

VersaFlow TWM 9000 Electromagnetic Flow Converter Technical Datasheet

34-VF-03-02
June 1, 2007

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 Specification 34-VF-03-01 for sensor 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 deviation (see accuracy curves)	$\pm 0.15\%$ of MV ± 1 mm/s
Repeatability	$\pm 0.06\%$ 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)	1 μ S/cm (see flow sensor)
Min. process liquid conductivity (water)	20 μ S/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	Standard
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Combinations

VersaFlow MM01	DN10...150
VersaFlow MM10	DN25...3000
VersaFlow MM40	DN2.5...3000

Communication

Current, pulse & status output, frequency output, limit switch	Standard
HART communication, control input, 3 counters	Standard
Ex-i	Option
Foundation Fieldbus	Option ¹
Profibus PA	Option
Profibus DP	Option

¹ pending

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
Other than water (OIML R-117)	Option ¹

Power supply

100...230 VAC (-15/+10%), 50/60 Hz	Standard
12...24 VDC / 9...31 VDC	Option
24 V AC/DC	Option
Power consumption	13 W

Approval

Non Ex	Standard
EEx - zone 1 / 2	Option ²
FM - Class I DIV 1 / 2	Option ²
CSA - GP / Class I DIV 1 / 2	Option ²
SAA - Aus Ex zone 1 / 2 (pending)	Option ²
TIIS - 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 conductivity)	5...600 m / 15...1800 ft
Separate - BTS (dep. on conductivity)	5...600 m / 15...1800 ft
Separate - LIYCY (Class 1 Div. 2 only) (dep. on conductivity)	5...100 m / 15...300 ft

¹ pending² only for C and F version

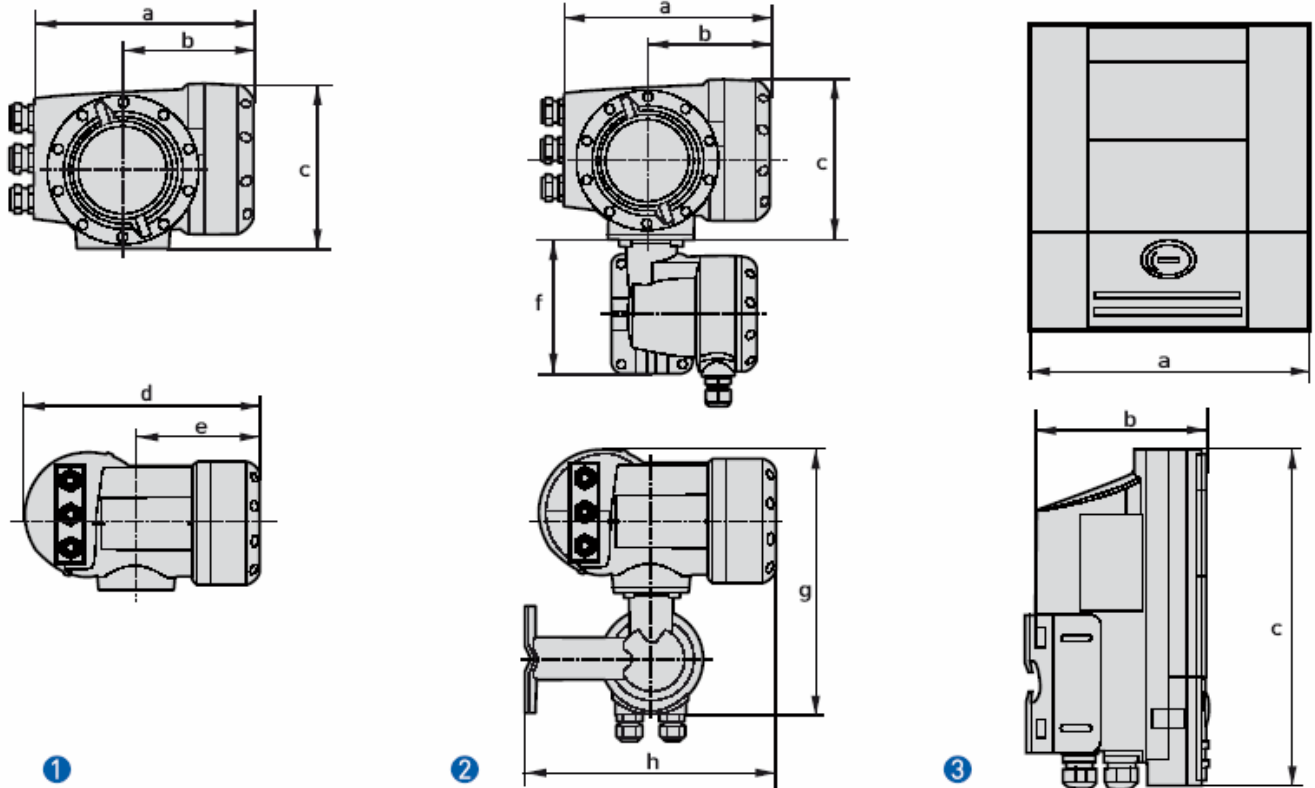
Cable connection

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

Dimensions and Weights



1. TWM 9000 C
2. TWM 9000 F
3. TWM 9000 W

Dimensions and Weights in mm and kg

Version	Dimensions [mm]								Weights [kg]
	a	b	c	d	e	f	g	h	
TWM 9000 C	202	120	155	260	137	-	-	-	4.2
TWM 9000 F	202	120	155	-	-	140.5	295.8	277	5.7
TWM 9000 W	198	138	299	-	-	-	-	-	2.4

Dimensions and Weights in inches and lbs

Version	Dimensions [inches]								Weights [lbs]
	a	b	c	d	e	f	g	h	
TWM 9000 C	7.75	4.75	6.10	10.20	5.40	-	-	-	9.30
TWM 9000 F	7.75	4.75	6.10	-	-	5.50	11.60	10.90	12.60
TWM 9000 W	7.80	5.40	11.80	-	-	-	-	-	5.30

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	All operating data configurable; galvanically isolated; HART communication
Settings	Q = 0%: 0...15 mA
	Q = 100%: 10...22 mA
	Error identification: 0...22 mA
Connection	
Basic / Modular IO: Active	$I \leq 22 \text{ mA} / R_L \leq 1 \text{ k}\Omega$
Ex-i: Active	$I \leq 22 \text{ mA} / R_L \leq 470 \text{ }\Omega$
	$U_0 = 21 \text{ V} / I_0 = 90 \text{ mA}$
	$P_0 = 0.5 \text{ W}$
	$C_0 = 90 \text{ nF} / L_0 = 2 \text{ mH}$
Basic / Modular IO: Passive	$I \leq 22 \text{ mA} / U \leq 32 \text{ VDC}$
Ex-i: Passive	$I \leq 22 \text{ mA}$
	$U_i = 30 \text{ V} / I_i = 100 \text{ mA}$
	$P_i = 1 \text{ W}$
	$C_i = 10 \text{ nF} / L_i \sim 0 \text{ mH}$

Pulse output and Status output

Function	Configurable as pulse output, identification for automatic range change, indicator of flow direction, overflow, errors, trip point or empty pipe indication
	Valve control, if batch control function is activated
Settings	Q = 100%: 0.0001...10000 pulses per second or pulses per unit volume
	Pulse width: 0.05...2000 ms or auto or sym.
	Status: On or Off
Connection	
Basic / Modular IO: Passive	$f \leq 10 \text{ kHz} / I \leq 20 \text{ mA}$
	$f \leq 10 \text{ Hz} / I \leq 100 \text{ mA}$
	$U \leq 32 \text{ VDC} / I \leq 100 \text{ mA}$
Passive	$U_i = 30 \text{ V} / I_i = 100 \text{ mA}$
	$P_i = 1 \text{ W}$
	$C_i = 10 \text{ nF} / L_i \sim 0 \text{ mH}$
Active	$U_{nom} 24 \text{ VDC} / I < 1 \text{ mA}$
	$U_0 = 1.5 \text{ V} \text{ at } 10 \text{ mA}$
Namur (acc. to EN 60947-5-6)	Passive

Control input

Function	Freeze output (e.g. during cleaning), forced return to zero, counter and error reset, ext. range selection. Start batching, if batch control function is activated
Settings	Freeze outputs, output zero, reset counter, reset error, start batch (in batch mode)
Connection	
Basic / Modular IO: Active	I_{nom} 16 mA / U_{nom} 24 VDC
Basic / Modular IO: Passive	$U \leq 32$ VDC
	$U_{on} > 19$ VDC / $U_{off} < 2.5$ V DC
Namur (acc. to EN 60947-5-6)	Active

Low flow cut-off

On	0...±9,999 m/s; 0...20.0% ¹
Off	0...±9,999 m/s; 0...19.0% ¹

Time constant

Time constant	0...99.9 seconds (set in increments of 0.1)
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¹ : of Q100%, adjustable in 0.1% increments for every mA and pulse output

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

Profibus PA			
Profibus DP			

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

1	I/O	2	1st module	3	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 ¹	H	Cn	H	Cn	Cn = control input - active, Namur
F	Profibus DP	K	Cp	K	Cp	Cp = control input - passive, high current

¹ pending

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								
1	2	3	1	2	3	1	2	3
4	8	8	8	8	8	D	8	8
	A	B		B	8		A	8
		A		B	8		A	8
		C		C	8		C	8
		G		G	8		K	8
	C	8		C	8		C	8
		C		C	8		K	8
		G		G	8		K	8
	G	8		G	8		K	8
		G		G	8		K	8
6	8	8	C	8	8	E	8	8
	A	8		B	8		A	8
		A		B	8		A	8
		E		E	8		C	8
		K		K	8		K	8
	E	8		E	8		C	8
		E		E	8		C	8
		K		K	8		K	8
	K	8		H	8		K	8
		K		H	8		K	8
7	8	8	C	8	8	F	8	0
	A	8		B	8		A	8
		A		B	8		B	8
		F		F	8		C	8
		H		H	8		D	8
	F	8		F	8		E	8
		F		F	8		F	8
		H		H	8		G	8
	H	8		H	8		H	8
		H		H	8		K	8

Full-scale flowrates

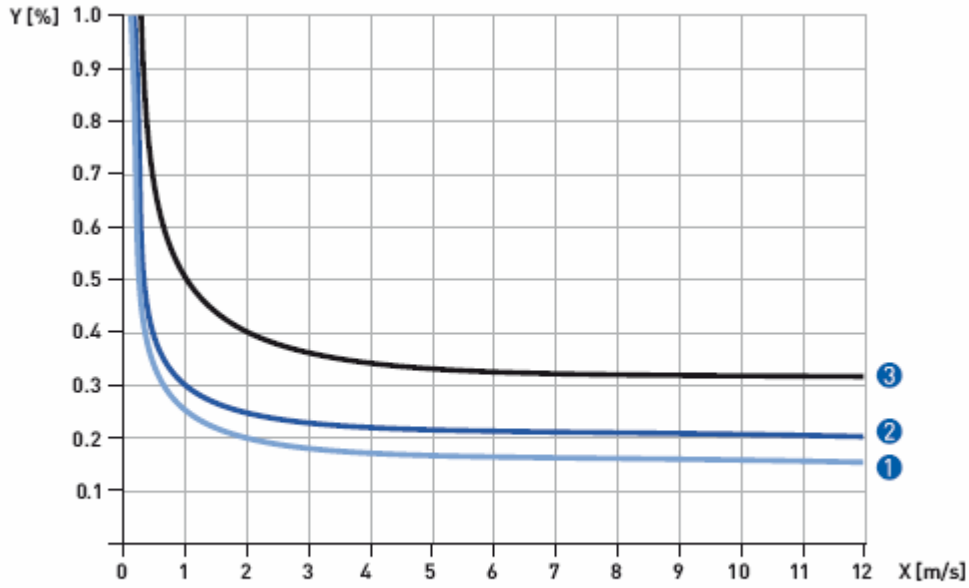
Flowrates in m/s and m³/h

v [m/s]	Q _{100%} in m ³ /h		
	0.3	3	12
DN [mm]	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
DN [inch]	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: $\geq 5DN$

VersaFlow version	DN [mm]	DN [inches]	Accuracy	Curve
Mag 6000	10....100	3/8...10	0.15% of MV + 1 mm/s	1
Mag 1000, 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 1000, 4000, 6000	<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.
Khalifa Street,
Sheikh Faisal Building
Abu Dhabi, U. A. E.

In Japan:

Honeywell K.K.
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Minato-ku, Tokyo, Japan 105-0023

Or, visit Honeywell on the World Wide Web at: <http://www.honeywell.com>
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