



## Visual Acceptance Criteria

Procedure Title	Number	Revision	Release Date
<b>Visual Acceptance Criteria</b>	<b>QP-20020</b>	<b>E</b>	<b>11/6/23</b>

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### Revision History

Rev.	Page	Description of Revision	Date
A	All	Initial Release	3/05/2015
B	13	Updated to discoloration	01/03/2017
C	3	Para 1.0 – Completely re-written	08/23/2018
	3	Para 3.1 – Completely re-written	
	3	Para 3.2 – Completely re-written	
	3	Added Para. 3.3	
	3	Para 5.0 – Completely re-written. Removed redundant definitions that are listed in the Component Inspection Matrix	
	4	Para 6.0 – Completely re-written	
	5	Added Para 7.0 and renumbered remaining sections	
	5	Component Inspection Matrix is now Para 9.0	
	5	Table 14.0 Completely re-written	
	9	Photos additional requirements and historical non-conformances have been put into an Appendix at the end of the document	
D	9	Added photos showing the difference between dents, nicks, chips, gouges, and scratches	04/02/2020
	3	Added Para. 5.1	
	4	Added Para. 5.7	
	4	Added Para. 5.8	
	4	Added Para. 6.1	
	4	Para. 6.6 – Added “threads”	
	4	Moved Para. 7.1 to Para. 6.3	
	4	Updated Para. 6.3	
	5	Added Para. 7.1	
	5	Para. 7.3 – Deleted “...at arm’s length or closer”	
	5	Updated Para. 7.3	
	6	Added Section 8.0 and renumbered remaining sections	
	7	Updated Section 10.0	
E	6	Updated Section 7 adding 30x magnification for seat inspection	10/26/2023

## Visual Acceptance Criteria

### 1.0 Purpose and Scope

The purpose of this standard is to provide visual acceptance criteria for Curtiss Wright Sensors machined, assembled, and procured products. It applies during all manufacturing and inspection activities.

This document does not supersede any engineering drawing requirements.

This document does not apply to military or aerospace standard components. Components procured to military or aerospace standards shall be controlled by their associated specifications.

### 3.0 Responsibility

- 3.1 Curtiss Wright Engineering and Quality Management is responsible for the application and administration of this procedure.
- 3.2 All Curtiss Wright employees are responsible for properly handling and documenting non-conforming material in accordance with Curtiss Wright discrepancy and MRB procedures.
- 3.3 Suppliers are responsible for providing products that comply with the visual standards of this document unless otherwise stated on the associated engineering drawing or purchase order.

### 4.0 Applicable Documents

- 4.1 Applicable documents are per procedures instituted by each Curtiss Wright manufacturing site and Curtiss Wright supplier. Documents include Control of Non-Conforming Product, Material Review Board and Records Retention.

### 5.0 Definitions / Acronyms

Below are general definition for topics discussed within this document. For a list of specific visual defect definitions, see the Component Inspection Matrix (Table 1) of this document.

- 5.1 ***Tactilely Discrete Imperfection:*** A surface defect that can be felt
- 5.2 ***Contamination:*** the presence of unwanted material or residue on or inside of a part or product
- 5.3 ***FOD (Foreign Object Debris):*** foreign material introduced into the machining, assembly, inspection or packaging processes.

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- 5.4 **Surface Roughness:** the finely spaced surface irregularities caused by machining feed-rate, tool geometry, and tool condition
- 5.5 **Surface Waviness:** surface irregularities that have a spacing greater than the surface roughness. Usually due to warping or vibrations during machining.
- 5.6 **Surface Lay:** the direction of the surface pattern produced by the machining method
- 5.7 **Base Material:** the parent material to which a coating or plating is applied
- 5.8 **Flow Hole:** A component feature intended to be a pneumatic or hydraulic passage

### 6.0 General Requirements

- 6.1 The surface flaws and defects defined in this document shall not be evaluated using a surface roughness measurement. They shall be evaluated per the requirements of this document. Surface roughness is a measurement of closely spaced irregularities caused by machining operations. Flaws and defects are unintentional, discrete, and infrequent.
- 6.2 Visual defect definitions and accept / reject criteria are included in the Component Inspection Matrix (Table 1) of this document.
- 6.3 When measuring the size of defects it is permissible to validate the length, width, and depth by any practical means (scale, Vernier caliper, comparator, molding, etc.).
- 6.4 Additional clarification of requirements and examples of historical non-conformances are included in the Appendix of this document.
- 6.5 Some images and examples contained in the appendix may not be of current CWC products, but represent required levels of acceptance and rejection.
- 6.6 Defects found on sealing grooves, sealing surfaces, threads, and functional interfaces are generally never acceptable. See the Component Inspection Matrix (Table 1) for details. If a technician or inspector is unable to identify if the surface is a sealing groove, sealing surface, or functional interface, they are responsible for contacting the appropriate person for clarification.
  - Curtiss Wright suppliers shall contact the CW buyer associated with the purchase order
  - Curtiss Wright employees shall contact a quality assurance representative

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- 6.7 Rejected parts shall be processed in compliance with the site non-conforming material procedures. Suspect non-conforming parts shall be quarantined until disposition can be completed by the appropriate MRB authority.
- 6.8 If the Customer Eyes (CEO) process is required in the manufacturing instructions, traveler, routing, or purchase order, inspect the part against the appropriate CEO documentation and to the requirements of this procedure.
- 6.9 Visual features shall fall into the following categories
- Acceptable **without** rework (in compliance with Table 1)
  - Acceptable **with** immediate rework activity (described in Table 1)
  - Rejected – product with visual defects deemed unacceptable shall be considered as non-conforming and dealt with in accordance with the site non-conforming product procedures

### 7.0 Visual Examination Procedures

- 7.1 Visual inspection shall be performed, when practical, after all required inspections utilizing gages, fixtures, etc. have been completed.
- 7.2 Part inspections shall take place under lighting conditions of 1100 lumens minimum. The inspector's vision shall be corrected for 20/20 vision.
- 7.3 Magnification
- All accessible surfaces shall be inspected with an unaided eye. If abnormalities are found, then a referee 4x optical magnification is permissible to evaluate an observed condition.
  - All sealing surfaces shall be inspected at 4x magnification for surface defects, burrs, contamination, chips, and FOD
  - All internal threads, external threads, and holes shall be 100% inspected at 4x for burrs, contamination, chips, and FOD
  - All valve bodies and manifolds shall be 100% visually inspected with 20x magnification for burrs, contamination, chips, and FOD. Areas that are difficult to access may require mirrors, borescopes, etc.
  - Holes should be examined from both sides when possible

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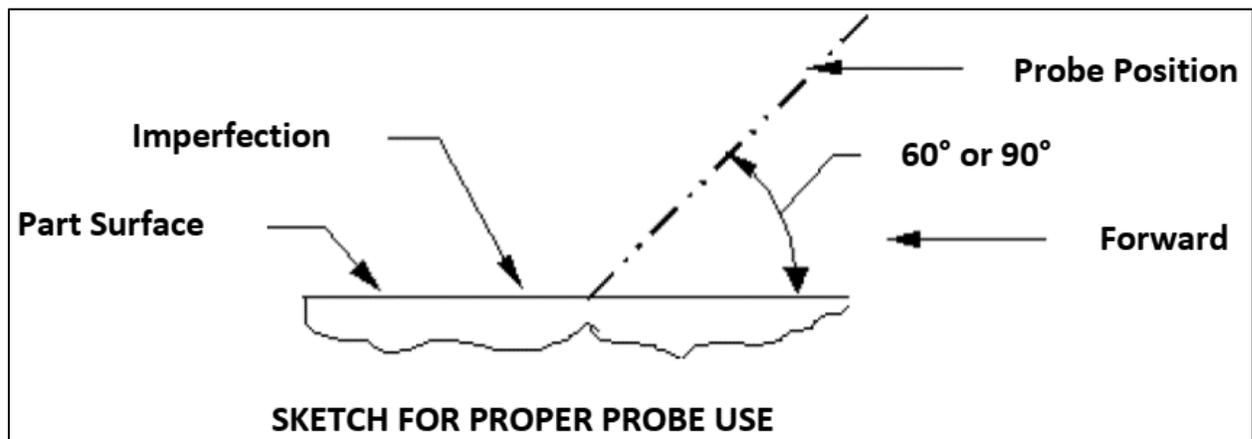
- All parts where the drawing identifies a seat and/or seat edge shall be 100% visually inspected with 30x magnification for nicks, burrs, and scratches (applicable for Gilbert, Nogales, and United Kingdom). Areas that are difficult to access may require mirrors, borescopes, etc.

### 8.0 Tactilely Discrete Imperfection Measurement

8.1 For visually detected surface defects that may be tactilely discrete, a .025" radius spherical ruby probe shall be used to validate the defect

8.2 Probe Inspection Method

- Hold the probe lightly near the top between the thumb and forefinger
- Incline the probe at 60 degrees to the part surface toward the imperfection
- Push the probe forward over the surface without applying pressure other than the weight of the probe itself in a direction approximately 90 degrees to the lay of the imperfection
- If the movement is smooth with no interruption and the probe does not hesitate or catch in the imperfection, the imperfection is acceptable
- If the probe cannot be positioned at 60 degrees to the part surface due to part configuration, the probe can be held at 90 degrees to the part surface



### 9.0 Records Retention

The preservation, storage and period of records must be in accordance with the applicable site procedures.

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### 10.0 Component Inspection Matrix (Table 1).

FEATURES	DEFINITIONS	APPLICABLE PARTS	ACCEPT / REJECT	CONDITION
Blister	A localized lifting of coating, plating or paint from base material, appearing as a protuberance that may break when probed.	All coated, plated or painted parts and details.	REJECT	ALWAYS
			ACCEPT	NEVER
Burnish Mark	A local smoothing of a metal surface. Often to a high luster resulting from rubbing. It may contain scratches of no apparent depth. Includes buffing and polishing marks.	All parts and details on un-painted areas only	ACCEPT	Provided that it meets the probe inspection requirement and the material thickness meets drawing requirement
Burr	A rough ridge, edge, or poorly attached material left at the intersection of two surfaces. Typically produced during machining operations.	On seal grooves, sealing surfaces, internal passages, threads, and flow holes	REJECT	ALWAYS
		All other surfaces and features	REJECT	If length is greater than 0.003" or it is hanging, loose, or can be easily dislodged
Chatter Mark	A tool mark on material caused by vibration or jumping of a machine cutting tool.	All parts and details	REJECT	Not acceptable in seal grooves or sealing surfaces
			ACCEPT	On all other surfaces provided part meets drawing surface roughness requirement
Chip	A breaking away of an edge sometimes caused by impact from a foreign object. Material is removed	All parts and details	REJECT	ALWAYS
Corrosion	A deterioration of the metal resulting in change of color and leaving a rough surface that may show pits (small cavities)	All parts and details	REJECT	ALWAYS
			ACCEPT	NEVER
Crack	A tear or fracture in the material surface	All parts and details	REJECT	ALWAYS
			ACCEPT	NEVER
Crazing	A network of fine cracks on the surface of a material	Typically occurring in polymers and coatings	REJECT	ALWAYS
			ACCEPT	NEVER

## Visual Acceptance Criteria

FEATURES	DEFINITIONS	APPLICABLE PARTS	ACCEPT / REJECT	CONDITION
Dent	A depression in a surface, normally having rounded edges, corners and bottom. Caused by an impact with a blunt object	On seal grooves, sealing surfaces, threads, and functional interfaces	REJECT	ALWAYS
		On edges	ACCEPT	Provided no base material is exposed, meets the edge break tolerance requirement, and is less than 0.005" deep
		On all other surfaces	ACCEPT	Provided it meets all dimensional tolerances, meets the probe inspection requirement, has rounded edges, and there is no base material is exposed
Nick	A depression in a surface with raised material. Caused by an impact with a sharp edge or object	On seal grooves, sealing surfaces, threads, and functional interfaces	REJECT	ALWAYS
		On edges	ACCEPT	Provided no base material is exposed, meets the edge break tolerance requirement, and is less than 0.005" deep
		On all other surfaces	ACCEPT	Provided it meets all dimensional tolerances, meets the probe inspection requirement, has rounded edges, and there is no base material is exposed. Cannot be longer than 0.010".
Gouge	A wide, rough scratch usually with sharp corners accompanied by deformation. The depth is generally larger than the width.	All parts and details	REJECT	ALWAYS
Scratch	A long, narrow sharp cornered impression caused by the movement of a sharp object across a surface. The depth is assumed to be no greater than the width.	On seal grooves, sealing surfaces, threads, and functional interfaces	REJECT	ALWAYS
		Superficial scratches (a scratch that has no apparent depth)	ACCEPT	Provided it meets all dimensional tolerances, meets the probe inspection requirement, has rounded edges, and there is no base material is exposed
		On all other surfaces	ACCEPT	Provided it meets all dimensional tolerances, meets the probe inspection requirement, has rounded edges, and there is no base material is exposed. Cannot be longer than 0.050".
Rack Mark	A small depression or cavity caused by racking during an anodize or hardcoating process	All parts and details	ACCEPT	Provided the rack marks are not on seal grooves, sealing surfaces, and functional interfaces

## Visual Acceptance Criteria

FEATURES	DEFINITIONS	APPLICABLE PARTS	ACCEPT / REJECT	CONDITION
Discoloration	A localized or generalized change in color of the part. May be induced by Induction, Welding, Heat Treatment, or Etching.	All heat treated parts and details made of steel, nickel alloys	ACCEPT	Provided it is an even light straw or light blue in color and free of corrosion
		All nitride parts and details	ACCEPT	Provided it is light to dark grey in color
		All Anodized parts	ACCEPT	Provided it is uniform light grey
		All Hard Anodized parts	ACCEPT	Provided it is adherent, uniform in color and not powdery
		Alocrom	ACCEPT	Provided it is a uniform gold/yellow color. Some variation is allowable in touch up areas.
		Electroless nickel plated steel parts which have been subject to a thermal deposit hardening process (bake) in a non-inert atmosphere e.g. SAE AMS 2404, Class 2. (See Note 1)	ACCEPT	Any shade of light yellow to dark peacock blue/purple, and any variability across the part is acceptable
		Electroless nickel plated steel parts which have been hardened in an inert atmosphere	REJECT	Discoloration is not acceptable
Fettling	Removal of excess material or surface defects from casting flash/forging seams and other similar parts	All parts and details	ACCEPT	Provided material removal areas are blended and uniformed. Drawing limits must be maintained.
Finger Print	Stains left by unprotected hands	All parts and details	ACCEPT	Provided that the stain is completely removed
Flaking/Peeling	A section or area of a plated, anodized, painted, or other coating medium that lifts away from the intended surface.	All parts and details	REJECT	ALWAYS
Stain or excess processing material	Local visual indication resulting from liquid drying on parts e.g Alocrom. Includes ANY processing material which is visible on the component.	All parts and details	ACCEPT	Provided there is no visible change in height and excess has been cleaned. Must meet drawing requirement
			REJECT	If excess material remains after cleaning
Step	An abrupt change in a surface profile or a mismatch between two or more surfaces	All machined parts and details	REJECT	Not acceptable in seal grooves or sealing surfaces
			ACCEPT	Provided it complies with drawing requirements

## Visual Acceptance Criteria

FEATURES	DEFINITIONS	APPLICABLE PARTS	ACCEPT / REJECT	CONDITION
Surface Finish	The result of the machining process including roughness, waviness, and lay	All machined parts and details	ACCEPT	MUST meet drawing requirements
Tool Mark	A mark in the direction of the machining lay left by the machining tool or across the lay caused by tool withdraw or metal chips. Marks can be straight, circular or spiral. Can also be caused by a dull or broken tool.	All machined parts and details	ACCEPT	Provided part meets drawing surface requirement and scratch requirements per this table
Undercut	A groove or recess cut into a surface near a shoulder or other projection	All machined parts and details	REJECT	Not acceptable in seal grooves or sealing surfaces
			ACCEPT	Provided it blends smoothly with adjacent surfaces and that it is within drawing tolerances.

**Note 1:**

*Discoloration occurs due to the formation of nickel sulfate when the parts undergo thermal deposit hardening in the presence of moisture from the atmosphere. There are at least 7 nickel sulfate salts which differ in their hydration or crystal habit, resulting in the range of colors from light yellow to dark peacock blue/purple. Small variances in moisture or humidity will cause a range of these colors to be evident within a single part or batch of parts, and this is completely normal. SAE AMS 2404, Class 2 specifically states that discoloration may occur and is acceptable. As additional proof, sample parts demonstrating the greatest variation have been subject to copper sulfate tests to prove that iron is not present.*

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### Appendix

#### Dent/Nick/Chip/Gouge/Scratch Visual Differences and Identification:

Dent



A depression with rounded edges caused by impact with a blunt object

Nick



A depression with raised material caused by impact with a sharp edge

Chip



A breaking away of an edge caused by impact from a foreign object

Gouge



A wide, rough scratch with sharp corners and deformation

Scratch

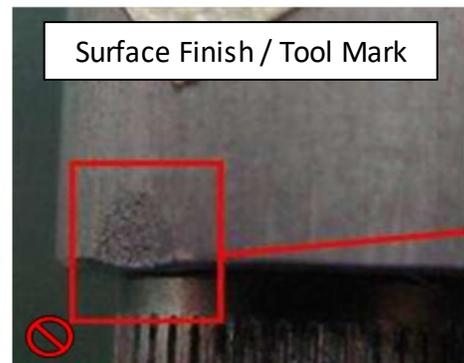
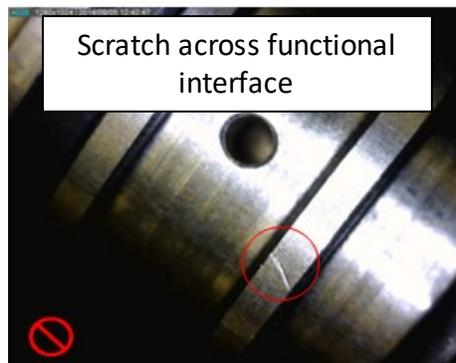
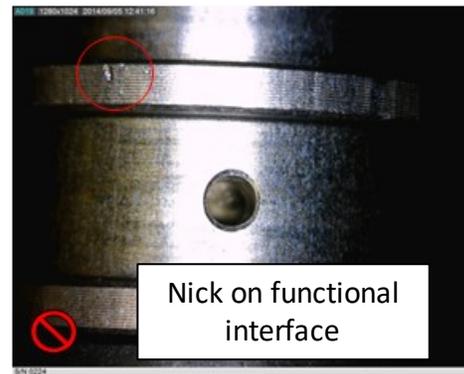
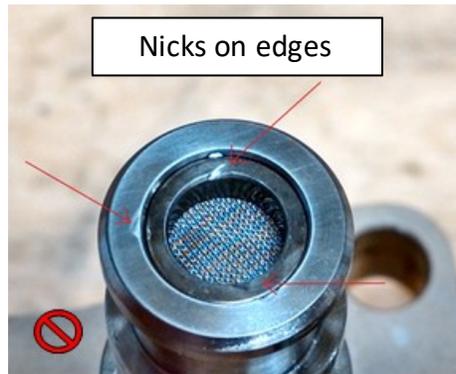


A long, narrow sharp cornered impression caused by movement of a sharp object across a surface

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### Examples of Unacceptable Machined Surface Conditions:

Shown are **unacceptable** conditions.



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### Paint / Sealant / Coated Surfaces:

- All sealed surfaces shall be free of dirt, grease, oil, nicks, scratches, voids/pin holes, bubbles, peeling, and cracks.
- The finish shall be smooth with complete uniform coverage without noted blemishes, paint buildup or overspray.

Shown are **unacceptable** conditions:

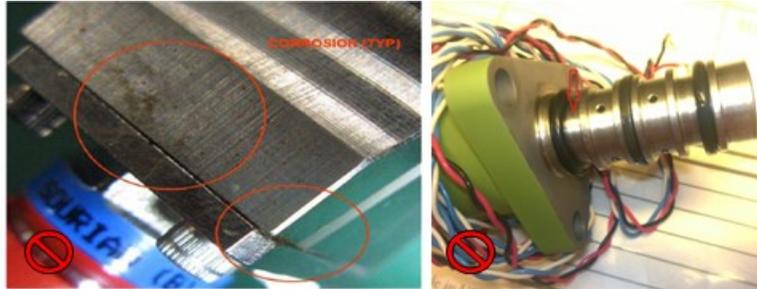


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### Rust/Corrosion Surfaces:

- There shall be no rust or corrosion on painted and unpainted surfaces.

Shown are **unacceptable** conditions:

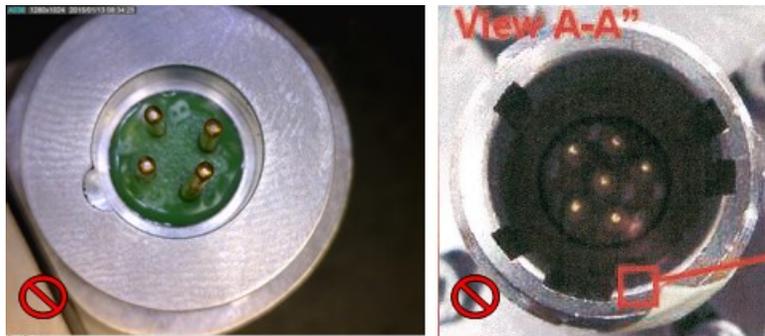


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### Electrical Connectors:

- Electrical connectors shall be examined using the unaided eye and a 4x referee magnification. This section is for reference only and is to show typical unacceptable conditions. Electrical connectors shall be evaluated for acceptability against their industry standard specifications.
- There shall be no visible damage to the connector shell or internal contacts (pins).
- The contacts shall not be bent, damaged, or deformed.
- There shall be no flakes or metallic FOD in the connector or contacts (sockets).
- All seals on connector pins shall be intact without damage or voids.
- On circular “MIL” standard connectors, there shall be no damage (tear) of the rubber seal surrounding the metal contacts.
- All contacts shall be seated (no noted recessed contacts).

Shown are **unacceptable** conditions:



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### Exit Wires/Cable:

- All wiring and heat shrink insulation shall be inspected for damage including insulation tears and cuts. There shall be no exposed wiring except allowed per drawing.
- Potting fill around wires shall have complete fill without voids or holes.

Shown are **unacceptable** conditions:



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### Stamping / Marking:

- Blurred, illegible or incomplete stamping of information.
- Cage Code shall be correct per customer drawing / CW location.

Shown are **unacceptable** conditions:





**Curtiss-Wright Corporation  
Doc-Sign  
Document Approval**

Date :

Document Title :

**OBJECTIVE :**

**SIGNATURE'S :**

<b>REVIEWED BY</b> <small>(All signatures must show typed name and title)</small>	<b>SIGNATURE / DATE</b>
Prepared By	