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# LIGO LABORATORY

California Institute of Technology

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Pasadena, CA 91125

**Statement of Work**

**C-1900390-v3**

Note to LIGO users: all red text in this template is font type ‘hidden’ and comprises instructions to complete the SOW. Easier than deleting them, you can hide all red text before saving. In Word 2010, click File, Options (on the left side), Display (on the left side), and then unclick “Hidden Text”.

The “TEMPLATE” watermark can be removed by clicking Page Layout, Watermark, and then Remove Watermark.

1. **Scope (LIGO Aplus Vacuum System)**

This Statement of Work (SOW) is for the manufacture and procurement of conflat flanges (CF) and associated electrical vacuum feedthroughs as required for use in the Ultra-high Vacuum System (UHV) related to the LIGO A+ upgrade. Various types of UHV feedthroughs will be needed as detailed in the following SOW.

Briefly describe the work. For example: Fabrication of Vacuum Pod components for Advanced LIGO BSC-ISI Seismometers.

1. **Document Access**

Many supplemental documents and specifications are incorporated into and made a part this Statement of Work. Click on the document links to access these documents from the LIGO Document Control Center (DCC) or go on line to the LIGO Public DCC at <https://dcc.ligo.org/> to access the DCC#.

1. **Commercial Terms and Applicable LIGO Specifications:**

**Note: The documents listed below are invoked for this Statement of Work and comprise additional requirements which are integral to this Statement of Work.**

Important: C080185 and Q0900001 apply to all SOWs. Add/delete others as appropriate.

Check to be sure the latest revisions are specified below (please notify QAME or Systems if this template needs to be updated).

* [LIGO-C080185-v2](https://dcc.ligo.org/public/0002/C080185/002/LIGO%20GPs-Commercial%20Terms%20Final%2010-2018%20C080185-v2.pdf) LIGO Commercial Items or Services Contract General Provisions
* [LIGO-Q0900001-v5](https://dcc.ligo.org/public/0001/Q0900001/005/Q0900001-V5.pdf) Advanced LIGO Supplier Quality Requirements
* [LIGO-Q1100003-v1](https://dcc.ligo.org/public/0038/Q1100003/001/Q1100003-v1%20AQL.pdf) Acceptable Quality Level (AQL) for Inspection of LIGO Components
* [LIGO-E2000003-v2](https://dcc.ligo.org/public/0165/E2000003/002/AplusVacuumFeedThroughRequirements_v2.pdf) Aplus Vacuum Feedthrough Mechanical and Electrical Performance Requirements

1. **Quality System:**

Referring to the above referenced LIGO Specification Q0900001, Suppliers should include a copy of their current ISO 9001, AS9100, or TS16949 certification in their bid package. Suppliers lacking current certification should send a copy of their Quality Manual with their bid package.

1. **Parts/Assemblies to be manufactured, Quantity Required, and Inspection requirements:**

Note: refer to Section 8.0 for delivery schedule and location. Dimensional inspection frequency is specified in Table 2. All other inspections are detailed in section 3.0 by following [LIGO-E2000003-v1](https://dcc.ligo.org/LIGO-E2000003/public).

Table

|  |  |  |
| --- | --- | --- |
| Figure 1 | Figure 2 | Figure 3 |
| Figure 4 | Figure 5 | Figure 6 |
| Figure 7 |  |  |

List all parts to be made, including the **public** hyperlink to the latest revision, and the total quantity required. If you have more than ten parts, create a separate drawing document posted to the DCC as a public document, and link here.

Table

|  |  |  |  |
| --- | --- | --- | --- |
| **Figure Reference** | **Part Description** | **Total Qty:** | **Dimensional check Frequency AQL Number** |
| Figure 1 | 4.5 Inch CF (Blank Off) | 6 | 5 |
| Figure 2 | 4.5 Inch CF with Dual 3-pin Power Dsub | 16 | 5 |
| Figure 3 | 4.5 Inch CF with Dual 25-Pin Dsub | 48 | 5 |
| Figure 4 | 4.5 Inch CF with Dual Triaxial Connectors | 16 | 5 |
| Figure 5 | 12 Inch CF with (12) 25-pin Dsub | 10 | 5 |
| Figure 6 | 12 Inch CF with (3) 4.5 Inch CF Subflanges | 26 | 5 |
| Figure 7 | 12 Inch CF (Blank Off) | 6 | 5 |

Note: refer to [LIGO-Q1100003-v1](https://dcc.ligo.org/cgi-bin/DocDB/ShowDocument?docid=38519) for the AQL table.

Note 1: Care should be given to the selection of the AQL number. Consider the amount of time (which equals cost) required to 100% inspect a given number of parts. Contact QAME for advice.

1. **Manufacturing:** 
   1. **Requirements:**

Suppliers must refer to the LIGO Specifications referenced in section 3 for additional, and in some cases, non-industry standard requirements.

* 1. **Sub-Contracted Work:**
* LIGO expects that at least 2/3 (by dollar value) of the contracted work be performed by the Supplier named on the Purchase Order. The Supplier shall be responsible for all sub-contracted work.
* The Supplier’s quote shall state their intent to sub-contract any welding operations performed on components intended for Vacuum use.
  1. **Precedence:**

The drawings typically represent the finished part as needed for use in service. There may be requirements on the drawing (such as coatings) which are specifically defined as not the responsibility of the supplier in this SOW. Suppliers should always contact a LIGO representative to resolve any discrepancies uncertainties in the documentation or instructions.

* 1. **Special Instructions:**

NoneAdd special manufacturing notes

* 1. **Exclusions:** Add/delete as appropriate

None

1. **End Item Data Package:** Add/delete lines as necessary

Before delivery of the parts, the Supplier shall provide the following data, as a minimum:

* Specific to each serial number part 100% testing for continuity on all pins that are part of the electrical feedthroughs
* Specific to each serial number part 100% HIPOT testing of all pins to the metal body of each conflat flange.
* Specific to each serial number part 100% testing of hermeticity
* Specific to each serial number part 100% visual inspection for damage to the knife edge of all conflat flanges
* Any as-built modifications (with approval of the LIGO Contracting Officer) as mark-ups to the drawings
* Material certifications
* Inspection reports of all dimensional features for the number of parts specified per the AQL number and referenced in the AQL table [LIGO-Q1100003-v1](https://dcc.ligo.org/cgi-bin/DocDB/ShowDocument?docid=38519) and any other inspection requirements detailed in Section 5 of this SOW
* Certificate of compliance for each part number stating conformance to contract and drawing requirements

1. **Delivery Requirements:**
   1. **Shipping Containers and Packaging:**

The contractor is responsible for providing shipping containers and transportation which protects these parts from damage from the transportation environment (weather, handling, accidents, etc.). Mating edges of parts should be especially protected from damage during shipping.

Note any special packaging requirements here (i.e., wrap in UHV foil and Ameristat).

* 1. **Shipping Destination(s):**

The deliveries are FOB at these destinations, i.e. the Supplier has the responsibility for shipping title and control of goods until they are delivered, and the transportation has been completed. The contractor selects the carrier and is responsible for the risk of transportation and for filing claims for loss or damage.

Delete shipping destinations that don’t apply to this SOW. Be sure to reference the shipping abbreviations (i.e., LLO) in the Delivery Schedule if there is more than one shipping destination.

Once manufactured, the order will be split equally and shipped to:

**LIGO Livingston Observatory (LLO) LIGO Hanford Observatory (LHO)**  
Attn: Scott McCormick Attn: Chandra Romel  
19100 LIGO Lane 127124 North Route 10  
Livingston, LA 70754 Richland, WA  99354

* 1. **Delivery Schedule:**

8 weeks ARO

Insert a list or table detailing the delivery requirements (by P/N, as necessary). Delivery should be specified in weeks ARO (after receipt of order). Please also specify the shipping destination (i.e. LLO).

Note any first article requirements. If applicable, the SOW must state upfront that LIGO wants to assemble the first articles for fit check before the rest of the order is completed.