



TI-S64-01-US
Issue 2

Model MAGFLO®

Sensor Model MAG 1100, MAG 1100 Food and MAG 3100, MAG 5100 W, Signal Converter Model MAG 6000 and MAG 5000

Description

MAGFLO® electromagnetic flowmeters employ Faraday's Law to measure the volumetric flow rate of conductive liquids. Spirax Sarco offers a wide variety of electromagnetic flowmeters. In addition to standard meters for typical applications, we have specialized meters, like our sanitary MAG 1100 FOOD—for application-specific flow measurement.



Features

6000 signal converter (electronics)	- 0.20% accuracy	3100 sensor	- Line Sizes: ½" to 78"
	- Compact and practical design		- Several Liner and Electrode Materials Available
	- User-friendly design		- NEMA 6 (Accidental Submersible)
	- SENSORPROM™ Technology		- Flange Connection
	- Bidirectional measurement		- DN 15 to DN 1200/2000 (½" to 48"/78")
	- Self-diagnostic	5100 W	- Connection flanges EN 1092-1 (DIN 2501), ANSI, AWWA and AS.
	- Backlit display		- NBR for all water and wastewater applications
	- Communication protocols available		- Drinking water EPDM liner with approvals
	- Empty Pipe Detection		- Integrated Hastelloy grounding and measuring electrodes
	- Low Flow Cut-off		- Increased low flow accuracy for water leak detection, due to coned liner design.
5000 same features as 6000 except	- Batch Control Function	1100 sensor	- Drinking water approvals per NSF61 using EPDM liner
	- Electrode Cleaning available		- Suitable for direct burial and constant flooding with Submersible Kit Option
	- 0.4% accuracy		- Build-in length according to ISO 13359
	- No Batch Control Function		- Easy commissioning, SENSORPROM unit automatically uploads calibration values and settings.
	- Universal sensor		- Unique external, in-situ verification via third-party and ISO traceable calibration for up to 20 meters using built-in SENSORPROM fingerprint data.
1100 sensor	- High liquid temperature		- No upstream or downstream straight run requirements when used with MAG 6000 electronics with up to 0.8% accuracy.
	- Food version		
	- 3A and FDA approved		
	- Steam CIP cleanable		
	- Sanitary Design		
	- Tri-clamp connections		
	- Line sizes		
	- Standard: ½" to 4"		
	- High temperature: ½" to 4"		
	- Food: ⅜" to 4"		
	- Flangeless Connection		

Applications

MAGFLO® electromagnetic flowmeters offer important advantages such as no pressure drop, no moving parts, high accuracy, and a wide variety of materials of construction. They have been successfully used in many industries including food, beverage, pharmaceutical, chemical, power, heat, pulp & paper, steel and water treatment. No maintenance, low cost of ownership, and high reliability make MAGFLO® the flowmeter of choice for many flow measurement applications.

Performance Specifications

MAG 6000 signal converter	
Accuracy	Better than $\pm 0.20\%$ of rate
Compact and practical design	The NEMA 6 signal converter can be installed either integrally on the sensor or remote on a wall or pipe. Front and back panel NEMA 4x converters are also available as an option.
User-friendly design	Alphanumeric display
	Electronic unit and display can be rotated for easy viewing.
SENSORPROM™ technology	Easy to start-up - sensor data is downloaded from the SENSORPROM™ located in the terminal box to the signal converter. After power failure or converter replacement, all settings are automatically downloaded from the SENSORPROM™ to the MAG 6000 –no need for reprogramming.
Self-diagnostic	Operating malfunctions are indicated in the display and error relay are activated. The last 10 errors are stored in Error Pending and Error Log.
Backlit display	
Hart protocol available	
Electrode cleaning	Converter can control an optional external electrode cleaning unit—output and display values are maintained during cleaning when Rack-type converter is selected and housed in an enclosure.
Bidirectional	Flow can be measured in both forward and reverse directions using a relay output to indicate direction changes.
Empty-pipe cut-off	If the sensor is drained, the converter automatically suppresses the input and indicates zero flow.
Batch function	
MAG 5000 signal converter	
Accuracy	$\pm 0.4\%$ of rate
Compact and practical design	The NEMA 6 signal converter can be installed either integrally on the sensor or remote on a wall or pipe. Front and back panel NEMA 4x converters are also available as an option.
User-friendly design	Alphanumeric display
	Electronic unit and display can be rotated for easy viewing.
SENSORPROM™ technology	Easy to start up—sensor data is downloaded from the SENSORPROM™ located in the terminal box to the signal converter. After power failure or converter replacement, all settings are automatically downloaded from the SENSORPROM™ to the MAG 5000—no need for reprogramming.
Bidirectional	Flow can be measured in both directions with two internal totalizers.
Self-diagnostic	Operating malfunctions are indicated in the display and error relay are activated. The last 10 errors are stored in Error Pending and Error Log.
Backlit display	
HART protocol available	

MAG 1100 sensor (standard, high temp and food)	
Universal sensor	Ceramic Liner with platinum electrodes
High liquid temperature	Standard 302 °F, optional 390 °F
Withstands rigorous cleaning	External construction in stainless steel, and enclosure meets NEMA 6 (accidental submersible), and can be steam cleaned.
Food version	<ul style="list-style-type: none"> - 3A and FDA approved
	<ul style="list-style-type: none"> - Steam CIP cleanable
	<ul style="list-style-type: none"> - Withstands Rigorous Cleaning:
	<ul style="list-style-type: none"> - External construction in stainless steel.
	<ul style="list-style-type: none"> - Enclosure meets NEMA 6 (accidental submersible).
Line sizes	<ul style="list-style-type: none"> - Sanitary Design:
	The electrodes are fused into the ceramic liner –no crevices where bacteria can grow
	<ul style="list-style-type: none"> - Tri-clamp connections
	<ul style="list-style-type: none"> - Standard: ½" to 4"
	<ul style="list-style-type: none"> - High temperature: ½" to 4"
Line sizes	<ul style="list-style-type: none"> - Food: ⅜" to 4"
MAG 3100 sensor	
Line sizes:	½" to 78"
Several liner and electrode materials available	See following pages for selection
Nema 6 (accidental submersible)	Can easily be upgraded to NEMA 6P with optional submergence kit after 6P (continuously submersible to 30 ft of water)
Fully welded sensor construction	
Flange version	ANSI Class 150, 300 or AWWA class D (28" and above)
MAG 5100W	
	<ul style="list-style-type: none"> - DN 15 to DN 1200/2000 (½" to 48"/78")
	<ul style="list-style-type: none"> - Connection flanges EN 1092-1 (DIN 2501), ANSI, AWWA and AS.
	<ul style="list-style-type: none"> - NBR for all water and wastewater applications
	<ul style="list-style-type: none"> - Drinking water EPDM liner with approvals
	<ul style="list-style-type: none"> - Integrated Hastelloy grounding and measuring electrodes
	<ul style="list-style-type: none"> - Increased low flow accuracy for water leak detection, due to coned liner design.
	<ul style="list-style-type: none"> - Drinking water approvals per NSF61 using EPDM liner
	<ul style="list-style-type: none"> - Suitable for direct burial and constant flooding with Submersible Kit Option
	<ul style="list-style-type: none"> - Build-in length according to ISO 13359
	<ul style="list-style-type: none"> - Easy commissioning, SENSORPROM unit automatically uploads calibration values and settings.
	<ul style="list-style-type: none"> - Unique external, in-situ verification via third-party and ISO traceable calibration for up to 20 meters using built-in SENSORPROM fingerprint data.
	<ul style="list-style-type: none"> - No upstream or downstream straight run requirements when used with MAG 6000 electronics with up to 0.8% accuracy.

Specifications - Sensor MAG 1100 Ceramic and MAG 1100 PFA



Type		MAG 1100 Ceramic	MAG 1100 PFA Flangeless sensor (Wafer)
Nominal size		¼", ⅜", ½", 1", 1½", 2", 3", 4"	⅜", ½", 1", 1½", 2", 3", 4"
Operating pressure		¼"-2½": 600 psi, 3": 560 psi, 4": 450 psi	300 psi
	Vacuum	1.5 × 10 ⁻⁵ psi	0.3 psi
Temperature of medium	PFA		-20 °F to +265 °F
	Ceramic	0 °F to +300 °F	
	High temperature version	0 °F to +400 °F	Suitable for steam sterilization at 300 °F
Temperature shock (Ceramic liner)		(Duration > 1 min.): ¼", ⅜", ½", 1": Max. ΔT 60 °F/min. 1½", 2", 2½": Max. ΔT 50 °F/min. 3", 4": Max. ΔT 40 °F/min.	Max. ±210 °F momentarily
		(Duration 1 min., followed by 10 min. rest): ¼", ⅜", ½", 1": Max. ΔT 175 °F 1½", 2", 2½": Max. ΔT 160 °F 3", 4": Max. ΔT 140 °F	
Ambient temperature		Remote mount signal converter: -40 °F to +210 °F	
		Integral mount signal converter: -5 °F to +120 °F	
Liner		Aluminum oxide Al ₂ O ₃ (ceramics)	Reinforced PFA (Teflon)
Electrodes		Platinum with gold/titanium brazing alloy	Hastelloy C-276
Enclosure		Stainless steel AISI 316L (1.4404)	Stainless steel AISI 316 (1.4436)
Terminal box (Remote installation only)	Standard	Fiberglass-reinforced polyamide	Fiberglass-reinforced polyamide
	High temp.	Stainless steel AISI 316 (1.4436)	Stainless steel AISI 316L (1.4404)
Studs & nuts		Stainless steel AISI 304 (1.4301)	
		Number and size to DIN 2501	
Mating flanges		DIN 2501 (150-600 psi), ANSI B16.5, class 150 and 300 or equivalent	
	Option	¼" and ⅜": ½" NPT threaded adaptor	
Gaskets	Standard	EPDM (max. 300 °F, 600 psi)	
	Option	Graphite (max. 390 °F, 600 psi)	
	Option	PTFE (max. 210 °F, 300 psi)	
Cable entries			4 pcs. ½" NPT
Enclosure rating	Standard	NEMA 4X / 6 (3 ft. submersion for 30 min)	
	Option	NEMA 6P (30 ft. continuous submersion)	
Mechanical load (vibration)		18-1000 Hz random, 3.17 G rms in all directions to EN 60068-2-36	
Test pressure		1200 psi (2 × nominal)	600 psi (2 × nominal)
Ex approvals			
Excitation frequency programmable		¼" - 2½": 15 Hz	⅜" - 2½": 15 Hz
		3", 4": 7.5 Hz	3", 4": 7.5 Hz

Specifications - Sensor MAG 1100 FOOD



MAG 1100 FOOD		
Type	Hygienic sensor	
Nominal size	3/8", 1/2", 1", 1 1/2", 2", 3", 4"	
Process connection	Hygienic adapters available for: Direct welding in Clamp fitting Threaded fitting	
Operating pressure	3/8"-2 1/2": 600 psi, 3": 560 psi, 4": 450 psi	
	Vacuum	1.5 × 10 ⁻⁵ psi
Temperature of medium	0°F to +300°F	
	Suitable for steam sterilization	
Temperature shock	(Duration > 1 min.): 3/8", 1/2", 1" 1 1/2", 2", 2 1/2" 3", 4"	Max. ΔT 60°F/min. Max. ΔT 50°F/min. Max. ΔT 40°F/min.
	(Duration 1 min., followed by 10 min. rest): 3/8", 1/2", 1" 1 1/2", 2", 2 1/2" 3", 4"	Max. ΔT 175°F Max. ΔT 160°F Max. ΔT 140°F
Ambient temperature	Remote mount signal converter:	-40°F to +210°F
	Integral mount signal converter:	-5°F to +120°F
Liner	Aluminum oxide Al ₂ O ₃ (ceramic)	
Electrodes	Platinum with gold/titanium brazing alloy	
Enclosure	Stainless steel AISI 316L (1.4404)	
Terminal box	Standard	Fiberglass-reinforced polyamide
(Remote installation only)	Option	Stainless steel AISI 316 (1.4436)
Cable entries	4 pcs. 1/2" NPT	
Enclosure rating	Standard	NEMA 4X / 6 (3 ft. submersion for 30 min)
	Option	NEMA 6P (30 ft. continuous submersion)
Mechanical load (vibration)	18-1000 Hz random, 3.17 G rms in all directions, to EN 60068-2-36	
Test pressure	1200 psi (2 × nominal)	
Approvals	3A, EHEDG	
Excitation frequency	3/8" - 2 1/2": 15 Hz	
	3", 4": 7.5 Hz	

Specifications - Sensor MAG 1100 FOOD PFA



MAG 1100 FOOD PFA		
Type	Hygienic sensor	
Nominal size	3/8", 1/2", 1", 1 1/2", 2", 3", 4"	
Process connection	Hygienic adapters available for: Direct welding in, Clamp fitting, Threaded fitting	
Operating pressure		300 psi
	Vacuum	0.3 psi
Temperature of medium	-20 °F to +270 °F	
	Suitable for steam sterilization at 300°F	
Temperature shock	Max. ±212°F momentarily	
Ambient temperature	Remote mount signal converter:	-40 °F to +210 °F
	Integral mount signal converter:	-5 °F to +120 °F
Liner	Reinforced PFA (Teflon)	
Electrodes	Hastelloy C-276	
Enclosure	Stainless steel AISI 316L (1.4404)	
Terminal box (Remote installation only)	Standard	Fiberglass-reinforced polyamide
	Option	Stainless steel AISI 316 (1.4436)
Cable entries	4 pcs. 1/2" NPT	
Enclosure rating	Standard	NEMA 4X / 6 (3 ft. submersion for 30 min)
	Option	NEMA 6P (30 ft. continuous submersion)
Mechanical load (vibration)	18-1000 Hz random, 3.17 G rms in all directions, to EN 60068-2-36	
Test pressure	600 psi (2 × nominal)	
Approvals	3A	
Excitation frequency	3/8" - 2 1/2": 15 Hz	
	3", 4": 7.5 Hz	

Accessories : MAG 1100 FOOD

Adapters	Stainless steel AISI 316	Pressure
Pipe connection/ Operating pressure	Adapter for direct welding into pipe:	3/8", 1/2", 1", 1 1/2", 2", 3" 600 psi
		4" 350 psi
	Clamp adapter:	3/8", 1/2", 1", 1 1/2", 2" 200 psi
		2 1/2", 3", 4" 150 psi
	Thread adapter:	3/8", 1/2", 1", 1 1/2" 600 psi
		2", 2 1/2", 3", 4" 350 psi
		ISO 2853, SS 3351, BS 4825-4: 3/8", 1/2", 1", 1 1/2", 2", 3", 4" 200 psi
		SMS 1145: 1", 1 1/2", 2", 2 1/2", 3" 80 psi
Gasket	Standard	EPDM (ethylene, propylene rubber) (-5 °F to 300 °F)
	Option	NBR (nitrile butadiene rubber) (-5 °F to 210 °F)
Material	Stainless steel AISI 304, ISO 2852	

Note: It is always a system so please state system max. pressure and not MAG 1100 or adapter.

Specifications - Sensor MAG 3100



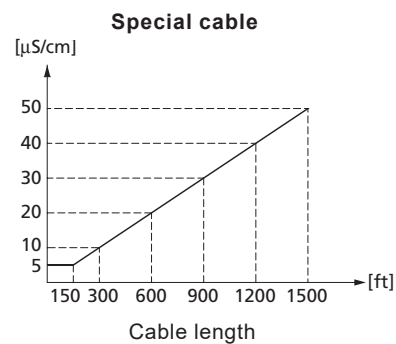
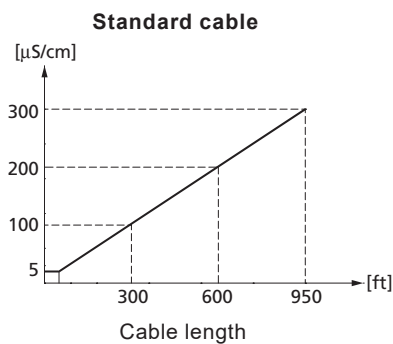
Type	Sensor with flanges	
Nominal Size	½" to 78"	
Measuring Range	Adjustable from 0-0.8 ft/s to 0-33 ft/s	
Coil Current	Pulsating DC with one of the following frequencies: 7.5 Hz or 15 Hz depending on sensor size	
Process Temperature (Pressure ≤ 580 psi)	Neoprene: 32° to 158 °F	Linatex Rubber: -40° to 160 °F
	PTFE®: -5° to 266 °F **	Ebonite: 32° to 200 °F
	High Temp PTFE 0 to 355° F	EPDM: -15 to 158 °F
Ambient Temperature	Remote Signal Converter	-40 °F to 210 °F
	Integral Signal Converter	-40 °F to 120 °F
Pipe Connection		
Standard	½" to 24" ANSI B 16.5 Class 150; 28" to 78" AWWA C-207 Class D (150 psi)	
Option	½" to 24" ANSI B 16.5 Class 300 Others on request	
Process Vacuum	Maximum process vacuum depends on liner material:	
	Neoprene, Ebonite, EPDM, Natural rubber: 7.25 psia	
Liner		
Standard	Neoprene	
Option	Teflon®, Natural rubber, EPDM, Ebonite	
Electrodes		
Standard	Stainless steel 316 Ti	
Option	Hastelloy C276, Platinum, Titanium, Monel, Tantalum	

Specifications - Sensor MAG 3100 (continued on next page)

Specifications - Sensor MAG 3100 (continued)

Enclosure	
Standard	Carbon steel, corrosion-resistant two-component coating
Option	Stainless steel AISI 316
Measuring Pipe	Stainless steel AISI 304
Enclosure Rating	
Standard	NEMA 6 accidental submersible (tested to 3 ft of water for 30 mins)
Option	NEMA 6 submersible, tested to 30 ft of water (no time limit if kit is being used)
	NEMA 6P submersible
Cable Entries	2 Pg ½" NPT –2 others available
Mechanical Load Design Pressure	3 G, 1-800 Hz sinusoidal in all directions
	1.5 x flange rating
Conductivity	
Compact installation	Liquids with an electric conductivity $\geq 5 \mu\text{S/cm}$
	For a conductivity between 1 and 5 $\mu\text{S/cm}$, the accuracy may degrade to $\pm 0.5\%$ of actual flow.

Remote installation



Note: For detection of empty sensor the min. conductivity must always be $\geq 20 \mu\text{S/cm}$ and the max. length of electrode cable when remote mounted is 150 ft. Special cable must be used.

* -5 to 120 °F with signal converter mounted on sensor
** Each temperature class assumes a maximum ambient temperature of 105 °F.

MAG 3100 Liner Selection Guide

Liner	Applications
Neoprene	General purpose, sewage, drinking water and district heating
EPDM	Drinking water, sea water
PTFE	Aggressive chemicals, paper and pulp, high temperature applications
Linatex®	Abrasive media and mining slurries
Ebonite	Drinking water, high pressure applications and district heating

Electrode Selection Guide

Electrodes	Applications
AISI 316 Ti	General purpose, water, sewage and district heating
Hastelloy C-276	Good chemical properties, sea water
Titanium	Chlorine, chlorite, nitric and chromic acids.
	Textile bleaching industry
Tantalum	Almost any acid solution
Platinum and platinum/irridium	The ultimate electrode material.
	Unaffected by most liquids

Specifications - MAG 5100 W

Technical specifications

Design	Full bore sensor	Coned bore sensor	Full bore sensor
Nominal size	DN15 ... DN40 (½" ... 1½")	DN 50 ... 300 (2" ... 12")	DN 350 ... 1200 (14" ... 78")
Measuring principle	Electromagnetic induction		
Excitation frequency	15 Hz	50 ... 65 mm (2" ... 2½"): 15 Hz 80 ... 150 mm (3" ... 6"): 7.5 Hz 200 ... 300 mm (8" ... 12"): 3.75 Hz	DN350 ... 2000 (14" ... 78"): 1.875 Hz

Process connection

Flanges	Raised Face		
EN 1092-1	PN 40 (580 psi)	50 ... 300 mm: PN 16 (2" ... 12"): 230 psi 200 ... 300 mm: PN 10 (8" ... 12"): 145 psi	PN 10 (145 psi) PN 16 (230 psi)
ANSI B16.5	Class 150 lb	Class 150 lb ~20 bar (290 psi)	Class 150 lb, 14" ... 24"
AWWA C-207	--	--	28" ... 48": Class D
AS4087	PN16 (232 psi) DN50 ... DN300 (2" ... 12") Raised Face; DN350 ... DN2000 (14" ... 78") Raised Face		

Rated Operation conditions

Ambient temperature

Sensor	-40 ... +70 °C (-40 ... +158 °F)		
With compact transmitter MAG 5000/6000	-20 ... +60 °C (-4 ... 140 °F)"		
Operating pressure	0.01 ... 40 bar (0.15 ... 580 psi)	0.03 ... 20 bar (0.44 ... 290 psi)	0.01 ... 16 bar (0.15 ... 232 psi) DN350 ... DN1200; 0.01 ... 10 bar (0.15 ... 145 psi) DN1400 ... DN2000"

Enclosure rating

Standard	IP67 to EN 60529/NEMA 4X/6 (1 mH2O for 30 minutes)		
Option	IP68 to EN 60529/NEMA 6P (10 mH2O continuously)		
Pressure drop at 3 m/s (10 ft/s)	Max 20 mbar (0.29 psi)	Max. 25 mbar (0.36 psi)	As straight pipe
Medium conditions			

Temperature of medium

NBR	-10 ... +70 °C (14 ... +158 °F)		
EPDM	-10 ... +70 °C (14 ... +158 °F)		
EMC	2014/30/EU		

Specifications - MAG 5100 W (continued)

	Full bore sensor	Coned bore sensor	Full bore sensor
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Design

Weight	See dimensional drawings		
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Material

Housing and flanges	Carbon Steel ASTM A 105, with corrosion-resistant coating of category C4 or C5 according to ISO 12994-2		
Terminal box	Standard Fiber glass reinforced polyamide		
Electrodes	Hastelloy C276		
Grounding electrodes standard	Hastelloy C276		

Certificates and approvals

Custody Transfer, order as special Approvals	MI-001 cold water (EU): DN50 ... DN1200 (2" ... 48"); Kiwa water approval (NL): DN50 ... DN1200 (2" ... 48"); Chilled water pattern approval PTB K 7.2: DN15 ... DN1200 (Germany)"		
Approvals	PED - 2014/68/EU; CRN; FM - Class I Div. 2 Groups A, B, C, D; FM - Class I Zone 2 Groups IIC		

1) For sizes larger than 600 mm (24") in PN 16 PED conformity is available as a cost added option. The basic unit will carry the LVD (Low Voltage Directive) and EMC approval.

Specifications - MAG 6000 Signal Converter: 0.2%



Functions	Display flowrate, 2 totalizers, low flow cut-off, empty pipe cut-off, flow direction, error system, operating time uni/bidirectional flow, limit switches, pulse output, control for cleaning unit (With Rack-Style Unit), batch	
Current Output	Current	0-20 mA or 4-20 mA
	Load	< 800 ohm
	Time Constant	0.1-30 s adjustable
Frequency/Pulse Output	Short-circuit-protected	
Frequency	0-10 kHz, 50% duty cycle	
Pulse Width	50 ms, 500 ms, 5 ms, 50 ms, 100 ms, 500 ms, 1 s, 5 s	
Time Constant	0.1-30 s adjustable	
Active	24 Vdc	
	$\leq 1 \text{ Hz}$	$\leq 10 \text{ kHz}$
	Min. R_{load}	150 Ω 1 K Ω
	Max. R_{load}	$\leq 10 \text{ K}\Omega$ $\leq 10 \text{ K}\Omega$
Passive	3-30 Vdc	
	$U = 3 \text{ V}$	$U = 30 \text{ V}$
	Min. R_{load}	10 Ω 225 Ω
	Max. R_{load}	$\leq 10 \text{ K}\Omega$ $\leq 10 \text{ K}\Omega$
Relay	Switch relay to indicate flow direction or fault	
Load	Max.: 42 V/ 2 A, 24 Vd.c./1 A	
Time Constant	Flow direction: 5 s; Fault: 1 s	
Digital input	11-30 V d.c., $R_i = 4.4 \text{ K}\Omega$ (reset Totalizer, Force Output and Batch Control)	
Activation time	50 msec.	
Current	$I_{11 \text{ V d.c.}} = 2.5 \text{ mA}$, $I_{30 \text{ V d.c.}} = 7 \text{ mA}$	
Galvanic Isolation	All inputs and outputs are galvanically isolated	
Cut-off	Low-flow	0–9.9% of maximum flow
	Empty Pipe	Detection of empty pipe. (special electrode cable required)
Counter	Two internal eight-digit counters for forward, net or reverse flow source	



Specifications - MAG 5000 Signal Converter: 0.4% accuracy



Functions	Display flowrate, 2 totalizers, low flow cut-off, empty pipe cut-off, flow direction, error system, operating time, uni/bidirectional flow, limit switches, pulse output.
Current Output	
Current	0-20 mA or 4-20 mA
Load	< 800 ohm
Time Constant	0.1-30 s adjustable
Frequency/Pulse Output	Short-circuit-protected
Frequency	0-10 kHz, 50% duty cycle
Pulse Width	50 ms, 500 ms, 5 ms, 50 ms, 100 ms, 500 ms, 1 s, 5 s
Time Constant	0.1-30 s adjustable
Active	24 Vdc supplied by the signal converter
	0-2 Hz: load: 125 ohm to 100 kohm
	0-10 kHz: load: 125 ohm to 100 kohm
Passive	External supply of 5-50 Vdc (max. current: 200 mA)
	0-10 kHz: load: 125 ohm to 10 kohm
Relay	Switch relay to indicate flow direction or fault
Load	Max.: 42 V/2A, 24 Vd.c./1A
Time Constant	Flow Direction: 5 s; Fault: 1 s
Digital input	11-30 V d.c., Ri = 4.4 KΩ (reset Totalizer, Force Output)
Activation time	50 msec
Current	$I_{11\text{ V d.c.}} = 2.5\text{ mA}$, $I_{30\text{ V d.c.}} = 7\text{ mA}$
Galvanic Isolation	All inputs and outputs are galvanically isolated
Cut-off	
Low-flow	0–9.9% of maximum flow
Empty Pipe	Detection of empty pipe. (special electrode cable required)
Counter	Two internal eight-digit counters for forward, net or reverse flow source



Specifications - MAG 6000 Signal Converter: 0.2%



Electrode Cleaning		For process liquids which can leave insulating deposits on the sensor's electrodes, or leave conductive deposits on the inside of the sensor.
		Electrode cleaning requires a special 19" rack converter cleaning unit.
Display		Backlit alphanumeric text, 3 x 20 characters to indicate flow, volume, settings and faults. Reverse flow indicated by negative sign.
Zero Point Adjustment		Automatic
Input Impedance		> 1 x 10 ¹⁴ Ω
Excitation Frequency		Pulsating DC current with one of the following frequencies: 1⅓ Hz, 3¾ Hz, 7.5 Hz, 15 Hz, or 30 Hz
Ambient Temperature		During operation -5° to 120 °F
		During storage -40° to 160 °F (RH max. 95%)
Supply Voltage		
AC		115/230 Vac. +10% to -15%, 50-60 Hz, 9 VA
DC		11-30 Vdc/11-24 Vac, 9 W
Integral/Remote		Can be mounted integrally on sensor, or remote on pipe or wall
	Material	Fiberglass-reinforced polyamide or optional stainless steel
	Rating	NEMA 6, accidental submersible (3ft of water for 30 min.)
	Mechanical Load	3.17 G, 18-1000 Hz random in all directions
19" insert		Insert fits in a 19" rack or wall, front, back panel unit
	Material	Standard 19" insert of Aluminum/steel
	Rating	19" Insert and back panel mount: NEMA 1 Front panel and wall mount unit: NEMA 4X
	Mechanical Load	115/230 Vac version: 1 G, 1-800 Hz sinusoidal in all directions 24 Vdc version: 1 G, 1-800 Hz sinusoidal in all directions
Communication		
Standard		Prepared for client mounted add-on modules
Optional		HART® as add on module

Specifications - MAG 5000 Signal Converter: 0.4% accuracy



Electrode Cleaning	N/A	
Display	Backlit alphanumeric text, 3 x 20 characters to indicate flow, volume, settings and faults. Reverse flow indicated by negative sign.	
Zero Point Adjustment	Automatic	
Input Impedance	> 1 x 10 ¹⁴ Ω	
Excitation Frequency	Pulsating DC current at a frequency of 3¼ Hz	
Ambient Temperature	During operation -5° to 120 °F During storage -40° to 160 °F (RH max. 95%)	
Supply Voltage		
AC	115/230 Vac +10% to -15%, 50-60 Hz, 9 VA	
DC	11-30 Vdc/11-24 Vac 9 W	
Integral/Remote	Can be mounted integrally on sensor, or remote on pipe or wall	
	Material	Fiberglass-reinforced polyamide or optional stainless steel
	Rating	NEMA 6, accidental submersible (3 ft of water for 30 min.)
	Mechanical Load	3.17 G, 18–1000 Hz random in all directions
19" insert	Insert fits in a 19" rack or wall, front, back panel unit	
	Material	Standard 19" insert of Aluminum/steel
	Rating	19" Insert and back panel mount: NEMA 1
		Front panel and wall mount enclosure unit: NEMA 4X
	Mechanical Load	115/230 Vac version: 1 G, 1-800 Hz sinusoidal in all directions
		24 Vdc version: 1 G, 1-800 Hz sinusoidal in all directions
Communication		
Standard	Without serial communication	
Optional	HART® (available with VAC options only as a factory installed option)	

MAGFLO® Cleaning Unit

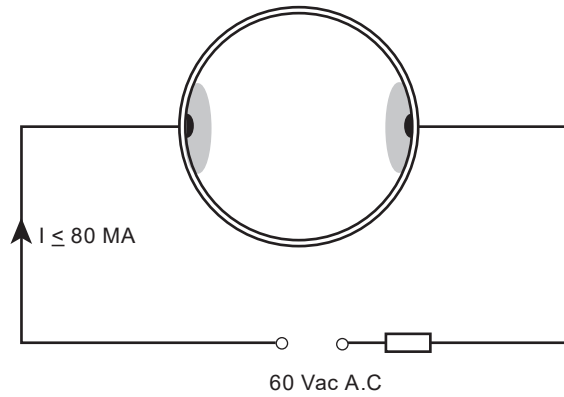


Application	For use with MAG 6000 19" insert to clean the electrodes on MAG 1100 and MAG 3100.
Cleaning Voltage	
AC	cleaning: 60 Vac.
DC	cleaning: 30 Vdc.
Cleaning Period	60 sec + 60 sec. recovery period
Relay	Switch relay indicating cleaning in progress
Load:	42 V/2A
Indicator Lamps	LEDs: "ON" and "CLEANING"
Supply Voltage	
AC	115/230 Vac +10% to -15%, 50-60 Hz, 7 VA cleaning, 5 VA stand by
DC	18-30 Vdc, 17 W cleaning, 3 W stand by
Ambient Temperature	During operation: -5 to 120 °F During storage: -5 to 160 °F
19" insert	19" insert for MAG 6000 in either a front, back or wall mount unit Enclosure material: Standard 19" insert in Aluminum/steel Enclosure rating: NEMA 1; if front or wall mount kit is used: NEMA 4X Mechanical load: 1 G, 1-800 Hz sinusoidal in all directions

MAG 6000 can be mounted with the Cleaning Unit. The electronic package can be mounted in either a wall, front, or back panel unit.

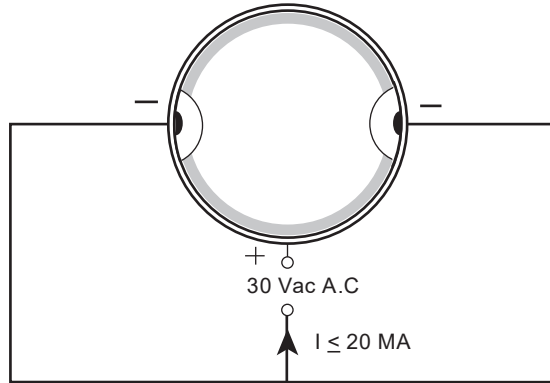
AC Cleaning

AC Cleaning is used to remove greasy deposits on the electrodes caused from measurement of waste water flows from Meat Processor or water containing oil, grease, or fat residues. During cleaning, heat is generated on the electrode surface, softening the greasy particles. This causes gas bubbles which remove the deposits from the electrode surface.



DC Cleaning

DC cleaning is used to remove conductive deposits from the meter pipe. When measuring district heating water flows, conductive magnetite deposits can accumulate. If the water's conductivity is below approx. $250 \mu\text{S/cm}$, these deposits can short the electrode signal and cause measuring error. This cleaning method involves electrolysis in which the electron flow leads the deposited particles away from the area around the electrodes.



Sensor size selection guide

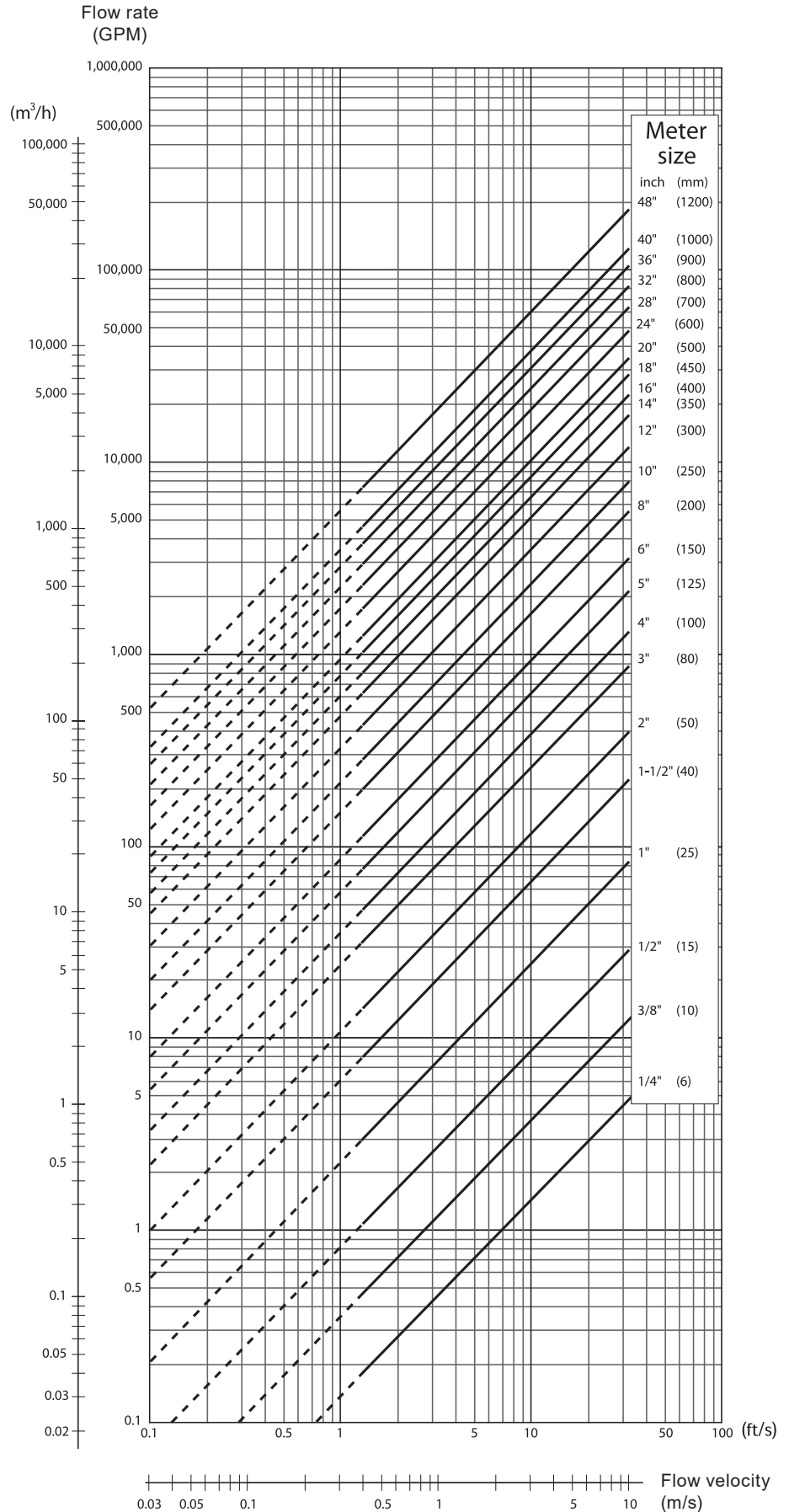
The table shows the relationship between flow velocity V, flow quantity Q, and sensor size.

Guidelines for selection of sensor

Min. measuring range: 0-0.8 ft/s

Max. measuring range: 0-33 ft/s

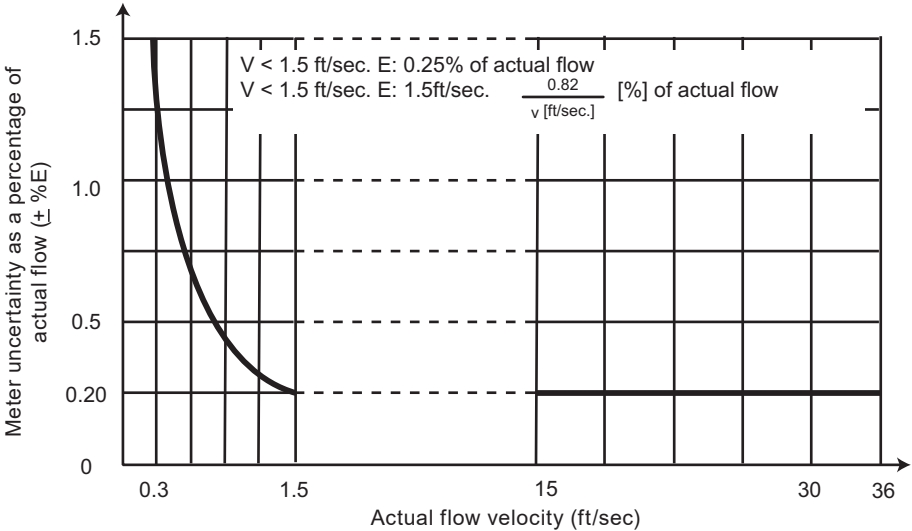
Normally the sensor is selected with a nominal flow in the measuring range of 3 to 20 ft/s.



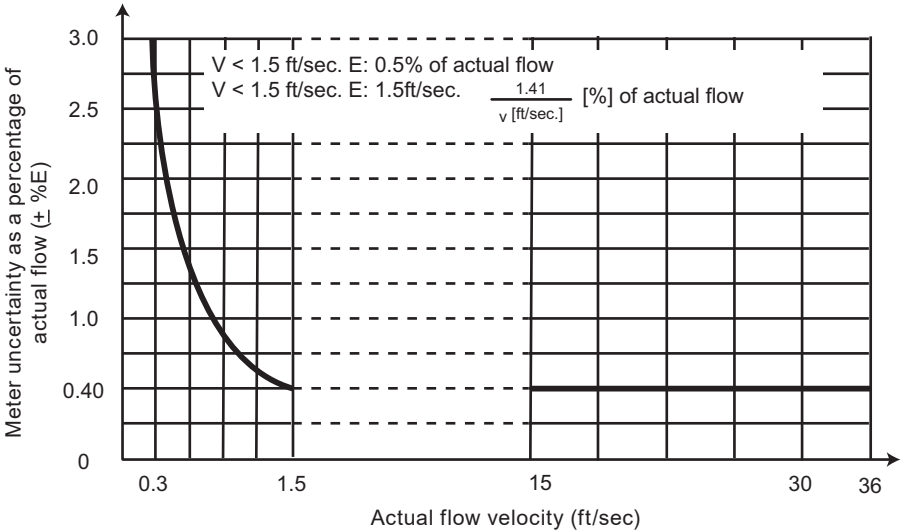
Accuracy

Meter uncertainty under reference conditions (display/frequency/pulse output)

MAG 6000



MAG 5000



Reference Conditions (ISO/DP9104)

Temperature of medium	68 °F ±4 °F
Ambient temperature	68 °F ±4 °F
Supply voltage	Un ±1%
Warm-up time	30 min
Incorporation in pipe section in accordance with reference conditions (ISO)	Inlet section 10 x DN
	Outlet section 5 x DN
	Sensor optimally grounded and centered
	For further information contact Spirax Sarco
Flow conditions	Fully developed flow profile

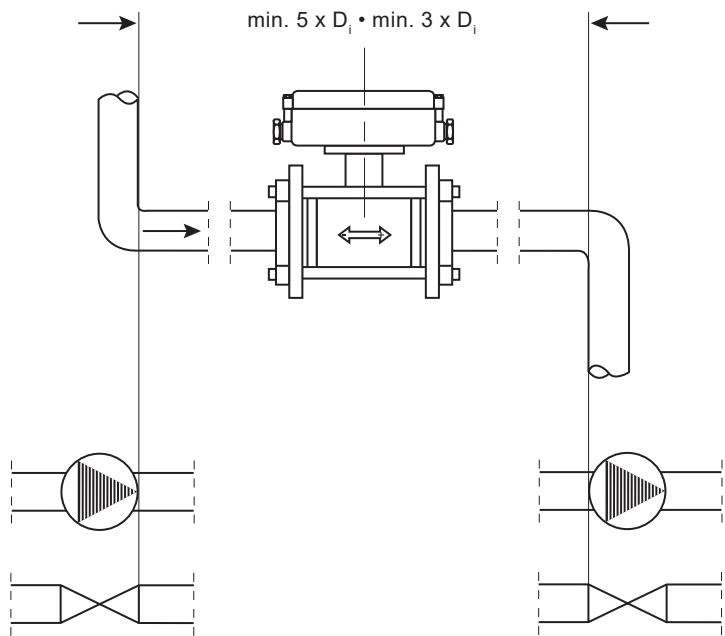
Other Accuracy Statements

Current output	Pulse output: $\pm(0.1\%$ of actual flow $+0.05\%$ FSO)
Effect of ambient temperature	Display/frequency/pulse output: $< \pm 0.003\%$ /Kelvin
	Current output: $< \pm 0.005\%$ /Kelvin
Effect of supply voltage	$< 0.005\%$ of measuring value on 1% change
Repeatability	$\pm 0.1\%$ of actual flow for $V \geq 1.5$ ft/s

Inlet and outlet conditions

For accurate flow measurement, it is essential to have sufficient straight run of inlet and outlet pipes, and a certain minimum distance between pumps and valves.

It is also important to center the flowmeter in relation to the pipe flanges and gaskets.

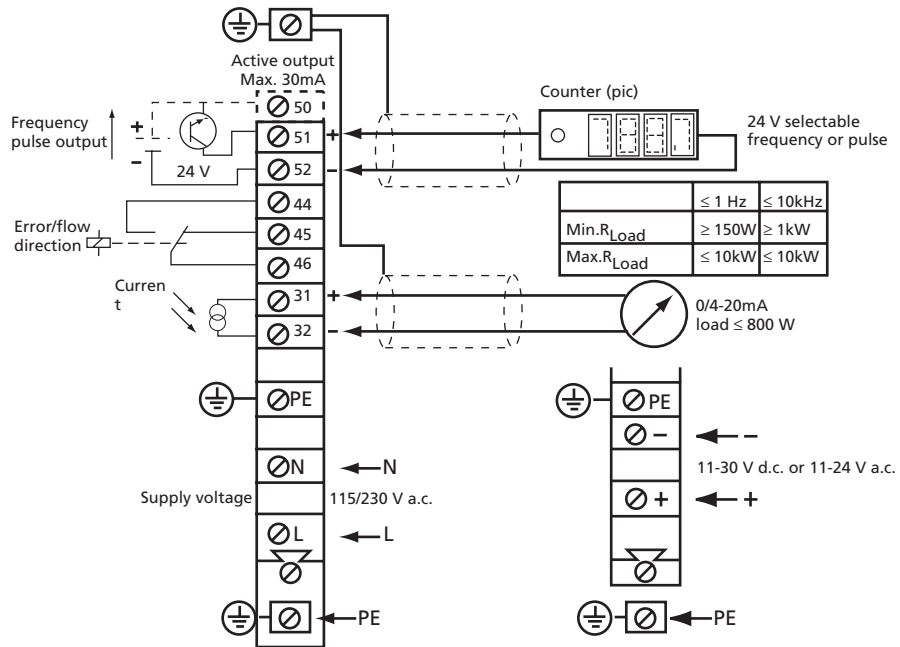


Additional distance may be required following pumped or valved applications to return to the rated accuracy of the converter

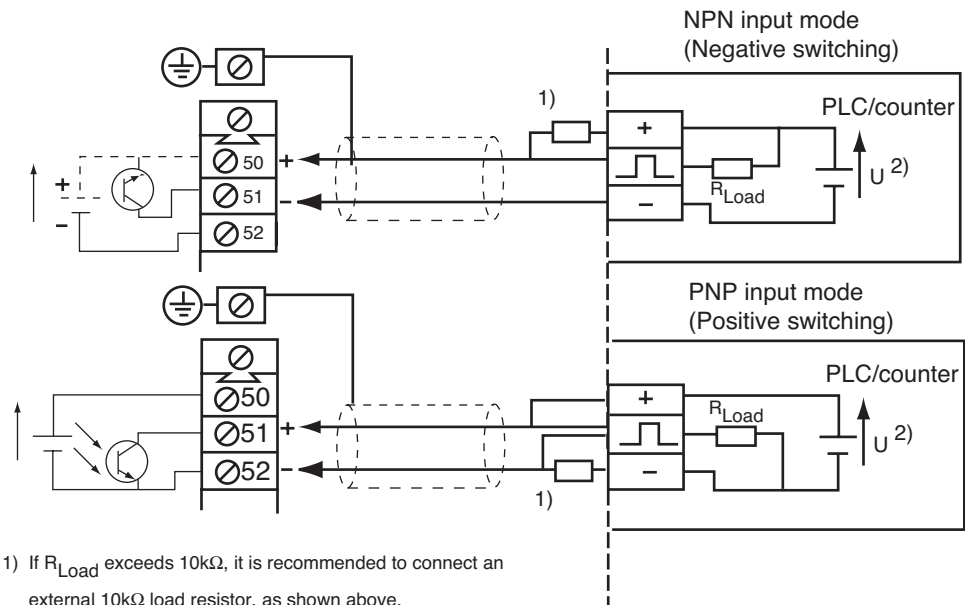
Electrical connection mag 6000 and mag 5000

Signal converter MAG 6000 and MAG 5000 integrally mounted on sensor

Connection of electromechanical counter (active output), current output, power supply.



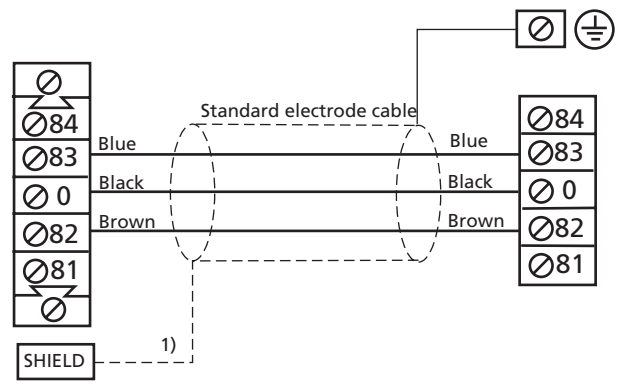
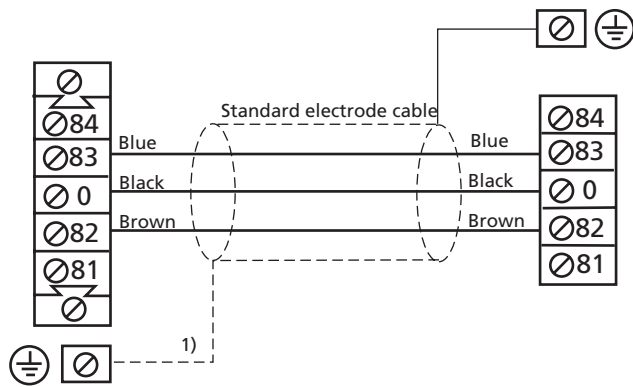
Other pulse-frequency output connection options using passive mode.



	*U=3V	*U=30V
Min. R_{Load}	10 Ω	225 Ω
Max. R_{Load}	$\leq 10 \text{ k}\Omega$	$\leq 10 \text{ k}\Omega$

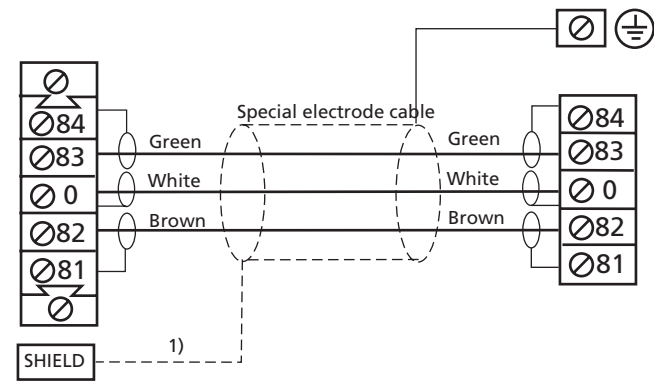
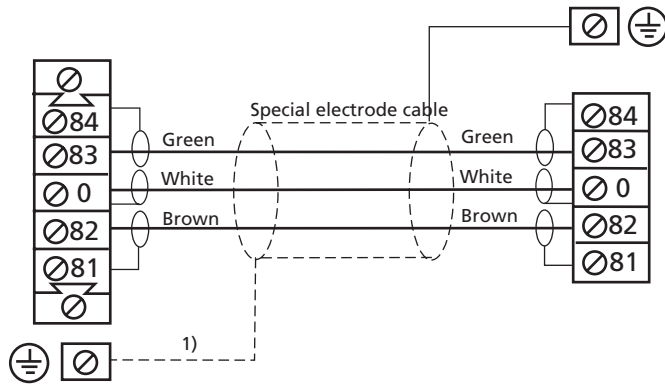
2) $U = 3-30 \text{ V d.c.}$

Signal converter mag 6000 and mag 5000 remote mounted on sensor
(other connections as shown opposite)



Signal converter remote mounted using a standard electrode cable.

MAG 6000 NEMA 6 version with special electrode cable for empty pipe detection.



MAG 6000 NEMA 6 version with special electrode cable for empty pipe detection.

19 insert remote mounted using special electrode cable. empty pipe detection.

1) EMC immunity: In areas with severe electrical interference, the shield on the electrode and coil cables must be grounded at both ends.

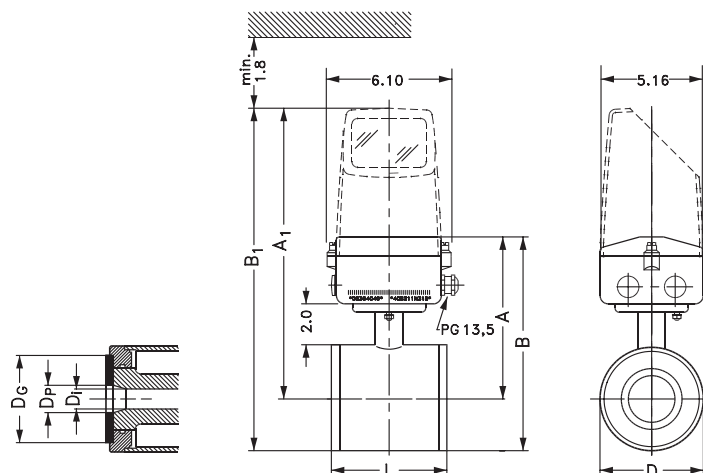
Dimensions/weights

Sensor MAG 1100 Standard and high temperature

MAG 1100, integral/remote



Grounding ring required for all applications, except when using the NPT adaptor, not shown



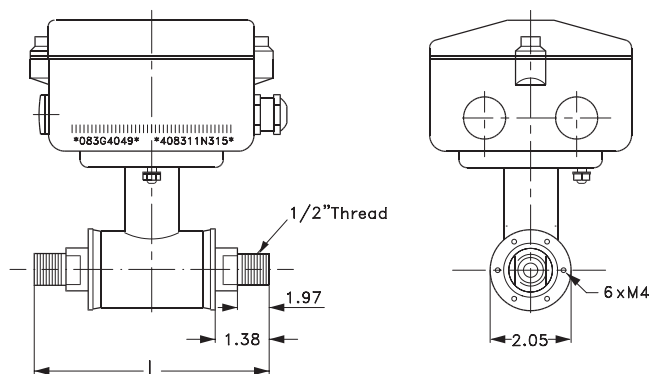
Size	A1	B1	A1	B1	D	Di (Al ₂ O ₃)	Dp	DG	Weight ²	The total built-in length "L", depends on the gasket selected.				
										EPDM	Graphite	PTFE (Teflon)	Without gasket	Earthing Ring
.25"	6.14"	7.13"	12.16"	13.15"	1.90"	0.24"	0.68"	1.34"	4.8"	2.52	2.60	2.75	2.52	3.03
.375"	6.14"	7.13"	12.16"	13.15"	1.90"	0.39"	0.68"	1.34"	4.8"	2.52	2.60	2.75	2.52	3.03
.5"	6.14"	7.13"	12.16"	13.15"	1.90"	0.59"	0.68"	1.57"	4.8"	2.56	2.60	2.75	2.52	3.03
1"	6.46"	7.72"	12.48"	13.74"	2.50"	0.98"	1.12"	2.20"	4.9"	3.15	3.19	3.35	3.10	3.62
1.5"	6.93"	8.58"	12.95"	14.61"	3.31"	1.57"	1.71"	2.95"	7.5"	3.74	3.78	3.94	3.70	4.21
2"	7.24"	9.25"	13.27"	15.27"	4.00"	1.97"	2.15"	3.54"	9.2"	4.13	4.17	4.33	4.05	4.61
2.5"	7.64"	10.00"	13.66"	16.02"	4.72"	2.56"	2.68"	4.41"	12.0"	5.12	5.15	5.31	5.05	5.59
3"	7.87"	10.47"	13.90"	16.50"	5.24"	3.15"	3.25"	4.88"	15.0"	6.10	6.14	6.30	6.00	6.57
4"	8.39"	11.50"	14.41"	17.52"	6.26"	3.94"	4.22"	5.91"	22.0"	7.28	7.31	7.48	7.20	7.76

¹ 0.5" shorter when the AISI terminal box is used. (High temperature version 390 °F).

² With signal converter MAG 5000 or MAG 6000 installed, weight is increased by approx. 1.8 lbs.

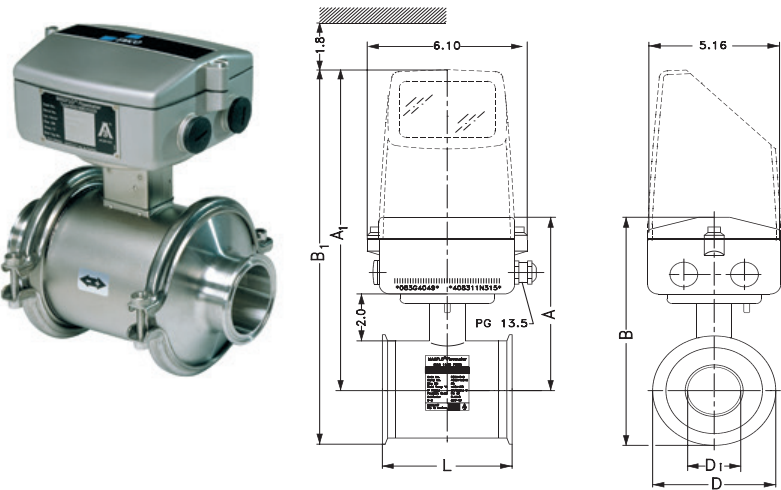
The MAG 1100 1/4" and 3/8" can be assembled with a 1/2" NPT SS fitting instead of wafer mount, which removes the need for grounding rings.

	Without gasket	EPDM	Graphite	Teflon
L	5.9"	5.9"	6.0"	6.1"



Dimensions/weights

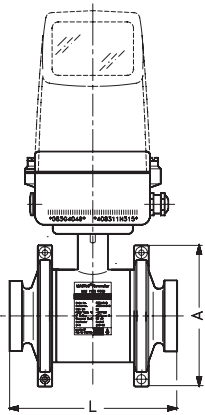
Sensor MAG 1100 food



Sensor Size	L	A	B	A1	B1	D	Weight *
.375"	2.60"	5.63"	6.89"	11.8"	13.1"	2.52"	4.8"
.5"	2.60"	5.63"	6.89"	11.8"	13.1"	2.52"	4.8"
1	3.19"	5.94"	7.48"	12.1"	13.6"	3.05"	4.9"
1.5"	3.78"	6.34"	8.15"	12.5"	14.3"	3.58"	7.5"
2	4.17"	6.69"	9.06"	12.8"	15.2"	4.69"	9.2"
2.5"	5.24"	7.01"	9.57"	13.2"	15.7"	5.12"	12"
3	6.22"	7.32"	10.40"	13.5"	16.6"	6.10"	15"
4	7.40"	8.43"	12.04"	14.6"	18.2"	7.20"	22"

* With signal converter MAG 5000 or MAG 6000 installed weight is increased by approx. 4.4 lbs.

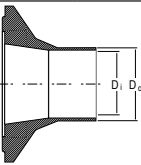
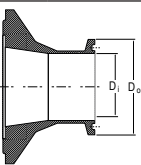
Built-in length



Sensor Size	A	L **
.375	3.90"	5.75"
.5	3.90"	5.75"
1	4.45"	6.34"
1.5	4.96"	6.93"
2	6.06"	7.32"
2.5	6.50"	8.78"
3	7.87"	10.5"
4	8.86"	11.34"

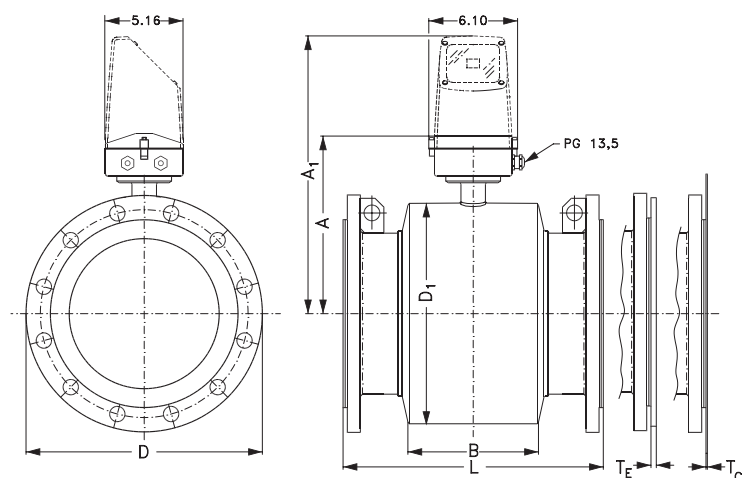
** The total built-in length "L" is independent of the adapter type selected

Accessories

MAG 1100 food				
	Tri-Clover®		Tri-Clamp®	
Sensor Size	Di	Do	Di	Do
.5	0.53	0.63		
1			0.89	2
1.5	1.40	1.52	1.4	2
2	1.91	2.03	1.91	2.52
2.5	2.37	2.52	2.37	3.05
3	2.87	3.02	2.87	3.58
4	3.85	4.04	3.85	4.69

Dimensions/weights

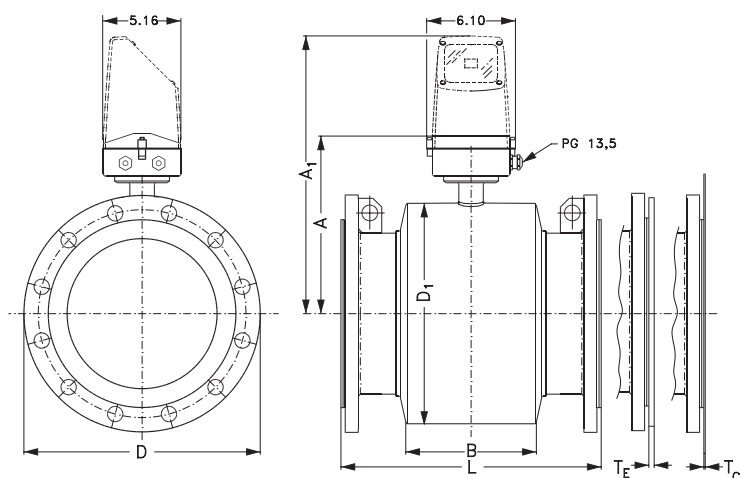
Sensor MAG 3100



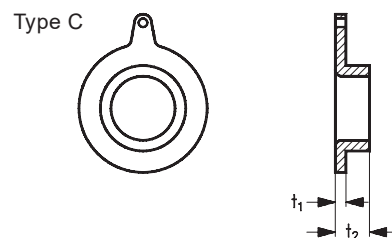
Size	A ¹	A ₁	B	D ₁	L ²			T _c ³	T _E ³	Weight ⁴
					ANSI 16.5		AWWA			
					Class 150	Class 300	C-207 Class D			
.5"	7.36"	13.31"	2.32"	4.09"	7.87"	7.87"			0.24"	11"
1"	7.36"	13.31"	2.32"	4.09"	7.87"	7.87"		0.05"	0.24"	13"
1.5"	7.76"	13.70"	3.23"	4.88"	7.87"	7.87"		0.05"	0.24"	17"
2"	8.07"	14.01"	2.83"	5.47"	7.87"	7.87"		0.05"	0.24"	28"
2.5"	8.35"	14.29"	2.83"	6.06"	7.87"	10.71"		0.05"	0.24"	30"
3"	8.74"	14.69"	2.83"	6.85"	10.71"	10.71"		0.05"	0.24"	33"
4"	9.53"	15.47"	3.35"	8.43"	9.84"	12.20"		0.05"	0.24"	44"
5"	10.04"	15.98"	3.35"	9.41"	9.84"	13.10"		0.05"	0.24"	55"
6"	10.87"	16.81"	5.39"	11.10"	11.81"	11.81"		0.05"	0.24"	66"
8"	11.97"	17.91"	5.39"	13.31"	13.78"	13.78"		0.05"	0.31"	110"
10"	13.07"	19.02"	5.39"	15.47"	17.72"	17.72"		0.05"	0.31"	155"
12"	14.05"	20.00"	5.39"	17.48"	19.69"	19.69"		0.06"	0.31"	176"
14"	14.25"	20.20"	10.63"	17.76"	21.65"	21.65"		0.06"	0.31"	242"
16"	15.24"	21.18"	10.63"	19.76"	23.62"	23.62"		0.06"	0.39"	275"
18"	16.45"	22.40"	12.20"	22.16"	23.62"	25.20"		0.06"	0.39"	385"
20"	17.44"	23.39"	13.78"	24.17"	26.77"	28.70"		0.06"	0.39"	440"
24"	19.45"	25.39"	16.93"	28.15"	32.28"	33.80"		0.06"	0.39"	660"
28"	21.42"	27.36"	19.69"	32.13"			34.5"	0.08"		770"

Dimensions/weights

Sensor MAG 3100 (continued)

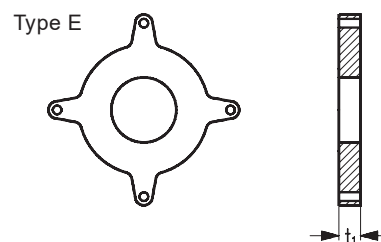


Earthing/protection flange



Size	t ₁	t ₂	Weight (lbs)
1" to 10"	0.05"	0.6"	0.07-0.9
12" to 24"	0.06"	0.8"	1.3-5.7
28" to 48"	0.08"	1.0"	6.6-11.0
56" to 80"	0.12"	1.6"	20.0-35.0

Size	A ¹	A ₁	B	D ₁	L ²		T _C ³	T _E ³	Weight ⁴
					ANSI 16.5 Class 150	ANSI 16.5 Class 300			
30"	22.48"	28.43"	21.89"	34.21"			36.9"	0.08"	880"
32"	23.86"	29.80"	22.05"	36.50"			39.4"	0.08"	1045"
36"	25.71"	31.65"	24.80"	40.63"			44.3"	0.08"	1233"
40"	27.72"	35.67"	26.38"	44.72"			49.2"	0.08"	1541"
44"	29.72"	35.67"	30.31"	48.74"			54.1"	0.08"	
48"	31.89"	37.83"	31.18"	53.07"			59.1"	0.08"	2751"
56"	36.42"	42.36"	39.37"	65.94"			68.9"	0.12"	3211"
60"	38.27"	44.21"	40.15"	65.83"			73.8"	0.12"	3731"
64"	40.35"	46.30"	44.49"	75.39"			78.7"	0.12"	4257"
72"	44.21"	50.16"	49.21"	77.72"			88.5"	0.12"	5291"
78"	48.15"	54.09"	54.13"	85.59"			98.4"	0.12"	7492"



Size	t ₁	Weight
.5"	0.2	0.15
1" to 6"	0.2	0.7-3.0
8" to 14"	0.3	3.7-9.0
16" to 24"	0.4	14.0-28.0

Type C flanges for liners of neoprene, EPDM, linatex® and ebonite.

Type E flanges for liners of PTFE.

MAG 3100 high temperature (PTFE) is always equipped with 2 pcs. type E grounding flanges.

¹ 0.5" shorter with AISI terminal box (Ex and high temperature)

² When earthing flanges are used the thickness of the earthing flange must be added to the built-in length

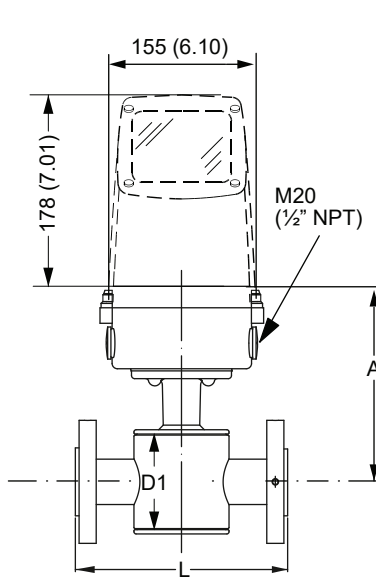
³ T_C = Type C grounding ring, T_E = Type E grounding ring

³ Weights are approx and for ANSI 150 without signal converter.

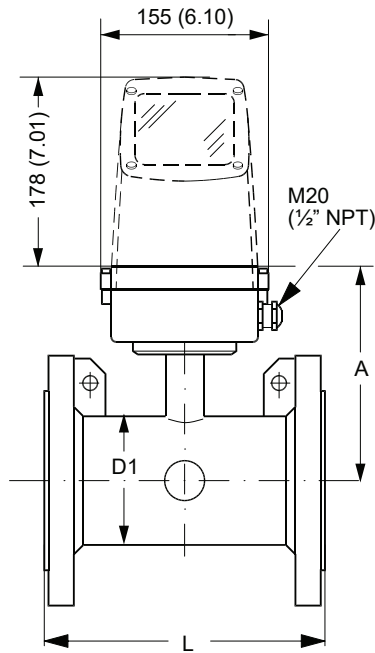
D = Outside diameter of flange, see flange tables

Dimensions/weights

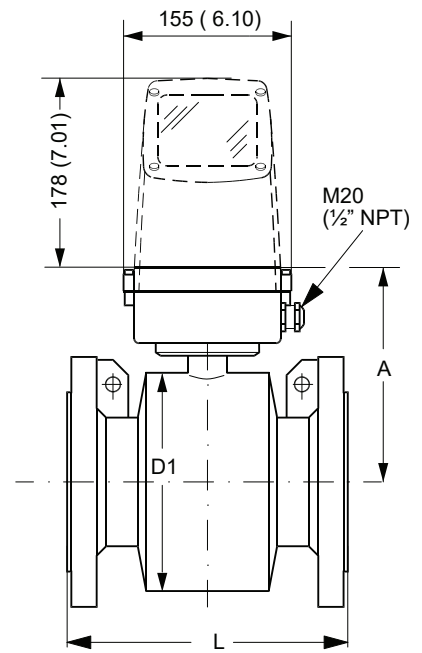
Sensor MAG 5100 W



7ME6520: DN 15 ... 40 (½" ... 1½")



7ME6520: DN 50 ... 300 (2" ... 12")

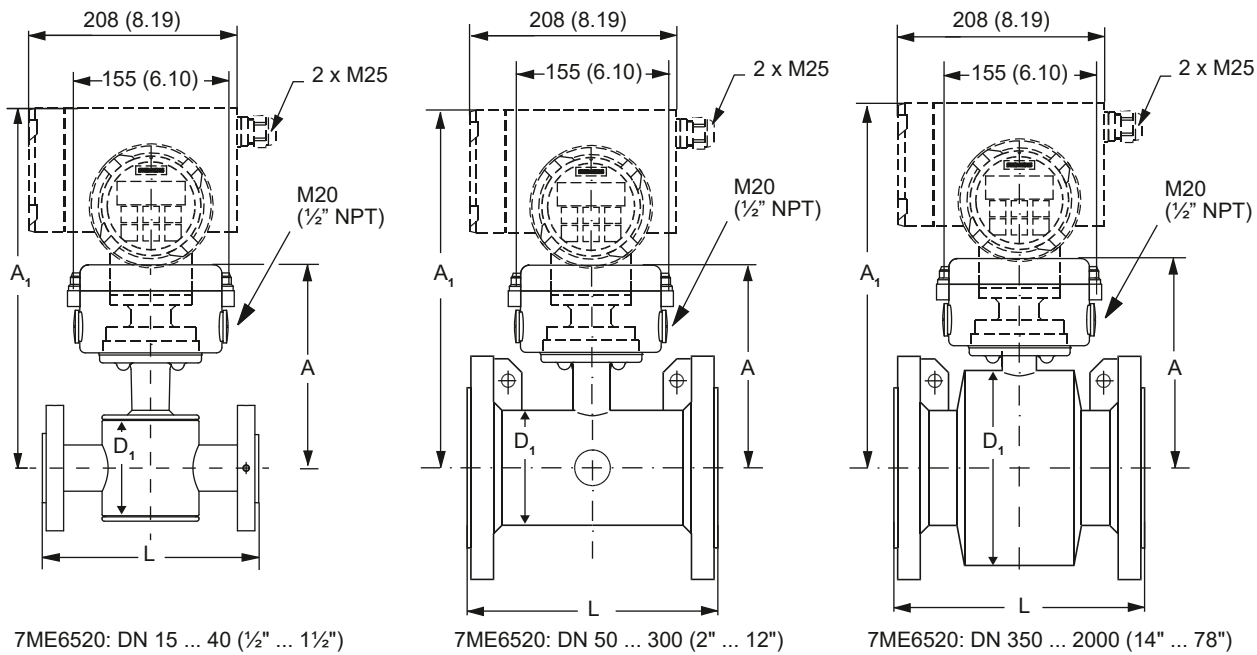


7ME6520: DN 350 ... 200 (14" ... 8")

Nominal Size		A		A1		L										Weight	
						PN 10		PN 16		PN 40		Class 150 / AWWA		AS			
(mm)	(")	(mm)	(")	(mm)	(")	(mm)	(")	(mm)	(")	(mm)	(")	(mm)	(")	(mm)	(")	[kg]	[lbs]
15	½	177	7.0	331	13.0	-	-	-	-	200	7.9	200	7.9	-	-	4	9
25	1	187	7.4	341	13.4	-	-	-	-	200	7.9	200	7.9	-	-	5	11
40	1½	202	8.0	356	14.0	-	-	-	-	200	7.9	200	7.9	-	-	7	15
50	2	188	7.4	342	13.5	-	-	200	7.9	-	-	200	7.9	200	7.87	8	20
65	2½	194	7.6	348	13.7	-	-	200	7.9	-	-	200	7.9	200	7.87	11	24
80	3	200	7.9	354	14.0	-	-	200	7.9	-	-	200	7.9	200	7.87	13	28
100	4	207	8.1	361	14.2	-	-	250	9.8	-	-	250	9.8	250	9.84	19	41
125	5	217	8.5	371	14.6	-	-	250	9.8	-	-	250	9.8	250	9.84	24	52
150	6	232	9.1	386	15.2	-	-	300	11.8	-	-	300	11.8	300	11.81	29	64
200	8	257	10.1	411	16.2	350	13.8	350	13.8	-	-	350	13.8	350	13.78	56	124
250	10	284	11.2	438	17.2	450	17.7	450	17.7	-	-	450	17.7	450	17.72	79	174
300	12	310	12.2	464	18.3	500	19.7	500	19.7	-	-	500	19.7	500	19.69	110	243
350	14	382	15	536	21.1	550	21.7	550	21.7	-	-	550	21.7	550	21.65	139	307
400	16	407	16	561	22.1	600	23.6	600	23.6	-	-	600	23.6	600	23.62	159	351
450	18	438	17.2	592	23.3	600	23.6	600	23.6	-	-	600	23.6	600	23.62	182	400

Dimensions/weights

MAG 5100 W/6000 I Compact



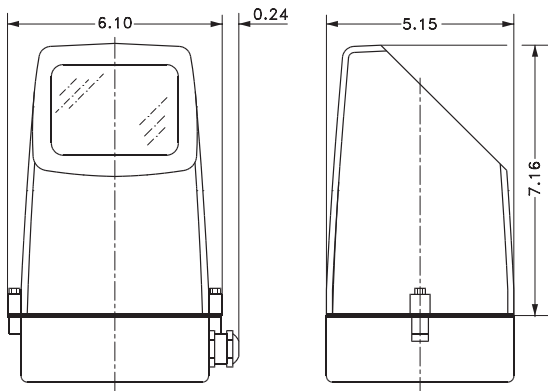
Nominal Size		A		A1		L										Weight	
						PN 10		PN 16		PN 40		Class 150 / AWWA		AS			
(mm)	(")	(mm)	(")	(mm)	(")	(mm)	(")	(mm)	(")	(mm)	(")	(mm)	(")	(mm)	(")	[kg]	[lbs]
500	20	463	18.2	617	24.3	600	23.6	600	23.6	-	-	600	23.6	600	23.6	225	495
600	24	514	20.2	668	26.3	600	23.6	600	23.6	-	-	600	23.6	600	23.6	320	704
700	28	564	22.2	718	28.3	700	27.6	700	27.6	-	-	700	27.6	700	27.6	273	602
750	30	591	23.3	745	29.3	-	-	-	-	-	-	750	29.5	750	29.5	329	725
800	32	616	24.3	770	30.3	800	31.5	800	31.5	-	-	800	31.5	800	31.5	365	804
900	36	663	26.1	817	32.2	900	35.4	900	35.4	-	-	900	35.4	900	35.4	495	1089
1000	40	714	28.1	868	34.2	1000	39.4	1000	39.4	-	-	1000	39.4	1000	39.4	583	1282
	42	714	28.1	868	34.2	-	-	-	-	-	-	1000	39.4	-	-	687	1512
	44	765	30.1	919	36.2	-	-	-	-	-	-	1100	43.3	-	-	763	1680
1200	48	820	32.3	974	38.3	1200	47.2	1200	47.2	-	-	1200	47.2	1200	47.2	861	1896
1400	54	925	36.4	1079	42.5	-	-	-	-	-	-	1400	55.1	1400	55.1	1600	3528
1500	60	972	38.2	1126	44.3	-	-	-	-	-	-	1500	59.1	1500	59.1	2460	5423
1600	66	1025	40.4	1179	46.4	-	-	-	-	-	-	1600	63.0	1600	63.0	2525	5566
1800	72	1123	44.2	1277	50.3	-	-	-	-	-	-	1800	70.9	1800	70.9	2930	6460
2000	78	1223	48.1	1377	54.2	-	-	-	-	-	-	2000	78.7	2000	78.7	3665	8080

- not available

Dimensions/weights

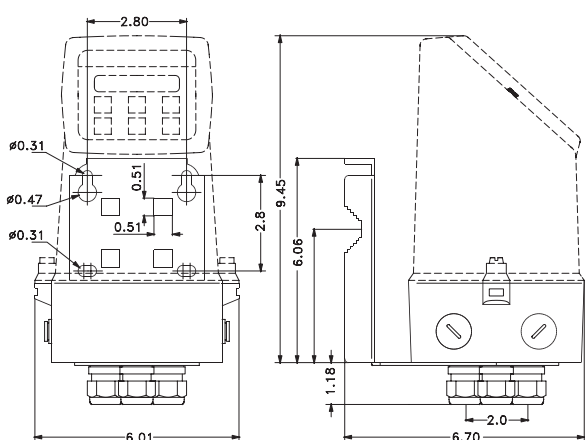
Signal converter compact polyamid—standard

Signal converter installed in compact mode



Weight
MAG 6000 and MAG 5000: 1.65 lbs

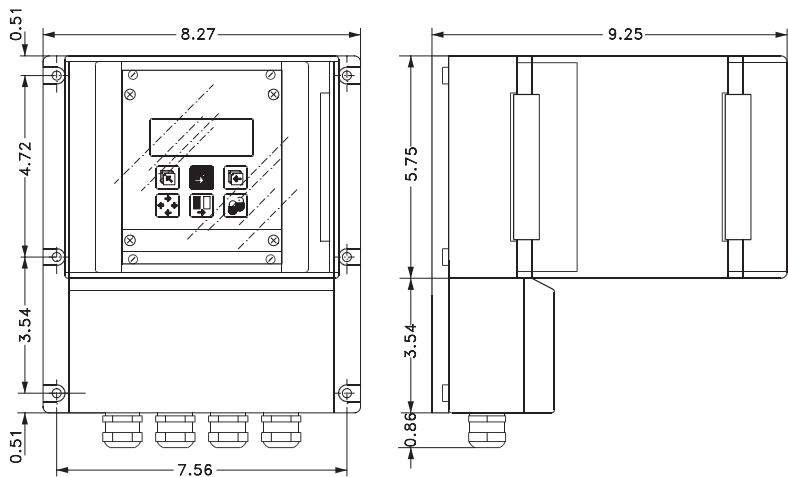
Signal converter installed remote



Weight
Wall bracket: 2.0 lbs

Wall mounting box 21 TE
(for optional 19" insert
signal converter)

Weight excl. signal converter
7.56 lbs



Wall mounting box 42 TE
(for optional 19" insert
signal converter and
electrode cleaning unit)

Weight excl. signal converter
6.4 lbs

