



**JOHNSON PUMP**  
AN SPX BRAND



Instruction Manual  
**OptiFlo**  
Explosion Protection  
according to ATEX (94/9/EC)



Read and understand this manual prior to operating or servicing this product.

A.0201.401– IM-OF/02.00 EN (08/2009)

**SPX**<sup>®</sup>

# Declaration of conformity


according to EC directive 94/9/EC (ATEX)

## Manufacturer

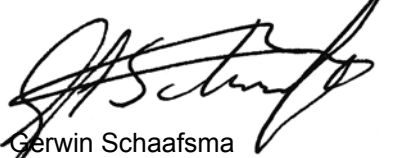
SPX Process Equipment BE NV  
Evenbroekveld 2-6  
BE-9420 Erpe-Mere  
Belgium  
Declares hereby that

the following product families, if ordered as Atex pump or Atex pump unit, are meeting the requirements set forth in EC directive 94/9/EC of 23 March 1994.

If the product is modified without our written permission, or if the safety instructions in the instruction manuals are not being followed, this declaration becomes invalid.

- Product families: OptiFlo
- Notified body: SP Sveriges Provnings- och Forskningsinstitut  
P.O. Box 857  
SE-501 15 Borås  
Sweden
- Tech. File Ref.: CEF515351
- Standards: Applicable harmonised standards  
EN 13463-1  
EN 13463-5  
EN 1127-1
- Marking: The marking includes the  symbol and the technical file reference.  
Special conditions for safe use are specified in the Ex-Instruction Manual.

Örebro, Sweden, 1 August 2009



Gerwin Schaafsma  
Operational Manager Europe

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# OptiFlo – Operating instructions concerning explosion protection

## Disclaimer

Considerable effort has been made to ensure that this manual is free of inaccuracies and omissions. However, even though the manual contains up to date data at time of going to press, due to constant improvements some of the data contained herein may not exactly reflect the current model of the particular product described in this manual.

SPX Process Equipment reserves the right to change the construction and design of the products at any time without being obliged to change previous models accordingly.



These instructions contain important and useful information on explosion protection in accordance with EU directive 94/9/EC – ATEX.

All relevant instructions about installation, operation and maintenance of the pump and the pump unit can be found in the separate pump's "Instruction Manual". These instructions should be adhered to at all times!

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# 1.0 General

## 1.1 Symbol

The following symbol is used to indicate special instructions concerning explosion protection:



## 1.2 Safety Information

This manual covers the main issues concerning explosion protection and must be used together with the general Instruction Manual for OptiFlo pumps, hereafter called “IM” and the manuals of other equipment such as gear and motor drives. For explosion protection safety it is imperative that the pump set must be protected from all unauthorised operation and unnecessary wear. Explosive gas mixtures or concentrations of dust, in conjunction with hot surfaces can lead to severe or fatal personal injuries.



Installation, connection, start-up, maintenance and repair work may only be performed by qualified personnel while taking in account:

- these specific instructions, together with all other instructions for the installed equipment and installation;
- warning and information signs on the equipment;
- the specific regulations and requirements for the system in which the pump unit will operate (current valid national and regional regulations).

## 1.3 Responsibility for ATEX certification – extend of delivery

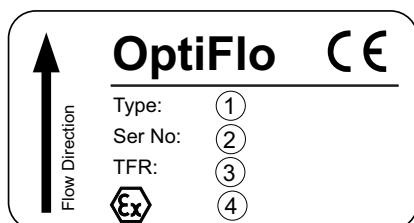
SPX Process Equipment will be held responsible only for delivered materials and equipment selected according to the operating conditions data, based on information supplied by the customer or the end user and stated in the order confirmation. When in doubt contact your local supplier.


Normally SPX Process Equipment delivers the basic pump. In this case the explosion protection certification marking on the pump nameplate refers exclusively to the pump. All other assembled equipment should have separate certification of at least the same or higher grade of protection as the pump, delivered by the supplier(s) of that equipment.

In the event SPX Process Equipment delivers a complete unit, the explosion protection certification, and marking on the nameplate attached to the base plate or to the pump frame, will refer to that specific unit.

## 1.4 Marking

### Name plate on the pump



- ① Type: example: OF0015PXT
- ② Serial No: A consecutive number
- ③ Tech. File Ref.: TFR CEF515351
- ④ Ex marking.: example:  II 2G c T6

## 1.5 ATEX type designation examples

### Example 1: Ex II 2G c T3-T4

- II 2G** marking according to Group II, Category 2, Gas (G) protection
- c** marking essential for safe use ignition protection (c = constructional safe)
- T3-T4** temperature class T3 to T4

### Example 2: Ex II 2G c 240°C (T2)

- II 2G** marking according to Group II, Category 2, Gas (G) protection
- c** marking essential for safe use ignition protection (c = constructional safe)
- 240°C** for a maximum surface temperature of 240 centigrade (degrees Celsius)
- (T2)** corresponding T2 temperature class.

### Example 3: Ex II 2D c 240°C

- II 2D** marking according to Group II, Category 2, Dust (D) protection
- c** marking essential for safe use ignition protection (c = constructional safe)
- 240°C** for a maximum surface temperature of 240 centigrade (degrees Celsius)

Environment temperature should be between -20°C and +40°C, if not, the corresponding environment temperature will be indicated on the nameplate.

## 1.6 Remark on EX type name plate concerning CE marking

A single pump without drive, according to the EC-Machine Directive, is not considered to be a machine and does not have to be CE-marked, a II-B Manufacturers Declaration will suffice. However the CE-marking forms part of the ATEX regulations, and is therefore compulsory.

## 1.7 Temperature classes and allowable temperatures

In normal operation the highest temperature on the surfaces of the pump will either correspond to the temperature of the pumped liquid marked up with safety margin for a possible spot temperature rise. The maximum permissible temperature depends on the temperature class (T6 to T1) or on Tmax to be complied with. The complete pump surfaces must be freely exposed to the atmosphere to allow proper cooling.

All data (temperature classes) are related to max ambient temperature of 40°C. If an ambient temperature above 40°C, correction must be made according to the difference. Always contact your local supplier.

### 1.7.1 II 2G allowable temperature

EX II 2G cT: Permissible temperature class related to the liquid temperature.

### 1.7.2 II 2(G)D allowable temperature

The maximum surface temperature ( $T_{max}$ ) is indicated on the name plate.

$T_{max}$  is determined as the lowest temperature derived from following equations:

- $T_{max}$  = temperature limits of selected internal materials (i.e. pump selection).
- $T_{max} = T_{5mm} - 75^{\circ}\text{C}$  ( $T_{5mm}$  "ignition temperature of a dust layer of 5 mm thickness")
- $T_{max} = 2/3 \times T_{Cl}$  ( $T_{Cl}$  "ignition temperature of a dust cloud").
- 

**Remark:**

$T_{5mm}$  and  $T_{Cl}$  are to be determined by the customer/user in case of dust (D) protection.

In case the ambient temperature exceeds the range of -20°C / +40°C contact your local supplier.

## 1.8 Responsibility

It is the responsibility of the operator to ensure that specified product temperatures are not exceeded and to ensure regular inspections and maintenance for good operation of the shaft seal and the internal pump parts, see 1.10.

## 1.9 Operation

- Under no circumstances it is allowed to pump non conductive flammable and/or explosive liquids. Static charges can be built up and cause penetration of the diaphragms.
- The pump must always be filled completely when pumping flammable and explosive liquids.
- When flow control is performed by by-passing the return liquid, the liquid may be returned to the suction port of the pump. The cooling from the diaphragms are sufficient.
- The pump can operate with the shut-off valves in the suction or discharge lines closed. Note: Closed suction valve can damage the pump due to cavitation.
- The pump can run dry only for shorter periods of time – see IM.
- The liquid discharge connections (hose or pipe connections) must always be of metal type (material depending on type of liquid). Never use the polymeric type of connections.

## 1.10 Monitoring

If good function and/or maximum allowable surface temperatures cannot be ensured by regular inspection by the operator, suitable monitoring and alarm devices must be provided for.

## 1.11 Residual risks

(based on the risk analysis according to SS-EN13463-1)

Potential ignition source			Measures applied to prevent the source becoming effective	Ignition protection used
Normal operation	Foreseeable malfunction	Rare malfunction		
Related to hot surfaces on hydraulic part.			The customer has to secure that the temperature of the pumped liquid does not exceed the allowable temperature limits.	SS-EN 13463-1 §6.1
			Additionally, the operator has to ensure that both the operating limits for the pump pressure and the air supply pressure does not exceed max allowable level.	Instruction Manual + Ex Instruction Manual
		Accumulation heat.	May only arise if the backvalves and/or the shaft sleeve are heavily worn out in combination with closed discharge valves. Operator must see to that regular maintenance of the pump is performed.	Instruction Manual + Ex Instruction Manual
		Excessive heat at shaft and shaft sleeve	The operator has to ensure that the pump does not run dry for a longer period time.	SS-EN 13463-1 §6.1 Instruction Manual + Ex Instruction Manual
	Related to ruptured diaphragm.		The operator must regularly see to that the diaphragms are exchanged before max. pumping-cycles are reached.	Instruction Manual + Ex Instruction Manual
		Electrostatic charges of diaphragms.	The operator must see to that non conductive flammable liquids are never pumped.	Instruction Manual + Ex Instruction Manual
	Electrostatic discharges pump unit.		Customer must ensure that correct earth connections are in use on the pump unit.	SS-EN 13463-1 Instruction Manual + Ex Instruction Manual

### Remarks:

- For category 2, the risks at “normal operation” and those at “foreseeable malfunction” have to be controlled.
- For category 3, the risks at “normal operation” have to be controlled.

## 2.0 Performance

- Operation of the pump outside its specified operating range may severely jeopardize the whole function of the pump and increase the risk of exceeding allowable temperature limits. See IM.



## 3.0 Installation

### 3.1 Checks

Before installation, the equipment must be checked.

- Ensure the equipment data (as indicated on nameplate, documentation etc.) corresponds to the explosive atmosphere zone, category and system requirements.
- Possible damage: the installed equipment must be undamaged and must have been properly stored before installation. In case of any doubt or any damage found contact your local supplier.
- Ensure that heated air from other units will not affect the environment of the pump unit; environment air should not exceed a temperature of 40°C.
- Check that polymeric materials are conductive.
- The detailed check list (see 6.0) should be thoroughly followed.
- Check that all screws and bolts are tightened according to recommendations in the Instruction Manual (IM).
- Check that the air valve on the pump is easily accessible and in good condition.

### 3.2 ATEX certification

Additional equipment such as monitoring equipment etc. must be part of the ATEX certification or must be certified separately for the appropriate temperature category. The assembled pump unit must have a separate certification and a separate nameplate supplied by the pump unit manufacturer.

### 3.3 Working environment

- The pump must be accessible for maintenance and inspection during operation, see IM.
- Proper separate grounding facilities should be provided for on the pump or pump stand.

### 3.4 Base plate

- The base plate must always be provided with an earthing boss.
- Ensure the earth circuit is properly connected to the baseplate and that the baseplate is correctly fastened to the pump body.

### 3.5 Direction of flow

- The flow is well marked on the pump, see IM.

### 3.6 Piping

- The suction and discharge lines should be designed properly for the required performance conditions and should be executed accordingly, see IM. Non compliance to the working conditions of the pump unit can cause severe problems such as NPSH-problems, vapour lock, excessive vibrations and premature pump failure.
- Pipes should be checked on dimensions and tightness under pressure and should be internally cleaned and be free of welding and foreign particles before they are connected to the pump.
- Hoses must be of the reinforced type according to applied safety margins. On suction side the hose must be able to handle vacuum pressure without imploding.

## 4.0 Commissioning

### 4.1 General

Take note that diaphragm pumps are positive displacement pumps and procedures may often differ from procedures commonly used for other types of pumps.



**Ensure that all the shut-off valves are fully opened when starting up the pump!**

### 4.2 Precautions

For explosion protection the following precautions are of importance:

- Ensure that the area around the pump and the pump unit is clean.
- Ensure that the suction line is fitted securely. Welding particles should be removed in advance. The whole pump system must be cleaned from particles.
- Ensure the shutoff valves in the suction and discharge lines are opened at start-up.
- Shut down the pump immediately in the event of irregular operating modes or malfunction.
- Shut down the pump in case the flow drops or the pump pressure changes abnormally (i.e. lower or higher pressure). A flow decrease or pressure change is often a sign of malfunction, such as a clogged inlet, internal wear, etc. The cause must be found and eliminated before the pump should be started again, see the Trouble Shooting list, in the IM.

Read "6.0 Limiting risks by means of check list" carefully as a complement to the above.

## 5.0 Maintenance

### 5.1 General

- Pumps certified for "Explosion protection" need regular maintenance and precaution to prevent risks of ignition due to malfunction and unacceptable wear.
- Follow the instructions given in the IM.
- A decrease of flow rate is an indication of a possible malfunction or a sign of internal pump/system clogging or wear which requires maintenance or repairs.

## 6.0 Limiting risks by means of “check list”

### 6.1 During installation

- Check that the pipes are correctly connected and self supported. The pipe system should not exert excessive forces on the pump connections during operation, including weight of liquid, reaction forces and thermal expansion – have separate pipe supports and compensators been provided for?
- Check connections on the suction and pressure pipes/hoses.
- Possible presence of residues in the pipes/hoses must be eliminated.
- Check that the pump and baseplate is thoroughly earth grounded.
- Check the status on all electrically/ electronic devices such as sensors, etc. are in accordance with the applied ATEX regulation.
- Check that polymeric materials are conductive.
- Check that a shut-off valve is easily accessible for the air supply to the pump.

### 6.2 Before starting the pump

- Have all connections been sealed and tightened?
- Are the suction and pressure valves opened?
- Is the pump completely filled up with liquid if flammable or explosive liquids will be pumped?

### 6.3 When starting the pump

- Check that the pumps outlet and inlet valves are opened.

### 6.4 When the pump is running

- Never close completely the suction valve or regulate the capacity/pressure by means of it.
- Check for leakage and apply measures if necessary.
- Clean up any leakage and trace the cause of it.
- Check and evaluate regularly the data relevance from installed sensors.
- Regularly check and clean up dust accumulation on the pump unit and its surroundings.
- Regularly check and take measures for abnormal vibrations on the pump unit and the pipe system.
- Regularly check the condition of the diaphragms in accordance with the IM.

### 6.5 When stopping the pump

- Try to stop the pump slowly and/or with reduced flow to avoid pressure transients (high energetic pressure spikes) in the pipe system.



**PROCESS EQUIPMENT**

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