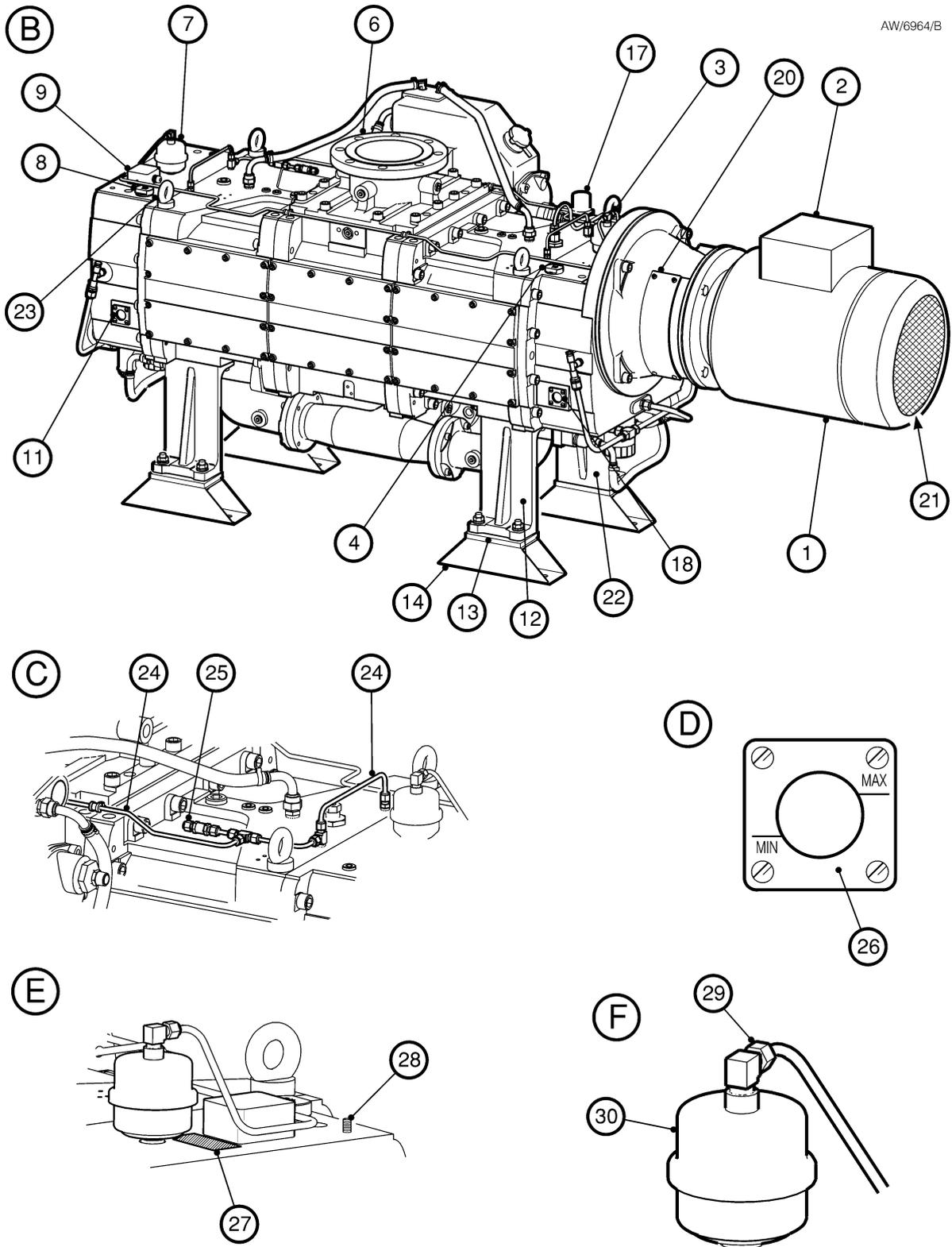
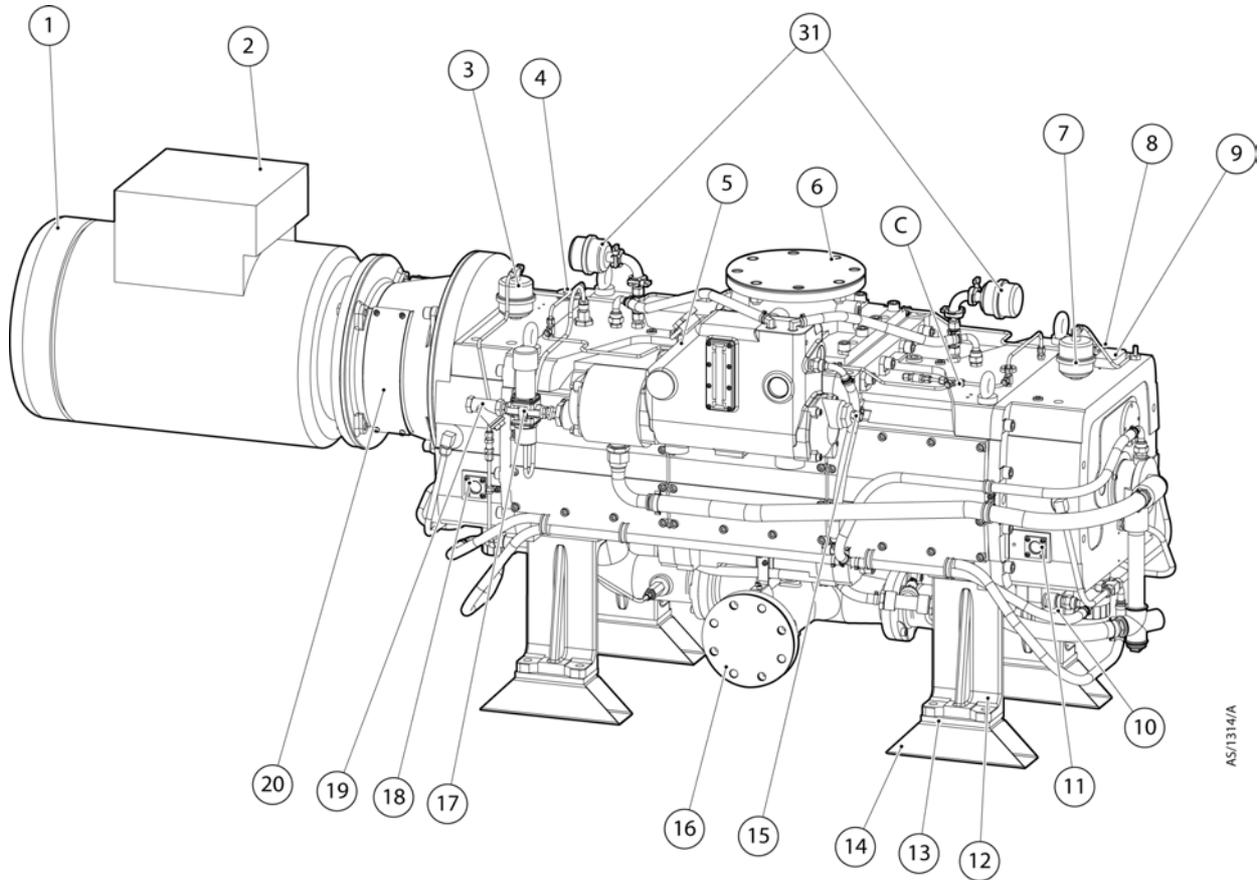


Figure 2 - The IDX1300 Pump (Sheet 1 of 2)



AS/1314/A

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| <ul style="list-style-type: none"> 1. Pump-motor (typical) 2. Motor terminal-box (typical) 3. Gearbox vent filter 4. Gearbox oil filler-plug and bonded seal (in filler port) 5. Heat exchanger 6. Pump-inlet 7. End-cover vent filter 8. End-cover oil filler-plug and bonded seal (in filler port) 9. Thermal snap-switch box 10. End-cover oil cooler 11. End-cover oil-level sight-glass (2 off*) 12. Mounting brackets (4 off) 13. Mounting pads (4 off, between items 12 and 14) 14. Mounting feet (4 off, box section) 15. Cooling-water outlet | <ul style="list-style-type: none"> 16. Pump-outlet 17. TCV (thermostatic control valve) 18. Gearbox oil-level sight-glass (2 off*) 19. Cooling-water inlet 20. Coupling cover (2 off*) 21. Motor fan 22. Gearbox oil cooler 23. Lifting-bolts (4 off) 24. Shaft-seals purge pipelines 25. Shaft-seals purge inlet 26. Sight-glass bezel 27. Temperature measurement area 28. Earth (ground) stud 29. Nut (on tube fitting) 30. Vent filter body top 31. Air Bleed |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

* One on each side of the pump

Figure 2 - The IDX1300 Pump (Sheet 2 of 2)

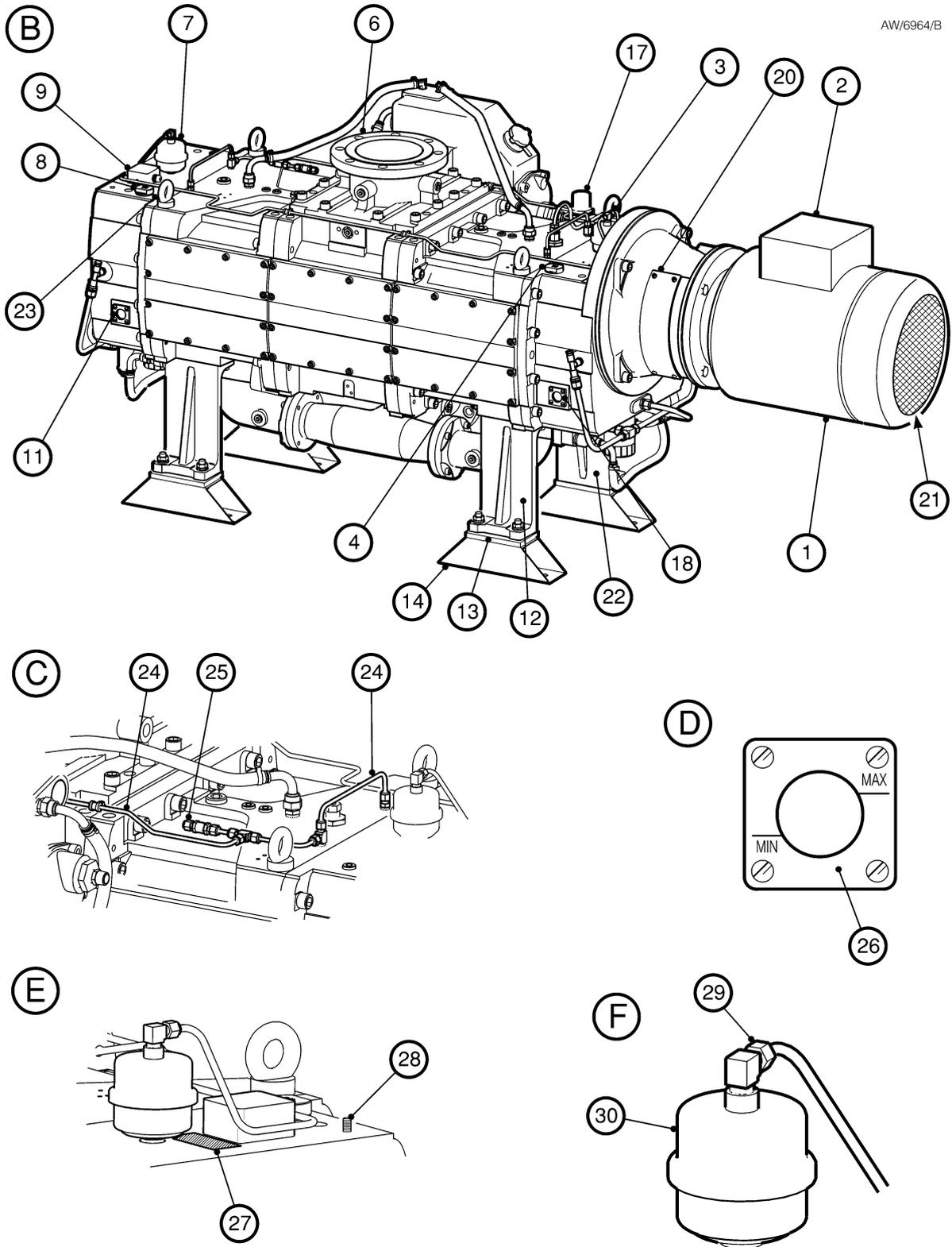
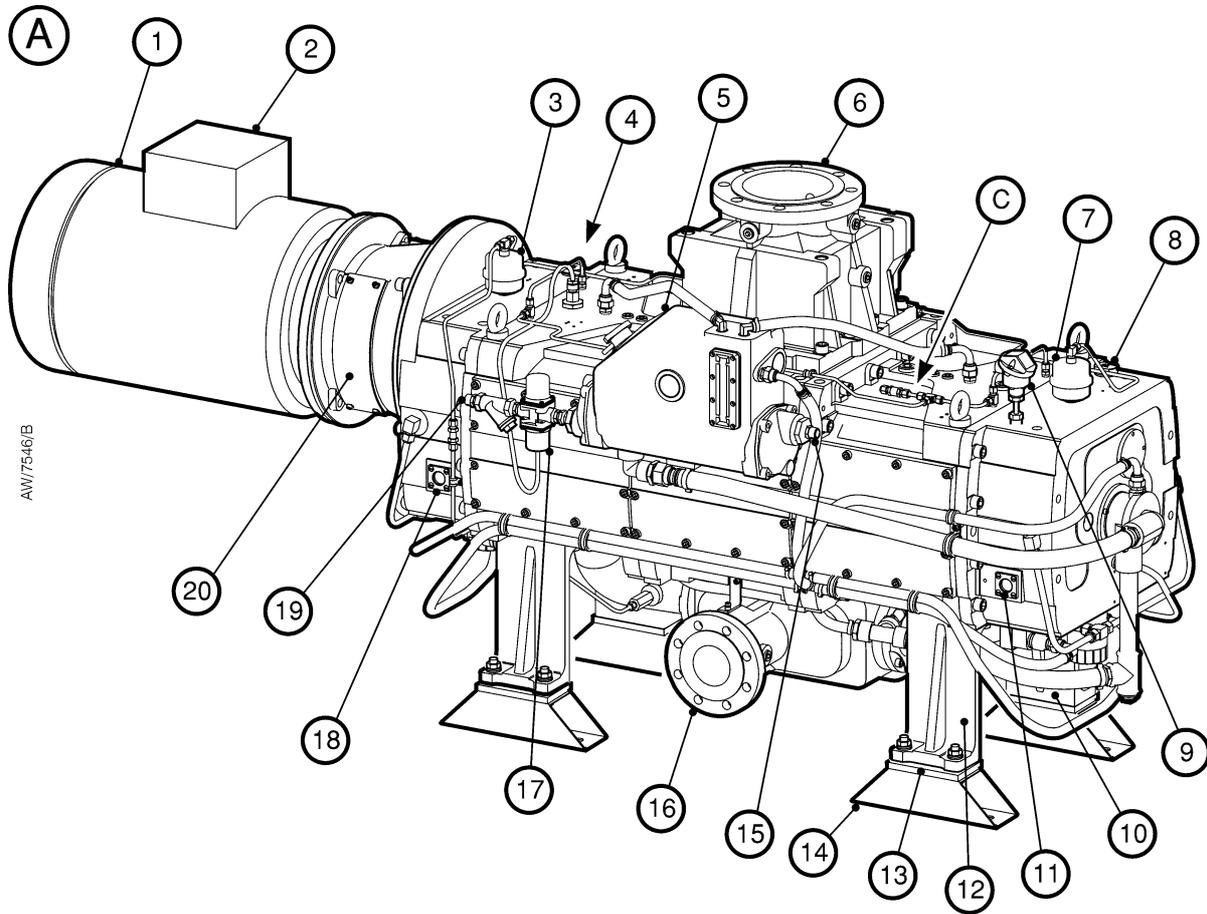


Figure 3 - The CDX Pump (Sheet 1 of 2)



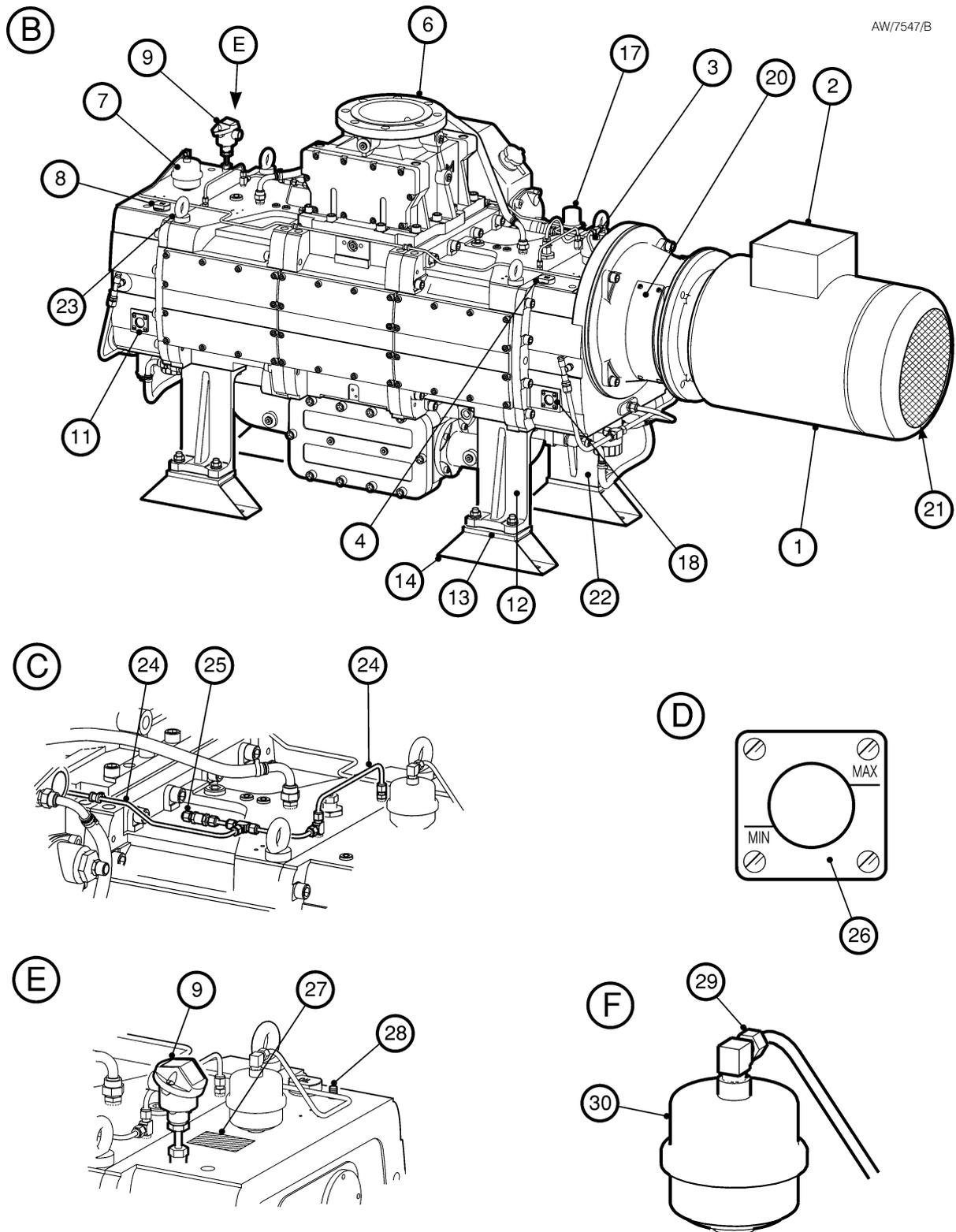
- 1. Pump-motor (typical)
- 2. Motor terminal-box (typical)
- 3. Gearbox vent filter
- 4. Gearbox oil filler-plug and bonded seal (in filler port)
- 5. Heat exchanger
- 6. Pump-inlet
- 7. End-cover vent filter
- 8. End-cover oil filler-plug and bonded seal (in filler port)
- 9. Thermal snap-switch box
- 10. End-cover oil cooler
- 11. End-cover oil-level sight-glass (2 off*)
- 12. Mounting brackets (4 off)
- 13. Mounting pads (4 off, between items 12 and 14)
- 14. Mounting feet (4 off, box section)
- 15. Cooling-water outlet
- 16. Pump-outlet

- 17. TCV (thermostatic control valve)
- 18. Gearbox oil-level sight-glass (2 off*)
- 19. Cooling-water inlet
- 20. Coupling cover (2 off*)
- 21. Motor fan
- 22. Gearbox oil cooler
- 23. Lifting-bolts (4 off)
- 24. Shaft-seals purge pipelines
- 25. Shaft-seals purge inlet
- 26. Sight-glass bezel
- 27. Temperature measurement area
- 28. Earth (ground) stud
- 29. Nut (on tube fitting)
- 30. Vent filter body top

* One on each side of the pump

Note: This Figure shows a CDX with integral flame arrestors. The inlet and outlet configuration on a CDX without integral flame arrestors is as shown in Figure 1.

Figure 3 - The CDX Pump (Sheet 2 of 2)



Non hazardous gases and vapours do not constitute a hazard should they leak into the external environment or should the pump develop an inward air leakage, this could include one or more of the following:

- Vapours
- Inert gases
- Materials below the lower flammability limit
- Non toxic materials
- Non corrosive materials.

Pumps that are suitable for pumping non hazardous gases and vapours cannot be guaranteed not to leak small amounts of gas (greater than 10^{-3} mbar l s) into or out of the pump, therefore it has to be assumed that there is the possibility for some pumped gases to be present in the external atmosphere.

Note: *Where pumps suitable for non hazardous gases and vapours are used to pump inert gases they should be located in a well ventilated area in order to avoid the possibility of asphyxiation.*

The CDX pumps are suitable for Hazardous Area operation. Refer to your CDX Pumping System Instruction Manual which will specify the technical specification and hazard classification of your system.

IDX pumps are only suitable for Safe Area operation: see [Section 1.9.2](#).

1.8 Accessories

A number of accessories are available for the CDX and IDX pumps; use these to configure the pump for specific applications.

These accessories are listed in [Section 7.4](#).

1.9 Normal/abnormal operation

1.9.1 Normal operation: CDX pumps

In normal operation, depending on the flame arrestors fitted and the level of systemisation, CDX pumps are safe to handle gases as follows:

External

Category 2, IIC, 160°C (T3)

Internal

Category 1, IIB, IIB3, T4

If your CDX pump is part of a hazardous area system, it may be fitted with integral or external flame arrestors: refer to your CDX Pumping System Instruction Manual.

If your CDX pump is part of an ATEX system, it may be fitted with integral or external flame arrestors: refer to your ATEX System Instruction Manual.

1.9.2 Normal operation: IDX pumps

IDX pumps are designed for Safe Area applications only.

You must not use IDX pump in hazardous areas, or for pumping hazardous gases/dusts.

1.9.3 Abnormal operation: CDX and IDX pumps



WARNING

Misuse of the CDX or IDX pump as described below is strictly prohibited.

- Use of the pump as a positive pressure compressor.
- Use of the pump while subjected to high back-pressure (for example, caused by a blockage in the exhaust pipeline). Refer to [Section 2.2](#) for the system limitation.
- Pumping gases that cause the inlet flame arrestor (where fitted) or associated pipelines to exceed a surface temperature of 60°C (140°F).
- Reverse rotation of the pump.
- Pumping hydrocarbon oxides.
- Pumping gases that tend to self-decompose, or that are chemically unstable.
- Pumping of group IIC gases.
- Use of the pump with materials which have auto-ignition temperatures below the defined temperature rating.
- Operation such that the pump inlet temperature falls below the dew point of a flammable vapour being pumped. This could lead to condensate that can collect and lead to the risk of corrosion or an ignition hazard.
- Pumping of, or use of the pump in the presence of, explosive dust atmospheres.
- Use of the pump in ambient conditions other than those specified in [Section 2.1](#).
- Pumping pyrophoric gases.
- Use with oxygen enriched atmospheres.
- Use in an external atmosphere where there is a potentially flammable dust atmosphere.
- Use of the pump in a potentially explosive external atmosphere, unless the pumping system is certified as compliant with ATEX Directive 94/9/EC (European Union only).

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2 Technical data

2.1 Operating and storage conditions

Table 1 - Operating and Storage Conditions

Ambient operating temperature range*	-20 to 40°C (-4 to 104°F)
Ambient storage temperature range	-20 to 50°C (-4 to 122°F)
Maximum ambient operating humidity	90% RH
Maximum operating altitude	1000 m (3300 ft)
Typical warm-up time†	90 minutes
Cool-down time (to a safe temperature for maintenance)	3 hours
Normal surface temperature of the pump at ultimate vacuum:	
Case (water jacket)	65 to 90°C (149 to 194°F)
End cover and gearbox (oil)	80 to 105°C (176 to 221°F)
Typical continuous A-weighted sound pressure level at ultimate vacuum	82 dB(A)

* Consult Edwards for advice on operation of the pump in ambient temperatures below -5°C (23°F).

† To a pump case temperature of 65°C (149°F).

2.2 Performance

Table 2 - Performance Data

	CDX/IDX1000	IDX1300
Minimum pumping speed	800 m ³ h ⁻¹ (470 cfm)	1100 m ³ h ⁻¹ (649 cfm)
Displacement (swept volume)	1110 m ³ h ⁻¹ (655 cfm)	1440 m ³ h ⁻¹ (850 cfm)
Ultimate vacuum	5 x 10 ⁻² mbar, 5 Pa, 0.04 Torr	5 x 10 ⁻² mbar, 5 Pa, 0.04 Torr
Pump rotational speed	4300 r min ⁻¹ (4300 r.p.m.)	5185 r min ⁻¹ (5185 r.p.m.)
Maximum outlet pressure	1.15 bar absolute, 1.15 x 10 ⁵ Pa, 16.7 psi	1.05 bar absolute, 1.05 x 10 ⁵ Pa, 15.3 psi

2.3 Mechanical data

Table 3 - Mechanical Data

Dimensions	See Figures 4, 5 and 6	
CDX1000 mass (maximum) 30 kW, 50 Hz, Flameproof with Flame Arrestors 40 h.p., 60 Hz, Flameproof with Flame Arrestors 30 kW, 50 Hz, Flameproof 40 h.p., 60 Hz, Flameproof	Pump and motor 1810 kg (3985 lb) 1805 kg (3965 lb) 1710 kg (3765 lb) 1705 kg (3745 lb)	Motor only 310 kg (685 lb) 305 kg (665 lb) 310 kg (685 lb) 305 kg (665 lb)
IDX1000 mass (maximum) 22 kW, 50 Hz, Safe Area 30 h.p., 60 Hz, Safe Area 30 kW, 50 Hz, Safe Area 40 h.p., 60 Hz, Safe Area IDX1300 30 kW Safe Area IDX1300 40 h.p. Safe Area	Pump and motor 1575 kg (3460 lb) 1630 kg (3585 lb) 1640 kg (3610 lb) 1705 kg (3745 lb) 1640 kg (3610 lb) 1705 kg (3745 lb)	Motor only 175 kg (380 lb) 230 kg (505 lb) 240 kg (530 lb) 305 kg (665 lb) 240 kg (530 lb) 305 kg (665 lb)
Cleaning solution required to flood the pump cavities (see Section 5.9)	40 l (10.56 US gal)	

2.4 Electrical data

Note: The CDX temperature sensor is a safety-critical device for ATEX systems. If applicable, refer to your ATEX System Instruction Manual for details.

Table 4 - Electrical Data

Nominal electrical supply Voltage tolerance Full load current No load current	Refer to the motor manual supplied with the pump Refer to the motor manual supplied with the pump Refer to the motor manual supplied with the pump Refer to the motor manual supplied with the pump
Starting current/time Recommended electrical supply cable size	Refer to the motor manual supplied with the pump Refer to the motor manual supplied with the pump
Temperature sensor (CDX only: see Note above) Supply voltage Signal current	24 V d.c. 4 to 20 mA
Thermal snap-switches (IDX only) contact ratings Maximum voltage Maximum current (resistive load)	24 V a.c./d.c. 2 A

2.5 Lubrication data

Note: An Edwards Material Safety Data Sheet for the oil referenced below is available on request.

Table 5 - Lubrication Data

Gearbox	
Oil capacity	
Minimum	5 l (1.32 US gal)
Maximum	5.5 l (1.45 US gal)
Recommended oil (supplied)	Mobil SHC 629
End-cover	
Oil capacity	
Minimum	5 l (1.32 US gal)
Maximum	5.5 l (1.45 US gal)
Recommended oil (supplied)	Mobil SHC 629

2.6 Shaft-seals purge gas supply

Note: Your compressed gas supply must be dry.

You must use a nitrogen purge if you operate a CDX pump with an oil temperature (measured on the end cover) higher than 95°C (203°F): see Section 3.12.

Table 6 - Shaft-Seals Purge Gas Supply Data

Suitable compressed gases	Dry air or nitrogen
Purge gas supply pressure	2 to 10 bar, 2×10^5 to 1×10^6 Pa, 29 to 145 psi
Regulated pressure to shaft-seals*	0.3 to 0.5 bar, 3×10^4 to 5×10^4 Pa, 5 to 7 psi

* Above exhaust back-pressure

2.7 Cooling-water supply

Table 7 - Cooling-Water Supply Data

Supply temperature range	5 to 35°C (41 to 95°F)
Maximum supply pressure	10 bar, 1×10^6 Pa, 145 psi
Minimum flow rate*	10 l min^{-1} , 2.64 US gal min^{-1}
Typical heat removed from pump	10 kW (13.4 h.p.)

* With a supply temperature of 20°C (68°F).

2.8 Temperature control system



WARNING

If your CDX pump is part of an ATEX system, there may be an operating case temperature limit. Refer to the ATEX System Instruction Manual for details.

Note: *The CDX temperature sensor senses the temperature of the oil in the end cover, and is a safety-critical device for ATEX systems. If applicable, refer to your ATEX System Instruction Manual for details.*

Table 8 - Temperature Control System Data

Water cooling system	
Type	Indirect water-to-coolant heat exchanger
Coolant capacity	50 l (13.2 US gal)
TCV (Thermostatic Control Valve)	
Sensor operating temperature range	10 to 80°C (77 to 176°F)
Maximum sensor temperature	130°C (266°F)
CDX temperature sensor (see Note above)	
Type	Platinum resistance thermometer (PRT)
Sensing range	0 to 200°C (32 to 392°F)
IDX warning thermal snap-switch	
Opening temperature	88°C (190°F)
Closing temperature	78°C (172°F)
IDX shut-down thermal snap-switch	
Opening temperature	95°C (203°F)
Closing temperature	85°C (185°F)

2.9 Connections

Table 9 - Connections

Process connections	
Pump-inlet	150 DIN* or 6 inch ANSI†
Pump-outlet	80 DIN* or 3 inch ANSI†
Recommended inlet and outlet seals	PTFE envelope gaskets: Klinger milled type with a 1.5 mm (0.06 inch) full-face insert
Cooling-water connections	
Supply inlet	½ inch BSP male* or ½ inch NPT male†
Return outlet	½ inch BSP male* or ½ inch NPT male†
Shaft-seals purge gas inlet	¼ inch compression

* 50 Hz pumps

† 60 Hz pumps

2.10 Coolant

The pump is supplied filled with Edwards coolant which is monopropylene based, and is both an antifreeze and a corrosion inhibitor. Spare Edwards coolant is available: refer to [Section 7.3](#). A Material Safety Data Sheet for the coolant is available on request.

If you will use another coolant type to replenish lost coolant:

- It must prevent the formation of visible oxide sludge and scale deposits.
- It must provide frost protection down to a temperature of -14°C (7°F), when mixed in accordance with the manufacturer's recommendations.
- It must be compatible with the materials of construction of the cooling system; that is: SG iron, copper, brass, aluminium, stainless steel, rubber (hoses) and fluoroelastomer (Viton) seals.
- It must comply with the requirements of BS 6580-1992 and BS 5117.
- It must be based on monopropylene glycol or ethylene glycol fluid.
- It must not contain amines.

The coolants shown in [Table 10](#) may be suitable for use in the CDX and IDX pumps. All of these coolants are amine free, automotive grade, ethylene glycol antifreezes and must be diluted to between 35% to 50% by volume with water to provide the required cooling protection. However, we recommend that you use Edwards coolant; Edwards cannot guarantee that other types of coolant will provide the best corrosion protection for the pump.

Table 10 - Possible Alternative Coolants

Manufacturer	Product
BP (Chemicals) Texaco Lubricants Castrol	NAPGEL C2230 (Universal) Texaco Engine Coolant ETX 6024 Castrol Antifreeze

2.11 Materials of construction

Note: A Material Safety Data Sheet for Fluoroelastomer (Viton) is available on request.

Table 11 - Construction Materials

Component	Material(s)
Stators and W/C plates	SG iron
Rotors	SG iron
Gear/end-covers	SG iron
Inlet flange and exhaust manifold	SG iron
Coupling cover	Grey iron
Bearings, gears and oil pumps	Steel
Layshaft	Steel
Heat exchanger	Aluminium/copper
Oil coolers and pipelines	Stainless steel
Coolant pump	SG iron/PPS/Neodymium magnets
Hoses	Rubber
Hose fittings	Brass/iron
Seals purge pipelines and fittings	Stainless steel
Shaft seals	PTFE (polytetrafluoroethylene)
O-rings	Fluoroelastomer (Viton)
Flame arrestor housings	SG iron
Flame arrestor elements	Stainless steel

Figure 4 - IDX1000 Dimensions: mm (inch) (key)

- A. Side view
- B. Plan view
- C. End view
- D. Front fixing dimensions with mounting feet removed

- 1. Pump inlet
- 2. Pump outlet
- 3. Fixing-holes: Ø18 mm (0.71 inch), 2 holes on each mounting foot
- 4. Fixing-holes: Ø17 mm (0.67 inch), 2 holes on each mounting bracket

Figure 4 - IDX1000 Dimensions: mm (inch)

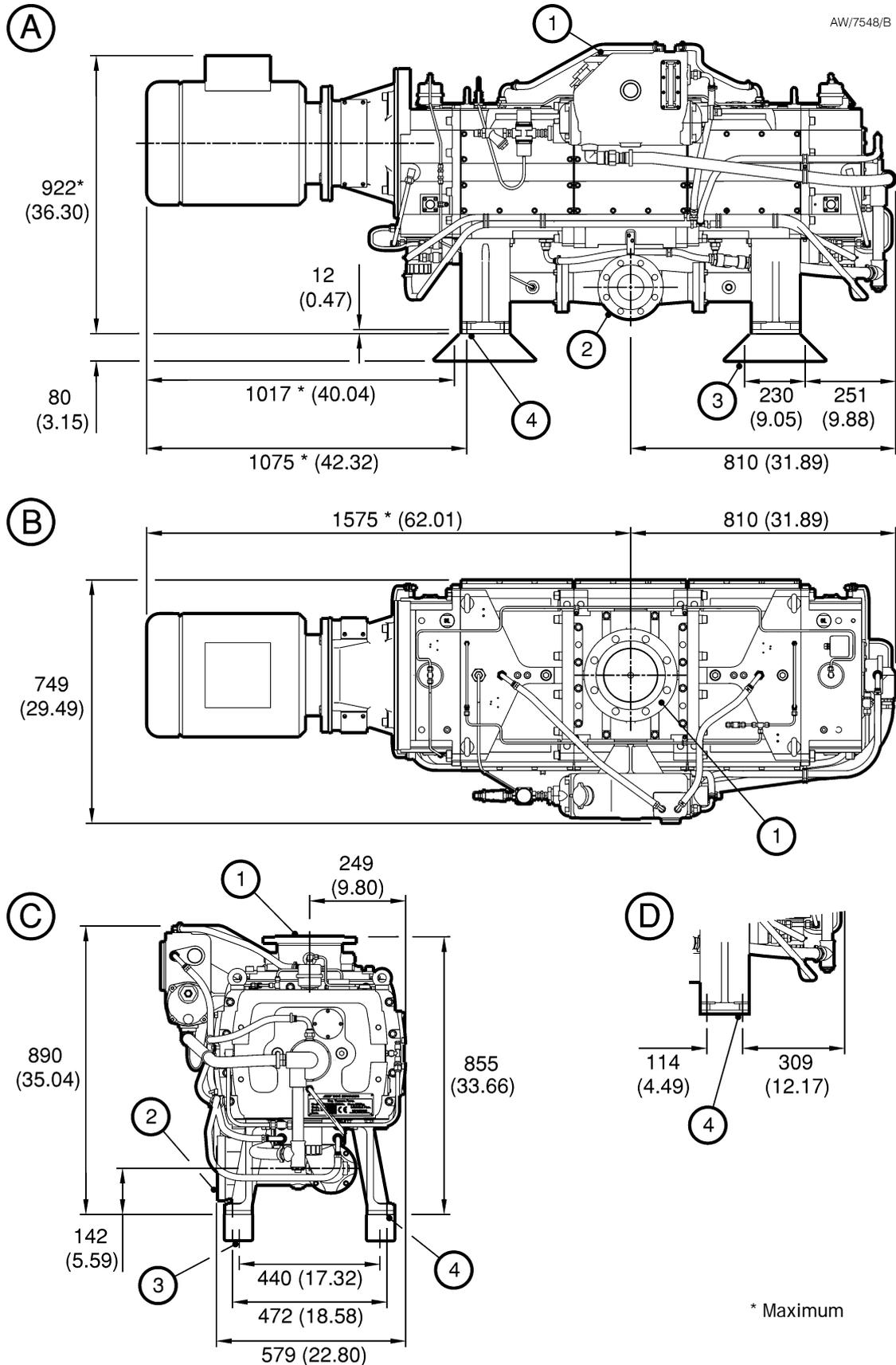
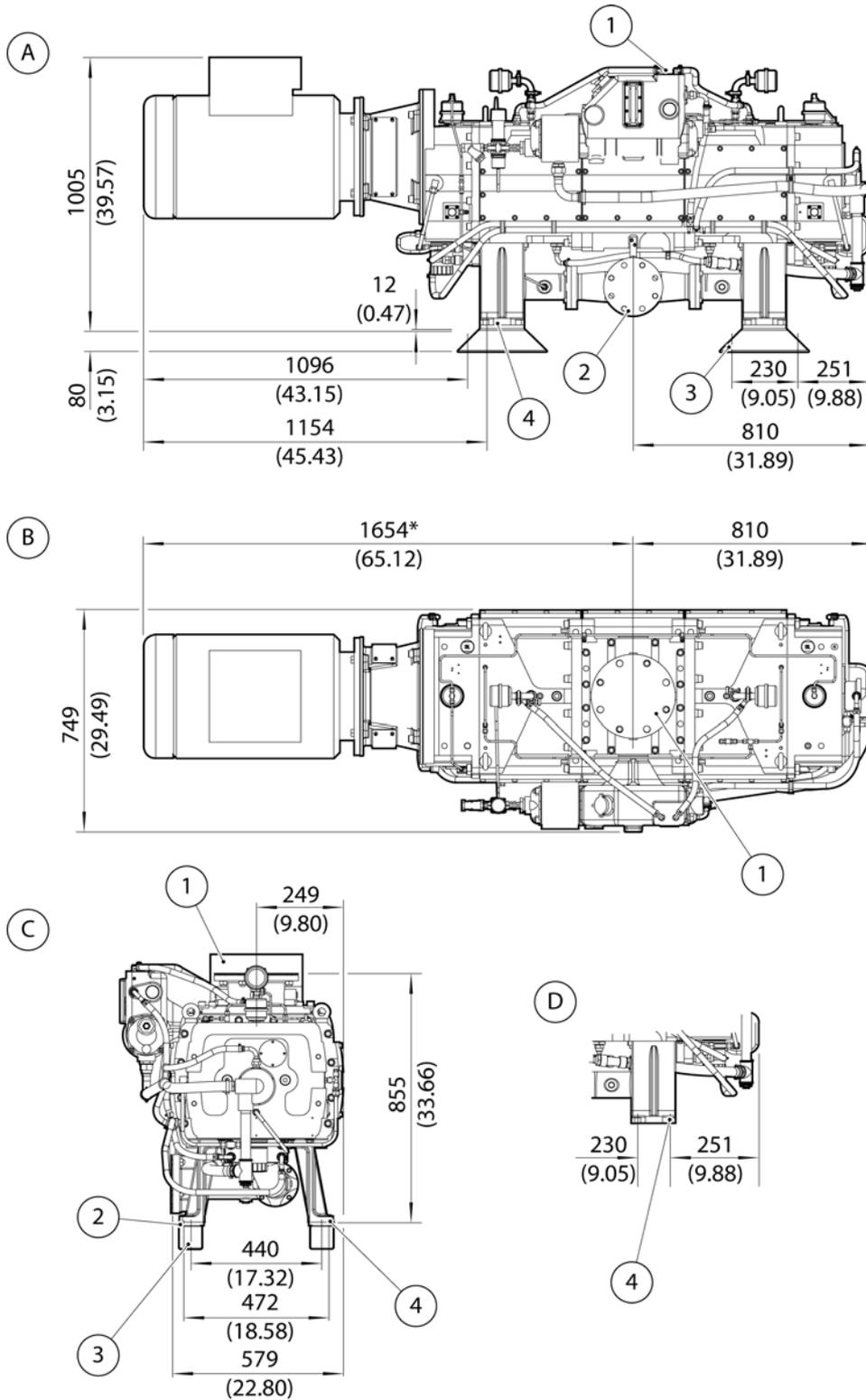


Figure 5 - IDX1300 Dimensions: mm (inch)



* Maximum

AS/1316/A

Figure 5 - IDX1300 Dimensions: mm (inch) (key)

- A. Side view
 - B. Plan view
 - C. End view
 - D. Front fixing dimensions with mounting feet removed
-
- 1. Pump inlet
 - 2. Pump outlet
 - 3. Fixing-holes: $\varnothing 18$ mm (0.71 inch), 2 holes on each mounting foot
 - 4. Fixing-holes: $\varnothing 17$ mm (0.67 inch), 2 holes on each mounting bracket

Figure 6 - CDX Dimensions: mm (inch)

AW/7549/B

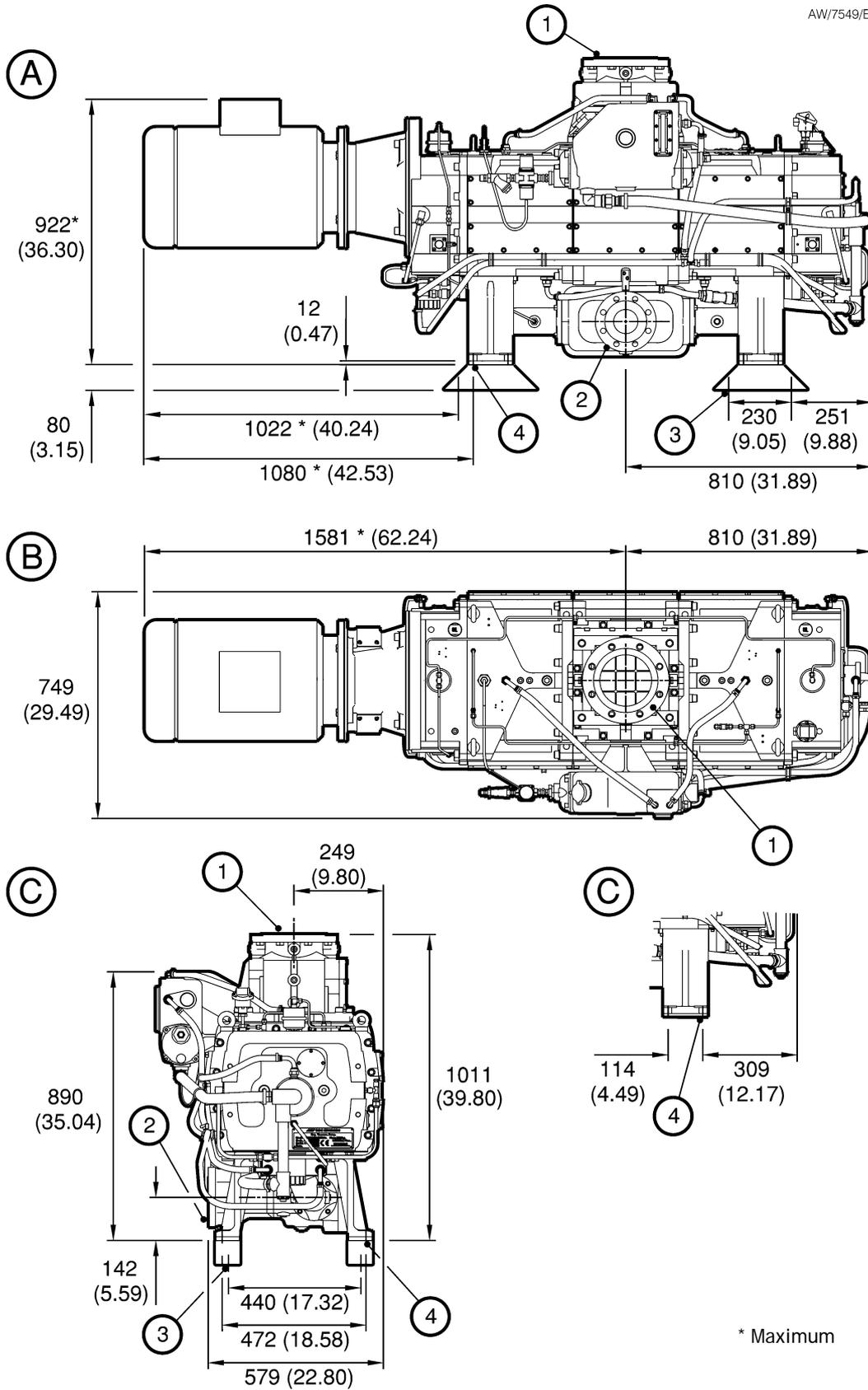


Figure 6 - CDX Dimensions: mm (inch) (key)

- A. Side view
 - B. Plan view
 - C. End view
 - D. Front fixing dimensions with mounting feet removed
-
- 1. Pump inlet
 - 2. Pump outlet
 - 3. Fixing-holes: Ø18 mm (0.71 inch), 2 holes on each mounting foot
 - 4. Fixing-holes: Ø17 mm (0.67 inch), 2 holes on each mounting bracket

Note: *This Figure shows a CDX with integral flame arrestors. The inlet/outlet dimensions on a CDX without integral flame arrestors are as shown in Figure 4.*

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3 Installation

3.1 Safety



WARNING

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

- A suitably trained and supervised technician must install your CDX or IDX pump.
- Ensure that the installation technician is familiar with the safety procedures which relate to the products pumped. Wear the appropriate safety-clothing when you come into contact with contaminated components. Dismantle and clean contaminated components inside a fume-cupboard.
- Vent and purge the process system before you start installation work.
- Check that all the required components are available and of the correct type before you start work.
- Disconnect the other components in the process system from the electrical supply so that they cannot be operated accidentally.
- Do not reuse O-rings if they are damaged.

3.2 Unpack and inspect the pump



WARNING

Use suitable lifting equipment to move the pump. If you do not, you can injure yourself or damage the pump. Refer to [Section 2.3](#) for the mass of the pump.

Use the following procedure to unpack and inspect the pump.

1. Use a fork-lift truck or a pallet truck to place the pallet in a convenient position.
2. Remove the packing material from around the pump.
3. Inspect the pump. If the pump is damaged, notify your supplier and the carrier in writing within three days; state the Item Number of the pump together with your order number and your supplier's invoice number. Retain all packing materials for inspection. Do not use the pump if it is damaged.
4. Check that you have also received a pack containing four mounting pads. If the mounting pads are missing, notify your supplier in writing within three days.

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

3.3 Locate the pump



WARNING

Use suitable lifting equipment to move the pump. If you do not, you can injure yourself or damage the pump. Refer to [Section 2.3](#) for the mass of the pump.



WARNING

Ensure that the pump tilts no more than 15° from vertical. If it does, it may topple and cause injury to people or damage to equipment.

CAUTION

Ensure that the pump is mounted, and levelled as described in [Section 3.3.1](#) to [3.3.3](#) below. If you do not, you may distort the pump casing and damage the pump.

CAUTION

Ensure that the cooling-air flow around the pump is not restricted. If the flow is restricted, the pump may overheat during operation.

3.3.1 Introduction

Before you locate the pump:

- Ensure that the installation area is clean and free from debris and contamination (such as oil).
- Ensure that the surface on which the pump will be installed is firm and level.
- Ensure that there is sufficient space around the pump for safe access during installation, operation and maintenance.
- If the pump is to be bolted down ensure that you have suitable fixing bolts available. You must use eight M16 (5/8 inch) bolts with shakeproof washers, or other suitable anchor bolts of the same size.

You can locate the pump directly on the floor, on a base frame, or on a steel frame.

To locate the pump directly on the floor, you must use a suitable concrete foundation, and:

- The mass of the foundation should be at least (1.5 pump mass): see [Section 2.3](#).
- The length and width of the foundation must extend at least 100 mm (4 inches) beyond the length and width of the pump: see [Figure 4](#), [5](#) and [6](#).
- The surface of the foundation must be level to within 1 mm m⁻¹ (0.012 inch ft⁻¹).

To locate the pump on a base frame, fit suitable steel pads to the base frame, positioned so that the pump mounting feet will fit on the steel pads.

To locate the pump on a steel frame, you must ensure that the frame sections are suitably sized to support the pump.

Refer to [Figure 1](#), [2](#) or [3](#). The pumps have mounting brackets (12), and are supplied fitted with mounting pads (13) and mounting feet (14). The mounting feet are designed to enable easy installation of the pump, without distortion of the pump casing, as long as you correctly locate the pump as described in [Section 3.3.2](#).

Alternatively, you can locate the pump without the mounting feet, as described in [Section 3.3.3](#).

3.3.2 Locate the pump on its mounting feet

Use the following procedure to locate the pump on its mounting feet:

1. Refer to Figure 1, 2 or 3. Use suitable lifting-equipment attached to the four lifting-bolts (23) to move the pump into its operating location.
2. Level the pump to within 1 mm m^{-1} ($0.012 \text{ inch ft}^{-1}$), measured across the pump-inlet (6). If necessary, fit shims under the mounting feet (14), next to the fixing holes in the feet.
3. If the pump is to be bolted down, when the pump is level:
 - Fit a fixing bolt through the two fixing holes in each of the four pump mounting feet (14).
 - Tighten the bolts to a torque of 100 N m (74 lbf ft).

3.3.3 Locate the pump without the mounting feet

Use the following procedure to locate the pump without its mounting feet:

1. Refer to Figure 1, 2 or 3. Use suitable lifting-equipment attached to the four lifting-bolts (23) to lift the pump off of the ground.
2. For each mounting foot (14): undo and remove the two M16 bolts, nuts and washers which secure the mounting foot (14) to the corresponding mounting bracket (12), then remove the mounting foot and mounting pad (13).
3. Use the lifting equipment to move the pump into its operating location: fit one of the mounting pads (13) under each of the four pump mounting brackets (12).
4. Level the pump to within 0.5 mm m^{-1} ($0.006 \text{ inch ft}^{-1}$), measured across the pump-inlet (6). If necessary, fit large shims, the same size as the mounting pads, between the mounting pads and the pump mounting brackets (12).
5. If the pump is to be bolted down, for each pump mounting bracket (12):
 - Fit a suitable fixing bolt through one of the fixing holes in the mounting bracket and pad, into the surface on which the pump is mounted.
 - Tighten the fixing bolt while you use a dial gauge to measure the free movement of the mounting bracket relative to the mounting surface.
 - If the free movement is $> 0.5 \text{ mm}$ (0.02 inch), fit a shim (or shims) in order to reduce the free movement to 0.5 mm (0.02 inch) or less.
 - Loosen the fixing bolt, and repeat this Step to check the next mounting bracket.
6. When the free movement of all four mounting brackets is 0.5 mm (0.02 inch) or less:
 - Fit a second fixing bolt to each of the four pump mounting brackets.
 - Tighten all eight of the fixing bolts to a torque of 100 N m (74 lbf ft).

3.4 Check the coolant level

CAUTION

Ensure that you correctly fill the pump with coolant, as described below. If you do not, an air-lock may develop in the cooling-jacket and the pump may overheat.

Note: Edwards coolant is available as a spare: refer to [Section 7.3](#).

The pump is supplied filled with coolant. Use the following procedure to check the coolant level before you operate the pump:

1. Refer to [Figure 7](#), detail B. Press down the coolant filler-cap (6), turn it anticlockwise and remove it from the heat exchanger (2).
2. Remove any dirt or water-scale from the seal of the filler-cap (6) and from the filler-tube (5).
3. Check the level of coolant in the coolant level sight-glass (3); if it is below the minimum level, continue at Step 4, otherwise continue at Step 7.
4. Remove the cap from a new container of coolant. Place a clean funnel into the container and fill the container with clean water.
5. Replace the cap on the container, shake the container to fully mix the water and coolant, then remove the cap.
6. Pour the coolant mixture through the filler-tube (5) and into the heat exchanger until the coolant level reaches the filler-tube. Repeat Steps 4 to 6 to mix and add more coolant as necessary.
7. Refit the coolant filler-cap (6); press it down and turn it clockwise to secure it to the pump.
8. Check the pump for obvious signs of a coolant leak. If there are signs of a coolant leak, contact your supplier or Edwards for advice.

3.5 Check the oil levels

The pump is supplied filled with oil. Before you operate the pump, use the following procedures to check the oil levels in the pump.

3.5.1 Check the gearbox oil-level

Check that the gearbox oil-level is correct. Refer to [Figure 1](#), [2](#) or [3](#) for the locations of the two gearbox oil-level sight-glasses (18) on the pump:

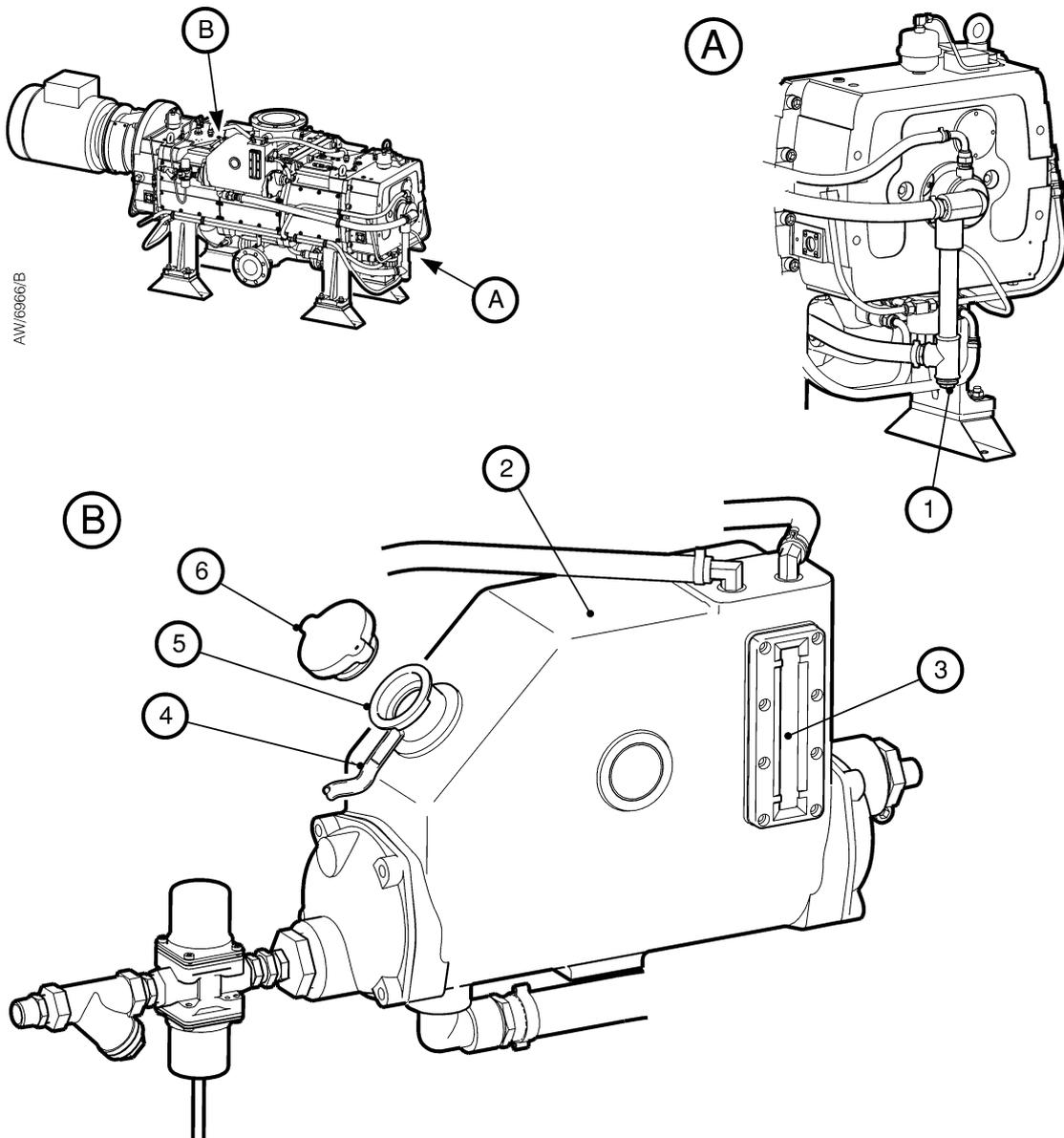
- See detail D. The oil-level must be between the MIN and MAX marks on the bezel (26) of either of the two oil-level sight-glasses.
- If necessary, pour more oil into the gearbox: refer to [Section 5.3.1](#).

3.5.2 Check the end-cover oil level

Check that the end-cover oil-level is correct. Refer to [Figure 1](#), [2](#) or [3](#) for the locations of the two end-cover oil-level sight-glasses (11) on the pump:

- See detail D. The oil-level must be between the MIN and MAX marks on the bezel (26) of the end-cover oil-level sight-glass.
- If necessary, pour more oil into the end-cover: refer to [Section 5.3.2](#).

Figure 7 - Fill the Pump with Coolant



AW/6966/B

- | | |
|------------------------------|--------------------------|
| 1. Coolant drain-plug | 4. Coolant overflow pipe |
| 2. Heat exchanger | 5. Coolant filler-tube |
| 3. Coolant level sight-glass | 6. Coolant filler-cap |

3.6 Connect the temperature sensor (CDX pumps only)



WARNING

You must connect the temperature sensor to a suitable control circuit to shut down the pump when it overheats. If you do not, the system will not be ATEX compliant (if applicable), you can damage the pump, and there may be a risk of explosion or fire.



WARNING

Incorporate a manual reset device in your control equipment. If you do not (and the temperature sensor causes the control circuit to shut down the pump), the pump will automatically switch on again when it cools down. If you have started maintenance or fault finding on the pump, there will then be a risk of fire or explosion and injury to people.

CAUTION

Ensure that you route the temperature sensor cable away from hot surfaces of the pump or other equipment. If you do not, the cable may be damaged.

The temperature sensor measures the oil temperature in the end cover. You must connect the output of the sensor to a suitable control circuit to shut down the pump when it reaches an unsafe temperature.

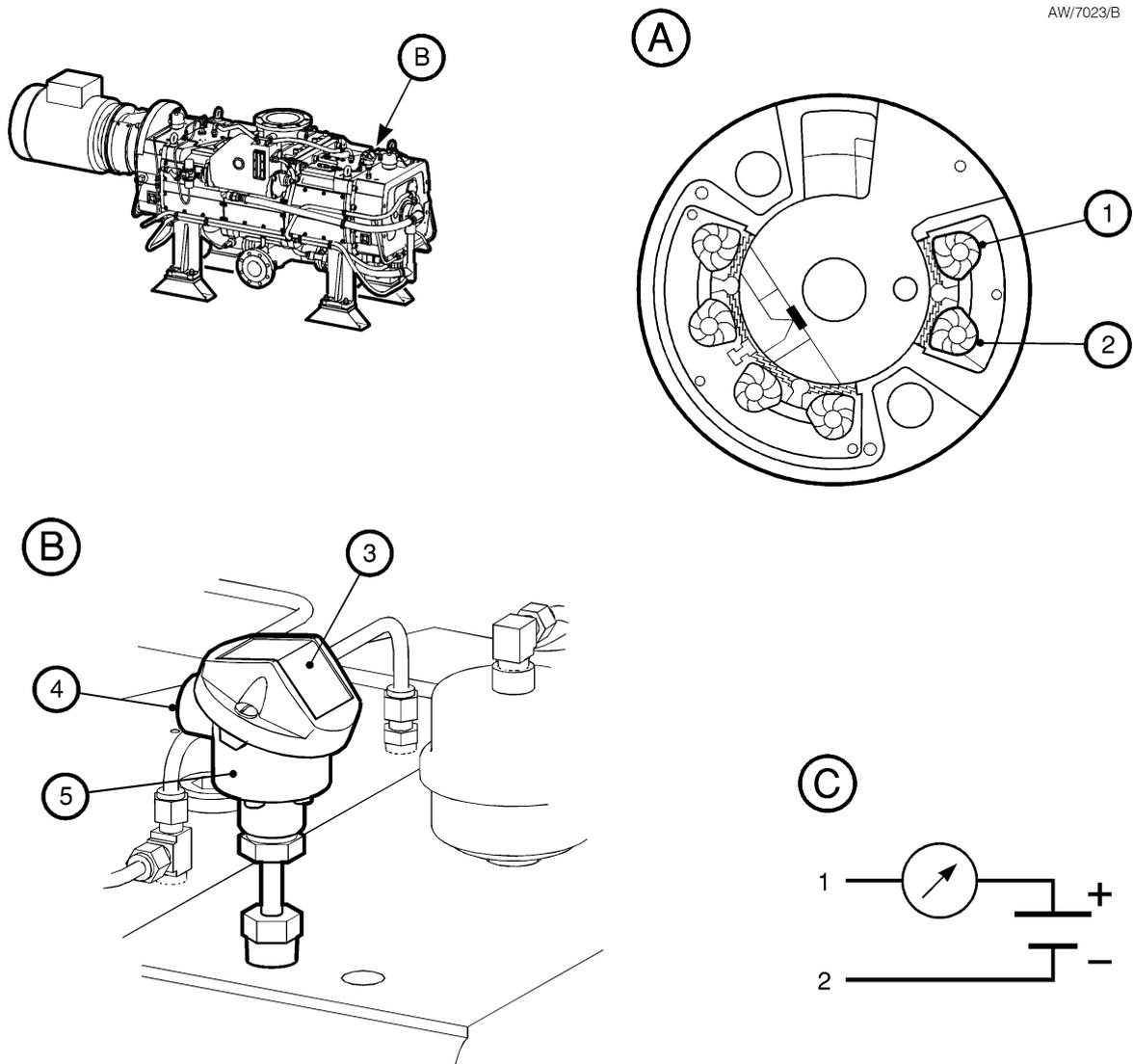
Set the trip setpoint of your control circuit (that is, the temperature setpoint at which your control circuit will shut down the pump) as follows:

- For safe area and non-ATEX compliant systems, you must set the trip setpoint to 95°C (203°F) when you use an air shaft-seals purge, and 115°C (239°F) when you use nitrogen shaft-seals purge.
- For ATEX compliant systems, the trip setpoint will be defined in the ATEX System Instruction Manual.

Connect the temperature sensor as follows:

1. Refer to [Figure 8](#), detail B. Remove the top cover (3) from the sensor (5).
2. Fit a suitable cable-gland to the cable leadthrough hole (4).
3. Pass a suitable two-wire control cable through the cable-gland and into the sensor.
4. Refer to detail A. Connect the two control cable wires to terminals 1 and 2 (1, 2), as shown in the circuit schematic in detail C.
5. Tighten the cable-gland, then refit the top cover (3).
6. Connect the other ends of the two control cable wires to your control circuit.

Figure 8 - Connect the CDX Temperature Sensor



- A. Interior of the sensor
- B. General view
- C. Circuit schematic

- 1. Terminal 1
- 2. Terminal 2
- 3. Top cover
- 4. Cable leadthrough hole
- 5. Temperature sensor

3.7 Connect the thermal snap-switches (IDX pumps only)



WARNING

You must connect the shut-down thermal snap-switch so that the pump stops when the thermal snap-switch opens. If you do not, there may be a risk of fire.



WARNING

Incorporate a manual reset device in your control equipment. If you do not (and a fault which causes the shut-down thermal snap-switch to open is not corrected), the pump will automatically switch on again when it cools down. If you have started maintenance or fault finding on the pump, there will then be a risk of injury to people.

CAUTION

Ensure that you route the thermal snap-switch cable away from hot surfaces of the pump or other equipment. If you do not, the cable may be damaged.

If required, you can connect the output of the warning thermal snap-switch to your control equipment to provide an indication that the pump is too hot.

You must connect the output of the shut-down thermal snap-switch so that the pump is automatically switched off when it is too hot.

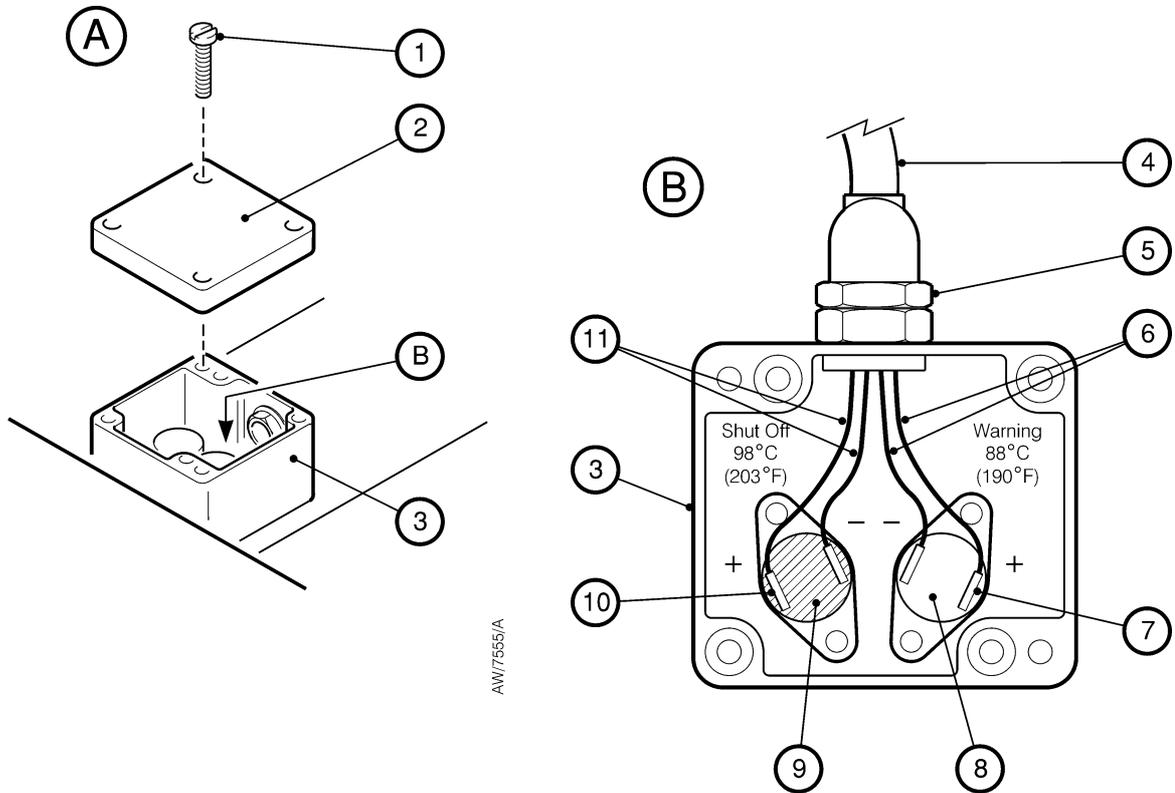
The thermal snap-switches will reset (that is, close again) when the pump cools down to a preset temperature (see [Section 2.8](#)). We therefore recommend that your control equipment incorporates a manual reset device so that the pump does not automatically switch on again when it cools down.

Use the following procedure to connect to the thermal snap-switches. If you connect to the thermal snap-switches as described below, the outputs from the thermal snap-switches will be normally closed and will open when the pump is too hot.

1. Refer to [Figure 9](#). Undo and remove the four screws (1) which secure the cover (2) to the thermal snap-switch box (3), then remove the cover.
2. Remove the plastic bag from inside the box, then open the bag; this bag contains the crimp connectors and insulators you will use to connect to the snap-switches.
3. Pass a suitably rated four-core cable through the cable-gland (5).
4. Fit the crimp connectors to the ends of the four wires in the cable (4), then fit the insulators around the connections.
5. Fit the crimp connectors on one pair of wires (11) to the spade terminals (10) of the shut-down thermal snap-switch (9).
6. Connect the other ends of the same pair of wires:
 - If you will use direct on-line (DOL) starting, connect the wires to the electrical-overload loop of your contactor, so that the contactor will shut down the pump when the snap-switch opens.
 - If you will use an inverter to start the pump, connect the wires to the fault relay input on the inverter, so that the relay will shut down the pump when the snap-switch opens.
7. Fit the crimp connectors on the remaining pair of wires (6) to the spade terminals (7) on the warning thermal snap-switch (8).
8. Connect the other ends of the same pairs of wires to the warning circuit of your control equipment.
9. Tighten the cable-gland (5) to secure the cable in position.

10. Refit the cover (2) and secure with the four screws (1).

Figure 9 - Connect the IDX Thermal Snap-Switches



AW/7555/A

- | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> 1. Screws (4 off) 2. Cover 3. Thermal snap-switch box 4. Four-core cable 5. Cable-gland 6. Warning wires | <ul style="list-style-type: none"> 7. Spade terminals 8. Warning thermal snap-switch 9. Shut-down thermal snap-switch 10. Spade terminals 11. Shut-down wires |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

3.8 Pump-motor electrical connections



WARNING

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



WARNING

You must use suitable flameproof cable-glands to connect the electrical supply and control cables to the pump-motor of CDX pumps. If you do not, the installation will not be flameproof.



WARNING

If your CDX pump is part of an ATEX system, refer to the ATEX System Instruction Manual before you make any of the electrical connections. There may be additional electrical requirements mandated by the ATEX Directive.



WARNING

Incorporate a manual reset device in the pump electrical supply circuit. If you do not, and a fault condition causes a transient failure of the electrical supply, the pump will automatically switch on again when the electrical supply is restored. If you have started maintenance or fault finding on the pump, there will then be a risk of injury to people.

3.8.1 Introduction

Make the electrical connections to the pump-motor as described in the following sections.

We recommend that you connect the electrical supply to the pump-motor through a suitable current monitor, and that you configure the high current setting on the current monitor to switch off the pump-motor at a suitable overload current. This overload current must not exceed the maximum current rating shown on the rating plate on the pump-motor.

The pump motor can be started either Direct On-Line (DOL) or through a suitable inverter.

You must refer to the Motor Instruction Manual (supplied with the pump) for starting and overload protection requirements.

3.8.2 Connect the electrical supply to the pump-motor



WARNING

If your CDX pump is part of an ATEX system, it must be powered by an electrical supply at the rated frequency of the pump-motor, unless your system is specifically designed to operate with a variable speed drive. If this is the case, consult your ATEX System Instruction Manual.

Connect the electrical supply to the pump-motor in accordance with the requirements specified in the Motor Instruction Manual (supplied with the pump).

3.8.3 Connect the thermistor outputs



WARNING

Connect the pump-motor thermistor outputs to a suitable control circuit to isolate the electrical supply when the pump-motor overheats. If you do not, you can damage the pump, and there may be a risk of explosion or fire.



WARNING

Incorporate a manual reset device in your control equipment. If you do not (and a fault which causes the thermistors to shut down the pump is not corrected), the pump will automatically switch on again when the motor windings cool down. If you have started maintenance or fault finding on the pump, there will then be a risk of injury to people.

The motor windings are fitted with thermistors which are terminated in the motor terminal-box. You must connect the thermistor outputs to a suitable control circuit to isolate the electrical supply from the pump-motor and shut down the pump if the windings overheat.

Connect the thermistor outputs to a suitable control circuit in accordance with the requirements specified in the Motor Instruction Manual (supplied with the pump).

3.9 Connect the pump to earth (ground)



WARNING

Connect the pump earth (ground) stud to a suitable earth (ground) point. If you do not, static electricity build-up might provide a source of ignition, and lead to explosion or fire.

1. Refer to Figure 1, 2 or 3, detail E. Connect one end of a suitable earth (ground) conductor to the earth (ground) stud (28).
2. Connect the other end of the conductor to a suitable earth (ground) point in your installation.

3.10 Check the direction of pump rotation



WARNING

You must ensure that the direction of rotation of the pump is correct before you operate the pump. If you do not, and the pump direction of rotation is incorrect, the inlet pipeline will be pressurised and may be damaged and there will be a risk of injury to people or explosion or fire.



WARNING

Keep clear of the pump inlet when you operate the pump. If you do not, there will be a danger of injury or death from the rotating mechanisms of the pump.

1. Refer to Figure 1, 2 or 3. Remove the cover plates fitted to the pump-inlet (6) and pump-outlet (16).
2. Watch the motor fan (21) while you switch on the pump for one or two seconds, then switch the pump off. Note that the correct direction of rotation (which is shown by an arrow on the coupling cover) is clockwise, when viewed from the motor end of the pump.

3. If the motor fan does not rotate in the correct direction:
 - Isolate the pump from the electrical supply.
 - Reverse any two of the electrical supply phase-wires in the pump-motor terminal-box: refer to the motor manual supplied with the pump.
4. Repeat Steps 2 and 3 to ensure that the direction of rotation is now correct.

3.11 Connect the cooling-water supply

Refer to Figure 1, 2 or 3 and connect the cooling-water supply as described below. If you need to connect more than one pump to the water supply, you must connect the pumps in parallel and not in series.

1. Remove the red blanking caps from the cooling-water inlet and outlet connections (19, 15).
2. Fit appropriate pipe fittings (see Section 2.9) to your cooling-water supply and return pipes.
3. Fit the pipe fitting on your cooling-water supply pipe to the water inlet connection (19), then tighten the connection.
4. Fit the pipe fitting on your cooling-water return pipe to the water outlet connection (15), then tighten the connection.

3.12 Connect the shaft-seals purge gas supply



WARNING

Your shaft-seals purge gas supply pressure must comply with the requirements of Section 2.6. If it does not, the shaft-seals purge may not operate correctly, or the purge pipelines may become over-pressurised and may explode.



WARNING

If your CDX pump is part of an ATEX Category 1 system, or part of any system which handles flammable gases in their flammable range, the shaft-seals purge is safety critical, and you must ensure that the purge supply cannot be interrupted during operation. Refer to the ATEX System Instruction Manual for further details.

CAUTION

If you will operate a CDX pump with an oil temperature (measured on the end cover) higher than 95 °C (203 °F), you must use a nitrogen shaft-seals purge. If you do not the shaft seals may be damaged during operation.

Use a rigid metal (such as stainless steel) pipeline with an outside diameter of ¼ inch for your nitrogen or compressed dry air supply. If you will fit an acoustic enclosure, ensure that the pipeline will not obstruct the enclosure.

We recommend that you install an automatically operated isolation-valve in your gas supply pipeline configured so that:

- The shaft-seals purge gas supply is on whenever the pump is on.
- The shaft-seals purge gas supply remains on for a period of at least 30 minutes after the pump is stopped.

Refer to Figure 1, 2 or 3, detail C and use the following procedure to connect your shaft-seals purge gas supply:

1. Remove the red blanking cap from the shaft-seals purge inlet (25)
2. Connect your gas supply pipeline to the inlet.

3.13 Connect the pump inlet and outlet



WARNING

Take all necessary safety precautions when you pump toxic, flammable or explosive gases. If you do not, there will be a danger of injury or death to people.



WARNING

Ensure that your system can provide adequate gas ballast and/or inlet purge to dilute toxic gases to safe limits. If you do not, there will be a risk of emission of dangerous gases.



WARNING

If you will pump flammable and explosive gases, you must use a CDX flameproof pump (use a pump with integral flame arrestors, or fit external flame arrestors) and ensure that your system can provide adequate gas ballast and/or inlet purge to dilute the gases to safe levels. If you do not, there may be a danger of fire or explosion.

Note: If your CDX pump is part of an ATEX system, refer to the ATEX System Instruction Manual for further information when you connect the pump inlet and outlet.

Where there is a risk that corrosive or dangerous condensates may form inside the pumping system, we recommend that you fit suitable heaters to the inlet and outlet pipelines. If necessary, contact Edwards or your supplier for advice.

3.13.1 Connect the pump to your process system

Note: Flame arrestors are available as accessories: refer to [Section 7.4](#).

When you connect the pump to the process system:

- Support process pipelines to stop the transmission of stress to pipeline joints.
- You must be able to isolate the pump from the atmosphere and from your process system if you have pumped or produced dangerous chemicals.
- To get the best pumping speed, ensure that the pipeline which connects the process system to the pump is as short as possible and has an internal diameter not less than the pump-inlet.
- Use a flexible connection in the pipeline from the process system to the pump to reduce vibration and stress in the system pipelines.

Use the following procedure to connect the pump-inlet to your process system. Do not allow debris to get into the pump during installation. Refer to [Figure 1](#), [2](#) or [3](#).

1. As supplied, both IDX pumps and CDX pumps without flame arrestors have an inlet filter in the pump-inlet (6):
 - If you install the pump in a new process system, leave the filter in the pump-inlet to prevent the entry of weld particles or other debris into the pump. You will remove the filter in [Section 5.6](#).
 - If you install the pump in an existing process system which you are sure does not contain any debris which could damage the pump, remove the filter from the pump-inlet.
2. Use suitable bolts to connect the pump-inlet (6) to your process system. Use a suitable PTFE gasket to seal the connection. We recommend that you use the gasket type specified in [Section 2.9](#).

3.13.2 Connect the pump-outlet



WARNING

Connect the pump outlet to a suitable exhaust treatment plant, to prevent the discharge of dangerous gases and vapours into the surrounding atmosphere.



WARNING

Incorporate safety devices to prevent operation of the pump when the exhaust pipeline is restricted or blocked. If you do not, the exhaust pipeline may become over-pressurised and may burst.

CAUTION

Install an outlet catchpot to prevent the drainage of condensate back into the pump. If you do not, condensate which drains back into the pump may damage it or cause it to seize.

Use suitable bolts to connect the pump-outlet (Figure 1, 2 or 3, item 16) to your exhaust system. Use a suitable PTFE gasket to seal the connection. We recommend that you use the gasket type specified in Section 2.9.

Your exhaust pipeline system must be designed so that the pressure in the pipeline during pump operation is less than 1.15 bar absolute (1.15×10^5 Pa, 16.7 psi) for the CDX/IDX1000 and less than 1.05 bar absolute (1.05×10^5 Pa, 15.25 psi) for the IDX1300. If the pressure in the pipeline is higher than this pressure, the pump will operate at a high temperature and may trip (because of excessive electrical current consumption) or seize.

Support the exhaust pipelines to prevent the transmission of stress to the pipeline coupling-joints.

If you use flexible bellows, you must ensure that you use bellows which have a maximum pressure rating which is greater than the highest pressure that can be generated in your system.

3.14 Leak test the system



WARNING

Leak-test the system after installation and seal any leaks found to prevent the leakage of dangerous substances out of the system and leakage of air into the system.

Leak-test the system after installation and seal any leaks found. Substances which leak from the system may be dangerous to people and there may be a danger of explosion if air leaks into the system.

The leak rate of the pump is tested to be less than 1×10^{-3} mbar l s⁻¹ (1×10^{-1} Pa l s⁻¹, 7.5×10^{-2} Torr l s⁻¹) when supplied. The required leak rate for your system will depend on your safety and process requirements.

If required, contact your supplier or Edwards for advice.

3.15 Commission the pump

3.15.1 Commissioning procedure

1. Isolate the pump from your process system.
2. Turn on the cooling-water supply and your exhaust-extraction system.
3. Turn on the shaft-seals purge gas supply.

4. Check that there are no leaks in the water, gas system, and exhaust-extraction system connections. Seal any leaks found.
5. As supplied, the TCV (Figure 1, 2 or 3, item 17) is adjusted to provide a pump case (water jacket) operating temperature of 65°C (149°F), with a corresponding oil temperature (measured at point 27) of 80°C (176°F).

Refer to Section 3.15.2 if you want to operate the pump at a different temperature.

6. Switch on the pump.
7. Check that the pressure shown on your shaft-seals purge pressure gauge is between 0.34 and 0.48 bar (3.4 x 10⁴ and 4.8 x 10⁴ Pa, 4.9 and 6.9 psi) above the exhaust back pressure.
8. Leave the pump to operate for approximately 90 minutes to allow the pump operating temperature to stabilise.
9. Check that the pump operating temperature is correct. If necessary, adjust the TCV to change the pump operating temperature (refer to Section 3.15.2).
10. Turn off the pump.
11. Turn off the shaft-seals purge gas supply and the cooling-water supply.

3.15.2 Adjust the TCV (thermostatic control-valve)

Note: The minimum pump operating temperature of 65°C (149°F) stated in Table 12 is with a cooling-water flow of 10 l min⁻¹ (2.6 US gal min⁻¹) and with a cooling-water supply temperature of 20°C (68°F).

Refer to Table 13 and 14 for the full operating temperature range of the pump.

The TCV regulates the flow of water through the water cooling system to maintain the pump at the required operating temperature and is adjustable between 0 (minimum) and 5 (maximum). These TCV settings correspond to the pump operating temperatures shown in Table 12.

If you need to adjust the TCV to suit your operating conditions, turn the adjuster knob on the TCV (Figure 1, 2 or 3, item 17) clockwise or anticlockwise to the position corresponding to your required pump operating temperature. Note that it takes approximately 90 minutes for the pump to stabilise at its final operating temperature.

Table 12 - TCV Settings

Pump operating temperatures		TCV setting
Case (water jacket)	End cover/gearbox (oil)	
65°C (149°F)	80°C (176°F)	3.25
75°C (167°F)	90°C (194°F)	3.5
90°C (194°F)	105°C (221°F)*	4.3

* CDX pumps only. You cannot operate IDX pumps at this temperature.

CAUTION

The maximum back pressure (absolute) for the IDX1300 is 1.05 bar (1.05×10^5 Pa).

Table 13 - Minimum Pump Operating Temperatures (°C)

Cooling-water temperature	Minimum operating temperatures #	Back pressure (absolute)			
		1 bar 1×10^5 Pa	1.05 bar 1.05×10^5 Pa	1.1 bar 1.1×10^5 Pa	1.15 bar 1.15×10^5 Pa
5	Case *	61	62	63	64
	Oil †	77	79	80	81
10	Case *	63	65	66	67
	Oil †	80	82	83	84
15	Case *	65	67	69	70
	Oil †	83	85	86	87
20	Case *	68	69	72	73
	Oil †	85	87	88	89
25	Case *	72	74	76	77
	Oil †	88	90	92	93
30	Case *	76	78	81	81
	Oil †	91	93	95	97
35	Case *	79	81	83	85
	Oil †	94	96	98	100

With TCV set to 0.

* Case (water jacket) temperature.

† End cover/gearbox (oil) temperature.

Note: A nitrogen shaft-seals purge is required at the operating temperatures/conditions in the shaded cells above.

CAUTION

The maximum back pressure (absolute) for the IDX1300 is 15.2 psi.

Table 14 - Minimum Pump Operating Temperatures (°F)

Cooling-water temperature	Minimum operating temperatures #	Back pressure (absolute)			
		14.5 psi	15.2 psi	16.0 psi	16.7 psi
40	Case *	142	144	145	147
	Oil †	171	174	176	178
50	Case *	145	149	151	153
	Oil †	176	189	181	183
60	Case *	149	153	156	158
	Oil †	181	185	187	189
70	Case *	154	158	162	163
	Oil †	185	189	190	192
75	Case *	162	165	169	171
	Oil †	190	194	198	199
85	Case *	169	172	176	178
	Oil †	196	199	203	207
95	Case *	174	178	181	185
	Oil †	201	205	208	212

With TCV set to 0.

* Case (water jacket) temperature.

† End cover/gearbox (oil) temperature.

Note: A nitrogen shaft-seals purge is required at the operating temperatures/conditions in the shaded cells above.

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4 Operation

4.1 Operational safety



WARNING

The CDX pump is suitable for handling flammable vapours from gas groups IIA, IIB3 and IIB within temperature classifications T₁, T₂, T₃ and T₄, depending on the flame arrestor configuration fitted. If in any doubt, contact Edwards for advice.



WARNING

If your CDX pump is part of an ATEX Category 1 system, or part of any system which handles flammable gases in their flammable range, the shaft-seals purge is safety critical, and you must ensure that the purge supply cannot be interrupted during operation. Refer to the ATEX System Instruction Manual for further details.



WARNING

If your CDX pump is part of an ATEX system, a pump case temperature limit will have been specified for normal pump operation. (Refer to the ATEX System Instruction Manual for details.) You must ensure that the pump case temperature is maintained below this limit, otherwise the pump will be switched off by the ATEX control system.



WARNING

During operation, parts of the pump can become very hot. Under abnormal conditions, the temperature of the pump-body can reach 115°C (239°F). Ensure that you do not touch the pump.



WARNING

Do not operate the pump with a coupling cover removed. If you do, there will be a danger of injury or death from the rotating mechanisms.



WARNING

Do not operate the pump with the pump-inlet or pump-outlet open to atmosphere. If you do, there will be a danger of injury or death from the rotating mechanisms, from the exposure to vacuum or to toxic gases, from explosive gases, or from hot exhaust gases.



WARNING

Take all necessary safety precautions when you pump toxic, flammable or explosive gases. If you do not, there will be a danger of injury or death to people.



WARNING

Do not expose any part of your body to vacuum. If you do, you may be injured.

The procedures in the following sections assume that you have a pump-inlet isolation-valve fitted to your pump.

4.2 ATEX system control

If your CDX pump is part of an ATEX system, use the predefined procedures in the ATEX System Instruction Manual to:

- Start up the system.
- Allow the pump to warm up.
- Shut down the system.

4.3 Non-ATEX system control

4.3.1 Start the pump

1. Use the procedure below to start the pump.
2. Refer to [Figure 7](#). Look at the level of coolant in the coolant level sight-glass (3). If the coolant level is below the minimum level, refill the pump with coolant: refer to [Section 5.5](#).
3. Check the gearbox oil-level: refer to [Section 3.5.1](#).
4. Check the end-cover oil-level: refer to [Section 3.5.2](#).
5. Turn on your cooling-water supply, shaft-seals purge gas supply and exhaust-extraction system (if fitted).
6. Check that the pressure of the shaft-seals purge gas supply is correct and adjust if necessary.
7. Switch on the pump.

4.3.2 Allow the pump to warm up



WARNING

During pump warm-up, coolant may drain out of the coolant overflow pipe. Take all necessary precautions if this may present a hazard.

CAUTION

Allow the pump to warm up and use full gas inlet purge and gas ballast (if fitted) before you pump condensable vapours. If you do not, the vapours may condense in the pump and corrode or damage the pump.

Leave the pump to operate (with the inlet isolation-valve closed) to allow the pump to warm up to its operating temperature.

Without inlet purge, warm-up takes approximately 90 minutes, depending on the ambient temperature.

When the pump has warmed up to its operating temperature, you may start process pumping.

In the first 30 seconds of pumpdown, open the inlet isolation-valve slowly if there is liquid in the inlet pipeline, in order to minimize the ingress of liquid (entrained in the process gas stream) into the pump.

4.3.3 Shut down the pump

CAUTION

If the pump is operating in an ambient temperature between -20 and -5 °C (-4 and 23 °F), we recommend that the pump is never shut down, other than for maintenance. If you have any doubts about this, contact Edwards for advice.

CAUTION

Purge the pump before you shut it down. If you do not, process vapours may condense in the pump and corrode or damage the pump.

Note: *If the pump will be shut down for a long time in an environment where the temperature is close to freezing, we recommend that you drain the cooling-water from the pump to prevent damage to the pump: refer to Section 6.1.*

1. Isolate the pump-inlet from the process gases.
2. Purge the pump of contaminants and potentially damaging vapours. Use one of the following methods:
 - Operate the pump for at least 45 minutes.
 - Operate the pump at or close to atmospheric pressure for at least 15 minutes.
 - Operate the pump with full inlet purge (if fitted) for at least 15 minutes.
 - Operate the pump with full gas ballast (if fitted) for at least 15 minutes.
3. Switch off the pump.
4. When the pump has cooled down, turn off the cooling-water supply and the shaft-seals purge gas supply.

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5 Maintenance

5.1 Safety information



WARNING

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

- A suitably trained and supervised technician must maintain the pump.
- Ensure that the pump is stationary before carrying out any maintenance.
- Ensure that the pump is located in a well-lit area with sufficient space around it to allow maintenance to be carried out safely.
- Ensure that the maintenance technician is familiar with the safety procedures which relate to the synthetic oils used and the products pumped. Wear the appropriate safety-clothing when you come into contact with contaminated components and pump oil. Dismantle and clean contaminated components inside a fume-cupboard.
- Use suitable lifting equipment and wear safety shoes when you replace the pump-motor.
- Leave the pump to cool to a safe temperature (see [Table 1](#)) before you start maintenance work.
- Isolate the pump and other components in the process system from the electrical supply so that they cannot be operated accidentally.
- Recheck the pump rotation direction if the electrical supply has been disconnected.
- Do not reuse O-rings or gaskets.
- Protect sealing-faces from damage.
- Do not touch or inhale the thermal breakdown products of fluorinated materials which may be present if the pump has overheated to 260°C (500°F) and above. These breakdown products are very dangerous. The pump may have overheated if it was misused, if it malfunctioned, or if it was in a fire. Edwards Material Safety Data Sheets for the fluorinated materials used in the pump are available on request: contact your supplier or Edwards.
- Leak-test the system after maintenance work is complete and seal any leaks found to prevent leakage of dangerous substances out of the system and leakage of air into the system: refer to [Section 3.14](#).

5.2 Maintenance plan



WARNING

If your CDX pump is part of an ATEX system, you must maintain the pump using the schedule given in [Table 15](#) and as described in [Sections 5.6, 5.7, 5.8, 5.9, 5.10, 5.11, 5.12, 5.13, 5.14, 5.15](#) and [5.16](#) of this manual, for the ATEX certification to remain valid.



WARNING

If your CDX pump is part of an ATEX system, there may be additional maintenance requirements for your ATEX system: refer to your ATEX System Instruction Manual.

The plan in [Table 15](#) (page 49) details the maintenance operations you must carry out for CDX pumps which are part of an ATEX system, and the maintenance operations we recommend to maintain non-ATEX CDX pumps and IDX pumps in normal operation. Instructions for each operation are given in the section shown.

In practice, the frequency of maintenance of IDX and non-ATEX pumps is dependent on your process. In clean processes, you may be able to decrease the frequency of maintenance operations; in harsh processes you may have to increase the frequency of maintenance operations. Adjust the maintenance plan for IDX and non-ATEX pumps according to your experience.

When you maintain the pump, use Edwards maintenance and service kits. These contain all of the seals and other components necessary to complete maintenance operations successfully. The Item Numbers of these kits are given in [Section 7.3](#).

5.3 Check the oil-levels

Note: *If you need to pour oil into the gearbox or end-cover frequently, or if there is a sudden loss of a large amount of oil, this may indicate that the pump has a fault. In these circumstances, we recommend that you shut down the pump as soon as possible and contact your supplier or Edwards for advice.*

5.3.1 Check the gearbox oil-level



WARNING

The gearbox may be pressurised. To remove the oil filler-plug, undo it slowly until the vent hole is visible, allow the gearbox to vent to atmosphere to reduce the pressure in the gearbox, then fully undo and remove the oil filler-plug. If you do not, hot (up to 115 °C, 239 °F) oil may be ejected under pressure from the gearbox and cause injury.

Figure 1, 2 and 3 show the locations of the two gearbox oil-level sight-glasses (18).

1. Refer to detail D. Check that the pump gearbox oil-level is at the MAX mark on the bezel (26) of either of the two oil-level sight-glasses. If the oil-level is below the MAX mark, continue at Step 2, otherwise continue at [Section 5.3.2](#).
2. If the pump is operating, shut down the pump: (refer to [Section 4](#)) and allow the pump to cool.
3. Remove the gearbox oil filler-plug and bonded seal (4): see Warning above.
4. Fit a suitable funnel or nozzle to the oil filler- port, then pour oil into the pump gearbox until the oil-level is at the MAX mark on the bezel of the oil-level sight-glass (see detail D).
5. If you overfill the gearbox: place a suitable container under the gearbox drain-plug ([Figure 10](#), item 3); unscrew and remove the drain-plug and bonded seal and allow the oil to drain from the gearbox until the oil level reaches the MAX mark on the sight-glass ([Figure 1, 2 or 3](#), detail D), then refit and tighten the drain plug and bonded seal.
6. Remove the funnel or nozzle from the oil filler-port, then refit the oil filler-plug and bonded seal (4).

5.3.2 Check the end-cover oil-level



WARNING

The end-cover may be pressurised. To remove the oil filler-plug, undo it slowly until the vent hole is visible, allow the end-cover to vent to atmosphere to reduce the pressure in the end-cover, then fully undo and remove the oil filler-plug. If you do not, hot (up to 115 °C, 239 °F) oil may be ejected under pressure from the end-cover and cause injury.

Table 15 - Maintenance Plan

Operation	Frequency	Refer to Section
Check the oil levels	Weekly	5.3
Check the shaft-seals purge gas supply	Weekly	5.4
Check the coolant level and refill if necessary	Weekly	5.5
Remove the inlet filter	After 1 month of operation	5.6
Inspect the pipelines and connections	3 monthly	5.7
Clean the flame arrestors (if fitted)	6 monthly or when necessary	*
Change the oil and oil filters, drain the vent filters, and clean the oil-level sight-glasses	12 monthly or when necessary	5.8
Flush the pump with cleaning solution	When necessary	5.9
Clean the cooling system	Yearly or when necessary	5.10
Replace the pump-motor	When necessary	5.11
Replace the flexible coupling insert	When necessary	5.12
Clear a hydraulic lock	When necessary	5.13
Clean the vent adaptor	Yearly or when necessary	5.14
Change the bearings and seals	3 Yearly	5.15
Check the bleed filters (IDX1300 only)	Monthly	5.16

* Refer to your CDX Pumping System Instruction Manual.

Figure 1, 2 and 3 show the location of the two end-cover oil-level sight-glasses (11).

1. Refer to detail D. Check that the end-cover oil-level is at the MAX mark on the bezel (26) of either of the two sight-glasses. If the oil-level is below the MAX mark, continue at Step 2.
2. If the pump is operating, shut down the pump: (refer to Section 4) and allow the pump to cool.
3. Remove the end-cover oil filler-plug and bonded seal (8): see Warning above.
4. Fit a suitable funnel or nozzle to the oil filler- port, then pour oil into the end-cover until the oil-level is at the MAX mark on the bezel of the oil-level sight-glass (see detail D).
5. If you overfill the end-cover: place a suitable container under the end-cover drain-plug (Figure 8, item 6); unscrew and remove the drain-plug and bonded seal and allow the oil to drain from the end-cover until the oil level reaches the MAX mark on the sight-glass (Figure 1, 2 and 3 detail D), then refit and tighten the drain plug and bonded seal.
6. Remove the funnel or nozzle from the oil filler-port, then refit the oil filler-plug and bonded seal (8).

5.4 Check the shaft-seals purge gas supply



WARNING

Your shaft-seals purge gas supply pressure must comply with the requirements of [Section 2.6](#). If it does not, the shaft-seals purge may not operate correctly, or the purge pipelines may become over-pressurised and may explode.

1. Inspect the shaft-seals purge gas supply pipelines and connections; check that they are not corroded or damaged. Replace any of the pipelines and connections that are corroded or damaged.
2. Check that all of the shaft-seals purge gas supply connections are secure. Tighten any loose connections.
3. Check that your purge gas supply can still provide the necessary pressure as specified in [Section 2.6](#).

5.5 Check the coolant level and refill if necessary



WARNING

Ensure that you correctly fill the pump with coolant, as described in the following sections. If you do not, an air-lock may develop in the cooling-jacket and the pump may overheat.

5.5.1 Check the coolant level



WARNING

Allow the pump to cool down and release the pressure in the cooling-jacket before you remove the coolant filler-cap. If you do not, hot coolant may be expelled from the heat exchanger and may cause injury.

Note: To refill the pump with Edwards coolant, you will require new coolant, available as a spare: refer to [Section 7.3](#).

1. If the pump is operating, shut down the pump: (refer to [Section 4](#)) and allow the pump to cool.
2. Refer to [Figure 7](#), detail B. Wear thermal protective gloves and push down the coolant filler-cap (6) and turn it anticlockwise by a $\frac{1}{4}$ of a turn to release the pressure in the cooling-jacket.
3. Turn the coolant filler-cap (6) anticlockwise and remove it from the heat exchanger (2).
4. Remove any dirt or water-scale from the seal of the filler-cap (6) and from the filler-tube (5).
5. Look at the level of coolant in the coolant level sight-glass (3):
 - If the coolant level is below the minimum level, continue at Step 6.
 - Otherwise, continue at Step 8 of [Section 5.5.2](#).
6. When you need to refill the pump:
 - If the pump contains Edwards coolant, and you want to refill it with the same coolant, continue at Step 4 of [Section 3.4](#).
 - If the pump contains Edwards coolant, but you want to drain it and refill it with a different coolant, continue at [Section 5.5.2](#).
 - If the pump already contains a different coolant, and you want to refill it with the same coolant, continue at Step 5 of [Section 5.5.2](#).

5.5.2 Drain the coolant and refill the pump with a different coolant

Note: You will require a Routine Maintenance Kit (see Section 7.3) to drain and refill the pump with a different coolant.

If you will refill the pump with a different coolant, use the following procedure. The coolant you use must comply with the requirements of Section 2.10.

1. Refer to Figure 7. Place a suitable container under the coolant drain-plug (detail A, item 1) to contain the drained coolant. Alternatively, provide some other suitable facility for draining the coolant. The container/drain facility must be capable of handling 50 l (13.2 US gal) of drained coolant.
2. Remove the drain-plug from the pump and allow the coolant to drain from the cooling jacket.
3. Flush the cooling-jacket with clean water (through the heat exchanger filler tube) to remove any sludge or debris from the cooling-jacket.
4. Apply a suitable thread sealant (such as Loctite 577) to the threads of the coolant drain-plug (1), then refit the drain-plug to the pump.
5. Mix the coolant with water as recommended by the coolant manufacturer.
6. Fill the pump with new coolant through the heat exchanger filler tube (5): use the procedure in Step 6 of Section 3.4.
7. Continue to fill the pump with coolant until the coolant level reaches the heat exchanger filler-tube (5).
8. Refit the coolant filler-cap (6); press it down and turn it clockwise to secure it to the heat exchanger.
9. Check the pump for obvious signs of a coolant leak. If there are signs of a coolant leak, contact your supplier or Edwards for advice.

5.6 Remove the inlet filter (if necessary)

If you left the inlet filter in the pump-inlet when you installed the pump (refer to Section 3.13.1), you must remove the inlet filter after the pump has been in operation for one month. If you do not, the performance of the pump will be impaired.

Use the following procedure to remove the inlet filter

1. Disconnect the pump-inlet from your process system.
2. Refer to Figure 1, 2 and 3. Remove the inlet filter from the pump-inlet (6).
3. Reconnect the pump-inlet to your process system.

5.7 Inspect the pipelines and connections

1. Inspect all of the cooling-system pipelines and connections; check that they are not corroded or damaged. Replace any of the pipelines and connections that are corroded or damaged. Check that all of the cooling-system connections are secure. Tighten any loose connections.
2. Inspect all of the shaft-seals purge gas supply pipelines and connections; check that they are not corroded or damaged. Replace any pipelines and connections that are corroded or damaged. Check that all of the gas supply connections are secure. Tighten any loose connections.
3. Inspect all of the oil pipelines and connections; check that they are not corroded or damaged. Replace any of the pipelines and connections that are corroded or damaged. Check that all of the oil pipeline connections are secure. Tighten any loose connections.

4. Inspect all of the gearbox and end cover vent pipelines and connections; check that they are not corroded or damaged. Replace any of the pipelines and connections that are corroded or damaged. Check that all of the vent pipeline connections are secure. Tighten any loose connections.
5. Inspect all of the electrical cables; check that they are not damaged and have not overheated. Replace any cables that are damaged or have overheated. Check that all of the electrical connections are secure. Tighten any loose connections.
6. Inspect all of the process and exhaust pipelines; check that they are not corroded or damaged. Replace any pipelines that are corroded or damaged. Check that all of the process and exhaust connections are secure. Tighten any loose connections.

5.8 Change the oil and oil filters, drain the vent filters, and clean the oil-level sight-glasses

5.8.1 Drain the end-cover oil and clean the end-cover sight-glasses



WARNING

Ensure that you do not come into contact with the used pump oil. The end-cover oil may be hot (up to 115 °C, 239 °F) and can cause injury.



WARNING

The end-cover may be pressurised. To remove the oil filler-plug, undo it slowly until the vent hole is visible, allow the end-cover to vent to atmosphere to reduce the pressure in the end-cover, then fully undo and remove the oil filler-plug. If you do not, hot (up to 115 °C, 239 °F) oil may be ejected under pressure from the end-cover and cause injury.

Note: There are two oil-level sight-glasses on the end-cover (Figure 1, 2 and 3, items 11). You must clean both sight-glasses when you change the oil.

1. Refer to Figure 1, 2 and 3. Remove the end-cover oil filler-plug and bonded seal (8): see Warning above.
2. Refer to Figure 10, detail B. Place a suitable container under the end-cover oil drain-plug (6); the container must have a capacity of at least 7.5 litres.
3. Unscrew and remove the oil drain-plug and bonded seal (6) and allow the oil to drain from the end-cover. Dispose of the bonded seal.
4. Refer to detail C. Undo and remove the four M5 screws (15) from the bezel (14) on one of the end-cover oil-level sight-glasses.
5. Remove the bezel (14), O-ring (13), sight-glass (12), O-ring (11) and compression ring (10). Dispose of the O-rings (11, 13).
6. Clean all of the sight-glass components and the sight-glass recess in the end-cover (9) with a soft lint-free cloth. If necessary, use a suitable cleaning solution; if you use a cleaning solution, ensure that all of the solution is removed before you reassemble the sight-glass.
7. Refit the compression ring (10) in the sight-glass recess in the end-cover (9).
8. Fit two new O-rings (11, 13) and the sight-glass (12), then fit the bezel (14) and secure with the four M5 screws (15).
9. Repeat Steps 4 to 8 to clean the other end-cover oil-level sight-glass.

5.8.2 Change the end-cover oil filter

1. Refer to [Figure 10](#), detail B. Place a suitable container under the end-cover oil filter (8), to catch any spilled oil.
2. Unscrew and remove the end-cover oil filter (8) and gasket (7) from the filter port adaptor (5) on the end-cover.
3. Dispose of the oil filter and gasket (8, 7) and the oil in the container: refer to [Section 6.2](#).
4. Use a soft lint-free cloth (and a suitable cleaning solution if necessary) to wipe clean the filter port adaptor (5) and the end-cover around the adaptor.
5. Fit the new oil filter (8) and gasket (7) to the filter port adaptor (5) on the end-cover. Tighten by hand.

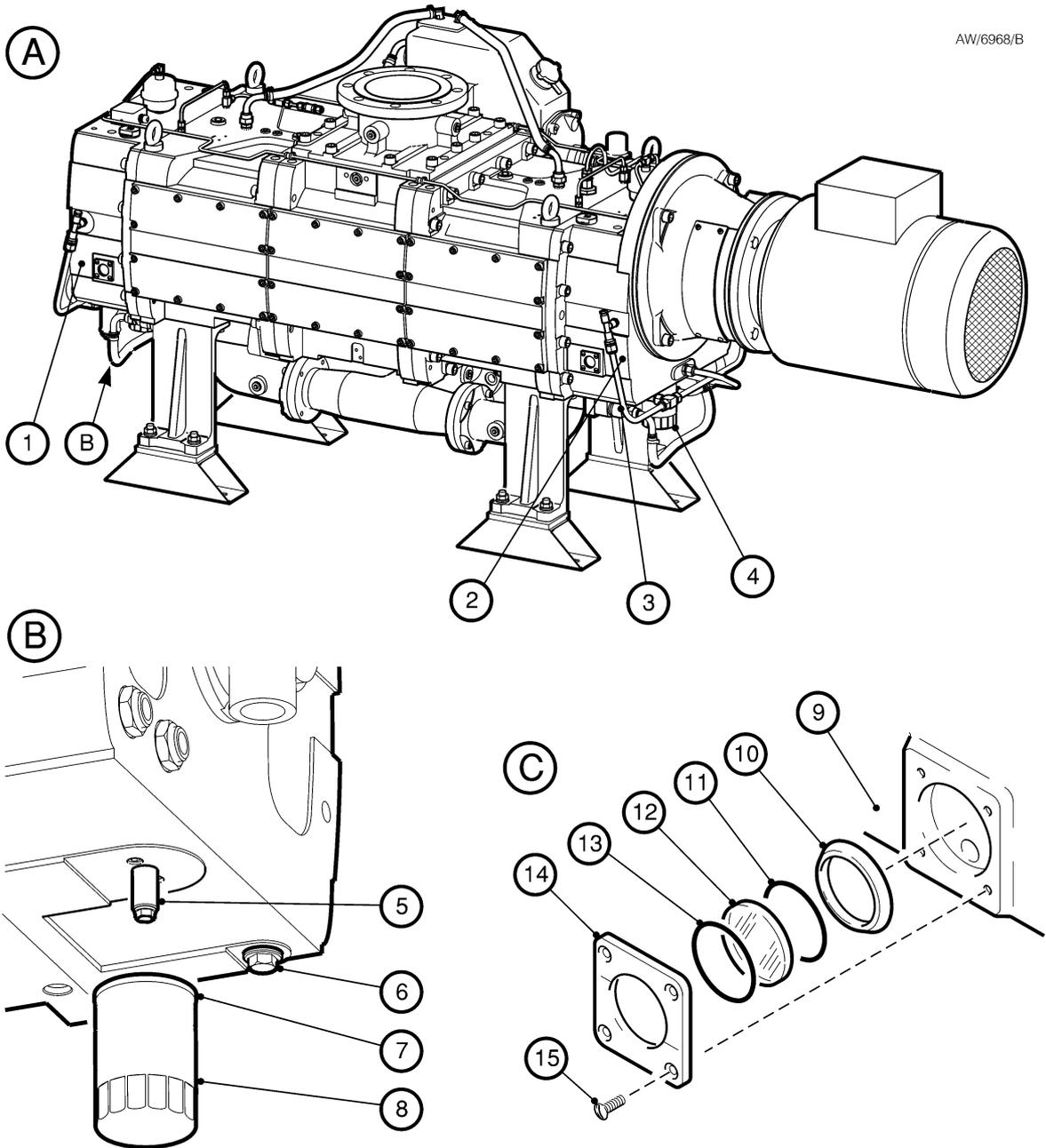
5.8.3 Drain the end-cover vent filter

1. Refer to [Figure 1](#), [2](#) and [3](#), detail F. Loosen the nut (29) on the tube fitting and disconnect the vent tube from the nut.
2. Turn the top of the filter body (30) clockwise (to release the bayonet fitting) and remove the top from the bottom of the vent filter (7).
3. Inspect the interior of the vent filter (7). If there is oil in the vent filter:
 - Undo the M6 bolt and remove the filter element.
 - Wait until the oil has drained back into the end cover.
 - Refit the filter element and secure with the M6 bolt.
4. Align the bayonet fitting on the top of the filter body (30) with the fitting on the bottom of the vent filter (7), then press down on the top and turn it anticlockwise to secure the bayonet fitting.
5. Refit the vent tube to the tube fitting and tighten the nut (29).

5.8.4 Fill the end-cover with new oil

1. Place a suitable funnel or nozzle into the end-cover oil filler-port ([Figure 1](#), [2](#) and [3](#), item 8).
2. If the oil drained from the pump is very discoloured, flush the end-cover with new or clean oil two or three times, until the oil which drains from the end-cover is clean.
3. Refer to [Figure 10](#). Wipe clean the oil drain plug (6), then fit a new bonded rubber seal.
4. Fit the oil drain-plug and bonded seal (6) to the end-cover.
5. Fill the end-cover through the funnel or nozzle, with the correct grade and quantity of oil. Allow the oil to drain into the end-cover and then check the level on one of the oil sight-glasses (refer to [Section 5.3.2](#)).
6. Remove the funnel or nozzle from the oil filler-port and refit the oil filler-plug and bonded seal ([Figure 1](#), [2](#) and [3](#), item 8) to the end-cover.
7. Dispose of the used oil safely: refer to [Section 6.2](#).

Figure 10 - Change the Oil Filters and Clean the Oil-Level Sight-Glasses



- 1. End-cover
- 2. Gearbox
- 3. Gearbox oil drain-plug
- 4. Gearbox oil filter
- 5. Filter port adaptor
- 6. End-cover oil drain-plug
- 7. Gasket
- 8. Oil filter

- 9. End-cover/gearbox
- 10. Compression ring
- 11. O-ring
- 12. Sight-glass
- 13. O-ring
- 14. Bezel
- 15. Screws (4 off)

5.8.5 Drain the gearbox oil and clean the gearbox sight-glasses



WARNING

Ensure that you do not come into contact with the used pump oil. The end-cover oil may be hot (up to 115 °C, 239 °F) and can cause injury.



WARNING

The gearbox may be pressurised. To remove the oil filler-plug, undo it slowly until the vent hole is visible, allow the gearbox to vent to atmosphere to reduce the pressure in the gearbox, then fully undo and remove the oil filler-plug. If you do not, hot (up to 115 °C, 239 °F) oil may be ejected under pressure from the gearbox and cause injury.

Note: There are two oil-level sight-glasses on the gearbox (Figure 1, 2 and 3, items 18). You must clean both sight-glasses when you change the gearbox oil.

1. Refer to Figure 1, 2 and 3. Remove the gearbox oil filler-plug and bonded seal (4): see Warning above.
2. Refer to Figure 10. Place a suitable container under the gearbox oil drain-plug (3); the container must have a capacity of at least 7.5 litres.
3. Unscrew and remove the oil drain-plug and bonded seal (3) and allow the oil to drain from the gearbox. Dispose of the bonded seal.
4. Refer to detail C. Undo and remove the four M5 screws (15) from the bezel (14) on one of the gearbox oil-level sight-glasses.
5. Remove the bezel (14), O-ring (13), sight-glass (12), O-ring (11) and compression ring (10). Dispose of the O-rings (11, 13).
6. Clean all of the sight-glass components and the sight-glass recess in the gearbox (9) with a soft lint-free cloth. If necessary, use a suitable cleaning solution; if you use a cleaning solution, ensure that all of the solution is removed before you reassemble the sight-glass.
7. Refit the compression ring (10) in the sight-glass recess in the gearbox (9).
8. Fit two new O-rings (11, 13) and the sight-glass (12), then fit the bezel (14) and secure with the four M5 screws (15).
9. Repeat Steps 4 to 8 to clean the other gearbox oil-level sight-glass.

5.8.6 Change the gearbox oil filter

1. Refer to Figure 10, detail B. Place a suitable container under the gearbox oil filter (8), to catch any spilled oil.
2. Unscrew and remove the gearbox oil filter (8) and gasket (7) from the filter port adaptor (5) on the gearbox.
3. Dispose of the oil filter and gasket (8, 7) and the oil in the container: refer to Section 6.2.
4. Use a soft lint-free cloth (and a suitable cleaning solution if necessary) to wipe clean the filter port adaptor (5) and the gearbox around the adaptor.
5. Fit the new oil filter (8) and gasket (7) to the filter port adaptor (5) on the gearbox. Tighten by hand.

5.8.7 Drain the gearbox vent filter

1. Refer to Figure 1, 2 and 3, detail F. Loosen the nut (29) on the tube fitting and disconnect the vent tube from the nut.
2. Turn the top of the filter body (30) clockwise (to release the bayonet fitting) and remove the top from the bottom of the vent filter (3).
3. Inspect the interior of the vent filter (3). If there is oil in the vent filter:
 - Undo the M6 bolt and remove the filter element.
 - Wait until the oil has drained back into the end cover.
 - Refit the filter element and secure with the M6 bolt.
4. Align the bayonet fitting on the top of the filter body (30) with the fitting on the bottom of the vent filter (3), then press down on the top and turn it anticlockwise to secure the bayonet fitting.
5. Refit the vent tube to the tube fitting and tighten the nut (29).

5.8.8 Fill the gearbox with new oil

1. Place a suitable funnel or nozzle into the gearbox oil filler-port.
2. If the oil drained from the gearbox is very discoloured, flush the gearbox with new or clean oil two or three times, until the oil which drains from the gearbox is clean.
3. Refer to Figure 10. Wipe clean the gearbox oil drain plug (3), then fit a new bonded rubber seal.
4. Fit the oil drain-plug and bonded seal (3) to the gearbox.
5. Fill the gearbox through the funnel or nozzle, with the correct grade and quantity of oil. Allow the oil to drain into the gearbox and then check the level on one of the oil sight-glasses (refer to Section 5.3.1).
6. Remove the funnel or nozzle from the oil filler-port and refit the oil filler-plug and bonded seal (Figure 1, 2 and 3, item 4) to the gearbox.
7. Dispose of the used oil safely: refer to Section 6.2.

5.9 Flush the pump with cleaning solution



WARNING

Use a cleaning solution which is suitable for the process materials pumped. If you do not, there may be a risk of explosion, or you may damage the pump.



WARNING

Shut down the pump and leave the pump for at least 15 minutes to allow any static charges to dissipate before you remove a coupling cover. If you do not, there may be a risk of explosion if the pump is installed in a flammable atmosphere.



WARNING

Take care not get trapped by the rotating mechanisms when you fit a rod (or other tool) to the drive hub to turn the pump.

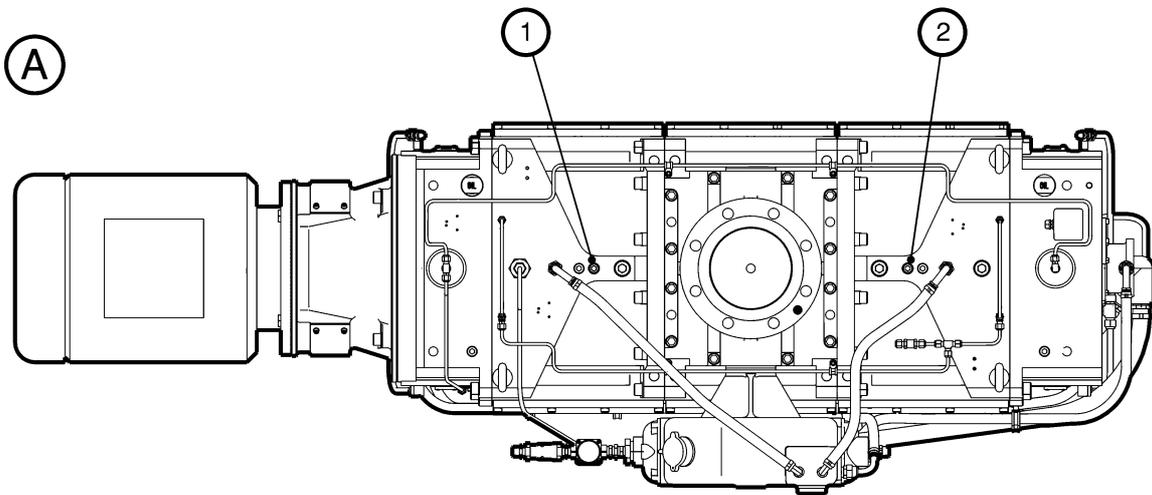
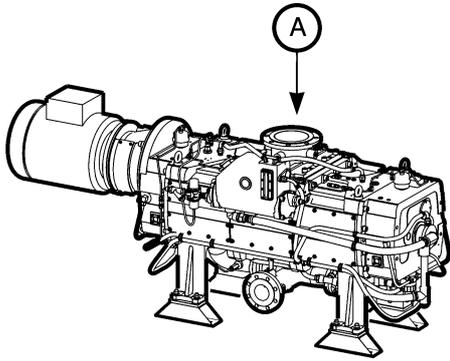
If you want to remove deposits from a pump which has been operating correctly, or want to free a pump which has seized, use the procedure below.

Choose a cleaning solution suitable for the process substances pumped. Note that to completely flood all the unblocked cavities in the pump, you will require the quantities of cleaning solution shown in [Table 3](#).

1. Switch on the shaft-seals purge gas supply. If you do not, you will contaminate the lip seals in the pump when you flush it with cleaning solution.
2. Switch off the pump, and leave it for at least 15 minutes (see warning above).
3. Refer to [Figure 1](#), [2](#) and [3](#). Remove the four bolts which secure one of the coupling covers (20) and remove the coupling cover.
4. If you have a pump-inlet isolation-valve in your system, close the valve. If you do not have a pump-inlet isolation-valve, disconnect the pump-inlet (6) from your process system and fit a blanking-flange to the pump-inlet.
5. Refer to [Figure 11](#). Remove the two plugs (1, 2) from the cleaning solution flush ports.
6. Disconnect the pump-outlet ([Figure 1](#), [2](#) and [3](#), item 16) from your exhaust pipeline and fit a blanking-flange to the pump-outlet.
7. Slowly pour a suitable cleaning solution into one of the cleaning solution flush ports (1, 2). (The other port will allow air to vent from the pump when you fill it.) Wait for several minutes to allow the cleaning solution to drain into the pump.
8. Repeat Step 7 until the level of cleaning solution in the pump reaches the flush ports (see [Table 3](#) for the capacity of the pump).
9. Leave the pump for at least one hour for the cleaning solution to fully react with the deposits in the pump.
10. Fit a steel rod or other suitable tool (not supplied) into one of the 16 mm (0.625 inch) holes in the drive hub ([Figure 14](#), item 19), then try to turn the pump clockwise:
 - If you cannot turn the pump, continue at Step 9 (to leave the pump for longer).
 - If you can turn the pump, continue at Step 11.
11. Place a suitable container under the pump-outlet ([Figure 1](#), [2](#) and [3](#), item 16) and remove the blanking-flange.
12. Use the steel rod or tool to turn the pump clockwise through three or four complete revolutions. If the pump seizes, this is probably because of a hydraulic lock in the pump: wait for a few seconds for the cleaning solution to drain through the pump.
13. If necessary, repeat Steps 7 to 12 to flush the pump again.
14. Remove the blanking-flange from the pump-inlet ([Figure 1](#), [2](#) and [3](#), item 6) and reconnect the pump-inlet to your process system (refer to [Section 3.13.1](#)) or open the pump-inlet isolation-valve.
15. Reconnect the pump-outlet to your exhaust pipeline: refer to [Section 3.13.2](#).
16. Refer to [Figure 1](#), [2](#) and [3](#). Refit the coupling cover (20) and secure with the four bolts (removed in Step 3).
17. Tighten the bolts to a torque between 3 and 5 Nm (2.2 and 3.7 lbf ft).
18. Refit the two plugs ([Figure 11](#), items 1 and 2) to the cleaning solution flush ports.
19. Dispose of the used cleaning solution and deposits removed.

Figure 11 - Flush the Pump with Cleaning Solution

AW/7297/B



- 1. Plug (in cleaning solution flush port)
- 2. Plug (in cleaning solution flush port)

5.10 Clean the cooling system

WARNING



If your pump cooling-water supply contains chemical contaminants or biological contaminants which might settle and/or propagate in the pump cooling system, you must:

- Thoroughly flush the cooling system with clean water before you start work.
- Wear the appropriate Personal Protective Equipment (PPE) when you clean the cooling system.

5.10.1 Drain the coolant from the cooling system



WARNING

Allow the pump to cool down and release the pressure in the cooling-jacket before you remove the coolant filler-cap. If you do not, hot coolant may be expelled from the heat exchanger and may cause injury.

Clean the cooling system every year or when you think that the efficiency of the cooling system is reduced because of deposits or other contamination in the heat exchanger or cooling-water pipelines.

1. Refer to Figure 1, 2 and 3. Ensure your cooling-water supply is switched off, then turn the adjuster knob on the TCV (17) to the '0' setting.
2. Refer to Figure 7. Push down the coolant filler-cap (6) and turn it anticlockwise by a $\frac{1}{4}$ of a turn to release the pressure in the cooling-jacket: see detail A.
3. Turn the coolant filler-cap (6) anticlockwise and remove it from the heat exchanger (2).
4. Refer to Figure 12, detail B for the CDX/IDX1000 and Figure 13 for the IDX1300. Place a suitable container under the cooling-water return outlet (10) to collect any spilled water, then remove your cooling-water return pipeline from the outlet.
5. Place a suitable container under the hex fitting (4) to collect any spilled water, then undo the hex fitting to disconnect the TCV and hose from the end-cap (17) and allow the cooling-water to drain from the heat exchanger.
6. Place a suitable container under the coolant drain plug (3), then remove the drain plug and allow the coolant to drain from the pump.
7. When the coolant level has fallen below the level of the sight-glass (14), apply a suitable thread sealant (such as Loctite 577) to the coolant drain plug (3) then refit the plug.

5.10.2 Clean the cooling-water filter

1. Refer to Figure 12, detail C. Undo the hex-head nut (21) and remove the filter element (20) and the gasket (22) from the cooling-water filter-body (23).
2. Empty the deposits from the filter element (20); if required, you can use a compressed air supply to blow the deposits from the filter element.
3. Fit the new gasket (22), the cleaned filter element (20) and the hex-head nut (21) to the cooling-water filter-body (23).

5.10.3 Clean the heat exchanger

Refer to Figure 12, detail B for the CDX/IDX1000 and Figure 13 for the IDX1300 and use the following procedure to clean the heat exchanger.

1. Remove the four bolts (Figure 12, item 11) (Figure 13, item 14) which secure the right-hand end-cap (Figure 12, item 9) (Figure 13, item 15) to the heat exchanger (Figure 12, item 6) (Figure 13, item 10) and remove the end-cap and the O-ring (Figure 12, item 8) (Figure 13, item 12).
2. CDX/IDX1000 Remove the four bolts (Figure 12, item 18) which secure the left-hand end-cap (Figure 12, item 17) to the heat exchanger and remove the end-cap and the O-ring (Figure 12, item 16). IDX1300 Remove the four nuts (Figure 13, item 2) and four washers (Figure 13, item 3) that secure the left-hand end-cap (Figure 13, item 5) to the housing extension and remove the end-cap O-ring (Figure 13, item 6).
3. Use a pipe cleaner which will pass through a 400 mm (15.75 inch) length of 5 mm (0.2 inch) diameter tube to clean and remove any scale from each tube in the tube stack (Figure 12, item 7) (Figure 13, item 8).

4. Clean the O-ring sealing faces of the left- and right-hand end-caps (Figure 12, items 17, 9) (Figure 13, items 5, 15) and the mating surfaces on the heat exchanger (Figure 12, item 6) (Figure 13, item 10).
5. Fit the new O-ring (Figure 12, item 16) (Figure 13, item 6) and then use the four bolts (Figure 12, item 18) to refit the left-hand end-cap (Figure 12, item 17) to the heat exchanger. IDX1300 use the four washers (Figure 13, item 3) and four nuts (Figure 13, item 2) to refit the left-hand end-cap (Figure 13, item 5).
6. Fit the new O-ring (Figure 12, item 8) (Figure 13, item 12) and then use the four bolts (Figure 12, item 11) (Figure 13, item 14) to refit the right-hand end-cap (Figure 12, item 9) (Figure 13, item 15) to the heat exchanger.
7. Refit the hex fitting (Figure 12, item 4) (Figure 13, item 21) to the left-hand end-cap (Figure 12, item 17) (Figure 13, item 5).
8. Refit your cooling-water return pipe to the cooling-water outlet (Figure 12, item 10) (Figure 13, item 13). Do not turn on the cooling-water supply yet.

5.10.4 Clean the coolant level sight-glass

Refer to Figure 12, detail B and use the following procedure to clean the coolant level sight-glass.

1. Undo and remove the eight bolts and washers (12) from the bezel (13) of the coolant level sight-glass.
2. Remove the bezel (13), sight-glass (14) and gasket (15) from the heat exchanger (6).
3. Clean all of the sight-glass components and the sight-glass recess in the heat exchanger (6) with a soft lint-free cloth. If necessary, use a suitable cleaning solution; if you use a cleaning solution, ensure that all of the solution is removed before you reassemble the sight-glass.
4. Fit the gasket (15), sight-glass (14) and bezel (13) to the heat exchanger (6) and secure with the eight bolts and washers (12).

5.10.5 Prepare the pump for operation

1. Check the coolant level and refill if necessary as described in Section 5.5.
2. Check that there are no coolant leaks, particularly at the joints where you have removed and refitted cooling system components. If any leaks are found, remake the connections and ensure that the leaks are sealed.
3. Turn on your cooling-water supply, then check for cooling-water leaks, particularly at the joints where you have removed and refitted cooling system components. If any leaks are found, remake the connections and ensure that the leaks are sealed.

5.11 Replace the pump-motor

5.11.1 Remove the pump-motor



WARNING

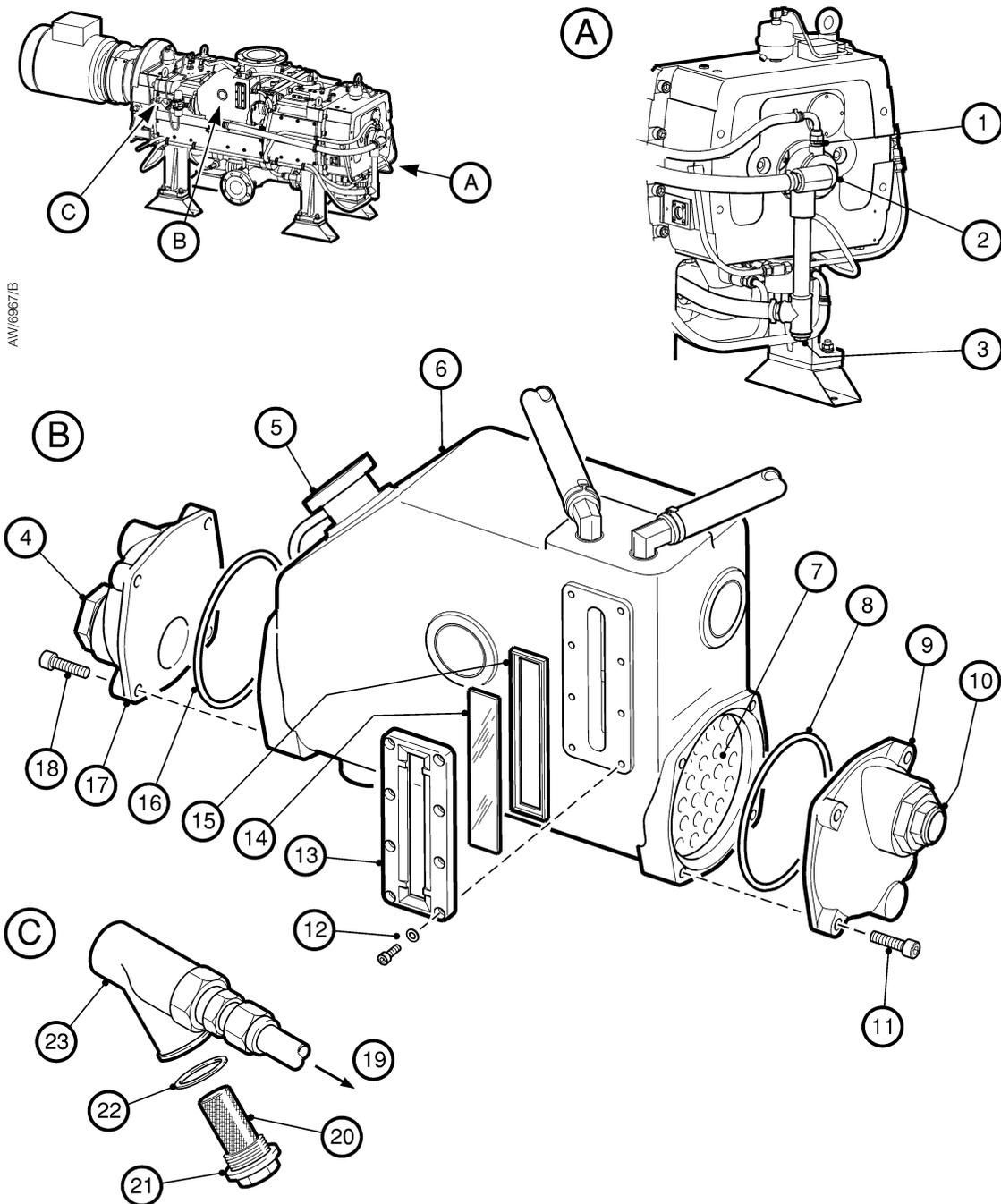
Ensure that the electrical supply cable is isolated from the electrical supply before you start work. If you do not, there is a risk of injury or death by electric shock.



WARNING

Ensure that the pump-motor cannot fall when you remove it. The pump-motor is heavy and can cause injury to people if it falls.

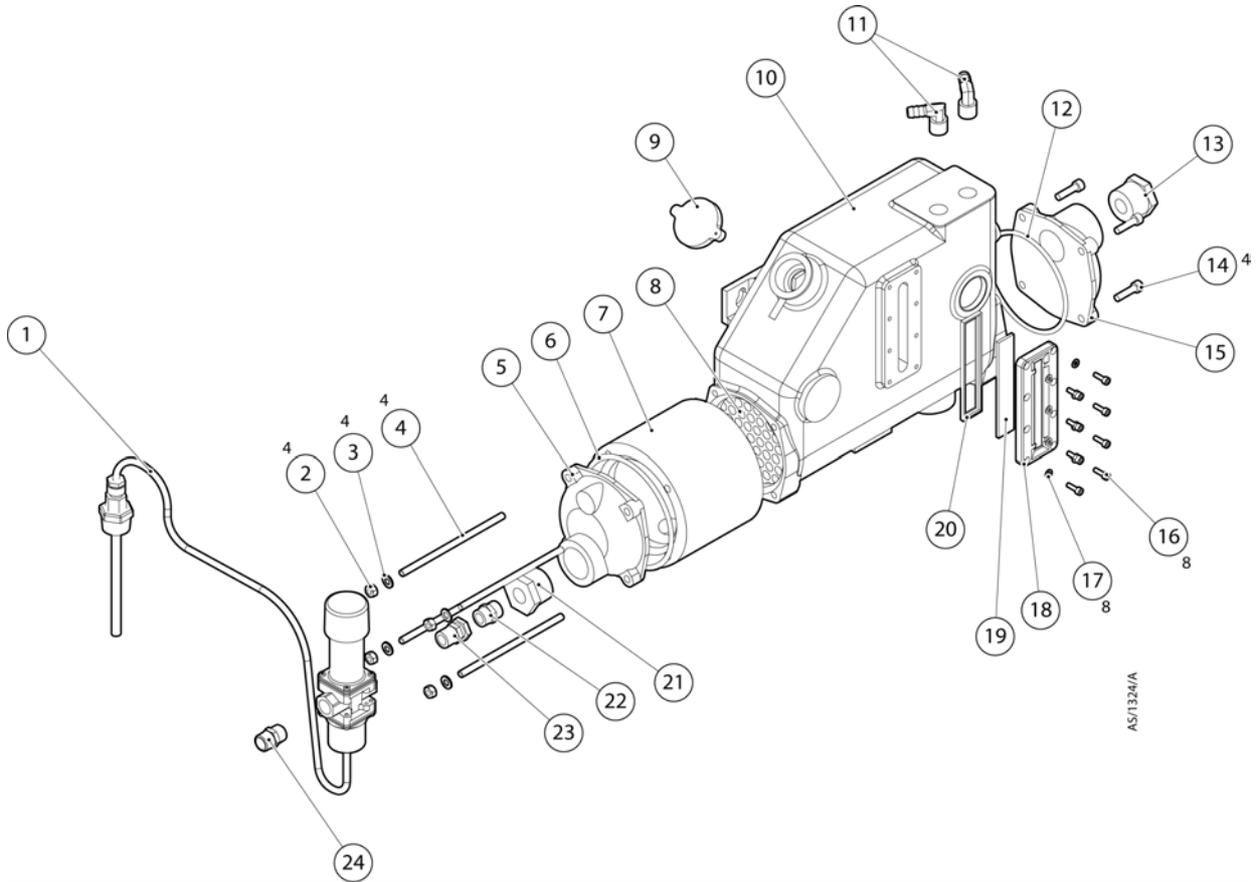
Figure 12 - Clean the Cooling System - CDX/IDX1000



AW/6967/B

- | | | |
|-----------------------|-------------------------------|-----------------------------|
| 1. Vent plug | 9. Right-hand end-cap | 17. Left-hand end-cap |
| 2. Coolant pump | 10. Cooling-water outlet | 18. Bolts (4 off) |
| 3. Coolant drain plug | 11. Bolts (4 off) | 19. Direction of water flow |
| 4. Hex fitting | 12. Bolts and washers (8 off) | 20. Filter element |
| 5. Coolant filler-cap | 13. Bezel | 21. Hex-head nut |
| 6. Heat exchanger | 14. Sight-glass | 22. Gasket |
| 7. Tube stack | 15. Gasket | 23. Filter body |
| 8. O-ring | 16. O-ring | |

Figure 13 - Clean the Cooling System - IDX1300



AS/1324/A

- | | | |
|----------------------|--------------------------|---------------------|
| 1. TCV | 9. Coolant filler cap | 17. Washers (8 off) |
| 2. Nuts (4 off) | 10. Heat exchanger | 18. Bezel |
| 3. Washers (4 off) | 11. Hose elbows | 19. Sight-glass |
| 4. Studs (4 off) | 12. O-ring | 20. Gasket |
| 5. Left-hand end-cap | 13. Cooling-water outlet | 21. Hex fitting |
| 6. O-ring | 14. Bolts (4 off) | 22. Water fitting |
| 7. Body extension | 15. Right-hand end-cap | 23. Water fitting |
| 8. Tube stack | 16. Bolts (8 off) | 24. Water fitting |

Use the following procedure to remove the pump-motor. Ensure that the pump-motor is adequately supported throughout and does not fall: the masses of the pump-motors are given in [Section 2.3](#).

1. Ensure that the electrical supply cable is isolated from the electrical supply.
2. Refer to [Figure 1](#), [2](#) and [3](#). Remove the cover from the pump-motor terminal-box (2), then disconnect your electrical supply cable (and the motor thermistors cable, if separate) from the terminal-box.
3. Refer to [Figure 14](#). Fit slings and suitable lifting equipment to support the pump-motor (1), then remove the fixing bolts (2) which secure the pump-motor flange (3) to the coupling housing (15).
4. Use the lifting equipment to move the pump-motor (1) away from the pump, then carefully lower the pump-motor, so that it rests on the floor in an upright orientation (that is, with the drive hub (19) at the top).
5. Remove the gasket (6) from the motor flange (3) or coupling housing (15).
6. Undo and remove the two set screws (8) in the drive hub (19).
7. Use a suitable puller tool to remove the drive hub (19) from the motor shaft (4), then remove the key (5) from the motor shaft. Dispose of the key.
8. If you want to dispose of the pump-motor: refer to [Section 6.2](#).
9. Inspect the flexible coupling insert (18): if necessary, replace it.

5.11.2 Fit the new pump-motor



WARNING

Ensure that the pump-motor cannot fall when you fit it. The pump-motor is heavy and can cause injury to people if it falls.

CAUTION

Ensure that the pump-motor flange and the coupling housing flange are clean and free of burrs. If you do not, the pump-motor and coupling housing may be misaligned and you may damage the pump-motor, the pump or the drive coupling when you operate the pump.

1. Refer to [Figure 14](#). Inspect the motor shaft (4) of the new pump-motor (1). The motor shaft must be free of burrs and dirt. If necessary, clean or refinish the motor shaft.
2. Inspect the motor shaft bore of the drive hub (19). The bore must be free of burrs and dirt. If necessary, clean or refinish the bore.
3. Fit the new key (5, supplied with the new motor) into the motor shaft (4).
4. Loosely fit the drive hub (19) onto the motor shaft (4), so that you can subsequently move it (in Step 13) into the correct position.
5. Inspect the mating flange of the coupling housing (15) and the motor flange (3). The flanges must be free of burrs and dirt. If necessary, clean or refinish the flanges.
6. Use suitable lifting equipment to lift the pump-motor (1) off the floor and move it close to the pump.
7. If necessary, fit slings around the pump-motor (1) and attach suitable lifting equipment to the slings. Use both sets of lifting equipment to turn the pump-motor so that it is horizontal, with the pump-motor terminal-box at the top, and with the drive hub (19) towards the coupling housing (15).
8. Place the bolts (2) through the fixing-holes in the motor flange (3) and place the gasket (6) in position on the flange.
9. Undo and remove the four bolts (17) which secure one of the coupling covers (16) to the coupling housing (15), then remove the coupling cover.

10. Move the pump-motor so that the motor flange (3) locates against the flange of the coupling housing (15), and so that the bolt holes in the two flanges are aligned.
11. Ensure that the gasket is correctly located and is not distorted, then use the bolts (2) to secure the pump-motor to the coupling housing (15).
12. Use the access hole in the coupling housing (15) and slide the drive hub (19) on the motor shaft (4) until the gap (21) between the drive hub and the coupling hub (10) is correctly set, as shown in detail B.
13. Apply a suitable thread sealant (such as Loctite 243 Nutlock) to the two new set screws (8), then fit the set screws into the drive hub (19) and tighten to a torque of 17 Nm (12.5 lbf ft).
14. Check the gap (21) between the drive hub and the coupling hub again:
 - If the gap is still correctly set, continue at Step 16.
 - If the gap is not correctly set, loosen the set screw (8) and continue at Step 13 above to set the gap again.
15. Move the motor (1) slightly away from the coupling housing (15), then fit the flexible insert (18) to the coupling hub (10).
16. Move the motor (1) towards the coupling housing (15) again, and turn the drive hub (19) as necessary (so that it is correctly aligned with the gaps in the coupling insert, 18), until the drive hub fully engages in the coupling insert, and the motor flange (3) is fully located against the flange of the coupling housing (15).
17. Tighten all of the fixing bolts (2) to a torque of 70 Nm (50 lbf ft).
18. Use the four bolts (17) to secure the coupling cover (16) to the coupling housing (15). Tighten the bolts to a torque between 3 and 5 Nm (2.2 and 3.7 lbf ft).

5.11.3 Check the direction of pump rotation



WARNING

You must ensure that the direction of rotation of the pump is correct before you operate the pump. If you do not, and the pump direction of rotation is incorrect, the inlet pipeline will be pressurised and may be damaged and there will be a risk of injury to people or explosion or fire.

After you have fitted the new pump-motor, you must check the direction of pump rotation before you operate the pump: use the procedure in [Section 3.10](#).

5.12 Replace the flexible coupling insert

Use the following procedure to replace the flexible coupling insert:

1. Ensure that the pump is isolated from the electrical supply.
2. Refer to [Figure 14](#). Undo the four bolts (17) which secure one of the coupling covers (16) to the coupling housing (15), then remove the coupling cover.
3. Undo the four bolts (17) which secure the other coupling cover (16) to the coupling housing (15), then remove the coupling cover.
4. Loosen the set screws (7) on the holding ring (20), then slide the holding ring off the coupling insert (18).
5. Remove the coupling insert (18) and dispose of it: refer to [Section 6.2](#).
6. Fit the new coupling insert (18) to the gaps between the teeth on the drive hub (19) and coupling hub (10).
7. Turn the holding ring (20) so that the reference line on the holding ring is aligned with the split in the coupling insert (18), then slide the holding ring over the insert.
8. Tighten the set screws (7) to secure the holding ring (20) in place.

9. Use the four bolts (17) to secure one of the coupling covers (16) to the coupling housing (15). Tighten the bolts to a torque between 3 and 5 Nm (2.2 and 3.7 lbf ft).
10. Use the four bolts (17) to secure the other coupling cover (16) to the coupling housing (15). Tighten the bolts to a torque between 3 and 5 Nm (2.2 and 3.7 lbf ft).

5.13 Clear a hydraulic lock (when necessary)



WARNING

Shut down the pump and leave the pump for at least 15 minutes to allow any static charges to dissipate before you remove a coupling cover. If you do not, there may be a risk of explosion if the pump is installed in a flammable atmosphere.



WARNING

Take care not get trapped by the rotating mechanisms when you fit a rod (or other tool) to the drive hub to turn the pump.

If the pump stops and you think this may be because of a hydraulic lock, use the following procedure to try to clear the lock and free the pump.

1. Isolate the pump from the process gases.
2. Switch off the pump, and leave it for at least 15 minutes (see warning above).
3. Refer to [Figure 14](#). Undo and remove the four bolts (17) which secure one of the coupling covers (16) to the coupling housing (15), and remove the coupling cover.
4. Fit a metal rod or other suitable tool to one of the holes in the drive hub (19), then try to turn the drive hub. If you can turn the pump, you have cleared the hydraulic lock: continue at Step 5.

If you cannot turn the pump, it may have seized due to deposits in the pump. Flush the pump with cleaning solution (refer to [Section 5.9](#)). If you can free the pump, continue at Step 4, otherwise contact your supplier or Edwards for advice.

5. Remove the metal rod/tool from the drive hub.
6. Refit the coupling cover (16) and secure with the four bolts (17). Tighten the bolts to a torque between 3 and 5 Nm (2.2 and 3.7 lbf ft).
7. Reconnect the pump to the electrical supply and restart it as described in [Section 4.3.1](#).

5.14 Clean the vent adaptor

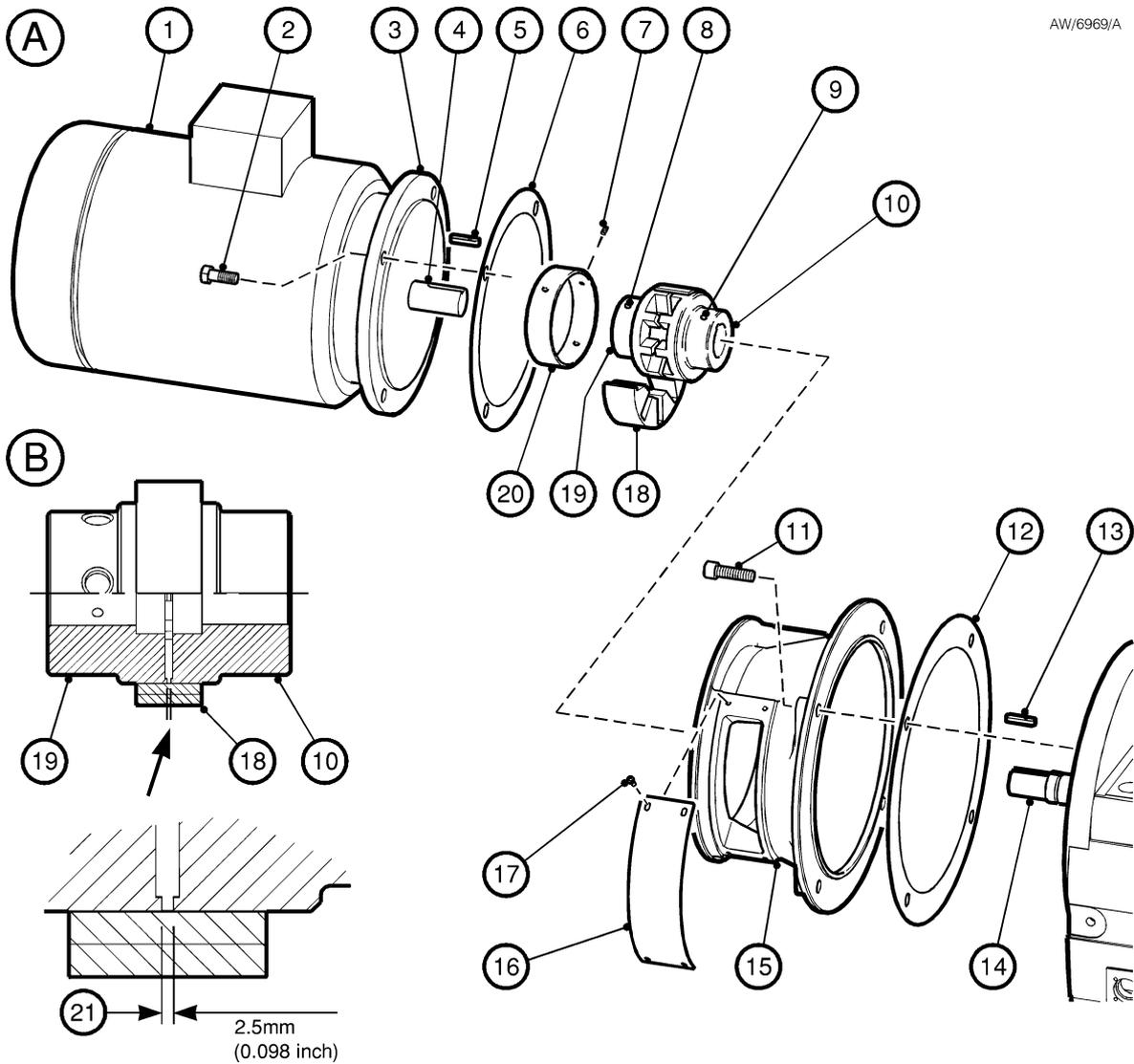


WARNING

Ensure that you wear the appropriate Personal Protective Equipment (PPE) and observe all necessary safety precautions applicable to any hazardous substances which may be in the vent adaptor or exhaust elbow.

Figure 14 - Pump Motor and Drive Coupling

AW/6969/A



- 1. Pump-motor
- 2. Bolts (4 off)
- 3. Motor flange
- 4. Motor shaft
- 5. Key
- 6. Gasket
- 7. Set screw

- 8. Set screws (2 off)
- 9. Set screw
- 10. Coupling hub
- 11. Bolts (4 off)
- 12. Gasket
- 13. Key
- 14. Pump shaft

- 15. Coupling housing
- 16. Coupling cover
- 17. Bolts (4 off)
- 18. Coupling insert
- 19. Drive hub
- 20. Holding ring
- 21. Gap: 2.5 mm (0.098 inches)

1. Ensure that the pump is isolated from the electrical supply and has cooled to a safe temperature.
2. Refer to [Figure 15](#). Undo the nut (2) which secures the vent pipe (1) to the vent adaptor (5), and move the pipe to one side.
3. Unscrew and remove the vent adaptor (5) from the exhaust elbow.
4. Secure the vent adaptor (for example, lock it in a vice), then remove the ¼ inch male connector (3).
5. Remove the restrictor (4): if necessary push it through the vent adaptor (5) and out of the exhaust elbow connection on the vent adaptor.
6. Place all of the components in a container filled with a cleaning solution suitable for the products pumped. Leave the components to soak until all of the deposits can be removed.
7. Clean all of the components with a suitable lint-free cloth, then allow the components to dry.
8. Refit the restrictor (4) to the vent adaptor (5).
9. Refit the ¼ inch male connector (3) to the vent adaptor (5).
10. Screw the vent adaptor (5) back on to the exhaust elbow.
11. Refit the vent pipe (1) to the vent adaptor (5) and secure with the nut (2).

5.15 Change the bearings and seals

The bearings and seals must be replaced every three years.

This is outside the scope of this manual and should be done by qualified service personnel who have received the appropriate training: contact your supplier or Edwards.

5.16 Clean/change the air bleed filters IDX1300 only

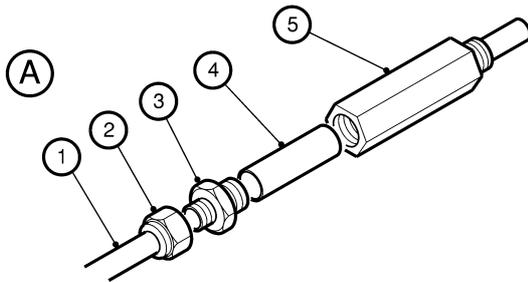
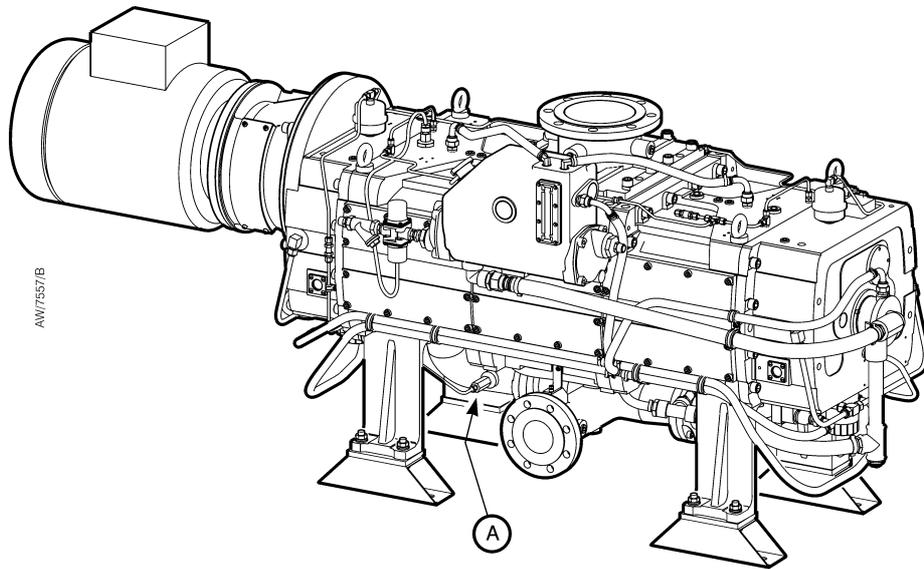
Refer to [Figure 16](#). Remove the top cap (1) by turning it clockwise. Take out the filter element (3) and remove any dust or debris from it and from the filter body (4). Either re-fit the cleaned filter element (3) or a replacement by pushing it into the top cap (1).

Reassemble the top cap (1) and filter element (3) to the filter body (4) and turn the top cap (1) anticlockwise until it locks into place.

5.17 Fault finding

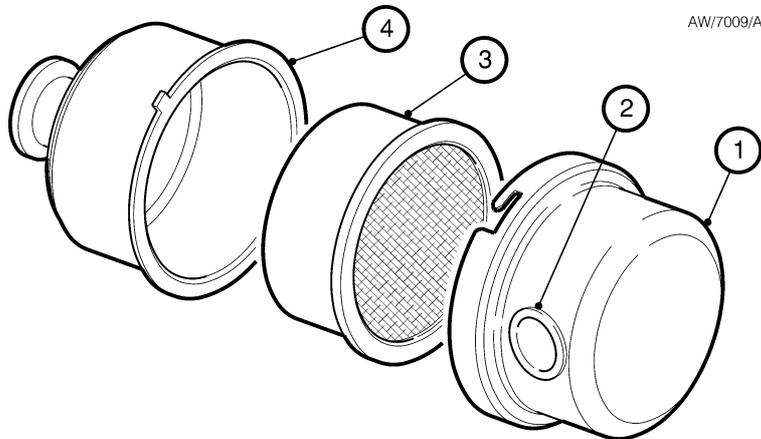
Refer to [Table 16](#) for general fault finding. If you have referred to [Table 16](#) but still cannot identify the cause of a fault, or you cannot rectify a fault you have identified, contact your supplier or Edwards for advice.

Figure 15 - Clean the Vent Adaptor



- 1. Vent pipe
- 2. Nut
- 3. ¼ inch male connector
- 4. Restrictor
- 5. Vent adaptor

Figure 16 - Air Bleed Filter Element Cleaning/Replace



- 1. Top cap
- 2. Inlet
- 3. Filter element
- 4. Filter body

Table 16 - Fault Finding

Symptom	Check	Action
The pump suddenly stops.	Has the cooling-water supply been interrupted, or has it failed?	Check that there is a sufficient flow of cooling-water through the pump: check that the cooling-water supply is on, is at the correct pressure and is of the correct temperature (see Section 2.7).
	Is the TCV incorrectly set?	Check that the TCV is correctly set for the required pump operating temperature. If necessary, adjust the TCV: see Section 3.15.2 .
	Is the coolant level too low?	Check the level of coolant in the pump, and add more coolant if necessary: refer to Section 5.5 .
	Is the heat exchanger blocked?	If your cooling-water supply is on and is at the correct pressure and temperature, the heat exchanger may be blocked: clean the heat exchanger (refer to Section 5.10).
	Has the pump seized because the shut-down system is faulty?	Check that the trip temperature setpoint is correctly set, and that the shut-down system operates correctly.
	Has the pump seized due to inadequate cooling of the rotors?	If your cooling-water supply is on and is at the correct pressure and temperature: <ul style="list-style-type: none"> • Check the oil levels and add more oil as necessary: refer to Section 5.3. • The oil filters may be blocked: replace the oil filters as described in Section 5.8. • IDX1300 only - the air bleed filter may be blocked.
	Is there a hydraulic lock in the pump?	Try to free the hydraulic lock (refer to Section 5.13). If you cannot free the pump, contact your supplier or Edwards.
	Has the pump seized due to deposits in the pump?	Flush the pump with cleaning solution (refer to Section 5.9). If you cannot clean the pump of deposits, contact your supplier or Edwards.
The pump operates at too high a temperature or the pump temperature is unstable.	Is the cooling-water flow inadequate, or is the flow being interrupted?	Before you restart the pump, check for correct cooling-water flow.
	Is the cooling-water filter blocked?	Clean the cooling-water filter (refer to Section 5.10.2).

Table 16 - Fault Finding (continued)

Symptom	Check	Action
The gearbox/end cover and oil are contaminated with the process substances pumped.	Has the shaft-seal purge failed?	Check the pressure of the air or nitrogen purge flow to the shaft-seals; if necessary adjust the air or nitrogen pressure. Change the gearbox/end cover oil before you restart the pump (refer to Section 5.8.1).
	Have the seals in the pump failed?	The seals must be replaced. Contact your supplier or Edwards for advice.
The gearbox/end cover is noisy.	Is the oil level low?	Check the oil level and fill as necessary (refer to Section 5.3.1).
The pump does not operate.	Has the pump seized due to deposits in the pump?	Flush the pump with cleaning solution (refer to Section 5.9). If you cannot clean the pump of deposits, contact your supplier or Edwards.
	Is the pump-motor faulty?	Make all the other appropriate checks in this table. If there is no other apparent cause for failure of the pump to operate, check the pump-motor and if necessary replace it (refer to Section 5.11).

6 Storage and disposal

6.1 Storage

Note: If you will store the pump in an environment with an ambient temperature below -14°C (7°F), you must also drain the oil and coolant from the pump: use the procedures in [Section 5.8](#) and [Section 5.5](#), then refit all of the drain-plugs and pipe connections to the pump before you store it.

Store the pump as follows:

1. Ensure that the pump has been shut down as described in [Section 4.3.3](#), then disconnect the pump from the electrical supply.
2. Refer to [Figure 1](#), [2](#) and [3](#). Place a suitable container under the cooling-water connections (15 and 19), then remove your cooling-water supply and return hoses from the connections and allow the cooling-water to drain from the pump.
3. Drain the cooling-water from the heat exchanger as described in [Section 5.10.1](#).
4. Disconnect the shaft-seals purge gas supply from the shaft-seals purge gas inlet (25).
5. Disconnect the pump process and exhaust connections.
6. Fit blanking-plates to the pump-inlet (6) and pump-outlet (16). Place protective covers over the pump services connection points.
7. Store the pump in clean dry conditions until required.
8. When required for use, prepare and install the pump as described in [Section 3](#) of this manual.

6.2 Disposal



WARNING

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

Dispose of the pump, cleaning solution, deposits removed from the pump, used pump oil, coolant, and any components safely in accordance with all local and national safety and environmental requirements.

Take particular care with the following:

- Hazardous deposits removed from the pump.
- Fluoroelastomers which may have decomposed as the result of being subjected to high temperatures
- Components and oil which have been contaminated with dangerous process substances.

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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, USA and a world-wide network of distributors. The majority of these employ service engineers who have undergone comprehensive Edwards training courses.

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

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

7.2 Service

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

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

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

7.3 Spares and maintenance kits

Note: *You will need 25 containers: of coolant to completely fill a pump with coolant.*

Refer to [Table 17](#) for the spares and maintenance kits available for the CDX and IDX pumps.

7.4 Accessories

A number of accessories are available for the CDX and IDX pumps, as listed below. Contact your supplier or Edwards for details of these accessories.

- Exhaust Silencers (mild steel or stainless steel)
- Flame arrestors
- Acoustic enclosures and acoustic cover kits
- Gas ballast kits
- Inlet purge kit
- Exhaust purge kit

Table 17 - Spares and Maintenance Kits

Spare	Item Number
Mobil SHC 629 oil: 4 litres (1.06 US gal)	H110-23-011
Container of coolant*	H128-10-003
Routine Maintenance Kit	A708-01-800
Heat Exchanger Cleaning Kit	A708-01-801
Cooling System Overhaul Kit	A708-01-802
Motor Fitting Kit	A708-01-803
Drive Coupling Kit	A708-01-804
Bearing and Seal Replacement Kit	A708-01-805
Oil Pump Replacement Kit	A708-01-806
Strip and Rebuild Kit	A708-01-807
Flame Arrestor Cleaning Kit	A708-01-808
Hoses Kit	A708-01-809
Flame Arrestor Replacement Kit (Inlet)	A708-01-810
Flame Arrestor Replacement Kit (Outlet)	A708-01-811
Flame Arrestor Tooling Kit	A708-01-812
Air Bleed Filter Replacement Kit	A709-01-801

* 0.9 litres (0.24 US gal) as supplied, 2.0 litres (0.53 US gal) when diluted.

Index

A

Abnormal operation - CDX and IDX pumps	11
Accessories	10, 73
Adjust the TCV (thermostatic control-valve)	39
Air bleed - IDX1300 only	2
Allow the pump to warm up	44
ATEX system control	44

C

Change the bearings and seals	67
Change the end-cover oil filter	53
Change the gearbox oil filter	55
Change the oil and oil filters, drain the vent filters, and clean the oil-level sight-glasses	52
Check the coolant level	28, 50
Check the coolant level and refill if necessary	50
Check the direction of pump rotation	35, 64
Check the end-cover oil level	28
Check the end-cover oil-level	48
Check the gearbox oil-level	28, 48
Check the oil levels	28
Check the oil-levels	48
Check the shaft-seals purge gas supply	50
Clean the coolant level sight-glass	60
Clean the cooling system	58
Clean the cooling-water filter	59
Clean the heat exchanger	59
Clean the vent adaptor	65
Clean/change the air bleed filters IDX1300 only	67
Clear a hydraulic lock	65
Commission the pump	38
Commissioning procedure	38
Connect the cooling-water supply	36
Connect the electrical supply to the pump-motor	34
Connect the pump inlet and outlet	37
Connect the pump to earth (ground)	35
Connect the pump to your process system	37
Connect the pump-outlet	38
Connect the shaft-seals purge gas supply	36
Connect the temperature sensor (CDX pumps only)	30
Connect the thermal snap-switches (IDX pumps only)	32
Connect the thermistor outputs	35
Connections	16
Coolant	17
Cooling-water supply	15

D

Description	2
Disposal	71
Drain the coolant and refill the pump with a different coolant	51
Drain the coolant from the cooling system	59

Drain the end-cover oil and clean the end-cover sight-glasses	52
Drain the end-cover vent filter	53
Drain the gearbox oil and clean the gearbox sight-glasses	55
Drain the gearbox vent filter	56
Drive coupling operation	3

E

Electrical data	14
-----------------	----

F

Fault finding	67
Fill the end-cover with new oil	53
Fill the gearbox with new oil	56
Fit the new pump-motor	63
Flush the pump with cleaning solution	56

H

Hazardous area	3
Hazardous area and safe area versions of the pump	3

I

Inspect the pipelines and connections	51
Installation	25
Introduction	1, 26, 34, 73

L

Leak test the system	38
Locate the pump	26
Locate the pump on its mounting feet	27
Locate the pump without the mounting feet	27
Lubrication data	15

M

Maintenance	47
Maintenance plan	47
Materials of construction	18
Mechanical data	14

N

Non-ATEX system control	44
Normal operation - CDX pumps	10
Normal operation - IDX pumps	10
Normal/abnormal operation	10

O

Operating and storage conditions	13
Operation	43
Operational safety	43

P

Performance	13
Prepare the pump for operation	60
Pumped gases	3
Pump-motor electrical connections	34

R

Remove the inlet filter	51
Remove the pump-motor	60
Replace the flexible coupling insert	64
Replace the pump-motor	60

S

Safe area (in relation to an external atmosphere) ...	3
Safety	25
Safety information	47
Scope and definitions	1
Service	73
Service, spares and accessories	73
Shaft-seals purge gas supply	15
Shaft-seals purge system	2
Shut down the pump	45
Spares and maintenance kits	73
Start the pump	44
Storage	71
Storage and disposal	71

T

Technical data	13
Temperature control system	2, 16

U

Unpack and inspect the pump	25
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