

Installation, Operation & Maintenance Manual

ZV200 Bypass Valve



Model ZV200 Bypass Valve

Warning: (1) Periodic inspection and maintenance of Corken products is essential. (2) Inspection, maintenance and installation of Corken products must be made only by experienced, trained and qualified personnel. (3) Maintenance, use and installation of Corken products must comply with Corken instructions, applicable laws and safety standards (such as NFPA Pamphlet 58 for LP-Gas and ANSI K61.1-1972 for Anhydrous Ammonia). (4) Transfer of toxic, dangerous, flammable or explosive substances using Corken products is at user's risk and equipment should be operated only by qualified personnel according to applicable laws and safety standards.

Solutions beyond products...

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IDEX

Warning

Install, use and maintain this equipment according to Corken's instructions and all applicable federal, state, local laws and codes. Periodic inspection and maintenance is essential.

Corken One Year Limited Warranty

Corken, Inc. warrants that its products will be free from defects in material and workmanship for a period of 12 months following date of purchase from Corken. Corken products which fail within the warranty period due to defects in material or workmanship will be repaired or replaced at Corken's option, when returned, freight prepaid to Corken, Inc., 3805 N.W. 36th Street, Oklahoma City, Oklahoma 73112.

Parts subject to wear or abuse, such as mechanical seals, vanes, piston rings, packing and other parts showing signs of abuse are not covered by this limited warranty. Also, equipment, parts and accessories not manufactured by Corken but furnished with Corken products are not covered by this limited warranty and purchaser must look to the original manufacturer's warranty, if any. This limited warranty is void if the Corken product has been altered or repaired without the consent of Corken.

All implied warranties, including any implied warranty of merchantability or fitness for a particular purpose, are expressly negated to the extent permitted by law and shall in no event extend beyond the expressed warranty period.

Corken disclaims any liability for consequential damages due to breach of any written or implied warranty on Corken products. Transfer of toxic, dangerous, flammable or explosive substances using Corken products is at the user's risk. Such substances should be handled by experienced, trained personnel in compliance with governmental and industrial safety standards.

Contacting the Factory

Before you contact the factory, note the model number and serial number of your pump. The serial number directs us to a file containing all information on material specifications and test data applying to your specific pump. When ordering parts, the Corken service manual or Installation, Operation and Maintenance (IOM) manual should be consulted for the proper part numbers. **ALWAYS INCLUDE THE MODEL NUMBER AND SERIAL NUMBER WHEN ORDERING PARTS.**

The model and serial numbers are shown on the nameplate of the unit. Record this information for future reference.

Model no. _____

Serial no. _____

Date purchased _____

Date installed _____

Purchased from _____

Installed by _____

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Applicable Notices for ATEX 94/9/EC Conformity

Product Type:

Corken Liquid Transfer Bypass Valves

Model covered: ZV200

Intended Application:

The bypass valve models covered by this manual conform to the European Union ATEX 94/9/EC Directive for explosive gas atmospheres and transfer of liquefied gases such as Liquefied Petroleum Gas, anhydrous ammonia, freons, etc.

Possible Misuse Warning:

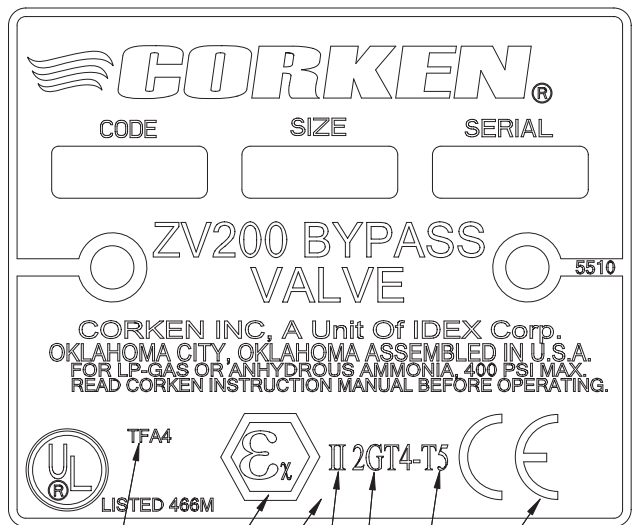
The designated bypass valve models must only be installed in systems designed for its intended use, similar to the examples presented in this manual.

ATEX Classification:

Group II; Category 2; G; Temperature Class T4 – T5

These products are classified under the ATEX directive as Equipment – Group II – Category 2 – equipment is intended for use in areas where explosive atmospheres caused by gases or vapors (G) may be present. The surface Temperature Class rating is a range between T4 275°F (135°C) and T5 212°F (100°C).

Nameplate:



File number
 Explosion protection
 ATEX Directive 94/9/EC marking
 Equipment classified as Group II—Category 2
 TFA4
 Ex II 2GT4-T5
 Surface temperature range
 T4 (135°C) 275°F
 T5 (100°C) 212°F
 ATEX and machinery directive

Training Instructions:

Instructions for the safe application and use of this product are provided in this manual. Read this manual completely prior to installation and use of this product. Only qualified and properly trained personnel should be allowed to install, operate, and maintain this equipment.

Mechanical Ignition Sources:

The bypass valve is installed as part of an assembly including the pump and the entire system must be grounded to prevent possible electrostatic discharge. Preventive maintenance guidelines are provided in this manual and are to be followed for the proper operation and performance of the valve.

Sound Levels:

These products are reactionary devices used in pumping systems. Sound levels are highly dependent upon the application, product being pumped, and installation. When operating in the system the valves should have a noise level no higher than 80 dbA.

Piping Forces and Moments:

Maximum Allowable Nozzle Forces and Moments

Note: Piping systems should be designed according to standard engineering practice and applicable national and local codes. NO piping induced forces or moments are recommended for Corken ZV200 bypass valves.

X—Horizontal (perpendicular to valve discharge port)

Y—Vertical

Z—Horizontal (parallel to valve discharge port)

$F_x = F_y = F_z = 42 \text{ lb (19 kg)}$

$M_x = M_y = M_z = 70 \text{ ft}\cdot\text{lb (10 kg}\cdot\text{m)}$

! Notice!

CORKEN BYPASS VALVES SHOULD ONLY BE INSTALLED IN LPG & NH₃ SYSTEMS THAT HAVE BEEN DESIGNED BY QUALIFIED ENGINEERING PERSONNEL AND OPERATED AND MAINTAINED BY QUALIFIED TECHNICIANS. THE SYSTEM MUST CONFORM TO ALL APPLICABLE LOCAL AND NATIONAL REGULATIONS AND SAFETY STANDARDS (SPECIFICALLY, LPG SYSTEMS **MUST** CONFORM TO NFPA 58). THIS MANUAL **MUST** BE KEPT WITH THE BYPASS VALVES AND BE REVIEWED **BEFORE** INSTALLING, OPERATING OR PERFORMING ANY MAINTENANCE WORK.

! Warning!

DO NOT ATTEMPT TO OPEN THE PUMP OR BYPASS VALVE UNTIL YOU HAVE BLED OFF THE PRESSURE. HIGH PRESSURE IN THE SYSTEM CAN CAUSE PERSONAL INJURY AND/OR PROPERTY DAMAGE. **PLEASE NOTE:** IF THE SYSTEM CONTAINS A METER, THE DIFFERENTIAL VALVE WILL KEEP LIQUID UNDER PRESSURE IN THE PUMP, METER AND PIPING EVEN AFTER THE HOSE HAS BEEN EMPTIED.

Installation

A bypass valve is essential in an LPG application to maximize performance and extend life of the pump. The valve should be installed to prevent excessive pressure resulting from accidental pump over-speed, discharge shut-off, or highly restrictive receiving systems. The bypass valve must be installed downstream of the pump and piped back to the supply tank. **NOTE: Never pipe a bypass valve back to the pump inlet.** This applies to below ground tank pumping system design as well.

The correct position for installation of the bypass valve is on the discharge side of the pump with the valve inlet and discharge indicated by the flow direction arrow on the side of the valve. The ZV200 valve can be installed in a vertical or horizontal position in the piping.

The bypass valve and its piping should be sized to accommodate the full flow from the pump when the pump's discharge line is closed and the pump is running at its operated speed. Piping line sizes should be at least as large as the valve openings. If this is not performed properly it is possible that the actual operating conditions of the installation can be higher than the bypass valve setting and cause the valve to open thereby reducing system delivery and efficiency.

The outlet piping from the valve should return to the storage tank, either into the liquid or vapor section.

Operation

The standard ZV200 bypass valves are factory set at 95 psi (6.55 bar) differential pressure. The maximum pressure setting of the valve is 125 psi (8.62 bar) for LP-Gas and NH₃ service, per Underwriters Laboratories. For optional spring ranges and settings, refer to the bypass valve assembly drawing in this manual for a complete list of parts and construction configurations.

Cold Temperature Operation - Note: Impact strength is reduced at temperatures below -20°F (-28.9°C). Use extreme caution to prevent tools and other objects from impacting the pressurized components of the pumping system.

NOTE: The bypass valve pressure setting must be verified when installed in a system.

Adjustment of the valve is as follows:

The differential pressure setting of the ZV200 valve is adjustable in various ranges depending on the size of the spring. A tag is attached to the valve cap to identify the spring furnished and that information is repeated in the table below. All of the springs for each valve size are interchangeable.

ZV200, Flange Sizes	Spring Number	Differential Pressure (psig)
1-1/4", 1-1/2", 2", 2-1/2"	5513	41–70
	5515	71–90
	5511 (std.)	91–125
	5512	126–150

Mobile/Truck Mount Applications.

1. Install liquid-filled pressure gauges equipped with a needle valve or snubber in the following locations: At the pump discharge gauge port; on the tank; on the inlet side of the ZV200.
2. Connect the delivery hose to a receiving tank or to a delivery tank port for recirculation.
3. All shut-off valves in the pump's discharge line and the bypass return line should be open.
4. Start pumping at normal delivery rate. The delivery tank outlet valve should be wide open. Record the pump discharge gauge pressure. The difference between this reading and the tank pressure (before pumping) is the normal system operating pressure, or differential pressure.
5. To check the pressure setting of the pump's internal relief valve (when applicable), slowly close the shut-off valve in the bypass return line.

Next, slowly close the shut-off valve in the pump's discharge line while observing the pump discharge gauge pressure. Record the highest differential (difference between discharge and tank pressure) when the internal relief valve begins to open. The highest or "peak" pressure must be recorded. Once the valve opens, the pressure may drop during recirculation. On Corken "Z" model truck pumps this valve is non-adjustable in the field. The pressure at which the valve opens, or "cracks", for specific applicable model pumps is listed below.

Z2000: 135 – 145 psig
 Z3200: 140 – 150 psig



WARNING: If pressure continues to increase above 155 psig without dropping, discontinue and refer to pump operations manual or contact the factory.

Open the pump discharge and ZV200 shut-off valves and return to normal pumping.

6. To check the ZV200 bypass valve setting, gradually close the shut-off valve in the pump's discharge line


and record the gauge pressure. The difference between this reading and the tank pressure (before pumping) is the external bypass valve setting (record this number).

7. Reopen the shut-off valve in the pump's discharge line and resume normal pumping operation.
8. Adjust the ZV200 setting if necessary.

On installations where the pump has an internal relief valve, the ZV200 valve should be set at least 20 to 25 psi (1.38 to 1.72 bar) *below* the setting of the pump's internal relief valve setting. This will eliminate the possibility of erratic "hunting" between the two valves in the system and potential noise and accelerated wear on pump components. This pressure setting will ensure that all the liquid does not recirculate through the relief valve and cause excessive wear and noise.

The ZV200 external bypass valve setting should also be at least 15 psi (1.03 bar) higher than the normal system operating pressure. (Operating pressure nearing the bypass valve setting may mean liquid is being recirculated unnecessarily.)


Adjustment to the ZV200 external bypass valve can be made by removing the valve cap and loosening the locknut.

 **WARNING: Do not remove the valve cap on the bypass valve until you have bled off the pressure.**

To increase the pressure setting, turn the adjusting stud and nut assembly (or adjusting screw) inward, or *clockwise*. To reduce the pressure setting, turn the adjusting stud and nut assembly (or adjusting screw) outward, or *counter clockwise*.


Stationary Pumping Installations equipped with an electric motor drive:

1. Install liquid-filled pressure gauges equipped with a needle valve or snubber in the following locations: At the pump discharge gauge port; on the tank; on the inlet side of the ZV200.
2. Attach an ammeter to a motor lead of the electric motor.
3. Remove the valve cap on the ZV200 and adjust the valve to its lowest pressure setting by turning the adjusting screw *clockwise* 4-5 full turns until the screw turns freely. **Note: Do not remove the adjusting screw.**

 **WARNING: Do not remove the valve cap on the bypass valve until the pressure has been bled off the valve.**

4. Check all valves. The pump discharge line and bypass line shut-off valves should be in full open position.
5. Start the pump and circulate back to tank through the discharge line system.

6. Slowly close the pump discharge line shut-off valve and allow all capacity to flow through the bypass valve.
7. Slowly increase the ZV200 bypass valve setting by turning the adjustment screw clockwise until the ammeter indicates the full load current indicated on the motor nameplate. Record the pressure on the gauge mounted on the valve.

 **WARNING: Do not adjust the valve beyond the range of the spring being used.**

Note: On Anhydrous Ammonia and LP Gas installations, a maximum differential pressure of 125 psi is allowed by Underwriter's Laboratories, Inc. UL Standard for Safety for Power-Operated Pumps for Anhydrous Ammonia and LP-Gas, UL 51 and NFPA Pamphlet # 58 Liquefied Petroleum Gas Code. Corken model 1521 pumps should never be operated over 100 psi differential.

Appendix A—Model Number and Identification Code for Model ZV200

Model Number Identification

ZV200..... Full opening high capacity bypass valve for full pump capacity.

Base Model Number	ZV200
Inlet	2" NPT
Outlet	2" NPT
Maximum flow rate (gpm)	250
Ship weight (lb)	23

Model Number

Base X X X X

Specification Fields

Springs	41–70 psig differential range	No charge option	A
	71–90 psig differential range	No charge option	C
	91–125 psig differential range	Standard	B
	126–150 psig differential range	No charge option	D

O-ring material	Buna-N	Standard	A
	Neoprene ^{®1}	No charge option	B
	Viton ^{®1}	Charge option	D
	PTFE	Charge option	E
	EPDM	Charge option	G
	Kalrez ^{®1}	Charge option	K

Inlet Flanges	1.25" NPT	No charge option	A
	1.50" NPT	No charge option	C
	2.0" NPT	Standard	E
	2.5" NPT	No charge option	J
	1.25" Slip-on weld	Charge option	B
	1.50" Slip-on weld	Charge option	D
	2.0" Slip-on weld	Charge option	F
	2.5" Slip-on weld	Charge option	K

Outlet Flanges	1.25" NPT	No charge option	A
	1.50" NPT	No charge option	C
	2.0" NPT	Standard	E
	2.5" NPT	No charge option	J
	1.25" Slip-on weld	Charge option	B
	1.50" Slip-on weld	Charge option	D
	2.0" Slip-on weld	Charge option	F
	2.5" Slip-on weld	Charge option	K

¹Neoprene®, Viton®, and Kalrez® are registered trademarks of the Dupont Company.

Accessory–Options

Description	Part Number
Optional hydrostatic relief valve, 450 psig	2141-450
Hydrostatic test	3000-X5

Appendix B—Technical Specifications and Performance Curves for the ZV200 Bypass Valve

Operating Specifications

Maximum differential pressure:	150 psid (10.34 bar)
Operating temperature range:	Up to 225°F (107°C) ¹
Maximum working pressure:	400 psi (27.6 bar)
Spring ranges:	91–125 psi (6.3–8.6 bar) standard 41–70 psi (2.8–4.8 bar) optional 71–90 psi (4.9–6.2 bar) optional 126–150 psi (9.0–10.3 bar) optional

¹Fitted with Buna-N O-rings.

Material Specifications

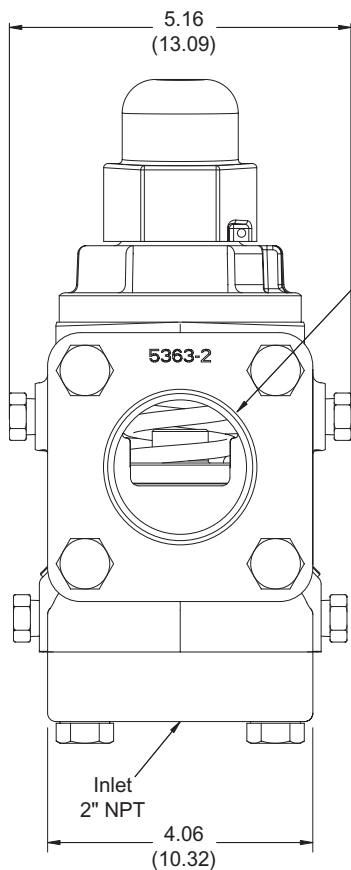
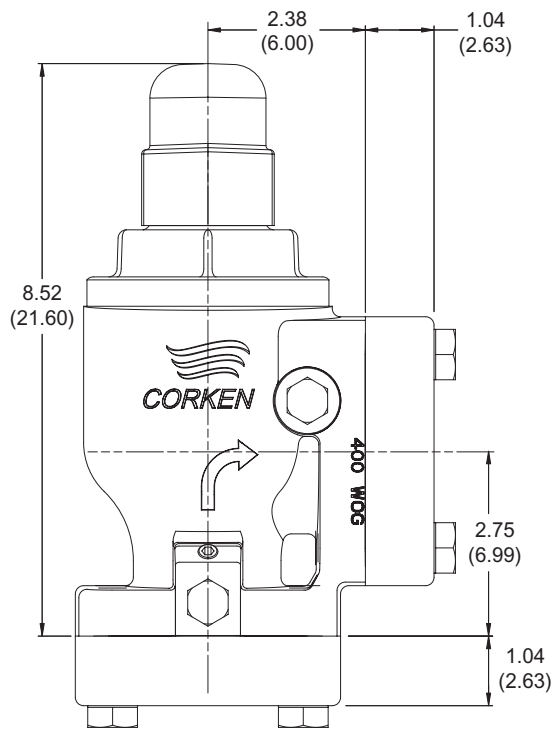
Part	Material
Adjustment nut cap	ASTM A536 65-45-12
Adjusting screw	Steel
Bypass valve body	Ductile iron: ASTM 536, 60-40-18
Bypass valve cap	Ductile iron: ASTM 536, 60-40-18
Gasket	1010 hot rolled steel
Flanges	Ductile iron: ASTM 536, 65-45-12 (standard)
	Plate steel: ASTM A516 (optional weld)
O-rings	Viton® (standard) ²
	Buna-N, Neoprene®, EPDM, PTFE, Kalrez® (optional) ²
Spring	Music wire/chrome silicon
Spring guide	8620 A322 ASTM steel
Relief valve	17-4 PH stainless steel

²Viton®, Neoprene®, and Kalrez® are registered trademarks of the Dupont Company.

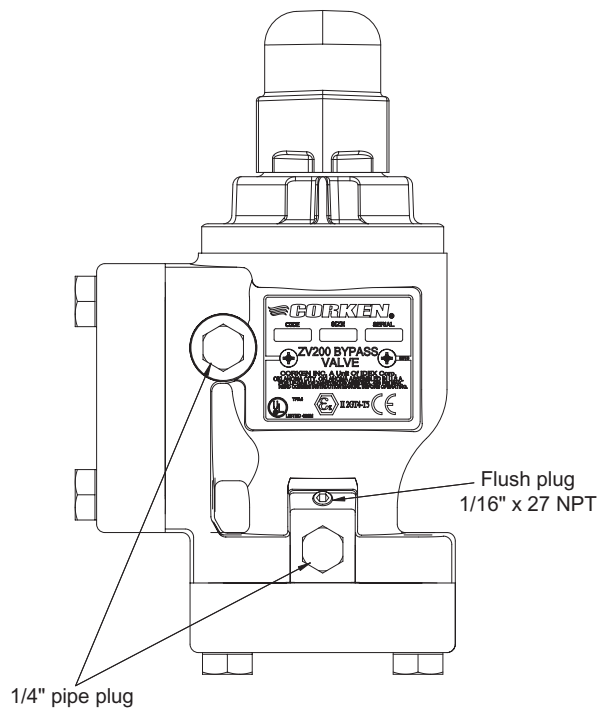
Performance

Differential Pressure psi (bar)	Maximum Rated Flow for Propane gpm (L/min)
70 (4.82)	180 (681)
120 (8.27)	250 (946)

Appendix C—Outline Dimensions for the ZV200 Bypass Valve



Discharge
2" NPT



All dimensions are in inches (centimeters).

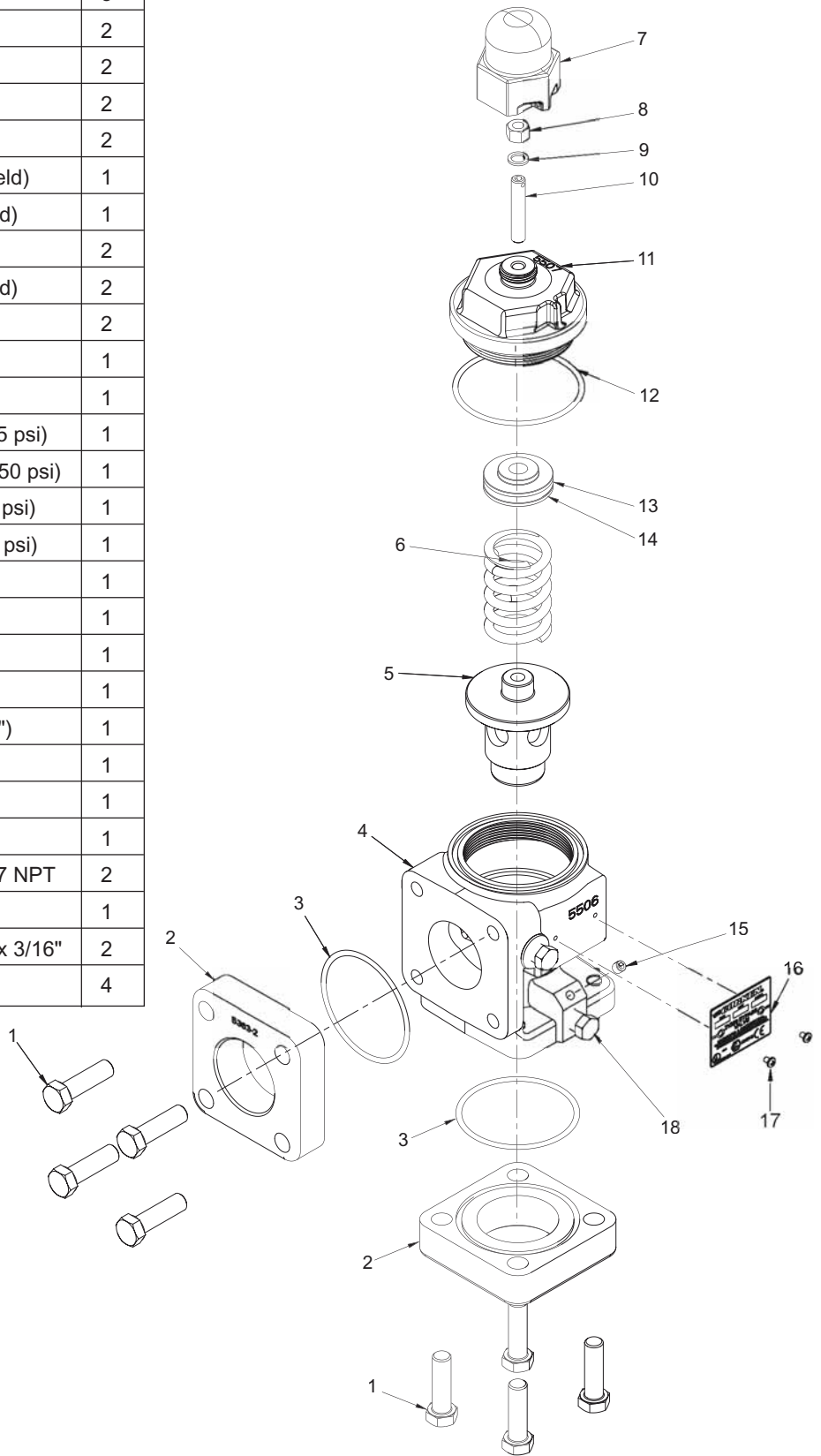
Appendix D—Parts Details For the ZV200 Bypass Valve

No.	Part No.	Description	Qty
1	7001-050NC175A	Hex head bolt	8
2	5363-1.25	Flange (1.25" NPT)	2
	5363-1.5	Flange (1.5" NPT)	2
	5363-2	Flange (2" NPT)	2
	5363-2.5	Flange (2.5" NPT)	2
	5363-1.25S	Flange (1.25" slip weld)	1
	5363-1.5S	Flange (1.5" slip weld)	1
	5363-2S	Flange (2" slip weld)	2
	5363-2.5S	Flange (2.5" slip weld)	2
3	2-234__	O-ring ¹	2
4	5506	Bypass valve body	1
5	5509	Relief valve (2")	1
6	5511	Valve spring (91–125 psi)	1
	5512	Valve spring (126–150 psi)	1
	5513	Valve spring (41–70 psi)	1
	5515	Valve spring (71–90 psi)	1
7	5457	Adjustment nut cap	1
8	7101-037NC01A	Hex nut	1
9	2732	Gasket	1
10	2911	Adjusting screw	1
11	5507	Bypass valve cap (2")	1
12	2-235__	O-ring ¹	1
13	2-223__	O-ring ¹	1
14	5516	Spring guide (2")	1
15	1629	Flush plug 1/16" x 27 NPT	2
16	5510	Nameplate	1
17	7012-006SF019E	Pan hd. Phillip 6-32 x 3/16"	2
18	3442	Pipe plug 1/4" NPT	4

¹ __ denotes O-ring code. See chart below.

O-ring Code	
A	Buna-N
B	Neoprene ^{®2}
D	Viton ^{®2}
E	PTFE
G	Ethylene Propylene
K	Kalrez ^{®2}

²Registered trademarks of the DuPont company.



Appendix E—Troubleshooting Guide for the ZV200 Bypass Valve

Issue	Cause	Solution
Low capacity	Valve set too low. Note: After all potential causes from the pump and system have been investigated	Adjust valve as demonstrated in this IOM manual on pages 5 and 6.
Adjusting screw will not turn	Screw adjusted full in	Adjustment too high—back out adjustment and adjust valve per instructions in this IOM manual on pages 5 and 6.
Noise from valve during system operation	Spring broken	Depressurize system. Open valve and inspect. Replace spring if necessary.
	Adjustment screw set too far out	Adjust valve per instructions in this IOM manual on pages 5 and 6.
	Excessive restriction in return line	Remove restrictions.
Valve leaking product	O-ring failure	Depressurize system. Open valve and inspect. Replace O-ring.
	Fitting loose	Identify and tighten fitting.
Valve will not adjust to desired pressure	Spring guide or O-ring failure	Depressurize system. Open valve and inspect O-ring and spring guide.

Appendix F—Storage of the ZV200 Bypass Valve

If your bypass valve is to be removed from service for some time, it must be protected as propane, butane and anhydrous ammonia all leave the metal “bare” and open to corrosion. Piping and tanks not in service should also be protected as the rust particles can destroy the pump’s seals almost immediately after startup.

1. Fill or thoroughly flush the bypass valve with a light rust inhibiting oil. (If the bypass valve is flushed with oil, placing some desiccant packets inside the bypass valve will provide added protection.)
2. Plug all bypass valve openings.
3. Store in a dry location.
4. Before placing the bypass valve back into service, drain the oil and remove any desiccant packets.
5. Refer to the “Operation of Your Bypass Valve” on page 5 of this Installation, Operation and Maintenance (IOM) manual.



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