Formula Air
Supporting your performance

STFR – ATEX fire break sash shutter

Maintenance manual

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1. Norms and general information

The following symbols are used in the manual to draw the consumers attention on :

: EXPLOSIVE ATMOSPHERES DANGER

This symbol places the attention on prescriptions or indications relative to the directive ATEX 94/9/CE.
The operations concerned by this symbol must be executed by highly qualified personnel, competent in safety regulations relative to zones characterized by presence of potentially explosive atmosphere.

: DANGER/ ATTENTION

This symbol is used to point out the operations that can cause damages to the operators. Follow carefully the information indicated beside this symbol before proceeding with the necessary operations.

: INDICATION

This symbol is used to point out the operations that need particular attention.
So respect the information indicated beside this symbol before proceeding with the necessary operations.

: CAUTION / PRUDENCE

This symbol is used to furnish useful indications in the execution of some operations with interesting information.
It is advisable to follow the furnished indications before proceeding with the necessary operations.

1.1 Documents identification “Maintenance Manual'”

The maintenance manual is a document issued by FORMULA AIR and it is an integral part of the protection system. It is identified in univocal way to allow the traceability and possible following references.

1.2 Document purpose

The principal purpose of the maintenance manual is to furnish to the customer and to the personnel to interact with the protection system, the necessary information for the correct installation and use and maintenance in optimal conditions, with particular respect in order that this happens in the safest conditions. It is recommended to observe all of the precautions for safety both during the installation as well as during the operative phases, of service, reparation and draining of the outlet panel.

Make sure that the safety prescriptions are read, understood and executed by all personnel employed to the operation of the protection system and that it becomes usual for everybody.

1.3 General instructions and limited responsibility

Every operator interaction with the protection system, in the ambit of expected use and the whole life cycle of the same has been attentively and thoroughly analyzed by FORMULA AIR during the planning phases, construction and layout of the maintenance manual. Nevertheless it is understood that nothing can replace the experience, the suitable training and the “good sense” of those people who interact with the device.

These last requisites are essential whether in the operative phase inherent to the system, or during the reading of the present manual.

The non-respect of precautions and specific warnings present in this manual, the improper use of all or part supply, the use of spare parts not authorized, the system use from no-suitable personnel violate every safety norm regarding the planning, the building and the use expected by the supply and release FORMULA AIR from every responsibility in case of damages to people or things.

FORMULA AIR cannot be accounted responsible for the missed observance from the consumer of precautions for safety indicated in the present manual.

1.4 Maintenance of the maintenance manual

The present manual is an integral part of the system and has to be kept and used for the whole operative life of the product, also in case of transfer to third parties.

Possible requests for further copies of the present document must be requested at the purchase department of FORMULA AIR.

In order to correctly preserve for a long time the present document it is recommended to :

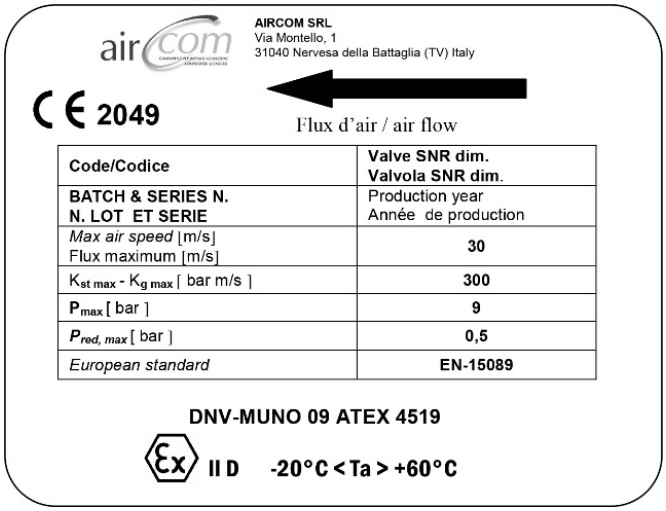
- use in such way not to damage the content, not to drop it during the use, and put it back in the assigned place after the consultation.
- Do not remove, tear or rewrite part of it. Possible copies have to be request to FORMULA AIR.

- Preserve the manual in a zone protected from humidity, heat and other environmental agents that can prejudice the integrity or duration of it.

1.5 Identification data of the product

The identification of AIRCOM S.r.l. as manufacturer of protection system, happens in conformity with the current legislation by means of listed acts:

- Declaration of conformity according to second attached X point B – ATEX EU 34/2014/CE
- Marking plate ATEX of outlet explosion device
- Instruction's manual



The identified data in the plate are refer to :

1) Identified data of manufacturer
2) Model of system protection
3) Internal assignment serial number
4) Construction year
5) Identification of production number batch
6) alpha-numerical string that identifies the l'O.N. that has executed the CE examination

Marking explanation:

- Group II;
- Explosive atmosphere for presence of dusts or gas (Gas or Dust);

1.6 Warranty

Concerning the warranty norms make reference to the general sales conditions draw up in contractual center.

1.7 Technical assistance

In case of necessity of an intervention by the manufacturer, please contact FORMULA AIR.

In case the consumer doesn't respect the indications in the present publication, we don't respond for inconveniences or anomalies on the good operation of the product.

2. Obligations and duties

2.1 Employer duties

The employer is responsible of the present document communication towards all personnel that will interact with the process where is installed this protection system.

2.2 Obligations in case of intervention

The operators called to interact with the protection system have the obligation to learn adequately themselves using the present manual before making any intervention, adopting the relative specific safety prescriptions.

2.3 Obligation of norms respect

The operators have to adopt and necessarily respect the general accident prevention prescriptions prescribed from community directives and of the legislations where the product is placed.

2.4 Obligations in case of malfunctions and potential dangers

The operators have to warn their direct supervisor of every possible deficiency and/or potential dangerous situation that they can verify. In case of necessity contact FORMULA AIR.

2.5 Consumer obligation

The consumer has the obligation to inform FORMULA AIR in time if he finds defects and/or malfunctions, as well as any presumed dangerous situation.

It is severely forbidden for the customer and/or third party (excluded FORMULA AIR personnel duly authorized) to bring whatever changes and entity to the outlet's panel, as well as to the present technical document.

In case of malfunctions and/or dangers, due to a missed respect other than above, FORMULA AIR doesn't answer to any consequences resulting from this.

It is suggested to ask for possible changes directly to FORMULA AIR.

3. Introduction to the ATEX directives

Explosive atmosphere

The purpose of the directive 94/9/CE is intended for explosive atmosphere constituted by a mixture of :

- inflammable substances to the state of gas, vapors, fogs and dusts;
- with air;
- in definite atmospheric conditions ;
- in which, after the primer, the combustion is propagated to the whole mixture not burnt (it is necessary to notice that in presence of dust, not always the whole quantity of dust is consumed by the combustion).

4. General accident prevention prescriptions

Is it an obligation for the consumer and operators to respect the accident prevention norms in force, both at a legal and business level and particularly it is asked to respect the following points :

- all working personnel cannot be under the influence of sedatives, drugs or alcohol and must be perfectly aware of the operation characteristics;
- it is absolutely forbidden to exclude and open or remove the outlet panel during the operation;
- connect the protection system to the grounding of the plant and maintain the equipotentiality among the parts without interposing the same materials/components in the assembling not foreseen in this manual;
- in case a maintenance operation is necessary, insure to stop the process operation affecting the mounted protection system;
- always use the original spare parts or commercial parts completely compatible with those mounted in the protection system;
- during the maintenance operations or anything else that requires the process plant intervention on which the shutter is installed, it is obligatory to affix on the electrical supply (interrupters, disconnecting switches, shutters , etc) a special sign that prohibits everyone the reactivation of the system, if possible it is recommended to block these devices with a padlock;
-  the protection system is allowed in plants where the risk of explosive atmosphere can't be brought to the minimum tolerable level, according to directive 99/92/CE with presence of dusts or gas.
-  The operators in the classified areas must wear preferably antistatic clothing, possibly in natural fiber.
-  all interventions have to be carried out with non-sparking equipment in areas with explosion risk.

-  Do not use compressed air systems to clean the interstices because will only lift dust and create new deposits. Employ a vacuum system.
-  The process structures where the non-return shutter is installed must be connected to an efficient grounding system, as to be able to disperse possible currents of electrostatic nature.
-  The installation of protection system has to happen respecting the safety norms to protect safety of structure and people.
-  Absolute prohibition to use open flames in proximity of process where the protection system is installed and in general in every hazardous zone.
-  Prohibited to smoke.
-  Prohibited to use cellular phones if not marked ATEX for the relative category of belonging with plant in operation in classified zone according to directive 99/92/CE.

5. Residual risks

The accurate analysis of the risks developed by the builder and filed in the technical brochure, has allowed to remove the greater part of risks connected to the outlet panel condition of use. The builder recommends to meticulously follow the instructions, procedures and recommendations contained in this manual and to follow the safety norms in force. The residual risks tied to the application of outlet panel can be:

Wrong interpretations of the risks on the safety pictograms

Following the risks and their individuation, the manufacturer has installed a danger label to the outlet panel established in conformity with the related normative to the graphic symbols in use.

The user is asked to replace immediately the safety plates that can become illegible by wear or damage.

⚠ **WARNING : It is absolutely forbidden to remove the safety plates from the shutter.**

The manufacturer refuses all responsibilities on the outlet panel safety in case of non-observance of this prohibition.

6. Description of the protection system

The fire shutters series “STFR” for the fire insulation are projected by FORMULA AIR, to be employed as ATEX protection systems, in accordance with the vertical European Directive that disciplines them, as they are able to isolate, from the effects of a deflagration, two systems of containment separated by a connection system.

Concerning the protection system denominated non-return shutters series “STFRT-STFRPTM-STFRPCMT"”, produced by Formula Air, the present document describes the followings points:

− The evaluation of the risks associated to the use of the protection system in potentially explosive atmosphere;

- The conformity of the protection system to the least requisites in safety and health subjects described in the directive 94/9/CE.

The typology of above indicated shutters are distinguished in twelve different dimensions, which differ exclusively by the diameter of passage.

The base physic of explosion insulation provides that the system has the aim to avoid the propagation of the pressure wave and the flame produced by a deflagration in a system.

In such way it is possible to isolate in a process, systems of containment that for functional reasons they are among them continuous.

The shutter is a protection system of passive type that doesn't need a system of survey, control or functional indication.

Such systems have to be dimensioned following the size of ducts on which they are installed to bear the maximum pressure of an explosion (Pred).

The distance between the containment system that has to isolate, and the shutter is directly related to the maximum speed of flame front propagation and from the response times of protection system.

The main factors that influence the performances of a protection system are:

- Speed at which the substances mix in the ducting,

- Flamme front speed,

- Closing time of the shutter.

The speed of the flame’s front, keeping in mind of the flow speed inside the pipeline is:

$V_F = V_{flux\ air} + S_F$

Where:

- V_F total speed of flame’s front [m/s]

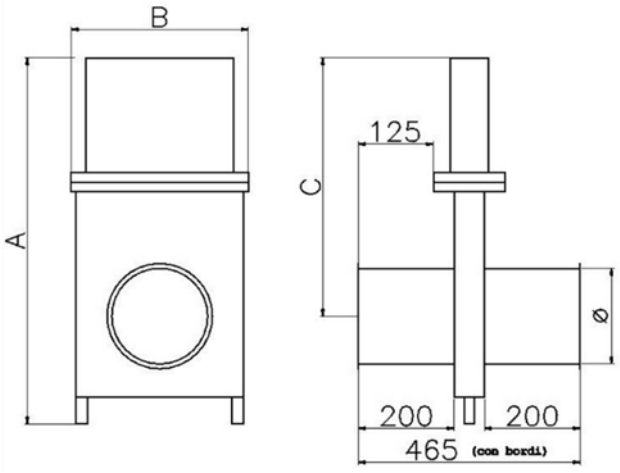
- $V_{flux\ air}$ speed of transport in pipeline [m/s]

- S_F speed of flame’s front in absence of flow of transport [m/s]

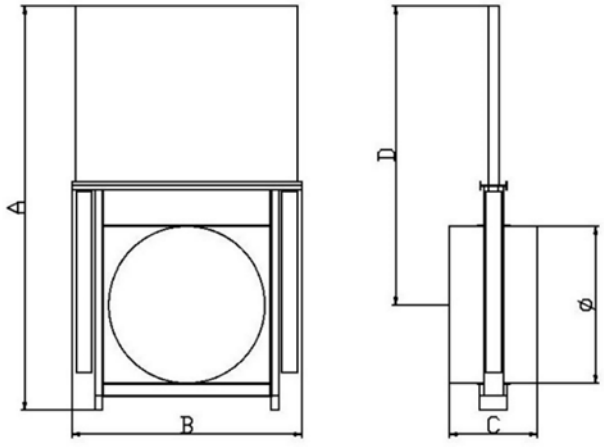
The shutter object of the present analysis, are structures in thickness for the closing and the insulation of containment systems; they are produced in carbon steel thickness 30/10 or 40/10 (in relationship to the dimension of the protection system).

THE FOLLOWING SCHEDULE REPORTS THE TECHNICAL DATA OF FIRE SHUTTERS :

Model Ømm	Drawing 1 : STFRT - STFRPTM				Drawing 2: STFRT - STFRPCTM				
	A	B	C	Kg	A	B	C	D	Kg
Ø200	765	350	540	24	830	555	335	605	48
Ø250	865	400	615	30	980	605	335	730	55
Ø300	965	450	690	38	1030	655	335	755	60
Ø350	1065	500	765	44	1180	705	335	880	68
Ø400	1165	550	840	50	1230	769	335	905	75
Ø450	1265	600	915	60	1480	819	335	1130	88
Ø500	1365	650	990	68	1530	900	335	1155	95
Ø550	1465	700	1065	80	1680	950	335	1280	110
Ø600	1565	750	1140	90	1730	1021	335	1305	130
Ø650	1665	800	1215	102	1880	1071	335	1430	150
Ø700	1765	850	1290	112	1930	1121	335	1455	180
Ø750	1865	900	1365	140	2080	1171	335	1580	205
Ø800	-	-	-	-	2215	1206	540	1620	230
Ø850	-	-	-	-	2365	1256	540	1745	255
Ø900	-	-	-	-	2415	1306	540	1770	285
Ø950	-	-	-	-	2565	1356	540	1895	305
Ø1000	-	-	-	-	2615	1420	540	1920	320
Ø1050	-	-	-	-	2765	1470	540	2045	345
Ø1100	-	-	-	-	2815	1520	540	2070	370
Ø1150	-	-	-	-	2965	1570	540	2195	395
Ø1200	-	-	-	-	3015	1620	540	2220	420



Drawing 1 : STFRT - STFRPTM



Drawing 2: STFRT - STFRPCTM

The limits of the environmental conditions within the shutter are of 60°C with 90% relative humidity. The shutter is a thermally passive object, the maximum superficial temperature that it can reach depends solely on the process within which it is installed.

7. Transport and storage of the Shutters

To avoid damages during the transport, the shutter is protected with polystyrene protections and the whole is positioned on a pallet.

Before removing the shutter from its package, verify its integrity within the package and also that the documentation corresponds to the order.

Open the package from a side and remove the shutter taking care not damage it

Verify the integrity removing all the polystyrene supports.

Verified the shutter's integrity put it back inside the package until the moment of use.

Preserve the shutter so packed in dry place, to the shelter of atmospheric agents or from possible causes of damages.

8. Installation of STFR fire shutters

The protection system called fire shutters series "STFR" is fit to operate in the expected conditions as explicitly stated on the plate fixed on the same panel and as described on the declaration of conformity CE (static pressure activation, characteristics of the external environment, nature and state of dusts or processed gas, etc..).

WARNING : The installation of the protection systems must be performed in absence of potentially explosive atmospheres by stopping the production plant.

Make sure to wear the appropriate personal protection devices.

8.1 Installation Instructions for fire shutter series STFRT with gravity shutter with fuse 72° and STFRPTM with grvity shutter and pneumatic cylinder (ONLY IN HORIZONTAL POSITION)

Only install in under-pressure

1) The shutter is delivered with the diaphragm blocked in the closed position and the lever B loose. Before installation, make sure that the shutter wasn't damaged during transport.
2) Remove the blocking screw 4, introduce the crank A on pin B, and turn the crank clockwise or counter clockwise to lift or drop the diaphragm.
3) Make sure that the diaphragm moves freely by moving it up and down a few times with the crank as instructed on point 2 and block the diaphragm in place with the safety pin 4 to avoid undesired movements during installation.

4) Install the shutter (with diaphragm in vertical position) like in drawing X-Z held by the anchoring holes, repeat operation in point 2 to see if the diaphragm moves good.
5) Proceed with the definitive rearmament of the diaphragm and remove the protection 2 fig.Z, remove the safety pin 4 fig. X, by holding the shutter in the open position to its maximum with the crank A, BE CRZFUL NOT TO FORCE ON THE METAL CABLE DURING THIS PHASE OF INSTALLATION, set the rearmament block 5 in the hole 4 and release gently the diaphragm until it hold on the block. Remove the fuse support E by unscrewing the 4 screws, pull on lever D 'fig. U) on the inside of the protection, reposition the fuse support E and make sure the lever F (fig.U) blocks the lever D, fix the support E with the 4 screws.

For the model STFRPTM, pull on the lever D (fig. Y) on the inside of the protection, reposition the lever F (fig. Y) block the lever D, and the lever G and the block the lever F until the pin of the cylinder falls and blocks the movement of the lever G.

6) Lift slightly the diaphragm with the crank A, remove the rearmament pin 5 and slowly turn the crank to drop the diaphragm until it rests on the lever D.
7) Remove the crank and place it back on its support. Reassemble the protection 2.
8) Control that the discharge plate 11 is closed and free of obstacles.

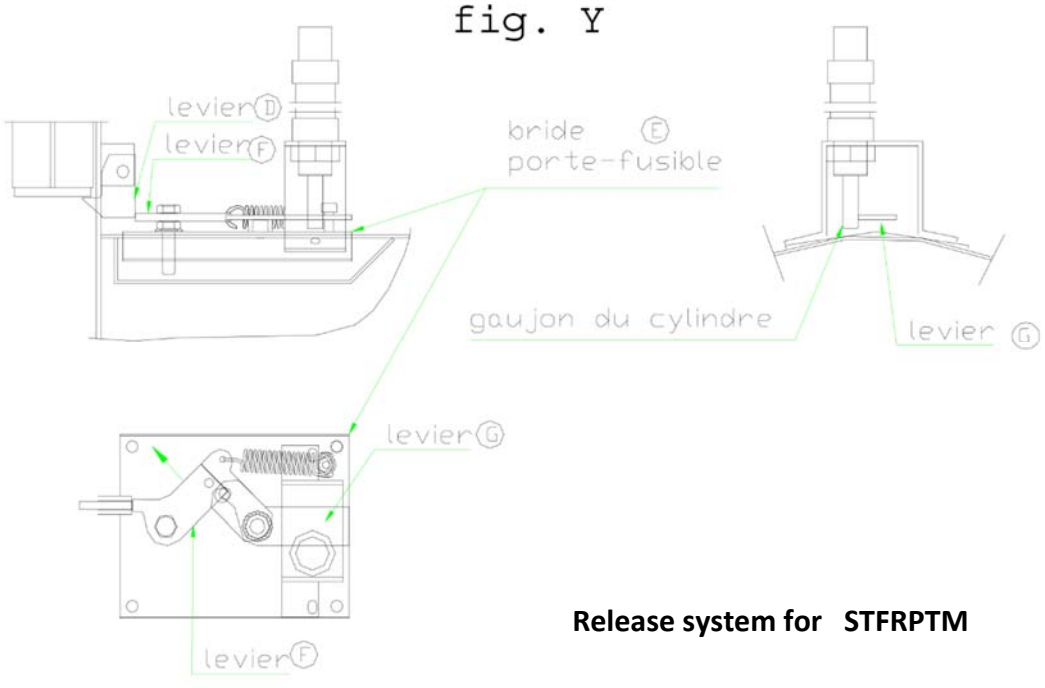
IMPORTANT:

- Working temperature range -20°C ÷ +70°C;
- Working temperature range with fuse -20°C ÷ +45°C;
- Avoid overheating as of 45°C, the thermo fuse 72°C could loosen up on models STFRT;
- Avoid at all costs that the diaphragm gets in contact with oil, water or humidity ;

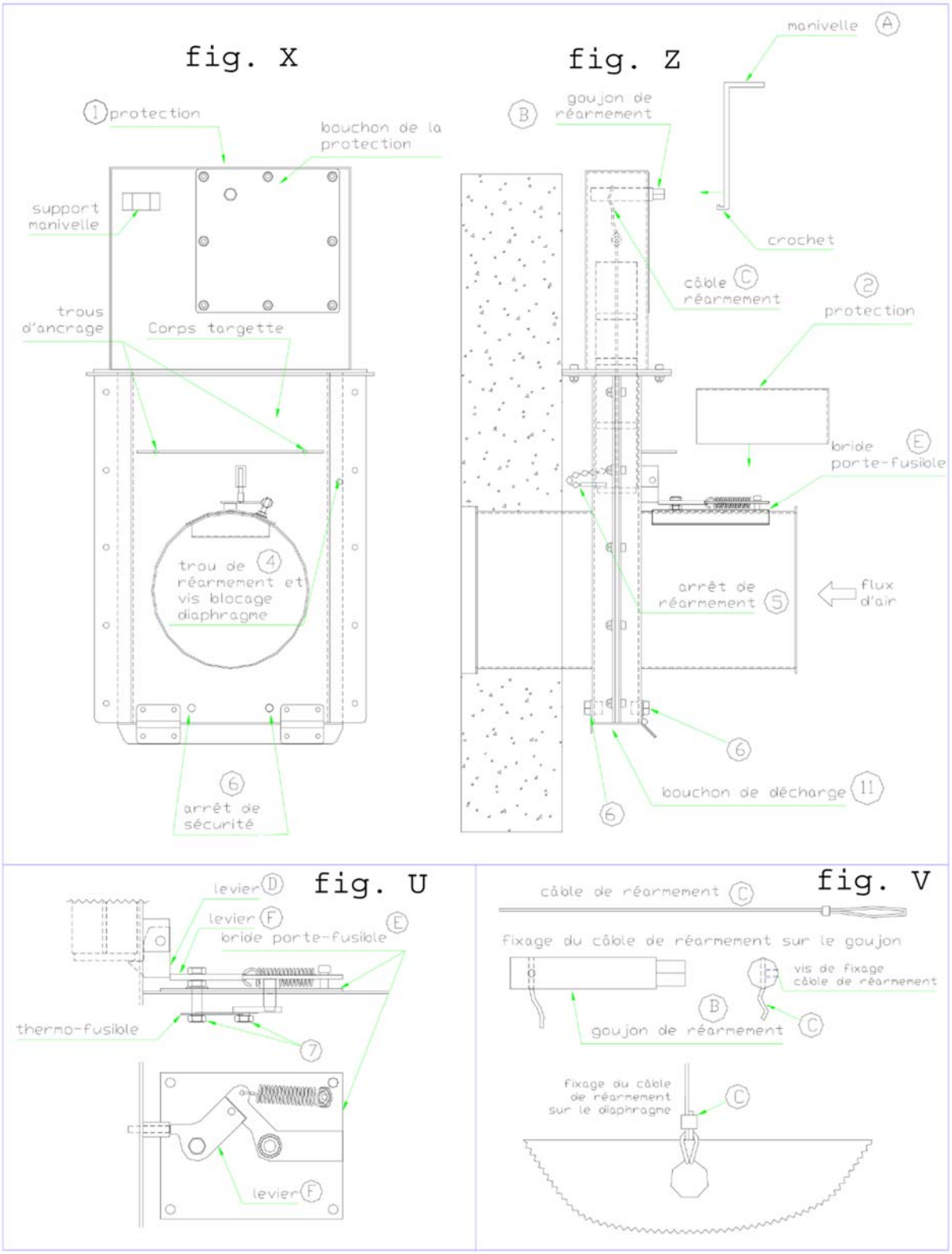
- Working pressure : 6 bar (models STFRPTM and STFRPCMT)

- The inspection door must always be oriented upward.

fig. Y



Release system for STFRPTM



STFRT shutter

8.1.1 Instructions to replace the fuse and rearm the shutter STFRT

A- repeat the instructions as indicated in point 8.1-5 ;

B- Remove the fuse support E, unscrew bolt 7 (fig. U page 18) remove the damaged thermo fuse and replace with a new one. Place the support back in place and proceed to normal rearmament of the shutter strictly following the assembly instructions as stated in points 5-6-7-8;

C- control and eventually replace the two stops 6 because they could be damaged by the closing of the shutter.

8.1.2 Instructions for the replacement of inner cable to rearm the shutter STFRT – STFRPTM

If the cable should break, follow these steps :

- Remove the protection cover (fig. X page 18);
- Remove the protection on the body of the shutter (fig. X page 18);
- Remove the surplus of rearmament cable, lift the diaphragm up manually with the crank until you have reached the hole for the safety pin 5 (fig. Z page 18). Secure the cable in the hole of the cable support and then pass it through the hole on the shutter diaphragm (fig. V page 18).
- Mount the protection in its original position and insert the extremity of the cable in the support B B (fig. V page 18) and then block the regulating screw.

8.2 Assmbly instructions for fire shutter series STFRPTM with gravity shutter with cylinders and STFRPCMT - closing by pneumatic 2 pneumatic cylinders

STFRPTM Installation only in under-pressure

1. Assemble the electro-shutter with compressed air hose Ø 6/8 to the single effect cylinder (normally in open position without air) and proceed to the electrical connection of the electro-shutter to the spark system of thermo-sensor. (in case the shutter is equipped with fuse and micro-disruptor, make sure the fuse is good), Electro-shutter normally with contact open (contact closed when signal of flame or spark).
2. After installation, and electrically connected, make sure the diaphragm moves freely by opening and closing it a few times with the lever A and then with the pneumatic system by manually activating the electro-shutter and rearming the shutter (see 8.1-5); In case it doesn't close well, make sure that the pressure of the ducting on the sides of the shutter isn't too great.
3. Control that the discharge cap with spring closing is closed (and not obstructed)

IMPORTANT:

- Working temperature range -20°C ÷ +70°C;
- Working temperature range with fuse -20°C ÷ +45°C;
- Max humidity work level at 90%;
- Avoid at all costs that the diaphragm gets in contact with oil, water or humidity ;

After intervention of the cylinders and closing of the shutter, the reopening of the shutter needs to be done manually, as described in point 8.1-5, after restoration of the electric signal per spark detector.

STFRPCMT Installation only in under-pressure

4. The fire shutter is delivered in closed position. Before installation, make sure shutter is not damaged during transport. The installation can be in a wall or in ducting and the position does not matter.
5. Make sure the diaphragm moves freely, by opening and closing it a few times manually and then with the cylinders by operating the electro-shutter manually.
6. Install the shutter in the installation by supporting it to the holes provided for this.
7. Install the compressed air to the shutter and then connect the electrical connection to the electro-shutter to the spark detection system or thermo-sensor. See 8.2.1 (In case the shutter is equipped with fuse and micro-switch, make sure the fuse is good and connect the micro-switch as per diagram)
8. After installation and electric & pneumatic connection, make sure the diaphragm moves freely by moving it up and down a few times :
9. In case it is blocked, make sure that the pressure of the ducting on the sides of the shutter isn't too great. With the installation functioning normally (without spark signal) the shutter needs to stay in open position. If this is not the case, just reverse the air hoses to the electro-shutter.
10. Control that the discharge cap with spring closing is closed (and not obstructed)

IMPORTANT:

- Working temperature range -20°C ÷ +70°C;
- Working temperature range with fuse -20°C ÷ +45°C;
- Max humidity work level at 90%;
- Avoid at all costs that the diaphragm gets in contact with oil, water or humidity ;

After intervention of the cylinder and the closing of the shutter, the automatic reopening occurs after restoration of the electrical signal by spark detector, or other detector or replacement of the fuse.

A micro-switch can be isntalled on each type of fire shutter with NO and NC contacts to detect the position of the diaphragm.

The model is MIC1 or MIC1Q ATEX zone 22.


Make sure to earth the non-return shutter on the bolt having the following pictogram.

The personnel performing the installation needs to use non-sparking tools.

WARNING ! The personnel working on the installation needs to make sure to wear the proper clothing and footwear to perform the task.


Dissipative clothes : clothes constituted by a material with inferior superficial resistivity to $5x10^{10}\Omega$.

Dissipative footwear : footwear that guarantees an earthing resistance to a standing person on a conductive or dissipative floor superior to $10^5\Omega$, but inferior to $10^8\Omega$.

In order to have an efficient insulation, it is recommended to place the shutter taking into account to have the most direct path for the explosion front with as little possible obstacles.

Only qualified and instructed personnel can execute the installation of the non-return shutter SNR.

The safety device must be installed according to the manufacturer's expectations and in no way may the components be modified from their original state.

9. Control and periodic maintenance

WARNING : before beginning any inspection operation and maintenance intervention on the shutter, it is necessary that the protected equipment is not under pressure and it doesn't contain substances able to produce an explosive, toxic or harmful atmosphere.

The shutter's duration essentially depends on the usage conditions to which it is subjected once installed in the plant.

A visual check on the integrity shutter and its parts is not sufficient to determine the conditions of the product.

In all cases a visual check must be executed every month to assess possible corrosion phenomenon, breakings or deformation that can influence the proper functioning of the shutter.

Besides verify that there are no losses traces from the seal's gasket, verifying the clamping torque of all screws of the shutter.

WARNING : The maintenance and cleaning of the shutter must be performed in absence of potentially explosive atmospheres by stopping the production plant..

9.1 Check that the diaphragm slides well STFRT: Remove the protection 2 (Fig. Z), with the cranck A (fig. Z); bring the diaphragm in the up position (turn clockwise) and insert safety pin 5 fig. Z (blocks armement), free the diaphragm until it stops on the pin. Remove the fuse holder, lift the diaphragm lever, remove the pin and release (turn counter clockwise) until the diaphragm is at the bottom of the shutter (6 bolts). Repeat this cycle twice then stop in the up position and replace the pin and put the fuse holder and protection back in place. Remove the safety pin and let go.

10. Controls

Operation to execute	Frequency	Procedures
Check the state of the nuts and bolts		
Check the general state of the shutter and if there is corrosion	6 months	Visual control for eventual tears, cracks, vibrations during functioning.
Check the connection to the earth of the protection device and the electrical and/or pneumatic connections.	6 months	
Check periodically that there is no excessive dust build-up in the shutter.	3 months	Check when opening the discharge latch on the bottom of the shutter and remove any dust build-up inside the shutter. Make sure that the discharge latch is back in the closed position, aided by the springs.
In the STFR model, check the opening and closing of the diaphragm.	Yearly	Manually check that the diaphragm moves freely. See point 9.1
In the STFRPCMT, check the opening and closing of the diaphragm.	Yearly	Activate the electro-shutter manually to check that the diaphragm moves freely.
In the STFRPTM, check check the opening and closing of the diaphragm and cylinder.	Yearly	Check that the diaphragm and cylinder move freely.

11. Dismantling and recycling

When dismantling a unit, be sure to keep in mind the following important information:

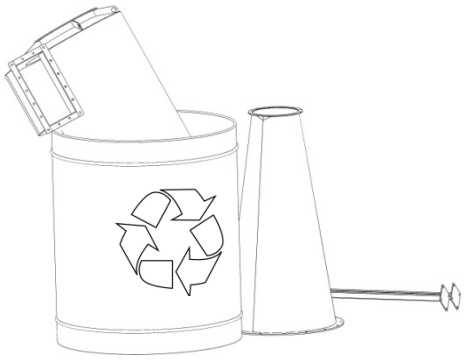
As the unit is dismantled, set aside all still functioning parts in order to re-use them on another unit.

You should always separate the different materials depending on their type : iron, rubber, oils, greases, etc…

Recyclable parts must be disposed of in the appropriate containers or brought to a local recycling company.

The rubbish must be collected in special containers with appropriate labels and disposed of in compliance with the national laws and/or local legislations in force.

CAUTION! It is strictly forbidden to dispose of toxic wastes in municipal sewerage and drain systems. This concerns all oils, greases, and other toxic materials in liquid or solid form.



12. Spare parts

For spare parts please contact Formula Air Group.

Formula Air
The Netherlands
Bosscheweg 36
SX 5741 Beek en Donk
The Netherlands
Tel: +31 (0) 45 492 15 45
Fax: +31 (0) 492 45 15 99

info-nl@formula-air.com
view Google Map

Formula Air
Belgium
Rue des Dizeaux 4
1360 Perwez
Belgium
Tel: +32 (0) 81 23 45 71
Fax: +32 (0) 81 23 45 79

info-be@formula-air.com
view Google Map

Formula Air
Baltic
Televizorių G.20
LT-78137 Šiauliai
Lithuania
Tel: +370 41 54 04 82
Fax: +370 41 54 05 50

info-lt@formula-air.com
view Google Map

Formula Air
France
Zac de la Carrière Doree
BP 105, 59310 Orchies
France
Tel: +33 (0) 320 61 20 40
Fax: +33 (0) 320 61 20 45

info-fr-nord@formula-air.com
view Google Map

Formula Air
Est Agence France
2, rue Armand Bloch
25200 Montbeliard
France
Tel. +33 (0) 381 91 70 71
Fax +33 (0) 381 31 08 76

info-fr-est@formula-air.com
view Google Map

Formula Air
France Agence Ouest
19a rue Deshoulières
44000 Nantes
France
Tel. +33 (0) 251 89 90 75
Fax +33 (0) 251 89 94 06

info-fr-ouest@formula-air.com
view Google Map

Formula Air
France Agence Sud
Chemin de Peyrecave
09600 Regat
France
Tel: +33 561 66 79 70
Fax: +33 567 07 01 09

info-fr-sud@formula-air.com
view Google Map

Air Formula
Russia
Нижний Новгород
Россия
Tel: +7 (499) 609 23 45
Fax: +7 (831) 277 85 38

info-ru@formula-air.com
View Google Map

Formula Air
Vietnam
33, Lot 2, Den Lu 1
Hoang Mai District, Hanoi,
Vietnam
Tel: +84 (4) 38 62 68 01
Fax: +84 (4) 38 62 96 63

info@vinaduct.com
www.vinaduct.com
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NOTE : All drawings and references contained within this manual are non-contractual and are subject to change without prior notice at the discretion of the Formula Air group and its partners.