

Instruction Manual

CDP/QDP/iQDP accessories: Exhaust-Silencers

Description	Item Number
CDP Exhaust-Silencer	A386-11-000
QDP/iQDP Exhaust-Silencer	A528-19-000



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Associated publications

Publication title	Publication number
Vacuum pump and vacuum system safety	P400-40-100

1 Introduction

1.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for the Edwards CDP and QDP/iQDP Exhaust-Silencers. You must use the Exhaust-Silencer as specified in this manual.

Read this manual before you install the Exhaust-Silencer. 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 units used throughout this manual conform to the SI international system of units of measurement.

1.2 Description

Two models of Exhaust-Silencer are available, one model for use with the Edwards CDP range of pumps and one model for use with the Edwards QDP and iQDP ranges of pumps. The two models are identical, except that the Exhaust-Silencer for the CDP pumps has mounting hooks (Figure 1, item 14).

The Exhaust-Silencer attenuates the pulses in the exhaust pressure from the pump and reduces pump-induced resonance in your exhaust-extraction system.

The Exhaust-Silencer is suitable for use with all of the corrosive and particulate gases typically used in semiconductor applications and is designed for ease of maintenance.

1.3 Construction

Refer to Figure 1 in the following description.

The body of the Exhaust-Silencer (5) has a two-stage expansion chamber (6, 9) which is separated by a baffle-plate (8) at one end of the body. Both ends of the body of the Exhaust-Silencer have an end-cover plate (3, 12) which is retained by cap-head bolts (1) and sealed by a fluoroelastomer 'O' ring (4, 10).

Inlet and outlet connections (15, 13) to the Exhaust-Silencer are standard NW40 flanges.

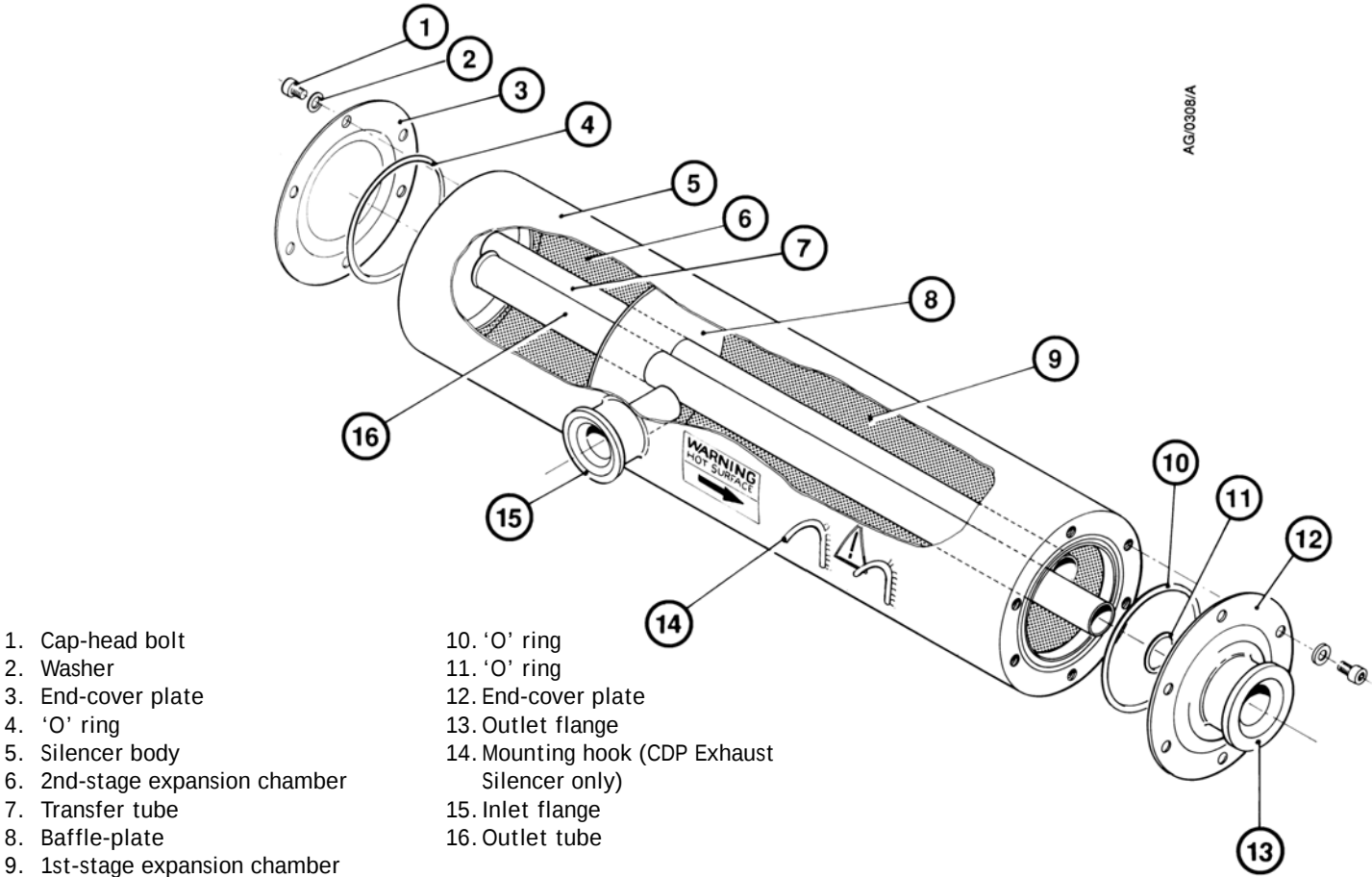
1.4 Principle of operation

Exhaust gases from the pump-outlet enter the Exhaust-Silencer through the inlet (15) and pass into the first-stage expansion chamber (9). The gases then pass through the transfer tube (7) into the second-stage expansion chamber (6) and then pass through the outlet tube (16) to the outlet of the Exhaust-Silencer (13).

The internal transfer and outlet tubes (6, 16) provide a long attenuation path for the exhaust gases.

Materials which sublime from the pump exhaust gases will collect in the expansion chambers of the Exhaust-Silencer. These materials must be removed regularly from the Exhaust-Silencer to maintain its efficiency (refer to Section 4).

Figure 1 - Components of the Exhaust Silencer



2 Technical Data

2.1 Mechanical data

Dimensions	See Figure 2
Mass	5.5 kg
Inlet connection	NW40
Outlet connection	NW40

2.2 Performance

Maximum throughput	80 m ³ h ⁻¹
Maximum back-pressure	3 psig (at maximum throughput)
Exhaust gas temperature range	5 to 150 °C
Exhaust pulse attenuation	30 dB(A)
Leak tightness	better than 1 x 10 ⁻⁵ mbar.l.s ⁻¹ (1 x 10 ⁻³ Pa.l.s ⁻¹) helium

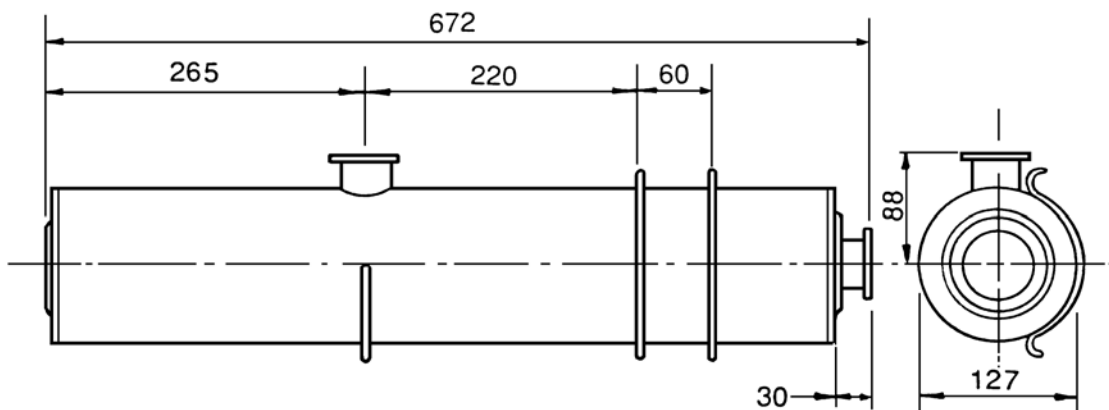
2.3 Operating and storage conditions

Ambient temperature range (operation)	5 to 40 °C
Ambient temperature range (storage)	-30 to 50 °C
Maximum ambient humidity (operation)	90% RH
Maximum ambient humidity (storage)	97% RH (non-condensing)

2.4 Construction materials

Silencer body	Stainless steel, ISI grade 304L
'O' rings	Fluoroelastomer

Figure 2 - Dimensions (mm) (CDP Exhaust-Silencer shown)



Technical Data

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 the Exhaust-Silencer.
- Ensure that the installation technician is familiar with the safety procedures which relate to the products processed by the pumping system. Wear the appropriate safety-clothing when you come into contact with contaminated components and dismantle and clean contaminated components inside a fume-cupboard.
- Vent and purge the pumping 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 components in the pumping system from the electrical supply so that they cannot be operated accidentally.
- Do not re-use 'O' rings and Co-Seals if they are damaged.
- Leak-test the system after installation and seal any leaks found to prevent leakage of dangerous substances out of the system and leakage of air into the system.

3.2 System requirements



WARNING

Use bellows which have a suitable pressure rating. If the exhaust pipeline is blocked, the CDP, QDP and iQDP pumps can generate pressures of up to 7 bar in the pipeline.



WARNING

Ensure that the pressure in the exhaust pipeline does not exceed 6 psi.

The Exhaust-Silencer (and the exhaust check-valve) are designed to be installed directly onto the Edwards CDP, QDP and iQDP ranges of pumps; fitting kits are supplied with the pumps to enable you to fit these accessories. If necessary, you can mount the accessories in alternative positions, provided that you obey the following rules:

- Always mount the Exhaust-Silencer so that it is horizontal.
- Incorporate flexible bellows in the exhaust pipeline to reduce the transmission of vibration and to prevent loading of coupling joints. Ensure that you use bellows which have a maximum pressure rating which is greater than the highest pressure that can be generated in the exhaust pipeline. We recommend that you use Edwards bellows.

Figure 3 shows correct and incorrect installation configurations; further information on installation configurations is given in the instruction manual supplied with the CDP, QDP or iQDP pump.

Incorporate suitable control equipment to monitor the pressure in the exhaust pipeline and to switch off the nitrogen purge supply when the pressure in the exhaust pipeline exceeds 6 psi. If you do not, the exhaust pipeline could be pressurised up to the nitrogen supply pressure.

If the Exhaust-Silencer is to be fitted to a new pump, locate the pump in its operating position before you fit the Exhaust-Silencer. If you do not, you may damage the Exhaust-Silencer when you move the pump.

3.3 Unpack and inspect

Remove all packing materials and protective covers and check the Exhaust-Silencer.

If the Exhaust-Silencer is damaged, notify your supplier and the carrier in writing within three days; state the Item Number of the Exhaust-Silencer together with your order number and your supplier's invoice number. Retain all packing materials for inspection. Do not use the Exhaust-Silencer if it is damaged.

If the Exhaust-Silencer is not to be used immediately, replace the protective covers. Store the Exhaust-Silencer in suitable conditions, as described in Section 6.

3.4 Remove the old Exhaust-Silencer (if necessary)



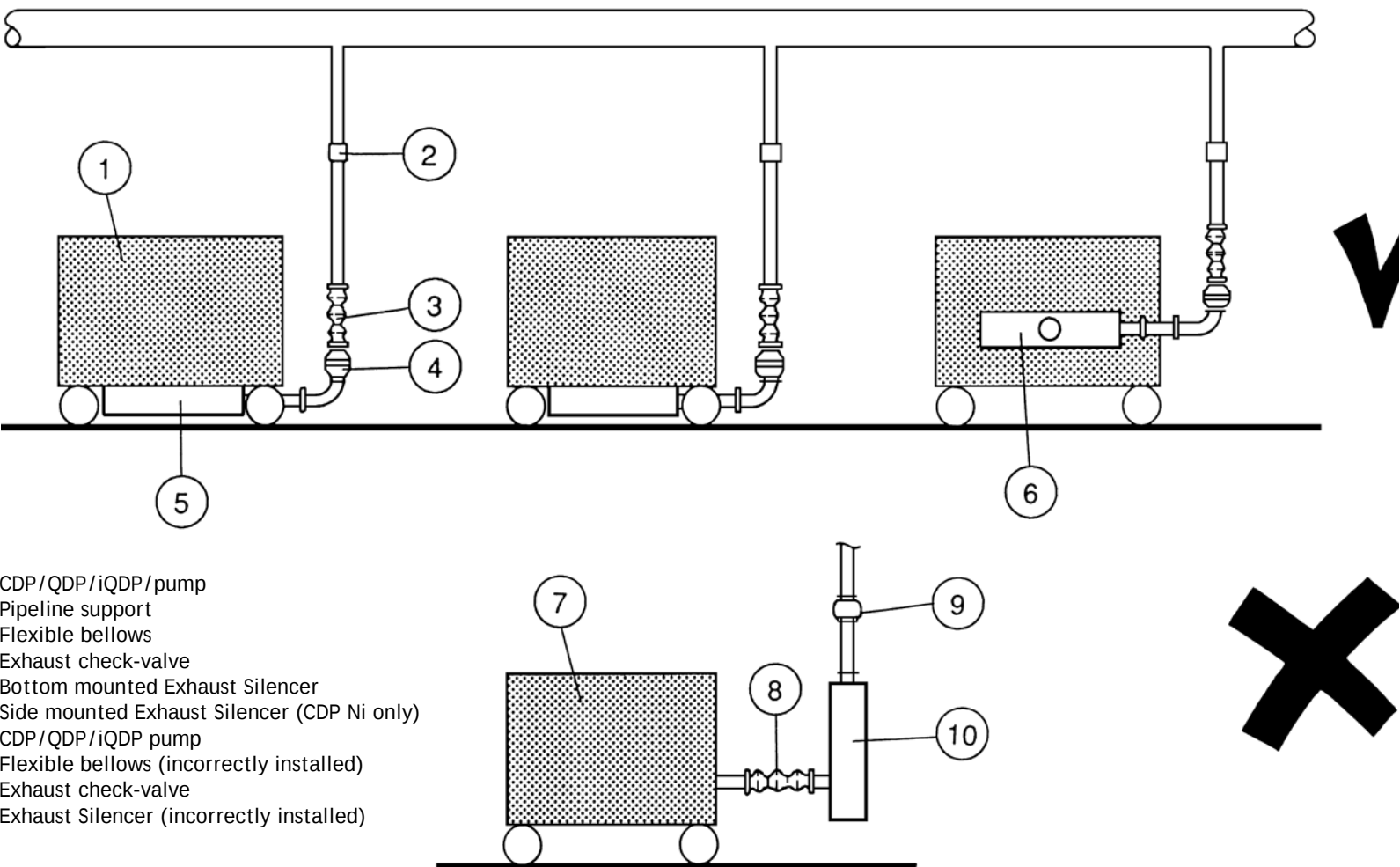
WARNING

Substances which accumulate in the Exhaust-Silencer may be dangerous. Do not allow these substances to come into contact with your skin or eyes. Do not inhale vapours from these substances.

Note: The following procedure assumes that the old Exhaust-Silencer has been installed in the recommended configuration.

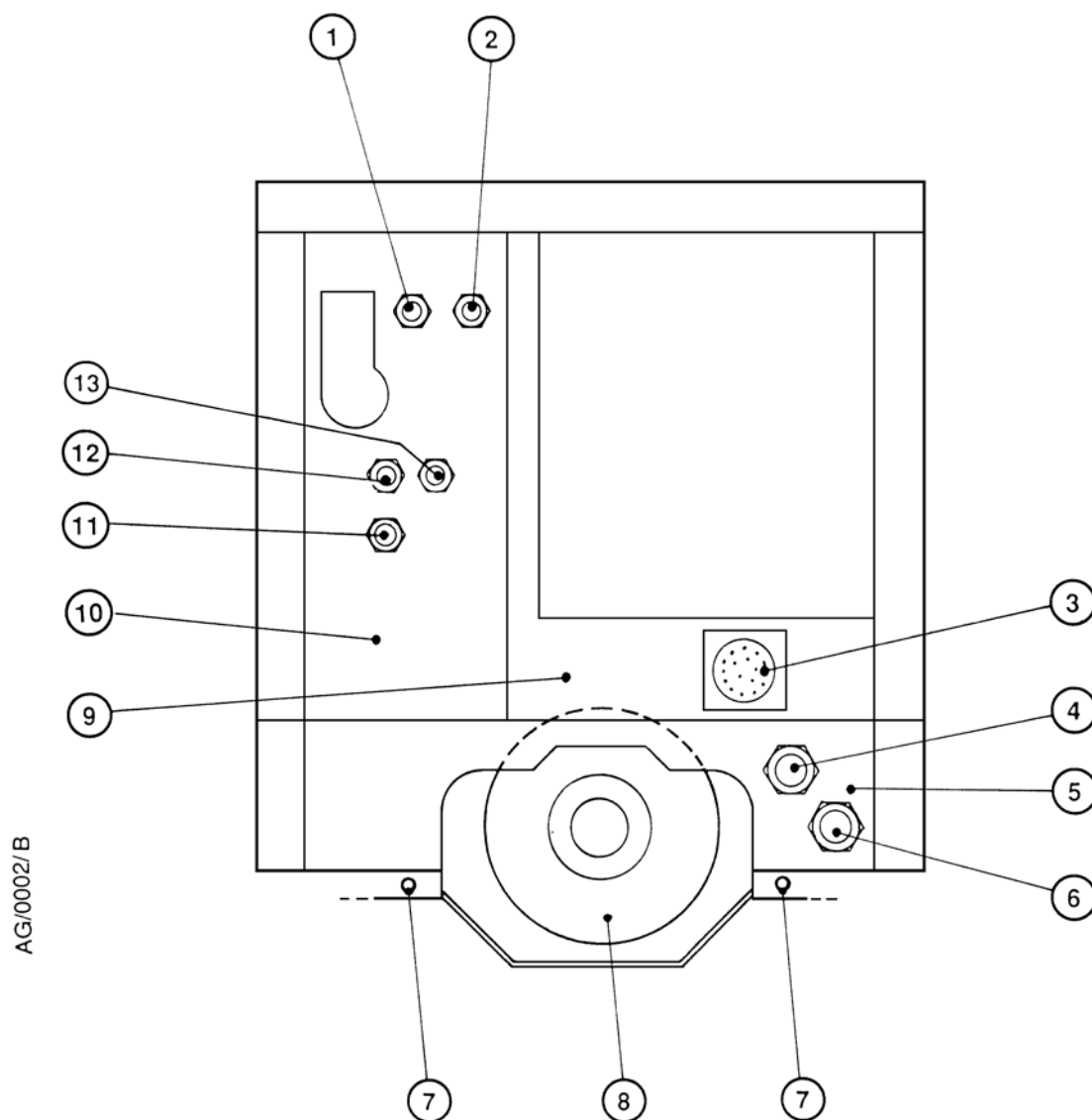
1. Release the NW40 clamp which secures the inlet-flange of the Exhaust-Silencer to the CDP, QDP or iQDP pump outlet or the outlet of the long NW40 elbow connected to the outlet of the CDP, QDP or iQDP pump. Remove the clamp and the Co-Seal.
2. Release the NW40 clamp which secures the outlet-flange of the Exhaust-Silencer to the exhaust check-valve. Remove the clamp and the Co-Seal.
3. On CDP pumps only: Remove the 2 'O' rings from each of the 3 mounting hooks on the Exhaust-Silencer, then remove the Exhaust-Silencer from the pump.
4. On QDP and iQDP pumps only: Slide the Exhaust-Silencer out towards the high-vacuum end of the pump to remove the Exhaust-Silencer from the pump. Alternatively, undo the two support-plate retaining screws (Figure 4, item 7) and slide the Exhaust-Silencer complete with the support-plate towards the motor end of the pump.

Figure 3 - Correct and incorrect installation configurations



1. CDP/QDP/iQDP/pump
2. Pipeline support
3. Flexible bellows
4. Exhaust check-valve
5. Bottom mounted Exhaust Silencer
6. Side mounted Exhaust Silencer (CDP Ni only)
7. CDP/QDP/iQDP pump
8. Flexible bellows (incorrectly installed)
9. Exhaust check-valve
10. Exhaust Silencer (incorrectly installed)

Figure 4 - QDP pump services



- | | |
|--|---------------------------------|
| 1. Exhaust-purge supply | 8. Exhaust silencer |
| 2. Inlet-purge supply | 9. Electrical services panel |
| 3. 17-way electrical connector | 10. Gas services panel |
| 4. Water return connector | 11. Gas-ballast boost supply |
| 5. Water services panel | 12. Shaft-seals purge supply |
| 6. Water supply connector | 13. 2/3-interstage purge supply |
| 7. Exhaust support-plate retaining screw | |

3.5 Fit the new Exhaust-Silencer

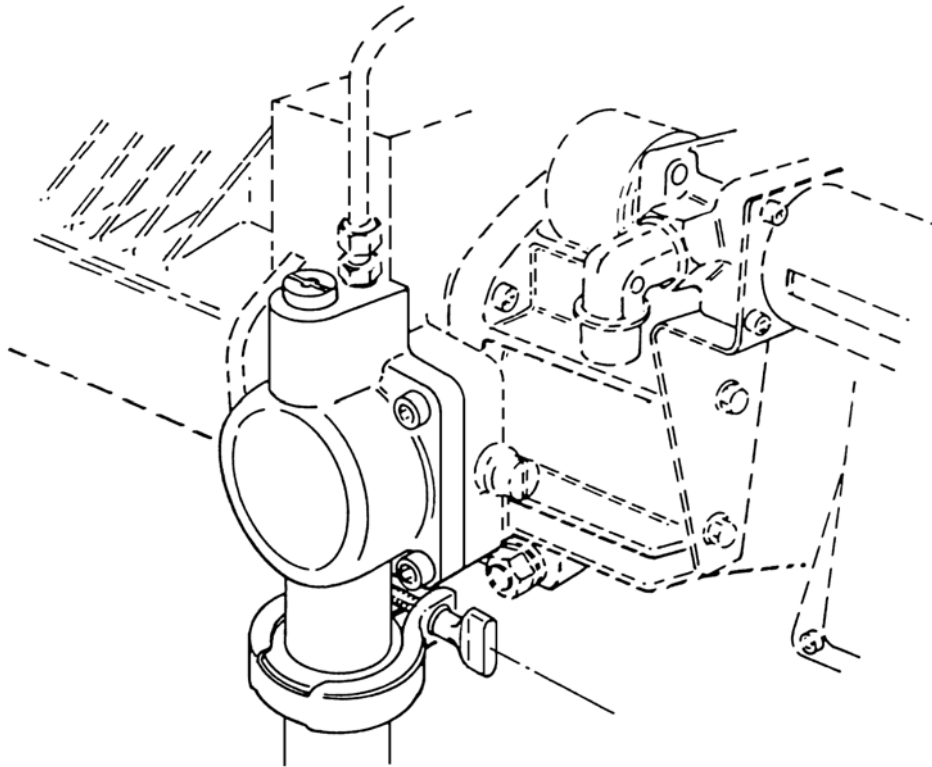
Note: The procedures in Sections 3.5.1 and 3.5.2 assume that the new Exhaust-Silencer will be installed in the recommended configuration.

3.5.1 Fit the new Exhaust-Silencer to a QDP, iQDP or CDP i, Ei or Si pump

Refer to Figures 6 and 7 to determine the correct installation configuration for your pump and fit the new Exhaust-Silencer as described below.

1. Remove the protective covers from the inlet- and outlet-flanges of the Exhaust-Silencer and check that the sealing-faces of the flanges are clean and are not damaged.
2. If you have a new pump, remove the protective cover from the outlet of the NW40 long elbow fitted to the outlet of the pump.
3. Check that the sealing-face on the outlet of the NW40 long elbow is clean and is not damaged.
4. Check that the mounting clamp which secures the long elbow to the outlet of the pump is correctly orientated; the clamping-bar must be parallel with and in its closest position to the pump, as shown in Figure 5.
5. If the Exhaust-Silencer is to be fitted to a QDP80, iQDP80 or CDP80 i, Ei or Si pump, use the NW40 Co-Seal and clamp supplied to fit the 50 mm NW40 straight adaptor supplied to the outlet of the Exhaust-Silencer.
6. On CDP pumps only:
 - Position the Exhaust-Silencer underneath the pump.
 - Check that the inlet of the Exhaust-Silencer is correctly orientated with the long NW40 elbow, then fit the 'O' rings on the mounting hooks on the pump to the corresponding mounting hooks on the Exhaust-Silencer.
7. On QDP and iQDP pumps only: Slide the Exhaust-Silencer in from the high-vacuum end of the pump. Alternatively, slide the Exhaust-Silencer complete with the support-plate in from the motor end of the pump and tighten the support-plate retaining screws (Figure 4, item 7).
8. Use the NW40 Co-Seal and clamp supplied to fit the inlet of the Exhaust-Silencer to the outlet of the NW40 long elbow on the outlet of the pump.
9. Use the NW40 Co-Seal and clamp supplied to connect the Exhaust-Silencer to the exhaust check-valve.

Figure 5 - Correct mounting clamp orientation (CDP pump shown)

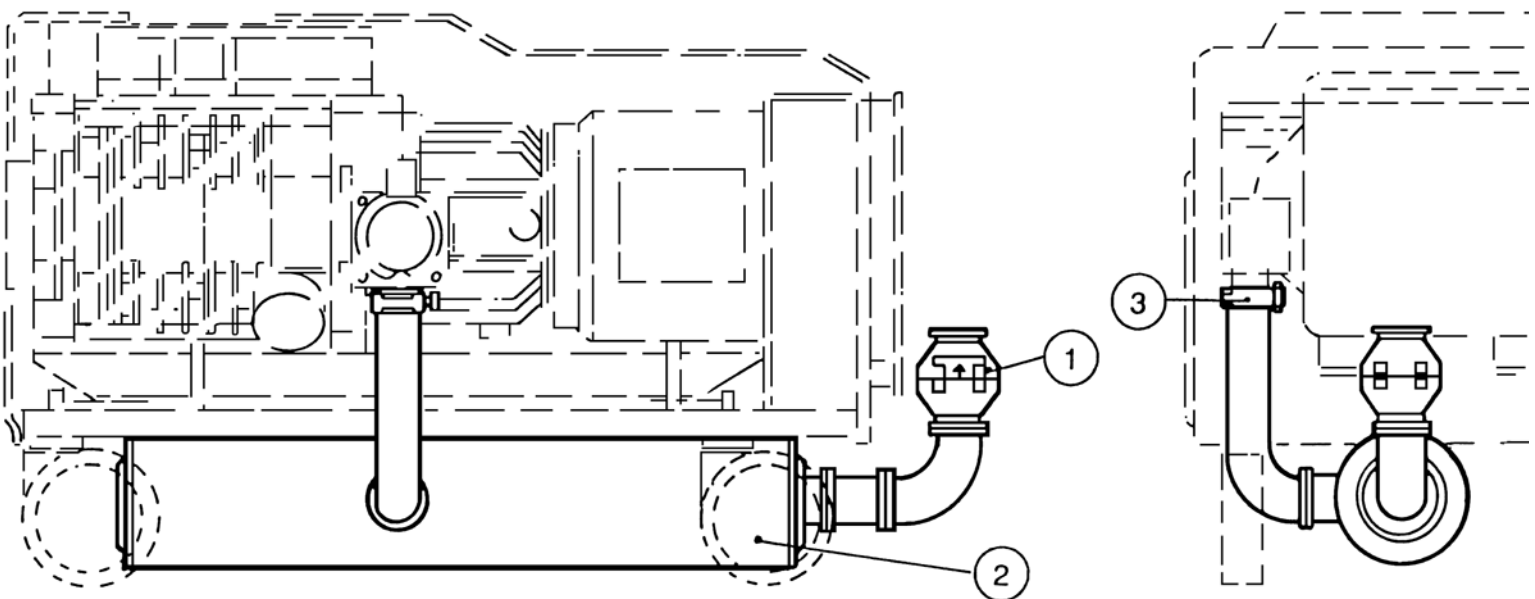


3.5.2 Fit the new Exhaust-Silencer to a CDP Ni pump

The correct installation configuration for your pump is shown in Figure 8. Fit the new Exhaust-Silencer as described below.

1. Remove the protective covers from the inlet- and outlet-flanges of the Exhaust-Silencer and check that the sealing-faces of the flanges are clean and are not damaged.
2. If you have a new pump, remove the protective cover from the outlet of the pump and check that the sealing-face of the outlet is clean and is not damaged.
3. Use the NW40 Co-Seal and clamp supplied to fit the inlet of the Exhaust-Silencer to the outlet of the pump.
4. Use the NW40 Co-Seal and clamp supplied to connect the Exhaust-Silencer to the exhaust check-valve.

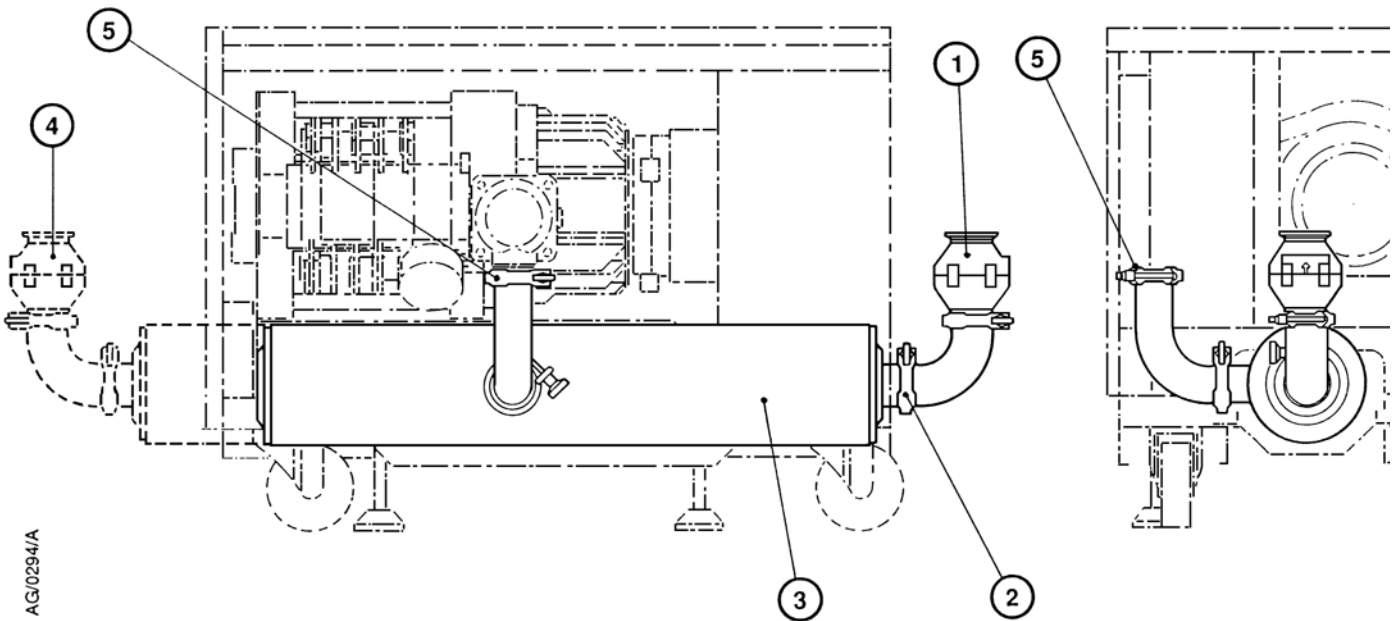
Figure 6 - Installation of the Exhaust-Silencer on CDP i, Ei and Si pumps



1. Exhaust check-valve
2. Exhaust-Silencer
3. Mounting clamp

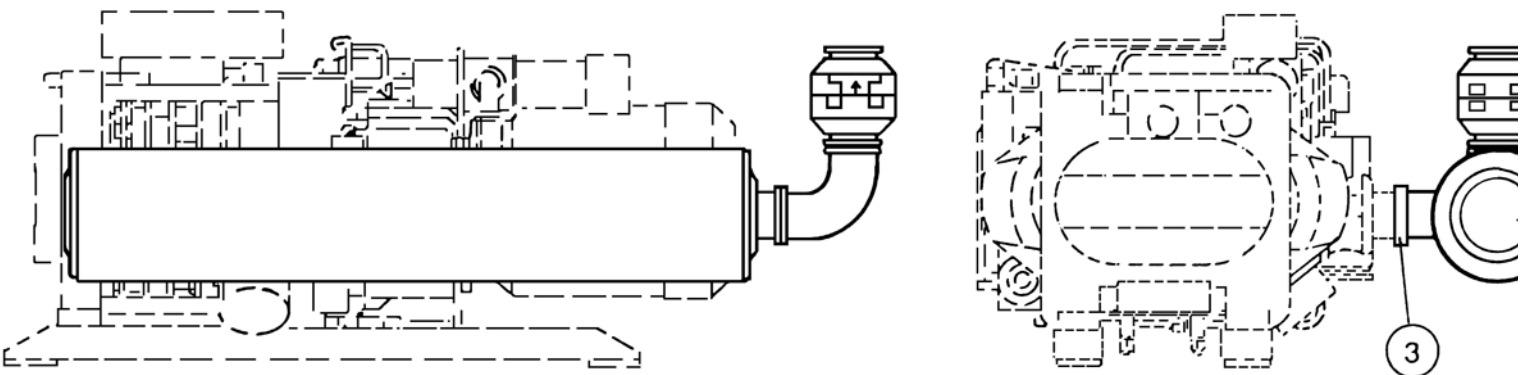
Installation

Figure 7 - Installation of the Exhaust-Silencer on QDP and iQDP pumps



1. Exhaust check-valve
2. Clamp
3. Exhaust-Silencer
4. Alternative outlet position
5. Mounting clamp

Figure 8 - Installation of the Exhaust-Silencer on CDP Ni



1. Exhaust check-valve
2. Exhaust-Silencer
3. Mounting clamp

3.6 Leak-test the installation



WARNING

Leak-test the system after installation and seal any leaks found to prevent 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. Dangerous substances which leak from the system will be dangerous to people and there may be a danger of explosion if air leaks into the system. We recommend that the leak rate is $1 \times 10^{-5} \text{ mbar.l.s}^{-1}$ ($1 \times 10^{-3} \text{ Pa.l.s}^{-1}$) helium or less.

4 Maintenance

4.1 Introduction

4.1.1 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.

- Ensure that the maintenance technician is familiar with the safety procedures which relate to the products processed by the pumping system. 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 pumping system before you start maintenance work.
- Check that all the required components are available and of the correct type before you start work.
- Disconnect the other components in the pumping system from the electrical supply so that they cannot be operated accidentally.
- Do not reuse 'O' rings and Co-Seals if they are damaged.
- Leak-test the system after maintenance if you have connected or disconnected any vacuum joints. Seal any leaks found to prevent leakage of dangerous substances out of the system and leakage of air into the system.

4.1.2 Overheated fluorinated materials



WARNING

Do not touch or inhale the thermal breakdown products of fluorinated materials which may be present if the Exhaust-Silencer or the pump has been heated to 260 °C and above. These breakdown products are very dangerous. Fluorinated materials in the Exhaust-Silencer and pump may include oils, greases and seals.

Fluorinated materials are used in the Exhaust-Silencer and the CDP, QDP and iQDP pumps. Fluorinated materials are safe in normal use but can decompose into very dangerous substances (which may include hydrofluoric acid) if they are heated to 260 °C and above.

The Exhaust-Silencer or the pump may have overheated if they were misused, malfunctioned or were in a fire. If the Exhaust-Silencer or pump has overheated, take extreme care to avoid skin contact with any part of the Exhaust-Silencer and pump and to avoid inhalation of vapours from the Exhaust-Silencer and pump. Edwards Health and Safety Data sheets for the fluorinated materials used in the pump and the Exhaust-Silencer are available on request: contact your supplier or Edwards.

4.2 Frequency of maintenance

We recommend that you inspect and clean the Exhaust-Silencer at least every three months. However in practice, the frequency of maintenance is dependent on your process. In clean processes, you may be able to decrease the frequency of maintenance; in harsh processes you may have to increase the frequency of maintenance. Adjust the frequency of maintenance according to your experience.

4.3 Inspect and clean the Exhaust-Silencer



WARNING

Substances which accumulate in the Exhaust-Silencer may be dangerous. Do not allow these substances to come into contact with your skin or eyes. Do not inhale vapours from these substances.

Refer to Figure 1 and dismantle, inspect and clean the silencer as described below. When you maintain the Exhaust-Silencer, use an Edwards Exhaust-Silencer service kit. This kit contains all of the seals and other components necessary to complete maintenance operations successfully. The Item Number of the service kit is given in Section 6.

1. Remove the Exhaust-Silencer from the pump as described in Section 3.4.
2. Weigh the silencer. If the mass of the silencer is greater than 7.5 kg, dismantle, clean and reassemble the silencer as in Steps 3 to 10 below. If the mass of the silencer is below 7.5 kg, it does not need to be cleaned; refit the silencer as in Step 11.
3. Remove and retain the six bolts and washers (1, 2) which secure each end-cover plate (3, 12) to the silencer body (5). Pull the end-cover plates squarely from the outlet pipe (16) to remove them.
4. Remove the three 'O' rings (4, 10, 11) from the silencer and discard.
5. Empty all loose deposits from the silencer body; take care not to damage the end-cover plate sealing surfaces.
6. Use a suitable tool to dislodge remaining deposits, then wash the silencer body with steam or water. Finally, glass-bead blast the silencer body. If required, use a cleaning solution suitable for the nature of the deposits.
7. Inspect the silencer for internal corrosion and check that the wall of the silencer body is not excessively eroded. Inspect the end-cover plate and inlet and outlet flange sealing-faces for damage and refinish if necessary. If silencer damage is excessive, it should be replaced.
8. Check that the 'O' ring grooves are clean. Apply a light wipe of vacuum grease and place the new 'O' rings in position.
9. Refit the end-cover plates and secure with the bolts and washers removed in Step 3. Tighten the bolts progressively; alternate between bolts on opposite sides of the end-cover plate. Tighten to a torque of 10 Nm.
10. Leak-test the silencer.
11. Refit the Exhaust-Silencer to the pump:
 - For QDP, iQDP and CDP i, Ei and Si pumps, refer to Steps 6 to 9 of Section 3.5.1.
 - For CDP Ni pumps, refer to Steps 3 and 4 of Section 3.5.2.

5 Storage and Disposal

5.1 Storage

Place protective covers over the inlet and outlet-flanges of the Exhaust-Silencer and store in cool, dry conditions until required.

When required for use, install the Exhaust-Silencer as described in Section 3.

5.2 Disposal

Dispose of the Exhaust-Silencer and any components safely in accordance with all local and national safety and environmental requirements.

Particular care must be taken with the following:

- Fluorinated materials which may have decomposed as the result of being subjected to high temperatures
- Components which have been contaminated with dangerous process substances.

Storage and Disposal

6 Spares and Accessories

6.1 Introduction

Edwards products, spares and accessories are available from Edwards companies in Belgium, Brazil, Canada, France, Germany, Hong Kong, Italy, Japan, Korea, Switzerland, United Kingdom, U.S.A, and a world wide network of distributors. The majority of these centres employ Service Engineers who have undergone comprehensive Edwards training courses.

Order spare parts and accessories from 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 part

6.2 Spares

The following service kit is available for the Exhaust-Silencer:

Product	Item Number
Exhaust-Silencer service kit	A386-11-820

Spares and Accessories