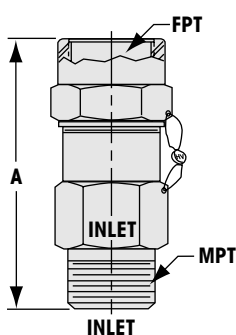


Needless Loss of Refrigerant Through Relief Valves During Abnormal Operating Conditions

tech
tips



To prevent nuisance refrigerant loss through pressure relief valves during HIGH AMBIENT or ABNORMAL operating conditions, it is necessary that the relief valve setting be SUBSTANTIALLY higher than the system OPERATING pressure.

For relief valves:

- A. The MINIMUM setting should be at least 25% above the Maximum System Operating Pressure (MSOP):

Example: MSOP = 280 PSI

$$\begin{aligned} \text{Minimum Relief Valve Setting} \\ = 1.25 \times 280 = 350 \text{ PSI} \end{aligned}$$

- B. and the MAXIMUM allowable setting should be equal to the DESIGN WORKING PRESSURE of the vessel.

These factors of safety will provide sufficient spring force on the valve seat to maintain a tight seal and still allow for setting tolerances and other factors which cause settings to vary.

A refrigerant safety valve is designed to prevent pressure in a vessel from rising above a safe level when operating controls fail or, when the vessel is exposed to EXCESSIVE HEAT.

With a properly sized relief valve installed on the vessel, the refrigerant is released at a CONTROLLED rate so that a safe pressure is maintained in the vessel. If sized correctly, the relief valve has enough discharge capacity to prevent the pressure in the vessel from rising more than 10% above its design WORKING PRESSURE.

Experience has shown that although relief valves are originally set to within a few pounds of the stamped setting, the variation MAY be as much as 10% of the stamped setting after the valves have been stored, or placed in service for prolonged periods of time.

If vessel pressure increases within 10% of set pressure of the relief valve, the valve may begin to "seep". With increasing pressure, gas flow will increase to the "pop" point when the valve goes full open providing full discharge. By Code, the valves must be full open within 10% of the valves stamped setting. However, under certain system conditions, it is possible a valve could start to relief, but not open fully. Under these conditions valves would either continue to "seep" or "chatter".

Relief valves are designed to reclose as the pressure is reduced. However, it is generally due to an accumulation of dirt and foreign matter that impinges on the valve seat disc, while the valve is discharging. For this reason, it is almost impossible to predict with any degree of certainty the reliability of the relief valves RESEALING after they have discharged in service. This condition also allows the relief valve to "seep" refrigerant after RECLOSING, but not necessarily RESEAL.

Although relief valves are designed to RECLOSE after discharging, this feature is intended only to minimize the loss of refrigerant UNTIL THE VALVE CAN BE REPLACED.

Service complaints concerning the loss of refrigerant are greatest with refrigerants having high saturation pressures such as Refrigerants 22 and 404. Complaints are noted particularly in the summertime with very high ambient temperatures.

Table 1
Relief Valve Parameters
as a % of R.V. Set Pressure

		Example	
		A	B
R.V. Setting Tolerance	+10% RV FULL OPEN -----	385	495
	+3% -----	360.5	463.5
	RELIEF VALVE (RV) SETTING -----	350	400
	-3% -----	339.5	463.5
	-10% Potential R.V. "Seep" Point Max. system oper. pressure	315 280	405 360

Relief valve parameters as a percent of R.V. set pressure

Problems may arise with valve subjected to HIGH AMBIENT temperatures which might be encountered in an equipment room or on a roof top. Failure to take advantage of the maximum allowable relief valve setting may contribute to relief valves seeping.

Consider a system with:

- Maximum System Operating Pressure (MSOP) 280 PSI
(25% Above MSOP)
- Minimum Relief Valve Setting 350 PSI
(25% Above MSOP)
- Pressure Vessel-Maximum Operating Pressure 450 PSI

Table 2
Relief Temperature Valves R-22 & R404a

Ambient Temp. °F.	Equipment Room			Temp. °F.	Roof Top		
	Temp. °F.	PSI			Temp. °F.	PSI	
		R22	R404a			R22	R404a
90	115	242.8	294	120	260.0	311	
95	120	260.0	311	125	278.1	333	
100	125	278.1	333*	130	297.0	355*	
105	130	297.0	355*	135	316.7*	378*	
110	135	316.7*	378*	140	337.4*	402*	

¹Equipment Room Temperature = Ambient Temperature + 25°F.
²Roof Top = Ambient Temperature +30°F.

*Potential R.V. "Seep" points valve set at 350 PSI

Example A. Relief Valve set at 350 PSI

Example B. Relief Valve set at 450 PSI

By comparing the potential relief valve "seep" point from Table 1 with the pressures shown in Table 2, we note the added safety zone provided by the properly sized relief valve.

Failure to consider the above factors when sizing relief valves can lead to valves that are set at too low a pressure. The result can be valves that "seep" in extremely hot weather with the possibility they will continue to "seep" after reclosing