MOLEX MATERIAL SPECIFICATION – C26800 ALLOY METAL STRIPS

1.0 SCOPE

This specification covers the technical requirements, applicable reference documents, and quality requirements for metal strips. The values listed for acceptance criteria are in SI units.

2.0 PURPOSE

The purpose of this specification is to comprehensively define the Molex requirements for alloy C26800 chemical composition, physical properties, mechanical properties, and reference other applicable documents related to quality requirements and standard default dimensional tolerances.

This specification is a merger of ASTM B36/B36M, JIS H3100 and other industry norms for UNS alloy C26800 to meet the needs of Molex connector applications.

3.0 REFERENCE DOCUMENTS

This primary specification focuses on the physics of C26800 alloy and related mechanical properties to ensure Molex product performance. Other Molex documents are necessary to verify material characteristics that support high quality and manufacturability of products.

These reference documents are crucial to the Molex process / product and therefore all requirements contained within them must be attested to and demonstrate their conformance, within the supplier's process certification:

ASTM B36M and the associated reference documents listed under Section 2.1 *ASTM Standards*
ASTM B820 is specifically mentioned as critical to Molex formability requirements
2090580043 Geometric Conditions and Tolerances for Metal Strips
2090580044 Metal Strip Surface Conditions and Requirements

4.0 ORDER OF PRECEDENCE

This defines the priority order that should be followed when reviewing attributes and requirements of metal strip:

1. Molex Purchase Order
2. Packaging Specifications
3. Molex (Individual) Metal Strip Specification (i.e. Part Number Specification)
4. Molex Material Alloy Specification (**This document –** 2090580052– Molex Material Specification – C26800 Alloy Metal Strips)
5. Surface (2090580044) and Geometric (2090580043) Global Engineering Specifications

5.0 TECHNICAL REQUIREMENTS

5.1 Chemical Composition

UNS #	Cu wt.%	Fe wt.%	Zn wt.%
C26800[2]	64.0 – 68.5	≤ 0.05	Remainder

2. Copper + Sum of Named Elements = 99.7% min.
Limits for named and unnamed elements may be established between Molex and the supplier to satisfy certain environmental (REACH/RoHS) or other customer requirements. Reference “Molex Chemical Substances Specification for Products and Packaging: Supplier Requirements” (2014040014).

5.2 Mechanical Properties (longitudinal direction)

Mechanical Properties Table C26800				
Designation	**Tensile (1)**	**Yield (1)**	**Elongation %**	**RTF Grain Size (2)**
	(MPa)	0.2% offset (MPa)	In 50mm	(mm)
OS025	N/A	N/A as per B36M	N/A	0.015 – 0.035
O81	340 - 405	N/A as per B36M	≥ 35	≤ 0.030
O82	380 - 450	N/A as per B36M	≥ 30	≤ 0.015
H01	340 - 405	≥ 145	≥ 21	≤ 0.040
H02	380 - 450	≥ 265	≥ 9	≤ 0.030
H03	425 - 495	≥ 355	≥ 8	≤ 0.025
H04	470 - 540	≥ 435	≥ 6	≤ 0.015
H06	545 - 615	≥ 520	≥ 2	≤ 0.015
H08	595 - 655	≥ 540	≥ 1	≤ 0.015
H10	620 - 685	≥ 570	≥ 1	≤ 0.015

Notes:
(1) Tensile requirements are longitudinal values in uniaxial tension in accordance with ASTM E8M

(2) OS025 is annealed material with acceptability requirements for grain size

(3) Ready to Finish (RTF) grain size is measured before final rolling (H tempers) and at finish annealing for the OS025, 081 and 082 anneal to temper designations.

(4) For tempers H06 and up, add 20 MPa to the maximum tensile strength when the strip is hot dip tin or reflow tin plated.

(5) The rolled “H” tempers from H02 > H10 are listed with restricted grain sizes prior to finish rolling, this promotes bend formability.

(6) For cold worked tempers that are “stress relieved”, an “R” should be added after the “H”; ex. HR08. The “H” temper properties listed also apply for the corresponding “HR” temper code as a default.

5.3 Electrical Conductivity

5.3.1 For anneal to temper (“O” temper codes) the minimum requirement shall be 15.1 MS/m (26% IACS) @ 20ºC
5.3.2 For rolled tempers (“H”, “HR” temper codes) the minimum requirement shall be 11.6 MS/m (20% IACS) @ 20ºC
5.3.3 The test standard shall be ASTM E 1004 (eddy current) or ASTM B 193 (resistivity)

5.4 Bending properties

Bending of metal strip samples shall be in accordance with ASTM B 820; Bend Test for Formability of Copper Alloy Spring Material. The requirement is that the supplier’s material when tested at finished thickness and temper, will be capable to achieve the inside bend radii as listed in the tables below without observable cracking on the outside bend radius (reference 5.4.1.) At a minimum, samples shall be tested in both directions, at 180º of bending, at the most representative thickness category for the metal strip purchase order.

If special forming requirements are necessary, those will be listed separately on the part number document.

H03		90° GW	180° GW	90° BW	180° BW
	Thickness	10:1 w/t		10:1 w/t	
	0.51-1.0 mm	0.5 r/t	1.0 r/t	0.5 r/t	1.0 r/t
	0.3-0.5 mm	0.25 r/t	0.5 r/t	0.25 r/t	0.5 r/t
	0.15-0.29 mm	0.25 r/t	0.5 r/t	0.25 r/t	0.5 r/t
	≤0.149 mm	0.25 r/t	0.5 r/t	0.25 r/t	0.5 r/t

H04		90° GW	180° GW	90° BW	180° BW
	Thickness	10:1 w/t		10:1 w/t	
	0.51-1.0 mm	1.0 r/t	2.0 r/t	1.0 r/t	2.5 r/t
	0.3-0.5 mm	0.5 r/t	1.5 r/t	0.5 r/t	2.0 r/t
	0.15-0.29 mm	0.5 r/t	1.5 r/t	0.5 r/t	2.0 r/t
	≤0.149 mm	0.5 r/t	1.5 r/t	0.5 r/t	2.0 r/t

H06		90° GW	180° GW	90° BW	180° BW
	Thickness	10:1 w/t	10:1 w/t	10:1 w/t	10:1 w/t
	0.51-1.0 mm	1.5 r/t	2.0 r/t	2.5 r/t	3.5 r/t
	0.3-0.5 mm	1.0 r/t	1.5 r/t	2.0 r/t	3.0 r/t
	0.15-0.29 mm	1.0 r/t	1.5 r/t	2.0 r/t	3.0 r/t
	≤0.149 mm	1.0 r/t	1.5 r/t	2.0 r/t	3.0 r/t

H08		90° GW	180° GW	90° BW	180° BW
	Thickness	10:1 w/t	10:1 w/t	10:1 w/t	10:1 w/t
	0.51-1.0 mm	2.5 r/t	3.0 r/t	7.0 r/t	9/0 r/t
	0.3-0.5 mm	2.0 r/t	2.5 r/t	6.0 r/t	8.0 r/t
	0.15-0.29 mm	2.0 r/t	2.5 r/t	6.0 r/t	8.0 r/t
	≤0.149 mm	2.0 r/t	2.5 r/t	5.0 r/t	7.0 r/t

H10		90° GW	180° GW	90° BW	180° BW
	Thickness	10:1 w/t	10:1 w/t	10:1 w/t	10:1 w/t
	0.51-1.0 mm	3.5 r/t	4.0 r/t	9.0 r/t	11.0 r/t
	0.3-0.5 mm	3.0 r/t	3.5 r/t	8.0 r/t	10.0 r/t
	0.15-0.29 mm	3.0 r/t	3.5 r/t	8.0 r/t	10.0 r/t
	≤0.149 mm	3.0 r/t	3.5 r/t	7.0 r/t	9.0 r/t

Notes:
(1) W/t = width to thickness ratio (defining bending width). r/t = inside bend radius to thickness ratio.
(2) It is the expectation that tempers lower than H03 will possess bend formability that is as good (or better) than the values listed for the H03 temper

5.4.1 Acceptance Criteria for Bending

Bending Observations	Acceptance Criteria	Rank
	"Accepted", smooth, no orange peel, no cracks	1
	"Accepted", small orange peel, no cracks	2
	"Accepted", heavy orange peel, no cracks	3
	"Rejected", heavy orange peel, shallow cracks	4
	"Rejected", heavy orange peel, deep cracks	5

5.5 Stress Relaxation Resistance minimum expectation (in accordance with ASTM E 328)

C26800 Alloy Stress Relaxation in Percent Retained @ 1000 Hours						
Temp °C	50% $R_{p0.2}$∥	80% $R_{p0.2}$∥	100% $R_{p0.2}$∥	50% $R_{p0.2}$⊢	80% $R_{p0.2}$⊢	100% $R_{p0.2}$⊢
75	92%	88%	70%	88%	82%	64%
100	82%	78%	60%	78%	72%	54%
125	72%	67%	47%	65%	59%	39%
150	58%	52%	35%	50%	44%	27%

Confirmation testing: On well-established alloys such as C26800, it is allowable to use Larson Miller Parameters to fulfill the annual confidence testing requirement.

6.0 CERTIFICATION REQUIREMENTS

Certification at P.O. Level	Supplied Data at P.O. Level	Annual Capability Statement	Engineering Data by Request
Chemical Compostion (data)		Chemical Capability	
Tensile (data)		Tensile Capability	Transverse properties
Yield (data)		Yield Capability	Spring Bending Limit
Elongation (data)			
Grain size (data)			
			Elastic Modulus (data)
Thickness (data)		Thickness Capability	
Width (data)		Width Capability	
Camber (pass/fail)			
Surface Roughness (data)			
		Stress Relaxation Verification	
Burr (pass/fail)			
Bend Formability (pass/fail)			ASTM B820 Appendix narrow beam reporting table, or other
Electrical Conductivity (data)			
			Other Physical Properties
Reference Documents (pass/fail)			

6.1 Requirements for "Annual Capability Assessment" of critical characteristics

6.1.1 Chemical composition requires a statistical assessment on an annual basis to verify capability. This assessment be on file and available to Molex when requested.

6.1.2 Mechanical properties, requires a statistical assessment on an annual basis to verify capability. This assessment be on file and available to Molex when requested.

6.1.3 Dimensional tolerances, requires a statistical assessment on an annual basis to verify capability. This assessment be on file and available to Molex when requested.

6.1.4 Stress relaxation resistance is to be verified for a temper and a process in the H04 to H08 designation range at 80% of yield strength for 1000 hours at 75ºC and 125ºC. The supplier shall select and active Molex item to fulfill this requirement. It is acceptable to utilize Larson Miller Parameters to facilitate this annual verification audit.

6.2 Engineering Data

Acceptance of this material specification and the requirements includes the supplier's commitment to provide other engineering data when requested. These types of data may include transverse properties, spring bending limits or other physical properties of this material.

6.3 Recent Change Summary

Document ID# Change from **400005027-ES** → **2090580052**.

Updated **Section 3: Reference Documents** to reflect new **2090580043** and **2090580044** titles and content.

Changed **Section 4: Definitions** (with no entries) to **Section 4: Order of Precedence**.

Removal of what was previous **Section 6: Dimensional Requirements**

- All current Geometric and Dimensional Requirements are contained in **2090580043: GEOMETRIC CONDITIONS AND TOLERANCES FOR METAL STRIPS**. Including:
  - Strip Thickness
  - Strip Width
  - Burr
  - Camber
- All current Surface Condition Requirements are contained in **2090580044: METAL STRIP SURFACE CONDITIONS AND REQUIREMENTS**. Including:
  - Surface Roughness

Therefore, the previous **Section 7: Certification Requirements** and associated 7.X.Y subsections have decreased by one to become **Section 6: Certification Requirements** and associated 6.X.Y subsections.