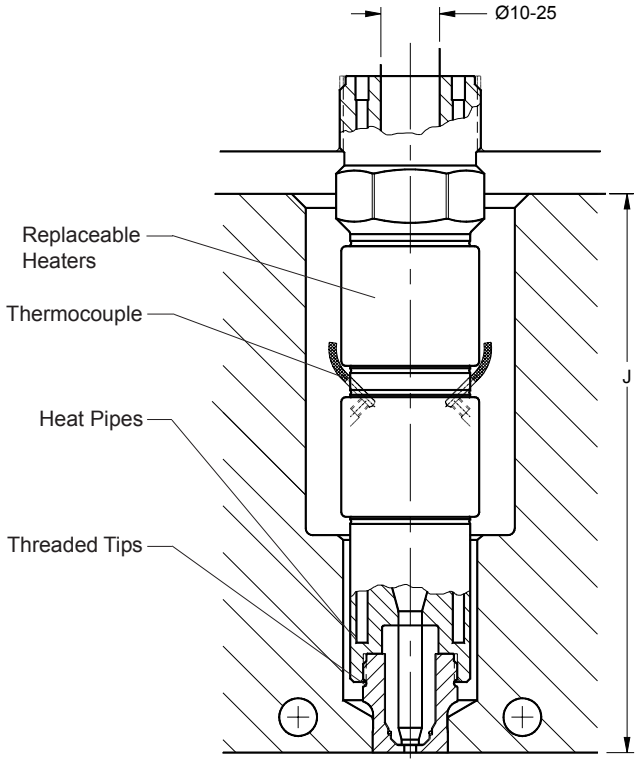
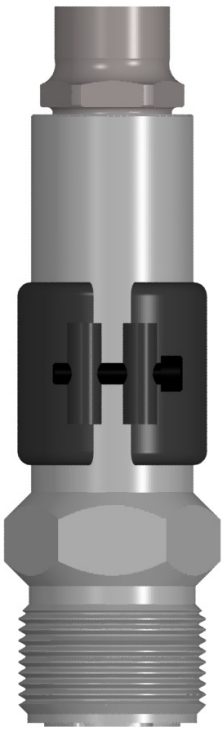
T24 Hot Runner Nozzles are for large part applications and are available with band or helical heaters. In most cases one band heater is required for operation but an installed spare may be provided if space allows. They are available in lengths from 160 to 1000 (“J” dimension). Because the nozzles are threaded, preload in the cold condition is not required. Designed for high flow these nozzles are available with CV10, CV20 full flow and valve gate tips only.

Suitable for all materials and available with six Synventive Controlled Vestige (CV) tip options including valve gates for zero gate vestige applications.



Features:
25 maximum flow channel maximum
160 - 1000 mold depth ("J" dimension)
Replaceable long life heater and thermocouple
240V heaters
6 controlled vestige tip styles
Replaceable threaded tips
Internal heat pipes for temperature uniformity
For all plastics including those with fillers
32 tip dia



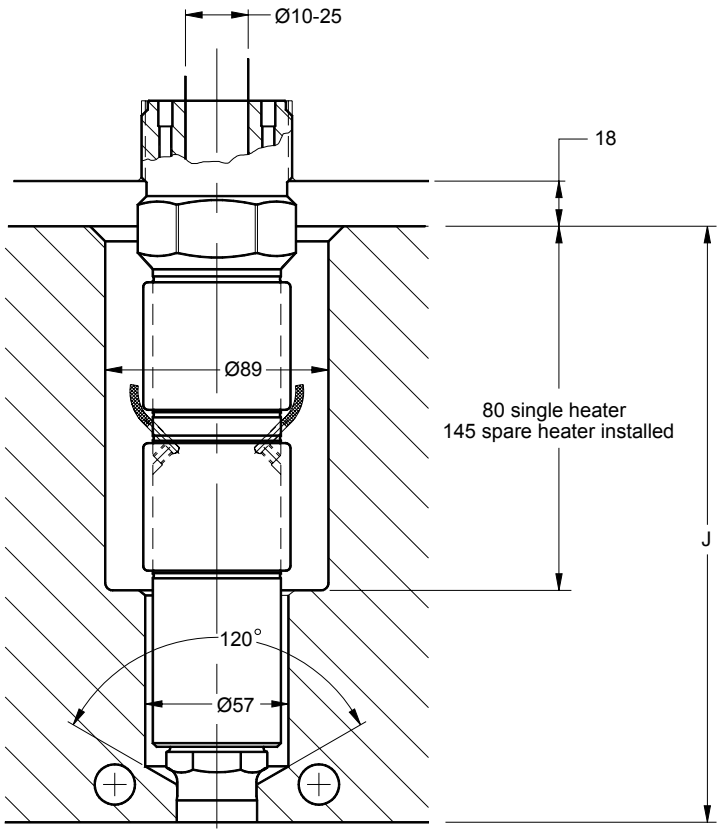
Band Heater

One heater required for operation. If mold thickness allows a spare band heater will be installed.

When the distance from the manifold center locator to the hot runner nozzle center line exceeds 500 the 57 diameter clearance hole must be increased to 62 and the 89 diameter hole to 94.

J Minimum = 160

J Maximum = 380



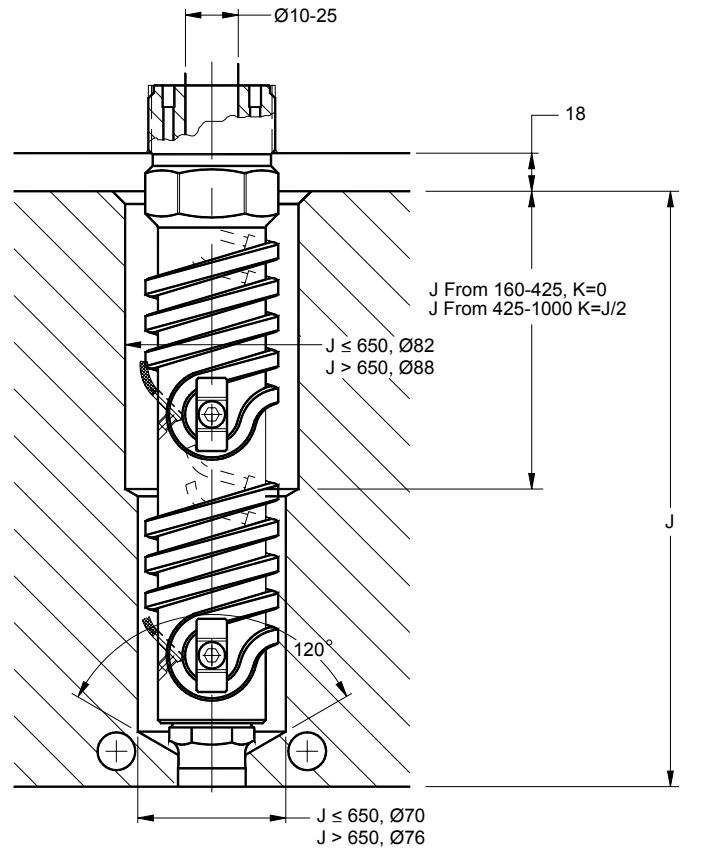
Helical Heater

When J is greater than 650 two heaters are required for operation.

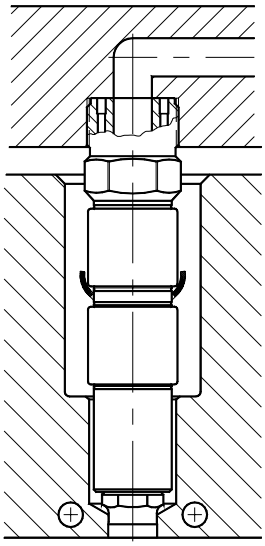
When the distance from the manifold center locator to the hot runner nozzle center line exceeds 500 the 70 diameter clearance hole must be increased to 75, 76 to 81, 82 to 87 and the 88 diameter hole to 93.

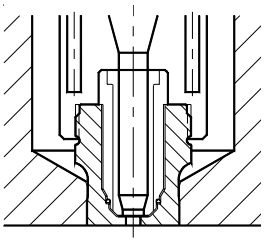
J Minimum = 160

J Maximum = 1000



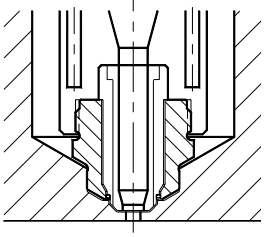
Thermal Gate Nozzle





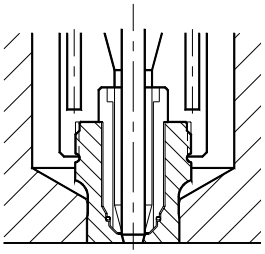
CV10
- Filled and unfilled materials
- Open flow channel/higher flow
- 3.0 to 8.0 orifice diameter
- Patented seal
- Easier mold geometry

Dimensional data on Pages T24-8, 9 & 10



CV20
- Filled and unfilled materials
- Open flow channel/higher flow
- 3.0 to 8.0 orifice diameter
- Patented seal
- No witness mark
- Easier color change

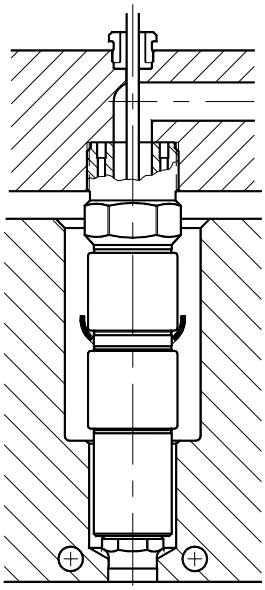
Dimensional data on Pages T24-11, 12 &13

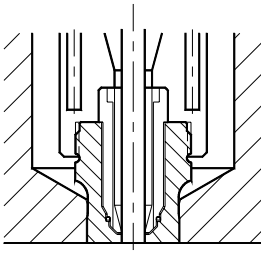


VG12
- Filled and unfilled materials
- “0” vestige
- Tapered shut off
- 6.4 orifice diameter
- Patented seal
- Easier mold geometry

Dimensional data on Pages T24-14 & 15

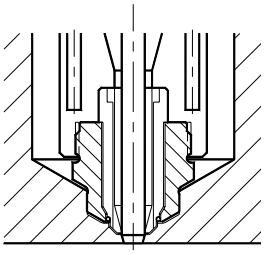
Valve Gate Nozzle





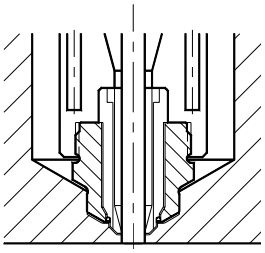
VG12S
- Filled and unfilled materials
- “0” vestige
- Diametric shut off
- Materials having glass fiber fillers
- 8.0 orifice diameter
- Patented seal
- Easier mold geometry

Dimensional data on Pages T24-16 & 17



VG23
- Filled and unfilled materials
- “0” Vestige
- Tapered shut off
- 6.4 orifice diameter
- Patented seal
- No witness mark

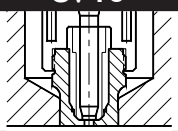
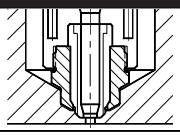
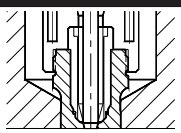
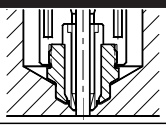
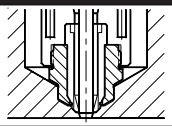
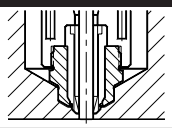
Dimensional data on Pages T24-18 & 19



VG23S
- Filled and unfilled materials
- Materials having glass fibers
- Diametric shut off
- “0” Vestige
- 8.0 orifice diameter
- Patented seal
- No witness mark

Dimensional data on Pages T24-20 & 21

See page T24-4 to select a tip that suits your application

Tip Style \ Material	Additives	Semi-crystalline										Amorphous											
		PE	PP	PEEK	PPS	PET	PBT	PPO/PA	PA	PPA	POM	PMMA	ABS	ASA	SAN	PS	PC/ABS	PC	PES	PSU	PEI	PPO	TPE
CV10 	A	+	+	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	-	-	-	+	-
	B	+	+	-	-	-	-	-	-	-	-	-	+	-	-	-	+	+	-	-	-	+	-
	C	+	+	-	-	+	-	+	+	-	+	-	+	-	-	-	+	+	-	-	-	+	-
	D	+	+	-	-	-	-	-	-	-	-	-	+	-	-	-	+	+	-	-	-	+	-
CV20 	A	+	+	-	-	-	-	-	-	-	0	+	+	+	+	+	+	+	-	-	-	+	-
	B	+	+	-	-	-	+	-	-	-	0	-	+	-	-	+	+	+	-	-	-	+	-
	C	+	+	-	+	+	+	+	+	-	0	-	+	-	-	+	+	+	-	-	-	+	-
	D	+	+	-	-	-	-	-	-	-	0	+	+	+	-	+	+	+	-	-	-	+	-
VG12 	A	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	+	+
	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	D	0	0	-	-	0	0	-	0	-	0	0	0	0	0	0	0	0	-	-	-	+	0
VG12S 	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	B	+	+	-	-	0	0	0	0	-	+	-	+	-	+	+	+	+	-	-	-	+	0
	C	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	+	0
	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VG23 	A	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	+	+
	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	D	+	+	-	-	0	0	0	0	-	0	0	+	0	0	+	+	+	-	-	-	+	+
VG23S 	A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	B	+	+	-	-	+	+	0	+	-	0	0	+	-	0	+	+	+	-	-	-	+	0
	C	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	+	0
	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

The above table defines which tip styles are best suited for a given material.

Note:
The selection table is meant to be a guide for the initial selection of the tip style. It is based on the more common grades of material.
Synventive will verify the correct tip selection as part of the quote/order process.

Additive Index
A - None
B - Fillers
C - Glass Fiber
D - Flame retardants

+	Very suitable
0	Suitable
-	Not suitable

Maximum flow rate of hot runner nozzles varies depending on the melt index of the material being processed.

The flow rate of any hot runner nozzle is controlled by three factors:

1) Flow bore size

2) Melt temperature, viscosity vs shear rate relationship.

3) The cavity wall thickness, flow length from the gate, mold temperature and required fill rate.

The last two factors can combine to change the maximum shot capacity by a factor of 5 or more. Synventive uses computerized flow analysis to assure the correct nozzle is chosen.

Material	Tip Style	
	CV10/CV20	VG12(S)/VG23(S)
ABS	1500 gm/sec	800 gm/sec
PC	550 gm/sec	175 gm/sec
PPO	750 gm/sec	175 gm/sec
PBT	750 gm/sec	175 gm/sec
PBT/PC	500 gm/sec	175 gm/sec
PC/ABS	550 gm/sec	175 gm/sec
PS	2000 gm/sec	900 gm/sec
PP	2500 gm/sec	900 gm/sec
PA	1500 gm/sec	700 gm/sec
POM	650 gm/sec	350 gm/sec
PE	2000 gm/sec	900 gm/sec
Acrylic	1200 gm/sec	450 gm/sec
PVC	650 gm/sec	350 gm/sec
TPR	-	900 gm/sec

Example

Material: PE

Tip style: CV10

Maximum flow rate:
2000 grams/second

Note:
Values in the table do not include reinforced materials or materials with fillers.

This table lists the normal gate orifice required to fill an average cavity of the listed wall thickness and surface area.

The orifice diameter is based on the flow and freeze characteristics of each type of plastic at its normal processing conditions. It is not dependent on whether the cavity is fed by a hot or cold runner.

Some of the listed wall thickness and surface area combinations are not applicable to all plastics because of the flow length to wall ratios of each material. Consult plastic supplier's processing recommendations.

Due to the gate limitations of each hot runner nozzle, the actual gate may be slightly smaller or larger than the tabulated orifice.

Orifice Diameter Guideline mm(inch)

Part Area		Wall thickness mm/(inch)									
sq mm	sq inch	0.75 (0.03)	1.00 (0.04)	1.25 (0.05)	1.50 (0.06)	1.75 (0.07)	2.00 (0.08)	2.25 (0.09)	2.50 (0.10)	3.00 (0.13)	4.00 (0.16)
600		0.90	0.90	0.90	0.90	0.90	0.90	0.95	1.00	1.12	1.27
	1.0	0.035	0.035	0.035	0.035	0.035	0.035	0.037	0.039	0.044	0.050
1200		0.90	0.90	0.90	0.92	1.00	1.05	1.12	1.17	1.32	1.50
	2.0	0.035	0.035	0.035	0.036	0.039	0.041	0.044	0.046	0.052	0.059
1800		0.90	0.90	0.95	1.02	1.10	1.17	1.25	1.30	1.47	1.68
	3.0	0.035	0.035	0.037	0.040	0.043	0.046	0.049	0.051	0.058	0.066
2400		0.90	0.90	1.02	1.10	1.20	1.25	1.35	1.40	1.58	1.78
	4.0	0.035	0.035	0.040	0.043	0.047	0.049	0.053	0.055	0.062	0.070
3000		0.90	0.95	1.07	1.17	1.25	1.32	1.42	1.47	1.65	1.88
	5.0	0.035	0.037	0.042	0.046	0.049	0.052	0.056	0.058	0.065	0.074
6000		1.00	1.12	1.27	1.37	1.50	1.58	1.68	1.76	1.98	2.26
	10.0	0.038	0.044	0.050	0.054	0.059	0.062	0.066	0.069	0.078	0.089
12,000		1.17	1.32	1.53	1.65	1.78	1.88	2.00)	2.08	2.36	2.67
	20.0	0.046	0.052	0.060	0.065	0.070	0.074	0.079	0.082	0.093	0.105
18,000		1.30	1.47	1.68	1.83	1.96	2.06	2.21	2.31	2.62	2.97
	30.0	0.051	0.058	0.066	0.072	0.077	0.081	0.087	0.091	0.103	0.117
24,000		1.37	1.58	1.80	1.96	2.10	2.24	2.39	2.49	2.80	3.18
	40.0	0.054	0.062	0.071	0.077	0.083	0.088	0.094	0.098	0.110	0.125
30,000		1.45	1.65	1.90	2.06	2.24	2.36	2.51	2.64	2.95	3.35
	50.0	0.057	0.065	0.075	0.081	0.088	0.093	0.099	0.104	0.116	0.132
36,000		1.53	1.73	1.98	2.16	2.34	2.46	2.64	2.77	3.10	3.53
	60.0	0.060	0.068	0.078	0.085	0.092	0.097	0.104	0.109	0.122	0.139
42,000		1.58	1.80	2.08	2.26	2.41	2.57	2.75	2.87	3.23	3.66
	70.0	0.062	0.071	0.082	0.089	0.095	0.101	0.108	0.113	0.127	0.144
48,000		1.65	1.88	2.13	2.34	2.51	2.64	2.82	2.97	3.33	3.79
	80.0	0.065	0.074	0.084	0.092	0.099	0.104	0.111	0.117	0.131	0.149
54,000		1.70	1.93	2.21	2.39	2.60	2.72	2.92	3.05	3.43	3.89
	90.0	0.067	0.076	0.087	0.094	0.102	0.107	0.115	0.120	0.135	0.153
60,000		1.73	1.98	2.26	2.46	2.64	2.80	3.00	3.12	3.53	3.99
	100.0	0.068	0.078	0.089	0.097	0.104	0.110	0.118	0.123	0.139	0.157
90,000		1.93	2.18	2.51	2.72	2.92	3.10	3.30	3.45	3.89	4.42
	120.0	0.076	0.086	0.099	0.107	0.115	0.122	0.130	0.136	0.153	0.174
120,000		-	2.36	2.70	2.92	3.10	3.33	3.56	3.73	4.20	4.75
	200.0	-	0.093	0.106	0.115	0.124	0.131	0.155	0.147	0.165	.187
180,000		-	-	2.97	3.23	3.48	3.68	3.94	4.15	4.62	5.26
	300.0	-	-	0.117	0.127	0.137	0.145	0.155	0.162	0.182	0.207
240,000		-	-	-	3.48	3.76	3.98	4.22	4.42	4.98	5.54
	400.0	-	-	-	0.137	.148	0.156	0.166	0.174	0.196	0.218

Material Factors

Use tabulated orifice for PE, PP, PS, SAN and PUR.

Use tabulated orifice x 1.15 for POM, PC, PPO and ABS.

Use tabulated orifice x 1.30 for Acrylic, PA, PET, and PBT

Use tabulated orifice x 1.50 for PVC.

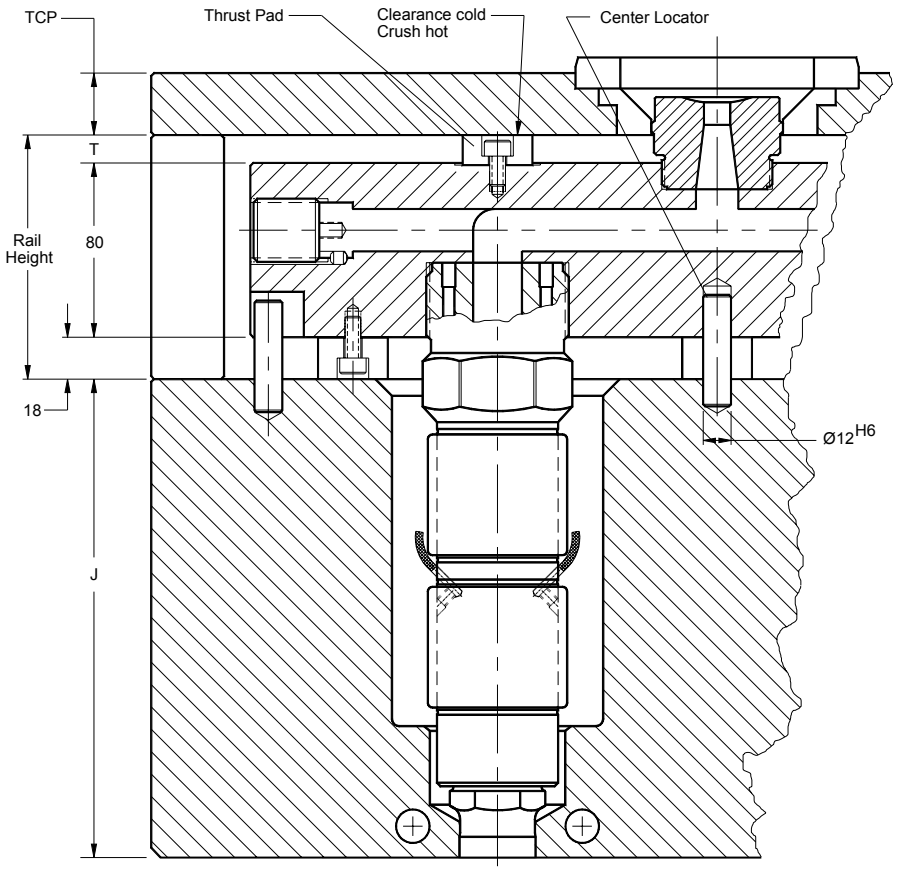
For reinforced PA, PET and PBT the minimum orifice diameter should be 3.96.

Part Area is total outside area and not the projected area of the part.

T24 manifold system do not require preload because they are threaded directly into the manifold.
The systems typically have a clearance between the thrust pads and mold plates in the cold condition. As the manifolds heats and expands the thrust pads make contact with the plates.

The thrust pads are made of a low conductivity material and should only be replaced with an equivalent Synventive part.

Excessive contact with the mold will cause heat sinks and affect the system performance. Contact with the mold must be limited to specified areas.



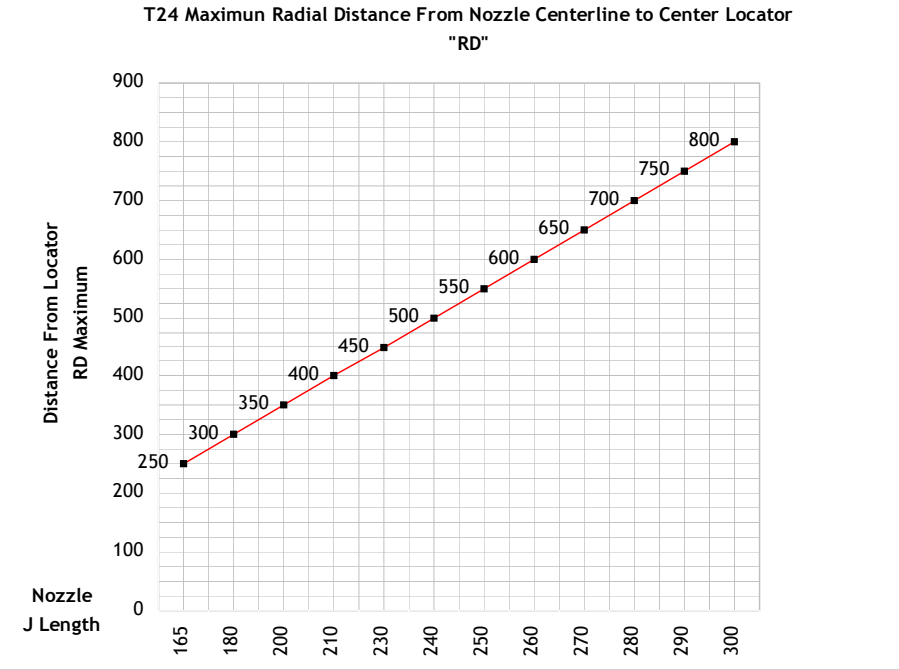
Minimum rail height = 108 (thermal gate).

Threaded nozzles line up with the gate locations in the mold in the cold condition. As the manifold heats and expands the nozzles flex. The distance from the center locator (RD) determines the amount of nozzle flex. The table to the right defines the maximum allowable distance from the nozzle to the center locator.

Variable	Description
T	Top air gap
J	Mold depth
TCP	Top clamp plate

T = Rail height - 18- 80 (manifold)

Minimum T = 10 (thermal gate)



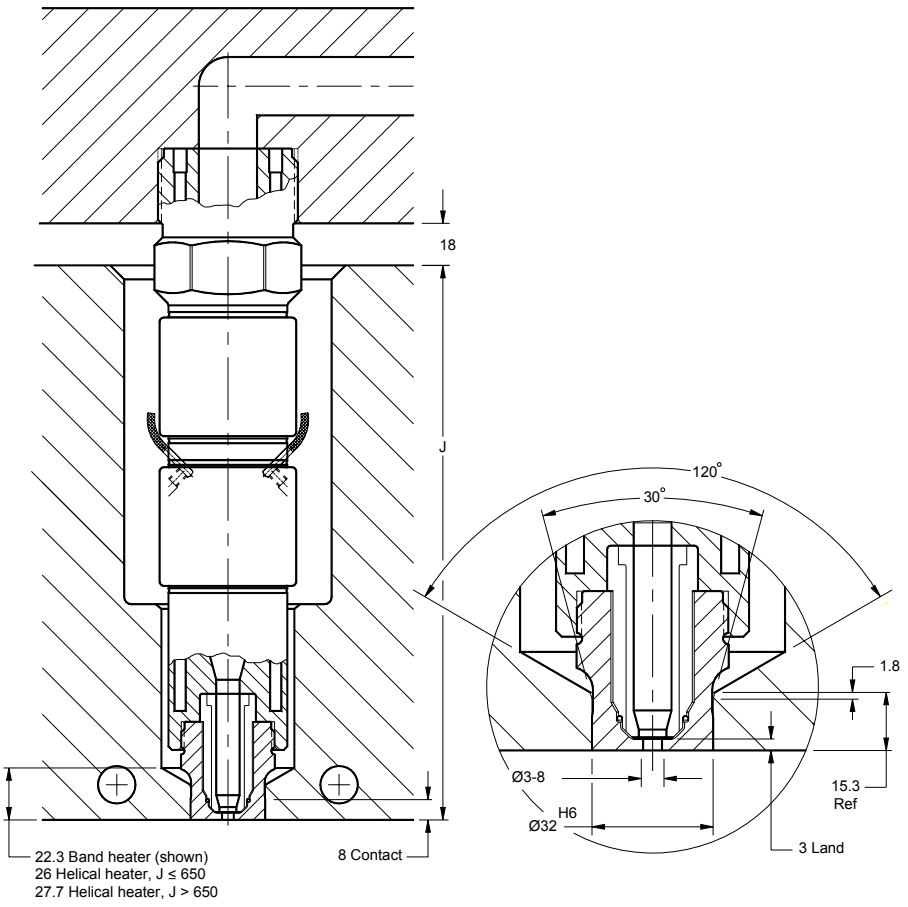
T24 CV10

Filled and unfilled materials.

Easy orifice size changes by straight reaming

Open flow bore

Heat pipes for isothermal operation.



The front face of the tip must be in contact with plastic.

Cooling is required in the gate area.

Heater Style	J Min	J Max	Heater Qty	Watts/ Volts
Band	160	380	1	750W/240V
Helical	160	220	1	550W/240V
Helical	220	425	1	850W/240V
Helical	425	650	2	550W/240V (each)
Helical	650	1000	2	850W/240V (each)

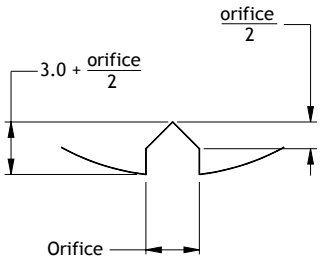
RD is the radial distance from the manifold center locator to the manifold nozzle center line.

For longer RD dimensions, consult with Synventive.

RD	J Min	RD	J Min
250	165	550	250
300	180	600	260
350	200	650	270
400	210	700	280
450	230	750	290
500	240	800	300

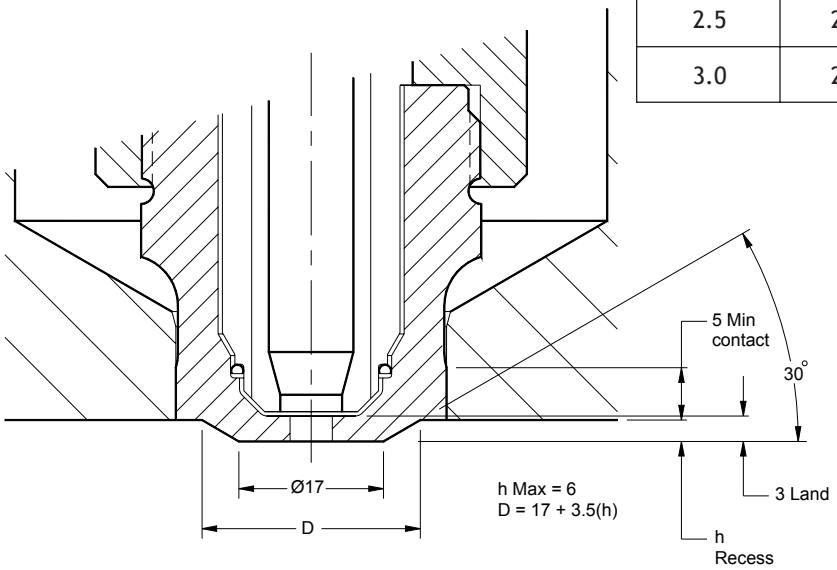
Recessed gates are used to reduce vestige height above the part surface or keep the vestige below the part surface.

For most materials CV10 vestige height is equal to 3.0 + orifice/2.



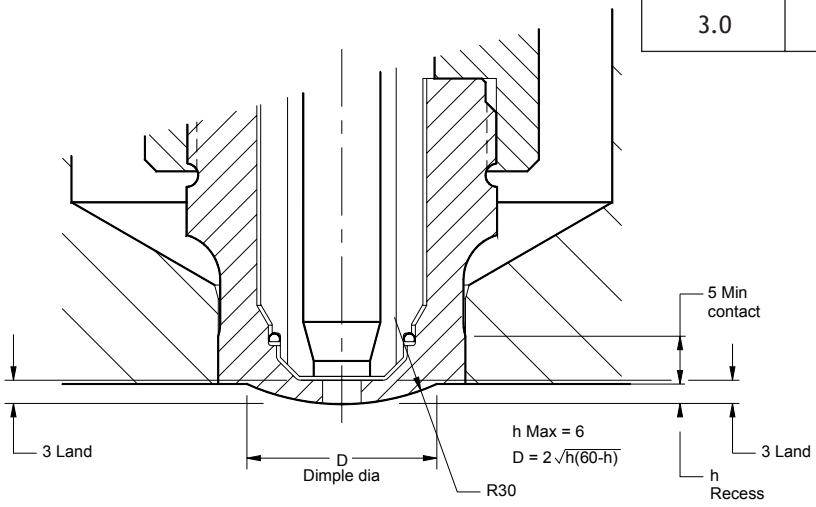
Values in tables are for materials not having glass fibers. Consult Synventive for vestige height when using glass fillers.

Conical Recess	
h	D
1.0	20.5
1.5	22.3
2.0	24.0
2.5	25.8
3.0	27.5



Conical Recess

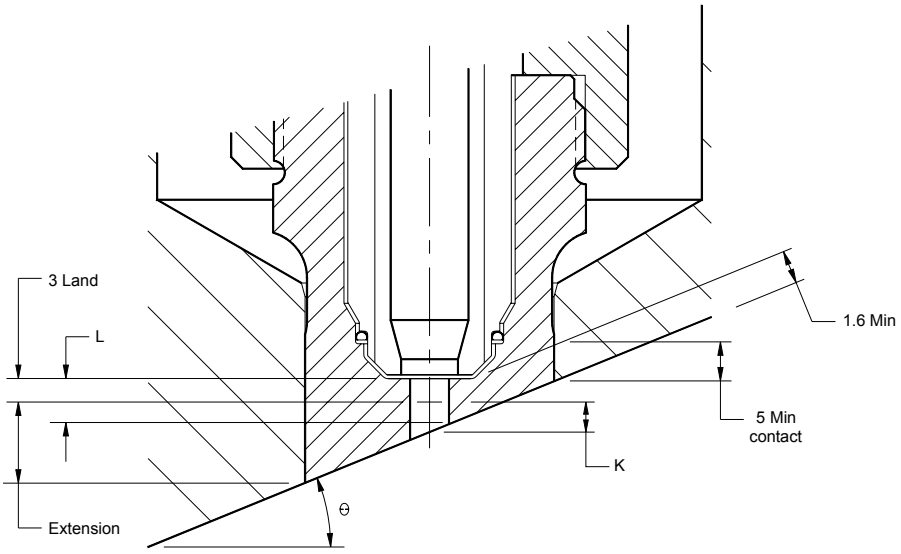
Spherical Recess	
h	D
1.0	15.4
1.5	18.7
2.0	21.5
2.5	24.0
3.0	26.2



Spherical Recess

When gating onto an angled mold contour the vestige height may be increased depending on the angle.

K is the increase in vestige height required to maintain 1.6 wall and/or 5 minimum contact.



$\Theta \leq 14°$; K = 0	$14 < \Theta \leq 27°$; $K = 5.7\tan\Theta + \frac{1.6}{\cos\Theta} - 3$	$\Theta > 27°$; $K = 16\tan\Theta - 6.5$
$E = 16\tan\Theta$	$E = K + 16\tan\Theta$	$E = 32\tan\Theta - 6.5$
$L = 3 - \frac{\text{Orifice Dia.}}{2}\tan\Theta$	$L = 3 + K - \frac{\text{Orifice Dia.}}{2}\tan\Theta$	$L = 3 + K - \frac{\text{Orifice Dia.}}{2}\tan\Theta$

Angled Mold Contour

T24 CV20

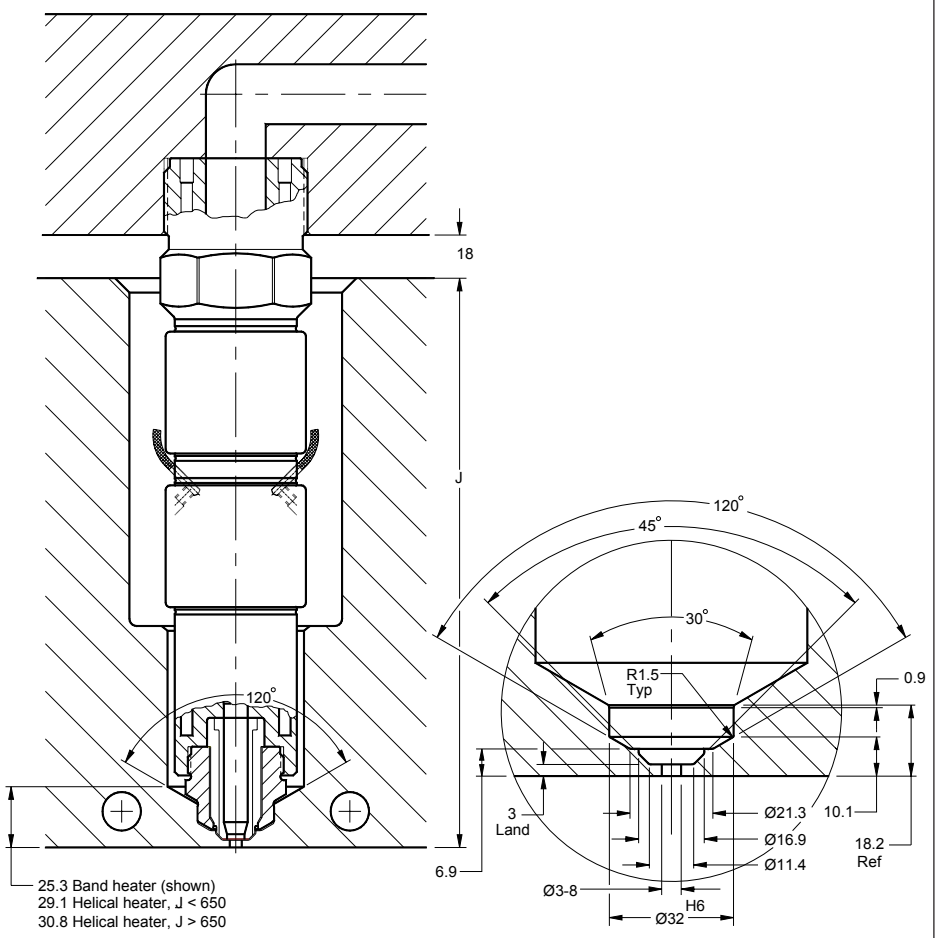
Filled and unfilled materials.

Easy orifice size changes by straight reaming

No tip witness mark on part

Open flow bore

Heat pipes for isothermal operation.



The front face of the tip must be in contact with plastic.

Cooling is required in the gate area.

Heater Style	J Min	J Max	Heater Qty	Watts/ Volts
Band	160	380	1	750W/240V
Helical	170	220	1	550W/240V
Helical	220	425	1	850W/240V
Helical	425	650	2	550W/240V (each)
Helical	650	1000	2	850W/240V (each)

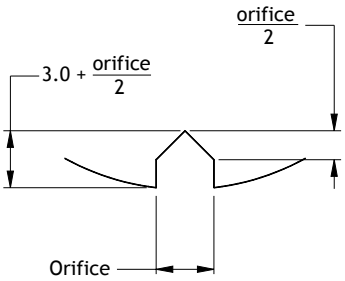
RD is the radial distance from the manifold center locator to the manifold nozzle center line.

For longer RD dimensions, consult with Synventive.

RD	J Min	RD	J Min
250	165	550	250
300	180	600	260
350	200	650	270
400	210	700	280
450	230	750	290
500	240	800	300

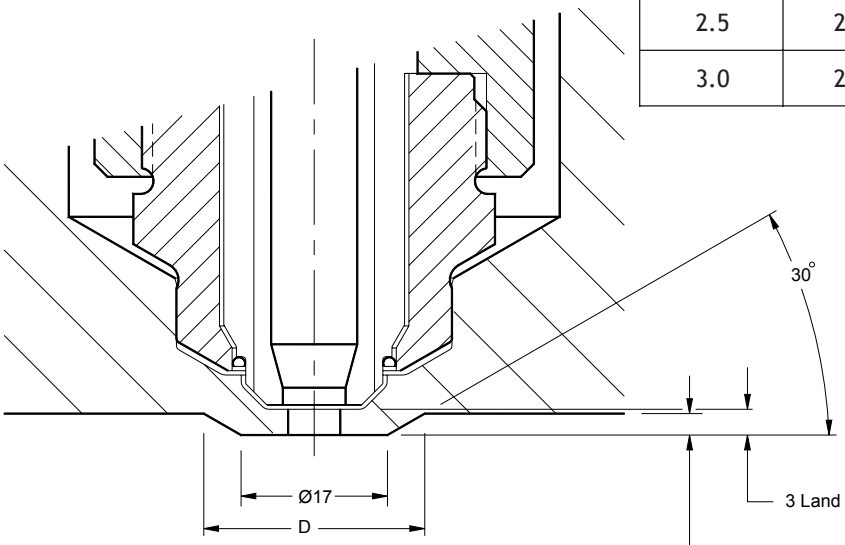
Recessed gates are used to reduce vestige height above the part surface or keep the vestige below the part surface.

For most materials CV10 vestige height is equal to 3.0 + orifice/2.



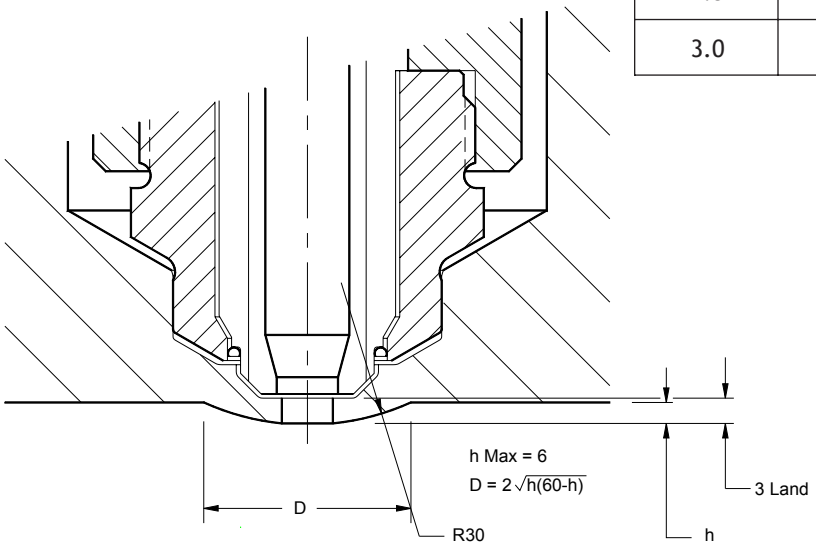
Values in tables are for materials not having glass fibers. Consult Synventive for vestige height when using glass fillers.

Conical Recess	
h	D
1.0	20.5
1.5	22.3
2.0	24.0
2.5	25.8
3.0	27.5



Conical Recess

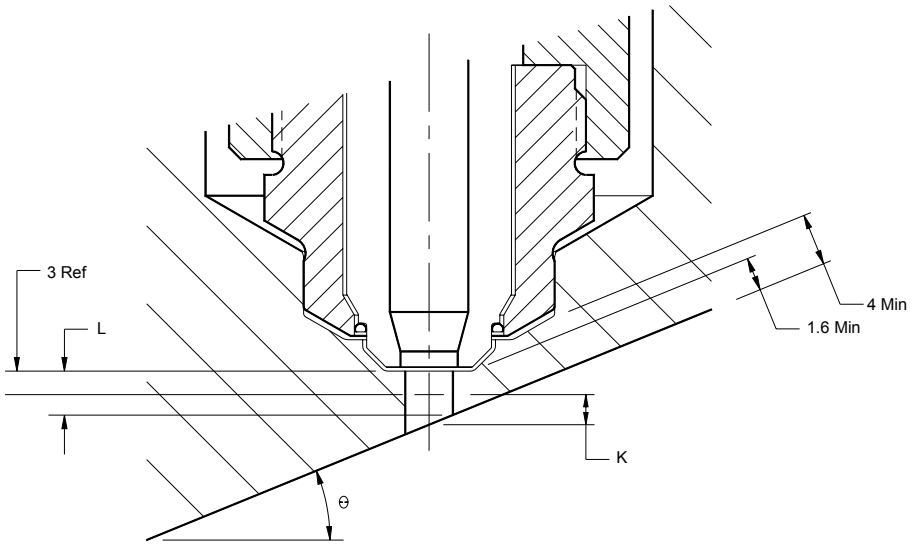
Spherical Recess	
h	D
1.0	15.4
1.5	18.7
2.0	21.5
2.5	24.0
3.0	26.2



Spherical Recess

When gating onto an angled mold contour the vestige height may be increased depending on the angle.

K is the increase in vestige height required to maintain 1.6 wall and/or 4 minimum wall thickness.



$\theta \leq 11°$; K = 0 $\qquad$ $11 < \theta \leq 30°$; $K = 5.7\tan\theta + \frac{1.6}{\cos\theta} - 3$ $\qquad$ $\theta > 30°$; $K = 16\tan\theta + \frac{4}{\cos\theta} - 10.1$

$L = 3 - \frac{\text{Orifice Dia.}}{2}\tan\theta$ $\qquad$ $L = 3 + K - \frac{\text{Orifice Dia.}}{2}\tan\theta$ $\qquad$ $L = 3 + K - \frac{\text{Orifice Dia.}}{2}\tan\theta$

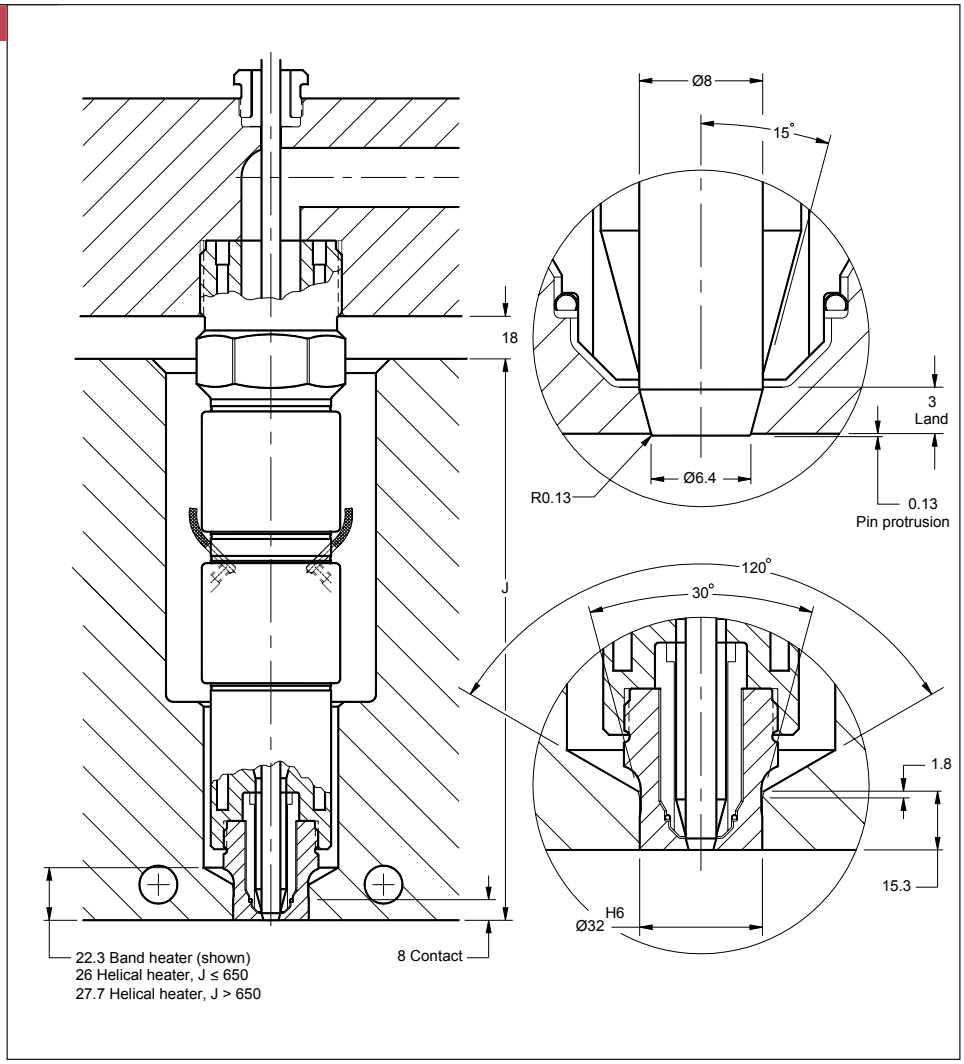
Angled Mold Contour

T24 VG12 Tapered

Filled and unfilled materials.

Heat pipes for isothermal operation.

Tapered gate to eliminate gate flash.



The front face of the tip must be in contact with plastic.

Cooling is required in the gate area.

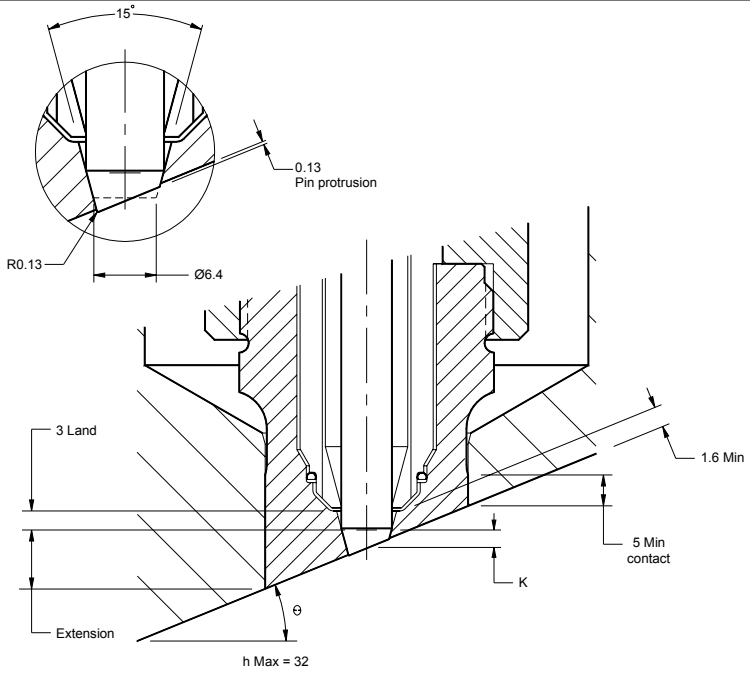
Heater Style	J Min	J Max	Heater Qty	Watts/ Volts
Band	160	380	1	750W/240V
Helical	160	220	1	550W/240V
Helical	220	425	1	850W/240V
Helical	425	650	2	550W/240V (each)
Helical	650	1000	2	850W/240V (each)

RD is the radial distance from the manifold center locator to the manifold nozzle center line.

For longer RD dimensions, consult with Synventive.

RD	J Min	RD	J Min
250	165	550	250
300	180	600	260
350	200	650	270
400	210	700	280
450	230	750	290
500	240	800	300

K is the increase in orifice land required to maintain 1.6 wall and/or 5 minimum contact.

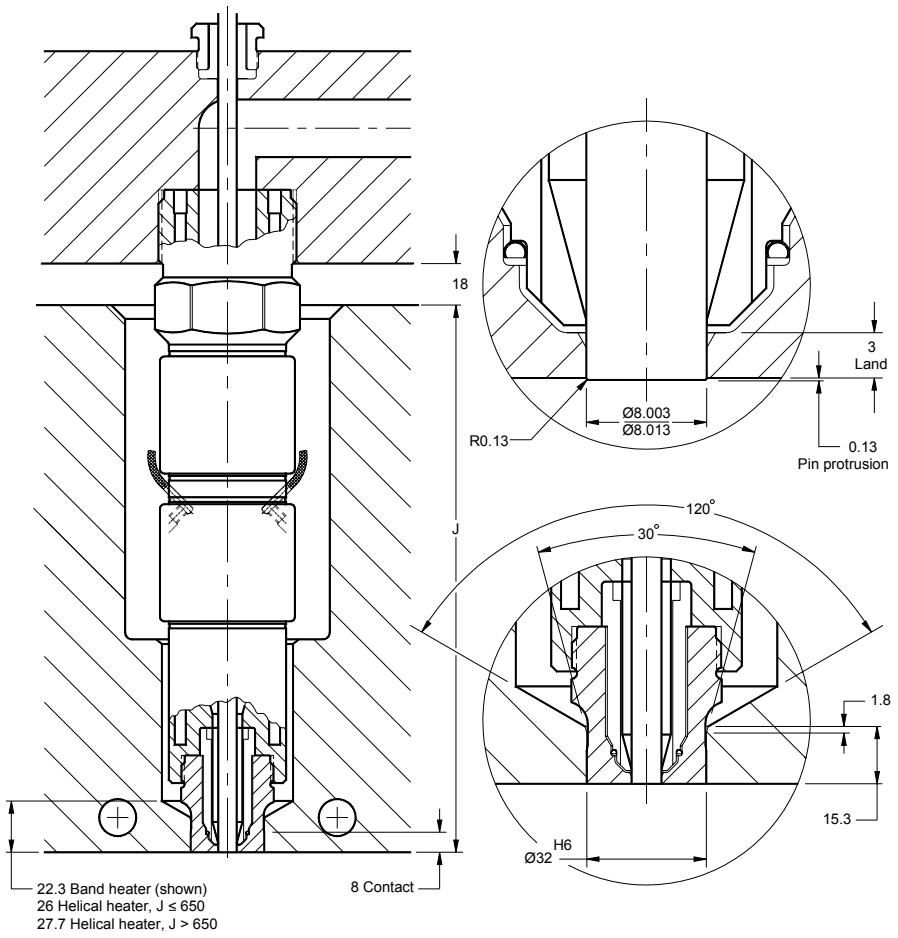


Angled Mold Contour

T24 VG12S Straight

Filled and unfilled materials.

Heat pipes for isothermal operation.



The front face of the tip must be in contact with plastic.

Cooling is required in the gate area.

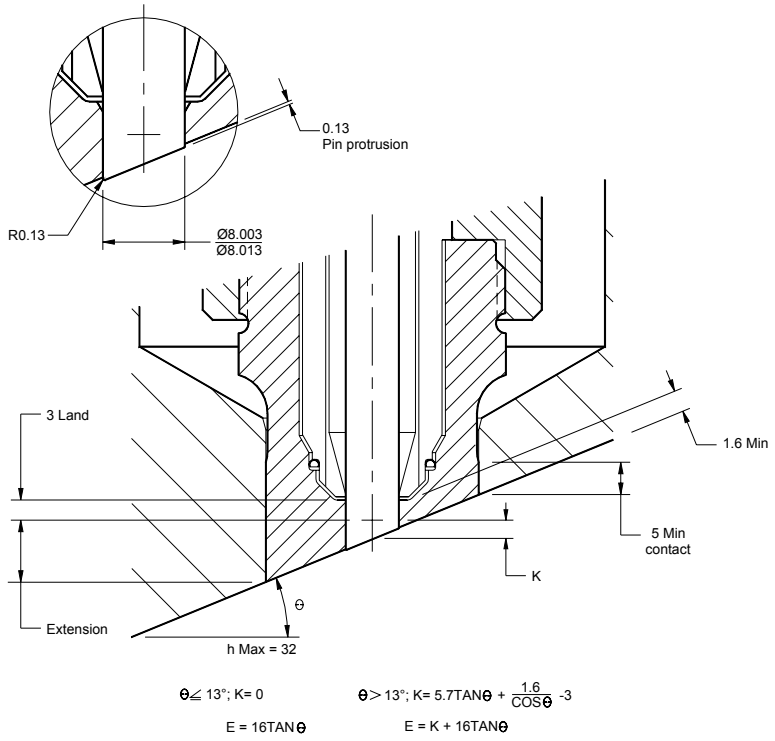
Heater Style	J Min	J Max	Heater Qty	Watts/ Volts
Band	160	380	1	750W/240V
Helical	160	220	1	550W/240V
Helical	220	425	1	850W/240V
Helical	425	650	2	550W/240V (each)
Helical	650	1000	2	850W/240V (each)

RD is the radial distance from the manifold center locator to the manifold nozzle center line.

For longer RD dimensions, consult with Synventive.

RD	J Min	RD	J Min
250	165	550	250
300	180	600	260
350	200	650	270
400	210	700	280
450	230	750	290
500	240	800	300

K is the increase in orifice land required to maintain 1.6 wall and/or 5 minimum contact.



Angled Mold Contour

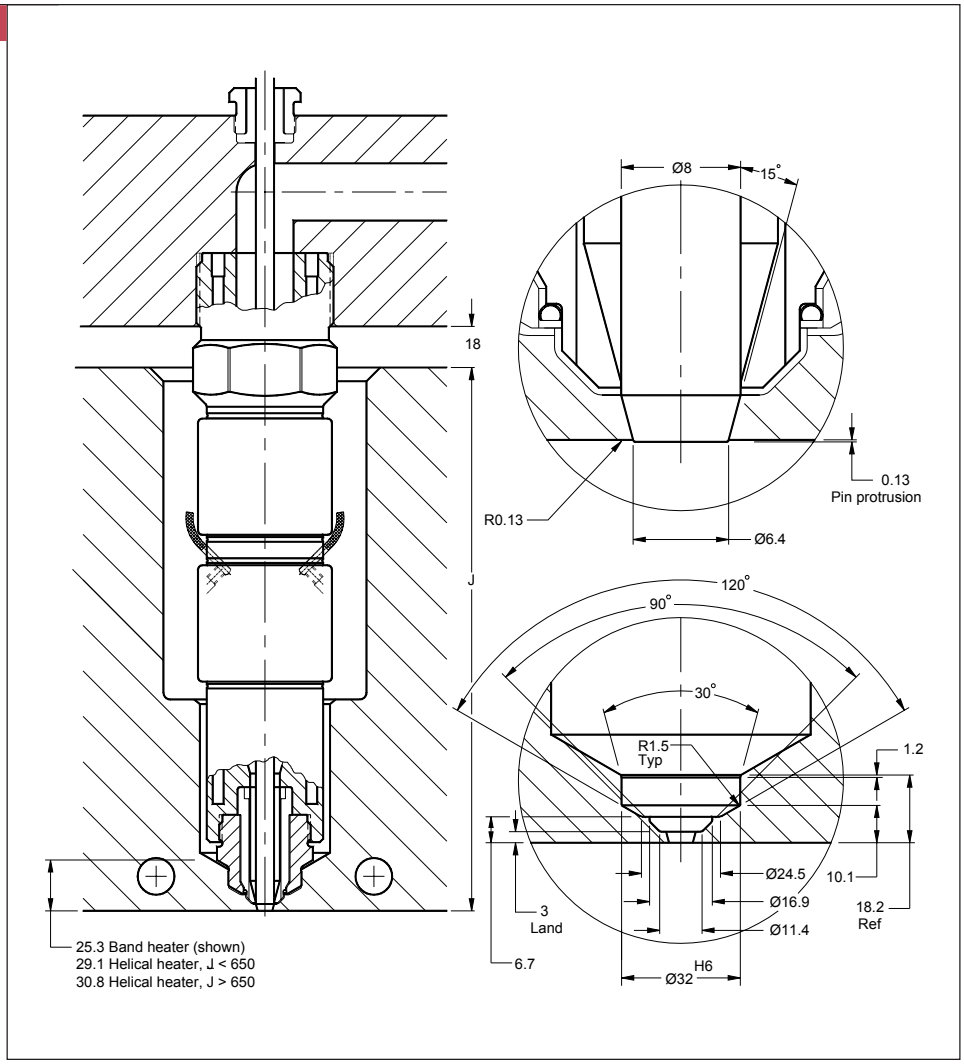
T24 VG23 Tapered

Filled and unfilled materials.

No tip witness mark on part.

Heat pipes for isothermal operation.

Tapered valve pin to eliminate gate flash.



Cooling is required in the gate area.

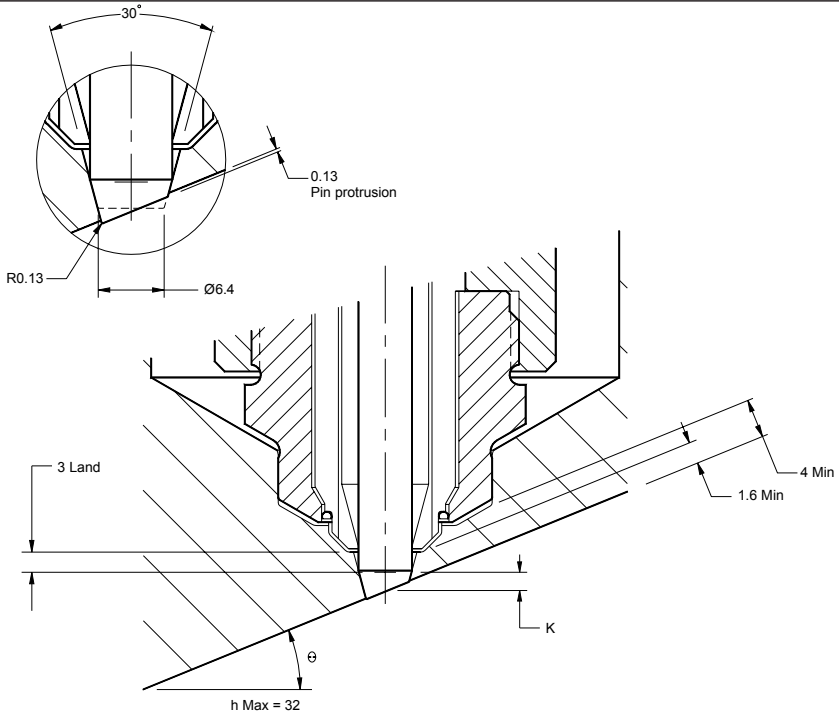
Heater Style	J Min	J Max	Heater Qty	Watts/ Volts
Band	160	380	1	750W/240V
Helical	160	220	1	550W/240V
Helical	220	425	1	850W/240V
Helical	425	650	2	550W/240V (each)
Helical	650	1000	2	850W/240V (each)

RD is the radial distance from the manifold center locator to the manifold nozzle center line.

For longer RD dimensions, consult with Synventive.

RD	J Min	RD	J Min
250	165	550	250
300	180	600	260
350	200	650	270
400	210	700	280
450	230	750	290
500	240	800	300

K is the increase in orifice land required to maintain 1.6 wall and/or 4 minimum wall thickness



$\theta \leq 13°$; K= 0 $\quad 13° < \theta < 24°$; $K = 5.7\tan\theta + \frac{1.6}{\cos\theta} - 3$ $\quad \theta > 24°$; $K = 16\tan\theta + \frac{4}{\cos\theta} - 10.1$

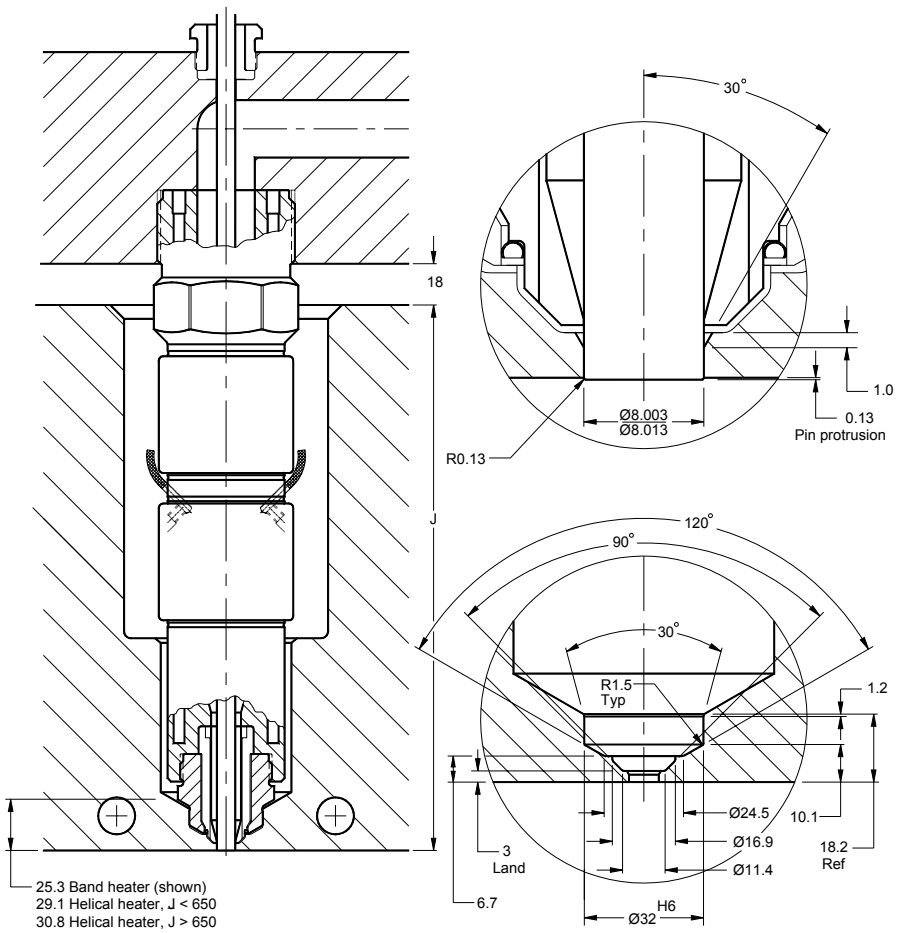
Angled Mold Contour

T24 VG23S Straight

Filled and unfilled materials.

No tip witness mark on part.

Heat pipes for isothermal operation.



Cooling is required in the gate area.

Heater Style	J Min	J Max	Heater Qty	Watts/ Volts
Band	160	380	1	750W/240V
Helical	160	220	1	550W/240V
Helical	220	425	1	850W/240V
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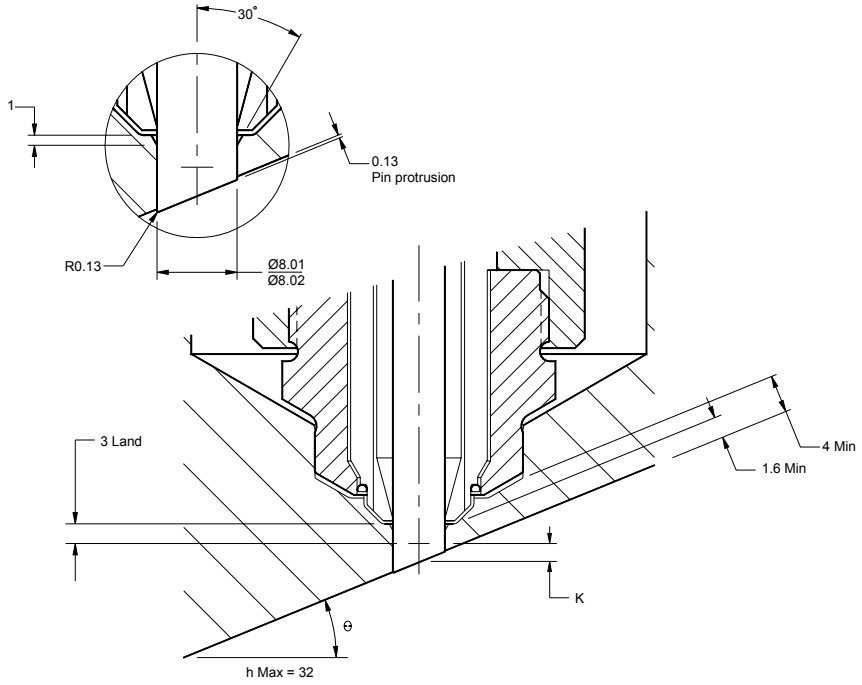
RD is the radial distance from the manifold center locator to the manifold nozzle center line.

For longer RD dimensions, consult with Synventive.

RD	J Min	RD	J Min
250	165	550	250
300	180	600	260
350	200	650	270
400	210	700	280
450	230	750	290
500	240	800	300

K is the increase in orifice land required to maintain 1.6 wall and/or 4 minimum wall thickness



Angled Mold Contour