



Chemical (ATEX) Dry Vacuum Pumps

EDS 200, EDS 300

INSTRUCTION MANUAL

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

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1. Safety and compliance

For safe operation from the start, read these instructions carefully before you install or commission the equipment and keep them safe for future use. Read all the safety instructions in this section and the rest of this manual carefully and make sure that you obey these instructions.

The instruction manual is an important safety document that we often deliver digitally. It is your responsibility to keep the instruction manual available and visible while working with the equipment. Please download the digital version of the instruction manual for use on your device or print it if a device will not be available.

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 and keep them safe for future use.

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.



DANGER:

Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

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 equipment.

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 Trained personnel








For the operation of this equipment “trained personnel” are:

- skilled workers with knowledge in the fields of mechanics, electrical engineering, pollution abatement and vacuum technology and
- personnel specially trained for the operation of vacuum pumps

1.3 Safety symbols

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

The safety symbols that we use on the product or in the product documentation have the following meanings:

	<p>Warning/Caution</p> <p>An appropriate safety instruction must be followed or caution to a potential hazard exists.</p>
	<p>Warning - Automatic start up</p> <p>The equipment can be remotely started.</p>
	<p>Warning - Dangerous voltage</p> <p>Identifies possible hazards from hazardous voltages.</p>
	<p>Warning - Hot surfaces</p> <p>Identifies a potential hazard from a hot surface.</p>
	<p>Warning - Moving parts present</p> <p>Identifies parts that move. You must let the parts that turn stop before you remove the electrical power.</p>
	<p>Warning - Pressurised</p> <p>The equipment contains pressurised gases/liquids.</p>
	<p>Warning - Risk of explosion</p> <p>There is a risk of explosion when you do the task.</p>

2. Important safety information

2.1 Mechanical hazards



CAUTION: LOSS OF STABILITY DURING TRANSPORT

Uncontrolled movement due to incorrect attachment / lifting / carrying / rolling or movement of the vacuum pump. Only use the attachment points and conveying means described in this manual for vertical and horizontal conveying.



WARNING: EJECTION OF PARTS

Ejection of parts through bursting of vacuum system due to excessive pressure caused by the incorrect direction of rotation. Pressure build-up in the vacuum system or vacuum chambers. Check the direction of rotation of the vacuum pumps before each start-up, after each motor change and after each electrical connection change.

Ejection of parts through bursting of vacuum system as a result of excessive pressure caused by clogged or constricted exhaust. Pressure build-up in the vacuum system or exhaust pipes. Do not start up or operate the vacuum system with the outlet closed or throttled.

Ejection of parts through bursting of vacuum system due to excessive pressure, caused by faulty function at the gas inlet into the vacuum system. Pressure build-up in the vacuum system or inlet lines. Check correct connection of inlet and outlet flanges before commissioning. The inlet pressure at the suction port of the vacuum system must not exceed atmospheric pressure. If seal gas or gas ballast from pressure vessels is used, secure the supply in such a way that no overpressure can occur in the vacuum system in the event of a fault or power interruption.

Ejection of parts through bursting of vacuum system as a result of excessive pressure caused by the pump running backwards after it has been switched off under vacuum. The danger of overpressure in the inlet lines and recipients as well as the uncontrolled backward running of rotors. In the event of a fault or during service, separate the vacuum pumps from the vacuum vessel and connecting lines before the inlet using suitable valves.

If you use flame arresters, check the Lp/D ratio (refer to [Flame arresters](#) on page 19 and [Table: Flow resistance values](#)).



WARNING: RISK OF CUTTING AND CRUSHING

Risk of cutting and cutting off by contact with moving parts such as couplings, shafts and rotors.

Risk of cutting and crushing when reaching into open flanges or covers.

Do not operate the vacuum pump with open flanges or covers. When installing, first mechanically connect the inlets and outlets, close the covers of rotating parts and then make the electrical connections. Disconnect the vacuum pump from the power supply before servicing. Only use trained service personnel.

WARNING: UNEXPECTED RESTART



Failure or malfunction of the central control system (unexpected start-up) or danger of a pump restarting automatically after switching off due to a fault.

Risk of crushing, cutting or cutting off by touching moving parts due to recurring start command or power supply.

Before carrying out maintenance or service work, disconnect the pump from the power supply, secure it against being switched on again, determine that it is de-energised, ground and short-circuited and cover / isolate adjacent live parts.

CAUTION: RISK OF INJURY



Pulling in of body parts and objects into the vacuum through open flanges. Do not operate the vacuum pump with open flanges. When installing the vacuum pump, first mechanically connect the inlets and outlets and then make the electrical connections.

CAUTION: HIGH PRESSURE GAS



Danger due to incorrect connection of the pump to the system to be pumped out. Pressure build-up in the vacuum system.

Check correct connection of inlet and outlet flanges before commissioning. When using the pump with seal gas, protect the seal gas supply so that no overpressure can occur in the pump system in the event of a malfunction or power interruption.

CAUTION: TRIP HAZARD



Slipping, tripping or falling as a result of oil leaking from the pump. Oil can escape from the vacuum pump during pumping or depending on the work process. Risk of falling on oil spills. Check the vacuum pump regularly for oil leaks. Take the appropriate safety measures

2.2 Electrical hazards

DANGER: ELECTRICAL SHOCK



Risk of electrical shock caused by direct or indirect contact with live parts. Electrical shock due to faulty electrical connection and possible residual voltage up to 5 minutes after disconnection from the mains. The electrical connection may only be carried out by a trained person. Observe the national regulations in the user country, e.g. for Europe EN 50110 - 1. Prior to servicing, disconnect the vacuum pump from the power supply.

Risk of electrical shock due to interruption of the protective conductor system. In the event of a fault, life-threatening voltages may be present on electrically conductive components. Before commissioning, check the resistance of the earthing cable and the suitability of the assigned overcurrent protection device.



DANGER: LIGHTNING STRIKE

Risk of fire and injury from lightning strike. The operator is responsible for assessing the hazard potential when used outside of buildings.

2.3 Thermal hazards

CAUTION: HOT SURFACES

Burning of fingers, hands or arms on hot surfaces. Handle the pump only when ventilated and cooled down. Wear suitable protective equipment.



Scalding by contact with hot equipment or lubricants. Danger of scalding when opening the hot pump with hot operating fluid or cooling-water. Only open the outlet or inlet port for operating media if the operating medium has adapted to the room temperature. Wear suitable protective equipment.

A barrier must be placed around the pump to prevent accidental contact with hot surfaces. The barrier must consist of barricade tapes or warning signs and must be reliable. Tools (such as screwdriver or allen key) are required for removal.

2.4 Danger through materials and substances



DANGER: HAZARDOUS GASES

Danger due to a rapid increase in pressure due to the decomposition of pumped gases. Uncontrolled emission of process gases by reaction products within the pump. The pumping of reactive gases, vapours or gas mixtures is generally prohibited. The operator is responsible for assessing the hazard potential of the process media or mixtures.

Danger of escaping or emitting pumped hazardous gases, vapours or substances. Pumped process gases may escape from the exhaust and leaks in the vacuum system. The pumping of exothermic substances/ pyrophoric / radioactive / oxidizing gases or gas mixtures, as well as the pumping of oxygen of more than atmospheric concentration (21 Vol.-%) is generally prohibited. The operator is responsible for assessing the hazard potential of the process media or mixtures.

WARNING: HAZARDOUS MATERIAL AND SUBSTANCES



Risk of Asphyxiation. Some pumps use perfluoropolyether (PFPE) as lubricant. During thermal decomposition at temperatures over 290 °C toxic and corrosive gases are released. When you use PFPE, keep the pump away from open fires. Do not smoke with PFPE on your fingers.

Do the service and maintenance work in clean and dry rooms. Wear clean gloves and use clean tools when you touch the inner sections of the pumps.

Start the pump immediately after it is removed from its packaging as cleaning agents solvents based on hydrofluorether compounds can be used.

Fluoropolymers are used as sealants (FKM) and as lubricants (PFPE) in the pumps. In case the pump suffers a severe mechanical failure, there is a possibility of hazardous substances being released due to their thermal decomposition. Refer to the Material Safety Data Sheets for details of the hazards caused by such decomposition of the material.

2.5 Explosion hazard

DANGER: INTERNAL EXPLOSION



The pump is suitable for use with internal and external flammable atmospheres as defined by the pump marking. There is a risk of internal explosions within the pump, or ignition sources externally, if the pump is operated outside of the limits of operation.

2.6 Noise hazard



CAUTION: HIGH NOISE LEVELS

The operating conditions can cause higher noise levels than specified in the technical data. Take suitable hearing protection measures.

Pressure values in bar or mbar are absolute pressures, unless expressly stated otherwise (e.g. bar(g)).

3. ATEX certification

DANGER: INTERNAL EXPLOSION



The pump is designed to pump gas and/or vapour. Ensure that the pump temperatures are sufficient to prevent condensation forming which may otherwise lead to corrosion and loss of explosion protection. The use of seal purges and correct warm-up and shut-down procedures are necessary to prevent the formation of condensation. If in any doubt, consult us.

Shaft-seal purge must be maintained in order to ensure long term reliability of shaft-seals and the zoning/protection concept.

Where solvent flush is required to maintain constructional safety, the solvent flush system is safety critical. It is your responsibility to determine and maintain the required level of solvent flow into the pump to ensure that build-up of process deposits that cause the risk of an ignition hazard is a rare event.

3.1 Pumps certified as Category 2/2

The EDS ATEX Category 2/2 dry pump uses the protection strategy of constructional safety for internal and external atmospheres and satisfies the requirements for ATEX Category 2. In addition to normal use, it is essential to protect the pump with suitable measuring and control equipment, refer to [Conditions of safe use](#) on page 16.

Constructional safety relies on there being no ignition sources inside the pump. EDS dry pumps are manufactured and tested to show that running clearances are maintained in the pump during extremes of normal operation and at trip points of pump safety instruments. For Category 2/2 pumps, ignition hazards are prevented from occurring in normal operation and expected malfunctions. When using constructional safety as the protection concept ensure that no process deposits are formed inside the pump which could potentially create an ignition source. This can be achieved either by process control or by the use of solvent flush. In such systems the solvent flush operation is safety critical and suitable safeguards must be put in place to ensure that solvent flow is maintained to the prescribed regime. The gearbox of the EDS pump is classified one zone lower than the pumping chamber; the high-integrity seal in combination with seal purge ensures zone separation.

The EDS is capable of pumping a potentially explosive atmosphere that is likely to occur occasionally in normal operation and therefore satisfies the essential requirements identified in Annex II of the ATEX Directive 2014/34/EU for Category 2 equipment.


Instruments fitted to the pump are suitably rated for the external hazardous zone and use the protection concept intrinsic safety and/or simple apparatus. The instruments are specified in [Pump safety instruments](#) on page 54.

3.2 Pumps certified as Category 1/2

The pump certified as ATEX Category 1/2 uses flame arresters mounted on the inlet and outlet of the pump as the additional protection strategy. This will prevent the transmission of a flame originating inside the dry pump from reaching a potentially explosive atmosphere inside the process lines.

3.3 Classification and marking of the pump


The pump is marked as follows:

	<p>II 2/2 G Ex h IIC T3 Gb -20 °C ≤ Ta ≤ 40 °C</p> <p>or</p> <p>II 2/2 G Ex h IIC T4 Gb -20 °C ≤ Ta ≤ 40 °C</p> <p>or</p> <p>II 2/- G Ex h IIC T3 Gb/- -20 °C ≤ Ta ≤ 40 °C</p> <p>or</p> <p>II 1/2 G Ex h IIB3 T3 Ga / Ex h IIC T3 Gb X II 1/2 G Ex h IIB3 T4 Ga / Ex h IIC T4 Gb X -20 °C ≤ Ta ≤ 40 °C</p>
---	---

The ATEX category for the outside area can change depending on the type of motor. Use only such motors which are approved for the respective category. Modifying the supplied pump, voids the CE and ATEX Declaration of Conformity.

For motor variants, refer to [Ordering information](#) on page 25.

Table 1 Key to the Symbols

	ATEX logo
.. / ..	Means that the product has two different categories, information before the '/' refers to the inside atmosphere and after the '/' refers to the outside atmosphere
h	The code letter "h" is valid for all non-electrical devices.
IIB3 or IIC	Gas group
T3	Temperature class. Pumps belonging to temperature class T3 must only be operated with gases or vapours which exhibit an ignition temperature of over 200 °C.
T4	Temperature class. Pumps belonging to temperature class T4 must only be operated with gases or vapours which exhibit an ignition temperature of over 135 °C. Pumps belonging to temperature class T4 may also be operated where temperature class T3 is required.
X	Special operating conditions need to be obeyed. The special conditions and notes provided in the Operating Instructions will be applicable.

3.4 Conditions of safe use



CAUTION: EQUIPMENT SAFETY

The mandatory safety instruments specified in this manual must be used and must not be replaced with alternatives from other manufacturers without consulting us.

The EDS pump must be operated in accordance with the definitions of normal use and operational limits taking into account the requirements for safe use and special conditions for Category 1 as specified within this manual.

Accessories and additional parts fitted to the EDS pump must fulfil the requirements of the ATEX Directive 2014/34/EU regarding the equipment group and category and they must be applicable for use in explosive atmospheres of the respective gas group and temperature class. Accessories and additional parts should be approved by us otherwise they may have a detrimental effect on pump performance and safety.

Only processes which fulfil the conditions of the normal operation as specified in this manual must be used.

EDS pumps must only be used on processes if their materials resist the mechanical and/or chemical influences and corrosion, under the respective operating conditions, so that the explosion protection is always maintained. This applies particularly to the elements of the flame arresters, whose protection against flame transmission can be compromised by corrosion.

Do not clean the pump with dry cloths in order to avoid an electrostatic charge on non-dissipative materials. Processes generating intensive charge must not be operated close to the EDS pump.

Means for preventing back-flow of the pumped media must be used if back-flow can result in process hazards.

Opening the EDS pump is only permitted with the pump switched off, isolated from the electrical supply and in the absence of an explosive atmosphere.

Process limits

Inlet pressure: The range of allowable inlet pressures is 0 - 1013 mbar.

Exhaust pressure: The maximum allowable exhaust pressure is 1190 mbar for T3 pumps and 1090 mbar for T4 pumps.

Inlet gas temperature: The maximum allowable inlet gas temperature is 110 °C for inlet pressures < 150 mbar, and 80 °C for inlet pressures > 150 mbar.

Safety instruments

Refer to [Pump Safety Instruments](#) on page 54 and install and connect all mandatory safety switches.

3.5 Special conditions for EDS Cat1

1. The vacuum pump must be operated in accordance with the definitions of normal use and operational limits as specified in this manual. Grounding has to be done as given in [Pump safety instruments](#) on page 54 and [Grounding](#) on page 67. During

maintenance work, explicit attention must also be paid to deposits in the heat exchanger (fouling).

After a possible ignition inside the unit, all parts exposed to flames must be checked.

2. The vacuum pumps can only be used if their materials resist the mechanical and/or chemical effects and corrosion under the respective operating conditions so that the explosion protection is always maintained. This applies in particular to the filter discs of the flame arrester elements whose protection against flame transmission can be compromised by corrosion, among other things.

Both flame arresters are not tested for endurance burning on the flame arrester element.

The inlet flame arrester has been tested against short time burning. The control of the vacuum pump must ensure that the pump is switched off if the temperature transmitter of the inlet flame arrester reaches > 60 K temperature increase during 30 seconds. The pump must be stopped immediately (< 30 seconds).

The control of the vacuum pump must ensure that the pump is switched off without delay if the temperature on the inlet flame arrester exceeds 110 °C or 80 °C depending on the inlet pressure (refer to [Table: Limit values for category 1 inside pumps](#)).

Furthermore, the flame arresters on the exhaust side are not suitable for arresting flame against a stabilised burning on the flame arrester (short-time and endurance burning). They are marked with "c" - no burn time - as fire classification according to EN ISO16852:2016 section 12.2.1.2.

The user must make sure that there is no potential ignition source or ignition on the process facing side of the exhaust flame arrester. Therefore, the flame arresters must not be used if a burn on the flame arrester element is anticipated due to the plant and process conditions.

3. On the protected side (side to the operating plant), the connection of pipes with a larger nominal diameter is allowed, if the design of the flame arrester and the flame arrester housing remains unchanged.

For the installation of the flame arresters, the specifications in the instruction manual must be observed. The flame arrester can only be mounted directly on the inlet and outlet flange of the vacuum pump. You can use the deflagration flame arresters only when the cross-sectional area of the pipe is at least 10% open at the ignition source.

4. Depending on the L_p/D ratio, the values for flow resistance must not be exceeded on the L_p distance. Refer to [Table: Flow resistance values](#). You must make sure that pressure loss is less than 30 mbar on the suction side over a length of 5 m and less than 25 mbar over a length of 3.25 m on the exhaust side.
5. You must do visual inspections of the flame arresters at regular intervals in accordance with the specifications given in the instruction manual. In particular, the flame arresters must be checked for contamination, damage and corrosion and handled in accordance with the specifications in the instruction manual.
6. The limit values in [Table: Limit values for category 1 inside pumps](#) must be observed.
7. The attachments and accessories used on the vacuum pumps must fulfil the requirements of Directive 2014/34/EU regarding equipment group and category. They must be suitable for use in potentially explosive atmospheres of the

respective explosion group and temperature class. Safety devices must fulfil the requirements for safety devices in accordance with Directive 2014/34/EU, Annex II, section 1.5. An HFT of 1 can be assumed for the vacuum pumps with flame arresters.

8. Make sure that when the vacuum pump is switched off, the medium can no longer flow or backflow.
9. It must be made sure that no foreign bodies enter the vacuum pumps.
10. The safety of screw connections against self-loosening or loosening must be made sure by suitable measures, such as prescribe tightening torques of the screws according to the operating instructions of the vacuum pump, use of locking elements or glueing in with suitable adhesives.
11. Before you open the pump, make sure that the pump is stopped and no explosive atmosphere is present.
12. The vacuum pumps must not be cleaned with dry cloths to prevent electrostatic charging on non-dissipative materials, lacquered outer surfaces of the vacuum pumps and labels made of non-dissipative materials attached outside the vacuum pump.

Processes that generate intensive electrostatic charges are not allowed in the immediate surrounding of the vacuum pumps.

13. A correct supply of purge gas must be ensured before commissioning and before you start the pump.
14. If the vacuum pumps are intended to be operated with a frequency converter, the frequency converter must be suitable for the motor and the software version must be specified and documented by you. The motor then must be marked with "For Converter Operation" in accordance with EN 60079-0. It may only be operated with an integrated PTC according to DIN 44082, with the set temperature as specified in the technical documentation and a separately certified PTC thermistor evaluation system.

In addition to the speed or frequency of the motor, the minimum and maximum speed of the vacuum pumps according to the instruction manual must be observed.

Table 2 Flow resistance values

Pump area	Lp/D* [-]	Lp [m]	Δp [mbar]
Suction side	100	≥ 5	30
Pressure side	65	≥ 3.25	25

* Lp= length of pipe on protection side (m) and D = Diameter of pipe (m)

Table 3 Limits for category 1 inside pumps

Vacuum pump type	EDS 200		EDS 300	
	Temperature class	T3	T4	T3
Power consumption (kW)	5.5	7.5	7.5	7.5
Rotor speed (maximum)	6600		7500	
Internal explosive atmosphere	IIB3			
External explosive atmosphere	IIC			
Inlet pressure ≥ 150 mbar(a)	≤ 80 (inlet temperature °C)			

Vacuum pump type	EDS 200		EDS 300	
Inlet pressure ≤ 150 mbar(a)	≤ 110 (inlet temperature $^{\circ}\text{C}$)			
Pump exhaust gas temperature ($^{\circ}\text{C}$)	≤ 164	≤ 135	≤ 175	≤ 145
Pump case temperature ($^{\circ}\text{C}$)	≤ 90	≤ 69	≤ 90	≤ 70
Pump exhaust pressure (mbar(a))	$\leq 1190^*$	$\leq 1090^*$	$\leq 1190^*$	$\leq 1090^*$

* includes safety margin for the sensor (also refer to [Pump safety instruments](#) on page 54).

Table 4 Limits for category 2 inside/outside pumps

Vacuum pump type	EDS 200		EDS 300	
Temperature class	T3	T4	T3	T4
Power consumption (kW)	5.5	7.5	7.5	7.5
Rotor speed (maximum)	6600		7500	
Internal explosive atmosphere	IIC			
External explosive atmosphere	IIC			
Inlet pressure ≥ 150 mbar(a)	≤ 80 (inlet temperature $^{\circ}\text{C}$)			
Inlet pressure ≤ 150 mbar(a)	≤ 110 (inlet temperature $^{\circ}\text{C}$)			
Pump exhaust gas temperature ($^{\circ}\text{C}$)	≤ 165	≤ 135	≤ 165	≤ 145
Pump case temperature ($^{\circ}\text{C}$)	≤ 90	≤ 65	≤ 90	≤ 65
Pump exhaust pressure (mbar(a))	$\leq 1190^*$	$\leq 1090^*$	$\leq 1190^*$	$\leq 1090^*$

* includes safety margin for the sensor (also refer to [Pump safety instruments](#) on page 54).

3.6 Flame arresters

WARNING: PROTECTION FROM EXPLOSION



EDS dry pumps with mandatory flame arresters are supplied with the exhaust flame arrester inside the pump packaging, but not pre-fitted to the pump. This flame arrester must be fitted directly to the pump's exhaust flange as shown in [Figure: PROTEGO® flame arresters](#) or the downstream exhaust system will not be protected against explosions.

EDS ATEX Category 1/2 dry pumps must be used with the approved PROTEGO® flame arrester. As the flame arresters are part of the pump and must not be used separately, the marking of the operational limits on the flame arresters is therefore no longer valid. Refer to [Special conditions for EDS Cat1](#) on page 16.

PROTEGO® flame arresters

Part	Part number
Inlet arrester FA-E-80-IIB3-P1.6	A60022032
Exhaust arrester FA-E-50-IIB3-P1.6	A60022033

For replacement parts refer to [Inspect and clean the inlet and exhaust flame arresters](#) on page 76.

EDS ATEX Category 1/2 dry pumps must use a temperature transmitter fitted to the inlet flame arrester and connected as described in [Conditions of safe use](#) on page 16. Inlet

arrester temperature transmitter (A60029011) is the approved transmitter for the EDS ATEX Category 1/2 dry pump.

 **Note:**

The inlet flame arrester must be fitted directly to the pump inlet flange. The exhaust flame arrester must be fitted directly to the pump exhaust flange. Do not install other pipework or fittings between the pump connections.

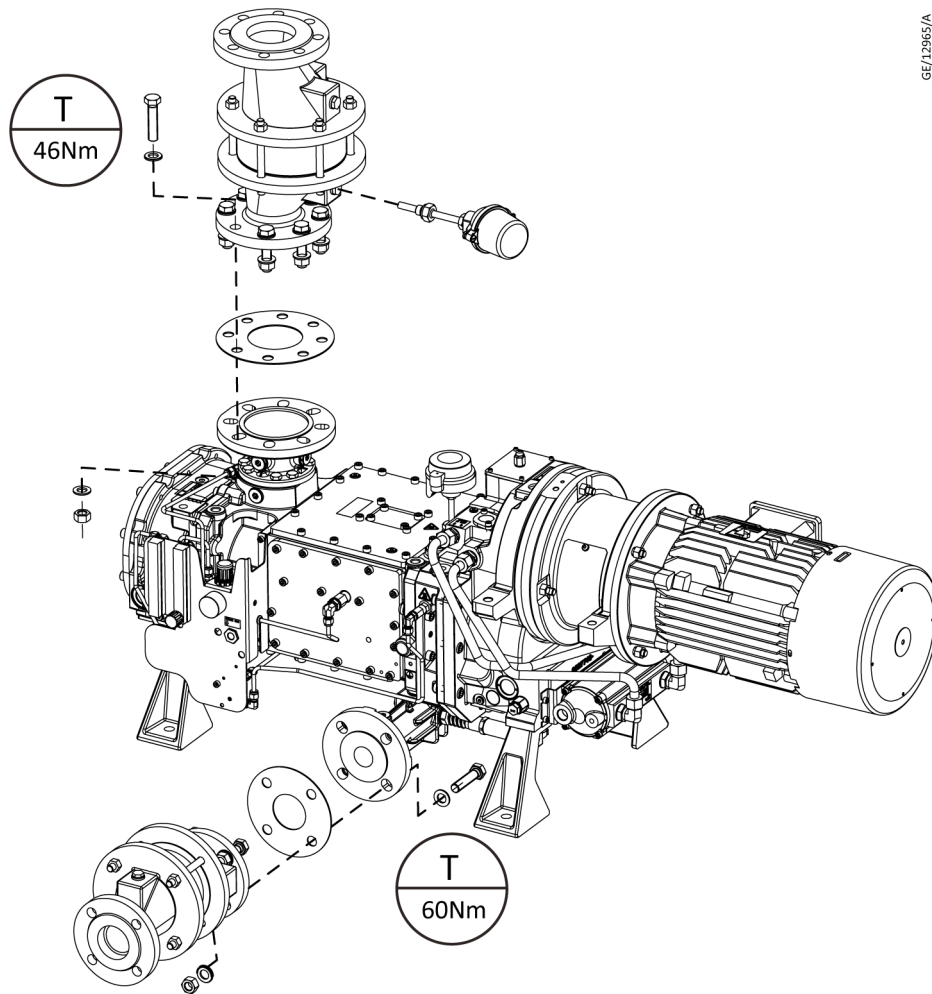
Before returning the pump for service, remove flame arresters and retain them for future use.

The vacuum pump EDS 200/300 Cat 1/2 has been tested under the operating conditions with the flame arresters type PROTEGO FA-E-80-IIB3-P1.6 and PROTEGO FA-E-50-IIB3-P1.6 (standard types).

The marking on the flame arrester refers to the testing condition for that arrester in a pipe. The marking on the arrester must not be changed. When tested with the vacuum pump the parameters given [Special conditions for EDS Cat1](#) on page 16 in take priority.

For using aggressive and corrosive chemicals, consult us. Flame arresters with E-CTFE coating are available on request. Gas temperatures in front of the flame arresters must be limited to < 120 °C. This may require the pump or booster (if applicable) to be slowed down. Contact our application team for further support when using E_CTFE coating.

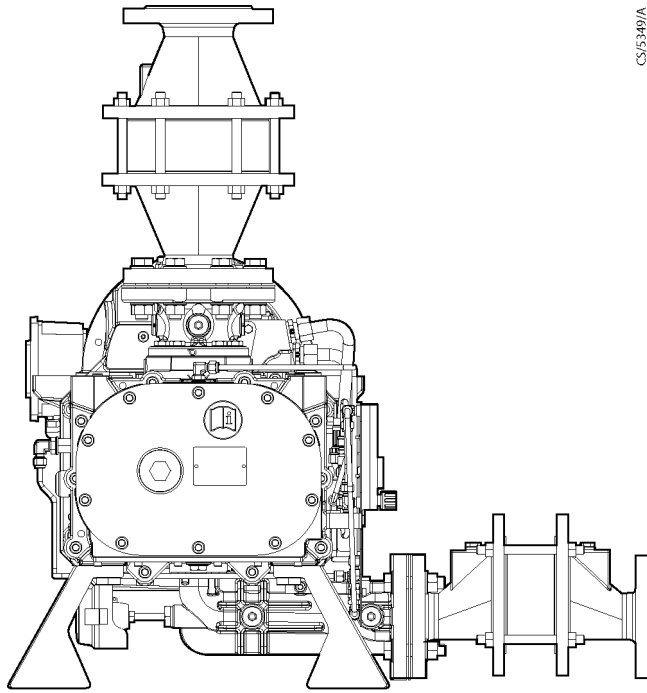
Figure 1 Flame arrester assembly



GF/12965/A

Pt100 is mandatory for Cat1 and must be mounted in the position and location as shown.

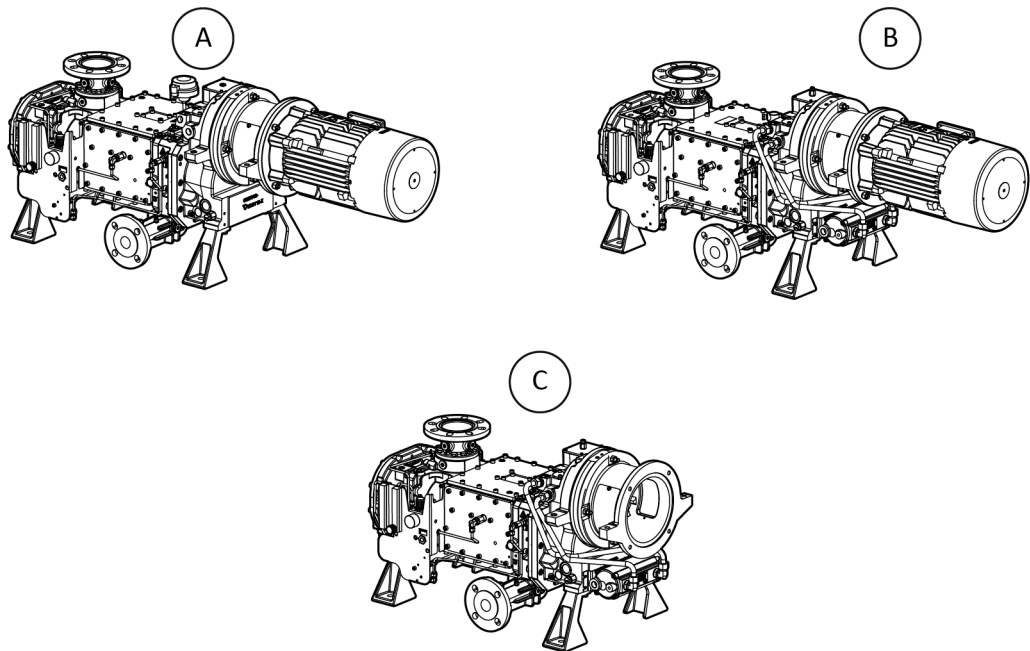
Figure 2 PROTEGO® flame arresters



CS/5340/A

4. Description

Figure 3 EDS pump models

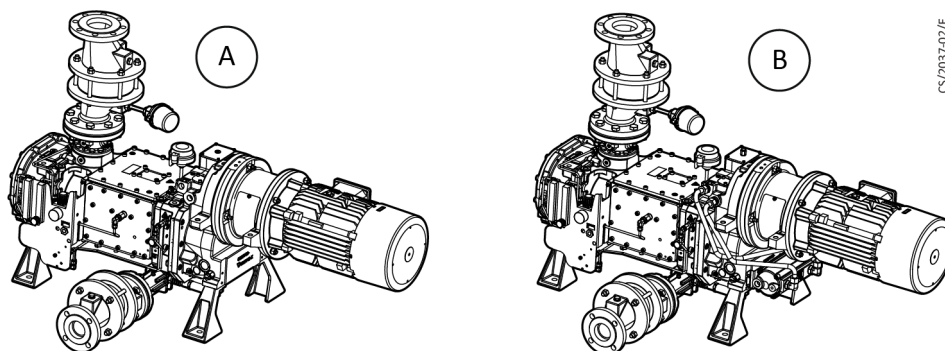


CS/5967/A

EDS 200 and EDS 300 look the same, they differ only in their performance.

- A. EDS 200/300 direct water-cooled with Pt 100 with head transmitter
- B. EDS 200/300 indirect water-cooled (with heat exchanger)
- C. EDS 200/300 indirect water-cooled, without motor

Figure 4 EDS200-300 pump models with flame arrester



CS/2037-02/E

- A. EDS 200/300 direct water-cooled with flame arrester
- B. EDS 200/300 indirect water-cooled with flame arrester

4.1 Design

The EDS dry pump range has been developed to meet the demanding requirements for pumping solutions in industrial and chemical applications. The EDS dry pumps are assigned ATEX certification enabling them to operate with hazardous atmospheres both internally and externally.

The pump is a dry, positive displacement screw vacuum pump in which pairs of intermeshing, non-contacting screw rotors are turning contrawise in phase by timing-gears. The screw rotors are driven by an asynchronous electrical motor. Blow-off valves within the mechanism minimise pumping power at high pressures and allow the pump to be started direct-on-line. The rotational speed of screw rotors is increased by transmission gears. Gears and bearings are oil lubricated.

The EDS pumps are supplied with hazardous area motors. The EDS pump is direct or indirect water-cooled depending on the variant.

Cooling system

The motor is air-cooled by an integrated cooling fan. The EDS pump itself is directly or indirectly water-cooled.

Direct cooled: cooling water circulates around the pump body and then passes out of the pump. The cooling system is open-loop and unregulated such that the cooling water flow-rate and temperature will directly influence the temperature of the pump.

Indirect cooled: Drystar/water mixture circulates around the pump body and through the water channels to the water-cooled heat exchanger via an integrated water pump. The cooling system is closed-loop.

Temperature monitoring is fitted to the EDS pump to protect against overheating in the case of a loss of supplied cooling water.

Gas system



CAUTION: OPERATION SAFETY

The shaft-seals and purge system together maintain the reliability of the pump and also the ATEX zoning strategy. The shaft-seal purge must be used at all times. A safe inert gas must be used.

The EDS pumps have a shaft-seal purge system and a gas-ballast system.

The shaft-seal purge delivers the supplied gas, for example- nitrogen, to the internal shaft-seal system to protect it and ensure lifetime and functionality. Shaft-seal purge ensures that the shaft-seals are maintained at a positive pressure gradient to pumping chamber during pump operation; therefore it 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 shaft-seals by debris.

The gas-ballast system can deliver the supplied gas, for example- nitrogen, to the pump gas-ballast inlet. Gas-ballast use depends on your application and can, for example, reduce temperature load or increase water vapour capability. A manual needle valve is supplied on the gas-ballast line enabling the flow to be adjusted or shut off completely, depending on your application.

4.2 Supplied equipment

1. Pump as described in [Design](#) on page 23 and [Ordering information](#) on page 25
2. The pumps are filled with lubricant: Ultragrade® Endurance Extend 110
3. The pump flanges have been blanked off with a sealing cap
4. 4 x crane eyes M16

5. Inlet diffuser (Category 2/2 only)
6. Plug for purge and gas-ballast valve (G1/4 female thread)
7. For non-motorized pumps the required coupling to mount the motor is supplied separately.
8. Inlet and exhaust flame arresters for Category 1 pumps.

We supply the flame arresters loose and include the mounting material. The inlet flame arrester is fitted with temperature transmitter.

4.3 Ordering information

Table 5 Pump ordering information

EDS	ATEX	Electrical supply	Part No.
EDS200ex 50 Hz 380-415V Cat2 T3 DC	Ex II 2/2 G Ex h IIC T3 Gb	400 V 50 Hz	A41822945
EDS300ex 50 Hz 380-415V Cat2 T3 DC			A41832945
EDS200ex 50 Hz 380-415V Cat2 T3 IC			A41824945
EDS300ex 50 Hz 380-415V Cat2 T3 IC			A41834945
EDS200ex 50 Hz 380-415V Cat2 T4 DC	Ex II 2/2 G Ex h IIC T4 Gb		A41823945
EDS300ex 50 Hz 380-415V Cat2 T4 DC			A41833945
EDS200ex 50 Hz 380-415 V Cat1 T3,T4 DC	Ex II 1/2 G Ex h IIB3 T3 Ga / Ex h IIC T3 Gb X Ex II 1/2 G Ex h IIB3 T4 Ga / Ex h IIC T4 Gb X		A41826945
EDS300ex 50 Hz 380-415 V Cat1 T3,T4 DC			A41836945
EDS200ex 50 Hz 380-415 V Cat1 T3 IC	Ex II 1/2 G Ex h IIB3 T3 Ga / Ex h IIC T3 Gb X		A41827945
EDS300ex 50 Hz 380-415 V Cat1 T3 IC			A41837945
EDS200 Chemical (ATEX) IEC ready 50 Hz indirect water cooled	Ex II 2/- G Ex h IIC T3 Gb/- -20 °C < Ta < 40 °C (internal atmosphere only)	50 Hz	A41824985
EDS200 Chemical (ATEX) NEMA ready 60 Hz indirect water cooled		60 Hz	A41824986
EDS300 Chemical (ATEX) IEC ready 50 Hz indirect water cooled		50 Hz	A41834985
EDS300 Chemical (ATEX) NEMA ready 60 Hz indirect water cooled		60 Hz	A41834986
EDS200W Chemical (ATEX) IEC ready 50 Hz direct water cooled		50 Hz	A41822985
EDS300W Chemical (ATEX) IEC ready 50 Hz direct water cooled		50 Hz	A41832985

4.4 Accessories

For more information about the sensors (optional or mandatory) refer to [Pump safety instruments](#) on page 54.

Table 6 Accessories

Accessories	Part number
Exhaust pressure transmitter (PS1)	A41894000
Exhaust gas temperature transmitter (TS3)	A41895001
Stator temperature transmitter (Pt 100)	A41895000
Roots adapter for EH 1200 / 2600	A41893000
Roots adapter for EH 500	A41893001
Ultragrade® Endurance Extend 110, 1 l	H11032010
Ultragrade® Kinetic 150, 1 l (optional)	H11033015
Ultragrade® Endurance Extend 110, 4 l	H11032012
Ultragrade® Kinetic 150, 4 l (optional)	H11033010
TCV accessory indirect cooled	A41890001
TCV accessory direct cooled	A41890000
Solenoid valve for purge system	A41891001
Coolant change accessory kit	A41892005
200/300 Inlet purge / Solenoid valve ATEX	A41891003
200/300 Flush kit / Solenoid valve ATEX	A41892003
BoV Plug accessory for EDS 200, EDS 300 and EDS 480	A41897000
BoV Kit valve ball PEEK for EDS 200, EDS 300 and EDS 480	A41897001

5. Technical data

Table 7 General technical data

EDS	200	300
Pumping speed without gas-ballast and without flame arresters	> 210 m ³ /h	> 280 m ³ /h
Ultimate pressure	< 0.05 mbar	< 0.01 mbar
Maximum permissible inlet pressure	1013 mbar	
Maximum permanent exhaust pressure (absolute pressure)	1190 mbar (for T3) 1090 mbar (for T4)	
Swept volume maximum pressure rating	11 bar	
Integral leak rate	< 10 ⁻⁴ mbar l/s	
Water vapour capacity without condensation at pressure between 10 - 50 mbar	1.5 - 7 kg/h	2 - 10 kg/h
Permissible ambient temperature*	-20 to +40 °C	
Storage temperature	-30 to +50 °C	
Typical continuous A-weighted sound pressure level at ultimate pressure (without silencer but long exhaust line)	≤ 72 dB(A)	
Relative atmospheric humidity	maximum 90%	
Installation location	up to 1000 m (m ASL)	
Cooling (indirect cooled)	Water and Drystar water mix (50%)	
Mains voltage (only for motorized variants)	400 V a.c. ± 10%	
Frequency (only for motorized variants)	50 Hz	
Phases	3-phase	
Motor rating	5.5 kW (7.5 HP) 7.5 kW (10 HP) (for T4)	7.5 kW (10 HP)
Current rating (380 - 400 V systems) at full load (50 Hz)	11.5 A 13 A (for T4)	15.4 A
Recommended branch circuit fuse		
UL (200 - 230 V systems)	32 A	
IEC (200 - 230 V systems)	32 A	
UL (380 - 460 V systems)	16 A	
IEC (380 - 460 V systems)	16 A	
Minimum cable size for		
200 - 230 V systems	6 mm ²	
380 - 460 V systems	4 mm ²	
575 V systems	4 mm ²	

EDS	200	300
Power consumption at ultimate pressure	4.1 kW (5.5 HP) 4.5 kW (6 HP) (for T4)	4.5 kW (6 HP)
Installation category	II (IEC 60664-1)	
Input supply voltage unbalance	Should not exceed 2% when assessed over any one minute period	
Short circuit current rating according IEC/EN 60947 suitable for motors with efficiency class IE3.	225 A	
Second protective earth (ground) conductor	Must be fitted with cross-sectional area at least equal to phase conductor size	
Pump body thermal snap switch		
Supply voltage 1-phase	6 - 48 V d.c.	
Rotor speed	6600 rpm	7500 rpm
Minimum permissible motor speed ¹⁾	20 Hz	
Protection class	IP 54	
Approximate warm-up time to a temperature of 40 °C (stator), with a cooling-water flow of 8 l/min at 20 °C	60 minutes	
Oil filling	Ultragrade® Endurance Extend 110	
Oil quantity: Drive (gearbox) Inlet side	1250 ml 250 ml	
Vibration velocity	< 2 mm/s	
Inlet flange	DIN 80 / 3" ANSI Combination flange	
Exhaust flange	DIN 50 / 2" ANSI Combination flange	
Materials		
Rotors, Stators, Shafts, Gearbox	Cast SG Iron	
Seals	PTFE and fluoroelastomer	
Coupling cover	Cast grey iron, steel, aluminium, brass, rubber	
Timing gears	Steel	
Closed water circuit filling	Drystar coolant mixture 50:50	
Oil filling	Synthetic oil	
Blow-off valve balls	Viton	
Weight (approximate)	470 kg (535 kg with flame arrester)	
Water		
Water connection	G1/2" female threads	
Water supply temperature		
T3	5 °C - 35 °C (direct cooled and indirect cooled)	
T4	5 °C - 25 °C (direct cooled)	

EDS	200	300
Minimum required cooling water flow		
T3	> 4 l/min (direct cooled and indirect cooled)	
T4	> 8 l/min (direct cooled)	
Required water pressure differential (to achieve 8 l/min)	0.2 bar	
Maximum supply pressure	7 bar(g)**	
Primary cooling circuit volume (Drystar water mixture volume in case of variant with indirect cooling)	6 l	
Purge		
Connection	G1/4" female thread	
Purge gas regulated pressure	> 2.2 bar(g)	
Purge gas supply pressure range	4 to 10 bar(g)	
Purge gas supply quality	< 5 µm	
Seal purge flow rate	12 slm total	
Gas-ballast flow rate	0 to 50 slm (adjustable)	

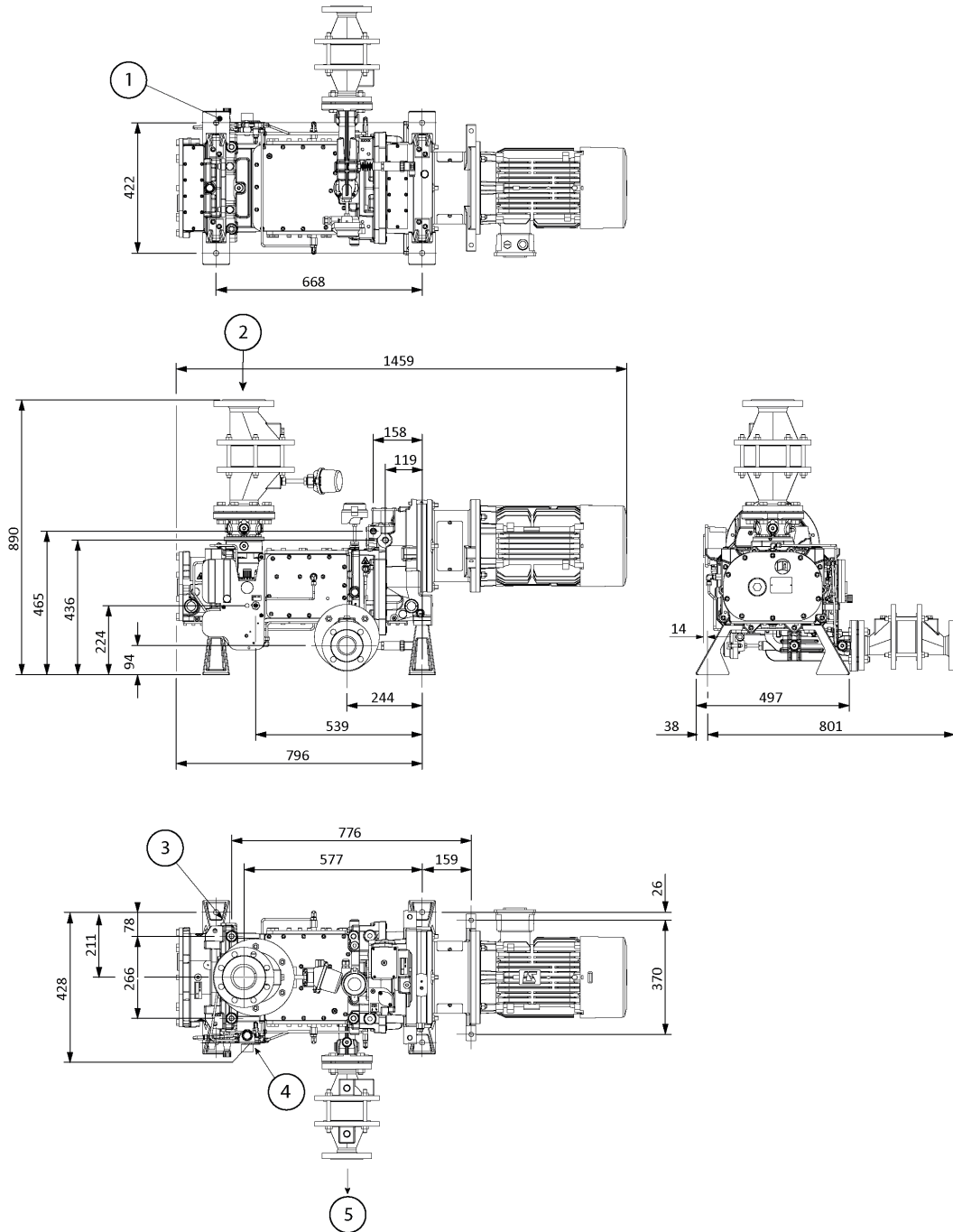
1) The minimum permissible speed is relevant for the oil lubrication of bearings and gears. Running the pump at less than the minimum speed for more than 1 hour can cause damage to the pump due to a lack of lubrication.

* at temperatures below freezing point, an appropriate mixing ratio with glycol must be observed.

** bar(g): bar(gauge) is the overpressure, for example, atmospheric pressure = 0 bar(g)

5.1 Dimension drawings

Figure 5 EDS200-300 Cat 1 Flame arrester direct cooled

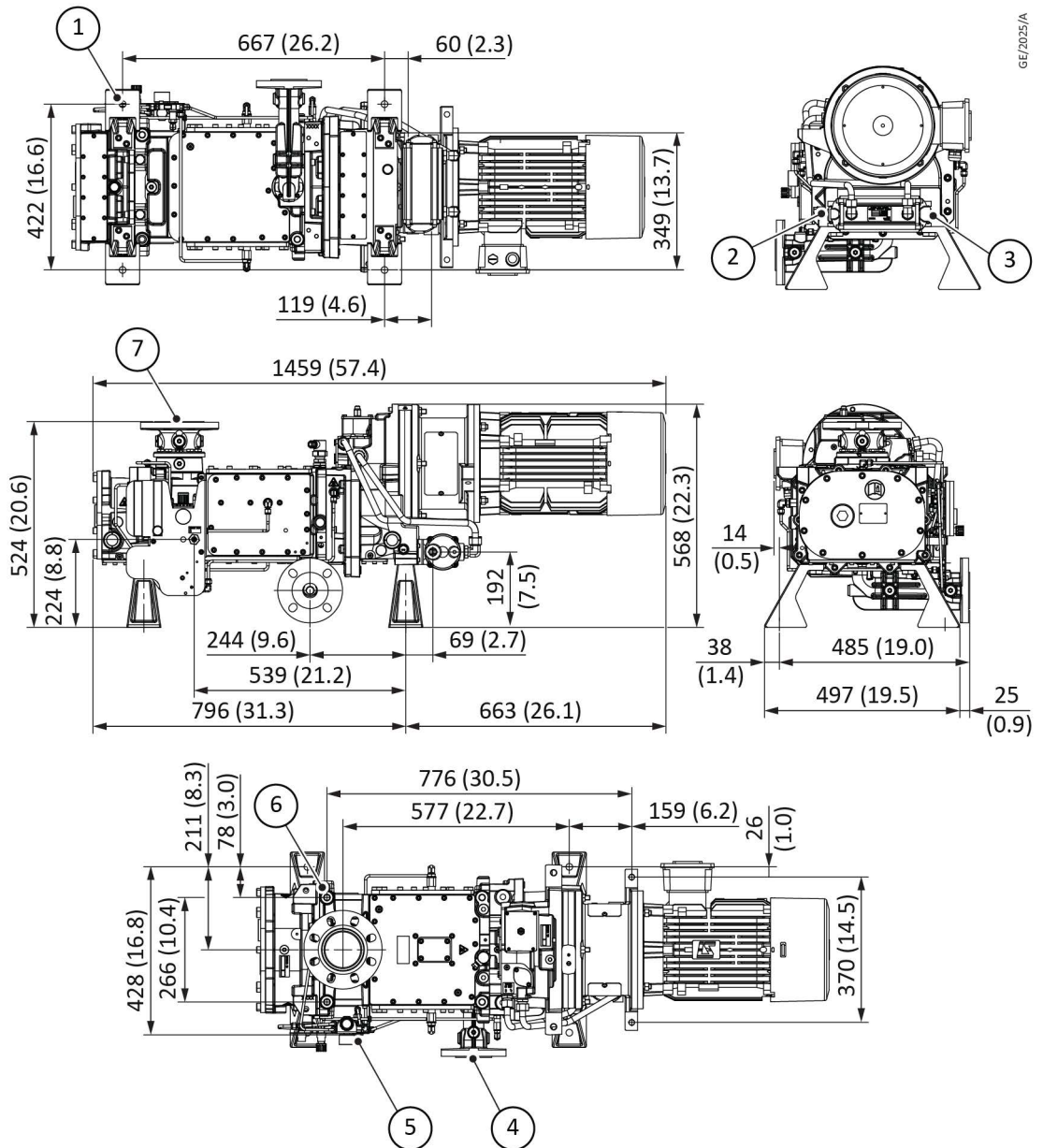


- | | |
|-----------------------|-------------------------|
| 1. 4 x 17 diameter | 2. Inlet DN 80 PN16 |
| 3. 4 x M16 | 4. G1/4 Purge gas inlet |
| 5. Exhaust DN 50 PN16 | |

Note:

Only a directly cooled version is shown. For connection points to the heat exchanger on the indirectly cooled version refer to [Figure: EDS200-300 Cat 2 indirect cooled](#).

Figure 6 EDS200-300 Cat 2 indirect cooled

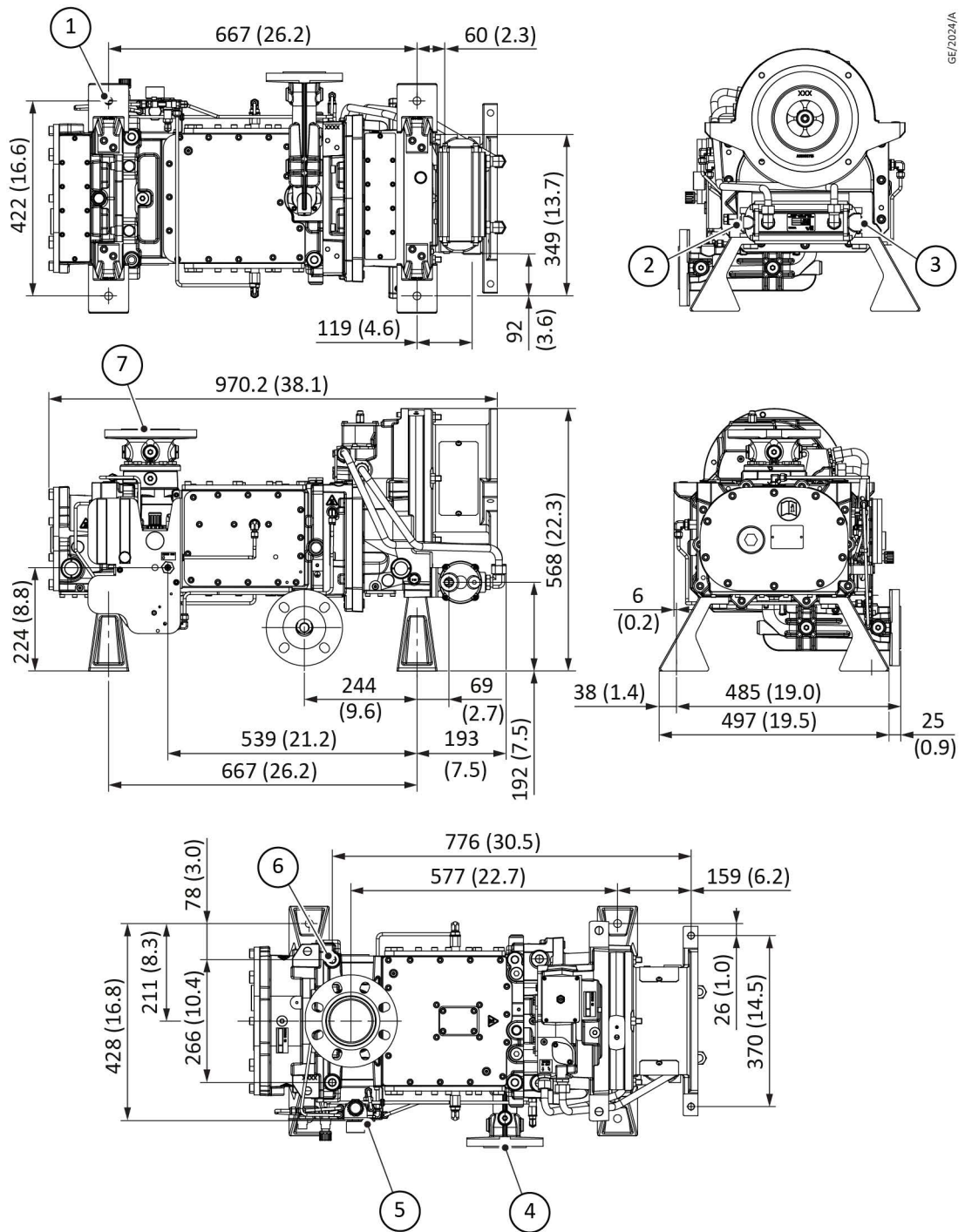


GE/2025/A

All dimensions given are in mm (inch).

- | | |
|-------------------------|---------------------------|
| 1. 4 x 17 diameter | 2. G1/2 Water inlet |
| 3. G1/2 Water outlet | 4. Exhaust 2" DN 50 PN 16 |
| 5. G1/4 Purge gas inlet | 6. 4 x M16 |
| 7. Inlet 3" DN 80 PN16 | |

Figure 7 EDS200-300 bare-shaft pump



GE/2024/A

All dimensions given are in mm (inch).

- | | |
|-------------------------|--------------------------|
| 1. 4 x 17 diameter | 2. G1/2 Water inlet |
| 3. G1/2 Water outlet | 4. Exhaust 2" DN 50 PN16 |
| 5. G1/4 Purge gas inlet | 6. 4 x M16 |
| 7. Inlet 3" DN 80 PN16 | |

6. Transport and storage



CAUTION: LOSS OF STABILITY DURING TRANSPORT

Uncontrolled movement due to faulty attaching/lifting/carrying/rolling or moving the vacuum pump. For vertical and horizontal transport, use only the attachment points and transport means described in this manual.



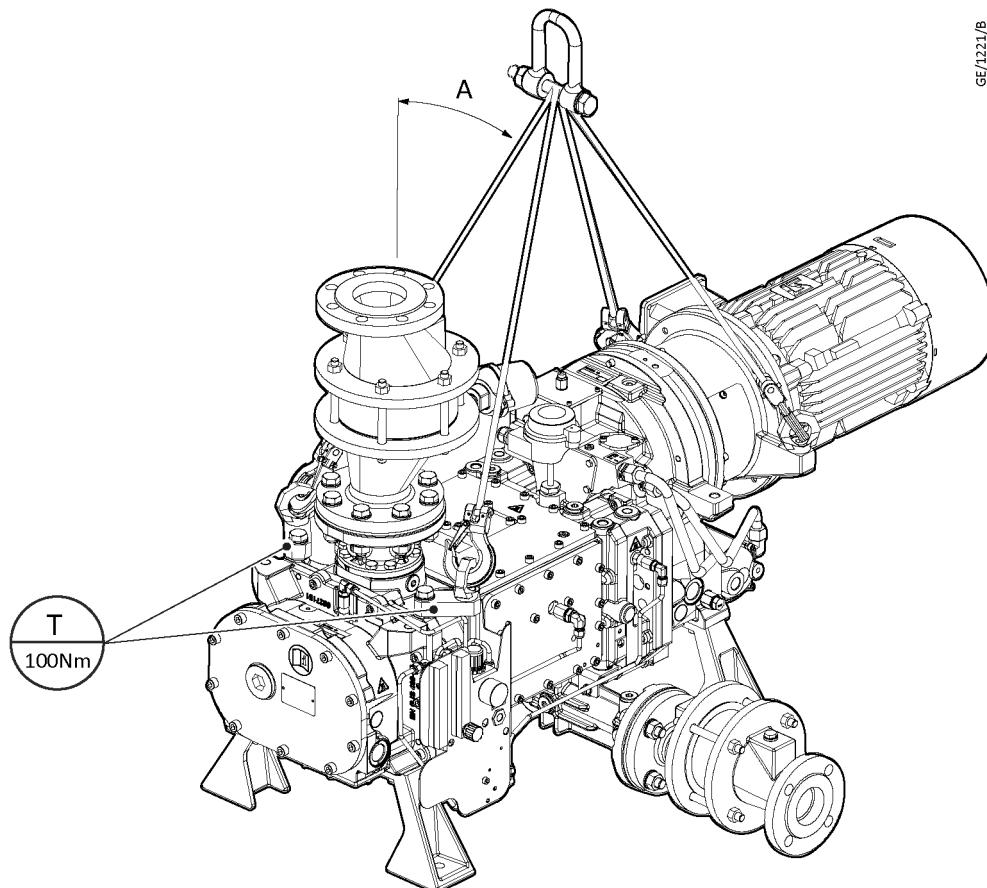
NOTICE:

The pumps are supplied filled with synthetic oil. For this reason they should, while being transported or shipped, not be subjected to much tilting (10° maximum). Store the pumps only horizontally standing on their feet.

Use a suitable fork-lift truck or pallet truck to move the pump on its pallet, close to where you will install it.

Remove all packing materials.

Lift the pump at the crane eyes. Use all crane eyes. Ensure that it cannot tip over.



GE/1221/B

A - maximum 35°

6.1 Storage

Store the pumps only horizontally standing on their feet.

Open the pumps only immediately before installing them.

**NOTICE:**

If there is the danger of frost, the cooling-water must be drained.

You may use a water glycol mixture of up to 50% for indirectly cooled pumps.

Temperature (only for storage without cooling-water)	-30 °C to +50 °C
Storage site	dry
Maximum atmospheric humidity	90%, non-condensing

The pump must be stored at the most for one year only. Longer storing without turning the rotors will damage the bearings. Connect the pump to operate it briefly and then decommission it as described in the following sections. (The intake flange can stay sealed during this brief operation, the exhaust flange must be opened).

7. Installation

WARNING: RISK OF CUTTING AND CRUSHING



Risk of cutting and cutting off by contact with moving parts such as couplings, shafts and rotors. Risk of cutting and crushing when reaching into open flanges or covers. Do not operate the vacuum pump with open flanges or covers. When installing, first mechanically connect the inlets and outlets, close the covers of rotating parts and then make the electrical connections. Disconnect the vacuum pump from the power supply before servicing. Only use trained service personnel.

WARNING: EJECTION OF PARTS



Ejection of parts through bursting of vacuum system due to excessive pressure caused by incorrect direction of rotation. Pressure build-up in the vacuum system or in vacuum chambers. Check the direction of rotation of the vacuum pumps before each start-up, after each motor change and after each electrical connection change.

Ejection of parts through bursting of vacuum system due to excessive pressure, caused by faulty function at the gas inlet into the vacuum system. Pressure build-up in the vacuum system or inlet lines. Check correct connection of inlet and outlet flanges before commissioning. The inlet pressure at the suction port of the vacuum system must not exceed atmospheric pressure. If seal gas or gas-ballast from pressure vessels is used, secure the supply in such a way that no overpressure can occur in the vacuum system in the event of a fault or power interruption.

WARNING: EXTERNAL IGNITION SOURCE

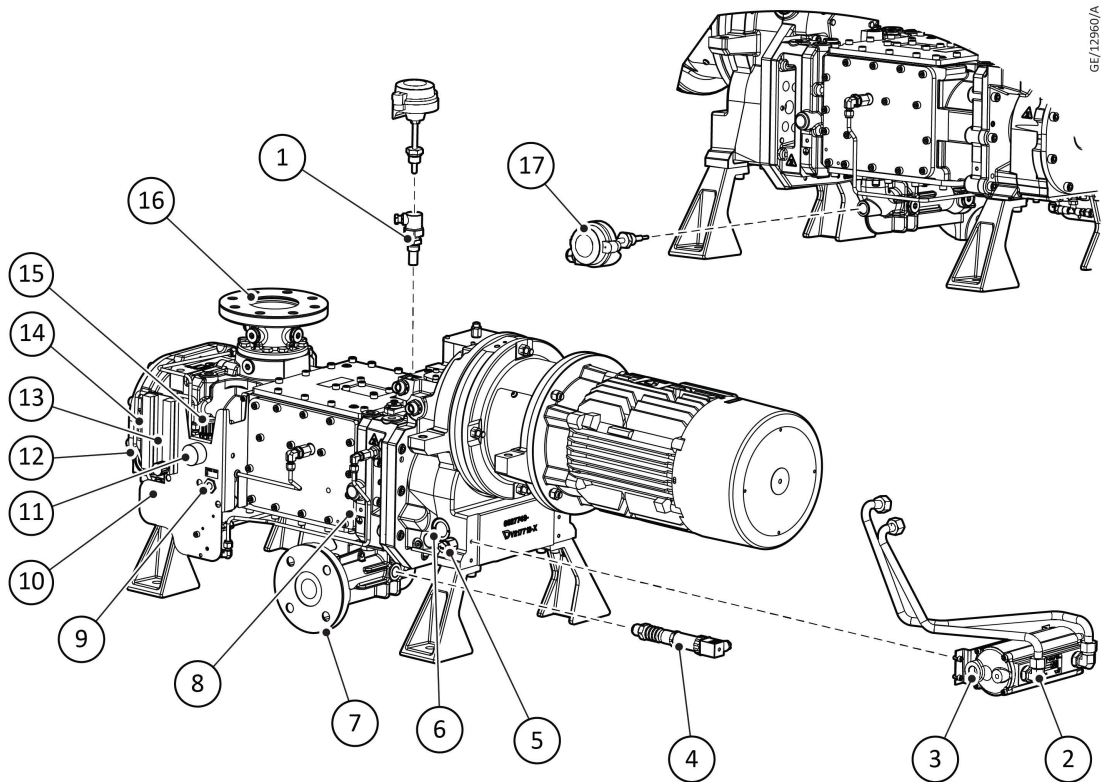


Risk of explosion. The gas that escapes could be more than 135 °C, make sure to take adequate measures to insulate the outlet piping according to the outside zoning.

Only competent persons may install this EDS pump.

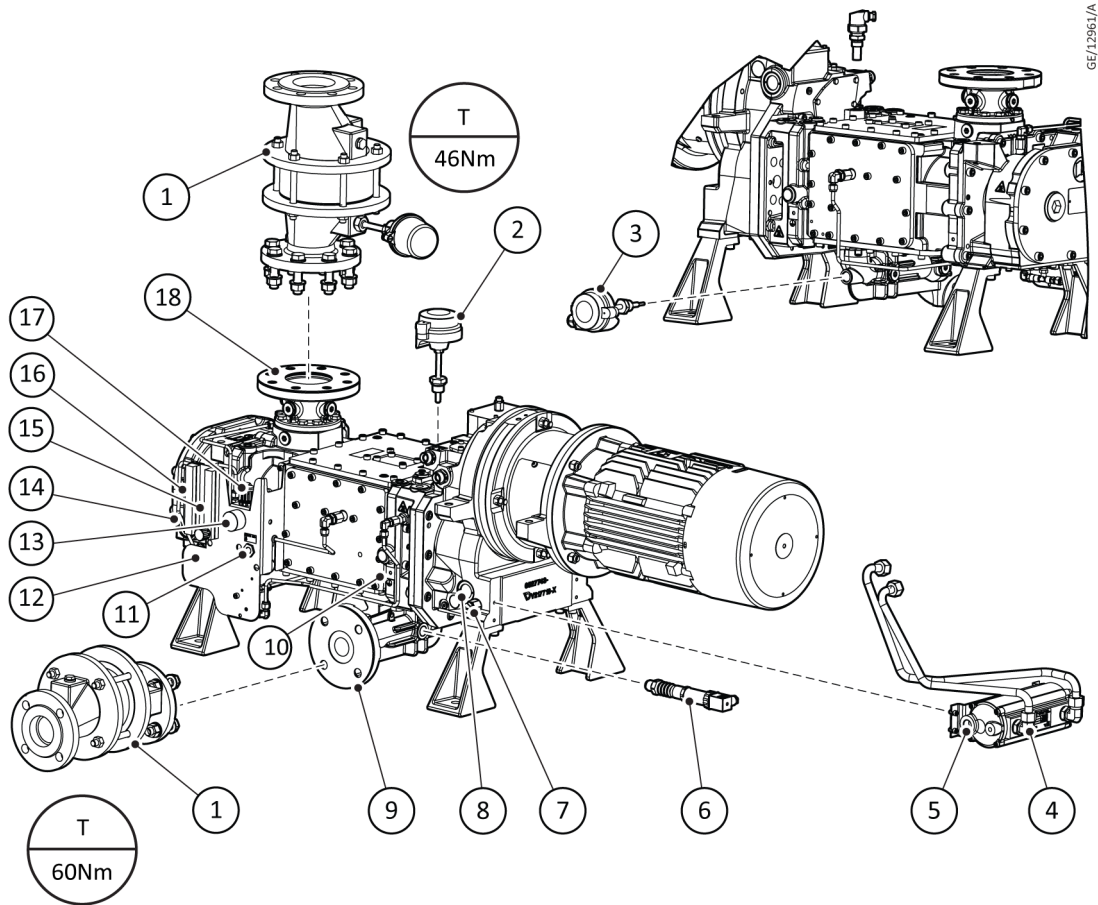
- Ensure that you comply with all local and national safety requirements when you install the pump.
- Do not operate the pump system unless the inlet and outlet are connected to your piping system.
- Disconnect the other components in the pumping system from the electrical supply so that they cannot be operated accidentally.
- Electrical, purge gas and water supplies are all potentially hazardous energy sources. Before carrying out any maintenance the supply of these sources should be locked and tagged out.
- Ensure that the cooling-air flow through the pump-motor cooling fan cannot be obstructed.
- Ensure that all electrical cables, purge gas pipelines and cooling-water pipelines are safely positioned, secured and routed so that they do not present a trip hazard.

Figure 10 Connections and controls, indirect cooled version (Category 2)



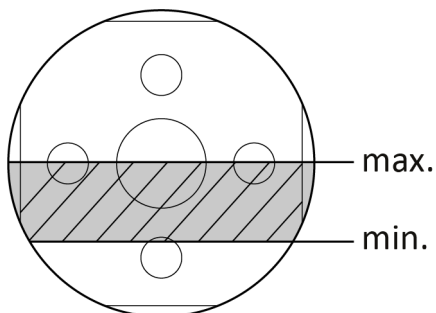
- | | |
|--|--|
| 1. Thermal snap switch (only for T3)
PT100 with head transmitter (only
for T4) | 2. Heat exchanger (only for indirectly
cooled version) |
| 3. Cooling-water IN | 4. Exhaust pressure transmitter port
(only for Cat 1 pump) |
| 5. Tube for TCV | 6. Gearbox oil level glass |
| 7. Exhaust | 8. Grounding connection M6 (also
refer to Grounding on page 67) |
| 9. Purge gas IN | 10. Gas panel |
| 11. Gas system pressure gauge | 12. HV end oil level glass |
| 13. Gas-ballast flowmeter with needle
valve | 14. Seal purge flowmeter |
| 15. Gas system pressure regulator | 16. Inlet |
| 17. Exhaust gas temperature
transmitter (only for T4) | |

Figure 11 Connections and controls, indirect cooled version with flame arrester (Category 1)



- | | |
|---|---|
| 1. Flame arresters | 2. PT100 with head transmitter |
| 3. Exhaust gas temperature transmitter | 4. Heat exchanger (only for indirectly cooled version) |
| 5. Cooling-water IN | 6. Exhaust pressure transmitter port |
| 7. Tube for TCV | 8. Gearbox oil level glass |
| 9. Exhaust | 10. Grounding connection M6 (also refer Grounding on page 67) |
| 11. Purge gas IN | 12. Gas panel |
| 13. Gas system pressure gauge | 14. HV end oil level glass |
| 15. Gas-ballast flowmeter with needle valve | 16. Seal purge flowmeter |
| 17. Gas system pressure regulator | 18. Inlet |

Figure 12 Oil level at pump standstill



CS/3095/C

7.1 Placement

Place the pump system on a flat and level surface.

The pump is designed for indoor operation. We recommend leaving the crane eyes screwed in.

Remove the covers and blank flanges on the pump just before fitting the pump so that the assembly work can be performed under the cleanest conditions.

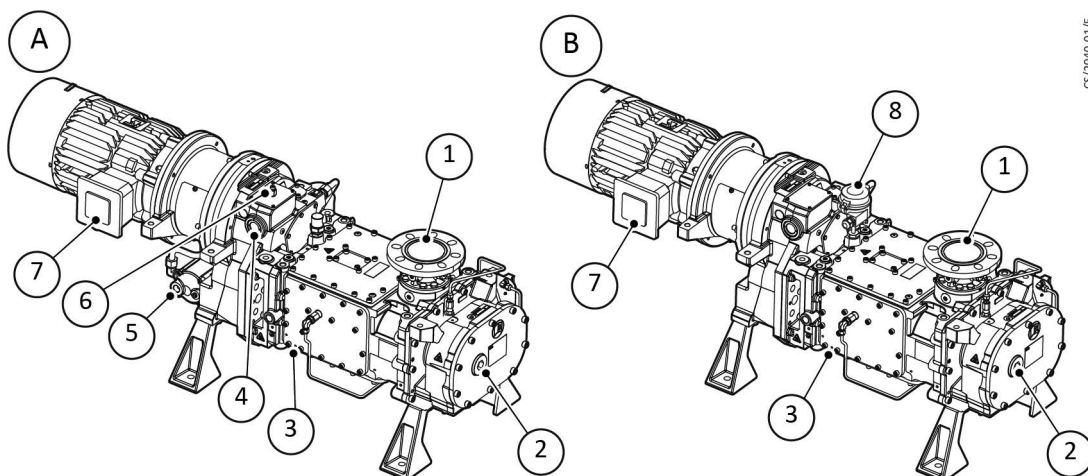
Check whether there is any desiccant present in the intake area and remove it.

The pumps are supplied filled with synthetic oil. Nothing will have to be refilled. Check the oil levels through both oil level glasses.

If one of the oil levels is found to be incorrect, please contact us.

Fit suitable bolts through the fixing holes in the mounting feet, to secure the pump in position.

Figure 13 Connections and controls for category 2/2 version

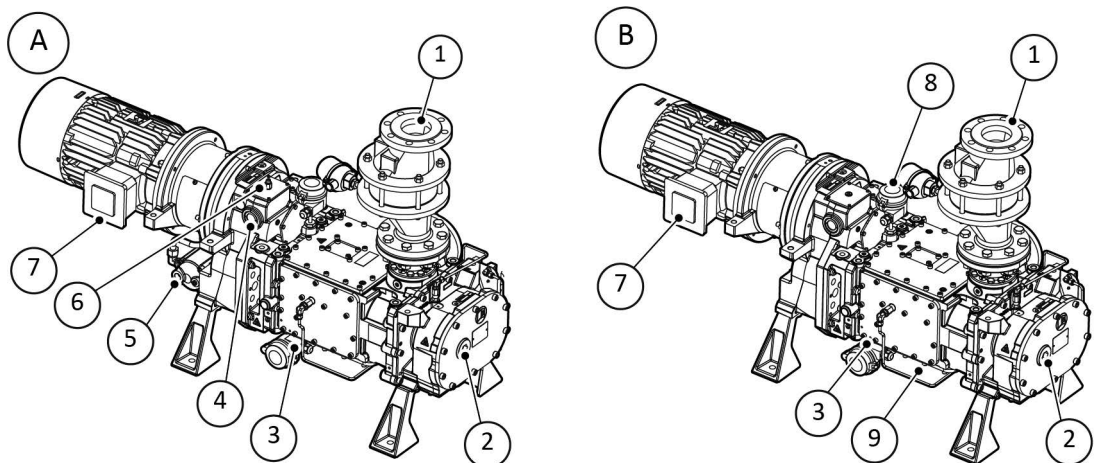


A. *Indirect cooled version*

B. *Direct cooled version*

- | | |
|---|--|
| 1. <i>Inlet</i> | 2. <i>Hand crank access plug</i> |
| 3. <i>Exhaust gas temperature transmitter (under the pump, optional for T3, mandatory for T4)</i> | 4. <i>Cooling-water level glass</i> |
| 5. <i>Cooling-water out</i> | 6. <i>Pressure relief valve</i> |
| 7. <i>Pump motor terminal box</i> | 8. <i>Pt 100 with head transmitter (optional for T3, mandatory for T4)</i> |

CS/2040-01/E

Figure 14 Connections and controls with flame arrester for category 1/2 version

A. *Indirect cooled version with flame arresters*

1. *Inlet*
3. *Exhaust gas temperature transmitter*
5. *Cooling-water out*
7. *Pump motor terminal box*
9. *Exhaust pressure transmitter (under the pump)*

B. *Direct cooled version with flame arresters*

2. *Hand crank access plug*
4. *Cooling-water level glass*
6. *Pressure relief valve*
8. *PT100 with head transmitter*

CS/2040-02/E

7.2 Normal operation

The EDS pumps are suitable for a wide range of industrial and chemical applications. We have a dedicated team of applications engineers who can help you determine the best EDS system for your application.

If you use the system on an application for which it is not suitable, you may invalidate your warranties. If in doubt, contact us.

7.3 Abnormal operation



WARNING: UNPREDICTABLE FAILURES

Use of equipment in abnormal operations can lead to failures that result in injury or death. Misuse of the pump as described below is strictly prohibited.

- Use of the pump as a positive displacement compressor
- Operation outside the limits of operation further defined in this manual
- Operation outside the limits of the ATEX marking
- Reverse rotation of the pump
- Pumping gases and vapours for which the materials (see [Technical data](#) on page 27) of the pump are not suitable
- Pumping of exothermic substances, pyrophoric, radioactive, oxidising gases or gas mixtures, as well as the pumping of oxygen of more than the atmospheric

concentration (21 Vol.-%) and explosive substances and mixtures (gases, liquids and solids)

- Pumping gases that tend to self-decompose, or that are chemically unstable
- Use of the pump with materials that have auto-ignition temperatures below the defined temperature rating
- Operation such that dust and process deposits can build up inside the pump mechanism, blow-off valve and exhaust. This could lead to a loss of constructional safety and an ignition hazard
- Operation such that the pump inlet temperature falls below the dew point of a 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 a system or flammable process that causes the ingress of metallic particles into the pump
- Pumping of liquids and solid particles
- Pumping pyrophoric gases
- Use with oxygen enriched atmospheres
- Operation with the insufficient attachment of the pump
- Conversion, manipulation, and maintenance by people not authorized by us
- Use of accessories that are not suitable for the internal or external ATEX rating, or which are not permitted or approved by us.

7.4 Connecting the inlet and exhaust lines

7.4.1 Inlet lines

When you connect the EDS pump to the process system:

1. Support process pipelines to stop the transmission of stress to pipeline joints.
2. Use a flexible connection in the pipeline from the process system to the pump to reduce vibration and stress in the system pipelines.
3. Ensure the loads on the pump-inlet flange do not exceed the limits specified in [Exhaust Lines](#) on page 42.
4. Consider to isolate the pump from the atmosphere and your process systems if you have pumped or produced dangerous chemicals.
5. On very dusty applications, incorporate an inlet filter in the inlet pipeline, to minimise the ingress of dust into the pump.
6. An inlet diffuser is supplied fitted in the process inlet of the EDS pump if no inlet flame arresters are fitted. This prevents debris or process particulate from entering the pump and ensures that any liquid slugs are broken up to a level which will not damage the pump mechanism. This should be left in place for the life of the pump.

Use four suitable bolts to connect the process system to the pump inlet flange or flame arrester as appropriate. Use a suitable PTFE gasket to seal the connection.

Figure 15 Inlet flange dimension without flame arresters (in mm)

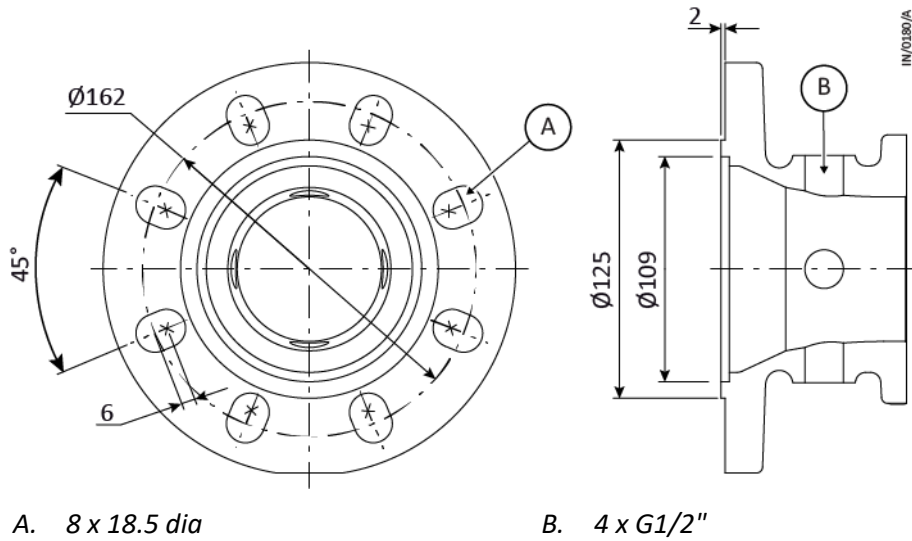
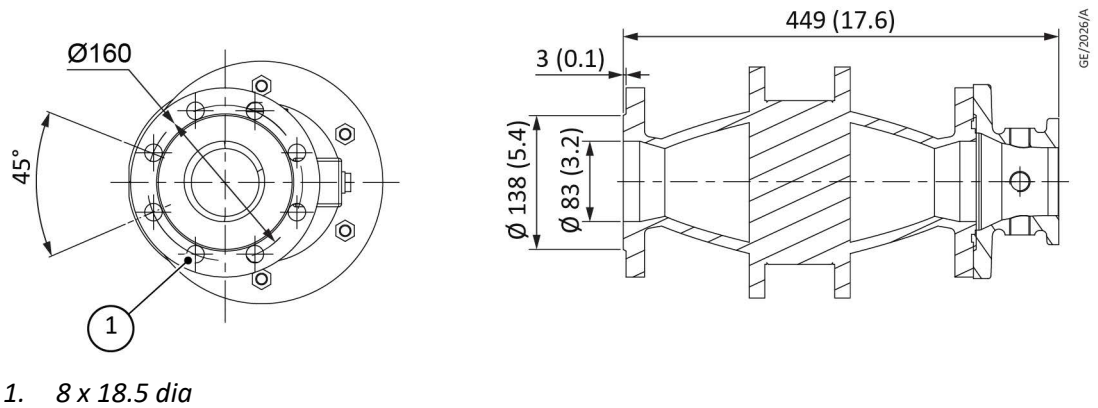


Figure 16 Inlet flange dimension with flame arresters (in mm)



7.4.2 Exhaust lines

Your exhaust pipeline system must be designed so that the pressure in the pipeline during operation is less than 1.2 bar absolute for T3 and 1.1 bar absolute for T4.

Incorporate flexible bellows in the exhaust pipeline to reduce the transmission of vibration and to prevent the loading of coupling joints, which can withstand pressure and at least 200 °C temperature.

Use four suitable bolts to connect the EDS dry pump outlet to the exhaust system. Use a suitable PTFE gasket to seal the connection.

Figure 17 Maximum permissible flange loads

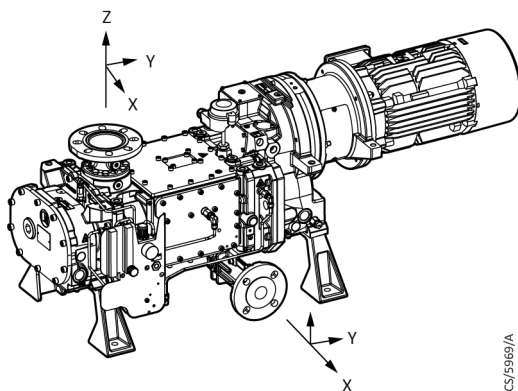


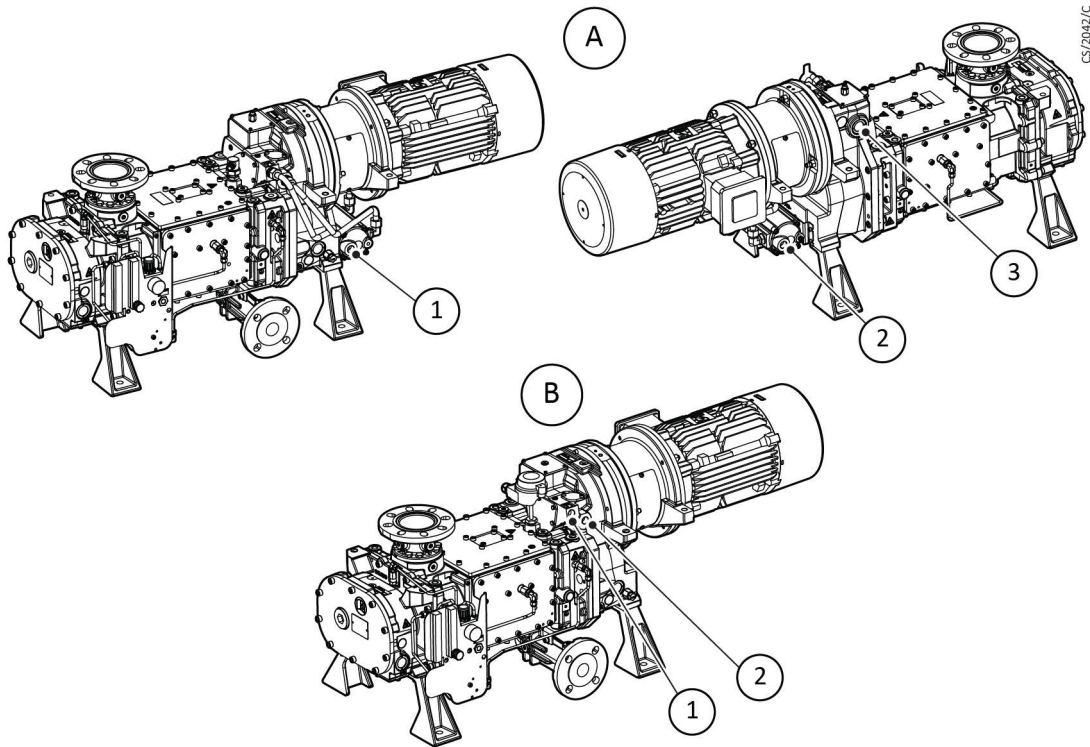
Table 8 Maximum permissible flange load (with/without flame arresters)

Maximum force	Pump inlet	Pump outlet
F_X	$\pm 892 \text{ N}$	$\pm 200 \text{ N}$
F_Y	$\pm 1070 \text{ N}$	$\pm 150 \text{ N}$
F_Z	$\pm 1338 \text{ N}$	$\pm 150 \text{ N}$
F_R	$\pm 1931 \text{ N}$	$\pm 290 \text{ N}$
Maximum moment	Pump inlet	Pump outlet
M_X	$\pm 260 \text{ Nm}$	0 Nm
M_Y	$\pm 520 \text{ Nm}$	$\pm 31 \text{ Nm}$
M_Z	$\pm 390 \text{ Nm}$	0 Nm
M_R	$\pm 700 \text{ Nm}$	$\pm 31 \text{ Nm}$

No additional load is permitted for the outlet flange with flame arrester.

7.5 Connecting cooling-water

Figure 18 Cooling-water connections for direct and indirect cooled versions



A. *Indirect cooled version*

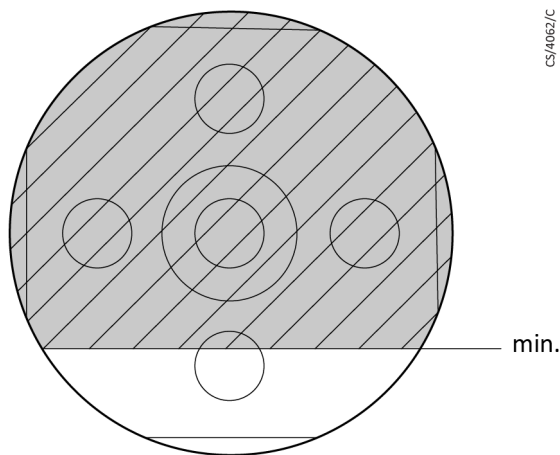
B. *Direct cooled version*

1. *Cooling-water inlet*

2. *Cooling-water outlet*

3. *Cooling-water level glass*

Refer to [Technical data](#) on page 27 for the cooling water temperature and flow rate. Depending on your application and use of thermostatic valve temperatures and flows may differ.

Figure 19 Cooling water level

Make sure that the coolant level does not fall below the minimum indicated on the label. This may cause the internal cooling circuit to be inefficient or even to stop.

It is also possible that the coolant level in the expansion tank is above the sight glass due to temperature fluctuations. This may affect the reading of the correct level. In the indirectly cooled variants, this is easily recognisable by the colour of the glycol mixture (for example, red or green).

7.5.1 Water quality

To make sure long trouble-free operation, the cooling water must not contain any oils, greases and suspended solids. Moreover, we recommend compliance with the following limit values:

Appearance	Clear, free of oils and greases
Suspended matter	< 250 mg/l
Particle size	< 150 µm
Electrical conductivity	< 700 µS/cm
pH value	7.0 to 9.0
Total hardness (total alkaline earths)	< 8 °dH
Aggressive carbon dioxide	None, not detectable
Chloride	< 100 mg/l
Sulphate	< 150 mg/l
Nitrate	≤ 50 mg/l
Iron	< 0.2 mg/l
Manganese	< 0.1 mg/l
Ammonium	< 1.0 mg/l
Free chlorine	< 0.2 mg/l
8 °dH (degrees German hardness) = 1.4mmol/l= 10 °e (degrees English hardness)= 14 °f (degrees French hardness)	

If there is the danger of frost, you may use a water Drystar mixture of up to 50 %.

DS water can be used for cooling the pump if the pH value corresponds to the range indicated above.

7.6 Connecting purge gas



WARNING: LEAKAGE OF GAS

The atmospheric shaft-seal between the gearbox and atmosphere is a PTFE dynamic seal, which may, under wear-out conditions, lead to small leakage of gearbox gas. Ensure that purge gas is supplied continuously to the main pump shaft-seals to prevent process gas entering the gearbox which could otherwise leak from the atmospheric shaft-seal. Leakage of purge gas to atmosphere should also be considered; ensure the pump is in a well ventilated area.

The pump must be operated with inert purge gas. The purge gas is distributed in the pump via flow restrictors as follows:

- to the shaft-seal on the low vacuum side
- into the pumping chamber (balance line)
- to the shaft-seal on the high vacuum side.

The flow restrictors ensure that the gas flow to the shaft-seal on the high vacuum side becomes very low at ultimate pressure.

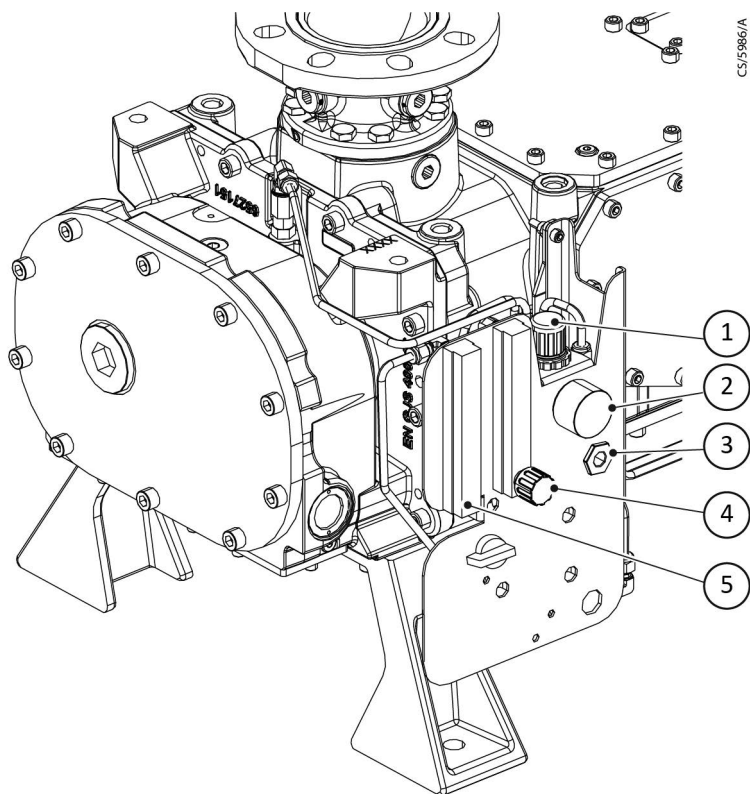
The purge gas on the shaft-seals provides an air cushion under the shaft-seals and thus prevents premature wear.

Gas-ballast requirements depend on your application. If in doubt about your application setting, contact us.

- Connect an inert gas supply to the gas system. An upstream supply pressure of 4 to 10 bar(g) is required. Ensure that your gas system can maintain pressure while flowing up to 62 slm of purge gas. Refer to [Figure: Ports and regulators](#).
- Adjust the regulator on the gas panel to 2.2 bar(g). Refer to [Figure: Ports and regulators](#).
- The purge supply should be maintained whenever the pump is operational, to ensure the process seals operate correctly and that the oil boxes are adequately protected from process media.
- Be aware that the purge supplies are not automatically controlled, therefore it could be possible to pressurise the pump or system if the purge is left on with a closed system.
- Gas-ballast can be adjusted or shut off completely, depending on your application, using the manual needle valve. Refer to [Figure: Ports and regulators](#).

[Table: Actual purge flow](#) shows the conversion of the displayed flow indicator (shows slm) which is part of the mounted gas panel and the real flow (l/min) into the purge connectors.

Figure 20 Ports and regulators



- | | |
|----------------------------------|--|
| 1. Gas system pressure regulator | 2. Gas system pressure gauge |
| 3. Purge gas IN | 4. Gas-ballast flowmeter with needle valve |
| 5. Seal purge flowmeter | |

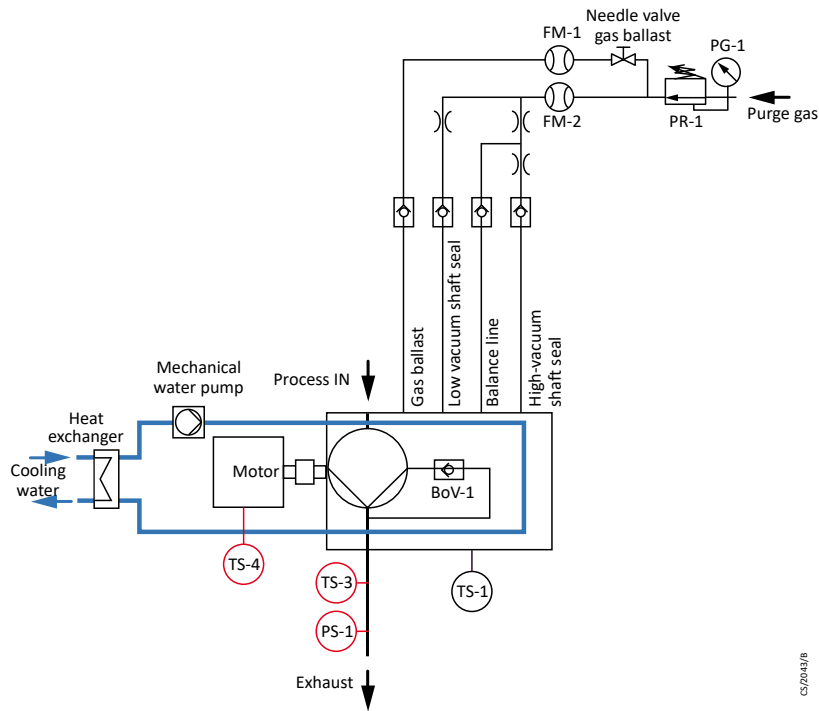
Table 9 Actual purge flow




Actual purge flow (l/min) in dependency of displayed value and supply pressure purge					
Displayed value (l/min)	Supply pressure purge (bar) vs actual flow in l/min regulator indicator @ 20 °C				
	2.2	2.4	2.6	2.8	3.0
1	1.7	1.8	1.8	1.9	1.9
2	3.5	3.6	3.7	3.8	3.9
3	5.2	5.4	5.5	5.7	5.8
4	7.0	7.2	7.4	7.6	7.8
5	8.7	9.0	9.2	9.5	9.7
6	10.5	10.8	11.1	11.4	11.7
7	12.2	12.6	12.9	13.3	13.6
8	13.9	14.4	14.8	15.2	15.6
9	15.7	16.2	16.6	17.1	17.5
10	17.4	18.0	18.5	19.0	19.5
11	19.2	19.7	20.3	20.9	21.4
12	20.9	21.5	22.2	22.8	23.4

Note:

The displayed value 7 l/min is the standard adjustment value.

Figure 21 Schematic for purge gas and switches - indirect cooling

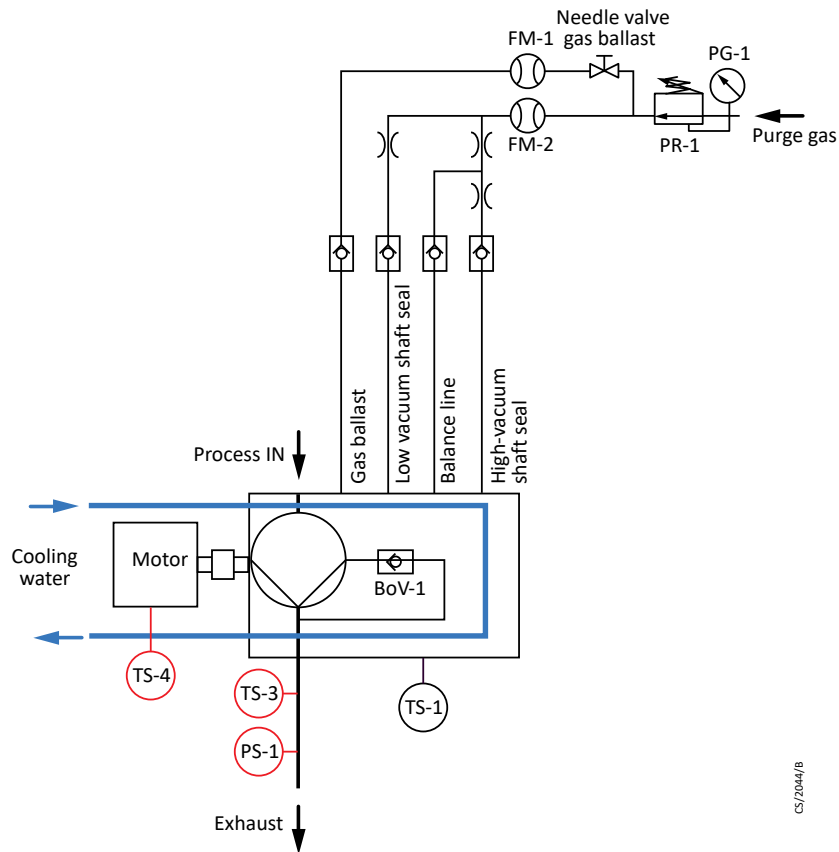


PG-1	Pressure gauge purge gas
PR-1	Pressure regulator purge gas
BoV-1	Blow off valve
TS-1	Pump body thermal snap switch or Pt100 with head transmitter
TS-3	Exhaust gas temperature transmitter
TS-4	Motor thermistor
PS-1	Exhaust pressure transmitter
	Flowmeter
	Flow restrictor
	Non-return valve




Note:

Transmitters are installed depending on the ATEX rating of the pump.

Figure 22 Schematic for purge gas and switches - direct cooling



CS/204/8

PG-1	Pressure gauge purge gas
PR-1	Pressure regulator purge gas
BoV-1	Blow off valve
TS-1	Pump body thermal snap switch (trip) or Pt100 with head transmitter
TS-3	Exhaust gas temperature transmitter
TS-4	Motor thermistor
PS-1	Exhaust pressure transmitter
	Flowmeter
	Flow restrictor
	Non-return valve

Note:

Transmitters are installed depending on the ATEX rating of the pump.

7.7 Connecting the motor

On request, the EDS pump can also be ordered without a connected motor.

NOTICE: NON-CONFORMANCE and VOID WARRANTY



If you select and fit the motor yourself then you are responsible for the operation of the pump. You can void the CE mark, the ATEX conformity and we might also reject warranty claims. How you mount the motor affects the operation and reliability of the pump and its components; coupling and bearings in particular. Comply with all the technical data and install information in this section to maintain compliance and warranty.

The ATEX category for the outside area can change depending on the type of motor. Use only such motors which are approved for the respective category. If you have a bareshaft pump with only Category 2 inside and you want to achieve Category 2 inside and 2 outside, make sure that you mount a suitable Category 2 motor that complies with the ATEX directive.

Specific motor data

Feasible for adoption in ATEX approved pumps according to EN 60079-0 (Explosive atmospheres - Equipment - General requirements)

Ex II 2G Ex db IIC T3 Gb, Ex II 2G Ex db IIC T4 Gb

Ex II 2G Ex eb IIC T3 Gb, Ex II 2G Ex eb IIC T4 Gb

Ex II 2G Ex db eb IIC T3 Gb, Ex II 2G Ex db eb IIC T4 Gb

5.5 kW for EDS 200 T3 (7.5 kW for T4) / 7.5 kW for EDS 300

380 - 415 V, 50 Hz, 3000 min⁻¹

Rotating direction: counter clockwise (view from flange/drive end side)

Figure 23 Flange dimensions for EDS pump (flange size 132 according to IEC standard)

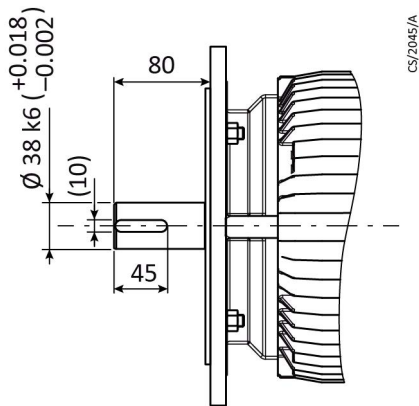


Table 10 Flange comparison (dimensions in mm)

Standard	IEC	NEMA
Frame	132 S/M/L	215T
Power	7.5 kW	10 HP
Shaft diameter	38.6	34.9
Shaft length	80	85.7
Flange type	B5 (FF)	D
Flange diameter	300	279.4

Standard	IEC	NEMA
Centering diameter	230	228.6
Flange bore diameter	265	254
Bore diameter	14.5	14.2

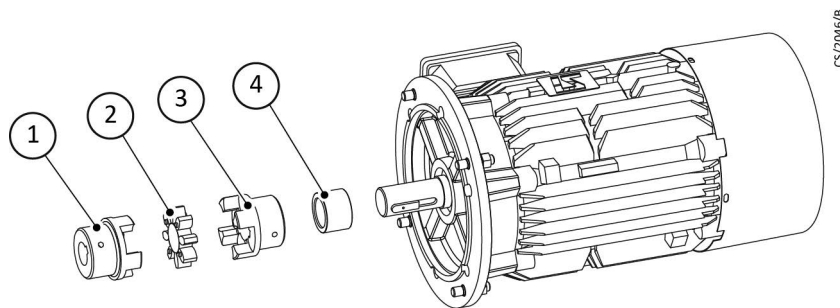
Note:

If you want to use NEMA motors for a non-motorised pump, please note that there are special catalogue number which includes NEMA coupling and coupling cover to connect the NEMA standard motor.

For further information regarding requirements for IE3 motors, we can supply detailed manual on request.

General installation information

Figure 24 Mounting the motor to the pump



1. Layshaft coupling half (pre-assembled on the pump)
2. Spider
3. Motor coupling half
4. Spacer

For mounting the motors use only the original parts supplied by us.

- Motor coupling half
- Coupling spider
- Nuts and washers

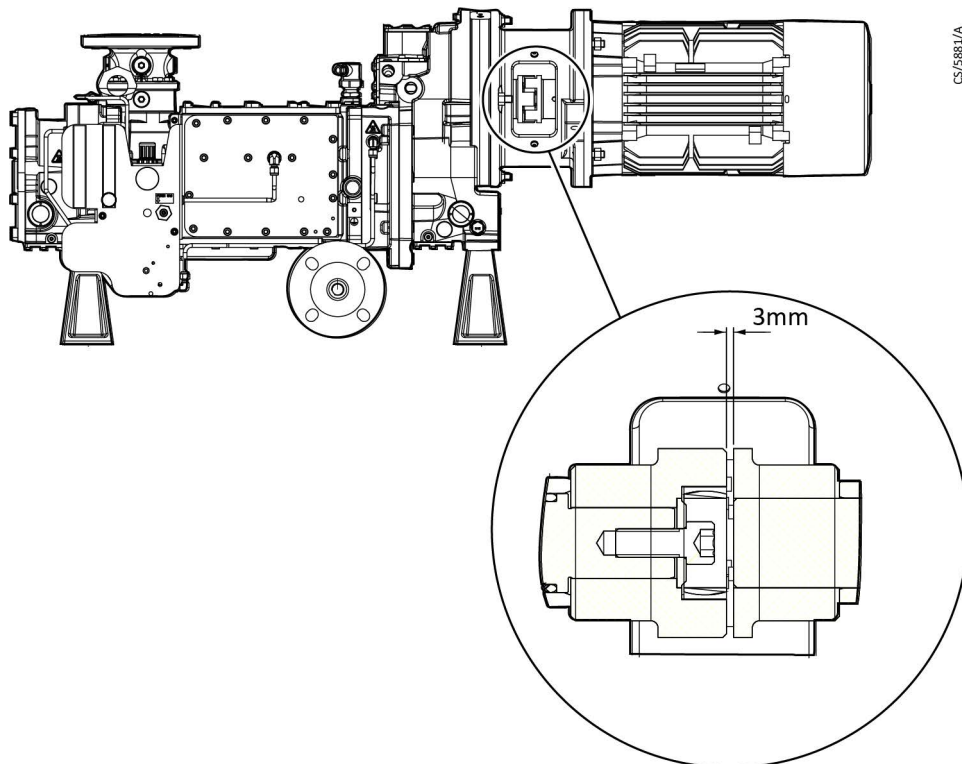
The motor must be fitted with the pump aligned horizontally. Tilting the pump by over 5° can cause the oil to flow from the gear chambers into the pump chamber.

All mating surfaces and centering surfaces must be clean, undamaged and free of any paint residues.

Only air cooled motors must be used. The fan on the side of the motor is also required to cool the pump housing. If this air cooling arrangement is not present, then the surface temperatures may under certain circumstances exceed the permissible temperature range for the pump.

Fitting the coupling

The pump half of the coupling is supplied pre-fitted onto the pump layshaft. The motor coupling half is supplied for assembly onto the motor. To assemble, first lightly grease the bore of the coupling and fully engage it onto the motor shaft. Secure the coupling onto the motor shaft with the supplied M8 screw and tighten it to 10 Nm.

Figure 25 Fitting the coupling

When you fit the coupling, make sure that there is a distance of 3 mm (+0.9/-0.35) between the coupling halves.

Fitting the motor

Fit the coupling spider into the pump half of the coupling. Lift the motor using a crane or hoist and bring the motor towards the coupling cover, ensuring that both coupling halves are aligned. Engage the coupling halves and push the motor fully so that the flange face is against the coupling cover. Tighten the 4 nuts to 80 Nm.

Electrical connection

The electrical connections for the motor are provided according to the information given in [Electrical connections](#) on page 53, respectively according to the information of the manufacturer of the motor.

7.8 Electrical connections

DANGER: ELECTRIC SHOCK



Electrical shock caused by direct or indirect contact with live parts. Electrical shock due to faulty electrical connection and possible residual voltage up to 5 minutes after disconnection from the mains. The electrical connection may only be carried out by a trained person. Observe the national regulations in the user country, e.g. for Europe EN 50110 - 1. Prior to servicing, disconnect the vacuum pump from the power supply.

Electrical shock due to interruption of the protective conductor system. In the event of a fault, life-threatening voltages may be present on electrically conductive components. Before commissioning, check the resistance of the earthing cable and the suitability of the assigned overcurrent protection device.

WARNING: LIGHTNING STRIKE



Risk of fire and injury from lightning strike. The operator is responsible for assessing the hazard potential when used outside of buildings.

7.8.1 Wiring the motor

ATEX variants of EDS pump are supplied with a three-phase 5.5 or 7.5 kW pump motor.

Wire the motor in accordance with the instructions supplied with the motors.

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

Provide suitable strain relief on the electrical supply cables. If you do not, the cables (or wires in the cables) may become disconnected and there may be a risk of injury or death by electric shock.

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.

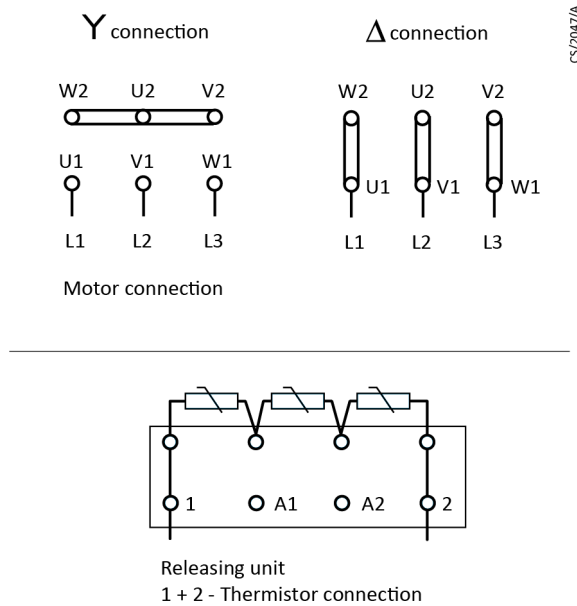
Connect the electrical supply to the pump motor through a contactor that has a manual reset control. The contactor must be installed such that a manual reset is required after a power failure. The contactor must incorporate a motor circuit-breaker which meets the full load current ratings of the pump motor.

You must be able to isolate and lock out the electrical supply to the EDS pump motor.

The EDS pump can be operated direct-on-line or via a frequency converter. The selection and installation of a frequency inverter is the responsibility of the user. Ensure that the motor operation and certification are not adversely affected by the use of a frequency converter. The minimum and maximum motor speeds given in the [Technical data](#) on page 27 must be followed.

Motors of increased protection safety, type "e" or "eb", may only be operated as direct online (DOL). To operate in combination with a frequency inverter, a common type test certificate (motor-frequency motor with proposed frequency converter) is needed.

Figure 26 Wiring schematic-1



Motor thermistors (check motor name plate)

Connect the motor thermistors to your pump-motor control circuit. These must be configured so that manual reset is required, otherwise, the pump may restart automatically once it has cooled down.

The temperature sensor only has basic insulation to the motor winding. You must provide appropriate measures against indirect electrical effects. For example, a monitoring body with galvanic isolation between the temperature sensor and the pump control can provide this.

In addition to the type of protection specified for motors in potentially explosive atmospheres and areas as specified in the EN 60079-14 standards, further provisions also apply for the respective types of protection. EN 60079-7 demands additional measures for operating motors with “increased safety” type of protection “e”. These measures provide an enhanced degree of safety for protection against impermissible high temperatures and against the development of sparking and arcing on the motors, which does not usually occur under normal operating conditions. The motor-protective devices for this, that are themselves not located in the Ex-e area must be certified by a notified body.

To protect the machinery from overload, direct temperature monitoring systems can be used in addition to current dependent protective devices. The overload relays (for example EMT6 from EATON) monitor the thermistor sensors used for monitoring temperature and switch off the power relay in the event of overheat in the machinery.

7.8.2 Pump safety instruments

Safety instruments are used to control the following parameters. Control of mandatory parameters is a requirement for ATEX compliance and safe operation.

Category 2

For the ATEX Cat 2 T3 pumps, you must control:

- the pump body temperature (either by supplied thermal snap switch or optional Pt100)
- the exhaust gas pressure (this can be achieved either by using a pressure transmitter or by the design of the exhaust pipework)

For the ATEX Cat 2 T4 pumps, you must control:

- the pump body temperature
- the exhaust gas temperature and
- the exhaust gas pressure

Table 11 Sensors for category 2 inside/outside pump temperature class T3

Vacuum pump type	EDS 200	EDS 300
TS-1a Pump case temperature (°C)	Switch supplied and fitted control mandatory ⁽¹⁾	
Limit	90 °C ± 5 K	
Connection	Refer Figure: Pump body thermal snap switch connection and Figure: Endress and Hauser transmitter connection	
TS-1b Sensor type TR10 (optional for TS-1a)	E+H Pt100 with 4-20 mA (measure range 0 - 200 °C) head transmitter, GBA8CASXH200K part number A41895000 ⁽²⁾	
Connection	Refer Figure: Endress and Hauser transmitter connection	
TS-3 Pump exhaust temperature (°C)	Transmitter and control optional	
Limit	165 °C	
Sensor type TR10	E+H Pt100 4 - 20 mA (measure range 0 - 250 °C) head transmitter, Type GBA8CAR2H200K part number A41895001 ⁽³⁾	
Connection	Refer Figure: Endress and Hauser transmitter connection	
PS-1 Exhaust gas pressure (mbar)	Transmitter not supplied and fitted, control mandatory	
Limit	1190 mbar(a)	
Sensor type IS-3	WIKA Exhaust pressure transmitter 4 - 20 mA (measure range 0 - 2.5 bar(g)) Exhaust pressure transmitter, Type IS-3-0-2111-1SZ-SBFHSZZGTA3ZZZ-8AZZ part number A41894000 ⁽⁴⁾	
Connection	Refer Table: Specification of the electrical connections	

Table 12 Sensors for category 2 inside/outside pump temperature class T4

Vacuum pump type	EDS 200	EDS 300
TS-1b Pump case temperature (°C)	Transmitter supplied and fitted control mandatory	
Limit	65 °C	
Sensor type TR10	E+H Pt100 with 4 - 20 mA (measure range 0 - 200 °C) head transmitter, GBA8CASXH200K part number A41895000 ⁽²⁾	
Connection	Refer Figure: Pump body thermal snap switch connection and Figure: Endress and Hauser transmitter connection	
TS-3 Pump exhaust temperature (°C)	Transmitter supplied and fitted control mandatory	
Limit	135 °C	145 °C
Sensor type TR10	E+H Pt100 4 - 20 mA (measure range 0 - 250 °C) head transmitter, Type GBA8CAR2H200K part number A41895001 ⁽³⁾	
Connection	Refer Figure: Endress and Hauser transmitter connection	
PS-1 Exhaust gas pressure (mbar)	Transmitter not supplied and fitted control mandatory	
Limit	1090 mbar(a)	
Sensor type IS-3	WIKA Exhaust pressure transmitter 4 - 20 mA (measure range 0 - 2.5 bar(g)) Exhaust pressure transmitter, Type IS-3-0-2111-1SZ-SBFHSZZGTA3ZZZ-8AZZ part number A41894000 ⁽⁴⁾	
Connection	Refer Table: Specification of the electrical connections	

1	<p>The bimetallic thermal snap switch falls within the category “simple apparatus” (EN 60079-11:2012 clause 5.7 a), passive components). A barrier system must be used, with values suitable for the hazardous area (Figure: Pump body thermal snap switch connection). It must be connected to a control system in a way that the instrument and control system together fulfil the requirements of an ignition protection system type b1 under EN 80079-37, protection concept ‘b’. The thermal snap switch has an MTBF of 225 a.</p> <p>The thermal snap switch has to be connected to the control system so that it switches the EDS motor off when the switch trips. This must be configured so that manual reset is required.</p>
2	<p>The case and inlet temperature transmitter must be connected to a suitable control system in a way that the instrument and control system together fulfil the requirements of an ignition protection system type b1 under EN 80079-37, protection concept ‘b’. A suitable barrier system must also be used, rated for the temperature transmitter and hazardous area.</p> <p>The trip must be configured so that the manual reset is required.</p>

3	The exhaust temperature transmitter must be connected to a suitable control system in a way that the instrument and control system together fulfil the requirements of an ignition protection system type b1 under ISO 80079-37, protection concept 'b'. A suitable barrier system must also be used, rated for the temperature transmitter and hazardous area. The trip must be configured so that the manual reset is required.
4	The exhaust system and process must either be controlled such that the pressure rise (above 1100 mbar(a) for T4 and 1200 mbar(a) for T3) cannot occur in normal or expected fault conditions or the exhaust pressure transmitter must be used. The exhaust pressure transmitter must be connected to a suitable control system in a way that the instrument and control system together fulfil the requirements of an ignition protection system type b1 under EN 80079-37, protection concept 'b'. A suitable barrier system must be used, correctly rated for the pressure transmitter and hazardous area. The trip must be configured so that the manual reset is required.

Category 1

For the ATEX Cat 1 T3/T4 pumps, in addition to the requirements for Category 2 T4, you must control the pump inlet temperature on the pump facing side of the inlet flame arrester.

The protection intrinsic safety Ex ia IIC for connection sensor needs to a certified intrinsically safe circuit.

The integrity of an intrinsically safe circuit must be protected from the intrusion of energy from other electrical sources so that the safe energy limitation in the circuit is not exceeded, even when breaking, shorting or earthing of the circuit occurs.

Do not exceed the maximum permissible capacitance, inductance or L/R ratio and surface temperature when you install intrinsically safe circuits, including cables. The permissible values must be taken from the associated apparatus documentation or the marking plate.

A descriptive system document must be prepared by the system designer in which the items of electrical equipment and the electrical parameters of the system, including those of interconnecting wiring are specified according to EN60079-14 and EN60079-25.

The operator must do the verification of the intrinsic safety after installing and before commissioning.

Table 13 Sensors for category 1 inside 2 outside pump temperature class T3

Vacuum pump type	EDS 200	EDS 300
TS-1b Pump case temperature (°C)	Transmitter supplied and fitted control mandatory	
Limit	90 °C	
Sensor type TR10	E+H Pt100 with 4 - 20 mA (measure range 0 - 200 °C) head transmitter, GBA8CASXH200K part number A41895000 ⁽²⁾	
Connection	Refer Figure: Pump body thermal snap switch connection and Figure: Endress and Hauser transmitter connection	

Vacuum pump type	EDS 200	EDS 300
TS-3 Pump exhaust temperature (°C)	Transmitter supplied and fitted control mandatory	
Limit	164 °C	175 °C
Sensor type TR10	E+H Pt100 4 - 20 mA (measure range 0 - 250 °C) head transmitter, Type GBA8CAR2H200K part number A41895001 ⁽³⁾	
Connection	Refer Figure: Endress and Hauser transmitter connection	
PS-1 Exhaust gas pressure (mbar)	Transmitter supplied and fitted control mandatory	
Limit	1190 mbar(a)	
Sensor type IS-3	WIKA Exhaust pressure transmitter 4 - 20 mA (measure range 0 - 2.5 bar(g)) Exhaust pressure transmitter, Type IS-3-0-2111-1SZ-SBFHSZZGTA3ZZZ-8AZZ part number A41894000 ⁽⁴⁾	
Connection	Refer Table: Specification of the electrical connections	

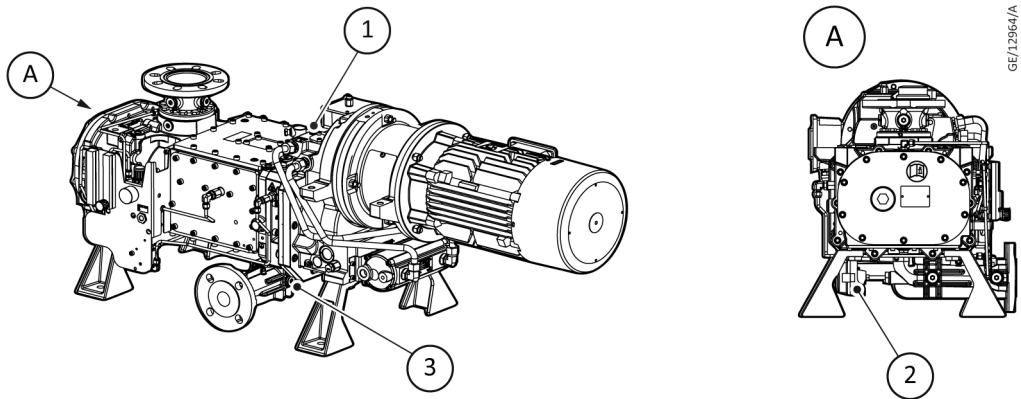
Table 14 Sensors for category 1 inside 2 outside pump temperature class T4

Vacuum pump type	EDS 200	EDS 300
TS-1b Pump case temperature (°C)	Transmitter supplied and fitted control mandatory	
Limit	69 °C	
Sensor type TR10	E+H Pt100 with 4 - 20 mA (measure range 0 - 200 °C) head transmitter, GBA8CASXH200K part number A41895000 ⁽²⁾	
Connection	Refer Figure: Pump body thermal snap switch connection and Figure: Endress and Hauser transmitter connection	
TS-3 Pump exhaust temperature (°C)	Transmitter supplied and fitted control mandatory	
Limit	135 °C	145 °C
Sensor type TR10	E+H Pt100 4 - 20 mA (measure range 0 - 250 °C) head transmitter, Type GBA8CAR2H200K part number A41895001 ⁽³⁾	
Connection	Refer Figure: Endress and Hauser transmitter connection	
PS-1 Exhaust gas pressure (mbar)	Transmitter supplied and fitted control mandatory	

Vacuum pump type	EDS 200	EDS 300
Limit	1090 mbar(a)	
Sensor type IS-3	WIKA Exhaust pressure transmitter 4 - 20 mA (measure range 0 - 2.5 bar(g)) Exhaust pressure transmitter, Type IS-3-0-2111-1SZ-SBFHSZZGTA3ZZZ-8AZZ part number A41894000 ⁽⁴⁾	
Connection	Refer Table: Specification of the electrical connections	

1	<p>The bimetallic thermal snap switch falls within the category “simple apparatus” (EN 60079-11:2012 clause 5.7 a), passive components). A barrier system must be used, with values suitable for the hazardous area (Figure: Pump body thermal snap switch connection). It must be connected to a control system in a way that the instrument and control system together fulfil the requirements of an ignition protection system type b1 under EN 80079-37, protection concept ‘b’. Static charging must be avoided. The thermal snap switch has an MTBF of 225 a.</p> <p>The thermal snap switch has to be connected to the control system so that it switches the EDS motor off when the switch trips. This must be configured so that the manual reset is required.</p>
2	<p>The case and inlet (only Cat1) temperature transmitter must be connected to a suitable control system in a way that the instrument and control system together fulfil the requirements of an ignition protection system type b1 under EN 80079-37, protection concept ‘b’. A suitable barrier system must also be used, rated for the temperature transmitter and hazardous area.</p> <p>The trip must be configured so that the manual reset is required.</p>
3	<p>The exhaust temperature transmitter must be connected to a suitable control system in a way that the instrument and control system together fulfil the requirements of an ignition protection system type b1 under ISO 80079-37, protection concept ‘b’. A suitable barrier system must also be used, rated for the temperature transmitter and hazardous area.</p> <p>The trip must be configured so that the manual reset is required.</p>
4	<p>The exhaust system and process must either be controlled such that the pressure rise (above 1100 mbar(a) for T4 and 1200 mbar(a) for T3) cannot occur in normal or expected fault conditions or the exhaust pressure transmitter must be used.</p> <p>The exhaust pressure transmitter must be connected to a suitable control system in a way that the instrument and control system together fulfil the requirements of an ignition protection system type b1 under EN 80079-37, protection concept ‘b’. A suitable barrier system must be used, correctly rated for the pressure transmitter and hazardous area.</p> <p>The trip must be configured so that the manual reset is required.</p>

Figure 27 Pump safety devices (Category 2)

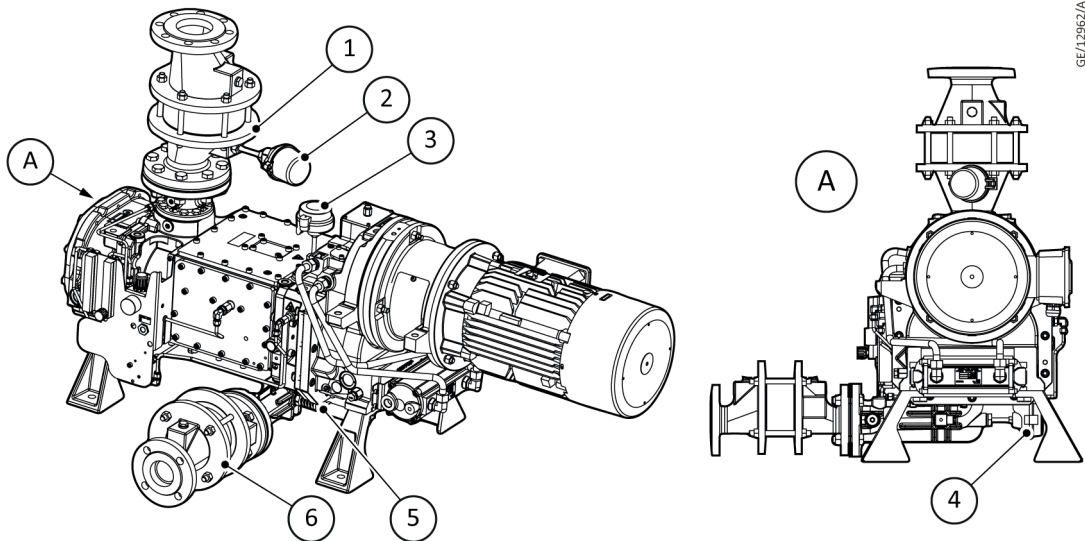


Pumps with direct cooling are similar.

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Pump body thermal snap switch (Pt100 with head transmitter (only for T4)) 3. Exhaust pressure transmitter port | <ol style="list-style-type: none"> 2. Exhaust gas temperature transmitter optional for T3, mandatory for T4 for Category 2, mandatory for Category 1 |
|--|---|

Also refer to [Figure: Connections and controls, indirect cooled version](#).

Figure 28 Pump safety devices with flame arrester (Category 1)



- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Inlet flame arrester 3. PT100 with head transmitter 5. Exhaust pressure transmitter | <ol style="list-style-type: none"> 2. PT100 Inlet temperature transmitter 4. Exhaust gas temperature transmitter 6. Exhaust flame arrester |
|--|---|

Additional equipment for the [Figure: Pump safety devices \(Category 2\)](#) is shown. Pump with direct cooling is similar.

Figure 29 Pump body temperature transmitter

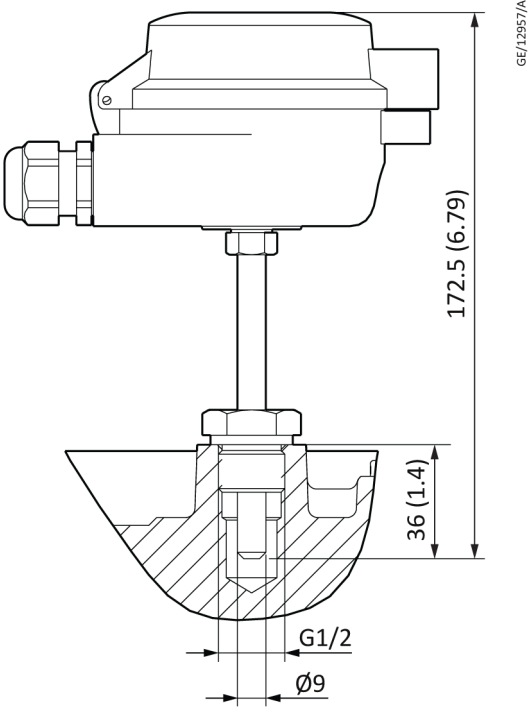
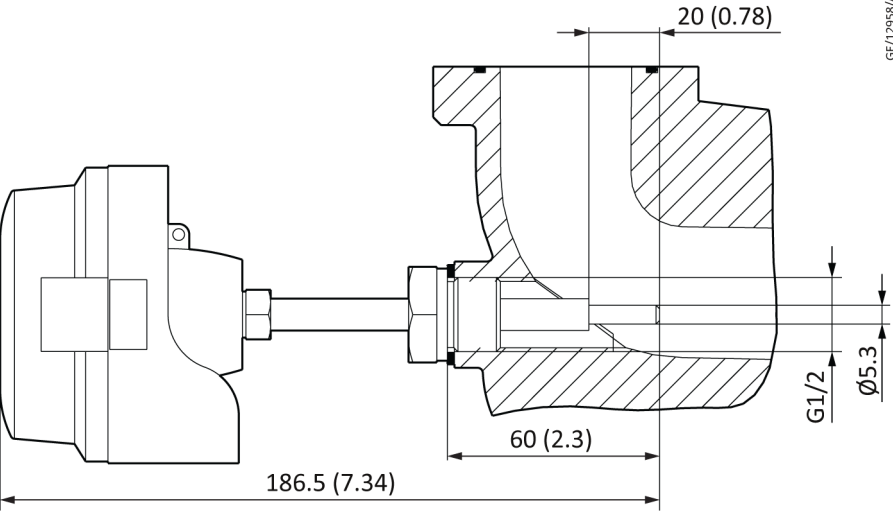


Figure 30 Exhaust gas temperature transmitter



All dimensions given are in mm (inch).

Figure 31 Exhaust pressure transmitter

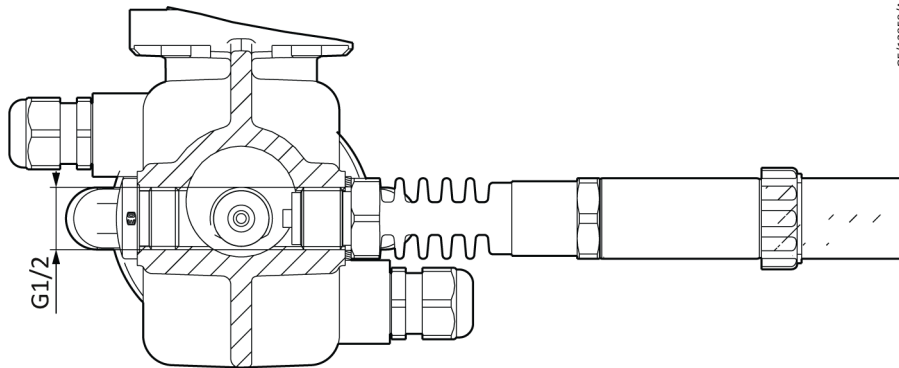
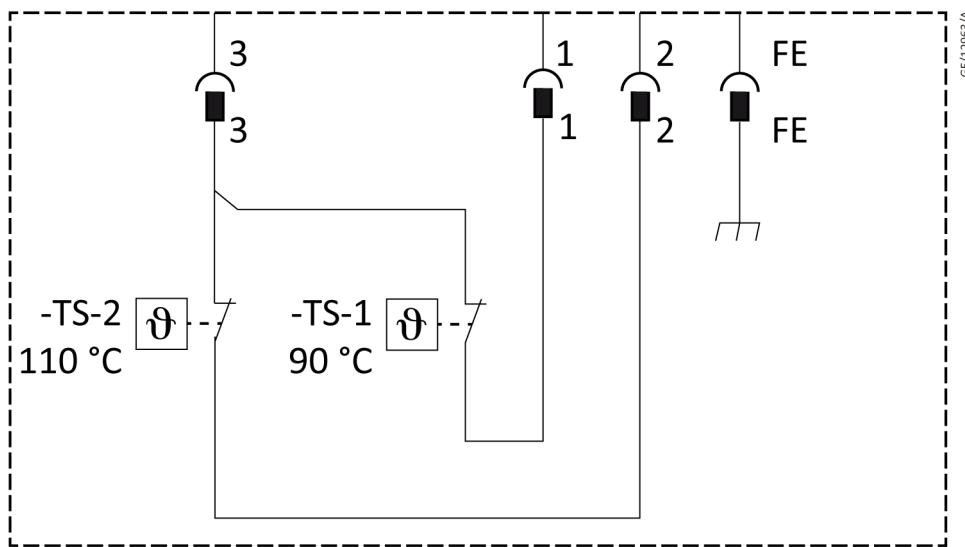


Figure 32 Pump body thermal snap switch connection (Cat2 T3)



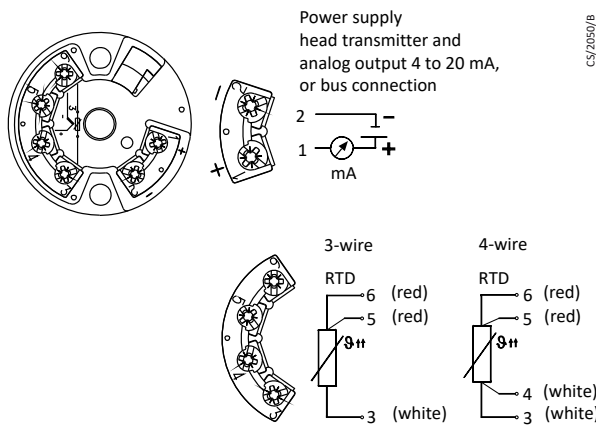
**Included female plug for customer application (crew side)*

Wire the snap switch into the pump-motor control circuit so that it stops the pump motor. This must be configured so that a manual reset is required.

Switching point(s)	Connection
M12 5 pole (part of delivery)	Plug: GSP3-U1
90 °C ± 5 K trip	90 °C: terminal 1 and 3
Maximum 48 V d.c/a.c, 1.0 A	see Figure: Wiring schematic-1

The output of the thermal snap-switch has two connections: one will open the circuit when the temperature of pump body is higher than 90°C. Use this output to shut-down the pump when it is too hot. The switch is designed to close normally.

Figure 33 Endress and Hauser transmitter connection



Transmitters in type of protection Ex ia IIC (TMT82)

- Supply and output circuit: in type of protection intrinsic safety Ex ia IIC, only for connection to a certified intrinsically safe circuit, with the following maximum values:
 $U_1 = 30 \text{ V}$, $I_1 = 130 \text{ mA}$, $P_1 = 800 \text{ mW}$, $C_1 = 0 \text{ nF}$, $L_1 = 0 \text{ }\mu\text{H}$
- sensor circuit: in type of protection intrinsic safety Ex ia IIC, with the following maximum values:
 $U_0 = 7.6 \text{ V}$, $I_0 = 13 \text{ mA}$, $P_0 = 24.7 \text{ mW}$, $C_1 = 0 \text{ nF}$, $L_1 = 0 \text{ }\mu\text{H}$

	Ex ia IIC	Ex ia IIB	Ex ia IIA
C0	1 μF	4.5 μF	6.7 μF
L0	10 mH	50 mH	50 mH

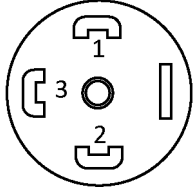
The sensor circuit is galvanically isolated from the supply and output circuit up to a peak voltage of 30 V. Refer to manufacturer's instruction.

Connect the pressure sensor

For electrical mounting of the field case and the angle connector do the steps that follow:

- Ground the cable shield at one end, preferably in the non EX area (EN 60079-14).
- For pressure transmitters with cable outlet, the shield is normally connected to the case. The simultaneous connection of the case and the cable shield to the ground is only permitted if any potential losses between the shield connection (e.g. at the isolated barrier) and the case can be excluded (See EN 60079-14).
 For pressure transmitters with cable outlet if the shield is not connected to the case, the note "Shield not connected to the case" is indicated on the product label. In this situation, the shield and the case (through the process connection) must be grounded.
- Ensure that no moisture can enter at the cable end of the pressure transmitter with cable outlet.

Table 15 Specification of the electrical connections

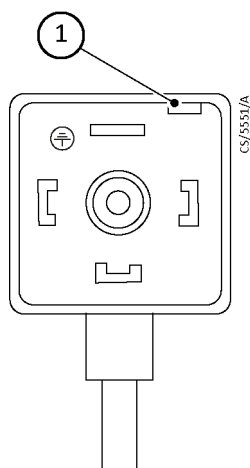
	Angular connector DIN 175301-803 A
Connection diagram	
Assignment (2-wire)	U+ = 1 U- = 2
Cable shield	
Wire cross-section	1.5 mm ² (maximum)
Cable diameter	6 mm - 8 mm Ship approval: 10 mm - 14 mm
Ingress protection per IEC60529*	IP65

*The stated ingress protection only applies when plugged in using mating connectors that have the appropriate ingress protection.

Fit the angular connector

To fit a DIN 175301-803 angular connector, refer to [Figure: Angular connector](#) and do the steps that follow:

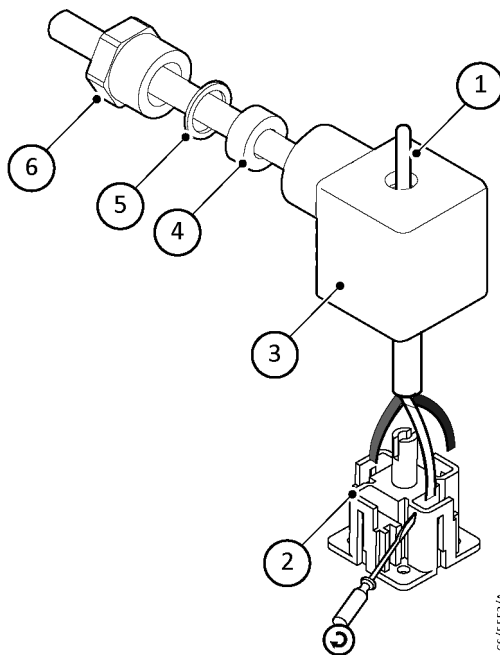
1. Loosen the screw.
2. Loosen the cable gland.
3. Pull the angle housing (with the terminal block inside) away from the instrument.
4. Through the mounting hole (1), pull the terminal block out of the angle housing. Do not try to push the terminal block out through the screw holes or the cable gland, otherwise, the sealing of the angle housing could be damaged.



5. Select a conductor with an outer diameter matched to the angle housing cable bushing. Slide the cable through the cable gland, washer, gland seal and angle housing.
6. Connect the end of the cable to the appropriate connection terminals on the terminal block.

7. Press the angle housing onto the terminal block.
8. Tighten the cable gland around the cable. Make sure that the seals are not damaged and the cable gland and seals are correctly seated to ensure ingress protection.
9. Place the flat square gasket over the pressure transmitters connection pins.
10. Slide the terminal block onto the pressure transmitter connection pin.
11. Tighten the angle housing and terminal block to the pressure transmitter with the screw.
12. Refer to manufacturer's instruction.

Figure 34 Angular connector

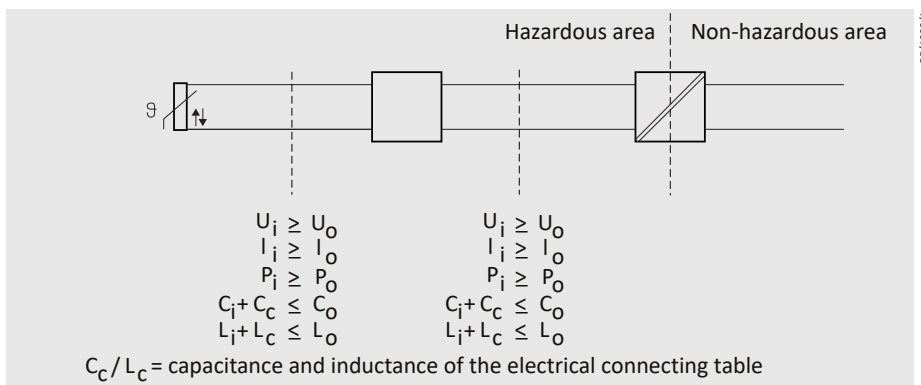


- | | |
|------------------|-------------------|
| 1. Screw | 2. Terminal block |
| 3. Angle housing | 4. Gland seal |
| 5. Washer | 6. Cable gland |

7.8.3 Inlet flame arrester Pt100 (only for Category 1)

A temperature sensor (Pt100) is attached to the inlet flame arrester. It detects the flame arrester over-temperature in the event of a burn. For trip points, see [Pump safety instruments](#) on page 54.

Figure 35 Sensor details Pt100 WIKA

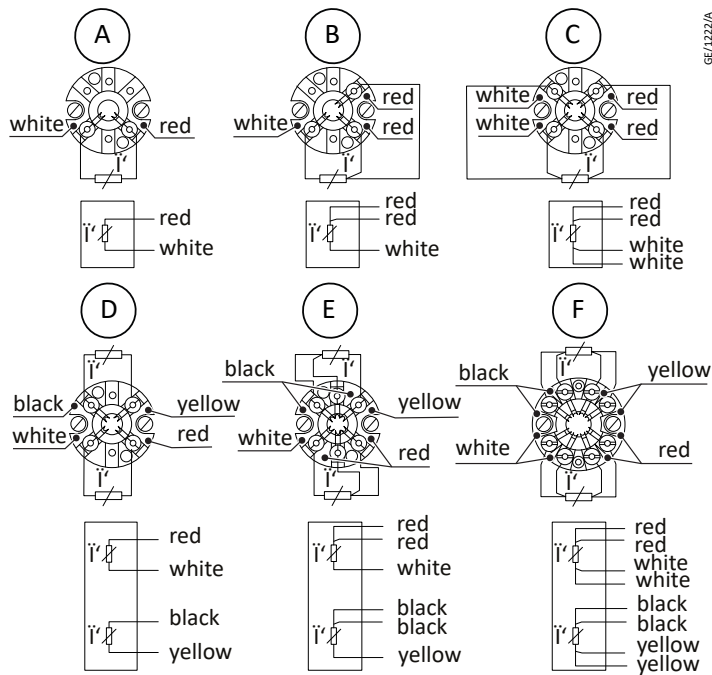


Simplified verification of intrinsic safety for the above-mentioned combination

Measuring insert	Head-mounted transmitter	Isolated barrier
U_i : DC 30 V	U_o : DC 6.5 V	U_i : DC 30V \geq U_o : DC 25.4V
I_i : 550mA	I_o : 9.3 mA	I_i : 130 mA \geq I_o : 88.2 mA
P (max) at the sensor = 1.5W	P_o : 15.2 mW	P_i : 800 mW \geq P_o : 560 mW
C_i : negligible	C_o : 24 $\hat{\mu}$ F	C_i : 7.8 nF \leq C_o : 93 nF
L_i : negligible	L_o : 365 mH	L_i : 100 $\hat{\mu}$ H \leq L_o : 2.7 mH

Transmitter type	TR10-C
Manufacturer	WIKA
Type	TR10-C with head transmitter T32
Part no.	A60029011
ATEX Category	II 1G Ex ia IIC T6-T1 Ga
Power supply	4-20 mA
Measuring range	0-250 °C
Connection	G1/2"
Materials in the process	1.4571
Connection	G1/2"

Figure 36 Terminals Pt100 WIKA



GE/1222/A

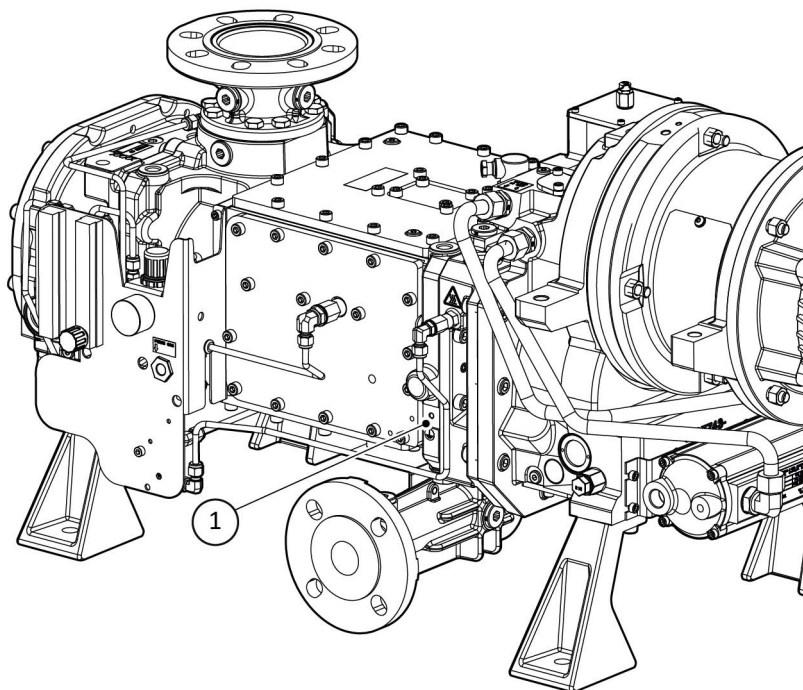
- A. 1 x Pt100, 2-wire
- C. 1 x Pt100, 4-wire
- E. 2 x Pt100, 3-wire

- B. 1 x Pt100, 3-wire
- D. 2 x Pt100, 2-wire
- F. 2 x Pt100, 4-wire

7.8.4 Grounding

Connect the pump to a suitable factory or plant earth (ground) via a M6 earth thread.

Figure 37 Grounding



CS/2051/C

- 1. M6 thread

7.8.5 Check the direction of rotation of the motor

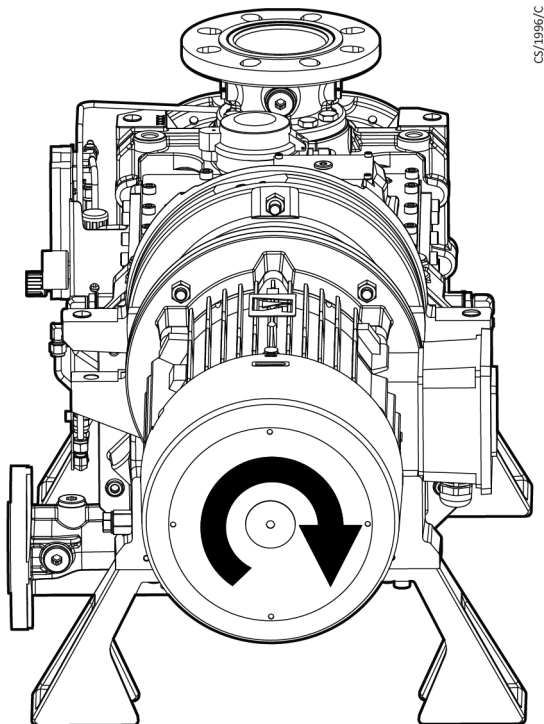
Blank the inlet or connect the EDS pump to the vacuum system before you check the direction of pump rotation. If you do not, there is danger of objects being trapped in the rotating pump rotors.

Direction of rotation is clockwise as viewed from the motor end of the pump. View the motor fan direction.

Let the pump run up briefly (for approximately 1 second) and then immediately switch it off again.

If the rotation direction is incorrect, isolate and lock-out the power supply, then change the phases on the pump-motor and recheck direction.

Figure 38 Direction of rotation of the motor



7.9 Leak check after installation

On delivery, the pump is leak tight to $< 10^{-4}$ mbar·l/s (integral, leak-checked). Leak check all relevant connections after having installed the pump.

8. Operation

DANGER: EMISSION OF HAZARDOUS GAS



Danger as a result of rapid increase in pressure due to decomposition of pumped gases. Uncontrolled emission of process gases by reaction products within the pump. The pumping of exothermic substances, reactive gases, vapours or gas mixtures is generally prohibited. The operator is responsible for the assessment of the hazard potential of the process media or mixtures.

WARNING: HAZARDOUS SUBSTANCES



Dangers through escaping or emitting transported hazardous gases, vapours or substances. Process gases may escape from the exhaust and leaks in the vacuum system. The pumping of exothermic substances, pyrophoric, radioactive, oxidising gases or gas mixtures, as well as the pumping of oxygen of more than the atmospheric concentration (21%) is generally prohibited. The operator is responsible for the assessment of the hazard potential of the process media or mixtures.

WARNING: EJECTION OF PARTS



Ejection of parts by bursting of the vacuum system due to excessive pressure caused by clogged or constricted exhaust. Pressure build-up in the vacuum system or exhaust pipes. Do not operate the vacuum system with the outlet closed or throttled.

Ejection of parts by bursting of the vacuum system due to excessive pressure caused by the pump running backwards after it has been switched off under vacuum. The danger of overpressure in the inlet lines and recipients as well as the uncontrolled backward running of rotors. In the event of a fault or during service, separate the vacuum pumps from the vacuum container and connecting lines before the inlet using suitable valves.

CAUTION: EXTREME SUCTION



Pulling body parts and objects into the vacuum through open flanges. Do not put the vacuum pump into operation with open flanges. During the installation of the vacuum pump first, mechanically connect the inlets and outlets, and only then make the electrical connections.

CAUTION: TRIP HAZARD



Hazard of slipping, tripping or falling due to oil leakage from the pump. During transport or depending on the work process, the oil may escape from the vacuum pump. Risk of falling on oil spills. Check vacuum pump regularly for oil leaks. Take appropriate safety measures.

**CAUTION: HOT SURFACES**

Burns due to contact with hot surfaces. Burning of fingers, hands or arms on hot surfaces. Handle the pump only when ventilated and cooled down. Wear suitable protective equipment.

**CAUTION: HIGH NOISE LEVELS**

Hearing loss due to high noise level. Depending on the operating conditions, higher noise levels can be achieved than specified in the technical data. Take suitable hearing protection measures.

8.1 Media compatibility

See *Normal operation* on page 40. For a list of materials in contact with the process gas, see *Technical data* on page 27.

If you use the system on an application for which it is not suitable, you may invalidate your warranties. If in doubt, contact us.

8.2 Start-up

**CAUTION: WARM UP**

Allow the pump to warm up for 60 minutes after you start the pump. If you do not obey there is a risk of damage to the pump.

1. Ensure that any isolation valves in the process pipework are in the correct positions (exhaust must be open).
2. Switch on the cooling-water.
3. Switch on or open the purge gas supply line and ensure right setting. Refer to *Connecting purge gas* on page 46.
4. Start the EDS pump by switching on the electrical supply.

The pump is ready for process when the stator temperature, measured next to the stator thermal switch / Pt 100, reaches 40 °C. (note this process-ready temperature may be different, depending on your application).

8.3 Manual shut-down

1. Close the pump-inlet isolation-valve (if fitted).
2. Leave the EDS pump operating for sufficient time such that the pump is thoroughly purged of any process gases. If condensable fluids have been pumped, operate the EDS pump for at least 40 minutes with all purges on.
3. Switch off the EDS pump.
4. Close or switch off the purge gas supply line.
5. Keep the water cooling on for 10 min. Switch off the cooling-water.

**NOTICE:**

If you directly switch of water-cooling by closing both cooling-water inlet and outlet, temperature may rise and result in unacceptable high water pressure and the water circuit may leak.

8.4 Unplanned shut-down and alarms

If the pump stops unexpectedly while processing corrosive or condensable vapours internally, it must be fully purged for sufficient time to ensure it is free of corrosives or liquids. Otherwise, the pump may corrode and be damaged.

**WARNING: INEFFECTIVE FLAME ARRESTER**

Whenever a flashback is registered, inspect the complete flame arrester and renew the PROTEGO® flame arrester unit. It is also necessary to check the pump in case of a registered flashback.

Refer to *Inspect and clean the inlet and exhaust flame arresters* on page 76 for spares information.

8.5 Dry pump clean

**WARNING: HOT LIQUID AND STEAM**

Risk of burn. Hot liquid and steam will exit the pump during the solvent flush procedure. Make sure that the exhaust is piped away safely and solvent are disposed of in accordance with local and national safety and environmental requirements.

An inlet purge and solvent flush kit are available as an accessory (refer to *Accessories* on page 25 and the respective manual) to clean the pump mechanism on applications where large quantities of dust and sticky deposits are encountered. The cleaning process should be run during the shutdown sequence of the pump.

The solvent flush procedure can be run as often as required.

For the correct procedure, refer to the instruction manuals for inlet purge and solvent flush.

The appropriate solvent depends on the chemical characteristics of the product/deposit found in the pump. Make sure that the solvent you select is compatible with the materials of construction of the vacuum pump to prevent damage. For a list of the material of construction refer to the *Technical data* on page 27 and the datasheets of your components.

If in doubt, contact us.

9. Maintenance

WARNING: UNEXPECTED RESTART



Failure or malfunction of the central control system (unexpected start-up) or danger of a pump restarting automatically after switching off due to a fault. Crushing, cutting or cutting off by touching moving parts due to recurring start command or power supply. Before carrying out maintenance or service work, disconnect the pump from the power supply, secure it against being switched on again, determine that it is de-energised, ground and short-circuit it and cover/isolate adjacent live parts.

CAUTION: HOT EQUIPMENT



Scalding by touching hot equipment or lubricants. Danger of scalding when opening the hot pump with hot operating fluid or cooling water. Open outlet or inlet port for operating fluids only if the operating fluid has adapted to the room temperature. Wear suitable protective equipment.

CAUTION: HIGH PRESSURE GAS



Danger due to incorrect connection of the pump to the system to be pumped out. Pressure build-up in the vacuum system. Check correct connection of inlet and outlet flanges before operation. When using the pump with seal gas, protect the seal gas supply so that no overpressure can occur in the pump system in the event of a malfunction or power interruption.

WARNING: HAZARDOUS SUBSTANCES



Risk of injury or asphyxiation. The substances that accumulate in the exhaust pipe and flame arresters can be dangerous. Do not allow these substances to come into contact with skin or eyes. Do not inhale vapours from these substances. Install blanking caps to the inlet and outlet flanges when you move the exhaust pipe or flame arrester around the workplace.

9.1 Maintenance intervals

Standard maintenance activities are listed below. These activities are given for standard operating conditions and may differ depending on the harshness of your application. Therefore the maintenance plan might need to be adapted to your process conditions. If in doubt, contact us for any further advice.

Electrical installations in potentially explosive atmospheres have special features that enable proper operation in this area. It is essential for safety reasons that the effectiveness of these special features is maintained throughout the life of such equipment. Standard EN 60079-17 provides the details for initial and ongoing testing.

Table 16 Maintenance intervals

Service work	Interval
Check the oil level and top-up if required	1 week
Check the cooling-water level and top-up if required	1 week (indirect cooled pumps only)
Check the coupling	2000 to 4000 operating hours or 3 to 12 months see Check the coupling wear on page 76.
Check the purge gas supply pressure and pipes	6 months
Check the water pipes	6 months
Drain and replace oil	1 year
Drain and replace coolant*	1 year
Replace blow-off valve	1 year
Remove and clean water pump	1 year (indirect cooled pumps only)
Clean the heat exchanger	1 year (indirect cooled pumps only)
Complete overhaul by service centre	4 years or 32,000 operating hours
Leak check the entire pump system	after all maintenance and assembly work and upon request
Flamer arresters (Cat 1 only)	Refer to manufacturer's instructions

* We recommend you to use our maintenance kit for coolant change. You must follow the procedure from the relevant manual.

9.2 Checking the oil



WARNING: RISK OF BURNS

Before removing the oil-drain or oil-fill plug always switch off the pump first and vent to atmospheric pressure. When the pump has become warm during operation the casing and the oil temperature may exceed 80 °C. Leave the pump to cool down. Always wear protective gloves also to protect yourself against aggressive residues in the oil

The oil level should be between the maximum and minimum level of the glass for a non-operating pump. When the pump is operating the oil level is slightly lower than in a static condition.

If the oil shows any significant change in normal colour consider an oil change and contact us for any further advice.

Make sure to use the right kind of oil, see [Accessories](#) on page 25. Only use the oil supplied by the manufacturer.

Figure 39 Oil level check

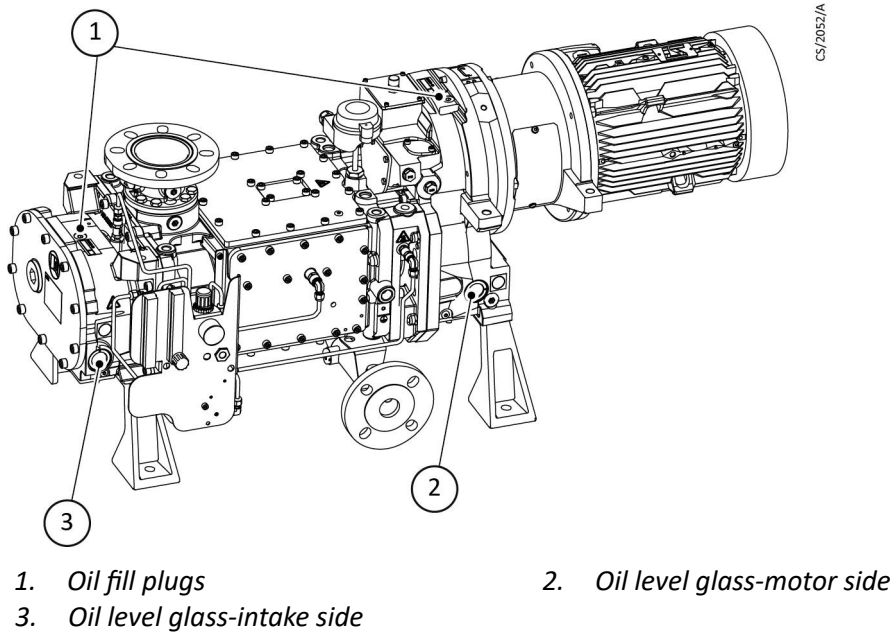
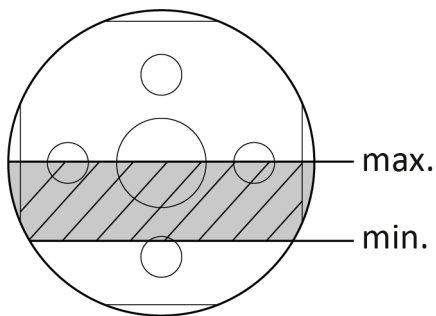


Figure 40 Oil level at pump standstill



NOTICE:



If the oil level is too low, the bearings and gearwheels are not lubricated adequately; if it is too high, oil may enter the pumping chamber.

The oil filling openings must be airtight. Under vacuum, the inflow of ambient air can cause oily gas to enter the pump chamber via the shaft seals.

Clean the oil-fill port and reinstall the plug using a gasket which is in perfect condition. Wipe off any oil residues from the casing.

9.3 Inspect the closed cooling-water circuit

(only for indirect cooled pump variants)



CAUTION: HIGH PRESSURE

Risk of damage to equipment. The cooling system may be pressurised. Ensure that the EDS pump is cooled before attempting to open the cooling-water header tank. Slowly open the filler cap to release pressure.

CAUTION: HIGH TEMPERATURE

Risk of damage to equipment. Ensure that you use the correct procedure to refill or exchange the glycol mixture during yearly maintenance. Incorrect filling of the cooling circuit can result in a higher pump temperature which may cause to pump to trip.

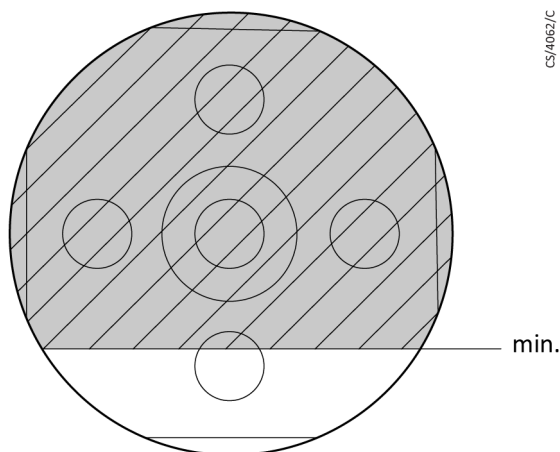
Only for indirect cooled EDS pump the water and Drystar coolant mixture filling of the closed-loop circuit need to be checked.

Cooling-water or Drystar coolant mixture should be visible in the cooling-water level sight glass above the gearbox. If no water or Drystar coolant mixture is visible, the system will require additional coolant. Fill up the system with adequate coolant, so that the sight glass is completely filled up.

 **Note:**

To vent the cooling circuit and refill an accessory, refer and follow instructions given in manual A41892840.

Figure 41 Cooling water level



Make sure that the coolant level does not fall below the minimum indicated on the label. This may cause the internal cooling circuit to be inefficient or even to stop.

It is also possible that the coolant level in the expansion tank is above the sight glass due to temperature fluctuations. This may affect the reading of the correct level. In the indirectly cooled variants, this is easily recognisable by the colour of the glycol mixture (for example, red or green).

9.4 Inspect pipelines and connectors

Inspect all of the cooling system and purge gas 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 connections are secure. Tighten any loose connections.

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.

Inspect all of the process inlet and exhaust 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 connections are secure. Tighten any loose connections.

9.5 Inspect and clean the inlet and exhaust flame arresters

If installed, the inlet and exhaust flame arresters require periodic inspection and cleaning. Contact us for advice or refer to the manufacturer's instructions.

Note:

The Protego® filter discs require a special orientation. The orientation is L-R-L.

In case of an internal explosion or burn or if the flame arrester temperature sensor has given an alarm, inspect the flame arresters. Replace the flame arresters if they are damaged.

We supply new elements and gaskets as follows.

Part number	Description
A60022832	Element for Protego® inlet flame arrester (including gaskets)
A60022932	Set of gaskets for Protego® inlet flame arrester element
A60022833	Element for Protego® exhaust flame arrester (including gaskets)
A60022933	Set of gaskets for Protego® exhaust flame arrester element

9.6 Inspect motor and pump fan and cooling fins

The slits in the fan cowl as well as the fins on the motor and on the pump may be contaminated depending on humidity conditions and the degree of contamination in the ambient air.

In order to ensure a sufficient air flow for the motor and the pump's casing, the grid of the fan cowl must be cleaned with a clean brush when contaminated.

Any coarse dirt must be removed from the fins on the motor and the pump.

In order to avoid electrostatic charging, the plastic surfaces should be cleaned with a moist piece of cloth. Metal surfaces which are painted are not affected by this.

9.7 Check the coupling wear

The coupling must be checked regularly for noise. In connection with increasing wear on the teeth, noise will increase. Increased wear is caused by severe contamination, unacceptably high ambient temperatures or vibration stresses.

Checking intervals

(must be observed for ATEX operation)

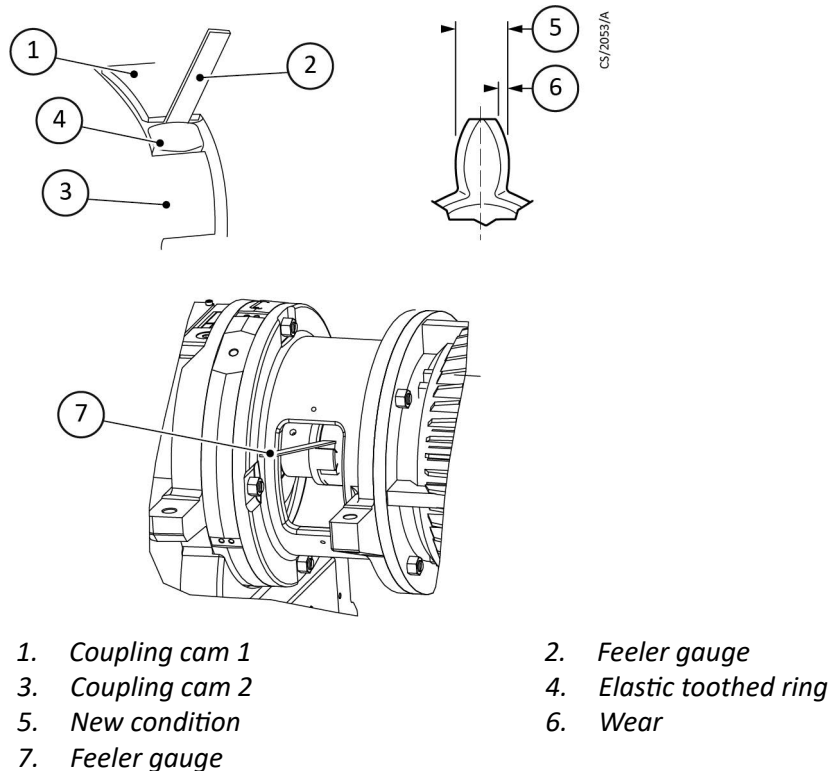
Ensure that the pump is protected against being started up inadvertently (lockout/tagout).

The wear check on the elastic teeth must be performed for the first time 2000 operating hours after commissioning, but at the latest three months after commissioning.

If during the initial inspection insignificant or no wear on the teeth is found, then when maintaining the same operating conditions, the further inspection intervals can be run after 4000 hours but at the latest after 12 further months. If during the initial inspection increased wear is found indicating a replacement, then the cause must be determined and remedied. In such a case the maintenance intervals must under all circumstances be adapted to the changed operating conditions.

In connection with conforming utilisation, coupling star and, if required, the worn out coupling halves must be replaced in the course of the normal bearing maintenance interval.

Figure 42 Checking for coupling wear



- | | |
|--------------------------|--------------------------------|
| 1. <i>Coupling cam 1</i> | 2. <i>Feeler gauge</i> |
| 3. <i>Coupling cam 2</i> | 4. <i>Elastic toothed ring</i> |
| 5. <i>New condition</i> | 6. <i>Wear</i> |
| 7. <i>Feeler gauge</i> | |

Inspection for wear

The toothed ring is accessible through the inspection hatch at the motor flange. For checking, remove the cover.

For checking, use a feeler gauge to check play between the coupling cams and the elastic toothed ring.

The wear limit is 1 mm (maximum permissible thickness of the feeler gauge).

In the as new condition, respectively in the case of normal operating conditions the slot will amount to less than 0.2 mm.

Due to the type of operation, only every second star segment is stressed. For this reason, two segments behind each other must be checked. If required the coupling can be turned further by approximately 20° using a suitable tool (screwdriver, for example).

After having completed the inspection, seal off the inspection hatch.

9.8 Hand-cranking the pump

In the event of the pump rotors requiring freeing, the pump can be turned manually via a 24 mm hex drive on the end of one of the pump shafts. This is accessed via a G1 1/2 blanking screw in the inlet end oil box cover see [Figure: Inlet flange dimension \(in mm\)](#).



CAUTION: ACCIDENTAL OPERATION

Risk of damage to equipment. Ensure the pump is switched off and isolated so that it cannot be accidentally started. Allow the pump to cool to a safe temperature and ensure that the pump is fully purged and vented. If you do not, you could be exposed to vacuum, or process gases could escape.

Preparation

Purge and vent the pump. Switch off and isolate the pump from the power supply and wait until the pump is cool. Unscrew the blanking screw from the oil box cover and keep it in a safe clean place. You must ensure that the thread is kept clean as any debris on the thread might damage it when it is screwed back in and/or carry debris into the oil box which can damage the bearings.

Hand cranking

Once the blanking screw is removed, insert a 24 mm socket hex and engage it on the hex on the pump shaft. You must ensure that the tool used to turn the pump is clean, as any debris entering the oil box might cause serious damage to the bearings.

Apply torque to the pump shaft. The normal direction of rotation is anti-clockwise as viewed from the hex end, but the pump can be hand cranked in any direction. Do not exceed a torque of 300 Nm.

After hand cranking, re-seal the blanking screw and tighten it to 35 Nm. A leak test must be carried out to ensure that the screw has been fitted correctly before you re-start the pump.

If the pump cannot be turned or cannot be turned easily, contact our service centre.

10. Fault finding

A list of fault conditions and their possible causes are provided here to assist in basic troubleshooting. If you are unable to rectify a fault using this guide, call your supplier or our nearest service centre for advice.

Fault	Pump does not start up
Cause	Motor incorrectly connected.
Remedy	Connect motor correctly.
Cause	Overtemperature switch or motor stator defective.
Remedy	Contact us.
Cause	Pressure switch is defective.
Remedy	Replace the pressure switch.
Cause	Lubricant is too thick.
Remedy	Exchange the lubricant or warm up lubricant and pump.
Cause	Motor rotor defective.
Remedy	Contact us.
Cause	Pump has seized: defective rotors, bearings or toothed gears.
Remedy	Contact us.
Fault	Pump gets too hot
Cause	Cooling water pump is not working or there are air bubbles in the indirect cooling circuit.
Remedy	Vent the cooling circuit and refill. Refer and follow instructions given in manual A41892840.
Cause	Cooling-water supply is not sufficient.
Remedy	Make sure sufficient cooling-water supply.
Cause	Cooling-water lines are clogged.
Remedy	Decalcify cooling-water lines.
Cause	Ambient temperature is too high.
Remedy	Install the pump at a suitable place or ensure a sufficient flow of cooling air.
Cause	Pump is operating in the wrong pressure range.
Remedy	Check the pressure levels within the system.
Cause	Inlet gas temperature is too high.
Remedy	Check system.

Cause	Clearance between housing and rotors are too small due to contamination.
Remedy	Clean pumping chamber.
Cause	Clearance between housing and rotors are too small due to distortion of the pump.
Remedy	Install and connect the pump free of tension.
Cause	Friction resistance is too high due to contaminated bearings and/or contaminated oil.
Remedy	Clean pump, respectively perform maintenance.
Cause	Oil level is too high.
Remedy	Drain oil down to the correct level.
Cause	Oil level is too low.
Remedy	Top up oil to the correct level.
Cause	Wrong oil filled in.
Remedy	Contact us.
Cause	Bearing is defective.
Remedy	Contact us.
Fault	Pump is extremely loud
Cause	Bearing damage.
Remedy	Repair pump.
Cause	Thick particle deposits.
Remedy	Clean pump, respectively perform maintenance.
Fault	Motor power consumption is too high
Cause	Like "Pump gets too hot".
Remedy	See Pump gets too hot on page 79.
Cause	Incorrect mains voltage for the motor.
Remedy	Connect the motor to the correct mains voltage.
Fault	Pump is too loud
Cause	Motor stator defective.
Remedy	Contact us.
Cause	Motor rotor defective.
Remedy	Contact us.
Cause	Distances between housing and rotors is too small due to contamination.
Remedy	Clean pumping chamber.

Cause	Distances between housing and rotors is too small due to distortion of the pump.
Remedy	Affix and connect the pump free of tensions.
Cause	Rotors make contact with the housing.
Remedy	Shutdown pump immediately. Contact us.
Cause	Rotor is running untrue.
Remedy	Shutdown pump immediately. Contact us.
Cause	Oil slinger disc makes contact with the gear housing.
Remedy	Contact us.
Fault	Pump is losing lubricant
Cause	Oil drain plug is leaky.
Remedy	Drain lubricant, firmly screw in a new oil drain plug with the gasket, fill in correct lubricant quantity.
Cause	Oil level glasses leaks.
Remedy	Contact us.
Cause	Gear cover is leaky.
Remedy	Replace the O-ring of the gear cover.
Cause	Puddle under the motor, leak in the seal.
Remedy	Contact us. shutdown pump immediately.
Cause	No lubricant leak is apparent.
Remedy	See Lubricant in the pump chamber on page 81.
Fault	Oil gets too dark
Cause	Oil has been used up.
Remedy	Exchange the oil.
Cause	Pump gets too hot.
Remedy	See Pump gets too hot on page 79; after remedy of the fault, exchange the oil.
Fault	Lubricant in the pump chamber
Cause	Lubricant level is too high.
Remedy	Drain the lubricant down to the correct level.
Cause	Lubricant is ejected from the system.
Remedy	Check system.
Cause	Pump is not standing horizontally.
Remedy	Place the pump correctly.

Cause	Pump has a gas leak towards the outside.
Remedy	Run a leak search and pinpoint leaks. If the leak is not at the oil-fill or oil-drain plugs, return the pump to us.
Cause	Pump has an internal leak.
Remedy	Contact us.
Cause	Shaft-seals are defective.
Remedy	Contact us.
Fault	Pump does not attain its pumping speed
Cause	Intake screen is clogged.
Remedy	Clean intake screen.
Cause	Motor incorrectly connected.
Remedy	Connect motor correctly.
Cause	Motor stator defective.
Remedy	Contact us.
Cause	Motor rotor defective.
Remedy	Contact us.
Cause	Vacuum pump system has a gas leak.
Remedy	Detect leak and seal it.
Cause	Rotor gap is too great.
Remedy	Contact us.
Cause	Bearing defective.
Remedy	Contact us.

11. Disposal

11.1 Waste disposal

The equipment may have been contaminated by the process or by environmental influences. In this case, the equipment must be decontaminated in accordance with the relevant regulations. We offer this service at fixed prices. Further details are available on request.

Separate clean components according to their materials, and dispose of these accordingly.

When sending us any equipment, observe the regulations given in section [Return the equipment or components for service](#) on page 84.

Disposal of waste oil

Owners of waste oil are responsible for the proper disposal of this waste.



Waste oil from vacuum pumps must not be mixed with other substances or materials.

Waste oil from vacuum pumps (oils are based on mineral oils) which are contaminated due to the influence of oxygen in the air, high temperatures or mechanical wear must be disposed of through a local waste oil disposal system.

Waste oil from vacuum pumps which is contaminated with other substances must be marked and stored in such a way that the type of contamination is apparent. This waste must be disposed of as special waste.

European, national and regional regulations concerning waste disposal need to be observed. Waste must only be transported and disposed of by an approved waste disposal vendor.

Symbols on the vacuum device

	<p>Do not dispose of the vacuum device as residual waste. Dispose of it in accordance with the applicable local regulations.</p>
	<p>China RoHS: Products marked with this symbol contain residual quantities of substances that are subject to quantitative regulation in accordance with Chinese Directive GB/T 26552. These parts can safely be used for the environmental protection use period (20 years) as indicated and should enter into the recycling system after their environmental protection use period.</p>

12. Service

Our products are supported by a world-wide network of our 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.

The local service centre can also provide our engineers to support on-site maintenance, service or repair of the equipment.

For more information about service options, contact the nearest service centre or our other company.

12.1 Return the equipment or components for service

Before you send your equipment to us for service or for any other reason, you must complete a Declaration of Contamination Form. The 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.

If you are returning equipment note the following:

- If the equipment is configured to suit the application, make a record of the configuration before returning it. All replacement equipment will be supplied with default factory settings.
- Do not return equipment 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 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 form, your equipment cannot be serviced.

13. Spares

Table 17 Spares

Part number	Description
H11032010	Ultragrade® Endurance Extend 110 1 l
H11032012	Ultragrade® Endurance Extend 110 4 l
H11033015	Ultragrade® Kinetic 150 1 l
H11033010	Ultragrade® Kinetic 150 4 l
H12810003	Drystar coolant 0.9/2 l
A41889706	EDS 200-480 Direct cooled service kit
A41889708	EDS 200-480 Indirect cooled service kit
A41889705	EDS 200-480 BOV kit
A41889702	EDS 200-480 Chemical atmospheric seal kit
EK32000113	Sight glass 40, 3 x 4 kit ATEX
A41889710	EDS 200/300 Chemical exhaust kit
A41829000	200 Service module
A41839000	300 Service module

13.1 Wearing parts

Part number	Description
ES23955165	Gasket for plug screw G3/8 (oil fill plug)

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EU Declaration of Conformity

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The product specified and listed below

- Screw Vacuum Pump - with motor

EDS 200 and EDS 300**ATEX Marking:****A41822945, A41824945, A41832945, A41834945**

II 2/2 G Ex h IIC T3 Gb
-20°C ≤ Ta ≤ 40°C

EDS 480**A41842945**

II 2/2 G Ex h IIC T3 Gb X
-20°C ≤ Ta ≤ 40°C

A41823945, A41833945

II 2/2 G Ex h IIC T4 Gb
-20°C ≤ Ta ≤ 40°C

Is in conformity with the relevant requirements of European CE legislation:

2006/42/EC	Machinery directive <i>Note: The safety objectives of the Low Voltage Directive 2014/35/EU were complied with in accordance with Annex 1 No. 1.5.1 of this directive.</i>
2014/34/EU	ATEX directive on use in potentially explosive atmospheres
2014/30/EU	Electromagnetic compatibility (EMC) directive
2011/65/EU	Restriction of certain hazardous substances (RoHS) directive as amended by Delegated Directive (EU) 2015/863

Based on the relevant requirements of harmonised standards:

EN 1012-2:1996 +A1:2009	Compressors and vacuum pumps. Safety requirements. Vacuum pumps
EN 60204-1:2018	Safety of machinery. Electrical equipment of machines. General requirements
EN ISO 80079-36:2016	Explosive atmospheres – Part 36: Non-electrical equipment for explosive atmospheres. Basic method and requirements*
EN ISO 80079-37:2016	Explosive atmospheres - Part 37: Non-electrical equipment for explosive atmospheres -- Non-electrical type of protection constructional safety "c", control of ignition sources "b", liquid immersion "k"*
EN 61000-6-2:2005	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 declaration, based on the requirements of the listed Directives and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: 2021-12-14

You must retain the signed legal declaration for future reference

This declaration becomes invalid if modifications are made to the product without prior agreement.



*Andries De Bock – Vice President Engineering
Industrial Vacuum Division, Cologne*



*Axel Guddas – General Manager
Product Company Cologne*

ADDITIONAL LEGISLATION AND COMPLIANCE INFORMATION

EMC (EU, UK): Class A/B Industrial equipment

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

RoHS (EU, UK): Material Exemption Information

This product is compliant with the following Exemptions

Annex III:

- 6(a) **Lead** as an alloying element in steel for machining purposes and in galvanised steel containing up to 0.35 % lead by weight
- 6(b) **Lead** as an alloying element in aluminium containing up to 0.4% by weight

REACH (EU, UK)

This product is a complex article which is not designed for intentional substance release. To the best of our knowledge the materials used comply with the requirements of REACH. The product manual provides information and instruction to ensure the safe storage, use, maintenance and disposal of the product including any substance based requirements.

Article 33.1 Declaration (EU, UK)

This product contains Candidate List Substances of Very High Concern above 0.1%ww by article as clarified under the 2015 European Court of Justice ruling in case C-106/14.

- Lead (Pb)
This substance is present in certain steel / aluminium components.

Additional Applicable Requirements

The product is in scope for and complies with the requirements of the following:

2012/19/EU

Directive on waste electrical and electronic equipment (WEEE)

材料成分声明

China Material 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
<p>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.</p> <p>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.</p>						

EU Declaration of Conformity

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The product specified and listed below

- Screw vacuum pump - bare shaft without motors

EDS 200 and EDS 300

A41822985, A41824985, A41822986, A41824986
A41832985, A41834985, A41832986, A41834986

EDS 480

A41842985, A41842986

ATEX Marking:

II 2/- G Ex h IIC T3 Gb/-
-20°C ≤ Ta ≤ 40°C
(internal atmospheres only)



II 2/- G Ex h IIC T3 Gb/- X
-20°C ≤ Ta ≤ 40°C
(internal atmospheres only)

Is in conformity with the relevant requirements of European CE legislation:

2006/42/EC	Machinery directive <i>Note: The safety objectives of the Low Voltage Directive 2014/35/EU were complied with in accordance with Annex 1 No. 1.5.1 of this directive.</i>
2014/34/EU	ATEX directive on use in potentially explosive atmospheres
2011/65/EU	Restriction of certain hazardous substances (RoHS) directive as amended by Delegated Directive (EU) 2015/863


Based on the relevant requirements of harmonised standards:

EN 1012-2:1996 +A1:2009	Compressors and vacuum pumps. Safety requirements. Vacuum pumps
EN 60204-1: 2018	Safety of machinery. Electrical equipment of machines. General requirements
EN ISO 80079-36:2016	Explosive atmospheres – Part 36: Non-electrical equipment for explosive atmospheres. Basic method and requirements
EN ISO 80079-37:2016	Explosive atmospheres - Part 37: Non-electrical equipment for explosive atmospheres -- Non-electrical type of protection constructional safety "c", control of ignition sources "b", liquid immersion "k"

This declaration, based on the requirements of the listed Directives and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: 2021-12-14

You must retain the signed legal declaration for future reference

This declaration becomes invalid if modifications are made to the product without prior agreement.



Andries De Bock – Vice President Engineering
Industrial Vacuum Division, Cologne



Axel Guddas – General Manager
Product Company Cologne

ADDITIONAL LEGISLATION AND COMPLIANCE INFORMATION

RoHS (EU, UK): Material Exemption Information

This product is compliant with the following Exemptions

Annex III:

- 6(a) **Lead** as an alloying element in steel for machining purposes and in galvanised steel containing up to 0.35 % lead by weight
- 6(b) **Lead** as an alloying element in aluminium containing up to 0.4% by weight

REACH (EU, UK)

This product is a complex article which is not designed for intentional substance release. To the best of our knowledge the materials used comply with the requirements of REACH. The product manual provides information and instruction to ensure the safe storage, use, maintenance and disposal of the product including any substance based requirements.

Article 33.1 Declaration (EU, UK)

This product contains Candidate List Substances of Very High Concern above 0.1%ww by article as clarified under the 2015 European Court of Justice ruling in case C-106/14.

- Lead (Pb)
This substance is present in certain steel / aluminium components.

Additional Applicable Requirements

The product is in scope for and complies with the requirements of the following:

2012/19/EU

Directive on waste electrical and electronic equipment (WEEE)

材料成分声明

China Material 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

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.

EU Declaration of Conformity

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The product specified and listed below

- Screw Vacuum pump
- EDS 200 / EDS 300
- A418vwxz
v = 2, 3 (pumping speed)
w = 6, 7 (cooling system)
x = 945 (motor variant)

ATEX Marking:

	II 1/2G Ex h IIB3 T3 Ga / Ex h IIC T3 Gb X II 1/2G Ex h IIB3 T4 Ga / Ex h IIC T4 Gb X -20°C ≤ Ta ≤ 40°C	*Where w=6
	II 1/2G Ex h IIB3 T3 Ga / Ex h IIC T3 Gb X -20°C ≤ Ta ≤ 40°C	*Where w=7

Is in conformity with the relevant requirements of European CE legislation:

2006/42/EC	Machinery directive <i>Note: The safety objectives of the Low Voltage Directive 2014/35/EU were complied with in accordance with Annex 1 No. 1.5.1 of this directive.</i>
2014/34/EU	ATEX directive on use in potentially explosive atmospheres ATEX Notified Body – IBExU, Freiberg, reg. no. 0637 EU-Type Examination Certificate number: IBExU20ATEX1086 X
2014/30/EU	Electromagnetic compatibility (EMC) directive
2011/65/EU	Restriction of certain hazardous substances (RoHS) directive as amended by Delegated Directive (EU) 2015/863

Based on the relevant requirements of harmonised standards:

EN 1012-2:1996 +A1:2009	Compressors and vacuum pumps. Safety requirements. Vacuum pumps
EN 60204-1:2018	Safety of machinery. Electrical equipment of machines. General requirements
EN ISO 80079-36:2016	Explosive atmospheres – Part 36: Non-electrical equipment for explosive atmospheres. Basic method and requirements
EN ISO 80079-37:2016	Explosive atmospheres - Part 37: Non-electrical equipment for explosive atmospheres -- Non-electrical type of protection constructional safety "c"
EN 61000-6-2:2005	Electromagnetic Compatibility (EMC) - Part 6-2: Generic Industrial Immunity Standard
EN 61000-6-4:2007/A1:2011	Electromagnetic Compatibility (EMC) - Part 6-4: Generic Industrial Emission Standard

This declaration, based on the requirements of the listed Directives and EN ISO/IEC 17050-1, covers all product serial numbers from this date on: 2021-12-14

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*Andries De Bock – Vice President Engineering
Industrial Vacuum Division, Cologne*



*Axel Guddas – General Manager
Product Company Cologne*

ADDITIONAL LEGISLATION AND COMPLIANCE INFORMATION

EMC (EU, UK): Class A/B Industrial equipment

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.

RoHS (EU, UK): Material Exemption Information

This product is compliant with the following Exemptions

Annex III:

- 6(a) **Lead** as an alloying element in steel for machining purposes and in galvanised steel containing up to 0.35 % lead by weight
- 6(b) **Lead** as an alloying element in aluminium containing up to 0.4% by weight

REACH (EU, UK)

This product is a complex article which is not designed for intentional substance release. To the best of our knowledge the materials used comply with the requirements of REACH. The product manual provides information and instruction to ensure the safe storage, use, maintenance and disposal of the product including any substance-based requirements.

Article 33.1 Declaration (EU, UK)

This product contains Candidate List Substances of Very High Concern above 0.1%ww by article as clarified under the 2015 European Court of Justice ruling in case C-106/14.

- Lead (Pb)
This substance is present in certain steel / aluminium components.

Additional Applicable Requirements


The product is in scope for and complies with the requirements of the following:

2012/19/EU

Directive on waste electrical and electronic equipment (WEEE)

材料成分声明

China Material 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

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。

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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.

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