Instructions No EH30204E
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Masoneilan 41300, 41400, 41500, 41600 and 41900 Series Control Valve Instructions

Masoneilan
Valve & Controls DRESSER

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Helpful Hints

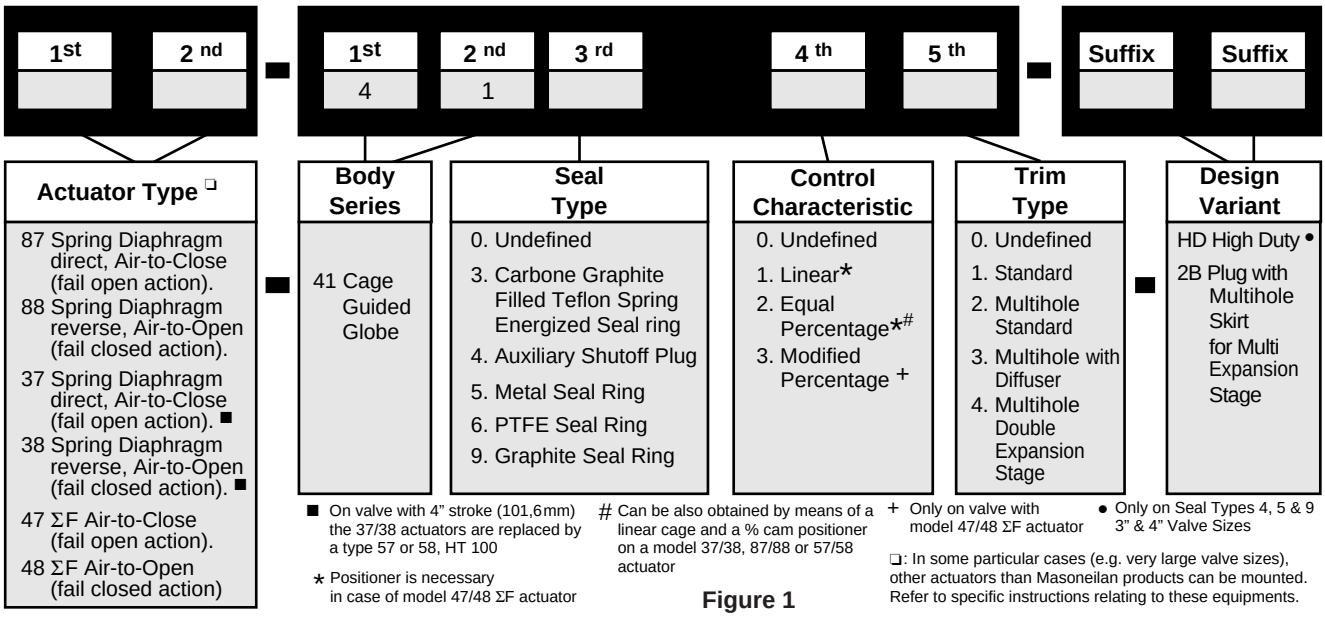
1. Have spare parts on hand before starting.
2. Read the instructions carefully.
3. Study the figures carefully and identify each part.
4. Use the right tool for the job.
5. Be careful not to score the stem, plug and guiding surfaces.
6. Avoid rotating the plug on the seat ring.
7. Insure all lubricants, gaskets and packing are compatible with the service.
8. Don't overtighten nuts or bolts.
9. CIean the valve parts thoroughly before reassembling.
10. Work safely.

The following instructions should be thoroughly reviewed and understood prior to installing, operating or performing maintenance on this equipment. Throughout the text, safety and/or caution notes will appear and must be strictly adhered to, otherwise, serious injury or equipment malfunction could result.

WARNING

LINE MUST BE CLEANED PRIOR TO INSTALLATION

41000 MODELS NUMBERING SYSTEM



■ On valve with 4" stroke (101,6mm) the 37/38 actuators are replaced by a type 57 or 58, HT 100

* Positioner is necessary in case of model 47/48 ΣF actuator

\# Can be also obtained by means of a linear cage and a % cam positioner on a model 37/38, 87/88 or 57/58 actuator

\+ Only on valve with model 47/48 ΣF actuator

• Only on Seal Types 4, 5 & 9 3" & 4" Valve Sizes

❑: In some particular cases (e.g. very large valve sizes), other actuators than Masoneilan products can be mounted. Refer to specific instructions relating to these equipments.

Figure 1

CAUTION: The Model Numbering System of the Figure 1 shows that a large quantity of design combinations is offered on purpose to answer to a large range of applications. These installation and maintenance instructions apply to all sizes and ratings of the most standard configurations of the Masoneilan 41000 Series Valves, except the 41•14 and 41•14-2B Models (valves with multihole cages for double or triple expansion stage) which are the subject of another instructions manual No 182053 E.

- **The complete sectional views of Figures 14 to 18 (pages 18 & 19) show the basic configurations of the series ; i.e. 41000 valves with standard cage (Code 41..1). All other configurations are shown in the form of details displaying their differences of design in regard of the standard cage valves, (Figures 19 to 34).**
- **In this instruction manual, the shown configurations are essentially identified by means of the 3rd digit of the valve model code (balanced plug seal type), the 5th digit (Trim type) and, if the case arises, a terminal suffix.**
- **The 4th digit of the model code, corresponding to the valve control characteristic, is not necessary for the showing of the valve and for maintenance descriptions. So, in all codified designations used in these instructions, the 4th digit will be replaced by the mark "•".**
- **Refer to the above Figure 1 for codes meaning. Refer to hereunder Figure 2 to know the figure(s) No(s) corresponding to the code number of your valve.**

Valve Code	Refer to Figure Number According to Variant Code Digit		
	❶	❷	❸
41 3• ❑	Fig. 18	Fig. 18	No offered
41 4• ❑	Fig. 14 or 15*	Fig. 14 or 15* + Fig. 19 or 20*	Fig. 14 or 15* + Fig. 21 or 22*
41 5• ❑	Fig. 16 or 17*	Fig. 16 or 17* + Fig. 23 or 24*	Fig. 16 or 17* + Fig. 25 or 26*
41 6• ❑			
41 9• ❑			
❶❷❸	* According to Valve Size		
	❷	❸	
41 3• ❑ –2B...	Fig. 18 + Fig. 28	No offered	
41 4• ❑ –2B...	Fig. 14 or 15* + Fig. 19 or 20* + Fig. 28	Fig. 14 or 15* + Fig. 21 or 22* + Fig. 29	
41 5• ❑ –2B...	Fig. 16 or 17* + Fig. 23 or 24* + Fig. 28	Fig. 16 or 17* + Fig. 25 or 26* + Fig. 29	
41 6• ❑ –2B...			
41 9• ❑ –2B...			
❷❸	* According to Valve Size		
	❶	❷	❸
41 4• ❑ –HD..	Fig. 14 + Fig. 27	Fig. 14 + Fig. 19 + Fig. 27	Fig. 14 + Fig. 21 + Fig. 27
41 5• ❑ –HD..	Fig. 16 + Fig. 27	Fig. 16 + Fig. 23 + Fig. 27	Fig. 16 + Fig. 25 + Fig. 27
41 9• ❑ –HD..			
❶❷❸			

Figure 2

Notes:
- If plug with two sets of seal rings, refer to Figure 30,
- If valve size ≥6" with a wound flexitalic gasket instead of the flat spring washer (17), refer detail to Figure 31,
- If valve with unbalanced plug, with or without multihole skirt, refer to Figure 32

1. Introduction

The following instructions are designed to assist personnel in performing most of the maintenance required on the MASONEILAN 41300, 41400, 41500, 41600 and 41900 Series Control Valves, sizes 2" thru 24" (50 thru 600 mm). Ratings of these valves are ANSI class 300, 600, 900,1500, or 2500, according to sizes and designs.

If maintenance followed carefully will reduce maintenance time.

Note: *These valves, originally designed with a globe body, can also be provided under various designs such as:*

- *globe body or angle body,*
- *flanged ends or welded ends,*
- *equipped with inlet combining-tube and/or outlet diverging-tube,*
- *equipped with one or several multi holes plates, integrated into the outlet diverging-tube.*

In case of angle valve bodies, these ones are sometimes named 70000 or 71000, instead of 41000, (Figure 33).

After Sales Department

Masoneilan has a highly skilled After Sales Department available for start-up, maintenance and repair of our valves and components parts. Contact the nearest Masoneilan sales office or representative or After Sales Department of Condé-sur-Noireau plant.

Training

A regularly scheduled training program is conducted at our Condé-sur-Noireau plant, to train customer service and instrumentation personnel in the operation, maintenance and application of our control valves and instrument. Arrangements for these services can be made through your local Masoneilan Representative or our Training Department.

2. General

These installation and maintenance instructions apply to all sizes and ratings of the Masoneilan 41000 Series Valves above mentioned. When performing maintenance on these valves, always use Masoneilan replacement parts. Parts are obtainable through your local Masoneilan Representative or Spare Parts Department.

When ordering parts, always **include Model and Serial Numbers of the unit being repaired.** The Model and Serial numbers, size and rating of the valve are shown on the Serial plate located on the actuator. Recommended spare parts required for maintenance are listed in Parts Reference. Refer to Figure 1 to identify valve model with numbering system.

For actuator maintenance, refer to instructions manual No ER 30004E for types 37/38, No ER8788 for types 87/88, No ER 20004E in case of types 47/48, or No 174448 E if types 57/58 are installed.

3. Unpacking

Care must be exercised when unpacking the valve to prevent damage to the accessories and component parts. Should any problems arise, contact your local Masoneilan Representative or After Sales Department.

4. Installation

Before installing the valve in the line, clean piping and valve of all foreign material such as welding chips, scale. oil, grease or dirt. Gasket surfaces must be thoroughly cleaned to insure leak-free joints.

4.1. To allow for in-line inspection, maintenance and removal of the valve without service interruption, provide a manually operated stop valve on each side of the control valve and a manually operated throttling valve in the by-pass line.

4.2. In case of heat insulated installation, do not insulate the valve bonnet and take protection measures related to personal safety.

CAUTION: The 41000 Series throttling control valves must not be used as isolating valves. So, THESE VALVES MUST BE IMPERATIVELY OPEN BEFORE PERFORMING PRESSURE TESTS IN PROCESS LINE, CLEANING OF PIPES, ETC..., otherwise equipment damages or destroying of seal rings could result.

The valve must be installed so that the controlled substance will flow through the valve in the direction indicated by the flow arrow located on the body.

On 41300 Series valves, Flow Tending to Open must be strictly observed. The flow direction in the valve body must never be reversed.

On 41400 Series valves, Flow Tending to Close must be strictly observed.

PILOT CAUTION

CAUTION: To bring the 41400 Series control valve on line after isolation and depressurization, Masoneilan recommends the valve be in the fully open position (unless service conditions prevent), and the upstream isolation valve be opened first to pressurize the control valve in the proper direction.

5. Air Piping (Figures 3 & 4)

Masoneilan actuators are normally designed to accept 1/4" NPT air supply piping (see Fig. 3 for exceptions). Use 1/4" OD tubing (4x6 mm) or equivalent for all air lines. If the air line exceeds 25 feet (7,5 meters) in length or if the valve is equipped with volume boosters, 3/8" OD tubing (6x8 mm) is preferred. All connections must be free of leaks.

Caution: Do not use air supply pressure greater than specified on serial plate on the yoke of actuator.

6. Body Disassembly (Figures 14 to 34 according to code valve and size)

Caution: New gaskets (10, 14 & 36) and new piston seal rings should be on hand before disassembling the valve since it is recommanded that the new gasket and rings be installed during reassembly.

Access to the internal components of the body should be accomplished with the actuator removed. To remove actuator from the body, refer to either Section 9 of this manual for types 37/38 or 47/48 actuators, instruction manual No ER8788 for types 87/88, or instruction manual No 174448 E if types 57/58 actuators are installed.

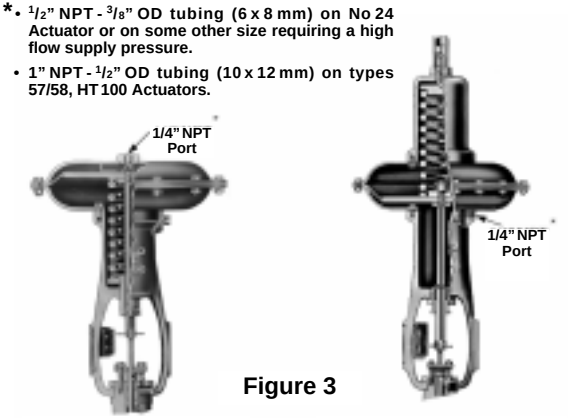
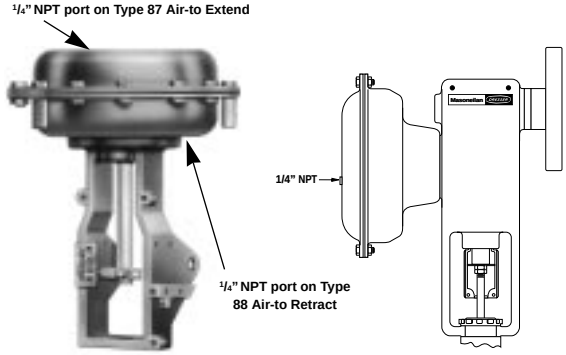


Figure 3

Air-to-Extend Direct Actuator (37) | Air-to-Retract Reverse Actuator (38)



Type 87/88 Multispring Actuator | **Figure 4** | **Type 47/48 ΣF Actuator**

Caution: Prior to performing maintenance on the valve, isolate the valve, vent the process pressure and shut off air supply and signal air or electrical lines to the unit.

A. Remove packing flange nuts (3), then remove packing flange (4) and packing follower (23).

B. Insure exposed part of stem (1) is clean and free of dirt to enable it to slide through the packing when removing the bonnet (7).

C. Remove body stud nuts (8). In case of 20" or 24" valve size, remove also the washers (50), (see Figure 34).

D. By means of a pad eye secured at the upper part of the bonnet (7) and a hoist, lift and separate bonnet from body (18).

Note: It is suggested that two tapered pieces of flat stock be inserted at the bonnet-to-body joint 180° apart, to facilitate initial separation of the bonnet from the body. Two heavy screw drivers placed 180° apart could also be utilized. Pressure should be applied evenly to prevent the bonnet from binding on the stem or cage.

E. Push the plug stem (1) down so the plug is on the seat and slowly remove the bonnet (7), insuring that the plug stem, plug (15) and cage (16) remain in the body (18).

Note: It may be necessary to push the plug stem down through the bonnet as the bonnet is being raised.

F. Remove flat (or conical) spring washer (17) and body gasket (10). If the case arises, remove also the cage gasket (36). *(Refer to opposite **Caution** Note). In case of 20" or 24" valve size, two tapped lifting holes Dia. M 4 have been provided at the top of spring washer, for ease of disassembly-reassembly.*

*Note: Spiral wound gaskets are standard in this design and **it is imperative that new gaskets are installed each time the valve is disassembled.***

G. Remove together plug (15) and cage (16) from body (18) by pulling upward on the plug stem (1).

*Note: **On type 41300, 2" to 10" and 20" & 24" valve sizes and some other design variants,** the inside diameter of cage (16) is constant on full plug stroke height. So, the plug must be first removed by pulling upward on the plug stem, then the cage can be removed from the body. In case of 20" or 24" valve size, three tapped lifting holes Dia. M 10 have been provided at the top of cage, for ease of disassembly-reassembly.*

***Caution:** The design of the body-cage-bonnet joining is different according to valve size, service conditions, etc…*

- ***In case of 50 to 100 mm (2" to 4") valve sizes,** tight joining between the three parts is performed by means of a spiral wound gasket (10), straddling body and cage, (see ex. Figures 14 & 16, page 18).*
- ***In case of 150 to 600 mm (6" to 24") valve sizes,** tight joining is performed by means of a spiral wound gasket (10) located between body and bonnet and a flat or conical spring washer (17) between bonnet and cage, (see ex. Figures 15 & 17, page 18 and Figure 34, page 22).*
- ***In some cases,** the latter described configurations are replaced by a spiral wound gasket (10) located between body and bonnet and another spiral wound gasket (36), placed between bonnet and cage (16), (see Figure 31, page 21).*
- ***In the type HD (High Duty) 80 and 100 mm (3" & 4") valve sizes,** a conical spring washer (17) and a spiral wound gasket (10) are installed instead of the gasket (10) alone, used as a general rule, (Figure 27, page 21).*

These different configurations do not change the way or the chronology of disassembly steps.

H. Remove plug from cage by lifting cage over top of plug stem.

Caution: In case of a 41900 Series Valve [valve plug equipped with a graphite seal ring (45)], care should be taken, when removing the plug from the cage that the ring is not damaged. In all cases, inspect piston ring (45) and replace if it shows signs of wear.

I. Lift out seat ring (13) and seat ring gasket (14) from the body. According to the valve design, remove either spring energized seal ring (31) or other seal rings (35 or 40 & 41 or 45 & 46) from the plug.

*Note: Spiral wound gasket are standard in this design and **it is imperative that a new gasket be installed each time the valve is disassembled.***

J. Remove packing (6), packing spacer (5) and guide bushing (22) from the bonnet (7).

Note: In some cases, the packing box with expanded graphite rings do not includes spacer (5).

K. Clean and inspect all components for excessive wear or damage.

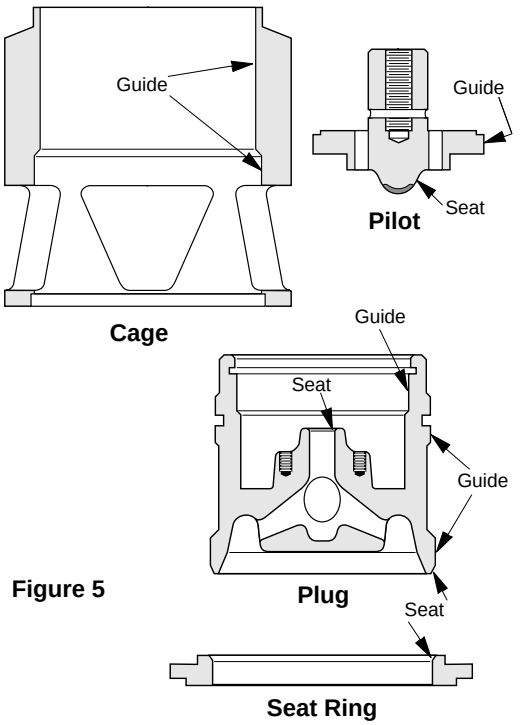


Figure 5

Note : Inspect all guiding, seating and sealing surfaces. Metal guiding and seating surfaces must be free of scratches dents, nicks, etc. Since new gaskets are to be used during reassembly, old gaskets should be discarded. Replace all excessively worn or damaged parts. After determining the maintenance required, refer to the appropriate section of this instruction manual.

7. Maintenance - Repair

The purpose of this section is to assist maintenance personnel by suggesting methods of component maintenance which is largely dependent on the tools and machine shop equipment available.

Each section should be completely read and understood before proceeding.

7.1 Packing Box (Figure 9)

Packing box maintenance is one of the principle chores of routine servicing. Tightness of the packing is maintained by packing compression. Compression is achieved by evenly tightening the packing flange nuts (3) against the packing flange (4). Care must be taken not to over tighten as this could prevent smooth operation of the valve. If all compression is used up and the valve leaks, new packing is required.

Caution : Valve must be isolated and the pressure vented before performing packing box maintenance.

Proceed as follows :

7.1.1 Expanded Graphite Packing Rings

Note : Expanded Graphite packing rings replacement requires to disconnect the plug stem from actuator connector or actuator stem and removing of actuator.

A. Remove actuator from the body S/A. Refer to Section 9.1 of this instruction manual for actuators types 87/88. Refer to Section 9.2 for actuators types 37/38 or Section 9.3 in case of a Type 47/48 ∑F Actuators and refer to instruction manual No 174448 E if types 57/58 are installed.

B. Loosen and remove packing flange nuts (3).

C. Remove packing flange (4), and packing follower (23) from the plug stem.

D. By means of a hook remove packing rings (6), insuring not to damage the sealing surface of packing box or plug stem.

E. Replace new packing set (6); first one back-up ring *(Carbon/Graphite/Inconel braided ring),* then expanded graphite rings *(smooth rings),* at last, one other braided back-up ring. (Refer to Figure 9).

Note : Cram rings one by one into packing box.

F. Place packing follower (23) and packing flange (4).

G. Place and tighten packing stud nuts (3).

Caution : Do not overtighten.

H. Proceed to proper Section for actuator to body assembly and plug stem adjustment.

I. Place valve back in service and tighten packing only as much as is necessary to stop leaking.

7.1.2 Kevlar/PTFE, Carbon/PTFE or pure PTFE Packing Rings

Note : The Kevlar/PTFE, Carbon/PTFE or pure PTFE packing rings have a skive cut allowing packing replacement without disconnect the plug stem from actuator connector or actuator stem.

A. Loosen and remove packing flange nuts (3).

B. Raise packing flange (4), and packing follower (23) up the valve stem.

Note : They may be taped in place to keep them out of the way before proceeding.

C. By means of a hook remove packing rings (6), insuring not to damage the sealing surface of packing box or plug stem. *On Kevlar/PTFE or pure PTFE packing rings remove the spacer (5).*

D. ***On Kevlar/PTFE or pure PTFE packing rings***, replace packing (6) and spacer (5) referring to Figure 9 for correct amount of rings to place under the spacer.

On Carbon/PTFE packing rings, replace packing (6) ; first one back-up ring *(Carbon/Graphite/Inconel black braided ring),* then Carbon/PTFE rings *(white braided rings),* at last, one other black braided back-up ring. (Refer to Figure 9).

Note : *Cram rings one by one into packing box. The skive cut of each packing ring must be placed about 120 degrees apart.*

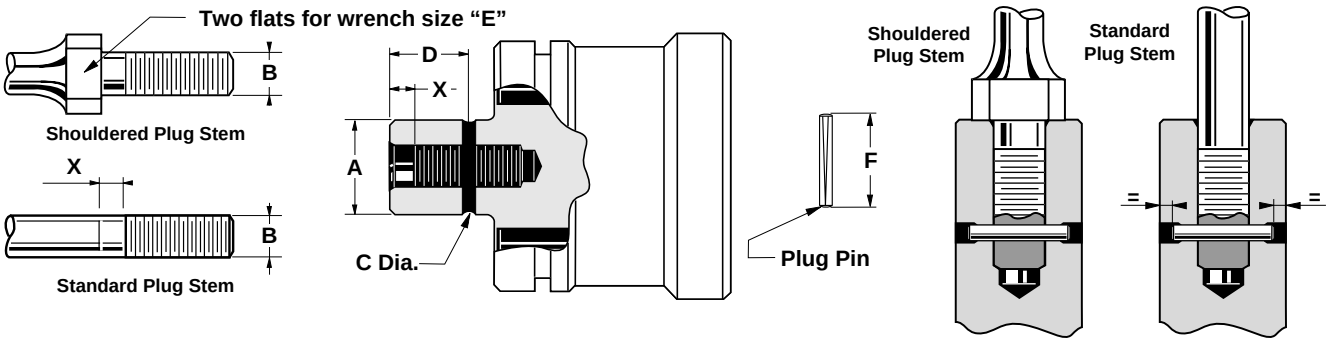
E. Replace packing follower (23) and packing flange (4).

F. Replace and tighten packing stud nuts (3).

Caution : Do not overtighten.

G. Put valve back in service and tighten packing only as much as is necessary to stop leaking.

Note : In an emergency, string packing may be used as a temporary repair only. It must be replaced with the correct packing as soon as possible.



Plug Shank Dia. "A"		Plug Stem Dia. "B"		Pin Hole Dia. "C"		Pin Length "F"		"D"		"X"		Torque on Plug Stem *		Wrench Size "E"	
in.	mm	*in.*	mm	*in.*	mm	*in.*	mm	*in.*	mm	*in.*	mm	*Ft. Lbs*	daN.m	in.	mm
.79	20,0	1/2	12,70	.138	3,50	.70	18,0	.91	23,0	.24	6,0	44	6	11/16	17
.98	25,0	5/8	15,87	.197	5,00	.95	24,0	1.10	28,0	.30	8,0	118	16	7/8	22
														1 1/16	27
1.38	35,0	3/4	19,05	.197	5,00	1.20	30,0	1.77	45,0	.75	19,0	147	20	1 1/16	27
1.75	44,5	1	25,4	.197	5,00	1.58	40,0	1.87	47,5	.98	25,0	295	40	1 1/4	30
														1 7/16	36
1.66	42,0	1 1/8	28,6	.394	10,00	1.58	40,0	1.87	47,5	.62	16,0	406 •	55 •	1 7/16	36
2.77	70,5	1 1/2	38,1	.394	10,00	2.56	65,0	3.55	90	1.30	33,0	1106 •	150 •	2	50

* Only on shouldered plug stem

• Special wrench required ; consult MASONEILAN

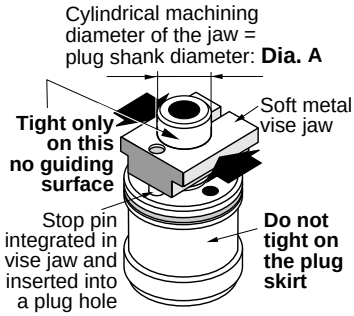


Figure 6 — Plug Stem Pinning

7.2 Plug Stem Pinning*

Plug stem pinning during field assembly may be divided into two parts :

— Replacing old plug and old stem,
— Replacing only old stem.

Replacing Plug and Stem

The plug (15) and stem (1) assembly consists of a shaft threaded into the plug and pinned in place. To replace the stem (1) it is necessary to drill or drive out the pin (9) and unscrew the stem (1) from the plug (15).

If it is necessary to replace the plug [or the pilot plug (20) in case of type 41400], it is necessary to replace the plug stem at the same time. Indeed, the original pin hole in an old stem prevents satisfactory results and might seriously impair strength of the assembly.

A. Reference Marking on the Plug Stem

Measure the depth of the pilot recess in the plug (X in Figure 6) and make a reference mark to the plug stem at the same distance, from the thread.

Note : In case of great sizes and/or high temperature service and some other cases, the plug stem has a shoulder with two flats to improve the strength of the plug and stem assembly and to facilitate screwing and tightening. In this case, the previous step is not required, (see Figure 6 for the required wrench size).

Note : While pinning is being performed, care must be taken not to damage the seating surface or plug guide. In holding plug (or pilot plug) in order to tightening the plug stem, always tight jaws of the vise on a no guiding surface of the parts. Always use a soft metal vise jaw with a special machining to hold the shank of the plug (or the shank of the pilot plug on type 41400), (see Figure 6).

B. Screwing Stem into Plug

- Hold the plug in a vise.
- Apply a small amount of grease such as Gripcott® (or an equivalent compatible with the fluid process) on the threaded part of the plug stem.
- Lock one nut against another one to the end of the new plug stem and, using a wrench on the upper nut, screw the stem solidly into the plug.

  When properly assembled, the reference mark (see § A) should be flush with the end of the plug shank.

  Note : In case of great sizes and/or high temperature service and some other cases, the plug stem has a shoulder with two flats to improve the strength of the plug and stem assembly and to facilitate screwing and tightening. In this case do not use the two nuts, (see Figure 6 for the required wrench size and torque).

C. Drilling the New Parts

- **If the plug is already full drilled,** (in case of 440 C stainless steel, hardened material or solid stellite), drill the stem to the same diameter than the plug skank hole.
- **If the plug shank area has a center mark,**

  PIace the plug shank on a V-block and, using a size of drill bit suitable to either,

  — match the hole size in the plug, or
  — match the "C" diameter (see Figure 6),

  drill the plug-stem assembly.
- **If the plug shank area hasn't any hole or any center mark,**

  — Measure the "D" dimension, (see Figure 6).
  — PIace the plug shank on a V-block and, by means of a center punch, make a center mark on the plug shank area.
  — Using a suitable size drill bit, drill the plug-stem assembly.

* In the Section 7.2.— Plug Stem Pinning — the word "plug" denotes either "plug" on types 41300/500/600/900 or "pilot plug" if 41400 type valves.

In all cases: After drilling, remove any burrs from the plug shank by making a slight chamfer.

D. Pinning the Plug-Stem Assembly

1. Select the correct size pin according to plug shank diameter and stem diameter, (see Figure 6). Apply a small amount of grease on it, and hand place the pin to the hole inlet.
2. By means of an hammer, introduce the pin into the hole. Complete the pinning operation, taking care to ensure that the pin is recessed by the same amount at both sides, (see Figure 6).

   Note: Using a ball tooling and hammer, caulk the pin hole edge of the plug. (Except in case of plug in 440 C St. St., hardened material or solid stellite).
3. After the plug has been pinned, it should be placed in a lathe to insure it is running "true." The stem should be placed in a collet with the plug shank against it and the plug should be struck. Alignment of plug stem can be performed using appropriate means.

   Note: In case of great sizes and/or high temperature service and some other cases, the plug stem has a shoulder which relieves of this step.

Replacing Only Old Stem

A. Removing Old Pin and Stem From the Plug

1. Place the plug shank on a V-block, and using a drift punch, drive out the old pin.

   Note: If it is necessary to drill out the pin, a drill bit somewhat smaller than the pin should be used and the remainder of the pin driven out.
2. Hold the plug shank in a vise, (see bordered note in the paragraph A on previous page).
3. Lock one nut against another one to the end of the plug stem and, using a wrench on the lower nut, unscrew the stem from the plug. The stem is removed by turning it anti-clockwise.

   Note: In case of great sizes and/or high temperature service and some other cases, the plug stem has a shoulder which allows to unscrew plug stem without using of the two nuts, (see Figure 6 for the required wrench sizes).

B. Screwing Stem to Plug

Refer to paragraph B of the above section "REPLACING PLUG AND STEM".

C. Drilling the New Stem

PIace the plug shank on a V-block and, using a suitable size drill bit, drill the stem using the hole in the plug as a guide.

Note: If the hole in the plug shank has been slightly damaged while removing of the old pin, choose a drill bit and a pin with a diameter somewhat larger than the normal pin.

D. Pinning

Select the correct size pin according to plug shank diameter and pin hole diameter, (see Figure 6). Proceed as described in the above paragraph D2, taking care not to damage the plug shank area.

Ensure plug stem alignment as indicated in the above paragraph D3.

7.3 Seat Repair

Any trim part which is scored or otherwise damaged on the guiding surfaces, to the extent that it could interfere with proper valve action, should be replaced.

Minor scratches or nicks, in the seating surfaces of either the plug or seat ring, should be repaired in the following manner:

7.3.1 41400 Series Valves

7.3.1.1 Plug Disassembly

2", 3" or 4" sizes (50, 80 or 100 mm) (Figure 14)

Pressure must be applied on the auxiliary pilot plug (20) to compress the spring washers (12). The retaining ring (19) can now be removed, thus allowing separation of the auxiliary pilot plug and spring washers from the valve plug.

6" to 16" sizes (150 to 400 mm) (Figures 7 & 15)

Install socket head capscrews through the holes provided in the auxiliary pilot plug (20) engaging the capscrews in the tapped holes provided in the plug (15), (refer to Figure 7 for screws sizes and quantity). Tighten capscrews simultaneously and progressively until the retaining ring (19) can be removed. Then, loosen capscrews in same manner until the auxiliary pilot plug and spring (12) can be removed.

All sizes

If the auxiliary pilot plug tip and (or) guide show damage, the auxiliary pilot plug must be replaced. If pilot seat in the plug and/or other seating surfaces on the valve plug or seat ring show signs of minor damage, they should be turned on a lathe to remove the damaged areas. However, no more than 0.010" (0.25 mm) of material should be removed in case 2", 3" or 4" (50, 80 or 100 mm) sizes. If 6" to 16" (150 to 400 mm) sizes, no more than 0.015" (0,4 mm) of material should be removed. On the 20" & 24" (500 & 600 mm) sizes, no more than 0.200" (0,5 mm) of material should be removed. The seat angles shown in Figure 10 must be held.

Continue to page 10

Valve Size		Pilot Dismounting Screws Size		
mm	in.	Qty	Length (mm)	Dia.
150	6	2	57	1/4"- 20 UNC 2A
200	8	2	70	3/8"- 16 UNC 2A
250	10	2	63,5	
300	12	3	101,5	
400	16	3	63,5	

Figure 7

Valve Dia.		ANSI Class ①	Stud (21)		Req'd. Torque							
					Carbon Steel Bolting				Stainless Steel Bolting			
					Min.		Max.		Min.		Max.	
mm	in.		Qty	Size	*Ft. Lbs.*	daN.m	*Ft. Lbs.*	daN.m	*Ft. Lbs.*	daN.m	*Ft. Lbs.*	daN.m
50	2	300	6	3/4"-10 NC - 2A	*96*	13	*103*	14	*74*	10	*81*	11
		600			*147*	20	*162*	22				
		900	8	7/8"-9 NC - 2A	*140*	19	*151*	20,5	*140*	19	*151*	20,5
		1500			*199*	27	*221*	30				
80	3	150	8	3/4"-10 NC - 2A	*125*	17	*133*	18	*66*	9	*74*	10
		300			*125*	17	*133*	18	*96*	13	*103*	14
		600			*147*	20	*162*	22				
		900	6	1 1/4"-8 UN - 2A	*531*	72	*560*	76				
		1500			*737*	100	*811*	110				
100	4	300	8	7/8"-9 NC - 2A	*155*	21	*170*	23	*110*	15	*125*	17
		600			*221*	30	*258*	35				
		900	6	1 1/2"-8 UN - 2A	*811*	110	*878*	119				
		1500			*1254*	170	*1364*	185				
150	6	300	8	1"-8 NC - 2A	*221*	30	*243*	33	*206*	28	*221*	30
		600	12		*221*	30	*258*	35				
		900	8	1 3/4"-8 NS - 2A	*1401*	190	*1512*	205	*1003*	136	*1069*	145
		1500			*1401*	190	*1512*	205				
200	8	300	8	1 1/4"-8 UN - 2A	*332*	45	*369*	50	*332*	45	*369*	50
		600	12		*442*	60	*516*	70	*442*	60	*516*	70
		900	8	1 3/4"-8 NS - 2A	*1770*	240	*1918*	260	*1217*	165	*1291*	175
		1500			*1991*	270	*2124*	288				
250	10	300	8	1 1/2"-8 UN - 2A	*516*	70	*553*	75	*516*	70	*553*	75
		600	12		*856*	116	*922*	125	*664*	90	*737*	100
		900	12	1 3/4"-8 NS - 2A	*1475*	200	*1549*	210	*1106*	150	*1180*	160
300	12	300	12	1 1/2"-8 UN - 2A	*516*	70	*553*	75	*516*	70	*553*	75
		600			*929*	126	*1003*	136				
		900	16		*996*	135	*1069*	145				
400	16	300	12	1 1/2"-8 UN - 2A	*1084*	147	*1158*	157	*701*	95	*737*	100
		600	16	1 1/2"-8 UN - 2A	*959*	130	*1033*	140				
500	20	300-600	24	1 3/4"-8 UN - 2A	*1549*	210	*1549*	210	*1328*	180	*1328*	180
600	24	150-300	20	1 3/4"-8 UN - 2A	*1401*	190	*1401*	190	*1328*	180	*1328*	180
Only on 41•••-HD Valves												
80	3	600	8	1 "-8 NC - 2A	*221*	30	*258*	35				
100	4	600	12	7/8"-9 NC - 2A	*177*	24	*192*	26				

① *For 2500 ANSI Class or other no indicated rating, refer to attached special ADD. If no ADD., consult MASONEILAN.*

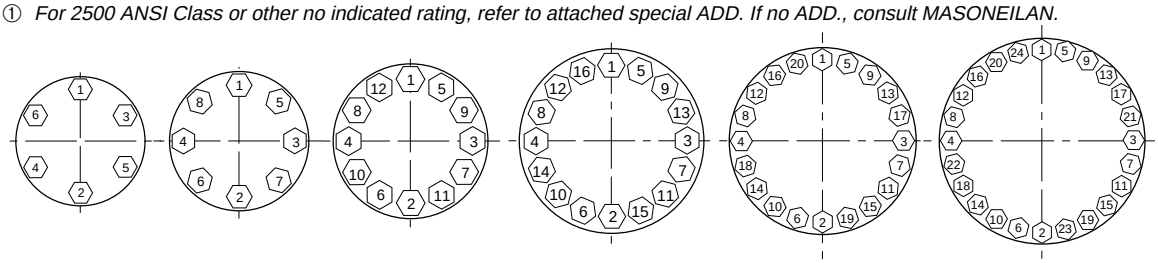
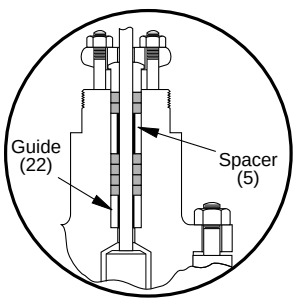


Figure 8 — Torque and Sequence for Body Stud Nuts (8)

Packing box with Kevlar/PTFE packing rings or pure PTFE packing rings



Valve Dia.		Quantity of Packing Rings (6)			
		Kevlar/PTFE or pure PTFE			Carbon/PTFE or Expanded Graphite
mm	in.	Above Spacer (5)	Below Spacer (5)	Total	Above Spacer (5)
50	2	2	4	6	1 set
80 & 100	3 & 4	3	5	8	1 set
150, 200, 250, 300, 400, 500 & 600	6, 8, 10, 12, 16, 20 and 24	2	5	7	1 set
300 (900 ANSI)	12 (900 ANSI)	6	5	11	1 set

Packing box with two Back-up rings and Carbon/PTFE packing rings or Expanded Graphite packing rings

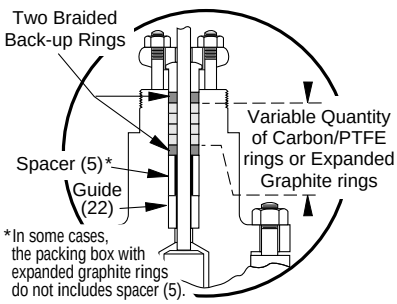


Figure 9 — Packing Box

Continued from page 8

7.3.1.2 Grinding the Pilot Seat in the Plug

In case of a new auxiliary pilot plug is installed and/or after the pilot seat in the plug has been turned, the parts must be ground as follows:

1. Apply a good grade of fine grinding compound at several spots equally spaced on the periphery of the seating surface of auxiliary pilot in the plug (15).

2. PIace the pilot, with stem attached, in the seated position without assembling the pilot spring (12).

3. To facilitate lapping, screw a rod with T-handle on top of the valve stem and secure with a locknut. Or as an alternative, drill a hole through a small flat piece of steel and fasten it to the plug stem with two locknuts.

4. Lap by rotating the plug in short oscillating strokes. After 8 or 10 strokes, lift plug and turn 90°. Repeat the lapping operation.

Note: Intermittent lifting is important to keep the plug and seat concentric during lapping. The lapping operation should be repeated four times before removing the pilot. If there is a dull gray ring around the entire seat, the lapping is complete.
The gray area must be as thin as possible. Do not lap to cover the complete seat area width. This will destroy the effectiveness of the seat. If the ring is not continuous, repeat the entire lapping operation until the ring is continuous. Remove all the compound when the lapping operation has been completed. Reassemble the pilot in valve plug.

7.3.2 41300, 41400, 41500, 41600 or 41900 Series Valves

Main Seat Grinding

Grinding the main seat is accomplished in basically the same manner as grinding the pilot. However the trim including the gaskets (10 & 14) should be assembled in the body *[in case of 6" (150 mm) and greater sizes, the flat spring (17) should be also assembled]*. The bonnet, with the guide bushing (22) in it should be temporarily placed in position to act as an alignment fixture for the grinding operation. Otherwise, the grinding procedure is identical (see 7.3.1.2).

Caution: Do not tighten nuts to torque specifications given in Figure 8 at this time. The bonnet is used temporarily for guiding purpose.

Note: The gasket used for lapping should not be reused for the body reassembly.

8. Body Reassembly (Figures 14 to 34 according to code valve and size)

After completing the required maintenance the valve should be re-assembled using the following procedures:

Note: If any of the following steps were completed during maintenance, proceed to the next step.

Caution: Insure that any recommended lubricant or sealing compound is compatible with the process fluid. If not, equivalent substitutes must be used.

A. Insure that all seating and guiding surfaces are clean and free of any dirt, scale or burrs.

B. Install the gasket (14) and seat ring (13) into the body (18).

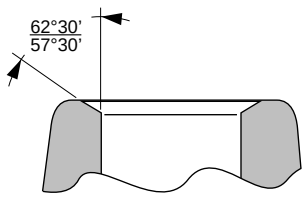
C. Place plug seal rings on the plug groove using the following procedures, according to valve series, then continue with steps D and follows, page 11.

Note: Refer to Figures 14 to 18 (pages 18 & 19) to identify proper seal ring, according to each seal type.

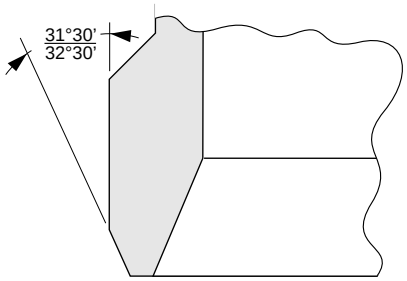
On 41300 Series Valves (Figures 18 & 34):

- *Only on 2" to 10" and 20" & 24" valve sizes (50 to 250 and 500 & 600 mm),* install the cage on the seat ring. In case of standard cage (Trim Type 1), orient this one such that a port faces the input orifice of the valve body.
- Place seal ring (31) around the upper conical part of the plug, such that its open side is facing up.
- By hand, evenly exert a sufficient thrust to constrain seal ring to slide until its groove. *Take care not to damage seal ring during this step.* Ensure seal ring is completely and correctly inserted before perform next assembly step.

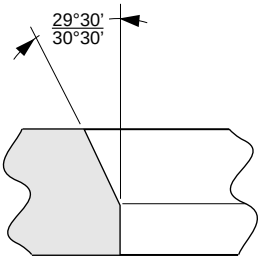
  Note: On 41300 lower valve sizes (2" to 4"—50 to 100 mm), using of mounting accessory can be necessary to facilitate placing the seal ring on the plug groove. This simple accessory can be made in a maintenance workshop and consists in a conical piece having a low conicity. The great diameter of the cone must be equal to the small diameter of upper conical part of the plug. A metal ring with inside diameter lightly greater than the great diameter of upper conical part of plug allows to evenly thrust the seal ring on the cone. If difficulties, contact MASONEILAN.



PILOT SEAT (41400 ONLY)



MAIN PLUG



SEAT RING

Figure 10

- To easy introducing plug with its seal ring into the cage, it is recommended to apply a small amount of grease such as Bardhal® (or equivalent) around the seal ring (31).

On 41400 and 41500 Series Valves (Figures 14 to 17):

- Open each Ni-resist® seal ring (35) sufficiently to place it on the plug, taking care not to damage the parts. Slide rings along the plug then insert one after the other into the plug groove.

  ***Note**: The cut of each Ni-resist® seal ring must be placed about 180 degrees apart. The cut of the inner ring is straight according to its generating line. The outer ring can be easy identified with the help of its cut performed according to a broken line.*

> ***Caution: For somes service conditions, two sets of Ni-resist® seal rings (35), are installed on the plug (15)** instead of the only standard set, (see Figure 30, page 21).*
>
> *It's also possible that sets of installed rings are, on request, supplied in other material that Ni-resist®.*
>
> *In all cases, slide the first set of rings along the plug then insert it into the lower groove.*
>
> *Repeat this step for the second set of rings in the upper groove of plug.*

On 41600 Series Valves (Figures 16 & 17):

- Dip the PTFE seal ring (40) into boiling water during few minutes prior place it in the plug groove.
- Open the Nordel® backup ring (41) sufficiently to place it on the plug, taking care not to damage the part. Slide backup ring along the plug then insert it into plug groove.
- Slide the PTFE seal ring (40) along the plug then insert it into plug groove.
- To avoid the plastic deformation of the PTFE seal ring during cooling, tighten it in its groove using a ring compressor (type Serflex®) during few minutes, prior perform next mounting step. Remove the ring compressor at the time of assembly.
- To easy introducing plug with its seal ring into the cage, it is recommended to apply a small amount of grease such as Bardhal® (or equivalent) around the seal ring (40).

On 41900 Series Valves (Figures 16 & 17):

- Open the Ni-resist® backup ring (46) sufficiently to place it on the plug, taking care not to damage the part. Slide backup ring along the plug then insert it into plug groove.

New graphite seal rings (45) are furnished as a whole ring and must be broken at one point before installation.

Caution: Graphite seal rings are brittle parts, so care must be taken to avoid damage during following steps.

- Using a sharp knife, score the graphite ring in one location.
- Hold each side of the ring around the score mark between thumbs and forefingers and bend the ring to break at the scribe mark.
- By means of a very fine file, adjust each broken end so that the external ring circumference equal the proper internal circumference of the cage (16).

  *Note: To ensure that ring length adjustment is correctly made, try to insert the new graphite seal ring into the proper cylindrical part of the cage: **the seal ring must just slide along the cage without clearance.***

- Remove seal ring from the cage. Open the seal ring sufficiently to place it around the top of the piston. Slide the ring along the piston and insert into piston groove.

  Note: Take care not to break or damage the graphite seal ring during this step. Cut of the seal ring should be positioned approximately 180 degrees apart from the separation of the backup ring (46).

D. Install the plug and stem into the cage.

On type 41300, 2" to 10" and 20" & 24" valve sizes *(50 to 250 and 500 & 600 mm),* **and some other design variants, the internal diameter of the cage (16) is not shouldered,** i. e., it's a only cylinder on full plug stroke height. Due to this design, the plug with seal ring and stem S/A must be introduced through the top of the cage, once this one has been installed into the body. *In case of 20" or 24" valve size, three tapped lifting holes Dia. M 10 have been provided at the top of cage, for ease of disassembly-reassembly.*

In all other cases (cage with internal diameter shouldered), the plug with seal ring and stem S/A must be introduced through the bottom of the cage, before this one is installed into the body. Proceed as follows:

Put down the cage (16) on the side. Insert plug and stem subassembly with seal ring *through the bottom of the cage*. Set upright plug and cage and by hand, evenly exert a sufficient thrust on the cage to constrain the seal ring to bring in the plug groove and allow to complete introduction of the plug into cage.

E. Lower plug and cage into body until they rest squarely on the seat ring (13). Do not damage seat ring. In case of standard cage (Trim Type 1), orient this one such that a port faces the input orifice of the valve body.

F. Place in position spring washer (17) and body gasket (10) as well as cage gasket (36) according to the valve configuration. Refer to under caution note. *In case of 20" or 24" valve size, two tapped lifting holes Dia. M 4 have been provided at the top of spring washer, for ease of disassembly-reassembly.*

> ***Caution:** The design of the body-cage-bonnet joining is different according to valve size, service conditions, etc…*
>
> - ***In case of 50 to 100 mm (2" to 4") valve sizes,** tight joining between the three parts is performed by means of a spiral wound gasket (10), straddling body and cage, (see Figures 14 & 16, page 18, for example).*
> - ***In case of 150 to 600 mm (6" to 24") valve sizes,** tight joining is performed by means of a spiral wound gasket (10) located between body and bonnet and a flat or conical spring washer (17) between bonnet and cage, (see Figures 15 & 17, page 18 and Figure 34, page 22, for example).*
> - ***In some cases,** the latter described configurations are replaced by a spiral wound gasket (10) located between body and bonnet and another spiral wound gasket (36), placed between bonnet and cage (16), (Figure 31, page 21).*
>
> *…/…*

.../...

- ***In the types HD (High Duty) 80 and 100 mm (3" & 4") valve sizes,*** *a conical spring washer (17) and a spiral wound gasket (10) are installed instead of the gasket (10) alone, used as a general rule. The internal diameter of conical spring must be in contact with the top of the cage, (Figure 27, page 21).*

These different configurations do not change the way or the chronology of reassembly steps.

G. Insure that the packing (6), spacer (5) and guide (22) are removed from the bonnet.

Note : In some cases, the packing box with expanded graphite rings do not includes spacer (5).

H. Position bonnet (7) over the valve so that the packing studs (2) are positioned across the flow path.

I. SIowly and squarely, lower the bonnet (7) over the plug stem (1), body studs (21) and into the bolting position. On 20" or 24" valve size, place washers (50) over body studs (21), (see Figure 34).

J. Apply a light coat of a lubricant, such as Gripcott NF® (or equivalent) to the body studs threads and the bearing surfaces of the body stud nuts (8).

Note : In some cases, the valve service requires ANSI Class IV or V seat leakage. These conditions impose that internal parts are perfectly centered prior tightening the body stud nuts (8). On types 41300 and 41600, 2" to 6" valve sizes, this can be achieved proceeding as follows (steps K and following). In other cases, proceed straight with steps O and following.

K. Finger screw the body stud nuts (8). Lightly and evenly tight the nuts so that internal parts are just held *but they will be self aligned by a thrust applied on the plug.*

L. Slide guide bushing (22) over top of plug stem, dropping it to the bottom of the packing box.

M. Install actuator on the bonnet (7) with drive nut (33) (or the eight screws in case of No 24 type 37/38 actuator or type 57/58 HT 100 actuator) and secure plug stem on actuator stem. *(A plug stem adjustment is not necessary at this time).*

For actuator installation, refer to Section 9 of this manual, *(or refer to No 174448 E instructions manual if types 57/58 actuators are installed).*

N. Proceed to alignment of internal parts as followed :

On Valve with an Air-to-Extract Actuator Stem, (Type 37, 47, 57 or 87) :

- Connect a temporary supply pressure line on the actuator. Admit sufficient pressure to apply the plug on the seat ring with a force about 1000 daN (2250 lbs) and *cause the self centering of internal parts.*
- Remove supply pressure and shut off the line. Disconnect plug stem from actuator stem and remove actuator from valve bonnet, **taking care not to disturb position of parts**. Continue with steps O and following.

On Valve with an Air-to-Retract Actuator Stem (Type 38, 48, 58 or 88) :

- Vent actuator pressure so that actuator springs apply the plug on the seat ring and *cause the self centering of internal parts.*
- Admit again sufficient pressure to retract actuator stem about few millimeters. Disconnect plug stem from actuator stem, remove actuator from valve bonnet, **taking care not to disturb position of parts** and shut off the line. Continue with steps O and following.

O. Evenly tighten the body stud nuts (8) in the sequence and to the torque shown in table of Figure 8.

Note : During and after tightening of body stud nuts, check that overall plug travel can be made.

P. Slide guide bushing (22) over top of plug stem, dropping it to the bottom of the packing box. *(If this step has been already performed before internal parts alignment (Step L), proceed with following step).*

Q. Insert packing (6) and spacer (5). Refer to table of Figure 9 and Section 7.1.1 or 7.1.2 to apply proper order and procedure for packing box filling.

Note : In some cases, the packing box with expanded graphite rings do not includes spacer (5).

R. Install packing follower (23), flange (4) and nuts (3). Packing flange nuts should be finger tightened (see paragraph 7.1).

S. Replace actuator to body and adjust plug stem. Refer to Section 9 of this manual, *(or refer to No 174448 E instructions manual if types 57/58 actuators are installed).*

9. Actuators

For removal and maintenance of the **type 87/88 actuator**, refer to Instruction No ER 8788 E. For its installation and adjustment, see the below Section 9.1.

For maintenance of the **type 37/38 actuator**, refer to Instruction No ER 30004 E. For the removal, installation and adjustment, see the below Section 9.2.

For maintenance of the **type 47/48 actuator**, refer to Instruction No ER 20004 E. For the removal, installation and adjustment, see the below Section 9.3.

For removal, maintenance, installation and adjustment of the **type 57/58 actuator**, refer to Instruction No 174448 E

9.1 Types 87/88 Actuators (see Figure 11)

9.1.1 Actuator Assembly and Adjustment

On Air-to-Extend Actuator (Type 87)

A. Install actuator on the valve body with drive nut.

B. Position top and bottom stem connectors (2 and 4) and replace the two socket head cap screws (5). Turn as far as possible the plug stem into lower part of the stem connector (2 or 6).

Note Size 6 actuator *- Screw the plug stem into the actuator stem (10) thru the bottom stem connector (2). Depending on stem length, it may be required, to allow this step, to progressively lower the actuator towards the body, during screwing plug stem into actuator stem.*

C. Pneumatically or with the handwheel, stroke the actuator to the rated spring range or stroke (if using the handwheel).

Note : This procedure is only suitable for 41300, 41500, 41600 or 41900 Series Valves. On 41400 Series Valves, it is necessary to extend actuator stem to valve stroke, ***minus auxiliary pilot plug stroke,*** *(refer to table on page 16).*

D. Using the stem lock nuts (1) unscrew the plug stem until the plug touches the seat.

Caution: DO NOT TURN the plug against the seat as damage can occur.

E. Release the pressure in the actuator or back off the handwheel to raise the stem.

F. Unscrew the stem 1/2 turn and lock the stem in place by tightening the stem nuts (1) against the stem connector (2 or 6).

G. Line up the stroke scale (9) with the pointer (7) and check actuator for operation.

On Air-to-Retract Actuator (Type 88)

A. Connect manual loading panel tubing to the lower diaphragm case.

B. Apply required air pressure through the manual loading panel to completely retract the actuator stem (10).

C. Install actuator on the valve body with drive nut.

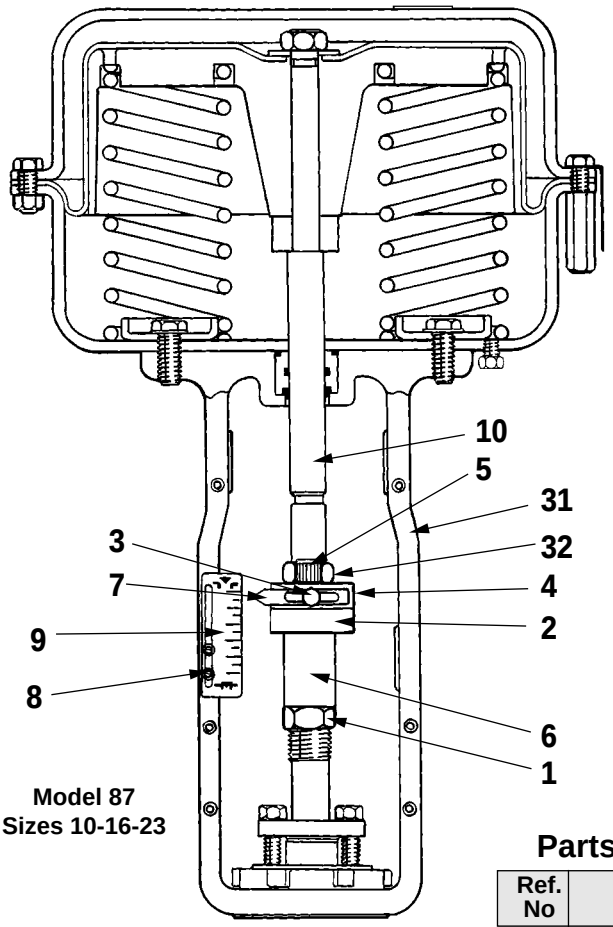
D. Position top and bottom stem connectors (2 and 4) and replace the two socket head cap screws (5). Turn as far as possible the plug stem into lower part of the stem connector (2 or 6).

Note Size 6 actuator *- Screw the plug stem into the actuator stem (10) thru the bottom stem connector (2). Depending on stem length, it may be required, to allow this step, to progressively lower the actuator towards the body, during screwing plug stem into actuator stem.*

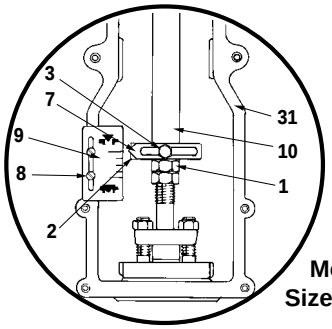
E. Release air pressure, then ensure that the actuator stem is fully extended.

F. Using the stem lock nuts (1), unscrew the plug stem until the plug touches the seat.

Caution: DO NOT TURN the plug against the seat as damage can occur.



Model 87
Sizes 10-16-23

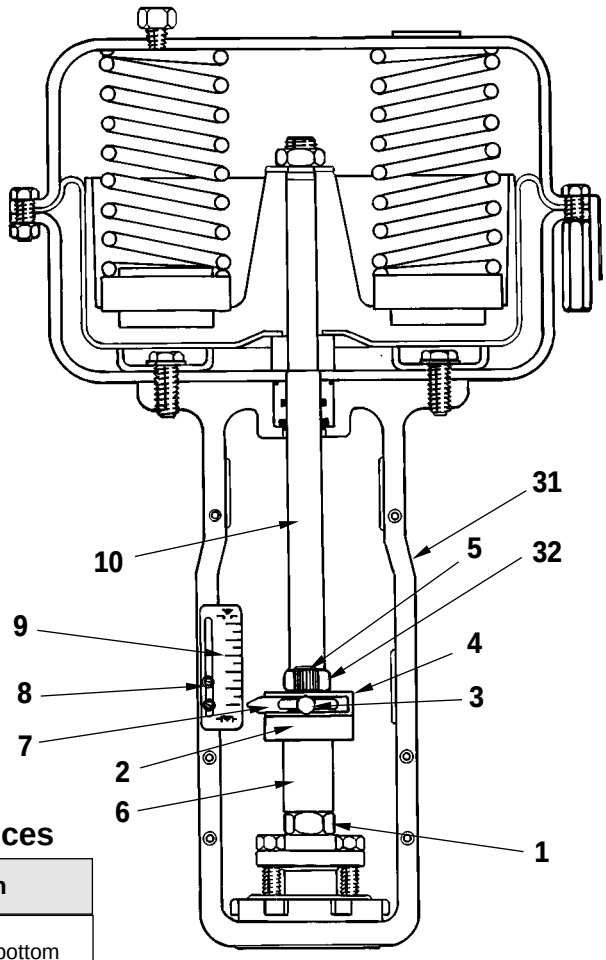


Model 87
Size 6 detail

Parts References

Ref. No	Description
1	Hex Nut
2	Stem Connector, bottom
3	Cap Screw, Hex head
★ 4	Stem Connector, top
★ 5	Cap Screw, soc. head
★ 6	Connector Insert
7	Pointer
8	Screw, Pan head
9	Scale - Travel
10	Actuator Stem
31	Yoke, machining
★32	Lock Nut

★Not provided for Size 6 Actuator



Model 88
Sizes 10-16-23

Figure 11
Types 87/88 Multispring Diaphragm Actuators

G. Pneumatically or with the handwheel, stroke the actuator to raise the plug off the seat. Unscrew the plug stem one full turn and lock the stem in place with the lock nut(s) (1) against the stem connector (2 or 6).

Note : *This procedure is only suitable for 41300, 41500, 41600 or 41900 Series Valves. On 41400 Series Valves, it is necessary to unscrew plug stem one full turn* ***plus the auxiliary pilot plug stroke,*** *(refer to table on page 16).*

H. Line up the stroke scale (9) with the pointer (7) and check actuator for operation.

9.2 Types 37/38 Actuators (see Figure 12)

9.2.1 Actuator Removal

Sizes No 11 & 13 Actuators

On Air-to-Extend Actuator (Type 37)

1. Shut off air supply pressure and disconnect air lines at the actuator. Loosen stem locknuts (27), turn them down until threaded end of plug stem (1) and lock. On size No 13, disengage the locking plate (55) from actuator stem (26).

2. Unscrew drive nut (33). By means of a wrench applied over the locknuts (27), turn the plug stem (1) out of actuator stem (26).

Note : On lower plug stroke, after removing drive nut (33), it may be necessary to lift the actuator during unscrewing plug stem, because the length engaged into actuator stem can be larger than valve stroke.

Caution : Do not allow the plug to turn on the seat during this operation.

3. Plug stem being unscrewed and actuator removed, remove locking plate (55), locknuts (27) and travel indicator (58) from the plug stem.

On Air-to-Retract Actuator (Type 38)

1. Fully retract actuator stem (26) and plug by applying air pressure. Loosen stem locknuts (27), turn them down until threaded end of plug stem (1) and lock. On size No 13, disengage the locking plate (55) from actuator stem (26).

2. Unscrew drive nut (33). By means of a wrench applied over the locknuts (27), turn the plug stem (1) out of actuator stem (26).

Note : On lower plug stroke, after removing drive nut (33), it may be necessary to lift the actuator during unscrewing plug stem, because the length engaged into actuator stem can be larger than valve stroke.

Caution : Do not allow the plug to turn on the seat during this operation.

3. Plug stem being unscrewed and actuator removed, remove locking plate (55), locknuts (27) and travel indicator (58) from the plug stem. Shut off air pressure and disconnect air lines at the actuator.

Sizes No 15, 18, 18L & 24 Actuators

On Air-to-Extend Actuator (Type 37)

Shut off air supply and disconnect air lines at the actuator. Remove nut (53) *(On No 15, 18 & 18L only)*, screw(s) (52) and clamps (51). Unscrew drive nut (33), *(or the eight screws in case of No 24 actuator),* then remove actuator from the valve.

On Air-to-Retract Actuator (Type 38)

Retract actuator stem and plug about 5 millimeters *(.20 in.)* by applying air pressure. *(On 41400 Series valves, retract actuator stem and plug about 7 millimeters (.28 in.)* ***plus auxiliary pilot plug stroke,*** *(refer to table on page 16).* Remove nut (53) *(On No 15, 18 & 18L only)*, screw(s) (52) and clamps (51). Unscrew drive nut (33), *(or the eight screws in case of No 24 actuator),* then remove actuator from the valve. Shut off air pressure and disconnect air lines at the actuator.

9.2.2 Actuator Assembly and Adjustment

Caution : On actuator equipped with auxiliary handwheel, ensure this one is set on neutral position prior adjustment of plug stem.

Sizes 11 & 13 Actuators

1. Push plug stem (1) down until the plug seats, then replace locknuts (27) and travel indicator (58) (and locking plate (55) on No 13 actuators).

2a. On Air-to-Extend Actuator (Type 37) :

- Install actuator on bonnet in required position and secure with drive nut (33). Turn plug stem (1) into actuator stem (26) as far as it will go.

  Caution : Do not allow the plug to turn on the seat during this operation.

- Connect a temporary supply air line on actuator. Apply to diaphragm sufficient air pressure to extend actuator stem to used valve stroke. Turn plug stem out of actuator stem until plug is seated. Slightly release air pressure and tighten stem locknuts (27) against actuator stem [or locking plate (55)].

  Note : This procedure is only suitable for 41300, 41500, 41600 or 41900 Series Valves. On 41400 Series Valves, it is necessary to extend actuator stem to used valve stroke, ***minus auxiliary pilot plug stroke,*** *(refer to table on page 16).*

- Ensure that travel of actuator stem corresponds to used valve stroke and that closed position is completed for the maximum of spring range stamped on serial plate.

- Relieve air pressure. Adjust travel indicator scale (56) : travel indicator (58) should indicate “open” when air pressure is relieved.

2b. On Air-to-Retract Actuator (Type 38) :

- Connect a temporary supply air line on actuator. Admit sufficient air pressure to fully retract actuator stem. Install actuator on bonnet in required position and secure with drive nut (33).

- Turn plug stem (1) into actuator stem (26) as far as it will go. Relieve air from actuator.

  Caution : Do not allow the plug to turn on the seat during this operation.

- Unscrew plug stem from actuator stem until plug is seated. Increase air pressure to retract actuator stem about 1,5 mm (.06 in.) and ***unscrew*** again plug stem until plug is seated. Slightly increase air pressure and tighten stem locknuts (27) against actuator stem [or locking plate (55)].

  Note : This procedure is only suitable for 41300, 41500, 41600 or 41900 Series Valves. On 41400 Series Valves, it is necessary to retract actuator stem about 1,5 mm (.06 in.) ***plus auxiliary pilot plug stroke,*** *(refer to table on page 16). Ex : for the 2" valve size-ANSI 600, total stem retraction would be : 4 mm (.16 in.).*

- Ensure that travel of actuator stem corresponds to used valve stroke and that closed position is completed for the minimum of spring range stamped on serial plate.

- Relieve air pressure then adjust travel indicator scale (56) : travel indicator (58) should indicate "closed" when air pressure is relieved.

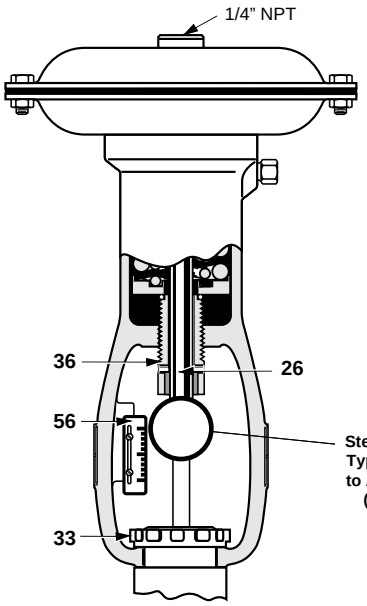
Sizes No 15, 18, 18L & 24 Actuators

1. Push plug stem (1) down until the plug seats.

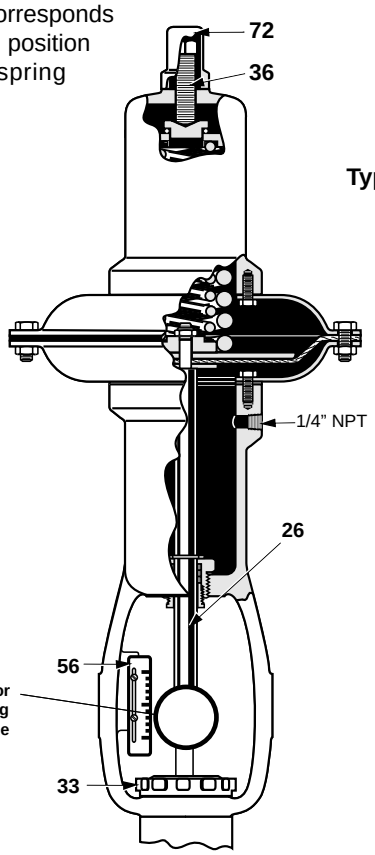
2a. On Air-to-Extend Actuator (Type 37) :

- Install actuator on bonnet in required position and secure with drive nut (33), *(or the eight screws in case of No 24 actuator).* Connect a temporary supply air line on actuator. Apply to diaphragm sufficient air pressure to extend actuator stem to used valve stroke.

Figure 12
Types 37/38 Spring Diaphragm Actuators



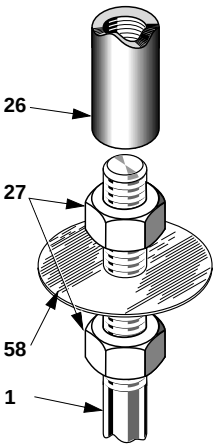
Type 37
Air to Extend Actuator



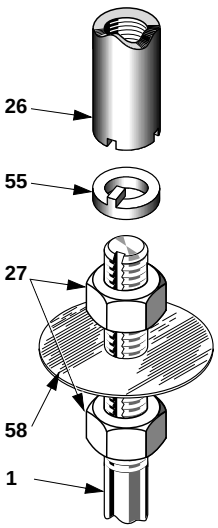
Type 38
Air to Retract Actuator

PARTS REFERENCE

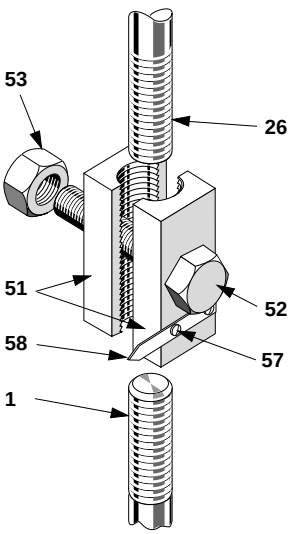
1	Plug Stem
26	Actuator Stem
27	Actuator Stem Nut
33	Drive Nut
36	Adjusting Screw
51	Clamp
52	Clamp Screw
53	Clamp nut
55	Locking Plate
56	Stroke Scale
57	Pointer Screw
58	Travel Indicator Pointer (or Indicator Disk)
72	Spring Barrel Cap



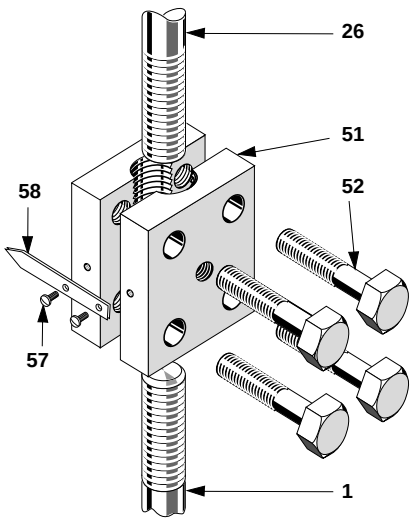
Stem Locknuts
(On No 11 Spr. Diaph. Actuator)



Stem Lock
(On No 13 Spr. Diaph. Actuator)



Split Stem Clamp
(On No 15, 18 & 18L Spr. Diaph. Actuators)



Split Stem Clamp
(On No 24 Spr. Diaph. Actuator)

Detail of the Four Stem Connector Types

Note : This procedure is only suitable for 41300, 41500, 41600 or 41900 Series Valves. On 41400 Series Valves, it is necessary to extend actuator stem to used stroke, ***minus auxiliary pilot plug stroke,*** *(refer to below table).*

- Install the stem clamps (51) and travel indicator pointer (58). The amount of thread engagement of both stems should be approximately equal. Tighten screw(s) (52) *[and clamp nut (53), on No 15, 18 & 18L only].*
- Ensure that travel of actuator stem corresponds to used valve stroke and that closed position is completed for the maximum of spring range stamped on serial plate.
- Relieve air supply pressure. Adjust travel indicator scale (56) : travel indicator pointer (58) should indicate “open” when air pressure is relieved.

2b. On Air-to-Retract Actuator (Type 38) :

- Connect a temporary supply air line on actuator. Admit sufficient air pressure to fully retract actuator stem. Install actuator on bonnet in required position and secure with drive nut (33), *(or the eight screws in case of No 24 actuator).*
- Relieve air pressure from actuator. Increase air pressure to retract actuator stem about 1,5 mm (.06 in.).

  Note : This procedure is only suitable for 41300, 41500, 41600 or 41900 Series Valves. On 41400 Series Valves, it is necessary to retract actuator stem about 2 to 3 mm (.08 to .12 in.) ***plus auxiliary pilot plug stroke.*** *(refer to below table). Ex : for the 6” valve size, total stem retraction would be : 8 mm (.31 in.).*
- Install stem clamps (51) and travel indicator pointer (58). The amount of thread engagement of both stems should be approximately equal. Tighten screw(s) (52) *[and clamp nut (53), on No 15, 18 & 18L only].*
- Ensure that travel of actuator stem corresponds to used valve stroke and that closed position is completed for the minimum of spring range stamped on serial plate.
- Relieve air pressure then adjust travel indicator scale (56) : travel indicator pointer (58) should indicate “closed” when air pressure is relieved.

Valve Dia.		Maximum Stroke of Auxiliary Pilot Plug (20) on 41400 Type Valve
mm	in.	
50-ANSI 600	2-ANSI 600	2,5 mm (.10 in.)
50-ANSI 1500	2-ANSI 1500	2 mm (.08 in.)
80 & 100	3 & 4	3 mm (.12 in.)
150	6	5 mm (.20 in.)
200	8	6 mm (.24 in.)
250, 300 & 400	10, 12 & 16	7 mm (.28 in.)

9.3 Types 47/48 ∑F Actuators (see Figure 13)

9.3.1 Actuator Removal

Air-to-Extend ∑F Actuator (Type 47)

Shut off air supply and disconnect air lines at the actuator. Remove stem cover (84), loosen the locknuts (35) on the plug stem and unscrew the plug stem (1) from the stem connector (80). Remove drive nut (33) and remove actuator from the valve.

Note : On lower plug stroke, after removing drive nut (33), it may be necessary to lift the actuator during unscrewing plug stem, because the length engaged into stem connector (80) can be larger than valve stroke.

Caution : Do not allow the plug to turn on the seat during this operation.

Air-to-Retract ∑F Actuator (Type 48)

Apply sufficient air pressure to the diaphragm to lift the plug off the seat (the handwheel may also be used). Remove the stem cover (84), loosen the locknuts (35) on the plug stem and unscrew the plug stem (1) from the stem connector (80). Remove drive nut (33) and remove actuator from the valve. Shut off the air supply pressure and disconnect the air tubing from the actuator.

Note : On lower plug stroke, after removing drive nut (33), it may be necessary to lift the actuator during unscrewing plug stem, because the length engaged into stem connector (80) can be larger than valve stroke.

Caution : Do not allow the plug to turn on the seat during this operation.

9.3.2 Actuator Assembly and Adjustment

Caution : On actuator equipped with auxiliary handwheel, ensure this one is set on neutral position prior adjustment of plug stem.

Air-to-Extend ∑F Actuator (Type 47)

- Install actuator on valve and secure with drive nut (33) in the required position.

  Note : If the wiper (54) has been removed during disassembly operations, replace it.
- Screw plug stem full into stem connector (80) after replacing two locknuts (35) and travel indicator (34) on plug stem.

  Note : If the actuator is a size C SIGMA F, with a stem connector threading of half an inch, the travel indicator has not been removed during disassembly procedure.
- Connect a temporary supply air line on actuator.
- On 41300, 41500, 41600 or 41900 Series Valves, increase air pressure to extend stem connector (80) to used valve stroke. Unscrew plug stem until the plug is seated. Slightly release air pressure and tighten stem locknuts (35).

Note : On 41400 Series Valves, it is necessary to extend stem connector to used valve stroke, ***minus auxiliary pilot plug stroke,*** *(refer to table on page 16).*

- Ensure that travel of stem connector corresponds to used valve stroke and that closed position is completed for the maximum of spring range stamped on serial plate.
- Relieve air pressure. Replace the two stem covers (84). Tighten cover screws and nuts. Adjust stroke scale : travel indicator (34) should indicate "open" when air pressure is relieved.

Air-to-Retract ∑F Actuator (Type 48)

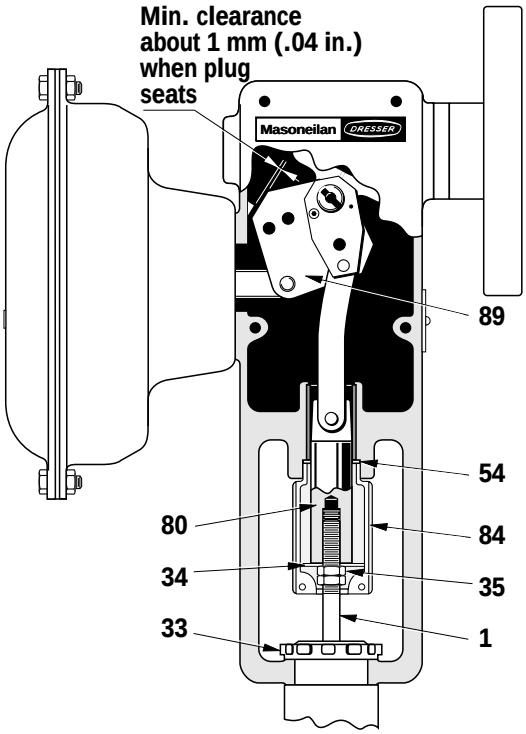
- Connect on actuator connection a temporary air supply pressure and apply sufficient air pressure to the diaphragm to fully retract stem connector (80).

  Note : On actuator equipped with auxiliary handwheel, this one may also be used for this operation. Set to neutral position after actuator installation.
- Install actuator on valve and secure with drive nut (33) in the required position.

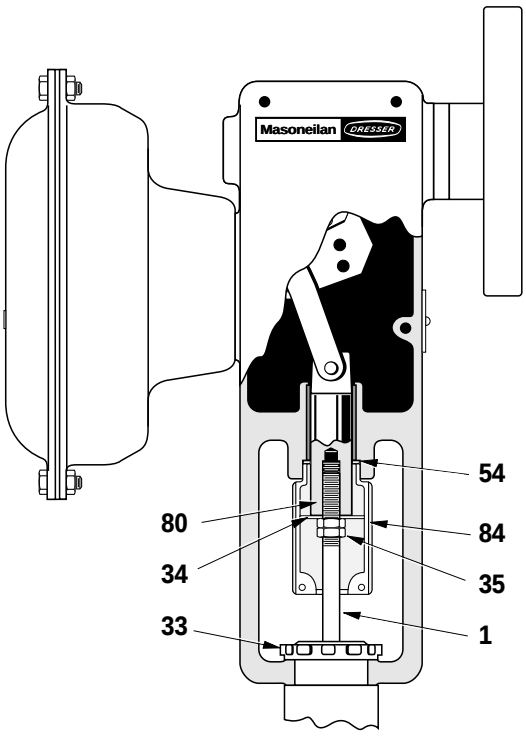
  Note : If the wiper (54) has been removed during disassembly operations, replace it.
- Screw plug stem full into stem connector (80) after replacing two locknuts (35) and travel indicator (34) on plug stem.

  Note : If the actuator is a size C SIGMA F, with a stem connector threading of half an inch, the travel indicator has not been removed during disassembly procedure.
- Relieve air pressure and unscrew plug stem until plug is seated.
- On 41300, 41500, 41600 or 41900 Series Valves, increase air pressure to retract stem connector (80) about 1,5 mm (.06 in.) and unscrew again plug stem until plug is seated. Slightly increase air pressure and tighten stem locknuts (35).

  Note : On 41400 Series Valves, it is necessary to retract stem connector about 2 mm (.08 in.) ***plus auxiliary pilot plug stroke.*** *(Refer to table on page 16). Ex : for the 4" valve size, total stem connector retraction would be : 5 mm (.20 in.).*
- Relieve air pressure. Ensure there is a minimum clearance about 1 mm (.04 in.) between stop boss of actuator case and main lever (89), (see Figure 13). If not, begin again previous step, increasing total stem connector retraction.
- Ensure that travel of stem connector corresponds to used valve stroke and that closed position is completed for the minimum of spring range stamped on serial plate.
- Replace the two stem covers (84). Tighten cover screws and nuts. Adjust stroke scale : travel indicator (34) should indicate "closed" when air pressure is relieved.



Type 48
Air to Retract Actuator

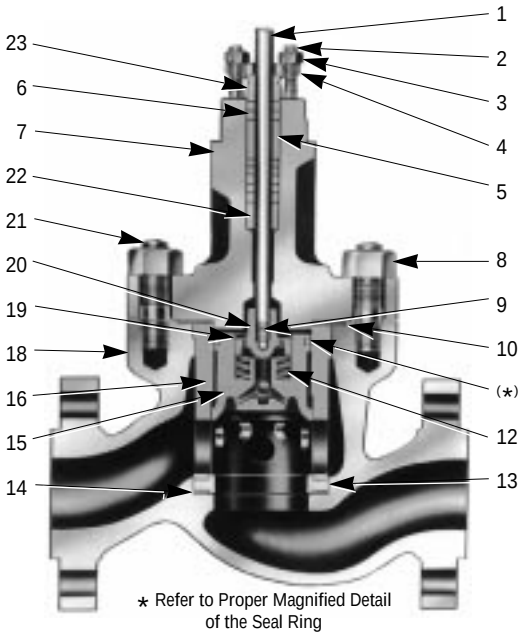


Type 47
Air to Extend Actuator

Figure 13
Types 47/48 ∑F Actuators

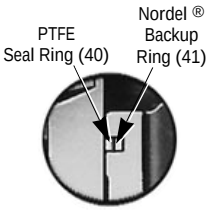
PARTS REFERENCE

1	Plug Stem
33	Drive Nut
34	Indicator Disk
35	Actuator Stem Nut
54	Wiper
80	Stem Connector
84	Stem Cover
89	Main Lever

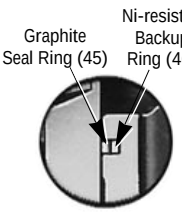


Balanced Tight Shutoff
Plug Construction 414•1 Series
2", 3" & 4" (50, 80 & 100 mm)
Figure 14

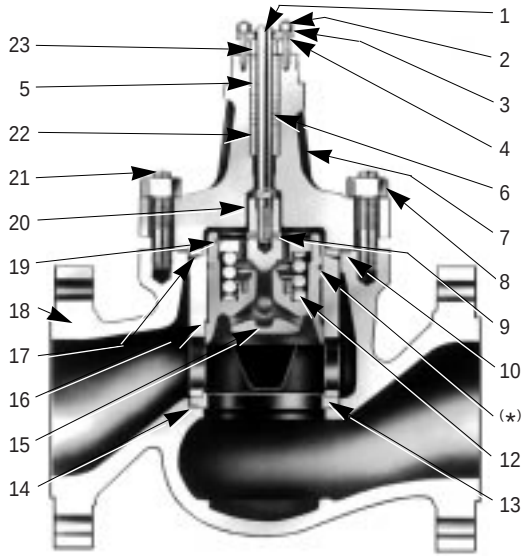
400/500 Seal Type (Magnified Detail)



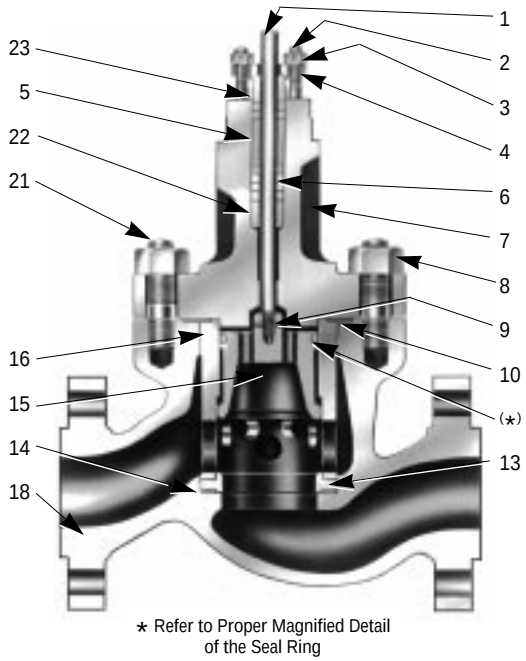
600 Seal Type (Magnified Detail)



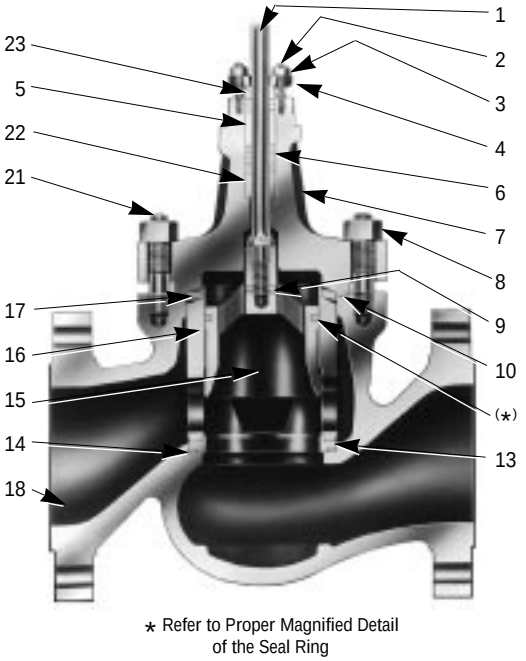
900 Seal Type (Magnified Detail)



Balanced Tight Shutoff
Plug Construction 414•1 Series
6" to 16" (150 to 400 mm)
Figure 15



Balanced Plug Construction
415•1, 416•1 or 419•1 Series
2", 3" & 4" (50, 80 & 100 mm)
Figure 16



Balanced Plug Construction
415•1, 416•1 or 419•1 Series
6" to 16" (150 to 400 mm)
Figure 17

PARTS REFERENCE

Ref. No	Parts Name	Ref. No	Parts Name	Ref. No	Parts Name
1	Valve Plug Stem	∗ 12	Spring (or Spring Washers Set)	22	Guide Bushing
2	Packing Flange Stud	13	Seat Ring	23	Packing Follower
3	Packing Flange Nut	● 14	Seat Ring Gasket	❍ ● 35	Ni-resist ® Seal Ring
4	Packing Flange	15	Valve Plug (or Piston)	★ ● 40	PTFE Seal Ring
5	Packing Spacer	16	Cage	★ ● 41	Nordel ® Backup Ring
● 6	Packing	✣ 17	Spring Washer	❑ ● 45	Graphite Seal Ring
7	Bonnet	18	Valve Body	❑ ● 46	Ni-resist ® Backup Ring
8	Valve Body Nut	∗ 19	Retaining Ring	▲ 50	Washer (Body nuts)
● 9	Plug Stem Pin	∗ 20	Auxiliary Pilot Plug		
● 10	Body Gasket	21	Valve Body Stud		

∗ On 41400 Series Valves Only
✣ On 6" to 20" Valve Sizes Only (150 to 600 mm)
★ On 41600 Series Valves Only

● Recommended Spare Parts
❑ On 41900 Series Valves Only
❍ On 41400/500 Series Valves Only
▲ On 20" & 24" Valve Sizes Only (500 & 600 mm)

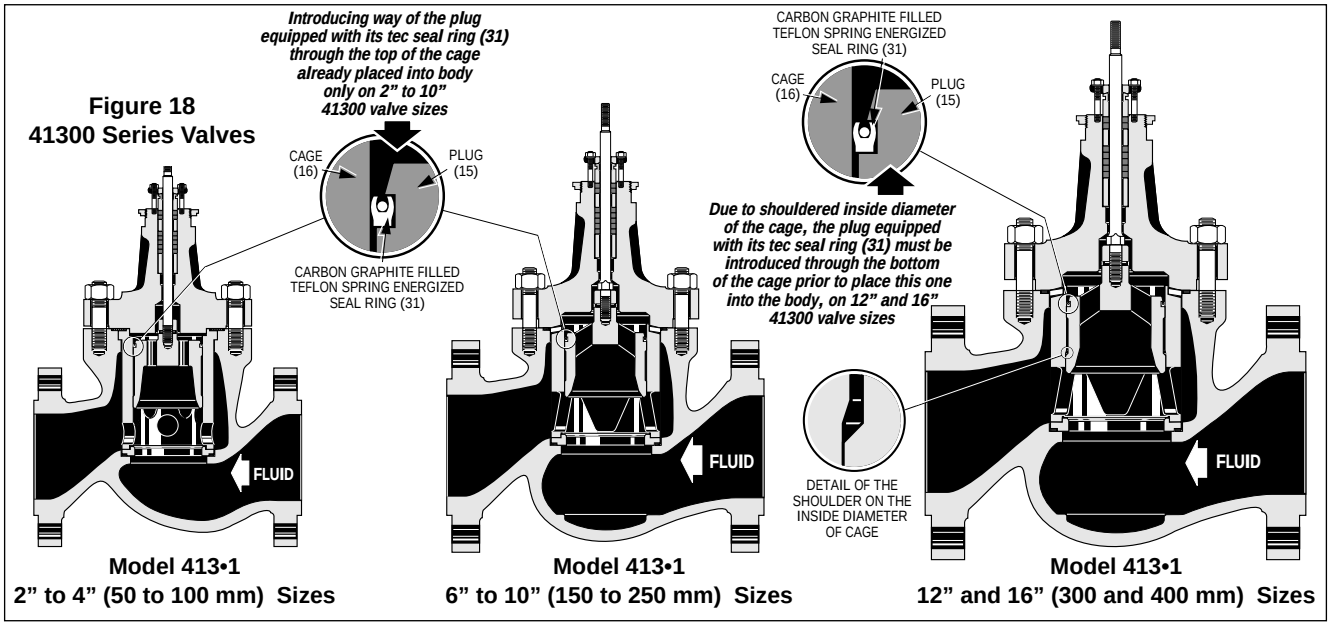


Figure 18
41300 Series Valves

Model 413•1
2" to 4" (50 to 100 mm) Sizes

Model 413•1
6" to 10" (150 to 250 mm) Sizes

Model 413•1
12" and 16" (300 and 400 mm) Sizes

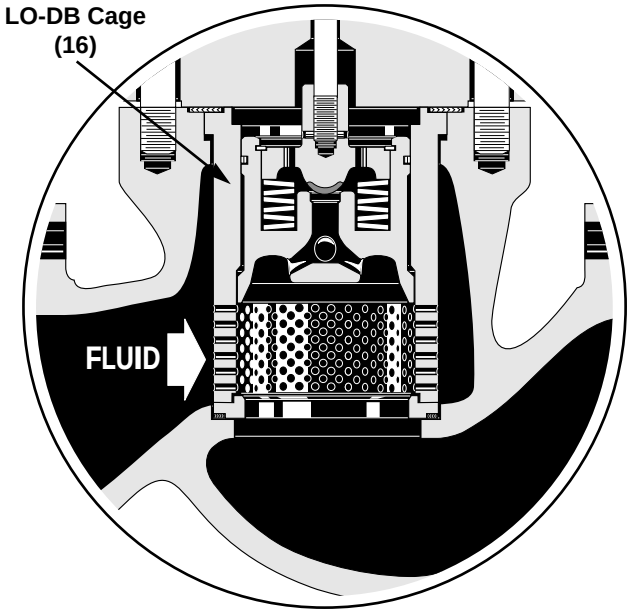


Figure 19 — 414•2 Model with LO-DB Cage
2" to 4" (50 to 100 mm) Valve Sizes

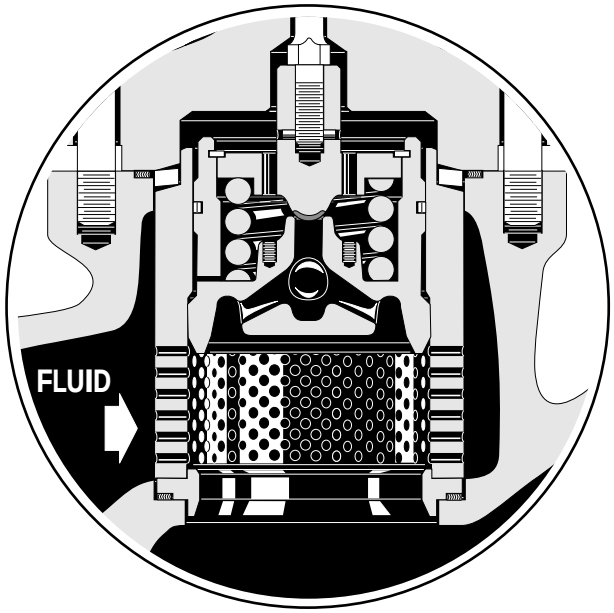


Figure 20 — 414•2 Model with LO-DB Cage
6" (150 mm) and Larger Valve Sizes

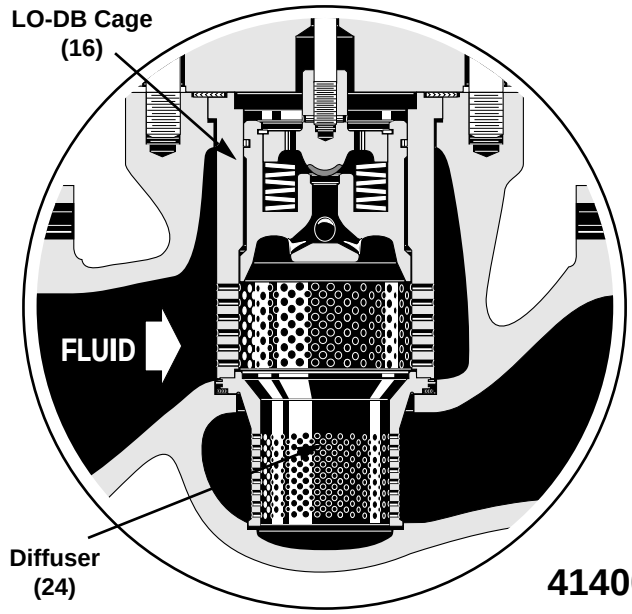


Figure 21 — 414•3 Model with LO-DB Cage and Diffuser; 2" to 4" (50 to 100 mm) Valve Sizes

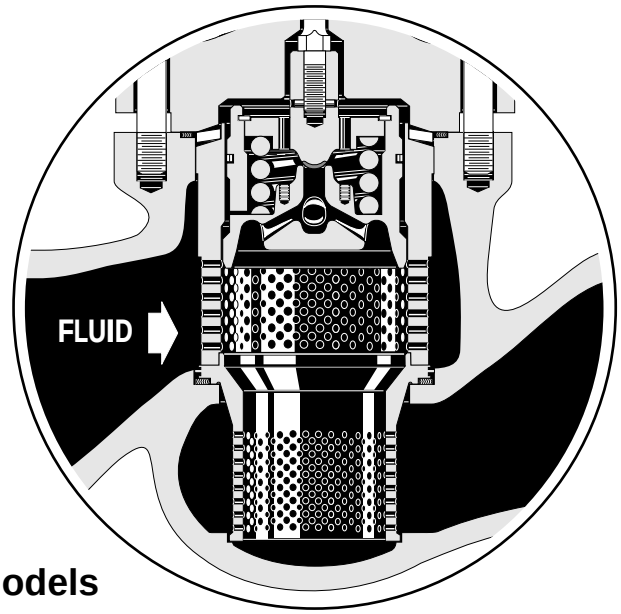


Figure 22 — 414•3 Model with LO-DB Cage and Diffuser; 6" (150 mm) and Larger Valve Sizes

41400 Models

The 41•12 valves with a LO-DB cage mounted instead of the standard cage or the 41•13 valves with a LO-DB cage and an internal diffuser mounted instead of the standard cage and seat ring are two standard variants of the 41000 Series.

These two single stage multiholes designs provide a noise attenuation and cavitation protection on liquid, gas or steam services. Its flow characteristics is always linear.

Disassembly and reassembly of these valves must be performed following the same instructions that 41000 valves with standard trim. Refer to Sections 6 and 8.

The valve must be installed so that the controlled substance will flow through the valve in the direction indicated by the flow arrow located on the body.

ON 414•2 OR 414•3 SERIES VALVES, FLOW TENDING TO CLOSE MUST BE STRICTLY OBSERVED.

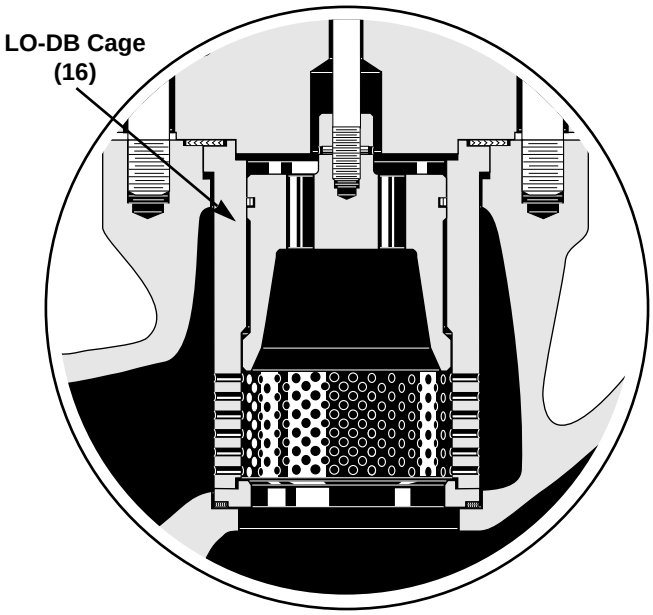


Figure 23 — 415•2, 416•2 or 419•2 Models with LO-DB Cage ; 2” to 4” (50 to 100 mm) Valve Sizes

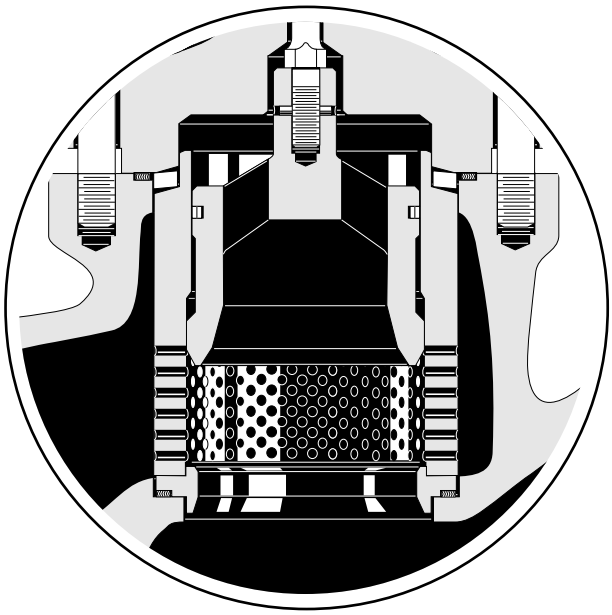


Figure 24 — 415•2, 416•2 or 419•2 Models with LO-DB Cage ; 6” (150 mm) and Larger Valve Sizes

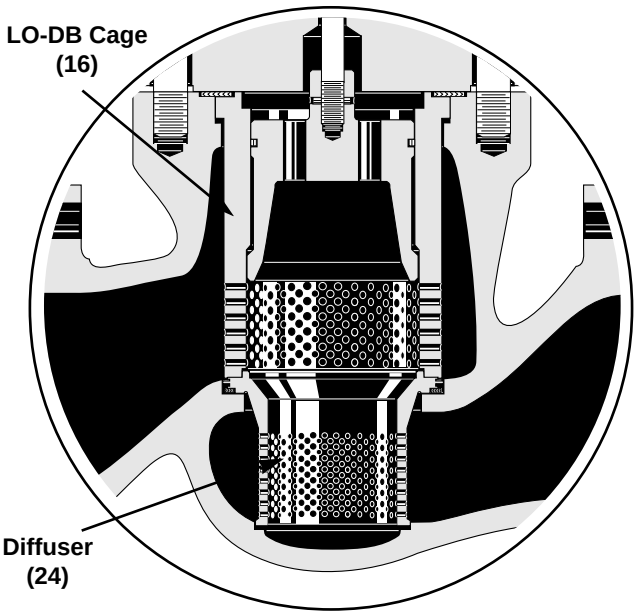


Figure 25 — 415•3, 416•3 or 419•3 Models with LO-DB Cage and Diffuser ; 2” to 4” (50 to 100 mm) Valve Sizes

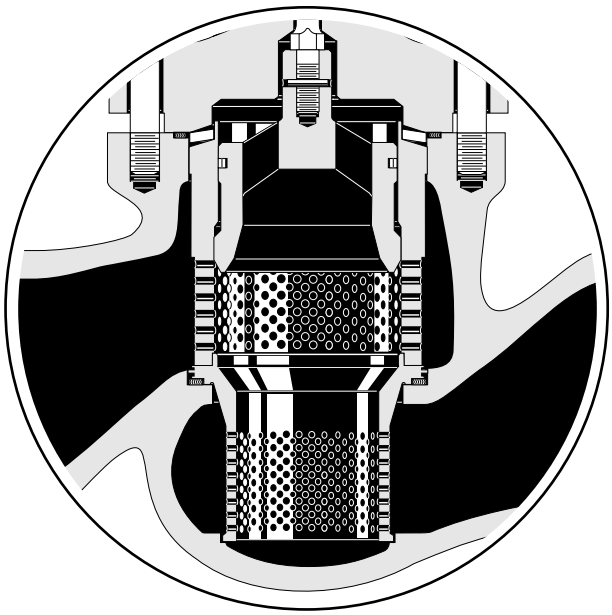


Figure 26 — 415•3, 416•3 or 419•3 Models with LO-DB Cage and Diffuser ; 6” (150 mm) and Larger Valve Sizes

41500, 600 or 900 Models

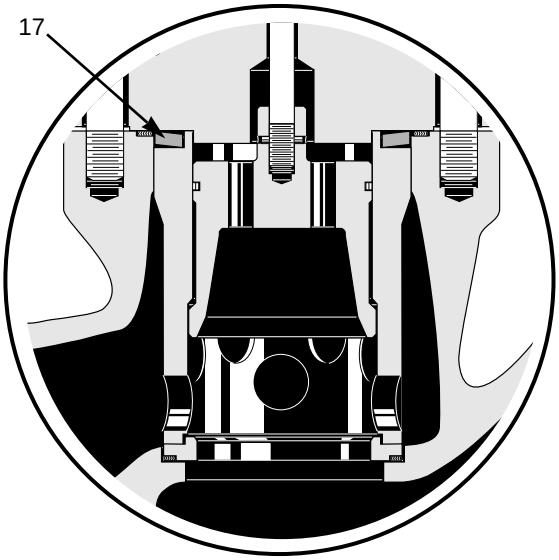


Figure 27 — Series 41400/500/900 HD Trim (High Duty) Only on 3" & 4" (80 & 100 mm) Valve Sizes

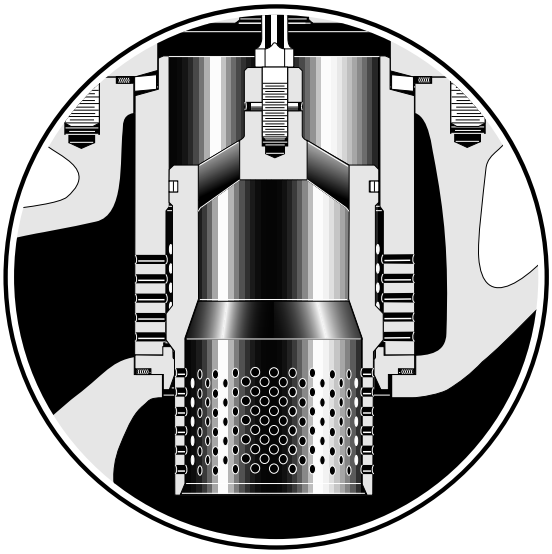


Figure 28 — Valve equipped with a LO-DB cage and a plug having a multihole skirt for pressure expansion double stage (type 41•12-2B)

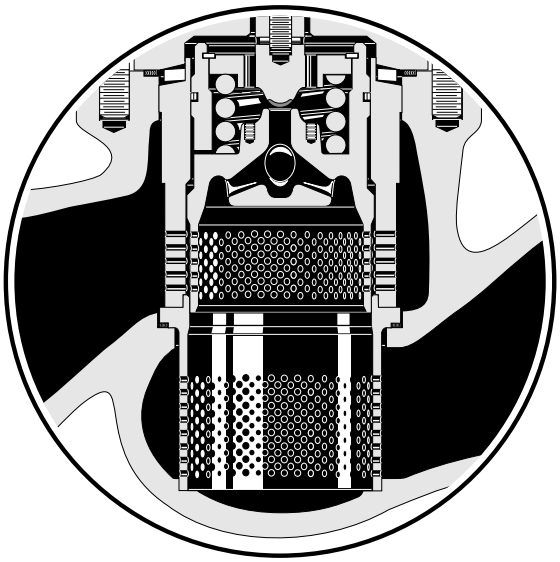


Figure 29 — Valve equipped with a LO-DB cage and a plug having a multihole skirt for pressure expansion double stage and Diffuser (type 41•13-2B)

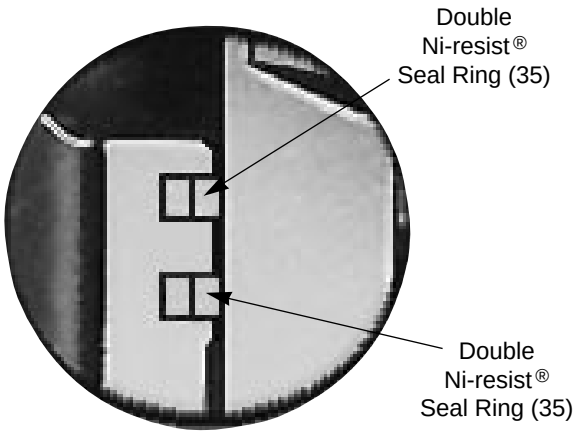
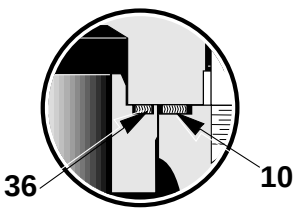


Figure 30
Plug with two sets of seal rings (detail)



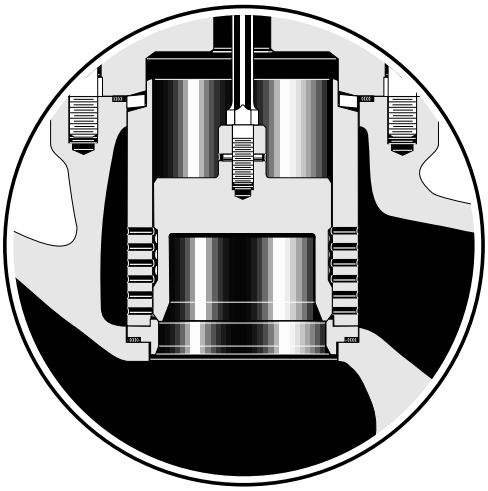
Valve Sizes		ANSI Class	Design Type
mm	inches		
150 to 400	6 to 16	300-600	On valves **without flat spring (17)** for particular service conditions
150 to 300	6 to 12	900	
150 to 250	6 to 10	1500	
50 to 250	2 to 10	2500	Standard Design

Figure 31 — Detail of the body-cage-bonnet joining on the referenced valves

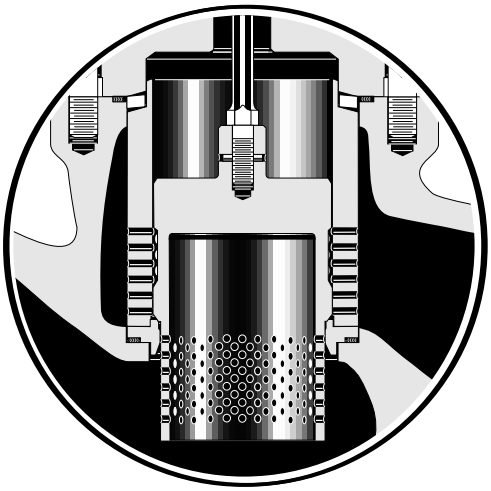
PARTS REFERENCE

Ref. No	Parts Name
● 10	Body Gasket
● 36	Cage Gasket
17	Conical Spring
❍ ● 35	Ni-resist ® Seal Ring

● Recommended Spare Parts
❍ On 41500 Series Valves Only



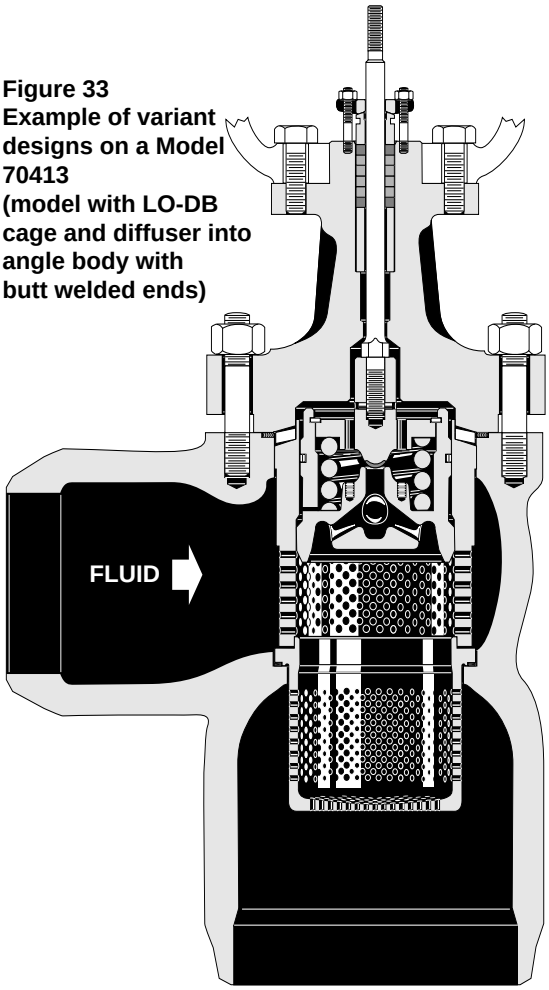
Valve equipped with LO-DB cage and unbalanced plug (Type 41012)



Valve equipped with LO-DB cage and unbalanced plug having a multihole skirt (Type 41012-2B)

Figure 32

Figure 33
Example of variant designs on a Model 70413 (model with LO-DB cage and diffuser into angle body with butt welded ends)



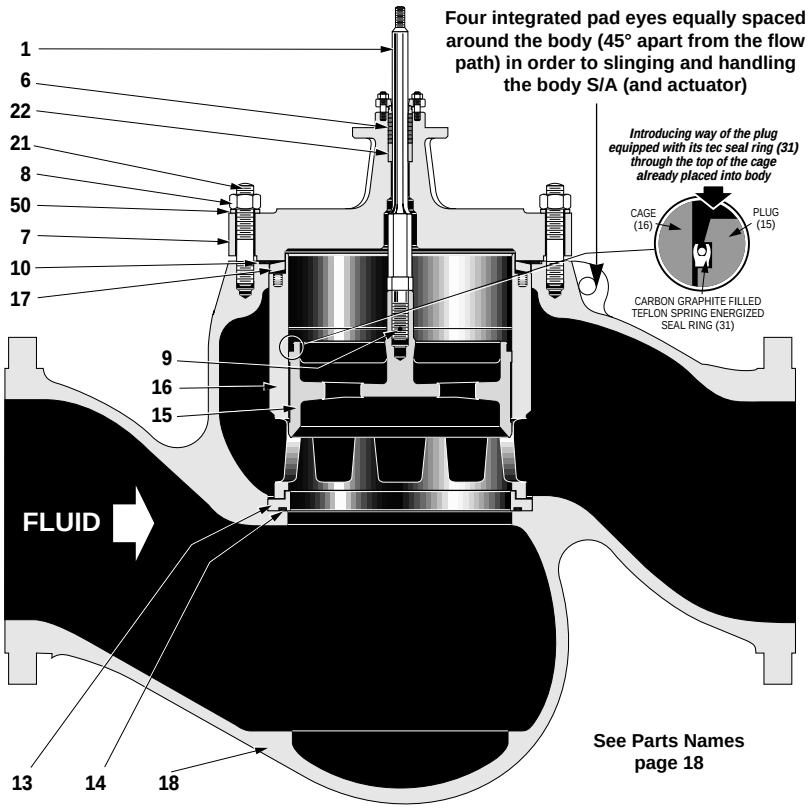


Figure 34
Model 413•1, 20" or 24" (500 or 600 mm) Valve Size

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