Section VI

2025

Bench Rules -BG ProAir on Demand Oxygen Dosage

Approved – 01/02/2025

2025 BENCH BG-PROAIR CONTEST

RULES INDEX

Section IV

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RULES GOVERNING 2025 BENCH BG PROAIR ON DEMAND OXYGEN DOSAGE CONTEST AND INTERPRETATIONS OF DISCOUNT CARDS

1. Each participant must be under guard before the start of the Contest in a location assigned by the Chief Judge and must remain continuously under guard until time to work the problem. Information for bench problem design is available on the MSHA website (https://www.msha.gov) in the Mine Rescue section under BG ProAir Designers Resources. Participants under guard must be in a location where they will be unable to obtain any information concerning the problem to be worked. Any participant receiving information concerning a Contest problem prior to starting to work the problem will be disqualified by the Chief Judge and the Assistant Chief Judge (no cell phones, iPad, smart watches, etc.). No person, except guards and Contest officials assigned to give the written examination, will be allowed to communicate with any participant under guard. Those who have performed will not be permitted to communicate with any participant awaiting their turn to perform.

2. Any indication of receiving unauthorized information during the working of the problem may result in disqualification as determined by the Chief Judge and the Assistant Chief Judge (no cell phones, iPad, smart watches, etc.). No one except judges, Contest officials, and working participants will be permitted in the bench station, unless special approval is given by the Chief Judge. Communication with bench participants, except for the judges, is prohibited. News media and photographers who wish to be in the working area must receive permission from the Director(s) and be accompanied by a Contest Official.

3. Any bench participant not in place and ready at the time specified will be disqualified from the Contest.

4. The bench participant will be provided with two BG ProAir on Demand Oxygen Dosage apparatus (one disassembled, one assembled), an RZ-25 tester, RZ-7000 tester, a stopwatch, defogging solution, leak detector fluid, test kit, and tool kit, bench record (optional and included in the 30-minute working time) and writing device. Only the tools and fluid provided will be used for testing and assembly of the apparatus. The problem at the bench station will consist of (1) a visual examination of a disassembled BG ProAir on Demand Oxygen Dosage and the proper assembly and preparation for use in rescue work. This will include correcting any predetermined problem(s) so that the apparatus is in proper working order. Simulating defogging of the

facepiece lens and simulating adding Dragersorb to the refillable cartridge and ice packs to the cooler will be done as part of the visual examination. This visual examination, correcting predetermined problem(s), and proper assembly can be done at any time allowed for working of the problem. (2) Test the assembled BG ProAir on Demand Oxygen Dosage apparatus with a tester and correct the predetermined/functional problem(s) so that the apparatus is in proper working condition. Except for removing the sealing cap from the coupling and removing the Cover shell, the assembled BG ProAir apparatus cannot be disassembled to look for problems/deficiencies, until the hoses are attached to the tester and the apparatus fails a test. When testing is completed on the assembled BG ProAir on Demand Oxygen Dosage apparatus, the hoses shall be removed from the tester, connected to the facepiece, and the back cover installed. This shall be done before the clock is stopped.

5. Spare parts to correct the predetermined problem(s)/deficiencies will be provided once the bench participant has specifically identified the problem/deficiency. This will require the participant to point out the exact location of the problem/deficiency. (Example: Positive pressure leak in the breathing bag. Participant will identify the location of the hole.)

6. When an unplanned problem/deficiency is encountered with the apparatus, the participant will be notified by the judges that the deficiency is not part of the problem. The judge will stop the clock, and any time used to correct the deficiency will not be charged to the working time. However, the process of verbal elimination shall not be used by the bench participant to find the predetermined problem(s). If it becomes obvious to the judges that this is occurring, the first offense will result in a warning, the second offense a discount, and the third offense could result in disqualification as determined by the Chief Judge. (Example: Participant verbally identifies a deficiency with every part of the facepiece when only one predetermined problem/deficiency exists.)

7. The bench participant will not be allowed to bring any materials, written information, or records to the bench station.

8. Tests will be performed in sequence on the assembled BG ProAir on Demand Oxygen Dosage apparatus using the standard functional test procedures with a tester as outlined in the Draeger Instruction for Use manual for BG ProAir on Demand Oxygen Dosage (Drager User's Manual Revision Draft, October 2024.

This revision can be found on the Holme's Association website https://www.holmessafety.org/holmes-mine-rescue-association-rules-and-contest-resources/. In addition to this guidance, the alternative relief valve test may be performed).

A maximum of 30 minutes will be allowed to complete the problem. The bench judge will inform the participant when he/she has Five minutes remaining to work the problem. At the completion of the problem, the judge(s) and the participant will note the working time of the problem with the official timekeeper. Work done after the clock is stopped will not be recognized.

9. Any bench contestant who intentionally disturbs, breaks or destroys any tester, apparatus or component of the aforementioned items on a bench problem will receive a warning. Manually abusing or intentionally over or under pressurizing the tester substantially will be considered abusing the equipment. The first offense will result in a warning. The judge will stop the clock and inform the contestant that this is their first warning. Judge must state what the warning is for (the keyword is **intentionally**). The second offense will result in a warning, the clock will not be stopped, and a 100-point discount will be given. The third offense will result in the judge stopping the clock, locating the Chief Judge of the bench and determine if the contestant will be disqualified.

A. Written Examination of Bench Participant

1. The written examination shall consist of 20 questions. Ten questions for the written examination will be taken from the Statements of Fact which will be multiple choice with three choices and each blank shall represent a key word with no more than two consecutive blanks per statement. Ten questions will be taken verbatim from identification of parts. Intentional misspelling of words by the test developer will not be allowed. Multiple choice answers with numbers will either be in the form of numbers written out or numerical. Either version is acceptable. "None of the above" is not acceptable as one of the answers. Twenty minutes will be allowed for the written examination.

2. In special circumstances, individual bench participants may be given oral instead of written examinations by at least two judges. Requests for consideration shall be presented to the Director(s) of the Contest at the time of registration.

3. Bench participants will be separated to the extent possible, and every effort will be made to prohibit discussion of questions and answers among the bench participants.

B. Miscellaneous

1. In the event of ties in the Bench Contest, the number of discounts at bench will be the first tie breaker; the number of discounts onwritten examination will be the second tie breaker; and the official working time at bench in minutes and seconds will be the third tiebreaker.

2. The bench participant and trainer will report to a designated location to review and prepare protests within one hour of notification. Twenty minutes will be given to review and prepare written protests. All protests will be considered by the Chief Judge and his/her Assistant, and their decision will be binding.

3. If a wireless internet connection is available, the Contest Director(s) may approve an option where the bench participant can review their results electronically. In those cases, the bench participant must provide an email address that will be used for the review on the form provided at registration. The form must be completed and submitted at registration. Contest officials will email the scorecards, written examination, etc. to the email address on record when they are ready for review. The bench participant will have 45 minutes to review the material starting upon the "read receipt" of the email, but no more than two hours from the time it was posted outside the appeals area and email any protests back to the Contest Officials.

4. Disputes with regard to the Bench Contest (except discounts), shall be immediately filed with the Director(s). Disputes filed shall be in writing and set forth incidents, times, names, source of information and act complained against. Complainant shall remain accessible to the Director(s) until the complaint is resolved. A decision by the Director(s) shall be final.

5. During the bench, any similar terminology used to describe a part is acceptable such as: cylinder or bottle, etc.

6. Bench participants must be bona fide employees of the mining industry or members of mine rescue teams designated to fulfill the requirements of 30 CFR Part 49. This does not exclude bench participants whose team is not participating at the National Contest or a member of a college mine rescue team.

7. All parts must correspond with the individual units that are being used for contest purposes only. (Drain valve, cooler, mask, CO_2 absorber, hoses, coupler, etc.)

Interpretations of Discount Sheet

A. Written Examination

1. For each incorrect statement_____1

B. Time

The time will be recorded in minutes and seconds.

C. Competition at Bench

1. Failure to verbally identify each test being conducted_____2

   Verbally identify each test being performed.

2. Failure to verbally identify each problem/deficiency_____5

   Failure to verbally identify is also interpreted as failure to find the problem/deficiency.

   Failure to find the problem/deficiency is interpreted as failure to correct the problem.

3. Failure to correct each problem/deficiency_____5

4. Continuing without correcting the predetermined problem/deficiency _____ 40

   Once a bench participant finds a predetermined problem and does not correct it before continuing with the remaining tests, he/she shall receive a 40-point discount for continuing without correcting the problem and a pending five-point discount for failing to correct the problem. If all of the remaining tests are properly conducted and passed and the participant returns to the uncorrected problem and corrects it, the pending five-point discount will not be assessed. Should the participant continue on from this point and properly conduct all of the remaining tests again, he/she would also have the original 40-point discount for continuing tests removed.

5. Failure to conduct any visual examination or test on the BG-ProAir, each test ___5

6. Failure to tighten connections properly during assembly, each connection_____1

   All connections must be tightened on the apparatus and verbally identified as connected or good at the time the connection is made. Failure to verbally identify at the time the connection is being made will result in a one-point discount for each. Zero adjustments shall be made on the tester prior to connecting the breathing hoses to the tester.

   This includes:
   - □ Cap on drain valve - connected or good
   - □ Cylinder connection – connected or good
   - □ Factory/Refillable Absorber connections – connected or good
   - □ Relief valve connection – connected or good
   - □ Cooler to bag connection – connected or good
   - □ Distribution hose connection – connected or good
   - □ Bypass hose connection – connected or good
   - □ Sensor hose connection – connected or good
   - □ Breathing hoses during the visual examination on the disassembled apparatus) – connected or good
   - □ Hose adapter on the tester – connected or good

     Once the zero adjustment on the tester has been made, do not readjust setting for balance of tests.

7. Failure to zero the tester_____10

8. Failure to comply with rules not covered in discount sheet, each infraction_____2

   If the discount is not listed on the discount sheet, and if it is not covered under one of the approved rules of the Contest, do not improvise a discount to cover the suspected violation.

D. Visuals/Disassembled

1. Failure to conduct a visual examination of the 9 components, all components, subcomponents, component parts, assembly, sub-assemblies retest dates are subject to problems/deficiencies. Contestant is required to verbally identify what is in capital bold print letters. The examples listed below for visual examination of the 9 components are a minimum starting point for training purposes.

2. Failure to conduct a visual examination of the **FRAME/HARNESS**___2

   The visual examination will include an examination of the harness assembly, frame, back cover, buddy light, hinges, visible sealing rings, Connect ECU, O_2 regulator, bypass, pre-flush, electronics assembly, minimum valve, tubes, and air lines.

3. Failure to conduct a visual examination of the **BREATHING BAG**_____2

   The participant will verbally identify that the breathing bag is being examined for pliability and signs of deterioration. Stretching or manipulating the breathing bag with a massaging action will be part of this examination. The participant will verbally identify that the sealing surfaces are being examined for signs of deterioration or damage.
   Also, the drain valve and the spring bridge will be examined for damage.

4. Failure to conduct a visual examination of the **O2 CYLINDER**_____2

   A proper cylinder examination includes a visual inspection of the cylinder. The participant will verbally identify the cylinder pressure on the gauge, the pressure rating on cylinder, the latest hydrostatic test date, the manufactured date, and identify if the cylinder is plus rated, if steel. Participant will inform the judge if the cylinder pressure is less than 2,175 PSI for the Connect ECU.

5. Failure to conduct a visual examination of the **FACTORY/REFILLABLE ABSORBER**_____2

   A proper examination includes a visual inspection for defects. If a Factory packed cartridge is used, verbally identify that the sealing surfaces are not damaged, and identify the expiration date with month and year. If a

refillable absorber is used, a visual inspection for defects, securing feet and hooks on the cartridge and back frame, seal, Refillable scrubber screens and filter mats are required. Adding Dragersorb to the refillable absorber shall be simulated as part of the visual refillable absorber examination.

6. Failure to conduct a visual examination of the **RELIEF VALVE**_____2

   A proper examination includes a visual inspection for defects. Verbally identify that the valve and O-ring are not damaged.

7. Failure to conduct a visual examination of the **COOLER**_____2

   A proper examination includes a visual inspection for defects. Verbally identify that the sealing surfaces are not damaged. Adding ice packs to the cooler shall be simulated as part of the visual cooler examination.

8. Failure to conduct a visual examination of the **HOSES**_____2

   The participant will verbally identify that the hoses are being inspected for pliability and signs of deterioration. Stretching or manipulating the hoses with a massaging action will be part of this examination. The participant will verbally identify that the sealing edges/surfaces, including bayonet rings and directional tabs are being examined for signs of deterioration.

9. Failure to conduct a visual examination of the **COUPLING, INHALATION AND EXHALATION VALVES**_____2

   A proper examination includes a visual inspection for defects, sealing surfaces and valve discs. Verbally identify that the sealing edges/surfaces and valve discs are not damaged.

10. Failure to conduct a visual examination of the **FACEPIECE**_____2

    The visual examination will include an examination of the head strap assembly, mask body (including sealing surfaces), the visor, speaking diaphragm, and wiper. Defogging the visor shall be simulated as part of the visual facepiece examination.

11. Failure to have Visual Apparatus fully assembled. (Ready for use) ___5

    NOTE: Breathing hoses do not need to be in straps on visual apparatus.

E. RZ-25 Tester

1. Failure to conduct a proper exhalation valve test_____2

   Set the RZ-25 tester on negative pressure pumping. Tightly pinch the inhalation hose with your hand. Gently activate bellows until -10 mbar is indicated on the pressure gauge.

2. Failure to conduct a proper inhalation valve test_____2

   The RZ-25 tester is set on positive pressure pumping. Tightly pinch the exhalation hose with your hand. Gently activate bellows until 10 mbar is indicated on the pressure gauge.

3. Failure to conduct a proper drain valve test_____2

   Set RZ-25 tester on positive pressure pumping. Pump bellows until 10 mbar is indicated on the pressure gauge. While pumping, lower the locking lever to stop the pressure plate bag plate, which is being raised by the inflated breathing bag. The drain valve must open between 10 and 25 mbar.

4. Failure to conduct a proper leak test with positive pressure_____2

   Set RZ-25 tester on leak test. Bleed needle to 7 mbar and start stopwatch. Needle should not change more than 10 mm H20 or 1 mbar in 60 seconds. Set RZ-25 tester on negative pressure pumping, the breathing bag is vented. Remove the sealing cap.

5. Failure to conduct a proper relief valve test_____2

   Set RZ-25 tester on positive pressure pumping. Pump the bellows until the relief valve opens, it should open between 4 and 8 mbar.
   Participant will verbally state reading of valve opening.

6. Failure to conduct a proper pre-flush unit test_____2

   Vent the apparatus completely. Open the cylinder. The addition of oxygen must stop in 10 seconds or less.

7. Failure to conduct a proper high pressure leak test_____2

   Open cylinder valve by at least two turns. The ECU switches to On mode

and an acoustic signal sound. The battery status is shown on the display. Watch the Connect ECU unit, the cylinder pressure is indicated here. If it is lower than 2175 psi, change the oxygen cylinder. If it is greater than 2175 psi, Connect ECU gives the option to conduct high pressure leak test. Select the button on the side with the check mark. The Connect ECU will give a "close cylinder" icon, as soon as the icon appears, close cylinder valve.

Result of the tests is output after approximately 15 seconds.
If the BG ProAir on Demand Oxygen Dosage is okay, the "open cylinder valve" icon is displayed, as soon as the icon appears open cylinder valve.

8. Failure to conduct a proper bypass valve test_____2

Set RZ-25 tester on leak test. Press red button for bypass valve. Oxygen must be heard to flow into the circuit, the breathing bag inflates.

9. Failure to conduct a proper minimum valve test_____2

Set RZ-25 tester on vent. The breathing bag is vented automatically, remove sealing cap, pump bellows until minimum valve is heard to open in breathing bag and there is a hissing sound.
Watch the pressure gauge, the minimum valve should open at a value between 0.5 and 3.0 mbar. Participant will verbally identify reading of opening of valve.

10. Failure to conduct a proper low/residual pressure warning test___2

Close cylinder valve. Watch the display or Connect ECU unit. The warning should be generated at approx. 650 psi. Alarm sounds intermittently, red indicator flashes. Unplug coupling from RZ-25 tester. Participant will verbally state reading.

11. Failure to conduct a proper battery test_____2

On activation and deactivation, the Connect ECU automatically checks and displays the battery capacity. To switch off the Connect ECU, simultaneously press the right- and left-hand button the screen counts down from 3. Release the buttons. For three seconds, Connect ECU shows the battery status. The battery status must show at least 2 green segments (charge status at least 50%). Connect ECU switches off.

12. Failure to follow proper sequence when conducting the tests as prescribed in the instruction for use per Drager BG ProAir (each occurrence, or 15 pt. max.) _____5

13. Failure to have Test Apparatus fully assembled. (Ready for use) _____5

NOTE: Breathing hoses do not need to be in straps on test apparatus.

F. RZ-7000 Tester

1. Failure to conduct a proper exhalation valve test_____2

Set the RZ-7000 tester on negative pressure pumping. Tightly pinch the inhalation hose with your hand. Pump until -10 mbar is indicated on the pressure gauge.

2. Failure to conduct a proper inhalation valve test_____2

The RZ-7000 tester is set on positive pressure pumping. Tightly pinch the exhalation hose with your hand. Pump until 10 mbar is indicated on the pressure gauge.

3. Failure to conduct a proper drain valve test_____2

Set RZ-7000 tester on positive pressure pumping. Pump bellows until 10 mbar is indicated on the pressure gauge. While pumping, lower the locking lever to stop the pressure plate bag plate, which is being raised by the inflated breathing bag. The drain valve must open between 10 and 25 mbar.

4. Failure to conduct a proper leak test with positive pressure_____2

Set RZ-7000 tester on leak test. Bleed needle to 7.5 mbar and start stopwatch. Needle should not change more than 10 mm H20 or 1 mbar in 60 seconds. Set RZ-7000 tester on negative pressure pumping, the breathing bag is vented and disengage the locking lever.

5. Failure to conduct a proper relief valve test_____2

Set RZ-7000 tester on positive pressure pumping. Pump until the relief valve opens, it should open between 4 and 8 mbar. Participant will verbally state reading of valve opening.

6. Failure to conduct a proper pre-flush unit test_____2

Vent the apparatus completely. Open the cylinder. The addition of oxygen must stop in 10 seconds or less.

7. Failure to conduct a proper high pressure leak test_____2

Set RZ-7000 tester on leak test. Open cylinder valve by at least two turns. The ECU switches to On mode and an acoustic signal sound. The battery status is shown on the display. Watch the Connect ECU unit, the cylinder pressure is indicated here. If it is lower than 2175 psi, change the oxygen cylinder. If it is greater than 2175 psi, Connect ECU gives the option to conduct high pressure leak test. Select the button on the side with the check mark. The Connect ECU will give a "close cylinder" icon, as soon as the icon appears, close cylinder valve.

Result of the tests is output after approximately 15 seconds.
If the BG ProAir on Demand Oxygen Dosage is okay, the "open cylinder valve" icon is displayed, as soon as the icon appears open cylinder valve.

8. Failure to conduct a proper bypass valve test_____2

Set RZ-7000 tester on leak test. Press red button for bypass valve. Oxygen must be heard to flow into the circuit, the breathing bag inflates.

9. Failure to conduct a proper minimum valve test_____2

Set RZ-7000 tester on vent. The breathing bag is vented automatically, by disengaging the locking lever, pump until minimum valve is heard to open in breathing bag and there is a hissing sound. Watch the pressure gauge, the minimum valve should open at a value between 0.5 and 3 mbar. Participant will verbally identify reading of opening of valve.

10. Failure to conduct a proper low/residual pressure warning test___2

Close cylinder valve. Watch the display or Connect ECU unit. The warning should be generated at approx. 650 psi. Alarm sounds intermittently, red indicator flashes. Unplug coupling from RZ-7000 tester. Participant will verbally state reading.

11. Failure to conduct a proper battery test_____2

On activation and deactivation, the Connect ECU automatically checks and displays the battery capacity. To switch off the Connect ECU, simultaneously press the right- and left-hand button the screen counts down from 3. Release the buttons. For three seconds, Connect ECU shows the battery status. The battery status must show at least 2 green segments (charge status at least 50%). Connect ECU switches off.

12. Failure to follow proper sequence when conducting the tests as prescribed in the instruction for use per Drager BG ProAir (each occurrence, or 15 pt. max.) _____5

13. Failure to have Test Apparatus fully assembled. (Ready for use) _____5

NOTE: Breathing hoses do not need to be in straps on test apparatus.

BG-ProAir Bench Record (Optional)

Team _____

Contestant _____

_____

_____

BG-PROAIR BENCH STATEMENTS OF FACT

1. A positive pressure leak could be caused by a leakage in or at device components.
2. The batteries in the electronics assembly should be replaced as necessary.
3. Dow Corning 111 is to be used to lubricate O-rings.
4. The pressure relief valve is designed to open when the pressure within the breathing circuit is between +40 and +80 millimeters (+4 mbar and +8 mbar) of pressure measured on the water gage.
5. To prepare for testing adjust zero point of the RZ-25 tester.
6. Test adapter is used to connect the BG-ProAir apparatus to the RZ-25 tester.
7. A leaky exhalation or inhalation valve could be caused by a defective valve seat or valve disc.
8. During the exhalation valve test, if valve is operating properly, -10 mbar is indicated on the pressure gauge.
9. The EPDM breathing hoses use Bayonet Rings.
10. During testing of the inhalation valve, if valve is operating properly, +10 mbar is indicated on the pressure gauge.
11. During the positive pressure leak test, the pressure change within 1 minute must be lower than 1 mbar.
12. Only DRAGERSORB 400 is to be used to fill the refillable absorber.
13. The factory packed cartridge is good for 2.5 years from the manufacture date.
14. A positive pressure in the breathing circuit prevents ambient air from entering the system.
15. The BG-ProAir is approved with a factory/refillable absorber.
16. The Connect ECU monitoring system comprises a sensor unit, electronics assembly, and Connect ECU.
17. The drain valve should not open at less than 10 mbar or more than 25 mbar.
18. A fully filled oxygen cylinder holds 414 liters of medical oxygen.
19. The accuracy of the Connect ECU pressure measurement is +or- 150 psi of the final value at 3000 psi.

20. The accuracy of the Connect ECU pressure measurement is +0 or- 72 psi of the final value at 580 psi.

21. Never replace the battery in potentially explosive areas.

22. The weight of a fully charged BG-ProAir apparatus is 16.9kg (37.3 lbs.).

23. Check the supply of oxygen gas on the Connect ECU at intervals of approximately 15 minutes.

24. The minimum valve provides greater than 80 L/min flow.

25. The breathing bag has a 6-liter volume.

26. Insert speech diaphragm, install retainer ring and tighten with spanner.

27. The belt and harness must be dried prior to storage, to prevent growth of mold and fungus.

28. The pressure reducer, minimum valve, and oxygen hoses must be replaced every 10 years.

29. The Connect ECU pressure sensor converts pressure into digital signal.

30. The cylinder connector and cylinder valve must not be contaminated with oil or grease.

31. Two TX10 screws are used in the battery cover of the electronics assembly.

32. Rubber parts must be particularly protected from direct exposure to radiation.

33. Do not use any solvents, such as acetone, alcohol, benzene, white spirit, trichloroethylene, etc. for cleaning rubber and silicone parts.

34. The first low pressure warning occurs when the pressure drops to approximately 650 psi.

35. At the first low pressure warning approximately 75% of the oxygen has been used up.

36. The last low-pressure warning occurs when the pressure drops to approximately 150 psi.

37. During the low-pressure warning test, the alarm should activate at approximately 650 psi for a 4-hour apparatus.

38. At the last low-pressure warning approximately 95% of the oxygen has been used up.

39. To start the main alarm, press the Yellow panic button in center of the Connect ECU.

40. When the first low pressure warning occurs, the alarm sounds intermittently, the red LED flashes, and the screen of the Connect ECU turns red.

41. When the last low-pressure warning occurs, the alarm sounds intermittently without stopping and the red LED flashes constantly.

42. Medium pressure is delivered to the minimum valve.

43. The drain valve opens at between 10 and 25 mbar.

44. The BG-ProAir breathing circuit is designed with an air cooler that can be filled with ice packs or phase change material to reduce the temperature of the inhaled breath.

45. Remove the Tally Key to activate the motion sensor.

46. All parts which come in contact with the exhaled air must be thoroughly cleaned and disinfected after use.

47. Disinfect parts by immersing them in a disinfectant bath using an approved disinfectant.

48. Slide the minimum valve into the slot in the breathing bag.

49. All parts which have been disinfected should be rinsed thoroughly under running water.

50. CO_2 absorber is not approved for use after indicated expiration date.

51. The maximum temperature of the air used to dry parts should not go above 60 degree C (140-degree F).

52. U.S. Department of Transportation requires hydro tests on composite cylinders every 5 years.

53. The O-ring under the speech diaphragm should be lubricated with Dow Corning 111.

54. The BG-ProAir is approved for use at temperatures above -6 degree C (21-degree F)

55. A defective pressure reducer should be replaced as needed.

56. Only oxygen (medical grade or better) with > 99.5% purity is to be used to fill the BG-ProAir oxygen cylinders.

57. Ice packs in the cooling system should only be used at ambient temperature above 0 degree C (32-degree F).

58. Pressurized oxygen in contact with oil, grease, or other contamination can result in fire or explosion.

59. It is safe to use the BG-ProAir for up to 4 hours with a yellow battery indicator with 1 bar.

60. The battery must be replaced if a red battery warning is indicated.

61. A defective bypass is the probable cause if the manual by-pass valve does not blow-off.

62. The blue LED pulses to indicate that the Connect ECU is operating normally.

63. Bypass output is > 80 L/min.

64. Relief valve activation is 4-8 bar or (58-116 psi).

65. The oxygen cylinder burst disc ruptures at 4,450 psi (307 bar).

66. Refillable absorber concerns are over packing and under packing.

67. The FPS 7000 masks allow 90% peripheral vision.

68. Polycarbonate or Plexiglas lenses can be used in the mask.

69. A minimum of 2175 psi is needed for a Connect ECU to perform a proper high pressure leak test.

70. The drain valve opens between 10 and 25 mbar and is therefore out of the RZ reading range.

71. To prepare the ice pack:

    Insert ice packs into freezing aid
    Freeze at least 24 hours @ -16 degree C (3-degree F)
    Remove from freezing aid
    Stack on top of each other

72. If the speech diaphragm is deformed or shows signs of damage, it must be replaced.

73. The BG-ProAir Connect ECU lights up when the button is briefly pressed.

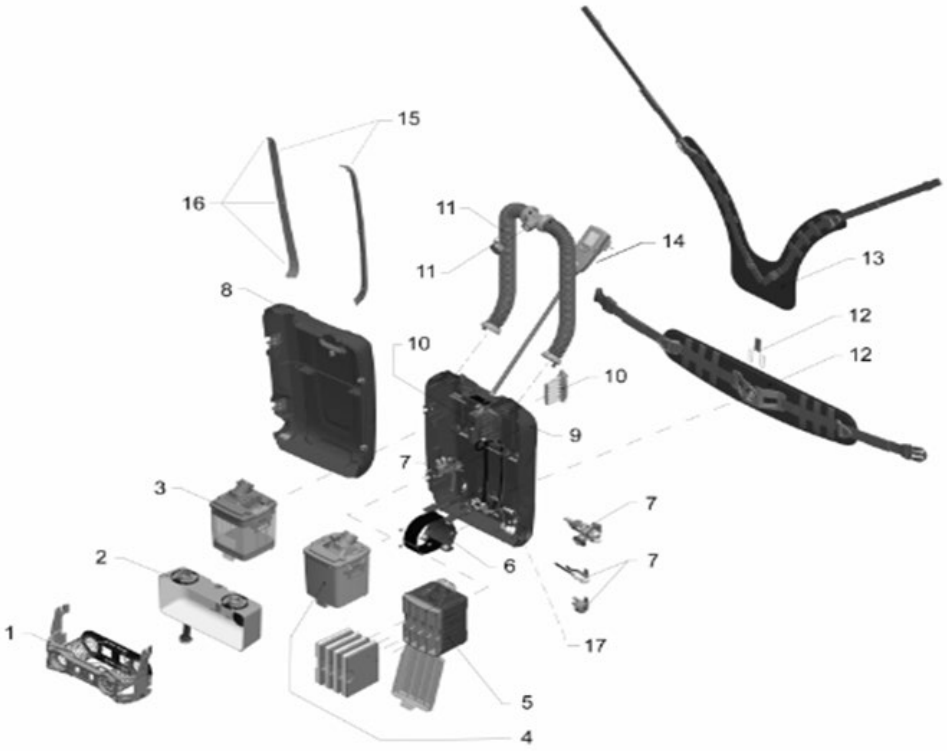
74. Press then release the right-hand button to display temperature.

75. Do not re-use Factory absorbers.

76. When conducting component checks use a test pressure between +7 mbar and +7.5 mbar with a max pressure loss of 1 mbar/min.

77. The only battery approved for use with the Connect ECU is the Energizer L91.

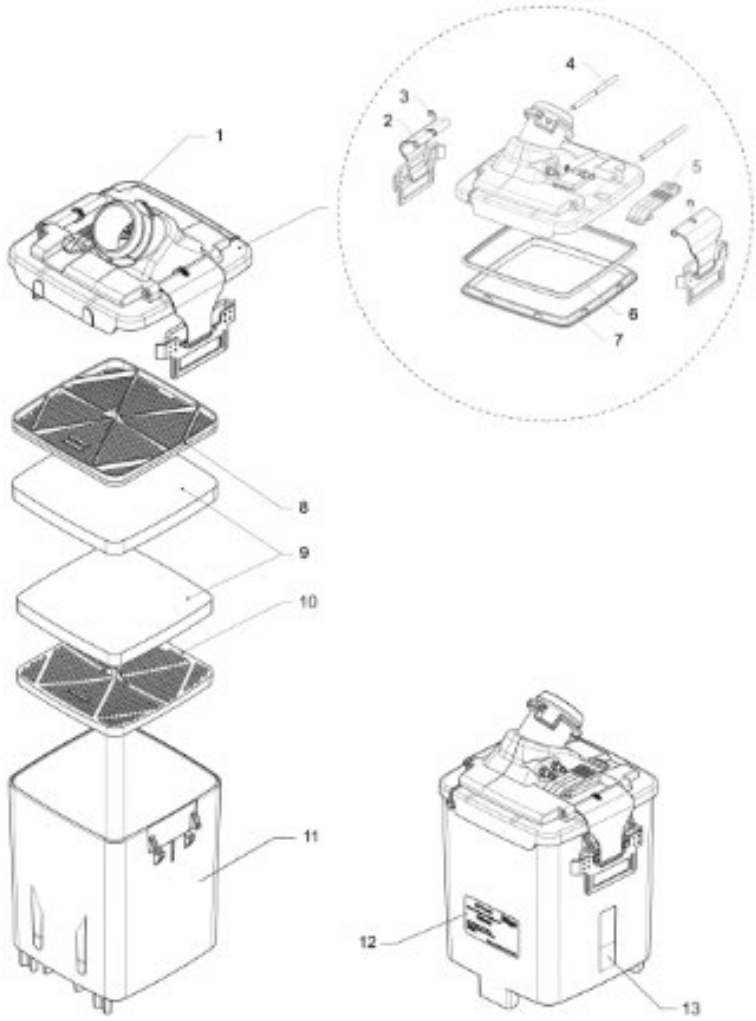
BG-ProAir



1 2 Cons. No. Designation	1 2 Cons. No. Designation
1 Spring Bridge 2 Breathing Bag 3 Refill Absorber 4 Breathing Air Cooler, PCM 5 Ice Cooler 6 Cylinder Holder 7 Pneumatics 8 Housing – Lower Shell 9 Housing – Upper Shell 10 Electronics	11 Breathing Connection 12 Waist Belt 13 Shoulder Harness 14 Connect ECU 15+16 BG ProAir Skids Set 16 Screw 17 Spare Part Set Handwheel BG ProAir -

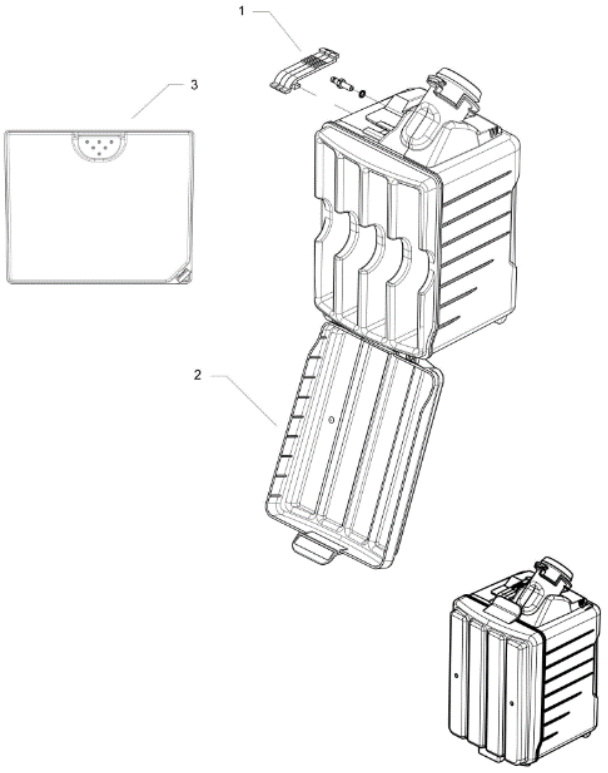
Refill Absorber

3 Refill absorber



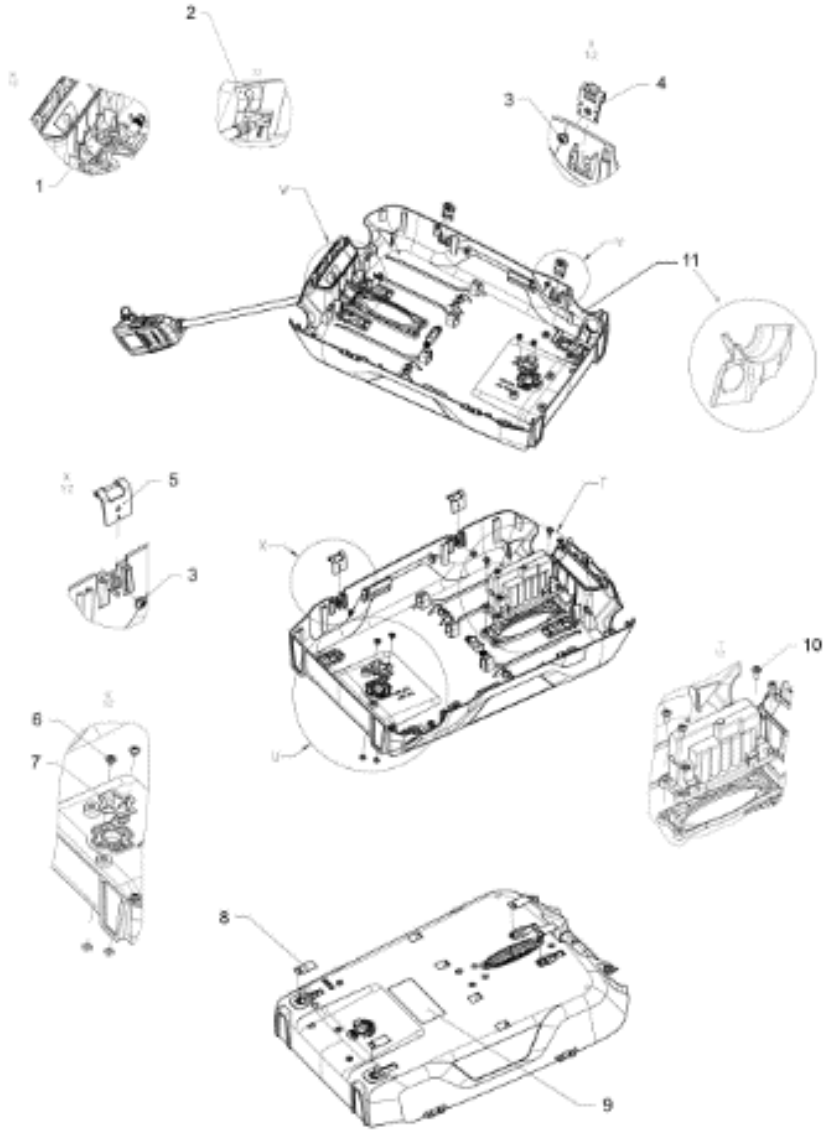
1 2 Cons. No.	Designation	1 2 Cons. No.	Designation
1	Refill Absorber Lid	7	Frame
2	Cooler/Absorber Lock	8	Top Sieve
3	Retaining Washer	9	Filter Pad
4	Cylinder Pin	10	Bottom Sieve
5	Snap-Fit Cooler, Absorber	11-13	Refill Absorber Housing
6	Sealing	12	Type Label
		13	Absorber RFID

Ice Cooler, Complete



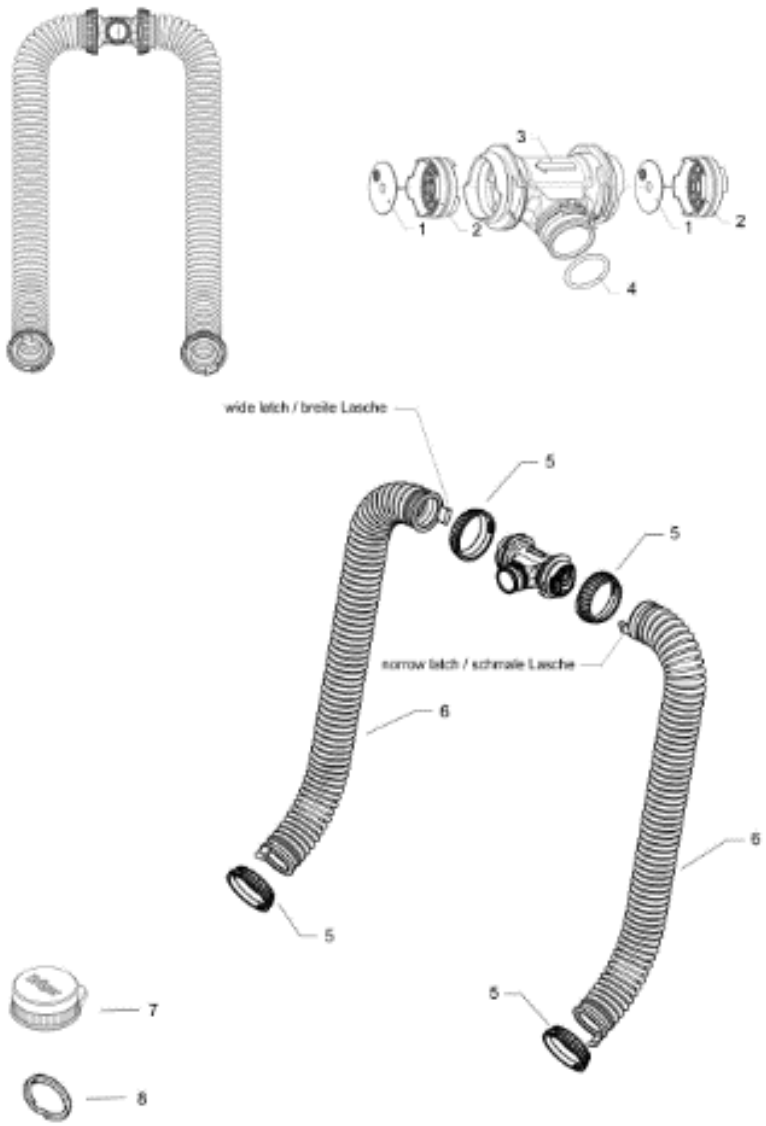
1 2 Cons. No. Designation	1 2 Cons. No. Designation
1 Snap-Fit 2 Ice Cooler Lid 3 Ice Cooler Cartridge	

Housing – Lower Shell



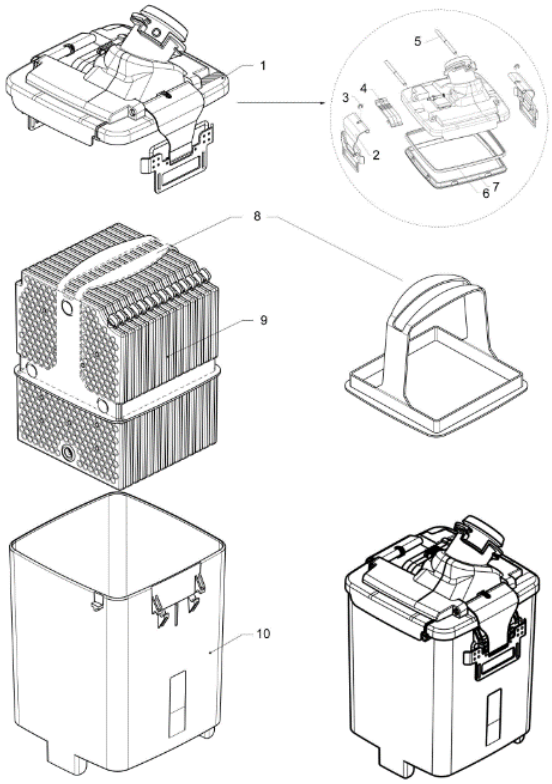
1 2 Cons. No. Designation		1 2 Cons. No. Designation	
1	Strain Relief Plate, Inside	6	Flat Head Screw
2	Strain Relief Plate, Outside	7	Waist Belt Bracket
3	Flat Head Screw	8	Leaf Spring Harness Mount
4	Snap-In Plate Lock	9	Approval Label
5	Hinge Bottom	10	Flat Head Screw
		11	Valve Handle

Breathing Connection



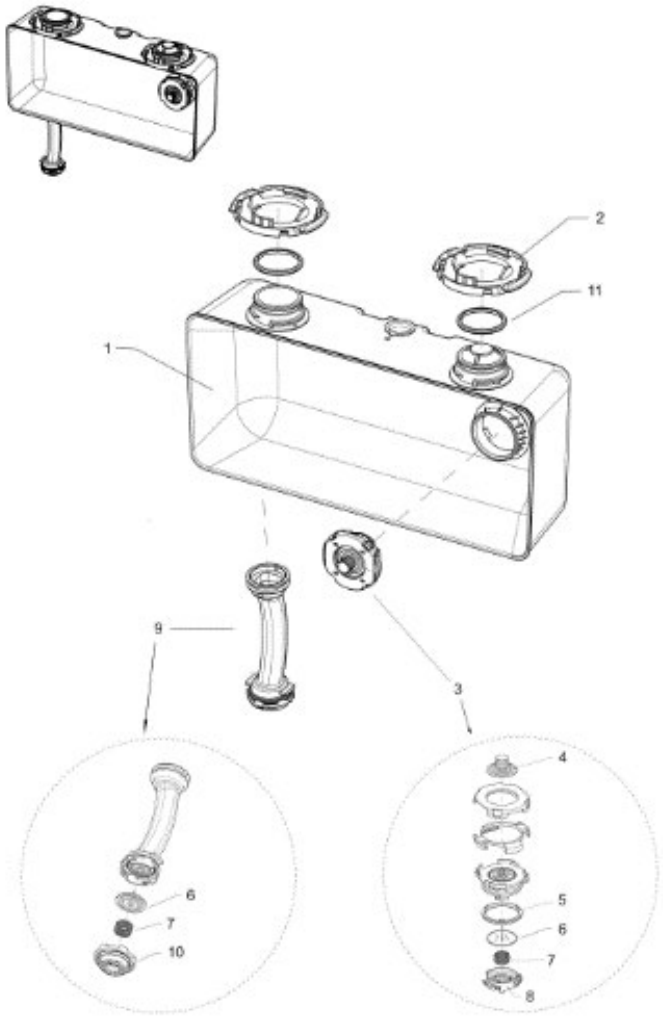
1 2 Cons. No. Designation	1 2 Cons. No. Designation
1 Valve Disc 2 Directional Valve Housing 3 Connector Piece 4 O-Ring	5 Bayonet Ring 6 Breathing Hose 7 Sealing Cap 8 Split Ring

Breathing air Cooler, PCM, Compl.



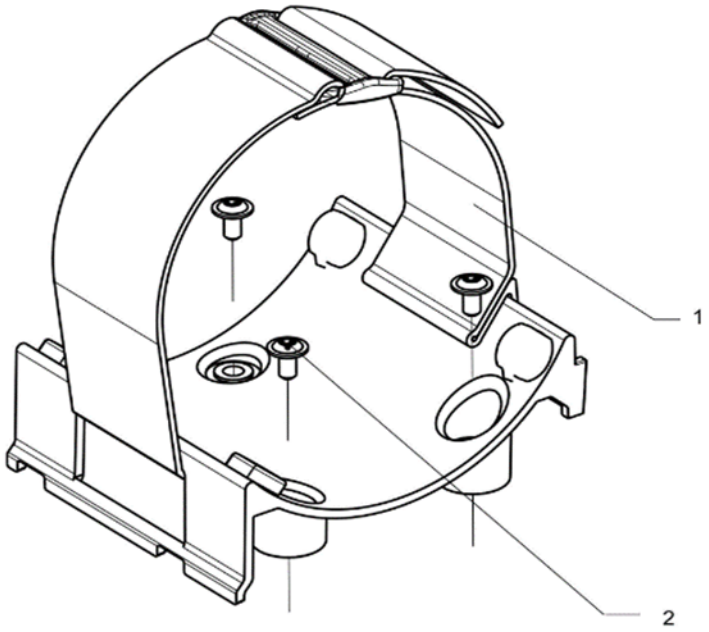
1 2 Cons. No. Designation	1 2 Cons. No. Designation
1 PCM Cooler Lid, Compl. 2 Lock, Compl. 3 Retaining Washer 4 Snap-Fit 5 Cylinder Pin 6 Sealing 7 Absorber Frame 8 Stack Bracket 9 PCM Container, Filled	10 PCM Cooler Case

Breathing Bag



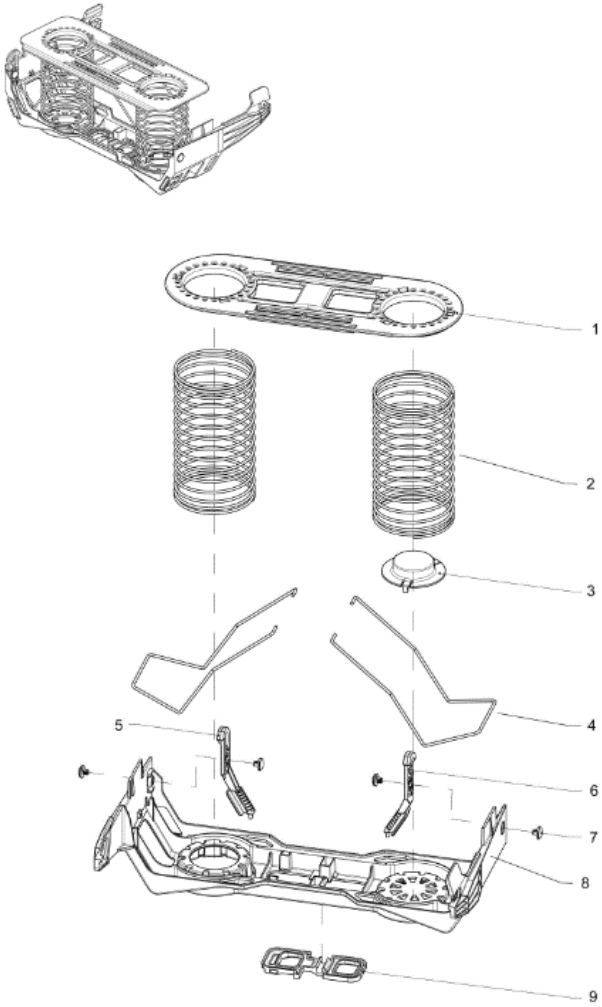
1 2 Cons. No. Designation	1 2 Cons. No. Designation
1 Breathing Bag 2 Breathing Bag Lock 3 Relief Valve 4 Relief Valve Disc 5 Relief Valve Seal 6 Valve Disc	7 Spring 8 Valve Cap 9 Drain Valve 10 Drain Valve Cap 11 Connector Seal

Cylinder Holder



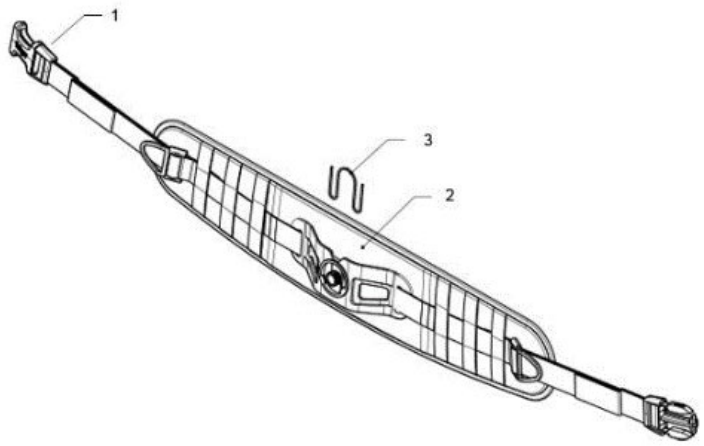
1 2 Cons. No. Designation	1 2 Cons. No. Designation
1 Cylinder Strap 2 Flat Head Screw	

Spring Bridge



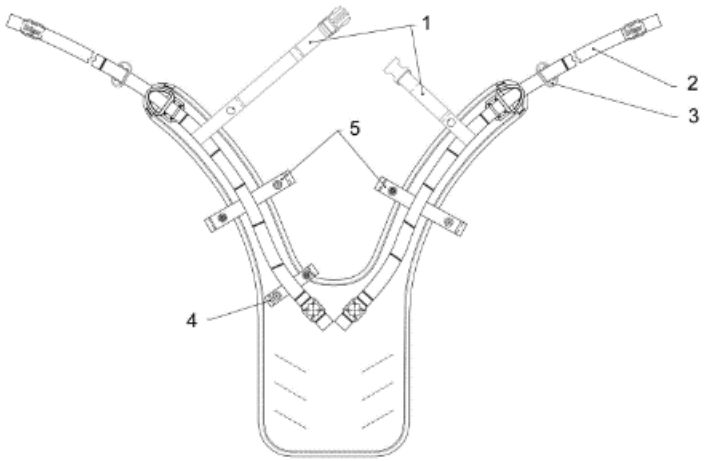
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Pressure Plate	7	Assembly Clip
2	Breathing Bag Spring	8	Spring Bridge
3	Pressure Relief Valve Limit Stop	9	Locking Lever
4	Wire Bow		
5	Snap-In Hook, Left		
6	Snap-In Hook, Right		

Waist Belt



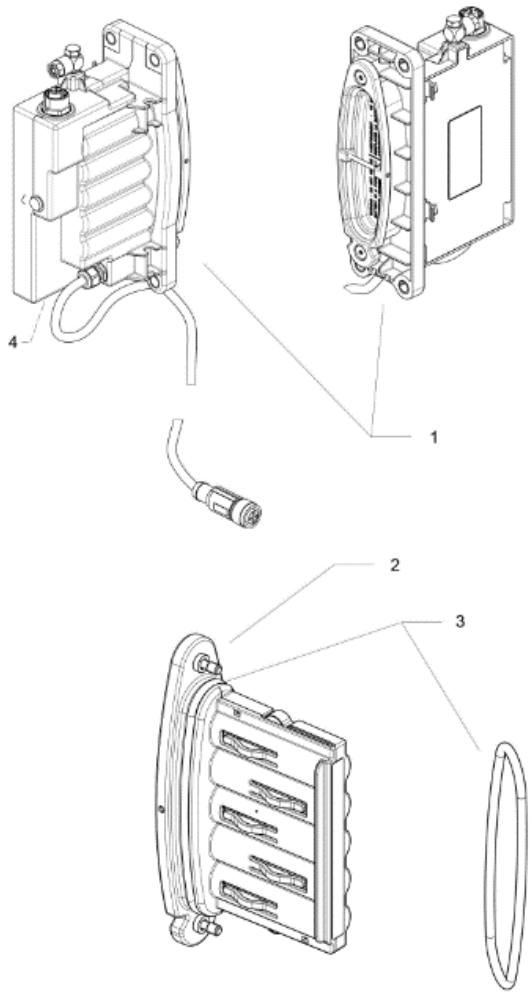
1 2 Cons. Designation No.	1 2 Cons. No. Designation
1 Buckle 2 Waist Belt Plate 3 Splint	

Shoulder Harness



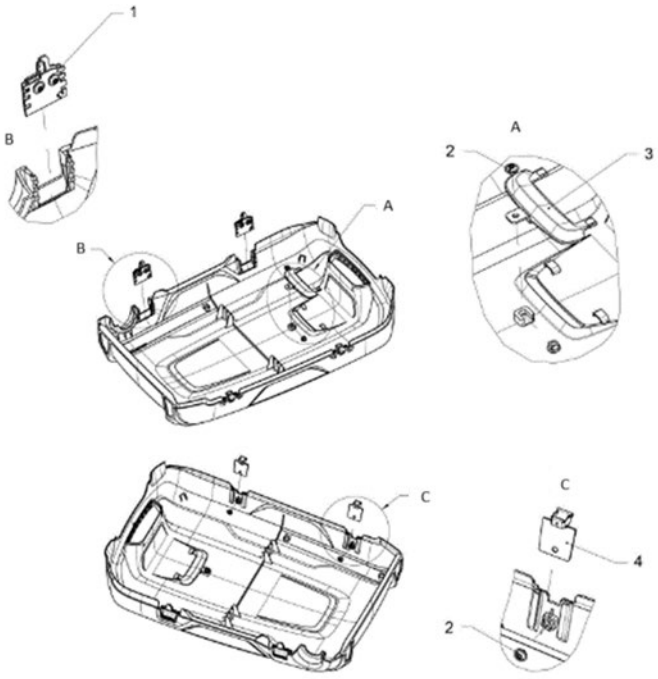
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Chest Strap		
2	Webbing With Loop Head		
3	Harness Anchor		
4	Hose Loop (100 mm)		
5	Hose Loop (210 mm)		
1-5	Shoulder Harness, Comfort		

Electronics



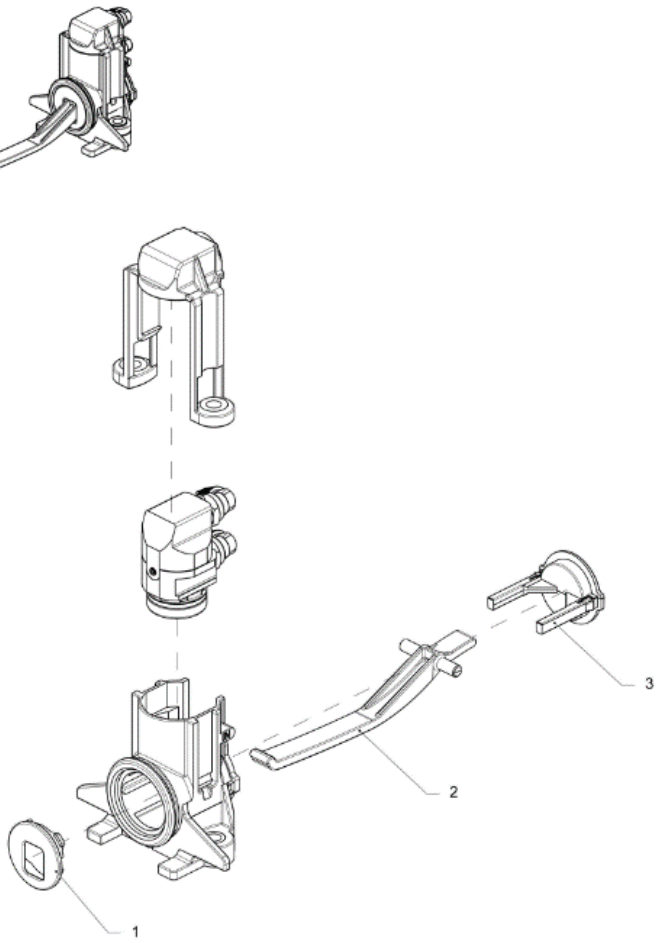
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1-4	Electronics Assembly		
2+3	Battery Carrier, Complete		
3	O-Ring		
4	Ventilation Diaphragm		

Housing – Upper Shell



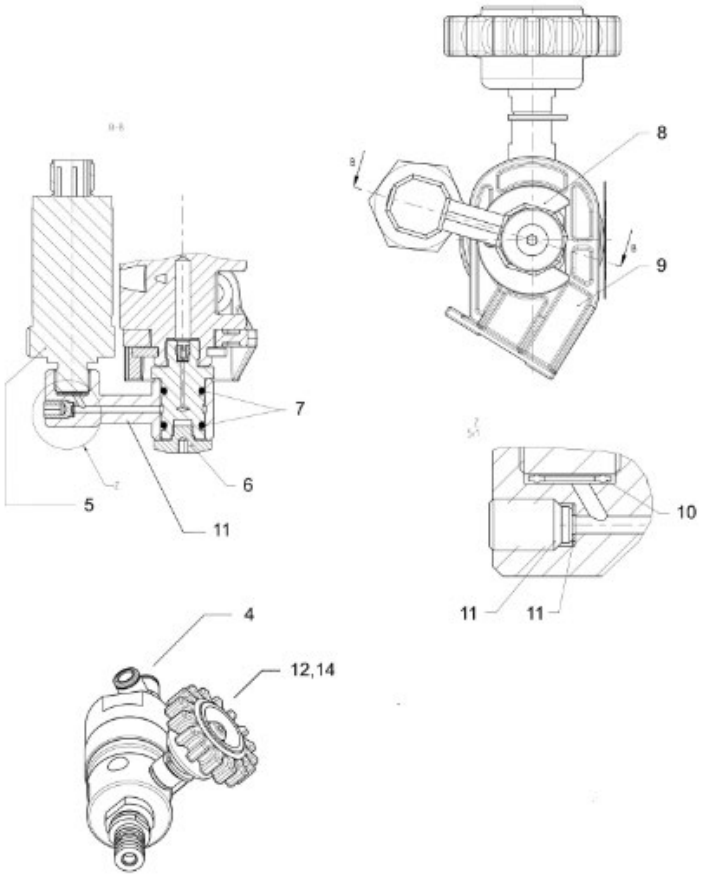
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Lock		
2	Flat Head Screw		
3	Buddy Light Window		
4	Hinge Top		
1-4	Upper Shell Compl.		

Minimum Valve



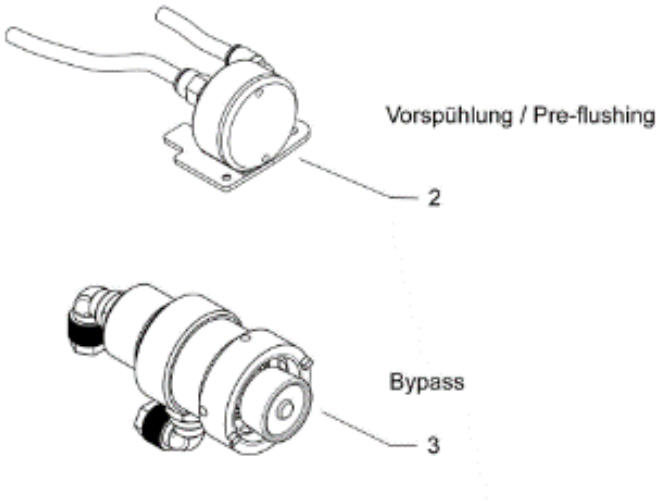
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	Dust Cover		
2	Valve Lever		
3	Valve Lever Cover		
1-3	Minimum Valve, Compl.		

Pressure Reducer



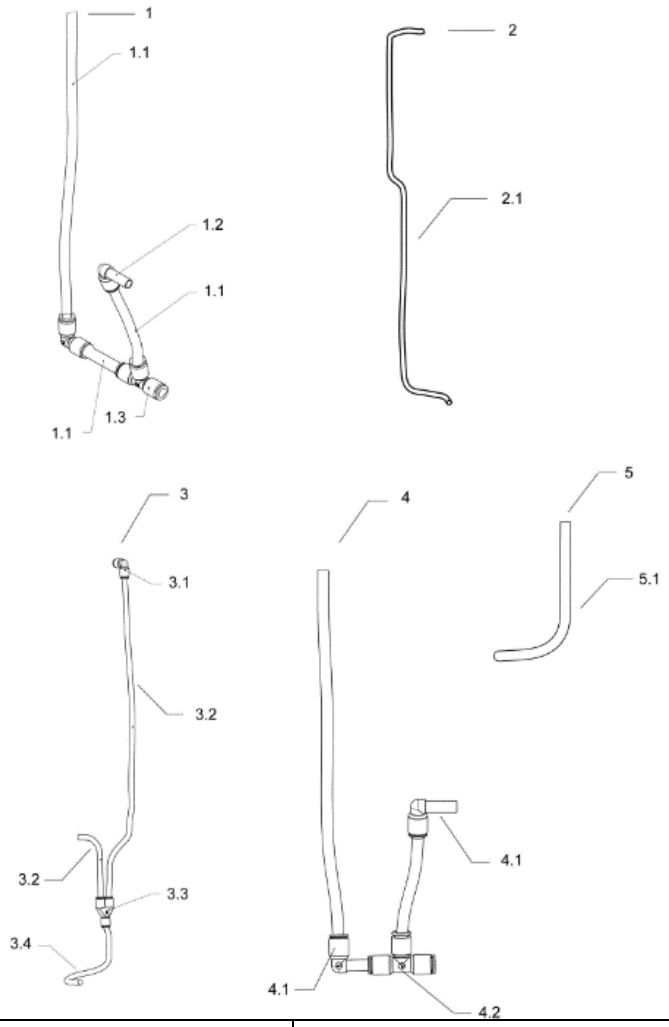
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
4	Pressure Reducer, CGA 540	10	Sealing Ring
5	PSP 5 Pressure Sensor	11	Angle Connection
6	Screw	12	Hand Wheel
7	O-Ring	13	O-Ring
8	Clamp	14	Sinter Filter
9	Bracket		

Pneumatics



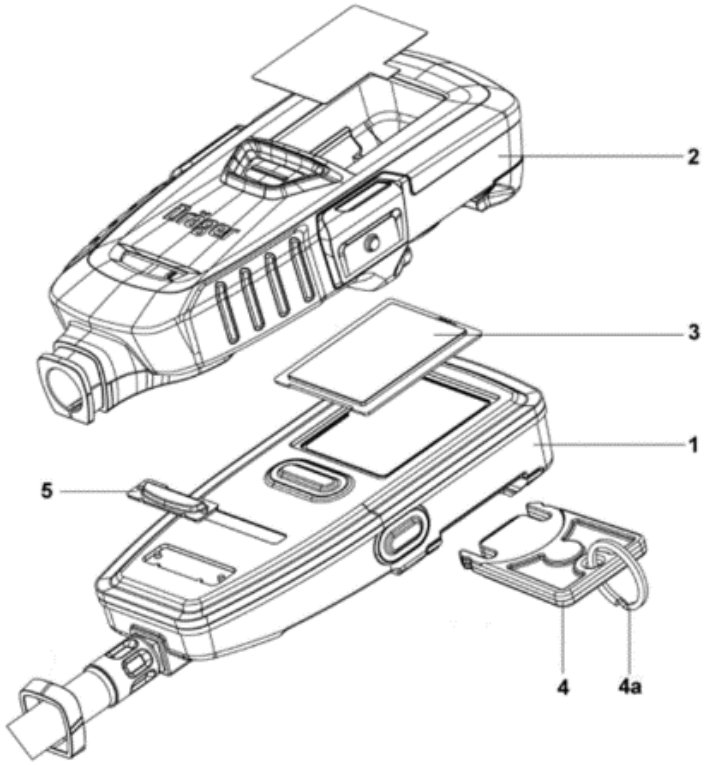
1 2 Cons. Designation No.	1 2 Cons. No. Designation
2 Pre-Flush 3 Bypass	

Tubes/Air Lines



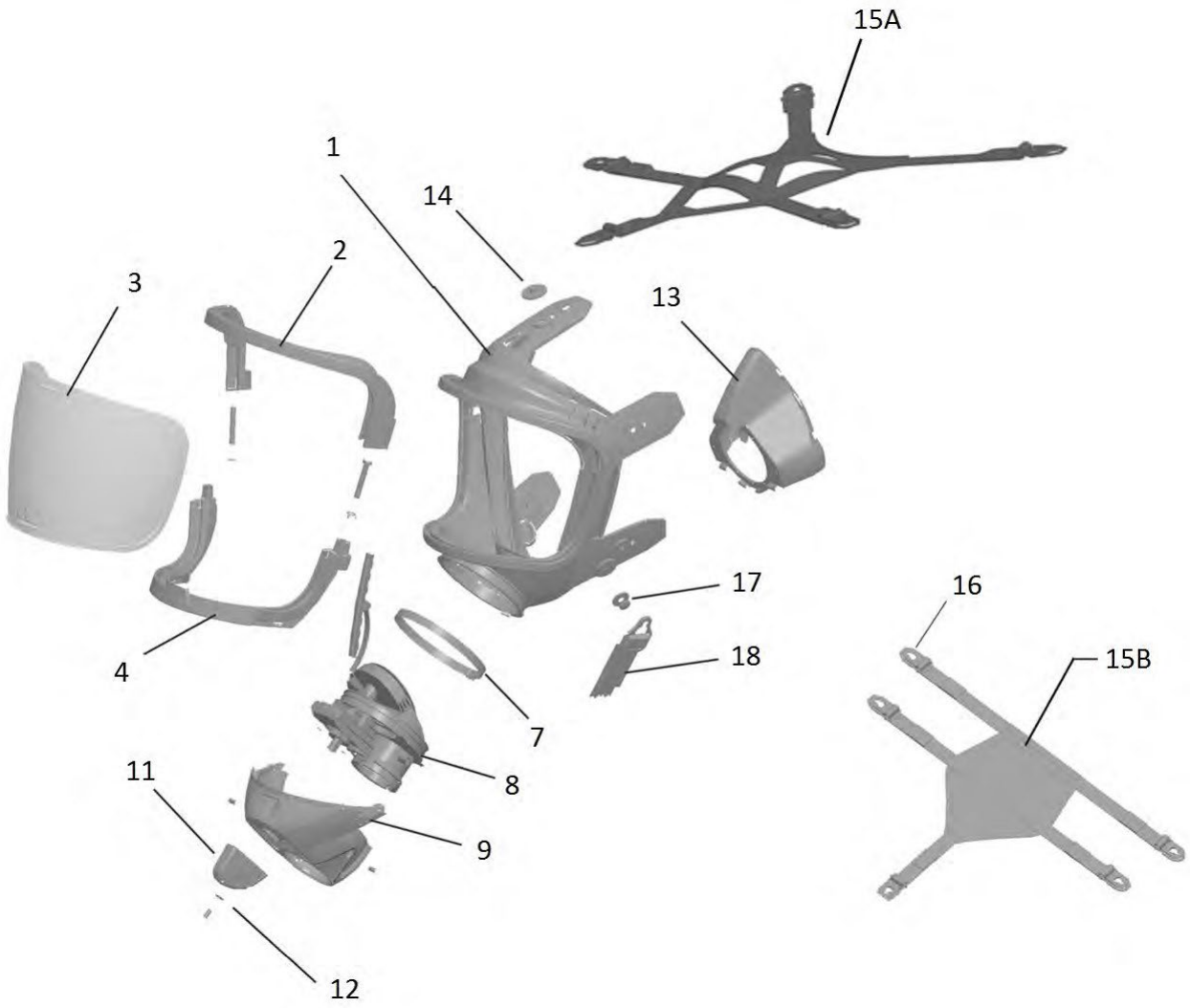
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1-1.3	Tube Assembly, Preflush	3.3	Y-Push-In Connector
1.1	Spare Part Tube, Black	3.4	Spare Part Tube, Blue
1.2	L-Push-In Connector, 1-Sided	4-4.3	Tube Assembly, MP
1.3	T-Push-In Connector, 1-Sided	4.1	L-Push-In Connector
2-2.1	Tube, Bypass	4.2	T-Push-In connector
2.1	Spare Part Tube, Red	5-5.1	Tube, E-Box
3-3.4	Tube Assembly, Absorber	5.1	Spare Part Tube, Blue
3.1	L-Push-In Connector		
3.2	Spare Part Tube, Black		

Connect ECU (Electronic Control Unit)



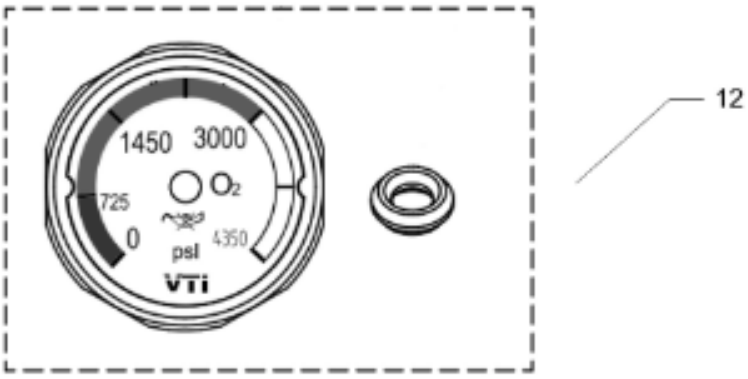
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
1	ECU Connect Aftersales		
2	Connect UI Module Rubber Cover		
3	Sacrificial Screen Display		
4	Tally Key		
4a	Split Ring		
5	Sacrificial Screen LED		

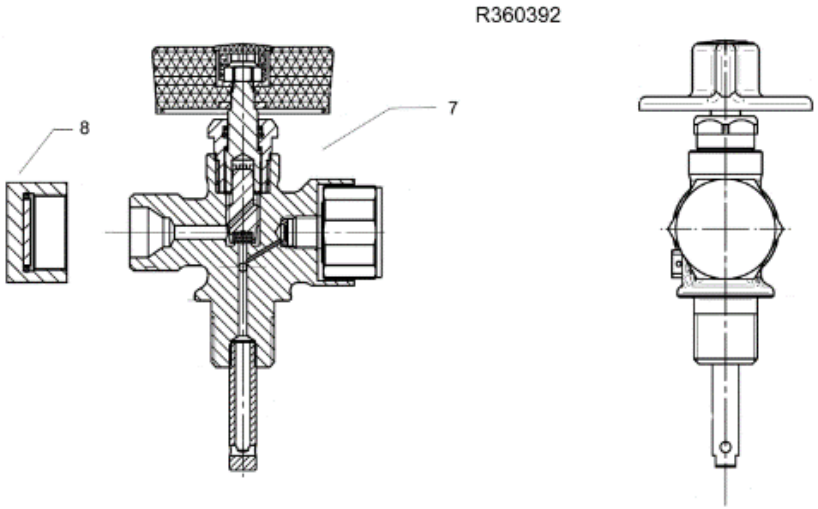
FPS 7000 Mask



1 2 Cons. No. Designation	1 2 Cons. No. Designation
1 Mask Body FPS 7000 2 Upper Visor Frame 3 Visor 4 Lower Visor Frame 7 Clamp 8 Connector Piece 9 Cover 11 Turning Knob 12 Disc	13 Inner Mask 14 Button 15A Head Strap 15B Hairnet 16 Sliding Buckle 17 Double Button 18 Neck Strap

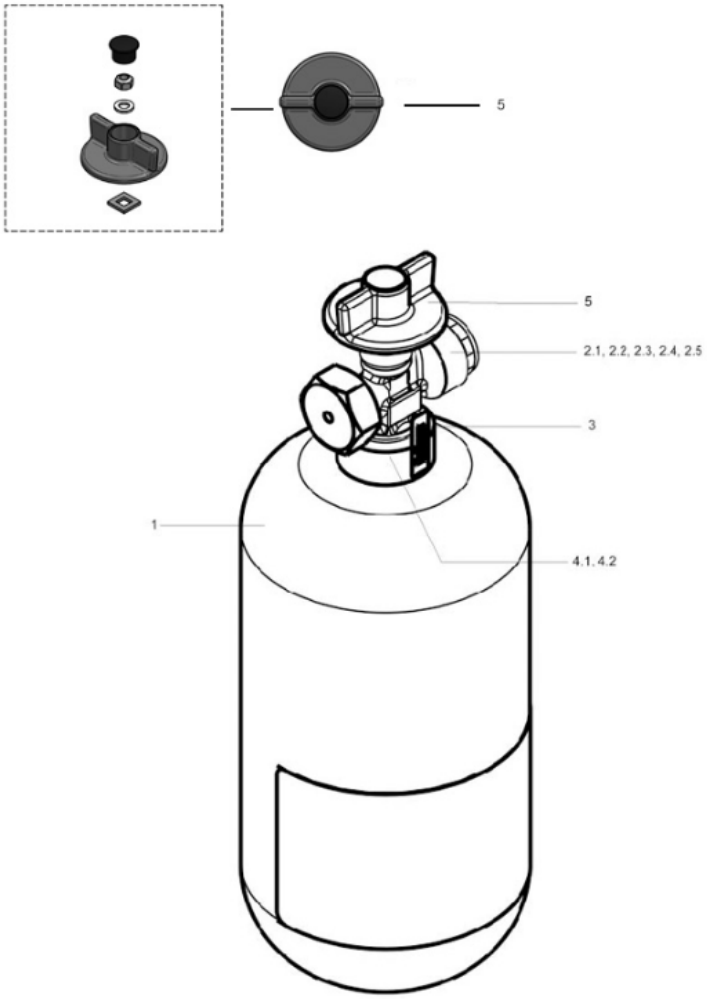
Oxygen Cylinder Valve





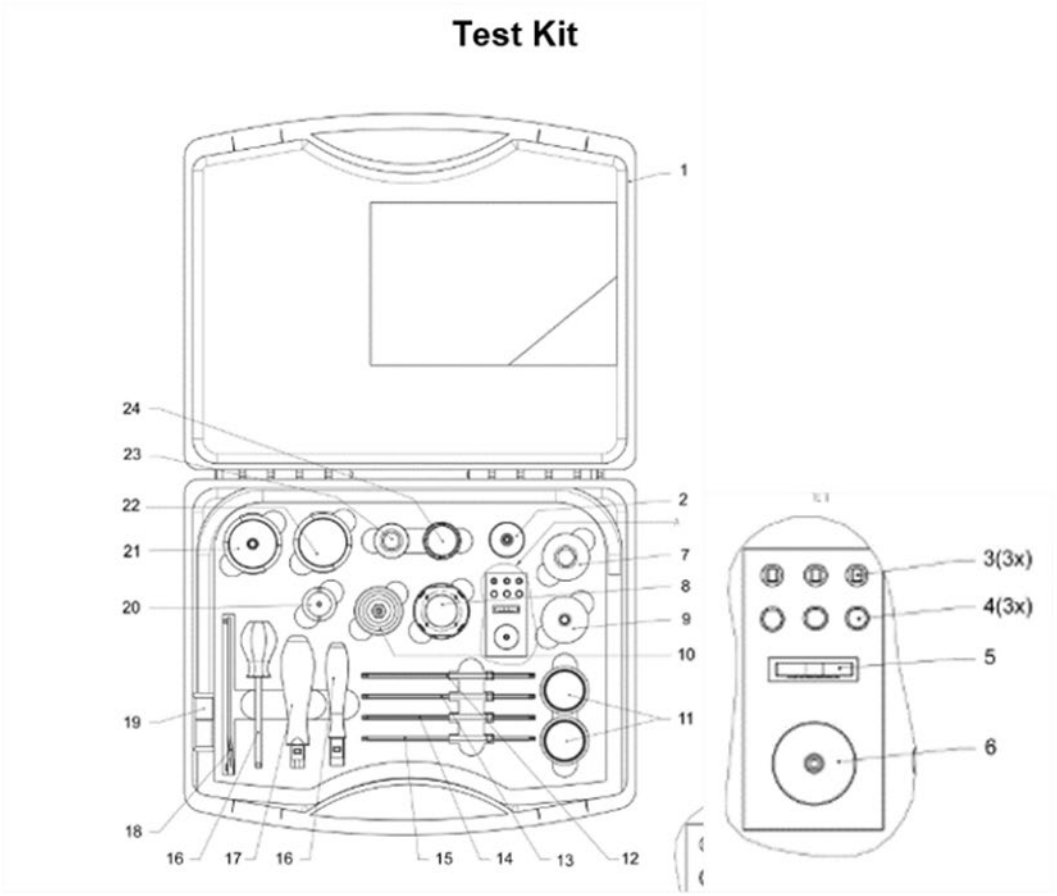
1 Cons. No.	2 Designation	1 Cons. No.	2 Designation
7	Cylinder Valve O2 207 bar CGA		
8	Locking Nut .903-14 NGO-RH		
12	Spare Part Set Gauge, PSI		

Oxygen Cylinder



1	2	1	2
Cons. No.	Designation	Cons.	No. Designation
1,2.4, 3, 4.2	Cylinder 2/200 O2 CGA540 NGO	4.2	O-Ring 18.72x3.53 FKM 80 Shore A
2.4	Cylinder Valve O2 207 bar CGA	5	Spare part set handwheel
3	Label		

Test Kit



1 2 Cons. No. Designation	1 2 Cons. No. Designation
1 Case, BG ProAir Test Set 2 Adapter RZ 7000 3 Plug, Male Coupling 4 Blind Plug 5 O-Ring Removal Tool 6 Adapter, Quick Coupling 7 Breathing Hose Sealing Plug 8 Breathing Bag Lock Plug 9 Test Connection, Breathing Hose 10 Test Adapter, Hose Connection 11 Plug c/a Breathing Bag Side 12 Torque TORX Blade T10	13 Torque TORX Blade T20 14 Torque TORX Blade T25 15 Torque Change Blade 6Kt 2.5 16 Torque Screwdriver 17 Torque Screwdriver 0.8 – 5.0 Nm 18 Face Spanner 19 Test Hose 20 Bypass Adapter 21 Breathing Bag Adapter 22 Breathing Bag Plug 23 Plug 24 Drain Valve Plug