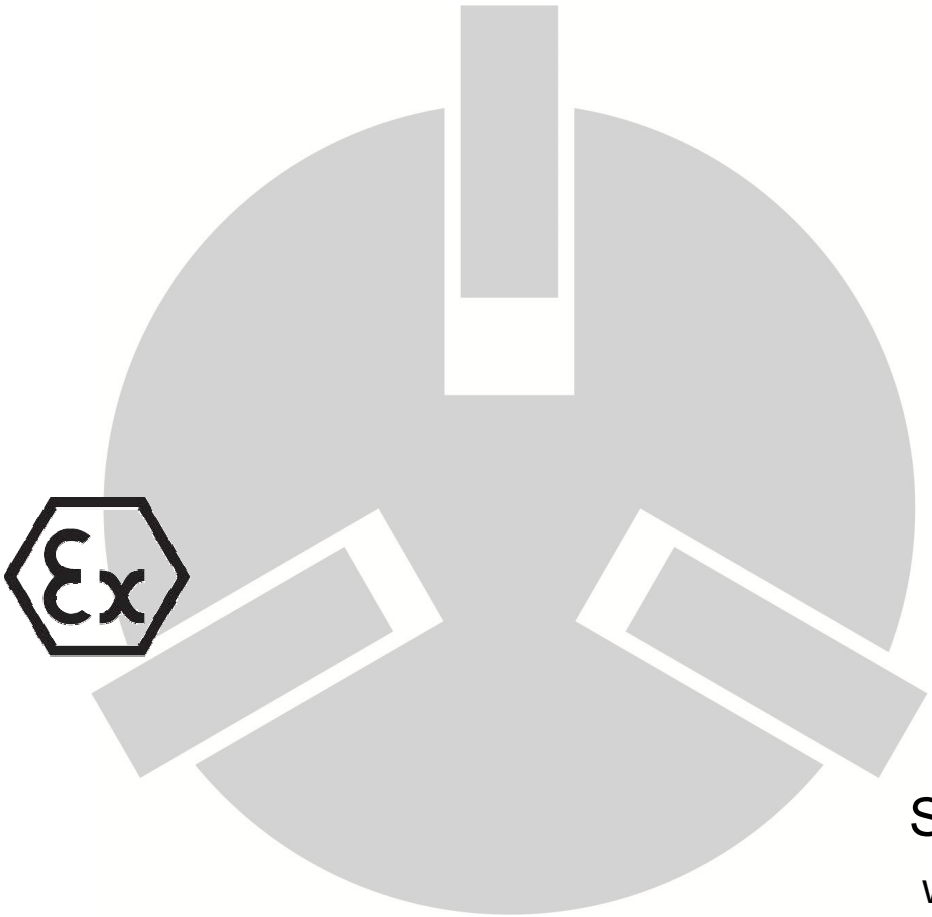
Installation and Operating Instructions



Vacuum Pump

Seco SG 0008 A

with 3~ Phase Motor

Busch Produktions GmbH
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Germany

0870162612 / 160902 / Original instructions / Modifications reserved

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Preface

Congratulations on your purchase of the Busch vacuum pump. With watchful observation of the field's requirements, innovation and steady development Busch delivers modern vacuum and pressure solutions worldwide.

These operating instructions contain information for

- product description,
- safety,
- transport,
- storage,
- installation and commissioning,
- maintenance,
- overhaul,
- troubleshooting and
- spare parts

of the vacuum pump.

For the purpose of these instructions, "handling" the vacuum pump means the transport, storage, installation, commissioning, influence on operating conditions, maintenance, troubleshooting and overhaul of the vacuum pump.

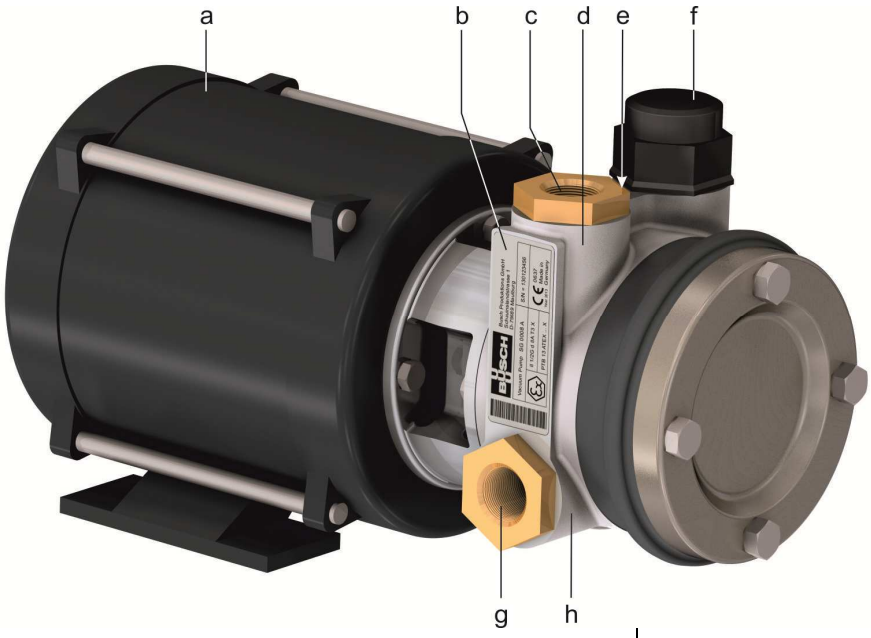
Prior to handling the vacuum pump these operating instructions shall be read and understood. If anything remains to be clarified please contact your Busch representative!

Keep these operating instructions and, if applicable, other pertinent operating instructions available on site.

Technical Data

Nominal suction capacity (50Hz, 20℃, 1013hPa)	m^3/h	7.8
Differential pressure	hPa (=mbar)	100 - 250
Power consumption (50Hz)	W	120
Motor speed (50Hz)	min^{-1}	3000
Sound pressure level* (DIN EN ISO 2151) (50Hz)	dB (A)	52
Ambient temperature range	℃	-30 ... 50
Max. temperatur of inlet gas	℃	50
Ambient pressure		Atmospheric pressure
ATEX-classification		Ex II 1/2G cd IIA T3 X II G IIA
Weight approx.	kg	~10

*as installed, piped



a Motor
b Nameplate, vacuum pump
c Suction connection
d Flame arrestor, suction side
e earthing connection
f Bypass valve
g Gas discharge
h Flame arrestor, discharge side

Product Description

Use

The vacuum pump is intended for

– the suction

of

– potentially explosive fuel-air mixtures according to the EC-Type-Examination Certificate.

Conveying media with a lower or higher density than air leads to an increased thermal and/or mechanical load on the vacuum pump and is permissible only after prior consultation with Busch.

Max. allowed temperature range of the inlet gas: -30 … 50 °C

The vacuum pump is thermally suitable for continuous operation (100 percent duty).

In case of intermittent operation (S3) observe the max. permissible number of startings per hour: 12

According to the directive 2014/34/EU the vacuum pump is made for the intended use in potentially explosive areas.

According to this directive the vacuum pump is inside a category 1 device (suitable for connection to tubings the inside of which is classified as zone 0). Outside the vacuum pump is approved as category 2 device (for use in zone 1).

According to the EC-Type-Examination Certificate issued by the German "Physikalisch-Technische Bundesanstalt" (PTB) the vacuum pump may be used for the conveyance of explosive atmospheres consisting of a mixture with air of flammable substances in the form of gas, provided that the material belongs to the temperature classes T1 to T3 and to the explosion groups IIA according to EN 13463–1.

The vacuum pump is suitable for placement in an environment where potentially explosive gas/air mixtures of flammable material with temperature class T1 to T3 are likely to occur in normal operation occasionally (zone 1).

Additionally the vacuum pump complies with the requirements of an autonomous protection system and can be used as flame arrestor between nozzle and storage tank.

The approval for use in potentially explosive atmospheres is valid for the vacuum pump together with the described measurement and safety equipment. The approval is void if the system is altered or if the scheduled maintenance is not complied with. Maintenance must be performed by specifically instructed personnel only.

Safety Concept

The safety concept for the vacuum pump Seco SG 0008 A for use in potentially explosive atmosphere as a category 1 device (inside) and category 2 device (outside) is based on two safety principles being independent from each other:

1. Avoidance of ignition caused by an electric or non-electric ignition source inside or outside the vacuum pump.

The drive motor is equipped with a motor protection relay, which protects the drive motor against thermal overload. After a cool down the motor starts self-acting. The drive motor must additionally be protected against overload of the vacuum pump by a motor safety switch.

In order to avoid an ignition an earthing connection (e) of the vacuum pump is intended additionally to the protective earth conductor of the drive motor.

2. Avoidance of hazards to persons and goods from the effects of an explosion that might happen inside the vacuum pump despite the mentioned safety precautions.

– Pressure proof design of the vacuum pump, capable of resisting an explosion without bursting.

– The suction connection and the gas discharge feature flame arrestors (d) (h), preventing flashbacks into the suction side and the discharge side of the system.

3. In case of using the vacuum pump as gas recovery pump between nozzle and storage tank the vacuum pump complies with the requirements of an autonomous protection system (flame arrestor) and avoids flame expansion from the direction of the nozzle through the vacuum pump to the neighbouring nozzle or storage tank of the petrol. To use the vacuum pump as an autonomous protection system, make sure that the following installation conditions will comply.

Max. permitted length of hoses or pipes between nozzle and suction connection thread G3/8 of the vacuum pump:

– by using a gas recovery hose with inner diameter ≤10 mm in coaxial hose: ≤6 m

– by using a pipe DN10 (≤12 mm): ≤3 m

Additionally it is allowed to install the following approved reservoirs between nozzle and gas recovery pump:

– snubber 250ml of the manufacturer Scheidt&Bachmann, No. 0582543 (documented in confidence test report PTB Ex 05-45017)

– Condensate separator of the manufacturer Fafnir, No. XO 013001 (documented in confidence test report PTB Ex 05-45027)

Observe the following installation conditions for reservoirs:

– distance of the reservoir to the gas recovery pump: 0,3 m to 2,5 m

– Min. length of the pipe between hose and reservoir: 0,5 m

Principle of Operation

The vacuum pump works on the rotating vane principle.

A circular rotor is positioned centrically on the shaft of the vacuum pump. The shaft of the vacuum pump is driven by the drive motor shaft by means of a flexible coupling.

The rotor rotates in an also circular, fixed cylinder, the centreline of which is offset from the centreline of the rotor such that the rotor and the inner wall of the cylinder almost touch along a line. Vanes, sliding in slots in the rotor, separate the space between the rotor and the cylinder into chambers. At any time gas is sucked in and at almost any time ejected. Therefore the vacuum pump works almost pulsation free.

By the bypass valve (f) a preset differential pressure on the suction side will not be exceeded.

The vacuum pump compresses the inlet gas absolutely oil-free. A lubrication of the pump chamber is neither necessary nor allowed.

Cooling

The vacuum pump is cooled by

– radiation of heat from the surface of the vacuum pump

– the process gas

Start Controls

The vacuum pump comes without start controls. The control of the vacuum pump is to be provided in the course of installation.

Safety

Intended Use

Definition: For the purpose of these instructions, “handling” the vacuum pump means the transport, storage, installation, commissioning, influence on operating conditions, maintenance, troubleshooting and overhaul of the vacuum.

The vacuum pump is intended for industrial use. It shall be handled only by qualified personnel.

The allowed media and operational limits (➔ page 3: Product Description) and the installation prerequisites (➔ page 5: Installation Prerequisites) of the vacuum pump shall be observed both by the manufacturer of the machinery into which the vacuum pump is to be incorporated and by the operator.

In particular the intended use in potentially explosive areas, i.e. either inside the vacuum pump or in its adjacency potentially explosive atmosphere can occur, requires that the vacuum pump is equipped accordingly and carries the Ex-mark and that the associated documentation acc. to the directive 2014/34/EU is available.

The maintenance instructions shall be observed.

Prior to handling the vacuum pump these installation and operating instructions shall be read and understood. If anything remains to be clarified please contact your Busch representative!

Safety Notes

The vacuum pump has been designed and manufactured according to state-of-the-art methods. Nevertheless, residual risks may remain. These operating instructions highlight potential hazards where appropriate. Safety notes are tagged with one of the keywords DANGER, WARNING and CAUTION as follows:

DANGER

Disregard of this safety note will always lead to accidents with fatal or serious injuries.

WARNING

Disregard of this safety note may lead to accidents with fatal or serious injuries.

CAUTION

Disregard of this safety note may lead to accidents with minor injuries or property damage.

Noise Emission

For the sound pressure level in free field according to EN ISO 2151 ➔ page 2: Technical Data.

Transport

Transport in Packaging

Vacuum pumps individually packed in cardboard boxes can be carried by hand.

Packed on a pallet the vacuum pump is to be transported with a forklift.

Transport without Packaging

In case the vacuum pump is packed in a cardboard box with inflated cushions:

♦ Remove the inflated cushions from the box

In case the vacuum pump is packed in a cardboard box cushioned with rolled corrugated cardboard:

♦ Remove the corrugated cardboard from the box

In case the vacuum pump is laid in foam:

♦ Remove the foam

- Grasp the vacuum pump with both hands
- Check the vacuum pump for transport damage

Note: Do not operate the vacuum pump in case of transport damage!

Storage

Short-term Storage

- Make sure that the suction connection and the gas discharge are closed (leave the provided plugs in)
- Store the vacuum pump

– If possible in original packaging,

– indoors,

– dry,

– dust free and

– vibration free.

Conservation

In case of adverse ambient conditions (e.g. aggressive atmosphere, frequent temperature changes) conserve the vacuum pump immediately. In case of favourable ambient conditions conserve the vacuum pump if a storage of more than 3 months is scheduled.

- Make sure that all ports are firmly closed; seal all ports that are not sealed with PTFE-tape, gaskets or o-rings with adhesive tape

Note: VCI stands for “volatile corrosion inhibitor”. VCI-products (film, paper, cardboard, foam) evaporate a substance that condenses in molecular thickness on the packed good and by its electro-chemical properties effectively suppresses corrosion on metallic surfaces. However, VCI-products may attack the surfaces of plastics and elastomers. Seek advice from your local packaging dealer! Busch uses CORTEC VCI 126 R film for the overseas packaging of large equipment.

- Wrap the vacuum pump in VCI film
- Store the vacuum pump

– If possible in original packaging,

– indoors,

– dry,

– dust free and

– vibration free.

For commissioning after conservation:

- Make sure that all remains of adhesive tape are removed from the ports
- Commission the vacuum pump as described in the chapter Installation and Commissioning (➔ page 5)

Installation and Commissioning

Installation Prerequisites

CAUTION

In case of non-compliance with the installation prerequisites, particularly in case of insufficient cooling:

Risk of damage or destruction of the vacuum pump and adjoining plant components!

Risk of injury!

The installation prerequisites must be complied with.

- Make sure that the integration of the vacuum pump is carried out such that the essential safety requirements of the Machine Directive 2006/42/EC are complied with (in the responsibility of the designer of the machinery into which the vacuum pump is to be incorporated; ➔ page 13: note in the EC-Declaration of Conformity)

Mounting Position and Space

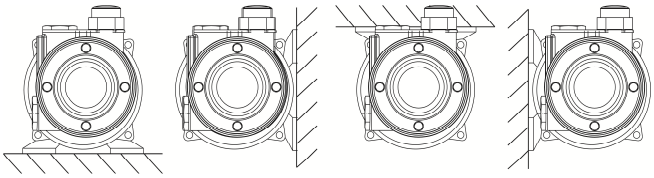
- Make sure that the following ambient conditions will be complied with:

– Ambient temperature range: -30 … +50 °C

– Ambient pressure: atmospheric

- Make sure that the environmental conditions comply with the protection class of the drive motor (IP54)

Note: The bypass valve must always be on top position, turn the motor of the vacuum pump if necessary (➔ figure).



- Make sure that the vacuum pump will be placed or mounted horizontally
- Make sure that the base for placement / mounting base is even
- Make sure that in order to warrant a sufficient cooling there will be a clearance of minimum 2 cm between the vacuum pump and nearby walls
- Make sure that the vacuum pump cannot be hit by falling or moving objects
- Make sure that no heat sensitive parts (plastics, wood, cardboard, paper, electronics) will touch the surface of the vacuum pump
- Make sure that the installation space or location is vented such that a sufficient cooling of the vacuum pump is warranted

CAUTION

During operation the surface of the vacuum pump may reach temperatures of more than 70 °C.

Risk of burns!

- Make sure that the vacuum pump will not be touched inadvertently during operation, provide a guard if appropriate

Suction Connection

CAUTION

Intruding foreign objects or liquids can destroy the vacuum pump.

In case the inlet gas can contain dust or other foreign solid particles:

♦ Make sure that a suitable filter (5 micron or less) is installed upstream the vacuum pump

♦ Make sure that the filter is sufficiently ATEX-qualified (electrically conductive, with equipotential bonding etc.)

- Make sure that the suction line fits to the suction connection (c) of the vacuum pump
- Make sure that the pipe will cause no stress on the vacuum pump’s connection, if necessary use an expansion joint
- Make sure that the line size of the suction line over the entire length is at least as large as the suction connection (c) of the vacuum pump

In case of very long and thin suction lines a loss of volume flow is possible. Seek advice from your Busch representative!

In case the vacuum pump is planned to be used for the suction of gas that contains limited quantities of condensable vapour or in case of risk of suction of liquids:

- ♦ Provide a shut-off valve, a drip-leg and a drain cock in the suction line, so that condensates can be drained from the suction line

- Make sure that the suction line does not contain foreign objects, e.g. welding scales

Gas Discharge

The discharged gas must flow without obstruction. It is not permitted to shut off or throttle the discharge line or to use it as a pressurised air source.
Max. permitted back pressure 0.1 mbar g.

WARNING

The vacuum pump is intended to convey potentially explosive gases/gas mixtures.

Risk of explosion in the discharge area!

The process gas/gas mixture must be disposed of such that no potentially explosive gas mixtures can accumulate in the discharge area.

- Make sure that the discharge line fits to the gas discharge (g) of the vacuum pump
- Make sure that the pipe will cause no stress on the vacuum pump's connection, if necessary use an expansion joint
- Make sure that the line size of the discharge line over the entire length is at least as large as the gas discharge of the vacuum pump

In case of very long and thin suction lines a loss of volume flow and an overload of the vacuum pump is possible. Seek advice from your Busch representative!

- Make sure that the discharge line either slopes away from the vacuum pump or provide a liquid separator or a drip leg with a drain cock, so that no liquids can back up into the vacuum pump

Electrical Connection / Controls

- Make sure that the stipulations acc. to the EMC-Directive 2004/108/EC and Low-Voltage-Directive 2006/95/EC as well as the EN-standards, electrical and occupational safety directives and the local or national regulations, respectively, are complied with (this is the responsibility of the designer of the machinery into which the vacuum pump is to be incorporated; ➔ page 13: note in the EC-Declaration of Conformity).
- Make sure that the power supply for the drive motor is compatible with the data on the nameplate of the drive motor
- Make sure that a motor safety switch (e.g. Eaton PKZM0-0,63) will be installed and adjusted to trip level I_R = Nominal current I_N
- Make sure that the drive of the vacuum pump will not be affected by electric or electromagnetic disturbance from the mains; if necessary seek advice from the Busch service
- Make sure that an earth point is available for connection to the earthing connection of the vacuum pump

All signal lines shall be executed with shielded cables according to EN 60079-14 or the equivalent national or local regulations.

Installation

Mounting

- Make sure that the installation prerequisites (➔ page 5) are complied with
- Set down or mount the vacuum pump at its location

Connecting Electrically

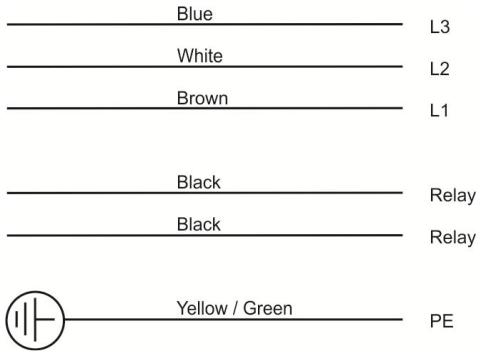
WARNING

Risk of electrical shock, risk of damage to equipment.

Electrical installation work must only be executed by qualified personnel that knows and observes the following regulations:
- IEC 364 or CENELEC HD 384 or DIN VDE 0100, respectively,
- IEC-Report 664 or DIN VDE 0110,
- BGV A2 (VBG 4) or corresponding national accident prevention regulation.

Connection Scheme Three-Phase Motor

- Electrically connect the drive motor



CAUTION

Operation in the wrong direction of rotation can destroy the vacuum pump in short time.

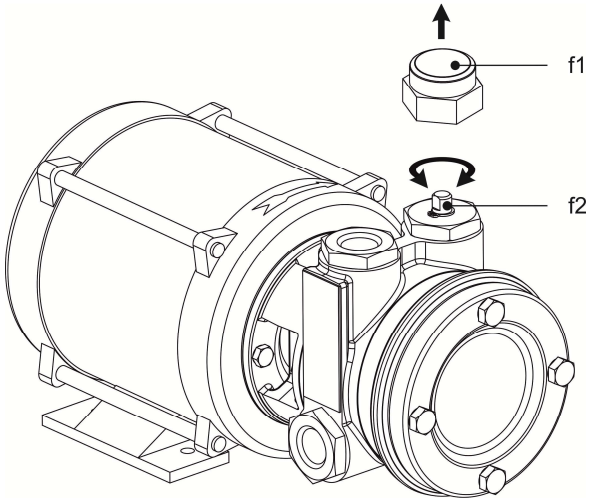
Risk of explosion!

Prior to starting-up it must be made sure that the vacuum pump is operated in the proper direction (clockwise rotating field).

- Determine the intended direction of rotation with the arrow (stuck on or cast)
- Connect the earthing connection (e) of the vacuum pump to the earth point with an earth cable

Adjusting the Bypass Valve

The difference pressure of the vacuum pump can be adjusted between 100 mbar and 250 mbar. Adjust the difference pressure as described below.



- Remove the cap (f1)
- Turn the bolt (f2) left to increase the difference pressure and turn the bolt (f2) right to reduce the difference pressure

Note: Do not use force to turn the bolt (f2). The rotation of the bolt (f2) is limited by a stopping mechanism.

- Close the bypass valve with the cap (f1)

Connecting Lines/Pipes

- Connect the suction line
- Connect the discharge line
- Check the pipe connections for possible leak

Recording of Operational Parameters

As soon as the vacuum pump is operated under normal operating conditions:

- Measure the drive motor current and record it as reference for future maintenance and troubleshooting work

Operating Notes

Use

WARNING

The vacuum pump is designed for operation under the conditions described below.

In case of disregard risk of explosion!

The vacuum pump must only be operated under the conditions described below.

WARNING

Operating a faulty vacuum pump puts the explosion safety at risk.

Risk of explosion!

The vacuum pump must only be operated in faultless condition. A faulty vacuum pump must immediately be removed from service.

The vacuum pump is intended for

– the suction

of

– potentially explosive fuel-air mixtures according to the EC-Type-Examination Certificate.

Conveying media with a lower or higher density than air leads to an increased thermal and/or mechanical load on the vacuum pump and is permissible only after prior consultation with Busch.

Max. allowed temperature range of the inlet gas: -30 … 50 ℃

The vacuum pump is thermally suitable for continuous operation (100 percent duty).

In case of intermittent operation (S3) observe the max. permissible number of startings per hour: 12

According to the directive 2014/34/EU the vacuum pump is made for the intended use in potentially explosive areas.

According to this directive the vacuum pump is inside a category 1 device (suitable for connection to tubings the inside of which is classified as zone 0). Outside the vacuum pump is approved as category 2 device (for use in zone 1).

According to the EC-Type-Examination Certificate issued by the German "Physikalisch-Technische Bundesanstalt" (PTB) the vacuum pump may be used for the conveyance of explosive atmospheres consisting of a mixture with air of flammable substances in the form of gas, provided that the material belongs to the temperature classes T1 to T3 and to the explosion groups IIA according to EN 13463–1.

The vacuum pump is suitable for placement in an environment where potentially explosive gas/air mixtures of flammable material with temperature class T1 to T3 are likely to occur in normal operation occasionally (zone 1).

The approval for use in potentially explosive atmospheres is valid for the vacuum pump together with the described measurement and safety equipment. The approval is void if the system is altered or if the scheduled maintenance is not complied with. Maintenance must be performed by specifically instructed personnel only.

CAUTION

During operation the surface of the vacuum pump may reach temperatures of more than 70 ℃.

Risk of burns!

The vacuum pump shall be protected against contact during operation, it shall cool down prior to a required contact or heat protection gloves shall be worn.

- Make sure that protective devices will not be disabled
- Make sure that the installation prerequisites (➔ page 5: Installation Prerequisites) are complied with and will remain complied with, particularly that a sufficient cooling will be ensured

Maintenance

WARNING

The approval of the vacuum pump for use in potentially explosive areas remains valid only if the maintenance is conducted regularly according to the maintenance schedule below and genuine spare parts and consumables, approved for use in potentially explosive areas by Busch, are used exclusively.

Maintenance work must be executed by qualified personnel, specially instructed in the maintenance of this type of vacuum pump by Busch.

DANGER

In case the vacuum pump conveyed gas that was contaminated with foreign materials which are dangerous to health, harmful material can reside in filters.

Danger to health during inspection, cleaning or replacement of filters.

Danger to the environment.

Personal protective equipment must be worn during the handling of contaminated filters.

Contaminated filters are special waste and must be disposed of separately in compliance with applicable regulations.

CAUTION

During operation the surface of the vacuum pump may reach temperatures of more than 70 °C.

Risk of burns!

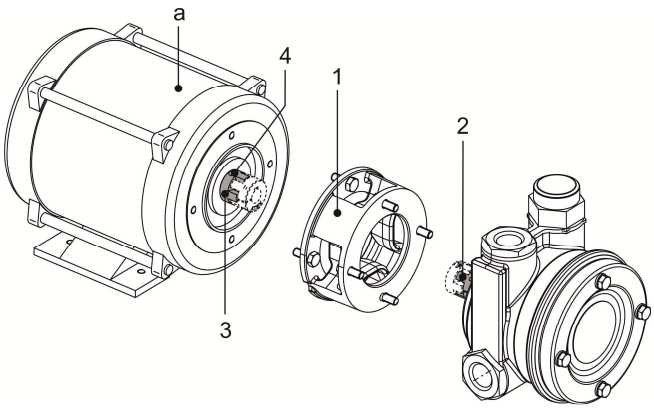
- Prior to disconnecting connections make sure that the connected pipes/lines are vented to atmospheric pressure

Maintenance Schedule

Note: The maintenance intervals depend very much on the individual operating conditions. The intervals given below are upper limits that must not be exceeded.
Particularly heavy duty operation, such like high dust loads in the environment or in the process gas, other contaminations or ingress of process material, can make it necessary to shorten the maintenance intervals significantly.

Every Year:

- Make sure that the vacuum pump is shut down and locked against inadvertent start up
- Make sure that the surface of the vacuum pump is free from dust and dirt, clean if necessary
- Blow out the drive motor lantern, ventilation slots and the coupling with pressurised air



- Remove the drive motor (a) from the motor lantern
- Remove the motor lantern (1)
- Clean the coupling hubs (2)(3) and the coupling element
- Check that the coupling hubs (2)(3) are firmly seated
- Check the coupling element for cracks and for a free of clearance seated, replace the complete coupling if necessary.

In case of replacing the coupling:

- ♦ Slide the new coupling hub (2) onto the shaft of the vaccum pump up to the stop
- ♦ Tighten the clamping screw (4) with Loctite 243 and tighten with 2 Nm
- ♦ Slide the new coupling hub (3) onto the motor shaft up to the stop
- ♦ Secure the clamping screw (4) with Loctite 243 and tighten with 2 Nm
- ♦ Insert the new coupling element

- Remount the motor lantern (1)
- Remount the drive motor (a)
- Check the electrical connection
- Make sure that the earth cable (cable between earth connection (e) of the vacuum pump and earth point) is undamaged (resistance check)

Every 5000 Operating Hours:

- Replace the vanes (➔ page 8: Replacement of Vanes)

Every 2 Years:

WARNING

The proper assembly of flame arrestors is essential for their safe function.

Risk of explosion in case of faulty assembly!

Flame arrestors must only be serviced by personnel that have received specific training for this purpose either by Busch or by the manufacturer of the flame arrestors.

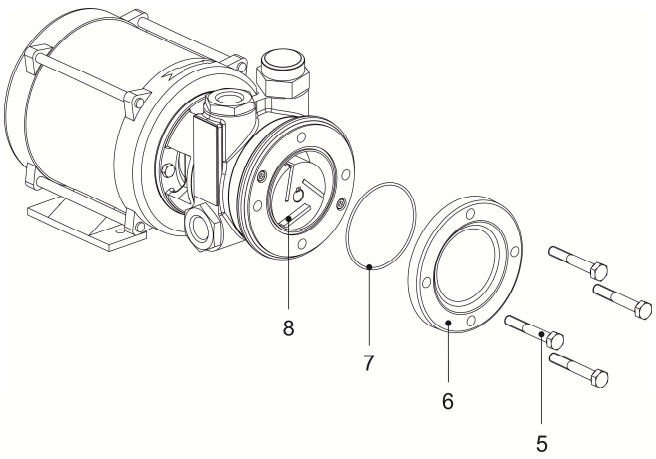
- Check and clean the flame arrestors (d)(h) - in case of discolouration or deformation consult Busch or the manufacturer of the flame arrestor in any case

Every 10000 Operating Hours, At the Latest after 5 Years:

- Have a major overhaul on the vacuum pump (Busch service)

Replacement of Vanes

- Make sure that the vacuum pump is shut down and locked against inadvertent start up



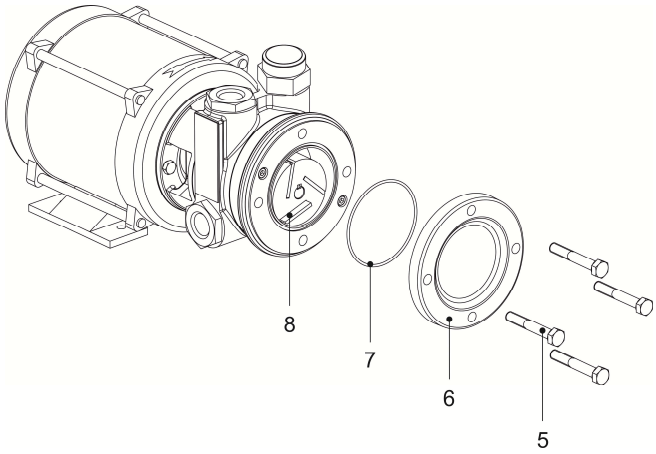
- Undo the four cylinder screws (5)
- Remove the cylinder cover (6) with o-ring (7)
- Remove the vanes (8)

CAUTION

The vanes (8) are self-lubricating.

The vanes must by no means be lubricated with oil or grease.

- Insert new vanes (8) as shown



- Make sure that the o-ring (7) is inserted and undamaged, replace if necessary
- Mount the cylinder cover (6)
- Tighten the cylinder screws (5) with 7 Nm

Overhaul

DANGER

Improper work on the vacuum pump puts the operating safety at risk.

Risk of explosion!

Approval for operation will be void!

Any dismantling of the vacuum pump that is beyond of what is described in this manual must be done by specially trained Busch service personnel only.

DANGER

In case the vacuum pump conveyed gas that was contaminated with foreign materials which are dangerous to health, harmful material can reside in pores, gaps and internal spaces of the vacuum pump.

Danger to health during dismantling of the vacuum pump.

Danger to the environment.

Prior to shipping the vacuum pump shall be decontaminated as good as possible and the contamination status shall be stated in a "Declaration of Contamination" (form downloadable from www.busch-vacuum.com).

Busch service will only accept vacuum pumps that come with a completely filled in and legally binding signed "Declaration of Contamination" (form downloadable from www.buschvacuum.com).

Removal from Service

Temporary Removal from Service

- Prior disconnecting pipes/lines make sure that all pipes/lines are vented to atmospheric pressure

Recommissioning

- Observe the chapter Installation and Commissioning (➔ page 5)

Dismantling and Disposal

DANGER

In case the vacuum pump conveyed gas that was contaminated with foreign materials which are dangerous to health, harmful material can reside in pores, gaps and internal spaces of the vacuum pump.

Danger to health during dismantling of the vacuum pump.

Danger to the environment.

During dismantling of the vacuum pump personal protective equipment must be worn.

The vacuum pump must be decontaminated prior to disposal.

- Make sure that materials and components to be treated as special waste have been separated from the vacuum pump
- Make sure that the vacuum pump is not contaminated with harmful foreign material

According to the best knowledge at the time of printing of this manual the materials used for the manufacture of the vacuum pump involve no risk.

- Dispose of the vacuum pump as scrap metal

Troubleshooting

WARNING

Vacuum pump for use in potentially explosive atmospheres.

Risk of explosion in case of operation of faulty equipment!

The vacuum pump must only be operated in faultless condition. A faulty vacuum pump must immediately be removed from service. In case of faults the cause of which cannot be determined the Busch service must be contacted.

WARNING

Vacuum pump for use in potentially explosive atmospheres.

Risk of explosion in case of operation of the vacuum pump after a thermal overload!

After switching off the vacuum pump by the motor protection relay or the motor safety switch caused by a thermal overload the coupling must be replaced.

WARNING

Risk of electrical shock, risk of damage to equipment.

Electrical installation work must only be executed by qualified personnel that knows and observes the following regulations:
- IEC 364 or CENELEC HD 384 or DIN VDE 0100, respectively,
- IEC-Report 664 or DIN VDE 0110,
- BGV A2 (VBG 4) or corresponding national accident prevention regulation.

CAUTION

During operation the surface of the vacuum pump may reach temperatures of more than 70 °C.

Risk of burns!

Let the vacuum pump cool down prior to a required contact or wear heat protection gloves.

Problem	Possible Cause	Remedy
The vacuum pump does not start	The drive motor and the motor protection relay are not properly connected	Check electrical connection of the drive motor and the motor protection relay
	The drive motor safety switch is too small or trip level is too low	Adjust the trip level of the motor safety switch to I_R = nominal current I_N
The vacuum pump does not reach the usual volume flow The drive motor draws a too high current (compare with initial value after commissioning) The motor protection relay trips	The vacuum pump runs in the wrong direction	Verification and rectification ➔ page 5: Installation and Commissioning
	Partial clogging in the suction or discharge line	Remove the clogging
	Flame arrestors on the suction side (d) or on the discharge side (h) are partially clogged	**WARNING**: Flame arrestors must only be cleaned by personnel that have received specific training for this purpose either by Busch. Clean the flame arrestors (d) (h)
	In case a filter is installed on the suction connection (c) The filter on the suction connection (c) is partially clogged	Clean or replace the inlet air filter
	Long suction or discharge line with too small diameter	Use larger diameter
	The vanes are worn	Replace the vanes

The vacuum pump is blocked	Solid foreign matter has entered the vacuum pump	Repair the vacuum pump (Busch service) Clean the suction line If necessary additionally provide a filter
	The vacuum pump was run in the wrong direction	Repair the vacuum pump (Busch service) When connecting the vacuum pump make sure the vacuum pump will run in the correct direction (➔ page 6 Installation)
The drive motor is running, but the vacuum pump stands still	The coupling between the drive motor and the vacuum pump is defective	Replace the coupling element (Busch service)
The vacuum pump runs very hot (thermal protection switch triggers)	Insufficient air ventilation	Make sure that the cooling of the vacuum pump is not impeded by dust/dirt Install the vacuum pump in a narrow space only if sufficient ventilation is ensured
	Ambient temperature too high	Observe the permitted ambient temperatures
	Temperature of the inlet gas too high	Observe the permitted temperatures for the inlet gas

Spare Parts

Note: When ordering spare parts or accessories acc. to the table below please always quote the type (“Type”) and the serial no. (“No”) of the vacuum pump. This will allow Busch service to check if the vacuum pump is compatible with a modified or improved part.

The exclusive use of the genuine spare parts and consumables is a prerequisite for the proper function of the vacuum pump and for the granting of warranty, guarantee or goodwill.

Your point of contact for service and spare parts in the United Kingdom:

Busch (UK) Ltd.
Hortonwood 30-35
Telford
Shropshire
TF1 7YB
Tel: 01952 677 432
Fax: 01952 677 423

Your point of contact for service and spare parts in Ireland:

Busch Ireland Ltd.
A10-11 Howth Junction Business Centre
Kilbarrack, Dublin 5
Tel: +353 (0)1 8321466
Fax: +353 (0)1 8321470

Your point of contact for service and spare parts in the USA:

Busch Inc.
516-B Viking Drive
Virginia Beach, VA 23452
Tel: 1-800-USA-PUMP (872-7867)

Your point of contact for service and spare parts in Canada:

Busch Vacuum Technics Inc.
1740, Boulevard Lionel Bertrand
Boisbriand (Montréal)
Québec J7H 1N7
Tel: 450 435 6899
Fax: 450 430 5132

Your point of contact for service and spare parts in Australia:

Busch Australia Pty. Ltd.
30 Lakeside Drive
Broadmeadows, Vic. 3047
Tel: (03) 93 55 06 00
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Your point of contact for service and spare parts in New Zealand:

Busch New Zealand Ltd.
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Find the list of Busch companies all over the world (by the time of the publication of these installation and operating instructions) on ➔ page 20 (rear cover page).

Find the up-to-date list of Busch companies and agencies all over the world on the internet at **www.buschvacuum.com**.

Pos.	Part	Qty	Part no.
-	Vanes	3	0722 162 513
-	O-ring between cylinder cover and cylinder	1	0486 000 636
-	Cap	1	0851 161 916
-	Flame arrestors (suction and discharge side)	1	0947 160 352
	Coupling, complete	1	0510 166 701

EU-Declaration of Conformity

Note: This Declaration of Conformity and the CE-mark affixed to the nameplate are valid for the vacuum pump within the Busch-scope of delivery. When this vacuum pump is integrated into a superordinate machinery the manufacturer of the superordinate machinery (this can be the operating company, too) must be conduct the conformity assessment process acc. to the Directive Machinery 2006/42/EC for the superordinate machine, issue the Declaration of Conformity for it and affix the CE-mark.

We

Busch Produktions GmbH
Schauinslandstr. 1
79689 Maulburg
Germany

Declare that the vacuum pumps **SG 0008 A**

In accordance with the European Directives:

- "ATEX" 2014/34/EU for use in potentially explosive areas acc. to the nameplate,
- "Machinery" 2006/42/EC,
- "Electromagnetic Compatibility" 2004/108/EC,
- "Restriction of the use of certain hazardous substances in electrical and electronic equipment" ("RoHS") 2002/95/EC

have been designed and manufactured to the following specifications:

Standard	Title of the Standard
Harmonised Standards	
EN ISO 12100	Safety of machinery –General principles for design –Risk assessment and risk reduction
EN ISO 13857	Safety of machinery - Safety distances to prevent hazard zones being reached by the upper and lower limbs
EN 1012-1 EN 1012-2	Compressors and vacuum pumps - Safety requirements - Part 1 and 2
EN ISO 2151	Acoustics - Noise test code for compressors and vacuum pumps - Engineering method (grade 2)
EN 60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 61000-6-1 EN 61000-6-2	Electromagnetic compatibility (EMC) - Generic immunity standards
EN 61000-6-3 EN 61000-6-4	Electromagnetic compatibility (EMC) - Generic immunity standards
EN 60079-1	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
EN 13463-1	Non-electrical equipment for potentially explosive atmospheres - Part 1: Basic methodology and requirements
EN 13463-3	Non-electrical equipment for potentially explosive atmospheres - Part 3: Protection by flame proof enclosure "d"
EN 13463-5	Non-electrical equipment intended for use in potentially explosive atmospheres - Part 5: Protection by constructional safety 'c'
EN 1127-1	Explosives atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology
EN ISO 16852	Flame arresters - Performance requirements, test methods and limits for use

Manufacturer	Person authorized to compile the technical file
Dr.-Ing. Karl Busch General Director	**Andrej Riwe** Technical writer

Maulburg, 02.09.2016

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

(1) # EC-TYPE-EXAMINATION CERTIFICATE

(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**

(3) EC-type-examination Certificate Number:

PTB 14 ATEX 4004

(4) Equipment: Rotary vane vacuum pump, type "SG 0008 A"

(5) Manufacturer: Busch Produktions GmbH

(6) Address: Schauinslandstraße 1, 79689 Maulburg, Germany

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential test report PTB Ex 14-44017.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 13463-1:2009, EN 13463-3:2005, EN 13463-5:2011, EN 60079-1:2008, EN 16852:2010

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

II 1/2 G dc IIA T3 X

ZSEx10100e.dotm

Konformitätsbewertungsstelle, Sektor Explosionsschutz Braunschweig, November 21, 2014
On behalf of PTB:

Dr.-Ing. D.-H. Frobese
Oberregierungsrat

(13) # SCHEDULE

(14) ## EC-TYPE-EXAMINATION CERTIFICATE PTB 14 ATEX 4004

(15) Description of equipment

The vacuum pumps, type "SG 0008 A" are rotary vane pumps with integrated flame arresters at their intake and outlet ends. They are to extract potentially explosive fuel vapour / air mixtures in vapour recovery systems of filling station dispensing elements. The operation of the rotary vane vacuum pumps is intermittent.

The vacuum pump uses the rotary vane principle for operation. The circular rotor is driven by an electric motor and is arranged inside an equally circular cylinder, so the rotor axis is staggered in relation to the cylinder axis, and the rotor and the cylinder nearly touch on one side. Vanes that are movably supported in slots in the rotor are forced to the outside by the centrifugal force that results from the rotary movement of the rotor. When they slide along the inside wall of the cylinder, the space between the rotor and the cylinder is separated into compartments. As a result of the rotary movement, the compartments become larger with every half turn, and they become smaller again with the next half turn. These cyclic changes in the compartment size produces the alternating suction and pressure effect in the compartment. The conveyed gas is sucked in and discharged again through inlet and outlet openings. Since the pump delivery is near-constant, the vacuum pump operates virtually without pulsation.

A bypass valve inside the vacuum pump ensures that the mixture can flow back from the delivery side to the suction side, should the flow of the medium be blocked on the delivery side and the set delivery pressure be exceeded. This is to prevent the pressure from rising beyond an allowable limit.

The inlet and the outlet of the "SG 0008 A" vacuum pump are each provided with an integrated flame arrestor. The flame arrestor is of the ribbon type and consists of a corrugated and a smooth ribbon made from stainless steel. Both ribbons are 10 mm wide and 0.2 mm thick and are rolled up to form tightly packed spiral layers. The vapour-air mixtures can pass through the triangular ducts with a maximum height of 0.7 mm that are thus created, while flashback is to be prevented.

The "SG 008 A" vacuum pump is driven by an electric motor, type "YBB700B", produced by Tianjin Sida Electric Motor Co., Ltd., EC Type Examination Certificate No. LCIE14ATEX3031X.

The "SG 0008 A" vacuum pumps form a closed coupled system with their driving motor, with a coupling element provided between the motor shaft and the crank shaft of the pump. The housing between the motor and the vacuum pump has gaps that ensure that the space between the vacuum pump and the motor will always be adequately ventilated.

The pump is rated for a maximum differential pressure of 250 mbar; on the suction side, the pressure can be between 0.75 bar (abs.) and ambient pressure. An internal overflow protection ensures that the maximum operating pressure on the discharge side will not exceed 1.35 bar (based on an ambient pressure of 1.1 bar), even if the pipeline should be blocked.

Requirements for explosion protection:

Category 1: internal parts of the piping connections in the suction and delivery branch of the "SG 0008 A" vacuum pump

Category 2: External parts of the "SG 0008 A" vacuum pump (pump casing, driving motor)

(16) Test Report PTB Ex 14-44017

Result: The vacuum pump, type "SG 0008 A" meets the requirements of Directive 94/9/EC for equipment of equipment group II, category 1/2 G (as specified in section 2, inside the connected pipelines of category 1G and to the surrounding atmosphere of category 2G).

(17) Special conditions for safe use

No conditions

Notes for manufacturing and operation

The "SG 0008 A" vacuum pumps may only be used in vapour recovery systems of filling stations as vapour recovery pumps for extracting fuel vapour / air mixtures.

The ambient temperature and the temperature of the fuel vapour / air mixture that is taken in must remain within the temperature range -30 °C to +50 °C at the intake end.

In addition, the "SG 0008 A" vacuum pumps must meet the following special conditions in the outlet pipe:

- Temperature of the volume flow of the mixture: max. 130 °C
- Operating gauge pressure in comparison with the atmosphere: max. 250 mbar (250 hPa)

(18) Essential health and safety requirements

The fundamental requirements of Directive 94/9/EC are complied with.

Konformitätsbewertungsstelle, Sektor Explosionsschutz — Braunschweig, November 21, 2014
On behalf of PTB:

Dr.-Ing. D.-H. Frobese
Oberregierungsrat

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

1. SUPPLEMENT

according to Directive 94/9/EC Annex III.6

to EC-TYPE-EXAMINATION CERTIFICATE PTB 14 ATEX 4004

(Translation)

Equipment: Rotary vane vacuum pump, type SG 0008 A

Marking: **II 1/2 G cd IIA T3 X**

Manufacturer: Busch Produktions GmbH

Address: Schauinslandstraße 1, 79689 Maulburg, Germany

Description of supplements and modifications

The rotary vane vacuum pump is subjected to the following modifications:

- The shaft of the vacuum pump is fabricated from a different kind of material.
- A different kind of material is used in the coupling and the elastomeric element.

Applied standards

EN 13463-1:2009, EN 13463-5:2011, EN 13463-6:2005, EN 13463-8:2003, EN 60079-1:2008, EN 16852:2010

Test Report: PTB Ex 15-45006 (consisting of 3 pages and 6 annexes)

Result: The modifications of the "SG 0008 A" rotary vane vacuum pump do not affect the safety against explosion of the pump. The "SG 0008 A" rotary vane vacuum pump meets the requirements of Directive 94/9/EC for equipment of equipment group II, category 1/2 G (for the inside the connected pipelines of category 1G and to the surrounding atmosphere of category 2G).

Special conditions

No special conditions

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Notes for manufacturing and operation

The "SG 0008 A" rotary vane vacuum pumps may only be used in vapour recovery systems of filling stations as vapour recovery pumps for extracting fuel vapour / air mixtures.

The ambient temperature and the temperature of the fuel vapour / air mixture that is taken in must remain within the temperature range -30 °C to +50 °C at the intake end.

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

1. SUPPLEMENT TO EC-TYPE-EXAMINATION CERTIFICATE PTB 14 ATEX 4004

In addition, the "SG 0008 A" vacuum pumps must meet the following special conditions in the outlet pipe:

- Temperature of the volume flow of the mixture: max. 130 °C
- Operating gauge pressure in comparison with the atmosphere: max. 250 mbar (250 hPa)

The "SG 0008 A" rotary vane vacuum pump must not be used as an autonomous protective system when ignitions take place at the filler nozzle.

Konformitätsbewertungsstelle, Sektor Explosionsschutz
On behalf of PTB:

Braunschweig, June 22, 2015

Dr.-Ing. M. Beyer
Direktor und Professor

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

2nd S U P P L E M E N T

according to Directive 94/9/EC Annex III.6

to EC-TYPE-EXAMINATION CERTIFICATE PTB 14 ATEX 4004

(Translation)

Equipment: Vapour recovery pump, type SG 0008 A

Marking: Ⓔx **II 1/2 G c d IIA T3 X**

Manufacturer: Busch Produktions GmbH

Address: Schauinslandstraße 1, 79689 Maulburg, Germany

Description of supplements and modifications

The rotary vane vacuum pumps, type SG 0008 A, are to also serve as an autonomous protection system as specified in EN 16852:2010, and to prevent flames from flashing back from the filler nozzle and into the storage tank.

Applied standards

EN 13463-1:2009, EN 13463-3:2005, EN 13463-5:2011, EN 60079-1:2014, EN 16852:2010

Test Report PTB Ex 16-46005

Result

The rotary vane vacuum pumps, type SG 0008 A, can be installed and operated in potentially explosive zone-1 areas and be used for pumping flammable gases and vapours from potentially explosive zone-0 areas (gases and vapours of explosion group IIA in accordance with EN 13463-1:2009 and temperature classes T1 to T3 in accordance with EN 13463-1:2009).

The rotary vane vacuum pumps, type SG 0008 A, with a connection size G3/8 can be used as flame arresters in vapour recovery systems of filling stations in order to prevent flashback, should potentially explosive vapour/air mixtures of explosion group IIA deflagrate or detonate when the medium ignites at the filler nozzle.

ZSEx10101e b

Konformitätsbewertungsstelle, Sektor Explosionsschutz Braunschweig, April 14, 2016
On behalf of PTB:

Dr.-Ing. M. Beyer
Direktor und Professor

Sheet 1/1

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