



TRANE

SINTECIS BALANCE™



Sustainable and simultaneous
cooling and **heating**. ALL YEAR ROUND.



Air-to-water Multi-pipe Units
CMAF 290-680 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 	 <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"> • Up to 20% higher efficiency vs. legacy products • Excellent Total Efficiency Ratio (TER) even exceeding 8 • Eurovent Class A in heating 	 <p>Every building application has specific needs.</p> <p>We offer several choices to reach ultimate performance:</p> <ul style="list-style-type: none"> • 3 efficiency levels • 2 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.

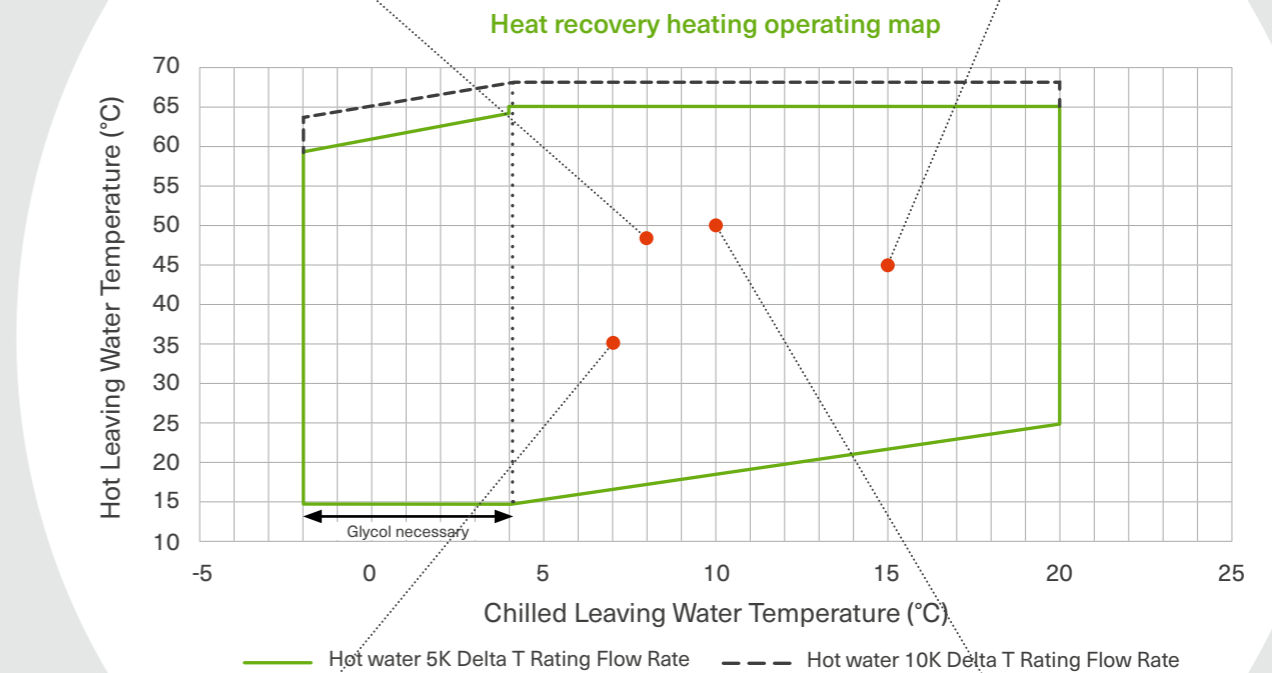
Examples of heating with recovered energy from the simultaneous cooling process

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



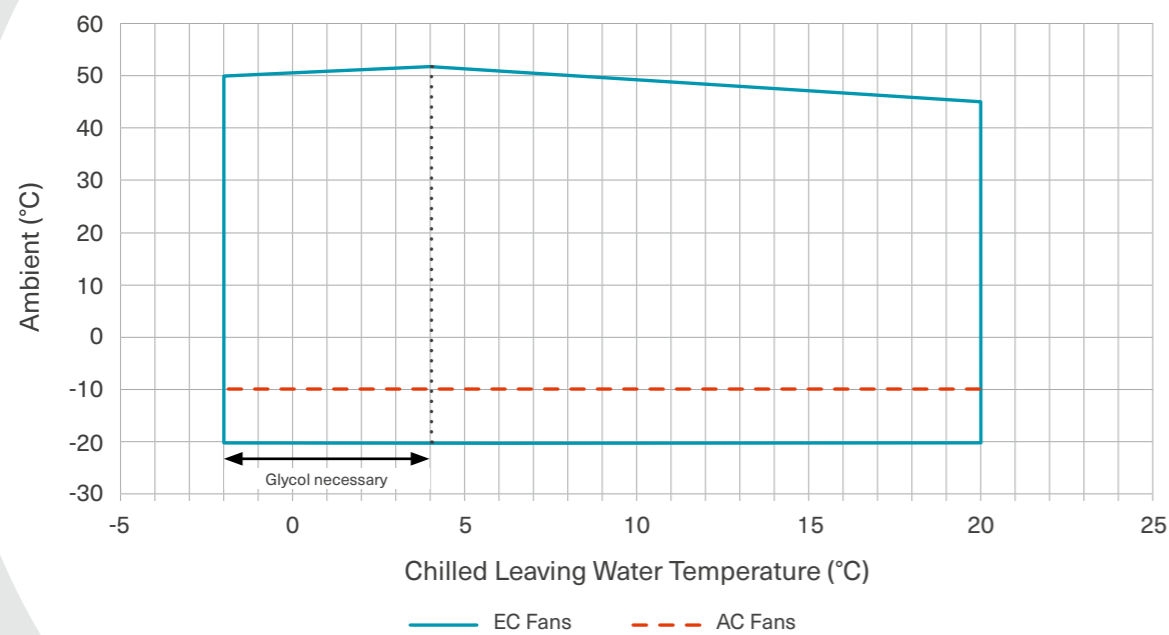
Hotel

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

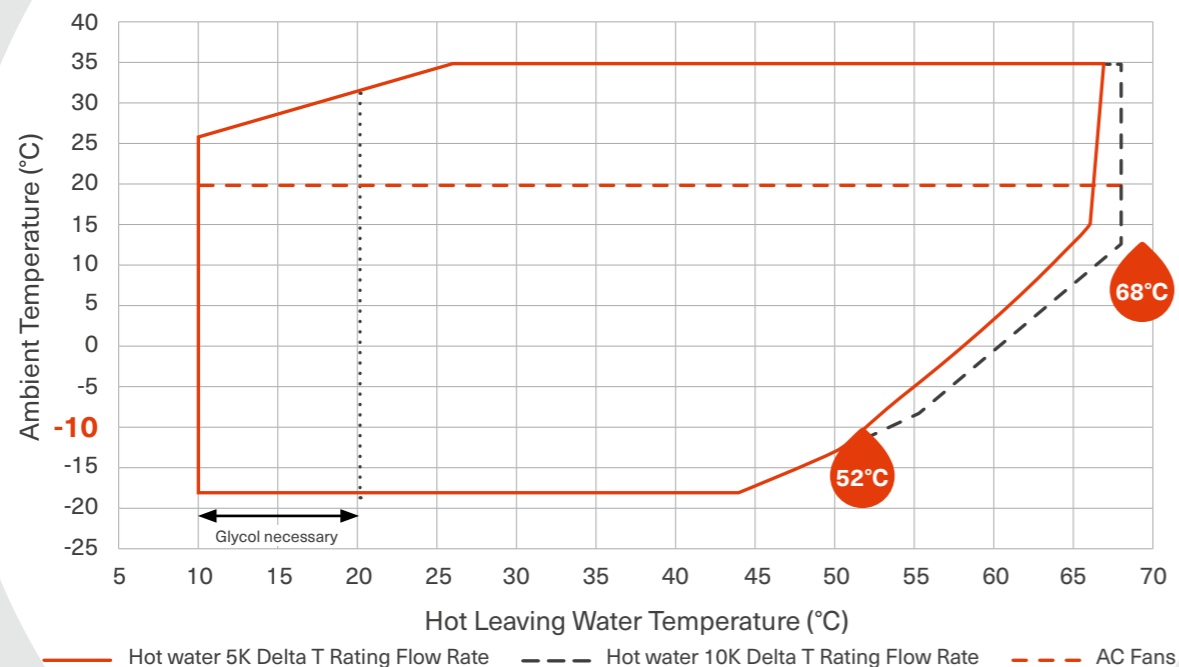
Theater

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

Cooling operating map



Heat pump heating operating map



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

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 UC800 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
- 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?

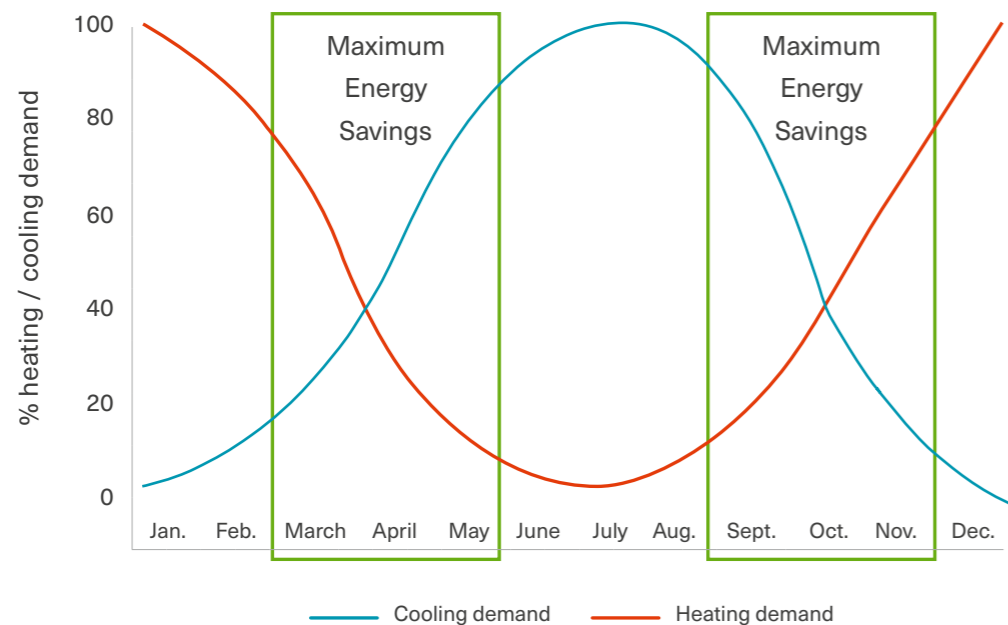
TER stands for Total Efficiency Ratio.

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

HE/SE/SSE



High Efficiency (HE)

R410A

Unit size		080	090	100	110	130	140	150	165	180	190
Cooling (1)											
Total cooling capacity	(kW)	276	311	341	386	430	469	502	545	602	641
Total power input	(kW)	88	102	117	133	151	165	181	198	208	225
Energy Efficiency Rating (EER)		3,15	3,05	2,92	2,90	2,85	2,84	2,78	2,75	2,90	2,85
Energy efficiency class (Eurovent)		A	B	B	B	C	C	C	C	B	C
Water flow rate	(m ³ /h)	47,5	53,5	58,5	66,3	73,8	80,6	86,2	93,6	102,6	110,1
Pressure drop	(kPa)	48,9	37,8	44,6	40,3	37,1	43,5	38,9	36,7	43,4	41,1
Heating (2)											
Total heating capacity	(kW)	298	331	368	413	450	501	536	573	638	676
Total power Input	(kW)	88	99	111	125	137	153	164	176	192	205
Coefficient Of Performance (COP)		3,39	3,34	3,32	3,31	3,28	3,28	3,27	3,25	3,33	3,30
Energy efficiency class (Eurovent)		A	A	A	A	A	A	A	A	A	A
Water flow rate	(m ³ /h)	51,7	57,4	63,9	71,6	78,2	87,0	93,0	99,5	110,7	117,3
Pressure drop	(kPa)	41,2	35,8	43,6	40,6	37,5	45,7	41,9	39,3	47,9	48,4
Heating + Cooling (3)											
Total cooling capacity	(kW)	274	314	347	401	455	485	524	578	623	675
Total heating capacity	(kW)	344	396	440	505	570	615	666	731	785	848
Total power input	(kW)	82	93	105	116	126	146	157	167	180	191
Total Efficiency Ratio (TER)		7,57	7,66	7,49	7,83	8,11	7,55	7,60	7,83	7,82	7,98
Seasonal efficiency in heating (4)											
Pdesign,h	(kW)	240	280	298	348	368	431	451	486	518	574
Space heating efficiency η _{s,h}	(%)	128,4%	127,8%	126,8%	126,5%	126,2%	125,4%	124,2%	125,4%	125,8%	125,5%
SCOP	(kWh/kWh)	3,29	3,27	3,25	3,24	3,23	3,21	3,18	3,21	3,22	3,21
Seasonal efficiency in cooling (5)											
Prated	(kW)	276	311	341	386	430	469	502	545	602	641
Space cooling efficiency η _{s,c}	(%)	182,2%	181,7%	170,0%	171,7%	168,7%	178,9%	171,1%	171,6%	179,6%	178,2%
SEER	(kWh/kWh)	4,63	4,62	4,33	4,37	4,29	4,55	4,35	4,37	4,56	4,53
Compressors											
Total tonnage compressor		100T	110T	120T	140T	160T	170T	180T	200T	220T	240T
Minimum compressor tonnage		25T	25T	30T	30T	40T	25T	30T	30T	30T	40T
Number of scroll compressors per circuit		2	2	2	2	2	3	3	3	3	3
Number of refrigerant circuits		2	2	2	2	2	2	2	2	2	2
Number of part load steps		4	8	4	8	4	14	14	6	14	6
Minimum capacity step	(%)	25%	23%	25%	21%	25%	15%	17%	15%	14%	17%
Fans											
Type		Axial fans with variable speed EC motors									
Number of fans		8	8	8	8	8	10	10	10	12	12
Air flow (1), cooling mode	(m ³ /h)	130772	135653	142378	150733	157324	181857	190348	196497	225866	233354
Air flow (2), heating/heat pump mode	(m ³ /h)	128254	133700	137421	150067	157366	171960	176558	185608	219862	228039
Electrical data											
Max. power input	(kW)	130	150	169	183	197	230	250	263	281	295
Max. amps	(A)	212	245	277	301	325	376	408	432	462	486
Max. starting current, direct start	(A)	426	502	534	639	663	633	746	770	801	825
Max. starting current, soft starter (option)	(A)	322	374	406	474	498	505	581	605	635	659
Power factor, cos φ		0,88	0,88	0,88	0,88	0,87	0,88	0,88	0,88	0,88	0,88
Dimensions and weight (basic model only)											
Length	(mm)	4520	4520	4520	4520	4520	5640	5640	5640	6770	6770
Width	(mm)	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200
Height	(mm)	2530	2530	2530	2530	2530	2530	2530	2530	2530	2530
Operating weight	(kg)	2835	2985	3085	3230	3355	3905	4125	4240	4645	4755
Shipping weight	(kg)	2740	2840	2970	3105	3210	3755	3960	4060	4460	4560
Sound level (6)											
Sound power level (SN)	(db(A))	90	92	94	95	96	95	96	97	97	98
Sound power level (LN)	(db(A))	88	90	91	93	94	92	94	95	95	96
Sound power level (XLN)	(db(A))	86	88	90	91	92	91	92	93	93	94
Sound pressure level at 10m (SN)	(db(A))	57	59	61	62	63	62	63	64	64	65
Sound pressure level at 10m (LN)	(db(A))	55	57	58	60	61	59	61	62	62	63
Sound pressure level at 10m (XLN)	(db(A))	53	55	57	58	59	58	59	60	60	61
Refrigerant Charge											
Total R410A refrigerant charge	(kg)	89	90	89	89	91	119	119	121	137	138
Charge per cooling kW	(kg/kW)	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

HE/SE/SSE



Standard Efficiency (SE)

R410A

Unit size	080	090	100	110	130	140	150	165	180	190
Cooling (1)										
Total cooling capacity (kW)	278	312	340	387	429	471	502	543	598	639
Total power input (kW)	88	101	115	132	148	163	178	195	205	221
Energy Efficiency Rating (EER)	3,17	3,08	2,95	2,94	2,90	2,88	2,82	2,78	2,92	2,89
Energy efficiency class (Eurovent)	A	B	B	B	B	C	C	C	B	C
Water flow rate (m ³ /h)	47,7	53,6	58,5	66,4	73,5	80,9	86,2	93,2	102,7	109,8
Pressure drop (kPa)	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)	299	332	369	413	449	505	539	574	640	676
Total power input (kW)	89	99	110	123	133	154	164	175	191	201
Coefficient Of Performance (COP)	3,37	3,35	3,34	3,36	3,36	3,28	3,28	3,29	3,36	3,35
Energy efficiency class (Eurovent)	A	A	A	A	A	A	A	A	A	A
Water flow rate (m ³ /h)	52,0	57,6	64,0	71,7	78,0	87,7	93,6	99,7	111,1	117,3
Pressure drop (kPa)	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)	274	314	347	401	455	484	524	578	623	675
Total heating capacity (kW)	344	396	440	505	570	615	666	731	785	848
Total power input (kW)	82	93	105	116	126	146	157	167	180	191
Total Efficiency Ratio (TER)	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)	252	281	298	348	367	434	455	487	520	574
Space heating efficiency $\eta_{s,h}$ (%)	126,8%	128,4%	128,6%	129,9%	132,6%	123,8%	124,1%	128,2%	127,9%	129,8%
SCOP (kWh/kWh)	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)	278	312	340	387	429	471	502	543	598	639
Space cooling efficiency $\eta_{s,c}$ (%)	179,9%	181,6%	174,5%	177,1%	176,4%	175,7%	172,7%	175,4%	179,7%	182,8%
SEER (kWh/kWh)	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	140T	160T	170T	180T	200T	220T	240T
Minimum compressor tonnage	25T	25T	30T	30T	40T	25T	30T	30T	30T	40T
Number of scroll compressors per circuit	2	2	2	2	2	3	3	3	3	3
Number of refrigerant circuits	2	2	2	2	2	2	2	2	2	2
Number of part load steps	4	8	4	8	4	14	14	6	14	6
Minimum capacity step (%)	25%	23%	25%	21%	25%	15%	17%	15%	14%	17%
Fans										
Type	Axial fans with fixed speed AC motors									
Number of fans	8	8	8	8	8	10	10	10	12	12
Air flow (1), cooling mode (m ³ /h)	141363	140899	140493	152439	151880	190686	190246	189692	228424	227869
Air flow (2), heating/heat pump mode (m ³ /h)	139972	140117	140298	151995	152162	189914	190080	190244	228092	228259
Electrical data										
Max. power input (kW)	118	138	158	172	186	217	236	250	265	279
Max. amps (A)	206	238	270	299	323	374	406	430	460	484
Max. starting current, direct start (A)	419	496	528	638	662	631	744	768	798	822
Max. starting current, soft starter (option) (A)	315	368	400	472	496	503	579	603	633	657
Power factor, cos ϕ	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	5645	5645	5645	6770	6770
Width (mm)	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200
Height (mm)	2530	2530	2530	2530	2530	2530	2530	2530	2530	2530
Operating weight (kg)	2835	2985	3085	3230	3355	3905	4125	4240	4645	4755
Shipping weight (kg)	2740	2840	2970	3105	3210	3755	3960	4060	4460	4560
Sound level (6)										
Sound power level (SN) (db(A))	90	92	94	95	96	95	96	96	97	97
Sound power level (LN) (db(A))	88	90	91	92	93	92	93	93	94	94
Sound power level (XLN) (db(A))	88	88	89	90	90	91	91	91	92	92
Sound pressure level at 10m (SN) (db(A))	58	60	62	63	64	62	63	63	64	64
Sound pressure level at 10m (LN) (db(A))	56	58	59	60	61	59	60	60	61	61
Sound pressure level at 10m (XLN) (db(A))	56	56	57	58	58	58	58	58	59	59
Refrigerant Charge										
Total R410A refrigerant charge (kg)	89	90	89	89	91	119	119	121	137	138
Charge per cooling kW (kg/kW)	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

Special Standard Efficiency (SSE)

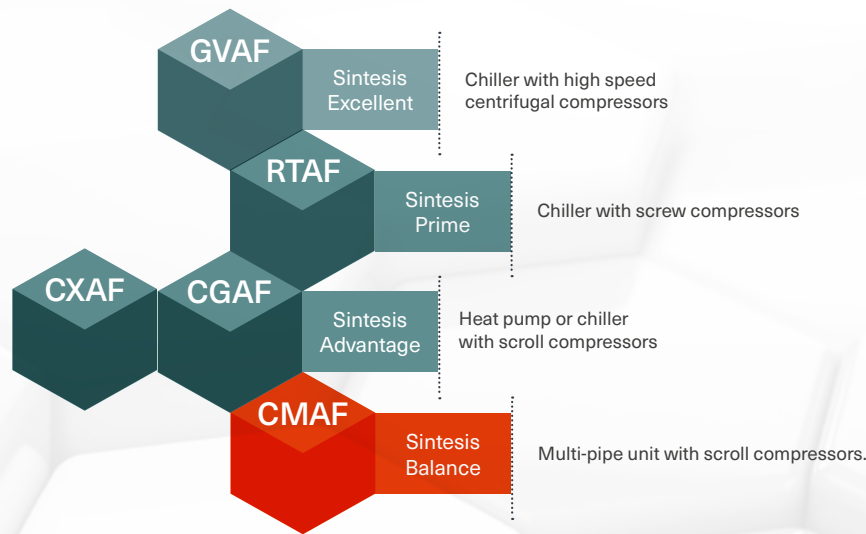
R410A

Unit size	080	090	100
Cooling (1)			
Total cooling capacity (kW)	269	301	327
Total power input (kW)	91	106	121
Energy Efficiency Rating (EER)	2,95	2,84	2,70
Energy efficiency class (Eurovent)	B	C	C
Water flow rate (m ³ /h)	46,3	51,8	56,2
Pressure drop (kPa)	46,8	35,7	41,5
Heating (2)			
Total heating capacity (kW)	290	323	353
Total power input (kW)	87	98	109
Coefficient Of Performance (COP)	3,32	3,31	3,25
Energy efficiency class (Eurovent)	A	A	A
Water flow rate (m ³ /h)	50,4	56,1	61,2
Pressure drop (kPa)	39,3	34,3	40,3
Heating + Cooling (3)			
Total cooling capacity (kW)	275	315	348
Total heating capacity (kW)	344	396	441
Total power input (kW)	81	92	104
Total Efficiency Ratio (TER)	7,61	7,70	7,55
Seasonal efficiency in heating (4)			
Pdesign,h (kW)	235	272	288
Space heating efficiency $\eta_{s,h}$ (%)	124,4%	125,7%	125,9%
SCOP (kWh/kWh)	3,19	3,22	3,22
Seasonal efficiency in cooling (5)			
Prated (kW)	269	301	327
Space cooling efficiency $\eta_{s,c}$ (%)	166,9%	168,0%	161,2%
SEER (kWh/kWh)	4,25	4,27	4,11
Compressors			
Total tonnage compressor	100T	110T	120T
Minimum compressor tonnage	25T	25T	30T
Number of scroll compressors per circuit	2	2	2
Number of refrigerant circuits	2	2	2
Number of part load steps	4	8	4
Minimum capacity step (%)	25%	23%	25%
Fans			
Type	Axial fans with fixed speed AC motors		
Number of fans	6	6	6
Air flow (1), cooling mode (m ³ /h)	114617	114169	113776
Air flow (2), heating/heat pump mode (m ³ /h)	113907	114062	114188
Electrical data			
Max. power input (kW)	118	138	157
Max. amps (A)	205	237	270
Max. starting current, direct start (A)	419	495	527
Max. starting current, soft starter (option) (A)	315	367	399
Power factor, cos ϕ	0,83	0,84	0,84
Dimensions and weight (basic model only)			
Length (mm)	4520	4520	4520
Width (mm)	2200	2200	2200
Height (mm)	2530	2530	2530
Operating weight (kg)	2555	2705	2805
Shipping weight (kg)	2460	2595	2695
Sound level (6)			
Sound power level (SN) (db(A))	90	92	94
Sound power level (LN) (db(A))	88	90	91
Sound power level (XLN) (db(A))	87	88	89
Sound pressure level at 10m (SN) (db(A))	58	60	62
Sound pressure level at 10m (LN) (db(A))	56	58	59
Sound pressure level at 10m (XLN) (db(A))	55	56	57
Refrigerant Charge			
Total R410A refrigerant charge (kg)	71	72	73
Charge per cooling kW (kg/kW)	0,26	0,24	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



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:

- 23 sizes offering heating capacities from 290 - 680 kW
- 3 efficiency levels: SSE, SE and HE
- 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.