



Telescope Mechanics

Statement of Work of the Procurement
of the Half Moon Platform

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Changes record

Issue	Date	Section	Page	Change description
1.A	10/10/2013	All	All	First Issue.
1.B	31/10/2013	7.1.1	12	Inclusion of explicit note refereeing to the enlargement of the Folded Cassegrain Instrument Envelope and its impact on the design of the Half-Moon Platform.

Applicable documents

Nº	Document title	Code	Issue
A 1	Half Moon Platform Specifications	ESP/TELE/0202-R	1.B
A 2			
A 3			
A 4			
A 5			

Reference documents

Nº	Document title	Code	Issue
R 1	Telescope Structure - Half Moon Platform Preliminary Design	RPT/TELE/0394-R	1.A
R 2			
R 3			
R 4			
R 5			

List of acronyms and abbreviations

PDR	Preliminary Design Review
CDR	Critical Design Review
GTC	Gran Telescopio Canarias
ISS	Interlock and Safety System
NA	Not applicable
SOW	Statement of Work
SRCF	Safety Related Control Function
TBC	To be confirmed
TBD	To be determined

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1. SUMMARY

This document constitutes the Statement of Work for the Procurement of the Half Moon Platform for the Gran Telescopio Canarias (GTC).

2. INTRODUCTION

The Half-Moon Platform is a moveable platform for operation and maintenance of the Cassegrain and Folded Cassegrain focal stations of the telescope. When the telescope tube is in vertical position the Folded Cassegrain foci can be attended, while in horizontal position it will be the Cassegrain focus. A third position, the Resting position, is taken by the platform when the telescope is in operation. In this position the platform stays completely outside the tube revolution volume. The Half-Moon Platform will be operated by means of control panels installed on both Nasmyth platforms and on the electronic cabinet. For a safe operation the Half-Moon platform will stay in communication with the Interlock and Safety System (ISS) of the telescope installations.

A more detailed description of the system can be found in the document *Telescope Structure – Half-Moon Platform Preliminary Design*, A 1. However, the worked out design in A 1 is a preliminary design being not mandatory.

Figure 1 shows the part of the GTC product tree at which this document refers to.

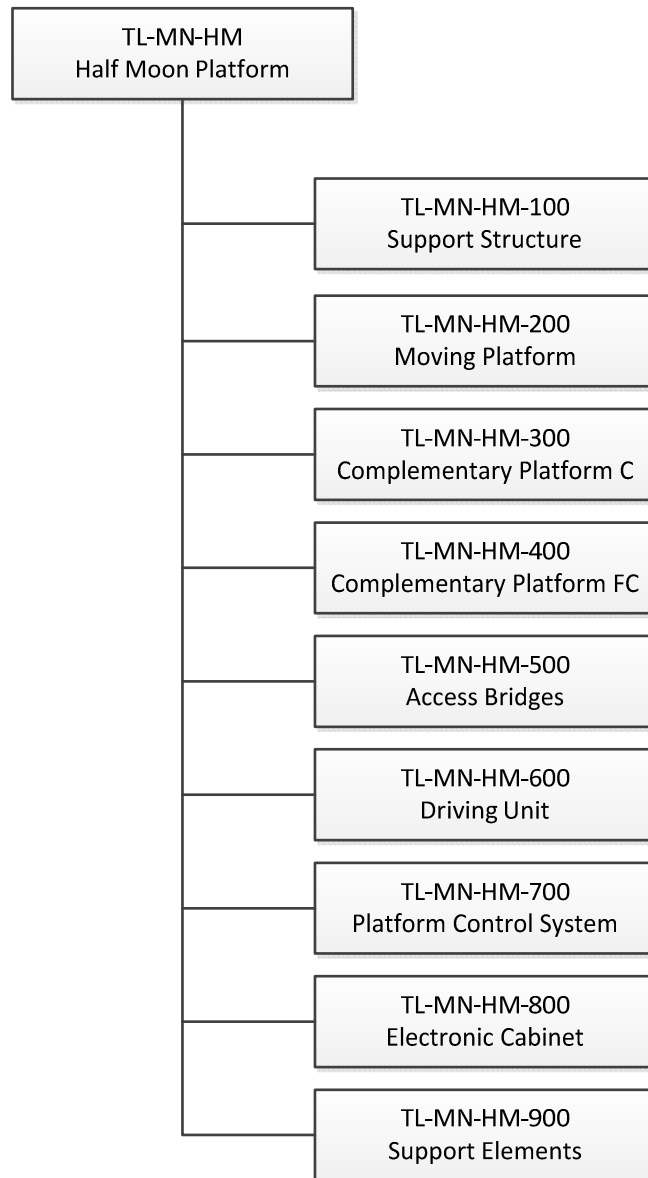


Figure 1 Configuration tree of the platform; can be subject to modifications. Support elements only if applicable.

3. DEFINITIONS

3.1 Contractor

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

3.2 Use of shall/should

“Shall” is used for requirements no matter how stable they are, whereas “should” is reserved for guidelines. Requirements are mandatory and guidelines are not mandatory, although their fulfillment should be strongly pursued.

3.3 Half-Moon Platform

This term refers to the complete system able to operate as an independent device, pre-assembled in shop or on the telescope structure, receiving external electrical energy. According to the actual preliminary design, the system comprises support structure, moving platform, complementary platforms, actuators, access bridges and doors, electronics and cabinet, cabling, as well as mounting material and support tools.

4. SCOPE – RESUME

4.1 Within Work Scope

The work to be carried out by the Contractor shall be (for work phase description see chapter 7):

- Detailed design and fabrication of the Half-Moon Platform.
- Documentation defined in this SOW.
- Assembly and integration in shop with subsequent acceptance tests (without tripods).
- Transport of the Half-Moon Platform to the GTC facilities on the ORM.

4.2 Optional Work Scope

- Integration of the Half-Moon Platform on the telescope structure (see chapter 8).

4.3 Within Product Scope

The items to be delivered by the Contractor shall be:

- One Half-Moon Platform.
- Spare parts for 10 years operation.

5. GENERAL HANDLING CONDITIONS ON SITE

The dimensions of the packages shall allow trouble-free unloading with the on-site overhead crane with 4.80 m free height under the load hook and 5 t maximum load capacity.

All items and packages shall be transportable with a conventional fork lifter with 2 t load capacity at 0.5 m distance. In case of exceeding 3.00 m length and/or the load capacity of the fork lifter, the item shall include transport wheels with a minimum diameter of 200 mm.

The industrial elevator to the telescope chamber has a load capacity of 5 t for objects with maximum dimensions of 4.00 m length, 3.00 m width and 2.00 m height. Larger objects must be inserted through the dome aperture with an external crane (must be hired).

For assembly and integration of the Half-Moon Platform in the telescope chamber a boom crane is available with 5 t load capacity.

Handling conditions for transport to the site can be found in applicable document *Half Moon Platform Specifications*, A 1.

6. REQUIREMENTS OF THE PRODUCT

The Half-Moon Platform shall be manufactured in accordance with the specifications and the interfaces described in the applicable document *Half Moon Platform Specifications*, A 1.

Requirements that are not fully defined are marked as TBD or TBC. Closing of these requirements shall be defined in close collaboration between the Contractor and GRANTECAN.

7. WORK PHASES

The project shall pass through the following main phases:

- Engineering
- Manufacturing, Assembly and Integration
- Factory Tests and Acceptance
- Delivery
- Provisional Acceptance
- Warranty Period and Final Acceptance

7.1 Engineering

This phase starts with the kick-off meeting being dedicated to the revision, enhancement and detailing of the preliminary design presented by GRANTECAN. This work phase terminates with a Critical Design Review (CDR) held in the facilities of the Contractor.

7.1.1 Scope

- Dimensioning and analysis of essential components of the Half-Moon Platform: The aim is to carry the existing preliminary design to fabrication level, in agreement with the requirements and interfaces described in the document *Half Moon Platform Specifications*, A 1.

The preliminary design presented in reference document R 1 is not mandatory being the engineering under full responsibility of the Contractor. The Contractor can present also a completely different concept if justified and in mutual agreement with GRANTECAN.

Important Note: The preliminary design presented in reference document R 1 is based on an obsolete version of the Folded Cassegrain Instrument Envelope which recently has been enlarged. Due to this enlargement the outer radius of the Half-Moon Platform will increase about 400 mm with respect to the preliminary design.

- Design of support and test tools: Design of the support and test equipment which are not an integral part of the end product but are required for handling, testing, integration on

the telescope, maintenance, etc. This includes equipment required at the facilities of the Contractor and at the GTC facilities at the ORM¹.

Lifting tools and mounting aids for integration on the telescope shall be included here, even if the optional scope of work 'Integration on Site' is not chosen (see chapter 8).

- Risk Assessment as per normative UNE ISO EN 12100:2012 considering the Half-Moon Platform an independent machine and taking into account the boundary conditions when the platform is integrated in the telescope.

7.1.2 Deliverables

- Design report including component selection and dimensioning, analysis of structural behavior, accessibility, maintenance and considerations for exchange of wear parts, etc.
- Risk assessment.
- Finite Element Models used for the analysis.
- Dimensional Model.
- Control System Description: Functions and electronic interfaces present on the electronics of the Half-Moon Platform, SRCF included, shall be documented, including a cabling table.
- Complete set of mechanical, electrical and interface drawings with index.

7.2 Manufacturing, Assembly and Integration

This phase starts with the successful CDR meeting ending with the complete integration of the Half-Moon Platform ready for the factory acceptance. As in the previous phase the Contractor and GRANTECAN will stay in close contact concerning the progressing of the project.

It will be held at least one manufacturing progress meeting previous to the factory acceptance tests with visual expertise of the manufactured components.

7.2.1 Scope

- Manufacturing and procurement of all components of the Half-Moon Platform.
- Manufacturing of the required test and support equipment, including assembling aids.

¹ Lifting devices that will be part of the final delivery require the CE marking according to EU Product Safety Regulations.

- Assembly of the Half-Moon Platform realizing the required dimensional verifications, functional tests and controls.

7.2.2 Deliverables

One month previous to the factory tests the following documentation shall be sent to GRANTECAN for revision, comments and approval.

- Updated documentation package of the documents and files mentioned in 7.1.2., in case of any changes.
- Operation, Maintenance and Safety Manual (see also 11.1.4): It shall be clear and precise with clipped and unambiguous instructions. Explicative images and illustrations shall be preferred to long descriptions. Images taken during shop assembly and maintainability tests shall be used for this purpose.

The manual shall contain, among others, the following sections:

Safety	Describing safety aspects concerning the staff and the machine itself. It shall contain hazard identifications and precautions to take, as well as descriptions of the safety devices and the limits of the machine.
Operation	Information for a safe operation taking into account the available signals of the Interlock and Safety System of the telescope (for signals consult applicable document A 1).
Maintenance	Containing maintenance tasks and procedures (corrective, preventive and predictive), originated either from the Contractor himself or from the original supplier of the equipment, indicating precautions to take into account and execution frequency

- Installation Guide (see also 11.1.4): It shall be clear and precise with clipped and unambiguous instructions. Explicative images (made during the shop-assembly) and illustrations shall be preferred to long descriptions.

The installation guide shall be worked out even if the optional scope of work 'Integration on Site' is not chosen (see chapter 8).

- Inspection point reports and nonconformities, if generated: GRANTECAN reserves the right to receive inspection reports once they are generated.

7.3 Factory Acceptance

The factory acceptance will be realized after a successful assembly and integration of the Half-Moon Platform.

GRANTECAN reserves the right to take part in all or part of the verification and acceptance tests. For that purpose the Contractor shall inform GRANTECAN with at least two weeks in advance about the date of the tests confirming it at least one week before. Additionally, GRANTECAN shall have the right to verify during these tests the agreement of the Half-Moon Platform with the documentation.

Once the platform has satisfactorily passed all the acceptance inspections and tests and the Contractor has updated the acceptance data package to the satisfaction of GRANTECAN, the Factory Acceptance of the Half-Moon Platform shall be declared.

7.3.1 Scope

- Realization of functional and performance tests using final cables and conducts. All Safety Related Control Functions (SRCF), defined in the document *Half Moon Platform Specifications*, A 1 and during the detailed design phase, shall be verified, both on local level and on global level simulating the inputs of the ISS.

Comment: Instead of the final support structure a provisional support can be used for factory acceptance tests reducing the overall height of the set-up. Further simplifications can be implemented after prior agreement with GRANTECAN.

7.3.2 Deliverables

- Acceptance Data Package. The Contractor shall update and compile in this Data Package all the documentation with the final status of the work:
 - Factory Acceptance report (raw data included)
 - Design documentation
 - Finite Element Model
 - Dimensional Model
 - Control System Description
 - Drawings (complete set of mechanical, electrical and interface drawings, as-built)
 - Installation Guide
 - Operation, Maintenance and Safety Manual

7.4 Delivery

This phase follows directly the factory tests which have to be completed satisfactorily and approved by GRANTECAN. The delivery will be under responsibility of the Contractor.

7.4.1 Scope

- Cleaning, protection, packing and shipping of all items as defined in 4.3. Final destination is the GTC facility at the ORM, La Palma, Canary Islands, Spain.

7.4.2 Deliverables

- See 4.3.

7.5 Provisional Acceptance

The Provisional Acceptance of the equipment shall be declared after successful reception and inspection of all components in the GTC facility at the ORM, realized as a start by staff from GTC. The Contractor has the right to realize the inspections itself or to be part of them.

7.6 Warranty Period and Final Acceptance

Starting at the date of declared Provisional Acceptance the equipment shall have a warranty period of two years. During this guarantee 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.

In the case that GRANTECAN has evidence of non-conformance of any element of the Half-Moon Platform with the specifications during the warranty period, GRANTECAN shall have the right to order 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).

The Final Acceptance of the equipment shall be declared by GRANTECAN after the Contractor has fulfilled its obligations during the warranty period.

8. OPTIONAL WORK SCOPE: INTEGRATION ON SITE

The integration of the Half-Moon Platform on the telescope structure shall be considered as an optional and completely independent scope of work. The contractor shall be responsible for interface preparation and for manipulation, alignment and fixing of all components. Staff from GRANTECAN will be responsible for supervision of all works related with the integration coordinating them with the telescope operation and current maintenance works.

GRANTECAN will decide the closure of contract of the optional work scope at the latest before the factory acceptance. The integration shall be realized in a maximum period of six months from the reception of the platform on site. The integration date will be established by mutual agreement between Contractor and GRANTECAN.

8.1.1 Scope

- Interface preparation.
- Alignment and mounting of all mechanical and electrical components of the Half-Moon Platform on the telescope tube structure, complete cabling and connection to the telescope supplies.
- Functional tests as in Factory Acceptance.

8.1.2 Deliverables

- Site Integration Report, including, among others, results of tests, performed inspections and dimensional measurement and possible incidents.

9. SCHEDULE REQUIREMENTS

The equipment should be delivered to the GTC facility 8 months after the Kick-Off meeting.

The proposed schedule is:

- Kick-off meeting T0 (maximum one month after closing contract)
- CDR meeting, T0 + 4 months
- Factory Acceptance Tests, T0 + 7 months
- Delivery, T0 + 8 months.

Offers with delivery time larger than proposed are admissible, but delivery time shall be considered as an evaluation criteria.

10. PROJECT MANAGEMENT

10.1 Contact Person

The Contractor shall designate a single 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.

10.2 Reporting and Progress Meetings

The Contractor shall report monthly the progress of the work, by a report in note form or by a more informal way (e-mail or phone discussion).

Monthly progress meetings will be held at the contractor premises (or by video conference if both parties agree). Minutes of progress meetings shall be taken by the Contractor. GTC will have 10 days to approve the minutes after reception.

With due advance notification, representatives of GTC can visit the Contractor facilities in a discretionary manner to ascertain progress. GTC representatives shall have access to all the necessary documentation of the project.

10.3 Review Meeting

The result of the Engineering phase shall be subjected to a design review. For this review the Contractor shall generate a Data Package compiling all the documentation requested for the review. This Data Package shall be delivered to GRANTECAN at least two weeks in advance to the review meeting.

During the review meeting the Contractor shall provide clarifications to the documentation and GRANTECAN shall request for modification of the design/documentation or additions to the work developed by the Contractor. The minutes of the meetings shall be taken by the Contractor.

The Contractor shall incorporate the requested modifications/additions within the next four weeks. The Design Review shall be considered fulfilled once these modifications/additions have been finished.

11. QUALITY ASSURANCE REQUIREMENTS

11.1 Documentation management

11.1.1 Documents

The Contractor shall deliver documents in paper and an electronic copy.

The electronic copy shall be on MS-Word or MS-Excel, other formats have to be previously authorized by GRANTECAN.

The Contractor should use the templates established and provided by GRANTECAN for documents. If this is not possible, the document templates used by the Contractor shall include at minimum:

- The GTC Project identification.
- The date and the Contractor code (GRANTECAN will provide the Contractor code).
- The Status of the document (draft, as-built, etc.)
- The section corresponding to changes control.
- The sections corresponding to applicable and reference documents.
- The table of contents

11.1.2 Drawings

Drawings shall be delivered in one electronic copy and two paper copies in DIN A3.

The electronic version shall be delivered in AUTOCAD 2011 or in any other full compatible format. For electrical drawings ePLAN format is admissible.

Drawings shall satisfy ISO norms. Electrical drawings shall fulfill IEC 61082.

The Contractor should use the templates established by GRANTECAN for the elaboration of drawings. If this is not possible, the drawing templates used by the Contractor shall at minimum:

- Include the GTC Project identification.
- Use the codes for drawings established by GRANTECAN.
- Use the codes for configuration elements, components and interfaces, established by GRANTECAN.

11.1.3 CAD and FEA models

The CAD models shall be delivered in a format compatible with Creo Elements/Pro 5.0 or Creo Parametric 2.0.

Finite Element models for analysis shall be delivered in a format compatible with Ansys 13.0

11.1.4 Language

English or Spanish shall be used both for text in drawings and documents, excepting the *Installation Guide* and the *Operation, Maintenance and Safety Manual*, which shall be written in Spanish.

11.1.1 Units

The Contractors shall use the International System of Units (SI).

11.1.2 Dates

The date system shall follow the format: day-month-year.

11.1.3 New editions of documents

Every new edition of any document or drawing shall be clearly identified by the Contractor.

11.2 Configuration Management

11.2.1 Configuration codes

The Contractor shall use the codes established by GRANTECAN for the configuration elements (subsystems, components and interfaces). GRANTECAN will provide these codes.

The Contractor shall use the coding system for drawings as established by GRANTECAN. GRANTECAN will provide the Contractor with instructions for coding the drawings.

11.2.2 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 be in conflict with them. These requests shall be made written.

11.2.3 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 making the problem following process visible at any time.