



**28XR  
FIRST STAGE**

## TB 42-BIS

## NEW TRIMATERIAL POPPET 2K22

**DEC 2022**

The technical department of Mares S.p.A. would like to announce a Trimaterial Poppet modification.

The new Poppet is softer than the previous one, designed and tested to provide a better seal, especially in cold water. The new parts can easily be identified following the pictures below.

ACTUAL 30N VERSION	ACTUAL 50N VERSION
Poppet Trimat. 2k18 CPL COD. 46201575 Poppet Trimat. 2k18 CPL COD. <b>46201575</b> 	Poppet Trimat. 50N CPL COD. <b>46201784</b> 
NEW 30N VERSION 2k22	NEW 50N VERSION 2k22
Poppet Trimat. 2k22 30N CPL COD. <b>46201815</b> 	Poppet Trimat. 2k22 50N CPL COD. <b>46201816</b> 



### NOTE

1) The new poppet will be assembled in other Mares 1st stages as a running change.

2) As a consequence of TB42, the new service kits will be:















46201784	Poppet Trimat 50N cpl>	will be replaced by>	<b>46201816</b>	Poppet Trimat 2k22 50N CPL
46201575	Trimaterial Poppet 2k18 cpl>	will be replaced by>	<b>46201815</b>	Poppet Trimat 2k22 30N CPL
46201355	Service Kit 22X INT-DIN >	will be replaced by>	<b>46201827</b>	Service Kit 22X 2k22
46201370	Service Kit 12S INT-DIN >	will be replaced by>	<b>46201828</b>	Service Kit 12S-2k22
46201572	Service Kit 75XR DIN >	will be replaced by>	<b>46201829</b>	Service kit 1st Stage 75XR-30N-2k22
46201580	Service Kit 52X-15X-25XR INT DIN >	will be replaced by>	<b>46201830</b>	Service Kit 52X-15X-25XR-30N-2k22
46201739	Service kit first stage 82X >	will be replaced by>	<b>46201831</b>	Service kit first stage 82X-30N-2k22
46201741	Service kit 1st stage 52X/25XR AST >	will be replaced by>	<b>46201832</b>	Service kit 1st stage 52X/25XR AST-30N-2k22
46201744	Service kit NX 1ST 52X AST (EN 13949) >	will be replaced by>	<b>46201833</b>	Service kit NX 1st 52X AST (EN 13949) 2k22
46201780	Service kit 1st stage 72X AST >	will be replaced by>	<b>46201834</b>	Service kit 1st stage 72X AST-30N-2k22
46201820	Service Kit 15X-HRZ-30N-AST >	will be replaced by>	<b>46201835</b>	Service Kit 15X-HRZ-30N-AST-2k22
46201792	Service Kit first stage 62X INT/DIN >	will be replaced by>	<b>46201836</b>	Service Kit 62X 2k22
46201787	Service kit first stage 82x-50N >	will be replaced by>	<b>46201837</b>	Service Kit 82X-50N-2k22
46201789	Service kit first stage 72x-AST-50N >	will be replaced by>	<b>46201838</b>	Service Kit 72X-50N-2k22
46201802	Service Kit first stage 15X-50N-AST>	will be replaced by>	<b>46201839</b>	Service Kit 15X-50N-AST 2k22
46201800	Service Kit first stage 15X-50N >	will be replaced by>	<b>46201840</b>	Service Kit 15X-50N 2k22
46201807	Service Kit first stage 15X-HRZ-50N-AST>	will be replaced by>	<b>46201841</b>	Service Kit 15X-HRZ-50N-AST 2k22
46201783	Service Kit first stage 28XR DIN/NX>	will be replaced by>	<b>46201860</b>	Service Kit 28XR-DIN-NX-2k22
46201818	Service Kit first stage 25XR-50N-TBP>	will be replaced by>	<b>46201862</b>	Service Kit 25XR-2k22



### WARNING

All service and repair procedures on Mares products should be performed by qualified Mares Service Technicians at authorized Mares Dealers and Service Centers. Service Technicians should have the Mares Service Manual and Spare Parts Catalog readily available for reference while performing service procedures and closely follow the recommended procedures and guidelines outlined in these materials.

## 28XR. REQUIRED TOOLS AND SUPPLIES

Tool	Description	#Code	Tool	Description	#Code
	B-18 (14mm)	46106218		B-8 (6mm)	46106208
	B-52 7/16"	46201746		B-13 (10mm)	46106213
	Hex 4mm	No code		B-21	46106221
	B-6	46106206		B-42	46201042
	B-16 (32mm)	46106216		B-47 O-ring removal Tool	46201387
	B-5	46106205		B-2 (28mm)	46106202
	B-51 AST Special Tool	46201551		B-23	46106223

- Compressed diver grade air supply circuit or tank (2600-2900 PSI/ 185-200 bar)
- Compressed air gun (120-145 PSI/8-10 bar)
- Ultrasonic cleaner & Descaling solution (e.g. Deox Extra type) or similar
- Loctite 415 or similar
- Magnehelic gauge (416923 - 416924)
- Silicone grease Tribolube-71 Lubrification Technology or equal
- Neoprene Workpad (449822)
- First Stage service kit **#46201860** Service Kit 28XR-DIN-NX-2k22
- Nylon brush
- Torque Wrench
- 3mm Screw

## 28XR. DISASSEMBLY



### WARNING

**IF THE FIRST STAGE IS USED TO DIVE WITH OXYGEN-ENRICHED MIXTURES, IT MUST BE O<sub>2</sub> CLEANED. MARES RECOMMENDS O<sub>2</sub> CLEANING USING THE PROCEDURES OUTLINED IN THE MARES O<sub>2</sub> CLEANING GUIDELINES, AND FOLLOWING THE DISASSEMBLY/ REASSEMBLY/ADJUST PROCEDURES OUTLINED IN THIS MANUAL. OXYGEN ENRICHED MIXTURES IS DEFINED IN THE US AS OVER 40% O<sub>2</sub>. IN EU COUNTRIES IT IS DEFINED IN THE EN 13949 NORM.**

1. Remove the Retaining Ring TBP (24) with the Diaphragm TBP (23) using the special tool (B-23).



### NOTE

**Please pay attention not to lose the Washer (11) during the next operation.**



### NOTE

**Flip the First Stage over, the Upper Piston (21) should fall down, if it doesn't happen, screw-in an M3 screw on the top of the Upper piston (21) and pull it up, removing the Upper piston (21); if an M3 screw isn't available, you can use the second stage Poppet stem.**

2. Remove the Upper Piston (21).
3. Remove the Regulating Nut (22) using the 10mm allen wrench (B-13).
4. Remove the TBP Spring (12).
5. Unscrew the TBP Body (8) from the First Stage Body (1) using a special tool 28 mm wrench (B-2)



1



1b



2



3



4



5

## 28XR. DISASSEMBLY

6. Remove the Lower Piston (9) from the TBP Body (8).
7. Remove the Washer Spring TBP (11) from the Lower Piston (9).
8. Remove the O-ring (10) from the Lower Piston (9).
9. Remove the O-ring (7) from the First Stage Body (1).
10. Remove the First Stage Poppet Button (6), the Pin (5) and the Metal Disc (2).



6



7-8



9-10

## 28XR. DISASSEMBLY

11. Remove the O-ring (38-44 NX) from the AST DIN (39-45 NX).
12. Remove the AST DIN (39 - 45 NX) using the AST Special Tool (B-51).
13. Remove the AST gasket (47-48 NX) from the AST System (39-45 NX).
14. Remove the Conical Filter (37 - 43 NX) from the Body Din Connector (36 - 42NX), by turning the First Stage Body (1) upside down.
15. Insert a 5mm Allen wrench (B4) inside the Body Din Connector (36 - 42 NX) and unscrew it completely.
16. Remove the O-ring (20) from the Body Din Connector (36-42 NX).
17. Remove the Threaded Locking Ring (35 - 41 NX).



12



13-14



15



16-17

## 28XR. DISASSEMBLY

18. Remove the Retaining Ring 1st Stage (25) that connect the 1st Stage Body (1) with the Swivel Turret (30) using the special tool (B-23).
19. Remove the O-ring (26) from the 1st Stage Body (1).
20. Using the threaded bar tool (B-5), and a 6mm allen wrench (B-8) disassemble the Swivel Turret (30) from the Retaining Ring 1st Stage (25), by unscrewing the Insert (28).
21. Remove the Rotating Turret Washer (27) from the Insert (28).
22. Remove the O-ring (29) from the Swivel Turret (30).
23. Remove all LP plugs (32) and HP plugs (34) using a 4mm Allen wrench.
24. Remove the O-rings (31) from the LP plugs (32) and O-rings (33) from the HP plugs (34).
25. Remove the O-ring (29) from the Swivel Turret (30) and remove the threaded bar Tool (B-5).



18



18b



20



22-23



## 28XR. DISASSEMBLY

26. Using a 6mm Allen wrench (B-8), unscrew the HP Chamber (16), remove the Spring (14) and the Poppet Trimat (4), from the First Stage Body (1).
27. Remove the O-ring (20), and Washer (15) from the HP Chamber (16).
28. Extract the O-ring (18) and the Backup Ring (19) from the HP Chamber (16), using an O-ring removal tool made in plastic or brass.



### WARNING

**DO NOT USE SHARP OR POINTED TOOLS MADE OF STEEL OR OTHER MATERIALS, TO AVOID SCRATCHING THE SURFACES OF THE HP CHAMBER.**

29. Insert the special tool (B-42) in the center hole of the First Stage Body (1) and remove the HP Seat (3).
30. Remove the O-ring (17) from the HP Seat (3).
31. Remove the threaded bar tool (B-52) from the HP port



26



26b



27-28



29



30



## 28XR. INSPECTION AND CLEANING

### AST System

#### Cleaning

Clean the AST INT and AST DIN by blowing it with LP compressed air to remove possible dirt.



#### NOTE

**To be sure the AST System is perfectly clean, the LP air must be blown in the same direction of the air flow under regular use.**

Clean the metal part only using a nylon brush and a small quantity of acid such as Deox Extra or a solution of white vinegar diluted with hot water (with the same percentage of dilution as the other metal part).

Be sure to rinse all parts in fresh water and allow to completely dry before proceeding with reassembly.

#### Inspection

If, after having performed step 14, the filter shows excessive dirt, the AST System needs to be replaced.

### Reusable Rubber and Plastic Components

#### Cleaning

Clean all rubber and plastic components by washing them in a mixture of warm water and mild detergent. If necessary, scrub parts with a soft brush. Do not use abrasive cleaners, solvents or acids on rubber components.

#### Inspection

Inspect all reusable rubber and plastic components for excessive wear and/or damage. Replace parts as necessary.



#### CAUTION

**SOLVENTS AND ACIDS MAY DAMAGE PLASTIC AND RUBBER PARTS. BEFORE CLEANING METAL COMPONENTS, MAKE SURE THAT ALL RUBBER AND PLASTIC PARTS HAVE BEEN REMOVED.**

### Metal Components

#### Cleaning

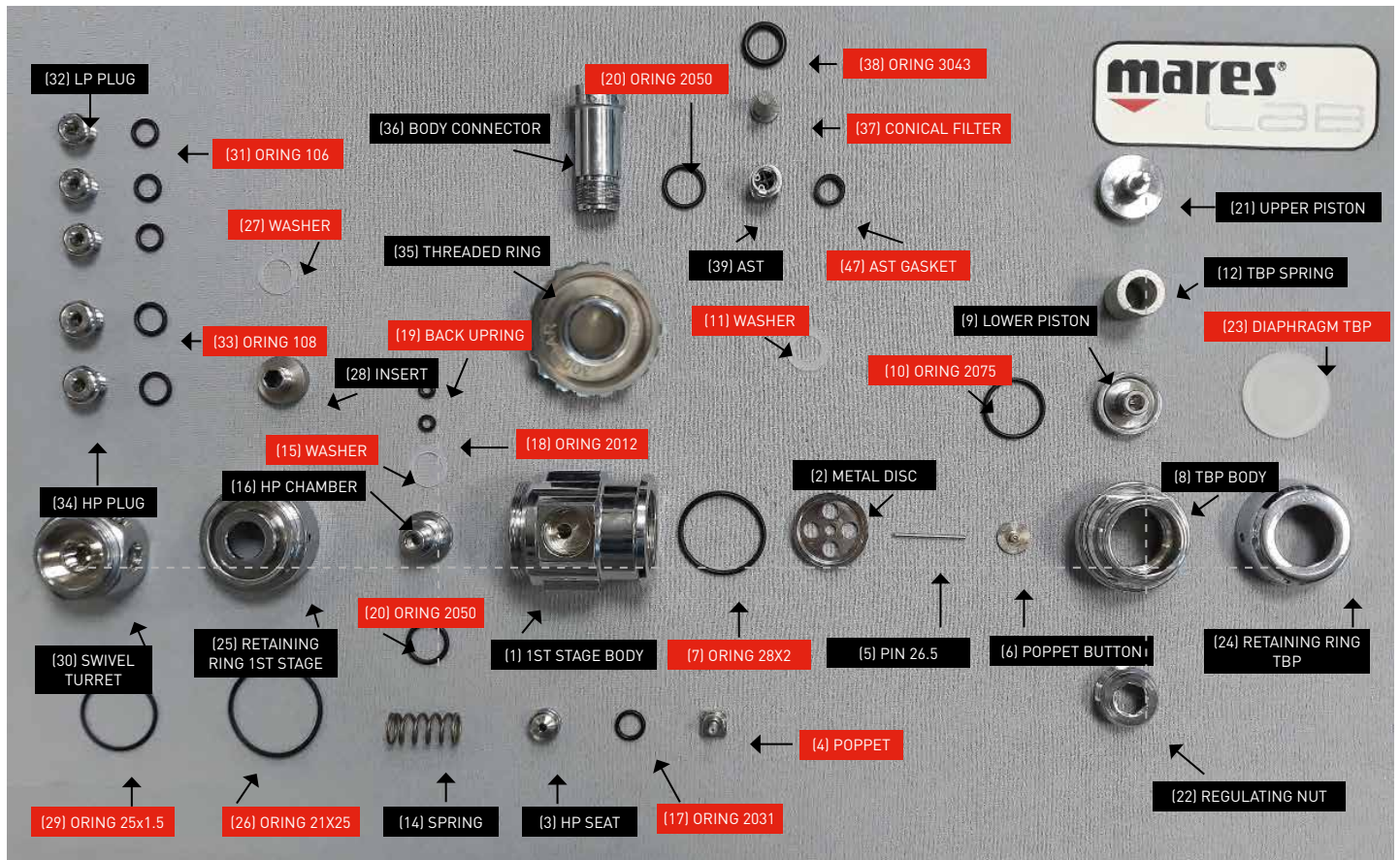
Chrome plated, brass, and stainless steel parts are cleaned by immersing them in an ultrasonic cleaner containing a de-scaling agent such as Deox Extra or a solution of white vinegar diluted with hot water. A nylon brush may be used to remove any stubborn deposits.

Be sure to rinse all parts in fresh water and allow to completely dry before proceeding with reassembly.

#### Inspection

Inspect all parts for excessive wear and/or damage. Replace parts as necessary.

## 28XR. FIRST STAGE SERVICE KIT



Certain key components of the First Stage should be replaced during the overhaul. These key parts are included in the 28XR First Stage Service Kit (Code **46201860** Service Kit 28XR-DIN-NX-2k22) and are identified in the **RED BOXES** above.

**SERVICE KIT**

**#46201860** Service Kit 28XR-DIN-NX-2k22

## 28XR. REASSEMBLY

### NOTE

Lubrication reduces the likelihood of damage during reassembly. Before beginning the reassembly procedure, lightly lubricate all O-rings Tribolube-71 Lubrification Technology or equal.

32. Install the O-ring (17) on the HP Seat (3), and position the Seat on the special Tool (B-21).
33. Insert the HP Seat (3) into the First Stage Body (1) and gently press until the Seat is properly seated.

### CAUTION

TAKE SPECIAL CARE NOT TO DAMAGE THE SEAT WHEN INSERTING IT. IT IS CORRECTLY SEATED IF THE CONICAL SECTION IS VISIBLE WHEN VIEWING IT FROM THE HIGH PRESSURE CHAMBER.

34. Correctly position the Backup Ring (19) and the O-ring (18) into the HP Chamber (16).

### CAUTION

MAKE SURE THAT SIDE "A" OF THE BACK UP RING (19) IS FACING THE O-RING (18), AND SIDE "B" IS FACING THE BOTTOM OF THE HP CHAMBER (16).

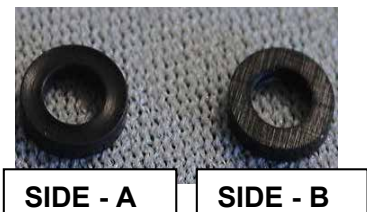
35. Install the O-ring (20), and the Washer (15) on the HP Chamber (16).
36. Insert the First Stage valve (4) inside the First Stage Body (1), with the flat part facing the Valve Seat (3).
37. Position the Spring (14) on the First Stage valve (3) and tighten the HP Chamber (16) using a 6mm Allen wrench (B-4).
38. Install the O-ring (26) on the First Stage Body (1).



32



33



34



36



37

## 28XR. REASSEMBLY

39. Install the O-ring (29) on the Swivel Turret (30).
40. Position the Retaining Ring 1st Stage (25) on the Swivel Turret (30).
41. Position the Rotating Turret Washer (27) in to the Retaining Ring 1st Stage (25).
42. Place the Insert (28) on the Retaining Ring 1st Stage (25).
43. Tighten the Insert (28) using the threaded bar Tool (B-5) and a 6mm allen wrench (B-8).



### WARNING

**IF USING A TORQUE WRENCH TO TIGHTEN THE INSERT (28), USE A TIGHTENING TORQUE OF APPROXIMATELY 9 ft lb / 12 Nm.**



### NOTE

**For best results, place the threaded bar Tool (B-5) in a bench vise to hold the First Stage during the assembly.**

44. Using a special tool (B-23), install the Retaining Ring 1st Stage (25) plus the Swivel Turret (30), on the First Stage Body (1), using the thread ed bar tool (B-52).



### WARNING

**IF USING A TORQUE WRENCH TO TIGHTEN THE RETAINING RING (25), USE A TIGHTENING TORQUE OF APPROXIMATELY 25 Nm / 18.5 ft lb.**



### NOTE

**For best results, place the threaded bar Tool (B-52) in a bench vise to hold the First Stage during the assembly.**

45. Install all LP plugs (32) and HP plugs (34) using a 4mm Allen wrench.
46. Install the O-rings (31) from the LP plugs (32) and O-rings (33) from the HP plugs (34).



39



40



41



42



43



44



## 28XR. REASSEMBLY DIN - NX

47. Position the O-ring (20) on the Body Din Connector (36 – 42 NX).
48. Insert the Body DIN Connector (36 – 42 NX) into the Threaded Locking Ring (35 – 41 NX).
49. Using a 5-mm allen wrench (B 4), tighten the Body DIN Connector (15 – 48 NX) to the First Stage Body (1).



### WARNING

**IF USING A TORQUE WRENCH, TIGHTEN TO A TORQUE OF APPROXIMATELY 18.5 ft lb / 25 Nm**

50. Insert the Conical Filter (37– 43 NX) in the Body Din Connector (36 – 42 NX).
51. Place the AST gasket (47 – 48 NX) on the AST System (39 – 45 NX).
52. Install the AST System (39 – 45 NX) using the AST special tool (B51).



### WARNING

**IF USING A TORQUE WRENCH, TIGHTEN TO A TORQUE OF APPROXIMATELY 1.1-1.5 ft lb / 1,5-2 Nm**

53. Install the O-ring (38–44 NX) on the AST DIN (39–45 NX).
54. Remove the threaded bar tool (B-52) from the First Stage Body (1).
55. Install the O-rings (28) on the HP Plugs (33), and the O-rings (17) on the LP Plugs (12).
56. Install all HP and LP Plugs on the First Stage Body, leaving two LP ports open for the Second Stage and IP Gauge.



47



48



49



50



51



52



53

## 28XR. REASSEMBLY

57. Flip the First Stage Body over (as shown in the picture) and insert the Metal Disc (2) (with the bigger edge facing up) into the First Stage Body (1)
58. Insert the O-ring (7)
59. Insert the the Pin 26,5mm (5) in the center hole of the Metal Disc (2).
60. Position the First Stage Valve Button (6) on the First Stage Pin (5) and press it down to feel the "response" of the Spring (14).



57



58



59



60



## 28XR. REASSEMBLY

61. Install the O-ring (10) on the Lower piston (9)
62. Install the Washer (11) on the Lower Piston (9)
63. Install the Lower Piston (9) into the TBP body (8)



### NOTE

To properly place the Lower Piston into the TBP body, turn the TBP body upside down and insert the lower piston; turn the TBP body back upright and place it on a flat, hard surface. Push down on the TBP body, depressing the lower piston inside until it is in contact with the internal flat surface.

64. Tighten the TBP Body (8) on the First Stage Body (1) using the special tool 28 mm wrench (B-2)



### WARNING

USE A TORQUE WRENCH TO TIGHTEN TO A TORQUE OF: 37 ft lb / 50 Nm.

65. Install the Diaphragm Spring (12) on the Lower Piston (9)
66. Install the Regulating Nut (22) making 2/3 of a complete turn using the allen 10mm allen wrench (B-13).



### NOTE

Start to screw the Regulation Nut (22) using your finger, then the 10mm allen wrench (B-13)



61



62



63



64



65



66

## 28XR. REASSEMBLY



### NOTE

Connect the First Stage to a full tank (at least 2600 psi/180 bar), and slowly, open the tank valve to remove any debris from the first stage, close the tank.

67. Using Dual Stand Magnehelic (#416924) or Low Pressure gauge (#46106252), screw and tighten the Lp hose into the Lp port of the First Stage
68. Connect the Second Stage hose to a LP Port ( without the 2nd Stage cover installed).
69. Install the Upper Piston (D) on the Lower Piston (H) passing through the Regulating Nut (22)
70. Holding down the Second Stage demand lever, slowly open the tank valve and, almost simultaneously, release the demand lever and check the IP.



### WARNING

USE A TORQUE WRENCH, TIGHTEN HOSES TO A TORQUE OF 3-3.5 ft lb / 4 -4,5 Nm

TABLE 1: IP ADJUSTABLE RANGE

HP Air Supply	Intermediate Pressure (IP)
2900 psi	142 – 148 psi
200 bar	9.8 – 10.2 bar

## 28XR. TWIN BALANCED PISTON - ADJUST INTERMEDIATE PRESSURE

71. If the Intermediate Pressure (IP) is not correct, close the tank and release the air from the regulator, then remove the Upper piston (D) using an M3 screw.
  - 71.1.a If the intermediate pressure is greater than the specified value (see the IP Adjustment Range of the relative first stage Service Manual), use the 10 mm hex wrench (B-13) to slowly loosen the Regulating Nut (22) until the specified value is obtained.
  - 71.1.b If the First Stage pressure is lower than the specified value (see the IP Adjustment Range of the relative first stage Service Manual), use the 10 mm hex wrench (B-13) to slowly tighten the Regulating Nut (22) until the specified value is obtained.



### CAUTION

When the intermediate pressure is reduced, it is necessary to vent the excess air in order to obtain a correct reading of the new value.



### CAUTION

The Adjustments to the Regulating Nut described on steps 71.1a and/or 71.1.b must be done without Lp air to the First Stage

72. Holding down the second Stage Demand Lever, slowly open the tank valve and, almost simultaneously, release the Demand Lever and check the IP



69



71



IP



HP

## 28XR. TWIN BALANCED PISTON - ADJUST INTERMEDIATE PRESSURE

73. Check the IP, If the IP is not correct proceed again with the step 71 until you find the correct IP
74. Install the Diaphragm (23) into the Retaining Ring TBP (24)
75. Install the Retaining Ring TBP (24) onto the TBP Body (8)



### WARNING

**USE A TORQUE WRENCH TO TIGHTEN TO A TORQUE OF: 4.5 ft lb / 6 Nm.**

76. Check the Intermediate Pressure (IP) again, If it is not correct, remove the sealing ring (A) and proceed again starting from step 71 until you reach the correct IP.



### NOTE

The adjustments of the IP, have to be done according to the IP difference we have from the IP value at step 71 and the IP value at step 76 e.g.: if at step 71 the IP value was 10.7bar and at step 76 was 10.0bar, the adjustment on step 70 should be 0,7bar less (9.3bar instead of 10.0bar).



74 a



74 b



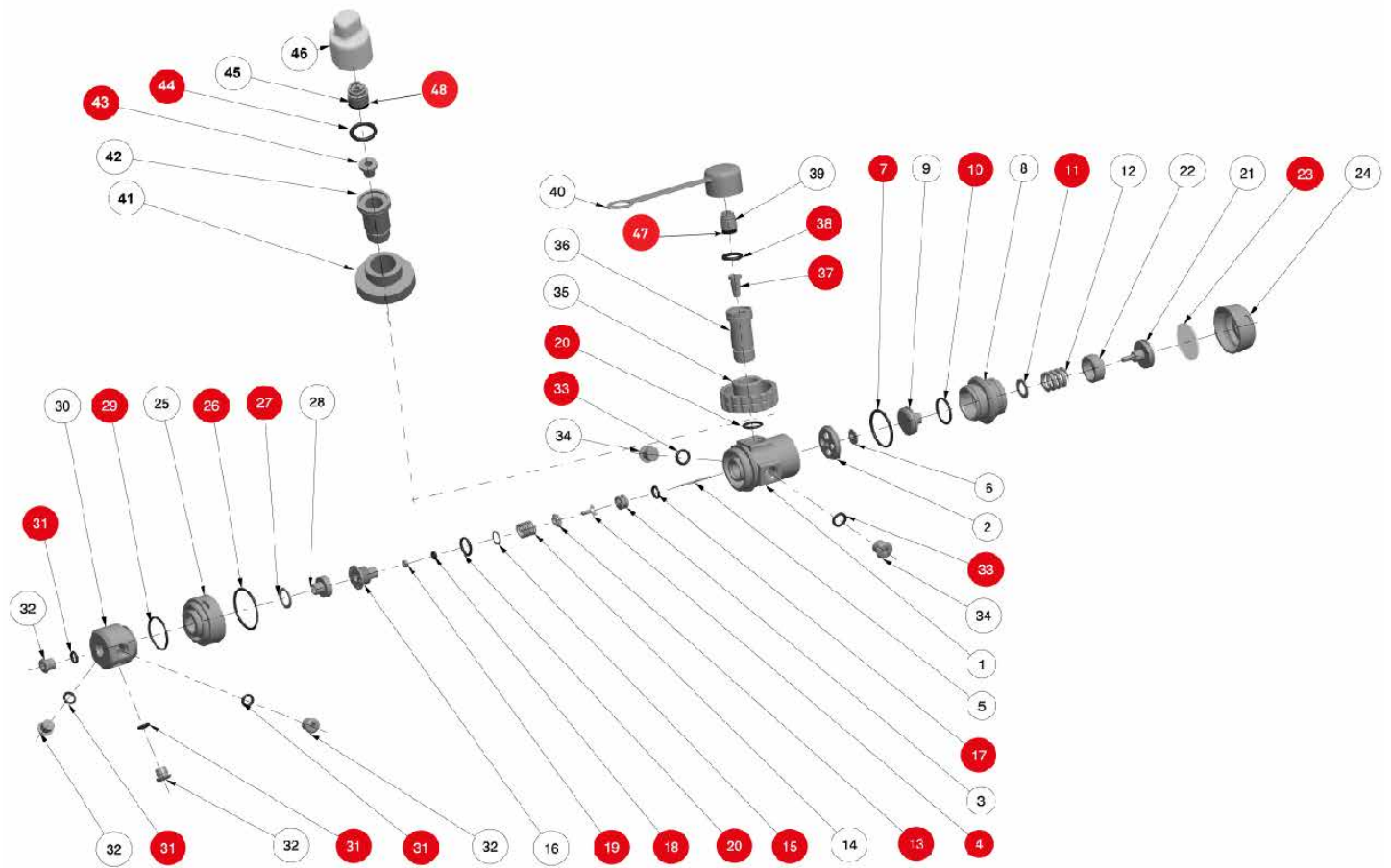
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## 28XR. TROUBLESHOOTING

Problem	Probable Cause	Solution
CONTINUOUS AIR FLOW FROM SECOND STAGE (FREE FLOW) CAUSED BY: 1. AN INCREASE IN THE INTERMEDIATE PRESSURE, or 2. A CONTINUALLY INCREASING IP (IP CREEP)	1. Intermediate Pressure too high	Readjust IP per procedures
	2. Damaged First Stage Tri-material Poppet	Replace Tri-material Poppet
	2. Damaged Poppet Seat	Replace Poppet Seat
	2. Damaged HP Housing Assembly components or damaged HP Chamber	Check internal surfaces of HP Chamber. Clean or replace HP Chamber. Replace O-ring and/or Back Up Ring.
AIR LEAKS FROM FIRST STAGE DIAPHRAGM	Lose Locking Nut	Tighten CWD Kit Body
	First Stage Diaphragm damaged	Replace the Diaphragm
	First Stage diaphragm seating surface damaged	Replace the First Stage Body
AIR LEAKS FROM THE FIRST STAGE HP/LP PORT PLUGS AND/OR HOSE PORTS	Damaged O-ring – corrosion on metal surface	Clean the Seat and/or replace O-ring
	Lose hose and/or port plug	Tighten hose and/or plug
AIR LEAKS BETWEEN BODY DIN CONNECTOR AND TANK VALVE	O-ring seal of tank valve corroded or damaged	Clean the Seat of the tank valve and replace the O-ring
	Body Din Connector sealing surface damaged	Replace Body Din Connector
	O-Ring damaged	Replace O-ring

28XR. DRAWING E 1189

Updated: 11/04/2018



## 28XR. CHART XRF2

Updated: 01/12/2023

CHART NO: 43			FIRST STAGE 28XR / DIN - NX		
REF	CODE	DESCRIPTION	REF	CODE	DESCRIPTION
1	46201670	FIRST STAGE BODY 28XR	30	46201431	SWIVEL TURRET
2	46201676	METAL DISC	31	46110106	ORING 106
3	46201541	HP SEAT "MR"	32	46185204	LP PLUG 3/8"
4	V	POPPET TRIMAT 2K18	33	46110108	ORING 108
5	46201303	PIN 26,5	34	46185205	HP PLUG 7/16"
6	46200545	FIRST STAGE POPPET BUTTON	35	46201268	THREADED LOCKING RING
7	46201715	ORING-28x2	36	46201101	BODY, DIN CONNECTOR 300 BAR
8	46201698	TBP BODY 28XR	37	46200560	CONICAL FILTER, DIN
9	46201690	LOWER PISTON	38	46110247	ORING 3043
10	46110243	Oring-2075	39	416812	AST DIN
11	46201725	WASHER SPRING TBP	40	46200562	DIN CONNECTOR DUST CAP
12	46201285	TBT SPRING	41	N	NITROX LOCKING RING 200 Bar (EN13949)
	V	BASE POPPET SPRING 50 N	42	N	BODY, NITROX CONNECTOR 200 BAR (EN13949)
14	46202047	SPRING 1ST STAGE 50N	43	46186202	CONICAL FILTER, NX
15	46202048	HP CHAMBER WASHER	44	46110227	OR 3056
16	46202044	HP CHAMBER 50N	45	46201422	AST NX + GASKET
17	46110107	ORING 2031	46	46200658	YELLOW DUST CAP, NITROX
18	46110101	ORING 2012	47	46201581	AST GASKET
19	46110506	BACKUP RING	48	46201737	AST GASKET NX
20	46110211	ORING 2050			
21	46201692	UPPER PISTON	<b>ASSEMBLIES</b>		
22	46201120	REGULATING NUT	V	46201784	Poppet Trimat 50N CPL
23	46201711	DIAPHRAGM TBP	N	46201743	NITROX CONNECTOR 200 BAR AST (EN13949)
24	46201748	RETAINING RING TBP	---	46201860	Service Kit 28XR-DIN-NX-2k22
25	46201748	RETAINING RING 1ST STAGE	---	46200855	10 PACK BLACK MOUTHPIECES
26	46110175	ORING 2125			
27	46201424	ROTATING TURRET WASHER	<b>NOTE</b>		
28	46201423	INSERT	Parts highlighted in red are included in the service kits 46201860		
29	46201426	ORING-25x1.5			