

PLAGATE NOZZLES

The superior runnerless molding system



FISA
CORPORATION

FISA Corporation

The American company, based in Shelbyville, Tennessee, is the marketing, distribution and service arm of a highly respected Japanese manufacturer of precision nozzles for the injection molding industry. Its PLAGATE System is recognized as superior to any competitive product currently on the market in the U.S., and has been popular in other parts of the world for many years.

The PLAGATE System is simple and compact in design, without pneumatic or hydraulic cylinders, requires no timing device for opening and closing the gate, has easy gate balance control and a perfect gate seal, which increases product quality and reduces waste. The nozzles are easy to install or remove, require minimum maintenance and are cost effective through reduction in wasted material, minimized cycle time and reduction of post-injection finishing processes.

The company was established in 1959, and during its early years developed and produced a high-temperature camera for X-ray analysis, a sphere-boring machine, and a series of electrostatic eliminators. It developed the PLAGATE System in 1974 and was subsequently awarded the Ichimura Prize for Originality in Engineering. In 1994, FISA won an award from the Tokyo Chamber of Commerce and Industry for environmental preservation.

The company now operates 6 manufacturing facilities and 7 sales and service offices throughout Japan, and markets its products in over 15 countries worldwide. Opening of the U.S. company in 1996 was its first venture in North America.



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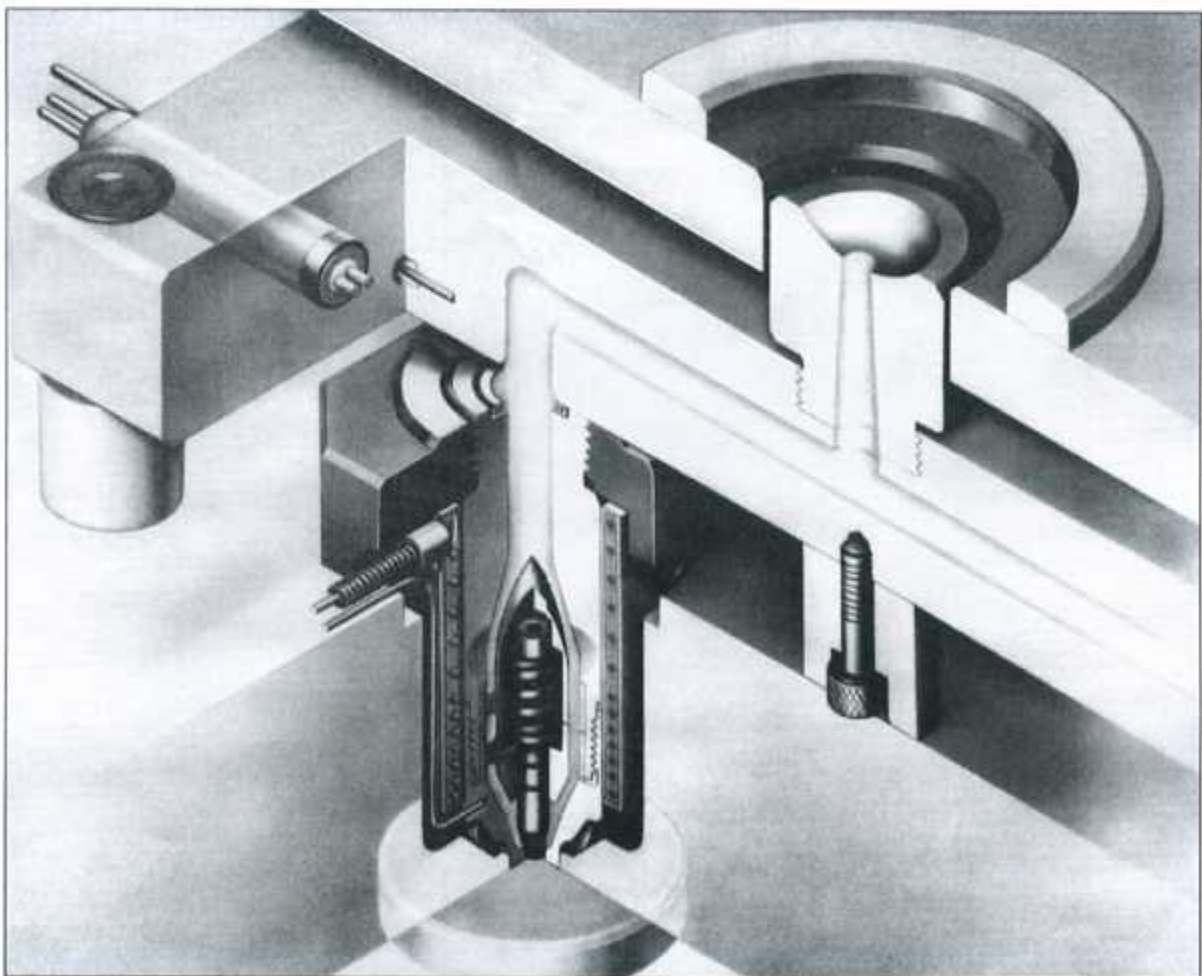
FISA's original valve-gate system, a practical design to meet the needs of the customer.

Plagate is FISA's original runnerless molding system, equipped with a special valve-mechanism.

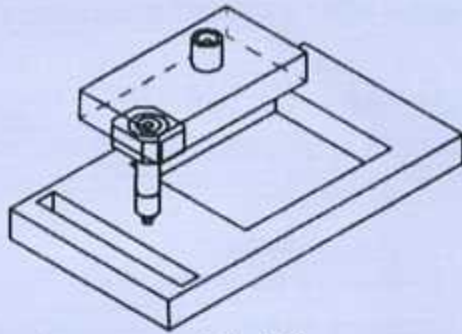
The NH type Plagate runnerless molding nozzle is mounted to the mold, and used in the automatic injection molding of thermoplastics. 100% of material is utilized, leaving no sprues or runners.

For the Plagate nozzle, no external driving force is needed to open or close the gate. The gate is opened and closed automatically by the injection-pressure operated valve.

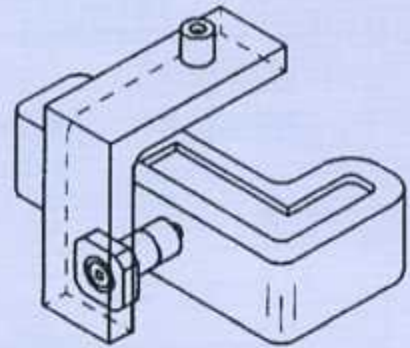
The NR type Plagate barrel nozzle is of the same patented design as the NH type.
(U.S. Patent #4,427,361)



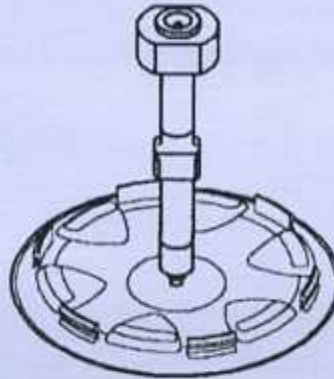
Examples of Plagate Molded Products



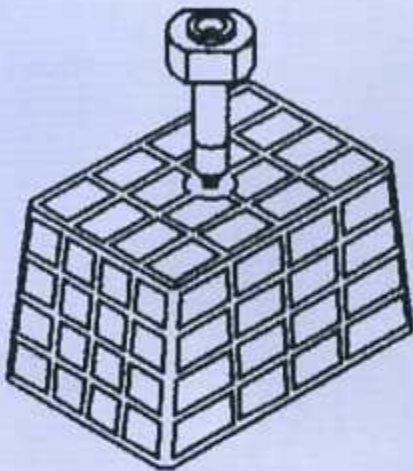
PA 170g



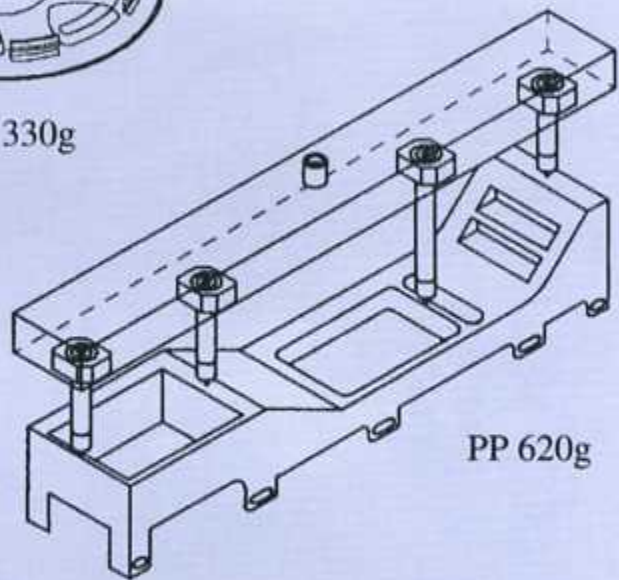
ABS 410g



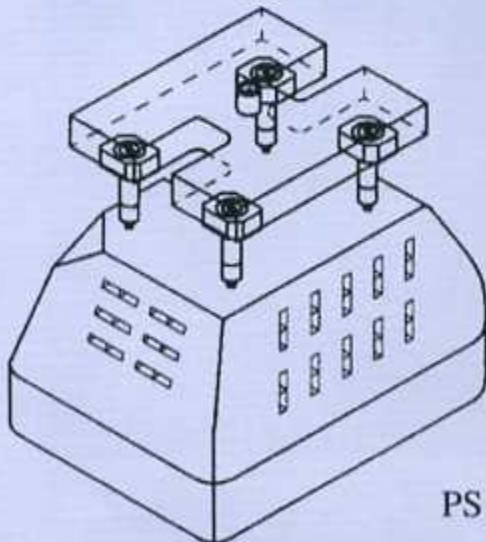
PPO 330g



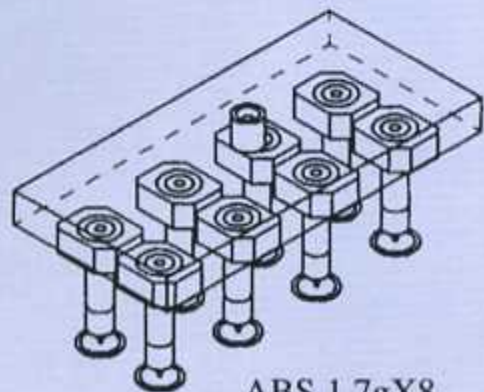
PP 670g



PP 620g

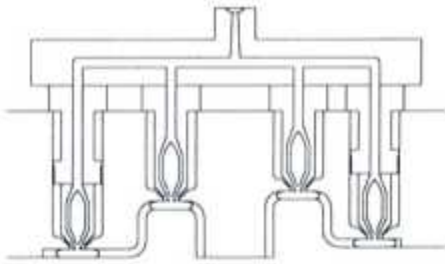


PS 3.7kg



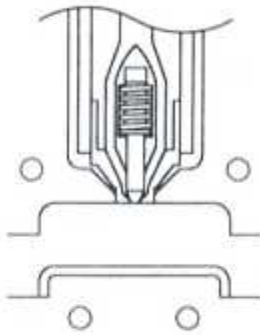
ABS 1.7gX8

Versatility and ease of use with the Plagate Nozzle



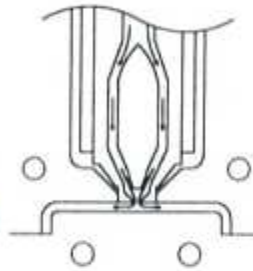
Well-balanced gate for multicavity production

Multicavity gates open only after the pressure in all nozzles is equal, thus all nozzles open and close simultaneously. This also prevents the nozzles from injecting uneven amounts of resin, insuring continuity in production.



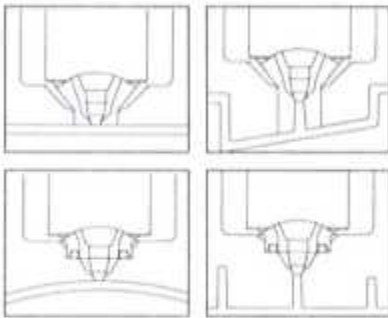
Perfect Gate-Seal

The perfect sealing of the gate, through the use of a powerful spring and piston, eliminates problems normally encountered with stringing or drooling of resin, as well as unwanted stubs or projections.



No Resin Build-up Points

All flow channels in the Plagate nozzle are streamlined in design, insuring complete melting and usage of resin without overheating, scorching, or burning. Color changes do not require disassembly.

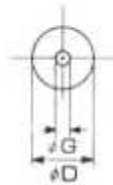


Quality, Accuracy, and Reliability

The Plagate nozzle is manufactured precisely and uniformly to the highest manufacturing standards, to withstand extremes of heat and high pressure.



If a non-catalog nozzle length is required, an adaptor or special body is required.



Top Type Gate Marks

With the top-type nozzle, the cap ØD , and ØG leave a mark on the product, seen as a double-circle.



Topless Type Gate Marks

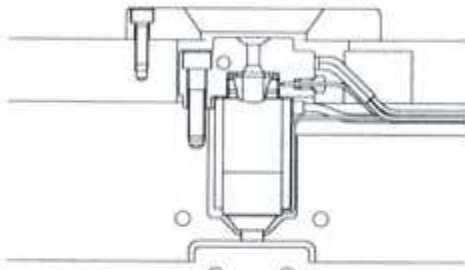
With the topless-type nozzle, the circle mark of the gate ØG is left on the product.

Maintenance and repairs, when needed, are quickly and easily made with common shop tools. All Plagate parts may be replaced with interchangeable components from parts stocks in Shelbyville, Tennessee.

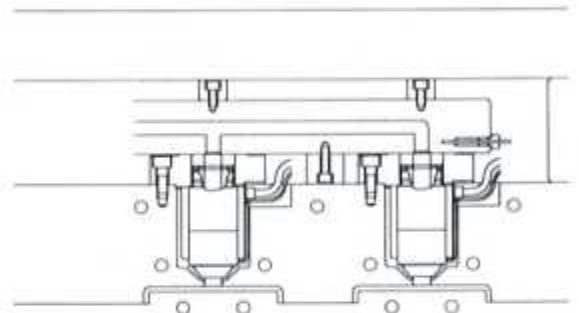
Plagate Molded Products



Through the use of the proper flange, the Plagate Nozzle can be easily mounted to the mold.



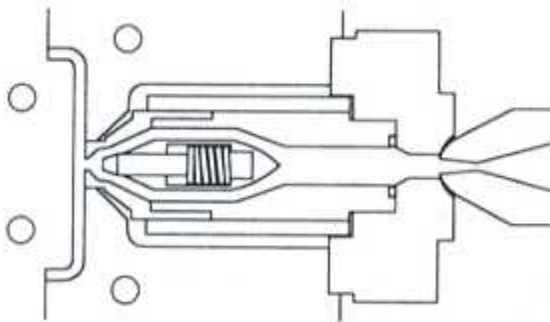
Single gate and mold



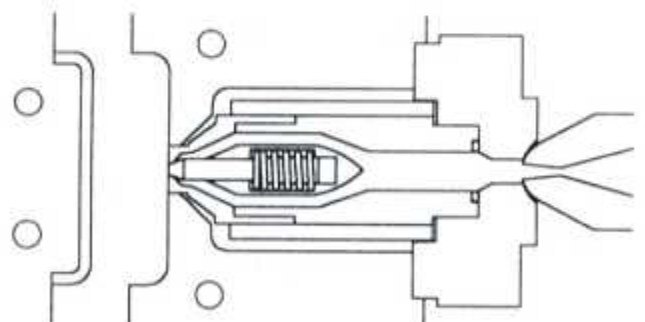
Multi-gate and mold

Manifolds are custom made

The gate is opened and closed by the pressure of the resin in the nozzle.



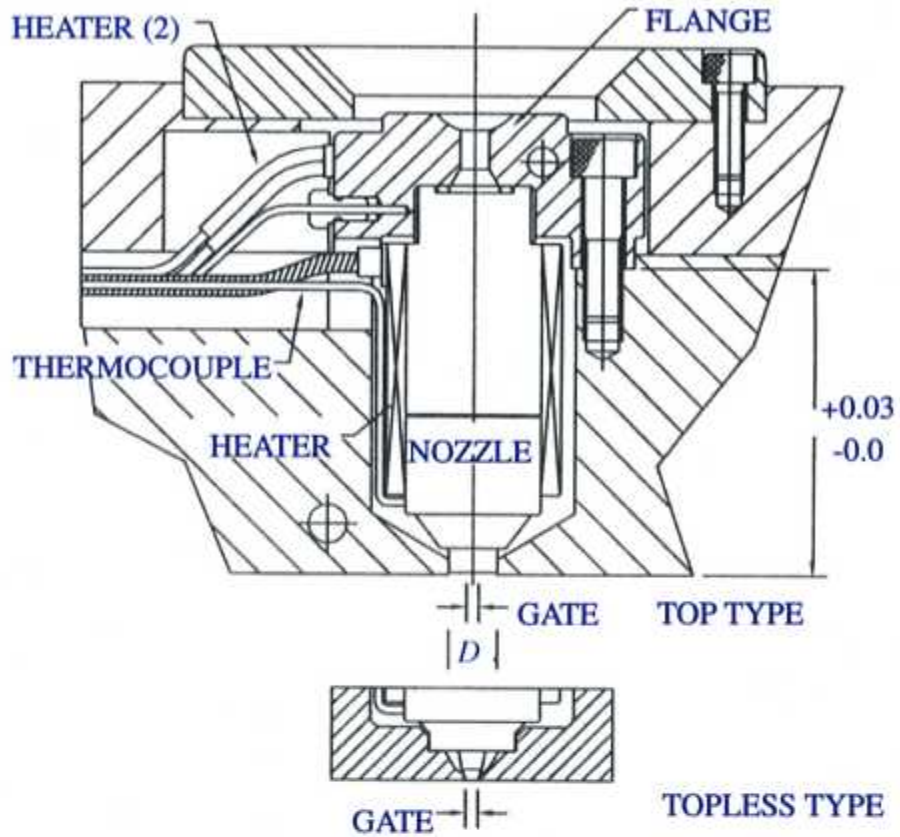
When high resin pressure is in the nozzle, the piston slides back, opening the gate.



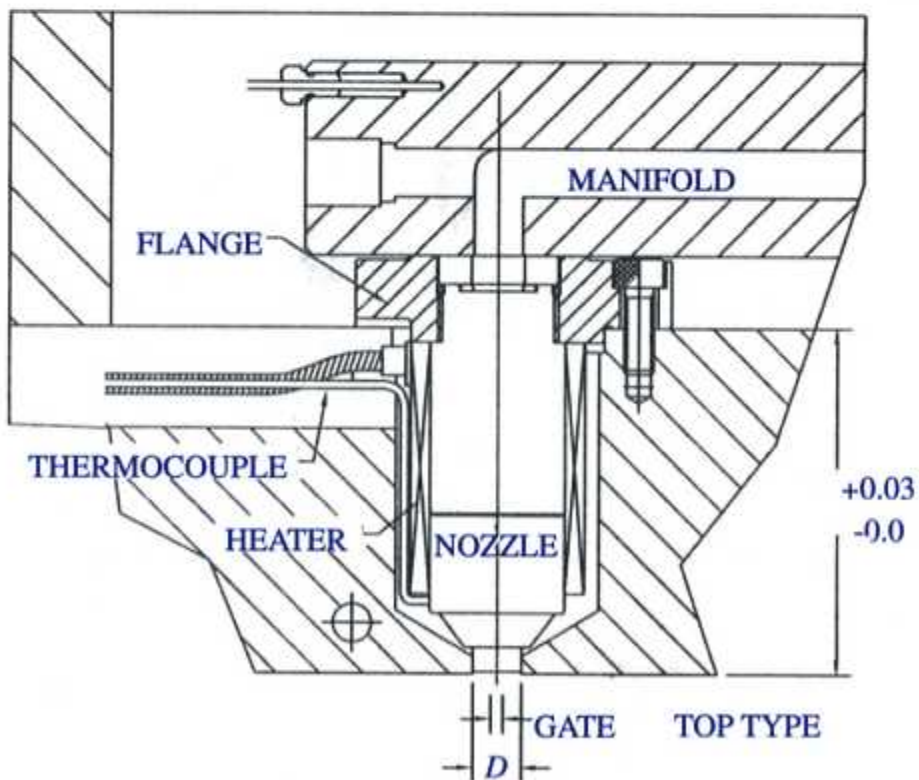
When there is low resin pressure in the nozzle, the spring pressure on the piston closes the gate.

Typical Installations

NH & AH MONO FLANGE INSTALLATION



NH & AH MULTI FLANGE INSTALLATION

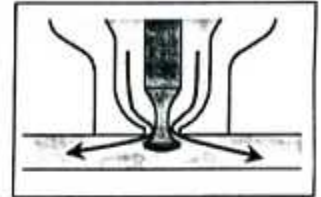


PLAGATE NOZZLES

The AH Plagate Series is designed for PC & PC Alloys, and performs well with nearly any resin. The mold preparation is as the NH Series. Contact FISA for information about Topless Type AH Nozzles.

AH Series

FISA's new patented valve gate nozzle has less flow stress and improved resin flow near the gate.



FEATURES

High Resin Flow, Low Sheer Stress

The resin flow through the gate area is smoother, reducing molecular pressure and fragmentation of the resin, therefore, reducing sheer stress.

Preventing The Backflow of Resin

The piston is a specially shaped design which seals the gate precisely and prevents backflow from the cavities.



Durable, Low Maintenance Design for High Volume Production

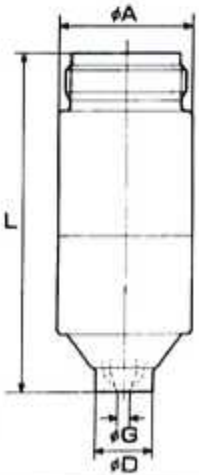
FISA's patented internal structure is a durable, low maintenance design for high volume production.

FISA's Patented Valve Mechanism

Patented internal spring design, utilizes resin pressure for opening and closing of the gate.

Simple Mechanism

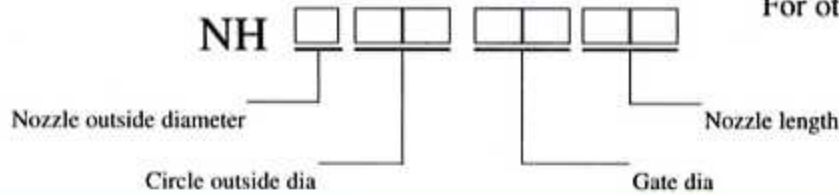
The simplicity of the design permits easy operation on the piston, eliminating drooling problems, and insuring smooth resin flow.

AH NOZZLE STANDARD SPECIFICATIONS											
TYPE	MODEL	CIRCLE OUTSIDE DIA (ØD)	GATE DIA (ØG)	NOZZLE OUTSIDE DIA (ØA)	06	07	08	10	12	15	
					60mm	70mm	80mm	100mm	120mm	150mm	
AH2	1030	10	3.0	28	•	•	•	•	•		
	1240		4.0		•	•	•	•			
	1550	15	5.0				•	•	•	•	
AH4	2050		5.0				•	•	•	•	
	2068		20		6.8			•	•	•	
*AH7	30120	30	12.0		70			•	•	•	

*Contact FISA

NH Standard Specifications

Example



For other than standard lengths
contact FISA.

TOP TYPE

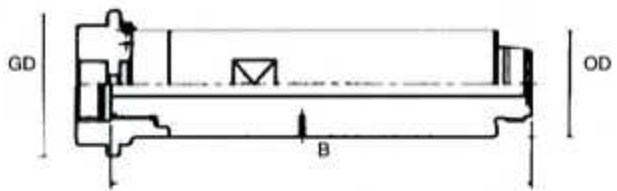
TYPE	MODEL	CIRCLE OUTSIDE DIA (ØD)	GATE DIA (ØG)	NOZZLE OUTSIDE DIA (ØA)	NOZZLE LENGTH (L)					
					06 60mm	07 70mm	08 80mm	10 100mm	12 120mm	15 150mm
NH2	05 12	5	1.2	28	.	.	.			
	07 12	7	1.2		.	.	.	.	.
	" 18		1.8		.	.	.	.	.
	10 18	10	1.8		.	.	.	.	.
	" 26	12	2.6		.	.	.	.	.
	12 26		2.6		.	.	.	.	.
	15 26		15		2.6	.	.	.	.	.
NH4	15 30	15	3.0	40			.	.	.	.
	20 50	20	5.0				.	.	.	.

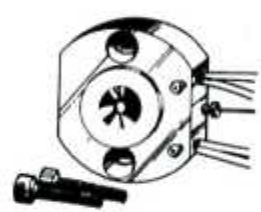
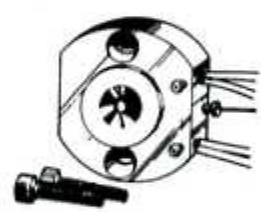


TOPLESS TYPE

TYPE	MODEL	CIRCLE OUTSIDE DIA (ØD)	RING	GATE DIA (ØG)	NOZZLE OUTSIDE DIA (ØA)	NOZZLE LENGTH (L)					
						06 60mm	07 70mm	08 80mm	10 100mm	12 120mm	15 150mm
NH2	16 12	16	SU1618	1.2	28	.	.	.	.	.
	" 18			1.8		.	.	.	.	.
	" 26			2.6		.	.	.	.	.
	18 12	18	PS157	1.2		.	.	.	.	.
	" 18			1.8		.	.	.	.	.
	" 26			2.6		.	.	.	.	.
NH4	20 30	20	SU2022	3.0	40	.	.	.	.	.	.
	22 30	22	PS157					.	.	.	.






Nozzle Parts

ADAPTER FOR LONG NOZZLE				
TYPE OF NOZZLE	MODEL	GUIDE DIA. (GD)	ADAPTER OUTSIDE DIA. (OD)	+B (NH STANDARD NOZZLE +B)
AH2/NH2	AD24	42	28	130 370
NH2/NH4	AD45	54	40	170*500



PF MONO-FLANGE	PF MULTI-FLANGE
<p>For single gate</p> <p>AH2/NH2</p>  <p>PF2832R (SPHERICAL RADIUS)</p> <p>Includes 2 cap screws (M8X30) and 2 heaters (60603, 240VX300W)</p> <p>AH4/NH4</p>  <p>PF4036R (SPHERICAL RADIUS)</p> <p>Includes 2 cap screws (M8X30) and 2 heaters (60703, 240VX300W)</p>	<p>For multi-cavity</p> <p>AH2/NH2</p>  <p>PART #</p> <p>PF2815 (PS256)</p> <p>(Including 2 pcs of cap-screw M6X25 and one PC of PS256)</p> <p>AH4/NH4</p>  <p>PART #</p> <p>PF4019 (PS286)</p> <p>(Including 2 pcs of cap-screw M6X25 and one PC of PS286)</p>





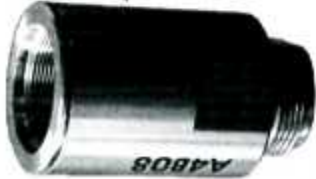
GATE	STOCK CAP	MAX SHOT RECOMMENDED	SPRING PRESSURE	HIGH
1.2mm (.047)	5mm, 7mm & TL	100g (0.22lbs.) ABS 200g (0.44lbs.) PP	110Kg/cm (1562 psi)	161Kg/cm (2286 psi)
1.8mm (.070)	7mm, 10mm & TL	300g (0.66lbs.) ABS 400g (0.88lbs.) PP	122Kg/cm (1732 psi)	180Kg/cm (2556 psi)
2.6mm (.102)	10, 12 & 15mm & TL	500g (1.1lbs.) ABS 800g (1.7lbs.) PP	165K/cm (2343 psi)	240K/cm (3408 psi)
3.0mm (.118)	15mm & TL	800g (1.7lbs.) ABS 1200g (2.64lbs.) PP	80 Kg/cm (1136 psi)	185 Kg/cm (2627 psi)
5.0mm (.196)	20, 25.4mm	1000g (2.2lbs.) ABS 2000g (4.4lbs.) PP	62Kg/cm (880 psi)	145Kg/cm (2059 psi)

NH COMPOSITION					
					
Cap	Torpedo	Piston	Spring	Torpedo	Body

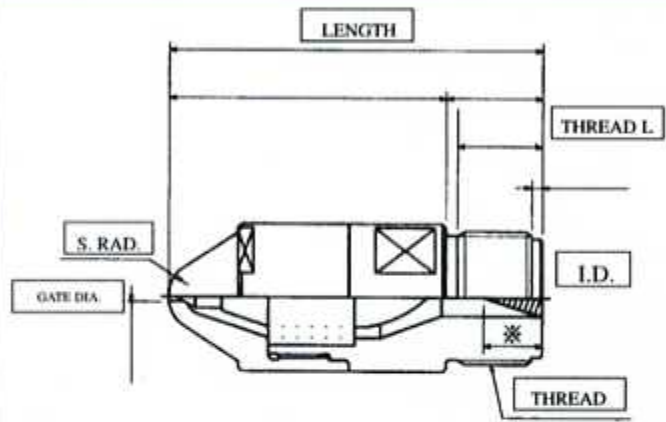
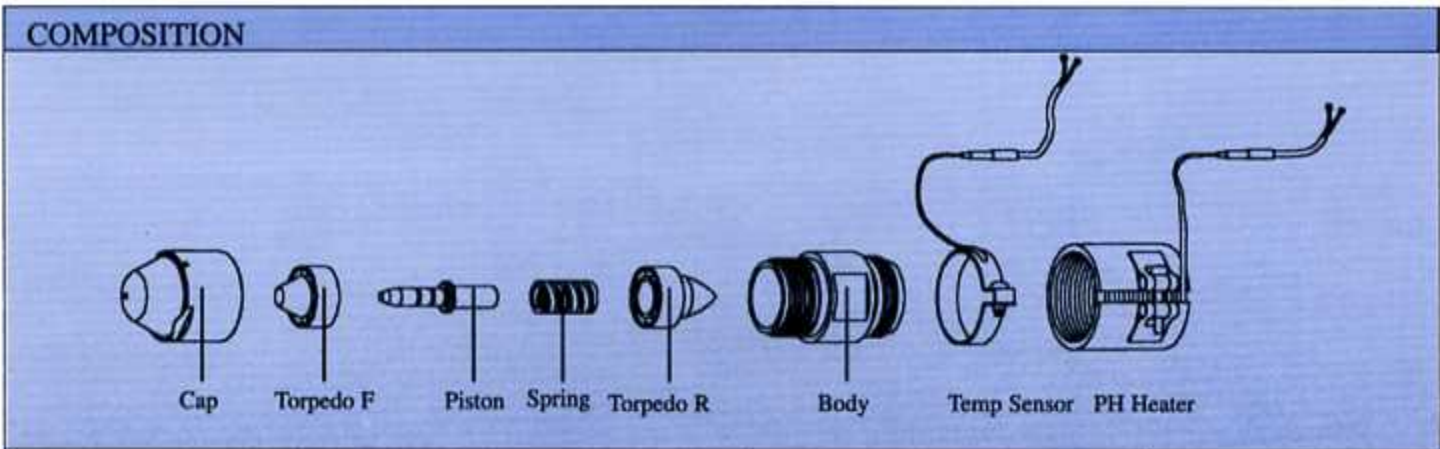
Ring Heaters and Thermocouples

PART #	D X L mm	D x L in	watts / 240 V	ohms	PH 28 ID 28mm (1.10 in.) PH 28 OD 36mm (1.42 in.)			
					Part #	Length	Ohms	Watts @ 240
CH60603	6.3 x 63.5	1/4 x 2.5	300	192				
CH60703	6.3 x 76.2	1/4 x 3	300	192				
CH90605	9.5 x 63.5	3/8 x 2.5	500	115	PH28F06	32mm (1.26 in.)	165	350
CH90706	9.5 x 76.2	3/8 x 3	600	96	PH28F07	42mm (1.65 in.)	165	350
CH90707	9.5 x 76.2	3/8 x 3	750	82	PH28F08	52mm (2.05 in.)	165	350
CH90806	9.5 x 88.9	3/8 x 3.5	600	96	PH28F10	72mm (2.83 in.)	144	400
CH91006	9.5 x 101.6	3/8 x 4	600	96	PH28F12	92mm (3.62 in.)	144	400
CH91008	9.5 x 101.6	3/8 x 4	850	72	PH28F145	117mm (4.60 in.)	96	600
CH91105	9.5 x 114.3	3/8 x 4.5	500	115	PH28F170	142mm (5.59 in.)	96	600
CH91206	9.5 x 127	3/8 x 5	600	96	PH28F195	167mm (6.57 in.)	96	600
CH91208	9.5 x 127	3/8 x 5	800	72	PH28F220	192mm (7.56 in.)	96	600
CH91306	9.5 x 139.7	3/8 x 5.5	600	96				
CH91310	9.5 x 139.7	3/8 x 5.5	1000	58	PH 40ID 40mm (1.58 in.) PH 40 OD 48mm (1.89 in.)			
CH91507	9.5 x 152.4	3/8 x 6	750	82	Part #	Length	Ohms	Watts @ 240
CH91510	9.5 x 152.4	3/8 x 6	1000	58	PH40F08	48mm (1.89 in.)	165	350
CH91606	9.5 x 165.1	3/8 x 6.5	600	96	PH40F10	68mm (2.68 in.)	152	380
CH91610	9.5 x 165.1	3/8 x 6.5	1000	58	PH40F12	88mm (3.46 in.)	120	480
CH91710	9.5 x 177.8	3/8 x 7	1000	58	PH40F15	118mm (4.65 in.)	115	500
CH91906	9.5 x 190.5	3/8 x 7.5	600	96	PH40F292	260mm (10.23 in.)	96	600
CH91910	9.5 x 190.5	3/8 x 7.5	1000	58				
CH92010	9.5 x 203.2	3/8 x 8	1000	58	Thermocouples (J type)			
CH92406	9.5 x 241.3	3/8 x 9.5	600	96	Part #	Sheath	Comp. Wire	Overall Length
CH92410	9.5 x 241.3	3/8 x 9.5	1000	58	TJ0203H	200 (7 in.)	300 (11 in.)	500 (19 in.)
CH92506	9.5 x 254	3/8 x 10	600	96	TJ0307H	300 (11 in.)	700 (27 in.)	1000 (39 in.)
CH92510	9.5 x 254	3/8 x 10	1000	58	TJ0510H	500 (19 in.)	1000 (39 in.)	1.5m (59 in.)
CH92810	9.5 x 280	3/8 x 11	1000	58	TJ0713H	700 (27 in.)	1300 (51 in.)	2m (79 in.)
CH93010	9.5 x 304.8	3/8 x 12	1000	58	TJ1010H	1000 (39 in.)	1000 (39 in.)	2m (79 in.)
CH93313	9.5 x 330	3/8 x 13	1300	58	TJ1500H	1500 (59 in.)	1000 (39 in.)	2.5m (98 in.)
CH93513	9.5 x 355.6	3/8 x 14	1300	44	Thermocouples (K type) available. Contact FISA			
CH93913	9.5 x 390	3/8 x 15.3	1300	44				

SENSOR PLUG		SENSOR BANDS	
PART #SN05		PART #SB28 (NH2)	PART #SB28P (NH2), SB40P (NH4)
			

AH COMPOSITION				
Cap	Collar	Spring	Piston	Body
				

NR (Barrel) Nozzle Specifications



	NOZZLE CAP		NOZZLE BODY	
	GATE DIA	MINIMUM LENGTH	OUTSIDE DIA	
NR2	1.8, 2.5, 3.0	62	28	
NR3	2.5, 3.0	60+ THREAD	32	
NR4	2.5, 3.0, 4.0	76+ THREAD	40	
NR5	3.0, 4.0, 5.0, 6.0	82+ THREAD	50	

NOZZLE MODEL	HEATER				THERMOCOUPLE (T/C)				
	MODEL	V	W	MAXIMUM DIA	PART #	SHEATH LENGTH	COMP. LEAD WIRE	TYPE	
NR2	PH28F06	240	350	42					<p>IC type</p>	TJ0203	200	300	J(IC)
	PH28F07	240	350	42	0307	300	700		
	PH28F08	240	350	42	0510	500	1,000		
	PH2842	240	170	55	0713	700	1,300		
NR3	PH3238S	240	250	53	1010	1,000	1,000		
NR4	PH4045	240	300	67	1510	1,500	1,000		
NR5	PH5045	240	500	77					

Nozzle Specifications for Quote

NOZZLE MODEL	CAP		BODY				HEATER MODEL	T/C PART NO.
	S. RAD.	"O"	LENGTH	I.D.	THREAD	THREAD L.		
NR2								
NR3					M _ _ X _ _			
NR4								
NR5	— — —	— — —	— — —	— — —	/ X . — — —	— — —	— — —	

MAINTENANCE PROCEDURE

NH/NR Nozzles (For AH Series, contact FISA)

A. Conditions Requiring Overhaul

When drooling, stringing, irregular gate mark, discoloring, no flow, or streaking occur, these are indications that the nozzle possibly requires servicing. When these conditions occur, the nozzle temperature control system should be checked, the mold cooling system checked, and the gate temperature determined by direct measurement. If all control items are in proper working order, then proceed with nozzle overhaul.

B. Prevention of Conditions Requiring Overhaul

For the best performance of the FISA valve gate and to reduce maintenance, there are several factors to consider and procedures to be utilized. The system should be designed or approved by FISA Corporation. This will create a system that is balanced for heating/cooling and resin flow. Use the FISA startup-shutdown procedure. Utilize only uncontaminated resin. Operate the mold in a machine of the proper size for the mold and part.

C. General Maintenance

The FISA NH and NR style nozzles are of a very durable construction and may be overhauled by anyone with good hand-tool skills and using this manual. A period of instruction by FISA would be advantageous.

A fluidized bed resin removal system may be used to facilitate maintenance, but do not operate over 340 °C (650 °F). Higher temperature operation may be used if the spring is to be replaced.

FISA Corporation offers a cleaning/evaluation service with one day turnaround.

Parts/Service

**CONTACT AND SHIP TO:
FISA CORPORATION**

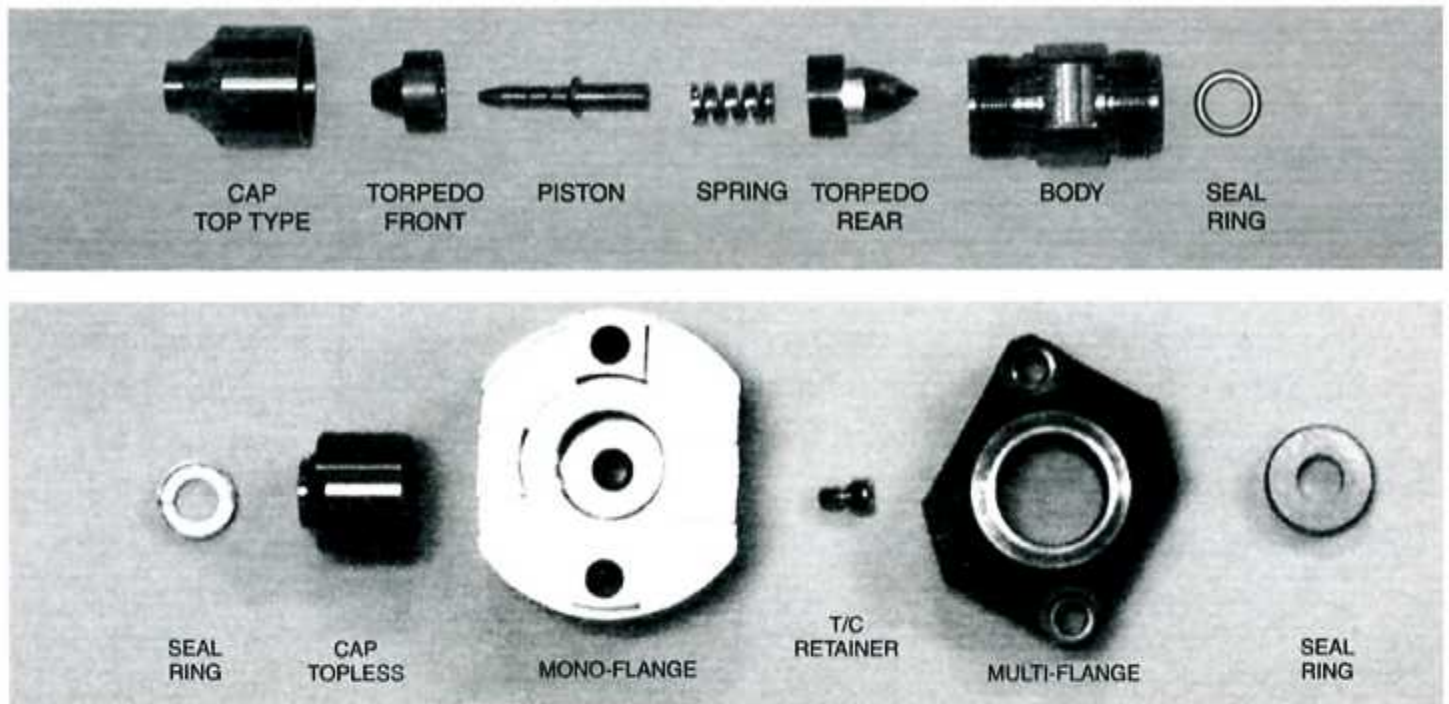
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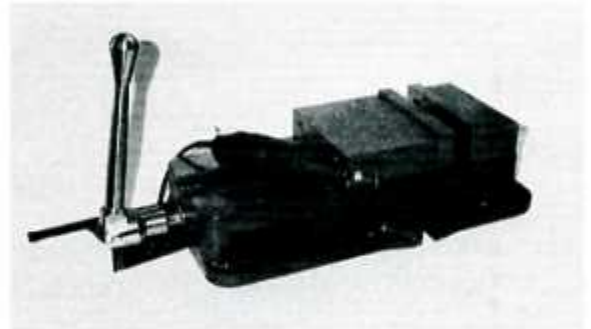
D. Nozzle Components and Nomenclature

(See catalog for part numbers)



E. Suggested Tools

1. Vise, must be square jawed, similar to a milling machine vise, or use special hardened jaw faces with 1 degree back faces in a bench vise
2. Wrenches, 24mm, 36mm, solid jaw, open end, mechanic style and pipe to fit. Torque wrench that will operate up to 1000 kg. cm. (75 ft. lb.)
3. Slip joint pliers, wire cutters, standard pliers
4. Propane torch (not MAPP gas)
5. 1000 grit wet/dry sandpaper, very fine grit abrasive hand pads (such as Scotch-Brite), soft rags
6. 3/8 diameter brass dowel, pointed or edged brass rod
7. Power rotary hand tool w/ wire wheel, for thread cleaning

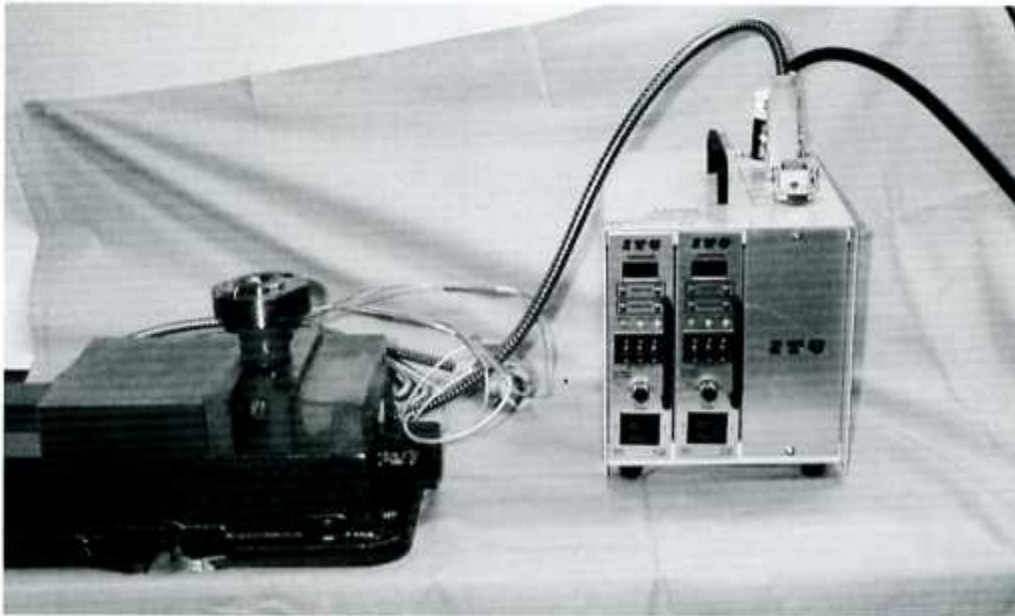


8. Brass bristle bore brushes, 5.5mm d., 6mm d., 8mm d

9. Heat resistant gloves

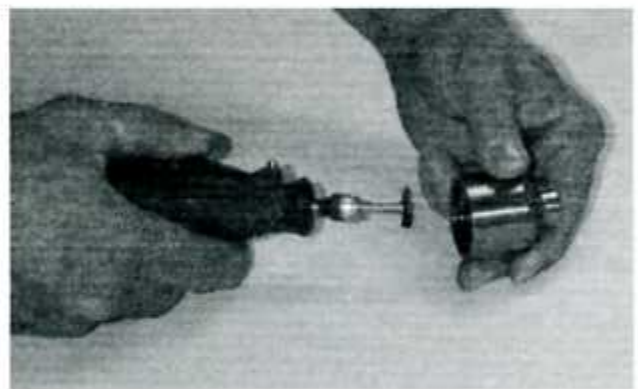
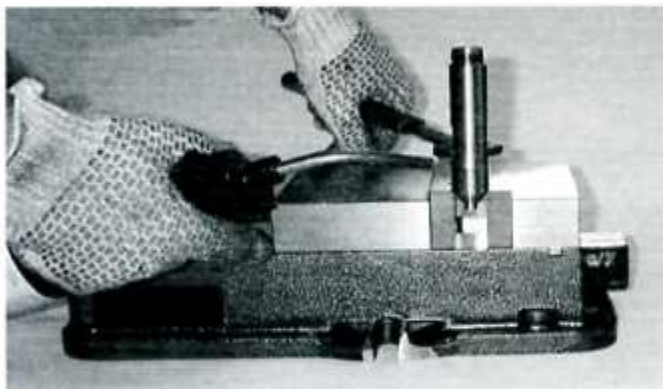


10. Temperature Controller



F. Overhaul Procedures

1. Nozzle Removal: The use of care when removing the nozzle will preserve the most external parts for reuse, and prevent damage to the cap/piston assembly. Remove the T/C's and heaters prior to removal of the body from the flange. If resin is on the outside of the nozzle, use the system heaters or propane torch to soften material for removal of heaters. The use of a brass rod to chip resin off is advisable, but very careful use is needed to prevent damage to wires or T/C's. Do not heat above operating temperature of molding.
2. Removal and Cleaning of the Cap: Clamp the cap in the vise and use the solid jaw wrench with extension pipe to remove the body. If the body does not unscrew with the extension pipe on the wrench, evenly apply heat with the propane torch to the cap. Utilize brass tools and the power wire wheel to clean the cap.



3. Removal and Cleaning of Torpedoes: Clamp the body into the vise, piston pointing down, protecting the threads from damage. Heat the body, if needed, to permit the 3/8" brass rod to push through the body and push the torpedoes out. Provide a soft surface or container to catch the torpedoes and piston. Remove as much resin as possible without using heat, then carefully heat the resin until it carbonizes and can be chipped off with a brass tool. Do not mar the surfaces that seal against the body, cap, and other torpedo. Set the piston assembly on the vise jaws and GENTLY tap the piston for removal. Do not hit the vise with the piston flange. Use the brass bore brush or a strip of abrasive pad to gently clean the torpedo I.D.



4. Cleaning the Piston: Use the hand pads to remove any deposits from all surfaces of the piston, including the sealing area grooves. The removal of very difficult deposits may require solvent application or use of 1000 grit sandpaper. Insert the piston into the front torpedo and ensure that it slides smoothly. If the motion is not uniformly smooth, recheck the cleanliness of the piston and torpedo and/or apply a light coating of molybdenum grease. The use of abrasive paper should be a last resort for stubborn deposits. Any scratching or overaggressive polishing may lead to piston seal failure. If the piston fit requires frequent cleaning, it may be damaged or out of specification. Please arrange for FISA to evaluate this item.

5. Cleaning of Other Components: Cleaning of bodies, flanges, manifolds, and heating components can all be done with the same procedures as cap cleaning. The torpedo seat area (bore) of the body must be very clean. Do not use lubricants to assist assembly. The PS157 seal ring may be reused. Lightly heat the resin and "scrub" the ring with an abrasive hand pad. Replace the ring if scratched or distorted.

6. Spring Cleaning and Evaluation: Remove the resin by scraping and wire brushing. If heating is needed, use the least heat possible. A spring heated to glowing, or over 340 °C (650 °F), will be weakened and possibly destroyed. Through regular usage, the spring, over time, may shorten and replacement may be required. Springs can be evaluated by measuring their length; (NH2)SG2818K, 16mm Min., SG2819K, 17mm Min. (NH4)SG4022K, 22mm Min., SG4024K, 23mm Min., or returned to FISA for spring pressure gauging. Springs in a multi-gate application should only be replaced in a full set of equal strengths.

7. Reassembly of the Nozzle: After lightly coating the seal portion of the piston with molybdenum grease, replace parts into the body, in this order: Torpedo rear, Spring, Piston/Torpedo assembly (test piston motion) Cap (hand tight). Coat the body threads with a high temperature anti-seize compound. Place the cap in the vise jaws and torque the body tight (NH2, 700kg-cm) NH4, 1000 kg-cm). For fitting the nozzle to the flange, hand assemble, (monoflange with the PS 157 ring in place) and then torque to specification in the vise.



Heaters and Thermocouples

EVALUATION

Ring and cartridge heaters should be examined for frayed wiring, damage to the metal case and loss of the wire seal on cartridge heaters. Thermocouple examination is for frayed insulation, kinks and crushed areas on the metal sheath. Frayed insulation may be repaired with high temperature electrical tape. If the conductor wire is damaged, replace the component or repair by splicing. A T/C with sheath kinks or crushed areas should be replaced.

Metal cases of heaters that have been damaged but not penetrated may be OK. Heaters and thermocouples may be instrument tested to determine suitability for service. Contact FISA for test methods and ratings.

**QUESTIONS CONCERNING SERVICE?
CONTACT FISA CORP. (888) 684-3472.**

REASSEMBLY OF HEATING COMPONENTS

Place ring heater(s) on nozzle body with wire away from gate end, lightly coat the inside of heater with anti-seize compound. Use the FISA T/C bender to create a proper end shape for insertion into nozzle cap. If a "bender" is not available, insert T/C into hole and carefully bend it over the heater, do not create a kink in the T/C. Place the sensor band groove over the T/C sheath and form the band around the body, use the thumb to bend the tab into place. Do not use tools to bend the band.



NH and AH Styles

Operating Procedure

A. First Time Startup

Set manifold or monoflange temperature to match barrel nozzle. After the manifold or monoflange has been at temperature for 3 minutes, bring the barrel nozzle into contact. Mold nozzles to be set at 100°F (55°C) lower than proposed operating temperature. When temperatures are attained, shoot enough resin into system to fill it, then raise the nozzle temperatures to the proposed operating level. When the system temperatures are at the desired level, "soak" the system for 5 minutes at that temperature and then proceed with making the normal initial shots until full part size is attained. After full part shot size is reached, reduce a monoflange to the material data sheet's melt index temperature. Manifold system temperature should also be reduced, to a level several degrees above the temperature at which reduced performance is noticed. The mold nozzle temperatures should be reduced, after the manifold or monoflange temperatures have stabilized, to a level above which reduced performance is noted. These temperatures must be verified by restarting the system after it has completely cooled and adjusting the temperatures to obtain full performance at the first shot. The restart should be handled as described in paragraph "B".

B. Startup of Previously Operated System

With All Components Full of Resin

Set all temperatures at full operating level. When the monoflange or manifold has been at temperature for 3 minutes, bring the barrel nozzle into contact with the sprue bushing. When all system components have been at their operating temperature for 5 minutes total, begin your molding shots. We suggest that the nozzle temperatures be reduced by 100°F (55°C) if the system is not to be used for more than 10 minutes. Upon raising the nozzles back to operating temperature, provide a 2 minute "soak" time before resumption of molding.

C. Startup of System With Any Component(s) Not Full of Resin

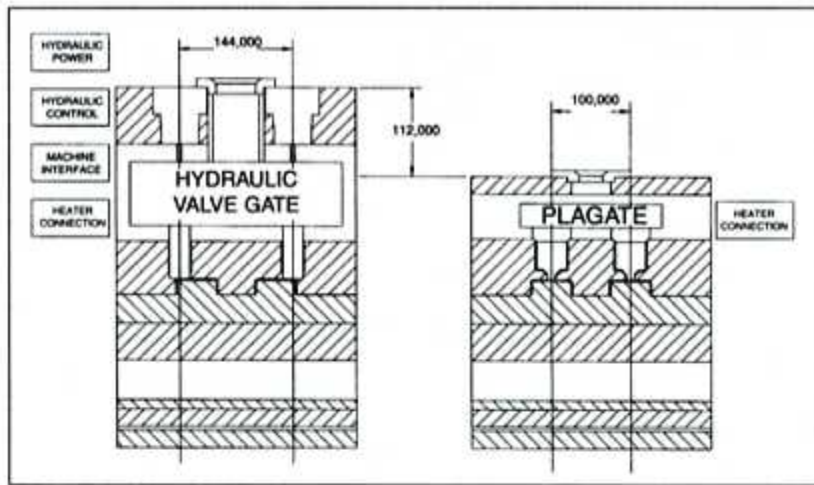
Set the temperature of all "full" components, at the operating temperature. Set the "not full" components 100°F (55°C) below operating temperature. After the manifold or monoflange has been at temperature for 3 minutes, bring the barrel nozzle into contact and make a shot sufficient to fill the empty component with resin. Bring all component temperatures up to operating level, and wait for a 2 minute "soak" time, then proceed with the molding operation.

D. Shut Down

The Plagate system can be shut off, without system damage, at the last shot of a run. We suggest that the nozzle temperature be reduced by at least 100°F (55°C), or shut off prior to the last five or six shots, and that the entire system be shut off prior to the last two shots. The lowered temperature will reduce degrading of material left in the system. The exact number of shots after temperature reduction should be determined on an individual mold basis.

E. The above procedures should be followed to reduce cycle time, provide the best material condition, reduce scrap, and reduce maintenance.

Stack-Height Comparison



Dynac Static Eliminators



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