



Statement of Work

AO-523 TMS Top Mass Machined Components

LIGO-C1201789-v2

1.0 Scope (AOS Trans Mon Suspension)

This Statement of Work covers the manufacturing of most machined metal class A components used in each LIGO TMS Suspension assembly and installation. Quantities listed are for 6 TMS assemblies, and include spares. Manufacturing is according to LIGO Specification E0900364-v8 wherever applicable.

2.0 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#.

3.0 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.

- [LIGO-C080185-v1](#) LIGO Commercial Items or Services Contract General Provisions
- [LIGO-Q0900001-v5](#) Advanced LIGO Supplier Quality Requirements
- [LIGO-Q1100003-v1](#) Acceptable Quality Level (AQL) for Inspection of LIGO Components
- [LIGO-E0900364-v8](#) Metal Components for use in the Advanced LIGO Vacuum System

4.0 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.

5.0 Parts to be manufactured, Quantity Required, and Inspection requirements:

Note: refer to Section 8.0 for delivery schedule and location

- 5.1** AQL Number is 1.0.
- 5.2** All tapped holes (100%) must be gauged.

Item #	Part Number	Rev	Description	Material	Set 1	Set 2	TOTAL
1	D060315	C	ADVANCED LIGO, SUS, QUAD N-PTYPE TABLECLOTH, TABLECLOTH PINCH PLATE, UPPER STRUCTURE	6061-T6 Al	12	12	24
2	D060318	E	ADVANCED LIGO, SUS, QUAD N-PTYPE TABLECLOTH, OSEM AND ECD MOUNTING BRACKET (LOCAL CONTROLS)	6061-T6 Al	12	12	24
3	D060321	D	ADVANCED LIGO, SUS, QUAD N-PTYPE TABLECLOTH, POSITION ADJUSTER FOR FRONT PITCH OSEM	6061-T6 Al	3	3	6
4	D060323	F	ADVANCED LIGO, SUS, QUAD N-PTYPE TABLECLOTH, TRANSVERSE OSEM POSITION ADJUSTMENT PLATE	6061-T6 Al	3	3	6
5	D060325	F	Advanced LIGO, SUS, TOP STAGE N-P TYPE, ROTATIONAL ADJUSTER, STATIC HALF	304/316 SSSL	6	6	12
6	D060326-0	F	Advanced LIGO, SUS, Quad N-Ptype Top Stage, BLADE CLAMP (TOP HALF)	304/316 SSSL	6	6	12
7	D060327-0	F	Advanced LIGO, SUS, Quad N-Ptype Top Stage, BLADE CLAMP (BTM HALF)	304/316 SSSL	6	6	12
8	D060328	v3	Advanced LIGO, SUS, Quad N-Ptype Top Stage, 3/8-16 UNC T NUT Based on Wixroyd 2418.W120	304/316 SSSL	12	12	24
9	D060329	E	Advanced LIGO, SUS, Quad N-Ptype Top Stage, Top Stage STIFF BACK	6061 Al	6	6	12
10	D060330	F	Advanced LIGO, SUS, Quad N-Ptype Top Stage, ROTATIONAL ADJUSTER BASE PLATE	304/316 SSSL	6	6	12
11	D060331	F	Advanced LIGO, SUS, Quad N-Ptype Top Stage, JACKING SCREW/Earthquake Stop	304/316 SSSL	20	20	40
12	D060333	F	Advanced LIGO, SUS, Quad N-Ptype Top Stage, WIRE CLAMP BODY, TOP STAGE	304/316 SSSL	6	6	12
13	D060336	v4	Advanced LIGO, SUS, Penre MASS Quad N-Ptype, 2MM CAM, OSEM ADJUSTER	PH Bronze	48	48	96
14	D060377	H	Advanced LIGO, SUS, Quad N-Ptype UI MASS, BLADE TIP Z POSITION ADJ (BTM HALF PART 2)	6061-T6 Al	6	6	12
15	D060378	J	Advanced LIGO, SUS, Quad N-Ptype UI MASS, BLADE TIP Z POSITION ADJ (BTM HALF)	304, 316 OR 302 SSSL	6	6	12
16	D060380	J	ADVANCED LIGO, SUS, QUAD N-PTYPE UI MASS, BLADE CLAMP (TOP HALF)	304 SSSL	6	6	12
17	D070140-05	v3	Advanced LIGO, SUS, Quad N-Ptype Top Stage, top stage blade wire clamp shim	6061-T6 Al	54	54	108
18	D070140-1	v3	Advanced LIGO, SUS, Quad N-Ptype Top Stage, top stage blade wire clamp shim	6061-T6 Al	54	54	108
19	D070140-2	v3	Advanced LIGO, SUS, Quad N-Ptype Top Stage, top stage blade wire clamp shim	6061-T6 Al	54	54	108
20	D0901439	B	Top Stage Modified Backbone Member	6061 Al	6	6	12
21	D1000395	v1	aLIGO INTERMEDIATE TOP MASS SPACER	304 SSSL	9	9	18
22	D1000396	v1	aLIGO INTERMEDIATE WIRE CLAMP BODY MIDDLE WIRE	304 SSSL	6	6	12
23	D1000407	v3	aLIGO_OSEMS_INTERMEDIATE_SUPPORT_RIGHT_SIDE_BRACKET	6061-T6 Al	3	3	6
24	D1000408	v3	aLIGO_BOSEMS_INTERMEDIATE_SUPPORT_LEFT_SIDE_BRACKET	6061-T6 Al	3	3	6
25	D1000409	v3	aLIGO_BOSEMS_INTERMEDIATE_SUPPORT_RIGHT_SIDE_TRAY	6061-T6 Al	3	3	6
26	D1000410	v3	aLIGO_BOSEMS_INTERMEDIATE_SUPPORT_LEFT_SIDE_TRAY	6061-T6 Al	3	3	6
27	D1000411	v3	TMS Intermediate OSUM Support Plate, Rear	6061-T6 Al	3	3	6
28	D1001534	v1	Magnetic Plug, BOSEM	416 SSSL	42	42	84
29	D1001697	v1	Magnet Retainer, BOSEM	316 SSSL	42	42	84
30	D1100358	v1	TMS Telescope Mass Attachment Screw	Titanium	100	100	200
31	D1100421	v1	TMS Suspension Tablecloth Plate, Front	6061-T6 Al	3	3	6
32	D1100573	v5	BOSEM Flat Magnet Flag, aLIGO SUS	6061-T6 Al	36	36	72

Item #	Part Number	Rev	Description	Material	Set 1	Set 2	TOTAL
33	D1100574	v3	BOSEM Flat Flag Disk	416 SSSL	36	36	72
34	D1100712-01	v2	TMS Earthquake Stop Screw	316 SSSL	25	25	50
35	D1100712-02	v2	TMS Earthquake Stop Screw	316 SSSL	100	100	200
36	D1100980	v1	ALIGO, QUAD, E.STOP SCREW, SPLIT SHAFT COLLAR	SSSL	6	6	12
37	D1101186	v1	aLIGO SUS .500-13 X 1 SHCS Modified	316 SSSL	60	60	120
38	D1101273	v1	aLIGO SUS Top Mass Stop Bridge	6061-T6 Al	6	6	12
39	D1101511	v1	aLIGO TMS Upper Mass Top Plate	304 SSSL	6	6	12
40	D1101512	v1	aLIGO TMS Upper Mass Bottom Plate	304 SSSL	3	3	6
41	D1101519	v1	aLIGO TMS Top Add Mass Tower	304 SSSL	6	6	12
42	D1101520	v1	aLIGO TMS Upper Roll Trim Mass	304 SSSL	6	6	12
43	D1200312	v1	aLIGO TMS Top Add Mass Bar	304 SSSL	6	6	12
44	D1200327	v1	aLIGO SUS BOSEM Flag Bracket	6061-T6 Al	12	12	24
45	D1200328	v1	aLIGO SUS BOSEM Flag Center Bracket	6061-T6 Al	3	3	6
46	D1200356	v1	aLIGO TMS Mass Spacer	6061-T6 Al	3	3	6
47	D1200404	v1	aLIGO TMS Lower Stage Spring Adjuster Screw	300 SSSL	20	20	40
48	D1200405	v1	aLIGO TMS Upper Pitch Trim Mass	304 SSSL	6	6	12
49	D1200406	v1	aLIGO TMS Spring Stop Screw	300 SSSL	20	20	40
50	D1200420	v1	aLIGO TMS Mass Cable Clamp Bracket	6061-T6 Al	3	3	6
51	D1200426	v1	aLIGO TMS Mass Wire Clamp Adjustment Block	6061-T6 Al	6	6	12
52	D1200427	v1	aLIGO TMS Upper SUS Wire Adjuster	6061-T6 Al	12	12	24
53	D1200431-01	v1	aLIGO TMS Balance Weight	304 SSSL	18	18	36
54	D1200431-02	v1	aLIGO TMS Balance Weight	304 SSSL	18	18	36
55	D1200432-01	v1	aLIGO TMS Small Balance Weight	304 SSSL	18	18	36
56	D1200432-02	v1	aLIGO TMS Small Balance Weight	304 SSSL	18	18	36
57	D1200476	v1	aLIGO TMS Mass Cable Clamp Screw	300 SSSL	20	20	40
58	D1200477	v1	aLIGO TMS Mass Cable Clamp Nut	Nickel-Copper Alloy 400	20	20	40

6.0 Manufacturing:

6.1 Requirements:

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

6.2 Sub-Contracted Work:

- The Supplier shall be responsible for all sub-contracted work.

6.3 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 or uncertainties in the documentation or instructions.

6.4 Special Instructions:

- Parts with material call outs for 5083 Aluminum MUST be manufactured with **6061-T6 Aluminum**.
- All completed parts must consist of 100% virgin material, free of repairs such as plugs or welds.
- All parts are to be 63 μ Ra.
- Part markings may be laser marked or engraved.
- Vendor is responsible for electro-polish processing where specified.
- All tapped holes oversized 0.005" unless 1) there is a call-out for heli-coils 2) there is a specific note that says not oversized.
- LIGO must approve source of all 'make from' parts.

6.5 Exclusions:

- Supplier is NOT responsible for the procurement and installation of Heli-Coils.

7.0 End Item Data Package:

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

- Any as-built modifications (with approval of the LIGO Contracting Officer) as mark-ups to the drawings
- Material certifications
- Heat Treat and/or Stress Relief certifications, if applicable
- Electro-polish certifications, if applicable
- Pickle/Passivation certifications, if applicable
- Inspection reports of all dimensional features for the number of parts specified per the AQL number and referenced in the AQL table LIGO-Q110003-v1 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

8.0 Delivery Requirements:

8.1 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.

8.2 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.

These items will be shipped to:

LIGO Livingston Observatory (LLO)

Attn: Valera Frolov
19100 LIGO Lane
Livingston, LA 70754

LIGO Hanford Observatory (LHO)

Attn: Cheryl Vorvick
127124 North Route 10
Richland, WA 99354

8.3 Delivery Schedule:

Early and/or partial deliveries are welcome.

- Ship Set 1 to: **LIGO Livingston Observatory (LLO)**
 - Due 8 weeks ARO

- Ship Set 2 to: **LIGO Hanford Observatory (LHO)**
 - Due 12 weeks ARO