

# LAMECO STANDARD

## LAMINATED SHIMS MATERIALS



The paragraphs numbered from 1.1 to 1.8 concern material specifications.

In whole chapter 2, physical and mechanical properties are indicated for each of them.

Part 4 is devoted to examples of formulations for drawing up demands, plans or any other technical document that may be required.

At the end of the document is a codification of non-peelable products, that are appendixes to the standard.

### 1. DESCRIPTION

#### 1.1 SHIM MATERIALS

LS1 – Aluminium 1200  
 LS2 – Aluminium 5052  
 LS18 – Aluminium 1050  
 LS19 – Aluminium 1100  
 LS3 – Brass CuZn 36/37  
 LS4 – Stainless steel AISI 302  
 LS5 – Stainless steel AISI 304  
 LS6 – Stainless steel AISI 304L  
 LS7 – Stainless steel AISI 316  
 LS8 – Stainless steel AISI 316L  
 LS9 – Carbon steel 1010  
 LS23 – Carbon steel DC04  
 LS10 – Titanium 1 (T35)  
 LS11 – Titanium 2 (T40)  
 LS12 – Single colour polymer  
 LS13\* – Two-colour polymer  
 LS15\* – Carbon fabric  
 LS16 – PLUS glass fabric  
 LS21 – High-Density glass fabric  
 LS17 – BCRW fabric  
 LS20 – Polyimide  
 LS22 – PolyEtherEtherKetone (PEEK)

For the whole range of INSTANT-PEEL®, CURVPEEL®, PEEL-STICK® or SILENTLINE® products, put "IP", "CP", "PST" or "S" in front of the material required (for example: IPLS7 for AISI 316 stainless steel in INSTANT-PEEL®).

\*LS14 has been superseded

**NOTA: Other materials can also be made. Replies by return of e-mail.**

#### 1.2 TYPE

- A – Fully laminated
- B – Half-laminated (See Type B shim materials in 1.6 below)
- C – Bi-laminated (The products of the DUOPEEL® range are bi-laminated by nature, since they are composed of LS12 and LS13)
- D – Laminated part + solid part + laminated part

#### 1.3 TOTAL THICKNESS

X = Total thickness

#### 1.4 THICKNESS OF LAMINATED SHEETS

- 1 – 0.005 mm / 0.0002 inch (prototype LS17 under test)
- 2 – 0.01 mm / 0.0004 inch
- 3 – 0.012 mm / 0.0005 inch
- 4 – 0.019 mm / 0.0007 inch
- 5 – 0.023 mm / 0.0009 inch
- 6 – 0.025 mm / 0.001 inch
- 7 – 0.05 mm / 0.002 inch
- 8 – 0.075 mm / 0.003 inch
- 9 – 0.1 mm / 0.004 inch
- 10 – 0.11 mm / 0.0043 inch
- 11 – 0.2 mm / 0.008 inch

#### 1.5 LAMINATED SHEETS / MATERIALS

- LS1, LS2, LS7, LS19: 7, 8
- LS4, LS6, LS8, LS11, LS16: 7, 8, 9
- LS5: 2, 6, 7, 8, 9
- LS3, LS10: 6, 7, 8, 9
- LS9: 7, 9
- LS12, LS22: 3, 4, 5, 6, 7, 8, 9 & 11
- LS13: 3, 4, 5, 7
- LS15: 10
- LS17: 1
- LS18: 7, 9, 11
- LS20: 8
- LS21: 9
- LS23: 6

#### 1.6 MATERIALS (TYPE B: SOLID PART)

- 1 – Aluminium A5
- 2w – Aluminium 2024T3
- 2y – Aluminium 5052
- 3w – Stainless steel 304
- 3y – Stainless steel 304L
- 4w – Carbon steel DC01
- 4y – Carbon steel DC04
- 5 – Titanium AB-1
- 6 – Cotton / phenolic resin fabric
- 7 – Single colour polymer

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## LAMINATED SHIM MATERIALS

### 1.7 THICKNESS OF SOLID PARTS

- 11 – 0.2 mm / 0.008 inch
- 12 – 0.25 mm / 0.0098 inch
- 13 – 0.4 mm / 0.016 inch
- 14 – 0.5 mm / 0.020 inch
- 15 – 0.6 mm / 0.024 inch
- 16 – 0.8 mm / 0.031 inch
- 17 – 1 mm / 0.039 inch
- 18 – 1.2 mm / 0.047 inch
- 19 – 1.5 mm / 0.059 inch
- 20 – 2 mm / 0.079 inch
- 21 – 2.5 mm / 0.098 inch
- 22 – 3 mm / 0.12 inch
- 23 – 4 mm / 0.16 inch
- 24 – 5 mm / 0.20 inch
- 25 – 6 mm / 0.24 inch

### 1.8 SOLID PARTS / MATERIALS

- 1: 14, 16, 17, 19, 20, 21, 22, 23, 24
- 2w: 16, 18, 19, 20
- 2y: 16, 17, 18, 22
- 3w: 14, 16, 17, 19, 20, 21, 22, 23, 24, 25
- 3y: 14, 16, 17, 19, 20, 21, 22, 23, 24, 25
- 4w: 14, 16, 17, 19, 20, 21, 22
- 4y: 14, 16, 17, 19, 20, 21, 22
- 5: 17, 19, 20
- 6: 12, 16, 18, 19
- 7: 11

The foregoing data are our standard thicknesses. Other thicknesses are available. Please consult us.

## 2. PHYSICAL & MECHANICAL CHARACTERISTICS

### 2.1 DENSITIES

- LS1, LS2 & LS18: 2.8
- LS3: 8.5
- LS4 to LS8: 8.2
- LS9 & LS23: 7.85
- LS10 & LS11: 4.5
- LS12 & LS13: 1.395
- LS15: 1.05 (10)

- LS16: 1.37 (8) & 1.39 (9)
- LS17: 1
- LS19: 2.71
- LS20: 1.42
- LS21: 1.35
- LS22: 1.3

### 2.2 COMPRESSIVE FRACTURE STRENGTH LIMITS

- LS1 to LS11, LS18 & LS19 – 1 900 MPa (physical limit of the test machine: no fracture)
- LS12 & LS13 – 600 MPa
- LS15 – 1 570 MPa
- LS16 & LS17 – 1 900 MPa (physical limit of the test machine: no fracture)
- LS22 – 450 MPa

### Test results supplied on request.

### 2.3 PERMANENT RESIDUAL DEFORMATIONS

This data is communicated on request by return of e-mail.

### 2.4 RESIN TEMPERATURE RESISTANCE \*

- LS1 to LS11, LS18, LS19 & LS23 – 200 °C / 392 °F
- LS12, LS13 & LS20 – 130 °C / 266 °F
- LS15 – 300 °C / 572 °F
- LS16 – 370 °C / 698 °F
- LS22 – 250 °C / 482 °F

### 2.5 MATERIALS' MAXIMUM TEMPERATURE RESISTANCE AS PER 1.1 ABOVE

This data is communicated on request by return of e-mail.

### 2.6 MINIMUM (NEGATIVE) TEMPERATURE RESISTANCE

This data is communicated on request by return of e-mail.

### 2.7 PEELING STRENGTH

This data is communicated on request by return of e-mail.

### 2.8 BEHAVIOUR UNDER IMMERSION

This data is communicated on request by return of e-mail.

## 3. INDUSTRIAL SECTORS (NON-EXHAUSTIVE LIST)

- Defence
- Space:
  - launchers,
  - satellites
- Formula 1
- Medical engineering
- Textile engineering
- Production machines and machining units
- Specialised machines
- Aeronautical equipment:
  - landing gear,
  - aircraft manufacturers,
  - helicopter manufacturers,
  - aircraft engine manufacturers,
  - nacelles,
  - structures
- Scientific and research equipment
- Cryogenic systems
- Etc.

\*Due to the extremely small quantities of the binding agent used, its destruction above the listed temperature does not affect the shim's operational performance.

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## LAMINATED SHIM MATERIALS

### 4. FORMULATION - EXAMPLES

#### 4.1 TYPE A

- A/ Without the standard: "PLUS glass fabric, total thickness 2 mm/.079 inch, peelable in 0.05 mm/.002 inch"
- B/ With the standard: "LS16, A, 7, X2"

#### 4.2 TYPE A

- A/ Without the standard: "Brass CuZn 37, total thickness 5 mm/.20 inch, peelable in 0.05 mm/.002 inch"
- B/ With the standard: "LS3, A, 7, X5"

#### 4.3 TYPE A

- A/ Without the standard: "Titanium 1, total thickness 1.2 mm/.047 inch, peelable in 0.025 mm/.001 inch"
- B/ With the standard: "LS10, A, 6, X1.2"

#### 4.4 TYPE A

- A/ Without the standard: "INSTANT-PEEL® Stainless steel AISI 316L, total thickness 2.5 mm/.098 inch, peelable in 0.1 mm/.004 inch"
- B/ With the standard: "IPLS8, A, 9, X2.5"

#### 4.5 TYPE A

- A/ Without the standard: "CURV-PEEL® Stainless steel AISI 304, total thickness 3 mm/.12 inch, peelable in 0.05 mm/.002 inch"
- B/ With the standard: "CPLS5, A, 7, X3"

#### 4.6 TYPE B

- A/ Without the standard: "Total thickness 2 mm/.079 inch, 1 mm/.039 inch stainless steel AISI 304 peelable in 0.1 mm/.004 inch (peelable part first) + 1 mm/.039 inch solid part stainless steel AISI 304L"
- B/ With the standard: "LS5&3y, B, 9&17, X2"

#### 4.7 TYPE B

- A/ Without the standard: "Total thickness 6 mm/.24 inch, 3 mm/.12 inch aluminium 1200 peelable in 0.05 mm/.002 inch (peelable part first) + 3 mm/.12 inch solid part aluminium A5"
- B/ With the standard: "LS1&1, B, 7&22, X6"

#### 4.8 TYPE B

- A/ Without the standard: "Total thickness 4.5 mm/.18 inch, 0.5 mm/.020 inch carbon steel 1010 peelable in 0.025 mm/.001 inch (peelable part first) + 4 mm/.16 inch solid part carbon steel D01"
- B/ With the standard: "LS9&4w, B, 6&23, X4.5"

#### 4.9 TYPE C

- A/ Without the standard: "INSTANT-PEEL® Stainless steel AISI 304, total thickness 10 mm/.39 inch, 1st part thickness (highest value first) 9.8 mm/.385 inch peelable in 0.1 mm/.004 inch & 2nd part thickness 0.2 mm/.008 inch peelable in 0.01 mm/.0004 inch"
- B/ With the standard: "IPLS5, C, 7&2, X10=9.8+0.2"

#### 4.10 TYPE C

- A/ Without the standard: "DUOPEEL®, total thickness 2.5 mm/.098 inch, 1st part thickness (highest value first) 2.3 mm/.09 inch single colour polymer peelable in 0.1 mm/.004 inch & 2nd part thickness 0.2 mm/.008 inch two-colour polymer peelable in 0.025 mm/.001 inch"
- B/ With the standard: "LS12&LS13, C, 9&6, X2.5=2.3+0.2"

#### 4.11 TYPE D

- A/ Without the standard: "Total thickness 6 mm/.24 inch, 1st part thickness (peelable part with highest value first) 1.7 mm/.067 inch carbon steel 1010 peelable in 0.1 mm/.004 inch + 4 mm/.16 inch solid part carbon steel D01 + 2nd part thickness 0.3 mm/.012 inch carbon steel 1010 peelable in 0.05 mm/.002 inch"
- B/ With the standard: "LS9&4w, D, 9&23&7, X6=1.7+4+0.3"

#### 4.12 TYPE D

- A/ Without the standard: "Total thickness 6.3 mm/.25 inch, 1st part thickness (peelable part with highest value first) 3.8 mm/.15 inch stainless steel AISI 304 peelable in 0.10 mm/.004 inch + 1.5 mm/.06 inch solid part stainless steel AISI 304 + 2nd part thickness 1 mm/.039 inch stainless steel AISI 304 peelable in 0.025 mm/.001 inch"
- B/ With the standard: "LS5&3w, D, 9&19&6, X6.3=3.8+1.5+1"

# LAMECO STANDARD - APPENDIX

## NON PEELABLE MATERIALS

### 5. APPENDIX - NON PEELABLE MATERIALS

#### 5.1 SOLID SHIMS

Aluminium 1200  
 Aluminium 5052  
 Aluminium 1050  
 Aluminium 1100  
 Brass CuZn 36/37  
 Stainless steel AISI 302  
 Stainless steel AISI 304  
 Stainless steel AISI 304L  
 Stainless steel AISI 316  
 Stainless steel AISI 316L  
 Carbon steel 1010  
 Carbon steel DC04  
 Titanium 1 (T35)  
 Titanium 2 (T40)  
 Single colour polymer  
 Tinted polymer  
 Polyimide  
 PolyEtherEtherKetone (PEEK)  
 Polytetrafluoroethylene (PTFE)

See the available thicknesses for peelable materials (§ 1.3)

#### 5.2 SHEETS

Aluminium A5  
 Aluminium 2024T3  
 Aluminium 5052  
 Stainless steel 304  
 Stainless steel 304L  
 Stainless steel 316  
 Stainless steel 316L  
 Carbon steel DC01  
 Carbon steel DC04  
 Titanium AB-1  
 Brass CuZn36

See the available thicknesses for solid parts (§ 1.7) and consult us for materials other than those mentioned in § 1.6.



LAMECO · 2 bis, rue Blaise Pascal · ZA de Pissaloup  
 78190 TRAPPES France · Tél.: 01 30 68 61 05 · Fax: 01 30 68 14 47  
 E-mail: Lameco@LamecoGroup.com · SA au Capital de 312 800 Euros  
 SIRET 302 177 936 00051 - APE 2562 B

[www.LamecoGroup.com](http://www.LamecoGroup.com)