Thermal Solutions Worldwide

SECTION L

Isobars®

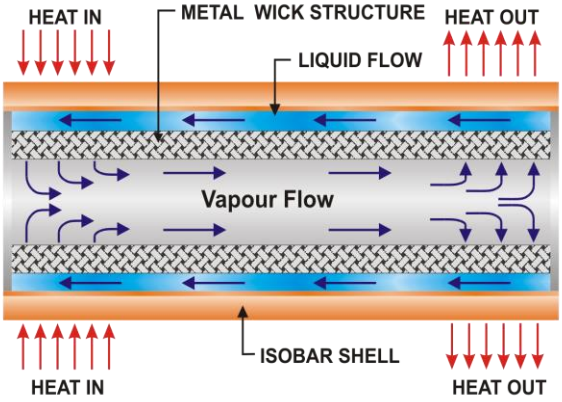
Introduction to Isobar® Heat Pipes and How They Work

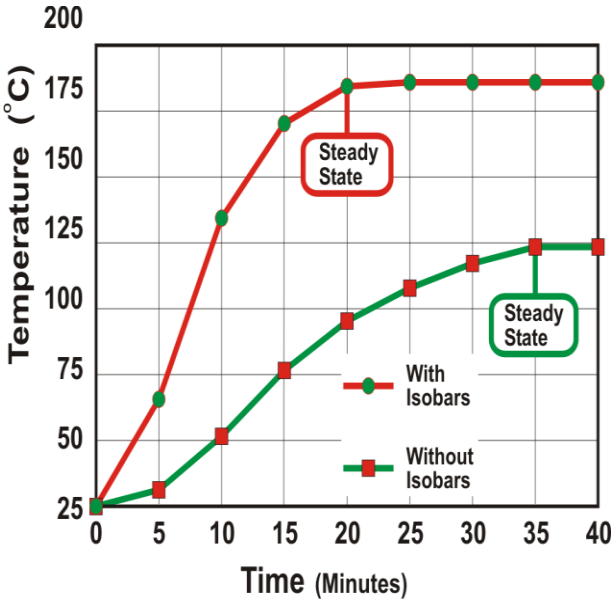
Where Isobars Come From

Acrolab's Isobar® heat pipes have their roots in thermosyphons. Thermosyphons function as a super-thermal conductor only in a vertical or near vertical plane. In a thermosyphon, a small quantity of working fluid is placed in an evacuated tube. Heat is applied to the base of the tube, causing the temperature of the working fluid to rise — as this fluid heats, it vaporizes. This vapor then migrates to the colder end of the tube where it is condensed. The condensate is returned to the heated tube end by gravity. Since the latent heat of evaporation is large, considerable quantities of heat can be transferred with a very small temperature difference from end to end. The thermosyphon is limited in application because the evaporator region must be situated lower than the condenser region.

How Isobars Work

The Isobar® Heat Pipe improves on this in that it incorporates a sophisticated solid-state pump to return the condensate to the evaporator site. This pump takes the form of a fine metallic wick that resides tight to the inner wall of the Isobar. This wick, through its capillary action, returns the working fluid to the evaporator without regard to orientation. In a normal environment, the wick permits equal function in vertical and horizontal planes. In applications where the evaporator site is above the condenser, the performance of the Isobar® Heat Pipe is controlled by the capillary action of the wick structure.





Steel Core Heating Comparison

Common Isobar® Types

Straight: Utilized for basic applications: Plastic Tooling, Composite Tooling, Rubber Tooling.

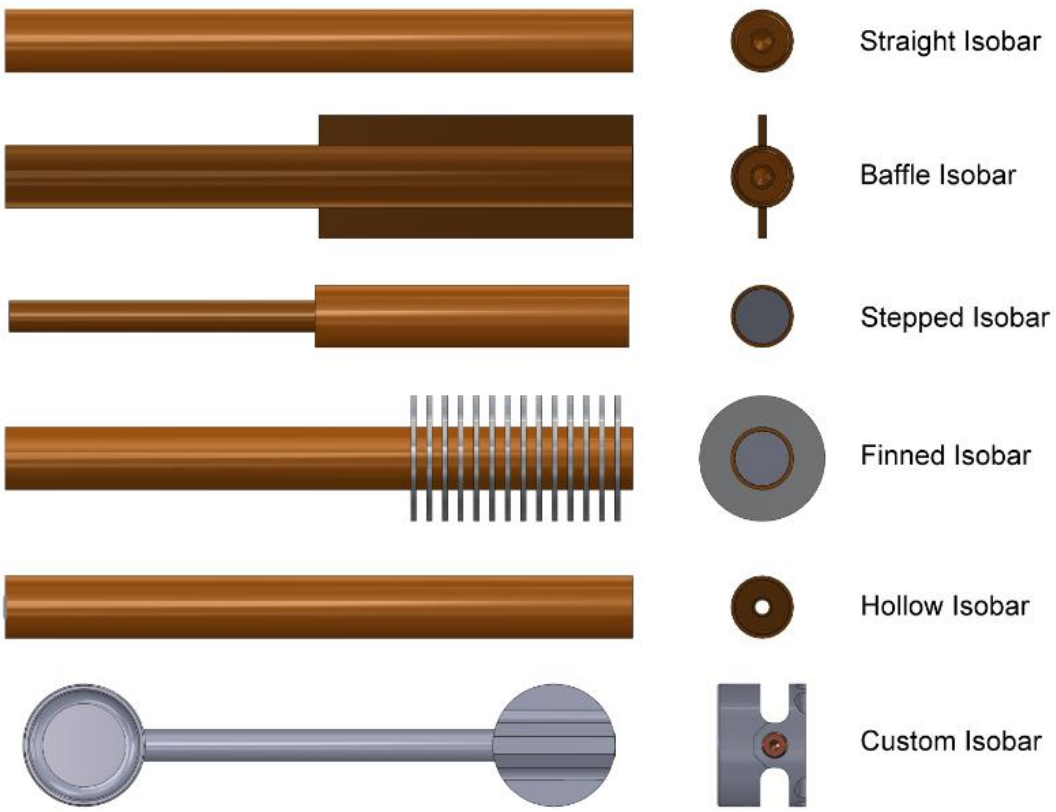
Baffle: Used mainly for cooling applications to enhance cooling over standard baffles or bubblers.

Stepped: Typically used in cores or core pins for heating or cooling applications.

Finned: Used in more advanced applications: Typically found in oven or autoclave tooling, natural or forced air convection applications.

Hollow: Used in applications with center extraction or heating/cooling is required down a center shaft.

Custom: Acrolab has built thousands of custom Isobars for many different clients and industries. Contact us if you require something outside of the norm.



Acrolab engineers and customizes Isobar heat pipes to all different shapes and sizes. Commonly used Isobars are: straight, baffled, finned, and stepped. For these types of Isobars, temperatures can range from 50°F to 500°F.

Acrolab also engineers low temperature Isobars that operate at temperatures from -103°F to 50°F. These special Isobars are application dependent and are available upon request.

Sizing and Ordering

Standard Isobars

Acrolab Isobars are a 3 in 1 solution. They can provide cooling and/or heating solutions for your application. Looking for thermal uniformity? They can also create a uniform temperature along the linear length.

Sample Part Number For Straight Isobars

ISO — OD X LENGTH

Example ISO — 1/2 X 24”

Sizes

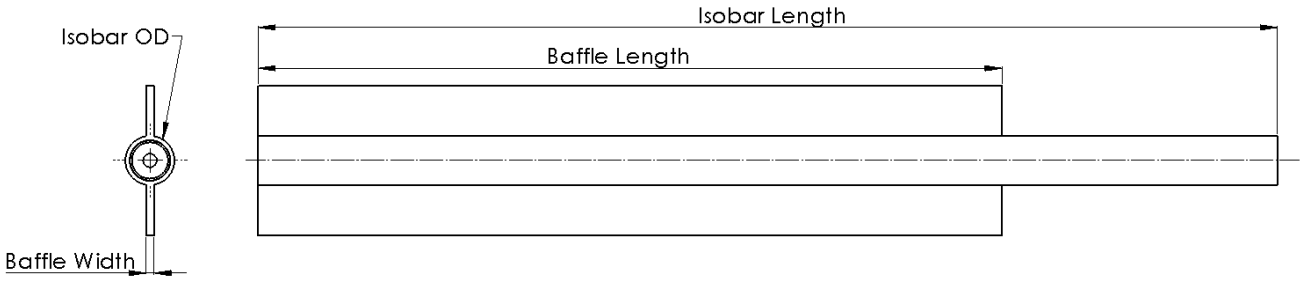
ISOBAR NOMINAL Outside Diameter	ISOBAR ACTUAL Outside Diameter	PASTE Hole Diameter	ISOBAR RETAINER SET SCREW
3/32"	0.093"	0.096"	N/A
1/8"	0.124"	0.127"	N/A
5/32"	0.154"	0.157"	N/A
3/16"	0.185"	0.189"	4-40NC
1/4"	0.249"	0.252"	4-40NC
5/16"	0.311"	0.314"	6-32NC
3/8"	0.374"	0.377"	6-32NC
1/2"	0.499"	0.502"	10-24NC
5/8"	0.624"	0.627"	10-24NC
3/4"	0.748"	0.752"	3/8-16NC

ISOBAR NOMINAL Outside Diameter	ISOBAR ACTUAL Outside Diameter	PASTE Hole Diameter	ISOBAR RETAINER SET SCREW
3mm	2.99mm	3.07mm	N/A
4mm	3.96mm	4.04mm	N/A
5mm	5.00mm	5.08mm	M-2 x 0.4
6mm	5.97mm	6.04mm	M-2 x 0.4
8mm	7.98mm	8.05mm	M-2 x 0.4
10mm	9.91mm	10.00mm	M-5 x 0.8
12mm	11.86mm	11.96mm	M-5 x 0.8
15mm	14.86mm	14.96mm	M-5 x 0.8
16mm	15.98mm	16.08mm	M-5 x 0.8
18mm	17.88mm	17.98mm	M-6 x 1.0
20mm	19.84mm	19.94mm	M-6 x 1.0
25mm	24.84mm	24.94mm	M-6 x 1.0
30mm	29.85mm	29.94mm	M-6 x 1.0

OD Tolerance	Hole Tolerance	Isobar Length Tolerance
+0.001" / -0.003"	±0.001"	+0.000" / -0.060"

Sizing and Ordering

Baffle Isobars



Acrolab's baffle Isobars allow for deeper cooling in a tool. Having grime build up in your holes? They also give the option to replace bubblers and baffles to avoid grime build up.

Sample Part Number For Baffle Isobars

ISO — BAF — OD X LENGTH

Example ISO — BAF — 5/8 X 10"

For Ordering SEE FORMATS

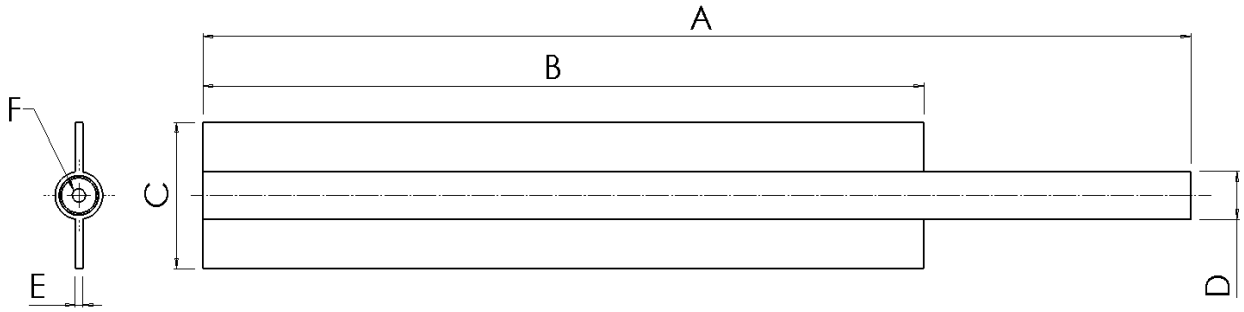
Sizes

ISOBAR NOMINAL Outside Diameter	ISOBAR ACTUAL Outside Diameter	PASTE Hole Diameter	ISOBAR RETAINER SET SCREW
3/32"	0.093"	0.096"	N/A
1/8"	0.124"	0.127"	N/A
5/32"	0.154"	0.157"	N/A
3/16"	0.185"	0.189"	4-40NC
1/4"	0.249"	0.252"	4-40NC
5/16"	0.311"	0.314"	6-32NC
3/8"	0.374"	0.377"	6-32NC
1/2"	0.499"	0.502"	10-24NC
5/8"	0.624"	0.627"	10-24NC
3/4"	0.748"	0.752"	3/8-16NC

ISOBAR NOMINAL Outside Diameter	ISOBAR ACTUAL Outside Diameter	PASTE Hole Diameter	ISOBAR RETAINER SET SCREW
3mm	2.99mm	3.07mm	N/A
4mm	3.96mm	4.04mm	N/A
5mm	5.00mm	5.08mm	M-2 x 0.4
6mm	5.97mm	6.04mm	M-2 x 0.4
8mm	7.98mm	8.05mm	M-2 x 0.4
10mm	9.91mm	10.00mm	M-5 x 0.8
12mm	11.86mm	11.96mm	M-5 x 0.8
15mm	14.86mm	14.96mm	M-5 x 0.8
16mm	15.98mm	16.08mm	M-5 x 0.8
18mm	17.88mm	17.98mm	M-6 x 1.0
20mm	19.84mm	19.94mm	M-6 x 1.0
25mm	24.84mm	24.94mm	M-6 x 1.0
30mm	29.85mm	29.94mm	M-6 x 1.0

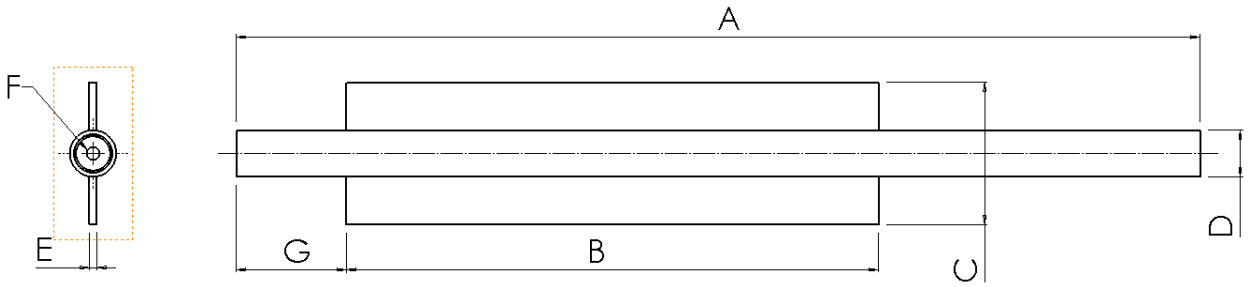
OD Tolerance	Hole Tolerance	Isobar Length Tolerance
+0.001" / -0.003"	±0.001"	+0.000" / -0.060"

Acrolab Baffle Isobar Detail – Format #1



QTY	A	B	C	D	E	F
					0.0625"	Extractable Threads
					0.0625"	Extractable Threads
					0.0625"	Extractable Threads
					0.0625"	Extractable Threads
					0.0625"	Extractable Threads

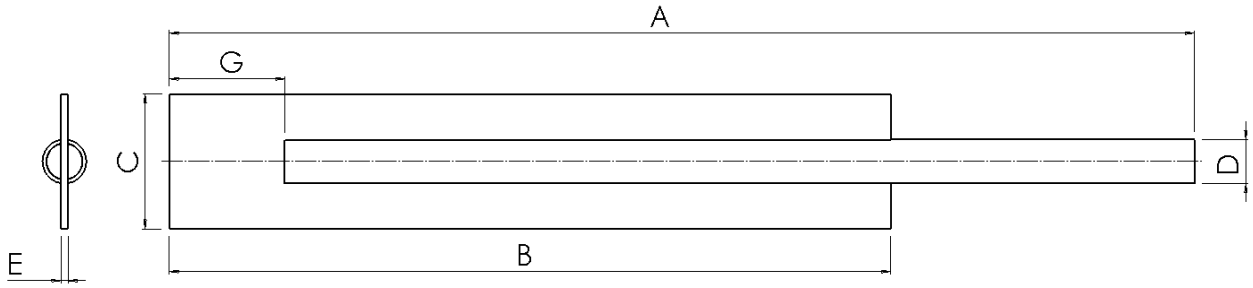
Acrolab Baffle Isobar Detail – Format #2



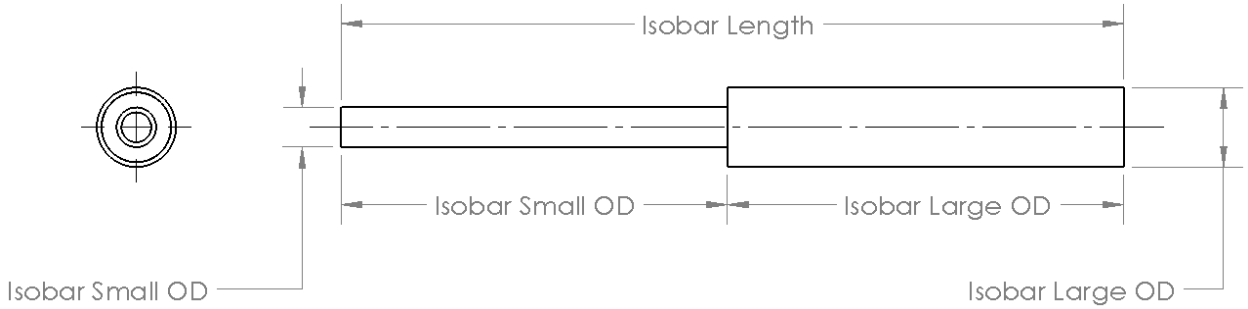
QTY	A	B	C	D	E	F	G
					0.0625"	Extractable Threads	
					0.0625"	Extractable Threads	
					0.0625"	Extractable Threads	
					0.0625"	Extractable Threads	
					0.0625"	Extractable Threads	

Acrolab Baffle Isobar Detail – Format #3

QTY	A	B	C	D	E	F
					0.0625"	
					0.0625"	
					0.0625"	
					0.0625"	
					0.0625"	



Stepped Isobars



Acrolab's Stepped Isobars can be used in many applications. The most popular application is core pin cooling. By installing the Isobar with a tail end sticking into the water channel you can increase cooling capacity and achieve better uniformity without running water up the core pin.

Sample Part Number For Stepped Isobars

ISO	—	STEP	—	LG OD	X	LENGTH	—	SM OD	X	LENGTH

Example | ISO | — | STEP | — | 1/2 | X | 24" | — | 3/8 | X | 5" |

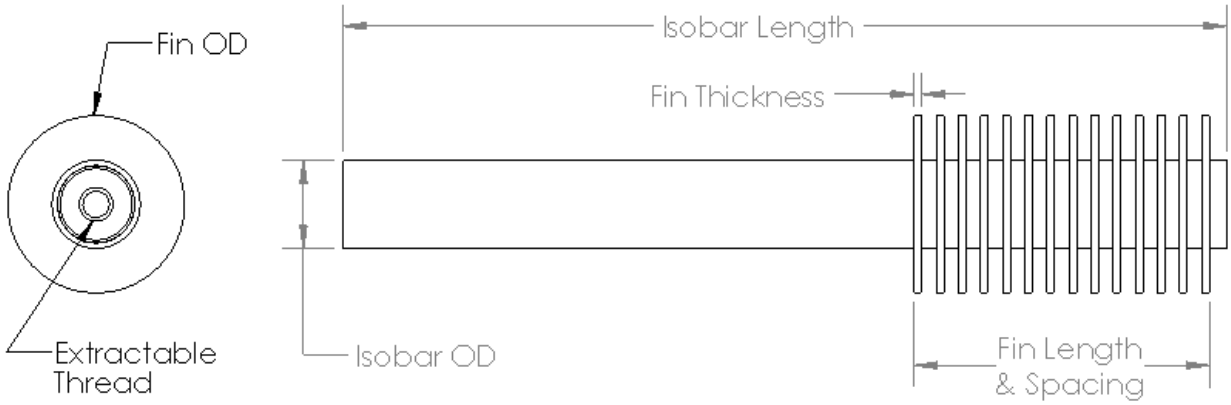
Sizes

ISOBAR NOMINAL Outside Diameter	ISOBAR ACTUAL Outside Diameter	PASTE Hole Diameter	ISOBAR RETAINER SET SCREW
3/32"	0.093"	0.096"	N/A
1/8"	0.124"	0.127"	N/A
5/32"	0.154"	0.157"	N/A
3/16"	0.185"	0.189"	4-40NC
1/4"	0.249"	0.252"	4-40NC
5/16"	0.311"	0.314"	6-32NC
3/8"	0.374"	0.377"	6-32NC
1/2"	0.499"	0.502"	10-24NC
5/8"	0.624"	0.627"	10-24NC
3/4"	0.748"	0.752"	3/8-16NC

ISOBAR NOMINAL Outside Diameter	ISOBAR ACTUAL Outside Diameter	PASTE Hole Diameter	ISOBAR RETAINER SET SCREW
3mm	2.99mm	3.07mm	N/A
4mm	3.96mm	4.04mm	N/A
5mm	5.00mm	5.08mm	M-2 x 0.4
6mm	5.97mm	6.04mm	M-2 x 0.4
8mm	7.98mm	8.05mm	M-2 x 0.4
10mm	9.91mm	10.00mm	M-5 x 0.8
12mm	11.86mm	11.96mm	M-5 x 0.8
15mm	14.86mm	14.96mm	M-5 x 0.8
16mm	15.98mm	16.08mm	M-5 x 0.8
18mm	17.88mm	17.98mm	M-6 x 1.0
20mm	19.84mm	19.94mm	M-6 x 1.0
25mm	24.84mm	24.94mm	M-6 x 1.0
30mm	29.85mm	29.94mm	M-6 x 1.0

OD Tolerance	Hole Tolerance	Isobar Length Tolerance
+0.001" / -0.003"	±0.001"	+0.000" / -0.060"

Finned Isobars



Acrolab's Finned Isobars are typically utilized in natural or forced air applications. Finned Isobars are used inside an oven or autoclave to absorb additional heat from the environment, and direct it into a specific area; such as a tool. They can also be used in rotational molding to get heat in tough geometry locations.

Sample Part Number For Finned Isobars

ISO	—	FIN	—	OD	X	LENGTH	X	FIN LENGTH	X	# OF FINS

Example | ISO | — | FIN | — | 30MM | X | 200MM | X | 75MM | X | 10 |

Sizes

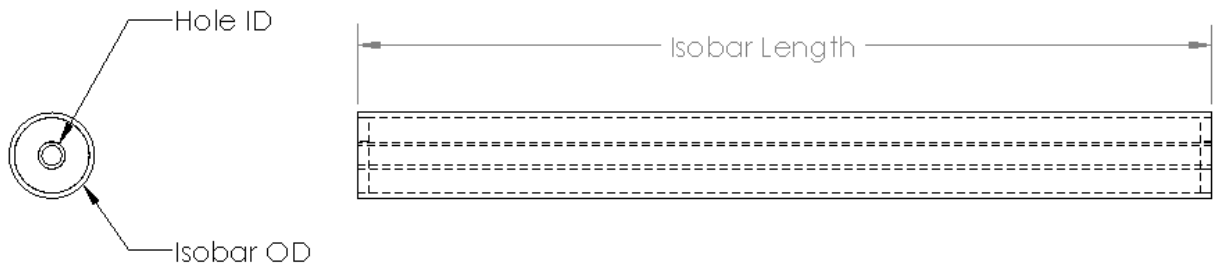
ISOBAR NOMINAL Outside Diameter	ISOBAR ACTUAL Outside Diameter	PASTE Hole Diameter	ISOBAR RETAINER SET SCREW
3/32"	0.093"	0.096"	N/A
1/8"	0.124"	0.127"	N/A
5/32"	0.154"	0.157"	N/A
3/16"	0.185"	0.189"	4-40NC
1/4"	0.249"	0.252"	4-40NC
5/16"	0.311"	0.314"	6-32NC
3/8"	0.374"	0.377"	6-32NC
1/2"	0.499"	0.502"	10-24NC
5/8"	0.624"	0.627"	10-24NC
3/4"	0.748"	0.752"	3/8-16NC

ISOBAR NOMINAL Outside Diameter	ISOBAR ACTUAL Outside Diameter	PASTE Hole Diameter	ISOBAR RETAINER SET SCREW
3mm	2.99mm	3.07mm	N/A
4mm	3.96mm	4.04mm	N/A
5mm	5.00mm	5.08mm	M-2 x 0.4
6mm	5.97mm	6.04mm	M-2 x 0.4
8mm	7.98mm	8.05mm	M-2 x 0.4
10mm	9.91mm	10.00mm	M-5 x 0.8
12mm	11.86mm	11.96mm	M-5 x 0.8
15mm	14.86mm	14.96mm	M-5 x 0.8
16mm	15.98mm	16.08mm	M-5 x 0.8
18mm	17.88mm	17.98mm	M-6 x 1.0
20mm	19.84mm	19.94mm	M-6 x 1.0
25mm	24.84mm	24.94mm	M-6 x 1.0
30mm	29.85mm	29.94mm	M-6 x 1.0

OD Tolerance	Hole Tolerance	Isobar Length Tolerance
+0.001" / -0.003"	±0.001"	+0.000" / -0.060"

**Fin material, shape, size, spacing, and quantity will vary depending on application

Hollow Isobars



Acrolab's Hollow Isobars can be applied to many applications. Typically clients utilize hollow Isobars where air ejection is required down the center of the Isobar. The center tube can also be used to heat or cool.

Sample Part Number For Hollow Isobars

ISO	—	HOL	—	OD	—	INNER TUBE OD	X	LENGTH

Example | ISO | — | HOL | — | 1/2 | — | 1/4 | X | 15" |

Sizes (Inches)

OUTSIDE DIAMETER	INSIDE DIAMETER	DIAMETER TOLERANCE	HOLE DRILLING SPECIFICATION	ISOBAR RETAINER SET SCREW
3/32"	0.064"	+0.001" / -0.003"	3/32" ±0.001"	N/A
1/8"	0.097"	+0.001" / -0.003"	1/8" ±0.001"	N/A
5/32"	0.116"	+0.001" / -0.003"	5/32" ±0.001"	N/A
3/16"	0.147"	+0.001" / -0.003"	3/16" ±0.001"	N/A
1/4"	0.188"	+0.001" / -0.003"	1/4" ±0.001"	N/A
5/16"	0.250"	+0.001" / -0.003"	5/16" ±0.001"	N/A
3/8"	0.313"	+0.001" / -0.003"	3/8" ±0.001"	N/A
1/2"	0.438"	+0.001" / -0.003"	1/2" ±0.001"	N/A
5/8"	0.563"	+0.001" / -0.003"	5/8" ±0.001"	N/A
3/4"	0.680"	+0.001" / -0.003"	3/4" ±0.001"	N/A

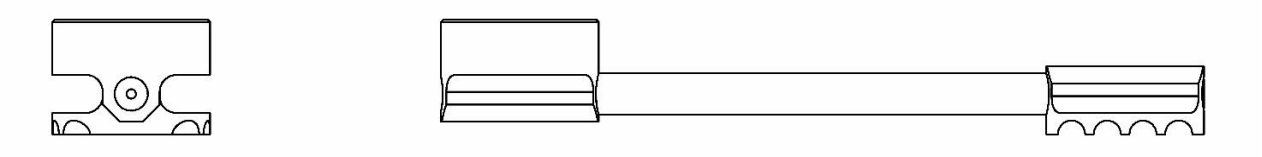
*ISOBAR LENGTH TOLERANCE = +0.000/-0.060"

Sizes (mm)

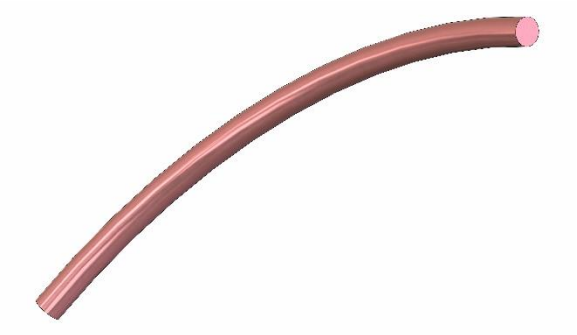
OUTSIDE DIAMETER	INSIDE DIAMETER	DIAMETER TOLERANCE	HOLE DRILLING SPECIFICATION	ISOBAR RETAINER SET SCREW
3mm	1.98mm	+0.025mm / -0.065mm	3mm ±0.03mm	N/A
4mm	3.15mm	+0.025mm / -0.065mm	4mm ±0.03mm	N/A
5mm	4.05mm	+0.025mm / -0.065mm	5mm ±0.03mm	N/A
6mm	4.42mm	+0.025mm / -0.065mm	6mm ±0.03mm	N/A
8mm	6.43mm	+0.025mm / -0.065mm	8mm ±0.03mm	N/A
10mm	8.79mm	+0.025mm / -0.065mm	10mm ±0.03mm	N/A
12mm	10.16mm	+0.025mm / -0.065mm	12mm ±0.03mm	N/A
15mm	12.93mm	+0.025mm / -0.065mm	15mm ±0.03mm	N/A
16mm	14.30mm	+0.025mm / -0.065mm	16mm ±0.03mm	N/A
18mm	15.88mm	+0.025mm / -0.065mm	18mm ±0.03mm	N/A
20mm	17.78mm	+0.025mm / -0.065mm	20mm ±0.03mm	N/A
25mm	22.81mm	+0.025mm / -0.065mm	25mm ±0.03mm	N/A
30mm	27.81mm	+0.025mm / -0.065mm	30mm ±0.03mm	N/A

*ISOBAR LENGTH TOLERANCE = +0.000/-1.5mm

Custom Isobars



Acrolab's can manufacture custom Isobars to suit your specific application(s). Because every application is different Acrolab engineers can review your specific needs and design a custom Isobar to suit.

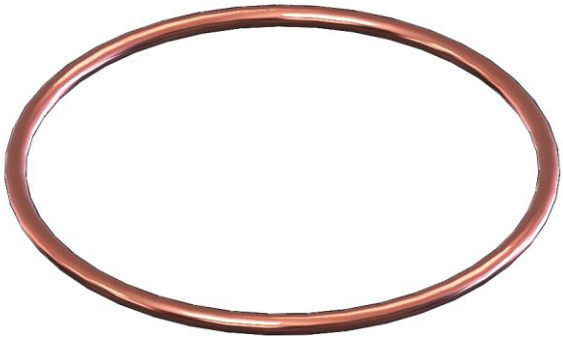


Isobar For Brake Tooling

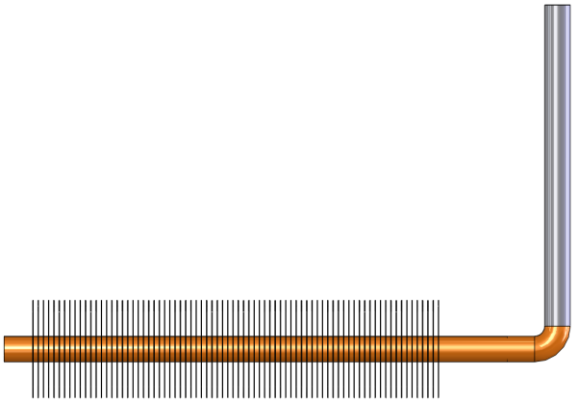
Isobar For Medical Application

Hollow Isobar For Plastic Barrel Screw

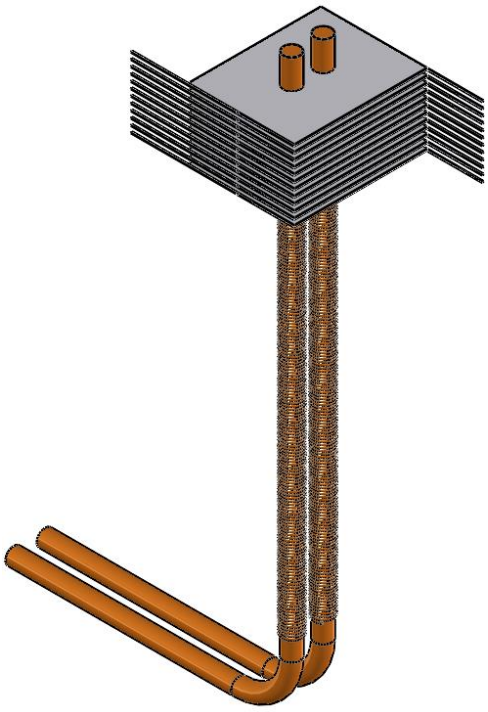
Baffle Isobar For Plastic Injection



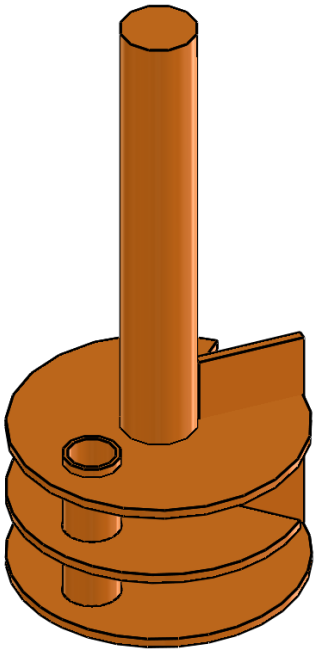
Circular Isobar For Plastic Welding



Finned Isobar For TEG Application



Finned Isobar For Auto Lens Application



Baffle Isobar For Plastic Cooling Application