Exhaust Gas Heat Exchangers

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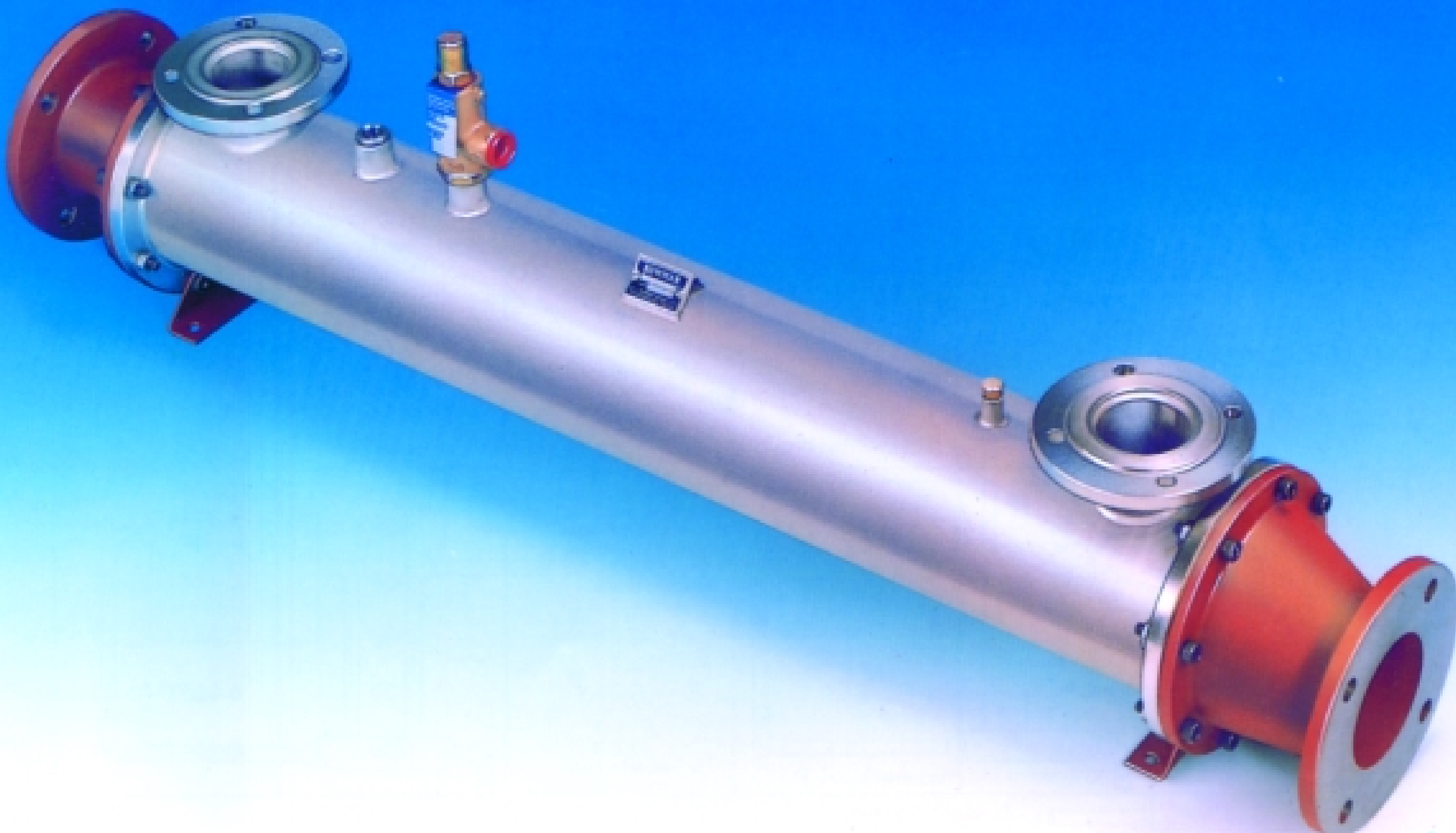
Echangeurs de chaleur de gaz d’échappement
Abgaswärmeaustauscher



BS EN ISO 9002
Reg. No. FM38224

Exhaust Gas Heat Exchangers

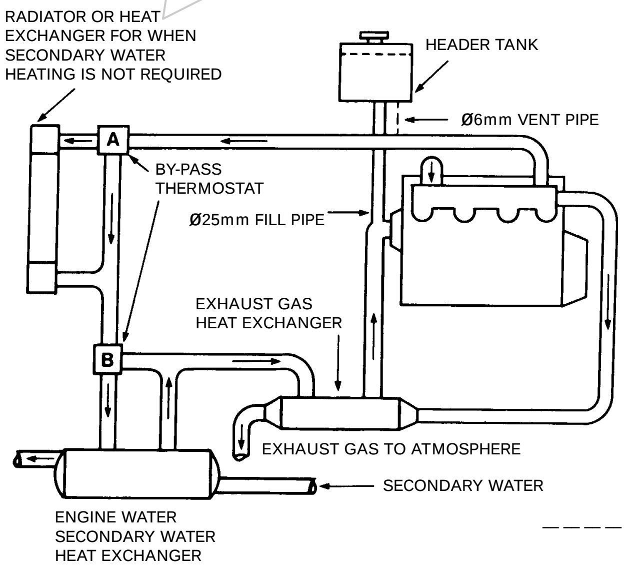
These heat exchangers are designed to remove heat from the exhaust gas of a natural gas engine and transfer it to the water circuit. They can be used for heat recovery and also engines operating in hazardous environments where for safety reasons it is necessary to reduce the temperature of the exhaust gases.

The heat exchangers have stainless steel tubes, tube plates and shell and cast iron end covers. They should be installed horizontally with the water connections on top so that they are always full of water. It is important that any thermostatic valves are arranged so that there is always a flow of water through the heat exchanger, even on starting when the engine is cold. Automatic engine shutdown equipment should be provided with temperature probes in the exhaust gas heat exchanger and the engine. The heat exchanger should be installed below the level of the cylinder head, so that in the unlikely event of a tube leak occuring, water will not leak back into the engine.

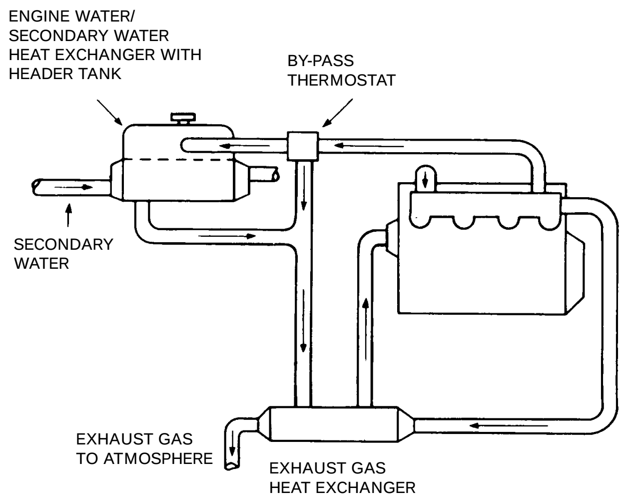
The diagram below left (System1) is for waste heat recovery from an engine driving an alternator. The circuit includes a shell and tube engine water/secondary water heat exchanger for transferring heat from the engine water to a secondary water circuit and also a radiator for dissipating all the heat should it not be required for any useful purpose. This radiator should be larger than on a normal installation because of the additional heat from the exhaust gas heat exchanger. Two by-pass thermostats are shown. One, A, set at a higher temperature of say, 90˚C and a second, B, set at a lower temperature of say, 80˚C. When the engine is cold, water will by-pass both the radiator and the engine water/ secondary water heat exchanger. When the engine water reaches a temperature of 80˚C, it will continue to by-pass the radiator, but will now pass through the engine water/secondary water heat exchanger. If the heating requirement is insufficient to stabilise the temperature of the engine water and it continues to rise, the by-pass thermostat A will open at 90˚C and will pass the engine water through the radiator. This type of installation should be used if the engine continues to run even when heat is not required. If the only object is to reduce the temperature of the exhaust gas for environmental reasons and no heat recovery is required, a similar circuit arrangement can be used, but without thermostat B and the engine water/secondary water heat exchanger.

If the engine is driving a heat pump and is stopped when there is no heating requirement, a radiator will not be required and an installation can be arranged as shown below right (System 2). With this type of installation one of our combined heat exchanger/header tank assemblies can be used for transferring heat from the engine water to the secondary water circuit. Automatic engine shutdown equipment should be provided with a temperature probe in the shell of the exhaust gas heat exchanger and the water outlet from the engine.

On the opposite page, we have suggested some typical examples of exhaust gas heat exchanger performance. With a computer program, we can calculate the optimum size for any duty. We can also supply water/water heat exchangers and water/oil coolers for integrated systems. These components are illustrated on separate leaflets and again, can be selected by computer to match the duty.



SYSTEM 1



— — — — — — Ø6mm VENT PIPE

SYSTEM 2

Typical examples of exhaust gas heat exchanger performance

The figures below are as a general guide only and are not based on any particular natural gas engine. They assume an air/fuel ratio of 10.23 : 1 by volume, a fuel consumption of 0.34m^3/kWh (measured at 1.013 bar and 15C°) and an exhaust gas temperature of 600°C and a water inlet temperature of 80°C.

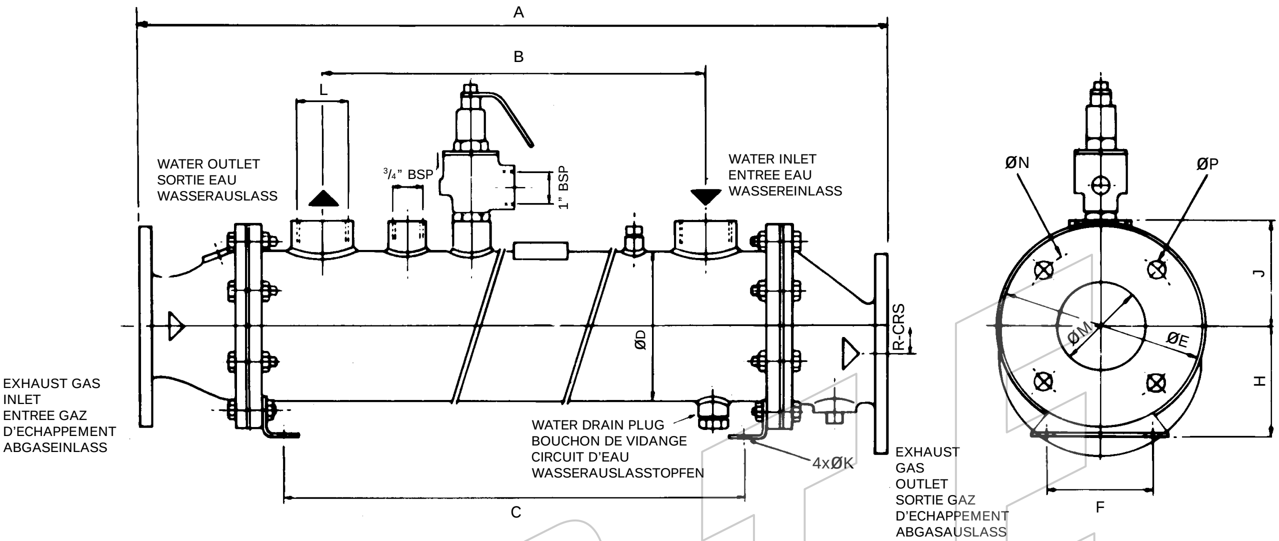
Type	Engine power kW	Exhaust gas flow kg/min	Exhaust gas outlet temperature °C	Heat recovery kW	Exhaust gas pressure drop kPa
3-32-3738-5	32	2.4	210	19	2.4
3-40-3738-6	32	2.4	170	21	2.8
3-60-3738-8	32	2.4	120	23	3.4
4-32-3739-5	60	4.5	210	35	2.2
4-40-3739-6	60	4.5	170	39	2.4
4-60-3739-8	60	4.5	120	43	3.0
5-32-3740-5	90	6.7	210	52	2.1
5-40-3740-6	90	6.7	170	57	2.4
5-60-3740-8	90	6.7	120	65	2.9
6-32-3741-5	140	10.5	210	82	2.2
6-40-3741-6	140	10.5	170	90	2.4
6-60-3741-8	140	10.5	120	101	3.0
8-32-3742-5	250	18.7	210	147	2.3
8-40-3742-6	250	18.7	170	160	2.5
8-60-3742-8	250	18.7	120	181	3.0
10-32-3743-5	400	30.0	210	236	2.4
10-40-3743-6	400	30.0	170	256	2.6
10-60-3743-8	400	30.0	120	288	3.1
12-32-3744-5	600	45.0	210	353	2.3
12-40-3744-6	600	45.0	170	380	2.5
12-60-3744-8	600	45.0	120	425	3.1

100kPa = 1bar

Maximum working gas side pressure	0.5 bar
Maximum working water side pressure	4 bar
Maximum working gas side temperature	700°C
Maximum working water side temperature	110°C

European Pressure Equipment Directive

This range of products fall within Article 3 Paragraph 3 (Sound Engineering Practice) and do not require CE marking.



	A	B	C	D	E	F	H	J	K	L	M	N	P	R
	mm	mm	mm	mm	mm	mm	mm	mm	mm	BSP	mm	mm	mm	mm
3-32-3738-5	962	718	762	89	140	60	75	70	9	Rp1”	54	110	4x14	16
3-40-3738-6	1164	920	964	89	140	60	75	70	9	Rp1”	54	110	4x14	16
3-60-3738-8	1672	1428	1472	89	140	60	75	70	9	Rp1”	54	110	4x14	16
4-32-3739-5	992	698	762	114	160	80	90	85	9	Rp1½”	66	130	4x14	22
4-40-3739-6	1194	900	964	114	160	80	90	85	9	Rp1½”	66	130	4x14	22
4-60-3739-8	1702	1408	1472	114	160	80	90	85	9	Rp1½”	66	130	4x14	22
5-32-3740-5	1032	688	762	141	190	100	105	100	11	Rp2”	82	150	4x18	26
5-40-3740-6	1234	890	964	141	190	100	105	100	11	Rp2”	82	150	4x18	26
5-60-3740-8	1742	1398	1472	141	190	100	105	100	11	Rp2”	82	150	4x18	26
6-32-3741-5	1082	668	762	168	210	130	120	140	11	*60	104	170	4x18	28
6-40-3741-6	1284	870	964	168	210	130	120	140	11	*60	104	170	4x18	28
6-60-3741-8	1792	1378	1472	168	210	130	120	140	11	*60	104	170	4x18	28
8-32-3742-5	1152	648	752	219	240	180	150	180	14	*80	130	200	8x18	40
8-40-3742-6	1354	850	954	219	240	180	150	180	14	*80	130	200	8x18	40
8-60-3742-8	1862	1358	1462	219	240	180	150	180	14	*80	130	200	8x18	40
10-32-3743-5	1232	608	752	273	265	250	180	220	14	*100	154	225	8x18	55
10-40-3743-6	1434	810	954	273	265	250	180	220	14	*100	154	225	8x18	55
10-60-3743-8	1942	1318	1462	273	265	250	180	220	14	*100	154	225	8x18	55
12-32-3744-5	1332	538	738	324	320	300	220	270	18	*150	204	280	8x18	55
12-40-3744-6	1534	740	940	324	320	300	220	270	18	*150	204	280	8x18	55
12-60-3744-8	2042	1248	1448	324	320	300	220	270	18	*150	204	280	8x18	55

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