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INTRODUCTION

Pressure relief valves are used on liquid storage tanks and other process vessels or systems to prevent structural damage due to excess internal pressure.

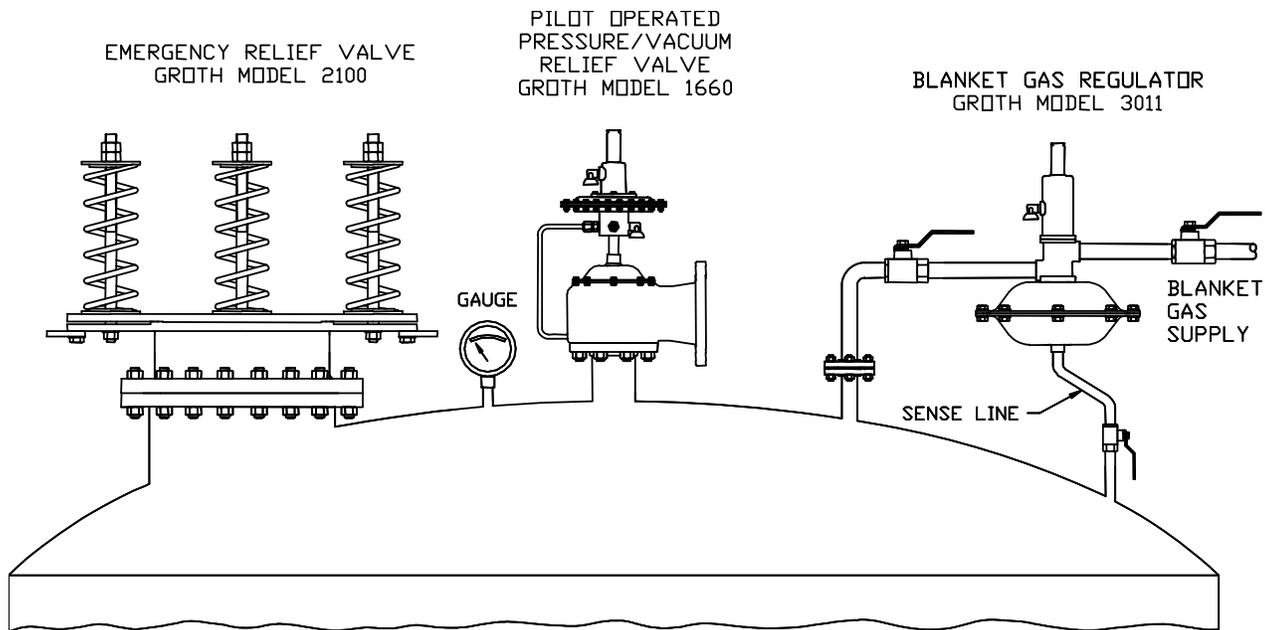
Storage tanks are pressurized when liquid is pumped in, compressing the existing vapor or when increasing temperature causes increased evaporation or expansion of existing vapor. To prevent damage, vapor must be allowed to escape or enter the tank at a specified pressure condition. The volume rate of venting depends upon the tank size, volatility of the contents, the pumping rate and the temperature. See API Standard 2000 for the procedures to determine venting requirements.

The 2100 Spring Loaded Emergency Relief Valve provides pressure relief. Emergency pressure relief provides protection for fire exposure and/or failure of the inert gas blanketing system. The valves can be set for pressure relief in the range of 1 - 15 PSIG.

High operating pressures reduce evaporation and total venting volume, thereby reducing product loss and the cost of processing emissions.

All valves must be carefully maintained by a qualified valve technician. They should only be assembled under clean conditions, preferably in a service shop environment. Carefully read and understand this manual before attempting to repair a 2100 Emergency Pressure Relief Valve.

FIGURE 1: TANK INSTALLATION - SAFETY EQUIPMENT



EMERGENCY RELIEF VALVE DESIGN AND FUNCTION

The 2100 Series Emergency Relief Valve is designed to provide pressure relief for API 620 and 650 tanks.

This series of valve is available with a standard O-Ring seat. Depending on application, it is available in a wide range of material options.

Each application must be reviewed to ensure material compatibility of all metal and soft good

This manual is intended to provide recommended procedures and practices for installation, operation, and maintenance of the Groth 2100 Emergency Relief Valve. Any standard procedures and practices developed for a specific plant or process may supersede this manual. Although this manual cannot cover all possible contingencies, following these guidelines should provide safe, reliable valve performance.

components. Consult factory for special requirements. (See Table 7 for a complete standard material list.)

The Emergency Relief Valve is set at the factory to comply with the specification on the purchase order. The range of adjustment (for pressure relief) is shown in Table 6. The pressure setting may be changed within the design range in a service shop.

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SAFETY WARNINGS

This section is an overview of safety guidelines that should be followed during the installation, operation and maintenance of Groth Pressure Emergency Relief Valves. To understand the context of these instructions and warnings, it is necessary to completely read and understand the contents of this manual.

The purpose of an Emergency Relief Valve (ERV) is to prevent excessive pressure in a tank or process system. The valve must be designed for the proper MAWP and flow requirements of the system. Consult API Standard 2000 for tank protection sizing procedures. An improperly specified or functioning relief valve may result in structural damage to the tank or system.

Do NOT attempt to remove the valve from the tank or process vessel without first bleeding all pressure from the system. **ALTERNATIVE MEANS OF PRESSURE RELIEF MUST BE PROVIDED WHEN THE VALVE IS OUT OF SERVICE.**

The ERV is exposed to process vapors while in service. Observe all plant procedures and Material Safety Data Sheet (MSDS) recommendations for the products in the system when inspecting, adjusting or servicing the valve. Take appropriate safety precautions regarding eye protection, respiration and skin contact.

SEE PAGES 4, 5, & 7 FOR ADDITIONAL WARNINGS.

SHIPPING, INSPECTION AND STORAGE

The ERV is normally bolted to a pallet during shipping. When received inspect the valve for any sign of damage that may have occurred in shipment and report this to the carrier.

If the valve is to be stored before installation, it should be in a clean environment and protected to prevent intrusion of foreign materials into the body. Before installation inspect the unit visually. If there is any indication of physical damage or internal contamination, the valve must be cleaned and inspected before installation.

WARNING: The valve must be installed in a vertical position as shown in Fig. 1. To achieve nominal flow capacity, the tank nozzle bore must be at least the same nominal dimension as the relief valve body.

Lifting eyes are bolted to the upper body flange and are to be used for handling the valve. To avoid damage to the lower flange surface, set the valve on a soft clean gasket material until it is ready to be installed.

INSTALLATION

The 2100 ERV must be handled carefully to ensure seat tightness.

1. At installation, the valve should be smoothly lifted into position using the lifting eyes on the body flange. Do NOT lift the valve by the spring assemblies; this can damage the seat and cause the valve to leak in service.
2. The mating flanges on the valve body and tank nozzle should be the same type (i.e. RF with RF and FF with FF). Mating flanges **MUST** be flat within .015" and clean, free of scratches, corrosion and tool marks.
3. Begin by inspecting the gasket; make sure that the material is suitable for the service. Gasket dimensions are listed in the Table 1 below. Center the gasket on the tank nozzle.

Table 1 Body Flange Gasket Dimensions					
150# ANSI Flange					
Size	OD	ID	BC	Hole	No.
16" FF	23.50"	15.25"	21.25"	1.13"	16
20" FF	27.50"	19.25"	25.00"	1.25"	20
24" FF	32.00"	23.25"	29.50"	1.38"	20
16" RF	18.50"	15.25"	---	---	---
20" RF	23.00"	19.25"	---	---	---
24" RF	27.25"	23.25"	---	---	---
API 650# Flange					
Size	OD	ID	BC	Hole	No.
20"	26.00"	19.25"	23.50"	0.75"	16
24"	30.00"	23.25"	27.50"	0.75"	20

5. Set the valve carefully on the nozzle
6. Lubricate all studs and nuts with an appropriate thread lubricant. If stainless steel fasteners are used, use an anti-seize lubricant such as moly-disulfide.
7. Install the studs in the valve body and tighten nuts hand tight.
8. Torque all fasteners to half the value listed in Table 2 in a staggered, alternating pattern or follow appropriate Plant Maintenance guideline standards.
9. Make sure that the flanges are not distorted and that the gasket is evenly compressed.
10. Make up the final torque and check that no further nut rotation occurs at the specified torque value.

Table 2 Flange Bolt Torque [Ft. Lb.]			
150# ANSI Flange (30 PSI MAWP)			
ANSI Flange	Number of Studs	Stud Size	Torque
16" FF	16	1.00"	330
20" FF	20	1.13"	410
24" FF	20	1.25"	630
16" RF	16	1.00"	225
20" RF	20	1.13"	320
24" RF	20	1.25"	500

API 650# Flange (2 PSIG MAWP)			
20"	16	0.63"	22
24"	20	0.63"	25

ROUTINE MAINTENANCE

The 2100 ERV does not require routine lubrication or adjustments. It should be checked periodically, at least once a year, to confirm that the valve is functioning properly and that the set point is correct.

Periodic inspection for seat tightness should be done to ensure compliance with local air pollution control requirements. This may be accomplished with a gas detector calibrated for the principle product in the system.

The valve will need to be periodically removed from the tank for inspection of the main cover seal. When this is done, the valve must be carefully lifted using the lifting eyes on the body upper flange.

Refer to handling instructions listed in the Installation section of this manual.

If a vapor leak is detected, it will be from one of the following sources:

1. Cover Seal.
2. Body - nozzle flange joint gasket.

Refer to the Troubleshooting section (p. 6) of this manual for probable causes for these type of problems.

TOOLS

Most service, adjustment and assembly of the 2100 valve may be performed with the following open end wrench sizes:

15/16", 1-1/8", 1-1/2", 1-11/16" & 1-7/8"

DISASSEMBLY

Note that throughout this manual, numbers in [] after the part descriptions are item numbers which refer to the drawings and bills of material. They apply only to drawing C-91726 [on page 7].

The valve should be handled by the lifting eyes attached to the main valve body upper flange. It should be set on a flat surface.

WARNING: Before disassembling a valve, carefully read and understand the Safety Warnings listed on page 3.

Measure the distance from the top of the pressure upper spring button [4] and the top of the adjustment screw [6]. This should also be recorded. Remove the top hex nut [5] from each adjustment screw and then back off the lower nut [5], releasing spring compression. Use care as the nut is removed from the adjustment screw in case of spring pre-load. Loosen the lower nuts [11] and remove the adjustment screws [6]. Lift the springs [3] from the valve; handle carefully to avoid bending them or scratching the wire.

Lift the cover (using appropriate equipment) with one of the lifting lugs [8] and turn it upside down, exposing the cover seal [7]. Inspect the O-Ring for signs of mechanical damage or deterioration from product exposure and replace if necessary.

ASSEMBLY:

This valve is built with an integral body seat. If construction is C.S., a 316 SS weld overlay was used to build up the seat. Consult the factory before machining this surface.

To install a new pressure O-Ring, the cover should be turned upside down to provide access to the groove. It must be cleaned and can be lubricated with a small amount of grease. The O-Ring should be started at three or four points around the circumference to minimize the effect of -O-Ring stretch. Use your finger or a smooth tool to roll the O-Ring into the groove.

Using all four lifting lugs [8], carefully lift the cover assembly onto the body [1]. Align the adjustment screw holes in the cover with the body. (Depending on size and set pressure range there are either four or eight holes.) Place an adjustment screw [6] into each of these holes and lock into place using the two 3/4"-10 UNC hex nuts [11] and lock washers [10]. Slide spring buttons [4] over each of the adjustment screws [6] and then the springs [3]. Put a spring button [4] on top and then tighten the two 1"-8 UNC hex nuts [5] until the desired spring compression is achieved. [Refer to the dimension that was recorded before the valve was disassembled.]

TABLE 3: TROUBLESHOOTING GUIDE

PROBLEM	INSPECTION	SUGGESTED CORRECTIVE ACTION
Vapor leakage between the cover & valve top flange	Visual, audible or vapor detector	Leakage can occur at the cover O-Ring seal and valve body seat. This will generally occur because of deterioration of the O-Ring, but can also be caused by mounting the valve on a warped flange. The seat can be distorted resulting in a leak path; the tank nozzle must be machined or replaced to correct this condition.
Vapor leakage between the valve body and tank nozzle	Visual, audible or vapor detector	Leakage between the flanges may be corrected by tightening the fasteners. Follow installation instructions listed on pages 3 - 4. The gasket may have deteriorated due to the chemical environment; replace if required. The tank nozzle may be warped, corroded or scratched. This will require resurfacing of the flange face.

TABLE 4: O-RINGS - 2100 PRESSURE COVER:

Part Number	Description	SIZE
891A70384	O-Ring, 2100 ERV, 16", Aflas, #384	16"
891A70388	O-Ring, 2100 ERV, 20", Aflas, #388	20"
891A70392	O-Ring, 2100 ERV, 24", Aflas, #392	24"
89102384	O-Ring, 2100 ERV, 16", Buna N, #384	16"
89102388	O-Ring, 2100 ERV, 20", Buna N, #388	20"
89102392	O-Ring, 2100 ERV, 24", Buna N, #392	24"
891E70384	O-Ring, 2100 ERV, 16", EPR, #384	16"
891E70388	O-Ring, 2100 ERV, 20", EPR, #388	20"
891E70392	O-Ring, 2100 ERV, 24", EPR, #392	24"
891V75384	O-Ring, 2100 ERV, 16", FKM, #384	16"
89107388	O-Ring, 2100 ERV, 20", FKM, #388	20"
89107392	O-Ring, 2100 ERV, 24", FKM, #392	24"

TABLE 5: ABBREVIATIONS

API	American Petroleum Institute	PH	Precipitation Hardened
CS	Carbon Steel	PSIG	Pounds/Sq. Inch - Gauge
EPA	Environmental Protection Agency	QCP	Quality Control Procedure
OSI	Oz. per Square Inch	SS	Stainless Steel
MAWP	Maximum Allowable Working Pressure	VOC	Volatile Organic Compounds
NPT	National Pipe Thread	WC	Water Column

Fig. 2: Model 2100 Certified Drawing - (C-91726)

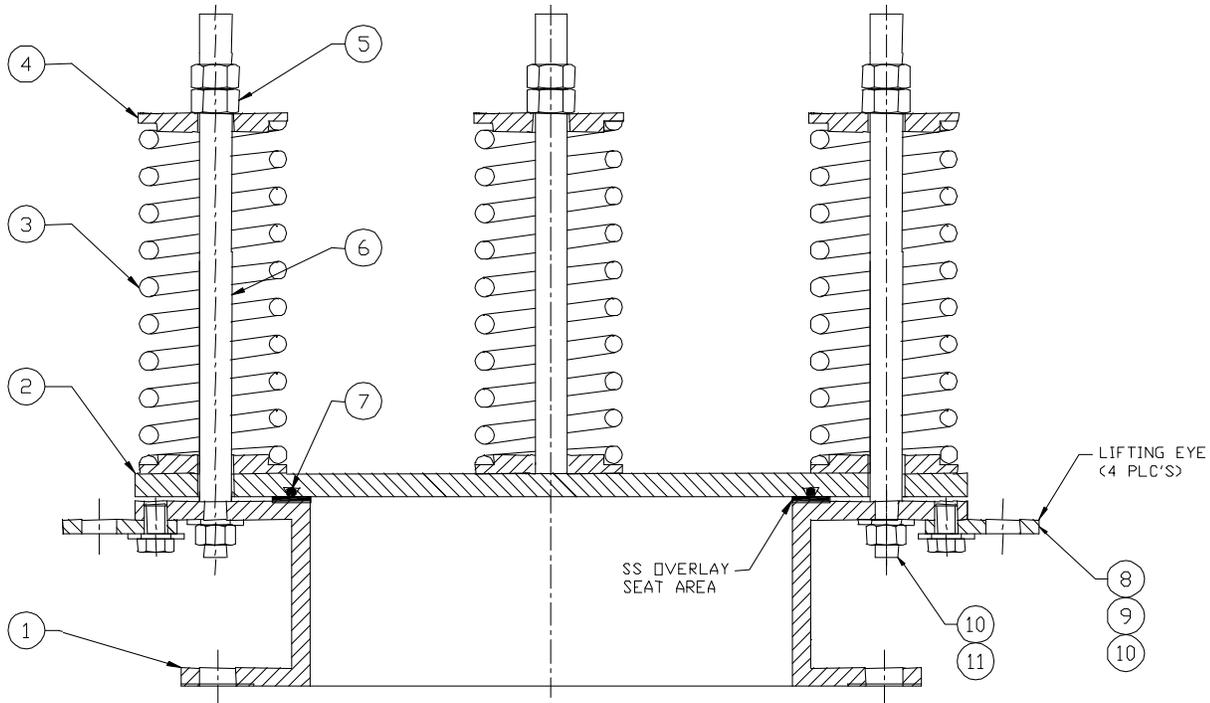


TABLE 6: Pressure Spring - Allowable Set Pressure Ranges:

Range	Min. Press. (PSIG)	Max. Press. (PSIG)
1	1.00	1.39
2	1.40	1.89
3	1.90	2.49
4	2.50	3.29
5	3.30	4.29
6	4.30	5.59
7	5.60	7.29
8	7.30	9.49
9	9.50	12.29
10	12.30	15.00

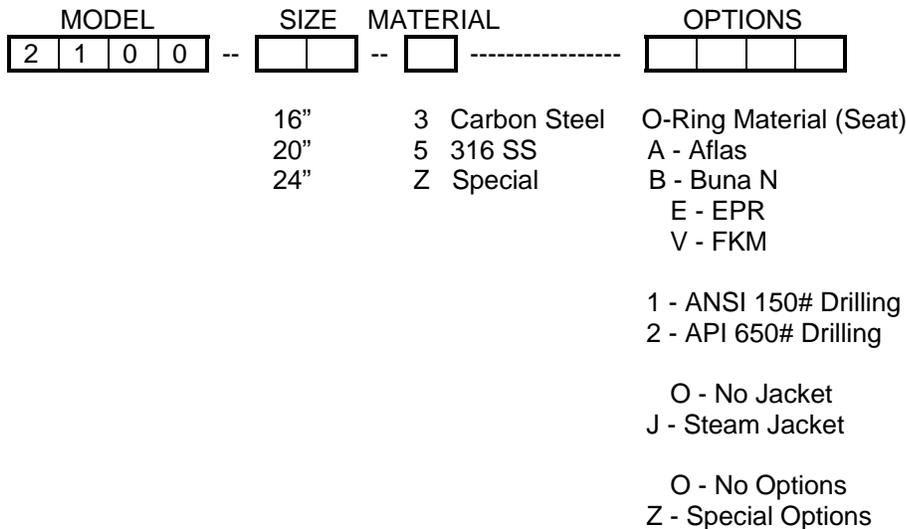
WARNING: Failure to properly set a spring loaded valve can result in a valve that is either set too high or has insufficient lift to attain rated flow capacity. Under these conditions, the valve will not protect the tank or system from rupturing due to changes in internal pressure. Tank failure can cause material damage and loss and result in severe personal injury or death.

TABLE 7: BILL OF MATERIAL: DRAWING C-91726
(Standard Materials of Construction)

ITEM	DESCRIPTION	CS	316 SS	SPARE
1	BODY (1)	CS	316 SS	
2	COVER	CS	316 SS	
3	SPRING	CS	17-7 PH	
4	BUTTON, SPRING	CS	316 SS	
5	NUT, HEX	SS	SS	
6	SCREW, ADJUSTMENT	316 SS	316 SS	
7	O-RING, COVER (2)	FKM	FKM	X
8	EYE, LIFTING	CS	316 SS	
9	BOLT, HEX	SS	SS	
10	WASHER, LOCK	SS	SS	
11	NUT, HEX	SS	SS	

- (1) 316 SS Seat Overlay on CS Body
- (2) Elastomers Also Available in Aflas, Buna-N, EPR, & FFKM.

The nameplate on the Valve contains the Model Number, Serial Number, set pressures and flow capacity at a specified over-pressure. The Model Number contains additional information about materials of construction, soft goods and options. The following chart will assist in relating the Model Number to the characteristics of your valve:



EXAMPLE: 2100-20-5-V200 indicates a Model 2100 20" with 316 SS body and seat, FKM cover O-Ring, API 650 Drilling and no special options.

PRODUCT LIMITED WARRANTY

A. Seller warrants that products which are manufactured by Seller, are manufactured in accordance with published specifications and free from defects in materials and/or workmanship for a period of (12) twelve months. Seller, at its option, will repair or replace any products returned intact to the factory, transportation charges prepaid, which Seller, upon inspection, shall determine to be defective in material and/or workmanship. The foregoing shall constitute the sole remedy for any breach of Seller's warranty.

B. THERE ARE NO UNDERSTANDINGS, AGREEMENTS, REPRESENTATIONS, OR WARRANTIES, EXPRESS OR IMPLIED, (INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE REGARDING PRODUCTS) UNLESS SPECIFIED IN THE SALES CONTRACT. THIS CONTRACT STATES THE ENTIRE OBLIGATION OF SELLER.

Seller makes no warranties, either express or implied, except as provided herein, including without limitation thereof, warranties as to marketability, merchantability, for a particular purpose or use, or against infringement of any patent of products. In no event shall Seller be liable for any direct, incidental or consequential damages of any nature, or losses or expenses resulting from any defective new product or the use of any such product, including any damages for loss of time, inconvenience, or loss of use of any such product.

C. The original Manufacturer shall be solely responsible for the design, development, supply, production, and performance of its products hereunder, and the protection of its trade name or names, if any. It assumes no responsibility, for products modified or changed in any way by its agent or customer. Any such modifications or changes to products sold by Seller hereunder shall make the product limited warranty null and void.

D. The Manufacturer shall be under no obligation to manufacture, sell, or supply, or to continue to manufacture, sell or supply any of the Products.