

Application guidelines

# DC Compressors **DL19H / DL22H / DL30H**

Compressors for mobile applications  
12 - 24V Direct Current Compressor





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**Compressor Overview**

Many vehicles for transportation of goods or recreation, such as trucks, caravans, boats, cars, etc. are often equipped with cooling appliances. The compressors for such mobile applications must be designed to operate from a low voltage DC power supply. These compressors must also be compact in their dimensions, highly reliable and yield high performances.

DL19H, DL22H and DL30H are the answer to the users' needs requiring comfort and reliability in their travelling, either on holidays, at work or in any other circumstance where Direct current is required for cooling.

These compressors are designed to operate silently, efficiently and reliably even up to angles of tilt of 30°, working with refrigerant R134a.

The DL series of compressors are not designed for off-road applications. Special approval is required by Danfoss Commercial Compressors for this type of application. The maximum tilt angle allowed in DL compressors (stopped or running) is 30°.

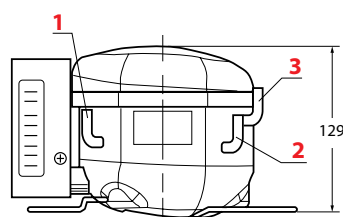
DL19H, DL22H and DL30H can be powered at any voltage within the 12 to 24V DC range, and are designed for capillary tube expansion.

**Technical specification**

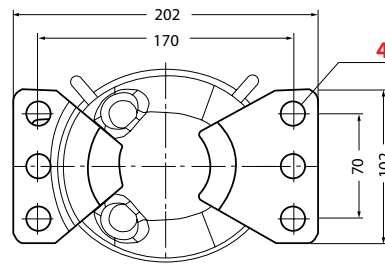
Refrigerant	R134a *
Oil type / charge	ISO VG 15 ESTER / 120cm <sup>3</sup>
Expansion	capillary tube
Application	LBP/ MBP / HBP
Evaporation temperature range	-35°C to +10°C.
Condensation temperature range	up to 65°C (Pull-down peak: 70°C).
Ambient temperature range	-10 to 43°C **
voltage range DC	9.6 - 17 / 21.3 - 31.5 VDC
Motor speed range	2000 - 3500 rpm
Consumption of the electronic driver when the compressor is stopped	0.5W
Comp. displacement DL19H/DL22H/DL30H	1.9cm <sup>3</sup> / 2.2cm <sup>3</sup> / 3cm <sup>3</sup>
Weight DL19H/DL22H/DL30H+ Electronic unit	3.9kg / 4.2kg /4.2 kg + 0.2 kg
Suction connector I.D.	6.2 mm (1)
Service connector I.D.	6.2 mm (2)
Discharge connector I.D.	4.9 mm (3)

\* Compatible refriger. R1234yf

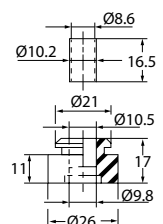
\*\* In case of ambient temperature lower than 0°C. an oil heater will be needed.

**Fixings and Silent blocks (Mounting Accessories)**


1. Suction 6.2 mm
2. Service 6.2 mm
3. Discharge 4.9 mm
4. 6 holes Ø16 (170 X 70 net)


**Standard**

6 holes Ø16  
(170 X 70 net)



**Table 1: Cooling Capacity [W] ASHRAE**

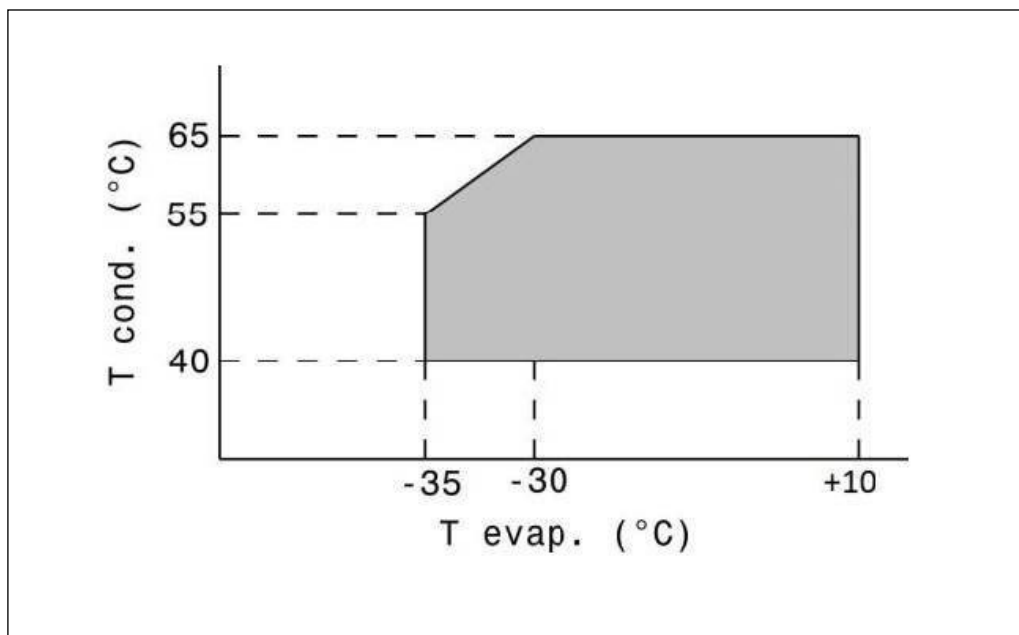
Type / Code	rpm	Cooling Capacity [W] ASHRAE °C											
		-35	-30	-25	-23.3	-20	-15	-10	-5	0	5	7.2	10
DL19H / 123F1905	2000	10	16	26	29	37	52	70	91	114	141	154	171
	2500	13	22	35	40	50	69	91	115	144	174	190	209
	3000	15	25	38	44	57	79	103	135	168	208	227	253
	3500	16	30	50	57	73	100	131	167	208	252	273	301
DL22H / 123F1906	2000	14	22	34	38	49	66	87	110	138	169	183	201
	2500	17	27	40	45	57	78	104	133	165	202	220	243
	3000	22	33	48	54	68	93	123	158	196	241	262	289
	3500	28	41	59	66	83	113	148	190	236	288	314	348
DL30H / 123F1907	2000	21	30	45	49	64	88	116	149	187	229	103	276
	2500	24	37	56	63	79	108	144	184	230	283	306	340
	3500	34	53	79	89	110	147	188	235	287	344	369	407

**Table 2: Power consumption [W] ASHRAE**

Type / Code	rpm	Power consumption [W] ASHRAE °C											
		-35	-30	-25	-23.3	-20	-15	-10	-5	0	5	7.2	10
DL19H / 123F1905	2000	0.58	0.75	0.99	1.08	1.26	1.56	1.88	2.22	2.56	2.91	3.07	3.27
	2500	0.56	0.80	1.07	1.16	1.35	1.65	1.95	2.25	2.56	2.87	3.01	3.18
	3500	0.54	0.83	1.12	1.21	1.4	1.68	1.95	2.22	2.48	2.74	2.85	2.99
DL22H / 123F1906	2000	0.66	0.85	1.08	1.16	1.33	1.60	1.89	2.18	2.49	2.80	2.95	3.13
	2500	0.67	0.86	1.10	1.19	1.37	1.66	1.96	2.25	2.55	2.84	2.97	3.13
	3500	0.80	0.94	1.15	1.23	1.39	1.65	1.93	2.21	2.50	2.78	2.97	3.07
DL30H / 123F1907	2000	0.78	0.93	1.14	1.22	1.38	1.64	1.90	2.17	2.43	2.69	2.80	2.94
	2500	0.74	0.93	1.17	1.26	1.43	1.71	1.99	2.26	2.53	2.79	2.9	3.04
	3500	0.77	0.96	1.17	1.24	1.39	1.62	1.87	2.12	2.39	2.66	2.79	2.95

**Table 3: COP [W/W] ASHRAE**

Type / Code	rpm	COP [W/W] ASHRAE °C											
		-35	-30	-25	-23.3	-20	-15	-10	-5	0	5	7.2	10
DL19H / 123F1905	2000	0.58	0.75	0.99	1.08	1.26	1.56	1.88	2.22	2.56	2.91	3.07	3.27
	2500	0.56	0.80	1.07	1.16	1.35	1.65	1.95	2.25	2.56	2.87	3.01	3.18
	3500	0.54	0.83	1.12	1.21	1.4	1.68	1.95	2.22	2.48	2.74	2.85	2.99
DL22H / 123F1906	2000	0.66	0.85	1.08	1.16	1.33	1.60	1.89	2.18	2.49	2.80	2.95	3.13
	2500	0.67	0.86	1.10	1.19	1.37	1.66	1.96	2.25	2.55	2.84	2.97	3.13
	3500	0.80	0.94	1.15	1.23	1.39	1.65	1.93	2.21	2.50	2.78	2.97	3.07
DL30H / 123F1907	2000	0.78	0.93	1.14	1.22	1.38	1.64	1.90	2.17	2.43	2.69	2.80	2.94
	2500	0.74	0.93	1.17	1.26	1.43	1.71	1.99	2.26	2.53	2.79	2.9	3.04
	3500	0.77	0.96	1.17	1.24	1.39	1.62	1.87	2.12	2.39	2.66	2.79	2.95



**General rules and wiring connections**

- DL series must always be powered through the dedicated electronic driver, which is supplied with the compressor as a separate device.
- Never connect the compressor’s hermetic pins (fusite) to the terminals of a battery or any other dc or ac source directly.
  - Do not try to fit an electronic driver different than the electronic driver supplied with the compressor. the compressor will not operate and irreversible damage may occur.
  - Always respect the polarity of the battery with

the power input terminals of the electronic driver

- “-” Power input terminal of the electronic driver should be connected to the chassis of the vehicle as well as the appliance frame
- A fuse must be placed between the “+” pole of the battery or dc power supply and the “+” power input terminal of the electronic driver:
  - 12V systems: 12A fuse
  - 24V systems: 7.5A fuse

**Voltage drop in the power leads**

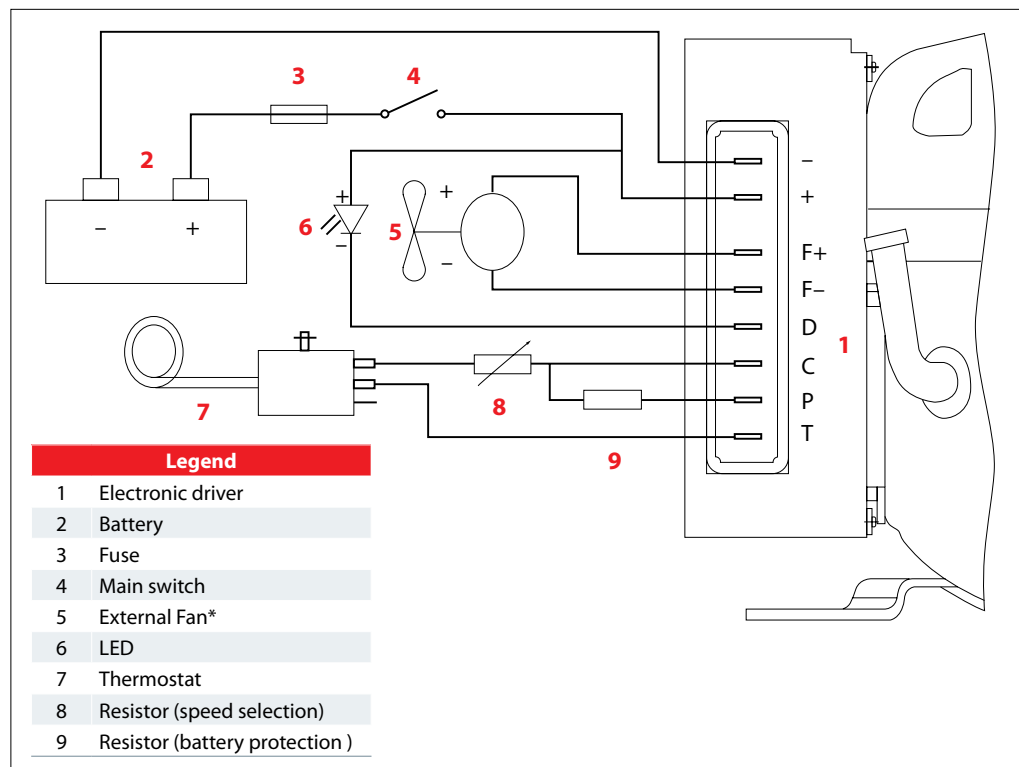
To avoid excessive voltage drop in the leads, their length and cross section must be related to the voltage supply as indicated in Table below.

**Table 4**

Cross section mm <sup>2</sup>	Rated Operating Range Length (m)	
	12V	24V
2.5	2.5	5
4	4	8
6	6	12
10	10	20

**Terminal lay out Wiring Diagram**

The electronic driver features a terminal board where all connections are made. The terminal lay out is described in the wiring diagram.



\* The positive side of the fan is connected to the (F +) end of the controller, and the negative terminal of the controller is connected to the (F-) terminal of the controller. A terminal of the controller (F +) and (F-) can be connected with a 12V DC fan. When the input voltage of the controller exceeds 12V, the output value between the terminals (F +) and (F-) is always kept at 12V.

Regardless of whether the input voltage system is 12V or 24V, the fan must be a 12V DC fan. B, the controller can continue to output 0.5A fan drive capability.

**Operating voltage**

DL series are designed to operate in a wide range of DC voltages, supplied either by a battery or by any other kind of filtered DC power supply.

DC voltage supply allowed: 9.6V to 31.5V. Controller itself detect if is connected to 12V or 24V.

**Table 5: Operating Voltage Setting Table**

External resistance	12V Stop value	12V Boot value	12V High pressure stop value	24V Stop value	24V Boot value	24V High pressure stop value
K $\Omega$	V	V	V	V	V	V
0	9.6	10.9	17.0	21.3	22.7	31.5
1.6	9.7	11.0	17.0	21.5	22.9	31.5
2.4	9.9	11.1	17.0	21.8	23.2	31.5
3.6	10.0	11.3	17.0	22.0	23.4	31.5
4.7	10.1	11.4	17.0	22.3	23.7	31.5
6.2	10.2	11.5	17.0	22.5	23.9	31.5
8.2	10.4	11.7	17.0	22.8	24.2	31.5
11	10.5	11.8	17.0	23.0	24.5	31.5
14	10.6	11.9	17.0	23.3	24.7	31.5
18	10.8	12.0	17.0	23.6	25.0	31.5
24	10.9	12.2	17.0	23.8	25.2	31.5
33	11.0	12.3	17.0	24.1	25.5	31.5
47	11.1	12.4	17.0	24.3	25.7	31.5
82	11.3	12.5	17.0	24.6	26.0	31.5
220	9.6	10.9	17.0	21.3	22.7	31.5

**Battery protection system**

There is a protection system for the battery that prevents the compressor from operating if the available voltage becomes too low. The electronic driver will start and stop the compressor as needed by detection of the voltage between the input terminals (+) and (-) to protect the different power supply batteries.

The recommended standard battery protection values are listed in table 6. Other voltage can be set by adjusting the controller terminal (C) and (P) connection resistance (9), the specific value of Table 5.

**Table 6: Limits of battery protection parameters**

12V Cut-out	12V Cut-in	24V Cut-out	24V Cut-in
V	V	V	V
10.4	11.7	22.8	24.2

**Temperature Switch**

The temperature switch (7) e.g. mechanical or electronic thermostat is connected to C and T pins and determine compressor ON and OFF operation.



**Speed determination**

If there is no resistor between C and T pins compressor running speed will be 2000rpm. Table 3 shows the compressor running speed according to the resistance value connected between pins C and T.

**Table 7**

Compressor speed rpm	C/T Resistance $\Omega$	C/T Current mA
2000	0	5
2100	51	4.8
2200	100	4.6
2300	150	4.4
2400	200	4.2
2500	277	4
2600	330	3.8
2700	400	3.6
2800	490	3.4
2900	586	3.2
3000	692	3
3100	816	2.8
3200	963	2.6
3300	1137	2.4
3400	1331	2.2
3500	1523	2

**Protections and alarms**

DL series are electronically protected against a number of possible malfunctions and failures. As shown in Terminal lay out Wiring Diagram:

- The controller terminal (+) and (D) can be connected between a 10mA LED (6) for the display fault, LED anode connected to the controller (+) side, the cathode connected to the controller (D) end.
- When the failure occurs, LED every 3 seconds for the cycle, continuous flash in each cycle, according to different failures flash different times, each flashing for 0.4 seconds, continuous flashing for 3.2 minutes. The number of specific codes and blinks is shown in Table 8.

**Table 8: Alarm codification**

No. of blinks	Fault type
1	Voltage fault - The input voltage is outside the set range
2	Fan current fault - fan current output current greater than 1A
3	Compressor start fault - compressor motor stall or system pressure too large
4	Compressor minimum speed fault - The compressor is overloaded or the motor speed is too small.
5	Controller temperature fault - controller housing temperature too high (> 85 ° C)
6	Controller hardware failure - The controller has detected an abnormal parameter

**Packaging and Ordering**

Compressors are packed in industrial pack on polyester trays (25pcs each) on the pallet.

Model	Industrial pack			Pallet dimensions (mm)		code
	Qty/Level	Nb of levels	Qty/Pallet	Length	Wight	
DL19H including electronic driver	25	6	150	1135	830	123F1905
DL22H including electronic driver	25	6	150	1135	830	123F1906
DL30H including electronic driver	25	6	150	1135	830	123F1907



# Danfoss Commercial Compressors

is a worldwide manufacturer of compressors and condensing units for refrigeration and HVAC applications. With a wide range of high quality and innovative products we help your company to find the best possible energy efficient solution that respects the environment and reduces total life cycle costs.

We have 40 years of experience within the development of hermetic compressors which has brought us amongst the global leaders in our business, and positioned us as distinct variable speed technology specialists. Today we operate from engineering and manufacturing facilities spanning across three continents.



Danfoss Scrolls



Danfoss Inverter Scrolls



Danfoss Turbocor Compressors



Danfoss Light Commercial Refrigeration Compressors



Danfoss Maneurop Reciprocating Compressors



Danfoss Optyma Condensing Units

Our products can be found in a variety of applications such as rooftops, chillers, residential air conditioners, heatpumps, coldrooms, supermarkets, milk tank cooling and industrial cooling processes.

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