

Procedure No. DZP.26.3.2026

Appendix No. 1 to the Announcement of intention to award a contract-

DESCRIPTION OF THE SUBJECT MATTER OF THE ORDER (hereinafter referred to as the "DSO")

I. General Information

The subject of the order is the delivery of a multi-channel measurement system for strain gauge, temperature and other signals, with the parameters specified in Section II of the DSO.

II. Technical Requirements for the system

1.	Number of measurement channels	<p>128 measurement channels (grouped into 16 cards with 8 channels each), including:</p> <ul style="list-style-type: none">• 120 channels (15 cards) of strain gauge type ($\frac{1}{4}$ bridge, $\frac{1}{2}$ bridge, full bridge configurations)• 8 channels (1 card) of DC type (± 10 V) <p>One of the strain gauge cards shall be interchangeable with an additional DC measurement card (± 10 V) and with a thermocouple (TC) card (at least type K). The replacement shall be user-performable and shall not result in any loss of calibration nor require re-calibration of the system. The interchangeable items (1 DC card and 1 TC card) shall be supplied by the Contractor as part of this Order.</p>
2.	Maximum permissible measurement error	<ul style="list-style-type: none">• For strain gauge measurements:<ul style="list-style-type: none">- $\pm 2 \mu\text{m/m}$ for strain values up to $800 \mu\text{m/m}$;- $\pm 0.25\%$ of measured value for strain values above $800 \mu\text{m/m}$;• For DC voltage measurements:<ul style="list-style-type: none">- $\pm 1 \text{ mV}$ for voltage values up to 0.5 V;- $\pm 0.2\%$ of measured value for voltage values above 0.5 V;• For thermocouple temperature measurements: not greater than $\pm 2^\circ\text{C}$.
3.	Sampling	<ul style="list-style-type: none">• Simultaneous sampling of all measurement channels with a software-configurable sampling rate, from 10 samples/s to 1000 samples/s• Ability to set a data recording rate to file lower than the sampling rate, while maintaining continuous real-time monitoring of the measured quantities• Capability for manual stepwise logging of individual samples and saving them collectively in a single file, while maintaining continuous real-time monitoring• Capability for automatic data logging only upon exceeding predefined thresholds, while maintaining continuous real-time monitoring• The above-mentioned sampling and logging modes shall be available as standard functionalities of the main application

		and shall not require user-developed scripts or custom add-ons.
4.	Required capability to connect transducers	<ul style="list-style-type: none"> Strain-gauge transducers with nominal resistances of 120 Ω, 350 Ω and 1000 Ω, in quarter-bridge, half-bridge and full-bridge configurations. <ul style="list-style-type: none"> For each of the above types, bridge excitation voltages of 1 V, 2 V, 5 V and 10 V DC shall be available (the nominal value may deviate by ± 0.5 V). The excitation voltage shall be software-configurable individually for each channel. Potentiometric-type transducers, with excitation voltage of at least 12 V DC. Transducers with an output voltage signal of ± 10 V DC. Thermocouple transducers, at least type K thermocouples. The capability to connect the above-specified transducers shall be integrated into the system and shall not require the use of any additional external devices or intermediate components. In the case of connecting single strain gauges (120 Ω, 350 Ω, 1000 Ω), completion to a full-bridge configuration shall be performed by means of internal completion resistors, permanently incorporated into the internal circuits of the system modules.
5.	Standards of signal connections	For non-standard required connector types (e.g. dedicated terminals connecting multiple channels), it shall be required to deliver a complete set of connectors for all supplied modules, plus one additional spare set for each module type.
6.	Outputs	At least one software-controlled output of relay type (NC or NO) or with an analog output signal of 0–5 V DC shall be provided. Control of the output shall be performed within the settings of the main application, without the need to create additional scripts, virtual (computational) channels or monitoring channels. It is required that the output state can be correlated with the exceeding of predefined limit values.
7.	Software	<p>Functions integrated in the measurement system:</p> <ul style="list-style-type: none"> Numerical and graphical real-time presentation of measurement results, including plots as a function of time and plots as a function of another measurement signal. Real-time reduction of strain-gauge measurements from rosettes of 0°–45°–90° and 0°–60°–120° types, including principal strains, principal stresses, principal directions, equivalent stresses, etc. Creation and real-time presentation of computational variables based on the measured values. Compensation for the transverse sensitivity of strain gauges. Capability for real-time correction of the strain gauge factor due to temperature changes, when SG+TC transducers are used. For non-linear strain-gauge configurations (quarter-bridge, Poisson half-bridge, Poisson full-bridge), real-time

		<p>non-linearity correction integrated with the respective configuration type.</p> <ul style="list-style-type: none"> • The above-specified functionalities shall be implemented in the main application and shall not require the creation of additional scripts or the creation and implementation of correction characteristics in virtual (computational) channels. • Post-processing of data (numerical and graphical review, filtering, conversion and export to other formats, including text-based formats) within the main application or by means of an additional application supplied as part of the system. <p>The software license shall not be subject to any time limitations.</p>
8.	Other	<p>For all specified strain-gauge resistances, Shunt Calibration verification shall be performed by means of internal shunt calibration resistors, integrated into the circuits of the system modules.</p>

III. Delivery Requirements

1. The Contractor shall deliver the offered multi-channel measurement system to the premises of the Contracting Authority: Łukasiewicz Research Network – Institute of Aviation, al. Krakowska 110/114, 02-256 Warsaw, to the location specified by the Contracting Authority. Delivery shall include the following activities:
 - 1) Delivery of the equipment to the Contracting Authority's premises;
 - 2) An on-site implementation training for up to five (5) employees of the Contracting Authority, at a date agreed by the Parties, with a duration of no less than eight (8) clock hours.
2. The delivery shall be carried out using the Contractor's own means of transport (or transport arranged at the Contractor's expense). The Contractor shall bear full responsibility for any damage to the subject matter of the contract, including accidental loss or destruction, arising during transport.
3. The delivery date shall be coordinated with the Contracting Authority at least ten (10) working days in advance.
4. The bid price shall include all costs necessary for the proper performance of the subject matter of the contract, including, but not limited to: transport, transport insurance, training of the Contracting Authority's personnel, applicable customs duties, taxes, and any other public charges (where applicable), as well as the costs related to the warranty.
5. The subject matter of the contract shall be delivered by the Contractor to the registered office of the Contracting Authority, together with documentation necessary for the proper use of the delivered equipment, in either Polish or English. The documentation shall include, in particular:
 - 1) A CE Declaration of Conformity or equivalent;
 - 2) Operating instructions and/or technical and operational documentation;
 - 3) Technical specifications of the device;

- 4) Warranty documentation. If the Contractor provides a warranty document containing provisions less favourable to the Contracting Authority than those stipulated in the Civil Code or in the Agreement (Annex No. 3 to the ToR), the provisions of the Civil Code and the aforementioned Agreement shall prevail. .
6. The delivered multi-channel measurement system must be brand new.
7. The subject of the Contract shall include training of the Contracting Authority's employees, including training in the basic operation and use of the equipment. The training shall have both a theoretical and practical character and shall include, at a minimum, presentation of the operating principles of the equipment, the possibilities for using its functions, and practical operation of the equipment. The Contractor shall be obliged to conduct implementation training for employees designated by the Contracting Authority (max. 5 employees).
8. The Acceptance Protocol shall be signed by the Contracting Authority following successful verification of the delivery, which shall include:
 - 1) Verification of the completeness of the delivery;
 - 2) Verification of the completeness of the documentation;
 - 3) Confirmation of the equipment's compliance with this DSO;
 - 4) Confirmation that the required training has been delivered.

IV. Warranty and Service

1. Guarantee
 - 1.1. The minimum full guarantee period for the subject matter of the contract shall be 12 months, commencing from the date of signing the Acceptance Protocol.
 - 1.2. The Contractor shall provide guarantee documentation in Polish or English, delivered together with the subject matter of the contract.