

heat exchangers for marine electric & hybrid propulsion

in association with

BOWMAN[®]
100 YEARS OF HEAT TRANSFER TECHNOLOGY



marine heat exchangers for electric & hybrid propulsion

mdt

www.mdtco.com

Bowman Shell and Tube Marine Heat Exchangers - the efficient, reliable cooling solution for Electric and hybrid propulsion systems

Heat generated from electric and hybrid marine propulsion systems can have a direct and adverse effect on the performance of the equipment, if not controlled within pre-set limits.

Partial system shut down during operation and premature component wear and failure are two of the issues caused by excess heat build-up in the propulsion system.

With over 80 years' experience, providing heat exchangers to the marine industry, Bowman has the expertise and products to provide efficient cooling solutions for electric and hybrid propulsion.

Electric Propulsion

Cooling applications include: the battery pack and on board charger (where fitted), AC-DC converter, DC-DC converter, plus the electric drive motor itself.



Hybrid Propulsion

Cooling applications include: the Hybrid Control Unit, the combined Electric Motor/Generator, plus cooling for the engine and lubrication systems (please see our Marine Cooling brochure for more information).

Easy Product Selection

Electric and Hybrid systems are often designed to operate with sea water temperatures of 30°C plus, making selecting the right heat exchanger critical. Whilst the table on page 4 lists typical performance examples at given temperatures and flow rates, this is intended as a general guide only. However, by supplying the following information, we can provide a computer aided product selection, to recommend the most appropriate heat exchanger for your requirements:

Coolant type and concentration

Heat to be dissipated	kW
Required coolant outlet temperature	°C
Coolant flow	l/min
Seawater temperature	°C

Fire Resistant Fluids

For applications where the heat exchanger will be used with fire resistant fluids, the standard nitrile seals can be changed for either Ethylene Propylene or Viton. To specify these seals, please add a suffix to the heat exchanger type number, as follows: EP (for Ethylene Propylene), or VT (for Viton).



10 reasons why the marine industry specifies Bowman heat exchangers:

Premium quality

UK manufactured, using quality components.

Reliability

Renowned for reliable operation and long life.

Performance

Precision engineered for efficient heat transfer.

Advanced engineering

3D CAD models are available.

Fully floating tube stack

Minimises thermal stress.

Compact design

Easier system integration.

Extensive range

Widest choice of sizes to suit application.

Simple to maintain

Tube stack easily removed for cleaning.

Rapid delivery

Extensive stock holding for fast response.

Product support

Includes technical data, spare parts and global stockists.



Marine Shell and Tube Heat Exchangers

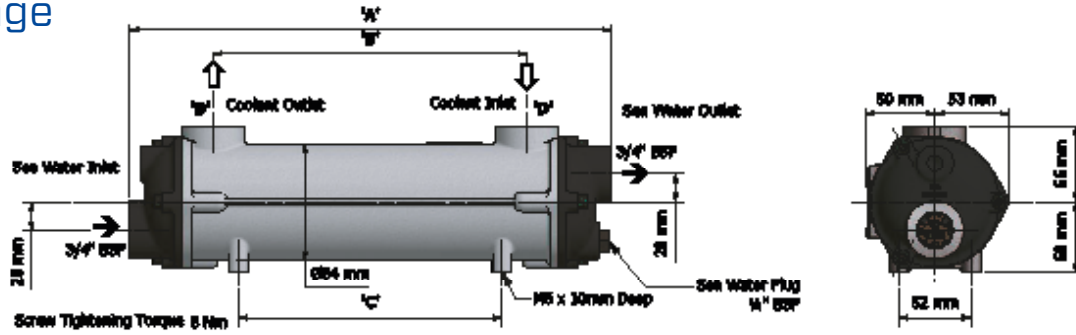
This table is intended to provide a general guide to the typical performance of Bowman marine shell and tube heat exchangers with:

Coolant type: 50/50 water/glycol
Coolant outlet temperature: 40°C
Seawater inlet temperature: 30°C



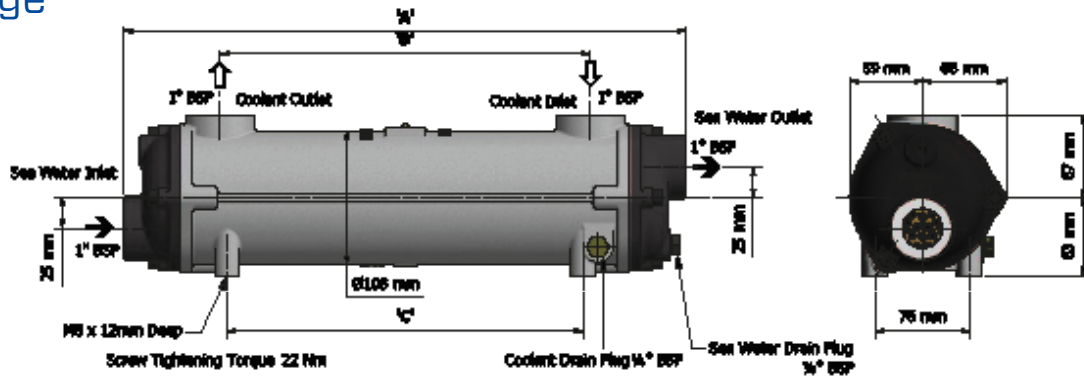
Type	Heat Dissipated	Coolant Flow	Sea Water Flow	Internal Coolant Volume	Internal Sea Water Volume
	kW	l/min	l/min	Litre	Litre
EC 80-3875-1	3	40	40	0.26	0.31
EC100-3875-2	7	50	50	0.49	0.44
EC120-3875-3	11	50	50	0.74	0.57
EC140-3875-4	15	50	50	0.97	0.71
EC160-3875-5	19	50	50	1.30	0.91
FC 80-3876-1	11	80	80	0.75	0.65
FC100-3876-2	16	80	80	1.10	0.84
FC120-3876-3	22	80	80	1.50	1.06
FC140-3876-4	29	80	80	2.00	1.35
FC160-3876-5	37	80	80	2.60	1.68
FG 80-3877-1	24	120	120	1.64	1.26
FG100-3877-2	32	120	120	2.40	1.56
FG120-3877-3	43	120	120	3.00	1.96
FG140-3877-4	53	120	120	3.90	2.42
FG160-3877-5	65	120	120	5.00	2.97
GL140-3878-2	50	200	200	3.60	3.10
GL180-3878-3	66	200	200	4.80	3.80
GL240-3878-4	82	200	200	6.30	4.60
GL320-3878-5	100	200	200	8.00	5.50
GL400-3878-6	121	200	200	10.00	6.60
GL480-3878-7	136	200	200	12.20	7.70
GK190-3879-3	98	300	300	7.00	6.30
GK250-3879-4	125	300	300	9.00	7.50
GK320-3879-5	153	300	300	11.60	9.00
GK400-3879-6	181	300	300	14.60	10.60
GK480-3879-7	206	300	300	17.40	12.30
GK600-3879-8	238	300	300	22.10	14.70
JK190-3881-3	121	400	400	9.70	8.80
JK250-3881-4	157	400	400	12.50	10.40
JK320-3881-5	195	400	400	16.10	12.50
JK400-3881-6	233	400	400	20.30	14.70
JK480-3881-7	267	400	400	24.20	17.10
JK600-3881-8	306	400	400	30.70	20.40
PK190-3880-3	117	650	650	13.60	16.00
PK250-3880-4	238	650	650	17.70	18.60
PK320-3880-5	303	650	650	22.60	21.80
PK400-3880-6	367	650	650	28.50	25.30
PK480-3880-7	424	650	650	34.00	29.00
PK600-3880-8	501	650	650	42.50	34.40
RK400-5882-6	524	900	900	43.40	37.90
RK600-5882-8	701	900	900	65.20	50.10

EC Range



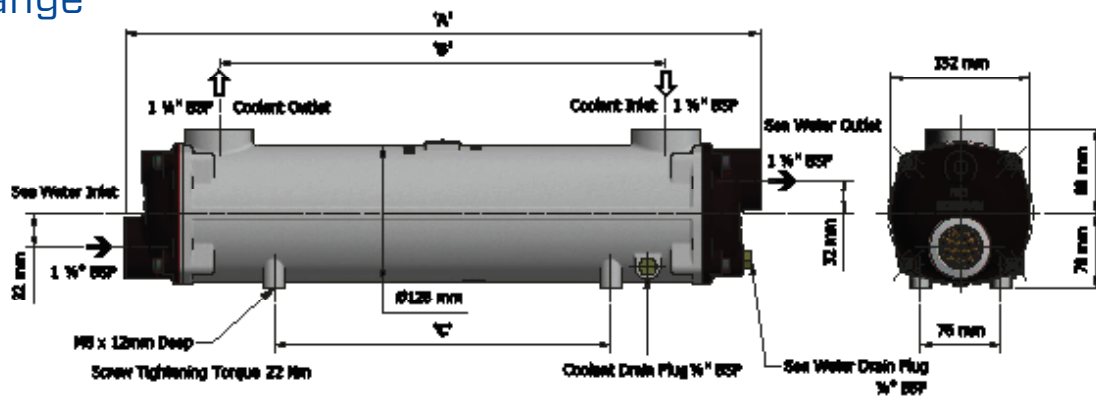
Type	Weight	A	B	C	D
	kg	mm	mm	mm	BSP
EC 80-3875-1	2.4	174	60	60	1/2"
EC 100-3875-2	3.2	260	140	104	3/4"
EC 120-38775-3	3.8	346	226	190	3/4"
EC 140-3875-4	4.8	444	324	288	3/4"
EC 160-3875-5	5.7	572	452	416	3/4"

FC Range



Type	Weight	A	B	C
	kg	mm	mm	mm
FC 80-3876-1	5.5	272	116	104
FC 100-3876-2	6.3	358	202	190
FC 120-3876-3	7.3	456	300	288
FC 140-3876-4	9.4	584	428	288
FC 160-3876-5	11.0	730	574	434

FG Range



Type	Weight	A	B	C
	kg	mm	mm	mm
FG 80-3877-1	8.5	374	196	92
FG 100-3877-2	10.0	472	294	190
FG 120-3877-3	12.0	600	422	318
FG 140-3877-4	14.5	746	568	464
FG 160-3877-5	17.5	924	746	642

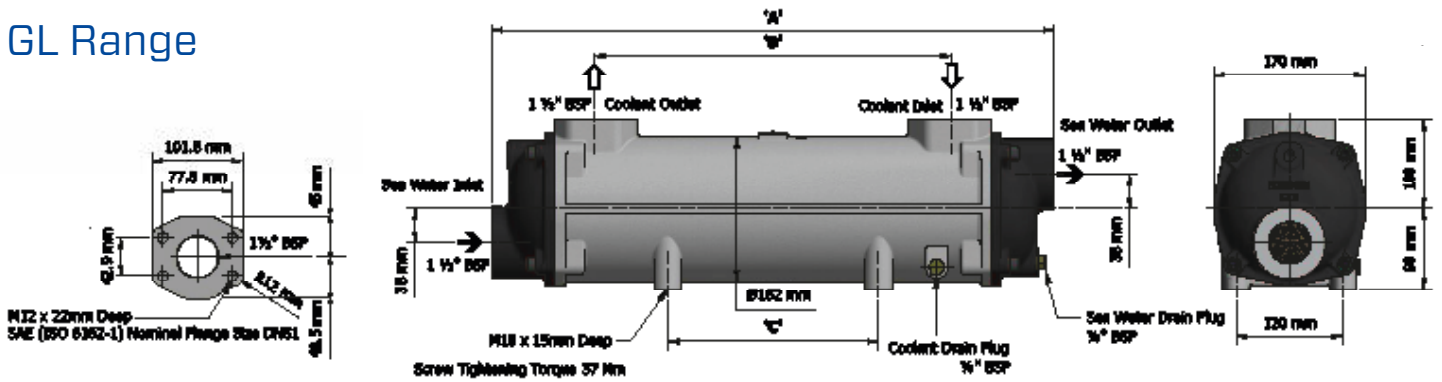
Maximum working coolant pressure
Maximum working sea water pressure

20 bar.
16 bar.

Maximum working coolant temperature

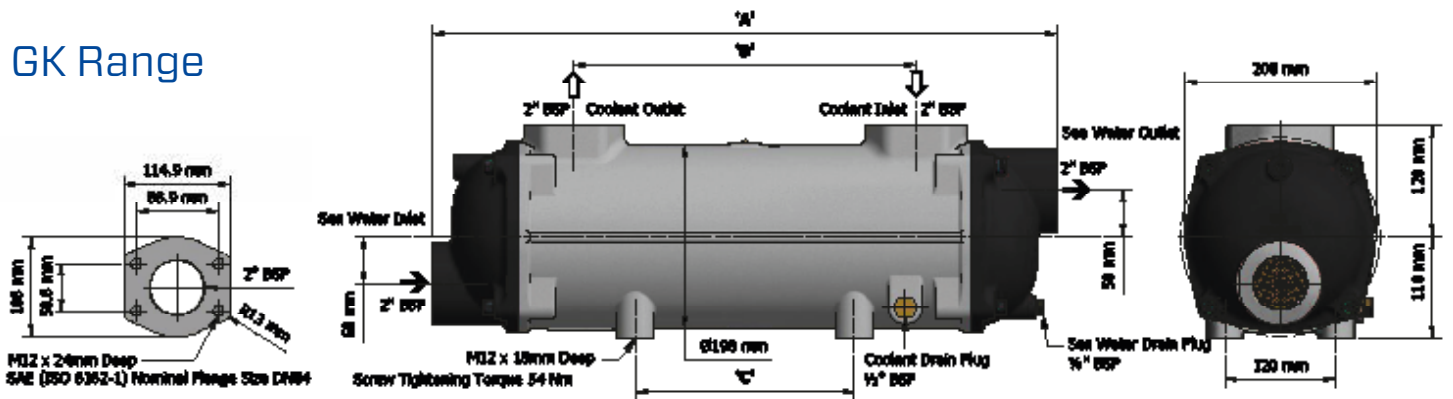
110°C.

GL Range



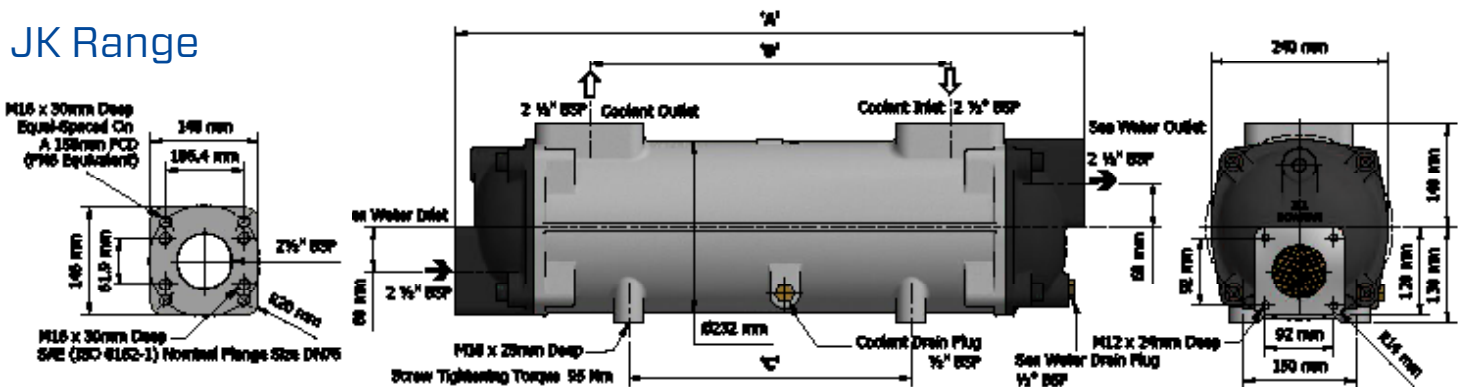
Type	Weight	A	B	C
	kg	mm	mm	mm
GL 140-3878-2	18	502	272	108
GL 180-3878-3	21	630	400	236
GL 240-3878-4	25	776	546	382
GL 320-3878-5	30	954	724	560
GL 400-3878-6	36	1156	926	762
GL 480-3878-7	42	1360	1130	966

GK Range



Type	Weight	A	B	C
	kg	mm	mm	mm
GK 190-3879-3	34	674	370	236
GK 250-3879-4	39	820	516	382
GK 320-3879-5	46	998	694	560
GK 400-3879-6	54	1200	896	762
GK 480-3879-7	62	1404	1100	966
GK 600-3879-8	74	1708	1404	1270

JK Range



Type	Weight	A	B	C
	kg	mm	mm	mm
JK 190-3881-3	58	704	340	236
JK 250-3881-4	66	850	486	382
JK 320-3881-5	78	1028	664	560
JK 400-3881-6	92	1230	866	762
JK 480-3881-7	105	1434	1070	966
JK 600-3881-8	126	1738	1374	1270

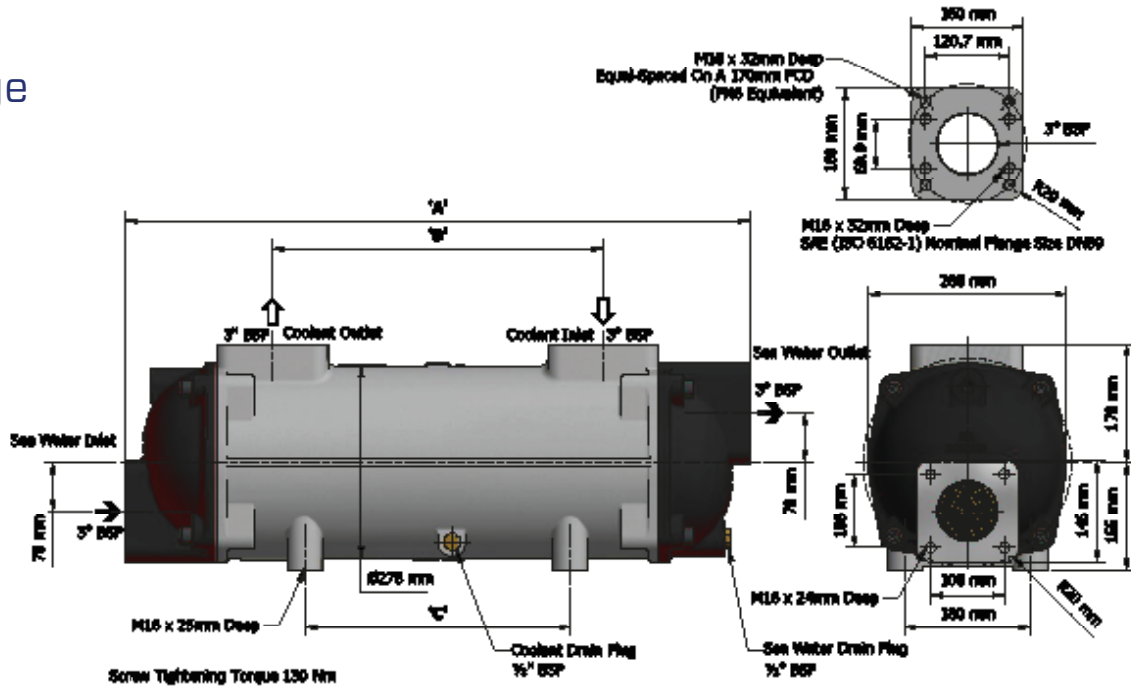
Maximum working coolant pressure
Maximum working sea water pressure

20 bar.
16 bar.

Maximum working coolant temperature

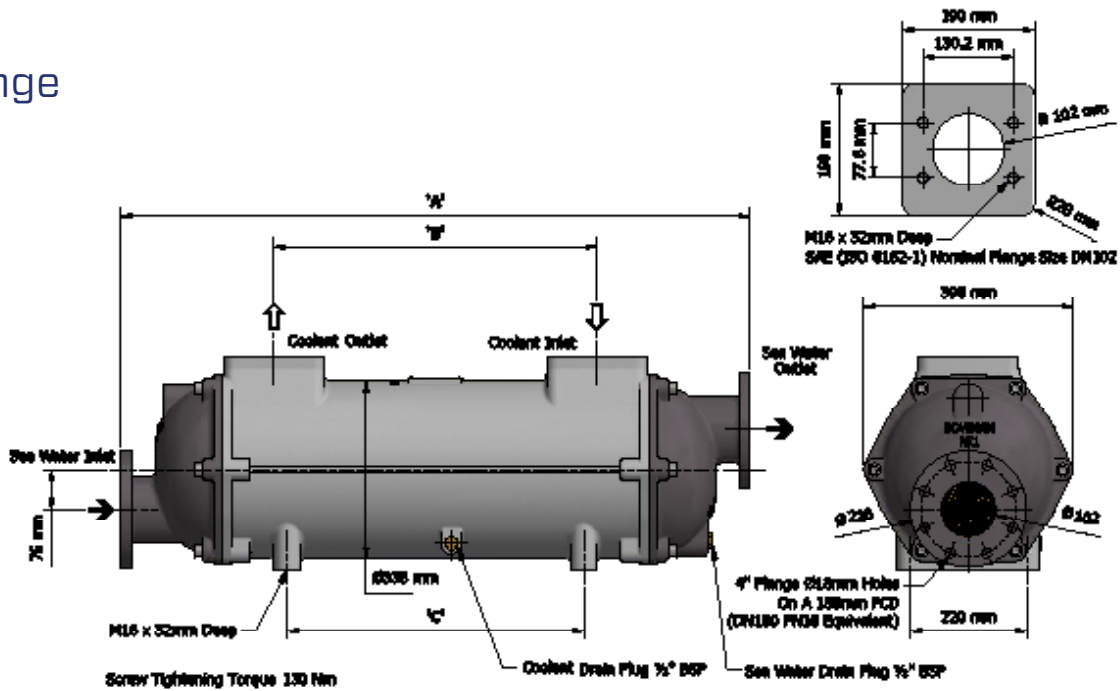
110°C.

PK Range



Type	Weight	A	B	C
	kg	mm	mm	mm
PK 190-3880-3	81	754	330	236
PK 250-3880-4	94	900	476	382
PK 320-3880-5	110	1078	654	560
PK 400-3880-6	125	1280	856	762
PK 480-3880-7	140	1484	1060	966
PK 600-3880-8	158	1788	1364	1270

RK Range



Type	Weight	A	B	C
	kg	mm	mm	mm
RK 400-5882-6	186	1392	812	762
RK 600-5882-8	246	1900	1320	1270

Maximum working coolant pressure
Maximum working sea water pressure

20 bar.
16 bar.

Maximum working coolant temperature

110°C.

Engine, gearbox oil and fuel cooling solutions

Oil Coolers

Bowman manufacture a comprehensive range of marine oil coolers suitable for engines rated from 75kW to 1350kW. Whilst often imitated, the quality and durability of genuine Bowman marine oil coolers is seldom matched, which is why they provide a longer operational life and higher efficiency cooling compared with most alternatives.

Product Benefits

- Compact design** - Easily installed and integrated with the engine
- Premium quality** - UK manufactured, using quality components
- Easy product selection** - Available quickly for our technical experts
- Rapid delivery** - Extensive stockholding for fast response



DC Range – for oil or fuel cooling

The DC is a compact, efficient oil cooler suitable for engines up to 180kW, with durable cupro-nickel tubes and a choice of neoprene seawater connections. Models for marine fuel cooling are also available. For more information, download our "DC Oil Coolers" brochure at www.ejbowman.co.uk



EC to PK Range – quality & durability

Bowman's standard shell and tube oil cooler range has been proven worldwide, with literally hundreds of thousands of units operating reliably and efficiently on leisure craft, super yachts, workboats and commercial vessels.



SAE flanges

From GL size oil coolers and above, SAE oil flange connections are provided on the shell side of the unit. On DC, EC, FC & FG models, BSP oil connections are provided.

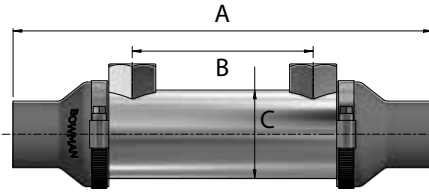


Specification options

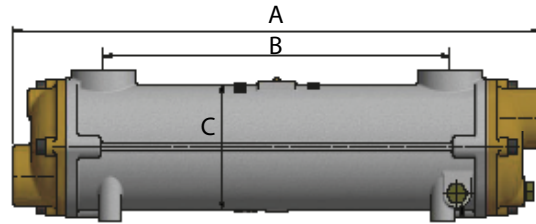
Double seal retaining flanges are available on some larger units for cleaning the cooling circuit easily without draining the oil system. 1, 2 & 3 pass versions are available on most models from EC upwards, as are titanium tube stacks.

Typical Performance & Dimensions for transmission applications

The following information offers a general guide to the performance and dimensions of our standard marine oil cooler range. For more detailed information on additional configurations and engine oil coolers, please contact our technical sales team.



Type	Typical Engine Rating	Typical Oil Flow rate	Max Seawater Flow rate	Dimensions			Weight
	kW	l/m	l/m	A (mm)	B (mm)	C (mm)	kg
DC060	80	10	60	240	104	51	0.9
DC090	140	15	60	314	178	51	1.1
DC120	180	15	60	396	260	51	1.4



Type	Heat Dissipated from Gearbox	Typical Engine Rating	Typical Oil Flow rate	Max Seawater Flow rate	Dimensions			Weight
	kW	kW	l/m	l/m	A (mm)	B (mm)	C (mm)	kg
EC120	12	240	20	20	346	226	84	3.8
EC140	15	300	20	20	444	324	84	4.8
EC160	18	360	20	20	572	452	84	5.7
FC100	19	380	40	40	358	202	108	6.3
FC120	26	520	40	40	456	300	108	7.3
FC140	32	640	40	40	584	428	108	9.4
FC160	38	760	40	40	730	574	108	11.0
FG100	33	660	50	50	472	294	128	10.0
FG120	42	840	50	50	600	422	128	12.0
FG140	48	960	50	50	746	568	128	14.5
FG160	55	1100	50	50	924	746	128	17.5
GL140	50	1000	80	640	502	272	162	18.0
GL180	62	1240	80	640	630	400	162	21.0
GL240	72	1440	80	640	776	546	162	25.0
GL320	82	1640	80	640	954	724	162	30.0
GL400	94	1880	80	640	1156	926	162	36.0
GL480	101	2020	80	640	1360	1130	162	42.0
GK190	82	1640	100	975	674	370	198	34.0
GK250	97	1940	100	975	820	516	198	39.0
GK320	111	2220	100	975	998	694	198	46.0
GK400	123	2460	100	975	1200	896	198	54.0
GK480	132	2640	100	975	1404	1100	198	62.0
GK600	142	2840	100	975	1708	1404	198	74.0
JK190	128	2560	200	1350	704	340	232	58.0
JK250	158	3160	200	1350	850	486	232	66.0
JK320	187	3740	200	1350	1028	664	232	78.0
JK400	212	4240	200	1350	1230	866	232	92.0
JK480	234	4680	200	1350	1434	1070	232	105.0
JK600	255	5100	200	1350	1738	1374	232	126.0
PK190	191	3820	350	2100	754	330	278	81.0
PK250	249	4980	350	2100	900	476	278	94.0
PK320	302	6040	350	2100	1078	654	278	110.0
PK400	350	7000	350	2100	1280	856	278	125.0
PK480	391	7820	350	2100	1484	1060	278	140.0
PK600	445	8900	350	2100	1788	1364	278	158.0



Easy Product Selection

Computer aided selection software (CAS) is available to accurately select the correct oil cooler for your application. Please contact Bowman or your nearest stockist with the following information to receive a CAS selection:

- Oil type (or Viscosity at a specific temperature)
- Oil flow rate
- Required oil outlet temperature in °C
- Heat to be dissipated in kW
- Cooling water temperature in °C

Hydraulic equipment cooling solutions

Hydraulic Oil Coolers

Bowman marine specification hydraulic oil coolers are designed to provide efficient cooling for a wide range of hydraulic applications, including: air compressors, cranes and lifting equipment, deck machinery, power packs, power steering, thruster and stabiliser control systems, plus hydraulic winches.

Product Benefits

- Compact design** - Saves space. Simplifies installation
- Thermal calculations** - Provided quickly by our technical experts
- Premium quality** - UK manufactured, using quality components
- Comprehensive range** – Suitable for heat loads from 4kW to 900kW
- Rapid delivery** - Extensive stockholding for fast response



High temperature versions

Standard units are suitable for cooling oil up to 120°C, but for applications where higher temperature capability is required, Bowman offer a range of oil coolers designed for temperatures up to 200°C.



Tube stack options

Whilst Cupro-nickel is the standard tube material on all units, titanium tube stacks are also available as an option, offering even greater durability and backed with a 10 year guarantee*.



SAE flanges

On Bowman GL size Hydraulic Oil Coolers and larger, SAE oil flange connections are provided on the shell side of the unit, whilst the smaller EC, FC & FG models feature BSP connections.



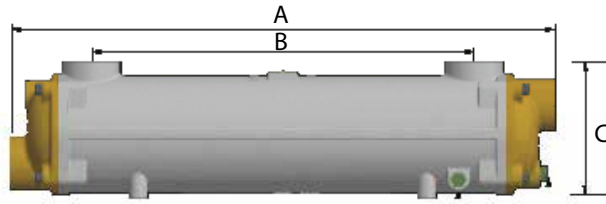
Specification options

Double seal retaining flanges are available on some units, allowing the cooling circuit to be cleaned without draining the hydraulic system. 1, 2 and 3 pass versions are available for most models to suit application requirements.

* 10 year guarantee on all titanium material in contact with cooling water.

Typical Performance & Dimensions

The following information offers a general guide to the performance and dimensions of our standard marine hydraulic oil cooler range. For more detailed information please download the "Hydraulic Oil Coolers" brochure



Type	Heat Dissipated	Dimensions			Weight
	kW	A (mm)	B (mm)	C (mm)	kg
EC80-3875-1	4	174	60	105	2.4
EC100-3875-2	9	260	140	105	3.2
EC120-3875-3	13	346	226	105	3.8
EC140-3875-4	17	444	324	105	4.8
EC160-3875-5	22	572	452	105	5.70
FC80-3876-1	13	272	116	130	5.5
FC100-3876-2	19	358	202	130	6.30
FC120-3876-3	26	456	300	130	7.30
FC140-3876-4	35	584	428	130	9.40
FC160-3876-5	45	730	574	130	11.00
FG80-3877-1	28	374	196	150	8.50
FG100-3877-2	37	472	294	150	10.00
FG120-3877-3	50	600	422	150	12.00
FG140-3877-4	62	746	568	150	14.50
FG160-3877-5	79	924	746	150	17.50
FG200-3877-7	123	1330	1152	150	24.00
GL140-3878-2	56	502	272	190	18.00
GL180-3878-3	73	630	400	190	21.00
GL240-3878-4	93	776	546	190	25.00
GL320-3878-5	114	954	724	190	30.00
GL400-3878-6	146	1156	926	190	36.00
GL480-3878-7	172	1360	1130	190	42.00
GK190-3879-3	112	674	370	230	34.00
GK250-3879-4	144	820	516	230	39.00
GK320-3879-5	181	998	694	230	46.00
GK400-3879-6	221	1200	896	230	54.00
GK480-3879-7	259	1404	1100	230	62.00
GK600-3879-8	329	1708	1404	230	74.00
JK190-3881-3	145	704	340	270	58.00
JK250-3881-4	186	850	486	270	66.00
JK320-3881-5	232	1028	664	270	78.00
JK400-3881-6	283	1230	866	270	92.00
JK480-3881-7	335	1434	1070	270	105.00
JK600-3881-8	401	1738	1374	270	126.00
PK190-3880-3	212	754	330	275	81.00
PK250-3880-4	270	900	476	275	94.00
PK320-3880-5	336	1078	654	275	110.00
PK400-3880-6	414	1280	856	275	125.00
PK480-3880-7	497	1484	1060	275	140.00
PK600-3880-8	660	1788	1364	275	158.00
RK400-5882-6	570	1392	812	TBC	186.00
RK600-5882-8	900	1900	1320	TBC	246.00

Typical examples of oil cooler performance with,

Oil type	ISO VG 37
Oil outlet temperature	50°C
Oil pressure drop	100 kPa
Water inlet temperature	25°C
Water pressure drop	50 kPa

Easy Product Selection

Computer aided selection software (CAS) is available to accurately select the correct heat exchanger specifically for your application. Please contact Bowman or your nearest stockist with the following information to receive a CAS selection:

- Oil type (or Viscosity at a specific temperature)
- Oil flow rate
- Required oil outlet temperature in °C
- Heat to be dissipated in kW
- Cooling water temperature in °C

A world of applications

Bowman heat exchangers can be found cooling marine propulsion, transmission, plus electric and hydraulic control systems throughout the world. Renowned for their excellent heat transfer performance and long operational life, even in the most difficult conditions, here are just a few examples of Bowman marine heat exchangers in action:



Electric & Hybrid cooling

This 'leading edge' manufacturer, who specifies Bowman heat exchangers for cooling its larger (100 kW plus) propulsion products, is just one of a number of companies at the forefront of electric and hybrid marine development, that rely on Bowman cooling for their propulsion systems.



Transmission Cooling

Thousands of work boats and leisure craft rely on Bowman gearbox oil coolers for safe, reliable operation of the vessels power transmission. Bowman oil coolers deliver efficient cooling for the lubrication and transmission systems, ensuring the oil is kept within the required temperature range.



Marine Deck Machinery

Designed to combine extended service life with minimal running costs, this hydraulic propulsion system replaces conventional marine gearboxes to provide smooth, quiet operation for inland commercial charter boats. Proven over thousands of hours, Bowman oil cooler technology is at the heart of the system.



Roll Reduction Systems

A pioneer in the development of advanced marine stabiliser technology and roll reduction systems, this leading manufacturer uses Bowman heat exchangers in their hydraulic power packs to ensure the fluid power required to articulate the stabiliser fins is always kept at the required temperature.



All Bowman marine heat exchangers are produced to the highest quality in our UK manufacturing facility. With 100 years' experience producing efficient heat transfer solutions, you can have complete confidence when you specify Bowman marine heat exchangers.

BOWMAN®

100 YEARS OF HEAT TRANSFER TECHNOLOGY

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