

Data Sheet

Plug and Spray Unit NPS

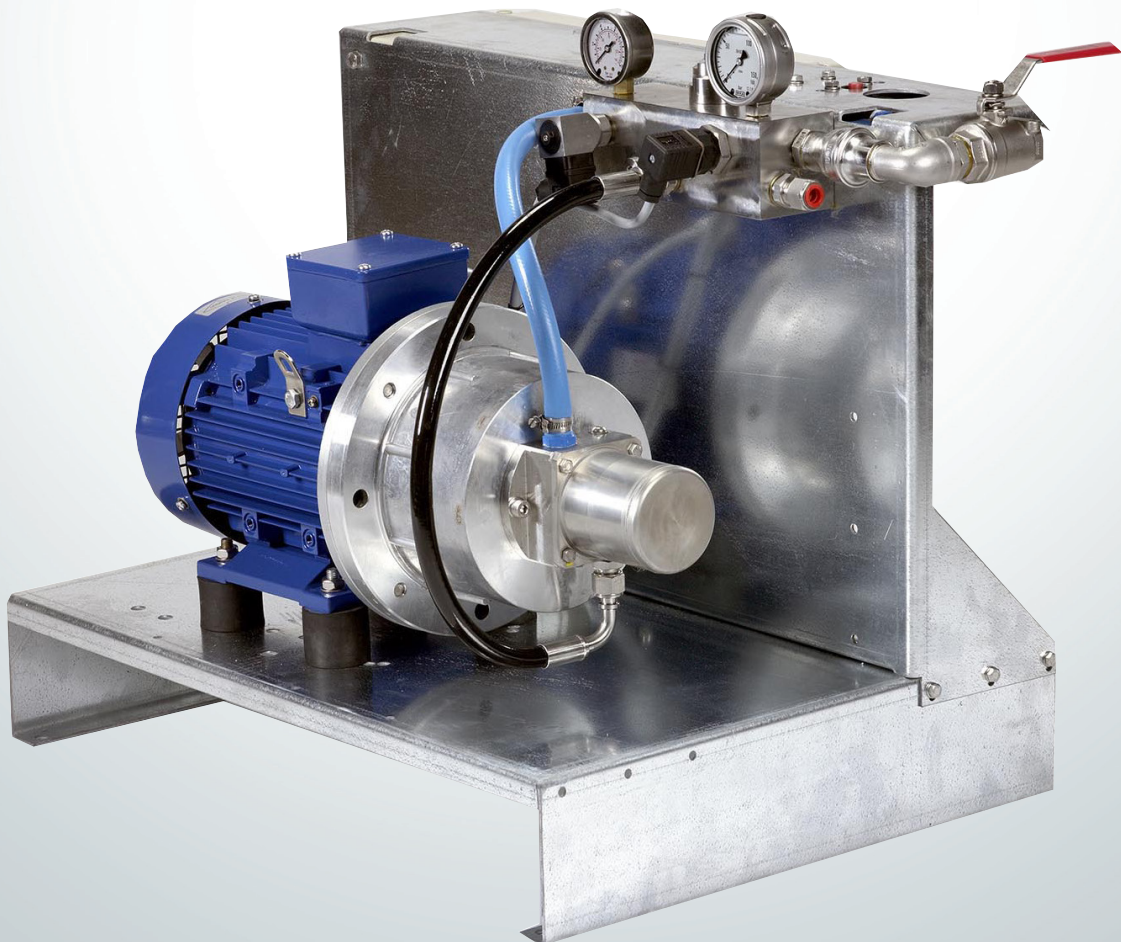




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1. General information

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.

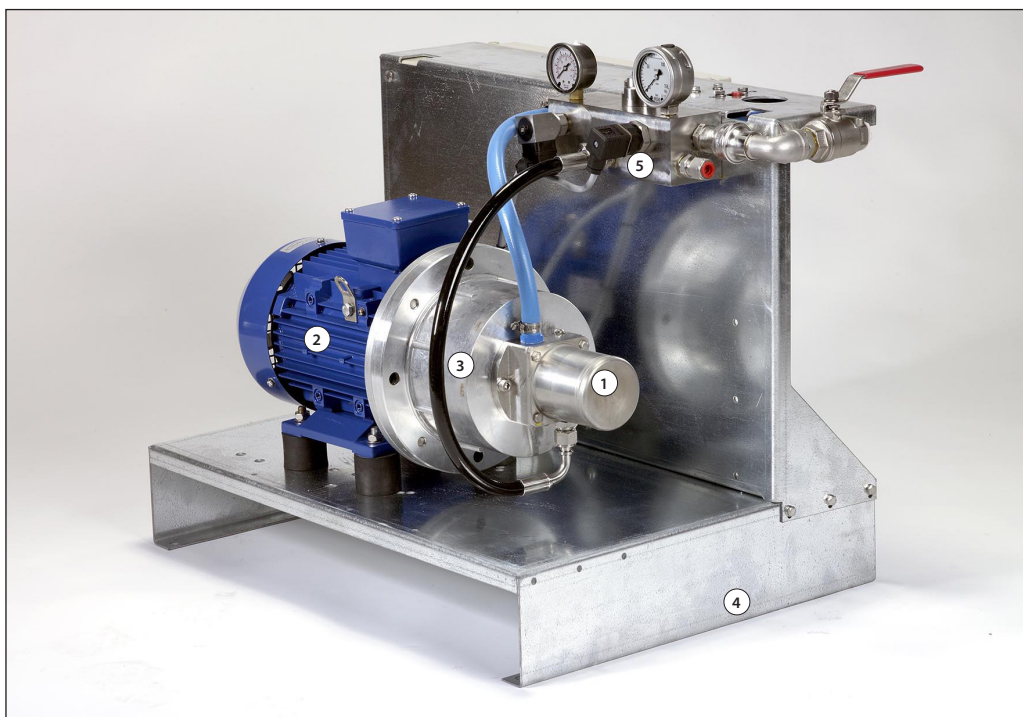
The Plug & Spray unit comprises all necessary components to ensure the best possible performance, maximum service life with maximum protection of the pump. It is very compact, requires very little space and is suitable for both wall and floor mounting.

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).

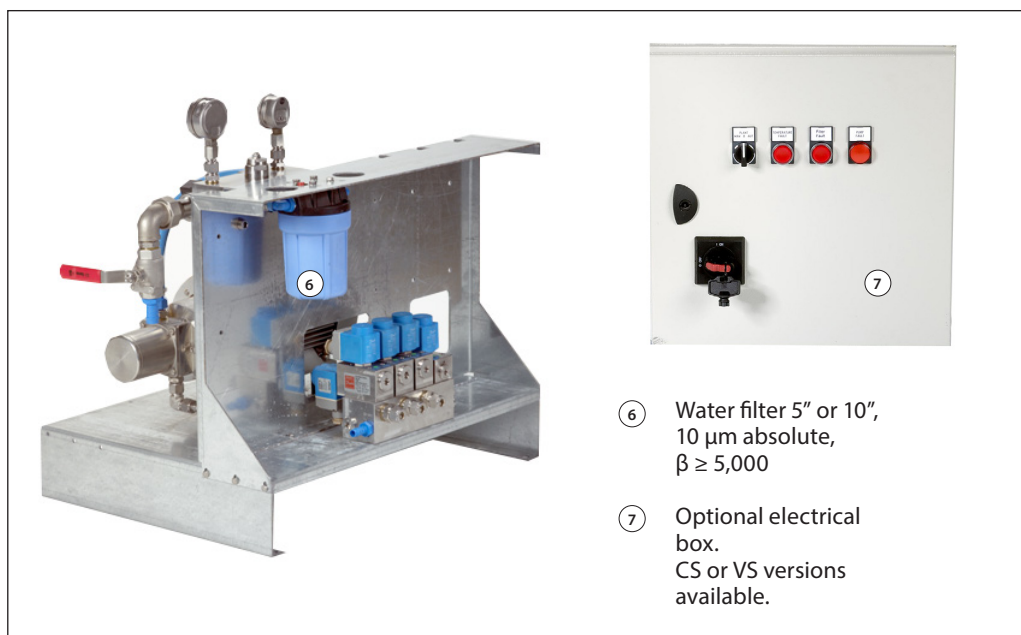
The Plug & Spray unit is suitable for a variety of applications, such as:

- 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.

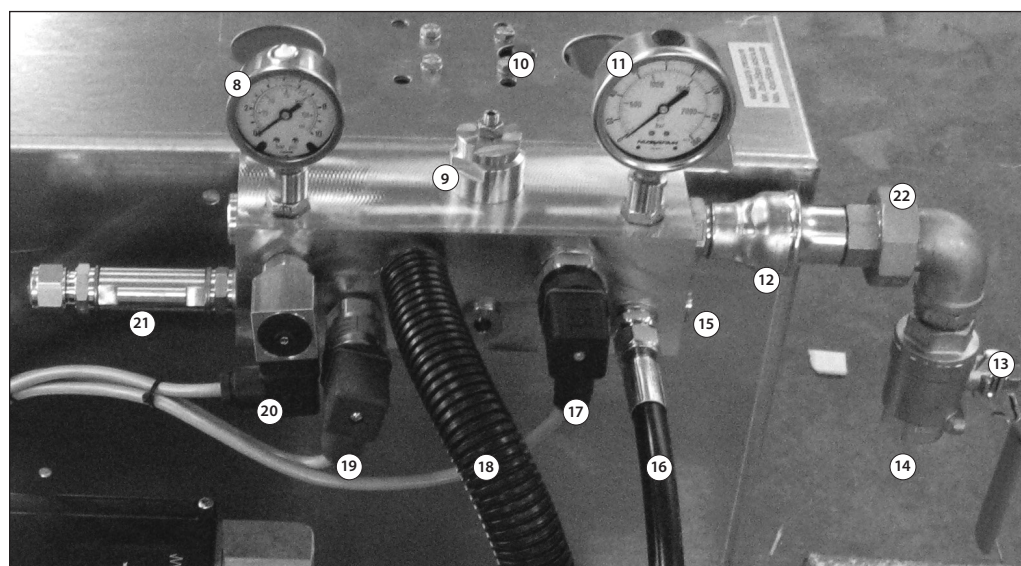
If the recommendations in the manual are not followed, Danfoss reserves the right to void the warranty.



- 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



- ⑥ Water filter 5" or 10", 10 μm absolute, β ≥ 5,000
- ⑦ Optional electrical box. CS or VS versions available.



- ⑧ Supply pressure gauge 0-10 barg
- ⑨ Pressure relief valve VRH 5 (30) CA cartridge, adjustable 20–100 barg / 363–1450 psig (25–140 barg / 363–2031 psig)
- ⑩ Filter bleed button
- ⑪ High-pressure gauge
- ⑫ Check valve - inlet 3/4"
- ⑬ Ball valve G 3/8" female
- ⑭ Inlet G 3/4" female
- ⑮ High-pressure outlet G 3/8" female, optional
- ⑯ MBS 3050 pressure transmitter on VS-unit
- ⑰ High-temperature switch
- ⑱ Low-pressure hose
- ⑲ Low-pressure switch
- ⑳ Check valve - outlet
- ㉑ Swivel union 3/4"
- ㉒ High-pressure hose
- ㉓ High-temperature switch
- ㉔ Low-pressure hose
- ㉕ MBS 3050 pressure transmitter on VS-unit
- ㉖ Low-pressure switch
- ㉗ Check valve - outlet
- ㉘ Swivel union 3/4"

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⁾

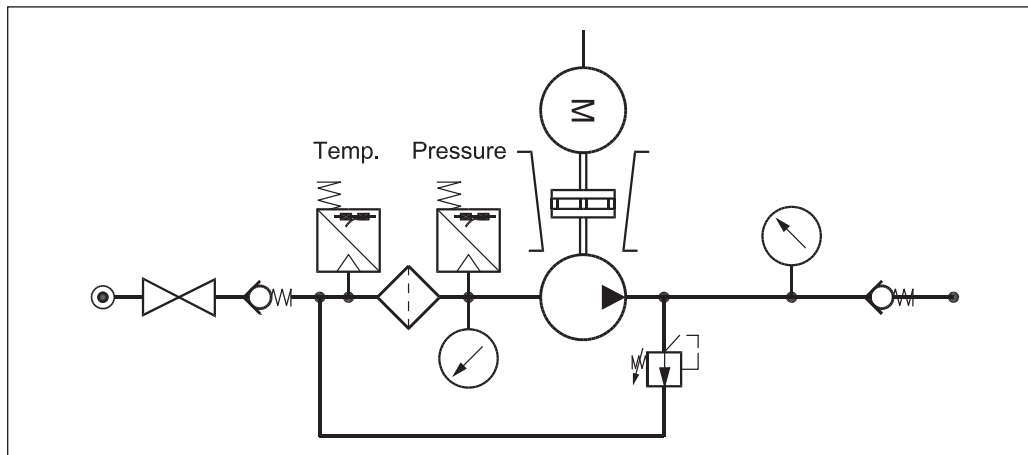
The connection block is mounted with a check valve and a male connector for a 12 mm pipe. By removing the male connector the outlet can be changed to G 3/4" female.

2.22 Swivel union 3/4" ⁽²²⁾

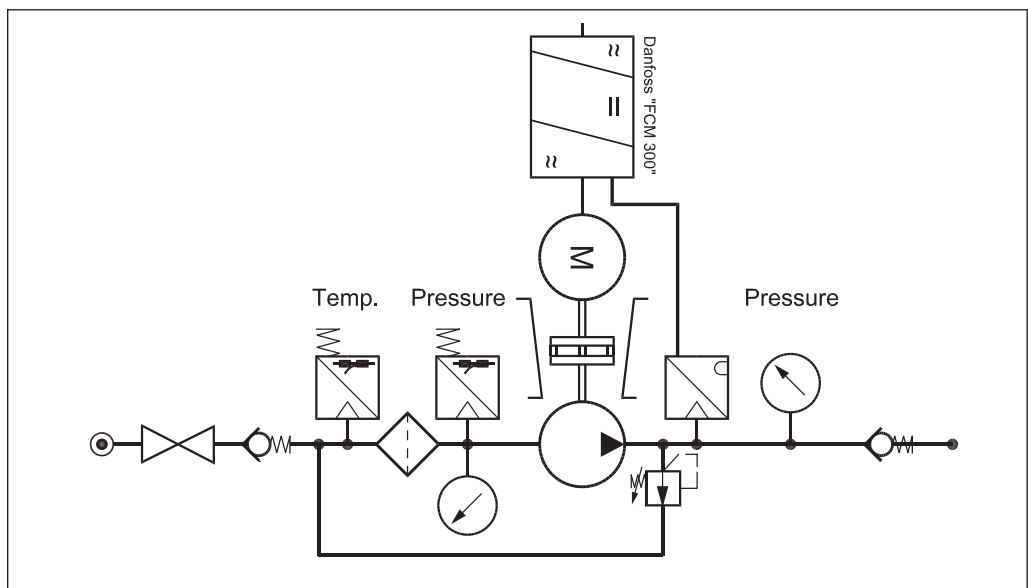
The swivel union allows establishing the water supply from the top, back, front or bottom.

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, β ≥ 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 ± 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 | |
|------------------------------------|------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--|
| | 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 | |

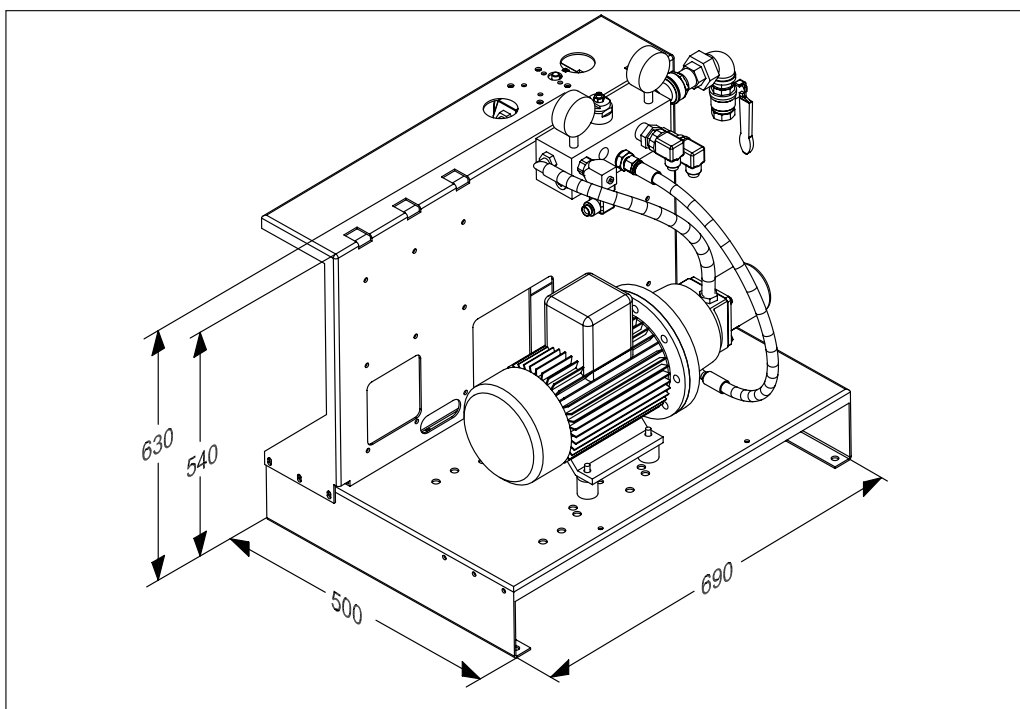
* Minimum and maximum flow increase with decreasing system pressure. Please observe technical data in pump data sheet.

| | | 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)

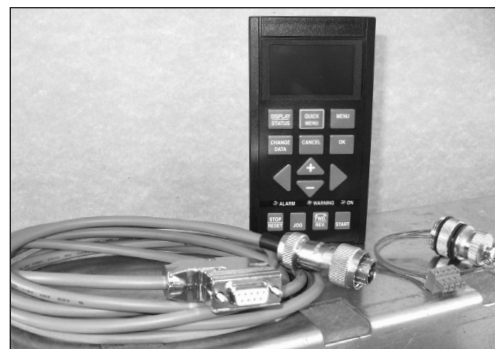
5. Dimensions [mm]



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

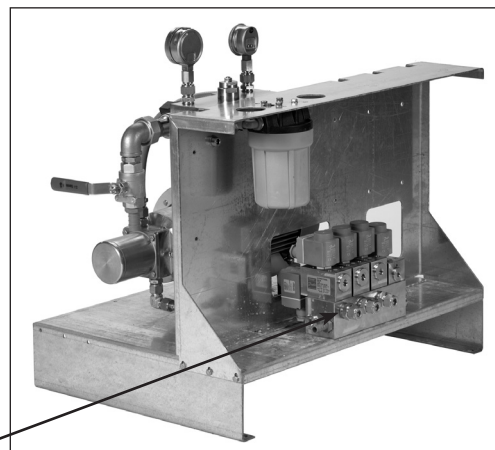
7. Options

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.



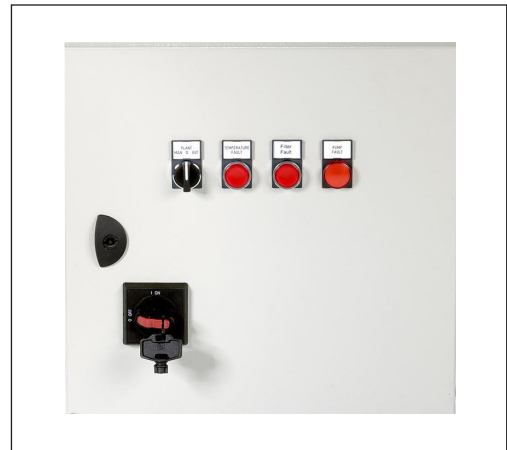
Multiple valve block solution installed on base frame

8. Electrical connection box

The electrical connection box can be directly connected to a 3x400 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.

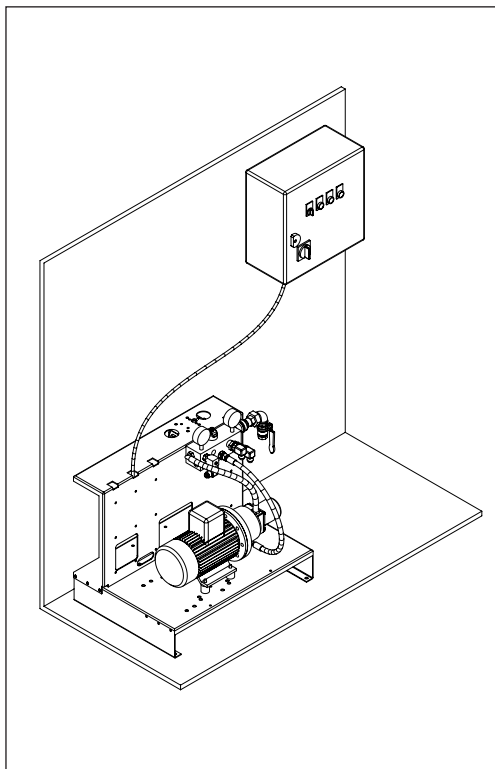
The electrical connection box comprises following basic components:

- 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)

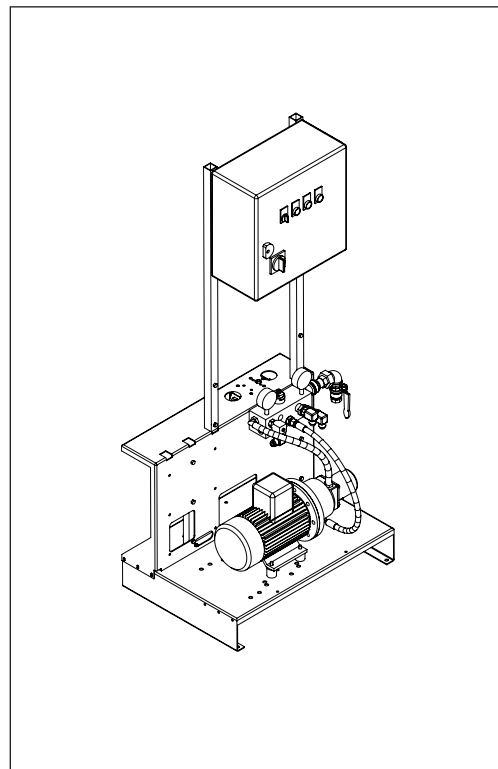


The electrical connection box can be ordered from factory in two versions:

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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