



# **MSA G1 SCBA**

**(2216, 4500 and 5500 psig)**

## **Product Specification**

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### **I. Approvals:**

1. Apparatus shall be approved by the National Institute for Occupational Safety and Health (NIOSH), under 42 CFR, Part 84 for chemical, biological, radiological, and nuclear protection (CBRN) with 30-, 45- or 60-minute-rated service life and compliant with all requirements of the National Fire Protection Association's 2013 Edition of NFPA-1981 Standard on Open-Circuit Self-Contained Breathing Apparatus.
2. Units equipped with integrated PASS device must meet requirements of NFPA 1982, 2013 edition.
3. Units equipped with emergency egress system shall also comply with NFPA 1983 Standard on Fire Service Life Safety Rope and System Components, 2012 Edition; Type: Escape.
4. Units equipped with accountability system must meet minimum requirements for FCC part 15 and part 90.

### **II. Specific Requirements:**

#### **Facepiece**

1. Facepiece shall have removable inhalation check valve to prevent exhaled air from entering and contaminating regulator (demand valve).
2. Facepiece shall have open port to provide miniscule breathing resistance when regulator is not attached.
3. Facepiece shall not contain electronic components.
4. Facepiece shall provide means to display to user with visual indicators for HUD.
5. Facepiece shall have icon for HUD system status indicators.
6. Facepiece shall have regulator attachment that does not bear any weight on lens.
7. Facepiece shall have effective field of view of 86% and overlapping field of view of 122% without attached component.
8. Facepiece shall be available in three sizes in Hycar Rubber (small, medium, large).
9. Facepiece shall have nosecup comprised of silicone rubber and available in three sizes (small, medium, large).
10. Facepiece shall have three head harness options constructed of flame/heat resistant assembly: Kevlar Head Harness (4-pt. adjustable), Kevlar 5-pt. adjustable and rubber 5-pt. adjustable.
11. Facepiece shall have universal lens that can be used with all three facepiece sizes, shall be comprised of non-shatter type material and shall be field-replaceable.
12. Lens shall be hard-coated on outside and anti-fog coated on inside.
13. Facepiece shall have optional flame/heat-resistant fabric or rubber neck strap to carry facepiece in ready position for quick donning.

14. Facepiece shall have removable speaking diaphragm with aluminum-coated membrane, suitably protected and located centrally on facepiece for optimal voice projection.
15. Facepiece shall have exhalation valve that is to be serviceable without special tools.
16. Facepiece shall be capable of water submersion for cleaning and disinfection.
17. Facepiece provides optional RFID chip for asset and maintenance tracking.

**Mask-Mounted Regulator (Demand Valve): Push-to-Connect**

1. When doffing regulator, regulator disengagement shall simultaneously stop air flow and release regulator.
2. Regulator shall house electronic module that functions as microphone and HUD system.
3. Regulator shall be equipped with variable flow bypass.
4. Regulator shall not have exposed wiring in order to prevent snags and increase product durability.
5. Regulator shall have two cover options: hard cover or purge cover.
6. Regulator shall have fewer than 35 parts that are easily replaceable without special tools.
7. Regulator shall have two options for air-supply hose:
  - 1) Continuous hose from pressure reducer to regulator.
  - 2) Quick-connect hose that terminates on shoulder in front of user.
8. Regulator must be equipped with positive protection Tetraplex Shield membrane that covers diaphragm, preventing permeation of CBRN agents.
9. Regulator shall have optional RFID chip for asset and maintenance tracking.

**Heads-Up Display (HUD)**

1. Heads-Up Display (UD) System shall be integrated within regulator, eliminating snag hazards and increase product durability.
2. HUD shall be powered from central power system.
3. HUD System shall eliminate cross-talk among firefighters.
4. HUD System shall be immune to radio frequency interference (RFI) and must function properly in close proximity to fire service hand-held radios.
5. HUD System shall separate pressure indicators from status indicators:
  - o Left: status indicators.
  - o Right: pressure indicators.
6. HUD system shall provide user with remaining cylinder air volume, available in four increments through series of four colored LEDs:
  - o Four green lights                      76 to 100% cylinder volume
  - o Three green lights                      51 to 75% cylinder volume
  - o Two flashing amber lights              36 to 50% cylinder volume
  - o One flashing red light                  0 to 35% cylinder volume
7. HUD status indicators shall be icon-based and display battery life warning, PASS alarms, EVACUATE indicator, and secondary alarm indicator.
8. HUD shall incorporate photoelectric sensor that senses ambient light conditions, automatically adjusting display to one of multiple pre-programmed light intensities.
9. Buddy lights shall be visible from outside of firefighter's facepiece.
10. HUD system shall allow user to select from four modes of operation:
  - 1) Continuous pressure mode that shall always have pressure LEDs on.
  - 2) Intermittent pressure mode that shall turn on first three increments when reached for 20 seconds.
  - 3) Oscillating pressure mode that shall brighten and dim LEDs every 20 seconds.
  - 4) Mixed pressure mode that shall turn on first two increments when reached for 20 seconds and last two increments are in continuous mode.
11. HUD shall be field-removable and replaceable without use of special tools.

### **Universal Air Connection (UAC)**

1. System shall be capable of:
  - 1) Refill within immediately dangerous to life or health (IDLH) atmospheres.
  - 2) Transfilling between two SCBA wearers (connection allows for donation and receipt of air), providing emergency breathing system (EBS) while maintaining NIOSH approvals.
  - 3) Quickly refilling (approximately one-minute duration) SCBA cylinder from mobile compressor, cascade system or RIT pack.
  - 4) Extending wearer's air supply over longer duration when remote cascade system or other compressed gas source is located within remote area.
2. Primary UAC shall be illuminated when supply pressure reaches Low Pressure Warning Alarm or can be configured to optional medium pressure warning alarm.
3. SCBA shall have secondary options for UAC to be mounted on user's waist.

### **Pressure Reducer (First-Stage Regulator) with Primary Low Pressure Warning Device**

1. Pressure reducer shall incorporate downstream valve to ensure fail-safe design when in open position.
2. Pressure reducer shall incorporate bell alarm mechanism.
3. Bell alarm mechanism shall be an air-actuated, continuously ringing audible warning alarm, automatically operating when supply cylinder air pressure reaches approximately 35% of rated service life.
4. Bell alarm mechanism shall cover multiple levels of frequencies to cover all hearing levels.
5. Bell alarm mechanism shall be user-accessible while wearing SCBA.
6. Pressure reducer reduces cylinder pressure to outlet pressure not to exceed 115 psi; outlet pressure must be adjustable.
7. Pressure reducer shall have flow capacity of 700 liters per minute at full pressure.
8. Pressure reducer shall have two options for cylinder connection type: threaded or quick-connect.
9. Quick-connect connection shall not be removable from cylinder while under pressure.
10. Pressure reducer shall have two options for cylinder connection location: remote connection or direct connection.
11. Pressure reducer shall be capable of converting from threaded to quick-connect or vice versa.
12. Pressure reducer body shall be constructed of high-strength aluminum alloy and anodized with Teflon hard coat to minimize corrosion and wear of internal and external components.
13. Pressure reducer shall be sealed system that does not allow moisture to enter valve components.
14. Pressure reducer shall have no more than 42 individual regulator replacement parts.
15. Pressure reducer shall not require special tools for disassembly.
16. Pressure reducer shall have two accessory ports, one medium pressure and one high pressure.

### **Cylinders**

1. Cylinders with 2216 psig operating pressure must be 30-minute-rated. Cylinders with 4500 psig operating pressure must be available in 30-, 45- and 60-minute durations. Cylinders with 5500 psig operating pressure must be available in 30-, 45-, 60-, and 75-minute durations.
2. Cylinders must be available in three operating pressures: 2216, 4500 and 5500 psig.
3. Cylinder shall be constructed of deep-drawn, seamless aluminum liner that is fully wound over entire surface (except for thick neck area) with high-strength carbon fiber filaments impregnated with epoxy resin.
4. Cylinder shall contain cylinder valve that shall incorporate pressure gauge to indicate cylinder pressure at all times. Pressure gauge face shall be luminescent. Hand wheel shall be placed at 90° angle from cylinder axis.
5. Cylinder valve shall be available in two options: remote connection or direction connection
6. Cylinder valve shall incorporate flow control insert to limit air flow over hand wheel's first half-rotation, minimizing propulsion thrust in event that cylinder is mishandled.
7. Cylinder valve shall incorporate CGA thread that can be converted to quick connect cylinder without special tools.

8. Cylinder shall have bracket and boot that can be user-installed and provide positioning and added security of cylinder to backplate.

#### **Emergency Egress Rescue Belt (Optional)**

1. In addition to meeting NFPA 1983 standard, rescue belt must be NIOSH-certified and NFPA 1981-2012 edition-compliant as SCBA component.
2. Rescue system shall include Ara-shield pouch, carabiner or Crosby hook with sewn-in connection and F4 Sterling auto-locking descender.
3. Rope shall be available with 50-ft. FireTech 32 rope or aramid/nylon blend.
4. Rope shall be detachable under user load, with pull-to-release knot at end of rescue rope as safety feature.
5. Rope assembly shall have two end-of-rope flags, one at 15 feet and second at 10 feet.
6. Rescue system shall have double-action waist belt buckle as safety feature.
7. Rescue system shall have web management system for reduced snag hazards.
8. Rope assembly shall be available as replacement part.
9. Rescue system shall be capable of quickly detaching from SCBA as safety feature.

#### **PASS Device**

1. PASS device shall contain power, control and battery modules.
2. Power module shall provide power to all electronic SCBA components from battery module and act as central power system.
3. Power module shall act as central command center, distributing all information and data among electronic components.
4. Battery module shall be powered by six C-cell batteries or one lithium-ion rechargeable battery.
5. Expected battery service life batteries shall be 4 to 6 months on average for units with speaker module (without telemetry) and 3 to 5 months on average with telemetry.
6. PASS device shall be designed for battery level check and removal of batteries while SCBA remains in jump seat.
7. Power module shall be capable of illuminating UAC fitting when supply cylinder reaches 35% of rated service time.
8. Control module shall have analog and digital display for added redundancy. Analog gauge must be positioned above digital display as viewed by user.
9. Control module shall be equipped with full color graphical display. Display shall be reprogrammable and capable of future integrations. Display's background color coordinates with HUD pressure status.
10. Control module shall automatically provide information to user when placed in upright position. Device can be manually activated by pressuring reset button.
11. PASS device shall use single line to connect power and control module.
12. Control module shall have two reset buttons that perform same function no matter which button is pressed.
13. Control module shall have alarm button to activate full alarm and is to be illuminated.
14. PASS device shall be capable of being reprogrammed to fire department standard operating procedures (SOP). Using PC software program, configuration tag can be created and tagged on each device needed. Reprogramming options are as follows:
  - 1) Medium pressure alarm.
  - 2) Pressure drop alarm.
  - 3) Primary temperature alarm.
  - 4) Secondary temperature alarm.
  - 5) Audible low pressure alarm
15. PASS device shall be equipped with buddy lights on firefighter's front and back and viewable from 360° view; two buddy lights on front of user and four buddy lights in back of user.
16. PASS device shall have colored buddy lights: green (pressure above 50% and no alarms), yellow (pressure between 36 and 50%) or red (below 36% or alarms are active).
17. Power module shall be equipped with dual sound emitters; sound emitters shall perform at minimum 100 dBA in room temperature.

18. PASS device shall be capable of storing up to 25 hours of use information in event log form that are generated each time SCBA is pressurized. Event logs must indicate on/off cycles, alarms, alarm reset, and tagging events.
19. PASS device shall be capable of storing periodic logs. Periodic logs must indicate cylinder pressure for each SCBA pressurization stored at 15-second intervals.
20. PASS device's event and periodic logs shall provide ability to download to personal computer for maintenance records or for use in incident investigations.
21. PASS device shall be immune to radio frequency interference (RFI) and must function properly in close proximity of fire service hand-held radios.
22. PASS device shall have optional time-remaining display. Time remaining function must update calculations every 30 seconds based upon user's previous three minutes of air consumption. Initial calculation will appear after three minutes. Calculations can be made to zero pressure, low pressure alarm or medium pressure alarm.
23. PASS device shall employ gasket perimeter seal to provide highest protection level against water ingress, while providing ability to upgrade or repair electronics.
24. PASS device shall be capable of electronically storing user's name into memory via ID tag.
25. PASS device shall be removable with no more than two screws.
26. Control module shall have service mode that provides ability to see number of hours used, connect to PC and firmware versions.
27. Control module shall incorporate rubber boot for added protection and is to be replaceable.
28. Power and Control Modules shall have optional RFID chip for asset and maintenance tracking.

### **Speaker Module**

1. Speaker module shall provide amplified speech that removes inhalation breath noise.
2. Speaker module shall provide at minimum, 70 dBA output.
3. Speaker module shall turn on and off with PASS device.
4. Speaker module shall be powered by central power system.
5. Speaker module shall be capable of passing NFPA heat and immersion leakage test (not NFPA-required).
6. Speaker module shall be positioned on chest and attached to shoulder straps.
7. Speaker module shall be capable of being mounted on either shoulder.
8. Speaker module shall easily be attached and removed without special tools.
9. Speaker module shall have light to indicate that device is powered on.
10. Speaker module shall have on/off button to allow user to manually power off as needed.

### **Emergency Escape Breathing Support System**

- A. As option, emergency escape breathing support system must be accommodated by SCBA.
- B. System must be available with common SCBA quick-disconnect fitting.
- C. System shall connect to intermediate pressure side of SCBA, downstream of pressure reducer.
- D. System shall have both male and female connections.

### **Carrier and Harness**

1. Shoulder harness shall have separate left and right pads for easier and less costly replacement.
2. Shoulder harness shall have retro-reflective markings for better visibility within low light conditions.
3. Shoulder harness shall have localized frictions pads on shoulders to prevent slippage.
4. Shoulder harness shall be available in standard and serviceable tunnel.
5. Shoulder harness shall have improved color stability up to 600 degrees Fahrenheit.
6. Shoulder harness shall be capable of washing 40 times before color fastness fades.
7. Shoulder harness shall have optional chest strap.
8. Harness design shall have Kevlar webbing.
9. Shoulder harness shall have accessory attachment point available for facepiece or pouch and can be moved from left to right shoulder strap or vice versa.
10. Shoulder harness shall differentiate pad inside from pad outside by color; pad inside is grey and outside is black.
11. Waist pad shall be available in four options:
  - 1) Basic – basic pad with straps attaching directly to backplate.

- 2) Fixed swiveling – standard pad attached to metal bracket that swivels in center and automatically centers.
  - 3) Adjustable swiveling – standard pad attached to metal bracket that has three positions and automatically centers.
  - 4) Rescue Belt II System
12. Adjustable swiveling waist pad shall be one-handed operation and can be performed while on user's back.
  13. Backplate shall be capable of accepting all three waist pad designs.
  14. Backplate shall have two side handles and one top handle that are accessible with gloved hand.
  15. Backplate side handles shall be capable of 500 lbs. of force.
  16. Backplate top handle shall be capable of 1000 lbs. of force.
  17. Backplate cylinder band shall be available in two types: metal or fabric.
  18. Waist pad shall be of rigid construction to allow for easy donning and support.
  19. Waist straps shall be double-pull forward design.
  20. Harness design shall have regulator keeper for storage that can be attached to waist strap or chest strap.
  21. Regulator keeper shall allow regulator to be connected at any angle.

**Weight**

1. Weight of SCBA shall not exceed 24 lbs.
2. Weight of facepiece (without regulator, with communications) shall not exceed 1.4 lbs.
3. Weight of cylinder and valve assemblies (empty) shall not exceed:

<b>Cylinder Type</b>	<b>Weight</b>
Carbon-wrapped L30	8 lbs. 0 oz.
Carbon-wrapped H30-SL	7 lbs. 4 oz.
Carbon-wrapped H45	9 lbs. 7 oz.
Carbon-wrapped H45-SL	9 lbs. 10 oz.
Carbon-wrapped H60-SL	11 lbs. 12 oz.