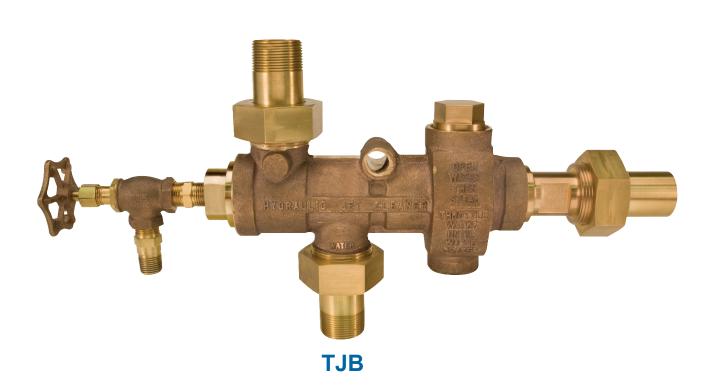


TankJet® B Injectors



Operation & Maintenance Instructions

MI-TJB

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IMPORTANT! READ ALL INSTRUCTIONS IN THIS MANUAL BEFORE OPERATING THE MACHINE.

GENERAL SAFETY INFORMATION

READ AND FOLLOWING INSTRUCTIONS:

WARNING: All safety related and operating instructions should be read before the nozzle is operated. Follow all operating instructions. Failure to do so could result in serious injury.

- **WARNING:** It is important to recognize proper safety precautions when using a pressurized spray system. Fluids under pressure can penetrate skin and cause severe injury.
- WARNING: When dealing with pressure applications, the system pressure should never exceed the lowest rated component. Always know your system and all component capabilities, maximum pressures and flow rates.
- WARNING: Before performing any maintenance, make sure all liquid/steam supply lines to the machine are shut off and/or disconnected and chemical/fluid are drained.
- **WARNING:** The use of any chemicals requires careful control of all worker hygiene.
- WARNING: Spraying Systems Co. does not manufacture or supply any of the chemical components used in this equipment and is not responsible for their effects. Because of the large number of chemicals that could be used and their different chemical reactions, the buyer and user of this equipment should determine compatibility of the materials used and any of the potential hazards involved.
- WARNING: Spraying Systems Co. strongly recommends the use of appropriate safety equipment when working with potentially hazardous chemicals.
- WARNING: Before use be sure appropriate connections are secure and made to withstand weight and reaction forces of the operating unit.

This equipment includes but is not limited to:

- · Protective hat
- · Safety glasses or face shield
- Chemical-resistant gloves and apron
- · Long sleeve shirt and long pants

NOTE: Always remember to carefully read the chemical manufacturer's label and follow all directions.

- WARNING: It is important to operate equipment within the temperature range of all components. Also insure that appropriate time lapses or proper safety equipment is used when handling components after they're exposed to high temperatures.
- WARNING: Never operate tank cleaning equipment in the open due to the potential of bodily injury.
- **WARNING:** Remove equipment from the tank before attempting any repairs.
- WARNING: If walking on top of a tank is deemed safe and is necessary, use proper safety precautions to protect individuals as well as the equipment.









- WARNING: Proper hoisting procedures should be used when installing and removing all equipment.
- WARNING: Do not put any part of your body in the tank during operation of the tank cleaner or spray manifolds. This is NOT a safe procedure for verification of operation.
- **WARNING:** To insure the safety of the equipment as well the individuals using them, only use Spraying Systems Co. components.
- **WARNING:** When packaging and transporting use structurally sound boxes or crates that can handle the weight of the equipment.
- WARNING: Tank cleaners, injectors, spray manifolds should be flushed out with clean water before they're stored or shipped to minimize health hazards or cross contamination.
- WARNING: Do not use any equipment outside the intended purposes of the product. Misuse can result in personal injury or product damage.

OPERATIONAL SAFETY DATA SHEET

Hazard Communication (per OSHA Title 29, CFR 1910.1200)

RIGHT-TO-KNOW INFORMATION:

The handling of pressurized systems: I.E. injectors, steam and water, requires the attention of technical and safety personnel, proper implementation and application of all applicable codes. Management is responsible for development of proper operating and emergency procedures routine and preventative maintenance programs for every facility where work involves pressurized systems. After a rational and functional assessment of the job demands, tools, environment and exposures, development of strict guidelines should include as to how, where, and by whom pressurized systems can be used. Adequate training of all personnel and periodical testing of knowledge and procedures should be practiced, including the use of proper protective clothing or equipment. Once all necessary administrative controls have been established to regulate the design, procurement, and use of pressurized systems, the user should see that all necessary maintenance, inspections and tests are conducted on schedule.

During installation, all components should be secured to a firm foundation. Static weight, dynamic and concentration loads, as well as thermal expansion should be considered. The floor and foundation must be able to support the combined weight of the system, associated equipment, contents and operating personnel. Remote operation, or special construction should be provided for any pressure system for emergency shutdown in order to reduce

personnel exposure. The component installation should provide for interruptions, surge, or fluctuations in supply sources. System de-pressurizing or venting should be controlled and directed according to established procedures. Locate and orient any relief or venting devices so the direction of discharge is not hazardous to personnel. Shield necessity will depend upon the relief magnitude and device. All system components should be visibly and properly labeled and identified to reduce chances of error.

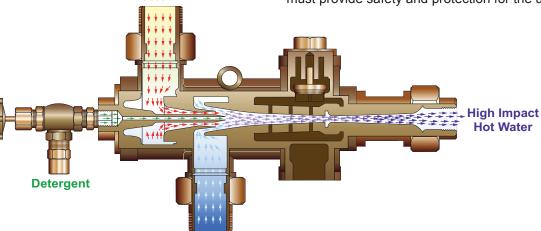
PRINCIPLE OF OPERATION

The injector is a powerful cleaning tool capable of delivering a stream of liquid at high pressure and temperature. Detergent solution can be automatically aspirated and mixed into the high pressure stream. The injector in conjunction with a tank cleaner can be used for high pressure pre-cleaning, cleaning, and rinsing. The injector creates this high pressure and temperature by combining steam and water in a unique manner, using a set of venturi tubes. The assembly has four major components: the detergent tube (5); the steam nozzle (4); the combining tube (3); and the delivery tube (2).

stream of hot water advancing down the throat of the delivery tube. Fluid energy is converted in a venturi. When passing through a contracting taper the fluid increases in velocity and decreases in pressure, when passing through an expanding taper the fluid slows down and the pressure goes up. Thus, the high speed jet formed by combining the hot steam and cold water increases in velocity in the combining tube until it reaches the orifice of the venturi in the delivery tube. In expanding the taper of the delivery tube the hot jet loses speed but gains pressure as it enters the pipe to the tank cleaner or spray manifolds.

The tank cleaner is a very important part of the system, its nozzle size is critical. If the nozzle orifice is too small allowing insufficient flow, the hot water will back through the holes in the combining tube and exit out the overflow pipe. This is regarded as an unbalanced condition and wastes water. If the nozzle orifice is too large then water pressure is lowered with correspondingly less impact on the area to be cleaned. This is why manifolds and tank cleaners must be properly sized for the job.

The installation of the overflow piping is also important and warrants a short discussion. The drainage piping arrangement must be vented to atmosphere so no back pressure is directed into the unit, yet the arrangement must provide safety and protection for the user.



Cold Water

Detergent Tube: Aspirates a metered amount of detergent into the combining tube injecting the detergent into the hot water jet stream.

Steam Nozzle: Directs and accelerates steam flow from the steam chamber into the combining tube.

Combining Tube: In the chamber the steam, water, (and detergent if requested) are mixed to form the hot water jet. The overflow holes and slots in the tube release excess steam and water into the overflow chamber when balancing the unit.

Delivery Tube: Delivers the balanced high pressure jet into the pipe which supply the tank cleaner.

In operation the steam enters the steam chamber and is directed by the steam nozzle into the combining tube. This steam meets the cold water (the colder the better) flowing from the cold water chamber into the combining tube. The cold water instantly condenses the hot steam creating a high vacuum; the cold water absorbs the heat and velocity from the steam; and the result is a high speed

Never cap or valve the overflow pipe, as the full passage opening of the drain is required. Visibility of the drainage must be maintained for the balancing procedures. If a closed loop drainage system is required, use an in-line sight flow indicator.

All this is not the only part of the system design. There is an important safety consideration, such as a cut or burst pipe that will provide the system with the same effect as that of a large orifice nozzle. The pressure will immediately drop and although the water will still be hot it will not be discharging through the pipe at high pressure. The only moving part in the system is the overflow valve (8). When the fluid jet is in balance the valve is held closed by the vacuum created in the combining tube by the venturi action. Unbalance always results from either more water or more steam than the unit can use. Any excess flows through the holes in the combining tube into the overflow chamber, lifts the overflow valve, and escapes through the overflow pipe. Incidentally, these holes are large enough to accept the entire flow even when the exit flow is completely shut off. Thus, water or steam cannot backup into either line regardless of the difference in pressure between the two. However, local regulations may require an approved siphon breaker or back flow preventer in the water line.

TECHNICAL SPECIFICATIONS

TANKJET B HYDRAULIC INJECTOR MODELS:

SSCo Models #	Description
TJB-4	4GPM-6.5GPM Injector with 1.25" NPT Conn.
TJB-7	7GPM-12GPM Injector with 1.25" NPT Conn.
TJB-9	9GPM-16.5GPM Injector with 1.25" NPT Conn.
TJB-15	15GPM-29GPM Injector with 1.25" NPT Conn.
TJB-20	20GPM-34GPM Injector with 1.25" NPT Conn.
TJB-4-B	4GPM-6.5GPM Injector with 1.25" BSPT Conn.
TJB-7-B	4GPM-6.5GPM Injector with 1.25" BSPT Conn.
TJB-9-B	9GPM-16.5GPM Injector with 1.25" BSPT Conn.
TJB-15-B	15GPM-29GPM Injector with 1.25" BSPT Conn.
TJB-20-B	20GPM-34GPM Injector with 1.25"BSPT Conn.

The B injector is available as a unit only and does not include any pipe, cleaning head, lance, or nozzle.

SPECIFICATIONS:

Inlet Steam

Pressure Range: 50 to 150 psi (3.4 to 10.3 bar)

Steam Capacity

Range: 160 to 2000 lbs/hr

(73 to 907 kgs/hr)

Max. Liquid Discharge

Pressure Range: 120 to 340 psi (8.3 to 23.4 bar)

Liquid Discharge

Flow Rate Range: 4 to 34 gpm (15.1 to 129 l/min)

Max. Liquid Discharge

Temperature: 180°F (82°C)

Inlet Conn.: Steam: 1-1/4" NPT / BSPT (M)

Water: 1-1/4" NPT / BSPT (M) Detergent: 1/2" NPT / BSPT (M)

Outlet Conn.: Discharge: 3/4" NPT / BSPT (F)

Overflow: 1" NPT (F) / BSPT (M)

Weight: 24 lbs (11 kg)

Materials: Brass, 303SS detergent tube

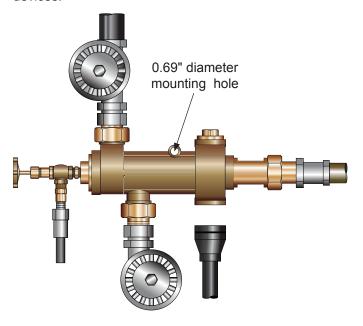
with EP O-ring

PERFORMANCE DATA:							
		Inlet Steam Pressure psi (bar)					
		50 (3.4)	75 (5.2)	100 (6.9)	125 (8.6)	150 (10.3)	
SSCo Steam Capacity Models # Ibs/hr (kgs/hr)	Steam Capacity lbs/hr (kgs/hr)	Maximum Liquid Discharge Pressure psi (bar)					
	ibs/iii (kgs/iii)	120 (8.3)	170 (11.7)	220 (15.2)	280 (19.3)	340 (23.4)	
		Liquid Discharge Capacity gpm (I/min)					
TJB-4	160 TO 400 lbs/hr (73 to 182 kgs/hr)	4 (15.1)	4.5 (17.0)	5.5 (21)	6 (23)	6.5 (25)	
TJB-7	280 TO 700 lbs/hr (127 to 318 kgs/hr)	7 (26)	8 (30)	9 (34)	10.5 (40)	12 (45)	
TJB-9	360 TO 900 lbs/hr (163 to 408 kgs/hr)	9 (34)	12 (45)	13 (49)	15 (57)	16.5 (62)	
TJB-15	700 TO 1500 lbs/hr (318 to 680 kgs/hr)	15 (57)	20 (76)	24 (91)	27 (102)	29 (110)	
TJB-20	800 TO 2000 lbs/hr (363 to 907 kgs/hr)	20 (76)	25 (95)	29 (110)	32 (121)	34 (129)	

INSTALLATION

All injectors <u>MUST</u> be installed by securing the units in position by using the mounting holes in the outer body casting. Injectors cannot be installed using only water/steam pipe fittings as water hammer could cause vibration and/or damage at connections. Teflon tape can be use if needed.

The injectors should be installed exactly as shown below. Injector should be installed near tank cleaner or spray manifolds to prevent pressure loss. Position it high enough to clear the top of the detergent drum. Locate the steam and water valves as close as possible to the unit for ease of operation. Do not use valves that are smaller than the union connections of the Jet without factory approval. Also, certain plumbing codes require backflow prevention devices.



NOTE: Do not use flexible hose on steam or water lines feeding the injector. Connections should be hard piped as indicated.

STEAM SUPPLY SETUP:

The nominal minimum steam pressure used to supply these Jets is 50 PSI. Approximately one pound of steam by volume is required for each gallon of the Jet's discharge. It is important that this pressure and volume be available at the Jet when it is in operation. The chart below recommends the pipe sizes to be used with the various models. The sizes are determined by the length of run from the boiler or large main. Blow out all new lines before connecting the Jet to eliminate filling it with debris.

Jet Cleaner	Steam Supply Pipe Size From Boiler or Main				
Model	0 - 50 Ft. Run	50 - 100 Ft. Run	100 + Ft. Run		
В	1-1/4"	1-1/2"	2"		

WATER SUPPLY SETUP:

Water supply pressure, temperature range, and pipe size: Low pressure water (less than 30 PSI (2.1 BAR)) needs larger diameter pipelines to ensure adequate water supply to the unit. High pressure water may cause balancing problems because of the narrower range of valve adjustment. If water temperature is above 80° F (26.7° C), the unit may have problems forming a jet. Listed below is the recommended water pipe line size for the injector.

Jet Cleaner	Water Supply Pipe Size at
Model	Normal Pressure
В	1-1/4"

Where water pressure is less than 30 PSI (2.1 BAR) a 2" water line is needed.

OVERFLOW SETUP:

TankJet B are furnished with standard female NPT or male BSPT threads for connection of overflow piping. The overflow pipe and elbow should extend to the floor. Point the elbow away from the operating position. Overflow must remain open to atmosphere in order to balance.

OPERATION

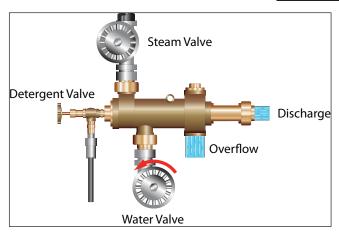
INITIAL SETUP INSTRUCTIONS:

To test the adequacy of your water supply, fully open the water valve, then fully open the steam valve. If the Jet continues to spill at the overflow, when the steam valve is wide open with full pressure, the Jet is getting sufficient water.

If the overflow stops as the steam valve is opened, the water supply is inadequate. To remedy this condition, increase the size of the water supply line or install a booster pump. The water supply must not pulsate.

OPERATING INSTRUCTIONS:

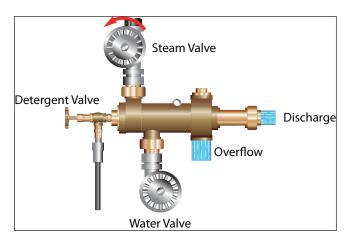
TO START INJECTOR



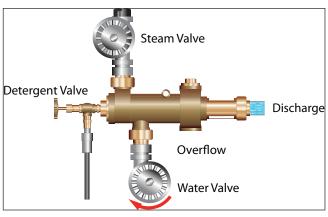
1. Open water valve fully



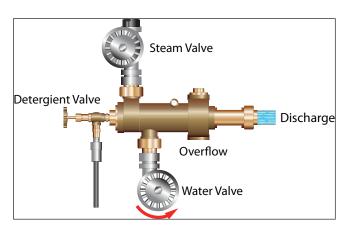
Must open water valve before opening steam valve.



2. Open steam valve fully



3. Adjust water valve in close direction until overflow stops

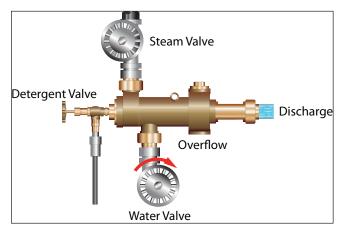


4. After a few seconds, throttle water valve to position just before overflow reoccurs.

The unit is now balanced and a steady discharge of liquid exits the injector.

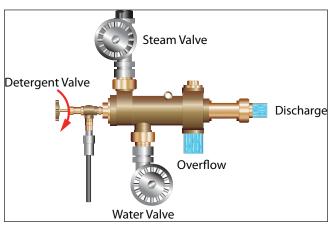
Discharge

- 1. While discharge is correctly set (see To Start Jet), open detergent valve as desired.
 - * When opening detergent valve, overflow will start to come out.



2. Adjust water valve to stop overflow.

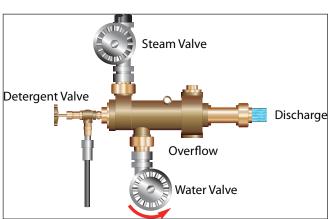
TO TURN OFF DETERGENT



- 1. Close detergent valve.
 - * While closing detergent valve, overflow will start to come out.

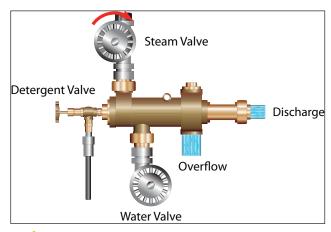


Detergent valve should be closed before turning off the steam/water valves.



2. Open water valve for maximum flow without overflow.

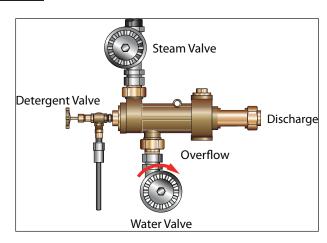
TO TURN OFF JET





If detergent valve is open, go to "To Turn Off Detergent" before continuing.

1. Close steam valve.



2. Close water valve.

DETERGENT

CAUTION: If chemicals, hazardous materials, operations, and equipment are used in conjunction with this cleaning equipment, it is the responsibility of the user to establish appropriate associated safety and health practices. Prior to application, the user must consult and determine the applicability of regulatory (federal, state, local and facility) safety and environmental agency limitations. All chemicals must be compatible with brass and stainless steel.

TankJet B Injectors can aspirate cold liquid detergents or solvents to aid their cleaning action. The units are equipped to mix such solutions in proportions controllable from 0 to 10% of the rated discharge volume. The percentage is adjusted by the Detergent Control Valve, piece (11).

Any good commercial detergent may be used provided it is compatible with materials and contains ingredients that will prevent the precipitation of water solids that can clog the tubes and nozzle orifices. The detergent can be mixed in a concentrated form in the detergent container and metered into the Jet as necessary. If the detergent mixing process heats the solution, allow it to cool before using.

The use of raw chemicals such as Trisodium Phosphate or Caustic Soda can precipitate residues which cake on the venturi tubes and cause operating problems.

NOTE: Excess solution temperatures or heat soaking into the detergent valve can cause a vapor lock. In that event, it is necessary to cool either the solution or the valve with cold water until the desired flow is obtained.

Do not attempt to start the Jet with the detergent valve open. Follow the normal start up procedure and then open the detergent valve. Since the detergent solution displaces some of the cold water supply, it may be necessary to readjust the water valve to stop the overflow.

Always shut off the detergent valve first so as to flush the Jet, then the steam and water. If rinsing is to continue after the detergent flow has been stopped, increase the water flow to the Jet.

<u>SERVICING</u>

REMOVAL OF TUBES AND INSPECTION:

All threads used on the TankJet B are right hand. No gaskets are used or required.

WARNING: Before performing any maintenance, make sure all liquid/steam supply line to the machine are shut-off and/or disconnected and chemical fluid are drained.

Remove the pipe by undoing Union Nut (6). Use a wrench to remove the Delivery Tube (2) and the Combining Tube (3).

Disconnect the Detergent Suction Pipe. The Detergent Control Valve (11) may be removed or left in place at this time. Remove the Detergent Tube (5). Be careful not to damage the feather edge at its tip.

Remove the Steam Nozzle (4). Screw the brass guide into the body opening carefully to prevent damage to the internal threads of the body. The guide need only be finger tight. Insert suitable piece of 1/2" round bar stock through hole in stem. Locate cross bar of stem in slot of Steam Nozzle. Hit bar stock with hammer to loosen nozzle while holding bar in slot. Once loose, the Steam Nozzle can be easily removed. Be careful not to damage the feather edge.

Remove Overflow Cap (7) and Overflow Valve (8).

NOTE: Spraying System Co. will not service any TankJet B injectors at the factory after use/sale. Only replacement parts will be sold and reassembly will be the responsibility of the owner.

INSPECTION:

Pieces (2) and (3) should have mirror smooth internal surfaces. Look for deposits of water solids or chemicals. See section on venturi tube cleaning. Roughness caused by corrosion or erosion require that the tubes be replaced.

Inspect piece (4) for cracking or breakage at the feather edge. Any such damage, nicks or bending require that the nozzle be replaced.

Inspect piece (5) for the same type of damage as on piece (4). Additionally, look for evidence of corrosion in the tube section and in the brass base. The tube must be tight in its base. The tube is not separately replaceable.

Examine the Overflow Valve (8) and its internal body seat. Check to see that the Valve Stem can move freely in the Overflow Cap. Valve is held closed by vacuum, dirt or scale on valve and/ or seat must be removed. Wipe mating surfaces clean. Reseat by placing fine grinding compound on valve face and touch up seat. Rotate valve with screwdriver in stem slot.

VENTURI TUBE CLEANING:

Internal deposits can be removed by immersing the parts in a 10% solution of inhibited Phosphoric Acid or other safe brass descaler. Rinse thoroughly and re-examine per the preceding instruction.

TROUBLE SHOOTING

The primary symptom of a malfunctioning TankJet B is found when the unit overflows during operation and the overflow cannot be stopped by throttling the water valve to obtain balance.

The appearance of the overflow changes from that of relatively cool running water to a swirling cone shaped mass of hot water that contains some steam.

INSPECT AS FOLLOWS:

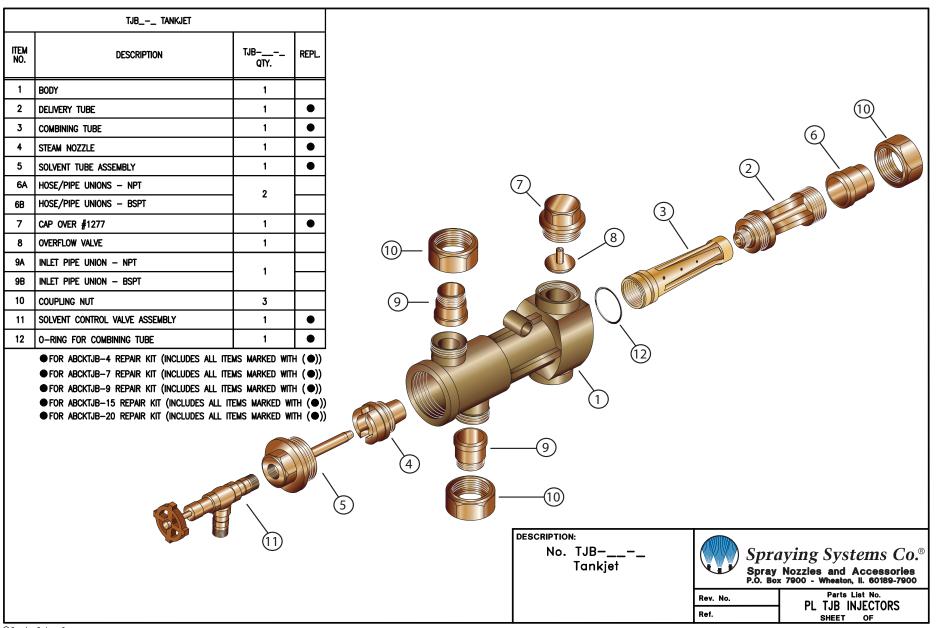
- 1. Close detergent valve. Shut off steam and water supplies.
- Disconnect tank cleaner or spray manifold and check for foreign matter that might be obstructing passage way.
- Without connecting the tank cleaner or spray manifold, start the injector in the normal manner (see Operating Instructions). Although no pressure will be developed, if the overflow stops, the problem has been located in the tank cleaner or spray manifold.
- 4. If Step 3 was not successful, disconnect the discharge pipe by removing the Union Nut (9). If the installation site permits water spraying straight out of the injector, again start the injector in the normal manner. If the overflow can be stopped, the discharge pipe is defective and should be replaced.
- 5. If Step 4 was not successful, remove pieces (2), (3), (4), and (5). Look for foreign matter lodged in any of the throats. Any buildup of water or solids or chemical deposits must be removed. Damage to the feather edges on (4) or (5), or roughness inside of (2) and (3) will require that they be replaced.

DELIVERY TEMPERATURES(at Normal Balanced Operation)

- TankJet B Injector Models: The steam-to-water ratio on these injector are similar at corresponding steam pressures. As a result, similar delivery temperatures and pressures can be found regardless of the unit size.
- 2. Input Water Temperatures: Remember, water supply temperatures do fluctuate, seasonally and by locality. Since we are dealing with temperature rise, should input water be hotter than 60° F (15.6° C), the final operating temperature will be higher by the same degree. Conversely, as temperatures drop below 60° F (15.6° C), discharge solution temperature will likewise, be lower. However, if water temperature is above 80° F (26.7° C), the unit may have problems forming a jet.

WARRANTY

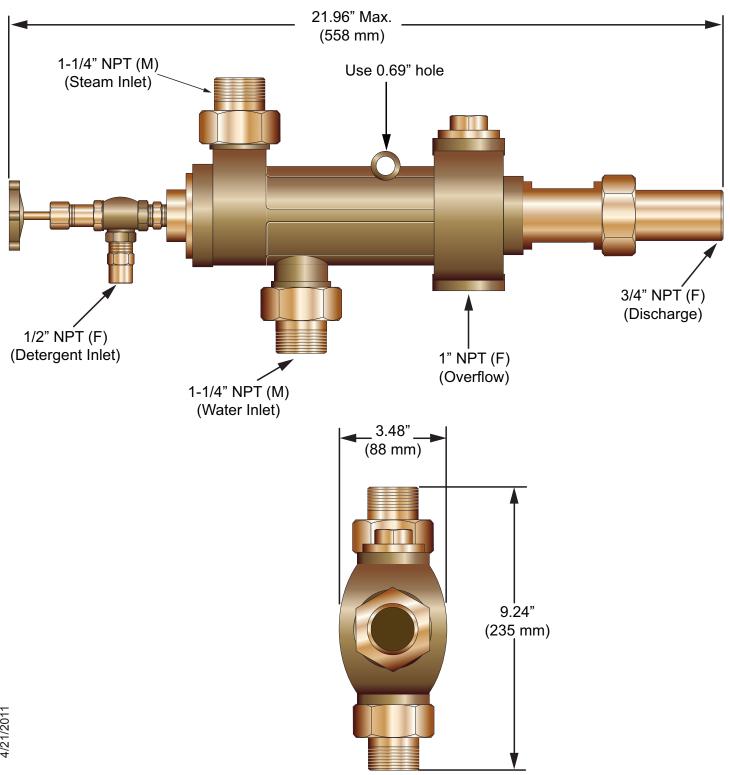
For newly purchased units the warranty is 18 months from the date of shipment or 12 months from the date of installation, whichever occurs first. This warranty includes manufacturing defects but does not cover the wear parts that include the o-rings, seal and bushings. This warranty will be void if parts other than those supplied by Spraying System Co. are used.



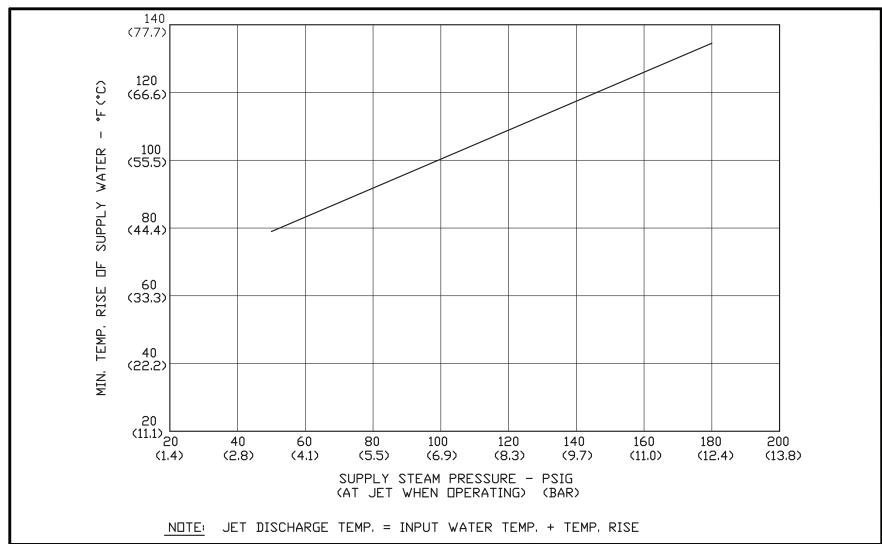




TJB DIMENSION



Note: All connections are also available in BSPT connections. The only exception is the overflow outlet which will have an adapter to make it a 1" BSPT (M) connection.



DESCRIPTION:

Minimum Temp Rise vs.
Supply Steam Pressure



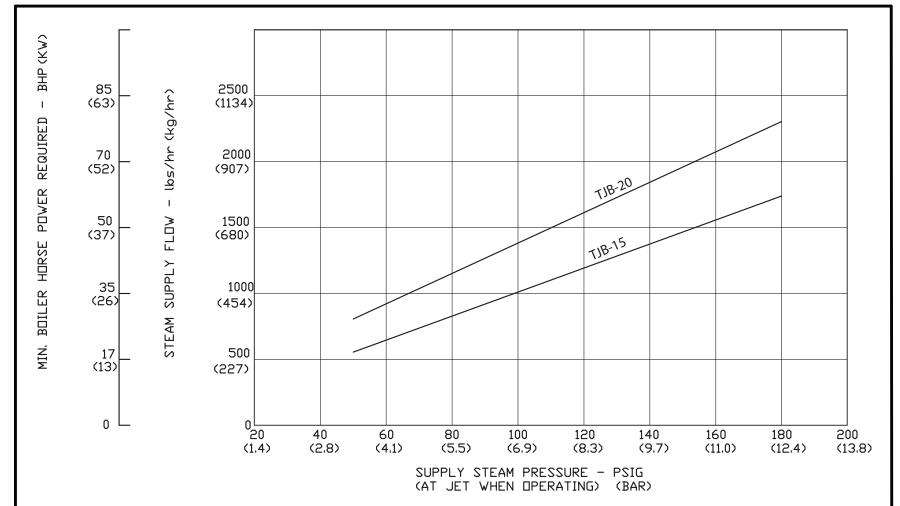
Spray Nozzles and Accessories P.O. Box 7900 - Wheaton, II. 60189-7900

Rev. No.

Data Sheet No.

DS TJB TEMP. RISE CURVE
SHEET OF





NOTE: DATA BASED ON 70° WATER SUPPLY

DESCRIPTION:

Steam Flow vs. Supply Steam Pressure Boiler HP Required vs. Supply Steam Pressure



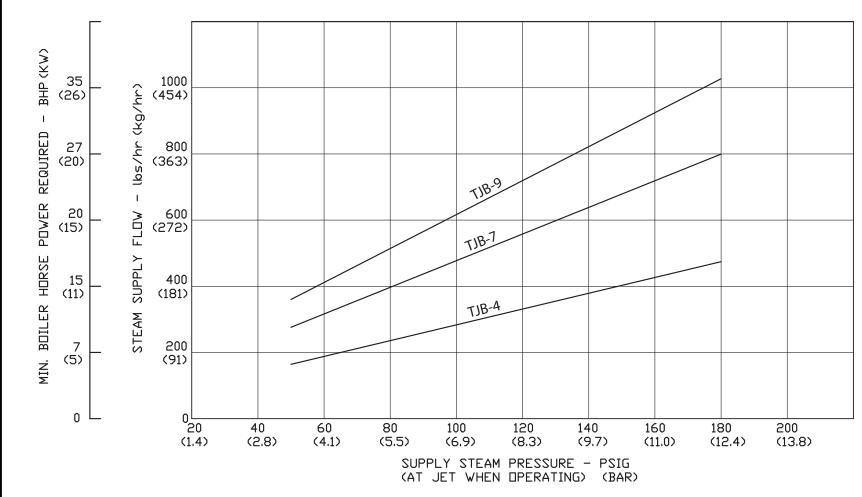
Spraying Systems Co.

Spray Nozzles and Accessories P.O. Box 7900 - Wheaton, II. 60189-7900

Rev. No.

Data Sheet No.

STEAM/BOILER HP CURVE
SHEET 1 OF 2



NOTE: DATA BASED ON 70° WATER SUPPLY

DESCRIPTION:

Steam Flow vs. Supply Steam Pressure
Boiler HP Required vs. Supply Steam Pressure



Spraying Systems Co.

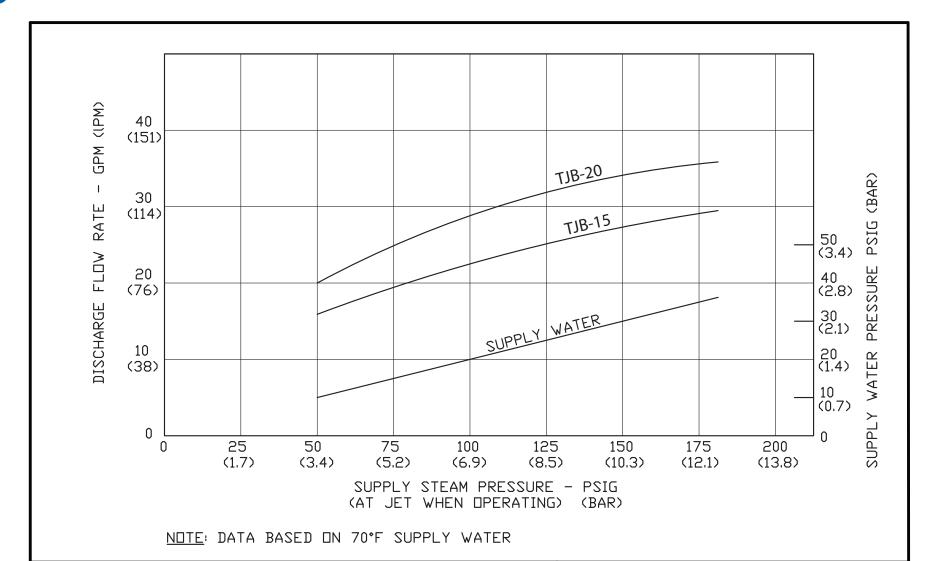
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Rev. No.

Data Sheet No.

STEAM/BOILER HP CURVE
SHEET 2 OF 2





DESCRIPTION:

Discharge Flow Rate vs.
Supply Steam Pressure



Spraying Systems Co.

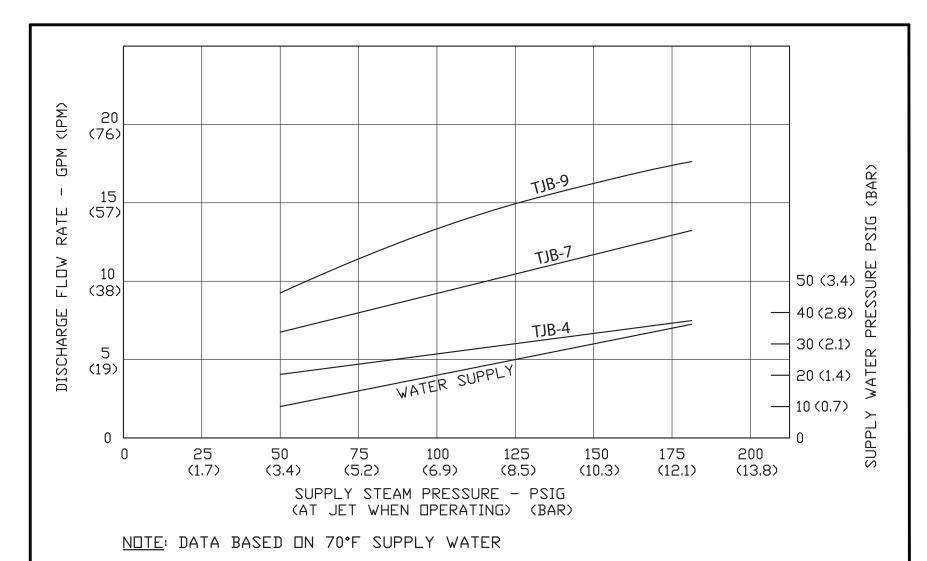
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Data Sheet No.

DS TJB DISCHARGE FLOW CURVE

SHEET 1 OF 2



DESCRIPTION:

Discharge Flow Rate vs.
Supply Steam Pressure



Rev. No.

Data Sheet No.

DS TJB DISCHARGE FLOW CURVE

SHEET 2 OF 2





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