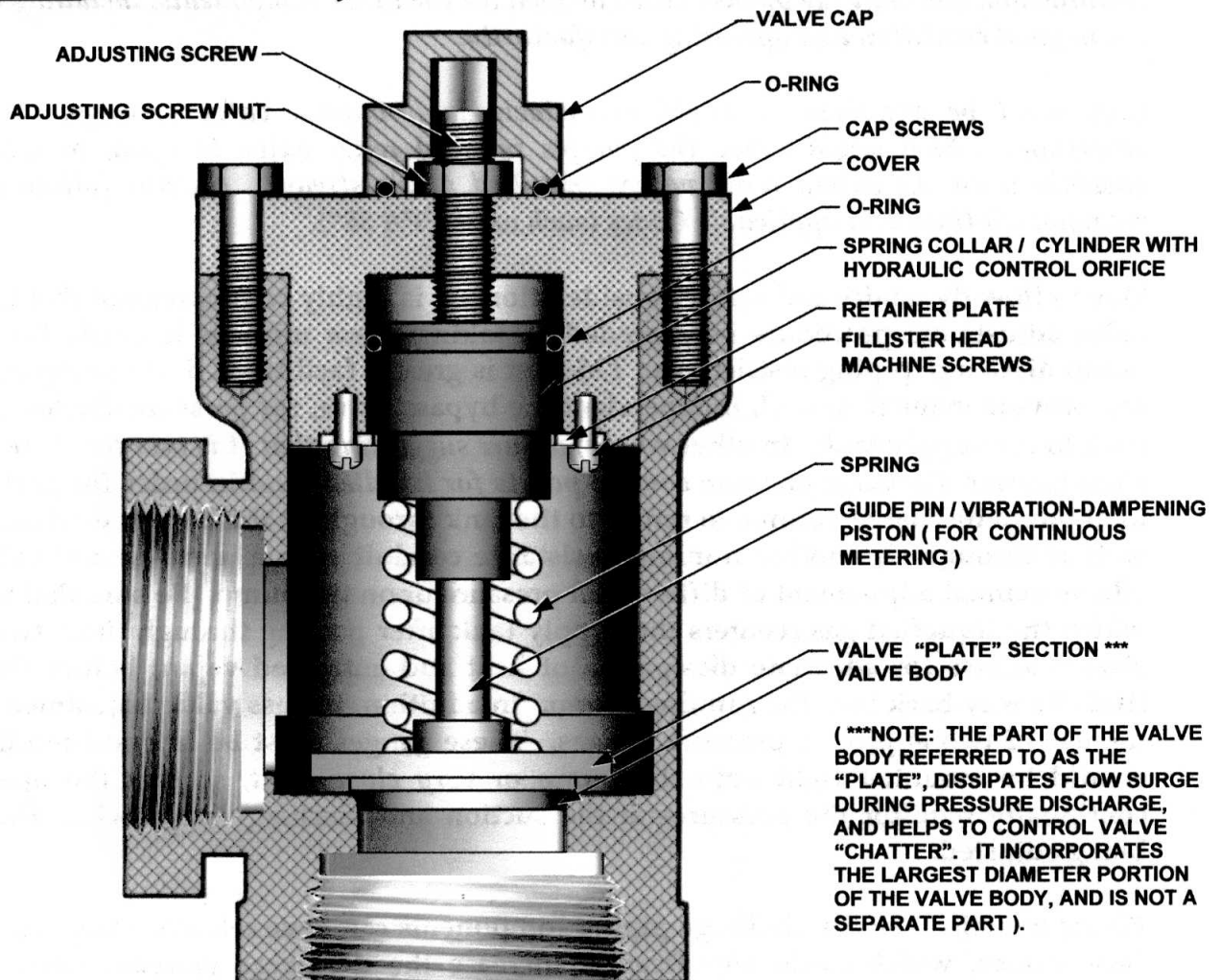


SMITH PUMPS

FIELD ADJUSTMENT OF "WW-SERIES" BYPASS VALVES



VALVE ILLUSTRATED IS "WW-112, 200, AND 212". OTHER SIZES OF BYPASS VALVES ARE OF SLIGHTLY DIFFERENT INTERNAL CONFIGURATION.

The SMITH bypass valves are manufactured to the same specifications as the SMITH pumps for the same liquids. They are U/L listed for both LPG and CO₂ services. The design of the SMITH bypass valves is based upon our several decades of field experience with other makes, before the decision was finally made to produce our own valve for general use in the market. The problems and shortcomings observed with competitive makes were designed out of this bypass valve, which is now offered in seven different pipe sizes, from 1/2" NPT to 2-1/2" NPT.

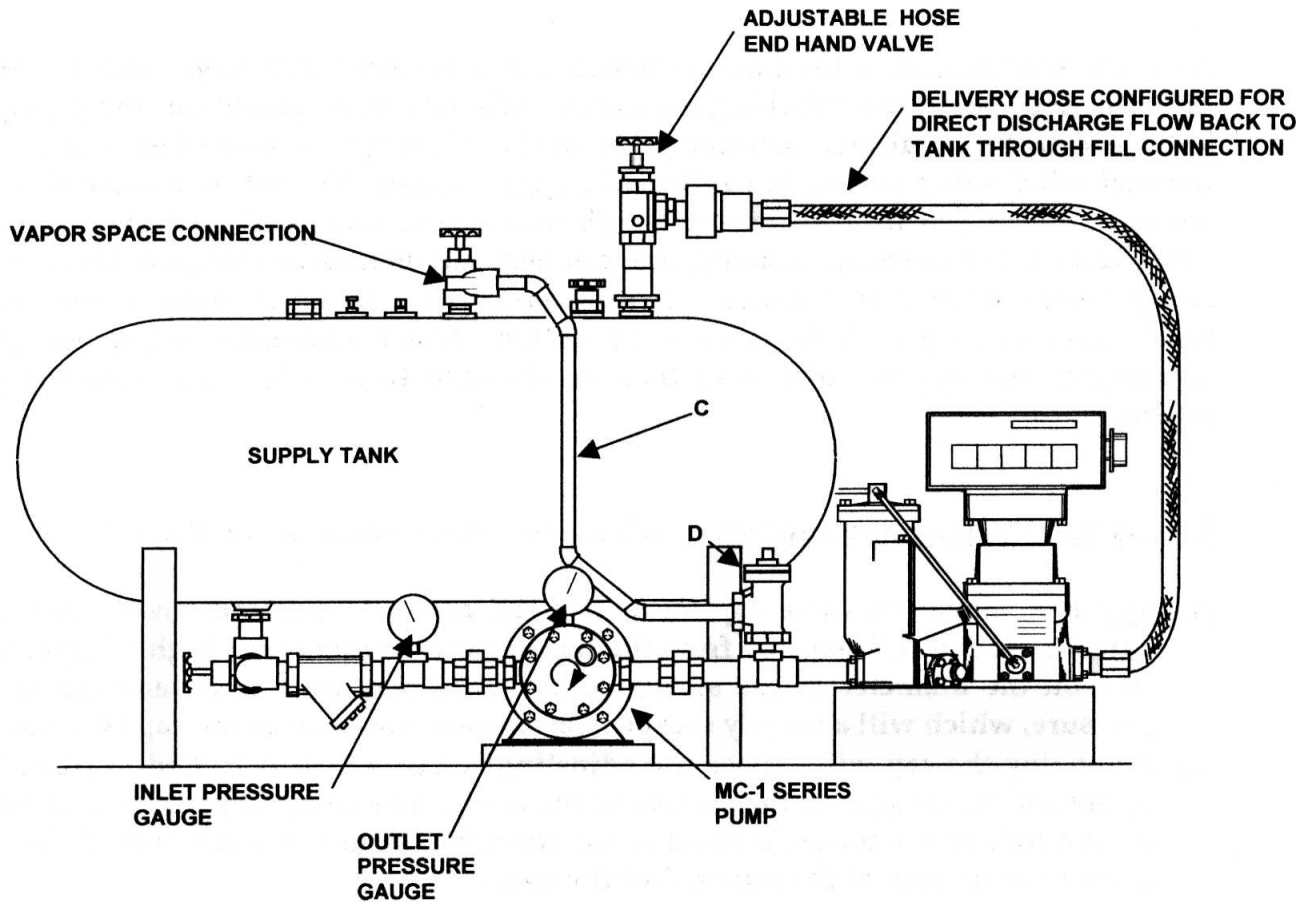
The most obvious important features of SMITH bypass valves include (1) minimal overpressure; (2) minimum number of working parts; (3) exceptionally large internal flow area; (4) heavy, reinforced, extra wide, threaded inlet and outlet; (5) large, rugged hexagonal ends, which facilitate assembly to the piping system; (6) large, durable, high-tensile, plated, steel cap screws, which are very easily removed to service the valve; (7) precisely machined, lap-finished, metal-to-metal valve and seat; (8) application-specific, stainless steel, helical compression spring; (8) the valve-"plate"- guide pin assembly, and collar, control pressure relief and inhibit chattering; (9) valve cannot be completely closed-off by turning-in the adjustment screw as far as it will go; (10) the valve adjusting screw is isolated from the liquid handling chamber, and can be adjusted without product leakage to atmosphere.

The purpose of this bulletin is to describe proper procedures for adjusting SMITH "WW-Series" external bypass valves to higher or lower settings, after they have been installed in a working system. *Before attempting to change the discharge pressure setting, the end user must insure that the piping system in question is a safe, well designed, properly sized installation, and that the bypass valve as well all the other components, including the pump, are in good condition and operating satisfactorily.*

Care must be exercised to avoid excessively high bypass valve settings. Avoid any situations, which might cause the pump's internal relief valve to open, or which could possibly open the safety relief valves installed down stream. Always follow all safety recommendations and applicable Codes (such as "NFPA 58").

Due to flow dynamics and safety considerations, it is highly recommended that the bypass valve adjustment procedure be preceded by taking a few minutes to verify the extent of pump discharge piping restrictions. This test is greatly facilitated if the pump outlet lines can provide manual control, independent the bypass valve, for pressure discharge directly back to the supply tank. In other words, *we are suggesting that it is best for there to be two simultaneous discharge pressure control points for handled fluid* in order for partial and/or total pump discharge volume to return to the tank through (1) the bypass discharge line, as well as through (2) another minimal-resistance conduit with a hand control valve which allows manual adjustment of differential pressure upon the pump. Be sure that the way in which the liquefied gas reenters the supply tank after passing through these two devices, always allows for adequate dissipation of heat and entrained vapor, before the product finds its way back into the running pump. In addition, bypass valve adjustment requires the use of two approved pressure gauges. These gauges must be in good condition, and should be mounted right onto the pump or *very close to it*, so that the operator can continually monitor the pressures at the suction and discharge ports while the valve is being adjusted.

Please note that certain discharge piping components can have relatively high resistance to flow values, which could significantly increase the discharge pressure when the total pump volume passes through the bypass valve, and/or through the discharge line. These important dynamic aspects can easily be determined during a system discharge pressure test. For example, when the total pump output is run through the external bypass valve, the difference between the inlet and outlet gauge readings is the functional system PSID level. If this value is higher than that originally stamped by the factory on the bypass valve tag, the *dynamic* differential pressure includes an additional flow resistance, or "overpressure" factors, which may have caused the pump output to be less than expected. Sometimes, the functional differential pressure at the pump outlet is substantially higher than the set pressure, or "cracking pressure", of the bypass valve, itself. *In such cases, increasing the bypass valve discharge pressure adjustment does not necessarily increase the flow into the tanks being filled, and better installation performance would only occur if the piping were modified.* Modification would have to be done to the bypass return system, and/or to the discharge line as well. See Technical Bulletins "AL-3", "AL-17A", "AL-36 (Booklet A)", and appropriate service manuals for additional information.



TYPICAL TRANSFER SYSTEM, PROPERLY CONFIGURED AS RECOMMENDED

The above drawing shows a low-capacity transfer system typically configured as described in the previous page. After passing through the meter, the handled liquid travels through the delivery hose, through a hand valve, and back into the tank fill connection, as illustrated. Since this particular system is utilizing a SMITH Model "MC-1", the inlet pressure gauge is installed in a pipe tee immediately before the pump inlet connection, and the outlet pressure gauge is mounted right onto the pump. Other models would require slightly different gauge mounting arrangements. For example, a pressure gauge mounted directly onto a "GC-1" model type would indicate inlet pressure, and the discharge pressure gauge would require a pipe tee installed immediately after the pump discharge port. "E" and "D-Series" units would need a pipe tee on either side of the pump to accommodate pressure gauges for this procedure. With most higher capacity SMITH pumps, both pressure gauges could be mounted right onto the main housing (see appropriate dimension drawings and assembly views). Higher capacity transfer systems can usually be set-up in a fashion similar to the one shown above. In most cases, the significant "overpressure" restrictions are to be found within the bypass return system ("C") after the flow leaves the bypass valve ("D").

If the pump has an internal relief valve, contact the factory to confirm its setting before proceeding. This internal valve should always be set for a "cracking pressure" of at least 20 PSID higher than that of the external valve adjustment. If the flow return into the tank

is overly restrictive, or if the external bypass valve installed in the system is too small, the differences between the "cracking pressures" will have to be greater, or the piping system will need to be modified. Do not perform the discharge pressure test, until the pump internal relief valve setting is confirmed *by the factory*. Do not determine this by field testing.¹ When you initiate the system discharge test, make sure that the pump internal relief valve is not opening: usually, one can hear the internal valve open, and it will cause the pressure gauges to vibrate. After testing the discharge system for significant restrictions, *as long as it is found to be within normal parameters which permit further adjustment*, the bypass valve may then be changed to a different differential pressure setting.

Bypass Valve Adjustment Procedure. (Please refer to the drawing on Page 1).

- (1) *Slowly* remove the valve cap located in the center of the end cover. Although the adjustment screw is isolated from the liquid flow chamber by a highly impermeable o-ring on the diameter of the spring collar, there may be a small amount of residual pressure, which will abruptly escape to atmosphere as soon as the cap is removed.
- (2) Removing the cap will expose the adjusting screw, which is locked in place by a nut tightened firmly against the surface of the cover. Use an appropriate open-end wrench on the nut, and a correctly-sized Allen wrench inserted into the end of the screw, to release the tension of the nut against the cover.
- (3) Start the pump, and slowly close the hand valve in the discharge line, so that the total output is forced through the bypass valve and into the bypass line. After this hand valve is totally closed, determine the difference between the two pressure gauge readings. Compare this difference to the original adjustment as stamped on the valve from the factory. Make sure that this total pressure is safe for proper operation of the system. If it is not safe, either adjust the valve to a lower working pressure, or consider modifying the piping system. If it is safe to adjust the valve upwards, do so *slowly*, by turning the Allen wrench in the appropriate direction.
- (4) If the adjustment screw is turned outward (counterclockwise), the spring tension decreases, and the differential pressure lowers. If the adjustment screw is turned inward (clockwise), the spring tension increases, and the differential pressure raises.
- (5) Continue observing the outlet pressure gauge during this procedure. When the desired pressure is reached, hold the screw in place with the Allen wrench, and firmly tighten the nut against the cover.
- (6) Stop the pump. Replace the valve cap finger tight. Do not use a wrench or pliers to tighten the valve cap. Make sure the o-ring in the cap is properly positioned within its o-ring groove. Replace this o-ring if it appears to have been damaged in any way.
- (7) Open the valve at the end of the delivery hose, so that the pump will discharge its total output back to the supply tank, once again. Start the pump, slowly close the hose end

¹ Be sure to ascertain if the internal valve is set at a "cracking pressure", or "full pump output pressure". The "cracking pressure" of the external valve must be at least 20 PSID less than the "cracking pressure" of the internal valve. In other words, "cracking pressure" is the same as "start-to-discharge pressure". "Full pump outlet pressure" through the internal relief valve, or through the external bypass valve, would always be somewhat higher than "cracking pressure".

valve until the total pump discharge returns to the tank through the bypass return line. Check to see if the differential pressure adjustment just accomplished has had the desired effect, and that the discharge pressure remains at the same level as previously observed once the adjustment was accomplished.

- (8) If the pressure changes to a different level, or if the pressure gauge needles are seen to continually vibrate, this is indicative of dirt trapped between the valve and the valve seat, cavitation, pump internal valve opening, or poor pump mechanical condition. Once this happens, do not continue to adjust the valve. Discontinue operations, and immediately contact the factory or our nearest representative.
- (9) If the system appears to be functioning satisfactorily, fill a typical container to confirm if the adjustment has solved the problem. Further "fine tune" adjustments may be made at this time by removing the cap, loosening the lock nut, and slightly turning the adjustment screw to the left, or to the right, as required.
- (10) If adjustment to a higher pressure appears to make no difference in the time it takes to fill a typical cylinder or small tank, there may be either debris trapped in the valve, or physical damage to the valve, or to the valve seat. Should such a problem occur, the bypass valve may have to be cleaned, repaired, or replaced; contact the factory, or our nearest representative before continuing to utilize the installation.
- (11) Once the bypass valve is adjusted, and the system is working properly, make note of the observed difference in readings between the pump inlet, and outlet, pressure gauges. The true pressure built by the pump, is the dynamic, or "functional" differential pressure, affected by the operation of the entire transfer system. Many components other than the bypass valve, in the way of product flow, can actually add to the differential pressure. Therefore, a functioning pump always works against a *total resistance to flow as varied as the specific installation construction from site to site*, which is always at least somewhat above the "cracking pressure", or spring tension adjustment of the bypass valve, itself.²

² The drawings and diagrams utilized in this technical bulletin, and elsewhere, by Smith Precision Products Company, Inc., should not be taken literally. They are intended only to illustrate general principles from a pump manufacturer's point of view, and are not necessarily indicative of required configurations approved by fabricators, safety codes, governmental agencies, and other authorities. We also wish to emphasize at this point, that the aforementioned procedures will give good results only if the installation in question is properly assembled and all of its components are in good condition. Otherwise improper conclusions may be drawn by the observer, and non-recommended solutions might be mistakenly applied to a poorly designed piping system, or one with worn out components. For example, a clogged strainer, plugged delivery hose, worn meter assembly, broken excess flow valve, bad pump, or worn out bypass valve which have gone unnoticed, may give the impression that a higher differential pressure setting is all that is needed to decrease fill time. Obviously, these and other items are of critical importance to proper, safe, transfer operations, and they do require scheduled maintenance, repairs, or complete replacement, from time to time. We cannot be responsible for the designs or condition of systems in which our products are utilized, but we do recommend a regimen of routine inspections to prevent failures, and maintain safe operation.



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