

Information Notice, belongs to the European open tender for a HPHT Triaxial Apparatus, Ref. WS3011436760, dated 10 March 2026

Date : 02.04.2026

Questions about the European Public procurement tender procedure and/or the European Public procurement tender documents can be asked until no later than the closing date of the 'Closing date for

No.	Section nr. / subject	Questions Tenderer	Answers TNO
1	Requirement 8.1.4	Requirement 8.1.4 - P-T means Pressure and Temperature? Do you require to do tests at 140 Mpa and 200°C? if not which maximum pressure you need to generate above 150°C	Yes, P-T means Pressure and Temperature and yes we do require to do tests at 140 Mpa and 200°C.
2	Requirement 8.1.6	Requirement 8.1.6 - please provide the specimen stiffness (min/max)	Specimen stiffness ($K = E \cdot A/L$) for our standard 25.4 mm diameter \times 50.8 mm length geometry ranges from approximately 24 kN/mm (minimum — HPHT-degraded class G cement, $E \approx 1$ GPa) to approximately 1900 kN/mm (maximum — peridotite, $E \approx 190$ GPa). Failure (UCS and triaxial strength) tests will not be performed on materials with $E > \sim 80$ GPa; testing will be limited to elastic regime measurements and sub-failure protocols. For reference, our standard strain rate target is 10^{-5} s^{-1} , which corresponds to a displacement rate of about 0.50 $\mu\text{m/s}$ for our standard specimens — well within the specified range of 0.1 $\mu\text{m/s}$ to 0.1 mm/s. The full specified range corresponds to strain rates of $2 \times 10^{-6} \text{ s}^{-1}$ to $2 \times 10^{-3} \text{ s}^{-1}$, which covers all our intended test protocols from slow creep weak material to rapid brittle loading of stiff rocks.
3	Requirement 8.1.7	Requirement 8.1.7 - how many axial and how many radial measurement points you need?	The ealier published answer "We need at least 1 axial and 1 radial measurement point" (in the Memorandum of Information dated 24 March 2026) to question 3 was incorrect and has been changed. The correct answer to question 3 is: "We need at least 2 axial and 1 radial measurement point."
4	Requirement 8.1.9	Requirement 8.1.9 - you required ultrasonic measurement system + 6 acoustic emission sensors? Please provide exact details about the UT system please provide exact details about the required positions of the 6 acoustic emission sensors	We do not require ultrasonic measurement system or accoustic emission system. We require that there is enough electrical feedthroughs to accommodate an ultrasonic measurement system (at least 2 for top and bottom transducers) and at least 6 acoustic emissions sensors (to be place lateraly). The requirement is about the feedthroughs not the UT or AE systems.
5	Requirement 8.1.15	Requirement 8.1.15 - How the frame stiffness is to be documented? please provide details of acceptance of documentation	Manufacturer's Declared Value: - Frame stiffness in kN/mm or MN/mm, measured between the crosshead and the actuator platen (or between platens), at the rated load capacity. - Must be stated for the full load train (frame + load cell + platters + any adapters), not just the frame column alone. Calibration / Verification Method: how frame stiffness is measured. Accepted methods include: - Dead weight / hydraulic loading against a calibrated steel reference specimen of known stiffness (back-calculation) - Strain-gauged reference block (direct measurement of deformation under load) - Compliance correction curve supplied with the apparatus, relating apparent to true displacement at different load levels.
6	Preference 8.2.1 c	Preference 8.2.1 c - which pore pressure fluids must be considered for the corrosion resistance?	Most conditions can be simulated by water but it is always a nice option to have more possibilities, so TNO considers at least Water, but Formation brine, CO2 (liquid), CO2-saturated formation Brine, Alkaline brine, H2-saturated water, H2-saturated formation brine would be nice.
7	Preference 8.2.2	Preference 8.2.2 - between 15 mm to 87 mm diameter with a height ratio of 2:1?	Nowhere is written: "between 15 mm to 87 mm diameter with a height ratio of 2:1". Preference 8.2.2 is about having the capability to test samples of 1.5" (= inches) or 38.1 mm diameter and a length to diameter ratio of at least 2:1.

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8	Requirement 8.1.3	Loading Frame Stiffness Could you please indicate the required stiffness of the loading frame? You mentioned the stiffness of the sample, however specifying a target value for the frame stiffness would provide clearer guidance. Would a stiffness of approximately 4500 kN/mm (about 2.5 times the average specimen stiffness) be considered sufficient?	The required system stiffness is not a fixed threshold but depends on the type of experiment and material being tested. TNO acknowledges that total system compliance governs post-peak behaviour, not frame stiffness alone. For sub-failure elastic and acoustic measurements, system stiffness is not a governing constraint. For failure and post-peak characterisation, the required stiffness depends on the stiffness of the specimen being tested, which varies significantly across our intended material range. Rather than prescribing a minimum stiffness value, TNO requires tenderers to declare the stiffness of their complete load train at rated load, describe the post-peak behaviour and relaxation characteristics of their system, and detail any compliance correction methodology implemented in the control software or hardware. This information will allow TNO to adapt testing procedures and apply appropriate corrections where necessary.
9	Requirement 8.1.19	Signal Feedthroughs A. Please clarify the exact number of axial displacement sensors required for internal sample measurements. In Item 3 of the amendment (Questions & Answers released on 10.03.2026), it is mentioned that at least one axial measurement point is required. Could you please confirm whether one axial sensor is sufficient? B. Since the apparatus shall support in-situ ultrasonic measurements, could you please specify whether the ultrasonic system to be used is: a. P/S, or b. P/S1/S2 configuration? c. The number of required electrical feedthroughs differs significantly between these configurations. C. You mentioned up to 4 strain gauges. Could you please clarify the intended purpose or application of these strain gauges? D. Should the tenderer provide all required feedthrough connectors for these systems, or is it sufficient to provide sealed ports (with dummy caps) in the triaxial cell for later installation of ultrasonic or acoustic emission systems or additional temperature sensor? E. For the acoustic emission and ultrasonic systems, do you require: a. 4-pin electrical feedthroughs, or b. coaxial feedthroughs?	A) Two internal axial displacement measurement points, measured along the specimen axis is sufficient as a minimum. B) We do not prescribe a specific ultrasonic configuration or connector standard at this stage, as the external ultrasonic system will be selected separately at a later date. The tenderer shall provide sufficient feedthrough ports at both end caps to support at minimum a P/S1/S2 configuration. Tenderers shall declare: (i) the number of feedthrough ports provided at each end cap; (ii) the connector type/standard and pin count. All feedthroughs, shall be rated to the full cell working pressure and temperature. . C) The up to 4 strain-gauge channels are intended for optional local strain measurements on the specimen (axial and/or circumferential gauges or rosettes) and/or on internal fixtures. These channels require multi-pin electrical feedthroughs (not coaxial), rated to full working pressure and temperature. D) It is sufficient to provide pressure-rated sealed feedthroughs/ports (with dummy caps) to allow later installation of UT, AE, and additional temperature sensors. Supplying the full external sensor systems is not required. All feedthroughs and dummy caps, including unpopulated ports, shall be rated to the full cell working pressure and temperature. Tenderers shall specify the connector type/standard used and confirm that mating connectors are commercially available. E) The tenderer shall declare what feedthrough types (coaxial, multi-pin, or mixed) are provided and their specifications (connector standard, pin count, impedance for coaxial, pressure and temperature rating). A flexible or modular feedthrough design is preferred, allowing the end user to adapt to commercially available ultrasonic, acoustic emission, and strain measurement systems at the time of instrument procurement. The tenderer shall confirm whether feedthrough inserts are field-replaceable without breaking cell pressure integrity. In responding to this requirement, tenderers are encouraged to propose a complete and coherent solution in which the feedthrough types, counts, and connector standards of the triaxial cell are matched to the ultrasonic and acoustic emission systems they propose or recommend. Where the tenderer proposes specific UT and/or AE instrumentation, the feedthrough specification shall be demonstrated to support simultaneous connection of all systems listed in the requirement (thermocouples, displacement sensors, UT, up to 6 AE sensors, up to 4 strain gauges) without conflict or port sharing that would prevent concurrent operation.
10	Requirement 8.1.10	Pressure Lines Could you please specify the number of pressure line feedthroughs required for Triaxial cell e.g. confining pressure, pore pressure (Top ,bottom)(Fluid/Gas)? Additionally, would you require separate pore pressure lines, for example one line dedicated to gas injection and another for liquid pore fluid, or would a single inlet and outlet line be sufficient?	Minimum expected pressure feedthrough capability through/at the triaxial cell: (1) one high-pressure connection for confining pressure, and (2) two pore-pressure connections (top and bottom) to enable independent control and/or flow-through/permeability testing (one can act as inlet and the other as outlet). Separate dedicated pore-pressure lines for gas vs. liquid service are not required; the same pore-pressure circuit may be used for both provided compatibility and safe purging/cleaning are ensured. Additional lines (e.g., separate circuits, drain/vent lines, or dedicated gas/liquid paths) may be proposed as added value.
11	Requirement 8.1.15	Documentation Should the documentation listed in this section be submitted together with the tender documents, or delivered together with the apparatus at the time of delivery?	The documentation listed in this section shall be provided in two stages: With the tender submission: datasheets and technical specifications, outline drawings with overall dimensions, footprint and weight, electrical supply requirements, declared frame stiffness (kN/mm) with measurement basis, and description of the sensor calibration approach. At delivery: full user and service manuals, Factory Acceptance Test (FAT) report including measured frame stiffness and sensor calibration records with traceability to national standards, individual calibration certificates for all displacement sensors, pressure transducers and load cells, pressure vessel test certificate, CE marking and Declaration of Conformity, spare parts list, and recommended maintenance schedule.
12	Requirement 8.1.17	Budget Could you please clarify whether the stated budget of €540,000 is inclusive of taxes, or exclusive of taxes?	The stated maximum price of €540,000 is indicative for the budget amount excluding VAT. Tenderers should quote prices excluding VAT and state VAT separately (if applicable).

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13	Requirement 8.1.20	Site Visit Is a site visit to the laboratory location before submission of the tender required or recommended, or is it not necessary at this stage?	A site visit is not required at this stage and is not a condition for submitting a tender. If needed, clarification can be handled via written questions.
14	Preference 8.2.1.a	Pore Pressure System A. Since the maximum confining pressure is 140 MPa, would you prefer the pore pressure system to be limited to 100 MPa, or would you prefer a pore pressure capability equal to the confining pressure (140 MPa) even if this implies a smaller cylinder volume? For sample sizes of 1 inch or 1.5 inches, the required pore fluid volume is typically relatively small unless otherwise you have specific permeability tests. B. Could you please clarify how many pumps are required for the pore pressure system?	Tenderers may propose the pore-pressure capability (pressure range/volume) and number of pore-pressure circuits/pumps that best meet the published preference and intended test performance, and shall clearly describe the offered configuration.
15	Preference 8.2.1.b	Gas Tight System Could you please indicate which types of gases you intend to use in the pumps (e.g., CO ₂ , N ₂ , CH ₄ , etc.)? Do you want to use same pore pressure pump for both Gas and fluid injections or you would prefer to have a separate pumps for each applications.	Tenderers shall state the gas-tightness level and media compatibility of the offered system (gases/fluids, materials, seals) and may propose either shared or separate pumping solutions, including any operational constraints.
16	Preference 8.2.1.c	Corrosion Resistance You requested a corrosion-resistant pump. Could you please clarify whether the requirement for corrosion resistance should apply only to the pump, or also to all the wetted parts of the triaxial cell, pressure tubing between the pump and the triaxial cell, and/or valves and fittings?	Tenderers shall specify whether corrosion resistance applies to the pump only or to all wetted components (cell wetted parts, tubing/lines, valves/fittings/seals) and provide materials/limits accordingly.
17	Preference 8.2.1.d	Minimum Flow Rate Could you please confirm whether the required flow rate is expressed in µL/min (microliters per minute)?	Yes, the mentioned "µm/min" (micrometers per minute) is a mistype concerning Preference 8.2.1 d and should be read as µL/min (microliters per minute). The flow-rate is expressed in µL/min (microliters per minute).
18	Preference 8.2.5	Active Cooling System The requirement for an active cooling system for the triaxial cell is clear. Do you require Active cooling system between cell and confining pressure unit because of: A. However, as the confining fluid inside the triaxial cell will reach temperatures up to 200 °C during testing, and this fluid is hydraulically connected to the pressure intensifier and its cylinder(including the fluid that interacts with the pressure sensors and sealing system) could you please clarify whether an additional active cooling system is required between the cell and the intensifier to limit thermal effects on the pressure intensifier, sensors, and seals during long-term tests by high temperature fluid? B. Additionally, would you prefer: • Flexible high pressure tubing between confining pressure intensifier and Pressure cell, allowing the triaxial cell to slide out of the loading frame for easier specimen handling. This high pressure tubes have a temperature limit which is much lower than 200C degree and requires additional active cooling system, or • Rigid steel tubing between confining pressure intensifier and Pressure cell, which would require connecting/ disconnecting the tubing from the back part of the cell for each specimen installation/tests (because you have to remove the cell from its loading position)?	The active cooling (Preference 8.2.5) refers to cooling of the triaxial cell itself to reduce test turnaround time. Tenderers shall propose a complete thermal management concept for their system — including any cooling or thermal isolation they consider necessary between the cell, the pressure lines, and the intensifier. TNO does not prescribe the connection type (flexible or rigid) or the extent of the cooling system; tenderers are free to propose the solution they consider optimal. Please state ratings and practical implications.
19	Question/answer 3	Information Notice (24.03.2026 – Item 3) In this notice, the explanation refers to one axial displacement measurement point. Could you please confirm whether only one axial on sample displacement sensor is required, or whether multiple axial measurement sensors are expected?	At least Two internal axial displacement measurement points, measured along the specimen axis is sufficient as a minimum. Additional internal channels are welcome. See also the answer to question 9 part A. The earlier published answer (in the Memorandum of Information dated 24 March 2026) to question 3 was incorrect and has been changed. The correct answer to question 3 is: "We need at least 2 axial and 1 radial measurement point."
20	8.1.11	<i>Can you clarify whether raw (unfiltered) data acquisition is required for all critical measurement channels, and how this will be evaluated? In high-stiffness rock testing, insufficient controller resolution or low update rates may require signal filtering, which can affect data fidelity and interpretation. Please confirm the minimum requirements for controller resolution and update rate to ensure high-quality, unfiltered data acquisition (e.g. ≥32-bit resolution and ≥6 kHz update rate).</i>	Requirement 8.1.11 specifies synchronized data acquisition across channels and compatibility with TNO computers. TNO does not prescribe minimum controller resolution or update rate beyond what is necessary to meet the measurement performance requirements stated in the Procurement Guide. TNO does not adopt the specific numerical thresholds cited in this question as minimum requirements.

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21	8.1.12	<p>Can you confirm whether detailed structural and installation constraints have been defined for the laboratory, including:</p> <ul style="list-style-type: none"> – Maximum allowable floor loads (static and dynamic) – Load distribution requirements during transport and installation – Verified final positioning relative to structural support elements (e.g. columns or reinforced foundations) <p>For high-mass test systems, these factors can significantly influence installation methodology, required equipment, and associated risks. Please clarify whether these aspects are within the supplier's scope or have been pre-assessed by the client.</p>	<p>The Procurement Guide defines the scope and responsibilities for installation-related conditions. Requirement 8.1.12 requires the tenderer to cover delivery, transport and installation; the associated methodology, equipment and risks are within the supplier's scope. Any structural or infrastructural constraints relevant to the project are handled separately by TNO. According to requirement 8.1.15 Tenderers shall declare frame stiffness, calibrations for displacement and pressure sensors and load cells, apparatus footprint, dimension and weight, and electrical needs. No additional constraints beyond those described in the tender documentation are imposed.</p>
22	8.1.15	<p>Can you confirm how system stiffness will be evaluated, particularly for post-peak failure analysis of high-stiffness rock specimens? It is understood that not only frame stiffness, but total system compliance (including load train, fixtures, and pressure vessel) significantly affects the ability to accurately capture post-peak behaviour. Please clarify whether suppliers are required to provide quantified system stiffness data and/or experimental validation demonstrating suitability for post-peak testing.</p>	<p>The required system stiffness is not a fixed threshold but depends on the type of experiment and material being tested. TNO acknowledges that total system compliance governs post-peak behaviour, not frame stiffness alone. For sub-failure elastic and acoustic measurements, system stiffness is not a governing constraint. For failure and post-peak characterisation, the required stiffness depends on the stiffness of the specimen being tested, which varies significantly across our intended material range. Rather than prescribing a minimum stiffness value, TNO requires tenderers to declare the stiffness of their complete load train at rated load, describe the post-peak behaviour and relaxation characteristics of their system, and detail any compliance correction methodology implemented in the control software or hardware. This information will allow TNO to adapt testing procedures and apply appropriate corrections where necessary. Experimental validation demonstrating post-peak capability is welcome but not mandatory.</p>
23		<p>Can you confirm whether all required utilities for system operation, including heat dissipation and cooling, are available on-site, or whether these must be included within the supplier's scope? For high-power systems, thermal management can have a significant impact on system design, installation complexity, and overall cost. Please clarify how this aspect will be evaluated within the tender.</p>	<p>Basic utilities such as electrical supply are available at the TNO Princetonlaan location in line with typical laboratory infrastructure. The tender does not prescribe specific cooling or heat-dissipation provisions as minimum requirements. Tenderers must therefore (according to requirement 8.1.15) specify the electrical needs of their proposed system in their tender submission. Any site adaptations that may be required to accommodate the selected system will be examined by TNO after award, in consultation with the chosen tenderer.</p>
24		<p>Can you clarify how the performance of the ultrasonic velocity measurement system will be evaluated, particularly with respect to:</p> <ul style="list-style-type: none"> – Measurement accuracy and repeatability – Signal-to-noise ratio and signal integrity – Sensitivity to transducer placement and coupling conditions <p>For reliable rock testing, these factors can significantly influence the quality and interpretation of the results. Please confirm whether suppliers are required to provide validation data demonstrating measurement performance under representative test conditions.</p>	<p>Ultrasonic velocity measurement system is included in the tender only as a preference. Tenderers will also be evaluated for preference 8.2.4 if the proposed system is applicable to the sample dimensions specified in Requirement 8.1.7, and suitable for operation up to pressures and temperatures defined in Requirements 8.1.1 and 8.1.2.</p>
25	8.1.16	<p>Can you clarify whether service level requirements during the warranty period will be part of the evaluation criteria? In particular, please define expectations regarding:</p> <ul style="list-style-type: none"> – Guaranteed response time for technical support – Maximum time to on-site intervention – Availability of local or regional service engineers <p>Given the potential impact of system downtime on ongoing test programs, clearly defined service levels may be critical to ensure operational continuity.</p>	<p>Service-level commitments during the warranty period are not part of the evaluation criteria. The Procurement Guide does not include separate assessment criteria for response times, on-site intervention times, or requirements regarding local or regional service engineers. Tenderers may describe their service approach, but this will not be evaluated as a standalone criterion. The General Purchasing Conditions of TNO (Annex C03) can provide information in specific situations that could occur.</p>

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26	8.1.19	<p>Can you confirm whether the requirement for a brand-new system is mandatory, or if alternative solutions based on fully refurbished and performance-validated platforms could be considered? In practice, such systems can provide equivalent technical performance, (optional 24 month) warranty coverage, and may offer significant advantages in terms of cost-efficiency and delivery time. Considering typical budget constraints for high-capacity HPHT systems, allowing such alternatives could increase the range of technically compliant solutions.</p>	<p>The requirement for a brand-new system is mandatory and was intentionally defined as such in the Procurement Guide. This decision was made to mitigate risks associated with wear, remaining service life, and long-term reliability. Consequently, refurbished solutions, regardless of validation status or warranty coverage, are not acceptable under this procedure, and the requirement will not be amended.</p>																
27		<p>Given the number of technical clarifications currently under review, and their potential impact on system configuration and scope, we kindly request an extension of the submission deadline. This will allow us to incorporate the clarifications properly and ensure a technically sound, complete, and compliant proposal. Could you please confirm whether an extension beyond the current deadline of 23 April can be accommodated?</p>	<p>TNO considers your request reasonable and agrees to adjust the schedule. The new deadline is being moved from 23 April 2026 14:00 CET to 4 May 2026 14:00 CET, shifting forward by 11 calendar days. The proposed schedule as mentioned in paragraph 2.1 of the Procurement Guide is therefore cancelled, and the new schedule for the remaining duration of the procurement procedure is as follows:</p> <table border="0"> <tr> <td>1. Publication of Announcement</td> <td>10 March 2026</td> </tr> <tr> <td>2. Closing date for submission of questions by Tenderers</td> <td>31 March 2026, 14:00 CET</td> </tr> <tr> <td>3. Issue of (final) Information Notice</td> <td>2 April 2026</td> </tr> <tr> <td>4. Closing date and time for submission of Tenders</td> <td>4 May 2026, 14:00 CET</td> </tr> <tr> <td>5. Notification of Award Decision</td> <td>13 May 2026</td> </tr> <tr> <td>6. Closing date supporting documents intended beneficiar</td> <td>18 May 2026</td> </tr> <tr> <td>7. Closing date for submission of challenges</td> <td>2 June 2026</td> </tr> <tr> <td>8. Final award</td> <td>3 June (or short after)</td> </tr> </table>	1. Publication of Announcement	10 March 2026	2. Closing date for submission of questions by Tenderers	31 March 2026, 14:00 CET	3. Issue of (final) Information Notice	2 April 2026	4. Closing date and time for submission of Tenders	4 May 2026, 14:00 CET	5. Notification of Award Decision	13 May 2026	6. Closing date supporting documents intended beneficiar	18 May 2026	7. Closing date for submission of challenges	2 June 2026	8. Final award	3 June (or short after)
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28		<p>Please confirm whether a cell pressure sensor mounted directly on the triaxial cell is required. This sensor provides direct measurement of the actual cell pressure inside the chamber and enables precise feedback control between the cell pressure intensifier and the true cell pressure within the triaxial cell.</p>	<p>Requirement 8.1.1 defines the required confining pressure capability (≥ 140 MPa) and overall system performance, but it does not require a specific pressure-measurement location. Tenderers are therefore free to propose their own measurement and control approach, provided it ensures accurate and stable regulation of the confining pressure in accordance with Requirement 8.1.1.</p>																