Output Faraday Isolator Rotator

APPROVALS	DATE	REV	DCN NO.	BY	CHECK	DCC	DATE
AUTHOR: M. R. Smith	**4/6/10**	**V1**	**E1000117**	**MRS**			**4/6/10**
CHECKED:							
APPROVED:							
DCC RELEASE							

1 SCOPE

This is a specification for a Faraday Rotator Assembly, which consists of: 1) a housing with mounting holes, 2) a permanent magnet subassembly, and 3) a Faraday optic subassembly.

2 APPLICABLE DOCUMENTS

2.1 LIGO Documents

http://www.ligo.caltech.edu/docs/E/E960022-B/E960022-B.pdf , Vacuum Compatibility, Cleaning Methods and Qualification Procedures
http://www.ligo.caltech.edu/docs/E/E960050-B/E960050-B.pdf, Vacuum Compatible Materials List

LIGO Vacuum Compatible Materials List

2.2 Non-Ligo Documents

MIL-C-675C, Coating Adhesion and Durability
EOT Mod. No. 1845-20 data sheet

3 REQUIREMENTS

3.1 Faraday Rotator Performance

Wavelength	1064 nm
Clear Aperture	20 mm
Optical Transmissivity	> 99.5 %
Power extinction ratio	> 30 dB (when placed between crossed polarizers with extinction ratio >30 dB)
Wavefront distortion	< 0.7 waves @ 633 nm wavelength

3.2 Design and Construction

Rotator material	TGG crystal
TGG wedge angle, both faces	0.5 deg
AR coating each face @ 1064 nm	high quality ion beam coating
Durability of AR coating	per MIL-C-675C
Surface roughness, each face	< 40 nm (super polish)

3.3 Marking on TGG Crystal

A mark shall be scribed on the barrel at the top side of the TGG crystal to mark the orientation of the crystal so that the specular reflections from the faces will be in the horizontal plane.

3.4 Physical Dimensions

The physical dimensions shall be according to D0900464, shown in Figure 1.

3.5 Allowed Materials

The standard materials used in EOT Model No. 1845-20, or equivalent, shall be allowed, except for the disallowed materials listed in section 3.6. It is desirable that materials conform to LIGO document E9960050, Vacuum Compatible Materials List.

Liquids containing hydrocarbons or other contaminants, other than the machining fluids specified herein, shall not be allowed to come into contact with the specified item. All machining fluids shall be water soluble and free of sulfur, chlorine and silicone; such as Cincinnati Milacron's Cimtech 410 for stainless steel.

3.6 Disallowed Materials

The following materials shall not be used: organic materials, vacuum grease, adhesives including epoxy, anodizing, or lubricants.

4 TEST PROCEDURES

4.1 Visual Surface Inspection Test

Both faces of the TGG crystal shall be free of visible stains and surface defects when the window is illuminated with a high-intensity light source and viewed in a darkened environment with the unaided eye.

4.2 Extinction Ratio Test

Extinction ratio between crossed polarizers for orthogonal polarizations shall be measured, using the test light source.

4.3 Optical Transmissivity Test

Optical transmissivity through the clear aperture shall be measured with the test light source.

4.4 Test Light Source

A collimated laser beam of 1064 nm wavelength and > 9.0 mm Gaussian beam waist diameter measured at the 1/e^2 power diameter shall fill the clear aperture when making transmissivity and extinction ratio measurements.

4.5 Wavefront Distortion Test

The transmitted wavefront distortion over the clear aperture shall be measured at 632.8 nm wavelength with an appropriate interferometer.

5 DOCUMENTATION

1. Interferogram of transmitted wavefront across the clear aperture
2. Optical transmissivity through the clear aperture
3. Extinction ratio for orthogonal polarizations through the clear aperture
4. Compliance Certification for this specification
5. Calibration certification for the test equipment, as appropriate
6. Inspection report
    - Dimensional verification
    - Test results
    - Material list
    - Inspection test procedures

6 Quality Assurance/Control

6.1 Serial Number

The serial number D0900464-v1 S/N 004 shall be etched, or scribed on the part at the location indicated in Figure 1.

6.2 Purchaser Access

The purchaser shall have the right to witness all manufacturing processes.

6.3 QA Approval

LIGO QA reserves the right to inspect and approve vendor/fabrication QA plan and processes.

7 HANDLING AND SHIPPING PROCEDURES

7.1 Cleaning

Approved cleaning procedures for UHV components are detailed in LIGO E960022, Vacuum Compatibility, Cleaning Methods and Compatibility procedures.
The TGG crystal shall be disassembled from the magnet housing for cleaning of the components.
Nothing shall contact the optical surfaces after cleaning, except lint-free lens tissue.

7.2 Packaging for Shipment

The cleaned optical components shall be protected with lint-free lens tissue. In addition, all components shall be placed in a sealed, clean polyethylene bag before shipping.
The shipping containers must ensure that the bag is not punctured and that the parts are properly protected during transit.

Output Faraday Isolator Rotator

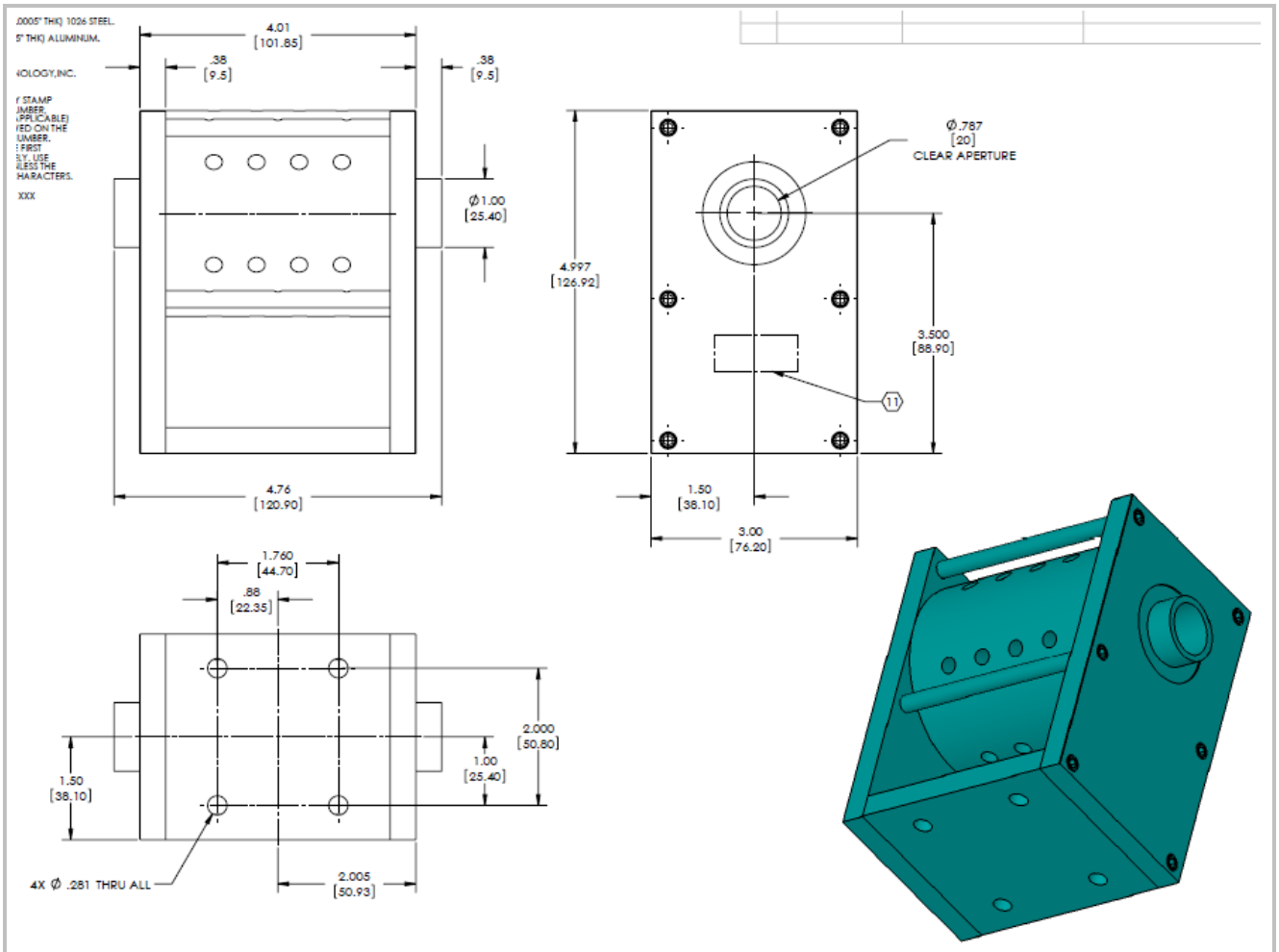

Figure 1: D0900464, Rotator 20 mm