

## Low Pressure Carbon Dioxide (CO<sub>2</sub>) Fire Suppression System

### Features

- Factory Mutual (FM) Approved
- Wide range of CO<sub>2</sub> storage units available (3 3/4 ton (3,402 kg) to 46 ton (41,731 kg) capacity)
- Hydraulic program for piping design and nozzle sizing
- CO<sub>2</sub> storage units are saddle mounted
- Low profile design
- NEMA 4 power control box

### Applications

The following are typical hazards protected by carbon dioxide systems:

- Printing presses
- Transformer vaults/electrical cabinets
- Open pits
- Dip tanks
- Rolling mills
- Ovens
- Coating machines
- Process equipment
- Exhaust and fume handling systems
- Flammable gas or liquid storage areas
- Generators
- Inerting applications

### Description

The ANSUL® Commercial Low Pressure CO<sub>2</sub> Fire Suppression System is designed to meet the requirements of NFPA 12, *Standard on Carbon Dioxide Extinguishing Systems*. The system consists of a low pressure storage unit, selector valves, manual and automatic controls, distribution nozzles, alarms, indicators, and supervisory devices as required to maintain a supply of carbon dioxide in a discharge-ready state, and to provide effective distribution of agent on demand.

The low pressure system consists of liquid CO<sub>2</sub> stored in an ASME coded pressure vessel which is equipped with a refrigeration system. The pressure within the vessel is kept near 300 psi (20.7 bar) by maintaining the internal temperature at approximately 0 °F (-18 °C). A manually operated tank shut-off valve, which is used to isolate the supply from the distribution network, is fitted to the storage unit. Low pressure storage units are available in sizes from 3 3/4 ton (3,402 kg) up to 46 ton (41,731 kg) capacity.



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Distribution of CO<sub>2</sub> is accomplished through a selector valve or a hand-hose line arrangement. A selector valve arrangement is commonly used when multiple hazards are protected from a common supply manifold that is located in close proximity to the storage unit. The master and selector valve arrangement is typically used to protect several hazards from the same supply manifold where the selector valve is located close to the hazard and at a significant distance from the storage unit. Hand-hose lines can either be supplied from a separate low pressure storage unit or connected to the same storage unit that supplies a fixed pipe system. In all cases, the hand hose line has its own operating discharge valve.

The carbon dioxide is distributed to the protected space through a piping network and discharge nozzles that are sized in accordance with the ANSUL® Low Pressure CO<sub>2</sub> flow calculation software. The type of nozzles used depends upon the specific flow and distribution requirements of each application.

Valve control is accomplished through electro-pneumatic or manual means. Each selector valve assembly consists of a ball or butterfly valve, a spring return pneumatic valve operator and an electrically operated solenoid valve. Selector valves with spring return actuators, solenoid valves, and pneumatic delay timers are available. A listed and approved releasing control panel is used to provide automatic detection and control. CO<sub>2</sub> vapor from the storage container is regulated to approximately 100 psi (6.9 bar) and piped to the inlet of the electrically operated solenoid valve. Upon receipt of an electrical actuation signal from the releasing panel, the solenoid valve operates, opening the selector valve and allowing the CO<sub>2</sub> extinguishing agent to flow into the protected area. When the discharge timing cycle is complete, the electrical actuation signal is removed. Deactivation of the actuation signal returns the selector valve to its stand-by position.

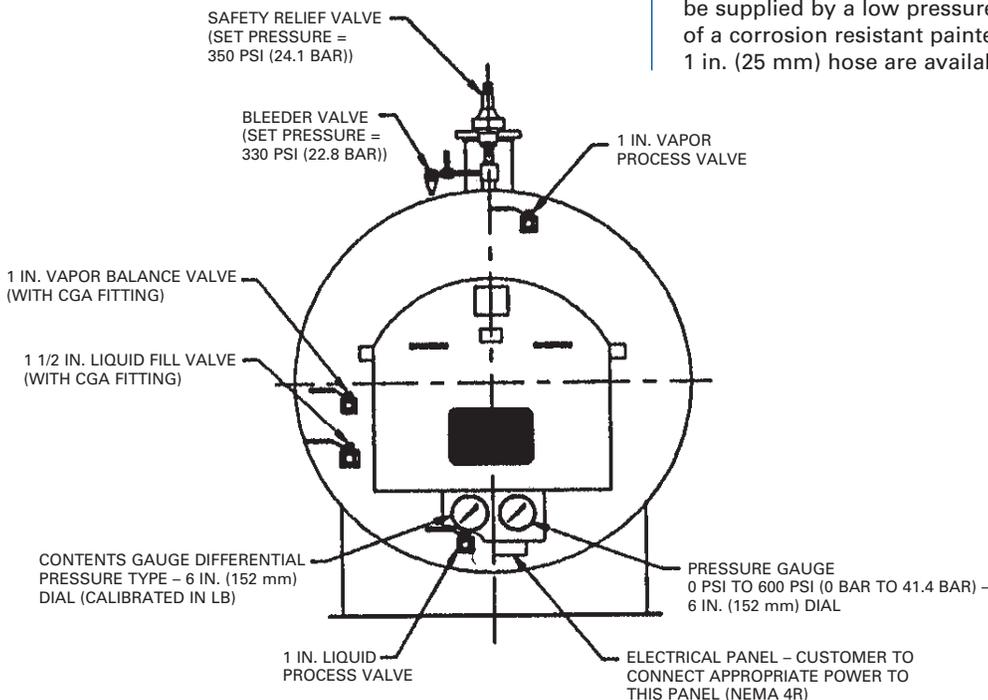
## Component Description

**Low Pressure CO<sub>2</sub> Storage Unit:** The low pressure storage unit is built to the ASME code for unfired pressure vessels. The storage unit is available in sizes from 3 3/4 ton (3,402 kg) to 46 ton (41,731 kg). The pressure vessel has piping for filling, for supplying CO<sub>2</sub> vapor to the system controls, and a large outlet for discharging CO<sub>2</sub> into the protected hazard. The pressure vessel is covered with 4 in. (102 mm) of polyurethane insulation. The insulation is covered with an aluminum vapor barrier. The pressure vessel is provided in a saddle mount configuration.

The pressure vessel is equipped with safety relief valves in accordance with ASME requirements. In addition to the safety relief valve required by ASME, the pressure vessel is also supplied with an auxiliary relief device known as a *bleeder* valve.

In the upper part of the pressure vessel, refrigerant evaporator coils serve to cool the stored CO<sub>2</sub>. A refrigeration unit supplies low pressure refrigerant to the evaporator coils inside the pressure vessel. The refrigerant extracts heat from the CO<sub>2</sub> vapor which surrounds the coils. The refrigeration compressor cycle is controlled by a pressure switch which monitors the pressure of the CO<sub>2</sub> within the vessel. Pressure of the CO<sub>2</sub> inside the tank is lowered to 295 psi (20.3 bar). The refrigeration compressor turns on when the CO<sub>2</sub> pressure reaches 305 psi (21.0 bar). When the vapor space temperature is cooled to about 0 °F (-18 °C), the CO<sub>2</sub> pressure switch opens to start the refrigerant pump-down cycle and turn off the compressor.

**CO<sub>2</sub> Agent:** Carbon dioxide is an effective fire suppressing agent that can be used on many types of fires. It is effective for surface fires, such as flammable liquids and most solid combustible materials. It expands at a ratio of 450 to 1 by volume. For fire suppression purposes, the discharge is designed to raise the carbon dioxide concentration in the hazard. This displaces the air, which contains oxygen that supports combustion, and results in fire suppression. Other attributes are its high degree of effectiveness, its excellent thermal stability, and its freedom from deterioration. It is electrically non-conductive, and leaves no residue to clean up after discharge.



## ⚠ WARNING

Due to the method of suppression, personnel occupying areas protected by carbon dioxide systems must be evacuated prior to system discharge. For this reason, discharge time delays and alarms are mandatory for occupied hazards. Failure to do this could lead to **serious personal injury or death**.

**Nozzles:** Nozzles are designed to direct the discharge of CO<sub>2</sub> in the hazard area. The system design specifies the orifice size to be used for proper flow rate and distribution pattern. The nozzle selection depends on the hazard and location to be protected. Standard nozzles are painted red or are natural brass, depending on the type. All are corrosion resistant.

**Distribution Valves:** Valves which control the discharge of CO<sub>2</sub> into the protected space(s) can be arranged in one of two configurations: master and selector, or selector. Operation of the valves is done pneumatically, electro-pneumatically, or manually.

*Master and Selector:* There are two discharge valves in the flow path between the low pressure storage unit outlet and the discharge nozzles. Starting from the storage unit, the first valve is the master valve. The valve downstream of the master valve is the selector valve. In most master and selector valve systems, one master valve will serve several selector valves. The advantage to this type of configuration is that it permits installing a single pipe from the storage unit to several distant hazards. The savings in installation cost by installing a single pipe rather than multiple individual pipes may more than offset the cost of the master valve and controls.

*Selector:* There is a single selector valve in the flow path between the low pressure storage unit outlet and the discharge nozzles. This configuration is typically used to protect multiple hazards which are 1) close to the low pressure storage unit and 2) widely separated from other protected hazards. Cost of the equipment is less than that of a master and selector arrangement, but installation may be greater if several large diameter pipe runs must be installed from the low pressure storage unit to the hazards.

**Hose Reels:** In addition to the fixed pipe systems, hose reels can be supplied by a low pressure storage unit. Hose reels consist of a corrosion resistant painted reel. Several different lengths of 1 in. (25 mm) hose are available.

## Available Options

- Dual relief valves with diverter valve
- NEMA 4X power control box
- Liquid level gauge switches (one or two)
- Dual refrigeration systems
- 200 VAC, 1 phase, 50 Hz refrigeration unit (3 3/4 ton (3,402 kg) through 10 ton (9,072 kg) only)
- 200/220 VAC, 3 phase, 50 Hz refrigeration unit (all sizes)
- 460 VAC, 3 phase, 60 Hz refrigeration unit (all sizes)
- 208/230 VAC, 1 phase, 60 Hz refrigeration unit (3 3/4 ton (3,402 kg) through 10 ton (9,072 kg), and 14 ton (12,701 kg) only)
- 208/230 VAC, 3 phase, 60 Hz refrigeration unit (all sizes)

## Approvals

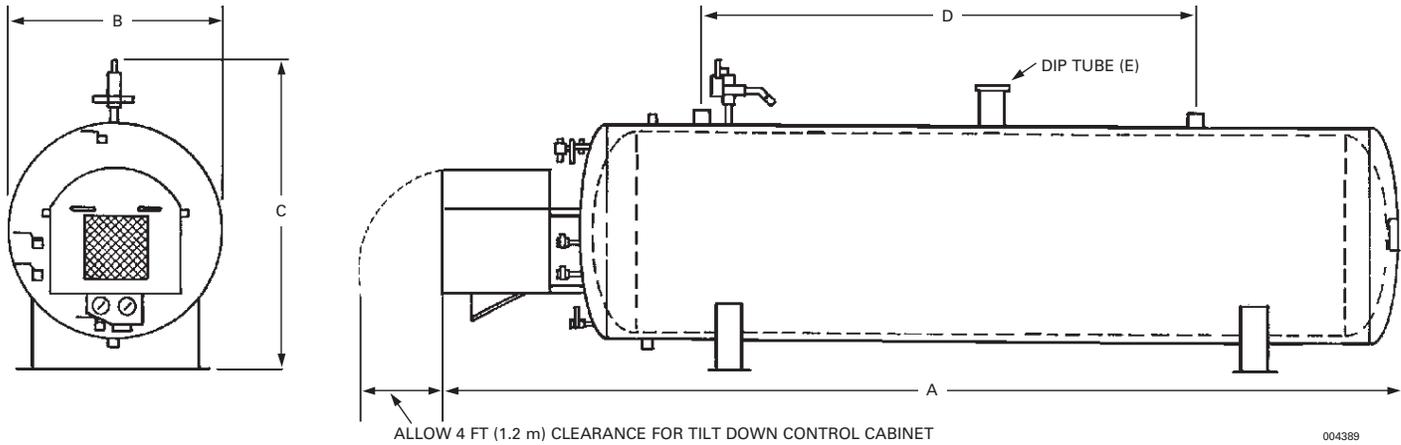
ANSUL® Low Pressure Carbon Dioxide Systems are designed to meet the requirements of NFPA 12 Standard on Carbon Dioxide Extinguishing Systems. They are FM Approved.

## Ordering Information

Order all system components through your Authorized ANSUL® Distributor who carries the ANSUL® Low Pressure CO2 System product line.

Nominal Tank Capacity (Tons)	Part No.	A Length		B Width		C Height		D Lift Lugs		E Dip Tube		Empty Weight		Weight of CO <sub>2</sub>	
		ft-in.	(m)	ft-in.	(m)	ft-in.	(m)	ft-in.	(m)	in.	(mm)	lb	(kg)	lb	(kg)
3.75	425950	11-10	(3.6)	5-10	(1.8)	8-6	(2.6)	2-8	(1)	4	(102)	7,500	(3,402)	7,500	(3,402)
3.75*	440443	11-10	(3.6)	5-10	(1.8)	8-6	(2.6)	2-8	(1)	4	(102)	7,500	(3,402)	7,500	(3,402)
6	441609	15-10	(4.8)	5-10	(1.8)	8-6	(2.6)	5-0	(1.6)	4	(102)	9,000	(4,082)	12,000	(5,443)
6	425899	15-10	(4.8)	5-10	(1.8)	8-6	(2.6)	5-0	(1.6)	6	(152)	9,000	(4,082)	12,000	(5,443)
6*	442562	15-10	(4.8)	5-10	(1.8)	8-6	(2.6)	5-0	(1.6)	6	(152)	9,000	(4,082)	12,000	(5,443)
6*	440461	15-10	(4.8)	5-10	(1.8)	8-6	(2.6)	5-0	(1.6)	6	(152)	9,000	(4,082)	12,000	(5,443)
8	425928	19-2	(5.8)	5-10	(1.8)	8-6	(2.6)	8-6	(2.6)	6	(152)	10,200	(4,627)	16,000	(7,257)
8*	440419	19-2	(5.8)	5-10	(1.8)	8-6	(2.6)	8-6	(2.6)	6	(152)	10,200	(4,627)	16,000	(7,257)
10	437372	23-4	(7.1)	5-10	(1.8)	8-6	(2.6)	12-3	(3.7)	8	(203)	11,500	(5,216)	20,000	(9,072)
10*	440420	23-4	(7.1)	5-10	(1.8)	8-6	(2.6)	12-3	(3.7)	8	(203)	11,500	(5,216)	20,000	(9,072)
12	437369	26-5	(8.1)	5-10	(1.8)	8-6	(2.6)	15-4	(4.7)	8	(203)	12,650	(5,738)	24,000	(10,886)
12*	440421	26-5	(8.1)	6-7	(2.0)	8-6	(2.6)	15-4	(4.7)	8	(203)	12,650	(5,738)	24,000	(10,886)
14	440307	20-7	(6.3)	7-4	(2.2)	10-3	(3.1)	7-4	(2.2)	8	(203)	14,000	(6,350)	28,000	(12,701)
14*	440422	20-7	(6.3)	7-4	(2.2)	10-3	(3.1)	7-4	(2.2)	8	(203)	14,000	(6,350)	28,000	(12,701)
14	441759	20-7	(6.3)	7-4	(2.2)	10-3	(3.1)	7-4	(2.2)	8	(203)	14,000	(6,350)	28,000	(12,701)
14*	441760	20-7	(6.3)	7-4	(2.2)	10-3	(3.1)	7-4	(2.2)	8	(203)	14,000	(6,350)	28,000	(12,701)
18	440308	25-1	(6.9)	7-4	(2.2)	10-3	(3.1)	10-0	(3.3)	8	(203)	16,800	(7,621)	36,000	(16,329)
18*	440423	25-1	(6.9)	7-4	(2.2)	10-3	(3.1)	10-0	(3.3)	8	(203)	16,800	(7,621)	36,000	(16,329)
22	440551	29-1	(8.7)	7-4	(2.2)	10-3	(3.1)	14-0	(4.3)	8	(203)	20,500	(9,299)	44,000	(19,958)
22*	440309	29-1	(8.7)	7-4	(2.2)	10-3	(3.1)	14-0	(4.3)	8	(203)	20,500	(9,299)	44,000	(19,958)
30	440554	37-1	(11.1)	7-4	(2.2)	10-3	(3.1)	22-0	(6.7)	8	(203)	26,500	(12,020)	60,000	(27,216)
30*	440312	37-1	(11.1)	7-4	(2.2)	10-3	(3.1)	22-0	(6.7)	8	(203)	26,500	(12,020)	60,000	(27,216)
38	440557	44-7	(13.6)	7-4	(2.2)	10-3	(3.1)	30-0	(6.8)	8	(203)	33,000	(14,970)	76,000	(34,473)
38*	440560	44-7	(13.6)	7-4	(2.2)	10-3	(3.1)	30-0	(6.8)	8	(203)	33,000	(14,970)	76,000	(34,473)
46	440377	53-1	(16.0)	7-4	(2.2)	10-3	(3.1)	38-0	(7.7)	8	(203)	37,500	(17,010)	92,000	(41,731)
46*	440565	53-1	(16.2)	7-4	(2.2)	10-3	(3.1)	38-0	(11.6)	8	(203)	37,500	(17,010)	92,000	(41,731)

\*Dual Refrigeration System Models



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**Note:** The converted values in this document are for dimensional reference only and do not reflect an actual measurement.

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