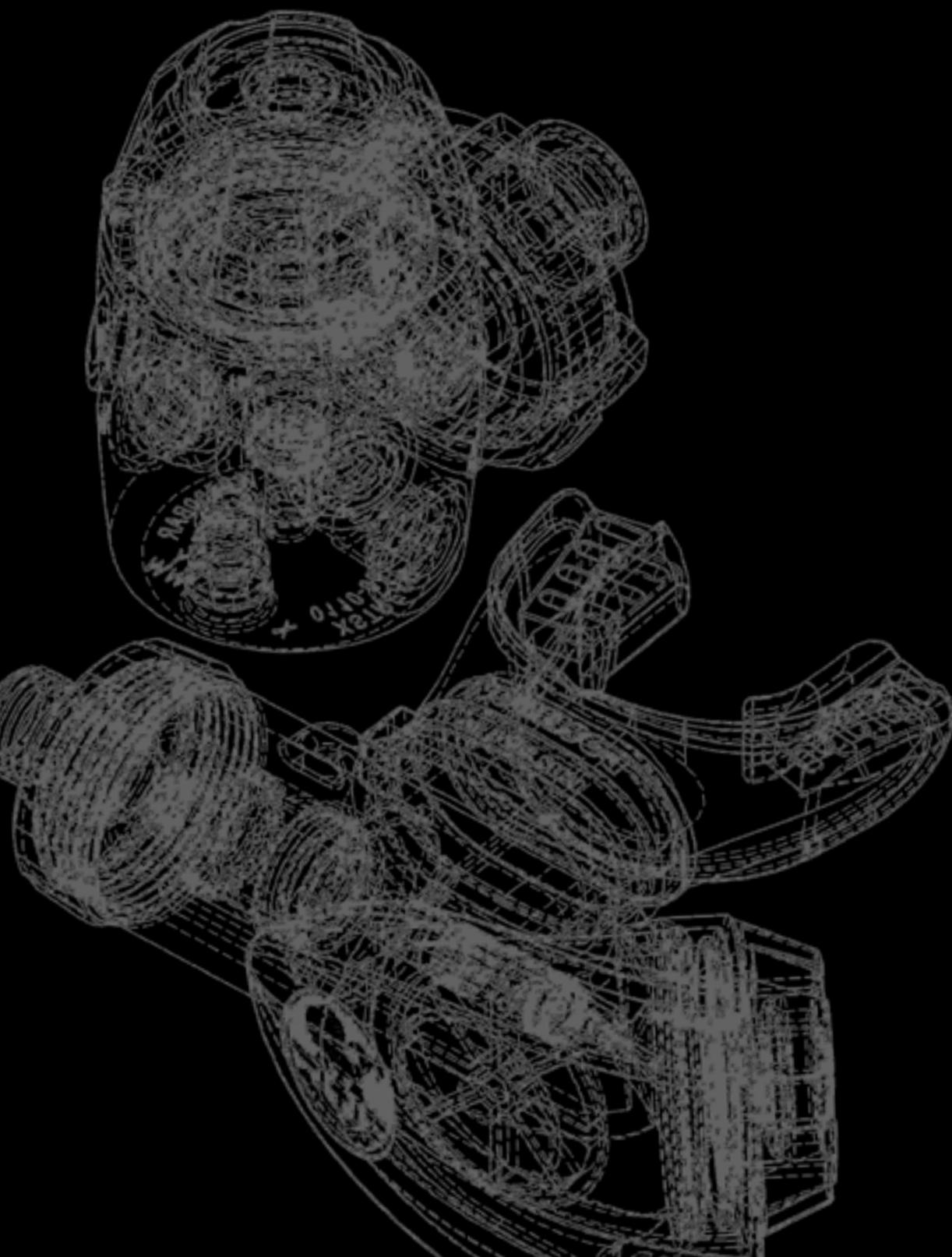




# XSTREAM

SERVICE MANUAL V2.9



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## 1. Safety regulations

 The instructions in this handbook must be followed in detail step by step. Negligence can cause serious injury or even death.

Special warnings are marked with this symbol 

 Xstream Deco and Xstream Duration manufactured prior to 2015-01-01, are designed to be used with gasses that has elevated oxygen content. This requires special procedures while servicing; to clean the regulator and to keep it clean. Negligence to follow the instructions given in this manual introduces a risk for the customer of having a fire which in turn can cause serious injury or even death. Servicing the above-mentioned regulators, shall always be conducted in a clean environment using clean tools, as described in section 6 and in Appendix B.

 To enhance safety during servicing, the regulators Xstream Deco and Xstream Duration shall be tested using clean air according to specification in 8. There is no need to test regulators in the servicing environment using gasses with > 21% oxygen.

 Starting with serial number 1500001 Xstream Deep is manufactured to be Nitrox Read out of the box. This means that all nitril o-rings have been replaced with EPDN and/or Viton o-rings and only oxygen compatible lubricants have been used during manufacturing. If the Nitrox Ready status is to be maintained after servicing, only service kit marked with EAN40 and oxygen compatible lubricant may be used.

 Servicing must only be carried out by persons who have been trained and certified by Poseidon. Servicing Xstream Deco and Xstream Duration requires an additional certification as "POSEIDON OXYGEN TECHNICIAN"

 Only POSEIDON original parts may be used for servicing. Where stated, POSEIDON original tools must be used.

## 2. Introduction

### Markings

This manual contains servicing and repair instructions and product information for the Poseidon Xstream regulator series. The different Xstream regulator models are most clearly identified by their color. There is always a possibility that the customer has altered the colors himself, why it is important always to check the permanently marked article number as part of the identification of the product. The pictures below show where to find the article and serial number:

4790-BK / 002-10

Xstream Deep / Xstream Deep (4+1)



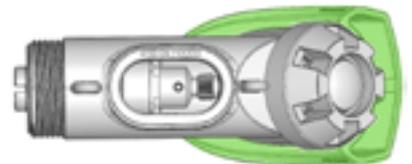
4791-BK / 001-47 / 0100-000

Xstream Deep90 / Xstream Deep90 (5+2) / Xstream Deep Mk3



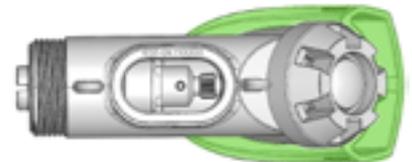
4790-GN/ 002-13 /4882-GN

Xstream Duration/Xstream Duration(4+1)/Xstream Duration EN 144-3



4791-GN/ 001-87 /4881-GN / 0100-001 / 0100-007

Xstream Duration90/Xstream Duration90(5+2)/  
Xstream Duration90 Mk3 / Xstream Duration90 Mk3 EN 144-3



4790-WE/ 002-16 /4882-WE

Xstream Deco/Xstream Deco (4+1)/Xstream Deco EN 144-3



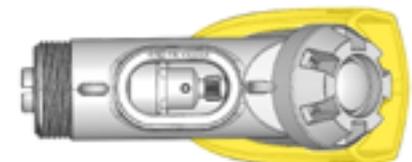
4791-GY

Xstream Dive90



0110-002 - Xstream Oxygen  
(Only sold with MkVI EU)

4792-YW Xstream Dive Octopus



- CE 0120 Meets or exceeds requirements in EU Directive 89/686/EEC, Personal Protective Equipment. Manufacturing assessment carried out by notified body SGS Yarsley, ID no. 0120.
- 0100-000 Model identification
- E.g 200001 or 1200001 Serial number, 6 or 7 digit, first or first two digits denotes year of manufacture. 2 = 2002 / 12 = 2012
- WP 300bar Working pressure 300 bar
- Oxygen Approved for use with 99.95% oxygen
- Nitrox 50% Approved for use with maximum 50% oxygen
- Nitrox Ready Approved for use with EAN40 max

### Service handbook

This servicing handbook is available for download at the Poseidon Extranet at <http://extranet.poseidon.se>. Make sure you have the latest issue before undertaking any servicing. The handbook is available in English only.

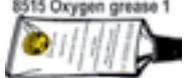
Further assistance can be reached between 8:00 am to 4:30 pm (GMT+1) at Poseidon Diving Systems:

Phone: +46 (0)31 7342900 ask for "technical assistance"

Fax: +46 (0)31 7342901

e-mail: [info@poseidon.se](mailto:info@poseidon.se)

### Symbols used throughout the handbook

Icon	Description	Other information
	Remove old part. Destroy and give back to customer	
	Replace with new part	
	Visually inspect	
 1	Poseidon grease #1, article no 8515	
 R	Poseidon grease #R, article no 8516	
	Warning. Negligence can cause serious injury or even death.	

### Improvements

Poseidon has made several improvements, all introduced 2003 starting with serial number 310001.

Starting in 2006, all Xstream 1st stages are equipped with an adjustment screw cover. Older versions with no adjustment screws should be upgraded.

Starting in 2009, all Xstream 90 model first stages are equipped with a built in over pressure valve.

Starting 2015-01-01, all Xstream Deep 1st stages/regulators are Nitrox ready out of the box.

### Product upgrades

Regulators with serial numbers less than 310001 are subject to a mandatory update programme. To obtain updated replacement parts, order the kit 4826 and submit to Poseidon the serial number of the regulator by sending an email to [service@poseidon.com](mailto:service@poseidon.com) with the serial number and date of service clearly marked.

Regulators fulfilling this criteria shall have the following parts replaced on its first service:

- 4560 replaced by 4760 Seat holder. Seats on regulators numbered after 310001 are different and will not fit older seat holders.
- 4577 replaced by 4777 Lower pin-guide. The part has been changed to withstand a greater torque.
- 4562 replaced by 4762 Upper centre piece. The part has been changed to correspond to the change of 4577
- 4581 Washer. The part has been changed to ease assembly through a more precise fit.
- 0015-012 (4423) O-ring
- 4563 Pin bushing 1.stage Xstream

### Information about Xstream Upgrade kit 4826

4760 Seat holder and 4581 Washer are not critical parts to replace, however old seat holders will not fit new seats and is therefore included in the Update kit Xstream at a special price. 4777 Lower pin-guide and 4762 Upper centre piece should be replaced and is therefore included in the kit at no cost.

### Information about Xstream 1st stage covers.

During 2006, we began manufacturing Xstream DEEP, DEEP90, DURATION, DURATION90 and DECO 1st stages with chrome colored 1st stage covers with an adjustment screw. Starting January 2007, all Xstream 1st stages, regardless of model/version, will have a chrome colored 1st stage cover with an adjustment screw.

### Information about Xstream Upgrade to cover with adjustment screw.

Any Xstream 1st stages that don't have a cover with an adjustment screw should be upgraded with a cover that has an adjustment screw. This upgrade is not mandatory but recommended.

The upgrade is made using the "Xstream Adjustable kit" (4767-KIT) that contains the following parts:

- 1 x 4767-CE Xstream cover
- 1 x 4798-CH Adjustment screw
- 1 x 4763 Adjustment spring
- 1 x 4764 Seat spring

All these parts must be replaced when upgrading the 1st stage!

### Recommendations

For regulators with serial numbers less than 310001 we recommend to offer the customer to replace the old type valve housing nut to the improved version with article number 4547. This will significantly reduce the inhalation effort. However if the customer chooses to keep his old valve housing nut it is perfectly safe to do so.

### EN 144-3

Xstream Deco, Xstream Duration and Xstream Duration90 are available also in EN 144-3 configurations, i.e., regulators which comply with the new EN 144-3 standard. See page 3 for correct article numbers.

Older Xstream models can be upgraded to comply with the same standard using an EN 144-3 upgrade kit. See Spare Parts lists on page 13 for details.

### Article number on o-rings

In this revision of the service manual, all o-ring article number have been updated to match the current article number system used by Poseidon. A conversion list between the old and new o-ring article numbers can be found on page 14.

### Nitrox ready (EAN40)

Xstream Deep regulators with serial number 1500001 and later are Nitrox ready from the manufacturer. A special EAN40 service kit for the Xstream Deep 1st stage (article number 0009-016) and a EAN40 service kit for the Xstream Deep / Jetstream 2nd stage (article number 0009-017) has been introduced.

### **3. Determination of required service**

To be covered by the Poseidon Lifetime Warranty program, all Xstream regulators must be serviced at least once every 24 months.

It's recommended that the Xstream regulator is service once every 24 months or once every 100 dives, which ever comes first.

The serviced regulator must also be registered on the Poseidon website (<http://extranet.poseidon.com>). It is always acceptable to do a service or cleaning up, on customers request.

It's recommended that low pressure hoses are replaced once every four (4) years to avoid LP hose failuires due to wear and tare.

If water has entered a first stage (or suspiciion there of), the first stage shoudl be disassembled, cleaned and dried before diving with it again. Water inside a 1st stage can cause corrosion or damage that has a negative effect on the functionality of the 1st stage.

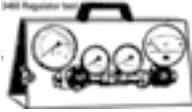
Xstream Deep 1st stages and regulators with serialnumber 1500001 or higher comes Nitrox Ready out of the box. To maintain this status, the EAN40 service kits must be used and only oxygen compatible lubricants applied. Testing and adjusting must be made using gas filtered in accordance with the EAN standard.

Xstream Deep 90 1st stages and regulators with serial numbers lower than 1500001 can be serviced to reach Nitrox Ready level if the following actions are taken:

- All 1st stage components made out of metal are washed in an ultra sonic cleaner, using the Poseidon Fine clean Ultra liquid, for a time period of 10 - 15 minutes.
- The EAN40 service kits (0009-016 and 0009-017) are used for the 1st and 2nd stage.
- Only Poseidon oxygen compatible lubricant (part number 8515) is used
- Gas filtered according to the EAN standard is used for testing/adjusting.

### 4. Tools

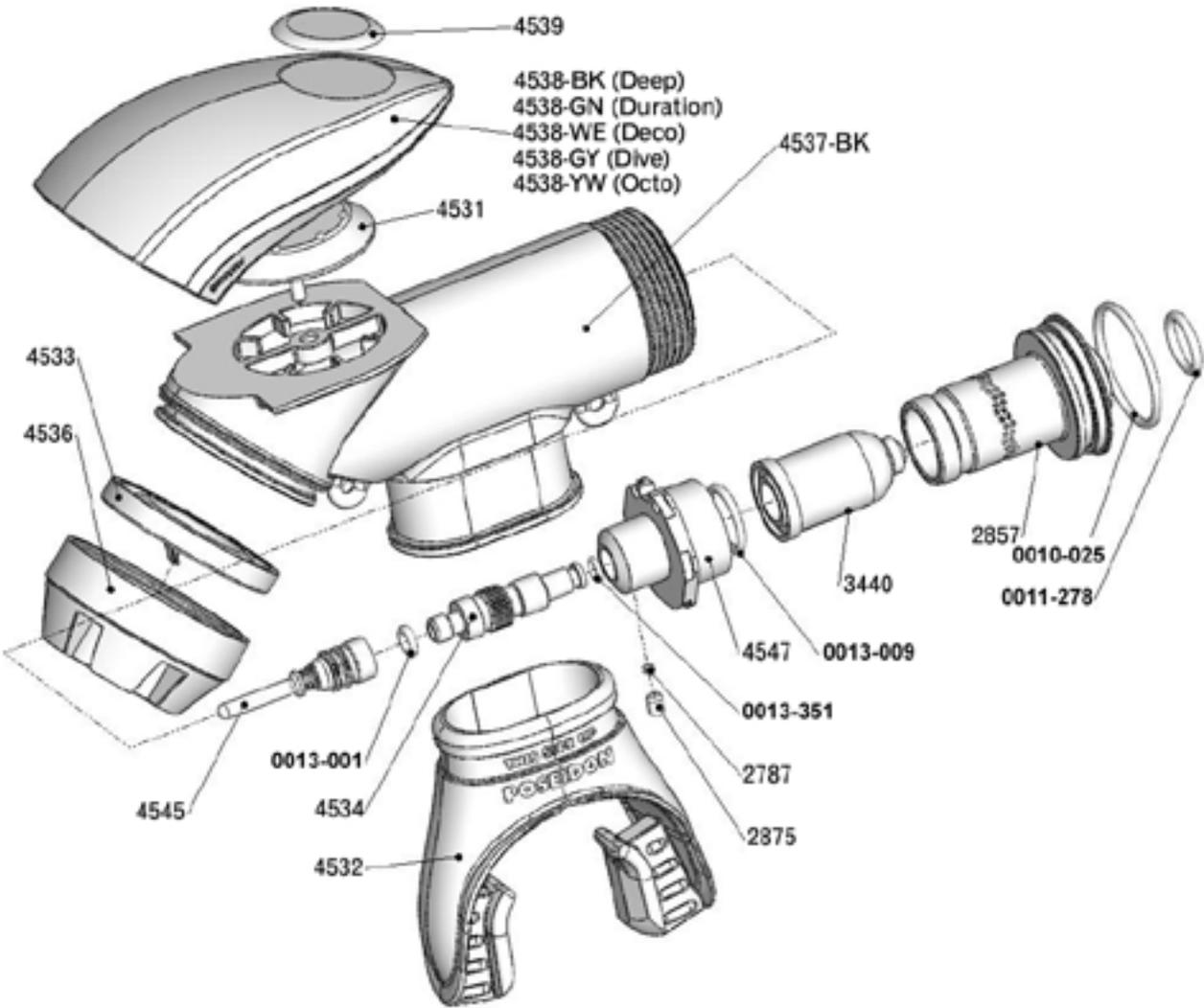
To service Poseidon regulators there is a number of tools required. Some of the tools are special tools for Xstream and Poseidon and some tools are standard tools available in most hardware stores. Below you will find a list of all tools needed, with a description of what it is used for. Note that tools intended to be used for Nitrox approved and O2 clean equipment should be kept separate to avoid contamination.

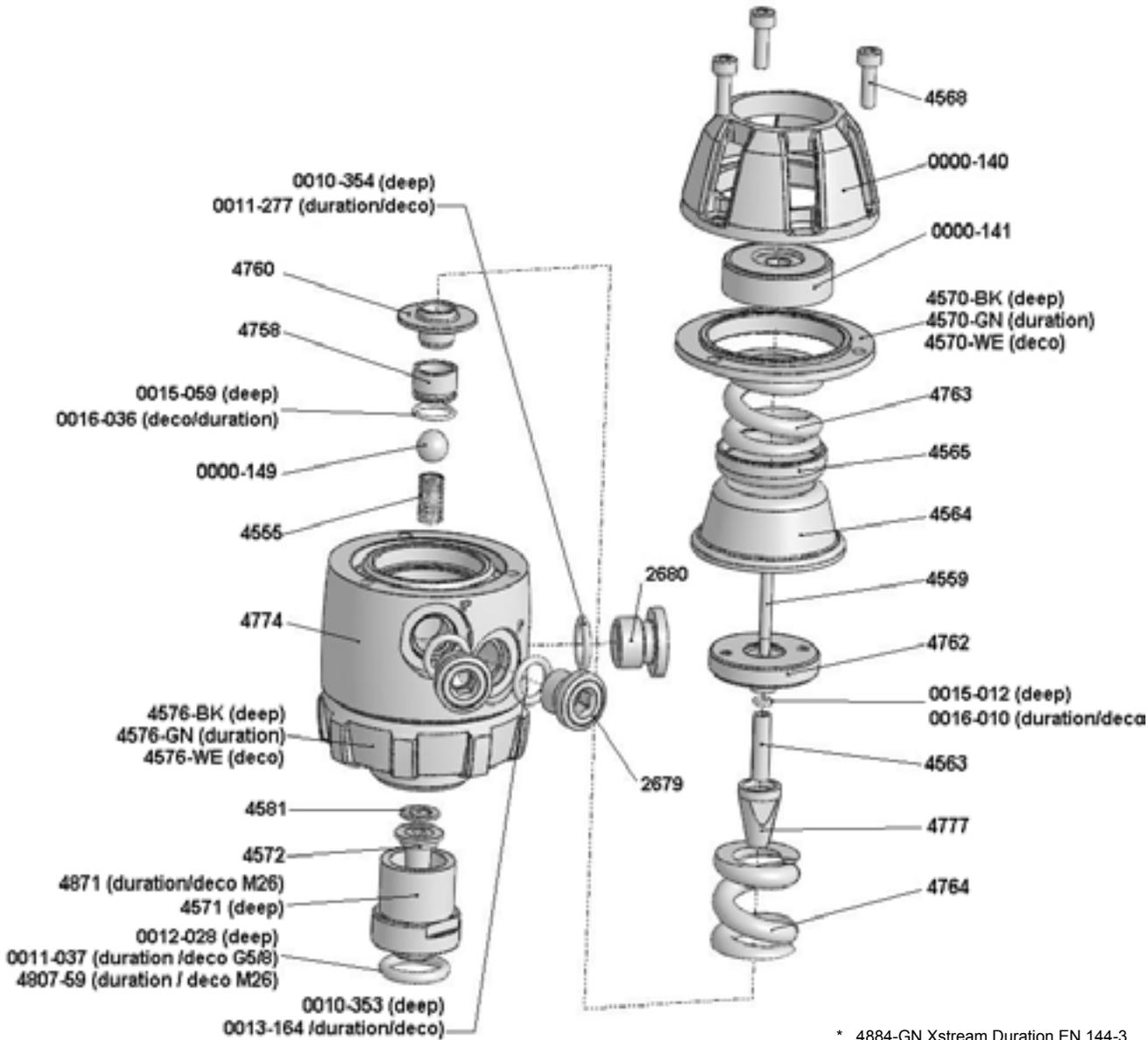
Item	Description	Xstream	Picture
2297 O-ring remover	Used to remove o-rings.	o	
Open end wrench 6, 13-23 mm	Various open end wrenches in millimeters are essential for assembly and disassembly of various things.	o	
3460 Regulator test	Used to check or finally adjust the regulator.	o	
Ultra Sonic Cleaner	Used to clean all regulators. Mandatory for Xstream Deco and Duration.	o	
3773 Torque wrench set	Used to set the torque on various parts of the regulator.	o	
Allen key 2,5 mm, 4mm, 5 mm, 6 mm	Used to unscrew blindplugs and to adjust IP on Xstream.	o	
2706 Allen key 1,5 mm	Used to untighten and tighten the locking screw on Jetstream and Xstream valve tube and stopscrews on most first stages.	o	
3605 Combination tool 1	Used to screw and unscrew various parts on the Xstream second stages.	o	
3606 Combination tool 2	Used to screw and unscrew various parts on the first stage and second stages.	o	
2705 Adjusting tool	Used to adjust the cracking pressure on Xstream second stages.	o	
4591 17 mm torque wrench	Used to untighten and tighten the connection stem on Xstream first stages.	o	
Item	Description	Xstream	Picture
<b>Articles of consumption</b>			
8515 Oxygen grease #1	Only approved oxygen grease when lubricating oxygen critical parts on the high pressure side. Approved for 300 bar 60oC.	o	
8516 Regulator grease	Used for lubrication of air version regulators.	o	
4835 Poseidon fine clean ultra	5 litre	o	

Second stages

4670-BK	Second stage Xstream Deep	0120-000	Second stage Xstream Deep
4670-GN	Second stage Xstream Duration	0120-001	Second stage Xstream Duration
4670-WE	Second stage Xstream Deco	0120-002	Second stage Xstream Deco
4670-GY	Second stage Xstream Dive	0120-003	Second stage Xstream Octopus
4670-YW	Second stage Xstream Octopus		

Item #	Description
4536	Diaphragm cover
4533	Diaphragm silicone
4538-BK	Cover Xstream 2nd stage (Deep)
4538-WE	Cover Xstream 2nd stage (Deco)
4538-GN	Cover Xstream 2nd stage (Duration)
4538-YW	Cover Xstream 2nd stage (Octopus)
4538-GY	Cover Xstream 2nd stage (Dive)
4539	Sticker Poseidon Xstream
4531	Checkvalve
4537-BK	Housing
0011-278	O-ring Xstream 2nd st., viton
0010-025	O-ring
2857	LP-valve housing
3440	Valve insert
0013-009	O-ring 2nd stage Xstream, EPDM
4547	Valve housing nut, Xstream
2787	Rubber plate
2875	Stop screw
1167	Locking strap
4532	Mouthpiece AIR
0013-351	O-ring 2nd stage Xstream, EPDM
4534	Valve tube Xstream
0013-001	O-ring 2nd stage Xstream, EPDM
4545	Servo-valve Xstream



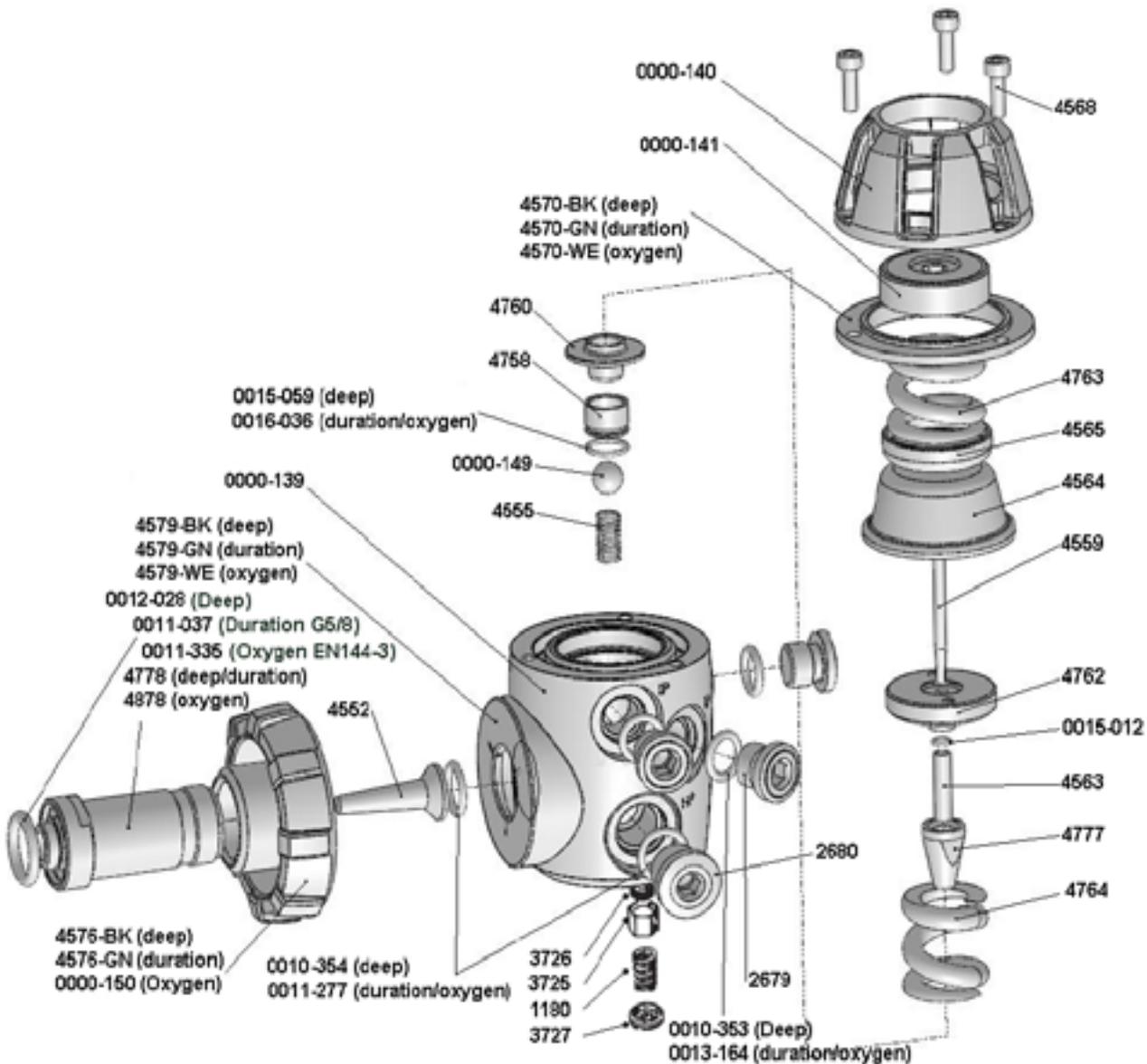


\* 4884-GN Xstream Duration EN 144-3  
 \*\* 4884-WE Xstream Deco EN 144-3

Item #	Description
0012-028	O-ring (Deep)
0011-037	O-ring, viton (Deco/Duration)
4807-59	O-ring, viton (**)**
4571	Conn. stem 1.stage Xstream
4871	Conn. stem 1.stage Xstream (**)**
4572	Cup type filter Xstream
4581	Stainl. washer 1.stage Xstream
4576-BK	Wheel G5/8" Xstream, black
4576-WE	Wheel G5/8" Xstream, white
4576-GN	Wheel G5/8" Xstream, green
4876-GN	Wheel Xstream, green (*)
4876-WE	Wheel Xstream, white (**)
4774	Housing 1.stage Xstream
4555	Spring for ball Xstream
4556	Ball 1.stage Xstream
0015-059	O-ring (Deep)
0016-036	O-ring, viton (Deco/Duration)
4758	Zytel valve seat Xstream
4760	Valve seat holder Xstream
4764	Valve seat spring Xstream
4777	Lower pin guide Xstream
4563	Pin bushing 1.stage Xstream
0015-012	O-ring
4762	Upper pin guide Xstream
4559	Actuating pin, Xstream
4564	Roll.diaphragm 1.stage Xstream
4565	Pressure plate 1.stage Xstream
4763	Adjust. spring 1.stage Xstream
4570-BK	Barrier 1.stage Xstream black
4570-WE	Barrier 1.stage Xstream white
4570-GN	Barrier 1.stage Xstream green
4767-BK	Cover Xstream 1st stage, black
4767-CE	Cover Xstream 1st stage, chrome
4568	Screw cover M3x10 Xstream, 3 pcs
4798-BK	Adjustment screw, black
4798-CE	Adjustment screw, chrome
2680	Blindscrew UNF7/16
0012-132	O-ring (Deep/Dive)
0011-277	O-ring, viton (Deco/Duration)
2679	Blindscrew UNF3/8, 2 pcs
0010-353	O-ring (Deep/Dive)
0013-164	O-ring, EPDM (Deco/Duration)

- First stage bottom mounted**
- 4780-BK 1st stage G 5/8" Xstream DEEP
  - 4780-GN 1st stage G 5/8" Xstream DURATION
  - 4780-WE 1st stage G 5/8" Xstream DECO
  - 4884-GN 1st stage Xstream DURATION EN 144-3
  - 4884-WE 1st stage Xstream DECO EN 144-3
- 002-09 1st stage G 5/8" Xstream DEEP (4+1)
  - 002-12 1st stage G 5/8" Xstream DURATION (4+1)
  - 002-15 1st stage G 5/8" Xstream DECO (4+1)

First stage 90



Item #	Description
0013-032	O-ring (Deep 90/Dive 90/ Deep 90 EAN40)
0011-037	O-ring, viton (Duration90)
0011-335	O-ring, viton (Duration90 EN 144-3)
4778	Conn. stem 1.stage 90 Xstream
4878	Conn. stem 1.stage Duration90 EN 144-3
4552	Cup type filter long Xstream 90
0012-132	O-ring (Deep90/Dive90)
0011-277	O-ring (Duration90)
4579-BK	Line protector Xstream, black
4579-GN	Line protector Xstream, green
4754	Housing 1.stage 90 Xstream
4754-5IP	Housing 1.stage Dive 90, Deep 90, Duration 90 Xstream (5+2 versions)
4555	Spring for ball Xstream
4556	Ball 1.stage Xstream
0000-149	Ruby ball 1.stage Xstream
0015-059	O-ring (Deep 90/Dive90)
0013-394	O-ring (Deep 90 EAN 40)
0016-036	O-ring, viton (Duration90)
4758	Zytel valve seat Xstream
4760	Valve seat holder Xstream
4764	Valve seat spring Xstream
4777	Lower pin guide Xstream
4563	Pin bushing 1.stage Xstream
0015-021	O-ring
4762	Upper pin guide Xstream
4559	Actuating pin, Xstream
4564	Roll.diaphragm 1.stage Xstream
4565	Pressure plate 1.stage Xstream
4763	Adjust. spring 1.stage Xstream
4570-BK	Barrier 1.stage Xstream black
4570-GN	Barrier 1.stage Xstream green
4767-BK	Cover Xstream 1st stage, black
4767-CE	Cover Xstream 1st stage, chrome
4568	Screw cover M3x10 Xstream, 3 pcs
4798-BK	Adjustment screw, black
4798-CE	Adjustment screw, chrome
2680	Blindscrew UNF7/16
0012-132	O-ring (Deep90/Dive90)
0011-277	O-ring, viton (Duration90)
2679	Blindscrew UNF3/8, 3 pcs
0010-353	O-ring (Deep90/Dive90)
0013-164	O-ring, EPDM (Duration90)
4576-BK	Wheel G5/8" Xstream, black
4576-GN	Wheel G5/8" Xstream, green
4876-GN	Wheel Xstream, green (Duration90 EN 144-3)
3726	Valve sealing
3725	Valve piston
1180	Pressure spring
3727	Locking screw

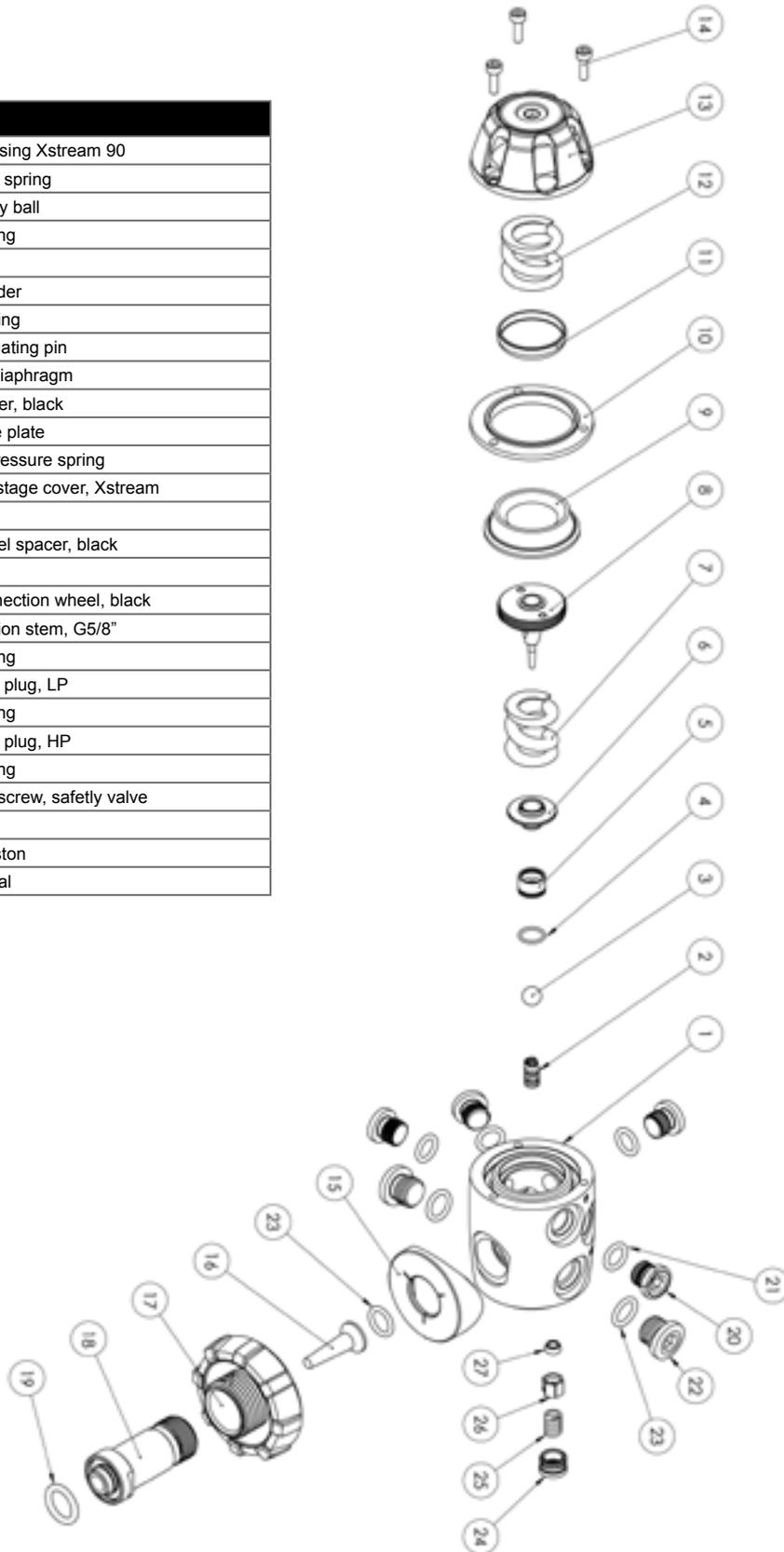
4751-BK	1st stage G 5/8" Xstream DEEP90	0110-000	1st stage G 5/8" Xstream black
4751-GN	1st stage G 5/8" Xstream DURATION90	0110-003	1st stage G 5/8" Xstream Duration 90 Mk3
4752-BK	1st stage G 5/8" Xstream DIVE90, DEEP90 (5+2)	0110-001	1st stage M26 Xstream Duration 90 Mk3 EN 144-3
4883-GN	1st stage Xstream DURATION90 EN 144-3	0110-002	1st stage M26 Xstream Oxygen Mk3 EN 144-3*
001-85	1st stage G 5/8" Xstream DURATION90 (5+2)		* Only sold with MkVI rebreather

First stage 90 EAN40

0110-000 1st stage G 5/8" Xstream Deep90\*

\*With serial number 1500001 or higher.

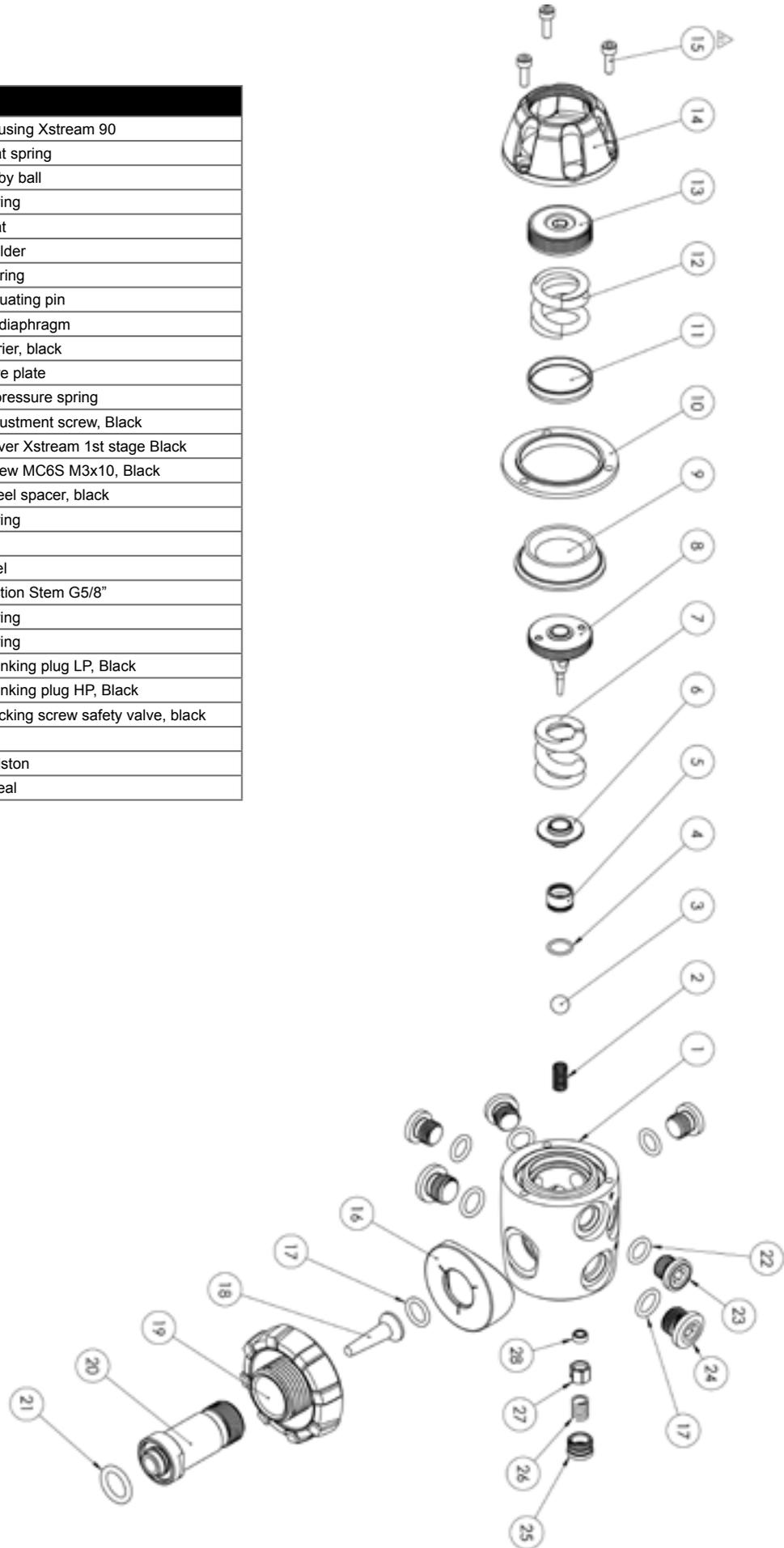
Item #	Description
1	0000-139 - Housing Xstream 90
2	4555 - Ball seat spring
3	0000-149 - Ruby ball
4	0013-349 - O-ring
5	4758 - Ball seat
6	4760 - Seat holder
7	4764 - Seat spring
8	0005-077 - Actuating pin
9	4564 - Rolling diaphragm
10	4570-BK - Barrier, black
11	4565 - Pressure plate
12	4763 - Upper pressure spring
13	0000-091 - 1st stage cover, Xstream
14	4568 - Screw
15	4579-BK - Wheel spacer, black
16	4552 - Filter
17	4576-BK - Connection wheel, black
18	4778 - Connection stem, G5/8"
19	0013-032 - O-ring
20	2679 - Blanking plug, LP
21	0013-164 - O-ring
22	2680 - Blanking plug, HP
23	0013-165 - O-ring
24	3727 - Locking screw, safety valve
25	1180 - Spring
26	3725 - Valve piston
27	3726 - Valve seal



First stage Black

0110-010 1st stage 1st Stage Xstream Black G5/8\*\*

Item #	Description
1	0002-100 - Housing Xstream 90
2	4555 - Ball seat spring
3	0000-149 - Ruby ball
4	0013-349 - O-ring
5	4758 - Ball seat
6	4760 - Seat holder
7	4764 - Seat spring
8	0005-077 - Actuating pin
9	4564 - Rolling diaphragm
10	4570-BK - Barrier, black
11	4565 - Pressure plate
12	4763 - Upper pressure spring
13	0002-102 - Adjustment screw, Black
14	0002-101 - Cover Xstream 1st stage Black
15	0002-111 - Screw MC6S M3x10, Black
16	4579-BK - Wheel spacer, black
17	0013-165 - O-ring
18	4552 - Filter
19	4576-BK Wheel
20	4778 - Connection Stem G5/8"
21	0013-032 - O-ring
22	0013-164 - O-ring
23	0002-103 - Blanking plug LP, Black
24	0002-104 - Blanking plug HP, Black
25	0002-105 - Locking screw safety valve, black
26	1180 - Spring
27	3725 - Valve piston
28	3726 - Valve seal



## Servicekits

4821 Servicekit Xstream Deep 1:st stage			
Included:	4758	Zytel valve seat Xstream	1 pc
	4572	Cup type filter Xstream	1 pc
	0010-353 (2782)	O-ring (Deep/Dive)	3 pcs
	0010-354 (2918)	O-ring (Deep/Dive)	2 pcs
	0015-059 (4557)	O-ring (Deep/Dive)	1 pc
	0015-012 (4423)	O-ring	1 pc
	0012-028 (1007)	O-ring (Deep/Dive)	1 pc

4822 Servicekit Xstream Deep90, Dive90 1:st stage			
Included	4758	Zytel valve seat Xstream	1 pc
	4552	Cup type filter long Xstream 90	1 pc
	0010-353 (2782)	O-ring (Deep/Dive)	5 pcs
	0010-354 (2918)	O-ring (Deep/Dive)	3 pcs
	0015-059 (4557)	O-ring (Deep/Dive)	1 pc
	0015-012 (4423)	O-ring	1 pc
	3726	Valve sealing	1 pc
	0012-028 (1007)	O-ring (Deep/Dive)	1 pc

4823 Servicekit Xstream Duration, Deco 1:st stage			
Included:	4758	Zytel valve seat Xstream	1 pc
	4572	Cup type filter Xstream	1 pc
	0013-164 (2782-55)	O-ring, EPDM (Deco/Duration)	3 pcs
	0011-277 (2918-59)	O-ring, viton (Deco/Duration)	2 pcs
	0016-036 (4557-59)	O-ring, viton (Deco/Duration)	1 pc
	0015-012 (4423)	O-ring	1 pc
	0011-037 (1007-59)	O-ring, viton (Deco/Duration)	1 pc

4824 Servicekit Xstream Duration90 1:st stage			
Included:	4758	Zytel valve seat Xstream	1 pc
	4552	Cup type filter long Xstream 90	1 pc
	0013-164 (2782-55)	O-ring, EPDM (Deco/Duration)	5 pcs
	0011-277 (2918-59)	O-ring, viton (Deco/Duration)	2 pcs
	0016-036 (4557-59)	O-ring, viton (Deco/Duration)	1 pc
	0015-012 (4423 59)	O-ring	1 pc
	3726	Valve sealing	1 pc
	0011-037 (1007-59)	O-ring, viton (Deco/Duration)	1 pc

4828 Servicekit Xstream Duration90 / Oxygen EN 144-3 1:st stage			
Included:	4758	Zytel valve seat Xstream	1 pc
	4552	Cup type filter long Xstream 90	1 pc
	0013-164 (2782-55)	O-ring, EPDM (Deco/Duration)	5 pcs
	0011-277 (2918-59)	O-ring, viton (Deco/Duration)	3 pcs
	0016-036 (4557-59)	O-ring, viton (Deco/Duration)	1 pc
	0015-012 (4423)	O-ring	1 pc
	3726	Valve sealing	1 pc
	0011-355	O-ring, viton EN 144-3	1 pc

0009-016 Servicekit Xstream Deep 90 EAN40 1st stage			
Included:	0013-392	O-ring	1 pc
	0013-164	O-ring	5 pcs
	0013-165	O-ring	3 pcs
	0013-032	O-ring	1 pc
	0013-394	O-ring	1 pc
	0050-028	Tamper proof sticker "Calibrated"	1 pc
	3726	Valve sealing for safety valve	1 pc
	4758	Seat Xstream	1 pc
	4552	Filter	1 pc

4825 Servicekit Xstream 2nd stage EAN40			
Included:	1167	Locking strap	1 pc
	2787	Rubber plate	1 pc
	0010-025 (1145)	O-ring	1 pc
	0013-009 (1233-55)	O-ring 2nd stage Xstream, EPDM	1 pc
	0011-278 (2856-59)	O-ring Xstream 2nd st., viton	1 pc
	0013-351 (2876-55)	O-ring Xstream 2nd st, EPDM	1 pc
	0013-001 (1896-55)	O-ring Xstream 2nd st , EPDM	1 pc

0009-017 Servicekit Xstream 2nd stage EAN40			
Included:	1167	Locking strap	1 pc
	2787	Rubber plate	1 pc
	0010-025 (1145)	O-ring	1 pc
	0013-009 (1233-55)	O-ring 2nd stage Xstream, EPDM	1 pc
	0011-278 (2856-59)	O-ring Xstream 2nd st., viton	1 pc
	0013-351 (2876-55)	O-ring Xstream 2nd st, EPDM	1 pc
	0013-001 (1896-55)	O-ring Xstream 2nd st , EPDM	1 pc

## Upgrade kits

**Xstream Upgrade Kit**

4826 Xstream upgrade kit for models below s/n 310001			
Included:	4760	Valve seat holder Xstream	1 pc
	4777	Lower pin guide Xstream	1 pc
	4762	Upper pin guide Xstream	1 pc
	4581	Stainl. washer 1.stage Xstream	1 pc
	0015-012 (4423)	O-ring	1 pc
	4563	Pin bushing 1st stage Xstream	1 pc
Note:	Servicing a Xstream 90 model leaves you 1 pcs washer 4581.		

4767-KIT Xstream adjustment kit for Xstream 1st stages with no adjustmentscrew			
Included:	0000-140	Xstream 1st stage cover	1 pc
	000-141	Adjustment screw	1 pc
	4763	Adjustment spring	1 pc
	4764	Seat spring	1 pc
Note:	Fits all Xstream 1st stages		

**Xstream EN 144-3 upgrade kits**

4851-GN Xstream Duration90 EN 14-3 kit			
Included:	4878	Connection stem Xstream Duration90 EN 144-3	1 pc
	0003-214	O-ring EN 144-3	1 pc
	0000-151	Wheel Xstream Duration EN 144-3	1 pc
	4552	Cup type filter long Xstream 90	1 pc
	0011-277 (2918-59)	O-ring	1 pc

**O-ring conversion table**

Old article number	New article number	Note
1007	0012-028	
1007 59	0011-037	
1145	0010-025	
1145 55	0013-018	
1156	0010-009	
1156 59	0011-006	
1164	0010-347	
1233	0012-007	
1233 55	0013-009	
1365	0010-177	
1368	0012-126	
1368 59	0011-270	
1561	0010-352	
1561 59	0011-275	
1562	0010-010	
1562 59	0011-007	
1651	0010-186	
1839	0010-013	
1839 59	0011-009	
1850	0010-343	
1851	0010-018	
1860	0010-112	
1860 59	0011-084	
1861	0015-627	
1861 59	0016-382	
1896	0010-002	
1896 55	0013-001	
2620	0010-122	
2640	0016-019	
2656	0010-006	
2656 59	0011-003	
2782	0010-353	
2782 55	0013-164	
2782 59	0011-276	
2809	0010-015	
2809 59	0011-011	
2856	0010-355	
2856 55	0013-166	
2856 59	0011-278	
2876	0015-019	
2876 55	0013-351	
2877	0015-104	
2918	0012-132	
2918 55	0013-165	
2918 59	0011-277	
3178	0010-054	
3396	0010-011	
3413	0010-358	
3458	0012-009	
3611	0015-157	
3728	0010-028	
3728 59	0011-023	
3734	0010-361	
3779	0015-004	
3779 59	0016-004	
2839	0013-159	
3831	0013-030	
4421 59	0016-085	
4423	0015-012	
4423 55	0013-392	
4423 59	0016-010	
4557	0015-059	
4557 59	0016-036	
4959-0-NR-7	0015-243	

## 6. Service

The parts that needs to be replaced during a service are described in the Spare parts & Servicekits section of this handbook. Make sure that you have servicekits for the corresponding model and that you have all special tools required available. The tools required are described in the Tools section of this hand book.

**⚠ For instructions on how to service the regulator follow the instruction below until you reach the "GO TO FINAL INSPECTION" text at the end of the instruction. The instructions in this handbook must be followed in detail step by step. Negligence can cause serious injury or even death.**

A service includes the following 5 steps:

1. Complete disassembly of the first stage and second.
2. Inspection of disassembled parts.
3. Cleaning prior to assembly.
4. Assembly.
5. Final inspection and adjustment, please refer to section 7 of this handbook.

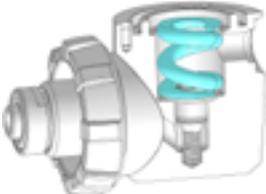
### Disassembly

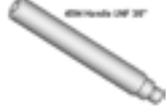
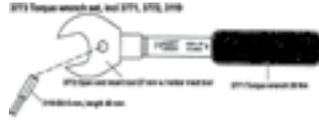
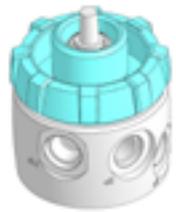
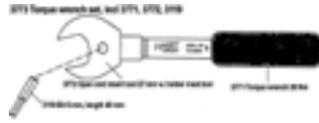
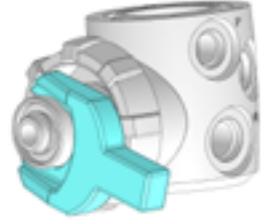
**⚠ Do not disassemble the regulator in the clean room environment. All parts shall be taken to the clean room environment after inspection and after the pre-cleaning process if such is needed. Otherwise you risk to contaminate the clean room environment. New parts should be stored in it's original packing until it is time for assembly.**

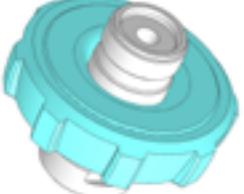
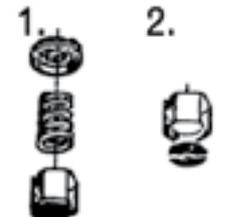
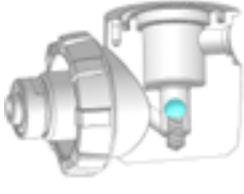
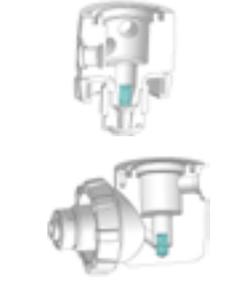
**⚠ To remove o-rings, ONLY use o-ring remover tool 2297. Make sure not to damage o-ring and sealing surfaces!!**

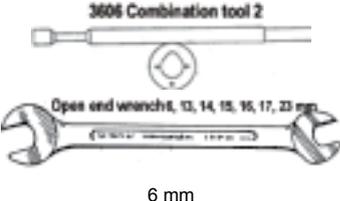
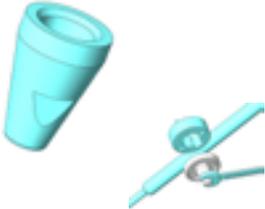
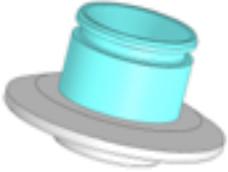
### Xstream first stage

Step	Parts	Tools/Instructions	Replace	Picture
<b>All first stages</b>				
1	2680 Blindscrew UNF 7/16" 1 or 2 pcs 2679 Blindscrew UNF 3/8" 2, 3 or 5 pcs			
2	4568 Screw M3x10 Xstream 3 pcs			
3	4767-BK Cover Xstream first stage black (discontinued) 0000-140 Cover Xstream first stage chrome			
4	4763 Press. spring 1.stage Xstream			

Step	Parts	Tools/Instructions	Replace	Picture
5	4565 Pressure plate 1.stage Xstream			
6	4570-BK Barrier 1.stage Xstream black 4570-WE Barrier 1.stage Xstream white 4570-GN Barrier 1.stage Xstream green			
7	4564 Roll. diaphragm 1.stage Xstream	Only use fingers. Tools may puncture the diaphragm		
8	Pin guide assembly			
9	4764 Valve seat spring Xstream			
10a	4760 Valve seat holder Xstream 4758 Zytel valve seat Xstream			
10b	4760 Valve seat holder Xstream 4758 Zytel valve seat Xstream			
10c	4760 Valve seat holder Xstream 4758 Zytel valve seat Xstream			

<b>Only for Xstream bottom mounted first stages</b>				
Step	Parts	Tools/Instructions	Replace	Picture
11	0012-028 O-ring (Deep) 0011-037 O-ring, viton (Deco/Duration) 0003-214 O-ring, viton EN 144-3 (Deco EN 144-3/Duration EN 144-3)			
12	4571 Conn. stem 1.stage Xstream	  		 
13	4576-BK Wheel G5/8" Xstream, black 4576-WE Wheel G5/8" Xstream, white 4576-GN Wheel G5/8" Xstream, green 0000-151 Wheel Xstream Duration M26, green 0000-150 Wheel Xstream Deco M26, white			
14	4572 Cup type filter Xstream			
15	4581 Stainl. washer 1.stage Xstream			
<b>Only for Xstream 90 first stages</b>				
16	0013-032 O-ring (Deep90 EAN40) 0012-028 O-ring (Deep90/Dive90) 0012-028 59 O-ring viton (Duration90) 0003-214 O-ring, viton EN 144-3 (Duration90 / Oxygen M26)			
17	4778 Conn. stem 1.stage 90 Xstream 4878 Conn. stem 1.stage EN 144-3 (Duration90 M26)	 		

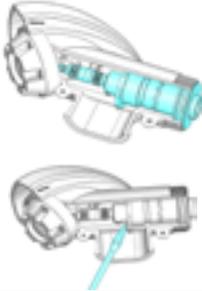
18	4576-BK Line protector Xstream, black 4576-GN Line protector Xstream, green			
19	0013-165 O-ring (Deep90 EAN40) 0012-132 O-ring (Deep90/Dive90) 0011-277 O-ring Viton (Duration90/Oxygen)			
20	4576-BK Wheel G5/8" Xstream, black 4576-GN Wheel G5/8" Xstream, green 0000-151 Wheel Xstream Duration M26, green 0000-150 Wheel Xstream Deco M26, white			
21	4552 Cup type filter long Xstream 90			
	<u>Over pressure valve</u> (only 1st stages with a built in OP valve)  3726 Valve sealing 3725 Valve piston 1180 Pressure spring 3727 Locking screw	1. Remove the locking screw with a 4mm Allen wrench. Remove the pressure spring and the valve piston.  2. Remove the valve sealing from the valve piston with an o-ring remover.		
<b>All first stages</b>				
22	4556 Ball 1.stage Xstream 0000-149 Ruby ball, Xstream			
23	4555 Spring for ball Xstream			

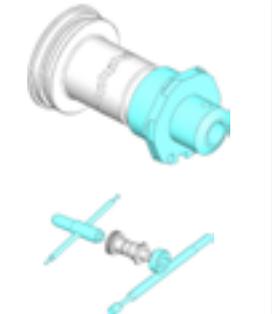
24	4559 Actuating pin, Xstream			
25	4777 Lower pin guide Xstream 	 <p>3606 Combination tool 2</p> <p>Open end wrenches, 13, 14, 15, 16, 17, 23 mm</p> <p>6 mm</p>		
26	4563 Pin bushing 1.stage Xstream  Do not pull out nor replace the Pin bushing while servicing Dive or Deep models. This should only be done while servicing Deco, Oxygen and Duration models.	Screw in M3 screw 4568 in the pin bushing and pull out.		
27	0013-392 O-ring (EAN40) 0015-012 O-ring	 <p>2297 O-ring remover</p>		
28	0013-394 O-ring (Deep90 EAN 40) 0015-059 O-ring (Deep/Dive) 0016-036 O-ring, viton (Deco/Duration)	 <p>2297 O-ring remover</p>		
29	4758 Zytel valve seat Xstream			
30	On blindscrew UNF 3/8" 0010-353 O-ring Deep 2 or 3 pcs, Dive 5 pcs 0013-164 O-ring Deep 90 EAN40, 4 pcs 0013-064 O-ring EPDM Deco 2 or 3 pcs Duration 2 or 3 pcs  On blindscrew UNF 7/16" 0012-132 O-ring Deep 1 pcs, Dive 2 pcs 0013-165 O-ring Deep90 EAN40, 2 pcs 0012-132 59 O-ring Viton Deco/Duration 1 pcs	 <p>2297 O-ring remover</p>		

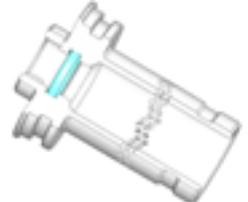
31	0000-141 Adjusting screw Chrome	 <p>1246 Allen key 5 mm</p>	
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**Xstream second stage**

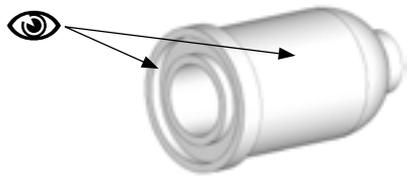
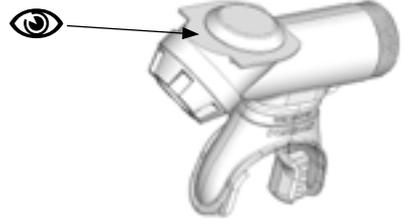
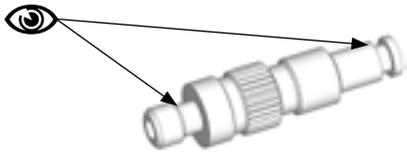
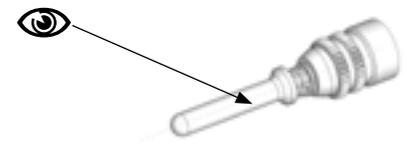
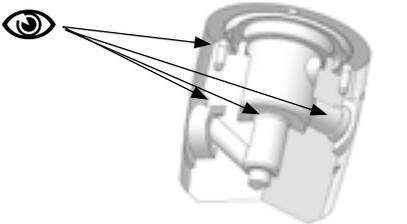
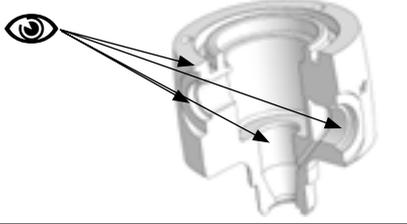
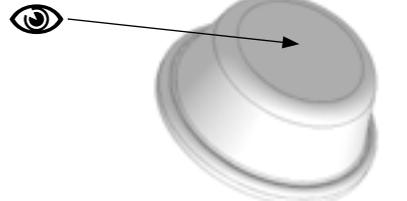
**⚠ To remove o-rings, ONLY use o-ring remover tool 2297. Make sure not to damage o-ring surfaces!! Do not disassemble the exhalation check-valve, since this is not included in the servicing kit and can be hard to put back if taken out.**

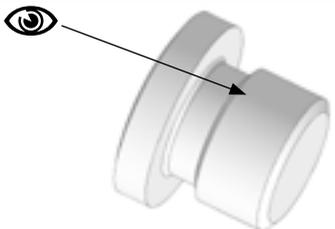
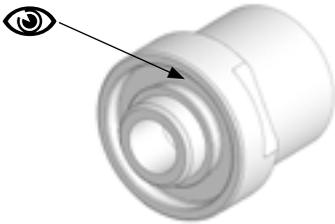
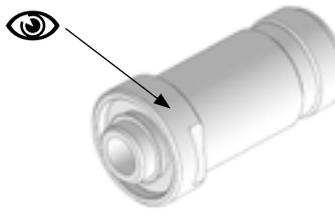
Step	Parts	Tools	Replace	Picture
1	4532 Mouthpiece AIR	<p>4462 Pliers</p>  <p>For cutting strap</p>		
2		<p>Screw driver 3.5, 5.5 (short) 8.5 mm</p> 		
3	<p>4538-BK Cover Xstream 2nd stage (Deep)</p> <p>4538-WE Cover Xstream 2nd stage (Deco)</p> <p>4538-GN Cover Xstream 2nd stage (Duration)</p> <p>4538-YW Cover Xstream 2nd stage (Octopus)</p>	<p>Twist off.</p>		
4	4536 Diaphragm cover	<p>Screw driver 3.5, 5.5 (short) 8.5 mm</p>  <p>Snap connection.</p>		
5	4533 Diaphragm silicone			
6	4531 Checkvalve	<p><b>Do not remove!</b> <b>Unless damaged</b></p>		
7	4545 Servo-valve Xstream			

Step	Parts	Tools	Replace	Picture
8	2875 Stop screw	2106 Allen key 1,5 mm		
9	4534 Valve tube Xstream			
10	0013-001 O-ring 2nd stage Xstream, EPDM	2297 O-ring remover		
11	0013-365 O-ring 2nd stage Xstream, EPDM	2297 O-ring remover		
12	4547 Valve housing nut, Xstream	3003 Combination tool 1 3006 Combination tool 2		
13	2787 Rubber plate	2297 O-ring remover		
14	0013-009 O-ring 2nd stage Xstream, EPDM	2297 O-ring remover		
15	0010-025 O-ring	2297 O-ring remover		
16	3440 Valve insert	3606 Combination tool 2		

17	0011-278 O-ring Xstream 2nd st., viton			
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**Inspections**

Step	Parts	Inspect	Picture
1	3440 Valve insert	1. Ensure no circular cuts on bladder surface. 2. Check O-ring sealing surface	
2	4531 Checkvalve	1. Check for damages on check valve edge	
3	4534 Valve tube Xstream	1. Check O-ring sealing surfaces	
4	4545 Servo-valve Xstream	1. Make sure not bent	
5	4754 Housing 1.stage 90 Xstream	1. Check sealing surfaces	
6	4774 Housing 1.stage Xstream	1. Check sealing surfaces	
7	4564 Roll.diaphragm 1.stage Xstream	1. Check for wear and tear	

Step	Parts	Inspect	Picture
8	2680 Blindscrew UNF7/16 2679 Blindscrew UNF3/8,	1. Check O-ring sealing surfaces	
9	4571 Conn. stem 1.stage Xstream 4871 Conn. stem 1.stage Xstream EN 144-3 (Deco EN 144-3/Duration EN 144-3)	1. Check O-ring sealing surfaces	
10	4778 Conn. stem 1.stage 90 Xstream 4878 Conn. stem 1.stage Xstream EN 144-3 (Duration90 EN 144-3)	1. Check O-ring sealing surfaces	

**Cleaning**

**Xstream Deep/Dive/Deep EAN40 Cleaning**

**⚠ Make absolutely sure Hydrochloric acid is NOT poured into the ultra-sonic cleaner. It would then destroy the ultra-sonic cleaner and the parts attempted to be cleaned.**

If corrosion or salt deposits occurs on metallic parts, immerse part in concentrated Hempodid\* or 15% Hydrochloric acid for about 10 minutes or clean them using an ultra sonic cleaner. Then rinse them thoroughly in fresh water and blow them dry with air. The synthetic parts must not be treated with solvents and must only be cleaned with fresh water.

\*Hempodid=Acid Liquid detergent containing phosphoric acid (5-10%) and bactericide for disinfectant cleaning

**Xstream Deep EAN40**

Xstream Deep EAN40 1st stages/regulators intended to be used with Nitrox/Enriched gas up to EAN40 should always be cleaned using an ultra sonic cleaner. Avoid touching the cleaned components with your bare hand, use latex or lint free gloves when handling the components.

When cleaned rinse them thoroughly in fresh water and blow them dry with air.

Store components in such a way that they don't risk getting in contact with silicone based lubricant.

### ***Xstream Deco/Duration Cleaning for Oxygen Use***

The process of cleaning for oxygen use and the information given herein shall be strictly adhered to. Only then can Poseidon guarantee the regulator will be cleaned to a cleanliness level which is acceptable for its intended use. This process has been verified to produce hydrocarbon residual levels less than 50mg/m<sup>2</sup> and a particulate level less than Cleaning Test Level 100 (ASTM G 93 Spec.)

As an alternative, oxygen servicing procedures can be carried out in accordance with other herein listed organizations standard procedures and requirements. However, the use of cleaning agents, the order of the operating sequences and the time to treat parts during ultra sonic cleaning as specified in this manual must be adhered to. Wherever there is a conflict between the procedures and set of requirements, unless the other procedure represents a greater requirement for cleanliness, this manual takes precedence. Some methods, equipment, and detergents which are not mentioned in this manual can have a harmful or unknown effect on materials, such as e.g. ozone cleaning systems, strong acids etc. and shall therefore be discarded.

The other standard procedures that can be used given the limitations above are:

EAN and Oxygen Servicing Procedures, Fourth Edition (ANDI)

IANTD Gas Blender & Service Technician Program, First Edition, August 1999

MIL-STD-1330D (SH) of the 20 September 1996

**⚠ The safety of your customer and yourself depends on you carefully and strictly following these instructions. Negligence in any step can cause serious injury or even death.**

**⚠ You must be certified by Poseidon as oxygen technician to undertake this procedure.**

**⚠ Keep hands and tools clean and free from grease, except for what is required and stated in this manual.**

**⚠ Use protective clothing to prevent dust, fingerprints, hair, and particles to contaminate.**

**⚠ Use only dedicated and cleaned tools.**

**⚠ Ensure your oxygen handling is in conjunction with national laws.**

**⚠ Ensure no foreign contaminants, such as e.g. liquids, grease, particulate, dust, and mist can enter into the cleanroom area.**

### ***The cleanroom area and work environment requirements***

The cleanroom area and work environment should be setup according to minimum demands listed in Appendix D. A cleanroom area and work environment audit should be performed once a year either by a service technician or by a from Poseidon appointed auditor. The checklist in Appendix D should be used to make sure that all criterias are fulfilled. For detailed instructions on how to perform and audit please refer to Appendix D.

### ***Preparations and Pre-cleaning***

1. These preparations and the pre-cleaning shall NOT be conducted in the clean room, since it may then contaminate the clean room.
2. If any part is visibly contaminated, it shall be pre-cleaned, including the parts listed below which shall not be ultra sonic cleaned.
3. Only undertake the pre-cleaning if you are sure you can move on to the cleaning stage immediately after. If the parts dry between the two stages of operation, undesirable deposits can be left on part surfaces.
4. Bag the parts below in a plastic bag for later assembly. These parts shall not be ultra sonic cleaned.



5. Use IPA and a toothbrush to agitate away all visible contaminants. Rinse part(s) in municipal running water until all visible soil, particulate and cleaning agent is removed. When using IPA make sure you have sufficient ventilation. Please refer to the safety instructions of the IPA.
6. Use air of any quality to blow dry.

**THE PROCESS BELOW SHOULD BE PERFORMED OUTSIDE THE CLEANROOM AREA**

**Cleaning**

1. Wash your hands before this cleaning process.
2. Always ensure the UltraSonic cleaner is absolutely clean inside
3. Fill the UltraSonic cleaner with Poseidon FineClean Ultra and water in the ratio 1:5.
4. Let the UltraSonic cleaner reach its working temperature 60-70°C .
5. Place all parts in the basket. The parts shall be placed so that no air is trapped inside. Turn the part a few times under the solution until no bubbles are coming from it. Ultra Sonic cleaning agitates away contaminants, why it is important to finally place the part so that contaminants can drop out freely, i.e. open holes pointing down. (as shown in the figure). Ensure parts are not contacting each other, since that may reduce the cleaning effectiveness.
6. Immerse and ultra sonic clean the parts for 20-25 minutes
7. 3440, rolling diaphragm and the servovalve shall only be cleaned for 10 minutes
8. Bring all parts needed to assemble the complete regulator to the clean room. Keep the bagged 2<sup>nd</sup> stage parts and the service kit parts in their bags until immediately before assembly.

**THE PROCESS BELOW SHOULD BE PERFORMED INSIDE THE CLEANROOM AREA**

**Rinsing and drying in the cleanroom**

From this stage and through the assembly stages cleanroom clothing including gloves shall be used.

Pick up each part from the basket and rinse carefully under running water at least 30 seconds per part, or; Rinse in two stages keeping the parts in the basket. Immerse the basket with the parts in another container of at least 3 litres of clean water and agitate for at least 5 minutes. Then replace the rinsing water with new clean water (ideally deionised, distilled, and filtrated water), and rinse for another 5 minutes. Ensure all cavities are carefully rinsed. It is the internal rinsing which is the most important!

Dry the parts by using a cleaned blowgun and clean air, and blow dry each part carefully.

**Verification**

White light

All parts shall be observed for the absence of contaminations under strong white light and for the accumulations of lint fibres. This method will detect particulate matter in excess of 50 microns and other contaminations in relatively large amounts. The part being examined must be recleaned if any contamination is detected using this method. You shall have access to, and use if found necessary, a magnifying glass or a microscope with at least x10 magnification.

Ultraviolet light (Black light)

Examine all parts in darkness using an ultraviolet light of between 3200 to 3800 Angstrom wavelength. If a bluish-white fluorescent blotch, smear, smudge, or film is present, the part must be recleaned. Ultraviolet light inspection will help to verify that cleaned surfaces are free from any hydrocarbon fluorescence.

If parts cannot be used immediately for assembly, pack in clean plastic bags to avoid parts from being recontaminated.

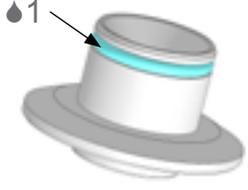
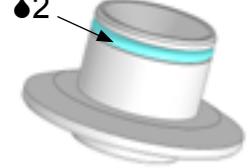
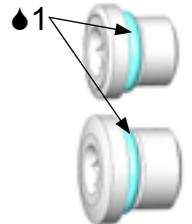
**Assembly**

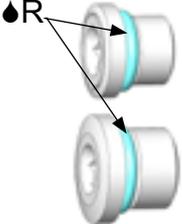
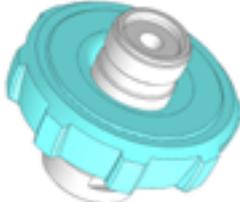
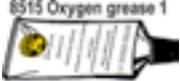
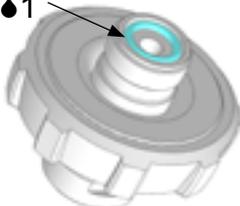
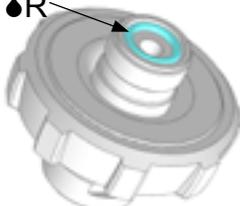
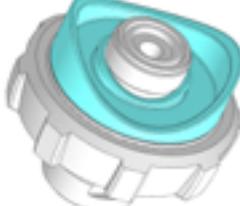
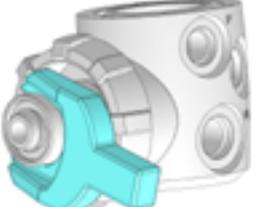
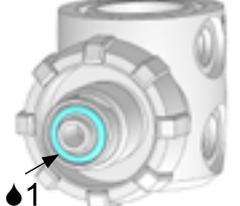
**▲ Lubricants shall be used sparingly. Excessive quantities of lubricant can trap particulate and other contaminants developing a potential fire hazard.**

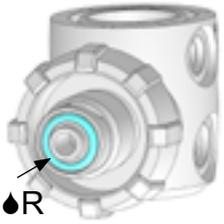
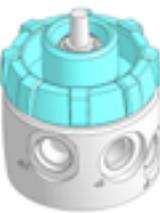
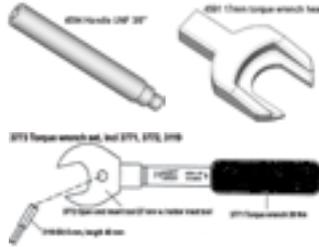
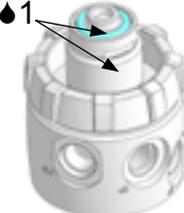
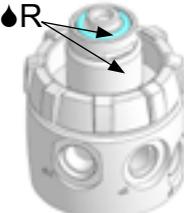
**▲ Parts marked with the (↻) symbol are parts that must be replaced at every service. New parts should be stored in it's original packing until it is time for assembly.**

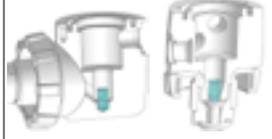
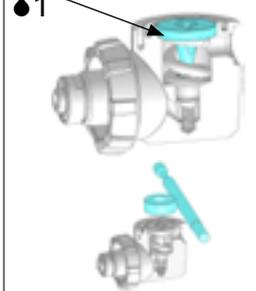
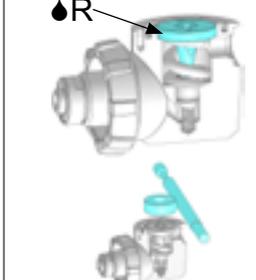
**Xstream first stage**

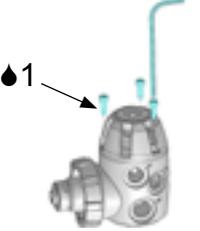
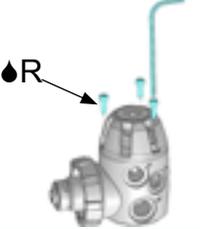
Step	Parts	Tools/Instructions	Replace	Picture
<b>All first stages</b>				
1	4758 Zytel valve seat Xstream		(↻)	

2a	0016-036 O-ring, viton (Deco/Duration) 0013-394 O-ring (Deep EAN40)	<p><b>Deco/Duration/Oxygen/ Deep EAN40</b></p> 	<p>( )</p> 
2b	0015-059 O-ring (Deep/Dive)	<p><b>Deep/Dive</b></p> 	<p>( )</p> 
3	0015-012 O-ring 0013-392 O-ring (Deep EAN 40)	<p>Use bushing 4563 to install o-ring</p> 	
4	4763 Pin bushing 1.stage Xstream	<p>Make sure fully to the bottom</p>	
5	4777 Lower pin guide Xstream	 <p>3 +/- 1 Nm Refer to section 9 for other units.</p>	
6	4759 Actuating pin, Xstream	<p>Lubricate pin at top section only. Leaving lower end dry. Wipe off excessive grease under the hat.</p>	
7	4798 Adjusting screw		
8a	<p><u>On blindscrew UNF 3/8"</u> 0013-164 O-ring Deep 90 EAN40, 4 pcs 0013-064 O-ring EPDM Deco 2 or 3 pcs Duration 2 or 3 pcs</p> <p><u>On blindscrew UNF 7/16"</u> 0013-165 O-ring Deep90 EAN40, 2 pcs 0012-132 59 O-ring Viton Deco/Duration 1 pcs</p>	<p><b>Deco/Duration/Oxygen/ Deep EAN40</b></p> 	<p>( )</p> 

<p>8b</p>	<p>On blindscrew UNF 3/8" 0010-353 O-ring Deep 2 or 3 pcs, Dive 5 pcs</p> <p>On blindscrew UNF 7/16" 0012-132 O-ring Deep 1 pcs, Dive 2 pcs</p>	<p><b>Deep/Dive</b> 8516 Regulator grease</p> 	<p>( )</p>	
<p>9</p>	<p>4552 Cup type filter long Xstream 90</p>		<p>( )</p>	
<p>10</p>	<p>4576-BK Wheel G5/8" Xstream, black 4576-GN Wheel G5/8" Xstream, green 4876-GN Wheel Xstream, green (Duration90 EN144-3)</p>			
<p>11a</p>	<p>0011-277 O-ring Viton (Duration90) 0013-165 O-ring (Deep90 EAN40)</p>	<p><b>Deco/Duration/Oxygen/Deep EAN40</b> 8515 Oxygen grease 1</p> 	<p>( )</p>	
<p>11b</p>		<p><b>Deep/Dive</b> 8516 Regulator grease</p> 	<p>( )</p>	
<p>12</p>	<p>4576-BK Line protector Xstream, black 4576-GN Line protector Xstream, green</p>			
<p>13</p>	<p>4771 Conn. stem 1.stage 90 Xstream 4878 Conn. stem 1.stage Xstream EN 144-3 (Duration90 EN 144-3)</p>	 <p>Ensure line protector is correctly positioned, with one slot facing to the bottom of the housing Torque setting 30 Nm Refer to section 9 for other units.</p>		
<p>14a</p>	<p>0012-028 59 O-ring viton (Duration90) 0003-214 O-ring viton EN 144-3 (Duration90 EN 144-3) 0013-032 O-ring (Deep90 EAN40)</p>	<p><b>Deco/Duration/Oxygen/Deep EAN40</b> 8515 Oxygen grease 1</p> 	<p>( )</p>	

14b	0012-028 O-ring viton (Deep/Dive)	<p><b>Deep/Dive</b></p> 		
<b>180 degree model</b>				
15	4581 Stainl. washer 1.stage Xstream			
16	4572 Cup type filter Xstream			
17	4572 Cup type filter Xstream			
18	4576-BK Wheel G5/8" Xstream, black 4576-WE Wheel G5/8" Xstream, white 4576-GN Wheel G5/8" Xstream, green 4876-GN Wheel Xstream, green (Duration EN144-3) 4876-WE Wheel Xstream, white (Deco EN144-3)			
19	4571 Conn. stem 1.stage Xstream 4871 Conn. stem 1.stage Xstream EN 144-3 (Duration EN 144-3/Deco EN 144-3)	 <p>Use handle to hold first stage. Torque setting 30 Nm Refer to section 9 for other units.</p>		
20a	0011-037 O-ring, viton (Deco/Duration/Oxygen) 0003-214 O-ring, viton EN 144-3 (Deco M26/Duration M26/Oxygen)	<p><b>Deco/Duration</b></p> 		
20b	0012-028 O-ring (Deep/Dive)	<p><b>Deep</b></p> 		

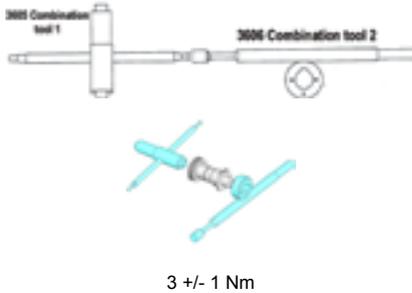
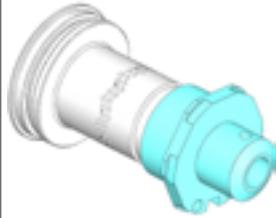
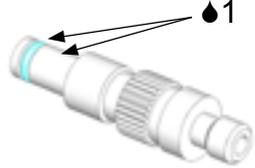
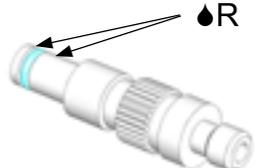
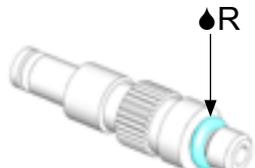
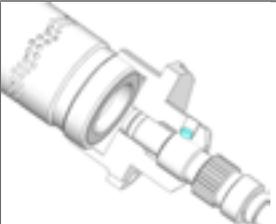
21	4555 Spring for ball Xstream	 Wider end facing upwards, towards the ball.	
22	4556 Ball 1.stage Xstream		
23	4760 Valve seat holder Xstream 4758 Zytel valve seat Xstream		
24	4761 Valve seat spring Xstream		
25a	Pin guide assembly	<p><b>Deco/Duration/Oxygen/ Deep EAN40</b>                      8515 Oxygen grease 1</p>   3 +/- 1 Nm Refer to section 9 for other units.	
25b	<p><u>Over pressure valve assembly</u> (only 1st stages with a built in OP valve)</p> <p>3726 Valve sealing                      3725 Valve piston                      1180 Pressure spring                      3727 Locking screw</p>	<p>1. Attach the new valve sealing to the valve piston and place the valve piston in the OP valve hole with the seal towards the housing.</p> <p>2. Place the pressure spring in the valve piston and tighten the locking screw with a 4 mm Allen key.</p>	
25b	Pin guide assembly	<p><b>Deep/Dive</b>                      8516 Regulator grease</p>   6 +/- 1 Nm Refer to section 9 for other units.	
26	4564 Roll. diaphragm 1.stage Xstream		

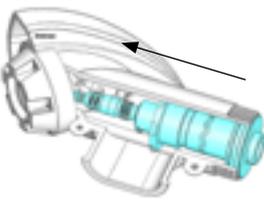
27	4570-BK Barrier 1.stage Xstream black 4570-WE Barrier 1.stage Xstream white 4570-GN Barrier 1.stage Xstream green	 You should see the marking "This side up" on the barrier.	
28	4565 Pressure plate 1.stage Xstream		
29	4766 Adj. spring 1.stage Xstream		
30	4567-BK Cover Xstream first stage, black 4567-CE Cover Xstream first stage, chrome		
31a	4568 Screw cover M3x10 Xstream 3 pcs	<p><b>Deco/Duration/Oxygen/Deep EAN40</b></p>  4593 Allen key 2,5 mm 1 - 2,5 Nm Refer to section 8 for other units.	
31b	4568 Screw cover M3x10 Xstream 3 pcs	<p><b>Deep/Dive</b></p>  4593 Allen key 2,5 mm 1 - 2,5 Nm Refer to section 9 for other units.	
32	2680 Blindscrew UNF 7/16" 1 or 2 pcs 2679 Blindscrew UNF 3/8" 2, 3 or 5 pcs		

 **Parts marked with the ( ) symbol are parts that must be replaced at every service. New parts should be stored in its original packing until it is time for assembly.**

**Xstream second stage**

Step	Parts	Tools/Instructions	Replace	Picture
1a	0011-278 O-ring Xstream 2nd st., viton	<p><b>Deco/Duration/Deep EAN40</b></p>	(C)	
1b	0011-278 O-ring Xstream 2nd st., viton	<p><b>Deep/Dive</b></p>	(C)	
2	3440 Valve insert			
3a	0010-025 O-ring	<p><b>Deco/Duration/Deep EAN40</b></p>	(C)	
3b	0010-025 O-ring	<p><b>Deep/Dive</b></p>	(C)	
4a	0013-009 O-ring 2nd stage Xstream, EPDM	<p><b>Deco/Duration/Deep EAN40</b></p>	(C)	
4b	0013-009 O-ring 2nd stage Xstream, EPDM	<p><b>Deep/Dive</b></p>	(C)	

Step	Parts	Tools/Instructions	Replace	Picture
5	4547 Valve housing nut, Xstream	 <p>3 +/- 1 Nm</p>		
6a	0013-365 O-ring 2nd stage Xstream, EPDM	<p><b>Deco/Duration/Deep EAN40</b></p> 	( )	
6a	0013-365 O-ring 2nd stage Xstream, EPDM	<p><b>Deep/Dive</b></p> 	( )	
7a	0013-001 O-ring 2nd stage Xstream, EPDM	<p><b>Deco/Duration/Deep EAN40</b></p> 	( )	
7b	0013-001 O-ring 2nd stage Xstream, EPDM	<p><b>Deep/Dive</b></p> 	( )	
8	4534 Valve tube Xstream			
9	2787 Rubber plate		( )	
10	2875 Stop screw			

Step	Parts	Tools/Instructions	Replace	Picture
11	4545 Servo-valve Xstream	Firm by hand		
12	4531 Exhalation diaphragm	<b>ONLY IF REPLACED</b>		
13	4533 Diaphragm silicone			
13	4536 Diaphragm cover			
14	4538-BK Cover Xstream 2nd stage (Deep) 4538-WE Cover Xstream 2nd stage (Deco) 4538-GN Cover Xstream 2nd stage (Duration) 4538-YW Cover Xstream 2nd stage (Octopus) 4538-GY Cover Xstream 2nd stage (Dive)			
15		Install valve tube		
16	4532 Mouthpiece AIR			

**GO TO FINAL INSPECTION**

## 7. Final inspection

### Setting, final inspection

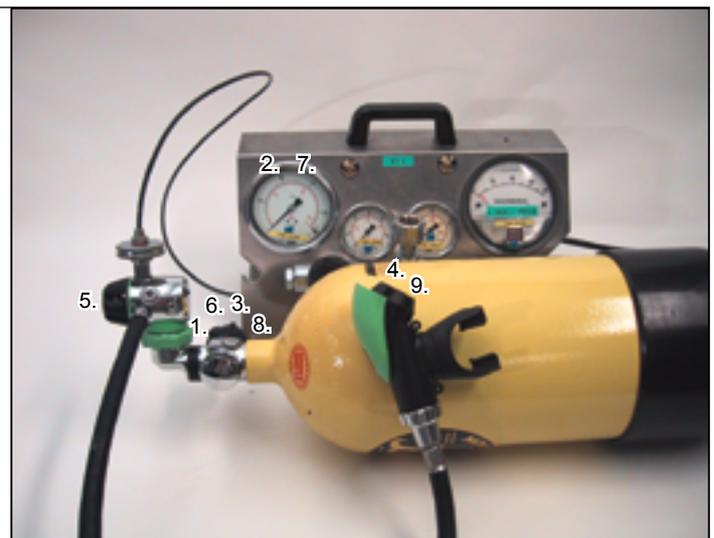
Property 1st stage	Setting SI units	Setting common units	Setting US units
P1	30 MPa	300 bar	4351 psi
P2	>750 kPa	> 7.5 bar	>109 psi
P3	2 MPa	20 bar	290 psi
P4@p1, P4@p3.	800 – 1100 kPa (unadjustable) 840 – 860 kPa (adjustable)	8bar - 11bar (unadjustable) 8.4bar - 8.6bar (adjustable)	116 - 160 psi (unadjustable) 122 - 125 psi (adjustable)
P5	>750 kPa	> 7.5 bar	>109 psi
i	+/- 110 kPa	+/- 1.1 bar	+/-16 psi
R	max 100 kPa	max 1 bar	max 15 psi
Q	0.12 m <sup>3</sup> /h	2 L/min	0.07 ft <sup>3</sup> /min
Internal leaktightness		12 ml/h* * Corresponds to a pressure climb of 0,01 bar/ min for a regulator with a 70 cm hose.	
Property 2nd stage	Setting SI units	Setting common units	Setting US units
CP (cracking pressure)	274 Pa to 392 Pa	28 to 40 mm.w.c	1.1 to 1.6 inch of water

### Method for regulators cleaned for EAN40 and oxygen use

**⚠** Unless you do have access to an oxygen cleaned test station, you must ensure you do not re-contaminate the regulator when doing the final adjustment and setting. Re-contamination can be caused by e.g. contaminated test gas, contaminated gauge fittings, contaminated regulator connection, contaminated test station pipings etc.

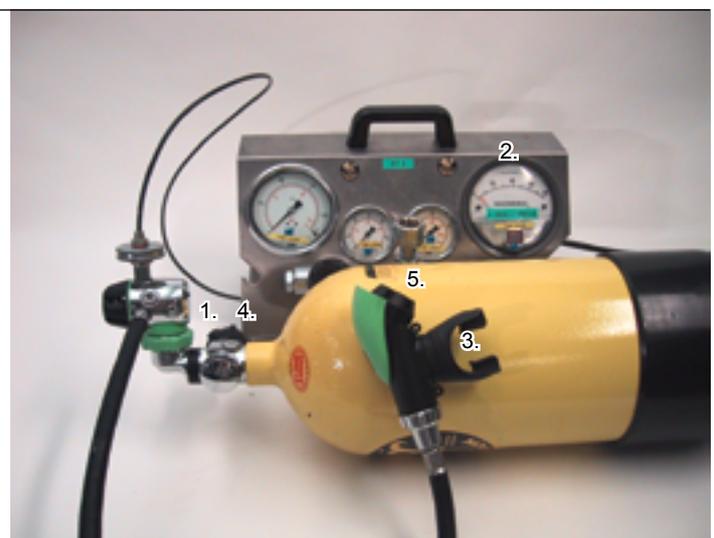
#### FIRST STAGE SETTING:

- 1) Slowly open cylinder valve
- 2) Check IP
- 3) Close valve
- 4) Purge
- 5) Adjust IP (1/2 turn = 1.5 bar)
- 6) Open valve
- 7) Check IP (loop to 3)
- 8) Close valve
- 9) Purge



#### SECOND STAGE SETTING:

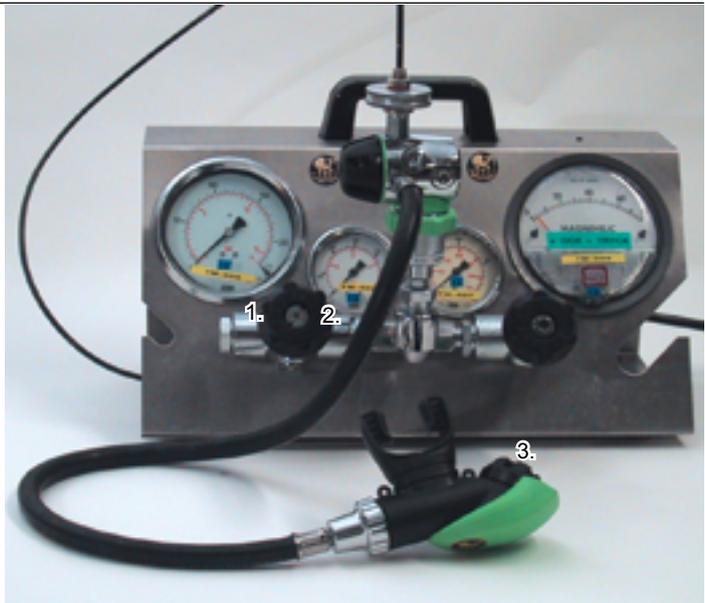
- 1) Open valve
- 2) Check cracking pressure
- 3) Adjust cracking pressure
- 4) Close valve
- 5) Purge



**Method for all other regulators**

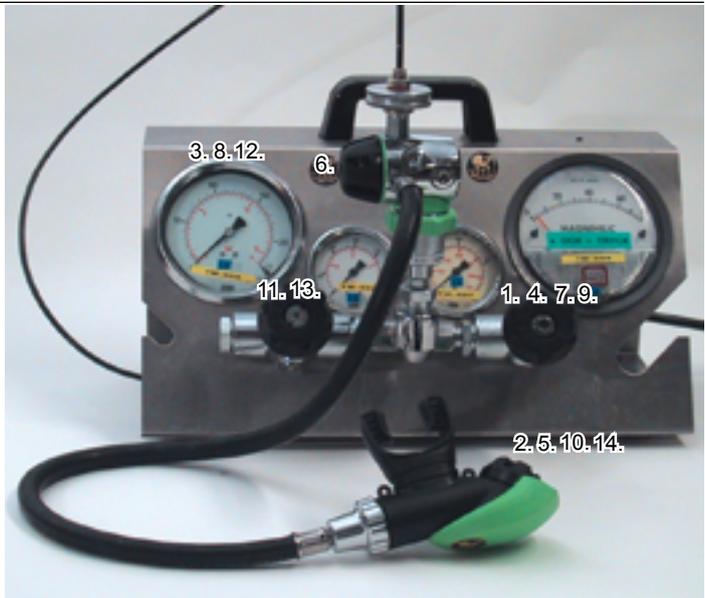
**SYSTEM CHECK:**

- 1) Open left valve 20 bar
- 2) Close left valve 20 bar
- 3) Purge



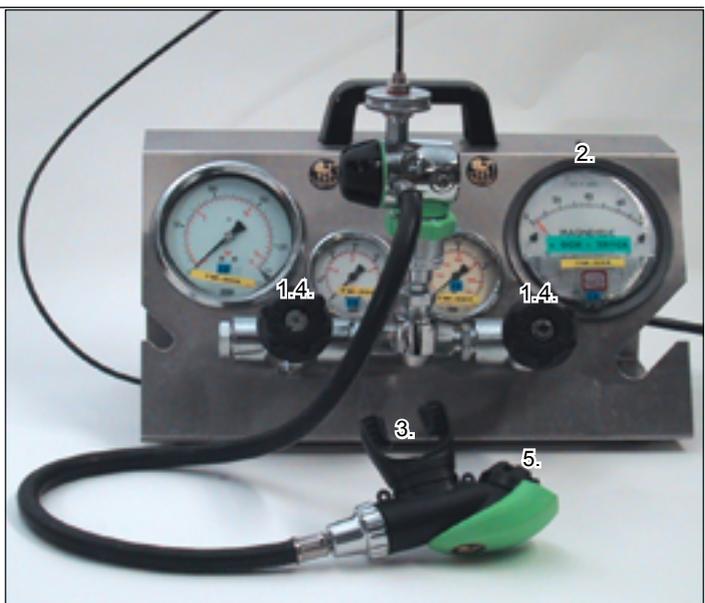
**FIRST STAGE SETTING:**

- 1) Open right valve HP (200-300bar)
- 2) Purge
- 3) Check IP (go to 9 if OK)
- 4) Close right valve
- 5) Purge
- 6) Adjust IP (1/2 turn = 1.5 bar)
- 7) Open right valve
- 8) Check IP (loop to 4)
- 9) Close right valve
- 10) Purge
- 11) Open left valve (20 bar)
- 12) Check IP
- 13) Close left valve
- 14) Purge



**SECOND STAGE SETTING:**

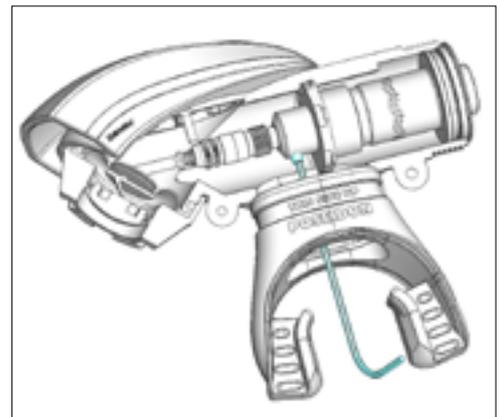
- 1) Open either left or right valve, whichever gave the lowest IP
- 2) Check cracking pressure
- 3) Adjust cracking pressure
- 4) Close valve
- 5) Purge



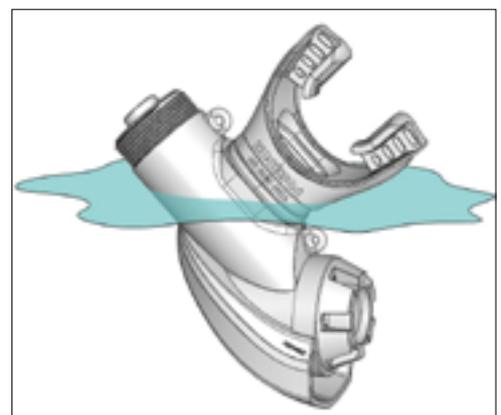
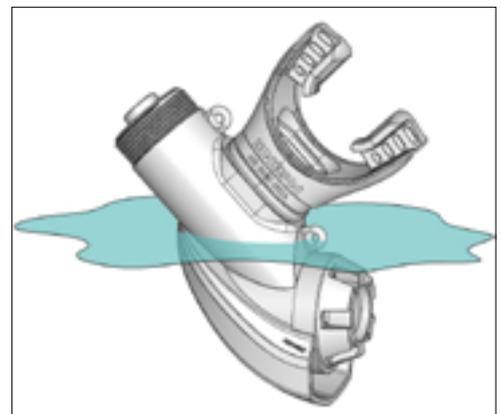
**ADJUST THE 2<sup>ND</sup> STAGE TO 28-40 MM.W.C.**

1) Hold the mouthpiece-part of the cracking pressure gauge tight to the outlet of the 2<sup>nd</sup> stage

2) Take a few rather slow and long inhalations from the mouthpiece part and simultaneously check the pressure gauge needle. **It shall during inhalation reach a maximum of 28-40 mm.w.c, and at the end of the inhalation decrease again.** If the reading is too high, unscrew the stopscrew as shown in the illustration below-right. Screw the valve tube away from the diaphragm as shown in illustration to the right. If the reading is too low, screw the valve tube towards the diaphragm. Once the reading is correct tighten the stopscrew and then doublecheck the reading.



3) Alternatively: immerse the 2<sup>nd</sup> stage as shown in the illustration. A sizzling sound from the servo-valve opening shall occur within the two markings.

**TIP!**

Some divers like the setting extremely light, and some prefer a higher cracking pressure. Ask your customer. **Technically, Xstream can be adjusted from 0 mm.w.c to > 100 mm.w.c. The risk for a free flow increases with decreasing cracking pressure.** Below 25 mm.w.c in a certain attitude (exhalation diaphragm the shallowest and inhalation diaphragm the deepest), the regulator inhalation valve will stay permanently open, bubbling. Above 40 mm.w.c the breath doesn't feel good.

## 8. Technical data

### Torque table

Part subject to torque wrench use	Newton Meter	Inch Pounds	Foot Pounds	Kilogram Meter
	Nm	Inch-lbs	Ft-lbs	Kgm
Blind screws	6 +/- 1	53 +/- 9	4.4 +/- 0.7	0.6 +/- 0.1
First stage connection stem to body	30 +/- 2	265 +/- 18	22 +/- 2	3 +/- 0.2
Centre piece	6 +/- 1	53 +/- 9	4.4 +/- 0.7	0.6 +/- 0.1
Lower centre piece	3 +/- 1	27 +/- 5	2.2 +/- 0.4	0.3 +/- 0.05
2 <sup>nd</sup> stage	3 +/- 1	27 +/- 5	2.2 +/- 0.4	0.3 +/- 0.05
Hose to 1 <sup>st</sup> stage	6 +/- 1	53 +/- 9	4.4 +/- 0.7	0.6 +/- 0.1
Cover screws 1 <sup>st</sup> stage	6 +/- 1	53 +/- 9	4.4 +/- 0.7	0.6 +/- 0.1
Valve house nut	3 +/- 1	27 +/- 5	2.2 +/- 0.4	0.3 +/- 0.05
Servo valve	Firm by hand	Firm by hand	Firm by hand	Firm by hand
Hose to 2:nd stage	Firm by hand	Firm by hand	Firm by hand	Firm by hand

### Product data

General:		
Maximum Operational depth	Certified to 200 m (656 ft)	
Typical Work of Breathing 50m on air, 62.5 l/min	1.5 J/l (see diagrams below)	
Typical Work of breathing 200m on Trimix, 62.5 l/min	1.7 J/l (see diagrams below)	
Approved gas	Dive	Air / Trimix
	Deep	Air / Trimix / EAN 40*
	Duration, EN 144-3	Air / EAN 50 / 99,95% Oxygen
	Deco, EN 144-3, Oxygen	Air / 99,95% Oxygen
Maximum working pressure	300 bar (4351 psi)	
Cold water performance	Exceeding EN 250 requirements for cold water use	
Approvals	Type Approved acc. to EU Directive Personal Protective Equipment 89/686/EEC	
Applicable Performance Standards	EN 738-1, clause 6.6, 6.6.2 NORSOK U-101 clause 5.2-5.5, 5.9 EN 250:2000	
Cleaned to hydrocarbon levels < 50mg/m <sup>2</sup> & particle level X	Dive	No
	Deep	No
	Duration/EN 144-3	Yes
	Deco/Oxygen	Yes
O-ring materials	Dive	Nitrile, EPDM, Viton
	Deep	Nitrile, EPDM, Viton
	Duration/Oxygen/EN 144-3	Viton, EPDM, Nitrile
	Deco/EN 144-3	Viton, EPDM, Nitrile
Lubricants	Poseidon 1; BAM appr. 270 bar @ 100°C Poseidon 2; BAM appr. 140 bar @ 100°C Poseidon R; silicone oil.	
Colour	Dive	Grey
	Deep	Black
	Duration/EN 144-3	Green
	Deco/Oxygen	White
	Octopus	Yellow
Warranty	24 months (if serviced)	
2 <sup>nd</sup> stage		
Flow Rate	>2150 l/min STPD (>76 scfm)	
Inner Volume (dead space)	49.5 ml (3 in <sup>3</sup> )	
Weight	152 g (5.4 oz)	
Technique	Upstream servo-valve	
Safety valve opening pressure	18 +/- 1 bar (261 +/- 14 psi)	
Swivelling	Around axis, can be used either side	
Material	ASA, Brass, TPU, Silicone, PU	
Venturi assist	Automatic	
Inhalation control	Automatic	
Surgical cord	Silicone	
Dismountable w/o tools	Yes	
Anatomic Mouthpiece	4532 Poseidon AIR	

\*Regulators and 1st stages with serial number 1500001 or higher or regulators and 1st stages that has been serviced with the EAN40 service kit.

<b>1st stage</b>		
Flowrate (l/min)	>4000 l/min (>141 scfm)	
Nominal inter-stage pressure	<b>8.5 bar (123 psi)</b>	
Weight (with 70cm hose)	Deep Duration/EN 144-3 Deco/EN 144-3	920 g
	Dive Deep 90 Dur. 90/EN 144-3	1100 g
Anti-Freeze protection	Built in T.D.A	
Technique	Rolling diaphragm	
Valve technique	Ball valve	
Seat material	Zytel	
Test pressure	450 bar (6526 psi)	
Ports*	Dive	5 IP (UNF 3/8") / 2 HP (UNF 7/16")
	Deep Duration/EN 144-3 Deco/EN 144-3	4 IP (UNF 3/8") / 1 HP (UNF 7/16")
	Deep 90 Dur. 90/Oxygen/EN 144-3	5 IP (UNF 3/8") / 2 HP (UNF 7/16")
Connection	Dive	DIN 477, G5/8" – Yoke adapter available
	Deep	DIN 477, G5/8" – Yoke adapter available
	Duration	DIN 477, G5/8" – EN 144-3 (upgradeable)
	Duration & Oxygen EN 144-3	EN 144-3/M26x2
	Deco	DIN 477, G5/8" – EN 144-3 (upgradeable)
Deco EN 144-3	EN 144-3/M26x2	
Material	Brass, plastics, stainless steel	
<b>Hose</b>		
Standard lengths hose	0.7 m (2.3 ft) 0.9 m (3 ft) 1.6 m (5.2 ft) 2.15 m (7 ft)	
Burst pressure	>100 bar (1450 psi)	
Pull strength	>1000 Newton (225 lbf)	
Material	Reinforced NBR/SR *	
Safety inspection holes	Both ends	
Wear protecting crimps	Both ends	
Oxygen cleaned	Available	

Some of the older models of the bottom/side mounted Xstream had 2 IP and 1HP/3 IP 1HP ports. The specified ports for the different models are available from 2005

### Conversion tables

Known	Unknown	Multiply by
Bar	psi	14.5
Psi	bar	0.07
mm.w.c	mbar	0.1
mbar	mm.w.c	10
litre	ft <sup>3</sup>	0.0353
ft <sup>3</sup>	litre	28.32
m	ft	3.28
ft	m	0.305
Nm	poundfoot	0.7375
Poundfoot	Nm	1.356

**Performance**

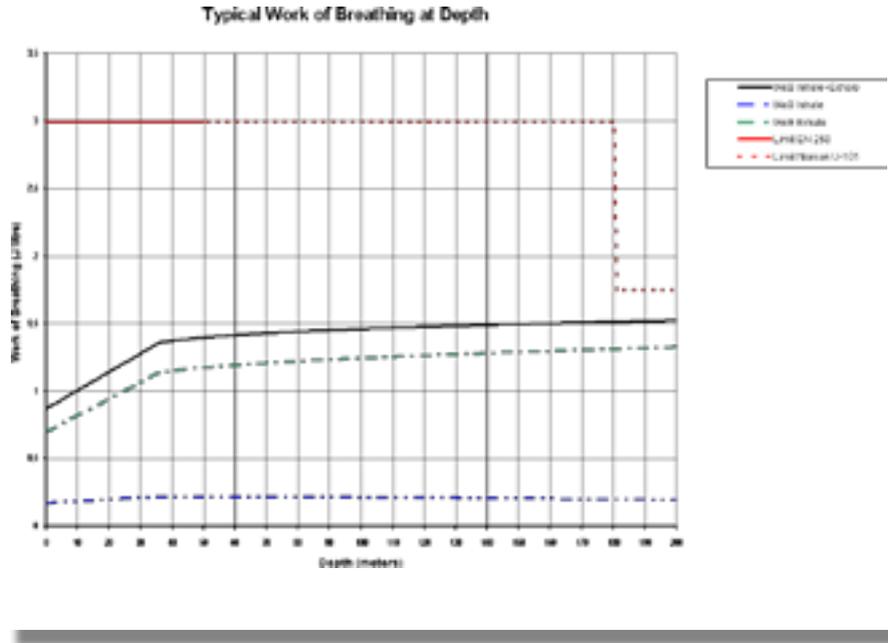
**Work of breathing**

The diagram to the right show a calculated graph for Work of Breathing in Joules/litre at  $Q_{average} = 62.5$  litres/min. The equation behind it, is extracted from hundreds of tests, from which coefficients for gas dependency, average flow dependency, and depth dependency is calculated.

Its maximum inaccuracy is within +/- 10%

The equation assumes the most dense gas possible to safely breath is used, i.e. a maximum tolerable  $pO_2$ ,  $pN_2$  at any depth. Adding more Helium will lower the figures.

It is important to understand that this equation does not apply to any other regulator, since the coefficients and characteristics are strongly dependent on the regulator construction.



**Breathing curve**

The diagram below shows a breathing curve for Xstream.

DEMAND REGULATOR PERFORMANCE

- ANSTI - POSEIDON - ANSTI -

CERTIFICATE REFERENCE : 0304 5 2384

DATE : 02-04-2003 TIME : 14:47:10

---

EQUIPMENT  
 REGULATOR TYPE : xstream deep 90  
 SERIAL NUMBER :  
 INTERSTAGE PRESSURE : 8.6 bar.g (SURFACE/STATIC)

---

CONDITIONS OF TEST  
 ROOM TEMPERATURE : 22.0 C  
 WATER TEMPERATURE : 20.3 C  
 EXHALE TEMPERATURE : 21.4 C  
 HP SUPPLY PRESSURE : 50 bar.g  
 TIDAL VOLUME : 2.50 litre BREATH RATE : 25.29 bpm  
 VENTILATION RATE : 63.2 lpm

---

RESULTS  
 INHALE PRESSURE = 6.66 mbar (LIMIT = 25 mbar)  
 INHALE POS PRESSURE = 2.36 mbar (LIMIT = 5 mbar)  
 EXHALE PRESSURE = 15.90 mbar (LIMIT = 25 mbar)  
 EXT WORK OF BREATHING = 1.19 J/l (LIMIT = 3.0 Joules/litre)  
 INHALE WORK = 0.14 J/l  
 POS INHALE WORK = 0.01 J/l (LIMIT = 0.3 Joules/litre)  
 EXHALE WORK = 1.04 J/l

---

PRESSURE - VOLUME DIAGRAM AT DEPTH OF : 51.2 msw (168 fsw)

The diagram shows two pressure-volume curves. The top curve is labeled "EXHALE" and shows pressure (nbar) on the y-axis (0 to 25) and volume (litre) on the x-axis. The pressure starts at ~15 nbar, rises to a peak of ~18 nbar, and then falls back to ~15 nbar. The bottom curve is labeled "INHALE" and shows pressure (bar) on the y-axis (2 to 6) and volume on the x-axis. The pressure starts at ~2 bar, rises to a peak of ~3 bar, and then falls back to ~2 bar. To the right of the curves, it says "IP - V", "IP MAX : 12.6 Bar.g", and "IP MIN : 18.7 Bar.g".

---

REMARKS :

RDTP-9906 -

## 9. Oxygen statement

The Poseidon Xstream Deco, Duration, Duration90 and Oxygen are all approved for use with gaseous oxygen up to 99.95 % purity at maximum 300 bar supply pressure and a maximum gas temperature of 60°C

Using gaseous mixtures containing oxygen at high pressure always presents a certain level of risk for equipment failure due to combustion. Greater concentration oxygen, greater pressure, greater temperature, respectively represents factors that contributes to increase the mentioned risk.

In diving operations, the use of oxygen is essential for the human metabolism. In addition, oxygen concentration levels greater than in air, can improve safety, especially but not only, by lowering the risk for DCS and Nitrogen narcosis.

Therefore, Poseidon has taken every precaution using “state of the art” technology, expertise, industrial standards, and knowledge to lower the risk as far as possible. Both Xstream Deco and Xstream Duration are engineered for oxygen use, assembled and cleaned in a clean room environment, made up by materials chosen to expose lowest possible risk x failure-effect product, and are tested and approved for oxygen use.

It is strictly prohibited to use the Poseidon Xstream Deco/Duration with oxygen (ref. “definitions”) without being fully trained and certified in the use of oxygen by a recognised training agency. Failure to have such training and certification could lead to death or serious personal injury.

It is likewise absolutely essential that the end user strictly follows the mandatory guidelines given in the users manual for the Xstream models. Regular maintenance, servicing and cleaning is a prerequisite for keeping the risk as low as possible.

Servicing and cleaning must be carried out by an authorised oxygen service dealer. Poseidon has developed and verified a servicing and cleaning method, which guarantee acceptable levels of contaminations. Poseidon can not be held responsible for the effects of other un-verified cleaning and servicing methods.

Failure to adhere to these mandatory requirements transfers the responsibility to the owner.



## APPENDIX A

### FAQ(T)'s

---

#### **What shall be used, viton or nitrile?**

In short, viton is less likely to ignite but if it does the fumes are extremely toxic. Nitrile is more likely to ignite and releases more heat energy than viton, but the fumes are less toxic. Nitrile has normally better mechanical properties, i.e. it is a better and more reliable seal. Therefore, the risk for, and the consequences of either a failure because of ignition or a loss of seal, determines whether viton or nitrile shall be used.

#### **What about the 40% rule?**

In the past some claimed that using gasses containing less than 40% oxygen did not require any special procedures such as e.g. oxygen cleaning. Since it is only a matter of what level of risk that can be accepted, and Poseidon's standpoint is to lower the risk as far as possible for our customers safety,

Xstream Deep 90 regulators and 1st stages with serial number 1500001 and higher are delivered "Nitrox Ready" from the factory. It means that all o-rings are approved for use with enriched gas according to EAN40 and only oxygen compatible lubrication is used. To keep the regulator "Nitrox Ready", a EAN40 service kit must be used and cleaning and lubrication instructions in this service manual must be followed.

Older Xstream Deep regulators and 1st stages can be cleaned to achieve "Nitrox Ready" status using the EAN40 service kit and EAN40 service instructions in this service manual.

#### **Upstream valve and sieze of gas?**

The servo valve of the Xstream (and Jetstream) is an upstream opening valve. Because of its small size, an extremely small force is required to crack it open and thereby allow the main valve to open. Even if there is a first stage failure increasing the Interstage pressure, the Interstage pressure will never be greater than twice the originally set IP because of the OPV. In this situation, the cracking pressure will be doubled, but still very small why the regulator will work normally.

#### **Unadjustable, will it keep its setting?**

Spontaneous alteration of setting is most commonly due to fatigue of springs. Significant fatigue only occur if the spring is stressed beyond its plastic deformation threshold. A correctly chosen spring will therefore not fatigue and keep its setting.

#### **Can I use Christo-Lube instead?**

As per 31/1 2003 Christo-Lube 111 is approved for use with 100% oxygen to 110 bar at 60°C, which is less than the maximum working pressure of Xstream Deco and can therefore not be used. Poseidon 1 Grease is approved for 100% oxygen to 270 bar at 100°C.

#### **Can I put a Jetstream 2<sup>nd</sup> stage on an Xstream 1<sup>st</sup> stage?**

Yes.

#### **Can I put a Cyklon 5000 2<sup>nd</sup> stage on an Xstream 1<sup>st</sup> stage?**

This combination is not CE-approved. The Cyklon 5000 2<sup>nd</sup> stage require an IP at 11.5 bar which can only be set with a Xstream 1<sup>st</sup> stage that has an adjustment screw.

#### **What is the expected service life of the servo valve?**

If handled in accordance with the instructions given in the users manual, it is not something that should be expected to need any replacement. The most common problem is ingress of water due to immersion of an unpressurised regulator. In such case, salt crystals can form inside the servo valve and create a minor leakage.

#### **Why do Poseidon refer to NORSOK U-101 TBD?**

NORSOK U-101 is a Norwegian off-shore standard for testing diving equipment's performance down to 400m (1312 ft) depth. Its requirements put greater demands on breathing resistance than EN 250 does.

#### **Why isn't Xstream marked EN 250?**

EN 250 requires a limitation in use to maximum 50m depth. Xstream is tested and fulfil all requirements of the EN 250, except for it is not limited to 50m, but to 200m depth

## APPENDIX B

### Fundamental oxygen risks comprehension

For a fire to occur, three elements must be present. A fuel, an oxidiser, and an ignition source. If any of these three is non present, combustion cannot take place. All regulators being used with a gas containing any percentage oxygen, exhibits all these elements and therefore the risk of a fire is present – ranging from extremely low risk to extremely high risk. The ignitability of the fuel, the concentration of oxygen, and the number of ignition sources and their likelihood to occur determines the level of risk exposed.

Everything can combust in an oxygen rich atmosphere, i.e. all materials can be regarded as fuels. Polymers and organic materials are oftenly more easily ignitable than metals, why they shall be avoided as far as possible in a regulator intended for oxygen rich mixtures, in order to lower the risk for combustion.

Gaseous oxygen is a strong oxidiser. The higher concentration, the higher temperature, and the higher pressure – the greater its oxidising properties.

What you as a regulator service technician can do to reduce the risk, is to remove the ignition sources.

- Particulate
- Auto ignition
- Electrical sparks
- Adiabatic Compression
- Heat
- Frictional heat
- Resonance (heat)

Ideally, if you could remove them all, there would be no risk for combustion.

Particulate material can ignite in at least two ways. A small particulate travelling at high speed in a gaseous stream can, when it hits a surface, create either a spark or transfer enough energy to trigger the absorbing materials auto ignition temperature. Or second, since a cluster of particulate material exhibits a large surface area, it can pick up e.g. resonance heat more effectively and thereby reach its own AIT. Particulates must therefore be removed effectively.

All materials have a threshold temperature upon reached the material will start to burn automatically, the Auto Ignition Temperature, AIT. The AIT depends on oxygen concentration, such as at a higher concentration the lower threshold. Hydrocarbons (oil, fingerprints, grease) have a very low AIT, and are almost certain to combust in an oxygen rich environment at high pressures.

Combustion, if it occurs, can be anything from unnoticeable to catastrophic. A low mass of e.g. some Nylon-like plastic materials will only produce fumes containing carbon-dioxid and water. Other plastics, e.g. viton, will produce hydroflouric acids, which even in extremely low concentrations can kill a diver if inhaled. Viton has a significantly higher AIT than Nylons, why it is far less likely to burn if compared in exactly the same situation. But the effects if it happens in a regulator is far worse.

Different materials when burning releases different amounts of energy. Hydrocarbons have a high heat of combustion. The produced heat can in turn act as an ignition source for less ignitable materials, producing what's referred to as a kindling chain reaction. Thereby, the presence of materials with low AIT and high HC, can ignite the nextcoming part downstream, which in turn possibly can ignite...etc.

There are no level of percentage of oxygen which can be guaranteed as safe. There are only factors which increases or decreases the risk for combustion.

### **The O<sub>4</sub> concept**

Poseidon has introduced the O<sub>4</sub> concept, which stands for oxygen engineered, oxygen compatible, oxygen clean, and oxygen approved.

- O<sub>1</sub> In short, oxygen engineered is taking every step to lower both the risk for combustion and the possible effect of combustion. The design must reduce the number of ignition sources, allow effective maintenance and cleaning, materials must be selected as to break kindling chain reactions, constructed to minimise effects of compression shocks etc.
- O<sub>2</sub> Oxygen compatible is selecting materials which have the best combination of AIT, HC, OI, and the severity of a possible failure for its function in the sytem.
- O<sub>3</sub> Oxygen clean means that either a component or a complete system is cleaned from especially hydrocarbons and particulate to a level which gives an acceptable risk for ignition.
- O<sub>4</sub> Oxygen approved means the product has passed tests conducted by independent organisations according to international standards.

## APPENDIX C

### Nomenclature regulator performance

#### 1<sup>st</sup> stage regulator performance

The nomenclature to describe the regulator is as far as possible in accordance with EN ISO 2503:1998.

##### Rated maximum inlet pressure. p1

Rated maximum inlet pressure for which the pressure regulator is designed

- $p1 = 300 \text{ bar}(4351\text{psi})$

##### Rated (maximum) outlet pressure. p2

Rated (maximum) downstream pressure for the standards discharge specified (Q1). Figure taken at p1.

- $p2 = > 7.5 \text{ bar}(109\text{psi})$

##### Lower test pressure. p3

- $p3 = 20 \text{ bar}(290\text{psi})$

##### Stabilized outlet pressure. p4@p1

Stabilized outlet pressure after flow (Q1) ceases, often referred to as Interstage pressure or Intermediate pressure. Figure is taken at p1.

- *Unadjustable* :  $8\text{bar} < p4@p1 < 11\text{bar} (116\text{psi} < p4@p1 < 160\text{psi})$
- *Adjustable*:  $8.4\text{bar} < p4@p1 < 8.6\text{bar} (122\text{psi} < p4@p1 < 125\text{psi})$

##### Stabilized outlet pressure. p4@p3

Stabilized outlet pressure after flow (Q1) ceases, often referred to as Interstage pressure or Intermediate pressure. Figure is taken at p3.

- *Unadjustable* :  $8\text{bar} < p4@p1 < 11\text{bar} (116\text{psi} < p4@p1 < 160\text{psi})$
- *Adjustable*:  $8.4\text{bar} < p4@p1 < 8.6\text{bar} (122\text{psi} < p4@p1 < 125\text{psi})$

##### Outlet pressure p5

Highest or lowest value of the outlet pressure (see figure) during a test where the inlet pressure varies from p1 to p3 for a flow equal to the standard discharge Q1. p5 is taken at 20-50 bar (290 - 725 psi)

- $p5 = > 7.5 \text{ bar}$

##### Irregularity coefficient (balance). i

The coefficient i is defined by:

- $i = P4@p1 - p4@p3$
- $i = +/- 1.1 \text{ bar} (+/-16\text{psi})$

##### Coefficient of pressure increase upon closure. R

The coefficient R is defined by:

- $R = p4 - p2$
- $R = \text{max } 1 \text{ bar}(\text{max } 15\text{psi})$

##### Standard discharge Q1

Corresponds approximately to a very light breath from the second stage.

- $Q1=2 \text{ L/min} (0.07 \text{ ft}^3/\text{min})$ .

##### Leakage

Leakages above 12ml/h is regarded as a leak. Judgement shall be made after 1 minute of settling time, where after a p4 increase greater than 0.01 bar/min is regarded a leakage.

This magnitude of leakage corresponds to an IP increase of 10 bars in 16 hours in a standard Xstream regulator w/ 70cm hose (27.5")

# APPENDIX D

## Cleanroom and oxygen cleaning requirement

### Check list

<b>1. Cleanroom / work environment requirements</b>		<b>OK</b>																		
1.1	The work area must be dedicated only for oxygen servicing. Ideally a separate room or at least a space clearly marked out as an oxygen clean area, e.g. by floor marking, signs, and/or screens. Ceiling, walls, and floor shall be non-contaminant producing and be easily cleaned. If the location is not sufficient in this respect, sheets of polyethylene plastic can be taped to fully surround the work area.																			
1.2	The work area must be free from airborne dust and droplets. It shall never be close to areas where machining takes place, compressors are running, or other activities which can produce a mist containing hydrocarbons or other flammable or particulate contaminants.																			
1.3	The work bench shall be sufficient in size as to enable a good organization of equipment, tools and the regulator parts. A clean polyethylene plastic sheet shall be used to protect the work bench. It is recommended to have a roll of plastic sheet at one end of the work bench. Used sheets shall be disposed if there are any signs of contamination.																			
1.4	Items incompatible with oxygen such as e.g. hydrocarbon oil and grease must not be stored or ever used in the area.																			
1.5	Oil, grease, residue, spilled chemicals, and any foreign material which develop in the area shall be cleaned immediately. At least monthly the clean room shall be completely cleaned.																			
1.6	It is recommended to keep cleanroom temperature close to standard room temperature and humidity less than 50%. Since all tools will be kept free from grease, the risk of them rusting increases the higher the humidity.																			
1.7	It is recommended to see to that the work area maintain a slight positive pressure so that the air flow will always be outward from the clean area.																			
1.8	The following activities are absolutely prohibited inside the cleanroom area: <ul style="list-style-type: none"> <li>• Smoking</li> <li>• Eating</li> <li>• The use of car heaters</li> </ul>																			
<b>2. Personnel clothing requirements</b>		<b>OK</b>																		
2.1	The special clothing as described below must not be worn or taken outside the cleanroom.																			
2.2	Lint free gloves shall be worn. Regard everything you touch as contaminated, unless you are sure it is clean. This means you shall replace your gloves if they have been in contact with something you can suspect being contaminated.																			
2.3	In the clean room a hair net and a coverall / laboratory coat shall be worn.																			
2.4	These requirements apply to anyone being in the cleanroom, including visitors and observers.																			
<b>3. Tools and equipment requirements</b>		<b>OK</b>																		
The cleaning procedure as described for the regulator also applies to all tools and equipment used.																				
3.1	All tools and equipment used must be cleaned and kept clean. It must be ensured that tools and equipment from this area is not shared with other servicing locations. Tools used to disassemble the regulator must be regarded as contaminated, and cannot be used for assembly unless they have been cleaned after the disassembly stage. We therefore recommend having two sets of the required tools, one of which is always kept clean.																			
3.2	Tools have to be re-cleaned every month or after 10 serviced regulators, whichever comes first.																			
3.3	An ultra-sonic cleaner Poseidon XXXX shall be used. In addition to the instructions for use and maintenance in the users manual, the bath shall be cleaned with IPA and a lint free mop or lint free paper on a regular basis, or when contamination can be suspected. This is to ensure that a possible trace of an oil-film on the inside of the bath is removed.																			
3.4	The solution in the ultrasonic bath shall be replaced after a) maximum 30 times of use, b) earlier if signs of contamination is present, c) at least every fourth week.																			
<b>4. Rinsing water requirements</b>		<b>OK</b>																		
4.1	Water quality must be in level with or better than: <table border="1" style="width: 100%; margin-top: 5px;"> <tr> <td>Chloride ion (ppm)</td> <td>1,0 maximum</td> </tr> <tr> <td>Conductivity (<math>\mu\Omega/\text{cm}^3</math>)</td> <td>20 maximum</td> </tr> <tr> <td>Resistivity (<math>\text{cm}^3/\Omega</math>)</td> <td>50K minimum</td> </tr> <tr> <td>pH</td> <td>6-8</td> </tr> <tr> <td>Visual clarity</td> <td>No turbidity, oil, or sediment</td> </tr> </table>	Chloride ion (ppm)	1,0 maximum	Conductivity ( $\mu\Omega/\text{cm}^3$ )	20 maximum	Resistivity ( $\text{cm}^3/\Omega$ )	50K minimum	pH	6-8	Visual clarity	No turbidity, oil, or sediment									
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pH	6-8																			
Visual clarity	No turbidity, oil, or sediment																			
4.2	A chemical analysis of the water quality shall be conducted at least annually by an independent laboratory.																			
<b>5. Gas requirements</b>		<b>OK</b>																		
5.1	Gas used for blow-guns and for regulator testing must fulfill the following requirements: <table border="1" style="width: 100%; margin-top: 5px;"> <tr> <td colspan="2"><b>Maximum level of:</b></td> </tr> <tr> <td>CO</td> <td>2 ppm</td> </tr> <tr> <td>CO<sub>2</sub></td> <td>500 ppm</td> </tr> <tr> <td>Water dew point</td> <td>-45°C (-50°F)</td> </tr> <tr> <td>Lubricants (droplets/mist)</td> <td>0.5mg/ m<sup>3</sup></td> </tr> <tr> <td>Water</td> <td>35 mg/ m<sup>3</sup> 39ppm</td> </tr> <tr> <td>Gaseous hydrocarbons</td> <td>15 ppm</td> </tr> <tr> <td>Condensed hydrocarbons</td> <td>0.1 mg/m<sup>3</sup></td> </tr> <tr> <td>Solid particles</td> <td>2 microns</td> </tr> </table>	<b>Maximum level of:</b>		CO	2 ppm	CO <sub>2</sub>	500 ppm	Water dew point	-45°C (-50°F)	Lubricants (droplets/mist)	0.5mg/ m <sup>3</sup>	Water	35 mg/ m <sup>3</sup> 39ppm	Gaseous hydrocarbons	15 ppm	Condensed hydrocarbons	0.1 mg/m <sup>3</sup>	Solid particles	2 microns	
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Solid particles	2 microns																			
5.2	A gas analysis of the gas quality shall be conducted at least annually by an independent laboratory for the gas used to dry cleaned parts.																			
5.3	It is strongly recommended to use filtered air for the purpose of drying and regulator testing.																			
<b>6. Disposal</b>		<b>OK</b>																		
6.1	Disposal of water shall be in accordance with local, state, or federal regulations																			
<b>7. Documentation</b>		<b>OK</b>																		
7.1	The Poseidon Oxygen Service Center must have documented maintenance procedures/routines covering: <table border="1" style="width: 100%; margin-top: 5px;"> <tr> <td>7.1.1</td> <td>Cleanroom cleaning</td> </tr> <tr> <td>7.1.2</td> <td>Tool cleaning</td> </tr> </table>	7.1.1	Cleanroom cleaning	7.1.2	Tool cleaning															
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Issue 2.9

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Service manual Xstream.