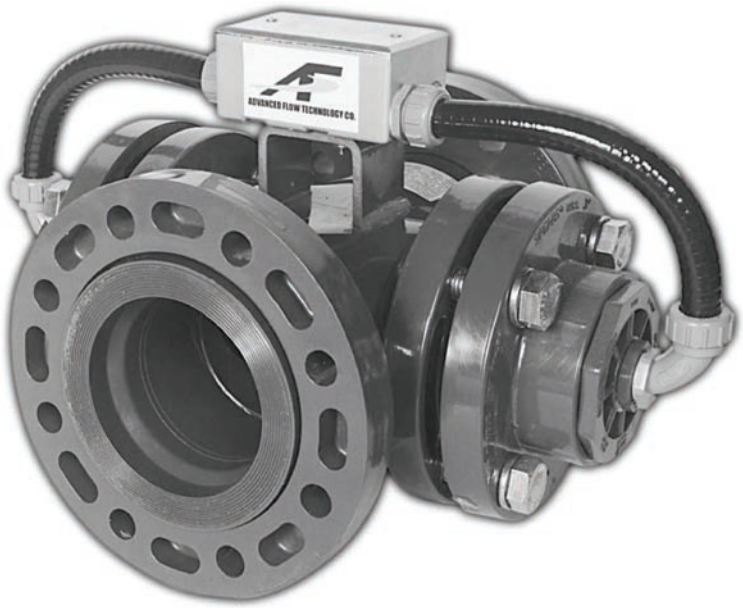
EMCO UniMag™ Magnetic Flowmeters

UniMag DP Series Magnetic Flowtubes



The UniMag Magnetic Flowmeter System consists of the patented UniMag Flowtube and the 4411e transmitter.

UniMag DP series flowtubes use a patented Pulsed AC technology which eliminates the large and costly magnetic coils used in conventional magmeters, as well as the need for a flowtube liner. DP series flowtubes are constructed from polyvinylchoride (PVC) to be low cost and lightweight. They are intended for use in plastic pipework in sizes 1½" - 12" (40 - 300 mm) Ø. They are not recommended for use in metal pipework.

All UniMag magmeters offer a uniquely high signal-to-media noise ratio, up to 3x higher than conventional AC, and up to 30x higher than pulsed DC magmeters.

The UniMag is approved as standard by Entela to UL and CSA compliance for safety in ordinary locations, to NEC and CSA standards for Class 1, Div. 2, Groups C, D, T4 and ATEX Zone 2 explosive atmospheres.

UNIMAG DP SERIES FEATURE	BENEFIT
Unlined PVC flowtube construction No flowtube liner required	Lowest cost UniMag flowtube for use with plastic piping systems; Low process pressures and temperature
UniMag encapsulated sensor(s)	Option for 1 or 2 sensors; Magnetic coils and other sensor components encapsulated within a block of insulating material up to 1 in. thick; Standard conical electrodes; Field replacement without hydraulic recalibration; Reduces costs associated with stocking spare parts; Functions accurately if one sensor should fail
Patented 4411e AC coil excitation (high coil current and high exciter frequency)	Fast time constant of 30 milliseconds; High signal-to-noise ratio for high insensitivity to media noise; Accuracy unaffected by electrode coatings such as sewage grease, calcium carbonate, algae or similar. Media conductivity to > 0.08 µS/cm
Internal grounding electrode	No grounding rings normally required
Flowtubes available in virtually any length	Meets ISO/DIS 13359 for many sizes; Simplifies installation and retrofits

EMCO Flow Systems

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Казань (843)206-01-48 Краснодар (861)203-40-90 Красноярск (391)204-63-61 Москва (495)268-04-70
Нижний Новгород (831)429-08-12 Новосибирск (383)227-86-73 Ростов-на-Дону (863)308-18-15
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Единый адрес для всех регионов: emp@nt-rt.ru || www.emco.nt-rt.ru

INNOVATIVE SENSOR TECHNOLOGY

UniMag sensors insert into the flowtube via standpipes. Each sensor includes an exciter coil, a reference coil, and is available in various electrically insulative materials. Two conical measurement electrodes and one grounding electrode protrude through the insulative material, which also insulates the electrodes from the piping. All internal sensor components and wiring are encapsulated using a solid setting insulator material. Two sensors are installed for enhanced accuracy, while a lower cost version uses a single sensor. The sensors are ready wired and conduited to a junction box installed on the flowtube. The cables to and in the junction box are potted with a re-enterable gel. The complete assembly is indefinitely submersible to NEMA 6 and IP68 to 30 feet (10 m) water column. The measurement electrodes are removable on sensors of various sizes.

A patented high ratio exists between the distance apart of the electrodes and the flowtube diameter, such that the magnetic field is well distributed over the entire flowtube cross section. These combined effects, together with a uniquely powerful field strength, provides a truly weighted velocity signal, highly insensitive to velocity profile distortion. As a result the enhanced accuracy version requires typically only 5 diameters of straight pipe upstream and 2 downstream, or less. The single sensor version requires typically 10 diameters upstream and 5 downstream.

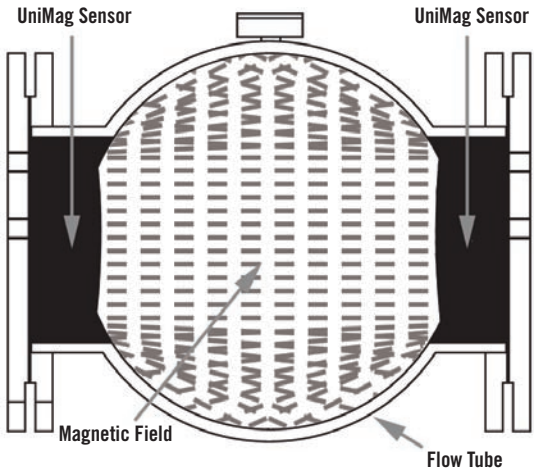
Each sensor uniquely incorporates a reference coil, quite separately from the exciter coil. The reference coil measures magnetic fields in the media, and compensates for it. For media containing magnetite, consult EMCO.

The use of one or two sensors has virtually no affect on accuracy, but does affect the minimum pipe run requirements (refer to flowtube specifications). Two sensors, in addition to making the flowtube less sensitive to velocity profile distortion and swirl effects, provides an inherent signal redundancy. The output signal will continue in the rare event of coil failure, with a typical accuracy of 0.5% -1% of rate, depending on straight pipe lengths available. The output will be interrupted if an electrode should fail, but can be quickly restored using the remaining sensor (consult EMCO for more information). This allows the convenience of scheduling downtime for sensor replacement. Any such failure in a conventional magmeter would cause immediate loss of signal and would mean returning the magmeter to the manufacturer.

UniMag Sensor

Note: For media that coats the pipework greater than 1/8" (3 mm) thick, the use of extended electrodes protruding through such coating is recommended. Use DT and DS type UniMags.

Magnetic Field Generated Inside Flowtube



Large UniMag sensors create a magnetic field over the entire flowtube area. The flow signal represents the true weighted velocity of the flowing media and is highly sensitive to velocity profile distortion/swirl effects

MODULAR CONSTRUCTION AND TRUE FIELD REPAIRABILITY

Many conventional magmeters can only be repaired by the manufacturer. Repair can run 80% of the initial cost of the flowtube, and may take several weeks. Many conventional magmeter users have adopted a repair-by-replacement philosophy and stock spare flowtubes to minimize process downtime should a failure occur.

It is only necessary to stock spare sensors for UniMag. Sensors have been designed for long life in even the harshest environments, and on the most difficult fluids. They can be easily replaced in the field, without having to remove the flowtube from the piping, and without any special know-how or equipment. Dedicated sensors (ordered and pre-calibrated at the factory with the flowtube) guarantee the same high accuracy after replacement, and without hydraulic recalibration. Any sensor can be used with a UniMag flowtube, and the same high repeatability and linearity are guaranteed.

UniMag DP series flowtubes and sensors have a standard 2 year warranty. The warranty is against defects in material and bad workmanship. Effects of media incompatability, erosion or abrasion are not included.

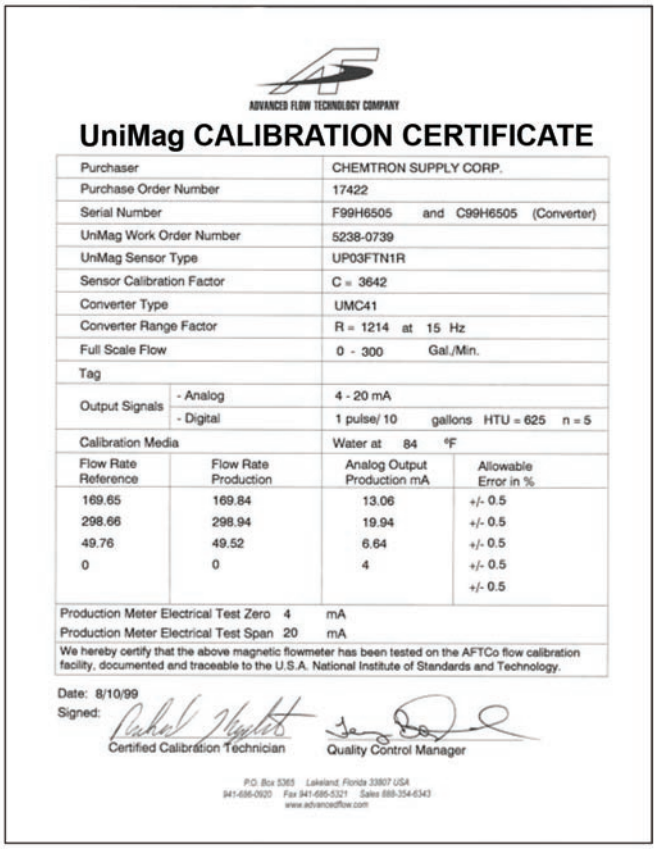
SIMPLIFIES INSTALLATIONS AND RETROFITS

Most size DP series flowtubes can be manufactured to any convenient face-to-face dimension, including those recommended in ISO/DIS 13359. This greatly facilitates replacement of existing meters, without having to cut or alter the piping, or use costly spacers or spool pieces.

UNIMAG CALIBRATION

The EMCO flow calibration installation is the largest NIST traceable facility available, having a capacity of 120,000 gpm (27,000 m³/h). DP series flowtubes are calibrated in either a pump loop using master meters, or in a weigh tank/diverter system. Facility accuracy is 0.1% for the weight tank system, and 0.25% for the systems using master meters.

All UniMags are traceable to the National Institute for Science and Technology (NIST) and are shipped with a computer generated Calibration Certificate. They are normally calibrated at zero flow and three additional points.



ADVANCED FLOW TECHNOLOGY COMPANY

UniMag CALIBRATION CERTIFICATE

Purchaser		CHEMTRON SUPPLY CORP.	
Purchase Order Number		17422	
Serial Number		F99H6505 and C99H6505 (Converter)	
UniMag Work Order Number		5238-0739	
UniMag Sensor Type		UP03FTN1R	
Sensor Calibration Factor		C = 3642	
Converter Type		UMC41	
Converter Range Factor		R = 1214 at 15 Hz	
Full Scale Flow		0 - 300 Gal./Min.	
Tag			
Output Signals	- Analog	4 - 20 mA	
	- Digital	1 pulse/ 10 gallons HTU = 625 n = 5	
Calibration Media		Water at 84 °F	

Flow Rate Reference	Flow Rate Production	Analog Output Production mA	Allowable Error in %
169.65	169.84	13.06	+/- 0.5
298.66	298.94	19.94	+/- 0.5
49.76	49.52	6.64	+/- 0.5
0	0	4	+/- 0.5
			+/- 0.5

Production Meter Electrical Test Zero 4 mA
Production Meter Electrical Test Span 20 mA

We hereby certify that the above magnetic flowmeter has been tested on the AFTCo flow calibration facility, documented and traceable to the U.S.A. National Institute of Standards and Technology.

Date: 8/10/99
Signed:

Certified Calibration Technician

Quality Control Manager

P.O. Box 5365 Lakeland, Florida 33807 USA
941-686-0920 Fax 941-686-5321 Sales 888-354-6343
www.advancedflow.com

Typical UniMag NIST traceable Calibration Certificate

ACCURACY

± 0.5% of rate for flows ≥ 1.5 fps (0.45 m/s) for 2 sensors or ≥ 2 fps (0.6 m/s) for 1 sensor
± 0.0075 fps (± 0.00225 m/s) for flows < 1.5 fps (0.45 m/s) for 2 sensors
± 0.01 fps (± 0.003 m/s) for flows < 2 fps (0.6 m/s) for 1 sensor

Accuracy is traceable to the National Institute of Science and Technology. A NIST traceable calibration certificate is provided with each flowtube.

Accuracy is unaffected by electrode coatings such as sewage grease, calcium carbonate, algae or similar.

Note: For media such as ferric chloride, ferric sulphate (Odophos), high temperature paper mill liquors, lime mud or similar highly conductive media, flowmeter performance can be adversely affected. Please consult EMCO for these types of applications, otherwise performance guarantee is null and void.

MINIMUM STRAIGHT PIPING RUNS

Piping	Upstream / Downstream Piping Requirement	
	2 Sensors	1 Sensor
Minimum Requirement	5D up / 3D down	10D up / 5D down
Single elbow, or tee upstream	5D up / 3D down	10D up / 5D down
Two elbows coupled in same plane	5D up / 3D down	10D up / 5D down
Two elbows, close coupled and out of plane	10D up / 3D down	20D up / 5D down
Pump, blending point, control valve upstream	20D up / 3D down	30D up / 5D down
Pump, control valve downstream	5D down	5D down

FLOW RANGE

0 - 2 fps (0 - 0.6 m/s) minimum to 0 - 50 f/s (0 - 15 m/s) maximum

or

0 - $5D^2$ gpm minimum to 0 - $120D^2$ gpm maximum, where D is in inches
(0 - $0.0017D^2$ m3/h minimum to 0 - $0.043D^2$ m3h maximum, where D is in millimeters)

COIL EXCITATION

Patented Pulsed AC excitation. Consult data sheets for 4411e for more information.

MEDIA CONDUCTIVITY

≥ 1.0 µS/cm with conductivity option A

≥ 0.08 µS/cm with conductivity option B. For deionized, distilled, or demineralized water, consult factory.

Note: For < 5 µS/cm an integral pre-amp is used.

ENVIRONMENTAL PROTECTION

NEMA 6 and IP68 indefinitely submersible to 30 ft. (10 m) water column

GROUNDING

Internal grounding electrode on each sensor

NOTE: *1. For cathodic protected pipes, consult EMCO Flow Systems.*
2. For transmission to a remote transmitter > 30 feet (10m), or when excessive unequal potentials exist between the pipeline and the flowmeter cable shields, it may be necessary to have a grounding ring or other grounding arrangement installed. Such excessive unequal potentials are beyond the control of EMCO and additional cost of remedy is extra to that of our normal supply.

CABLE TYPE

There are 3 separate cables used to the remote 4411e transmitter: 1 cable is for the sensing electrodes, 1 cable for the energizing coils and 1 cable for the reference coils. Each cable is 2-core multistranded and overall shielded, 2 x 18 gauge (US) e.g. Beldon #8760 or 2 x 0.75 mm^2. Additional cable of the same type is used for a pre-amp in the junction box.

For ATEX Zone 2 applications NEC approved cables must be used, with 4411e in the safe area.
For Class 1 Div. 2 applications cables must run in conduits or Teck metal clad cable, with 4411e in the safe area.

MAXIMUM RECOMMENDED CABLE LENGTH

For media conductivity < 3 µS/cm maximum cable length is 30 ft. (10 m)
For media conductivity > 3 µS/cm maximum cable length is 300 ft. or 10x C (100 m or 3xC), whichever is less.
C is the conductivity in µS/cm.

Note: For transmission > 30 feet (10 m) a grounding ring may be necessary. This is an additional cost to normal EMCO supply.

MAXIMUM TEMPERATURE AND PRESSURE (VALID FOR ALL FLOWTUBE/SENSOR OPTIONS)

85 F max @ 80 psi (30 C max @ 5.5 bar)
105 F max @ 60 psi (40 C max @ 4 bar)
140 F max @ 15 psi (60 C max @ 1 bar)
NOTE: The above is based on water. Other media may affect these ratings (Note 3).

UNIMAG MATERIALS OF CONSTRUCTION (REFER TO ORDERING CODE)

FLANGES/FLOWTUBE	Raised Face PVC flanges/Sch. 80 PVC flowtube
ELECTRODES	AISI 316 stainless steel, Hastelloy B and C, Titanium, Tantalum, Monel
SENSORS	PVDF with Elastomer gaskets and Viton electrode seals PVDF with Teflon gaskets and Viton electrode seals Other material on request

NOTES

1. ***PVC conforms to USA National Sanitation Foundation NSF61 for use with drinking water.***
2. ***DP series flowtubes are intended for use in plastic pipes. The product warranty cannot be extended for installation in metal piping systems unless flexible connectors are incorporated.***
3. ***Maximum temperature and pressure relationships are based upon information provided by material suppliers. EMCO holds no responsibility for the accuracy of this information.***
4. ***Standard 2 year warranty applies against material defects and bad workmanship, but not including media compatibility, erosion and abrasion.***

UniMag DP Flowtube Ordering Information

You must order UniMag and transmitter separately (see appropriate data sheet) for a complete flowmeter

DP 04 E C T N R 1 A A

DP = UniMag DP

Nominal Size
1H = 1½" (40mm) (double sensors only)
02 = 2 in (50 mm)
03 = 3 in. (80 mm)
04 = 4 in. (100 mm)
06 = 6 in (150 mm)
08 = 8 in. (200 mm)
10 = 10 in. (250 mm)
12 = 12 in. (300 mm)
OS = Special (note 1)

Sensor and Seal Material
E = PVDF Sensors, Elastomer gasket and Viton electrode seals
D = PVDF Sensors, Teflon gaskets and Viton electrode seals
S = Special (note 1)

Flowtube Material
C = Schedule 80 PVC
OS = Special (note 1)

Electrodes
T = AISI 316 Stainless Steel
B = Hastelloy B
C = Hastelloy C
I = Titanium
A = Tantalum
M = Monel
S = Special (note 1)

Accuracy Option
N = Normal accuracy (1 sensor)
E = Enhanced accuracy (2 sensors)
Note: 1½" UniMag is only available with 2 sensors

Transmitter Installation
R = 50 ft. (15m) cables NEMA 6/IP68 indefinitely submersible to 30 feet (10 m) water column
X = Entela approved to NEC/CSA Class 1, Div. 2, Grp C, D, Temp. T4. (Note 2)
C = Entela approved to ATEX Zone 2 (Note 2)
S = Special, including special cable length (note 1)

Standpipe Flange Rating
1 = ANSI 150rf
2 = AWWA flat face C207, Class D
3 = DIN/BS 4504 PN10
4 = JIS 10krf
5 = BS/AS2129 Table D
P = Pipe plain ends (schedule 80)
S = Special (note 1)

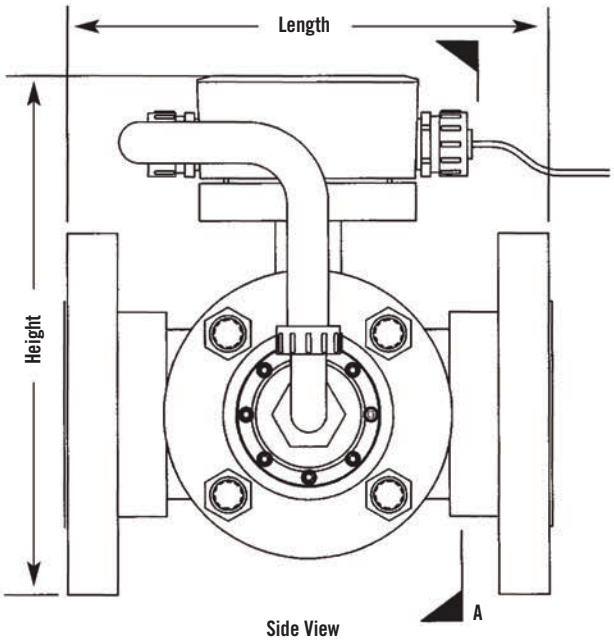
Conductivity Option
A = Conductivity ≥ 5 µS/cm
B = Conductivity ≥ 0.08 µS/cm

Transmitter Supply
A = 120V, 60 Hz
B = 230V, 50 Hz
C = 120V, 50 Hz
S = Special

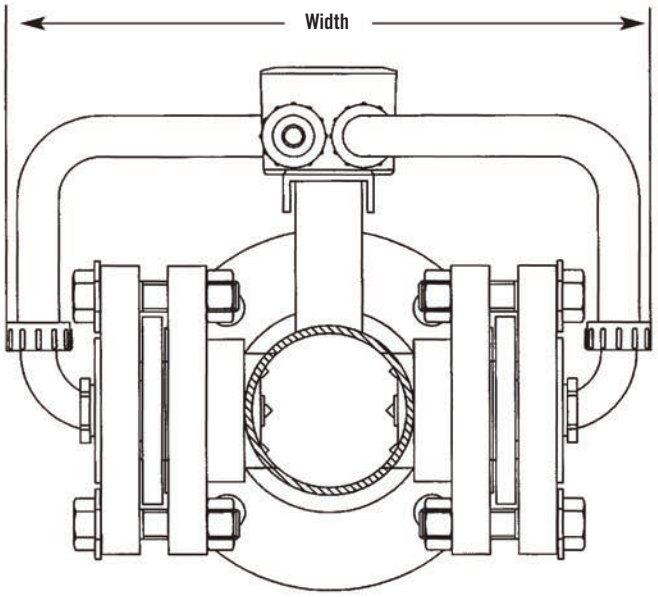
NOTES

1. All special orders must include a complete description along with the ordering code
2. 4411e transmitter must be located in non-explosive atmosphere.

UniMag DP Series Dimensions and Weights



Side View



Section A-A

NOTE: For single sensor flowtubes and L dimension remains the same as shown in the table below, and the W dimension in the table value less 2.50 in. (65 mm)

Nominal		Dimensions						Weight (Flanged)		Weight (Flanged)	
Size		Length		Height		Width		Double Sensors		Single Sensors	
Inches	mm	Inches	mm	Inches	mm	Inches	mm	lb	kg	lb	kg
1½	40	12.00	305	10.00	254	12.00	310	13	6.0	9	4
2	50	10.00	254	10.00	254	12.00	310	14	6.4	10	4.5
2½	65	10.00	254	11.00	280	13.00	330	16	7.3	11	5.0
3	80	10.00	254	11.00	280	13.50	345	18	8.2	12	5.5
4	100	12.00	305	12.00	305	16.00	410	25	11.4	17	8.0
6	150	12.00	305	14.00	360	17.00	435	32	15.0	22	10.0
8	200	20.00	508	16.00	410	18.00	460	58	26.0	40	18.0
10	250	20.00	508	19.00	485	25.00	635	72	33.0	48	22.0
12	300	20.00	508	22.00	560	26.00	660	95	43.0	65	30.0

Notes 1) For flowtubes 6" Ø (150mm) and less having ¾" NPT or 1½" NPT female sampling / pressure ports, the length dimension is increased to 16.00" (406mm).
2) 1½" (40mm) size is only available with 2 sensors