

FIRE Vacuum Dewar Request for Quote and Statement of Work

Background:

FIRE is a dual-mode infrared (IR) spectrometer designed for operation at the Magellan telescopes at Las Campanas Observatory, Chile. Its primary mode employs a combination of a diffraction grating and four prisms to deliver cross-dispersed spectra covering the whole near-IR bandpass in a single exposure, with wavelength resolution of $R = \Delta\lambda / \lambda = 6000$.

Purpose of this Document:

The Optics will be installed onto an Optical bench residing inside a vacuum Dewar. Engineering work needs to be performed on the vacuum Dewar Design to ensure that the vacuum seals and welds will meet the design requirements.

Drawing List

33-20100 Fire Dewar Assembly

33-20101 Dewar Interface Plate, Optical Bench (Not to be made by subcontractor)

33-20102 Dewar Feed Thru Collar

33-20103 Front Cover

33-20104 Back Cover

Part Descriptions

The Fire Dewar Assembly, 33-20100, comprise of 4 Main fabricated parts, requiring both machining and welding.

Front Cover: The front and back covers are intended to use a standard ASME Flange from AMS Industries, Vancouver, Canada. The Dome is made from 5052 spun aluminum. The rim is made from Aluminum 6061-T6. If possible there should be no Straight Flange between the dome and the .75" thick mounting rim. The intent is to have the overall height of the dome be as small as possible.

Back Cover: The front and back covers are intended to use a standard 33" I.D. ASME Flange from AMS Industries, Vancouver, Canada. The Dome is made from 5052 spun aluminum. The back cover requires provisions for mounting a flange (size TBD) towards the inside of the dome. This flange is for installation of an optical window. The location of plane with respect to the flange mating surface is important. The

rim is made from Aluminum 6061-T6. There shall be an O-ring Groove on the .75" thick rim to mate to the Dewar interface Plate.

Dewar Feed Thru Collar: The current design is for the feed through to be an aluminum weldment. The flange locations are shown (may change slightly) but not the flange type. At this time the flange types are not fully defined. The O-ring Grooves shall be on the Feed Thru Collar. The flanges are made from 6061 T6 and the collar is also from aluminum (type TBD). The tubes and flanges are also to be made from aluminum.

The feedthru collar can also be made from machining. There is an alternate design in process. (Due to the location of some of the feed throughs it may require changing to the machined version versus the welded version.)

Dewar Interface Plate: The Dewar interface plate is strictly a machined part and shall not be made by the subcontractor, but is shown for reference.

Up Front Engineering Work:

In an effort to streamline the design, engineering work is required by the subcontractor.

Scope of up Front Engineering Work:

O-Ring Design:

The subcontractor shall review the Front Cover, Back Cover, and the Dewar feedthru drawings and provide engineer detail design for a proper O-ring groove and supply the O-ring (Viton) to maintain a proper vacuum in the 1×10^{-6} Torr (TBR). The current dimensions for the O-rings grooves are for reference only.

Weldment review

The subcontractor shall provide engineering detail for the welds required for the top and bottom covers and the Dewar feed through. The current welds on the drawings are for reference only and may or may not be adequate. If required an FEA can be performed.

Feed Through tubing and Flanges:

The current feed through tubes on the dewar weldment are currently at a default of .083" wall thickness. The wall thickness can be changed as required by the subcontractor to ensure proper welds. The tubes and flanges (not currently shown) are to be made from Aluminum. The flanges are intended to be flat ASA type flanges where the o-ring groove will be on the part that mates to the flange on the dewar.

Bolt sizes:

The bolt sizes and locations defined are deemed to be adequate. However the subcontract shall review for concurrence to ensure proper vacuumis maintained based on their experience with vacuum chambers of this size. No FEA should be necessary for this effort.

Drawings

There will have to be a few drawing iterations between now and fabrication. During the up front design work, the subcontractor will supply MIT with the necessary design information to incorporate the information onto the prints. Once both MIT and the subcontractor review the final drawing changes and agree of their completeness, fabrication may begin. Depending on long lead times the ASM flanges or other material may be purchased in advance of completing the drawings.

Scope of Fabrication

The subcontractor will manufacture and supply the three main part; per the 33-20102, Dewar Feed Through Collar; per 33-20103, Front Cover; and per the 33-20104 Back Cover drawings.

These parts shall also be cleaned to remove an grease, oils, finger prints and particulates produced during the fabrication process. They shall be packaged and shipped in such a way as to protect the vacuum inner surfaces from contamination during shipment.

REQUEST For QUOTE:

MIT requests that the subcontractor provide a quote per this document in two separate line items. The first being the up front engineering (Non Recuring) cost per hour and an estimate of the number of hours required and not to exceed hours.

The second line item being an estimate for the cost to fabricate the three items. (33-20102, Dewar Feed Through Collar, 33-20103, Front Cover and 33-20104 Back Cover) The fabrication cost should be itemized per part and per any non-recurring costs per part.

Given that we are in the early stages of the design, the quotation of the dewar fabricated parts can also be deferred to after completion of the upfront engineering work when all the drawings are complete.