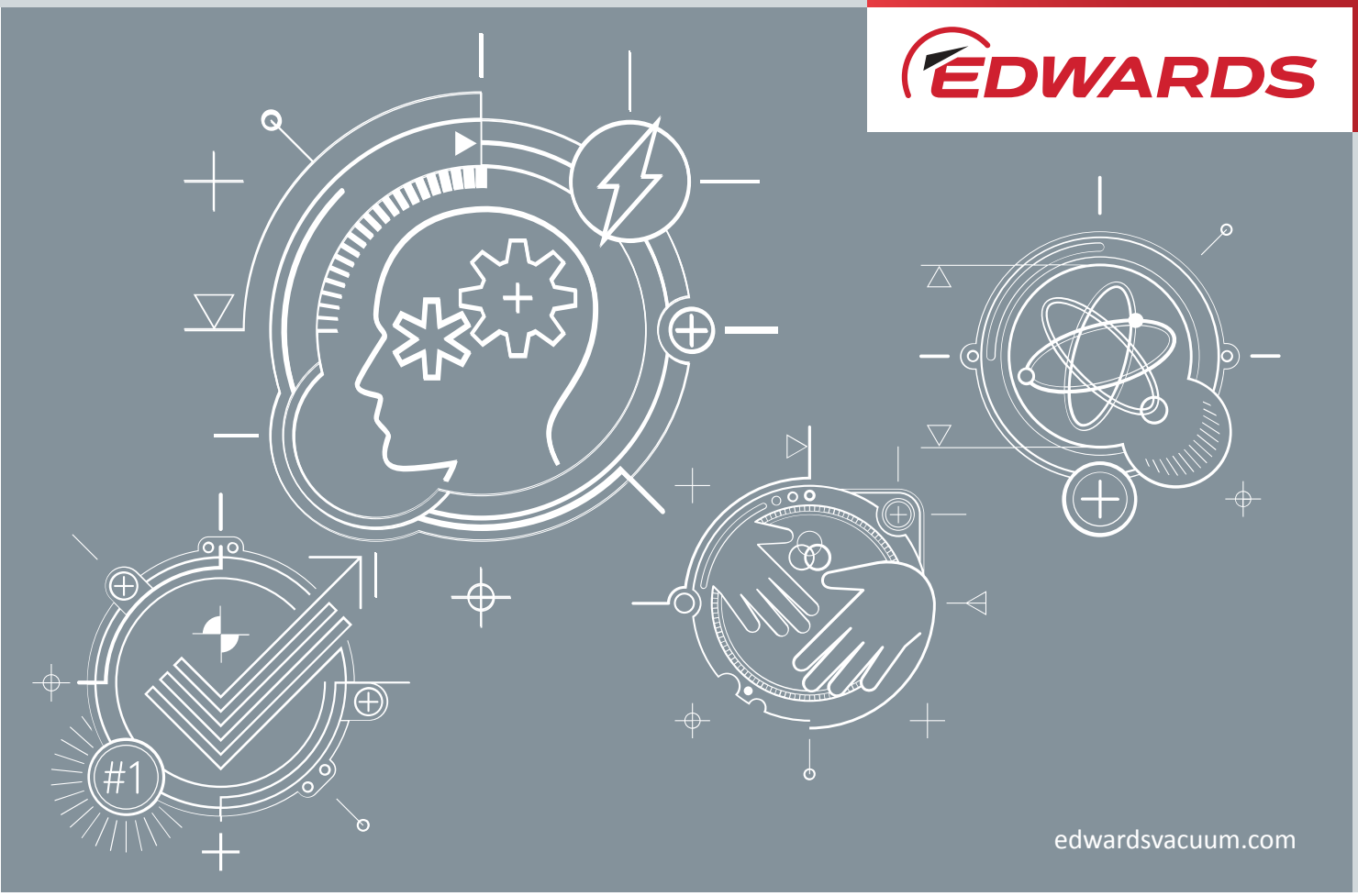


# Single Stage Rotary Vane Pumps nES Series

## INSTRUCTION MANUAL

| PUMP MODEL | PRODUCT ITEM NUMBERS | PUMP MODEL | PRODUCT ITEM NUMBERS |
|---|---|---|---|
| nES40 | A3510xxxx | nES300 | A356xxxxx |
| nES65 | A3530xxxx | nES470 | A3570xxxx |
| nES100 | A3540xxxx | nES570 | A3580xxxx |
| nES200 | A3550xxxx | nES630/nES750 | A3590xxxx |

# Copyright notice



# Trademark credit



# Disclaimer

The content of this manual may change from time to time without notice. We accept no liability for any errors that may appear in this manual nor do we make any expressed or implied warranties regarding the content. As far as practical we have ensured that the products have been designed and constructed to be safe and without risks when properly installed and used in accordance with their operating instructions.

We accept no liability for loss of profit, loss of market or any other indirect or consequential loss whatsoever.

Product warranty and limit of liability are dealt with in our standard terms and conditions of sale or negotiated contract under which this document is supplied.

You must use this product as described in this manual. Read the manual before you install, operate, or maintain the product.

# Declaration of Conformity

P200-10-195-A

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

The following product:

Product designation : nES, Single Stage Rotary Vane Pumps
Type designation: 40 / 65 / 100 / 200 / 300 / 470 / 570 / 630 / 750
Model number: nES40 / nES65/ nES100/ nES200/ nES300 / nES470/ nES570/ nES630 / nES750 and their variants

conform to the relevant requirements of European CE legislation:

| | |
|---|---|
| 2006/42/EC | Machinery directive |
| 2014/35/EU | The safety objectives of the Low Voltage Directive 2014/35/EU were complied with in accordance with Appendix 1 No. 1.5.1 of Machinery Directive 2006/42/EC. |
| 2014/30/EU | Electromagnetic compatibility (EMC) directive |
| 2011/65/EU | And 2015/863/EU<br>Restriction of certain hazardous substances (RoHS) Directive |

Based on the relevant requirements of harmonised standards:

| | |
|---|---|
| EN 1012-2:1996+A1:2009 | Compressors and vacuum pumps — Safety requirements — Part 2: Vacuum pumps |
| EN 60204-1:2006/A1:2009 | Safety of machinery — Electrical equipment of machines — Part 1: General requirements |
| EN 61000-6-2:2005/AC:2005 | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments |
| EN 61000-6-4:2007/A1:2011 | Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments |

*This covers all product serial numbers from the date of this declaration onwards*

Cologne, July 9th, 2018

Andries Desiron
VP Engineering
Industrial Vacuum Division

Valence, July 9th, 2018

Joseph Schott
General Manager Product Company Valence

This product has been manufactured under a quality management system certified to ISO 9001:2015.
This declaration is based on the requirements of EN ISO 17050-1 and the relevant directives.

# Material Declaration

In accordance with the requirements of the Chinese regulatory requirement on the Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products Order No. 32 (also known as 'China RoHS2') and SJ/T 11364 Marking for the Restricted Use of Hazardous Substances in Electronic and Electrical Products:

| Product | Product Labels | Meaning |
|---|---|---|
| nES Single Stage Pumps - nES40, nES65, nES100, nES200, nES300, nES470, nES570, nES630, nES750 |   | This product contains hazardous substances in at least one of the homogeneous materials used which are above the limit requirement in GB/T 26572 as detailed in the declaration table below. These parts can safely be used for the environmental protection use period as indicated. |

材料成分声明
**Materials Content Declaration**

| 部件名称 Part name | 有害物质 Hazardous Substances | | | | | |
|---|---|---|---|---|---|---|
| | 铅 Lead (Pb) | 汞 Mercury (Hg) | 镉 Cadmium (Cd) | 六价铬 Hexavalent Chromium (Cr VI) | 多溴联苯 Polybrominated biphenyls (PBB) | 多溴二苯醚 Polybrominated diphenyl ethers (PBDE) |
| 铸铝及铝合金制品 Aluminium alloys | X | O | O | O | O | O |
| 钢合金制品 Steel alloys | X | O | O | O | O | O |
| 铜管管件 Brass pipe fitting | X | O | O | O | O | O |
| 铜接头 Brass connectors | X | O | O | O | O | O |
| 铜衬套轴承 Brass bush bearing | X | O | O | O | O | O |

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

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

NOTE: These products are EU RoHS compliant, the following Exemptions apply:
6(a) **Lead** as an alloying element in steel for machining purposes and in galvanised steel containing up to 0.35% by weight
6(b) **Lead** as an alloying element in aluminium containing up to 0.4% by weight
6(c) Copper alloy containing up to 4% **lead** by weight

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# Contents

# List of Figures

# 1. Safety and compliance

## 1.1 Definition of Warnings and Cautions

**NOTICE:**

**For safe operation from the start, read these instructions carefully before you install or commission the equipment.**

**Read all the safety instructions in this section and the rest of this manual carefully and make sure that you obey these instructions. The equipment must only be operated and maintained by trained personnel in the proper condition and as described in this instruction manual.**

**Obey local and state requirements and regulations. If you have any questions about safety, operation or maintenance of the device, please contact our nearest subsidiary.**

Important safety information is highlighted as warning and caution instructions. Obey these instructions.

**WARNING:**

**If you do not obey a warning, there is a risk of injury or death. Different symbols are used according to the type of hazard.**

**CAUTION:**

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

**NOTICE:**

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

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

Keep the instructions for future use.

## 1.2 Safety symbols

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

The safety symbols that follow are used on the product or in the product documentation.

| | |
|---|---|
|  | Warning/Caution<br>An appropriate safety instruction must be followed or caution to a potential hazard exists. |
|  | Warning - Dangerous voltage<br>Identifies possible hazards from dangerous voltages. |
|  | Warning - Hot surfaces<br>Identifies a potential hazard from a hot surface. |
|  | Warning - Use protective equipment<br>Use appropriate protective equipment for the task. |
|  | Warning - Risk of explosion<br>There is a risk of explosion when you do the task. |
|  | Warning - Environmental hazard<br>Identifies possible hazards to the environment. |
|  | Warning - Flammable material<br>The material is flammable. If exposed to sources of ignition it can cause a fire. |
|  | Warning - Corrosive substances<br>The substance is corrosive. |
|  | Warning - Toxic material<br>The material is toxic. |

## 1.3 General precautions

### CAUTION: AUTOMATIC RESTART AFTER VOLTAGE FAILURE

**Risk of damage to equipment. If the machine is equipped with an automatic restart after voltage failure function and if this function is active, be aware that the machine will restart automatically when the power is restored if it was running when the power was interrupted.**

**Note:**

*All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.*

*Some precautions are general and cover several machine types and equipment, hence some statements may not apply to your machine.*

*These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included in this manual.*

1. The operator must follow safe working practices and observe all related work safety requirements and regulations.
2. If any of the following statements does not comply with the applicable legislation, the stricter of the two shall apply.
3. Installation, operation, maintenance and repair work must only be performed by authorised, trained and specialised personnel.
4. The vacuum pump is designed for handling atmospheric air only. No other gases, vapours or fumes should be exposed to the vacuum pump inlet or processed by the vacuum pump.
5. Before any maintenance, repair work, adjustment or any other non-routine checks, stop the vacuum pump, press the emergency stop button, switch off the voltage and make sure that the pump system is at atmospheric pressure level. Also, the power isolating switch must be opened and locked.
6. Avoid contact with pump inlet during operation.
7. The owner is responsible for maintaining the unit in a safe operating condition. Parts and accessories shall be replaced if unsuitable for safe operation.
8. Do not walk or stand on the unit or its components.

## 1.4 Safety precautions during installation

1. The machine must only be lifted using suitable equipment by the applicable safety regulations. Loose or pivoting parts must be securely fastened before lifting. It is strictly forbidden to dwell or stay in the risk zone under a lifted load. Lifting acceleration and deceleration must be kept within safe limits. Wear a safety helmet when working in the area of overhead or lifting equipment.
2. The unit is designed for indoor use. If the unit is installed outdoors, special precautions must be taken. Consult the supplier.
3. Place the machine where the ambient air is as cool and clean as possible. If necessary, install a suction duct. Never obstruct the air inlet. Water handling capacity is limited.
4. Any blanking flanges, plugs, caps and desiccant bags must be removed before connecting the pipes.
5. Air hoses must be of correct size and suitable for the working pressure. Never use frayed, damaged or worn hoses. Distribution pipes and connections must be of the correct size and suitable for the working pressure.
6. The aspirated air must be free of flammable fumes, vapours and particles, for example, paint solvents that can lead to internal fire or explosion.
7. Arrange the air inlet to prevent contact with loose clothing.
8. No external force may be exerted on the inlet and outlet connections. The connected pipes must be free of strain.
9. If remote control is installed, the machine must bear a clear sign stating: DANGER: This machine is remotely controlled and may start without warning.

   The operator must make sure that the machine is stopped, depressurised and that the electrical isolating switch is open, locked and labelled with a temporary warning before any maintenance or repair. As a further safeguard, persons switching remotely controlled machines shall take adequate precautions to make

sure that there is no one checking or working on the machine. A suitable notice must be affixed to the start equipment.

10. Air-cooled machines must be installed to make sure adequate flow of cooling air is available and that the exhausted air does not recirculate to the inlet.
11. The electrical connections must correspond to the applicable codes. The machines must be earthed and protected against short circuits by fuses in all phases. A lockable power isolating switch must be installed near the pump.
12. On machines with an automatic start/stop system or if the automatic restart function after voltage failure is activated, a sign stating "This machine may start without warning" must be affixed near the instrument panel.
13. In multiple vacuum pump systems, manual valves must be installed to isolate each pump. Non-return valves (check valves) must not be relied upon for isolating multiple systems.
14. Never remove or tamper with the safety devices, guards or insulation fitted on the machine.
15. Piping or other parts with a temperature over 70 °C (158 °F) and which may be accidentally touched by personnel in normal operation must be guarded or insulated. Another high-temperature piping must be marked.
16. For water-cooled machines, the cooling water system installed outside the machine must be protected by a safety device with set pressure according to the maximum cooling water inlet pressure.
17. If the ground is not level or can be subject to variable inclination, consult the manufacturer.
18. Pump outlet air contains traces of oil mist. Ensure compatibility with the working environment.
19. Whenever air containing hazardous substances enters the pump (that is, biological or microbiological agents), use abatement systems placed upstream of the vacuum pump.
20. Any vacuum pump placed in an application with inlet gas stream temperatures above the published maximum temperature should be approved by us before start-up.

**Note:**

*Refer to Safety precautions during operation on page 12 Safety precautions during operation on page 9 and Safety precautions during maintenance or repair on page 13 Safety precautions during maintenance or repair on page 10.*

## 1.5 Safety precautions during operation

1. Never touch any piping or components of the vacuum pump during operation.
2. Use only the correct type and size of hose end fittings and connections. Make sure that a hose is fully depressurised before disconnecting it.
3. Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote start equipment.
4. Never operate the machine when there is a possibility of taking inflammable or toxic fumes, vapours or particles.

5. Never operate the machine below or above its limit ratings.
6. Keep all bodywork doors shut during operation. The doors may be opened for short periods only, for example, to do routine checks. Wear ear protectors when opening a door.
   On vacuum pumps without bodywork, wear ear protection in the vicinity of the machine.
7. People staying in environments or rooms where the sound pressure level reaches or exceeds 80 dB(A) must wear ear protectors.
8. Periodically check that:
   - All guards are in place and securely fastened.
   - All hoses and pipes inside the machine are in good condition, secure and not rubbing.
   - There are no leaks.
   - All fasteners are tight.
   - All electrical leads are secure and in good order.
   - Safety valves and other pressure relief devices are not obstructed by dirt or paint.
   - Air outlet valve and air net, that is pipes, couplings, manifolds, valves, hoses, and so forth, are in good repair, free of wear or abuse.
   - Electrical cabinet air cooling filters are not clogged.
9. If warm cooling air from vacuum pumps is used in air heating systems, for example, to warm up a workroom, take precautions against air pollution and possible contamination of the breathing air.
10. On water-cooled vacuum pumps using open circuit cooling towers, protective measures must be taken to avoid the growth of harmful bacteria such as Legionella pneumophila bacteria.
11. Do not remove any of, or tamper with, the sound-damping material.
12. Never remove or tamper with the safety devices, guards or insulations fitted on the machine.
13. The oil separator tank can be slightly pressurised. Do not open and do not leave oil filler or drain plugs open during operation.
14. Do not use the pump as a compressor.
15. Never run the pump without the air inlet filter mounted.

**Note:**

*Refer to Safety precautions during installation on page 10 Safety precautions during installation on page 8 and Safety precautions during maintenance or repair on page 13 Safety precautions during maintenance or repair on page 10.*

## 1.6 Safety precautions during maintenance or repair

1. Always use the correct safety equipment (such as safety glasses, gloves, safety shoes, and so forth).
2. Use only the correct tools for maintenance and repair work.
3. Use only genuine spare parts.
4. All maintenance work shall be performed after the machine has cooled down.

5. A warning sign bearing a legend such as "Work in progress; do not start" shall be attached to the starting equipment.
6. Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote start equipment.
7. Before removing any component, effectively isolate the machine from all sources of under and/or overpressure and make sure that the pump system is at atmospheric pressure level.
8. Never use flammable solvents or carbon tetrachloride for cleaning parts. Take safety precautions against toxic vapours of cleaning liquids.
9. Scrupulously observe cleanliness during maintenance and repair. Keep dirt away by covering the parts and exposed openings with a clean cloth, paper or tape.
10. Never weld or perform any operation involving heat near the oil system. Oil tanks must be completely purged, for example, by steam cleaning, before carrying out such operations. Never weld on, or in any way modify, pressure vessels.
11. Whenever there is an indication or any suspicion that an internal part of a machine is overheated, the machine shall be stopped but no inspection covers shall be opened before sufficient cooling time has elapsed. This will avoid the risk of spontaneous ignition of the oil vapour when air is admitted.
12. Never use a light source with an open flame for inspecting the interior of a machine, pressure vessel, and so forth.
13. Make sure that no tools, loose parts or rags are left in or on the machine.
14. All regulating and safety devices shall be maintained with due care to ensure that they function properly. They may not be put out of action.
15. Before clearing the machine for use after maintenance or overhaul, check that operating pressures, temperatures and time settings are correct. Check that all control and shut-down devices are fitted and that they function correctly. If removed, check that the coupling guard of the vacuum pump drive shaft has been reinstalled.
16. Every time the separator element is renewed, examine the discharge and the inside of the oil separator vessel for carbon deposits. If there are excessive deposits, remove it.
17. Protect the motor, air filter, electrical and regulating components, and so forth, to prevent moisture from entering them, for example, when steam cleaning.
18. Make sure that all sound damping material and vibration dampers, for example, damping material on the bodywork and in the air inlet and outlet systems of the vacuum pump are in good condition. If damaged, replace it with genuine material from the manufacturer to prevent the sound pressure level from increasing.
19. Never use caustic solvents which can damage materials of the air net, for example, polycarbonate bowls.
20. Faults or wearing of seals may cause oil lubricant leaks. Avoid dispersion in soil and pollution of other materials.

**Note:**

*Refer to Safety precautions during installation on page 10 Safety precautions during installation on page 8 and Safety precautions during operation on page 12 Safety precautions during operation on page 9.*

# 2. Description

## 2.1 General description

The nES40 to nES750 are single-stage, oil-sealed and air or water-cooled rotary vane vacuum pumps driven by an electric motor. nES470, nES570, nES630 and nES750 are belt driven.

The pumps have been specifically designed to work with clean air, inert gas or small amounts of water vapour. The ambient temperature must be between 12 °C and 40 °C.

**Note:**

*Lower temperatures are possible with reduced viscosity oil. This temperature range is defined by the standards body Pneurop for performance conformity testing, but the ambient temperature given is most critical at motor start-up..*

## 2.2 Airflow

- Air drawn through the inlet protection screen and the inlet non-return valve is displaced by the vacuum pump element towards the air end exhaust valve. This valve ejects a mixture of air and oil into the exhaust filter element. After passing the exhaust filter element, clean air (conditioned to a few parts per million) is discharged through the outlet.
- The vacuum pump is driven by an electric motor.

## 2.3 Oil flow

Oil injected into the pump chamber serves to seal, lubricate and cool the pump. The oil mixed with the compressed gas is coarsely trapped in the bottom part of the oil casing. Then fine filtering occurs in the integrated exhaust filter elements. The proportion of oil in the exhaust gas is reduced below the visibility threshold (over 99% entrapment rate). The oil trapped in the exhaust filters is returned to the generator by the oil return line. To prevent gas flow at atmospheric pressure from the oil reservoir into the inlet port, the oil return line is controlled by a float valve. The oil cycle is maintained by the pressure difference existing between the oil casing (pressure above atmospheric pressure) and the inlet port (pressure below atmospheric pressure).

# 3. Technical data

## 3.1 References conditions and limitations

*Table 1 References conditions and limitations*

| Parameter | Unit | nES 40 | nES 65 | nES 100 | nES 200 | nES 300 | nES 300S | nES 470 | nES 570 | nES 630 | nES 750 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ambient barometric pressure | mbar(g) | 1013 | | | | | | | | | |
| | Torr (mmHg) | 760 | | | | | | | | | |
| Air inlet temperature | °C | 20 | | | | | | | | | |
| | °F | 68 | | | | | | | | | |
| Motor speed 50 Hz | rpm | 1500 | | | | | | | | | |
| Motor speed 60 Hz | rpm | 1800 | | | | | | | | | |
| Mineral oil viscosity | ISO | VG68 | | | | | | | | | |
| Maximum inlet pressure for continuous operation | mbar(g) | 1013 | | | | | | | | | |
| | Torr (mmHg) | 760 | | | | | | | | | |
| Maximum ambient temperature | °C | 40 | | | | | | | | | |
| | °F | 104 | | | | | | | | | |
| Minimum ambient temperature | °C | 12 | | | | | | | | | |
| | °F | 53.6 | | | | | | | | | |
| Maximum gas inlet temperature | °C | 40 | | | | | | | | | |
| | °F | 104 | | | | | | | | | |
| Minimum gas inlet temperature | °C | 12 | | | | | | | | | |
| | °F | 53.6 | | | | | | | | | |
| Maximum exhaust back pressure | mbar(g) | 150 | | | | | | | | | |
| | psi(g) | 2.2 | | | | | | | | | |
| Minimum exhaust back pressure | mbar(g) | -15 | | | | | | | | | |
| | psi(g) | -0.22 | | | | | | | | | |
| Maximum inlet pressure for water vapour with standard gas ballast | mbar(g) | 30 | | | | 10 | | 15 | | 40 | |
| | torr (mmHg) | 22.5 | | | | 7.5 | | 11 | | 30 | |

**Note:**

*Lower temperatures are possible with reduced viscosity oil. This temperature range is defined by Pneurop for performance conformity testing, but 8 °C is the critical point from the motor starting viewpoint.*

## 3.2 Pump data

***Table 2 Pump data***

| Parameter | Unit | nES 40 | nES 65 | nES 100 | nES 200 | nES 300 | nES 300S | nES 470 | nES 570 | nES 630 | nES 750 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Maximum displacement (50 Hz) | $m^3h^{-1}$ | 44.0 | 59.0 | 98.0 | 180 | 280 | 330 | 470 | 570 | 700 | 840 |
| | cfm | 25.9 | 34.8 | 57.4 | 106 | 165 | 194 | 277 | 366 | 412 | 494 |
| Maximum displacement (60 Hz) | $m^3h^{-1}$ | 53.0 | 71.0 | 117 | 230 | 340 | 385 | 570 | - | 840 | - |
| | cfm | 31.2 | 41.8 | 68.9 | 130 | 200 | 227 | 366 | - | 494 | - |
| Pumping speed (50 Hz) | $m^3h^{-1}$ | 38.5 | 54.0 | 87.5 | 170 | 240 | 284 | 400 | 470 | 640 | 755 |
| | cfm | 22.7 | 31.8 | 51.5 | 100 | 141 | 167 | 236 | 277 | 377 | 444 |
| Pumping speed (60 Hz) | $m^3h^{-1}$ | 47.0 | 64.0 | 105 | 200 | 290 | 330 | 470 | - | 755 | - |
| | cfm | 27.7 | 37.7 | 61.8 | 118 | 171 | 194 | 277 | - | 444 | - |
| Motor rated power (50 Hz) | kW | 1.3 | 1.8 | 3 | 4.5 | 5.5 | 6 | 11 | 11 | 18.5 | 18.5 |
| Motor rated power (60 Hz) | kW/hp | 1.3/2 | 1.8/3 | 3.6/5 | 5.5/ 7.5 | 6.6/ 10 | 7.2/10 | 13.2/ 15 | - | 18.5/ 25 | - |
| Dimensions (L x W x H) (Approximate) | mm | 540 x 284 x 303 | 586 x 320 x 314 | 721 x 400 x 319 | 1002 x 535 x 415 | 1115x 555 x 450 | 1117 x 565 x 450 | 1305 x 863 x 779 | 1305 x 863 x 779 | 1563 x 909 x 740 | 1563 x 909 x 740 |
| Maximum water vapour pumping rate (50 Hz) | $Kgh^{-1}$ | 0.76 | 1.0 | 1.60 | 3.4 | 1.3 | | 5.0 | 7.5 | 17 | 24 |
| | $Ibh^{-1}$ | 0.80 | 1.1 | 1.69 | 3.6 | 1.4 | | 5.3 | 8.0 | 18 | 25 |
| Maximum water vapour pumping rate (60 Hz) | $Kgh^{-1}$ | 0.90 | 1.25 | 1.70 | 5.4 | 1.8 | | 7.5 | - | 24 | - |
| | $Ibh^{-1}$ | 0.95 | 1.32 | 1.80 | 5.7 | 1.9 | | 8.0 | - | 25 | - |
| Weight (Approximate) | Kg | 67 | 86 | 104 | 142 | 244 | | 480 | 550 | 760 | 760 |
| | Ib | 148 | 190 | 230 | 313 | 539 | | 1059 | 1214 | 1678 | 1678 |
| Noise level (50 Hz) | dB(A) | 58 | 60 | 61 | 69 | 72 | | 72 | 75 | 72 | 75 |
| Noise level (60 Hz) | dB(A) | 60 | 64 | 64 | 73 | 76 | | 75 | - | 75 | - |
| Oil refill capacity | litre | 1 | 2 | 2 | 5-8 | 8.5 - 11.5 | | 20 | 20 | 20 - 23 | 20 - 23 |
| Inlet connection | ISO-F / G | ISO40 / G1 ¼ | | | ISO63 / G2 | | | ISO63 / G3 | | ISO100 | |
| Outlet connection | ISO-F / G | ISO40 / G1 ¼ | | | ISO63 / G2 | | | ISO63 / G3 | | ISO100 | |

| Parameter | Unit | nES 40 | nES 65 | nES 100 | nES 200 | nES 300 | nES 300S | nES 470 | nES 570 | nES 630 | nES 750 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ultimate vacuum without gas ballast | mbar | 0.5 | | | 0.08 | | | | | | |
| | torr | 0.4 | | | 0.06 | | | | | | |
| Ultimate vacuum without gas ballast | mbar | 1.5 | | | 0.7 | | | | | | |
| | torr | 1.1 | | | 0.5 | | | | | | |
| Maximum permitted outlet pressure | bar(a) | 1.15 | | | | | | | | | |
| Motor protection rating | IP55 | | | | | | | | | | |
| Recommended oil | Ultragrade Performance 70 | | | | | | | | | | |

### 3.2.1 Pumping performance curves

**Figure 1** nES40 Pumping performance curve

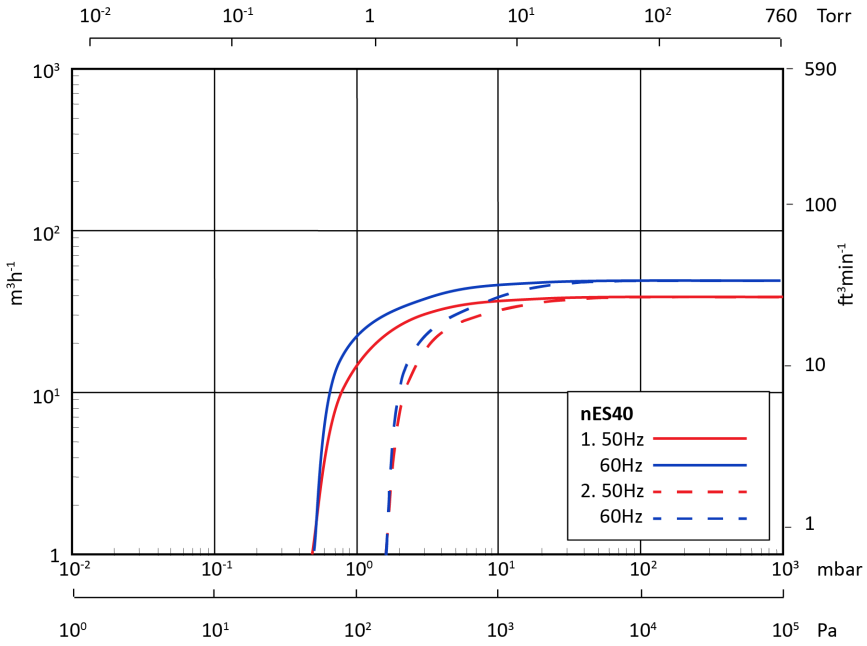


**Figure 2** nES65 Pumping performance curve

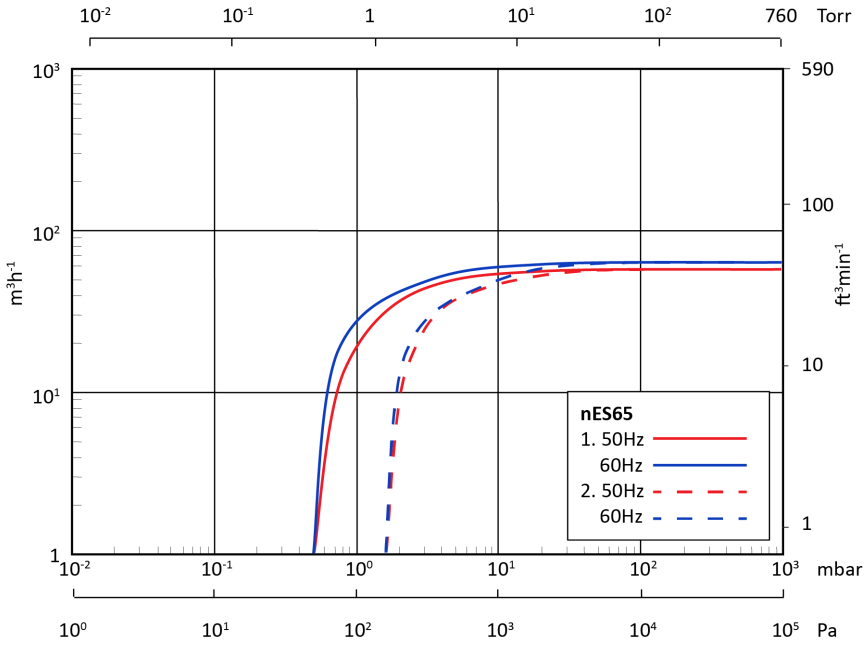



**Figure 3** nES100 Pumping performance curve

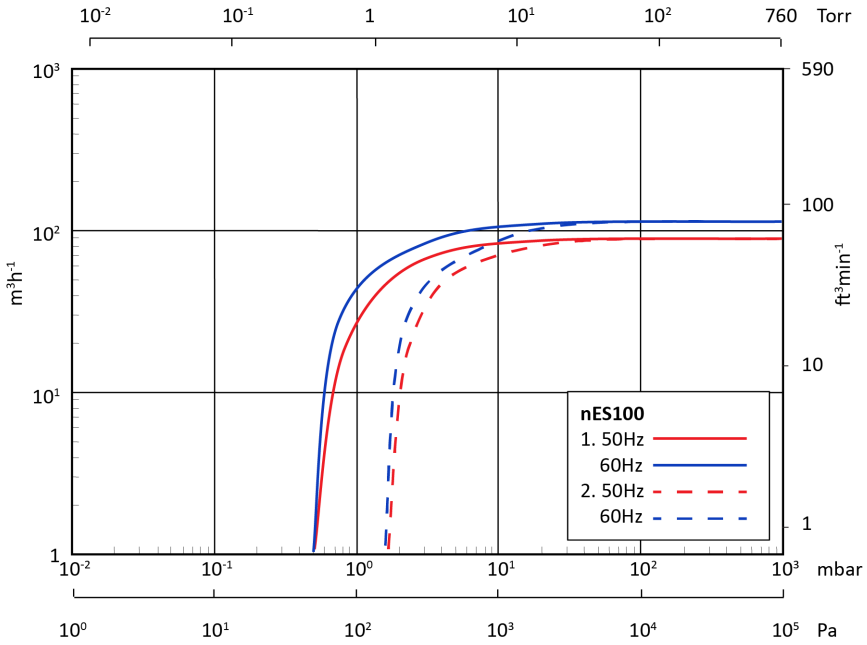


**Figure 4** nES200 Pumping performance curve

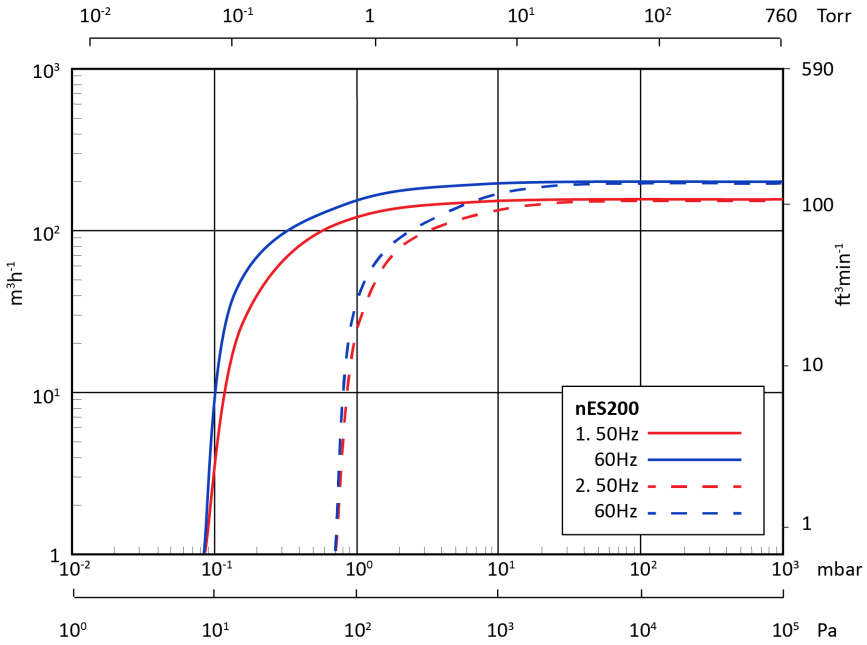



**Figure 5** nES300 Pumping performance curve

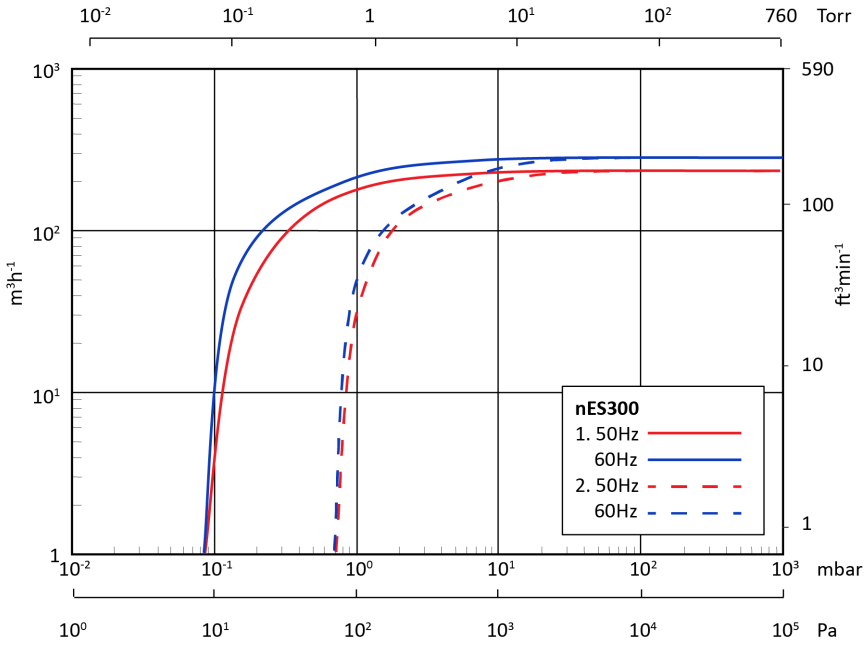


**Figure 6** nES300S Pumping performance curve

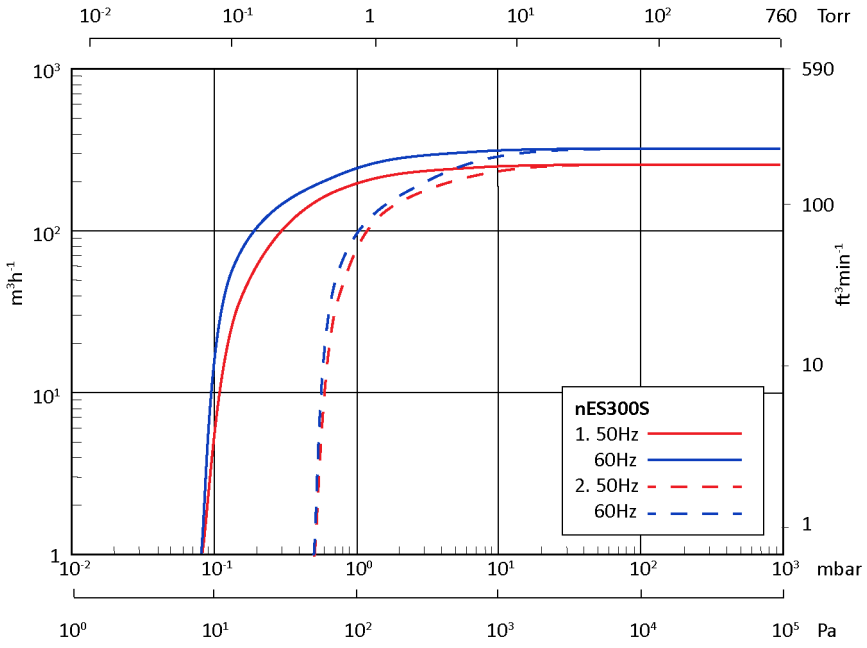



**Figure 7** nES470 Pumping performance curve

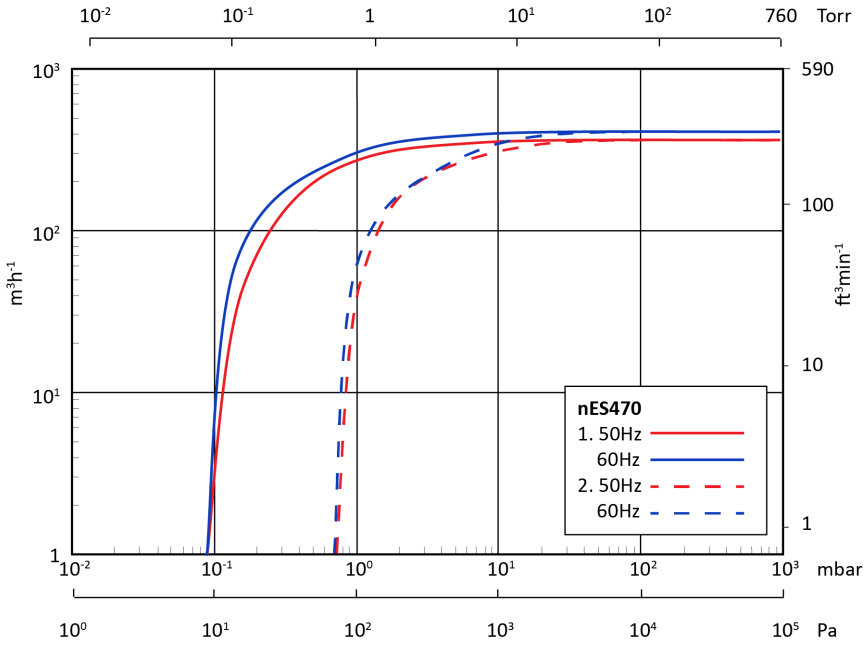


**Figure 8** nES570 Pumping performance curve

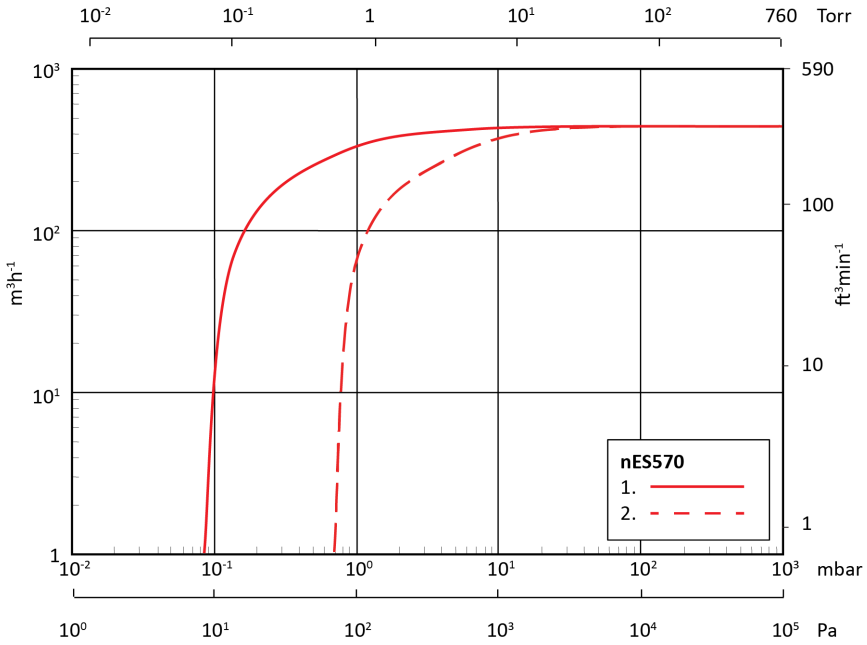



**Figure 9** nES630 Pumping performance curve

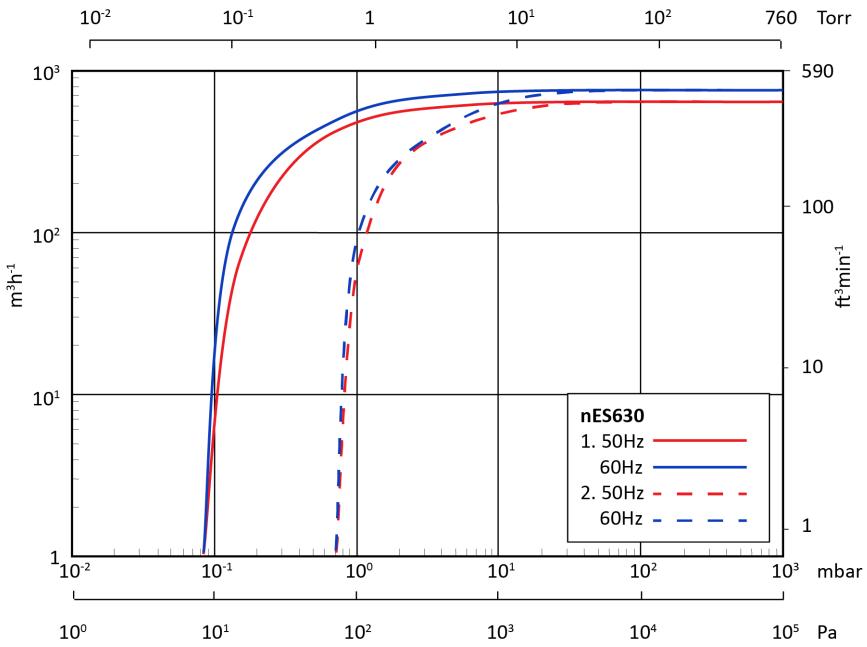
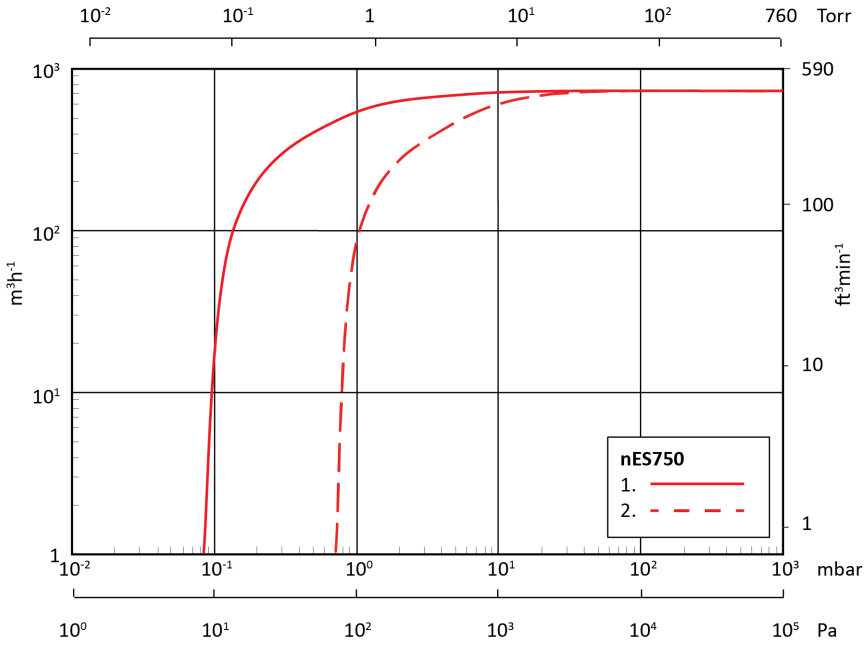


**Figure 10** nES750 Pumping performance curve




## 3.3 Motor data

Refer to the specification on the motor nameplates.

## 3.4 Materials of construction

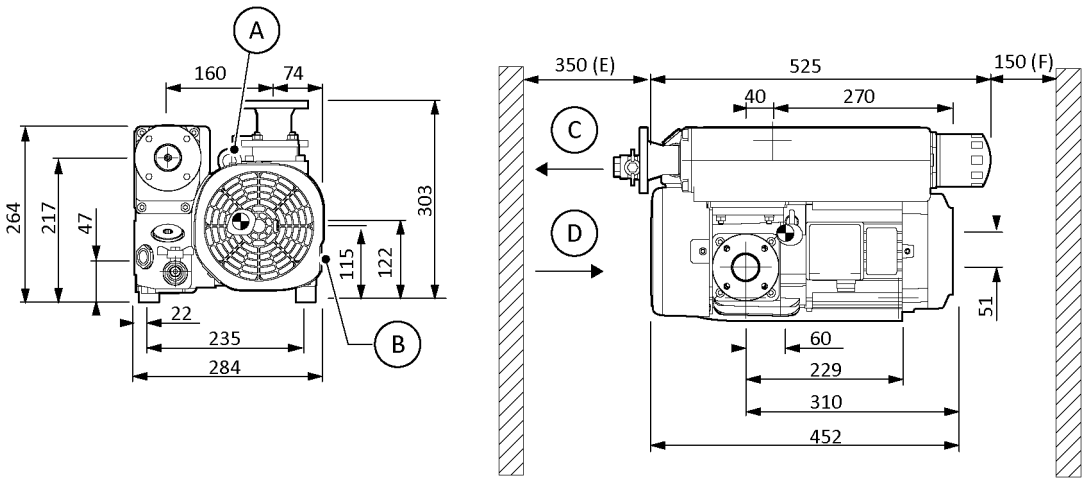
*Table 3 Components exposed to pumped gases*

| Component | Material |
|---|---|
| Oil casing | Aluminium |
| Rotor | Carbon steel |
| Stator and endplates | Grey cast iron |
| Lip seals | Fluoroelastomer or PTFE (polytetrafluoroethylene) |
| Cooling coil (if applicable) | Aluminium |
| Vanes | Epoxy resin and glass fibre |
| Bushing (if applicable) | Bronze |
| Needle bearings (if applicable) | Steel |
| Exhaust filters | Polyester |
| O-rings | Fluoroelastomer |
| Oil recovery float valve | Polyamide |
| Gas ballast membrane | Fluoroelastomer |

# 4. Installation

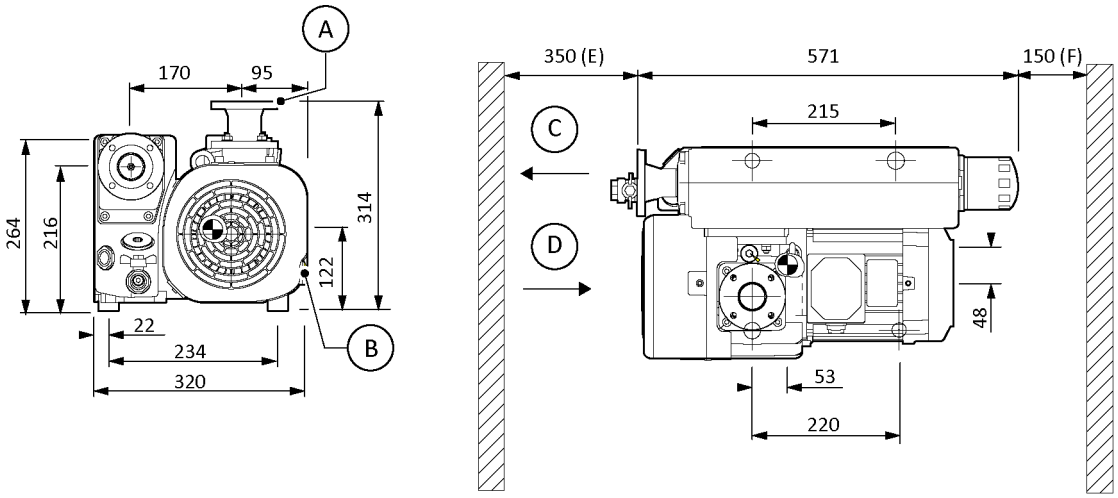
## 4.1 Dimension drawings

**Figure 11** nES40 Dimensions



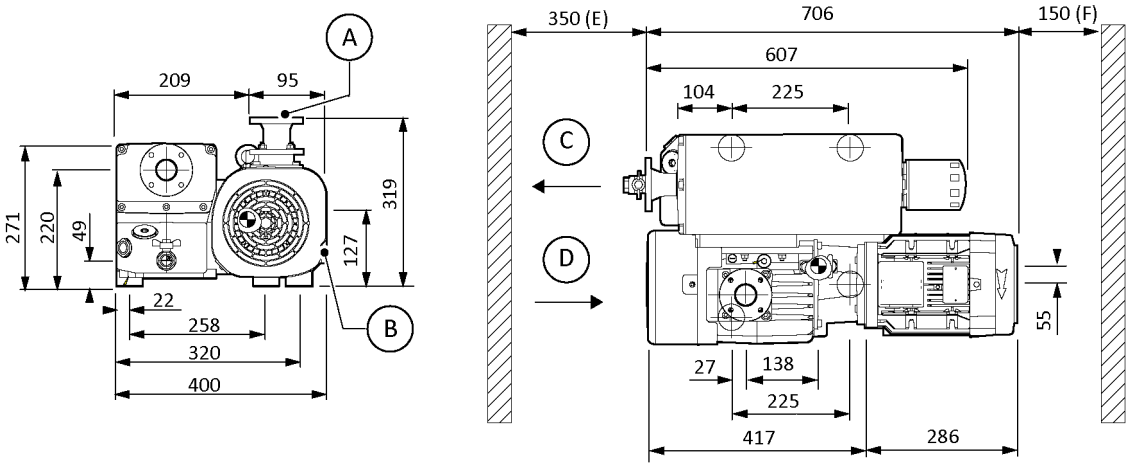

A. Lifting lug
B. Gas ballast
C. Exhaust port
D. Cooling air
E. Space for exhaust filter exchange and cooling
F. Space for motor ventilation

**Figure 12** nES65 Dimensions



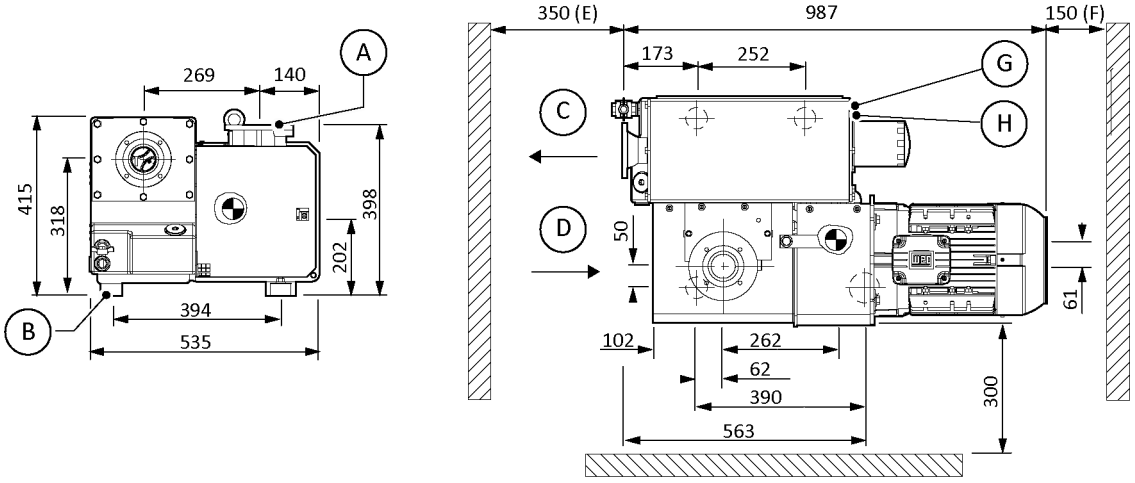

A. Inlet port
B. Gas ballast
C. Exhaust port
D. Cooling air
E. Space for exhaust filter exchange and cooling
F. Space for motor ventilation

**Figure 13** nES100 Dimensions



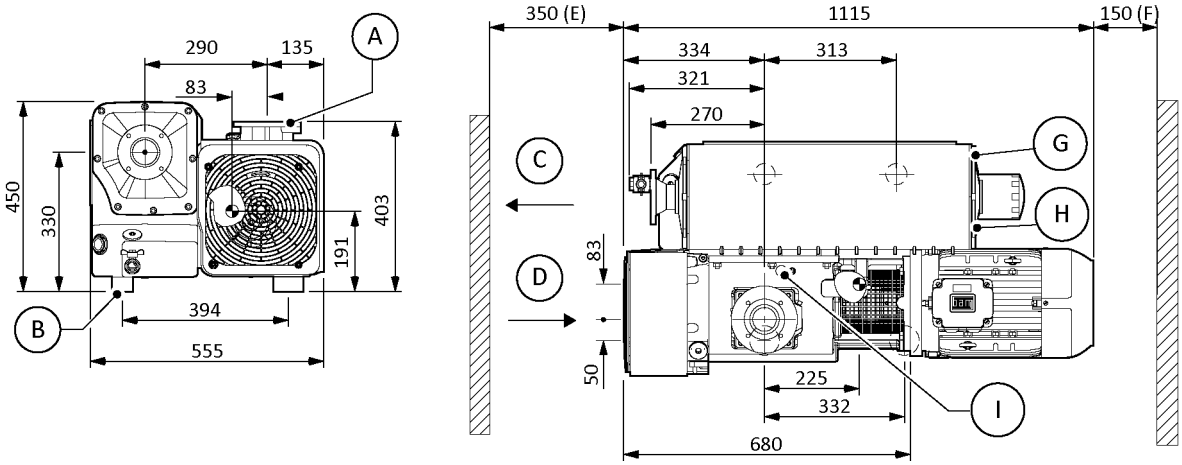

A. Inlet port
B. Gas ballast
C. Exhaust port
D. Cooling air
E. Space for exhaust filter exchange and cooling
F. Space for motor ventilation

**Figure 14** nES200 Dimensions



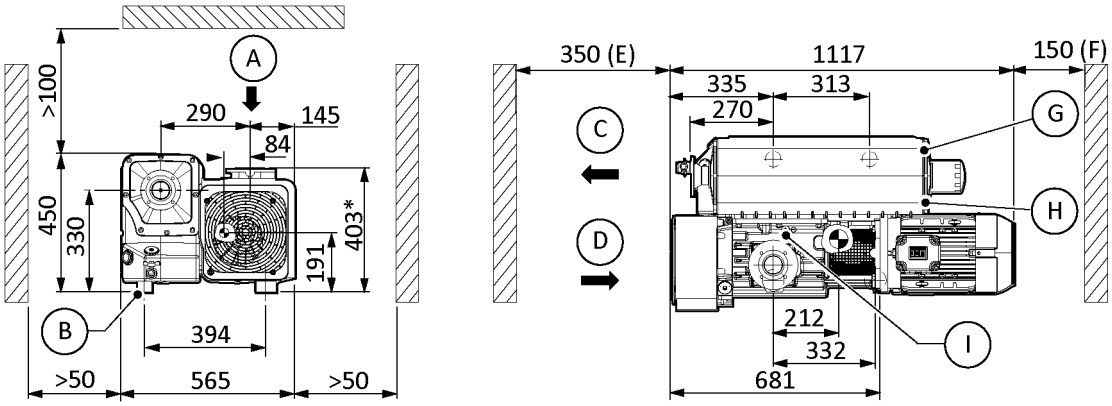

A. Inlet port
B. Mounting (4) M10 x 10
C. Exhaust port
D. Cooling air
E. Space for exhaust filter exchange and cooling
F. Space for motor ventilation
G. Oil level switch
H. Exhaust filter switch

**Figure 15** nES300 Dimensions



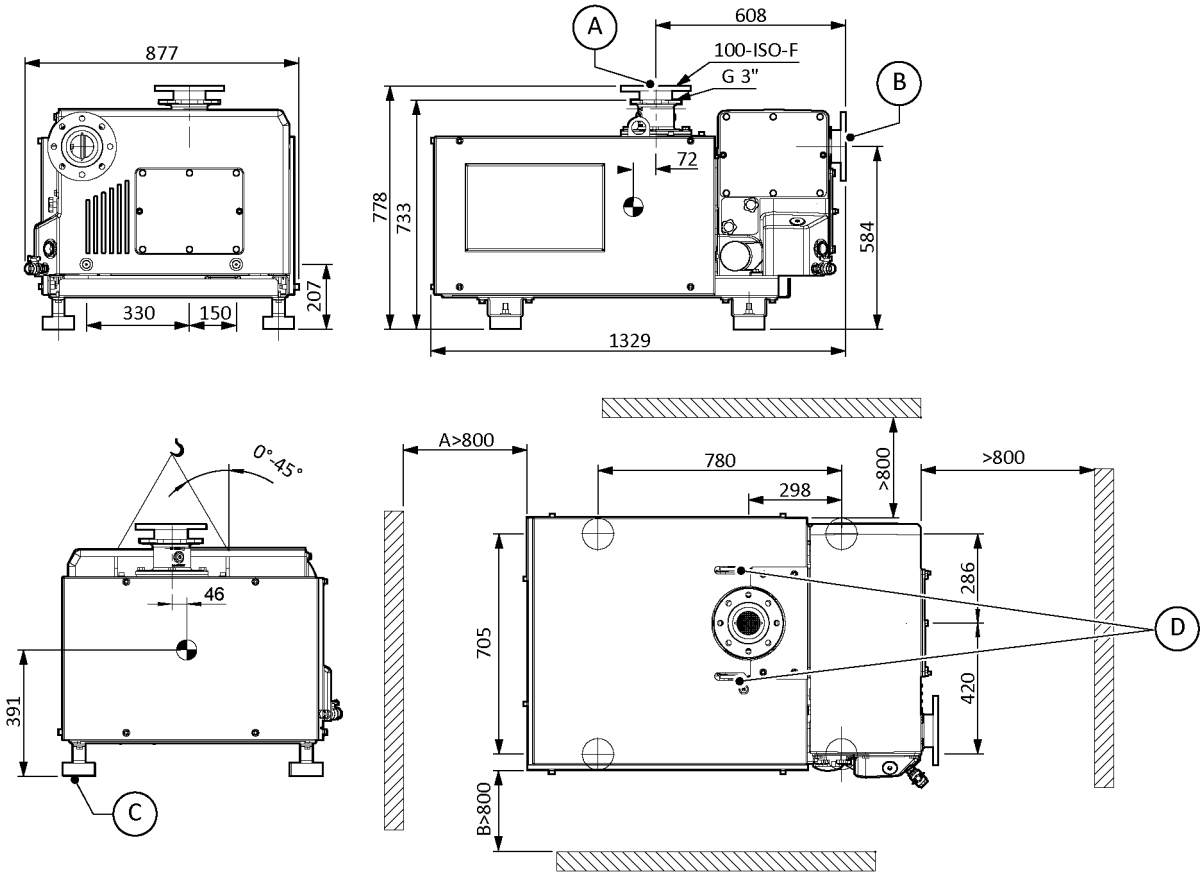

A. Inlet port
B. Mounting (4) M10 x 10
C. Exhaust port
D. Cooling air
E. Space for exhaust filter exchange and cooling
F. Space for motor ventilation
G. Oil level switch
H. Exhaust filter switch
I. Thermal switch

**Figure 16** nES300S Dimensions



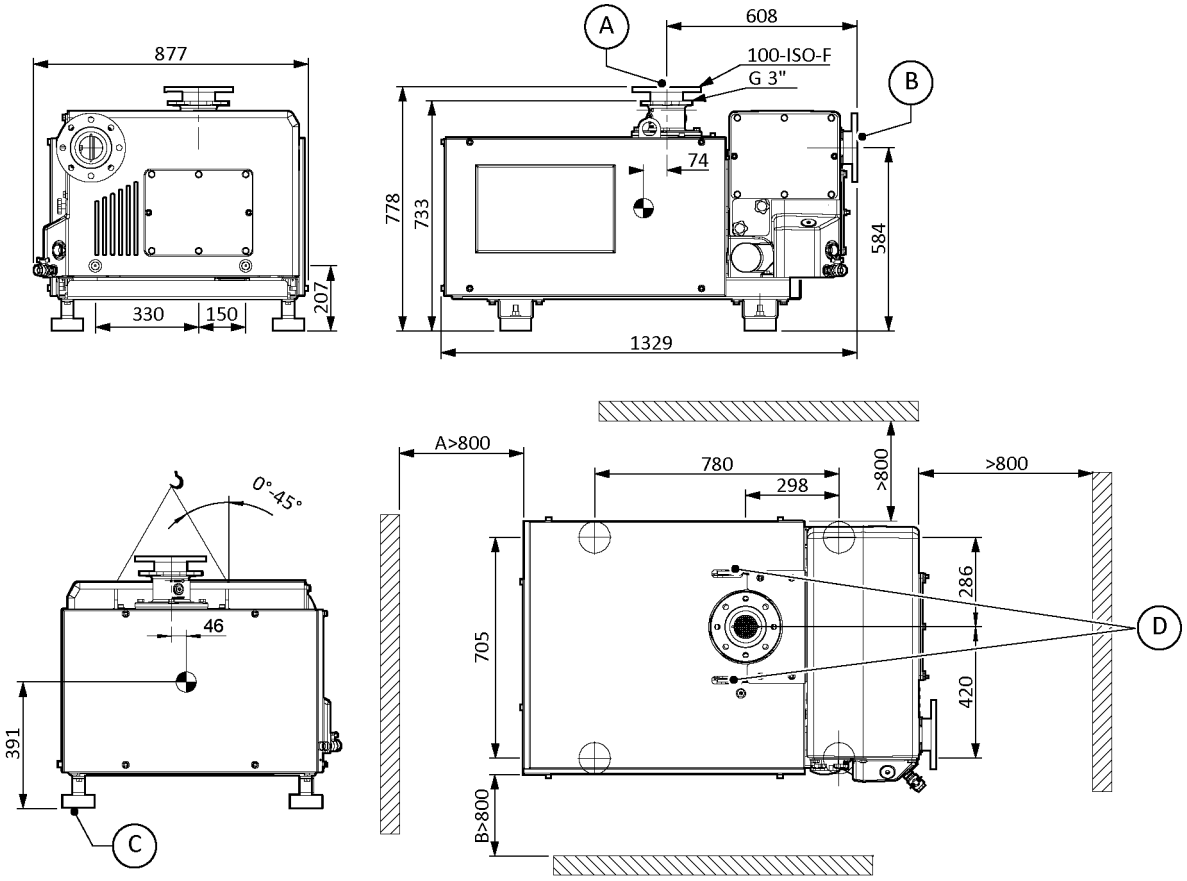

A. Inlet port
B. Mounting (4) M10 x 10
C. Exhaust port
D. Cooling air
E. Space for exhaust filter exchange and cooling
F. Space for motor ventilation
G. Oil level switch
H. Exhaust filter switch
I. Thermal switch

**Figure 17** nES470 Dimensions



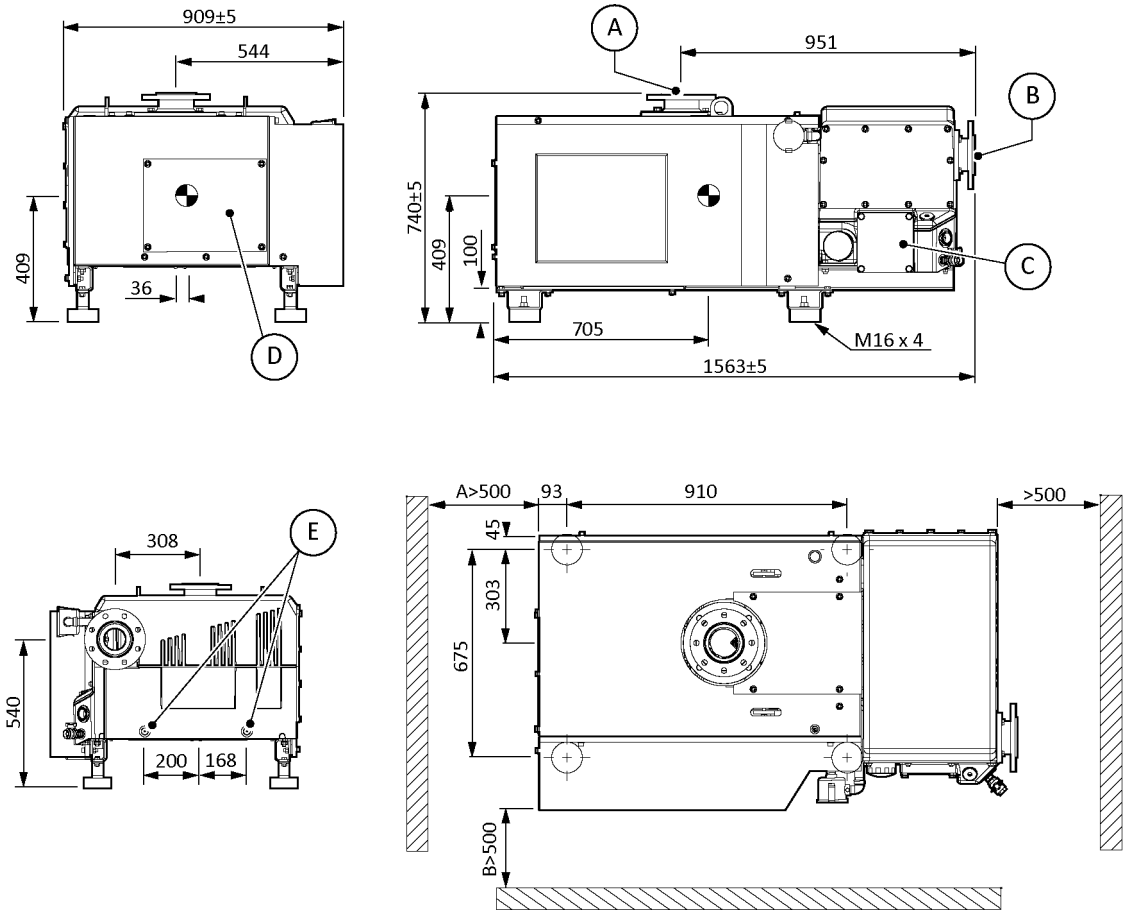

A. Inlet port
B. Exhaust port
C. Mounting (4) M16 x 14
D. Lifting lug

**Figure 18** nES570 Dimensions



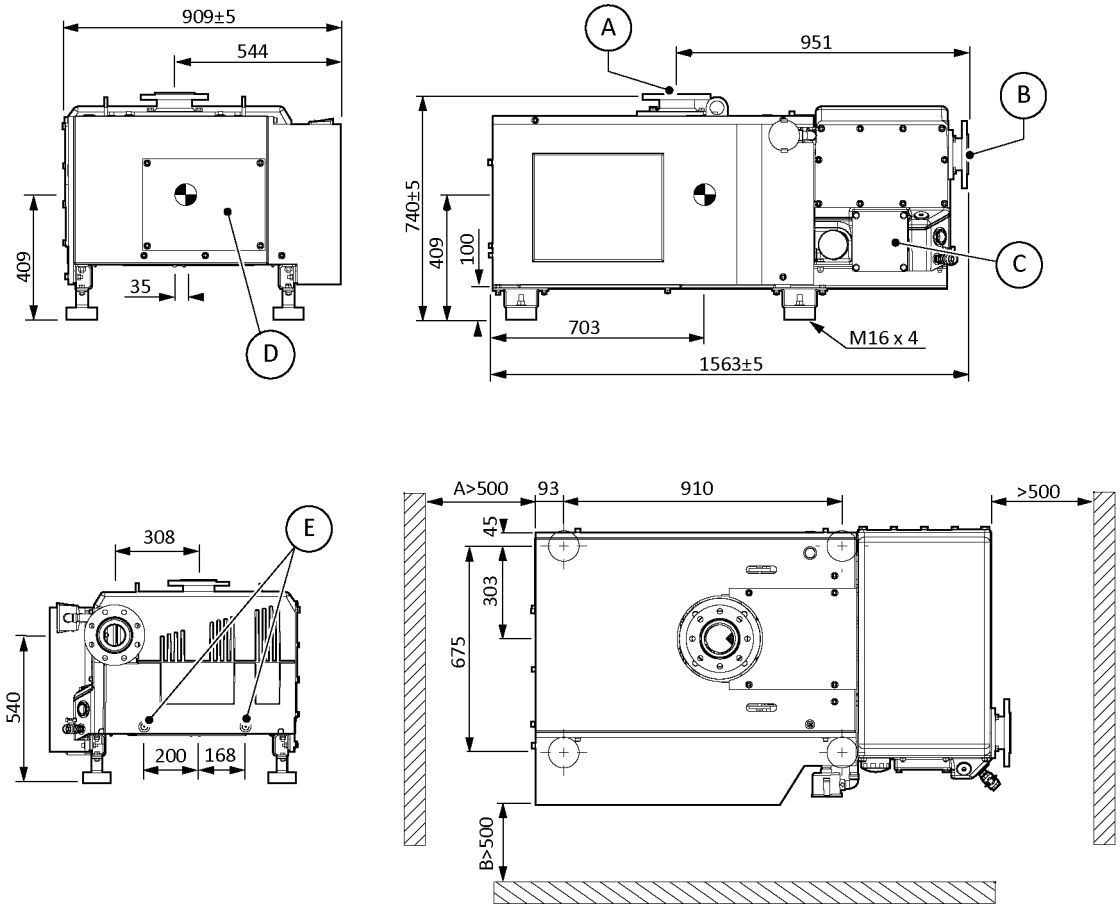

A. Inlet port
B. Exhaust port
C. Mounting (4) M16 x 14
D. Lifting lugs

**Figure 19** nES630 Dimensions




A. Inlet port
B. Exhaust port
C. Oil level switch
D. Motor connection
E. External filtration connection

**Figure 20** nES750 Dimensions




A. Inlet port
B. Exhaust port
C. Oil level switch
D. Motor connection
E. External filtration connection

## 4.2 Installation guidelines

- Use the list as a guide for the installation of the vacuum pump. The list is not exhaustive. Every vacuum pump installation is unique, and care must be used in the placement of each pump. If you are not sure of any installation variable, contact us.
- For bare-shaft nES pumps supplied without a motor, the installation of a three-phase electric motor is mandatory before use. Follow the installation procedure provided with the pump. Bare-shaft pumps are delivered either with an IEC or a NEMA motor coupling element. Use a motor with the power and frame size that matches the following specification:

| Pump size | NEMA motor frame size | NEMA motor power 60 Hz | IEC motor frame size (as per IEC60072-1) | IEC motor power 50 Hz/60 Hz |
|---|---|---|---|---|
| nES40 | 145TC | 2 HP | n/a | n/a |
| nES65 | 145TC | 3 HP | 100 L (B34/FT130) | 2.2/3.0 kW |
| nES100 | 184TCH | 5 HP | 100 L (B14/FT130) | 3.0/3.6 kW |
| nES200 | 213TC | 7.5 HP | n/a | n/a |
| nES300 | 215TC | 10 HP | 132 S (B14/FT165) | 5.5/6.6 kW |

- Install the pump on a solid, level surface, suitable for taking its weight. Respect the minimal distance between the pump and the walls (Refer to *Dimension drawings* on page 22).
- Correct process lines sizes must be used to prevent restrictions and resulting pressure drops. The inlet diameter of the pump should be maintained as far into the process as possible. Contact us for piping recommendations.
- The required ventilation capacity to limit the vacuum pump room temperature can be calculated from $Qv = 0.2\ N/\Delta t$, with:
  - Qv = required ventilation capacity in $m^3/s$
  - N = shaft input of the vacuum pump in kW.
  - $\Delta t$ = temperature increase of the incoming ventilation air in the vacuum pump room in °C
- Make sure all piping connections from the pump to the point of use are leak-tight and secure. Leaks add load to the vacuum pump. They decrease the available pump capacity and prevent the attainable ultimate pressure from being reached. All welds must be vacuum compatible.
- Vacuum rated isolation valves must be used. Compressed air valves and vacuum valves differ in their sealing characteristics and compressed air valves may leak in vacuum applications.
- All piping should be as straight as possible with non-restrictive diameters. Elbows, bends, tees and tapers should be used only when necessary.
- Keep the plumbing and the system free of fluids, water, dirt, and debris that are not part of the process. These can cause obstructions in the vacuum flow through the piping and can reduce available pumping capacity.
- Exhaust piping should be installed to not create additional back pressure on the vacuum pump. Also, the exhaust piping should be installed sloping away from the vacuum pump.
- A recommended alternative is the use of a drip leg with drain point provision, to prevent condensate from running back into the fluid reservoir.
- Take extreme care in selecting the proper inlet filtration system for the vacuum pump. Liquids, solids and abrasive powders must be prevented from entering the vacuum pump to prevent mechanical failure or reduced lifetime. Inlet filtration must be installed on every pump. The potential for particulate contamination in rough vacuum applications is significant. The particle micron retention of the filter element must be smaller than the smallest possible particle load. Also, the inlet filter should be mounted in such a way to prevent particles from falling into the inlet of the vacuum pump during cleaning or changing of the filter element.
- If there is a risk for liquids to be drawn into the vacuum system, a liquid separator should be used to separate these liquids from the incoming air. In applications where there is a significant amount of liquid, contact us.
- Keep the vacuum pump room dry and free from contamination.
- Follow recommended lubricant change schedules in normal applications (air) and watch closely the condition and appearance of the fluid in chemical or harsh applications. Check the leak rate of the system by pumping down to the ultimate pressure and then valve off the vacuum pump. Monitor the pressure rise for five or ten minutes and record this rate of rise for future reference. This value is a good tool to have if you believe there are pump or system problems. Compare new value with the original.

- When pumping condensible vapours and particulates, more frequent fluid changes are required to maintain pump life. Contact us about types and styles of filtration units.
- Make sure there is no backpressure in the exhaust line of the vacuum pump. Vacuum pumps are not specifically designed to compress exhaust gas above atmospheric pressure. Significant back pressure can overheat the pump and cause motor overloading. Backpressure on the pump should not exceed 0.15 bar(e) under normal operating conditions.
- Maintain system seals regularly. Damaged O-rings and gaskets must be replaced immediately. All flange faces must be free of dirt, lubricant and scratches.
- Do not use collapsible tubing to plumb the vacuum system. Any restrictions in line diameter caused by tube collapse will reduce available pumping capacity.
- In multiple pump installations, check valves should be installed in the inlet piping. This will prevent fluid from being drawn from an 'off' unit into an operating unit. Check valves should be properly sized so as not to "chatter" during operation. Spring-loaded, elastomer seated check valves are recommended. These should be mounted in a horizontal flow orientation. Using properly sized actuated valves is even a better solution. This generally results in a lower pressure drop when open and a better sealing when closed.
- Vacuum gauge ports and gauges should be installed in each leg of central vacuum piping. This provides a diagnostic tool for troubleshooting both the application and any pump-related problems.
- Make sure that no temperature-sensitive parts (plastic, wood, cardboard, paper, and electronics) will touch the surface of the vacuum pumps.
- Ambient and inlet temperature may never exceed the limits of the pump's working range. Make sure that the installation location is vented such that enough cooling of the vacuum pumps are available.

**WARNING: CONTAMINATION TO PARTS**

**Risk of damage to equipment. Touch the inner sections of the pumps only while wearing clean gloves. Use clean tools to do the necessary work in a clean and dry room.**

**Clean the bearings before re-greasing.**

**Note:**

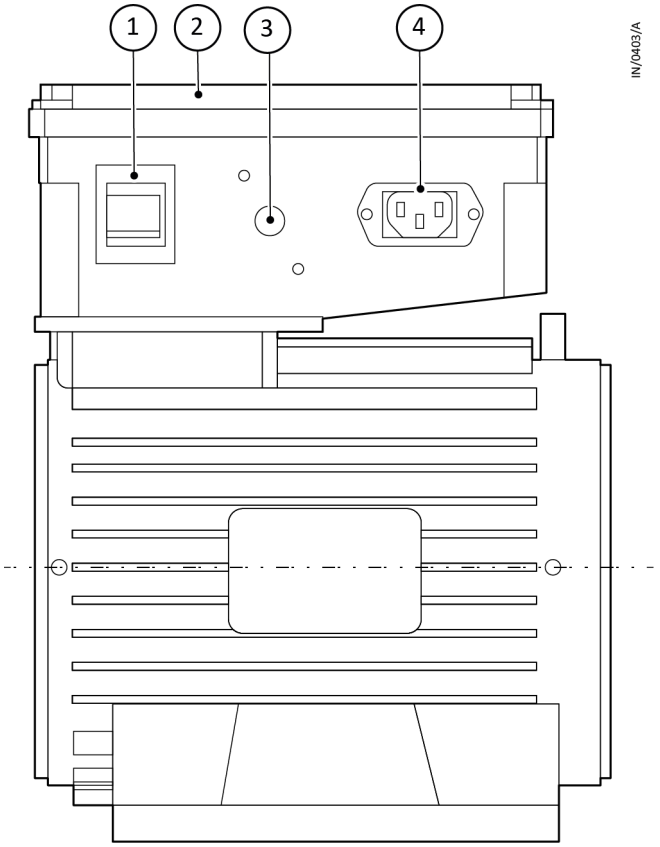
*The grease of the bearings must be changed once a year for an operating time higher than 5000 hours/year or every 5000 hours for an operating time less than 5000 hours/year.*

## 4.3 Electrical connections

- Always use a protection system, including an over-current protection and an electrical disconnecting device, between the pump and the electric power supply. Motor currents can be found on the motor data plate. The pump is normally delivered without an electrical cable or switch. For the electrical connection, check the diagram inside the terminal box or on the motor data plate.
- For pumps with a three-phase motor, check the diagram inside the terminal box or on the motor data plate.

- For pumps with a single-phase motor, the pump should be connected to a standard wall socket, a 16 A rated protection is necessary (fuse or breaker). The motor has a "Klixon" overload protection element which looks like a red push button that must be manually reset after an overload trip. The delivery includes a C13 plug but no power cable. If the C13 plug is wired to a purpose-made power cable, this must be done by an electrically certified staff. Check acceptable voltage and frequency on the pump nameplate before use.
- Additional safety devices are available as options including an oil pump temperature switch.

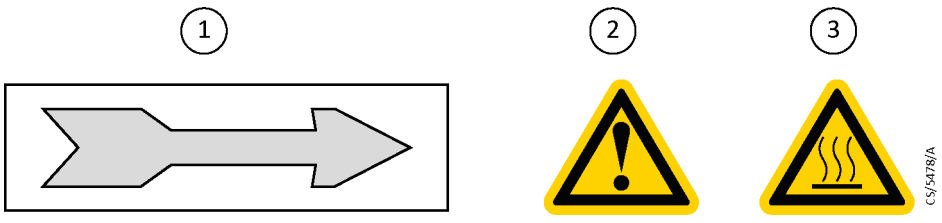
**Figure 21** Electrical connections




1. Switch 0/1
2. Junction box
3. Thermal protection Klixon
4. Socket CE1320 C14

## 4.4 Pictographs

**Figure 22** Pictographs




1. Rotation direction of the fan
2. Shock hazard
3. Hot surface

# 5. Operation

## 5.1 Initial start-up

**WARNING: SAFETY PRECAUTIONS**

**Risk of injury or damage to equipment. The operator must apply all relevant safety precautions. Refer to Safety precautions during operation on page 12 *Safety precautions during operation* on page 9.**

**Note:**

*The pump is supplied filled with oil.*

**Initial start-up instructions**

- Check the process lines for the correct size to prevent high-pressure drop and for cleanliness to protect the vacuum pump.
- Make sure the pump outlet is not obstructed.
- Check that the electrical connections correspond to the applicable codes and that all wires are clamped tight to their terminals. The installation must be earthed and protected against short circuits by fuses of the inert type in all phases. An isolating switch must be installed near the vacuum pump.
- Turn on the voltage and turn it off immediately. For pumps with the three-phase motor, check the rotation direction of the drive motor while the motor is coasting to a stop. The correct rotation direction of the drive motor is indicated by an arrow shown on the motor fan cowl. If the rotation direction of the drive motor is incorrect, open the isolating switch and reverse two incoming electric lines. Incorrect rotation direction of the drive motor may cause damage to the vacuum pump.
- Start and run the vacuum pump for a few minutes. Check that the vacuum pump operates normally.

**Note:**

*If you use the vacuum pump for humid applications, we recommend that the unit achieves optimal running temperature before it is put into operation. This can be done by running the unit against a closed suction line for 30 minutes with an open gas ballast.*

*Gas ballast location and use is indicated on the pump nameplate.*

## 5.2 Start the pump

**CAUTION: EXCESSIVE ENERGY CONSUMPTION**

**Risk of damage to equipment. To avoid excessive energy consumption and damage to the vacuum pump the maximum allowed starting frequency is 6 starts per hour.**

**For more frequent operation, let the pump operate continuously and control the vacuum demand by a pitot valve on the pump inlet.**

To start the pump:

1. Check oil level and oil condition.
2. Turn on the power.

## 5.3 During operation

**Note:**

*The operator must apply all relevant safety precautions. Refer to Safety precautions during operation on page 12 Safety precautions during operation on page 9 and Fault finding on page 39 Fault finding on page 43.*

Regularly check the oil level and the oil condition. The oil level should be in the middle of the oil sight glass. Refer to Preventive maintenance schedule on page 31 *Preventive maintenance schedule* on page 35.

## 5.4 Stop the pump

We recommend running the unit off-line for typically 30 minutes with closed inlet valve but open gas ballast prior to switching off. This will condition the oil ready for the next start-up. If the gas stream was heavily contaminated with water vapour, a longer period of running the unit off-line will extend the oil lifetime.

If the pump is stopped before all the condensed vapour has been disposed off, it will be deposited by gravity separation from the oil on the bottom of the oil after about 8 to 10 hours.

Before restarting, check for any water in the oil tank-leads to an increase of the oil level through the oil viewer (high water handling capability versions only). If there is water, follow the instructions in Preventive maintenance schedule on page 31 *Preventive maintenance schedule* on page 35.

In case of long machine downtime, refer to Taking out of operation on page 30 *Taking out of operation* on page 34.

## 5.5 Taking out of operation

**Note:**

*The operator must apply all relevant safety precautions. Refer to Safety precautions during operation on page 12 Safety precautions during operation on page 9 and Fault finding on page 39 Fault finding on page 43.*

**Procedure**

1. Switch off the voltage and disconnect the vacuum pump from the mains.
2. Drain the oil.
3. Recycle the oil, oil filter and exhaust filters as per the local environmental regulations for waste disposal and recycling.

# 6. Maintenance

## 6.1 Preventive maintenance schedule

**WARNING: SAFETY PRECAUTIONS**

**Risk of injury or damage to equipment. The operator must apply all relevant safety precautions. Refer to *Safety precautions during maintenance or repair* on page 10.**

Before the maintenance, repair or adjustments, do the steps as follow:

- Stop the vacuum pump.
- Set the voltage supply to off.
- Isolate the machine from all sources of under and overpressure.
- Make sure that the pump system is at atmospheric pressure.

Refer to *Fault finding* on page 43 for more information.

### Warranty - Product Liability

Use only authorised parts. Any damage or malfunction caused by the use of unauthorised parts is not covered by Warranty or Product Liability.

### Service kits

For overhauling or carrying out preventive maintenance, service kits are available. Contact our customer centre.

### Service contracts

We offer several types of service contracts, relieving you of all preventive maintenance work. Contact our customer centre.

### General

Replace the o-rings and washers that are removed during servicing.

### Intervals

Our local customer centre may overrule the maintenance schedule, especially the service intervals, depending on the environmental and working conditions of the vacuum pump.

The longer interval checks must also include the shorter interval checks.

*Table 4 Preventive maintenance schedule*

| Operation | Duty* | | |
|---|---|---|---|
| | Normal | Medium | Harsh |
| Check oil level and condition | 24 hours | 24 hours | 24 hours |
| Clean dirt-trap at pump inlet | Monthly | Monthly | Monthly |
| Clean anti suck back valve at pump inlet | Yearly | Yearly | Yearly |

| Operation | Duty* | | |
|---|---|---|---|
| | Normal | Medium | Harsh |
| Change oil, oil filter (if installed) and exhaust filter | | | |
| ▪ Mineral oil: Ultragrade Performance 70 | 4000 hours | 2000 hours | 1000 hours |
| ▪ Alternative: Ultragrade Extend 110 | 8000 hours | 4000 hours | 1000 hours |
| Clean the pump, the radiator and the motor fan guard | 2000 hours | 1000 hours | 500 hours |
| Check the vanes and replace them if required | 15000 hours | 10000 hours | 5000 hours |
| Check belt condition (nES470 - nES750) | Every 2000 hours or 6 months | Every 2000 hours or 6 months | Every 2000 hours or 6 months |

** Whichever comes first, 4000 running hours or 1 year.*

**Note:**

*We recommend that you monitor the oil condition through the sight glass and change the oil when it becomes discoloured or milky. Not changing oil in time can lead to premature blocking of the air exhaust filter and even failure of the vacuum pump.*

*Check for condensed water vapour on the bottom of the oil tank through the oil viewer (high water handling capability versions only). If there is condensed water vapour, open the oil discharge valve slightly, let the condensed water vapour flow out and close it again as soon as oil starts to come out. Check the oil level and top up if necessary.*

## 6.2 Oil specifications

Use of the genuine recommended lubricants is strongly recommended. They are the result of years of field experience and research. Refer to Preventive maintenance schedule on page 31 *Preventive maintenance schedule* on page 35 for the advised replacement intervals and consult your spare parts list for part number information.

**Note:**

*Avoid mixing lubricants of different brands or types as they may not be compatible, and the oil mix will have inferior properties.*

*Always drain the pump well. Used oil left in the pump shortens the lifetime of the new oil.*

nES series pumps are delivered with mineral oil, Ultragrade Performance 70, or with synthetic oil, Ultragrade Extend 110. Check the pump nameplate.

## 6.3 Service kits

For overhauling and for preventive maintenance, a wide range of service kits is available. Service kits comprise all parts required for servicing the component and offer the benefits of our genuine parts while keeping the maintenance budget low.

Also, a full range of extensively tested lubricants, suitable for your specific needs is available to keep the vacuum pump in excellent condition.

Contact us for more details.

# 7. Adjustments and servicing procedures

## 7.1 Drive motor

On nES100 - nES750 (nES40 - nES65 do not have motor bearings) the motor bearings must be changed every 20,000 hours. Check recommendations on the motor's website. If installed, remove the motor condensate drain plug yearly. Keep the motor free from dust for optimal cooling.

## 7.2 Exhaust filter replacement

**nES40, nES65 and nES100**

1. Unscrew the 4 or 6 screws of the filter cover and remove the filter cover together with the O-ring.
2. Remove the exhaust filters from the filter cover.
3. Clean the exhaust filter O-ring lodge and the filter cover O-ring before reassembling the new parts.
4. Install the new exhaust filters following the instructions delivered with them.
5. Reassemble the filter cover.

**nES200**

1. When the exhaust filter elements are clogged, the valves open and the filters are bypassed. Oil mist at the exhaust, and high oil consumption are signs that the exhaust filters are clogged.
2. The exhaust filters must be replaced more frequently if subject to increased oil cracking products at high operating temperatures and aggressive media.
3. Remove the exhaust flange with gasket. Unscrew the lock nut and remove the spring between both washers: take out the exhaust filter elements.
4. Take out the pressure relief valves and check that they move freely and seal properly.
5. Reassemble in the reverse sequence. Ensure that the exhaust filter elements are properly centred and positioned. Install the spring between both washers and tighten the stop nut fully home with the 10 mm box wrench.

**nES300, nES300S**

1. Remove the screws of the exhaust plate using an 8 mm Allen key.
2. Lift the 3 exhaust filters from the W shaped metal sheet holder and remove them from the oil casing.
3. Make sure that the new exhaust filters have the O-ring (opposite side of overpressure valve) and grease them using our vacuum grease.
4. Replace the O-ring of the exhaust plate.
5. Insert new exhaust filters. They are guided in the oil casing correct position. Make sure the compression springs are behind the W shaped metal sheet holder.
6. Plug the exhaust plate on the W shaped metal sheet holder with the 2 location pins and screw the exhaust plate on the oil casing using an 8 mm Allen key.

**nES630, nES750**

Tools required: Tubular box wrench 16 mm.

1. When the exhaust filter elements are clogged, the integrated bypass opens and the filters are bypassed.
2. Oil mist at the exhaust and high oil consumption are signs that the exhaust filters are clogged.
3. The exhaust filters must be replaced more often if subjected to increased oil cracking products at high operating temperatures and aggressive media.
4. Remove the cover with gasket. Remove the exhaust deflector by unscrewing the bolt. Remove both demister support units by unscrewing the nuts.
5. The exhaust filters can be removed individually. Check also the float valve.
6. Plug new exhaust filters into the oil casing. Carefully insert the demister support units over the new exhaust filters threaded bars (M6) and slightly compress the demister springs.
7. Tighten the demister support units and the exhaust deflector. If necessary, mount a new seal and mount the cover.

**nES470, nES570**

Tools required: Tubular box wrench 16 mm.

1. When the exhaust filter elements are clogged, the integrated bypass opens and the filters are bypassed. Oil mist at the exhaust, and high oil consumption are signs that the exhaust filters are clogged.
2. The exhaust filters must be replaced more often if subjected to increased oil cracking products at high operating temperatures and aggressive media.
3. Remove the cover with gasket. Remove the exhaust deflector by unscrewing the bolt.
4. Remove both demister support units by unscrewing the nuts.
5. The exhaust filters can be removed individually.
6. Check the float valve.
7. Plug new exhaust filters into the oil casing.
8. Carefully insert the demister support units over the new exhaust filters threaded bars (M6) and slightly compress the demister springs.
9. Tighten the demister support units with the 4 nuts and the exhaust deflector. If necessary, mount a new seal and mount the exhaust plate.

## 7.3 Oil and oil filter change

**WARNING: OIL CONTAMINATION**

**Risk of damage to equipment. Always apply all relevant safety precautions. Refer to *Safety precautions during maintenance or repair* on page 10.**

**Always drain the oil at all drain points. Used oil left in the pump can contaminate the oil system and can shorten the lifetime of the new oil.**

**Never mix lubricants of different brands or types as they may not be compatible and the oil mix will have inferior properties.**

**If the oil is replaced, replace the oil filter (if applicable) and exhaust filters too.**

### 7.3.1 Oil change procedure

1. If the pump is cold run the pump with closed suction inlet for approximately 10 minutes to warm up the oil.
2. Stop the pump and disconnect it from the mains.
3. Remove the oil filler plug.
4. Open the oil drain valve and drain the oil completely into a container large enough to hold all the oil and tilt the pump slightly (if possible).
5. Close the oil drain valve and fill with new oil via the filler plug up to the middle of the oil sight glass. The oil level may not exceed the allowed maximum level.
6. Close the oil filler plug.
7. Wipe off any oil spills from the pump and the floor.
8. Connect to the mains supply again and verify the correct rotation direction of the pump.
9. Run the pump with a closed inlet for a few minutes, stop the pump and check the oil level. Top up if necessary.

### 7.3.2 Oil type change

To prevent the oil dissolving residual oil sludge (and hence blocking channels), strictly follow the following procedure:

1. Drain the used oil completely (tilt the pump slightly if possible).
2. Clean the inside of the exhaust filter housing thoroughly with a clean dry cloth or other suitable cleaning material.
3. Change the oil filter but leave the existing exhaust filters inside the housing.
4. Fill the pump with the correct amount of new synthetic oil.
5. Run the pump for approximately 2 hours, then stop it. Drain the oil, clean inside as before and change the oil filter again.
6. Refill with new oil and change the exhaust filters. Repeat this procedure until the oil appears clean through the sight glass.

## 7.4 Cleaning radiator, motor fan guard and pump

The radiator, motor fan guard and pump must be kept clean. This can be done using compressed air and a dry cloth. Be careful not to damage the oil cooler (if applicable) by cleaning with compressed air or by exerting excessive pressure with the cloth.

Do not use fluids or substances other than those indicated.

## 7.5 Replacing V - belts

In normal operating conditions, the belt has a lifetime of 30,000 hours. Wear can be detected by slip, abnormal wear or cracks. In case of wear, the correct alignment of the pulleys must be checked. Tolerance ± 1.3 mm.

**Note:**

*A dismounted belt must be replaced with a new one.*

**nES470/570**

Tools required: Key 19 and 24.

1. Take off the hood.
2. Loosen the applicable nuts.
3. Remove the belt.
4. Replace the belt.
5. Reassemble in reverse sequence.

**nES630/750**

Tools required: Key 19 and 24.

1. Take off the hood.
2. Loosen the applicable nuts.
3. Loosen the pushrod.
4. Remove the V belts.
5. Replace the belt.
6. Reassemble in reverse sequence.
7. Stretch the V-Belts with the V-belt tension meter.

Refer to V-belt tensioning on page 37 *V-belt tensioning* on page 41 for details.

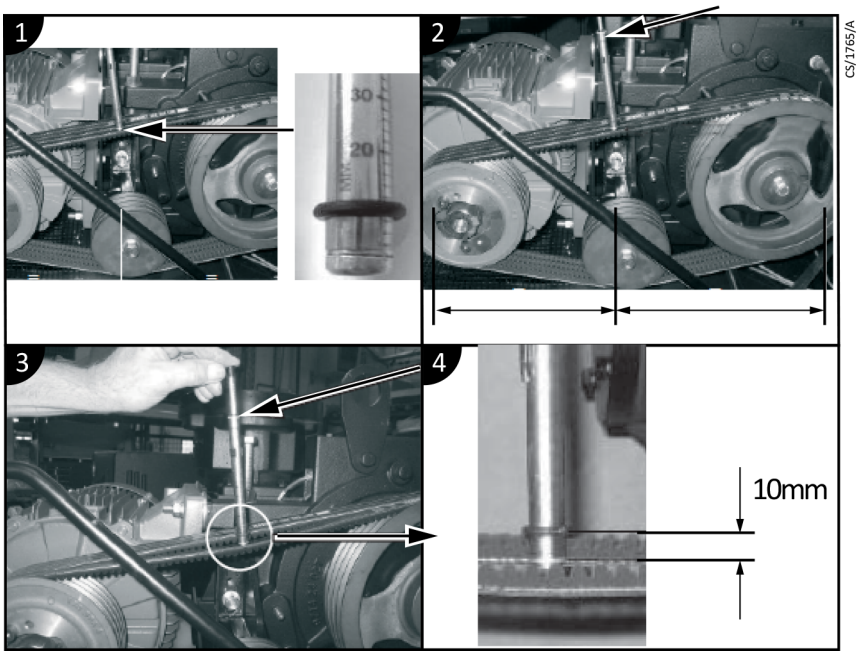
## 7.6 V-belt tensioning

### 7.6.1 How to use the v-belt tension meter

- The tension meter is a tool designed to check and re-tighten the V-belts. It is made of two sliding pipes with a graded spring inside.
- Refer to *Figure: Belt tensioning*. Set the first o-ring at 1 mm (PIX) on the millimetre scale or 25 inches of span, as shown in picture 3, and the other o-ring on position 0 on the Newton scale.

- Install the tension meter as shown in picture 1, in the middle, halfway between the V-belt contacts point of the V-belts and the two pulleys.
- Push the Newton scale's black rubber down to reach a 10 mm bending of the V-belt as shown in pictures 2 and 4.

**Figure 23** Belt tensioning




1. Set the o-ring to 10 mm position.
2. Place the tool on the centre of the longest V-belt and mark the belt.
3. Push the tool downward until you reach a 10 mm bending. The result of the measurement should be between 35 N and 58 N.
4. Check the result of your measurement. Tighten the belt tightener to reach the value given in the table:

| **Belt tension** | **Before run-in** | **Re-tightening (after 10 to 24 h)** | **Regular check (approximately 6 months or 3000 h) Value under which a re-tension is necessary** |
|---|---|---|---|
| | F (kg) | F (kg) | F (kg) |
| All pumps | 5 | 4.5 | 3.5 |

Always measure on the same belt.

**Note:**

*Do not loosen a belt if the measurement is over the values shown. In this instance, do not change the V-belt tension.*

# 8. Fault finding

*Table 5 Fault finding*

| Conditions |
|---|
| *The pump does not run* on page 43 |
| *The pump cannot reach stated vacuum* on page 43 |
| *Pump is noisy* on page 43 |
| *Pump runs hot* on page 44 |
| *High oil consumption* on page 44 |
| *Pump does not maintain vacuum after power-off and pump leaks oil* on page 44 |
| *The expected process vacuum level is not reached* on page 45 |

| Fault | The pump does not run |
|---|---|
| **Cause** | **No voltage** |
| Remedy | Provide power supply. |
| **Cause** | **Thermal switch has tripped** |
| Remedy | Identify cause and reset switch. |
| **Cause** | **Room temperature too low** |
| Remedy | Restore temperature to allowed value. |
| **Cause** | **Motor damaged** |
| Remedy | Contact service department. |

| Fault | The pump cannot reach stated vacuum |
|---|---|
| **Cause** | **Low oil level** |
| Remedy | Top up oil. |
| **Cause** | **Oil contaminated** |
| Remedy | Replace oil. |
| **Cause** | **Pump gaskets damaged** |
| Remedy | Contact service department. |
| **Cause** | **Discharge clogged** |
| Remedy | Check couplings and outlet. |

| Fault | Pump is noisy |
|---|---|
| **Cause** | **Exhaust filter element clogged** |
| Remedy | Replace. |
| **Cause** | **Bearings damaged** |

| | |
|---|---|
| Remedy | Contact service department. |
| **Cause** | **Motor coupling damaged (if applicable)** |
| Remedy | Contact service department. |
| **Cause** | **Vanes worn out** |
| Remedy | Contact service department. |
| **Cause** | **Solid particles in the oil** |
| Remedy | Change oil. |
| **Fault** | **Pump runs hot** |
| **Cause** | **Wrong oil type** |
| Remedy | Replace oil. |
| **Cause** | **Poor room ventilation** |
| Remedy | Install an auxiliary fan. |
| **Cause** | **Fan defect** |
| Remedy | Contact service department. |
| **Cause** | **Wrong power supply to motor** |
| Remedy | Check. |
| **Cause** | **Discharge clogged** |
| Remedy | Check couplings at outlet. |
| **Fault** | **High oil consumption** |
| **Cause** | **High working pressure (close to atmospheric pressure)** |
| Remedy | Check oil level frequently. |
| **Cause** | **Pump runs hot** |
| Remedy | Refer to *Pump runs hot* on page 44. |
| **Cause** | **Exhaust filter element clogged** |
| Remedy | Replace. |
| **Fault** | **Pump does not maintain vacuum after power-off and pump leaks oil** |
| **Cause** | **Check valve damage** |
| Remedy | Contact service department. |
| **Cause** | **Tank screws or plugs loose** |
| Remedy | Tighten. |
| **Cause** | **Tank gaskets damaged** |
| Remedy | Contact service department. |

| Cause | Oil sight glass loose |
|---|---|
| Remedy | Tighten. |

| Fault | The expected process vacuum level is not reached |
|---|---|

| Cause | Too high-pressure drop between process and pump inlet |
|---|---|
| Remedy | Check the process lines for the correct size and leaks and correct if necessary. |

| Cause | Clogged air inlet filter element |
|---|---|
| Remedy | Replace the filter. |

| Cause | The pump cannot reach stated vacuum |
|---|---|
| Remedy | Refer to *The pump cannot reach stated vacuum* on page 43. |

# 9. Storage

To keep rubber parts and lip seals efficient and working properly, we recommend the pump is operated for at least 30 minutes every 6 months with the inlet closed.

Store the pump in its packing in a covered, dry place at a temperature between -20 °C (-4 °F) and 50 °C (122 °F).

If the vacuum pump is going to be stored without running from time to time, protective measures must be taken. Contact us for details.

# 10. Disposal

Used filters or any other used material (for example, lubricants, cleaning rags and machine parts) must be disposed of in an environmentally friendly and safe manner, and in line with the local recommendations and environmental legislation.

## 10.1 Recycle the pump

The contaminated parts can be dangerous for your health and environment. Before you do the work, check if the parts are contaminated. Obey the regulations and take necessary precautions when you touch the contaminated parts.

Separate the components as per the material of construction and dispose of the components. Refer to *Table: Recycling* and *Figure: Components for recycling*. For more details, contact us.

## 10.2 Recycle oil

**CAUTION: ENVIRONMENTAL HAZARD**

**When you dispose of the used oil, obey the related environmental regulation.**

The owners are responsible for correct disposal of waste oil.

Do not mix the waste oil from vacuum pumps with other substances or materials.

The contaminated waste oil from the vacuum pumps (oil based on mineral oils) must be disposed of through the locally available waste oil disposal system. Oil can be contaminated due to influence of oxygen in air, high temperatures or mechanical wear of pump parts. Make sure to transport and dispose of the waste by an approved waste disposal vendor.

When you store the waste oil from the vacuum pumps (which is contaminated with other substances), make sure that:

- the contaminated oil is marked with the type of contamination
- the marking is clearly visible to everyone.

Dispose of the contaminated waste oil as special waste. Obey all national and regional regulations related to waste disposal.

As a minimum you must obey these instructions:

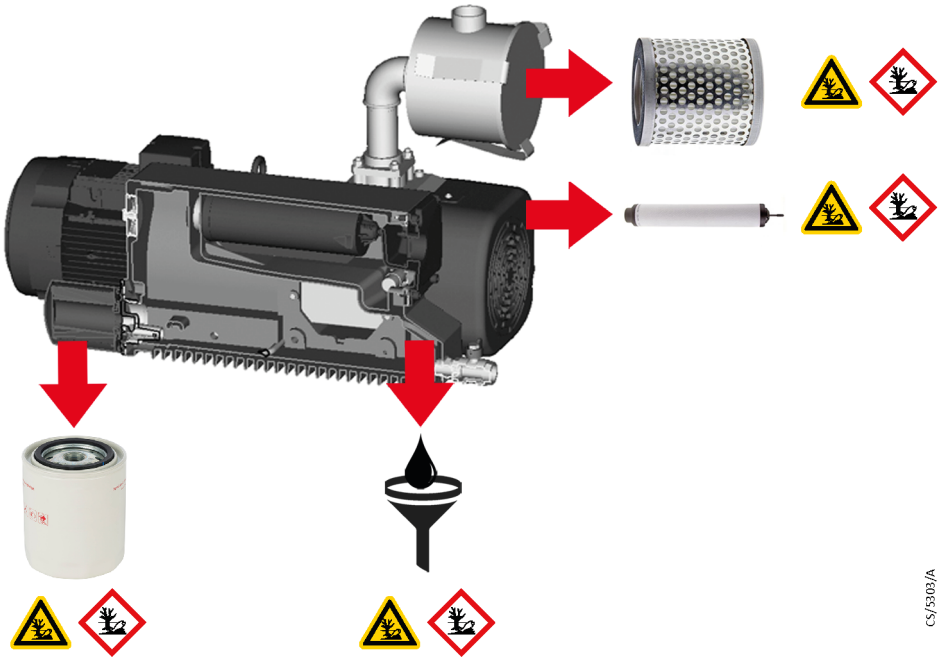
| Recycle symbol | Instruction |
|---|---|
|  | 1. Recycle the oil, oil filter, inlet filter and the exhaust filter.<br>2. Recycle the remaining pump which is mostly metal (for example, cast iron, steel, aluminium, copper). |

*Table 6 Recycling*

| Recycle symbol | Description | Component | |
|---|---|---|---|
|  | Metal, Plastic, wood, cardboard | Pump packaging wood, metal, polyethylene (PE) and cardboard |  |
| | | Stator, end plates, rotor, flanges |  |
| | | Plastic turbines, fans and covers |  |
| | | Oil casing |  |
|  | - | Inlet filter |  |
| | | Exhaust filter |  |
| | | Oil filter |  |
| | | Oil |  |
|  | Non-recyclable bin | O-rings, gaskets, shaft seals, anti-suckback valves, belts, feet, couplings, plugs, etc. (all elastomers) |  |
| | | Vanes |  |

| Recycle symbol | Description | Component | |
|---|---|---|---|
|   | WEEE | Motor |  |
| | | Frequency converter and electronics |  |

**Figure 24** Components for recycling



# 11. Return the equipment or components for service

Before you send your equipment to us for service or for any other reason, you must send us a completed Declaration of Contamination of Vacuum Equipment and Components – Form HS2. The HS2 form tells us if any substances found in the equipment are hazardous, which is important for the safety of our employees and all other people involved in the service of your equipment. The hazard information also lets us select the correct procedures to service your equipment.

We provide instructions for completing the form in the Declaration of Contamination of Vacuum equipment and Components – Procedure HS1.

If you are returning a vacuum pump, note the following:

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

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

**NOTICE:**

**If we do not receive a completed HS2 form, your equipment cannot be serviced.**