

VersaFlow TWM 9000 Electromagnetic Flow Converter Technical Datasheet

34-VF-03-02
September, 2009

Specification

The high-performance solution

The TWM 9000 is the only electromagnetic flow converter with diagnostics for the instrument and application. TWM 9000 is compatible with all electromagnetic flow sensors and is suitable for all applications.

Highlights

- Complete Diagnostics of the application and instrument
- Quick to install and easy to operate
- Excellent long-term stability
- Optimal zero point stability independent from process properties
- One converter for all applications; helps facilitate procurement, engineering and inventory management.
- Exceeds requirements VDI / VDE/ WIB 2650 and NAMUR NE 107
- Integrated temperature and conductivity measurement
- Suitable for Custody Transfer

Industries

- Chemicals
- Food & Beverage
- Minerals & Mining
- Oil & Gas
- Pharmaceuticals
- Power Plants
- Pulp & Paper
- Water
- Wastewater
- Machinery

Applications

- Products with low conductivity, high solid contents or entrained air
- Inhomogeneous, abrasive and corrosive products
- Quick media changes
- Abrupt changes of pH value
- Pulsating or turbulent flows



Figure 1 – VersaFlow Electromagnetic Flow Converter

Electromagnetic product range

VersaFlow converters are compatible with all sensors



All meters consist of a sensor and a converter. The converter may be mounted integral to the sensor, or remotely, either with a field mounting kit or a wall-mounted housing. See sensor specification for details.

Model

C (compact) (Integrally Mounted)	TWM 9000 C
F (field), W (wall), R (19" rack) (Remote Mounted)	TWM 9000 F, TWM 9000 W, TWM 9000 R

Performance

Maximum measuring error	See Accuracy Curves
Repeatability	±0.06% to OIML R117
Full-scale range (see flow table)	v = 0.3...12 m/s / 1...40 ft/s

Conductivity

Min. process liquid conductivity (non-water)	As low as 1 µS/cm (see flow sensor)
Min. process liquid conductivity (water)	20 µS/cm

Content of solids

Maximum percentage (by volume)	30%
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Display

With local display (2 meas. pages: 1 status page, 1 graphical page)	Standard
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Languages

English, French, German, Dutch, Polish, Portuguese, Danish , Spanish, Swedish, Slovenian, Italian	Standard
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Combinations

VersaFlow Mag 100 Specification 34-VF-03-08	DN10...150 (3/8" to 6")
VersaFlow Mag 1000 Specification 34-VF-03-16	DN25...3000 (1" to 120")
VersaFlow Mag 4000 Specification 34-VF-03-01	DN2.5...3000 (1/10" to 120")
VersaFlow Mag 2000 Specification 34-VF-03-21(F), 34-VF-03-22(SW)	DN2.5...250 (1/10" to 10")
VersaFlow Mag 3000 Specification 34-VF-03-23	DN2.5...150 (1/10" to 6")

Communication

Current, pulse & status output, frequency output, limit switch	Standard
HART communication, control input, 3 counters	Standard
Ex-i	Option
Foundation Fieldbus	Option
Profibus PA	Option
Profibus DP	Option
Modbus	Option

Verification

Integrated verification, diagnostics:	Standard
- instrument / process / measurement	Standard
- empty pipe indication / stabilization	Standard

Custody transfer

Without	Standard
Cold potable water (OIML R-49, KIWA K618)	Option ¹
Other than water (OIML R-117)	Option <small>Error! Bookmark not defined.</small>

Power supply

Voltage	Power Consumption	Standard/Option
100...230 VAC (-15% / +10%), 50/60 Hz	22 VA	Standard
24 VDC (-55% / +30%)	12 W	Option
24 VAC/DC (AC: -15% / +10%; DC: -25% / +30%)	AC 22 VA; DC: 12 W	Option

Approval

Non Ex	Standard
EEx - zone 1	Option ²
FM - Class I DIV 2	Option ²
CSA - Class I DIV 2	Option ²
NEPSI zone 1	Option ²
SAA – Aus Ex zone 1 / 2 (pending)	Option ²

Protection category (according to IEC 529 / EN 60 529)

C (compact)	IP 66 / 67 (eq. to NEMA 6)
F (remote)	IP 66 / 67 (eq. to NEMA 6)
W (wall)	IP 65 (eq. to NEMA 4/4X)
R (19" rack)	IP 20 (eq. to NEMA 1)

Temperature

Process temperature	See flow sensor
Ambient temperature	-40...+65°C / -40...+149°F
Storage temperature	-50...+70°C / -58...+158°F

Signal cable

Separate - DS (dep. on measuring sensor and conductivity)	5...600 m / 15...1950 ft
Separate - BTS (dep. on measuring sensor and conductivity)	5...600 m / 15...1950 ft
Separate - LIYCY (Class 1 Div. 2 only) (dep. on measuring sensor and conductivity)	5...100 m / 15...330 ft

¹ pending

² only for C and F version

Cable connection

M20 x 1.5	Standard
½" NPT	Option
PF ½	Option

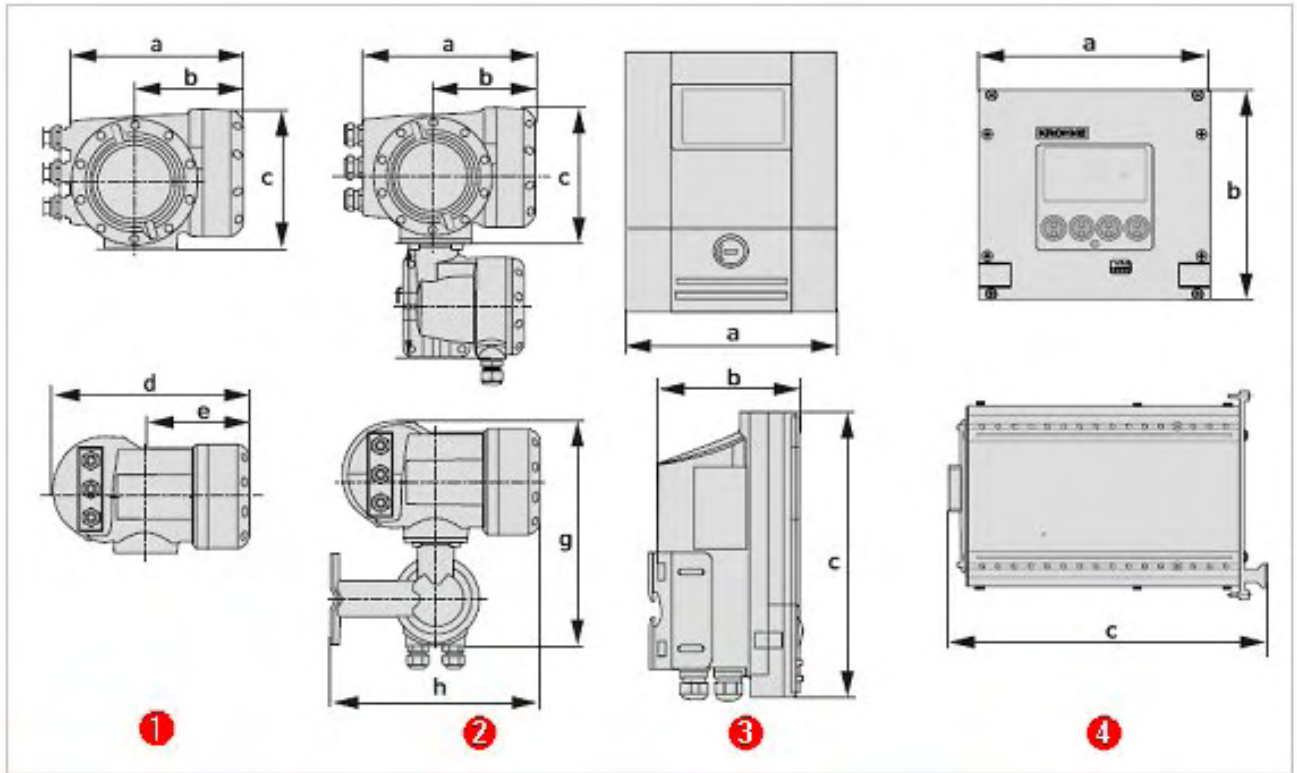
Materials used

Die-cast aluminum (polyurethane coated); C and F version only	Standard
Polyamide - polycarbonate; W version only	Standard
Stainless steel 316 L (1.4404); C and F version only	Option
Custody transfer lead & sealing; C and F version only	Option <small>Error! Bookmark not defined.</small>

¹ pending

¹ pending

Dimensions and Weights



- 1 Compact version (TWM 9000 C)
- 2 Field housing (TWM 9000 F) - remote version
- 3 Wall-mounted housing (TWM 9000 W) - remote version
- 4 19" rack (TWM 9000 R) - remote version

Dimensions and Weights in mm and kg

Version	Dimensions mm [inches]								Weights kg [lbs]
	a	b	c	d	e	f	g	h	
TWM 9000 C	202 (7.95)	120 (4.75)	155 (6.10)	260 (10.20)	137 (5.40)	-	-	-	4.2 (9.30)
TWM 9000 F	202 (7.95)	120 (4.75)	155 (6.10)	-	-	140.5 (5.50)	295.8 (11.60)	277 (10.90)	5.7 (12.60)
TWM 9000 W	198 (7.80)	138 (5.40)	299 (11.80)	-	-	-	-	-	2.4 (5.30)
TWM 9000 R	142 (5.60)	129 (5.08)	195 (7.68)	-	-	140.5 (5.53)	295.8 (11.65)	277 (10.90)	1.2 (2.65)

I/O Specifications

Overall functionality

Function	Continuous measurement of actual volume flow rate, flow velocity, conductivity, massflow (at const. density), coil temperature. Integrated batch controller
	Bidirectional flow measurement and totalisation
	Flow direction identified via status or current output
	Diagnostics: Accuracy, linearity, electrode contamination, noise, flow profile, field current, coil resistance and temperature, empty or non-full pipe + derived functions

Current output

Function	Measurement of volume and mass (at constant density), HART® communication		
Settings	With HART®		Without HART
	Q = 0%: 4...15 mA		Q = 0%: 0...15 mA
	Q = 100%: 10...21.5 mA		Q = 100%: 10...21.5 mA
	Error identification: 3.5...22 mA		Error identification: 0...22 mA
Operating data	Basic I/Os	Modular I/Os	EEx-i
Active	U _{int,nom} = 24 VDC I ≤ 22 mA R _L ≤ 1 kΩ		U _{int,nom} = 20 VDC I ≤ 22 mA R _L ≤ 450 Ω
			U ₀ = 21 V I ₀ = 90mA P ₀ = 0.5W C ₀ = 90 nF / L ₀ = 2 mH C ₀ = 110 nF / L ₀ = 0.5mH
Passive	U _{ext} ≤ 32 VDC I ≤ 22 mA U ₀ ≤ 1.8 V at I = 22 mA		U _{ext} = 32 VDC I ≤ 22 mA U ₀ ≤ 4 V at I = 22 mA
			U _i = 30 V I _i = 100 mA P _i = 1W C _i = 10 nF L _i ~ 0 mH

Pulse or Frequency output

Function	Can be set as a pulse output (e.g.- for volume or mass counting) or frequency output		
Settings	For Q = 100%: 0.01...10000 pulses per second or pulses per unit volume		
	Pulse width: setting automatic, symmetric or fixed (0.05...2000 ms)		
Operating data	Basic I/Os	Modular I/Os	EEx-i
Active	-	U _{nom} = 24 VDC	-
		f_{max} ≤ 100 Hz: I ≤ 20 mA open: I ≤ 0.05 mA closed: U _{0,nom} = 24 V at I = 20 mA	
		100 Hz < f_{max} ≤ 10 kHz: I ≤ 20 mA open: I ≤ 0.05 mA closed: U _{0,nom} = 22.5 V at I = 1 mA U _{0,nom} = 21.5 V at I = 10mA U _{0,nom} = 19 V at I = 20 mA	

Operating data	Basic I/Os	Modular I/Os	EEx-i
Passive	$U_{ext} \leq 32 \text{ VDC}$ $f_{max} \delta 100 \text{ Hz}$: $I \leq 100 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ at $U_{ext} = 32 \text{ VDC}$ closed: $U_0 \leq 0.2 \text{ V}$ at $I = 10 \text{ mA}$ $U_0 \leq 2 \text{ V}$ at $I = 100 \text{ mA}$		-
	$100 \text{ Hz} < f_{max} \delta 10 \text{ kHz}$: $I \leq 20 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ at $U_{ext} = 32 \text{ VDC}$ closed: $U_0 \leq 1.5 \text{ V}$ at $I = 1 \text{ mA}$ $U_0 \leq 2.5 \text{ V}$ at $I = 10 \text{ mA}$ $U_0 \leq 5.0 \text{ V}$ at $I = 20 \text{ mA}$		
NAMUR	-	Passive to EN 60947-5-6 open: $I_{nom} = 0.6 \text{ mA}$ closed: $I_{nom} = 3.8 \text{ mA}$	Passive to EN 60947-5-6 open: $I_{nom} = 0.43 \text{ mA}$ closed: $I_{nom} = 4.5 \text{ mA}$ $U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i \sim 0 \text{ mH}$

Status output/limit switch

Function and settings	Settable as automatic measuring range change, indicator for direction of flow, overflow, error, operating point or empty pipe detection		
	Valve control with activated dosing function		
	Status and/or control: ON or OFF		
Operating data	Basic I/Os	Modular I/Os	EEx-i
Active	-	$U_{int} = 24 \text{ VDC}$ $I \leq 20 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ closed: $U_{0,nom} = 24 \text{ V}$ at $I = 20 \text{ mA}$	-
Passive	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 100 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ at $U_{ext} = 32 \text{ VDC}$ closed: $U_0 \leq 0.2 \text{ V}$ at $I = 10 \text{ mA}$ $U_0 \leq 2 \text{ V}$ at $I = 100 \text{ mA}$	$U_{ext} = 32 \text{ VDC}$ $I \leq 100 \text{ mA}$ $R_L \leq 47 \text{ k}\Omega$ open: $I \leq 0.05 \text{ mA}$ at $U_{ext} = 32 \text{ VDC}$ closed: $U_0 \leq 0.2 \text{ V}$ at $I = 10 \text{ mA}$ $U_0 \leq 2 \text{ V}$ at $I = 100 \text{ mA}$	-
NAMUR	-	Passive to EN 60947-5-6 open: $I_{nom} = 0.6 \text{ mA}$ closed: $I_{nom} = 3.8 \text{ mA}$	Passive to EN 60947-5-6 open: $I_{nom} = 0.43 \text{ mA}$ closed: $I_{nom} = 4.5 \text{ mA}$ $U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i = 0 \text{ mH}$

Control input

Function	Hold value of the outputs (e.g. for cleaning counter and error reset, range change).		
	Start of dosing when dosing function is activated.		
Operating data	Basic I/Os	Modular I/Os	EEx-i
Active	-	$U_{int} = 24 \text{ VDC}$ Terminals open: $U_{0,nom} = 22 \text{ V}$ Terminals bridged: $I_{nom} = 4 \text{ mA}$ On: $U_0 \geq 12 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$ Off: $U_0 \leq 10 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$	-
Passive	$U_{ext} \leq 32 \text{ VDC}$ $I_{nom} = 6.5 \text{ mA}$ at $U_{ext} = 24 \text{ VDC}$ $I_{nom} = 8.2 \text{ mA}$ at $U_{ext} = 32 \text{ VDC}$ On: $U_0 \geq 8 \text{ V}$ with $I_{nom} = 2.8 \text{ mA}$ Off: $U_0 \leq 2.5 \text{ V}$ with $I_{nom} = 0.4 \text{ mA}$	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 9.5 \text{ mA}$ at $U_{ext} = 24 \text{ V}$ $I \leq 9.5 \text{ mA}$ at $U_{ext} = 32 \text{ V}$ On: $U_0 \geq 3 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$ Off: $U_0 \leq 2.5 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$	$U_{ext} \delta 32 \text{ VDC}$ $I \leq 6 \text{ mA}$ at $U_{ext} = 24 \text{ V}$ $I \leq 6.6 \text{ mA}$ at $U_{ext} = 32 \text{ V}$ On: $U_0 \geq 5.5 \text{ V}$ or $I \geq 4 \text{ mA}$ Off: $U_0 \leq 3.5 \text{ V}$ or $I \leq 0.5 \text{ mA}$ $U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i = 0 \text{ mH}$
NAMUR	-	Active to EN 60947-5-6 Terminals open: $U_{0,nom} = 8.7 \text{ V}$ Terminals bridged: $I_{nom} = 7.8 \text{ mA}$ On/off: $U_{0,nom} = 6.3 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$ Identification for open terminals: $U_0 \geq 8.1 \text{ V}$ with $I \leq 0.1 \text{ mA}$ Identification for bridged terminals: $U_0 \leq 1.2 \text{ V}$ with $I \geq 6.7 \text{ mA}$	-

Low flow cut-off

On	0...±9.999 m/s; 0...20.0%, settable in 0.1% steps, separately for each current and pulse output
Off	0...±9.999 m/s; 0...19.0%, settable in 0.1% steps, separately for each current and pulse output

Time constant

Function	Can be set together for all flow indicators and outputs, or separately for: current, pulse and frequency output, and for limit switches and the 3 internal counters
Time setting	0...100 seconds, settable in 0.1 second steps

I/O-module combination possibilities

Communication	Basic I/O	Ex-i I/O	Modular I/O
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Current output

Active / passive	
HART	

Pulse and status output

Active			
Passive			
Namur (acc. to EN 60947-5-6)			

Control Input

Active			
Passive			
Namur (acc. to EN 60947-5-6)			

Foundation Fieldbus

Foundation Fieldbus (pending)			
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Profibus/Modbus

Profibus PA			
Profibus DP			
Modbus			

Protection

Ex-d / e			
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standard
 optional
 on request

Note:

Ex-i I/O: up to 1 additional in-/output module possible (see I/O-module combinations)

Modular I/O: up to 2 additional in-/output module possible (see I/O-module combinations)

I/O modules

	I/O		1st module		2nd module	
1	Basic	0	no module possible	0	no module possible	
2	Ex-i (Ia + Pp)	1	Ex-i (Ia + Pp/Cp)			
3	Ex-i (Ip + Pp)	2	Ex-i (Ip + Pp/Cp)			
4	Modular (Ia + Pa)	8	no module	8	no module	
6	Modular (Ia + Pp)	A	Ia	A	Ia	Ia = current output - active
7	Modular (Ia + Pn)	B	Ip	B	Ip	Ip = current output - passive
8	Modular (Ip + Pa)	C	Pa/Sa	C	Pa/Sa	Pa/Sa = pulse/status output - active, high current
B	Modular (Ip + Pp)	E	Pp/Sp	E	Pp/Sp	Pp/Sp = pulse/status output - passive, high current
C	Modular (Ip + Pn)	F	Pn/Sn	F	Pn/Sn	Pn/Sn = pulse/status output - passive, Namur
D	Profibus PA	G	Ca	G	Ca	Ca = control input - active, high current
E	Foundation Fieldbus	H	Cn	H	Cn	Cn = control input - active, Namur
F	Profibus DP	K	Cp	K	Cp	Cp = control input - passive, high current
G	RS485 Modbus					
H	RS485 Modbus with interactive termination					

The TWM 9000 with standard basic I/O covers almost all applications, having 4 I/Os:

- active/passive current output (+HART)
- passive pulse/status output
- passive status output
- passive status output / control input

The I/O-module combination is thus 1-0-0 (see above).

The TWM 9000 with modular I/O can be tailor-made to any application:

- Suppose you require a converter with passive pulse output and 3 passive current outputs. The I/O-module combination then becomes B-B-B.
- Suppose you require a converter with 2 active pulse/status outputs. The I/O-module combination then becomes either 4-C-8 or 8-C-8 (depending on whether active or passive current output is required). The latter '8' indicates that 1 additional module can be added in the future.
- Suppose you require a converter with Profibus PA communication, 1 active current output and 1 passive control input. The I/O-module combination then becomes D-A-K.

For I/O-module combinations, not described in the overview on the right, please consult HONEYWELL.

Example for combination of I/O's

Basic I/O		
1	2	3
1	0	0

Ex- I/O		
1	2	3
2	0	0
	1	
	2	
3	0	0
	1	
	2	
D	0	0
	1	
	2	
E	0	0
	1	
	2	

Modular I/O			Modular I/O			Modular I/O			Modular I/O						
Comm	1st	2nd	Comm	1st	2nd	Comm	1st	2nd	Comm	1st	2nd				
4	8	8	6	8	8	7	8	8	8	8	8				
	A	8		A	8		E	F		8	H	C	8		
		A			A					A			A	A	A
		C			E					F			F	C	
		G			K					H			G		
	C	8		K	8		K	8		H	8	G	8		
		C			E			F			C				
		G			K			H			G				
		G			K			H			G				

D	8	8	E	8	8	G	8	8	H	8	8			
	A	8		C	8		K	C		8	K	C	8	
		A			A					A			A	A
		C			E					F			C	
		K			K					H			K	
	C	8		K	8		K	8		K	8	K	8	
		C			E			F			C			
		K			K			H			K			
		K			K			H			K			

B	8	8	C	8	8	F	8	0		
	B	8		F	8		H	A	0	
		B			B			B	0	
		E			F			C	0	
		K			H			E	0	
	E	8		H	8		H	8	K	0
		E			F			F		0
		K			H			G		0
		K			H			H		0
	K	8		H	8		H	8	K	0
		K			H			K		0

Full-scale flowrates

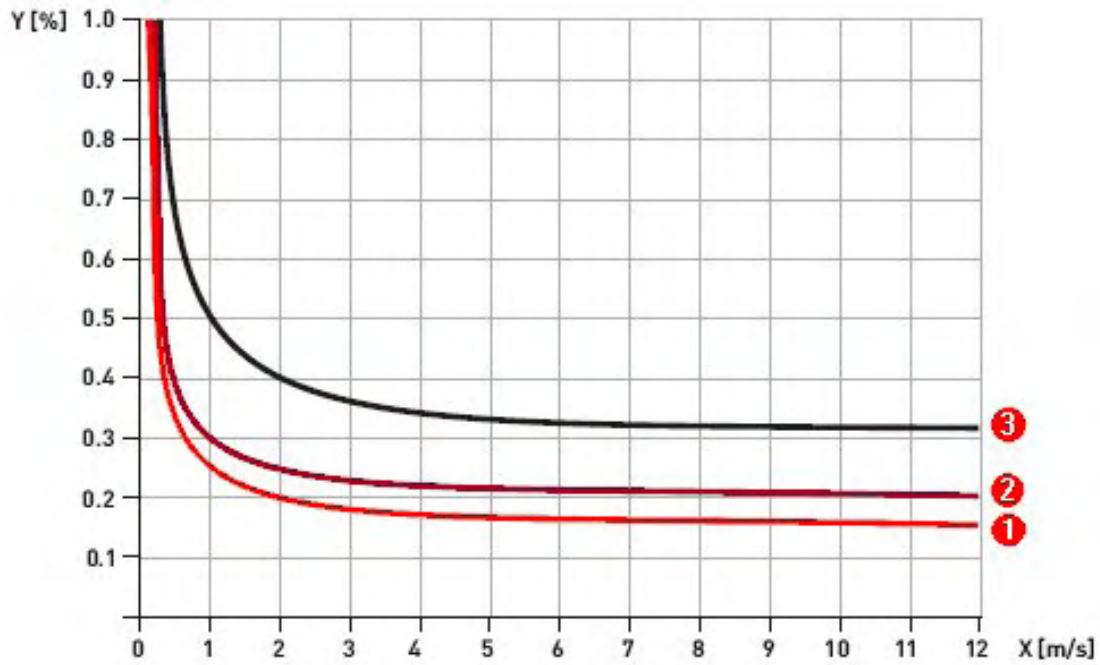
Flowrates in m/s and m³/h

v [m/s]	Q _{100%} in m ³ /h		
	0.3	3	12
	minimum	nominal	maximum
2.5	0.01	0.05	0.21
4	0.01	0.14	0.54
6	0.03	0.31	1.22
10	0.08	0.85	3.39
15	0.19	1.91	7.63
20	0.34	3.39	13.57
25	0.53	5.30	21.21
32	0.87	8.69	34.74
40	1.36	13.57	54.29
50	2.12	21.21	84.82
65	3.58	35.84	143.35
80	5.43	54.29	217.15
100	8.48	84.82	339.29
125	13.25	132.54	530.15
150	19.09	190.85	763.40
200	33.93	339.30	1357.20
250	53.01	530.13	2120.52
300	76.34	763.41	3053.64
350	103.91	1039.08	4156.32
400	135.72	1357.17	5428.68
450	171.77	1717.65	6870.60
500	212.06	2120.58	8482.32
600	305.37	3053.70	12214.80
700	415.62	4156.20	16624.80
800	542.88	5428.80	21715.20
900	687.06	6870.60	27482.40
1000	848.22	8482.20	33928.80
1200	1221.45	12214.50	48858.00
1400	1433.52	14335.20	57340.80
1600	2171.46	21714.60	86858.40
1800	2748.27	27482.70	109930.80
2000	3393.00	33930.00	135720.00
2200	4105.50	41055.00	164220.00
2400	4885.80	48858.00	195432.00
2600	5733.90	57339.00	229356.00
2800	6650.10	66501.00	266004.00
3000	7634.10	76341.00	305364.00

Flowrates in ft/s and gallons/min

v [ft/s]	Q _{100%} in US gallons/min		
	1	10	40
	minimum	nominal	maximum
1/10	0.02	0.23	0.93
1/8	0.06	0.60	2.39
1/4	0.13	1.34	5.38
3/8	0.37	3.73	14.94
1/2	0.84	8.40	33.61
3/4	1.49	14.94	59.76
1	2.33	23.34	93.36
1.25	3.82	38.24	152.97
1.5	5.98	59.75	239.02
2	9.34	93.37	373.47
2.5	15.78	159.79	631.16
3	23.90	239.02	956.09
4	37.35	373.46	1493.84
5	58.35	583.24	2334.17
6	84.03	840.29	3361.17
8	149.39	1493.29	5975.57
10	233.41	2334.09	9336.37
12	336.12	3361.19	13444.77
14	457.59	4574.93	18299.73
16	597.54	5975.44	23901.76
18	756.26	7562.58	30250.34
20	933.86	9336.63	37346.53
24	1344.50	13445.04	53780.15
28	1829.92	18299.20	73196.79
32	2390.23	23902.29	95609.15
36	3025.03	30250.34	121001.37
40	3734.50	37346.00	149384.01
48	5377.88	53778.83	215115.30
56	6311.60	63115.99	252463.94
64	9560.65	95606.51	382426.03
72	12100.27	121002.69	484010.75
80	14938.92	149389.29	597557.18
88	18075.97	180759.73	723038.90
96	21511.53	215115.30	860461.20
104	25245.60	252456.02	1009824.08
112	29279.51	292795.09	1171180.37
120	33611.93	336119.31	1344477.23

Accuracy



Y [%]: Deviation of actual measurement value
X [m/s]: Flow velocity

Reference conditions

Medium: Water

Temperature: 20°C / 68°F

Pressure: 1 bar / 14.5 psi

Inlet: ≥ 5DN

VersaFlow version	DN [mm]	DN [inches]	Accuracy	Curve
Mag 2000	10....100	3/8...10	0.15% of MV + 1 mm/s	1
Mag 1000, 3000, 4000	10....1600	3/8...80	0.2% of MV + 1 mm/s	2
Mag 100	10...150	3/8...6	0.3% of MV + 2 mm/s	3
Mag 1000, 4000	>1600	>64	0.3% of MV + 2 mm/s	3
Mag 2000, 3000, 4000	<10	<3/8	0.3% of MV + 2 mm/s	3

Ordering Information

Contact your nearest Honeywell sales office, or

In the U.S.:

Honeywell Process Solutions
Honeywell International Inc
2500 West Union Hills Drive
Phoenix, AZ 85027 1-800-343-0228

In Europe and Africa:

Honeywell S. A.
Avenue du Bourget 1
1140 Brussels, Belgium

In Asia:

Honeywell Asia Pacific Inc.
Honeywell Building,
17 Changi Business Park Central 1
Singapore 486073
Republic of Singapore

In Canada:

The Honeywell Centre
155 Gordon Baker Rd.
North York, Ontario M2H 3N7
1-800-461-0013

In Eastern Europe:

Honeywell Praha,
s.r.o. Budejovicka 1
140 21 Prague 4,
Czech Republic

In the Pacific:

Honeywell Pty Ltd.
5 Thomas Holt Drive
North Ryde NSW Australia 2113
(61 2) 9353 7000

In Latin America:

Honeywell Inc.
480 Sawgrass Corporate Parkway,
Suite 200 Sunrise, FL 33325
(954) 845-2600

In the Middle East:

Honeywell Middle East Ltd.
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