Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe, Brno, Republika Czeska
Engineering Test Institute. Public Enterprise. Brno. Czech Republic

CERTYFIKAT Z BADAŃ
TEST CERTIFICATE

Number **O-B-02030-24**

Klient *Customer*	Kermi GmbH Pankofen - Bahnhof 1 94447 Plattling GERMANY
Produkt *Product*	Pompa Ciepła powietrze/woda –monoblok *Air/water heat pump –monobloc*
Rodzaj oznaczenie / znak towarowy *Type designation / Trade mark*	**x-change dynamic pro ac 10 AW E**
Metoda testowa *Test methods*	ČSN EN 14511-2:2023, ČSN EN 14511-3:2023, ČSN EN 14825:2023; ČSN EN 12102-1:2023, EHPA Testing regulation – Testing of Air/Water Heat Pumps, version 2.4a
Podstawy zaświadczenia *Basis of certificate*	Raport z badań - *Test reports*: 39-18055/T z dnia - *of* 2024-11-14 39-18055/2/H z dnia - *of* 2024-11-13 Dokumentacja techniczna przedstawiona przez - *Technical documents of* Kermi GmbH
Referencyjny okres grzewczy *Reference heating season*	**„A" = Umiarkowany - *„A" = average*** (Warunki obliczeniowe odniesienia dla ogrzewania $T_{designh}$ = -10 °C - *Reference design temperature $T_{designh}$ = -10 °C*)

Wyniki - Results:

NISKA TEMPERATURA *LOW TEMPERATURE* Referencyjna temperatura wody 35 °C - *Reference water temperature 35 °C*		ŚREDNIA TEMPERATURA *MEDIUM TEMPERATURE* Referencyjna temperatura wody 55 °C - *Reference water temperature 55 °C*
10.92	**$P_{designh}$ [kW]** ... Obciążenie obliczeniowe dla trybu ogrzewania - *Full load heating*	**10.60**
5.61	**SCOP [-]** ... Wskaźnik sezonowej efektywności - *Seasonal coefficient of performance*	**3.88**

Temperatura zewnętrzna *Outdoor temperature* **T_j [°C]**	Deklarowana wydajność grzewcza *Heating declared capacity* **P_{dh} [kW]**	Wskaźnik efektywności dla deklarowanej wydajności *Coefficient of performance at the declared capacity* **COP_d [–]**	Temperatura zewnętrzna *Outdoor temperature* **T_j [°C]**	Deklarowana wydajność grzewcza *Heating declared capacity* **P_{dh} [kW]**	Wskaźnik efektywności dla deklarowanej wydajności *Coefficient of performance at the declared capacity* **COP_d [–]**
T_j = -7	9.797	3.379	T_j = -7	9.449	2.127
T_j = +2	5.941	5.570	T_j = +2	5.790	3.933
T_j = +7	4.854	7.312	T_j = +7	4.579	5.118
T_j = +12	5.564	9.259	T_j = +12	5.341	6.670
T_j = TOL = -10	10.924	2.782	T_j = TOL = -10	10.603	1.743
T_j = $T_{bivalent}$ = -10	10.924	2.782	T_j = $T_{bivalent}$ = -10	10.603	1.743

NISKA TEMPERATURA ***LOW TEMPERATURE*** Referencyjna temperatura wody 35 °C - *Reference water temperature 35 °C*	**ŚREDNIA TEMPERATURA** ***MEDIUM TEMPERATURE*** Referencyjna temperatura wody 55 °C - *Reference water temperature 55 °C*

Pobór mocy w trybach innych niż „tryb aktywny" - *Power consumption in modes other than „active mode"*

17.1	Tryb wyłączenia *Off mode*	P_{OFF}	[W]	17.1
17.0	Tryb wyłączonego termostatu *Thermostat off mode*	P_{TO}	[W]	17.0
17.1	Tryb czuwania *Standby mode*	P_{SB}	[W]	17.1
0.0	Tryb włączonej grzałki karteru *Crankcase heater mode*	P_{CK}	[W]	0.0

Roczne zużycie energii elektrycznej na potrzeby ogrzewania wg: - *Annual electricity consumption for heating according to*:

4024	ČSN EN 14825:2023	Q_{HE}	[kWh]	**5651**

Sezonowa efektywność energetyczna ogrzewania pomieszczeń - *Seasonal Space heating energy efficiency*

221.4	ČSN EN 14825:2023	η_s	[%]	**152.1**

Przepływ cieczy w zewnętrznym wymienniku ciepła - *Liquid flow rate in outdoor heating exchanger*

–	Ciecz obiegu źródła *Source liquid*	Min/Max	[m^3/h]	–

Przepływ cieczy w wewnętrznym wymienniku ciepła - *Liquid flow rate in indoor heating exchanger*

0.80/1.99	Woda grzewcza *Heating water*	Min/Max	[m^3/h]	0.63/1.16

Poziom mocy akustycznej dla warunków - Sound power level at condition A7W55* (at 10 %):

x-change dynamic pro ac 10 AW E – Jednostka zewnętrzna – *– outdoor unit –*	L_{WA}	50.7 ± 1.5	dB(A)	Klasa dokładności 2 (Techniczna) *Accuracy class 2 (Engineering)*

(*) Uwagi do skróconych oznaczeń: np. A7/W55: A (powietrze), 7 (temperatura wejściowa - temperatura termometru suchego w °C), W (woda), 55 (temperatura wyjściowa w °C).
Comment to abbreviated marking: e.g. A7/W55: A (air), 7 (input air – dry bulb temperature in °C) / W (water), 55 (output heating water temperature in °C).

Specyfikacja warunków - *Specification of conditions*:

Kontrola prędkości kompresora *Compressor speed control*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (wewnętrzny wymiennik ciepła) - *Rated liquid flow rate (indoor heat exchanger)*	**Zmienna** ***Variable***
Wylotowa temperatura wody (wewnętrzny wymiennik ciepła) - *Outlet water temperature (indoor heat*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (zewnętrzny wymiennik ciepła) - *Rated liquid flow rate (outdoor heat exchanger)*	–
Funkcja *Function*	**Odwracalna** ***Reversible***		

Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe potwierdza niniejszym certyfikatem z badań, że badanie produktu, którego dotyczy dało wyniki wskazane powyżej. Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe jest akredytowanym Laboratorium 1045.1.
Engineering Test Institute, Public Enterprise, confirms by this Test Certificate that the testing of the product in question was performed with the results as stated above. Engineering Test Institute, Public Enterprise, is an accredited Testing Laboratory 1045.1.

Brno, 2024-11-14

Ing. Mario Jankola
Kierownik ds. Urządzeń Grzewczych i Wyrobów Budowlanych
Heating Equipment and Construction Products Manager

- KONIEC CERTYFIKATU Z BADAŃ -
- END OF TEST CERTIFICATE-

STROJIRENSKY ZKUŠEBNÍ ÚSTAV, s.p. CZ 1

Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe, Brno, Republika Czeska
Engineering Test Institute. Public Enterprise. Brno. Czech Republic

CERTYFIKAT Z BADAŃ
TEST CERTIFICATE

Number **O-B-02031-24**

Klient *Customer*	Kermi GmbH Pankofen - Bahnhof 1 94447 Plattling GERMANY
Produkt *Product*	Pompa Ciepła powietrze/woda – monoblok *Air/water heat pump – monobloc*
Rodzaj oznaczenie / znak towarowy *Type designation / Trade mark*	**x-change dynamic pro ac 10 AW E**
Metoda testowa *Test methods*	ČSN EN 14511-2:2023, ČSN EN 14511-3:2023, ČSN EN 14825:2023; ČSN EN 12102-1:2023, EHPA Testing regulation – Testing of Air/Water Heat Pumps, version 2.4a
Podstawy zaświadczenia *Basis of certificate*	Raport z badań - *Test reports*: 39-18055/T z dnia - *of* 2024-11-14 39-18055/2/H z dnia - *of* 2024-11-13 Dokumentacja techniczna przedstawiona przez - *Technical documents of* Kermi GmbH
Referencyjny okres grzewczy *Reference heating season*	**„W" = Ciepły - *„W" = warmer*** (Warunki obliczeniowe odniesienia dla ogrzewania $T_{designh}$ = +2 °C - *Reference design temperature $T_{designh}$ = +2 °C*)

Wyniki - Results:

NISKA TEMPERATURA *LOW TEMPERATURE* Referencyjna temperatura wody 35 °C - *Reference water temperature 35 °C*		ŚREDNIA TEMPERATURA *MEDIUM TEMPERATURE* Referencyjna temperatura wody 55 °C - *Reference water temperature 55 °C*
9.93	**$P_{designh}$ [kW]** ... Obciążenie obliczeniowe dla trybu ogrzewania - *Full load heating*	**10.19**
7.24 (a)	**SCOP [-]** ... Wskaźnik sezonowej efektywności - *Seasonal coefficient of performance*	**4.75** (a)

Temperatura zewnętrzna *Outdoor temperature* **T_j [°C]**	Deklarowana wydajność grzewcza *Heating declared capacity* **P_{dh} [kW]**	Wskaźnik efektywności dla deklarowanej wydajności *Coefficient of performance at the declared capacity* **COP_d [–]**	Temperatura zewnętrzna *Outdoor temperature* **T_j [°C]**	Deklarowana wydajność grzewcza *Heating declared capacity* **P_{dh} [kW]**	Wskaźnik efektywności dla deklarowanej wydajności *Coefficient of performance at the declared capacity* **COP_d [–]**
T_j = -7	–	–	T_j = -7	–	–
T_j = +2	9.932	3.999	T_j = +2	10.190	2.555
T_j = +7 (a)	6.620	6.590	T_j = +7 (a)	6.700	4.160
T_j = +12 (a)	5.540	8.950	T_j = +12 (a)	5.290	6.020
T_j = TOL = +2	9.932	3.999	T_j = TOL = +2	10.190	2.555
T_j = $T_{bivalent}$ = +2	9.932	3.999	T_j = $T_{bivalent}$ = +2	10.190	2.555

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Engineering Test Institute, public enterprise, Hudcova 424/56b, 621 00 Brno, Czech Republic
www.szutest.cz

NISKA TEMPERATURA *LOW TEMPERATURE* Referencyjna temperatura wody 35 °C - *Reference water temperature 35 °C*				ŚREDNIA TEMPERATURA *MEDIUM TEMPERATURE* Referencyjna temperatura wody 55 °C - *Reference water temperature 55 °C*
Pobór mocy w trybach innych niż „tryb aktywny" - *Power consumption in modes other than „active mode"*				
17.1	Tryb wyłączenia *Off mode*	P_{OFF}	[W]	17.1
17.0	Tryb wyłączonego termostatu *Thermostat off mode*	P_{TO}	[W]	17.0
17.1	Tryb czuwania *Standby mode*	P_{SB}	[W]	17.1
0.0	Tryb włączonej grzałki karteru *Crankcase heater mode*	P_{CK}	[W]	0.0
Roczne zużycie energii elektrycznej na potrzeby ogrzewania wg: - *Annual electricity consumption for heating according to:*				
1832 (a)	ČSN EN 14825:2023	Q_{HE}	[kWh]	**2866** (a)
Sezonowa efektywność energetyczna ogrzewania pomieszczeń - *Seasonal Space heating energy efficiency*				
286.8 (a)	ČSN EN 14825:2023	η_s	[%]	**2866** (a)
Przepływ cieczy w zewnętrznym wymienniku ciepła - *Liquid flow rate in outdoor heating exchanger*				
–	Ciecz obiegu źródła *Source liquid*	Min/Max	[m^3/h]	–
Przepływ cieczy w wewnętrznym wymienniku ciepła - *Liquid flow rate in indoor heating exchanger*				
0.80/1.99	Woda grzewcza *Heating water*	Min/Max	[m^3/h]	0.63/1.16

Poziom mocy akustycznej dla warunków - Sound power level at condition A7W55* (at 10 %):

x-change dynamic pro ac 10 AW E – Jednostka zewnętrzna – *– outdoor unit –*	L_{WA}	50.7 ± 1.5	dB(A)	Klasa dokładności 2 (Techniczna) *Accuracy class 2 (Engineering)*

(*) Uwagi do skróconych oznaczeń: np. A7/W55: A (powietrze), 7 (temperatura wejściowa - temperatura termometru suchego w °C), W (woda), 55 (temperatura wyjściowa w °C).
Comment to abbreviated marking: e.g. A7/W55: A (air), 7 (input air – dry bulb temperature in °C) / W (water), 55 (output heating water temperature in °C).

(a) Dane techniczne deklarowane przez producenta lub obliczone z danych deklarowanych przez producenta, nie były przedmiotem badań laboratorium Instytutu Badawczego Przemysłu Maszynowego
The technical data were declared by the manufacturer or calculated of data declared by the manufacturer and were not tested by the Testing Laboratory.

Specyfikacja warunków - *Specification of conditions*:

Kontrola prędkości kompresora *Compressor speed control*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (wewnętrzny wymiennik ciepła) - *Rated liquid flow rate (indoor heat exchanger)*	**Zmienna** ***Variable***
Wylotowa temperatura wody (wewnętrzny wymiennik ciepła) - *Outlet water temperature (indoor heat*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (zewnętrzny wymiennik ciepła) - *Rated liquid flow rate (outdoor heat exchanger)*	–
Funkcja *Function*	**Odwracalna** ***Reversible***		

Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe potwierdza niniejszym certyficatem z badań, że badanie produktu, którego dotyczy dało wyniki wskazane powyżej. Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe jest akredytowanym Laboratorium 1045.1.
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Brno, 2024-11-14

Ing. Mario Jankola
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Heating Equipment and Construction Products Manager
- KONIEC CERTYFIKATU Z BADAŃ -
- END OF TEST CERTIFICATE -

STROJÍRENSKÝ ZKUŠEBNÍ ÚSTAV, s.p. CZ 1

Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe, Brno, Republika Czeska
Engineering Test Institute. Public Enterprise. Brno. Czech Republic

CERTYFIKAT Z BADAŃ
TEST CERTIFICATE

Number **O-B-02032-24**

Klient *Customer*	Kermi GmbH Pankofen - Bahnhof 1 94447 Plattling GERMANY
Produkt *Product*	Pompa Ciepła powietrze/woda – monoblok *Air/water heat pump – monobloc*
Rodzaj oznaczenie / znak towarowy *Type designation / Trade mark*	**x-change dynamic pro ac 10 AW E**
Metoda testowa *Test methods*	ČSN EN 14511-2:2023, ČSN EN 14511-3:2023, ČSN EN 14825:2023; ČSN EN 12102-1:2023, EHPA Testing regulation – Testing of Air/Water Heat Pumps, version 2.4a
Podstawy zaświadczenia *Basis of certificate*	Raport z badań - *Test reports*: 39-18055/T z dnia - *of* 2024-11-14 39-18055/2/H z dnia - *of* 2024-11-13 Dokumentacja techniczna przedstawiona przez - *Technical documents of* Kermi GmbH
Referencyjny okres grzewczy *Reference heating season*	**„C" = Chłodny - *„C" = cold*** (Warunki obliczeniowe odniesienia dla ogrzewania $T_{designh}$ = -22 °C - *Reference design temperature $T_{designh}$ = -22 °C*)

Wyniki - Results:

NISKA TEMPERATURA
LOW TEMPERATURE

Referencyjna temperatura wody 35 °C - *Reference water temperature 35 °C*

ŚREDNIA TEMPERATURA
MEDIUM TEMPERATURE

Referencyjna temperatura wody 55 °C - *Reference water temperature 55 °C*

11.46	**$P_{designh}$ [kW]** ... Obciążenie obliczeniowe dla trybu ogrzewania - *Full load heating*	**11.11**
4.77 (a)	**SCOP [-]** ... Wskaźnik sezonowej efektywności - *Seasonal coefficient of performance*	**3.48** (a)

Temperatura zewnętrzna *Outdoor temperature* **T_j [°C]**	Deklarowana wydajność grzewcza *Heating declared capacity* **P_{dh} [kW]**	Wskaźnik efektywności dla deklarowanej wydajności *Coefficient of performance at the declared capacity* **COP_d [–]**	Temperatura zewnętrzna *Outdoor temperature* **T_j [°C]**	Deklarowana wydajność grzewcza *Heating declared capacity* **P_{dh} [kW]**	Wskaźnik efektywności dla deklarowanej wydajności *Coefficient of performance at the declared capacity* **COP_d [–]**
T_j = -7	7.020	3.830	T_j = -7 (a)	6.830	2.830
T_j = +2	4.620	6.181	T_j = +2 (a)	4.290	4.650
T_j = +7	4.870	7.570	T_j = +7 (a)	4.600	5.590
T_j = +12	5.550	9.120	T_j = +12 (a)	5.380	7.090
T_j = TOL = -20	9.240	2.270	T_j = TOL = -18	7.068	1.634
T_j = $T_{bivalent}$ = -16	9.651	2.514	T_j = $T_{bivalent}$ = -16	9.359	1.699
T_j = -15 (a)	9.359	2.660	T_j = -15 (a)	9.078	1.825

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NISKA TEMPERATURA ***LOW TEMPERATURE*** Referencyjna temperatura wody 35 °C - *Reference water temperature 35 °C*				**ŚREDNIA TEMPERATURA** ***MEDIUM TEMPERATURE*** Referencyjna temperatura wody 55 °C - *Reference water temperature 55 °C*
Pobór mocy w trybach innych niż „tryb aktywny" - *Power consumption in modes other than „active mode"*				
17.1	Tryb wyłączenia *Off mode*	P_{OFF}	[W]	17.1
17.0	Tryb wyłączonego termostatu *Thermostat off mode*	P_{TO}	[W]	17.0
17.1	Tryb czuwania *Standby mode*	P_{SB}	[W]	17.1
0.0	Tryb włączonej grzałki karteru *Crankcase heater mode*	P_{CK}	[W]	0.0
Roczne zużycie energii elektrycznej na potrzeby ogrzewania wg: - *Annual electricity consumption for heating according to*:				
5922 (a)	ČSN EN 14825:2023	Q_{HE}	[kWh]	**7875** (a)
Sezonowa efektywność energetyczna ogrzewania pomieszczeń - *Seasonal Space heating energy efficiency*				
187.8 (a)	ČSN EN 14825:2023	η_s	[%]	**136.1** (a)
Przepływ cieczy w zewnętrznym wymienniku ciepła - *Liquid flow rate in outdoor heating exchanger*				
–	Ciecz obiegu źródła *Source liquid*	Min/Max	[m^3/h]	–
Przepływ cieczy w wewnętrznym wymienniku ciepła - *Liquid flow rate in indoor heating exchanger*				
0.80/1.99	Woda grzewcza *Heating water*	Min/Max	[m^3/h]	0.63/1.16

Poziom mocy akustycznej dla warunków - Sound power level at condition A7W55* (at 10 %):

x-change dynamic pro ac 10 AW E – Jednostka zewnętrzna – *– outdoor unit –*	L_{WA}	50.7 ± 1.5	dB(A)	Klasa dokładności 2 (Techniczna) *Accuracy class 2 (Engineering)*

(*) Uwagi do skróconych oznaczeń: np. A7/W55: A (powietrze), 7 (temperatura wejściowa - temperatura termometru suchego w °C), W (woda), 55 (temperatura wyjściowa w °C).
Comment to abbreviated marking: e.g. A7/W55: A (air), 7 (input air – dry bulb temperature in °C) / W (water), 55 (output heating water temperature in °C).

(a) Dane techniczne deklarowane przez producenta lub obliczone z danych deklarowanych przez producenta, nie były przedmiotem badań laboratorium Instytutu Badawczego Przemysłu Maszynowego
The technical data were declared by the manufacturer or calculated of data declared by the manufacturer and were not tested by the Testing Laboratory.

Specyfikacja warunków - *Specification of conditions*:

Kontrola prędkości kompresora *Compressor speed control*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (wewnętrzny wymiennik ciepła) - *Rated liquid flow rate (indoor heat exchanger)*	**Zmienna** ***Variable***
Wylotowa temperatura wody (wewnętrzny wymiennik ciepła) - *Outlet water temperature (indoor heat*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (zewnętrzny wymiennik ciepła) - *Rated liquid flow rate (outdoor heat exchanger)*	**Zmienna** ***Variable***
Funkcja *Function*	**Odwracalna** ***Reversible***		

Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe potwierdza niniejszym certyficatem z badań, że badanie produktu, którego dotyczy dało wyniki wskazane powyżej. Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe jest akredytowanym Laboratorium 1045.1.
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Brno, 2024-11-14

Ing. Mario Jankola
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- KONIEC CERTYFIKATU Z BADAŃ -
- END OF TEST CERTIFICATE -

STROJIRENSKÝ ZKUŠEBNÍ ÚSTAV, s.p. CZ 1

CERTYFIKAT Z BADAŃ
TEST CERTIFICATE

Number **O-B-02035-24**

Klient *Customer*	Kermi GmbH Pankofen - Bahnhof 1 94447 Plattling GERMANY
Produkt *Product*	Pompa Ciepła powietrze/woda – monoblok *Air/water heat pump – monobloc*
Rodzaj oznaczenie / znak towarowy *Type designation / Trade mark*	**x-change dynamic pro ac 16 AW E** **x-change dynamic pro ac 10 AW E** **x-change dynamic pro ac 6 AW E**
Metoda testowa *Test methods*	ČSN EN 14511-2:2023, ČSN EN 14511-3:2023, ČSN EN 14825:2023, EHPA Testing regulation – Testing of Air/Water Heat Pumps, version 2.4a
Podstawy zaświadczenia *Basis of certificate*	Raport z badań - *Test reports*: 39-18055/T z dnia - *of* 2024-11-14 39-18055/2/H z dnia - *of* 2024-11-13 Dokumentacja techniczna przedstawiona przez - *Technical documents of* Kermi GmbH
Teplotní aplikace *Temperature application*	**NISKOTEMPERATUROWA - *LOW*,** Referencyjna temperatura wody 35 °C - *Reference water temperature 35 °C*
Referencyjny okres grzewczy *Reference heating season*	**„A“ = Średni - *„A“ = average* / „W“ = ciepły - *„W“ = warmer* / „C“ = chłodny - *„C“ = cold*** (Warunki obliczeniowe odniesienia dla ogrzewania – *Reference design conditions for heating* $T_{designh}$ = -10 °C / +2 °C / -22 °C)

Specyfikacja warunków - *Specification of conditions*:

Kontrola prędkości kompresora *Compressor speed control*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (wewnętrzny wymiennik ciepła) - *Rated liquid flow rate (indoor heat exchanger)*	**Zmienna** ***Variable***
Wylotowa temperatura wody (wewnętrzny wymiennik ciepła) - *Outlet water temperature (indoor heat*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (zewnętrzny wymiennik ciepła) - *Rated liquid flow rate (outdoor heat exchanger)*	–
Funkcja *Function*	**Odwracalna** ***Reversible***		

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Strojírenský zkušební ústav, s.p., Hudcova 424/56b, 621 00 Brno, Česká republika
Engineering Test Institute, public enterprise, Hudcova 424/56b, 621 00 Brno, Czech Republic
www.szutest.cz

Wyniki - *Results*:

Zastosowania w niskich temperaturach – *Low temperature application*

(Referencyjna temperatura wody 35 °C - *Reference water temperature 35 °C*)

Nazwa modelu – *Model names*			x-change dynamic pro ac 16 AW E (Nie badana / *Not tested*)(	x-change dynamic pro ac 10 AW E (Badana / *Tested*)	x-change dynamic pro ac 6 AW E (Nie badana / *Not tested*)
Obciążenie obliczeniowe dla trybu ogrzewania *Full load heating*	$P_{designh}$ [kW]	A	15.89	10.92	7.06
		W	14.06	9.93	6.57
		C	16.26	11.46	7.20
Temperatura dwuwalencyjna *Bivalent temperature*	$T_{bivalent}$ [°C]	A	-10	-10	-10
		W	2	2	2
		C	-15	-16	-15
Wskaźnik sezonowej efektywności *Seasonal coefficient of performance*	SCOP [–]	A	5.38	5.61	5.35
		W	6.74	7.24 (not tested)	6.51
		C	4.45	4.77 (not tested)	4.48
Sezonowa efektywność energetyczna ogrzewania pomieszcze *Seasonal Space heating energy efficiency*	η_s [%]	A	212.2	221.4	210.9
		W	266.7	286.8 (not tested)	257.3
		C	175.1	187.8 (not tested)	176.3

(Badana - *Tested*) Tę próbkę analityczną/warunek zbadano w Laboratorium Badawczym. *This test sample was tested at the Testing Laboratory.*

(Nie badana - *Not tested*) Techniczne dane zostały zgłoszone przez Producenta zgodnie ze specyfikacją linii modeli i nie zostały zbadane przez Laboratorium Badawcze. *The technical data were declared by the Manufacturer according to the model range specifications and were not tested by the Testing Laboratory.*

Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe potwierdza niniejszym certyficatem z badań, że badanie produktu, którego dotyczy dało wyniki wskazane powyżej. Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe jest akredytowanym Laboratorium 1045.1.
Engineering Test Institute, Public Enterprise, confirms by this Test Certificate that the testing of the product in question was performed with the results as stated above. Engineering Test Institute, Public Enterprise, is an accredited Testing Laboratory 1045.1.

Brno, 2024-11-14

Ing. Mario Jankola
Kierownik ds. Urządzeń Grzewczych i Wyrobów Budowlanych
Heating Equipment and Construction Products Manager

- KONIEC CERTYFIKATU Z BADAŃ -
- END OF TEST CERTIFICATE -

CERTYFIKAT Z BADAŃ
TEST CERTIFICATE

Number **O-B-02036-24**

Klient *Customer*	Kermi GmbH Pankofen - Bahnhof 1 94447 Plattling GERMANY
Produkt *Product*	Pompa Ciepła powietrze/woda – monoblok *Air/water heat pump – monobloc*
Rodzaj oznaczenie / znak towarowy *Type designation / Trade mark*	**x-change dynamic pro ac 16 AW E** **x-change dynamic pro ac 10 AW E** **x-change dynamic pro ac 6 AW E**
Metoda testowa *Test methods*	ČSN EN 14511-2:2023, ČSN EN 14511-3:2023, ČSN EN 14825:2023, EHPA Testing regulation – Testing of Air/Water Heat Pumps, version 2.4a
Podstawy zaświadczenia *Basis of certificate*	Raport z badań - *Test reports*: 39-18055/T z dnia - *of* 2024-11-14 39-18055/2/H z dnia - *of* 2024-11-13 Dokumentacja techniczna przedstawiona przez - *Technical documents of* Kermi GmbH
Teplotní aplikace *Temperature application*	**WYSOKOTEMPERATUROWA - *MEDIUM*** Referencyjna temperatura wody 55 °C - *Reference water temperature 55 °C*
Referencyjny okres grzewczy *Reference heating season*	**„A“ = Średni - *„A“ = average* / „W“ = ciepły - *„W“ = warmer* / „C“ = chłodny - *„C“ = cold*** (Warunki obliczeniowe odniesienia dla ogrzewania – *Reference design conditions for heating* $T_{designh}$ = -10 °C / +2 °C / -22 °C)

Specyfikacja warunków - *Specification of conditions*:

Kontrola prędkości kompresora *Compressor speed control*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (wewnętrzny wymiennik ciepła) - *Rated liquid flow rate (indoor heat exchanger)*	**Zmienna** ***Variable***
Wylotowa temperatura wody (wewnętrzny wymiennik ciepła) - *Outlet water temperature (indoor heat*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (zewnętrzny wymiennik ciepła) - *Rated liquid flow rate (outdoor heat exchanger)*	–
Funkcja *Function*	**Odwracalna** ***Reversible***		

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Engineering Test Institute, public enterprise, Hudcova 424/56b, 621 00 Brno, Czech Republic
www.szutest.cz

Wyniki - *Results*:

Zastosowania w średnich temperaturach – *Medium temperature application*

(Referencyjna temperatura wody 55 °C - *Reference water temperature 55 °C*)

Nazwa modelu – *Model names*			x-change dynamic pro ac 16 AW E (Nie badana / Not tested)	x-change dynamic pro ac 10 AW E (Badana / Tested)	x-change dynamic pro ac 6 AW E (Nie badana / *Not tested*)
Obciążenie obliczeniowe dla trybu ogrzewania *Full load heating*	$P_{designh}$ [kW]	A	14.73	10.60	6.33
		W	13.91	10.19	6.46
		C	15.39	11.11	7.14
Temperatura dwuwalencyjna *Bivalent temperature*	$T_{bivalent}$ [°C]	A	-10	-10	-10
		W	2	2	2
		C	-15	-16	-14
Wskaźnik sezonowej efektywności *Seasonal coefficient of performance*	SCOP [–]	A	3.87	3.88	3.84
		W	4.71	4.75 (not tested)	4.52
		C	3.30	3.48 (not tested)	3.30
Sezonowa efektywność energetyczna ogrzewania pomieszcze *Seasonal Space heating energy efficiency*	η_s [%]	A	151.9	152.1	150.5
		W	185.4	187.0 (not tested)	178.0
		C	129.1	136.1 (not tested)	129.0

(Badana - *Tested*) Tę próbkę analityczną/warunek zbadano w Laboratorium Badawczym. *This test sample was tested at the Testing Laboratory.*

(Nie badana - *Not tested*) Techniczne dane zostały zgłoszone przez Producenta zgodnie ze specyfikacją linii modeli i nie zostały zbadane przez Laboratorium Badawcze. *The technical data were declared by the Manufacturer according to the model range specifications and were not tested by the Testing Laboratory.*

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Brno, 2024-11-29

Ing. Mario Jankola
Kierownik ds. Urządzeń Grzewczych i Wyrobów Budowlanych
Heating Equipment and Construction Products Manager

- KONIEC CERTYFIKATU Z BADAŃ -
- END OF TEST CERTIFICATE -

STROJIRENSKY ZKUŠEBNÍ ÚSTAV, s. p. CZ 1

Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe, Brno, Republika Czeska
Engineering Test Institute. Public Enterprise. Brno. Czech Republic

CERTYFIKAT Z BADAŃ
TEST CERTIFICATE

Number **O-B-02037-24**

Klient *Customer*	Kermi GmbH Pankofen - Bahnhof 1 94447 Plattling GERMANY
Produkt *Product*	Pompa Ciepła powietrze/woda – monoblok *Air/water heat pump – monobloc*
Rodzaj oznaczenie / znak towarowy *Type designation / Trade mark*	**x-change dynamic pro ac 16 AW E** **x-change dynamic pro ac 10 AW E** **x-change dynamic pro ac 6 AW E**
Metoda testowa *Test methods*	ČSN EN 14511-2:2023, ČSN EN 14511-3:2023, ČSN EN 12102-1:2023, EHPA Testing regulation – Testing of Air/Water Heat Pumps, version 2.4a
Podstawy zaświadczenia *Basis of certificate*	Raport z badań - *Test reports*: 39-18055/T z dnia - *of* 2024-11-14 39-18055/2/H z dnia - *of* 2024-11-13 Dokumentacja techniczna przedstawiona przez - *Technical documents of* Kermi GmbH
Zastosowanie *Temperature application*	**NISKOTEMPERATUROWA - *LOW*,** **WYSOKOTEMPERATUROWA - *MEDIUM*** referencyjna temperatura wody 35 °C i 55 °C - *Reference water temperature 35 °C and 55 °C*

Specyfikacja warunków - *Specification of conditions*:

Kontrola prędkości kompresora *Compressor speed control*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (wewnętrzny wymiennik ciepła) - *Rated liquid flow rate (indoor heat exchanger)*	**Zmienna** ***Variable***
Wylotowa temperatura wody (wewnętrzny wymiennik ciepła) - *Outlet water temperature (indoor heat*	**Zmienna** ***Variable***	Nominalne natężenie przepływu cieczy (zewnętrzny wymiennik ciepła) - *Rated liquid flow rate (outdoor heat exchanger)*	-
Funkcja *Function*	**Odwracalna** ***Reversible***		

Wyniki - *Results*:

Nazwa modelu – *Model names*			**x-change dynamic pro ac 16 AW E**	**x-change dynamic pro ac 10 AW E**	**x-change dynamic pro ac 6 AW E**
Warunki cieplne* – *Temperature conditions**			(Nie badana / *Not tested*)	(Badana / *Tested*)	(Nie badana / *Not tested*)
A7/W35	Skorygowana moc grzewcza *Corrected heat capacity*	[kW]	6.739	6.457	4.250
	Efektywny pobór mocy elektrycznej *Effective electric power input*	[kW]	1.204	1.157	0.777
	Współczynnik efektywności *Coefficient of performance*	[–]	5.597	5.580	5.467
	Ustawienia sterowania *Control settings*	[rps]	20	28	30

A7/W55	Skorygowana moc grzewcza *Corrected heat capacity*	[kW]	6.356	6.050	3.715
	Efektywny pobór mocy elektrycznej *Effective electric power input*	[kW]	2.054	2.003	1.255
	Współczynnik efektywności *Coefficient of performance*	[–]	3.095	3.021	2.960
	Ustawienia sterowania *Control settings*	[rps]	21	30	30
A2/W35	Skorygowana moc grzewcza *Corrected heat capacity*	[kW]	8.538	6.007	3.935
	Efektywny pobór mocy elektrycznej *Effective electric power input*	[kW]	1.824	1.250	0.844
	Współczynnik efektywności *Coefficient of performance*	[–]	4.682	4.804	4.661
	Ustawienia sterowania *Control settings*	[rps]	30	30	32
A-7/W35	Skorygowana moc grzewcza *Corrected heat capacity*	[kW]	14.046	9.737	5.940
	Efektywny pobór mocy elektrycznej *Effective electric power input*	[kW]	4.590	2.966	1.827
	Współczynnik efektywności *Coefficient of performance*	[–]	3.060	3.283	3.252
	Ustawienia sterowania *Control settings*	[rps]	70	67	67
A-7/W55	Skorygowana moc grzewcza *Corrected heat capacity*	[kW]	14.307	9.842	5.335
	Efektywny pobór mocy elektrycznej *Effective electric power input*	[kW]	7.629	5.038	2.715
	Współczynnik efektywności *Coefficient of performance*	[–]	1.875	1.953	1.965
	Ustawienia sterowania *Control settings*	[rps]	78	77	70

Poziom mocy akustycznej dla danych warunków temperaturowych A7/W55* (at 30 rps) – *Sound power level at condition A7/W55* (at 30 rps):*

L_{WA}	Jednostka zewnętrzna – *Outdoor unit*	[dB(A)]	51.9 ± 1.5	50.7 ± 1.5	49.9 ± 1.5
	Jednostka zewnętrzna – *Outdoor unit*			Techniczna (2) – *Engineering (2)*	

(*) Uwagi do skróconych oznaczeń: np. A7/W35: A (powietrze), 7 (temperatura wejściowa - temperatura termometru suchego) w °C, W (woda), 35 (temperatura wyjściowa) w °C. *Comment to abbreviated marking: e.g. A7/W35: A (air), 7 (input air – dry bulb temperature in °C) / W (water), 35 (output heating water temperature in °C).*

(Badana - *Tested*) Tę próbkę analityczną/warunek zbadano w Laboratorium Badawczym. *This test sample was tested at the Testing Laboratory.*

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Brno, 2024-11-14

Ing. Mario Jankola
Kierownik ds. Urządzeń Grzewczych i Wyrobów Budowlanych
Heating Equipment and Construction Products Manager
- KONIEC CERTYFIKATU Z BADAŃ -
- END OF TEST CERTIFICATE -

STROJIRENSKY ZKUŠEBNI USTAV, s.p. CZ 1

Strojírenský zkušební ústav, s.p.
(Engineering Test Institute, Public Enterprise)
Hudcova 424/56b, Medlánky, 621 00 Brno, Česká republika
Testing Laboratory 1045.1 accredited by the CAI pursuant to ČSN EN ISO/IEC 17025:2018

L 1045.1

TEST REPORT
39-18055/T

Product:	Outdoor Air/Water Heat pump - monobloc
Type designation:	**x-change dynamic pro ac 10 AW E**
Customer:	Kermi GmbH Pankofen - Bahnhof 1 94447 Plattling GERMANY
Manufacturer:	PZP HEATING a.s. Podzámčí 786 517 73 Opočno Česká republika
Report issue date:	2024-11-14
Distribution list:	1 copy to the Customer 1 copy to the Engineering Test Institute

*This test report references the results of the SZÚ test report no. 39-15400/T issued 2021-03-24.

I. Description of product tested

The Heat pump **x-change dynamic pro ac 10 AW E** supplied by the company **PZP HEATING a.s.** is structurally adapted to operate in air/water system. Device is designed as monobloc unit placed outdoor. Outdoor unit and heating circuit are connected by water pipes. Refrigerant R32 is used with charge 4.8 kg. Power supply is three-phase. Heat pump is able to work in heating/cooling mode. Heat pump has variable flow rate.

Main components of the outdoor unit **x-change dynamic pro ac 10 AW E**:

- Serial number W20448-30-20-00003
- Cuboid shape with dimensions 1435 × 690 × 1150 mm (W × D × H)
- Frame and casing made of varnished steel sheets
- Cuboid shaped evaporator, dimensions, 1060 × 77 × 914 mm (W × D × H), spacing 3 mm
- Compressor by Siam Compressor Industry co., ltd., type DVB36FV4MT
- Inverter control unit Carel power+ PS20184AW4100
- Refrigerant R32 (4.8kg)
- Electric expansion valve Carel E2W18
- Plate condenser with dimensions 150 × 100 × 415 mm
- 4-way reversing valve Sanhua SHF-(L)-7H-35-52 with coil Sanhua
- Axial fan Ziehl-Abbeg ø630 mm with motor ZN063
- Filter drier Sanhua DTGB 083s, Refrigerant accumulator FrigoMec RV-130X362
- Sight glass
- Pressostat Eliwell NSDHA11B00107
- Pressure sensors Carel SPKS01B6P, SPKS01F3P1
- 7x Temperature sensors

Scheme:

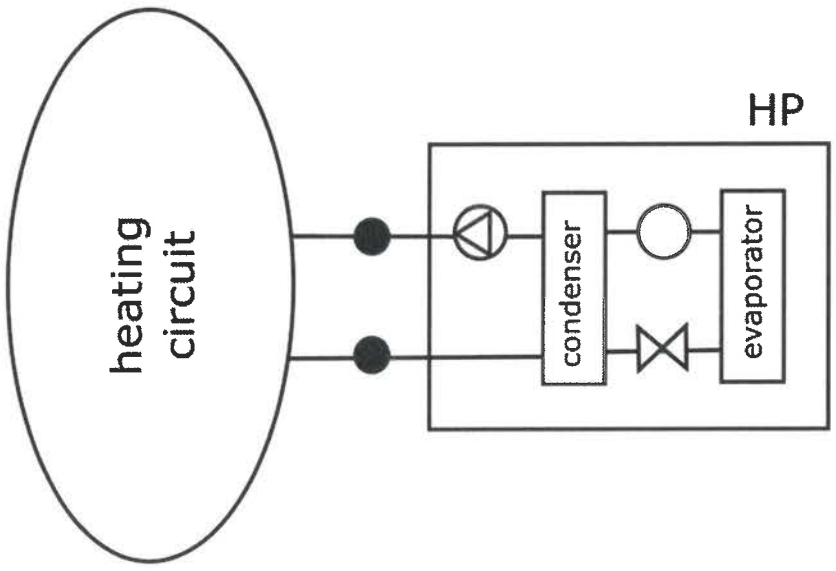
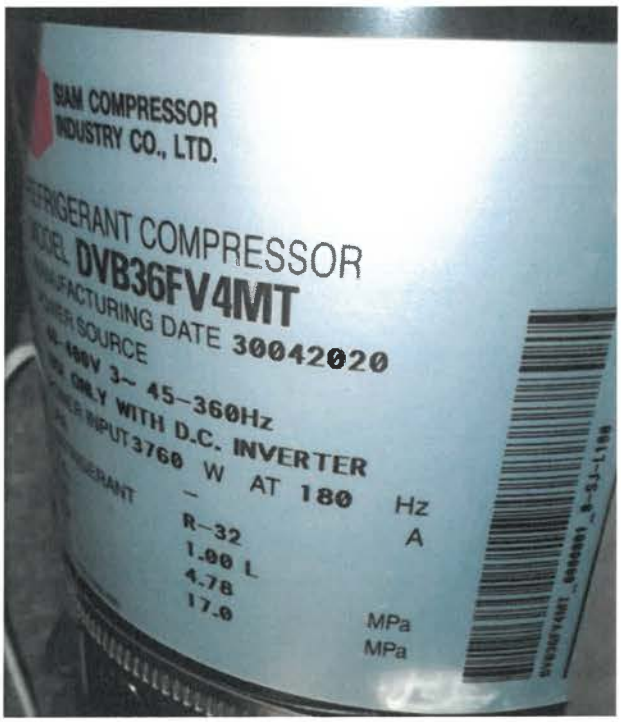
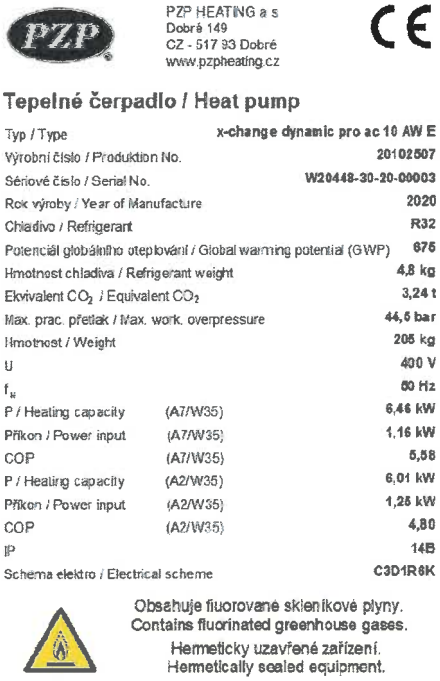


Photo documentation:

Heat pump **x-change dynamic pro ac 10 AW E**
– Outdoor unit: a) left /front/, b) right /back/ –





PZP HEATING a.s.
Dobrá 149
CZ - 517 93 Dobré
www.pzpheating.cz

CE

Tepelné čerpadlo / Heat pump

Typ / Type		**x-change dynamic pro ac 10 AW E**
Výrobní číslo / Produktion No.		**20102507**
Sériové číslo / Serial No.		**W20448-30-20-00003**
Rok výroby / Year of Manufacture		**2020**
Chladivo / Refrigerant		**R32**
Potenciál globálního oteplování / Global warming potential (GWP)		**675**
Hmotnost chladiva / Refrigerant weight		**4,8 kg**
Ekvivalent CO_2 / Equivalent CO_2		**3,24 t**
Max. prac. přetlak / Max. work. overpressure		**44,5 bar**
Hmotnost / Weight		**205 kg**
U		**400 V**
f_N		**50 Hz**
P / Heating capacity	(A7/W35)	**6,46 kW**
Příkon / Power input	(A7/W35)	**1,16 kW**
COP	(A7/W35)	**5,58**
P / Heating capacity	(A2/W35)	**6,01 kW**
Příkon / Power input	(A2/W35)	**1,25 kW**
COP	(A2/W35)	**4,80**
IP		**14B**
Schema elektro / Electrical scheme		**C3D1R6K**

Obsahuje fluorované skleníkové plyny.
Contains fluorinated greenhouse gases.
Hermeticky uzavřené zařízení.
Hermetically sealed equipment.

Heat pump **x-change dynamic pro ac 10 AW E**
– left: Compressor label, right: Outdoor unit label –

Heat pump **x-change dynamic pro ac 10 AW E**
– Outdoor unit (without cover) –

II. Sample tested

Reg. No. SZÚ	Product	Date of submission
0213.21.34049.001	Outdoor Air/Water Heat Pump – monobloc	2021-02-12

The visual inspection, tests and verification were carried out by Ing. Jan Uryč – Test engineer at the test station of SZU.

Description of sampling method: The sample was selected according to ratio numbers from model range data provided by customer.

III. Measuring and test equipment:

The tests were carried out with the use of validly calibrated measuring and test equipment.

No.	Name:	Inventory number:	Calibration is valid to:	Accuracy see Calibration Sheet number:
1.	Electrical energy meter	022370/1	07/2022	082/12/E
2.	Digital watt meter	MaR01/EM01	07/2027	K17071728
3.	Flow meter Krohne Optiflux	022370/5	02/2022	6015-KL-P0077-18
4.	Barometer	022370/7	04/2024	4257/2019
5.	Differential pressure gauge	MaR01_TI	05/2021	KL-P-0056-19
6.	Temperature-humidity meter HC2-IC305	022370/10	10/2024	6036-KL-V0417-19
7.	Temperature-humidity meter HC2-IC305	022370/11	10/2024	6036-KL-V0416-19
8.	Thermometers	022370/13	01/2022	KL-T-0002-21

Accredited test number: **T 037*** Test title: **Tests of leakage, pressure resistance, thermal and technical parameters, combustion efficiency, safety functions**

Testing method	ČSN EN 14511-2:2019, ČSN EN 14511-3:2019, ČSN EN 14825:2020, EHPA Testing regulation – Testing of Air/Water Heat Pumps – Version 2.4a
Sample tested	Heat pump **x-change dynamic pro ac 10 AW E**
Measuring equipment used	See previous page

Place of testing:	at the Engineering Test Institute	☒	at the Manufacturer´s premises	☐	at the Customer´s premises	☐	*other:*

Measured quantity	**Unit**	**Uncertainty of measurement**	**Evaluation**
Liquid			
- temperature difference (dT)	[K]	± 0,15 K	fulfilled
- temperature inlet/outlet	[°C]	± 0,15 K	fulfilled
- volume flow	[m³/s]	± 1 %	fulfilled
- static pressure difference	[kPa]	± 1 kPa (Δp ≤ 20 kPa) nebo ± 5 % (Δp > 20 kPa)	fulfilled
Air			
- dry bulb temperature	[°C]	± 0,2 K	fulfilled
- wet bulb temperature	[°C]	± 0,4 K	fulfilled
- volume flow	[m³/s]	± 5 %	not applied
- static pressure difference	[Pa]	± 5 Pa (Δp ≤ 100 Pa) nebo ± 5 % (Δp > 100 Pa)	not applied
Refrigerant			
- pressure at compressor outlet	[kPa]	± 1 %	not applied
- temperature	[°C]	± 0,5 K	not applied
Concentration (in volume)			
- heat transfer medium	[%]	± 2	not related
Electrical quantities			
- electric power	[W]	± 1 %	fulfilled
- voltage	[V]	± 0,5 %	fulfilled
- current	[A]	± 0,5 %	fulfilled
- electric energy	[kWh]	± 1 %	not applied
Compressor rotational speed	[min⁻¹]	± 0,5 %	not applied
The heating or cooling capacities measured on the liquid side shall be determined within a maximum uncertainty of 5 % independent of the individual uncertainties of measurement including the uncertainties on the properties of fluids.			fulfilled

The following expanded measurement uncertainties have been calculated as the coefficient of measurement uncertainty and the expanded coefficient k = 2, which corresponds to a coverage probability of 95% for normal distribution.
If a statement of conformity is given, the decision rule pursuant to ILAC-G8: 09/2019 Art. 4.2.1 – binary statement for the simple acceptance rule shall be used.

a) Rating conditions:

Measurement results: Heat pump **x-change dynamic pro ac 10 AW E**

Test number		1	2	3
Assessment condition		Rating conditions		
Specification of the assessment condition*		A7/W35	A7/W35	A7/W45
Date of testing		2021-02-12	2021-02-15	2021-02-15
Transient test procedure	YES / NO	NO	NO	NO
Average defrost time of 1 cycle	[min]	–	–	–
Average time of 1 cycle	[min]	–	–	–
Calculation time	[min]	70.0	70.0	70.0
Output heating water – temperature calculation	[°C]	35.00	35.01	45.01
Input heating water – temperature calculation	[°C]	30.00	30.00	40.00
Output heating water temperature	[°C]	35.00	35.01	45.01
Input heating water temperature	[°C]	30.00	30.00	40.00
Air temperature – dry bulb temperature	[°C]	7.07	7.00	7.01
Air temperature – wet bulb temperature	[°C]	6.08	6.02	6.03
Relative humidity	[%]	86.93	87.01	86.97
Barometric pressure	[kPa]	99.840	100.463	100.318
Ambient temperature	[°C]	7.13	6.98	7.00
Secondary circuit pressure difference	[kPa]	8.090	16.307	18.641
Efficiency of the secondary liquid pump	[–]	0.145	0.224	0.233
Volume flow rate of heating water	[$m^3 \cdot h^{-1}$]	1.1226	2.0574	1.9871
Density of heating water	[$kg \cdot m^{-3}$]	994.0	993.9	990.2
Specific heat capacity of heating water	[$kJ \cdot kg^{-1} \cdot K^{-1}$]	4.175	4.180	4.180
Voltage	[V]	400.10	399.79	399.88
Total current	[A]	8.15	14.92	18.32
Overall power input	[kW]	1.175	2.383	2.997
Capacity correction of sec. liquid pump	[W]	14.911	32.331	33.863
Power input correction of sec. liquid pump	[W]	17.43	41.65	44.15
Heating capacity – heating water	[kW]	6.472	11.892	11.442
Corrected heating capacity – heating water	**[kW]**	**6.457**	**11.859**	**11.408**
Uncertainty of corrected heating capacity	[kW]	± 0.092	± 0.169	± 0.163
Effective electric power input	**[kW]**	**1.157**	**2.342**	**2.952**
COP	**[–]**	**5.580**	**5.065**	**3.864**
Uncertainty of COP	[–]	± 0.080	± 0.073	± 0.055
Control settings	**[rps]**	**28**	**54**	**54**
Circulation pump settings – heating water	[%]	50	80	80

*Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Measurement results: Heat pump **x-change dynamic pro ac 10 AW E**

Test number		4	5	6
Assessment condition		Rating conditions		
Specification of the assessment condition*		A7/W55	A7/W55	A-7/W55
Date of testing		2021-02-15	2021-02-15	2021-02-16
Transient test procedure	YES / NO	NO	NO	NO
Average defrost time of 1 cycle	[min]	–	–	–
Average time of 1 cycle	[min]	–	–	–
Calculation time	[min]	70.0	70.0	70.0
Output heating water – temperature calculation	[°C]	54.99	54.99	54.99
Input heating water – temperature calculation	[°C]	46.99	46.99	47.00
Output heating water temperature	[°C]	54.99	54.99	54.99
Input heating water temperature	[°C]	46.99	46.99	47.00
Air temperature – dry bulb temperature	[°C]	7.00	7.00	-6.98
Air temperature – wet bulb temperature	[°C]	6.02	6.02	-7.98
Relative humidity	[%]	86.88	86.90	75.00
Barometric pressure	[kPa]	100.160	100.024	99.058
Ambient temperature	[°C]	7.01	7.06	-7.05
Secondary circuit pressure difference	[kPa]	15.372	10.523	14.520
Efficiency of the secondary liquid pump	[–]	0.176	0.137	0.168
Volume flow rate of heating water	$[m^3 \cdot h^{-1}]$	1.1795	0.6628	1.0797
Density of heating water	$[kg \cdot m^{-3}]$	985.8	985.8	985.8
Specific heat capacity of heating water	$[kJ \cdot kg^{-1} \cdot K^{-1}]$	4.180	4.180	4.180
Voltage	[V]	399.53	400.15	399.53
Total current	[A]	21.59	12.96	28.66
Overall power input	[kW]	3.614	2.017	5.064
Capacity correction of sec. liquid pump	[W]	23.522	12.187	21.605
Power input correction of sec. liquid pump	[W]	28.56	14.12	25.97
Heating capacity – heating water	[kW]	10.783	6.062	9.863
Corrected heating capacity – heating water	**[kW]**	**10.759**	**6.050**	**9.842**
Uncertainty of corrected heating capacity	[kW]	± 0.097	± 0.055	± 0.089
Effective electric power input	**[kW]**	**3.586**	**2.003**	**5.038**
COP	**[–]**	**3.000**	**3.021**	**1.953**
Uncertainty of COP	[–]	± 0.027	± 0.027	± 0.018
Control settings	**[rps]**	**54**	**30**	**77**
Circulation pump settings – heating water	[%]	60	45	57

*Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Measurement results: Heat pump **x-change dynamic pro ac 10 AW E**

Test number		7	8	9
Assessment condition		**Rating conditions**		
Specification of the assessment condition*		**A2/W35****	**A2/W35****	**A10/W35**
Date of testing		**2021-03-01**	**2021-03-01**	**2021-02-24**
Transient test procedure	YES / NO	NO	YES	NO
Average defrost time of 1 cycle	[min]	–	4.9	–
Average time of 1 cycle	[min]	–	151.9	–
Calculation time	[min]	70.0	151.9	70.0
Output heating water – temperature calculation	[°C]	35.00	34.45	35.00
Input heating water – temperature calculation	[°C]	29.99	29.84	30.00
Output heating water temperature	[°C]	35.00	35.02	35.00
Input heating water temperature	[°C]	29.99	30.01	30.00
Air temperature – dry bulb temperature	[°C]	2.00	2.00	10.00
Air temperature – wet bulb temperature	[°C]	1.02	1.02	9.01
Relative humidity	[%]	83.98	84.01	88.22
Barometric pressure	[kPa]	100.358	100.325	100.260
Ambient temperature	[°C]	2.18	2.10	10.05
Secondary circuit pressure difference	[kPa]	13.419	13.603	13.638
Efficiency of the secondary liquid pump	[–]	0.162	0.162	0.164
Volume flow rate of heating water	$[m^3 \cdot h^{-1}]$	1.0426	1.0303	1.0581
Density of heating water	$[kg \cdot m^{-3}]$	994.0	994.1	994.0
Specific heat capacity of heating water	$[kJ \cdot kg^{-1} \cdot K^{-1}]$	4.180	4.180	4.180
Voltage	[V]	400.16	400.00	399.97
Total current	[A]	8.32	8.28	7.06
Overall power input	[kW]	1.274	1.269	0.995
Capacity correction of sec. liquid pump	[W]	20.089	20.104	20.489
Power input correction of sec. liquid pump	[W]	23.97	23.99	24.50
Heating capacity – heating water	[kW]	6.027	5.518	6.104
Corrected heating capacity – heating water	**[kW]**	**6.007**	**5.498**	**6.083**
Uncertainty of corrected heating capacity	[kW]	± 0.086	± 0.085	± 0.087
Effective electric power input	**[kW]**	**1.250**	**1.245**	**0.970**
COP	**[–]**	**4.804**	**4.416**	**6.270**
Uncertainty of COP	[–]	± 0.069	± 0.068	± 0.090
Control settings	**[rps]**	**30**	**30**	**24**
Circulation pump settings – heating water	[%]	55	55	58

*Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)
** The condition A2W35 was measured in a conventional manner according to the article 4.4.4.1 of the standard EN14511-3:2019; this result is test number 7. The measuring was prolonged above requirement of the standard to calculate the steady state condition at the request of the manufacturer; such result is test number 8.

Measurement results: Heat pump **x-change dynamic pro ac 10 AW E**

Test number		10	11	12
Assessment condition		Rating conditions		
Specification of the assessment condition*		A27/W7	A27/W18	A35/W7
Date of testing		2021-03-02	2021-03-02	2021-03-02
Transient test procedure	YES / NO	NO	NO	NO
Average defrost time of 1 cycle	[min]	–	–	–
Average time of 1 cycle	[min]	–	–	–
Calculation time	[min]	35.0	35.0	35.0
Output cooling water – temperature calculation	[°C]	7.09	18.01	6.96
Input cooling water – temperature calculation	[°C]	12.03	23.00	12.00
Output cooling water temperature	[°C]	7.09	18.01	6.96
Input cooling water temperature	[°C]	12.03	23.00	12.00
Air temperature - dry bulb temperature	[°C]	26.99	27.01	35.01
Air temperature - wet bulb temperature	[°C]	19.65	20.67	23.49
Relative humidity	[%]	50.56	56.50	37.89
Barometric pressure	[kPa]	100.317	100.372	100.214
Ambient temperature	[°C]	26.99	26.99	35.83
Secondary circuit pressure difference	[kPa]	15.562	14.976	14.273
Efficiency of the secondary liquid pump	[–]	0.159	0.160	0.195
Volume flow rate of cooling water	$[m^3 \cdot h^{-1}]$	0.8458	0.8997	1.6736
Density of cooling water	$[kg \cdot m^{-3}]$	999.8	998.4	999.8
Specific heat capacity of cooling water	$[kJ \cdot kg^{-1} \cdot K^{-1}]$	4.200	4.180	4.200
Voltage	[V]	398.65	398.84	397.96
Total current	[A]	9.42	7.11	21.70
Overall power input	[kW]	1.428	1.020	3.669
Capacity correction of sec. liquid pump	[W]	19.312	19.608	27.356
Power input correction of sec. liquid pump	[W]	22.97	23.35	33.99
Cooling capacity - cooling water	[kW]	4.864	5.201	9.810
Corrected cooling capacity	**[kW]**	**4.883**	**5.221**	**9.838**
Uncertainty of corrected cooling capacity	[kW]	± 0.084	± 0.089	± 0.166
Effective electric power input	**[kW]**	**1.405**	**0.996**	**3.635**
EER	**[–]**	**3.476**	**5.240**	**2.706**
Uncertainty of EER	[–]	± 0.060	± 0.090	± 0.046
Control settings	**[rps]**	**28**	**21**	**60**
Circulation pump settings – cooling water	[%]	55	55	70

*Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Measurement results: Heat pump **x-change dynamic pro ac 10 AW E**

Test number		13	14
Assessment condition		**Rating conditions**	
Specification of the assessment condition*		**A35/W18**	**A35/W18**
Date of testing		**2021-03-02**	**2021-03-03**
Transient test procedure	YES / NO	NO	NO
Average defrost time of 1 cycle	[min]	–	–
Average time of 1 cycle	[min]	–	–
Calculation time	[min]	35.0	35.0
Output cooling water – temperature calculation	[°C]	17.96	18.04
Input cooling water – temperature calculation	[°C]	22.99	23.01
Output cooling water temperature	[°C]	17.96	18.04
Input cooling water temperature	[°C]	22.99	23.01
Air temperature - dry bulb temperature	[°C]	35.00	35.00
Air temperature - wet bulb temperature	[°C]	23.07	20.65
Relative humidity	[%]	36.14	26.42
Barometric pressure	[kPa]	100.143	99.896
Ambient temperature	[°C]	35.71	35.07
Secondary circuit pressure difference	[kPa]	9.137	12.895
Efficiency of the secondary liquid pump	[–]	0.173	0.154
Volume flow rate of cooling water	$[m^3 \cdot h^{-1}]$	1.8841	0.9130
Density of cooling water	$[kg \cdot m^{-3}]$	998.4	998.4
Specific heat capacity of cooling water	$[kJ \cdot kg^{-1} \cdot K^{-1}]$	4.180	4.180
Voltage	[V]	397.52	399.12
Total current	[A]	17.67	8.21
Overall power input	[kW]	2.897	1.196
Capacity correction of sec. liquid pump	[W]	22.821	17.926
Power input correction of sec. liquid pump	[W]	27.60	21.20
Cooling capacity - cooling water	[kW]	10.965	5.252
Corrected cooling capacity	**[kW]**	**10.988**	**5.270**
Uncertainty of corrected cooling capacity	[kW]	± 0.186	± 0.090
Effective electric power input	**[kW]**	**2.870**	**1.175**
EER	**[–]**	**3.829**	**4.485**
Uncertainty of EER	[–]	± 0.065	± 0.077
Control settings	**[rps]**	**48**	**22**
Circulation pump settings – cooling water	[%]	70	53

*Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

b) Seasonal performance tests and SCOP calculation – Low temperature application for reference heating seasons:

„A" = average (reference water temperature 35 °C, reference design conditions for heating Tdesignh = -10 °C)
„W" = warmer (reference water temperature 35 °C, reference design conditions for heating Tdesignh = +2 °C)
„C" = colder (reference water temperature 35 °C, reference design conditions for heating Tdesignh = -22 °C)

Model	Heat pump **x-change dynamic pro ac 10 AW E**
Design	Air / Water – monobloc

Conditions specification according to ČSN EN 14825:2020	Temperature application	**Low** (reference water temperature 35 °C)
	Reference heating season	**A, W, C**
	Outlet water temperature - indoor heat exchanger	Variable
	Compressor speed control	Variable
	Water flow rate – primary circuit	—
	Water flow rate – secondary circuit	Variable

Seasonal space heating energy efficiency	Heating	Average	η_s / A	**221.4**		%
		Warmer	η_s / W	286.8	(not tested)	%
		Colder	η_s / C	187.8	(not tested)	%
Seasonal efficiency according to ČSN EN 14825:2020	Heating	Average	**SCOP / A**	**5.61**		–
		Warmer	SCOP / W	7.24	(not tested)	–
		Colder	SCOP / C	4.77	(not tested)	–

Function	Cooling			Yes	
	Heating	Yes	Reference heating season: Average	Yes	
			Warmer (if designated)	Yes	
			Colder (if designated)	Yes	

Full heating load	Cooling		$P_{designc}$	–	kW
	Heating	Average	**$P_{designh}$**	**10.92**	kW
		Warmer	**$P_{designh}$**	**9.93**	kW
		Colder	**$P_{designh}$**	**11.46**	kW
Bivalent temperatures	Heating	Average	$T_{bivalent}$	-10	°C
		Warmer	$T_{bivalent}$	2	°C
		Colder	$T_{bivalent}$	-16	°C
Operation limit temperatures	Heating	Average	TOL	-10	°C
		Warmer	TOL	2	°C
		Colder	TOL	-20	°C
Seasonal power consumption according to ČSN EN 14825:2020	Cooling		Q_{CE}	–	kWh
	Heating	Average	Q_{HE}/A	4024	kWh
		Warmer	Q_{HE}/W	1832 (not tested)	kWh
		Colder	Q_{HE}/C	5922 (not tested)	kWh

Modes other than „active mode"	Off mode	P_{OFF}	17.1	W
	Thermostat off mode	P_{TO}	17.0	W
	Standby mode	P_{SB}	17.1	W
	Crankcase heater mode	P_{CK}	0.0	W

(Not tested): The technical data were declared by the Manufacturer and were not tested by the Testing Laboratory.

Calculation of SCOP according to ČSN EN 14825:2020:

Number of hours used for calculation of reference SCOP (Annex B – Table B.2, B.3)
- For reversible heat pumps and reference heating season „A“ = average

H_{HE}	2066	[h]
H_{TO}	178	[h]
H_{SB}	0	[h]
H_{CK}	178	[h]
H_{OFF}	0	[h]

Measured data:

P_{TO}	0.0170	[kW]
P_{SB}	0.0171	[kW]
P_{CK}	0.0000	[kW]
P_{OFF}	0.0171	[kW]
$P_{designh}$	10.92	[kW]
$SCOP_{ON}$	5.61	[–]

Coefficient and correction:

F(1)	3	[%]
F(2)	0	[%]
CC	2.5	[–]

Calculation of SCOP:

7.3 Calculation of the reference annual heating demand (Q_H)

$Q_H = P_{designh} \cdot H_{HE}$ [kWh]

$Q_H = 10.92 \cdot 2066 = 22570$ [kWh]

7.4 Calculation of the annual electricity consumption (Q_{HE})

$Q_{HE} = Q_H / SCOP_{on} + H_{TO} \cdot P_{TO} + H_{SB} \cdot P_{SB} + H_{CK} \cdot P_{CK} + H_{OFF} \cdot P_{OFF}$ [kWh]

$Q_{HE} = 22570 / 5.61 + 178 \cdot 0.017 + 0 \cdot 0.0171 + 178 \cdot 0 + 0 \cdot 0.0171 = 4024$ [kWh]

7.2 General formula for calculation of reference SCOP

$SCOP = Q_H / Q_{HE}$ [–]

$SCOP = 22570 / 4024 = 5.61$ [–]

7.1 Calculation of the seasonal space heating efficiency η_s

$\Sigma F(i) = F(1) + F(2)$ [–]

$\Sigma F = 0.03 + 0 = 0.03$ [–]

$\eta_s = 1 / CC \cdot SCOP - \Sigma F(i)$ [–]

$\eta_s (A) = (1 / 2.5) \cdot 5.61 - 0.03 = 2.214$ [–]

Test results for single part load conditions

Measurement results: Heat pump **x-change dynamic pro ac 10 AW E**

Test number		15	16	17
Temperature level		Low temperature application (reference water temperature 35 °C)		
Reference heating season		„A" = average ($T_{designh}$ = -10 °C)		
Assessment condition		A	B	C
Specification of the assessment condition*		A-7/W34	A2/W30	A7/W28.11
Date of testing		2021-02-23	2021-02-18	2021-02-19
Transient test procedure	YES / NO	NO	NO	NO
Average defrost time of 1 cycle	[min]	–	–	–
Average time of 1 cycle	[min]	–	–	–
Calculation time	[min]	70.0	70.0	70.0
Output heating water – temperature calculation	[°C]	33.96	30.00	28.10
Input heating water – temperature calculation	[°C]	29.00	24.99	23.11
Output heating water temperature	[°C]	33.96	30.00	28.10
Input heating water temperature	[°C]	29.00	24.99	23.11
Air temperature – dry bulb temperature	[°C]	-6.99	2.00	6.99
Air temperature – wet bulb temperature	[°C]	-7.99	1.01	6.01
Relative humidity	[%]	74.80	84.00	87.00
Barometric pressure	[kPa]	100.308	99.004	98.951
Ambient temperature	[°C]	-7.02	2.05	7.05
Secondary circuit pressure difference	[kPa]	12.387	13.652	16.156
Efficiency of the secondary liquid pump	[–]	0.187	0.162	0.161
Volume flow rate of heating water	[$m^3 \cdot h^{-1}$]	1.7140	1.0307	0.8446
Density of heating water	[$kg \cdot m^{-3}$]	994.3	995.5	996.1
Specific heat capacity of heating water	[$kJ \cdot kg^{-1} \cdot K^{-1}$]	4.180	4.180	4.180
Voltage	[V]	400.20	400.32	400.08
Total current	[A]	17.39	7.30	5.24
Overall power input	[kW]	2.931	1.091	0.687
Capacity correction of sec. liquid pump	[W]	25.701	20.164	19.769
Power input correction of sec. liquid pump	[W]	31.60	24.07	23.56
Heating capacity – heating water	[kW]	9.822	5.961	4.874
Corrected heating capacity – heating water	**[kW]**	**9.797**	**5.941**	**4.854**
Uncertainty of corrected heating capacity	[kW]	± 0.141	± 0.085	± 0.070
Effective electric power input	**[kW]**	**2.899**	**1.066**	**0.664**
COP	**[–]**	**3.379**	**5.570**	**7.312**
Uncertainty of COP	[–]	± 0.049	± 0.080	± 0.106
Control settings	**[rps]**	**67**	**29**	**20**
Circulation pump settings – heating water	[%]	**68**	**55**	**55**

* Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Test results for single part load conditions

Measurement results: Heat pump **x-change dynamic pro ac 10 AW E**

Test number		**18**	**19**
Temperature level		Low temperature application (reference water temperature 35 °C)	
Reference heating season		„A" = average ($T_{designh}$ = -10 °C)	
Assessment condition		**D**	**TOL (E), Tbiv (F)**
Specification of the assessment condition*		**A12/W27.49**	**A-10/W35**
Date of testing		**2021-02-19**	**2021-02-16**
Transient test procedure	YES / NO	NO	NO
Average defrost time of 1 cycle	[min]	–	–
Average time of 1 cycle	[min]	–	–
Calculation time	[min]	70.0	70.0
Output heating water – temperature calculation	[°C]	27.51	34.97
Input heating water – temperature calculation	[°C]	22.50	30.00
Output heating water temperature	[°C]	27.51	34.97
Input heating water temperature	[°C]	22.50	30.00
Air temperature – dry bulb temperature	[°C]	12.01	-10.02
Air temperature – wet bulb temperature	[°C]	11.02	-11.01
Relative humidity	[%]	89.04	69.87
Barometric pressure	[kPa]	98.958	99.297
Ambient temperature	[°C]	12.06	-10.07
Secondary circuit pressure difference	[kPa]	14.416	13.021
Efficiency of the secondary liquid pump	[–]	0.162	0.198
Volume flow rate of heating water	[$m^3 \cdot h^{-1}$]	0.9635	1.9097
Density of heating water	[$kg \cdot m^{-3}$]	996.2	994.0
Specific heat capacity of heating water	[$kJ \cdot kg^{-1} \cdot K^{-1}$]	4.180	4.180
Voltage	[V]	400.36	399.43
Total current	[A]	4.72	22.69
Overall power input	[kW]	0.625	3.961
Capacity correction of sec. liquid pump	[W]	19.996	27.928
Power input correction of sec. liquid pump	[W]	23.85	34.84
Heating capacity – heating water	[kW]	5.584	10.952
Corrected heating capacity – heating water	**[kW]**	**5.564**	**10.924**
Uncertainty of corrected heating capacity	[kW]	± 0.080	± 0.157
Effective electric power input	**[kW]**	**0.601**	**3.927**
COP	**[–]**	**9.259**	**2.782**
Uncertainty of COP	[–]	± 0.134	± 0.040
Control settings	**[rps]**	**20**	**86**
Circulation pump settings – heating water	[%]	**55**	**73**

* Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Test results for single part load conditions

Measurement results: Heat pump **x-change dynamic pro ac 10 AW E**

Test number		20	21	22
Temperature level		Low temperature application (reference water temperature 35 °C)		
Reference heating season		„W" = warmer ($T_{designh}$ = 2°C)	„C" = colder ($T_{designh}$ = -22 °C)	
Assessment condition		**B, Tbiv (F), TOL (E)**	**B**	**Tbiv (F)**
Specification of the assessment condition*		**A2/W35**	**A2/W27**	**A-16/W32.43**
Date of testing		**2021-02-17**	**2021-02-23**	**2021-02-22**
Transient test procedure	YES / NO	YES	NO	NO
Average defrost time of 1 cycle	[min]	7.0	–	–
Average time of 1 cycle	[min]	105.1	–	–
Calculation time	[min]	105.1	70.0	70.0
Output heating water – temperature calculation	[°C]	34.20	27.00	32.45
Input heating water – temperature calculation	[°C]	29.86	22.02	27.43
Output heating water temperature	[°C]	34.99	27.00	32.45
Input heating water temperature	[°C]	30.01	22.02	27.43
Air temperature – dry bulb temperature	[°C]	2.00	2.01	-16.00
Air temperature – wet bulb temperature	[°C]	1.01	1.02	-16.87
Relative humidity	[%]	83.97	83.91	59.63
Barometric pressure	[kPa]	98.591	100.366	99.629
Ambient temperature	[°C]	2.03	2.07	-15.61
Secondary circuit pressure difference	[kPa]	12.985	7.222	15.797
Efficiency of the secondary liquid pump	[–]	0.201	0.133	0.203
Volume flow rate of heating water	[$m^3 \cdot h^{-1}$]	1.9884	0.8029	1.6728
Density of heating water	[$kg \cdot m^{-3}$]	994.2	996.4	994.8
Specific heat capacity of heating water	[$kJ \cdot kg^{-1} \cdot K^{-1}$]	4.180	4.180	4.176
Voltage	[V]	399.67	400.33	400.29
Total current	[A]	15.73	5.75	22.15
Overall power input	[kW]	2.519	0.759	3.876
Capacity correction of sec. liquid pump	[W]	28.466	10.507	28.801
Power input correction of sec. liquid pump	[W]	35.64	12.12	36.14
Heating capacity – heating water	[kW]	9.960	4.630	9.680
Corrected heating capacity – heating water	**[kW]**	**9.932**	**4.620**	**9.651**
Uncertainty of corrected heating capacity	[kW]	± 0.164	± 0.066	± 0.138
Effective electric power input	**[kW]**	**2.484**	**0.747**	**3.840**
COP	**[–]**	**3.999**	**6.181**	**2.514**
Uncertainty of COP	[–]	± 0.066	± 0.089	± 0.036
Control settings	**[rps]**	**60**	**22**	**90**
Circulation pump settings – heating water	[%]	**75**	**42**	**70**

* Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Data for SCOP calculation (Heat pump **x-change dynamic pro ac 10 AW E**)
- Low temperature application (reference water temperature 35 °C)
- Reference heating season „A" – average

	Outdoor heat exchanger Outdoor air inlet	Indoor heat exchanger Outlet water temperature	Part load ratio	Part load	DC Declared capacity	COPd at declared capacity	Cdh degradation coefficient	CR	COPbin (Tj)	Eff. power input of compressor off state
	[°C]	[°C]	[%]	[kW]	[kW]	[–]	[–]	[–]	[–]	[kW]
A	-7	34.00	88.46	9.66	9.797	3.379	0.900	1.00	3.379	–
B	2	30.00	53.85	5.88	5.941	5.570	0.900	1.00	5.570	–
C	7	28.10	34.62	3.78	4.854	7.312	0.974	0.78	7.259	0.0170
D	12	27.49	15.38	1.68	5.564	9.259	0.972	0.30	8.691	0.0170
TOL (E)	-10	35.00	100.00	10.92	10.924	2.782	0.900	1.00	2.782	–
Tbiv (F)	-10	35.00	100.00	10.92	10.924	2.782	0.900	1.00	2.782	–

Adaption of water temperature – according to ČSN EN 14825:2020, Annex F
- Low temperature application (reference water temperature 35 °C)
- Reference season „A"– average
- Condition D
- Variable water flow rate – secondary circuit

General formulas and derivation:

$t_{outlet,\,average} = t_{inlet,\,capacity\,test} + (t_{outlet,\,capacity\,test} - t_{inlet,\,capacity\,test}) \cdot CR$ [°C]

$t_{outlet,\,average} = t_{inlet,\,capacity\,test} + (\Delta t) \cdot CR$ [°C]

$t_{outlet,\,average} = t_{outlet,\,capacity\,test} - \Delta t + \Delta t \cdot CR$ [°C]

$t_{outlet,\,capacity\,test} = t_{outlet,\,average} + \Delta t - \Delta t \cdot CR$ [°C]

For variable flow:

$\Delta t = 5$

$CR \cdot \Delta t$ = Part load / Declared capacity · 5

$t_{outlet,\,capacity\,test,\,variable\,flow} = t_{outlet,\,average} + 5 -$ Part load / Declared capacity · 5

Measured data:

$t_{outlet,\,average}$	24.00	[°C]
Declared capacity	5.564	[kW]
Declared capacity standard rating condition A7/W35	-	[kW]
Part load	1.68	[kW]

Calculation of water temperature

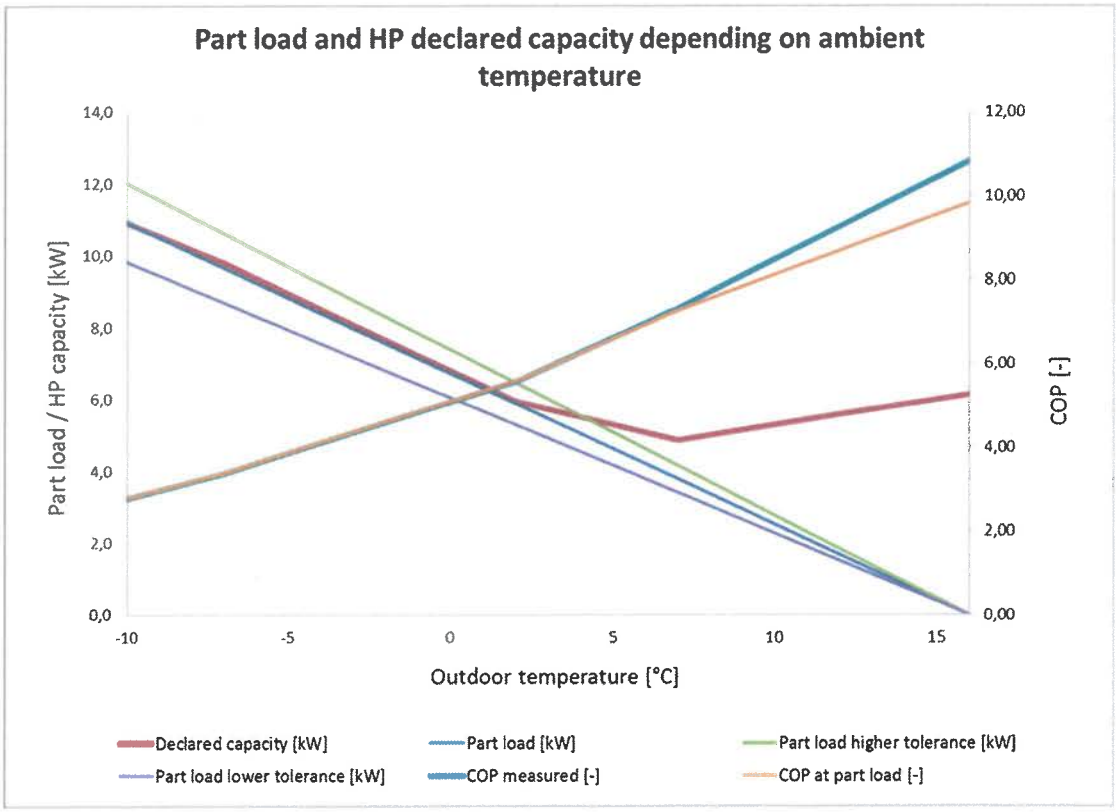
$t_{outlet,\,capacity\,test,\,fixed\,flow} = 24 + 5 - 1.68 / 5.564 \cdot 5 = 27.49$ [°C]

Calculation SCOP, $SCOP_{on}$, $SCOP_{net}$
(Heat pump **x-change dynamic pro ac 10 AW E**)
- Low temperature application (reference water temperature 35 °C)
- Reference heating season „A" – average

	Bin	Outdoor temp. (dry bulb)	Hours	Part load ratio	Heat load	Capacity of HP	Heat load covered by heat pump	Resistive heat elbu (Tj)	Annual resistive heat	COPbin (Tj)	Annual heating demand	Annual power input including electric back up heating	Net annual heating capacity	Net annual power input without electric back up heating
	j	T_j	h_j		$P_{h(Tj)}$			$elbu_{(Tj)}$	h_j x $elbu_{(Tj)}$	COPbin (Tj)	h_j x $P_{h(Tj)}$		h_j × ($P_{h(Tj)}$ - $elbu_{(Tj)}$)	
	[–]	[°C]	[h]	[%]	[kW]	[kW]	[kW]	[kW]	[kWh]	[–]	[kWh]	[kWh]	[kWh]	[kWh]
TOL(E), Tbiv(F)	**21**	**-10**	**1**	**100.00**	**10.92**	**10.92**	**10.92**	**0.00**	**0.00**	**2.78**	**11**	**4**	**11**	**4**
	22	-9	25	96.15	10.50	10.55	10.50	0.00	0.00	2.98	263	88	263	88
	23	-8	23	92.31	10.08	10.17	10.08	0.00	0.00	3.18	232	73	232	73
A	**24**	**-7**	**24**	**88.46**	**9.66**	**9.80**	**9.66**	**0.00**	**0.00**	**3.38**	**232**	**69**	**232**	**69**
	25	-6	27	84.62	9.24	9.37	9.24	0.00	0.00	3.62	250	69	250	69
	26	-5	68	80.77	8.82	8.94	8.82	0.00	0.00	3.87	600	155	600	155
	27	-4	91	76.92	8.40	8.51	8.40	0.00	0.00	4.11	765	186	765	186
	28	-3	89	73.08	7.98	8.08	7.98	0.00	0.00	4.35	710	163	710	163
	29	-2	165	69.23	7.56	7.65	7.56	0.00	0.00	4.60	1248	272	1248	272
	30	-1	173	65.38	7.14	7.23	7.14	0.00	0.00	4.84	1236	255	1236	255
	31	0	240	61.54	6.72	6.80	6.72	0.00	0.00	5.08	1613	317	1613	317
	32	1	280	57.69	6.30	6.37	6.30	0.00	0.00	5.33	1765	331	1765	331
B	**33**	**2**	**320**	**53.85**	**5.88**	**5.94**	**5.88**	**0.00**	**0.00**	**5.57**	**1882**	**338**	**1882**	**338**
	34	3	357	50.00	5.46	5.72	5.46	0.00	0.00	5.91	1950	330	1950	330
	35	4	356	46.15	5.04	5.51	5.04	0.00	0.00	6.25	1795	287	1795	287
	36	5	303	42.31	4.62	5.29	4.62	0.00	0.00	6.58	1400	213	1400	213
	37	6	330	38.46	4.20	5.07	4.20	0.00	0.00	6.92	1387	200	1387	200
C	**38**	**7**	**326**	**34.62**	**3.78**	**4.85**	**3.78**	**0.00**	**0.00**	**7.26**	**1233**	**170**	**1233**	**170**
	39	8	348	30.77	3.36	5.00	3.36	0.00	0.00	7.55	1170	155	1170	155
	40	9	335	26.92	2.94	5.14	2.94	0.00	0.00	7.83	985	126	985	126
	41	10	315	23.08	2.52	5.28	2.52	0.00	0.00	8.12	794	98	794	98
	42	11	215	19.23	2.10	5.42	2.10	0.00	0.00	8.40	452	54	452	54
D	**43**	**12**	**169**	**15.38**	**1.68**	**5.56**	**1.68**	**0.00**	**0.00**	**8.69**	**284**	**33**	**284**	**33**
	44	13	151	11.54	1.26	5.71	1.26	0.00	0.00	8.98	190	21	190	21
	45	14	105	7.69	0.84	5.85	0.84	0.00	0.00	9.26	88	10	88	10
	46	15	74	3.85	0.42	5.99	0.42	0.00	0.00	9.55	31	3	31	3
		Σ	4910							Σ	22565	4020	22565	4020

SCOPon	5.61	SCOPnet	5.61
		SCOP	**5.61**

Power diagram (Heat pump **x-change dynamic pro ac 10 AW E**)
- Low temperature application (reference water temperature 35 °C)
- Reference heating season „A" – average



c) Seasonal performance tests and SCOP calculation – Medium temperature application for reference heating seasons:

„A" = average (reference water temperature 55 °C, reference design conditions for heating Tdesignh = -10 °C)
„W" = warmer (reference water temperature 55 °C, reference design conditions for heating Tdesignh = +2 °C)
„C" = colder (reference water temperature 55 °C, reference design conditions for heating Tdesignh = -22 °C)

Model	Heat pump **x-change dynamic pro ac 10 AW E**
Design	Air / Water – monobloc

Conditions specification according to ČSN EN 14825:2020	Temperature application	**Medium** (reference water temperature 55 °C)
	Reference heating season	**A, W, C**
	Outlet water temperature - indoor heat exchanger	Variable
	Compressor speed control	Variable
	Water flow rate – primary circuit	—
	Water flow rate – secondary circuit	Variable

Seasonal space heating energy efficiency	Heating	Average	**η_s / A**	**152.1**	%
		Warmer	η_s / W	187.0 (not tested)	%
		Colder	η_s / C	136.1 (not tested)	%

Seasonal efficiency according to ČSN EN 14825:2020	Heating	Average	**SCOP / A**	**3.88**	–
		Warmer	SCOP / W	4.75 (not tested)	–
		Colder	SCOP / C	3.48 (not tested)	–

Function	Cooling			Yes	
	Heating	Yes	Reference heating season	Average	Yes
				Warmer (if designated)	Yes
				Colder (if designated)	Yes

Full heating load	Cooling		$P_{designc}$	–	kW
	Heating	Average	$P_{designh}$	**10.60**	kW
		Warmer	$P_{designh}$	**10.19**	kW
		Colder	$P_{designh}$	**11.11**	kW

Bivalent temperatures	Heating	Average	$T_{bivalent}$	-10	°C
		Warmer	$T_{bivalent}$	2	°C
		Colder	$T_{bivalent}$	-16	°C

Operation limit temperatures	Heating	Average	TOL	-10	°C
		Warmer	TOL	2	°C
		Colder	TOL	-18	°C

Seasonal power consumption according to ČSN EN 14825:2020	Cooling		Q_{CE}	–	kWh
	Heating	Average	Q_{HE}/A	5651	kWh
		Warmer	Q_{HE}/W	2866 (not tested)	kWh
		Colder	Q_{HE}/C	7875 (not tested)	kWh

Modes other than „active mode"	Off mode	P_{OFF}	17.1	W
	Thermostat off mode	P_{TO}	17.0	W
	Standby mode	P_{SB}	17.1	W
	Crankcase heater mode	P_{CK}	0.0	W

(Not tested): The technical data were declared by the Manufacturer and were not tested by the Testing Laboratory.

Calculation of SCOP according to ČSN EN 14825:2020:

Number of hours used for calculation of reference SCOP (Annex B – Table B.2, B.3)
- For reversible heat pumps and reference heating season „A" = average

H_{HE}	2066	[h]
H_{TO}	178	[h]
H_{SB}	0	[h]
H_{CK}	178	[h]
H_{OFF}	0	[h]

Measured data:

P_{TO}	0.0170	[kW]
P_{SB}	0.0171	[kW]
P_{CK}	0.0000	[kW]
P_{OFF}	0.0171	[kW]
$P_{designh}$	10.60	[kW]
$SCOP_{ON}$	3.88	[–]

Coefficient and correction:

F(1)	3	[%]
F(2)	0	[%]
CC	2.5	[–]

Calculation of SCOP:

7.3 Calculation of the reference annual heating demand (Q_H)

$Q_H = P_{designh} \cdot H_{HE}$ [kWh]

$Q_H = 10.6 \cdot 2066 = 21906$ [kWh]

7.4 Calculation of the annual electricity consumption (Q_{HE})

$Q_{HE} = Q_H / SCOP_{on} + H_{TO} \cdot P_{TO} + H_{SB} \cdot P_{SB} + H_{CK} \cdot P_{CK} + H_{OFF} \cdot P_{OFF}$ [kWh]

$Q_{HE} = 21906 / 3.88 + 178 \cdot 0.017 + 0 \cdot 0.0171 + 178 \cdot 0 + 0 \cdot 0.0171 = 5651$ [kWh]

7.2 General formula for calculation of reference SCOP

$SCOP = Q_H / Q_{HE}$ [–]

$SCOP = 21906 / 5651 = 3.88$ [–]

7.1 Calculation of the seasonal space heating efficiency η_s

$\Sigma F(i) = F(1) + F(2)$ [–]

$\Sigma F = 0.03 + 0 = 0.03$ [–]

$\eta_s = 1 / CC \cdot SCOP - \Sigma F(i)$ [–]

$\eta_s (A) = (1 / 2.5) * 3.88 - 0.03 = 1.521$ [–]

Test results for single part load conditions

Measurement results: Heat pump **x-change dynamic pro ac 10 AW E**

Test number		23	24	25
Temperature level		Medium temperature application (reference water temperature 55 °C)		
Reference heating season		„A" = average ($T_{designh}$ = -10 °C)		
Assessment condition		**A**	**B**	**C**
Specification of the assessment condition*		**A-7/W52**	**A2/W42**	**A7/W37.57**
Date of testing		**2021-02-16**	**2021-02-18**	**2021-02-24**
Transient test procedure	YES / NO	NO	NO	NO
Average defrost time of 1 cycle	[min]	–	–	–
Average time of 1 cycle	[min]	–	–	–
Calculation time	[min]	70.0	70.0	70.0
Output heating water – temperature calculation	[°C]	51.98	42.01	37.58
Input heating water – temperature calculation	[°C]	43.99	33.97	31.21
Output heating water temperature	[°C]	51.98	42.01	37.58
Input heating water temperature	[°C]	43.99	33.97	31.21
Air temperature – dry bulb temperature	[°C]	-7.00	2.02	7.01
Air temperature – wet bulb temperature	[°C]	-8.00	1.03	6.03
Relative humidity	[%]	75.00	84.00	86.90
Barometric pressure	[kPa]	98.963	98.935	100.513
Ambient temperature	[°C]	-7.11	2.07	7.07
Secondary circuit pressure difference	[kPa]	13.547	10.841	10.842
Efficiency of the secondary liquid pump	[–]	0.162	0.137	0.136
Volume flow rate of heating water	[$m^3 \cdot h^{-1}$]	1.0345	0.6280	0.6259
Density of heating water	[$kg \cdot m^{-3}$]	987.2	991.4	993.1
Specific heat capacity of heating water	[$kJ \cdot kg^{-1} \cdot K^{-1}$]	4.180	4.170	4.180
Voltage	[V]	399.65	399.97	400.06
Total current	[A]	25.77	9.90	6.50
Overall power input	[kW]	4.466	1.486	0.909
Capacity correction of sec. liquid pump	[W]	20.11	11.957	11.926
Power input correction of sec. liquid pump	[W]	24.00	13.85	13.81
Heating capacity – heating water	[kW]	9.469	5.802	4.591
Corrected heating capacity – heating water	**[kW]**	9.449	5.790	4.579
Uncertainty of corrected heating capacity	[kW]	± 0.085	± 0.052	± 0.052
Effective electric power input	**[kW]**	4.442	1.472	0.895
COP	**[–]**	2.127	3.933	5.118
Uncertainty of COP	[–]	± 0.019	± 0.036	± 0.058
Control settings	**[rps]**	72	30	20
Circulation pump settings – heating water	[%]	55	45	45

* Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Test results for single part load conditions

Measurement results: Heat pump **x-change dynamic pro ac 10 AW E**

Test number		**26**	**27**
Temperature level		Medium temperature application (reference water temperature 55 °C)	
Reference heating season		„A" = average ($T_{designh}$ = -10 °C)	
Assessment condition		**D**	**TOL (E), Tbiv (F)**
Specification of the assessment condition*		**A12/W35.57**	**A-10/W55**
Date of testing		**2021-02-24**	**2021-02-16**
Transient test procedure	YES / NO	NO	NO
Average defrost time of 1 cycle	[min]	–	–
Average time of 1 cycle	[min]	–	–
Calculation time	[min]	70.0	70.0
Output heating water – temperature calculation	[°C]	35.55	54.98
Input heating water – temperature calculation	[°C]	28.13	47.00
Output heating water temperature	[°C]	35.55	54.98
Input heating water temperature	[°C]	28.13	47.00
Air temperature – dry bulb temperature	[°C]	12.00	-10.01
Air temperature – wet bulb temperature	[°C]	11.01	-10.95
Relative humidity	[%]	89.01	71.29
Barometric pressure	[kPa]	100.368	99.141
Ambient temperature	[°C]	12.05	-9.90
Secondary circuit pressure difference	[kPa]	10.849	14.025
Efficiency of the secondary liquid pump	[–]	0.136	0.170
Volume flow rate of heating water	[$m^3 \cdot h^{-1}$]	0.6252	1.1644
Density of heating water	[$kg \cdot m^{-3}$]	993.8	985.8
Specific heat capacity of heating water	[$kJ \cdot kg^{-1} \cdot K^{-1}$]	4.180	4.180
Voltage	[V]	399.97	399.10
Total current	[A]	6.00	33.44
Overall power input	[kW]	0.815	6.111
Capacity correction of sec. liquid pump	[W]	11.922	22.114
Power input correction of sec. liquid pump	[W]	13.81	26.65
Heating capacity – heating water	[kW]	5.353	10.625
Corrected heating capacity – heating water	**[kW]**	**5.341**	**10.603**
Uncertainty of corrected heating capacity	[kW]	± 0.052	± 0.096
Effective electric power input	**[kW]**	**0.801**	**6.085**
COP	**[–]**	**6.670**	**1.743**
Uncertainty of COP	[–]	± 0.065	± 0.016
Control settings	**[rps]**	**20**	**92**
Circulation pump settings – heating water	[%]	42	58

* Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Test results for single part load conditions

Measurement results: Heat pump **x-change dynamic pro ac 10 AW E**

Test number		28	29	30
Temperature level		Medium temperature application (reference water temperature 55 °C)		
Reference heating season		„W" = warmer ($T_{designh}$ = 2°C)	„C" = colder ($T_{designh}$ = -22 °C)	
Assessment condition		**B, Tbiv (F), TOL (E)**	**TOL (E)**	**Tbiv (F)**
Specification of the assessment condition*		**A2/W55**	**A-18/W51.57**	**A-16/W49.86**
Date of testing		**2021-02-18**	**2021-02-22**	**2021-02-22**
Transient test procedure	YES / NO	NO	NO	NO
Average defrost time of 1 cycle	[min]	–	–	–
Average time of 1 cycle	[min]	–	–	–
Calculation time	[min]	70.0	70.0	70.0
Output heating water – temperature calculation	[°C]	54.96	51.56	49.86
Input heating water – temperature calculation	[°C]	46.99	43.57	41.87
Output heating water temperature	[°C]	54.96	51.56	49.86
Input heating water temperature	[°C]	46.99	43.57	41.87
Air temperature – dry bulb temperature	[°C]	2.02	-18.01	-16.01
Air temperature – wet bulb temperature	[°C]	1.03	-18.73	-16.83
Relative humidity	[%]	83.99	60.78	61.75
Barometric pressure	[kPa]	98.862	99.479	99.545
Ambient temperature	[°C]	2.05	-17.84	-15.67
Secondary circuit pressure difference	[kPa]	16.368	10.319	13.065
Efficiency of the secondary liquid pump	[–]	0.177	0.141	0.160
Volume flow rate of heating water	[$m^3 \cdot h^{-1}$]	1.1207	0.7742	1.0235
Density of heating water	[$kg \cdot m^{-3}$]	985.8	987.4	988.2
Specific heat capacity of heating water	[$kJ \cdot kg^{-1} \cdot K^{-1}$]	4.180	4.180	4.180
Voltage	[V]	399.42	400.08	399.25
Total current	[A]	23.60	24.54	30.38
Overall power input	[kW]	4.017	4.342	5.531
Capacity correction of sec. liquid pump	[W]	23.684	13.542	19.511
Power input correction of sec. liquid pump	[W]	28.78	15.76	23.22
Heating capacity – heating water	[kW]	10.214	7.082	9.378
Corrected heating capacity – heating water	**[kW]**	**10.190**	**7.068**	**9.359**
Uncertainty of corrected heating capacity	[kW]	± 0.092	± 0.064	± 0.084
Effective electric power input	**[kW]**	**3.989**	**4.326**	**5.508**
COP	**[–]**	**2.555**	**1.634**	**1.699**
Uncertainty of COP	[–]	± 0.023	± 0.015	± 0.015
Control settings	**[rps]**	**30**	**75**	**94**
Circulation pump settings – heating water	[%]	45	46	54

* Comment to abbreviated marking: e.g. A7/W35
A (air) 7 (input air, dry-bulb temperature in °C) / W (water), 35 (output heating water temperature in °C)

Data for SCOP calculation (Heat pump **x-change dynamic pro ac 10 AW E**)
- Medium temperature application (reference water temperature 55 °C)
- Reference heating season „A" – average

	Outdoor heat exchanger	Indoor heat exchanger	Part load ratio	Part load	DC Declared capacity	COPd at declared capacity	Cdh degradation coefficient	CR	COPbin (Tj)	Eff. power input of compressor off state
	Outdoor air inlet	Outlet water temperature								
	[°C]	[°C]	[%]	[kW]	[kW]	[–]	[–]	[–]	[–]	[kW]
A	-7	52.00	88.46	9.38	9.449	2.127	0.900	1.00	2.127	–
B	2	42.00	53.85	5.71	5.780	3.933	0.900	1.00	3.933	–
C	7	37.59	34.62	3.67	4.579	5.118	0.981	0.80	5.094	0.0170
D	12	35.56	15.38	1.63	5.341	6.670	0.979	0.31	6.363	0.0170
TOL (E)	-10	55.00	100.00	10.60	10.603	1.743	0.900	1.00	1.743	–
Tbiv (F)	-10	55.00	100.00	10.60	10.603	1.743	0.900	1.00	1.743	–

Adaption of water temperature – according to ČSN EN 14825:2020, Annex F
- Medium temperature application (reference water temperature 55 °C)
- Reference season „A"– average
- Condition D
- Variable water flow rate – secondary circuit

General formulas and derivation:

$t_{outlet,\,average} = t_{inlet,\,capacity\,test} + (t_{outlet,\,capacity\,test} - t_{inlet,\,capacity\,test}) \cdot CR$ [°C]

$t_{outlet,\,average} = t_{inlet,\,capacity\,test} + (\Delta t) \cdot CR$ [°C]

$t_{outlet,\,average} = t_{outlet,\,capacity\,test} - \Delta t + \Delta t \cdot CR$ [°C]

$t_{outlet,\,capacity\,test} = t_{outlet,\,average} + \Delta t - \Delta t \cdot CR$ [°C]

For variable flow:

$\Delta t = 8$

$CR \cdot \Delta t$ = Part load / Declared capacity · 8

$t_{outlet,\,capacity\,test,\,variable\,flow} = t_{outlet,\,average} + 8$ - Part load / Declared capacity · 8

Measured data:

$t_{outlet,\,average}$	30.00	[°C]
Declared capacity	5.341	[kW]
Declared capacity $_{standard\,rating\,condition\,A7/W35}$	-	[kW]
Part load	1.63	[kW]

Calculation of water temperature

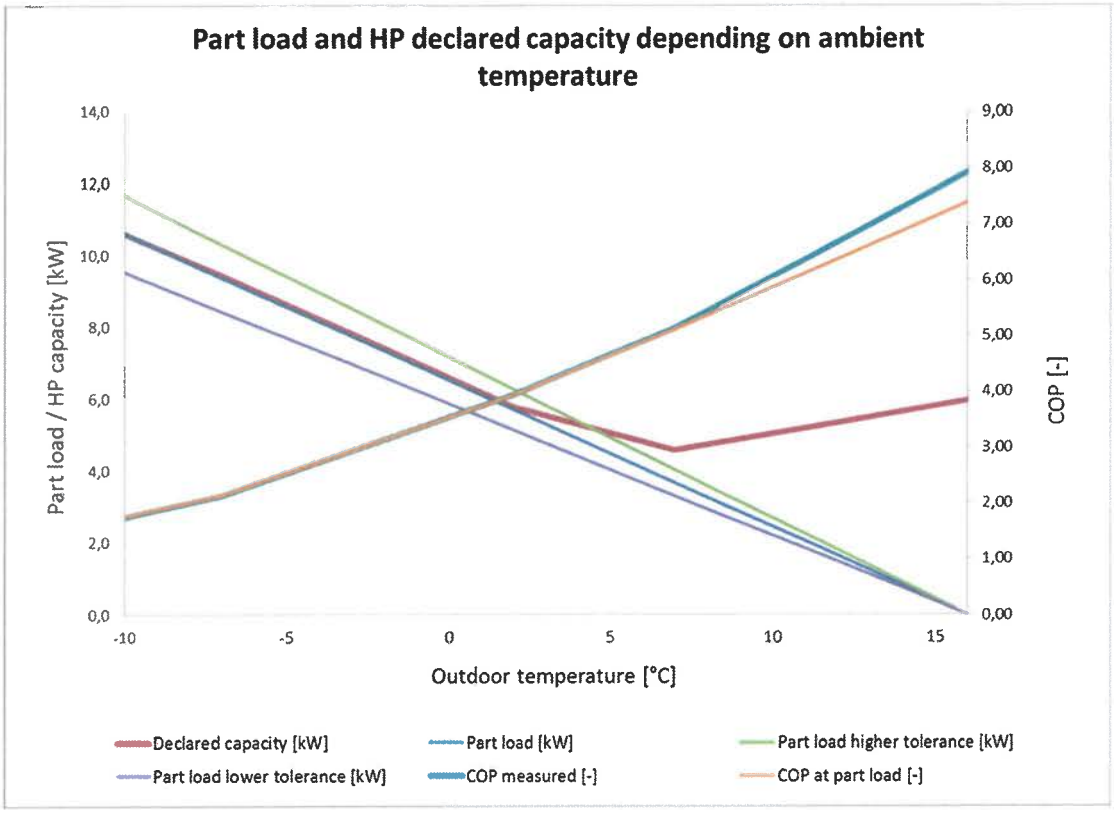
$t_{outlet,\,capacity\,test,\,fixed\,flow} = 30 + 8 - 1.63 / 5.341 \cdot 8 = 35.56$ [°C]

Calculation SCOP, $SCOP_{on}$, $SCOP_{net}$
(Heat pump **x-change dynamic pro ac 10 AW E**)
- Medium temperature application (reference water temperature 55 °C)
- Reference heating season „A" – average

	Bin j [–]	Outdoor temp. (dry bulb) T_j [°C]	Hours h_j [h]	Part load ratio [%]	Heat load $P_{h(Tj)}$ [kW]	Capacity of HP [kW]	Heat load covered by heat pump [kW]	Resistive heat elbu (Tj) $elbu_{(Tj)}$ [kW]	Annual resistive heat h_j x $elbu_{(Tj)}$ [kWh]	COPbin (Tj) COPbin (Tj) [–]	Annual heating demand h_j x $P_{h(Tj)}$ [kWh]	Annual power input including electric back up heating [kWh]	Net annual heating capacity h_j × ($P_{h(Tj)}$ - $elbu_{(Tj)}$) [kWh]	Net annual power input without electric back up heating [kWh]
TOL(E), Tbiv(F)	**21**	**-10**	**1**	**100.00**	**10.60**	**10.60**	**10.60**	**0.00**	**0.00**	**1.74**	**11**	**6**	**11**	**6**
	22	-9	25	96.15	10.20	10.22	10.20	0.00	0.00	1.87	255	136	255	136
	23	-8	23	92.31	9.79	9.83	9.79	0.00	0.00	2.00	225	113	225	113
A	**24**	**-7**	**24**	**88.46**	**9.38**	**9.45**	**9.38**	**0.00**	**0.00**	**2.13**	**225**	**106**	**225**	**106**
	25	-6	27	84.62	8.97	9.04	8.97	0.00	0.00	2.33	242	104	242	104
	26	-5	68	80.77	8.56	8.63	8.56	0.00	0.00	2.53	582	230	582	230
	27	-4	91	76.92	8.16	8.23	8.16	0.00	0.00	2.73	742	272	742	272
	28	-3	89	73.08	7.75	7.82	7.75	0.00	0.00	2.93	690	235	690	235
	29	-2	165	69.23	7.34	7.41	7.34	0.00	0.00	3.13	1211	387	1211	387
	30	-1	173	65.38	6.93	7.00	6.93	0.00	0.00	3.33	1199	360	1199	360
	31	0	240	61.54	6.52	6.60	6.52	0.00	0.00	3.53	1566	443	1566	443
	32	1	280	57.69	6.12	6.19	6.12	0.00	0.00	3.73	1713	459	1713	459
B	**33**	**2**	**320**	**53.85**	**5.71**	**5.78**	**5.71**	**0.00**	**0.00**	**3.93**	**1827**	**465**	**1827**	**465**
	34	3	357	50.00	5.30	5.54	5.30	0.00	0.00	4.17	1893	454	1893	454
	35	4	356	46.15	4.89	5.30	4.89	0.00	0.00	4.40	1742	396	1742	396
	36	5	303	42.31	4.49	5.06	4.49	0.00	0.00	4.63	1359	294	1359	294
	37	6	330	38.46	4.08	4.82	4.08	0.00	0.00	4.86	1346	277	1346	277
C	**38**	**7**	**326**	**34.62**	**3.67**	**4.58**	**3.67**	**0.00**	**0.00**	**5.09**	**1197**	**235**	**1197**	**235**
	39	8	348	30.77	3.26	4.73	3.26	0.00	0.00	5.35	1135	212	1135	212
	40	9	335	26.92	2.85	4.88	2.85	0.00	0.00	5.60	956	171	956	171
	41	10	315	23.08	2.45	5.04	2.45	0.00	0.00	5.86	771	132	771	132
	42	11	215	19.23	2.04	5.19	2.04	0.00	0.00	6.11	438	72	438	72
D	**43**	**12**	**169**	**15.38**	**1.63**	**5.34**	**1.63**	**0.00**	**0.00**	**6.36**	**276**	**43**	**276**	**43**
	44	13	151	11.54	1.22	5.49	1.22	0.00	0.00	6.62	185	28	185	28
	45	14	105	7.69	0.82	5.65	0.82	0.00	0.00	6.87	86	12	86	12
	46	15	74	3.85	0.41	5.80	0.41	0.00	0.00	7.12	30	4	30	4
		Σ	4910							Σ	21902	5647	21902	5647

SCOPon	3.88	SCOPnet	3.88
		SCOP	**3.88**

Power diagram (Heat pump **x-change dynamic pro ac 10 AW E**)
- Medium temperature application (reference water temperature 55 °C)
- Reference heating season „A" – average

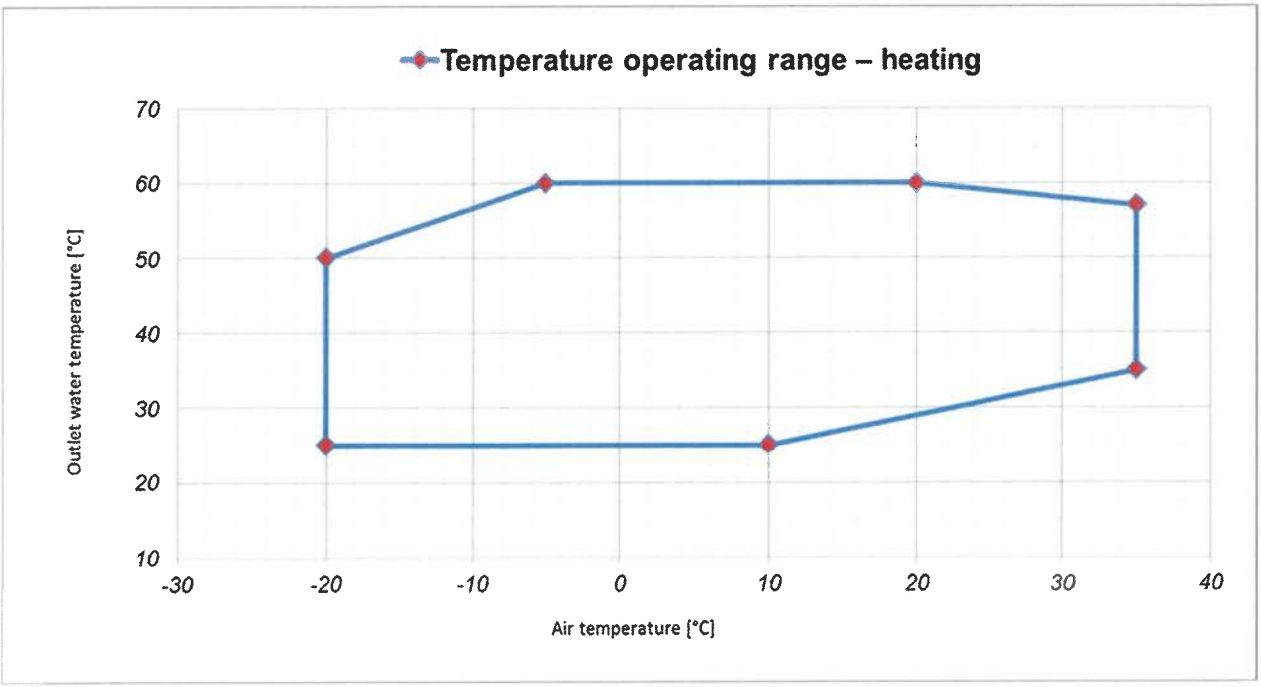


Accredited test number:	**T 037***	Test title:	**Tests of leakage, pressure resistance, thermal and technical parameters, combustion efficiency, safety functions**

Testing method	ČSN EN 14511-2:2019, ČSN EN 14511-3:2019, ČSN EN 14511-4:2019
Sample tested	Heat pump **x-change dynamic pro ac 10 AW E**
Measuring equipment used	See chapter II.

Place of testing:	at the Engineering Test Institute	☒	at the Manufacturer´s premises	☐	at the Customer´s premises	☐	*other:*

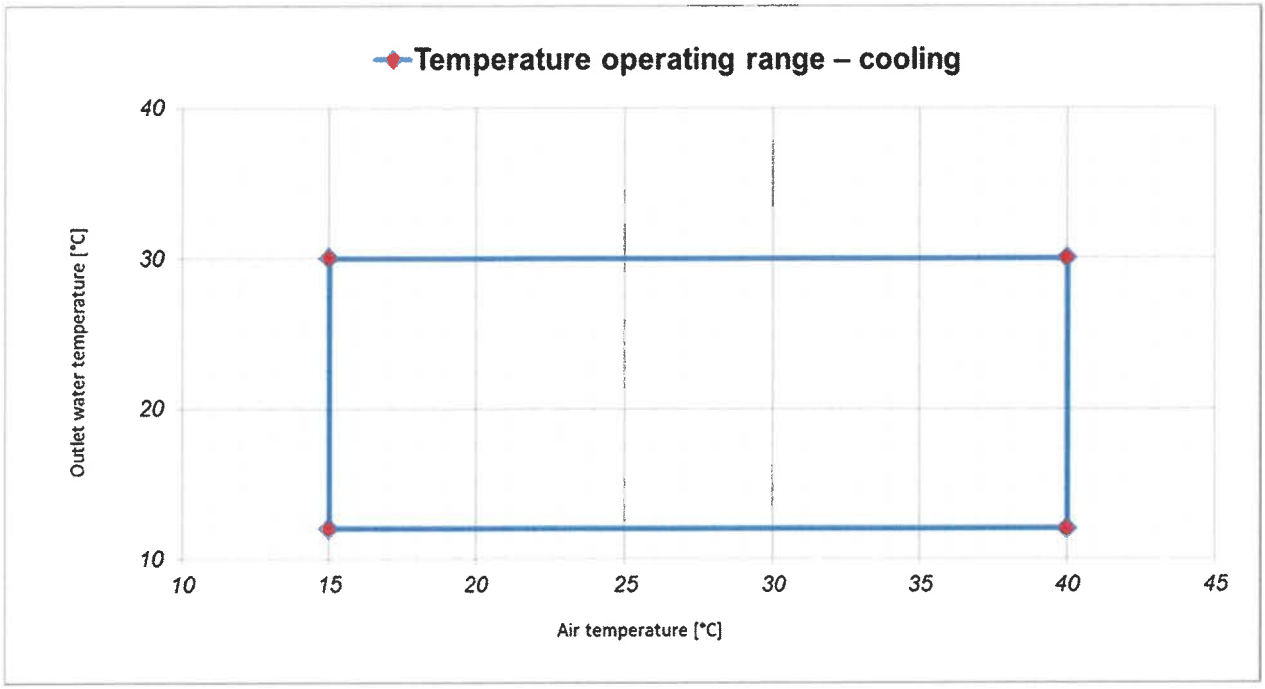
1) Temperature operating range – heating



Test point	Inlet air dry bulb temperature [°C]		Outlet heating water temperature [°C]		Water flow rate in condenser [m³/h]	Note
1.	A	-20	W	25	Minimum	Minimum water flow rate: **0.6280 m³·h⁻¹** Maximum water flow rate: **2.0574 m³·h⁻¹**
2.	A	-20	W	50	Minimum	

Heat pump **x-change dynamic pro ac 10 AW E** is fully operational in the temperature operating range.

1) Temperature operating range – cooling



Test point	Inlet air dry bulb temperature [°C]		Outlet heating water temperature [°C]		Water flow rate in condenser [m³/h]	Note
1.	A	15	W	12	Minimum	Minimum water flow rate: **0.8450 $m^3 \cdot h^{-1}$** Maximum water flow rate: **1.8850 $m^3 \cdot h^{-1}$**
2.	A	40	W	30	Maximum	

Heat pump **x-change dynamic pro ac 10 AW E** is fully operational in the temperature operating range.

Starting and operating tests (heating mode)

Test according to Article 4.2.1.2 of ČSN EN 14511-4:2019

Operational requirements conditions for air-to-water units					
Test point	**Inlet temperature at outdoor heat exchanger (°C)**	**Inlet temperature at indoor heat exchanger (°C)**	**Water flow rate at indoor heat exchanger**	**Voltage (V)**	**Test result**
1 (starting)	Lower limit of use	Lower limit of use	minimum	Rated voltage	+
2 (operating)	Lower limit of use	Upper limit of use	minimum	Rated voltage	+

Evaluation:
+... For a starting test, the unit shall start and operate during 15 min, for an operating test, the unit shall be able to operate during 1 h, without tripping of the motor overload protective devices.
–... The unit did not fulfill test requirements.
0... The requirement does not apply to the product concerned.
x... Test was not required.

Starting and operating tests (cooling mode)

Test according to Article 4.2.1.3 of ČSN EN 14511-4:2019

Operational requirements conditions for air-to-water units					
Test point	**Inlet temperature at outdoor heat exchanger (°C)**	**Inlet temperature at indoor heat exchanger (°C)**	**Water flow rate at indoor heat exchanger**	**Voltage (V)**	**Test result**
1 (starting)	Lower limit of use	Lower limit of use	minimum	Rated voltage	+
2 (starting)	Upper limit of use	Upper limit of use	maximum	Rated voltage	+

Evaluation:
+... For a starting test, the unit shall start and operate during 15 min, without tripping of the motor overload protective devices.
–... The unit did not fulfill test requirements.
0... The requirement does not apply to the product concerned.
x... Test was not required.

1) Outside the operating range

Requirements for outside the operating range	Requirement specification	Test result	Note
If operating outside the temperature range can cause damage to the unit, it shall be provided with safety devices which ensure that the unit suffers no damage when the operating limits of use indicated by the manufacturer are exceeded and remains capable of operating when coming back within these limits. A safety device that does not automatically reset may trip provided that a warning device is fitted. The manufacturer shall indicate any safety devices provided and their operating conditions according to 7.2.3.	ČSN EN 14511-4:2019 Art. 4.3	x	–

Evaluation:
+... The unit fulfills test requirements.
–... The unit did not fulfill test requirements.
0... The requirement does not apply to the product concerned.
x... Test was not required.

1) Freeze-up test in cooling mode

Air-to-air and water(brine)-to-air units

Required operating conditions	Test result	Note
Test according to Article 4.4 of ČSN EN 14511-4:2019	0	–

Evaluation:
+... After the unit has operated for 6 hours or after the last freeze up cycle has been completed after these 6 h, the following requirements shall be fulfilled:
- no ice shall have accumulated on the evaporator;
- no ice shall drip from the unit;
- no water shall drip or be blown off the unit into the room.

–... The unit did not fulfill test requirements.

0... The requirement does not apply to the product concerned.

x... Test was not required.

2) Shutting off the heat transfer medium flows

Required operating conditions	Test result	Note
Test for section a) Art. 4.5 ČSN EN 14511-4:2019 – heating	+	flow alarm in the secondary circuit
Test for section a) Art. 4.5 ČSN EN 14511-4:2019 – cooling	+	flow alarm in the secondary circuit
Test for section b) Art. 4.5 ČSN EN 14511-4:2019 – heating	+	Error: low suction pressure following a decrease of pressure
Test for section b) Art. 4.5 ČSN EN 14511-4:2019 – cooling	+	Error: low suction pressure following a decrease of pressure
Test for section c) Art. 4.5 ČSN EN 14511-4:2019	0	–

Evaluation:
+... The unit shall remain capable of operating after restoration of the flow rates for 30 min once the compressor has restarted.

–... The unit did not fulfill test requirements.

0... The requirement does not apply to the product concerned.

x... Test was not required.

3) Complete power supply failure

Required operating conditions	Test result	Note
Test according to Article 4.6 of ČSN EN 14511-4:2019	+	–

Evaluation:
+... The unit has to restart automatically within 30 min. When manufacturer states that the unit does not automatically restart, fault detection is necessary. The unit is checked for any damage sustained during the test and if any safety devices have operated during the test.

–... The unit did not fulfill test requirements.

0... The requirement does not apply to the product concerned.

x... Test was not required.

4) Condensate draining and enclosure sweat test

Air-to-air and water(brine)-to-air units

Required operating conditions	Test result	Note
Test according to Article 4.7 of ČSN EN 14511-4:2019	0	–

Evaluation:
+... During the test of 4 hours no condensed water shall drip, run or blow off the unit except through the drain. For indoor units, drain holes shall be provided with suitable pipe connection, the minimum diameter of which shall be 12 mm.

–... The unit did not fulfill test requirements.

0... The requirement does not apply to the product concerned.

x... Test was not required.

IV. Test results – Out of accredited tests

SCOP calculations – *based on values provided by the customer*

Testing method: ČSN EN 14511-2:2019, ČSN EN 14511-3:2019, ČSN EN 14825:2020, EHPA Testing regulation – Testing of Air/Water Heat Pumps – Version 2.4a

Sample tested: Heat pump **x-change dynamic pro ac 10 AW E**

Data for SCOP calculation (Heat pump **x-change dynamic pro ac 10 AW E**)
- Low temperature application (reference water temperature 35 °C)
- Reference heating season „W" – warmer

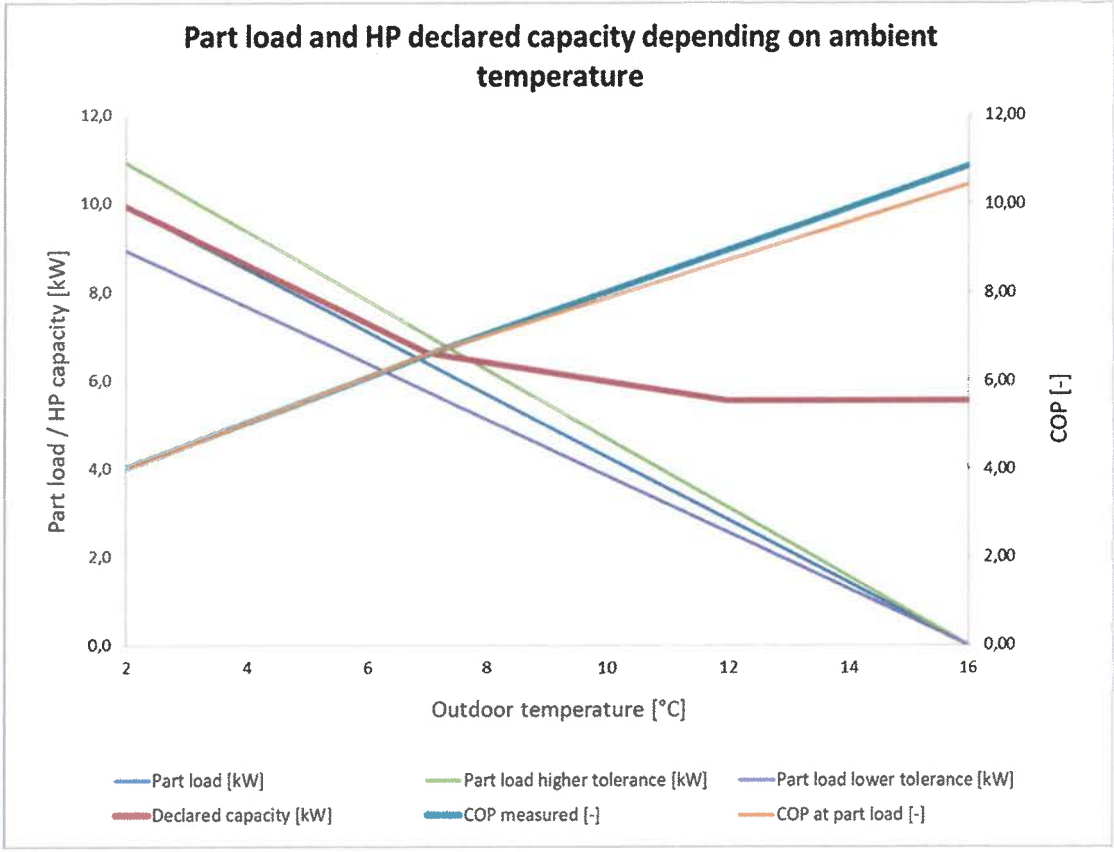
	Outdoor heat exchanger	Indoor heat exchanger	Part load ratio	Part load	DC Declared capacity	COPd at declared capacity	Cdh degradation coefficient	CR	COPbin (Tj)	Eff. power input of compressor off state
	Outdoor air inlet	Outlet water temperature								
	[°C]	[°C]	[%]	[kW]	[kW]	[–]	[–]	[–]	[–]	[kW]
A	–	–	–	–	–	–	–	–	–	–
B	2	35.00	100.00	9.93	9.932	3.999	0.900	1.00	3.999	–
C	7	31.00	64.29	6.38	6.620	6.590	0.900	1.00	6.590	–
D	12	28.44	28.57	2.84	5.540	8.950	0.973	0.51	8.722	0.0170
TOL (E)	2	35.00	100.00	9.93	9.932	3.999	0.900	1.00	3.999	–
Tbiv (F)	2	35.00	100.00	9.93	9.932	3.999	0.900	1.00	3.999	–

Calculation SCOP, $SCOP_{on}$, $SCOP_{net}$
(Heat pump **x-change dynamic pro ac 10 AW E**)
- Low temperature application (reference water temperature 35 °C)
- Reference heating season „W" – warmer

	Bin j [–]	Outdoor temp. (dry bulb) T_j [°C]	Hours h_j [h]	Part load ratio [%]	Heat load $P_{h(Tj)}$ [kW]	Capacity of HP [kW]	Heat load covered by heat pump [kW]	Resistive heat elbu (Tj) $elbu_{(Tj)}$ [kW]	Annual resistive heat h_j x $elbu_{(Tj)}$ [kWh]	COPbin (Tj) COPbin (Tj) [–]	Annual heating demand h_j x $P_{h(Tj)}$ [kWh]	Annual power input including electric back up heating [kWh]	Net annual heating capacity h_j x ($P_{h(Tj)}$ - $elbu_{(Tj)}$) [kWh]	Net annual power input without electric back up heating [kWh]
B, TOL(E), Tbiv(F)	**33**	**2**	**3**	**100.00**	**9.93**	**9.93**	**9.93**	**0.00**	**0.00**	**4.00**	**30**	**7**	**30**	**7**
	34	3	22	92.86	9.22	9.27	9.22	0.00	0.00	4.52	203	45	203	45
	35	4	63	85.71	8.51	8.61	8.51	0.00	0.00	5.04	536	107	536	107
	36	5	63	78.57	7.80	7.94	7.80	0.00	0.00	5.55	492	89	492	89
	37	6	175	71.43	7.09	7.28	7.09	0.00	0.00	6.07	1242	204	1242	204
C	**38**	**7**	**162**	**64.29**	**6.38**	**6.62**	**6.38**	**0.00**	**0.00**	**6.59**	**1034**	**157**	**1034**	**157**
	39	8	259	57.14	5.68	6.40	5.68	0.00	0.00	7.02	1470	210	1470	210
	40	9	360	50.00	4.97	6.19	4.97	0.00	0.00	7.44	1788	240	1788	240
	41	10	428	42.86	4.26	5.97	4.26	0.00	0.00	7.87	1822	232	1822	232
	42	11	430	35.71	3.55	5.76	3.55	0.00	0.00	8.30	1525	184	1525	184
D	**43**	**12**	**503**	**28.57**	**2.84**	**5.54**	**2.84**	**0.00**	**0.00**	**8.72**	**1427**	**164**	**1427**	**164**
	44	13	444	21.43	2.13	5.32	2.13	0.00	0.00	9.15	945	103	945	103
	45	14	384	14.29	1.42	5.11	1.42	0.00	0.00	9.57	545	57	545	57
	46	15	294	7.14	0.71	4.89	0.71	0.00	0.00	10.00	209	21	209	21
		Σ	3590							Σ	13267	1819	13267	1819

SCOPon	7.30	SCOPnet	7.30
		SCOP	**7.24**

Power diagram (Heat pump **x-change dynamic pro ac 10 AW E**)
- Low temperature application (reference water temperature 35 °C)
- Reference heating season „W" – warmer



Data for SCOP calculation (Heat pump **x-change dynamic pro ac 10 AW E**)
- Low temperature application (reference water temperature 35 °C)
- Reference heating season „C“ – colder

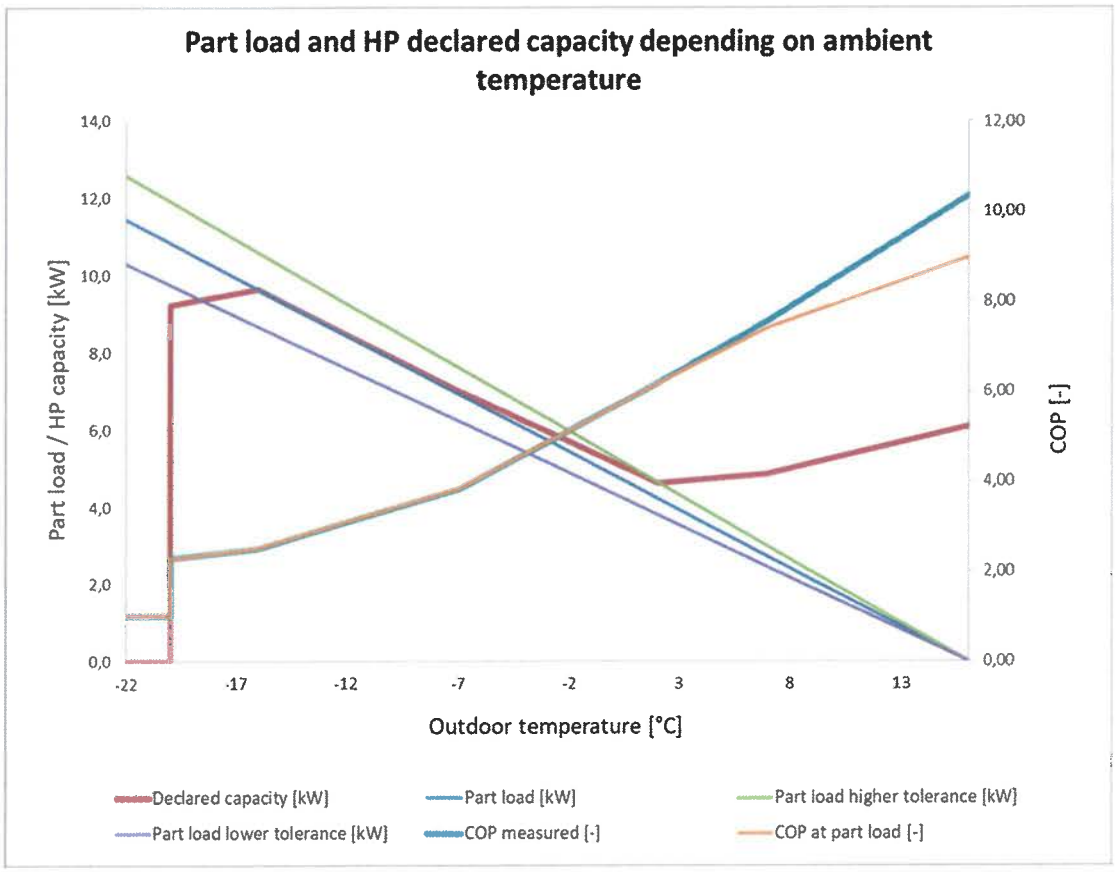
	Outdoor heat exchanger	Indoor heat exchanger	Part load ratio	Part load	DC Declared capacity	COPd at declared capacity	Cdh degradation coefficient	CR	COPbin (Tj)	Eff. power input of compressor off state
	Outdoor air inlet	Outlet water temperature								
	[°C]	[°C]	[%]	[kW]	[kW]	[–]	[–]	[–]	[–]	[kW]
A	-7	30.00	60.53	6.94	7.020	3.830	0.900	1.00	3.830	–
B	2	27.00	36.84	4.22	4.620	6.181	0.900	1.00	6.181	–
C	7	27.21	23.68	2.71	4.870	7.570	0.974	0.56	7.414	0.0170
D	12	27.91	10.53	1.21	5.550	9.120	0.972	0.22	8.287	0.0170
TOL (E)	-20	34.14	94.74	10.86	9.240	2.270	0.900	1.00	2.270	–
Tbiv (F)	-16	32.43	84.21	9.65	9.651	2.514	0.900	1.00	2.514	–
G	-15	32.00	81.58	9.35	9.359	2.660	0.900	1.00	2.660	–

	Bin	Outdoor temp. (dry bulb)	Hours	Part load ratio	Heat load	Capacity of HP	Heat load covered by heat pump	Resistive heat elbu (Tj)	Annual resistive heat	COPbin (Tj)	Annual heating demand	Annual power input including electric back up heating	Net annual heating capacity	Net annual power input without electric back up heating
	j	T_j	h_j		$P_{h(Tj)}$			$elbu_{(Tj)}$	h_j x $elbu_{(Tj)}$	COPbin (Tj)	h_j x $P_{h(Tj)}$		h_j × ($P_{h(Tj)}$ - $elbu_{(Tj)}$)	
	[–]	[°C]	[h]	[%]	[kW]	[kW]	[kW]	[kW]	[kWh]	[–]	[kWh]	[kWh]	[kWh]	[kWh]
	9	-22	1	100.00	11.46	0.00	0.00	11.46	11.46	1.00	11	11	0	0
	10	-21	6	97.37	11.16	0.00	0.00	11.16	66.95	1.00	67	67	0	0
TOL(E)	**11**	**-20**	**13**	**94.74**	**10.86**	**9.24**	**9.24**	**1.62**	**21.03**	**2.27**	**141**	**74**	**120**	**53**
	12	-19	17	92.11	10.56	9.34	9.34	1.21	20.62	2.33	179	89	159	68
	13	-18	19	89.47	10.25	9.45	9.45	0.81	15.37	2.39	195	90	179	75
	14	-17	26	86.84	9.95	9.55	9.55	0.40	10.51	2.45	259	112	248	101
Tbiv(F)	**15**	**-16**	**39**	**84.21**	**9.65**	**9.65**	**9.65**	**0.00**	**0.00**	**2.51**	**376**	**150**	**376**	**150**
G	**16**	**-15**	**41**	**81.58**	**9.35**	**9.36**	**9.35**	**0.00**	**0.00**	**2.66**	**383**	**144**	**383**	**144**
	17	-14	35	78.95	9.05	9.07	9.05	0.00	0.00	2.81	317	113	317	113
	18	-13	52	76.32	8.75	8.77	8.75	0.00	0.00	2.95	455	154	455	154
	19	-12	37	73.68	8.44	8.48	8.44	0.00	0.00	3.10	312	101	312	101
	20	-11	41	71.05	8.14	8.19	8.14	0.00	0.00	3.25	334	103	334	103
	21	-10	43	68.42	7.84	7.90	7.84	0.00	0.00	3.39	337	99	337	99
	22	-9	54	65.79	7.54	7.60	7.54	0.00	0.00	3.54	407	115	407	115
	23	-8	90	63.16	7.24	7.31	7.24	0.00	0.00	3.68	651	177	651	177
A	**24**	**-7**	**125**	**60.53**	**6.94**	**7.02**	**6.94**	**0.00**	**0.00**	**3.83**	**867**	**226**	**867**	**226**
	25	-6	169	57.89	6.64	6.75	6.64	0.00	0.00	4.09	1121	274	1121	274
	26	-5	195	55.26	6.33	6.49	6.33	0.00	0.00	4.35	1235	284	1235	284
	27	-4	278	52.63	6.03	6.22	6.03	0.00	0.00	4.61	1677	363	1677	363
	28	-3	306	50.00	5.73	5.95	5.73	0.00	0.00	4.87	1753	360	1753	360
	29	-2	454	47.37	5.43	5.69	5.43	0.00	0.00	5.14	2465	480	2465	480
	30	-1	385	44.74	5.13	5.42	5.13	0.00	0.00	5.40	1974	366	1974	366
	31	0	490	42.11	4.83	5.15	4.83	0.00	0.00	5.66	2364	418	2364	418
	32	1	533	39.47	4.52	4.89	4.52	0.00	0.00	5.92	2411	407	2411	407
B	**33**	**2**	**380**	**36.84**	**4.22**	**4.62**	**4.22**	**0.00**	**0.00**	**6.18**	**1604**	**260**	**1604**	**260**
	34	3	228	34.21	3.92	4.67	3.92	0.00	0.00	6.43	894	139	894	139
	35	4	261	31.58	3.62	4.72	3.62	0.00	0.00	6.67	945	142	945	142
	36	5	279	28.95	3.32	4.77	3.32	0.00	0.00	6.92	926	134	926	134
	37	6	229	26.32	3.02	4.82	3.02	0.00	0.00	7.17	691	96	691	96
C	**38**	**7**	**269**	**23.68**	**2.71**	**4.87**	**2.71**	**0.00**	**0.00**	**7.41**	**730**	**98**	**730**	**98**
	39	8	233	21.05	2.41	5.01	2.41	0.00	0.00	7.59	562	74	562	74
	40	9	230	18.42	2.11	5.14	2.11	0.00	0.00	7.76	486	63	486	63
	41	10	243	15.79	1.81	5.28	1.81	0.00	0.00	7.94	440	55	440	55
	42	11	191	13.16	1.51	5.41	1.51	0.00	0.00	8.11	288	36	288	36
D	**43**	**12**	**146**	**10.53**	**1.21**	**5.55**	**1.21**	**0.00**	**0.00**	**8.29**	**176**	**21**	**176**	**21**
	44	13	150	7.89	0.90	5.69	0.90	0.00	0.00	8.46	136	16	136	16

	45	14	97	5.26	0.60	5.82	0.60	0.00	0.00	8.64	59	7	59	7
	46	15	61	2.63	0.30	5.96	0.30	0.00	0.00	8.81	18	2	18	2
		Σ	6446							Σ	28248	5920	28102	5774

SCOPon	4.77	SCOPnet	4.87
		SCOP	**4.77**

Power diagram (Heat pump **x-change dynamic pro ac 10 AW E**)
- Low temperature application (reference water temperature 35 °C)
- Reference heating season „C" – colder



Data for SCOP calculation (Heat pump **x-change dynamic pro ac 10 AW E**)
- Medium temperature application (reference water temperature 55 °C)
- Reference heating season „W" – warmer

	Outdoor heat exchanger: Outdoor air inlet	Indoor heat exchanger: Outlet water temperature	Part load ratio	Part load	DC Declared capacity	COPd at declared capacity	Cdh degradation coefficient	CR	COPbin (Tj)	Eff. power input of compressor off state
	[°C]	[°C]	[%]	[kW]	[kW]	[–]	[–]	[–]	[–]	[kW]
A	–	–	–	–	–	–	–	–	–	–
B	2	55.00	100.00	10.19	10.190	2.555	0.900	1.00	2.555	–
C	7	46.00	64.29	6.55	6.700	4.160	0.900	1.00	4.160	–
D	12	37.60	28.57	2.91	5.290	6.020	0.981	0.55	5.926	0.0170
TOL (E)	2	55.00	100.00	10.19	10.190	2.555	0.900	1.00	2.555	–
Tbiv (F)	2	55.00	100.00	10.19	10.190	2.555	0.900	1.00	2.555	–

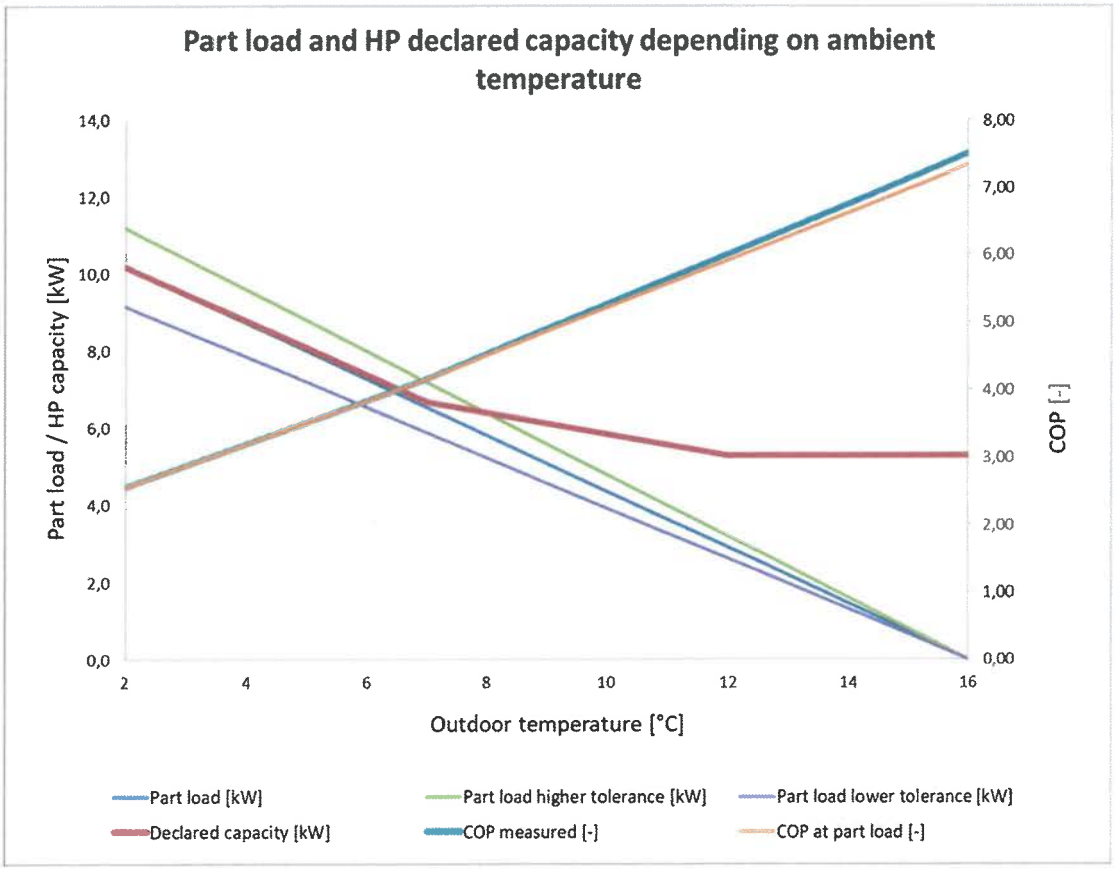
Calculation SCOP, $SCOP_{on}$, $SCOP_{net}$
(Heat pump **x-change dynamic pro ac 10 AW E**)
- Medium temperature application (reference water temperature 55 °C)
- Reference heating season „W" – warmer

	Bin j [–]	Outdoor temp. (dry bulb) T_j [°C]	Hours h_j [h]	Part load ratio [%]	Heat load $P_{h(Tj)}$ [kW]	Capacity of HP [kW]	Heat load covered by heat pump [kW]	Resistive heat elbu (Tj) $elbu_{(Tj)}$ [kW]	Annual resistive heat h_j x $elbu_{(Tj)}$ [kWh]	COPbin (Tj) COPbin (Tj) [–]	Annual heating demand h_j x $P_{h(Tj)}$ [kWh]	Annual power input including electric back up heating [kWh]	Net annual heating capacity h_j × ($P_{h(Tj)}$ - $elbu_{(Tj)}$) [kWh]	Net annual power input without electric back up heating [kWh]
B, TOL(E), Tbiv(F)	**33**	**2**	**3**	**100.00**	**10.19**	**10.19**	**10.19**	**0.00**	**0.00**	**2.56**	**31**	**12**	**31**	**12**
	34	3	22	92.86	9.46	9.49	9.46	0.00	0.00	2.88	208	72	208	72
	35	4	63	85.71	8.73	8.79	8.73	0.00	0.00	3.20	550	172	550	172
	36	5	63	78.57	8.01	8.10	8.01	0.00	0.00	3.52	504	143	504	143
	37	6	175	71.43	7.28	7.40	7.28	0.00	0.00	3.84	1274	332	1274	332
C	**38**	**7**	**162**	**64.29**	**6.55**	**6.70**	**6.55**	**0.00**	**0.00**	**4.16**	**1061**	**255**	**1061**	**255**
	39	8	259	57.14	5.82	6.42	5.82	0.00	0.00	4.51	1508	334	1508	334
	40	9	360	50.00	5.10	6.14	5.10	0.00	0.00	4.87	1834	377	1834	377
	41	10	428	42.86	4.37	5.85	4.37	0.00	0.00	5.22	1869	358	1869	358
	42	11	430	35.71	3.64	5.57	3.64	0.00	0.00	5.57	1565	281	1565	281
D	**43**	**12**	**503**	**28.57**	**2.91**	**5.29**	**2.91**	**0.00**	**0.00**	**5.93**	**1464**	**247**	**1464**	**247**

	44	13	444	21.43	2.18	5.01	2.18	0.00	0.00	6.28	970	154	970	154
	45	14	384	14.29	1.46	4.73	1.46	0.00	0.00	6.63	559	84	559	84
	46	15	294	7.14	0.73	4.44	0.73	0.00	0.00	6.99	214	31	214	31
		Σ	3590							Σ	13612	2853	13612	2853

SCOPon	4.77	SCOPnet	4.77
		SCOP	**4.75**

Power diagram (Heat pump **x-change dynamic pro ac 10 AW E**)
- Medium temperature application (reference water temperature 55 °C)
- Reference heating season „W" – warmer



Data for SCOP calculation (Heat pump **x-change dynamic pro ac 10 AW E**)
- Medium temperature application (reference water temperature 55 °C)
- Reference heating season „C“ – colder

	Outdoor heat exchanger: Outdoor air inlet	Indoor heat exchanger: Outlet water temperature	Part load ratio	Part load	DC Declared capacity	COPd at declared capacity	Cdh degradation coefficient	CR	COPbin (Tj)	Eff. power input of compressor off state
	[°C]	[°C]	[%]	[kW]	[kW]	[–]	[–]	[–]	[–]	[kW]
A	-7	44.00	60.53	6.73	6.830	2.830	0.900	1.00	2.830	–
B	2	37.00	36.84	4.09	4.290	4.650	0.900	1.00	4.650	–
C	7	35.42	23.68	2.63	4.600	5.590	0.979	0.57	5.505	0.0170
D	12	34.26	10.53	1.17	5.380	7.090	0.978	0.22	6.561	0.0170
TOL (E)	-18	51.57	89.47	9.94	7.068	1.634	0.900	1.00	1.634	–
Tbiv (F)	-16	49.86	84.21	9.36	9.359	1.699	0.900	1.00	1.699	–
G	-15	49.00	81.58	9.07	9.078	1.825	0.900	1.00	1.825	–

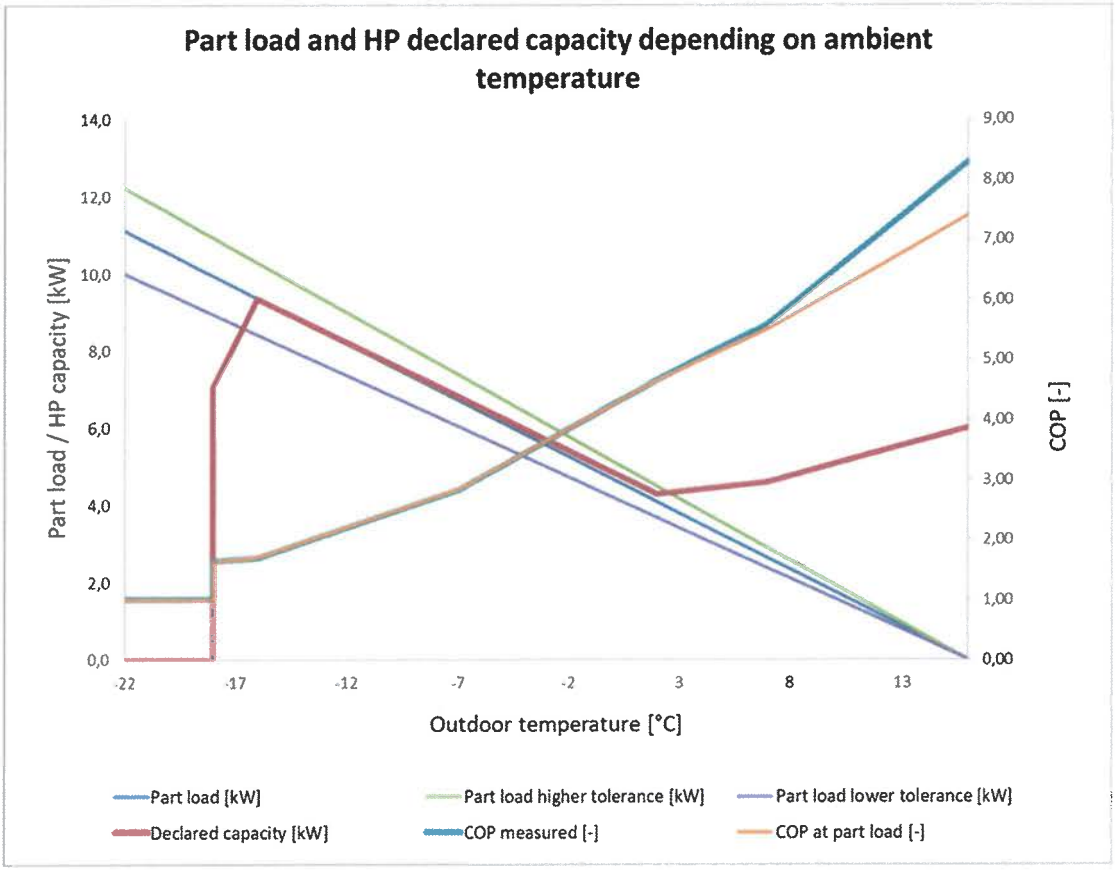
Calculation SCOP, $SCOP_{on}$, $SCOP_{net}$
(Heat pump **x-change dynamic pro ac 10 AW E**)
- Medium temperature application (reference water temperature 55 °C)
- Reference heating season „C“ – colder

	Bin: j	Outdoor temp. (dry bulb): T_j	Hours: h_j	Part load ratio	Heat load: $P_{h(Tj)}$	Capacity of HP	Heat load covered by heat pump	Resistive heat elbu (Tj): $elbu_{(Tj)}$	Annual resistive heat: h_j x $elbu_{(Tj)}$	COPbin (Tj): COP bin (Tj)	Annual heating demand: h_j x $P_{h(Tj)}$	Annual power input including electric back up heating	Net annual heating capacity: $h_j \times (P_{h(Tj)} - elbu_{(Tj)})$	Net annual power input without electric back up heating
	[–]	[°C]	[h]	[%]	[kW]	[kW]	[kW]	[kW]	[kWh]	[–]	[kWh]	[kWh]	[kWh]	[kWh]
	9	-22	1	100.00	11.11	0.00	0.00	11.11	11.11	1.00	11	11	0	0
	10	-21	6	97.37	10.82	0.00	0.00	10.82	64.93	1.00	65	65	0	0
	11	-20	13	94.74	10.53	0.00	0.00	10.53	136.88	1.00	137	137	0	0
	12	-19	17	92.11	10.24	0.00	0.00	10.24	174.02	1.00	174	174	0	0
TOL(E)	**13**	**-18**	**19**	**89.47**	**9.94**	**7.07**	**7.07**	**2.88**	**54.64**	**1.63**	**189**	**137**	**134**	**82**
	14	-17	26	86.84	9.65	8.21	8.21	1.44	37.39	1.67	251	166	214	128
Tbiv(F)	**15**	**-16**	**39**	**84.21**	**9.36**	**9.36**	**9.36**	**0.00**	**0.00**	**1.70**	**365**	**215**	**365**	**215**
G	**16**	**-15**	**41**	**81.58**	**9.07**	**9.08**	**9.07**	**0.00**	**0.00**	**1.82**	**372**	**204**	**372**	**204**
	17	-14	35	78.95	8.77	8.80	8.77	0.00	0.00	1.95	307	157	307	157

	18	-13	52	76.32	8.48	8.52	8.48	0.00	0.00	2.08	441	212	441	212
	19	-12	37	73.68	8.19	8.24	8.19	0.00	0.00	2.20	303	138	303	138
	20	-11	41	71.05	7.90	7.95	7.90	0.00	0.00	2.33	324	139	324	139
	21	-10	43	68.42	7.60	7.67	7.60	0.00	0.00	2.45	327	133	327	133
	22	-9	54	65.79	7.31	7.39	7.31	0.00	0.00	2.58	395	153	395	153
	23	-8	90	63.16	7.02	7.11	7.02	0.00	0.00	2.70	632	234	632	234
A	**24**	**-7**	**125**	**60.53**	**6.73**	**6.83**	**6.73**	**0.00**	**0.00**	**2.83**	**841**	**297**	**841**	**297**
	25	-6	169	57.89	6.43	6.55	6.43	0.00	0.00	3.03	1087	359	1087	359
	26	-5	195	55.26	6.14	6.27	6.14	0.00	0.00	3.23	1198	370	1198	370
	27	-4	278	52.63	5.85	5.98	5.85	0.00	0.00	3.44	1626	473	1626	473
	28	-3	306	50.00	5.56	5.70	5.56	0.00	0.00	3.64	1700	467	1700	467
	29	-2	454	47.37	5.26	5.42	5.26	0.00	0.00	3.84	2390	622	2390	622
	30	-1	385	44.74	4.97	5.14	4.97	0.00	0.00	4.04	1914	473	1914	473
	31	0	490	42.11	4.68	4.85	4.68	0.00	0.00	4.25	2293	540	2293	540
	32	1	533	39.47	4.39	4.57	4.39	0.00	0.00	4.45	2338	526	2338	526
B	**33**	**2**	**380**	**36.84**	**4.09**	**4.29**	**4.09**	**0.00**	**0.00**	**4.65**	**1556**	**335**	**1556**	**335**
	34	3	228	34.21	3.80	4.35	3.80	0.00	0.00	4.82	867	180	867	180
	35	4	261	31.58	3.51	4.41	3.51	0.00	0.00	4.99	916	183	916	183
	36	5	279	28.95	3.22	4.48	3.22	0.00	0.00	5.16	898	174	898	174
	37	6	229	26.32	2.92	4.54	2.92	0.00	0.00	5.33	670	126	670	126
C	**38**	**7**	**269**	**23.68**	**2.63**	**4.60**	**2.63**	**0.00**	**0.00**	**5.50**	**708**	**129**	**708**	**129**
	39	8	233	21.05	2.34	4.76	2.34	0.00	0.00	5.72	545	95	545	95
	40	9	230	18.42	2.05	4.91	2.05	0.00	0.00	5.93	471	79	471	79
	41	10	243	15.79	1.75	5.07	1.75	0.00	0.00	6.14	426	69	426	69
	42	11	191	13.16	1.46	5.22	1.46	0.00	0.00	6.35	279	44	279	44
D	**43**	**12**	**146**	**10.53**	**1.17**	**5.38**	**1.17**	**0.00**	**0.00**	**6.56**	**171**	**26**	**171**	**26**
	44	13	150	7.89	0.88	5.54	0.88	0.00	0.00	6.77	132	19	132	19
	45	14	97	5.26	0.58	5.69	0.58	0.00	0.00	6.98	57	8	57	8
	46	15	61	2.63	0.29	5.85	0.29	0.00	0.00	7.19	18	2	18	2
		Σ	6446							Σ	27393	7873	26914	7394

SCOPon	3.48	SCOPnet	3.64
		SCOP	**3.48**

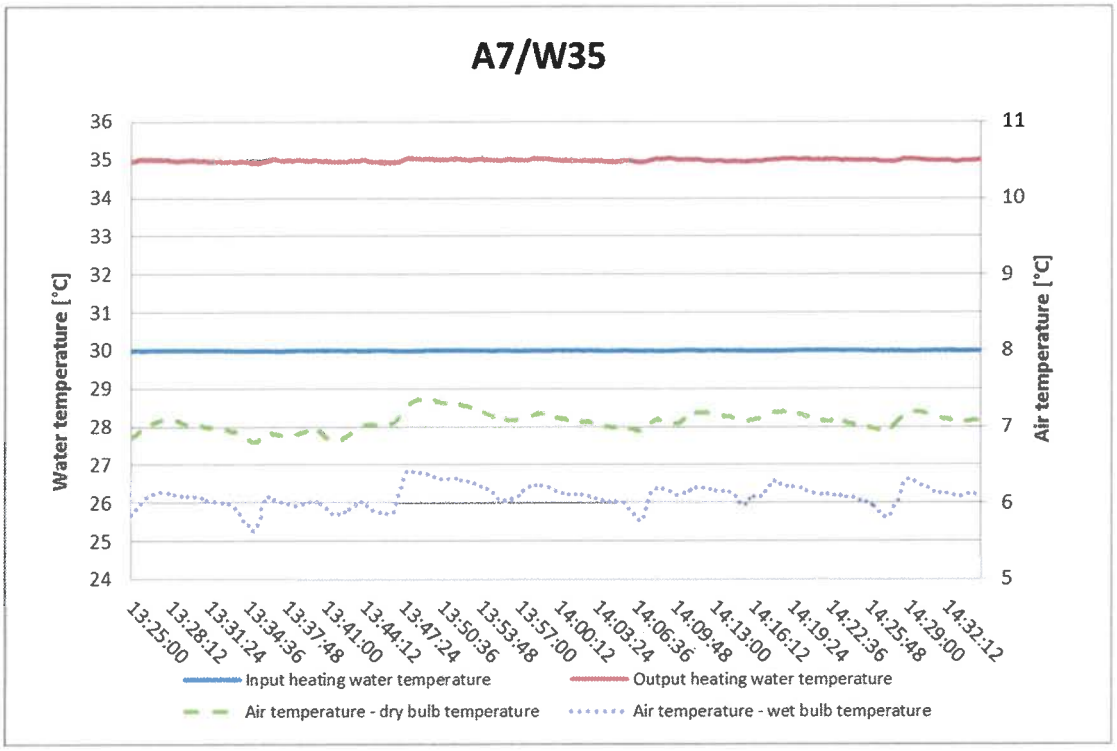
Power diagram (Heat pump **x-change dynamic pro ac 10 AW E**)
- Medium temperature application (reference water temperature 55 °C)
- Reference heating season „C“ – colder

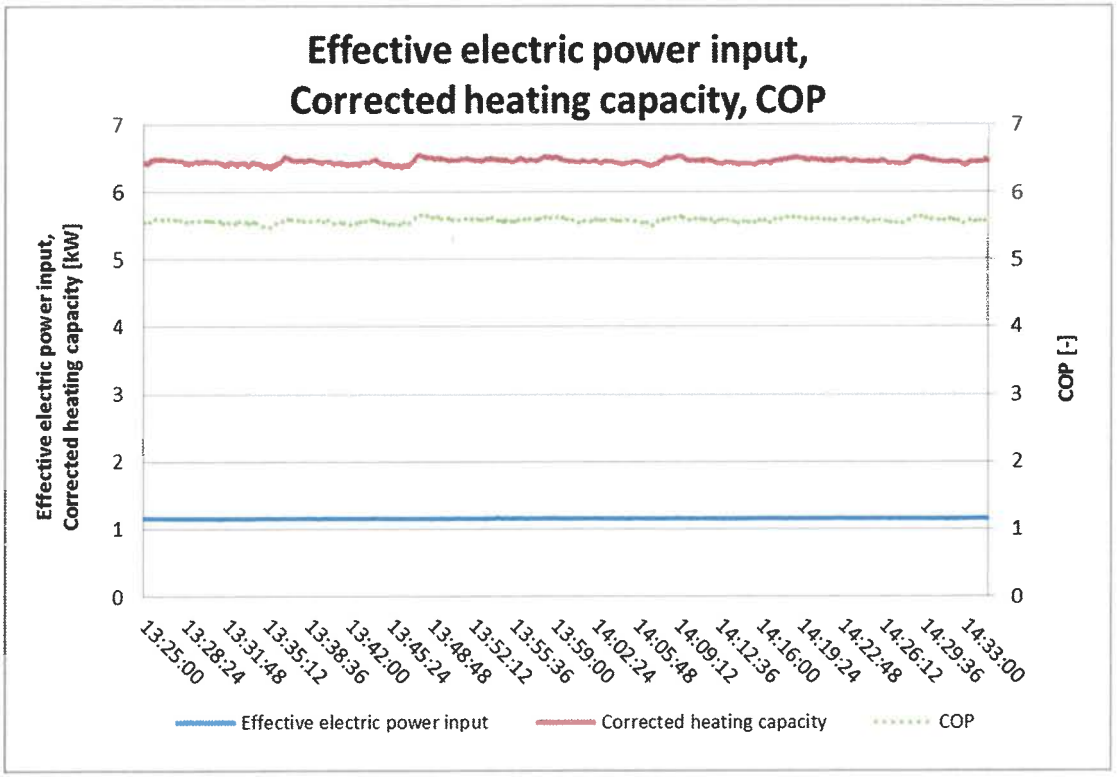


Tested by:	Ing. Tomáš Sedláček	Date:	2024-11-14	Signed:	Sedláček
Reviewed by:	Ing. Michal Faltýnek	Date:	2024-11-14	Signed:	Faltýnek

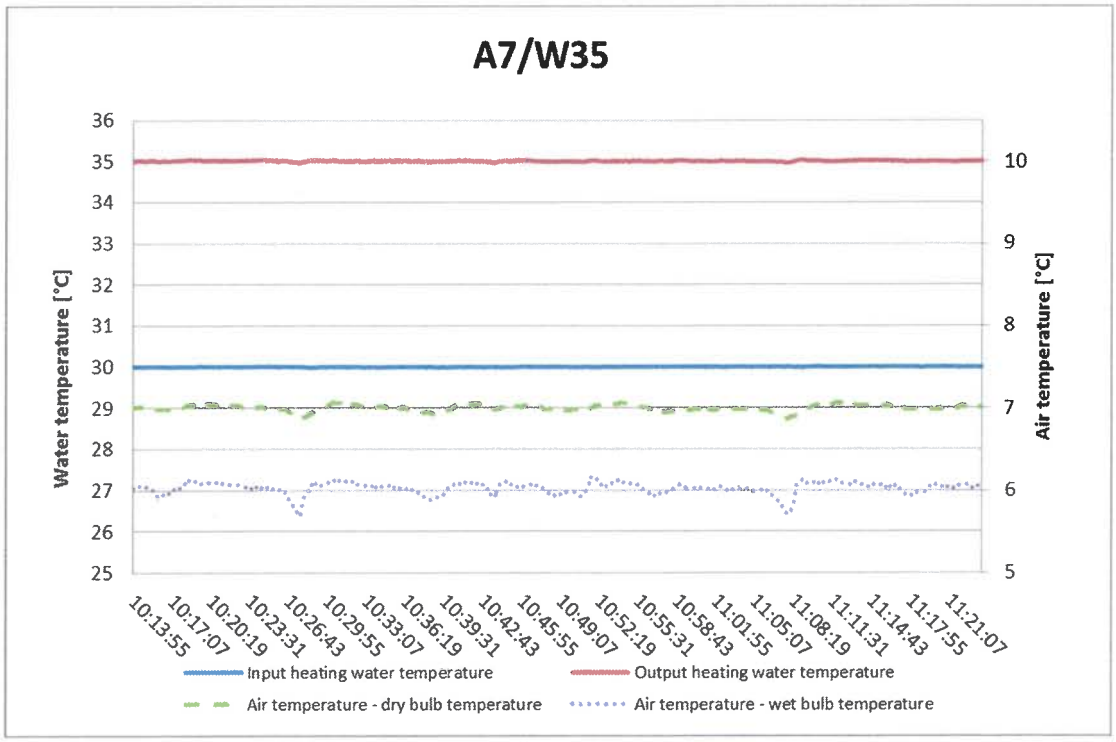
IV. Graphs:

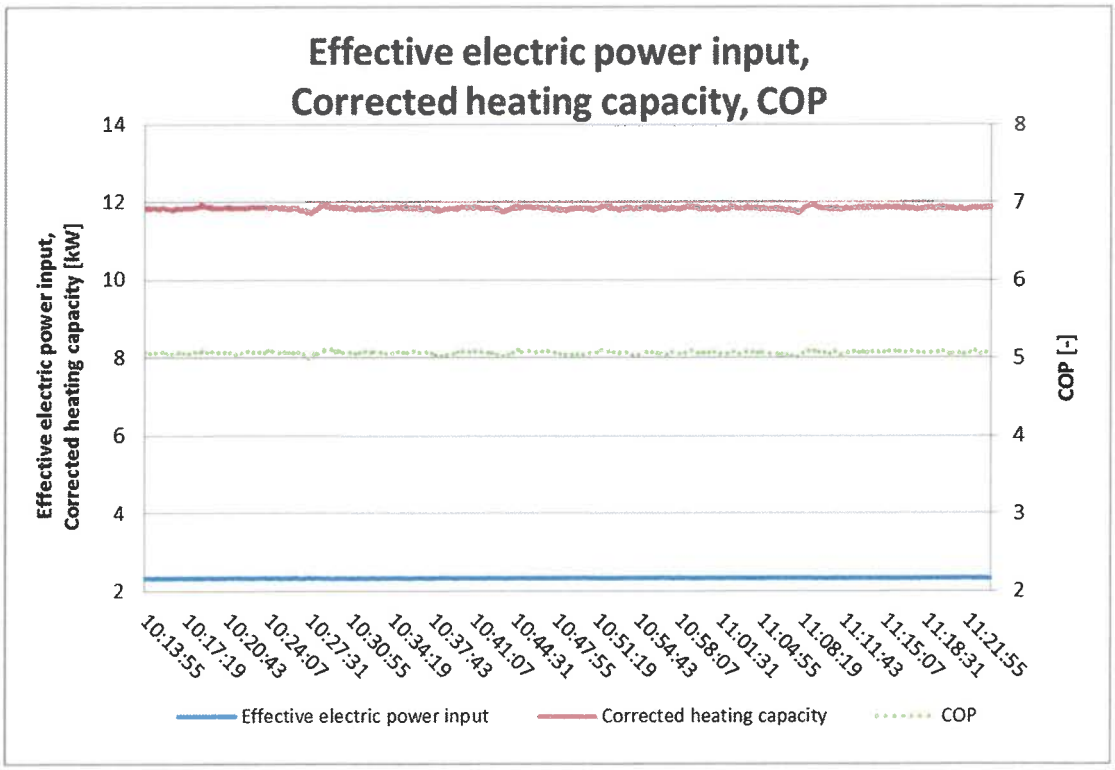
Heat Pump **x-change dynamic pro ac 10 AW E:** A7/W35 (28 rps)



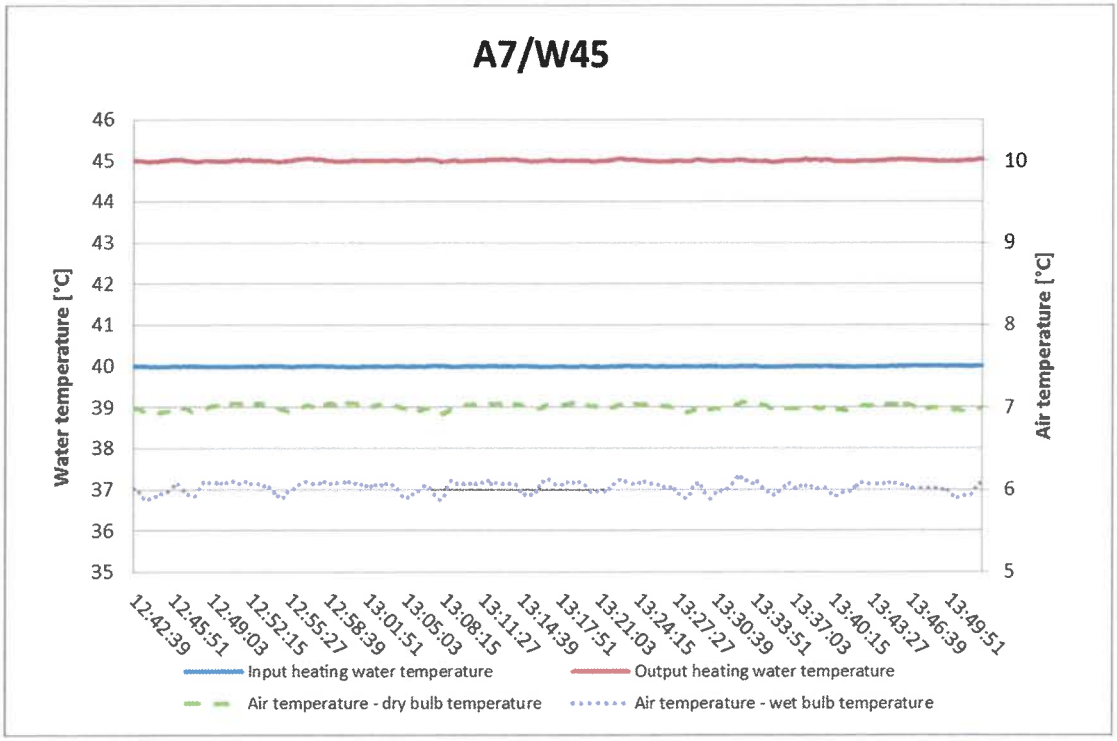


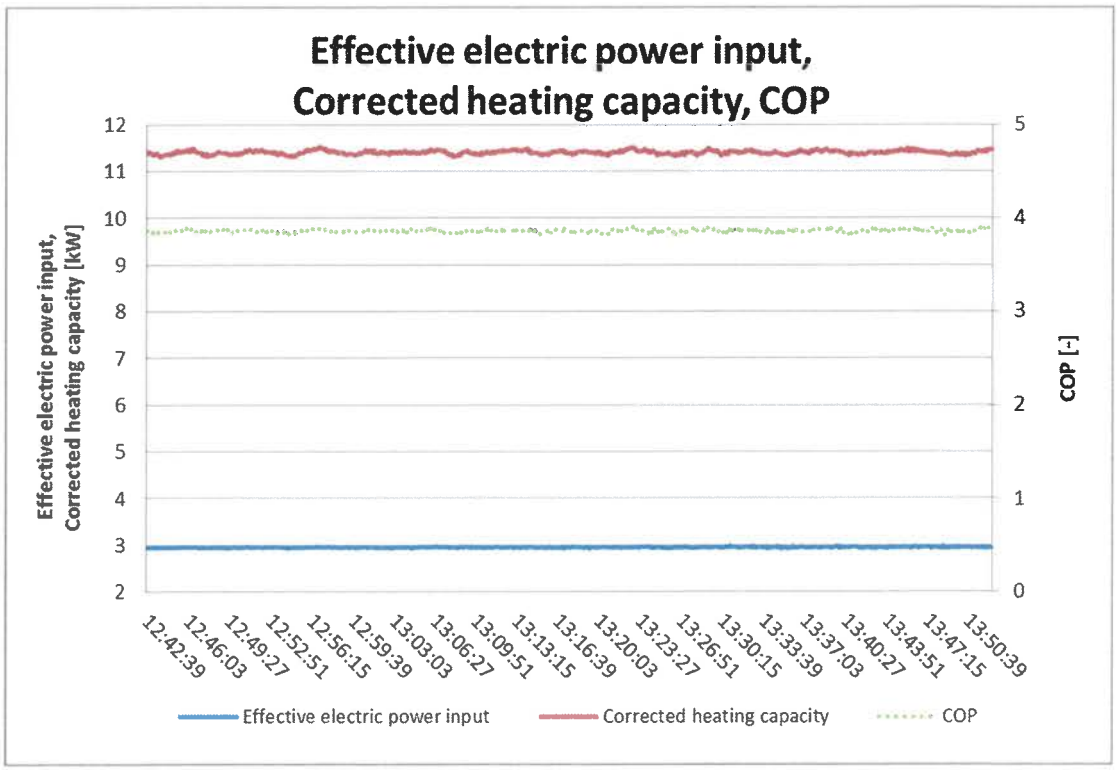
Heat Pump **x-change dynamic pro ac 10 AW E:** A7/W35 (54 rps)



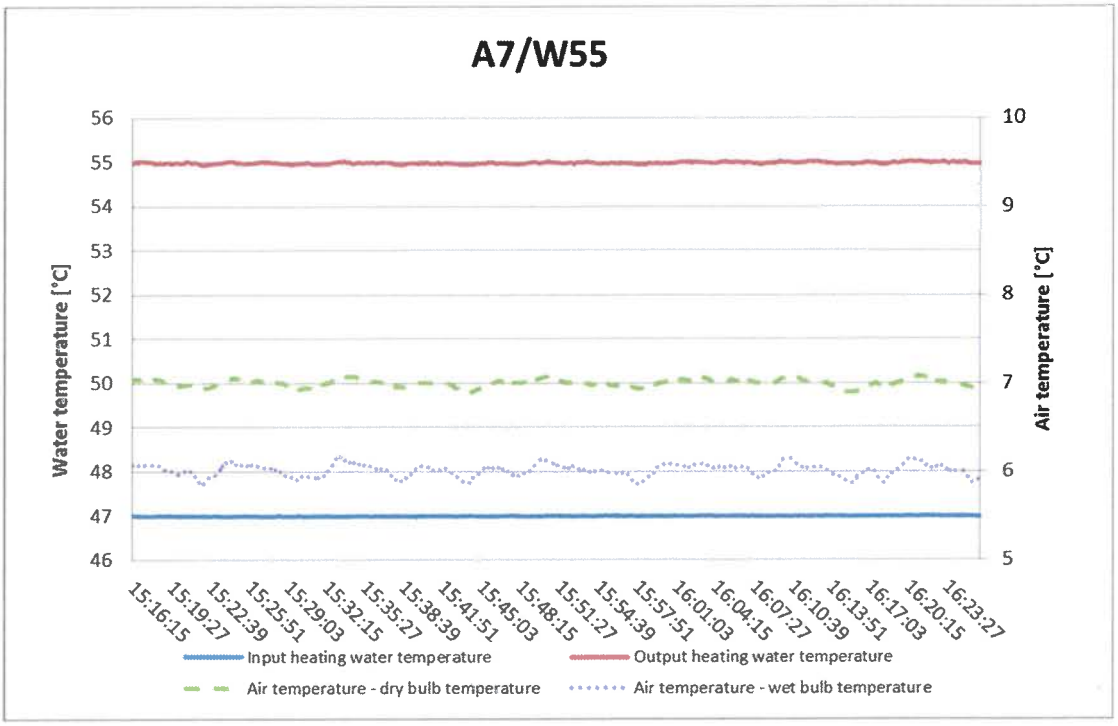


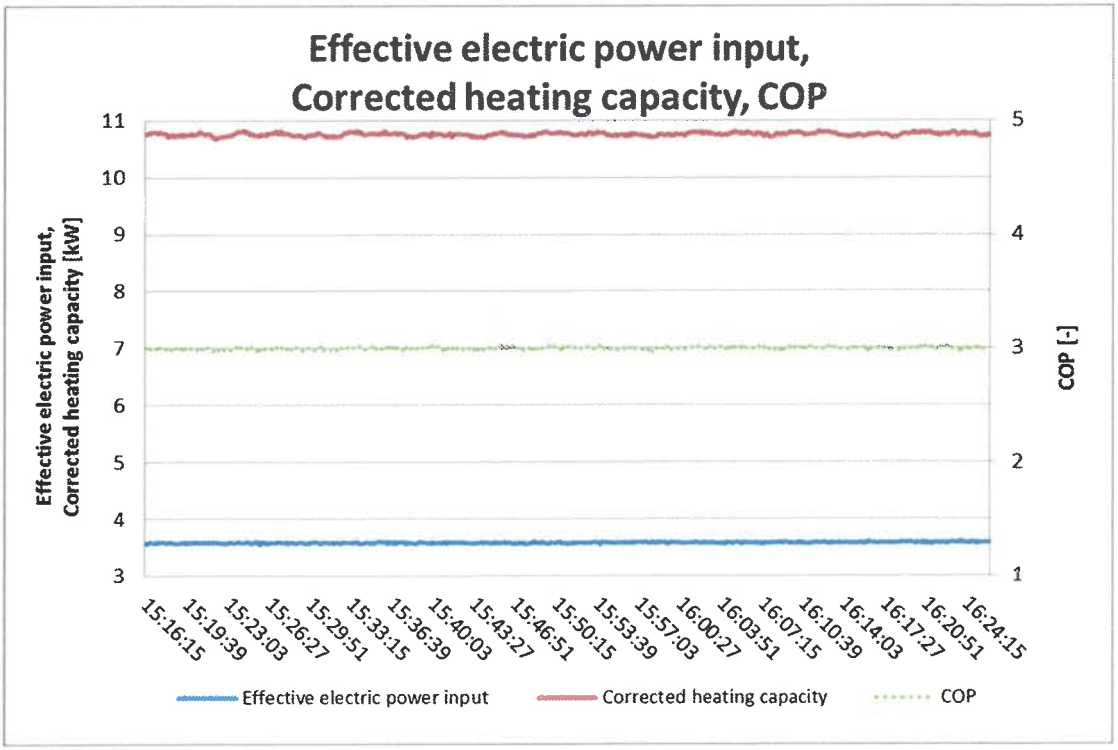
Heat Pump **x-change dynamic pro ac 10 AW E:** A7/W45 (54 rps)



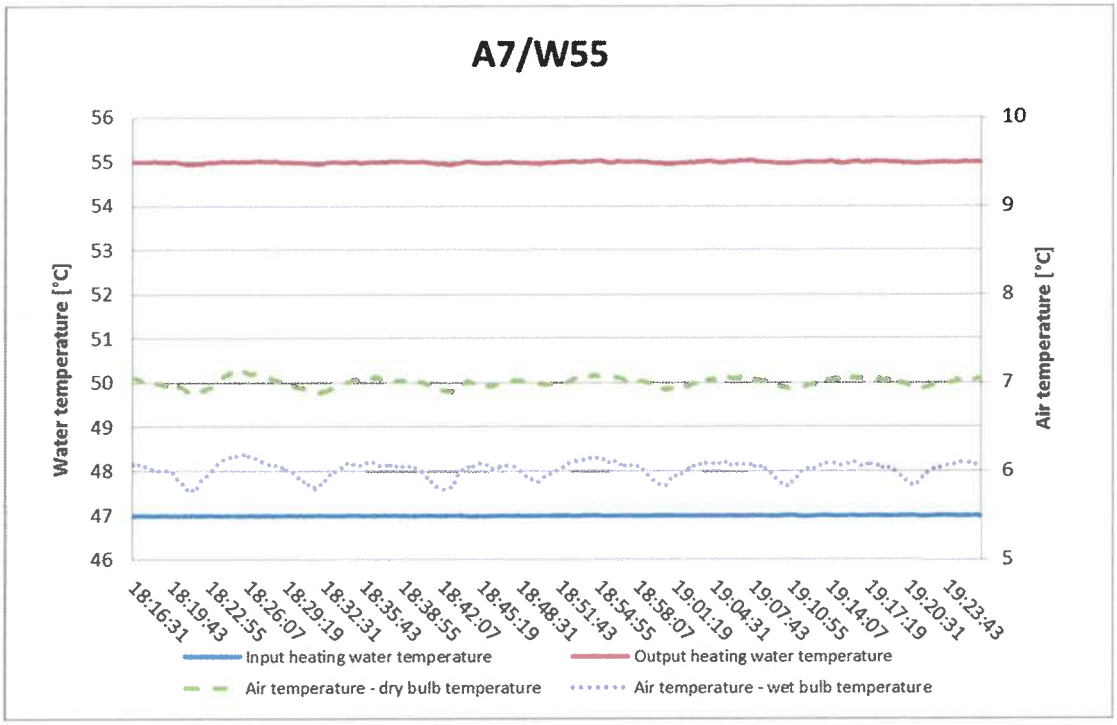


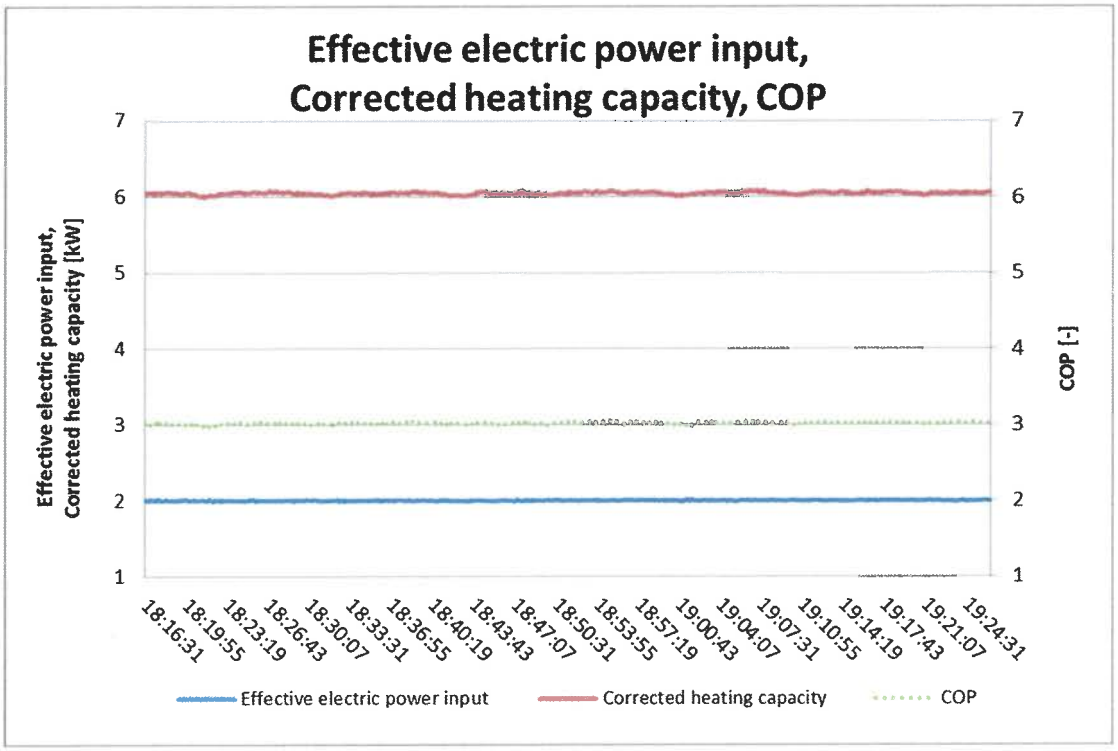
Heat Pump **x-change dynamic pro ac 10 AW E:** A7/W55 (54 rps)



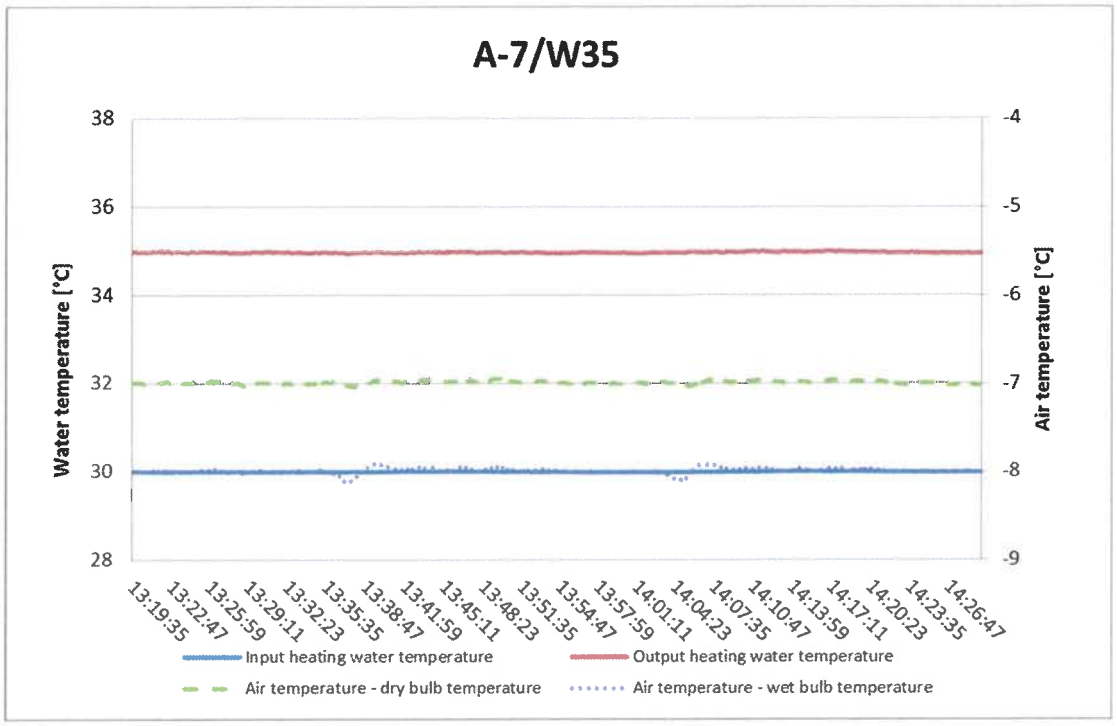


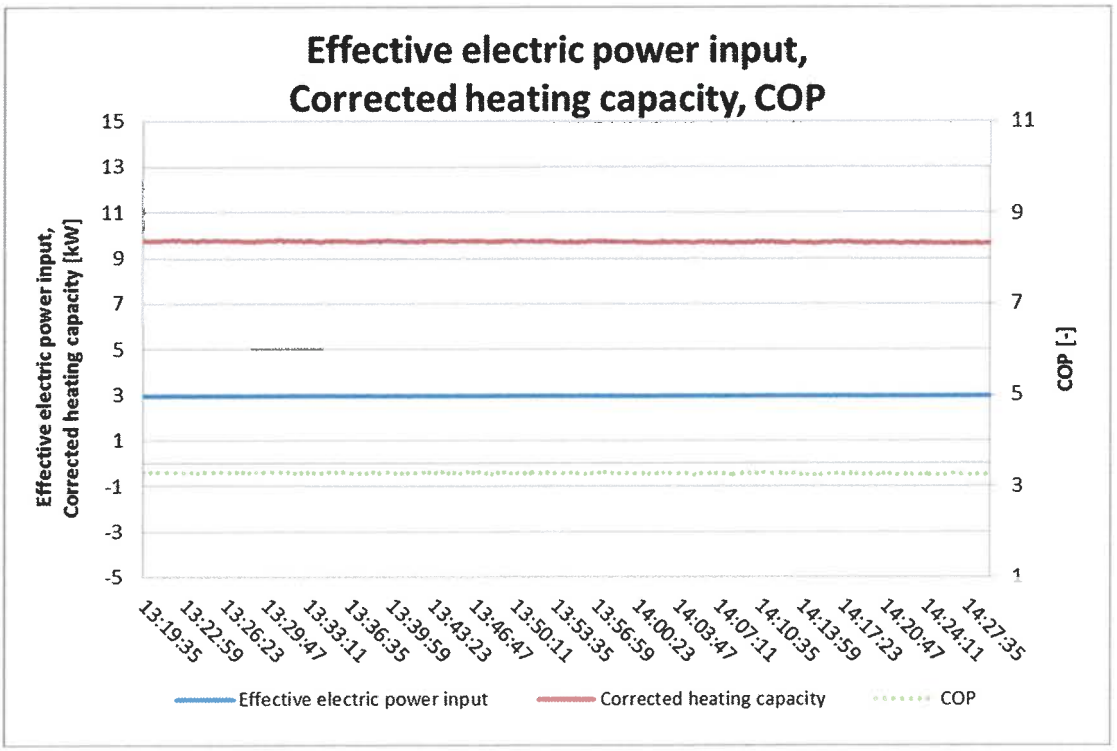
Heat Pump **x-change dynamic pro ac 10 AW E:** A7/W55 (30 rps)



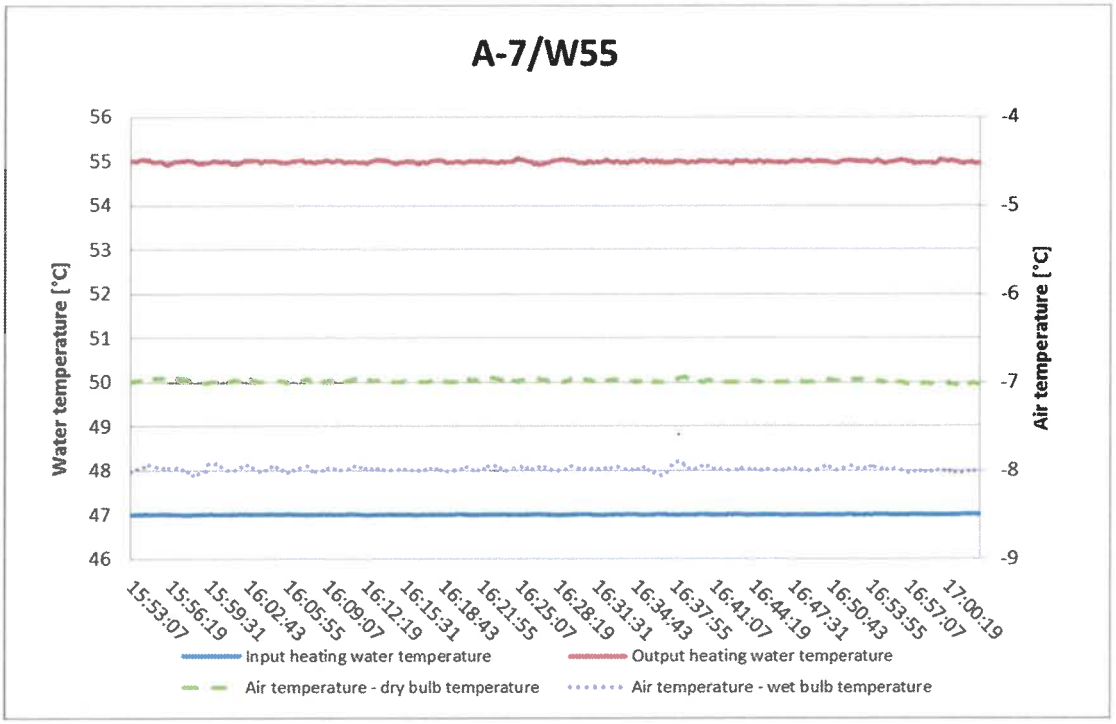


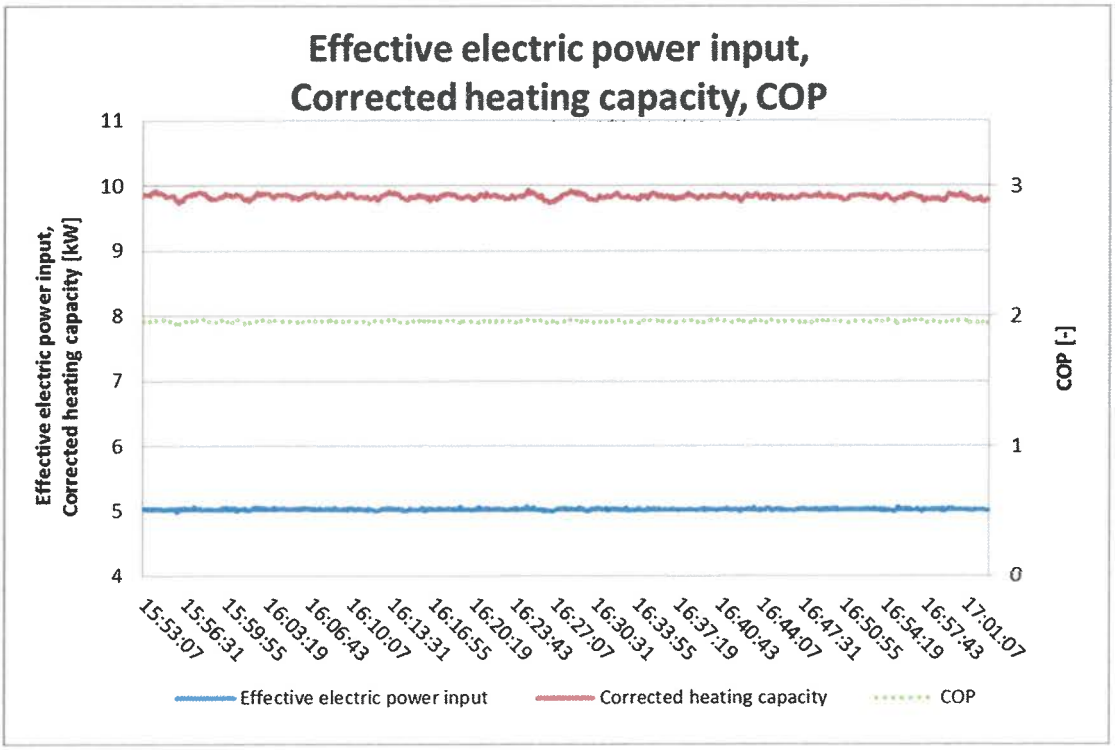
Heat Pump **x-change dynamic pro ac 10 AW E:** A-7/W35 (67 rps)



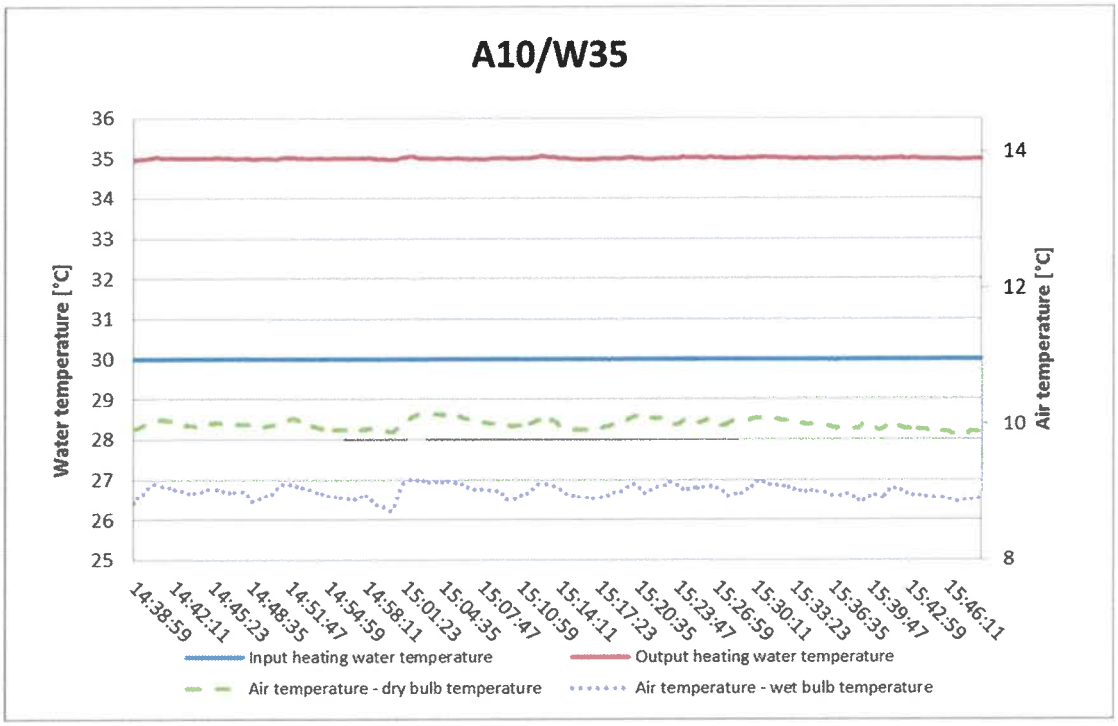


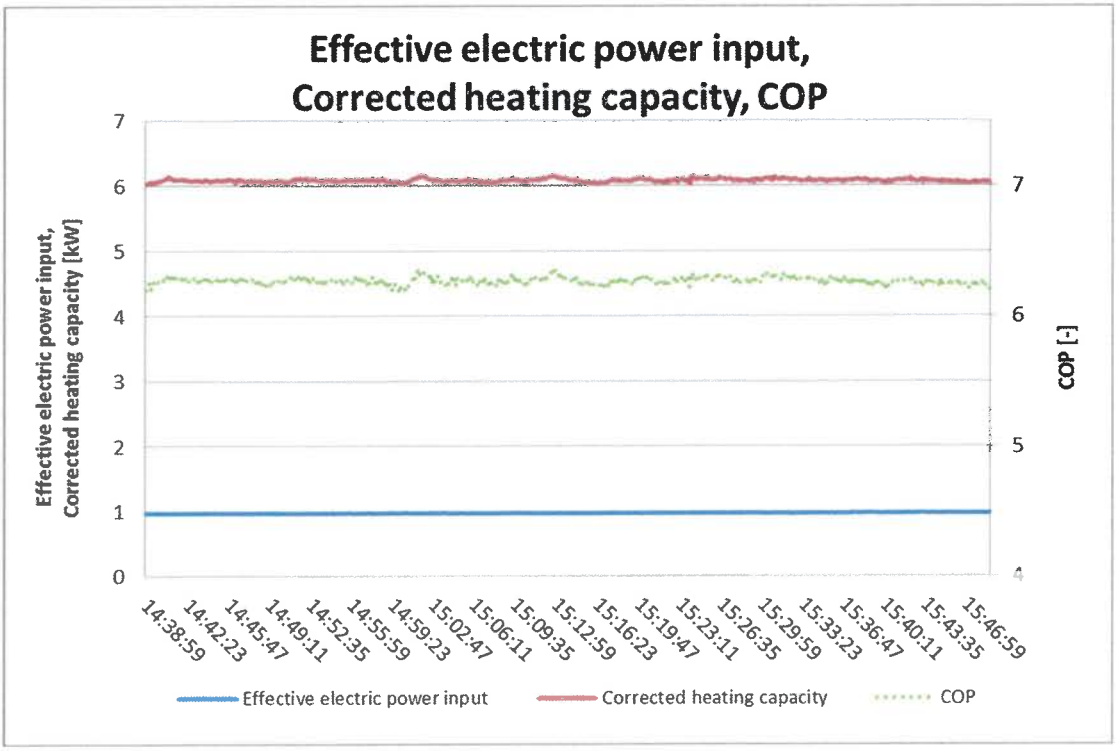
Heat Pump **x-change dynamic pro ac 10 AW E:** A-7/W55 (77 rps)



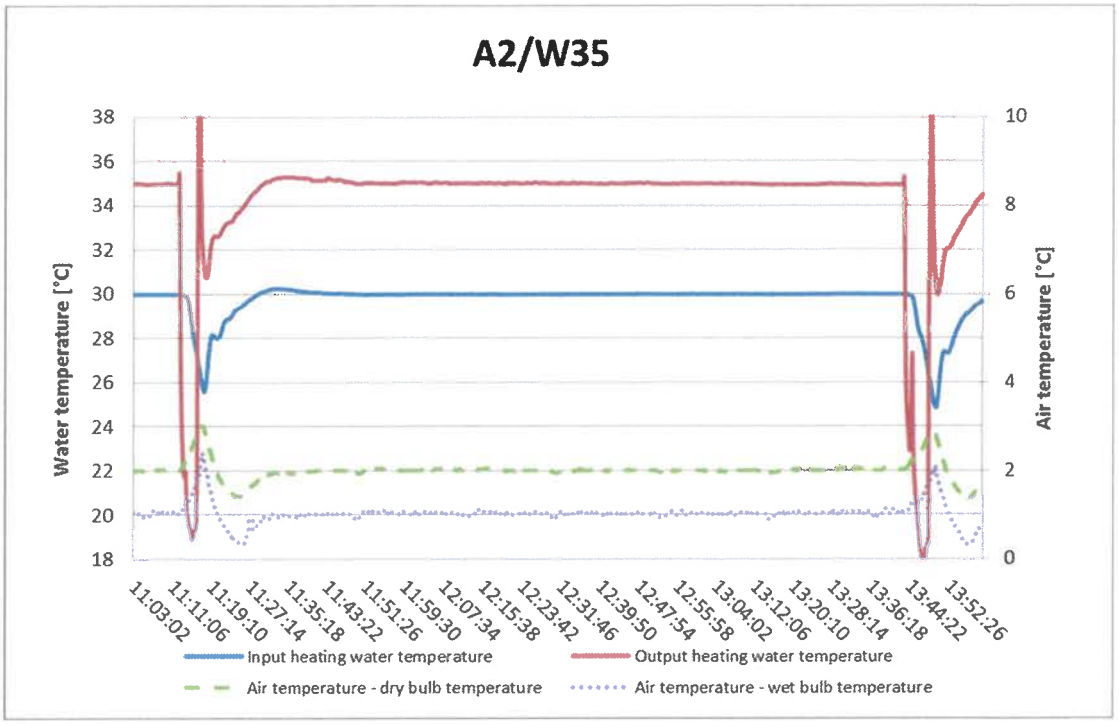


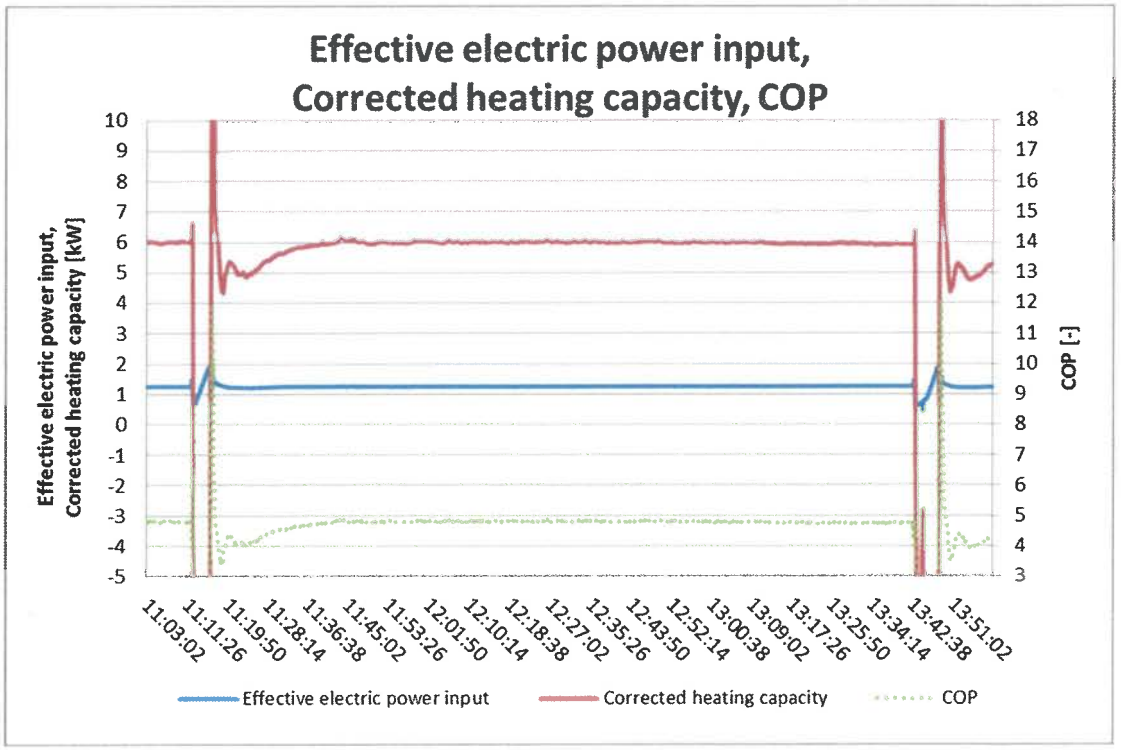
Heat Pump **x-change dynamic pro ac 10 AW E:** A10/W35 (24 rps)



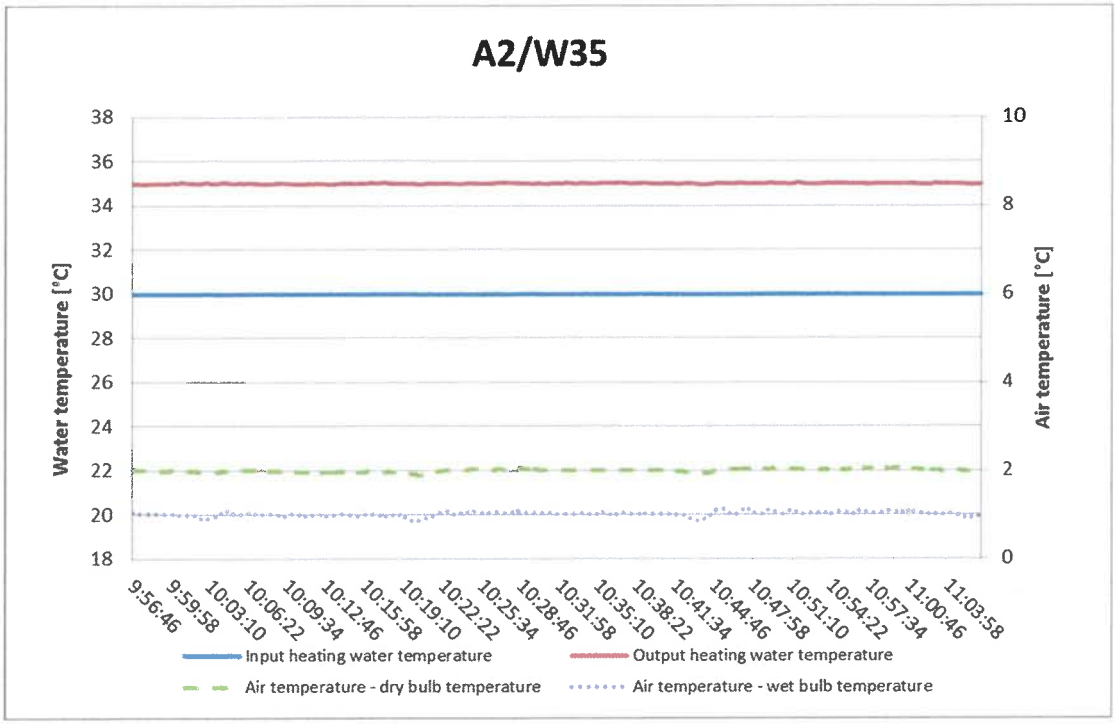


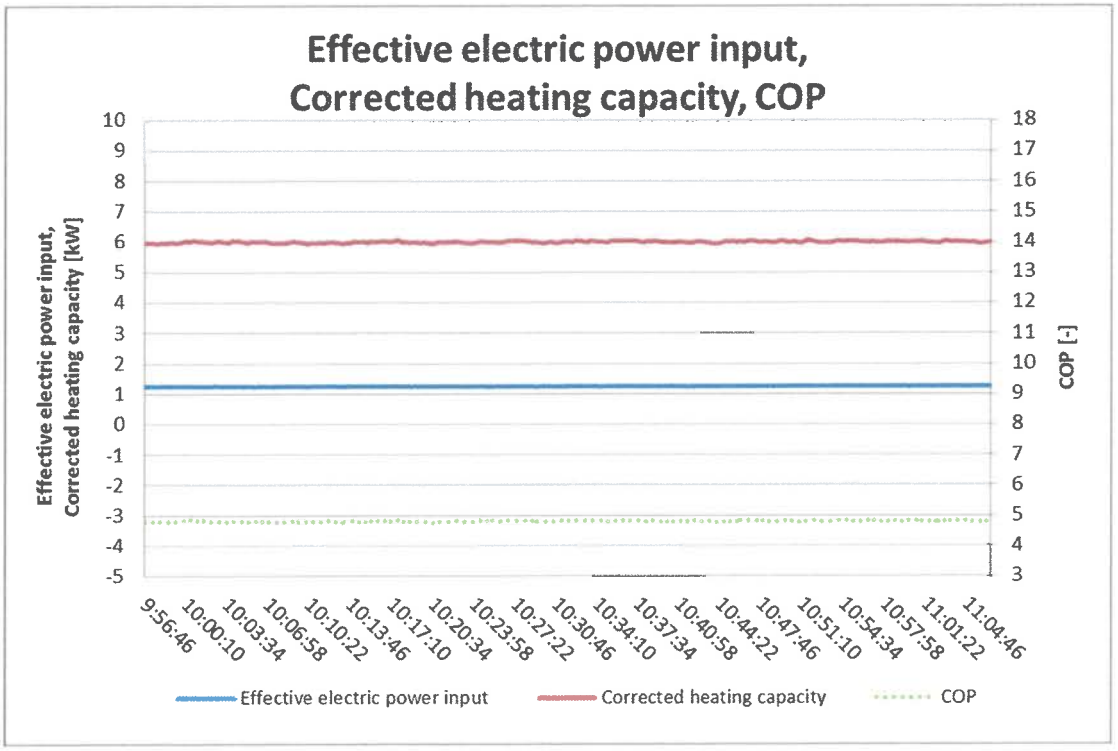
Heat Pump **x-change dynamic pro ac 10 AW E:** A2/W35 (30 rps)



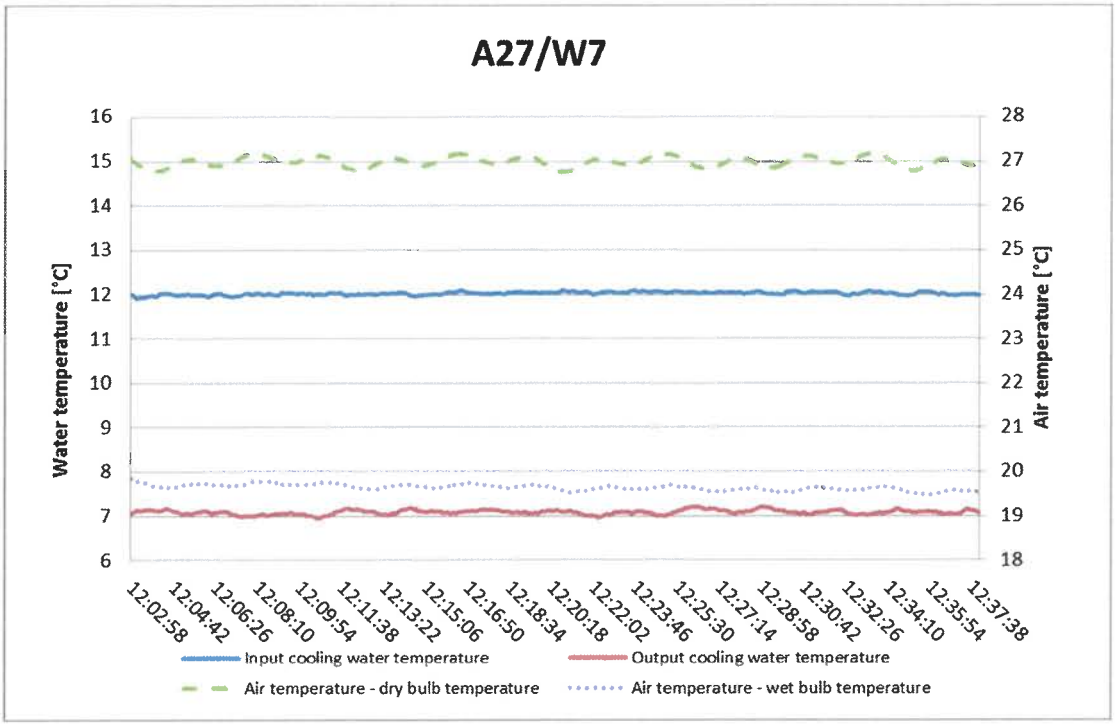


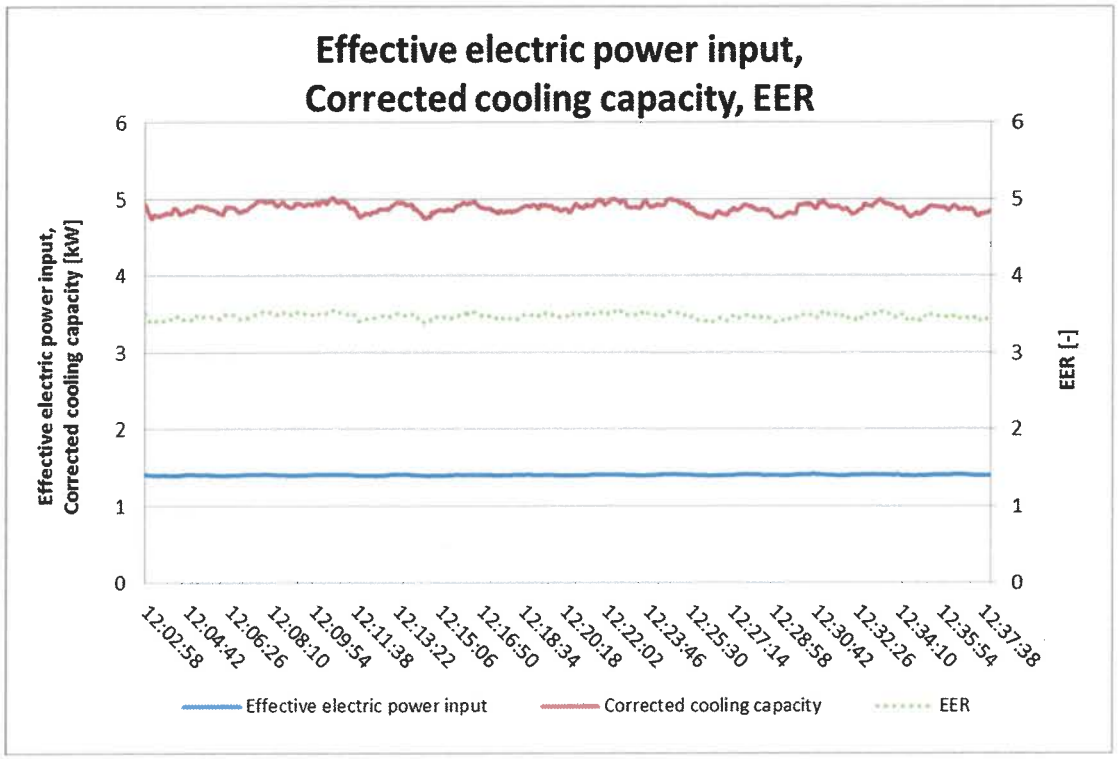
Heat Pump **x-change dynamic pro ac 10 AW E:** A2/W35 (30 rps)



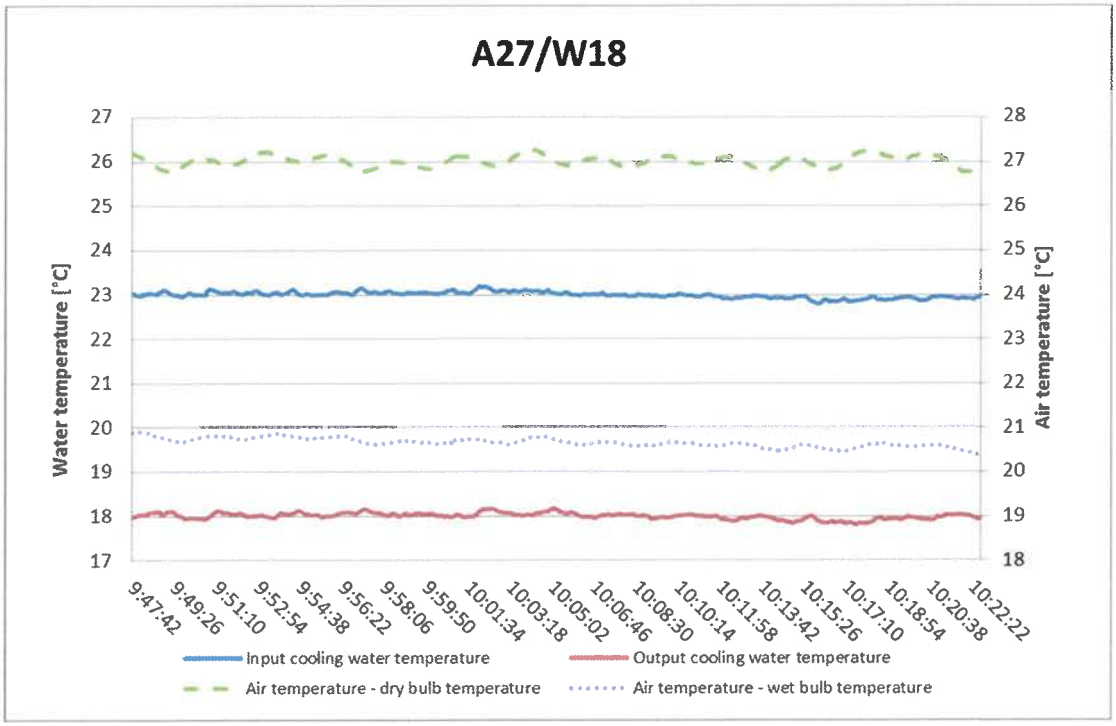


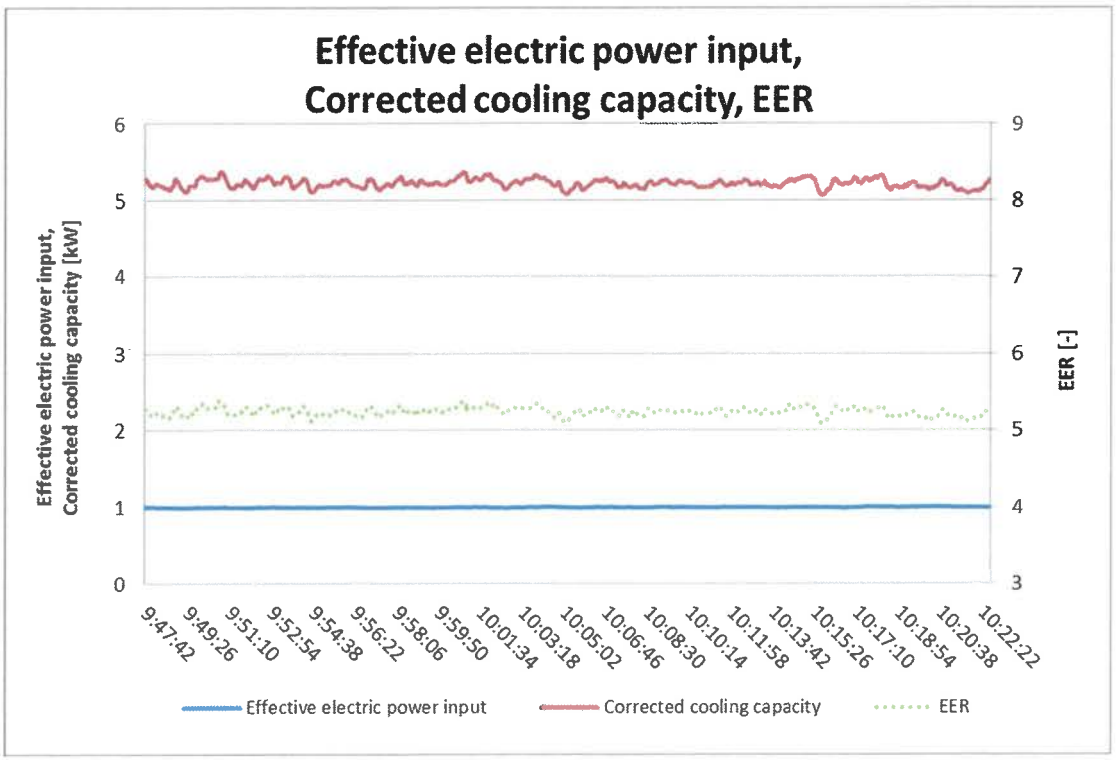
Heat Pump **x-change dynamic pro ac 10 AW E:** A27/W7 (28 rps)



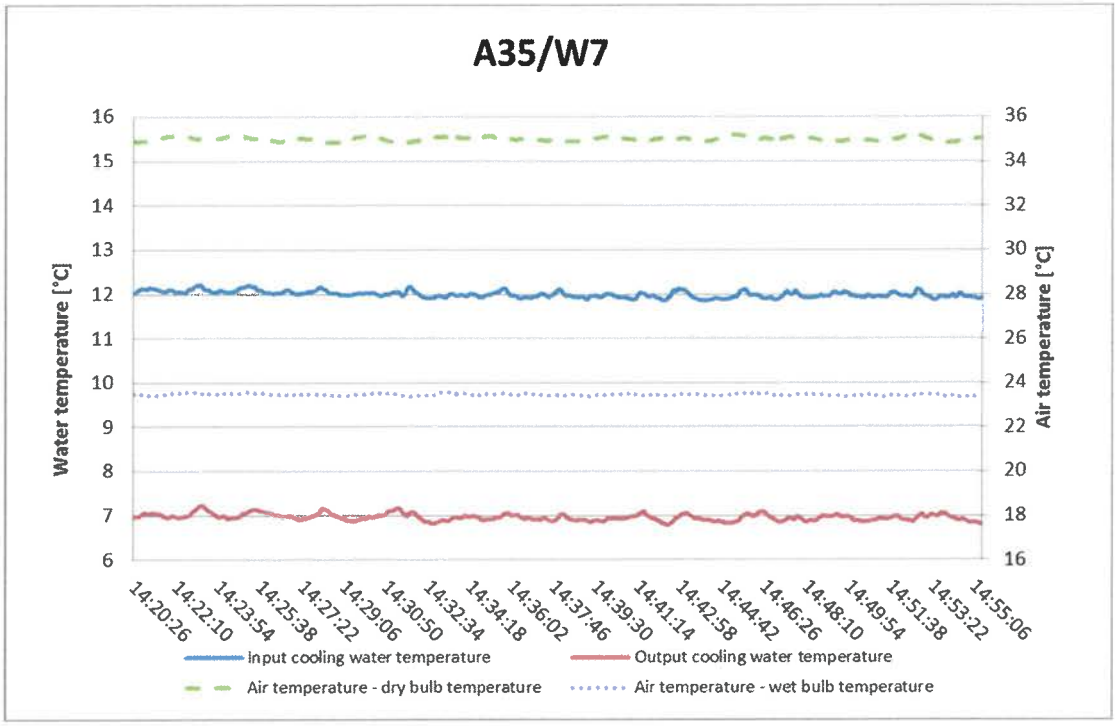


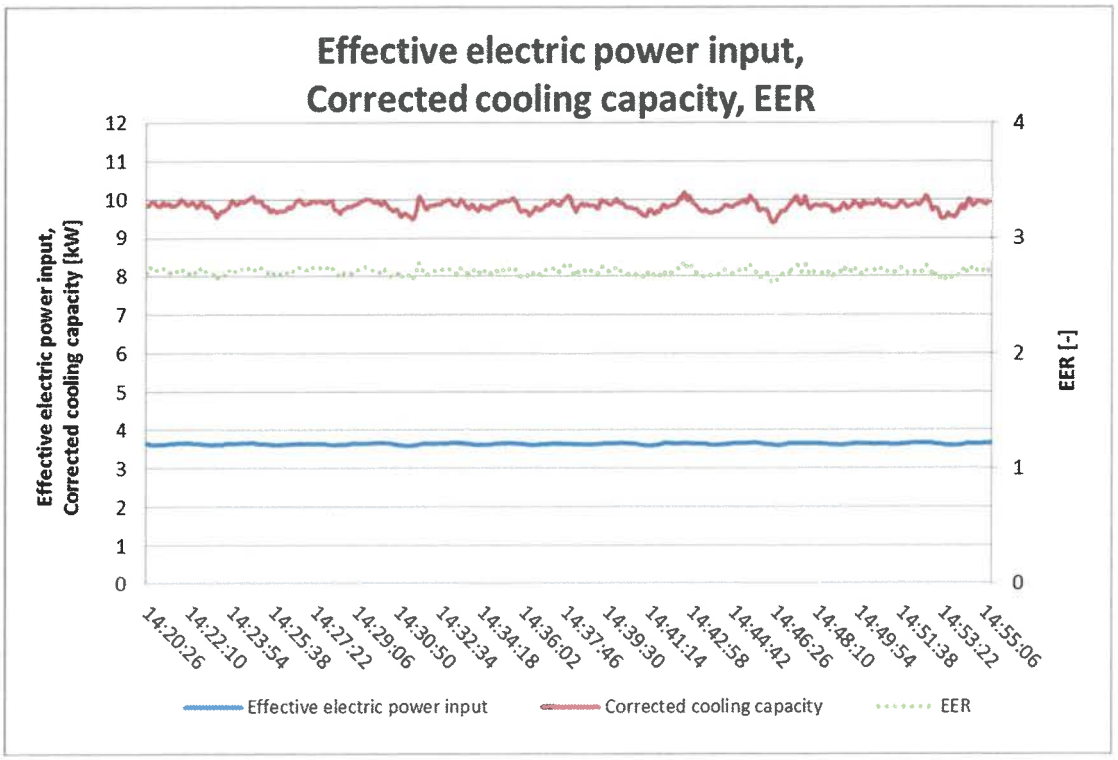
Heat Pump **x-change dynamic pro ac 10 AW E:** A27/W18 (21 rps)



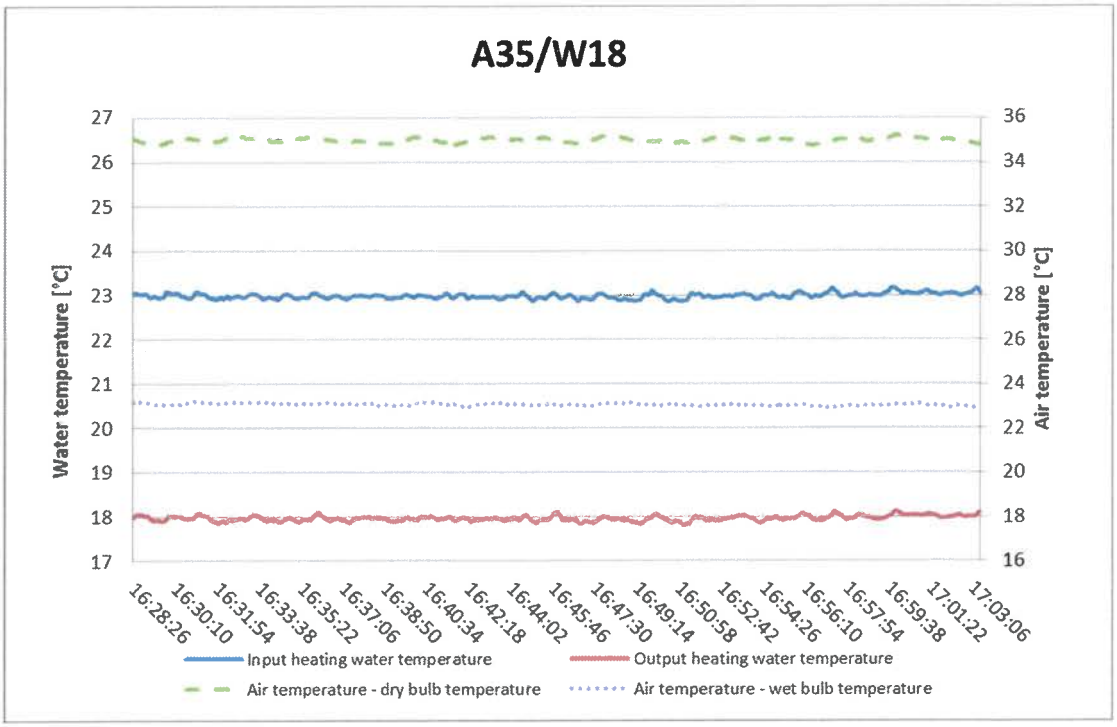


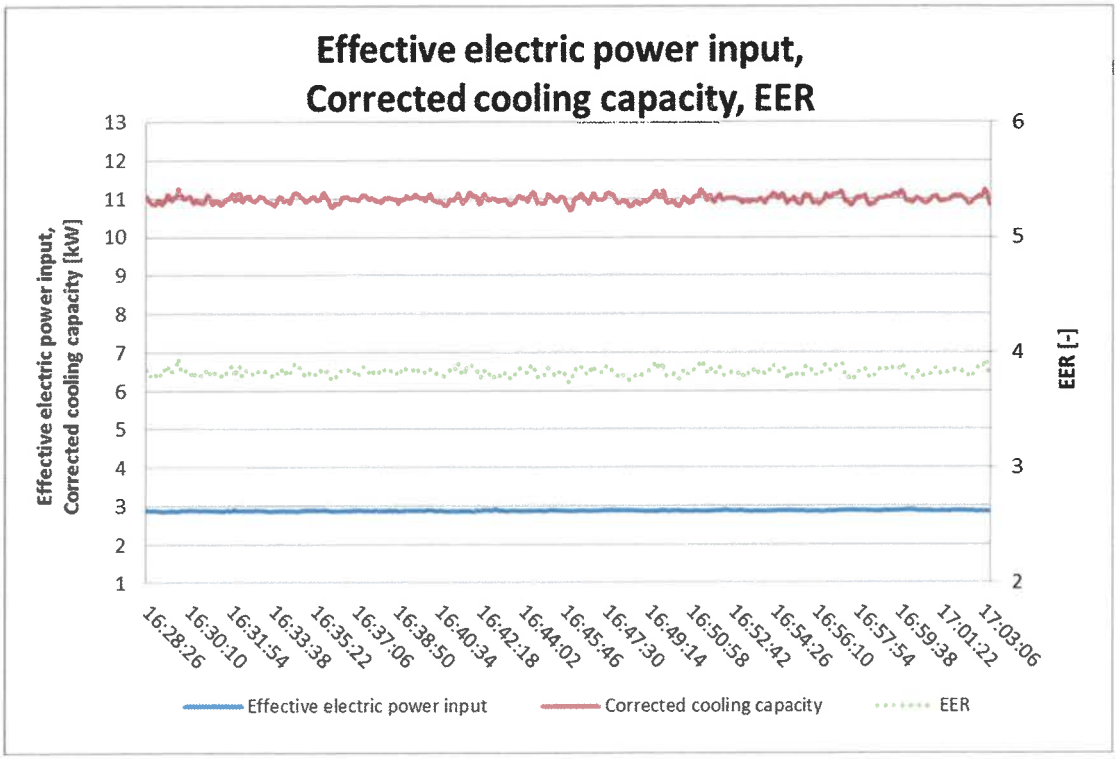
Heat Pump **x-change dynamic pro ac 10 AW E:** A35/W7 (60 rps)



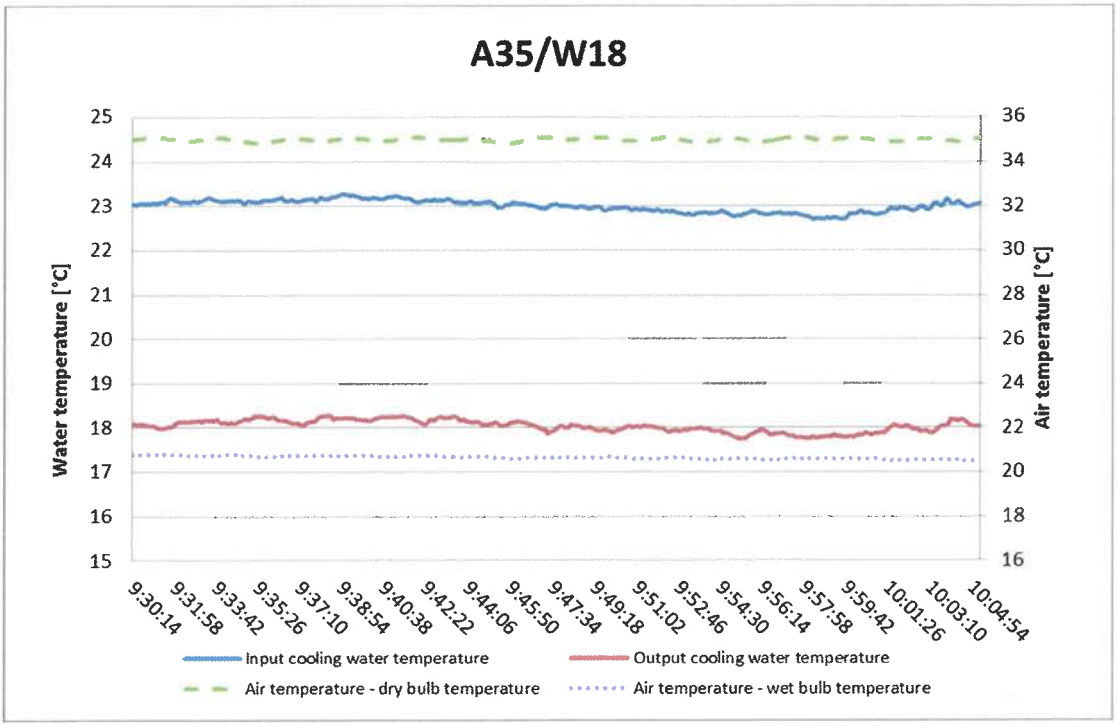


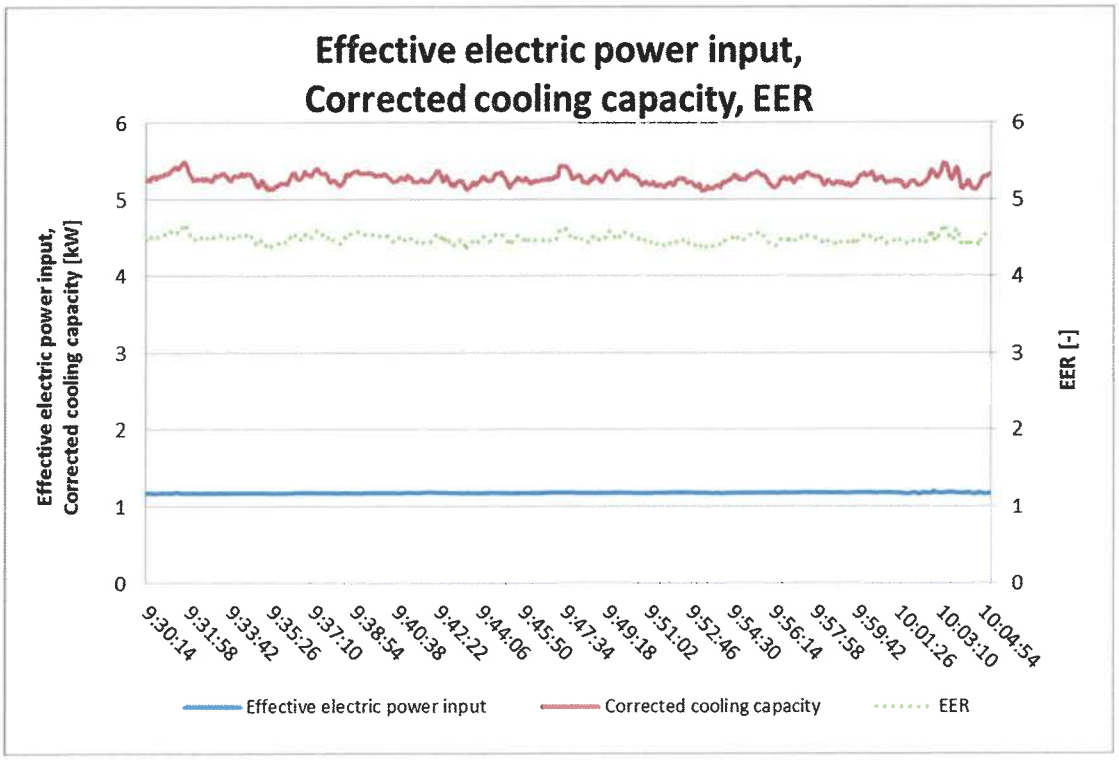
Heat Pump **x-change dynamic pro ac 10 AW E:** A35/W18 (48 rps)



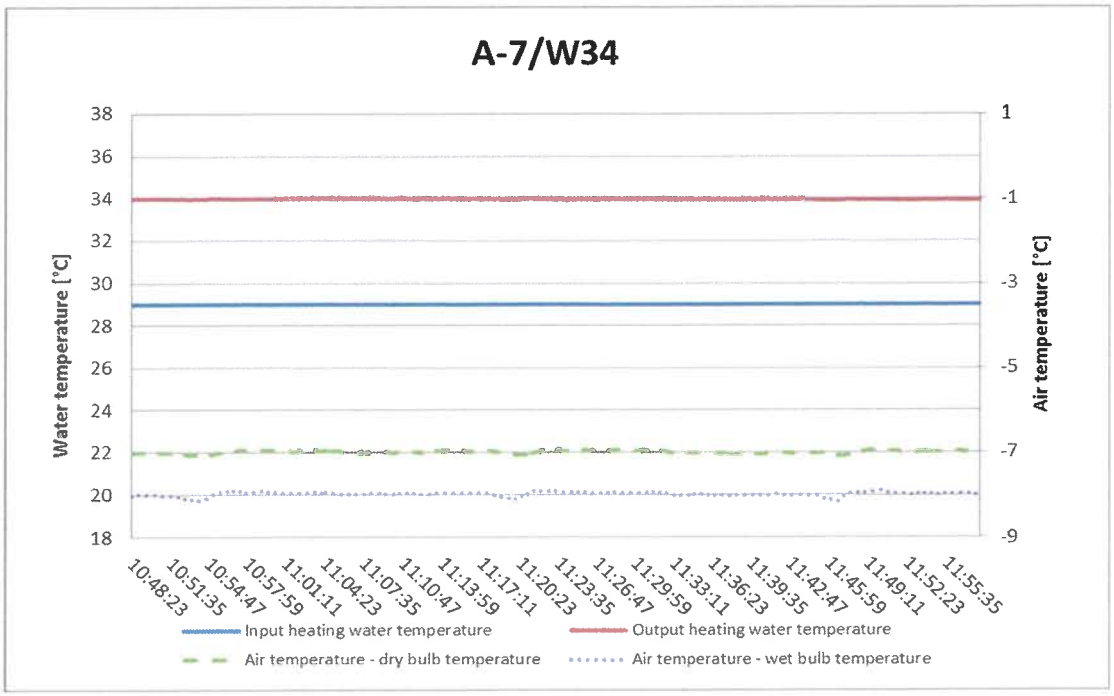


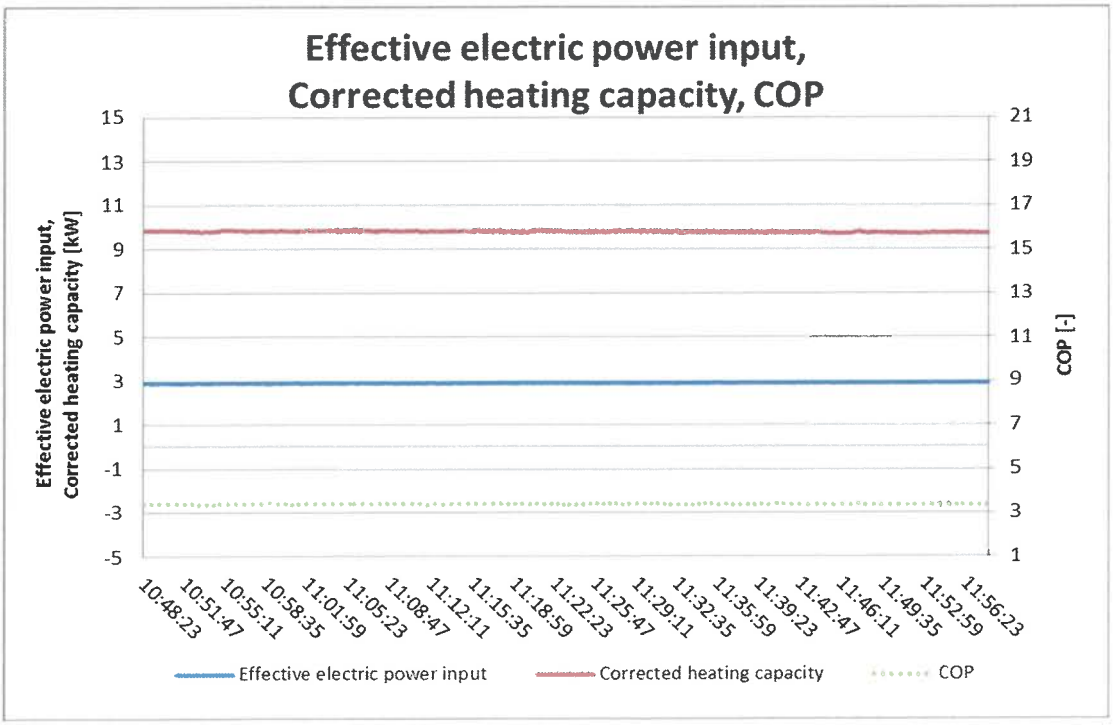
Heat Pump **x-change dynamic pro ac 10 AW E:** A35/W18 (22 rps)



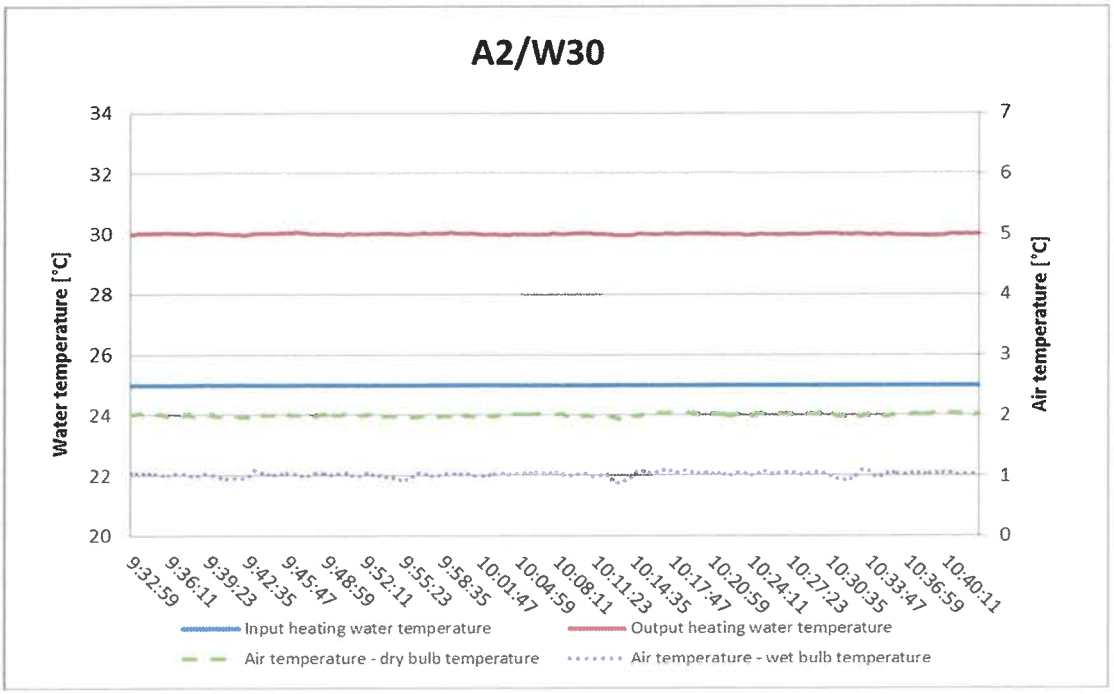


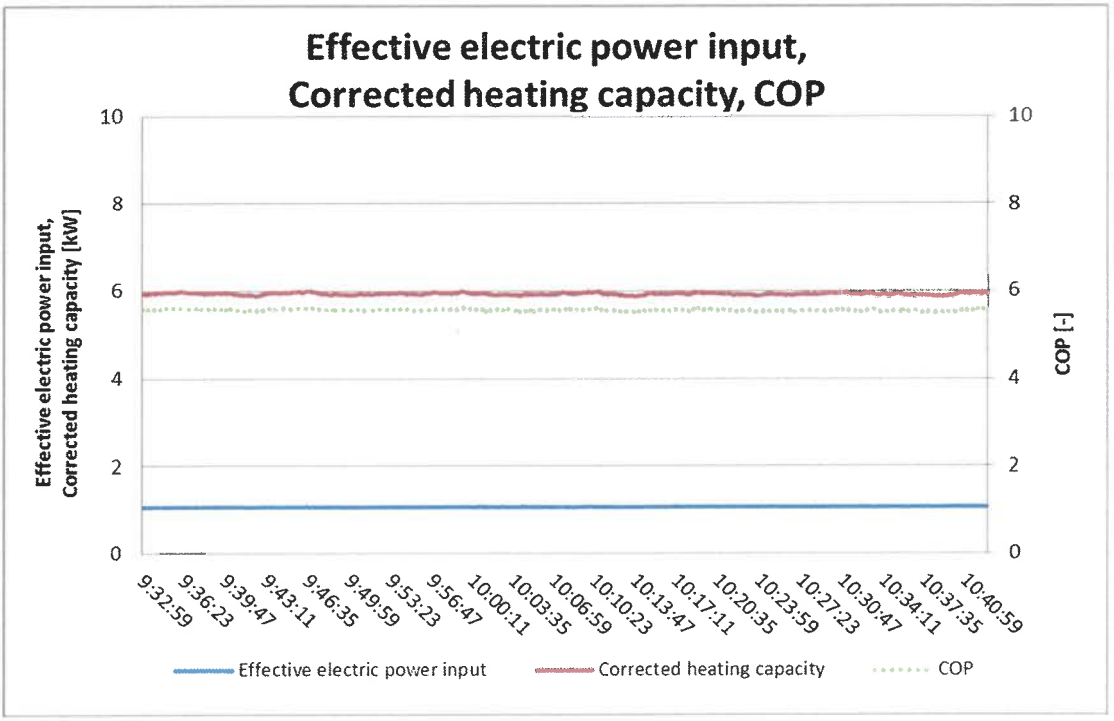
Heat Pump **x-change dynamic pro ac 10 AW E:** A-7/W34 (67 rps)



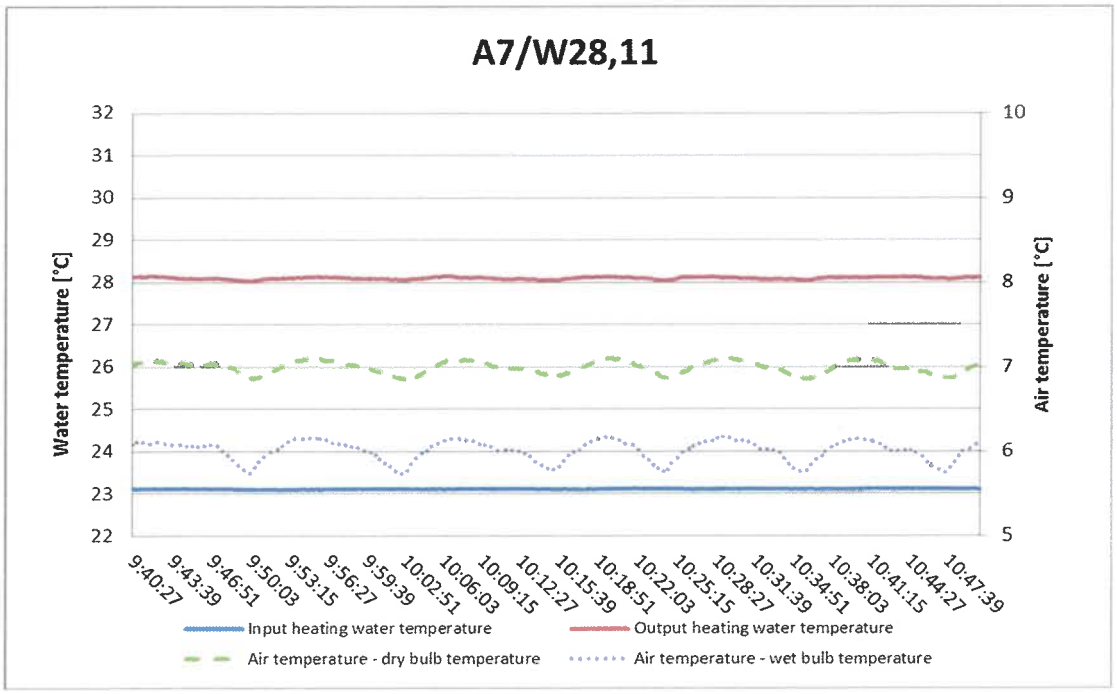


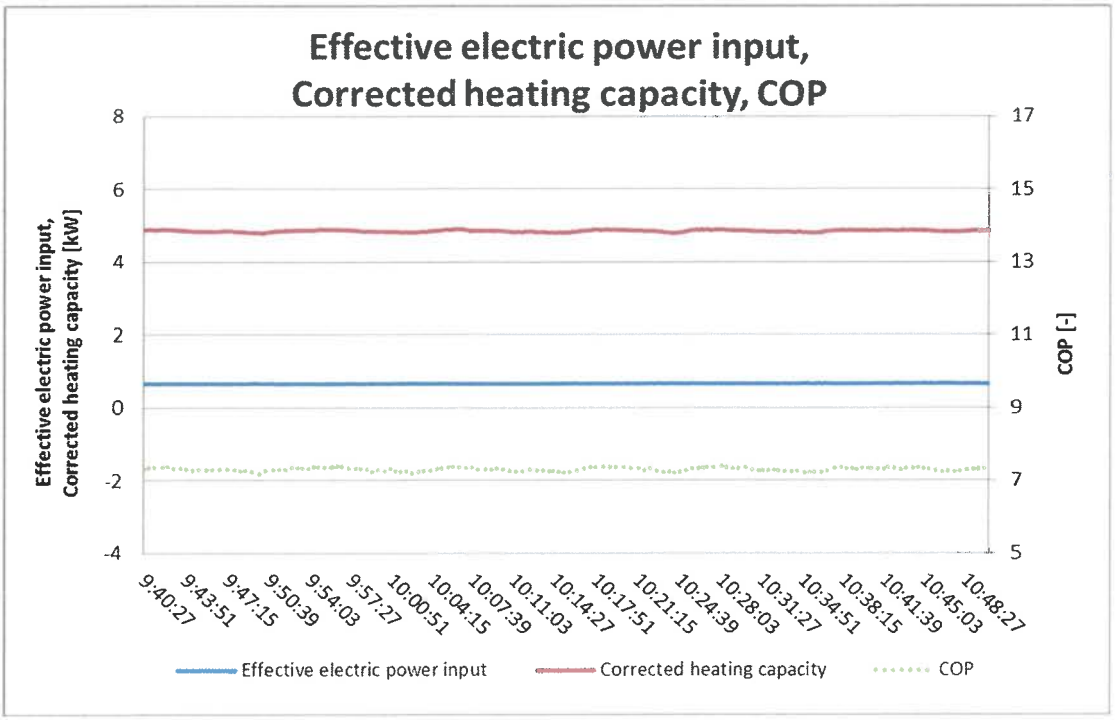
Heat Pump **x-change dynamic pro ac 10 AW E:** A2/W30 (29 rps)



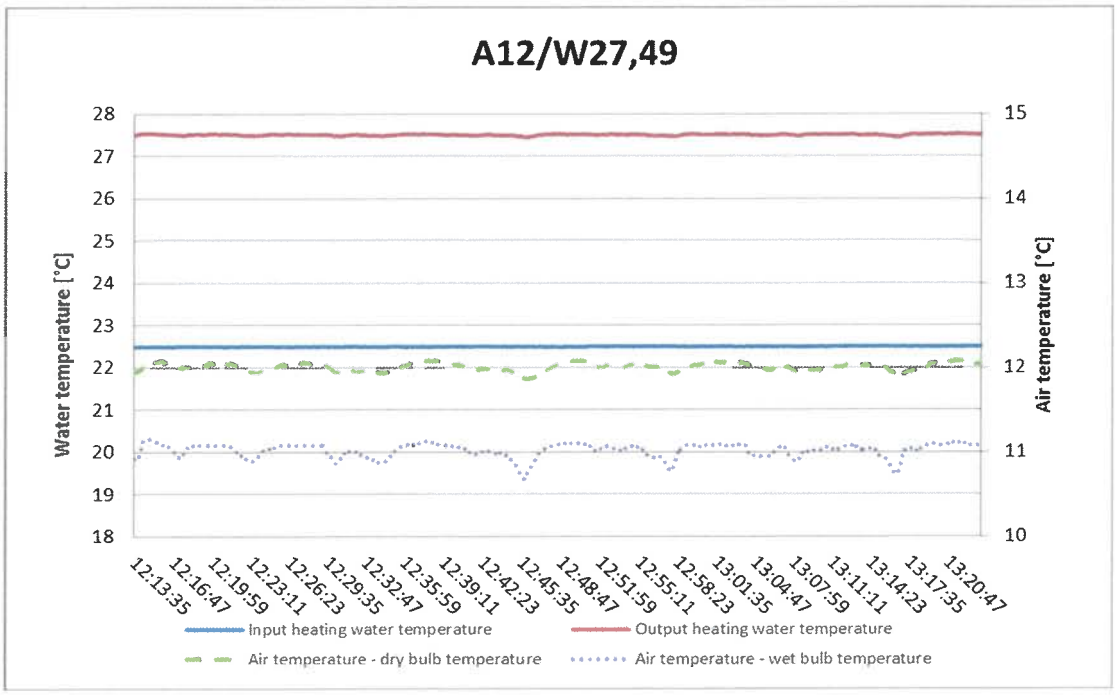


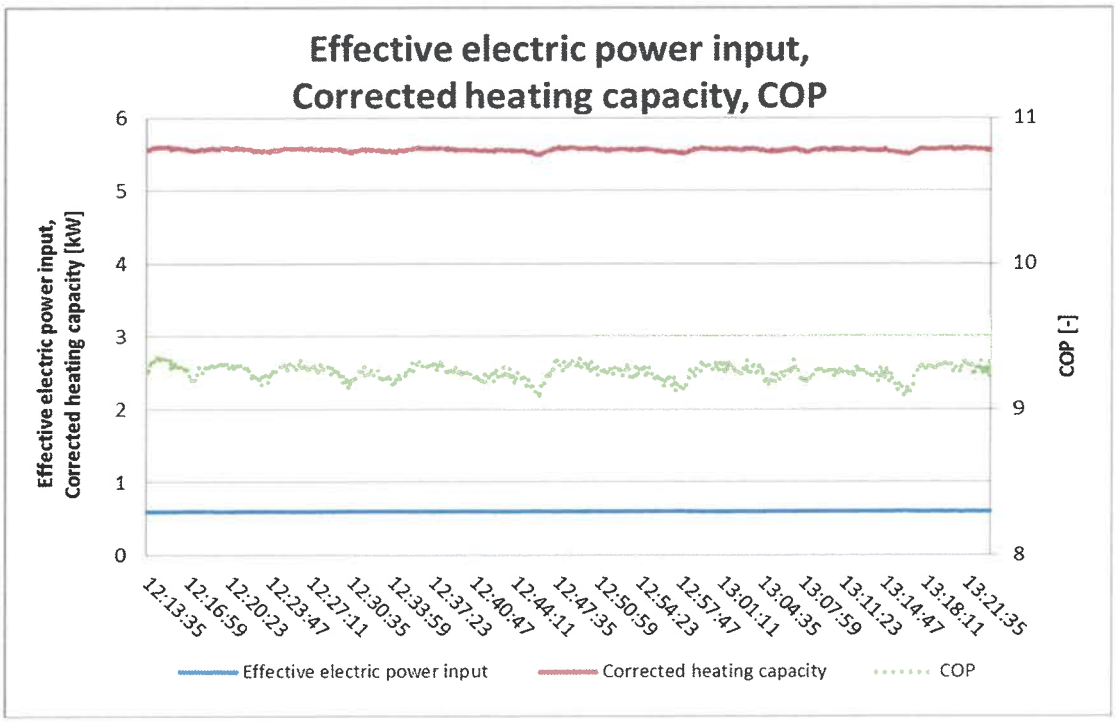
Heat Pump **x-change dynamic pro ac 10 AW E:** A7/W28.11 (20 rps)



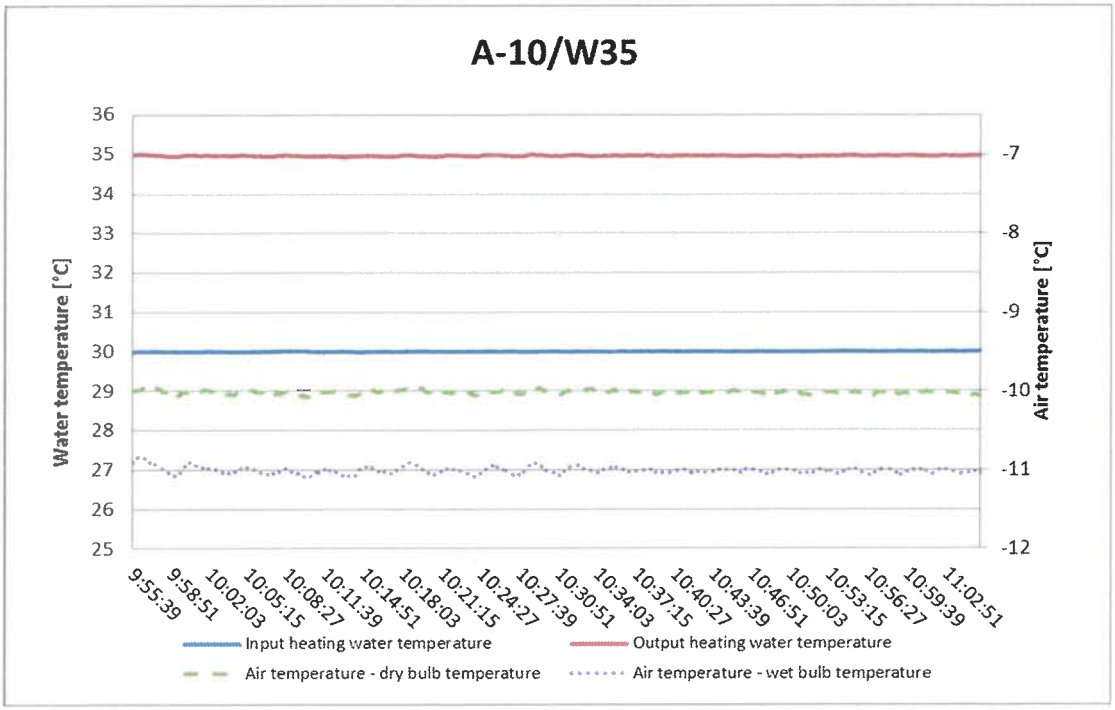


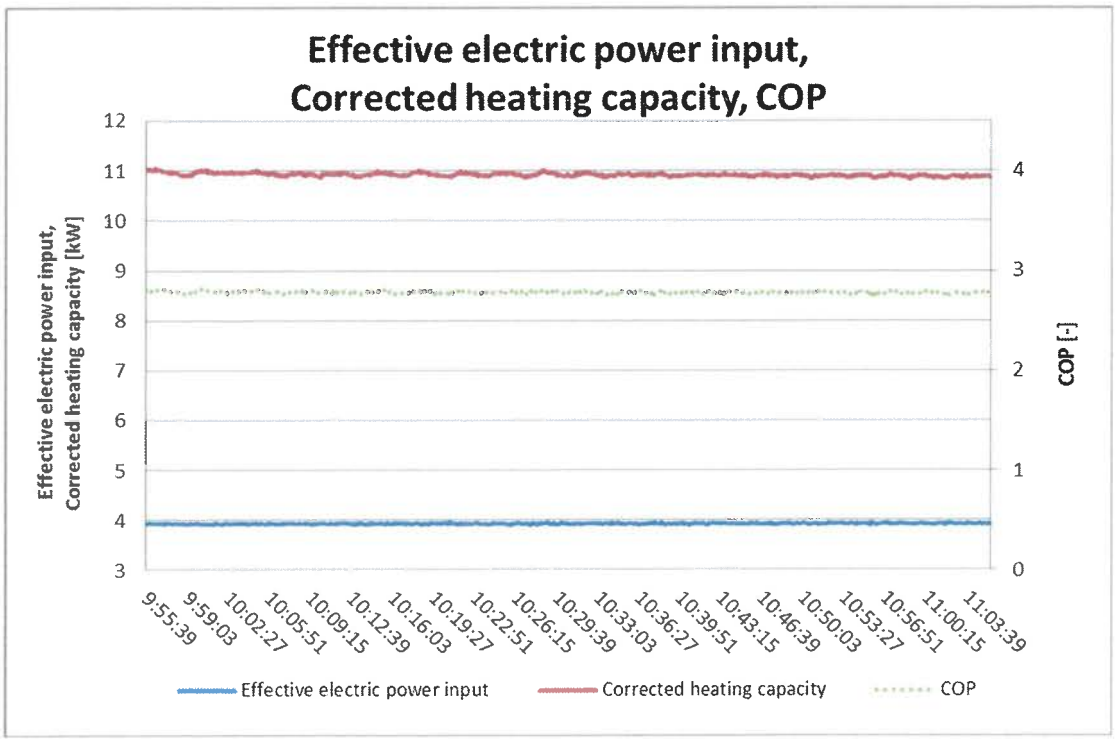
Heat Pump **x-change dynamic pro ac 10 AW E:** A12/W27.49 (20 rps)



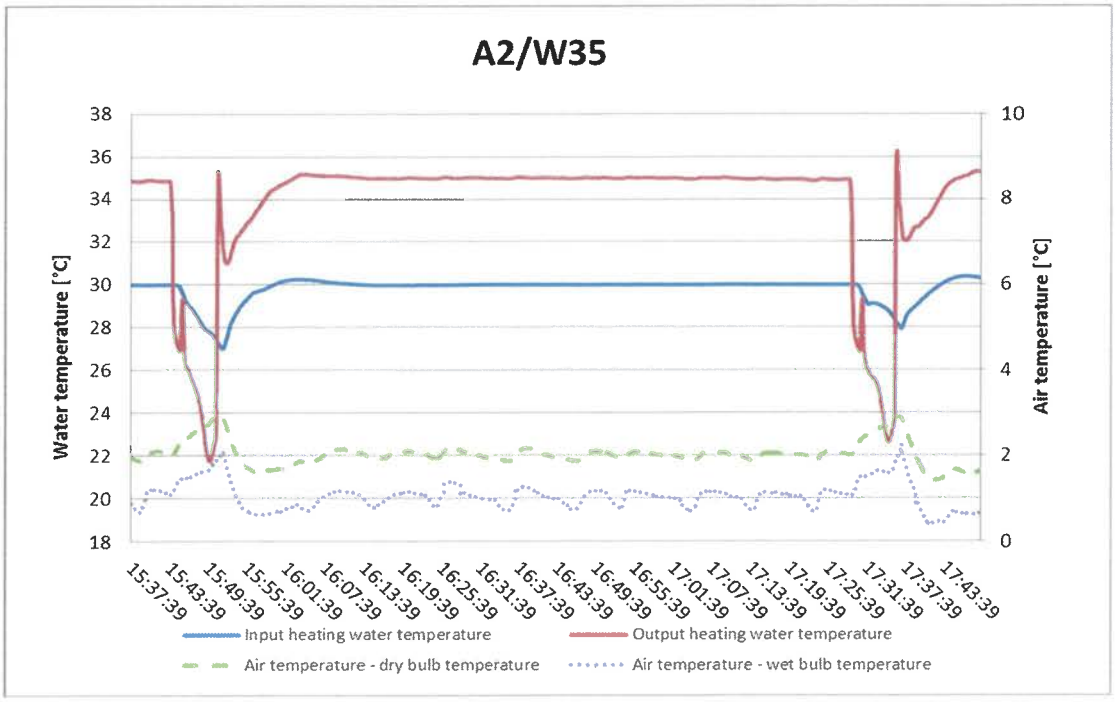


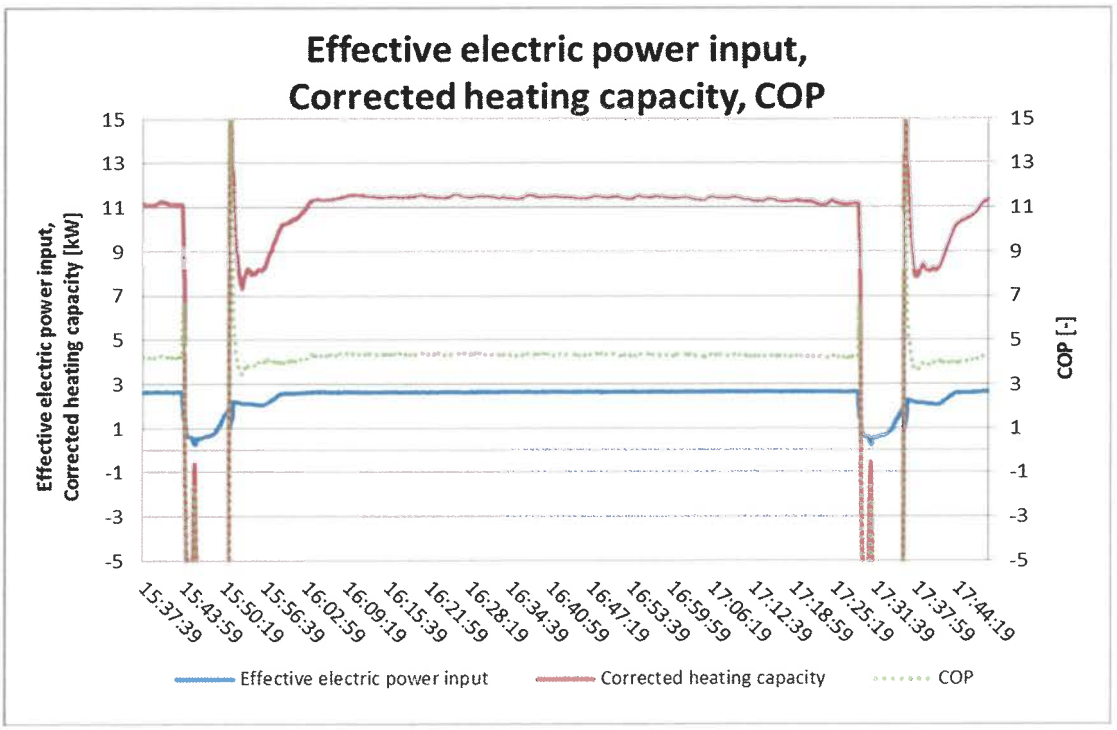
Heat Pump **x-change dynamic pro ac 10 AW E:** A-10/W35 (86 rps)



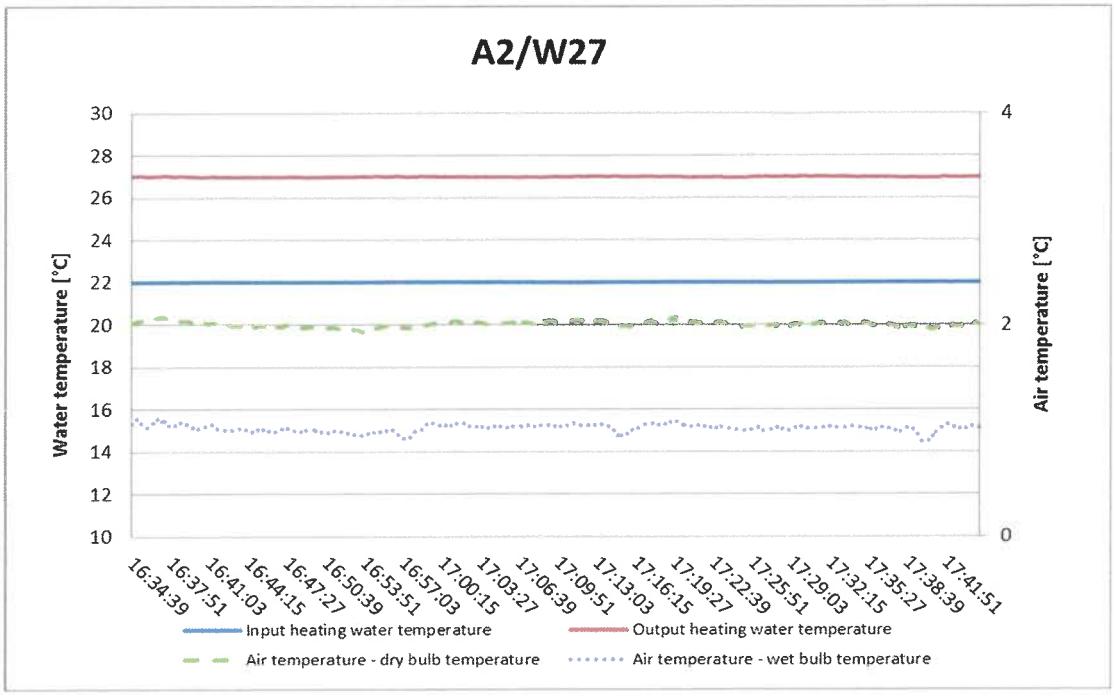


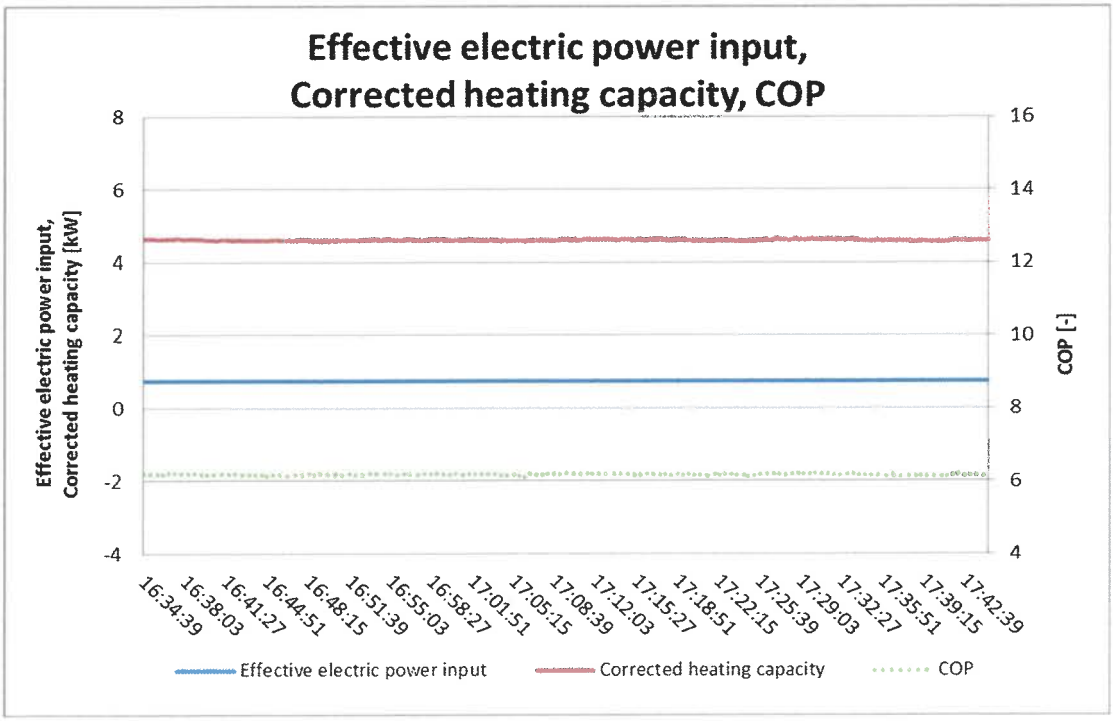
Heat Pump **x-change dynamic pro ac 10 AW E:** A2/W35 (60 rps)



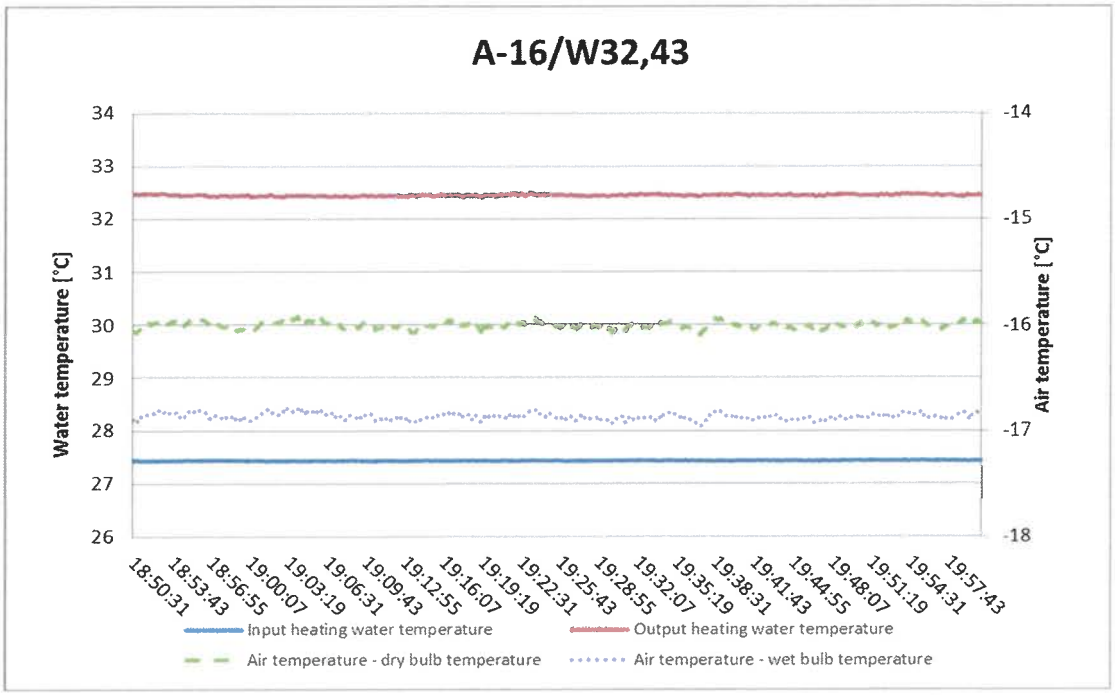


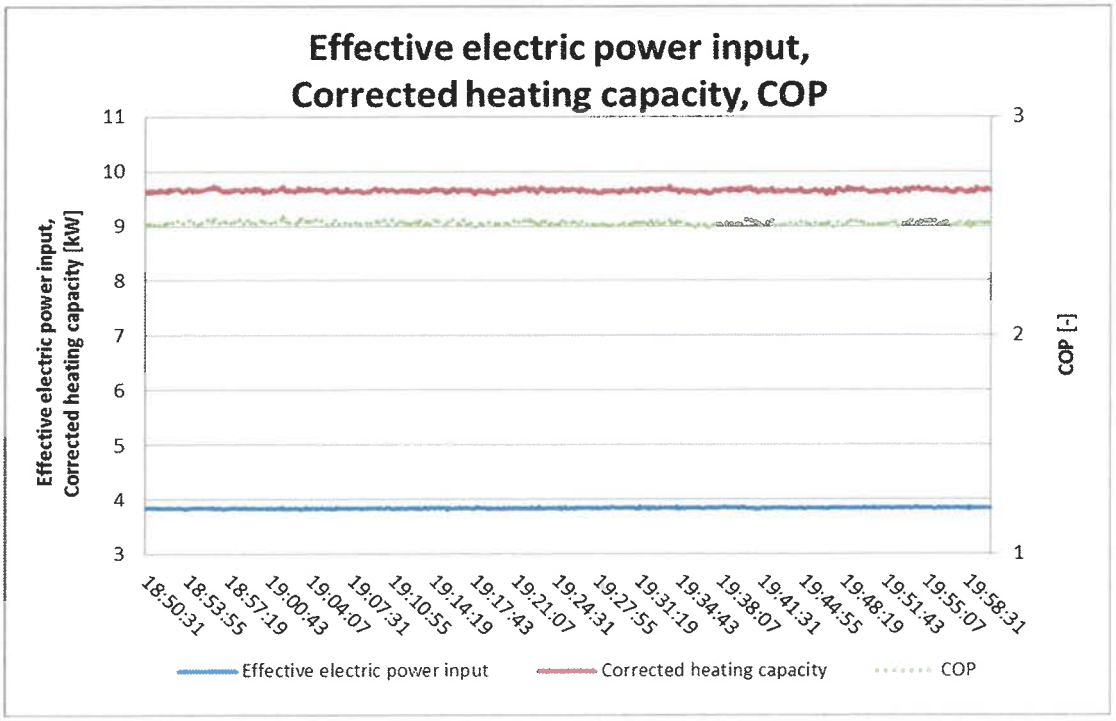
Heat Pump **x-change dynamic pro ac 10 AW E:** A2/W27 (22 rps)



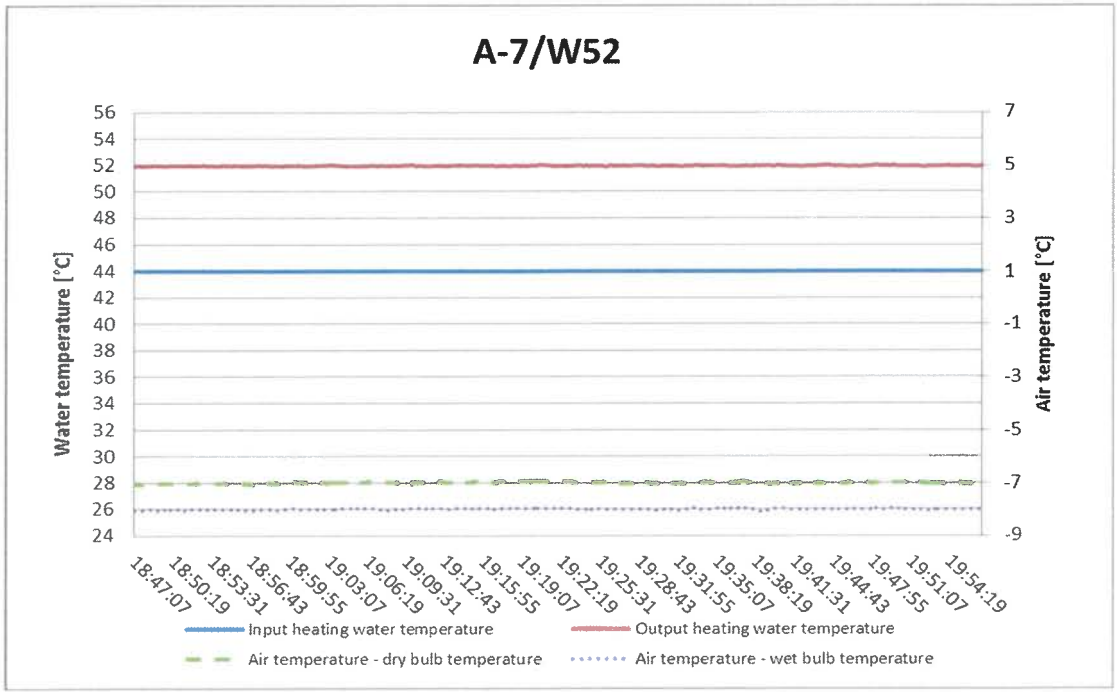


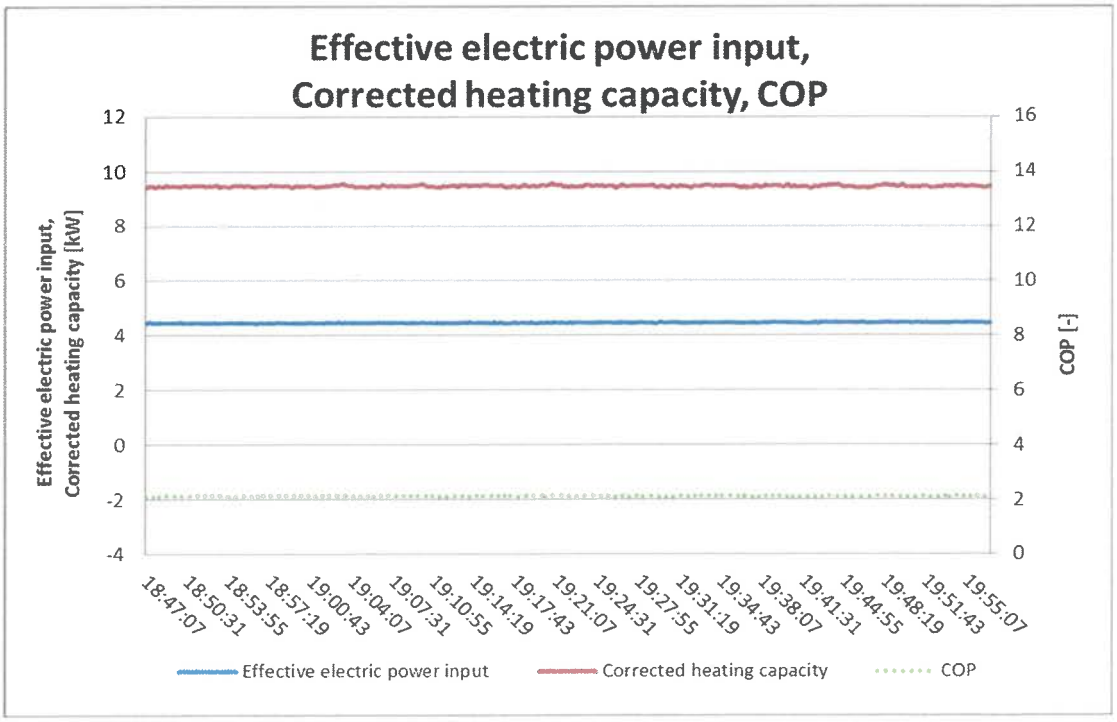
Heat Pump **x-change dynamic pro ac 10 AW E:** A-16/W32.43 (90 rps)



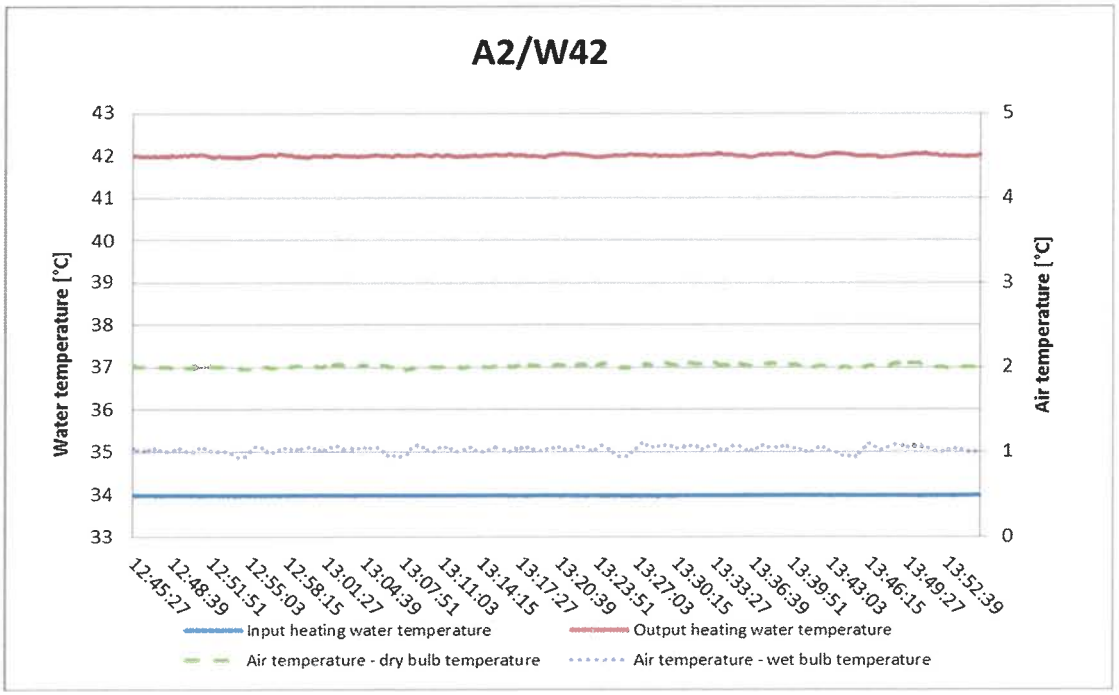


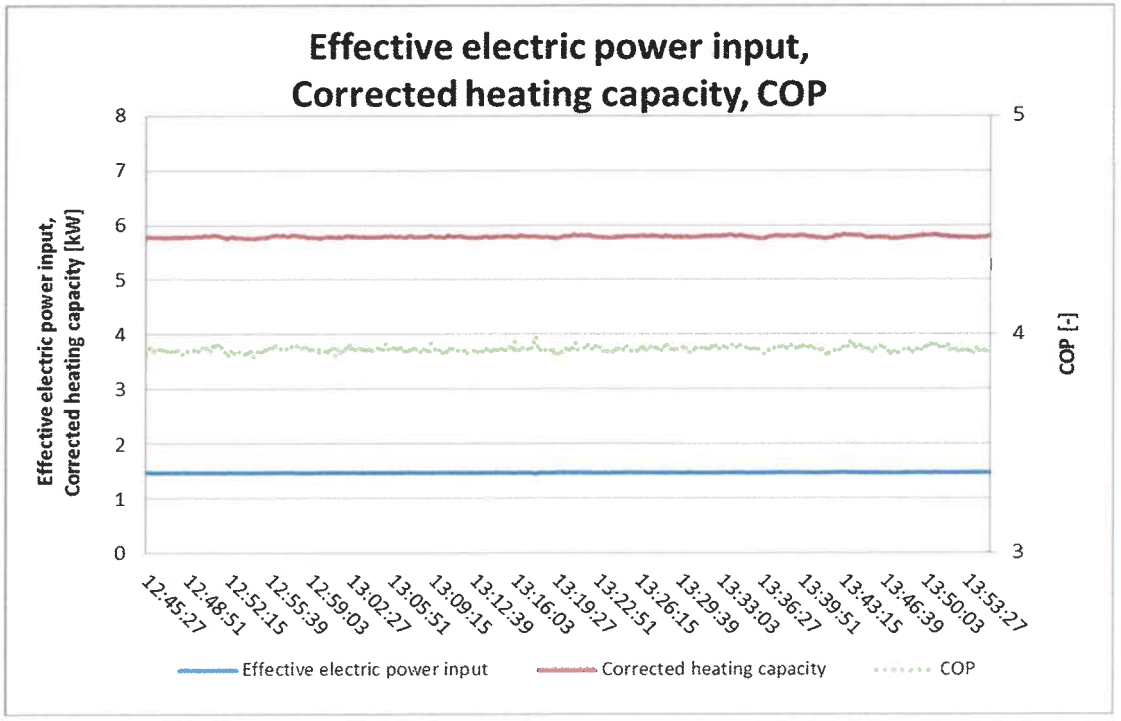
Heat Pump **x-change dynamic pro ac 10 AW E:** A-7/W52 (72 rps)



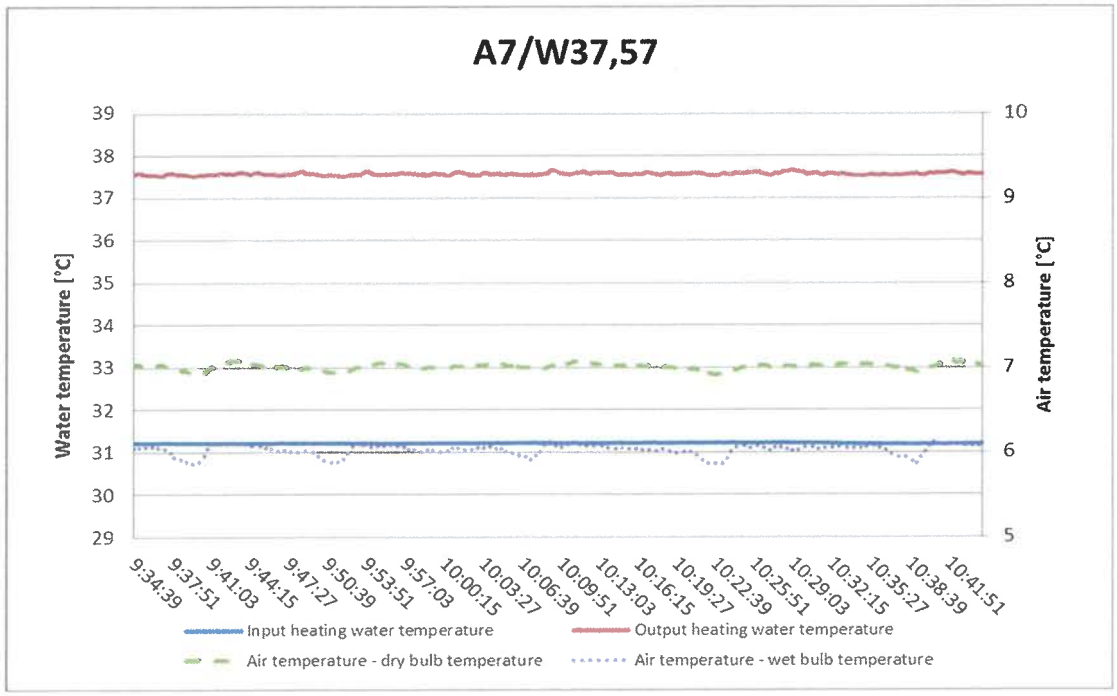


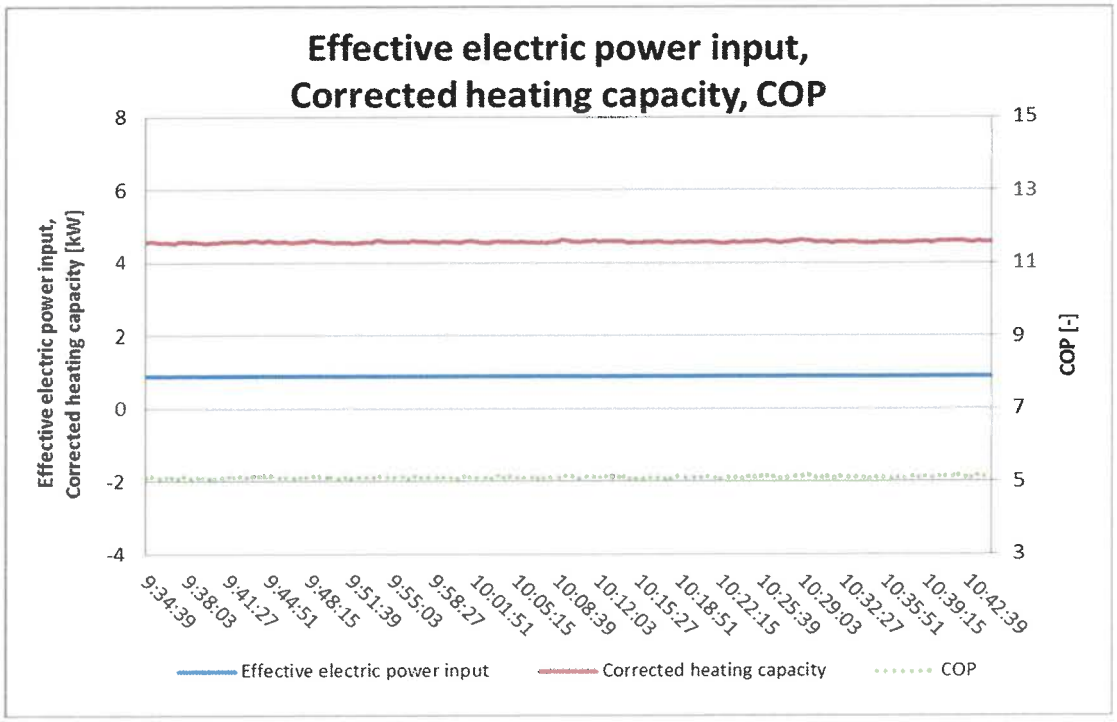
Heat Pump **x-change dynamic pro ac 10 AW E:** A2/W42 (30 rps)



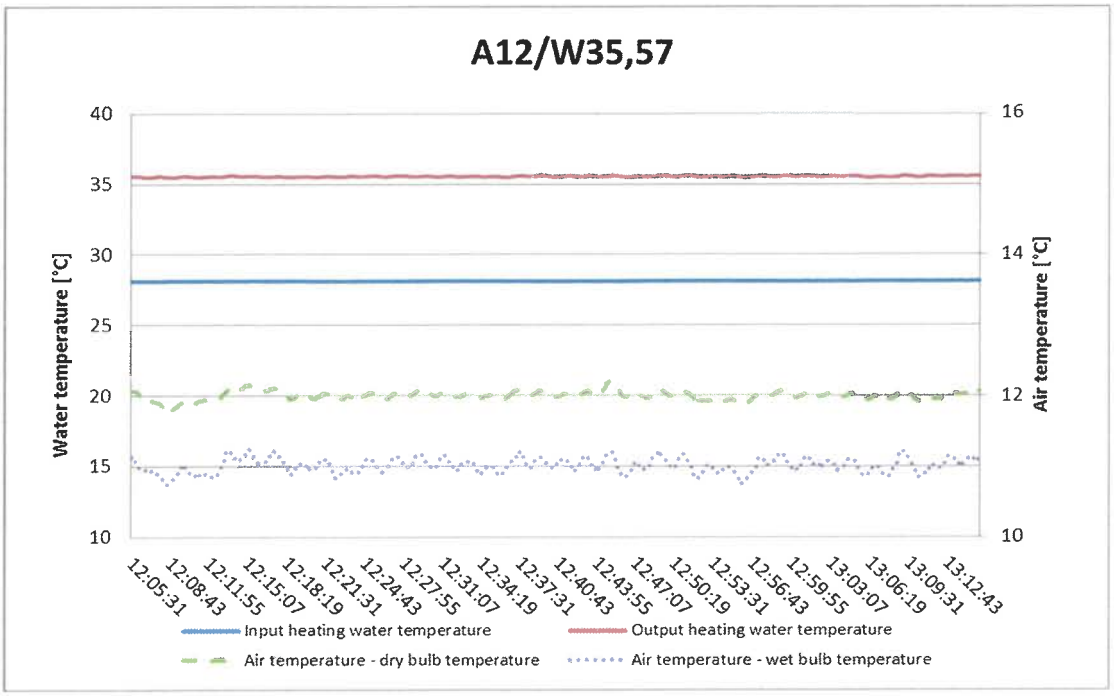


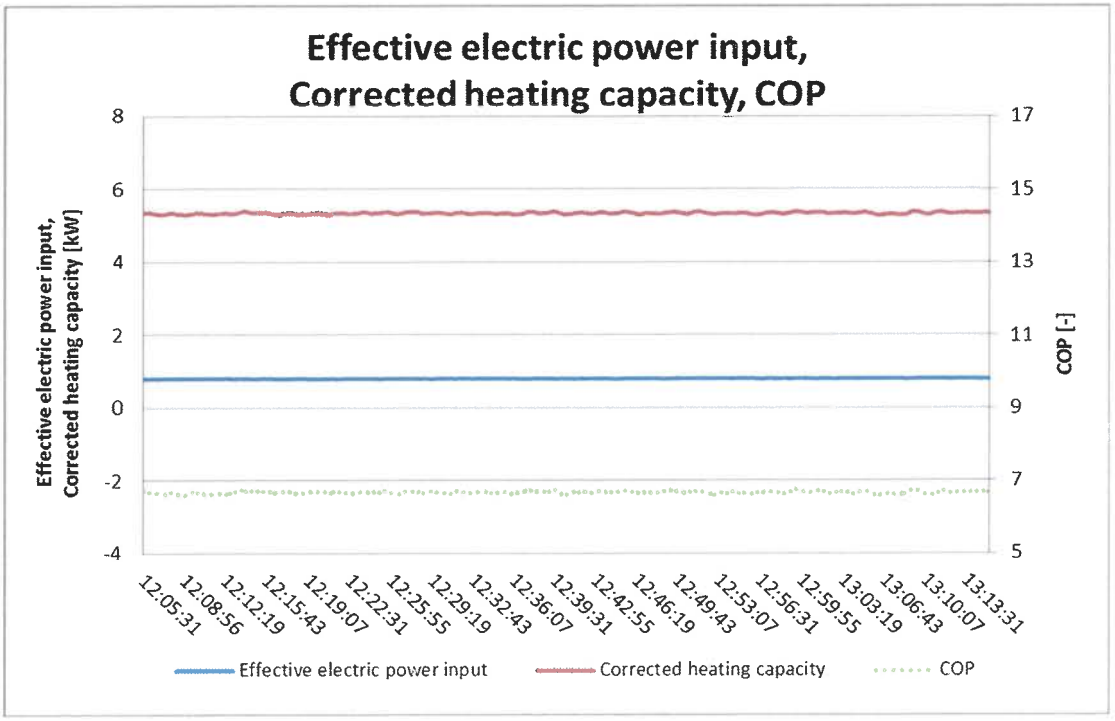
Heat Pump **x-change dynamic pro ac 10 AW E:** A7/W37.57 (20 rps)



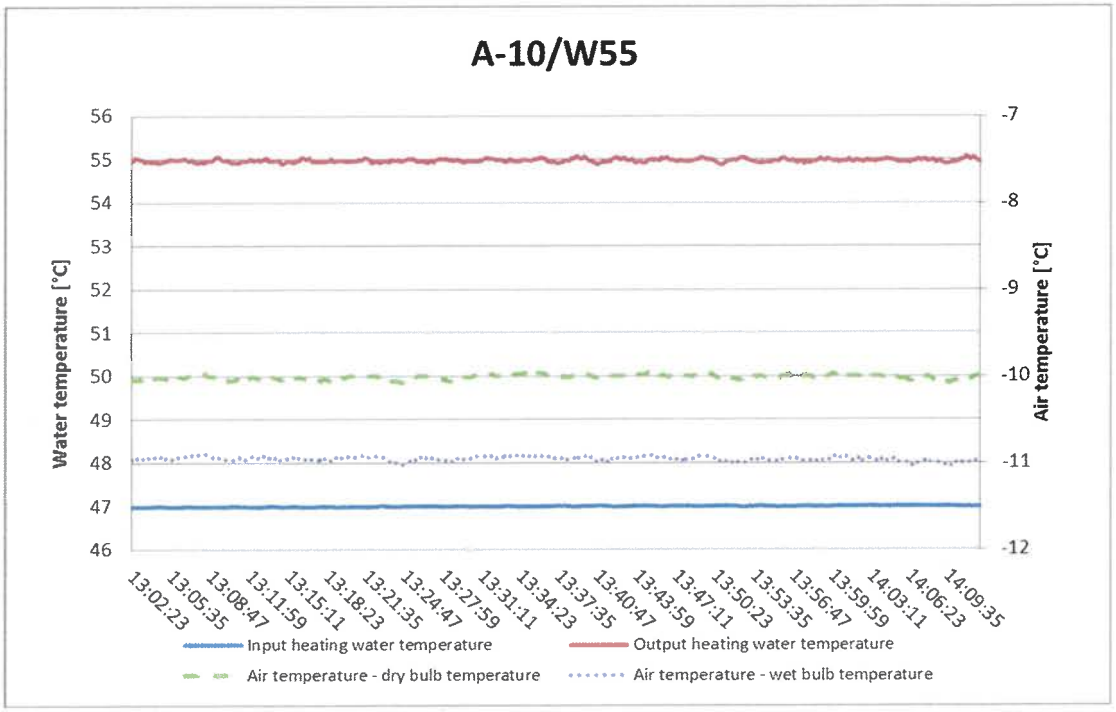


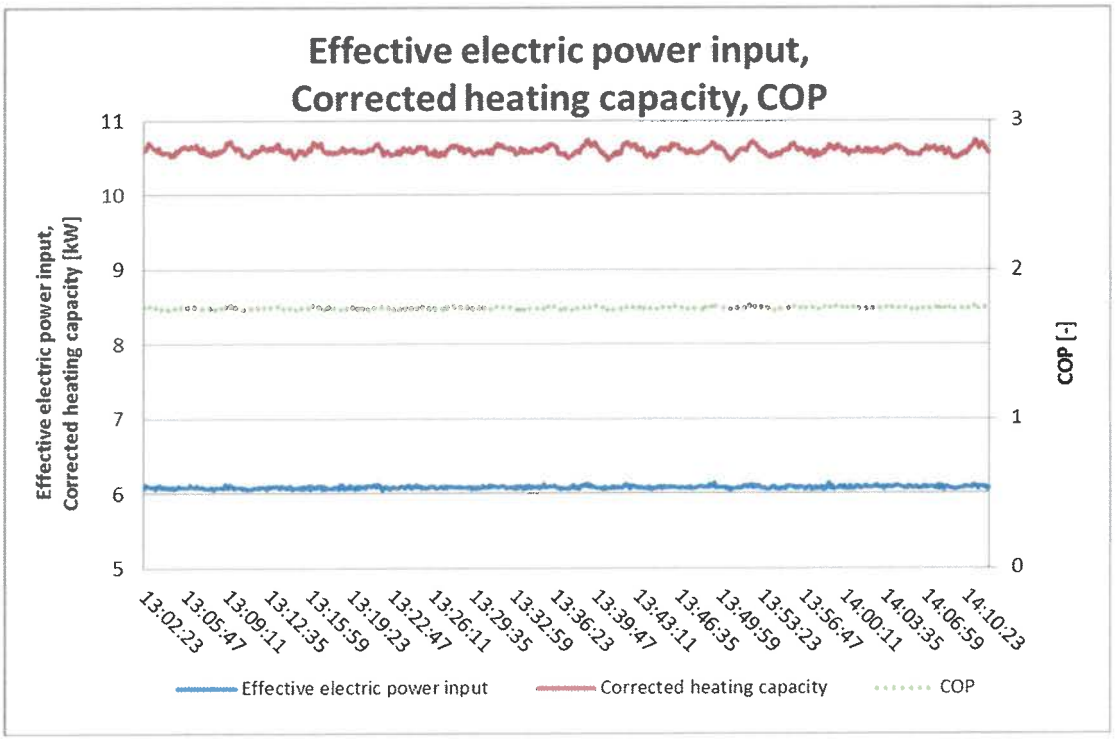
Heat Pump **x-change dynamic pro ac 10 AW E:** A12/W35.57 (20 rps)



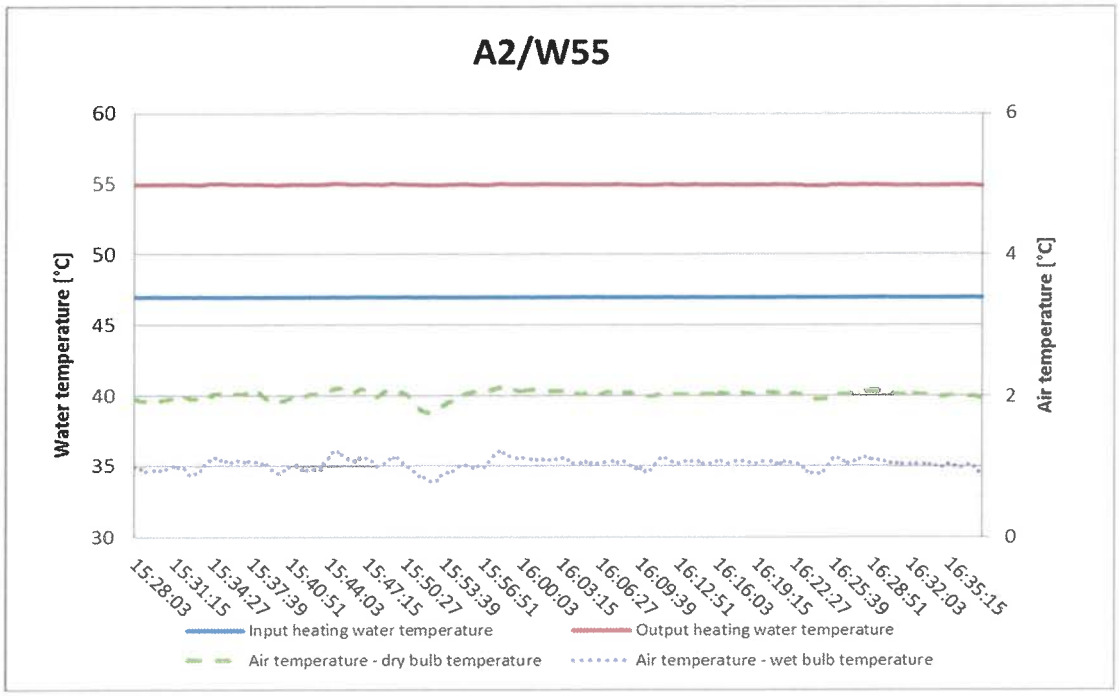


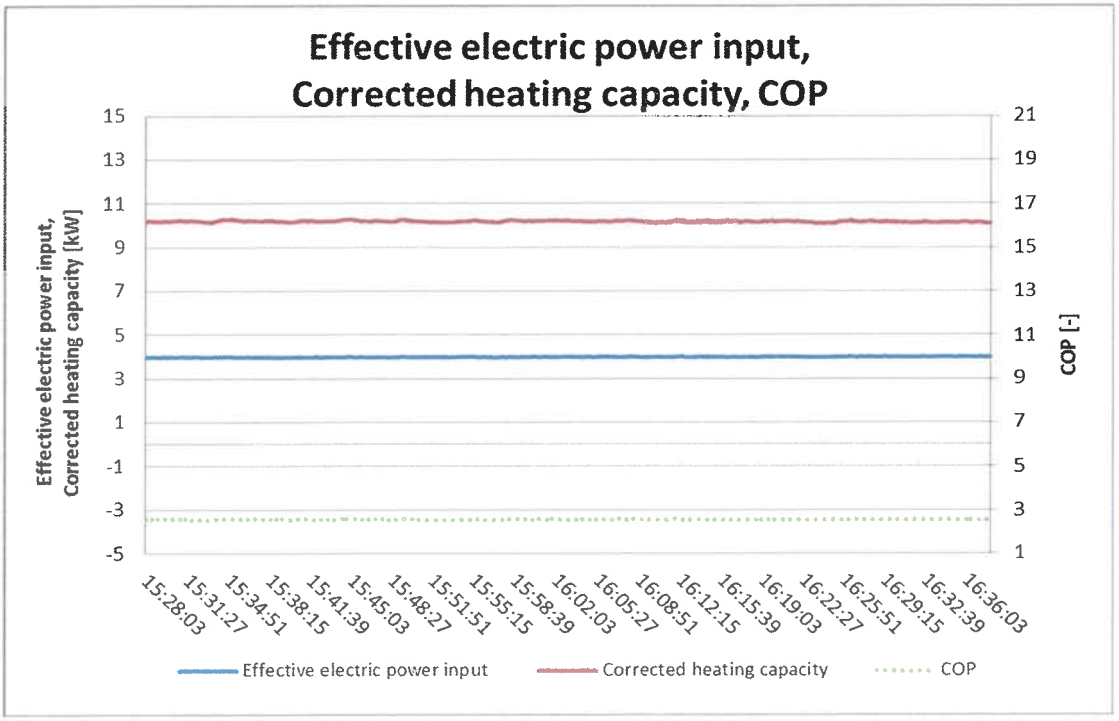
Heat Pump **x-change dynamic pro ac 10 AW E:** A-10/W55 (92 rps)



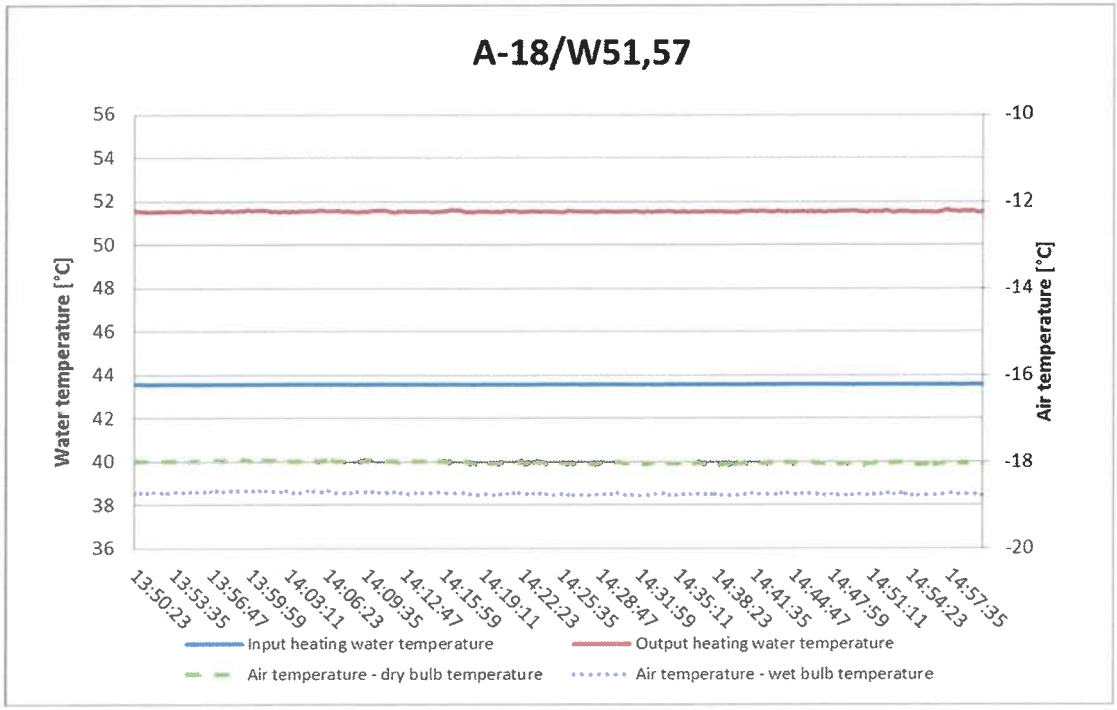


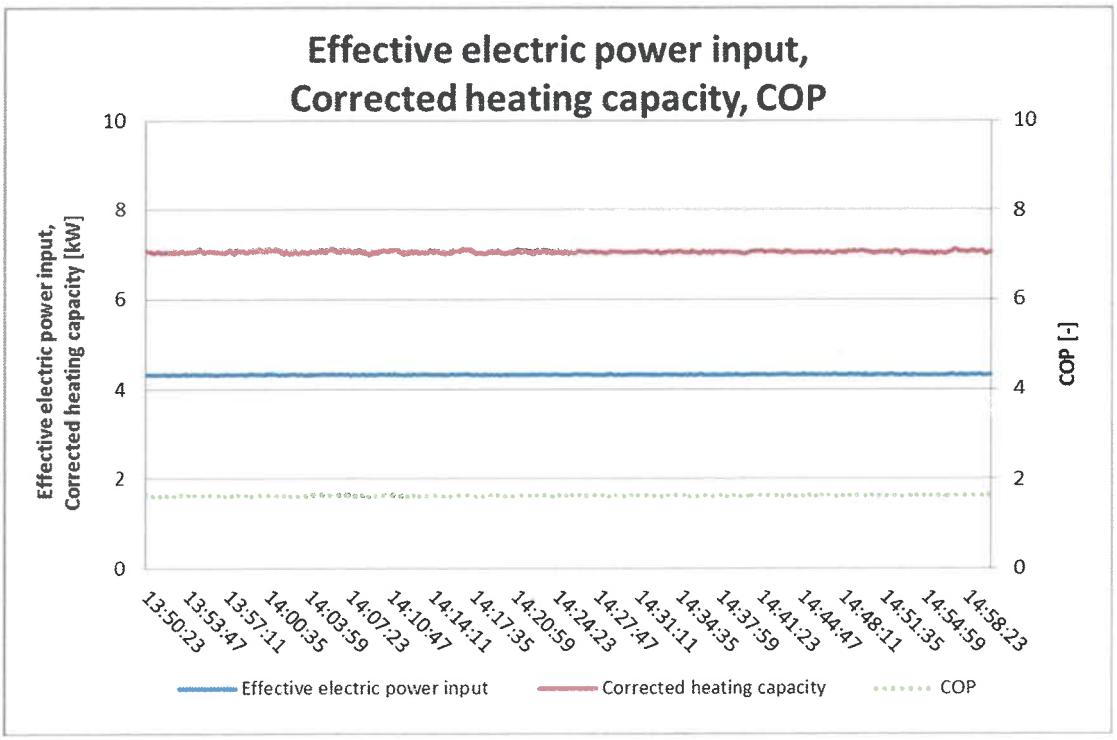
Heat Pump **x-change dynamic pro ac 10 AW E:** A2/W55 (30 rps)



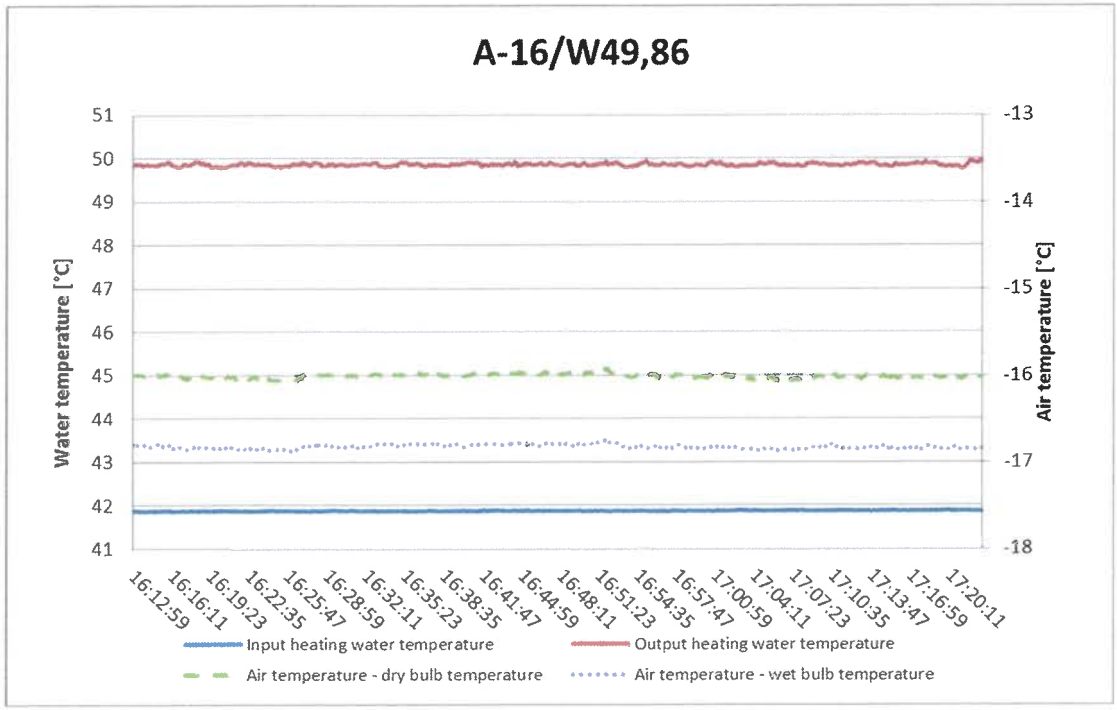


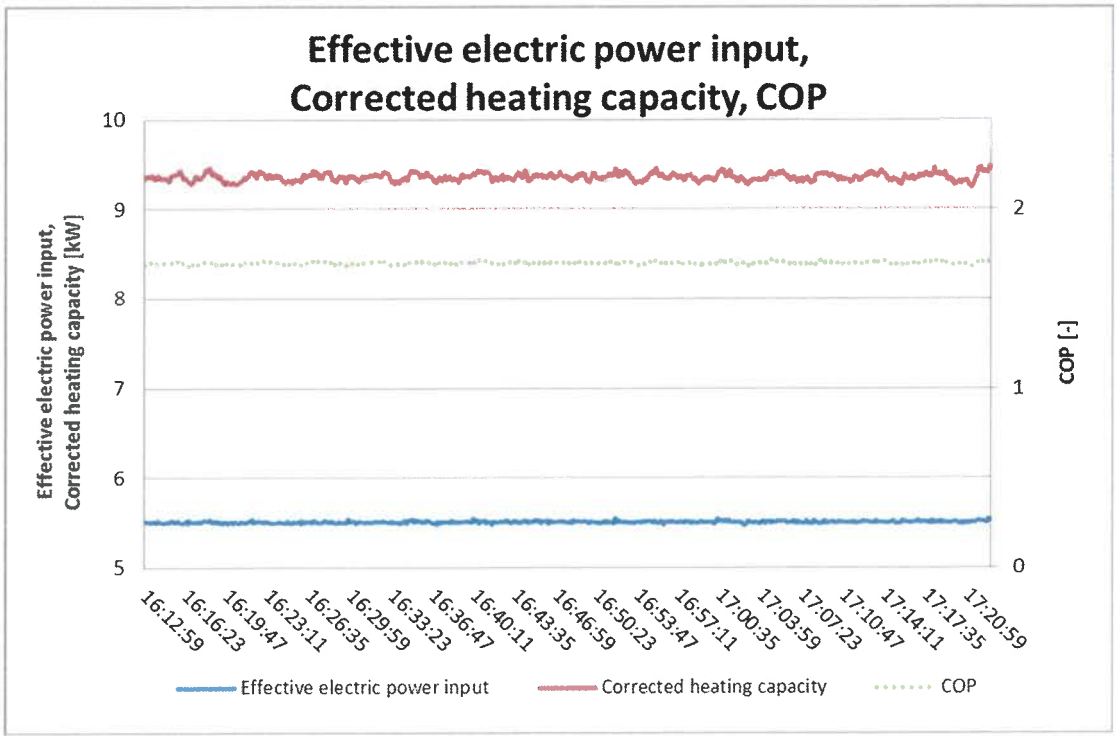
Heat Pump **x-change dynamic pro ac 10 AW E:** A-18/W51.57 (75 rps)





Heat Pump **x-change dynamic pro ac 10 AW E:** A-16/W49.86 (94 rps)





V. A list of other referenced documents

- Order 4501282945 of 2024-10-25 (Order reg. no. B-83463, received on 2024-11-01)
- Contract B-83463/39

- ČSN EN 14511-2:2019 - Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors - Part 2: Test conditions
- ČSN EN 14511-3:2019 - Air conditioners, liquid chilling packages and heat pumps for space heating and cooling a process chillers with electrically driven compressors - Part 3: Test methods
- ČSN EN 14511-4:2019 - Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors - Part 4: Requirements
- ČSN EN 14825:2020 - Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling - Testing and rating at part load conditions and calculation of seasonal performance
- EHPA Testing regulation – Testing of Air/Water Heat Pumps – Additional requirements for granting the international quality label for heat pumps – Version 2.4a
- Background of the task 39-15400
- Record measurement file: 39-15400 PZP.zip

Test Report compiled by: Ing. Tomáš Sedláček – Test engineer

Test Report approved by:

Accredited Testing Laboratory No. 1045.1 * STROJÍRENSKÝ ZKUŠEBNÍ ÚSTAV, s.p. * 1

Ing. Mario Jankola
Heating Equipment and Construction Products Manager

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