

Annex E - Schedule of requirements

In this schedule of requirements, SRON's requirements for the Cryogen free dilution refrigerator, pricing and services are listed. Subscribing parties need to sign Annex B - Declaration of conformity in a legally valid way and this annex needs to be included in the subscription on Tendered to declare that the subscribing party agrees with and complies with the mandatory requirements in the schedule of requirements for the full duration of the assignment.

If a subscribing party cannot comply with one of the mandatory requirements listed, the contracting authority will exclude this subscribing party from the assessment procedure.

Mandatory requirements for the Cryogen free dilution refrigerator

General requirements	
Requirements for the tender procedure	
1.	The publication with accompanying tender documents is not a contract and cannot be construed as such.
2.	Your tender will not incur any costs for the Contracting Authority, regardless of whether it will lead to the conclusion of an agreement. Until an agreement has been reached and a written contract signed by both parties has been concluded, the Contracting Authority will not be bound by any obligation and there will be no obligation to compensate any damages or costs whatsoever.
3.	The Contracting Authority reserves the right to stop the Tender in whole or in part, temporarily or permanently. Even in such a situation, Tenderer will not be entitled to reimbursement of any costs incurred in connection with this tendering procedure. Any damages are also at Tenderer's own risk.
4.	Tenderer agrees that the Contracting Authority reserves the right, in the event that Tenderer is eligible to be awarded the contract, to still request official supporting documents after the provisional award. If these supporting documents do not correspond to what is stated in the declarations, the company will be excluded from the award, without the right to compensation for any costs whatsoever.
5.	The person who makes your tender available via Tendered is authorized to represent your company.
6.	Registration and all further communication, including communication required during the term of the agreement, will be in the Dutch language or English language.
7.	The responsible management and the staff charged with carrying out the assignment shall have a sufficient command of the Dutch or English language, both spoken and written, to the extent relevant to the performance of the present work and any contractual obligations.
8.	Tenderer is familiar with and agree to the assessment methodology used by the Contracting Authority.
9.	No information that becomes available within the framework of this assignment will be made available to third parties from your company, with the exception of partners, subcontractors and/or auxiliary persons to be engaged by your company for the project at hand; in such a case, Tenderer will remain responsible for the confidentiality of those partners, subcontractors and/or auxiliary persons to be engaged.

10.	Your tender will have a standing period of at least 180 days from the deadline for submission of tenders. During this period, your tender has the character of an irrevocable offer.
11.	Tenderer agrees to extend the standstill period of your tender, in the event of summary proceedings being initiated, to at least two weeks from the date of the decision in the summary proceedings.
12.	All information submitted by your company has been completed truthfully and can be stood by Tenderer. The Contracting Authority reserves the right to compensation in case of incorrect and/or incomplete information and/or inability to fulfil what has been offered by a tenderer.
Communication, consultation and reporting requirements	
13.	If there are any changes in the name or address details of your company or the contact persons for the Contracting Authority, please notify the Contracting Authority's contract manager immediately.
14.	Your registration contains the names of the persons acting as central contact person and their deputy. These persons are employed by your organisation, they have sufficient knowledge of the Dutch or English language in word and writing and relevant work experience.
15.	Tenderer shall have a complaints procedure related to the service to be provided.
16.	Receipt of queries and complaints will be acknowledged in writing within three working days.
17.	Questions and complaints will be answered in writing within five working days.
Legal requirements	
18.	Tenderer fully and unconditionally conforms to the attached General Conditions of Purchase ARIV-2018. This means that only the terms and conditions used by the Contracting Authority will apply. Your tender will not refer (in part) to other legal terms and conditions, even if these would not contradict the Contracting Authority's terms and conditions.
19.	Tenderer fully and unconditionally conforms to the attached (draft) agreement.
20.	If Tenderer claims to be the (main) contractor and Tenderer specifies (a) particular subcontractor(s) in your tender, Tenderer will be bound, when awarded, to actually use said subcontractor(s) in accordance with what is stated in the tender.
21.	Subcontracting work is allowed only if the Contracting Authority has given Tenderer written consent.
22.	As the main contractor, Tenderer bears full responsibility for the activities of your subcontractors. Tenderer handles communication on behalf of and to the subcontractor.
23.	Invoicing of subcontracted work will be handled by the main contractor.
Billing requirements	
24.	An invoice should contain at least the following information: • Invoice date • Delivery dates • Description of all Products/Services provided, if necessary specified in a separate annex • Total invoice amount (excluding and including VAT) • Contract number • Work order number/Purchase number
Commercial requirements	
25.	All prices are submitted in Euro excluding VAT.

26.	The cost structure will take place in accordance with the schedule described in document 'Price Sheet'. The total amount of your tender is fixed and includes all costs, such as and insofar as applicable, but not exhaustive: execution, delivery, aftercare, overhead, travel and other costs.
27.	The prices quoted by Tenderer cover all the requirements set out in the Tender Document, including the offered quality criteria (as indicated in Annex D). This means that no additional costs will be charged by Tenderer.
28.	Additional work can only be carried out upon request and written consent of Contracting Authority.
Technical requirements	
General system requirements	
29.	The system shall comprise a fully operational cryogen free dilution refrigerator with gas handling system and computer control. No liquid helium shall be needed during operation. A quotation of the full system listing all its components shall be included.
30.	Turn-key delivery: All equipment needed to run the system as well as all needed supporting structures, floor mounts etc. shall be delivered with the system. The required helium-3/helium-4 mixture shall be included. The amount of helium-3 included with the system shall be specified in the offer.
31.	Fully automated (computer controlled) cool down and warm up procedure with possibility to switch the system to manual control. Possibility to customize the automated cooldown procedures.
32.	System can be operated in normal use (including the opening and closing of the vacuum components) by one person.
33.	The communication between the system and the software does not need an internet connection for operating the cooler.
34.	Temperature sensors at all stages of the dilution refrigerator (the pulse tube stage flanges, the still flange, and the mixing chamber) with readout electronics and connection to the control computer with control software shall be included. The temperature wiring and readout electronics shall allow for at least one extra sensor at the mixing chamber level.
35.	All temperature stages/plates inside the cooler shall be accessible to install custom components.
36.	PID control of the mixing-chamber temperature with heaters shall be included.
37.	The cryostat and gas-handling-system will include pressure sensors for house-keeping purposes, including but not limited to sensors measuring the pressure in the still, vacuum can, and condensing line. These sensors will be readout using included electronics and will be controlled via the supplied computer and control software.
38.	All radiation shields needed for specified operation and cool down times, shall be included.
39.	All pumps in the pumping and circulation systems and in the mixture compressor shall be oil-free.
40.	The layout of the gas handling system shall allow the user to self-maintain the pumps.
41.	There are no soft solder joints in the dilution unit.
42.	Complete documentation including user manuals and service manuals shall be provided in English.
43.	Contracting authority has the right to request a meeting to verify how the supplier meets the requirements if needed to evaluate the offer.

44.	It shall be possible to vacate the vacuum-can without shared components in the dilution circuit.
45.	To reduce influence of vibration from pulse tube cold head on the cryostat, all connections between cold head and flanges of the cryostat shall not be ridged, and shall prevent vibration propagation to the dilution unit (e.g. with braids).
46.	Vibration levels measured in vertical and both horizontal directions at the mixing chamber plate shall all be below: • 1000 nm RMS displacement at frequencies ≤ 20 Hz, including the pulse-tube frequency. Exceptions at one or two single frequencies not being the pulse tube frequency are acceptable, and will be part of the assessment. • 100 nm RMS displacement at frequencies above 20 Hz. Exceptions at single frequencies are acceptable, and will be part of the assessment. The specified vibration levels shall be achieved using passive damping measures only.
47.	The Tenderer shall provide measured vibration spectra, in the relevant directions, measured on the mixing chamber plate [vertical, and horizontal in both directions]. The Tenderer shall include vibration spectra with the cooler in regular operation, as well as with the pulse-tube off.
48.	The Tenderer can provide a material traceability report on the whole system when requested by the contracting authority.
Requirements regarding the cooling performance	
49.	The base temperature at the mixing chamber plate shall reach <20 mK with all factory-installed wiring, including the experimental wiring and coaxes as listed in the optional requirements, and optical access covered with metal blinds.
50.	The cooling power on the mixing chamber flange at 20 mK (measured away from the mixing chamber) shall be 10 μ W or higher.
51.	The cooling power on the mixing chamber flange at 100 mK (measured away from the mixing chamber) shall be 300 μ W or higher.
52.	The cooling power of the pulse tube (PT) at 4.2K shall be 1.5 W or higher. The tenderer shall guarantee that with the chosen PT model, 16 low-noise 4-8 GHz microwave amplifiers [reference model: Low Noise Factory LNF-LNC4_8] can be operated at the 4K stage without compromising the minimum requirements on cooldown time, base temperature and cooling power at 100 mK.
53.	The cooldown time from room temperature to base temperature shall be 30 hours or less, with all factory-installed components. The cooldown time shall be achieved without cryogenic liquids to cool the system itself (such as liquid nitrogen), except for the cold trap.
54.	The warmup time from 10 mK to room temperature shall be 12 hours or less.
Requirements regarding sample space, wiring and optical access	
55.	The diameter of the mixing chamber flange shall be 280 mm or larger.
56.	The vertical height of the sample space below the mixing chamber plate shall be 300 mm or larger.
57.	Enough line-of-sight ports shall be included to accommodate all optional DC and coaxial wiring mentioned in the Optional requirements (the wiring and coaxes themselves are to be included in the offer as optional).
58.	At least 1 free KF40 or larger port from outside the cooler with access down to the Still plate, in addition to the previous point.

59.	The cooler shall have optical access in the vacuum can and through all shields from the bottom of the vacuum can (ie to allow optical illumination of devices from below the cooler). It shall be possible to clamp windows with a diameter of 3 inch / 75 mm. The Tenderer shall share the design of the optical interfaces.
60.	Clamping mechanisms with blinds (metal plates) shall be included for all shields. Windows themselves are not required.
61.	The Tenderer shall provide CAD drawings (STEP file) of the whole system, with at least all plate distances, the pattern of holes and threaded interfaces at all temperature stages and of the window mounting interfaces.
Requirements regarding installation	
62.	The refrigerator is required to be installed in an experimental laboratory room on the ground floor of the building. All components except the compressor shall run on single-phase 220/230V, 50/60 Hz power. The compressor shall run on a 3-phase 380V, 50 Hz connection.
63.	The high-pressure lines of compressor to cooler are flexible and are 20 meter or longer.
64.	The minimum distance of the bottom of the vacuum can, or the window-holder, whichever reaches lower, to the floor is 1050 mm. This is to allow an optical table to be wheeled under the cooler.
65.	The minimum inner width of the frame shall be 1100 mm. This is to allow an optical table to be wheeled under the cooler.
66.	With the specified height from the floor, and the minimum specified experimental space, the frame-height is at maximum 2550 mm. Only the Still- and condensing lines, and the (wiring) connections on the flanges may reach higher than 2750 mm.
67.	The height of the experimental space, as specified in requirement 56, and the dimensions in requirements 64 and 65, can still be changed when the lab-layout is determined.
68.	The gas handling system can be placed in a separate room with a wall-feedthrough of the Still- and condensing lines, and the line for the system vacuum, to the cooler.
69.	All technical requirements for installation shall be specified with the offer.
Requirements regarding delivery and acceptance	
70.	Factory tests with the full provided system must be carried out before delivery and installation. The optimization of the helium mixture and the operation of the automated cool-down must be included and carried out in this configuration. The Tenderer is requested to propose a protocol for the Factory Acceptance Test.
71.	The supplier is responsible for delivery, installation, and on-site demonstration of the functionality of the device.
72.	All costs for installation, lab-layout, commissioning and shipping are included in the offer.
73.	During acceptance testing, the Supplier shall confirm that device operation and characteristics satisfy the requirements described above. The Tenderer is requested to propose a protocol for the Site Acceptance Test.
74.	The supplier will provide training on site immediately after accepted installation.
75.	Final payment will be made after onsite acceptance test.
76.	The full system shall be delivered within 9 months after signing the purchase contract. It shall be installed and pass the Site Acceptance Test within 1 month after delivery. Shorter delivery times will be positively evaluated in the assessment. This is to align with the timeline and urgency of the project.

Requirements regarding warranty and support	
77.	The offer includes at least 3-year warranty for the entire system.
78.	The service interval is equal or longer than 2 years.
79.	During the warranty period, all expenses related to warranty service, repairs, transportation etc. shall be covered by the Supplier. On-site service during the warranty period must be provided without undue delay and free of charge.
80.	At least 5-year phone & e-mail customer support with response time of 1 business day.
81.	Spare parts must be available during at least 10 years after the delivery of the equipment.
82.	The Supplier shall provide free updates of the measurement software for at least 5 years after installation.

Optional requirements

The ability to fulfil optional requirements will be taken into account in the award criteria as specified in Annex D – Quality Criteria Form. As such the optional requirements are part of the tender and of the final contract. The Tenderer specifies a price for each option in Annex C – Price Sheet. The Contracting Authority reserves the right for each option to choose whether or not to include it in the contract. If the Tenderer cannot deliver one of the options, no price for that option should be specified.

The options specified below shall be installed into the system in the factory, and are therefore to be included in the quoted delivery time.

Optional requirements	
Optional requirements regarding temperature sensor	
1.	An additional calibrated RuOx temperature sensor should be included (or equivalent sensor suitable for the mixing-chamber temperature), including casing and cabling to connect at the mixing-chamber plate.
Optional requirements regarding DC wiring option	
2.	At least 12 twisted pair (phosphorous-bronze or similar resistance) lines with metal shielding from room temperature to the mixing chamber plate should be installed.
3.	At least 12 twisted pair (low resistance, copper or similar) lines with metal shielding from room temperature to the Still plate should be installed.
Optional requirements regarding microwave lines and installations sets	
4.	32 coaxial semi-rigid cables with SMA connectors as input lines (frequencies up to 18 GHz, SCuNi-CuNi or similar) from room temperature to the mixing chamber plate. The sets should include room temperature vacuum flanges with vacuum sealed SMA connectors and thermal anchoring flanges with SMA bulk heads at all stages of dilution refrigerator: e.g. PT plate 1, PT plate 2, still-, cold- and mixing chamber plate flanges as well as cold attenuators for thermalizing the signal line. Precise values of attenuators can be chosen when ordering.
5.	16 coaxial semi-rigid cables with SMA connectors as output lines from room temperature to the mixing chamber plate (frequencies up to 18 GHz, SCuNi-CuNi or similar between room temperature and 4K, NbTi between mixing chamber and 4K amplifier). The sets include a room temperature vacuum flange with vacuum sealed SMA connectors and thermal anchoring flanges with SMA bulk heads at all stages of dilution

	refrigerator. The sets include cold attenuators for thermalizing the signal line. Precise values of attenuators can be chosen when ordering.
6.	A. Installation sets, to operate 16 microwave low-noise-amplifiers at the 4K plate, including low-resistance DC wiring, feed-throughs from room-temperature, thermalisation at all higher-temperature flanges, and mounting brackets for the amplifiers, should be included.
	B. If, and only if, option a. cannot be fulfilled, the offer should include 2 additional sets of 12 twisted pair lines with low resistance wires (copper or similar) from room temperature to the 4K plate.