

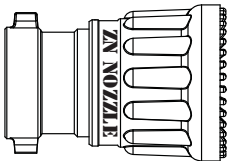
INSTRUCTIONS FOR INSTALLATION, SAFE OPERATION AND MAINTENANCE

▲ DANGER

Read instruction manual before use. Operation of this device without understanding the manual and receiving proper training is a misuse of this equipment. A person who has not read and understood all operating and safety instructions is not qualified to operate the ZN, ZM and ZO nozzle.

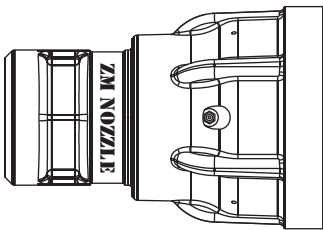
This instruction manual is intended to familiarize firefighters and maintenance personnel with the operation, servicing and safety procedures associated with the ZN, ZM and ZO firefighting nozzles.

This manual should be kept available to all operating and maintenance personnel.



ZN NOZZLE

250, 350, 500 or 750 GPM @ 100 PSI
 950, 1300, 2000 or 3000 LPM @ 7 BAR (700 KPA)

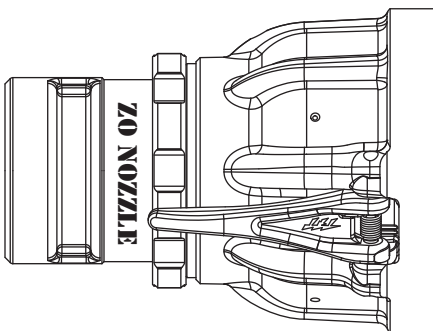


ZM NOZZLE

500 or 750 GPM @ 100 PSI
 2000 or 3000 LPM @ 7 BAR (700 KPA)



1000 or 1250 GPM @ 100 PSI
 3800 or 4750 LPM @ 7 BAR (700 KPA)



ZO NOZZLE

1250 or 1500 GPM @ 100PSI
 4750 or 5700 LPM @ 7 BAR (700KPA)



1750, 2000, or 2500 GPM @ 100 PSI
 6600, 7500, or 9500 LPM @ 7 BAR (700KPA)



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

Table Of Contents

1.0	MEANING OF SAFETY SIGNAL WORDS	4.0	FLUSHING DEBRIS
2.0	GENERAL INFORMATION	5.0	MAINTENANCE
2.1	USE WITH SALT WATER	6.0	FM APPROVAL (FACTORY MUTUAL)
2.2	VARIOUS MODELS AND TERMS	7.0	DRAWINGS & PARTS LIST
2.3	PATTERN CONTROL	8.0	WARRANTY
2.4	USE WITH FOAM		
2.4.1	FOAMJET LX WITH MASTERSTREAM NOZZLE		
3.0	FLOW CHARACTERISTICS OF ZN & ZM NOZZLES		
3.1	DETERMINING FLOW WITH PRE-PIPED MONITORS		
3.2	STREAM TRAJECTORY DATA		

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 standard Z535.4-2007, 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, may result in minor or moderate injury.





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

2.0 GENERAL INFORMATION

The Task Force Tips ZN, ZM and ZO Series nozzles are deluge nozzles with clean far reaching straight stream. They are adjustable from straight stream to a dense fog pattern. Their rugged construction is compatible with the use of fresh water as well as fire fighting foam solutions. A summary of each nozzle's characteristics is shown in the tables below.

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

NOZZLE	FLOW (GPM)	PRESSURE (PSI)	FLOW (LPM)	PRESSURE (BAR, KPA/100)	k FACTOR
ZN	250, 350, 500, 750	100	1000, 1500, 2000, 3000	7	15 - 75
ZM	500, 750	100	2000, 3000	7	50 - 125
ZM 	1000, 1250	100	3800, 4750	7	50 - 125
ZO	1250, 1500	100	4750, 5700	7	125-250
ZO 	1750, 2000, 2500	100	6600, 7500, 9500	7	125-250

NOTES ON TABLES:

- 2 ½ inch NH female threads are standard. Other threads and coupling sizes can be specified at time of order.
- ZM, ZN & ZO series nozzle are hardcoat anodized ANSI 356 aluminum.
- Temperature Rating: -25°F to 135°F (-32°C to 57°C) for ZN nozzles;
-40°F to 135°F (-40°C to 57°C) for ZM & ZO nozzles.

⚠ WARNING Injury can occur from an inadequately supported nozzle. The mounting must be capable of supporting the nozzle reaction force which can be in excess of 665 LBS (1250 GPM at 100 PSI).

⚠ WARNING Some volatile liquids can be ignited by static discharge. Static build-up can occur from:

- Electrochemical separation of charge as water drains through low conductivity, refined products.
- Applying foam over a low conductivity liquid of sufficient depth to retain the charge created as the foam blanket drains.
- Streaming currents as water or foam is introduced into the storage tank.¹

⚠ WARNING Water is a conductor of electricity. Application of water solutions on high voltage equipment can cause injury or death by electrocution. The amount of current that may be carried back to the nozzle will depend on the following factors:

Voltage of the line or equipment • Distance from the nozzle to the line or equipment
Size of the stream • Whether the stream is solid or broken • Purity of the water²

⚠ CAUTION Nozzle must be properly connected. Mismatched or damaged threads may cause nozzle to leak or uncouple under pressure and could cause injury.

⚠ CAUTION Do not couple aluminum to brass. Dissimilar metals coupled together can cause galvanic corrosion that can result in inability to unscrew threads or complete loss of thread engagement.

⚠ CAUTION The nozzle may become damaged if allowed to freeze while containing water. Always drain after use to avoid damage and possible loss of use.

¹ Electrostatic Hazards of Foam Blanketing Operations by Peter Howels. Industrial Fire Safety July/August 1993

² The Fire Fighter and Electrical Equipment, The University of Michigan Extension Service, Fourth Printing 1983. Page 47.

2.1 USE WITH SALT WATER

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

2.2 VARIOUS MODELS AND TERMS

See figures 1A, 1B and 1C for views of the ZN, ZM and ZO Series nozzles.

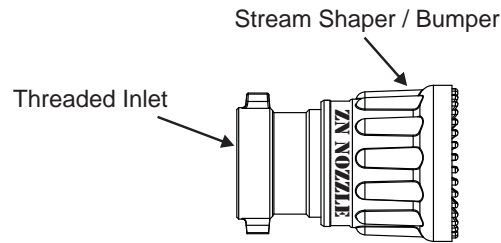


FIG 1A - ZN Nozzle

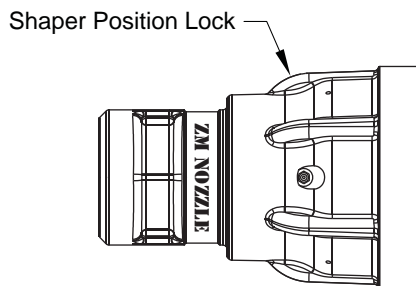


FIG 1B - ZM Nozzle

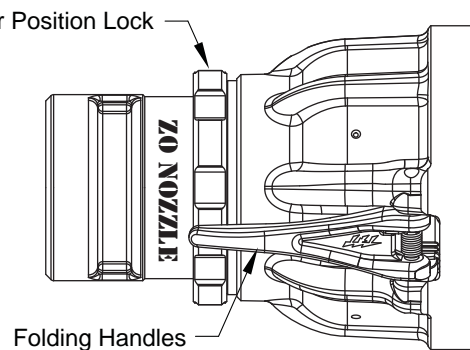


FIG 1C - ZO Nozzle

2.3 PATTERN CONTROL

TFT's nozzles have full pattern control from straight stream to wide fog. Turning the stream shaper clockwise (as seen from the operating position behind the nozzle) moves the shaper to the straight stream position. Turning the stream shaper counterclockwise will result in an increasingly wider pattern.

Since the stream trim point varies with flow, the stream trim point 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 narrow the fog pattern to parallel to give maximum reach. Note: Turning the shaper further forward will cause stream crossover and reduce the effective reach of the nozzle.

2.4 USE WITH FOAM

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

⚠ WARNING

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. Assure that: Application rate is sufficient (see NFPA 11 or foam manufacturer's recommendations); Enough concentrate is on hand to complete task (see NFPA for minimum duration time requirements); Foam logistics have been carefully planned. Allow for such things as: Storage of foam in a location not exposed to the hazard it protects; Personnel, equipment and technique to deliver foam at a rapid enough rate; Removal of empty foam containers; Keeping clear path to deliver foam as hoses, other equipment and vehicles are deployed.

⚠ WARNING

Improper use of foam can result in injury or damage to the environment. Follow foam manufacturer's instructions and fire service training to avoid: Using wrong type of foam on a fire, i.e. Class A foam on a Class B fire; Plunging foam into pools of burning liquid fuels; Causing environmental damage; Directing stream at personnel.

⚠ WARNING

There is a wide variety of foam concentrates. Each user is responsible for verifying that any foam concentrate chosen to be used with this unit has been tested to assure that the foam obtained is suitable for the purpose intended.

2.4.1 FOAMJET LX WITH MASTERSTREAM NOZZLE

To increase the expansion ratio and drain time, Task Force Tips "Foamjet LX" (model FJ-LX-MD) may be used with the ZN nozzle. This low expansion foam tube attaches and detaches quickly from the nozzle. Note: As expansion ratio is increased, the reach of the stream will be decreased due to the greater amount of bubbles in the stream and their inability to penetrate the air. Generally, the 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.

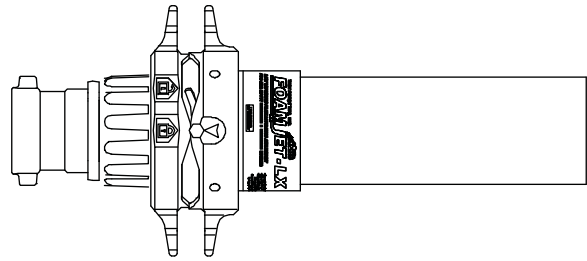
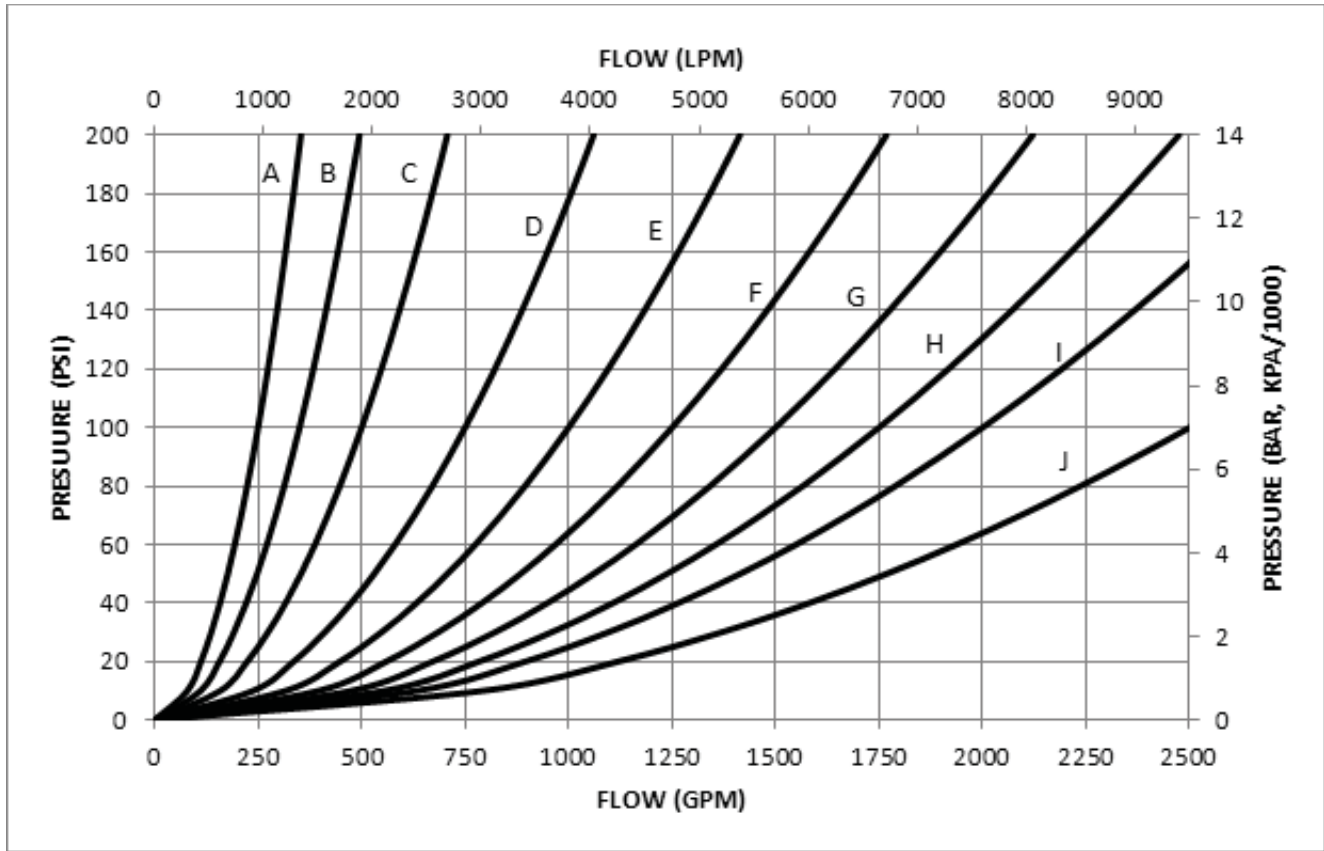


FIG 2.4.1 - FJ-LX-MD Shown on ZN Nozzle

3.0 FLOW CHARACTERISTICS OF ZN & ZM NOZZLES

The ZN, ZM & Z0 Nozzles are manufactured to a predetermined fixed orifice. The orifice size is not adjustable and is specified at time of order. 250, 350, 500 or 750 GPM flow rates at 100 PSI are available on the ZN, 500, 750, 1000 or 1250 GPM @ 100 psi are available on the ZM nozzle and 1250, 1500, 1750, 2000 or 2500 GPM flow rates @ 100 psi are available on the Z0. The flow rate is marked on the nozzle's baffle. Figure 3 gives relationship of flow and pressure for various orifice sizes.



Line	Baffle
A	250GPM @ 100PSI
B	350GPM @ 100PSI
C	500GPM @ 100PSI
D	750GPM @ 100PSI
E	1000GPM @ 100PSI

Line	Baffle
F	1250GPM @ 100PSI
G	1500GPM @ 100PSI
H	1750GPM @ 100PSI
I	2000GPM @ 100PSI
J	2500GPM @ 100PSI

FIG 3 - Nozzle Flow Characteristics



An inadequate supply of nozzle pressure and/or flow will cause an ineffective stream and can result in injury, death or loss of property.

3.1 DETERMINING FLOW WITH PRE-PIPED MONITORS

The simplest procedure to determine flow is with a flow meter. If a flow meter is unavailable then 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.

Step1: Determine flow of smooth bore nozzle.

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

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

Where: F = 29.71 for English units (GPM, INCHES, PSI)
 F = .667 for metric units (LPM, MM, BAR) Note: 1 BAR=100 KPA
 Q_{nozzle} is smooth bore nozzle flow in GPM (or LPM)
 D is nozzle exit diameter in INCHES (or MM)
 P_{pitot} is pitot pressure in PSI (or BAR)

Step 2: Find piping 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.

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

Where: C_{piping} is pressure loss constant in GPM²/PSI (or LPM²/BAR)
 $P_{\text{in-line}}$ is inline pressure gauge reading in PSI (or BAR)

Step 3: Calculate nozzle constant.

Where: C_{nozzle} is the nozzle's constant in GPM²/PSI (or LPM²/BAR)
 Q_{nominal} is the nozzle's nominal flow in GPM (or LPM)
 P_{nominal} is the nozzle's nominal pressure in PSI (or BAR)

$$C_{\text{nozzle}} = \frac{Q_{\text{nominal}}^2}{P_{\text{nominal}}}$$

Step 4: Calculate flow.

Using the pressure loss constant from step 2, the nozzle constant from step 3, and the in-line pressure gauge reading, the flow with a fixed orifice nozzle can be calculated with the following equation.

$$Q = \sqrt{\frac{C_{\text{piping}} \times C_{\text{nozzle}} \times P_{\text{in-line}}}{(C_{\text{piping}} + C_{\text{nozzle}})}}$$

Where: Q is fixed orifice nozzle's flow in GPM (or LPM)

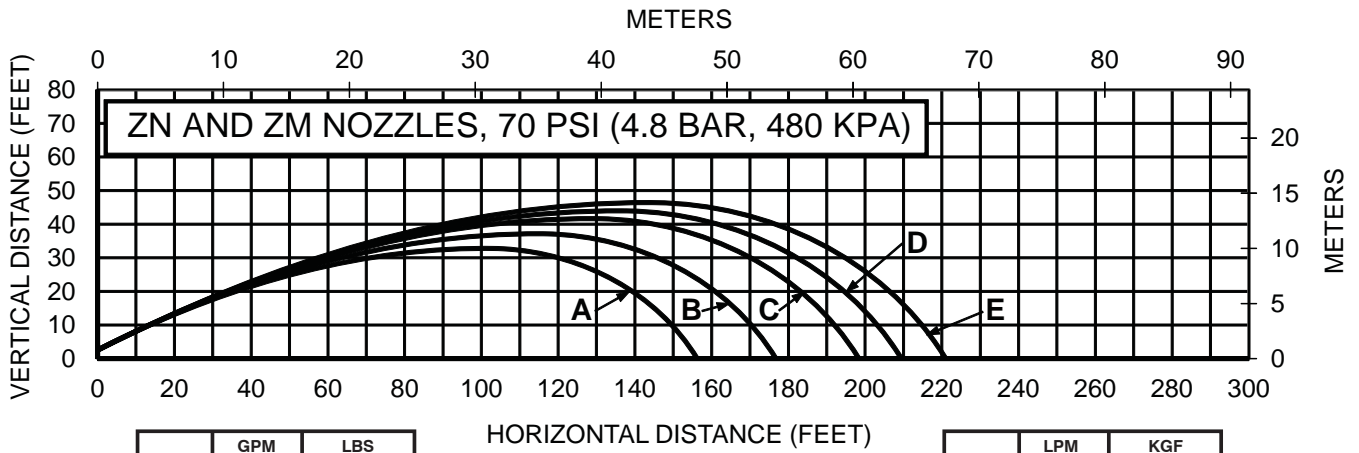
Mount a graph or table of the results adjacent to the in-line pressure gauge. Deliver any desired flow by adjustment of pump pressure.

3.2 STREAM TRAJECTORY DATA

Figure 5 gives the stream trajectory for the nozzles at various pressures. The graphs represent orifice sizes as defined in Figure 3. For other orifice sizes and pressures the graphs may be interpolated.

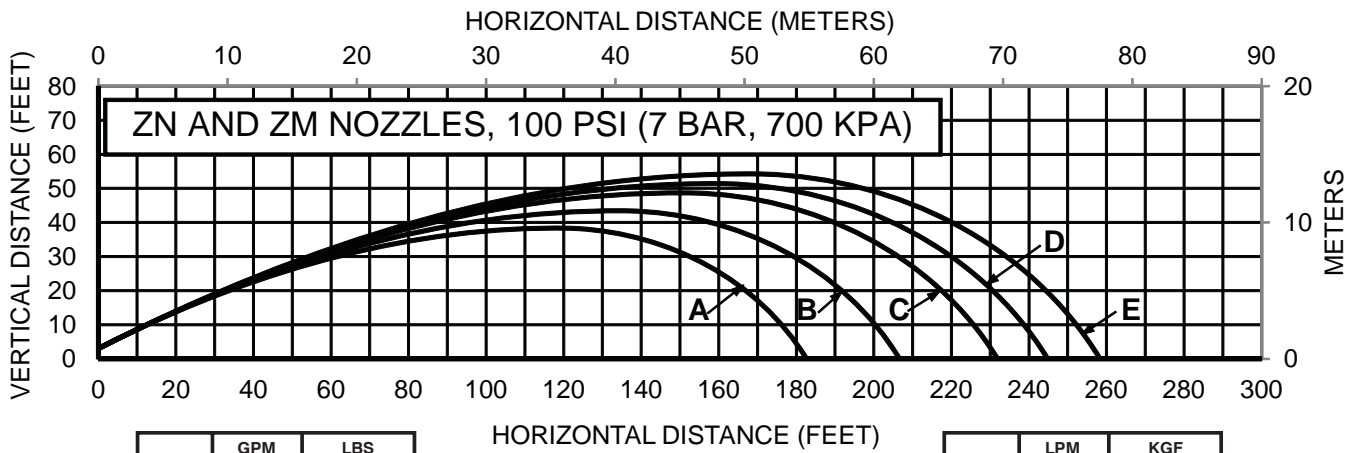
Notes on trajectory graphs:

- Graphs show approximate effective stream trajectory at 30 degrees elevation in no wind conditions. Distance to last water drops approximately 10% farther.
- Trajectories shown are for water. The addition of foam is expected to decrease the reach by approximately 10%.
- Tail or head winds of 20 MPH (30 KPH) may increase or decrease the range approximately 30%.



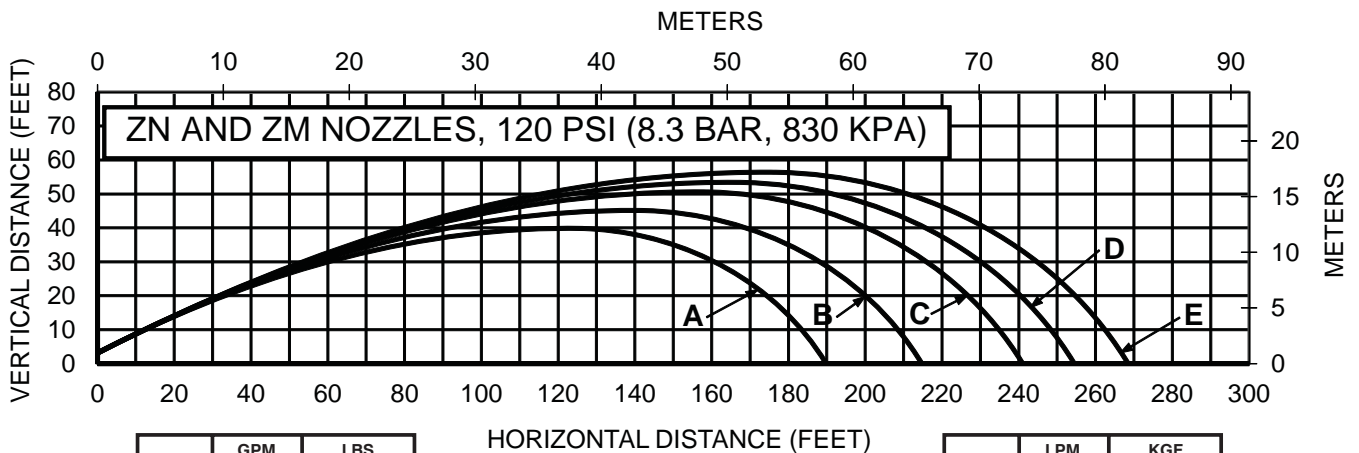
CURVE	GPM FLOW	LBS REACTION
A	250	110
B	420	180
C	670	280
D	840	350
E	1075	440

CURVE	LPM FLOW	KGf REACTION
A	900	50
B	1600	80
C	2500	130
D	3200	160
E	4000	200



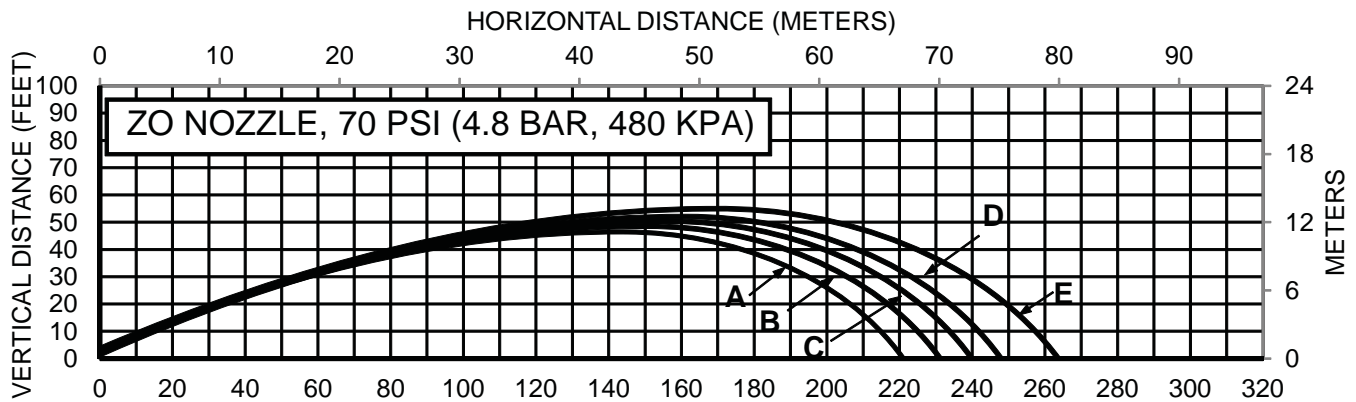
CURVE	GPM FLOW	LBS REACTION
A	300	150
B	500	250
C	800	400
D	1000	510
E	1250	630

CURVE	LPM FLOW	KGf REACTION
A	1100	70
B	1900	120
C	3000	180
D	3800	230
E	4700	290



CURVE	GPM FLOW	LBS REACTION
A	330	180
B	550	300
C	880	490
D	1100	610
E	1370	760

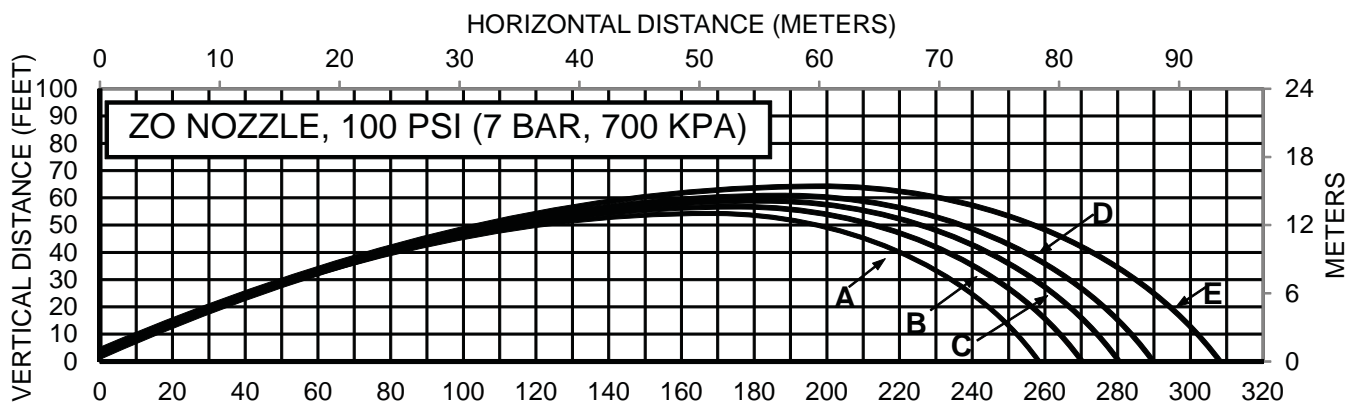
CURVE	LPM FLOW	KGf REACTION
A	1200	80
B	2100	140
C	3300	220
D	4200	280
E	5200	340



CURVE	GPM FLOW	LBS REACTION
A	1050	440
B	1250	530
C	1400	590
D	1700	720
E	2010	850

HORIZONTAL DISTANCE (FEET)

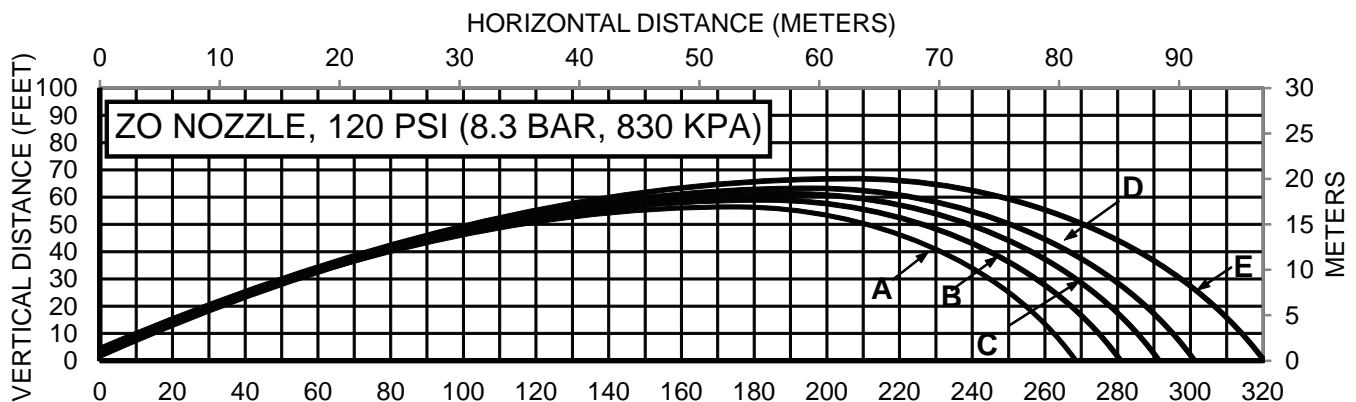
CURVE	LPM FLOW	KGf REACTION
A	4000	200
B	4700	240
C	5300	270
D	6400	320
E	7600	380



CURVE	GPM FLOW	LBS REACTION
A	1250	630
B	1500	760
C	1750	880
D	2000	1010
E	2500	1260

HORIZONTAL DISTANCE (FEET)

CURVE	LPM FLOW	KGf REACTION
A	4700	290
B	5700	350
C	6600	400
D	7600	460
E	9500	580



CURVE	GPM FLOW	LBS REACTION
A	1320	730
B	1650	910
C	2000	1110
D	2200	1220
E	2800	1550

HORIZONTAL DISTANCE (FEET)

CURVE	LPM FLOW	KGf REACTION
A	5000	330
B	6200	410
C	7600	500
D	8300	550
E	10600	700

Fig. 3.2 Stream Trajectory Data

4.0 FLUSHING DEBRIS

Debris in the water may get caught inside the nozzle. This trapped material will cause poor stream quality, shortened reach and reduced flow. To remove debris trapped in the nozzle:

- 1) Shut off flow to the nozzle.
- 2) Move the stream shaper to the wide fog position.
- 3) For ZN Nozzle: Unscrew baffle using a 1-1/8 inch (28mm) socket.
For ZM Nozzle: Unscrew the bolt using 7/8" socket and remove baffle.
For ZO Nozzle: Unscrew the bolt using a large adjustable wrench and remove baffle.
- 4) Remove debris. Flow water to flush if necessary.
- 5) Reassemble the nozzle.



Large amounts 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.

5.0 MAINTENANCE

Nozzles must be checked regularly to assure proper operation. Contact factory for parts lists and exploded views for particular models.

6.0 FM APPROVAL (FACTORY MUTUAL)

FM Approved nozzles are identified with the symbol



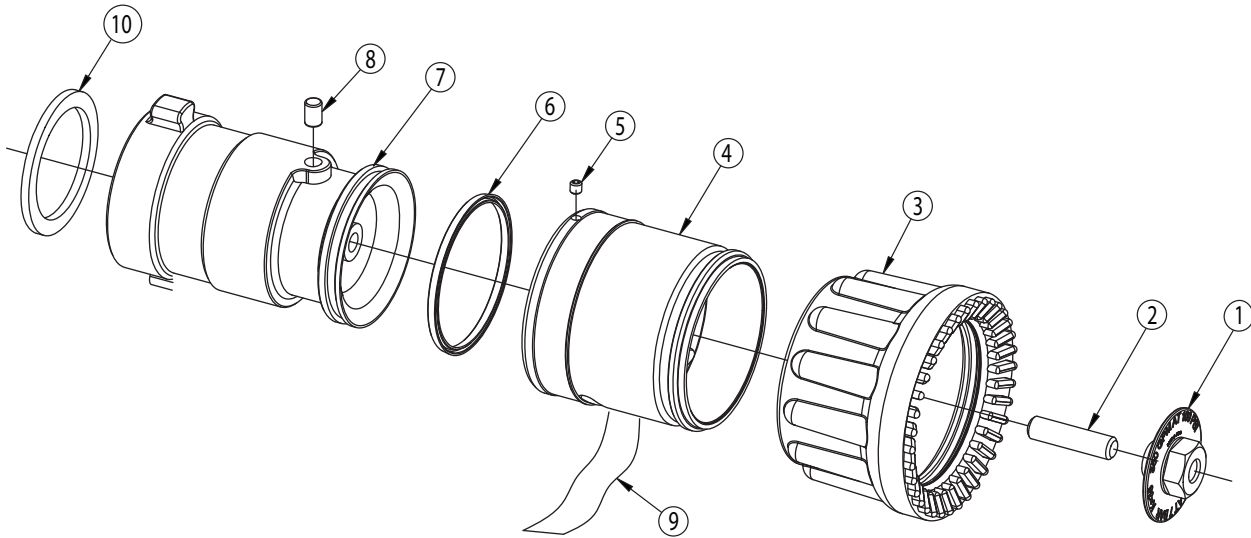
on their label.

All models with FM Approval have been tested to FM Approval Class 5511-Firefighting Nozzles for Use with Hose, Monitor Assemblies and other Firefighting Equipment.

FM Approved nozzles are not FM Approved for use with foam.

7.0 DRAWINGS & PARTS LIST

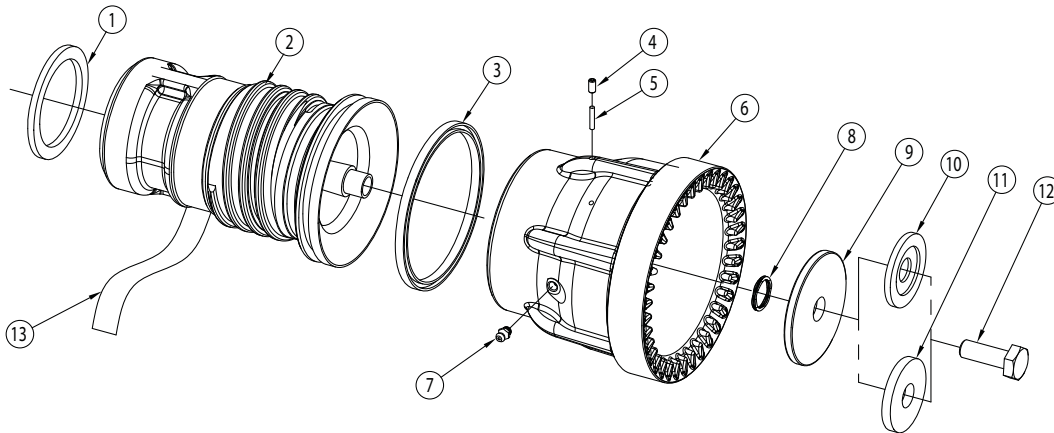
ZN NOZZLE



ITEM	DESCRIPTION	QTY	PART
1	BAFFLE 350 GPM	1	Z565
	BAFFLE 500 GPM	1	Z566
	BAFFLE 750 GPM	1	Z567
2	1/2-13 X 2 STUD - FULL THREAD	1	VT50-13SD2.0
3	BUMPER	1	Z700
4	STREAM SHAPER	1	Z505

ITEM	DESCRIPTION	QTY	PART
5	1/4-28 X 1/4 SOCKET SET SCREW	1	VT-25-28SS250
6	SHAPER SEAL 3.255 ID - DEFLASHED	1	Z330
7	IND. NOZ. BODY ALUM 2.5" NH	1	Z650ANJ
8	CAM PIN	1	Z660
9	NAME LABEL - ZN NOZZLE	1	ZL150
10	GASKET - 2.5" HOSE COUPLING	1	V3190

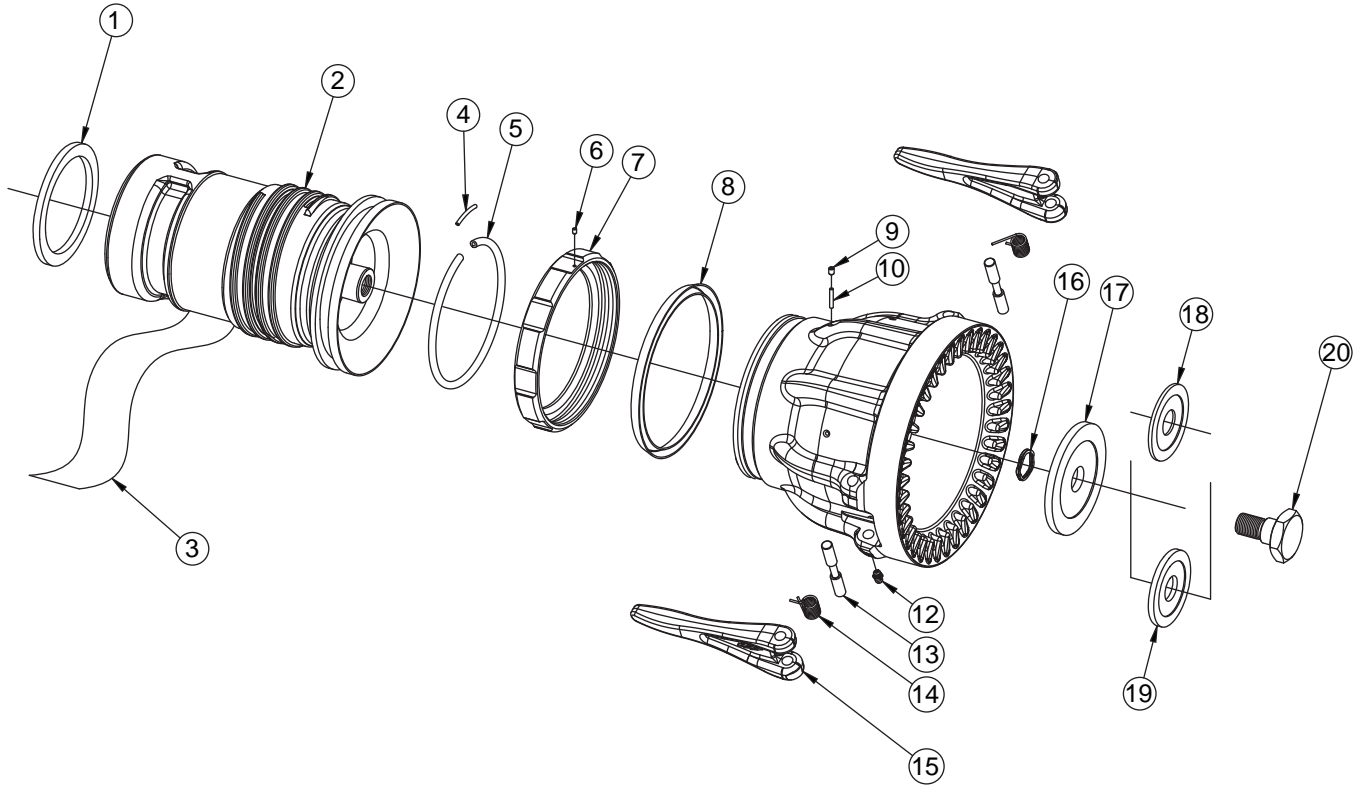
ZM NOZZLE



ITEM	DESCRIPTION	QTY	PART	ITEM	DESCRIPTION	QTY	PART
1	GASKET - 2.5" HOSE COUPLING	1	V3190	8	SPRING	1	ZFM580
2	NOZZLE BODY 2.5" NH	1	ZFM600NJ	9	BAFFLE K=125	1	ZFM560
3	CUP SEAL 4.25 X 4.75 X 1/4	1	XGE380	10	SUBBAFFLE K=75 & K=100	1	ZFM565
4	10-32 X 3/8 SOCKET SET SCREW	1	VT10-32SS375	11	SUBBAFFLE K=50 - LASERED	1	ZFM570
5	PIN - .680 X 1/8" DIA.	1	D07550	12	HEAVY HEX BOLT 1/2"-13 X 1.5"	1	ZFM575
6	NOZZLE SHAPER	1	ZFM500	13	ZM NAME LABEL	1	ZFML150
7	GREASE FITTING 1/4-28	1	VT25-28ZERK			1	

7.0 DRAWINGS & PARTS LIST

ZO NOZZLE



ITEM	DESCRIPTION	QTY	PART
1	GASKET - 2.5"	1	V3190
2	ZO NOZZLE BODY 3.5"NH INLET	1	ZFM700N
	ZO NOZZLE BODY 3.5"BSP INLET		ZFM700B
3	NAME LABEL - ZO NOZZLE	1	ZFML250
	NAME LABEL - ZO NOZZLE - FM APPROVED		ZFML255
4	TUBING	1	ZFM745
5	TUBING	1	ZFM755
6	6-32 X 3/16 SOCKET SET SCREW	1	VT06-32SS187
7	ZO LOCK RING	1	ZFM725
8	CUP SEAL 6.25"OD X 5.5" X .375"	1	ZFM750
9	10-32 X 1/4 SOCKET SET SCREW	1	VT10-32SS250
10	1/8 X 3/4 HDP SPIROL PIN	1	VP125X750
11	ZO NOZZLE SHAPER	1	ZFM710
12	GREASE FITTING 1/4-28	1	VT25-28ZERK
13	PIVOT PIN	2	A4262
14	HANDLE TORSION SPRING	2	A4263
15	STORZ FOLDING HANDLE	2	A4261
16	ZO NOZZLE BAFFLE SPRING	1	ZFM740
17	BAFFLE K= 250	1	ZFM730
18	BAFFLE K= 175 & K=200	1	ZFM731
19	BAFFLE K= 125 & K=150	1	ZFM732
20	HEAVY HEX BOLT	1	ZFM720

8.0 WARRANTY

Task Force Tips, Inc., 3701 Innovation Way, Valparaiso, Indiana 46383-9327 ("TFT") warrants to the original purchaser of its ZN, ZM and Masterstream series nozzles ("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, 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.

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