SMITH PUMPS

BASIC INSTALLATION INSTRUCTIONS

SLOW SPEED MODELS FOR PTO AND BELT-DRIVES: MCAT-Series, TC-Series.

HIGH SPEED MODELS FOR DIRECT ELECTRIC MOTOR AND ENGINE-DRIVES:
LOW CAPACITY: D-Series, E-Series, MC/GC-Series, SQ-Series.
MEDIUM CAPACITY: MC-1044/MC-1044H Series, MC-2 Series, ATC-2 Series.
HIGH CAPACITY: MC-3, 4, and 5 Series; ATC-3, 4, and 5 Series.

IMPORTANT: ***The following are simplified, general instructions for light liquids only. Before installation, read and understand all applicable Safety Codes (such as "NFPA-58"), and practices consistent with local, State, or Federal law and company procedures. See the other more specific literature from Smith Precision, such as Booklet "A", Bulletins "AL-1", "AL-17A", "AL-58A", "IS-6", etc.. Contact the other equipment manufacturers, fabricators, and suppliers, and follow their recommendations. Avoid potential safety hazards. All Smith pumps are quite capable of outstanding service, but only when they are installed and operated correctly. Be absolutely sure that the pump options, drive speeds, recommended differential pressure, and service intervals are always properly matched to the actual use conditions. If there are any questions, do not use the pump until you have contacted our nearest representative, or the factory, directly.***

STRAINERS: (See Table, column 6). For all models in intermittent services, except the E and D-Series, install a strainer between the tank liquid outlet and the pump inlet, having an appropriate reinforced wire mesh screen, with a particulate retention capability of at least between 0.012 - 0.016 inches, in intermittent services. *Continuous services require better protection.* Inspect and clean the strainer daily until abrasive particles from the tanks and piping have been washed out. Thereafter, inspect and clean often enough to assure free flow of liquid to the pump. Keep an extra screen in stock in case the one in service becomes damaged. A flanged opening to the screen facilitates inspection and cleaning. Smith "W-Series" strainers have a screen access flange designed specifically for this purpose. (See Catalogs "CP-1", "CP-3", "CP-9", and Bulletins "AL-17A" and "AL-40").

BYPASS VALVES: (See Table, columns 11 and 12). External differential pressure relief valves ("bypass valves") are required in most installations. They are a safety item, especially in LPG service. They should always be adjusted and piped-in correctly. Their purpose is to safely control and limit excessive differential pressure without cavitating the pump. When a pump builds-up too much pressure, there could easily be excessive internal recirculation to the pump suction port, dead-heading, or opening of the transfer system's atmospheric relief valves. A bypass valve properly installed, provides a safe, automatic, back-to-supply-tank product return through a separate circuit which allows generated heat and vaporization to dissipate before the same liquid passes once again to the pump inlet. Smith "WW-Series" bypass valves were designed specifically for this purpose. (See Catalogs "CP-1", "CP-3", "CP-9", and "DBV-1").

(1) E and D-Series Pumps. E and D-Series pumps have built in bypass valves. They should only be used intermittently, and be turned-off after each tank is filled. They may be used without external bypass valves. To do this with the E-Series units, unscrew the twelve bolts in the pump cover, and turn the cover one-quarter turn so the plugged hole is aligned directly over the internal bypass valve cartridge outlet. Remove the original casing sealant, and reapply approved sealant in the proper manner, before reassembling the cover. Remove the plug, connect a properly sized line to this port, and run it back to the supply tank through any sufficiently removed outlet, other than the liquid line to the pump, but preferably to the vapor phase, to prevent pump cavitation. (See available installation diagrams).

To use the D-Series pumps without an external bypass valve, remove the 1/2-inch plug from the flange in the gear end cover, and run a line from this port back to the supply tank through any sufficiently removed outlet other than the liquid line to the pump, but preferably to the vapor phase to prevent pump cavitation. (See available installation diagrams).

(2) GC and MC-1 Series Pumps. These units are available in many different configurations, for handling various fluids. Most of them have a built-in internal relief valve originally set at 100 PSID, suitable only for extra safety protection. All of these pumps require an external bypass valve of 1/2-inch or larger size. The setting depends on the liquids handled and the use conditions. For intermittent duty only with LPG and similar liquefied gases, see the Table on the following pages. Pipe the discharge from this bypass valve back to the supply tank through any sufficiently removed outlet other than the liquid line to the pump, in such a manner as to prevent pump cavitation when activated. (See available installation diagrams as for the previously-mentioned pumps). Contact the factory for recommendations involving continuous duty, or circulating systems.

(3) SQ-Series Pumps. These pumps are available for many fluids, and usually have a built-in bypass valve, which is suitable only for extra safety protection. The 1/2-inch external bypass valve port can be connected back to the supply tank with at least a 1/2-inch i.d. line to any other sufficiently removed outlet other than that which supplies liquid to the pump, in such a manner as to prevent pump cavitation when activated. The SQ-Series pumps must have an external bypass valve, connected to the pump discharge system by a tee close to the pump discharge port, as recommended for the MC-1 and GC-1 units. To use the internal discharge port with an external bypass valve, remove the 1/2-inch pipe plug, remove the foot flange, discard the internal bypass valve cartridge, and pipe to a 1/2-inch external bypass valve from the flange outlet. (See Bulletins "AL-17A", "AL-93", and others). Contact the factory for recommendations involving continuous duty, or circulating systems.

(4) Pumps Used in Mobile Systems. These units also require an external bypass valve piped back to the tank. 75 PSID is an average recommended setting, which is satisfactory for most LPG and related services. The typical LPG bypass valve can be set higher as necessary, up to 125 PSID (see column 12 in the Table). NEVER SET AN LPG BYPASS VALVE HIGHER THAN 125 PSID, as this invalidates the Underwriters' Laboratories Listing, and is DEFINITELY NOT SAFE (see U/L- 51). If the pump is designed for liquids other than LPG, the pump tag indicates the maximum differential pressure at the maximum RPM. Be sure to check Bulletin "AL-17A", and others, for differential pressure recommendations as per the specific use conditions. Contact the safety authorities for additional information.

(5) Bulk Transfer Pumps Used without Vapor Return Lines. Bulk transfer pumps used for filling fuel tanks on motor vehicles, cylinders, and other small containers also require external bypass valves properly piped

back to the supply tank. For intermittent duty with all liquids (LPG, NH3, CO2, and others), the bypass valve does not necessarily have to be set at the maximum stated in Column 12 of the Table, or footnote "4". For continuous services with many liquefied gases, the RPM and PSID *must be lowered as per "AL-17A", "AL-93", "CP-1", Booklet "A", and others.* Contact the factory for additional information.

(6) Bulk Transfer Pumps Always Used with Vapor Return Lines. These units need the protection of an external bypass valve. However, in this case, the discharge need not return to the supply tank, *provided that the system is properly designed and used.* In such cases, pipe it to the pump inlet line if more convenient, but do not cavitate the pump while running normally.

HAND-OPERATED BYPASS VALVE: Pumps handling liquefied gases used with bypass valves, should have an approved valve of the same size as the bypass valve, piped *around* the bypass valve; or the approved type of bypass valve that opens either automatically or by hand. This is convenient to open in order to remove a vapor lock condition quickly and safely, should this occur, for example, in unusually hot weather. A hand-operated bypass valve is an *absolute necessity* in situations where a well-designed transfer system is still subject to inevitable high vapor accumulations.

VAPOR LOCK: Vapor lock can, for the most part, be avoided through proper piping and use. Booklet "A", and Bulletin "AL-17A" explain this in more detail. The following consists of a few standard recommendations, especially when handling liquefied gases:

(1) The inlet line to the pump should be so designed that any vapor formations within it can rise naturally, back to the tank. The pump should occupy the lowest point in the inlet line, and the inlet line should be relatively short, and direct. It should slope upwards slightly to the tank. It should be the right size, and not have any "dead legs" which cannot be properly valved-off. Multiple tank manifolds must be designed with great care, when incorporated into pump inlet lines.

(2) In hot climates, avoid painting the pump and inlet line with dark colors. White reflects more sunlight than aluminum or other colors. In very difficult areas, it is even better to shade the pump and inlet piping, as might be the case with "mounded storage tanks". (See applicable safety codes such as "NFPA 58").

(3) Do not mount pumps in heated or partly heated buildings. They must have the same or lower temperature than the supply tank, to prevent adverse vapor accumulations.

(4) Mount the truck engine exhaust lines away from the pump and piping. Shield the pump if necessary from heated air that blows past the engine.

(5) Do not run pipes carrying warm or heated liquids, steam, etc., close to the pump piping, unless they are well insulated

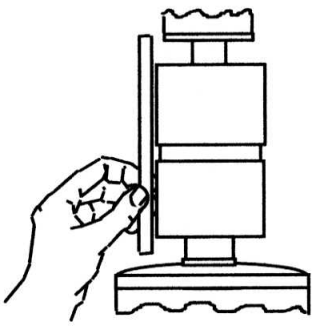
(6) Be sure the supply tank is not too small for the pump outlet and bypass return flows.

THE POSITION OF THE PUMP: The pump should be mounted close to the supply tank, and preferably, right under it, or just a few feet away. The bottom of the supply tank should be at least two feet or more above the pump centerline. Increasing this distance ("static head") above the pump to insure adequate NPSH ("Net Positive Suction Head"), at the pump liquid inlet connection, will give faster delivery and longer pump life. This is particularly important if the pump handles liquefied gases with relatively low vapor pressures, especially on a cold day. Mobile systems frequently require oversize valves, strainers, fittings, etc., to compensate for the lack of static head pressure. Flange-mounted bobtail pumps eliminate this problem by doing-away with the inlet line. See Booklet "A", "AL-58", "AL-58A", "AL-17A", and appropriate data from fabricators and equipment manufacturers.

THE SHAPE OF THE TANK: Properly sized cylindrical, spherical, or vertical tanks are all satisfactory if the liquid outlet to the pump is at the bottom, the pump inlet line is not excessively long, and they are not subject to excessive internal turbulence or whirlpools during operations. Tank liquid outlets at the side or the top of tanks, having dip tubes extending into the tanks, cause trouble. Avoid using these outlets to supply pumps. Railroad tank cars, which have liquid outlets at the top, present unusually difficult problems. Contact the factory for more information on this subject.

MOUNTING BULK TRANSFER PUMPS: Arrange the motor wiring
conduit so that it has enough flexibility to permit the motor to be moved a few inches away from the pump, or to be swung to one side. This will allow easy replacement of the flexible drive coupling or the pump mechanical shaft-seal assembly, should repairs ever be needed, without having to disconnect the pump from the piping.

CONNECTING ELECTRIC MOTORS TO PUMPS: If you are planning to mount the pump and motor to an existing base at the site, or if you have purchased the pump complete with base and coupling, and are mounting the motor, yourself, take care to properly align the pump and motor shafts to avoid stress. Flexible couplings are not universal joints, and they will cause fast wear unless the pump and motor shafts are in line to within 1/64", both top and bottom, and at the sides. Check this by laying a straight edge across the two halves of the Smith coupling, as shown. Bases that we supply are laid out to take perfect motors. However, it has been our experience that different makes of motors can vary somewhat from the true theoretical dimensions. It is therefore often necessary to put shims under the pump or motor feet, to raise the lower shaft into proper alignment. If side alignment is also bad, you may have to enlarge the motor foot holes by redrilling them until there is enough slack to tap the motor shaft into proper position. (Check with the motor manufacturer before modifying the motor in any way).



TRAILER AND TRUCK MOUNTED PUMPS: For convenience in piping, all Smith base-mount and flange-mount pumps are designed so that they may be installed upside-down, sideways, or in any other position. Many are provided with multiple porting which greatly simplifies mobile installations. Make sure that the motor or PTO shaft can be easily disconnected at the pump, allowing for withdrawal of the mechanical shaft-seal assembly, when necessary.

CONNECTING PUMP DRIVE: All ATC, MC, MCAT, SQ, and TC Smith pump drive shafts are hardened. D and E-Series shafts are not. Couplings, pulleys, and universal joints must be installed on them with care, in order to prevent chipping or deforming of the shaft at the keyway. Do not drive or hammer these items onto the shafts, as this may damage the ball bearings and mechanical seal parts, as well as the keyway. If the driver or coupling will not slide onto the shaft, check with the manufacturer. Use an expansion reamer to increase the size of the bore slightly, or dress the drive key with a file. In no case should a driver or coupling be installed without a key.

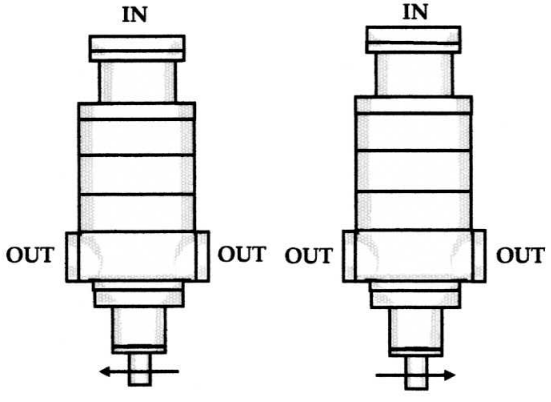
NOISE: All positive displacement pumps, including the Smith, make some noise in operation. This is not detrimental. It may even be desirable to tell from a distance that the pump is running. If an unusually loud noise develops, this indicates that something is wrong, such as a plugged suction line, clogged strainer, excessive pressures being developed, or badly worn pump parts. Noise can often be lessened substantially, by slowing the pump down within approved speed ranges. Lowering the pump RPM *by following factory recommendations*, will increase the useful service life as well, provided the speed is properly matched to the actual use conditions.

IMPORTANT: A little extra time spent initially in getting the installation right, will be repaid many times over in coming years. Proper routine preventive maintenance will also prolong the useful, safe, service life of the pump. Contact the factory for additional information on maintenance aspects. If any questions come up, let us help you with them. This is a service that goes along with Smith pumps at no cost or obligation. Using larger pipe sizes than those mentioned in the Table will usually not improve pumping efficiency, but can be done without harm if it makes the piping easier. *Do not use pipe sizes smaller than those recommended :* such abuse will cut down on the delivery, increase the noise, and significantly lower the service life of the pump.

Pumps used for one service should not be used to pump other fluids. Likewise, if the pumps must be tested after installation, do not use a liquid or a vapor, which is incompatible with the construction materials, or the original design specifications. The pump label shows the name of the liquid for which the pump was intended. The handling of the wrong fluids with a pump set-up originally for different liquids, may cause unsatisfactory performance and pump failures. Frequently, pumps can be fitted to handle several different liquefied gases and/or heavier liquids if these fluids are specified in advance to Smith Precision Products Company.

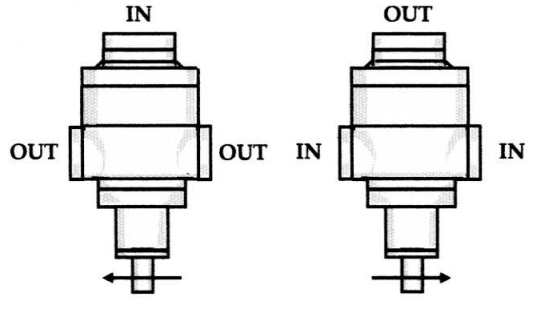
TOP VIEW OF SMITH PUMPS, INDICATING ROTATION AND CORRESPONDING PORT LOCATION

ATC-4L and 5L Model Types

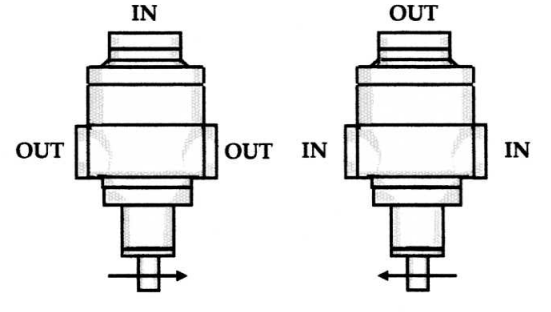


ATC-4R and 5R Model Types

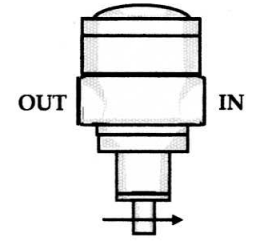
ATC-2L and ATC-3L Model Types



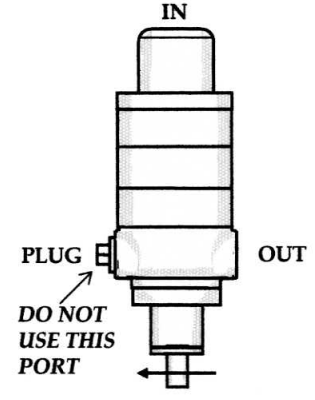
ATC-2R and ATC-3R Model Types



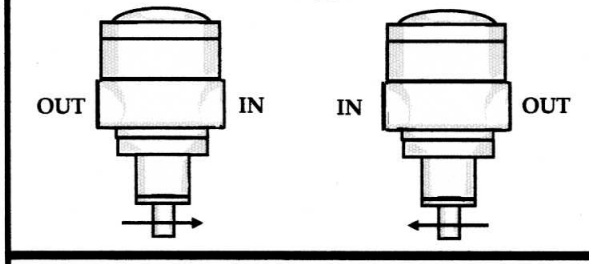
MC-2Q Model Types



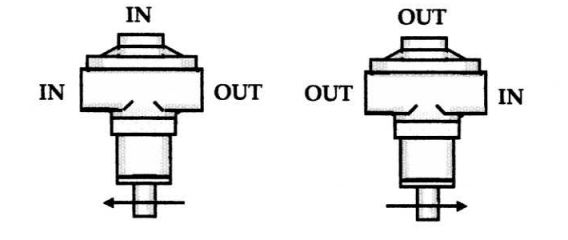
MC-4 and MC-5 Model Types



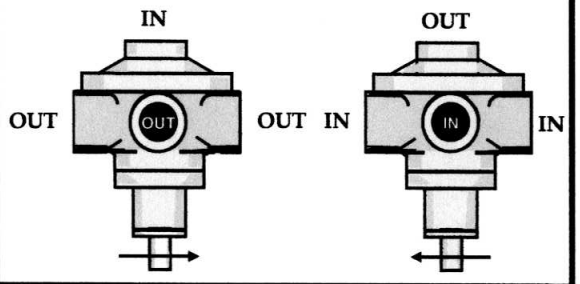
MC-2 and MC-3 Model Types



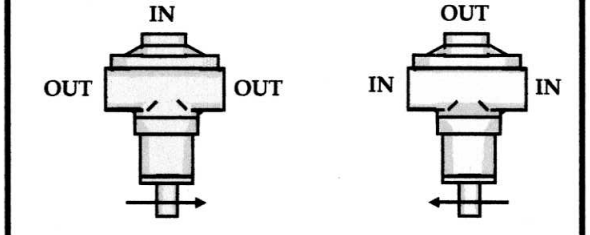
MC-1044 and MC-1044H Model Types



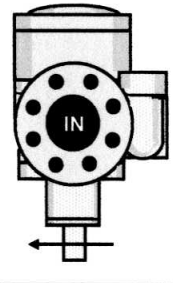
TC-2 and TC-3 Model Types



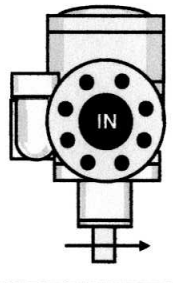
TC-1044H Model Types

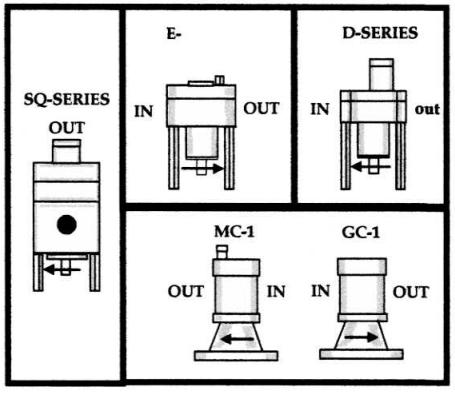


MCAT-2L, 3L, and 4L



MCAT-2R, 3R, and 4R





STORAGE OF PUMPS AFTER SHIPMENT FROM THE FACTORY. *WHENEVER PRACTICAL, SMITH PUMPS SENT FROM THE FACTORY CONTAIN RUST INHIBITOR TO PREVENT THE POSSIBILITY OF INTERNAL CORROSION DURING SHIPMENT AND SUBSEQUENT STORAGE. HOWEVER, IN CERTAIN APPLICATIONS WHERE ODOR, CONTAMINATION, OR DANGEROUS COMBUSTION ARE IMPORTANT CONSIDERATIONS, THE PUMPS ARE SHIPPED FROM THE FACTORY CLEAN AND "DRY" WHICH LIMITS THEIR SHELF LIFE. IN ALL CASES, THE INLET AND OUTLET PORTS ARE PLUGGED TO KEEP OUT MOISTURE AND DEBRIS. THESE PLUGS ARE EITHER PLASTIC, IRON, OR STEEL, AND DO NOT MEET APPLICABLE CODE REQUIREMENTS IN SOME AREAS. IF THE PUMP CANNOT BE PUT INTO SERVICE IMMEDIATELY AFTER RECEIPT, CONTACT THE FACTORY WITH REGARD TO APPLICABLE PROLONGED STORAGE PROCEDURES. FAILURE TO PREPARE THE UNIT PROPERLY FOR STORAGE CAN RESULT IN PUMP FAILURES.*

1	2	3	4	5	6	7	8
MODEL TYPE (NOT MODEL NUMBER)	PUMP CATEGORY	GENERAL RPM RANGE [1]	USUAL SIZE OF TANK LIQUID OUTLET [2]	SIZE OF SCH. 80 PUMP INLET LINE, VALVES, AND FITTINGS	SIZE OF STRAINER IN PUMP INLET LINE	SIZE OF PUMP INLET(S)	SIZE OF PUMP OUTLET(S)
TC-1044H	SLOW SPEED	450 - 900	2″	1-1/2″- 2″	2″	1-1/2″	1-1/2″
TC-2/ TC-2F	SLOW SPEED	250 - 500	2″	2″ - 2-1/2″	2″	2-1/2″	2-1/2″ / flanged 2″
TC-3/ TC-3F	SLOW SPEED	250 - 500	3″	2-1/2″ - 3″	3″	2-1/2″	2-1/2″ / flanged 2″
MCAT-2L/2R	SLOW SPEED	600 - 1200	3″	3″ int'l valve	part of int'l valve	3″, 2″ aux	2″
MCAT-3L/3R	SLOW SPEED	600 - 1200	3″	3″ int'l valve	part of int'l valve	3″, 2″ aux	2″
MCAT-4L/4R	SLOW SPEED	600 - 1200	3″	3″ int'l valve	part of int'l valve	3″, 2″ aux	2″
DW-1Z / Eg-1Z	LOW CAPACITY	1500 - 3600	3/4″	3/4″	part of pump assembly	3/4″	3/4″
DW-HZ / EC-HZ	LOW CAPACITY	1500 - 3600	1-1/4″	1″ - 1-1/4″	part of pump assembly	1″	1″
MC-1 Z / GC-1Z	LOW CAPACITY	750 - 3600 LPG (OTHERS 1800 RPM MAX)	3/4″	3/4″	3/4″	3/4″	3/4″
SQ-1,H,HH SQ-HH 8	LOW CAPACITY	750 - 1800 500 - 1200	3/4″ - 1-1/4″	3/4″ - 1″	3/4″ - 1″	3/4″ or 1″	3/4″
MC-1044	MEDIUM CAPACITY	750 - 1800	2″	1-1/2″ - 2″	2″	1-1/2″	1-1/2″
MC-1044H	MEDIUM CAPACITY	750 - 1800	2″	1-1/2″ - 2″	2″	1-1/2″	1-1/2″
MC-2 / ATC-2	MEDIUM CAPACITY	750 - 1800	2″	2″ - 2-1/2″	2-1/2″	2-1/2″	2-1/2″ / flanged 2″
MC-2H /ATC-2H	MEDIUM CAPACITY	600 - 1500	2″	2″ - 2-1/2″	2-1/2″	2-1/2″	2-1/2″ / flanged 2″
MC-3/ATC-3	HIGH CAPACITY [3]	750 - 1800	3″	2-1/2″ - 3″	3″	2-1/2″	2-1/2″ / flanged 2″
MC-3H /ATC-3H	HIGH CAPACITY [3]	600 - 1500	3″	2-1/2″ - 3″	3″	2-1/2″	2-1/2″ / flanged 2″
MC-4 /ATC-4	HIGH CAPACITY [3]	750 - 1800	3″	4″	4″	4″	2-1/2″ / flanged 2″
MC-4H / ATC-4H	HIGH CAPACITY [3]	600 - 1500	3″	4″	4″	4″	2-1/2″ / flanged 2″
MC-5 /ATC-5	HIGH CAPACITY [3]	750 - 1800	4″ - 6″	4″	4″	4″	2-1/2″ / flanged 2″
MC-5H /ATC-5H	HIGH CAPACITY [3]	600 - 1500	4″ - 6″	4″	4″	4″	2-1/2″ / flanged 2″

1 Contact the factory for recommended speed ranges per actual service conditions and installation liquid flow capacities. Pumps do not necessarily have to run at or near their maximum design speed to function properly.

2 Excess-flow check valves, or internal flow control valves, are typically required in all LPG and NH_3 bulk transfer installations, and some others. See applicable safety codes and manufacturer's specifications for proper recommendations on these and other excess flow prevention devices. Various numbers, makes, and/or sizes of excess-flow check valves, or internal valves, can often be substituted. This is a technical consideration best handled by other manufacturers and fabricators.

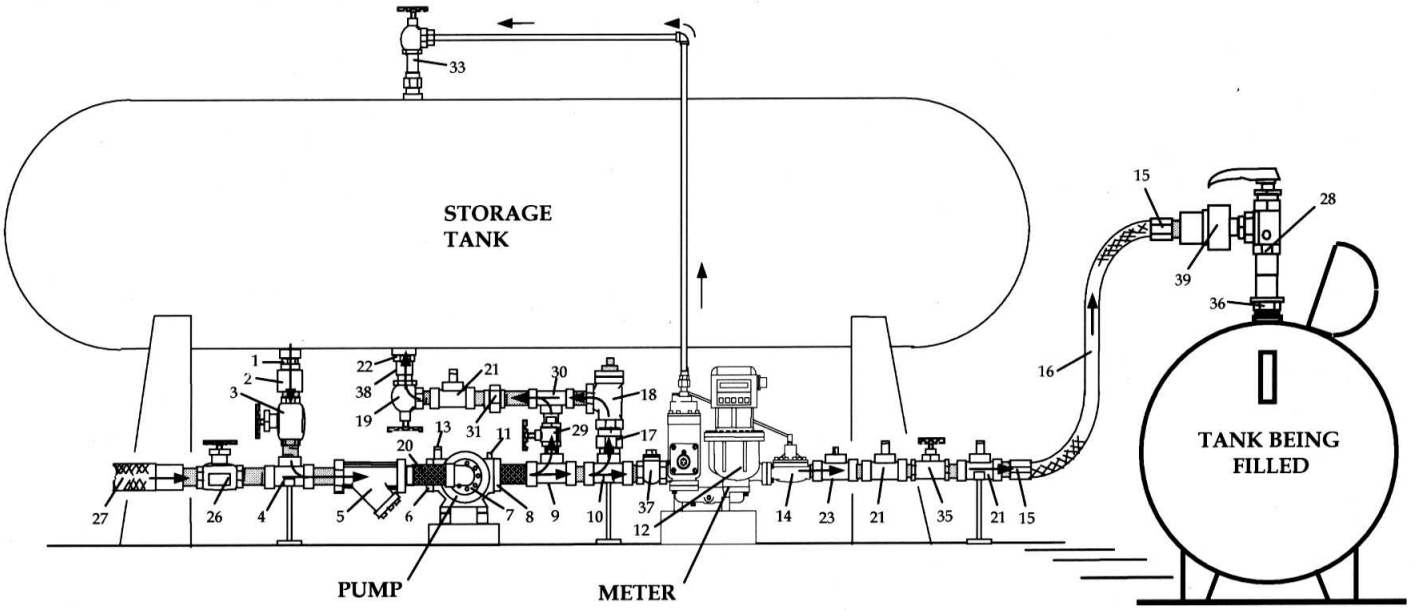
3 Pumps having high capacities require special attention to the installation. See Booklet "A" and Bulletin "AL-17A". Our Engineering Department is pleased to help with problem solving, and as a customer service, will review and critique system drawings (showing relative elevations, tank capacities, pipe sizes, and line lengths).

9	10	11	12	13	14	15	16
SIZE OF SCH. 80 PIPING, VALVES, AND FITTINGS IN DISCHARGE LINE WITH METER	SIZE OF SCH. 80 PIPING, VALVES, AND FITTINGS IN DISCHARGE LINE W/O METER	SIZE OF EXTERNAL BYPASS VALVE	MAX PSID IN INTERMITTENT DUTY AT MAX DESIGN RPM[4,5]	SIZE OF DELIVERY HOSE IN SYSTEMS WITH METER	SIZE OF DELIVERY HOSE IN SYSTEMS W/O METER	SIZE OF SCH. 80 VAPOR RETURN LINE IF USED	MODEL TYPE (NOT MODEL NUMBER)
SAME AS METER	1-1/2"	1"	125	3/4"	1-1/4	1/2"	TC-1044H
SAME AS METER	1-1/2"	1-1/4"	125	1"	2"	3/4"	TC-2/ TC-2F
SAME AS METER	2"	1-1/2"	125	1-1/2"	2"	1"	TC-3/ TC-3F
SAME AS METER	2"	1-1/4"	internal relief valve set at 150 PSID	3/4" - 1"	2"	3/4"	MCAT-2L/2R
SAME AS METER	2"	1-1/2"	internal relief valve set at 150 PSID	1" - 1-1/8"	2"	1"	MCAT-3L/3R
SAME AS METER	2-1/2"	2"	internal relief valve set at 150 PSID	1-1/8" - 1-1/4"	2-1/2"	1-1/2"	MCAT-4L/4R
3/4"	3/4"	1/2"	intl bypass valve set at 90 PSID	1/2"	1/2"	1/2"	DW-1Z / Eg-1Z
1"	3/4"	3/4"	intl bypass valve set at 90 PSID	3/4"	3/4"	1/2"	DW-HZ / EC-HZ
3/4"	1"	1/2"	internal relief valve set at 100 PSID	1/2"	1/2"	1/2"	MC-1 Z / GC-1Z
3/4" - 1"	3/4" - 1"	1/2" - 3/4"	may have intl bypass valve set at 90 PSID	1/2" - 3/4"	1/2" - 3/4"	1/2"	SQ-1,H,HH SQ-HH 8
SAME AS METER	1-1/2"	1"	125	3/4"	1"	1/2"	MC-1044
SAME AS METER	1-1/2"	1"	125	1"	1-1/4"	1/2"	MC-1044H
SAME AS METER	2"	1-1/4"	125	1"	2"	3/4"	ATC-2 / MC-2
SAME AS METER	2"	1-1/4"	125	1"	2"	3/4"	ATC-2H / MC-2H
SAME AS METER	2"	1-1/2"	125	1-1/2"	2"	1"	ATC-3 / MC-3
SAME AS METER	2"	1-1/2"	125	1-1/2"	2"	1"	ATC-3H / MC-3H
SAME AS METER	2-1/2"	2"	125	2"	2-1/2"	1-1/2"	ATC-4 / MC-4
SAME AS METER	2-1/2"	2"	125	2"	2-1/2"	1-1/2"	ATC-4H / MC-5H
SAME AS METER	3"	2-1/2"	125	2-1/2"	3"	2"	ATC-5 / MC-5
SAME AS METER	3"	2-1/2"	125	2-1/2"	3"	2"	ATC-5H / MC-5H

4 LPG only.

5 Maximum differential pressure settings good only for *intermittent bulk transfer duty* with a few other typical fluids handled by Smith pumps are as follows: CO_2, 50 PSID; N_2O, 50 PSID; NH_3, 75 PSID; SO_2, 75 PSID; LIGHT PETROLEUM SPIRITS, 300 PSID; MOST HFC AND HCFC REFRIGERANTS, 75 PSID. Do not use these maximum differential pressure settings always as a matter of course, because every situation is different. Do not use these maximum differential pressure settings in continuous transfer, or circulating service. Read the pertinent literature from Smith Precision, and other sources for system design data. Consult the standard engineering references and appropriate texts as required. Keep in mind that drive speed ranges relatively slower than maximum, and corresponding bypass valve adjustments lower than the maximum, may be recommended, not only in well established standard services, but especially with *continuous* services handling these low-lubricity fluids. Contact the factory for additional information. See Bulletin "AL-17A" as it relates to *specific use conditions*. Failure to properly match the duty cycle to the pump RPM, the piping system capacity to the pump capacity, or the differential pressure to the fluid handling characteristics, will result in premature unit failures.

TRADITIONAL BASIC LPG PUMPING SYSTEM



Our very first market was established in 1938, in the LPG industry. This drawing is an example of a basic LPG pumping system, originally designed for delivery trucks and also stationary plants where fuel tanks on motor vehicles, cylinders, trailer tanks, and the like, were filled. The theories and premises illustrated here, are still very much applicable, today. Of course, no single piping diagram can possibly be used in all cases. However, this drawing still serves to generally illustrate the best way to set-up a transfer system for most light liquids, including liquefied gases handled by Smith pumps within ambient temperature ranges, which comprise a large percentage of typical applications. With more viscous fluids or similar ones under less conventional circumstances than those shown here, naturally different piping systems will be required, and more attention must be paid to their special nature. Always use approved pipe, fittings, valves, meters, tanks, pumps, etc., to construct the system. Contact the suppliers, if there are any questions. Some liquids require special construction materials due to chemical incompatibilities with standard construction materials. Others require special degreasing techniques to be used during their construction. Shelf life of equipment may vary, depending upon these, and other related factors. There are many variables.

The system shown, above, may look somewhat complicated, but it is not costly and there is a very good safety or convenience reason for every item shown. Internal valves can be substituted for the external tank flow control valves, shown. Other changes have been recommended by safety authorities over the years. We recommend that the weight and stress of the piping system be properly taken-up by the tank or free-standing supports (not necessarily exactly as shown in the above drawing). The pump should not support the total piping system. Be sure that there is no undue stress on the pump casing (or any other system component) during or after installation. Avoid application of excessive angular force which might tend to misalign the pump with the motor. Avoid potentially hazardous situations. For more current information as required, please refer to handling equipment manufacturers' data, and the applicable local, State, and Federal codes and regulations. Obviously, modifications to this installation as shown above, must be made to suit safety requirements, and service conditions. This drawing is not intended to be taken literally.

The drawing is as complete as possible, but does not show everything that could be desired by all users. The storage tank, for example, is of the horizontal type, but spherical or vertical tanks are just as satisfactory if mounted as high above the pump level. Arrows indicate the direction of flow as follows:

TO FILL TANKS: Liquid flows out of the storage tank through the excess-flow valve (or internal valve in later versions of the same thing) 1, coupling 2, shutoff valve (or internal valve) 3, tee 4, strainer 5, flexible connector 20, flange 7, and into the pump. The pump develops the necessary delivery pressure, and pushes the liquid into the tank to be filled through the flange and flexible connector 8, tee 9, tee 10, check valve 37, meter assembly 12, back pressure valve 14, tee 23, tee 21, shut-off valve 35, tee 21, hose coupling 15, hose 16, hose coupling 15, swivel connector 39, quick-acting hose-end valve 28, and filler valve 36. Shut-off valves located at positions 26 and 29 are left closed. Valves 3 and 26 are preferably ball, plug, or gate types with low resistance to flow. All other shut-off valves can be globe or angle types if desired.

BYPASS VALVE: If the pump builds-up an excessive pressure, the bypass valve 18, opens, allowing enough of the liquid pumped to return to the storage tank to relieve the pump strain. The bypassed liquid comes out of the tee 10, through the union 17, bypass valve 18, tee 30, union 31, tee 21, shut-off valve (or internal valve) 19, coupling 38, and excess flow valve (or internal valve) 22, to storage tank.

TO FILL STORAGE TANK FROM TRANSPORT TRUCK OR RAILROAD TANK CAR: Connect the liquid hose 27, and the vapor return line (not shown). Liquid flows through the hose 27, shut-off valve 26, tee 4, strainer 5, flexible connector 20, and flange 7, to the pump. The pump fills the storage tank by pushing the liquid through the flange and flexible connector 8, tee 9, opened shut-off valve 29, tee 30, union 31, tee 21, shut-off valve (or internal valve) 19, coupling 38, and excess flow valve (or internal valve) 22. Shut-off valve (or internal valve) 3, and shut-off valve 35, are left closed.

For best operation with a properly installed Smith pump, in intermittent LPG transfer duty, the bypass valve 18, is initially set at about 75 PSID. Fittings at positions marked 21 and 13 (four pieces), are pop-off relief valves placed to relieve hydrostatic pressure that might build-up between closed shut-off valves when the system is not in use. Place 1/4" pipe plugs at points 11 and 23. These are places for inserting pressure gages which will help greatly in trouble-shooting if difficulties develop in the system after it has seen considerable service.

SMITH PUMPS

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