



CAHIER DES CHARGES

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EQUIPMENT SPECIFICATIONS

« Welding Machine »

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1. PURPOSE

The specifications set out the supply, on behalf of CEA, of an item of equipment of Welding. The aim is to weld connectors and solar cells assembly (SCA) for photovoltaic modules applications.

The equipment installation work will be analysed following the choice of equipment.

If the supplier is unable to draw up the required technical specifications or documents, this shall be clearly specified in its commercial bid by filling in at least the “Supplier’s Comments” area of these specifications.

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)
INES:	Institut National of l’Energie Solaire (Site du Bourget du Lac) – National solar energy institute (Bourget du Lac site)
DOE:	Dossier des Ouvrages Exécutés (As built file)
SCA :	Solar Cell Assembly
PVA :	Photovoltaic Assembly

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:

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Email: philippe.voarino@cea.fr

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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 Expected specifications

The equipment shall fulfil the following requirements with the indicated flexibility degree:

- F0 : almost not flexible
- F1 : preferable (To be quoted as an additional option)

A figure of the nominal configuration is shown below. Locations of the welding are comprised into the active area defined by a square of 500x500 mm².

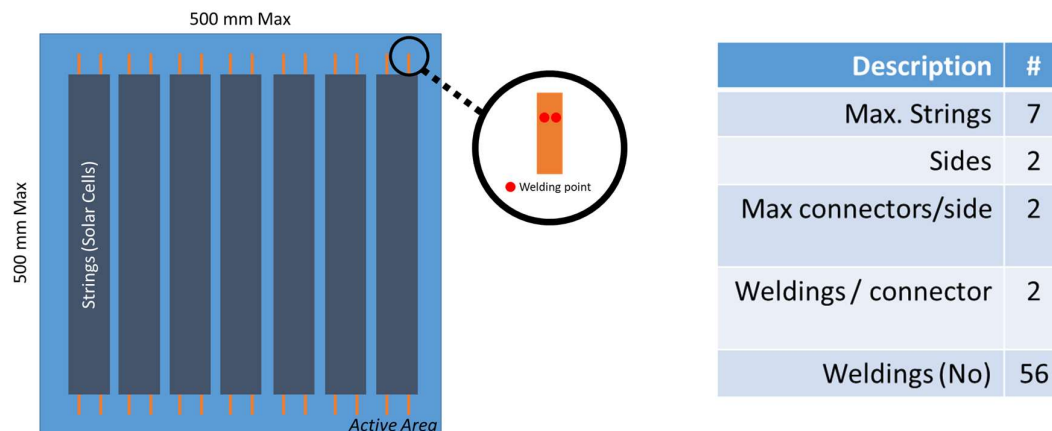


Figure 1: Nominal configuration and an example of number of welding which could be done by the welding machine.

Function	Criterium / Measurement	Level	Flexibility
Dimensions	Moving in space - displacement	Three axis (X, Y and Z)	F0
	Axis precision	+/-50µm (X, Y)	F0
	Active area (welding area)	400x400mm ²	F0
	Maximum PVA size	750x750mm ² x40mm ²	F1
	Variant active area (welding area)	1000x1000mm ² or any other close catalog dimension avoiding too much personalization study	F1
Materials	Materials of connectors / ribbons	KOVAR, INVAR, silver, copper or a combination of these materials	F0
	Connectors / ribbons width	From 1mm to 5mm	F0
	Connectors / ribbons thickness	From 25µm to 200µm	F0
	Typical materials of pads on flexible films	Silver paste / Copper / Silver coated with NiAu flashes	F0
	Pad size on flexible films	3x2mm ²	F1
	Typical materials of flexible films	Polyimide (50µm) for example	F1
	Typical materials of pads on solar cells	Silver paste / Copper / Silver coated with NiAu flashes	F0
	Pads size on solar cells	3x2mm ²	F1
	Typical materials of solar cells	GaAs, Ge, InGaAs, InP, GaInP	F1
	Thickness of the solar cells	From 20µm to 300µm	F0

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Function	Criterium / Measurement	Level	Flexibility
Process	Manual Load Module	yes	F0
	Time Manual load	<30s	F0
	Automatized Load Module	yes	F1
	Automatized welding mode	yes	F0
	Manual welding mode	yes	F0
	Manual Unload Module	yes	F0
	Time Manual unload	<30s	F1
	Automatized Unload Module	yes	F1
	Welding Connector / ribbons on pad of flexible films	yes	F1
	Welding Connector / ribbons on pad of solar cells	yes	F0
	Three weldings have to resist to a peeling test of 300g with an incidence of 0°. (Dage)	yes	F1
	No crack of solar cells (thickness 90µm) under the welding visible in electroluminescence (after welding) (X5 solar cells)	yes	F0
	Speed	5 weldings / min	F0
	Speed	20 weldings / min	F1
Control	Camera to check and to locate the pins / remote control	yes	F0

	Binocular of control	yes	F1
	Screen to display parameters and control	yes	F0

Operation	Criterium / Measurement	Level	Flexibility
Command	Fully automated mode	yes	F0
	Manual mode	yes	F0
	Recipe recording	yes	F0
	Recipe manager	yes	F0
	User friendly GUI with touch screen with French language available	yes	F0
	Remote diagnosis. Remote internet connection, diagnosis, and solution for most incidents.	yes	F0
	Emergency maintenance	yes	F1
Others	Low noise level	< 60dB	F0
	weight of the equipment	< 250kg/m ²	F0
	Doors at the first floor (stairs)	1400mm and 1990mm high.	F0
	Goods lift : depth and doors:	1470mm (depth) x 1190mm and 1990mm high.	F0
	Goods lift : maximum weight	< 750kg	F0

7.2 IT equipment

If the equipment is delivered with a computer, it shall be set up with a Windows 10 Entreprise (1607 version and later) 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

N.A.

8.2 Environment, Facilities

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 INES site in the LYNX4 building (Mezzanine).

The weight of the equipment will not exceed 250kg/m².

Lift: depth 147 cm, width 119 cm and height 199 cm

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 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 8 weeks from the date T0 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).

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)

Not Applicable

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

Not Applicable

11.6 Risks related to chemicals

Not 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.

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

Not Applicable

11.10 Risks related to artificial optical radiation

Not 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.

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.

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

Not 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 and in particular the supervisory system, the safety instructions and risk identification.
- The drawings.
- The as-built file (DOE).

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 are described in appendice 1 (see attached document)

- Demonstration of compliance to all the requirements described in 7.1.
- Supply of the documents stipulated in the "Documentation" paragraph 13.

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 conduct training on the use of the equipment for 3 people. The supplier shall specify the duration of the required training courses in its bid.

15.2 *Training on first level maintenance*

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

15.3 *Training on advanced maintenance*

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

16. WARRANTY

Notwithstanding the legal warranty, the equipment shall be guaranteed 2 year(s) 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 24 hours 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 maintenance contract.

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 § Annex 1).
- ☐ 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
- ☐ Safety analysis of the equipment (refer to § 11.1)

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 company.

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

Modèle de l'équipement :

Liste des Equipments & sous-equipements

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

Dimensionnement nécessaire des facilities pour le bon fonctionnement de l'équipement			Description (b)	Connection		Consumption (e) = "Consomation"				Pressure (bar) at the connection on the tool		Temp (° C)		Purity	Supplied by	Comments (ex: max length..) (f)
Fluid (a)	From	To		ID (c.)	Size (d)	Type	Min	Max	Average	Min	Max	Min	Max			

Comments

- (a): Voir feuille "Fluids" pour quelques exemples
- (b): Pour décrire le but et les caractéristiques de connexion
- (c): Nom de la connexion identifiée sur l'équipement
- (d): Taille de la connexion, l'unité doit être précisée
- (e): Flows (débit entrant et sortant) et consommations qui doivent être converti comme décrit ci-dessous :
 - Exhaust : m³/h
 - ERP (PCW), EDI (DIW), VP, drain : l/min
 - Gaz : Slm (Standard liter per minute)
- (f): Mettre les remarques et contraintes à connaître pour l'installation de l'équipement : par exemple longueur maximale, ...

Exigences Electriques									
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

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...