

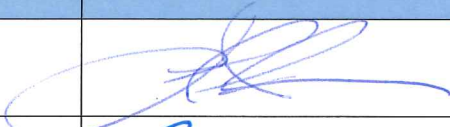

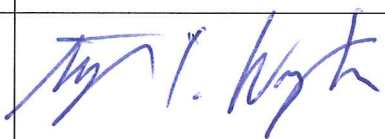


Standard Operating Procedure
Gas Tungsten Arc Welding

SOP #: 5.005 Rev. 10

Page #: 1 of 11

Approval

<i>Approving Authority</i>	<i>Name</i>	<i>Signature</i>	<i>Date</i>
President	Joseph Parisi		8/4/18
Operations Manager	Steve Hansen		8/2/18
Vice President Engineering	Steve Rusconi		8/5/13
Process Systems Manager	Michael Delgado		7/31/18
Quality Assurance Manager	Steve Washington		8/7/18

Revision History

<i>Revision #</i>	<i>Description of Change</i>	<i>Effective Date</i>	<i>DCR#</i>
5	Data modifications	-	00034
6	Data modifications	-	02016
7	Data modifications	03/30/06	06003
8	Data modifications	09/17/12	10004
9	Add Revision History, Revise Header, Data modifications	12/26/13	13005
10	Data modifications	08/07/18	16003



Standard Operating Procedure

SOP #: 5.005 Rev. 10

Gas Tungsten Arc Welding

Page #: 2 of 11

1 Purpose

- 1.1 To establish a standard operating procedure (SOP) for tacking, orbital/automatic and manual gas tungsten arc welding (GTAW).

2 Scope

- 2.1 This procedure applies to all shop and field high-purity stainless steel piping, and tool hookup assemblies requiring GTAW.

3 Responsibility

- 3.1 The Project Manager (PM) manages the GF/SF and verifies compliance with the project specifications and these procedures. The PM coordinates the shop, field and QC work with the owners and other trades.
- 3.2 Therma General Foreperson (GF) and/or Shop Foreperson (SF) manages the welders and verifies compliance with this procedure. The GF and/or SF manage document flow from the PM & Detailer through fabrication to QC for the Turnover Package (TOP).
- 3.3 The welders certified as per SOP # 7.009 (GTAW Welder Performance Qualification) shall be responsible for the following procedures and tracking document flow.
- 3.4 The Quality Control Examiners(QCE) verify compliance with the project specifications and Therma's SOP's and shall verify TOP documentation as required by the project.

4 Reference

- 4.1 American Society of Mechanical Engineers
 - 4.1.1 ASME Boiler & Pressure Vessel Code, Section IX for Welding and Brazing Qualifications, Current Edition/Addenda.
 - 4.1.2 ASME B31 Code for Pressure Piping, B-31.3 Process Piping, Current Edition/Addenda.
 - 4.1.3 ASME Bioprocessing Equipment(BPE) Standard, Current Edition/Addenda.



Standard Operating Procedure

SOP #: 5.005 Rev. 10

Gas Tungsten Arc Welding

Page #: 3 of 11

5 Procedures

- 5.1 Upon project kickoff, the Project Manager and General Foreperson (GF) or Shop Foreperson (SF) shall review the project specifications for each spool drawing or set of drawings.
- 5.2 The PM or GF/SF shall verify each isometric piping spool drawing has been properly prepared for the pre-fab shop or the field welding crew including verification of the following:
 - 5.2.1 The spool drawing(s) shall be printed on white paper, 11"x17" ('B'-size). This white copy is to be used as copy master to create the official blue weld map & log. Also, this white copy may then be used by the welder/foreman for fabrication notes, layout math, etc.
 - 5.2.2 Spool drawing shall be shown on Therma SOP Form FN 5.002.1 Process Systems Spool Title Block per SOP 5.002, then copied onto blue 11"x17" (B-size) paper for weld mapping and logging.
 - 5.2.3 Spool drawing shall have copied onto the back side Therma's SOP Form FN 5.005.5 GTAW Weld Log for Pharmaceutical Process systems or as required by project specifications.
 - 5.2.4 Spool drawing shall have the following information completed/filled-out prior to delivery to the pre-fab or field welding foreman:
 - 5.2.4.1 Job Number, Job Name, Drawing Number, Date, Revision
 - 5.2.4.2 Material Specification, Grade and Surface Finish
 - 5.2.4.3 Slope, Weld Count, Insulation, PID ref
- 5.3 FABRICATION
 - 5.3.1 Upon completion of each stage of construction or verification, the responsible person shall complete the sections of the form FN 5.005.5 GTAW Weld Log prior to proceeding to the next step.
 - 5.3.2 Inert Purge Gas Set-Up – Set-up the Inert Purge gas prior to welding per Therma Corp. SOP #5.007.



Standard Operating Procedure

SOP #: 5.005 Rev. 10

Gas Tungsten Arc Welding

Page #: 4 of 11

5.3.3 GTAW Welding, Coupons – Perform coupon welds and verify acceptable per Therma Corp. SOP #7.024. Therma QCE shall examine and indicate acceptance of the coupon by writing initial & date on the Form FN 5.005.1 Coupon Weld Log prior to start of production welding.

5.3.4 GTAW Welding – Perform welds including post purge, cleaning and labeling.

5.3.4.1 – Check for proper alignment.

5.3.4.2 – All weld joints shall be tack-welded prior to automatic and/or manual welding.

5.3.4.2.1 Note: Tacks must be made with the sole purpose of holding the weld joint(s) connected. Thus, tacks shall not exceed final weld bead width, nor shall they fully penetrate the wall thickness of the base material. Such tacks are commonly referred to as “feather” or “skin” tacks.

5.3.4.2.2 Welder shall visually examine all tack welds made and confirm that dimensions and orientation match the Isometric Weld Map drawing.

5.3.4.3 – Clean outside diameter (OD) discoloration around tack weld by wire brush and/or emery cloth. Wipe off residuals with isopropyl alcohol (IPA) soaked lint-free cloth.

5.3.4.4 – Verify the following:

5.3.4.4.1 - The orbital welding machine is connected to a dedicated electrical circuit. This is done to prevent an electrical surge in the power supply.

5.3.4.4.2 - Note: The electrode shall be verified to be sharpened to the manufacturer's recommendations.

5.3.4.5 – Ensure the weld program parameters are set to perform the weld. The weld program must be an approved weld program as documented under SOP # 5.024 (Weld Programs).



Standard Operating Procedure

SOP #: 5.005 Rev. 10

Gas Tungsten Arc Welding

Page #: 5 of 11

5.3.4.6 – Perform Weld.

5.3.4.7 – Post-purge weld and wire brush exterior of weld using a stainless steel brush to minimize OD discoloration.

5.3.4.8 – General Note: The orbital welding machines shall be left running during any single shift and not to be turned off during breaks and lunches.

5.3.4.9 – Welding labeling

5.3.4.9.1– All welds shall be serialized with alphanumeric identification. The first three numbers identify the Therma orbital machine serial number. Followed by the alphanumeric characters (SW) or (FW) for shop or field weld. The subsequent numeric digits identify the weld number, on that job. Example 049SW010 is the tenth shop weld made with welding machine “049”.

5.3.4.9.2– All weld coupons shall be serialized with alphanumeric identification. The first three numbers identify the Therma orbital machine serial number. Followed by alphanumeric characters (SC) or (FC) for shop or field coupon. Example 049SC010 is the tenth shop coupon made with welding machine “049”.

5.3.4.9.3– Label the weld per project specifications. Place number by the weld on tube.

5.3.4.9.4– Enter the same weld number on the weld map/isometric drawing.

5.3.5 GTAW Welding Records – Complete all welding records including SOP Form #FN 5.005.1 Coupon Weld Log and Form #FN 5.005.5 GTAW Weld Log.

5.3.5.1 – The following information must be filled in by the welder after each weld has been made, use Coupon Weld Log, Form # FN 5.005.1 and GTAW Weld Log Form # FN 5.005.5 found on the back of each fabrication/isometric drawing:



Standard Operating Procedure

SOP #: 5.005 Rev. 10

Gas Tungsten Arc Welding

Page #: 6 of 11

5.3.5.1.1– Weld number

5.3.5.1.2– Size (e.g. OD)

5.3.5.1.3– Argon Source # Code

5.3.5.1.3.1– Record bulk or cylinder # into Argon Source Table at bottom of log, then record code # into the weld log (typical)

5.3.5.1.4– Welding machine serial # (Table at bottom)

5.3.5.1.5– Weld head serial # (Table at bottom)

5.3.5.1.6– Component Type Code (legend at bottom)

5.3.5.1.7– Heat numbers

5.3.5.1.8– Welder/Operator's initials & Date

5.3.5.1.8.1- The Welder shall initial and date to record that each weld is completely verified prior to welding the next joint.

5.3.5.1.9– Foreperson's initials & Date

5.3.5.1.9.1- The Welder and separate Foreman shall initial and date each weld only after post-purge, labeling, mapping, logging and dimensions have been verified.

5.3.5.2 – Indicate on Form # FN 5.005.5 GTAW Weld Log if mandatory weld examination is required if the weld was made under the following conditions.

5.3.5.2.1– The weld machine was not operated for more than 30 minutes. This applies to the first weld of a shift.

5.3.5.2.2– The weld head was changed for a new diameter.

5.3.5.2.3– A new purge gas has been used.



Standard Operating Procedure

SOP #: 5.005 Rev. 10

Gas Tungsten Arc Welding

Page #: 7 of 11

5.3.5.2.4– Power interruption.

5.3.5.2.5– New or re-sharpened electrode.

5.3.5.3 – Welds requiring repair:

5.3.5.3.1– If the welder deems that the weld does not meet the examination criteria prior to documenting the weld on Form # FN 5.005.5 GTAW Weld Log, cut out the weld and make a new weld using the same weld number.

5.3.5.3.2– If a weld does not meet the weld requirement and can be rectified by one additional weld pass, re-weld the joint and label the weld in the weld log with the suffix R. Example 049-010 is identified as 049-010-R in the log only.

5.3.5.3.3– If the rejected weld cannot be repaired by means of a second pass, then the following shall apply:

5.3.5.3.4– Cut out the weld. Log weld as deleted, cause for rejection.

5.3.5.3.5– Perform a new weld.

5.3.5.3.6– Update/revise the fabrication/isometric drawing.

5.3.5.3.7– Assign the weld a new number.

5.3.5.3.8– Label the weld as indicated in step 5.3.4.9 (Weld Labeling).

5.3.5.3.9– Amend Form # FN 5.005.1 Coupon Weld Log and Form # FN 5.005.5 GTAW Weld Log found on the back of each fabrication/isometric drawing to indicate under the comment column that the particular weld has been replaced by a new weld number. Enter new data into new blank line on the forms.



Standard Operating Procedure

SOP #: 5.005 Rev. 10

Gas Tungsten Arc Welding

Page #: 8 of 11

5.3.6 If the welding is being performed in the prefab shop, repeat steps 5.3.2 through 5.3.5.3 until the prefabrication assembly is complete.

5.3.7 After completion of fabrication, cap off all openings of spool assemblies with appropriated plastic end protection as example "Caplug" that is manufactured by Protective Industries, Inc.

5.4 GTAW WELDING VERIFICATION

5.4.1 Welder shall visually examine all welds made and confirm that dimensions and orientation match the Isometric Weld Map drawing.

5.4.1.1 – All log entries to be large and clear so legible on 4th generation copies.

5.4.1.2 – Welder shall verify all weld ID#'s on the Orbital Weld Log match the drawing and labels on the welds. When satisfied with quality of work, Welder shall verify their initials and date are written on the Form FN 5.005.5 GTAW Weld Log for each weld and notify the GF or SF that the spool is complete.

5.4.1.3 – The GF/SF shall visually examine all welds made and confirm that dimensions and orientation match the Isometric Weld Map drawing. Also, the GF/SF shall verify all weld ID#'s on the GTAW Weld Log match the drawing and labels on the welds. When satisfied with quality of work, the GF/SF shall initial & date the Form FN 5.005.5 GTAW Weld Log and notify Therma's QC Examiner that the spool is complete and ready for examination.

5.4.2 GTAW Weld Examination – The QC Examiner shall examine the welds and document the examinations per Therma Corp SOP 7.005 Automatic GTAW Weld Examination. When satisfied with quality and completeness, QC Examiner shall complete examination portion of the Form FN 5.005.5 GTAW Weld Log and notify the Owner's Inspector or 3rd Party Inspector, as needed.

5.4.2.1 – The QCE shall record Accept(A)/Reject(R) for the materials, type of weld examination, Accept(A)/Reject(R)



Standard Operating Procedure

SOP #: 5.005 Rev. 10

Gas Tungsten Arc Welding

Page #: 9 of 11

for the weld, initials and date. If a weld is rejected, note the cause of rejection code in the comments for the weld.

5.4.2.2 – All rejections shall be communicated to the Therma QC Manager immediately.

5.4.3 Owner's or 3rd Party Final Weld Inspection – As required by the project specifications and or project contract, the Owner's inspector or 3rd Party Inspector shall inspect and document his findings, then notify the shop/field foreman, QCE or QCM upon completion.

5.4.3.1 – The 3PI shall record Accept(A)/Reject(R) for the materials, type of weld examination, Accept(A)/Reject(R) for the weld, initials and date. If a weld is rejected, note the cause of rejection code in the comments for the weld.

5.4.3.2 – All rejections shall be communicated to the Therma QC Manager immediately.

5.4.4 Pressure Test w/Calibrated Gauge - As required, the GF/SF shall review with the PM & QCM the project specifications for pressure testing the spool. Refer to Therma SOP 6.009 Pressure Test for Process Piping.

5.4.5 Passivation/Electropolish & Report – The Project manager shall communicate the Passivating and Electropolishing specifications to the Shop and Field Forepersons.

5.4.5.1 – The shop Foreman shall coordinate with the GF in the field to make arrangements for Passivation/Electropolish, re-examination and subsequent delivery to the field jobsite.

5.4.5.2 – Refer to Therma SOP 5.054 Passivation of Welded Stainless Steel Surfaces.

6 Review and Approval

6.1 The QCE shall examine and approve welds as prescribed in SOP # 7.005 (GTAW Weld Examination).

6.2 The QCE is to fill in the balance of the columns in the Form # FN 5.005.1 Coupon Weld Log and Form # FN 5.005.5 GTAW Weld Log found on the



Standard Operating Procedure

SOP #: 5.005 Rev. 10

Gas Tungsten Arc Welding

Page #: 10 of 11

back of each fabrication/isometric drawing. All blank cells which are not applicable are to be stricken with note 'N/A' with initials and date.

- 6.3 Therma shall make available for review all GTAW welding documentation as required by the specification to the owner or 3rd Party representative.

6.4 Figure No.1 Sample Form FN5.005.5 GTAW Weld Log

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