Design Guide Book for Gas Cabinets

BeaconMedæs

Gas Cabinet
Typical Installation

Why Using Gas Cabinets

NFPA Hazardous Information Guide

HEALTH HAZARD

4 EXTREME
Highly Toxic
May be fatal on short-term exposure.

3 SERIOUS
Toxic
Full protective suit and breathing apparatus should be worn.

2 MODERATE
Breathing apparatus and face mask must be worn.

1 SLIGHT
Breathing apparatus may be worn.

0 MINIMAL
No precautions necessary

FLAMMABILITY HAZARD

4 EXTREME
Extremely flammable gas or liquid.
Flash Point: below 73℉

3 SERIOUS
Flammable.
Flash Point: 73℉ to 100℉

2 MODERATE
Combustible. Requires heating to ignite.
Flash Point: below 200℉

1 SLIGHT
Slightly combustible.
Requires strong heating to ignite.

0 MINIMAL
Will not burn under normal conditions.

SPECIFIC HAZARD

OX	OXYGEN
OXY	OXDIZER
ACID	ACID
ALK	ALKALI
COR	CORROSIVE
W	Use NO WATER

INSTABILITY HAZARD

4 EXTREME
Explosive at room temperature.

3 SERIOUS
May detonate if shocked or heated under confinement or mixed with water.

2 MODERATE
Unstable.
May react with water.

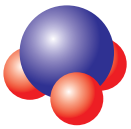
1 SLIGHT
May react if heated or mixed with water.

0 MINIMAL
Normally stable.
Does not react with water.

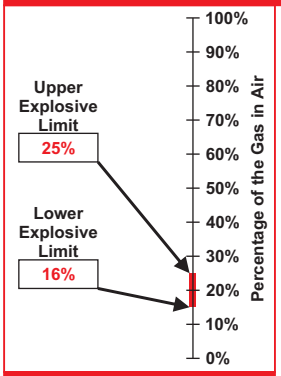
Gas Data Book

Ammonia (Gaseous)

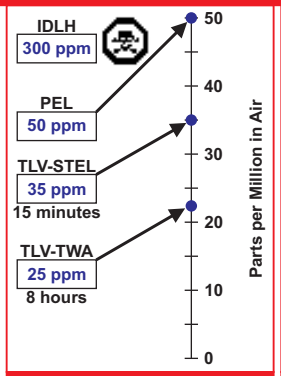
Gas Identification

Molecule Name	Chemical Formula	Molecular Arrangement	CAS Number	UN Number	General Description
Ammonia	NH_3		7664-41-7	UN1005	Colorless, toxic, corrosive, liquified gas with a sharp, intensely irritating odor.

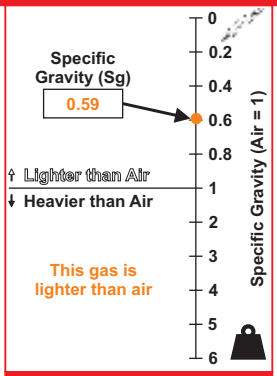
Hazards



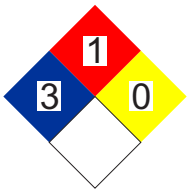
Flammability Range



Toxicity Level



Gas Density (Compared to Air)



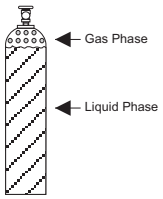
NFPA PRIMARY HAZARD
Poison, Toxic, Corrosive

NFPA SECONDARY HAZARD
Fire & Explosion

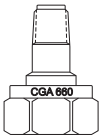
TGO Class
NR

Safety (NFPA) Placard

Gas Cylinder Data



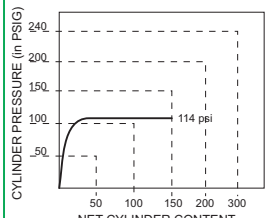
Molecule Distribution



CGA 660
Also available CGA 240 and CGA 705

North American Gas Cylinder Connection

DOT Label



Cylinder Pressure

Material Compatibility

Metals					Plastics					Elastomers (Synthetic Rubbers)			
F	B	B	S	S	S	B	S	B	S	S		F	B
Aluminum	Brass	Copper	Monel	Stainless Steel	Teflon (PTFE)	Nylon	Tefzel	Kynar	Kel-F	Buna-N	EPDM	Neoprene	Viton

Hazardous Information Guide
Toxic Gases

Primary Characteristics
- Gases that may produce lethal or other harmful effects on humans are classified as toxic or poison

Other Characteristics
- They can be high-pressure, reactive, nonflammable or flammable, and/or oxidizing in addition to their toxicity

Toxicity
- The degree of toxicity and the effects will vary depending on the gas; however, death will occur when breathed in sufficient quantities

Experience and Knowledge
- Read your MSDS thoroughly before use
- Consult with your gas supplier or a more knowledgeable coworker who has handled the gas before

Workers Safety
- Never work alone with toxic gases a backup safety person is essential
- Inspect the entire assembly or system that will contain the gas and thoroughly test it for leaks with an inert gas before use
- Purge all lines with an inert gas before opening the cylinder valve or breaking connections (contact the gas supplier for proper purge procedures)
- Full body showers, eye washes, fire alarms and firefighting equipment should be in the area of use and readily accessible

Ventilation
- Use toxic gases in a well-ventilated area

Gas Detection
- A gas detector can also be used as a leak detector on the lines of the equipment being used
- Room (space) gas monitors must be installed and properly functionning at all times
- TLV-TWA and TLV-STEL detections levels should actuate emergency ventilation and audible/visual alarms

Self-Contained Breathing Apparatus
- It is preferable that the breathing apparatus be stored in a safe area immediately adjacent to the work area, so that in the event of an emergency, a person can go directly into the area and close the door and safely put on the apparatus

Cylinder Storage
- Refer to your local building code for storage and use requirements for toxic gases
- Keep your inventory of toxic or poison gases to a minimum
- When a project is completed, return leftover cylinders to the gas supplier
- Cylinders should never be stored for a possible future use (this might result in accidental removal of cylinder labeling, making it an unnecessary hazard and greatly increasing the cost of proper disposal)

Common Toxic Gases (Non Exhaustive List)
- Ammonia
- Arsine
- Boron Trichloride
- Boron Trifluoride
- Boron-11 Trifluoride
- Bromine Trifluoride
- 1,3-Butadiene
- Carbon Monoxide
- Chlorine
- Chlorine Trifluoride
- Dichlorsilane
- Di-, Mono- and trimethylamine
- Fluorine
- Hydrogen Bromide
- Hydrogen Chloride
- Hydrogen Fluoride
- Hydrogen Sulfide
- Methyl Chloride
- Methyl Fluoride
- Nitrogen Dioxide
- Nitrogen Trifluoride
- Phosphine
- Silicone Tetrachloride
- Silicon Tetrafluoride
- Sulfur Dioxide
- Sulfur Tetrafluoride
- Tungsten Hexafluoride

Hazardous Information Guide
Oxydizing Gases

Primary Characteristics
- Gases that do not burn but will support combustion are classified as oxidants

Other Characteristics
- They can be high-pressure, toxic and reactive, and can displace breathing oxygen from air (except O_2itself)

Source of Ignition
- All possible sources of ignition must be eliminated when handling oxygen and other oxidants as they react rapidly and violently

Combustible Materials
- Do not store combustible materials with oxidants
- Do not allow oil, grease or other readily combustible materials to come in contact with the cylinder or equipment used for oxidant services

Material Compatibility
- Use only equipment that is intended for this type of service
- Use only a regulator that has been clearly prepared for use with this type of service-this regulator should be labeled "Cleaned for Oxygen Services"

Gas Detection
- A gas detector can also be used as a leak detector on the lines of the equipment being used
- Room (space) gas monitors must be installed and properly functionning at all times
- 23% oxygen detection level should actuate emergency ventilation and audible/visual alarms (this applies for oxygen only)

Common Oxidizing Gases (Non Exhaustive List)
- Air
- Bromine Trifluoride
- Chlorine Trifluoride
- Fluorine
- Nitrogen Dioxide
- Nitrogen Trifluoride
- Nitrous Oxide
- Oxygen

Hazardous Information Guide
Flammable Gases

Primary Characteristic
- Gases that, when mixed with air at atmospheric temperature and pressure, form a flammable mixture at 13% or less by volume, or have a flammable range in air of greater than 12% by volume regardless of the lower flammable limit, are classified as flammable

Other Characteristics
- They can be high-pressure, toxic, reactive and displace oxygen in air

Pressure and Temperature Effects
- A change in temperature, pressure or oxidant concentration may vary the flammability range considerably.

Keeping Away from Sources of Ignition
- All possible sources of ignition must be eliminated through proper design of facilities and the restriction of smoking and open flames

About Vent Lines
- Use a vent line made of stainless steel, purge with an inert gas and use a flash arrester

Fire Extinguisher
- It is important to have (and know how to use) a fire extinguisher in the area where flammable gases are used and stored, as well as a hand-held flammable gas detector to determine if flammable gases are building up

Gas Detection
- A gas detector can also be used as a leak detector on the lines of the equipment being used
- Room (space) gas monitors must be installed and properly functionning at all times
- 25% LEL and 50% LEL detections levels should actuate emergency ventilation and audible/visual alarms

System Shut Down
- Always remember that the source of flammable gas must be closed or shut-off before attempting to put out a fire involving flammable gases

Common Flammable Gases (Non Exhaustive List)
- Acetylene
- Ammonia
- Arsine
- 1,3-Butadiene
- n-Butane
- 1-Butene
- cis 2-Butene
- trans-2-Butene
- Carbon Monoxide
- Deuterium
- Dichlorosilane
- Di-, Mono- and trimethylamine
- Disilane
- Ethane
- Ethyl Chloride
- Ethylene
- Hydrogen
- Hydrogen Sulfide
- Isobutane
- Isobutylene
- Methane
- Methyl Chloride
- Methyl Fluoride
- Phosphine
- Propane
- Propylene
- Silane

Hazardous Information Guide
Inert Gases

Primary Characteristics
- Gases that do not react with other materials at ordinary temperature or pressure are classified as inert

Other Characteristics
- They are colorless and odorless, as well as nonflammable and nontoxic

Hazards
- The primary hazard of these gases is pressure
- These gases are often stored at pressures exceeding 2,000 psi (138 bar)
- They can displace the amount of oxygen necessary to support life when released in a confined place

Ventilation
- Use of adequate ventilation and monitoring of the oxygen content in confined places will minimize the danger of asphyxiation

Workers Safety
- Always wear safety glasses and safety gloves when working with the lines to avoid absorption of the gas through the skin

Gas Detection
- A gas detector can also be used as a leak detector on the lines of the equipment being used
- Room (space) gas monitors must be installed and properly functionning at all times
- 19% oxygen detection level should actuate emergency ventilation and audible/visual alarms

Common Inert Gases (Non Exhaustive List)
- Argon
- Halocarbon-23
- Halocarbon-116
- Helium
- Krypton
- Neon
- Nitrogen
- Sulfur Hexafluoride

Hazardous Information Guide
Corrosive Gases

Primary Characteristic
- Gases that corrode material or tissue with which they come in contact with, or do so in the presence of water, are classified as corrosive

Other Characteristics
- They can also be reactive and toxic and/or flammable or an oxidizer
- Most are hazardous in low concentration over long periods of time.

Material Compatibility
- It is essential that equipment used for handling corrosive gases be constructed of proper materials (refer to Material Compatibility Chart)

Pipeline Design Criteria
- Use check valves and traps in a system where there is a possibility that water or other inorganic materials can be sucked back into the cylinder.

Workers Safety
- Due to the probability of irritation or damage to the lungs, mucus membranes and eye tissues from contact, the threshold limit values of the gas should be rigidly observed
- Proper protective clothing and equipment must be used to minimize exposure to corrosive materials
- A full body shower and eye wash station should be in the area
- Personnel must be familiar with the work area
- Aisles should always be clear and unobstructed in the event that the gas makes contact with the eyes and vision is disrupted.
- Self-Contained Breathing Apparatus (SCBA) readily available

Cylinder Storage Criteria
- Special care should be taken when storing corrosive gases
- Air extractors and forced ventilation is necessary
- In case of a release, move the cylinder to a well-ventilated area (only if proper personal body protection such as a self-contained breathing apparatus is available) and use suitable means to direct the gas into a chemical neutralizer

Gas Detection
- Room (space) gas monitors must be installed and properly functionning at all times
- TLV and STEL detections levels should actuate emergency ventilation and audible/visual alarms

Common Corrosive Gases (Non Exhaustive List)
- Ammonia
- Boron Trichloride
- Boron Trifluoride
- Boron-11 Trifluoride
- Bromide Trifluoride
- Chlorine

Explosive Limits and Flammable Gas Detection

Unit of Measurement
- Explosive (flammable) gases are measured in the percent (%) in air

Explaining Lower Explosive Limit
- At BeaconMedaes , the alarm setpoints are set based on the Lower Explosive Limit (LEL)
- The LEL is the lowest limit of flammability of a gas or vapor at normal temperature and pressure
- LEL is expressed in percent of the gas or vapor in air by volume

Alarm Levels
- First alarm level: 25% LEL max. (factory default)
- Second alarm level: 50% LEL max. (factory default)
- Alarm setpoints can be changed downward upon request

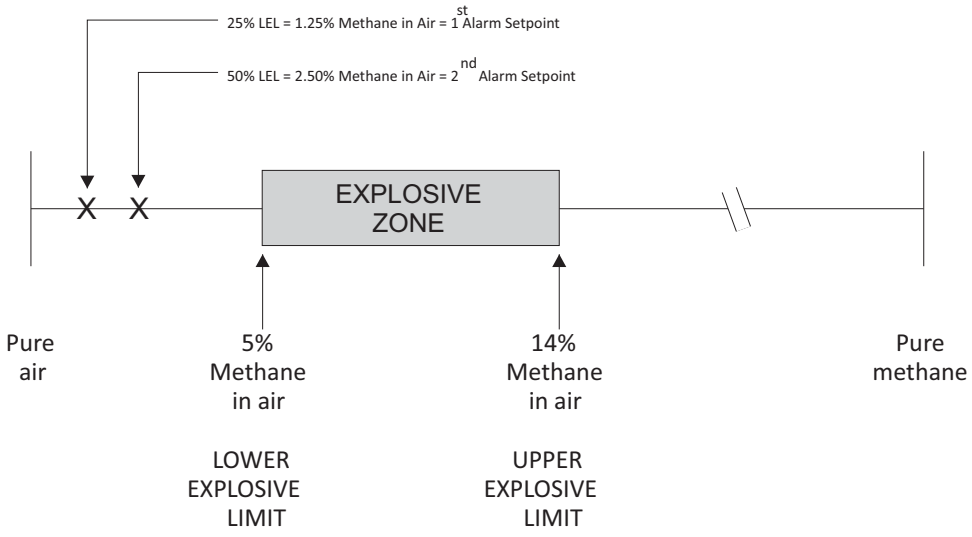
Recommended Actuations
- 25% LEL: Start ventilation
- 50% LEL: Actuate both audible and visual alarms

Quantity of Monitors in the Room
- One monitor generally covers a radius of 20 feet

Monitor Height
- Based on specific gravity of each gas (refer to Determining Sensor Location and Quantity for details)

Sensing Technology
- Catalytic Combustion Cell

Monitor Classification
- It is preferable to select explosion-proof rated gas monitors to detect the presence of flammable gases
- Shall other electrical components within the same area of the monitor are not explosion-proof rated, the need of having explosion-proof rated gas monitors become irrelevant



Treshold Limit Values and Toxic Gas Monitoring

Unit of Measurement
- Toxic and corrosive gases are all measured in the ppm range

Time Weighted Average
- Published by the American Conference of Governmental Industrial Hygienists (ACGIH)
- The Threshold Limit Value - Time Weighted Average (TLV-TWA) of a substance for a normal eight-hour workday or a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect

Short Term Exposure Limit
- Published by the American Conference of Governmental Industrial Hygienists (ACGIH)
- A Short Term Exposure Limit (STEL) is defined by ACGIH as the concentration to which workers can be exposed continuously for a short period of time (15 minutes) without suffering from:
  1. Irritation
  2. Chronic or irreversible tissue damage
  3. Narcosis of sufficient degree to increase the likehood of accidental injury, impair self-rescue or materially reduce work efficiency

Recommended Actuations
- TWA: Start ventilation
- STEL: Actuate both audible and visual alarms

Quantity of Monitors in the Room
- One monitor generally covers a radius of 20 feet

Monitor Height
- Based on specific gravity of each gas (refer to Determining Sensor Location and Quantity for details)

Sensing Technology
- Electrochemical cells

TWA and STEL values vary greatly upon gases

BeaconMedæs®

Table of Gas Properties and Material Compatibilities

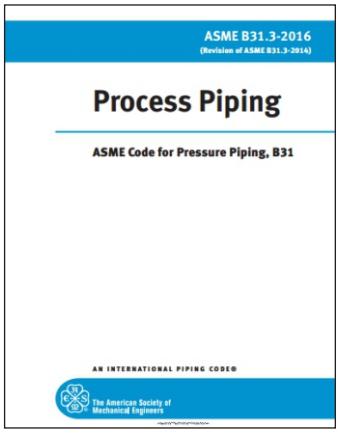
Gas	Primary Hazards					Metals					Plastics				Elastomers			Explosive Limits		Toxicity Levels		Physical Properties		
	Asphyxiant	Toxic	Flammable	Corrosive	Oxidizer	Aluminum	Brass	Copper	Monel	Stainless Steel	Kel-F	Teflon	Tefzel	Kynar	Viton	Buna-N	Neoprene	LEL (% in Air)	UEL (% in Air)	TLV-TWA (ppm in Air)	TLV-STEL (ppm in Air)	SPECIFIC VOLUME (ft³/lb)	BOILING POINT @ 1 atm (F)	SPECIFIC GRAVITY (Air = 1)
ACETYLENE	X		X			S	S	U	S	S	S	S	S	S	S	S	S	2.5	100	-	-	14.77	-119.6	0.899
AIR					X	S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	12.55	-317.8	1.000
AMMONIA		X	X	X		S	U	U	S	S	S	S	S	U	U	S	S	15.0	28.0	25	35	22.49	-28.3	0.588
ARGON	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	9.68	-302.5	1.379
ARSINE		X	X			-	S	S	S	S	S	S	S	S	S	S	S	-	-	0.05	-	4.91	-79.9	2.691
BORON TRICHLORIDE		X		X		U	D	D	S	S	S	S	S	-	-	-	-	-	-	-	-	3.18	55.1	4.045
BORON TRIFLUORIDE		X		X	X	-	D	D	S	S	S	S	S	-	-	-	-	-	-	1C	-	5.68	-147.5	2.341
BROMINE TRIFLUORIDE		X		X		D	D	D	S	S	D	D	S	U	U	U	U	-	-	-	-	415.1	258.2	4.727
1,3-BUTADIENE		X	X			S	S	S	S	S	S	S	S	S	S	S	S	2.0	12.0	2	-	6.98	23.7	1.868
n-BUTANE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	1.8	8.4	800	-	6.45	31.0	2.007
1-BUTENE			X			S	S	S	S	S	S	S	S	S	S	S	S	1.6	10.0	-	-	6.70	21.1	1.937
cis-2-BUTENE			X			S	S	S	S	S	S	S	S	S	S	S	S	1.7	9.7	-	-	6.61	53.1	1.937
trans-2-BUTENE			X			S	S	S	S	S	S	S	S	S	S	S	S	1.7	9.7	-	-	6.62	47.3	1.937
CARBON DIOXIDE	X					S	S	S	S	S	S	S	S	S	S	D	D	-	-	5000	30000	8.74	-126.5	1.519
CARBON MONOXIDE		X	X			S	S	S	S	S	S	S	S	S	S	S	S	12.5	74.0	25	-	13.80	-312.7	0.967
CHLORINE		X		X	X	U	U	U	S	S	S	S	S	S	S	U	U	-	-	0.5	1	5.39	-28.8	2.448
CHLORINE TRIFLUORIDE		X		X		U	-	-	S	S	D	D	S	U	U	U	U	-	-	-	-	4.09	53.1	3.192
DEUTERIUM	X		X			S	S	S	S	S	S	S	S	S	S	S	S	4.9	75.0	-	-	96.00	-417.0	0.139
DICHLOROSILANE		X	X	X		U	-	-	S	S	S	S	S	S	-	-	-	4.1	98.8	-	-	3.72	46.7	3.487
DI-, MONO-, AND TRIMETHYLAMINES		X	X	X		U	U	U	S	S	S	S	S	S	U	U	-	-	-	-	-	-	-	-
DISILANE			X			S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	6.01	6.7	2.148
ETHANE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	3.0	12.4	-	-	12.76	-127.5	1.038
ETHYL CHLORIDE			X			S	S	S	S	S	S	S	S	S	S	S	S	3.8	15.4	100	-	5.82	54.0	2.227
ETHYLENE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	2.7	36.0	-	-	13.71	-154.8	0.969
FLUORINE		X		X	X	D	D	D	S	S	D	D	D	D	U	U	U	-	-	1	2	10.18	-306.8	1.312
HALOCARBON- 14						S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	-	-	-
HALOCARBON- 23	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	5.48	-115.9	2.917
HALOCARBON-116	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	2.77	-108.7	4.765
HELIUM	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	96.67	-452.0	0.138
HYDROGEN	X		X			S	S	S	S	S	S	S	S	S	S	S	S	4.0	75.0	-	-	191.95	-423.2	0.070
HYDROGEN BROMIDE		X		X		U	U	U	S	S	S	S	S	S	S	U	U	-	-	3C	-	4.74	-88.0	2.794
HYDROGEN CHLORIDE		X		X		U	U	U	S	S	S	S	S	S	S	U	U	-	-	5C	-	10.55	-120.8	1.259
HYDROGEN FLUORIDE		X		X		U	U	U	S	S	S	S	S	S	U	U	U	-	-	3C	-	5.65	-108.7	4.765
HYDROGEN SULFIDE		X	X	X		S	S	-	S	S	S	S	S	S	U	S	S	4.0	44.0	10	15	11.26	-74.9	1.176
ISOBUTANE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	1.8	8.4	-	-	-	-	-
ISOBUTYLENE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	1.8	9.8	-	-	-	-	-
KRYPTON	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	4.61	-244.1	2.893
METHANE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	5.0	15.0	-	-	24.06	-258.7	0.554
METHYL CHLORIDE		X	X			U	S	S	S	S	S	S	S	S	S	U	U	7.0	17.4	50	100	4.83	-11.2	1.740
METHYL FLUORIDE		X	X			S	S	S	S	S	S	S	S	S	-	-	-	-	-	-	-	11.23	-109.0	0.170
NEON	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	19.18	-410.9	0.697
NITROGEN	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	13.80	-320.4	0.967
NITROGEN DIOXIDE		X		X	X	S	U	U	U	S	S	S	-	-	U	U	U	-	-	3	5	-	-	-
NITROGEN TRIFLUORIDE		X			X	-	S	S	S	S	S	S	S	S	S	-	-	-	-	10	-	5.43	-200.2	2.451
NITROUS OXIDE					X	S	S	S	S	S	S	S	S	S	S	S	S	-	-	50	-	8.74	-128.3	1.520
OCTAFLUOROCYCLOBUTANE	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	1.87	21.2	6.906
OCTAFLUOROPROPANE	X					S	S	S	S	S	S	S	S	-	-	S	S	-	-	-	-	2.01	-34.3	6.491
OXYGEN					X	D	S	S	S	D	S	S	S	S	D	U	D	-	-	-	-	12.08	-297.4	1.105
PHOSPHINE		X	X			S	-	-	S	S	S	S	S	-	-	-	-	-	-	0.3	1	11.30	-126.0	1.174
PROPANE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	2.1	9.5	-	-	8.62	-43.7	1.522
PROPYLENE	X		X			S	S	S	S	S	S	S	S	S	S	S	U	2.4	11.0	-	-	9.06	-53.8	1.453
SILANE			X			S	S	S	S	S	S	S	S	S	S	S	S	-	-	5	-	11.98	-170.4	1.109
SILICON TETRACHLORIDE		X		X		U	U	U	S	S	S	S	S	S	U	U	U	-	-	-	-	8.25	136.6	5.866
SILICON TETRAFLUORIDE		X		X		U	U	U	S	S	S	S	S	S	U	U	U	-	-	-	-	3.69	-148.3	3.593
SULFUR DIOXIDE		X		X		S	U	S	S	S	S	S	S	S	S	U	U	-	-	2	5	5.95	13.8	2.212
SULFUR HEXAFLUORIDE	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	1000	-	2.62	-90.8	5.042
SULFUR TETRAFLUORIDE		X		X		U	U	U	S	S	S	S	S	S	U	U	U	-	-	-	-	3.53	-53.5	3.731
TUNGSTEN HEXAFLUORIDE		X		X		U	U	U	S	S	S	S	S	S	U	U	U	-	-	-	-	1.26	63.0	10.283
XENON	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	2.93	-162.6	4.533

S = Satisfactory
U = Unsatisfacory
C = Ceiling value
- = Insufficient Data or Not Applicable
D = Suitability depends on condition of use
X = Indicates primary hazard

Codes, Standards & Regulations

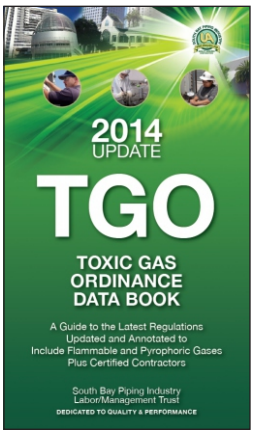
ASME B31.3
Process Piping

Design of **chemical and petroleum plants** and refineries processing chemicals and hydrocarbons, water and steam. This Code contains rules for piping typically found in petroleum refineries; **chemical**, **pharmaceutical,** textile, paper, semiconductor, and **cryogenic plants**; and related processing plants and terminals. This Code prescribes requirements for materials and components, design, fabrication, assembly, erection, examination, inspection, and testing of piping. This Code applies to piping for all fluids including: (1) raw, intermediate, and finished chemicals; (2) petroleum products; (3) **gas**, steam, air and water; (4) fluidized solids; (5) **refrigerants**; and (6) **cryogenic fluids**. Also included is piping which interconnects pieces or stages within a **packaged equipment assembly**..



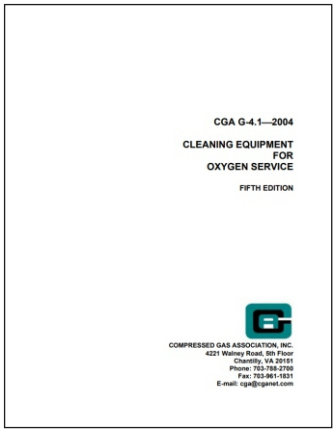
TOXIC GAS ORDINANCE DATA BOOK

In 1988 the Santa Clara County Fire Chief's Association drafted a "Model Ordinance for Toxic Gas Regulation" in conjunction with the Santa Clara County City Manager's Association, the Santa Clara County Manufacturing Group and the Silicon Valley Toxics Coalition. This model ordinance was subsequently adopted into municipal code and county ordinance by the various jurisdictions within Santa Clara County as well as various other regulatory agencies as the "Toxic Gas Ordinance" or TGO. The TGO has been subsequently used as the base model for the 1994 Uniform Fire Code (UFC) amendments for Toxic and Highly-Toxic gases through the current Fire Code adoption.



COMPRESSED GAS ASSOCIATION
Publications

CGA develops & publishes the broadest distribution of technical information, standards, and recommendations for safe and environmentally responsible practices in the manufacture, storage, transportation, distribution, and use of industrial gases.

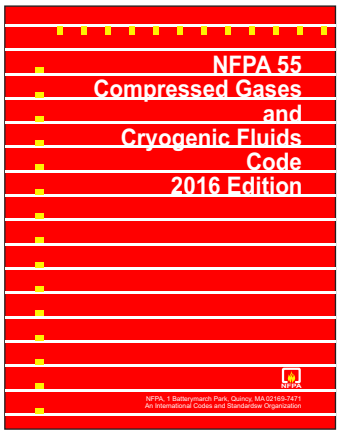


NFPA 55
Standard for the Strorage, Use and Handling of Compressed Gases and Cryogenic Fluids in Portable Stationary Containers, Cylinders, and Tanks

The most comprehensive industrial and medical gas storage and use document in the National Fire Codes®, NFPA 55 is essential for users, producers, distributors, and anyone who is involved with the storage, use, or handling of compressed gases or cryogenic fluids.
This edition expands coverage and incorporates three NFPA® Standards as individual chapters:

· NFPA 50: Bulk Oxygen Systems at Consumer Sites
· NFPA 50A: Gaseous Hydrogen Systems at Consumer Sites
· NFPA 50B: Liquefied Hydrogen Systems at Consumer Sites

Additionally, the 2005 edition of NFPA 55 includes provisions for underground hydrogen storage and the use of hydrogen generating devices. The allowable storage requirements are coordinated for consistency with the requirements in NFPA 5000®. (54 pages, 2005)



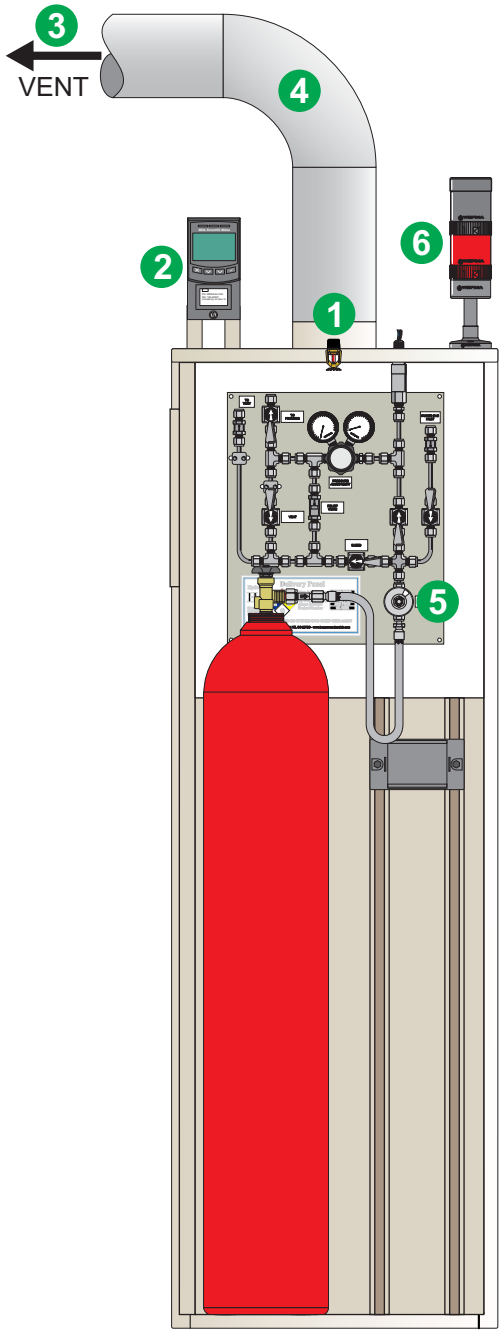
General Safety Requirements as per the Toxic Gas Ordinance (TGO)

GENERAL REQUIREMENTS	CLASS I HIGHLY TOXIC	CLASS II TOXIC	CLASS III MODERATELY TOXIC	MINIMUM THRESHOLD QUNATITIES	PYROPHORIC	FUEL GAS
General Obligation for Storage & Use	X	X	X	X	X	X
Permit - Operations, Storage & Use	X	X	X	X	X	X
Permit - Install, Alter, Modify or Repair	X	X	X	-	X	X
Permit - Close, Decommission or Demolition	X	X	X	-	X	X
Compliance Plan	X	X	X	X	X	X
Emergency Response Plan	X	X	X	X	X	X
Protective Plugs & Caps in Place for Safety	X	X	X	X	X	X
Flow Limiting Orifice & Devices	X	-	-	-	X	-
Inert Gas Purge System	X	X	X	-	X	-
Automatic Fire Sprinkler	X	X	X	-	X	X
Emergency Control Station	X				X	
PIPING SYSTEMS						
Installed and Leak Tested per ASME B31.3	X	X	X	-	X	X
Labeled per ASME A13/1	X	X	X	X	X	X
ESO Located at the Source and Point of Use	X	X	X	-	X	X
Excess Flow Control	X	X	X	-	X	-[2]
Seismic Protection - Importance Factor	I = 1.5	I = 1.25	I = 1.0	-	I = 1.5	I = 1.0
Welding Piping or Ventilated Enclosure	X	X	-[1]	-	X	-[3]
Double Walled Secondarily Containment Piping	X	-	-	-	-	-
TESTING & MAINTENANCE (Annually, or in accordance with approved manufacturer's requirements)						
Gas Detection and Leak Monitoring Systems	X	X	-[1]	-	X	-[2]
Limiting Controls: Level, Temperature, Pressure or Flow	-[2]	-[2]	-[2]	-[2]	-[2]	-[2]
Manual and Automatic ESO Controls	X	X	-[1]	-	X	-[2]
Alarms and Alarm Functions	X	X	-[1]	-	X	-[2]
EXHAUST VENTILATION SYSTEM						
Gas Room	X	X	-	-	X	-
Gas Cabinet, VMB's and Exhausted Enclosures	X	X	-[1]	-[3]	X	-[3]
Treatment to 1/2 IDLH at Point of Discharge	X	X	-	-	-[3]	-
EMERGENCY ALARM MONITORING & CONTROLS						
Gas Detection	X	X	X	-	X	
Optical Flame Detection	-	-	-	-	X	-
Smoke Detection	X	-	-	-	-[3]	-
Seismic Detection	X	X	X	-	-	-
Exhaust Flow	X	X	X	-	X	-
Manual or Remotely Actuated Automatic ESO	X	X	X	-	X	-
EMERGENCY SHUTOFF						
for Gas Detection	X	X	-[1]	-	X	
for Optical Flame Detection	-	-	-	-	X	-
for Smoke Detection	X	-	-	-	-[3]	-
for Seismic Sensor	X	X	-	-	-	-
for Exhaust Flow	X	X	-	-	X	-
for Manual or Remotely Actuated Automatic ESO	X	X	-[1]	-	X	X
for Activation of Automatic Fire Alarm System	X					
EMERGENCY POWER						
for Gas Detection	X	X	-[1]	-	X	
for Optical Flame Detection	-	-	-	-	X	-
for Smoke Detection	X	-	-	-	-[3]	-
for Seismic Sensor	X	X	-	-	-	-
for Exhaust Flow	X	X	-	-	X	-
for Manual or Remotely Actuated Automatic ESO	X	X	-[1]	-	X	X
for Temperature Control	X	X	-	-	-	-

X = Required per code.
1. May be required per Fire Code for materials having a NFPA hazard ranking of 3 or 4.
2. Required when provided, or as an alternate to other control requirements.
3. May be provided to mitigate other code requirements.

Gas Cabinets, Accessories & Field Requirements

Gas Cabinets
Minimum Requirements as per NFPA 55

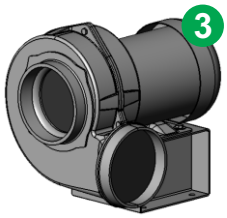


1 WATER SUPPLY FOR THE SPRINKLER

NFPA 55 - 6.16.3 Fire Protection - “Gas cabinets used to contain toxic, highly toxic, or pyrophoric gases shall be internally sprinklered.”

2 GAS DETECTOR (by Beacon Medaes... Strongly Recommended)

NFPA 55 - 7.9.3.2.1.2 - Gas Detection - “The gas detection system shall monitor the exhaust system at the point of discharge from the gas cabinet, exhausted enclosure, or gas room.”



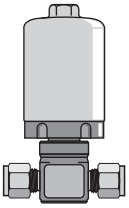
3 EXHAUST FAN (by Installing Contractor)

Indoor gas cabinets require ventilation. Hereunder are NFPA 55’s exhaust fan requirements:
- Air velocity: 200 ft/min with access window open 150 ft/min (no less) at any single point
- Explosion-proof classification might be required
- Material compatibility of exhaust fan components with gas service to be verified

4 DUCT WORK (by Installing Contractor)

Compatibility: The duct materials used must be compatible with the gas being vented

Duct work must be installed to prevent any leaks to the atmosphere



5 FAIL-SAFE AUTOMATIC CLOSING VALVE (by Beacon)

NFPA 55 - 7.9.3.2.2 - Fail-Safe Automatic Closing Valve -
“An approved automatic-closing fail-safe valve shall be located immediately adjacent to and downstream of active container, cylinder, or tank valves.”

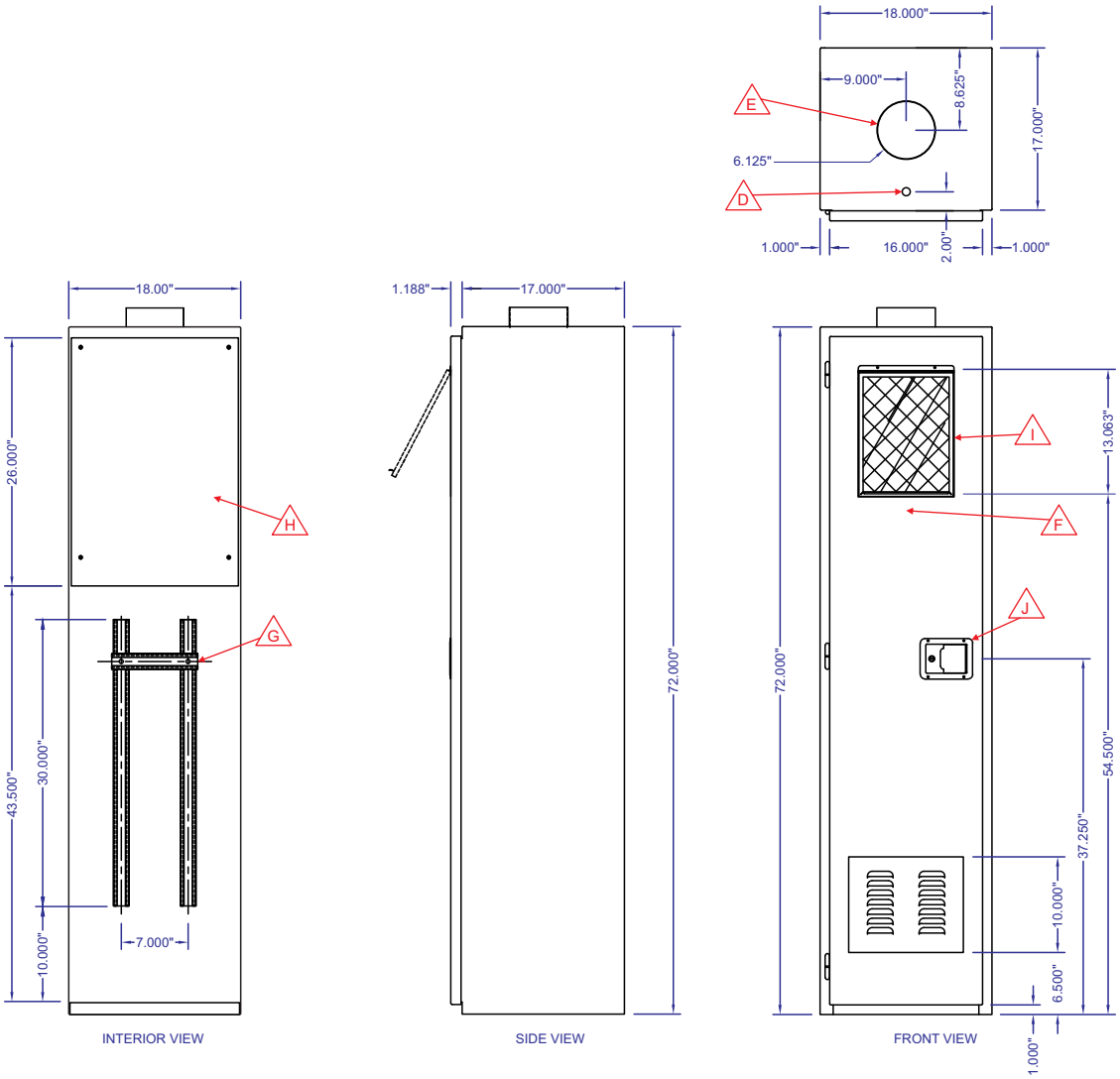
6 WARNING DEVICE (by Beacon Medaes or by Others)

NFPA 55 - 7.9.6.2 - Local Alarm.-
The gas detection system shall initiate a local alarm that is both audible and visible.”

TREATMENT SYSTEMS (by Others)

NFPA 55 - 7.9.3 - Treatment System - “Except as provided in 7.9.3.1 and 7.9.3.2, gas cabinets, exhausted enclosures, and gas gas containing toxic or highly toxic gases shall be provided with exhaust ventilation, with all exhaust directed to a system designed to process accidental release of gas.”
NFPA 55 - 7.9.3.2 - Use of Toxic Gases - “Treatment systems shall not be required for toxic gases in use where containers, cylinders and tanks are provided with controls specified in 7.9.3.2.1 (Gas Detector) and 7.9.3.2.2 (Fail-Safe Automatic Closing Valve).”

One-Cylinder Gas Cabinet



NOTE

a) CODE COMPLIANCE
MEET OR EXCEEDS ARTICLE 80 OF THE UNIFORM FIRE CODE REQUIREMENTS.

b) CONSTRUCTION
CABINET MATERIAL IS 11-GAUGE COLD ROLLED STEEL WITH WELDED SEAMS.
NEOPRENE GASKETS WITH OIL RESISTANT ADHESIVE.
PAINT IS EPOXY; INTERIOR IS WHITE (SMOOTH FINISH) AND EXTERIOR IS LIGHT GRAY (TEXTURED)
DOOR LATCHES IN THREE PLACES.

c) DOOR CLOSURE
AUTOMATIC DOOR CLOSURE IS INCLUDED

d) SPRINKLER HEAD
INLET CONNECTION IS 1/2" M.NPT AT ROOF.
SPRINKLER HEAD IS PROVIDED WITHIN CABINET.
STATIC (NON FLOWING) PRESSURE: 175 PSIG MAX.
DYNAMIC (FLOWING) PRESSURE: 7 PSIG MIN.
WATER USAGE: 7 TO 36 GPM DEPENDING ON WATER PRESSURE.

e) EXHAUST CONNECTION
DUCT CONNECTION IS 6.125" DIAMETER
SUITABLE FOR INTENDED PROCESS GAS
WINDOW OPEN DUCT FLOW: MINIMUM 100 SCFM AT 0.75" H2O
WINDOW CLOSED FLOW: MINIMUM 25 SCFM AT 0.75" H2O.
VENTILATION SYSTEM (EXTRACTOR) TO BE SUPPLIED BY OTHERS.

f) GAS IDENTIFICATION
GAS NAME, GAS FORMULA, AND NFPA 704 HAZARD INFORMATION TO BE DISPLAYED ON THE ENCLOSURE DOOR.

g) CYLINDER RESTRAINT
CYLINDER RESTRAINT IS PROVIDED WITH THE CABINET.

h) MOUNTING PANEL
GAS CONTROL COMPONENTS ARE INSTALLED ON THE MOUNTING PANEL INSIDE THE CABINET.

I) REINFORCED WINDOW
THE ACCESS WINDOW OPEN FROM THE BOTTOM UP.

j) LOCKABLE DOOR LATCH

NOT INCLUDED WITH THIS GAS CABINET:

- MECHANICAL VENTILATION (EXTRACTOR).
- VACUUM GENERATOR SUPPLY CONNECTION.
- VENT FROM VACUUM GENERATOR PRESSURE.
- GAS CABINET CONTROLLER.
- VENTURI VACUUM PNEUMATIC GAS SUPPLY.
- PHOTOHELIC PRESSURE DIFFERENTIAL SWITCH AND GAUGE

Two-Cylinder Gas Cabinet

NOTE

a) CODE COMPLIANCE
MEET OR EXCEEDS ARTICLE 80 OF THE UNIFORM FIRE CODE REQUIREMENTS.

b) CONSTRUCTION
CABINET MATERIAL IS 11-GAUGE COLD ROLLED STEEL WITH WELDED SEAMS.
NEOPRENE GASKETS WITH OIL RESISTANT ADHESIVE.
PAINT IS EPOXY; INTERIOR IS WHITE (SMOOTH FINISH) AND EXTERIOR IS LIGHT GRAY (TEXTURED)
DOOR LATCHES IN THREE PLACES.

c) DOOR CLOSURE
AUTOMATIC DOOR CLOSURE IS INCLUDED

d) SPRINKLER HEAD
INLET CONNECTION IS 1/2" M.NPT AT ROOF.
SPRINKLER HEAD IS PROVIDED WITHIN CABINET.
STATIC (NON FLOWING) PRESSURE: 175 PSIG MAX.
DYNAMIC (FLOWING) PRESSURE: 7 PSIG MIN.
WATER USAGE: 7 TO 36 GPM DEPENDING ON WATER PRESSURE.

e) EXHAUST CONNECTION
DUCT CONNECTION IS 6.125" DIAMETER
SUITABLE FOR INTENDED PROCESS GAS
WINDOW OPEN DUCT FLOW: MINIMUM 100 SCFM AT 0.75" H2O
WINDOW CLOSED FLOW: MINIMUM 25 SCFM AT 0.75" H2O.
VENTILATION SYSTEM (EXTRACTOR) TO BE SUPPLIED BY OTHERS.

f) GAS IDENTIFICATION
GAS NAME, GAS FORMULA, AND NFPA 704 HAZARD INFORMATION TO BE DISPLAYED ON THE ENCLOSURE DOOR.

g) CYLINDER RESTRAINT
CYLINDER RESTRAINTS ARE PROVIDED WITH THE CABINET.

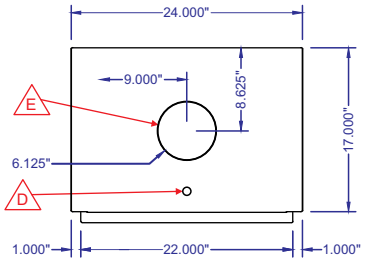
h) MOUNTING PANEL
GAS CONTROL COMPONENTS ARE INSTALLED ON THE MOUNTING PANEL INSIDE THE CABINET.

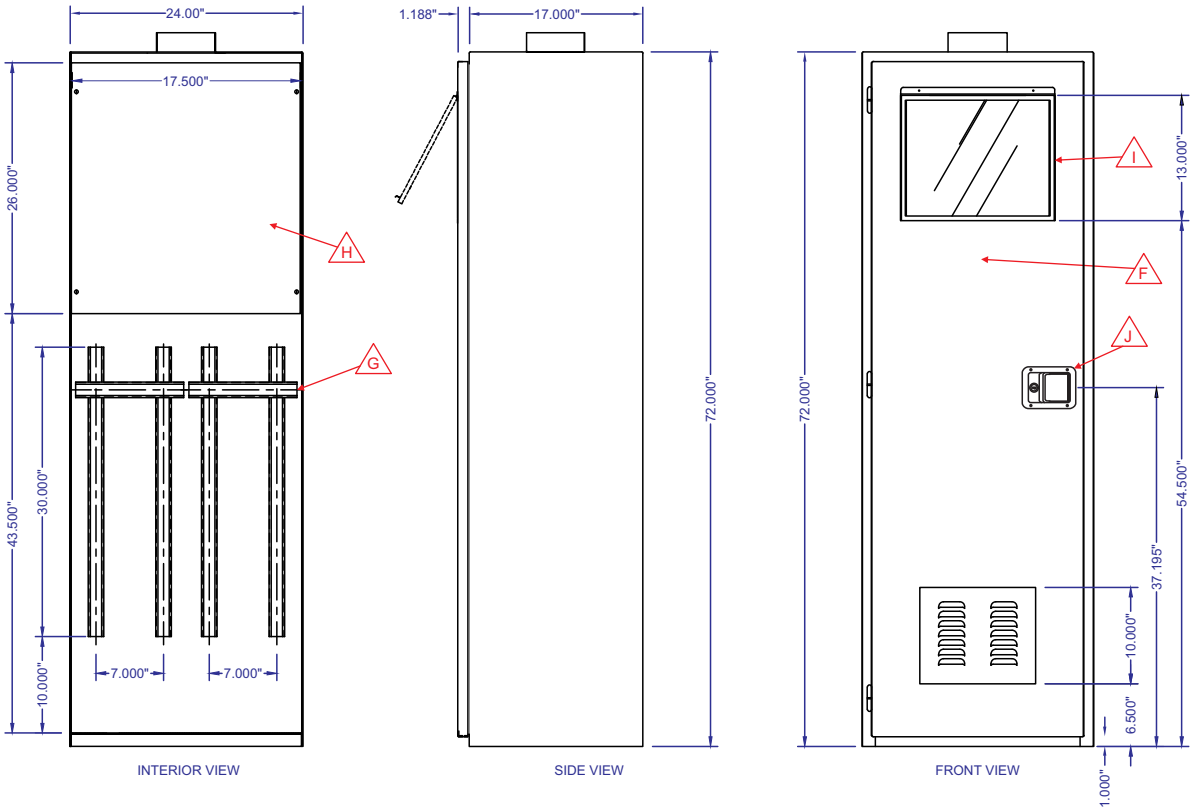
I) REINFORCED WINDOW
THE ACCESS WINDOW OPEN FROM THE BOTTOM UP.

j) LOCKABLE DOOR LATCH

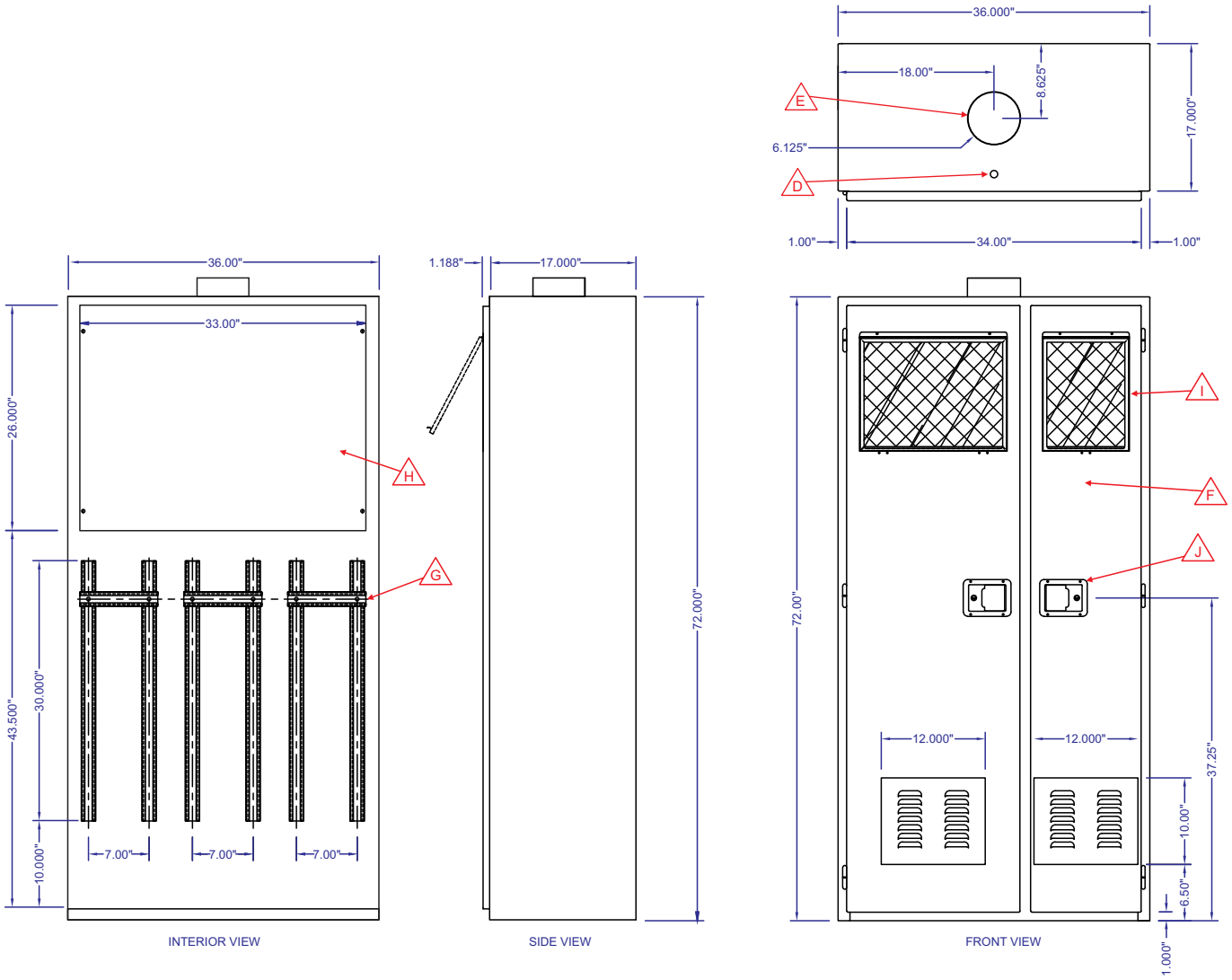
NOT INCLUDED WITH THIS GAS CABINET:

- MECHANICAL VENTILATION (EXTRACTOR).
- VACUUM GENERATOR SUPPLY CONNECTION.
- VENT FROM VACUUM GENERATOR PRESSURE.
- GAS CABINET CONTROLLER.
- VENTURI VACUUM PNEUMATIC GAS SUPPLY.
- PHOTOHELIC PRESSURE DIFFERENTIAL SWITCH AND GAUGE





Three-Cylinder Gas Cabinet



NOTE

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MEET OR EXCEEDS ARTICLE 80 OF THE UNIFORM FIRE CODE REQUIREMENTS.

b) CONSTRUCTION
CABINET MATERIAL IS 11-GAUGE COLD ROLLED STEEL WITH WELDED SEAMS.
NEOPRENE GASKETS WITH OIL RESISTANT ADHESIVE.
PAINT IS EPOXY; INTERIOR IS WHITE (SMOOTH FINISH) AND EXTERIOR IS LIGHT GRAY (TEXTURED)
DOOR LATCHES IN THREE PLACES.

c) DOOR CLOSURE
AUTOMATIC DOOR CLOSURE IS INCLUDED

d) SPRINKLER HEAD
INLET CONNECTION IS 1/2" M.NPT AT ROOF.
SPRINKLER HEAD IS PROVIDED WITHIN CABINET.
STATIC (NON FLOWING) PRESSURE: 175 PSIG MAX.
DYNAMIC (FLOWING) PRESSURE: 7 PSIG MIN.
WATER USAGE: 7 TO 36 GPM DEPENDING ON WATER PRESSURE.

e) EXHAUST CONNECTION
DUCT CONNECTION IS 6.125" DIAMETER
SUITABLE FOR INTENDED PROCESS GAS
WINDOW OPEN DUCT FLOW: MINIMUM 100 SCFM AT 0.75" H2O
WINDOW CLOSED FLOW: MINIMUM 25 SCFM AT 0.75" H2O.
VENTILATION SYSTEM (EXTRACTOR) TO BE SUPPLIED BY OTHERS.

f) GAS IDENTIFICATION
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g) CYLINDER RESTRAINT
CYLINDER RESTRAINT IS PROVIDED WITH THE CABINET.

h) MOUNTING PANEL
GAS CONTROL COMPONENTS ARE INSTALLED ON THE MOUNTING PANEL INSIDE THE CABINET.

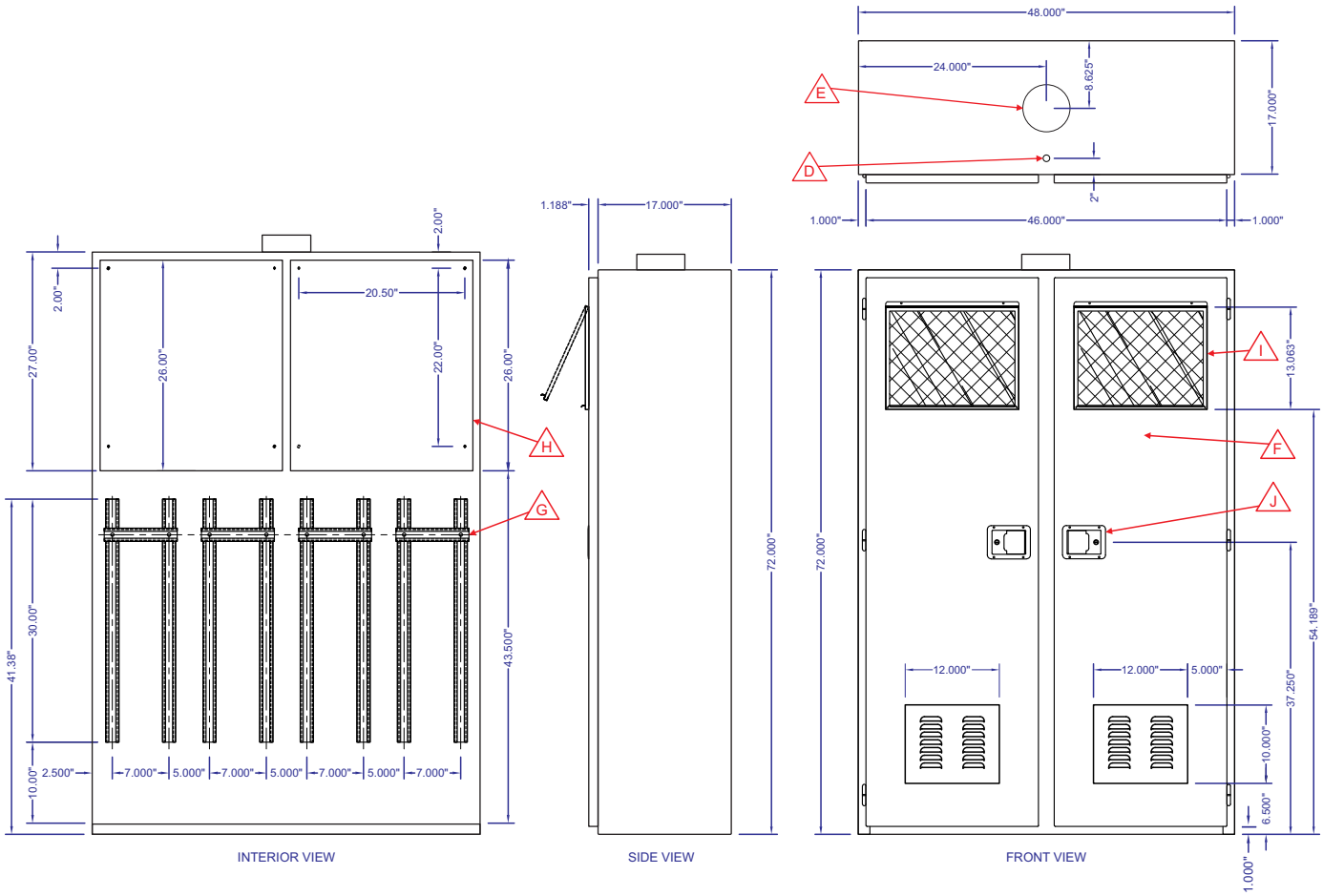
I) REINFORCED WINDOW
THE ACCESS WINDOW OPEN FROM THE BOTTOM UP.

j) LOCKABLE DOOR LATCH

NOT INCLUDED WITH THIS GAS CABINET:

- MECHANICAL VENTILATION (EXTRACTOR).
- VACUUM GENERATOR SUPPLY CONNECTION.
- VENT FROM VACUUM GENERATOR PRESSURE.
- GAS CABINET CONTROLLER.
- VENTURI VACUUM PNEUMATIC GAS SUPPLY.
- PHOTOHELIC PRESSURE DIFFERENTIAL SWITCH AND GAUGE

Four-Cylinder Gas Cabinet



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h) MOUNTING PANEL
GAS CONTROL COMPONENTS ARE INSTALLED ON THE MOUNTING PANEL INSIDE THE CABINET.

I) REINFORCED WINDOW
THE ACCESS WINDOW OPEN FROM THE BOTTOM UP.

j) LOCKABLE DOOR LATCH

NOT INCLUDED WITH THIS GAS CABINET:

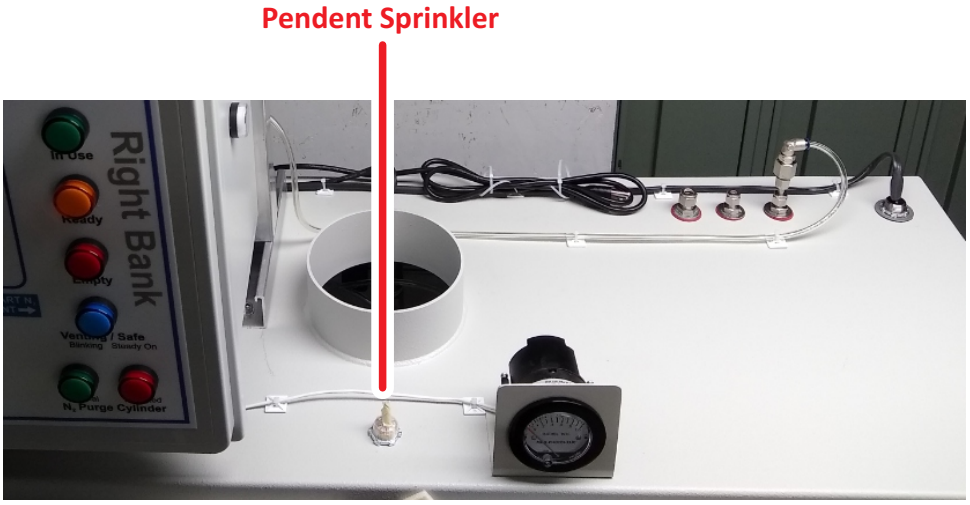
- MECHANICAL VENTILATION (EXTRACTOR).
- VACUUM GENERATOR SUPPLY CONNECTION.
- VENT FROM VACUUM GENERATOR PRESSURE.
- GAS CABINET CONTROLLER.
- VENTURI VACUUM PNEUMATIC GAS SUPPLY.
- PHOTOHELIC PRESSURE DIFFERENTIAL SWITCH AND GAUGE

IGC Series
Part Number Matrix

IGC -	2	-	FS	-	DC	-	MP	-	SFBH	-	EFS
	A		B		B		B		C		C

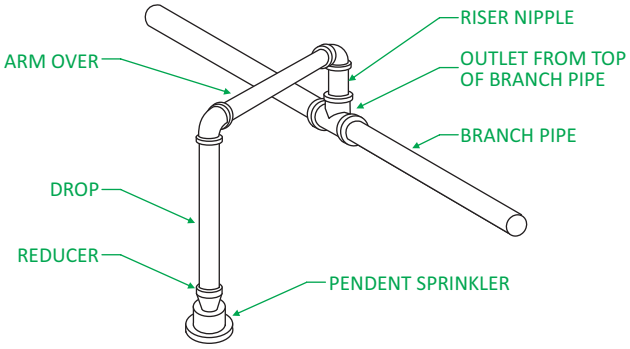
BeaconMedaes IGC Series Model Number Chart			
Variable	**Definition**	**Allowable Value**	**Description**
A	No. of Cylinder	1 2 3 4	1 Cylinder 2 Cylinders 3 Cylinders 4 Cylinders
B	Options	FS DC P DL IS FD CS COAX	Fire (Water) Sprinkler Door Closer Mounting Plate Keyed Door Latch Air Inlet Filter Fusible Link Fire Damper Adjustable Cylinder Shelf Coaxial Process Gas Outlet
C	Instruments	GCC FGM SFBH SCP DPS EFS	Gas Cabinet Controller Fixed Gas Monitor Flashing Beacon with Horn Scale Controller + Platform Differential Pressure Switch Excess Flow Switch

Water Sprinkler

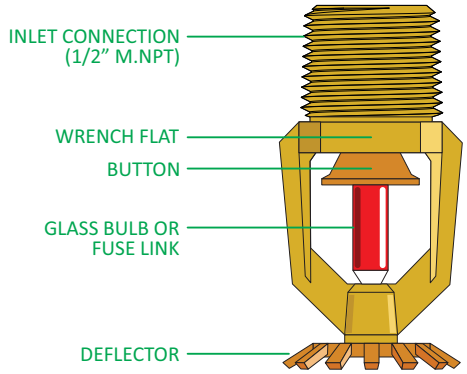


Exterior View From the Front - Acetylene Gas Cabinet

Water Supply Requirements to the Pendent Sprinkler



Pendent Sprinkler



Water Supply Requirements to the Pendent Sprinkler

The IGC Series cabinet contains a coated sprinkler head with a trip point of 165° F. It is located on the ceiling of the cabinet with an external 1/2" FNPT connection. The sprinkler head is capable of flowing 32 GPM @ 31 psig.

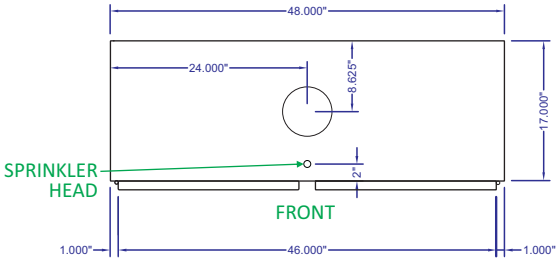
Maintenance

Sprinkler heads must be maintained according to the National Fire Protection Agency.

How They Work

Glass bulb sprinkler heads are triggered when the liquid filled bulb burst at the rated temperature.

Location of Pendent Sprinkler



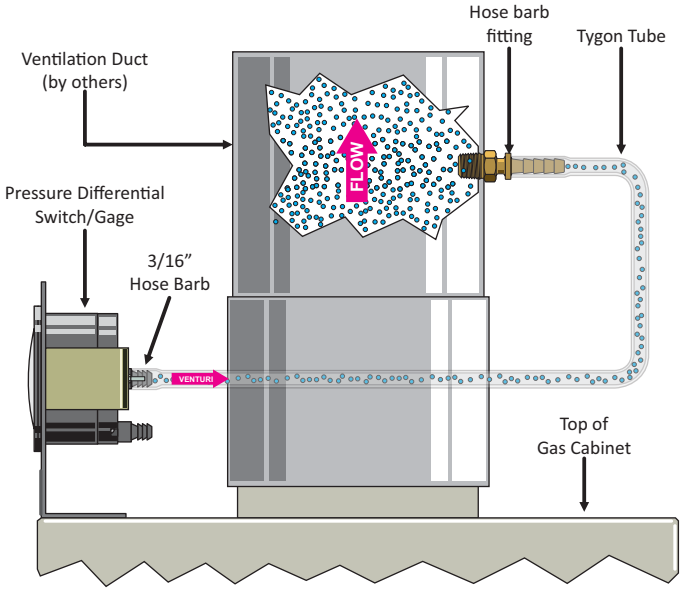
Differential Pressure Switch

Description - Differential Pressure Switch

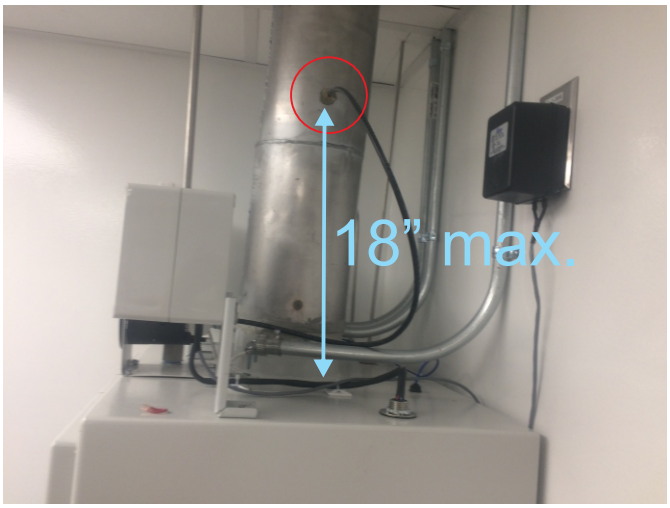
We use the Dwyer's MP Series Mini-Photohelic differential pressure switch/gage combines the time proven Minihelic II differential pressure gage with two SPDT switching set points. The Mini-Photohelic switch/gage is designed to measure and control positive, negative, or differential pressures consisting of non-conbustible and non-corrosive gases. Gage reading is independent of switch operation. Switching status is visible by LED indicators located on the front and rear of the gage. Set points are adjusted with push buttons on the back of the unit.

How it Works

The purpose of the ventilation is to keep a negative pressure inside the gas cabinet. In order to do so, a properly sized extractor/ventilator is pulling air out of the gas cabinet. The cabinet is mounted with several louvers so that air keeps flowing out and circulating. The air velocity must be maintained at 200 ft/min with access window open and 150 ft/min (no less) at any single point. The best way to monitor if there is ventilation in the gas cabinet is to install a differential pressure switch/gage (PDS). The PDS is equipped with switches that can be connected to a gas cabinet controller or directly to a building automation system. Upon loss of ventilation, the switches will be triggered and the alarm signal will be transmitted to the warning devices.



Typical Differential Pressure Switch Installation.



Maximum Height of Sampling Tube Into the Duct

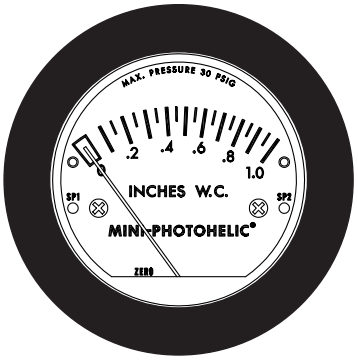
Installation

The process connection is located at the back of the differential pressure gauge. There are two ports on top of each other. The connection to be used is the low pressure one identified as "-". The hose barb connection is 3/16". A flexible tube shall link the top 3/16" hose barb connection to the exhaust duct. The tubing and the fitting connecting to the exhaust duct are to be provided by others. We recommend to install the exhaust duct fitting no more than 18" from the gas cabinet roof (preferably 3" to 6")

Default Factory Set Pressure

Normal Pressure (Door Closed)	0.9 inch water column
Normal Pressure (Door Open)	0.6 inch water column
Alarm Pressure (Door Open)	0.3 inch water column

The differential pressure is greatly influenced by the location of the sampling point connection into the duct. The final alarm pressure shall be adjusted in the field.



Differential Pressure Switch Front/Dial

Stackable Flashing Beacon With Horn

Description
The SFBH stacklight unit is a modular system that provides illuminated and audible status indication in all directions. It is easily assembled using plug-in modular units. The modular units consist of flashing LED lights and an audible alarm unit. The stacklights may be assembled in a variety of configurations.

Purpose
NFPA 55 mandates the use of audible and visible alarms in conjunction with a gas monitoring system.

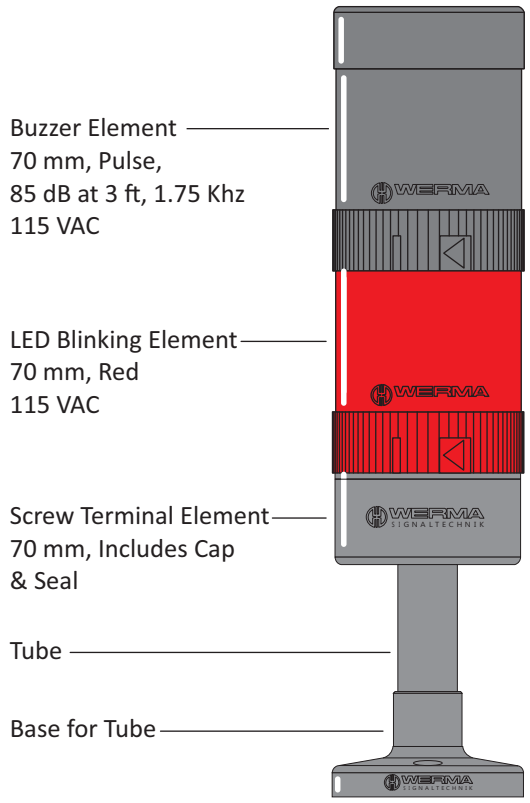
If a gas monitoring system is not used with the gas cabinet. An audible and visible alarm can be installed on a gas cabinet. The alarm devices can be triggered by various instruments. The goal is to warn nearby operators about a situation that shall be addressed with the gas cabinet.

Installation
The audible and visual alarm device is normally mounted on the roof of the gas cabinet. Unless otherwise specified or requested on specific projects. The installation, wiring and performance testing of the warning device are done at the factory.

Configurations
The typical configuration of the audible and visible alarm device is one (1) buzzer element and one (1) flashing LED. The alarm device can be expanded up to four (4) modules.

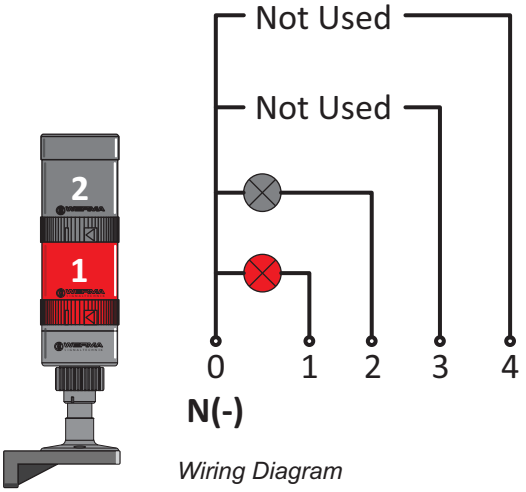
Available Colors
Red (Standard)
Green
Yellow
Clear
Blue

Available Voltage
24V AC/DC
115V AC/DC (Standard)

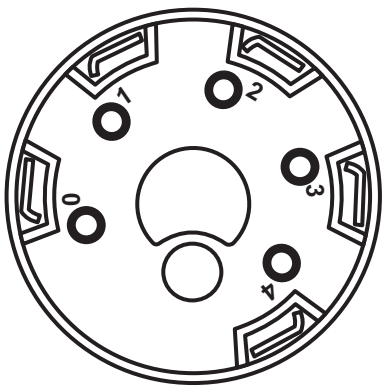


WARNING DEVICE
(by Beacon Medaes or by Others)

NFPA 55 - 7.9.6.2 - Local Alarm.-
The gas detection system shall initiate a local alarm that is both audible and visible."



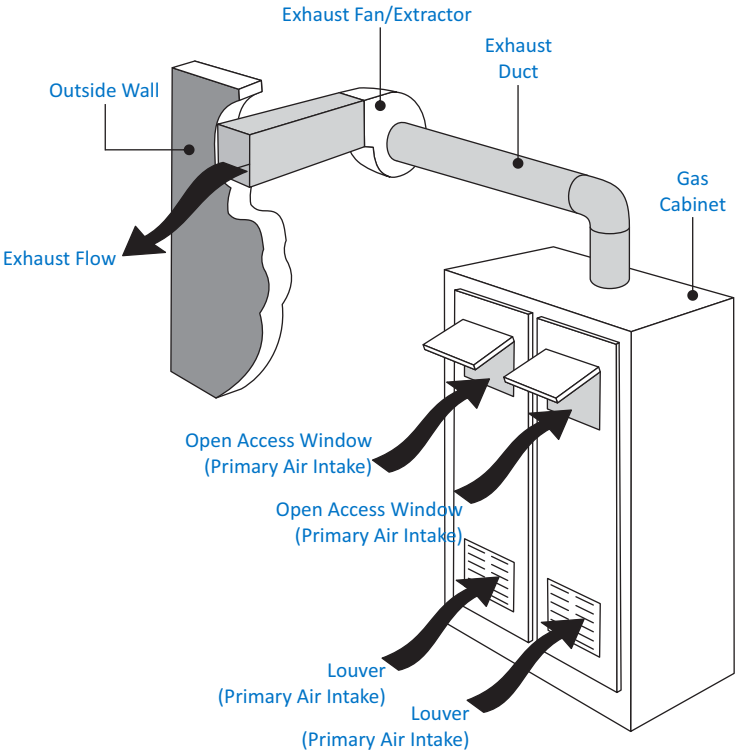
Wiring Diagram



Interior View of the Terminal Element

Exhaust System

Typical Installation of Vent Conduit



Representation of Air Flow Path From Gas Cabinet to Outside

NFPA 55 Exhaust System Criteria

The gas cabinet must be connected to an exhaust system that is capable of meeting the following criteria:

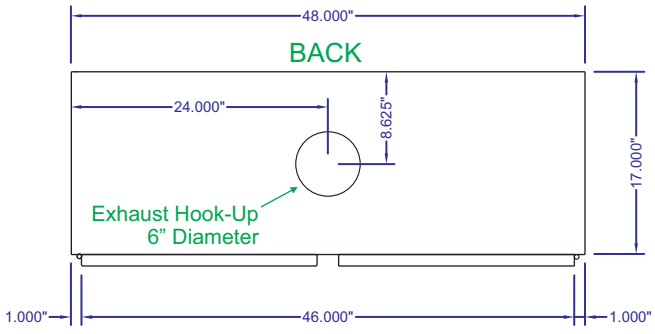
1. A minimum of 200 feet per minute air velocity must be achieved across an opened access hatch to prevent operator exposure to hazardous gas. This velocity must be achieved as an average with 150 feet per minute minimum at any point of the opening.

2. A minimum volume of air must flow through the cabinet to prevent a leak of hazardous gas from escaping the cabinet.

Warning !

The exhaust system must be independent of any general plant exhaust system and must be designed for the types of gases being used. Ensure that only compatible gases are fed into the exhaust system. Be certain the exhaust power and shut down interlocks comply with UFC and NFPA code requirements.

Exhaust Hook-Up Location



Exhaust Duct Discharge

The vent discharge shall be ducted directly to a safe location outdoors or to a treatment device designed to control ignitable gases or toxic gases in such manner that will not compromise the specified performance of the cabinet and in a manner that is acceptable to the AHJ.

Duct, Fan, Hardware and Labor

All duct, fan and related hardware to be supplied by others. Labor required to properly install the exhaust system is by others.

Gas Cabinet Exhaust Fan

Refer to he “Gas Cabinet Exhaust Fan” for details.

Process Piping

Exterior View From the Back - Acetylene Gas Cabinet

Interior View - Acetylene Gas Cabinet

Outlet Connection

The process line (acetylene) is 3/8” compression made out of Type 316 stainless steel. The outlet port location is shown on the above pictures.

Pressure Relief Valve

The pipeline is already protected by a pressure relief valve located inside the gas cabinet. The pressure relief valve is set at 25 psi. The pressure relief valve is venting to the vent line coming out of the gas cabinet.

Piping Pressure

The maximum delivery pressure of the acetylene manifold is 15 psi.

Piping Design & Construction Code

We recommend to use the latest edition of ASME B31.3 - Process Piping as a design and construction code for the acetylene (process) piping.

Standing Pressure Test

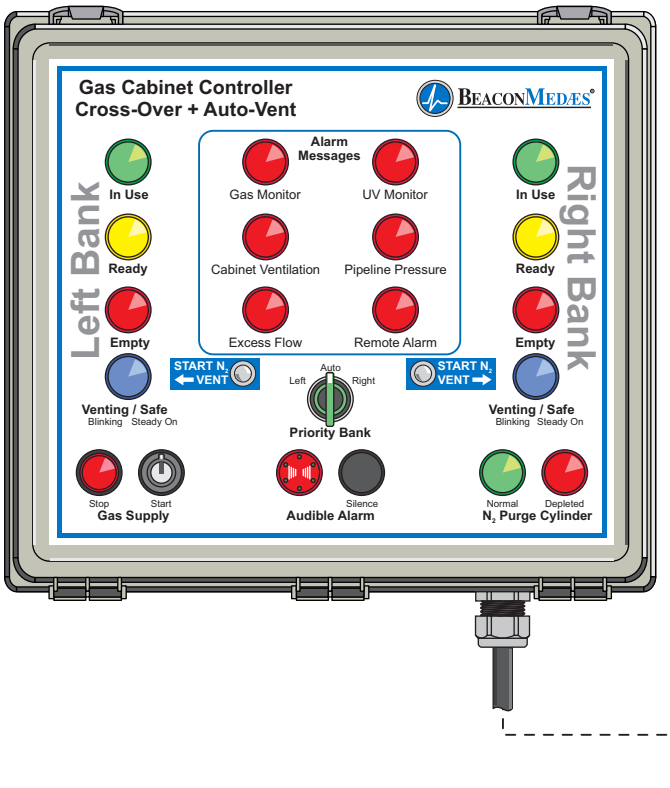
The process piping shall be tested with an inert gas (preferably Helium) at 110% of the design pressure. The standing pressure test should be run for at least 24 hours with no pressure variation during that period other then normal pressure fluctuation due to temperature fluctuation (which should also be monitored).

Tubing and Piping Joints

The best method to join piping or tubing together is to use an orbital welding machine. Compression fittings (Swagelok type) is an excellent way to link stainless steel together. Stainless steel piping can also be used as a vent conduit. It this case, the threaded schedule 40 pipes can be used.

Recommended Type 316L Stainless Steel Process Tubing	
1/4” diameter	0.035” wall thickness
3/8” diameter	0.035” wall thickness
1/2” diameter	0.049” wall thickness
3/4” diameter	0.049” wall thickness
1” diameter	0.065” wall thickness

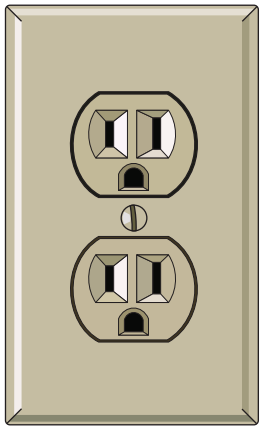
Electrical Connections

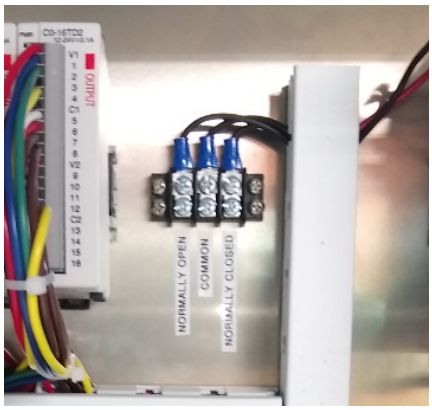


Power Requirements

The gas cabinet controller is mounted with a 120 power cord. The power cord is terminated by a three-prong straight-blade plug.

NEMA 5-15
120 VAC 50-60 Hz
15 Amp.





External Alarm Signal

An external alarm signal is available with the gas cabinet controller. This external signal is volt-free. This C-shape dry contact (which means it has a normally open, a normally close and a common) will be triggered each time a red light comes on.

This dry contact is good for low Amperage draw such as turning pilot lights or sending a sending to a building automation system. Should you require to actuate "heavier" equipment such as fans and motor starters. An additional power relay shall be used between the gas cabinet controller external signal and the high Amperage draw device.

Grounding

The equipment must be grounded in accordance with Article 250 - Grounding in the National Electrical Code (latest Edition).

Cabinet Grounding

Grounding Method - Cabinet
The equipment must be grounded in accordance with Article 250 - Grounding in the National Electrical Code (latest Edition). The customer is responsible for connections to earth ground.

Gas Cabinet Controller
The gas cabinet controller is supplied with a SJTOW/SJEOW electrical cord which includes a ground blade. The gas cabinet controller enclosure, electrical components and electronic components are already grounded.

General Instructions
a. Determine a convenient spot on the gas cabinet.[1]

b. Drill a hole for screw size 1/4" or 3/8" depending on the screw/bolt size.

c. Remove the paint down to the metal where the screw lug, bolt, or washers[2] will touch the cabinet.

d. Install the ground wire into a round lug or a screw lug.

e. Install the lug onto the threaded stud and tighten with washer, lock washer, and self locking nut.
Double nut with standard nuts if required by local code.

f. Attach the other end of the wire onto a suitable grounded pipe or other approved grounding device.

[1] *The location of the spot is NOT important as long as the location is on the cabinet itself. The goal is to ground the gas cabinet enclosure as an industry good practice and to comply with local applicable code. The gas cabinet controller is already grounded.*

[2] *When allowed by Code, paint piercing grounding washers (sold as a kit by Panduit - see below) can be used in lieu of scraping or sanding the painted surface of the gas cabinet (enclosure). Follow manufacturer's installation instructions.*

Warning
All local electrical codes must be followed, and supersede these instructions if different. It is the user's responsibility to secure the services of a qualified professional to meet all requirements.

Grounding Effectiveness
The overall resistance must be measured after grounding the cabinet enclosure. This resistance for the equipment ground to the grounding hardware can not exceed one (1) ohm. Check the effectiveness of grounding by attaching a wire to the nearest structural metal member and connect an ohmmeter in between the reference ground wire and the enclosure.

Recommendations
- Use commercially available grounding wires, as they are hardy and made for industrial service duty.
- Make sure all connections are secured.
- With painted equipment, you may want to remove some of the paint in order to contact metal (this is a well established good installation practice). This will ensure good electrical continuity through metal-to-metal contact when installing grounding devices.
  If removing paint is not an option. We suggest to use bonding hardware kits made by Panduit (see following page for details).

Suggested Grounding Methods
Schematics on Next Page

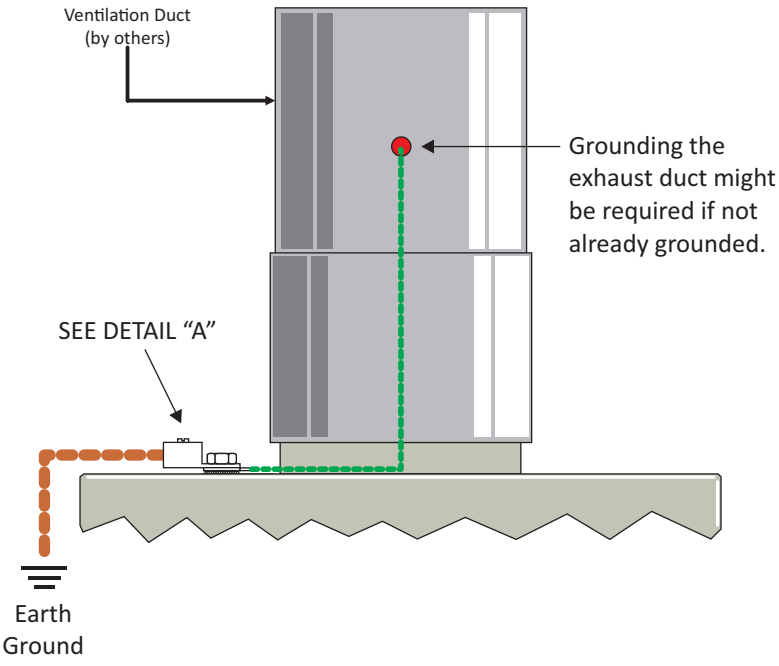
Paint Piercing Grounding Washer Kit

- Bonds frame members on bolt-together racks
- No paint scraping required
- Green color-coding to indicate bonding application
- Engineered to comply with US and International grounding requirements

Part Number	Part Description	Std. Pkg. Qty.
RGW-100-1Y	100 paint piercing bonding washers for 3/8" (M8) stud size; .875" (22.2mm) O.D.; provided with .16 oz. (5cc) of antioxidant.	1

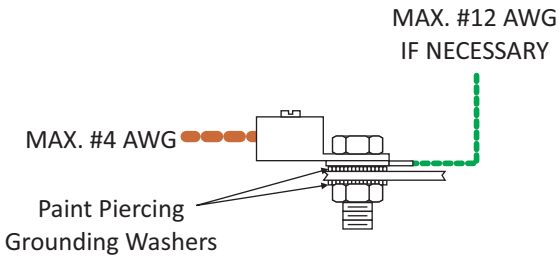
Cabinet Grounding

Suggested Cabinet Grounding Method



Typical Screw Lug
(hardware by others)

Copper *Aluminum*



DETAIL "A"

PATENTED Bonding Hardware Kits

- Patented bonding hardware kits incorporate paint piercing serrations to create a bond point between the rack or cabinet and painted patch panels, mounted equipment, servers, busbars, and jumpers
- Thread-forming, provide a bond to the rack or cabinet by removing paint from holes and minimizing metal shavings
- Green color-coding to indicate bonding application

TRBSK

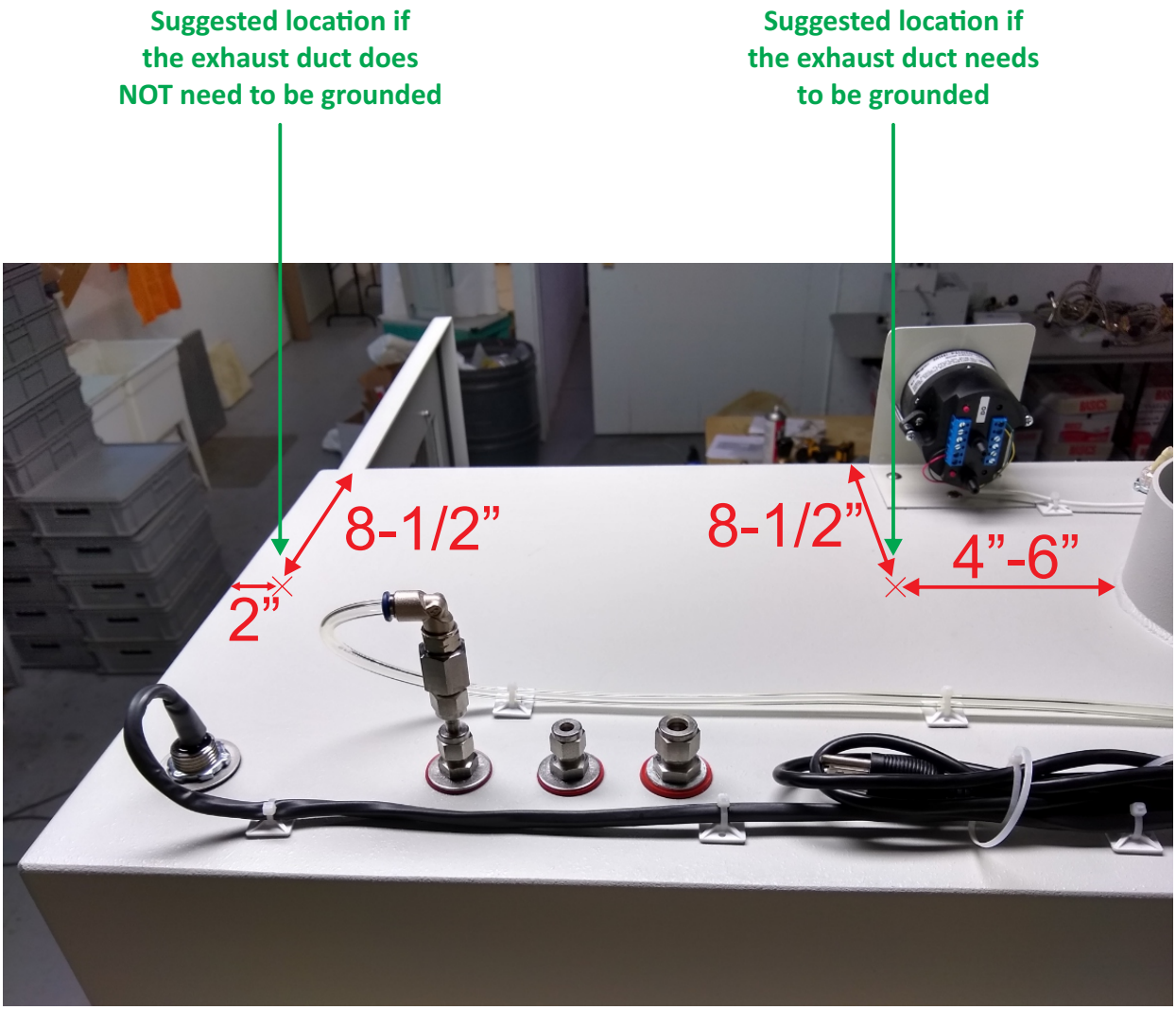
CGNBSK

BGN

Part Number	Part Description	Std. Pkg. Qty.
Bonding Stud Kits for Threaded Rail Fasteners		
TRBSK	Bonding stud kit for threaded #12-24 rail fasteners; includes 25 bonding studs and 50 bonding nuts.	1
TRBSM6K	Bonding stud kit for threaded M6 rail fasteners; includes 25 bonding studs and 50 bonding nuts.	1
Bonding Stud Kit for Cage Nut Rail Fasteners		
CGNBSK	Bonding stud kit for cage nut rail fasteners; includes 25 bonding studs and 50 bonding nuts.	1
Bonding Nuts		
BGN-C	Bonding nut for threaded #12-24, cage nut, and 1/4" thru-hole rail fasteners.	100
BGNM6-C	Bonding nut for threaded M6 rail fasteners.	100

Cabinet Grounding

Suggested Location for Ground Hardware



Delivery Panels & Manifolds

Pressure Differential Changeover Panel

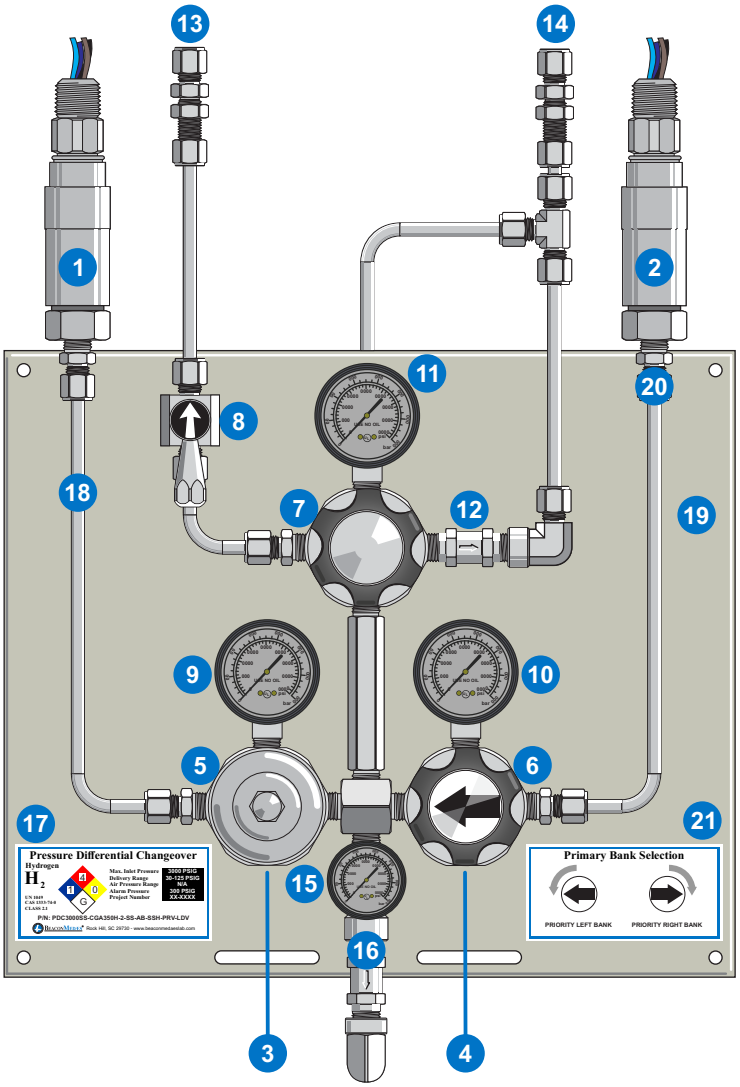
Description

This PDC3000SS changeover station is specifically designed and made to be mounted inside a gas cabinet. Its stainless steel construction makes it ideal for pretty much any kind of gases including inert, flammable or corrosive gases. Components are kept to a minimum to keep the gas as pure as possible.

The PDC Series Pressure Differential Changeover Stations are designed to supply an un-interrupted flow of high purity gases. The system automatically changes from the supply bank to the reserve bank without an interruption in gas supply. A simple rotation of the primary bank selector lever resets the unit.

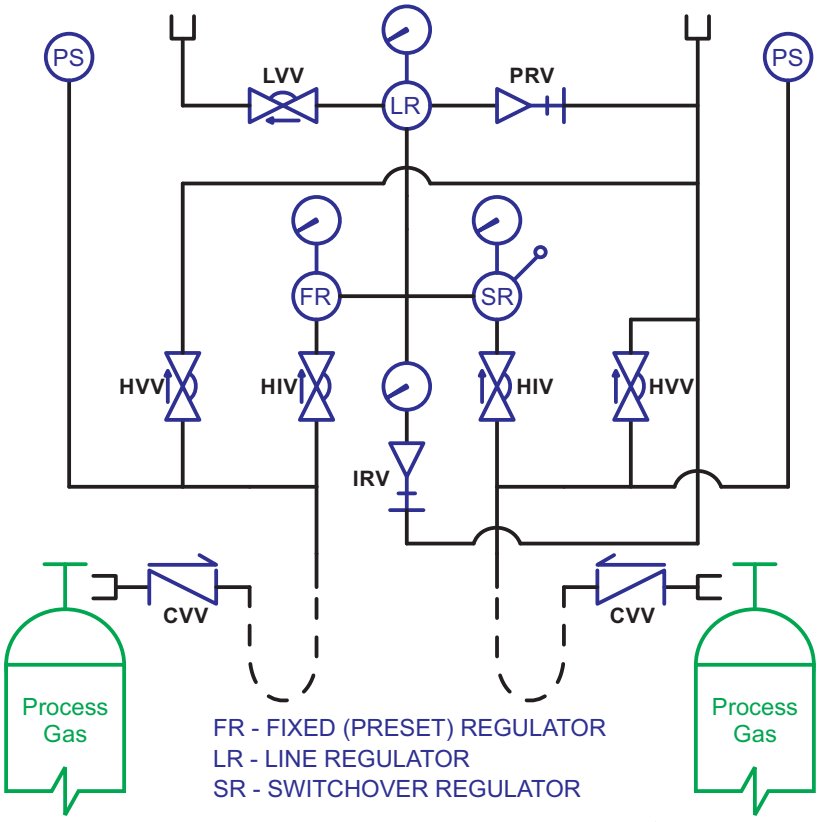
The pressure switches are monitoring the pressure of each cylinder bank. They are connected directly to the alarm box located directly on top of the gas cabinet.

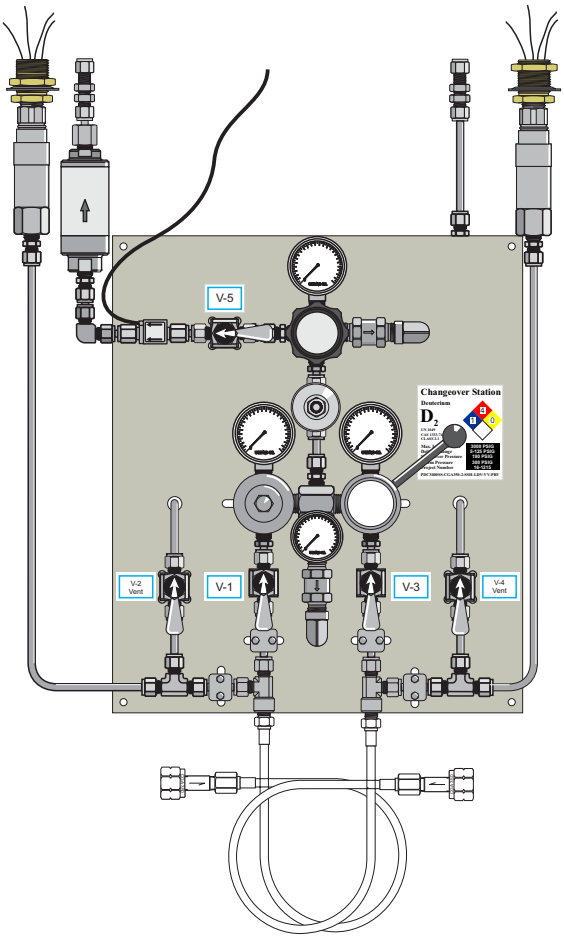
Pressure Settings	
Maximum Inlet	3000 psi
Delivery Range	30-125 psi
Switchover	Around 160 psi
Alarm	300 psi on fall
Outlet Relief Valve	180 psi
Inlet Gauges	0-4000 psi
Delivery Gauge	0-200 psi



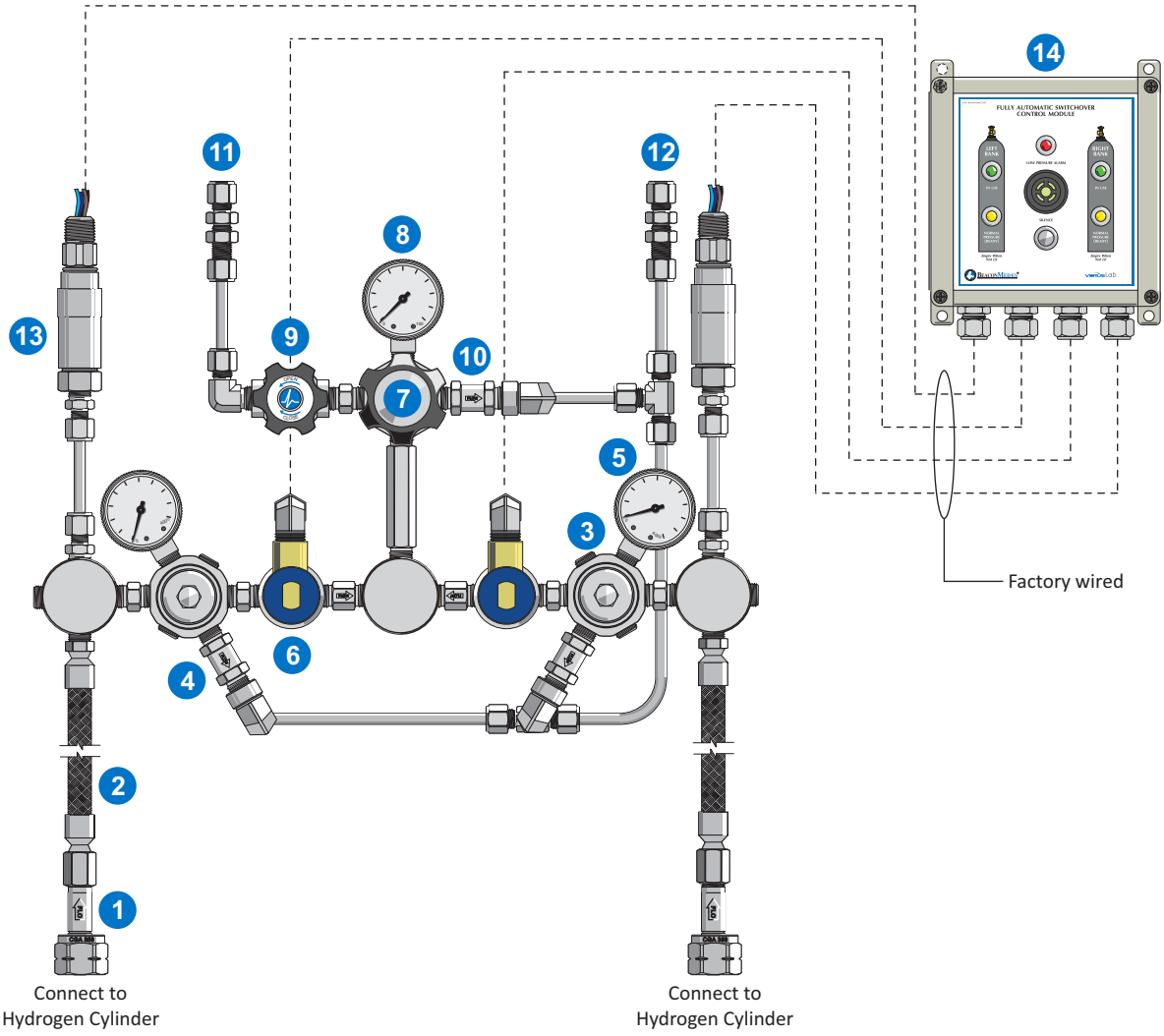
1. Low pressure switch - left bank
2. Low pressure switch - right bank
3. Flexible hose inlet - left bank
4. Flexible hose inlet - right bank
5. Preset pressure regulator
6. Switchover regulator
7. Delivery pressure regulator
8. Outlet (line) diaphragm valve
9. Inlet pressure gauge - left bank
10. Inlet pressure gauge - right bank
11. Delivery pressure gauge
12. Pipeline pressure relief valve
13. Outlet port (1/4” compression)
14. Vent port (1/4” compression)
15. Intermediate pressure gauge
16. Intermediate relief valve
17. Nametag
18. 1/4” O.D. stainless steel tube
19. Mounting panel
20. Compression fittings (typical)
21. Priority bank selection sticker

Pressure Differential Changeover Panel





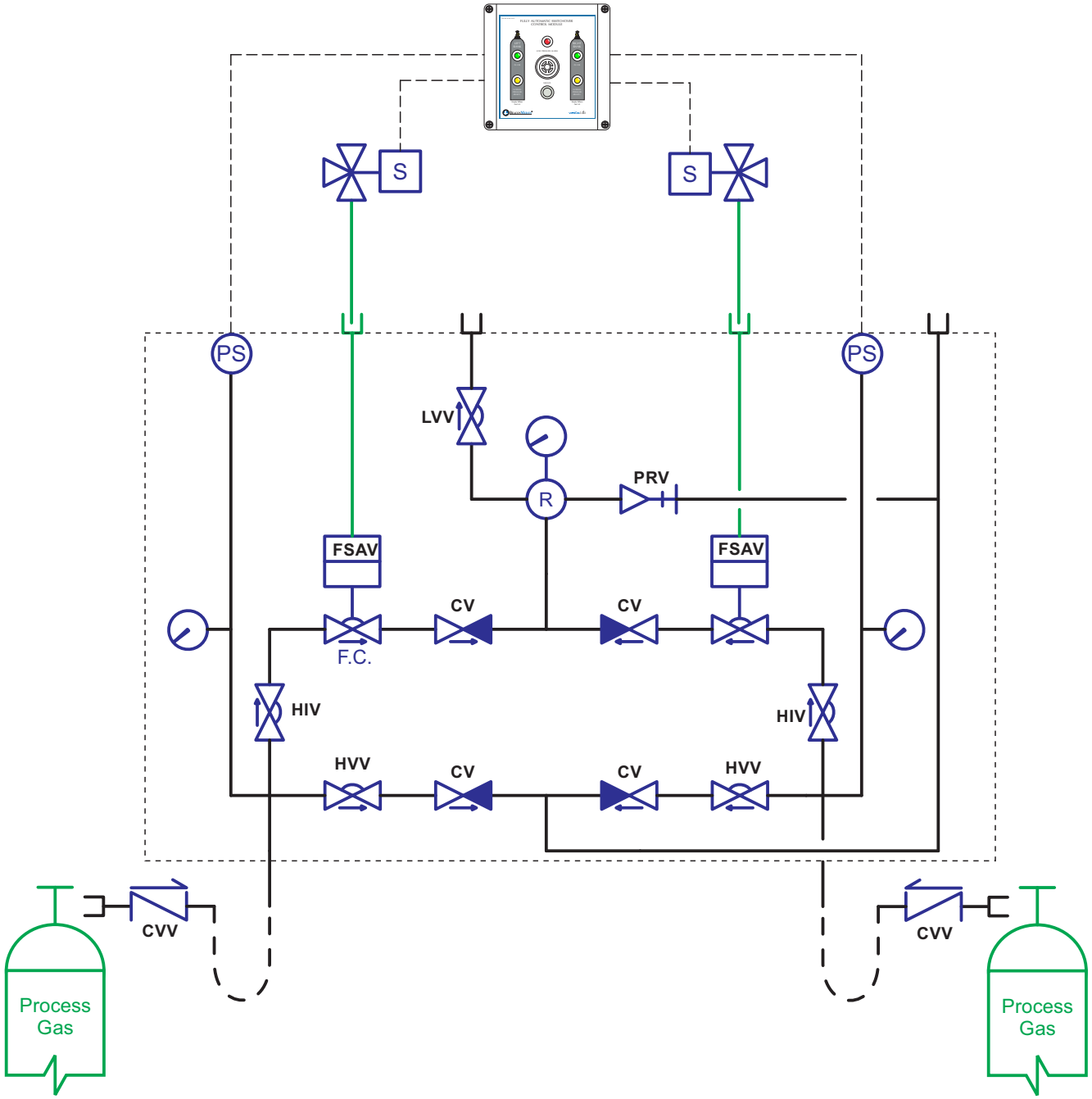
Fully Automatic Changeover Panel



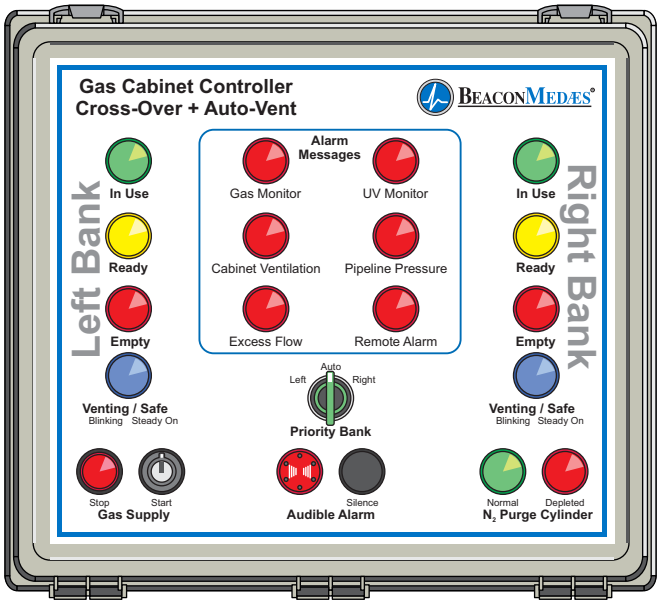
Components

1. Cylinder Nut CGA 350 (2)
2. Stainless Steel Hose (2)
3. Primary Regulator (2)
4. Intermediate Relief Valves (2)
5. High Pressure Gauge (2)
6. Solenoid Valve (2)
7. Line Regulator (1)
8. Delivery Pressure Gauge (1)
9. Line Diaphragm Valve (1)
10. Line Relief Valve (1)
11. Gas Service Outlet -1/4” Compression
12. Vent Outlet - 1/4” Compression
13. Pressure Switch (2)
14. Manifold Controller

Fully Automatic Changeover Panel



Gas Cabinet Controller
Cross-Over + Auto-Vent

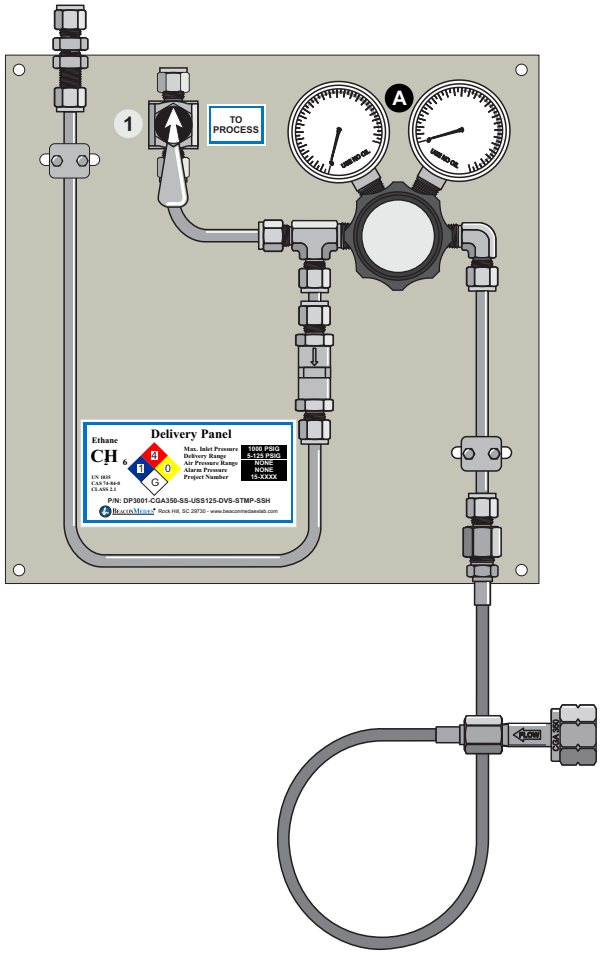


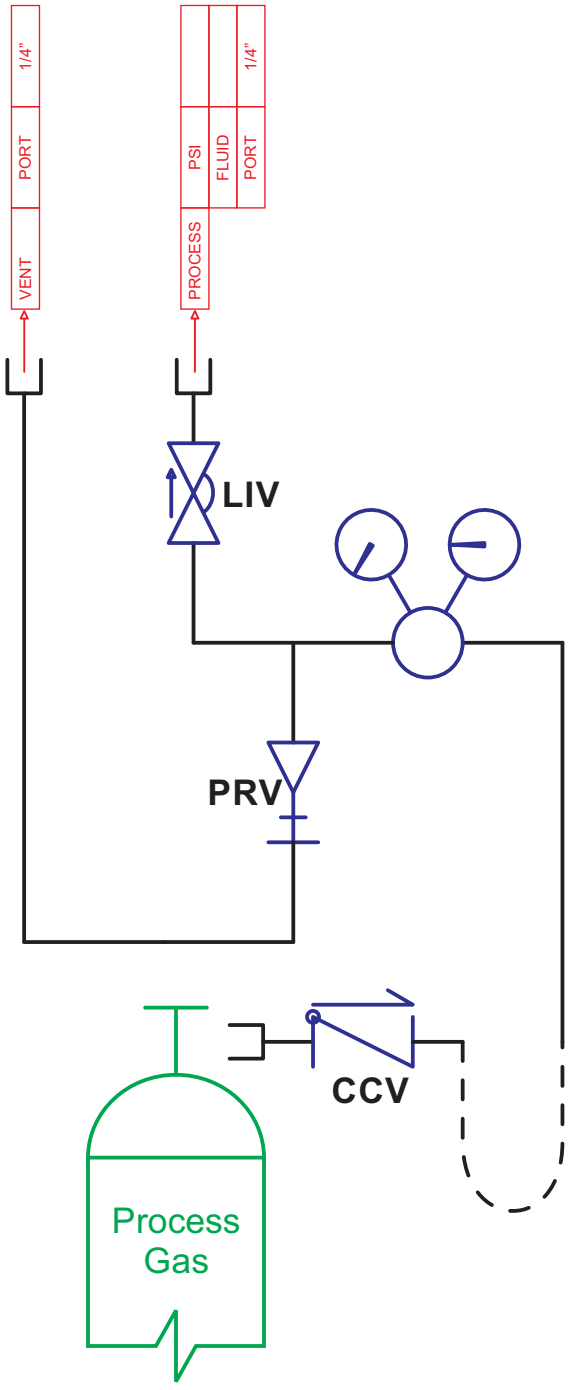
In Use	**IN USE - GREEN LED** Illuminated when the pressure of its related bank is in use.
Ready	**READY - YELLOW LED** Illuminated when the pressure of its related bank is satisfactory but not the gas cylinder is not in service.
Empty	**EMPTY - RED LED** Illuminated when the pressure of its related bank is depleted.
Venting / Safe Blinking Steady On	**VENTING/SAFE - BLUE LED** Blinking: Indicates that the manifold is in purge/vent mode. Steady-On: Indicates that the acetylene cylinder is safe to replace.
Stop Start Gas Supply	**GAS SUPPLY - STOP - ILLUMINATED RED PUSHBUTTON** When pressed, this button stops the acetylene supply and engage the nitrogen purge/vent.
Stop Start Gas Supply	**GAS SUPPLY - START -MOMENTARY KEY SWITCH** When the key is turned, the acetylene supply is engaged as long as all alarm conditions are cleared
Silence Audible Alarm	**AUDIBLE ALARM - ILLUMINATED BUZZER** Illuminated (light) and actuated (sound) each time a red LED is illuminated
Silence Audible Alarm	**SILENCE PUSHBUTTON - BLACK MOMENTARY PUSHBUTTON** When pressed, the silence pushbutton kills the buzzer.
Normal Depleted N_2 Purge Cylinder	**NITROGEN (N_2) PURGE CYLINDER - NORMAL - GREEN LED** Illuminated when the pressure of the nitrogen cylinder is adequate to purge the acetylene and to operates the pressure actuated ball valves.
Normal Depleted N_2 Purge Cylinder	**NITROGEN (N_2) PURGE CYLINDER - DEPLETED - RED LED** Illuminated when the pressure of the nitrogen cylinder is NOT adequate to purge the acetylene and to operate the pressure actuated ball valves.

Auto Left Right Priority Bank	**PRIORITY BANK - LEFT - THREE POSITION SELECTOR** In this position, the gas supply is coming from the left bank as long as the bank pressure is adequate.
Auto Left Right Priority Bank	**PRIORITY BANK - AUTO - THREE POSITION SELECTOR** In this position, the gas supply will alternate from the depleted "in use" bank to the full "ready" bank.
Auto Left Right Priority Bank	**PRIORITY BANK - RIGHT - THREE POSITION SELECTOR** In this position, the gas supply is coming from the right bank as long as the bank pressure is adequate.
Gas Monitor	**GAS MONITOR ALARM - RED LED** This red LED is linked to a gas monitor located inside the gas cabinet. Illuminated when there is a gas leak detected inside the gas cabinet. Under this condition, the supply of acetylene is stopped and the nitrogen purge/vent cycle is engaged automatically by the gas cabinet controller.
Cabinet Ventilation	**CABINET VENTILATION ALARM - RED LED** The cabinet ventilation is linked to the pressure differential switch. This red LED is illuminated when the PDS senses a low or stopped cabinet ventilation. The acetylene supply is stopped but there is no nitrogen vent/purge.
Excess Flow	**EXCESS FLOW SWITCH ALARM - RED LED** This red LED is linked to the excess flow switch mounted to gas manifold. Illuminated when the gas flow is too high. Under this condition, the supply of acetylene is stopped and the nitrogen purge/vent cycle is engaged automatically by the gas cabinet controller.
UV Monitor	**ULTRA-VIOLET MONITOR ALARM - RED LED** This red LED is linked to the UV detector located inside the gas cabinet. Illuminated when there is a flame inside the cabinet. Under this condition, the supply of acetylene is stopped and the nitrogen purge/vent cycle is engaged automatically by the gas cabinet controller.
Pipeline Pressure	**PIPELINE PRESSURE ALARM - RED LED** This red LED is linked to the pressure transmitter mounted to gas manifold. Illuminated when the gas is either too low or too high. Under this condition, the supply of gas is stopped and the nitrogen purge/vent cycle is engaged automatically by the gas cabinet controller.
Remote Alarm	**REMOTE ALARM - RED LED** This red LED is linked to an external signal (dry contact). Illuminated when the circuit is open. Under this condition, the supply of acetylene is stopped and the nitrogen purge/vent cycle is engaged automatically by the gas cabinet controller.

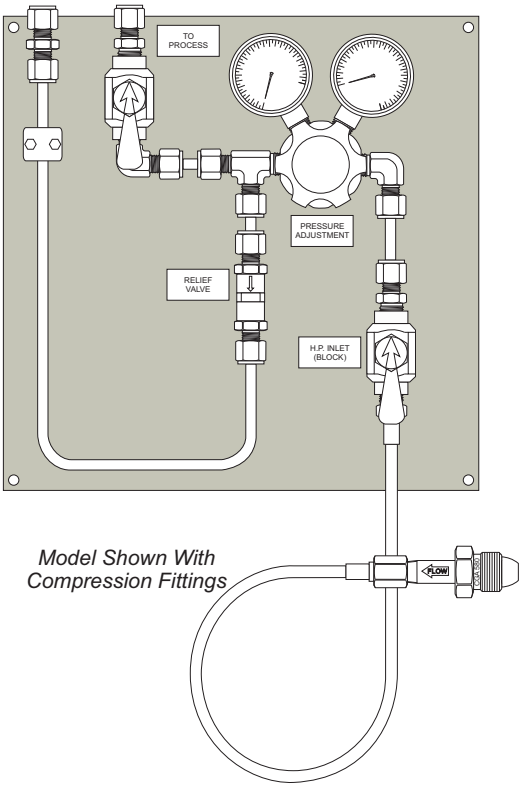
NOTE - NITROGEN PRESSURE
It is important to highlight that the acetylene supply will NOT be possible if the nitrogen cylinder pressure is not adequate (ie depleted).

One-Valve Delivery Panel

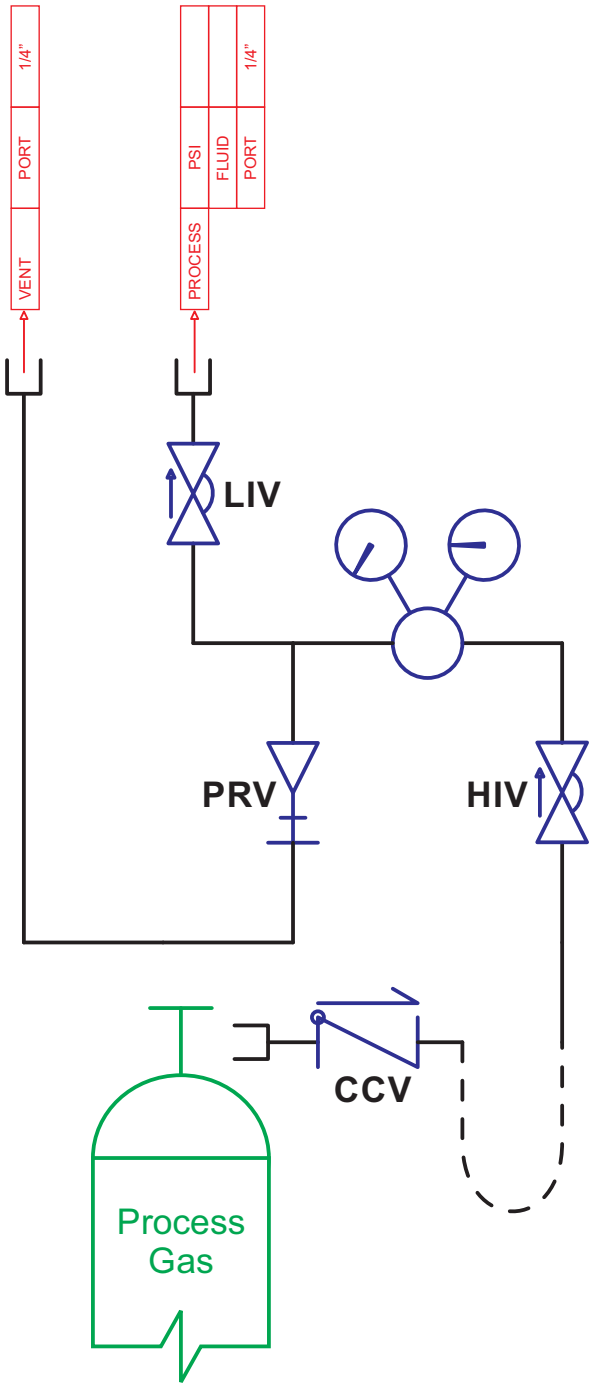




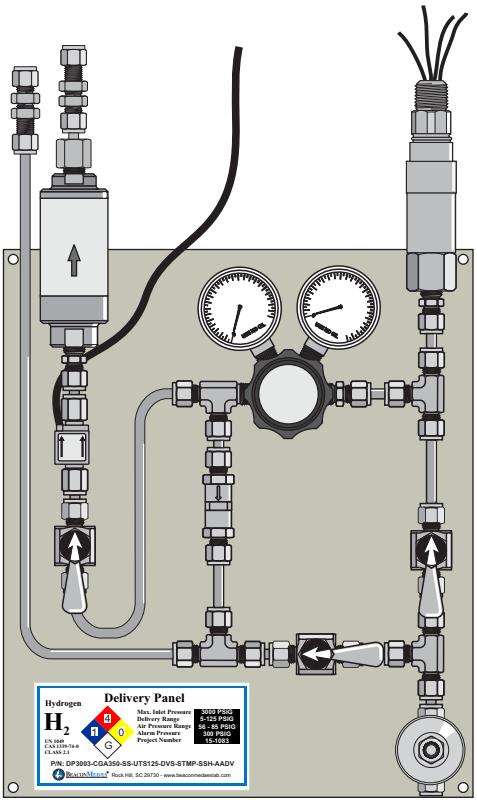
Two-Valve Delivery Panel

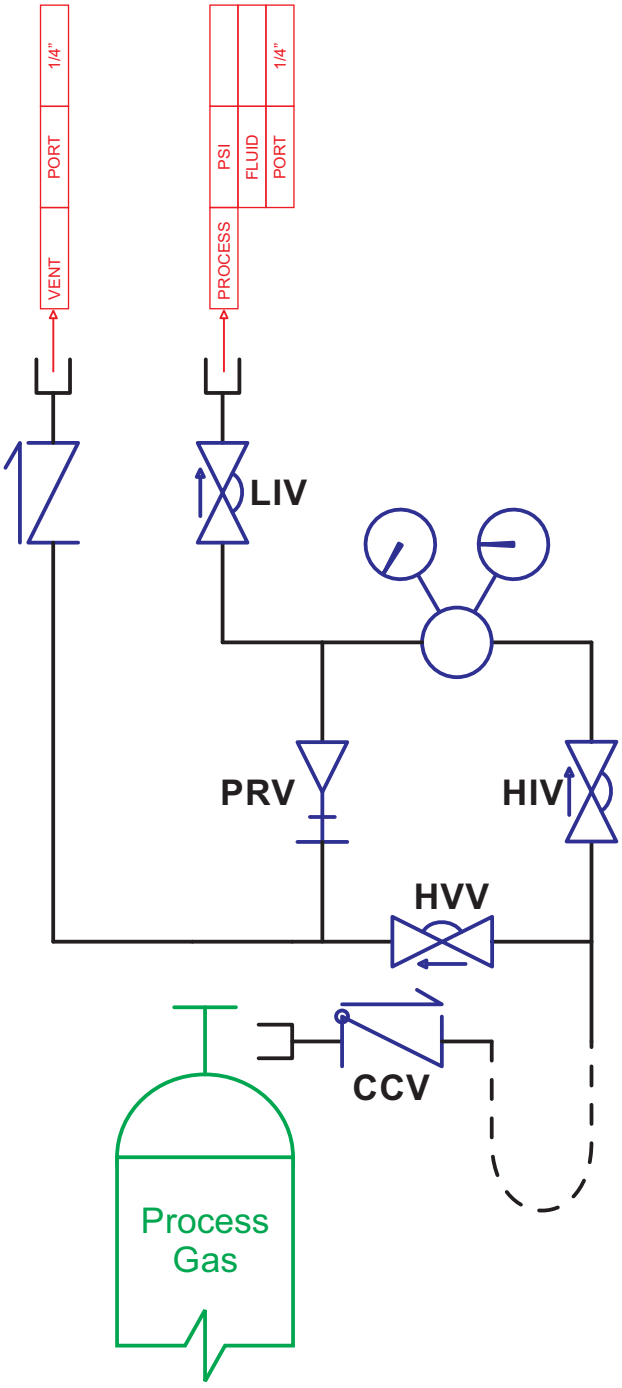


Model Shown With Compression Fittings

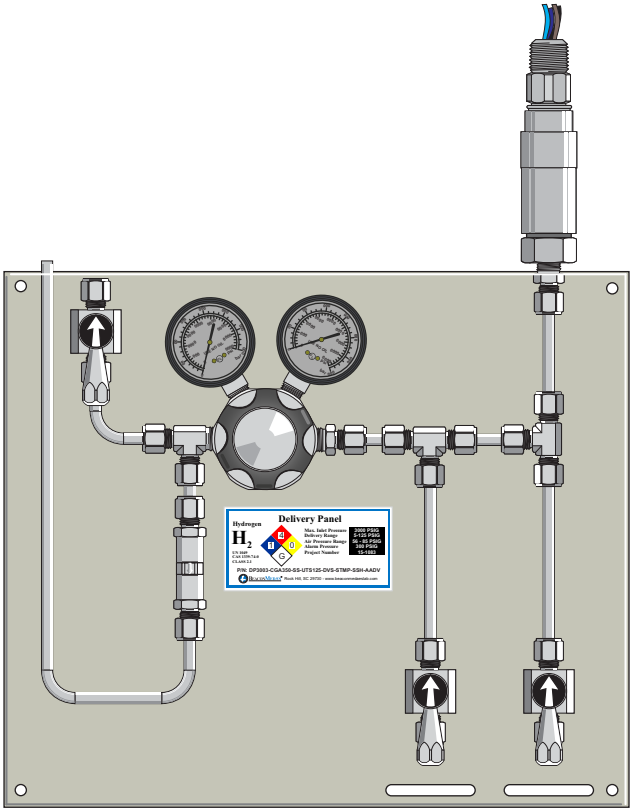


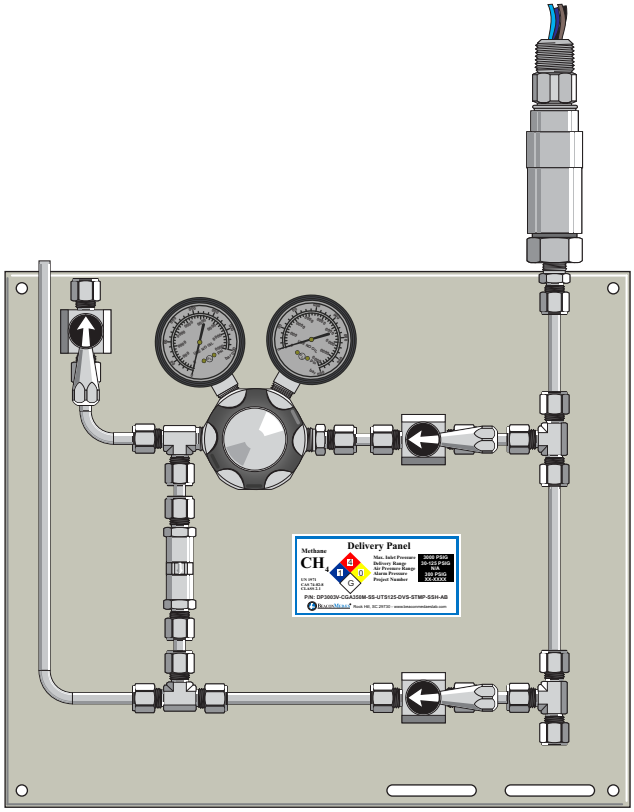
Three-Valve Delivery Panel



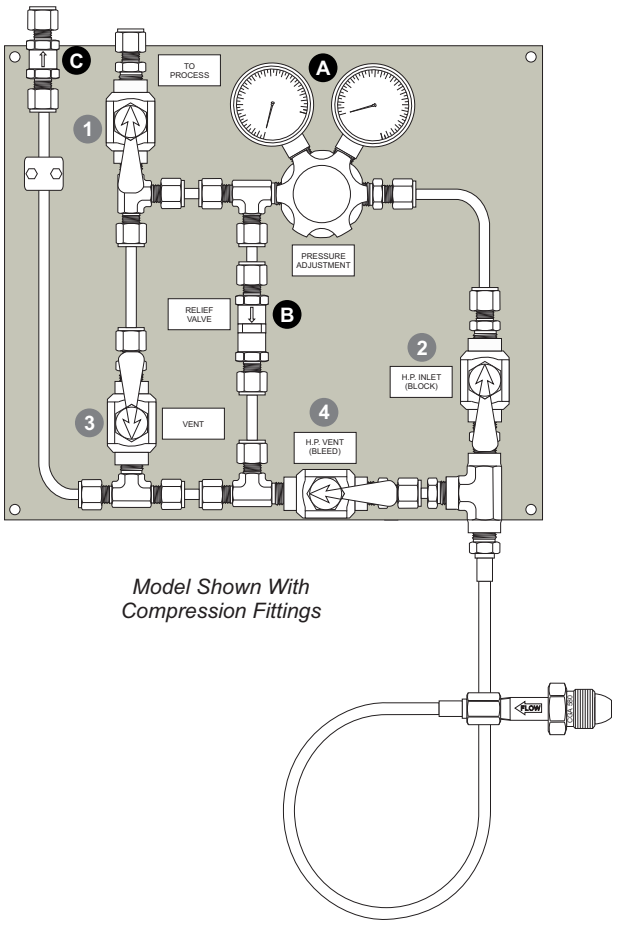


Three-Valve Delivery Panel

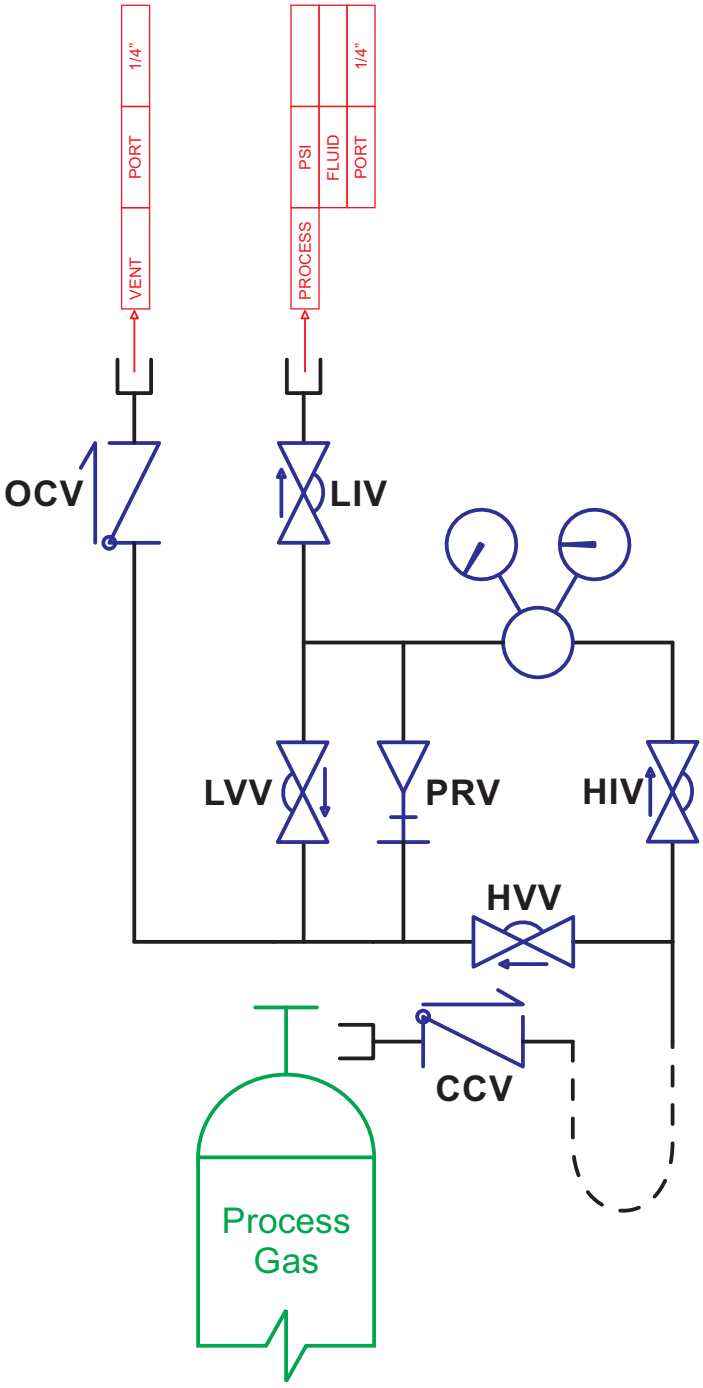




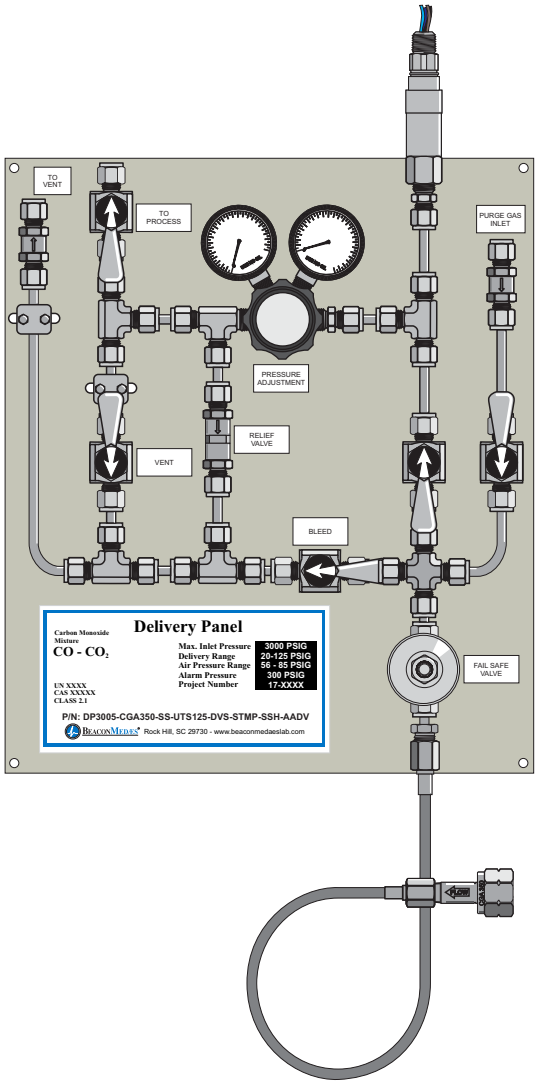
Four-Valve Delivery Panel

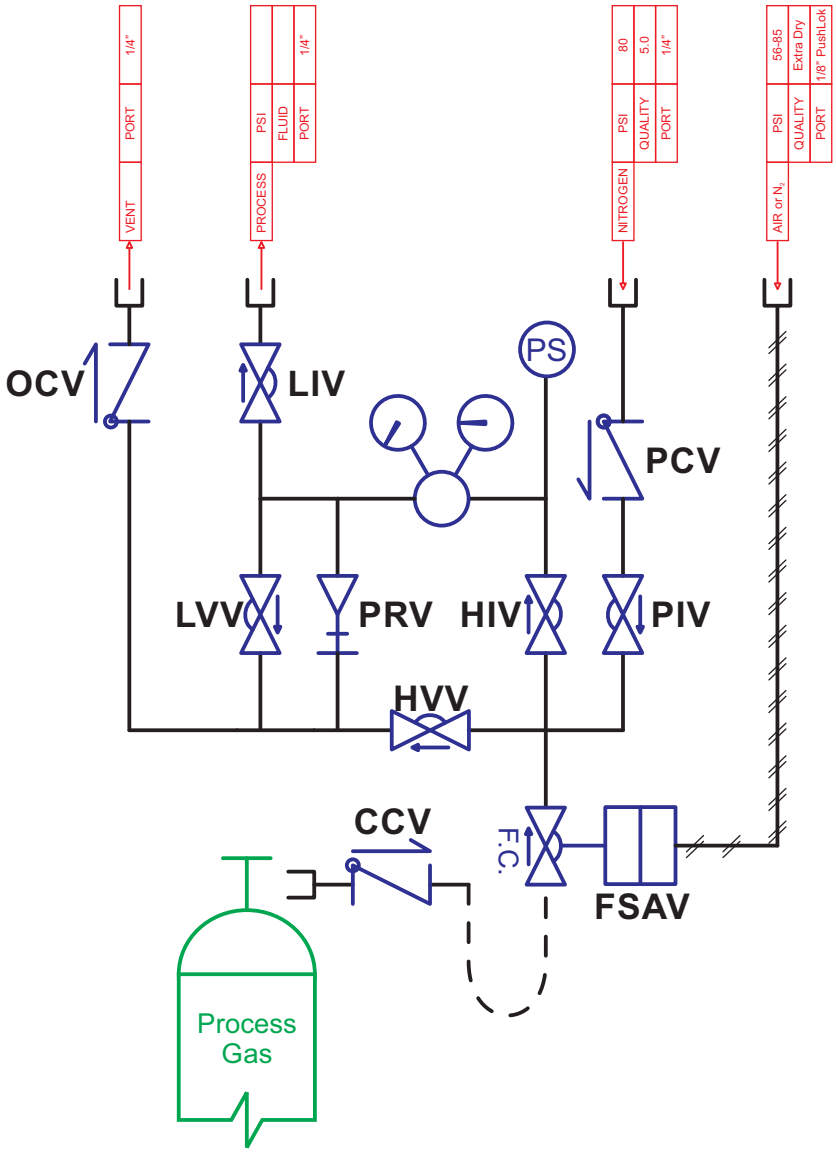


Model Shown With Compression Fittings

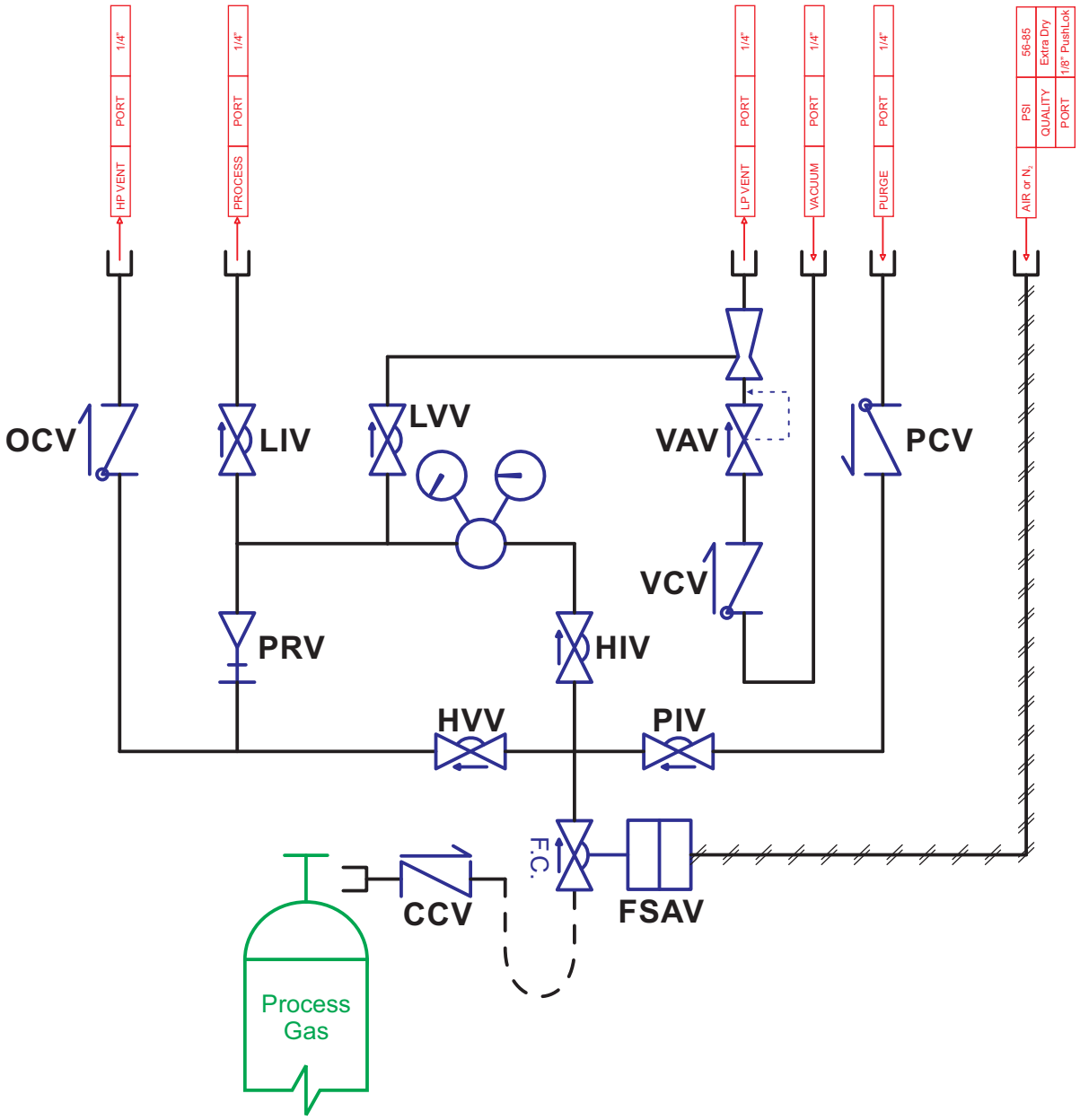


Five-Valve Delivery Panel

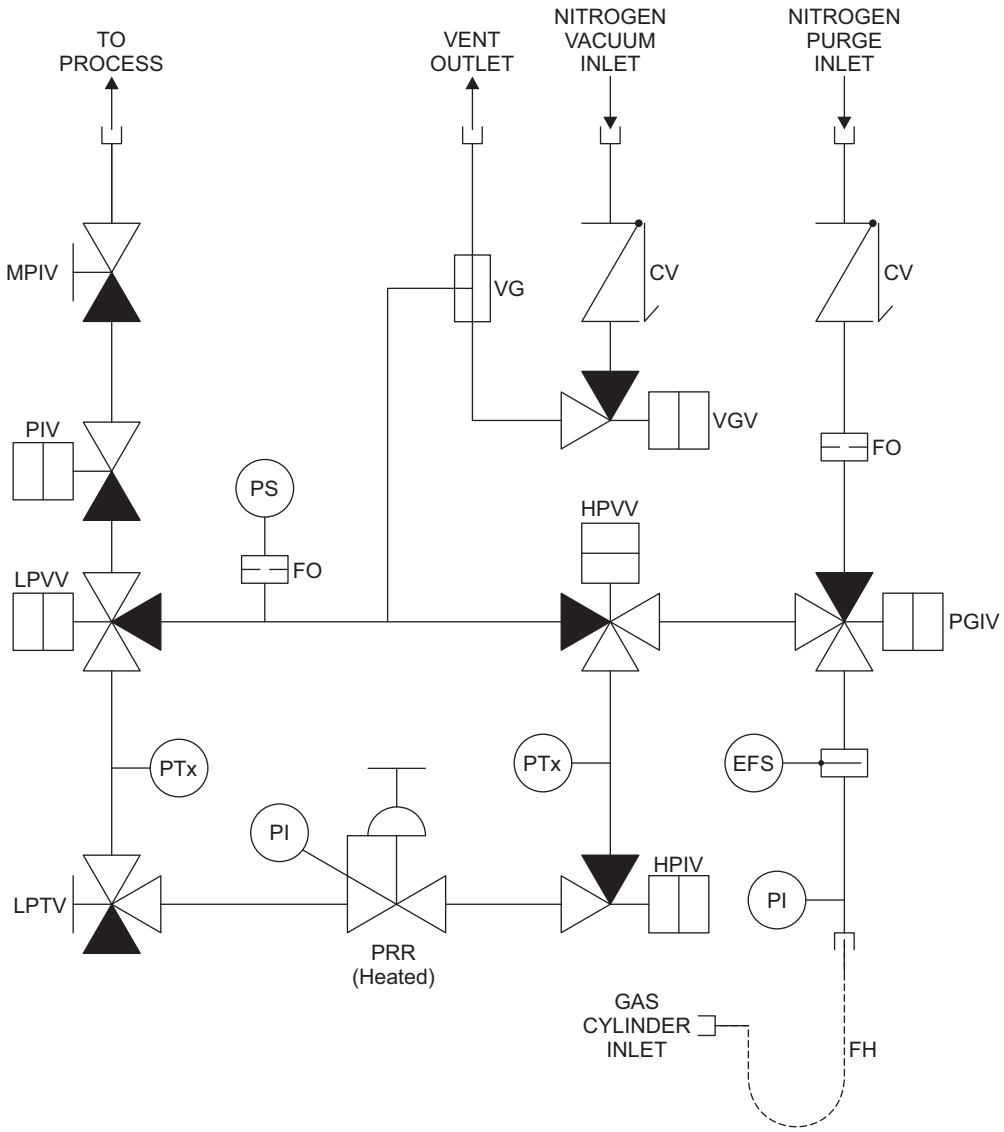




Six-Valve Delivery Panel



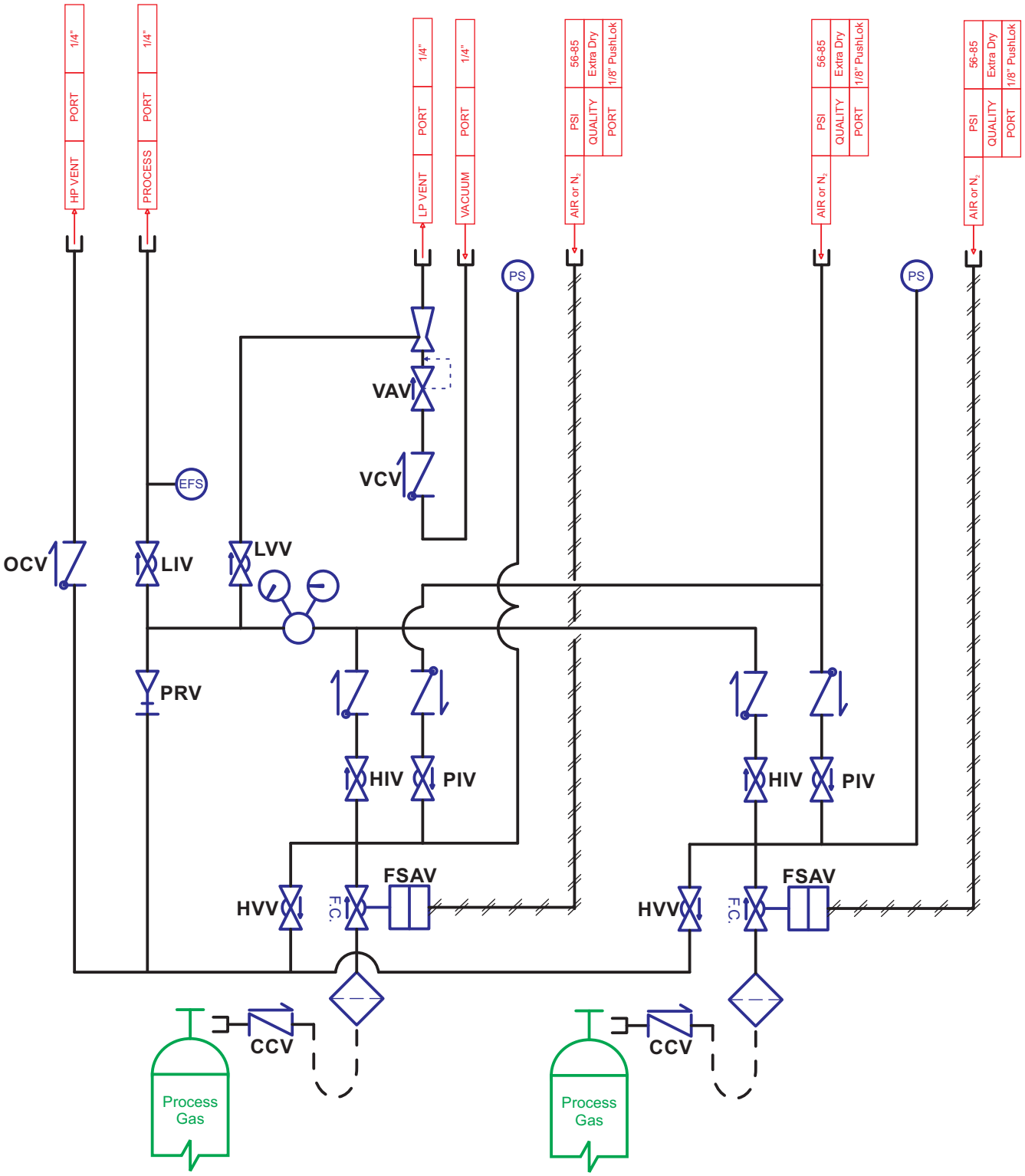
Six-Valve Delivery Panel with Auto Purge



VGV	VACUUM GENERATOR VALVE
CV	CHECK VALVE
PIV	PIPELINE ISOLATION VALVE
PRR	PRESSURE REDUCING REGULATOR
HPVV	HIGH PRESSURE INLET VALVE
EFS	EXCESS FLOW SWITCH
PGIV	PURGE GAS ISOLATION VALVE

FH	FLEXIBLE HOSE
VG	VACUUM GENERATOR
LPVV	LOW PRESSURE VENT VALVE
PI	PRESSURE INDICATOR
LPTV	LOW PRESSURE TIE-IN VALVE
PTx	PRESSURE TRANSMITTER
PS	MANUAL PIPELINE ISOLATION VALVE

Nine-Valve Delivery Panel



Cylinder Leads
Flexible Hose

Description - Flexible Hose

The “all-metallic” specialty gas flexible hoses are designed for small molecule gases (helium & hydrogen) and feature “zero permeation”. These hoses are constructed utilizing a corrugated 316L stainless steel inner core, reinforced with two layers of stainless steel braid and features either a 316L NPT male or female thread to ensure a tight connection.

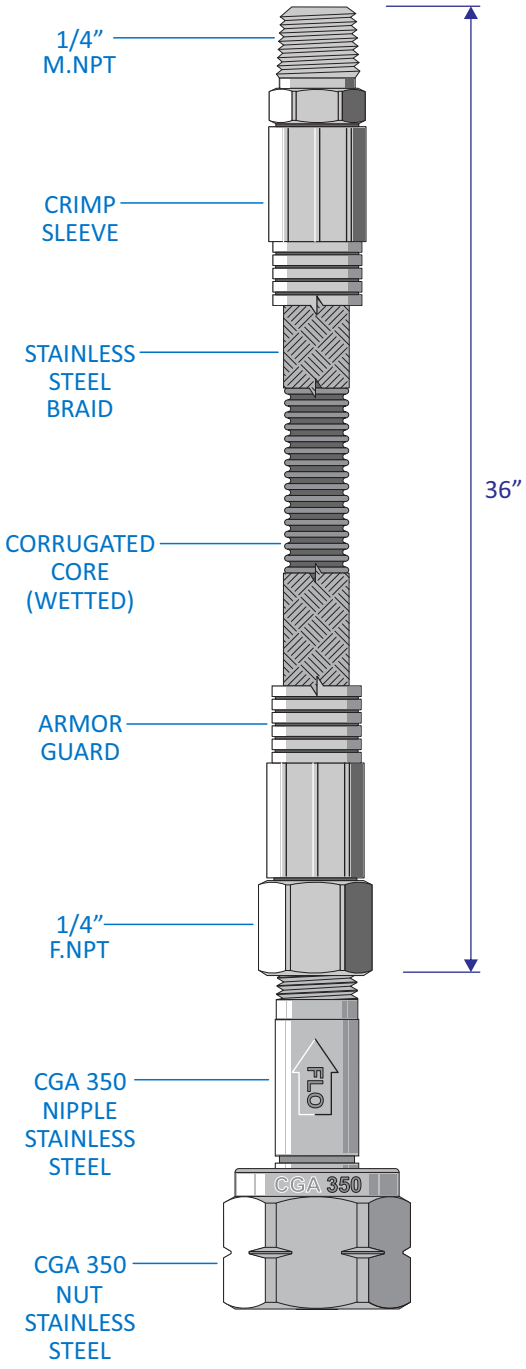
An optional “Safety Armor” (armor guard) is available for added protection. Each hose is marked with an aluminum belly band noting the working pressure and date manufactured. All assemblies are pressure tested to 1-1/2 times the working pressure and have a minimum burst pressure rating 4 times the maximum working pressure.

Hose Specifications	
Nominal Hose I.D.	1/4”
O.D w/out Armor	0.64”
O.D. with Armor	0.81”
Number of Braids	2
Dynamic Bend Radius	4.0”
Working Pressure	3850 psi
Burst Pressure	15,400 psi

Description - CGA Cylinder Connection

CGA (Compressed Gas Association) fittings, which are used to attach to compressed gas cylinders containing specialty gases, are the gas industry standard and were developed through the combined efforts of more than 200 member companies worldwide.

The CGA number defines the gas service by having different thread configurations and sizes. The number one goal of having different cylinder valve configurations is safety. The cylinder valves and related connecting fittings are grouped by type of gases (flammables, inerts, oxydizers and more). By doing so, it prevents potentially catastrophic cross-connections such as connecting an oxygen cylinder into a hydrogen pipeline.



Quantity = 2

Dry Flashback Arrester

Descrption

Dry flashback arrestors help prevent:

- Further gas flow in the case of pressure shocks.
- The entry of air or oxygen into the distribution line or gas cylinders.
- Flashbacks which are the rapid propagation of a flame down a conduit.
- Further gas flow in the event of a burnback.

They work equally effectively in all orientations, and need very little maintenance.

The DFBA Series dry flashback arrestor follows the norm EN 730-1 / ISO 5175 which call for a minimum of two safety elements:

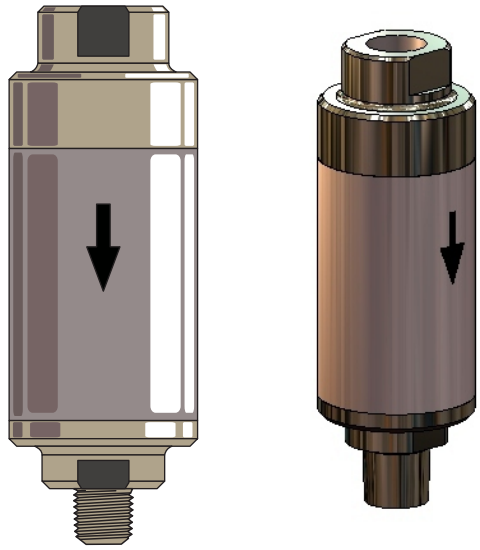
- prevents dangerous gas mixtures.
- ensures the gas only flows in the intended direction.

and a flame arrestor (FA), which:

- cools the flame to below the ignition temperature of the gas or gas mixture.
- prevents flashback.

The flashback arrestor is suitable for most combustible gases such as acetylene, hydrogen, methane, propane, propylene and butane as well as oxygen and compressed air.

Technical Specifications	
Body Material	316 Stainless Steel
Elastomer	Viton or Neoprene
Inlet Connection	1/4” F.NPT
Outlet Connection	1/4” M.NPT
Inlet Filter	100 micron
Working Pressure	286 psi
Check Valve	Built-In
Flame Barrier	Built-In
Thermal Cutoff	Built-In



Certifications
UL Listed 23Y5 (Flashback Arrestor)
EN 730 (Bam/DIN)
ISO 5175
BS 6158
AS 4603

Working Pressure as Per UL 23Y5 (Oxy Cutting)

Acetylene	15 psig	LPG	50 psig
Hydrogen	50 psig	Oxygen	143 psig

Flow Performance	
Inlet Pressure	**Air Flow**
7.3 psig	231 ft^3/hr
14.5 psig	465 ft^3/hr
21.8 psig	725 ft^3/hr
36.3 psig	1041 ft^3/hr
72.5 psig	1933 ft^3/hr

Flow Performance Correction Factors for Gases Other Than Air

Acetylene	1.05	Methane	1.34
Butane	0.70	Oxygen	0.95
Hydrogen	3.79	Propane	0.80
Propylene	0.80	Ethylene	1.35

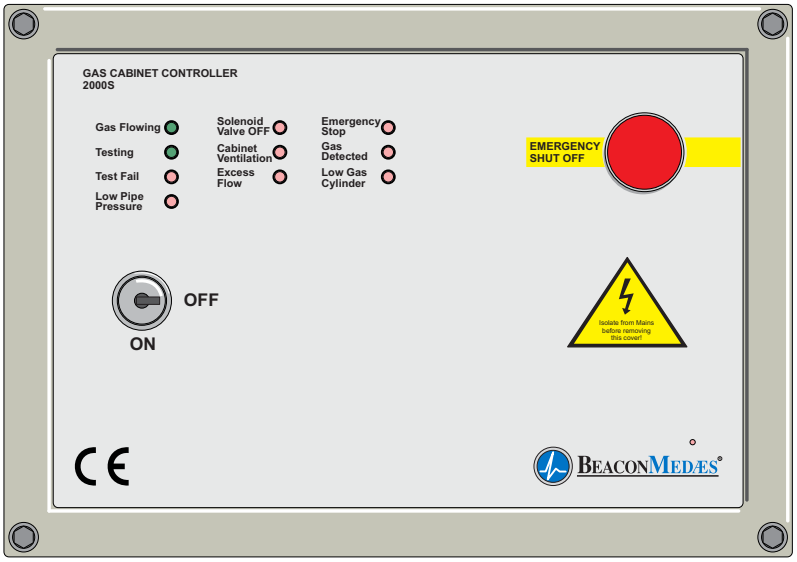
Automation & Controls

Gas Cabinet Controller

Description

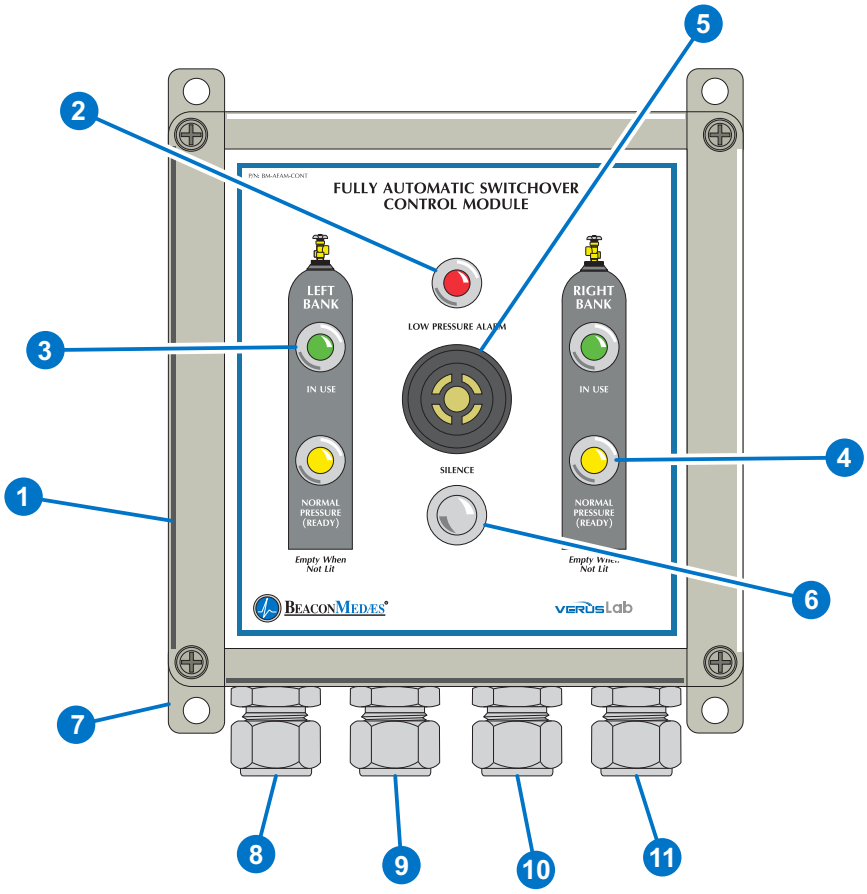
The gas cabinet controller's primary function is to shutdown the gas supply when any of the safety components connected to it falls into alarm condition.

When this feature is enable, the gas cabinet controller can also perform a pressure test to the distribution gas pipeline to determine if there is a leak. In case of a leak, the controller warns the operator and shuts down the gas supply.



Gas On	Green LED	Indicates Normal System Status and Gas Valve is ON
Testing	Green LED	Gas Proving Test
Test Fail	Red LED	Gas Proving Test Failed (ie Open Valve or Leak)
Low Pipe Pressure	Red LED	Indicates the Pipeline Pressure is Lower than Normal Pressure
Solenoid Valve OFF	Red LED	Indicates Gas Flow to the Process is Interrupted
Cabinet Ventilation	Red LED	Gas Cabinet Ventilation is Down
Excess Flow	Red LED	Gas Flow Triggered the Excess Flow Switch - Gas Supply is Down
Emergency Stop	Red LED	Emergency Stop Has Been Actuated
Gas Detected	Red LED	Gas Leak Has Been Detected
Low Gas Cylinder	Red LED	Supply Gas Cylinder Pressure is Low
Reset Switch	Keyed Switch	Opens the Gas Supply Solenoid Valve
Emergency Shut Off	Pushbutton	Gas Supply is Shut Off when Pressed

Switchover Manifold Controller



Controller

1. ABS Enclosure
2. Red LED - Empty (Quantity: 1)
3. Green LED - In Service (Quantity: 2)
4. Yellow LED - Ready (Quantity: 2)
5. Audible Alarm - Buzzer (Quantity: 1)
6. Silence Pushbutton (Quantity: 1)
7. Mounting Leg (Quantity: 4)
8. Cord Grip - Pressure Switch Left
9. Cord Grip - Solenoid Valve Left
10. Cord Grip - Solenoid Valve Right
11. Cord Grip - Pressure Switch Right

Description

The FCS3000 Series Stations provide fully automatic system control. The manifold monitors cylinder bank pressure electronically, controlling changeover and eliminating the need to manually reset levers and valves. Easy to read analog gauges show the line and individual bank pressure. A series of lights for each bank indicates whether the bank is “in service,” “ready for use,” or “bank depleted.” At a preset pressure, the system automatically changes from the supply bank to the reserve bank without an interruption in gas supply. FCS3000 Series Fully Automatic Changeover Stations operate on 24 VAC power (power transformer provided by BeaconMedæs), but will continue to function during a power failure (without changeover capabilities).

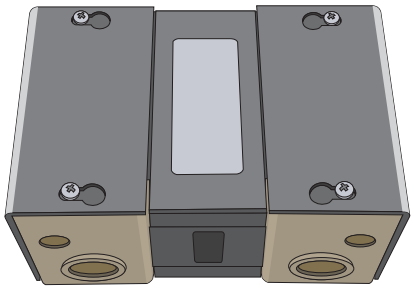
Factory Mechanical Installation

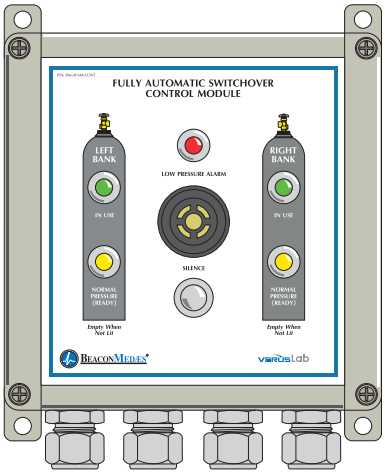
The control module is installed on top of the gas cabinet at the factory. The pressure switches and the solenoid valves are hard wired at the factory and tested for proper functionality.

Field Electrical Installation

The installing contractor will be required to connect 120 VAC to the control module. Refer to next page for details.

Switchover Manifold Controller



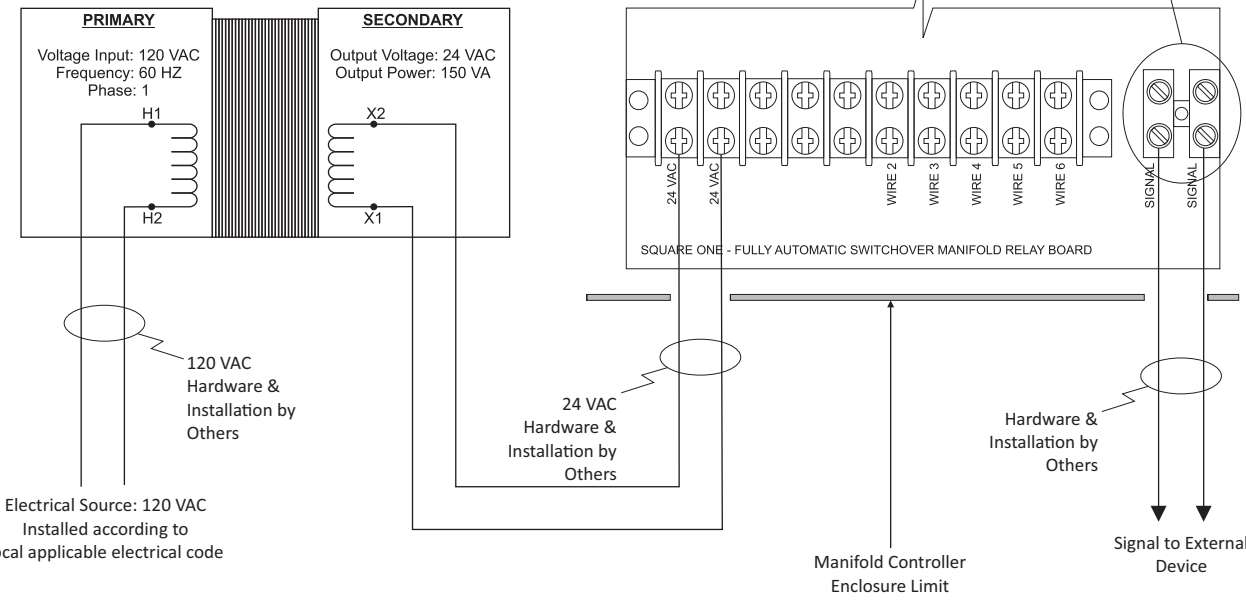


TERMINALS FOR REMOTE ALARM

Type: Dry Contact (Volt Free)
Position: Normally Open (Normally Closed Available)
Capacity: 30 Amps

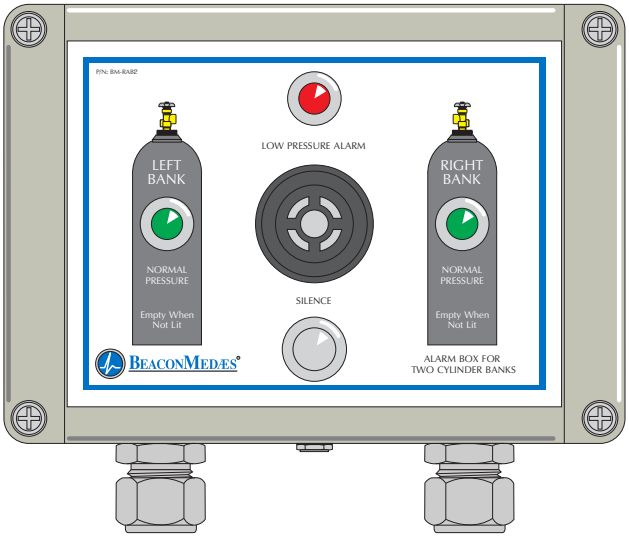
POWER TRANSFORMER PROVIDED BY BEACONMEDAES
Manufacturer: MARCUS
Model: MC150B
Field Installation: Installed separately from the controller module

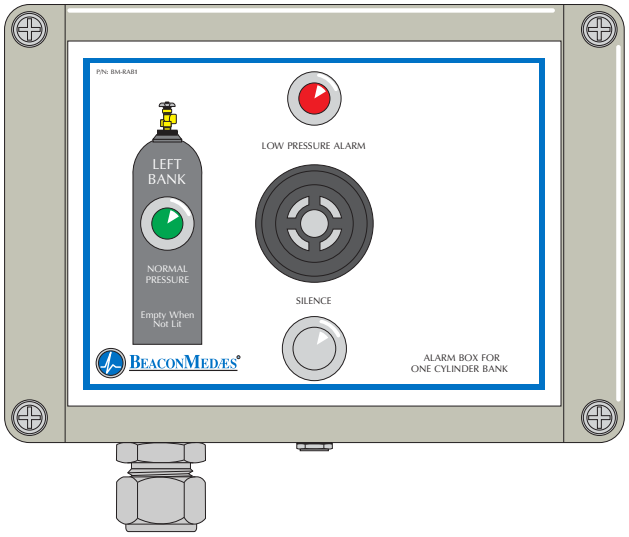
TERMINAL STRIPS INSIDE THE MANIFOLD CONTROLLER



Ground by electrician as per applicable electrical code

Alarm Boxes
Single & Double



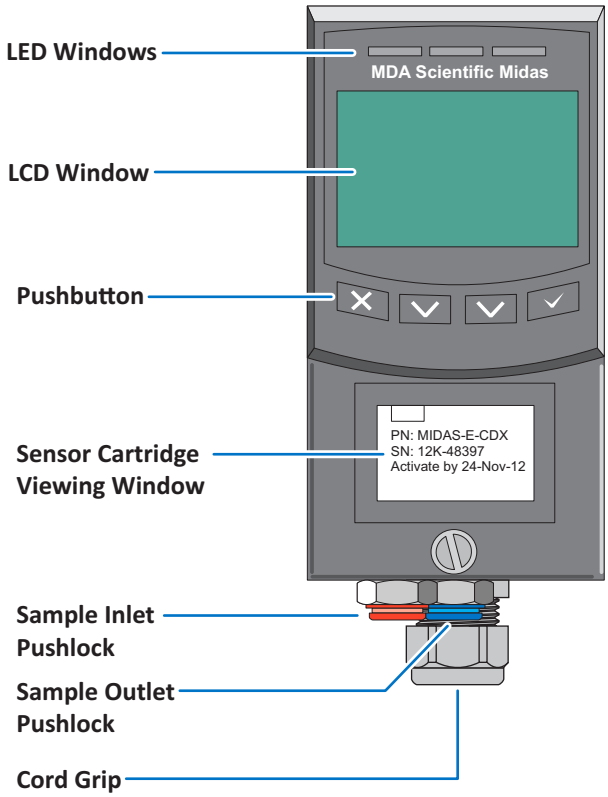


Extractive Gas Monitor

Introduction

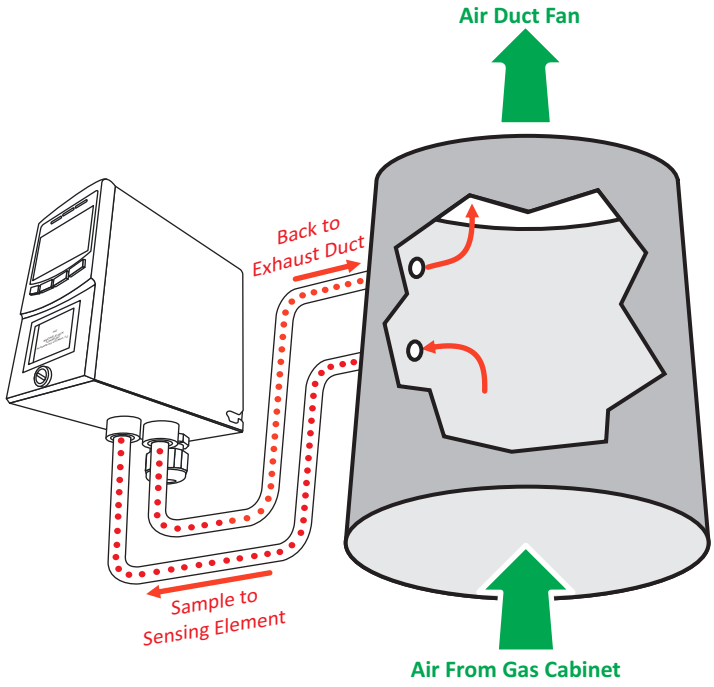
The Midas Gas Detector uses reliable sensor technology to detect many key toxic, atmospheric and flammable gases. The device monitors points up to 100 feet (30 meters) away while using patented technology to regulate flow rates and ensure error-free gas detection. Thanks to Honeywell's use of advanced robotics, the Midas Gas Detector offers unbeatable quality and reliability.

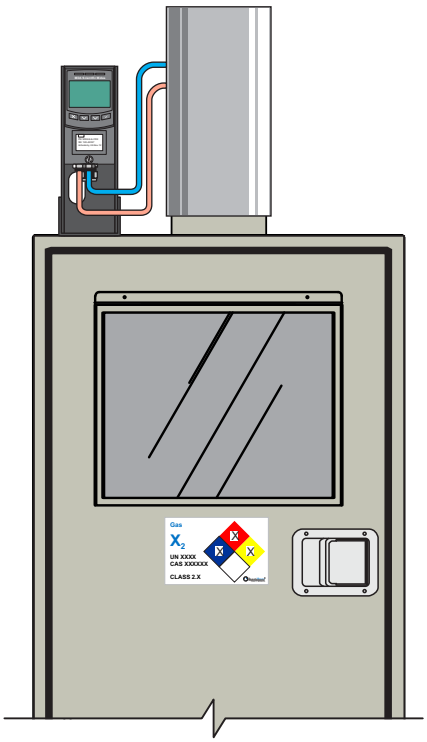
Technical Specifications - For Your Project	
Gas Detected	Hydrogen
Sensor Technology	Catalytic Combustion
Sensor Range	0-100% LEL (4% H_2 in Air)
Alarm Level	10% LEL (0.4% in Air



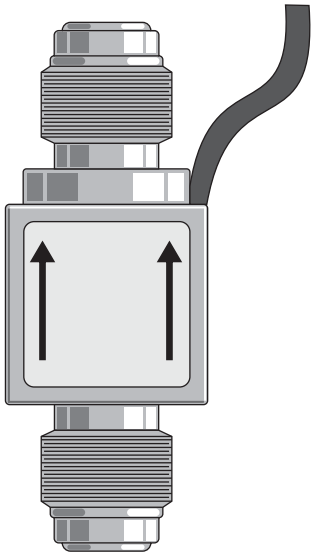
How it works

The unit is installed on top of the gas cabinet. The Midas Gas Detector is a sample draw (extractive) unit. It draws air via a built-in pump from the ventilation duct of the gas cabinet up to the sensing element located inside the gas detector. The inboard sensor detects the presence of the target gas and triggers relays upon high concentration. The air is then returned safely into the ventilation duct. The tubes are provided by BeaconMedaes but they are installed in the field.

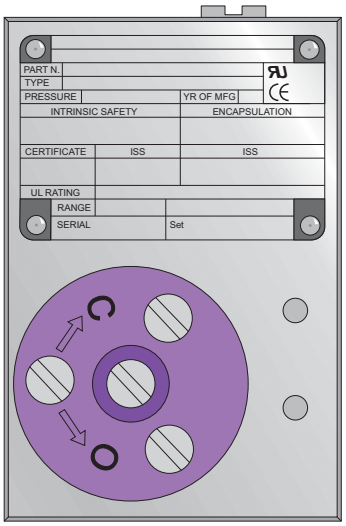




Excess Flow Switch



Preset Excess Flow Switch



Field Adjustable Excess Flow Switch

Specifications

- Vertical installation only
- Available from low to medium flow settings
- Flow setpoint are not field adjustable
- Source pressure from vacuum to 3,500 psi
- Accuracy: +/- 10% of trip point or 1/2 slpm whichever is greater
- Inlet and outlet: 1/4” face seal or tube weld
- Switch: Single Pole Double Throw (SPDT)
- Material: Electropolished and passivated Type 316L stainless Steel (Surface finish: 15 micron)
- Inboard/ouboard leakage 2 x 10^{-10}

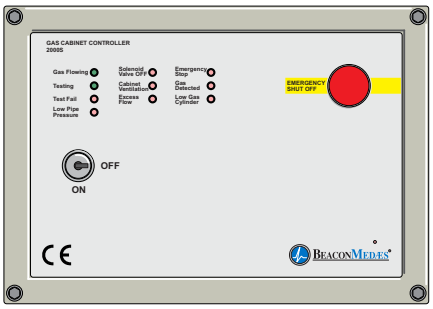
Specifications

- Universal mounting
- Available from low to high flow settings
- Field adjustable set point
- Source pressure up to 3000 psi
- Accuracy: +/1 10% of trip point
- Inlet and outlet: from 1/8” F.NPT or 1/4” F.NPT
- Switch: Single Pole Double Throw (SPDT)
- Material: Type 316L stainless steel
- Rating: Class 1, Division I, Group A, B, C and D

Excess Flow Switch Selection

The selection of the excess flow switch will be made by BeaconMedaes based on the specific project requirements. The excess flow switch selection is based on criteria such as gas, flow, set point accuracy, temperature, altitude to name a few. BeaconMedaes will provide a questionnaire at time of submittal.

Gas Cabinet
Automatic Gas Supply Shutdown Process

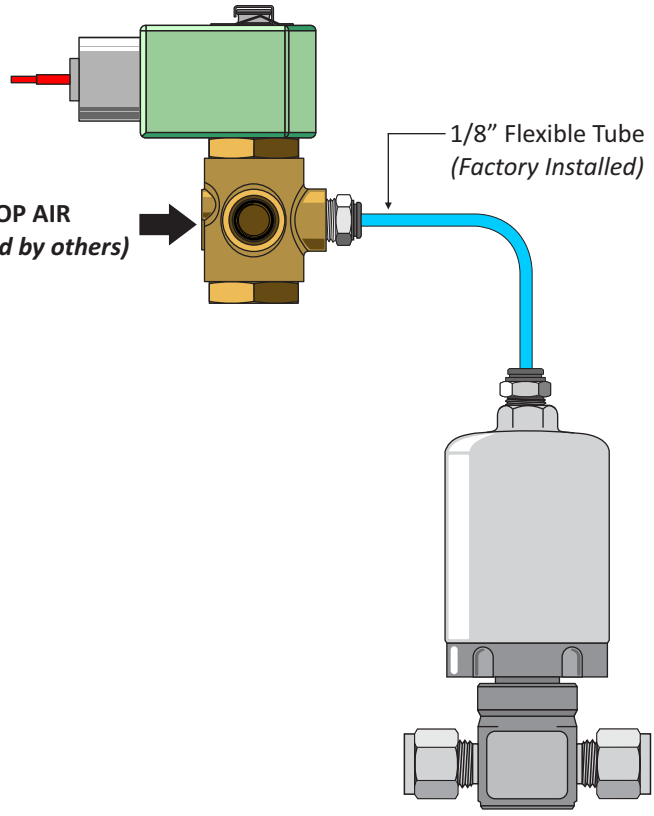


Gas Cabinet Controller
(Factory Installed On Top of Gas Cabinet)

Three-way Solenoid Valve
(Factory Installed On Top of Gas Cabinet)

Supplies or Empties Air from
Air Actuated Diaphragm Valve

Electrical Signal/Cable
(Factory Installed)



1/8" Flexible Tube
(Factory Installed)

SHOP AIR
(Provided by others)

Air Actuated Diaphragm Valve
(Factory Installed inside Gas Cabinet)

Opens and closes the gas flow
to the process.

How it works

The gas cabinet controller's primary function is to shutdown the gas supply when any of the safety components connected to it falls into alarm condition.

A three-way solenoid valve is connected to a specific output of the gas cabinet controller. The solenoid valve outlet is connected directly to the air actuator of the diaphragm valve (see diagram on this page).

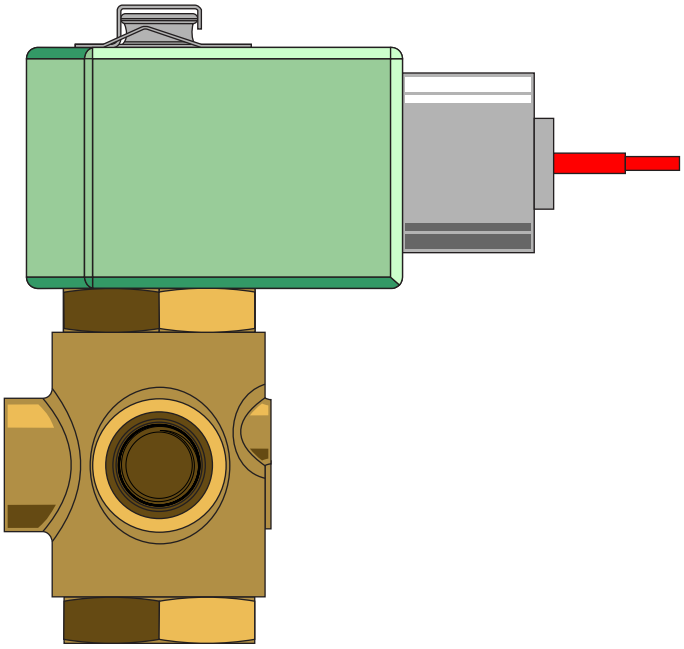
The diaphragm valve is mounted with an air actuator. It is a fail safe valve which means it is closed unless there is enough air pressure in the actuator to force the valve to open. The gas service flow is interrupted when the diaphragm valve is closed.

The solenoid valve has three ports: Inlet, outlet and exhaust. The solenoid valve is a directional (diverting) flow type of valve. The air flows from the inlet of the valve to the outlet until it receives an electrical signal from the gas cabinet controller to open the primary flow path and reverse the direction of flow. In this case, the air in the actuator is vented out which allows the diaphragm valve to close.

Three-Way Solenoid Valve

Description

This three-way solenoid valve automatically switch the direction of flow for diverting and venting the air actuated diaphragm valve. inside the gas cabinet. This valve does not require a minimum pressure drop for operation. They are closed unless energized (normally closed) and allow flow through the secondary flow path until they receive an electrical signal from the gas cabinet controller to open the primary flow path and reverse the direction of flow thus emptying the air from the actuator of the diaphragm valve. The three-way solenoid valve meets NEMA 4X for resistance to washdowns, splashing water, corrosive liquids, and dust. The solenoid valve is suitable for outdoor use. This valve can also be used in gas nitrogen service.



Technical Specifications	
Valve Function	Directional Control
For use with	Air, Nitrogen
Activation	Electromechanical
Electrical Actuation	Closed Until Powered
Ports	1/8” F.NPT
Number of Ports	Three (3)
Mounting Orientation	Any Position
Maximum Pressure	200 psi
Shape	Tee
Total Length	1-3/16”
Overall Height	2-15/16”
Min. Pressure Drop	0 psi
Temperature Range	32°F to 180°F
Vacuum Rating	Not for Vacuum
Seal Materials	Buna-N
Electrical Connections	Wire Leads (3)
Conduit Trade	1/2”
Voltage	120 VAC
Max. Current Draw	0.26 Amp.
Installation	Indoor & Outdoor
Specifications Met	CSA, UL, NEMA 4X
Valve Type	Direct-Acting
Flow Coefficient	CV = 0.05

Air Actuated Diaphragm Valves

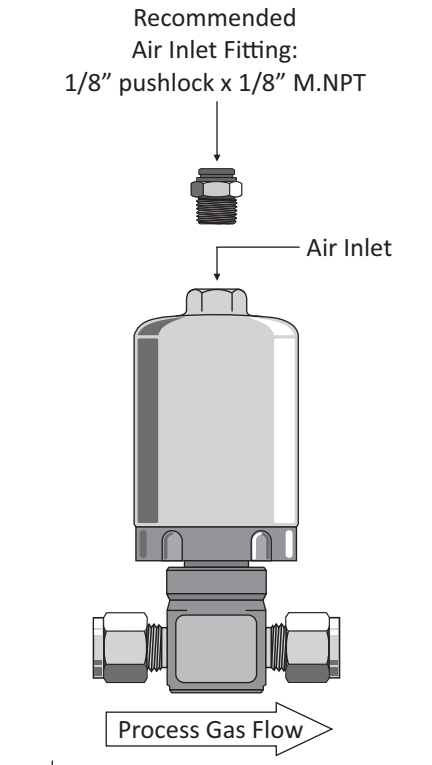
Description

Air Actuated Diaphragm Valves are used in gas cabinet applications as fail closed gas valve shutoff as required by NFPA 55 for toxic gases. This valve is also used for flammable gas applications where rapid and automatic gas shutdown is required. The valve is obviously normally closed which means air pressure is required to keep the valve open.

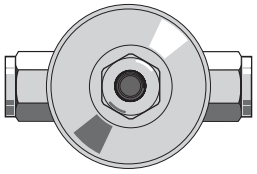
Unlike ball valves and needle valves, diaphragm valves have no packing and, therefore, there is no direct leak path between the interior of the valve and the opening and closing mechanism. That's why, diaphragm valves have the best leak rate ratio of any valve on the market.

Each valve comes cleaned for oxygen service. The same valves can be electropolished as an option.

Technical Specifications	
Actuation Pressure	60-90 psi [4 to 6 bar]
Valve Position	Normally Closed (Air to Open)
Acceptable Actuator Gas	Air or Nitrogen
Body Size	1/4"
Connection Type	Compression
Body Material	316L Stainless Steel
Maximum Pressure	150 psi [10.3 bar]
Seat Type	PCTFE
Temperature Range	14 to 176°F [-10 to 80°C]
Leak Rate - Inboard	<3 x 10^{-12} Pa m^3/sec (he)
Leak Rate - Across Seat	3 x 10^{-10} Pa m^3/sec (He)
Flow Coefficient	Cv = 0.27



Air Actuated Diaphragm Valve
Side View



Air Actuated Diaphragm Valve
Top View

Questionnaires & Forms

Gas Cabinet Schedule

GAS CABINET IDENTIFICATION	
TAG / I.D. NUMBER	
LOCATION	
OWNER / TEACHER / RESEARCHER / CONTACT	

PROCESS REQUIREMENTS	CYLINDER NO. 1	CYLINDER NO. 2	CYLINDER NO. 3	CYLINDER NO. 4
GAS NAME				
DELIVERY PRESSURE				
PEAK FLOW				
TEMPERATURE				
GAS PURITY (IN %)				
TOLERABLE PARTICLE SIZE (IN MICRON)				
EMPTY CYLINDER RESIDUAL CONTENT (IN %)				
DOUBLE CONTAINMENT (YES / NO)				

GAS CYLINDER INFORMATION	CYLINDER NO. 1	CYLINDER NO. 2	CYLINDER NO. 3	CYLINDER NO. 4
GAS NAME				
GAS CYLINDER PRESSURE WHEN FULL				
GAS CYLINDER SIZE (HEIGHT + DIAMETER)				
GAS CYLINDER CONNECTIONS (CGA / DIN)				
GAS CYLINDER EMPTY WEIGHT (TARE WEIGHT)				
NET CONTENT OF GAS (WEIGHT OR VOLUME)				

OUTPUT SIGNAL REQUIRED*	CYLINDER NO. 1	CYLINDER NO. 2	CYLINDER NO. 3	CYLINDER NO. 4
GAS NAME				
EXCESS FLOW (PIPELINE)				
LOW PIPELINE PRESSURE				
HIGH PIPELINE PRESSURE				
LEAK DETECTION				
LOSS OF EXHAUST FAN				
LOSS OF POWER				
LOSS OF WATER PRESSURE FOR SPRINKLER				
ACTUATION OF EMERGENCY STOP				
GENERAL ALARM				
LOSS OF NITROGEN PURGE				
LOSS OF AIR/N_2PRESSURE FOR VENTURI				

**Some output signals can be grouped into one general output*

Gas Cabinet Schedule

GAS TOXICITY + FLAMMABILITY		CYLINDER NO. 1	CYLINDER NO. 2	CYLINDER NO. 3	CYLINDER NO. 4
Gas Name					
Formula					
UN Number					
CAS Number					
TGO Class					
NFPA	Health				
	Flammability				
	Instability				
	Specific				
NFPA	Lower Explosive Limit (LEL)				
	Upper Explosive Limit (UEL)				
OSHA	PEL (Time Weighted Average)				
	PEL (Short Term Exposure Limit)				
	Permissible Exposure Limit (Ceiling)				
	Immedia. Dangerous Life Health (IDLH)				

HOUSE FACILITY

Nitrogen for Purge	SOURCE	PURITY	AVAILABLE PRESSURE
Nitrogen for Vacuum Venturi Generator	SOURCE	PURITY	AVAILABLE PRESSURE
Air for Actuated Valve	SOURCE	PURITY	AVAILABLE PRESSURE
Air for Vacuum Venturi Generator	SOURCE	PURITY	AVAILABLE PRESSURE
Grid Power	VOLTAGE	CYCLE	AMPERAGE
Emergency Power	VOLTAGE	CYCLE	AMPERAGE
Extractor / Exhaust Fan	DUCT SIZE	FLOW CAPACITY	NEGATIVE PRESSURE
Water for Sprinkler Head	PIPE SIZE	FLOW CAPACITY	WATER PRESSURE

CODE / STANDARD COMPLIANCE

System Design	☐ TGO	☐ NFPA 55	☐ CGA G-13 (Silane Only)
System Cleaning	☐ CGA G-4.1	☐ ASTM G93	☐ Other:
Building Code	☐ International Building Code		☐ Other:
Electrical Code	☐ National Electrical Code (NFPA 70)		☐ Other:
Occupational Safety & Health	☐ For OSHA, Specify Standard Number & Subpart:		
Authority Having Jurisdiction	☐ Provide Name:		

Gas Cabinet Schedule

GAS CABINET

Cabinet Size	☐ 1-Cylinder	☐ 2-Cylinder	☐ 3-Cylinder	☐ 4-Cylinder
Adjustable Shelf for Small Cylinder	☐ for Cylinder # 1	☐ for Cylinder # 2	☐ for Cylinder # 3	☐ for Cylinder # 4
Water Sprinkler Head	☐ Yes			
Automatic Door Closer	☐ Yes			
Mounting Plate	☐ Yes			
Keyed Door Latch	☐ Yes			
Air Inlet Filter	☐ Yes			
Fusible Link Fire Damper	☐ Yes			
Door Switch Monitor	☐ Yes			
Space for Spare / Empty Cyliner	☐ Yes			
Special Cabinet Color	Standard Color Is Light Gray. Specify New Color:			

DELIVERY PANEL		**CYLINDER NO. 1**	**CYLINDER NO. 2**	**CYLINDER NO. 3**	**CYLINDER NO. 4**
VALVES	Low Pressure Isolation Valve (LIV)	☐	☐	☐	☐
	Low Pressure Vent Valve (LVV)	☐	☐	☐	☐
	High Pressure Vent Valve (HVV)	☐	☐	☐	☐
	High Pressure Isolation Valve (HIV)	☐	☐	☐	☐
	Purge Gas Inlet Valve (PIV)	☐	☐	☐	☐
	Fail-Safe Automatic Isolation Valve (FSAV)	☐	☐	☐	☐
	Vacuum Assist Valve (VAV)	☐	☐	☐	☐
CHECK	Purge Gas Inlet Check Valve (PCV)	☐	☐	☐	☐
	Cylinder Connection Check Valve (CCV)	☐	☐	☐	☐
	Low Pressure Outlet Check Valve (LCV)	☐	☐	☐	☐
	High Pressure Outlet Check Valve (HCV)	☐	☐	☐	☐
	Venturi Gas Supply Check Valve (VCV)	☐	☐	☐	☐
	Vent Outlet Check Valve (OCV)	☐	☐	☐	☐
FILTER	Inlet Particle Filter (IPF)	☐	☐	☐	☐
	Outlet Particle Filter (OPF)	☐	☐	☐	☐
	Purge Gas Filter (PGF)	☐	☐	☐	☐
FLOW	Flow Limiting Orifice (FLO)	☐	☐	☐	☐
	Excess Flow Switch (EFS)	☐	☐	☐	☐
	Excess Flow Valve (EFV)	☐	☐	☐	☐
SWITCH	Cylinder Pressure Switch (CPS)	☐	☐	☐	☐
	Low Pipeline Pressure Switch (LPS)	☐	☐	☐	☐
	High Pipeline Pressure Switch (HPS)	☐	☐	☐	☐
	Vacuum Gas Low Pressure Switch (VPS)	☐	☐	☐	☐
SAFETY	Dry Flashback Arrestor (DFBA)	☐	☐	☐	☐
	Venturi Vacuum Generator (VVG)	☐	☐	☐	☐
	Pipeline Pressure Relief Valve (PRV)	☐	☐	☐	☐

Gas Cabinet Schedule

MANIFOLD

TYPE	Fully Automatic Changeover (FCS)	☐
	Pressure Differential Changeover (PDC)	☐
VALVES	Low Pressure Isolation Valve (LIV)	☐
	Low Pressure Vent Valve (LVV)	☐
	High Pressure Vent Valve (HVV)	☐
	High Pressure Isolation Valve (HIV)	☐
	Purge Gas Inlet Valve (PIV)	☐
	Fail-Safe Automatic Isolation Valve (FSAV)	☐
CHECK	Vent Outlet Check Valve (OCV)	☐
	Cylinder Connection Check Valve (CCV)	☐
	Low Pressure Outlet Check Valve (LCV)	☐
FILTER	Inlet Particle Filter (IPF)	☐
	Outlet Particle Filter (OPF)	☐
	Purge Gas Filter (PGF)	☐
FLOW	Flow Limiting Orifice (FLO)	☐
	Excess Flow Switch (EFS)	☐
	Excess Flow Valve (EFV)	☐
SWITCH	Cylinder Pressure Switch (CPS)	☐
	Low Pipeline Pressure Switch (LPS)	☐
	High Pipeline Pressure Switch (HPS)	☐
SAFE	Dry Flashback Arrestor (DFBA)	☐
	Pipeline Pressure Relief Valve (PRV)	☐
Number of Cylinders		☐ 1 cyl. X 1 cyl. ☐ 1 cyl. X 2 cyl. ☐ 2 cyl. X 1 cyl. ☐ 2 cyl. X 2 cyl.

SAFETY INSTRUMENTS & CABINETS CONTROLLERS

SAFETY	Gas Detector	☐ Extractive / Sample Draw ☐ Explosion-Proof Monitor Installed Inside the Cabinet
	Smoke Detector	☐
	Optical Flame Detector / UVIR	☐
	Seismic Detector	☐
	Exhaust Duct Differential Pressure Switch	☐
	Local Emergency Stop	☐
CONTROLLERS	Cylinder Scale + Controller	☐
	Alarm Box for One Cylinder	☐
	Alarm Box for Two Cylinders	☐
	Emergency Shutdown Controller	☐
	Fully Automatic Controller	☐
	Manual Operation (No Controller)	☐
	Controller Z-Purge	☐

Gas Cabinet Schedule

CONSTRUCTION

Cylinder Lead	☐ Stainless Steel Hose w/ Armor Guard	☐ Rigid Pigtail		
Diaphragm Valve Type	☐ 1/4-Turn Indicating	☐ Multi-Turn		
Joints	☐ Compression Fittings + NPT	☐ VCR Fittings + Orbital Welded Joints		
Type 316 Stainless Steel Tubing Internal Finish	☐ Standard Instrumentation	☐ 32 $R_a$max.	☐ 20 $R_a$max.	
Mounting Panel	☐ Stainless Steel	☐ Anodized Aluminum	☐ Painted Steel	
Pressure Reducing Regulator	☐ Single-Stage	☐ Two-Stage	☐ Piston	☐ Tied Diaphragm

INLET + OUTLET

Process Outlet	☐ Compression	☐ VCR Male	☐ Tube Stub	☐ F.NPT	☐ Coaxial Bulkhead
Vent Outlet	☐ Compression	☐ VCR Male	☐ Tube Stub	☐ F.NPT	☐ Coaxial Bulkhead
Purge Gas Inlet	☐ Compression	☐ VCR Male	☐ Tube Stub	☐ F.NPT	
Vacuum Venturi Gas Inlet	☐ Compression	☐ VCR Male	☐ Tube Stub	☐ F.NPT	

NOTES, COMMENTS AND SPECIAL REQUESTS

Pre-Start-Up Checklist

BeaconMedæs

Instruction Manual

IGC Series

COMPLETE ONE START-UP CHECKLIST FOR EACH GAS CABINET

Appendix 1 - Gas Cabinet Utility Checklist (Pre Start-Up Checklist)

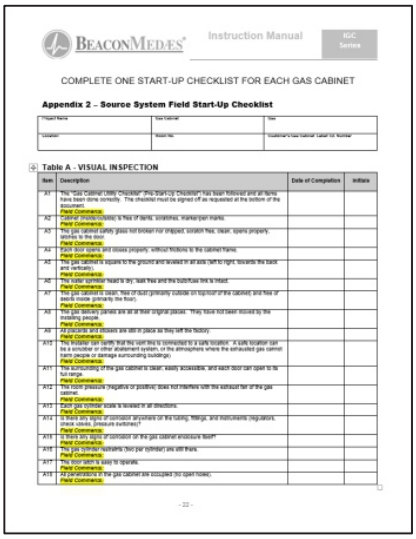
Project Name	Gas Cabinet	Gas
Location	Room No.	Customer's Gas Cabinet Label I.D. Number

Item	Description	Date of Completion	Initials
1	Cabinet located and mounted to floor.		
2	Cabinet exhaust duct installed, functioning and monitored for loss of exhaust.		
3	Water line installed for sprinkler head line and pressurized.		
4	Grounding wire installed (cabinet and controller) and checked for less than 1 ohm resistance.		
5	Electrical power (120 / 240 VAC) 50/60 Hz connected.		
6	Remote I/O wiring installed and checked.		
7	(If applicable) Network wiring installed and configured on the host.		
8	Process line installed and helium leak tested.		
9	Vent line installed, leak tested and 75-95 psig (5.2 to 6.6 barg) of nitrogen available.		
10	(If applicable) Venturi line installed, leak tested and 75-95 psig (5.2 to 6.6 barg) of nitrogen available.		
11	(If external nitrogen purge cylinder utilized) Purge line installed and helium leak tested.		
12	(If applicable) Pneumatic supply connected to controller and 85-95 psig max. (5.9 to 6.6 barg) of nitrogen available.		
13	Customer's pipeline standing pressure test executed and successfully passed.		
14	Nitrogen purge cylinder available		
15	(If applicable) Hazardous gas monitor installed and operating.		
16	(If applicable) Restrictive flow orifice installed in the valve.		

Inspection Sign Offs

Electrical – Company Name	Electrical - Signature	Date
Mechanical – Company Name	Mechanical – Signature	Date
Quality Control – Company Name	Quality Control – Signature	Date
Safety – Company Name	Safety – Signature	Date
BeaconMedaes Field Start-Up Technician	BeaconMedaes – Signature	Date

Start-Up Checklist



BEACONMEDÆS Instruction Manual IGC Series

COMPLETE ONE START-UP CHECKLIST FOR EACH GAS CABINET

Appendix 2 – Source System Field Start-Up Checklist

Project Name	Date Published	Date
Location	Model No.	Conditioner's Gas Cabinet Label No. Number

Table A - VISUAL INSPECTION

Item	Description	Date of Completion	Initials
A1	The "Gas Cabinet Utility Checklist" (Pre-Start-Up Checklist") has been followed and all items have been done correctly. The checklist must be signed off as requested at the bottom of the checklist. Field Comments:		
A2	Cabinet (inside/outside) is free of dents, scratches, marks/pen marks. Field Comments:		
A3	The gas cabinet safety glass not broken nor chipped, solation free, clean, opens properly, latches to the door. Field Comments:		
A4	Each door opens and closes properly, without frictions to the cabinet frame. Field Comments:		
A5	Cabinet is positioned square to the ground and leveled in all axis (left to right, towards the back and vertically). Field Comments:		
A6	The water sprinkler head is dry, leak free and the butterfuse link is intact. Field Comments:		
A7	The gas cabinet is clean, free of dust (primarily outside on top/roof of the cabinet) and free of debris inside (primarily the floor). Field Comments:		
A8	The gas delivery panels are all at their original places. They have not been moved by the installation crew. Field Comments:		
A9	All placards and stickers are still in place as they left the factory. Field Comments:		
A10	The installer can certify that the vent line is connected to a safe location. A safe location can be a scrubber or other abatement system, or the atmosphere where the exhausted gas cannot harm people or damage surrounding building). Field Comments:		
A11	The surrounding of the gas cabinet is clean, easily accessible, and each door can open to its full range. Field Comments:		
A12	The room pressure (negative or positive) does not interfere with the exhaust fan of the gas cabinet. Field Comments:		
A13	Each gas controller scale is leveled in all directions. Field Comments:		
A14	Is there any signs of corrosion anywhere on the tubing, fittings, and instruments (regulators, check valves, pressure switches)? Field Comments:		
A15	Is there any signs of corrosion on the gas cabinet enclosure itself? Field Comments:		
A16	The gas controller nameplate (two per controller) are still there. Field Comments:		
A17	The door latch is easy to operate. Field Comments:		
A18	All penetrations in the gas cabinet are occupied (no open holes). Field Comments:		

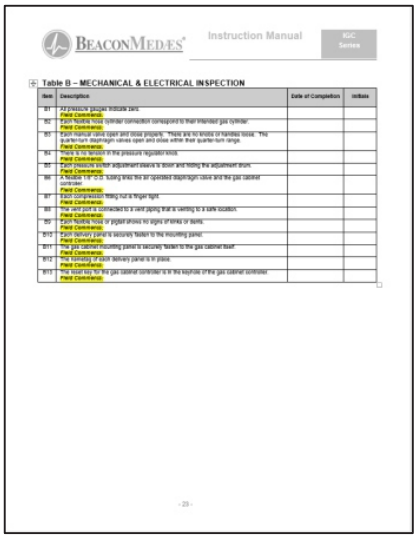


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Table B – MECHANICAL & ELECTRICAL INSPECTION

Item	Description	Date of Completion	Initials
B1	All pressure gauges indicate zero. Field Comments:		
B2	Each flexible hose/ cylinder connection correspond to their intended gas cylinder. Field Comments:		
B3	Each manual valve open and close properly. There are no knobs or handles loose. The quarter-turn diaphragm valves open and close within their quarter-turn range. Field Comments:		
B4	There is no tampon in the pressure regulator knob. Field Comments:		
B5	Each pressure switch adjustment sleeve is down and hiding the adjustment shaft. Field Comments:		
B6	Each soft tubing is cut to suiting lines the air operated diaphragm valve and the gas cabinet controller. Field Comments:		
B7	Each compression fitting nut is finger tight. Field Comments:		
B8	The vent port is connected to a vent piping that is venting to a safe location. Field Comments:		
B9	Each flexible hose or pigtail shows no signs of kinks or dents. Field Comments:		
B10	Each delivery panel is securely fasten to the mounting panel. Field Comments:		
B11	The gas cabinet mounting panel is securely fasten to the gas cabinet itself. Field Comments:		
B12	The remaining of each delivery panel is in place. Field Comments:		
B13	The install key for the gas cabinet controller is in the keychole of the gas cabinet controller. Field Comments:		

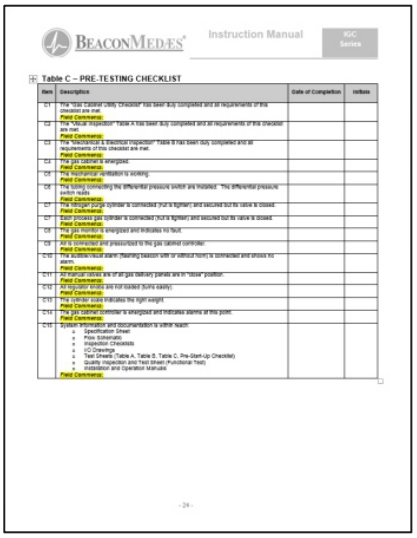

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Table C – PRE-TESTING CHECKLIST

Item	Description	Date of Completion	Initials
C1	The "Gas Cabinet Utility Checklist" has been duly completed and all requirements of this checklist are met. Field Comments:		
C2	The "Visual Inspection" Table A has been duly completed and all requirements of this checklist are met. Field Comments:		
C3	The "Mechanical & Electrical Inspection" Table B has been duly completed and all requirements of this checklist are met. Field Comments:		
C4	The gas cabinet is energized. Field Comments:		
C5	The mechanical ventilation is working. Field Comments:		
C6	The tubing connecting the differential pressure switch are installed. The differential pressure switch reads Field Comments:		
C7	Each nitrogen purge cylinder is connected (hut is tighten) and secured but its valve is closed. Field Comments:		
C8	Each process gas cylinder is connected (hut is tighten) and secured but its valve is closed. Field Comments:		
C9	The gas monitor is energized and indicates no hazd. Field Comments:		
C10	All is connected and pressurized to the gas cabinet controller. Field Comments:		
C11	The audible/visual alarm (flashing beacon with or without horn) is connected and shows no hazd. Field Comments:		
C12	All manual valves are of all gas delivery panels are in "close" position. Field Comments:		
C13	All regulator knobs are not loaded (turns easily). Field Comments:		
C14	The controller scale indicates the right weight. Field Comments:		
C15	The gas cabinet controller is energized and indicates alarms at this point. Field Comments:		
C16	System Information and documentation is within reach: a. Specification Sheet b. Flow Schematic c. Inspection Checklists d. I/O Drawings e. Test Sheets (Table A, Table B, Table C, Pre-Start-Up Checklist) f. Quality Inspection and Test Sheet (Functional Test) g. Installation and Operation Manuals Field Comments:		

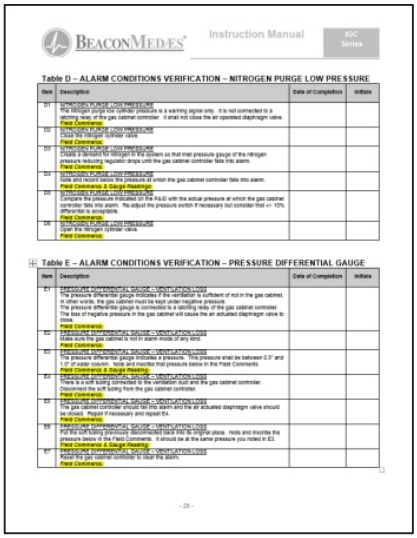

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Table D – ALARM CONDITIONS VERIFICATION – NITROGEN PURGE LOW PRESSURE

Item	Description	Date of Completion	Initials
D1	NITROGEN PURGE LOW PRESSURE The nitrogen purge low cylinder pressure is a warning signal only. It is not connected to a latching relay of the gas cabinet controller. It shall not close the air operated diaphragm valve. Field Comments:		
D2	NITROGEN PURGE LOW PRESSURE Close the nitrogen cylinder valve. Field Comments:		
D3	NITROGEN PURGE LOW PRESSURE Create a demand for nitrogen in the system so that inlet pressure gauge of the nitrogen pressure reducing regulator drops until the gas cabinet controller falls into alarm. Field Comments:		
D4	NITROGEN PURGE LOW PRESSURE Note and record below the pressure at which the gas cabinet controller falls into alarm. Field Comments & Gauge Readings:		
D5	NITROGEN PURGE LOW PRESSURE Compare the pressure indicated on the P&ID with the actual pressure at which the gas cabinet controller falls into alarm. Re-adjust the pressure switch if necessary but consider that +/- 10% differential is acceptable. Field Comments:		
D6	NITROGEN PURGE LOW PRESSURE Open the nitrogen cylinder valve. Field Comments:		

Table E – ALARM CONDITIONS VERIFICATION – PRESSURE DIFFERENTIAL GAUGE

Item	Description	Date of Completion	Initials
E1	PRESSURE DIFFERENTIAL GAUGE – VENTILATION LOSS The pressure differential gauge indicates if the ventilation is sufficient of not in the gas cabinet. In other words, the gas cabinet must be kept under negative pressure. The pressure differential gauge is connected to a latching relay of the gas cabinet controller. The loss of negative pressure in the gas cabinet will cause the air actuated diaphragm valve to close. Field Comments:		
E2	PRESSURE DIFFERENTIAL GAUGE – VENTILATION LOSS Make sure the gas cabinet is not in alarm mode of any kind. Field Comments:		
E3	PRESSURE DIFFERENTIAL GAUGE – VENTILATION LOSS The pressure differential gauge indicates a pressure. This pressure shall be between 0.5" and 1.0" of water column. Note and inscribe that pressure below in the Field Comments. Field Comments & Gauge Reading:		
E4	PRESSURE DIFFERENTIAL GAUGE – VENTILATION LOSS There is a soft tubing connected to the ventilation duct and the gas cabinet controller. Disconnect the soft tubing from the gas cabinet controller. Field Comments:		
E5	PRESSURE DIFFERENTIAL GAUGE – VENTILATION LOSS The gas cabinet controller should fall into alarm and the air actuated diaphragm valve should be closed. Repair if necessary and repeat E4. Field Comments:		
E6	PRESSURE DIFFERENTIAL GAUGE – VENTILATION LOSS Put the soft tubing pressure disconnected back into its original place. Note and inscribe the pressure below in the Field Comments. It should be at the same pressure you noted in E3. Field Comments & Gauge Reading:		
E7	PRESSURE DIFFERENTIAL GAUGE – VENTILATION LOSS Reset the gas cabinet controller to clear the alarm. Field Comments:		

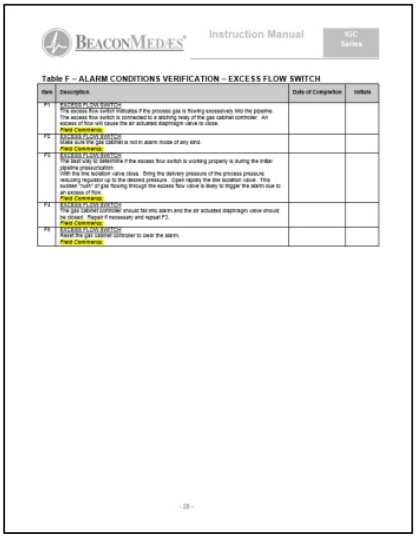

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Table F – ALARM CONDITIONS VERIFICATION – EXCESS FLOW SWITCH

Item	Description	Date of Completion	Initials
F1	EXCESS FLOW SWITCH The excess flow switch indicates if the process gas is flowing excessively into the pipeline. The excess flow switch is connected to a latching relay of the gas cabinet controller. An excess of flow will cause the air actuated diaphragm valve to close. Field Comments:		
F2	EXCESS FLOW SWITCH Make sure the gas cabinet is not in alarm mode of any kind. Field Comments:		
F3	EXCESS FLOW SWITCH The test is to determine if the excess flow switch is working properly is during the initial pipeline pressurization. With the line location valve close. Bring the delivery pressure of the process pressure reducing regulator up to the desired pressure. Open rapidly the line location valve. This sudden "rush" of gas flowing through the excess flow valve is likely to trigger the alarm due to an excess of flow. Field Comments:		
F4	EXCESS FLOW SWITCH The gas cabinet controller should fall into alarm and the air actuated diaphragm valve should be closed. Repair if necessary and repeat F3. Field Comments:		
F5	EXCESS FLOW SWITCH Reset the gas cabinet controller to clear the alarm. Field Comments:		

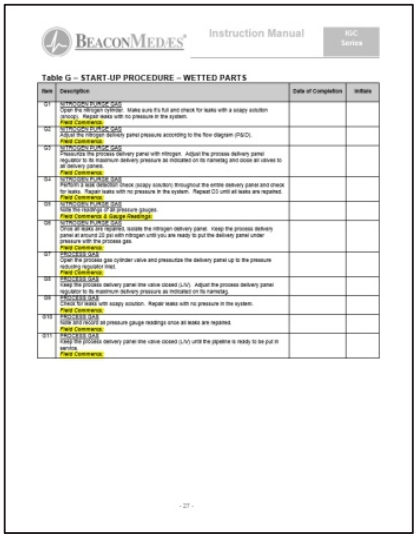

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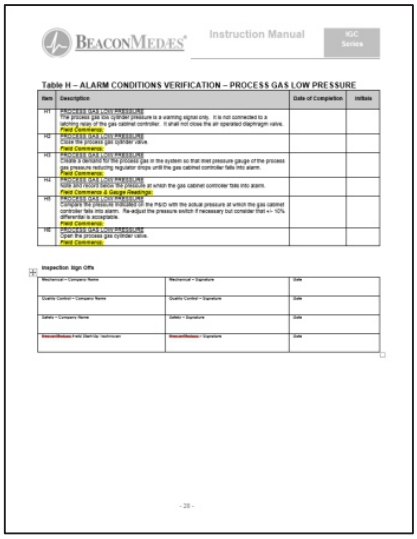
Table G – START-UP PROCEDURE – WETTED PARTS

Item	Description	Date of Completion	Initials
G1	NITROGEN PURGE GAS Open the nitrogen cylinder. Make sure it's full and check for leaks with a soapy solution (snoop). Repair leaks with no pressure in the system. Field Comments:		
G2	NITROGEN PURGE GAS Close the nitrogen cylinder. Field Comments:		
G3	NITROGEN PURGE GAS Pressurize the process delivery panel with nitrogen. Adjust the process delivery panel regulator to its maximum delivery pressure as indicated on its nameplate and close all valves to all delivery panels. Field Comments:		
G4	NITROGEN PURGE GAS Check for leaks with soapy solution (soapy solution) throughout the entire delivery panel and check for leaks. Repeat leaks with no pressure in the system. Repeat G3 until all leaks are repaired. Field Comments:		
G5	NITROGEN PURGE GAS Note the readings of all pressure gauges. Field Comments & Gauge Readings:		
G6	NITROGEN PURGE GAS Once all leaks are repaired, isolate the nitrogen delivery panel. Keep the process delivery panel at around 20 psi with nitrogen until you are ready to put the delivery panel under pressure with the process gas. Field Comments:		
G7	PROCESS GAS Open the process gas cylinder valve and pressurize the delivery panel up to the pressure reducing regulator inlet. Field Comments:		
G8	PROCESS GAS Open the process delivery panel line valve closed (LAV). Adjust the process delivery panel regulator to its maximum delivery pressure as indicated on its nameplate.		
G9	PROCESS GAS Check for leaks with soapy solution. Repair leaks with no pressure in the system. Field Comments:		
G10	PROCESS GAS Note and record all pressure gauge readings once all leaks are repaired. Field Comments:		
G11	PROCESS GAS Keep the process delivery panel line valve closed (LAV) until the pipeline is ready to be put in service. Field Comments:		



BEACONMEDÆS Instruction Manual IGC Series

Table H – ALARM CONDITIONS VERIFICATION – PROCESS GAS LOW PRESSURE

Item	Description	Date of Completion	Initials
H1	PROCESS GAS LOW PRESSURE The process gas low cylinder pressure is a warning signal only. It is not connected to a latching relay of the gas cabinet controller. It shall not close the air operated diaphragm valve. Field Comments:		
H2	PROCESS GAS LOW PRESSURE Close the process gas cylinder valve. Field Comments:		
H3	PROCESS GAS LOW PRESSURE Create a demand for the process gas in the system so that inlet pressure gauge of the process gas pressure reducing regulator drops until the gas cabinet controller falls into alarm. Field Comments:		
H4	PROCESS GAS LOW PRESSURE Note and record below the pressure at which the gas cabinet controller falls into alarm. Field Comments & Gauge Readings:		
H5	PROCESS GAS LOW PRESSURE Compare the pressure indicated on the P&ID with the actual pressure at which the gas cabinet controller falls into alarm. Re-adjust the pressure switch if necessary but consider that +/- 10% differential is acceptable. Field Comments:		
H6	PROCESS GAS LOW PRESSURE Open the process gas cylinder valve. Field Comments:		

Inspection Sign Offs

Mechanical – Company Name	Mechanical – Signature	Date
Quality Control – Company Name	Quality Control – Signature	Date
Safety – Company Name	Safety – Signature	Date
BeaconMedaes Field Start-Up Technician	BeaconMedaes – Signature	Date