

# Explosion Protection

according to ATEX-95 (94/9/EC)

CENTR-EX/EN (1505) 3.4

Original instructions

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





## Declaration of Conformity ATEX 95 (ATEX 100a)

### Manufacturer:

SPX Flow Technology Assen B.V.  
Dr. A.F. Philipsweg 51  
9403 AD Assen  
The Netherlands


We hereby declare that:

the following product families, when ordered as ATEX pump, are according directive 94/9/EC of the European Parliament and the Council of 23 march 1994.

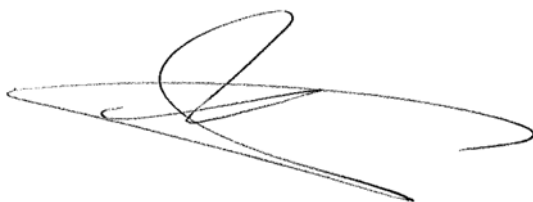
When the product is modified without our written permission, or safety instructions from our manual have not been followed, this declaration ceases to be valid.

- **Product families:** CombiBloc, CombiChem, CombiDirt, CombiFlex, CombiPrime H, CombiLineBloc, CombiMag, CombiNorm, CombiPro, CombiSump, CombiTherm, CombiPrime V, CombiWell, HCR/PHA, CombiFlexBloc, CombiFlex Universal, CombiMagBloc, CombiProMag, CombiProLine, CombiPro V, CombiSumpMag, FRE, FRES, KGE, MCH(W)(S), MCHZ(S), MCV(S)
- **Notified Body:** DEKRA Certification B.V.  
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6825 MJ Arnhem  
The Netherlands
- **Certificate number:** **KEMA 03ATEX2384** (CB, CC, CD, CF, CH, CLB, CM, CN, CR, CS, CT, CV, CW, HCR/PHA, CFB, CFU, CMB, CRM, CRL, CRV and CSM)  
**KEMA 03ATEX2385** (FRE, FRES and KGE)  
**KEMA 04ATEX2008** (MCH(W)(S), MCHZ(S), MCV(S))
- **Standards:** Following harmonized standards are applicable

Standard	Title
EN-ISO 12100	Safety of machinery - Risk assessment and risk reduction
EN 13463-1	Non-electrical equipment for potentially explosive atmospheres- part1: Basic method and requirements
EN 13463-5	part 5: protection by constructional safety
EN 13463-8	part 8: protection by liquid immersion
EN 1127-1	explosive atmospheres - explosion prevention and protection - part 1: Basic concepts and methodology

- **Marking:** Marking contains  symbol and certificate number

Assen, May 1st 2015



G. Santema,  
Ad Interim statutory director



# Operating instructions concerning explosion protection

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SPX is a Fortune 500, global multi-industry manufacturing leader. SPX divides its business into four segments and one of these is the SPX Flow Technology segment. SPX Flow Technology Assen B.V. is part of SPX Flow Technology segment.

**!** **These instructions contain important and useful information on explosion protection in accordance with EU directive 94/9/EC - ATEX 95. 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 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 supplied with the pump and the manuals of other equipment such as 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, live and moving parts on pump and motor unit, 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 95 certification - extent of delivery





SPX 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 SPX supplier.

In the event SPX delivers a pump with bare shaft, the explosion protection certification marking on the pump nameplate refers exclusively to the pump part. 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. The complete unit must be certified separately by the manufacturer and must have a separate nameplate supplied by the manufacturer.

In the event SPX 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

An explosion protected pump or pump unit is marked by a special EX type plate, which is shown below.

<b>SPX</b> SPX Flow Technology Assen B.V. - www.johnson-pump.com Dr. A.F. Philipsweg 51, NL-9403 AD Assen - CR Nr. 04029567		<b>CE</b>
Type: 1		∅ 6
Code: 2		MEI ≥ 7
No.: 3		eff. 8
		4
 		5
		

- 1 Type : example: CC 50-160
- 2 Code: example: R6 M3 L2
- 3 Serial number: example: NN xxxxxx (NN indicates the year of production)
- 4 Ex marking: Ex-symbol followed by Atex type designation: (see examples).
- 5 Certificate number: given by the certifying body, refers to the unit.
- 6 Impeller diameter [mm]
- 7 Minimum Efficiency Index at max. impeller diameter: 0,10 or 0,40
- 8 Efficiency for trimmed impeller diameter: [xx.x]% or [-,-]%

### Example 1: 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: II 2GD c 230°C

II 2GD marking according to Group II, Category 2, Gas (G) and Dust (D) protection,  
 c marking essential for safe use ignition protection (c = constructional safe),  
 230°C for a maximum surface temperature of 230 centigrade (degrees Celsius).

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

## 1.5 Remarks on EX type plate

- When a pump is shipped as an explosion proof pump unit, the EX type plate is placed on the base plate of the pump unit, or on the lantern piece of a CB or FRES pump. The pump units' CE-marking, compulsory to meet the EC-Machine Directive, is placed directly on the pump.
- When a single pump is shipped as explosion protected execution, the EX type plate is placed directly on the pump.

**1.6 Temperature classes and allowable temperatures**

In normal operation the highest temperature on the surfaces of the pump should correspond to the highest temperature of the pumped product, or the heating medium in case the pump is heated by jackets. The maximum permissible surface temperature depends on the temperature class (T4 to T1) or on  $T_{max}$  to be complied with. The bearing bracket surfaces must be freely exposed to the atmosphere to allow cooling.

1.6.1 II 2G allowable temperature

EN 13463-1 Temperature Class	Pumped medium temperature $T_{max}$	Heating medium $T_{max}$ (if any)	Bearing bracket temperature
		Steam-jacket	
T1 - 450°C	≤ 350°C (*)	-	≤ 180°C
T2 - 300°C	≤ 270°C (*)	-	≤ 160°C
T3 - 200°C	≤ 180°C	≤ 180°C	≤ 120°C
T4 - 135°C	≤ 120°C	≤ 120°C	≤ 100°C

(\*) temperature limit depends on materials selection.

- When the temperature limits are reduced because of internal materials selection, the maximum allowable surface temperature  $T_{max}$  will be supplied instead of the temperature class, the same way as in case of D, dust protection.
- For T5 (100°C) and T6 (85°C) classes and if ambient temperature exceeds the range -20°C / +40°C contact your local SPX distributor.

1.6.2 II 2(G)D allowable temperature ( $T_{max}$ )

The maximum allowable surface temperature ( $T_{max}$ ) is given.

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

- $T_{max}$  = temperature limits of selected internal materials (i.e. pump selection).
- $T_{max}$  =  $T_{5mm} - 75°C$  ( $T_{5mm}$  "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. If ambient temperature exceeds the range -20°C / +40°C contact your local SPX distributor.

The allowable bearing bracket temperature can be found in the table at paragraph 1.6.1.

**Example:**

If  $T_{max}$  indicated on the nameplate is 230°C consult the table for  $T_{max} \leq 270°C$  and locate the corresponding allowed temperature for the bearing bracket  $\leq 160°C$ .

**1.7 Responsibilities**

It is the responsibility of the operator to ensure specified product temperatures are not exceeded and to ensure regular inspections and maintenance for good operation of the shaft seal, the bearings and the internal pump parts. If this cannot be ensured by the operator, suitable monitoring facilities must be provided, see paragraph 1.8.

## 1.8 Monitoring

If good functioning and maximum allowable surface temperatures cannot be ensured by regular inspection by the operator, suitable monitoring devices must be provided.

Surface temperature monitoring is always of extreme importance in the following areas:

**I** Surface temperature of the pump casing.

**II** Surface temperature at the shaft seal.

In case of a gland packing, the pump may only be used when it is provided with a suitable temperature monitoring device.

In case of a quenched or double mechanical seal, monitoring can be done by checking the quench fluid, see Instruction Manual. Use of a quenched single mechanical seal or a double mechanical seal is recommended when there is a risk of dry running or lubrication failure of the mechanical seal such as in case of suction lift.

**III** Surface temperature at the bearing area of the bearing bracket.

The maximum allowable surface temperatures of I and II refer to  $T_{max}$ , see the table at paragraph 1.6.

The maximum allowable surface temperature of III refers to the maximum temperature of the bearing bracket, see the table at paragraph 1.6.

Additional vibration monitoring can be useful to detect excessive vibrations, indicating premature failure of bearings or internal wear in the following areas:

- bearings at bearing bracket.
- on the electric motor, in case the pump is not provided with bearings and the impeller is mounted directly onto the motor shaft.

## 1.9 Storage

If the pump is not to be used immediately, the pump shaft must be turned by hand twice a week in order to prevent the impeller, the mechanical seal and the bearing from getting seized up.

## 1.10 Ordering spare parts

An order form is included in the instruction manual of the pump, as well as ordering instructions. **In case the pump is an explosion proof execution, this must be mentioned explicitly on the order form when ordering spare parts!**

## 2 Constructive requirements

### 2.1 Materials

- When combustible liquids are pumped, all pressure-retaining pump parts must be made of ductile materials.
- Certification of the coupling guard is part of the pump certification. The coupling guard must be made of non-sparking materials. **Never use light metals containing more than 7.5% magnesium!**
- The drive must be provided with its own EC-Manufacturers Declaration and comply with the regulations concerning explosion protection!

### 2.2 Mechanical seal

A mechanical seal should never run dry. Therefore the pump and the seal chamber must always be fully filled with liquid during operation. If this cannot be assured **the mechanical seal must be quenched!**

### 2.3 Base plate

The base plate **always** must be provided with an **earthing boss**.

### 2.4 Operating range

- The pump should only operate within its specified operating range.
- Operation of the pump outside its specified operating range and unauthorised modes of operation may result in the specified temperature limits being exceeded.
- Ensure the system pressure is always within the working pressure limits of the pump.
- In order to keep it ATEX compliant the pump should NOT be used for applications other than those the pump was selected and ordered for!



## 3 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 (for maximum 3 years). In case of any doubt or any damage found contact your SPX 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.

### 3.2 Atex 95 certification

All additional equipment such as shaft couplings, guards, drive, motor, auxiliary equipment etc. must be part of the Atex 95 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

- Unobstructed air supply to the pump, drive and motor should be ensured.
- An electric motor should have a free inlet for cooling air of at least 1/4 of its motor diameter.
- The pump and unit must be accessible for maintenance and inspection during operation.
- All pump parts that can generate a heat build-up, like bearing bracket and pump casing, must be freely exposed to the atmosphere to allow cooling and to ensure good functioning and lubrication of bearings.
- Insufficient cooling could lead to unacceptable surface temperatures of the bearing bracket, to insufficient lubrication and to premature bearing failure. If proper cooling can not be maintained at all times, monitoring of the surface temperature of the bearing bracket should be ensured.
- Proper earthing facilities and equipotential bridges should be provided depending on the risks involved in the application.
- In hazardous areas the electrical connection has to be IEC60079-14 compliant.

### 3.4 Placement

- A pump should be mounted horizontally, bearing entirely and squarely on the pump feet.
- A pump unit should be mounted horizontally, bearing entirely and squarely on the baseplate.
- A CB or FRES pump mounted to a large electric motor should be mounted horizontally, bearing entirely and squarely on the motor feet.



**Deviation from the prescribed installation will influence draining, filling, venting and good functioning of the shaft seal.**

### 3.5 Piping

- The suction and discharge lines should be designed properly for the required performance conditions and should be executed accordingly. 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.
- Lines 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.

### 3.6 Shaft sealing auxiliary connections.

The pumps allow the application of several types of shaft seals. In order to ensure proper functioning, venting and lubrication of the shaft seal a number of connections are available which will enable liquid circulation or flushing. For more information on the possibilities and connections see the Instruction Manual.

### 3.7 Installing the pump (unit)



*Follow the separate instructions for motor drive and for explosion protected shaft couplings.*

- Pump may be shipped with a fixation of the rotating parts, in order to immobilize the pump shaft during transport. **In this event: Remove this fixation!**
- The maximum permissible system pressure is stated in the instruction manual of the pump. If there is a chance that this pressure is exceeded, for instance by an excessive inlet pressure, a safety valve should be installed in the system.
- It is assumed that the pump during operation is always completely filled with liquid, to prevent an explosive atmosphere. If this cannot be ensured, a proper monitoring device must be installed.
- **Ensure the pump unit is properly earthed!**



### 3.8 Checking the direction of rotation

- Checking the direction of rotation of the pump should NEVER be done with an empty pump. In order to prevent the mechanical seal from running dry or the generation of explosive gases, the pump must ALWAYS be completely filled with liquid. If this is not possible when checking the sense of rotation, disassemble the pump/motor coupling.

➤ *For the proper instructions on how to check the direction of rotation, see the Instruction Manual.*

- If necessary, the direction of rotation of the motor should be tested independently from the pump i.e. with the motor disengaged from the pump.
- Remember to secure or remove the shaft key in case of separate testing.

**!** **Always align the coupling after having disassembled it and refit the coupling guard!**

### 3.9 Checking the alignment

- 1 After installation, check the alignment of pump shaft and drive shaft, preferably with the pump and the pipes completely filled with liquid.
- 2 Correct the alignment if necessary.
- 3 Fit the coupling guard.



## 4 Operation

### 4.1 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 and tight and is clean. Welding particles should be removed in advance.
- The pump, the shaft sealing area and the auxiliary equipment must be vented and filled with the product to be pumped before any operation.
- In case of suction lift, dry running of the pump must be avoided and an appropriate quenched shaft seal must be provided to prevent dry running of the shaft seal.
- Ensure that the pump is filled up and vented before start-up.
- In case the pumped liquid needs to be heated, ensure that pump, shaft sealing area and the product to be pumped are sufficiently preheated before start-up.

### 4.2 Starting

!

**Ensure that shut-off valves in the suction line are fully opened and possible strainers are unclogged before starting up the pump!**

- Open the valve in the flushing or cooling liquid supply pipe if the pump is fitted with flushing or jacket cooling.
- Always start the pump with the discharge shutoff valve completely closed. Once the pump has reached its full speed, fully open the discharge shutoff valve.  
When the **FRE(S)** has to perform self priming duties, the sucked-in air must escape unobstructedly, so **he discharge shutoff valve must be fully opened!**

### 4.3 Operation

- Never operate the pump outside its specified operating range. This may result in a temperature increase which may exceed the specified temperature limits.

!

**It is always the responsibility of the operator to maintain the specified product temperature.**

- Shut down the pump in case the flow drops or abnormal pressure fluctuations occur. A flow decrease or pressure change is often a sign of malfunction, a clogged strainer or internal wear. The cause must be found and repaired before the pump should be started again, see the Trouble Shooting list in the Instruction Manual.

!

**Shut down the pump immediately in the event of irregular operating modes or malfunction!**



## 5 Maintenance

### 5.1 General

- Pumps certified for 'Explosion protection' need maintenance and precaution to prevent risks of ignition due to malfunction and unacceptable wear.
- Follow the Maintenance Instructions given in the Instruction Manual. Follow the separate instructions for motor drive as well.
- A decrease of flow rate (or in case the pump does not supply the required pressure) is an indication of a possible malfunction or a sign of internal pump wear and requires maintenance or repairs. Other indications of internal pump wear are excessive noise during operating, vibrations or shaft seal leakage.
- Regularly check the outlet pressure.

### 5.2 Bearings

- The bearing assembly must be checked regularly for correct functioning.
- Excessive noise, vibrations and heat build-up are an indication of malfunction and premature failure of a roller bearing or its lubrication.
- It is recommended to check a bearing on vibrations by monitoring it, or to renew a roller bearing after every 4<sup>th</sup> re-lubrication.
- Regularly check the oil level and the oil quality, when oil lubrication is applied. The oil must be clean and clear.
- Regularly check the condition of the bearing bracket. Bearings should not be noisy and no excessive heat build-up should occur.
- In case of grease lubrication: regularly check if the bearing are still sufficiently greased and no grease drips out of the bearing compartments.
- The axial clearance of the running internals of CombiBloc, CombiChem (L5 and L6), CombiPrime H, CombiSump and FRES is achieved by adjustment of the bearing assembly; excessive or irregular tightening of bolts and screws can dislocate the adjustment. For information about axial clearance adjustment, see the respective Instruction Manuals.

## 5.3 Lubrication of the bearings

### 5.3.1 Oil lubrication

- The constant level oiler must never be empty during operation.
- Always replace the oil at the recommended intervals. See the pumps' Instruction Manual. It is advised to replace the oil after first start-up after 300 hours.

### 5.3.2 Grease lubrication

- Always replace the grease / add new grease at the recommended intervals. See the pumps' Instruction Manual.
- In case of a V-belt driven grease lubrication pump, use of an **anti-static V-belt** is mandatory.

## 5.4 Mechanical seal

When a mechanical seal is running dry it may exceed its operational temperature limits. Therefore a mechanical seal **should never run dry**.

- Regularly check the correct functioning of the mechanical seal.
- Ensure the seal chamber is always completely filled with liquid during operation, or ensure the mechanical seal is sufficiently flushed by an external provision.
- Avoid the handling of liquids which contain excessive quantities of gas.
- Ensure the pump is always operated within the specified operational range.
- For a single mechanical seal, the operator must ensure that the temperature of the seal area surface will not exceed the allowable temperature. If this cannot be ensured by the operator, monitoring devices should be installed.
- Quenched mechanical seals (single or double) have to be protected by controlling the quench liquid.

For a non-pressurised quench:

- Check the level in the supply reservoir;
- Check the temperature of the quench liquid;
- Check the condition of the quench liquid by inspection: change the quench liquid in case it is heavily contaminated with leaking fluid.

➤ *Frequent contamination is an indication of an unacceptable shaft seal leakage, which should be repaired.*

For a pressurised quench:

- Check the level in the supply reservoir;
- Check the temperature of the quench liquid;
- Check the pressure.

!

**Take note: the quench liquid should always be pressurised while the pump is running, including at start and at shut-off period.**

- Check the condition of the quench liquid: change the quench liquid in case it is contaminated with leaking fluid.

➤ *Contamination of the liquid is an indication of irregular or faulty operation and should be inspected. E.g. the mechanical seal at medium side may be leaking or may be opened due to insufficient counter pressure of the quench liquid.*

# Explosion Protection

according to ATEX-95 (94/9/EC)



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ISSUED 11/2011 DV-1530  
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