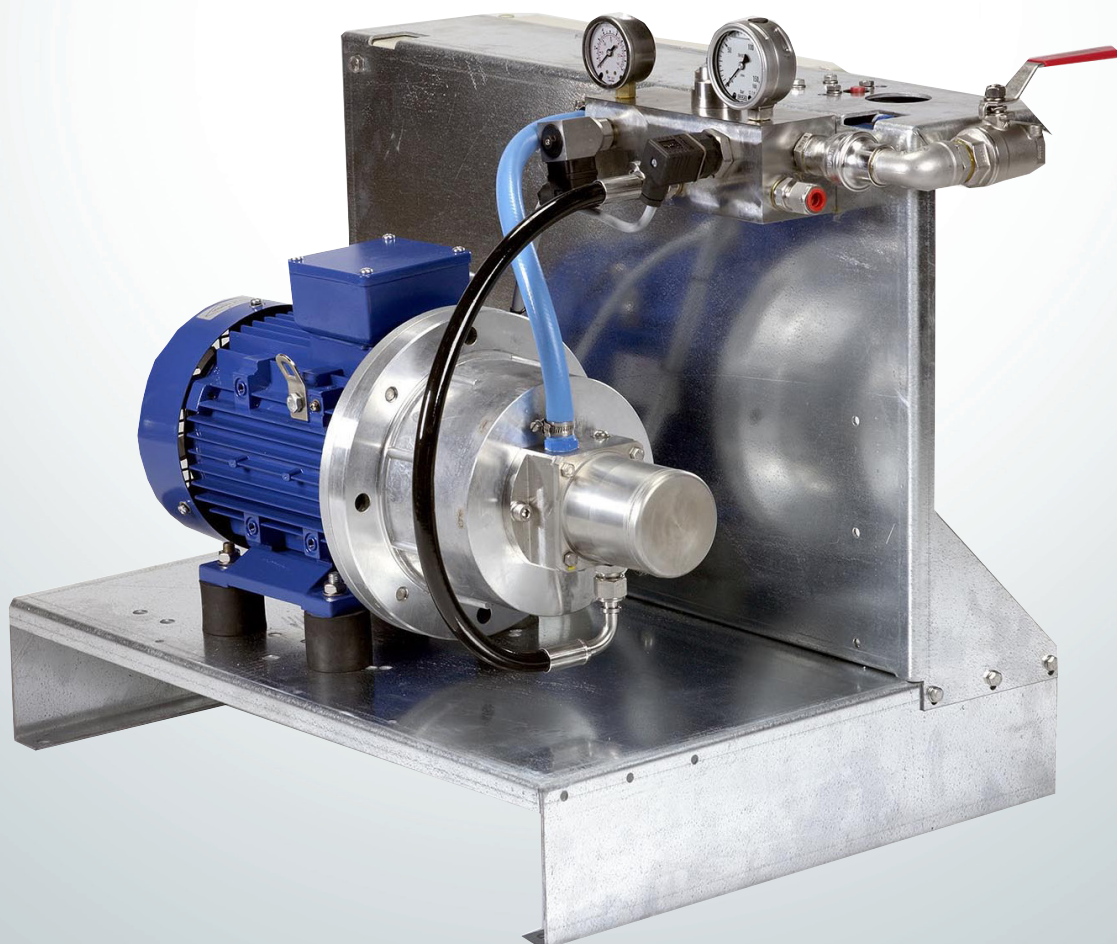


Data Sheet

Plug and Spray Unit NPS



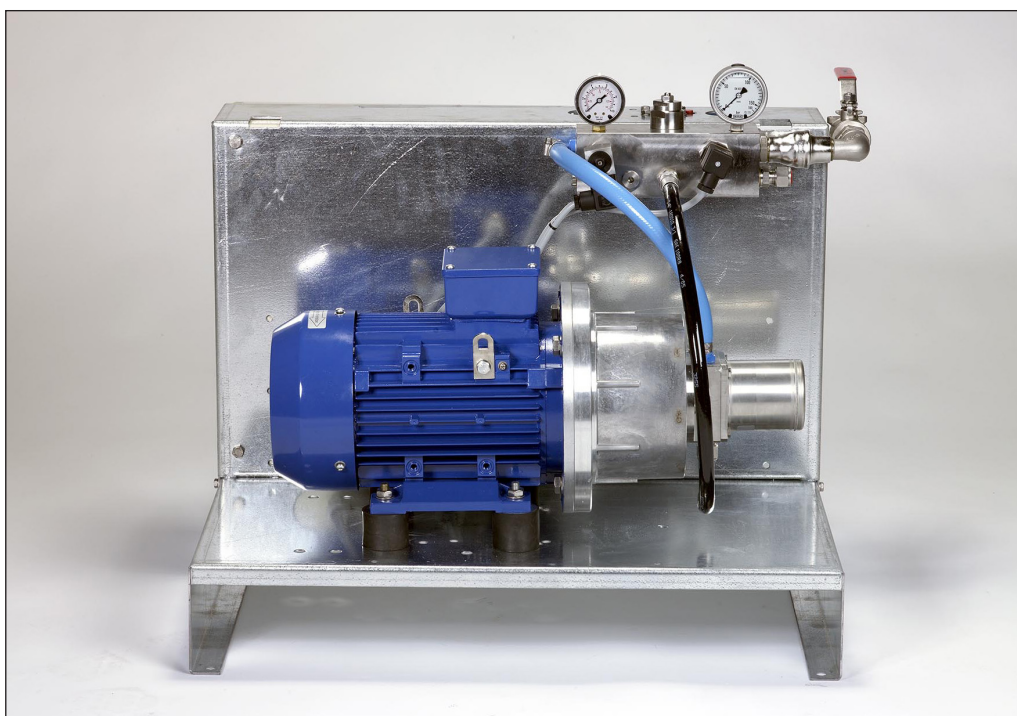


Table of Contents

Contents

1.	General information.....	3
2.	Component description.....	5
2.1	PAHT high-pressure pump	5
2.2	Electric motor	5
2.2.1	Danfoss FCP 106 drive motor	5
2.3	Aluminium cast bell housing and flexible coupling	5
2.4	Galvanized steel frame	5
2.5	Connection block	5
2.6	Water filter	5
2.7	Electrical connection box, optional	5
2.8	Supply pressure gauge	5
2.9	Pressure relief valve VRH 5 (30) CA cartridge	5
2.10	Filter bleed button	5
2.11	High-pressure gauge	5
2.12	Check valve - inlet 3/4"	5
2.13	Ball valve G 3/8" female	5
2.14	Inlet G 3/4" female	5
2.15	High-pressure outlet G 3/8" female, optional	5
2.16	High-pressure hose	6
2.17	High-temperature switch	6
2.18	Low-pressure hose	6
2.19	MBS 3050 pressure transmitter	6
2.20	Low-pressure switch	6
2.21	Check valve - outlet	6
2.22	Swivel union 3/4"	6
3.	P&ID	6
4.	Technical data	7
5.	Dimensions [mm]	8
6.	Local control panel.....	9
7.	Options.....	9
8.	Electrical connection box	10

1. General information

The Danfoss Plug & Spray unit is designed for humidification and adiabatic cooling systems based on the high-pressure principle. The units are available in a constant speed version (CS) with IEC electric motor, as well as in a version with constant pressure control using a Danfoss FCP 106 variable speed drive motor (VS).

The Plug & Spray unit is available with 6 different pump sizes (see Technical data, sec. 4) to match the required flow demand. The motor power is dimensioned to provide design flow at a system pressure of max. 100 barg or 1,450 psig.

The Danfoss high-pressure axial piston pumps provide excellent pressure stability at high energy efficiency and low noise level. Pulsation dampeners are superfluous.

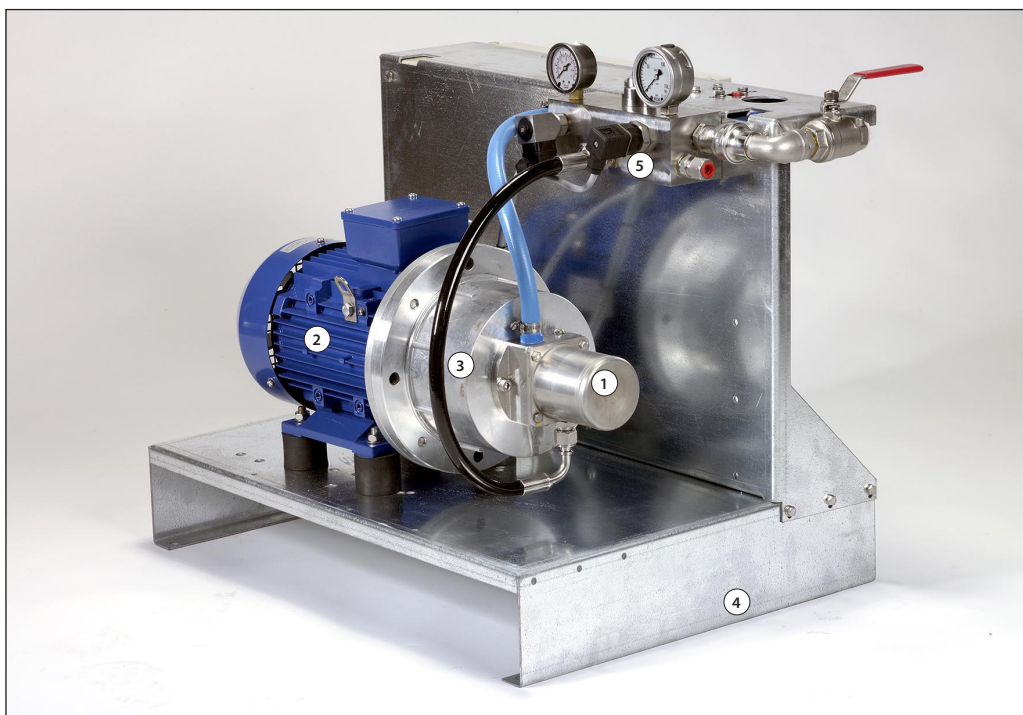
The Plug & Spray unit comprises all necessary components to ensure the best possible performance, maximum service life with maximum protection of the pump. It is very compact, requires very little space and is suitable for both wall and floor mounting.

The Danfoss Plug & Spray unit can be operated with ordinary tap water as well as with all kinds of technical water (distilled, de-ionised and demineralised water).

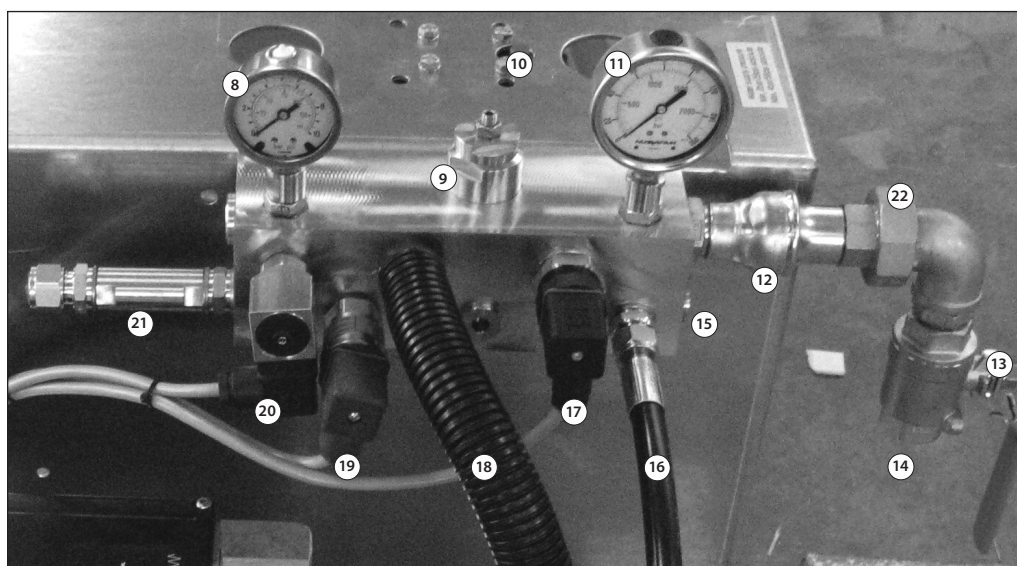
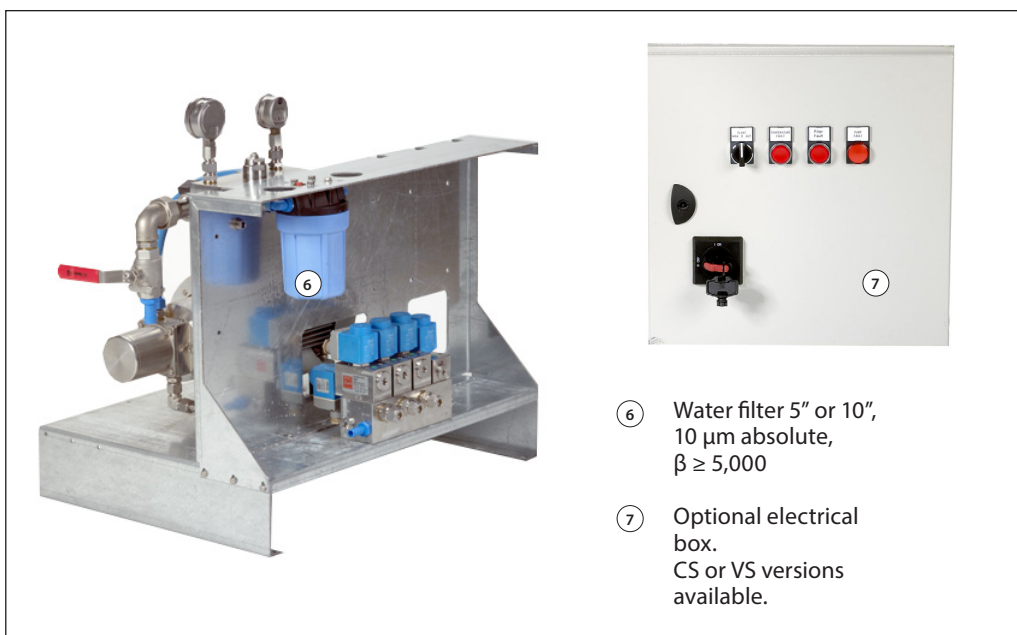
The Plug & Spray unit is suitable for a variety of applications, such as:

- High-pressure humidification and adiabatic cooling in HVAC systems (Air-handling units) i.e. in offices, server rooms etc.
- Open space humidification system in production halls, storages etc.
- Humidification and adiabatic cooling in animal farms, greenhouses and composting, server rooms
- Electrostatic Discharge (ESD) control
- Adiabatic outdoor cooling i.e. in pools, bars, restaurants etc.
- Dust suppression and dust binding in manufacturing and clean rooms
- Gas turbine inlet cooling and NOx control
- Odour control and soil filters
- Water mist clouds in theme parks, exhibitions etc.

If the recommendations in the manual are not followed, Danfoss reserves the right to void the warranty.



- ① Pumps: PAHT 2 to PAHT 12.5
- ② Electric motor, standard IEC or VS units with Danfoss FCP 106 Drive Motor
- ③ Aluminium cast bell housing and flexible coupling
- ④ Galvanized steel frame for floor mounting
- ⑤ Very compact and reliable connection block, see details on page 5



- | | |
|---|---|
| 8 Supply pressure gauge 0-10 barg | 16 High-pressure hose |
| 9 Pressure relief valve VRH 5 (30) CA cartridge,
adjustable 20–100 barg / 363–1450 psig
(25–140 barg / 363–2031 psig) | 17 High-temperature switch |
| 10 Filter bleed button | 18 Low-pressure hose |
| 11 High-pressure gauge | 19 MBS 3050 pressure transmitter on VS-unit |
| 12 Check valve - inlet 3/4" | 20 Low-pressure switch |
| 13 Ball valve G 3/8" female | 21 Check valve - outlet |
| 14 Inlet G 3/4" female | 22 Swivel union 3/4" |
| 15 High-pressure outlet G 3/8" female, optional | |

2. Component description

The components described in this chapter refer to the images on page 3 and 4.

2.1 PAHT high-pressure pump ^①

The heart of the Plug & Spray unit is the Danfoss axial piston high-pressure pump. The pump is water lubricated and fulfils the most stringent hygiene requirements as no lubricants or chemicals are involved at all.

Danfoss PAHT pumps are designed for long periods of service-free operation to provide customers with low maintenance and life cycle costs. Provided that the pump is installed and operated according to Danfoss specifications, Danfoss PAHT pumps typically run 8,000 hours between service routines.

We recommend that you inspect your pump after 8,000 hours of operation even if it is running without any noticeable problems.

2.2 Electric motor ^②

The electric motor is dimensioned to provide sufficient power for maximum flow at 100 barg / 1,450 psig system pressure. The motor is a standard IEC 3-phase 400 V, 50 Hz asynchronous motor.

2.2.1 Danfoss FCP 106 drive motor

The variable speed drive motor in connection with a pressure transmitter allows adjusting the pump capacity to the actual demand of the application, keeping the system pressure constant.

The FCP 106 has a built-in PID-controller and 24 V DC transmitter power supply.

2.3 Aluminium cast bell housing and flexible coupling ^③

The bell housing is made of cast aluminium. The electric motor and the pump are directly coupled with a flexible coupling. The bell housing requires minimum space and is lightweighted.

The transmission is maintenance free and cost efficient compared to traditional belt drives.

2.4 Galvanized steel frame ^④

The base frame is designed for floor mounting; however it can be mounted on a wall with suitable support bars. The base frame concept allows adding numerous options.

2.5 Connection block ^⑤

A central connection block with integrated pressure relief valve provides a very compact and reliable solution to connect all other necessary components such as gauges, switches etc.

Service friendly gasket concept:

All HP components as well as the connections to the pump are equipped with bonded seals, which provide easy and reliable connections.

2.6 Water filter ^⑥

The system comprises a 5" or 10" (10, 12,5 VS), 10-micron fine filter with a β -value $\geq 5,000$ abs. The filter protects the pump against rapid wear caused by contamination of the supply water and – as a second benefit – prevents the nozzles from clogging. The filter cartridge is easy to replace.

2.7 Electrical connection box, optional ^⑦

Both CS and VS units can be delivered with an electrical connection box, please see sec. 8.

2.8 Supply pressure gauge ^⑧

It allows monitoring the supply pressure under operation and the condition of the filter. The filter should be changed when the supply pressure is below 2 barg (29 psig).

2.9 Pressure relief valve

VRH 5 (30) CA cartridge ^⑨

The relief valve is integrated in the connection block with internal recirculation loop back to the filter. It works as a safety valve in case the discharge is blocked and allows adjusting the system pressure under normal operation. At 20 °C (68 °F) water temperature 90% of the water can be run over the bypass loop (recirculation). Pressure range: 20–100 barg / 363–1450 psig (25–140 barg / 363–2031 psig).

2.10 Filter bleed button ^⑩

It is important that there is no air in the system. At commissioning air can be bled from the filter by using the filter bleed button.

2.11 High-pressure gauge ^⑪

It allows monitoring the discharge pressure under operation and during adjusting the pressure relief valve. Pressure range: 0-160 barg (0-2,321 psig)

2.12 Check valve - inlet 3/4" ^⑫

In order to make back-flow impossible, a check valve at the water supply is mandatory when connecting the system to the public utilities.

2.13 Ball valve G 3/8" female ^⑬

The ball valve allows to interrupt the water supply i.e. for filter change or pump service.

2.14 Inlet G 3/4" female ^⑭

Connect your water supply to the inlet.

2.15 High-pressure outlet G 3/8" female, optional ^⑮

Not used by Danfoss.

2.16 High-pressure hose ⁽¹⁶⁾

To avoid vibrations in the system Danfoss always use a flexible high-pressure hose from the pump outlet to the connection block.

2.17 High-temperature switch ⁽¹⁷⁾

The water temperature is monitored to prevent overheating. The switch is set to 50 °C(122 °F).

2.18 Low-pressure hose ⁽¹⁸⁾

To avoid vibrations in the system Danfoss always use a flexible low-pressure hose from the connection block to the pump inlet.

2.19 MBS 3050 pressure transmitter ⁽¹⁹⁾

The pressure transmitter is connected to the internal PID controller of the FCP 106 Drive Motor, which is set up for constant pressure

regulation (only with VS units).

Pressure range: 0-160 barg (0-2,361 psig)/
4-20 mA.

2.20 Low-pressure switch ⁽²⁰⁾

If insufficient supply pressure occurs, the pump can be damaged by cavitation or dry running. A low-pressure switch set to 1.6 barg(23 psig) abs. protects the pump.

2.21 Check valve - outlet ⁽²¹⁾

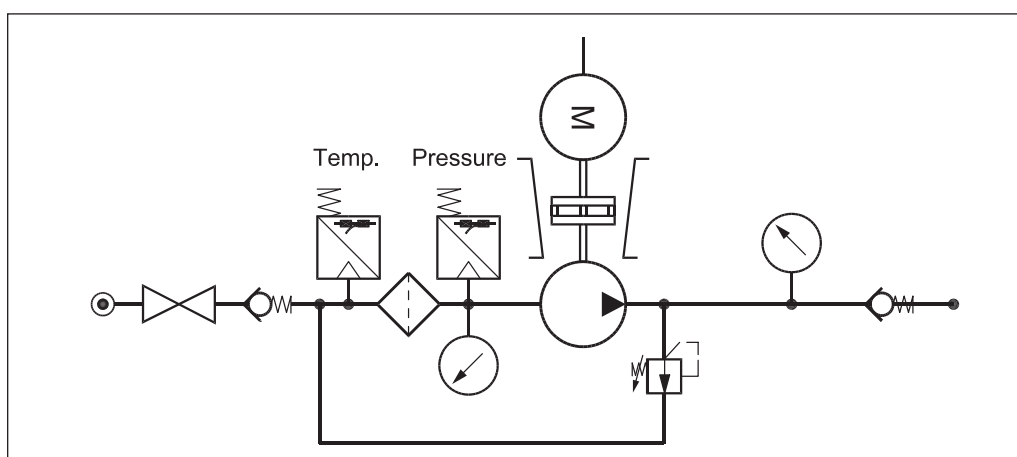
The connection block is mounted with a check valve and a male connector for a 12 mm pipe. By removing the male connector the outlet can be changed to G 3/4" female.

2.22 Swivel union 3/4" ⁽²²⁾

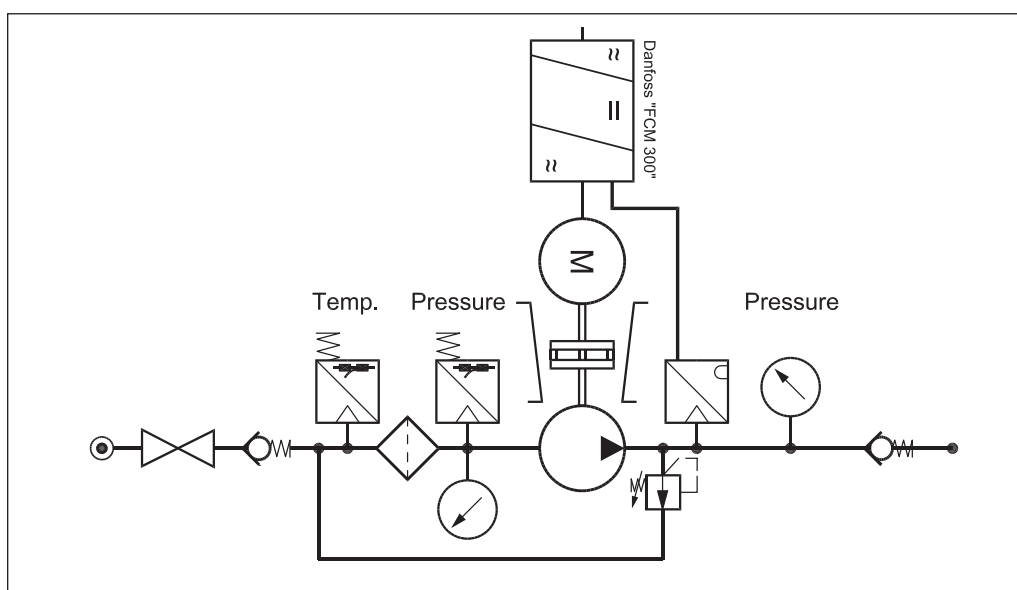
The swivel union allows establishing the water supply from the top, back, front or bottom.

3. P&ID

Constant speed versions:



Variable speed versions:



4. Technical data

Water supply	
Connection	ø19 mm hose fitting or G 3/4" female thread
Pressure	min. 2 barg (28 psig), max. 4 barg (56 psig)
Filter	10 µm absolute, $\beta \geq 5,000$, 5" or 10" (10, 12.5 VS)
Pressure switch	1.6 barg (23 psig), 250 V AC/24 V DC, 0.5 A
Temperature switch	50 °C \pm 5 °C, 250 V AC/24 V DC, 0.5 A
High pressure outlet	12 mm pipe

High-pressure pump	
Max. discharge pressure	100 barg (1,450 psig), continuous
Min. pump speed	1,000 rpm
Max. pump speed	3,000 rpm, 2,400 rpm, NPS 10, 12.5 VS
Discharge connection	G3/8" female, 3/8" NPT adaptor on request

Pressure relief valve	
Type	VRH 5 (30) CA Cartridge
Capacity	max. 30 l/min / 1,800 l/h / 8 gpm
Adjustment range	25–100 barg / 363–1450 psig (25–140 barg / 363–2031 psig)

Environmental conditions	
Water temperature supply	+3 °C – +50 °C / 37 °F – 122 °F
Ambient temperature	+3 °C – +50 °C / 37 °F – 122 °F, VS units max. 40 °C / 104 °F
Storage temperature	-25 °C – +65 °C / 13 °F – 149 °F with frost protection!
Operation and storage humidity	5–95% rF, non condensing

Type		NPS	NPS	NPS	NPS	NPS	NPS
		1CS	2CS	3.2CS	4CS	6.3CS	10CS
Ordering code		180U3300	180U3301	180U3302	180U3303	180U3304	180U3305
Pump type		PAHT 2	PAHT 2	PAHT 3.2	PAHT 4	PAHT 6.3	PAHT 10
Min. flow at 100 barg / 1450 psig*	l/h	7.5	10.0	20.0	30.0	50.0	75.0
	gal/h	2.0	2.6	5.3	7.9	13.2	19.8
Max. flow at 100 barg / 1450 psig*	l/h	75	100	200	300	500	750
	gal/h	2.0	26.4	52.8	79.2	132.0	198.0
Motor type	Pole	6	4	4	4	4	4
Rated power	kW @ 50 Hz	0.55	0.75	1.50	1.50	2.20	3.00
	kW @ 60 Hz	0.66	0.90	1.80	1.80	2.65	3.60
Motor voltage	V @ 50 Hz	3x230/400	3x230/400	3x230/400	3x230/400	3x230/400	3x230/400
	V @ 60 Hz	3x280/480	3x280/480	3x280/480	3x280/480	3x280/480	3x280/480
Motor current FLA	A	1.7	1.9	3.5	3.5	4.7	6.3
	V	400	400	400	400	400	400
Cos ϕ		0.72	0.77	0.79	0.79	0.82	0.83
Speed	rpm	900	1,400	1,400	1,400	1,420	1,420
Weight without options	kg	55	55	58	58	67	73
	lbs	121	121	128	128	148	161
Shipping	kg	85	85	88	88	97	103
	lbs	187	187	194	194	214	227
Crate size (HxWxD)	m	0.8 x 0.6 x 0.8	0.8 x 0.6 x 0.8	0.8 x 0.6 x 0.8	0.8 x 0.6 x 0.8	0.8 x 0.6 x 0.8	0.8 x 0.6 x 0.8
	inch	31.5 x 23.6 x 31.5	31.5 x 23.6 x 31.5	31.5 x 23.6 x 31.5	31.5 x 23.6 x 31.5	31.5 x 23.6 x 31.5	31.5 x 23.6 x 31.5

* Minimum and maximum flow increase with decreasing system pressure. Please observe technical data in pump data sheet.

Data sheet

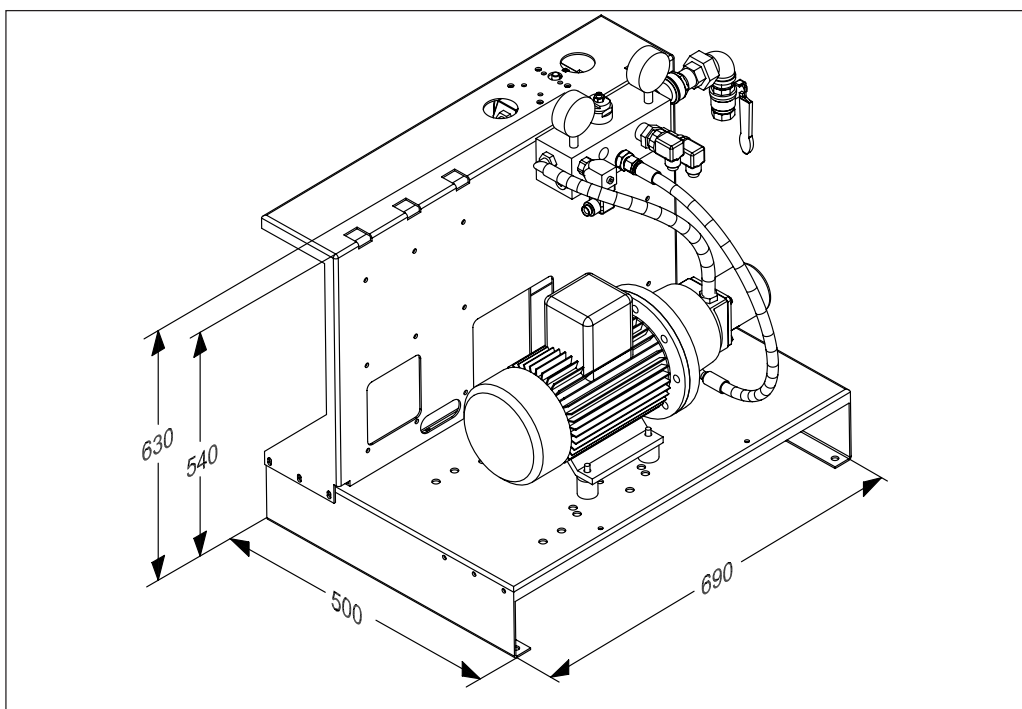
Plug & Spray unit

		Mounted with with Danfoss FCP 106 Drive Motor						
Type		NPS	NPS	NPS	NPS	NPS	NPS	NPS
		12.5CS	2VS	3.2VS	4VS	6.3VS	10VS **	12.5VS **
Ordering code		180U3306	180U3307	180U3308	180U3309	180U3310	180U3311	180U3312
Pump type		PAHT 12.5	PAHT 2	PAHT 3.2	PAHT 4	PAHT 6.3	PAHT 10	PAHT 12.5
Min. flow at 100 barg*	l/h	100	10	20	30	50	75	100
	gph	26.4	2.64	5.3	7.92	13.2	19.8	26.4
Max. flow at 100 barg*	l/h	1,000	300	450	600	1,000	1,350	1,650
	gph	264.0	79.2	119.0	158.0	264.0	356.0	443.0
Motor type	Pole	4	2	2	2	2	4	4
Rated power	kW @ 50 Hz	4.00	1.50	2.20	2.20	4.00	7.50	7.50
	kW @ 60 Hz	4.80	1.80	2.65	2.65	4.80	9.00	9.00
Motor voltage	V @ 50 Hz	3×400/690	3×230/400	3×230/400	3×230/400	3×400/690	3×400/690	3×400/690
	V @ 60 Hz	3×480/830	3×280/480	3×280/480	3×280/480	3×480/830	3×480/830	3×480/830
Motor current FLA	A	8.2	3.3/2.6	4.7/3.7	4.7/3.7	7.9/6.4	11/8.7	11/8.7
	V	400	380/480	380/480	380/480	380/480	380/480	380/480
Cos φ		0.83	1	1	1	1	1	1
Speed	rpm	1,440	1,000–3,000	1,000–3,000	1,000–3,000	1,000–3,000	1,000–2,400	1,000–2,400
Weight without options	kg	76	64	70	70	81	104	104
	lbs	168	141	154	154	179	229	229
Shipping	kg	106	94	100	100	111	134	134
	lbs	234	207	220	220	245	295	295
Crate size (H×W×D)	m	0.8 x 0.6 x 0.8	0.8 x 0.6 x 0.8	0.8 x 0.6 x 0.8	0.8 x 0.6 x 0.8	0.8 x 0.6 x 0.8	0.8 x 0.6 x 0.8	0.8 x 0.6 x 0.8
	inch	31.5 x 23.6 x 31.5	31.5 x 23.6 x 31.5	31.5 x 23.6 x 31.5	31.5 x 23.6 x 31.5	31.5 x 23.6 x 31.5	31.5 x 23.6 x 31.5	31.5 x 23.6 x 31.5

* Minimum and maximum flow increase with decreasing system pressure. Please observe technical data in pump data sheet.

** Mounted with VRH 30 CA (180G0032)

5. Dimensions [mm]



6. Local control panel

The Plug & Spray VS units with the Danfoss FCP 106 Drive Motor are pre-programmed from the factory. However some parameters must be adjusted during commissioning (i.e. for the PID loop).

Danfoss recommends ordering at least one Local Control Panel (LCP 102) per installation. For fixed installation of the LCP in a cabinet, Danfoss offers a remote mounting kit with 3 m cable.

Ordering codes:

VLT® Control Panel LCP 102

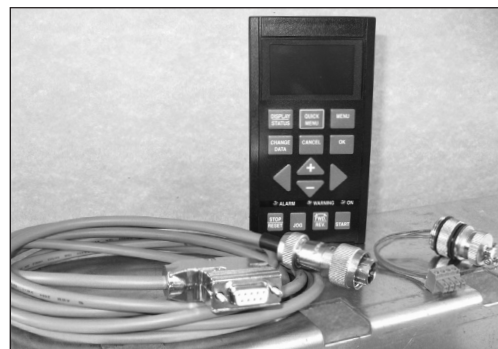
(Graphical LCP only):

130B1107

Remote Mounting Kit (LCP 102)

3 m cable, panel mounting bracket,
gasket and fasteners:

134B0564



7. Options

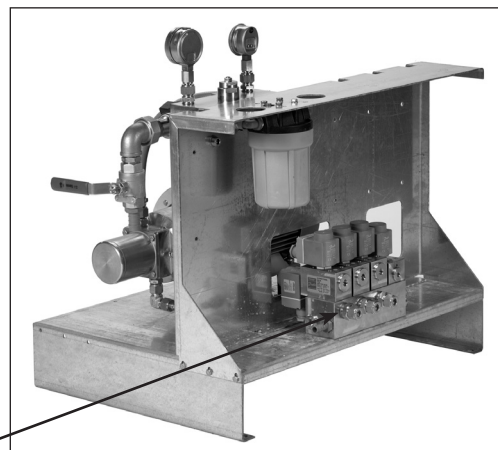
The Plug & Spray product program offers numerous options and possibilities for customization.

Examples of options:

- Water supply solenoid valve
- Pressure reduction valve (supply)
- Zone or step control valves (please refer to Danfoss' wide program of high-pressure solenoid valves).

For details, please contact your nearest Danfoss representative.

Multiple valve block solution installed on base frame

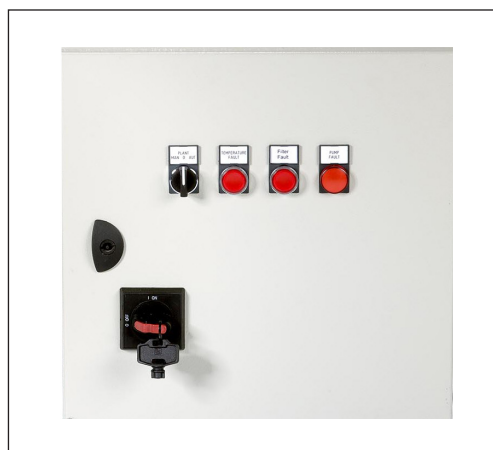


8. Electrical connection box

The electrical connection box can be directly connected to a 3×400 V, 50 Hz power supply and provides a simple, pre-wired “plug and play” solution for integrating the Plug & Spray unit in a humidification or adiabatic cooling system. The electrical connection box is available for CS and VS units.

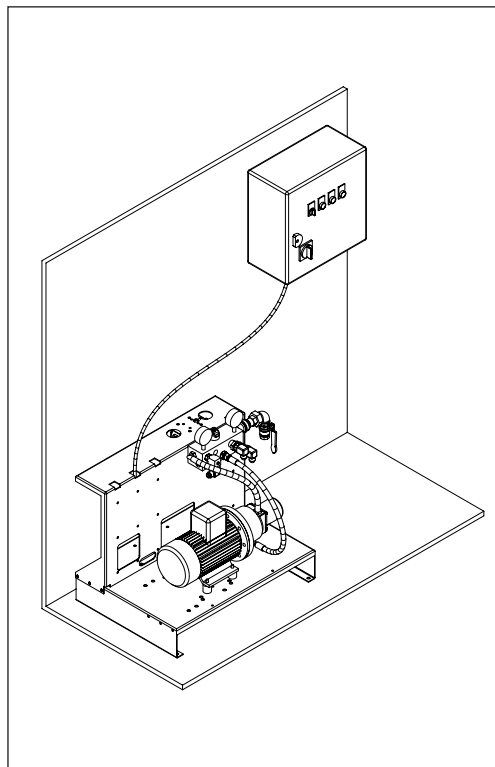
The electrical connection box comprises following basic components:

- Mains disconnect with fuses
- Hand-Off-Auto switch (CS only)
- Motor overload protection (CS only)
- Operation hour counter (CS only)
- Inlet pressure monitoring with reset button
- Water temperature monitoring with reset button
- Terminals for external start signal (potential free contact)
- Contacts for fault relay
- LCP 102 in front door (VS units only, allows monitoring operation hours and Hand-Off-Auto functionality)

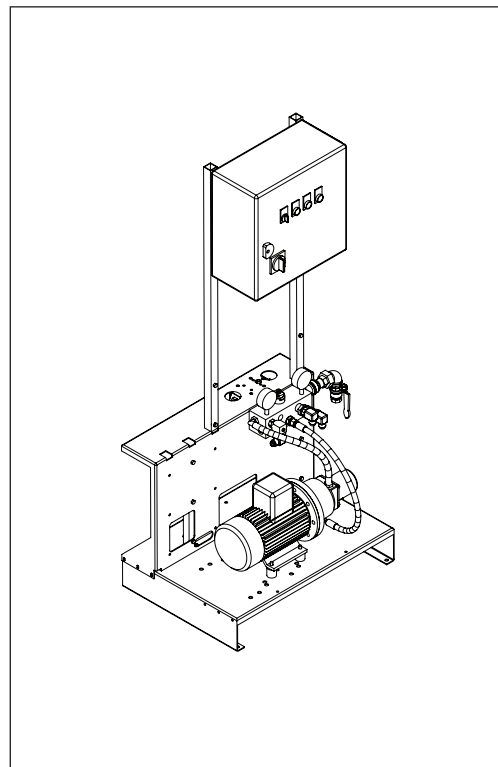


The electrical connection box can be ordered from factory in two versions:

Wall
With 2 metres cable



Free standing
On supports



Ordering codes for any customized units are available on request, please contact your nearest Danfoss representative.



Danfoss A/S

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