CRS ENGINEERING

Heat-pipes & Thermal Management Systems

High Performance Thermal Solutions

Heat-pipes & Cooljets for Core Cooling

A4 /V26

CRS ENGINEERING

Heat-pipes & Thermal Management Systems

Welcome to CRS Engineering!....

Thank you for your interest in our Heat-pipe products and services in providing thermal solutions.

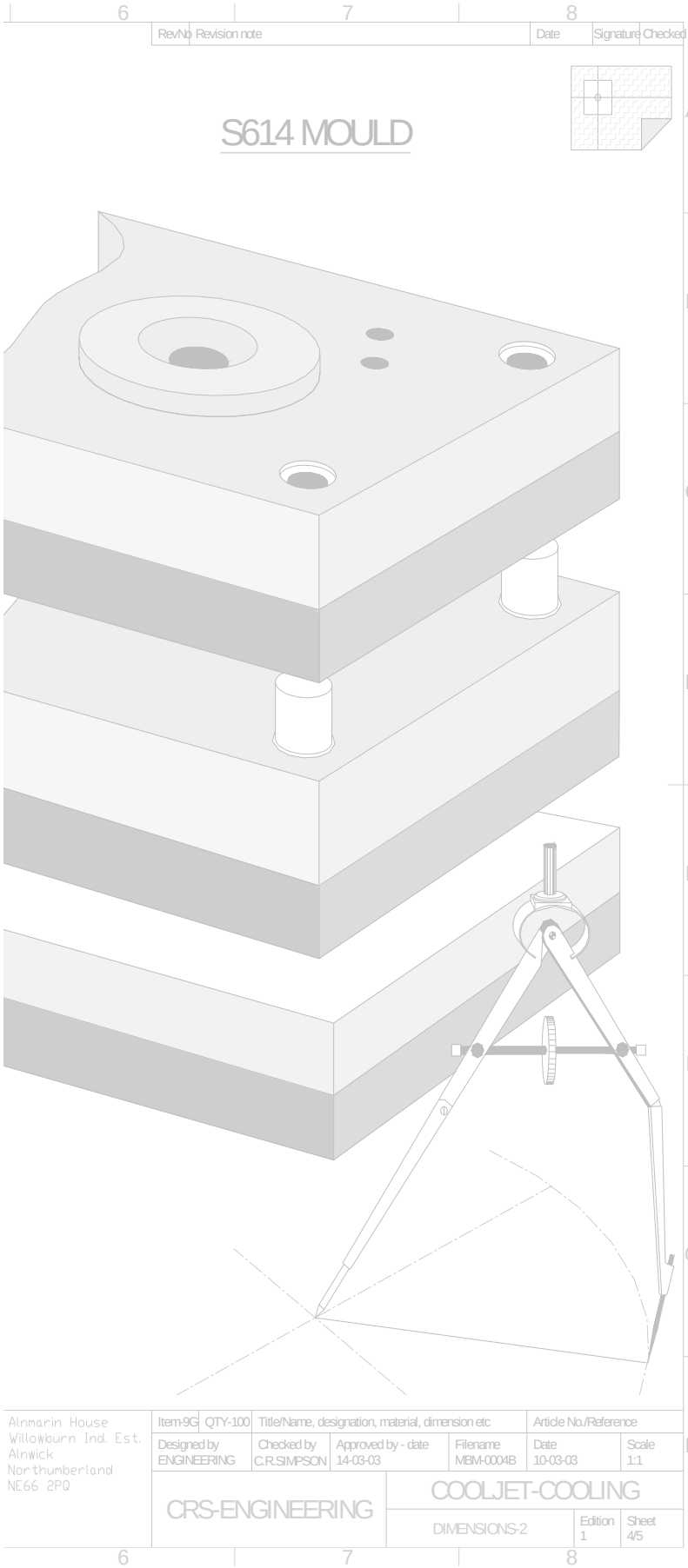
Most of our work is directly involved with customer specific applications, as such, the following pages are intended only as an insight into the products and services which our company can offer. We hope to inspire you with many new ideas together with our ability to resolve your particular thermal issues.

CRS Engineering has a wide experience in the field of thermal management and recognises the challenging and complex thermal demands facing today's development and application engineers.

We are confident that our early involvement will benefit you immediately by determining the best approach in finding the most appropriate solution to satisfy your thermal requirements, and would be pleased to invite you for a free initial consultation with us so that a first stage appraisal of your application can made as soon as possible.

CRS Engineering provides:-

- ✓***Consultancy & Design.***
- ✓***Standard & Custom built Heat-pipes***
- ✓***Research & Development***
- ✓***CAD Thermal Analysis and Drawing***
- ✓***Thermal Performance Testing***
- ✓***Prototyping and Pre-series Production***
- ✓***Series Manufacture.***



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Heat-pipe Types:

CRS Heat –pipes ….. for Effective Core Cooling!

CRS Cool Core Heat-pipes are used in moulding tool core pins to rapidly transport heat from the tip of the core pin back to the cooled tooling plates. In fact, even when moulding with engineering grade plastics, the heat-pipe temperature rarely exceeds 100° C, the largest temperature gradients occuring through the soldifying plastic, and in the wall of the steel core pin. The heat-pipes are inserted into the cores using CRS Cooflex 90 thermal compound to ensure a good thermal joint. (Note: use nominal drill size for nominal heat-pipe diameter). Ideally, cooling water is passed over the exposed end which idealy should be around 50% of the length of the heat-pipe length which is being heated at the core pin end. When using the heat-pipes to disipate heat directly to the cooling water, it is preferable that the water flow be of a high velocity rather than of a high volumetric flow-rate.

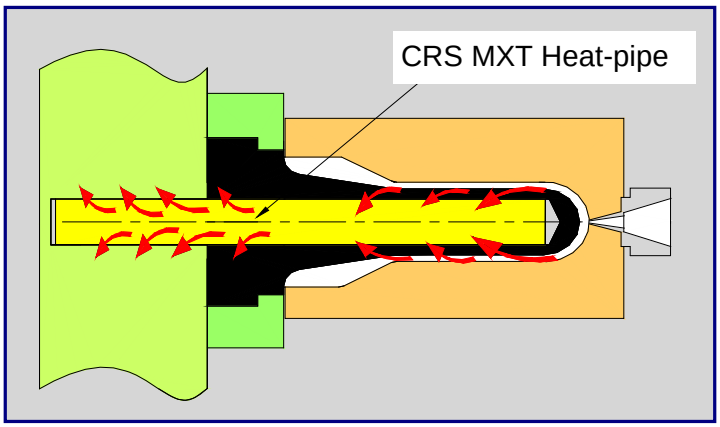
CRS-MST series + 5° C to +170° C

CRS-MXT series + 5° C to +270° C

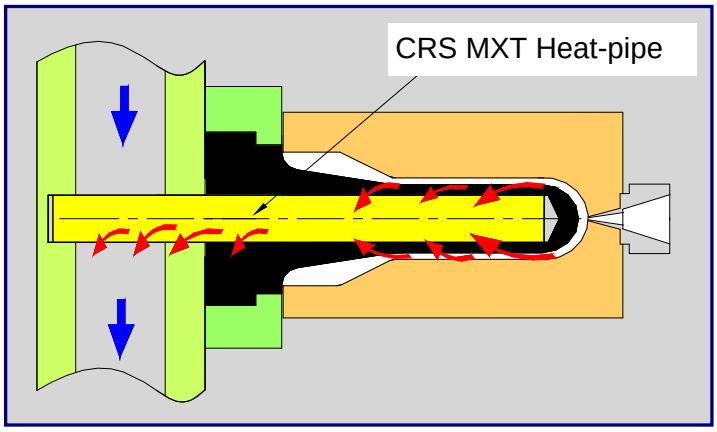
- ✓ ***Easy to install***
- ✓ ***Fast Cycle times***
- ✓ ***More Flexibility in Tool Design***
- ✓ ***Simplified Tool Construction***
- ✓ ***Highly Reliable and Consistent***
- ✓ ***Improved Moulding Quality***

Stay Cool !

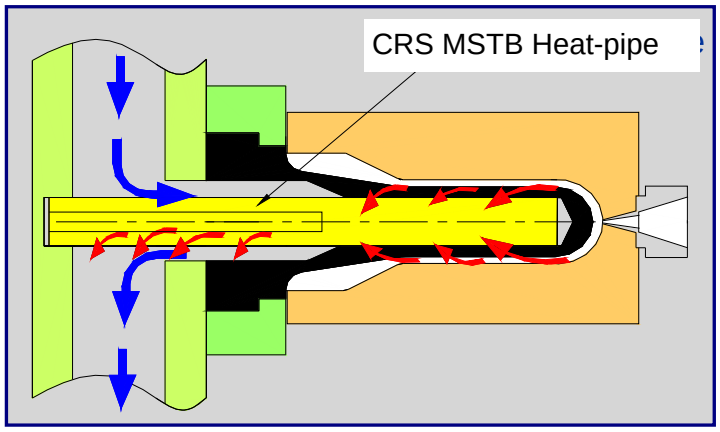
1. Heat-pipe core pin cooling without water



2. Heat-pipe core pin cooling with water



3. Baffled Heat– pipe core pin cooling



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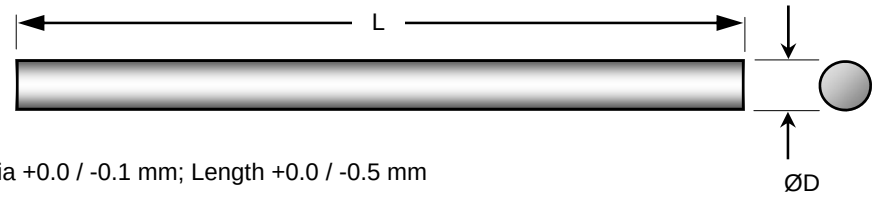
Cool Core Heat-pipe Types: ..... *Effective & Reliable Core Cooling!*

Standard Range Heat-pipes

MST series +5°C to +175°C

MXT series +5°C to +275°C

"Need a special length?"
.....available on request!



Tol: Dia +0.0 / -0.1 mm; Length +0.0 / -0.5 mm

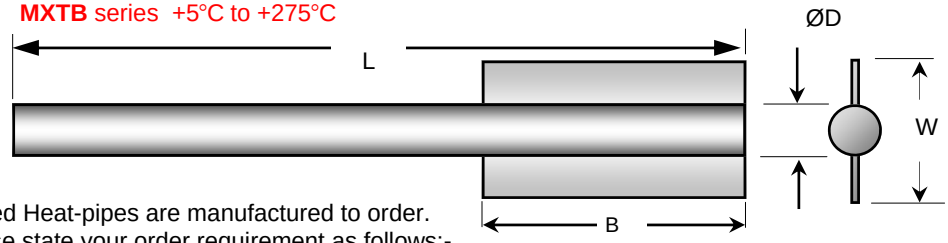
Order Code MST D x L

Order Code MXT D x L

Baffled Heat-pipes

MSTB series +5°C to +175°C

MXTB series +5°C to +275°C



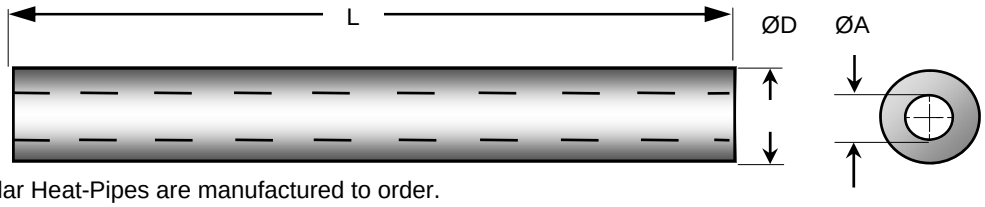
Baffled Heat-pipes are manufactured to order.
Please state your order requirement as follows:-
MSTB x *diameter* **D** x *length* **L** x *baffle length* **B** x *baffle width* **W**
Tol: Dia +0.0 / -0.1mm; Length +0.0 / -0.5mm

Order Code MSTB D x L x B x W

Annular Heat-pipes

(Operational temperature +5°C to +175°C)

Available Outside Diameters:	Available Inside Diameters:
5.0; 6.0; 8.0; 10.0 and 12.0 mm	1.3; 2.3; 4.0; 5.2 and 7.0 mm



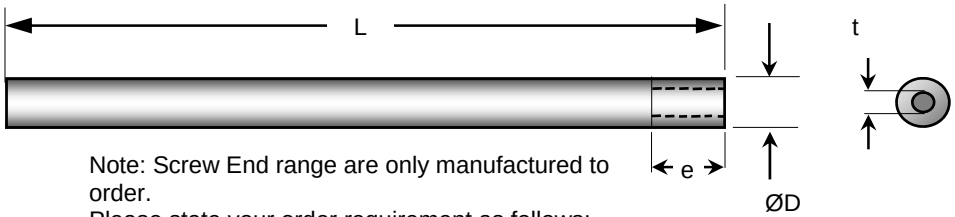
Annular Heat-Pipes are manufactured to order.
Please state your order requirement as follows:-
MSTA x *diameter* **D** x *length* **L** x *internal diameter* **A**
Tol: Dia +0.0 / -0.1mm; Length +0.0 / -0.5mm

Order Code MSTA D x L x A

Screw End Heat-pipes

MSTSE series +5°C to +175°C

MXTSEseries +5°C to +275°C



D	t	e
4	M2.5	2.5
5	M3	3.0
6	M3	3.0
8	M6	6.0
10	M6	6.0
12	M6	6.0

Note: Screw End range are only manufactured to order.
Please state your order requirement as follows:-
MSTSE x *diameter* **D** x *length* **L**
Tol: Dia +0.0 / -0.1mm; Length +0.0 / -0.5mm

Order Code MSTSE D x L

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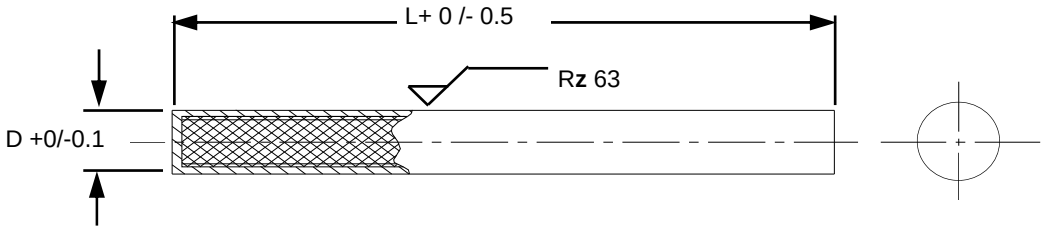
Standard Cool Core Heat-pipes

Super Thermal Conductivity!

Mat.: Copper Kupfer
MST Temp.: + 5ºC / + 175ºC
MXT Temp.: + 5ºC / + 275ºC



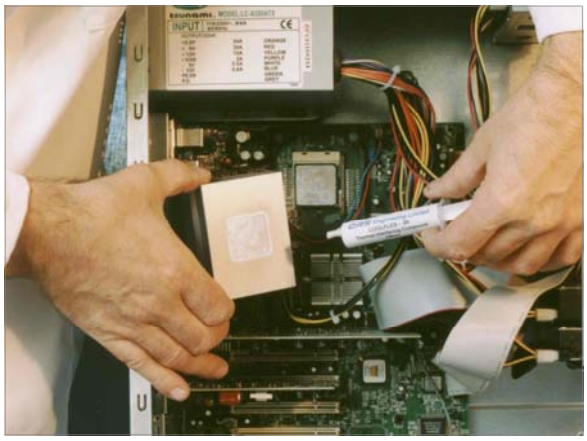
D	L	Order No. / Nr.
2	50	MST-020 x 050
	60	MXT-020 x 060
	70	x 070
	80	x 080
	100	x 100
	125	x 125
2.5	50	MST-025 x 050
	60	MXT-025 x 060
	70	x 070
	80	x 080
	100	x 100
	125	x 125
3	50	MST-030 x 050
	60	MXT-030 x 060
	70	x 070
	80	x 080
	100	x 100
	125	x 125
	150	x 150
	175	x 175
4	50	MST-040 x 050
	60	MXT-040 x 060
	70	x 070
	80	x 080
	100	x 100
	125	x 125
	150	x 150
	200	x 200

D	L	Order No. / Nr.
5	50	MST-050 x 050
	60	MXT-050 x 060
	70	x 070
	80	x 080
	100	x 100
	125	x 125
	150	x 150
	200	x 200
6	60	MST-060 x 060
	70	MXT-060 x 070
	80	x 080
	100	x 100
	125	x 125
	150	x 150
	175	x 175
	200	x 200
	250	x 250
8	100	MST-080 x 100
	125	MXT-080 x 125
	150	x 150
	175	x 175
	200	x 200
	250	x 250
10	100	MST-100 x 100
	125	MXT-010 x 125
	150	x 150
	175	x 175
	200	x 200
	250	x 250
	300	x 300
	350	x 350
12	100	MST-120 x 100
	125	MXT-120 x 125
	150	x 150
	175	x 175
	200	x 200
	250	x 250
	300	x 300
	350	x 350

Heat-pipe
Warmeleitpatrone
Cartouche thermconductrice

Installation of Heat-pipes:

Thermal Interfacing

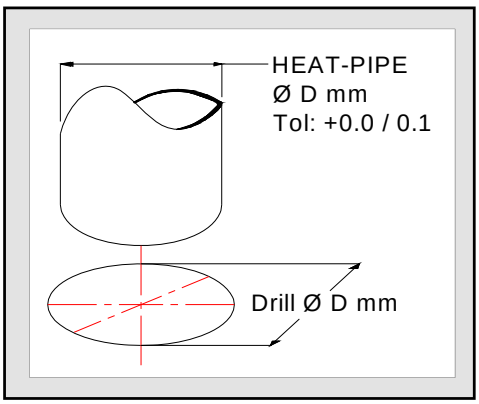


In all applications where heat is transferred, there are thermal resistances to overcome. The greatest thermal resistances in thermal systems are normally found at interfaces between component parts. To minimise these, it is preferable to eliminate any unnecessary thermal joints wherever possible. All remaining thermal joints need then to be optimised for good heat conduction. For jointing surfaces to have a good thermal interface they need to have intimate contact with each other. This requires that each surface has a fine finish, and is flat or co-planer to the adjoining surface. Good thermal interfacing can be difficult to achieve, uneven surfaces and necessary fitting tolerances often result in relatively poor contact. In some instances this can even result in having only several points of contact despite having a large surface contact area available. Generally it is necessary to use a suitable interfacing material to compensate for surface discrepancies of roughness and undulation. Wherever possible, close fitting, solder brazed interfaces provide the most satisfactory solution.

Thermal Interface Compounds

Where soldering of joints is not an option CRS Engineering offers two types of installation compounds: **Coolflex 90** a non setting high thermally conductive paste. (available in a 10 cc syringe)
Coolbond 85 a two-part high thermally conductive epoxy adhesive. (available in a 5 cc syringe with a separate phial of accelerator)

Fitting of heat-pipes into drilled holes



Installation of tubular heat-pipes into drilled components can offer a simple and convenient method of assembly. The drilling size for the heat-pipe should allow a radial gap of between +0.05 mm and +0.12 mm (+0.002/+0.005") around the heat-pipe.
CRS standard range heat-pipes are produced with a diametrical tolerance of +0.0/-0.1mm, so will easily fit into holes drilled to the nominal diametrical size.
(Note: drilled holes are invariably marginally oversize depending upon the concentricity of the individual drill bit used, it is advisable therefore to first drill the hole location with a smaller diameter drill bit.

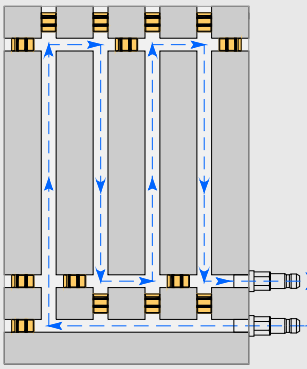
Important note: Soldering of heat-pipes should not be attempted without prior consultation with CRS Engineering. Accurate temperature control equipment is necessary and without this, damage or serious personal injury can occur.
CRS Engineering can provide this service during manufacture and assembly.

Pressure Plugs

Pressure Plugs provide a most cost effective and convenient solution for setting up flow paths in cross-channel matrix drillings. Pressure Plugs are manufactured from brass and assembled with Viton 'O' ring seals and stainless steel circlips. Pressure Plugs are available in six nominal bore size diameters and are suitable for systems operating with both water and mineral oil.

Installation:

Installation is simple, and requires only a normal flat screwdriver. Lightly adjust the Channel Plug screw to slightly expand the component before insertion to provide a slight amount of sliding resistance. Insert the Pressure Plug to the required depth and tighten the screw to fix into position.



Specification:

Maximum operating pressure: 10 bars (150psi)
Maximum operating Temperature: 150°C
Bore tolerance: Nom. drill size dia. -0.0 / + 0.4 mm.

(supplied in packs of 10 pcs)

Order Code	Drilling Size
CP-06	6.0
CP-08	8.0
CP-10	10.0
CP-12	12.0
CP-14	14.0
CP-16	16.0

Quick Release Couplings

Quick Release Couplings provide a convenient and cost effective means of hose connection, saving down time in production, maintenance and in making tool changes.

- ✓ ***Fast, Convenient Connection***
- ✓ ***Quality stainless steel and brass construction***
- ✓ ***Viton seal rings***
- ✓ ***Temperature rating to 150°C Continuous***
- ✓ ***Suitable for use with water or mineral oil***

Order Code	Female Connector	Bore Size mm
QR 9	Open	9.0
QR 9V	With Valve	9.0
QR 13	Open	13.0
QR 13V	With Valve	13.0

Order Code	Female Connector	Thread
QM 9	Open	1/4 BSP
QM 9V	With Valve	1/4 BSP
QM 13	Open	3/8 BSP
QM 13V	With Valve	3/8 BSP

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CRS Series Flow Cooljets ..... for Effective Core Cooling!

CRS Series Flow Cooljets are of rugged, high quality stainless steel manufacture for long life and durability. These popular, industry standard plug-in cooling components are conveniently installed into single flow channels and direct water cooling to the internal tip of the core pin. In a series flow installation, only a single flow channel is required to provide cooling to several cores.

Where parallel flow connection is required for a multi-core *"balance cooling"* and allowable tooling plate thickness is an added constraint, then CRS Series Flow Cooljets can also be installed between twin flow channels, in a parallel array, that provides a common pressure and return line to the core locations.

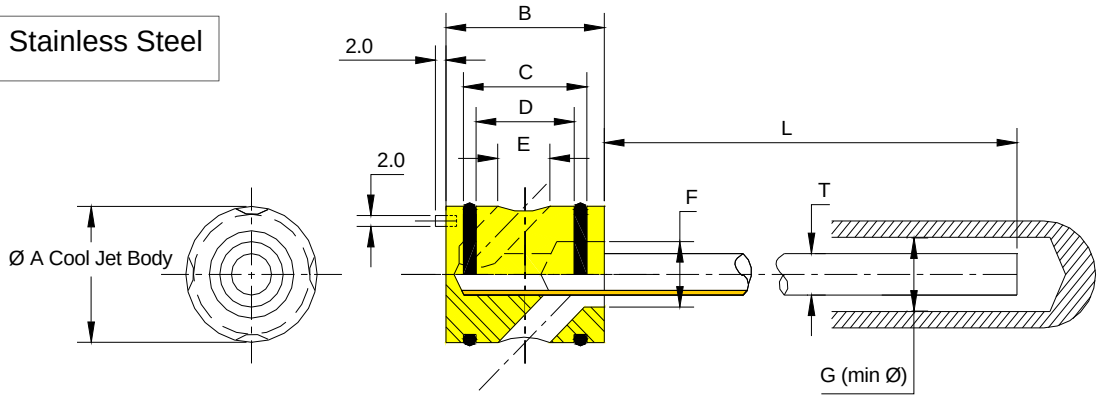
CRS Series Flow Cooljet - Options

✓Available in three manifold range sizes: Ø10mm, Ø16mm and 25mm.

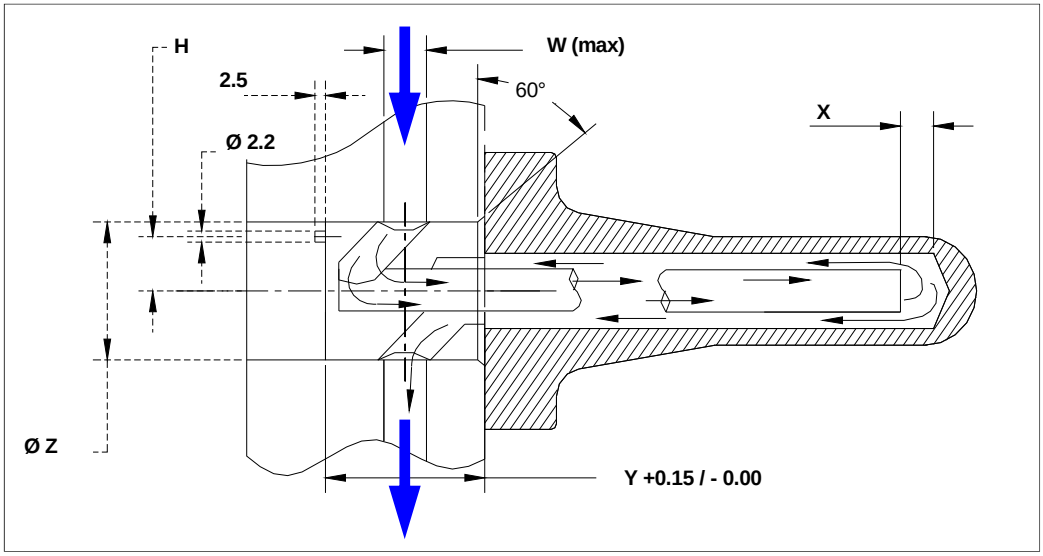
✓A choice of 4 sealing O - Ring configurations.

✓4 port options: Inline, Left, Right or Universal.

MATERIAL: Stainless Steel



INSTALLATION DIAGRAM



CRS *Cooljet Series Flow* — CJS-10 mm Range

Order No. / Nr.	T	L	A	B	C	D	E	F	G	H	W	X	Y	Z
CJS-10-0.80	0.80	200	9.90	15.0	11.2	7.0	2.0	4.0	1.0	3.0	6.0	3.0	15.0	10.0
CJS-10-1.30	1.30								1.5			4.0		
CJS-10-1.60	1.60								2.0			4.0		
CJS-10-2.40	2.40								3.2			5.0		
CJS-10-3.00	3.00								3.7			5.0		
CJS-10-3.30	3.30								4.0			6.0		

CRS *Cooljet Series Flow* — CJS-16 mm Range

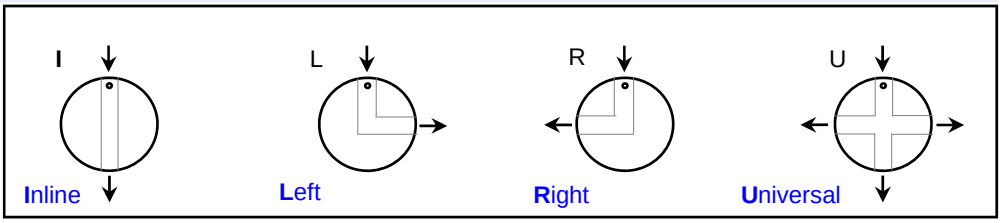
Order No. / Nr.	T	L	A	B	C	D	E	F	G	H	W	X	Y	Z
CJS-16-0.80	0.80	200	15.9	20.0	15.8	11.0	3.0	6.0	1.0	5.5	10.0	3.0	20.0	16.0
CJS-16-1.30	1.30								1.5			4.0		
CJS-16-1.60	1.60								2.0			4.0		
CJS-16-2.40	2.40								3.2			5.0		
CJS-16-3.00	3.00								3.7			5.0		
CJS-16-3.30	3.30								4.0			6.0		

CRS *Cooljet Series Flow* — CJS-25 mm Range

Order No. / Nr.	T	L	A	B	C	D	E	F	G	H	W	X	Y	Z
CJS-25-4.00	4.00	200	24.9	30.0	23.4	18.6	7.0	12.0	5.5	9.8	16.0	6.0	30.0	25.0
CJS-25-5.00	5.00								6.5			7.0		
CJS-25-6.00	6.00								8.0			8.0		
CJS-25-8.00	8.00								11.0			12.0		

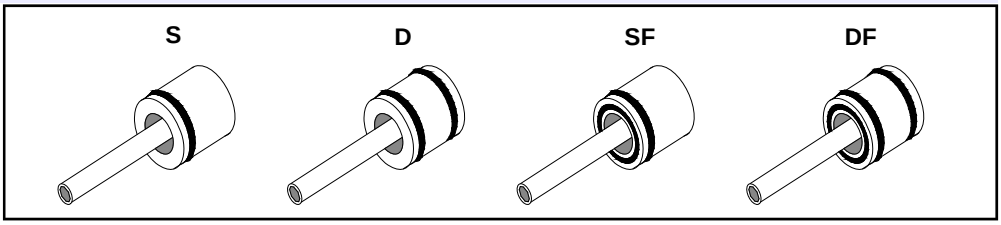
Port Configuration

Select the required port configuration, direction is as viewed looking from the location pin end



O-Ring Seal Configuration

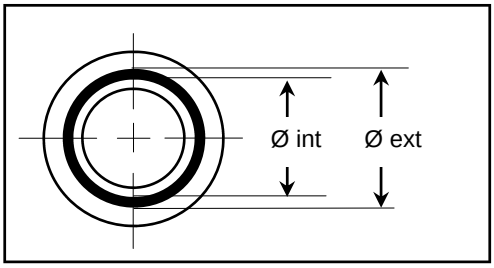
Select the required O-Ring Sealing configuration: Single or Double, and with or without Front face sealing.



Front Face O-ring Details

Front face O-Ring sealing dimensional details.

Cool Jet	Ø internal	Ø external
CJS-10	4.8	8.0
CJS-16	7.8	12.0
CJS-25	16.0	20.0



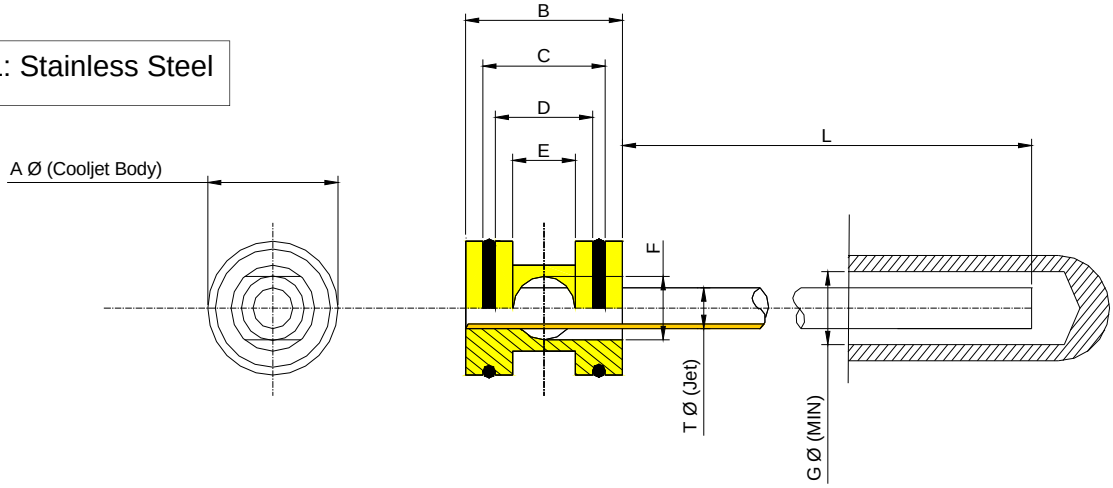
Order Code Example: 8 pcs CJS - 16 - 3.30 - 200 - I - DF
i.e. 8 pieces: Cooljet Series Flow from the 16 mm range with Ø3.3 mm jet tubes installed of standard length L= 200 mm; Inline porting and Double and Front face O-Rings fitted.

CRS Parallel Flow Cooljets

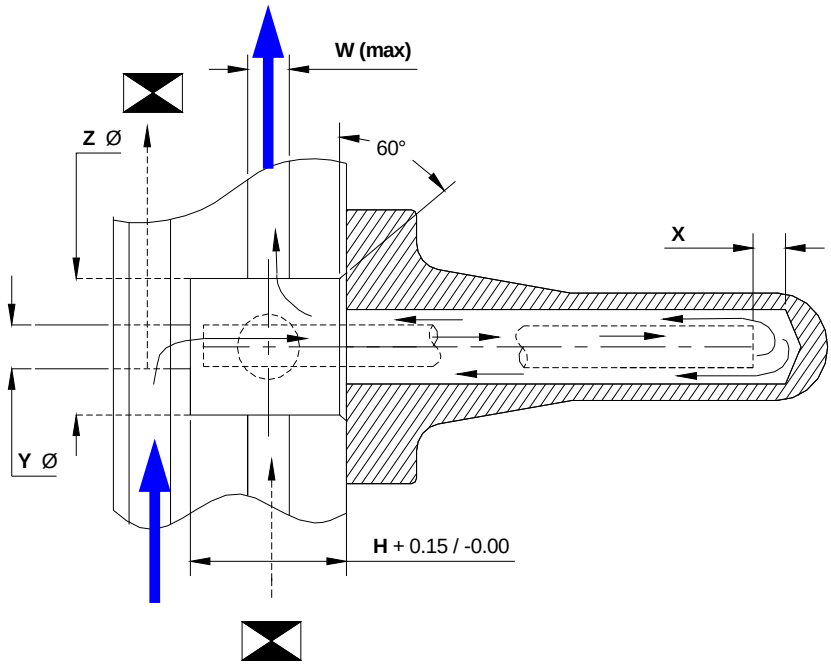
..... Sophisticated Balanced Core Cooling!

CRS Parallel Flow Cooljets are of rugged high quality stainless steel manufacture. They are similar to the series flow Cooljets but with a difference…., they provide the convenient means of installing a parallel connection cooling system. With multiple cavity systems much time and effort is spent in the design and tool making to optimise plastic material flow. The balancing of sophisticated hot runner systems involves critical temperature regulation to manage the very high operational performance demands. In such applications, then it is also vital to have a "***balanced cooling system"***. This allows rapid cooling of all cores at an equal rate, and assists with temperature regulation instead of working against it.

MATERIAL: Stainless Steel



INSTALLATION DIAGRAM



CRS *Cooljet Parallel Flow* — CJP-10 mm Range

Order No. / Nr.	T	L	A	B	C	D	E	F	G	H	W	X	Y	Z
CJP-10-0.80	0.80	200	9.90	15.0	11.2	7.0	4.0	4.0	1.0	15.0	6.0	3.0	4.0	10.0
CJP-10-1.30	1.30								1.5			4.0		
CJP-10-1.60	1.60								2.0			4.0		
CJP-10-2.40	2.40								3.2			5.0		
CJP-10-3.00	3.00								3.7			5.0		
CJP-10-3.30	3.30								4.0			6.0		

CRS *Cooljet Parallel Flow* — CJP-16 mm Range

Order No. / Nr.	T	L	A	B	C	D	E	F	G	H	W	X	Y	Z
CJP-16-0.80	0.80	200	15.9	20.0	15.8	11.0	7.0	7.0	1.0	20.0	10.0	3.0	6.0	16.0
CJP-16-1.30	1.30								1.5			4.0		
CJP-16-1.60	1.60								2.0			4.0		
CJP-16-2.40	2.40								3.2			5.0		
CJP-16-3.00	3.00								3.7			5.0		
CJP-16-3.30	3.30								4.0			6.0		
CJP-16-4.00	4.00								5.5			7.0		
CJP-16-5.00	5.00								6.5			8.0		

CRS *Cooljet Parallel Flow* — CJP-25 mm Range

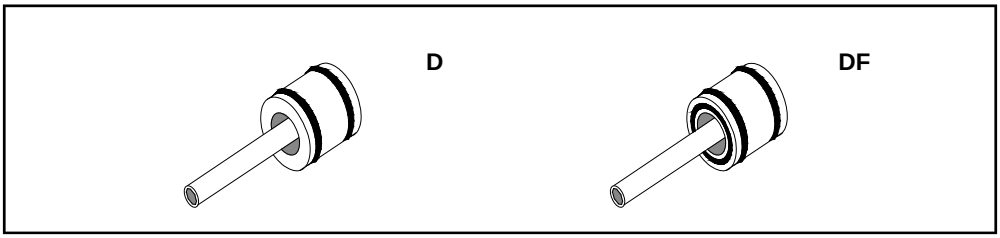
Order No. / Nr.	T	L	A	B	C	D	E	F	G	H	W	X	Y	Z
CJP-25-4.00	4.00	200	24.9	30.0	23.4	18.6	12.0	12.0	5.5	25.0	16.0	7.0	12.0	25.0
CJP-25-5.00	5.00								6.5			8.0		
CJP-25-6.00	6.00								8.0			8.0		
CJP-25-8.00	8.00								11.0			12.0		

Port Configuration: Universal Direction Porting with Parallel Flow Cooljets

O-Ring Seal Configuration

There are 2 options for O-Ring Sealing configuration:

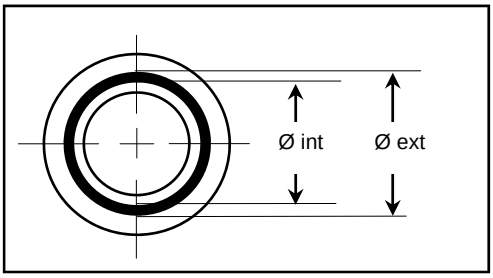
D, without or **DF** with front face sealing.



Front Face O-ring Details

Front face O-Ring sealing dimensional details.

Cool Jet	Ø internal	Ø external
CJP-10	4.8	8.0
CJP-16	7.8	12.0
CJP-25	16.0	20.0



Order Code Example: 24 pcs CJP - 25 - 8.00 - 200 - DF
This shows an order code example for 24 pieces: Cooljet Parallel Flow from the 25 mm range with Ø8.0 mm jet tubes installed of standard length L= 200 mm; fitted with Double and Front face O-Rings.

About CRS Engineering ....

Founded in 1999, CRS Engineering is a dynamic, privately owned limited company specializing in the design and manufacture of heat-pipe systems. Receiving the Tyneside & Northumberland Business Awards Technology Award in 2005 CRS is also acknowledged internationally for providing customer specific thermal solutions through innovative design and development.

CRS Engineering concentrates its efforts at the leading edge of thermal technologies. Investing in research and development together with an active involvement in customer applications has enabled CRS Engineering to make cutting edge advances in heat-pipe technology and to further elevate performance capabilities of specific thermal systems.

In response to customers requirements for components of optimal quality, performance and reliability, CRS Engineering sets exacting standards. All heat-pipes and integrated thermal systems are produced in house and undergo in-process checks throughout manufacture. All manufactured components are individually inspected and performance tested prior to despatch.

CRS Engineering has experience in a wide range of confidential technical development projects, including classified military defence work. An expanding client base ranges from companies involved in textiles, plastics, electronics, as well as in medical, aerospace and defence industries.

CRS Engineering provides customers with a complete thermal solutions service from application analysis, conceptual development and prototyping.

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