

POSITION STATEMENT

FACTORS FOR DETERMINING PRESSURE LIMITATIONS FOR VARIOUS EQUIPMENT TYPES

Background

One of the primary hazards of a compressed gas cylinder is its pressure. Organizations such as the American Society of Mechanical Engineers (ASME) and the Technical Standards & Safety Authority (TSSA) in Canada note that pressure greater than 15 psi (103 kPa) is considered hazardous.¹ CGA publications have addressed these concerns by assigning outlet connections for compressed gas cylinders, valves, and ancillary equipment.

Historically, CGA cylinder valve outlet connections, as specified in CGA V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections* have been designed and are selected to protect downstream equipment from overpressurization [2]. A number of pressure ranges have been established to safeguard the selection of the proper cylinder valve outlet connection. These ranges have been chosen to protect downstream regulators and other ancillary equipment from being overpressurized. These cylinder valve outlet connections fall into four categories: low pressure, standard pressure, intermediate high pressure, and high pressure. See Table 1 for the established pressure ranges for the four categories.

Table 1—CGA V-1 established pressure ranges at 70 °F (21.1 °C)

Low pressure	Standard pressure	Intermediate high pressure	High pressure
0 psi to 500 psi (0 kPa to 3450 kPa)	0 psi to 3000 psi (0 kPa to 20 680 kPa)	3001 psi to 4700 psi (20 690 kPa to 32 400 kPa)	4701 psi to 6400 psi (32 410 kPa to 44 100 kPa)
NOTE—For more information on CGA connection pressure ranges, see CGA V-1 [2].			

While the pressure ranges listed in Table 1 work well for the majority of applications, there are some unique applications where there are variances to the pressures listed in Table 1. The following are some examples of these variances:

- Liquid dewars (e.g., DOT 4L) have outlet connections rated to 3000 psi (20 680 kPa), although they may be connected to downstream equipment rated at lower pressures, e.g., CGA 540 for oxygen or CGA 580 for inert gases attached to regulators rated at 500 psi (3450 kPa); and
- Tube trailer connections are rated to 3500 psi (24 130 kPa) connected to manifold systems only rated to 3000 psi (20 680 kPa) see CGA V-10, *High Pressure Gas Trailer Connections* [3].

CAUTION: A lower rated connection shall not be used in an application where a higher pressure outlet connection is mandated.

Guidance for selecting an outlet connection for low pressure applications are be found in the following CGA publications:

- CGA E-1, *Standard for Rubber Welding Hose and Hose Connections for Gas Welding, Cutting, and Allied Processes* for ancillary equipment connected to a welding hose, for low pressure connections that do not exceed 200 psi (1380 kPa) [4];

¹ kPa shall indicate gauge pressure unless otherwise noted as (kPa, abs) for absolute pressure or (kPa, differential) for differential pressure. All kPa values are rounded off per CGA P-11, *Guideline for Metric Practice in the Compressed Gas Industry* [1].

- CGA V-5, *Standard for Diameter Index Safety System (Noninterchangeable Low Pressure Connections for Medical Gas Applications)* for low pressure medical connections that do not exceed 200 psi (1380 kPa) [5];
- CGA E-3, *Low Pressure Pipeline Station Outlet/Regulator Inlet Connection Standard* for low pressure pipeline station outlet and regulator inlets are also limited to a 200 psi (1380 kPa) maximum pressure [6]; and
- CGA V-1 for low pressure cylinder valves that are limited to 500 psi (3450 kPa) [2].

This position statement does not cover cryogenic or refrigerated liquid withdrawal equipment, for more information:

- CGA V-6, *Standard Bulk Refrigerated Liquid Transfer Connections* [7];
- CGA P-7, *Standard for Requalification of Cargo Tank Hose Used in the Transfer of Carbon Dioxide Refrigerated Liquid* [8];
- CGA P-27, *Recommended Hose Management Practice for Uninsulated Stainless Steel Cryogenic Cargo Tank Hose* [9]; and
- CGA P-42, *Recommended Hose Management Practice for Compressed Gas Transfer Hoses* [10].

This position statement does not apply to medical outlet connections not covered in CGA V-1 [2].

Question

What factors should be considered when determining the required pressure limitation for industrial equipment that will be attached to a CGA connection?

Answer

The terms low and high pressure should always be considered generic. Specific supply and operating pressures shall be communicated along with the maximum allowable working pressure (MAWP) of the various equipment being used.

CGA outlet connections are not only for various pressure ranges, but also for the assignment of connections to gases and mixtures within each of these pressure ranges. CGA outlet connections are found in CGA V-1 and CGA E-1 [2, 4].

Within each of these pressure ranges it should be noted that the connections are rated at 70 °F (21.1 °C).

CGA outlet connections have a MAWP, however they may be used for lower pressure service provided the downstream equipment is properly rated. The following 3000 psi (20 680 kPa) connections are typical examples of connections that can and are being used at pressure less than 500 psi (3450 kPa) for both low and high pressure supplies depending on the vapor pressure or compressed gas pressure:

- CGA 320;
- CGA 330;
- CGA 540;
- CGA 580;
- CGA 590;
- CGA 660; and
- CGA 705.

The rated MAWP's for all equipment downstream of the primary source shall be clear to all designers, installers, and end users. The actual source pressure typically discharged from the CGA connection, may be less than the