SIEMENS

Field Checklist – MAGFLO® electromagnetic flowmeters

User		**Contact**	
Site		**Service**	
Tag No.		**Loop ID**	
Converter Code No.		**Sensor Code No.**	
Converter Serial No.		**Sensor Serial No.**	
Cable run length		**Power supply**	

Note: For YES / NO values, if the response is YES, cross out the NO. If the initial response is NO, circle it, and then cross it out when the fault has been corrected.

Step	Check/Remark	Value	Done
A	**Flow sensor installation checks**		
1	Is there enough straight pipe upstream & downstream of the flow sensor?	_____Up ___Down	
	Reference conditions for the flow sensor calibration are: *Inlet section 10 x DN (DN ≤ 1200), 5 x DN (DN > 1200)* *Outlet section 5 x DN (DN ≤ 1200), 3 x DN (DN > 1200)* *Practical considerations allow for less straight pipe to be installed for smaller sizes.*	*5 Up* *3 Down*	
2	Will the pipe always be full?	YES / NO	
	Eg. If flow is downwards to an open end the flow can separate and readings will be high, unstable or both		
3	Is the sensor sized well for the application? Nominal flow velocity	_____m/s	
	$V = \frac{4.Q}{\pi.D^2}$ *where Q is [m³/s] and D is [m].* *The nominal resolution of MAG5000 is 2.5 mm/s, so at 0.1 m/s (100 mm/s) the flow error will be around 2.5%, and 1.25% for MAG6000.*	*> 0.5 m/s*	
4	Is ALL the flow, which should be measured, flowing through the sensor?	YES / NO	
	Piping system integrity is often assumed, not confirmed.		
5	Is the fluid conductivity within guidelines?	YES / NO	
	If conductivity is low, flow readings will also be low	*> 5 µS/cm*	
6	Is the flow sensor mounted on-centre with the pipe?	YES / NO	
	Off-centre mounting is a strong contributor to flow measuring errors.		
7	Are ALL the bolts in place and correctly tightened?	YES / NO	
	Uneven bolting can distort the magnetic circuit, or cause premature stress failure. Refer Table 1.		
8	**MAG3100:** Are the M6 holes in top of the flanges used, or capped?	YES / NO	
	Left unattended, these holes will allow corrosion of the flow sensor.		
9	**MAG3100 PTFE and MAG1100:** is the body of the flow sensor correctly bonded to the liquid with earthing rings or jumper to metal pipe?	YES / NO	
	With incorrect bonding the flow reading will be inaccurate or unreliable.		
10	Is the connection box dry?	YES / NO	
	Check for moisture, either as liquid in the base or as condensation on the surfaces. *Check for verdigris (greening) on the terminal clamps which indicates moisture corrosion.*		
11	If IP68 conversion gel has been used, is it intact and fully covering the terminals?	YES / NO	

B Signal converter mounted *compact* on flow sensor

1	Check insulation integrity of the coil circuit	85 ⇒ 0	_____MΩ	

Use 500 V Megger, or 100 V where lightning protection is installed. *200 MΩ*

Possible causes of insulation failure:
1. *Water in the connection box.*
2. *Water in the coil housing. This cannot be successfully repaired.*

2	Check the coil integrity with a DMM.		_____Ω	

Refer Table 2. for coil resistances vs DN size

3	Check the contact between the electrodes and liquid Use an Analog multimeter, set in x1kΩ resistance range.	82 ⇔ 0 0 ⇔ 83 82 ⇔ 83	_____kΩ _____kΩ _____kΩ	

The sensing current used by a DMM in "Ω" is too small to overcome the electro-chemical potential barrier at the metal/water interface. Upon applying the test probes the resistance reading may rise like a charging circuit. This is normal so wait until the reading is stable. Value can be between 5kΩ - 500 kΩ and still give good flow measurement.

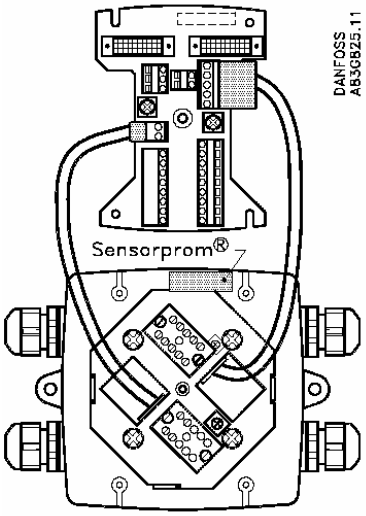
Principally, all readings should be the same.

4	Is the SENSORPROM® correctly placed?	YES / NO	

The label should face the connection housing wall.
For best communication with the signal converter, remove the SENSORPROM® from its clip, plug it onto the terminal plate, then mount the assembly together.

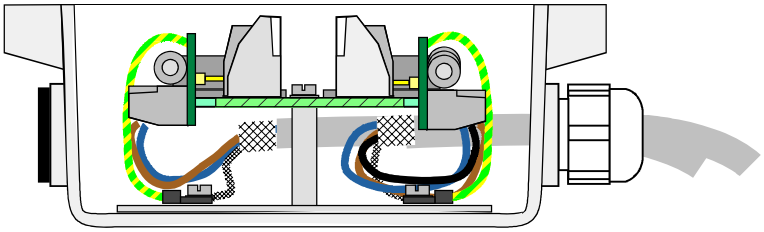
5	Are the flow sensor connections correct?	YES / NO	

The moulded plugs should be directly connected to the terminal plate – do not use jumpers.



6	Is lightning protection correctly mounted?	YES / NO	

The lightning protection modules should be interposed between the moulded plugs and the terminal plate. Check point-to-point terminal/pin numbers.



7	**Cathodic protected piping:** Are the connections correct?	YES / NO	

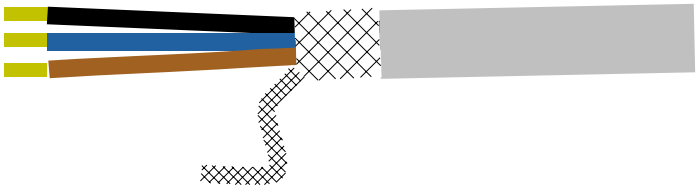
The signal converter must be supplied through an isolation transformer. The terminal "PE" must not be connected to earth.

C Signal converter mounted remote from flow sensor

Cabling checks

1	Are the signal cable tails (unscreened part of the wire) short?	Electrode Coil	_____mm _____mm	

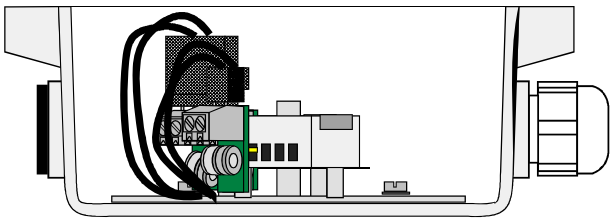
For normal installations *< 50 mm*
If internal lightning protection is fitted *< 40 mm*



Recommended signal cable tails length (Full size – use as a gauge)

2	Is lightning protection correctly mounted?	YES / NO	

The lightning protection modules should be interposed between the moulded plugs and the terminal blocks. Check point-to-point terminal/pin numbers.



3	Is lightning protection properly earthed?	YES / NO	

All earth leads MUST be terminated to a local lightning earth point. Where cathodic protection is applied, check that no earth loops cause interference.

4	Are the cable connections correctly point-to-point?		

Reverse the reported flow direction in the setup menu, not by swapping the wiring.

5	**Special electrode cable:** are the shields connected correctly?	YES / NO	

The individual "driven" shields are only connected to terminals 81 and 84 – never to earth! They have an equalising voltage imposed on them by the input stage and are not for screening.

6	Check that the cables are continuous	YES / NO	

Cables must be in one length and must not be taken to a distribution box or similar terminal arrangement.

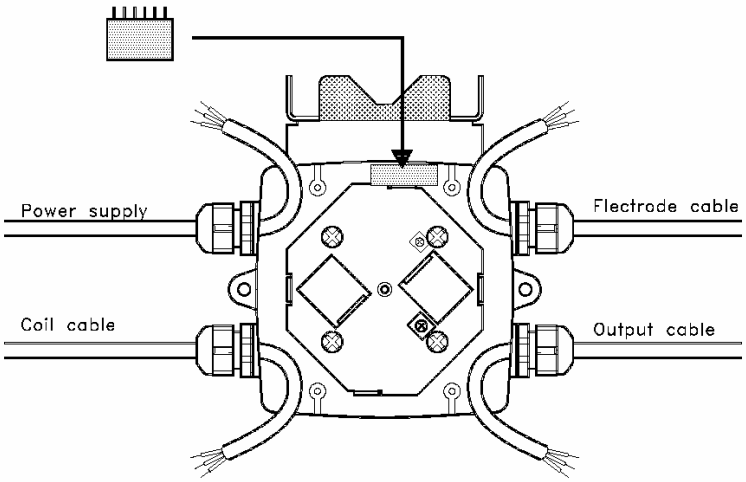
7 a)	Check that the screens are earthed correctly	Electrode Coil	YES / NO YES / NO	

Normally the screen is not connected at the signal converter. In environments with strong electrical noise the external screen may be earthed in both ends.

7 b)	Does connecting them at the signal converter end improve or worsen the stability?	YES / NO	
8	**Cathodic protected piping:** Are the connections correct?	YES / NO	

The screen must only be connected at the sensor end via a 1.5 µF capacitor. The screen must never be connected at both ends.

Cabling checks to be performed at the signal converter connection box



9	Is the mounting kit correctly earthed?	mains lightning ground	_____Ω _____Ω	

Mains earth can be established though the power cable connection, but lightning earth must be run to ground locally.

10	Check insulation integrity of the cables	Electrode 82 ⇒ 0 Electrode 83 ⇒ 0 Coil 85 ⇒ 0	_____MΩ _____MΩ _____MΩ	

Use 500 V Megger, or 100 V where lightning protection is installed. *20 MΩ*

If there is water in the pipe, disconnect the electrode cables to conduct the Megger test.
Possible causes of insulation failure:
1. *Stressed insulation, caused by drawing cables too harshly through bends in the conduit.*
2. *Water in the connection boxes.*
3. *Water in the coil housing. This cannot be successfully repaired.*

11	Check the coil integrity with a DMM.	85 ⇒ 86	_____Ω	

Refer Table 2 for coil resistances vs DN size

12	Check the contact between the electrodes and liquid	82 ⇔ 0 0 ⇔ 83 82 ⇔ 83	_____kΩ _____kΩ _____kΩ	

Use an Analog multimeter, set in x1kΩ resistance range. Principally, all readings should be the same, between 5kΩ - 500 kΩ.

Checks to be performed at the flow sensor connection box

13	If your DMM can register low frequency ac mA (eg Fluke 8060), check the coil excitation current at the flow sensor terminals.	_____mA	

Value will be a little different if true RMS feature is invoked. *126.5 mA*

- *Excitation current can be lost via stressed insulation, mentioned above. This may not be picked up in the Verificator testing, but will show as a reduced flow reading.*

Be careful not to short the coil circuit to earth – it's not protected!!

- *Half value indicates loss of one side of the bi-polar current driver.* *~ 65 mA*

D Signal converter checks

1	Check that the SENSORPROM® is correctly mounted.		

The label should face the connection housing wall.
For best communication with the signal converter, remove the SENSORPROM® from its clip, plug it onto the terminal plate, then mount the assembly together.

2	Confirm correct power supply		
3	Check for noise in electrodes cables	cross talk RFI noise	YES / NO YES / NO

Only with flow established at zero, *look for any flow reading (> 0%) in the Service Menu. If a reading is present, force the coil excitation to OFF, then step back to the flow reading. If it is now 0% then there is possibly cross-talk. If there is still a reading, possibly RFI or other induced noise. Run a temporary cable away from all potential noise sources and repeat. If noise is now zero, replace the original cable with Siemens standard or special cable.*

4	Check the 4-20 mA output. In the Service Menu, force to: 0% 25% 50% 75% 100%	 4.00 mA 8.00 mA 12.00 mA 16.00 mA 20.00 mA	 _____ _____ _____ _____ _____
5	Check the pulse output. In the Service menu force to ON		

Use an electronic external counter to register output pulses. Remember the output is open collector ***PNP****.*

6	Check the frequency output. In the Service Menu, force to:	0 Hz 2.5 kHz 5.0 kHz 7.5 kHz 10.0 kHz	_____ _____ _____ _____ _____

Many PLC systems are set up to count pulses at their digital I/O ports instead of using a counter card. This can lead to errors if the pulses occur more frequently than the program can capture them. Eg. if one pulse in six is lost, there will be 16.6% measuring error!

7	Check for noise between the signal ports to ground	mA port: 32 ⇔ PE digital port: 58 ⇔ PE	_____mV _____mV

Earthing these terminals may improve noise immunity.

8	Check that Empty Pipe Detection is correctly setup.		ON / OFF

In remote installation – only if the special electrode cable is used.

E Other checks

1			
2			
3			

Checked by:		**Signed:**	
Date:		**Next Check:**	

Necessary equipment to bring to site.

- The usual bag of hand tools
- High function DMM like Fluke 8060
- Low function Multimeter, 20 kΩ/V or thereabouts
- 100 V – 500 V Megger
- Spare display module 085U1038, in case the unit is blind, or the installed display is faulty.

Table 1 – MAG3100 tightening torques for standard flow sensor mounting, Neoprene liner.

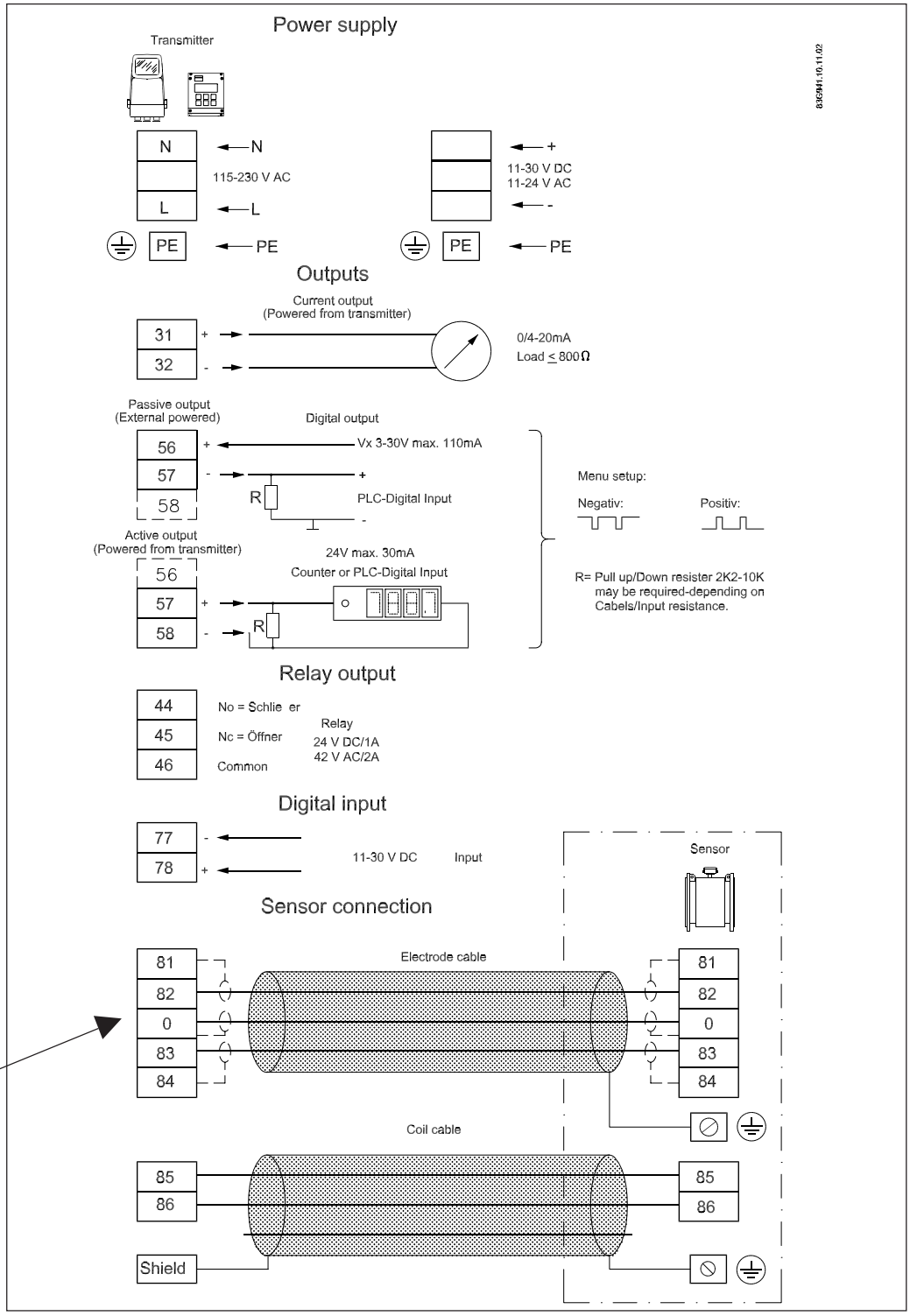
Nominal size	Tightening torque M_A [Nm]
25	15
40	25
50	30
65	30
80	30
100	30
125	40
150	50
200	55
250	80
300	110
350	125
400	140
450	150
500	150
600	180
700	180
800	190
900	190
1000	200
1200	200
1400	200
1600	200
1800	200
2000	200

Table 2. – Coil resistances

	MAG 1100	MAG 3100		MAG 3100 W		MAG 5100 W	
DN	Resistance	Ohms	Tolerance	Ohms	Tolerance	Ohms	Tolerance
2	104 Ω ± 5	104					
3	104 Ω ± 5	104					
6	98 Ω ± 4	104					
10	98 Ω ± 4	104					
15 1)	98 Ω ± 4	104					
25	98 Ω ± 4	104	± 2	104	± 2	104	± 2
40	98 Ω ± 4	92	± 2	92	± 2	92	± 2
50	98 Ω ± 4	92	± 2	92	± 2	124	± 4
65	98 Ω ± 4	100	± 2	100	± 2	127	± 4
80	98 Ω ± 4	94	± 2	94	± 2	126	± 4
100	98 Ω ± 4	92	± 2	92	± 2	125	± 4
125		92	± 2	92	± 2	126	± 4
150		94	± 2	94	± 2	116	± 4
200		90	± 2	90	± 2	109	± 4
250		92	± 2	92	± 2	104	± 4
300		100	± 2	100	± 2	108	± 4
350		112	± 2	112	± 2	112	± 2
400		100	± 4	100	± 4	100	± 4
450		108	± 4	108	± 4	108	± 4
500		122	± 4	122	± 4	122	± 4
600		115	± 4	114	± 4	114	± 4
700		128	± 4	112	± 4	112	± 4
750		133					
800		128	± 4	127	± 4	127	± 4
900		131	± 4	93	± 4	93	± 4
1000		131	± 4	103	± 4	103	± 4
1100		126					
1200		130	± 4	124	± 4	124	± 4
1400		130					
1500		124					
1600		133					
1800		133					
2000		147					

7. Electrical connection

7.1 Transmitter MAG 5000 and MAG 6000 connection diagram



Note
Special cable with individual wire shields (shown as dotted lines) are only requried when using empty pipe function or long cables. (See “Technical data” chapter 2 for further details.)

Potential Hazards

Grounding
The mains protective earth wire must be connected to the PE terminal in accordance with the diagram (class 1 power supply).

Mechanical counters
When mounting a mechanical counter to terminals 57 and 58 (active output), a 1000 µF capacitor must be connected to the terminals 56 and 58.
Capacitor + is connected to terminal 56 and capacitor – to terminal 58.

Output cables
If long cables in noise environment, we recommend to use screened cable.

Electrodes cables
Dotted connections only to be when using special electrode cable.

E. c.