ON-OFF VALVES SERIES FFF/10

FAMILY 01 – GROUP 66

Master handbook description: Guide to selection, operation and maintenance of FFF/10 ON-OFF Valves (English)

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DICHIARAZIONE DI CONFORMITA' UE

DECLARATION OF UE CONFORMITY

Mod: 702
Rev: 00
Data: 05/07/2016

VALVOLE ON-OFF D'INTERCETTAZIONE SERIE FFF

ON-OFF VALVES SERIES FFF

(in tutte le sue configurazioni / *in all their configurations*)

ITALVALVOLE® s.a.s. di Spadon Oscar & C. dichiara che l'intera gamma dei prodotti è stata progettata e costruita in accordo a quanto indicato nell'ALLEGATO I della direttiva UE:

ITALVALVOLE® *s.a.s. of Spadon Oscar & C. declare that all products it was engineered and built in according as indicated on Annex 1 of the directive UE:*

2014/68/UE

CLASSIFICAZIONE DELLE VALVOLE / *CLASSIFICATION OF THE VALVES*

CATEGORIA I per fluidi del gruppo **II** - ***CATEGORY I*** *for fluids group* ***II***

Secondo valutazione di conformità descritte dall' allegato III (MODULO A)
With respect to the conformity described in annex III (MODULE A)

NORME TECHICHE ARMONIZZATE e SPECIFICHE UTILIZZATE:
HARMONISED TECHNICAL STANDARDS and SPECIFICATIONS USED:

UNI EN 12266-1-2 / UNI EN 10213

ALTRE DIRETTIVE EUROPEE APPLICATE:
OTHER EUROPEAN STANDARDS APPLIED:

2014/34/UE

Marcatura dell'apparecchiatura:
Marking of equipments:

CE Ex II 2 G D c Tx X

Certificato numero:
Certification No:

0425 ATEX 2519

ENTE NOTIFICATO – *NOTIFIED BODY*

ICIM S.p.a

Via Don Enrico Mapelli, 75 – 20099 Sesto San Giovanni (MI)

Numero Identificativo dell'Organismo Notificato
Notified Body Identification Number:

0425

LUOGO e DATA - *Place and Date*
Cossato, 19/07/2016

Legale rappresentante
Legal representative

Firmato da:
SPADON OSCAR
Motivo:
CF: SPDSCR44M19L436J

Luogo:
Cossato, 13836 (BI)
Data: 21/03/2018 15:44:51

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Foreword

Our company policy, pursuing continuous research to improve quality and propose new products, led us to the design of the FFF/10 valves, providing a good quality/price ratio.
With limited dimensions, they are provided in different models, with threaded and pocket welding attachments.
They provide a solution for fluid, gas and vapour shutoff
Their maintenance is easy, their stem is provided with PTFE seal, and they are mainly made of pressed and microfused components.
They are available in the dimensions DN 15 to DN 65.
Table 3 includes a list of fluids which are perfectly compatible with these valves.
For any other fluid or use, which has not been expressly indicated in this manual, contact directly our service department.

Legend

- $\Delta p_{allowed}$ (allowed differential pressure): pressure whose algebraic value corresponds to the difference in pressure between the two sides of a partition panel (UNI EN 764-1:2005) at a given temperature and with the valve closed.
- **Maximum/minimum allowed temperature:** minimum/maximum temperature for which the equipment has been designed, as specified by the manufacturer (UNI EN 764-1:2005).
- **Maximum allowed pressure:** maximum pressure for which the equipment has been designed, as specified by the manufacturer (UNI EN 764-1:2005).
- **DN:** it is an alphanumeric designation of size for components of a pipework system, which is used for reference purposes.
  It comprises the letters DN followed by a dimensionless whole number which is indirectly related to the physical dimension, expressed in millimetres, of the hole or of the outer diameter of the ends of connection pipes (ISO 6708:1997).
- **Kv**: flow rate, expressed in m^3/h, of water (10 to 25 °C with a volume equal to 1000 Kg/m^3) flowing through two ways of a valve, with a pressure drop Δp of 100 KPa (1 bar)

$$Kv = \frac{Q}{\sqrt{\Delta p}}$$

  where : Q is the flow rate in m^3/h.

3 Technical features

General notice:	⇒ all the pressure values indicated hereinafter are relative pressure values
	⇒ **valve designed for fluids of group 2 (directive 2014/68/UE).**
DN:	⇒ 15 to 65
Connections:	⇒ GAS threaded
	⇒ socket welding
Pmax all.:	⇒ 16 bar (DN 15 to 65)
Pmin all.:	⇒ 0 bar
Seal:	⇒ EPDM, PTFE-coated EPDM, PTFE
Tmax all.:	⇒ +150 °C with EPDM seal; +155 °C with PTFE-coated EPDM seal; +200 °C with PTFE seal
Tmin all.:	⇒ -10 °C (in liquid phase)
Flow direction:	⇒ 2-way valve, with angle body, unidirectional (under shutter flow)
Air connection:	⇒ quick joint for RILSAN pipes Ø 6/4 mm
Supply fluid:	⇒ instrument air
Supply pipes:	⇒ pipe inner diameter = 4 mm, min. outdoor diameter = 6 mm
Supply P (supply):	⇒ 6-8 bar
Air consumption (NC):	⇒ see table 1
Versions:	⇒ with handwheel, with visual device, with inductive sensors, with magnetic sensors, with pneumatic limit switches, with mechanical limit switch and with solenoid valves (see paragraph 4 Accessories)
Manufacturing materials:	⇒ see drawings and relevant tables
Overall dimensions:	⇒ see overall dimensions drawings and relevant tables

3.1 Table 1: FFF Valve Air Consumption

CONTROL PRESSURE	∅ SERVO CONTROL			
	Servo control ∅ 32	Servo control ∅ 70	Servo control ∅ 80	Servo control ∅ 125
6 bar	0.087	0.824	1.182	4.982

3.2 Table 2: Δp seal of FFF valves (bar)

∅ Servo Control	DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	DN 65
32 (stroke 8mm)	7	4					
70 (stroke 15mm)	16	14	9.5	6.5	4	2.5	
80 (stroke 15mm)			16	16	11	7	
125 (stroke 20mm)					16	16	12

3.3 Table 3: Compatible Fluids

TYPE OF FLUID	SEAL TYPE		TYPE OF FLUID	SEAL TYPE	
	EPDM	PTFE		EPDM	PTFE
Vinyl acetate	**A**	**A**	Sodium chloride 20% max	**A**	**A**
Phenol acetylene	**B**	**A**	Potassium chloride 5% max	**A**	**A**
Glycerol fat acids	**A**	**A**	Butyl ether	**C**	**A**
Phenol	**B**	**A**	Petroleum ether	**D**	**A**
Phosphoric acid 20% max.	**A**	**A**	Dibenzile ether	**B**	**A**
Phthalic acid	**A**	**A**	Dibutyl ether	**C**	**A**
Gallic acid	**B**	**A**	Ethylene glycol	**A**	**A**
Nitric acid 5% - 65% max	**C**	**A**	Ammonium nitrate	**A**	**A**
Oleic acid	**C**	**A**	Copper nitrate	**A**	**A**
Stearic acid	**B**	**A**	Sodium nitrate	**A**	**A**
Tannic acid	**A**	**A**	Ethylene perchlorate	**D**	**A**
Butanol	**B**	**A**	Potassium sulphate 20% max at T=100 °C	**A**	**A**
Ethanol	**A**	**A**	Sodium sulphate	**A**	**A**
Methanol	**A**	**A**	Zinc sulphate 40% max at T=100 °C	**A**	**A**
Propanol	**A**	**A**	Potassium sulphite 10% max	**A**	**A**
Aniline	**B**	**A**	Sodium sulphide	**A**	**A**
Sodium carbonate 20% max	**A**	**A**	Toluene	**D**	**A**
Borax (sodium tetraborate)	**A**	**A**	Water Steam T_{max}=130 °C P=2.7 bar	**A**	**A**
Sodium carbonate	**A**	**A**	Water Steam T_{max}=170 °C P=8 bar	**C**	**A**
Potassium chlorate 30% max	**A**	**A**			

Table legend: **A** good resistance (weak or no attack)
B conditioned resistance (medium attack)
C no resistance (strong attack)
D decomposition (swelling and decay)

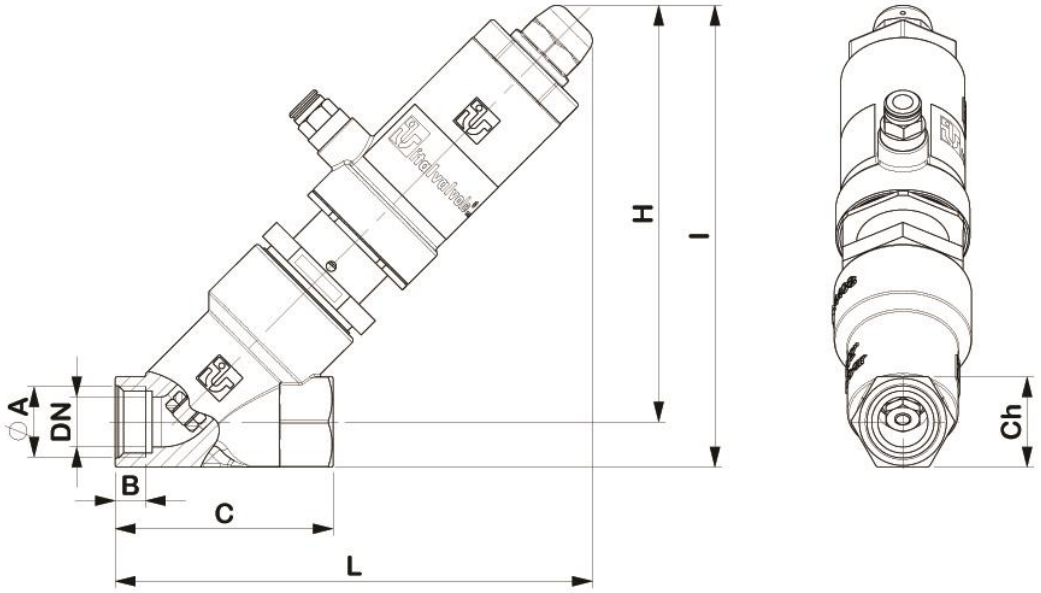
All data in table 3, if not otherwise specified, is relevant at a temperature of 21°C.
All data have a general meaning and are not valid for all possible working conditions. These data may considerably vary depending upon various conditions, such as: temperature, concentration, fluid speed.
For detailed information, please get in touch with the technical department.
Any use of the valve on explosive, easily inflammable, comburent and poison gases is strictly forbidden.
Any use of the valve on liquids based on: chlorine, fluorine, bromine, iodine and derivative elements is strictly forbidden.
Any deviation from such prohibitions may be issued for special applications, by our technical department, upon written request.

3.4 Safety Notes

- Valve body, under maximum operating temperature conditions, depending on the system, may reach a Tmax =200°C. It is up to the engineer to provide the system with the necessary safety guards and/or warning signals with the purpose to remove/indicate the risk of possible burns to the user.
- Each valve is provided with 2 inspection holes (located on the intermediate body). Their purpose is to signal any loss from the stem seal. They are extremely important as they limit the passage of fluid into the air circuit and warn about the loss, preventing the air from being contaminated. It is up to the engineer to provide the system with the necessary safety guards and/or warning signals with the purpose to remove/indicate the risk of contact of the user with dangerous fluids (if any).
- During any operation on the valve, the fluid shall not be present inside piping or valve.

3.5 Overall dimensions of FFF/10 valves

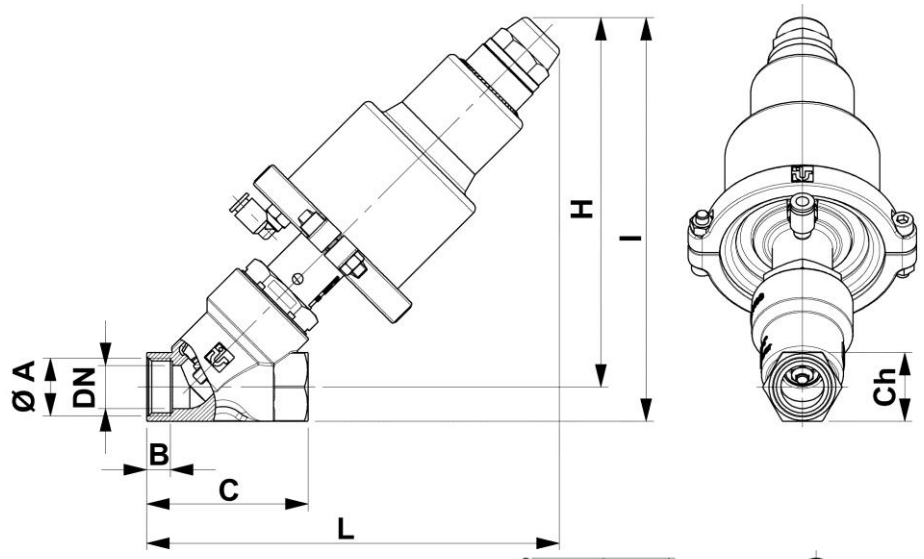
3.6 FFF/10 N.C. V.D.



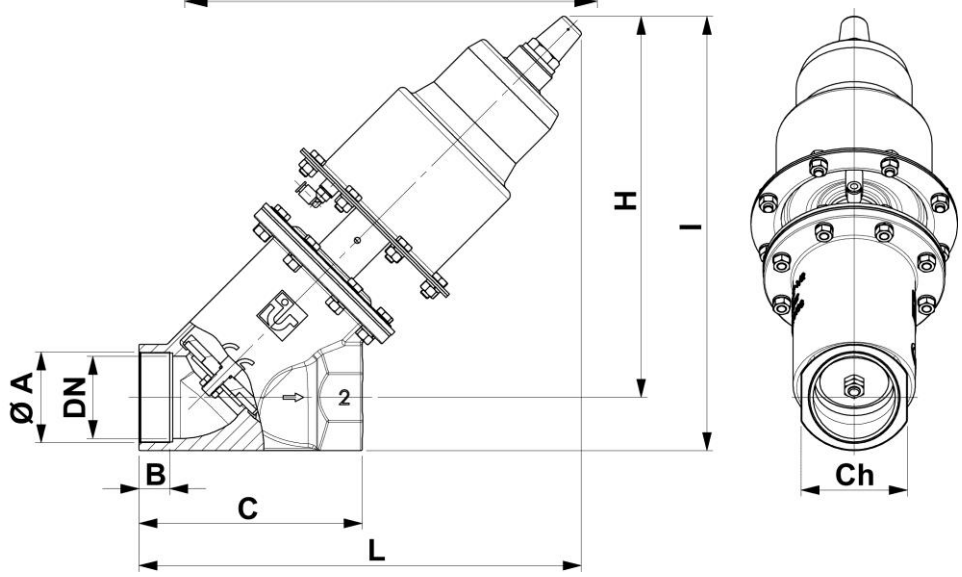
Serv. Ø 32

DN		15 *1/2"*		20 *3/4"*		25 *1"*		32 *1"1/4*		40 *1"1/2*			50 *2"*			65 *2"1/2*
Ø Serv.		32	70	32	70	70	80	70	80	70	80	125	70	80	125	125
Ø A	F(1)	1/2" GAS		3/4" GAS		1" GAS		1"1/4 GAS		1"1/2 GAS			2" GAS			2" 1/2 GAS
	ST(2)	22		27,5		34		43		49			61			77
B	F(1)	8		9		12		14		14			16			26
	ST(2)	11		12		15		17		17			19			28
C		65		75		90		110		120			150			185
H		125	171	126	172	179	196	192	209	197	214	276	208	225	287	328
I		138	184	142	188	199	216	216	233	224	242	303	242	259	321	372
L		143	189	147	192	206	223	227	244	231	248	310	246	263	325	379
Ch		27		32		39		49		55			68			88
Kv [m³/h]		4		7,5		12		19		30		43,8	45		58,1	78

Dimensions are in mm (1) "F" threaded connection (2) "ST" socket welding connection



Serv. Ø 70 – Ø80

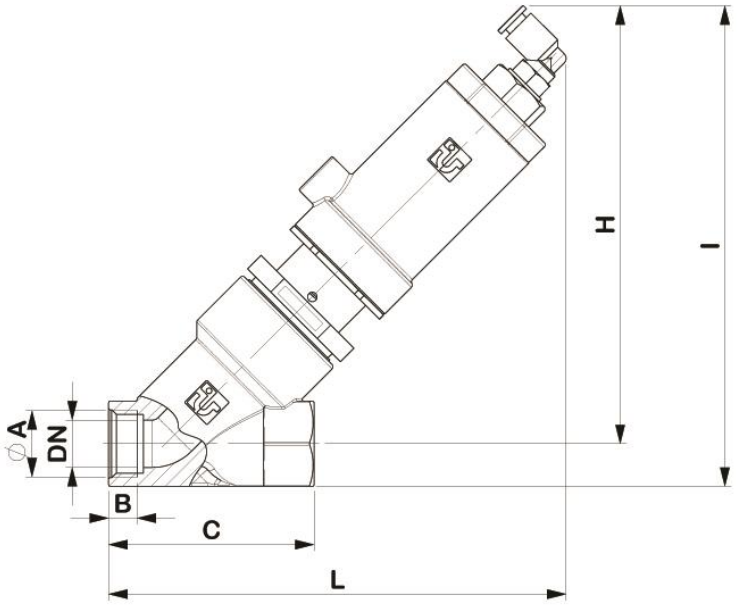


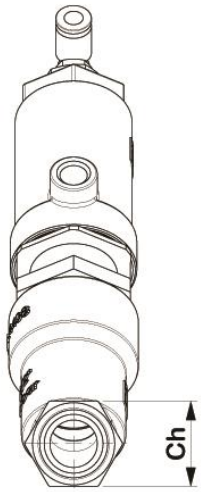
Serv. Ø 125

DN		**15** *1/2"*		**20** *3/4"*		**25** *1"*		**32** *1"1/4*		**40** *1"1/2*			**50** *2"*			**65** *2"1/2*
Ø Serv.		32	70	32	70	70	80	70	80	70	80	125	70	80	125	125
Ø A	F(1)	1/2" GAS		3/4" GAS		1" GAS		1"1/4 GAS		1"1/2 GAS			2" GAS			2" 1/2 GAS
	ST(2)	22		27,5		34		43		49			61			77
B	F(1)	8		9		12		14		14			16			26
	ST(2)	11		12		15		17		17			19			28
C		65		75		90		110		120			150			185
H		125	171	126	172	179	196	192	209	197	214	276	208	225	287	328
I		138	184	142	188	199	216	216	233	224	242	303	242	259	321	372
L		143	189	147	192	206	223	227	244	231	248	310	246	263	325	379
Ch		27		32		39		49		55			68			88
Kv [m³/h]		4		7,5		12		19		30		43,8	45		58,1	78

Dimensions are in mm (1) "F" threaded connection (2) "ST" socket welding connection

3.5.2 FFF/10 N.O.

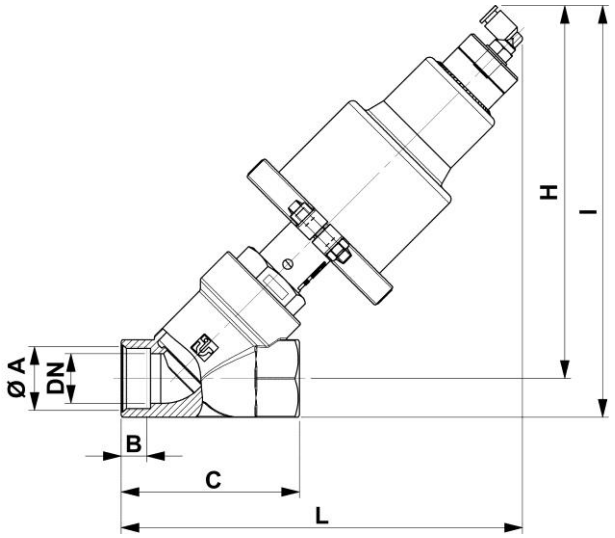


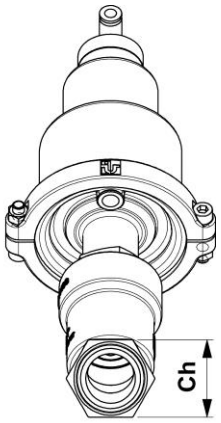


Serv. Ø 32N.O.

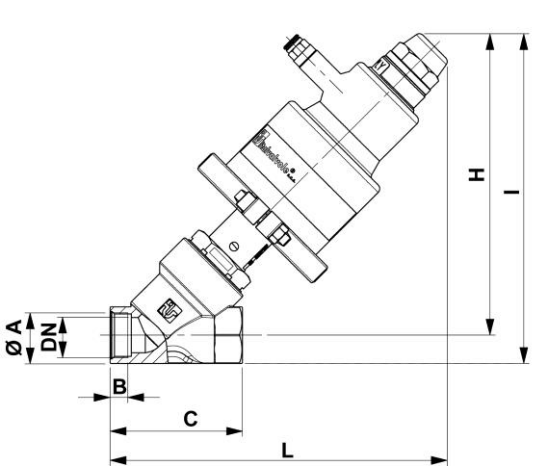
DN		15 *1/2"*		20 *3/4"*		25 *1"*		32 *1"1/4*		40 *1"1/2*		50 *2"*	
Ø Serv.		32	70	32	70	70	80	70	80	70	80	70	80
Ø A	F(1)	1/2" GAS		3/4" GAS		1" GAS		1"1/4 GAS		1"1/2 GAS		2" GAS	
	ST(2)	22		28		34		43		49		61	
B	F(1)	8		9		12		14		14		16	
	ST(2)	11		12		15		17		17		19	
C		65		75		90		110		120		150	
H	N.A.	125	180	126	181	188	205	200,5	217,5	205,5	223	217	224
	N.A. D.V.	-	171	-	172	179	196	191,5	208,5	196,5	214	208	225
I	N.A.	138	193	143	197	208	225	225	242	243	260,5	261	278
	N.A. D.V.	-	184	-	188	199	216	216	233	224	241,5	242	259
L	N.A.	145	186	148	189	203	220	224	241	238	255	253	270
	N.A. D.V.	-	189	-	192	206	223	227	244	231	248	246	263
Ch		27		32		39		49		55		68	
Kv [m³/h]		4		7,5		12		19		30		45	

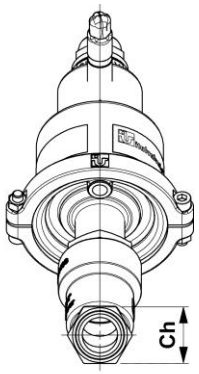
Dimensions are in mm (1) "F" threaded connection (2) "ST" socket welding connection





Serv. Ø 70 – Ø80
N.O.





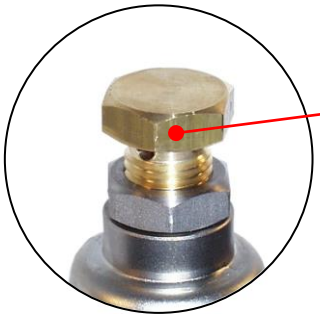
Serv. Ø 70 – Ø80
V.D. N.O.

DN		**15** *1/2"*		**20** *3/4"*		**25** *1"*		**32** *1"1/4*		**40** *1"1/2*		**50** *2"*	
Ø Serv.		32	70	32	70	70	80	70	80	70	80	70	80
Ø A	F(1)	1/2" GAS		3/4" GAS		1" GAS		1"1/4 GAS		1"1/2 GAS		2" GAS	
	ST(2)	22		28		34		43		49		61	
B	F(1)	8		9		12		14		14		16	
	ST(2)	11		12		15		17		17		19	
C		65		75		90		110		120		150	
H	N.A.	125	180	126	181	188	205	200,5	217,5	205,5	223	217	224
	N.A. D.V.	-	171	-	172	179	196	191,5	208,5	196,5	214	208	225
I	N.A.	138	193	143	197	208	225	225	242	243	260,5	261	278
	N.A. D.V.	-	184	-	188	199	216	216	233	224	241,5	242	259
L	N.A.	145	186	148	189	203	220	224	241	238	255	253	270
	N.A. D.V.	-	189	-	192	206	223	227	244	231	248	246	263
Ch		27		32		39		49		55		68	
Kv [m³/h]		4		7,5		12		19		30		45	

Dimensions are in mm (1) "F" threaded connection (2) "ST" socket welding connection

4 Fittings

FFF/10 valves can be supplied with several fittings to satisfy the different needs of the customer.

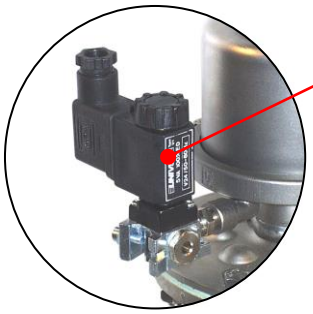


STROKE LIMITING DEVICE
The stroke limiting device enables to limit the valve stroke to the required value.

MAGNETIC SENSOR
This sensor enables to detect valve opening or closing: it is activated by a magnet moving with the shutter.

INDUCTIVE SENSOR
This sensor enables to detect the valve on/off condition.

SENSOR BOX
The sensor box is fitted on the upper part of the servo control: electric or pneumatic limit switches can be fitted inside it.



SOLENOID VALVE
The solenoid valve enables to control the opening and closing of the valve by means of an electric input.

EMERGENCY HANDWHEEL
The emergency handwheel enables to open the valve in case of lack of air.

5 Storage, Assembly, Check And Maintenance

5.1 Transport, Storage And Handling

FFF/10 valves, during transport and assembly, must be handled very carefully. Shocks as well as anomalous stresses must be avoided, (do not handle the valve by the transparent cap, in case of servo control normally closed).

Valves are delivered with dust-proof protections on all connections and these protections must not be removed until they are installed.

Valves shall be stored in areas which are not exposed to the sunshine, so as to prevent inner gaskets from getting dry and old before time.

Storage temperature shall be between 0°C and + 50°C.

5.2 Assembly Instructions

5.2.1 General information

Valve installation on the system shall be carried out only by personnel qualified in hydraulics and pneumatics, provided with all the equipment normally used in the industrial hydraulic and pneumatic plant engineering. The personnel shall always wear proper accident prevention garments, taking particular care to protect face, eyes and hands.

N.B. A compression spring is included inside the valve.

The valve must never be disassembled or modified. **Otherwise warranty is voided**.

Before assembly, dust-proof protections shall be removed from the valve body. In case of normally closed - N.C. - servo control, remove the threaded cap located sideways. In case of normally open - N.O. - servo control, remove the threaded cap located on the upper side.

In case of normally closed servo control, the supply shall be provided from the side connection.

In case of normally open servo control, the supply shall be carried out from the connection located on the cylinder head; the side threaded cap must not be removed to prevent dust or foreign matters from entering the cylinder.

Compressed air shall be industrial air, with a pressure between 6 and 8 bar, with supply pipes with $_{inner}$ ø= 4 mm.

The air connections on the valve shall be made of 1/8” gas male threaded couplings.

During the valve cleaning operations, do not blow compressed air into the inspection holes.

5.2.2 Assembly of valves with female threaded connections

In case the body has female threaded connections, it is necessary to coat the connection pipe terminals with PTFE seal tape to ensure a perfect seal; moreover, it is necessary to tighten connections to the prescribed torque, as specified later on, in table 4 of this manual. **Attention:** the installer must verify that all parts connected to the valve bear the required tightening torque.

5.2.3 Assembly of valves with socket welding ends

In case of bodies having butt and socket welding ends, with servo control normally closed N.C., before starting welding, the whole servo control complete with its gasket shall be removed, so as not to damage it during welding. In order to properly perform the servo control assembly and disassembly operations on the body, operate as follows:

1) Blow air inside the servo control (6 bar only for valves normally closed N.C.).
2) Unscrew the fastening screw fixing the intermediate body of the servo control to the valve body (DN 15#50), unscrew the bolts which fasten the intermediate body of the servo control to the valve body (DN 65).
3) Remove the servo control from the body.
4) Extract the body gasket.

Welding must be carried out considering the material of the valve body and the required thickness, according to the provisions in force for the whole system.

In order to prevent foreign matters (welding slags, chips and others), located in the pipes, from damaging the valve seat, before operating the valve, open it completely and make the fluid pass through at the maximum operating pressure of the system, so as to clean the pipe.

5.3 Operation Test

Before starting up the system and after any repair or overhaul, the following operation test shall be carried out:

On valves with normally closed NC servo control:

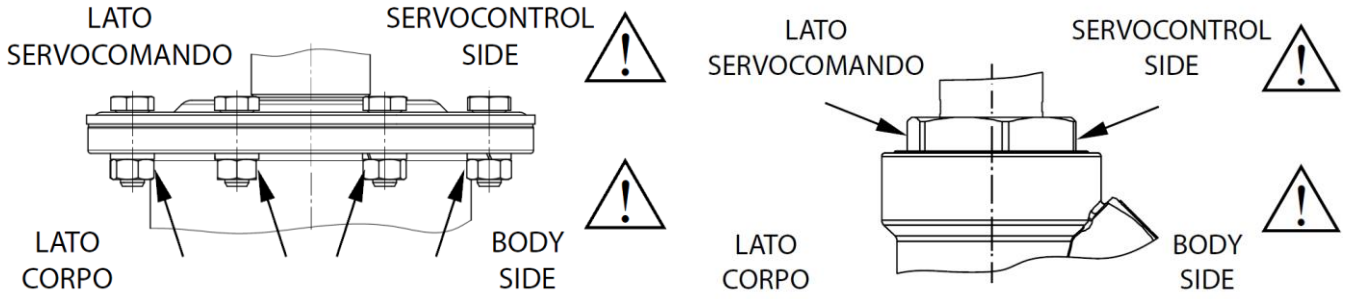
1) Send the fluid inside the valve under shutter at the operating pressure, (check that it is always lower than the maximum allowable pressure and Δp of the valve).
2) Blow air inside the servo control and check for opening, observing fluid passage.
3) Switch off air from the servo control.
4) Repeat this operation 5 times.
5) Check, with air off, that there is no fluid leak from the valve.
6) Check, with air on, that there is no air or fluid leak from the servo control.

On valves with normally open NO servo control:

1) Send the fluid under shutter into the valve at the operating pressure, (check that the operating pressure is always lower than the maximum allowable pressure of the valve) and that it satisfies the Δp condition.
2) Blow air inside the servo control and check for closure, observing fluid passage
3) Switch off air from the servo control.
4) Repeat this operation 5 times.
5) Check, with air on, that there is no fluid leak from the valve.
6) Check, with air on, that there is no air leak from the servo control.
7) Check, with air off, that there is no fluid leak from the servo control.

5.3.1 First check of the valve seal

FOR PTFE VALVES SEAL



THE FIRST HOURS OF USE MUST BE AT HOT TEMPERATURE (Tmin.: 130 °C).

After a few hours of hot use, depending on the type of closure:

1. YOU HAVE TO BLOW AIR IN IF THE VALVE HAS A CENTRAL CLAMP SCREW
2. SCREW DOWN THE NUTS INDICATED BY THE ARROWS OR THE CENTRAL CLAMP SCREW INDICATED BY THE ARROWS

5.4 Troubleshooting

Troubleshooting operations shall be always carried out by qualified personnel only, adequately equipped for the hydraulic and pneumatic operations and provided with the proper safety clothing, paying particular attention to the protection of face, eyes and hands.

5.4.1 N. C. VALVES

In case of anomalous operation or valve leakages, the valve operation shall be immediately stopped and the following checks shall be carried out:

close the air circuit; disconnect the air supply pipe (with air off), and make sure that no air is inside the servo control.

Attention: during troubleshooting, the valve shall not be removed, nor placed elsewhere. No component of the valve shall be disassembled or loosened.

Check, by means of a pressure gauge, that the pressure of the valve inlet fluid (upstream) is not higher than the maximum allowable pressure and the rated Δp value.

Should anomalies still be present after this check, valve inner parts are to be verified, disassembling the valve as indicated under the “Instructions for disassembly and re-assembly of N. C. valves” of this manual.

Should leakages still persist, contact our technical department.

5.4.2 N. O. VALVES

In case of anomalous operation or valve leakage, the operation shall be immediately stopped and the following checks shall be carried out:

blow air (at a pressure value equal to that specified for a proper operation) into the servo control so as to make the valve close.

Attention: during troubleshooting, the valve shall not be removed, nor placed elsewhere. No component of the valve shall be disassembled or loosened.

Check, by means of a pressure gauge, that the pressure of the valve inlet fluid (upstream) is not higher than the maximum allowable pressure and the rated Δp value.

Should anomalies still be present after this check, valve inner parts are to be verified, disassembling the valve as indicated under the “Instructions for disassembly and re-assembly of N. O. valves” of this manual.

Should leakages still persist, contact our technical department.

5.5 Scheduled Maintenance

Scheduled maintenance operations shall be carried out independently of the ones due to possible failures, which always require an immediate intervention.

The time interval between one maintenance operation and the following shall be included in the lower time interval between the one corresponding to 500,000 cycles and three years; it consists of a complete disassembly of the valve, replacement of all the gaskets and a complete cleaning of all other components. For disassembly and re-assembly operations, make reference to the relevant paragraphs of this manual.

5.6 Instructions for disassembly and re-assembly of FFF/10 DN 15 Serv. Ø32 with visual device, N.C.

Please refer to Dwg. No. 130257, annexed herein, for information about the valve disassembly and re-assembly operations.

Assembly and disassembly operations shall be carried out only by personnel qualified in hydraulics and pneumatics, provided with all the necessary work and safety equipment. Before carrying out any operation on systems and valves, get acquainted with operating temperatures and pressures and any other particular conditions, and take the relevant safety measures.

Whenever operations are to be carried out on valves, remove the fluid completely. The valve body shall be completely empty.

NOTE: Thoroughly read the procedures before proceeding with operation.

5.6.1 Disassembly

1) Supply the servo control with air (6 bar).
2) Unscrew the stop nut of the intermediate body (20).
3) Extract the servo control from the valve body (21).
4) Extract the gasket (11) from the body.
5) Cut off the air supply to the servo control. **Be careful to the movement of the shutter stem (19) due to air output!**
6) Keeping the intermediate body locked (9): unscrew the spring housing cylinder (13), using a 36 Allen wrench. **Caution! a compressed spring is placed inside the cylinder**. Adequate fixture shall then be used preventing the spring housing cylinder from (13) leaving the intermediate body too quickly, once the thread connecting them is no longer tightened.
7) Unscrew the transparent cap (12), using an hexagonal wrench 19.
8) Extract the OR gasket (18).
9) Remove the spring (2).
10) Lock the shutter stem (19 between soft jaws at the height of cap holder, remove the stroke indicator (1) and unscrew the spacer stroke end (14), then the self-locking nut (15), with a 10 wrench.
11) Remove the stem (19), successively: the flat washer (3), NADUOP seal (4), gasket OR (16), piston bearing washer (5).
12) Remove the stem from the intermediate body.
13) Extract the seeger ring (7) **Warning! Attention! The seeger ring (7) keeps the packing gland spring (3) compressed**; maximum care shall then be taken to prevent the spring and the packing gland from coming out suddenly during the disassembly operations.
14) Remove the spacer ring washer (17), the first packing gland (10) the spring (9) the second packing gland (10).
15) Now the valve is completely disassembled, so that the required components can be replaced.

***** [For version with PTFE coated EPDM disc, indications from 16 to 20 are to be followed]***

16) Lock the shutter stem (19) between the jaws.
17) Unscrew the hexagonal nut (19E), remove the cap stop washer (19D).
18) Remove the Cap (19B) and the cap holder (19C), then separate the two parts.
19) Remove OR gasket (19A).
20) At this point the valve is completely disassembled, you can replace the necessary details.

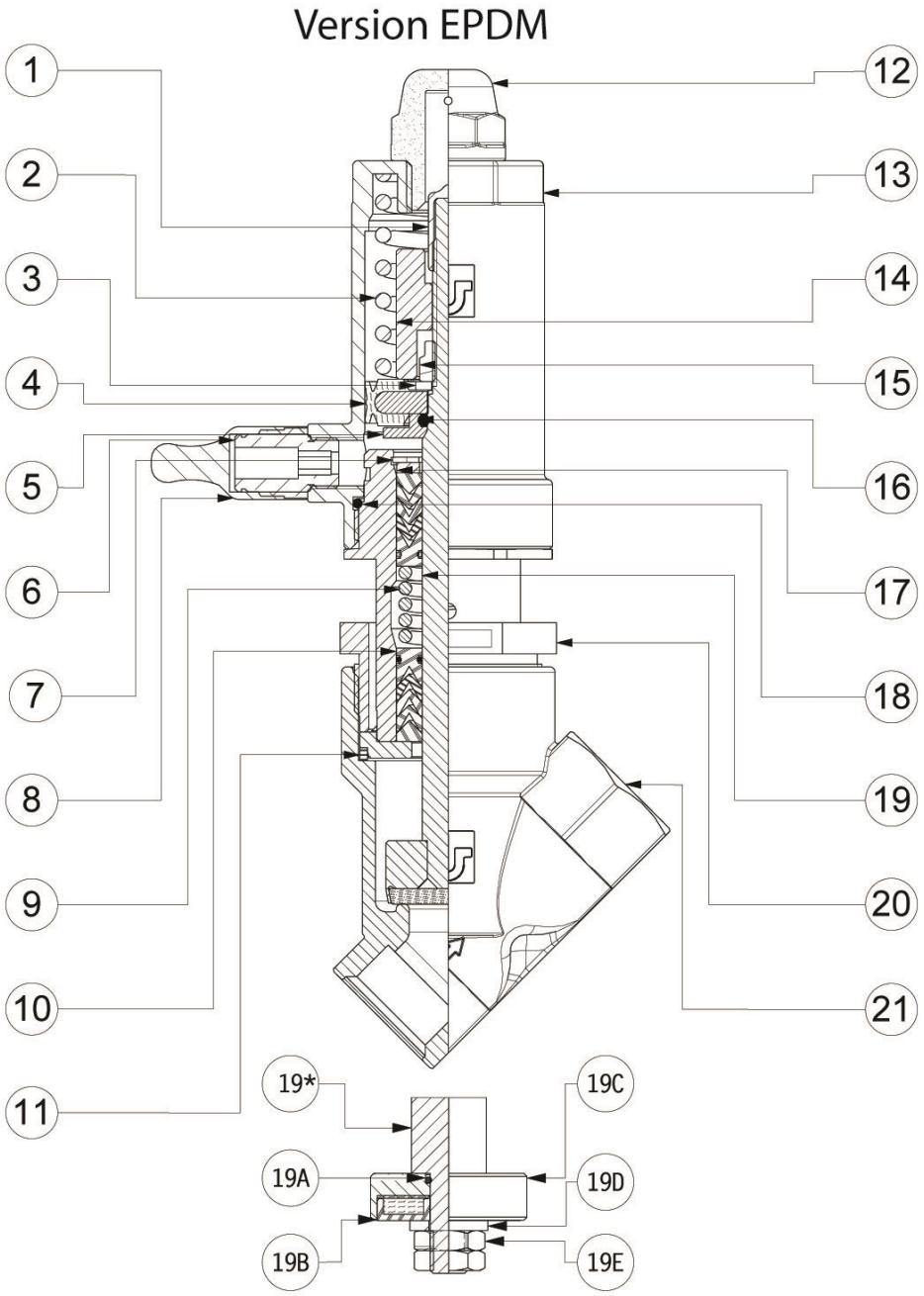
5.6.2 Assembly

1) Insert the OR gasket (16) onto the shutter stem (15).
2) Insert the cap holder (19C), the cap (19B) and the cap stop washer (19D) onto the shutter stem (19).
3) Screw the nuts (19E), adding some thread locker on the stem thread **[** Mounted version with PTFE coated EPDM disc].**
4) Thoroughly clean all components
5) Insert the first packing gland (10), the packing gland spring (9), the second packing gland (10) and the spacer ring washer (17) into the intermediate body (20).
6) Compress all the items and lock with the seeger ring (7). **Warning! Attention! The seeger ring (7) keeps the packing gland spring (12) compressed**; maximum care shall then be taken to prevent the spring and the packing gland from coming out suddenly during the re-assembly operations.
7) Fit the shutter stem (19), previously assembled and spread with silicone grease, into the intermediate body (20), making it rotate, so as to install it more easily and to avoid damaging the packing gland pack.
8) Insert onto the shutter stem the piston holding washer (5) the OR gasket (16) the NADUOP gasket (4) and the Flat washer (3).
9) Tighten all components with the self-locking nut (15) closing the component package but without torque tightening.
10) Screw the spacer stroke end (14), tighten, but without forcing, to avoid damaging thread PVC of stem. Hold the stem (19)between soft jaws at the height of the cap holder (19C).
11) Insert the stroke indicator (1) into the upper end thread of steam (19).
12) Insert the OR gasket (18) onto the spring housing cylinder (13)
13) Put the servo control spring (2) on the NADUOP gasket (4)
14) Lock the intermediate body (20) so that it cannot rotate and screw the spring housing cylinder (13), using a 36 wrench (with torque as indicated in Table 4 Chapter 6), taking care to lubricate with silicone grease seal lips NADUOP (4).**Inside the Interstage casing there is a compressed spring. Therefore you must provide suitable**

equipment that does not allow the abrupt dismissal of the spring housing cylinder from the intermediate body (20).

15) Using proper instruments, approach the spring bearing piston to the intermediate body and lock it with the two clamps (28). **Warning! A compression spring is inside the cylinder.**
16) Screw the transparent cap (12) on the spring housing cylinder (13).
17) Blow air in the servo control (6 bar). **Be careful about the movement of the shutter stem (19) due to air entry!**
18) Insert the body gasket (11) into the valve seat (21). Fit the servo control into the valve body.
19) Tighten to the prescribed torque the intermediate body closing screw (20) in the valve body (21) [see the tightening torque in Table 4 Chapter 6].
20) Cut off the air supply to the servo control.

5.6.3 Sectional View FFF/10 DN 15 Serv. Ø32 with visual device N.C.



Drawing No. 130257 Rev.:00

5.7 Instructions for the disassembly and the re-assembly of FFF/10 DN 15 to 50 with visual device, N.C.

Please refer to Dwg. No. 100815, annexed herein, for information about the valve disassembly and re-assembly operations.

Assembly and disassembly operations shall be carried out only by personnel qualified in hydraulics and pneumatics, provided with all the necessary work and safety equipment. Before carrying out any operation on systems and valves, get acquainted with operating temperatures and pressures and any other particular conditions, and take the relevant safety measures.

Whenever operations are to be carried out on valves, remove the fluid completely. The valve body shall be completely empty.

NOTE: Thoroughly read the procedures before proceeding with operation.

5.7.1 Disassembly

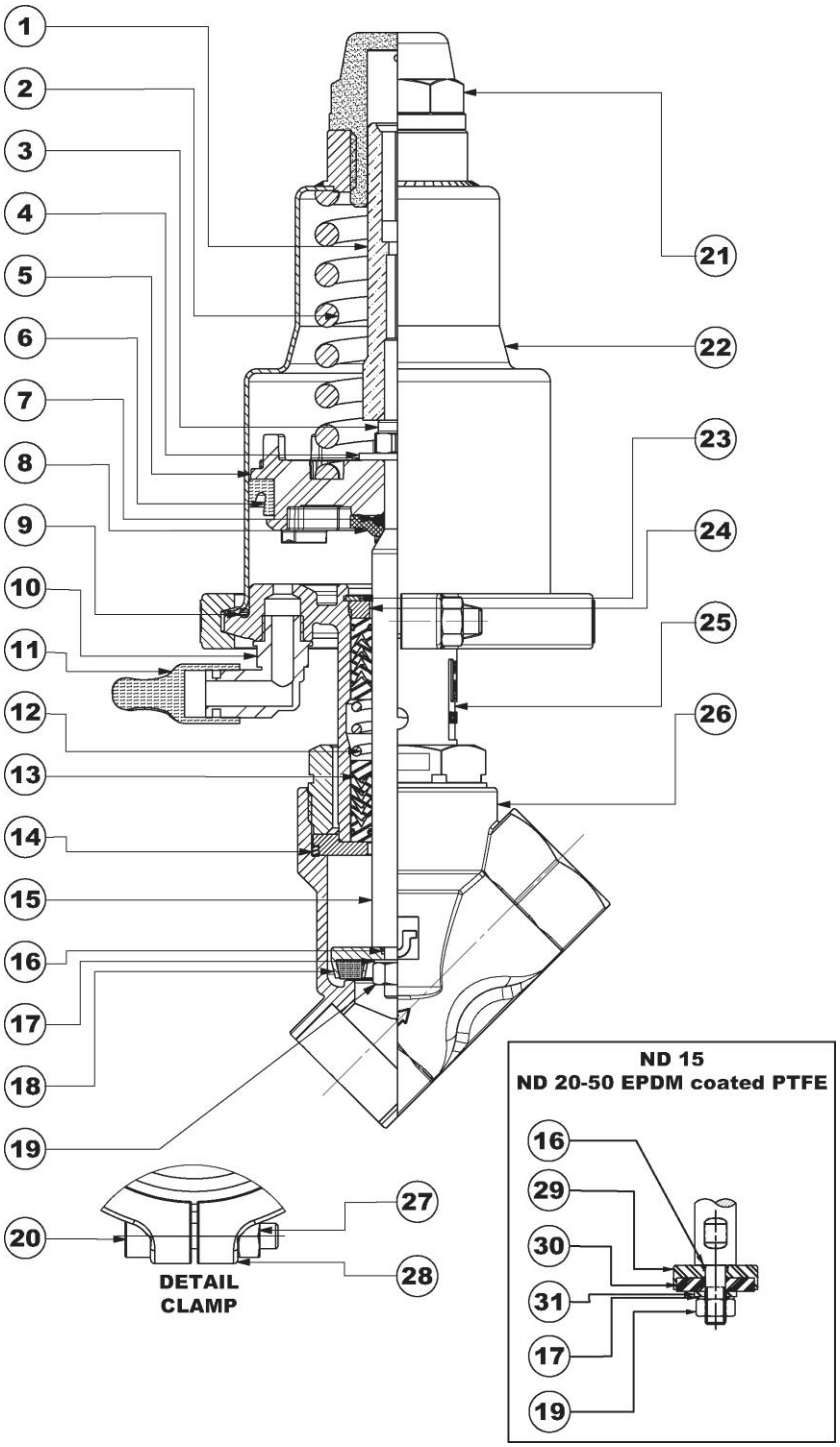
1) Supply the servo control with air (6 bar).
2) Unscrew the stop nut of the intermediate body (25).
3) Extract the servo control from the valve body (26).
4) Extract the gasket (14) from the body.
5) Cut off the air supply to the servo control. **Be careful about the movement of the shutter stem (15) due to air output!**
6) Unscrew screws (20), remove nuts (27) and remove the two clamps (28). **Warning! A compression spring is inside the cylinder.** Adequate fixture shall then be used preventing the spring housing cylinder (22) from leaving the intermediate body (25), once the two clamps are separated.
7) Remove the spring housing cylinder (22).
8) Unscrew the transparent cap (21).
9) Extract the OR gasket (9).
10) Remove the spring (2).
11) Lock the shutter stem (15) between the soft jaws.
12) Screw the stroke indicator (1) and the self-locking nut (3).
13) Remove the plain washer (4) and the piston (5) with the DE gasket (6).
14) Withdraw the OR gasket (7) and the piston support washer (8).
15) Remove the shutter stem (15) from the intermediate body (25).
16) Extract the seeger ring (23). **Warning! Attention! The seeger ring (23) keeps the packing gland spring (12) compressed**; maximum care shall then be taken to prevent the spring and the packing gland from coming out suddenly during the disassembly operations.
17) Remove the spacer ring washer (24), the first packing gland (13), the spring (12), the second packing gland (13).
18) Unscrew the nut (19), then withdraw the spring washer (17),
19) Remove the packed cap holder (18).
20) DN 15 and DN 20#50 EPDM coat. only PTFE: remove the cap holding washer (31), the cap (30) and the cap holder (29).
21) Extract the OR gasket (16).
22) Now the valve has been completely disassembled, so that the required components can be replaced.

5.7.2 Assembly

1) Insert the OR gasket (16) onto the shutter stem (15).
2) Insert the packed cap holder (18) onto the shutter stem (15).
3) DN 15 and DN 20#50 EPDM coat. only PTFE: insert onto the shutter stem (15), the cap holder (29), the cap (30) and the cap holding washer (31).
4) Insert the spring washer (17) and screw the nut (19), adding some thread locker on the stem thread [see tightening torque in Table 4 Chapter 6].
5) Insert the first packing gland (13), the spring (12), the second packing gland (13) and the spacer ring washer (24) into the intermediate body (25).
6) Compress all the items and lock with the seeger ring (23). **Warning! Attention! The seeger ring (23) keeps the packing gland spring (12) compressed**; maximum care shall then be taken to prevent the spring and the packing gland from coming out suddenly during the re-assembly operations.
7) Fit the shutter stem (15), previously assembled and spread with silicone grease, into the intermediate body (25), making it rotate, so as to install it more easily and to avoid damaging the packing gland pack.
8) Insert onto the shutter stem the piston holding washer (8) and the OR gasket (7).
9) Insert on the shutter stem the piston (5) with DE gasket (6), positioning it with the lip downwards, then drive the plain washer (4). Tighten all components with the self-locking nut (3) closing the component package but without torque tightening.
10) Screw the stroke indicator (1).
11) Insert the OR gasket (9) into the intermediate body.
12) Insert spring (2) into its seat.
13) Install the spring housing cylinder (22) on the intermediate body, taking care to grease with a layer of silicone grease the DE gasket (6).
14) Using proper instruments, approach the spring bearing piston to the intermediate body and lock it with the two clamps (28). **Warning! A compression spring is inside the cylinder.**
15) Insert the screws (20) into the clamps and tighten the nuts (27) on them.

16) Screw the transparent cap (21) on the spring housing cylinder (22).
17) Blow air in the servo control (6 bar). **Be careful about the movement of the shutter stem (15) due to air entry!**
18) Insert the body gasket (14) into the valve seat (26). Fit the servo control into the valve body.
19) Tighten to the prescribed torque the intermediate body closing screw (25) in the valve body (26) [see the tightening torque in Table 4 Chapter 6].
20) Cut off the air supply to the servo control.

5.7.3 Sectional View FFF/10 DN 15 to 50 with visual device N.C.



Drawing No. 100815 Rev.:01

5.8 Instructions for the disassembly and the re-assembly of FFF/10 DN 65, servo control, D.125, with visual device, N.C.

Please refer to Dwg. No. 100816, annexed herein, for information about the valve disassembly and re-assembly operations.

Assembly and disassembly operations shall be carried out only by personnel qualified in hydraulics and pneumatics, provided with all the necessary work and safety equipment. Before carrying out any operation on systems and valves, get acquainted with operating temperatures and pressures and any other particular conditions, and take the relevant safety measures.

Whenever operations are to be carried out on valves, remove the fluid completely. The valve body shall be completely empty.

NOTE: Thoroughly read the procedures before proceeding with operation.

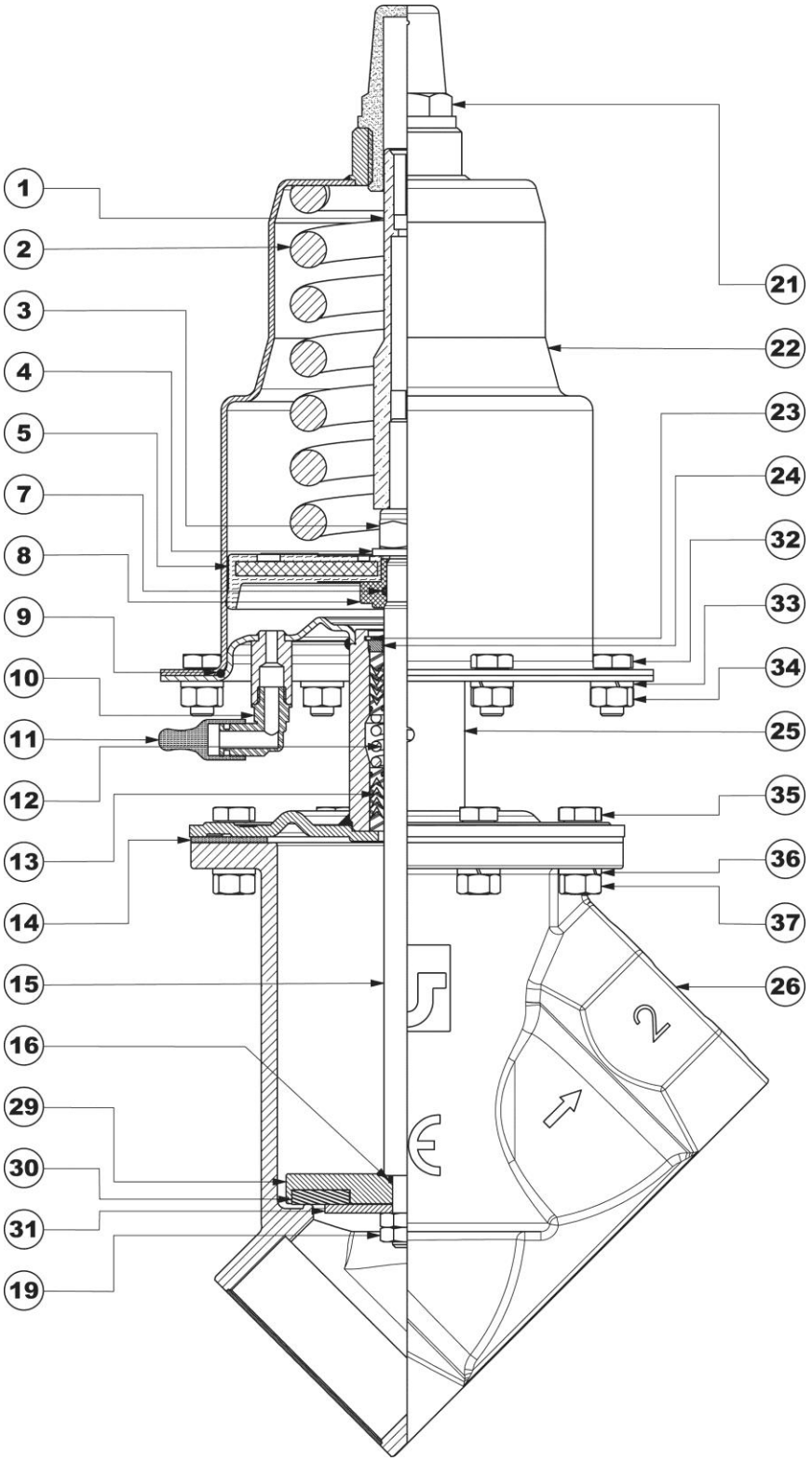
5.8.1 Disassembly

1) Supply the servo control with air (6 bar).
2) Unscrew the nuts (37) from the screws (35), extract the washers (36) and remove the screws (35).
3) Extract the servo control from the valve body (26).
4) Extract the body gasket (14).
5) Cut off the air supply to the servo control. **Be careful about the movement of the shutter stem (15) due to air output!**
6) Unscrew nuts (34) from the screws (32), and withdraw washers (33). **Warning! A compression spring is inside the cylinder.** Adequate fixture shall then be used preventing the spring housing cylinder (22) from leaving the intermediate body (25), once all screws (32) are removed.
7) Remove the spring housing cylinder (22).
8) Unscrew the transparent cap (21).
9) Extract the OR gasket (9).
10) Remove the spring (2).
11) Lock the shutter stem between soft cheeks (15). Unscrew the stroke indicator (1) and the self-braking nut (3).
12) Remove the plain washer (4) and the piston with TDUOP gasket (5).
13) Withdraw the piston bearing washer (8) and remove the OR gasket (7) from it.
14) Remove the shutter stem (15) from the intermediate body (25).
15) Extract the seeger ring (23). **Warning! Attention! The seeger ring (23) keeps the packing gland spring (12) compressed**; maximum care shall then be taken to prevent the spring and the packing gland from coming out suddenly during the disassembly operations.
16) Remove the spacer ring washer (24), the first packing gland (13), the spring (12), the second packing gland (13).
17) Unscrew nut and counternut (19).
18) Remove the cap retaining washer (31), the cap (30).
19) Remove the cap holder (30) and OR gasket (16).
20) Now the valve has been completely disassembled, so that the required components can be replaced.

5.8.2 Assembly

1) Insert the OR gasket (16) and the cap holder (29) on the shutter stem (15).
2) Insert onto the cap holder the cap (30) and the cap holding washer (31), then screw the nut and counternut (19), adding some thread locker on the stem thread [see tightening torque in Table 4 Chapter 6].
3) Insert the first packing gland (13), the spring (12), the second packing gland (13) and the spacer ring washer (24) into the intermediate body (25).
4) Compress the assembly and fix with the seeger ring for holes (23). **Warning! Attention! The seeger ring (23) keeps the packing gland spring (12) compressed**; maximum care shall then be taken to prevent the spring and the packing gland from coming out suddenly during the re-assembly operations.
5) Fit the shutter stem (15), previously assembled and spread with silicone grease, into the intermediate body (25), making it rotate, so as to install it more easily and to avoid damaging the packing gland pack.
6) Insert the OR gasket (7) into the piston bearing washer (8).
7) Insert on the shutter stem the piston bearing washer (8), the piston with TDUOP gasket (5), positioning it with the lip downwards, and the plain washer (4). Tighten all components with the self-locking nut (3) closing the component package but without torque tightening.
8) Screw the stroke indicator (1).
9) Insert the OR gasket (9) into the intermediate body.
10) Insert spring (2) into its seat.
11) Install the spring housing cylinder (22) on the intermediate body, taking care to grease with a layer of silicone grease the TDUOP gasket lip.
12) Using proper instruments, approach the spring bearing cylinder to the intermediate body, position the screws (32) and insert on them the spring washers (33), then torque tighten the nuts (34) [See tightening torque in Table 4 Chapter 6]. **Warning! A compression spring is inside the cylinder.**
13) Screw the transparent cap (21) on the spring housing cylinder (22).
14) Blow air in the servo control (6 bar). **Be careful about the movement of the shutter stem (15) due to air entry!**
15) Place the body gasket (14) on the valve body flange (26). Rest the servo control on the gasket.
16) Position the screws (35) into the intermediate body flange and insert on them the spring washers (36), then torque tighten the nuts (37) [See tightening torque in Table 4 Chapter 6].
17) Cut off the air supply to the servo control.

5.8.3 Sectional View FFF/10 DN 65 servo control D.125, with visual device, N.C.



Drawing No. 100816 Rev.:01

5.9 Instructions for disassembly and re-assembly of FFF/10 DN 15 Serv. Ø32 N.O.

Please refer to Dwg. No. 130258, annexed herein, for information about the valve disassembly and re-assembly operations.

Assembly and disassembly operations shall be carried out only by personnel qualified in hydraulics and pneumatics, provided with all the necessary work and safety equipment. Before carrying out any operation on systems and valves, get acquainted with operating temperatures and pressures and any other particular conditions, and take the relevant safety measures.

Whenever operations are to be carried out on valves, remove the fluid completely. The valve body shall be completely empty.

NOTE: Thoroughly read the procedures before proceeding with operation.

5.9.1 Disassembly

1) Unscrew the locking nut of the intermediate body (21).
2) Remove the servo control from the valve body (22).
3) Extract the gasket (11) from the body.
4) Keeping the intermediate body locked (9): unscrew the spring housing cylinder (13), using a 36 Allen wrench. **Caution! a compressed spring is placed inside the cylinder**. Adequate fixture shall then be used preventing the spring housing cylinder from (13) leaving the intermediate body too quickly, once the thread connecting them is no longer tightened.
5) Unscrew the transparent cap (12), using an hexagonal wrench 19.
6) Unscrew the air inlet fitting (13) from the cylinder (12), using a hexagonal wrench 19.
7) Extract the gasket OR (2) from the air fitting (13).
8) Unscrew the thread caps (8) from the spring housing cylinder (9).
9) Block the stem (19), tightening between soft jaws.
10) Unscrew the hex conical screw (15) with 5 hex wrench.
11) Remove the spacer stroke end (3) with the OR gasket (14).
12) Remove from the stem (19), successively: the NADUOP seal (4), gasket OR (16), piston bearing washer (5), servo control spring (6) and the spring bearing washer (17).
13) Remove the steam (19) from the intermediate body(21).
14) Remove the seeger ring (7) **Warning! Attention! The seeger ring (7) keeps the packing gland spring (20) compressed**; maximum care shall then be taken to prevent the spring and the packing gland from coming out suddenly during the disassembly operations.
15) Remove the distance ring washer (18), the first packing gland (10) packing gland spring (20) and the second packing gland (10).
16) At this point the valve is completely disassembled, so that the required components can be replaced.

***** [For version with PTFE coated EPDM disc, indications from 16÷20 are to be followed]***

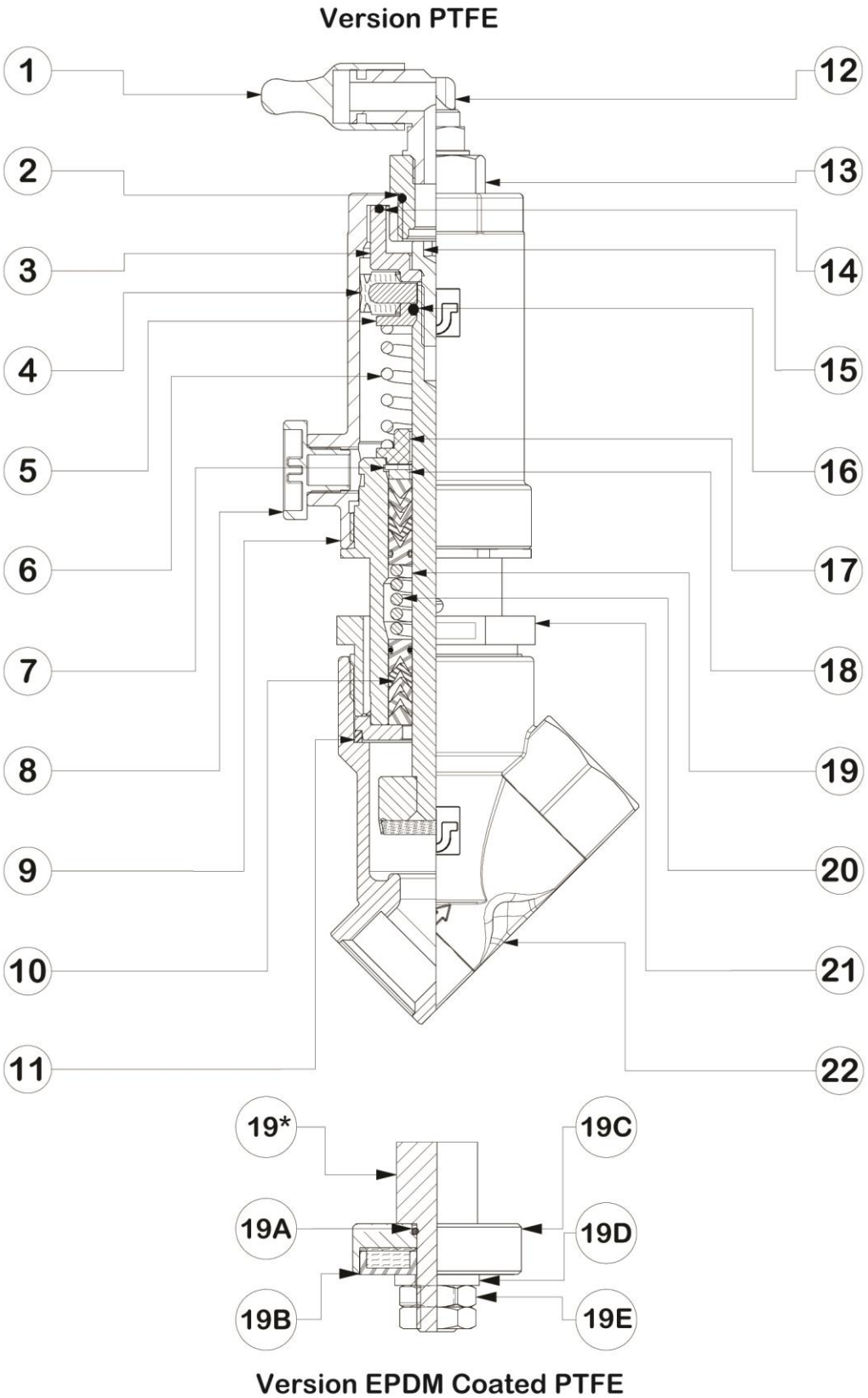
17) Lock the shutter stem (19) between the jaws.
18) Unscrew the hexagonal nut (19E), remove the cap stop washer (19D).
19) Remove the Cap (19B) and the cap holder (19C), then separate the two parts.
20) Remove OR gasket (19A).
21) Now the valve is completely disassembled, you can replace the necessary details.

5.9.2 Assembly

1) Insert the OR gasket (19A) onto the shutter stem (19).
2) Insert the cap holder (19C), the cap (19B) and the cap stop washer (19D) onto the shutter stem (19).
3) Screw the nuts (19E), adding some thread locker on the stem thread **[** Version with PTFE coated EPDM disc].**
4) Insert the first packing gland (10), the packing gland spring (9), the second packing gland (10) and the spacer ring washer (17) into the intermediate body (20).
5) Compress all the items and lock with the seeger ring (7). **Warning! Attention! The seeger ring (7) keeps the packing gland spring (12) compressed**; maximum care shall then be taken to prevent the spring and the packing gland from coming out suddenly during the re-assembly operations.
6) Fit the shutter stem (19), previously assembled and spread with silicone grease, into the intermediate body (21), making it rotate, so as to install it more easily and to avoid damaging the packing gland pack.
7) Insert onto the shutter stem the spring bearing washer (17), the servo control spring (6), piston holding washer (5) the OR gasket (16) the NADUOP gasket (4 the flat washer (3) and the spacer stroke end (3).
8) Tighten all components with the hex conical screw (15) with 5 hex wrench closing the component package with torque indicated in Table 4 Chapter 6.
9) Insert the OR gasket (14) onto the spacer stroke end (3).
10) Lock the intermediate body (21) so that it cannot rotate and screw the spring housing cylinder (8), using a 36 wrench (with torque as indicated in Table 4 Chapter 6), taking care to lubricate with silicone grease seal lips NADUOP (4).**Inside the Interstage casing there is a compressed spring. Therefore you must provide suitable equipment that does not allow the abrupt dismissal of the spring housing cylinder from the intermediate body (21).**
11) Insert the OR gasket (2) onto the spacer stroke end (3).
12) Screw the air fitting (13) using a hexagonal wrench 19 onto the spring housing cylinder (9), blocking it with a wrench 32.
13) Put the thread caps (8) into the spring housing cylinder (9) sure that it has a little hole for air passage.
14) Insert the body gasket (11) into the valve seat (22). Fit the servo control into the valve body.

15) Tighten to the prescribed torque the intermediate body closing screw (21) in the valve body (22) [see the tightening torque in Table 4 Chapter 6].

5.9.3 Sectional View FFF/10 DN 15 to 50 N.O.



Drawing No. 130258 Rev.:00

5.10 Instructions for disassembly and re-assembly of FFF/10 DN 15 to 50 N.O.

Please refer to Dwg. No. 100817, annexed herein, for information about the valve disassembly and re-assembly operations.

Assembly and disassembly operations shall be carried out only by personnel qualified in hydraulics and pneumatics, provided with all the necessary work and safety equipment. Before carrying out any operation on systems and valves, get acquainted with operating temperatures and pressures and any other particular conditions, and take the relevant safety measures.

Whenever operations are to be carried out on valves, remove the fluid completely. The valve body shall be completely empty.

NOTE: Thoroughly read the procedures before proceeding with operation.

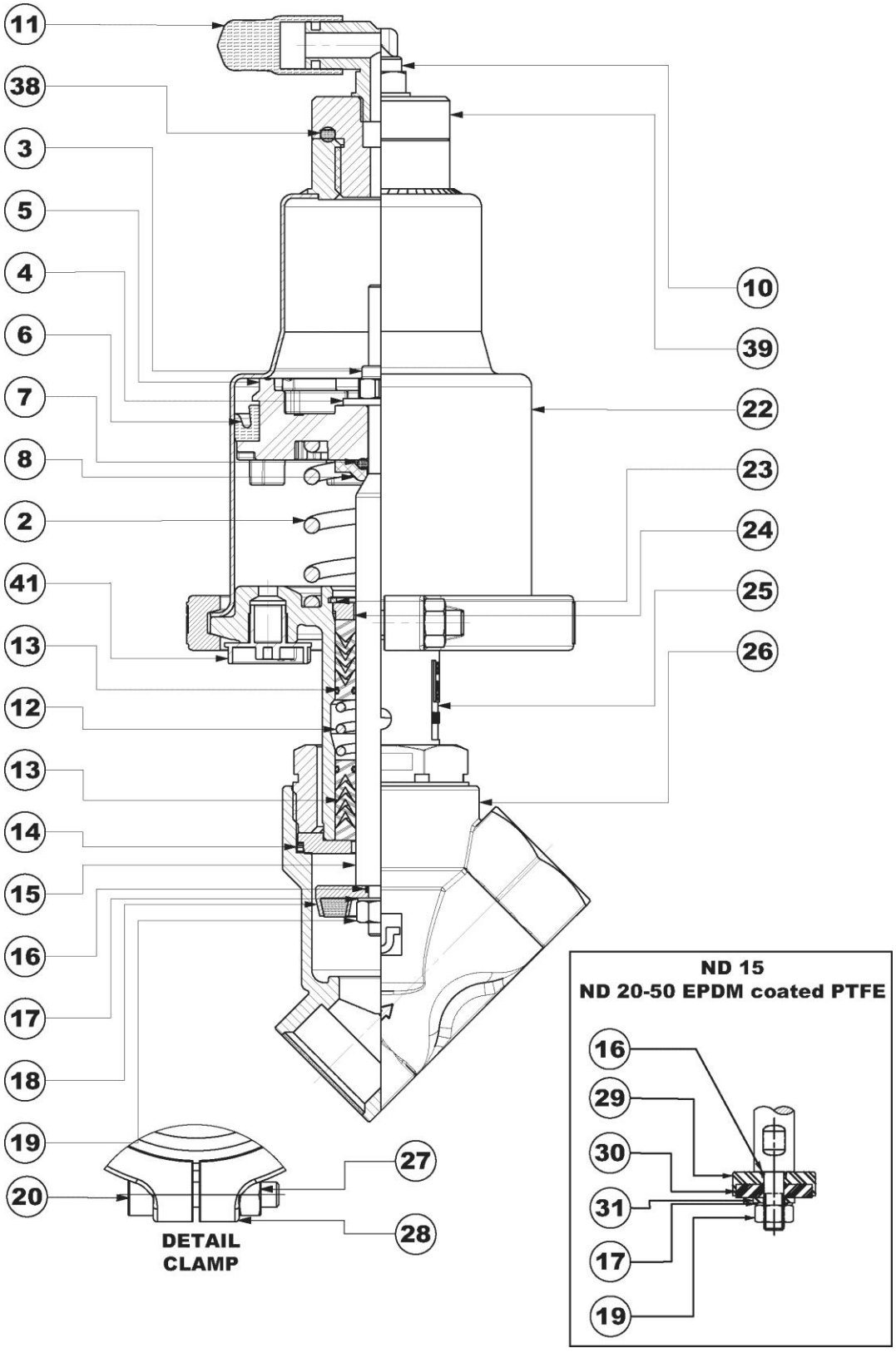
5.10.1 Disassembly

1) Unscrew the stop nut of the intermediate body (25).
2) Extract the servo control from the valve body (26).
3) Extract the gasket (14) from the body.
4) Unscrew screws (20), remove nuts (27) and remove the two clamps (28). **Warning! A compression spring is inside the cylinder.** Adequate fixture shall then be used preventing the spring housing cylinder (22) from leaving the intermediate body (25), once the two clamps are separated.
5) Remove the spring housing cylinder (22).
6) Unscrew the air inlet fitting (39) and extract the OR gasket (38) from it.
7) Lock the shutter stem (15) between the soft jaws.
8) Unscrew the self-locking nut (3).
9) Remove the plain washer (4) and the piston (5) with the DE gasket (6).
10) Withdraw the OR gasket (7) and the piston support washer (8).
11) Remove the shutter stem (15) from the intermediate body (25).
12) Extract the spring (2) from the intermediate body.
13) Extract the seeger ring (23). **Warning! Attention! The seeger ring (23) keeps the packing gland spring (12) compressed**; maximum care shall then be taken to prevent the spring and the packing gland from coming out suddenly during the disassembly operations.
14) Remove the spacer ring washer (24), the first packing gland (13), the spring (12), the second packing gland (13).
15) Unscrew the nut (19), then withdraw the spring washer (17),
16) Remove the packed cap holder (18).
17) DN 15 and DN 20#50 EPDM coat. only PTFE: remove the cap holding washer (31), the cap (30) and the cap holder (29).
18) Extract the OR gasket (13).
19) Now the valve has been completely disassembled, so that the required components can be replaced.

5.10.2 Assembly

1) Insert the OR gasket (16) onto the shutter stem (15).
2) Insert the packed cap holder (18) onto the shutter stem (15).
3) DN 15 and DN 20#50 EPDM coat. only PTFE: insert onto the shutter stem (15), the cap holder (29), the cap (30) and the cap holding washer (31).
4) Insert the spring washer (17) and screw the nut (19), adding some thread locker on the stem thread [see tightening torque in Table 4 Chapter 6].
5) Insert the first packing gland (13), the spring (12), the second packing gland (13) and the spacer ring washer (24) into the intermediate body (25).
6) Compress all the items and lock with the seeger ring (23). **Warning! Attention! The seeger ring (23) keeps the packing gland spring (12) compressed**; maximum care shall then be taken to prevent the spring and the packing gland from coming out suddenly during the re-assembly operations.
7) Fit the shutter stem (15), pre-assembled and spread with silicone grease, into the intermediate body (25), making it rotate, so as to install it more easily and to avoid damaging the packing gland pack.
8) Drive the spring (2) onto the intermediate body.
9) Insert onto the shutter stem the piston holding washer (8) and the OR gasket (7).
16) Insert on the shutter stem the piston (5) with DE gasket (6), positioning it with the lip upwards, then drive the plain washer (4). Tighten all components with the self-locking nut (3) closing the component package but without torque tightening.
10) Install the spring housing cylinder (22) on the intermediate body, taking care to grease with a layer of silicone grease the DE gasket (6) of the piston.
11) Using proper instruments, approach the spring bearing cylinder to the intermediate body and lock it with the two clamps (28). **Warning! A compression spring is inside the cylinder.**
12) Insert the screws (20) into the clamps and tighten the nuts (27) on them.
13) Insert the O-ring gasket (38) into the air inlet fitting (39).
14) Screw down the air inlet coupling (39) on the spring bearing cylinder (22).
15) Insert the body gasket (14) into the valve seat (26). Fit the servo control into the valve body.
16) Tighten to the prescribed torque the intermediate body closing screw (25) in the valve body (26) [see the tightening torque in Table 4 Chapter 6].

5.10.3 Sectional View FFF/10 DN 15 to 50 N.O.



Drawing No. 100817 Rev.:01

5.11 Instructions for disassembly and re-assembly of FFF/10 DN 15 to 50 with visual device N.O.

Please refer to Dwg. No. 110564, annexed herein, for information about the valve disassembly and re-assembly operations.

Assembly and disassembly operations shall be carried out only by personnel qualified in hydraulics and pneumatics, provided with all the necessary work and safety equipment. Before carrying out any operation on systems and valves, get acquainted with operating temperatures and pressures and any other particular conditions, and take the relevant safety measures.

Whenever operations are to be carried out on valves, remove the fluid completely. The valve body shall be completely empty.

NOTE: Thoroughly read the procedures before proceeding with operation.

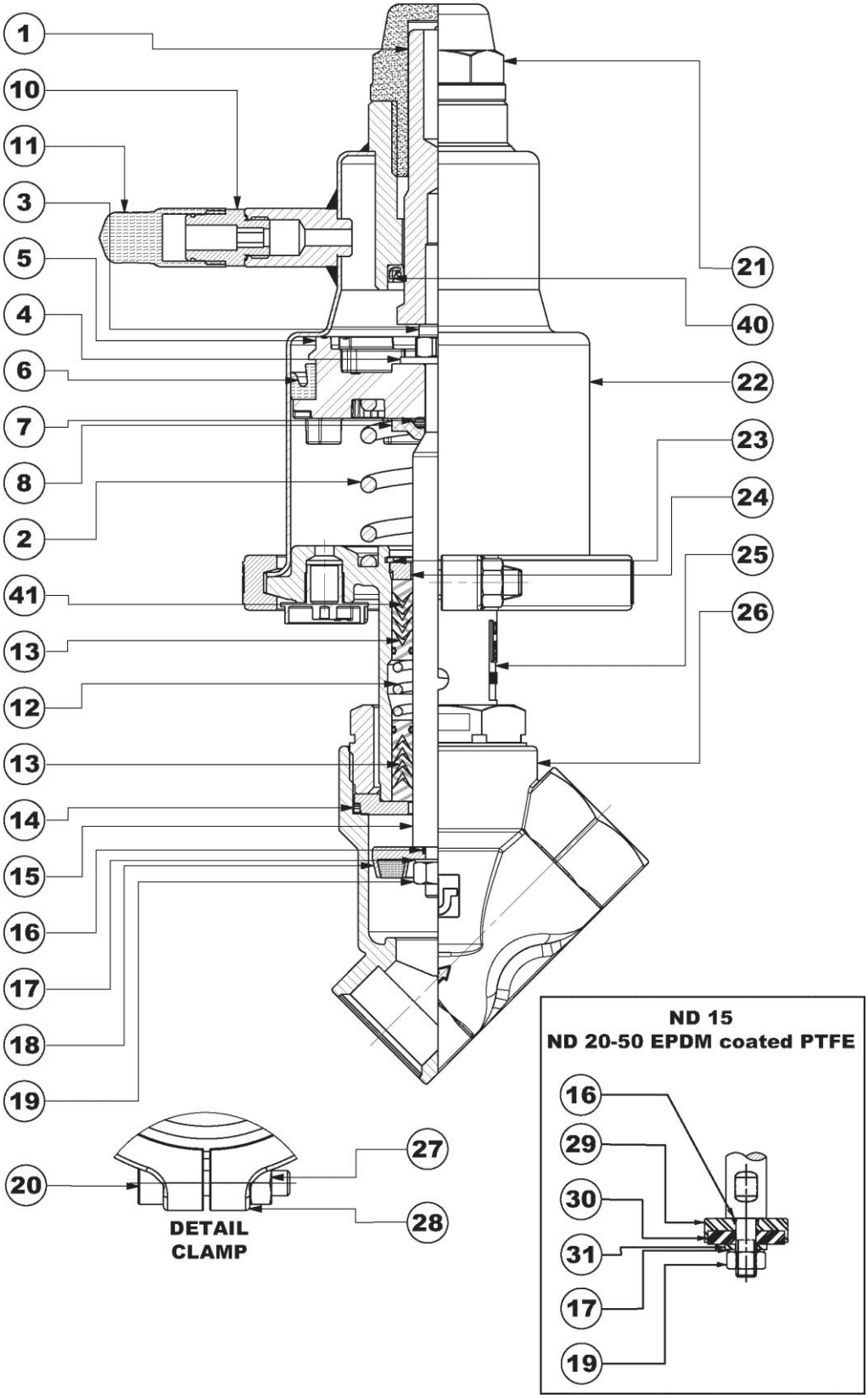
5.11.1 Disassembly

1) Unscrew the stop nut of the intermediate body (25).
2) Extract the servo control from the valve body (26).
3) Extract the gasket (14) from the body.
4) Unscrew screws (20), remove nuts (27) and remove the two clamps (28). **Warning! A compression spring is inside the cylinder.** Adequate fixture shall then be used preventing the spring housing cylinder (22) from leaving the intermediate body (25), once the two clamps are separated.
5) Remove the spring bearing cylinder (22) and extract the BA gasket (40) from it.
6) Unscrew the transparent cap (21).
7) Lock the shutter stem (15) between the soft jaws.
8) Unscrew the stroke indicator (1).
9) Unscrew the self-locking nut (3).
10) Remove the plain washer (4) and the piston (5) with the DE gasket (6).
11) Withdraw the OR gasket (7) and the piston support washer (8).
12) Remove the shutter stem (15) from the intermediate body (25).
13) Extract the spring (2) from the intermediate body.
14) Extract the seeger ring (23). **Warning! Attention! The seeger ring (23) keeps the packing gland spring (12) compressed**; maximum care shall then be taken to prevent the spring and the packing gland from coming out suddenly during the disassembly operations.
15) Remove the spacer ring washer (24), the first packing gland (13), the spring (12), the second packing gland (13).
16) Unscrew the nut (19), then withdraw the spring washer (17),
17) Remove the packed cap holder (18).
18) DN 15 and DN 20#50 EPDM coat. only PTFE: remove the cap holding washer (31), the cap (30) and the cap holder (29).
19) Extract the OR gasket (13).
20) Now the valve has been completely disassembled, so that the required components can be replaced.

5.11.2 Assembly

1) Insert the OR gasket (16) onto the shutter stem (15).
2) Insert the packed cap holder (18) onto the shutter stem (15).
3) DN 15 and DN 20#50 EPDM coat. only PTFE: insert onto the shutter stem (15), the cap holder (29), the cap (30) and the cap holding washer (31).
4) Insert the spring washer (17) and screw the nut (19), adding some thread locker on the stem thread [see tightening torque in Table 4 Chapter 6].
5) Insert the first packing gland (13), the spring (12), the second packing gland (13) and the spacer ring washer (24) into the intermediate body (25).
6) Compress all the items and lock with the seeger ring (23). **Warning! Attention! The seeger ring (23) keeps the packing gland spring (12) compressed**; maximum care shall then be taken to prevent the spring and the packing gland from coming out suddenly during the re-assembly operations.
7) Fit the shutter stem (15), pre-assembled and spread with silicone grease, into the intermediate body (25), making it rotate, so as to install it more easily and to avoid damaging the packing gland pack.
8) Drive the spring (2) onto the intermediate body.
9) Insert onto the shutter stem the piston holding washer (8) and the OR gasket (7).
10) Insert on the shutter stem the piston (5) with DE gasket (6), positioning it with the lip upwards, then drive the plain washer (4). Tighten all components with the self-locking nut (3) closing the component package but without torque tightening.
11) Screw the stroke indicator (1).
12) Insert into the hub of the spring bearing cylinder (22) the BA gasket (40).
13) Install the spring housing cylinder (22) on the intermediate body, taking care to grease with a layer of silicone grease the DE gasket (6) of the piston.
14) Using proper instruments, approach the spring bearing cylinder to the intermediate body and lock it with the two clamps (28). **Warning! A compression spring is inside the cylinder.**
15) Insert the screws (20) into the clamps and tighten the nuts (27) on them.
16) Insert the body gasket (14) into the valve seat (26). Fit the servo control into the valve body.
17) Tighten to the prescribed torque the intermediate body closing screw (25) in the valve body (26) [see the tightening torque in Table 4 Chapter 6].

5.11.3 Exploded view FFF/10 DN 15 to 50 with visual device N.O.



Drawing No. 110564 Rev.:00

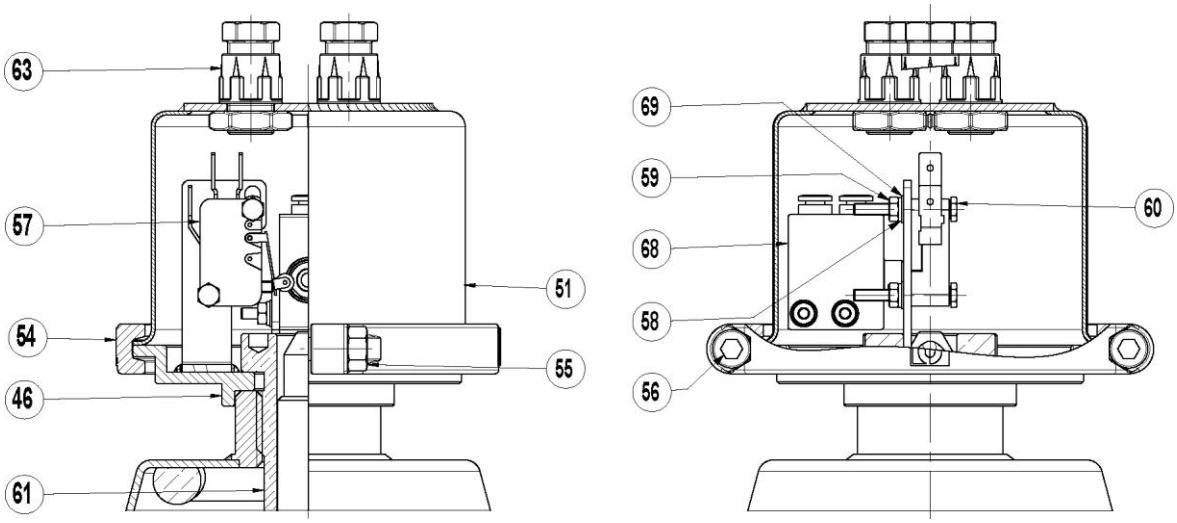
5.12 Instructions for the disassembly, wiring and re-assembly of the stainless-steel micro holding box

For valve disassembly and re-assembly operations please refer to dwg. No. 090194, annexed herein.
Assembly and disassembly operations shall be carried out only by personnel qualified in hydraulics and pneumatics, provided with all the necessary work and safety equipment. Before carrying out any operation on systems and valves, get acquainted with operating temperatures and pressures and any other particular conditions, and take the relevant safety measures.
Whenever operations are to be carried out on valves, remove the fluid completely. The valve body shall be completely empty.
NOTE: Thoroughly read the procedures before proceeding with operation.

5.12.1 Disassembly and re-assembly of the stainless steel micro holding box

1) Unscrew the Hex. con. head screws (56) from the nuts (55).
2) Separate the clamps (54).
3) Remove the micro holding cover (51) and remove from it the cable holder (63).
4) Then insert the electric cables and the pneumatic hoses in the cable holders (63).
5) Fasten again the cable holders (63) in the micro holding cover (51).
6) Connect the electric cables to the electro-pneumatic limit switch (57) (see the technical specifications of the limit switch in the final section of the manual).
7) Connect the pneumatic hoses to the pneumatic limit switch (68) (see the technical specifications of the limit switch in the final section of the manual).
8) Reposition the micro holding cover (51) on the micro holding plate (46), then fasten all of them with the clamps (54).
9) Insert the hex. nuts (55) into the clamps (54) and tighten the hex. con. screws (56).

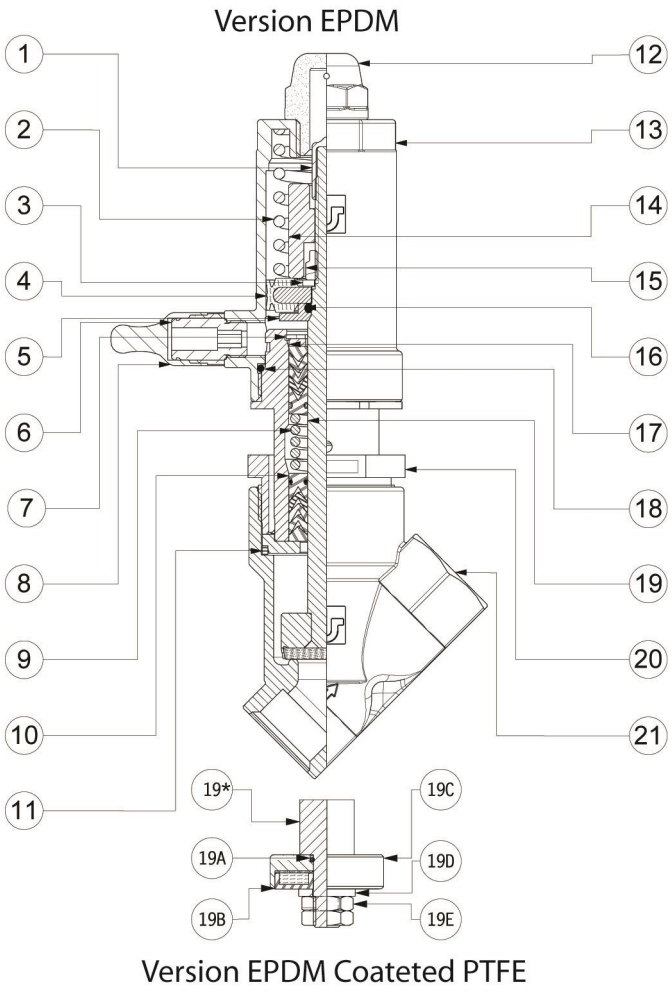
5.12.2 Micro holding box exploded view



Drawing no. 090194 Rev.:00

5.13 Parts and spare parts FFF/10 DN 15 Serv. Ø32 with visual device, N.C.

PART N°	DESCRIZIONE	MATERIALE
1	Stroke indicator	Red PVC
2	Servo control spring	Steel 55 Si Cr 6
3	Flat washer	Fe 360
4	NADUOP gasket	NBR - Steel
5	Piston bearing washer	Fe 360
6	Cylindric inlet fitting M 1/8”-6	Plastic
7	Seeger ring	1.4301
8	Protection cap	Rubber
9	Packing gland spring	1.4401
10	Packing gland	PTFE + graphite
11	Body gasket	PTFE
12	Trasparent cap	Plastic
13	Spring housing cylinder	1.4301
14	Spacer stroke end	PTFE/Carbon
15	Self-locking nut	Fe 360
16	OR gasket	GACO
17	Distance ring washer	1.4301
18	OR gasket	FPM
19	Stem with cap pressed	1.4401 + PTFE
19*	Stem	1.4401
19A	OR gasket	FPM
19B	Cap	PTFE coated EPDM
19C	Cap holder	1.4401
19D	Cap stop washer	1.4401
19E	Hexagon nut	1.4401
20	Intermediate body	1.4308 – 1.4401
21	Valve body	1.4408



Version EPDM Coateted PTFE

Body side spare parts

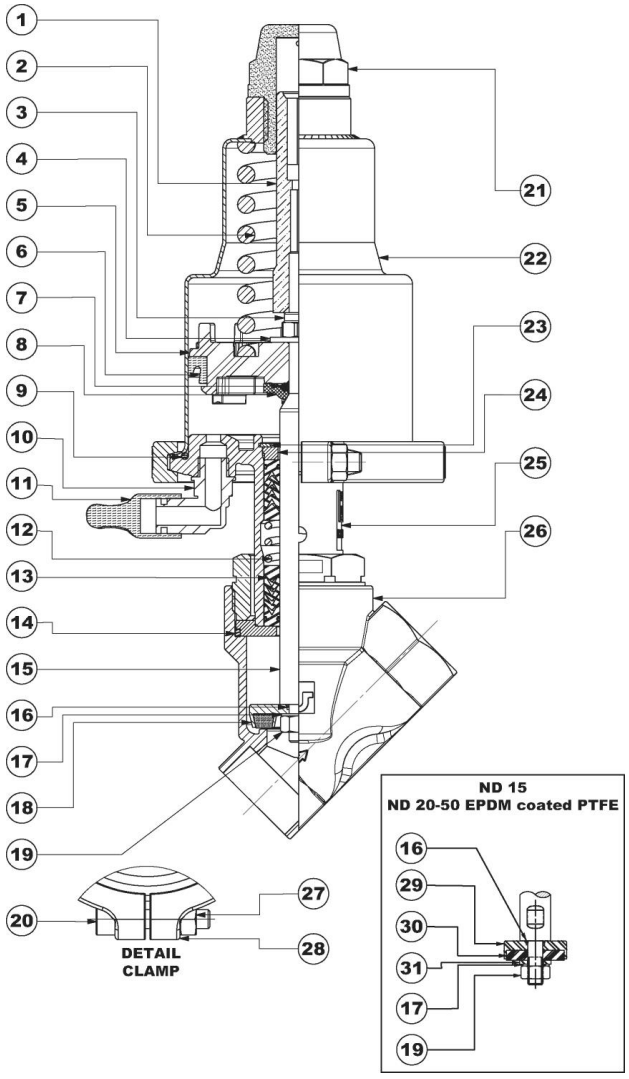
DN	SPARE PART CODE (Part. N° 9-10-11-16-19*-19A-19B) Version PTFE coated EPDM (Part. N° 9-10-11-16-19) Version PTFE		
	EPDM	PTFE	PTFE coated EPDM
15		12880	15835
20			

Air side spare parts

Ø SERV.	SPARE PART CODE (Part. No. 4-16-18)
Ø 32	15195

5.14 Parts and spare parts FFF/10 DN 15 to 50 with visual device, N.C.

PART No.	DESCRIPTION		MATERIAL
1	Stroke indicator		Red PVC
2	Servo control spring		Steel 55 Si Cr 6
3	Self- locking nut		Fe 360
4	Plain washer		Fe 360
5	Piston		PA66 + FV 30
6	DE gasket		NBR
7	OR gasket		GACO
8	Piston bearing washer		Fe 360
9	OR gasket		GACO
10	Rotary inlet fitting		Plastic
11	Protection cap		Rubber
12	Packing gland spring		1.4401
13	Packing gland		PTFE + graphite
14	Body gasket		PTFE
15	Shaft		1.4401
16	OR gasket		FPM
17	Spring washer		1.4401
18	Packed cap with gasket		1.4401 + EPDM
			1.4401 + PTFE
19	Hexagon nut		1.4301
20	Hex sunken conical Screw		1.4301
21	Transparent cap		Plastic
22	Spring housing cylinder		1.4301
23	Seeger ring		1.4301
24	Distance ring washer		1.4401
25	Intermediate body		1.4308 – 1.4401
26	Valve body		1.4408
27	Hexagon nut		1.4401
28	Clamp		1.4308
29	Cap holder		1.4401
30	Cap	DN 15	EPDM
			PTFE
		DN 15#50	EPDM coat. PTFE
31	Cap stop washer		1.4401



Body side spare parts

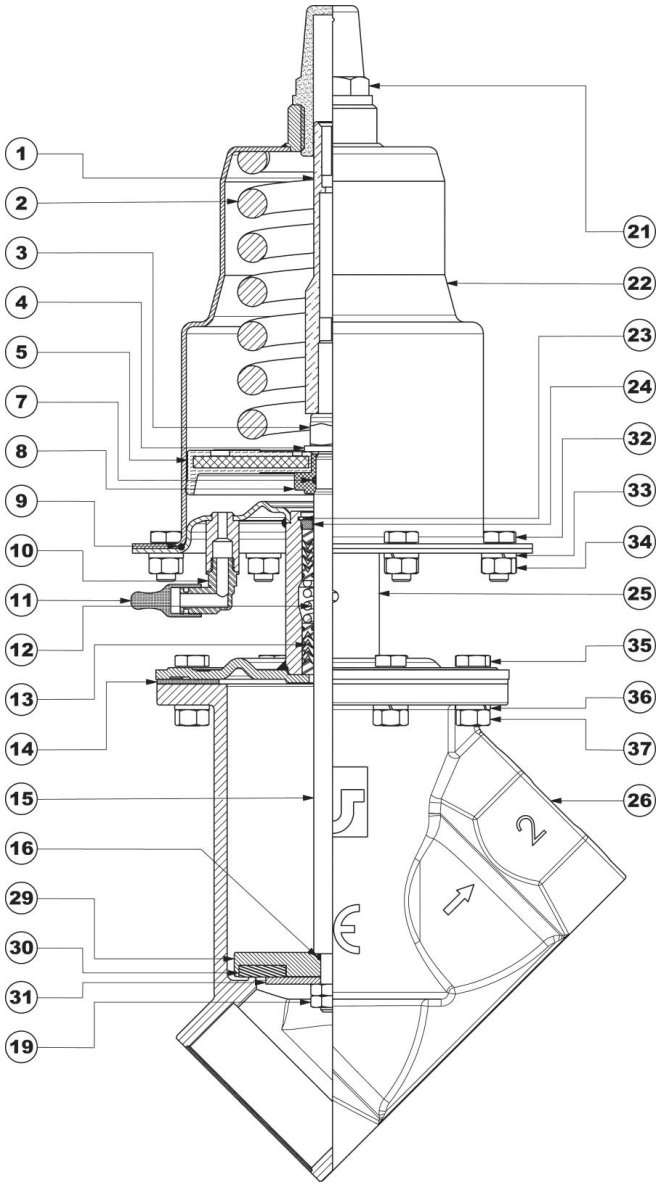
DN	SPARE PART CODE (Part. N° 12-13-14-16-17-19-30) DN 15 and DN 15#50 PTFE- coat. EPDM (Part. N° 12-13-14-16-17-18-19) DN 20#50 EPDM / PTFE		
	EPDM	PTFE	PTFE- coated EPDM
15		10167	10173
20	12432	12433	10174
25	12698	12697	10175
32	12915	12883	10176
40	12755	12754	10177
50	12147	12148	10178

Air side spare parts

Ø SERV.	SPARE PART CODE (Part. No. 4-5-6-7-9)
Ø 70	3424
Ø 80	7899

5.15 Parts and spare parts FFF/10 DN 65 with visual device, N.C.

PART No.	DESCRIPTION	MATERIAL
1	Stroke indicator	Red PVC
2	Servo control spring	Steel 55 Si Cr 6
3	Self- locking nut	Fe 360
4	Plain washer	Fe 360
5	TDUOP piston	NBR
7	Or gasket	GACO
8	TDUOP bearing washer	ASTM A105
9	Or gasket	GACO
10	Air inlet fitting	Plastic
11	Protection cap	rubber
12	Packing gland spring	1.4401
13	Packing gland	PTFE + graphite
14	Body gasket	FASIT 400
15	Shaft	1.4401
16	Or gasket	FPM
19	Hexagon nut	1.4401
21	Transparent cap	Plastic
22	Spring housing cylinder	1.4301
23	Seeger ring	1.4301
24	Distance ring washer	1.4401
25	Intermediate body	1.4301 – 1.4401
26	Valve body	1.4408
29	Cap holder	1.4401
30	Cap	EPDM
		PTFE- coated EPDM
		PTFE
31	Cap holding washer	1.4401
32	Hex. head screw	1.4301
33	Spring washer	1.4301
34	Hexagon nut	1.4301
35	Hex. head screw	1.4301
36	Spring washer	1.4301
37	Hexagon nut	1.4301



Body side spare parts

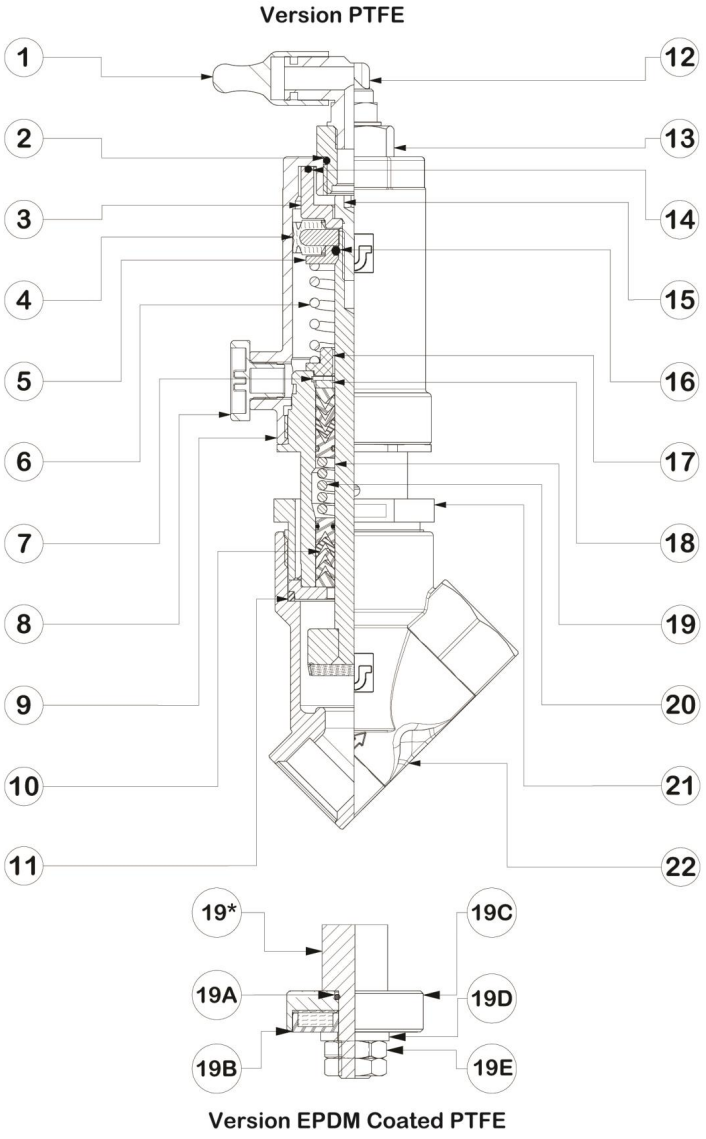
DN	SPARE PART CODE (Part. No. 12-13-14-16-30)		
	EPDM	PTFE	PTFE- coated EPDM
65	10331	10333	10332

Air side spare parts

Ø SERV.	SPARE PART CODE (Part. No. 5-7-9)
Ø 125	9731

5.16 Parts and spare parts FFF/10 DN 15 Serv. Ø32 N.O.

PART No.	DESCRIPTION	MATERIAL
1	Protection cap	Rubber
2	OR gasket	NBR
3	Spacer stroke end	1.4301
4	NADUOP gasket	NBR - Steel
5	Piston bearing washer	Fe 360
6	Servo control Spring	Steel 55 Si Cr 6
7	Seeger ring	1.4301
8	Threaded caps	Polyethylene
9	Spring housing cylinder	1.4301
10	Packing gland	PTFE + graphite
11	Body gasket	PTFE
12	Air inlet fitting	Plastic
13	Air fitting	1.4301
14	OR gasket	GACO
15	Hex sunken conical Screw	1.4301
16	OR gasket	GACO
17	Spring bearing washer	1.4301
18	Distance ring washer	1.4401
19	Stem with cap pressed	1.4401+PTFE
19*	Stem	1.4401
19A	OR gasket	FPM
19B	Cap	PTFE coated EPDM
19C	Cap holder	1.4401
19D	Cap stop washer	1.4401
19E	Hexagon nut	1.4401
20	Packing gland spring	1.4401
21	Intermediate body	1.4308 – 1.4401
22	Valve body	1.4408



Body side spare parts

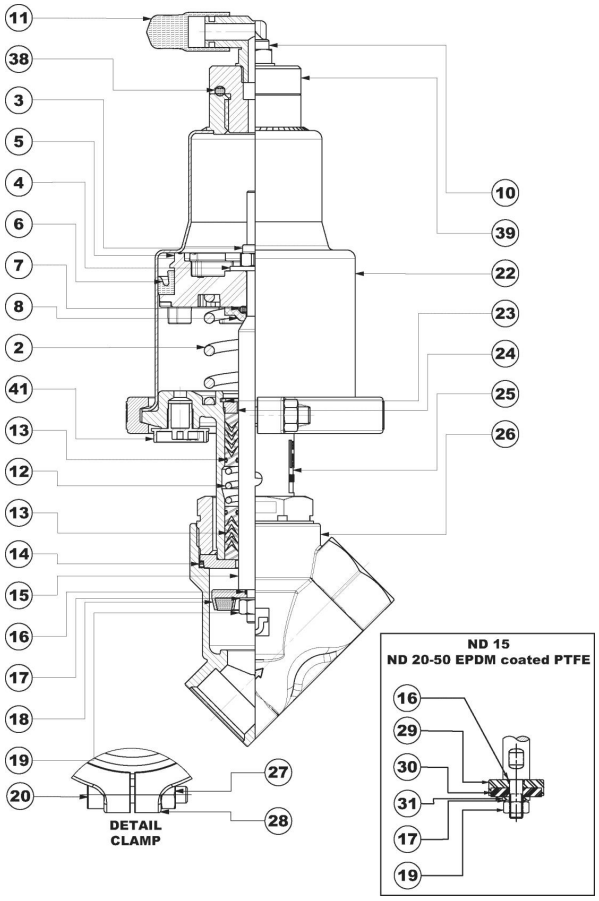
DN	SPARE PART CODE (Part. N° 12-13-14-16-17-19-30) Version PTFE- coated EPDM (Part. N° 12-13-14-16-17-18-19) Version PTFE		
	EPDM	PTFE	PTFE- coated EPDM
15		12880	
20			

Air side spare parts

Ø SERV.	SPARE PART CODE (Part. No. 4-5-6-7-38)
Ø 70	3422

5.17 Parts and spare parts FFF/10 DN 15 to 50 N.O.

PART No.	DESCRIPTION		MATERIAL
2	Servo control spring		Steel 55 Si Cr 6
3	Self- locking nut		Fe 360
4	Plain washer		Fe 360
5	Piston		PA66 + FV 30
6	DE gasket		NBR
7	OR gasket		GACO
8	Piston bearing washer		Fe 360
10	Rotary inlet fitting		Plastic
11	Protection cap		Rubber
12	Packing gland spring		1.4401
13	Packing gland		PTFE + graphite
14	Body gasket		PTFE
15	Shaft		1.4401
16	OR gasket		FPM
17	Spring washer		1.4401
18	Packed cap with gasket		1.4401 + EPDM
			1.4401 + PTFE
19	Hexagon nut		1.4301
20	Hex sunken conical Screw		1.4301
22	Spring housing cylinder		1.4301
23	Seeger ring		1.4301
24	Distance ring washer		1.4401
25	Intermediate body		1.4308 – 1.4401
26	Valve body		1.4408
27	Hexagon nut		1.4401
28	Clamp		1.4308
29	Cap holder		1.4401
30	Cap	DN 15	EPDM
			PTFE
		DN 15#50	EPDM coat. PTFE
31	Cap stop washer		1.4401
38	OR gasket		FPM
39	Air fitting		1.4301
41	Threaded caps		Polyethylene



Body side spare parts

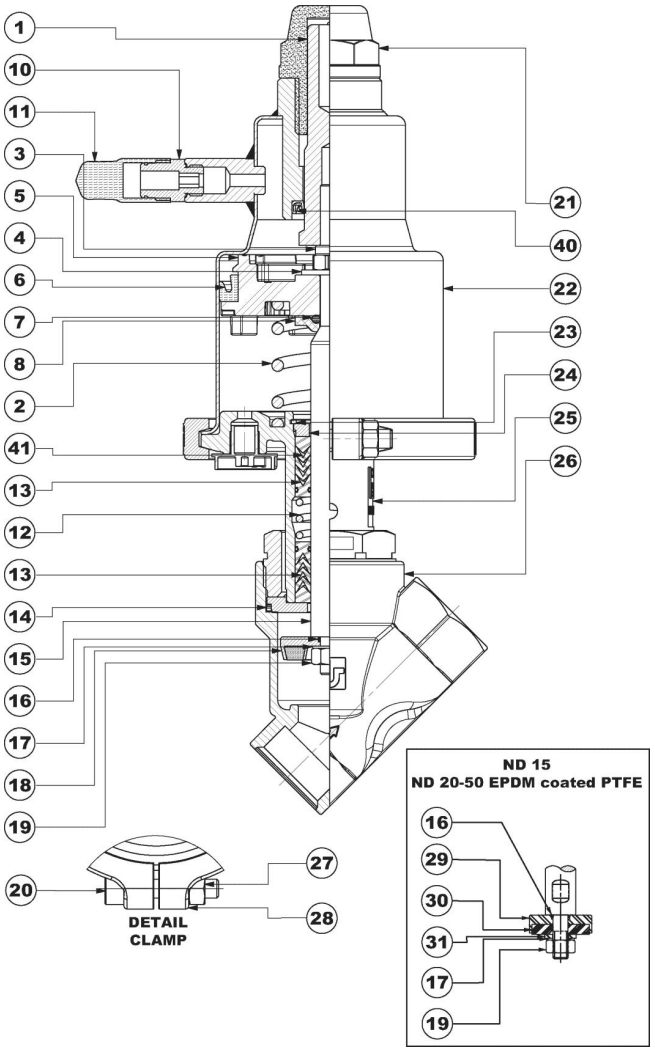
DN	SPARE PART CODE (Part. N° 12-13-14-16-17-19-30) DN 15 and DN 15#50 PTFE- coat. EPDM (Part. N° 12-13-14-16-17-18-19) DN 20#50 EPDM / PTFE		
	EPDM	PTFE	PTFE- coated EPDM
15		10167	10173
20	12432	12433	10174
25	12698	12697	10175
32	12915	12883	10176
40	12755	12754	10177
50	12147	12148	10178

Air side spare parts

Ø SERV.	SPARE PART CODE (Part. No. 4-5-6-7-38)
Ø 70	3422
Ø 80	3423

5.18 Parts and spare parts FFF/10 DN 15 to 50 V.D. N.O.

PART No.	DESCRIPTION		MATERIAL
1	Stroke indicator		Red PVC
2	Servo control spring		Steel 55 Si Cr 6
3	Self- locking nut		Fe 360
4	Plain washer		Fe 360
5	Piston		PA66 + FV 30
6	DE gasket		NBR
7	OR gasket		GACO
8	Piston bearing washer		Fe 360
10	Rotary inlet fitting		Plastic
11	Protection cap		Rubber
12	Packing gland spring		1.4401
13	Packing gland		PTFE + graphite
14	Body gasket		PTFE
15	Shaft		1.4401
16	OR gasket		FPM
17	Spring washer		1.4401
18	Packed cap with gasket		1.4401 + EPDM
			1.4401 + PTFE
19	Hexagon nut		1.4301
20	Hex sunken conical Screw		1.4301
21	Transparent cap		Plastic
22	Spring housing cylinder		1.4301
23	Seeger ring		1.4301
24	Distance ring washer		1.4401
25	Intermediate body		1.4308 – 1.4401
26	Valve body		1.4408
27	Hexagon nut		1.4401
28	Clamp		1.4308
29	Cap holder		1.4401
30	Cap	DN 15	EPDM
			PTFE
		DN 15#50	EPDM coat. PTFE
31	Cap stop washer		1.4401
40	BA gasket		NBR
41	Threaded caps		Polyethylene



Body side spare parts

DN	SPARE PART CODE (Part. N° 12-13-14-16-17-19-30) DN 15 and DN 15#50 PTFE- coat. EPDM (Part. N° 12-13-14-16-17-18-19) DN 20#50 EPDM / PTFE		
	EPDM	PTFE	PTFE- coated EPDM
15		10167	10173
20	12432	12433	10174
25	12698	12697	10175
32	12915	12883	10176
40	12755	12754	10177
50	12147	12148	10178

Air side spare parts

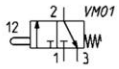
Ø SERV.	SPARE PART CODE (Part. No. 4-5-6-7-40)
Ø 70	5372
Ø 80	5373

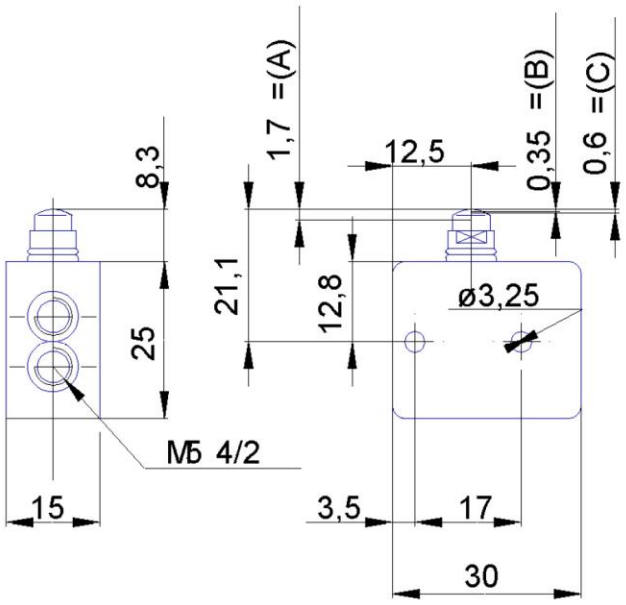
Annex 1 – Pneumatic limit switch type FINC000234

CAMOZZI

234-945

The mechanically operated miniature valves Series 2 with 3/2 normally closed function are available with M5 threaded ports or with an integrated super-rapid fitting for tubes ø 4.
The devices are actuated by a plunger, roller/lever or a unidirectional lever.





GENERAL DATA	
Construction	poppet - type (closed centre)
Valve group	3/2 way/pos., normally closed
Materials	aluminium body, OT58 (brass) plunger, NBR seals
Mounting	by through - holes in valve body
Ports	M5, cartridge dia. 4
Ambient temperature	0°C ÷ 60°C
Medium temperature	0°C ÷ 50°C
Operating pressure	see models
Fluid	Filtered air, without lubrication. If lubricated air is used, it is recommended to use ISO VG32 oil. Once applied the lubrication should never be interrupted.

Minivalves

Operating pressure = 2 ÷ 8 bar
Flow rate = 60 Nl/min.
Actuating force at 6 bar = 6 N
A = Complete stroke
B = Centres closed position
C = Effective stroke

Annex 2 – Pneumatic limit switch type FINCVME201

METAL WORK PNEUMATIC

MINIVALVES, MECHANICALLY AND HAND OPERATED SERIES VME

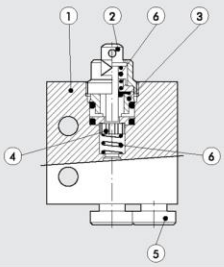
- Minivalves with 3/2 NO NC poppet,
- Installation in any position
- Push-in fittings for pipe Ø 4 mm and M5 on the valve body
- Low actuation force
- Rapid, accurate signal
- Mechanical actuation
- The 2 places adapter allows manual actuation of 1 or 2 VME valves with manual Ø 22 panel actuators. Thus it is possible to obtain 3/2, 5/2, 5/3 open centre and 5/3 pressure centre pneumatic functions.
- On request, it is possible to place a NC-NO electric switch next to VME valve for mixed solenoid/pneumatic signals.

TECHNICAL DATA

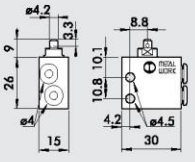
Valve fitting port		Push-in fitting for pipe diam. 4 and M5 (axial or side)
Fluid		Filtered air without lubrication; lubrication, if used, must be continuous
Type		With poppet
Versions		Mechanical and manual
Operators:		
• mechanical		With Plunger – Plunger for wall-mounting – Roller lever – Unidirectional roller lever
• manual		Depending on the type of actuation panel selected
Operating pressure	bar	0.5 to 10
Operating temperature range	°C	-10° to +60
Nominal diameter	mm	2.5
Conductance C	Nl/min · bar	16.5
Critical ratio b	bar/bar	0.03
Flow rate at 6 Bar ΔP 0.5 Bar	Nl/min	35
Flow rate at 6 Bar ΔP 1 Bar	Nl/min	60
Actuation force – Plunger at 6 Bar	N	8
Recommended lubricant		ISO and UNI FD22
Installation		In any position
Compatibility with oils		Please refer to page 6-7 of the tecnical documentation

COMPONENTS

① VALVE BODY: Aluminium
② BUTTON: chemically nickel-plated brass
③ DISTANCE PLATES: Brass
④ GASKETS: NBR
⑤ PUSH-IN FITTING CARTRIDGES: stainless steel, brass and plastic
⑥ SPRINGS: stainless steel



Ø 4



Code	Description
W3501001101	VME2-01 NC Ø 4

Annex 3 – Electro-mechanic limit switch type FINC00E100

Position switches

Technical data

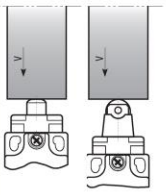
Insulation resistance			500 V DC	MΩ	100
Dielectric strength			50/60 Hz per 1' *	V AC	2500
Rated insulation voltage	Ui	IEC947-5-1		V AC	500
Rated thermal current	Ithe	IEC947-5-1		A	10
Rated operating current		IEC947-5-1/EN60947-5-1			
Category AC15	Ie		24 V	A	10
A300			125 V	A	6
			230 V	A	6
			400 V	A	3
Category DC13	Ie		24 V	A	6
Q300			48 V	A	4
			120 V	A	1
			250 V	A	0,4
Contact resistance		IEC255-7 cat.3	initial value	mΩ	25
Short circuit protective devices		IEC269 (IEC947-5-1) gl or gG type fuse		A	10
Rated conditionals short circuit current		IEC947-5-1		A	1000
Pollution degree		IEC947-5-1			3
Protection degree		EN 60529		IP	66
Protection against electric shock			plastic	class	II
			metal	class	I
Vibration resistance		IEC68-2-6	mm		0,35 ± 15% (10 ÷ 55 Hz ± 1 Hz)
Shock resistance		IEC68-2-27	11 ms	g	30
Mechanical life				cycles	15.000.000
Electrical life		a 250 V AC 6A with resistance load cos φ=1		cycles	500.000
		a 250 V AC 6A with resistance load cos φ=0,4		cycles	500.000
Distance between contacts		snap action type		mm	2x1,25
		slow action type		mm	2x2
Terminals		Type			Screw with combined notch and retactable plate (notch Ph. Size 1)
		Screw		M	3,5
		Protection degree		IP	20 A
		Material			Steel class 8,8/ Galvanized
		Max. screw tightening torque		cNm (Kg cm)	120 (12,24)
		Max connecting capacity	rigid cable	mm²	2x1,5
			flexible cable	mm²	2x1,5
		Terminal numbering			In accordance with EN50013

Condition of use

Air ambient temperature	operational	°C	-35 ÷ +85 (without formation of ice)
Relative humidity	operational		95% max

* between terminals of the same polarity: between terminals with different polarity: between live mechanical parts and ground; between live mechanical parts and non-current-carrying metal parts

Operating features



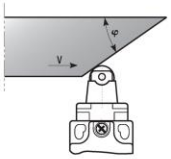
Plunger, Roller plunger, vertical travel
Actuators: A-B

Drive cam operating parameters

	V max (m/s)
Act. A	0,5
Act. B	0,5

Drive forces

Minimum command force	9 N
Minimum forced opening force	28 N



Roller plunger, side travel
Actuator: B

Drive cam operating parameters

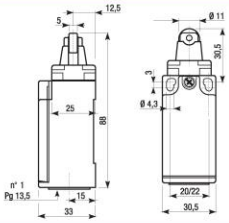
φ	V max (m/s)
30°	0,5
20°	1

Drive forces

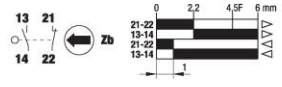
Minimum command force	9 N
Minimum forced opening force	28 N

Steel roller plunger

Thermoplastic



Part no.	Contact block	Circuit diagram	Contact travel
E10000BI	Snap action 1NO+1NC	00	



Annex 4 – Electro-mechanic limit switch type FINC00161E

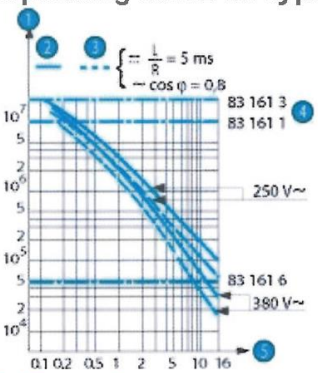
V3 - Standard83 161 3

The strengths of the family

- Nominal ratings 0.1 A to 20 A / 250 VAC
- Operating temperature up to +125°C
- Conforming to EN 61058 and UL 1054
- Choice of actuators with 4 possible fixing positions

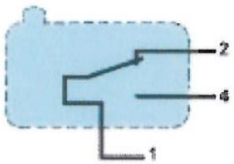
Reference characteristics	83 161 338
Function	I (changeover)
Connections	W3
Electrical characteristics	
Rating nominal / 250 VAC (A)	16
Rating thermal / 250 VAC (A)	20
Mechanical characteristics	
Maximum operating force (N)	0,8
Min. Release force (N)	0,2
Maximum total travel force (N)	2
Max. permitted overtravel force (N)	20
Maximum rest position (mm)	16,2
Operating position (mm)	$14,7^{\pm 0,3}$
Maximum differential travel (mm)	0,35
Min. overtravel CRA (mm)	1,2
Ambient operating temperature (°C)	-20 →+125
Mechanical life for 2/3 CRA (operations)	2×10^7
Contact gap (mm)	0,4
Weight (g)	5,6

Operating curve for types 831611 / 831613



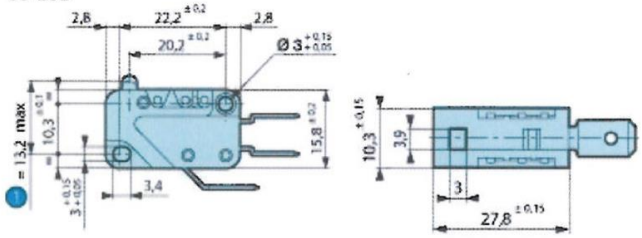
N°	Legend
1	Number of cycles
2	Resistive circuit
3	Inductive circuit
4	Mechanical life limit
5	Current in Amps

Single break changeover switch



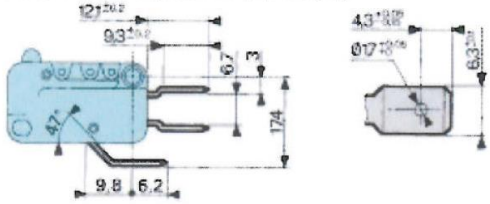
→ *Encombrements

83 161

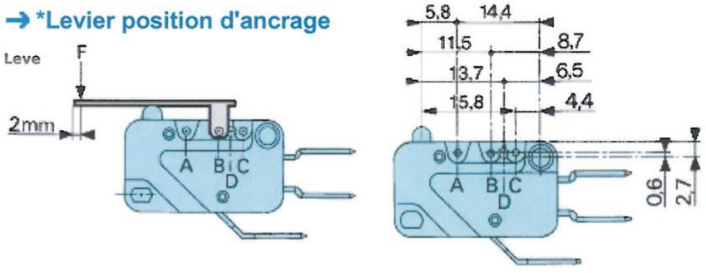


→ *Connexions

W3 per faston 6,35 mm (6,3 x 0,8)

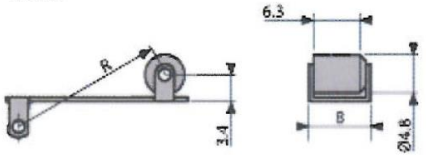


→ *Levier position d'ancrage



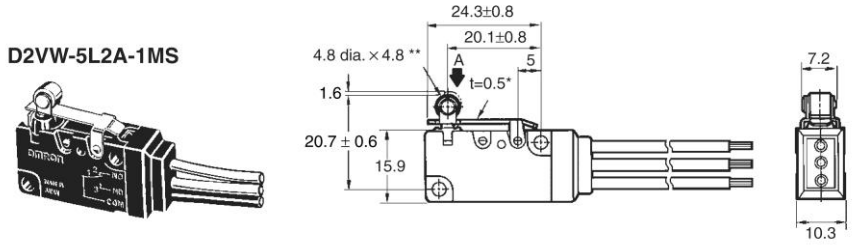
→ *Accessoires de manoeuvre

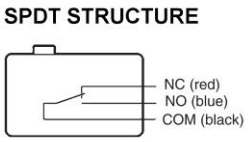
161 E



Annex 5 – Electro-mechanic micro switch type FINC100684

Electro-mechanic micro switch Omron type D2VW-5L2A-1MS with actuator lever equipped with a polyacetal resin wheel.





Operating frequency	Mechanical: 300 opt/min Electrical: 30 opt/min
Supply voltage	30 VDC (5 A) 125 VDC (0.4 A) 125 VAC (5 A) 250 VAC (5 A)
Insulation	100 MΩ min at 500 VDC
Contact resistance	50 mΩ max
Degree of protection	IEC IP67 (excluding the terminals)
Degree of protection against electric	Class I
Operating environment temperature	-40°C to +85°C
Operating environment humidity	95% max (5°C to 35°C)
Mechanical life	10,000,000 cycles
Contact material	Silver
Distance between contacts	0.5 mm.
Tripping force	1.18N
Release force	0.15N

Annex 6 – 2-wire inductive proximity switch A.C. N.O.

Proximity Sensors

XS6 Extended Range and Auto-Adaptable Inductive Sensor

Metal Tubular, DC and AC/DC

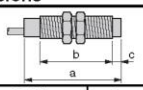
XS6 ••B1••L2

Features

Entire range of fully shielded metal body tubular inductive proximity sensors

- Increased sensing range, fully shielded
- 2-wire AC/DC and 3-wire DC
- Normally open or normally closed outputs available
- Cable and connector versions
- PNP or NPN, DC
- Self-Teach available on 12–30 mm versions

Dimensions



	Cable		Connector	
	a	b	a	b
∅ 8	1.9 (50)	1.6 (42)	2.4 (61)	1.6 (40)
∅ 12	1.9 (50)	1.6 (42)	2.4 (61)	1.6 (42)
∅ 18	2.3 (60)	0.09 (51)	2.8 (72.2)	2.0 (51)
∅ 30	2.3 (60)	0.09 (51)	2.8 (72.2)	2.0 (51)

in. (mm)

Nominal Sensing Distance	Circuit Type	Output Mode	Voltage Range	Load Current Maximum	Operating Frequency DC	Operating Frequency AC	Catalog Number
12 mm Diameter, 2 m (6.6 ft) cable ▲							
4 mm	2-wire	N.O.★	12–48 Vdc	1.5–100 mA	4,000 Hz	25 Hz	**XS612B1MAL2**

★ To order a normally closed (N.C.) version, change the A to B. Example: XS518B1PAL2 to XS518B1PBL2.
◆ Self-teach version only
▲ For a 5 m (16.4 ft) cable length, add suffix **L5**. For a 10 m (32.8 ft) cable length, add suffix **L10**.

Minimum Mounting Clearances, in. (mm)

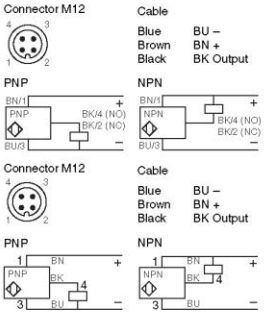
Auto-Adaptable | **Extended Range**

—	Side by Side Flush	Side by Side Not Flush	Face to Face Flush	Face to Face Not Flush
∅ 12	e ≥ 0.55 (14)	1.9 (50)	e ≥ 1.9 (50)	3.9 (100)
∅ 18	e ≥ 1.1 (28)	3.9 (100)	e ≥ 3.9 (100)	7.9 (200)
∅ 30	e ≥ 1.9 (48)	7.1 (180)	e ≥ 7.1 (180)	14.1 (360)

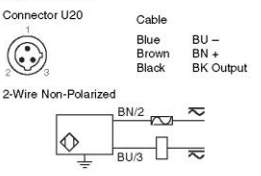
∅	Side by Side	Face to Face	Face to Metal Object
∅ 8	e ≥ 0.1 (3)	e ≥ 0.7 (18)	e ≥ 0.17 (4.5)
∅ 12	e ≥ 0.2 (4)	e ≥ 0.9 (24)	e ≥ 0.2 (6)
∅ 18	e ≥ 0.4 (10)	e ≥ 2.4 (60)	e ≥ 0.6 (15)
∅ 30	e ≥ 0.8 (20)	e ≥ 4.7 (120)	e ≥ 1.2 (30)

Wiring

3-Wire Selectable



2-Wire AC/DC



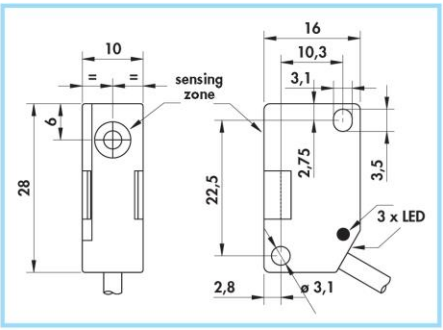
Specifications

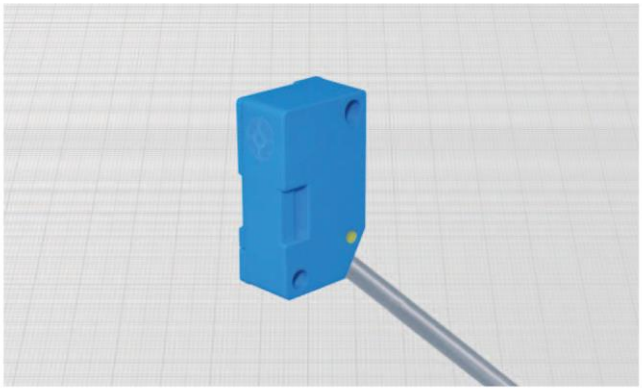
Mechanical		Extended Range	Auto-Adaptable Shielded	Auto-Adaptable Non-Shielded
Fine Detection Zone	12 mm	0–3.2 mm	1.7–3.4 mm	1.7–5 mm
Sn	12 mm	—	0–3.4 mm	0–5 mm
Temperature Rating	Storage	-40 to +185 °F (-40 to +85 °C)		
	Operation	-13 to +158 °F (-25 to +70 °C)		
Enclosure Rating	NEMA Type	3, 4X, 6P, 12, 13		
	IEC	IP68 cable versions (IP67 connector versions)		
Enclosure Material	Case	Nickel-plated brass		
	Face	PBT		
Maximum Tightening Torque	12 mm	15 N•m (11 lb-ft)		
Vibration		25 g, ±2 mm amplitude (10–55 Hz)		
Shock Resistance		50 g, 11 ms duration		
Differential (%of Sr)		15%		
Repeatability (% of Sr)		3%		
LED Indicator	Power and Teach	—	Green	
	Output	Yellow		
Cable		PVR 3 x 0.34 mm² / PVR2 x 0.5 mm²	PVR – 4.2 mm (0.17 in.) O.D.	
Connector		M12 4-pin / U20 3-pin micro-style	M12 micro-style 4-pin	
Electrical		**2-wire AC/DC**	**3-wire DC**	**Auto-adaptable DC**
Voltage Range		24–240 Vac; 24–210 Vdc	12–48 Vdc	12–24 Vdc
Voltage Limit (Including Ripple)		20–264 Vac/Vdc	10–58 Vdc	10–36 Vdc
Voltage Drop		5.5 V	2 V	2 V
Maximum Leakage (Residual) Current—Open State		0.8 mA	—	—
Current Consumption		—	10 mA	10 mA
Maximum Current Limit		AC: 5–300 mA; DC: 5–200 mA	200 mA	100 mA
Power-up Delay (Maximum)		20 ms—12 mm; 25 ms—18/30 mm	5 ms	5 ms
On Delay (Maximum)	12 mm	0.5 ms	0.2 ms	0.3 ms
Off Delay (Maximum)	12 mm	0.2 ms	0.2 ms	0.7 ms
Operating Frequency, Maximum	12 mm	AC: 25 Hz / DC: 1,000 Hz	2,500 Hz	1,000 Hz
Protective Circuitry	Short Circuit Protection	No	Yes	Yes
	Overload Protection	Yes	Yes	Yes
	Reverse Polarity Protection	Yes	Yes	Yes
Agency Listings				

Annex 7 - 2-wire D.C. inductive sensor type FINC100683

RECTANGULAR INDUCTIVE SENSORS

- **Type Z**
- **Amplified in d.c. 2 wires non polarized**
- Cable output





Materials:
- Cable: 2 m PVC CEI 20 - 22 II; 90°C; 300 V; O.R.
- Housing: plastic

General Features:
These sensors are not polarized and the load can be connected on both positive and negative lead (function PNP or NPN).
So they can replace traditional mechanical microswitches in many applications. They have shape and fixing holes as V3 standard microswitches. The particular cable position allows the mounting on every side of the housing. The output status is indicated by LED visible from 3 sides.

Technical data:
- Supply voltage (U_B): 10 ÷ 48 Vdc
- Max ripple: 10%
- Off-state current (I_r): ≤ 1 mA
- Minimum operational current (I_m): 5 mA
- Voltage drop (U_d) con I_e = 10 mA: ≤ 5 V
- Voltage drop (U_d) con I_e = 100 mA: ≤ 6 V
- Temperature range: - 25° ÷ + 70°C
- Max thermal drift of sensing distance S_r: ± 10%
- Repeat accuracy (R): 2%
- Switching hysteresis (H): 10%
- Degree of protection: IP67
- Switch status indicator: yellow LED
- Cable conductor cross section: 0,35 mm²
- Protected against short-circuit and overload
- Suppression of initial false impulse
- Electromagnetic compatibility (EMC) according to EN60947-5-2 CE
- Shock and vibration resistance according to EN60068-2-27 EN60068-2-6

Flush mounting / Non flush mounting	Cable diameter	Sensing zone diameter	Rated operational current (I_e)	Max switching frequency (f)	Nominal sensing distance (S_n) ± 10%%	ORDERING REFERENCES	
						NO	NC
	mm	mm	mA	KHz	mm		
•	4	9	100	2	2	DCMZ/4600KS	DCMZ/4610KS

Annex 8 – 3-wire inductive proximity switch D.C. N.O.

Sensori di prossimità induttivi

872C WorldProx™ CC rilevamento esteso a 3 fili

Superficie sensibile di plastica/Cilindro filettato di ottone nichelato

872C CC con cavo
12, 18, 30 mm

872C CC
con connettore micro
12, 18, 30 mm

Caratteristiche

- Funzionamento a 3 fili
- Connessione a 3 fili, 4 pin
- 10-30 Vcc
- Normalmente aperto o normalmente chiuso
- Protezione da inversione di polarità, corto circuito, sovraccarico, falsi impulsi e disturbi transitori
- Riconosciuto UL e c-UL e marcato CE per tutte le direttive applicabili

Caratteristiche tecniche

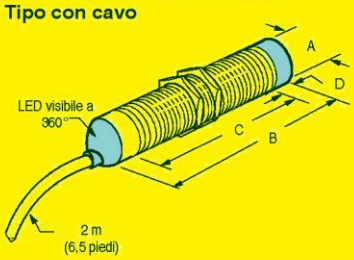
	12 mm	18 e 30 mm
Corrente di carico	≤200 mA	≤400 mA
Corrente di dispersione	≤m50 A	
Tensione di funzionamento	10-30 Vcc	
Caduta di tensione	≤1,2 V	
Ripetibilità	≤5%	
Isteresi	10% tipico	
Protezione dall'inversionedi polarità	Incorporata	
Protezione da disturbi transitori	Incorporata	
Protezione da cortocircuito	Incorporata	
Protezione da sovracorrente	Incorporata	
Protezione da falsi impulsi	Incorporata	
Approvazioni	Riconosciuto UL e c-UL e marcato CE per tutte le direttive applicabili	
Custodia	NEMA 1, 2, 3, 4, 612P, 13, IP67 (IEC529) Cilindro di ottone nichelato, superficie sensibile di plastica (PBT)	
Collegamenti	Cavo: 2 m (6,5 piedi) di lunghezza, 4,4 mm (0,175 pollici) di diametro 3 fili da 26 AWG PVC Connettore: micro a 4 pin	
LED	Giallo: uscita eccitata, visibilità a 360°	
Temperatura di funzionamento	Da -25 °C a +70 °C (da -13 °F a +158 °F)	
Urti sopportati	30 g, 11 ms	
Vibrazioni tollerate	55 Hz, 1 mm di ampiezza, 3 piani	

Fattori di correzione

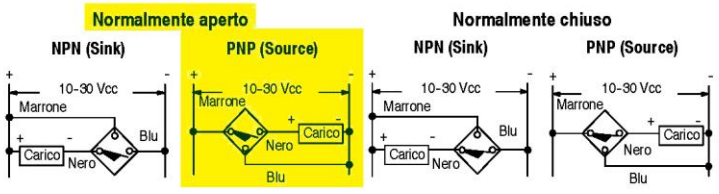
Materiale del target	Fattori di correzione
Acciaio	1,0
Acciaio inossidabile	0,7-0,8
Ottone	0,5-0,6
Alluminio	0,5-0,6

Dimensioni – mm (pollici)

Tipo con cavo



Schemi di cablaggio

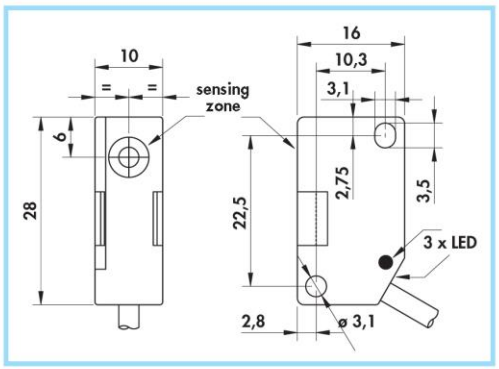


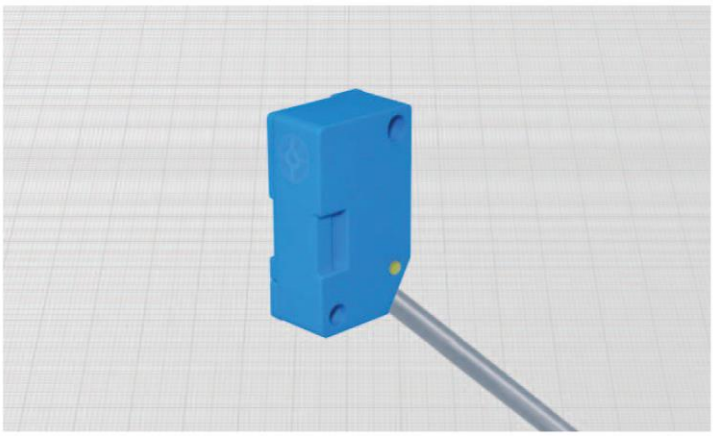
Caratteristiche filettatura	Schermato	mm (pollici) A	B (max)	C (min)	D (max)
M12 X 1	S	12,0 (0,47)	54,0 (2,12)	45,0 (1,77)	0,5 (0,02)
	N			40,0 (1,57)	5,0 (0,19)
M18 X 1	S	18,0 (0,71)	50,0 (1,96)	40,0 (1,57)	0,5 (0,02)
	N			35,0 (1,37)	8,0 (0,31)
M30 x 1,5	S	30,0 (1,18)	60,0 (2,36)	50,0 (1,96)	0,5 (0,02)
	N			38,0 (1,49)	12,2 (0,48)

Annex 9 - 3-wire D.C. inductive sensor type FINC100682

RECTANGULAR INDUCTIVE SENSORS

- **Type Z**
- **Amplified in d.c. 3 wires**
- Cable output

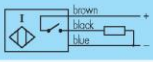
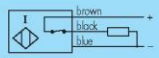




Materials:
- Cable: 2 m PVC CEI 20 - 22 II; 90°C; 300 V; O.R.
- Housing: plastic

General Features:
This sensor has the same shape and fixing holes as V3 standard microswitches. The particular cable position allows the mounting on every side of the housing. The output status is indicated by LED visible from 3 sides.

Technical data:
- Supply voltage (U_B): 7 ÷ 30 Vdc
- Max ripple: 10%
- No-load supply current (I_o): ≤ 10 mA
- Voltage drop (U_d): ≤ 1,5 V
- Temperature range: - 25° ÷ + 75°C
- Max thermal drift of sensing distance S_r: ± 10%
- Repeat accuracy (R): 2%
- Switching hysteresis (H): 10%
- Degree of protection: IP67
- Switch status indicator: yellow LED
- Cable conductor cross section: 0,15 mm²
- Protected against short-circuit and overload
- Protected against any wrong connection
- Suppression of initial false impulse
- Electromagnetic compatibility (EMC) according to EN60947-5-2 CE
- Shock and vibration resistance according to EN60068-2-27 EN60068-2-6

Flush mounting / Non flush mounting	Cable diameter	Sensing zone diameter	Rated operational current (I_e)	Max switching frequency (f)	Nominal sensing distance (S_n) ± 10%	ORDERING REFERENCES PNP (positive switching) NO	ORDERING REFERENCES PNP (positive switching) NC
	mm	mm	mA	KHz	mm		
•	3	9	200	2	2	DCAZ/4609KS	DCAZ/4619KS

Annex 10 – 2-wire magnetic sensor A.C. N.O.

Proximity Magnetic Sensors Cylindrical Body, FSM Series

- Cylindrical case
- Brass or nickel plated brass body
- M12 or M16 diameter
- NO or CO output functions
- Front side switching

Product Description

The cylindrical proximity magnetic sensors of the FSM series are available in different versions with brass or nickel-plated brass body, different dimensions and output contacts and can be mounted directly on ferromagnetic supports. FSM.A.7 model is provided with output function status LED, while FSM.S.2/S2/AT can resist to temperatures up to 180 °C.

Ordering Key

FSM.S.2/S2/AT

- Type
- Output Function
- Reed Contact Type
- Special Versions
- Special Applications

Type Selection

Dimensions	Output function	High temperature applications	Reference
M12 x 1	NO	-	FSM.A.2
			FSM.A.7
	Change-over	-	FSM.S.2
M16 x 1		-	FSM.S.2/S2
		Yes	FSM.S.2/S2/AT

General specification

Case		**Output connection**	
FSM.A.2 FSM.A.7 FSM.S.2	Nickel-plated brass	**FSM.A.2 FSM.S.2 FSM.S.2/S2**	PVC Cable
FSM.S.2/S2 FSM.S.2/S2/AT	Brass	**FSM.A.7 FSM.S.2/S2/AT**	Silicone Cable
Protection degree	IP67		
Operating temperature	-25 to +75°C		
FSM.S.2/S2/AT	-25 to +180°C		

Electrical specifications

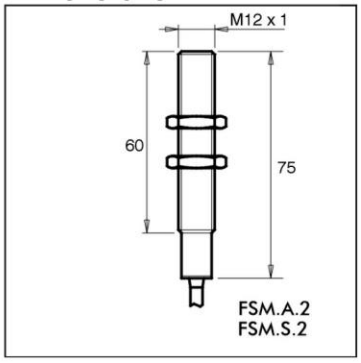
Contacts	2	7	S.2
Max switching voltage	250 Vac	-	220 Vac
Max switching current	3 A	50 mA	1 A
Max switching power	100 VA	-	60 VA

Operating distance

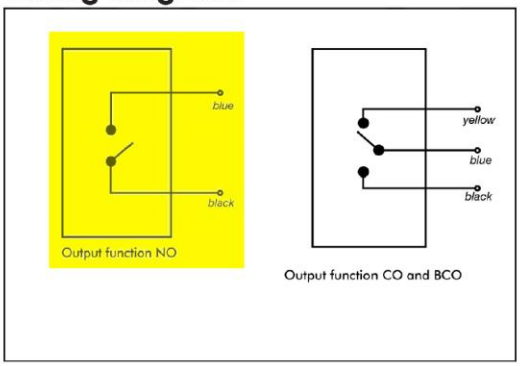
Magnetic Units	CL.10	CL.11	CL.18	CL.20/S1	CL.20/S3	CL.23	CL.31	CL.50
FSM.A.2	-	16	2	14	13	11	19	-
FSM.S.2	-	9	-	-	-	-	-	19
FSM.A.7*	-	-	-	-	-	-	-	-
FSM.S.2/S2/AT	-	-	-	-	8	-	-	-

** ≥ 7 mm with Neodimium REN 35, 5x5x1,5 magnetic unit mounted on iron*

Dimensions



Wiring Diagrams

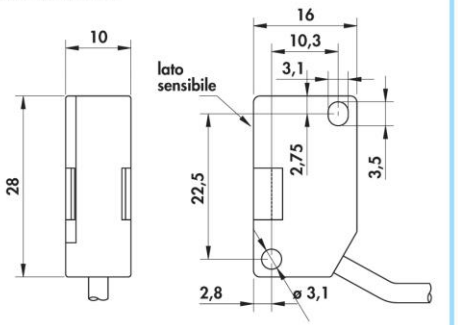


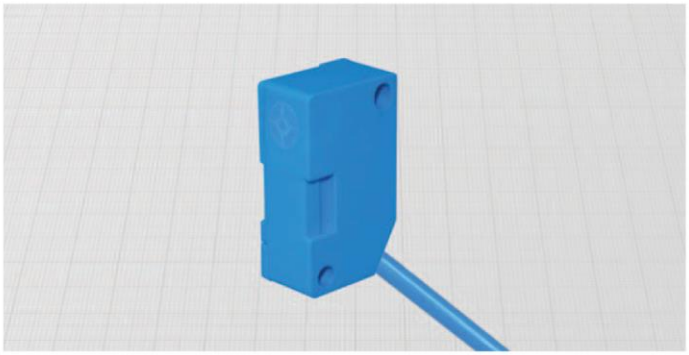
Annex 11 – Magnetic switch type FINC100681

RECTANGULAR MAGNETIC SENSORS

- **REED CONTACT 2 wires**
- **Type Z**
- Cable output

Custodia Z-1



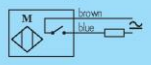


Materials:
- Cable: 2m PVC CEI 20 - 22 II; 90°C; 300 V; O.R.
- Housing: plastic

General Features:
These sensors give on the output a contact activated by an external magnetic field, not depending by the polarity of the field. The activation distance depends by the power of the magnet (see on page C-12), which must be ordered separately.
Reed contacts allows to drive directly dc loads (PNP/NPN) or ac loads.

Technical data:

• Working voltage	max 50 Vac/75 Vdc
• Output function	normally open
• Contact resistance max	0,1 Ω
• Operate time max	1 ms
• Release time max	0,4 ms
• Temperature range	- 25 ÷ + 85°C
• Degree of protection	IP67
• Cable conductor cross section	0,15 mm² Type Z 0,50 mm² Type W

Housing	Cable diameter	Max switching frequency (f)	Rated operational current (I_e)	ORDERING REFERENCES
	mm	KHz	mA	NO 
Z - 1	3	0,5	500	**BMSZ/4600**

6 Table 4: Tightening Torques

Part match	Tightening torque for FFF valve threaded couplings [Nm]						
	DN 15	DN 20	DN 25	DN 32	DN 40	DN 50	DN 65
P. 25 and P. 26	165	270	358	490			
P. 19 and P. 15	9			19			32
P. 20 and P. 27	9						
P. 32 and P. 34							19
P. 35 and P. 37							19
System connections	40	65	120	195	255	500	800

7 Disposal

After use, for the valve disposal, it is necessary to disassemble the valve and separate the different materials the valve is composed of, according to the tables annexed to the valve working drawings, then dispose of the different materials in compliance with the laws in force.

Assembly and disassembly operations shall be carried out by qualified personnel only, equipped with all the work and safety tools. **WARNING! Compressed springs are included inside the servo control**. Thus, during valve disassembly, components are disposed of by using all safety equipment necessary to prevent sudden separation of upper head from lower head when all servo control head fastening screws have been removed.

8 Warranty

Each valve is tested before leaving the factory. Following a request by the customer we can issue the testing certificate. The customer may inspect and test in person the material at our site, before shipping. This inspection is considered as final. All the charges associated with special testing or requests by the customer shall be paid by the customer himself.

Our responsability (for damage to person or/and properties during installation and/or maintenance) lapses when the valve is removed from its original packaging.

Our responsibility is limited to the replacement or repair of any components that should turn out to have any material or manufacturing defects, within 12 months of shipping and used under normal operating conditions. This use excludes any other obligation.

All the transport and accessory expenses, anyway, shall be paid by the customer. ITALVALVOLE® s.a.s. reserves the right to stop or change or modify the characteristics and the manufacturing of any of its products without incurring any obligation to replace or install on the already supplied products the modified parts.

WARNINGS:

- The safety conditions shall not be guaranteed and malfunctions shall not be subjected to valves in case:
  - disassembly, re-assembly, maintenance operations are not carried out in compliance with the use and maintenance manual.
  - original spare parts are not used.
- It is forbidden to remove pages from this document or to make any correction.
- In case of doubt, make reference to Italian version of the manual.
- ITALVALVOLE® s.a.s. reserves the right to change its products and the relevant documentation without prior notice.
- The use of the handbook does not exempt from the observance of the laws in force.
- We inform you that some components may come from countries other than Italy.