INDIVIDUAL METAL STRIP, WIRE, ROD, BAR AND TUBE SPECIFICATIONS

1.0 SCOPE

This specification covers the Molex individual metal strip, wire, rod, bar and tube specification forms and the information to be specified on these forms. These individual specifications along with the purchase order, packaging specifications (supplied by manufacturing and purchasing) and alloy specifications establish the complete specifications for a given metal strip, rod, bar, wire or tube.

2.0 PURPOSE

The purpose of this specification is to provide common forms and methods for specifying individual metal strip, wire, rod, bar or tube for Molex.

3.0 REFERENCE DOCUMENTS

3.1 REFERENCE DOCUMENTS

2090580043	Geometric Conditions and Tolerances for Metal Strips
2090580044	Metal Strip Surface Conditions and Requirements
2090580007-ES	Material Number Assignment & Description
22090580047-0060	Alloy Standard Specifications (Metal Strip)
ES-88-*	Plating Standard Specifications
ASTM B***	Alloy Standard Specifications (Metal Wire, Rod, Bar and Tube)

Unless otherwise specified, the latest revision of the above specifications shall apply.

3.2 ORDER OF PRECEDENCE

In the event of a conflict between this specification and the reference documents, the order of precedence shall be as follows:

1. Molex Purchase Order
2. Packaging Specifications
3. Molex (Individual) Metal Strip Specification (i.e. Part Number Specification)
4. Molex Material Alloy Specification (i.e. 2090580050– Molex Material Specification – C70250 Alloy Metal Strips)
5. Surface (2090580044) and Geometric (2090580043) Global Engineering Specifications

4.0 DEFINITIONS

5.0 PROCEDURES

5.1 FORMS

The forms to be used for specifying individual metal strip shall be as shown in Appendix A. For metal wire, rod, and bar they shall be shown on Appendix B. For Metal tube they shall be shown on Appendix C.

5.2 CONTENTS

The information to be entered into each of the fields of the individual metal strip, wire, bar, rod and tube specifications shall be as specified below.

5.2.1 METAL STRIP

A Template of the form can be viewed in **Appendix A.**

For the fields that are **blank**, preferred values are given in:

- in their matching Molex alloy specification (www.molex.com/supplier/login.jsp)
- 2090580043
- 2090580044

General Fields

Standard Part Number Information

* Molex Part Number - The assigned Molex Part Number.

* Temper Code - The temper code assigned in the Alloy Specification shall be inserted in this field as a reference. When any material properties are omitted on the completed specification, the properties specified in the Alloy Specification for the alloy and temper code shall apply. This field shall be blank for special tempers that are not included in the Alloy Specification.

* UNS number / Trade Name - The number used to identify the alloy in the Alloy Specifications shall be inserted in this field. (Example: C51000 for Phosphor Bronze, 5%) For alloys that are not included in the Alloy Specifications, the UNS alloy number shall be used. This number consists of a letter and five digits.

* Nominal Thickness - Indicates nominal thickness of bare strip material in millimeters.

* Nominal Width - Indicates nominal width of bare strip material in millimeters.

* Die Exit Twist Category- The maximum twist shall be specified in this field in a category of twist in a specified length as detailed in 2090580043. The default die exit twist specification will be Category 1. Superior categories (Categories 2, 3 and 4) of twist shall be specified only when critical to the processing of the material or the function of the end product.

* Molex Alloy Specification - Indicates specific Alloy Engineering Standard (if applicable). The Alloy Engineering standards are available in the Molex SupplierNet portal.

* Required Reference Documents - Molex Reference Engineering Standards that are applicable to this Part Number as indicated. Please refer to our Molex SupplierNet portal.

Plating Requirements

* Plated – Mark as YES if Preplated or NO if Unplated.

* ES-88 Code – If applicable, specify the type of Plating as defined by the ES-88 Standards (www.molex.com/supplier/login.jsp)

* Other Finish Requirements (for Preplated material only) - The plating finish specification shall be entered into this field. The plating finish specifications specified in ES-88 are the preferred specifications and shall be used whenever possible.

Properties and Tolerance requirements

* Tensile Strength - The tensile strength range shall be specified in this field in Megapascals (MPa). The tensile strength values specified in the respective Alloy Specification are the preferred values and shall be used whenever possible.

* Yield Strength (0.2% Offset) - The minimum yield strength shall be specified in this field in Megapascals (MPa). The minimum yield strength values specified in the respective Alloy Specification are the preferred values and shall be used whenever possible. In cases where it is necessary to specify a range for yield strength, the range shall be specified in the form itself and the “min.” notation shall be dropped.

* Elongation - The minimum elongation shall be specified in this field as a percentage. The minimum elongation values specified in the respective Alloy Specification are the preferred values and shall be used whenever possible. In cases where it is necessary to specify a range for elongation, the range shall be specified in the form itself and the “min.” notation dropped.

* Grain Size (Ready to finish) - The average maximum grain size shall be specified in this field in micrometers. The average maximum grain size values specified in the Alloy Specifications are the preferred values and shall be used whenever possible. In cases where it is necessary to specify a range for grain size, the range shall be specified in the form and the “min.” or “max.” notation dropped.

* Thickness and Tolerance - The metal strip nominal thickness and tolerance (prior to plating) shall be specified in this field in millimeters. The metal strip thickness tolerances specified in 2090580043 are the preferred values and shall be specified whenever possible.

* Width and Tolerance - The metal strip nominal width and tolerance (prior to plating) shall be specified in this field in millimeters. The metal strip width tolerances specified in 2090580043 are the preferred values and shall be specified whenever possible.

* Strip Camber - The maximum metal strip camber shall be specified in this field in millimeters per the standard length. The camber values specified in 2090580043 are the preferred values and shall be used whenever possible.

* Burr - The maximum burr shall be specified in this field in millimeters. The maximum burr size values specified in 2090580043 are the preferred values and shall be specified whenever possible.

* Surface Roughness (Unplated) - The maximum surface roughness shall be specified in this field in micrometers. The maximum surface roughness values specified in 2090580044 are the preferred values and shall be specified whenever possible

Bend Formability Requirements

* Minimum R/T Bend Ratio for a beam width ≥ 10 x thickness of strip for both 90º and 180º, in perpendicular (GOOD WAY) and parallel (BAD WAY) to rolling direction - Where the Minimum Bend Radius is a critical requirement in the application of a metal strip, the R/T requirements shall be entered in this field, for GOOD WAY and/or BAD WAY bends. The testing against this requirement should be performed following the ASTM B 820 standard or equivalent.

If filled in the form, these Special Requirements supersede the reference values listed in the respective Alloy Specification and Reference Documents. If **blank**, the standard requirements in Alloy Specification and Reference Documents Apply.

Notes and other requirements

Additional notes may be added in this space:

* Spring Bending Limit (Optional) – The minimum flexural yield limit shall be expressed in Megapascals (MPa). In cases where it is necessary to specify a range for flexural yield limit, the range shall be specified and the “min.” notation shall be dropped.

* Design / Performance requirements (Optional) - Any requirements related to the final design that do not fit in the above categories can be included here. Additional information conveyed to the supplier related to formability (i.e. MBR < 10:1 Beam width/Thickness ratio), Electrical Conductivity or requirements not covered under the specific Alloy Specifications can be found here.

5.2.2 METAL WIRE, ROD, BAR

A Template of the form can be viewed in **Appendix B.**

For the fields that are **blank**, preferred dimensional tolerances are given in:

- ASTM B249M – Standard specification for General requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes and Forgings
- ASTM B250M – Standard Specification for General Requirements for Wrought Copper-Alloy Wire

For the fields that are **blank**, Alloy mechanical properties are given in:

- The matching ASTM standard, for ASTM conforming alloys
- The producers Alloy Technical Datasheet for Non-conforming ASTM alloys

General fields

Standard Part Number Information

* Molex Part Number - The assigned Molex Part Number.

* Form – Select the form for Wire, Rod, or Bar.

* Temper Code - The temper code assigned in the ASTM Standard (or producer datasheet) shall be inserted in this field as a reference. When any material properties are left blank on the specification, the properties specified in the ASTM Standard (or producer datasheet) for the alloy and temper code shall apply. This field shall be blank for special tempers that are not included in the ASTM Standards.

* UNS number / Trade Name - The number used to identify the alloy in the ASTM Standards shall be inserted in this field. (Example: C51000 for Phosphor Bronze, 5%) For alloys that are not included in the ASTM Standards, the UNS alloy number shall be used. This number consists of a letter and five digits.

* Required Reference Documents - Molex Reference Engineering Standards that are applicable to this Part Number as indicated. Please refer to our Molex SupplierNet portal.

Plating Requirements

* Plated – Mark as YES if Preplated or NO if Unplated.

*ES-88 Code – If applicable, specify the type of Plating as defined by the ES-88 Standards (www.molex.com/supplier/login.jsp)

* Other Finish Requirements (For Preplated material only) - The plating finish specification shall be entered into this field. The plating finish specifications specified in ES-88 are the preferred specifications and shall be used whenever possible.

Properties and Tolerance Requirements

* Tensile Strength - The tensile strength range shall be specified in this field in Megapascals (MPa). The tensile strength values specified in the respective ASTM Standards are the preferred values and shall be used whenever possible.

* Yield Strength (0.2% Offset) - The minimum yield strength shall be specified in this field in Megapascals (MPa). The minimum yield strength values specified in the respective ASTM Standard are the preferred values and shall be used whenever possible. In cases where it is necessary to specify a range for yield strength, the range shall be specified and the “min.” notation shall be dropped.

* Elongation - The minimum elongation shall be specified in this field as a percentage. The minimum elongation values specified in the respective ASTM Standards are the preferred values and shall be used whenever possible. In cases where it is necessary to specify a range for elongation, the range shall be specified and the “min.” notation dropped.

* Grain Size (Ready to finish) - The average maximum grain size shall be specified in this field in micrometers. The average maximum grain size values specified in the ASTM Standards are the preferred values and shall be used whenever possible. In cases where it is necessary to specify a range for grain size, the range shall be specified and the “min.” or “max.” notation dropped**.**

* Surface Roughness (Unplated) - The maximum surface roughness shall be specified in this field in micrometers.

* Straightness (Optional) - Straightness can be specified here in millimeters if the requirement is more stringent than as specified in the corresponding ASTM standard.

* Wire, Bar or Rod Dimensions - The dimensional requirements of the individual wire cross-section shall be specified according to shape either in figure A (Square / Rectangular Cross Section) or B (Circular Cross Section).

Notes and other requirements

Additional notes may be added in this space:

* Design / Performance requirements (Optional) - Any requirements related to the final design that do not fit in the above categories can be included here.

5.2.3 METAL TUBE

A Template of the form can be viewed in **Appendix C.**

For the fields that are **blank**, preferred dimensional tolerances are given in:

- ASTM B251M -Standard specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube

For the fields that are **blank**, Alloy mechanical properties are given in:

- The matching ASTM standard, for ASTM conforming alloys
- The producers Alloy Technical Datasheet for Non-conforming ASTM alloys

General fields

Standard Part Number Information

* Molex Part Number - The assigned Molex Part Number.

* Form – Select the form for Tube.

* Temper Code - The temper code assigned in the ASTM Standard (or producer datasheet) shall be inserted in this field as a reference. When any material properties are omitted on the completed specification, the properties specified in the ASTM Standard for the alloy and temper code shall apply. This field shall be **blank** for special tempers that are not included in the ASTM Standards.

* UNS number / Trade Name - The number used to identify the alloy in the ASTM Standards shall be inserted in this field. (Example: C51000 for Phosphor Bronze, 5%). For alloys that are not included in the ASTM Standards, the UNS alloy number shall be used. This number consists of a letter and five digits.

* Required Reference Documents - Molex Reference Engineering Standards that are applicable to this Part Number as indicated. Please refer to our Molex SupplierNet portal.

Plating Requirements

* Plated – Mark as YES if Preplated or NO if Unplated.

*ES-88 Code – If applicable, specify the type of Plating as defined by the ES-88 Standards (www.molex.com/supplier/login.jsp)

* Other Finish Requirements (for Preplated material only) - The plating finish specification shall be entered into this field. The plating finish specifications specified in ES-88 are the preferred specifications and shall be used whenever possible.

Properties and Tolerance Requirements

* Tensile Strength - The tensile strength range shall be specified in this field in Megapascals (MPa). The tensile strength values specified in the respective ASTM Standard are the preferred values and shall be used whenever possible.

* Yield Strength (0.2% Offset) - The minimum yield strength shall be specified in this field in Megapascals (MPa). The minimum yield strength values specified in the respective ASTM Standard are the preferred values and shall be used whenever possible. In cases where it is necessary to specify a range for yield strength, the range shall be specified and the “min.” notation shall be dropped.

* Elongation - The minimum elongation shall be specified in this field as a percentage. The minimum elongation values specified in the respective ASTM Standard are the preferred values and shall be used whenever possible. In cases where it is necessary to specify a range for elongation, the range shall be specified and the “min.” notation dropped.

* Grain Size (Ready to finish) - The average maximum grain size shall be specified in this field in micrometers. The average maximum grain size values specified in the ASTM Standard are the preferred values and shall be used whenever possible. In cases where it is necessary to specify a range for grain size, the range shall be specified and the “min.” or “max.” notation dropped.

* Surface Roughness (Unplated) - The maximum surface roughness shall be specified in this field in micrometers.

* Straightness (Optional) - Straightness can be specified here in millimeters if the requirement is more stringent than as specified in the corresponding ASTM standard.

* Tube Dimensions - The dimensional requirements of the individual tube cross-section shall be specified according to shape either in figure A (Square / Rectangular Cross Section) or B (Circular Cross Section).

Notes and other requirements

Additional notes may be added in this space:

*Design / Performance requirements (Optional) - Any requirements related to the final design that do not fit in the above categories can be included here.

5.3 DOCUMENT CONTROL

5.3.1 Title Block Contents

Strip Document Specification Number - The engineering number assigned to the metal strip or wire specification shall be entered in this field. A standard engineering part number per 2090580007-ES shall be used. No wild card place holders (*'s) shall be used. (Example: 95001-*001 is not acceptable; all numbers must be specified.) Engineering part numbers for new metal strips or wire shall be controlled and assigned by International Engineering in Lisle.

Strip Specification Revision - The latest revision of the specification shall be entered in this field. Only one revision shall be listed on the specification itself.

Revision Description - Reason for change to the existing specification. New Release: if it is newly created.

EC Number - The EC number routed in ECTR/Teamcenter to release the document specification.

5.3.2 Releases, Revisions, and Distribution

All individual metal strip and wire specifications shall be released, revised, and distributed per Drafting Standards and Practices.

6.0 QUALITY ASSURANCE

The critical and major characteristics for a given metal strip or wire shall be specified on the individual metal strip or wire specification by the controlling Product Engineering Group in accordance with Molex Quality Policies.

7.0 PACKAGING

Packaging specifications shall be completed and maintained by Manufacturing and Purchasing.

8.0 SUMMARY OF CHANGES

Document ID# Change from **ES-40000-5001 → 2090580042**.

Removed **ES-40000-5006: Mechanical Tool-Wear Test Standard** from **Section 3: Reference Documents** due to obsolescence.

Removed mention of Alloy specification for individual properties – these are now all contained in global specifications for surface (2090580044) and geometric (2090580043) requirements.

Updated Order of Precedence.

Changed titles of 2090580044 and 0043 in accordance with 0044 Revision update A.

Revised Appendix A template.

Appendix A

MOLEX METAL STRIP SPECIFICATION

STANDARD PART NUMBER INFORMATION:

MOLEX PART NUMBER		**TEMPER**	
UNS ALLOY NUMBER / TRADE NAME		**DIE-EXIT-TWIST CATEGORY**	
NOMINAL THICKNESS	mm		
NOMINAL WIDTH	mm		
MOLEX ALLOY SPECIFICATION (www.molex.com/supplier/login.jsp)			
REQUIRED REFERENCE DOCUMENTS (www.molex.com/supplier/login.jsp)	**2090580044: METAL STRIP SURFACE CONDITIONS AND REQUIREMENTS** **2090580043: GEOMETRIC CONDITIONS AND TOLERANCES FOR METAL STRIPS**		

PLATING REQUIREMENTS:

PLATED		ES-88 CODE	
OTHER FINISH REQUIREMENTS			

PROPERTIES AND TOLERANCE REQUIREMENTS:

THESE SPECIAL REQUIREMENTS SUPERSEDE THE STANDARD VALUES LISTED IN ABOVE ALLOY SPECIFICATION AND REFERENCE DOCUMENTS. IF BLANK, THE STANDARD REQUIREMENTS IN ALLOY SPECIFICATION AND REFERENCE DOCUMENTS APPLY.

PROPERTIES	**Min**	**Max**	UoM
TENSILE STRENGTH			MPa
YIELD STRENGTH			MPa
ELONGATION			%
GRAIN SIZE (READY TO FINISH)			mm
THICKNESS			mm
WIDTH			mm
STRIP CAMBER			mm/m
BURR			mm
SURFACE ROUGHNESS (UNPLATED)			µm R_A

BEND FORMABILITY REQUIREMENTS
(MINIMUM R/T BEND RATIO FOR BEAM WIDTH ≥ 10 x THICKNESS)

Angle / Orient	90°	180°
GOOD WAY		
BAD WAY		

NOTES AND OTHER REQUIREMENTS:

EC NUMBER	STRIP DOCUMENT SPECIFICATION NUMBER		STRIP SPECIFICATION REVISION	
REVISION DESCRIPTION				

REVISION DESCRIPTION	**NEW RELEASE (TRANSITIONED FROM ES-40000-5001)**			**INDIVIDUAL METAL STRIP, WIRE, ROD, BAR AND TUBE SPECIFICATIONS**			
CHANGE NO.	**849682**						
REVISED BY	**ELIJAH RESNICK**	DATE	**2026/04/15**	DOC TYPE	DOC TYPE DESCRIPTION	DOC PART	SERIES
REV APPR BY	**DANIEL MOLLA**	DATE	**2026/04/15**	**QMD**	**ENGINEERING STANDARD**	**000**	**209058**
INITIAL RELEASE				CUSTOMER	DOCUMENT NUMBER	REVISION	SHEET
INITIAL DRWN	**ELIJAH RESNICK**	DATE	**2026/01/20**	MOLEX INTERNAL	**2090580042**	**A**	**11** OF 13
INITIAL APPR	**SHIVA B. ARALI**	DATE	**2026/01/20**				

Appendix B

MOLEX METAL ROD, BAR, WIRE SPECIFICATION

STANDARD PART NUMBER INFORMATION:

MOLEX PART NUMBER		FORM	
UNS ALLOY NUMBER / TRADE NAME		TEMPER	
REQUIRED REFERENCE DOCUMENTS (www.molex.com/supplier/login.jsp)			

PLATING REQUIREMENTS:

PLATED	NO	ES-88 CODE	
OTHER FINISH REQUIREMENTS			

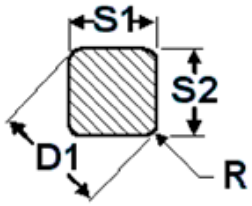
PROPERTIES AND TOLERANCE REQUIREMENTS:

THESE VALUES, NOTES AND REQUIREMENTS "SUPERCEDE" THE ASTM (REFERRED IN REFERENCE DOCUMENTS FIELD ABOVE) STATED VALUES

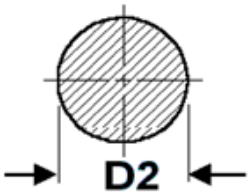
	Min	Max	UoM
TENSILE STRENGTH			MPa
YIELD STRENGTH			MPa
ELONGATION			%
GRAIN SIZE (READY TO FINISH)			mm
SURFACE ROUGHNESS (UNPLATED)			µm R_A
STRAIGHTNESS			

D1: (Ref)	+ -	mm	
S1:	+ -	mm	
S2:	+ -	mm	
R:	+ -	mm	
D2:	+ -	mm	

SQUARE/RECTANGULAR CROSS SECTION (A)



CIRCULAR CROSS SECTION (B)



NOTES AND OTHER REQUIREMENTS:

CAST CAMBER: WHEN A FULL LOOP OF WIRE IS CUT FROM A SPOOL, THE DIAMETER OF LOOSE WIRE IS 762 TO 1168 mm (30 TO 46 INCHES), 914 mm (36 INCHES) NOMINAL. THE SAME LOOP OF WIRE SHALL NOT EXCEED 50 mm (2 INCHES) OF SPIRAL WHEN HANGING BY ITS OWN WEIGHT.

EC NUMBER	SPECIFICATION DOCUMENT NUMBER		SPECIFICATION REVISION
REVISION DESCRIPTION			

REVISION DESCRIPTION	NEW RELEASE (TRANSITIONED FROM ES-40000-5001)			INDIVIDUAL METAL STRIP, WIRE, ROD, BAR AND TUBE SPECIFICATIONS			
CHANGE NO.	849682						
REVISED BY	ELIJAH RESNICK	DATE	2026/04/15	DOC TYPE	DOC TYPE DESCRIPTION	DOC PART	SERIES
REV APPR BY	DANIEL MOLLA	DATE	2026/04/15	QMD	ENGINEERING STANDARD	000	209058
INITIAL RELEASE				CUSTOMER	DOCUMENT NUMBER	REVISION	SHEET
INITIAL DRWN	ELIJAH RESNICK	DATE	2026/01/20	MOLEX INTERNAL	2090580042	A	12 OF 13
INITIAL APPR	SHIVA B. ARALI	DATE	2026/01/20				

Appendix C

MOLEX METAL TUBE SPECIFICATION

STANDARD PART NUMBER INFORMATION:

MOLEX PART NUMBER		FORM	
UNS ALLOY NUMBER / TRADE NAME		TEMPER	
REQUIRED REFERENCE DOCUMENTS (www.molex.com/supplier/login.jsp)			

PLATING REQUIREMENTS:

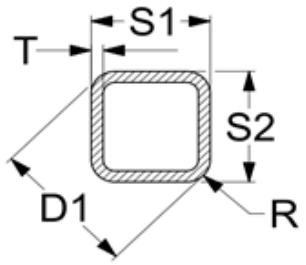
PLATED	NO	ES-88 CODE	
OTHER FINISH REQUIREMENTS			

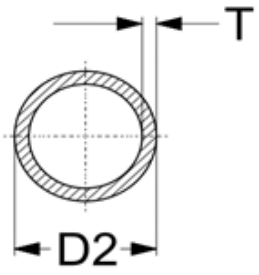
PROPERTIES AND TOLERANCE REQUIREMENTS:

THESE VALUES, NOTES AND REQUIREMENTS "SUPERCEDE" THE ASTM (REFERRED IN REFERENCE DOCUMENTS FIELD ABOVE) STATED VALUES

	Min	Max	UoM
TENSILE STRENGTH			MPa
YIELD STRENGTH			MPa
ELONGATION			%
GRAIN SIZE (READY TO FINISH)			mm
SURFACE ROUGHNESS (UNPLATED)			µm R_A

D1: (Ref) + - mm	SQUARE/RECTANGULAR CROSS SECTION (A)	CIRCULAR CROSS SECTION (B)
S1: + - mm		
S2: + - mm		
R: + - mm		
D2: + - mm		
T: + - mm		





NOTES AND OTHER REQUIREMENTS:

EC NUMBER	SPECIFICATION DOCUMENT NUMBER		SPECIFICATION REVISION
REVISION DESCRIPTION			

REVISION DESCRIPTION	NEW RELEASE (TRANSITIONED FROM ES-40000-5001)			INDIVIDUAL METAL STRIP, WIRE, ROD, BAR AND TUBE SPECIFICATIONS			
CHANGE NO.	849682						
REVISED BY	ELIJAH RESNICK	DATE	2026/04/15	DOC TYPE	DOC TYPE DESCRIPTION	DOC PART	SERIES
REV APPR BY	DANIEL MOLLA	DATE	2026/04/15	QMD	ENGINEERING STANDARD	000	209058
INITIAL RELEASE				CUSTOMER	DOCUMENT NUMBER	REVISION	SHEET
INITIAL DRWN	ELIJAH RESNICK	DATE	2026/01/20	MOLEX INTERNAL	2090580042	A	13 OF 13
INITIAL APPR	SHIVA B. ARALI	DATE	2026/01/20				