Blackmer®

ATEX MANUAL
S Series Twin Screw Pumps

Where Innovation Flows

Guidelines and regulations for use in potentially explosive atmospheres
Explosion protection according to the 2014/34/EU directive

Store for use at later date

PSG®
a DOVER company

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ATEX Manual

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S Series
Screw Pumps
- Twin Screw

Blackmer®

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1 General notes on this ATEX Manual

This ATEX Manual is only valid in connection with the Operating Manual for the Blackmer S Series Twin Screw Pumps and the relevant documentation listed there.

1.1 Purpose of the 2014/34/EU directive

ATEX = **AT**mosphères **EX**plosives

— Explosion protection based on the 2014/34/EU directive

The 2014/34/E directive for non-electrical equipment in potentially explosive atmospheres has been valid since April 20th, 2016.

The directive applies to potentially explosive atmospheres under atmospheric conditions up to +60°C.

1.2 Definition of terms

Manufacturer:	PSG (Tianjin) Co., Ltd.
User:	Any natural person or legal entity that uses the screw pump, or on behalf of whom the screw pump is used.
Screw Pump:	Screw pump from this manufacturer.
Manual:	The ATEX Manual from this manufacturer.
Operating manual:	The operating manual for a Screw Pump from the manufacturer.
Order confirmation:	The order confirmation for a Screw Pump from the manufacturer.

1.3 Validity of this ATEX Manual

The information in this ATEX Manual applies to the following Screw Pump from the manufacturer:

Twin Screw

1.4 Symbols, Abbreviations

No.	Symbol	Meaning
1	☐	Check box for check lists, can be checked
2	1, 2, ...	Sequence of steps (operating steps), Instruction: keep to the step sequence
3	➢	Instructions relating to safety labels
4	•	List with actions to be performed
5	–	List without actions

Table 1.1 Symbols

Abbreviations are explained as they occur.

2 Safety

2.1 Proper Use

- Proper use of the Screw Pump: please refer to operating manual for the Screw Pump.

  The assignment of the Screw Pump to a specific category or temperature class only applies if the Screw Pump is operated within the limits defined in the operating manual and order confirmation.
- If the user is not in possession of the operating manual and/or order confirmation, these must be obtained from the manufacturer.

2.2 Responsibility

2.2.1 Obligations of the Manufacturer

- PSG will acquire the design data from the user. The data will be subsequently checked and recorded in the order confirmation.
- PSG will provide all the relevant information needed for the user to check the correct usage.

2.2.2 Obligations of the user

- The user is responsible for ensuring the Screw Pump is only used as defined in the operating manual and order confirmation.
- All information contained in this ATEX manual and the operating manual must be adhered to.
- Only use screw pumps in accordance with explosion protection class.
- Screw Pump must be earthed.
- Avoid dry running. Only operate screw pump with pumping medium, do not operate without pumping medium.
- Screw Pump with magnetic couplings must not pump medium containing ferritic additives.
- Make sure the maximum permissible surface temperature of the Screw Pump is not exceeded.
- Protective covers must not come into contact with moving parts.
- Regularly check and service the Screw Pump.
- Only use original spare parts manufactured, delivered by the producer.

2.3 Indication of Hazard

2.3.1 How hazards are indicated

Hazards are indicated in this ATEX manual in the following manner:

Signal word field with safety alert symbol, signal word and signal color
Text field – Type of hazard and hazard source. – Consequences of ignoring hazard. ➢ Measures to be taken to avoid hazard.

2.3.2 Warning regarding personal injury, property damage and environmental damage

DANGER
– Signal color: red – Signal word **DANGER** indicates an **imminent hazard**. – Consequences of ignoring hazard: death or serious injury as a result of explosion.

3 Hazard Analysis and Assignment

3.1 Hazard Analysis

Screw Pump are pieces of equipment which are potential sources of explosion. Possible sources of explosion with the manufacturer's screw pumps are:

– hot surfaces – mechanical formation of sparks – electrostatic charging

To evaluate the risks of explosion, the manufacturer has undertaken a risk analysis of the Screw Pump. During the analysis the following standards were consulted:

– EN 13463-1: 2009 – EN 13463-5: 2011 – EN 13463-8: 2003

3.2 Assignment of zones and evaluation of explosion risk

The Twin and Triple Screw pumps have been assigned to equipment category II					
Category 3		**Category 2**		**Category 1**	
3 G gasses, vapours	**3 D** dust	**2 G** gasses, vapours	**2 D** dust	1 G gasses, vapours	1 D dust
Zone Z2	Zone Z22	Zone Z1	Zone Z21	Zone Z0	Zone Z20
For equipment which guarantees **normal levels** of safety. For use in situations where an explosive atmosphere is unlikely to develop and, if it does, most likely only for a short period of time.		For equipment which guarantees **high levels** of safety. For use in situations where an explosive atmosphere is likely to develop.		For equipment which guarantees **very high levels** of safety. **Screw pumps from PSG may not be used in zones Z0 and Z20.**	

Table 3.1 Assignment of zones and evaluation of explosion risk

The Twin Screw pumps have been assigned to equipment category 2 and 3; depending on the application they can be used in zones 1, 21, 2 and 22.

3.3 Temperature classes

3.3.1 Screw Pump

The maximum permissible surface temperature of a screw pump depends primarily on the temperature of the pumping medium used.

Temperature class	**Ignition temperature**	**Maximum permissible surface temperature in continuous operation**					
		Gasses (G)			**Dust (D)**		
		Z2 ≙ 3G normal operation	**Z1 ≙ 2G** malfunction expected	**Z0 ≙ 1G** malfunction unlikey	**Z22 ≙3D**	**Z21 ≙ 2D**	**Z20 ≙ 1D**
T1	> **450°C**	440°C (450°C)	360°C (450°C)	cannot be used	300°C	300°C	cannot be used
T2	> **300°C**	290°C (300°C)	240°C (300°C)		200°C	200°C	
T3	> **200°C**	195°C (200°C)	160°C (200°C)		133°C	133°C	
T4	> **135°C**	130°C (135°C)	108°C (135°C)		90°C	90°C	
* Safety leeway of 75°C if a dust layer (glimmer) exists; values in (...) = short-term							

Table 3.2 Maximum permissible surface temperature and temperature classes

Depending on the temperature of pumping medium and type of seal used, the Twin Screw Pumps can be used in the zones marked gray and in the temperature classes T1 to T4. The order confirmation contains information about which temperature class each screw pump has been assigned to.

- If the user is not in possession of the order confirmation, it must be obtained from the manufacturer.

3.3.2 Maximum temperature of pumping medium for shaft seals and other components

Category	Temperature class	Screw Pump	Double mechanical seal	External bearing, long shaft, single mechanical seal	External bearing, Medium shaft, single mechanical seal	Internal bearing, single mechanical seal
2G	T1	320	320	180	150	100
	T2	200	200	180	150	100
	T3	120	120	120	120	100
	T4	68	68	68	68	68
3G	T1	400	320	180	150	100
	T2	250	250	180	150	100
	T3	155	155	155	150	100
	T4	90	90	90	90	90

Table 3.3 Temperature classes and maximum pumping medium temperature for shaft seals

This table can be used to determine the maximum permissible pumping medium temperature for a given category, defined temperature class and selected shaft seal. The lowest temperature for any given combination of Screw Pump and shaft seal must be observed.

- Please read the information provided by ATEX in the operating manual for other components such as sealing unit, seal medium container etc..

DANGER

Formation of sparks due to damaged screw pump.
The maximum pumping medium temperatures listed in the table do not apply to all plain bearing and shaft combinations; the table is only provides a guideline.

3.3.3 Flat seals, O-rings and oil seals

For information about the temperature stability of the integrated flat seals, O-rings and oil seals, please refer to 5.1 *Tolerance list for flat seals, O-rings and oil seals*.
If the operating temperature is not specified during ordering, the screw pump is provided with O-rings from NBR.

3.3.4 Permissible temperature difference ΔT between pumping medium and housing

If the temperature difference ΔT between the pumping medium and screw pump is too high, the radial play of the screws and casing/liner will be blocked causing damage to the Screw Pump.

$\Delta T = T_{\text{pumping medium suction side}} - T_{\text{housing screw pump}}$

Permissible temperature difference before starting and while operating the Screw Pump:

$\Delta T_{max.} = 10°C$

DANGER

Formation of sparks due to damaged screw pump.
The temperature difference between the pumping medium and housing must not exceed the maximum permissible
value of ΔT.

3.4 Explosion protection class

No.	Standard	Method	Code
1	EN 13463-1	Basic method and requirements	
2	EN 13463-2	Protection by flow restricting enclosure	**fr**
3	EN 13463-3	Protection by flameproof enclosure	**d**
4	EN 13463-4	Protection by inherent safety	**g**
5	EN 13463-5	Protection by constructional safety	**c**
6	EN 13463-6	Protection by control of ignition source	**b**
7	EN 13463-7	Protection by pressurization	**p**
8	EN 13463-8	Protection by liquid immersion	**k**

Table 3.5 Explosion protection class

Depending on application and category (zone), the Twin Screw Pumps have been assigned to the explosion protection classes, **c** or **k**, marked gray in the table.

3.5 Pumping media with ferritic additives

DANGER

Formation of sparks due to damaged Screw Pump.
Screw Pump with magnetic couplings must not pump medium containing ferritic additives.

4 Labeling in the Potentially Explosive Atmosphere

The name plate for screw pumps from PSG lists the following information:

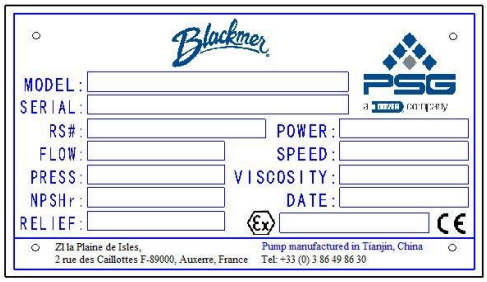

Fig. 4.1 Name plate for Screw Pump labeling
for potentially explosive atmosphere (example)

The name plate of a screw pump in a potentially explosive atmosphere lists the following information:

	II	2	G	c	T*X*
1	2	3	4	5	6

Explosion protection labeling for external bearings structure (such as 2HM, 2HR, 2VM, 2HC, etc series) on the Screw Pump (example)

1 Specific marking of explosion protection (ATEX only)
2 Equipment group
3 Equipment category (2 for zone 1 and 2)
4 Type of explosive atmosphere: G = gases, vapors or mists
5 Protection concept: c = Constructional safety
6 Temperature classes (see Item 3.3.1)

	II	2	G	ck	T*X*
1	2	3	4	5	6

Explosion protection labeling for internal bearings structure (such as 2HE, 2VE, 2HCE, etc series) on the Screw Pump (example)

1 Specific marking of explosion protection (ATEX only)
2 Equipment group
3 Equipment category (2 for zone 1 and 2)
4 Type of explosive atmosphere: G = gases, vapors or mists
5 Protection concept: c = Constructional safety, k = Liquid immersion
6 Temperature classes (see Item 3.3.1)

The Twin Screw Pumps from Blackmer S Series use the following labeling:

II 2 G c T*X*

II 2 G ck T*X*

5 Electronic Safety Standards

5.1 Monitoring of temperature

If magnetic coupling is used, the following temperature must be measured and monitored:

No.	Item	Unit	Where (to measure)
1	$T_{magnetic\ coupling}$	°C	on the containment shell of the magnetic coupling
T = temperature			

Table 5.1 Monitoring of temperature

5.2 Automatic shutdown

5.2.1 Definition

Shutdown = emergency shutdown of Screw Pump motor and plant

5.2.2 Shutdown

If a magnetic coupling is used, shutdown is required as described below:

No.	Item	Shutdown value	Function
While starting and operating the screw pump			
1	$T_{magnetic\ coupling}$	≥ HH	shutdown
HH = high high = shutdown value, see 5.2.3 *Shut-off values*			

Table 5.2 Shutdown

5.2.3 Shutdown values

Tempera-ture class	Ignition tempera-ture	Shutdown value HH $T_{magnetic\ coupling}$					
		Gasses (G)			Dust (D)		
		Z2	Z1	Z0	Z22	Z21	Z20
		3G	2G	1G	3D	2D	1D
T1	> **450 °C**	300°C	300°C	NA [1)]	300°C		NA [1)]
T2	> **300 °C**	290°C	240°C		200°C		
T3	> **200 °C**	195°C	160°C		125 °C		
T4	> **135 °C**	130°C	108°C		65 °C		
	Gray cells = maximum temperature depending on the material properties						
[1)] NA = not allowed: Screw Pump from PSG may not be used in zones Z0 and Z20.							

Table 5.3 Shutdown values

6 Regulations for Potentially Explosive Atmospheres

6.1 Tolerance list for flat seals, O-rings and oil seals

The sealing materials in your Screw Pump can be ascertained from the parts list delivered with Screw Pump. The standard materials which we use are listed below.

- If the user is not in possession of the parts list, it must be obtained from the manufacturer

6.1.1 Tolerance list for non-asbestos flat seals according to manufacturer's data

The parts inside the Screw Pump can be adversely affected by solvents. Before cleaning the screw pump, the user must check whether the non-asbestos flat seal will be damaged by the cleaning agent.

Solvent, cleaning agent	Suitability	Solvent, cleaning agent	Suitability
Acetone	X	Methyl alcohol	1
Acryl nitrile	1	Naphtha	2
Ethyl acrylate	1	Pentane	X
Alcohols	1	Petrol	1
Amyl alcohol	1	Phenol	X
Benzen	3	Propylalcohol	1
Butyl acetate	2	Propylene glycol	1
Cyclo hexane	2	Pyridine	X
Cyclo hexanone	X	Carbon disulfide	1
Diethylene glycol	1	Turpentine	X
Dibenzyl ether	X	Tetraline	X
Dimethylformamide	2	Toluene	X
Dioxan	2	Trichloroethane	X
Glycerin	1	Vinyl acetate	3
Methanol	1	Xylon	1
1 excellent suitability; **2** good suitability; **3** moderate suitability; **X** intolerant, cannot be recommended			

Table 6.1 Solvents and cleaning agents

Important Information

The table contents are based on data delivered by the manufacturers of the raw materials. The list is not conclusive. The values relate solely to laboratory test with the raw materials. Parts which contain these materials are often subject to influences which cannot be covered by the laboratory tests. The given values are hence guidelines only.

The temperature durability of the non-asbestos flat seals (CPS 5220) is 250℃. The limits applicable during use depend on the combination of the medium, pressure and temperature.

6.1.2 Tolerance list for O-rings and oil seals, according to manufacturer's data

Before cleaning the screw pump, the user must check whether the Viton O-rings and oil seals will be damaged by the cleaning agent.

Solvent, cleaning agent	Suitability	Solvent, cleaning agent	Suitability
Acetone	X	Methyl alcohol	1
Acryl nitrile	2	Naphtha	1
Ethyl acrylate	X	Pentane	1
Alcohols	1	Petrol	1
Amyl alcohol	1	Phenol	3
Benzene	1	Propylalcohol	1
Butyl acetate	X	Propylene glycol	1
Cyclo hexane	1	Pyridine	1
Cyclo hexanone	X	Carbon disulfide	1

Diethylene glycol	1	Turpentine	1
Dibenzyl ether	1	Tetraline	1
Dimethylformamide	X	Toluene	1
Dioxan	X	Trichloroethane	1
Glycerin	3	Vinyl acetate	2
Methanol	X	Xylon	2
1 excellent suitability; **2** good suitability; **3** moderate suitability; **X** intolerant, cannot be recommended			

Table 6.2 Solvents and cleaning agents

Important Information
The table contents are based on data supplied the manufacturers of the raw materials. The list is not conclusive. The values relate solely to laboratory tests with the raw materials. Parts which contain these materials are often subject to influences which cannot be covered by the laboratory tests. Hence, the values shown are only guidelines.

The temperature durability of the Viton O-rings is 180°C. The limits applicable during use depend on the combination of the medium, pressure and temperature.
If using other O-rings materials for which the data deviates from that in the order confirmation, please contact PSG Auxerre - Mouvex or a sealant specialist in order to confirm its durability.

6.1.3 Tolerance list for O-rings and oil seals, according to manufacturer's data

Before cleaning the screw pump, the user must check whether the NBR O-rings and oil seals will be damaged by the cleaning agent.

Solvent, cleaning agent	**Suitability**	**Solvent, cleaning agent**	**Suitability**
Acetone	X	Methyl alcohol	2
Acryl nitrile	X	Naphtha	2
Ethyl acrylate	X	Pentane	1
Alcohols	1	Petrol	1
Amyl alcohol	2	Phenol	X
Benzene	X	Propylalcohol	2
Butyl acetate	X	Propylene glycol	1
Cyclo hexane	1	Pyridine	X
Cyclo hexanone	X	Carbon disulfide	X
Diethylene glycol	1	Turpentine	1
Dibenzyl ether	X	Tetraline	X
Dimethylformamide	2	Toluene	X
Dioxan	X	Trichloroethane	X
Glycerin	1	Vinyl acetate	X
Methanol	2	Xylon	X
1 excellent suitability; **2** good suitability; **3** moderate suitability; **X** intolerant, cannot be recommended			

Table 6.3 Solvents and cleaning agents

Important Information
The table contents are based on data supplied the manufacturers of the raw materials. The list is not conclusive. The values relate solely to laboratory tests with the raw materials. Parts which contain these materials are often subject to influences which cannot be covered by the laboratory tests. Hence, the values shown are only guidelines.

The temperature durability of the NBR O-rings is 100°C. The limits applicable during use depend on the combination of the medium, pressure and temperature.
If using other O-rings materials for which the data deviates from that in the order confirmation, please contact PSG Auxerre - Mouvex or a sealant specialist in order to confirm its durability.

6.2 Installation in the system

DANGER

Failure to comply with these regulations may result in an explosion causing serious injury or putting people's lives at risk.

- On installing the Screw Pump it must be checked that no explosive atmosphere exists.
- First inspect the Screw Pump to check it has not been damaged during transport.
- Pay attention to the explosion protection of the Screw Pump and all other attached components. Relevant information here can be obtained from the type plates for each component. If used in explosive atmospheres, the lowest class of explosion protection for all components always applies.
- If the shaft and bearings are damaged there is the risk of sparks forming.
  The Screw Pump motor must be properly aligned.
- Earthing screws must be attached to avoid the risk of electrostatic charging; an impedance measurement must be carried out to ensure there is adequate contact.
- Any shut-off devices which have been installed on the pressure side of the Screw Pump must be open. The Screw Pump must not be allowed to operate against any closed discharge openings, shut-off devices or pressure pipes. If it is possible that the Screw Pump operates against a closed system, an overflow valve must be installed on the pressure side directly after the Screw Pump. The return flow pipe however must not be fed directly over the suction pipe; it should be fed to the supply tank.
  The operating pressure directly after the Screw Pump should be measured and displayed.
- The pumping medium temperature should be measured on the pressure side directly after the Screw Pump.
- A sealing unit which complies with requirements must be available for any double mechanical seal and external mechanical seals.
- Never install the Screw Pump with motor in an enclosed area where there is not sufficient ventilation as the motor cannot be properly cooled which may lead to overheating.
- It is only permitted to operate the screw pump in the indicated rotational / flow direction. The following malfunctions are possible:
  - The Screw Pump empties the pipeline and it runs dry
  - The shaft seal isn't lubricated, the shaft seal runs dry or the shaft seal heats up due to chafing
- In case this is due to the pumping medium (viscosity), it is recommend installing a flow indicator. The flow indicator must not cause any significant build-up of pumping medium if it becomes damaged.
- The Screw Pump may only be installed with the motor vertically above the screw pump if it has been explicitly stated in the order confirmation that this is possible.
- Twin pumps with integrated pressure limited valve:
  - This valve is only a pressure limited valve and hence suitable for short-term use only. Continuous return flow of fluid within the screw pump would lead to rapid overheating of the Screw Pump.
  - If pressure control is required, an external valve must be installed in the pressure pipe with return flow into the tank.

6.3 Checks before first commissioning

DANGER

Failure to comply with these regulations may result in an explosion causing serious injury or putting people's lives at risk.

- Check the earthing screws are connected.
- Is the flow direction in accordance with the arrow on type plate?
- Before operating the Screw Pump, make sure the pipes are free of deposits, filings or other similar contamination. It may be necessary to wash the pipe.
- A new or reassembled Screw Pump must not be run dry. This can lead to heating or formation of sparks in the Screw Pump. The Screw pump and all the pipes must be filled with the pumping medium before the Screw Pump is turned on.
- Check the sealing unit is connected and functioning correctly (only applies to double mechanical seal and external mechanical seal).
- Open any shut-off devices which have been installed on the pressure side of the Screw Pump.
- Check all pipes, fitting and screw connections are absolutely leak-proof. Otherwise gasses can enter the Screw Pump on the suction side. The Screw Pump no longer able to suck properly causing damage to the Screw Pump. Pumping medium can escape on the pressure side.
- Applies To all Screw Pumps with integrated pressure limited valve:
  - This valve is only a pressure limited valve and hence suitable for short-term use only. Continuous return flow of fluid within the Screw Pump would lead to rapid overheating of the Screw Pump.

6.4 Start-up

DANGER

Failure to comply with these regulations may result in an explosion causing serious injury or putting people's lives at risk.

- Risk of the seal overheating during dry running. Shut-off devices on the suction and pressure side must be open.
- Check the blocking system is connected and functional (only applies to double mechanical seal and external mechanical seal).
- Fill the Screw Pump and all the suction pipes with the pumping medium before starting up the Screw Pump. Otherwise there is the risk of heating or formation of sparks in the Screw Pump.
- Applies To all Screw Pumps with integrated pressure limited valve:
  - This valve is only a pressure limited valve and hence suitable for short-term use only. Continuous return flow of fluid within the Screw Pump would lead to rapid overheating of the Screw Pump.

6.5 Malfunctions

DANGER

Formation of sparks due to damaged Screw pump.

- **The Screw Pump is making noises**
  - If vibration or grinding noises can be heard, stop the Screw Pump motor immediately.
  - Consult the table of malfunctions in the operating manual in order to ascertain what the problem is and how to fix it. The possible malfunctions listed in the table only serve for orientation. When looking for the cause of the problem, take all operating factors and system elements into account.
  - Only start the motor again when it is sure that the cause has been found and repaired.
- **Severe wear and tear of Screw Pump**
  - Stop Screw Pump immediately.
  - Take the Screw Pump apart and replace the worn parts.
- **Cavitation operation**
  - A combination of inlet pressure, suction height and steam pressure of the pumping medium can lead to bubbles developing in the suction area of the Screw Pump. These implode on the pressure side causing wear and vibration to the Screw Pump. This operational aspect can be avoided by modifying the inflow conditions.
- **Coupling wear and tear**
  - Please refer to the coupling operating manual.

DANGER

Danger of hot surfaces as a result of the Screw Pump heating up.

- **The Screw Pump or the seals can heat up**
  - Consult the table of malfunctions in the operating manual in order to ascertain what the problem is and how to fix it. The possible malfunctions listed in the table only serve for orientation. When looking for the cause of the problem, take all operating factors and system elements into account.
  - Only start the motor again when it is sure that the cause has been found and repaired.
- **If the temperature of the pumping medium is too hot the Screw Pump will heat up**
  - Control the temperature of the pumping medium
  - Perhaps this mode of operation is normal. Please check beforehand whether heating from the pumping medium is to be expected. The surface temperature of the screw pump casing normally is the same as the pumping temperature.
- **Grinding noises**
  - If grinding noises can be heard, this is an indication of worn parts.
  - Stop Screw Pump immediately.
  - Take the Screw Pump apart and replace the worn parts.
- **Screw Pump is not filled**
  - Check the inflow
- **Worn Screw pump**
  - If the amount of medium transported declines over time, but the Screw Pump is still able to create pressure, the cause is most likely worn parts. Repair the Screw Pump
- **Closed slider after the Screw Pump**
  - Screw Pump is working against a closed slider and is "rotating about itself", leading to overheating of the Screw Pump. Slider may not be closed.
  - **Sealing unit of a seal is faulty**Check the function of the sealing unit and repair it accordingly.

6.6 Inspections

If used in potentially explosive atmospheres the following inspections must take place in addition the checks listed in the operating manual.

- Regularly clean dust off of the pump surface, motor and connecting pipes to reduce the risk of dust igniting. How often cleaning is required depends on the amount of dust that collects.
- Check the correct functioning and calibration of the temperature measurement probe
- Check the correct functioning and calibration of the pressure measurement probe
- Check the correct functioning and calibration of all other measurement, monitoring, control and recording devices.
- Check the correct functioning of the safety equipment i.e. locks, alarms and shut-offs etc..
- Control pump noises during operation. If grinding can be heard, turn off the pump immediately. Chafing metal parts can lead to overheating and hence the formation of sparks.

6.7 Repairs

DANGER

Risk of serious injury or putting people's lives at risk.

➢ Make sure no explosive atmosphere exists when carrying out repairs.

6.7.1 Disassembly and assembly

DANGER

Formation of sparks due to damaged Screw Pump.
Please read the operating manual carefully before taking apart the Screw Pump and then putting it back together again.

6.8 Spare parts

DANGER

Formation of sparks due to damaged screw pump.
Use original Spare Parts only, provided by the constructor.

6.9 Changing the pumping medium

If the pumping medium is regularly changed i.e. in a laboratory or test department, the user must always check beforehand that all parts which come into contact with the pumping medium are resistant to the medium and that they can withstand the temperatures which may develop.

The assignment of the Screw Pump to a specific category or temperature class only applies if the Screw Pump is operated within the limits defined in the operating manual and order confirmation.

For maximum permissible pumping temperature with respect to the shaft seal, please refer to 3.3 *Temperature class*.

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Authorized PSG Partner:

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