



**Testing results
of the determination of the COP
for hot water operation
according to ÖNORM EN 255 part 3**

Firm:
Testing date:

Heat pump 1
16.04.03 - 17.04.03

General information:

Heat pump according to type plate:

	GMDW 12WW
Firm	Heat pump 1
Heat pump type	Direct Expansion
Refrigerant	R407C
Heating output	13 kW at E4/W35
COP	4,96 at E4/W35

hot water storage:

storage tank:	300l
system:	boiler
separating layer plate:	yes <input type="checkbox"/> no <input checked="" type="checkbox"/>
storage set temperature:	48°C
volume flow:	0,2dm³/s

Testing:

Heating:

The test of the heat pump for heating has been carried out according to the D-A-CH regulation. The measurement takes place with a temperature difference of 10 K.

Following operating points were tested:

E4/W35	☒ date: 16.04.03
E4/W50	☒ date: 17.04.03

Results:

Heating E4/W35:

		abs. uncertainty
Electric power	2,46 kW	± 0,002
Heating output	12,75 kW	± 0,118
COP _{heating}	5,19	± 0,050

Heating E4/W50:

Electric power		3,47 kW	± 0,003
Heating output		11,74 kW	± 0,111
COP _{heating}	3,38	± 0,033	

Hot water:

The hot water operation has been carried out according to EN 255 part 3. Figure 1 shows the operating sequence of the test

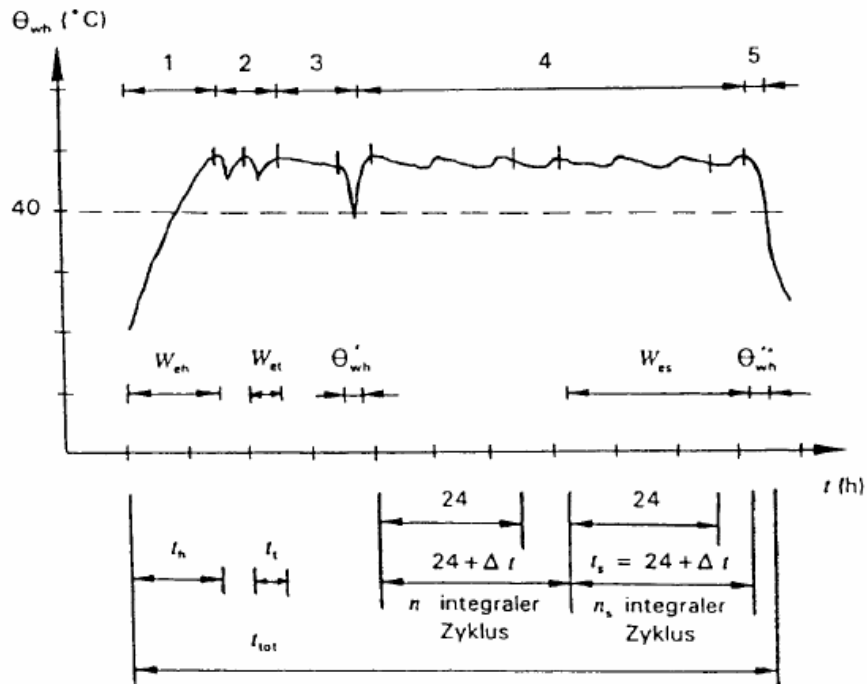


Figure 1 Temperature pattern of hot water testing according to EN 255 part 3

Cycles:

- 1 heating-up period
- 2 COP determination for extraction of hot water
- 3 First level to collect the delivery hot water temperature
- 4 During standby period determination of power consumption
- 5 Second level to collect the delivery hot water temperature and appointment of the maximum usable hot water amount

The fourth period consists of two parts, the time where the system is kept constant (first 24 hours) and the standby period. For temporal reasons only the stand by period was measured. Instead of 3 only 2 ON – OFF cycles have been measured, because this had already last for 24 hours

In period 3 the delivery hot water temperature should be measured. It was necessary to accomplish a water extraction when the heat pump was activated. The extraction has been conducted until the hot water was colder than 40°C. This measuring could not accomplish because the necessary automation was unavailable.

Following duty points were tested:

COP by extraction of hot water at E4

1. extraction of half the storage amount – date: 14.04.03

Start	End	kg _{Start}	kg _{End}	T _{Start}	T _{End}
11:50:10	12:02:45	27kg	177kg	49,2°C	49,75°C

2. extraction of half the storage amount – date: 14.04.03

Start	End	kg _{Start}	kg _{End}	T _{Start}	T _{End}
12:37:39	12:50:20	28kg	178kg	49,7°C	49,6°C

Maximum usable water quantity (turning off=50 °C) – date: 14.04.03

Start	End	kg _{Start}	kg _{End}	T _{Start}	T _{End}
13:24:25	13:41:40	27,5kg	232kg	49,2°C	40°C

COP by extraction of process water – Sommerfall E15

1. extraction of half the storage amount – date: 14.04.03

Start	End	kg _{Start}	kg _{End}	T _{Start}	T _{End}
11:50:10	12:02:45	27kg	177kg	49,2°C	49,75°C

2. extraction of half the storage amount – date: 14.04.03

Start	End	kg _{Start}	kg _{End}	T _{Start}	T _{End}
12:37:39	12:50:20	28kg	178kg	49,7°C	49,6°C

Maximum usable water quantity (turning-off=50 °C) – Datum: 14.04.03

Start	End	kg _{Start}	kg _{End}	T _{Start}	T _{End}
13:24:25	13:41:40	27,5kg	232kg	49,2°C	40°C

Results:

hot water E4:

		abs. uncertainty
<i>heating-up period</i>		
Heating-up time t_h	1,01 h	$\pm 0,003$
Energy consumption W_{eh}	2,80 kWh	$\pm 0,003$
<i>Figure of merit</i>		
Extraction and heating-up time t_t	0,62 h	$\pm 0,167$
Energy consumption W_{et}	1,80 kWh	$\pm 0,008$
Thermal capacity Q_t	6,18 kWh	$\pm 0,300$
Energy consumption $W_{et}-P_{es}t_t$	1,80 kWh	$\pm 0,008$
Thermal capacity Q_t	6,18 kWh	$\pm 0,300$
COP_{hot water}	3,44	$\pm 0,169$
<i>Standby period</i>		
Time t_s	27,61 h	$\pm 0,003$
Energy consumption W_{es}	1,72 kWh	$\pm 0,003$
Effective power consumption P_{es}	62,38 W	$\pm 0,125$
<i>Maximum usable water amount</i>		
Hot water temperature Start	49,55 °C	$\pm 0,050$
Hot water temperature End	33,60 °C	$\pm 0,050$
Maximum hot water amount	247,53 dm ³	$\pm 0,301$

hot water E15:

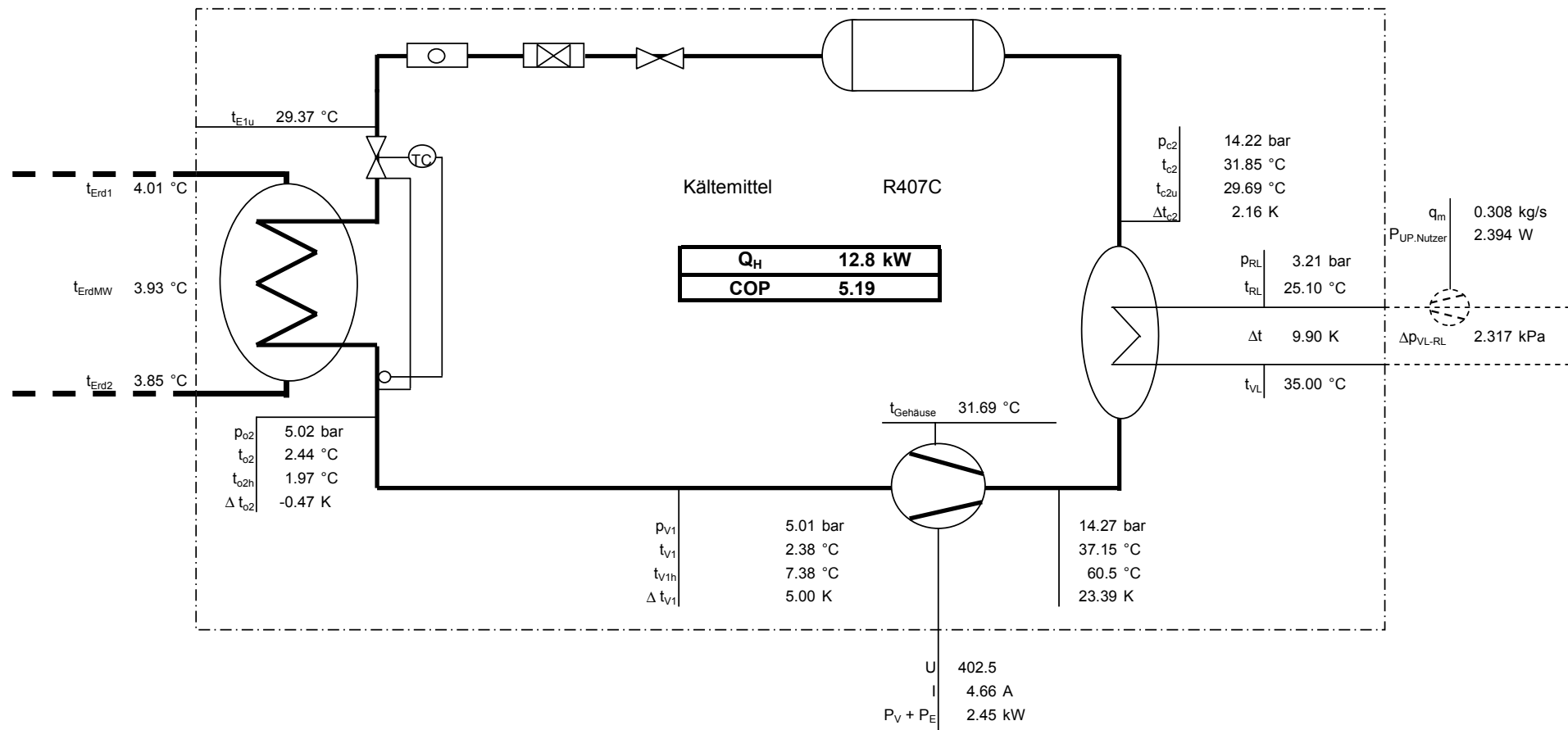
		abs. uncertainty
<i>heating-up period</i>		
heating-up time t_h	0,7 h	$\pm 0,003$
Energy consumption W_{eh}	2,18 kWh	$\pm 0,002$
<i>Figure of merit</i>		
Extraction and heating-up time t_t	0,65 h	$\pm 0,167$
Energy consumption W_{et}	1,48 kWh	$\pm 0,006$
Thermal capacity Q_t	6,39 kWh	$\pm 0,300$
Energy consumption $W_{et}-P_{es}t_t$	1,46 kWh	$\pm 0,006$
Heating output Q_t	6,39 kWh	$\pm 0,300$
COP_{hot water}	4,36	$\pm 0,210$
<i>Standby period</i>		
Time t_s	27,61 h	$\pm 0,003$
Energy consumption W_{es}	0,69 kWh	$\pm 0,003$
Power consumption P_{es}	24,95 W	$\pm 0,125$
<i>Maximum usable water amount</i>		
Hot water temperature Start	48,77 °C	$\pm 0,050$
Hot water temperature End	34,42 °C	$\pm 0,050$
Maximum hot water amount	299,33 dm ³	$\pm 0,300$

Messtellenschema

Messbeginn 16.4.03 8:15
 Messende 16.4.03 8:45

Messpunkt E4/W35

Umgebungslufttemperatur 22.4 °C
 Luftdruck 1003 mbar



Messtellenschema

Messbeginn 17.4.03 11:55
 Messende 17.4.03 12:25

Messpunkt E4/W50

Umgebungslufttemperatur 24.0 °C

Luftdruck 1005 mbar

