

Instruction Manual

FRM-NOC

1 Target group

This manual is intended for personnel qualified in gas safety and regulation technology, as well as personnel trained or instructed by them.

The former are in a position to judge the work assigned to the latter on the basis of their technical training, knowledge and experience, as well as knowledge of the relevant regulations, and are able to recognise potential dangers. Only they are permitted to carry out assembly, commissioning, settings and maintenance on the devices in compliance with the recognised rules for occupational safety.



Hang this instruction manual in a clearly visible place inside the installation room! Do not carry out any work until you have read the safety instructions of this instruction manual and are qualified to do so.

2. Warnings

2.1 General warnings



The recognised occupational safety rules and accident prevention regulations must be observed and, if necessary, personal protective measures must be taken.



All adjustments and settings should only be performed in accordance with the instruction manuals of the connected machines.



Never carry out work as long as gas pressure or voltage is applied. Avoid naked flames. Please observe public regulations.



Prior to assembly, the device must be inspected for transport damage.



The device must not be exposed to naked flames. Protection against lightning strikes must be guaranteed.



Connected line systems must be free from dirt and contamination.



Protection from environmental impacts and weather conditions (corrosion, rain, snow, icing, humidity (e.g. by condensation), mould, UV radiation, harmful insects, poisonous, corrosive solutions/liquids (e.g. cutting and cooling fluids), must be guaranteed. Depending on the installation site, it may be necessary to take protective measures.



The device may only be operated in compliance with the operating conditions stated on the type plate.



The device must be protected from vibrations and mechanical impacts.



The device must not be used in areas with increased seismic risk.

Explanation of the symbols

1, 2, 3,...	=	Act based on the sequence
•	=	Instruction

2.2 Designated use

The device is used in accordance with its designated use if the following instructions are observed:

- Use of the device in gas transport and gas distribution networks, commercial and industrial plants.
- Use in pressure regulator stations according to EN 12186 and EN 12279 or for use in gas piping systems according to NFPA 54 or CSA B149.1 or for use in gas trains according to NFPA 86, NFPA 37, NFPA 85 or CSA B149.3.
- Use with gases of the 1st, 2nd and 3rd gas families according to EN 437 only (e.g. manufactured gas (town gas), commercial grade natural gas and commercial grade LPG gases in the vaporized phase).
- Use with dry and clean gases only, no aggressive media.
- Use only in compliance with the operating conditions stated on the type plate.
- Use in perfect condition only.
- Malfunctions and faults must be eliminated immediately.
- Use only in observance of the instructions given in this instruction manual and of national regulations.

2.3 Risks in the case of misuse

- If used in accordance with their designated use, the devices are safe to operate.
- Non-observance of the regulations may result in personal injury or material damage, financial damage or environmental damage.
- Operator errors or misuse present risks to life and limb of the operators and also to the device and other material property.

3. EU Declaration of conformity

Produkt / Product Produit / Producto	FRM-NOC 100...	Medium Pressure Regulator 10 bar	
Hersteller / Manufacturer Fabricant / El Fabricante	Karl Dungs GmbH & Co. KG Karl-Dungs-Platz 1 73660 Urbach, Germany		
bescheinigt hiermit, dass die in dieser Übersicht genannten Produkte einer EU-Baumusterprüfung (Baumuster) unterzogen wurden und die wesentlichen Sicherheitsanforderungen der: EU-Druckgeräterichtlinie 2014/68/EU in der gültigen Fassung erfüllen. Bei einer von uns nicht freigegebenen Änderung des Gerätes verliert diese Erklärung ihre Gültigkeit. Der oben beschriebene Gegenstand der Erklärung entspricht den einschlägigen Harmonisierungsrechtsvorschriften der Union. Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller.	certifies herewith that the products named in this overview were subjected to an EU-Type Examination (production type) and meet the essential safety requirements: EU-Pressure Equipment Directive “2014/68/EU” as amended. In the event of an alteration of the equipment not approved by us this declaration loses its validity. The object of the declaration described above conforms with the relevant Union harmonisation legislation. This declaration of conformity is issued under the sole responsibility of the manufacturer.	certifie par la présente que le produit mentionné dans cette vue d'ensemble a été soumis à un examen UE de type (type de fabrication) et qu'il est conforme aux exigences en matières de sécurité des dernières versions en vigueur de : Directive européenne relative aux appareils sous pression 2014/68/UE Ce communiqué n'est plus valable si nous effectuons une modification libre de l'appareil. L'objet décrit ci-dessus de la présente déclaration correspond aux prescriptions légales applicables en matière d'harmonisation de l'Union. Le fabricant porte l'entière responsabilité pour l'établissement de la présente déclaration de conformité.	certifica que los productos mencionados en este resumen han sido sometidos a un examen UE de tipo (tipo de producción) y cumplen con los requisitos mínimos de seguridad de: Directiva de equipos a presión de la UE 2014/68/UE en su versión vigente. En caso de una modificación no autorizada por nosotros, esta declaración pierde su validez. El objeto de la declaración descrita anteriormente es conforme a la legislación de armonización pertinente de la Unión. El fabricante es el único responsable de la expedición de esta declaración de conformidad.
Prüfgrundlage der EU-Baumusterprüfung (Baumuster) Specified requirements of the EU-Type Examination (production type) Base d'essai de l'examen UE de type (type de fabrication) Requisitos específicos del examen UE de tipo (tipo de producción))		DIN EN 334 DIN EN 14382	
Gültigkeitsdauer/Bescheinigung Term of validity/attestation Validité/certificat Periodo de validez / Certificado		2024-09-12 CE-0085CP0256	
Notifizierte Stelle (EU Baumusterprüfung: Modul B) Notified Body (EU type-examination: Module B) Organisme notifié (Examen de type de l'UE: module B) Organismo notificado (Examen tipo UE: Módulo B)		DVGW CERT GmbH Josef-Wirmer-Straße 1-3 D-53123 Bonn, Germany Notified Body number: 0085	
Überwachung des QM-Systems (Modul D) Monitoring of the QM system (module D) Contrôle de la gestion de l'assurance qualité (module D) Supervisión del sistema de calidad y seguridad módulo D)		TÜV SÜD Industrie Service GmbH Westendstraße 199 D-80686 München, Germany Notified Body number: 0036	
B. Sc., MBA, Simon P. Dungs Geschäftsführer / Chief Operating Officer Directeur / Gerente Urbach, 2023-07-17			

3. Declaration of conformity

Product	FRM-NOC 100...	Medium Pressure Regulator 10 bar
Manufacturer	Karl Dungs GmbH & Co. KG · Karl-Dungs-Platz 1 · D-73660 Urbach/Germany	
Certifies herewith that the products named in this overview were subjected to a Type Examination (production type) and meet the essential safety requirements: • The Pressure Equipment Safety Regulations, UKSI 2016:1105 (as amended by UKSI 2019: 969) In the event of an alteration of the equipment not approved by us this declaration loses its validity. The object of the declaration described above conforms with the relevant legislation. This declaration of conformity is issued under the sole responsibility of the manufacturer.		
Specified requirements of the Type Examination (production type)		DIN EN 334 DIN EN 14382
Term of validity		2032-07-13
Approved Body		2016 No. 1105 TUV SUD BABT Unlimited Octagon House, Concorde Way, Segensworth North, Fareham, Hampshire, PO15 5RL, United Kingdom Approved Body Number: 0168
Monitoring of the QA system		Conformity process adopted: Module B+D
B.Sc., MBA Simon P. Dungs, Chief Operating Officer Urbach, 2023-07-17		

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5. Abbreviations

Abbreviation	Description
AG_o	Response pressure group of the overpressure shut-off (OPSO)
AG_u	Response pressure group of the underpressure shut-off (UPSO)
AC	Accuracy class
ASE	Safety shutoff valve (SAV) without housing (as spare part)
K_G	Flow volume coefficient for natural gas
DN	Nominal diameter
Fail-open	If the main diaphragm or the auxiliary pressure required for the actuation of the main valve fails, the main valve moves automatically to the open position.
DS	Type: differential strength range
Class A	Functional class: in case the membrane is damaged or in the event of a breakdown of the impulse line pressure the SAV closes
MOP	Maximum admissible operating pressure
p_d	Outlet pressure
$p_{d, abs.}$	Output pressure as absolute pressure
p_u	Inlet pressure
$p_{u, abs.}$	Inlet pressure as absolute pressure
p_{do}	Overpressure shut-off (OPSO)
p_{du}	Underpressure shut-off (UPSO)
p_{max}	Maximum operating pressure
PN	Nominal pressure rating of the flange
PS	Maximum admissible pressure
SAV	Safety shutoff valve / Slam-shut valve (same as ASE but with housing)
SBV	Safety relief valve
SG	Lock-up pressure class
SN	Serial number
SZ	Lock up pressure zone group
T_p	Operating temperature -20 °C ... +60 °C
W_{ds}	Specific guide range
W_{do}	Adjustment range for the overpressure shut-off (OPSO) through regulation of the available adjusting springs
W_{du}	Adjustment range for the underpressure shut-off (UPSO) through regulation of the available adjusting springs
W_{dso}	Specific adjustment range of the adjusting spring installed for the over pressure shut-off (OPSO)
W_{dsu}	Specific adjustment range of the adjusting spring installed for the under pressure shut-off (UPSO)

6. Features

6.1 Technical data

Technical data	FRM-NOC			
Device	Medium pressure regulator with spring loading in accordance with EN 334			
Type of construction	DS (differential range)			
Type of gas	Family 1+2+3 (e.g. manufactured gas (town gas), commercial grade natural gas and commercial grade LPG gases in the vaporized phase).			
Nominal diameters Flange	Connecting flanges PN 25 according to EN 1092-1 or ANSI Class 150 per B16.5			
	DN	25	40	50
	NPS	1"	1.5"	2"
Nominal diameters Thread	Connecting thread in accordance (ISO7/1) or NPT (B1.20.1)			
	Rp	1"	1.5"	2"
	NPT	1"	1.5"	2"
Permissible pressure load	10 bar (1 000 kPa / 145 PSI)			
Max. inlet pressure	10 bar (1 000 kPa / 145 PSI)			
Outlet pressure range	20 - 4 000 mbar (2 - 400 kPa) / 8 - 1 600 "W.C. (0.3 - 58 PSI)			
Minimum inlet pressure (ND)	40 mbar (4 kPa) / 16 "W.C. (0.6 PSI)			
Minimum inlet pressure (MD)	160 mbar (16 kPa) / 64 "W.C. (2.3 PSI)			
Minimum inlet pressure (HD)	550 mbar (55 kPa) / 220 "W.C. (8 PSI)			
Minimum inlet pressure (UHD)	1 250 mbar (125 kPa) / 502 "W.C. (18 PSI)			
Materials	Body of the regulator:		Cast iron GJS 400-15	
	Actuator housing:		Steel sheet (UHD)/aluminium	
	Membranes:		NBR	
Ambient temperature	-20 °C to + 60 °C / -4 °F to + 140 °F			
Relief valve	Optional. Can be activated with limited capacity			

Technical data	SAV ...
Device	Safety shut-off valve according to EN 14382
Type of construction	DS (differential range)
Reaction time	≤ 2s
Adjustment range for shut-down W_{du}	10 - 3 000 mbar (1 - 300 kPa) / 4 - 1 200 "W.C. (0.15 - 43 PSI)
Adjustment range for overpressure W_{do}	40 - 5 000 mbar (4 - 500 kPa) / 16 - 2 005 "W.C. (0.6 - 72 PSI)
Materials	Actuator body: Cast iron GJS 400-15 Actuator housing: Aluminium Diaphragms: NBR

6.2 Nomenclature

Example FRM-NOC 100025 ND / SAV ND		100	025	ND	SAV	ND
Type	Medium pressure regulator spring-loaded					
Maximum operating pressure MOP	100 ... 10 000 mbar (1 000 kPa) 4 018 "W.C. (145 PSI)					
Nominal diameter	10 1"					
	15 1½"					
	20 2"					
	025 DN 25					
	040 DN 40					
	050 DN 50					
Outlet pressure ranges	ND Low pressure					
	MD Medium pressure					
	HD High pressure					
	UHD Ultra high pressure					
Safety device	SAV Integrated safety cut-off valve					
Cracking pressure ranges	ND Low pressure					
	MD Medium pressure					
	HD High pressure					
	UHD Ultra high pressure					
Type of thread/flange	with Standard Rp or PN-25					
	ANSI with flanges ANSI Class 150					
	NPT with threads NPT					

6.3 Adjustment ranges

Type	Con- nection	Ver- sion	Ac- curacy class* [AC]	Closing pressure class* [SG]	Outlet pressure range W _d	Monitoring depression SAV		Monitoring overpressure SAV	
						W _{du}	AG	W _{do}	AG
FRM-NOC 10010 ND	Rp 1	ND	10 %	20 %	20-100 mbar 8-40 "W.C.		10 % ***		10 %
FRM-NOC 10010 MD	Rp 1	MD	10 %	20 %	80-400 mbar 32-161 "W.C.		10 % ***		10 %
FRM-NOC 10010 HD	Rp 1	HD	5 %	10 %	300-1 500 mbar 120-602 "W.C.		5 %		5 %
FRM-NOC 10010 UHD	Rp 1	UHD	5 %	10 %	1 000-4 000 mbar 400-1 600 "W.C.		5 %		5 %
FRM-NOC 10010 ND / SAV ND	Rp 1	ND	10 %	20 %	20-100 mbar 8-40 "W.C.	10-115 mbar 4-46 "W.C.	10 % ***	40-240 mbar 16-96 "W.C.	10 %
FRM-NOC 10010 MD / SAV MD	Rp 1	MD	10 %	20 %	80-400 mbar 32-161 "W.C.	35-400 mbar 12-160 "W.C.	10 % ***	180-800 mbar 72-321 "W.C.	10 %
FRM-NOC 10010 HD / SAV HD	Rp 1	HD	5 %	10 %	300-1 500 mbar 120-602 "W.C.	150-1400 mbar 60-562 "W.C.	5 %	500-3 500 mbar 200-1 406 "W.C.	5 %
FRM-NOC 10010 UHD / SAV UHD	Rp 1	UHD	5%	10 %	1 000-4 000 mbar 400-1 600 "W.C.	150-3000 mbar 60-1 200 "W.C.	5 %	1 300-5 000 mbar 522-2 005 "W.C.	5 %
FRM-NOC 10015 ND	Rp 1½	ND	10 %	20 %	20-100 mbar 8-40 "W.C.		10 % ***		10 %
FRM-NOC 10015 MD	Rp 1½	MD	10 %	20 %	80-400 mbar 32-161 "W.C.		10 % ***		10 %
FRM-NOC 10015 HD	Rp 1½	HD	5 %	10 %	300-1 500 mbar 120-602 "W.C.		5 %		5 %
FRM-NOC 10015 UHD	Rp 1½	UHD	5 %	10 %	1 000-4 000 mbar 400-1 600 "W.C.		5 %		5 %
FRM-NOC 10015 ND / SAV ND	Rp 1½	ND	10 %	20 %	20-100 mbar 8-40 "W.C.	10-115 mbar 4-46 "W.C.	10 % ***	40-240 mbar 16-96 "W.C.	10 %
FRM-NOC 10015 MD / SAV MD	Rp 1½	MD	10 %	20 %	80-400 mbar 32-161 "W.C.	35-400 mbar 12-160 "W.C.	10 % ***	180-800 mbar 72-321 "W.C.	10 %
FRM-NOC 10015 HD / SAV HD	Rp 1½	HD	5 %	10 %	300-1 500 mbar 120-602 "W.C.	150-1 400 mbar 60-562 "W.C.	5 %	500-3 500 mbar 200-1 406 "W.C.	5 %
FRM-NOC 10015 UHD / SAV UHD	Rp 1½	UHD	5 %	10 %	1 000-4 000 mbar 400-1 600 "W.C.	150-3 000 mbar 60-1 200 "W.C.	5 %	1 300-5 000 mbar 522-2 005 "W.C.	5 %
FRM-NOC 10020 ND	Rp 2	ND	10 %	20 %	20-100 mbar 8-40 "W.C.		10 % ***		10 %
FRM-NOC 10020 MD	Rp 2	MD	10 %	20 %	80-400 mbar 32-161 "W.C.		10 % ***		10 %
FRM-NOC 10020 HD	Rp 2	HD	5 %	10 %	300-1 500 mbar 120-602 "W.C.		5 %		5 %
FRM-NOC 10020 UHD	Rp 2	UHD	5 %	10 %	1 000-4 000 mbar 400-1 600 "W.C.		5 %		5 %
FRM-NOC 10020 ND / SAV ND	Rp 2	ND	10 %	20 %	20-100 mbar 8-40 "W.C.	10-115 mbar 4-46 "W.C.	10 % ***	40-240 mbar 16-96 "W.C.	10 %
FRM-NOC 10020 MD / SAV MD	Rp 2	MD	10 %	20 %	80-400 mbar 32-161 "W.C.	35-400 mbar 12-160 "W.C.	10 % ***	180-800 mbar 72-321 "W.C.	10 %
FRM-NOC 10020 HD / SAV HD	Rp 2	HD	5 %	10 %	300-1 500 mbar 120-602 "W.C.	150-1 400 mbar 60-562 "W.C.	5 %	500-3 500 mbar 200-1 406 "W.C.	5 %
FRM-NOC 10020 UHD / SAV UHD	Rp 2	UHD	5 %	10 %	1 000-4 000 mbar 400-1 600 "W.C.	150-3 000 mbar 60-1 200 "W.C.	5 %	1 300-5 000 mbar 522-2 005 "W.C.	5 %
FRM-NOC 10025 ND	DN 25	ND	10 %	20 %	20-100 mbar 8-40 "W.C.		10 % ***		10 %
FRM-NOC 10025 MD	DN 25	MD	10 %	20 %	80-400 mbar 32-161 "W.C.		10 % ***		10 %
FRM-NOC 10025 HD	DN 25	HD	5 %	10 %	300-1 500 mbar 120-602 "W.C.		5 %		5 %
FRM-NOC 10025 UHD	DN 25	UHD	5 %	10 %	1 000-4 000 mbar 400-1 600 "W.C.		5 %		5 %

Type	Con- nec- tion	Ver- sion	Ac- cu- racy class* [AC]	Closing pressure class* [SG]	Outlet pressure range W_d	Monitoring depression SAV		Monitoring overpressure SAV	
						W_{du}	AG	W_{do}	AG
FRM-NOC 100025 ND / SAV ND	DN 25	ND	10 %	20 %	20-100 mbar 8-40 "W.C.	10-115 mbar 4-46 "W.C.	10 % ***	40-240 mbar 16-96 "W.C.	10 %
FRM-NOC 100025 MD / SAV MD	DN 25	MD	10 %	20 %	80-400 mbar 32-161 "W.C.	35-400 mbar 12-160 "W.C.	10 % ***	180-800 mbar 72-321 "W.C.	10 %
FRM-NOC 100025 HD / SAV HD	DN 25	HD	5 %	10 %	300-1 500 mbar 120-602 "W.C.	150-1 400 mbar 60-562 "W.C.	5 %	500-3 500 mbar 200-1 406 "W.C.	5 %
FRM-NOC 100025 UHD / SAV UHD	DN 25	UHD	5 %	10 %	1 000-4 000 mbar 400-1 600 "W.C.	150-3 000 mbar 60-1 200 "W.C.	5 %	1 300-5 000 mbar 522-2 005 "W.C.	5 %
FRM-NOC 100040 ND	DN 40	ND	10 %	20 %	20-100 mbar 8-40 "W.C.		10 % ***		10 %
FRM-NOC 100040 MD	DN 40	MD	10 %	20 %	80-400 mbar 32-161 "W.C.		10 % ***		10 %
FRM-NOC 100040 HD	DN 40	HD	5 %	10 %	300-1 500 mbar 120-602 "W.C.		5 %		5 %
FRM-NOC 100040 UHD	DN 40	UHD	5 %	10 %	1 000-4 000 mbar 400-1 600 "W.C.		5 %		5 %
FRM-NOC 100040 ND / SAV ND	DN 40	ND	10 %	20 %	20-100 mbar 8-40 "W.C.	10-115 mbar 4-46 "W.C.	10 % ***	40-240 mbar 16-96 "W.C.	10 %
FRM-NOC 100040 MD / SAV MD	DN 40	MD	10 %	20 %	80-400 mbar 32-161 "W.C.	35-400 mbar 12-160 "W.C.	10 % ***	180-800 mbar 72-321 "W.C.	10 %
FRM-NOC 100040 HD / SAV HD	DN 40	HD	5 %	10 %	300-1 500 mbar 120-602 "W.C.	150-1 400 mbar 60-562 "W.C.	5 %	500-3 500 mbar 200-1 406 "W.C.	5 %
FRM-NOC 100040 UHD / SAV UHD	DN 40	UHD	5 %	10 %	1 000-4 000 mbar 400-1 600 "W.C.	150-3 000 mbar 60-1 200 "W.C.	5 %	1 300-5 000 mbar 522-2 005 "W.C.	5 %
FRM-NOC 100050 ND	DN 50	ND	10 %	20 %	20-100 mbar 8-40 "W.C.		10 % ***		10 %
FRM-NOC 100050 MD	DN 50	MD	10 %	20 %	80-400 mbar 32-161 "W.C.		10 % ***		10 %
FRM-NOC 100050 HD	DN 50	HD	5 %	10 %	300-1 500 mbar 120-602 "W.C.		5 %		5 %
FRM-NOC 100050 UHD	DN 50	UHD	5 %	10 %	1 000-4 000 mbar 400-1 600 "W.C.		5 %		5 %
FRM-NOC 100050 ND / SAV ND	DN 50	ND	10 %	20 %	20-100 mbar 8-40 "W.C.	10-115 mbar 4-46 "W.C.	10 % ***	40-240 mbar 16-96 "W.C.	10 %
FRM-NOC 100050 MD / SAV MD	DN 50	MD	10 %	20 %	80-400 mbar 32-161 "W.C.	35-400 mbar 12-160 "W.C.	10 % ***	180-800 mbar 72-321 "W.C.	10 %
FRM-NOC 100050 HD / SAV HD	DN 50	HD	5 %	10 %	300-1 500 mbar 120-602 "W.C.	150-1 400 mbar 60-562 "W.C.	5 %	500-3 500 mbar 200-1 406 "W.C.	5 %
FRM-NOC 100050 UHD / SAV UHD	DN 50	UHD	5 %	10 %	1 000-4 000 mbar 400-1 600 "W.C.	150-3 000 mbar 60-1 200 "W.C.	5 %	1 300-5 000 mbar 522-2 005 "W.C.	5 %

*Accuracy class de / closing pressure group in accordance with EN 334

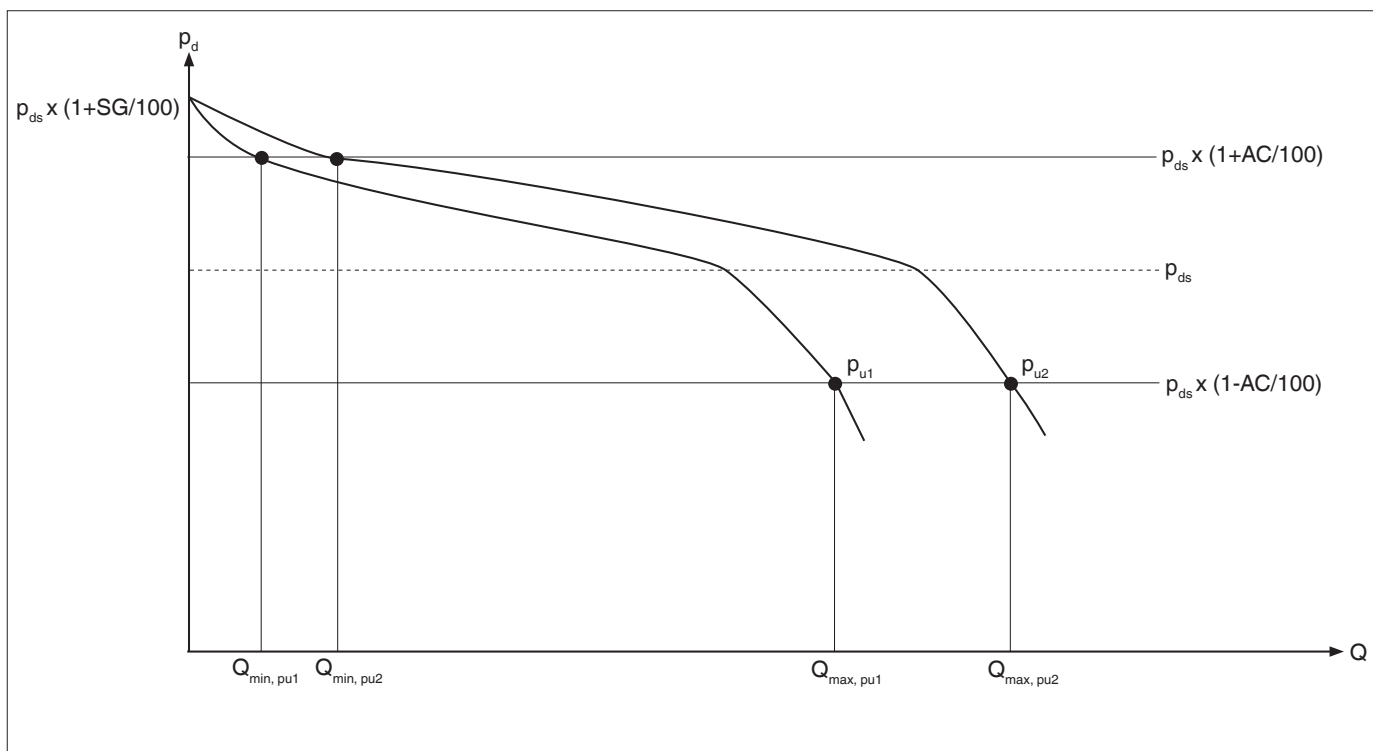
** p_d = 80-180 mbar: AC 10, SG 20 / p_d = 180-420 mbar: AC 5, SG 10

*** AG 30 for W_{du} settings 10...39 mbar // AG 20 for W_{du} settings 40...59 mbar

6.4 Accuracy class / closing pressure class

AC and SG data according to EN 334 do not constitute a declaration with respect to the modulation range. For field use it is important to know the minimum and maximum flow rates. Therefore, the accuracy characteristics 'accuracy class and shut-off pressure class' were determined which can be guaranteed for a flow rate of 1:10.

The AC values of the above table refer to the maximum possible percentage deviation of the output pressure from the adjusted set-point, in which $Q_{\max} / Q_{\min} \leq 10$ is observed.



Abbrevia- tion	Description
AC	Accuracy class
p_d	Outlet pressure
$p_{u\frac{1}{2}}$	Inlet pressure
p_{ds}	Set nominal value of the outlet pressure
SG	Lock-up pressure class
$Q_{\min} / p_{u\frac{1}{2}}$	AC minimum flow volume at a specific inlet pressure p_u (lower limit of the volume flow at which the stable operating conditions for a given nominal value within the given operating temperature range).
$Q_{\max} / p_{u\frac{1}{2}}$	AC maximum flow volume at a specific inlet pressure p_u (upper limit of the volume flow at which a given accuracy class for a given nominal value within the given operating temperature range).

6.5 Selection of regulating spring

6.5.1 For FRM-NOC 10010 / 10015 / 100025

Outlet pressure adjustment range W_{ds}								
Spring colour	Item N°	Wire Ø [mm]	Ø [mm]	Length [mm]	Adjustment range			
					ND	MD	HD	UHD
Red	287881	2.5	37	134	20-35 mbar 8-14 "W.C.			
White	287882	2.8	37	134	30-50 mbar 12-20 "W.C.			
Yellow	287883	3	37	134	50-75 mbar 20-30 "W.C.			
Blue	274969	3.2	37	130	60-100 mbar 24-40 "W.C.	80-150 mbar 32-60 "W.C.		
Black	274970	3.5	37	130		100-200 mbar 40-80 "W.C.		
Purple	274971	3.7	37	130		130-250 mbar 52-100 "W.C.		
Orange	274972	4	37	130		180-350 mbar 72-141 "W.C.		
Pink	274973	4.3	37	130		200-400 mbar 80-161 "W.C.		
White 2	287888	4.5	35	100			300-500 mbar 120-201 "W.C.	
Yellow 2	287889	5	35	100			450-700 mbar 181-281 "W.C.	
Blue 2	287890	5.5	35	100			550-900 mbar 221-361 "W.C.	
Black 2	287891	6	35	100			650-1 150 mbar 261-462 "W.C.	
Purple 2	287892	6.5	35	100			1 000-1 500 mbar 401-602 "W.C.	
Purple 3	287893	10	70	155				1 000-1 600 mbar 401-642 "W.C.
Orange 2	287894	11	70	155				1 500-2 400 mbar 602-964 "W.C.
Pink 2	287895	12	73	155				2 300-3 600 mbar 923-1 445 "W.C.
Red 2	287896	13	74	160				3 500-4 000 mbar 1 405-1 606 "W.C.

6.5.2 For FRM-NOC 10020 / 100040 / 100050

Outlet pressure adjustment range W_{ds}								
Spring colour	Item N°	Wire Ø [mm]	Ø [mm]	Length [mm]	Adjustment range			
					ND	MD	HD	UHD
Yellow	287884	3.5	50	220	20-25 mbar 8-10 "W.C.			
Blue	287885	4	50	220	25-45 mbar 10-18 "W.C.			
Black	287886	4.5	50	220	30-65 mbar 12-26 "W.C.			
Silver	287887	5	50	220	50-100 mbar 20-40 "W.C.			
Pink	274982	5.5	50	260		80-150 mbar 32-60 "W.C.		
Green	274983	6	50	260		130-250 mbar 52-100 "W.C.		
Blue 2	274985	7	50	240		200-350 mbar 80-141 "W.C.		
Black 2	274986	8	50	240		300-400 mbar 120-161 "W.C.		
White	287888	4.5	35	100			300-500 mbar 120-201 "W.C.	
Yellow 2	287889	5	35	100			450-700 mbar 181-281 "W.C.	
Blue 3	287890	5.5	35	100			550-900 mbar 221-361 "W.C.	
Black 2	287891	6	35	100			650-1 150 mbar 261-462 "W.C.	
Purple 2	287892	6.5	35	100			1 000-1 500 mbar 401-602 "W.C.	
Purple 3	287893	10	70	155				1 000-1 600 mbar 401-642 "W.C.
Orange 2	287894	11	70	155				1 500-2 400 mbar 602-964 "W.C.
Pink 2	287895	12	73	155				2 300-3 600 mbar 923-1 445 "W.C.
Red 2	287896	13	74	160				3 500-4 000 mbar 1 405-1 606 "W.C.

6.6 Selection of spring SAV

Specific adjustment range, underpressure W_{dsu}								
Spring colour	Order number	Wire Ø [mm]	Length [mm]	Ø [mm]	Setpoint range			
					ND	MD	HD	UHD
White	270353	1.2	60	10.0	10 - 32 mbar 4 - 12 "W.C.			
Yellow	270355	1.5	55	12.3	24 - 40 mbar 9 - 16 "W.C.			
Blue	270356	2.0	55	12.3	30 - 115 mbar 12 - 46 "W.C.	35 - 110 mbar 14 - 44 "W.C.		
Black	270357	2.3	55	12.3		50 - 250 mbar 20 - 100 "W.C.		
Purple	270358	2.5	55	12.3		80 - 400 mbar 32 - 160 "W.C.	150 - 500 mbar 60 - 200 "W.C.	150 - 500 mbar 62 - 101 "W.C.
Orange	270359	3.2	55	15.0			300 - 1 000 mbar 120 - 401 "W.C.	300 - 1 000 mbar 121 - 402 "W.C.
Silver	270360	3.0	60	15.0			800 - 1 400 mbar 321 - 563 "W.C.	800 - 1 400 mbar 321 - 563 "W.C.
Pink	276126	3.5	60	15.0				1 200 - 3 000 mbar 482 - 1 205 "W.C.

Specific adjustment range, overpressure W_{dso}								
Spring colour	Order number	Wire Ø [mm]	Length [mm]	Ø [mm]	Setpoint range			
					ND	MD	HD	UHD
Silver	270361	2.2	60	30.0	40 - 130 mbar 16 - 52 "W.C.			
Green	270366	2.5	60	30.0	60 - 190 mbar 24 - 76 "W.C.	180 - 290 mbar 72 - 116 "W.C.		
Red	270367	2.7	60	30.0	90 - 240 mbar 36 - 98 "W.C.	230 - 370 mbar 92 - 148 "W.C.		
Yellow	270368	3.2	60	30.0		300 - 500 mbar 120 - 200 "W.C.		
Blue	270369	3.5	60	30.0		400 - 800 mbar 160 - 321 "W.C.	500 - 1 000 mbar 120 - 401 "W.C.	
Black	270370	3.7	60	30.0			700 - 1 300 mbar 281 - 522 "W.C.	
Purple	270371	4.0	60	30.0			1 000 - 1 800 mbar 401 - 723 "W.C.	
Orange	270372	4.5	60	30.0			1 300 - 2 500 mbar 522 - 1 004 "W.C.	1 300 - 2 500 mbar 522 - 1 005 "W.C.
Pink	270373	4.8	60	30.0			1 800 - 3 500 mbar 723 - 1 406 "W.C.	1 800 - 3 500 mbar 723 - 1 407 "W.C.
White	271115	5.0	60	30.0				2 500 - 5 000 mbar 1 005 - 2 009 "W.C.

6.7 Type plate

Regulator



Abbrevia- tion	Description
AG_o	Response pressure group of the overpressure shut-off (OPSO)
AG_u	Response pressure group of the underpressure shut-off (UPSO)
AC	Accuracy class
K_G	Flow volume coefficient for natural gas
DN	Nominal diameter
Fail-open	If the main diaphragm or the auxiliary pressure required for the actuation of the main valve fails, the main valve moves automatically to the open position.
DS	Type: differential strength range
Class A	Functional class: in case the membrane is damaged or in the event of a breakdown of the impulse line pressure the SAV closes
p_d	Outlet pressure
p_u	Inlet pressure
PN	Nominal pressure of the flange
PS	Maximum admissible pressure
SAV	Safety shutoff valve / slam-shut valve (ASE without housing)
SG	Lock-up pressure class
-20T60	Operating temperature -20 °C ... +60 °C / -4 °F to + 140 °F
SN	Serial number
W_{ds}	Specific guide range
W_{do}	Adjustment range for the overpressure shut-off (OPSO) through regulation of the available adjusting springs
W_{du}	Adjustment range for the underpressure shut-off (UPSO) through regulation of the available adjusting springs
W_{dso}	Specific adjustment range of the adjusting spring installed for the overpressure shut-off (OPSO)
W_{dsu}	Specific adjustment range of the adjusting spring installed for the underpressure shut-off (UPSO)

7. Function

The pressure regulator has the task of maintaining constant outlet pressure despite fluctuations in inlet pressure and/or flow. In the depressurised state, the regulator is open. The pressure regulator meets the requirements of EN 334 as a gas pressure regulator of the differential resistance type (DS) and zero flow rate.

Main components

- A** Seal
- B** Set point spring
- C** Bottom membrane enclosure
- D** Lever system
- E** Breathing connection
- F** Working membrane

Depressurised state

The force of the setpoint spring **B** acts on the working diaphragm **F**. In depressurised state there is no counterforce acting in the lower diaphragm shell **C**, since no overpressure is applied in the outlet range. The resulting upward movement of the working diaphragm causes the lever system **D** to be pushed downwards. In this way, the control plate **A** is then pulled upwards and lifted from the seat. The regulator is open.

Steady State

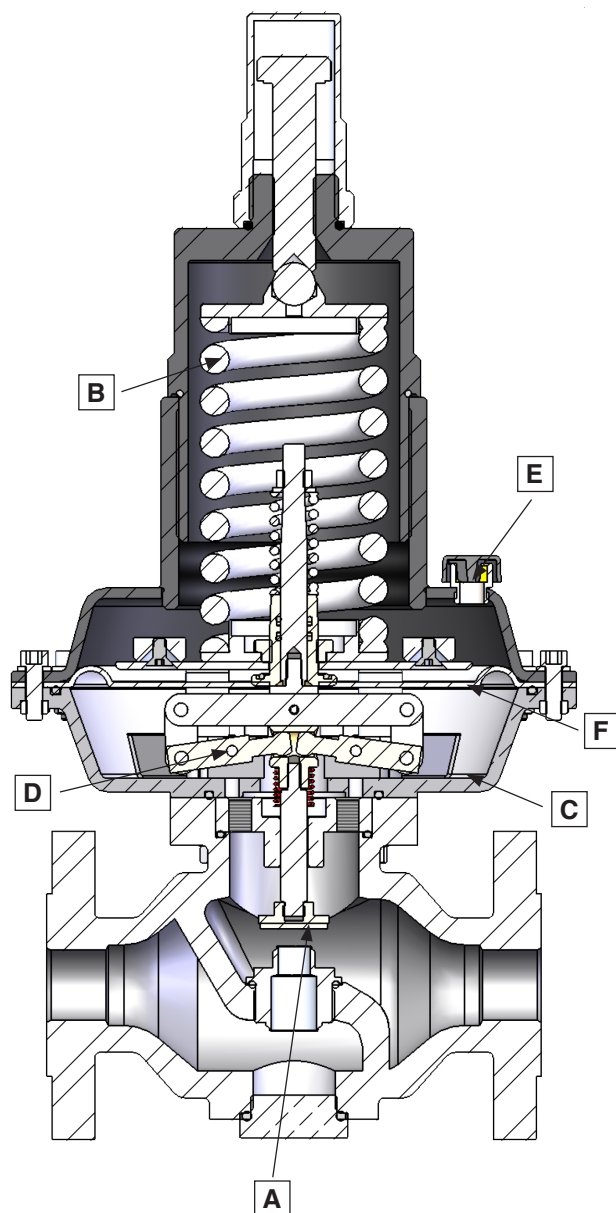
In case of increasing outlet pressure, the force on the working diaphragm **F** in the diaphragm shell **C** increases also. The working diaphragm **F** is thus pushed upwards until the force of the setpoint spring **B** is equal to that of the outlet pressure. The upward movement of the working diaphragm **F** causes the lever system **D** to be pulled upwards. In this way, the control plate **A** is then pushed downwards and the valve gap is reduced. The flow volume decreased in this way reduces the outlet pressure until the set nominal value (outlet pressure) is reached again and a balance of forces at the working diaphragm **F** is established.

If the outlet pressure drops, the force on the working diaphragm **F** in the lower diaphragm shell **C** decreases also. The working diaphragm **F** is, thus, pushed downwards until the force of the setpoint spring **B** is equal to that of the outlet pressure. The downward movement of the working diaphragm **F** causes the lever system **D** to be pushed downwards. In this way, the control plate **A** is then pulled upwards and the valve gap is increased. The increased flow volume increases the outlet pressure until the set nominal value (outlet pressure) is reached again and a balance of forces at the working diaphragm **F** is established.

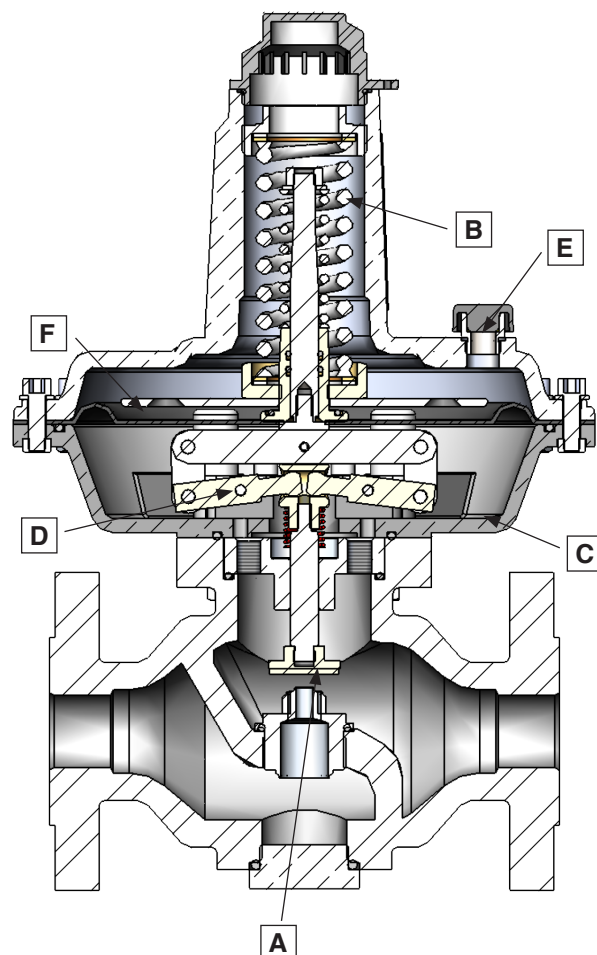
Influence of changes in inlet pressure on outlet pressure

Changes in the inlet pressure have a influence on the outlet pressure, as there is no balancing device. The ratio of changes depends on the size of the working membrane (fixed size) and the size of the shell (variable).

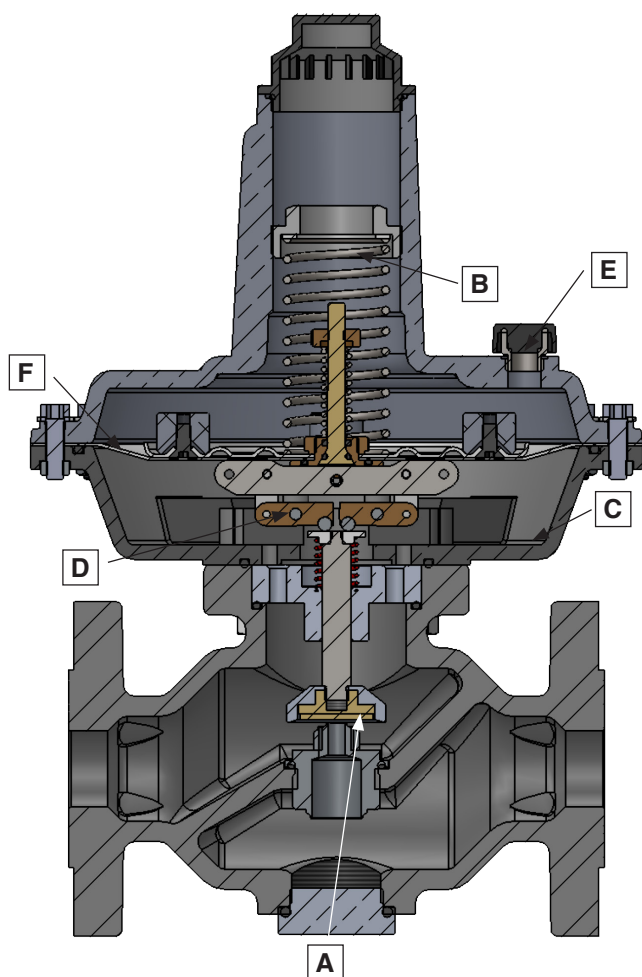
Type UHD



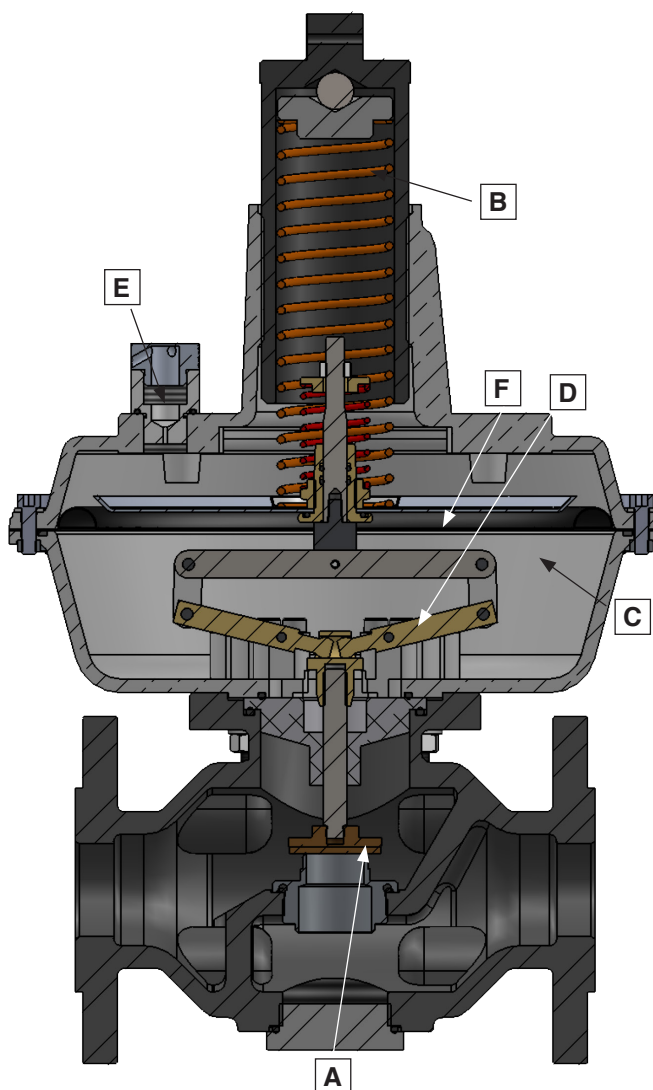
Type HD



ND, MD for Rp 1", Rp 1,5" and DN 25

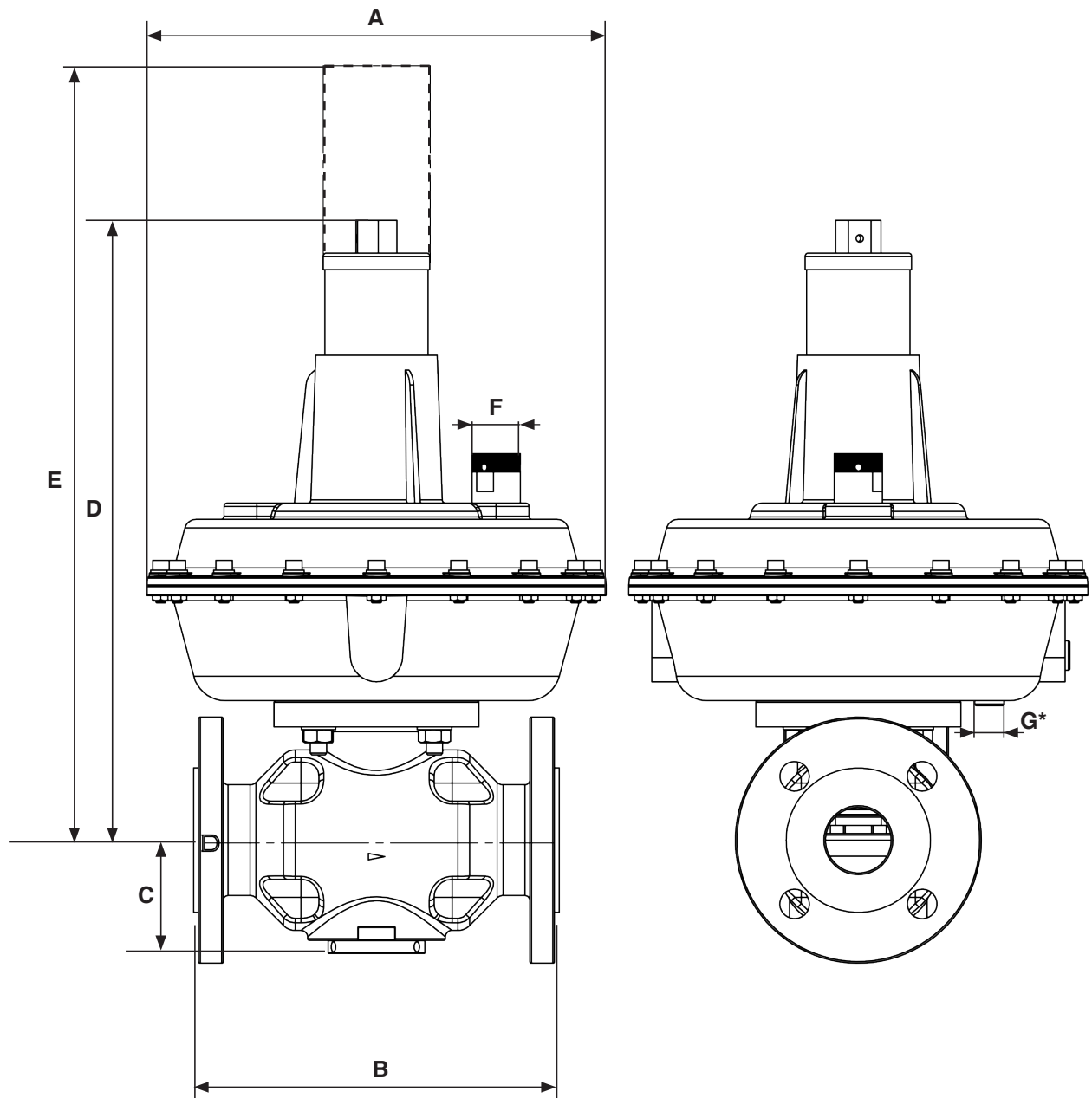


ND, MD for Rp 2", DN 40, DN 50



8. Dimensions

FRM-NOC...



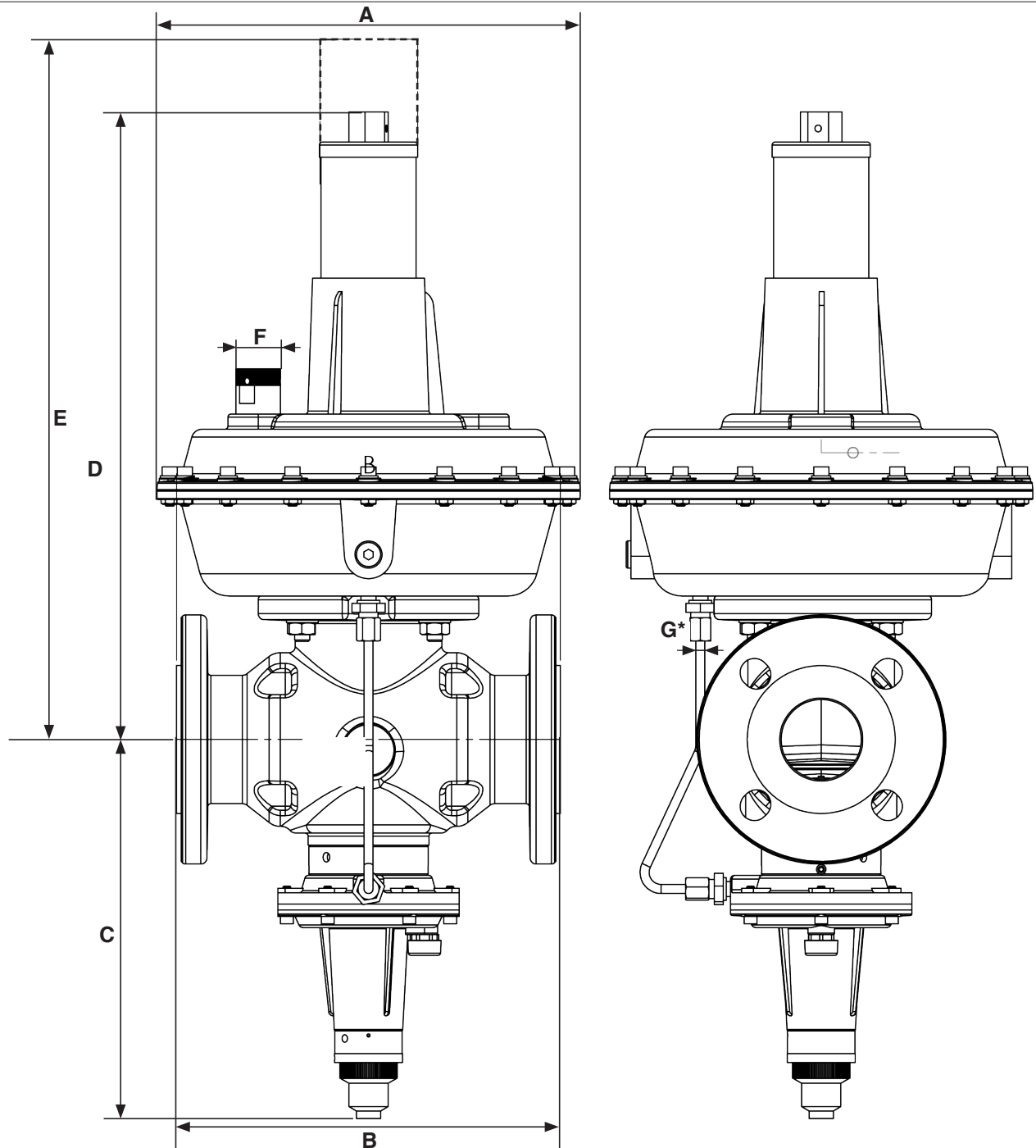
Option external line: Only on request.

* Ermeto screw connection 12 L: GE 12 - 1/4 with screw connection M 16 for pipes 12 x 1.5

Type	Item N°		p _{max.} [bar/kPa/PSI]	DN	Dimensions [mm]							Weight [kg/lbs]
	Rp	NPT			A	B	C	D	E	F	G	
FRM-NOC 10010 ND	279054	280236	10 / 1 000 / 145	1"	210	104	-240	240	250	½ "G	¼ "G	5/11.0
FRM-NOC 10010 MD	279055	280237	10 / 1 000 / 145	1"	210	104	-240	240	250	½ "G	¼ "G	5/11.0
FRM-NOC 10010 HD	279058	280238	10 / 1 000 / 145	1"	210	104	-240	240	250	½ "G	¼ "G	5/11.0
FRM-NOC 10010 UHD	279059	280239	10 / 1 000 / 145	1"	210	104	-342	342	667	½ "G	¼ "G	9/19.8
FRM-NOC 10015 ND	279060	280240	10 / 1 000 / 145	1½"	210	132	-240	240	250	½ "G	¼ "G	6/13.2
FRM-NOC 10015 MD	279061	280241	10 / 1 000 / 145	1½"	210	132	-240	240	250	½ "G	¼ "G	6/13.2
FRM-NOC 10015 HD	279062	280242	10 / 1 000 / 145	1½"	210	132	-240	240	250	½ "G	¼ "G	6/13.2
FRM-NOC 10015 UHD	279063	280243	10 / 1 000 / 145	1½"	210	132	-342	342	667	½ "G	¼ "G	10/22.0
FRM-NOC 10020 ND	279064	280244	10 / 1 000 / 145	2"	280	156	61	345	495	½ "G	¼ "G	12/26.5
FRM-NOC 10020 MD	279065	280245	10 / 1 000 / 145	2"	280	156	61	345	495	½ "G	¼ "G	12/26.5
FRM-NOC 10020 HD	279066	280246	10 / 1 000 / 145	2"	210	156	61	245	255	½ "G	¼ "G	11/24.3
FRM-NOC 10020 UHD	279067	280247	10 / 1 000 / 145	2"	210	156	61	345	670	½ "G	¼ "G	16/35.2

Type	Item N°		p _{max.} [bar/kPa/PSI]	DN	Dimensions [mm]							Weight [kg/lbs]
	DN	NPS			A	B	C	D	E	F	G	
FRM-NOC 100025 ND	279085	280260	10 / 1 000 / 145	25	210	184	50	260	270	½ "G	¼ "G	9/19.8
FRM-NOC 100025 MD	279086	280261	10 / 1 000 / 145	25	210	184	50	260	270	½ "G	¼ "G	9/19.8
FRM-NOC 100025 HD	279087	280262	10 / 1 000 / 145	25	210	184	50	260	270	½ "G	¼ "G	9/19.8
FRM-NOC 100025 UHD	279088	280263	10 / 1 000 / 145	25	210	184	50	362	687	½ "G	¼ "G	13/28.7
FRM-NOC 100040 ND	279089	280264	10 / 1 000 / 145	40	280	223	70	350	500	½ "G	¼ "G	17/37.5
FRM-NOC 100040 MD	279090	280265	10 / 1 000 / 145	40	280	223	70	350	500	½ "G	¼ "G	17/37.5
FRM-NOC 100040 HD	279091	280266	10 / 1 000 / 145	40	210	223	70	250	260	½ "G	¼ "G	16/35.2
FRM-NOC 100040 UHD	279092	280267	10 / 1 000 / 145	40	210	223	70	350	675	½ "G	¼ "G	21/46.3
FRM-NOC 100050 ND	279093	280268	10 / 1 000 / 145	50	280	254	80	400	550	½ "G	¼ "G	20/44.1
FRM-NOC 100050 MD	279094	280269	10 / 1 000 / 145	50	280	254	80	400	550	½ "G	¼ "G	20/44.1
FRM-NOC 100050 HD	279095	280270	10 / 1 000 / 145	50	210	254	80	300	310	½ "G	¼ "G	19/41.9
FRM-NOC 100050 UHD	279096	280271	10 / 1 000 / 145	50	210	254	80	395	720	½ "G	¼ "G	24/52.9

FRM-NOC... / SAV



Option external line: Only on request.

* Ermeto screw connection 12 L: GE 12 - 1/4 with screw connection M 16 for pipes 12 x 1.5

Type	Item N°		p _{max.} [bar/kPa]	DN	Dimensions [mm]							Weight [kg/lbs]
	Rp	NPT			A	B	C	D	E	F	G	
FRM-NOC 10010 ND /SAV ND	279042	280224	10 / 1000 / 145	1"	210	104	245	240	250	½" G	¼" G	7/15.4
FRM-NOC 10010 MD /SAV MD	279043	280225	10 / 1000 / 145	1"	210	104	245	240	250	½" G	¼" G	7/15.4
FRM-NOC 10010 HD /SAV HD	279044	280226	10 / 1000 / 145	1"	210	104	245	240	250	½" G	¼" G	7/15.4
FRM-NOC 10010 UHD /SAV UHD	279045	280227	10 / 1000 / 145	1"	210	104	245	342	667	½" G	¼" G	11/24.3
FRM-NOC 10015 ND /SAV ND	279046	280228	10 / 1000 / 145	1½"	210	132	245	240	250	½" G	¼" G	8/17.6
FRM-NOC 10015 MD /SAV MD	279047	280229	10 / 1000 / 145	1½"	210	132	245	240	250	½" G	¼" G	8/17.6
FRM-NOC 10015 HD /SAV HD	279048	280230	10 / 1000 / 145	1½"	210	132	245	240	250	½" G	¼" G	8/17.6
FRM-NOC 10015 UHD /SAV UHD	279049	280231	10 / 1000 / 145	1½"	210	132	245	342	667	½" G	¼" G	12/26.5
FRM-NOC 10020 ND /SAV ND	279050	280232	10 / 1000 / 145	2"	280	156	245	345	495	½" G	¼" G	14/30.9
FRM-NOC 10020 MD /SAV MD	279051	280233	10 / 1000 / 145	2"	280	156	245	345	495	½" G	¼" G	14/30.9
FRM-NOC 10020 HD /SAV HD	279052	280234	10 / 1000 / 145	2"	210	156	245	245	255	½" G	¼" G	13/28.7
FRM-NOC 10020 UHD /SAV UHD	279053	280235	10 / 1000 / 145	2"	210	156	250	345	670	½" G	¼" G	18/39.7

Type	Item N°		p _{max.} [bar/kPa]	DN	Dimensions [mm]							Weight [kg/lbs]
	DN	NPS			A	B	C	D	E	F	G	
FRM-NOC 100025 ND /SAV ND	279073	280248	10 / 1000 / 145	25	210	184	245	260	270	½" G	¼" G	11/24.3
FRM-NOC 100025 MD /SAV MD	279074	280249	10 / 1000 / 145	25	210	184	245	260	270	½" G	¼" G	11/24.3
FRM-NOC 100025 HD /SAV HD	279075	280250	10 / 1000 / 145	25	210	184	245	260	270	½" G	¼" G	11/24.3
FRM-NOC 100025 UHD /SAV UHD	279076	280251	10 / 1000 / 145	25	210	184	245	362	687	½" G	¼" G	15/33.1
FRM-NOC 100040 ND /SAV ND	279077	280252	10 / 1000 / 145	40	280	223	250	350	500	½" G	¼" G	19/41.9
FRM-NOC 100040 MD /SAV MD	279078	280253	10 / 1000 / 145	40	280	223	250	350	500	½" G	¼" G	19/41.9
FRM-NOC 100040 HD /SAV HD	279079	280254	10 / 1000 / 145	40	210	223	250	250	260	½" G	¼" G	18/39.7
FRM-NOC 100040 UHD /SAV UHD	279080	280255	10 / 1000 / 145	40	210	223	250	350	675	½" G	¼" G	23/50.7
FRM-NOC 100050 ND /SAV ND	279081	280256	10 / 1000 / 145	50	280	254	250	400	550	½" G	¼" G	22/48.5
FRM-NOC 100050 MD /SAV MD	279082	280257	10 / 1000 / 145	50	280	254	250	400	550	½" G	¼" G	22/48.5
FRM-NOC 100050 HD /SAV HD	279083	280258	10 / 1000 / 145	50	210	254	250	300	310	½" G	¼" G	21/46.3
FRM-NOC 100050 UHD /SAV UHD	279084	280259	10 / 1000 / 145	50	210	254	250	395	720	½" G	¼" G	26/57.3

9. Assembly/installation

9.1 General information



- **This device can only be installed in compliance with the rules and standards applicable and in accordance with the local regulations and authorisations.**
- **Install the device in a building or housing, do not install it outdoors without suitable protective measures!**
- **The lifting devices used must be suitable for the load to be lifted.**
- **Enough installation space for operation and maintenance has to be provided.**
- **It is recommended to install a filter with a pore size $\leq 50 \mu\text{m}$ upstream of the regulator.**
- **The installation must not impair the functioning of other components.**

Check prior to installation!

- Shut-off valves both on the inlet and outlet side are closed.
- Upstream and downstream piping are free from combustible gas.
- Prevent explosive gas-air mixture: the room atmosphere must be monitored for gas leakages. For the US and Canada, piping shall be purged per NFPA 56, NFPA 54 or per B 149.1.
- Ensure electrical continuity with use of suitable bonding straps. Prevent contact voltage and ignitable flashover.
- The performance data on the type plate corresponds to the purchase ordering data.

- Flanges on the inlet side and outlet side of the connecting lines are parallel with the FRM flanges.
- The sealing surfaces of the flange are undamaged and clean.
- The maximum inlet pressure of the system is lower than the maximum admissible pressure of the regulator.
- Protective caps at the connection flange, if any, must be removed.
- The minimum distances for the setting and changing springs must be observed.
- The pipeline on the inlet side must be free of water and dirt.

Note during installation!

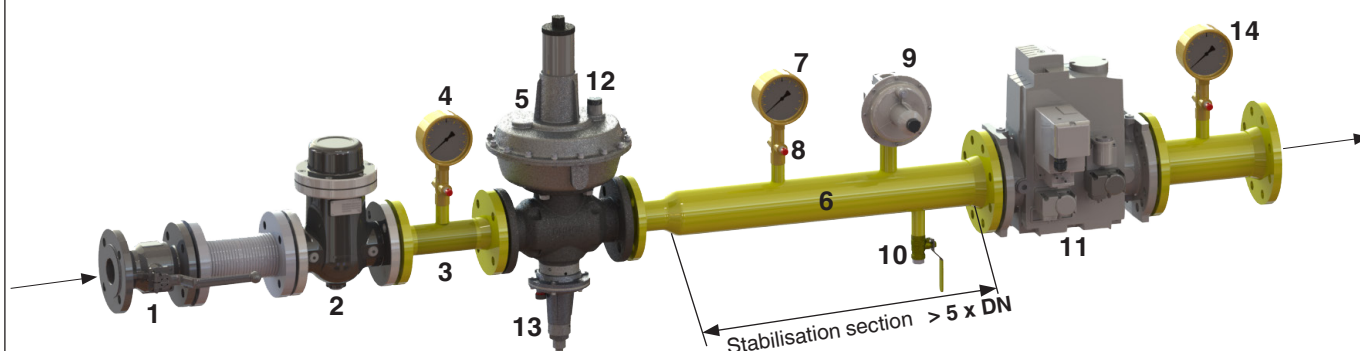
- Mounting must be carried out in a tension-free state. No excessive bending.
- Tighten the screws crosswise.
- Tightening torques must be observed.
- Vent lines and blow-off lines have to be positioned separately.
- Vent lines and blow-off lines must lead outdoors: gases must be able to escape to a non-hazardous environment. See section "vent lines".
- The impulse lines may not be shut off or isolated from the gas pressure.
- The specified distance between the measuring points of the impulse lines must be observed.
- The flow direction (arrow) on the housing must be followed.



9.2 Installation instructions

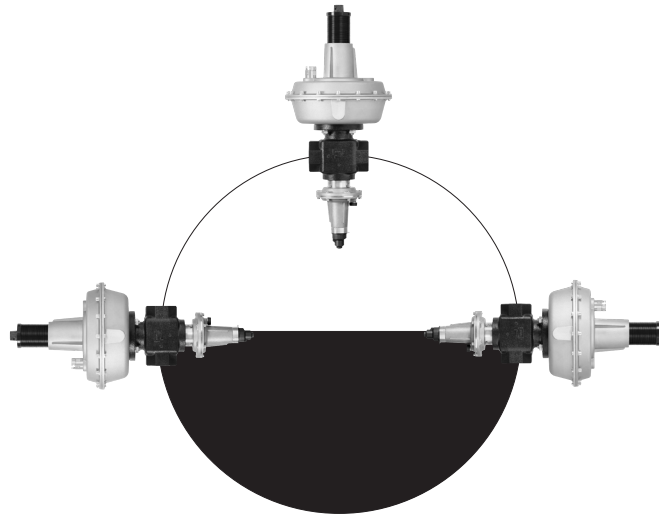
- The installation must be carried out according to the installation scheme specified below.
- Installation of the safety shut-off valve in the flow direction (arrow/housing).
- Design a straight stabilisation section with the same diameter.
- Run pulse line clean and burr-free. Distance $> 5 \times \text{DN}$
- Maximum flow velocity in the stabilisation section:
 $\leq 30 \text{ m/s}$.
- (When needed external impulse lines: steel pipe $D = 12 \times 1.5$, only with external pulse)
- (Avoid accumulation of condensate: install the pulse lines with a gradient, only with external pulse.)

Installation scheme



Pos.	Designation
1	Shut-off valve, inlet side (e.g. ball valve or butterfly valve)
2	Filter
3	Welded part
4	Pressure gauge, inlet side
5	Regulator with SAV integrated
6	Stabilisation section
7	Pressure gauge, outlet side
8	Pushbutton cock
9	SBV
10	Venting ball valve
11	Shut-off valve outlet side (e.g. DMV)
12	Breathing connection regulator
13	Breathing connection SAV
14	Relief connection SBV

Mounting position



9.3 Vent Lines (Only U.S.A and Canada)

In addition to the requirements below, vent lines shall be installed in accordance with the applicable installation code (e.g. NFPA 86, NFPA 37, NFPA 54, B149.3, B1491) and shall terminate to an approved and safe location.

Requirements for Vent line Installation

- Keep elbows to an absolute minimum, and when a 90 deg needs to be made, do as follows:
 - If using rigid pipe, use long radius elbows (not short). Long radius elbows have a bending radius of 1.5 times the pipe diameter. Short elbows have a bending radius of 1 times the pipe diameter.
 - If using tubing and permitted by code, use a minimum bending radius of 2 x the vent line outside diameter.
- Do not reduce along the entire run of the vent line the pipe size that is established at the regulator's threaded vent connection.
- Do not apply a bending moment on the vent line, if rigid pipe is used. This can apply a large bending force (a severe stress) to the vent connection of the regulator and damage the housing, which will bypass of the vent line.
- Apply proper pipe hangers and supports so that the vent line does not load or strain due to the regulator vent line connection due weight of the vent piping or due to a bending moment at the vent connection.

Manifolding of vent lines

- Do not manifold the FRM vent with the SAV vent or a relief valve vent.
- Do not manifold the SAV vent with a relief valve vent.
- Do not manifold other vents of similar devices (regulator to regulator, relief valve to relief valve, etc), unless permitted by and manifolded in accordance with the applicable installation code.

Requirements for Vent Line Length and Size for FRM and SAV vents

- The diameter of vent line shall be the same size at the vent connection.
- The vent line from the SAV vent connection to the point of termination shall be the same size.
- The vent line from the FRM vent connection to the point of termination shall be the same size if
 1. downstream equipment is an industrial application covered by NFPA 37, NFPA 85, NFPA 86, or NFPA 87, or
 2. a relief valve (or token relief valve) is mounted downstream of the FRM.

Otherwise, the following apply:

- Use schedule 40, ½ " pipe or minimum 15mm OD tubing.
- After a length of 15 ft: schedule 40, ¾ " pipe or minimum 20 mm OD tubing.
- After additional 15 ft, increase pipe to schedule 40, 1 " pipe or minimum 26 mm OD tubing until the point of termination.

Requirements for the Vent Line's Point of Termination

- Considerations depending on the gas type:
 - For Natural Gas and lighter than air combustible gases, the gas will eventually leave the area of discharge.
 - However, for heavier than air combustible or even non-combustible gases, they could accumulate at the point of discharge or even accumulate underneath the point of discharge which can create areas of retained combustible or non-breathable gases. Specific attention must be taken for such cases.

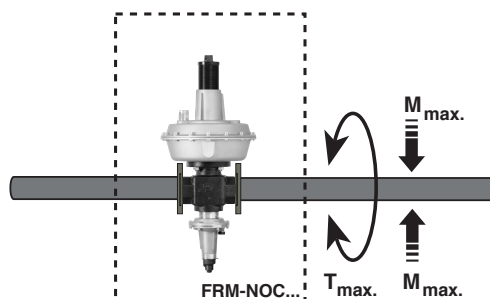
- If a vent line runs through a roof, verify that the vent line terminates above the point where water and snow accumulation on the roof does not cover or isolate the termination point from the atmosphere.
- To limit the consequences of rain or debris getting into the vent, always turn the outlet of the vent down towards the ground.
- Bug Screens:
 - Some bugs are attracted to the smell of the natural/ LP gas odorant and could nest in the vent line, which could seal the termination point. Install a bug screen on the termination point to deter insects from nesting in the line.
 - Do not paint the bug screen.
- Points of Discharge
 - The vent line must discharge away from where people might walk or work, such as pedestrians, roofers and other maintenance professionals.
- The vent line must discharge away from fresh air intakes and from windows. See applicable fuel gas installation code (e.g. CSA B149.1, NFPA 54, or International Fuel Gas Code) for acceptable clearances.
- The end shall be goose-necked downwards.

9.4 Torques

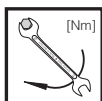


Use adequate tools!
Tighten the screws crosswise!

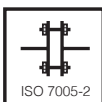
The device must not be used as lever.



DN	--	--	--	25	40	50	65	80	100	125	150
Rp	3/8	1/2	3/4	1	1 1/2	2	2 1/2	--	--	--	--
M _{max.} [Nm] t 10 s	70	105	225	340	610	110	1600	2400	5000	6000	7600
T _{max.} [Nm] t 10 s	35	50	85	125	200	250	325	400	--	--	--



Max. torque of system accessories										
M ... / G ...	M 4	M 5	M 6	M 8	M 10	G 1/8	G 1/4	G 1/2	G 3/4	
M _{max.} [Nm] t 10 s	2.5 Nm	5 Nm	7 Nm	15 Nm	40 Nm	5 Nm	7 Nm	10 Nm	15 Nm	



Max. torque of flanged joint		
Stud	M 12 x 55 (EN 13611)	M 16 x 65 (DIN 939)
M _{max.} [Nm] t 10 s	30 Nm	60 Nm

10. Function Safety Shut off Valve (SAV+ASE)

SAV protects downstream fittings or lines against pressures that are too high or too low. As soon as the pre-set trip pressure falls below or exceeds a limit due to a fault, the SAV automatically interrupts the gas flow. Under normal operating condition the SAV is open.

If the equipment downstream of the regulator, including any pipework, cannot safely operate or contain a pressure equal to the highest supply pressure (inlet to regulator), a SAV must be installed. The SAV is designed to shut down the gas supply in the event of a fault condition.

The SAV complies with the requirements of EN 14382 as safety shutoff valve.

It is classified as a Class A device when both protections for over-pressure and under-pressure monitoring are installed. In case of not having the Under-pressure protection, it is functionally a Class B device. In this conditions SAV stays open even when there is no pressure detected.

Note: When using a SAV functional Class B, it implies the hazard of not detecting a rupture on the diaphragm. With a combination of a failure in the regulator (fail to open), inlet pressure will be on the downstream side too with the corresponding risk to the components downstream.

Main components

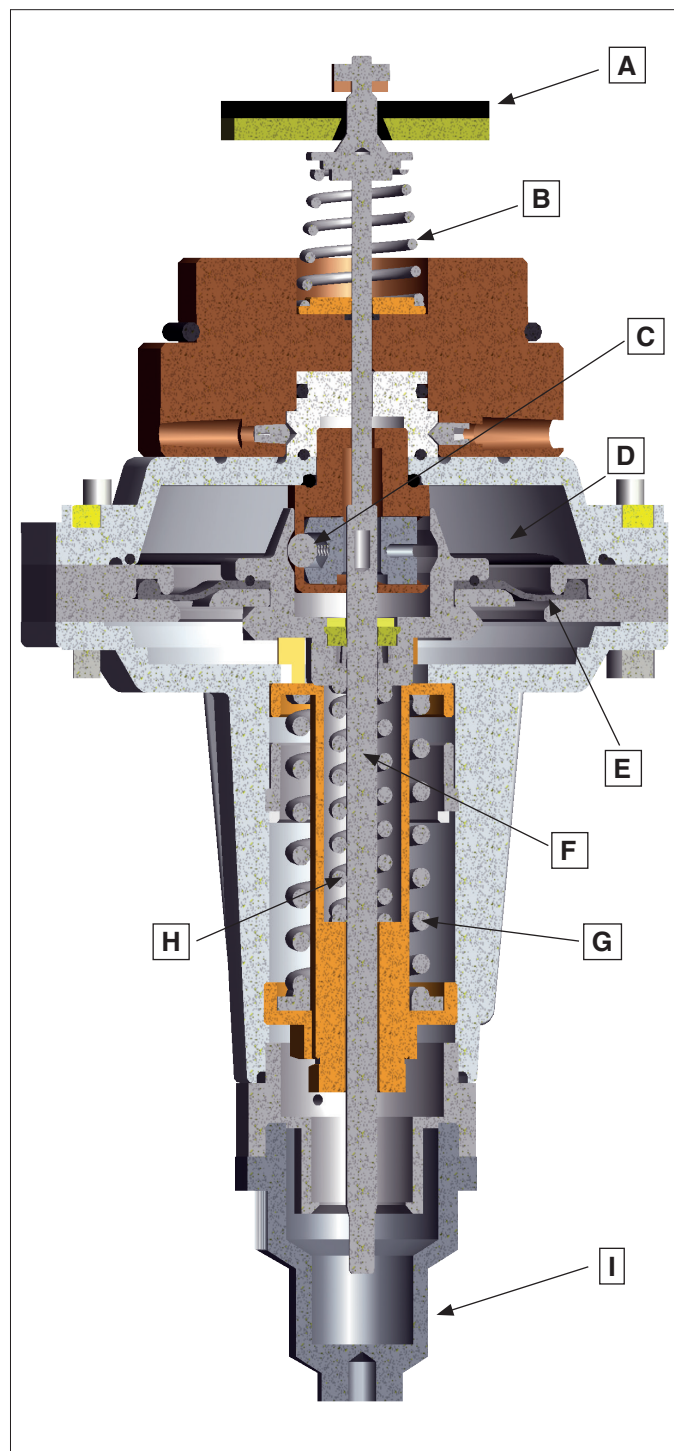
- A** Valve disc
- B** Closing spring
- C** Ball catch / trigger mechanism
- D** Chamber with the pressure to be monitored
- E** Working diaphragm
- F** Push rod
- G** Setpoint spring for p_{do}
- H** Setpoint spring for p_{du}
- I** Protective cap

Function

Chamber **D** is connected to the outlet pressure via a pulse line.

The pressure to be controlled acts on the working membrane **E**. The force of the set point springs **G** and **H** acts as a counter force.

In case of an unbalance of forces (overpressure or underpressure), the SAV is actuated and the gas supply is blocked.



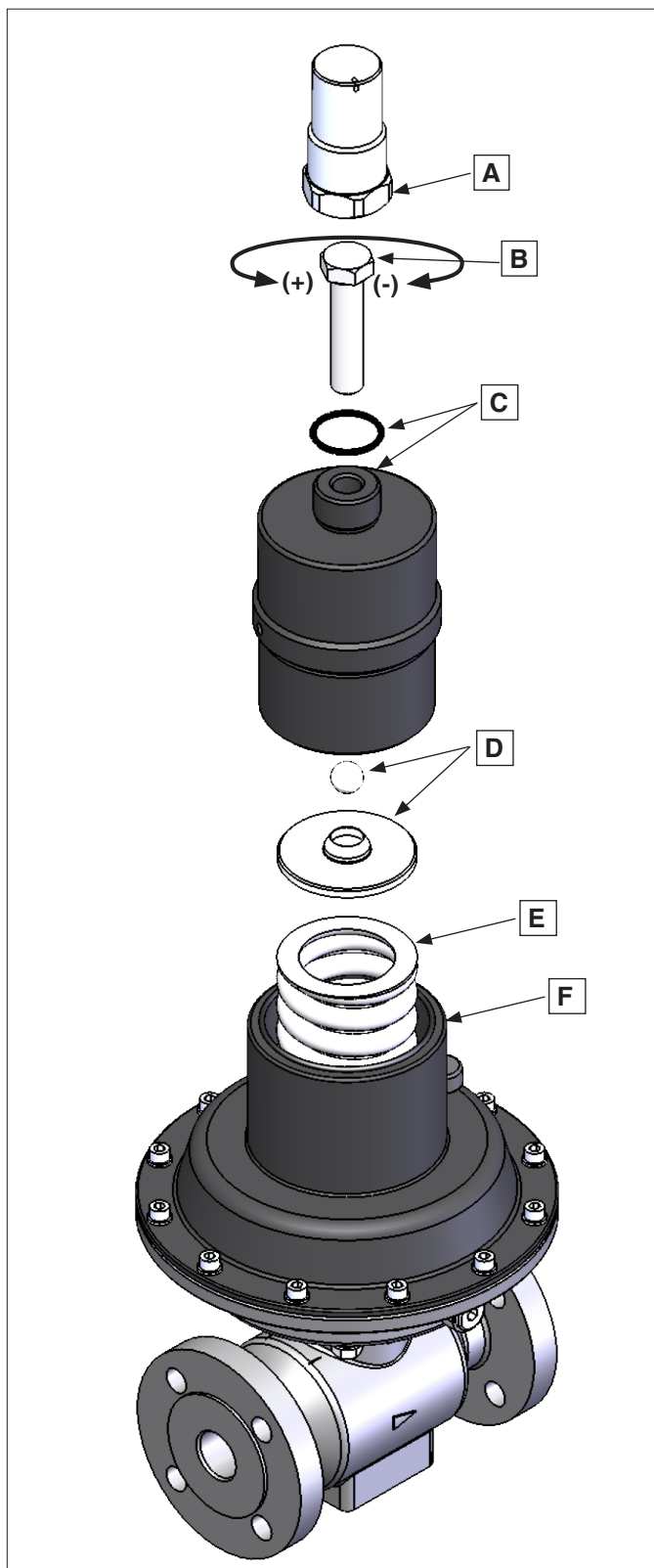
11. Adjustment

11.1 Adjusting the regulator

Adjusting the outlet pressure (type UHD)

The regulator is adjusted by turning the adjustment screw **B**.

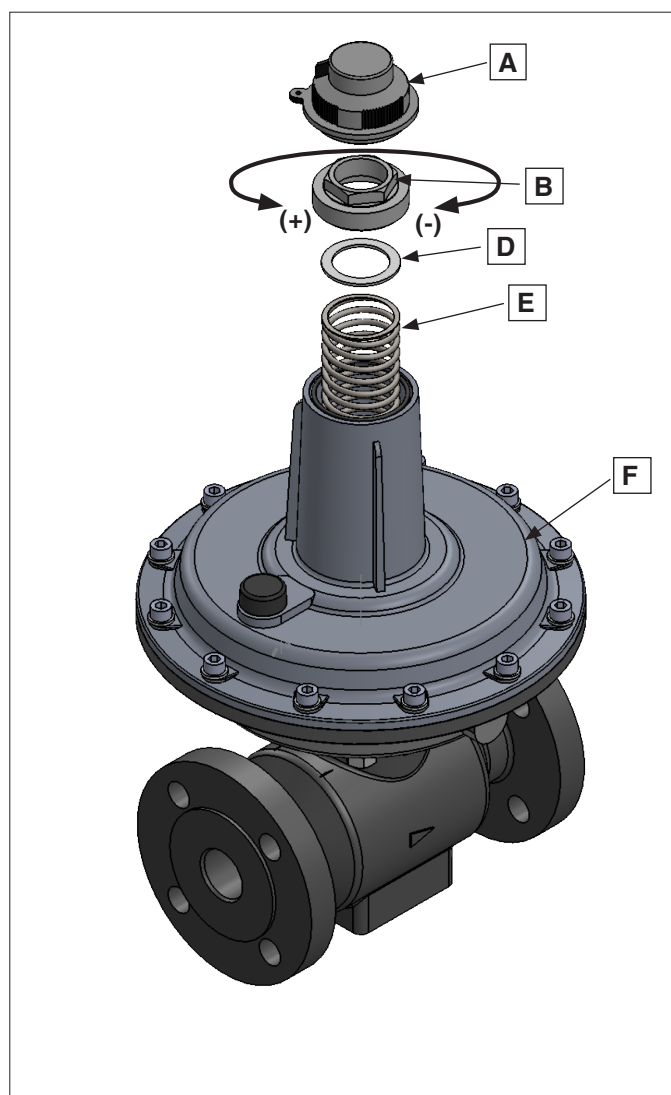
1. Remove the protective cap **A**.
2. Turn the external adjusting screw **B** using the spanner **size 24 mm**.
3. Clockwise rotation: Increases the initial tension of the adjustment spring, thus increasing (+) the outlet pressure p_{ds} .
4. Counterclockwise rotation: Reduces the tension of the adjustment spring, reducing (-) the outlet pressure p_{ds} .
5. After the setting: Screw on the protective cap **A** again.



Adjusting the outlet pressure (ND, MD, HD)

The regulator is adjusted by turning the adjustment screw **B**.

1. Remove the protective cap **A**.
2. Turn the external adjusting screw **B** using the Allen key size.
3. Clockwise rotation: Increases the initial tension of the adjustment spring, thus increasing (+) the outlet pressure p_{ds} .
4. Counterclockwise rotation: Discharges the adjustment spring, reducing (-) the outlet pressure p_{ds} .
5. After the setting: Screw on the protective cap **A** again.



11.2 Adjusting the SAV

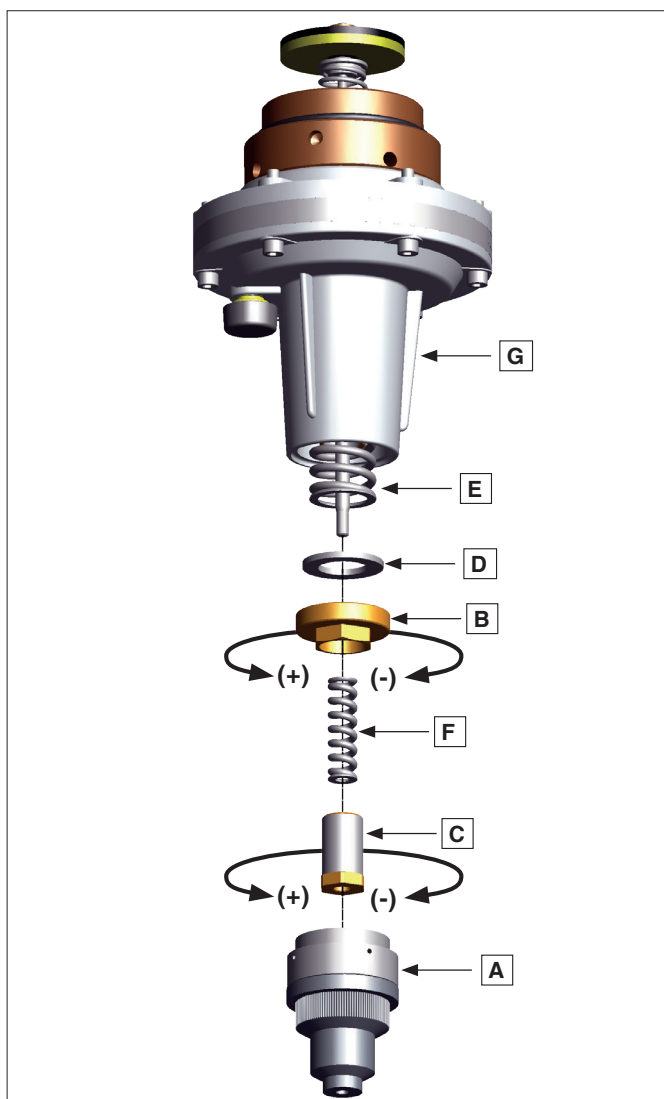
Adjusting the upper (over) response pressure p_{do} setpoint

1. Remove the protective cap **A**.
2. Turn the external adjusting screw **B** using a socket wrench **SW 22 mm**.
3. Turning **clockwise**: increase (+) the upper (over) response pressure p_{do} setting.
4. Turning **counter-clockwise**: reduction (-) in the upper (over) response pressure p_{do} setting.
5. After the setting: screw on the protective cap **A** again.

Adjusting the lower (under) response pressure p_{du} setpoint

1. Remove the protective cap **A**.
2. Turn the internal adjusting screw **C** using a socket wrench **SW 17 mm**.
3. Turning **clockwise**: increase (+) the lower (under) response pressure p_{du} .
4. Turning **counter-clockwise**: reduction (-) the lower (under) response pressure p_{du} .
5. After the setting: screw on the protective cap **A** again.

Attention: The setting for lower (under) pressure setpoint affects the set value for upper (over) pressure setting. Please set the (under) pressure setpoint, first. If an adjustment to the (under) pressure setpoint is ever made, the upper (over) pressure setting might need to be re-adjusted.



A mutual influence of the pressure regulator and the safety shut-off valve must be excluded.

Calculation of the recommended set values according to the outlet pressure of the regulator p_d

$p_d \leq 100 \text{ mbar (40 "W.C.)}$
 $p_{do} = p_d + 100 \text{ mbar (40 "W.C.)}$

$100 \text{ mbar (40 "W.C.)} < p_d \leq 300 \text{ mbar (120 "W.C.)}$
 $p_{do} > p_d + 150 \text{ mbar (60 "W.C.)}$

$p_d > 300 \text{ mbar (120 "W.C.)}$
 $p_{do} > p_d \times 1.5$

- The SAV must lock as soon as 1.1 times the max. system-specific operating pressure is reached.
- The SAV set values must be defined taking into account the settings and tolerances of the pressure regulator.
- The tolerances and set values of additional safety devices must also be considered when setting the SAV.
- In case of a fault or regular shut-down of the downstream shut-off valve, the SAV may not respond. The upper shut-down pressure must be determined accordingly.

11.3 Example of calculations of adjustment values

Determination of the setting values by means of a pressure graduation table	
Selected regulator	FRM-NOC 100025 MD / SAV MD
Outlet pressure of the regulator p_d	200 mbar (80 "W.C.)
System-specific operating pressure downstream of the regulator p_{perm}	500 mbar (200 "W.C.)
Limiting pressure in case of fault	550 mbar (220 "W.C.)
Accuracy class	AC 5
Response pressure group of the upper (over) shut down pressure SAV	AG _o 10
Response pressure group of the lower (under) shut down pressure SAV	AG _u 10
Response group of the SBV	AG 5

Result		
Device group	Device data	Pressure graduation
Safety devices against excessive pressure	Limiting pressure in case of fault: $1.1 \cdot p_{perm}$	550 mbar (200 "W.C.)
	AG _o 10	440 mbar (176 "W.C.)
	SAV	$p_{do} =$ 400 mbar (160 "W.C.)
	AG _o 10	360 mbar (144 "W.C.)
	AG 5	315 mbar (126 "W.C.)
	SBV	$p_d =$ 300 mbar (120 "W.C.)
	AG 5	285 mbar (114 "W.C.)
Gas pressure regulator	SG 20	240 mbar (96 "W.C.)
	AC 5	210 mbar (84 "W.C.)
	FRM	$p_d =$ 200 mbar (80 "W.C.)
	AC 5	190 mbar (76 "W.C.)
Safety device against insufficient pressure	AG _u 20	60 mbar (24 "W.C.)
	SAV	$p_{du} =$ 50 mbar (20 "W.C.)
	AG _u 20	40 mbar (16 "W.C.)

11.4 Regulating spring replacement

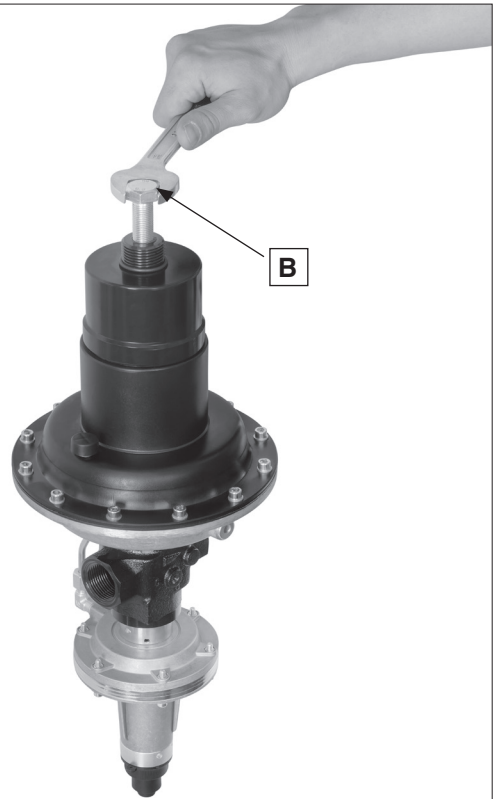
11.4.1 Type UHD

1



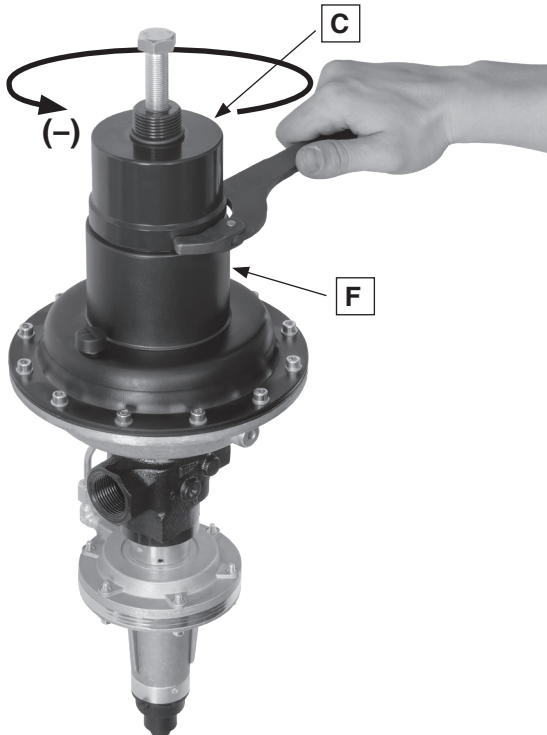
Remove the protective cap **A**.

2



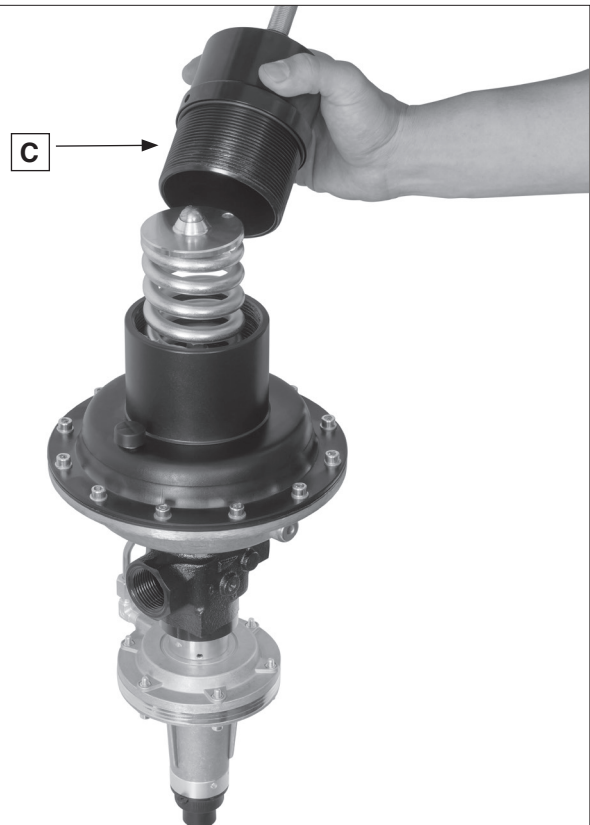
Unscrew adjustment screw **E**: Unscrew the adjusting nut **B** counterclockwise as far as it will go.

3

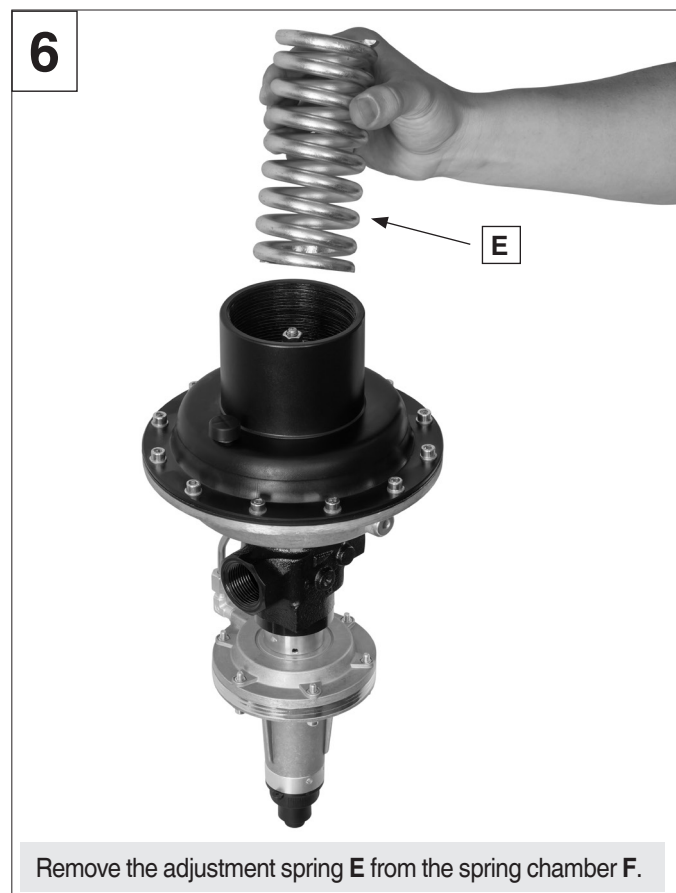


Remove from the spring housing **F** the shut-off cover **C** using a hook wrench **90-155 mm**.

4



Remove the cap **C**.



7. Insert a new spring with the appropriate adjustment range.
8. Place the disc **D** with the ball back on the spring
9. Screw on the shut-off cap **C** **again** on the spring dome. Tighten the adjusting screw **B** until the desired spring pre-load is reached. Re-fit the protective cap **A**.



Never have your head above or near the aluminium cap when removing regulator spring. The spring tension can be high enough to rapidly eject the aluminium cap with a large force.

11.4.2. Type ND, MD and HD

1

A



Remove the protective cap **A**.

2

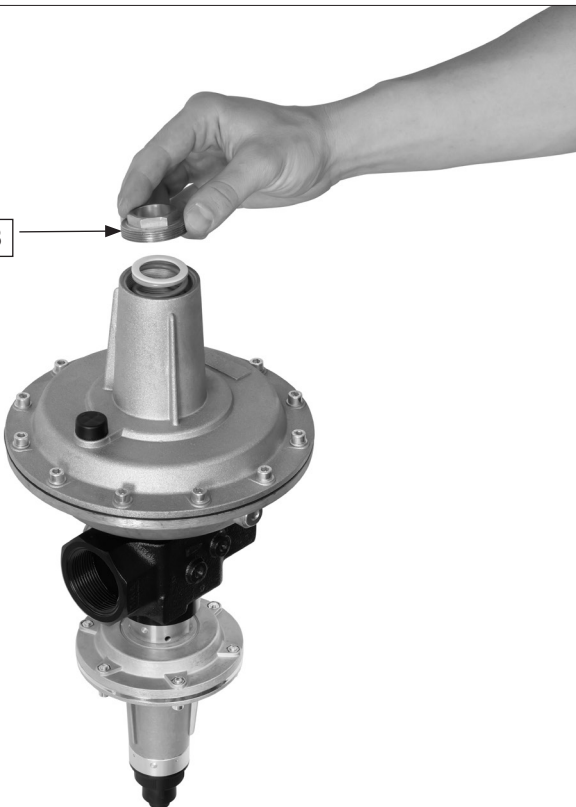
B



Release the setpoint spring **E**: Completely loosen adjusting nut **B** counterclockwise.

3

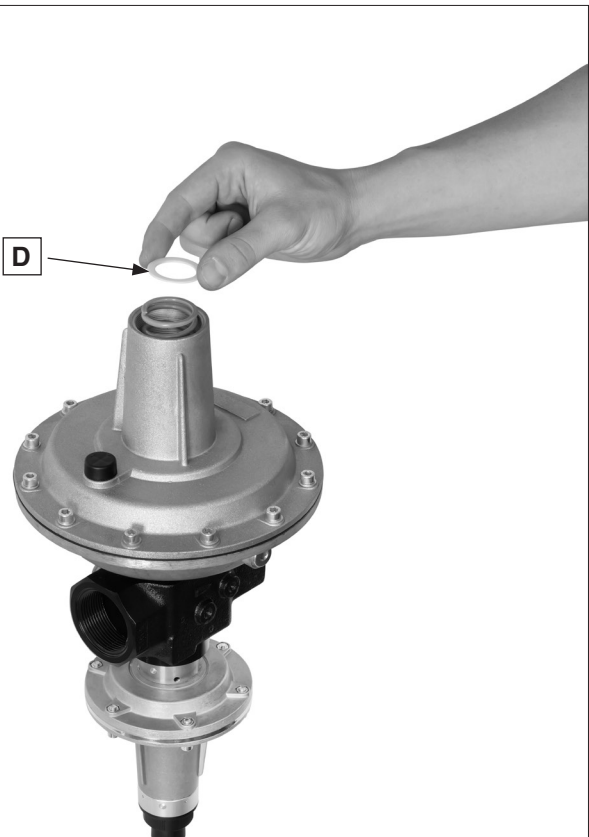
B



Remove the adjusting nut **B**.

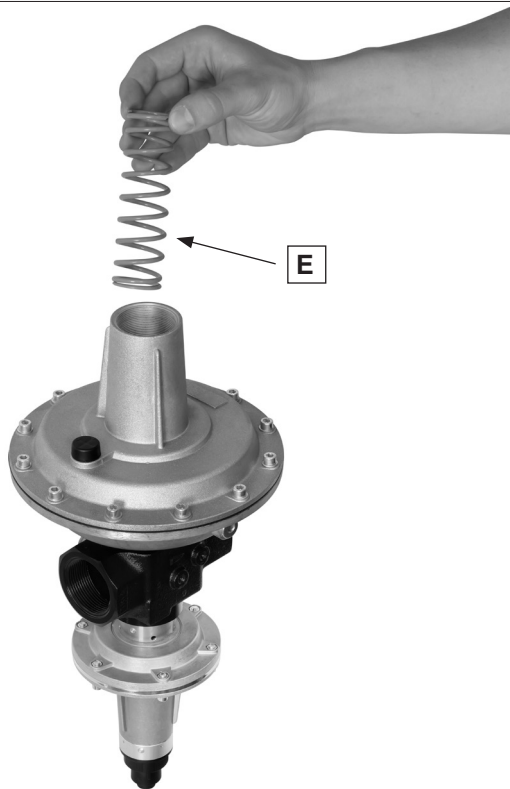
4

D



Remove the washer **D**.

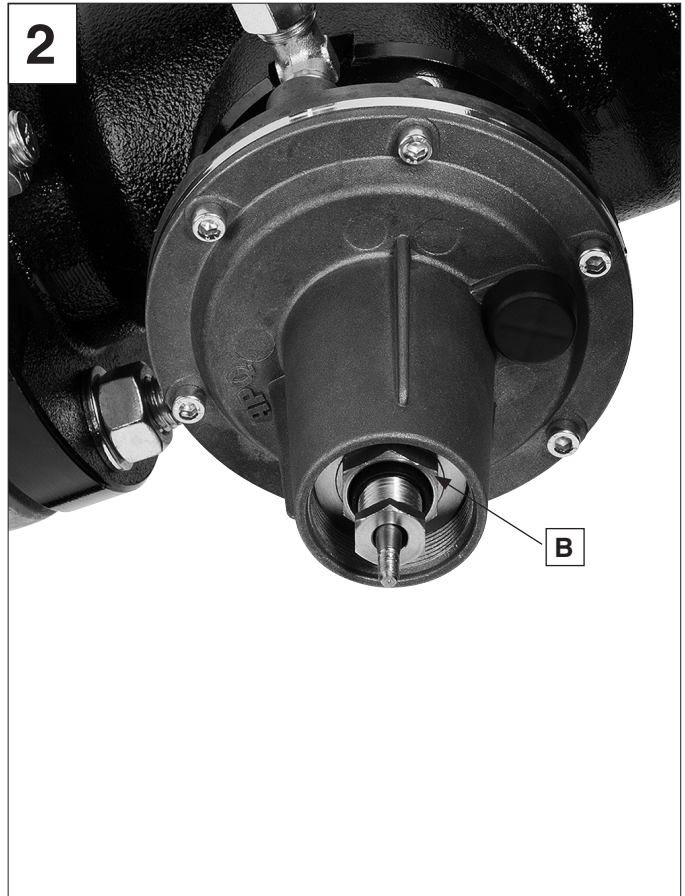
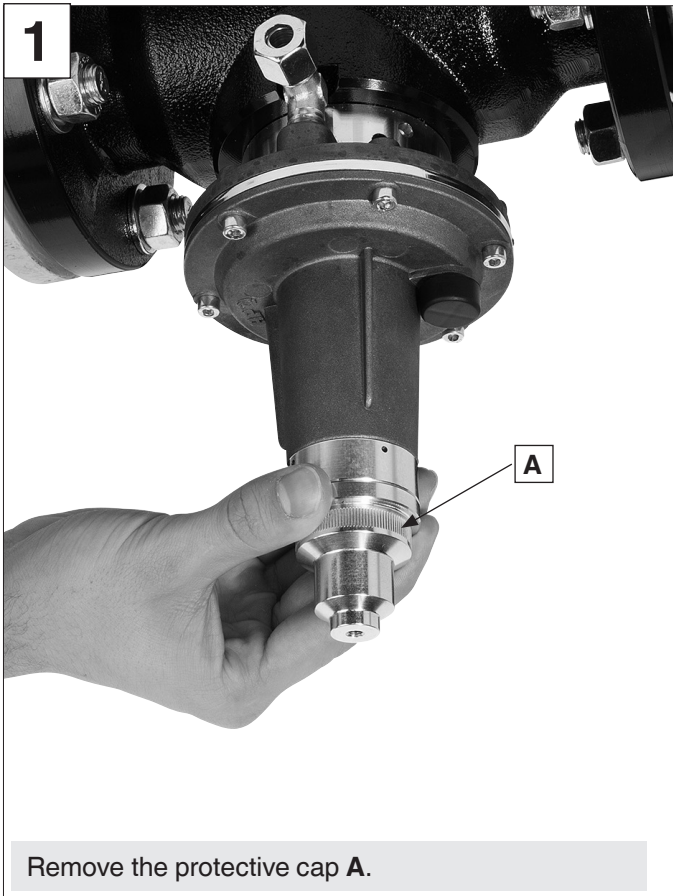
5



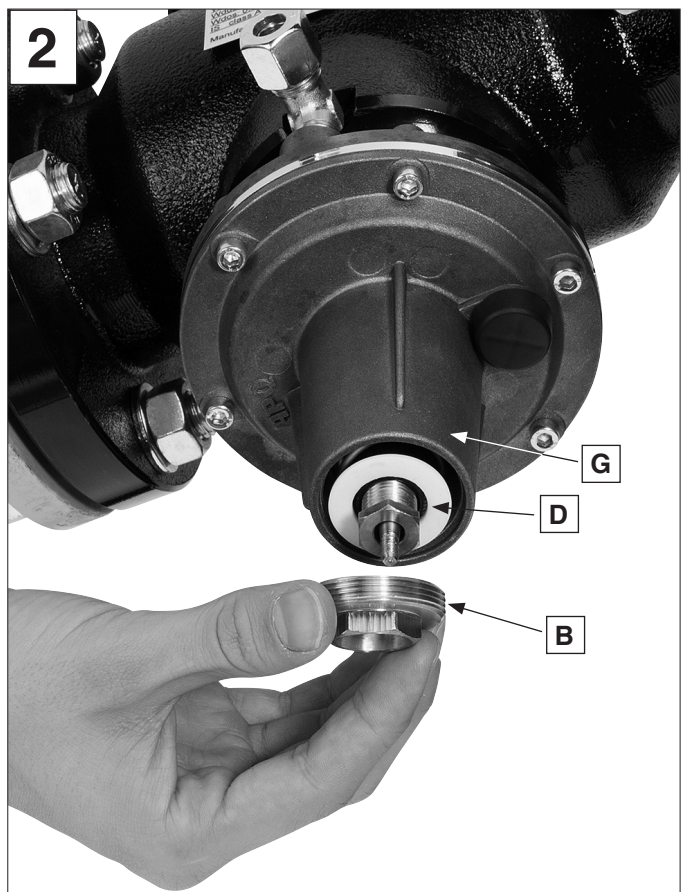
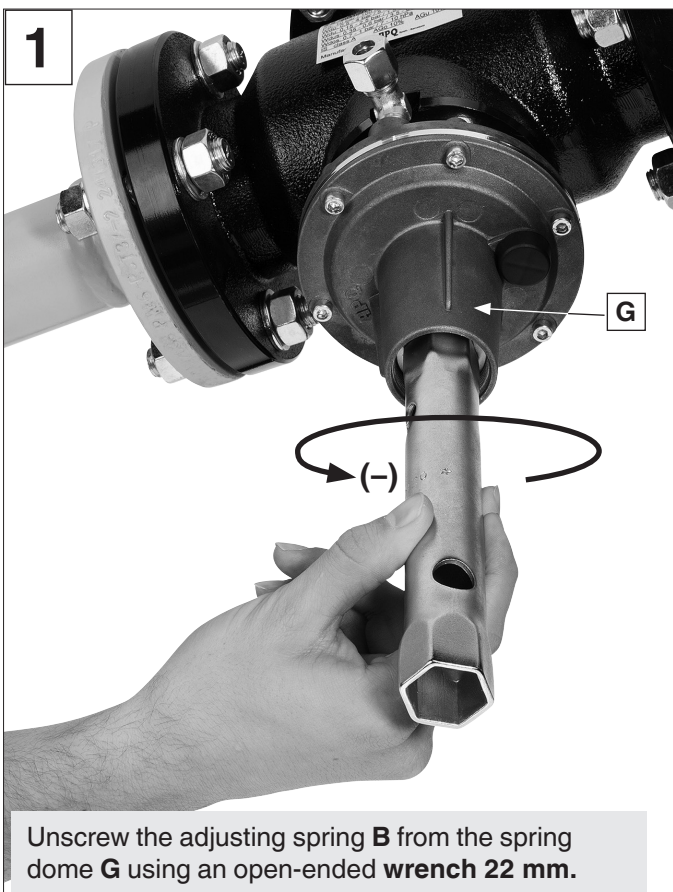
Remove the adjustment spring **E** from the spring chamber **F**.

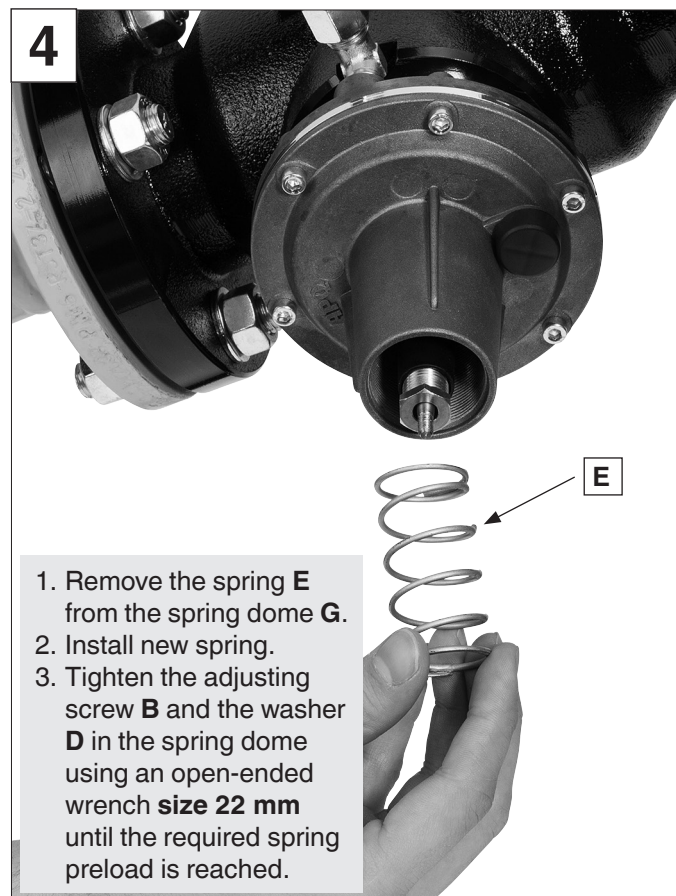
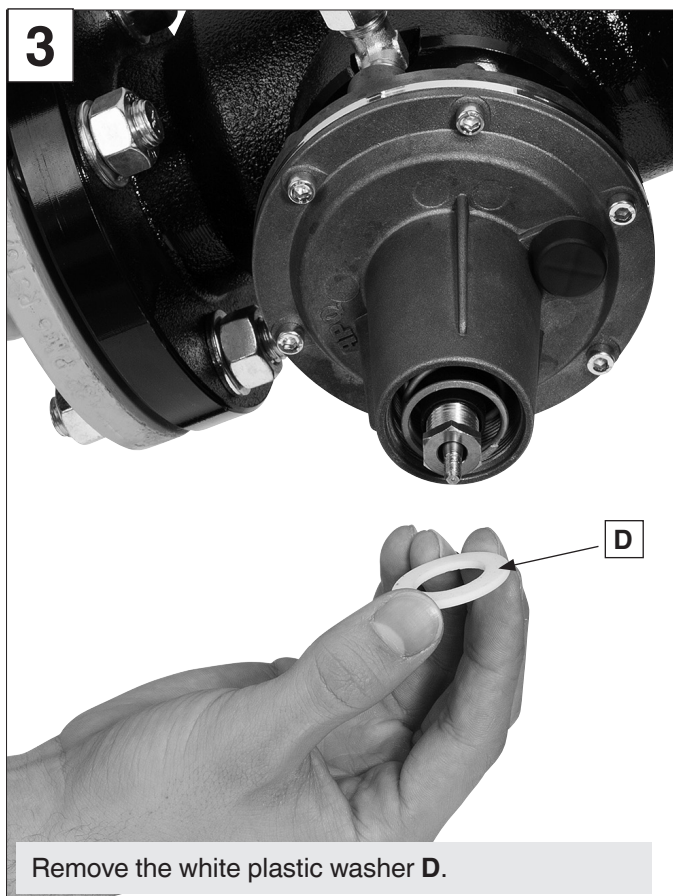
6. Insert a new spring with the appropriate adjustment range.
7. Place the washer **D** back on the spring.
8. Screw the adjusting nut **B** back into the spring dome until the desired initial spring tension is reached. Re-fit the protective cap **A**.

11.5 Spring replacement SAV

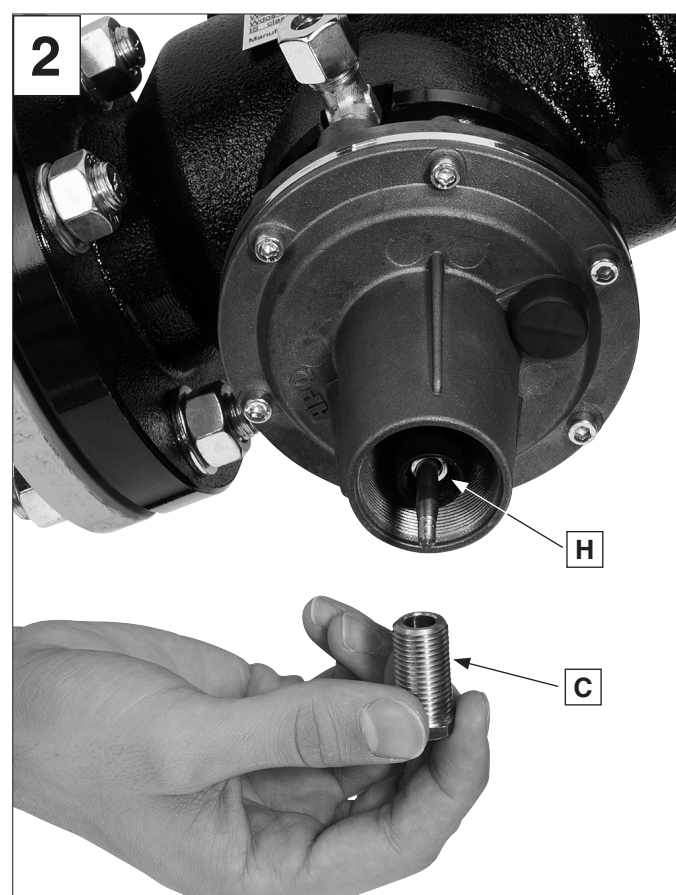


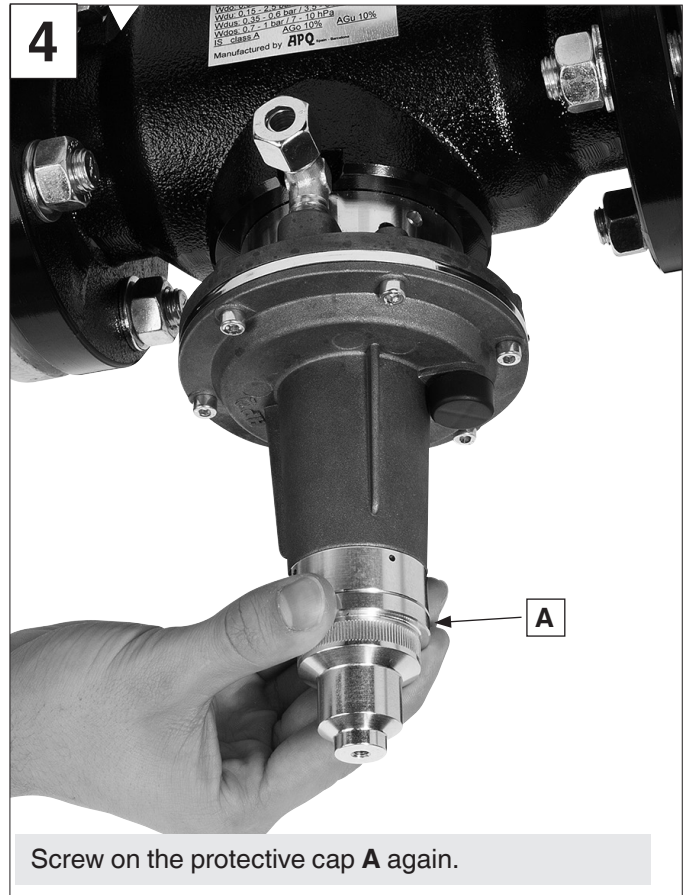
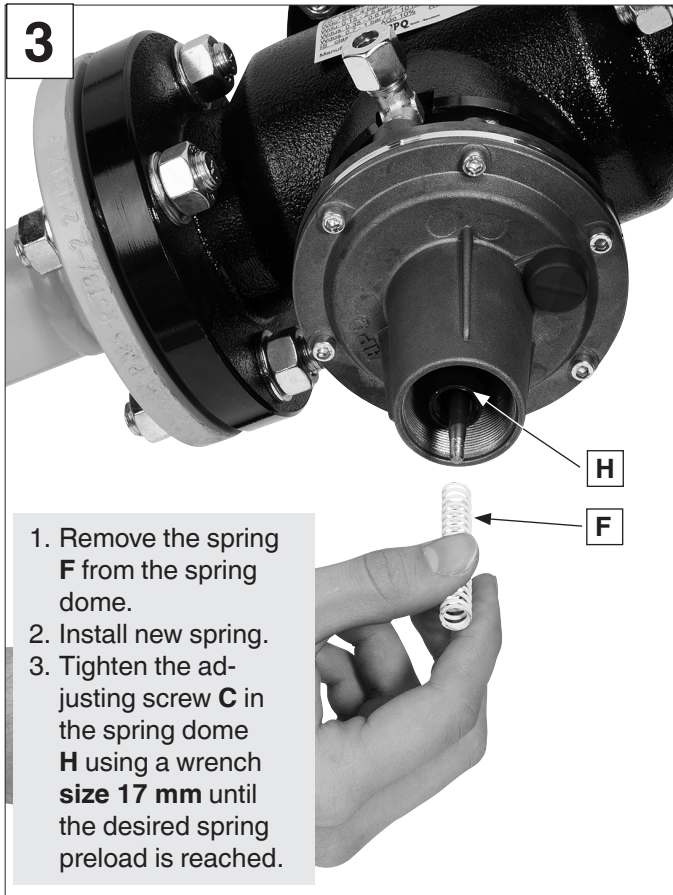
11.5.1 Spring replacement W_{dso}





11.5.2 Spring replacement W_{dsu}





12. Commissioning, decommissioning and recommissioning FRM-NOC or SAV

12.1 General information



Prior to commissioning and recommissioning

- The performance data on the type plate must correspond to the ordering data.
- Prevent explosive gas-air mixture: the room atmosphere must constantly be monitored using appropriate gas concentration measuring devices for the detection of gas leakages.
- Operate the device only if all safety devices are fully functional.
- Only qualified personnel is allowed to carry out the commissioning.

12.2 Initial Pressurization of FRM

1. When first applying pressure to the FRM or SAV, apply pressure slowly to prevent overpressure conditions or damage. This also allows all mechanisms to properly engage.
2. While slowly apply pressure, apply the pressure in "pulses" (open the main valve upstream 5-10% of stroke for about 1-2 seconds and then close it for 10-20 seconds) and repeat until the operating or test pressure is achieved. Large pressure and volumes of pipe require longer waiting times (e.g. 20 s) before applying another pulse.
3. It is recommended to monitor the pressure rise using a pressure gauge in the test section to prevent overpressure conditions.

12.3 Leakage test

Before commissioning the device, a test for internal and external leakages must be carried out.

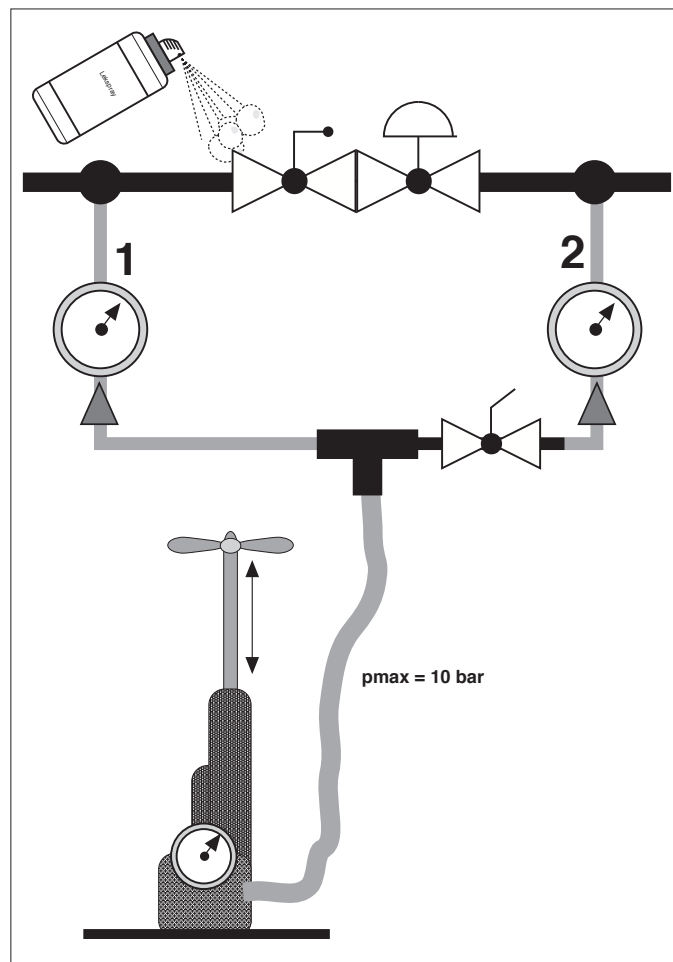
1. Test gases for the leakage test: Use air or inert gases.
2. Upstream and downstream shutoff valves must be closed.
3. Release all pressure from the test section. Check the presence of gas and safely release to the atmosphere.
4. If test pressure > blow-off pressure SBV: block the line upstream of the SBV.
5. Connect the test section to the test device.
6. Test pressure: 1.1 x system-specific operating pressure Maximum PS of the device (SAV 100... 10 bar/SAV 60... 6 bar). If different pressure ratings of the system must be taken into account. If a relief valve (SBV) is installed in the test section, either the test pressure > SBV relief valve pressure setting or block the line upstream of the SBV and test at 1.1 x system-specific operating pressure maximum PS of the device.
7. Observe the waiting time necessary for the pressure compensation (pressure equilibrium) according to the system-specific volumes. A minimum of one minute is required to reach pressure equilibrium.

External leakage test

8. Use a suitable leak detection spray on the device.
9. Monitor the foam formation.

Internal tightness test for SAV only

10. Remove the pressure in the test section downstream of the SAV and verify that SAV is closed.
11. Monitor the increase in pressure on the outlet side: pressure gauge accuracy 0.1 mbar. The SAV passes the test if there is no pressure increase for five minutes.
12. Once the leakage test has been carried out, open the shutoff valve upstream of the SBV, if installed.
13. Release pressure in the test section, if test failed.



12.4 Commissioning/unlocking/control of adjustment values

1. Slowly open the shutoff valve on the inlet side per 12.2 "Initial applying pressure during commissioning, recommissioning or testing". The ball valve on the outlet side remains closed.

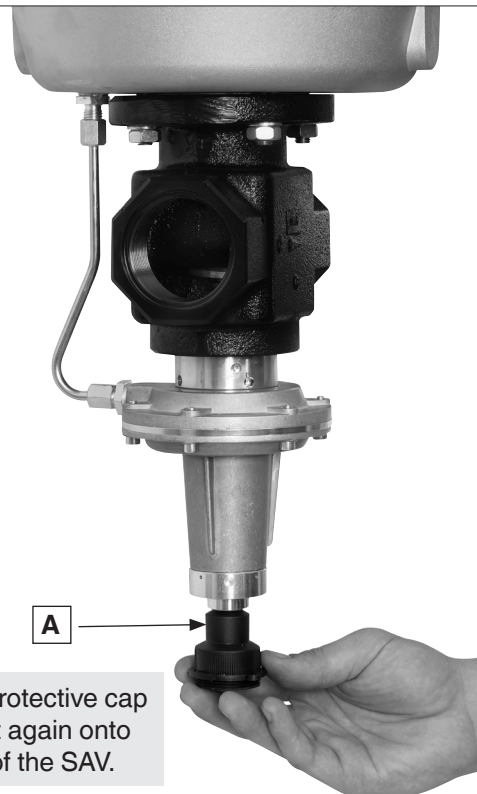
2. Monitor the pressure rise on the pressure gauge on the inlet side upstream of the device.
3. SAV resetting:

3.1



Unscrew the protective cap **A**.

3.2



Reverse the protective cap **A** and screw it again onto the push rod of the SAV.

3.3



Use the protective cap **A** as a handle.

- 3.4 Compensate pressure by pulling the protective cap **A** downwards by approx. 2 mm. This opens the compensation valve on the valve disc.
- 3.5 Monitor the pressure rise on the outlet side of the pressure gauge.
- 3.6 Once the operating pressure (setting of the pressure regulator) on the outlet side is reached, the SAV can be reset by pulling the protective cap **A** to its mechanical stop and until it locks in place (resets).
- 3.7 SAV is now reset.
- 3.8 Unscrew the protective cap **A** from the push rod and screw it again on the spring dome **G**.

4.0 Venting the test section to atmosphere

- 4.1 If venting fuel gas to test the setting of the FRM or SAV, use a manual valve connected to a suitable hose to release the fuel gas to a safe location. Or, if a relief valve is installed, it might be possible to use it to vent some or all of the fuel gas for proper testing. Do not use a test burner for venting, and see 12.1 General information regarding risks of venting into spaces.
- 4.2 Pressurizing Test Section
- 4.3 When the test section must be completely filled with fuel gas: make sure that the test section is free from air by using a test burner. Close the stop-cock on the venting hose.

5.0 Initial Checking of the FRM outlet pressure

- 5.1 Before initially starting of the equipment, an initial check of the FRM outlet pressure setting shall be done.
- 5.2 To check the outlet pressure setting of the regulator:
- 5.3 Partially open a manual valve connected to the hose in 4.0 above just enough to generate gas flow, and check the set value (outlet pressure) using a pressure gauge. If necessary, correctly adjust the setting according to section 11.1 Regulator Setting.
- 5.4 Close the manual valve, remove the hose, insert the sealing cap **A**.

6.0 Checking upper(over) response pressure p_{do}

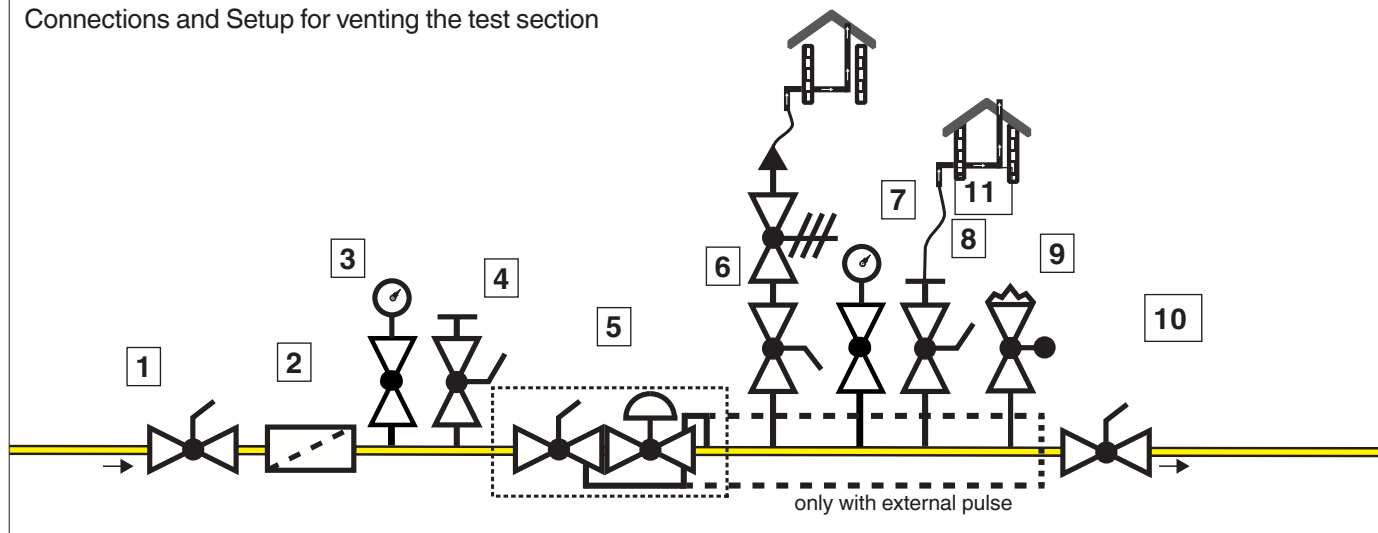
- 6.1 SBV installation on the outlet side: block the line upstream of the SBV.
- 6.2 Create bypass around the FRM (see below).
- 6.3 Connect a line between the inlet and outlet side of FRM using manually operated test/purge valves.
- 6.4 With both valves closed, slowly open the upstream valve to charge the bypass line.
- 6.5 Slowly open the downstream valve in the bypass line and monitor the increase of pressure on the outlet side using a pressure gauge.
- 6.6 Avoid inadmissible high pressure on the outlet side. Stop applying pressure immediately after the SAV has tripped.

- 6.7 Once the SAV trips, read the upper (over) response pressure on the pressure gauge on the outlet side.
- 6.8 If necessary, correct the SAV set points according to the specifications in section 11.2 "SAV setting" and check it again.

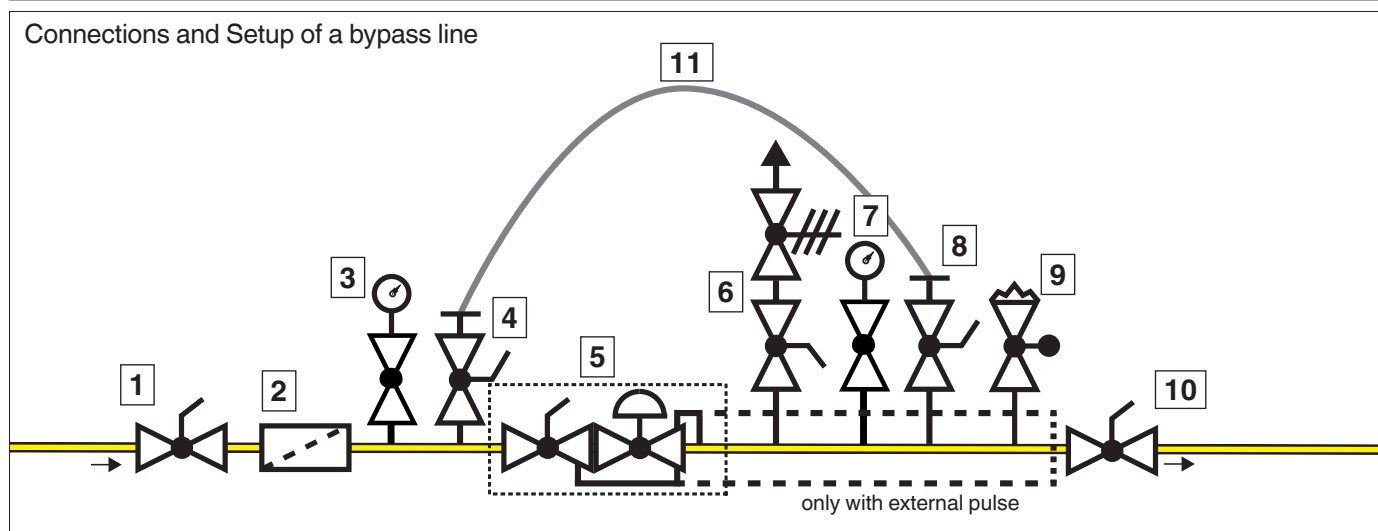
7.0 Check of the lower (under) response pressure p_{du} setting.

- 7.1 Release the pressure in the test section on the outlet side until the operating pressure is reached.
- 7.2 Check if gas is available and release it safely in the atmosphere.
- 7.3 Monitor pressure drop on the pressure gauge.
- 7.4 Unlock / reset SAV, if SAV is tripped.
See "3. SAV resetting" in section 12.4.
- 7.5 Check that all test/purge valves are closed.
- 7.6 Create a means to safely release the fuel gas in downstream the SAV into the atmosphere. See figures below and reference "4.0 Venting the test section to atmosphere" in section 12.3.
- 7.7 Slowly vent the fuel gas per "4.0 Venting the test section to atmosphere". After the SAV trips, read the lower (under) response pressure on the pressure gauge.
- 7.8 Close the vent valve, remove the hose, insert the sealing cap.
- 7.9 Slowly open the shut-off valve on the inlet side.

Connections and Setup for venting the test section



Connections and Setup of a bypass line



Pos.	Designation
1	Shut-off valve, inlet side
2	Filter
3	Pressure gauge with pushbutton cock
4	Venting ball valve
5	Regulator with SAV integrated
6	SBV with shut-off valve

Pos.	Designation
7	Pressure gauge with pushbutton cock
8	Venting ball valve
9	Test burner
10	Shut-off valve, outlet side
11	Hose

12.5 Recommissioning

1. Close the shutoff valve upstream of the bypass line.
2. Remove the hose.
3. Open the ball valve upstream of SBV, if installed.
4. Reset SAV, see section 12.4.
5. Once SAV has been reset, open the shutoff valve on the outlet side of the SAV.

12.6 Decommissioning

1. Slowly close the shut-off valve on the outlet side.
2. Slowly close the shut-off valve on the inlet side.
3. Release gas in the test section in a controlled and safe manner into the atmosphere.

13. Faults and their causes



- Repair work on the device must only be performed by authorised and skilled personnel.
- Use only original spare parts.

Fault in the SAV	Possible causes	Troubleshooting
The SAV cannot be opened/unlocked	The pulse line is not connected.*	Install the pulse line.
	The pulse line is clogged.*	Clean the pulse line.
	The pulse line has leaks.*	Seal the pulse line.
	The pulse line is damaged.*	Replace the pulse line.
	The pulse pressure is outside the adjustment range.	Adjust the locking pressure of the SAV or the outlet pressure.
	The adjusting springs are not suitable for the application.	Replace the adjusting spring.
	The adjustment range of the SAV is outside the outlet pressure.	Replace the SAV or the ASE.
The SAV does not switch or does not respond.	The pulse line is not connected.*	Connect/install the pulse line.
	The pulse line is clogged.*	Clean the pulse line.
	The pulse line has leaks.*	Seal the pulse line.
	The pulse line is damaged.*	Replace the pulse line.
	The pulse pressure is outside the adjustment range.	Adjust the locking pressure of the SAV.
	The adjustment springs are not suitable for the application.	Replace the adjusting spring.
The SAV switches, but does not seal.	The valve head is damaged or worn.	Replace the ASE or have it repaired by DUNGS.
	The seat of the valve is damaged.	Replace the valve seat.
	The movable parts are contaminated with foreign particles.	Clean the movable parts or replace the ASE.
	The drive is damaged.	Replace the ASE.
	The O-Ring is damaged.	Replace the O-Ring or the ASE.
The SAV is leaking towards the atmosphere.	The working diaphragm is damaged.	Change the working diaphragm or replace the ASE.
	The sealing ring between ASE and housing of the SAV is damaged.	Replace the ring or the ASE.
	The O-Ring junta on the ASE is damaged.	Replace the O-Ring or the ASE.

Fault in the regulator	Possible causes	Troubleshooting
There is no gas	The regulator is not receiving gas.	Check the gas installation prior to the regulator.
	The SAV is closed.	Unlock the SAV.
The regulator provides a wrong outlet pressure.	The regulator contains a spring with the wrong set point.	Replace the set point spring.
	The desired output pressure is outside the possible output pressure range.	Replace the regulator model.
	Inlet pressure is too low.	Check the gas system or resize the regulator.
With no flow volume the outlet pressure corresponds to the inlet pressure.	The pulse line is not connected.*	Install the pulse line.
	The pulse line is closed.*	Check the pulse line
	The pulse line has leaks.*	Seal the pulse line.
	The seal is damaged.	Replace the seal.
	The seat of the seal is damaged.	Replace the seat of the seal.
	The working diaphragm is damaged.	Replace the working membrane.
	The lever system is damaged.	Replace the lever system.
	The O-Rings juntas on the regulator are damaged.	Replace the O-Rings of the regulator.
	The O-Rings of the SAV are damaged.	Replace the O-Rings of the SAV.
During operation the outlet pressure corresponds to the inlet pressure.	The pulse line is not connected.*	Install the pulse line.
	The pulse line is closed.*	Check the pulse line
	The pulse line has leaks.*	Seal the pulse line.
	The working diaphragm is damaged.	Replace the working membrane.
	The lever system is damaged.	Replace the lever system.
As the flow rate increases, the outlet pressure drops.	The desired flow rate exceeds the capacity of the regulator.	Re-size the regulator and replace it.
	Incorrect dimensioning of the gas pipe.	Increase the nominal diameter of the line.
	The gas filter before the regulator is dirty.	Clean the gas filter, replace the filter screen.
	The lever system is damaged.	Replace the lever system.
	The pulse line is closed.	Check the pulse line
	The SAV is damaged.	Check the SAV.
Gas escapes at the vent connection.	The working diaphragm is damaged.	Replace the working membrane.
	The O-Rings on the compensation shaft are damaged.	Replace the lever system.
Outlet pressure is oscillating in operation.	Required flow is lower than minimum operating flow.	Transitory situation at start-up. Nozzle change for damping factor may help. Nozzle kit 270712.
	Regulator is oversized.	Replace regulator with the right one.
	Ressonance effect with a regulator downstream.	Change nozzle configuration (kit 270712). Change outlet pressure setting.

* in the case of regulator with external line

14. Maintenance

14.1 General information



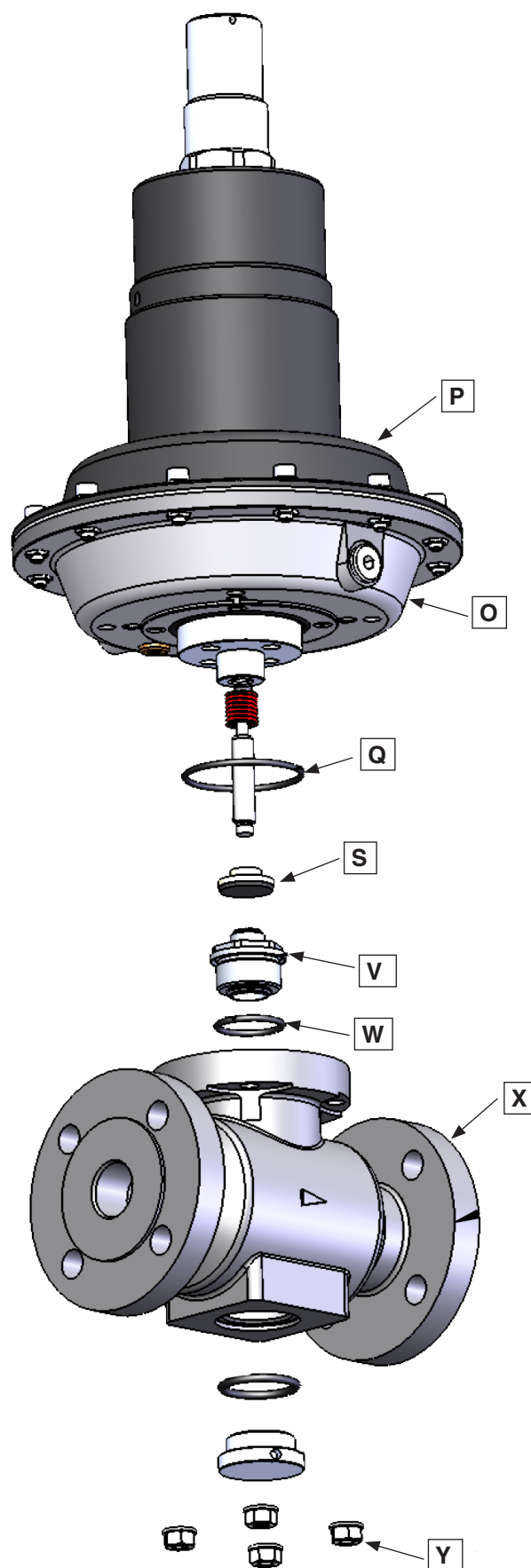
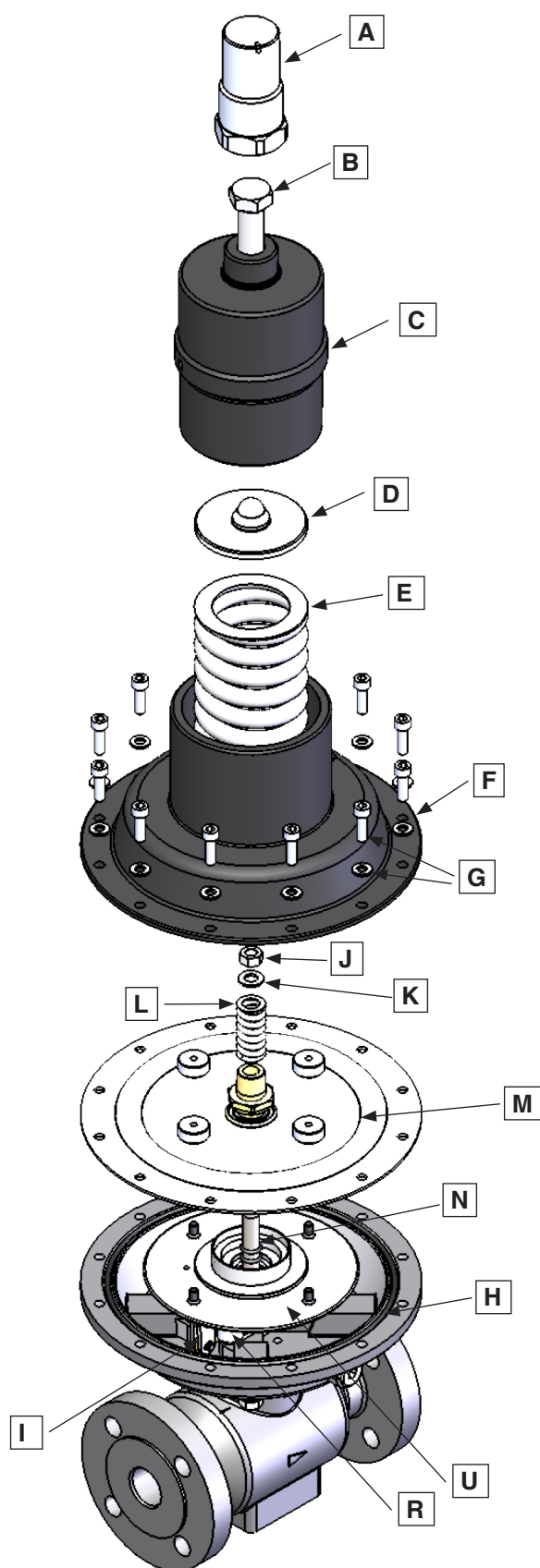
- The Pressure Equipment Directive (PED) requires the devices to be checked at regular intervals to ensure the following in the long term: Safety and functioning of the device, high long-term utilisation ratios, resulting in minimum environmental impact.
- The maintenance of the device can only be carried out in compliance with the applicable rules and standards and in accordance with current local regulations.
- Repair work on the device must only be performed by authorised and skilled personnel.
- Adhere to the maintenance intervals indicated.
- The risks in case of an escape of flammable or noxious gases into the atmosphere have to be assessed.
- Always install new seals after replacement or modification of parts.
- Use only original spare parts.
- Do not use alcohol-based or solvent-containing cleaning solutions for cleaning the device.
- Greases, adhesives, sealing material must be approved.

Prior to maintenance

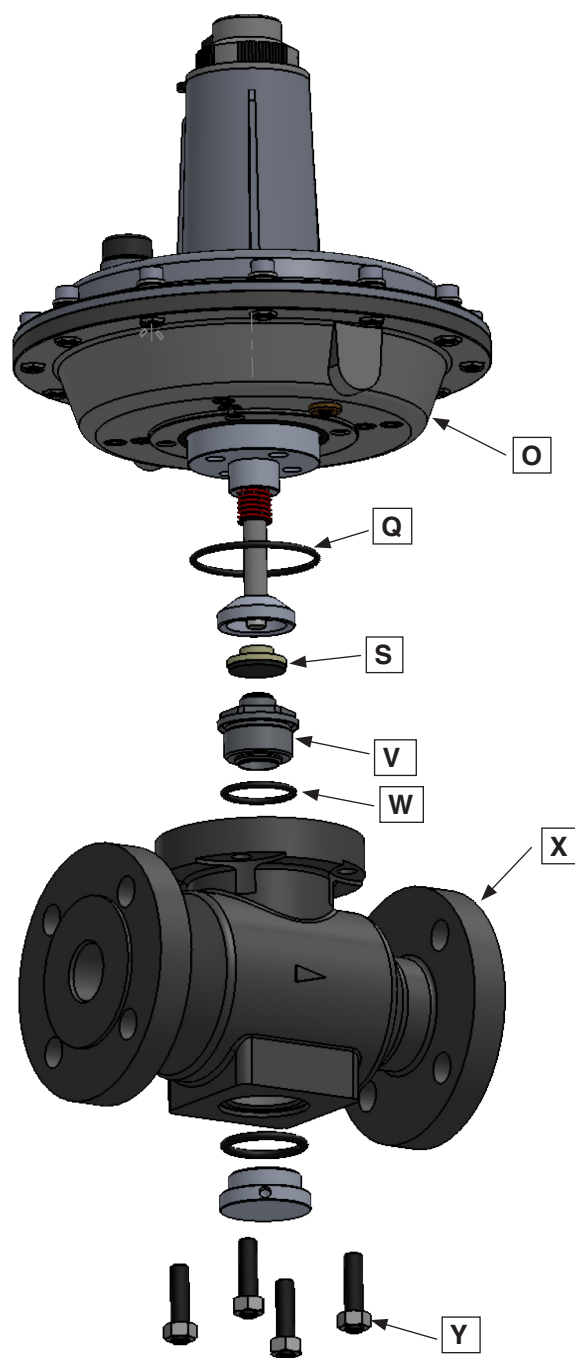
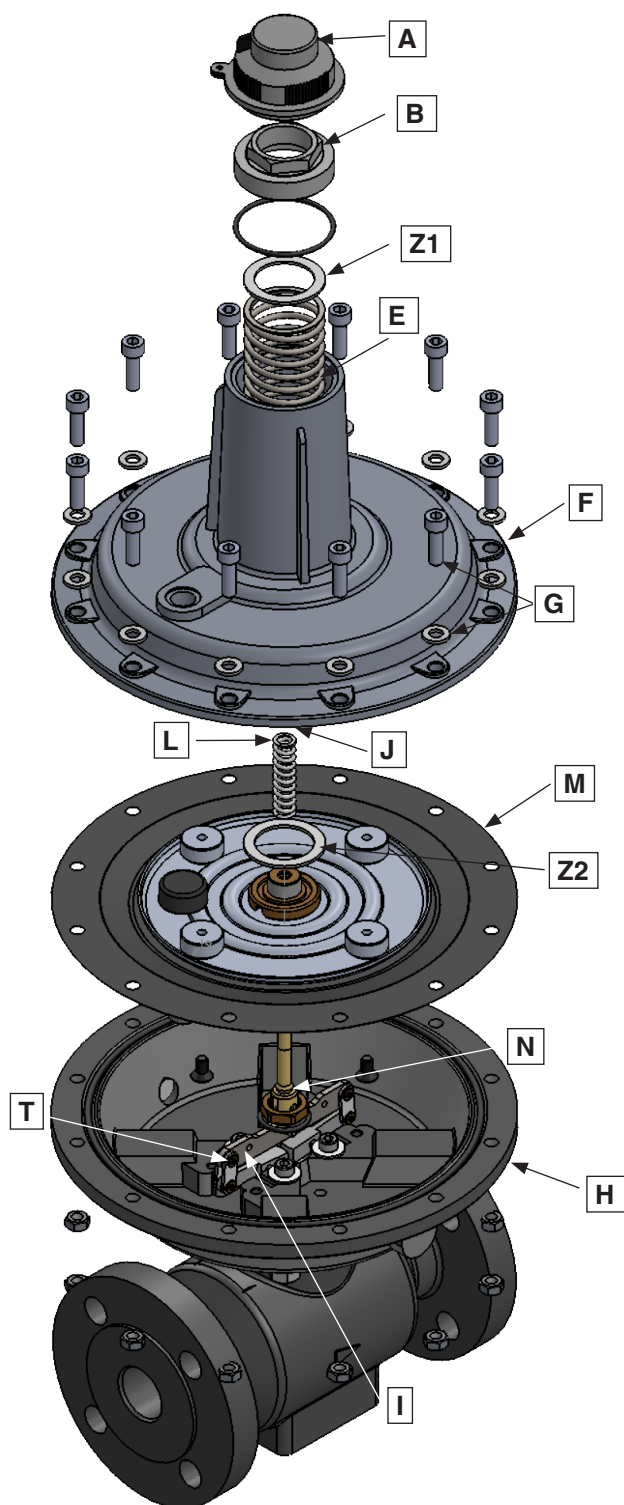
- Shut-off valves both on the inlet and outlet side are closed.
- Line is depressurised and free from combustible gas.
- Prevent explosive gas-air mixture: the room atmosphere must constantly be monitored using appropriate gas concentration measuring devices for the detection of gas leakages.
- SAV is in the closed position.
- Original spare parts are available.

Pos.	Designation
A	Protective cap
B	Adjusting screw + washers
C	Sealing plug
D	Spring disc with ball
E	Adjusting spring
F	Membrane cover
G	Hexagonal screws + nuts + washers
H	O-Ring
I	Lever system
J	Safety nut
K	Spring disc
L	Safety spring
M	Working diaphragm
N	Guide bar
O	Bottom membrane enclosure
P	Lower diaphragm disc
Q	Sealing ring
R	Washers
S	Seal
T	Mounting screws
U	Mounting plates
V	Seat of the seal
W	O-Ring
X	Body of the regulator
Y	Hexagon screws + nuts + washers
Z1	Upper washer
Z2	Lower washer

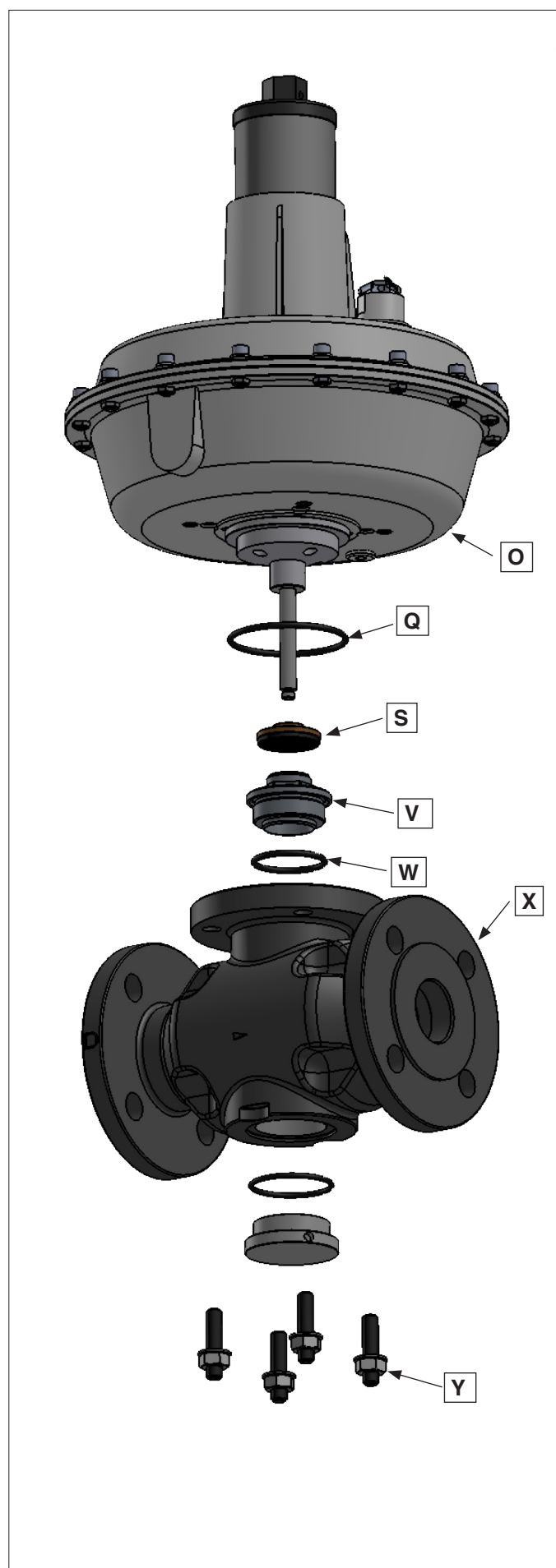
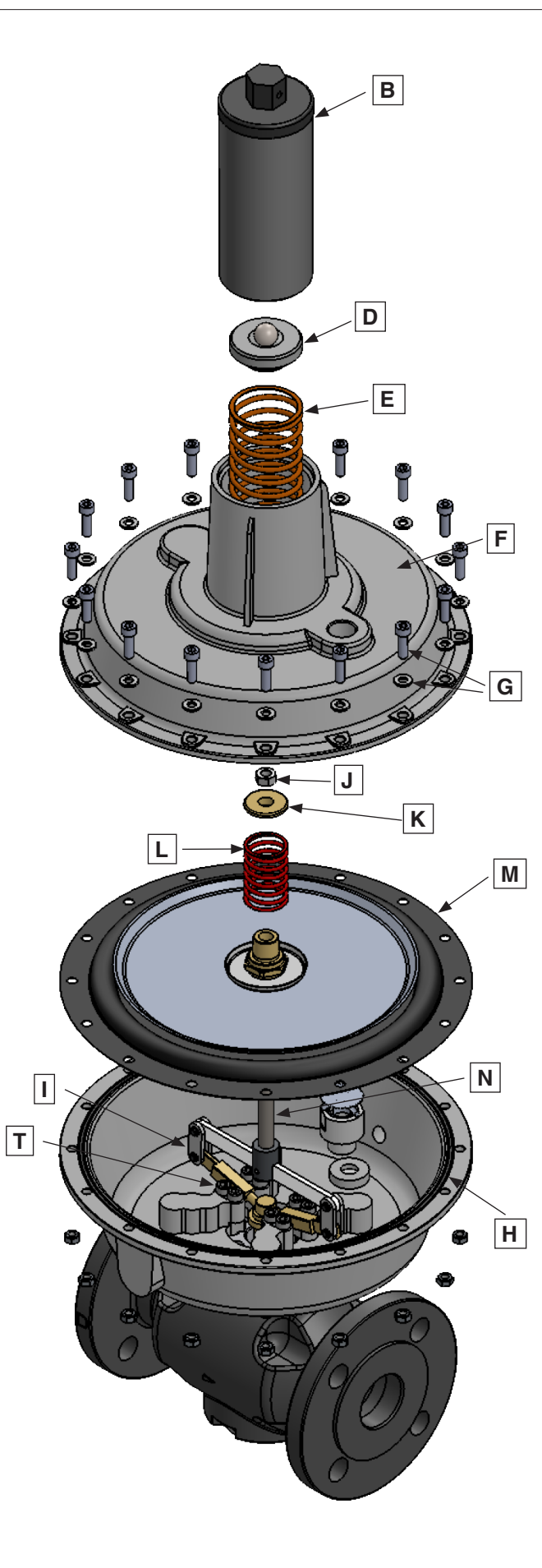
Type UHD



Type ND, MD for 1", 1½" and DN 25 and type HD



Type ND, MD for 2", DN 40, DN 50



14.2 Regulatory maintenance instructions

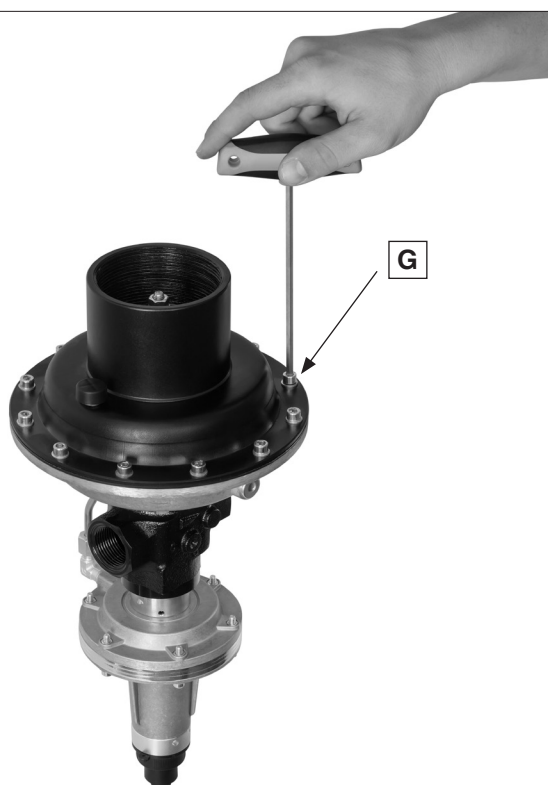
14.2.1 Preparation

Follow the steps shown in section 11.4 to extract the regulating spring.

14.2.2 Replace working membrane

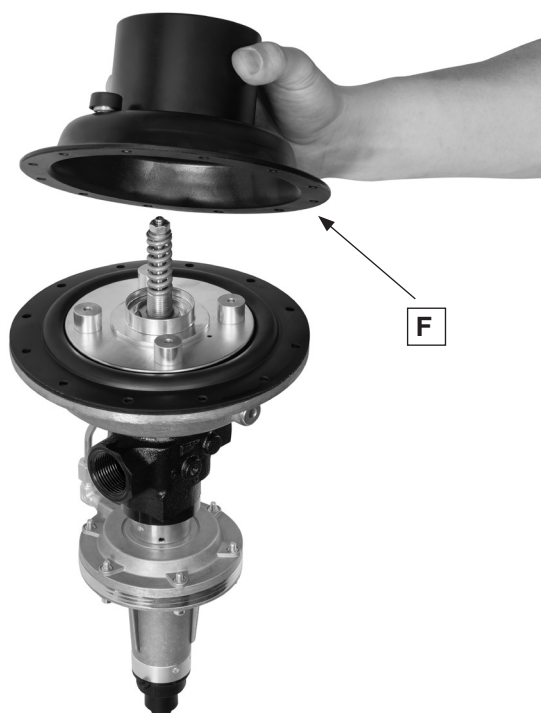
14.2.2.1 Type UHD

1



Loosen the screws **G** using an Allen key **size 5 mm**.

2



Remove the upper membrane cover **F**.

3



Loosen the nut **J** (M 8) using a spanner **size 13 mm**.

4



Remove the disc from the spring **K**.

5



Remove the safety spring **L**.

6



Remove the working membrane **M** from the guide rod **N**. Check the condition of the working membrane. If necessary, use a new working membrane **M** (maintenance set 20 or 24 as appropriate) when reassembling.

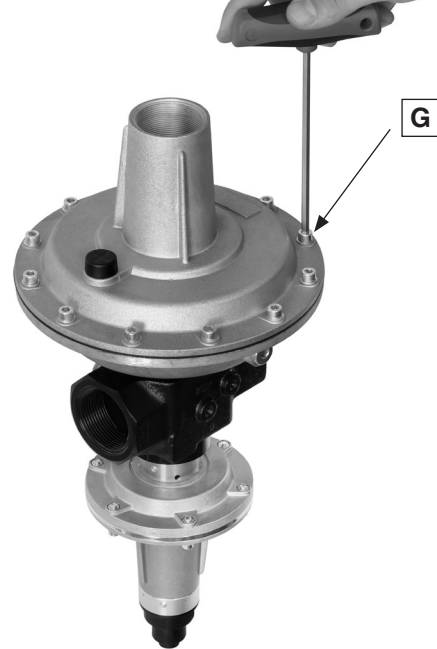
14.2.2.2 Type ND, MD for 1", 1½", DN25 and type HD

7



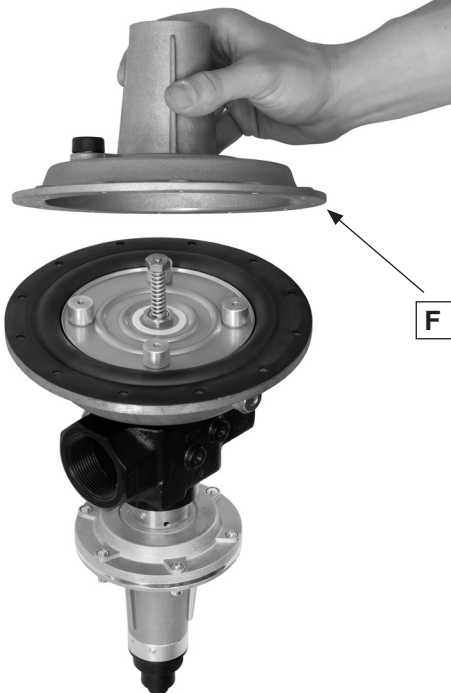
Replace the O-Ring **H**.

1



Loosen the screws **G** using an Allen key size **5 mm**.

2



Remove the upper membrane cover **F**.

3



Remove the washer **Z2**.

4



Loosen the nut **J** using a spanner size **13 mm** (15 mm for 1", 1½" and DN 25 ND and MD).

5



Remove the safety spring **L**.

6



Remove the working membrane **M** from the guide rod **N**. Check the condition of the working membrane. If necessary, use a new working membrane **M** (maintenance set 17, 18, 19 or 23 as appropriate) when reassembling.

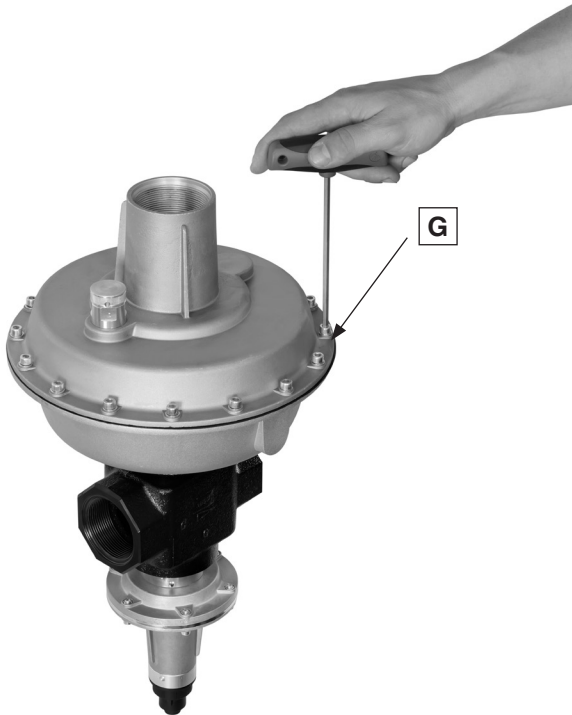
7



Replace the O-Ring **H**.

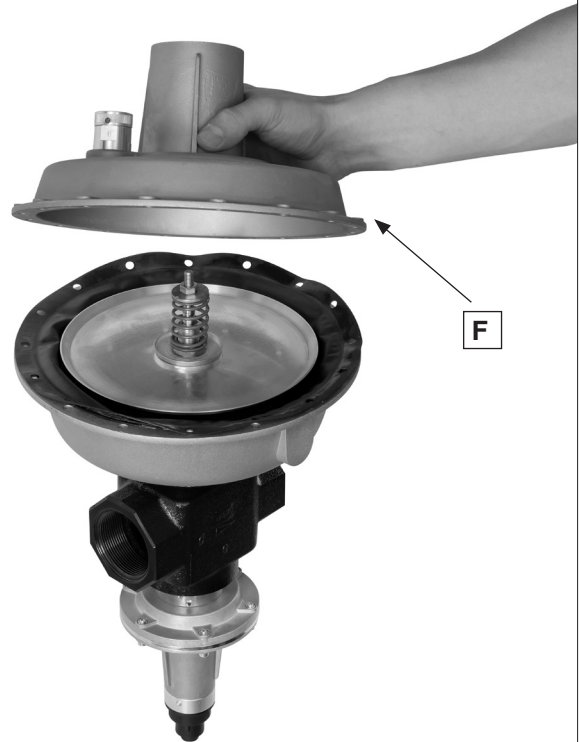
14.2.2.3 Type ND, MD for 2", DN 40 and DN 50

1



Loosen the screws **G** using an Allen key size **5 mm**.

2



Remove the upper membrane cover **F**.

3



Loosen the nut **J** using a spanner size **13 mm**.

4



Remove the disc from the spring **K**.

5



Remove the safety spring **L**.

6



Remove the working membrane **M** from the guide rod **N**. Check the condition of the working membrane. If necessary, use a new working membrane **M** (maintenance set 21 or 22 as appropriate) when reassembling.

7

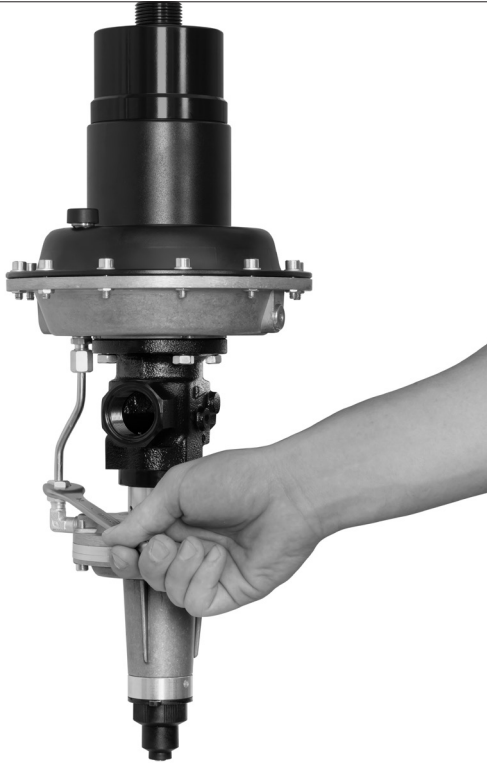


Replace the O-Ring **H**.

14.2.3 Replace valve seat

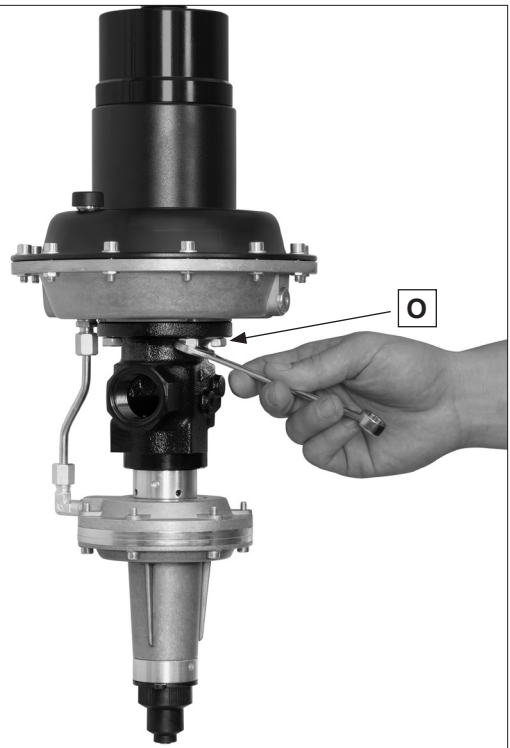
14.2.3.1 Type UHD

1



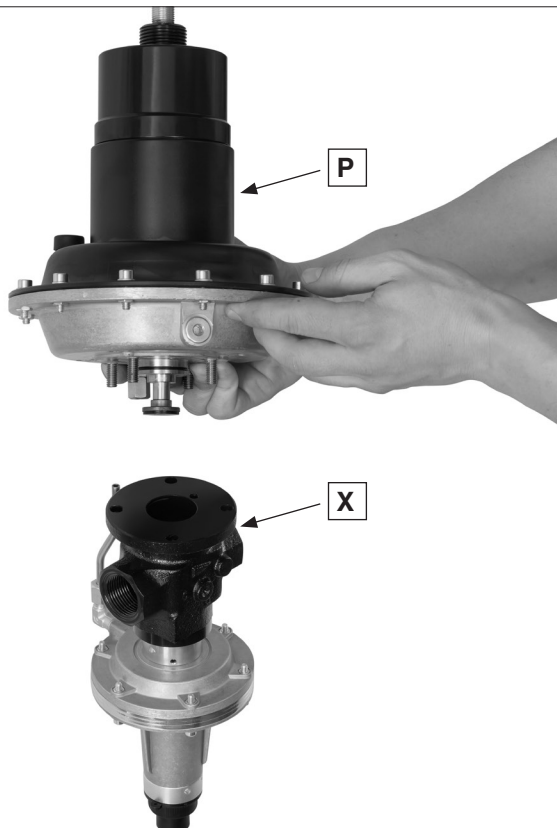
Loosen the pulse line outlet of the SAV with a spanner measuring **14 mm**.

2



Remove the screws **O** from the body **X** using a spanner size **13 mm** (1", 1½", DN 25) or **17 mm** (2" DN 40, DN 50).

3



Remove the regulator hood **P** from the body **X**.

4



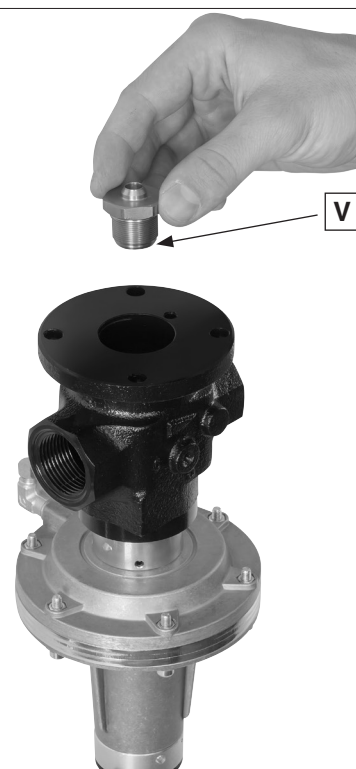
Replace the O-Ring **Q**.

5



Replace valve seat **V**: Unscrew from the body **X** the valve seat **V** using the socket wrench.

6



Screw a new valve seat **V** of the desired size with a new O-Ring **W** (maintenance set 3, 4, 5, 6 as required) onto the body **X**.

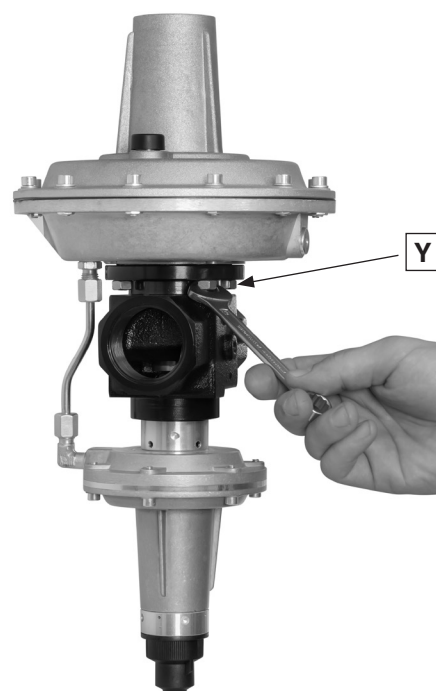
14.2.3.2 Type ND, MD for 1", 1½", DN25 and type HD

1



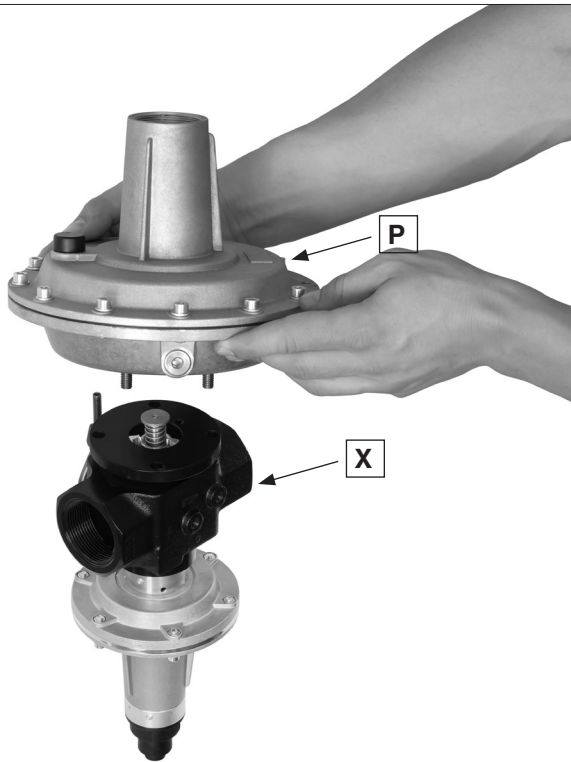
Loosen the pulse line outlet of the SAV with a spanner measuring **14 mm**.

2



Remove the screws **Y** from the body **X** using a spanner measuring **13 mm**.

3



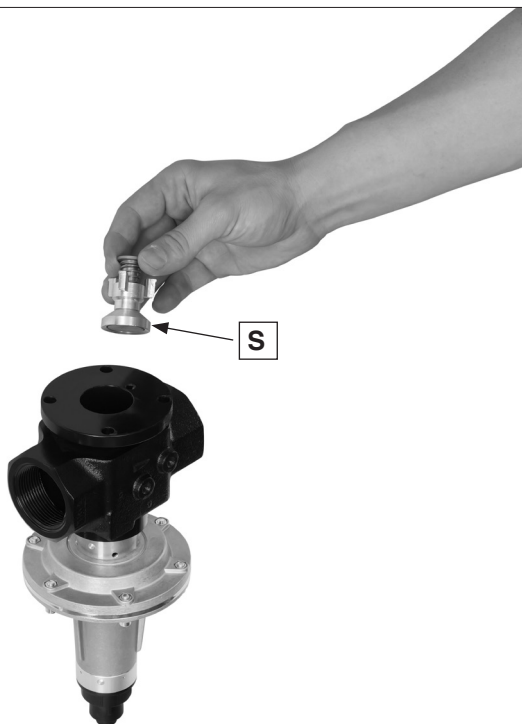
Remove the regulator hood **P** from the body **X**.

4



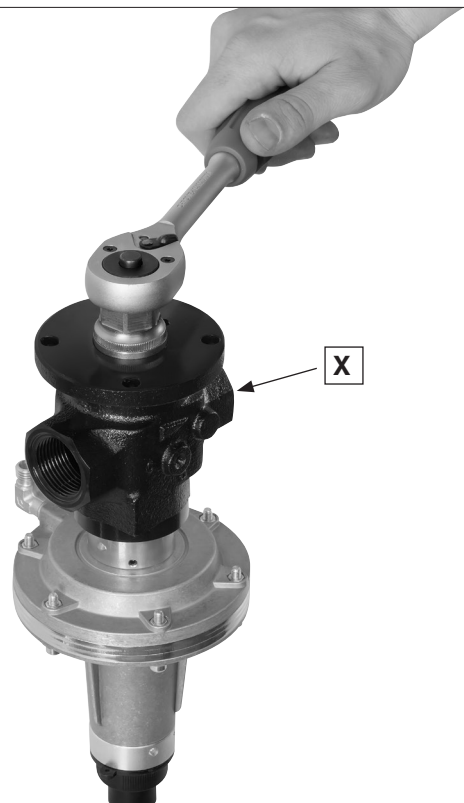
Replace the O-Ring **Q**.

5



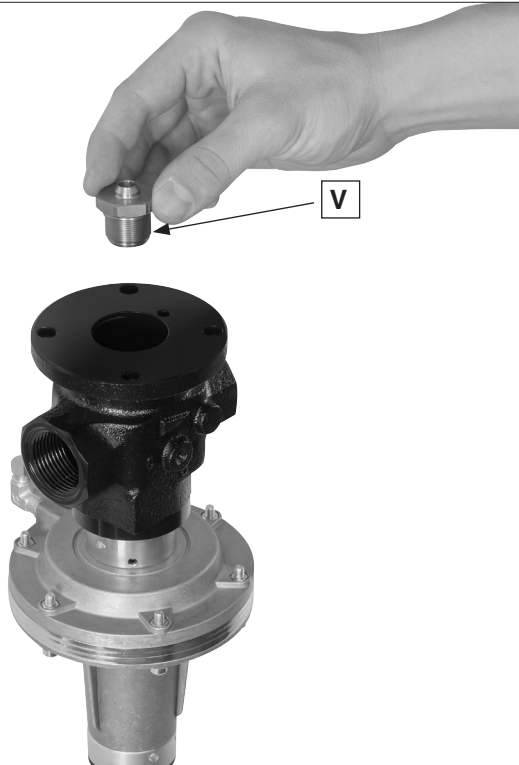
Remove the seal assembly **S**.

6



Replace valve seat **V**: Unscrew from the body **X** the valve seat **V** using the socket wrench.

7



Screw a new valve seat **V** of the desired size with a new O-Ring **W** (maintenance set 3 or 4 as required) into the body **X**.

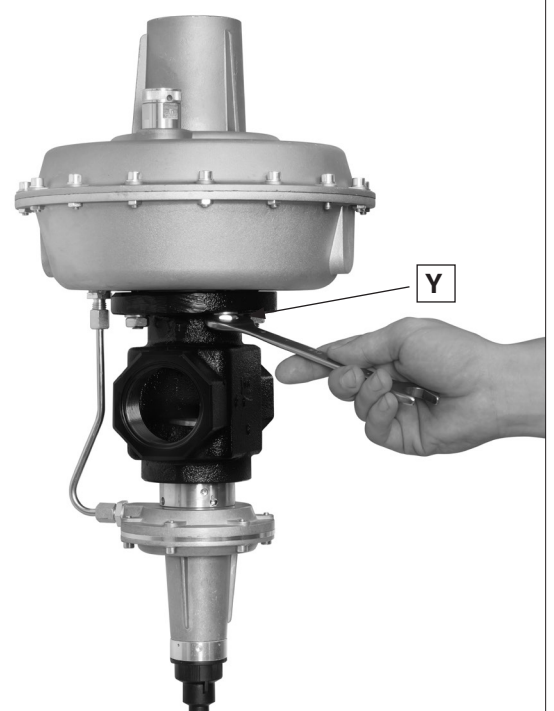
14.2.3.3 Type ND, MD for 2", DN 40 and DN 50

1



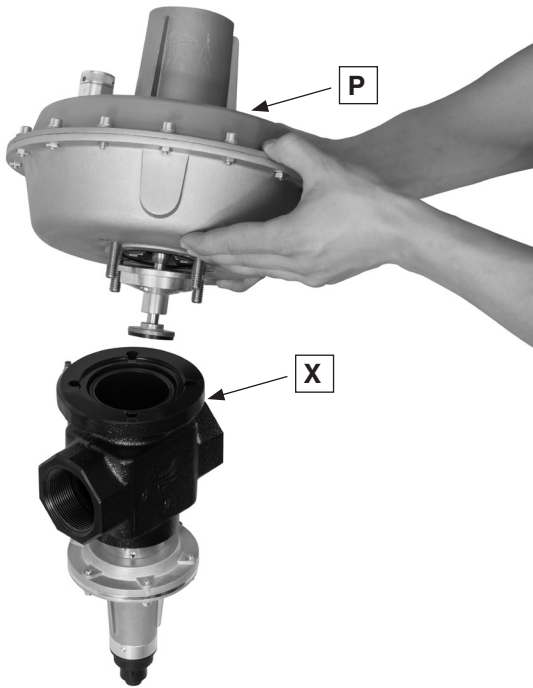
Loosen the pulse line outlet of the SAV with a spanner measuring **14 mm**.

2



Remove the screws **Y** from the body **X** using a spanner measuring **17 mm**.

3



Remove the regulator hood **P** from the body **X**.

4



Replace valve seat **V**: Unscrew from the body **X** the valve seat **V** using the socket wrench.

5



Screw a new valve seat **V** of the desired size with a new O-Ring **W** (maintenance set 5 or 6 as required) onto the body **X**.

6



Replace the O-Ring **Q**.

14.2.4 Replace seal

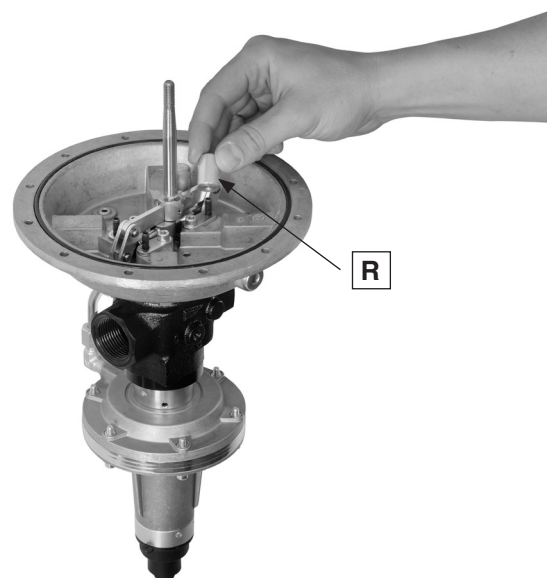
14.2.4.1 Type UHD

1



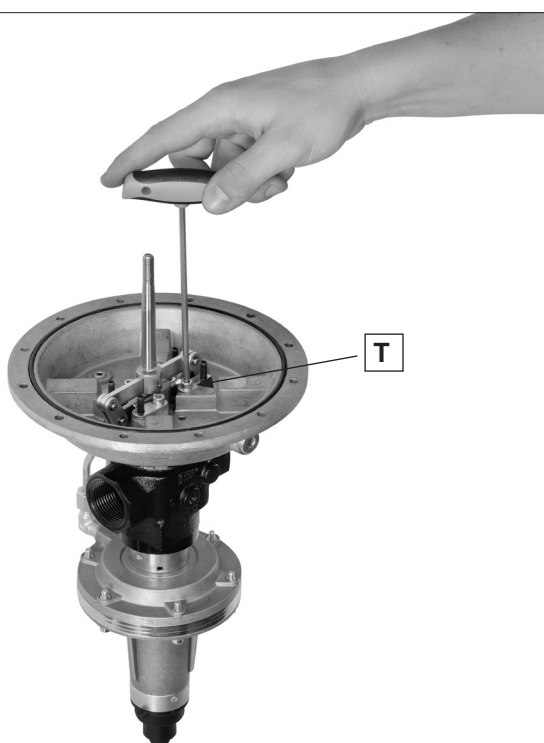
Loosen the nuts **R**.

2



Remove the **R** nuts.

3



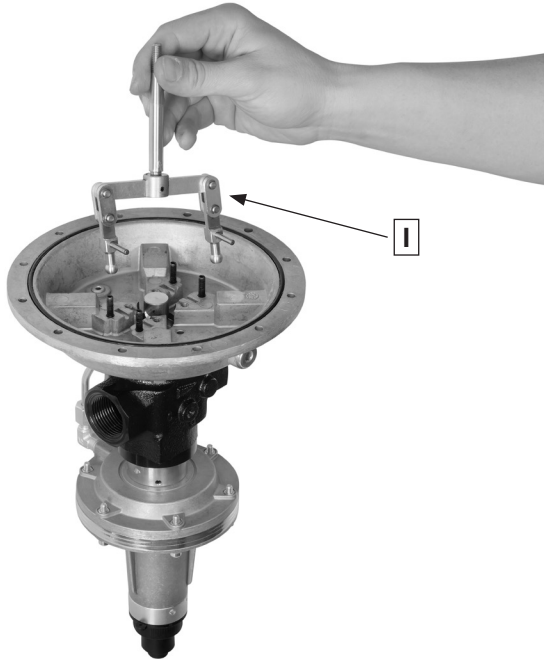
Remove the fastening screws **T** from the lever set with a size **4 mm** Allen key.

4



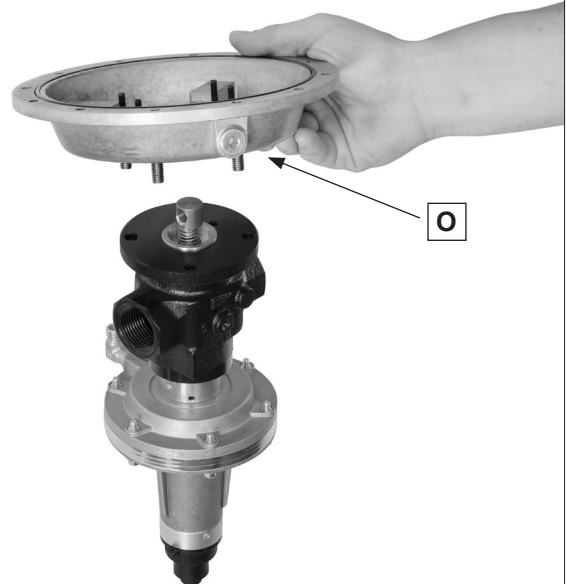
Remove the **U** clamping plates from the lever set.

5



Remove the lever set **I**.

6



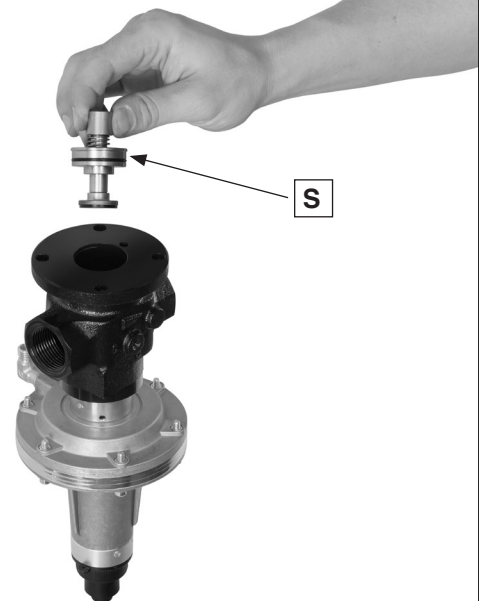
Remove the bottom cover **O**.

7



Replace the O-Ring **Q**.

8



Replace seal assembly **S** (maintenance set 8, 11, 13 or 16 as required).

14.2.4.2 Type ND, MD for 1", 1½", DN 25 and type HD

See section 14.2.3.2, steps 1 to 5 and replace with maintenance kit 7, 8, 10, 12, 13 as appropriate).

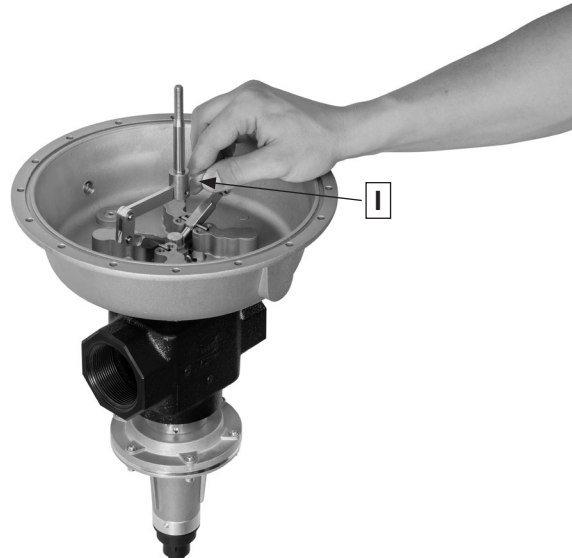
14.2.4.3 Type ND, MD for 2", DN 40 and DN 50

1



Remove the fastening screws **T** from the lever set with a size **5 mm** Allen key.

2



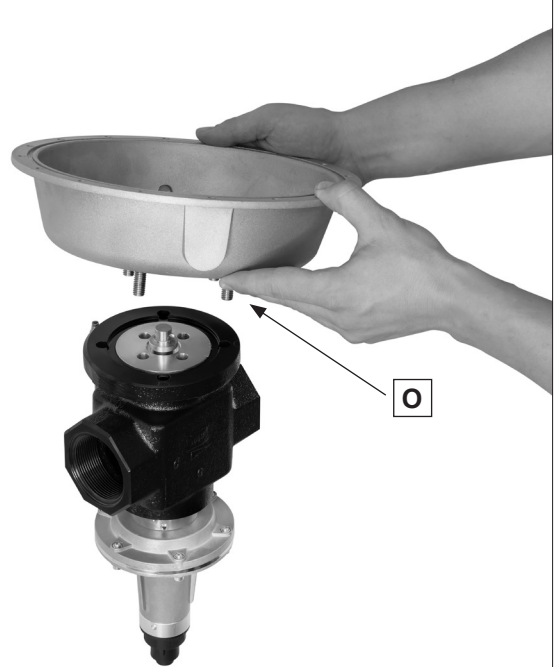
Remove the lever set **I** by unlocking the seal.

3



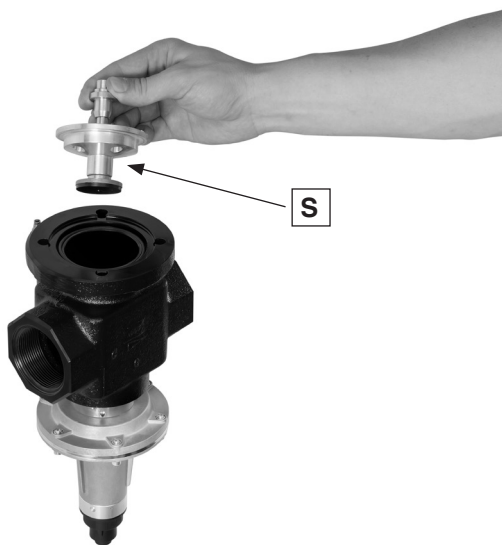
Remove the lever set **I**.

4



Remove the bottom cover **O**.

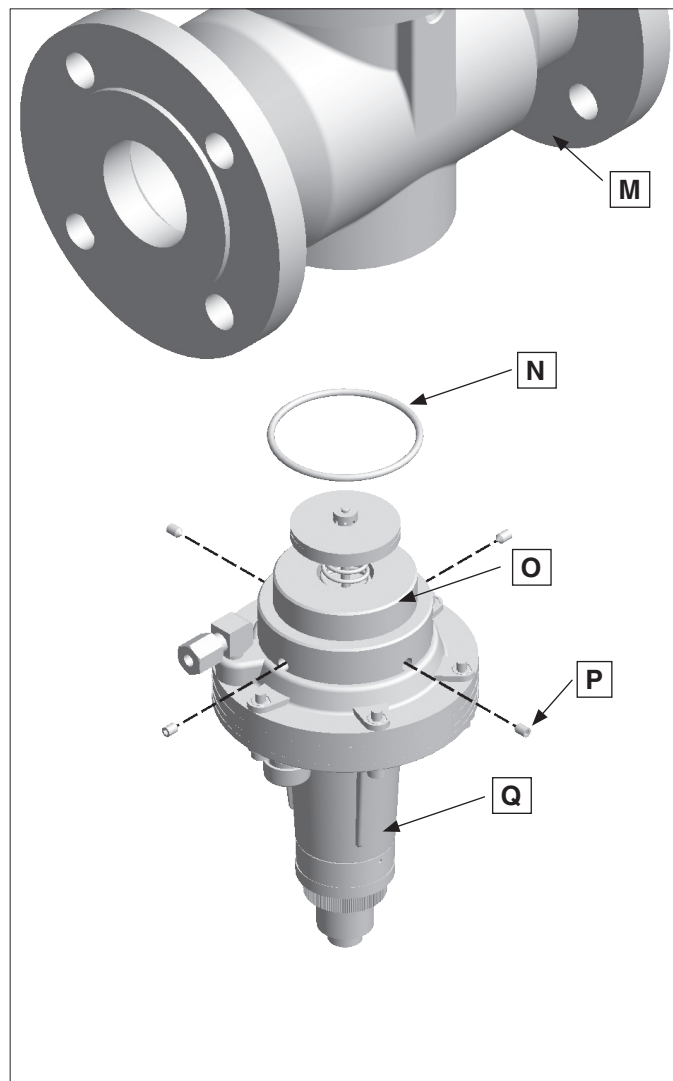
5



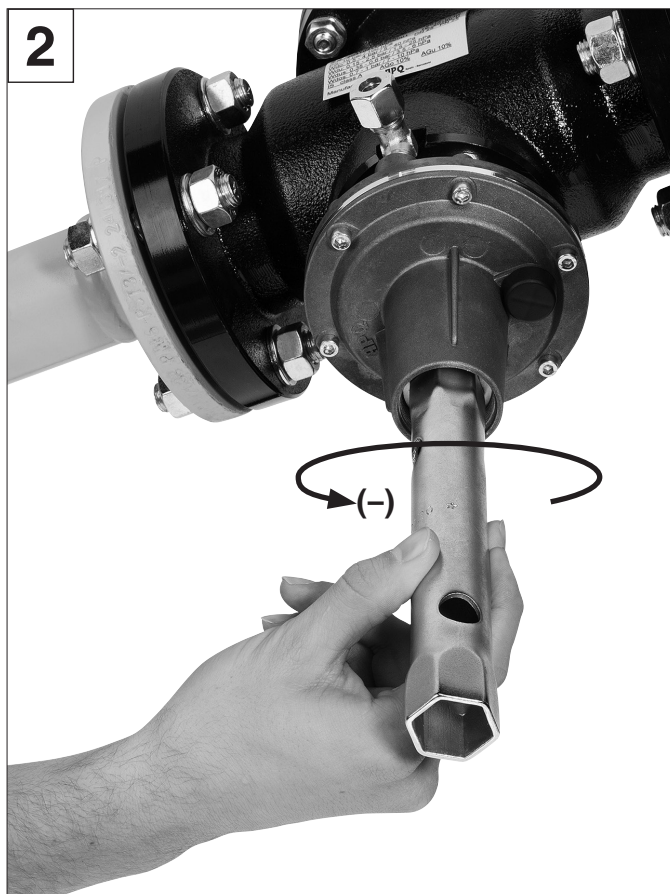
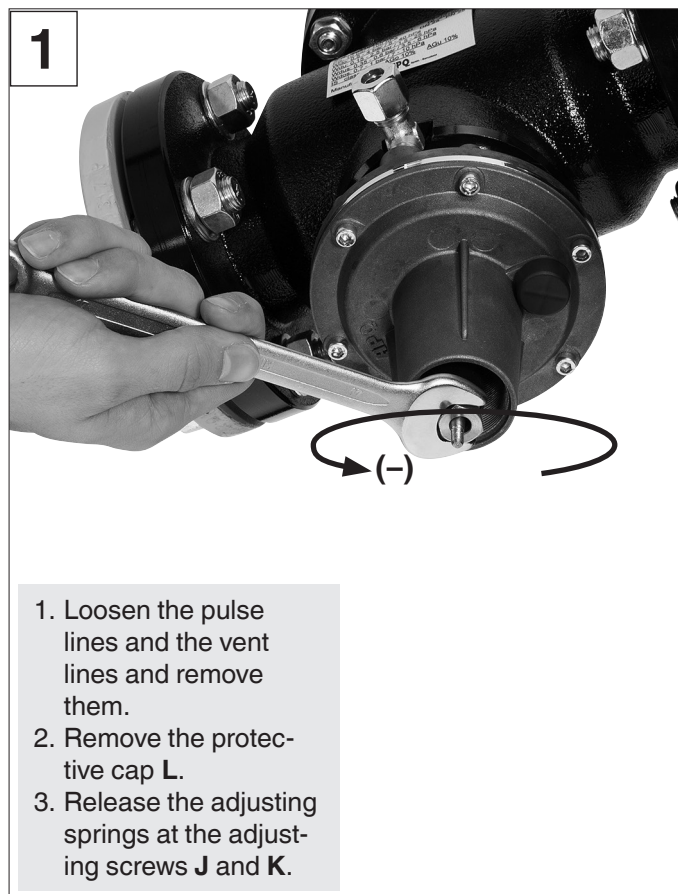
Replace seal assembly **S** (maintenance set 9, 14, 21 or 22 as required).

14.3 Maintenance instructions SAV

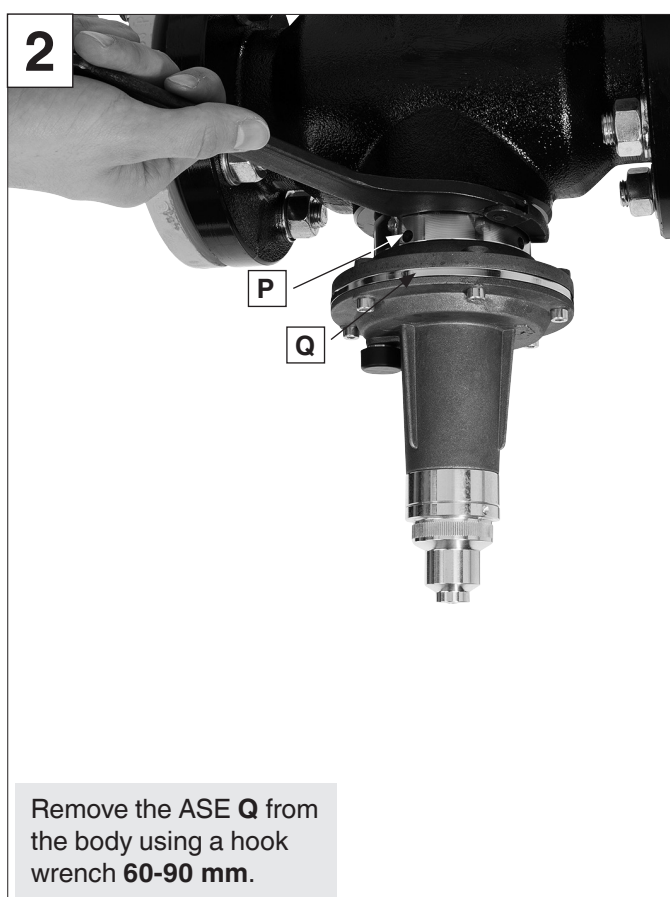
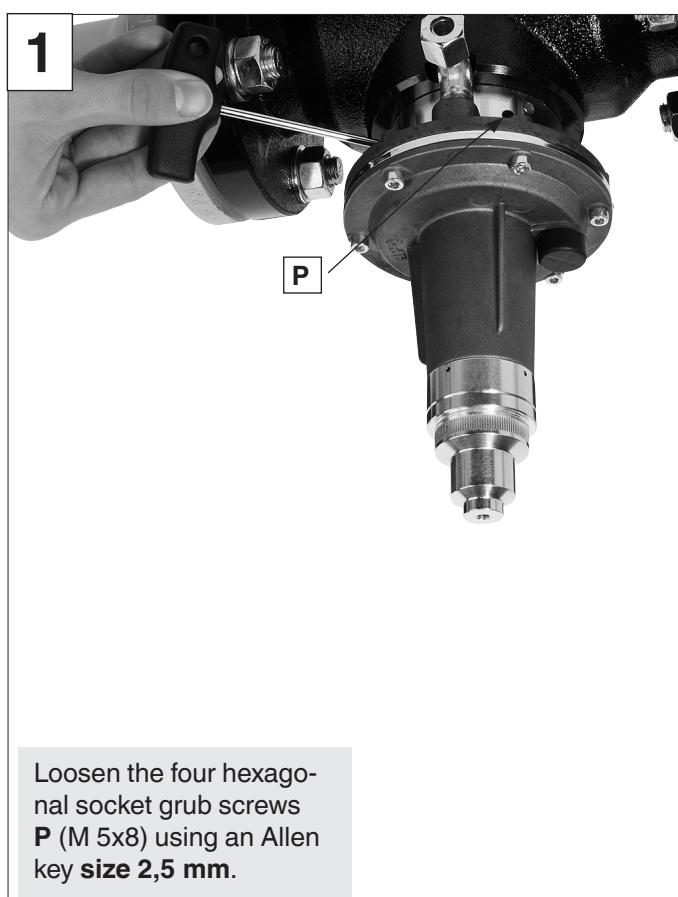
Pos.	Designation
A	Diaphragm shell
B	Push rod
C	O-Ring diaphragm shell
D	Lower diaphragm disc
E	Working diaphragm
F	Bottom locking pressure adjustment spring
G	Upper diaphragm disc (only in the version HD)
H	Allen screws, 6 units.
I	Spring dome ASE
J	Top locking pressure adjustment screw
K	Bottom locking pressure adjustment screw
L	Protective cap
M	ASE housing
N	O-Ring
O	Connecting piece ASE/housing
P	Threaded Allen screws, 4 units.
Q	ASE

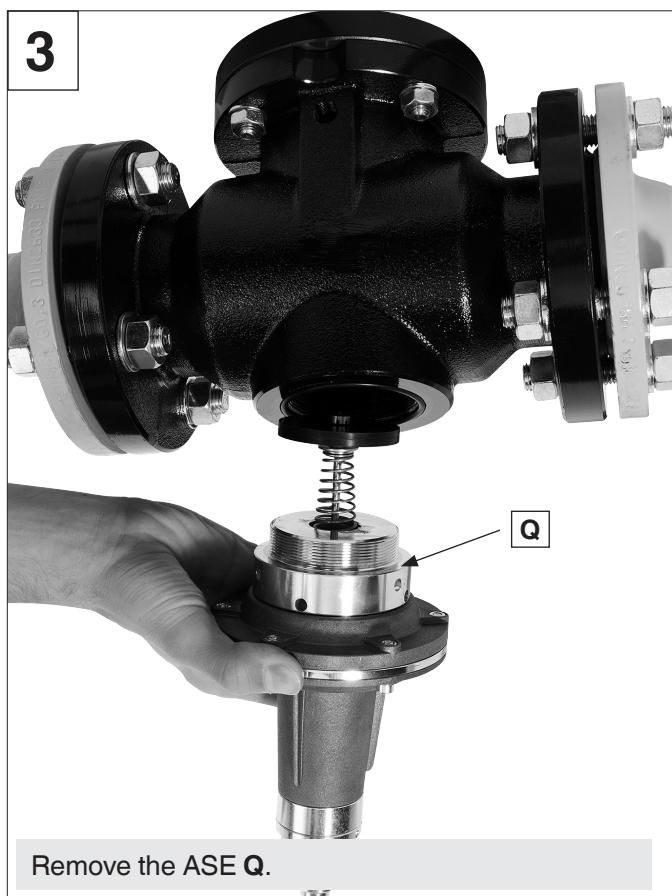


14.3.1 Preparation



14.3.2 Removing the ASE (SAV mechanism only) from the housing





14.3.3 Assembly of the ASE on the body

1	Insert a new O-Ring N (maintenance set 4 or 5) into the groove provided in the housing M .
2	Screw the thread of the connecting piece O onto the body M using a hook wrench 60-90 mm .
3	Fix the connecting piece O of the ASE Q using 4 hexagonal socket grub screws P (M5x8).

14.4 Tools required

A



B



C1



C2



D



SAV

Work step		Tool designation	Pressure rating	Wrench size (mm)		
				DN 25	DN 40	DN 50
1	Loosen the pulse line.	Open-ended wrench (A)	ND/MD/HD	24	24	24
2	Release the adjusting springs.	Socket wrench (B)	ND/MD/HD	17	17	17
		Socket wrench (B)		22	22	22
3	Separate the ASE from the body	Internal hex key (C1)	ND/MD/HD	2.5	2.5	2.5
		Jointed hook wrench with pins according to DIN 1810 (D)		60-90	60-90	60-90
4	Replace the working membrane in the ASE.	Internal hex key (C2)	ND/MD/HD	4	4	4

Regulator

Work step		Tool designation	Pressure rating	Wrench size (mm)		
				DN 25	DN 40	DN 50
1	Loosen the pulse line.	Open-ended wrench (A)	ND/MD/HD	24	24	24
2	Release the adjusting springs.	Open-ended wrench (A)	ND/MD/HD	24	24	24
		Jointed hook wrench with pins (D) (UHD)		90-155	90-155	90-155
3	Replace the working membrane.	Internal hex key (C1)	ND/MD/HD	5	5	5
		Open-ended wrench (A)		13	13	13
4	Replace the seal.	Open-ended wrench (A)	ND/MD/HD	13	17	17
5	Replace the valve seat.	Socket wrench (B)	ND/MD/HD	27	46	46

14.5 SAV Leakage test

Go to section "12. Commissioning, decommissioning and recommissioning for FRM-NOC or SAV" for performing functional and leakage testing of SAV.

14.6 Recommended maintenance intervals

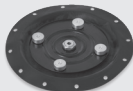
1. The maintenance intervals depend on the system-specific operating and environmental conditions, gas quality, state of the pipelines, etc.
2. The maintenance intervals have to be set by the system operator according to the system requirements.
3. It is recommended to perform a functional test on a monthly base and carry out maintenance works every year including a leakage testing, in order to guarantee the system availability.
4. It is necessary to comply at least with the maintenance intervals specified in G 495.

Max. inlet pressure [bar]	Functional test	Maintenance
> 0.1 to 1	every 4 years	every 8 years
> 1 to 5	every 2 years	every 4 years
> 5	once a year	every 2 years

15. Spare parts

15.1 Regulatory list of spare parts

Set	Spare part	Version	Item N°	Spare part/ illustration
1	TOP COVER ALUMINI CAP	FRM-NOC10010/12/025 ND/MD FRM-NOC10010/15/20/025/040/050 HD	287754	
2	TOP COVER UHD	FRM-NOC100XXX UHD	270396	
3	KIT SHELL M.22 + O-Ring	FRM-NOC10010/15 XX	287755	
4	KIT SHELL M.30 + ORING	FRM-NOC100025 XX	287756	
5	KIT SHELL M.45 + ORING	FRM-NOC10020/040XX	287757	
6	KIT SHELL M.56+ORING	FRM-NOC100050 XX	287758	
7	SEAL + O-Ring (BODY AND COVER)	FRM-NOC10010/15 ND/MD	287759	
		FRM-NOC10010/15 HD/UHD	287760	
		FRM-NOC10020/040 ND/MD	287761	
		FRM-NOC10020/040 HD	287762	
		FRM-NOC10020/040 UHD	287763	
		FRM-NOC100025 ND/MD	287764	
		FRM-NOC100025 HD/UHD	287765	
		FRM-NOC100050 ND/MD	287766	
		FRM-NOC100050 HD	287767	
		FRM-NOC100050 UHD	287768	

Set	Spare part	Version	Item N°	Spare part/ illustration
8	MEMBRANE(1000411) 10/15/25 ND + MEMBRANE JOINT	FRM-NOC10010/15/025 ND	287769	
9	MEMBRANE(1000412) 10/15/25 MD + MEMBRANE JOINT	FRM-NOC10010/15/025 MD	287770	
10	MEMBRANE(1000413) 10/15/25 HD + MEMBRANE	FRM-NOC10010/15/025 HD	287771	
11	MEMBRANE(1000414) 10/15/25 UHD + MEMBRANE JOINT	FRM-NOC10010/15/025 UHD	287772	
12	MEMBRANE(1000421) 20/40/50 ND + MEMBRANE JOINT	FRM-NOC10020/040/050 ND	287773	
13	MEMBRANE(1000422) 20/40/50 MD + MEMBRANE JOINT	FRM-NOC10020/040/050 MD	287774	
14	MEMBRANE(1000413) 20/40/50 HD + MEMBRANE + SPACER JOINT	FRM-NOC10020/040/050HD	287775	
15	MEMBRANE(1000424) 20/40/50 UHD + MEMBRANE JOINT + SPACER JOINT	FRM-NOC10020/040/050UHD	287776	

15.2 List of spare parts SAV

Set	Spare part	Version	Item N°	Spare part/illustration
1	Protective cap	FRM-NOC	on request	
2	ASE WITH O-Ring	FRM-NOC10010/15ND	287777	
		FRM-NOC10010/15MD	287778	
		FRM-NOC10010/15HD/UHD	287779	
		FRM-NOC10020/040ND	287780	
		FRM-NOC10020/040MD	287781	
		FRM-NOC100025ND	287783	
		FRM-NOC100025MD	287784	
		FRM-NOC100025HD/UHD	287785	
		FRM-NOC100050ND	287786	
		FRM-NOC100050MD	287787	
		FRM-NOC100050HD/UHD	287788	

15.3 Storage conditions

Basically, DIN 7716 (guidelines for storage, maintenance and cleaning of rubber products) applies to the storage of diaphragms and O-Rings.

The ageing process depends mainly on the following factors:

- Temperature
- Thermal radiation
- Solar radiation
- Humidity
- Relative humidity
- Ozone
- Stress condition of the component

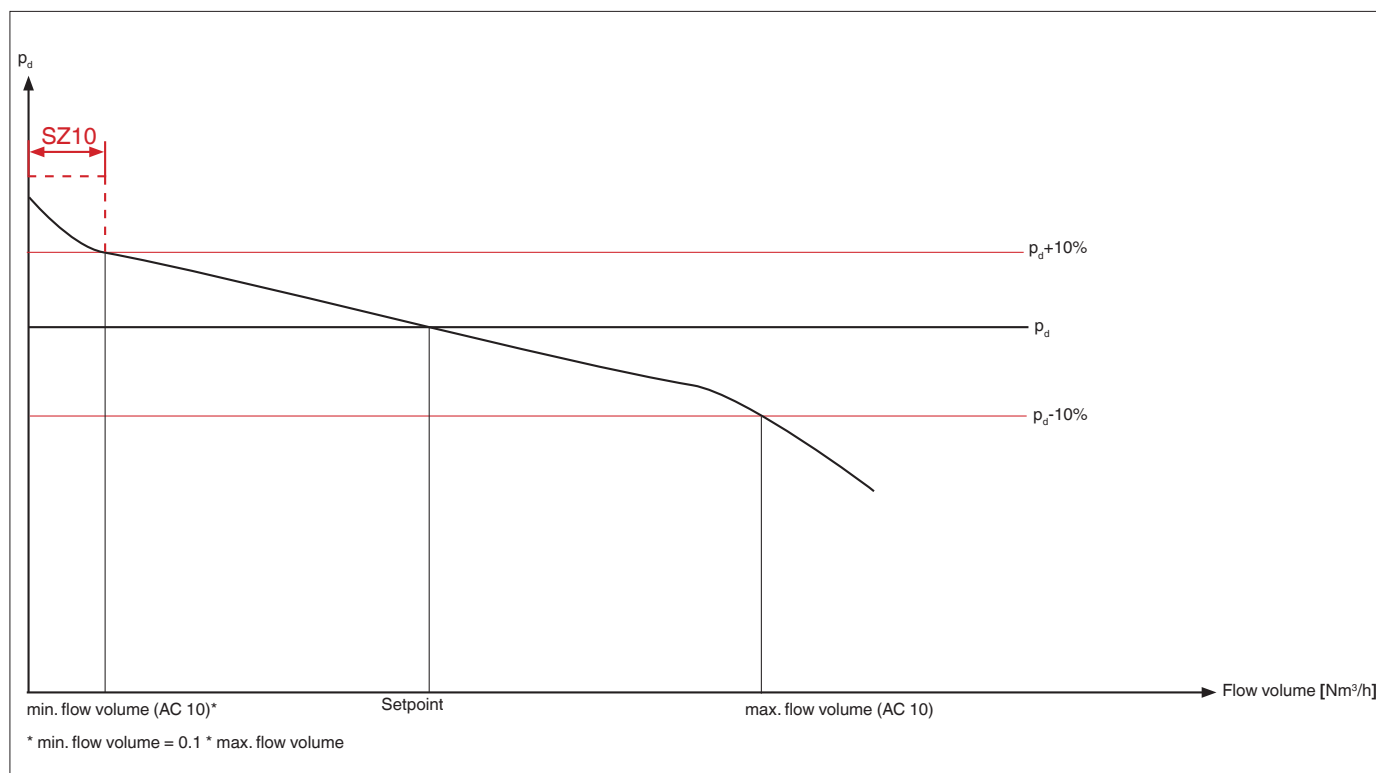
Proper storage

- Storage temperature between 5 °C and 20 °C
- No direct solar radiation
- No direct heat sources in the storage area
- No exposure to ozone
- Tension-free storage
- Storage in polyethylene bags
- Do not exceed the max. storage periods of 3 years.

16. Flow diagram

16.1 Flow diagrams AC 10 explanation

Flow diagram AC10: Please, refer to document number. 288127 “Flow diagrams FRM-NOC”.



The maximum flow rate indicated refers to natural gas with a density of 0.81 kg/m³ or to the air with a density of 1.24 kg/m³ at 15 °C under normal conditions. In the case of different types of gases, a conversion of the volume flow according to the equation shown below is carried out.

$\dot{V}_{\text{gas used}} =$	$\dot{V}_{\text{air}} \times f$	Type of gas	Density [kg/m³]	dv	f
$f = \sqrt{\frac{\text{Specific mass of the air}}{\text{Spec. mass of the gas used}}}$		Natural gas	0.81	0.65	1.24
		City gas	0.58	0.47	1.46
		LPG	2.08	1.67	0.77
		Air	1.24	1.00	1.00

16.2 Flow volume coefficient of the valve K_G

Model	Thread	Ø6	Ø8	Ø10	Ø12	Ø14	Ø16	Ø20	Ø25	Ø30	Ø35
1", 1½"	M 22	34	61	87	115	144					
DN 25	M 30	34	61	87	115	144					
2", DN 40	M 45			105			279	396	546		
DN 50	M 56				151		282	412	575	737	900

The flow coefficient of the valve K_G of the FRM is equal to the flow rate with the actuator fully open, with an absolute inlet pressure of $p_{u, \text{abs.}} = 2,01325$ bar and an absolute outlet pressure of $p_{d, \text{abs.}} = 1.01325$ bar. The value K_G refers to natural gas with a relative density of $d = 0.64$, corresponding to a standard density of $p_n = 0.83$ kg/m³ and a gas inlet temperature of $t = 15$ °C

The mass flow through a nozzle increases with a constant inlet pressure and a decrease in pressure after the nozzle, until it reaches its maximum when the pressure ratio is critical and thereafter remains constant. With constant outlet pressure, an additional increase in inlet pressure causes an increase in the mass flow through the regulator. For this reason, to calculate the mass flow that flows through a nozzle, two areas are distinguished:

a) sub-critical or critical relative pressure $\frac{p_{d, \text{abs.}}}{p_{u, \text{abs.}}} \geq 0,53$

$$K_G = \sqrt{\frac{Q_N}{(p_u + 1,013) \cdot (p_u - p_d)}}$$

Abbreviation	Description
p_d [bar]	Outlet pressure
$p_{d, \text{abs.}}$ [bar]	Outlet pressure as absolute pressure ($p_d + 1,013$)
p_u [bar]	Inlet pressure
$p_{u, \text{abs.}}$ [bar]	Inlet pressure as absolute pressure ($p_u + 1,013$)

b) super-critical relative pressure $\frac{p_{d, \text{abs.}}}{p_{u, \text{abs.}}} < 0,53$

$$K_G = \frac{Q_N \cdot 2}{(p_u + 1,013)}$$

where
 Q_N = regulator power under normal conditions



The Pressure Equipment Directive (PED) and the Energy Performance of Buildings Directive (EPBD) require a periodic inspection of heat generators in order to ensure a high degree of efficiency over a long term and, consequently, the least environmental pollution.

It is necessary to replace safety-relevant components after they have reached the end of their useful life:

Sicherheitsrelevante Komponente Safety relevant component Composant relatif à la sécurité Componenti rilevanti dal punto di vista della sicurezza	Konstruktionsbedingte Lebensdauer Designed Lifetime Durée de vie prévue Durata di vita di progetto		Norm Standard Norme Norma	Dauerhafte Lagertemperatur Durable storage temperature Température de stockage permanente Temperatura di stoccaggio permanente
	Zyklenzahl Operating cycles Cycle d'opération Numero di cicli di funzionamento di progetto	Jahre Years Année Anni		
Ventilprüfsysteme / Valve proving systems / Systèmes de contrôle de vannes / Sistemi di controllo valvole	250 000	10	EN 1643	0...45 °C 32...113 °F
Gas / Gas / Gaz / Gas Druckwächter / Pressure switch / Manostat / Pressostati	50 000	10	EN 1854	
Luft / Air / Air / Aria Druckwächter / Pressure switch / Manostat / Pressostati	250 000	10	EN 1854	
Gas mangelschalter / Low gas pressure switch / Pressostat gaz basse pression / Pressostati gas di minima pressione	N/A	10	EN 1854	
Feuerungsmanager / Automatic burner control / Dispositif de gestion de chauffage / Gestione bruciatore	250 000	10	EN 298 EN 230	
UV-Flammenfühler¹ Flame detector (UV probes)¹ Capteur de flammes UV¹ Sensore fiamma UV¹	N/A	10 000 h³	---	
Gasdruckregelgeräte¹ Gas pressure regulators¹ Dispositifs de réglage de pression du gaz¹ Regolatori della pressione del gas¹	N/A	15	EN 88-1 EN 88-2	
Gasventil mit Ventilprüfsystem² Gas valve with valve testing system² Vanne de gaz avec système de contrôle de vanne² Valvola del gas con sistema di controllo valvola²	nach erkanntem Fehler after error detection après détection d'erreur dopo segnalazione di errore		EN 1643	
Gasventil ohne Ventilprüfsystem² Gas valve without valve testing system² Vanne de gaz sans système de contrôle de vanne² Valvola del gas senza sistema di controllo valvola²	DN ≤ 25 200 000 25 < DN ≤ 80 100 000 80 < DN ≤ 150 50 000	10	EN 161	
Gas-Luft-Verbundsysteme / Gas-air ratio control system / Systèmes combinés gaz/air / Sistemi di miscelazione gas-aria	N/A	10	EN 88-1 EN 12067-2	
¹ Nachlassende Betriebseigenschaften wegen Alterung / Performance decrease due to ageing / Réduction de performance due au vieillissement / Riduzione delle prestazioni dovuta all'invecchiamento ² Gasfamilien II, III / Gas families II, III / Familles de gaz II, III / per i gas delle famiglie II, III ³ Betriebsstunden / Operating hours / Heures de service / Ore di esercizio N/A nicht anwendbar / not applicable / ne peut pas être utilisé / non può essere usato				
Lagerzeiten / Storage times / Périodes de stockage / Tempi di stoccaggio				
Lagerzeiten ≤ 1 Jahr verkürzen nicht die konstruktionsbedingte Lebensdauer. Storage time ≤ 1 year does not reduce the designed lifetime. Les périodes de stockage ≤ 1 an ne réduisent pas la durée de vie liée à la conception. I tempi di stoccaggio ≤ 1 anno non riducono la durata di vita legata al design.				
DUNGS empfiehlt eine maximale Lagerzeit von 3 Jahren. DUNGS recommends a maximum storage time of 3 years. DUNGS recommande une durée de stockage maximale de 3 ans. DUNGS raccomanda un tempo massimo di stoccaggio di 3 anni.				

We reserve the right to make modifications in the course of technical development.

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