

# INTERNATIONAL STANDARD

# IEC 61190-1-2

Second edition  
2007-04

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## Attachment materials for electronic assembly –

### Part 1-2: Requirements for soldering pastes for high-quality interconnects in electronics assembly

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## CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references .....	6
3 Terms and definitions .....	7
4 Standardized description for products.....	7
5 Test methods .....	7
6 Requirements.....	8
6.1 Conflict.....	8
6.2 Alloy composition .....	8
6.3 Flux characterization and inspection.....	8
6.4 Solder powder particle size .....	9
6.5 Metal per cent .....	10
6.6 Viscosity.....	10
6.7 Slump and smear test.....	10
6.8 Solder ball test.....	12
6.9 Tack test.....	12
6.10 Wetting.....	12
6.11 Labelling .....	13
7 Quality assurance provisions.....	14
7.1 Responsibility for inspection.....	14
7.2 Classification for inspections .....	15
7.3 Inspection report form .....	15
7.4 Qualification inspection .....	15
7.5 Quality conformance .....	16
8 Preparation for delivery .....	16
9 Additional information – Performance and shelf-life extension inspections.....	16
Annex A (normative). Test report on solder paste .....	18
Figure 1 – Slump test stencil thickness, 0,20 mm.....	11
Figure 2 – Slump test stencil thickness, 0,10 mm.....	12
Figure 3 – Solder ball test standards.....	14
Table 1 – Standardized solder paste description .....	7
Table 2 – Standard solder powders.....	9
Table 3 – Test methods for particle size distribution .....	10
Table 4 – Solder paste qualification inspection .....	16
Table 5 – User inspection for solder paste prior to use .....	17
Table A.1 – Solder paste inspection report form.....	18

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## ATTACHMENT MATERIALS FOR ELECTRONIC ASSEMBLY –

**Part 1-2: Requirements for soldering pastes  
for high-quality interconnects in electronics assembly**

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International Standard IEC 61190-1-2 has been prepared by IEC technical committee 91: Electronics assembly technology.

This second edition cancels and replaces the first edition, published in 2002, and constitutes a technical revision. The main changes with regard to the first edition concern a definition of lead-free solder alloy and an explanation of solder ball test standards.

The text of this standard is based on the following documents:

FDIS	Report on voting
91/646/FDIS	91/678/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61190 series, under the general title *Attachment materials for electronic assembly*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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## INTRODUCTION

This part of IEC 61190 defines the characteristics of solder paste through the definitions of properties and specification of test methods and inspection criteria. Materials include solder powder and solder paste flux blended to produce solder paste. Solder powders are classified according to both shape and size distribution of the particles. It is not the intention of this standard to exclude those particle sizes or distributions not specifically listed. For flux properties of solder paste, including classification and testing, see IEC 61190-1-1.

The requirements for solder paste are defined in general terms. In practice, where more stringent requirements are necessary, additional requirements may be defined by mutual agreement between the user and supplier. Users are cautioned to perform tests (beyond the scope of this specification) to determine the acceptability of the solder paste for specific processes.

This standard is intended to be applicable to all types of solder paste used for soldering in general, as well as for soldering in electronics assembly. The solder pastes involved relate to all aspects of application. Generic specifications for soldering pastes are given in ISO 9454-2.

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## ATTACHMENT MATERIALS FOR ELECTRONIC ASSEMBLY –

### Part 1-2: Requirements for soldering pastes for high-quality interconnects in electronics assembly

#### 1 Scope

This part of IEC 61190 specifies general requirements for the characterization and testing of solder pastes used to make high-quality electronic interconnections in electronics assembly. This standard serves as a quality control document and is not intended to relate directly to the material's performance in the manufacturing process.

Related information on flux characterization, quality control and procurement documentation for solder flux and flux containing material may be found in IEC 61190-1-1.

#### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60194, *Printed board design, manufacture and assembly – Terms and definitions*

IEC 61189-5, *Test methods for electrical materials, interconnection structures and assemblies – Part 5: Test methods for printed board assemblies*

IEC 61189-6, *Test methods for electrical materials, interconnection structures and assemblies – Part 6: Test methods for materials used in manufacturing electronic assemblies*

IEC 61190-1-1, *Attachment materials for electronic assembly – Part 1-1: Requirements for soldering fluxes for high quality interconnections in electronics assembly*

IEC 61190-1-3, *Attachment materials for electronic assembly – Part 1-3: Requirements for electronic grade solder alloys and fluxed and non-fluxed solid solders for electronic soldering applications*

IEC 61191-1, *Printed board assemblies – Part 1: Generic specification – Requirements for soldered electrical and electronic assemblies using surface mount and related assembly technologies*

IEC 61191-2, *Printed board assemblies – Part 2: Sectional specification – Requirements for surface mount soldered assemblies*

IEC 61191-3, *Printed board assemblies – Part 3: Sectional specification – Requirements for through-hole mount soldered assemblies*

IEC 61191-4, *Printed board assemblies – Part 4: Sectional specification – Requirements for terminal soldered assemblies*

ISO 9000, *Quality management systems – Fundamentals and vocabulary*

ISO 9001, *Quality management systems – Requirements*



ISO 9453, *Soft solder alloys – Chemical compositions and forms*

ISO 9454-2, *Soft soldering fluxes – Classification and requirements – Part 2: Performance requirements*

ISO 10012-1, *Quality assurance requirements for measuring equipment – Part 1: Metrological confirmation system for measuring equipment*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60194, as well as the following apply.

#### 3.1

##### **drying**

ambient or heating process to evaporate volatile components from solder paste which may, or may not, result in melting of rosin/resin

#### 3.2

##### **rheology**

study of the change in form and the flow of matter, generally characterized by elasticity, viscosity, and plasticity

#### 3.3

##### **lead-free solder**

solder alloy which lead content is equal to, or less than 0,10 % by mass

#### 3.4

##### **thinner (paste)**

solvent or paste system with, or without, activator which is added to solder paste to replace evaporated solvents, adjust viscosity, or reduce solids content

#### 3.5

##### **viscosity**

internal friction of a fluid, caused by molecular attraction, which makes it resist a tendency to flow, expressed in pascal-seconds (Pa s)

### 4 Standardized description for products

The solder paste product shall be described as outlined in Table 1.

**Table 1 – Standardized solder paste description**

Alloy designation	Flux classification <sup>a</sup>	Powder size type	Nominal metal content	Viscosity
Designation from IEC 61190-1-3	Classification from IEC 61190-1-1 or ISO 9454-2	Type no. <sup>b</sup>	Weight per cent	Pa s
<sup>a</sup> As defined and determined in IEC 61190-1-1 for low (L), moderate (M), and high (H) activity of the flux residues. <sup>b</sup> See Table 2.				

### 5 Test methods

The test methods used in this standard are taken from IEC 61189-5 and IEC 61189-6:

**IEC 61189-5, Test methods for printed board assemblies**

- 5X04 Solder paste viscosity – t-bar spin spindle method (applicable for 300 Pa s to 1 600 Pa s)
- 5X05 Solder paste viscosity – t-bar spindle method (applicable at less than 300 Pa s)
- 5X06 Solder paste viscosity – spiral pump method (for 300 Pa s to 1 600 Pa s)
- 5X07 Solder paste viscosity – spiral pump method (applicable at less than 300 Pa s)
- 5X08 Solder paste – slump test
- 5X09 Solder paste – solder ball test
- 5X10 Solder paste – tack test
- 5X11 Solder paste – wetting test

**IEC 61189-6, Test methods for printed board materials**

- 6X01 Solder powder particle size distribution – screen method
- 6X02 Solder powder particle size distribution – measuring microscope method
- 6X03 Solder powder particle size distribution – optical image analyzer method
- 6X04 Determination of maximum solder powder particle size
- 6X05 Solder paste metal content by weight

**6 Requirements**

Except when otherwise specified in the design or assembly drawings, or instructions by the user, the soldering pastes covered by this standard shall conform with the following subclauses.

**6.1 Conflict**

In the event of conflict between the requirements of this standard and other requirements of the applicable acquisition documents, the precedence in which documents shall govern in descending order is as follows:

- a) the applicable acquisition document;
- b) the applicable specification sheet/drawing;
- c) this standard;
- d) applicable normative references.

**6.2 Alloy composition**

The alloy composition of the solder pastes shall be characterized by the supplier in accordance with the alloy characterization requirements specified in IEC 61190-1-3 and shall be inspected in accordance with the alloy inspection requirements of IEC 61190-1-3. The results of these inspections should be recorded on the report form included in IEC 61190-1-3 and the alloy type shall be recorded on the solder paste report form (see Table A.1).

The percentage of each element in an alloy shall be determined by any standard analytical procedure. Wet chemistry shall be used as the reference procedure.

**6.3 Flux characterization and inspection**

The fluxes in solder pastes shall be characterized by the supplier in accordance with the flux characterization requirements specified in IEC 61190-1-1 and shall be inspected in accordance with the flux inspection requirements of IEC 61190-1-1. The results of these inspections should be recorded on the report form included in IEC 61190-1-1 and the flux type shall be recorded on the solder paste report form (see Table A.1). If the reflow temperature is