

Telescope Mechanics

TITLE

Statement of Work for the Procurement of
the CG-Set
(Pliego de Prescripciones Técnicas)

Code: ESP/TELE/0217-R

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Gran Telescopio de Canarias, S.A.

Instituto de Astrofísica de Canarias

Vía Láctea s/n

38200 - LA LAGUNA, TENERIFE, Islas Canarias

Tfno +34 922 315 031 Fax +34 922 315 032

Centro Común de Astrofísica de La Palma

Cuesta de San José s/n

38712 BREÑA BAJA, LA PALMA, Islas Canarias

Tfno +34 922 425 720 Fax +34 922 425 725



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Approval control

Prepared by	Germán Prieto Engineer of Development Group	Signed in the original copy
Revised by		
Approved by	Javier Castro Head of Development Group Romano Corradi General Director	Signed in the original copy Signed in the original copy
Authorized by	Romano Corradi General Director Date:	Signed in the original copy



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Changes record

Issue	Date	Section	Change code	Brief description
1.A	22/06/17	All	All	First version



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Applicable documents

Nº	Document title	Code	Issue
A1	Cassegrain Set (CG-Set) Specifications	ESP/TELE/0216-R	1.A
A2	CG-Set Interface Requirements	DCI/TELE/0061-R	1.A
A3	CG-Set – Science Instrument Interface	DCI/TELE/0062-R	1.A

Reference documents

Nº	Document title	Code	Issue
R1	Cassegrain Set (CG-Set) Preliminary Design	RPT/TELE/0442-R	1.A



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List of acronyms and abbreviations

PDR	Preliminary Design Review
AG	Acquisition and Guiding
CDR	Critical Design Review
CG-Set	Set formed by the Instrument Rotator, AG-Mechanics, Electronics Cabinet and Support Elements
GTC	Gran Telescopio Canarias
ICD	Interface Control Document
RAMS	Reliability, Availability, Maintainability and Safety
SOW	Statement of Work
TBC	To Be Confirmed
TBD	To Be Determined
WP	Work Package



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1 SUMMARY

This document constitutes the Statement of Work for the Procurement of the CG-Set for the Cassegrain focal station of the Gran Telescopio Canarias (GTC).

2 INTRODUCTION

The CG-Set is an electro-mechanical system for the Cassegrain focal station of the Telescope consisting of the Instrument Rotator, the Acquisition and Guiding (AG) Mechanics, and the corresponding Electronics Cabinet, Local Control System and Support Elements. The Instrument Rotator provides the rotation of the Scientific Instrument attached to the CG-Set. The AG-Mechanics, mounted inside the rotating part, supports the AG-Instrument.

A more detailed description of the system can be found in the document R1.

Document A1 shows the branches of the GTC product tree related to the procurement.

Interfaces for the system are defined in documents A2 and A3.

3 DEFINITIONS

3.1 Contractor


Entity who is assigned to provide the services and products determined in this SOW.

4 SCOPE

4.1 Within Work Scope

The work to be carried out by the contractor shall be (for work phase description see chapter 6):

- Preliminary Design of the CG-Set, consisting of the review, modification and improvement of the GRANTECAN Preliminary Design.
- Detailed design and fabrication of the CG-Set, as specified in A1, A2 and A3, including the SW necessary for the Local Control System.
- Development of the test software and hardware necessary to test requirements in A1, A2 and A3, where needed.
- Documentation deliverables as specified in A1.
- Assembly and integration of the CG-Set and subsequent acceptance tests at the contractor's facilities.
- Transport of the equipment to the GTC facilities at the ORM

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- Site acceptance tests of the CG-Set at the GTC facilities.

4.2 Optional Work Scope

No optional work has been defined.

4.3 Within Product Scope

The items to be delivered by the contractor shall be (see applicable items of the Product Tree in document A1):

- Rotator and AG Mechanics Assembly, including cabling of the AG Instrument and alignment elements, as defined in A1.
- Electronics Cabinet, including the corresponding Local Control HW and SW.
- Support Elements (Transport Cart and Dummy Instrument).
- Spare parts for 5 years operation. See minimum spares list in document A1.

4.4 Out of Product Scope

The following items are not included in delivery:

- The Pick-Off Mirror unit.
- The AG-Instrument.
- Cable Rotator of the Science Instrument.

5 DOCUMENTATION SUPPLIED BY GRANTECAN

- Requirements and interfaces (documents A1, A2 and A3)
The CG-Set shall be designed and manufactured according to the specifications and the interfaces described in these documents. Verification deliverables are specified for each requirement and are considered part of the requirement to all extent and purposes.

Requirements that are not fully defined or confirmed are marked as TBD or TBC. Closing of these requirements shall be done in close collaboration between the contractor and GRANTECAN.
- Reference design (document R1)
The preliminary design in R1 should be taken as a reference but is not mandatory. The preliminary design includes 3D and Finite Elements Models (FEM).



6 WORK PHASES

6.1 Introduction

The project shall go through the phases detailed hereafter. Each phase comprises usually the following sub-phases:

- Core work
- Delivery of Documentation, HW, SW (according to the work performed)
- Phase Review
- Delivery of updated Documentation, HW, SW (according to the review)
- Phase approval

The work performed at each phase shall be subjected to a review to verify the work compliance with the requested scope. During the review minutes of meeting shall be taken, including modifications to deliverables, if applicable (to be compliant with the contractual documentation or because so agreed by both parties).

Each phase shall end with the written approval by GRANTECAN, when the requested modifications have been satisfactorily implemented. This approval is required to have the green light to proceed to the next phase.

The phases of the Project shall be:


- Kick-Off Meeting
- Design phases
 - Preliminary Design
 - Detailed Design
- Product phases
 - Manufacturing, Assembly and Integration and Testing
 - Factory Acceptance
 - Delivery
 - Site Acceptance
- Warranty Period

Non-conformances with the requirements and interfaces may be applied for at any time. These shall be managed as instructed in section 8.1.3.

All the deliverable documentation shall comply with the Documentation Deliverables Specification in A1. The contractor may propose a different documentation breakdown subject to approval by GRANTECAN. Documentation shall be sent to GRANTECAN 2 weeks before each phase review, unless otherwise specified.

Changes to documentation at each phase shall be clearly identified in the Changes Record Table of each document, including changes in the annexed files.

The schedule is summarized in section 7.

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6.2 Preliminary Design

This phase starts from the kick-off meeting and concludes with the approval of the Preliminary Design Review (PDR).

6.2.1 Work Scope


The aim of this phase is to issue and review the contractor's own Preliminary Design.

- Revision of the preliminary design provided by GRANTECAN (see R1). It is explicitly pointed out that the design provided by GRANTECAN is not mandatory, being the engineering under full responsibility of the contractor. Nevertheless, it is strongly encouraged to respect the design choices already made about brand/model of components, cables and connectors as far as these comply with the specifications and applicable regulations.
- Additional analysis, improvements, or modifications shall be made in agreement with the requirements and interfaces described in the documents A1, A2 and A3. At the end of this phase the design must be basically closed and only minor choices and details must be left for the next phase.
- Preliminary Design of support and test tools: Design of the support and test equipment required for handling, maintenance/repairing, testing, etc. This includes equipment required at the facilities of the Contractor (Test Bench, etc...) as well as deliverable equipment. Tools for installing the CG-Set at the Telescope are out of scope (except for any alignment elements).
- PDR Documentation.

6.2.2 Deliverables

The following documentation shall be sent to GRANTECAN before the PDR:

- Design Document
- Finite Element Models updated.
- Dimensional 3D Model updated.
- Mechanical and electrical drawings.
- Long delivery terms item list. List of the components proposed to be fabricated/purchased during the critical design phase due to long delivery terms foreseen.
- RAMS analysis document.
- Updated Component List.
- Assembly, Packaging, Handling, Storage and Transportation Procedure (preliminary version addressing the major question involved)
- PDR Verification Control Document

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6.3 Detailed Design

This phase starts from the PDR approval and concludes with the approval of the Critical Design Review (CDR).

6.3.1 Work Scope

- Dimensioning, design and selection of all components of the CG-Set up to the level of detail needed to go into the manufacturing phase in agreement with the requirements and interfaces described in the documents A1, A2 and A3.
- Design of support and test tools up to the level of detail needed to go into the manufacturing phase.
- During this phase, it might be necessary to launch manufacturing or purchase of certain components whose design is completely defined and have long delivery terms.
- PDR Documentation.

6.3.2 Deliverables

The following documentation shall be sent to GRANTECAN before the PDR (first or updated versions, as applicable):

- Design document
- Finite Element Models
- Dimensional 3D Models
- Drawings (complete set of mechanical, electrical and interface drawings)
- Component List
- Commercial components documentation
- Materials certification
- RAMS Analysis.
- Assembly, Packaging, Handling, Storage and Transportation Procedure
- Acceptance Test Plan according to the requirements Verification Deliverables including any other tests deemed necessary.
- Factory Acceptance Verification procedures
- CDR Verification Control Document.

6.4 Manufacturing, Assembly Integration and Testing

This phase starts at the CDR approval and concludes with a Readiness Review approval.

During this phase, the complete integration and testing of the CG-Set shall be carried out.

GRANTECAN reserves the right to take part in all or part of the tests. For this purpose, the Contractor shall inform GRANTECAN with at least one month in advance about the date of any planned test, confirming it at least two weeks before.



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The aim of the Readiness Review is to check that the Contractor has completed and tested the HW and SW, that it has released the corresponding documentation (Acceptance Data Package), and that these are ready for a thorough review and for Factory Acceptance Tests.

Documentation, HW or SW identified as missing shall be sent to GRANTECAN before approval is given to move into the Factory Acceptance phase.

NOTE: The Readiness Review is not intended to be a thorough review of the Acceptance Data Package. This shall take place as part of the Factory Acceptance phase.

6.4.1 Work Scope

- Manufacturing/procurement of all the components of CG-Set, including cabling, Local Control System and Support Elements.
- Manufacturing/procurement of the required test equipment.
- Assembly of the CG-Set including the required dimensional verifications, functional tests and controls of all the components following the Assembly and Verification Procedures.
- Integration of the CG-Set on the test bench.
- Execution of any test required to verify compliance of the CG-Set with the requirements. The configuration of the CG-Set shall be the configuration for delivery. These tests shall include the test dummies where needed. The tests shall be realized on the CG-Set in vertical and horizontal positions, with and/or without the Instrument dummy, as needed to demonstrate requirements compliance in every specified condition or, alternatively, worst-case if adequately justified.

6.4.2 Deliverables

The Acceptance Data Package, consisting on the following documentation, shall be delivered for Readiness Review (first or updated versions, as applicable):

- Design document
- Dimensional 3D Models
- FE Models
- Drawings (complete set of mechanical, electrical and internal interfaces drawings)
- Component List
- Commercial components documentation
- Materials certification
- RAMS Analysis.
- Assembly, Packaging, Handling, Storage and Transportation Procedure.
- Acceptance Test Plan.
- Manufacturing, Assembly and Integration Report (including metrology reports, assembly and integration issues, etc...)
- Factory Acceptance Verification Procedures
- Site Acceptance Verification Procedures



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- Factory Acceptance Verification Reports
- Operation, Maintenance and Safety Manual.
- CG-Set CE Mark Certificate.
- Factory Acceptance Verification Control Document (including Nonconformity applications).

6.5 Factory Acceptance

This phase, in contrast with others, shall begin with a Documentation review by GRANTECAN (the Acceptance Data Package from previous phase).

As part of the Acceptance Data Package Review, GRANTECAN shall identify additional tests or tests to be rerun during the Factory Acceptance. A list of these tests shall be sent by GRANTECAN.

The Contractor shall send confirmation for the dates of the Factory Acceptance Tests at least 3 weeks in advance.

Then, Factory Acceptance Tests shall be carried out and a Factory Acceptance Review shall follow identifying the necessary updates in the Acceptance Data Package.

Documentation shall be updated consequently.

Once the CG-Set has satisfactorily passed all the acceptance inspections and tests, the updated Acceptance Data Package has been successfully reviewed, and the non-conformances have been resolved, the Factory Acceptance of the CG-Set shall be declared as accomplished and GRANTECAN will authorize delivery to the Telescope.

6.5.1 Work Scope

- Realization of any additional tests and inspections GRANTECAN may consider necessary.
- Any modification/update of the HW, SW, or Documentation identified during the Factory Acceptance Review

6.5.2 Deliverables

- Final version of the Acceptance Data Package, as defined in 6.4.2.

6.6 Site Acceptance

This phase starts with the Delivery on Site and ends with the Provisional Acceptance.

The delivery will be under full responsibility of the Contractor.



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A Reception on Site shall take place to check that the HW has not suffered any evident damaged during transportation and is ready for Site Acceptance Tests. During the review, minutes of meeting shall be taken, listing any damage and the corresponding required actions.

Then, some functional verification shall be carried out on Site (Site Acceptance Testing) and the corresponding documentation released

Once the CG-Set have satisfactorily passed all the Site Acceptance inspections and tests, any non-conformances have been resolved, and updates in the documentation have been reviewed and corrected, the Provisional Acceptance of the CG-Set shall be declared by GRANTECAN.

6.6.1 Work Scope

- Cleaning, protection, packaging and shipping of all deliverables following the Assembly, Packaging, Handling, Storage and Transportation Procedure. Destination are the facilities of the GTC at the ORM, La Palma, Canary Islands, Spain.
- Unpacking of the items at the GTC facilities at the ORM. The integrity of the items shall be verified by the Contractor by visual inspection, in the presence of a representative of GRANTECAN.
- Integration of the CG-Set on the Transport Cart.
- Realization of all the tests and inspections defined in the Site Acceptance test plan. These tests will consist of reduced functional verifications.
- Any repair, modification or Documentation update resulting from the Site acceptance tests, and the corresponding repetition of tests. Any such modification and subsequent tests are under full responsibility of the contractor. This shall make provisions and take any tools, spares or support elements to the GTC needed in such case.

6.6.2 Deliverables

- GC-Set, as specified in 4.3.
- On-site Inspection report after the visual inspection of the units.
- Site Acceptance Report, including the results of the Site Acceptance Tests and inspections performed on the CG-Set.
- Any documentation update, if necessary.
- Complete Product Documentation Dossier as specified in A1.

6.7 Warranty Period and Final Acceptance

Starting on the date of the declared Provisional Acceptance the equipment shall have a warranty period of two years. During this period, the Contractor shall have the obligation to substitute or repair any defective equipment that shows up not to be in conformity with the specifications except for tear and wear and usual obsolescence and use of the equipment. Additionally, the Contractor shall have the obligation to update any documentation proved to not be in accordance with the equipment.



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In the case that GRANTECAN finds evidence of non-conformance of any element of the CG-Set with the specifications during the warranty period, GRANTECAN shall have the right to ask the Contractor to repeat the corresponding acceptance tests and inspections included in the inspection plan and site acceptance plan.

If it is necessary to transport items to the Contractor facilities for test or inspections, the cost of the transport (round trip) shall be paid by GRANTECAN. In the case that non-conformance is confirmed the Contractor shall pay back to GRANTECAN the cost of the transport (round trip).

Final Acceptance of all deliverables of the contract shall be declared by GRANTECAN only if the Contractor has fulfilled its obligations during the warranty period.

7 SCHEDULE REQUIREMENTS

The proposed schedule is:

- Kick-off meeting T0 (expected October 2017)
- PDR meeting, T0 + 3 months
- CDR meeting, T0 + 7,5 months
- Factory Acceptance Tests, T0 + 15,5 months
- Delivery at ORM, T0 + 18,5 months

The required date for Provisional Acceptance is:

- Provisional Acceptance. T0 + 20 months

Modifications to the schedule proposed shall be applied by a written manner with the corresponding justification and must be agreed by both parties.

8 QUALITY ASSURANCE REQUIREMENTS

8.1 Configuration Management


8.1.1 Configuration codes

The Contractor shall use the codes established by GRANTECAN for the Configuration Items, Interfaces and Drawings through all its documentation.

The Product Tree is found in A1, showing the corresponding codes. Lower level components and parts shall follow the Component List in the GRANTECAN Preliminary Design Document R1. This document shall be updated at every phase.

Interfaces codes are identified in documents A2 and A3.

Any new code in the Product Tree, Configuration Items List, Interfaces or changes on the existing ones need written approval from GRANTECAN.

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The coding system for drawings is specified the Documentation Deliverables Specification in A1. The contractor may use its own system for cables, hoses and connectors coding as long as it fulfils the referred requirements in A1.

8.1.2 Changes in the specifications

The Contractor shall make a formal request to GRANTECAN for any change in the technical specifications of the contract, or any decision which could conflict with them. The request shall be sent by e-mail to GRANTECAN specifying at least the following data:


- Configuration Change Request Reference
- Company
- Initiator name
- Date
- Configuration Items affected
- Configuration Documents affected
- Requirements affected
- Description
- Technical analysis/justification
- Impact on contractual terms
- Attachments (if needed)

The Configuration Change Request shall be subject to GRANTECAN approval.

8.1.3 Non-conformances

If a non-conformance arises at any moment during the development of the work, the Contractor shall open a non-conformance procedure established by the own quality management system. The event shall be communicated immediately to GRANTECAN by e-mail specifying at least the following data:

- Non-Conformance reference
- Company
- Initiator name
- Date
- Configuration Items affected
- Parts affected, serial number, etc... (if applicable).
- Configuration Documents affected
- Requirements affected
- Description
- Resolution proposed (Waiver, Corrective action, Change of specifications)
- Corrective/preventive actions plan (if any)
- Technical analysis/justification
- Impact on contractual terms
- Attachments (if any)

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The Non-Conformance resolution shall be subject to GRANTECAN approval.

8.2 Project Management

The Contractor shall designate a single contact person in charge of any interaction with GRANTECAN.

The contractor shall maintain a Project Plan for all the activities (design, production, inspection, tests and delivery) and key dates meetings and share this Plan with GRANTECAN regularly (minimum at review meetings).

The Contractor shall report the progress of the work by means of monthly progress meetings. Progress reports shall be delivered right before the meetings including highlights, technical and planning concerns, as well as the status of deliverables.

The progress meetings will take place at the Contractor premises unless otherwise agreed. Minutes of progress meetings shall be taken by the Contractor and signed by both parties or sent by e-mail and agreed by GRANTECAN.

Information about the work progress shall be provided in a more informal way (e-mail or phone discussion) when deemed convenient.

With prior notice of one week, GRANTECAN may visit the Contractor or Subcontractors facilities in a discretionary manner to ascertain progress. GRANTECAN representatives will have access to all the necessary documentation and equipment of the project.

8.3 Phase Review Meetings

Any meetings shall be held at GTC facility or headquarters unless otherwise agreed. The date shall be agreed in advance between the contractor and GRANTECAN according to the milestones of the contract.

9 SAFETY

The contractor shall be responsible for identifying the applicable Safety Standards and Regulations and for compliance of the GC-Set with those Standard and Regulations.