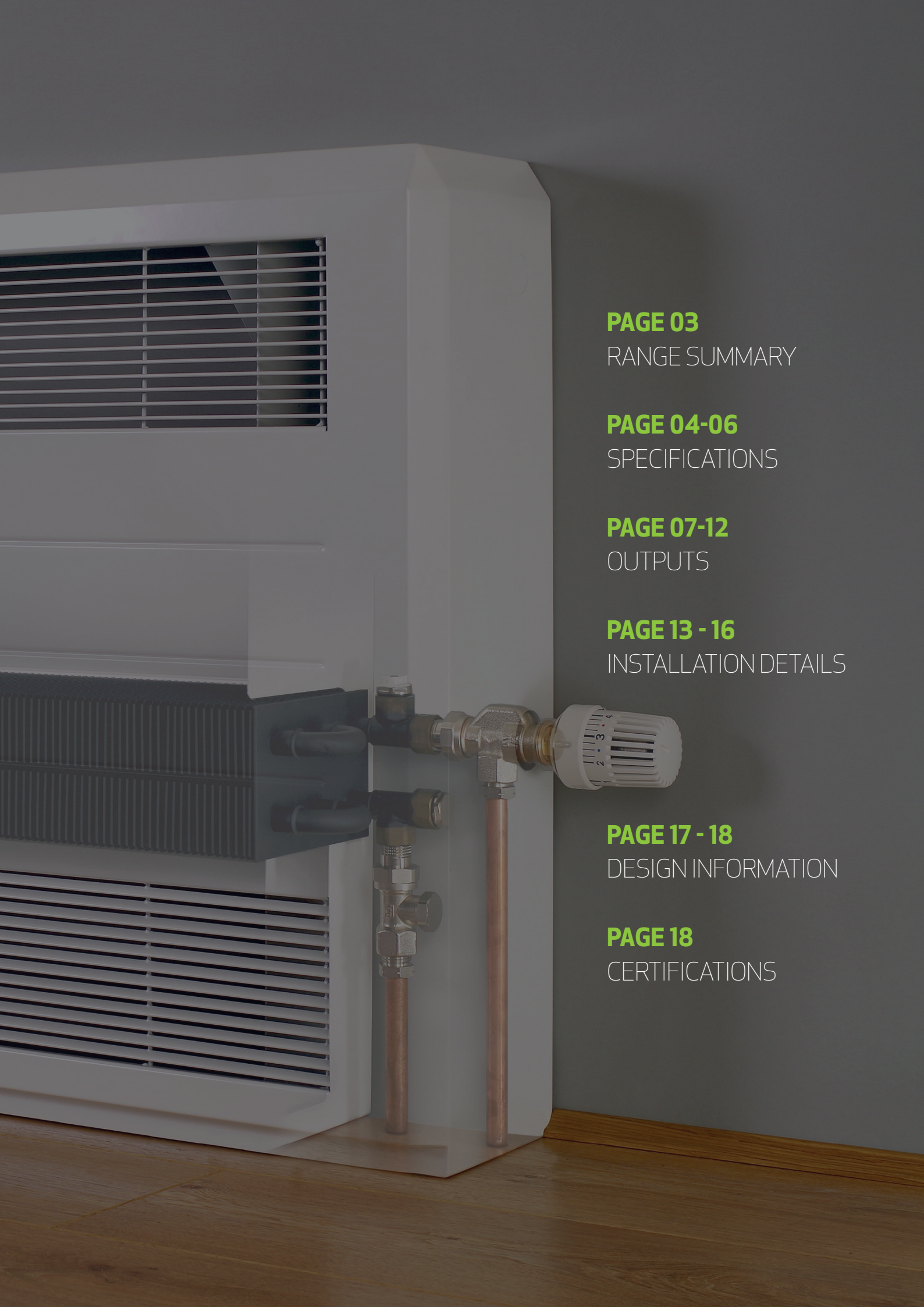


**DONOHUE HEATING SERVICES
OPTIMA DATA SHEETS**





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RANGE SUMMARY

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A LOW WATER CONTENT,
HIGH HEAT OUTPUT
LST RANGE WHICH IS
QUICK & EASY TO INSTALL

Meeting the market's demand in terms of low water content and energy savings, the new LST Optima, certified in accordance with BS EN 442, delivers warmth, safety and elegance for end-users and simplicity of installation for contractors.

CASING:

- Strong single piece profiled casing in 1.6mm steel
- 3 heights:** 500mm, 650mm, 800mm
- 8 lengths:** 650mm, 850mm, 1050mm, 1250mm, 1450mm, 1650mm, 1850mm, 2050mm
- 3 depths:** 120mm, 170mm, 220mm
- 4 models:** WTG (Wall Top Grille), WFG (Wall Front Grille), FTG (Floor Top Grille), FFG (Floor Front Grille)
- Style:** Linear front with 3mm deep rib detail for extra strength & durability

The Optima Range is ideal for
the education, healthcare and
residential care sectors.



FLOOR STANDING



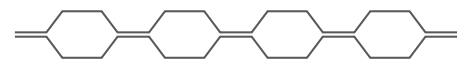
WALL MOUNTED



EMITTER:

- Low H₂O, high output fin coil heat exchanger
- 2 height:** 100mm, 200mm
- 8 lengths:** 525mm, 725mm, 925mm, 1125mm, 1325mm, 1525mm, 1725mm, 1925mm
- 3 depths:** 100mm, 150mm, 200mm





SPECIFICATIONS

EMITTER SPECIFICATION:

Low H₂O, high output fin coil heat exchanger.

Low water content from 0.75 litres per metre.

Non-corrosive 0.2mm aluminium fins & 15mm diameter copper tubes.

Corrugated aluminium fins to maximise convective surface area.

Single pipe reverse flow heat exchanger, continuous mass flow for optimum output efficiency.

Same end connections, reversible heat exchanger can be connected left or right with standard valve, TRV or remote sensor.

High, low level and internal tamper proof TRV options available.

Standard connection position 40mm close to the wall for all heat exchangers.

Dual quick-fit bracket system for emitter & casing, supplied with bracket spacing bar.

Supplied with ½" BSP directional air vent & blank.

Dirt and dust repellent epoxy polyester powder coat finish in matt graphite grey to RAL7024.

Working pressure 10 bar, test pressure 13 bar
Maximum operating temperature 120 °C.

10 year warranty.

Outputs tested in accordance with BS EN442 independently by BSRIA.

Optima is the result of a pioneering partnership between QRL, the leading manufacturer of high technology radiator solutions in UK and Ireland, and Kampmann, one of the leading manufacturers in the heating, cooling and ventilation sector in Germany and mainland Europe.

QRL and Kampmann collaborated on 12 months of research and development utilising QRL's £150m, fully automated 1,000,000 square foot production facility in South Wales and Kampmann's state-of-the-art R&D facility in Germany, which includes a certified EN442 Test Booth, and a 125m² Anechoic chamber.

The resulting Optima LST range benefits from the unique water flow characteristics of the Kampmann emitter, and the exceptional air flow characteristics of the QRL LST casing. This unrivalled combination delivers the highest efficiency, low water content LST on the market, with EN 442 outputs and surface temperature certification by BSRIA in the UK.

THE SCIENCE BEHIND EMITTER EFFICIENCY

The reason for the higher efficiency of the Kampmann single pipe fin coil heat exchanger compared to a multi-pipe manifold in parallel flow is due to the effect of Turbulent Flow.

Heat transfer occurs only at the pipe wall. Laminar Flow develops an insulating blanket around the wall that significantly reduces emitter heat output. Conversely Turbulent Flow due to turbulence has no restriction at the pipe wall therefore maximum heat output is transferred rapidly to the room.

Whether flow is Turbulent or Laminar is indicated by the Reynolds number for the pipe. For Reynolds numbers below 2,000 flow is Laminar, for numbers above 2,000, the flow is Turbulent. The higher the number, the more turbulent the flow.

Example emitter comparison:

Optima Fin Coil Single Pipe Emitter

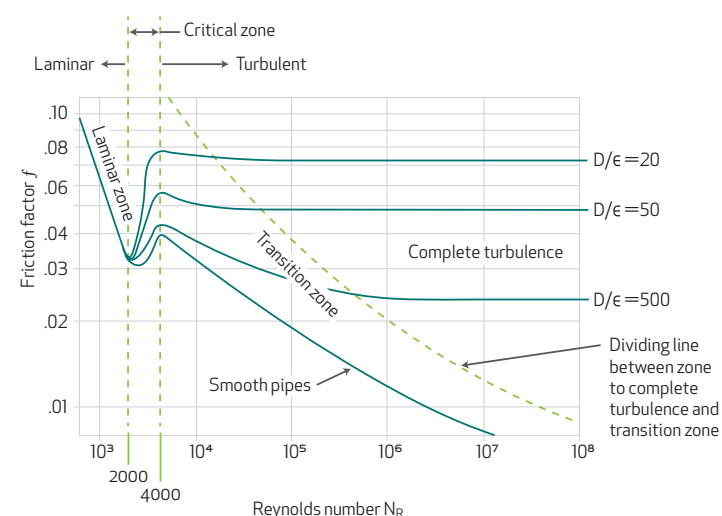
100mm high x 150mm deep

Reynolds Number, 5,200
(Turbulent Flow)

Typical Parallel Flow (with manifold) Emitter

100mm high x 150mm deep

Reynolds Number, 1,750
(Laminar Flow)



(Diagram highlighting how Reynold numbers affect whether flow is laminar or turbulent)

CASING SPECIFICATION:

Low surface temperature NHS DN4 compliant at 50 ΔT, maximum flow temperature 80°C.

Surface temperatures independently tested by BSRIA.

Strong single piece profiled casing in 1.6mm steel with 3mm deep rib detail for extra strength and durability.

Easy wipe clean, soft bevelled design to prevent accidental injury.

No joints in the casing to gather dirt, dust and potential bacteria.

Non-handed casing with knock-outs can be fitted with valve left or right, decision can be made on site as required.

Scratch resistant epoxy polyester powder coat finish in satin white to RAL9016, high UV resistance to ASTM G53.

Anti-bacterial coating standard on brackets and casing at no extra cost.

Pencil proof bar grilles maximum aperture 7.1mm at no extra cost.

Integral bottom grille on wall mounted casings to prevent emitter access. NHS Estates compliant without loss of output.

Security screw locking system for both floor and wall mounted options to prevent unauthorised access.

A deflector is fitted on WFG and FFG models to optimize hot air flow through the front grille.

Floor casings sit directly on the floor to prevent dirt and dust ingress beneath the cover and any potential trap hazard.

Manufactured in UK & Ireland, all radiators are CE marked to BS EN442 and manufactured under a BS EN ISO 9001: 2008 quality system accepted by BSI.

10 year warranty.

VALVE OPTIONS:

Herz external high level capillary TRV valve.

Herz internal tamper proof capillary TRV valve.

Oventrop external low level direct TRV valve.

Oventrop straight pattern lock shield valve for use with all of the above

2 year warranty.

HARDWARE:

4 x 40mm long M6 Hex. head setscrews.

4 x 40mm long No.8 plastic universal rawl plugs.

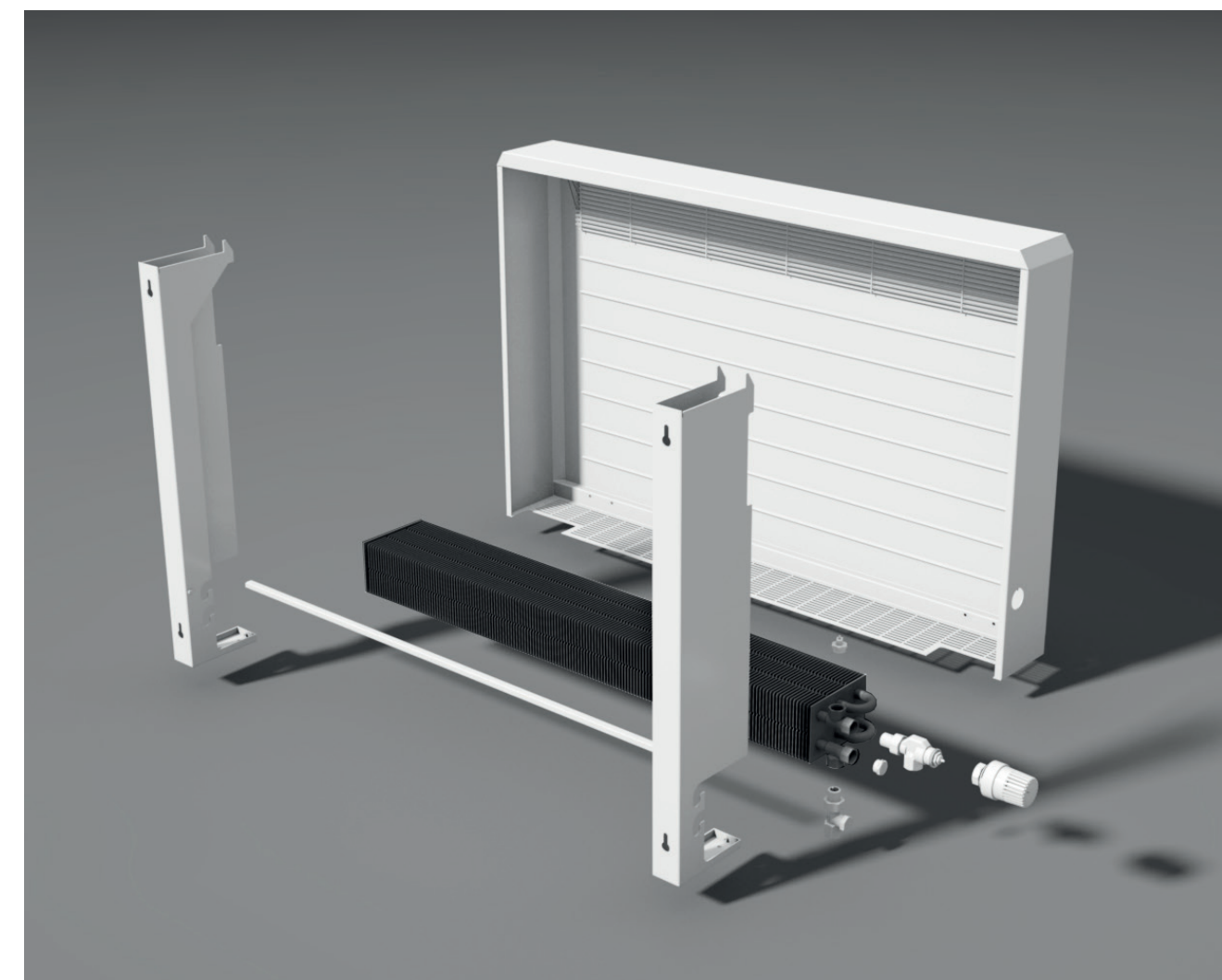
4 x M6 washers.

1 x ½" BSP air vent.

1 x ½" BSP blank.

2 x 10mm long M4 TORX pan head security screws.

2 x 7mm dia. white plastic captive inserts.



PACKAGING:

Optima is supplied as a single pack; the casing is packaged in a heavy-duty cardboard box with lid and within the box the emitter is wrapped separately in a cardboard sleeve and plastic banded. The brackets are nested together and wrapped separately and securely in protective bubble wrap. The box is also supplied with additional inner cardboard corner pads and polystyrene stack supports to ensure complete protection for the product whilst in transit.

INSTALLATION:

For indirect or closed circuits only, with a maximum working temperature of 80°C.

The system should be designed in accordance with the British Standard Code of Practice for Water Based Heating Systems in Buildings BS EN 12828+A1:2014 and BS EN 12831:2003.

The installation of the system and commissioning of the system should comply with BS EN 14336:2004.

On completion of the installation the system should be properly flushed and filled in accordance with the British Standard Code of Practice for the Treatment of Water in Domestic Hot Water Central Heating Systems BS 7593:2006, Part L of the Building Regulations and Good Practice Guidance for Scotland.

Merriott strongly recommend the use of corrosion inhibitor for all applications. Failure to observe these standards may invalidate the manufacturer’s warranty.

THERMOSTATIC RADIATOR VALVES:



EXTERNAL HIGH LEVEL CAPILLARY

Consists of a 15mm angled valve body fitted to the emitter inside the casing and linked by capillary tube to an external TRV head. The head is secured by simply tightening the unit thru the pre-formed knock out at the top side of the casing. This can be positioned left or right. The specially designed grip on the TRV head facilitates the use by people with limited hand mobility and can be pre-set to the desired temperature required.

INTERNAL TAMPER PROOF CAPILLARY

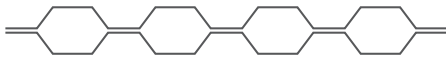
Consists of a 15mm angled valve body and TRV head fitted to the emitter inside the casing with an external remote capillary sensor attached to the wall or underside of the casing below the emitter. This can be positioned left or right. The TRV head can be pre-set to the desired temperature and is tamper proof, only accessible to authorised personal by unlocking the casing.

EXTERNAL LOW LEVEL DIRECT

Consists of a simple 15mm axial valve body fitted to the emitter that protrudes thru a pre-formed knock out at the bottom side of the casing. This can be positioned left or right. The TRV head fits directly on the valve outside the casing. The TRV head can be pre-set to the desired temperature required.

OPTIONS AVAILABLE ON REQUEST:

- Style: Flat front (without rib detail).
- Anti-ligature grilles to BS EN 60529:1992+A2:2013, IPX3 rated (maximum aperture 2.5mm diameter).
- TRV valves with mass flow pre-setting.



OPTIMA EN442 OUTPUTS

CASING HEIGHT 500MM

		SINGLE EMITTER					TWIN EMITTER				
CASING LENGTH	EMITTER LENGTH	EMITTER TYPE	WTG WATTS ΔT50	WFG WATTS ΔT50	FTG WATTS ΔT50	FFG WATTS ΔT50	EMITTER TYPE	WTG WATTS ΔT50	WFG WATTS ΔT50	FTG WATTS ΔT50	FFG WATTS ΔT50
650	525	100S	425	362	413	341	100T	524	425	509	n/a
		150S	673	539	653	508	150T	793	604	769	n/a
		200S	928	686	900	647	200T	1051	737	1020	n/a
850	725	100S	626	532	607	501	100T	771	624	748	n/a
		150S	990	793	960	748	150T	1166	888	1131	n/a
		200S	1364	1009	1323	951	200T	1546	1084	1499	n/a
1050	925	100S	826	702	801	662	100T	1018	824	988	n/a
		150S	1307	1047	1267	987	150T	1539	1172	1492	n/a
		200S	1801	1332	1747	1256	200T	2040	1431	1979	n/a
1250	1125	100S	1026	872	995	822	100T	1265	1024	1227	n/a
		150S	1624	1301	1574	1226	150T	1912	1456	1854	n/a
		200S	2238	1655	2170	1560	200T	2535	1778	2459	n/a
1450	1325	100S	1226	1042	1189	982	100T	1512	1224	1466	n/a
		150S	1940	1555	1882	1465	150T	2285	1740	2216	n/a
		200S	2674	1978	2593	1864	200T	3029	2125	2939	n/a
1650	1525	100S	1426	1213	1384	1143	100T	1758	1424	1706	n/a
		150S	2257	1808	2189	1704	150T	2658	2024	2578	n/a
		200S	3111	2301	3017	2169	200T	3524	2472	3419	n/a
1850	1725	100S	1627	1383	1578	1303	100T	2005	1623	1945	n/a
		150S	2574	2062	2496	1944	150T	3031	2308	2940	n/a
		200S	3547	2624	3440	2473	200T	4019	2819	3898	n/a
2050	1925	100S	1827	1553	1772	1464	100T	2252	1823	2185	n/a
		150S	2891	2316	2803	2183	150T	3404	2592	3301	n/a
		200S	3984	2947	3864	2778	200T	4513	3166	4378	n/a

CASING HEIGHT 650MM

		SINGLE EMITTER					TWIN EMITTER				
CASING LENGTH	EMITTER LENGTH	EMITTER TYPE	WTG WATTS ΔT50	WFG WATTS ΔT50	FTG WATTS ΔT50	FFG WATTS ΔT50	EMITTER TYPE	WTG WATTS ΔT50	WFG WATTS ΔT50	FTG WATTS ΔT50	FFG WATTS ΔT50
650	525	100S	457	418	453	394	100T	576	491	558	463
		150S	739	624	716	588	150T	870	698	844	657
		200S	1018	794	987	748	200T	1154	853	1119	804
850	725	100S	687	615	666	580	100T	848	723	821	681
		150S	1087	918	1053	864	150T	1280	1027	1241	967
		200S	1498	1168	1452	1100	200T	1697	1254	1645	1182
1050	925	100S	907	812	879	766	100T	1119	954	1084	899
		150S	1435	1211	1390	1141	150T	1690	1355	1638	1276
		200S	1977	1541	1916	1452	200T	2240	1656	2171	1560
1250	1125	100S	1126	1009	1092	951	100T	1390	1185	1347	1117
		150S	1782	1505	1727	1418	150T	2099	1684	2035	1586
		200S	2456	1915	2381	1804	200T	2783	2057	2698	1938
1450	1325	100S	1346	1205	1305	1137	100T	1661	1416	1610	1335
		150S	2130	1798	2064	1694	150T	2509	2013	2432	1895
		200S	2935	2288	2846	2156	200T	3326	2459	3224	2316
1650	1525	100S	1566	1402	1518	1322	100T	1932	1647	1872	1553
		150S	2478	2092	2401	1971	150T	2918	2341	2829	2204
		200S	3414	2662	3310	2508	200T	3869	2860	3751	2695
1850	1725	100S	1786	1599	1731	1508	100T	2204	1879	2135	1771
		150S	2826	2386	2738	2247	150T	3328	2670	3226	2514
		200S	3894	3036	3775	2860	200T	4412	3261	4277	3073
2050	1925	100S	2006	1796	1944	1694	100T	2475	2110	2398	1989
		150S	3174	2679	3075	2524	150T	3738	2998	3623	2823
		200S	4373	3409	4239	3212	200T	4955	3663	4803	3451

CASING HEIGHT 800MM

		SINGLE EMITTER					TWIN EMITTER				
CASING LENGTH	EMITTER LENGTH	EMITTER TYPE	WTG WATTS ΔT50	WFG WATTS ΔT50	FTG WATTS ΔT50	FFG WATTS ΔT50	EMITTER TYPE	WTG WATTS ΔT50	WFG WATTS ΔT50	FTG WATTS ΔT50	FFG WATTS ΔT50
650	525	100S	496	452	482	426	100T	612	531	594	501
		150S	786	674	762	636	150T	926	755	898	712
		200S	1083	859	1050	809	200T	1227	922	1190	869
850	725	100S	730	665	708	627	100T	901	781	873	736
		150S	1156	992	1120	935	150T	1362	1110	1320	1047
		200S	1593	1263	1544	1189	200T	1804	1356	1749	1278
1050	925	100S	964	878	935	827	100T	1189	1031	1153	972
		150S	1525	1309	1478	1234	150T	1798	1465	1742	1382
		200S	2102	1667	2038	1570	200T	2382	1790	2309	1686
1250	1125	100S	1197	1091	1161	1028	100T	1477	1281	1432	1207
		150S	1895	1627	1837	1533	150T	2233	1820	2165	1717
		200S	2612	2071	2532	1951	200T	2959	2224	2869	2095
1450	1325	100S	1431	1303	1388	1229	100T	1765	1531	1711	1443
		150S	2265	1944	2195	1833	150T	2669	2176	2587	2052
		200S	3121	2475	3026	2331	200T	3537	2658	3429	2504
1650	1525	100S	1664	1516	1615	1429	100T	2053	1781	1991	1679
		150S	2635	2261	2554	2132	150T	3105	2531	3010	2387
		200S	3631	2879	3520	2712	200T	4114	3092	3989	2913
1850	1725	100S	1898	1729	1841	1630	100T	2342	2031	2270	1914
		150S	3005	2579	2912	2431	150T	3541	2886	3432	2722
		200S	4141	3283	4014	3092	200T	4691	3526	4548	3322
2050	1925	100S	2132	1942	2068	1830	100T	2630	2281	2550	2150
		150S	3374	2896	3270	2730	150T	3977	3241	3854	3057
		200S	4650	3687	4508	3473	200T	5269	3960	5108	3730

DRY WEIGHTS (KG/M) AND WATER CONTENTS (LITRES/M) PER METRE OF CASING

Type	Model WTG			Model WFG			Model FTG			Model FFG			Water Content
	500.00	650.00	800.00	500.00	650.00	800.00	500.00	650.00	800.00	500.00	650.00	800.00	
100S	14.41	17.15	19.90	15.47	18.22	20.95	11.71	14.50	17.30	13.98	16.78	19.58	0.65
150S	17.79	20.89	23.99	19.81	22.90	26.01	14.41	17.59	20.77	17.64	20.82	24.00	0.97
200S	21.18	24.63	28.10	23.73	27.18	30.64	17.12	20.68	24.24	20.88	24.44	28.01	1.31
100T	16.45	19.19	21.94	17.51	20.26	22.99	13.75	16.54	19.34	16.02	18.82	21.62	1.31
150T	20.85	23.94	27.05	22.86	25.96	29.06	17.46	20.65	23.82	20.70	23.88	27.06	1.95
200T	25.24	28.70	32.16	27.79	31.25	34.70	21.18	24.74	28.30	24.94	28.50	32.07	2.60

EXPONENT ‘n’ VALUES

Type	Model WTG			Model WFG			Model FTG			Model FFG		
	500.00	650.00	800.00	500.00	650.00	800.00	500.00	650.00	800.00	500.00	650.00	800.00
100S	1.3656	1.3380	1.3247	1.4333	1.3559	1.3334	1.3669	1.3392	1.3260	1.4453	1.3673	1.3445
150S	1.3386	1.3115	1.2985	1.4012	1.3255	1.3035	1.3398	1.3127	1.2997	1.4129	1.3366	1.3144
200S	1.3461	1.3188	1.3057	1.4046	1.3287	1.3066	1.3473	1.3200	1.3069	1.4163	1.3398	1.3176
100T	1.5028	1.4725	1.4578	1.5716	1.4867	1.4621	1.5043	1.4738	1.4593	n/a	1.4992	1.4742
150T	1.4731	1.4433	1.4290	1.5364	1.4534	1.4293	1.4744	1.4446	1.4303	n/a	1.4656	1.4412
200T	1.4814	1.4513	1.4369	1.5401	1.4569	1.4327	1.4827	1.4527	1.4382	n/a	1.4691	1.4447

CONVERSION INFORMATION (DELTA ΔT FACTORS)

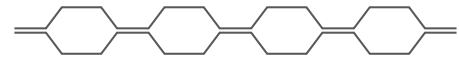
The heat outputs quoted in this publication are based on ΔT50 °C to calculate other operating conditions, the following example should be used:

Example: Add flow water temperature (75 °C) and the return water temperature (65 °C) together (140 °C), divide by two (70 °C) and then subtract the room temperature (20 °C). This will give you a ΔT factor of 50 °C.

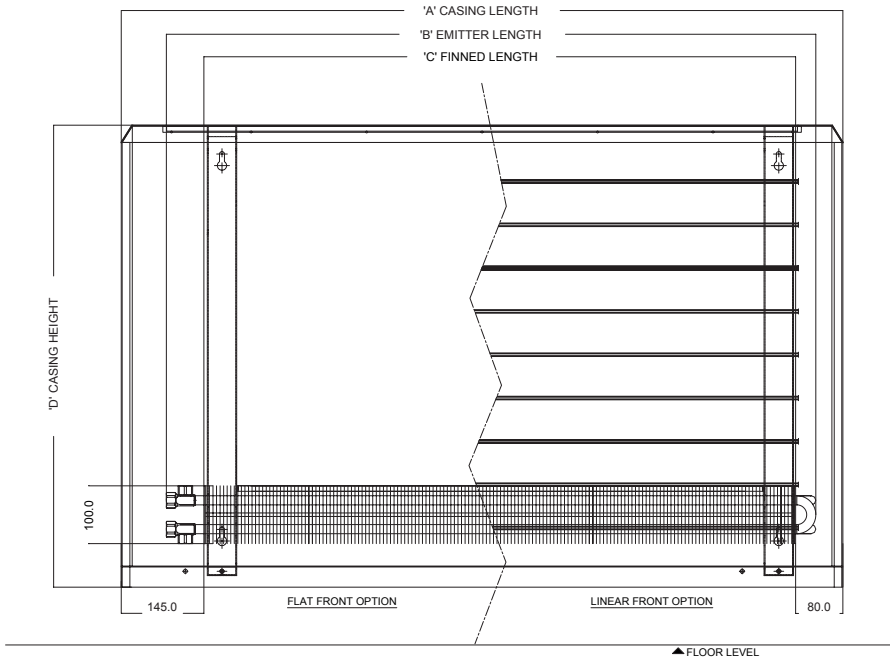
For ΔT factors other than 50 °C multiply the catalogue figure by the conversion factor from the table

DEGREES CENTIGRADE					
5 °C	0.0501	30 °C	0.5148	55 °C	1.1319
10 °C	0.1234	35 °C	0.6290	60 °C	1.2675
15 °C	0.2091	40 °C	0.7482	65 °C	1.4065
20 °C	0.3039	45 °C	0.8720	70 °C	1.5487
25 °C	0.4061	50 °C	1.0000	75 °C	1.6940

Delta T factors in °C other than 50 °C, Exponent n=1.3



WALL MOUNTED (WTG & WFG)



LENGTHS

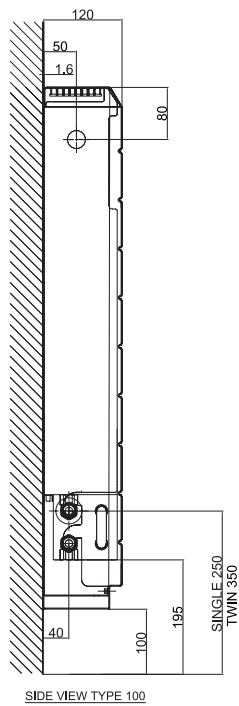
'A'	'B'	'C'
650	525	425
850	725	625
1050	925	825
1250	1125	1025
1450	1325	1225
1650	1525	1425
1850	1725	1625
2050	1925	1825

HEIGHTS

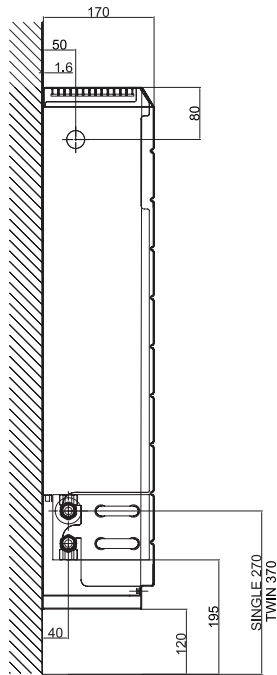
'D'	'E'
500	350
650	500
800	650

DEPTHS

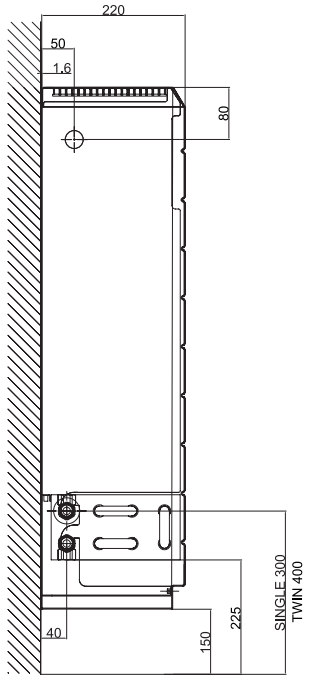
DEPTH	'F'
120	100
170	120
220	150



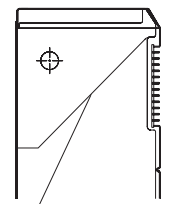
SIDE VIEW TYPE 100



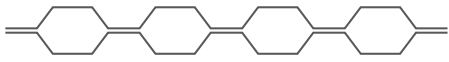
SIDE VIEW TYPE 150



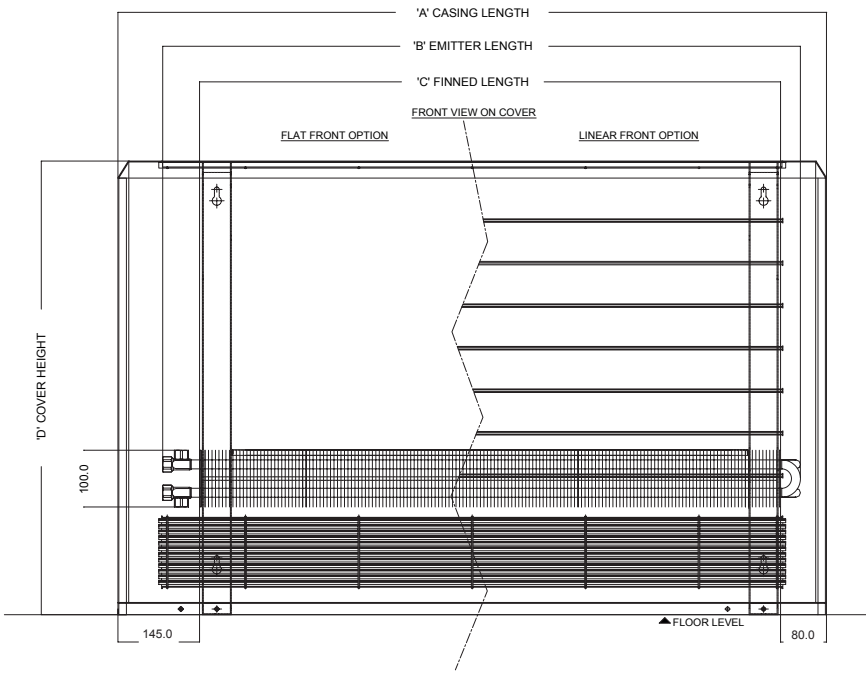
SIDE VIEW TYPE 200



HEAT DEFLECTOR FITTED TO WFG MODELS ONLY



FLOOR MOUNTED (FTG & FFG)

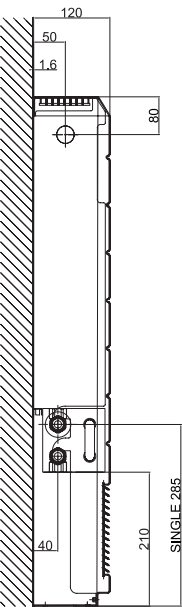


LENGTHS

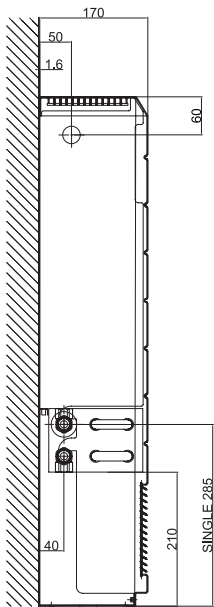
'A'	'B'	'C'
650	525	425
850	725	625
1050	925	825
1250	1125	1025
1450	1325	1225
1650	1525	1425
1850	1725	1625
2050	1925	1825

HEIGHTS

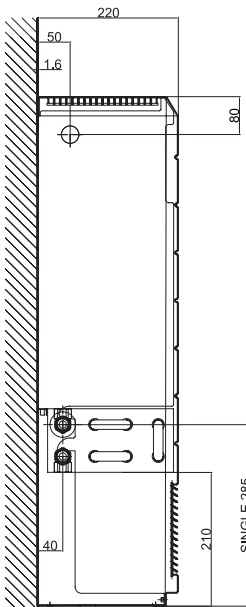
'D'	'E'
500	350
650	500
800	650



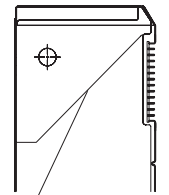
SIDE VIEW TYPE 100



SIDE VIEW TYPE 150



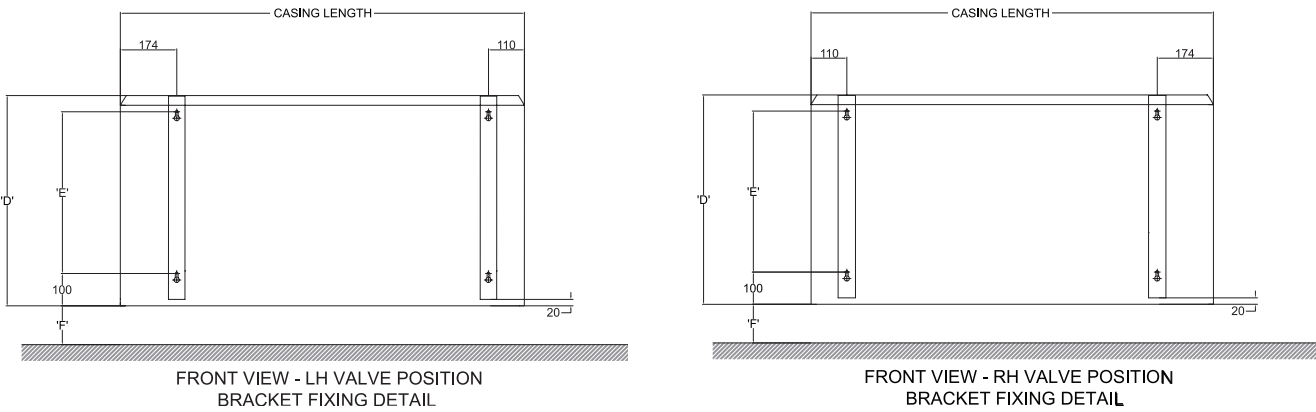
SIDE VIEW TYPE 200



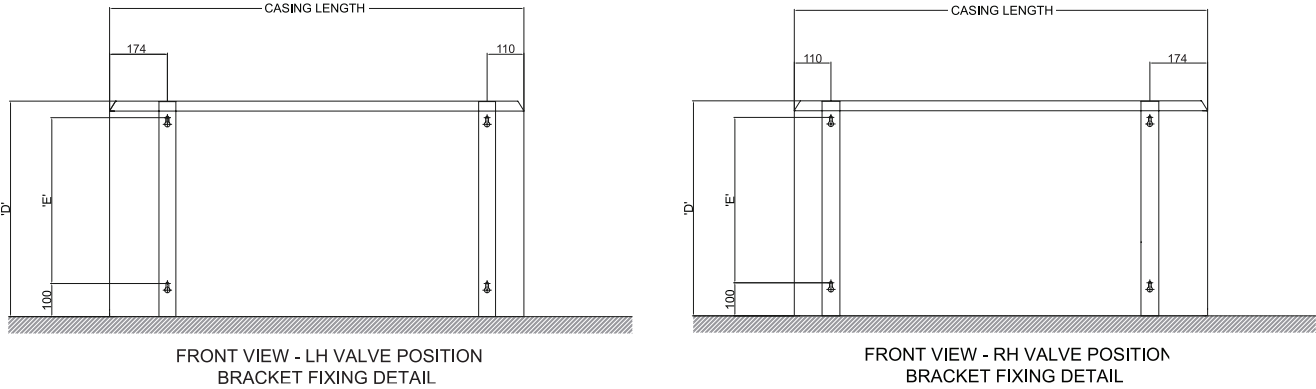
HEAT DEFLECTOR FITTED TO FFG MODELS ONLY

INSTALLATION

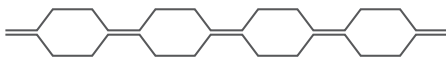
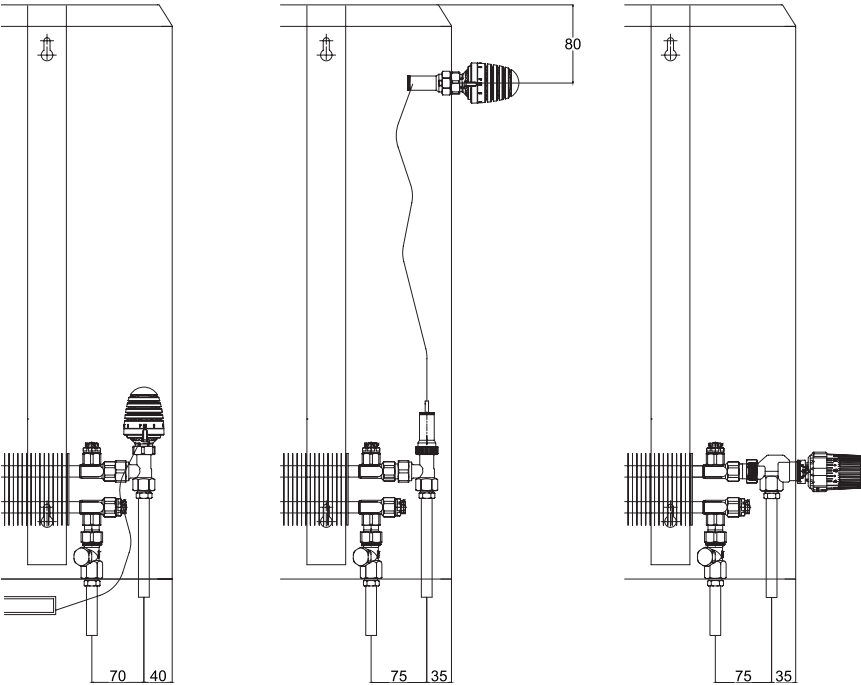
Wall mounted



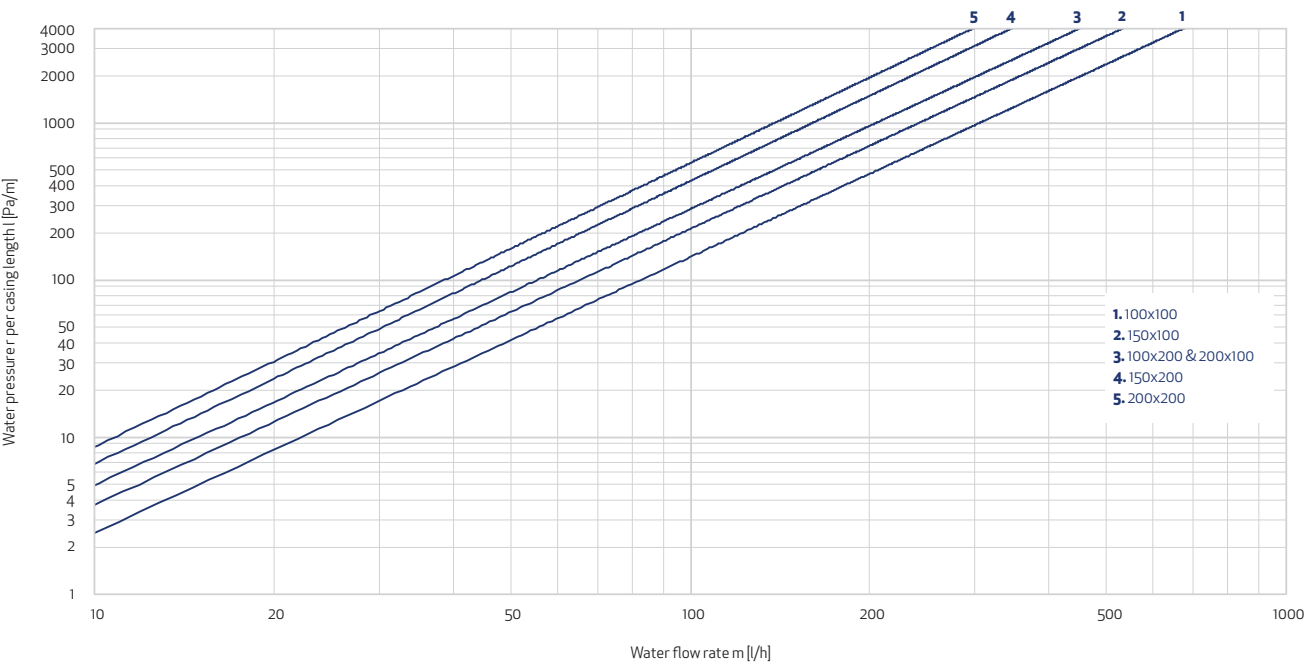
Floor mounted



VALVE POSITIONS



DESIGN INFORMATION



CONVERSION OF OPTIMA
HEAT OUTPUTS

The following formulae can be used to calculate the heat output with water temperatures not listed in the technical data:

ABBREVIATIONS

- t_{w1} [°C] = Flow temperature
- t_{w2} [°C] = Return temperature
- t_L [°C] = Room air temperature
- Δt_w [K] = Water temperature difference
- Δt [K] = Mean excess temperature
- f [/] = Heat output corrector factor
- Q [W] = Heat output
- Q_n [W] = Heat output at LPHW 75/65 °C, $t_L = 20$ °C
- n [/] = Exponent 'n' from output tables
- m [l/h] = Water flow rate
- R [Pa] = Water pressure
- r [Pa/m] = Water pressure per m of casing length
- L [mm] = Casing length

FORMULAE

$$\Delta t = \frac{t_{w1} + t_{w2}}{2} - t_L \quad (1)$$
$$f = \left[\frac{\Delta t}{50} \right]^n \quad (2)$$
$$Q = Q_n \cdot f \quad (3)$$

Use the following formula to calculate the water pressure:

$$t_w = t_{w1} - t_{w2} \quad (4)$$
$$m = \frac{Q}{t_w} \cdot 0.86 \quad (5)$$
$$R = \frac{r \cdot L}{1000} \quad (6)$$

DIAGRAMMATIC CURVES

EMITTER TYPE	[MM]	CASING DEPTH [MM]		
		120	170	220
SINGLE	CURVE NO.	1	2	3
		3	4	5

CALCULATION OF OPTIMA WATER PRESSURE

REQUIRED

Heat output Q in w
Water pressure R in Pa

GIVEN

Water temperatures LPHW 60/50 °C
Room air temperature t_L = 20 °C
WTG casing height 650mm
WTG casing length 1050mm
Emitter type 150S

CALCULATION

$$\Delta t = \frac{t_{w1} + t_{w2}}{2} - t_L \quad (1) \quad \Delta t = \frac{60 + 50}{2} - 20 = 35K$$
$$f = \left[\frac{\Delta t}{50} \right]^n \quad (2) \quad f = \left[\frac{35}{50} \right]^{1.3115} = 0.63$$

Exponent 'n' from output tables: Heat output at LPHW 75/65 °C, t_L = 20 °C, L = 1050 mm, Q_n = 1435 w

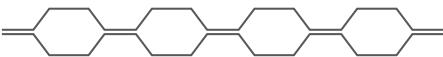
$$Q = Q_n \cdot f \quad (3) \quad Q = 1435 \cdot 0.63 = 904 w$$
$$\Delta t_w = t_{w1} - t_{w2} \quad (5) \quad \Delta t_w = 60 - 50 = 10 k$$
$$m = \frac{Q}{\Delta t_w} \cdot 0.86 \quad (6) \quad m = \frac{904}{10} \cdot 0.86 = 78 l/h$$

From the Diagrammatic curve table: curve 2; from Water pressure graph: at m = 78 l/h and curve 2: r = 130 Pa/m

$$R = \frac{r \cdot L}{1000} \quad (7) \quad R = \frac{130 \cdot 1050}{1000} = 137 Pa$$

RESULT

Heat output Q = 904 w
Water pressures R = 137 Pa



CERTIFICATIONS



OPTIMA EN442 TEST REPORT



OPTIMA CE DECLARATION OF CONFORMITY

Copy available from Merriott upon request.





Merriott

A **QRL** COMPANY

MERRIOTT UK
(MANUFACTURING FACILITY)

QRL Radiator Group, Imperial Park
Newport, NP10 8FS

Tel: +44 (0) 1633 657 000

Fax: +44 (0) 1633 681 864

MERRIOTT IRELAND

Derrylin, Co. Fermanagh, BT92 9AU

NORTHERN IRELAND

Tel: 0800 389 9980

Fax: 0286 774 2998

sales@merriottuk.com


REPUBLIC OF IRELAND

Tel: 1800 882 332

Fax: 0486 774 2998

sales@merriott.ie

www.merriottuk.com / www.merriott.ie

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