Datasheet
Copper-Water Heat Pipes

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Transport heat quickly, reliably, and effectively with Copper-Water Heat Pipes designed and fabricated by Boyd. Copper-Water Heat Pipes are a popular component in a wide variety of thermal management solutions across broad range of industries because of the high heat capacity of two-phase water cooling in a versatile copper package.

Boyd has pioneered heat pipe development and solutions over the last 50 years, setting the world standard for commercial application of this passive, highly conductive two-phase heat transfer device. Boyd heat pipes are designed for high heat load or gravity sensitive applications where reliability and long life are critical.

Copper-Water Heat Pipes are often integrated into thermal management assemblies to improve effective conductivity and efficiency, improving overall system performance. By using epoxy, solder, or a mechanical interference fit, Boyd's Copper-Water Heat Pipes can be integrated into other components to fabricate heat transport or heat spreading assemblies that are more customized to your specific application.

Using water as the internal working fluid, Boyd Copper-Water Heat Pipe moves heat from the heat source to where the heat can be managed more effectively through dissipation to air, liquid, or radiated to space. Ductile copper walls and sintered powder wick enable bending or flattening to meet an application's thermal and geometric requirements. This can be used to reduce overall height, increase surface contact, or route heat pipes around keep-out areas like mounting hardware. Thermal architects have more flexibility because embedded heat pipes don't require changing the geometry of the heat sink, which is especially useful in retrofit or increasing the power of existing products.

Tightly controlled manufacturing processes backed by product field experience ensure our integrated heat pipe assemblies can last well over 20 years. Today, Boyd has one of the world's largest collection of heat pipes on life test. With more than 200 heat pipes using various material systems and working fluids on continuous life and reliability testing, Boyd has gathered more than 40 years of life test data (>350,000 hours).

Ordering Information

Contact your Boyd representative for more information on custom heat pipe solutions or heat pipe assemblies or contact us at www.boydcorp.com.

Boyd offers a wide range of high performance two-phase heat transport and thermal management solutions.

Features and Benefits

Features and Benefits
Passive components with no moving parts means longer life and reliability
Withstand numerous freeze-thaw cycles and temperatures ranging from -55°C to 180°C
Commercially proven technology ensures versatile, cost effective, and reliable heat transport or spreading that last decades
Copper enables design flexibility with bending and flattening options
Water working fluid covers most commercial operating temperatures with high heat transport capacity
Easily combined with other technologies for complete thermal management solutions

Mechanical and Perfromance

Dimensions are in mm, Qmax in W

Round Heat Pipes: 3 - 6 mm Diameter

Part Number	Diameter	Length	Wall Thickness	Typical Q_{max}*
HP-CWS-R03-075-N	3	75	Thin	35
HP-CWS-R03-100-N	3	100	Thin	24
HP-CWS-R03-150-N	3	150	Thin	17
HP-CWS-R03-200-N	3	200	Thin	13
HP-CWS-R03-250-N	3	250	Thin	10
HP-CWS-R03-300-N	3	300	Thin	8
HP-CWS-R04-085-N	4	85	Thin	91
HP-CWS-R04-100-N	4	100	Thin	65
HP-CWS-R04-149-N	4	149	Thin	43
HP-CWS-R04-207-N	4	203	Thin	32
HP-CWS-R04-260-N	4	260	Thin	26

Round Heat Pipes: 3 - 6 mm Diameter continued...

Part Number	Diameter	Length	Wall Thickness	Typical Q_{max}*
HP-CWS-R04-302-N	4	302	Thin	28
HP-CWS-R05-097-N	5	97	Thin	100
HP-CWS-R05-150-N	5	150	Thin	72
HP-CWS-R05-200-N	5	200	Thin	52
HP-CWS-R05-258-N	5	258	Thin	42
HP-CWS-R05-300-N	5	300	Thin	35
HP-CWS-R05-350-N	5	350	Thin	29
HP-CWS-R06-100-N	6	100	Thin	137
HP-CWS-R06-150-N	6	150	Thin	91
HP-CWS-R06-200-N	6	200	Thin	69
HP-CWS-R06-250-N	6	250	Thin	55
HP-CWS-R06-310-N	6	310	Thin	47
HP-CWS-R06-350-N	6	350	Thin	40

* See Performance Notes below for more information on Q_{max}

Round Heat Pipes: 8 and 10 mm Diameter

Part Number	Diameter	Length	Wall Thickness	Typical Q_{max}*
HP-CWS-R08-100-N	8	100	Thin	199
HP-CWS-R08-155-N	8	155	Thin	135
HP-CWS-R08-200-N	8	200	Thin	99
HP-CWS-R08-250-N	8	250	Thin	80
HP-CWS-R08-300-N	8	300	Thin	49
HP-CWS-R08-360-N	8	350	Thin	67
HP-CWS-R10-101-K	10	101	Thick	254

Mechanical and Perfromance

Dimensions are in mm, Q_{max} in W

Round Heat Pipes: 8 and 10 mm Diameter continued...

Part Number	Diameter	Length	Wall Thickness	Typical Q_{max}*
HP-CWS-R10-156-K	10	156	Thick	170
HP-CWS-R10-216-K	10	216	Thick	127
HP-CWS-R10-266-K	10	266	Thick	103
HP-CWS-R10-321-K	10	321	Thick	85
HP-CWS-R10-346-K	10	346	Thick	72

Flat Heat Pipes: 5 - 10 mm Width

Part Number	Diameter	Length	Flat Width	Flat Height	Wall Thickness	Typical Q_{max}*
HP-CWS-F04x25-100-N	4	100	5	2.5	Thin	35
HP-CWS-F04x25-150-N	4	150	5	2.5	Thin	24
HP-CWS-F05x35-100-N	5	100	6	3.5	Thin	46
HP-CWS-F05x35-150-N	5	150	6	3.5	Thin	33
HP-CWS-F05x20-075-N	5	75	7	2	Thin	55
HP-CWS-F05x20-100-N	5	100	7	2	Thin	40
HP-CWS-F05x20-150-N	5	150	7	2	Thin	27
HP-CWS-F05x20-200-N	5	200	7	2	Thin	21
HP-CWS-F06x28-075-N	6	75	8	2.8	Thin	81
HP-CWS-F06x28-100-N	6	100	8	2.8	Thin	57
HP-CWS-F06x28-150-N	6	150	8	2.8	Thin	36
HP-CWS-F06x28-200-N	6	200	8	2.8	Thin	31
HP-CWS-F08x47-075-N	8	75	10	4.7	Thin	52
HP-CWS-F08x47-100-N	8	100	10	4.7	Thin	50
HP-CWS-F08x47-150-N	8	150	10	4.7	Thin	54
HP-CWS-F08x47-200-N	8	200	10	4.7	Thin	75

Performance Notes

Typical Q_{max} Values:

Heat Pipe performance is highly dependent upon application configuration and operating conditions. The amount of heat a single Heat Pipe can move, Q_{max}, is a function of both heat pipe design and environmental conditions. Adiabatic temperature, effective heat pipe length, bends, flattened regions, and gravity inclination all affect the Q_{max} of a heat pipe.

Q_{max} values shown in the tables above are assuming typical sized evaporator and condenser regions in a gravity aided orientation under common operating temperatures. Boyd highly recommends testing or simulating your heat pipe assembly in your specific application prior to production.

General Tips to Achieve Peak Heat Pipe Performance:
- Place Evaporator Below Condenser in Relation to Gravity
- Use in Warmer Ambient Temperatures
- Use Largest Diameter Heat Pipes Possible in Space Constraints
- Ensure Good Thermal Contact between Heat Pipe and Heat Sources
- Limit Heat Pipe Flattening and Bending to Critical Regions

Customization Options

With our decades of experience and expertise, Boyd can customize your heat pipe solution to meet application-specific requirements to withstand difficult environments and operating condition.

Some Customization Options Include:
- Geometry: Diameter, Length, Wall Thickness, Bends, Flattening
- Wick Structure: Sintered Powder, Mesh, Axially Grooved
- Heat Pipe Casing Materials
- Working Fluids

Boyd is the world leader in integrating technologies into complex, multifunctional assemblies, including Heat Transport Heat Pipe Assemblies and Embedded Heat Pipe Assemblies.

Common components and technologies used with Copper-Water Heat

Simulating Qmax Dry Out Calculations in Your Application:

Boyd Copper-Water Heat Pipes are easily modeled in Boyd SmartCFD, whose heat pipe modeling algorithms are derived from decades of empirical heat pipe performance data. Boyd SmartCFD modeling not only calculates Q_{max}, the point of heat pipe dry out, but partial dry out conditions. This enables thermal engineers to accommodate safety margins and difficult use cases that work against gravity or experience multiple gravity orientations.

Contact your Boyd representative for more information about Boyd SmartCFD.

Wall Thickness:

Thinner Heat Pipe Walls (below 0.6mm) enable easier bending and flattening for creating your Heat Pipe Assembly. Thick walled Heat Pipes will take more effort to bend or flatten but are more robust and better suited for rugged applications. Thicker walls are also a safer option when the Heat Pipe Assembly will be subject to machining as it will be less likely to puncture the sealed Heat Pipe Wall.

Related Technologies

Boyd's expertise extends to more advanced Two-Phase Technologies such as:
- Ultra-Thin Vapor Chambers
- Loop Heat Pipes
- High Temperature Heat Pipes
- Cryogenic Heat Pipes
- Isothermal Furnace Liners

Contact your Boyd representative for more information about finding the best fit technology and solution for your application.