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CONHECIMENTO
EM VALOR

Specifications

Acquisition of a Battery testing system

September 2024

Chapter I

General provisions

Clause 1

Object

1. These specifications include the clauses to be included in the contract to be entered into following the pre-contractual procedure, the object of which is the acquisition of a Battery testing system by “INEGI - Institute for Science and Innovation in Mechanical Engineering and Industrial Engineering”, referred to hereinafter as INEGI, in compliance with the technical specifications and normative provisions contained in these specifications and their annexes.
2. The execution of this agreement is subject, as a condition of effectiveness, to the approval of financing suitable for the present acquisition by the financing entity, within the scope of the project NGS - New Generation Storage (operation code 02/C05-i01.01/2022.PC644936001-00000045).

Clause 2

Contract Elements

1. The contract consists of the respective contractual clauses and annexes.
2. The following are always an integral part of the contract, regardless being put in writing:
 - a) Correction of errors and gaps in the specifications identified by applicants, provided that said errors and gaps have been expressly accepted by INEGI, pursuant to the provisions of art. 50 of the Code of Public Procurement.
 - b) Clarifications and corrections related to the specifications.
 - c) These specifications and annexes.
 - d) The winning bid;
 - e) Clarifications on the winning bid provided by the contractor.
3. In case of divergence between the documents referred to in the preceding paragraph, prevalence among them is defined by the order in which they are listed therein.
4. In case of divergence among the documents mentioned above and the contract and its annexes, the former prevail, except for the adjustments proposed in accordance with the provisions of article 99 of the Code of Public Procurement and accepted by the contractor under the terms of article 101 of that law.

Clause 3

Validity

The contract starts on the date when it is entered into, remaining in force for a period of 6(six) months, without prejudice to the ancillary obligations that must survive beyond the contract cessation.

Chapter II

Obligations of the Parties

Section I

Obligations of the contractor

Clause 4

General obligations of the contractor

1. Without prejudice to other obligations provided in the applicable legislation, these specifications and annexes or the contractual clauses, entering into the contract entails the following main general obligations for the contractor:
 - a) Obligation to provide the supply the goods under the terms that they proposed and in compliance with the provisions of these specifications;
 - b) Obligation to comply with the legal requirements in force and ensure the quality of the goods that they supply;
 - c) Obligation to take responsibility for all damages caused to the awarding entity related to the supply of goods covered by these specifications and resulting from action or inaction by its professionals;
 - d) Report to the awarding entity, as soon as made aware of them, the facts that totally or partially prevent providing the service/supplying the goods concerned in the procedure, or fulfilling any of their obligations, under the terms of the contracts entered into with the awarding entity;
 - e) Not change the conditions for the supply of goods outside the cases provided for in these specifications;
 - f) Provide correctly and faithfully all information regarding the conditions under which the supply of goods is carried out, as well as all reasonable clarifications, according to the circumstances;
 - g) Report to the awarding entity any fact that arises during the execution of the contracts that changes, namely, their name and registered office, legal representatives relevant to the supply of goods or provision of services, legal situation or business situation, and changes to the contacts and addresses listed in the contract for their management.

- h) Have all authorisations, consents, approvals, records and licenses required for timely fulfilment of the obligations undertaken in the contract;
 - i) Perform the services with absolute subordination to the principles of professional ethics, impartiality, independence, zeal and competence;
 - j) Submit to inspection by INEGI, providing the information requested;
 - k) Carry out all works listed in the award, under the terms of the contracted term and price;
 - l) Make available a sufficient number of human resources with adequate technical qualification, in order to guarantee correct articulation between its collaborators and INEGI representatives;
 - m) Observe all legislation in force regarding the activity performed and the means involved.
2. The contractor also undertakes to employ all human, material and computer resources required and adequate to provide the service/supply the goods, and establish the organisation system needed for perfect and full execution of the tasks under their responsibility.

Clause 5

Risks, losses and indemnities

- 1. The contractor is liable for any losses caused by breach of the contract and those caused by themselves or their staff to the Awarding entity or to third parties, during the performance of the contract.
- 2. For fines and indemnities payable for damages caused, sums receivable by the contractor are firstly liable; secondly the guarantee deposits; and, finally, the remaining assets of the contractor.

Clause 6

Monitoring contract performance

To monitor the performance of the contract, the contractor undertakes to hold coordination meetings with the representatives appointed by INEGI, whenever so requested.

Clause 7

Duty of secrecy

- 1. The contractor must keep confidential all information and documentation, technical and non-technical, commercial or otherwise, related to INEGI, that they may become aware of in connection with the performance of the contract.
- 2. The information and documentation covered by the duty of secrecy may not be transmitted to third parties, nor can they be used for any purpose other than as intended directly and exclusively for the execution of the contract.

3. Information and documentation that were proven to be in the public domain when the contractor obtained it or that the latter is legally required to disclose, by law, due to legal proceedings or at the request of regulatory authorities or other competent administrative bodies are excluded from the duty of secrecy provided.

Clause 8

Privacy, personal data protection and preservation thereof

1. In the event that the contractor needs to access personal data during the performance of the contract, they must do so exclusively to the extent strictly needed to fully and properly pursue the purposes of the contract, as a subcontractor, and on behalf and in accordance with the instructions of INEGI, under the terms of the legislation applicable to personal data protection.
2. The contractor may not reproduce, record, copy or disclose personal data for purposes other than those listed in the contract, or for their own benefit.
3. The contractor must strictly comply with the instructions of INEGI regarding access, registration, transmission or any other operation of personal data processing.
4. The contractor must implement security measures for personal data processing and adopt technical and organisational measures to protect the data against accidental or unlawful destruction, accidental loss, unauthorised changes, divulgation or access, and against any other form of unlawful treatment thereof.
5. The contractor must take appropriate measures to ensure the suitability of their workers or collaborators, in any capacity, who access the personal data provided by INEGI, or those acting on their behalf.
6. The contractor must ensure that access to personal data is limited to people who actually need to access it in order to comply with the obligations set forth by this contract and that workers, collaborators or subcontractors have undertaken a confidentiality commitment or are subject to appropriate legal obligations regarding confidentiality, the contractor being liable for their use of personal data.
7. Upon written request from INEGI, the contractor must, within 15 (fifteen) days, inform which measures are to be taken to ensure fulfilment of the duties mentioned in the preceding paragraphs.
8. The contractor must immediately inform INEGI of any complaints or questions raised by personal data subjects.
9. The contractor is bound to immediately notify INEGI of any monitoring, audit or control by regulatory/supervisory entities that they are subject to.
10. If the contractor becomes aware of, or suspects, personal data breaches that cause, or may cause, accidental or unauthorised destruction of data, loss, change, access or unauthorised disclosure of data, they must inform INEGI in writing, providing a description of the data breach that has taken place, reporting the categories and number of data subjects affected and the likely consequences of the

breach, and providing any other information that the public contractor can reasonably request.

11. When there is a personal data breach, for reasons attributable to the contractor, the latter undertakes to adopt the following measures, at no additional cost to INEGI:
 - a) Immediately take the measures required to investigate the breach that took place, identify and prevent repetition of that breach and make reasonable efforts to mitigate the effects of that breach;
 - b) Develop the necessary action to remedy the breach; and
 - c) Document all circumstances relating to the breach for the purposes of control by the supervisory authority.
12. The contractor undertakes to reimburse INEGI for all losses that the latter may incur as a result of illegal and/or unlawful use of personal data, namely for indemnities and expenses borne as a result of complaints or lawsuits brought by data subjects, as well as fees, penalties and fines that they must pay.
13. Breach by the contractor of the duties set out in this clause and the non-existence of compliance guarantees by the contractor is grounds for INEGI to terminate this contract with just cause, which may entail the duty of compensation for any breaches attributed to them.
14. The contractor must delete and destroy the processed personal data when they are no longer needed for the performance of the contract, and always within a period of no more than one year after the cessation of the contract that was the basis for the lawfulness of its processing and in accordance with the instructions given by the public contractor.
15. Depending on the choice of the awarding entity, the contractor will delete or return all personal data, after the performance of the Contract is completed, deleting the existing copies, unless data retention is required under applicable law.
16. The contractor may not transfer any personal data to another entity, regardless of its location, without prior and written authorisation from INEGI, unless the contractor is obliged to do so by applicable law, undertaking to inform INEGI in that case before carrying out said transfer.

Clause 9

Patents, licenses and trademarks

1. Charges or civil liabilities arising from the incorporation in any of the goods/services covered by the contract, or use in said goods/services, of any patents, licenses, trademarks, registered designs and other industrial property rights or copyright or related rights are to entirely borne by the contractor.
2. If INEGI is sued for having infringed, in the performance of the contract or subsequent use of the goods/services concerned by it, any of the rights mentioned

in the preceding paragraph, it will have the right to be refunded by the contractor for any amounts paid, for whatever reason.

3. Charges and civil liability to third parties arising from the facts mentioned in paragraphs 1 and 2 are not payable by the contractor if the latter demonstrates that they are attributable to the awarding entity or to third parties other than their subcontractors.

Section II

Obligations of INEGI

Clause 10

Price

1. Without prejudice to the provisions of the following paragraph, the contractual/base price payable by the awarding entity for the performance of all services covered by this contract is 510.000.00€ (five hundred and ten thousand euros) plus VAT at the legal rate in force, if legally due.
2. For the supply of goods covered by the contract, and for the fulfilment of the other obligations contained in these specifications, INEGI must pay to the contractor the prices provided in the winning bid, plus VAT at the legal rate in force, if legally due.
3. The price mentioned in paragraph 1 includes all costs, charges and expenses for which responsibility is not expressly attributed to INEGI, namely costs of accommodation, food and travel for human resources, costs of acquisition, transport, storage and maintenance of material resources as well as any charges arising from the use of trademarks, patents or licenses.

Clause 11

Payment terms

1. The amounts payable by INEGI, under the terms of the preceding clause, must be paid within 60 (sixty) days of receipt by INEGI of the relevant invoices, which can be issued only after expiration of the obligation at stake, as described:
 - a) Place of order: 60%
 - b) Reception: 20%
 - c) Conformity validation: 20%
2. The invoices to be presented by the successful tenderer must contain the necessary elements for a complete, clear and adequate understanding of the invoiced amounts.
3. Electronic invoices should preferably be sent.
 - a. Electronic invoice is an invoice that has been issued, transmitted and received in a structured electronic format that allows its automatic and electronic

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processing, as worded in paragraph 1, article 2, of Directive No. 2014/55/EU, of the European Parliament and of the Council of 16 April 2014 on electronic invoicing in public contracts.

- b. INEGI's broker is SERES, which the winning candidate's broker must contact to automate the procedure.
4. Alternatively, a digital invoice may be sent to the email address: efatura@inegi.up.pt
5. For the purposes of the preceding paragraphs, the obligation is deemed to have expired with the delivery of the goods/provision of services mentioned in the respective order forms, without prejudice to the inherent warranty conditions.
6. It is essential to indicate the purchase order numbers on the invoices issued for acceptance.
7. In case of disagreement on the part of INEGI, as to the amounts indicated in the invoices, it must notify the successful tenderer, in writing, of the respective grounds, which is obliged to provide the necessary clarifications or issue a new corrected invoice.
8. As long as they are duly issued and subject to the provisions of the previous numbers, invoices are paid by bank transfer.

Chapter III

Contractual penalties and termination

Clause 12

Contractual penalties

1. For breach of the obligations arising from the contract, INEGI may require the contractor to pay a financial penalty, of an amount to be determined according to the seriousness of the breach, namely:
 - a) For non-compliance with the dates and terms of delivery of the goods, up to 10%;
 - b) For non-compliance with the technical guarantee obligation, up to 10%;
 - c) Failure to comply with the obligation to continue the manufacture and supply of goods, up to 10%;
2. In determining the seriousness of the breach, INEGI takes into account, namely, the duration of the breach, possible repetition, level of guilt of the contractor and consequences of the breach.
3. INEGI may offset payments due under the contract with the financial penalties due under this clause.
4. The financial penalties provided for in this clause do not prevent INEGI from demanding compensation for excess damage.

Clause 13

Force majeure

1. Penalties cannot be imposed on the contractor for non-performance of contractual services by any of the parties resulting from a case of force majeure, nor shall that be deemed a breach, force majeure being understood as circumstances that prevent doing so, beyond the will of the party concerned, which could not know or predict it on the date of entering into the contract and whose effects they could not be reasonably required to circumvent or avoid.
2. Force majeure may consist of, namely, if the requirements of the preceding paragraph are met, earthquakes, floods, fires, epidemics, sabotages, strikes, international embargoes or blockades, acts of war or terrorism, riots and injunctive government or administrative orders.
3. The following, namely, do not constitute force majeure:
 - a) Circumstances that do not constitute force majeure for the subcontractors of the contractor, in the part in which they intervene;
 - b) Strikes or labour disputes limited to the companies of the contractor or groups of companies that they belong to, as well as to companies or groups of companies of their subcontractors;
 - c) Government, administrative or judicial rulings of a sanctioning nature or otherwise resulting from breach by the contractor of their duties or burdens;
 - d) Popular demonstrations due to breach by the contractor to comply with legal norms;
 - e) Fires or floods originating in the premises of the contractor whose cause, spread or proportions are due to the latter's fault or negligence or breach of safety standards;
 - f) Malfunction in the computer or mechanical systems of the contractor not due to sabotage;
 - g) Events that are or should be covered by insurance.
4. The occurrence of circumstances that may substantiate cases of force majeure must be immediately reported to the other party.
5. Force majeure entails the extension of deadlines for fulfilment of contractual obligations affected by the period of time proven to correspond to the impediment resulting from force majeure.

Clause 14

Termination by INEGI

1. Without prejudice to the general grounds for terminating the contract and the right to compensation under the general terms, INEGI may terminate the contract in the event that the contractor seriously or repeatedly breaches any of their obligations.
2. The right of termination mentioned in the preceding paragraph is enforced by means of a declaration sent to the supplier and does not entail repetition of the services already performed, unless this is determined by INEGI.
3. The sanctioning termination of the service purchase contract, due to definitive contract breach by the contractor, entitles the awarding entity to compensation for

the losses suffered due to the other party's default, which compensation, under the terms of article 810 (1) of Civil Code, sets the amount corresponding to 20% of the contract price.

4. The provisions of the preceding paragraph do not prevent the awarding entity from demanding compensation for damage in excess of the pre-settlement carried out therein.
5. The amounts mentioned in paragraphs 3 and 4 of this clause will be deducted, under the terms of article 333 (3) of the Code of Public Procurement, from the amounts payable and/or for the execution of the guarantees provided and/or pursued in court, when not voluntarily paid by the contractor within 10 (ten) days of notification of the sanctioning resolution decision by the awarding entity.

Clause 15

Termination by the contractor

1. Without prejudice to other grounds for resolution provided for by law, the contractor may terminate the contract when:
 - a) Any amount owed to them has been in debt for more than 6 (six) months;
 - b) The amount owed exceeds 30% of the contract price, excluding interest.
2. In the cases provided for in paragraph 1 a), the right of termination may be enforced by means of a declaration sent to INEGI, effective 30 (thirty) days after receipt of said declaration, unless the latter fulfils the obligations in arrears within that period, plus payment of any delay interest.
3. Contract termination under the terms of the preceding paragraphs does not entail repetition of the services already performed by the contractor, but entails cease of all the latter's obligations under the contract, except for those mentioned in article 444 of the Code of Public Procurement.

Clause 16

Insurance

1. The contractor undertakes to purchase and keep valid civil liability and occupational accident insurance, guaranteeing liability for damages arising from actions or omissions in the performance of their activity related to the object of this service provision, covering any persons that serve in their activity.
2. The insurance policies mentioned in the preceding paragraph and applicable legislation must be submitted at the request of INEGI and within the time frame established for that purpose, the contractor undertaking to keep them valid until the end of the contract term.
3. INEGI may require, at any time, copies and payment receipts of said policies.

4. Insurance policies and their deductibles are the sole and exclusive charge of the contractor, and insurance contracts must be entered into with an insurance entity legally authorised and established in Portugal.

Clause 17

Payments retention

1. No guarantee is required, but in order to ensure the exact and timely fulfilment of all legal and contractual obligations that the contractor assumes with the conclusion of the contract, under the terms of paragraph 3 of article 88 of the CCP, INEGI may, if deemed convenient, retain up to 10% of the amount of payments to be made.
2. If this is the case, the amount withheld referred to in the previous number is released under the terms of article 295 of the Public Contracts Code.

Section III

Final legal provisions

Clause 18

Competent jurisdiction

To settle all disputes arising from the contract, the jurisdiction of the Administrative and Tax Court of Oporto is appointed, with express waiver of any other.

Clause 19

Liabilities

The contractor is solely liable for the damages caused to people and goods by the defective nature of the supply, even if they arise from carelessness, negligence or bad faith of the agents at their service, being liable for reimbursing them.

Clause 20

Subcontracting and assignment of contractual position

1. The contractor may not assign their contractual position or any of the rights and obligations arising from the contract without authorisation from INEGI.
2. The authorisation provided for in the preceding paragraph will always be subject to the provisions of article 316 and following of the Code of Public Procurement.

Clause 21

Communications and notices

1. Without prejudice to the possibility that other rules may be agreed to, notices and communications between the contract parties will be sent, in accordance with the

provisions of the Code of Public Procurement, to the relevant contractual address, by registered mail with acknowledgment of receipt or by email, to the following contacts:

2. Any changes to the contact information in the contract must be communicated to the other party.

Clause 22

Counting deadlines

The deadlines set forth in these specifications are continuous, running on Saturdays, Sundays and public holidays, the other rules contained in article 471 of the Code of Public Procurement applying to the counting of deadlines.

Clause 23

Applicable legislation

The formation of the contract and its execution is fully governed by Portuguese law.

Clause 24th

Preliminary Market Consultation

1- In accordance with the provisions of article 35-A of the CCP, informal market consultations were carried out, essential for the preparation of the process.

2- The entities listed below were consulted, and the proposed price results in a lower cost, in line with the best economic and public treasury management principles, considering the technical characteristics required by the Contracting Authority:

1. Sinexcel Electric Co., Ltd
2. AVL Ibérica S.A.
3. AVL Deutschland GmbH.
4. Guangdong Sanwood Technology Co., Ltd

3- In compliance with the provisions of article 35-A, paragraph 3 of the CCP, no information that could give them a competitive advantage was provided to the consulted entities.

ANNEX I

TECHNICAL CLAUSES

Clause 1

General characteristics

This clause specifies the technical characteristics of the laboratory equipment and systems for battery pack testing to be acquired, which must fully comply with the following technical specifications:

Main Unit

Battery testing System composed of:

- 1- Front end system for data acquisition
 - a. High-precision data acquisition system for various measurements operating up to 10 kHz and interfaces with an automation system via EtherCAT.
- 2- Temperature monitoring and acquisition system
 - a. PT100 HV ISO/END OPEN temperature sensor for measuring temperatures on live parts up to 1000V with a 4-wire connection cable and an insulated sensor tip with an open end for easy connection.
- 3- HUMIDITY MEASURING EQUIPMENT
 - a. Humidity (RH) and temperature measurement in the intake port (duct mounting) and tight spaces. According to specification:

RELATIVE HUMIDITY

Measuring range	0 ... 100%RH
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Accuracy:

at +15 ... +25 °C (59 ... +77 °F)	±1 % RH (0 ... 90%)
	±1.7 % RH (90 ... 100%RH)

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at -20 ... +40 °C (-4 ... +104 °F)	$\pm(1.0 + 0.009 \times \text{reading}) \%RH$
at -40 ... +180 °C (-40 ... +356 °F)	$\pm(1.5 + 0.018 \times \text{reading}) \%RH$
Output signal	4 ... 20 mA

TEMPERATURE

Measuring range	-40 ... +80°C
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Accuracy:

at +20 °C (+68 °F)	$\pm 0.2 \text{ °C } (\pm 0.36 \text{ °F})$
Output signal	4 ... 20 mA
Temperature sensor	Pt100 RTD Class F0.1 IEC 60751 or equivalent

OPERATING ENVIRONMENT

for transmitter body	-40 ... +60 °C (-40 ... 140 °F)
for probe	same as measurement range
Operating voltage	10 ... 35 VDC / 24 VAC $\pm 20\%$

4- Modular system for data aquisition

a. Specifications:

size (W x H x D)	41,5 x 132,3 x 150 mm (1.6 x 5.2 x 5.91 inch) w/o connector, with end panels
data interface	EtherCAT or equivalent
power supply	24 V _{DC} typ. with reverse polarity protection 9 ... 36 V _{DC}
Number adressable meas. modules	≤ 14
power consumption	3 W typ. only 4 NET 280 W max. for entire system
ambient temperature	-40 ... +80°C (-40 ... 176°F)
storage temperature	-40 ... +80°C (-40 ... 176°F)
rel. humidity	20 ... 80 %, non-condensing
weight	450 g (15.87 oz) w/o end panels 630 g (22.22 oz) with end panels
installation	DIN top-hat rail
cascading of units	spring loaded side contacts

Specifications

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protection class	IP20
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5- Modular system for 24 channel temperature acquisition

a. Specifications

size (W x H x D)	41,5 x 132,3 x 150 mm (1.6 x 5.2 x 5.91 inch) w/o connector, w/o end panels
data interface	EtherCAT or equivalent
power supply	supplied via main module
power consumption	3 W typ.
sampling rate	≤ 100 Hz
resolution	24 bit
ambient temperature	- 40 ... +80 °C (-40 ... +176°F)
storage temperature	- 40 ... +80 °C (-40 ... +176°F)
relative humidity	20 ... 80 %, non-condensing
number of channels	up to 12 (RTD) or 24 (TC) temperature inputs
sensor or analog inputs	RTD, TC
isolation between blocks	1500 V _{DC}
isolation between channels	2,5 V _{DC}
ISO17025	yes
weight	400 g (14.10 oz)
installation	DIN top-hat rail
protection class	IP 20

6- System of compatible connectors for temperature, cables and similar

a. Specifications

number of poles	12
opening for cable entry	12 mm (0.47 inch)
type of contact	spring balancer
conductors cross sectional	0.2 mm ² - 1,5 mm ² (AWG24 – AWG16)
stripping length	9 - 10 mm (0.354 - 0.395 inch)
length (without cable)	46 mm (1.81 inch)
strain relief	yes, with cable tie, enclosed

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locking	yes, with screwdriver 2 mm
coding	yes, for CT
size of the marking label	15 x 10 mm (0.59 x 0.394 inch)
delivery details	4 pcs

7- Connection boxes\Racks for modules with supporting structures

a. Specifications

Wall / Foot mounted housing for measuring modules accommodation.

19" racks and top hat rail modules with door hinged on the right-hand side.

Mounting panel	EMC compatible, hot-dip galvanised
Sponge rubber seal at the line entrance into the housing.	
Door hinged right hand side.	
Protection class	IP23
In addition to the rails for 19"-rack mounting, a DIN TS35 standard profile for the integration of non-19"-modules is provided. The Wall Box is mounted at the test cell wall.	

Mobile Stand for Wall Box (measurement equipment accommodation within the Testing area) built with aluminum frame, equipped with four rotatable and lockable rollers.

8- Automation system for testing campaigns

a. specifications

- Battery Pack/Module application software to control climate chambers, power supplies, and battery testing equipment while collecting data in real-time via CAN-Bus (or other interfaces\protocols), ensuring reliable measurements.
- Battery Pack/Module application software capable of: defining demand values, initiating continuous measurements, and controlling supplementary devices.
- Integrated diagnostic logbook and signal viewer\navigator.
- Visualization and organization of testbed parameters and runs, management of the parameters with the available editors directly at the testbed workstation and remote.
- Parameter compare application to compare parameter sets, blocks, library components, and various versions of sets or blocks.
- Test editor to allow the configuration of complex testing tasks.
- Test runs and parameters library with integrated version management and predefined test run elements. Test templates, norms and standardized test libraries.
- Measurement data acquisition and storage data throughput of all connected channels (min. 500ch) up to 100,000 values per second.
- EtherCAT Based communication system for high data throughput
- Steady-state measurements with up to 5000 channels

- Continuous recording using up to 5 recorders with a maximum of 10,000 channels and a total data throughput of 1,000,000 values per second.
- Media Control allowing to control testbed media (e.g. water, oil, air) by using at least 32 PID and/or 32 2/3-point-controllers.
- Hardware to perform calculation functions and perform complex calculations in real-time during testbed operation up to 1 kHz.
- Interfaces, all: Driver E-Power / Indicating System TCP/IP, Profinet Windows Driver, EtherCAT Interface, Modbus (TCP/RS232) Windows Driver, ASAM Interface
- Parameters and data stored in ASAM ODS (Open Data Services) format.
- Multi-level limit monitoring tools to ensure the optimal safety of operator, unit under test and testbed in all operating states. Up to 1,000 channels can be monitored. Each limit violation triggers a freely definable reaction for safety.
- Filter Function to enable the controlled filtering of all quantities with filter functions like e.g. Bessel-filter, first-order high-pass or user definable filters.
- Creation of post-process arbitrary look-up tables in the system.
- Power fail software to force a defined stop and new start of an automatic test run.
- Measurement device driver integration support RS232 and TCP/IP as interface types.

Drivers for measurement devices:

- Driver Cooling system
- Driver E-Power/Indi. Systems TCP/IP
- Driver External Ripple Emulator
- Driver Programmable DC Supply
- Driver Interface to HOST System
- Driver Share ASAM-ODS Interface
- Driver Interfaces to IO Subsystems (network measurement modules)
- Driver Interface IEEE 1394
- CAN Interface (and other when adequate)
- Data required for the parameterization of the I/O channels readable out of ASAM MCD2 (*.A2L). integrated support for Vector DB is supported. Support for ARXML, CRC8 check support and, CAN FD protocol.
- The Battery Pack/Module Testing software with at least one Battery Pack/Module and one Battery Pack/Module Chamber Interface.
- Battery Pack/Module Testing SW can automate up to eight test items with up to eight independent test sequences (test programs).
- Capacity and flexibility to have Battery Pack/Module Chamber Interfaces to be operated in parallel.

9- Battery pack and module chamber interfaces

a. specifications

Interface that enables communication to one chamber in the Battery Pack/Module SW. It must define which testbed resources are shared with the respective Battery Pack/Module. The execution of a test sequence for a pack / module is completely independent of the test sequence of the respective other pack / module.

Battery Pack / Module SW must offer intelligent control method of the test sequence execution relative to the common chamber temperature.

10- Battery pack and module chamber interfaces

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The Battery Pack / Module Test SW must offer multi-test support. The multi-test support must enable test items to be tested independently. A separate test sequence (test program) can be defined for each test item. These test sequences must be started, stopped or changed independently of each other. Each test item has its own visualization dashboard. Separate visualization, to warrant an overview of all test items and the entire testbed configuration.

11- Test workstation hardware

a. specifications

- Testbed Workstations, I/O boards and I/O modules fit to the automation software.
- Mountable as 19" rack or used stand-alone (as tower).
- 34" ultra-wide LED flat panel for display of two HD contents on one screen.
- CAN Interface PCI-E Board, exchange data automation system with control units and other nodes via CAN (Controller Area Network).
- I/O and communication must be handled in real-time system of the automation system.
- CAN-FD Extender
- Real-time ethernet network card with 4 real-time ports for connecting iLink RT, EtherCAT or measurement devices.

12- Test System Cabinet for hardware mounting with modular design, 19" hinged frame

a. Specifications

- Dimensions: at least 41 HU, height: 2010 mm, max. mounting depth: 485 mm
- Temperature range: 5 ... 35 °C
- Relative humidity: 20 .. 80 %, not condensing
- Supply voltage: 3~400/230 VAC / +/-10% (L1, L2; L3, N, PE)
- Frequency: 50/60 Hz \pm 2 %
- Power consumption: approx. 5,000 VA
- Compliant with EN60204-1 or equivalent

13- Test system coolant unit

a. Specifications

- Active conditioning system with integrated refrigerant circuit for accurate temperature control in a wide temperature range. With controller and display.
- Designed as a mobile unit with internal expansion tank
- Manual bypass valve for flow adjustment between the pump power stages.
- All fittings to connect the active conditioning system with DN20 hose to a climatic chamber.
- Coolant hose DN20 with insulation for Active conditioning system

Cooling power @ 20°C	9,2kW
Temperature range for water/glycol 40/60	-35°C to +85°C

Included controller	Temperature, pressure
Flow measurement	No
Flow rate adjustable	0 to 60l/min
Max. supply pressure	3,1bar
Cooling	Water cooled
Noise level (in 1m distance)	≤ 67 dB(A) @ 50Hz, ≤ 69 dB(A) @ 60Hz
Protection class according to IEC 60529	IP21
Lifetime	Minimum 20.000 operating hours
Refrigerant	R-449A, 1,8kg, GWP: 1397
Electric power supply	
Voltage supply	3 x 400 VAC ±10%, 50Hz ±1%, PE 3 x 460 VAC ±10%, 60Hz ±1%, PE
Current consumption	16A
Coolant circuit (primary circuit / unit under test)	
Coolant ¹	Water/Glycol-mixture
Cooling capacity in relation to pump stage and coolant temperature with ethanol ²	9,5kW at >20°C (pump stage 8) 8,5kW at 10°C (pump stage 8) 6,2kW at 0°C (pump stage 8) 4,3kW at -10°C (pump stage 8) 3,0kW at -20°C (pump stage 4) 1,7kW at -30°C (pump stage 4) 0,9kW at -40°C (pump stage 4)
Heating power	8kW
Working temperature range	-50°C to +220°C
Note: Not relevant for water/glycol operation	
Operating temperature range for water/glycol (40/60)	-40°C to +90°C
Temperature control accuracy, steady state, unit outlet ³	<+/-0,7K
Temperature stability, steady state, unit outlet ³	+/-0,05K (for standard conditions DIN 12876)
Circulation pump pressure (for ambient conditions)	max. 3,1bar at 0l/min ⁴
Circulation pump flow rate (for ambient conditions)	max. 65l/min at 0bar ⁴
Internal coolant content	min./max. 4,8/17,2l
Secondary cooling circuit (facility)	

Specifications

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Cooling media	Water ⁵
Cooling water consumption at 3bar, 15°C	20l/min 1,2m ³ /h
Cooling water supply temperature	15°C recommended, 10 to 30°C permitted (in upper temperature range with reduced cooling capacity)
Cooling water differential pressure	Min. 3 to max. 10bar
Max. system pressure	10bar
Supply pressure stability over 5 min	±0,2bar
Max. heat dissipation to cooling water	13,3kW
Ambient conditions	
Temperature range	5 °C to 40 °C
Humidity	maximum relative humidity 80 % for temperatures up to 31 °C, decreasing linearly to 50 % relative humidity at 40 °C
Max. sea level	2000m
Heat dissipation to ambient	0,7kW at 50Hz, 0,8kW at 60Hz
Interfaces	
Data interface	Ethernet (TCP/IP) to automation system, USB
Coolant circuit UUT feed and return	M30x1,5mm, male thread
Cooling water to facility feed and return	G ¾ inch, male thread

Cooling water quality	
pH	7,5 to 9
Hydrogen carbonate (HCO ₃ ⁻)	70 to 300mg/l
Chloride	<50mg/l
Sulfate (SO ₄ ²⁻)	<70mg/l
Ratio hydrogen carbonate / sulfate	>1
Water hardness	4 to 8°dH
Electric conductivity	30 to 500µS/cm

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Sulfite (SO ₃ ²⁻)	<1mg/l
Free chlorine gas (Cl ₂)	<0,5mg/l
Nitrate (NO ₃ ⁻)	<100mg/l
Ammonia (NH ₃)	Not allowed
Iron (Fe), solved	<0,2mg/l
Manganese (Mn), solved	<0,05mg/l
Aluminum (Al), solved	<0,2mg/l
Free aggressive carbon dioxide (CO ₂)	Not allowed
Hydrogen sulfide (H ₂ S)	Not allowed
Algae growth	Not allowed
Suspended sediment	Not allowed

14- Test Unit Control Interface

Hardware interface for test applications in combination with CAN applications\ analyzers.

Requirements:

- Processor unit with memory for executing simulations and time-critical program sections in stand-alone mode.
- Module network interface to provide interfaces as plug connections via. FlexRay, CAN, LIN or digital-analog input/ outputs
- Connection from the Vector network interface to the electrical networks via appropriate transceivers (FlexRay/CAN/LIN and/or others).
- Execution of time-critical CAN analyzers configurations without any user PC and without any negative effects on functionality of the running application on the testbed.

15- Environmental\Climate chamber

a. Specifications

- Insulated 16m³ test chamber (built on a base frame) with a performance rating of 1 K/min and 2 K/min.
- Refrigerant system installed separately from the chamber.
- Skid proof floor.
- Floor drains inside the chamber.
- Breathable flaps system for over and under pressures compensation.
- Signal lamp (status information about the operating state of the overall system)
- Refrigeration unit with integrated electrical cabinet
- Frequency converter working compressor (operate the system in the optimal range).
- Energy-saving operation.
- Manufacturing Services, Checkout, Installation, Commissioning, CE marking for Refrigerant system unit.

Specifications

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Technical Specification Insulated 16m³ test chamber		
Test space volume	m³	Approx. 16
Test space dimensions, WxDxH *2)	mm	2200x3500x2200
Dimensions test space door (double-wing door), WxH	mm	2200x2200
Exterior dimensions chamber WxDxH *3)	mm	2520x4790x2960
Weight of the insulated chamber, approx. *4)	Kg	4460 for 2K/min 4850 for 4.5K/min
Load of test space floor (Wheel load)	N/m²	50 000 N/m²
Power loss chamber, approx (heat release in ambient)	kW	0.7 kW (90°C) 1.1 kW (130°C)
Operation Side		Left
Exterior		
Exterior housing		Coated steel
Interior		
Chamber-inner wall		Stainless steel 1.4301
Insulation material		160mm : 120mm PU + 40mm MiWo
Lighting		4 x LED lights
Data for installation and operation, to be provided by facilities		
Ambient conditions		
Ambient temperature for operation	+10°C up to +26°C	
Ambient humidity for operation	≤ 60% r.H. (non-condensing)	
Drain		
Connections	1 x G¾"Chamber Drainage (evaporator) 1 x G2"Chamber Drainage 1x Ø16 Chamber Front drip pan 1x Ø30mm for Humidifier Elutriation	
Ex-Air extraction exhaust facility	Piping 1 x DN200	
2 x Ex-Air extraction inlet	Piping 1 x DN200 255x180mm PN16 (5 m piping, flaps and ventilation system for air extraction system included)	

Specifications

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Compressed air	
Pressure	2 to 10bar

16- Refrigerant Unit Specifications

Maximum temperature		°C	+85 to +90
Minimum temperature		°C	-30 to -40
Temperature change rate (for 12m ³ chamber) According to IEC 60068-3-5 ^{*1)} , empty chamber		K/min	Heating: 4,5 (-27 up to +77°C) Cooling: 4,5 (+77 down to -27°C)
Temperature fluctuation in time ^{*2)}		K	±0.6
Dimension (LxWxH)		mm	Up to 1800x1400x2200
Weight		Kg	1550. max
Cooling			Water cooled
Refrigerant ^{*3)}			R452A, 40 kg
Noise emission cooling unit			<=85dB(A), at a distance of 1 m
Installation environment			
Location type		Indoor	
Ambient Air Temperature,		12°C to 28°C	
Pollution Degree		3	
EMC environment		A, B	
Installation Type		Floor Standing	
Installation Category		Stationary	
External Conductor Type		Cable	
External Conductor Material		Copper	
External phase conductor, cross sections, and terminations (Maximum cross section)		185 mm ²	
Cooling water			
Cooling water connection		DN50 PN10, EN-1092-1-type 13B flange for Supply and Return or equivalent	
Cooling water temperature at the inlet		+7 °C (+/- 1°C)	
Outlet temperature (at full load)		5K above inlet temp.	

Specifications

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Cooling water supply pressure (inlet)	2- 6 bar
Cooling water supply differential pressure	1 - 2,5 bar
Cooling power water	85kW (max)
pH-value	> 6 pH
Chlorides (Cl ⁻)	< 100 mg/l
Free chlorine (Cl ₂)	< 1 mg/l
Maximum flow rate	8.000 m3/h.
Electric Supply	
Nominal voltage	400 VAC (+/- 10%), 3/N/PE, 50 Hz (+/-1Hz)
Nominal power cabinet (including compresor, heating, fan, control humidifier)	80 kW (max)

17- Humidifier for climatic chamber with steam injection system.

Technical Specification Humidification System (See diagram below)		
Humidity range, see Climate chart below	% RH	12% up to 96%
Temperature range (for humidity control)	°C	12 to 90
Humidity constancy in time	% RH	+/- 3 up to 5 % r.H. (steady state)
Dimension (W x D x H)	mm	Up to 550x420x1100
Data for installation and operation, to be provided by facilities		
Mains water		
Temperature	+1°C to +40°C	
Pressure	1 up to 10bar	
Max. flow	30 l/h	
Elutriation	3.6l/h -> deionized water	
	7.2l/h -> fresh water	
Conductivity	15 µS/cm	
Humidifier connection	3/4" whitworth thread or equivalent	

18- RAILS FOR ADDITIONAL EQUIPMENT 50KG

a. Specifications

Rails to be able to mount additional equipment on the isolation cells inner wall, appropriate mounting rails must be included. Single threaded hole M8

General	
Mounting rail type	41/22, cold formed, serrated for non-slip connection, for loads of the longitudinal direction of the rail
Resilience	50 kg/rail
Dimension (WxH)	41 x 21 mm
Profile weight	1.57 kg/m
Profile cross section	1.87 cm ²
Material	Stainless steel 1.4571/1.4404

Portholes for battery pack and module fixed positions includes:

6x200mm portholes for power and signal cables with sealing. (Hole with inner diameter 200mm and welded stainless steel reveal, thermal decoupled, not heated).

4 x 1¼" portholes for coolant of unit under test with sealing

1 Rectangular Porthole for 5 copper bars

Appropriate sealing of the cables or pipes fed through the portholes

19- GAS SAMPLING UNIT and safety system

Gas Sampling Unit (GSU) is present to monitor climatic chambers for defined gases and smoke for the safety monitoring of battery or fuel cell tests.

Functional safety applications up to SIL2. To be used as **safety system for explosion protection** and other safety-critical applications. Smoke detection is compliant with **EN54** or equivalent, **VdS** and **FM** and integration into fire alarm systems.

Must include connection to the safety PLC, calibration, and connectivity to adequate devices and systems.

a. Specifications

Probe specifications	
Probe air temperature	-55 to 150°C
Probe air humidity	Max. 400 g/m ³ (89°C with 98 % r.H.)
Probe air flow rate	1 to 2.4 m ³ /h (17 to 40 l/min)
Max. external pressure loss inlet side	500 Pa
Max. external pressure loss outlet side	250 Pa
Probe air quality	The GSU should be equipped with a particle filter.
Hardware interface for probe air	G ¾" ale thread for feed and return, device will be delivered with ball valves and extendable hoses.

Specifications

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	T-Adapter to install a chamber temperature sensor.
Environmental specifications	
Ambient temperature	10 to 30°C
Ambient humidity	< 95 % r.H., non-condensing
Device specifications	
Dimensions of main device	approx.1090x655x365 mm (HxWxD)
Weight (with all options)	Not more than 90kg
Protection class of housing	IP30
Power supply	24 VDC, max. 6 A (typically 3 A during operation)
Signal interface	Siemens ProfiNet, or equivalent. Smoke sensor to be directly connected with fire alarm central stations (signals on terminal)
Certifications	CE or equivalent

Sensor type	Application	Details
Catalytic Sensor (HC, H ₂ , C ₃ H ₈ , ...)	Monitoring of explosive/combustible gases for battery testing with SIL2	Catalytic sensor for combustible gases up to C ₄ -Hydrocarbons, calibrated on propane, 0-100% LEL
Infrared CO ₂ Sensor	Monitoring of CO ₂ released during venting of a battery cell (back-up sensor, not safety related)	Infrared sensor calibrated for 0-5 vol. % CO ₂ . Poison resistant sensor with long lifetime
Aspirating smoke sensor	Early-stage fire detection EN54-20 or equivalent	Detection sensitivity from 0.025-20% obs/m

Requirements for HAZARD LEVEL 6 Chamber

Status signal light

A signal lamp at the insulation cell shows status information about the operating state of the overall

Safety interlock switch

The Safety interlock needs two main functions. First the door lock prevents the test room door can be opened while operating at high temperatures. Secondly the test room door is monitored, and in case of the detection of hazardous gases or smoke within the test chamber has to be locked.

Door lock	Safety switch with guard locking and integrated evaluation electronics
Locking force	Up to 6500 N

Guard locking	Closed-circuit current principle (by spring force)
Unlocking	Applying a voltage to the guard locking solenoid
Door position	Is also monitored and indicated by LED
Operating voltage	DC 24 V (+10%, -15%)

Safety Cabinet With Fire Alarm Central Station

The Safety Cabinet with FAC has the primary task of controlling the safety functions of the Safety System of the climatic chamber.

Connectivity to Gas sampling unit.

The Fire Alarm Central Station (FAC) is a fire alarm control panel according to EN54 or equivalent. It contains an appropriate signal forwarding in case of fire and has accumulators, which keep the FAC in function for at least 30 minutes without power supply.

The flooding of chamber as standard solution.

1x 2nd overpressure flap

1x Water mist system and/or 1x water sprinkler system

20- Testbed safety

20.1 Operator Panel with:

- Operator panel in size 19" / up to 4 height units
- Operating mode selection accordance to 2006/42/EC Machinery Directive Annex I or equivalent, EN 60204-1 or equivalent, EN ISO 12100 or equivalent
- Testbed safety system with access and authorization levels for authorized operation of the testbed.
- EMERGENCY STOP button
- HMI with membrane push button
- RESET button
- ON / OFF button
- RFID key switch

20.2 PLC RACK FOR CABINET

- PLC rack 19" / 4 HU design

Specifications

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- Dimensions PLC rack: (W x H x D) = up to 450 mm x 200 mm x 500 mm MAX
- (interface to operator panel, to the testbed automation system and to the building management system)
- Standard und fail-safe digital IO modules
- Safe contact extension module
- Communication module
- Control voltage power supply to supply the testbed safety system
- Module for potential distribution including electronic fuses, 4 channels of 4 A each
- 8-Port industrial Ethernet switch (installed in the automation system cabinet)
- Modular expandability for maximum flexibility, station width up to 1m.
- Diagnostic display for: Error, Operation, Maintenance, Power Supply.
- PROFINET IO IRT interface with three integrated switch ports.
- Digital IO interface

20.3 SAFETY INSTRUCTIONS AND WARNING SIGNS

Pictograms & HV warning signs for the safe operation of the testbed.
RFID keys for activating the three basic operating modes of the testbed safety system

Documentation „Safe work on HV systems” & „Safety Instructions “(digital & print version)

1x Stencil for attaching the pictograms

6x Pictogram

3x RFID key each for activating the three basic operating modes (RFID keys in the colors green, yellow and red)

2x HV warning sign

1x CE type plate 105 mm x 148 mm in aluminium

1x Documentation „Safe work on HV systems”

1x Documentation „Safety Instructions “in print version

20.4 RISK AND HAZARD ANALYSIS

Creation of a risk assessment for the scope of supply on system level according EN ISO 12100 or equivalent for internal use.

Declaration of conformity (CE) / declaration of incorporation according European directives or equivalent

21- DC TESTING / EMULATION

21.1 2-QUADRANT DC POWER SOURCE - 1200V 275KW 1 chanel

Regenerative 2-quadrant DC power source with a voltage output level of up to 1200 V.

High current and power dynamics while ensuring high precision.

Flexible, fully automated switching of configurations and testbeds, including parallel operation of output channels for higher power and current demands.

a. Specifications

AC Input

Rated input power	297 kVA
Mains frequency	47 - 63 Hz
Network configuration	TN-S system with separate ground conductor starting with network supply transformer required.
Efficiency	Range: 91% to 95%
Power factor	Typical: >0.95 (typical) At full load: 0.99
Rated power loss (AC)	22 kW
THDI Total Harmonic Distortion for Current	< 6% at rated power
THDU Total Harmonic Distortion for Voltage	< 3.85% at rated power or minimum as specified in IEC 61000-2-4:2002 - Cat. C2
EMC	2014/30/EU Electromagnetic Compatibility
Standards	EN 61000-6-2 or equivalent EN 61000-6-4 or equivalent EN 61000-2-4 KL3 or equivalent EN55011 A1 >20kVA or equivalent
General	
Sample frequency digital controller	16 kHz
Effective switching frequency at DC output	48 kHz
Preset range of the virtual inner resistance	-2 to +2 Ω (standalone) 0 to +2 Ω (parallel mode)

Specifications

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	Passive discharge of the intermediate circuit to an intermediate circuit voltage < 60 V with uncontrolled switching off	< 10 min
	Mechanical main switch	
	Isolation monitoring device	
	Power Control Unit & Programmable Logic Controller (PLC)	
DC-Output		
	Max. output power	275 KW
	Max. output voltage	1200 V
	Min. output voltage	12 V
	Recommended output voltage range	100 V – 1200V ¹⁾ ¹⁾ For applications below 100V, dynamic specifications cannot be guaranteed. Please also consider residual ripple and measurement accuracy.
	Max. output current	$\pm 1000 \text{ A}^2)$ ²⁾ Feedback mode: In the range 200V to 12V linearly derated from -1000 A to -900 A
	Overvoltage category	III, 4 kV
	Isolation voltage input to output	3 kV AC
	Isolation voltage input to housing	1.4 kV AC
DC-output at the PDU BE		
	Static voltage tolerance at 100 % load change	$\pm 0,1\%$ RMS of FS
	Voltage residual ripple and voltage noise, RMS	$\leq 0.0167\%$ RMS of FS
	$\pm 0.1\%$ of FS	Static voltage stability over 5 hours
	Voltage rise time ($\Delta U = 50 \text{ V}$)	0.5 ms
	Max. output filter discharge time (at max. inverter input capacity of 20 mF external)	7 s
DC-output at system cabinet		
	Static current tolerance at 100 % voltage change	$\pm 0,1\%$ RMS of FS

Specifications

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	Static current stability over 5 hours	±0.1% of FS
	Current residual ripple and current noise, RMS, bandwidth 0...100 kHz	≤ 0,06 % RMS of FS
DC measurement accuracy		
	Current	±0.1% of FS
	Voltage	±0.1% of FS
Additional technical data		
	Dimensions WxDxH (approx.)	System cabinet: 1409 x 858 x 2202 mm incl. 200mm plinth
	Weight	approx. 1745 kg
	Noise level	< 71 dB(A)
	Protection class	IP54
	Allowed altitude of site	1000 m a.s.l. at nominal load
	Cooling	Primary / internal cooling circuit: Water cooling (80% water / 20% Antifrogen N)
	Water terminal	1" DN25 inside thread

22- CONDITIONING UNIT 40KW COOLING POWER

Water Cooling Unit for DC power source 275kW

Cooling power, approx.	40 kW
Allowed floor evenness tolerance	±12 mm according DIN 18202
Noise level	< 65 dB(A)
Protection class	IP54
Operating temperature (ambient)	5 - 40 °C
Air humidity (ambient)	0 - 85 % RH, non-condensing
Climate category	3K3, as defined in EN 60721
Allowed altitude of site	1000 m a.s.l. at nominal load
Cooling	Internal (primary) cooling circuit – to the system: Water cooling (80% water, 20% Antifrogen N)

Specifications

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	External (secondary) cooling circuit: Water cooling (water)
Water inlet temperature (external)	6 - 25 °C
Water demand	Max. 6 m ³ / h (control based on losses)
Coolant pressure drop	2 bar
Max.pressure cooling circuit	10 bar
Weight	approx. 635 kg

23- POWER DISTRIBUTION UNIT BATTERY TESTING 1200A

PDU (Power Distribution Unit for Battery Testing) max. 1200 V / 1200 A

Provide a safe connection between DC power source and unit under test and compensates for the voltage drop caused by long power cables. Power Distribution Unit is a connection box to be mounted near the unit under test.

Cabinet	Lockable PDU-cabinet, appropriate for wall mounting
Protection level	IP54
Dimensions (WxDxH)	800x300x1000 mm
Weight	approx. 97kg
Min. cable length	1.5 m
Max. cable length	50 m
Power connection	Power cables can be connected to the PDU through ICOTEK-cable ducts.
Installation space for current sensor (total amount and type)	1x LEM IT 1000-S or 2x LEM IT 700-S
Additional safety	redundant DC-indicators door switches

24- CONTROL CABLES DC POWER SOURCE UP TO 15M

System cables connect the DC power source with the automation system up to 15 m.

Function	Type
----------	------

Specifications

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CAN-Bus	4x 0,25 mm ²
Emergency-Off or Emergency Stop (redundant design) from 2-QUADRANT DC POWER SOURCE to automation system	4x 0,75 mm ²
Stop from automation system to DC power source (redundant design)	4x 0,75 mm ²
Stop from 2-QUADRANT DC POWER SOURCE to automation system	4x 0,75 mm ²

25- POWER CABLE SET 1200V/1000A 10M CE

<p>Power cables:</p> <p>cable layout design complies with DIN VDE 0298-4 or equivalent</p>	<ul style="list-style-type: none"> - Length: 10 m - Amount: 8 - Copper wire strands - Cable size per cable: 150 mm² - Design Orange (similar to RAL 2003) - Nominal voltage Phase/Ground 1500V (DC) 4000V (AC) - Flame retardant acc. IEC 60332-1 or equivalent - Temperature range: <ul style="list-style-type: none"> - Flexing: max. conductor temperature -5 up to +90 °C - Fixed installation: max. conductor temperature -40 up to +90 °C - Min. bending radius: <ul style="list-style-type: none"> - Flexing: 15x cable diameter (d = 27.5 mm) - Fixed installation: 7.5x cable diameter
Grounding cable	<ul style="list-style-type: none"> - Length: 10 m - Amount: 2 - Copper wire strands - Cable size: 150 mm² - Min. bending radius: <ul style="list-style-type: none"> - At intended use: 6x cable diameter (d = 22 mm) - At cautious bending: 4x cable diameter (d = 22 mm)
Sense line	<ul style="list-style-type: none"> - Length: 10 m - Sense line incl. cable end sleeves - Designed for maximal system output voltage

Specifications

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	- Cable size: 2x 1,5 mm ²
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26- PROGRAMMABLE DC SUPPLY 30V/25A/750W

Programmable DC Supply for Electronic Control Equipment and Vehicle Systems with Voltage Drop Measurement and Compensation using Sensing Lines. Integrated Ethernet Interface with LXI-Compatibility required.

Technical Specification	
Rated output power	750 W
Input voltage	85 – 265 VAC
Mains frequency	47 – 63 Hz
Rated output voltage	0 - 30 VDC
Rated output current	0 - 25 A
Max.line regulation (85~132V _{ac} or 170~265V _{ac} , constant load)	5mV
Max load regulation (from No-load to Full-load, constant input voltage)	5mV
Operating temperature	0-50 °C
	19" rack slot, 1 RU

Installation, training and provisions

Provision of full services for the adequate implementation of the described infrastructure above, including all, but not limited to:

- Implementation Project management
- Engineering works
- Facility engineering
- Commissioning
- Documentation
- Training – at least 80 hours
- Delivery and handling
- Installation of the systems and integration in a complete, unique automated and controlled environment\platform

Clause 2

Delivery of the goods covered by the contract

1. Delivery will be made within the period proposed by the contractor, after issuing the order form, never exceeding 120 (one hundred and twenty) days.

Specifications

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2. The goods covered by the contract must be delivered to the facilities of INEGI, at Rua Dr. Roberto Frias, 4200-465, borough of Paranhos, municipality of Oporto, in transport by the contractor.
3. The contractor undertakes to make available, simultaneously with the delivery of the goods covered by the contract, all documents in Portuguese or English required for proper and integral use or operation thereof.
4. Receipt of the items on the delivery date is deemed provisional and becomes final only after they have been duly verified, and the equipment will be started by the contractor at the premises of INEGI.
5. Items that do not comply with the features/quality proposed and accepted will be returned to the supplier, who will replace them, the latter bearing the resulting charges.
6. With the delivery of the goods covered by the contract, there is a transfer of possession and property thereof to the public contractor, as well as the risk of deterioration or perishing thereof, without prejudice to the warranty obligations imposed on the contractor.
7. All expenses and costs of transporting the goods covered by the contract (packing, transport and transport insurance) and the relevant documents to the place of delivery are the responsibility of the contractor.

Clause 3

Inspection, acceptance tests and compliance check

1. It is of contractor responsibility to perform the installation, testing and its commissioning to INEGI. INEGI will assist the contractor during this process providing space and required connection points for the equipment (e.g. electricity and electric energy).
2. After the installation of the testing equipment, the contractor within 30 (thirty) business days must provide training to INEGI's staff, starting with the demonstration of the fulfilment of the technical specifications and operational requirements as established in Annex I. INEGI may ask a third party to attend the inspection and training.
3. During the testing stage, the contractor must provide INEGI with all necessary cooperation and clarifications.
4. In case of defects or discrepancies with the features, specifications and technical requirements defined in the specifications, the contractor must carry out, at their expense and within the reasonable period determined by INEGI, the remedies or replacements needed to ensure the operability of the assets and the compliance with legal requirements and the required features, specifications and technical requirements.

Clause 4

Specifications

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Inoperability, defects or discrepancies

1. In case of defects or discrepancies with the features, specifications and technical requirements defined in the specifications, INEGI must inform the supplier in writing.
2. In the case provided for in the preceding paragraph, the contractor must carry out, at their expense and within 22 (twenty-two) business days, the remedies or replacements required to guarantee the operability of the goods and compliance with legal requirements and features, specifications and technical requirements.
3. After making the necessary replacements, the contractor carries out a new demonstration.
4. If the testing equipment to be purchased does not meet the required features and functions, the awarding entity may, within 30 days, return the goods.
5. The return provided for in the preceding paragraph must be duly justified with the contractor, who must return the amounts paid.

Clause 5

Acceptance of assets and transfer of ownership

1. If the tests mentioned in clause 3 prove full operability of the goods covered by the contract, as well as their compliance with legal requirements, and no defects or discrepancies with the features, specifications and technical requirements are detected as per Appendix 1 to these specifications, a receipt must be issued, within 5 days of the end of the tests, signed by the representatives of the contractor and INEGI.
2. With the declaration of acceptance mentioned in the preceding paragraph, possession and ownership of the assets are transferred to INEGI, including the risk of deterioration or perishing thereof, without prejudice to the warranty obligations imposed on the contractor.
3. The signature of the report mentioned in paragraph 1 does not imply acceptance of any defects or discrepancies in the equipment covered by the contract with the legal requirements or the features, specifications and technical requirements set out in Annex I to these specifications.

Clause 6

Technical warranty

1. Under the terms of this clause and the law that governs aspects related to the sale of goods and the guarantees related thereto, and without prejudice to the period proposed in the winning bid, the contractor guarantees the goods covered by the contract for a minimum period of 3 (three) years from the date of commissioning of

equipment and the onsite training, against any defects or discrepancies with the legal requirements and features, specifications and technical requirements defined in Annex I to these specifications, from the moment of signature thereof. Higher warranty periods will benefit the supplier enrolled in the public tender according to the formula proposed in the procedure programme.

2. The guarantee provided for in the preceding paragraph covers:
 - a) Transportation of the defective or disparate goods or parts or components to the place of their repair or replacement and return of those goods or the delivery of missing, repaired or replaced parts or components;
3. Within 2 (two) months of the date when INEGI has detected any defect or discrepancy, they must notify the contractor, for the purpose of the relevant repair or replacement.
4. The repair or replacement provided for in this clause must be carried out within a reasonable time frame set by INEGI and without serious inconvenience for the latter, taking into account the nature of the asset and the purpose for which it is intended.
5. The minimum technical guarantee period set out in these specifications does not prejudice an extended period, set out in the bid to be submitted by the contractor, the latter being the definitive and binding period, for the purposes of technical guarantee.

Clause 7

Manufacturing continuity guarantee

The contractor must ensure continuity in the manufacture and supply of all parts, components and equipment that form the goods covered by the contract for the estimated shelf life of the goods, in accordance with the applicable accounting depreciation rules.

MAIS DE 30 ANOS
A CONVERTER
CONHECIMENTO
EM VALOR

**INEGI - Instituto de Ciência e Inovação
em Engenharia Mecânica e Engenharia Industrial**

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