



TRANE

SINTECIS BALANCE™



R454B

Sustainable and simultaneous
cooling and heating. ALL YEAR ROUND.



Air-to-water Multi-pipe Units
CMAF 135 -1400 kW
Best TER in the industry

TRANE
TECHNOLOGIES

Become a global contributor

Electrification of heating

At Trane, we believe in **electrification of heating** as an important contributor across the globe to reduce carbon footprint and mitigate climate change. We are doing our part.

Low consumption, reliable performance and comfort are our key design criteria for our Sintesis™ Balance range of multi-pipe units.

Sustainability	Reliability
 <p>Electrification of heating</p> <ul style="list-style-type: none"> • Air-sourced renewable technology • Full recovery and repurposing of heat • Lower carbon footprint compared to fossil fuel technologies • Replaces gas/oil boiler in new or existing buildings • Low GWP refrigerant R454B 	 <p>Reliability is a Trane guarantee.</p> <ul style="list-style-type: none"> • Expertise and knowledge in designing cooling and heating products • Hundreds of air-sourced multi-pipe units installed and in operation since 2014 • Proven Sintesis™ family platform and components • 3 R&D facilities • Factory compliant with latest ISO standards • Eurovent certification
Efficiency	Configurability
 <p>Innovative features to reach market-leading efficiency</p> <ul style="list-style-type: none"> • Trane Adaptive Refrigerant System™ optimizing refrigerant charge in every mode • Up to 25% higher efficiency vs. legacy products • Excellent Total Efficiency Ratio (TER) even up to 8.6 • COP in heating mode up to 3.55 	 <p>Every building application has specific needs.</p> <p>We offer several choices to reach ultimate performance:</p> <ul style="list-style-type: none"> • 4 efficiency levels • 3 acoustic packages • AC or EC fan technologies • Integrated chilled water buffer tank • Multiple hydraulic module packages

Sintesis Balance multi-pipe units are ideal for



Hospitality



Healthcare



Entertainment



Office buildings



Education

Electricity To Heat



Buildings have the biggest role to play on climate change as they consume more energy than any other sector. This means that the realistic potential for energy savings and reducing carbon emissions is significant.

Most European commercial buildings are, today, heated with gas or oil boilers. A sustainable heating sector means phasing out oil and natural gas.

Think about the advantages of replacing the fossil-fuel boiler system with one unit that can deliver both chilled water and hot water for your entire HVAC system. Cooling in the summer, heating in the winter or simultaneous cooling and heating for many other months during the year.

With the innovative and very high efficient Trane Balance™ CMAF multi-pipe units you can !

Trane multi-pipe units deliver real value and real comfort for you:

Proprietary Trane Adaptive Refrigerant System™ - Optimized charge in every operating mode to deliver maximum performance and highest efficiency levels.

Total Efficiency Ratio (TER) even exceeding 8, in other words 8 kW of simultaneous cooling and heating can be generated with only 1 kW of electrical power. CMAF is a great contributor in lowering your annual HVAC system operating costs!

Unique Operating maps including high hot water temperatures for CMAF applications in regions where ambient air temperatures can reach -18°C

Tracer™ Symbio 800 controller

- Six arbitration choices to optimize performances per application
- Optimized defrosting algorithm for maximizing heating capacity (= comfort)
- Superior unit protections in all operating modes & conditions

Step coil condensers – Higher heating performances with lower refrigerant charge and no tradeoff on cooling performances

Scroll compressors with intermediate discharge valve (IDV) technology increasing the part load efficiencies and unit operating map

Increased energy efficiency in and decarbonization of buildings is a “win/win” proposition. No other unit makes more use of renewable energy or recovered energy.

Today's reality is the Electrification of Heating with CMAF being a Perfect Fit !



Exceptional operating maps

Sustainable and reliable cooling or heating. All year round.

CMAF multi-pipe units have exceptionally wide heating operating maps

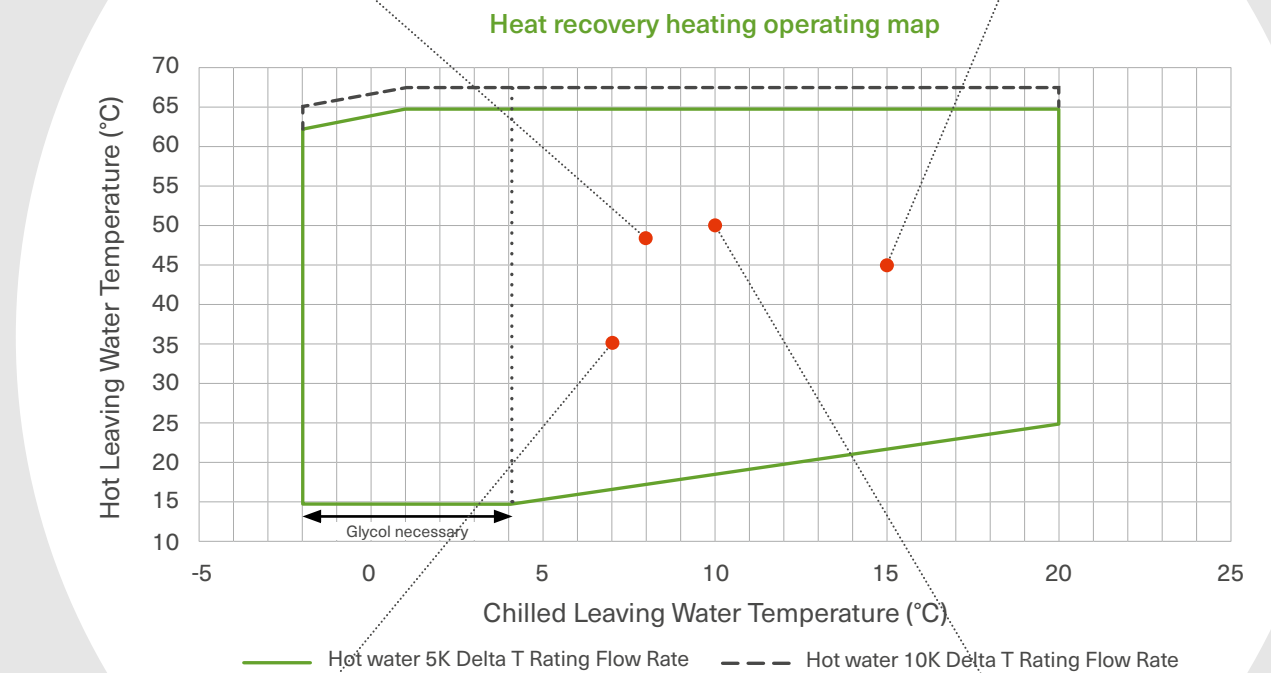
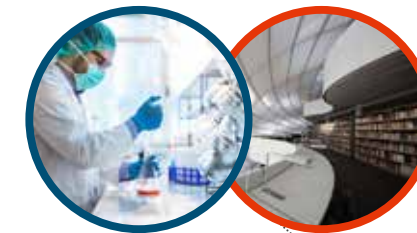
- high leaving hot water temperatures at very low ambient air temperatures in heat pump operation
- or when heating with recovered energy from the simultaneous cooling process

CMAF multi-pipe units can deliver you chilled water, hot water or any combination of cooling and heating.

Examples of heating with recovered energy from the simultaneous cooling process

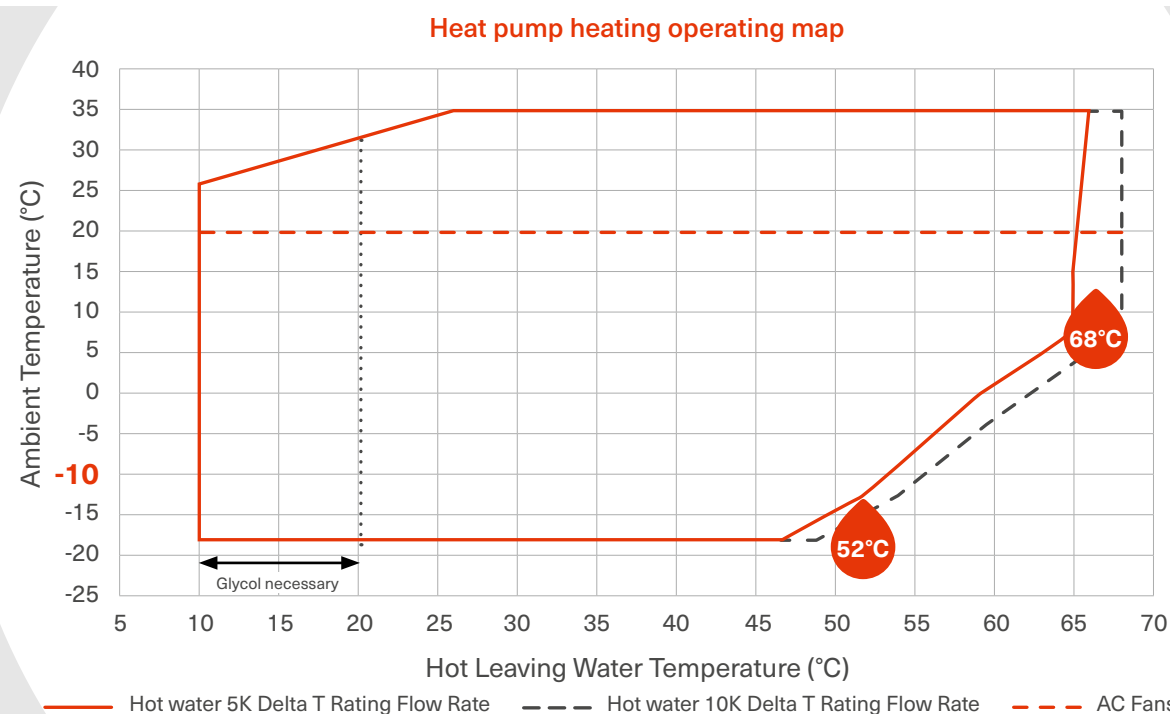
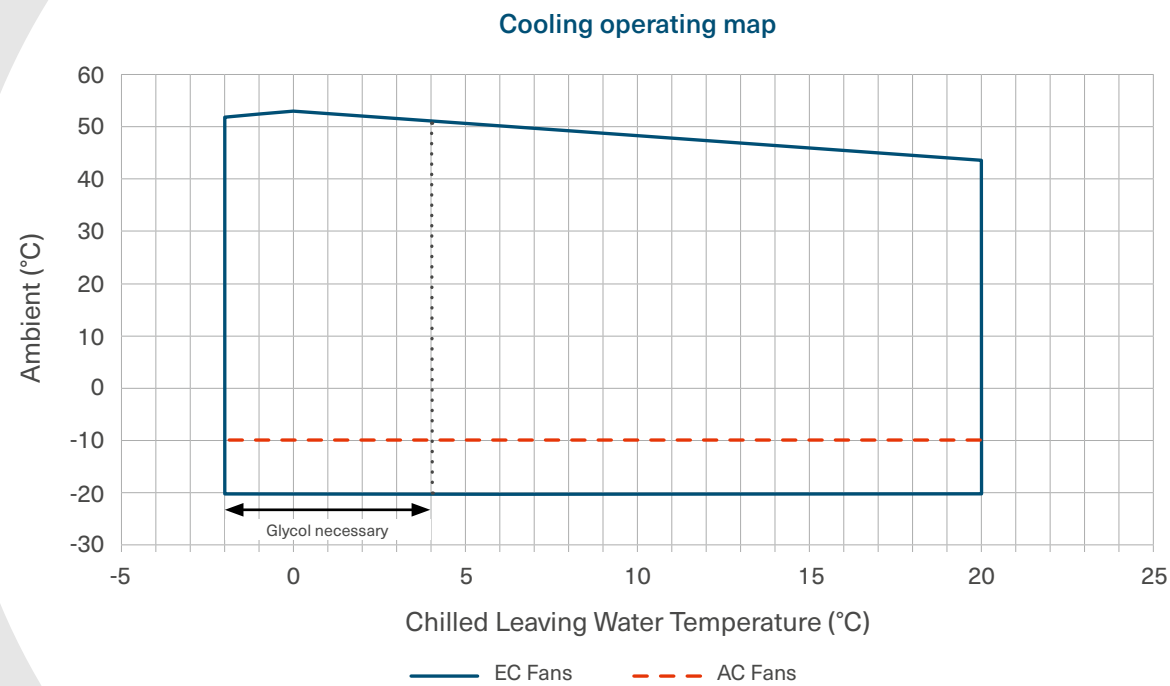
Education facilities
Simultaneous cooling of the research laboratories while reusing the heat to make students comfortable in the library/classrooms

Hospital
Simultaneous cooling of the IT server room while reusing the heat to warm up patient recovery rooms



Hotel
Simultaneous air conditioning of the bedrooms while pre-heating the swimming pool water the recovered heat

Theater
In winter, below 10°C ambient air, the building requires heating. Simultaneous heating of the audience while cooling the performance stage



The best bundled in one

An innovative solution for a better building and world



Oil and gas price volatility breeds energy cost uncertainty. With CMAF your building energy costs will be driven by better predictable electricity prices, being less volatile. Electricity is 100% sustainable when generated by renewable energy sources.

CMAF is built on Trane's well-known Sintesis™ platform, sharing many of the same components and technologies as Sintesis™ chillers and heat pumps and a proven reliability record. This guarantees smooth operation and reliable comfort for your building users, while also facilitating service and keeping operating costs to a minimum.

Trane Adaptive Refrigerant System™

- Proprietary technology optimizing refrigerant charge in each operating mode
- Ensures the highest performance in all conditions with market-leading TER and COP efficiency ratios
- Enhanced heating operating map for delivering hot water up to +68°C

Low-GWP refrigerant R454B

- The lowest GWP value option to replace R410A
- Better cooling/heating capacity and power usage compared to R410A
- Operating maps are as wide as or even wider than operating maps of R410A or R32

Trane smart control interface

- Leading TD7 touch screen with 7" color display
- Clear display of critical information
- Monitor settings, data trending, reports and alarms
- Simple, intuitive navigation
- Effective operation, monitoring and management
- Durable construction for outdoor use



Trane Tracer™ Symbio 800 and TD7 touch screen

Tracer™ Symbio 800

State-of-the-art control to guarantee superior dependability and lowest cost of ownership

- New generation of Trane control platform
- Advanced algorithms to endure smooth operation and optimum defrosting
- Perfect balance of performance and operating costs

Connectivity

- Full interoperability via SmartCom interface BACnet® and Modbus
- Full remote control capability via our Trane BMS



Multi-speed axial fans

State-of-the-art AC or EC fans:

- Improved capacity modulation
- Reduced power consumption
- Reduced energy costs

Optional hydraulic module

- Single or dual pump
- Optional water buffer tank (units >260 kW)
- Pumps with or without inverter drives

Industry leading variable volume scroll compressor

- Optimized for part-load efficiency and higher seasonal efficiency
- Reliable operation over the lifetime of the unit
- Reduced energy consumption: no overcompression thanks to intermediate discharge valves

Fin & Tube heat exchanger

Modular design in 'V' shape for maximum performance in a small footprint

Brazed plate heat exchanger

- Compact, reliable and proven design
- Low water pressure drops
- Full protection against ice formation

What is TER?

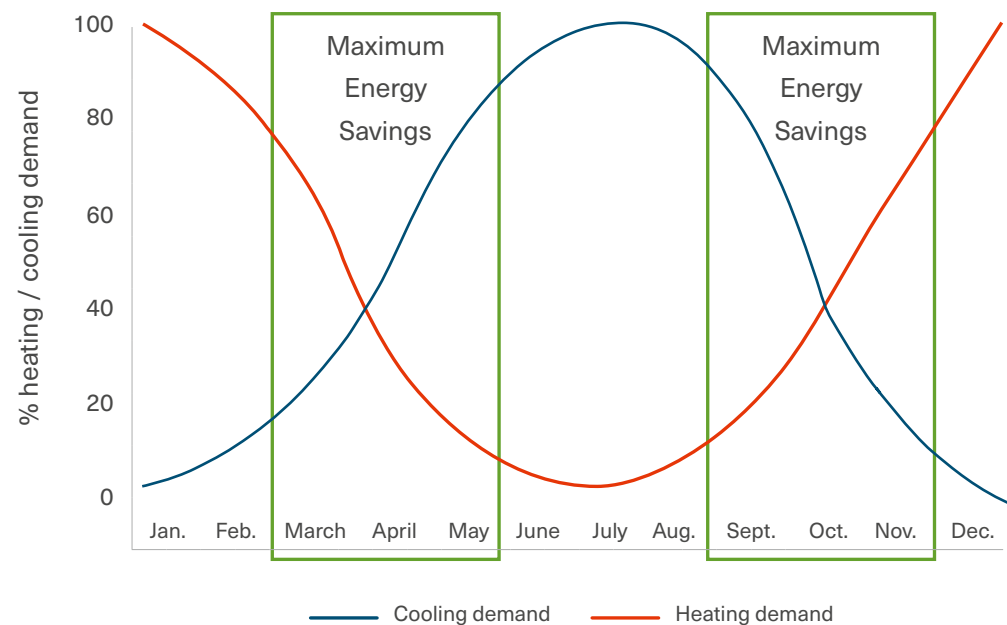
TER stands for Total Efficiency Ratio.

The highest TER means that the cooling and heating demands of a building are completely balanced. The ratio also expresses the substantial energy savings when the unit operates in the simultaneous cooling and heating mode.

If a building's heating demand does not exceed the cooling demand, the CMAF delivers comfort heating without increasing your energy bill thanks to the repurposing of recovered heat.

$$TER = \frac{\text{Cooling} + \text{Heating Capacity}}{\text{Power input}}$$

Simplified Seasonal Energy Profile



Trane CMAF units are Eurovent Certified. TER is defined in the Eurovent Certification program for multi-pipe units.
Trane CMAF multi-pipe units have the **best TER in the industry.**

General specifications

Compact units - High Efficiency (HE)



Unit size		040	045	050	055	065	070	075	085	095	105
Cooling (1)											
Total cooling capacity	(kW)	137	147	157	185	208	244	254	274	297	319
Total power input	(kW)	43	47	52	63	74	74	78	86	99	114
Energy Efficiency Rating (EER)		3.20	3.12	3.03	2.96	2.82	3.30	3.27	3.19	2.99	2.81
Water flow rate	(m³/h)	23.6	25.3	27.0	31.9	35.8	42.0	43.7	47.1	51.2	54.9
Pressure drop	(kPa)	53.2	61.2	69.4	40.7	51.1	30.4	32.7	37.4	43.5	49.5
Heating (2)											
Total heating capacity	(kW)	144	157	168	195	221	253	265	289	320	349
Total power input	(kW)	44	48	51	59	67	71	75	81	91	102
Coefficient Of Performance (COP)		3.27	3.27	3.27	3.31	3.29	3.55	3.56	3.56	3.50	3.43
Water flow rate	(m³/h)	24.9	26.9	28.9	33.5	38.0	43.6	45.6	49.6	55.0	60.1
Pressure drop	(kPa)	24.8	29.1	33.6	29.8	38.1	16.5	18.0	21.0	25.4	29.8
Heating + Cooling (3)											
Total cooling capacity	(kW)	137	147	158	193	220	246	257	281	309	335
Total heating capacity	(kW)	175	189	204	247	283	309	324	354	392	429
Total power input	(kW)	39	43	47	55	65	65	68	75	86	96
Total Efficiency Ratio (TER)		7.90	7.76	7.62	7.95	7.81	8.57	8.52	8.48	8.18	7.93
Seasonal efficiency in heating (4)											
Pdesign,h	(kW)	available on request									
Space heating efficiency η _{s,h}	(%)	available on request									
SCOP	(kWh/kWh)	available on request									
Seasonal efficiency in cooling (5)											
Prated	(kW)	available on request									
Space cooling efficiency η _{s,c}	(%)	available on request									
SEER	(kWh/kWh)	available on request									
Compressors											
Total tonnage compressor		50T	55T	60T	70T	80T	85T	90T	100T	110T	120T
Minimum compressor tonnage		12T	12T	15T	15T	20T	20T	20T	25T	25T	30T
Number of scroll compressors per circuit		2	2	2	2	2	2	2	2	2	2
Number of refrigerant circuits		2	2	2	2	2	2	2	2	2	2
Number of part load steps		8	11	4	8	4	7	8	4	8	4
Minimum capacity step	(%)	24%	22%	20%	21%	25%	24%	22%	25%	23%	25%
Fans											
Type		EC fans									
Number of fans		4	4	4	4	4	6	6	6	6	6
Air flow (1), cooling mode	(m³/h)	80285	80122	80045	79426	79424	119890	119895	119658	119347	119040
Air flow (2), heating/heat pump mode	(m³/h)	85608	85368	85238	84801	84802	127631	127632	127041	127170	127282
Electrical data											
Max. power input	(kW)	65	70	76	89	102	106	111	121	140	159
Max. amps	(A)	109	119	129	148	167	174	182	198	226	255
Max. starting current, direct start	(A)	243	287	296	324	343	388	396	411	460	488
Max. starting current, soft starter (option)	(A)	178	208	218	238	257	284	292	307	342	370
Power factor, cos φ		0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Dimensions and weight (basic model only)											
Length	(mm)	2500	2500	2500	2500	2500	3290	3290	3290	3290	3290
Width	(mm)	1993	1993	1993	1993	1993	2244	2244	2244	2244	2244
Height	(mm)	2408	2408	2408	2408	2408	2537	2537	2537	2537	2537
Operating weight	(kg)	1519	1526	1533	1631	1707	2115	2122	2132	2275	2376
Shipping weight	(kg)	1505	1512	1520	1612	1689	2092	2095	2101	2239	2340
Sound level (6)											
Sound power level (SN)	(db(A))	89	89	90	91	91	92	92	92	95	96
Sound power level (LN)	(db(A))	88	88	89	90	90	91	91	91	93	94
Sound power level (XLN)	(db(A))	87	87	88	89	89	90	90	90	91	92
Sound pressure level at 10m (SN)	(db(A))	57	57	58	59	59	60	60	60	63	64
Sound pressure level at 10m (LN)	(db(A))	56	56	57	58	58	59	59	59	61	62
Sound pressure level at 10m (XLN)	(db(A))	55	55	56	57	57	58	58	58	59	60
Refrigerant Charge											
Total R454B refrigerant charge	(kg)	45	45	45	45	45	60	60	60	60	60
Charge per cooling kW	(kg/kW)	0.33	0.31	0.29	0.24	0.22	0.25	0.24	0.22	0.20	0.19

(1) According EN 14511:2018. Outdoor air temperature 35°C - Chilled water temperature 12/7°C
 (2) According EN 14511:2018. Outdoor air temperature 7°C with 6°C wet (87% RH) - Hot water temperature 40/45°C
 (3) According Eurovent ECP - 3 LCP. Hot leaving water temperature 45°C - Chilled leaving water temperature 7°C according water flow rates related to (1) and (2)
 (4) According EN 14825:2018. Ecodesign rating at low temperature conditions. Outdoor air temperature 7°C dry bulb/6°C wet bulb - Hot water temperature 30/35°C
 (5) According EN 14825:2018. Ecodesign rating at outdoor air temperature 35°C dry bulb - Chilled water temperature 12/7°C
 (6) According ISO 9614:2009. Eurovent conditions, with 1pW reference sound power

General specifications

Compact units - Standard Efficiency (SE)



Unit size	3V			4V-5V-6V										
	080	090	100	080	090	100	110	130	140	150	165	180	190	
Cooling (1)														
Total cooling capacity	(kW)	269	301	327	278	312	340	387	429	471	502	543	598	639
Total power input	(kW)	91	106	121	88	101	115	132	148	163	178	195	205	221
Energy Efficiency Rating (EER)		2.95	2.84	2.70	3.17	3.08	2.95	2.94	2.90	2.88	2.82	2.78	2.92	2.89
Water flow rate	(m³/h)	46.3	51.8	56.2	47.7	53.6	58.5	66.4	73.5	80.9	86.2	93.2	102.7	109.8
Pressure drop	(kPa)	46.8	35.7	41.5	49.4	38.0	44.5	40.4	36.9	43.9	38.9	36.5	43.5	40.9
Heating (2)														
Total heating capacity	(kW)	290	323	353	299	332	369	413	449	505	539	574	640	676
Total power Input	(kW)	87	98	109	89	99	110	123	133	154	164	175	191	201
Coefficient Of Performance (COP)		3.32	3.31	3.25	3.37	3.35	3.34	3.36	3.36	3.28	3.28	3.29	3.36	3.35
Water flow rate	(m³/h)	50.4	56.1	61.2	52.0	57.6	64.0	71.7	78.0	87.7	93.6	99.7	111.1	117.3
Pressure drop	(kPa)	39.3	34.3	40.3	41.6	36.0	43.7	40.7	37.3	46.4	42.3	39.5	48.2	48.4
Heating + Cooling (3)														
Total cooling capacity	(kW)	275	315	348	274	314	347	401	455	484	524	578	623	675
Total heating capacity	(kW)	344	396	441	344	396	440	505	570	615	666	731	785	848
Total power input	(kW)	81	92	104	82	93	105	116	126	146	157	167	180	191
Total Efficiency Ratio (TER)		7.61	7.70	7.55	7.56	7.66	7.49	7.83	8.12	7.54	7.59	7.83	7.82	7.98
Seasonal efficiency in heating (4)														
Pdesign.h	(kW)	235	272	288	252	281	298	348	367	434	455	487	520	574
Space heating efficiency $\eta_{s,h}$	(%)	124.4%	125.7%	125.9%	126.8%	128.4%	128.6%	129.9%	132.6%	123.8%	124.1%	128.2%	127.9%	129.8%
SCOP	(kWh/kWh)	3.19	3.22	3.22	3.25	3.28	3.29	3.32	3.39	3.17	3.18	3.28	3.27	3.32
Seasonal efficiency in cooling (5)														
Prated	(kW)	269	301	327	278	312	340	387	429	471	502	543	598	639
Space cooling efficiency $\eta_{s,c}$	(%)	166.9%	168.0%	161.2%	179.9%	181.6%	174.5%	177.1%	176.4%	175.7%	172.7%	175.4%	179.7%	182.8%
SEER	(kWh/kWh)	4.25	4.27	4.11	4.57	4.62	4.44	4.50	4.48	4.47	4.39	4.46	4.57	4.65
Compressors														
Total tonnage compressor		100T	110T	120T	100T	110T	120T	140T	160T	170T	180T	200T	220T	240T
Minimum compressor tonnage		25T	25T	30T	25T	25T	30T	30T	40T	25T	30T	30T	30T	40T
Number of scroll compressors per circuit		2	2	2	2	2	2	2	2	3	3	3	3	3
Number of refrigerant circuits		2	2	2	2	2	2	2	2	2	2	2	2	2
Number of part load steps		4	8	4	4	8	4	8	4	14	14	6	14	6
Minimum capacity step	(%)	25%	23%	25%	25%	23%	25%	21%	25%	15%	17%	15%	14%	17%
Fans														
Type		Axial fans with fixed speed AC motors			Axial fans with fixed speed AC motors									
Number of fans		6	6	6	8	8	8	8	8	10	10	10	12	12
Air flow (1), cooling mode	(m³/h)	114617	114169	113776	141363	140899	140493	152439	151880	190686	190246	189692	228424	227869
Air flow (2), heating/heat pump mode	(m³/h)	113907	114062	114188	139972	140117	140298	151995	152162	189914	190080	190244	228092	228259
Electrical data														
Max. power input	(kW)	118	138	157	118	138	158	172	186	217	236	250	265	279
Max. amps	(A)	205	237	270	206	238	270	299	323	374	406	430	460	484
Max. starting current, direct start	(A)	419	495	527	419	496	528	638	662	631	744	768	798	822
Max. starting current, soft starter (option)	(A)	315	367	399	315	368	400	472	496	503	579	603	633	657
Power factor, cos ϕ		0.83	0.84	0.84	0.83	0.84	0.84	0.83	0.83	0.84	0.84	0.84	0.83	0.83
Dimensions and weight (basic model only)														
Length	(mm)	4520	4520	4520	4520	4520	4520	4520	4520	5645	5645	5645	6770	6770
Width	(mm)	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200
Height	(mm)	2530	2530	2530	2530	2530	2530	2530	2530	2530	2530	2530	2530	2530
Operating weight	(kg)	2555	2705	2805	2835	2985	3085	3230	3355	3905	4125	4240	4645	4755
Shipping weight	(kg)	2460	2595	2695	2740	2840	2970	3105	3210	3755	3960	4060	4460	4560
Sound level (6)														
Sound power level (SN)	(db(A))	90	92	94	90	92	94	95	96	95	96	96	97	97
Sound power level (LN)	(db(A))	88	90	91	88	90	91	92	93	92	93	93	94	94
Sound power level (XLN)	(db(A))	87	88	89	88	88	89	90	90	91	91	91	92	92
Sound pressure level at 10m (SN)	(db(A))	58	60	62	58	60	62	63	64	62	63	63	64	64
Sound pressure level at 10m (LN)	(db(A))	56	58	59	56	58	59	60	61	59	60	60	61	61
Sound pressure level at 10m (XLN)	(db(A))	55	56	57	56	56	57	58	58	58	58	58	59	59
Refrigerant Charge														
Total R454B refrigerant charge	(kg)	71	72	73	89	90	89	89	91	119	119	121	137	138
Charge per cooling kW	(kg/kW)	0.26	0.24	0.22	0.32	0.29	0.26	0.23	0.21	0.25	0.24	0.22	0.23	0.22

(1) According EN 14511:2018. Outdoor air temperature 35°C – Chilled water temperature 12/7°C
 (2) According EN 14511:2018. Outdoor air temperature 7°C with 6°C wet (87% RH) - Hot water temperature 40/45 °C
 (3) According Eurovent ECP - 3 LCP. Hot leaving water temperature 45 °C – Chilled leaving water temperature 7 °C according water flow rates related to (1) and (2)
 (4) According EN 14825:2018. Ecodesign rating at low temperature conditions. Outdoor air temperature 7°C dry bulb/6°C wet bulb - Hot water temperature 30/35°C
 (5) According EN 14825:2018. Ecodesign rating at outdoor air temperature 35°C dry bulb - Chilled water temperature 12/7°C
 (6) According ISO 9614:2009. Eurovent conditions, with 1pW reference sound power

General specifications

Duplex units - Standard Efficiency (SE)



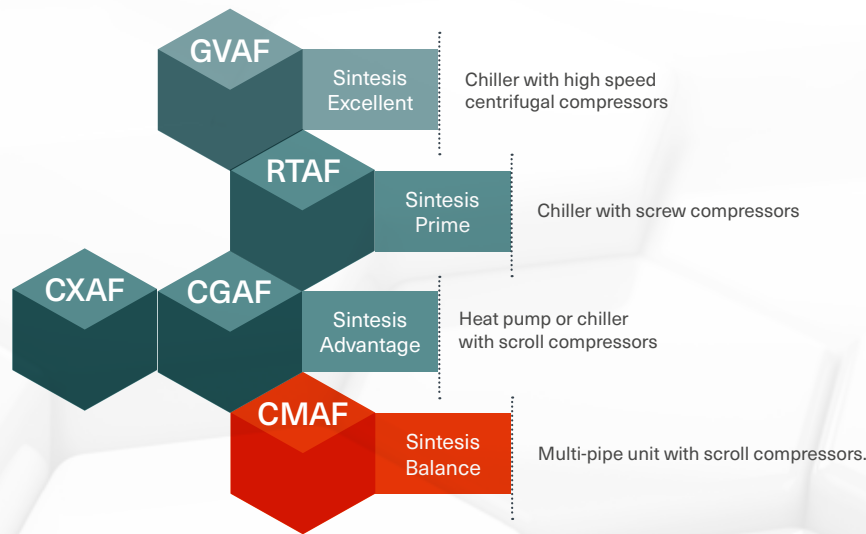
Data below is for a combination of two equal CMAF SE models (e.g. Duplex 200 SE = 2 x 100 SE, Duplex 220 SE = 2 x 110 SE)

Unit size		200	220	260	280	300	330	360	380
Cooling (1)									
Total cooling capacity	(kW)	681	773	858	942	1004	1085	1196	1279
Total power input	(kW)	231	263	296	327	357	390	410	443
Energy Efficiency Rating (EER)		2.95	2.94	2.90	2.88	2.82	2.78	2.92	2.89
Heating (2)									
Total heating capacity	(kW)	737	826	898	1010	1078	1149	1279	1351
Total power Input	(kW)	221	246	267	308	329	350	381	403
Coefficient Of Performance (COP)		3.34	3.36	3.36	3.28	3.28	3.29	3.36	3.35
Heating + Cooling (3)									
Total cooling capacity	(kW)	694	801	910	969	1048	1156	1246	1350
Total heating capacity	(kW)	880	1010	1141	1230	1332	1462	1570	1696
Total power input	(kW)	210	232	253	292	313	334	360	382
Total Efficiency Ratio (TER)		7.49	7.83	8.12	7.54	7.59	7.83	7.82	7.98
Dimensions and weight (basic model only) (4)									
Length total, including connection plates	(mm)	10240	10240	10240	12490	12490	12490	14740	14740
Width	(mm)	2200	2200	2200	2200	2200	2200	2200	2200
Height	(mm)	2530	2530	2530	2530	2530	2530	2530	2530
Operating weight total for 2 connected units	(kg)	6220	6510	6760	7860	8300	8530	9340	9560

(1) According EN 14511:2018. Outdoor air temperature 35°C – Chilled water temperature 12/7°C
 (2) According EN 14511:2018. Outdoor air temperature 7°C with 6°C wet (87% RH) - Hot water temperature 40/45 °C
 (3) Hot leaving water temperature 45 °C – Chilled leaving water temperature 7 °C according water flow rates related to (1) and (2)
 (4) Operating weight is combined weight of two equal CMAF units including connection plates.
 Shipping weight and dimensions of each single unit (without connection plates): see other CMAF SE table



Family of chillers, heat pumps and multi-pipe units



The Sintesic™ Balance model CMAF belongs to the Trane Sintesic™ portfolio representing industry leading performance and flexibility — for a perfect fit not only to your building and application requirements, but also to your sustainability and budget targets.

The Trane Sintesic™ Balance range:

- 41 unit sizes offering heating capacities from 135 - 1400 kW
- 4 efficiency levels: SSE, SE, HE and XE compact
- 3 acoustic packages: SN, LN, XLN

The Trane advantage

Trane is recognized as a world leader with over 100 years of experience in creating and sustaining safe, comfortable and energy efficient environments while improving the performance of buildings and processes around the world.

Trane solutions optimize indoor environments with a broad portfolio of energy efficient heating, ventilating and air conditioning systems, building services, parts support and advanced controls.

To ensure your equipment continues to work at its optimum, throughout the life of the building, Trane provides a full range of service solutions, combined with in-house expertise and an extensive support network.



Trane – by Trane Technologies (NYSE: TT), a global climate innovator – creates comfortable, energy efficient indoor environments through a broad portfolio of heating, ventilating and air conditioning systems and controls, services, parts and supply. For more information, please visit trane.eu or tranetechnologies.com.