

FLOWROX

ATEX-240816-EN



Instruction Manual: Flowrox LPP-T and LPP-D hose pumps in explosive conditions



These instructions must be read carefully and understood prior to installation, use, and servicing of this ATEX product.

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1 DIRECTIVE CONFORMANCE DECLARATIONS

DECLARATION OF CONFORMITY (Appendix IIA to the Machine Decree (koneasetus), 400/2008)

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hereby declares that the LPP pump delivered complies with the following applicable regulations:

European Union Machinery Directive, 2006/42/EC
Finnish Government Decree on Machine Safety, 400/2008, Machine Decree (koneasetus)

Directives, decrees, and standards applied:

SFS- EN 809+A1 (2009), Pumps and pump units for liquids. Common safety requirements.

SFS- EN ISO 12100:2010, Safety of machinery. General principles for design. Risk assessment and risk reduction.

SFS- EN ISO 14847, Rotary positive displacement pumps. Technical requirements.

SFS- EN ISO 13732-1 (2008), Ergonomics of the thermal environment. Methods for the assessment of human responses to contact with surfaces. Part1: Hot surfaces

SFS- EN ISO 20361 (2009), Liquid pumps and pump units. Noise test code. Grades 2 and 3 of accuracy

SFS- EN 60204-1/A1 (2009), Safety of machinery. Electrical equipment of machines. Part1: General requirements

On behalf of Flowrox Oy
In Lappeenranta, 1 September 2015



Jukka Koskela
President and CEO

2 EXEMPTION FROM LIABILITY

These ATEX instructions deal with implementation of the safety requirements specified in the EU Machinery Directive, 94/9/EC, for Flowrox Oy's hose pumps as applicable, in accordance with the standards EN 13463-1, EN 13463-5, and EN 13463-8, harmonised under the directive. These standards are applicable to design of equipment operated by other than electrical means and to atmospheres with a pressure between 0.8 and 1.1 bar and a temperature between -20 and 40°C. If the intended temperature range for the hose pump differs from -20...40°C, this is indicated on its type plate. The purpose of the standards is to prevent and eliminate explosive conditions in advance. Explosive ignition sources include the following:

- Hot surfaces
- Flames and hot gases or liquids Self-ignition of dust
- Mechanical sparks
- Sparks from electrical equipment
- Stray current
- Cathodic protection currents
- Static electricity
- High-frequency electrical fields
- Light-frequency radiation
- Ionising radiation
- Light-frequency radiation
- Ultrasound frequencies
- Adiabatic compression
- Pressure waves
- Heat-generating chemical reactions

2.1 Electrical equipment:

All electrical equipment used with the pumps and installed in explosive atmospheres must meet the ATEX requirements and, at minimum, comply with the standards for Equipment Category 2 GD (LPP-T and LPP-D pumps). The electrical equipment used also determines the explosion group and temperature class of the assembly. The electrical equipment must be installed in accordance with the EN 60079-14 standard. If power is supplied to the Exd motor by means of a frequency converter, the motor temperature must be monitored with temperature sensors, located on the stator windings and connected to an ATEX-approved thermistor relay.

Flowrox Oy is responsible for the functioning of its pumps and the related equipment in conditions that have been determined according to information provided by the customer and that comply with the above standards.

Due to continuous product development, there may be some differences between the pump products and the instructions. Also, Flowrox Oy reserves the right to change the structure of its pumps without being obliged to change previously manufactured pumps to correspond to the new structure. Customers with any questions about the pumps or their operating conditions are advised to contact Flowrox Oy's sales service.

3 DEFINITIONS

3.1 Normal operation

The equipment, protection systems, or components operate in accordance with their design parameters.

3.2 Foreseeable fault condition

Problems and equipment malfunctions occurring during normal use.

3.3 Maximum surface temperature:

The highest temperature of a piece of equipment, protection system, or component that causes ignition of an explosive atmosphere. To prevent ignition, the maximum surface temperature must be lower than the ignition temperature of the explosive atmosphere.

4 GENERAL

4.1 Safe operation of the LPP-D and LPP-T pumps


Instructions for normal operation of the pumps are provided in Flowrox Oy's hose pump manuals *Installation, operation, and maintenance instructions for LPP-D hose pumps* and *Installation, operation, and maintenance instructions for LPP-T hose pumps*. These manuals include detailed instructions for the pumps, covering, e.g., the following:

- Principle of operation
- Installation and commissioning
- Safe operation
- Maintenance (servicing and repair) and adjustment

The purpose of these ATEX instructions is to provide information about safe operation of hose pumps in explosive atmospheres. The manuals covering normal operation of the pumps complement these ATEX instructions at a general level.


Installation, commissioning, operation, maintenance, and adjustment procedures must be performed by authorized personnel. The authorized personnel must follow these ATEX instructions, in addition to the instructions for normal operation, and take into account the warning labels on the pumps. In addition to the operating instructions, attention must be paid to national and regional regulations and instructions related to the operating conditions, to ensure safe operation of the hose pumps.

4.2 CE and Ex markings

 on the product means that the manufacturer assures that the product meets the requirements of the relevant directives.

According to the EU Machinery Directive, pumps without a drive unit must not be CE-marked. By contrast, pumps with a drive unit are CE-marked.



 on the product indicates conditions applying to explosion protection and the related special instructions.

4.3 Application of ATEX legislation

ATEX legislation is applied to *equipment* and *explosive atmospheres*:

Equipment:

- Electrical equipment and electrical installations
- Mechanical equipment, such as pumps
- Safety, adjustment, and control systems located outside explosive atmospheres

Explosive atmospheres:

- Flammable liquids and gases
- Explosive dusts (coal, wood, sugar, grain, flour, plastic, metal)

5 DELIVERY OF AN ATEX-APPROVED HOSE PUMP

Flowrox Oy delivers LPP-D and LPP-T hose pumps as follows:

1. ATEX hose pump ready for operation (ATEX-approved gear motor connected to the pump).
2. ATEX hose pump without a gear motor (Pump Head pump).

If the pump delivered to the customer corresponds to Item 1 (ATEX hose pump ready for operation), the pump fully meets the ATEX requirements and this is indicated on its type plate.

If the pump has been delivered to the customer without a gear motor and thus is a Pump Head hose pump in accordance with Item 2, the ATEX protection structure marking on its type plate applies only to the structure of the pump section delivered by Flowrox Oy. All components and equipment subsequently connected to the pump must have an ATEX protection structure corresponding to at least that of the pump section delivered by Flowrox Oy.

6 ATEX GROUPING AND CLASSIFICATION OF HOSE PUMPS

Flowrox Oy's LPP-D hose pumps meet the following ATEX and other Ex requirements:



II 2 GD c IIB T4, in which

II = *Equipment Group*, including *other equipment* than that intended for use in mines and surface installations of mines (normal industrial use; flammable gases and dusts).

2 = *Equipment Category*. The electrical equipment has been designed such that a *high level of protection* is guaranteed with the operational values given by the manufacturer. For equipment in Equipment Category 2, the manufacturer must meet the following requirements for proof of compliance: EC type inspection and either ATEX-approved product quality assurance or ATEX-approved type compliance verification is required for electrical equipment. *The equipment in this category is intended for places in which an explosive atmosphere is likely to occur* (zones 1 and 21). The equipment must guarantee a sufficient level of protection *during recurring problems or normal equipment malfunctions*.

For mechanical equipment, the manufacturer must perform an internal inspection and send the technical documentation to the notified body.

G = *flammable substance; gas or liquid*

D = *flammable substance; dust*

c = *constructional safety* - i.e., a protective structure that prevents ignition due to hot surfaces, sparks, or compression of moving parts (Ex protection via constructional safety according to EN 13463-5 for non-electrical equipment)

IIB = *Explosion Group* - the explosion group indicates the suitability of *electrical equipment* for explosive atmospheres, with Explosion Group II including *other electrical equipment* than that intended for use in mines and Explosion Group IIB referring to the properties of equipment with Exd and Exi protective structures

Allowable temperature for equipment in Equipment Group II G (inside and outside of the pump):

T4 = *Temperature Class* (or maximum surface temperature; Tmax). The maximum allowable surface temperature for the pump is stated for normal operating conditions (-20°C....+40°C), either as Temperature Class T4 (max.: 135°C) or as a maximum allowable surface temperature (Tmax) specified by the manufacturer.

This means that the ignition temperature of the gas or vapour in the customer's process must be higher than 135°C.

In ATEX operation of hose pumps manufactured by Flowrox Oy, the maximum allowable temperature of the liquid to be pumped is 70°C.

Allowable temperature for equipment in Equipment Group II D (outside of the pump):

For equipment in this group, the manufacturer must specify the actual maximum surface temperature of the pump. The maximum allowable surface temperature (Tmax) for Flowrox Oy's pumps is 135°C when operated in conditions with a risk of dust explosion (-20°C....+40°C). *The customer using the flow pump is obliged to ensure that no flammable*

layer or cloud of dust accumulates on top of the pump. The maximum surface temperature of the pump must always be 75°C lower than the glowing temperature of the dust in the customer's process, and a maximum of 2/3 of the ignition temperature of the dust/air mixture in question.

Flowrox Oy's LPP-T and LPP-D hose pumps meet the following ATEX and other Ex requirements:



II 2 GD c IIB T4 (LPP-T hose pumps with claw clutches):

- LPP-T25
- LPP-T32
- LPP-T40



II 2 GD ck IIB T4 (LPP-T hose pumps with gear clutches):

- LPP-T50
- LPP-T65
- LPP-T80

II = *Equipment Group*, including *other equipment* than that intended for use in mines and surface installations of mines (normal industrial use; flammable gases and dusts).

2= *Equipment Category*. The electrical equipment has been designed such that a *high level of protection* is guaranteed with the operational values given by the manufacturer. For equipment in Equipment Category 2, the manufacturer must meet the following requirements for proof of compliance: EC type inspection and either ATEX-approved product quality assurance or ATEX-approved type compliance verification is required for electrical equipment. *The equipment in this category is intended for places in which an explosive atmosphere is likely to occur* (zones 1 and 21). The equipment must guarantee a sufficient level of protection *during recurring problems or normal equipment malfunctions*.

For mechanical equipment, the manufacturer must perform an internal inspection and send the technical documentation to the notified body.

G= *flammable substance / explosive atmosphere; gas, vapour, mist, or liquid*

D= *flammable substance / explosive atmosphere; dust*

c = *constructional safety* - i.e., a protective structure that prevents ignition due to hot surfaces, sparks, or compression of moving parts (Ex protection via constructional safety according to EN 13463-5 for non-electrical equipment)

k = *protection by liquid immersion*, in which potential ignition sources in explosive atmospheres are made ineffective by covering them with viscous lubrication oil (the clutch with lubrication grease)

IIB = *Explosion Group* - the explosion group indicates the suitability of *electrical equipment* for explosive atmospheres, with Explosion Group II including *other electrical equipment* than that intended for use in mines and Explosion Group IIB referring to the properties of equipment with Exd and Exi protective structures

Allowable temperature for equipment in Equipment Group II G (inside and outside of the pump):

T4 = *Temperature Class* (or maximum surface temperature; Tmax). According to the standard, the maximum allowable surface temperature for the pump is determined in normal operating conditions (-20°C...+40°C) as either Temperature Class T4 (max.: 135°C) or a maximum allowable surface temperature (Tmax) specified by the manufacturer.

In ATEX operation of hose pumps manufactured by Flowrox Oy, the maximum allowable temperature of the liquid to be pumped is 70°C. In foreseeable fault conditions, the pump temperature may increase to 100°C if the hose breaks, if the pump is clogged, or if pumping against a closed valve is attempted. *This means that the ignition temperature of the gas or vapour in the customer's process must be higher than 135°C.*

Allowable temperature for equipment in Equipment Group II D (outside of the pump):

For equipment in this group, the manufacturer must specify the actual maximum surface temperature of the pump. The maximum allowable surface temperature (T_{max}) for Flowrox Oy's pumps is 135°C when operated in conditions with a risk of dust explosion (-20°C...+40°C). *The customer using the flow pump is obliged to ensure that no flammable layer or cloud of dust accumulates on top of the pump. The maximum surface temperature of the pump must always be 75°C lower than the glowing temperature of the dust in the customer's process, and a maximum of 2/3 of the ignition temperature of the dust/air mixture in question.*

7 ZONE CLASSIFICATION BY THE CUSTOMER

The customer performs zone classification and assessment of the probability of an explosion hazard for the hose pump's planned location, and this information is used to determine the suitability of Flowrox Oy's pump for the customer's ATEX conditions.

LPP-T and LPP-D hose pumps (Equipment Category 2 GD) are suitable for use with *gases and liquids in Zone 1 and 2, and dusts in Zone 21 and 22 conditions.*

Instructions for zone classification are provided in the standards EN 60079-10 and EN 61241-10 as well as in SFS Handbook 59.

7.1 Zones for gases and liquids

Zone 1: A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour, or mist is likely to occur in normal operation occasionally. A potentially explosive concentration is present in Zone 1 for 10-1,000 h/a.

Zone 2: A place, in which, an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour, or mist is not likely to occur in normal operation and where, if it does occur, it will persist for a short while only. A potentially explosive concentration is present in Zone 2 for <10 h/a.



7.2 Zones for dusts

Zone 21: A place, in which, an explosive atmosphere (in the form of a cloud of combustible dust) in air is likely to occur in normal operation occasionally.

Zone 22: A place, in which, an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation and where, if it does occur, it will persist for a short while only.

PUMP TYPE PLATES

Below is an example of a type plate attached to a hose pump: a hose pump ready for operation (a gear motor has been connected to the pump).

 	
Manufacturer: Flowrox Oy Address: P.O. Box 338, FI-53101 Lappeenranta	
Type:	<div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div>
Manuf. Year:	<div style="border: 1px solid black; padding: 2px; display: inline-block;">2</div>
Serial number:	<div style="border: 1px solid black; padding: 2px; display: inline-block;">3</div>
Flow rate:	<div style="border: 1px solid black; padding: 2px; display: inline-block;">4</div>
Max. pressure:	<div style="border: 1px solid black; padding: 2px; display: inline-block;">5</div>

- 1

 Pump type: e.g. LPP-T65 GM10-2-0-I-TD
- 2

 Pump manufacturing year: e.g. 2009
- 3

 Pump serial number: e.g. 08-4045-10
- 4

 Pump flow rate: e.g. 14 m³/h (not specified for Pump Head pumps)
- 5

 Maximum operating pressure: e.g. 10 bar

Hose pumps used in ATEX operating conditions have the following plate in addition to the normal type plate, indicating the ATEX and other Ex requirements:

Below is an example of an ATEX plate for a piece of equipment in Group II, Equipment Category 2, intended for *explosive gas atmospheres*, with a surface temperature class of 135°C (T4), and for *explosive dust atmospheres*, with a maximum equipment surface temperature of 135°C.

 
Ex II 2 G c IIB T4 Ex II 2 D c IIB 135°C

8 HOSE PUMP OPERATOR'S RESPONSIBILITY

Instructions for installation, maintenance, and inspection of the equipment are provided in the normal operation manuals *Installation, operation, and maintenance instructions for LPP-D hose pumps* and *Installation, operation, and maintenance instructions for LPP-T hose pumps* as well as these ATEX instructions.

Special safety precautions must be taken when the pumps are used in explosive ATEX conditions. *The hose pump operator is responsible for following the maintenance instructions in the manuals and performing regular inspections, to ensure that the pump temperatures remain below the maximum temperatures specified.* The pump operator may perform the required regular measurements by means of temperature and vibration gauges as well as visual and aural observation.

The customer's zone classification and assessment of the probability of an explosion hazard are used to determine the operating area for the hose pumps, as well as the operating range, which must not be exceeded. If the operating range is exceeded, the pump temperatures could exceed the allowable limit.

Operation of the hose pumps causes internal friction heat, which is influenced by, e.g., the rotating friction between the pressing wheel and the rotor, the viscosity and specific heat of the liquid being pumped, and the LPP lubricant inside the pump housing. It is the customer's responsibility to ensure that the amount of LPP lubricant specified in the instructions is present inside the pump during operation and that the flow rate of the liquid being pumped is sufficient to eliminate internal friction heat. The liquid flow rate decreases as the pump hose is subjected to wear, causing backflow, which may impede the dissipation of friction heat. The customer must perform appropriate monitoring to ensure that the surface temperatures do not exceed the allowable limits.

8.1 Precautions, maintenance, and monitoring

Special attention must be paid to the following procedures:

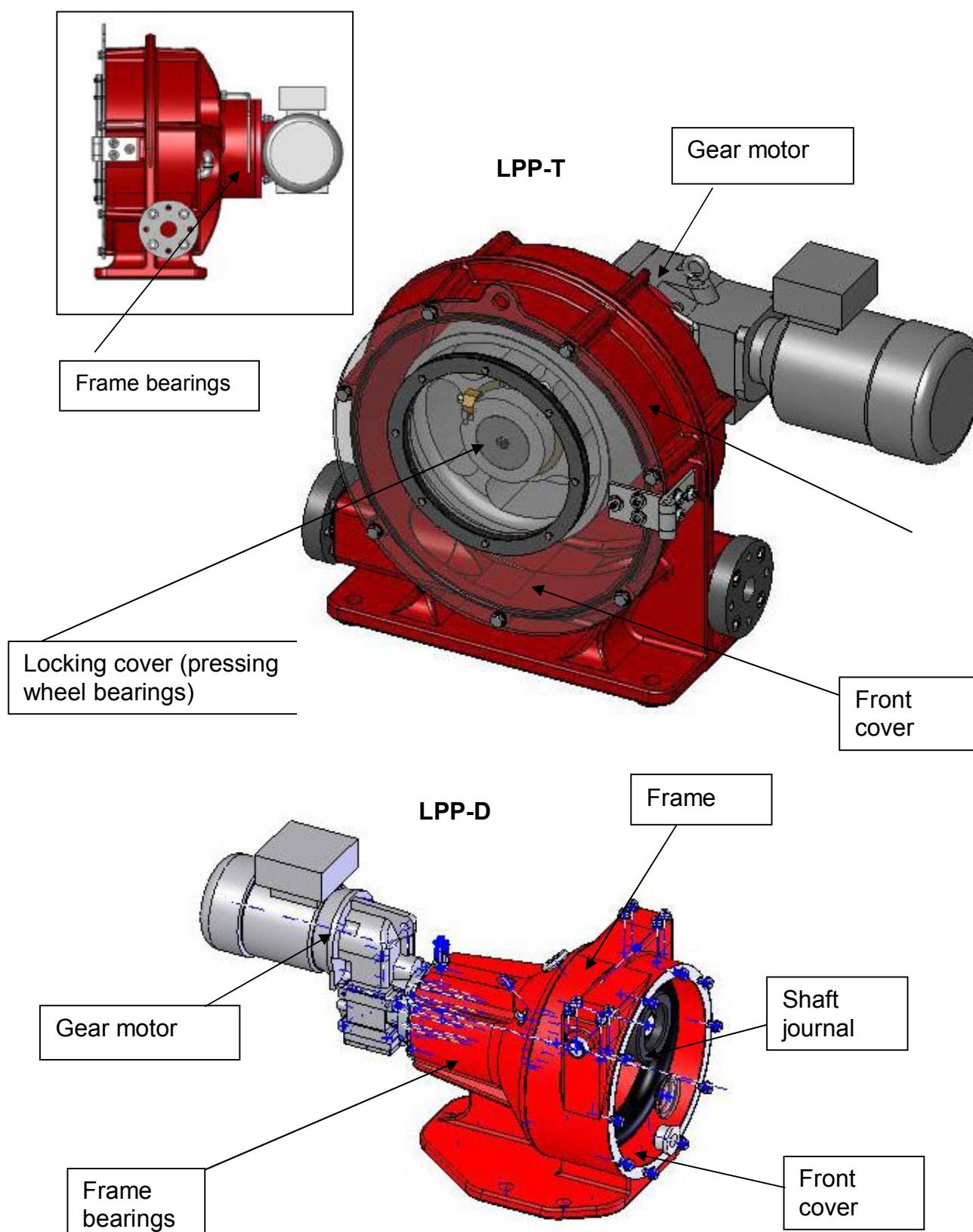
- *Preventive maintenance measures* (replacing the hose, checking the condition of the gaskets, and lubricating the bearings and gear clutch):
 - The condition of the pump bearings and the sufficiency of their lubrication must be checked at least every three months (more often if the conditions so require). Greasing instructions as well as grease types and amounts are provided in the manuals *Installation, operation, and maintenance instructions for LPP-D hose pumps* and *Installation, operation, and maintenance instructions for LPP-T hose pumps*.

The gear clutch surfaces of the hose pumps must be well-greased to eliminate the risk of explosion. It is the operator's responsibility to check the grease status of the gear clutch every six months. The suitable grease type for the clutch is SKF LGHP2 or equivalent.

- Monitoring of the temperature of the hose pump frame bearings is important for detection of impending bearing damage at a sufficiently early stage. Bearing damage often increases the pump's surface temperature to above normal values and thus makes it necessary to replace the bearings:
 - *Frame bearings:* The temperature of the pump frame bearings can be measured and monitored by means of a temperature strip, a portable temperature gauge, vibration measurement equipment, and aural observation.

- *Pressing wheel bearings*: The condition of the pump pressing wheel bearings can be monitored by means of infrared thermometers, vibration measurement equipment, and aural observation.

The surface temperatures of the frame and pressing wheel bearings and the other items to be observed must be measured at the following points:



springs used in explosive atmospheres must be made of stainless steel.

- *Static electricity and earthing:*

- LPP-T hose pumps have a polycarbonate plate window to facilitate adjustment of the hose and monitoring of hose condition. To prevent static discharge, the window must not be cleaned with a dry cloth. The pump has a warning label that reminds the operator of the dangers of static electricity.



- To prevent a discharge of static electricity, the earthing (equipotential bonding) between the hose pump and the related parts (frame, valves, and pipes) must be checked before use of the pump. The pump has a warning label that reminds the operator of the importance of earthing.



- *Hose leak detectors:*

- Hose leak detectors must be wired to the Exi circuit by means of suitable Ex-approved ancillary equipment, which is to be installed outside the Ex space.

- *Temperature of the pumped medium* (heat is conducted into the pump structures):

- The pump and the motor must be kept clean in order to prevent excessive heat production. At normal operating temperatures, the temperature of a running hose pump is approximately equal to that of the medium being pumped. When the unit is used in compliance with the ATEX standard, the maximum temperature of the medium is 70 °C.

- *Hose lubricant:*

The operator must ensure that the amount of LPP Silicon lubricant inside the hose pump is always correct, to prevent excessive wear and heating of the hose. Instructions related to hose replacement and lubricants are provided in the manuals *Installation, operation, and maintenance instructions for LPP-D hose pumps* and *Installation, operation, and maintenance instructions for LPP-T hose pumps*.

WARNING:

The glycerine hose lubricant used in Flowrox Oy's LPP-D and LPP-T pumps may react with oxidising substances, resulting in a risk of fire or explosion.



Oxidising chemicals include the following:

- Ammonium nitrate
- Ammonium persulphate (diammonium peroxide sulphate)
- Chromium trioxide
- Sodium chlorate
- Organic peroxides
- Nitric acid
- Hydrogen peroxide solution

Customers with any questions about the operating conditions are advised to contact Flowrox Oy's sales service.