

*Danfoss*

Selection  
& Application Guidelines

**Performer<sup>®</sup>**  
**scroll compressors**  
**Single 20 to 110 kW**  
**50 - 60 Hz**

R22, R407C, R134a, R404A/R507A



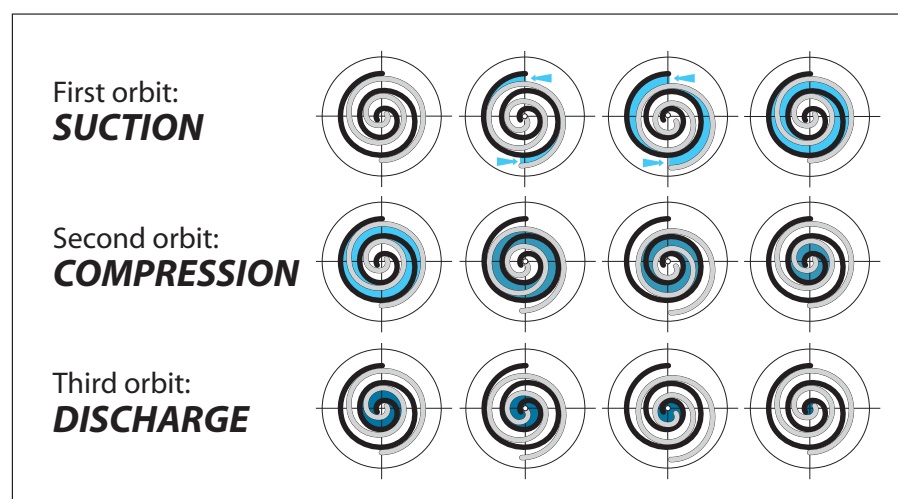
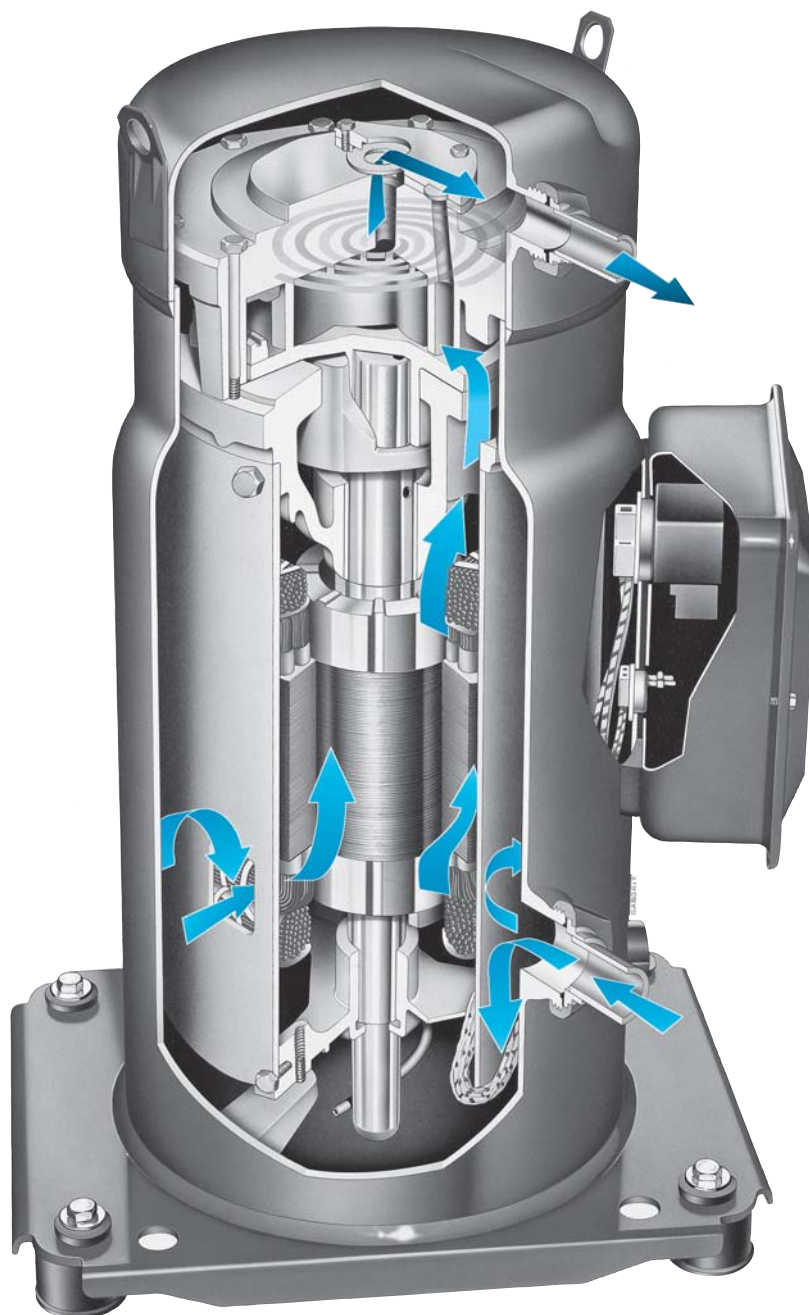
 **Performer**  
SCROLL COMPRESSORS

REFRIGERATION AND  
AIR CONDITIONING

## PERFORMER® SCROLL COMPRESSION PRINCIPLE

In a Danfoss Performer® scroll compressor, the compression is performed by two scroll elements located in the upper part of the compressor above the motor (see adjacent figure). Suction gas enters the compressor at the suction connection. The gas then flows around the motor and enters at the bottom side through the openings as shown. Oil droplets separate from the suction gas and fall into the oil sump. All of the suction gas passes through the electrical motor, thus ensuring complete motor cooling in all applications. After exiting the electrical motor, the gas enters the scroll elements where compression takes place. A check valve is located directly above the fixed scroll discharge port; this feature prevents the compressor from running backwards once the power has been switched off. Ultimately, the discharge gas leaves the compressor at the discharge connection.

The figure below illustrates the entire compression process. The center of the orbiting scroll traces a circular path around the center of the fixed scroll. This movement creates symmetrical compression pockets between the two scroll elements. Low pressure suction gas is trapped within each crescent-shaped pocket as it gets formed; continuous motion of the orbiting scroll serves to seal the pocket, which decreases in volume as the pocket moves towards the center of the scroll set increasing the gas pressure. Maximum compression is achieved once a pocket reaches the center where the discharge port is located; this stage occurs after three complete orbits. Compression is a continuous process: when one quantity of gas is being compressed during the second orbit, another quantity is entering the scrolls and yet another is being discharged all at the same time.



## COMPRESSOR MODEL DESIGNATION

Performer® scroll compressors are available both as single compressors and as tandem units. The example below presents the single compressor codification (technical reference

shown on compressor nameplate).

For tandem assemblies, please refer to the Performer® Parallel Application Guidelines documentation.

### Nomenclature

Family, lubricant & refrigerant	Nominal capacity	UL index	Voltage	Version	Evolution Index
<b>S Z</b> <b>S Y</b>	<b>1 8 5</b> <b>3 0 0</b>	<b>S</b> <b>A</b>	<b>4</b> <b>9</b>	<b>R</b> <b>AA</b>	<b>C</b> <b>A</b>

**Family, lubricant & refrigerant**  
**SM:** Scroll, mineral oil, for R22  
**SY:** Scroll, POE lubricant, for R22  
**SZ:** Scroll, POE lubricant, for R407C - R134a

**Nominal capacity**  
in thousand Btu/h at 60 Hz, R22, ARI conditions

**UL index**

**Voltage**  
Motor voltage code:  
3: 200-230/3/60  
4: 380-400/3/50 - 460/3/60  
6: 230/3/50  
7: 500/3/50 - 575/3/60  
9: 380/3/60

**Motor protection type**

Motor protection type	Description	Applies to
Internal overload protector	V: brazed	S 084 - 090 100 - 110 - 120 148 - 161
Internal thermostat	C: brazed	S 115 - 125 160 - 175 - 185
	R: rotolock	
Electronic protection module	AA: brazed	S 240* - 300* - 380*
	AB: brazed	
	MA: rotolock	
	MB: rotolock	

\*For trio assemblies, please contact Danfoss

### Connection details

MODEL	SM/SZ 084 - 090 - 100 110 - 120 - 148 - 161		SM/SZ 115 - 125 - 160 170 - 185		SY/SZ 240 - 300		SY/SZ 380
	Version	V	R	C	MA MB	AA AB	AA AB
Suction and discharge connection	brazed	rotolock	brazed	rotolock	brazed	brazed	brazed
Oil sight glass	threaded	threaded	threaded	threaded	threaded	threaded	threaded
Oil equalization connection	3/8" flare	3/8" flare	3/8" flare	3/8" flare	1/2" flare	1/2" flare	1/2" flare
Oil drain connection	-	1/4" NPT	1/4" NPT	1/4" NPT	1/4" NPT	1/4" NPT	1/4" NPT
Low pressure gauge port (schrader)	1/4" flare	1/4" flare	1/4" flare	1/4" flare	1/4" flare	1/4" flare	1/4" flare

## TECHNICAL SPECIFICATIONS

### 50-Hz data

Model	Nominal Cap. 60 Hz TR	Nominal cooling capacity		Power input kW	A max A	Efficiency		Sound power dB(A)	Swept volume cm <sup>3</sup> /rev	Displacement m <sup>3</sup> /h	Oil charge dm <sup>3</sup>	Net weight kg	
		W	Btu/h			COP W/W	E.E.R. Btu/h/W						
R22 SINGLE	SM084	7	20400	69 600	6.12	17	3.33	11.4	70	114.5	19.92	3.3	72
	SM090	7.5	21800	74 400	6.54	17	3.33	11.4	70	120.5	20.97	3.3	72
	SM100	8	23100	79 000	6.96	19	3.33	11.3	70	127.2	22.13	3.3	72
	SM110	9	25900	88 600	7.82	20	3.32	11.3	75	144.2	25.09	3.3	80
	SM115	9.5	28000	95 600	8.31	25	3.37	11.5	76	155.0	26.97	3.8	80
	SM120	10	30100	102 800	8.96	29	3.36	11.5	75	166.6	28.99	3.3	80
	SM125	10	30100	102 800	8.93	25	3.37	11.5	76	166.6	28.99	3.8	80
	SM148	12	36100	123 100	10.80	32	3.34	11.4	79	199.0	34.60	3.6	86
	SM160	13	39100	133 500	11.60	29	3.37	11.5	79.5	216.6	37.69	4.0	94
	SM161	13	39000	133 200	11.59	32	3.37	11.5	79.5	216.6	37.69	3.6	86
	SM175	14	42000	143 400	12.46	35	3.37	11.5	80	233.0	40.54	6.2	103
	SM185	15	45500	155 300	13.62	35	3.34	11.4	80	249.9	43.48	6.2	103
	SY240	20	61200	208 700	18.20	50	3.36	11.5	82	347.8	60.50	8.0	160
	SY300	25	78200	267 000	22.83	69	3.43	11.7	82	437.5	76.10	8.0	160
	SY380	30	92000	313 900	26.82	72	3.43	11.7	85	531.2	92.40	8.4	163
R407C SINGLE	SZ084	7	19300	66 000	6.13	17	3.15	10.7	73	114.5	19.92	3.3	72
	SZ090	7.5	20400	69 600	6.45	17	3.16	10.8	73	120.5	20.97	3.3	72
	SZ100	8	21600	73 700	6.84	19	3.15	10.8	73	127.2	22.13	3.3	72
	SZ110	9	24600	84 000	7.76	20	3.17	10.8	77	144.2	25.09	3.3	80
	SZ115	9.5	26900	91 700	8.49	25	3.16	10.8	78	155.0	26.97	3.8	80
	SZ120	10	28600	97 600	8.98	29	3.18	10.9	77	166.6	28.99	3.3	80
	SZ125	10	28600	97 500	8.95	25	3.19	10.9	78	166.6	28.99	3.8	80
	SZ148	12	35100	119 800	10.99	32	3.19	10.9	80.5	199.0	34.60	3.6	86
	SZ160	13	37600	128 200	11.58	29	3.24	11.1	80.5	216.6	37.69	4.0	94
	SZ161	13	37900	129 500	11.83	32	3.21	10.9	80.5	216.6	37.69	3.6	86
	SZ175	14	40100	136 900	12.67	35	3.17	10.8	81	233.0	40.54	6.2	103
	SZ185	15	43100	147 100	13.62	35	3.16	10.8	81	249.9	43.48	6.2	103
	SZ240	20	59100	201 800	18.60	50	3.18	10.9	83.5	347.8	60.50	8.0	160
	SZ300	25	72800	248 300	22.70	69	3.20	10.9	84	437.5	76.10	8.0	160
	SZ380	30	89600	305 900	27.60	72	3.25	11.1	86.5	531.2	92.40	8.4	163

TR = Ton of Refrigeration  
COP = Coefficient Of Performance  
EER = Energy Efficiency Ratio

### Rating conditions

	SM/SY compressors	SZ compressors
Refrigerant	R22	R407C
Frequency	50 Hz	50 Hz
Standard rating conditions	ARI standard conditions	-
Evaporating temperature	7.2 °C	7.2 °C (dew point)
Condensing temperature	54.4 °C	54.4 °C (dew point)
Sub-cooling	8.3 K	8.3 K
Superheat	11.1 K	11.1 K

Subject to modification without prior notification  
For full data details and capacity tables refer to Online Datasheet Generator : [www.danfoss.com/odsg](http://www.danfoss.com/odsg)

## TECHNICAL SPECIFICATIONS

### 60-Hz data

Model	Nominal Cap. 60 Hz TR	Nominal cooling capacity		Power input kW	A max A	Efficiency		Sound power dB(A)	Swept volume cm <sup>3</sup> /rev	Displacement m <sup>3</sup> /h	Oil charge dm <sup>3</sup>	Net weight kg	
		W	Btu/h			COP W/W	E.E.R. Btu/h/W						
<b>R22 SINGLE</b>	<b>SM084</b>	7	24600	84 000	7.38	17	3.34	11.4	75	114.5	24.05	3.3	72
	<b>SM090</b>	7.5	26400	90 000	7.82	17	3.37	11.5	75	120.5	25.31	3.3	72
	<b>SM100</b>	8	27500	94 000	8.14	19	3.38	11.5	75	127.2	26.71	3.3	72
	<b>SM110</b>	9	31600	107 800	9.35	20	3.38	11.5	78	144.2	30.28	3.3	80
	<b>SM115</b>	9.5	33700	115 200	10.08	25	3.35	11.4	79	155.0	32.55	3.8	80
	<b>SM120</b>	10	36700	125 300	10.80	29	3.40	11.6	78	166.6	34.99	3.3	80
	<b>SM125</b>	10	37000	126 400	10.99	25	3.37	11.5	79	166.6	34.99	3.8	80
	<b>SM148</b>	12	43800	149 500	13.01	32	3.37	11.5	83	199.0	41.80	3.6	86
	<b>SM160</b>	13	47700	163 000	14.22	29	3.36	11.5	84	216.6	45.49	4.0	94
	<b>SM161</b>	13	47600	162 600	14.07	32	3.39	11.5	84	216.6	45.49	3.6	86
	<b>SM175</b>	14	51100	174 300	15.27	35	3.34	11.4	82.5	233.0	48.93	6.2	103
	<b>SM185</b>	15	54300	185 400	16.22	35	3.35	11.4	82.5	249.9	52.48	6.2	103
	<b>SY240</b>	20	74100	252 700	22.10	50	3.35	11.4	84.7	347.8	73.00	8.0	160
	<b>SY300</b>	25	94500	322 500	27.50	69	3.43	11.7	85.9	437.5	91.90	8.0	160
	<b>SY380</b>	30	110000	375 300	33.54	72	3.28	11.7	88.0	531.2	111.60	8.4	163
<b>R407C SINGLE</b>	<b>SZ084</b>	7	22500	76 900	7.06	17	3.19	10.9	78	114.5	24.05	3.3	72
	<b>SZ090</b>	7.5	24400	83 300	7.63	17	3.20	10.9	78	120.5	25.31	3.3	72
	<b>SZ100</b>	8	26500	90 500	8.18	19	3.24	11.0	78	127.2	26.71	3.3	72
	<b>SZ110</b>	9	30100	102 800	9.29	20	3.24	11.1	81	144.2	30.28	3.3	80
	<b>SZ115</b>	9.5	32800	112 000	10.22	25	3.21	10.9	81	155.0	32.55	3.8	80
	<b>SZ120</b>	10	34800	118 900	10.75	29	3.24	11.1	81	166.6	34.99	3.3	80
	<b>SZ125</b>	10	34900	119 200	10.89	25	3.21	10.9	81	166.6	34.99	3.8	80
	<b>SZ148</b>	12	42600	145 400	13.35	32	3.19	10.9	85	199.0	41.80	3.6	86
	<b>SZ160</b>	13	45500	155 400	14.08	29	3.23	11.0	85	216.6	45.49	4.0	94
	<b>SZ161</b>	13	46000	156 900	14.32	32	3.21	10.9	85	216.6	45.49	3.6	86
	<b>SZ175</b>	14	48700	166 200	15.28	35	3.19	10.9	84	233.0	48.93	6.2	103
	<b>SZ185</b>	15	51800	176 800	16.43	35	3.15	10.7	84	249.9	52.48	6.2	103
	<b>SZ240</b>	20	71100	242 800	22.70	50	3.14	10.7	87	347.8	73.00	8.0	160
	<b>SZ300</b>	25	87900	300 000	27.49	69	3.20	10.9	87.5	437.5	91.90	8.0	160
	<b>SZ380</b>	30	108500	368 500	33.40	72	3.25	11.0	89.5	531.2	111.60	8.4	163

TR = Ton of Refrigeration  
 COP = Coefficient Of Performance  
 EER = Energy Efficiency Ratio

### Rating conditions

	SM/SY compressors	SZ compressors
Refrigerant	R22	R407C
Frequency	60 Hz	60 Hz
Standard rating conditions	ARI standard conditions	-
Evaporating temperature	7.2 °C	7.2 °C (dew point)
Condensing temperature	54.4 °C	54.4 °C (dew point)
Sub-cooling	8.3 K	8.3 K
Superheat	11.1 K	11.1 K

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## OPERATING ENVELOPES

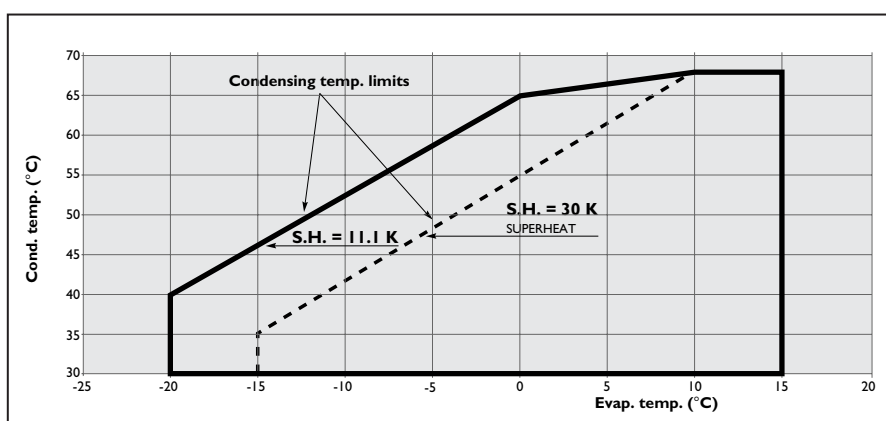
### Application envelopes at dew temperatures

The figures below show the operating envelopes for SM / SY compressors with refrigerant R22 and for SZ compressors with refrigerants R407C, R134a, R404A and R507A. The discharge temperature depends on the combination of evaporating temperature, condensing temperature and suction gas superheat. Because of this dependence, discharge temperature limits are indicated by a double line. The solid line represents the limit should the superheat be 11.1 K or less. The dashed line, on the other hand, provides the limit when the superheat is 30 K. For superheat values between 11.1 K and 30 K, these two lines may

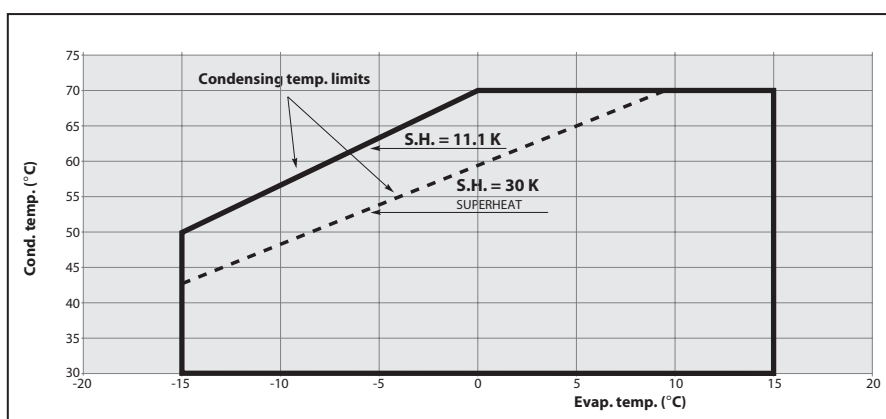
be interpolated. The operating limits serve to define the envelope within which reliable operations of the compressor are guaranteed:

- Maximum discharge gas temperature: +135°C
- Maximum ambient temperature: +63°C (for SM / SZ 084 to 185), + 52°C (for SY / SZ 240 to 380)
- A suction superheat below 5 K is not recommended due to the risk of liquid floodback
- Maximum superheat of 30 K
- Minimum and maximum evaporating and condensing temperatures as per the operating envelopes.

### SM 084 to SM 185 SY 240 to SY 380 R22

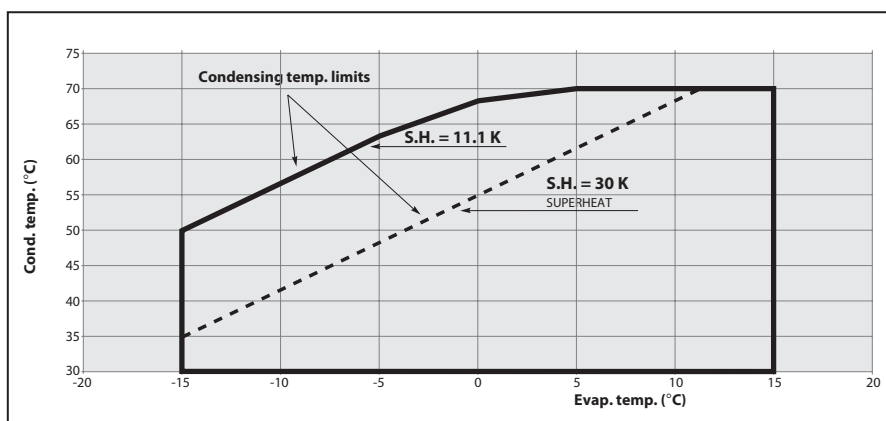


### SZ 084 to SZ 185 R134a

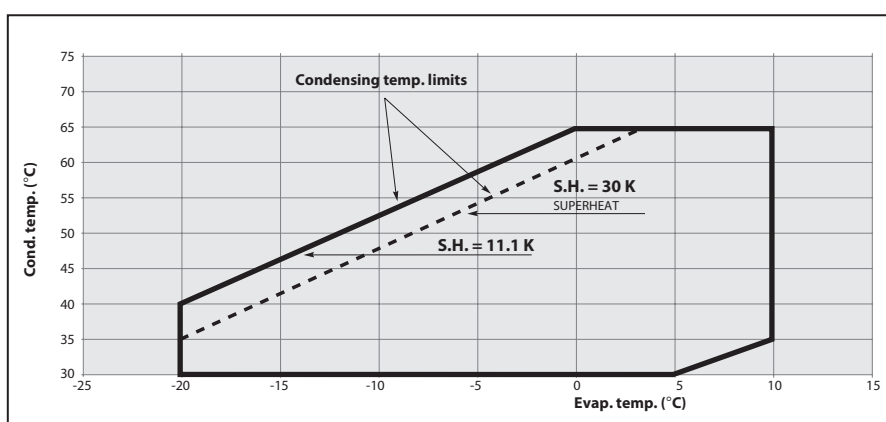


## OPERATING ENVELOPES

### SZ 240 - 300 R134a

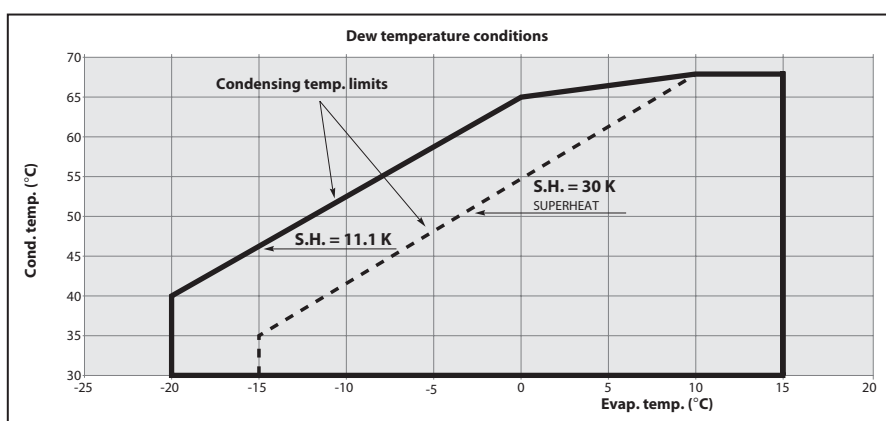


### SZ 084 to SZ 185 R404A / R507A



### SZ 084 to SZ 185 R407C at DEW temperature

(refer to the explanation p.10)



### SZ 240 to SZ 380 R407C at DEW temperature

(refer to the explanation p.10)

