SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter

APPLICATIONS

- Reading of SF6 gas density or Dry-Air or any gas mixture
- Monitoring of critical parameter of SF6 such as pressure, temperature, density
- Digital version with RS485 Modbus RTU for smart grid application
- Predictive signals available for digital version
- Suitable to work with pure SF6 or mix without any adaptation*
- Suitable for indoor or outdoor, IP67 protection
- Industrial, medical or aerospace fields

High voltage or medium voltage circuit breakers commonly used for distribution and transmission are reliable if they are able to operate in steady and controlled conditions.
The use of SF6 or Dry-Air as quenching gas is extremely important to guarantee a safe operation during the life of equipment.
In order to have continuous check of gas filling and immediate warning in case of leakage the EMD transmitter is suitable to be connected to most standard monitoring systems.
It is ready to operate immediately after installation because of our technology based on ceramic primary element capable of reading the temperature and pressure of gas and calculate density.
All the materials used, such as thick ceramic and stainless steel are insensitive to chemical attach of corrosive and polluted gases.
The case is very robust and it is tested to face heavy duty conditions, so all the inner parts are immersed into resin to guarantee resistance to moisture and vibrations.
The sensor is available with both analog or digital output.
The analog version is a two wires loop powered and the digital is a standard Modbus RTU 485.

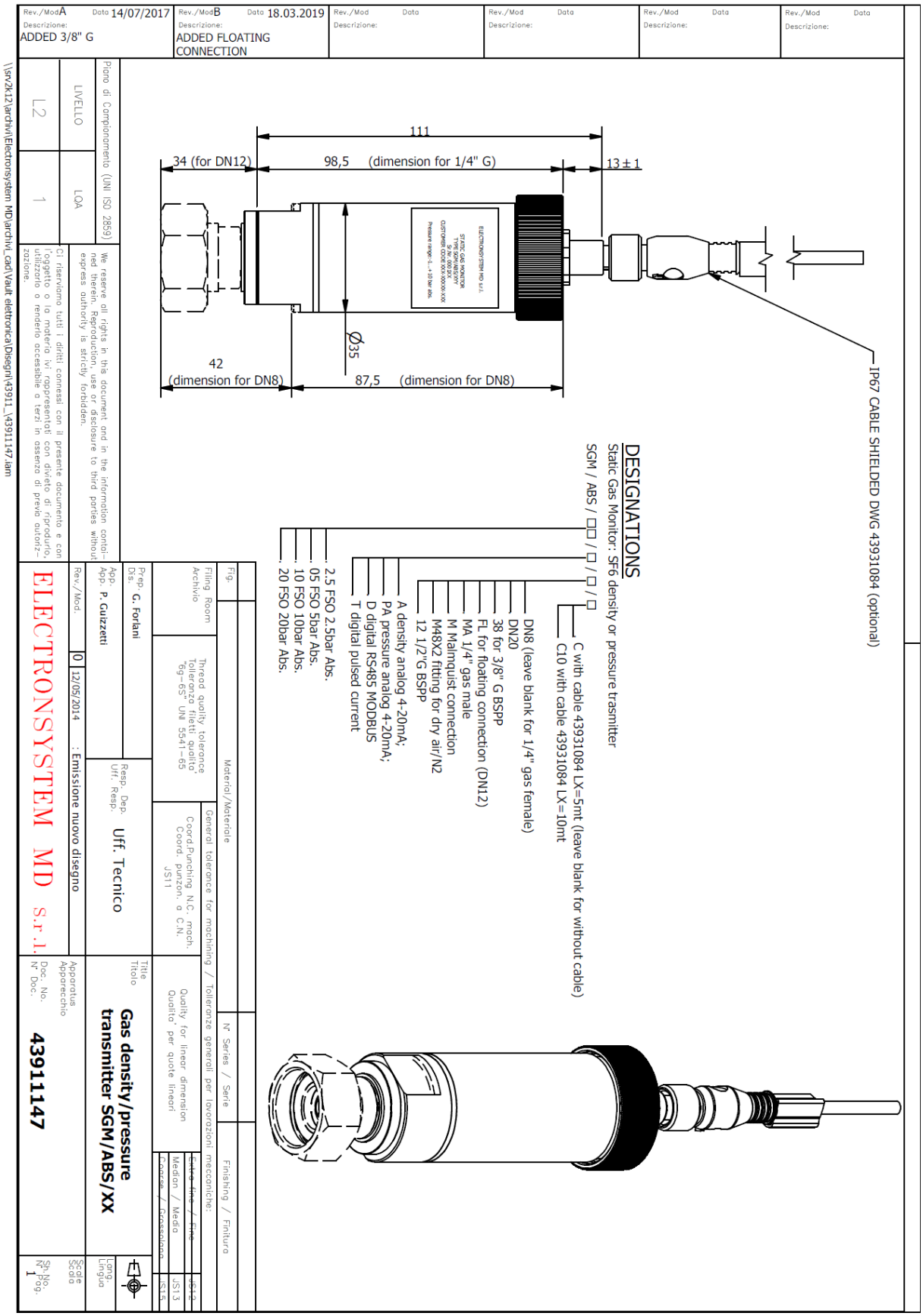
Density calculation is based on measurement of two physical data: pressure and temperature; proprietary algorithm is used to convert these data into density and can be customized by changing some coefficients to meet specific request.

HIGHLIGHTS

- Absolute compensated pressure reading
- High accuracy +/- 1°C FSO over a wide temperature range
- Ceramic primary element chemically resistant
- Excellent long term stability
- Quick response time
- Factory calibration by laser trimming and automated process
- 14 bit ASIC core
- Multiple transmission data output customizable on request

*density g/l depending on type of gas

SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter



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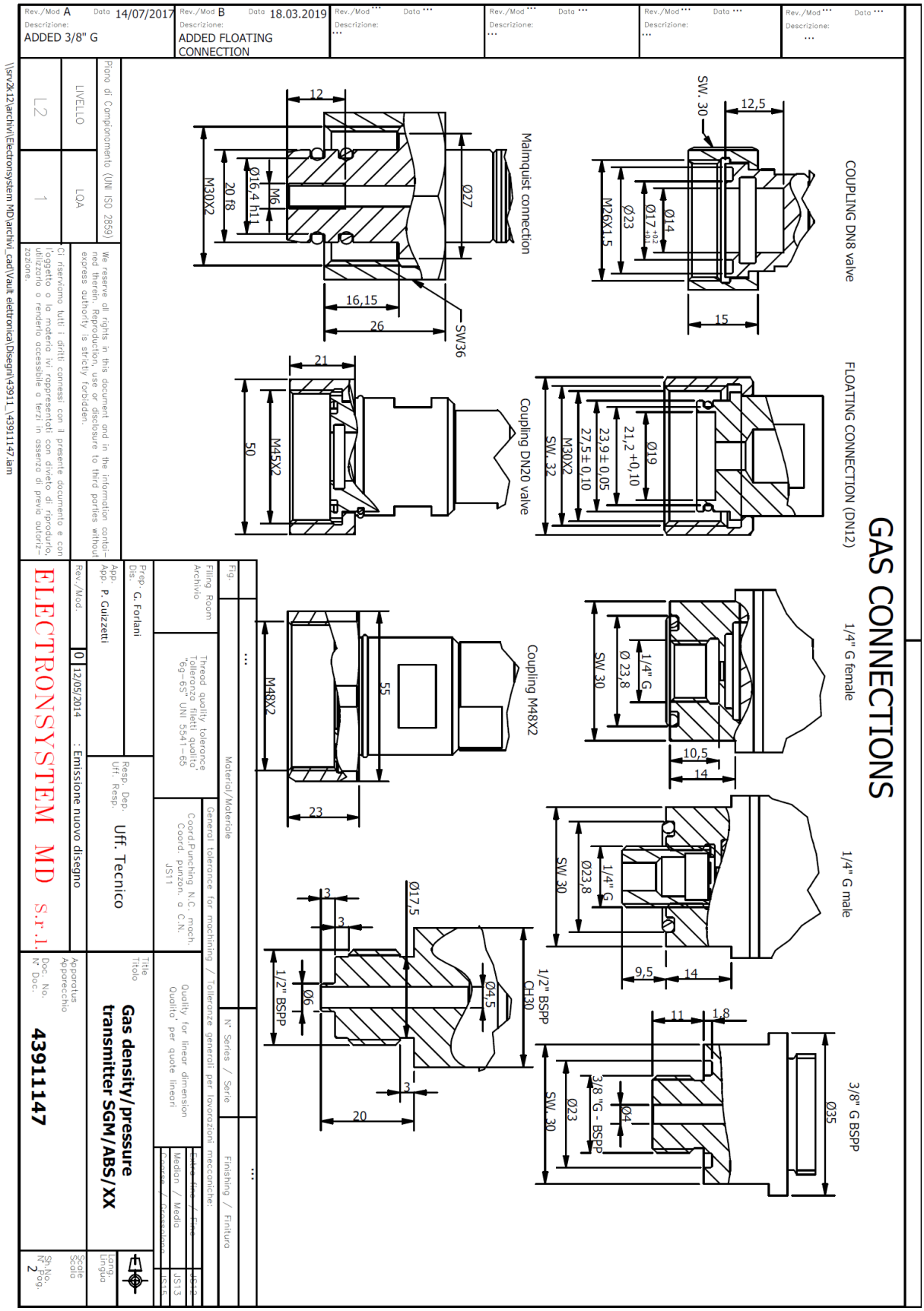
SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter



SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter

Rev./Mod A	Data 14/07/2017	Rev./Mod B	Data 18.03.2019	Rev./Mod	Data	Rev./Mod	Data	Rev./Mod	Data	Rev./Mod	Data
Descrizione: ADDED 3/8" G		Descrizione: ADDED FLOATING CONNECTION		Descrizione:		Descrizione:		Descrizione:		Descrizione:	

TECHNICAL FEATURES:

DESCRIPTION:
TEMPERATURE COMPENSATED SF6 GAS DENSITY TRANSMITTER

1 Materials:
1.1 Housing material : AISI 316
1.2 Inner o.rings material : EPDM70 peroxide cured
1.3 Primary sensing element: Ceramic
1.4 Cable connection material: aluminium alloy nickel-plated
1.5 Conformity to 2002/95/CE (RoHS)

2 Electrical data of sensors
2.1 Electrical data analog version
2.1.1 Output signal : 4 - 20 mA 2 wires loop system (see diagram 1)
2.1.2 Input voltage : 15-30 Vdc
2.1.3 Rload: Rin< 250 ohm
2.2 Electrical data digital pulsed current version:
2.2.1 Output signal : PWM pulse current (see diagram 2)
2.2.2 Input voltage : 15-30 Vdc
2.2.3 Rload: Rin< 100 ohm
2.3 Electrical data digital version:
2.3.1 Output signal : RTU MODBUS RS485 (see diagram 3)
2.3.2 Data protocol: baudrate 19200, databits 8, parity even, stopbit 1
2.3.3 Input voltage : 15-30 Vdc
2.3.4 Current Consumption : 10mA typ. / 15mA max.
2.4 Common electrical data:
2.4.4 Input protection : overvoltage supressor and reverse voltage diode
2.4.5 Response time : < 30 msec.
2.4.6 Resolution : < 0.1% of full scale
2.4.7 Stability : < 0.2% of full scale per yearù
2.4.8 Accuracy : < ± 1% @ T=0÷40°C (± 0.3%/10°C extended temp. range)
2.4.9 Repeatitivity : < 10^-3
2.4.10 Isolation: max 250Vac 50Hz against mass
2.4.11 Resistance of insulation: >10Mohm
2.4.12 Terminal block : circular shielded M12x1 connector (see diagram 4)
2.4.13 Gas condensation: measurement of SF6 in liquid phase is not allowed
(see isochores diagram 5)

3 Output range:
3.1 Pressure: 0 - 2,5, 0 - 5 or 0 - 10 Bar ABS @20°C compensated
3.2 Density: 15,33g/l @ 2,5 Bar ABS, 31,56g/l @ 5 Bar ABS, 66,86g/l @ 10 Bar ABS
3.3 Density: 56,4g/l @ 8,5 Bar ABS *
3.4 Temperature: -40 - 100°C *

* available only for SGM/ABS/T or SGM/ABS/D

4 Electromagnetic protection:
4.1 EN61000-4-2: ESD air 15kV
4.2 EN61000-4-3: Radiated immunity AM 10V/m 80...1000MHz, PM 10V/m 900...2700MHz with 10m cord
4.3 EN61000-4-4: Burst 4kV withstand of the communication & power supply interfaces with 10m cord
4.4 EN61000-4-5: Surge 4kV withstand on the shield of 10m cord
4.5 EN61000-4-6: Conducted immunity 10V/m
4.6 EN61000-6-4: Radiated disturbances 30MHz-1000MHz class B

5 Working conditions:
5.1 Mechanical stresses:
Shockproof 100G, pulse duration 6ms on 3 axys (IEC EN 60068-2-27:2009)
5.2 MTBF indoor: 20 years, MTBF outdoor: 15 years
5.3 Max allowable pressure: 16 bar ABS

6 Environmetal conditions:
Operating temperature:
Standard : -25°C to +80°C (LT version: -40°C to +80°C)
Transport and storage : -60°C to 85°C
Relative air humidity in yearly average <80%, occasionally 100%
Solar radiation: <= 1000 W/mq
Wind: <= 34 m/s
Altitude: <= 2000 m
6.1 Pollution Class III IEC 60815, table 1
6.2 Gas Media: SF6, pure>99% , other medias such as N2/SF6 are allowable
6.3 Protection degree (DIN EN 60529): IP65; IP67 on request

7 Leakage rate
7.1 Leakage rate: < 1x10^ -9 mbar x l/s.
7.2 Leakage test with helium gas

8 Weight : ≈ 250 gr

Piano di Campionamento (UNI ISO 2859)	
LIVELLO	LQA
L2	1

Fig.	Materiali/Materiale	N° Series / Serie	Finishing / Finitura
Filing Room Archivio	General tolerance for machining / Tolleranze generali per lavorazioni meccaniche:		
Thread quality tolerance Tolerance fillet quality "6g-6G" UNI 5541-65	Coord.Punching N.C. mach. Coord. punzon. a C.N. JS11	Quality for linear dimension Qualita' per quote lineari	Edge Break / Finitura JS12
			Medium / Media JS13
			Coarse / Grossolana JS14

Prep. Dis.	G. Forlani	Resp. Dep. Uff. Resp.	Uff. Tecnico	Title Titolo	Gas density/pressure transmitter SGM/ABS/XX
App. App.	P. Guizzetti				
Rev./Mod.	0 12/05/2014 : Emissione nuovo disegno			Apparatus Apparecchio	
				Doc. No. N° Doc.	43911147
				Lang. Lingua	
				Scale Scala	
				Sh. No. N° Fog.	3

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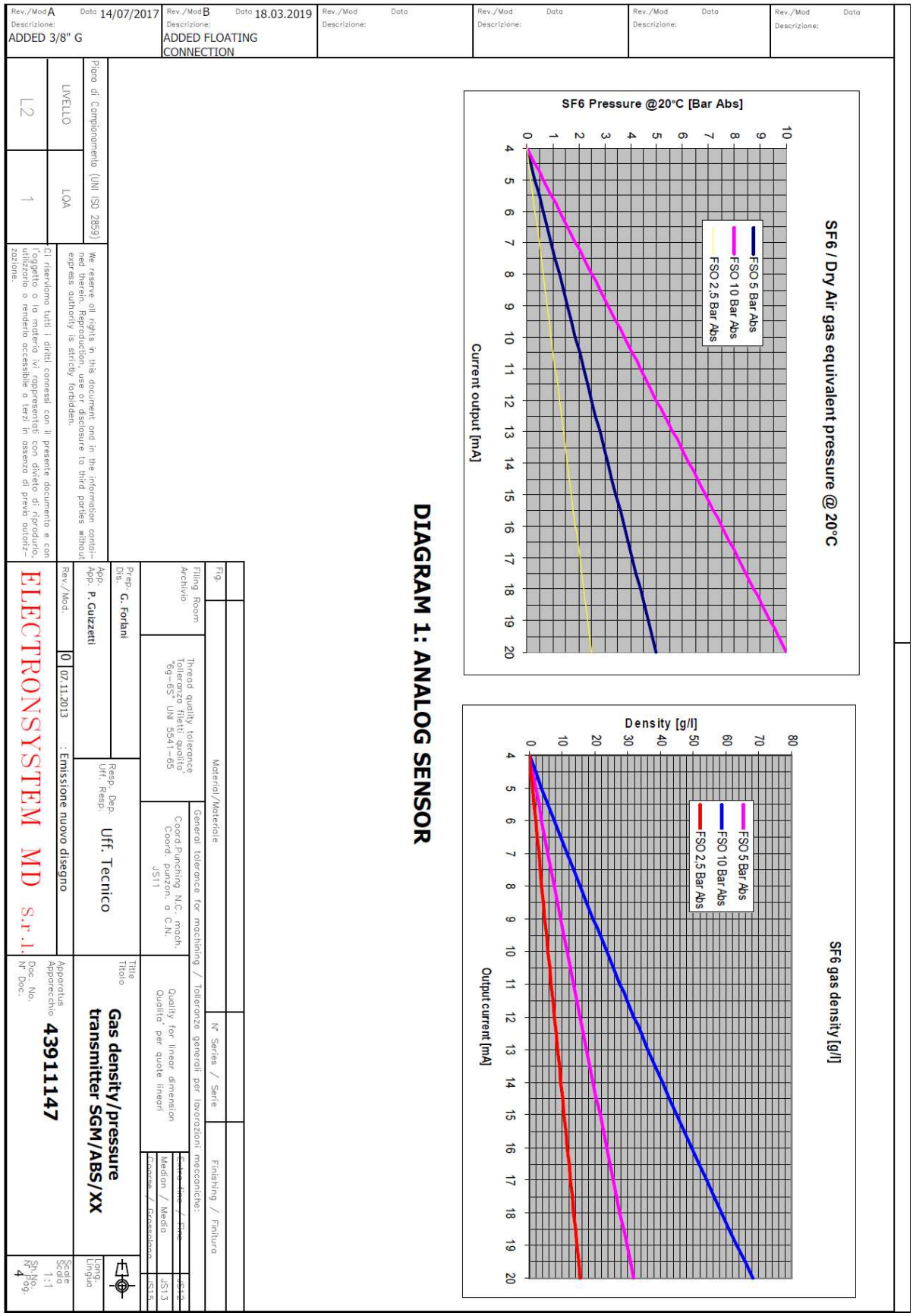
SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter

Rev./Mod	Data	Descrizione:
A	14/07/2017	ADDED 3/8" G
B	18.03.2019	ADDED FLOATING CONNECTION



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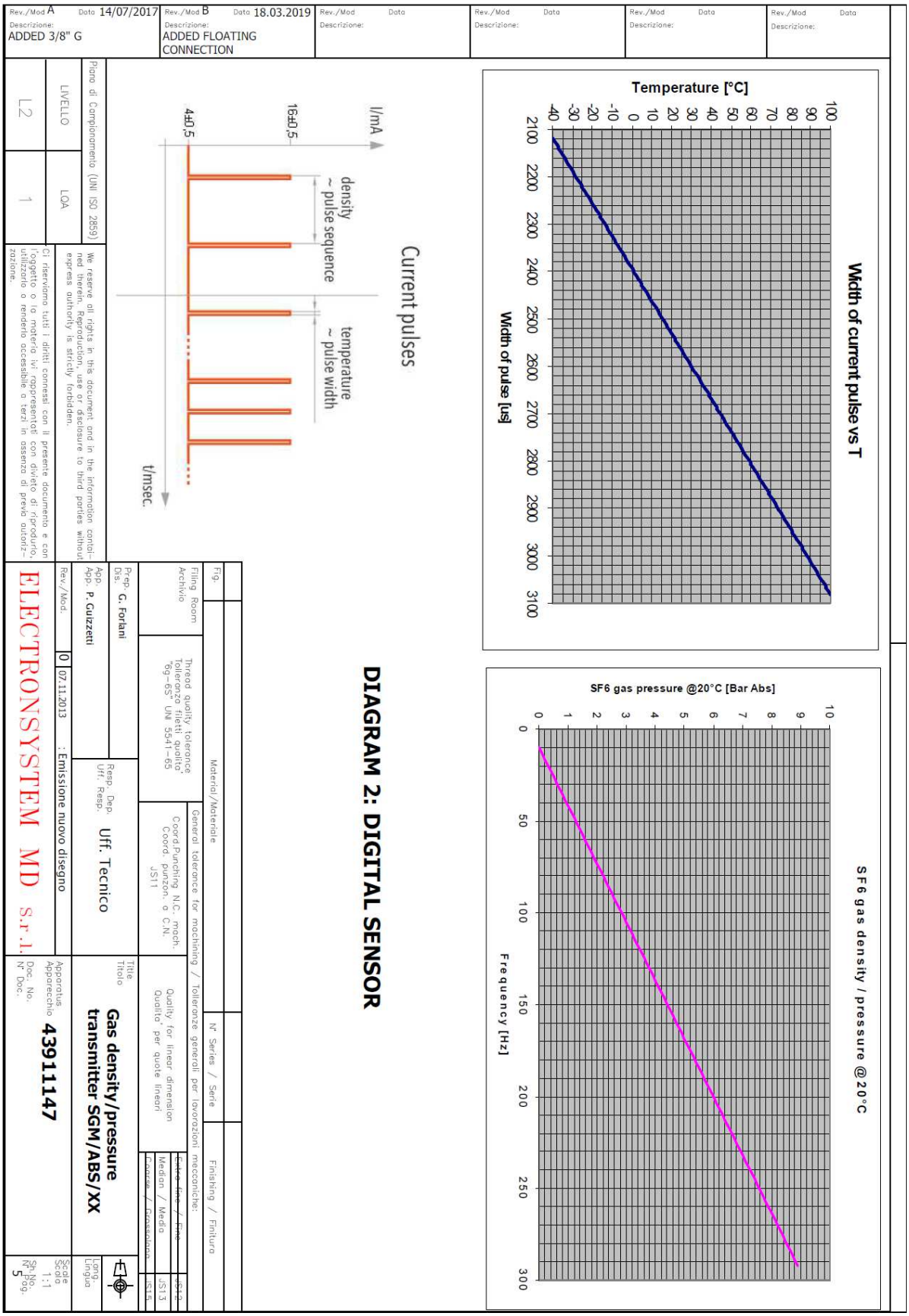
SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter



All specs are subject to change without notice

SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter

DIAGRAM 3: TABLE OF TELEGRAM

Address	Information	Type	Function
Add_0	ID_slave	Unsigned Int	Read/Write
Add_1	Pressure.Read [mbar ABS]	Unsigned Int	Read only
Add_2	Temperature.Read [°K/10]	Signed Int	Read only
Add_3	Compensated Pressure.Read [mbar ABS @20°C]	Unsigned Int	Read only
Add_4*	Density SF6.Read [g/l]	Unsigned Int	Read only
Add_5*	Leakage rate [mbar/week]	Unsigned Int	Read only
Add_6*	Confidence level [%]	Unsigned Int	Read only
Add_7	Firmware release	Unsigned Int	Read only

*=available on request

Protocol settings

ADDRESS	127 default
Protocol	Modbus RTU
Speed	19200 Baud
Data	8 bit
Parity	Even parity
Stop	1 bit stop
Scan rate	50ms
Response time out	500ms
Delay	200ms

Example

Registry	bit reading	value	Unit	Description
0	127	127	slave add	
1	987	987	[mbar abs]	pressure
2	2945	294,5	[°K]	temperature
3	981	981	[mbar abs]	comp. Pressure
4	5970	5,97	[g/l]	SF6 density
5	0	0	mbar/week]	leakage rate
6	100	100	[%]	confidence
7	304	304		FW revision

Rev./Mod A Data 14/07/2017 — Descrizione: ADDED 3/8" G
Rev./Mod B Data 18.03.2019 — Descrizione: ADDED FLOATING CONNECTION
Rev./Mod Data Descrizione: (×4)

Piano di Campionamento (UNI ISO 2859)
LIVELLO: L2
LQA: 1

Fig.
Filing Room / Archivio
Thread quality tolerance "6g-6G" UNI 5541-65 / Tolleranza filetti qualità "6g-6G" UNI 5541-65
Coord.Punching N.C. mach. / Coord. punzon. a C.N. JS11
Materiali/Materiale
Generali tolerance for machining / Tolleranze generali per lavorazioni meccaniche:
N° Series / Serie
Finishing / Finitura
Prep. Dis. G. Forlani
App. App. P. Guizzetti
Resp. Dep. Uff. / Resp. Uff. Tecnico
Rev./Mod. 0 07.11.2013 : Emissione nuovo disegno
Quality for linear dimension / Qualità per quote lineari
Extra fine / Fine IS12
Median / Medio JS13
Coarse / Grossolano IS14
Title / Titolo: Gas density/pressure transmitter SGM/ABS/XX
Apparatus / Apparecchio: 43911147
Doc. No. / N° Doc.
Scale / Scala 1:1
Sh. No. / N° Pag. 6
Long. / Lingua

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Via Madonna delle Rose, 72 24061 Albano S.Alessandro (BG) ITALY - Phone +39035584000, Fax +39035584099 E-mail: info@elecmd.it Web www.elecmd.it

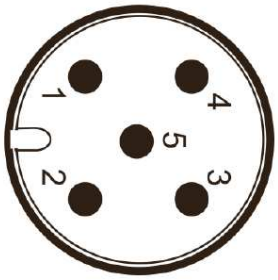
SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter

Rev./Mod	Data	Descrizione
A	14/07/2017	ADDED 3/8" G
B	18.03.2019	ADDED FLOATING CONNECTION
...	...	...

DIAGRAM 4: TERMINAL BLOCK

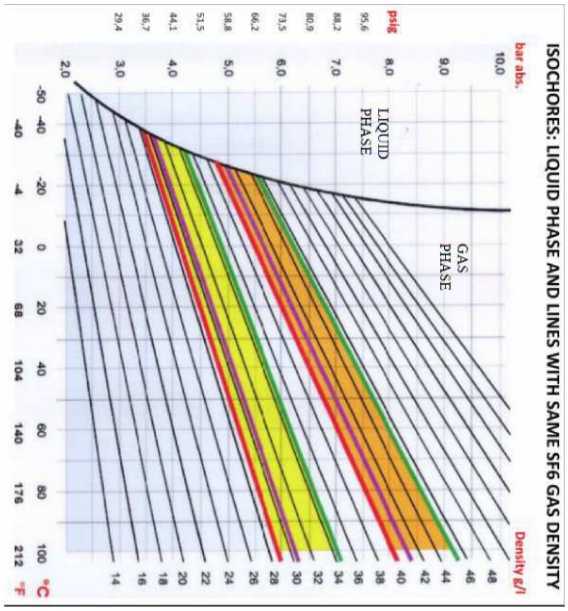
SGM/ABS/X/A or SGM/ABS/X/T
3: +VDC
4: -VDC

SGM/ABS/X/D:
1: +VDC
2: Modbus Gnd
3: -VDC
4: A(+) / TR (+)
5: B(-) / TR (-)



View on sensor plug

DIAGRAM 5: ISOCHORES



Piano di Campionamento (UNI ISO 2859)
LIVELLO L2
LQA 1

Filing Room / Archivio
Thread quality tolerance "6g-6S" UNI 5541-65 / Tolleranza filetti qualità
Coord.Punching N.C. mach. / Coord. punzon. a C.N. JS11
Fig.
Material/Materiale
General tolerance for machining / Tolleranze generali per lavorazioni meccaniche:
N° Series / Serie
Finishing / Finitura
Prep. / Dis. G. Forlani
App. / App. P. Guizzetti
Resp. Dep. / Uff. Resp. Uff. Tecnico
Rev./Mod. 0 07.11.2013 : Emissione nuovo disegno
Quality for linear dimension / Quality per quote lineari
Title / Titolo Gas density/pressure transmitter SGM/ABS/XX
Apparatus / Apparecchio 43911147
Doc. No. / N° Doc.
Fine / Fine JS12
Median / Media JS13
Coarse / Grossolano JS15
Scale / Scala 1:1
Sh. No. / N° Fog. 7
Lang. / Lingua

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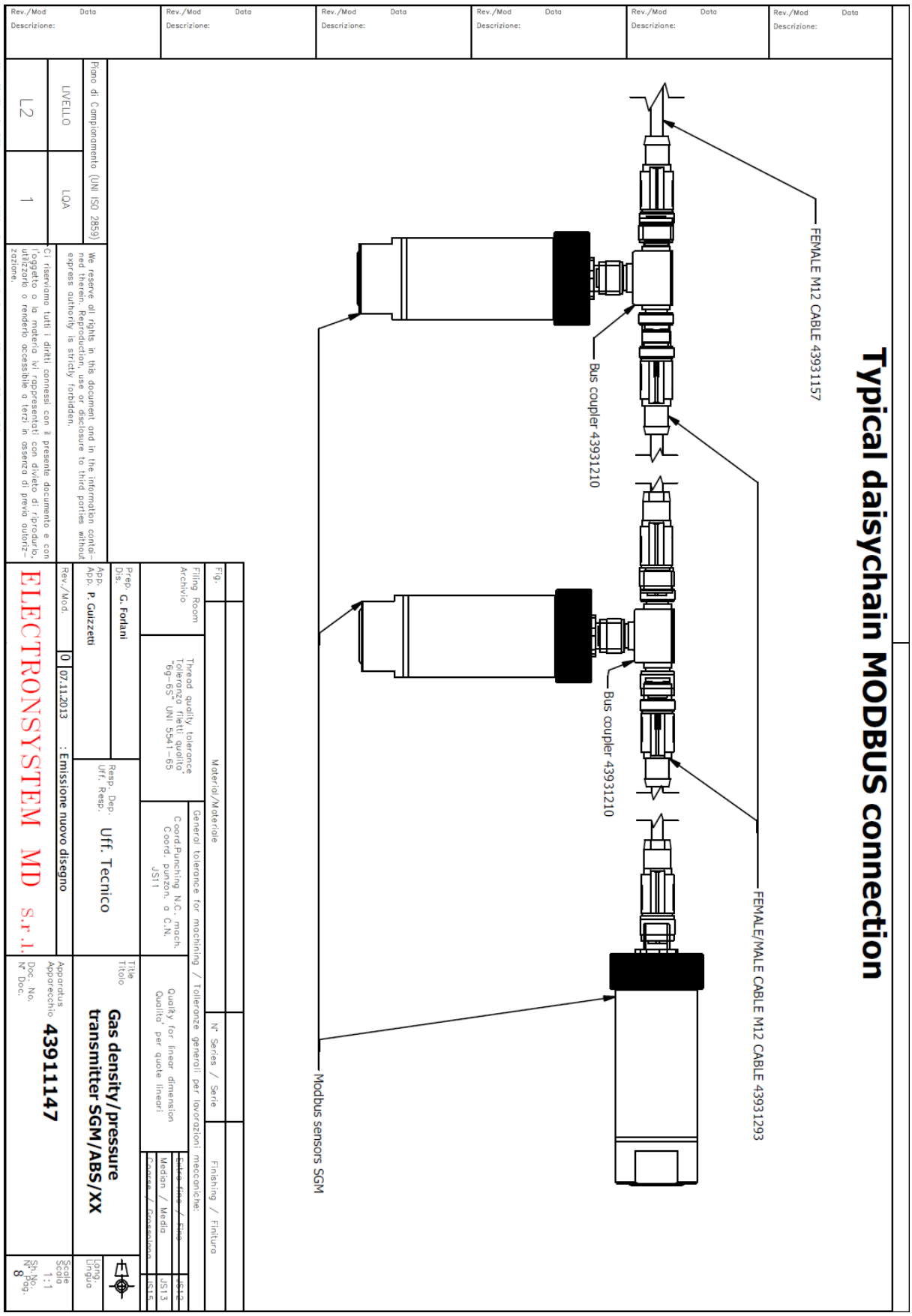
SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter



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SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter

Rev./Mod	Data	Descrizione:
A	14/07/2017	ADDED 3/8" G
B	18.03.2019	ADDED FLOATING CONNECTION

Chemical Material Compatibility

CHEMICAL	COMPATIBILITY
Acetic Acid	A - Excellent
Acetic Acid 20%	A - Excellent
Acetic Acid 80%	A - Excellent
Acetic Acid, Glacial	A - Excellent
Acetic Anhydride	A - Excellent
Acetone	A - Excellent
Alcohols: Amyl	A - Excellent
Alcohols: Benzyl	A - Excellent
Alcohols: Butyl	A - Excellent
Alcohols: Ethyl	A - Excellent
Alcohols: Isopropyl	A - Excellent
Alcohols: Methyl	A - Excellent
Alcohols: Propyl	A - Excellent
Aluminum Chloride 20%	A - Excellent
Aluminum Sulfate	A - Excellent
Ammonia 10%	A - Excellent
Ammonia, liquid	A - Excellent
Ammonium Carbonate	A - Excellent
Ammonium Chloride	A - Excellent
Ammonium Hydroxide	A - Excellent
Ammonium Nitrate	A - Excellent
Ammonium Persulfate	A - Excellent
Ammonium Sulfate	A - Excellent
Amyl Acetate	A - Excellent
Amyl Alcohol	A - Excellent
Amyl Chloride	A - Excellent
Aniline	A - Excellent
Antimony Trichloride	B - Good
Barium Carbonate	A - Excellent
Barium Chloride	A - Excellent
Barium Hydroxide	A - Excellent
Barium Sulfate	A - Excellent
Barium Sulfide	A - Excellent
Benzaldehyde	A - Excellent
Benzene	A - Excellent
Benzene Sulfonic Acid	A - Excellent
Benzoic Acid	A - Excellent
Benzol	A - Excellent
Boric Acid	A - Excellent
Bromine	A - Excellent
Calcium Carbonate	A - Excellent
Calcium Chlorate	A - Excellent
Calcium Chloride	A - Excellent
Calcium Hydroxide	A - Excellent
Calcium Hypochlorite	A - Excellent
Calcium Nitrate	A - Excellent
Calcium Sulfate	A - Excellent
Carbolic Acid (Phenol)	A - Excellent

CHEMICAL	COMPATIBILITY
Carbon Dioxide (wet)	A - Excellent
Carbon Tetrachloride	A - Excellent
Carbon Tetrachloride (dry)	A - Excellent
Carbon Tetrachloride (wet)	A - Excellent
Carbonic Acid	A - Excellent
Chlorine Water	A - Excellent
Chlorobenzene (Mono)	A - Excellent
Chlorobromomethane	A - Excellent
Chloroform	A - Excellent
Chlorosulfonic Acid	A - Excellent
Chromic Acid 10%	A - Excellent
Chromic Acid 30%	A - Excellent
Chromic Acid 5%	A - Excellent
Chromic Acid 50%	A - Excellent
Cider	A - Excellent
Citric Acid	A - Excellent
Copper Chloride	A - Excellent
Copper Cyanide	A - Excellent
Copper Nitrate	A - Excellent
Copper Sulfate 5%	A - Excellent
Cyclohexanone	A - Excellent
Detergents	A - Excellent
Dichloroethane	A - Excellent
Ethanol	A - Excellent
Ethanolamine	A - Excellent
Ethyl Acetate	A - Excellent
Ethyl Chloride	A - Excellent
Ethylene Dichloride	A - Excellent
Ethylene Glycol	A - Excellent
Fatty Acids	A - Excellent
Ferric Sulfate	A - Excellent
Ferrous Sulfate	A - Excellent
Freon 113	A - Excellent
Freon TF	A - Excellent
Fruit Juice	A - Excellent
Gasoline (high-aromatic)	A - Excellent
Gasoline, leaded, ref.	A - Excellent
Glycerin	A - Excellent
Hydrogen Peroxide 100%	A - Excellent
Hydrogen Sulfide (aqua)	A - Excellent
Ink	A - Excellent
Kerosene	A - Excellent
Ketones	A - Excellent
Lactic Acid	A - Excellent
Lead Acetate	A - Excellent
Lye: Ca(OH)2 Calcium Hydroxide	A - Excellent
Lye: NaOH Sodium Hydroxide	A - Excellent
Magnesium Carbonate	A - Excellent
Magnesium Chloride	A2 - Excellent

CHEMICAL	COMPATIBILITY
Magnesium Hydroxide	A - Excellent
Magnesium Nitrate	A - Excellent
Magnesium Sulfate	A - Excellent
Mercuric Chloride (dilute)	A - Excellent
Mercuric Cyanide	A - Excellent
Mercurous Nitrate	A - Excellent
Mercury	A - Excellent
Methanol (Methyl Alcohol)	A - Excellent
Methyl Alcohol 10%	A - Excellent
Methyl Ethyl Ketone	A - Excellent
Milk	A - Excellent
Molasses	A - Excellent
Motor oil	A - Excellent
Naphthalene	A - Excellent
Nickel Chloride	A - Excellent
Nickel Nitrate	A - Excellent
Nickel Sulfate	A - Excellent
Nitric Acid (20%)	A - Excellent
Nitric Acid (50%)	A - Excellent
Nitric Acid (5-10%)	A - Excellent
Nitric Acid (Concentrated)	A - Excellent
Oils: Castor	A - Excellent
Oils: Cottonseed	A - Excellent
Oils: Linseed	A - Excellent
Oils: Mineral	A - Excellent
Oils: Olive	A - Excellent
Oleic Acid	A - Excellent
Oxalic Acid (cold)	A - Excellent
Paraffin	A - Excellent
Perchloroethylene	A - Excellent
Phenol (10%)	A - Excellent
Phenol (Carbolic Acid)	A - Excellent
Phosphoric Acid (>40%)	A - Excellent
Phosphoric Acid (540%)	A - Excellent
Photographic Developer	A - Excellent
Plating Solutions, Indium Sulfamate Plating R.T.	A - Excellent
Plating Solutions, Lead Fluoborate Plating	A - Excellent
Plating Solutions, Rhodium Plating 120 F	A - Excellent
Potassium Bicarbonate	B - Good
Potassium Chlorate	B - Good
Potassium Chromate	B - Good
Potassium Dichromate	B - Good
Potassium Ferricyanide	B - Good
Potassium Ferrocyanide	B - Good
Potassium Iodide	B - Good
Potassium Nitrate	B - Good
Potassium Oxalate	A - Excellent
Potassium Permanganate	A - Excellent
Potassium Sulfate	A - Excellent
Potassium Sulfide	A - Excellent

CHEMICAL	COMPATIBILITY
Propylene Glycol	A - Excellent
Pyridine	A - Excellent
Soap Solutions	A - Excellent
Sodium Acetate	A - Excellent
Sodium Bicarbonate	A - Excellent
Sodium Bisulfate	A - Excellent
Sodium Bisulfite	A - Excellent
Sodium Borate (Borax)	A - Excellent
Sodium Carbonate	A - Excellent
Sodium Chlorate	A - Excellent
Sodium Chloride	A - Excellent
Sodium Cyanide	A - Excellent
Sodium Ferrocyanide	A - Excellent
Sodium Fluoride	A - Excellent
Sodium Hydroxide (20%)	A - Excellent
Sodium Hydroxide (50%)	A - Excellent
Sodium Hydroxide (80%)	A - Excellent
Sodium Hypochlorite (<20%)	A - Excellent
Sodium Hypochlorite (100%)	A - Excellent
Sodium Nitrate	A - Excellent
Sodium Silicate	A - Excellent
Sodium Sulfate	A - Excellent
Sodium Sulfide	A - Excellent
Stannic Chloride	A - Excellent
Stannous Chloride	A - Excellent
Starch	A - Excellent
Sulfuric Acid (<10%)	A - Excellent
Sulfuric Acid (10-75%)	A - Excellent
Sulfuric Acid (75-100%)	A - Excellent
Sulfuric Acid (hot concentrated)	A - Excellent
Tannic Acid	A - Excellent
Tartaric Acid	A - Excellent
Tetrahydrofuran	A - Excellent
Toluene (Toluol)	A - Excellent
Trichloroacetic Acid	A - Excellent
Trichloroethylene	A - Excellent
Triethylamine	B - Good
Turpentine	A - Excellent
Urea	B - Good
Vegetable Juice	A - Excellent
Vinegar	A - Excellent
Vinyl Acetate	B - Good
Vinyl Chloride	A - Excellent
Water, Acid Mine	A - Excellent
Water, Deionized	B - Good
Water, Fresh	A - Excellent
Water, Salt	B - Good
Weed Killers	B - Good
Whiskey & Wines	A - Excellent
Xylene	A - Excellent

Ratings - Chemical Effect
A - Excellent
B - Good. Minor Effect, slight corrosion, or discoloration.

Piano di Campionamento (UNI ISO 2859)

LIVELLO	LQA
L2	1

Fig.

Material/Materiale

General tolerance for machining / Tolleranze generali per lavorazioni meccaniche

Filing Room Archivio	Coord.Punching N.C. mach. Coord. punzon. a C.N. JS11	Quality for linear dimension Qualità per quote lineari	Extra fine / Fine	±0.2
Thread quality tolerance Tolleranzo filetti qualità "6g-6G" UNI 5541-65			Medium / Media	±0.3
			Coarse / Grossolano	±0.5

N° Series / Serie

Finishing / Finitura

Prep. Dis.	G. Forlani
App. App.	P. Guizzetti
Resp. Dep. Uff. Resp.	Uff. Tecnico

Rev./Mod.		
0	07.11.2013	: Emissione nuovo disegno

ELECTRONSYSTEM MD S.r.l.

Title
Titolo

Gas density/pressure transmitter SGM/ABS/XX

Apparatus
Apparecchio

43911147

Doc. No.
N° Doc.

Scale
Scala 1:1

Sh. No.
N° pag. 8

Long.
Lungo

All specs are subject to change without notice

STORAGE

If the complex must be storage before use, please keep dry and repaired.
Do not leave outdoor.
Device is strongly sensitive to humidity hence avoid to store where relative humidity is more than 90%

STORAGE TEMPERATURE: -30°C ÷ +70°C
RELATIVE HUMIDITY: max 90% @ +40°C

MAINTENANCE

Maintenance of transmitter must be done compulsory in factory. We recommend every 5 years to send back transmitter for calibration check and inspection.

WARRANTY

Device is covered by 24 months after installation or max 36 months after delivery.
In case of service the transmitter must be sent back to factory for inspection.

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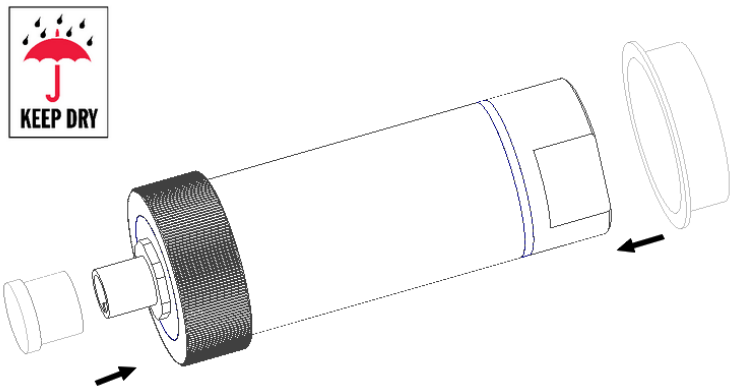
SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter

WARNINGS

CAUTION
Do not drop or hit the transmitter. The sensor is fragile and may break from sudden shock.
When transporting the transmitter, use the original shipping box from Electronsystem MD.

NOTE
Keep the transmitter dry and clean.
Do not remove the transparent transport protection caps before you are ready to install the transmitter.



NOTE
Connect the transmitter directly to the main SF_6 gas volume, not behind a sampling line because this is the area where high humidity tends to accumulate and where the temperature of gas is not the imagine of gas near breaker.
The use of original cable wiring is advised to have the better protection performances.

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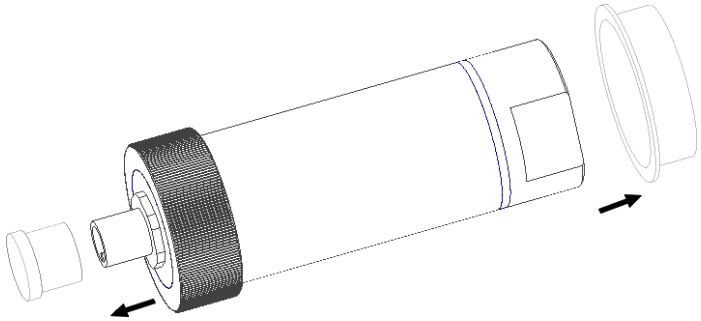
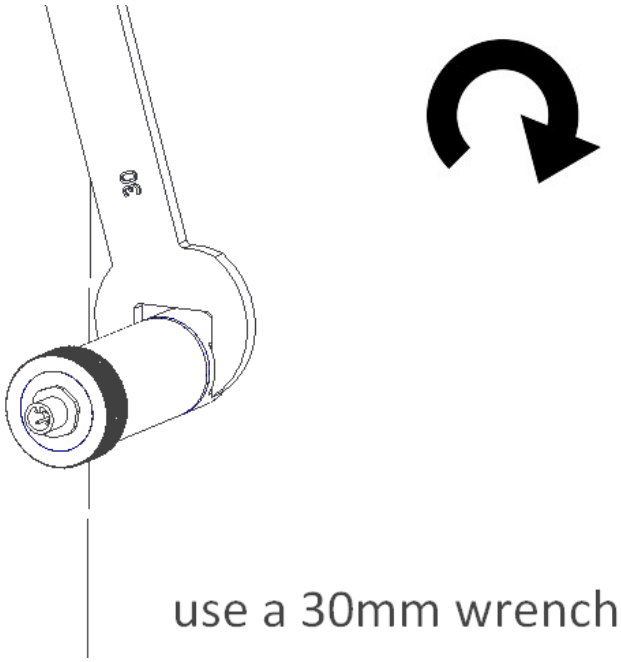
SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter

INSTALLATION

1. Remove the transparent transport caps when you are ready to install the transmitter. Check o-ring is clean without dust and properly assembled.



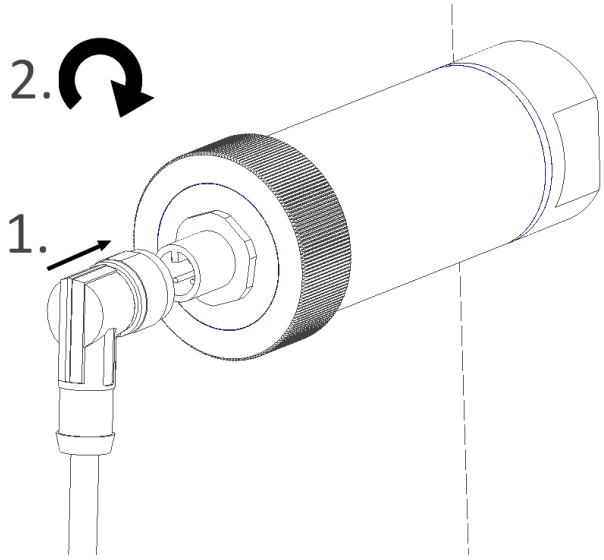
2. Install the transmitter to the mechanical coupling and tighten gently by hand. Then use a 30mm wrench to tighten the connection. Use a sufficient force to achieve a tight installation (recommended 10-15Nm) . The system must be leak-free for accurate measurement.



Via Madonna delle Rose, 72 24061 Albano S.Alessandro (BG) ITALY - Phone +39035584000, Fax +39035584099 E-mail: info@elecmd.it Web www.elecmd.it

SF_6 /Dry-Air Gas density - Oil & Gas pressure transmitter

3. Connect proper circular wiring into the output port checking the correct polarization of the connector then turn firmly the rotating crown of the cable.
   Use a cable with a suitable outdoor IP67 connector for your installation (straight or angled)



4. In case the weather shield is needed (optional), can be added to the transmitter by fitting the two rubber clamps on the body of transmitter and tightening to assure it can remain in place.
   Assure that the stainless roof completely cover the transmitter and the cable connection.