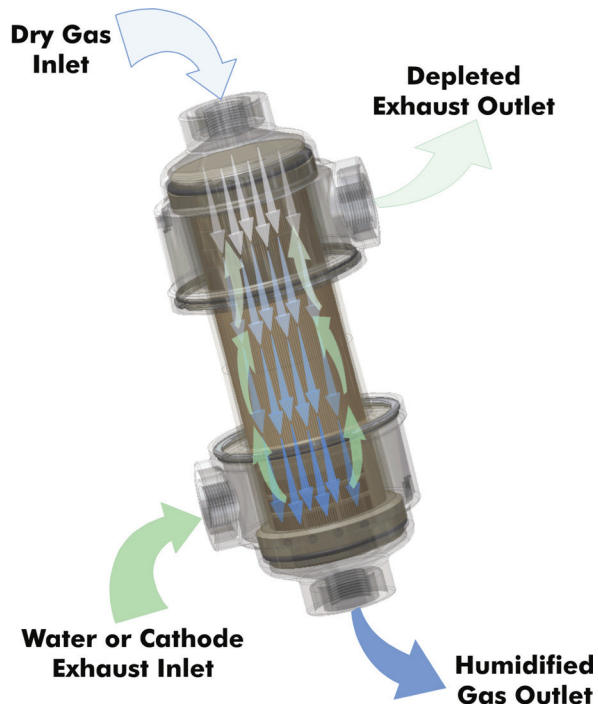


PRINCIPLE OF OPERATION

FC™-Series Humidifiers are shell and tube moisture exchangers that allow transfer of water vapor. Humidifiers can be setup Gas-to-Gas or Water-to-Gas. Water molecules are absorbed into walls of the Nafion® tube and transferred to dry gas stream. This transfer is driven by the difference in partial pressures of water vapor on opposing sides.



Nafion® is a registered trademark of DuPont
FC™ is a trademark of Perma Pure LLC.

DOC# FC-MAN-001 REV 00

FC™ - Series Humidifier

User Manual

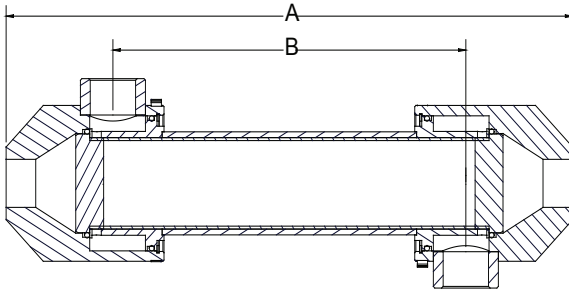


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FC HUMIDIFIER SPECIFICATIONS



Model Number	A	B	Ports
FC125-240-5PP	8.25"	4.75"	1/2"
FC125-240-7PP	10.25"	6.75"	1/2"
FC125-240-10PP	13.25"	9.75"	1/2"
FC150-480-7PP	11.50"	6.75"	3/4"
FC150-480-10PP	14.50"	9.75"	3/4"
FC200-780-7PP	11.25"	6.50"	1"
FC200-780-10PP	14.25"	9.50"	1"
FC300-1660-7ABS	12.10"	5.60"	1.5"
FC300-1660-10ABS	15.10"	8.60"	1.5"
FC300-1660-15ABS	20.10"	13.60"	1.5"
FC400-2500-10PP	16.63"	8.63"	2"
FC400-2500-12PP	18.63"	10.63"	2"
FC400-2500-15PP	21.63"	13.63"	2"
FC400-2500-20PP	26.63"	18.63"	2"
FC600-7000-8PP	15.5	7.25	2"
FC600-7000-14PP	21.5	13.25	2"

SETUP 1: GAS TO GAS

In Gas-to-Gas setup, constant dewpoint wet gas needs to be continuously flowing at same flow rate as sample.

GAS-TO-GAS PERFORMANCE

Model Number	Approach Temperature*		
	4 Deg.	6 Deg.	9 Deg.
FC125-240-5PP	13	30	40
FC125-240-7PP	18	42	56
FC125-240-10PP	25	60	80
FC150-480-7PP	35	84	112
FC150-480-10PP	50	120	160
FC200-780-7PP	57	137	182
FC200-780-10PP	80	195	260
FC300-1660-7ABS	121	291	387
FC300-1660-10ABS	173	415	553
FC300-1660-10HP	173	415	553
FC300-1660-15ABS	259	623	830
FC400-2500-10ABS	260	625	833
FC400-2500-12ABS	312	750	1000
FC400-2500-15ABS	390	938	1250
FC400-2500-20ABS	520	1250	1667
FC600-7000-8PP	583	1400	1860
FC600-7000-14PP	1020	2450	3267

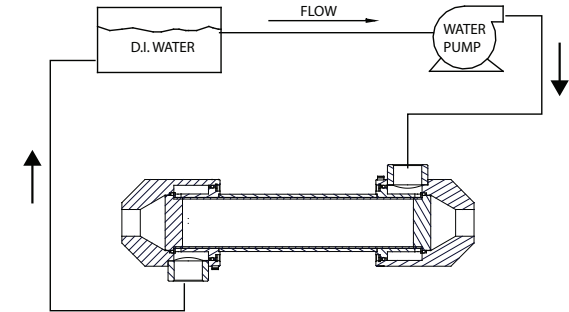
* Units are expressed as flow rate of air (slpm) in relation to approach dewpoint temperature. Approach temperature is defined as difference between wet gas entering humidifier and humidified stream outlet. For example, for FC-125-240-10PP at 25 lpm, wet gas enters humidifier at 70°C at Approached Temperature of 4°C, humidified stream outlet would be 66°C.

SETUP 2: WATER-TO-GAS

In Water-to-Gas setup, the humidification process is endothermic. Heated water needs to be continuously circulated through the humidifier so as to prevent cold spots from forming inside and reducing performance. Flow with greater pressure must be flowing inside tubes to prevent tubing collapse, which can lead to poor performance and permanent leaks through the headers.

DI water is required for humidification, and the water should be circulated at 4 LPM for 100 LPM of dry gas flow.

The surface of Nafion™ in a Water-To-Gas setup chemically behaves like liquid water, and will react with anything in the gas that would react with liquid water. Additionally, users may experience losses when humidifying gases that are soluble in water. Liquid water under pressure can transfer directly through the membrane in liquid form, and provisions should be taken to evaporate that water downstream of the gas exit as necessary.



WATER-TO-GAS PERFORMANCE

Performance can be controlled by increasing heat or by decreasing sample flow. Chart below shows performance of various models.

