Paddle Wheel Flow Sensors
for Low Viscosity Liquids

measuring • monitoring • analyzing

DF

- Body Material Options: Brass, Stainless, or Polysulfone
- Easy to Install, No Straight Runs Required
- Robust and Reliable
- 6 Different Material Combinations Available
- Electronic Options: Frequency, Analog, Relay, Totalizer, and/or Batch Controllers with Digital Displays

KOBOLD companies worldwide:

AUSTRALIA, AUSTRIA, BELGIUM, BULGARIA, CANADA, CHINA, CZECHIA, FRANCE, GERMANY, GREAT BRITAIN, HUNGARY, INDIA, INDONESIA, ITALY, MALAYSIA, MEXICO, NETHERLANDS, PERU, POLAND, REPUBLIC OF KOREA, RUSSIA, SPAIN, SWITZERLAND, THAILAND, TUNISIA, TURKEY, USA, VIETNAM

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Description

The main feature of the DF flow sensors is the incorporation of a multipole magnet ring embedded into the paddlewheel. As the paddle wheel rotates, the magnets, hermetically separated from the liquid media, induce a DC signal into a Hall-Effect sensor mounted on the device housing. Since the DC signal frequency is proportional to paddlewheel rotation, an accurate flow rate reading is possible.

The DF sensors, when coupled with the appropriate KOBOLD electronics unit, can offer the user a number of features useful in the measurement and control of low viscosity liquid flow. These features include a frequency output, analog output, adjustable switches, digital displays with integrated batch controllers, or totalizers.

DF
Sensor

DF-WM

DF-MA

DF-KL
-DL
-ZL

Specifications

Accuracy:	± 2.5% of full scale
Media:	Water and low viscosity liquids
Orientation:	Universal
Fittings:	1/8" NPT ... 1-1/2" NPT

Material Combination

Material Combination	Standard				High Pressure Design	
	I B	II	III	IV[1)]	VI[1)]	VII[1)]
Order Code	**P**	**B**	**D**	**E[1)]**	**G[1)]**	**H[1)]**
Connecting type	Female thread	Female thread	Female thread	Female thread	Female thread	Female thread
Housing	Polysulfone	Polysulfone	Brass, Nickel-plated	316L SS	Brass, Nickel-plated	316L SS
Housing lid	Polysulfone	Polysulfone	Polysulfone	Polysulfone	Brass, Nickel-plated	316L SS
Connection	Brass, Nickel-plated	316-Ti SS	Brass, Nickel-plated	316-Ti SS	Brass, Nickel-plated	316-Ti SS
Locking pins	Brass[3)]	Brass[3)]	Brass[3)]	-	-	-
O-rings	NBR	FKM	NBR	FKM	NBR	FKM
Paddle wheel	POM	PTFE	POM	PTFE	POM	PTFE
Axle	316L SS	316L SS	316L SS	316L SS	316L SS	316L SS
Axle bushing	PTFE	PTFE	PTFE	PTFE	PTFE	PTFE
Orifice	PTFE[2)]	PTFE[2)]	PTFE[2)]	PTFE[2)]	PTFE[2)]	PTFE[2)]
Max. operating pressure [PSI]	145	145	230	230	1450	1450
Max. operating temperature [°F]	180	180	180	180	180	180

[1)] Fittings are not rotatable [2)] For Model DF..01 Stainless Steel Orifice [3)] Non-wetted

No responsibility taken for errors;
subject to change without prior notice.

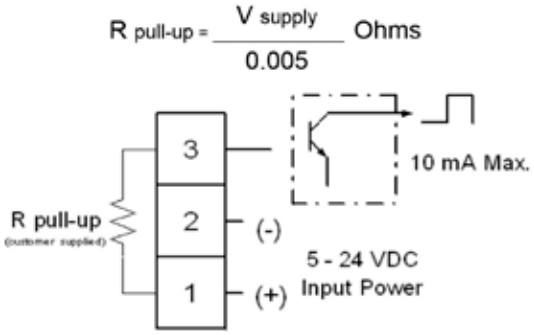
Description

The KOBOLD DF Flow Sensor is used in applications where flow measurement is desired and flow rate data is to be transmitted as a pulse rate output. The DF Flow Sensor contains a flow transducer which transmits a pulse signal. The output signal is linearly proportional to the flow and is transmitted by a bipolar transistor operating in an open collector configuration (max. 10 mA sinking capability). A user-supplied, pull-up resistor is required to produce a signal output.

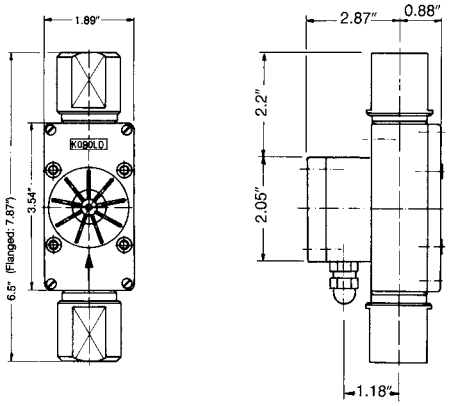
Specifications

Power Supply:	5 to 24 V_{DC}
Signal Output:	NPN - Open Collector 10 mA max.
Temperature Range:	-4...176 °F
Protection:	IP 65
Accuracy:	± 2.5% of F.S.

Wiring Diagram



Dimensions



Order Details (Example: **DF-0402B**)

Range (Water) (GPM)	Standard Connection (NPT)	Diameter of Orifice (Inch)	Pressure Drop Max. (PSI)	DF Flow Sensor Material Combination						Options (Add Suffix to Order Number)	
				I B	II	III	IV	VI	VII	Suffix "..B" Special Conn. (NPT)	Suffix "..HNP"
0.02...0.14	1/8"	0.04	10.2	**DF-0901**	**DF-0201**	**DF-0301**	**DF-0401**	**DF-0601**	**DF-0701**	1/4"	5 point Calibration Cert
0.05...0.30	1/4"	0.08	4.2	**DF-0902**	**DF-0202**	**DF-0302**	**DF-0402**	**DF-0602**	**DF-0702**	3/8"	
0.05...0.60	1/4"	0.08	10.4	**DF-0903**	**DF-0203**	**DF-0303**	**DF-0403**	**DF-0603**	**DF-0703**	3/8"	
0.1...0.7	1/4"	0.11	9.6	**DF-0904**	**DF-0204**	**DF-0304**	**DF-0404**	**DF-0604**	**DF-0704**	3/8"	
0.2...2.5	3/8"	0.19	6.0	**DF-0905**	**DF-0205**	**DF-0305**	**DF-0405**	**DF-0605**	**DF-0705**	1/2"	
0.4...5	1/2"	0.32	2.9	**DF-0906**	**DF-0206**	**DF-0306**	**DF-0406**	**DF-0606**	**DF-0706**	3/4"	
0.5...6	3/4"	0.32	4.4	**DF-0907**	**DF-0207**	**DF-0307**	**DF-0407**	**DF-0607**	**DF-0707**	1"	
0.5...12	3/4"	0.49	4.4	**DF-0908**	**DF-0208**	**DF-0308**	**DF-0408**	**DF-0608**	**DF-0708**	1"	
1...25	1-1/4"	0.59	15.9	**DF-0909**	**DF-0209**	**DF-0309**	**DF-0409**	**DF-0609**	**DF-0709**	1-1/2"	
1.5...36	1-1/4"	0.73	20.0	**DF-0910**	**DF-0210**	**DF-0310**	**DF-0410**	**DF-0610**	**DF-0710**	1-1/2"	

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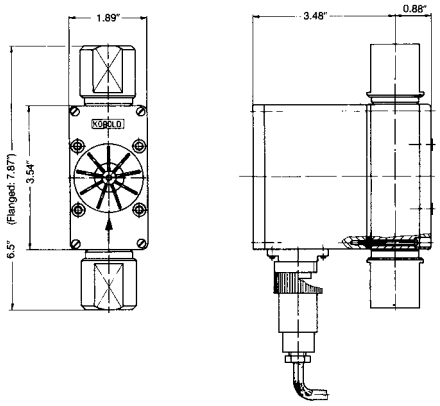
Special Features

- For Transmission of Measured Flow
- Output: 0(4)–20 mA, 0-10 V_{DC}, 0-5 V_{DC}

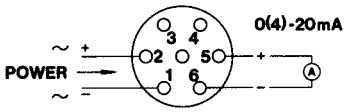
Specifications

Power Consumption:	3.5 W max.
Power Supply:	24 V_{DC} , 24 V_{AC}, 110 V_{AC}, 230 V_{AC} + 15% / –10%
Analog Output:	0-20 mA, 4-20 mA, 0-5 V_{DC} or 0-10 V_{DC}
Max Load:	500 Ω
Temperature Range:	–10...180 °F
Cable Connections:	(5 ft PVC-cable standard, Plug connection optional)
	No. 1 Power (–)
	No. 2 Power (+)
	No. 5 Analog Output (+)
	No. 6 Analog Output (–)

Dimensions



Wiring Diagram



Order Details (Example: **DF-7202BP04S1**)

Range (Water) (GPM)	Standard Connection (NPT)	Diameter of Orifice (Inch)	Pressuure Drop Max. (PSI)	DF-MA Material Combination						Options (Add Suffix to Order Number)		
				I B	II	III	IV	VI	VII	Suffix "..B.." Special Conn. (NPT)	Suffix "..L.." Special Range GPH (Water)	Suffix "..P.."
0.02...0.14	1/8"	0.04	10.2	**DF-7901..**	**DF-7201..**	**DF-7301..**	**DF-7401..**	**DF-7601..**	**DF-7701..**	1/4"	1...7	Power Conn. with Plug
0.05...0.30	1/4"	0.08	4.2	**DF-7902..**	**DF-7202..**	**DF-7302..**	**DF-7402..**	**DF-7602..**	**DF-7702..**	3/8"	3...25	
0.05...0.60	1/4"	0.08	10.4	**DF-7903..**	**DF-7203..**	**DF-7303..**	**DF-7403..**	**DF-7603..**	**DF-7703..**	3/8"	3...36	
0.1...0.7	1/4"	0.11	9.6	**DF-7904..**	**DF-7204..**	**DF-7304..**	**DF-7404..**	**DF-7604..**	**DF-7704..**	3/8"	6...42	
0.2...2.5	3/8"	0.19	6.0	**DF-7905..**	**DF-7205..**	**DF-7305..**	**DF-7405..**	**DF-7605..**	**DF-7705..**	1/2"	12...150	
0.4...5	1/2"	0.32	2.9	**DF-7906..**	**DF-7206..**	**DF-7306..**	**DF-7406..**	**DF-7606..**	**DF-7706..**	3/4"	-	
0.5...6	3/4"	0.32	4.4	**DF-7907..**	**DF-7207..**	**DF-7307..**	**DF-7407..**	**DF-7607..**	**DF-7707..**	1"	-	
0.5...12	3/4"	0.49	4.4	**DF-7908..**	**DF-7208..**	**DF-7308..**	**DF-7408..**	**DF-7608..**	**DF-7708..**	1"	-	
1...25	1-1/4"	0.59	15.9	**DF-7909..**	**DF-7209..**	**DF-7309..**	**DF-7409..**	**DF-7609..**	**DF-7709..**	1-1/2"	-	
1.5...36	1-1/4"	0.73	20.0	**DF-7910..**	**DF-7210..**	**DF-7310..**	**DF-7410..**	**DF-7610..**	**DF-7710..**	1-1/2"	-	

Power Supply Options	
Description	Add Suffix to Model Number
Power Supply 24 VDC	**..P01..**
Power Supply 24 VAC	**..P02..**
Power Supply 110 VAC	**..P03..**
Power Supply 230 VAC	**..P04..**

Output Options	
Description	Add Suffix to Model Number
0–20 mA Output	**..S1**
4–20 mA Output	**..S2**
0-10 V_{DC}	**..S3**
0-5 V_{DC}	**..S4**

Note: To place an order

1. Select the sensor order no.
2. Select the desired option suffixes
3. Specify the required power supply suffix
4. Specify the required output option suffix

No responsibility taken for errors;
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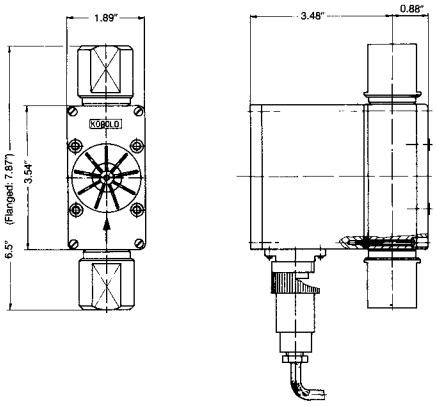
Special Features

- Adjustable Limit Contact for Flow Control
- Push-Button Alarm Override Switch and Potentiometer with Scale for Indirect Flow Measurements

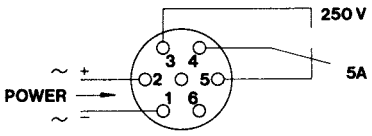
Specifications

Power Consumption:	3.5 W max.
Power Supply:	24 V_{DC} , 24 V_{AC}, 110 V_{AC} 230 V_{AC} + 15% / –10%
Contact Rating:	250 V max./5A
Contact Resistance:	= < 100 Ω
Temperature Range:	–10...180 °F
Cable Connection:	(5 ft PVC-cable standard, Plug connection optional)
	No. 1 Power Supply (-)
	No. 2 Power Supply (+)
	No. 3 Relay Contacts
	No. 4 Relay Contacts
	No. 5 Relay Contacts

Dimensions



Wiring Diagram



Order Details (Example: **DF-8308BP03**)

Range (Water) (GPM)	Standard Connection (NPT)	Diameter of Orifice (Inch)	Pressure-Drop Max. (PSI)	DF-WM Material Combination						Options (Add Suffix to Order Number)		
				I B	II	III	IV	VI	VII	Suffix "..B.." Special Conn. (NPT)	Suffix "..L.." Special Range GPH (Water)	Suffix "..P.."
0.02...0.14	1/8"	0.04	10.2	**DF-8901..**	**DF-8201..**	**DF-8301..**	**DF-8401..**	**DF-8601..**	**DF-8701..**	1/4"	1...7	Power Conn. with Plug
0.05...0.30	1/4"	0.08	4.2	**DF-8902..**	**DF-8202..**	**DF-8302..**	**DF-8402..**	**DF-8602..**	**DF-8702..**	3/8"	3...25	
0.05...0.60	1/4"	0.08	10.4	**DF-8903..**	**DF-8203..**	**DF-8303..**	**DF-8403..**	**DF-8603..**	**DF-8703..**	3/8"	3...36	
0.1...0.7	1/4"	0.11	9.6	**DF-8904..**	**DF-8204..**	**DF-8304..**	**DF-8404..**	**DF-8604..**	**DF-8704..**	3/8"	6...42	
0.2...2.5	3/8"	0.19	6.0	**DF-8905..**	**DF-8205..**	**DF-8305..**	**DF-8405..**	**DF-8605..**	**DF-8705..**	1/2"	12...150	
0.4...5	1/2"	0.32	2.9	**DF-8906..**	**DF-8206..**	**DF-8306..**	**DF-8406..**	**DF-8606..**	**DF-8706..**	3/4"	-	
0.5...6	3/4"	0.32	4.4	**DF-8907..**	**DF-8207..**	**DF-8307..**	**DF-8407..**	**DF-8607..**	**DF-8707..**	1"	-	
0.5...12	3/4"	0.49	4.4	**DF-8908..**	**DF-8208..**	**DF-8308..**	**DF-8408..**	**DF-8608..**	**DF-8708..**	1"	-	
1...25	1-1/4"	0.59	15.9	**DF-8909..**	**DF-8209..**	**DF-8309..**	**DF-8409..**	**DF-8609..**	**DF-8709..**	1-1/2"	-	
1.5...36	1-1/4"	0.73	20.0	**DF-8910..**	**DF-8210..**	**DF-8310..**	**DF-8410..**	**DF-8610..**	**DF-8710..**	1-1/2"	-	

Plug Connector with Plug Options	
Description	**Add Suffix to Model Number**
Power Supply 24 VDC	**..P01**
Power Supply 24 VAC	**..P02**
Power Supply 110 VAC	**..P03**
Power Supply 230 VAC	**..P04**

Note: To place an order

1. Select the sensor order no.
2. Select the desired option suffixes
3. Specify the required power supply suffix

Special Features

- Digital Display: Continous Rate with Bargraph
- Output: 2 SPDT Relays Fully Programmable
- Output: 4-20 mA or 0-10 V_{DC}

Electrical Connection

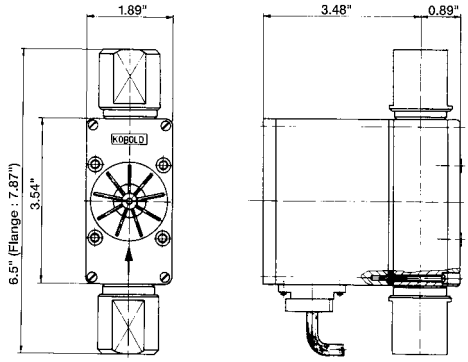
Specifications

Display:	3-digit, 7-segment LED with fixed decimal place and bar graph indicator
Temperature Range:	–10...180 °F
Protection:	NEMA 4
Wiring:	5 foot cable, 10-wire (standard) Extended cable (optional)

Electrical Specifications

Power Supply	
Voltage:	24 V_{DC}, ±20%
Consumption:	Approx. 100 mA analog output
Current Output:	4–20 mA Load: 500 ohm max
Voltage Output:	0–10 V_{DC} Load: > 100 kohm
Relays:	2 SPDT: 1 Minimum 1 Maximum
Contact Rating:	2 amps at 30 Volts max
Hysteresis:	2.5% of full scale
Set Points:	Front panel adjustable

Dimensions



Order Details (Example: **DF-U1BN06KLK34**)

Flow Rate (GPM)	Model	Material Combination	Fitting Type*/Size	Electronic	Analog Output
0.02...0.14	**DF-U1..**	**..B..** = Polysulfone/ Stainless Steel **..D..** = Brass **..E..** = Stainless Steel **..G..** = Brass (1450 PSI) **..H..** = Stainless Steel (1450 PSI) **..P..** = Polysulfone/Brass	**..N06..** = 1/8" NPT **..N08..** = 1/4" NPT	**..KLK3..** = Digital flowrate display, switching, and analog output, 24 V_{DC} with 1.5 m cable connection **..KLL3..** = Digital flowrate display, switching, and analog output, 24 V_{DC} cable connection (please clearly specify cable length)	**..4** = 4-20 mA **..1** = 0-10 V
0.05...0.30	**DF-U2..**		**..N08..** = 1/4" NPT **..N10..** = 3/8" NPT		
0.05...0.60	**DF-U3..**				
0.1...0.7	**DF-U4..**				
0.2...2.5	**DF-U5..**		**..N10..** = 3/8" NPT **..N15..** = 1/2" NPT		
0.4...5.0	**DF-U6..**		**..N15..** = 1/2" NPT **..N20..** = 3/4" NPT		
0.5...6.0	**DF-U7..**		**..N20..** = 3/4" NPT **..N25..** = 1" NPT		
0.5...12.0	**DF-U8..**				
1.0...25.0	**DF-U9..**		**..N32..** = 1-1/4 " NPT **..N40..** = 1-1/2 " NPT		
1.5...36.0	**DF-UA..**				

* For G fitting type, substitute R for N

No responsibility taken for errors;
subject to change without prior notice.

Special Features

- Ditigal Display: Rate, Total, and Grand Total
- Output: 2 SPDT Relays Fully Programmable
- Output: 4-20 mA or 0-10 V_{DC}

Electrical Connection

Wire Number	Function
1	+ 24 VDC
2	GND
3	Analog output
4	GND
5	do not connect
6	Reset part quantities
7	Relay S1
8	Relay S1
9	Relay S2
10	Relay S2

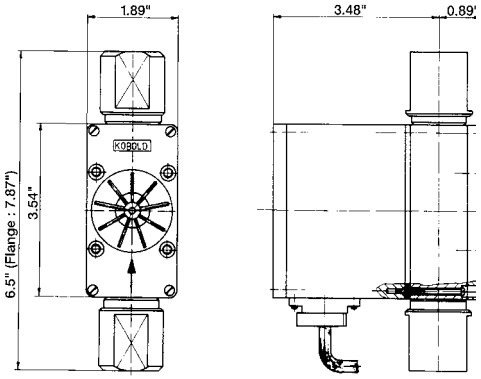
Specifications

Display:	2x 8-digit, 7-segment LED with fixed decimal place
Temperature Range:	–10...180 °F
Protection:	NEMA 4
Wiring:	5 foot cable, 10-wire (standard) Extended cable (optional)

Specifications

Power Consumption:	2.4 W max.
Power Supply:	24 $V_{DC,}$ ±20%
Contact Rating:	250 V, 5A max
Contact Resistance:	<100 mΩ
Analog Output:	4-20 mA
Max Load:	500 Ω, 4-20 mA, or >100 kΩ 0-10 V_{DC}
Temperature Range:	0...180 °F (145 °F for DF-..A..)
Protection:	NEMA 4

Dimensions



Order Details (Example: **DF-U1BN06ZLK34**)

Flow Rate (GPM)	Model	Material Combination	Fitting Type*/Size	Electronic	Analog Output
0.02...0.14	**DF-U1..**	**..B..** = Polysulfone/ Stainless Steel **..D..** = Brass **..E..** = Stainless Steel **..G..** = Brass (1450 PSI) **..H..** = Stainless Steel (1450 PSI) **..P..** = Polysulfone/Brass	**..N06..** = 1/8" NPT **..N08..** = 1/4" NPT	**..ZLK3..** = Electronic ratemeter/totalizer, 24 V_{DC}, 1.5 m cable connection **..ZLL3..** = Electronic ratemeter/totalizer, 24 V_{DC}, cable connection (please clearly specify cable length)	**..4** = 4-20 mA **..1** = 0-10 V
0.05...0.30	**DF-U2..**		**..N08..** = 1/4" NPT **..N10..** = 3/8" NPT		
0.05...0.60	**DF-U3..**				
0.1...0.7	**DF-U4..**				
0.2...2.5	**DF-U5..**		**..N10..** = 3/8" NPT **..N15..** = 1/2" NPT		
0.4...5.0	**DF-U6..**		**..N15..** = 1/2" NPT **..N20..** = 3/4" NPT		
0.5...6.0	**DF-U7..**		**..N20..** = 3/4" NPT **..N25..** = 1" NPT		
0.5...12.0	**DF-U8..**				
1.0...25.0	**DF-U9..**		**..N32..** = 1-1/4 " NPT **..N40..** = 1-1/2 " NPT		
1.5...36.0	**DF-UA..**				

* For G fitting type, substitute R for N

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Special Features: DF-..DL

- Digital Display: Rate, Totalizing, and Batching
- Subtracting and Adding Totalizer
- Output: 2 SPDT Relays Fully Programmable
  1 Batching Relay and 1 Limit Relay
- Output: 0(4)-20 mA or 0-10 V_{DC}

Wiring Diagram

Wire Number	Function
1	+ 24 VDC
2	GND
3	Analog output
4	GND
5	Control 1*
6	Control 2*
7	Relay S1
8	Relay S1
9	Relay S2
10	Relay S2

* Control 1 <-> GND: Start-batching
Control 2 <-> GND: Stop-batching
Control 1 <-> Control 2 <-> GND:
Reset-batching

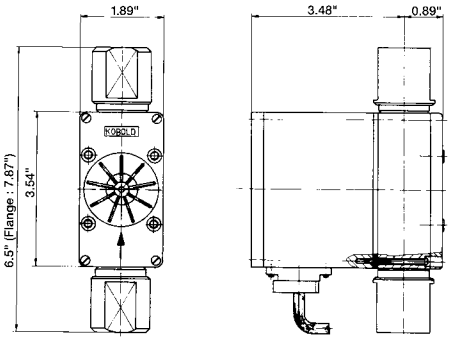
Specifications

Display:	2x 8-digit, 7-segment LED with fixed decimal place
Temperature Range:	–10...180 °F
Protection:	NEMA 4
Wiring:	5 foot cable, 10-wire (standard) Extended cable (optional)

Specifications

Power Consumption:	2.4 W max.
Power Supply:	24 V_{DC}, ±20%
Contact Rating:	250 V, 5A
Contact Resistance:	<100 mΩ
Analog Output:	0(4)-20 mA
Max Load:	500 Ω, 4-20 mA, or >100 kΩ 0-10 V_{DC}
Temperature Range:	0...180 °F
Protection:	NEMA 4

Dimensions



Order Details (Example: **DF-U5DN15DLK34**)

Flow Rate (GPM)	Model	Material Combination	Fitting Type*/Size	Electronic	Analog Output
0.02...0.14	**DF-U1..**	..B.. = Polysulfone/ Stainless Steel ..D.. = Brass ..E.. = Stainless Steel ..G.. = Brass (1450 PSI) ..H.. = Stainless Steel (1450 PSI) ..P.. = Polysulfone/Brass	..N06.. = 1/8" NPT ..N08.. = 1/4" NPT	..DLK3.. = Batching electronic, 24 V_{DC} 1.5 m cable connection ..DLL3.. = Batching electronic, 24 V_{DC} cable connection (please clearly specify cable length)	..4 = 4-20 mA ..1 = 0-10 V
0.05...0.30	**DF-U2..**		..N08.. = 1/4" NPT ..N10.. = 3/8" NPT		
0.05...0.60	**DF-U3..**				
0.1...0.7	**DF-U4..**				
0.2...2.5	**DF-U5..**		..N10.. = 3/8" NPT ..N15.. = 1/2" NPT		
0.4...5.0	**DF-U6..**		..N15.. = 1/2" NPT ..N20.. = 3/4" NPT		
0.5...6.0	**DF-U7..**		..N20.. = 3/4" NPT ..N25.. = 1" NPT		
0.5...12.0	**DF-U8..**				
1.0...25.0	**DF-U9..**		..N32.. = 1-1/4 " NPT ..N40.. = 1-1/2 " NPT		
1.5...36.0	**DF-UA..**				

* For G fitting type, substitute R for N

No responsibility taken for errors;
subject to change without prior notice.