

Référence (n° chrono) : 25-067 DEHT STB

Version C

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EQUIPMENT SPECIFICATIONS

Twin screw extrusion equipment for compounding of batteries components

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	Name	Fonction	Signature / Date
Written by	J. SALOMON / S. CHAZELLE	Research Engineer	
Checked by security	M. LEBRUN	Safety Engineer	
Checked by Hiérarchique	B. CHAVILLON	Laboratory Head or Platform Manager	
Issued by	S. PERRAUD	Head of Department	

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	- Writer(s)	- 1 copy (email)

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B	J. SALOMON	13/11/2025	Modification
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1. PURPOSE

The specifications set out the supply, on behalf of CEA, of an equipment of **twin screw extruder** for compounding of small material quantities at laboratory scale. This equipment should allow the development of new batteries components such as electrolytes and electrodes.

Please note that this machine should be designed for **R&D applications**.

2. DEFINITION

In this document, the contractor is referred to as “the supplier”.

The instructing party is referred to as “CEA”.

3. GLOSSARY

LITEN:	Laboratoire d'Innovation pour les Technologies des Energies Nouvelles et les nanomatériaux - Laboratory of innovation for new energy technologies and nanomaterials
PMAD:	Prise en Main A Distance (Remote control access)
DOE:	Dossier des Ouvrages Exécutés (As built file)
NMP:	N-Methyl-2-pyrrolidone

4. APPLICABLE DOCUMENTS

The supplier shall comply with the documents and all procedures in force at CEA/GRENOBLE. Below is a non-exhaustive list:

EQ/CS23-10: Règles applicables aux entreprises extérieures (French version)
EQ/CS23-11: Applicable rules for outside companies (English version)

These documents shall be available for consultation upon request by the supplier.

5. CUSTOMER – SERVICE PROVIDER CONTACT

The technical contacts for the basic and additional services are:

Mr SALOMON Jérémie
Tel.: +33(4) 38 78 46 38
Email: jeremie.salomon@cea.fr

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For any commercial information:

Mrs RAVARY Emlyne
Tel.: +33(4) 38 78 00 00
Email: emlyne.ravary@cea.fr

6. CONFIDENTIALITY

The supplier undertakes to keep confidential and shall refrain from disclosing to any third party, without written approval from CEA, the whole or part of information and/or knowledge belonging to CEA or any third party, that it may obtain or may have obtained during the service performed on behalf of CEA.

7. TECHNICAL SPECIFICATIONS

7.1 Context

The extrusion equipment will be used in the field of **battery cell manufacturing**, especially for **producing homogeneous compounds** that will be then shaped as sheets or thin films (electrodes, polymer membranes, ...).

Exemplary final compounds are composed of some or all of the following materials:

- one or several thermoplastic polymers (polyolefines, fluoropolymers,...).
- liquid dosing: **one inlet above the barrel**. one or several inorganic powders (graphite, metal oxide, ...).
- one or several conductor additives (carbon black, carbon fibers, ...).
- one or several additives (inorganic salt, plasticizer, pore former, ...).
- one liquid phase (organic solvent, water, ...).

The polymers (in powdery or pellets form) should be able to melt in the first section of the extruder and then the other powders should be intimately distributed and dispersed along the screw profile with appropriate mixing elements.

After compounding, the mixture will be **directly shaped** out of the twin-screw extruder head by using a flat die.

Note that one particular application of this process will be the compounding of **highly-filled mixtures** containing a large fraction of micron-sized and dense inorganic powders (**more than 60 %v./v.**).

When needed a **solvent fraction** could be advantageously added during the compound preparation in order to reduce the viscosity of the mixture. In this case the **dry content of the mixtures will be in the range 70 - 100% (w./w.)**.

Particular attention will have to be paid to the process using highly-filled mixtures and/or limited quantity of a solvent. Indeed the inorganic powders (with various morphologies such as spheres, flakes, ...) could exhibit abrasive properties that could lead to **premature wear of the elements in contact with the mixture** (barrel, screws). Besides solvents (deionised water, NMP, THF, acetone, ethylene carbonate, ...) could have **dissolving or corrosive effects** on soft parts such as gaskets or tubes.

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In consequence all parts in contact with the product should be wear resistant for all considered component productions. When selecting the appropriate barrel and screw materials (see § 7.2.2) **strong abrasion protection should be first considered**, with sufficient corrosion protection to be ensured in cases where inorganic salts and solvents are used.

Table 1: List of representative inorganic powders used for compounding

Chemical formula	Theoretical specific mass (g/cm ³)	D50 (µm)	Website link for example
LiFePO ₄	3.6	~ 3.5	https://mtixtl.com/products/lib-lfpo?_pos=1&_sid=7ac75d52c&_ss=r
Li[Ni _x Mn _y Co _z]O ₂ (x+y+z=1)	4.7	~ 10	https://mtixtl.com/products/linicom-no2-ni-co-mn-8-1-1-powder-for-li-ion-battery-200g-bag-eq-lib-lncm811?_pos=9&_sid=2269460_da&_ss=r
Graphite (natural or synthetic)	2.2	~ 20	https://mtixtl.com/products/lib-mcmb?_pos=6&_sid=d811daf65&_ss=r
Li ₇ La ₃ Zr ₂ O ₁₂	5.5	~ 1to10	https://mtixtl.com/products/llzo-li7la3zr2o12-powder-for-solid-state-electrolyte-of-li-ion-battery-100g-bag-lib-llzo?_pos=1&_sid=f89c38f16&_ss=rhttps://www.mtixtl.com/EQ-Lib-LLZTO.aspx
Li ₆ PS ₅ Cl	1.6	~ 1to10	https://www.sigmaaldrich.com/FR/fr/product/aldrich/916137?srsId=AfmBOorFOldzAoXDxKk7DloDvkNm-yK39IS8STsmvSXCTeFuVEIBq2Bb

7.2 Machine specifications and descriptions**7.2.1 General specifications**

The equipment should be based on **twin-screw extrusion technology with parallel co-rotating axes**. For all the following equipment specifications the Supplier should prefer standard existing solutions. If equipment specifications should deviate from CEA ones the Supplier would precisely describe these deviations.

7.2.2 Extruder design

A stand-alone, floor-standing drive unit with integrated motor will be preferred.

1) Barrel

The barrel length should be designed such that the ratio “length over diameter” (L/D) is equal or greater than 40 ($L/D \geq 40$). Barrel with **segmented or modular design** will be highly preferred in order to adjust the configuration depending on the materials to be processed. A barrel configuration will be detailed by the Supplier (total length, port positioning, ...). Several inlets/outlets should be present along the total barrel length, with at least the following ones as required items:

- Solid dosing: **one port to feed from above the barrel.**
- liquid dosing: **one inlet above the barrel.**
- devolatilization: **one outlet for degassing.**

The Supplier is asked to provide **drawings of the barrel with relative ports positioning.**

The Supplier should provide all necessary plugs to easily close the ports when not used as well as connecting equipment with the feeders (see § 7.2.3).

Some parts of the barrel should be removable to easily have an access to the screws for cleaning steps, screw inspection or design modulation. The Supplier should detail the selected technology and its advantage (**clamshell opening, shaft extraction from the front, ...**). All necessary accessories needed or helping for the screw removal (mobile workplan, ...) should be provided by the Supplier.

In order to be able to process highly-filled blends the barrel parts in contact with the product should exhibit strong **wear resistance** (abrasion and corrosion). Based on its own experience and CEA materials specifications (see § 7.1), the Supplier should propose appropriate **anti-abrasive and anti-corrosion treatment** for the barrel inner surface (direct coating or removable inner liner). A detailed description of the material(s) used for this treatment should be provided, as well as a rigorous comparison with “standard” materials in terms of hardness or “ratings” for the protection against abrasion. In the prospective case of removing and replacing all treated parts (liners, barrels, ...) the Supplier is asked to include an *informative quotation* with costs for material and intervention on equipment.

2) Screws

A set of two screws will be designed with **diameters between 10 mm and 13 mm**. A **modular design** would be preferred in order to adjust it to the products to be processed when necessary. Based on its own experience and CEA materials specifications (see § 7.1), the Supplier is asked to provide a detailed screw configuration with the following items:

- Drawings of the screw design.
- List of the selected screw elements with detailed description (type, length, ...).

In order to adjust the screw profile in the future the Supplier should also quote representative screw elements as spare parts. Besides, a list of all available screw elements with detailed specification (type, length, ...) will be provided with *indicative prices* for subsequent CEA purchase orders in the future.

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In order to be able to process highly-filled blends the screw parts in contact with the product should exhibit strong **wear resistance** (abrasion and corrosion). Based on its own experience and CEA materials specifications (see § 7.1), the Supplier should propose appropriate **anti-abrasive and anti-corrosion treatment** for the screw elements. A detailed description of the material(s) used for this treatment should be provided, as well as a rigorous comparison with “standard” materials in terms of hardness or “ratings” for the protection against abrasion. In the prospective case of removing and replacing all treated parts (screw elements, ...) the Supplier is asked to include an *informative quotation* with costs for material and intervention on equipment.

3) Heating and cooling systems

The twin-screw extruder should be equipped with **at least 5 and ideally between 8 and 10 electrical heating sections** along the barrel with separate temperature control in each section to make temperature profiles. **Maximum admissible temperature should be at least 300°C**. Each section should be equipped with thermocouples for precise measurement of temperature.

The twin-screw extruder should be equipped with a **cooling system based on liquid fluid circulation** (water for example). The Supplier should describe all necessary facilities to run the heating/cooling system on the extruder (cold water input, ...).

4) Other general specifications related to the extruder

The twin-screw extruder should also satisfy the following specifications:

- Maximum screw rotational speed: **≥ 300 rpm**.
- Maximum torque per shaft: **≥ 6 Nm**.
- Maximum admissible temperature: **≥ 300°C**.
- Equipment capacity: **≤ 3 kg/h**.
- Maximum admissible pressure: **≥ 100 bars**.

The Supplier should provide a detailed specification list of the extruder. In particular the **admissible pressure** within the barrel should be mentioned.

All parts in contact with the product should be mechanically and chemically compatible.

7.2.3 Ancillary equipment

1) Feeder for small solid fraction introduction

A gravimetric feeder will be proposed for **small solid fraction introduction above the extruder** (for example the polymer dosing at the beginning of the compounding process). The feeder should be able to precisely introduce the solid with **flow rates from 0.01 Kg/h to 1 Kg/h**. **Two sets of screws** will be proposed depending on the material to be processed and flow rate to be achieved (for example free-flowing polymer powder, polymer in pellets form, micrometric free-flowing carbon powder). A **hopper with volume between 0.25 and 1L** should be included with a lid. Due to height constraint in the dry room environment the refill of the feeder will be done manually. In addition, the extruder and the feeder should be controlled from the same interface.

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2) Liquid dosing system

A **liquid feeding system** should be proposed to have the possibility to add small fractions of solvent in the compounded mixture. The dosing system should be able to precisely introduce liquid fractions with **flow rates between 0.5 and 10 mL/min**.

A volumetric dosing pump adapted for low viscosity fluids such as peristaltic pump could be advantageously proposed. Liquid dosing will be done at room temperature. The viscosities of the fluids that would be dosed are close to the one of water.

A global solution including a pump, piping, adaptors and all necessary accessories (specific support frame, hopper, ...) should be included. Tubing with Teflon, EPDM or silicone-based tubes will be preferred due to chemical compatibility considerations, especially with NMP solvent.

3) Output

For the considered application, the battery components shall be shaped in the form of flat films or sheets. A **flat die** outlet compatible with the single screw extruder should be provided. A design with adjustable die lips would be preferred with **a flexible gap between 500 and 1000 µm, and a width of at least 2 cm**.

In addition to the flat-die, a **strand-die** with a **diameter of 5 mm** should be provided.

The dies should be equipped with a controllable heating system with maximum temperature of 300°C. The addition of one pressure sensor would be appreciated. All parts of the die system should be easily removable to facilitate the cleaning steps.

7.2.4 Process monitoring

The equipment should be equipped with a **control system** that enable to monitor all processing parameters (temperature, pressure, rotational speed and torque) in each heating section of the extruder. The **same interface** should also give the possibility to drive the rotational speed and the extruder temperatures during the process as well as integrate the parameters related to ancillary equipment (feeder operation via extruder control, flow rate of each feeder, ...). A **numeric HMI with touch panel** would be highly preferred.

A data recovery system would be provided to save the data and shall be compatible with Windows 11 Enterprise operating system (see § 7.3).

7.2.5 Spare parts

The Supplier will have a recommended spare part and consumable list for equipment and consumables which will relate to his knowledge of the equipment design and component lifetimes, and the equipment's intended function by the buyer. A corresponding *indicative price list* for all these items will be added in the bid for CEA information.

7.2.6 Equipment dimension

Main dimensions of the equipment (without dosing systems) should be as compact as possible with length inferior to 1500 mm and width inferior to 1000 mm. The **total height including dosing systems and hoppers should be less than 2200 mm**.

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7.2.7 Other general specifications

The compounding system will run on the French electric network 220 V or 380 V (3 phases) at 50Hz, and all electrical installations must meet the European standard UTE18 510.

Connections of all facilities from the back side of the equipment would be preferred.

7.3 *IT equipment*

If the equipment is delivered with a computer, it shall be set up with a Windows 11 Entreprise. Operating System and shall be compatible with the SYMANTEC Endpoint Protection 12.1 RU6 MP6 at least (12.1 RU6 MP9 preferred) antivirus.

The hardware shall enable networking and shall feature at least [wired \(Ethernet\) network](#).

CEA's facilities management shall be called on to configure the PC to the CEA standard before its networking.

It must be possible to save the configuration and acquisition data in a repository of a network server. Therefore, the acquisition data shall be supplied as result files that can be transferred onto the network.

The system must have a remote supervisory system. This supervisory system shall feature a read only profile of the parameters. It shall not be possible to perform any action on the operation of the equipment.

Additional profiles will allow to make the following functions:

- User for the piloting of the equipment
- Maintenance technician for the configuration of the equipment
- Administrator (only for the system administrator staff)

Remote control access of the computer equipment from the Internet shall not be authorised for the maintenance or commissioning phases. Should, for technical reasons, remote control access from an Intranet be required, the supplier shall specify such requirement in its bid. It shall provide the list of all the remote actions that may occur on the equipment using the remote control access. CEA will then carry out an analysis to determine whether or not CEA grants an exception, without this being constituted as a commitment. In any case, the implementation of remote control access shall give rise to a reduction by the supplier which shall be specified in the bid. By default, the remote control access shall then be implemented via RDP (Remote Desktop Protocol) software.

In case parameters of the system can be modified, the supplier will have to indicate in the offer the elements of **analysis of security of this system of supervision allowing to demonstrate that the security of the equipment remains mastered by technical means independent from the system of supervision**. If these elements are not briefly known at the time of the offer, the supply of these elements will constitute a deliverable in the putting into service.

8. WORK ENVIRONMENT, PLACE OF INSTALLATION, SUPPLY LIMITS

8.1 Supply limits

The supply limits between CEA and the supplier are as follows:

Elements	Incumbent upon CEA	Incumbent upon the supplier
Equipments used to perform the measurement during acceptance	X	

8.2 Environment, Facilities

The equipment will be installed in a **room with dry air conditions (-50°C dew point)**. All components of the equipment should be compatible with these conditions.

Two adjustable extraction arms will be positioned by CEA above the equipment, in order to eliminate any fume during utilization.

The supplier shall include in its bid the fluid requirements, electrical power supply and any other required interfaces.

8.3 Delivery

Any item of equipment delivered shall bear the order number as well as the recipient's name.

The supplier shall plan all measures for unloading and installing the equipment.

Delivery shall be performed between 8 a.m. and 4:30 p.m. from Monday to Friday.

The equipment shall be installed on the **CEA – LITEN/DEHT/STB site in the D2 building – “Salle anhydre SA2”**. A door will enable the entrance of the equipment into the dry room, with following dimensions: width 4000 mm – height 2800 mm.

The equipment and peripherals shall be delivered in a clean condition and packaged in a proper manner.

Transport trays, pallets and packaging crates shall be suited to the weights and volumes of the items so as to ensure safe transport and to subsequently prevent any dispute related to defective packaging.

All transport trays, pallets and packaging crates shall be removed by the supplier as the processing of packaging waste is not managed by CEA.

8.4 Conditions for performing work on the CEA site

In cooperation with the supplier and its subcontractors (if any), CEA shall draw up the overall prevention plan for the equipment installation and commissioning services.

As equipment lending, including safety equipment, is prohibited by CEA, the supplier and its subcontractors (if any) shall provide the required safety equipment for preventing the specific risks caused by its work (PPE, CPE, etc.). It shall be responsible for replacement and repair of said

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equipment and, as applicable (without compensation from CEA), it shall train and acquaint its staff with the use thereof in keeping with regulations. Said equipment shall comply with the regulations in force and the supplier shall possess a certificate of conformity.

The supplier and its subcontractors (if any) shall provide collective safety equipment designed to prevent accidents stemming from the work (marking out of the work areas, marking out of the traffic areas; marking out of the handling areas, marking out and implementation of barriers around pits, height differences, etc.). It shall perform and ensure their removal insofar as the service no longer requires the presence of marking systems.

9. LEAD TIMES

The equipment will be installed on site and received within a desired timeframe of **maximum 16 weeks (shorter delay will be appreciated)** from the date To of notification of the order by the CEA.

10. QUALITY

The supplier shall apply a quality management system that is of the same level as ISO 9001 for all its activities.

Any significant and/or repeated failures to comply with the specifications shall be notified to the supplier (anomaly email or improvement sheet) in order to perform corrective actions within a stipulated timeframe. In the event of failures or should said corrective actions not be performed, penalty shall be applied to the service provider in reference to the contract.

CEA Grenoble reserves the rights to inspect the effective operation of the system at any time, via quality audits which may be performed at the service provider's premises and on the CEA Grenoble site.

Any measurements taken by the supplier for acceptance tests shall comply with the requirements of paragraph 7.6 of ISO 9001 (control of monitoring and measuring devices). Should the supplier subcontract these measurements, they shall be supplied with a certificate of conformity.

11. SAFETY AND CONFORMITY

As set forth in CEA's general purchasing conditions, the supplier undertakes to consider safety as an absolute priority in the design, preparation and performance of the services subject of the Contract.

The supplier shall read and apply the "Rules applicable to outside companies working at the Grenoble centre" (refer to chapter 4, "Applicable documents").

The supplier and its subcontractors (if any), irrespective of their rank, shall apply the legal and regulatory provisions pertaining to safety and environmental protection.

The equipment shall comply with the regulations in force.

The equipment shall be CE certified, feature a "CE marking" and shall be accompanied by a CE declaration of conformity (refer to chapter 0 "Documentation").

11.1 Risk analysis

The Supplier shall provide a risk analysis for the equipment and include all the associated items of safety equipment, their actions and servo-controls.

Said analysis shall highlight the specific risks related to the equipment and provide substantiation for the associated protection measures.

The supplier shall transmit this analysis to CEA right from the design phase (refer to chapter 0 "Documentation").

11.2 Risks related to facilities and machines

The equipment shall comply with the regulations in force, especially the "Machinery" Directive 2006/42/EC.

11.2.1 Power supply disconnection and separation device

A power supply disconnection and separation device shall be provided on the equipment, for each source of energy of the machine.

11.2.2 Power supply lockout / tagout device

A power supply lockout / tagout device with dissipation of the residual energy shall be provided on the equipment, for each source of energy of the machine.

11.2.3 Emergency stop



Emergency stop buttons shall feature protection against unintentional operation. See the example on the photo opposite.

11.2.4 "Service" nitrogen or compressed air connection

Whenever the equipment uses compressed air or nitrogen to control valves, actuators and other systems, the machine shall be equipped with a general shut-off valve.

This valve may be secured in closed position by means of a padlock in order to allow lockout / tagout of the facility (maintenance).

One or more bleeding devices shall also be provided to allow the residual pneumatic energy stored within the machine to be dissipated after closing the general shut-off valve. This dissipation shall be carried out without any risk for the exposed personnel.

11.3 Risks related to electricity

11.3.1 Generalities

The equipment shall comply with the regulations in force, in particular the following Directives:

- "Electrical Equipment" 2017/35/EU;
- "Electromagnetic compatibility" 2014/30/EU;
- "Restriction of the use of certain hazardous substances in electrical and electronic equipment" (2011/65/EU).

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If the equipment is composed of electrical measurement, control and laboratory devices, it shall comply with standard NF EN 61010-1.

If the equipment forms an electrical test equipment facility, it shall comply with standard NF EN 50191.

If the equipment uses safety extra low voltage, its source shall comply with standard NF EN 61558-2-6.

If the equipment features a source capable of feeding electricity back to the power grid, it shall comply with standard DIN VDE 0126.

11.3.2 Presence of an uninterruptible power supply (UPS)

If the whole equipment must be supplied by an uninterruptible power supply (UPS), then this power supply shall be provided by CEA.

The supplier shall give all the required information for product definition (voltage, power, battery life). The supplier shall provide connection terminals on the equipment to connect the uninterruptible power supply.

In the event that only a portion of the equipment is powered by an internal UPS integrated by the manufacturer, the following rules shall be observed:

- An all-pole isolating device shall be installed downstream of the UPS in order to enable maintenance operations.
- If voltage still remains after the master switch of the machine has been turned off, such presence shall be indicated close to the switch.
- All circuits that remain live after switch off shall be marked in orange colour in accordance with standard 60-204.

11.4 Risks related to fire

By default, the detectors integrated into the equipment shall not be connected to the fire safety system of the building and shall act only on the equipment concerned and its associated peripherals, if any.

If the supplier considers that it is necessary to connect its fire safety system to the fire safety system of the building, it shall previously contact CEA to verify the compatibility of the entire system.

11.5 Risks related to explosion

Non applicable.

11.6 Risks related to chemicals

Non applicable.

11.7 Risks related to handling

For those parts of the equipment requiring handling (pumping units, chamber lids, covers, etc.), in particular during maintenance or installation operations, suitable lifting means shall be provided and described in the safety instructions of the equipment.

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Systems integrated into the equipment shall be given preference over removable systems.

11.8 Risks related to pressure vessels

The equipment shall comply with the regulations in force, especially the following directive:

- "Pressure" Directive 68/2014/EC.

For equipment subject to this Directive, the supplier shall provide the complete design file of the equipment (drawings, design notes, etc.) as well as all necessary information to compile the operating file of the pressure equipment and allow commissioning inspection operations to be performed.

The supplier shall communicate the inspection and requalification intervals for the items which are to be inspected.

11.9 Risks related to work at height

In the event that use, maintenance or installation operation of the equipment require access at height, the supplier shall give priority to the installation of collective protective equipment (e.g.: built-in work platform with handrail complying with the standards in force) or, failing that, provide personal protective equipment (e.g.: anchoring points or lifelines complying with the standards in force). In the latter case, the technical documents shall very clearly refer thereto, so that the associated regulatory checks can be implemented.

Where necessary, the associated personal protections may be required.

These shall have been validated by CEA.

11.10 Risks related to artificial optical radiation

Non applicable.

11.11 Risks related to noise

The equipment shall comply with the regulations in force, in particular the "Machinery" Directive 2006/42/EC.

11.12 Risks related to temperatures

The equipment shall comply with the regulations in force, in particular the "Machinery" Directive 2006/42/EC.

11.13 Signalling

The equipment shall comply with the regulations in force, in particular the "Machinery" Directive 2006/42/EC.

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Residual risks shall be indicated on the machine by means of regulatory hazard pictograms (triangles with yellow background), accompanied by additional text when applicable. In this case, this text shall be written in French.

11.14 Regulatory inspections

CEA shall have the necessary regulatory inspections carried out by an authorised organisation of its choice, in order to verify that the supplied equipment complies with the regulations.

The Supplier shall remedy any non-conformity in the shortest time possible without being able to claim any compensation. Depending on the severity of the detected anomalies, CEA may decide to suspend the commissioning operations until the problems have been solved (refer to Article 30 of chapter 11 of the General Purchasing Conditions).

11.14.1 Inspection of the work equipment

The equipment supplied shall comply with the regulations in force in France.

These regulations include European texts.

The various standards applicable to the machine shall be complied with.

The general rules specified by the "Machinery" Directive 2006/42/EC on the use of work equipment and protection measures shall be complied with.

CEA may have an inspection of the work equipment carried out at the place of manufacture by an inspection organisation it will have previously selected. The report issued further to this inspection at the place of manufacture shall be free of any non-conformity. In the event of any non-conformity which would not have been remedied, a second inspection shall be carried out after the equipment is installed on the site.

Refer to chapter 14. CEA shall have an inspection of the work equipment carried out on the place of installation. The report issued further to this inspection shall be free of any non-conformity. In the event of a non-conformity, a second inspection shall be carried out after the equipment is installed on the site.

11.14.2 Regulatory electrical inspection

Once the equipment is installed on the site and prior to commissioning, CEA shall have a regulatory electrical inspection carried out by an inspection body of its choosing.

12. ENVIRONMENTAL CLAUSES

Non applicable.

13. EQUIPMENT DOCUMENTATION

The supplier undertakes to provide:

- The user's manual written in French; if this is not possible, only the "safety" section of the manual shall be written in French.
- The servicing and maintenance manual.
- The work equipment inspection.
- The regulatory electrical inspection.
- The CE declaration.
- The equipment safety analysis (refer to § 11.1) and in particular the supervisory system, the safety instructions and risk identification.
- The drawings.
- The as-built file (DOE).
- Any other document required by the applicable regulations.

14. ACCEPTANCE CONDITIONS

Acceptance is given after complete delivery of the equipment and at the end of the installation and commissioning operations, and after satisfactory tests. If there were any remarks during the pre-acceptance (if it was carried out in the factory, see 11.14.1 Checking work equipment), it will be necessary to check that the solutions provided comply with the safety requirements (for example, refer to to form FOR259).

Criteria for granting acceptance:

- Technical conformity with CEA specifications,
- Conformity following regulatory inspections (cf. § 11.14),
- Supply of the documents stipulated in the "Documentation" paragraph 13.

[CAUTION: Whenever an acceptance criterion requires a measurement, the equipment used to perform the measurement must be ECME.

If CEA supplies the measuring instrument, ensure that an ECME is available and that it has the appropriate measurement accuracy.

If the supplier provides the measuring instrument, specify:]

Measuring, testing and monitoring equipment (ECME) (as defined in standard ISO 9001 § 7.6) shall be used to check the achievement of the acceptance criteria. The supplier shall provide calibration or check certificates of the measuring equipment used.

15. TRAINING

The supplier undertakes to provide the following training:

15.1 Training on the use of the equipment

The supplier undertakes to commission the equipment and to conduct training in its use for **3 people**.

The supplier shall specify the duration of the required training courses in its bid.

This training shall include the formation on the equipment utilization, the formation on the control system and the cleaning steps of the equipment.

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15.2 Training on first level maintenance

The supplier undertakes to conduct training on first level maintenance for **3 people**. The supplier shall specify the duration of the required training in its bid.

This training shall include the formation on regular maintenance operations to be held by CEA to ensure good service life of the equipment.

15.3 Training on advanced maintenance

Non applicable.

16. WARRANTY

Notwithstanding the legal warranty, the equipment shall be guaranteed **1 year** as from acceptance against any material, manufacturing, installation and operating defect, in compliance with the technical requirements of the specifications.

Said warranty shall cover the parts (excluding consumables), workmanship, transportation and travel.

Throughout the warranty period, the supplier undertakes to carry out repair work at the latest within **one week** following receipt of a fax or an email from CEA requesting a service call. These services shall be carried out every day from Monday to Friday, from 8 a.m. to 5 p.m.

In the event of equipment unavailability, the warranty period shall be extended by a period of time equal to the equipment downtime.

17. MAINTENANCE

At the end of the warranty, CEA shall be given the possibility to purchase a 5 years maintenance contract for information only.

The supplier shall include in its price base, a cost estimate, of the maintenance services by taking into account the following levels of requirement:

- Full service (commitments on the availability time of the equipment including the preventive maintenance services, unlimited corrective maintenance and supply of spare parts). By default, the performance expected in the Full Service contract is that stipulated herein;
- Preventive maintenance (parts and manpower) + corrective maintenance on demand (hourly rate) including compliance with service and repair lead times.

Following adjustment of CEA's maintenance requirements, the maintenance contract may be put in place after the warranty period, further to negotiations.

18. ELEMENTS TO BE PROVIDED IN THE BID

- ❑ Comments from the Equipment Manufacturer on the Equipment Specifications (refer to § **Appendix 1**).
- ❑ **List of references from the Supplier** (customers with same kind of equipment provided by the Supplier). Any detailed information about process with highly-filled materials required in specific markets (battery electrodes and electrolytes, powder injection molding, filled polymer composites, ...) will be highly appreciated.
- ❑ **Equipment documentation** (user's manual, electrical diagram, ...).
- ❑ **Specific documentation** detailed in the Specifications part (see 7): drawings of barrel and screws, *informative quotations* for spare parts purchase orders, ...
- ❑ The description of required utilities. Completed characteristics of fluid requirements, power supply and all other necessary interfaces (refer to § **Appendix 2**).
- ❑ Maintenances costs.
- ❑ The duration and description of the planned training.
- ❑ As applicable, a copy of these specifications with the Supplier's comments.
- ❑ Compliance matrix (form 253) joigned to the bid.
- ❑ Safety analysis of the equipment (refer to § 11.1).

Appendix 1. **Equipment Specifications compliance - to be provided by the equipment manufacturer**

Supplier name	
Offer reference	

C = **Compliant**
NC = **Non Compliant adaptations are necessary**
NA = **Non Applicable**

Spécification Topics	Compliant ?			Supplier Comments	Supplier Alternative proposal	Final decision
1.Purpose	C ☐	NC ☐	NA ☐			
6. Confidentiality	C ☐	NC ☐	NA ☐			
7.1 Expected Spécifications	C ☐	NC ☐	NA ☐			
7.3 IT equipment	C ☐	NC ☐	NA ☐			
8.1 Supply limits	C ☐	NC ☐	NA ☐			
8.2 Environnement facilities	C ☐	NC ☐	NA ☐			

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Spécification Topics	Compliant ?			Supplier Comments	Supplier Alternative proposal	Final decision
8.3 Delivery	C ☐	NC ☐	NA ☐			
8.4. Conditions for performing work on the CEA site	C ☐	NC ☐	NA ☐			
9-Lead Times	C ☐	NC ☐	NA ☐			
10 Quality	C ☐	NC ☐	NA ☐			
11 1. Risk analysis	C ☐	NC ☐	NA ☐			
11.2.1- Power supply disconnection and separation device	C ☐	NC ☐	NA ☐			
11.2.2 Power supply lockout/tagout device	C ☐	NC ☐	NA ☐			
11.2.3- Emergency stop	C ☐	NC ☐	NA ☐			
11.2.4-“Service” nitrogen or compressed air connection	C ☐	NC ☐	NA ☐			

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Spécification Topics	Compliant ?			Supplier Comments	Supplier Alternative proposal	Final decision
11.3.1 Risks related to electricity - Generalities	C ☐	NC ☐	NA ☐			
11.3.2 Presence of an uninterruptible power supply (UPS)	C ☐	NC ☐	NA ☐			
11.4- Risk related to fire	C ☐	NC ☐	NA ☐			
11.5 Risks related to explosion	C ☐	NC ☐	NA ☐			
11.6 Risks related to chemicals	C ☐	NC ☐	NA ☐			
11.7 Risks related to handling	C ☐	NC ☐	NA ☐			
11.8 Risks related to pressure vessels	C ☐	NC ☐	NA ☐			
11.9 Risks related to work at height	C ☐	NC ☐	NA ☐			
11.10 Risks related to artificial optical radiation	C ☐	NC ☐	NA ☐			

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Spécification Topics	Compliant ?			Supplier Comments	Supplier Alternative proposal	Final decision
11.11 Risks related to noise	C ☐	NC ☐	NA ☐			
11.12 Risks related to temperatures	C ☐	NC ☐	NA ☐			
11.13 Signalling	C ☐	NC ☐	NA ☐			
11.14.1 Work equipment inspections	C ☐	NC ☐	NA ☐			
11.14.2 Regulatory electrical inspections	C ☐	NC ☐	NA ☐			
12. Environmental Clauses	C ☐	NC ☐	NA ☐			
13. Equipment documentation	C ☐	NC ☐	NA ☐			
14 Acceptance Conditions	C ☐	NC ☐	NA ☐			
15.1 Training on the use of the equipment	C ☐	NC ☐	NA ☐			

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Spécification Topics	Compliant ?			Supplier Comments	Supplier Alternative proposal	Final decision
15.2 Training on first level maintenance	C ☐	NC ☐	NA ☐			
15.3 Training on advanced maintenance	C ☐	NC ☐	NA ☐			
16 Warranty	C ☐	NC ☐	NA ☐			
17 Maintenance	C ☐	NC ☐	NA ☐			
18 Elements to be provided in the BID	C ☐	NC ☐	NA ☐			

Validation summary of the points to be clarified			
	Name	Date	Signature
SUPPLIER			
CDPE			
Division Manager			

Dispatch : Head of the Department- CDPE (Chef de Projet Equipement) - Service Achats - Chef d'installation - Responsable plateforme

Appendix 2. Specifications for installing equipment - to be provided by the equipment manufacturer

Features completed with fluid requirements, power supply and any other interfaces he deems necessary for a good estimate of the cost of installing the equipment.

- 1) This appendix will allow the CEA to produce the fluids PID and electrical PID.
- 2) These PIDs will then be sent for verification to the equipment supplier for approval.
- 3) The Hook Up and Fit Up will begin after the official validation of the PIDs by the supplier.



Annexe2_Datasheet
_for_Tool_Installatio

This file can be sent at a companie.

The file content is put here as an illustration of the requested content.

Twin screw extrusion equipment for compounding of batteries componentsRéférence (n° chrono) : 25-067 **DEHT - Version C****Equipment model:****List of equipment & sub-equipment**

Nom	Location (Fab or sub-fab)	Type (Chiller, pump...)	Model	Dimensions (L x w x h) in mm	Weight (Kg)	Supplied by

Required sizing of facilities for proper equipment operation

Required sizing of facilities for proper equipment operation				Connection		Consumption (e) = "Consomation"				Pressure (bar) at the connection on the tool		Temp (° C)		Purity		
Fluid (a)	From	To	Description (b)	ID (c.)	Size (d)	Type	Min	Max	Average	Min	Max	Min	Max		Supplied by	Comments (ex: max length..) (f)

Comments

- (a) See the 'fluids' sheet for some examples.
- (b) To describe the purpose and characteristics of the connection:
- (c) Name of the connection identified on the equipment.
- (d) Size of the connection; the unit must be specified.
- (e) Flows (incoming and outgoing flow rates) and consumption, which must be converted as described below:
 - Exhaust: m³/h
 - ERP (PCW), EDI (DIW), VP, drain: l/min
 - Gas: Slm (Standard liter per minute)
- (f) Include any remarks and constraints that need to be taken into account when installing the equipment: for example, maximum length, etc.

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Electrical requirements									
From	To	Type (power, signal..)	Voltage	Phases	Breaker Amp = limite en ampères de sécurité	FLA (Full Load Amperage)	Average Amp	Supplied by	Installed by

Nuisances									
From	To	Type (power, signal..)	Voltage	Phases	Breaker Amp = limite en ampères de sécurité	FLA (Full Load Amperage)	Average Amp	Supplied by	Installed by

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Nuisances		unity	level
Security description must be attached	Noise	dB	
	Vibrations		
	X rays		
	Magnetic		
	Dust		
	"Nano" particles		

Fluids	Descriptions
ACS / CDA	Air Comprimé Sec / Compressed Dry Air
N2S	Nitrogen Service
N2P	Nitrogen Process
Ar	Argon Process
He	Helium Process
Exhaust	Exhaust
Acid Drain	Acid Drain
HF Drain	HF Drain (if [HF] > 1%)
Solvent Drain	Solvent Drain
ERP / PCW	Eau de Refroidissement Process / Process Cooling Water
EDI / DIW	Eau Dé-Ionisée / Deionised Water
VP	Vide Process / Vacuum (P=-880mbar) (expect pump)
Process Gas	Example : H2, SiH4, CH4...
Process Fluid	Example : IPA, HF, H3PO4...