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HPS6

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PROCESS SPECIFICATION
ON
Heat Treating & Stress Relieving of Martensitic Stainless Steel (400 Series Stainless Steel)

DRAWN CG 2/23/56	HEAT TREATING & STRESS RELIEVING
CHECKED MP 3/7/63	
APPROVED LGS 3/5/63	
SCALE	
CODE IDENT. NO. **70236**	TACTAIR FLUID CONTROLS INC. LIVERPOOL, NY 13088
	HPS6
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REVISIONS

REVISIONS	DATE	DESCRIPTION	APP. BY
-	2/23/56	Release	CG
A	8/20/56	HPS6 superseded by HPS6A; rewritten	
B	9/12/56	Revised note 5	CG
C	12/4/56	Revised para. 5, detail req.	
D	3/5/63	Revised & updated was HPS6C	LJS
-	11/2/65	Sheets renumbered, sheet 1 updated	
E	2/7/69	In para. 5.7 -120ºF was -100ºF	MC
F	3/7/69	Para. 5.2, Temp. was 1950ºF Para. 5.3, Added oil temp. Para. 5.5, Stress relieve was 300ºF Para. 5.7, Stress rlv was 300ºF for one hour	MP
G	9/30/92	Company name change and re-sequencing of procedures	JM
H	4/21/94	Para. 5.6 Added sentence- *"Place part in "* Para. 5.8, Added words- *"cold and hot stabilization"*	JDM
J	9/8/95	Para. 2 Is: *"Reference Specifications"* Was: *"Applicable Specifications"* Para. 2.1 added sentence, *"The following"* Para. 3.3 Added: *"used for processing per para. 5.1, 5.2, and 5.3"* Para. 5.6 Revised wording	JDM
K	3/19/96	Reference specs updated Added para. 6.0 DETAIL REQUIREMENTS ECN 8826	JDM
L	5/26/99	Updated from MIL standards to AMS Para.7.1 Is: *"After magnetic particle examination"* Was: *"After magnaflux"* ECN 11891	
M	09/18/2000	Removed title *"DIMENSIONAL STABILIZATION OF STEELS: PROCESS FOR".* Para. 1.1 Removed *"alloy and hardenable stainless steels, tool steels, cast irons, carburized steels, and nitriding steels"* and Replaced with *"hardenable martensitic stainless steels"*.	

REVISIONS

REVISIONS	DATE	DESCRIPTION	APP. BY
M (Con't)	09/18/2000	Para. 2.1 Removed *"are listed for reference only and are not a part of HPS6"* and Replaced with *"are used except as noted within this document:"*. *Added specification "AMS-2759 Heat Treatment of Steel Parts" and "AMS-2759/5 Heat Treatment Martensitic Corrosion Resistant Steel Parts".* Para. 2.2 Removed Entire paragraph Para 3.1 Removed para and Replaced with *"All equipment used for processing parts shall meet the requirements of AMS-2759."* Para. 3.3 Removed paragraph's Para. 3.4 Removed paragraph's Para 4.1 Removed para and Replaced with *"All parts shall be cleaned to remove protective oils, dirt etc…prior to the heat treat process."* Para's 4.2 thru 4.3 – Added paragraph's. Para 5. Removed *"-Heat Treatment of 400 series steel"* Para. 5.1 Removed *"supplements the requirements of AMS-H-6875"* and Replaced with *"is used".* Added to end of para. *"(inert gas atmosphere and quench)"*. Para 5.2 Added *"All other 400 series material per AMS 2759/5."* Para. 5.3 Removed *"a furnace atmosphere as soon as possible after austenizing (bright hard)."* and Replaced with *"an inert gas atmosphere. The .25 inch cross sectional requirement and microhard/decarburization testing (Ref. AMS-2759/5) is not required."*. Para 6.1 Added *"After the complete treatment only light grinding and honing is permitted for final sizing."* Para 6.2 Removed *"After the complete treatment only light grinding and honing is permitted for final sizing."* And Replaced *with "Design Engineering shall specify if additional cold and hot stress relieving is required to stabilize for extreme tight fits of mating parts."*	

REVISIONS

REVISIONS	DATE	DESCRIPTION	APP. BY
M (Con't)	09/18/2000	Para 6.3 Removed paragraph Para 7.2 Removed *"conformance with this process. All other Quality Control requirements must be adhered to."* And Replaced with *"that proper certification covers the requirements of the drawing."* Note 1. Removed *",not furnace or cold temperature unit temperature."* Note 2 and 3 removed and renumbered accordingly. ECN13031	
N	10/19/2000	Para 5.1 Removed "(inert gas atmosphere and quench)." And Replaced with "(quench in protective atmosphere per AMS2759/5, Class A)". Para 5.3 Removed "an inert gas" and Replaced with "protective" ECN13148	
		THIS DATE REPRESENTS APPROVAL BY ENGINEERING. ACTUAL RELEASE DATE MAY VARY SEE PLM	
P	01/20/15	REVISED PER CN-003229	CJR
R	05/31/23	REVISED PER CN-009935	MLK
T	06/11/2024	REVISED PER CN-010281	SCP

1. Application

1.1 This process covers the minimum requirements for the treatment of hardenable martensitic stainless steels for the purpose of obtaining dimensional stabilization of parts for use in precision assemblies.

2. Reference Specifications

2.1 The following specifications are used except as noted within this document:

AMS-2759	Heat Treatment of Steel Parts
AMS-2759/5	Heat Treatment Martensitic Corrosion Resistant Steel Parts

3. Equipment

3.1 All equipment used for processing parts shall meet the requirements of AMS-2759.

4. General Requirements

4.1 All parts shall be cleaned to remove protective oils, dirt etc… prior to the heat treat process.

4.2 Part handling and racking is critical to protect parts from damage and distortion during the heat treat process.

4.3 All parts shall be protected from damage & corrosion during shipping and storage. Original or better packaging shall be used.

5. Detail Requirements – Heat Treat

5.1 AMS 2759/5 is considered an approved alternate to heat treatment defined in Section 5. If print doesn't require subsequent stress relief, cold stabilize must be performed per Section 5.5 and 5.6.

5.2 The following procedure is used to obtain structural and dimensional stability for mated slide fits and parts whose functional requirements depend on a high degree of dimensional stability. All heat treating of 400 series stainless shall be by bright hardening (quench in protective atmosphere per AMS2759/5, Class A).

5.3 Austenitize steel at temperatures indicated.

410 and 416	1750ºF - 1850ºF
440C	1850ºF - 1950ºF

All other 400 series material per AMS 2759/5

5.4 Quench in protective atmosphere. The .25 inch cross sectional requirement and microhard/decarburization testing (Ref. AMS-2759/5) is not required.

5.5 Continue cooling from quench to cold stabilizing temperature of -90ºF (maximum) for 20 minutes per inch of thickness.

5.6 Remove parts from cold chamber and bring to room temperature, then stress relieve at 300ºF ± 25ºF for one hour. Repeat cold stabilizing cycle as specified in Para. 5.4. Remove parts from cold chamber and bring to room temperature, then temper to required hardness as specified on drawing. Tempering 410 and 416 series stainless steel at temperatures which could negatively affect impact strength may be necessary to achieve required hardness and must be approved by Tactair Engineering. Approval is requested using a Supplier Deviation Waiver Request (SDWR).

6. Detail Requirements- Stress Relieve

6.1 Parts that require the major portion of machining done after heat treating must be cold and hot stress relieved, prior to final grinding. After the complete treatment only light grinding and honing is permitted for final sizing. Place part in cold chamber and cool to -90ºF (maximum) for 20 minutes per inch of thickness. Remove from cold chamber and bring to room temperature, then stress relieve at 300ºF ± 25ºF for one hour.

6.2 Design Engineering shall specify if additional cold and hot stress relieving is required to stabilize for extreme tight fits of mating parts.

7. Inspection

7.1 Parts treated per para. 5. and or 6. shall be given magnetic particle examination as noted on detail drawing prior to final sizing.

After magnetic particle examination parts must be completely demagnetized.

7.2 It shall be the responsibility of the Tactair Quality Control Department to assure that proper certification covers the requirements of the drawing.

NOTES:

1. All temperatures mentioned herein are metal temperatures.

2. Treatment in accordance with this process shall not alter physical properties specified on the drawing.

3. Deviations to any portions of the outlined process must be approved by Tactair Engineering.