



Black globe temperature sensor (Tg)

User manual



Revisions list

<i>Issue</i>	<i>Date</i>	<i>Description of changes</i>
Origin	02/05/2024	
1	08/07/2024	Updated schematic drawing of the DMA131A sensor

About this manual

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1 Introduction

The standard globe thermometer consists of a black-painted copper sphere with a diameter of 150 mm and a thickness of 0.4 mm. It contains a thermometer with its bulb at the centre of the sphere. Designed as described in the ISO7726 standard Annex B, the main scope of the globe temperature measurement in meteorological applications is the possibility of estimate the Mean Radiant Temperature (T_{mr}) which is one of the most important meteorological parameters governing human energy balance in the thermal comfort and heat stress applications.

2 Technical features

PN	EST131	DMA131A	DMA131.1	PRTEA4922 PRTEA4922.1
Connector	Mini-Din	None (free 4-wires)	Male connector for DWA5nnA cables	M5-4
Cable	L=1 m + connector	L=5 m	L=5 m + connector	L=2 m + connector
Output	Pt100 DIN-IEC 751 table (EN 60751)			Digital I ² C
Principle	Pt100 DIN-A (Class A EN60751), RTD 4-wires			High-precision digital
Accuracy	0.15°C			±0.10°C @ -20÷50°C ±0.15°C @ 50÷70°C ±0.20°C @ 70÷80°C
Power supply	-			3.3 V
Power consumption	-			Max 500 µA
Data logger compatibility	M-Log	E-Log, Alpha-Log		Alpha-Log (PRTEA4922) Sphensor (PRTEA4922.1)

Common technical specifications

Black globe temperature	Paint emissivity	0.98
	Measuring range	-20÷80°C
	Response time	20 min
	Accuracy	0.1°C (@0°C)
	Output	Pt100 DIN-IEC 751 table (EN 60751)
	Resolution	0.01°C
General information	Standard	ISO7726:2002
	Protection	IP66
	Material	Copper
	Operative temperature	-40÷80°C
	Mounting	On BVA305-BVA315 stands

3 Installation

3.1 General safety rules

Please read the following general safety rules in order to avoid injuries to people and prevent damages to the product or to possible other products connected with it. In order to avoid any damages, use this product exclusively according to the instructions herein contained.

The installation and maintenance procedures must be carried-out only by authorized and skilled service personnel.

Power the instrument in a suitable manner. Pay attention and observe the power supplies like indicated for the model in your possession.

Carry-out all connections in a suitable manner. Pay strict attention to the connection diagrams supplied with the instrument.

Do not use the product in case of suspected malfunctions. In case of suspected malfunction, do not power the instrument and contact authorized technical support immediately.

Before you carry-out any operation on electrical connections, power supply system, sensors and communication apparatus:

- Disconnect the power supply.
- Discharge the accumulated electrostatic discharges touching an earthed conductor or apparatus.

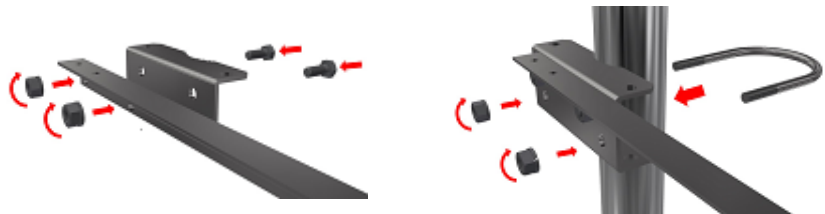
For safety regulations please refer to manual INSTUM_05290.

3.2 Mechanical installation

Black globe temperature sensors can be installed on pole, by means of DYA032 stand and DYA049 collar, or on tripod BVA304, using three different types of stands: BVA305, BVA315 or BVA320.

3.2.1 Installation on pole

1. Fix the DYA032 support to the DYA049 collar and mount them on pole.



2. Fix the Tg sensor to the DYA032 holder using the M5 screw provided.



3.2.2 Installation on tripod

1. Place tripod BVA304 at the place chosen to take measurements.
2. Screw the stand BVA305/BVA315/BVA320 to the tripod.
3. Fix the sensor to the stand using the N5 knurled knob supplied with the stand.

Below are some installation examples:



Tripod with stand BVA305



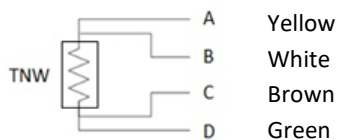
Tripod with stand BVA315



Tripod with stand BVA320

3.3 Electrical connection

Wiring connections must be performed as a 4-wires Pt100 (DMA131A and DMA131.1 only), as indicated below:



ANNEX 1 shows the connection diagrams of the various sensors.

3.4 Use with LSI LASTEM data logger

If the sensor is used with an LSI LASTEM data logger, proceed with the configuration of the data logger using the 3DOM software:

- Open the data logger configuration.
- Add the sensor by selecting its code (eg DMA131A) from the *3DOM Sensor Library*.
- Check the acquisition parameters (input, rate, etc.)
- Save the configuration and send it to the data logger.

For more information about the configuration, refer to the manual of the data logger in use.

4 Operational check

4.1 Check black globe emissivity

To verify the emissivity of the black globe, a comparison can be made between measurements taken with the current sphere and those taken with a new MC2509 sphere (see spare part list), used solely for comparison purposes. The procedure involves comparing the final black globe temperature recorded before the sphere's removal with the temperature measured after 20 minutes using the new MC2509 sphere. It is crucial that the air temperature and irradiance levels remain consistent, for 20 minutes, with the last recorded values before the globe replacement. If the removed black globe has decreased in emissivity, the temperatures recorded with this sphere will be lower than those measured with the MC2509 sphere.

4.2 Check signal output (DMA121A and DMA131.1 sensors only)

Multimeter is required.

1. Set the multimeter to measure signals in resistance and 200 Ω scale.
2. Disconnect the wires from the data logger.
3. Connect A to one test lead of the multimeter and D to the other one. Read the resistance value on the multimeter and obtain the corresponding temperature value indicated in Tab. 1. For example, if the resistance value is 109 Ω , the corresponding temperature is approximately 23 $^{\circ}\text{C}$.
4. Repeat the previous step with wires B and C. The value read should be the one found between wires A and D.

$^{\circ}\text{C}$	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-20	92,160	91,767	91,374	90,980	90,587	90,193	89,799	89,405	89,011	88,617
-10	96,086	95,694	95,302	94,910	94,517	94,125	93,732	93,339	92,946	92,553
0	100,000	99,609	99,218	98,827	98,436	98,045	97,653	97,262	96,870	96,478
$^{\circ}\text{C}$	0	1	2	3	4	5	6	7	8	9
0	100,000	100,391	100,781	101,172	101,562	101,953	102,343	102,733	103,123	103,513
10	103,902	104,292	104,681	105,071	105,460	105,849	106,238	106,627	107,016	107,404
20	107,793	108,181	108,570	108,958	109,346	109,734	110,122	110,509	110,897	111,284
30	111,672	112,059	112,446	112,833	113,220	113,607	113,994	114,380	114,767	115,153
40	115,539	115,925	116,311	116,697	117,083	117,469	117,854	118,240	118,625	119,010
50	119,395	119,780	120,165	120,550	120,934	121,319	121,703	122,087	122,471	122,855
60	123,239	123,623	124,007	124,390	124,774	125,157	125,540	125,923	126,306	126,689
70	127,072	127,454	127,837	128,219	128,602	128,984	129,366	129,748	130,130	130,511
80	130,893	131,274	131,656	132,037	132,418	132,799	133,180	133,561	133,941	134,322
90	134,702	135,083	135,463	135,843	136,223	136,603	136,982	137,362	137,741	138,121
100	138,500	138,879	139,258	139,637	140,016	140,395	140,773	141,152	141,530	141,908
110	142,286	142,664	143,042	143,420	143,797	144,175	144,552	144,930	145,307	145,684
120	146,061	146,438	146,814	147,191	147,567	147,944	148,320	148,696	149,072	149,448

Tab. 1- Correspondence table $^{\circ}\text{C} \rightarrow \Omega$.

After check, reconnect the wires to the data logger.

5 Maintenance

The only required maintenance is regular cleaning of the copper black sphere. This can be performed by spraying clean water onto the globe and then wiping it down with a cotton cloth to remove any dust and dirt stains.

Calibration of the sensor is recommended every two years.

6 Handling

The product, or part of it, is fragile, avoid mechanical shocks, abrasions or scratches on the surface and globe.

7 Storage, packaging, preservation, delivery

For storage and preservation, respect the temperature ($-20\div 80$ °C) limits. Avoid direct sun exposure.

For delivery and storage, use the packaging supplied with the product.

Upon receipt of the material, visually check the package for signs of crushing or perforation; in the presence of these signs, check the integrity of the product inside.

8 Disposal

This product is a device with high electronic content. In accordance with the standards of environmental protection and collection, LSI LASTEM recommends handling the product as waste of electrical and electronic equipment (RAEE). For this reason, at the end of its life, the instrument must be kept apart from other wastes.

LSI LASTEM is liable for the compliance of the production, sales and disposal lines of this product, safeguarding the rights of the consumer. Unauthorized disposal of this product will be punished by the law.



Recycle or dispose of the packaging material according to local regulations.

9 Accessories and spare parts

Code	Description
BVA304	Tripod
BVA305	Arm for fixing sensors on BVA304 tripod
BVA315	Arm for fixing sensors on BVA304 tripod
BVA320	Arm for fixing sensors on BVA304 tripod or on wall
DYA032	Arm for fixing DMA131A, DMA131.1 and PRTEA4922 sensors on DYA049 collar
DYA049	Mast-mounting collar for $\varnothing$ 45...65 mm pipe
DWA505A	Cable L=5 m for DMA131.1
DWA510A	Cable L=10 m for DMA131.1
DWA525A	Cable L=25 m for DMA131.1
SVICA0103	ISO9001 type calibration certificate
SVACA0105	ISO17025 type calibration certificate
DEA420.1	Signals converter: Output: $4\div 20$ mA. Power supply: $10\div 30$ V AC/DC More information on MW9008-ENG-04-Sensors-conditioningCatalogue
MDMMA1010.1	Same feature as DEA420.1 except the output that is RS-485 Modbus-RTU
MC2509	Copper Black Sphere (spare part)

10 How to contact LSI LASTEM

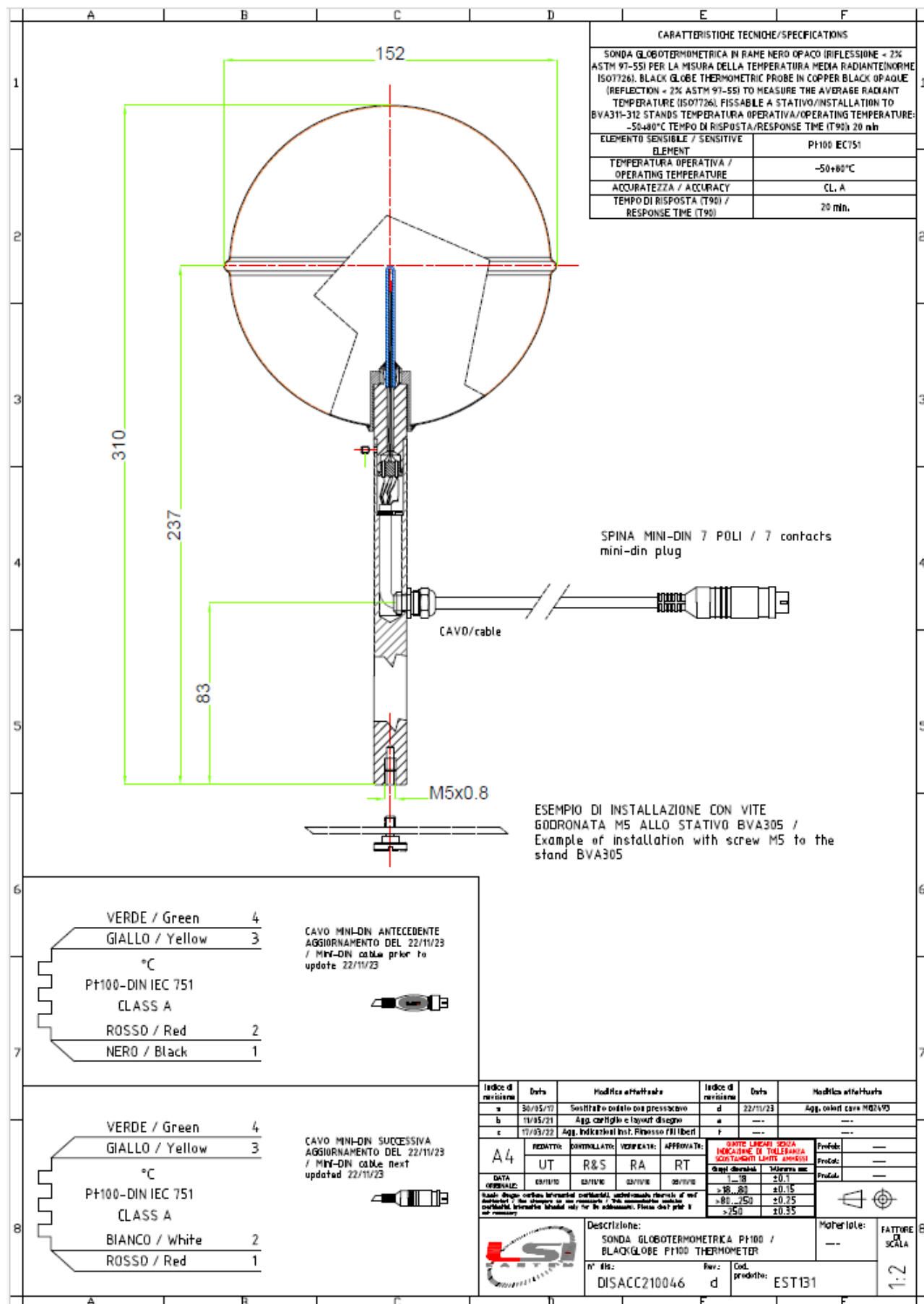
In case of problem contact the technical support of LSI LASTEM sending an e-mail to support@lsi-lastem.com or compiling the technical support request module at www.lsi-lastem.com.

For further information refer to addresses and numbers below:

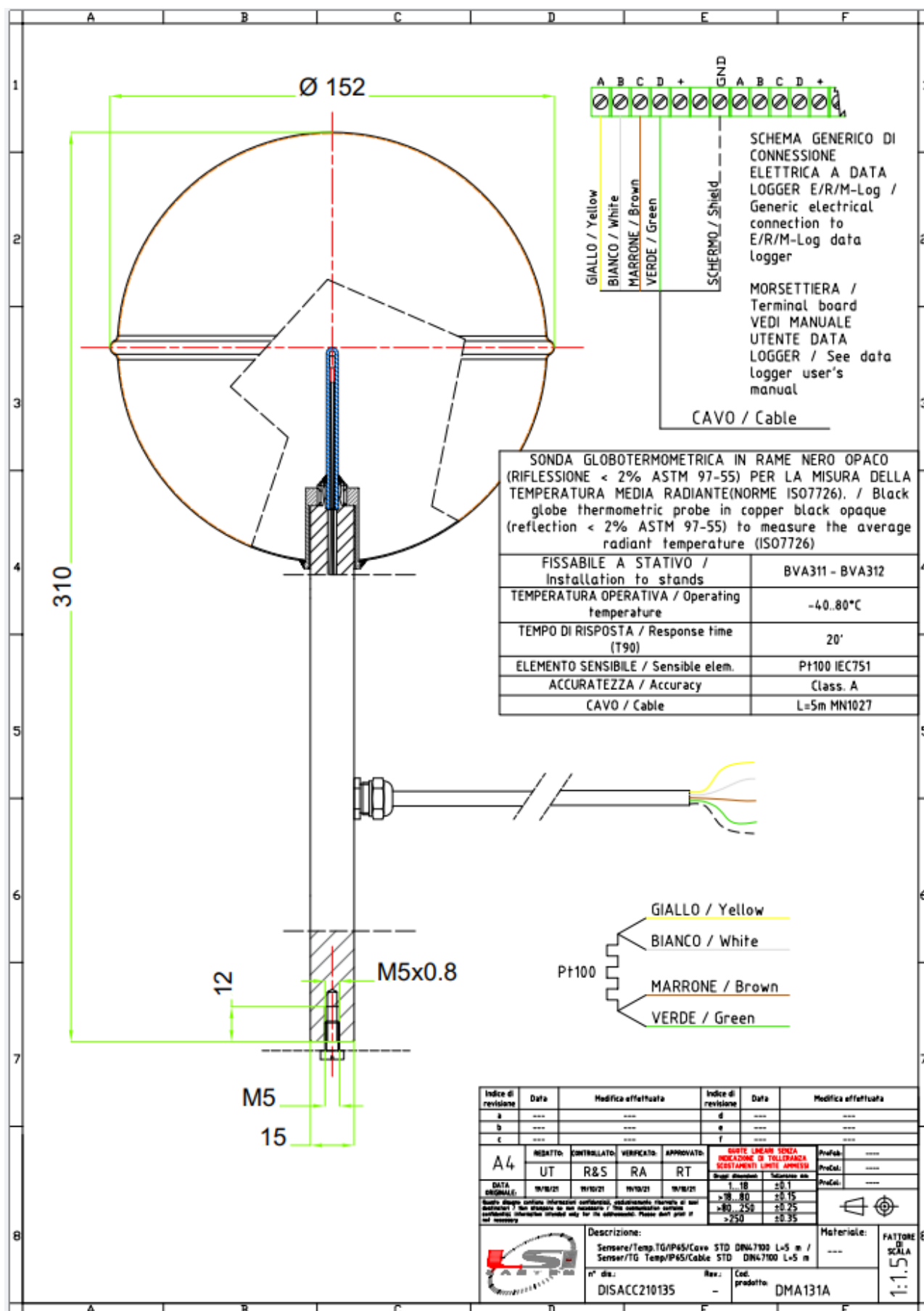
- Phone number +39 02 95.414.1 (switchboard)
- Address: Via ex S.P. 161 – Dosso n. 9 - 20049 Settala, Milano
- Web site: www.lsi-lastem.com
- Commercial service: info@lsi-lastem.com
- After-sales service: support@lsi-lastem.com, Repairs: riparazioni@lsi-lastem.com

11 ANNEX 1

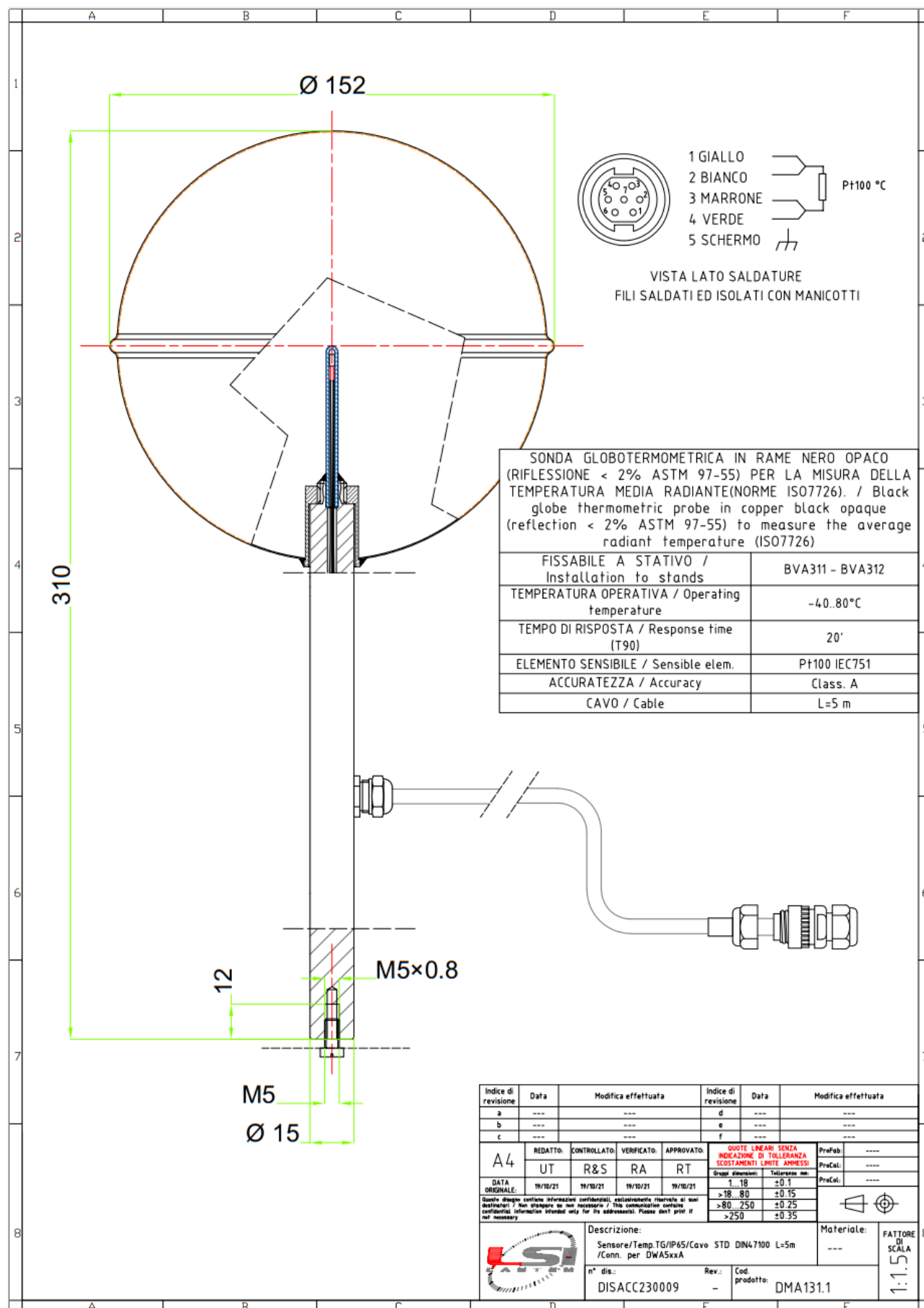
11.1 EST131 sensor schematic drawing



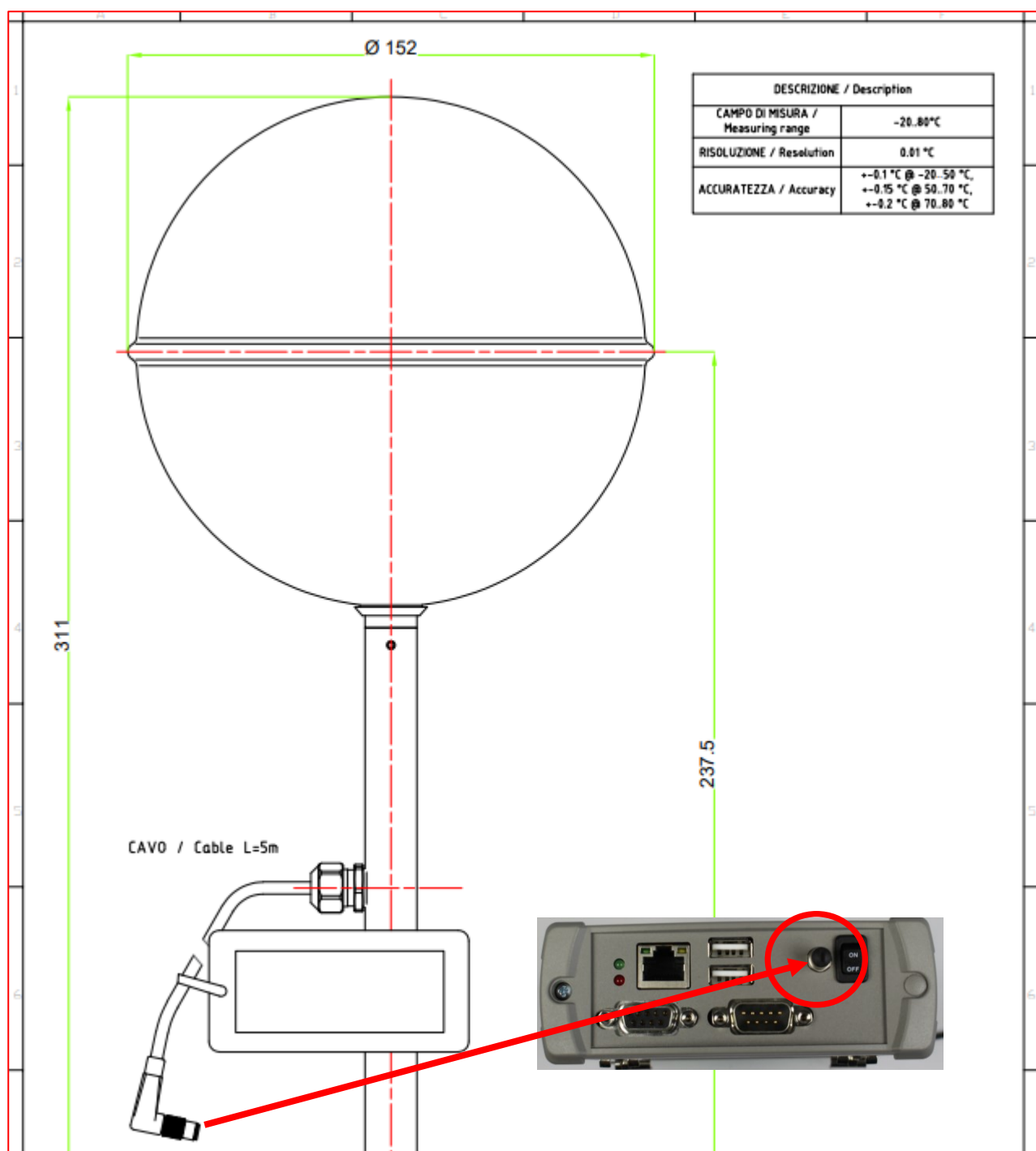
11.2 DMA131A sensor schematic drawing



11.3 DMA131.1 sensor schematic drawing



11.4 PRTEA4922 sensor schematic drawing to Alpha-Log data logger



11.5 PRTEA4922.1 sensor schematic drawing

