



Masterstream with Flush Nozzle Series

INSTRUCTIONS FOR INSTALLATION, OPERATION, AND MAINTENANCE

WARNING

Understand manual before use. Operation of this device without understanding the manual and receiving proper training is a misuse of this equipment. Obtain safety information at tft.com/serial-number.

This equipment is intended for use by trained and qualified emergency services personnel for firefighting. All personnel using this equipment shall have completed a course of education approved by the Authority Having Jurisdiction (AHJ).

This instruction manual is intended to familiarize firefighters and maintenance personnel with the operation, servicing, and safety procedures associated with this product. This manual should be kept available to all operating and maintenance personnel.

Masterstream 1250 Selectable Flow with Flush

500-750-1000-1250 GPM @ 100 PSI
2000-3000-3800-4800 l/min @ 7 BAR

Masterstream 1000 Selectable Flow with Flush

350-500-750-1000 GPM @ 100 PSI
1300-2000-3000-3800 l/min @ 7 BAR

Masterstream 1250 Fixed Flow with Flush

1000 GPM @ 100 PSI K=125
3800 l/min @ 7 BAR

Masterstream 1000 Fixed Flow with Flush

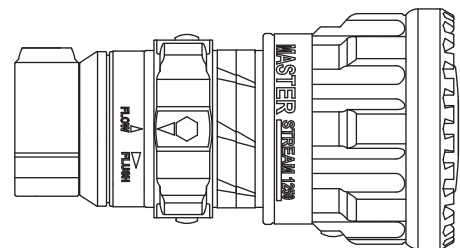
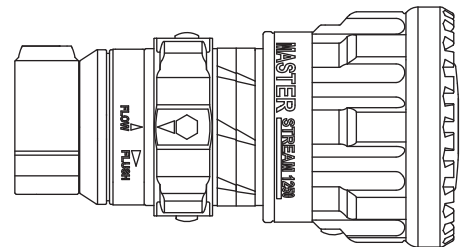
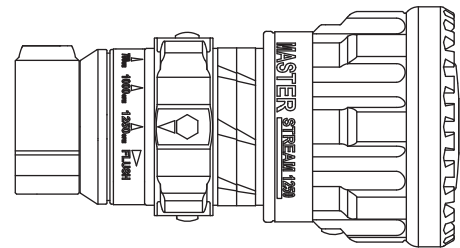
1000 GPM @ 100 PSI- K=100
3800 l/min @ 7 BAR

Masterstream 1250 Automatic Pressure with Flush

300-1250 GPM @ 80-120 PSI
1100-4800 l/min @ 5.5-8.3 BAR

Masterstream 1000 Automatic Pressure with Flush

300-1000 GPM @ 80-120 PSI
1100-3800 l/min @ 5.5-8.3 BAR



TASK FORCE TIPS LLC
MADE IN USA · tft.com

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PERSONAL RESPONSIBILITY CODE

The member companies of FEMSA that provide emergency response equipment and services want responders to know and understand the following:

1. Firefighting and Emergency Response are inherently dangerous activities requiring proper training in their hazards and the use of extreme caution at all times.
2. It is your responsibility to read and understand any user's instructions, including purpose and limitations, provided with any piece of equipment you may be called upon to use.
3. It is your responsibility to know that you have been properly trained in Firefighting and /or Emergency Response and in the use, precautions, and care of any equipment you may be called upon to use.
4. It is your responsibility to be in proper physical condition and to maintain the personal skill level required to operate any equipment you may be called upon to use.
5. It is your responsibility to know that your equipment is in operable condition and has been maintained in accordance with the manufacturer's instructions.
6. Failure to follow these guidelines may result in death, burns or other severe injury.



Fire and Emergency Manufacturers and Service Association
P.O. Box 147, Lynnfield, MA 01940 • www.FEMSA.org

SUPPORTING MATERIALS

The following documents contain supporting safety and operating information pertaining to the equipment described in this manual.

MANUAL: Foam Aspirators

INSTRUCTIONS FOR SAFE OPERATION AND MAINTENANCE

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FoamJet

FoamJet-LX

MX-FoamJet

FJ-LX-M

MX-FoamJet

MX-FoamJet

MX Foam Nozzle

FJ-LX-M2

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LIA025 September 23, 2019 Rev01

LIA-025
Manual: Foam Aspirators

NOZZLE TRAJECTORY ELEVATION FACTORS

Reach Factor (compared to 30° elevation)

Stream reach and height at non-optimal elevations can be estimated as a factor of the performance at the optimal 30° elevation. Refer to LIA-025 and LIA-026 for effective stream trajectories of Task Force Tips Masterstream nozzles at 30° elevation. This graph cannot be used to estimate maximum reach for elevation angles below 30°.

10. To estimate elevation angle when vertical and horizontal distances to target are known:
 1.1 Find the maximum height and reach at 30° from the appropriate trajectory curve in LIA-025 or LIA-026.
 1.2 Calculate the Height Factor by dividing the vertical distance to the target by maximum height from step 1.1.
 1.3 Calculate the Reach Factor by dividing the horizontal distance to the target by maximum reach from step 1.1.
 1.4 On the graph of nozzle trajectory elevation factors, find the intersection of the Height Factor and Reach Factor from steps 1.2 and 1.3. If this point lies on or between the curves given, estimate the appropriate elevation angle. If this point lies within the shaded region of the graph, then a higher flow or pressure must be used to reach the target.
 20. To estimate maximum reach for a given elevation angle above 30°:
 2.1 From the graph of nozzle trajectory elevation factors, choose the trajectory curve for the desired elevation angle.
 2.2 Find the point where this trajectory curve intersects the height of discharge (zero height line).
 2.3 Estimate the Reach Factor at this point using the scale across the top of the graph.
 2.4 Multiply this Reach Factor by the reach at 30° elevation from the appropriate trajectory curve in LIA-025 or LIA-026.
 30. To estimate maximum height for a given elevation angle above 30°:
 3.1 From the graph of nozzle trajectory elevation factors, choose the trajectory curve for the desired elevation angle.
 3.2 Find the maximum height on this trajectory curve.
 3.3 Estimate the Height Factor at the maximum height using the scale on the left side of the graph.
 3.4 Multiply this Height Factor by the height at 30° elevation from the appropriate trajectory curve in LIA-025 or LIA-026.

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LTT 109 July 26, 2009 Rev01

LTT-135
Nozzle Trajectory Elevation Factors

TASK FORCE TIPS ELECTRIC REMOTE NOZZLES
 ELECTRIC REMOTE WIRING DIAGRAM

LESS ELABORATE WIRING SYSTEMS MAY BE USED BY ELIMINATING UPPER CONTROL OR REMOTE CONTROL STATIONS

LEGEND

[] SWITCH DPDT 5 AMP MIN.	[] MOMENTARY ON, CENTER OFF	[] MOTOR
[] CIRCUIT BREAKER - NOT INCLUDED WITH NOZZLE	1.5 MFL, 1.5 AMP, 24 VOLT FOR 12 & 24 VDC SYSTEM	
	1.5 MFL, 1.5 AMP, 24 VOLT FOR 24 & 36 VDC SYSTEM	
[] WATERPROOF CORD CONNECTOR		
[] OPTIONAL - WATERPROOF CORD CONNECTOR OR WATER RESISTANT PLUG AND RECEPTACLE		

LEADS
 R = RED
 G = GREEN
 W = WHITE
 B = BLACK

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LIM040 August 1, 2019 Rev01

LIM-040
ER Nozzle Wiring Guide

MANUAL: Remote Control (RC) Monitor Electrical Controls

Supplemental Instructions for use with RC Monitor Manual

INSTRUCTIONS FOR INSTALLATION, SAFE OPERATION AND MAINTENANCE

Understand manual before use. Operation of this device without understanding the manual and receiving proper training is a misuse of this equipment. Obtain safety information at www.tft.com.

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LIY500 April 6, 2019 Rev01

LIY-500
Manual: Remote Control (RC) Monitor Electrical Controls

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1.0 MEANING OF SAFETY SIGNAL WORDS

A safety related message is identified by a safety alert symbol and a signal word to indicate the level of risk involved with a particular hazard. Per ANSI Z535.6, the definitions of the four signal words are as follows:



DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTICE is used to address practices not related to physical injury.

2.0 SAFETY

OPERATING NOTE ABOUT AUTOMATIC NOZZLES: The automatic nozzle is considerably different than Fixed and Selectable Flow nozzles because of basic changes in the operating principle. These differences not only assure the most effective operation under a variety of conditions, but will also utilize the available water supply most efficiently. It is important that nozzle operators, pump operators, and officers be fully aware of these differences. Therefore, proper instruction is required for safe and effective operations.

⚠ DANGER

An inadequate supply of pressure and/or flow will cause an ineffective stream and can result in injury or death. Choose operating conditions to deliver adequate fire suppression. See flow graphs.

⚠ WARNING

This equipment is intended for use by trained personnel for firefighting. Use of this equipment for other purposes may involve hazards not addressed by this manual. Seek appropriate guidance and training to reduce risk of injury.

⚠ WARNING

Injury or damage can occur from an inadequately supported monitor. The mounting must be capable of supporting the nozzle reaction force which can be as high as 1500 lbs.

⚠ WARNING

Some volatile liquids can be ignited by static discharge, which can occur during application of foam or water. Fire or explosion can result in injury or death. Follow procedures established by the AHJ to reduce risk of fire or explosion caused by static discharge.

⚠ WARNING

Application of water or foam solutions on energized electrical equipment could cause electrocution. Serious injury or death could result. Assume circuits are energized until confirmed to be de-energized. Do not apply water or foam to energized electrical equipment.

⚠ WARNING

The stream exiting a nozzle is very powerful and capable of causing injury and property damage. Make sure the nozzle is securely attached and pointing in a safe direction before water is turned on. Do not direct water stream to cause injury or damage to persons or property.

⚠ WARNING

Equipment may be damaged if frozen while containing significant amounts of water. Such damage may be difficult to detect visually. Subsequent pressurization can lead to injury or death. Any time the equipment is subject to possible damage due to freezing, it must be tested and approved for use by qualified personnel before being considered safe for use.

NOTICE

To prevent mechanical damage, do not drop or throw equipment.

3.0 GENERAL INFORMATION

The Master Stream 1250 with Flush has the ability to produce an excellent hard-hitting stream at any flow from 300 GPM to 1250 GPM (1100 l/min to 4800 l/min). Easily adjustable from a straight stream to a wide dense fog pattern, the Master Stream 1250 with Flush is standard with a rugged aluminum bumper with fixed fog teeth. The nozzle features a selector ring behind the shaper that allows gallonage selection or flushing the nozzle of debris without shutting down flow. Applications include truck mounted deluge devices, aerials, fireboats, industrial applications, or when flush while flowing is necessary or desired. The Master Stream 1250 with Flush is suitable for use with foam and accepts the FJ-LX-M2 Foamjet low expansion air aspirating attachment.

3.1 VARIOUS MODELS AND TERMS

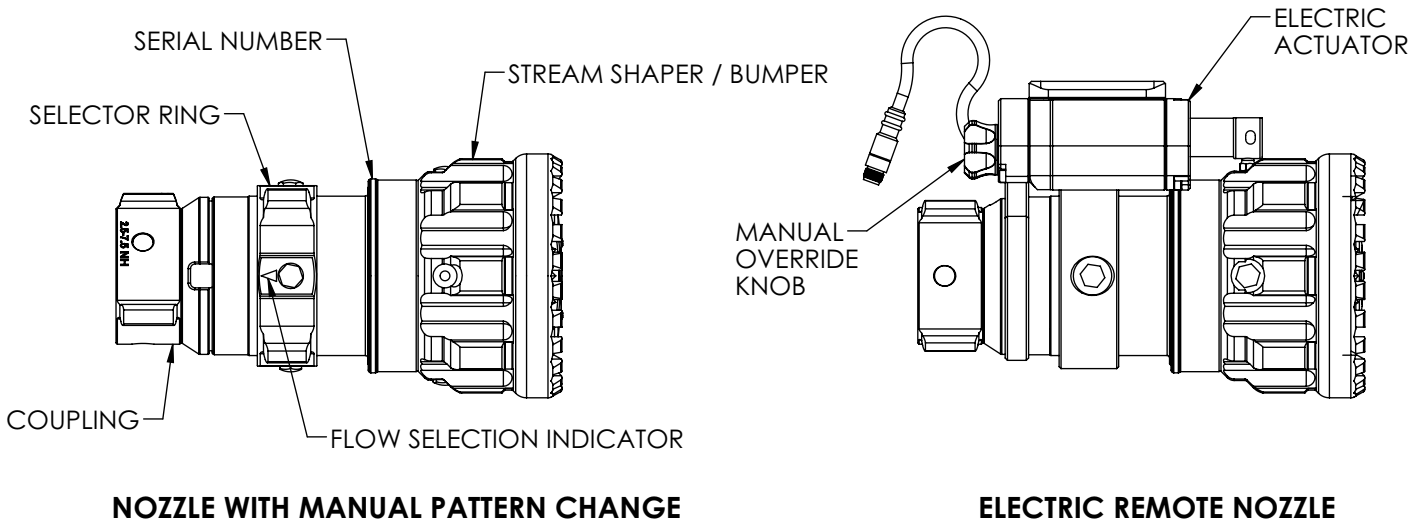


Figure 3.1

3.2 SPECIFICATIONS

	US	METRIC
Weight (Manual Versions)	11.1 lbs	5.0 kg
Weight (ER Versions)	15.1 lbs	6.8 kg
Maximum Flow	1250 GPM	4800 L/min
Maximum Flush Opening	5/8"	16mm
Maximum Operating Pressure	120 PSI	8.3 bar
Maximum Fog angle	110°	110°
Operating temperature of fluid	33 to 120°F	1 to 50°C
Storage temperature range of fluid	-40 to 150°F	-40 to 65°C
Materials used	Aluminum 6000 series hard anodized MIL 8625 class 3 type 2, stainless steel 300 series, nylon 6-6, nitrile rubber	

Table 3.2

3.3 NOZZLE COUPLINGS

NH (National Hose Threads) threads are standard on all nozzles. Other threads such as NPSH (National Pipe Straight Hose) can be specified at time of order.



Mismatched or damaged waterway connections may cause equipment to leak or uncouple under pressure. Failure could result in injury. Equipment must be mated to matched connections.



Dissimilar metals coupled together can cause galvanic corrosion that can result in the inability to uncouple the connection, or complete loss of engagement over time. Failure could cause injury. Per NFPA 1962, if dissimilar metals are left coupled together, an anti-corrosive lubricant should be applied to the connection and the coupling should be disconnected and inspected at least quarterly.

3.4 USE WITH SALT WATER

Use with salt water is permissible provided the equipment is thoroughly cleaned with fresh water after each use. The service life of the equipment may be shortened due to the effects of corrosion, and is not covered under warranty.

3.5 ELECTRIC INSTALLATION

Nozzles with electric stream shaper actuation are shipped with a wiring diagram (TFT item #LIM-040). Other documentation is available on request. ER nozzles are equipped with manual override in case of electrical power failure.



This device is not rated as ignition proof, explosion proof, or intrinsically safe. Use only in locations with adequate ventilation and no hazard of flammable vapor buildup.

4.0 FLOW CHARACTERISTICS

4.1 AUTOMATIC

The operating pressure of the Masterstream Automatic with Flush Nozzle is user adjustable. Pressure adjustment is performed by twisting the knob on the front of the nozzle to the desired pressure setting. The following figures show typical flow performance for each model when adjusted to the marked pressure settings. The automatic pressure control will maintain the set pressure anywhere within the flow ranges shown on the graphs, which vary according to pressure setting.

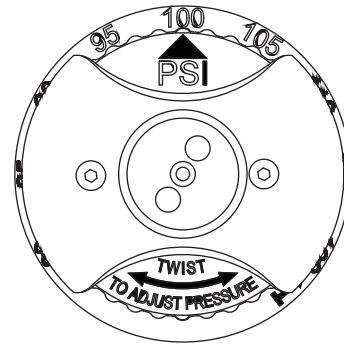


Figure 4.1A

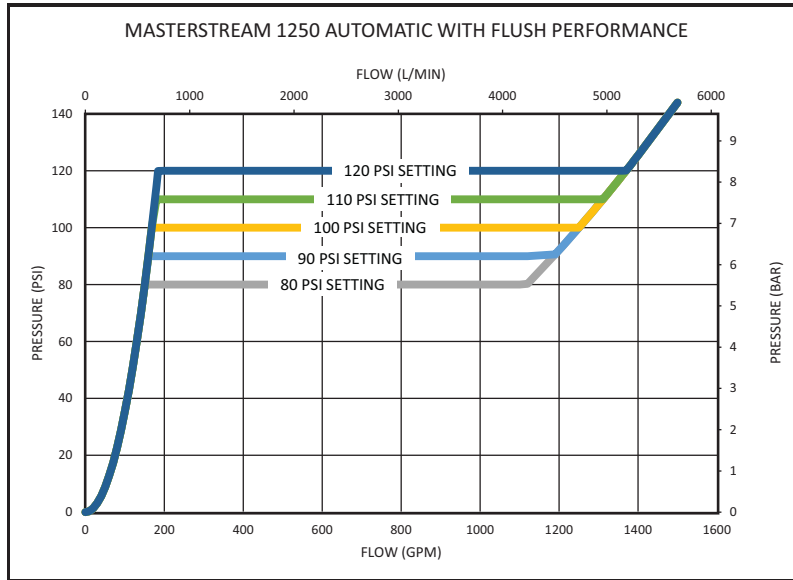


Figure 4.1B

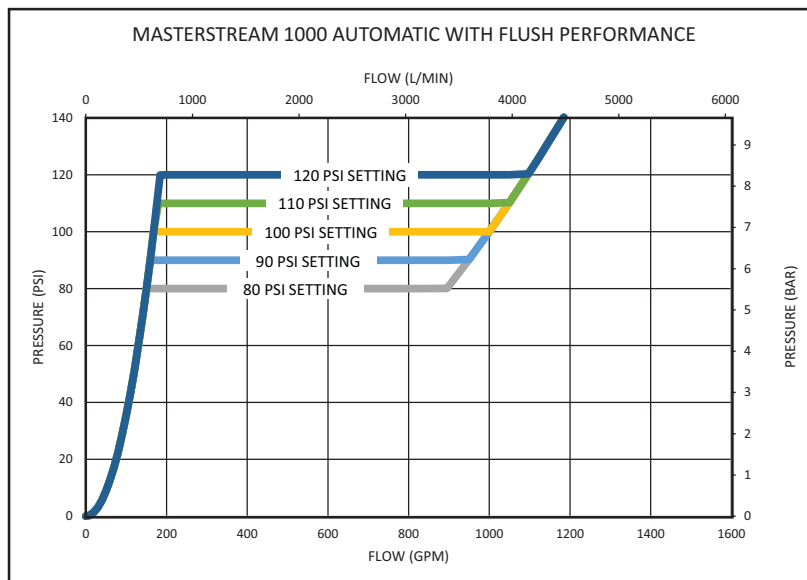


Figure 4.1C

4.2 SELECTABLE FLOW

The Masterstream 1000 and 1250 Selectable with Flush Nozzles allow the user to select one of several flow limiting settings by turning the selector ring at the base of the nozzle. The indicator on the selector ring lines up with the flow-limit selection. The following figures show the relationship of flow and pressure for each flow setting.

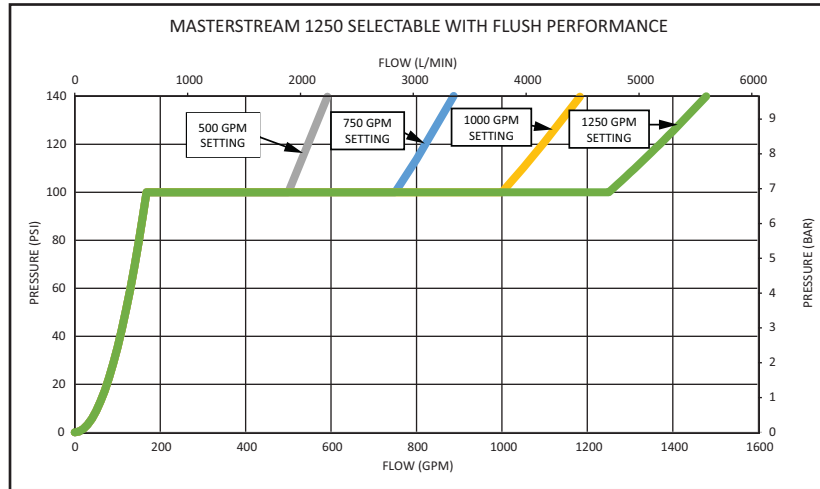


Figure 4.2A

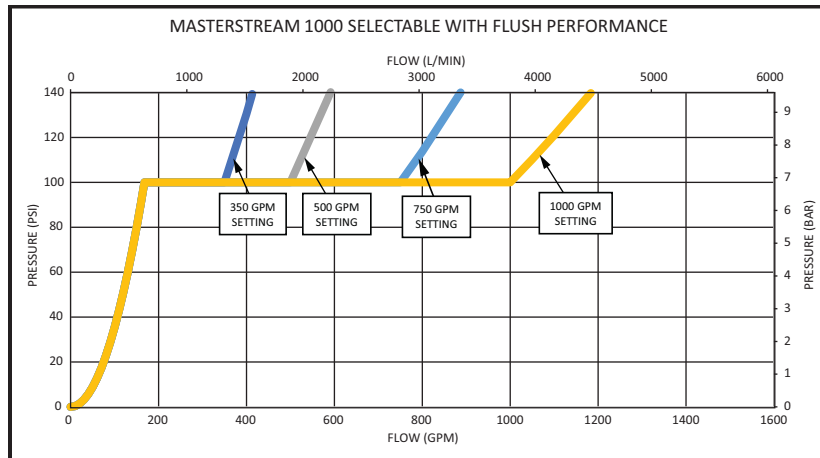


Figure 4.2B

4.3 FIXED FLOW

Masterstream 1250 and 1000 Fixed with Flush Nozzles are factory calibrated to K=125, K=100, or user specified K-Factor. The following figure shows the relationship between flow and pressure for various K-factors.

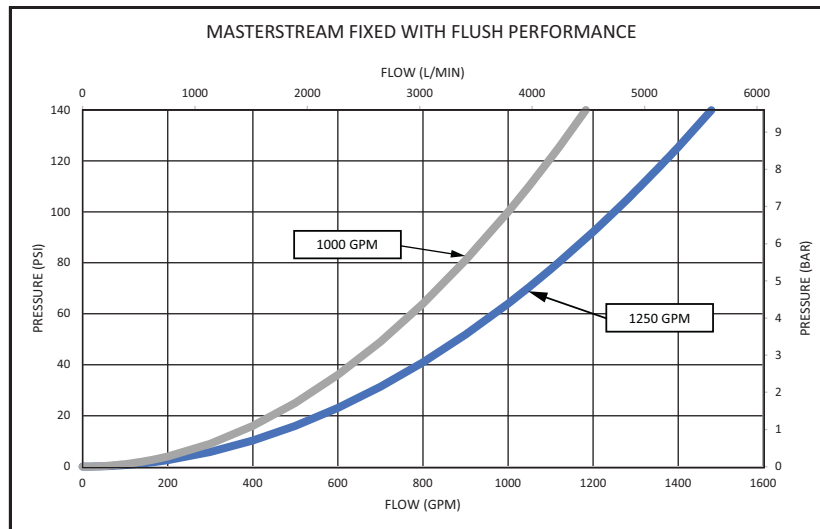


Figure 4.3

4.4 REACH AND TRAJECTORY

Care must be taken to avoid dents or nicks in the nozzle tip because they can seriously affect the stream reach.

Notes on trajectory graphs:

- Graphs show approximate effective stream trajectory at 30 degrees elevation in no wind conditions. Distance to last water drops approximately 10% farther.
- To estimate trajectories at elevations other than 30 degrees, refer to document LTT-135, available at tft.com.
- Trajectories shown are for water. The addition of foam is expected to decrease the reach by 10%.
- Tail or head winds of 20 MPH (30 KPH) may increase or decrease the range approximately 30%.

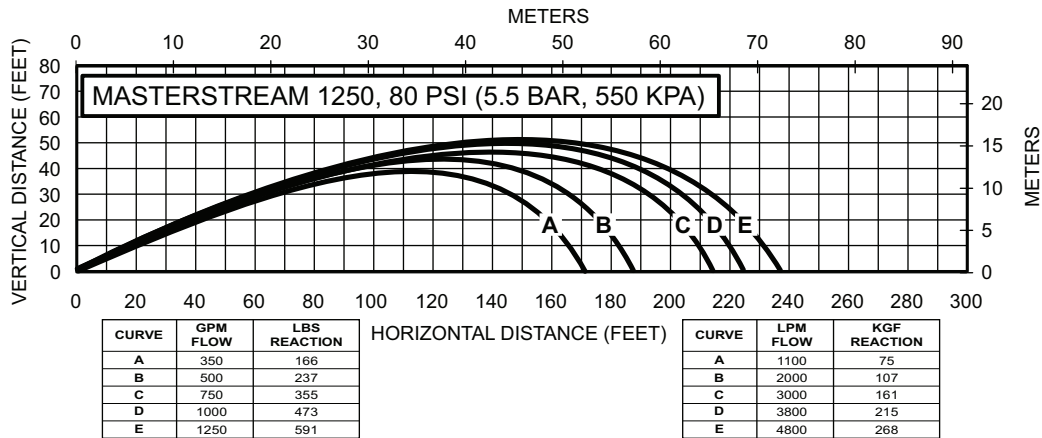


Figure 4.4A

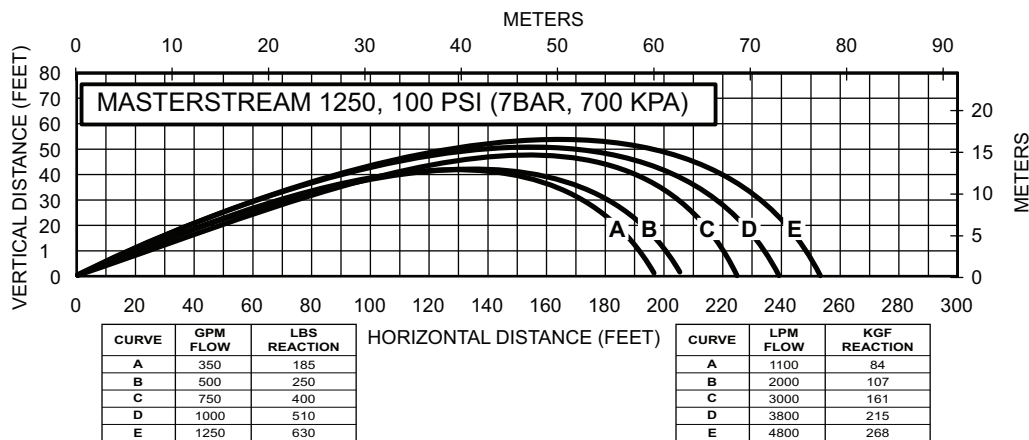


Figure 4.4B

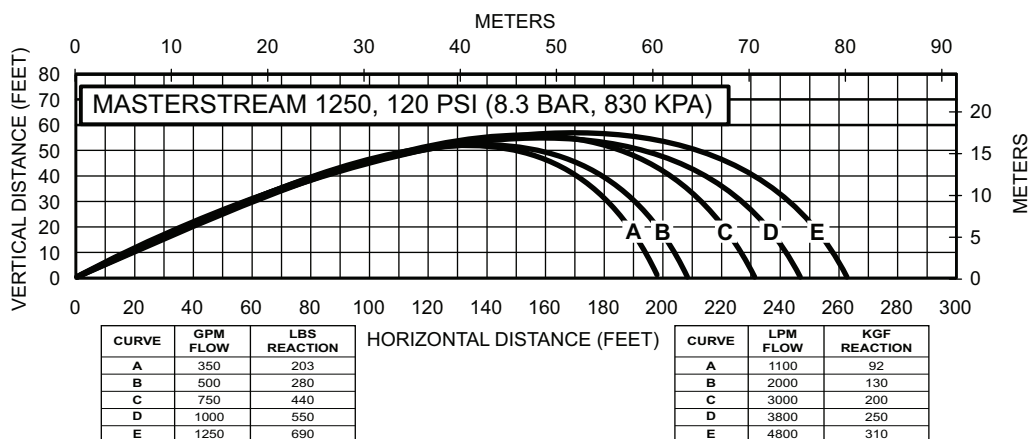


Figure 4.4C

4.5 DETERMINING FLOW WITH PRE-PIPED MONITORS

The simplest method to determine flow with automatic nozzles is with a flow meter. If a flow meter is unavailable, the flow may be estimated using pressure loss data between the nozzle and an in-line pressure gauge at the pump or considerably upstream from the nozzle. Data is taken with a smooth bore nozzle and handheld pitot gauge. Note: Equations assume no substantial change in elevation between in-line pressure gauge and nozzle.

Step 1: Determine flow of smooth bore nozzle.

Flow water with a smooth bore nozzle and record the nozzle size, pitot pressure, and in-line pressure gauge reading. The smooth bore nozzle's flow is calculated from the Freeman formula:

Where: $F = 29.71$ for English units (gpm, Inches, psi)

$F = .667$ for metric units (l/min, mm, bar) Note: 1 bar=100 kPa

Q_{smooth} flow in gpm (or l/min)

D exit diameter in Inches (or mm)

P_{pitot} pitot pressure in psi (or bar)

$$Q_{\text{smooth}} = F \times D^2 \sqrt{P_{\text{pitot}}}$$

Step 2: Find pressure loss constant.

Using the results from step 1, use the following equation to calculate the pressure loss constant between the in-line pressure gauge and the nozzle:

Where: C piping pressure loss constant in gpm²/psi (or l/min²/bar)

$P_{\text{in-line}}$ in-line pressure gauge reading in psi (or bar)

$$C = \frac{Q_{\text{smooth}}^2}{P_{\text{in-line}} - P_{\text{pitot}}}$$

Step 3: Calculate flow with automatic nozzle.

Using the pressure loss constant from step 2 and the following equation, the flow with an automatic nozzle can be calculated for your particular installation.

Where: Q_{auto} automatic nozzle flow in gpm (or l/min)

P_{auto} nominal nozzle operating pressure in psi (or bar)

$$Q_{\text{auto}} = \sqrt{(P_{\text{in-line}} - P_{\text{auto}})C}$$

Mount a graph or table of the results adjacent to the in-line pressure gauge. Deliver any desired flow by adjustment of pump pressure.

5.0 OPERATION

5.1 PATTERN CONTROL

TFT's Masterstream with Flush Series nozzles have full pattern control from straight stream to wide fog.

On models with manual shapers, turning the stream shaper clockwise (as seen from the operating position behind the nozzle) moves the shaper to the straight stream position.

On ER models, press and hold the FOG or STRAIGHT STREAM button until the desired pattern is obtained.

Since the stream trim point varies with flow, the nozzle should be "trimmed" after changing the flow to obtain the straightest and farthest reaching stream. To properly trim a stream, first open the pattern to narrow fog. Then close the stream to parallel to give maximum reach. Note: Turning the shaper further forward will cause stream crossover and reduce the effective reach of the nozzle.

5.2 FLUSHING DEBRIS

All nozzles are equipped with a flush setting so debris may be flushed from the nozzle while flowing. The flush opening is larger than the passageways inside the nozzle, allowing debris to pass.

Manually Operated Nozzles are flushed by turning the selector ring to FLUSH which opens the baffle further than the largest flow position. Resume operational flow by returning the selector ring to a flow setting. Stream pattern retains its original setting.

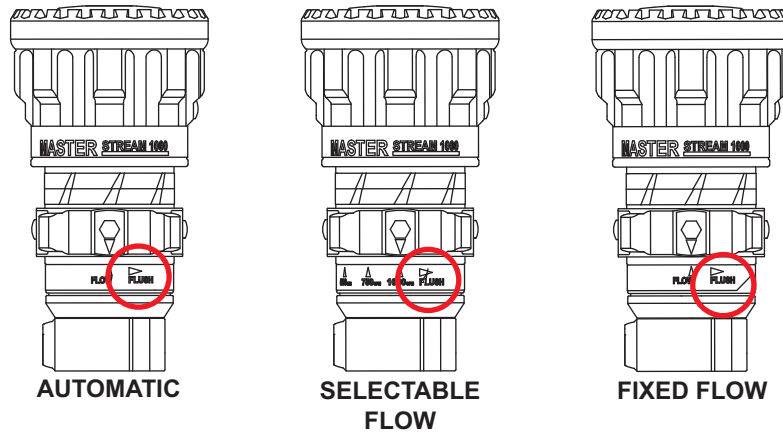


Figure 5.2

Electric Remote Nozzles are flushed from the control panel by pushing the FOG button twice. Smart Stream controls both stream shape and flush. Requiring a second button push avoids unintentional flush.

To Flush an Electric Remote Nozzle:

1. Push and hold FOG to move the nozzle to full fog.
2. Push the FOG button a second time to move the nozzle to flush by increasing the opening size further than the largest flow position.
3. Push the STRAIGHT STREAM button to return the nozzle to normal flow and adjust the stream shape as desired.

Debris too large to pass the flush opening is retained at the nozzle inlet by the vanes. Uncouple the nozzle and remove debris.



Large amounts or pieces of debris may be unflushable and can reduce the flow of the nozzle resulting in an ineffective flow. In the event of a blockage, it may be necessary to retreat to a safe area, uncouple the nozzle and remove debris.

6.0 USE WITH FOAM

The nozzle may be used with foam solutions. Refer to fire service training for the proper use of foam.



For Class B fires, lack of foam or interruption in the foam stream can cause a break in the foam blanket and greatly increase the risk of injury or death. Follow procedures established by the AHJ for the specific fuel and conditions.



Improper use of foam or using the wrong type of foam can result in illness, injury, or damage to the environment. Follow foam manufacturer's instructions and fire service training as directed by the AHJ.

6.1 FOAM ASPIRATING ATTACHMENTS

Multi-expansion or low expansion aspirating attachments may be used with nozzles to increase the expansion ratio. These foam tubes attach and detach quickly from the nozzle. As expansion ratio is increased, the reach of the nozzle will decrease due to the greater amount of bubbles in the stream and their ability to penetrate the air. Generally, the straight stream reach with foam is approximately 10% less than with water only. Actual results will vary based on brand of foam, hardness of water, temperature, etc. For specific information, see LIA-025 (MANUAL: Foam Attachments for TFT Nozzles).

7.0 WARRANTY

Task Force Tips LLC, 3701 Innovation Way, Valparaiso, Indiana 46383-9327 USA ("TFT") warrants to the original purchaser of its products ("equipment"), and to anyone to whom it is transferred, that the equipment shall be free from defects in material and workmanship during the five (5) year period from the date of purchase. TFT's obligation under this warranty is specifically limited to replacing or repairing the equipment (or its parts) which are shown by TFT's examination to be in a defective condition attributable to TFT. To qualify for this limited warranty, the claimant must return the equipment to TFT, at 3701 Innovation Way, Valparaiso, Indiana 46383-9327 USA, within a reasonable time after discovery of the defect. TFT will examine the equipment. If TFT determines that there is a defect attributable to it, TFT will correct the problem within a reasonable time. If the equipment is covered by this limited warranty, TFT will assume the expenses of repair.

If any defect attributable to TFT under this limited warranty cannot be reasonably cured by repair or replacement, TFT may elect to refund the purchase price of the equipment, less reasonable depreciation, in complete discharge of its obligations under this limited warranty. If TFT makes this election, claimant shall return the equipment to TFT free and clear of any liens and encumbrances.

This is a limited warranty. The original purchaser of the equipment, any person to whom it is transferred, and any person who is an intended or unintended beneficiary of the equipment, shall not be entitled to recover from TFT any consequential or incidental damages for injury to person and/or property resulting from any defective equipment manufactured or assembled by TFT.

It is agreed and understood that the price stated for the equipment is in part consideration for limiting TFT's liability. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above may not apply to you.

TFT shall have no obligation under this limited warranty if the equipment is, or has been, misused or neglected (including failure to provide reasonable maintenance) or if there have been accidents to the equipment or if it has been repaired or altered by someone else.

THIS IS A LIMITED EXPRESS WARRANTY ONLY. TFT EXPRESSLY DISCLAIMS WITH RESPECT TO THE EQUIPMENT ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND ALL IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. THERE IS NO WARRANTY OF ANY NATURE MADE BY TFT BEYOND THAT STATED IN THIS DOCUMENT.

This limited warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

8.0 MAINTENANCE

TFT products are designed and manufactured to be damage resistant and require minimal maintenance. However, as the primary firefighting tool upon which your life depends, it should be treated accordingly. To help prevent mechanical damage, do not drop or throw equipment.

8.1 FIELD LUBRICATION

All Task Force Tips nozzles are factory lubricated with high quality silicone grease. This lubricant has excellent wash out resistance, providing long term performance in firefighting nozzles. If your department has unusually hard or sandy water, the moving parts of the nozzle may be affected. Foam agents and water additives contain soaps and chemicals that may break down the factory lubrication.

The moving parts of the nozzle should be checked on a regular basis for smooth and free operation, and for signs of damage. **IF THE NOZZLE IS OPERATING CORRECTLY, THEN NO ADDITIONAL LUBRICANT IS NEEDED.** Any nozzle that is not operating correctly should be immediately removed from service. The nozzle can be returned to the factory at any time for a complete checkup and re-lubrication with silicone grease.

The field use of Break Free CLP (spray or liquid) lubricant will help to temporarily restore the smooth and free operation of the nozzle. These lubricants do not have the washout resistance and long-term performance of the silicone grease. Once Break Free CLP is applied, re-application will be needed on a regular basis until the nozzle can be returned to the factory for a complete checkup and re-lubrication with silicone grease.

CAUTION Aerosol lubricants contain solvents that can swell O-Rings if applied in excess. The swelling can inhibit smooth operation of the moving parts. When used in moderation, as directed, the solvents quickly evaporate without adversely swelling the O-Rings.

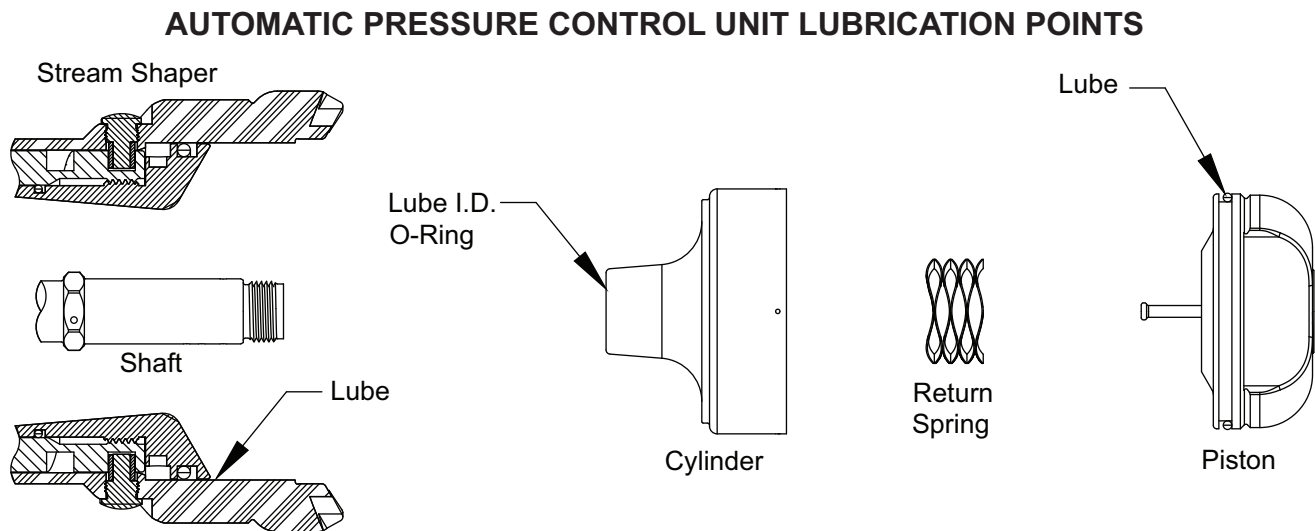


Figure 8.1

To access lubrication points in the control unit:

1. Shut off flow to the nozzle.
2. Move the Stream Shaper to the wide fog position.
3. Carefully unscrew the Piston/Cylinder.
 - The Cylinder is under about 25 lbs (11Kgf) of spring force. The spring must be compressed to reinstall.
4. Remove the Piston, Return Spring, and Cylinder.
5. Lubricate the points indicated.
6. Reassemble the nozzle.

8.2 SERVICE TESTING

In accordance with NFPA 1962, equipment must be tested a minimum of annually. Units failing any part of this test must be removed from service, repaired and retested upon completion of the repair.

8.3 REPAIR

Factory service is available with repair time seldom exceeding one day in our facility. Factory serviced equipment is repaired by experienced technicians, wet tested to original specifications, and promptly returned. Repair charges for non-warranty items are minimal. Any returns should include a note as to the nature of the problem and whom to reach in case of questions.

Repair parts and service procedures are available for those wishing to perform their own repairs. Task Force Tips assumes no liability for damage to equipment or injury to personnel that is a result of user service. Contact the factory or visit the web site at tft.com for parts lists, exploded views, test procedures and troubleshooting guides.

Performance tests shall be conducted on the equipment after a repair, or anytime a problem is reported to verify operation in accordance with TFT test procedures. Consult factory for the procedure that corresponds to the model and serial number of the equipment. Any equipment which fails the related test criteria should be removed from service immediately. Troubleshooting guides are available with each test procedure or equipment can be returned to the factory for service and testing.



Any alterations to the product or its markings could diminish safety and constitutes a misuse of this product.



All replacement parts must be obtained from the manufacturer to assure proper operation of the device.

9.0 EXPLODED VIEWS AND PARTS LISTS

Exploded views and parts lists are available at tft.com/serial-number.

10.0 OPERATION AND INSPECTION CHECKLIST

BEFORE EACH USE, the nozzle must be inspected to this checklist:

1. There is no obvious damage such as missing, broken or loose parts, damaged labels etc.
2. Waterway is clear of obstructions
3. Coupling is tight and leak free
4. Nozzle flow is adequate as indicated by pump pressure and nozzle reaction
5. Shaper turns freely and adjusts pattern through full range
6. Nozzle smoothly moves into full flush and out of flush with normal flow and pressure restored
7. Shaper detent (if so equipped) operates smoothly and positively.

BEFORE BEING PLACED BACK IN SERVICE, nozzles must be inspected to this checklist:

1. All controls and adjustments are operational
2. There are no broken or missing parts
3. There is no damage to the nozzle that could impair safe operation (e.g. dents, cracks, corrosion or other defects)
4. The thread gasket is in good condition
5. The waterway is clear of obstructions
6. Nozzle is clean and markings are legible
7. Coupling is retightened properly
8. Shaper is set to desired pattern



Equipment failing any part of the checklist is unsafe for use and must have the problem corrected before use or being placed back into service. Operating equipment that has failed the checklist is a misuse of this equipment.