

The Cellkraft F-series humidifier is suitable for high flow rate. The F-Series humidifies the airflow by injecting evaporated water. This technology gives the opportunity to humidify high flows of gas with high precision, quick response and low pressure drop.

**Advantages**

- Compact
- Fully automatic
- Maintenance free
- Suitable for air, oxygen, hydrogen and other gases.



**Industrial version**

- SS 304 enclosure
- IP 65
- ATEX/IEC zone 1/2
- GMP



**Capacity**

Model	F-250	F-500	F-1000
Flow (l/min)	0 (50)...250	0 (50)...500	0 (50)...1000
Humidity	-20...140 °C Tdew		
	0...(98) 100 % RH		
Temperature	20...300 °C		
Pressure	0...20 bar(a)		

**Applications**

- Climate chambers
- Environmental simulation
- Fuel Cell testing
- Semiconductor industry
- Tube furnaces
- Chamber furnaces
- Testing laboratories
- Pharmaceutical industry
- Humidity control of vacuum dryers

**Display**

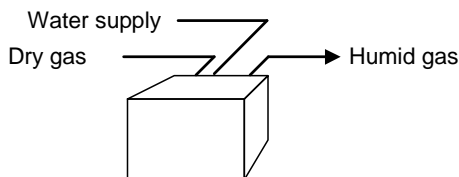
The front panel display will give all information about the produced gas flow. The F-Series can control the humidity and optionally: flow rate, temperature, pressure and gas composition.

SP Flow (%)	100
SP RH (%)	60,0
RH (%)	59,9
SP Temp. (°C)	32,0
Temp (°C)	32,0

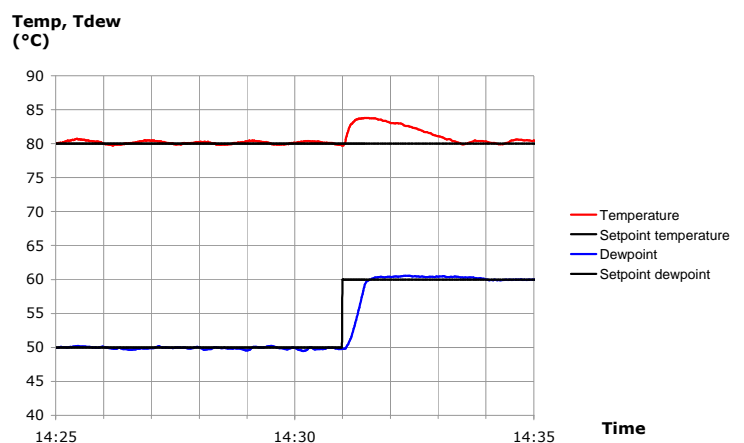
**Technology**

- Injection technology for precise and fast humidity control without droplets
- Precision pump for water vapour control
- Individual control of humidity, temperature (optional) and flow rate (optional).
- CE-compliance

**Principle**



**Transient and stable**



The graph shows the setpoint and the process value of temperature and humidity for a F-Series humidifier.

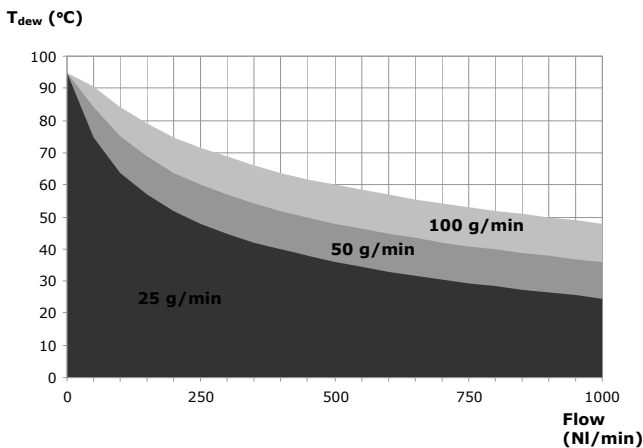
**Technical data**

	<b>F-250</b>	<b>F-500</b>	<b>F-1000</b>
<b>Flow</b>			
Capacity*	0...250 l/min	0...500 l/min	0...1000 l/min
Flow accuracy (flow control option)	± 1 % of full scale		
<b>Humidity</b>			
Capacity	-20...140 °C Tdew (0...(98) 100 % RH)**		
Sensor accuracy	± (1.5 + 0.015 × reading) %RH		
Sensor accuracy (configuration for atm pressure and max 75 °C)	At 0 ... +40 °C: ±1.7 % RH (0 ... 90 %RH) ±2.5 % RH (90 ... 100 %RH) At +40 ... +80 °C: ±3.0 % RH (0 ... 90 %RH) ±4.0 % RH (90 ... 100 %RH)		
<b>Temperature</b>			
Min temp at <20% flow due to auto-heating (at 25 °C supply temp)	40 °C	35 °C	30 °C
Capacity (temp control option)	25...300 °C		
Accuracy at +20° C	±0.2 °C		
<b>Pressure</b>			
Pressure range	0.8...1.2 bara (atm), 1...6 bar(a) or free def. between 0 (vacuum)...20 bar(a)		
Pressure drop	150 mbar	200 mbar	250 mbar
Pressure drop (option flow control)	2000 mbar		
<b>Liquid supply</b>			
Water quality	Deionised or distilled (max 10µS / cm)		
Suction capacity of inlet water	1 m		
Pressure of inlet water (option)	1...4 bar(g)		
<b>General</b>			
Power	1500-7500 W depending on configuration		
Ambient temperature in use/storage	+5... +45 °C / -40... +60 °C		
Wetted materials	Nafion®, PTFE, Stainless steel		
Certification	CE certified		
<b>Mechanical</b>			
Standard bench top enclosure (WxHxD)	471x281x413 mm	471x281x413 mm	471x281x413 mm
Weight	15.5 kg	23 kg	25 kg
<b>Interface</b>			
Voltage	230 V, 50-60 Hz single phase or 400 V, 50-60 Hz three-phase depending on configuration		
Remote control digital	RS 232 / RS 485 Modbus RTU or Modbus TCP Open source Java-based software included.		
Remote control analogue	0...10 V, 0...5 V, 0...20 mA or 4...20 mA. (optional)		
Liquid inlet	6 mm or 1/4" compression fitting Swagelok®		
Air inlet/outlet	12 mm or 1/2" Swagelok®	18 mm or 3/4" Swagelok®	

\* Operation below 50 nlpm may give unstable humidity output.

\*\* Lower limit depends on inlet gas humidity. Operation in the range 98-100 % RH can lead to condensation.

**Capacity**

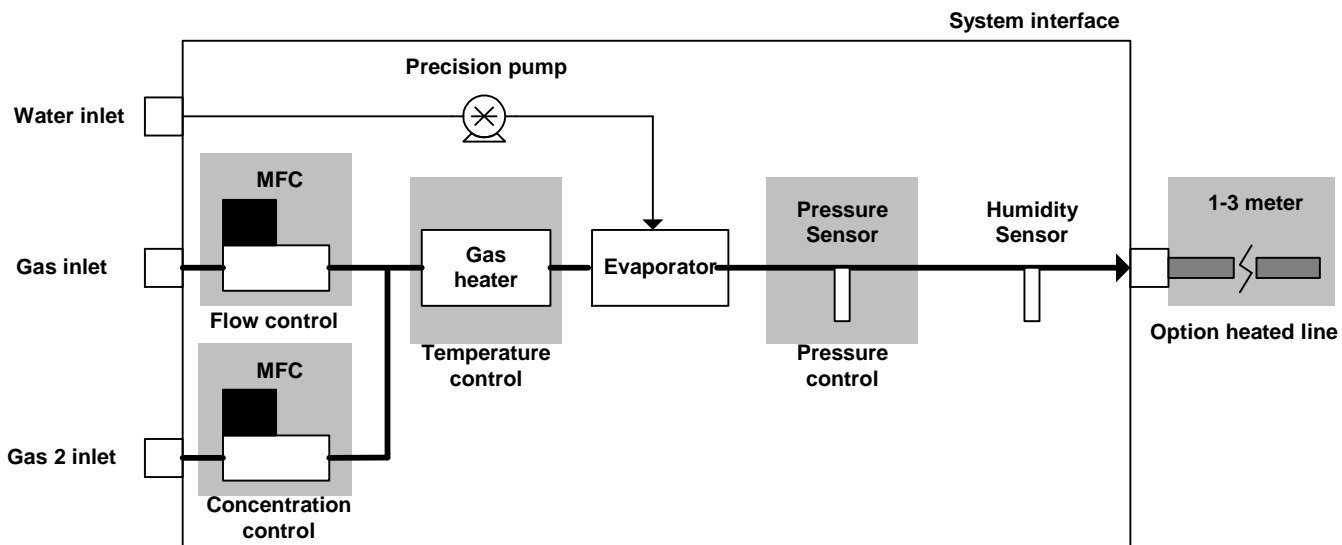


**Technical principle**

The F-Series humidifier creates a humidified air flow by injecting a precise flow of water vapour into the air flow. The technology gives extremely dynamic and transient performance. Humidity can be adjusted from 0-100% in a few seconds.

The capacity graph gives information on max available dewpoint as a function of flow and steam capacity.

**Control functions and options**



**Flow**

The humidifier can be equipped with an internal mass flow controller. This allows the user to control the flow rate from the front panel. This option requires that gas supply with some overpressure (typical min 2 bar) is available.

**Pressure**

The unit can be configured to monitor the gas pressure or even to set the pressure. Pressure control is effectuated by controlling the flow rate in order to keep the pressure at the set value.

**Humidity**

Closed loop control of humidity based on a signal from a humidity sensor will ensure accurate control of humidity. The setpoint and the actual value of humidity are presented on the front panel. Humidity can be expressed as relative humidity (% RH), dew point (°C) or partial pressure (mbar).

**Temperature**

An integrated internal heater will allow the user to set the temperature of the humidified gas. In this way the humidity and temperature can be set independently.

**Concentration**

Optionally the unit can be equipped with parallel flow control for several gases. In this way accurate concentration control can be achieved. Typical application is varying of the Oxygen concentration in the process gas.

**Heated output tube**

A heated flexible tube for the output gas facilitates condensation free transfer of the humid gas from the humidifier. The temperature of the output tube is controlled from the front panel in the range 20 to 180 °C.

**Explosion proof versions**

Explosion proof versions for ATEX zone 2 and zone 1 are available. Contact Cellkraft for more information.

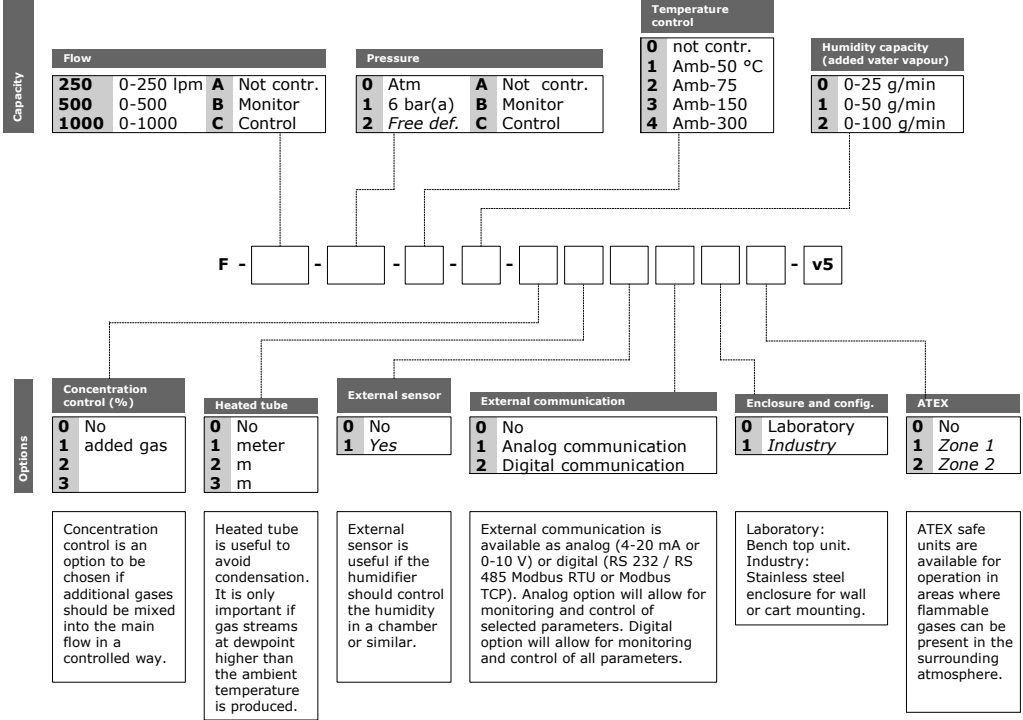
**Product configuration code**

Flow: Specify max flowrate = basic model of F-series humidifier. Also specify if the unit should monitor (B) or control (C) the flowrate. If flowrate is controlled externally choose code (A).

Pressure: Specify pressure range at the outlet of the unit:  
Atm: 1 +/- 0,2 bar(a)  
Pressure: 1-6 bar(a)  
Free def.: 0 (vacuum)-20 bar(a)  
  
Also specify if the unit should monitor (B) or control (C) the pressure.

Temperature: Specify the control range of the humidified gas.

Humidity capacity: Specify the max rate of added water vapour of the unit. Cellkraft can assist to calculate the needed capacity for a given humidity level.



Concentration control is an option to be chosen if additional gases should be mixed into the main flow in a controlled way.

Heated tube is useful to avoid condensation. It is only important if gas streams at dewpoint higher than the ambient temperature is produced.

External sensor is useful if the humidifier should control the humidity in a chamber or similar.

External communication is available as analog (4-20 mA or 0-10 V) or digital (RS 232 / RS 485 Modbus RTU or Modbus TCP). Analog option will allow for monitoring and control of selected parameters. Digital option will allow for monitoring and control of all parameters.

Laboratory: Bench top unit.  
Industry: Stainless steel enclosure for wall or cart mounting.

ATEX safe units are available for operation in areas where flammable gases can be present in the surrounding atmosphere.

Example configuration code: **F-250A-0A-3-0-0202000-v5**

This code describes a F-250 unit, capable of humidifying 250 liters/min without flow monitoring or control. Operating pressure is 0.8-1.2 bar(a) (+/- 0.2 bar from atmospheric/ normal ambient pressure.) Temperature of the outlet gas can be set from 25 to 150 °C. Humidification capacity is 25 g/min of added water vapour.

The unit has a 2 meter long heated tube on the outlet to avoid condensation. It can communicate by digital communication. The unit has a standard enclosure to be placed on a lab bench or similar. The last position shows that the configuration key is version 5.

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