



ATEX

Additional operator's manual
for
operating *Fristam* pumps and units
in explosive atmospheres in accordance with
Directive 2014/34/EU

For the series

Centrifugal pumps	Positive displacement pumps	Side channel pumps
FP / FPE / FP...V / FPM FPH / FPEH / FPH...V FC FSPE / FSP...V / FSM FPC	FL / FL2 / FL3 FK FKL FDS equals VPS	FZ / FZM

Pump type:

Pump no.:

Additional ATEX operator's manual/edition: June 2019 (Version 15.2)

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The original version of this document is the German version. Other languages are translations of the original operator's manual.

Foreword

This additional operator's manual describes important information and instructions for the proper operation of the respective *Fristam* pumps and units in an explosive atmosphere in compliance with the requirements of EU Directive 2014/34/EU. The additional operator's manual is only valid together with the "Original operator's manual and assembly instructions". Both documents must be used and delivered with the pump if passed on to third parties.

In order to avoid risks, the instructions contained therein must be strictly observed. The safety regulations applicable at the installation site are not taken into account and must be guaranteed separately by the operator.

Read the additional operator's manual carefully before installing and commissioning the pump. Keep the manual in a place which is accessible to users at all times.

Failure to comply with the safety instructions may result in personal injury and environmental risks as well as the loss of warranty claims and claims for defects.

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1 Intended use

The pumps and pump units of *Fristam* pumps are designed for use in the food, pharmaceutical, chemical and other industries and are individually designed and manufactured according to customer requirements.

The base materials and all sealing materials were selected according to the requirements of the pumping medium. The pump may only be used for the medium for which it was designed (see order-specific document parts in the appendix).

Fristam Pumpen is not liable for any damage resulting from misuse. The risk is borne solely by the operator.

A more reliable and orderly use of the pump also requires compliance with the instructions of the "Original operator's manual and assembly instructions" with regard to use and operation as well as inspection and maintenance.

Where it is to be expected that an explosive gas atmosphere will occur occasionally/rarely (zone 1; zone 2 Ex-inside) inside, operation of the pump is possible with FPC, FZ, FDS (see section 3.1) in the appropriate configuration.

For all other *Fristam* pump types, the pumps must always be filled with pumping medium during normal operation (zone 1; zone 2). Deviations from these specifications of the intended use can be found in the order-related documents.

Pumps that are approved for an occasional occurrence of an explosive gas atmosphere in the pump interior (Zone1, Zone2; Ex-Inside) must be clearly defined as such in the order-related documentation or in the additional ATEX operator's manual. In addition to the ATEX marking, these pumps are marked with an "X" on the rating plate. This "X" means that important additional conditions for safe use must be observed and adhered to. These additional conditions are explained in the order-related documents and in the additional ATEX operator's manual.

For more information, please contact *Fristam Pumpen*

1.1 ATEX version

The pumps and pump units from *Fristam Pumpen*, which are used in explosive atmospheres according to ATEX, are based on the respective standard version and configured in their constructive design in such a way that their suitability is guaranteed at all times. Terms for the definition of pump and pump unit can be found in the type-related "Original operator's manual and assembly instructions".

1.2 Restriction of normal intended use Zone 2 (outside)

The FZ EX side channel pump and FPC EX centrifugal pump *with single mechanical seal* must not be used for self-priming, venting the suction pipe, emptying product pipes and tanks and the area where the pump is pumped out of the vacuum.

This creates the risk of dry running of the sliding pairs and an uncontrolled temperature increase of the sliding surfaces.

An Ex zone inside the pump *does not constitute normal operation* of the FZ EX side channel pump and FPC EX centrifugal pump with *single mechanical seal*.

An Ex zone inside the pump with single mechanical seal is not permitted and must be completely excluded by the monitoring parameters listed (see section 6.4).

2 Safety instructions

2.1 Explanation of symbols



Safety-related instructions for operation in an explosive atmosphere



General safety instructions for operation



Instructions and information to facilitate operation of the pump and prevent damage

2.2 Operating personnel

The operating company of the pump and/or system must ensure that all work during installation, maintenance, cleaning and transport of the pump as well as its operation is carried out exclusively by qualified and authorized personnel.

The personnel employed must have received proven training on the use of pumps in explosive atmospheres in accordance with ATEX as well as instruction in this additional operator's manual. A written work permit must be issued before installation or maintenance. All work is only permitted if any potentially explosive atmosphere is excluded.

3 Basic safety instructions

Please read the contents of the type-related "Original operator's manual and assembly instructions" as well as the additional operator's manual and the order-related documents completely before putting the pump into operation. Keep all documents required for safe operation close to the pump installation site.

If you have any questions or need further information regarding the use of *Fristam* pumps in ATEX areas, please contact *Fristam* Pumpen.

All work relating to installation, operation and maintenance described in the assembly instructions may only be carried out by professionally qualified personnel in compliance with the appropriate safety precautions.

When doing so, the relevant national regulations of the country of operation, as well as the work and safety regulations of the company must be complied with.



Danger of contamination

When using the pump to pump hazardous substances, comply with the legal and operational safety regulations.



Personal injury and environmental risks

- It is essential to comply with the safety instructions described in the "Original operator's manual and assembly instructions" as well as the additional operator's manual.
- Failure to observe the safety instructions may result in the loss of claims for defects.

3.1 Working range

Pumps that are not built in accordance with ATEX and are not marked accordingly on the rating plate and do not have a *Fristam* declaration of conformity must not be used in explosive atmospheres.

The operating company must take all necessary safety measures in accordance with Directives 99/92/EC (ATEX137) and 2014/34/EU to prevent explosions. This includes determining the danger zone in accordance with ATEX137 and selecting suitable work equipment (device), so that the pump/unit can be designed in accordance with ATEX by *Fristam* on the basis of the application criteria. He must also ensure that the surface temperature of the pump/unit does not exceed the maximum value of the specified temperature class (see Classification and marking).



The pumps and pump units must never be operated outside the operating limits specified in the operator's manuals and order-related documents without the written consent of the manufacturer.

Explosive atmospheres are installation environments in which an explosive atmosphere in dangerous concentrations can occur due to local and operational conditions. Since *Fristam* pumps and pump units are classified as equipment group II and category 2 or 3 according to ATEX, they may only be used in explosive atmospheres of zones 1, 21, 2 and 22 (see order-related documents, observe the respective marking of the pump).

If a device is marked with both G and D on the rating plate, this means that the device may be used either in potentially explosive gas atmospheres or in potentially explosive dust atmospheres.

However, use in potentially mixed explosive atmospheres (Gas-Ex + Dust-Ex) is not possible with this approval.

Pumps that are approved for an occasional occurrence of an explosive gas atmosphere in the pump interior (Zone 1, Zone 2; Ex-Inside) must be clearly defined as such in the order-related documentation or in the additional ATEX operator's manual. In addition to the ATEX marking, these pumps are marked with an "X" on the rating plate. This "X" means that important additional conditions for safe use must be observed and adhered to. These additional conditions are explained in the order-related documents and in the additional ATEX operator's manual.

If no "X" is indicated on the rating plate, this means that no explosive atmosphere may be created inside the pump.

Pumps marked without "X" are only permitted for explosive atmospheres outside the pump.



Danger of explosion due to explosive atmosphere inside the pumps!

- Pumps with simple mechanical seals or magnetic couplings are **never** approved for an inside explosive gas atmosphere!!



Danger of explosion due to zone entrainment!

- The formation of a potentially explosive mixture within a pump which is not suitable for use and is not marked accordingly (no "X" on the rating plate and no unambiguous information in the order-related documents) is not permitted.
- The operating company is responsible for a clear zone assignment according to Directive 99/92/EC with indication of the gas or dust group according to DIN EN ISO 80079-36.

The following subdivision of the hazard zones must be distinguished:

Zone 1 Zone 21	Areas in which a hazardous explosive atmosphere consisting of gas, vapor, mist and mixtures thereof with air and/or dust and mixtures thereof with air is likely to occur occasionally.
Zone 2 Zone 22	Areas in which it is to be expected that a hazardous explosive atmosphere consisting of gas, vapor, mist and mixtures thereof with air and/or dust and mixtures thereof will occur infrequently and for short periods.

3.1.1 Ambient conditions at the place of installation

The ambient temperature must be within the range of -20 °C to +40 °C at the installation site of the *Fristam* pump or unit.

The maximum permissible relative humidity and the maximum installation altitude can be found in the manufacturer's documentation for the drive.



Danger of explosion due to dust deposits!

- Dust deposits on the outer surfaces of the pump unit as well as dust settling behind the enclosures in lantern compartments and on connecting components must be strictly prevented.
- Accumulated dust layers may not exceed the limit value of the maximum layer thickness of 5 mm.
- Dedusting work must be included in the cleaning and maintenance cycle.

3.1.2 Pumping medium

In addition to the intended use described in the "Original operator's manual", flammable liquids or liquids with flammable components can also be pumped in the ATEX area.



Danger of explosion!

- The continuous/frequent pumping of explosive medium/air mixtures is not permitted (zone 0 inside, zone 0 outside).
- The occasional occurrence of explosive gas atmospheres within the pump is only permitted for certain pumps under certain operating conditions with corresponding configurations. These pumps are marked accordingly as in section 4.
- The pumping of heavily gas-laden media is not permitted for pumps with single seals.
- Only liquids with high conductivity (> 1000 pS/m) may be pumped.
- The pumping medium must not show any exothermic chemical reaction.
- Exceeding the permissible density or viscosity is not permissible (see order-related documents).
- Foreign objects in the pumping medium are not permitted.
- Abrasive pumping media are only permitted after consultation and examination by *Fristam*.

3.1.3 Temperature operating limits

The maximum permissible surface temperatures on all external contours of the pump unit may never be exceeded at full load in continuous operation.



Danger of explosion due to temperature operating limits being exceeded!

- The maximum pumping media temperature can be found in the order-related documents and may not be exceeded without written confirmation from the manufacturer.
- The temperature limits apply under consideration of the ambient conditions at the installation site.
- *Fristam* pump units may not be used for temperature classes T5(100 °C) and T6(85 °C) in explosive atmospheres in installation areas.
- In the case of a pump version with heating jacket, the operating company is responsible for compliance with the prescribed Atex temperature class and the permissible heating medium temperature.
- Suitability of the pump for SIP processes only after consultation with *Fristam*. SIP process only when the pump is switched off. The pump casing adopts the sterilization temperature of the process. The Atex temperature limit values must be complied with.
- The pumping medium, barrier medium and medium for heat transfer in the heating jacket may not fall below the temperature of -20 °C.

- If the operating company cannot guarantee that the pumping media temperature or the surface temperature is within the permissible temperatures, it must provide a monitoring system.
→ **Monitoring parameters: Pumping media temperature or surface temperature**



The surface temperature depends on the operating conditions, the ambient temperature and the temperature of the flow medium.

The specification of the Atex temperature class on the rating plates, in the order-related documents and in the following tables "*Temperature limits of the pump types*" must be checked and compared. If the values differ, the lower value must be complied with as the maximum permissible pumping media temperature.

In case of doubt or for further information, please contact *Fristam Pumpen*.

The following tables show the individual pump types. These specify the maximum permissible temperature of the pumping medium in relation to the temperature class in the installation area in accordance with DIN EN ISO 80079-36.

3.1.3.1 Temperature limits of pump types FP / FPE / FP...V / FPH / FPEH / FPH...V / FSPE / FSP...V

Depending on the constructive design, different maximum pumping media temperatures are permissible for pumps of the FP series.

If the pumping media temperatures are not specified in the documentation, the lower value is permissible.

Temperature class; Temperature limit value	Max. permissible surface temperature [°C]	Max. permissible pumping media temperature [°C]
T1	450	≤ 150
T2	300	≤ 150
T3	200	≤ 150
T4	135	≤ 100

Table 1: Max. permissible pumping media temperature in [°C] for FP/FPE/FP...V/FPH/FPEH/FPH...V/FSPE/FSP...V



Temperature limit of pump type FP/FSP (Ex-Inside) Zones 1 & 2

FP/FSP pumps in which an occasional occurrence of explosive gas atmospheres within the pump is permissible (category 2; IIB; EPL Gb / Gc; additional marking on rating plate X), the following must be observed:

- Explosive atmospheres within the pump with the temperature class assignment T4, T5 and T6 are not permitted.
- The max. permissible pumping media temperature for the EPL Gc / Gb T1-T3 is $T_{\text{Pumping medium}} \leq 100 \text{ °C}$.

3.1.3.2 Temperature limits of pump type FC

Depending on the design, different maximum pumping media temperatures are permissible for pumps of the FC series.

If the pumping media temperatures are not specified in the documentation, the lower value is permissible.

Temperature class; Temperature limit value	Max. permissible surface temperature [°C]	Max. permissible pumping media temperature [°C]
T1	450	≤ 90/110
T2	300	≤ 90/110
T3	200	≤ 90/110
T4	135	≤ 80/80

Table 2: Max. permissible pumping media temperatures in [°C] for pump type FC

3.1.3.3 Temperature limits of pump type FPC

Depending on the design, different maximum pumping media temperatures are permissible for pumps of the FC series.

If the pumping media temperatures are not specified in the documentation, the lower value is permissible.

Temperature class; Temperature limit value	Max. permissible surface temperature [°C]	Max. permissible pumping media temperature [°C]
T1	450	≤ 150
T2	300	≤ 150
T3	200	≤ 150
T4	135	≤ 100

Table 3: Max. permissible pumping media temperature in [°C] for FPC



Temperature limit of pump type FPC (Ex-Inside) Zones 1 & 2

FPC pumps in which an occasional occurrence of explosive gas atmospheres within the pump is permissible (category 2; IIB; EPL Gb / Gc; additional marking on rating plate X), the following must be observed:

- Explosive atmospheres within the pump with the temperature class assignment T4, T5 and T6 are not permitted.
- The max. permissible pumping media temperature for the EPL Gb / Gc; T1-T3 is $T_{\text{Pumping medium}} \leq 100 \text{ °C}$.

3.1.3.4 Temperature limits of pump type FZ

Depending on the design, different maximum pumping media temperatures are permissible for pumps of the FZ series.

If the pumping media temperatures are not specified in the documentation, the lower value is permissible.

Temperature class; Temperature limit value	Max. permissible surface temperature [°C]	Max. permissible pumping media temperature [°C]
T1	450	≤ 150
T2	300	≤ 150
T3	200	≤ 150
T4	135	≤ 100

Table 4: Max. permissible pumping media temperature in [°C] for FZ



Temperature limit of pump type FZ (Ex-Inside) Zones 1 & 2

FZ pumps in which an occasional occurrence of explosive gas atmospheres within the pump is permissible (category 2; IIB; EPL Gb / Gc; additional marking on rating plate X), the following must be observed:

- Explosive atmospheres within the pump with the temperature class assignment T4, T5 and T6 are not permitted.
- The max. permissible pumping media temperature for the EPL Gb / Gc T1-T3 is $T_{\text{Pumping medium}} \leq 100 \text{ °C}$.

3.1.3.5 Temperature limits of pump types FPM/FSM/FZM

The temperature increase compared to the medium temperature on liquid-lubricated magnetic couplings during normal operation depends on the medium flow or pressure difference of the circulation as well as the physical thermal values of the pumping medium.

For the maximum permissible pumping media temperature, the marking on the rating plate and the "*Design data sheet for the magnetic coupling*" in the enclosed documents must be observed.



FPM/FSM/FZM pumps

- A complete filling of the magnetic coupling and the pump with medium is strictly necessary.
- Short-term dry running, e.g., at the start, is only permitted after examination and written confirmation by *Fristam*.
- Dry running is not permitted at speeds above 1500 rpm!



Temperature limits of pump types FPM/FSM/FZM

Compliance with the temperature class or the maximum permissible surface temperature during normal operation is ensured by a measuring point on the containment shell. The containment shell temperature may

not exceed the permissible temperature class.

$$T_{\text{Containment shell}} \leq T_x^*$$

*Temperature classes T1-T4 (minus 5 °C for T3-T4 and minus 10 °C for T1-T2 according to DIN EN ISO 80079-36)

$$T_{\text{Containment shell}} = T_{\text{Pumping medium}} + 35 \text{ °C}$$



A connection thread G1/4" for the installation of a temperature monitoring device for the surface of the containment shell is available.

A PT100 resistance thermometer with spring-loaded tip can be used reliably to monitor temperature excesses in the containment shell area when the pump is full. However, a resistance thermometer is not suitable as dry-running protection.

In case of uncertainty or for more information, please contact *Fristam Pumpen*.

3.1.3.6 Temperature limits of pump type FK

Depending on the constructive design (*temperature displacer), different max. pumping media temperatures are permissible for pumps of the FK series:

Temperature class; Temperature limit value	Max. permissible surface temperature [°C]	Max. permissible pumping media temperature [°C]
T1	450	≤ 90/150*
T2	300	≤ 90/150*
T3	200	≤ 90/150*
T4	135	≤ 90/100*

Table 5: Max. permissible pumping media temperatures in [°C] for pump type FK

3.1.3.7 Temperature limits of pump type FL

Depending on the constructive design (*temperature displacer), different max. pumping media temperatures are permissible for pumps of the FL series:

Temperature class; Temperature limit value	Max. permissible surface temperature [°C]	Max. permissible pumping media temperature [°C]
T1	450	≤ 90/150*
T2	300	≤ 90/150*
T3	200	≤ 90/150*
T4	135	≤ 90/100*

Table 6: Max. permissible pumping media temperatures in [°C] for pump type FL



Temperature limit of pump type FL (Ex-Inside) Zones 1 & 2

FL pumps for which an occasional occurrence of explosive gas atmospheres within the pump is permissible (category 2; IIB; EPL Gb / Gc; additional marking on rating plate X), the following must be observed:

- Explosive atmospheres within the pump with the temperature class assignment T4, T5 and T6 are not permitted.
- The max. permissible pumping media temperature for the EPL Gb / Gc T1-T3 is $T_{\text{Pumping medium}} \leq 100 \text{ }^{\circ}\text{C}$.

3.1.3.8 Temperature limits of pump type FKL

Depending on the constructive design (*temperature displacer), different max. pumping media temperatures are permissible for pumps of the FKL series:

Temperature class; Temperature limit value	Max. permissible surface temperature [$^{\circ}\text{C}$]	Max. permissible pumping media temperature [$^{\circ}\text{C}$]
T1	450	$\leq 95/135^*$
T2	300	$\leq 95/135^*$
T3	200	$\leq 95/135^*$
T4	135	$\leq 95/100^*$

Table 7: Max. permissible pumping media temperatures in [$^{\circ}\text{C}$] for pump type FKL

3.1.3.9 Temperature limits of pump type FDS

Temperature class; Temperature limit value	Max. permissible surface temperature [$^{\circ}\text{C}$]	Max. permissible pumping media temperature [$^{\circ}\text{C}$]
T1	450	≤ 150
T2	300	≤ 150
T3	200	≤ 150
T4	135	≤ 100

Table 8: Max. permissible pumping media temperature in [$^{\circ}\text{C}$] for FDS



Temperature limit of pump type FDS (Ex-Inside) Zones 1 & 2

FDS pumps for which an occasional occurrence of explosive gas atmospheres within the pump is permissible (category 2; IIB; EPL Gb / Gc; additional marking on rating plate X), the following must be observed:

- Explosive atmospheres within the pump with the temperature class assignment T4, T5 and T6 are not permitted.
- The max. permissible pumping media temperature for the EPL Gb / Gc T1-T3 is $T_{\text{Pumping medium}} \leq 100 \text{ }^{\circ}\text{C}$.

3.2 Assembly, modifications and changes

The assembly of devices and components may not constitute a new ignition source. The device or component with the lowest ignition protection determines the degree of protection of the entire unit.



Danger of injury and damage to machinery!

- Any constructive revisions or modifications to the pump/pump unit not authorized by *Fristam Pumpen* as well as modifications to the operating mode that impair safety are not permitted and will result in the loss of warranty claims.
- If modifications are necessary, consultation with *Fristam Pumpen* is required.



Danger of explosion due to modification!

An inspection must be carried out after any modifications have been made to the pump/unit. If the modification affects one or more health- and safety-related characteristics (e.g., temperature) covered by the "Essential health and safety requirements" or the integrity of a type of ignition protection, Directive 2014/34/EU must be applied.

3.2.1 Coatings

Painted pump components are painted to DIN EN ISO 80079-36 with a layer thickness <2 mm and suitable for use in ignition protection groups IIA and IIB.



Danger of explosion due to brush and propagating brush discharges!

Overpainting the parts of the pump unit could lead to the maximum permissible layer thicknesses being exceeded.

3.3 Motor

When used in explosive atmospheres, *Fristam* pumps must only be driven by suitable electric motors which are designed for the respective pump and have the required degree of explosion protection.



Danger of explosion!

- Only cable glands with ATEX approval must be used.
- All work must be carried out exclusively by qualified and authorized personnel.
- Regional work and safety regulations must be observed.
- The permissible frequency range may not be undercut or exceeded.
- The information in the manufacturer's documentation for correct use and mode of operation, e.g., switching frequency, must be observed.

3.4 Coupling

Only a suitable coupling designed for the respective pump unit and suitable for use in the ATEX area may be used for an ATEX pump unit.



Danger of explosion!

- Only use couplings suitable for operation in ATEX areas.
- The information in the manufacturer's documentation for correct use and mode of operation must be observed.

4 Classification and marking

Please refer to the rating plate on the machine for the classification of the pump/pump unit. The information on the rating plate and the designations according to DIN EN ISO 80079-36 are explained below.



- There may be further signs on the pump unit.
- Under no circumstances may nameplates be removed from the pump, electric motor or other components of the pump unit.

4.1 Rating plate

For the ATEX area, the rating plate is Fig. 1 labeled with the following information in addition to the rating plate entry described under section "Rating plate" of the respective "Additional operator's manual and assembly instructions":

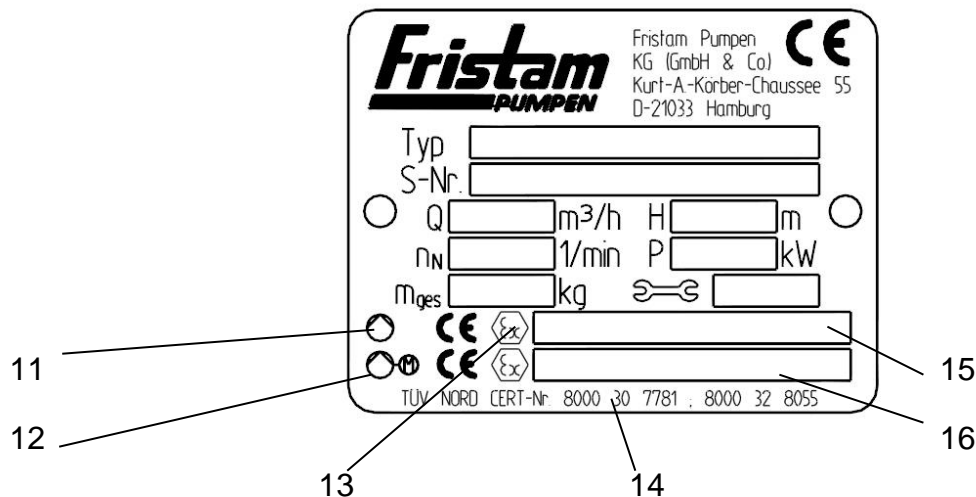


Fig. 1: Rating plate

- 11 Pictogram of the pump without drive
- 12 Pictogram of the pump unit
- 13 The Ex mark indicates that the product is explosion-proof
- 14 Ex-deposit and registration office – no. of the ATEX documents
- 15 Ex-protection data for the pump without drive
- 16 Ex-protection data for the pump unit

4.2 FDS rating plate

For the ATEX area, the nameplate is labeled according to Fig. 2 with the following information in addition to the nameplate entry described under section "Rating plate" of the respective "Additional operator's manual and assembly instructions":

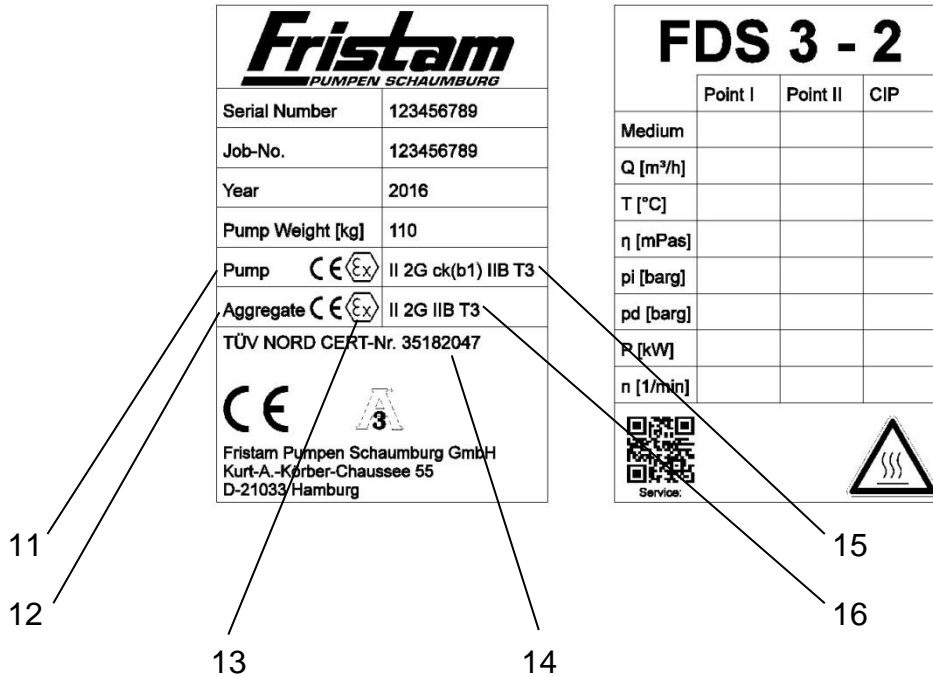


Fig. 2: Rating plate

- 11 Pump without drive
- 12 Pump unit
- 13 The Ex mark indicates that the product is explosion-proof
- 14 Ex-deposit and registration office – no. of the ATEX documents
- 15 Ex-protection data for the pump without drive
- 16 Ex-protection data for the pump unit

4.3 Marking according to Directives 2014/34/EU and DIN EN ISO 80079-36



In compliance with the order-related *Fristam* declaration of conformity according to ATEX, the rating plate entries in fields 15 and 16 as per Fig. 1 and Fig. 2 for the pumps without drive or pump unit must be interpreted as follows:

Symbol	Designation	Meaning	
CE	CE marking	Manufacturer's confirmation that the product complies with the product-specific European directives in force	
Ex	Ex-symbol	Explosion protection markings for equipment and protective systems intended for use in explosive atmospheres, in accordance with Directive 2014/34/EU	
II	Equipment group	Equipment group "II" /Equipment for use in explosive atmospheres outside the mining industry above ground	
2 3	Category	For use in zone 1 (gas) and zone 21 (dust) For use in zone 2 (gas) and zone 22 (dust)	
G D	Explosive atmosphere	Atmosphere gas "G"/Ex-atmosphere of gas/air Atmosphere gas "D"/Ex-atmosphere of dust/air	
Ex	Standard	Explosion protection standard DIN EN ISO 80079-36; -37	
h c k (b1)	Ignition protection type	Non-electrical devices that meet the requirements of the DIN EN ISO 80079-37 standard must be marked with "h" in accordance with ISO 80079-36 in addition to those of ISO 80079-36, i.e., with regard to the degree of protection applied without additional marking. "c" protection class "Constructional safety" "k" protection class "Liquid encapsulation" "(b1)" Control of ignition sources	
IIA IIB IIC	Gas explosion group	Group II equipment is classified according to the type of explosive gas atmosphere for which it is intended. IIA, a typical gas is propane; IIB, a typical gas is ethylene; IIC, a typical gas is hydrogen.	
IIIA IIIB IIIC	Dust explosion group	Group II equipment is classified according to the type of explosive dust atmosphere for which it is intended. IIIA: suitable for flammable suspended solids; IIIB: suitable for flammable suspended solids and non-conductive dust; IIIC: suitable for flammable suspended particles and non-conductive dust and conductive dust.	
T1 – T6	Temperature class	Temperature class	Maximum permissible surface temperature
		T1	450 °C
		T2	300 °C
		T3	200 °C
		T4	135 °C
		T5	100 °C
T6	85 °C		
T 135 °C	Temperature limit value	In the case of an explosive dust atmosphere, the maximum permissible surface temperature is specified as "D" as the temperature limit value in "°C".	
TX	Temperature class/Temperature limit value	The maximum surface temperature mainly depends on the operating conditions and not on the pump, i.e. on the pumping media temperature.	
Ga / Da Gb / Db Gc / Dc	Equipment protection level	Equipment protection level (<i>EPL= Equipment Protection Level</i>) according to DIN EN ISO 80079-36	
X	Additional marking: Important conditions for safe use must be observed and adhered to (see order-related documents in addition to the additional operator's manual).		

Table 9: Designation legend according to Directives 2014/34/EU and DIN EN ISO 80079-36

4.3.1 Marking example for pump and pump unit according to ATEX

Example: **CE Ex II2G Ex h IIB TX Gb**

Marking for a pump: (Field 15 on the rating plate)

1	2	3	4	5	6	7	8
II	2	G	Ex	h	IIB	TX	Gb
Marking according to ATEX			Marking according to standard DIN EN ISO 80079-36				

	<u>Symbol</u>	<u>Name/Meaning</u>
1	II	Group II equipment
2	2	Category 2
3	G	Gas EX-atmosphere
4	Ex	Standard DIN EN ISO 80079-36
5	h	Standard DIN EN ISO 80079-36
6	IIB	Medium explosion group, typical gas ethylene
7	TX	Max. surface temperature depends on the operating conditions, i.e. on the pumping media temperature → Temperature limit of the pump order-related documents and section 3.1.3 Temperature limits.
8	Gb	EPL Gb means a "high" protection level at which there is no danger of ignition during normal operation or foreseeable faults/malfunctions (Zone 1).

Example 2: **CE Ex II2G IIB T4 Gb**

Marking for a pump unit (pump+motor/gearbox, coupling): (lower Ex-line; field 16 on the rating plate)

Pump: (upper Ex-line; field 15 on the rating plate)	Electric motor: (electric motor rating plate)
CE Ex II2G Ex h IIB T4 Gb	CE Ex II2G Ex de IIC T4 Gb



- Pump units according to ATEX are marked with one marking for the pump and another for the entire assembly.
- If an X is marked on the type plate, this means that special conditions for the operation of the device in the ATEX area must be observed. These conditions are explained in the order-related documents. Example: Pumps that are approved for a zone according to ATEX within the device are marked with an X on the rating plate.

5 Installation and commissioning

5.1 Installation and transport

All installation work on a pump or pump unit must not take place in an explosive atmosphere. The operating company must ensure that no explosive atmosphere is present during installation. Before installation and commissioning, check if any parts have been damaged during transport. Transport safety devices and protective foils must be removed.

The machine may not be put into operation in the event of visible transport damage. In such a case, contact Fristam Pumpen.

Special Atex carriages are designed for the transport of Atex pump units. This sufficiently minimizes the risk of a potential ignition source arising during transport. The risk of the formation of a potential ignition source cannot be completely excluded, therefore a pump unit on a carriage should **never** be transported in an explosive atmosphere.

The operating company is responsible for ensuring that no parts, components, or devices are transported as long as there is an explosive atmosphere present.



Danger of explosion due to incorrect installation!

- Applicable explosion regulations and information on the rating plates of the equipment must be checked.
- The operating company must ensure that the pump and motor have sufficient clearance for sufficient air circulation.
- Sufficient space must be available for inspection and maintenance work.
- Forces, shocks and vibrations transmitted to the pump from outside, e.g., due to braced pipes or loading of covers and enclosures, are not permitted, as they can cause parts inside the pump to start up or protective devices to become ineffective, which can contribute to an increased risk of ignition.
- Incorrect installation influences the filling, venting and draining of the system and can lead to inadequate lubrication of the seals during operation.
- The foundation must be level and sufficiently dimensioned for the weight of the unit.
- The operating company must ensure that the pumping medium does not flow back after the pump has been switched off. →Non-return valve

5.2 Electrical connection

All electrical connection work may only be carried out by qualified personnel. The relevant connection and performance data of the drive, the sensors or electrical components must be complied with, further information can be found in the order-related documentation of the drive, the sensors or electrical components.



Danger of explosion due to incorrect electrical installation of the motor!

- Always connect motors via the motor protection circuit breaker.
- Observe Regulation IEC60079-14.
- Never operate the inverter outside the permissible area → Check the order-related documents, operator's manual and nameplates of all equipment.
- During inverter operation, always provide temperature monitoring by means of thermocouples (PTC thermistors, PT100, or thermostats) in the winding.

→ **Monitoring parameters: Thermal motor contactor**

5.3 Grounding



Danger of explosion due to electrostatic charge!

- All parts must be electrically connected to each other.
- To prevent electrostatic charges as well as to dissipate any electrical fault currents and leakage currents, potential equalization between the pump unit and the installation foundation must be installed by the operating company.
- Plastic parts and plastic cables are to be conductively connected by bridging.
- The information in the manufacturer's documentation of all devices and components, e.g., motor, must be observed.

5.4 Filling the pump

A pump interior and seal chamber completely filled with liquid cannot form an explosive atmosphere. Before the pump is put into operation, the pump interior, the suction line and the sealing chamber must be filled and vented.



Danger of explosion!

- During filling, standstill and operation of the pumps, an explosive atmosphere inside the pump must be safely excluded by the operating company.
- Ex inside (only permitted with double mechanical seal, additional marking on rating plate X): Pumps in which an occasional occurrence of explosive gas atmospheres within the pump is permissible (Category 2, Category 3; IIB; EPL Gb, Gc) must be excluded from this explosive atmosphere inside the pump during

filling, commissioning, prolonged standstill and start-up after prolonged standstill.

- If the operating company cannot ensure that the sealing chamber and the containment shell of a magnetic coupling are always filled with liquid during pump operation, appropriate protective and monitoring measures must be taken to ensure this.

→Monitoring parameters: Dry running in the pump interior and seal chamber



In case of doubt or for more information, please contact *Fristam Pumpen*.

5.4.1 Seal supply systems

Continuous supply of sealing medium to the seal prevents dry running during normal operation. Before each start-up of the pump, any installed supply system must be correctly connected and put into operation (existing sensors must be implemented in the ignition protection system).

Information and instructions for the correct connection or design of the supply system are contained in the operator's manual and assembly instructions or in the order-related documents.



In case of doubt or for more information, please contact *Fristam Pumpen*.

The operating company is responsible for the correct connection or design of the supply system, suitability of the components and devices of the sealing system, as well as for trouble-free operation and maintenance.



Danger of explosion!

- Improperly connected supply system, incorrect sealing medium, and incorrect operation may result in damage to the seal and inadmissible temperature increases.

5.4.2 Lubricant

Synchronous gearboxes, bearing blocks, and compact bearing supports are usually supplied filled with lubricant. In magnetic couplings, the pumping medium is the lubricant.

Information on the lubricant for motors and geared motors can be found in the manufacturer's documentation.

Synchronous gearbox: FKL/FK/FL/FDS

Version of bearing block or compact bearing support: FP/FPH/FSP/FZ/FPC

Version with magnetic coupling: FPM/FSM/FZM



Danger of explosion!

- Transport locks must be removed.
- Suitable lubricants must be used. These are listed in the operator's manual and assembly instructions for the respective pump types.
- When the pump is at a standstill, the oil level in the gearbox and bearing block must be filled to the middle of the sight glass.
- Too low or too high an oil level can lead to inadmissible temperature increases.

5.5 Direction of rotation check



Danger of explosion!

- Under no circumstances may the direction of rotation of the pump unit be checked by briefly switching on and off the pump that is still unfilled. This leads to an uncontrolled rise in temperature as the mechanical seals run dry.
- Observe the direction of rotation arrow on the motor and pump.
- If the pump is empty, check the direction of rotation without the motor connected.

5.6 Commissioning of control, monitoring and control equipment

The control, monitoring and control equipment for the pump units must be suitable for use in the ATEX area and must be installed and put into operation by qualified and authorized personnel in accordance with the manufacturer's instructions. Regional work and safety regulations must be observed.

The operating company is responsible for checking the functionality of the control, monitoring and control equipment.



Danger of explosion!

- Before commissioning the pump unit, the functionality of control, monitoring and control equipment must be checked.

6 Operation

6.1 Safety instructions for operation

The operating company must ensure that the pump or pump unit is only used within the parameters and work instructions permitted in the order-related data sheets and in the operator's manual. Exceeding the limit values or ignoring operating errors can lead to personal injury, environmental damage and material damage.



Danger of explosion due to inadmissible operating conditions!

During operation, closing the suction line and/or excessive throttling of the discharge line can lead to an undefined temperature rise and heat accumulation inside the pump. In order to achieve a shock-free and smooth start-up process, all pump types must be started up with the suction valve fully open when completely filled.

- Vibrations, oscillations and shocks caused by external influences must be excluded.
- The pump may not be operated in cavitation, with zero delivery or at inadmissible speeds.
- Foreign objects in the pumping medium must be avoided. If the operating company cannot ensure that the pump will not be damaged by impurities and solid materials, a filter must be installed in front of the pump. This filter must be designed to suit the medium and operating conditions. If foreign objects are detected during operation, the pump must be switched off immediately and the cause of the foreign bodies eliminated.
- Never exceed the permissible operating pressures. The maximum permissible operating pressures are contained in the order-related pump documentation.

→ Monitoring parameters: Operating pressure

- Never start and operate positive displacement pumps and side channel pumps with gate valves, valves or fittings closed.
- The maximum permissible differential pressure may never be exceeded for positive displacement pumps and side channel pumps. The maximum permissible differential pressures are contained in the order-related order documents.

- For differential pressure protection of positive displacement pumps (FK/FL/FKL/FDS) and side channel pumps (FZ), a safety valve on the outlet side with relief to the safe area or a circulation valve for pressure relief from the outlet side to the inlet side must be installed.
- Alternatively, a sensor-supported differential pressure monitoring system can be installed.
 → **Monitoring parameters: Differential pressure**
- The circulation via a differential pressure valve leads to an increase in the temperature of the pumping medium.

6.2 Safety instructions for the operation of pumps with shaft seals

Shaft seals are the main ignition sources. They do not normally take effect but must be taken into account as a foreseeable fault because any possible failure of the fluid supply can cause dry running. This means that the seal is not cooled. The non-dissipated frictional heat leads (<1 s) to overheating and can become an effective source of ignition.



Danger of explosion!

- Mechanical seals and rotary shaft seals must never run dry.
- Monitoring measures for the intended operation of seals must be provided.

To ensure the safest possible continuous operation in Zones 1 and 2, the main criterion "prevention of dry running" must be subject to continuous monitoring.

The following must be guaranteed for pumps with non-flammable pumping media installed in Zone 2:



Monitoring of a pump with a single mechanical seal:

The product supply (inlet side) to the pump must be monitored in such a way that

- the liquid flow is not lost
- the pumping medium is supplied as described under point 3.1.2
- the max. permissible pumping media temperature is maintained.
- **An explosive atmosphere never occurs inside the pump**
 → Deviations from this require a separate manufacturer's approval and can be found in the order-related documents!

For pumps with flammable pumping media in Zone 2, Zone 2 inside, or pumps for Zone 1, Zone 1 inside, as well as pumps of the FZ and FPC series, the shaft seals must be monitored on the basis of the ignition protection system type b1 according to DIN EN ISO 80079-37 as follows:



Monitoring of a pump with a single mechanical seal:

The product supply (suction side) to the pump must be monitored in such a way that

- the liquid flow is never lost
→ **Monitoring parameters: Dry running inside the pump**
- the pumping medium is supplied as described under point 3.1.2
- the max. permissible pumping media temperature is maintained.
- **An explosive atmosphere (zone 1 inside, zone 2 inside) inside the pump is not permitted**
→ Deviations from this require a separate manufacturer's approval and can be found in the order-related documents!



Monitoring of a pump with a double mechanical seal with a seal supply system:

The product supply (suction side) to the pump must be monitored in such a way that

- the pumping medium is supplied as described under point 3.1.2
- the max. permissible pumping media temperature is maintained
- the pump is only operated for a short time (<30 s) without the pumping medium
→ deviating dry running times can be found in the order-related documents if applicable
- no ignitable mixture can form inside the pump unless the pump is designed for this purpose.
→ **Monitoring parameters: Dry running inside the pump**

The sealing medium supply to the seal must be monitored in such a way that

- the flushing flow never breaks off, or there is a continuous sealing medium on the seal
- For pumps with an explosive atmosphere (Zone 1 inside, Zone 2 inside) within the pump head, a monitored forced circulation/flushing system must be provided.
→ Deviating supply plans must be approved by the manufacturer and may be found in the order-related documents.
- The sealing medium is compatible without foreign objects, lubricating, harmless, of low viscosity and compatible with the pumping medium, and there is sufficient differential temperature (>25 K) to the boiling point.

- Oils must be free of zinc and ash,
- the permissible operating limits such as flushing flow, pressure and temperature of the seals are not exceeded.
 - deviating operating data are possible with special mechanical seals. This can be found in the order-related documents.
 - Monitoring parameters: Dry running in the sealing chamber**

6.3 Safety instructions for the operation of pumps with magnetic coupling

In the case of magnetically coupled pumps, the pumping medium is also the flushing medium, which circulates due to the existing pressure difference within the pump and coupling and dissipates the introduced temperature.

Pumps with magnetic couplings must be completely filled with the pumping medium.

Dry running increases the temperature and destroys the parts.

Due to the stopping of the torque transmission in the case of pump units with magnetic couplings, damage to machinery and the risk of ignition due to excessive heating may occur.

The magnetic coupling is designed in relation to the order. It must be ensured that the loads during pump start-up do not exceed the design data (see "*Design data sheet for magnetic coupling*" in the enclosed documents and "*Magnetic coupling operator's manual*").

The operating company is responsible for compliance with the permissible operating limits.

To ensure the safest possible continuous operation, the main criterion "prevention of dry running" must be subject to continuous monitoring. On the basis of the ignition protection system type b1 according to DIN EN ISO 80079-37, the magnetic coupling must be monitored as follows:



Monitoring of a pump with a magnetic coupling:

- The product supply (suction side) to the pump must be monitored so that the liquid flow is never lost.
- A potentially explosive atmosphere on the product side of the magnetic coupling must be safely excluded by the operating company.
 - Monitoring parameters: Dry running inside the pump**
- The medium is recorded in the order-related documents and the conditions under section 3.1.2 must be complied with.
- The maximum permissible pumping media temperature for magnetically coupled pumps must be observed (see section 3.1.3.5).
- The containment shell temperature must be monitored.
 - Monitoring parameters: Containment shell temperature**
- In the case of pump units with magnetic couplings, the torque transmission may be lost; this must be monitored by a load monitor of the motor.



In case of doubt or for more information, please contact *Fristam Pumpen*.

6.4 Monitoring parameters

The following applies to the monitoring parameters for pumps with flammable pumping media in Zone 2, Zone 2 inside as well as FZ side channel pumps and FPC centrifugal pump or pumps for Zone 1: Monitoring must be carried out in accordance with DIN EN ISO 80079-37 type b1 ignition protection system to reduce the probability that it can become a potential source of ignition.

All parts of the ignition protection system used must be approved for use in the respective Ex area and must not be a source of ignition themselves.

The operating company is responsible for selecting the monitoring unit and integrating it into a monitoring system. This monitoring system must meet the requirements of the relevant ignition protection level. For pumps with non-flammable pumping media in Zone 2, this requirement for the safety of the monitoring parameters does not apply.



If the ignition protection system of the operating company is designed in such a way that, in the event of a fault, automatic intervention results in the pump unit being switched off, an interlock must be provided to prevent the pump unit from restarting without resetting the interlock.

In case of doubt or for more information, please contact *Fristam Pumpen*.

6.4.1 Categories 2&3, Zones 1&2 or 21&22 (Ex-outside) monitoring parameters

Monitoring parameters	Measures
<p>Dry running inside the pump</p> <p>Single seal</p> <p>Double seal</p> <p>Magnetic coupling</p>	<p><i>Fill level monitoring</i></p> <p>If the fill level of the pump reaches a critical value, the pump unit must be brought automatically and immediately into a safe operating condition → Shutdown of the pump unit.</p> <p>The pump unit must not be put back into operation until the fault has been rectified and the interlock reset.</p> <p>A fill level monitor must be installed in such a way that the pump interior and the sealing chamber are continuously filled with the pumping medium during operation.</p> <ul style="list-style-type: none"> - Mechanical seals and rotary shaft seals must never run dry. - Pumps with double mechanical seals can be operated for short periods (<30s*) without pumping medium inside the pump, provided that the seal supply system is in operation and is monitored and no ignitable mixture is produced inside the pump (see flow and level monitoring of double seals). <p>*deviating values, if applicable, can be found in the order-related documents</p> <ul style="list-style-type: none"> - For pumps with magnetic couplings, the critical values can be found in the "<i>Design data sheet for magnetic coupling</i>" and in the enclosed documents.

<p>Dry running in the sealing chamber</p> <p>Double seal Seal supply system</p>	<p><i>Flow monitoring of a flushed seal</i></p> <p>If the flow rate of the flushing reaches a critical value, the pump unit must be brought automatically and immediately into a safe operating condition.</p> <p>A flow monitoring system must be installed in such a way that the sealing chamber is continuously filled with sealing medium.</p> <p><i>Fill level monitoring of a quenched/blocked seal</i></p> <p>If the filling level of the quench/sealing pressure system reaches a critical value, the pump unit must be brought immediately into a safe operating condition.</p> <p>Monitoring the level of the quench/sealing pressure system by displaying critical values.</p> <ul style="list-style-type: none"> - Critical values in a sight glass on the sealing medium container: The filling level of the sealing medium falls below the lower edge of the sight glass. - Critical values in two or three sight glasses in the sealing medium container: Fill level of sealing medium at the level of the lower sight glass. <p>Monitoring the level of the quench/sealing pressure system by displaying critical values and/or automatically transferring to a safe operating condition.</p> <ul style="list-style-type: none"> - Fill level switch in the sealing medium container switches when the critical level of the sealing medium is reached. <p>The pump unit must not be put back into operation until the fault has been rectified.</p> <p>If other or further values of these monitoring parameters must be complied with, these are contained in the order-related documentation, sectional drawing of the shaft seal or documentation of the seal manufacturer.</p>
<p>Containment shell temperature</p> <p>Pump with magnetic coupling</p>	<p>If the pumping medium or the surface of the containment shell of a magnetically coupled pump reaches a critical value, the pump unit must be brought automatically and immediately into a safe operating condition → Shutdown of the pump unit.</p> <p>The pump unit must not be put back into operation until the fault has been rectified and the interlock reset.</p> <p>Set a suitable resistance thermometer to the limit value of the respective temperature class (see section 3.1.3.5).</p> <p>Monitoring the containment shell temperature is not sufficient for monitoring dry running!</p>
<p>Motor protection</p>	<p>Temperature monitoring with thermistor temperature sensor (PTC), PT100 or thermostich in the winding. (See operator's manual of the motor manufacturer).</p>

Operating pressure	<p>If the operating pressure reaches a critical value, the pump unit must be brought immediately into a safe operating condition.</p> <p>The permissible operating pressures are listed in the order-related documents or in the operator's manual of the respective pump types.</p>
Differential pressure monitoring Positive displacement pumps Side channel pumps	<p>If the differential pressure reaches a critical value, the pump unit must be brought immediately into a safe operating condition.</p> <p>The permissible differential pressures are listed in the order-related documents or in the operator's manual of the respective pump types.</p>
Pumping medium temperature Surface temperature Sealing/Quench medium temperature	<p>If the pumping media temperature, the surface temperature or the sealing/quench medium temperature reaches a critical value, the pump unit must be brought immediately into a safe operating condition.</p> <p>The pumping media temperature must be monitored at the outlet side or directly behind the outlet side of the pump.</p> <p>A suitable resistance thermometer must be set to the limit value of the respective ATEX temperature class.</p> <p>Monitoring of the pumping media temperature, surface temperature or sealing/quench media temperature by display of critical values:</p> <p>The permissible temperature application limits are listed in the order-related documents and in the additional ATEX operator's manual in section 3.1.3.</p> <p>If no information on the sealing/quench media temperature has been given in the order-related documentation, the maximum sealing/quench media temperature must be $T \leq 70 \text{ }^\circ\text{C}$. This sealing/quench media temperature may not be exceeded. The operating company is responsible for compliance with the temperature.</p> <p>If it cannot guarantee this, the operating company must ensure that the temperature is not exceeded (e.g., using a sealing/quench container with cooling coil for cooling, temperature monitoring with automatic switch-off, ...)</p>

6.4.2 Categories 2&3, Zones 1&2 (Ex-inside) monitoring parameters

The following monitoring parameters apply to pumps for which an occasional occurrence of explosive gas atmospheres within the pump is permissible.

Monitoring parameters	Measures
<p>Dry running inside the pump</p> <p>Double seal</p>	<p>Dry running inside the pump is never permitted for pumps with simple mechanical seals or magnetic couplings. They are therefore also never approved for an internal explosive gas atmosphere!</p> <p>Pumps with double mechanical seals can be operated for a short time (depending on the pumping media temperature) without pumping medium in the pump interior, provided that the seal supply system is in operation and monitored (see flow and level monitoring of double seals) and (forced) circulation/flushing is present.</p> <p>Occasional occurrence of an explosive gas atmosphere within pumps intended for this purpose is permissible (Zone 1 or Zone 2) if (forced) circulation is present.</p> <p>Permanent pumping of an explosive mixture is not permitted (Zone 0).</p>
<p>Dry running in the sealing chamber</p> <p>Double seal</p> <p>Seal supply system</p>	<p>Flow monitoring of a flushed seal</p> <p>If the flushing flow rate of a double seal reaches a critical value (high temperature rise of the quench/sealing medium, rapid drop in the flow rate or insufficient flow rate), the pump unit must be brought automatically and immediately into a safe operating condition. → Switching off the pump unit.</p> <p>The pump unit must not be put back into operation until the fault has been rectified and the interlock reset.</p> <p>A flow monitoring system must be installed in such a way that the sealing chamber is continuously filled with quench/sealing medium.</p> <p>Fill level monitoring of a quenched/pressurized seal</p> <p>If the filling level of the quench/sealing pressure system reaches a critical value (container not sufficiently filled), the pump unit must be brought automatically and immediately into a safe operating condition. → Switching off the pump unit.</p> <p>The pump unit must not be put back into operation until the fault has been rectified and the interlock reset.</p> <p>Monitoring of the filling level of the quench/sealing pressure system by automatically transferring it to a safe operating condition.</p> <ul style="list-style-type: none"> - Fill level switch in the sealing medium container switches when the critical level of the sealing medium is reached. <p>If other or further values of these monitoring parameters must be complied with, these are contained in the order-related documentation, sectional drawing of the shaft seal or documentation of the seal manufacturer.</p>
<p>Motor protection</p>	<p>Temperature monitoring with thermistor temperature sensor (PTC), PT100 or thermostitch in the winding (see operator's manual of the</p>

	motor manufacturer).
Operating pressure	<p>If the operating pressure reaches a critical value, the pump unit must be brought automatically and immediately into a safe operating condition.</p> <p>The permissible operating pressures are specified in the order-related documents.</p>
Differential pressure monitoring Positive displacement pumps Side channel pumps	<p>If the differential pressure reaches a critical value, the pump unit must be brought automatically into a safe operating condition immediately.</p> <p>The permissible differential pressures are listed in the order-related documents.</p>
Pumping medium temperature Surface temperature Sealing/Quench medium temperature	<p>If the pumping media temperature, the surface temperature or the sealing/quench medium temperature reaches a critical value, the pump unit must be brought automatically and immediately into a safe operating condition.</p> <p>The pumping media temperature must be monitored at the outlet side or directly behind the outlet side of the pump.</p> <p>A suitable resistance thermometer must be set to the limit value of the respective ATEX temperature class.</p> <p>The permissible temperature application limits are listed in the order-related documents and in the additional ATEX operator's manual in section 3.1.3.</p> <p>If no information on the sealing/quench media temperature has been given in the order-related documentation, the maximum sealing/quench media temperature must be $T \leq 70 \text{ }^\circ\text{C}$. This sealing/quench media temperature may not be exceeded. The operating company is responsible for compliance with the temperature.</p> <p>If it cannot guarantee this, the operating company must ensure that the temperature is not exceeded (e.g., using a sealing/quench container with cooling coil for cooling, temperature monitoring with automatic switch-off, ...)</p>

7 Maintenance

In order to ensure trouble-free and efficient operation over the entire service life of the pump, the regulations of the "Additional operator's manual and assembly instructions" as well as any additional documents of the order-related pump documentation regarding the performance of inspection and maintenance work must be strictly observed.



- Assembly, disassembly and most maintenance work on the pump unit must only be carried out with the electrical connections disconnected.
- Maintenance should be carried out in a dust-free environment.



Danger of explosion!

- The maintenance of the pump units must be carried out in a non-explosive environment or in an area without existing explosion hazard.
- When maintaining the pump units, an explosive atmosphere inside the equipment must be excluded by the operating company.
- For pump units with electric motors or geared motors, the control cycles, change intervals and lubricant qualities described or required in the "Additional operator's manual and assembly instructions" as well as in the documentation of the motors and geared motors used must be strictly complied with.
- Wear parts, such as mechanical seals, shaft seals, bearings and gear units, must be checked regularly and replaced if necessary in order to ensure permanent explosion protection.
- Control, monitoring and checking devices must be maintained in accordance with the manufacturer's instructions, and checked regularly for functionality.



Maintenance: Bearings and bearing seals

- Check running noises, vibration and temperature of gearwheels and bearings on a daily basis.
- Check the oil level daily. When the pump is at a standstill, the sight glass must be filled to the middle.
- Daily visual check of seat and for damage and leakage on radial shaft seals, V-rings and lip seals. Replace if necessary.
- Lubrication intervals, oil changes, and replacement intervals of the bearings must be strictly observed in accordance with the specifications of the "Additional operator's manual and assembly instructions" or the order-related documents.



Maintenance: Shaft seal, sealing system and seal

- Regular check for inadmissible leakage at the shaft seal.

- Regular visual inspection of static seals.
- Regular check for inadmissible leakage at the flush/quench or sealing pressure system.
- Daily check of pressure, temperature, level and flow of the sealing medium.
- Regular visual check and replacement of the sealing medium.



The functional end of a mechanical seal is indicated by an increase in the normal average leakage.

Contamination or increase of the sealing medium in the quench/sealing pressure vessel could be a sign of an impermissible leakage at the shaft seal. The mechanical seal must be checked and repaired if necessary.



Maintenance: Magnetic coupling

- In the case of pump units with magnetic couplings, which are used in an explosive atmosphere, repair and maintenance work on the coupling or replacement of the coupling may only be carried out by *Fristam* fitters or personnel trained by *Fristam*.

Before commissioning, a test run under exclusion of an explosive atmosphere must be carried out and a test protocol specified by *Fristam* must be drawn up.



Maintenance: Grounding

- The equipotential bonding and the grounding must be checked daily and after every change of location.



Maintenance: Cleaning

- Regular cleaning work must be carried out. Dirt and dust must be removed.
- Accumulated dust deposits must be removed immediately after they are visually detected, whereby a limit value of the maximum layer thickness of 5 mm may not be exceeded.
- Clean the filter in the suction line regularly.



Regular checks must be carried out in order to detect deviations from the normal operating condition caused by wear or damage in good time. The troubleshooting tables in the "Additional operator's manual and assembly instructions" of the respective pump must be observed.



Danger of explosion due to use of incorrect tools according to occupational health and safety regulation BGR 104

- Never use steel tools in Zone 1 if there is a risk of explosion from materials of explosion group IIC and hydrogen sulfide, ethylene oxide, or carbon monoxide.

7.1 Assembly / disassembly

If pumps or pump units are dismantled for the purpose of maintenance or repair work, it is the responsibility of the operating company to ensure that the instructions described in the "Additional operator's manual and assembly instructions" are carefully observed during reassembly. This applies in particular to the adjustment of the gap dimensions of rotating/stationary components and to screw tightening torques, which otherwise present an incalculable risk of ignition due to friction or parts becoming loose. Correct installation is a prerequisite for explosion protection.



- Connect the pump shaft to the motor shaft as described in the operator's manual.
- Correct alignment of the shafts.
- Correct installation of the coupling and sufficient space between coupling and coupling protection.
- Gap dimensions and tightening torques are recorded in the "Additional operator's manual and assembly instructions" of the respective pump.
- Stress-free integration of the pump into the pipe system.



Danger of explosion due to incorrect assembly!

- The mounting/removing of the pump units must be carried out in a non-explosive environment or in an area without an existing explosion hazard.
- When mounting/removing the pump units, an explosive atmosphere inside the equipment must be excluded by the operating company.
- In the case of pump units in which a potentially explosive atmosphere may occur inside the pump during operation, repair and maintenance work on housings, covers, seals and conveying elements may only be carried out by *Fristam* fitters or by personnel trained by *Fristam*.

Before commissioning, a test run under exclusion of an explosive atmosphere must be carried out and a test protocol specified by *Fristam* must be drawn up.

7.2 Replacement parts

The operating company of the pump/pump unit is responsible for selecting the correct replacement parts according to the replacement parts documentation supplied by *Fristam Pumpen*.



Wear parts must be replaced regularly to ensure permanent explosion protection.

The service life of the pump parts (e.g., bearings, seals, magnetic coupling, gearbox etc.) depends on the mode of operation. Only original spare parts may be used; otherwise the warranty expires, and there is a risk of malfunction with dangers to persons and the environment.

If original spare parts are not used, it must be checked whether there is any significant modification of the device and which affects safety-related features or the integrity of a type of protection. If this is the case, conformity according to Directive 2014/34/EU is no longer guaranteed and must be reapplied.

In particular for pumps in which an ignitable pumping medium occasionally occurs inside, contact-less running of internal parts of the pump is only guaranteed with original Fristam spare parts and the associated quality controls.



Please note that the mechanical shaft seals and magnetic couplings used by *Fristam Pumpen* are machine parts for general technical use. They are not components within the meaning of Directive 2014/34/EC.



Fristam Service is available for all assembly and maintenance work or information on spare parts.

8 Appendix

8.1 EU DECLARATION OF CONFORMITY

(within the meaning of Directive 2014/34/EU, Annex VIII)

The manufacturer: *Fristam Pumpen KG (GmbH&Co.)*
Kurt-A.-Körper-Chaussee 55
21033 Hamburg, Germany

hereby declares that pumps and pump units of the following series

- Centrifugal pumps: FP, FPE, FP...V, FPH, FPEH, FPH...V, FPM, FSPE, FSP...V, FSM
- Centrifugal pumps: FC
- Rotary piston pumps: FK, FKL, FL, FL2, FL3
- Side channel pumps: FZ, FZM
- Centrifugal pumps: FPC

(for serial number, see cover page of operator's manual)

comply with all relevant provisions of the following directives:

- Machinery Directive (**2006/42/EC**)

In addition to the pumps as a motor-driven device:

- Electrical Equipment Directive (**2014/35/EU**)
- Electromagnetic compatibility (**2014/30/EU**)
- Directive **ATEX 2014/34/EU**

The above product conforms to the following standards:

DIN EN ISO 12100 :2011	Safety of machinery - General principles for design - Risk assessment and risk reduction
DIN EN 1127-1:2011	Explosive atmospheres – Explosion prevention and protection, Part 1: Basic concepts and methodology
DIN EN ISO 80079-36:2016	Explosive atmospheres – Part 36: Non-electrical equipment for use in explosive atmospheres – Basic concepts and requirements

DIN EN ISO 80079-37:2016	Explosive atmospheres – Part 37: Non-electrical equipment for use in explosive atmospheres – Non-electrical type of protection constructional safety "c", control of ignition sources "b", liquid immersion "k"
DIN EN 60079-31:2014	Explosive atmospheres – Part 31: Equipment dust explosion protection by housing "t"
DIN EN 60079-14:2014	Explosive atmospheres – Part 14: Electrical installations design, selection and erection

The documents required for the assessment of conformity according to Directive 2014/34/EU Annex VIII have been filed with the notified body.

TÜV NORD CERT GmbH & CO. KG

ID no.: 0044

Documentation officer: Horst Helms
Tel.: +49 (0) 40 72556-107
Address: See manufacturer's address

Hamburg, Germany, dated 06/28/2019



Horst Helms / Head of Quality Management

8.2 EU DECLARATION OF CONFORMITY FOR FDS, VPS

(within the meaning of Directive 2014/34/EU, Annex VIII)

The manufacturer: *Fristam Pumpen* Schaumburg GmbH
Kurt-A.-Körber-Chaussee 55
21033 Hamburg, Germany

hereby declares that pumps and pump units of the following series

- Double screw spindle pump: FDS, VPS(I)

(for serial number, see cover page of operator's manual)

comply with all relevant provisions of the following directives:

- Machinery Directive (**2006/42/EC**)

In addition to the pumps as a motor-driven device:

- Electrical Equipment Directive (**2014/35/EU**)
- Electromagnetic compatibility (**2014/30/EU**).
- Directive **ATEX 2014/34/EU**

The above product conforms to the following standards:

DIN EN ISO 12100 :2011	Safety of machinery - General principles for design - Risk assessment and risk reduction
DIN EN 1127-1:2011	Explosive atmospheres – Explosion prevention and protection, Part 1: Basic concepts and methodology
DIN EN ISO 80079-36:2016	Explosive atmospheres – Part 36: Non-electrical equipment for use in explosive atmospheres – Basic concepts and requirements
DIN EN ISO 80079-37:2016	Explosive atmospheres – Part 37: Non-electrical equipment for use in explosive atmospheres – Non-electrical type of protection constructional safety "c", control of ignition sources "b", liquid immersion "k"
DIN EN 60079-31:2014	Explosive atmospheres – Part 31: Equipment dust explosion protection by housing "t
DIN EN 60079-14:2014	Explosive atmospheres – Part 14: Electrical installations design, selection and erection

The documents required for the assessment of conformity according to Directive 2014/34/EU Annex VIII have been filed with the notified body.

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