



FLAMELESS VENTING DEVICE FLEX PRO / FLEX PRO S



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1. GENERAL INFORMATION

1.1. IDENTIFICATION OF THE USER MANUAL

This user manual is drawn up for the flameless explosion venting device - FLEX (hereinafter referred to as FLEX) of the dimensional series F1 to F3, R1 to R4 and C1 to C5. The original user manual containing the operating and maintenance instructions is drawn up in the Czech language; other language versions are the translations of the original manual. If in any doubts, the original wording of the manual shall be considered decisive.

The following documents concerning FLEX are also supplied with this manual:

- Delivery note
- EU Declaration of Conformity under 2014/34/EU
- Inspection certificate
- Operational Log

The following can be supplied on request:

- FLEX control sheet
- Drawing of the connecting flanges
- The data sheet of the intrinsically safe relay (if included in the delivery)

1.2. FLEX CLASSIFICATION

FLEX is designed in accordance with the European Directive 2014/34EU:

Equipment group	II	
Explosive atmosphere	D Equipment category, interior/exterior	1 D 3G /
3G D Zone	Interior: 20, 21, 22	
Exterior:	2, 22	

Tab. 1 – FLEX Classification

The electrical components (intrinsically safe relays) installed in FLEX must be certified to the appropriate zone or category.



1.3. PURPOSE OF THE USER MANUAL

This user manual is intended for all employees who come into contact with the FLEX during their work.

The user manual is an integral part of the product and the manufacturer cannot be held liable for any damage or injuries caused as a result of insufficient knowledge of these instructions. Therefore, it is necessary that the user reads through this manual and any other documents thoroughly and communicates them to the appropriately qualified personnel (electric, mechanical, technological, safety engineers and others). The provisions concerning the operation and maintenance should be incorporated into the operating rules, maintenance schedules and other documents by the user.

If the user is in doubt, he/she should contact the company RSBP spol. s r.o. or its authorized representative.

The customer should pay increased attention mainly to chapter 4 concerning the proper installation because FLEX is the device, whose improper installation, operation and maintenance may endanger the human life.

FLEX must be installed and serviced by qualified and trained personnel using only original RSBP spare parts. Installation and service must be performed according to this manual. RSBPassumes no liability for defects, damage or malfunction of the supplied products supplied in the case of installation performed contrary to the manual or in the case of installation performed by a professionally incompetent person.

1.4. WARRANTY CONDITIONS

This product was manufactured with the most advanced, high-quality materials, and it was thoroughly inspected before dispatch. However, if any defect or damage occurs during storage, installation, operation, cleaning or servicing, the user is obliged to notify the manufacturer immediately and in writing.

The manufacturer shall replace the damaged or missing parts of the products in the shortest possible time. This product is covered by a warranty period of 2 years.

The warranty cannot be exercised in the following situations:

- The user did not familiarize himself/herself with these operating and maintenance instructions.
- The product was not used in accordance with these operating and maintenance instructions.
- The authorized person performed insufficient or improper installation or maintenance.
- Unsuitable spare parts were used (only the genuine spare parts distributed by the manufacturer can be used).
- Inappropriate accessories, which had not been approved by the manufacturer, were used.

The warranty can be exercised only provided that the damaged part, including the description of the defect and the product serial number, will be sent in to the manufacturer's address.



1.5. STORAGE

Prior to the installation to the protected technology, the product must be stored in a clean and dry place, and it must not be exposed to the weather. The product shall be stored in the original packaging. Under no circumstances can the product be exposed to rain, freeze, dust or any other weather conditions that affect the functions of the FLEX device. FLEX device store at temperatures from 10 °C to 40 °C.

The user manual must be kept throughout the life of the product and it must be readily accessible to all employees. If the product is removed from service or sold, it must be handed over to the new user together with these user manual. In the event of the loss of these instructions, they can be re-ordered from the manufacturer.

1.6. TERMS AND DEFINITIONS

The flameless explosion venting device – FLEX	consists of the equipment for explosion venting (membrane) and the devicefor the absorption of the released energy (FLEX), which spreads during the dust explosion in a confined space. FLEX prevents the transmission of the explosion pressure and flame through the release opening of the membrane, thereby protecting people and equipment in its vicinity. FLEX must be used in the event of the membrane installation inside the building, where the protected equipment is located.
The equipment for explosionventing	(membrane) - is the device protecting a vessel or other closed volumes using the explosion venting – releasing the explosion pressure to the surroundingspace. The membrane prevents the explosion pressure inside the vesselor any other closed volumes from exceeding the structural strength of the vessel and reduces the explosion pressure to a lower value than the allowablepressure load-capacity of the vessel.
Opening signalling device Authorized representative	is a device monitoring the position of the membrane (closing/opening). It works on the principle of breaking the wire firmly connected with the membrane and passed through a cable entry in the FLEX body. Upon breaking, the safety circuit is interrupted and the membrane opening is indicated. person authorized by the manufacturer (RSBP) to act as authorized person.
Trained person Operational log	 person who has thoroughly familiarized with this manual. document provided on request by RSBP to its products or other appropriate document of the operator. In the case of using a different document than supplied by RSBP spol. s r.o. this document must contain the following information on each operation on the device FLEX: date and time of the operation what caused the operation (regular service, malfunction) how the action was solved name and signature of the worker who performed the operation.



2. GENERAL SAFETY INSTRUCTIONS

The user must ensure that the product is used and operated only in a technically perfect condition. It is necessary to adhere to the recommended deadlines for inspection and maintenance and to provide the necessary service or repair.

All activities performed on the product must be recorded in the operational log so that the historyof these works can be checked at any time.

3. PRODUCT DESCRIPTION

If the explosive atmosphere in the form of a whirled dust cloud occurs in the technology and if the atmosphere comes into contact with a source of ignition, there may be immediate explosion. FLEX protects the technology, operators and the environment from the destructive effects of such explosions.

The FLEX devices of the F and R series feature the base, therefore the rectangular membrane. The FLEX devices of the C series feature the base, therefore the round membrane.



Fig. 1 - Product designation



3.1. OPERATING PRINCIPLE

The flameless explosion venting device - FLEX consists of the equipment for explosion venting (membrane) and the device for the absorption of the released energy (FLEX), which spreads during the dust explosion in a confined space. FLEX prevents the transmission of the explosion pressure and flame through the release opening of the membrane, thereby protecting people and equipment in its vicinity. FLEX must be used in the event of the membrane installation inside the building, where the protected equipment is located. In the event of explosion, FLEX captures the explosion energy (flame, pressure) coming from the open membrane. Any damage to the product may result in the product failure. This could cause the transmission of the dust explosion from the protected vessel to the operators' zone. For this reason, it is very important to read through these instructions prior to the commencement of the installation.

The distances of the installed FLEX devices to the adjacent machinery or walls must be approved by the manufacturer. This distance is required for the proper function of FLEX. The minimum distance between FLEX and the nearest machinery (or the building wall) must be at least 0,5 m.



2. Filter

Fig. 2 - An Example of the Installation of FLEX Devices in the Protected Equipment



3.2. TECHNICAL SPECIFICATIONS

Below, there are listed the dimensions of the designs together with the relevant drawings.

3.2.1. BASIC DIMENSIONS OF ROUND FLEX DEVICES - TYPE C (FLEX C)

Туре	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	d - diameter of openings [mm]	n – number of openings	Weight [kg]
FLEX C1 PRO	315	580	485	320	350	5	375	11	12	30
FLEX C1 PRO S	315	879	633	320	350	5	375	11	12	80
FLEX C2 PRO S	445	107 5	633	450	486	5	525	13	12	87
FLEX C3 PRO S	505	128 6	705	510	550	6	585	13	20	126
FLEX C4 PRO S	625	138 5	1020	630	680	6	705	13	20	243
FLEX C5 PRO	815	221 5	1020	820	860	6	895	13	24	291

Tab. 2 – Basic Dimensions of the Round FLEX C Devices



Fig. 3 - The Drawing of the Round FLEX C Devices



3.2.2. BASIC DIMENSIONS OF THE RECTANGULAR FLEX DEVICES OF THE R AND F TYPES (FLEX R / FLEX F)

Туре	А [мм]	В [мм]	С [мм]	D [MM]	d - diameter of openings [mm]	n – number of openings	Weight [kg]
FLEX R1 PRO	390	710	635	410	14	18	40
FLEX R2 PRO	540	890	900	580	14	22	74
FLEX R3 PRO	666	1000	1130	735	14	34	109
FLEX R4 PRO	996	1198	1660	1070	14	42	215

Tab. 3 – Basic Dimensions of the Rectangular FLEX R Devices



Fig. 4 - The Drawing of the Rectangular FLEX R



Туре	А [мм]	В [м м]	С [мм]	D [мм]	d - diameter of openings [mm]	n – number of openings	Weight [kg]
FLEX F1 PRO	225	675	265	465	14	20	24
FLEX F2 PRO	305	625	335	530	14	18	28
FLEX F3 PRO	390	710	420	620	14	18	35

Tab. 4 – Basic Dimensions of the Rectangular FLEX F Devices



Fig. 5 - The Drawing of the Rectangular FLEX F

3.2.3. MATERIAL DESIGN

FLEX is normally supplied in the material design of structural steel, with the surface treatment KOMAXIT RAL 9005 (black). Different colors can be supplied upon the customer's request.

3.2.4. OPTIONAL ACCESSORIES

a) The intrinsically safe relay forms the interface between the safe and the hazardous zones (Zone 20). The intrinsically safe relay requires power supply of 230 V / 50 Hz, protection with the circuit breaker of at least 1 A (tripping characteristics B or C). The intrinsically safe relay contains a throw-over contact, where the operational state of the membrane (closed/opened) is signalled.



Fig. 6 - Intrinsically Safe Relay



The intrinsically safe relay can be supplied as an optional accessory (also separately) upon the customer's requests. For more details, please refer to chapter No. 5.1. The intrinsically safe relay must always be used with the installation of the FLEX device.

The power supply and control cabling for the intrinsically safe relay is not included in the delivery and it should be provided for by the customer (if not agreed otherwise in the contract).

b) The flange packing (gasket) must be used between the flange of the protected device and the membrane, which is sealed to the flange of the FLEX device. This gasket supplied by the company RSBP spol. s r.o., with standard EPDM design and always is included. This gasket can be used in all commonaplications with the ambiente temperature betwen -40 °C to 80 °C all the time. For the application with special requirements for the features of the gasket, we can supply the gasket made of the material that meets the requirements. In the event that the operator decides to use his/her own gasket, neither the supplier nor the manufacturer is responsible for the problems related to the its inappropriate selection.

c) The protective bag is intended to cover the functional area of the FLEX flame filter, so that any penetration of foreign particles in the filter meshes reducing the functionality of FLEX is prevented. The protective bag is recommended for the use in dusty premises with the significant clogging risk of the flame filter. In the event of explosion, the bag breaks and the energy is absorbed without any disturbance. However, if the bag is damaged, either during the explosion or otherwise, it must be replaced with the new one.



Fig. 7 - Protective Bag



3.3. THE PARAMETERS ENSURING THE SAFE USE OF FLEX ACCORDING TO THE ATEX CERTIFICATE

All relevant parameters are summarized in the Table No. 5. If any other range of ambient temperatures is required, the manufacturer should be contacted.

Size	Safety zone[m]	Max. KSt organic dust [bar·m/s]	Max. K _{st} metallic dust [bar·m/s]	Ambient temperature [°C]	Operating temperature*[°C]
FLEX F1 PRO	0.75	235			
FLEX F2 PRO	1	220			
FLEX F3 PRO	1				-40 °C to 100 °C
FLEX R1 PRO	1	240	/		Or
FLEX R2 PRO	2			-40 °C to 60 °C	-40 °C to 240 °C
FLEX R3 PRO	2	220			
FLEX R4 PRO	3				
FLEX C1 PRO	1				
FLEX C1 PRO S	1		310		
FLEX C2 PRO S	1	300			-40 °C to 240 °C
FLEX C3 PRO S	2		150		
FLEX C4 PRO S	2				
FLEX C5 PRO	2		310		

*The operating temperature varies depending on the type of explosion relief device.

Tab. 5 – The Parameters Ensuring the Safe Use of FLEX

In the event of explosion, FLEX must be inspected by the manufacturer or by a trained person; they should determine the proper servicing, so that the proper function for the further safe use isensured.

A clearance of 0.5 m (or 1 m for FLEX R4) must be maintained in front of the FLEX PRO (S). Placingan obstacle in the space in front of the flame filter screens may affect the proper functioning of the FLEX PRO (S).



3.4. SAFETY ZONE

It is necessary to define the area in front of the free space of the flame filter at a distance of 0.75 m to 3 m, according to the FLEX type, see Tab. 5. This area is called the safety zone and its shape is shown for each type of device in Fig. 8 and Fig. 9.

The area inside the safety zone may be affected by explosions (increased temperature and pressure, formation of material combustion products...), and therefore it is not recommended to place equipment in this area that could be degraded. Entering the safety zone is allowed in case service work or maintenance needs to be done on the protected equipment, but only if appropriate measures have been taken to protect the operator from possible risks (e.g. shutting down equipment, venting explosive atmospheres, eliminating explosion hazards inside the equipment, installing protective shields, etc.).

If the safety zone is not respected, neither the supplier nor the manufacturer is liable for any damage to property or health.



Fig. 8 - Safety Zone for the Round FLEX Devices



Fig. 9 - Safety Zone for the Rectangular FLEX Devices



3.5. FORMATION OF OVERPRESSURE IN SURROUNDING VOLUME ACCORDING TO EN 16009

When using the flameless venting device for explosion venting, rises the pressure inside the room where is such device installed. This effect is obvious especially for installations inside small rooms. In such situation is necessary to check, if is the room volume according to the volume of protected vessel large enough, to avoid a damage of this room. Generally, is necessary to consider a reinforcement of the room if the room is 300x smaller than protected vessel. This is valid for buildings and rooms with common constructional strength 0.01 bar. This is described within following formula:

$$\frac{V_0}{V} = \alpha \cdot \frac{p_0}{\Delta p}$$

Where

p0 is the ambient pressure;

 Δp is the maximum pressure rise in the room or building;

α is the expnasion constant, empirical derived from the gas volume and temperature outside protected vessel;

V0 is the volume of the room or building;

V is the volume of the protected vessel;

4. THE INSTALLATION TO THE PROTECTED EQUIPMENT

FLEX is supplied assembled. The membrane is sealed and bolted to FLEX. These bolts must be removed prior to the installation (see chapter 4.3.). The installation of the device shall be carried out according to the manufacturer's documents concerning the specific use.

4.1. GENERAL PRINCIPLES FOR INSTALLATION

Immediately after the delivery and then before the commencement of FLEX installation, the following basic checks must be performed:

- Check the integrity of the original packaging of FLEX.
- Check the integrity and flawlessness of the top coat of FLEX.
- Check the integrity of the membrane.
- Check whether no fasteners (bolts, nuts, washers) holding the top lid (cover) of FLEX are missing.
- Check the integrity of the cabling.
- Check the integrity of the supllied bolting material for screwing the FLEX to the flange.
- Check the integrity of the supplied flange gasket.

After successful inspection, FLEX is ready to be installed. In the event of any defects or deficiencies, contact the manufacturer or the distributor immediately.



4.2. GENERAL INSTALLATION GUIDELINES

A) Only lifting eyes can be used for the transport and handling FLEX. The lifting eyes of the FLEX devices of the C and F series are firmly welded to the FLEX structure; as to the FLEX devices of the R series, they are bolted between the FLEX body and its lid.

B) The flange of the vessel must have the same connecting dimensions as the FLEX flange and it must be located, if possible, on the lowest possible branch extrusion, ensuring easy installation and sufficient strength for carrying the FLEX weight. The pressure resistance of the device must comply with the legislation relating to the device for explosion venting and flameless explosion venting devices.

C) Both the sealing faces, both on the FLEX device and on the connecting flange of the vessel, must be thoroughly cleaned and degreased. The material for the flange gasket (packing) must be fit for the respective operation and meet all necessary requirements (temperature, chemical resistance, tightness and others). The gasket is always part of the FLEX device delivery and is EPDM material standard. For special requirements, the gasket meeting the special requirements of the customer can also be supplied.

D) The FLEX devices can be installed vertically, horizontally or at an angle. The goal consists in the prevention of sticking an excessive amount of dust and dirt from the technology on the membrane. The allowed positioning of the installation is shown in Fig. 10.



Fig. 10 - The Allowed Positioning of the Installation

E) If FLEX C3, C4 or C5 is positioned otherwise than vertically, the end of the device must be fixed in the way that the load from the FLEX weight is distributed evenly between both the ends of the device. The end of FLEX must be hung by the welded eyes on the FLEX cover (lid) using a suitable structure. An example of such suspension is shown in Fig. 11. The specific fastening method must be discussed with the manufacturer or the supplier. The dimension of the structure as well as all suspension components must be fit for the load from the FLEX weight for all FLEX types and sizes. In the event of installation, the device must also be sufficiently sized to withstand the weight of the FLEX device.



Fig. 11 - The Proper Positioning of FLEX



F) FLEX must be installed in the way that the membrane is facing the free volume of the protected vessel. For instance, the space in front of the membrane must not be blocked with filter cartridges or any other elements.

G) The equipment for explosion venting (membrane) opening signalling device must be properly connected in each FLEX, so that the operators can surely distinguish, whether no membrane is opened. The opening signalling device must always be connected to the intrinsically safe relay. FLEX device is supplied with an attached equipment for explosion venting and is connected to the opening signalling device.

H) In case of outdoor installation, the flameless venting device must be used together with the protective bag supplied by RSBP and must be protected against any ingress or accumulation of dust, snow, ice, water, dirt, etc. If the flameless venting device is not protected, neither the manufacturer nor the supplier is liable for the operation of this device.

I) FLEX grounding must be made using the appropriate grounding element (earth termination, earth wire), by means of which the earth bolt with one of the flange bolts connecting FLEX with the protected device is connected. The contact faces for the placement of the earth element must be cleaned appropriately and their coating must be removed. The fasteners used for attaching the grounding element to the FLEX earth bolt must be galvanized. Specifically, the nut M8 (ISO 4032), property class 8, and serrated lock washer (DIN 6798) and plain washer (ISO 7090) - both of them with the size 8. First, the serrated lock washer should be put on the earth bolt, then the grounding element, the plain washer; finally the nut should be tightened with a torque 15 Nm. The other end of the grounding element should be placed under the head of one of the FLEX flange bolts. Between the grounding element and the actual FLEX, the serrated lock washer (DIN 6798) of the same size as the flange bolts FLEX must be inserted; tighten with the same tightening torque as the other flange bolts. The example of the proper grounding isshown in Fig. 12. The grounding must comply with the legislative requirements of the country where FLEX is installed. For FLEX types where the transition piece (FLEX C1 PRO S and FLEX C4 PRO S) is used, it si also necessary to ground this transition piece and FLEX itself. The transition piece i salso welded witha grounding screw (just like teh FLEX device).



- 1. Fasteners
- 2. Grounding element (earth terminal/wire)
- 3. Fasteners of FLEX and the protected vessel

Fig. 12 - FLEX Grounding

FLEX should be connected to the prepared flange on the vessel using the fasteners listed in table No. 6. In this table, all types of bolts, nuts and washers necessary for the proper installation must be listed. All fasteners must be galvanized, the property class of bolts must be 8.8 (ISO 4017) and the property class of nuts must be 8 (ISO 7040). The washers (ISO 7090) should be put under the nut. The table also shows the specific tightening torques for individual bolts. Bolting material is part of the FLEX device delivery.



FLEX	Number of bolts, nuts and washers [pcs]	Bolt ISO 4017 - 8.8 - A3L	Nut ISO 7040 - 8 - A3L	Washer ISO 7090 - A3L	Tightening torque [N·m]
F1 PRO	20	M10 x 35	M10	10	21
F2 PRO	18	M10 x 35	M10	10	21
F3 PRO	18	M10 x 35	M10	10	21
R1 PRO	18	M10 x 35	M10	10	21
R2 PRO	22	M10 x 35	M10	10	21
R3 PRO	34	M10 x 35	M10	10	21
R4 PRO	42	M10 x 35	M10	10	21
C1 PRO	12	M8 x 30	M8	8	15
C1 PROS	12	M8 x 30	M8	8	15
C2 PROS	12	M10 x 35	M10	10	21
C3 PROS	20	M10 x 35	M10	10	21
C4 PROS	20	M10 x 40	M10	10	21
C5 PRO	24	M10 x 40	M10	10	21



4.3. THE INSTALLATION TO THE PROTECTED EQUIPMENT

The installation of the FLEX device can be summarized in the following steps:

- 1. Removing the transport bolts (ISO 10642) which, together with the sealant, hold the membrane firmly on the FLEX body.
- 2. Cleaning and degreasing of the flange contact face on the vessel and the FLEX device (the underside of the membrane). Do not remove the membrane! Leave it intact, sealed to the underside of FLEX.
- 3. The installation of the appropriate flange gasket, either the gasket supplied by the company RSBP spol. s r.o., or the customer's own gasket. In case of problem with own gasket for any complication caused by the manufacturer or supplier has no responsibility.
- 4. For FLEX C3, C4, C5 or any other type or size, for which it was decided that the following procedure is required due to the total size of the protected device, the FLEX devices should be supported (suspended); see chapter 4.2. (E).
- 5. Strong tightening of the flange bolts listed in table No. 6 using the prescribed tightening torque, except for the selected bolt which is intended for the connection of the other end of the grounding element; see chapter 4.2. (I).
- 6. For the FLEX device mentioned under 4, the suspension of the overhanging end of FLEX on the prepared structure; see chapter 4.2. (E).
- 7. Grounding of the flameless device, see the previous chapter (I) and Fig. 12.



1.

2.

FLEX

Flange gasket

The figures 13 a 14 show the exploded view of the entire assembly system.







Fig. 14 - The Exploded View of the Round FLEX



5. OPENING SIGNALLING DEVICE

The membrane opening signalling device is an electronic component supplied by the company RSBP spol. s r.o. and it is an integral part of the technological system FLEX, which is also supplied by this company.

All assembly (mechanical and electrical preparation, actual installation, parameterization, adjustments) connected to the FLEX closing sensor is done by RSBP spol. s r.o. or its authorized representative.

The intrinsically safe relay should be installed into a plastic box, distribution boards, switchboards and other similar devices, in the proximity of FLEX or beyond its proximity (control room, switch room).

5.1. ELECTRICAL CONNECTION

The electrical connection should be made according to the drawing FLEX - signalling connection 4-002-005 or 4-002-006 These drawings list the recommended cable types and the precise values of the supply voltage protection.



Fig. 15 - Signalling Device Wiring Diagram



5.2 PROHIBITED ACTIVITIES

The operator may not perform the following prohibited activities:

- damage FLEX or its components,
- damage the membrane (and all its components) mechanically,
- damage the electric cabling (power, signal) for membrane opening.

All the activities listed above (installation, dismantling, maintenance, service, operation, damage, defects) must be demonstrably recorded in the Operation Log for the technological unit, indicating the date, name and signature of the worker who performed the intervention.

6. OPERATORS, MAINTENANCE AND STAFF TRAINING

Maintenance can only be performed if the technology protected by FLEX is switched off and there is no other risk of explosion or other danger to the maintenance worker.

The device can be operated only by the person who is physically and mentally capable and who has been demonstrably trained in this activity. Under normal operating conditions, there is no risk of electric shock or heat injury.

The maintenance interval performed by the operator must be specified on the basis of operating conditions for the given technology, in particular on the basis of the overall dust nuisance. It is recommended that the following procedure is observed:

1.	maintenance	2 weeks after commissioning		
2.	maintenance	6 weeks after commissioning		
3.	maintenance	8 weeks after commissioning		



Based on the identified operational data (the clogging rate of the flame filter meshes and other), the customer shall specify the FLEX maintenance interval (for example once a month). The lowest maintenance frequency is once a year. Each maintenance must be recorded in the operation log book, highlighting the information on the date and time of the respective maintenance activity. Furthermore, it must be indicated whether the activity was inspection, maintenance, change or repair, or what exactly was done with FLEX and why. Last but not least, the name of the worker who performed the operation and his/her signature must be indicated.

The FLEX maintenance may by only carried out by training person and consists in the following steps:

1) Check for any mechanical damage to FLEX.

2) Check of FLEX cleanliness. The flame filter meshes must be maintained in a perfectly clean condition; no dust or other dirt may stick on the surface or inside the FLEX device. Therefore, the meshes must be cleaned using an industrial vacuum cleaner and/or mechanical means (a dry cloth, broom or others) within each maintenance. If the FLEX is fitted with a protective bag, the bag must also be cleaned from dust and dirt regularly. The bag can also be washed.

For the rectangular FLEX devices (of the F and R series), the membrane integrity can be checked through the inspection hole. After the inspection and possible cleaning of dirt, the hole must be thoroughly sealed using the inspection hole gasket. In the event of damage, the new one can be ordered from the manufacturer. The original cover (lid) of the inspection hole and the original fasteners, a self-locking nut (ISO 7040, property class 8) and the plain washer (ISO 7090), both galvanized, should be used for covering the hole. In the event of loss, you can replace the fasteners with the new ones; for the FLEX devices of the F series and the FLEX device R1, they include the nuts and washers M6, for FLEX R2, R3 and R4 M8. The M6 nuts must be tightened using the tightening torque of 6 Nm, whereas the M8 nut with the tightening torque of 15 Nm.

The regular training of the staff means their warning against the danger of accidental or ordered movement within the area of FLEX and their instruction on this danger (on protection) once a year, including the newly hired staff.

The user is obliged to include the instructions from this chapter to his/her operational and safety rules.

All activities performed with the product must be recorded in the Operation Log, so that the historyof these tasks can be traced at any time.



7. SERVICE AND MAINTENANCE

Service can only be performed if the technology protected by FLEX is switched off and there is no other risk of explosion or other danger to the maintenance worker.

The general inspection and service of FLEX can be performed only by the manufacturer or the person certified by the manufacturer for these activities (authorized person).

The following service interval is recommended for the flawless functionality of FLEX:

1.	service (functionality check)	3 weeks after commissioning			
2.	service (functionality check)	6 weeks after commissioning			
3.	service	6 months after commissioning			
4.	service	1 year after commissioning			

Each additional service (under flawless operation) Once a yearThe Scope of Service Activities:

1) Check for any mechanical damage to FLEX.

2) Gasket and sealing inspection (flange gasket inspection, inspection hole gasket check with the rectangular FLEX device (of the F and R series)).

3) Check of FLEX cleanliness. The flame filter meshes must be maintained in a perfectly clean condition; no dust or other dirt may stick on the surface or inside the FLEX device. Therefore, the meshes must be cleaned using an industrial vacuum cleaner and/or mechanical means (a dry cloth, broom or others) within each service inspection. If the FLEX is fitted with a protective bag, the bag must also be cleaned from dust and dirt. Extensive bag cleaning should be ensured by the operator (washing of the bag).

4) The opening signalling device – the inspection of the supply cable, signalling operability and the settings.

5) For the rectangular FLEX devices (of the F and R series), the membrane integrity can be checked through the inspection hole. After the inspection and possible cleaning of dirt, the hole must be thoroughly sealed using the inspection hole gasket. In the event of damage, the new one can be ordered from the manufacturer. The original cover (lid) of the inspection hole and the original fasteners, a self-locking nut (ISO 7040, property class 8) and the plain washer (ISO 7090), both galvanized, should be used for covering the hole. In the event of loss, you can replace the fasteners with the new ones. In case of loss, any connecting material can be replaced with a new one. The nuts must be tightened to a torque of 15 Nm.

In the event of explosion, FLEX must be inspected by the manufacturer or by the trained person, sothat the proper function for the further safe use is ensured.

In the chapters below, the procedure for the FLEX service in the event of the explosion in the protected technology or after the damage to the membrane is detailed.



7.1. FLEX SERVICE AFTER EXPLOSION

In the event that the explosion occurs in the protected technology or the flame filter mesh is heavily polluted with dust and other dirt, the following procedure of the flame filter replacement must be observed. This procedure is different for individual types of FLEX.

FLEX R-Series:

1) Stop the production process in the protected technology immediately.

2) Let FLEX and its surrounding cool down to the acceptable level, so that it is possible to work in the vicinity of FLEX as well as with the actual device.

3) In the event of explosion, FLEX must be dismounted from the equipment.

4) After the dismounting, check whether no visible damage and plastic deformation to the FLEX body and lid has occurred and whether its integrity is maintained. If not, the further use of FLEX is prohibited!

5) Then disassemble the entire FLEX, remove the top cover and pull the flame filter out. Remove the used membrane.

6) In two places in FLEX, in the vicinity of the flame filter, there are two ALSIFLEX 1430 (thick. 2) gaskets applied (see Fig. 16). If these gaskets are not damaged or polluted after the explosion, or if their integrity is not infringed, there is no need to change them. Otherwise, replace them with the new ones.

7) This dismounted FLEX must be thoroughly cleaned and the residue materials after the explosion must all be removed. During this cleaning, pay attention to the surfaces, on which there is the gasket form the previous clause; it must not be damaged.

8) This cleaned FLEX can be further repaired and used. A new flame filter (a spare part delivered by the supplier) should be inserted into the upper part of the frame, or the gasket should be replaced and the FLEX lid should be tightened, using the original fasteners. For this purpose, there are galvanized fasteners, i.e. the bolts ISO 4762 with a property class 8.8, locking nuts with a property class 8 ISO 7040 and plain round washers ISO 7090, all sized M8 (for FLEX R4 M10). If they have been damaged or lost, they can be replaced with the new ones. The connections must all be tightened with a tightening torque 15 Nm (21 Nm for FLEX R4).

9) A new membrane (a spare part from the supplier) can be sealed from the underside to this prepared FLEX, using the silicone sealant suitable for this application. The identical flange gasket supplied by the company RSBP spol. s r.o. can also be used; the gasket is commonly used between the membrane and the flange on the technology. Please note that the membrane must face with the signalling device towards the FLEX entry and the signalling device must be wired properly.

10) Further installation is identical with the new FLEX, i.e. the same as the procedure detailed in chapter4.



FLEX F-Series:

1) Stop the production process in the protected technology immediately.

2) Let FLEX and its surrounding cool down to the acceptable level, so that it is possible to work in the vicinity of FLEX as well as with the actual device.

3) In the event of explosion, FLEX must be dismounted from the equipment.

4) After the dismounting, check whether no visible plastic deformation to the FLEX body has occurred and whether its integrity is maintained. If not, the further use of FLEX is prohibited!

5) Then remove the flame filter from FLEX; the filter is attached to the FLEX body using the welded bolts. Then remove the membrane.

6) The ALSIFLEX 1430 (thick. 2) gasket is applied on the FLEX body under the flame filter (see Fig. 16). If this gasket is not damaged or polluted after the explosion, or if its integrity is not infringed, there is no need to change it. Otherwise, replace it with a new one.

7) This dismounted FLEX must be thoroughly cleaned and the residue materials after the explosion must all be removed. During this cleaning, pay attention to the surfaces, on which there is the gasket form the previous clause; it must not be damaged.

8) This cleaned FLEX can be further repaired and used. A new flame filter (a spare part delivered by the supplier) should be inserted into the upper part of the FLEX body, or the gasket should be replaced and the new flame filter should be tightened to the FLEX body, using the original fasteners. For this purpose, there are galvanized fasteners, i.e. locking nuts with a property class 8 ISO 7040 and plain round washers ISO 7090, all sized M8. If they have been damaged or lost, they can be replaced with the new ones. The connections must all be tightened with a tightening torque 15 Nm.

9) A new membrane (a spare part from the supplier) can be sealed from the underside to this prepared FLEX, using the silicone sealant suitable for this application. The identical flange gasket supplied by the company RSBP spol. s r.o. can also be used; the gasket is commonly used between the membrane and the flange on the technology. Please note that the membrane must face with the signalling device towards the FLEX entry and the signalling device must be wired properly.

10) Further installation is identical with the new FLEX, i.e. the same as the procedure detailed in chapter4.



FLEX C-Series:

1) Stop the production process in the protected technology immediately.

2) Let FLEX and its surrounding cool down to the acceptable level, so that it is possible to work in the vicinity of FLEX as well as with the actual device.

3) In the event of explosion, FLEX must be dismounted from the equipment.

4) After the dismounting, check whether no visible plastic deformation to the FLEX body or the lid has occurred and whether its integrity is maintained. If not, the further use of FLEX is prohibited!

5) Then the entire FLEX must be disassembled. Remove the top lid and pull the flame filter out under the lid as well as the actual cylindrical flame filted (there are two cylindrical flame filters in the FLEX devices C4 and C5). Remove the used membrane. Do not interfere with the low counter nuts, which are located on the underside of the FLEX cover on the welded threaded rods; have them in the position set by the manufacturer!

6) All metal-metal interfaces of this series FLEX are fitted with the gaskets of ALSIFLEX 1430 (thickness 10) (see fig. 16). These gaskets must always be replaced.

7) This dismounted FLEX must be thoroughly cleaned and the residue materials after the explosion must all be removed.

8) This cleaned FLEX can be further repaired and used. First, one sealing ring ALSIFLEX 1430 (thickness 10) should be inserted into the body. The new cylindrical flame filter should be put on this gasket; the filter should be turned to the position that the end of the mesh installed in the filter with pins is opposite the membrane entry. Again, place the ALSIFLEX 1430 sealing ring (thickness 10) onto the cylindrical flame filter. A new flame filter should be put onto this layer under the lid and another ALSIFLEX 1430 sealing ring (thickness 10) should be placed on it. This procedure applies to the FLEX devices C1, C2 and C3. There are two cylindrical flame filters in the FLEX devices C4 and C5. The procedure differs from the previous one only with the fact that an adaptor should be inserted between these cylindrical flame filters, and between the adaptor and the new cylindrical flame filters the sealing ring ALSIFLEX 1430 (thickness 10) should be installed. The entire FLEX should then be covered with the lid; it should be slipped over the welded threaded rods and fastened tightly against the low nuts, which were adjusted into the correct position by the manufacturer. Do not tamper with the low nuts. The tightening of the upper nuts should be performed using the "cross" method; after tightening, check each nut again.

9) A new membrane (a spare part from the supplier) can be sealed from the underside to this prepared FLEX, using the silicone sealant suitable for this application. The identical flange gasket supplied by the company RSBP spol. s r.o. can also be used; the gasket is commonly used between the membrane and the flange on the technology. Please note that the membrane must face with the signalling device towards the FLEX entry and the signalling device must be wired properly.

10) Further installation is identical with the new FLEX, i.e. the same as the procedure detailed in chapter4.



Below, in Fig. 16, there is an exploded diagram of each FLEX design.



Fig. 16 - Exploded View



7.2. FLEX SERVICE IN THE EVENT OF DAMAGE TO THE MEMBRANE

In the event that the maintenance or the service reveals any damage to the membrane but no explosion occurs, the membrane must be replaced. The procedure is similar to the procedure detailed in the previous chapter 7.1., but there is no need to change the flame filter(s) of FLEX.

In the event of damage to the membrane, FLEX must be dismounted from the equipment. This is possible only if the entire technology is shut down and therefore there is no explosion hazard.

Then remove the old membrane from the FLEX and check whether FLEX was not polluted during this process; pay particular attention to the meshes in its flame filter. If so, remove the dirt. If it is not possible, the flame filter(s) must also be replaced; proceed according to chapter 7.1. as though there was an explosion.

A new membrane (a spare part from the supplier) can be sealed from the bottom using suitable silicone sealant to this prepared FLEX. The identical flange gasket supplied by the company RSBP spol. s r.o. can also be used; the gasket is commonly used between the membrane and the flange on the technology. Please note that the membrane must face with the signalling device towards the FLEX entry and the signalling device must be wired properly.

Further installation is identical with the new FLEX, i.e. the same as the procedure detailed in chapter 4.

8. SPARE PART LIST

a) Spare parts include all optional accessories from chapter 3.2.4. (Intrinsically Safe Relay, Flange gasket, Protective Bag). In particular, they include the following components:

b) The equipment for venting device (membrane) must be replaced after each explosion in the protected equipment or if any damage to it is found during the maintenance or servicing. Should this be the case, proceed according to chapters 7.1. or 7.2. The type of the membrane used is stated on the FLEX plate; the identical membrane can also be used as a spare part.

c) The FLEX flame filter must be replaced after each explosion or if it is strongly contaminated. Each FLEX has its unique size of the flame filter, therefore, for instance, the filter from FLEX R2 is fit only for FLEX R2, but not for other FLEX devices; therefore, note the filter type while ordering spare flame filters.

d) The inspection hole lid gasket is used for the sealing of the inspection hole in the rectangular FLEX devices (series F and R). If damaged during the service or activation of the device, the new one can be ordered from the manufacturer of the supplier. The gaskets of the same dimensions are included in the series FLEX F and FLEX R1; the other identical group include the FLEX devices R2, R3 and R4.

e) Gasket ALSIFLEX (pos. 4, 5 & 10 from Fig. No. 16) if damaged, must be replaced together with flame filter (mesh). Each type of FLEX has a unique size of this gasket.



	Notes:			 	•••••
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