

Nessie® Plug&Spray™ Unit



Generally

The Danfoss Nessie 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, both with IEC or Nema electrical motor as well as in a version with constant pressure control using a Danfoss FCM 300 variable speed drive motor.

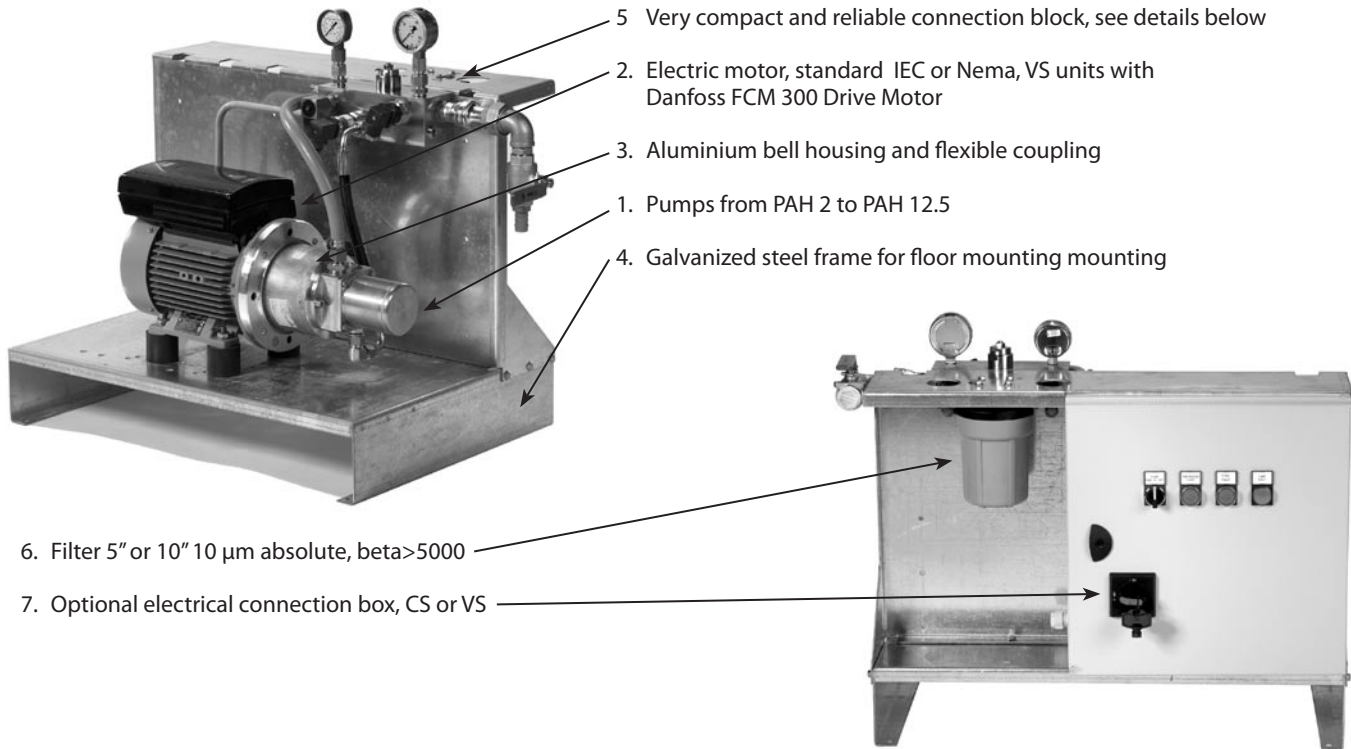
The Plug&Spray™ units are available with 6 different pump sizes (see technical data) to match the required flow demand. The motor power is dimensioned to provide design flow at a system pressure of max. 100 bar or 1450 psi.

The Nessie 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 Nessie Plug&Spray™ units can be operated with ordinary tap water as well as with all kinds of technical water (reverse osmosis, de-ionised and demineralised water).

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

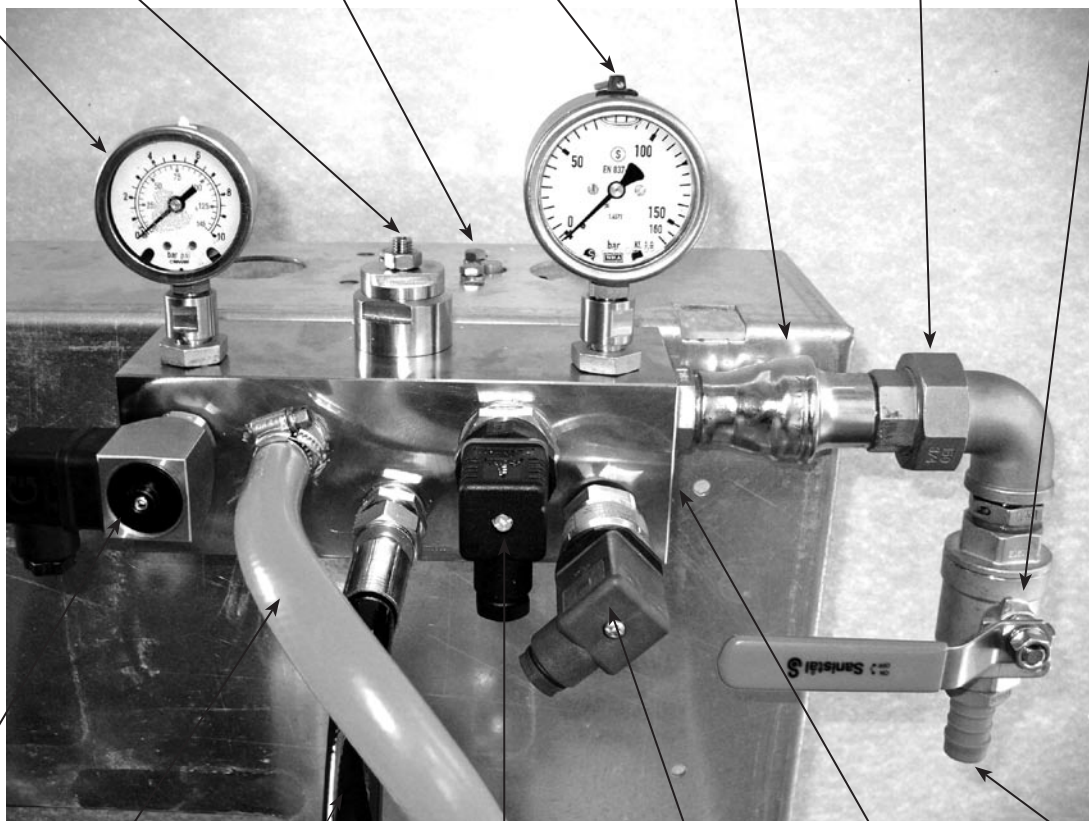
- High-pressure humidification and adiabatic cooling in HVAC systems (Air-Handling-Units)
- Open space humidification system in production halls, storages etc.
- Humidification and adiabatic cooling in animal farms, greenhouses and composting
- Adiabatic outdoor cooling i.e. in pools bars, restaurants etc.
- Dust suppression and dust binding in manufacturing and clean rooms
- Turbine inlet cooling and NOX control
- Odour control and soil filters
- Water mist clouds in theme parks, exhibitions etc.



- 5 Very compact and reliable connection block, see details below
- 2. Electric motor, standard IEC or Nema, VS units with Danfoss FCM 300 Drive Motor
- 3. Aluminium bell housing and flexible coupling
- 1. Pumps from PAH 2 to PAH 12.5
- 4. Galvanized steel frame for floor mounting mounting

- 6. Filter 5" or 10" 10 µm absolute, beta>5000
- 7. Optional electrical connection box, CS or VS

- 11) Supply pressure manometer 0-10 bar
- 8) VRH 30 CA Cartridge adjustable 25-140 bar
- Filter bleed button
- 9) High-pressure manometer 0-160 bar
- 10) 3/4" stainless check valve
- 12) 3/4" stainless swivel union
- 13) Ball valve



- Supply pressure switch
- Hose to pump
- Hose from pump
- Temperature switch
- MBS 3050 pressure transmitter on VS-unit
- High-pressure outlet G 3/8" female
- Ø19 mm hose connector or G 3/4" female

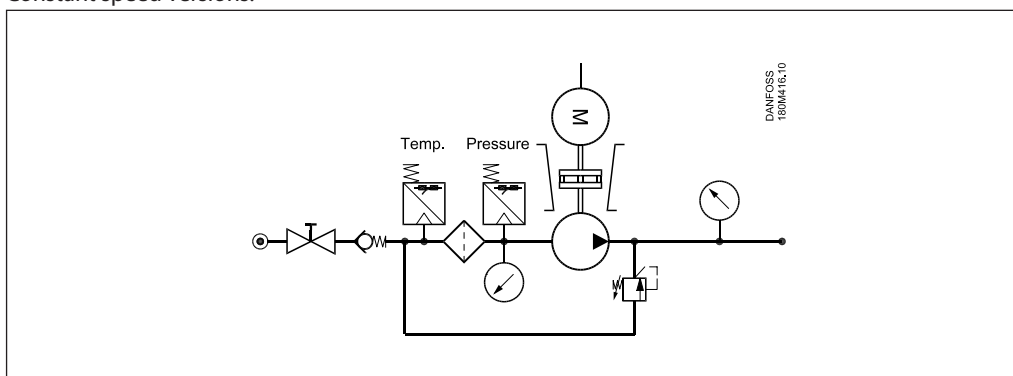
Component description:

- 1) *PAH high-pressure pump*
The heart of the Plug&Spray™ unit is the Nessie axial-piston high-pressure pump. The pump is water lubricated, 100% maintenance free over its entire service life and fulfils the most stringent hygiene requirements as no lubricants or chemicals are involved at all.
- 2) *Electric motor*
The electric motor is dimensioned to provide sufficient power for maximum flow at 100 bar/ 1450 psi system pressure.
The motor is a standard IEC 3-phase 400 V 50 Hz 4-pole asynchronous motor.
For the North American market the Plug&Spray™ units are available with Nema motors, 3×460 V 60 Hz 4-pole (contact Danfoss for other motor types).

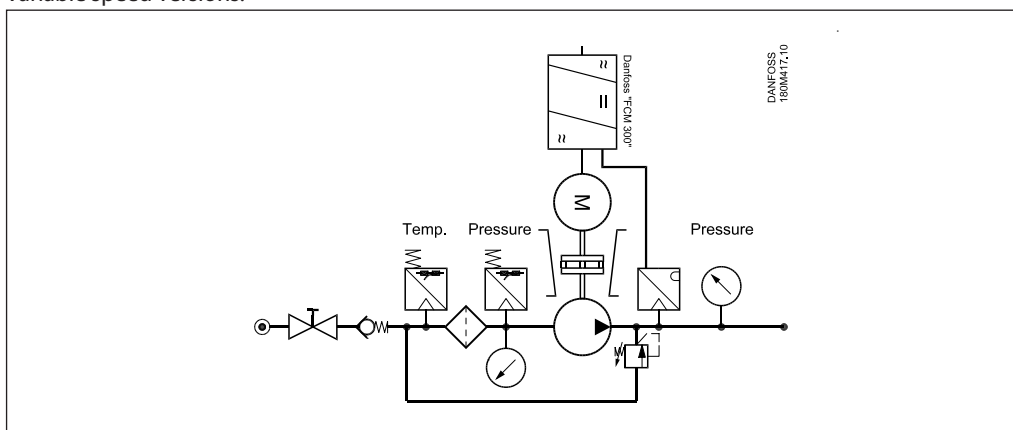
Danfoss FCM 300 drive motor
The variable speed drive motor in connection with a pressure transmitter allows adjusting the pump capacity to the actual demand of the application, keeping the system pressure constant.
The FCM 300 has a built-in PID-controller and 24 V d.c. transmitter power supply.
- 3) *Aluminium cast bell housing and flexible coupling*
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 light-weighted. The transmission is maintenance free and cost efficient compared to traditional belt drives.
- 4) *Galvanized steel frame*
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.
- 5) *Connection block*
A central connection block with integrated pressure relief valve provides a very compact a reliable solution to connect all other necessary components such as manometers, switches etc. See the more detailed description below. 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.
- 6) *Water filter*
The system comprises an 5" or 10" (10, 12,5 VS), 10-micron fine filter with a β -value >5000 abs. The filter protects the pump against rapid wear caused by contamination of the supply water and – as a second benefit – prevents the extreme fine atomization nozzles from clogging. The filter cartridge is easy to replace.
- 7) *Optional Electrical connection box*
Both CS and VS units can be delivered with an electrical connection box, please refer to the following chapter.
- 8) *Pressure relief valve VRH 30CA Cartridge*
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 water temperature 90% of the water can be run over the bypass loop (recirculation).
- 9) *High-pressure manometer*
It allows monitoring the discharge pressure under operation and during adjusting with the pressure relief valve.
- 10) *Check valve*
A check valve at the water supply is mandatory when connecting the system to the public utilities to make back-flow impossible.
- 11) *Supply pressure manometer*
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 bar.
- 12) *Swivel union*
The swivel union allows establishing the water supply from the top, back front or back.
- 13) *Ball valve*
The ball valve allows interrupting the water supply i.e. for filter change or pump service.
- 14,
- 15) *Low pressure and high temperature switch*
If insufficient supply pressure occurs, the pump can be damaged by cavitation or running dry.
A low-pressure switch set to 1.6 bar/23 psi abs. protects the pump. Accordingly the water temperature is monitored to prevent overheating.
The switch is set to 50°C / 122°F.
Both devices should be integrated into the control system circuitry to stop the motor when a switch is activated (see connection diagram).
- 16) *MBS 3050 pressure transmitter*
The pressure transmitter is connected to the internal PID controller of the FCM 300 Drive Motor, which is set up for constant pressure regulation (only with VS units).
- 17) *High-pressure outlet*
The connection block provides 2 G3/8" female outlet ports, one on each side of the block. A 3/8" NPT adapter can be provided on request. One port is blocked from the factory with a blind plug.

Hydraulic diagrams

Constant speed versions:



Variable speed versions:



Technical data

Water supply:	
Connection	Ø19 mm hose fitting or G 3/4" female thread
Pressure	min. 2 bar (28 psi), max. 4 bar (56 psi)
Filter	10 µm absolute beta>5000, 5" or 10" (10, 12.5 VS)
Pressure switch	1.6 bar (23 psi), make or break 250 V a.c./24 V d.c. 0.5 A
Temperature switch	50°C ±5°C, break 250 V a.c./24 V d.c. 0.5 A

High pressure pump:	
Max. Discharge pressure	100 bar (1450 psi), continuous
Min. pump speed	1000 rpm
Max. pump speed	3000 rpm, 2400 rpm NPS10,12.5 VS
Discharge connection	G 3/8" female, 3/8" NPT adapter on request

Pressure relief valve:	
Type	VRH 30 CA Cartridge
Capacity	max. 30 l/min / 1800 l/h (8 gpm)
Adjustment range	25-140 bar (350-2000 psi)

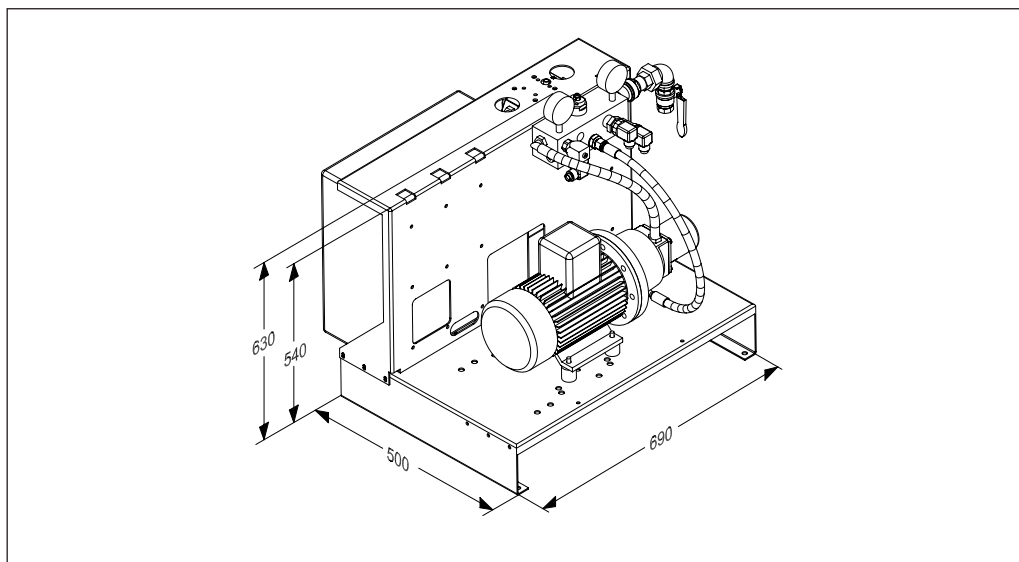
Environmental conditions:	
Water temperature supply	+3°C - +50°C / 37°F - 122°F
Ambient temperature	+3°C - +50°C / 37°F - 122°F, VS units max. 40°C/ 104°F
Storage temperature	-25°C - +65°C / 13°F - 149°F with frost protection!
Operation and storage humidity	5-95% rF, non condensing

Technical data

Type	NPS 1CS	NPS 2CS	NPS 3.2CS	NPS 4CS	NPS 6.3CS	NPS 10CS	NPS 12.5CS	NPS 2VS	NPS 3.2VS	NPS 4VS	NPS 6.3VS	NPS 10VS	NPS 12.5VS
Ordering code	180U 3300	180U 3301	180U 3302	180U 3303	180U 3304	180U 3305	180U 3306	180U 3307	180U 3308	180U 3309	180U 3310	180U 3311	180U 3312
Pump type	PAH 2	PAH 2	PAH 3.2	PAH 4	PAH 6.3	PAH 10	PAH 12.5	PAH 2	PAH 3.2	PAH 4	PAH 6.3	PAH 10	PAH 12.5
Minimum flow at 100 bar*	7.5 l/h	10 l/h	20 l/h	30 l/h	50 l/h	75 l/h	100 l/h	10 l/h	20 l/h	30 l/h	50 l/h	75 l/h	100 l/h
Maximum flow at 100 bar*	75 l/h	100 l/h	200 l/h	300 l/h	500 l/h	750 l/h	1000 l/h	300 l/h	450 l/h	600 l/h	1000 l/h	1350 l/h	1750 l/h
Motor type	0.55 kW 6-pole	0.75 kW 4-pole	1.5 kW 4-pole	1.5 kW 4-pole	2.2 kW 4-pole	3 kW 4-pole	4 kW 4-pole	FCM 315 2-pole	FCM 322 2-pole	FCM 322 2-pole	FCM 340 2-pole	FCM 355 4-pole	FCM 355 4-pole
Motor voltage	3×230/ 400 V 50 Hz	3×230/ 400 V 50 Hz	3×230/ 400 V 50 Hz	3×230/ 400 V 50 Hz	3×230/ 400 V 50 Hz	3×230/ 400 V 50 Hz	3×400/ 690 V 50 Hz	3×380- 480 V 50/60 Hz	3×380- 480 V 50/60 Hz	3×380- 480 V 50/60 Hz	3×380- 480 V 50/60 Hz	3×380- 480 V 50/60 Hz	3×380- 480 V 50/60 Hz
Motor current, FLA	1.7A	1.9A	3.5 A	3.5 A	4.7 A	6.3A	8.2A	3.3/2.6A	4.7/3.7A	4.7/3.7A	7.9/6.4A	11/8.7A	11/8.7A
Cos φ	0.72	0.77	0.79	0.79	0.82	0.83	0.83	1	1	1	1	1	1
Speed in rpm	900	1400	1400	1400	1420	1420	1440	1000- 3000	1000- 3000	1000- 3000	1000- 3000	1000- 2400	1000- 2400
Weight with-out options	55 kg	55 kg	58 kg	58 kg	67 kg	73 kg	76 kg	64 kg	70 kg	70 kg	81 kg	104 kg	104 kg
Shipping	85 kg	85 kg	88 kg	88 kg	97 kg	103 kg	106 kg	94 kg	100 kg	100 kg	111 kg	134 kg	134 kg
Crate size H×W×D	0.8 m × 0.6 m × 0.8 m	0.8 m × 0.6 m × 0.8 m	0.8 m × 0.6 m × 0.8 m	0.8 m × 0.6 m × 0.8 m	0.8 m × 0.6 m × 0.8 m	0.8 m × 0.6 m × 0.8 m	0.8 m × 0.6 m × 0.8 m	0.8 m × 0.6 m × 0.8 m	0.8 m × 0.6 m × 0.8 m	0.8 m × 0.6 m × 0.8 m	0.8 m × 0.6 m × 0.8 m	0.8 m × 0.6 m × 0.8 m	0.8 m × 0.6 m × 0.8 m

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

Dimensions [mm]



Local Control Panel

The Plug&Spray VS units with the Danfoss FCM 300 Drive Motor are pre-programmed from the factory. However some parameters must be adjusted during commissioning (i.e. for the PID-loop). Therefore Danfoss recommends ordering at least one Local Control Panel (LCP2) per installation. From factory the FCM 300 is equipped with a service plug (ordering code 175N2545, to the right in picture). For fixed installation of the LCP in a cabinet, Danfoss offers a remote mounting kit with 3m cable.



Ordering codes:

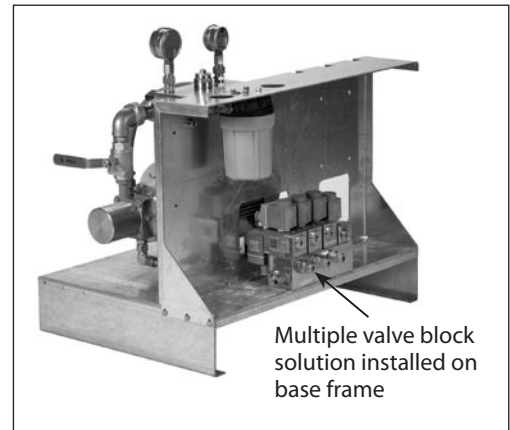
Local Control Panel LCP2	175N0131
Cable for service plug	175N0162
Remote mounting kit	175N0160

Options

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

- Examples for 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).

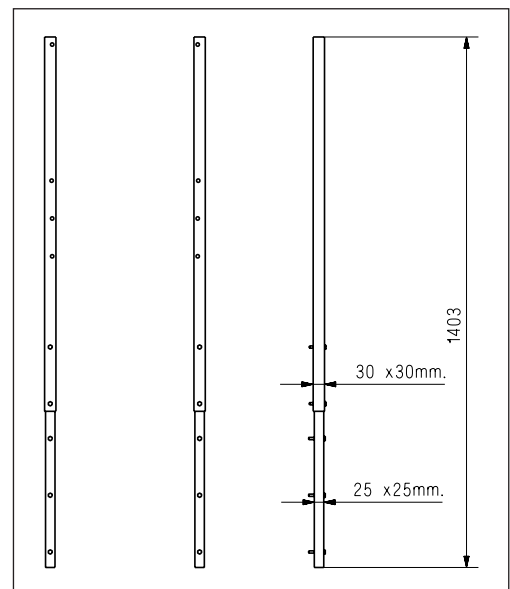
For details, please contact your nearest Danfoss Nessie representative.



Cabinet support kit

The Plug&Spray base frame is prepared for supports to carry a control cabinet with standard width 400 mm, 500 mm or 600 mm. The supports are made of aluminium and the total height of the system is app. 1600 mm.

Ordering code 180N0680.

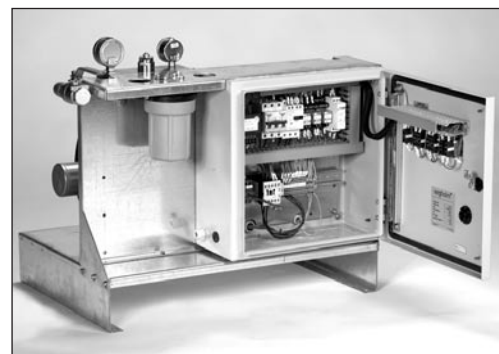


Electrical connection box

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

The electrical connection box is available for CS and VS unit. It comprises following basic components:

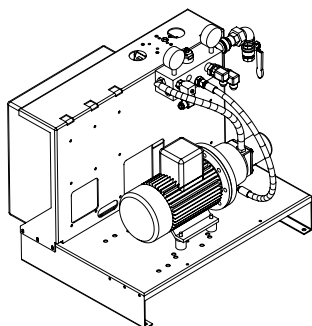
- Mains disconnect with fuses
- Hand-Off-Auto switch (CS only)
- Motor overload protection (CS only)
- Operation hour counter (CS only)
- Inlet pressure monitoring with reset button
- Water temperature monitoring with reset button
- Terminals for external start signal (potential free contact)
- Contacts for fault relay
- LCP2 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 three versions:

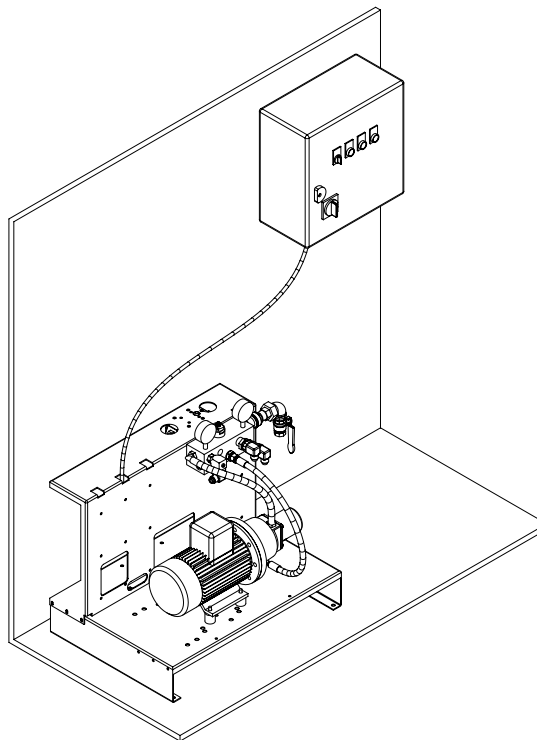
Compacts

Placed on base frame



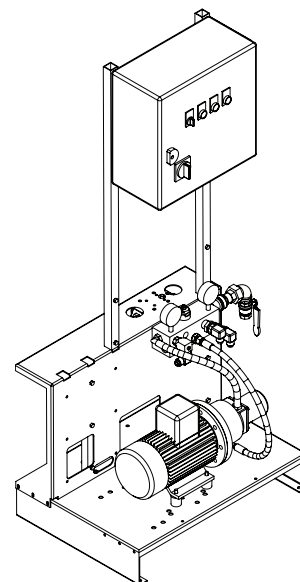
Wall

With 2 metres cable



Free standing

on supports



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

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