
MUST SYSTEM IITM



Precision solderability testing of conventional and SMD components, PCB pads and plated-through holes

MUST SYSTEM II™

Enhances product quality and reduces defect rates

This purpose-designed system enables fast, accurate solderability testing of SMDs, through-hole components, SMD pads and PCB plated-through holes, plus laboratory tests of fluxes and other soldering materials.

- Performs solderability tests in accordance with international standard methods
- Immediate pass/fail information on completion of each test
- Colour graphic display of test results
- Integral computer control for accuracy and ease of operation
- Automatic component alignment and testing of multi-lead components and PCBs
- Storage and recall of component data, test parameters and results

MUST System II has been developed by a Project Team from Multicore Solders, Philips, Siemens and the UK National Physical Laboratory with the assistance of the BRITE Research Award from the European Community.

WHY TEST SOLDERABILITY?

Accurate testing of component solderability as a routine part of soldering process control enhances product quality and reduces defect rates. As a consequence, it may also facilitate the use of lower cost environmentally friendly soldering materials such as Multicore No Clean fluxes and solder creams.

Quantitative solderability test methods for through-hole components have been in use for a number of years. However, attempts to produce a reliable quantitative test method for surface mount components have been hindered by the design of existing wetting balance instruments and difficulties in the handling and alignment of small components.

The **MUST System II** is a purpose designed instrument for testing through-hole and surface mount components, as well as PCB-SMD pads and PTHs, and hybrid circuits. Its development draws on more than 25 years of experience in solderability testing and eliminates the problems associated with existing test equipment.

OPERATING METHOD

MUST System II software leads the operator through each test, ensures that it is performed correctly and analyses each curve or series of curves using previously stored test and evaluation parameters from its database.

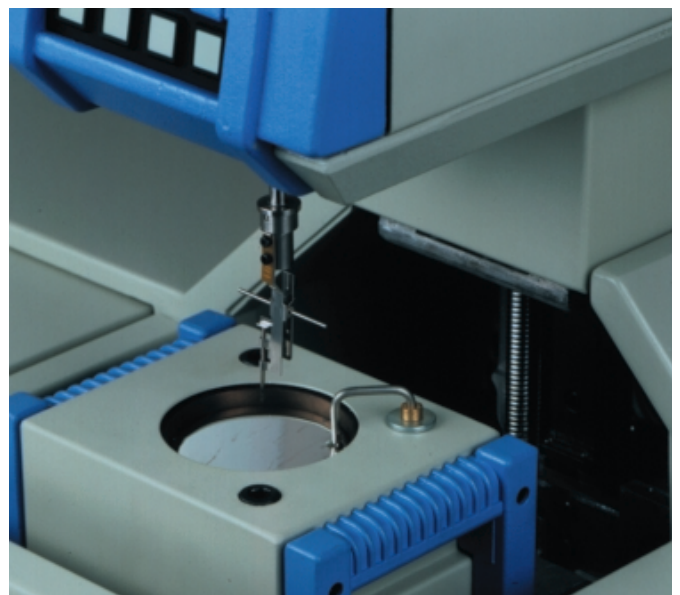
The component is secured above the solder bath or globule block with the appropriate specimen clip and the test is initiated simply by selecting the component code and a set of test parameters. Calibration of the system is not required during use; the weight of different specimen clips is compensated for automatically. The parameter files may use metric or US units as required and a wetting force sampling rate of 1,000 Hz provides high accuracy and sensitivity.

Test results may be evaluated after each individual test or an entire batch can be automatically evaluated after a series of tests is completed. Each wetting force curve is displayed in a separate colour for ease of identification and failed components are highlighted on the results display screen. Graphs and test data can be sent to a suitable parallel printer and/or stored on disk.

The software also controls the semi-automatic replacement of the solder bath or globule block and the operation of a safety cover, protecting the operator from accidental contact with molten solder.

WETTING BALANCE TEST FOR THROUGH-HOLE COMPONENTS

During the standard wetting balance test, a component lead is immersed in a bath of molten solder and the forces of buoyancy and surface tension acting upon it are measured.



Solder bath wetting test

Changes in the forces during wetting are converted by the **MUST System II** into digital signals and automatically analysed to assess the solderability of the component lead, presenting the operator with immediate pass/fail data and a force vs time curve.

MICROWETTING BALANCE TEST FOR SMT COMPONENTS

The **MUST System II** has a number of features specifically designed to overcome the problems associated with testing very small surface mount components.

The same solder bath method as used for through-hole components can be used to test SMT components but the test is often difficult to perform and produces poor resolution. Much greater resolution is obtained by utilising the "microwetting balance" procedure, in which the solder bath is replaced by a small globule block.

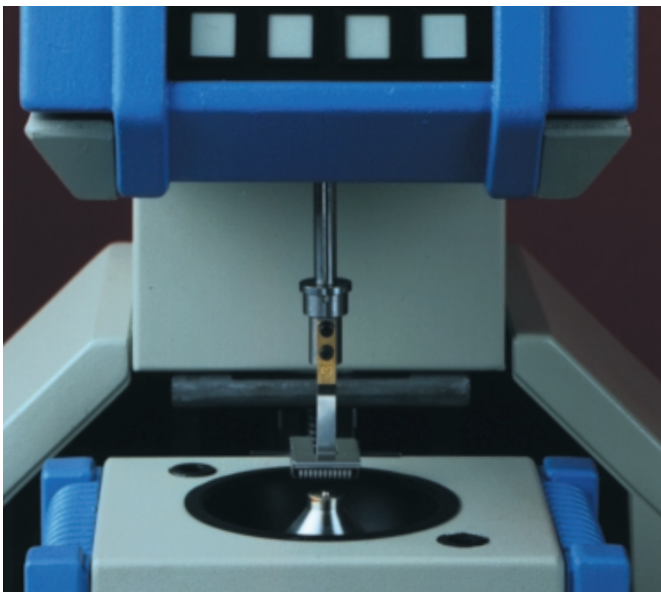
This method produces a larger wetting force for signal analysis and also allows individual leads to be tested on a multi-leaded component.

A unique and important feature of the **MUST System II** is the automatic detection of contact between the component and the solder globule which improves the reproducibility and accuracy of the microwetting balance method.

The solder globule block is mounted on a computer controlled work table, motor-driven in all three axes and the integrated software contains default test parameters for most component types, based on experience gained during the BRITE development project.

These features are used to align the solder globule beneath the termination to be tested and in the case of a multi-leaded component, to advance automatically to each subsequent termination. In each case, a component outline-specific specimen clip firmly holds the component in the correct position for testing.

The microwetting balance method for SMD components is described in the IEC standard 68-2-69 and JIS standard EIA J ET-7401. The microwetting balance method with the globule, for testing solderability of SMD components and PCB-SMD pads and PTHs are investigated by various national and international standards committees.



Microwetting balance test for SMT components using solder globule

MICROWETTING BALANCE TEST FOR PCBs - SMD PADS AND PTH

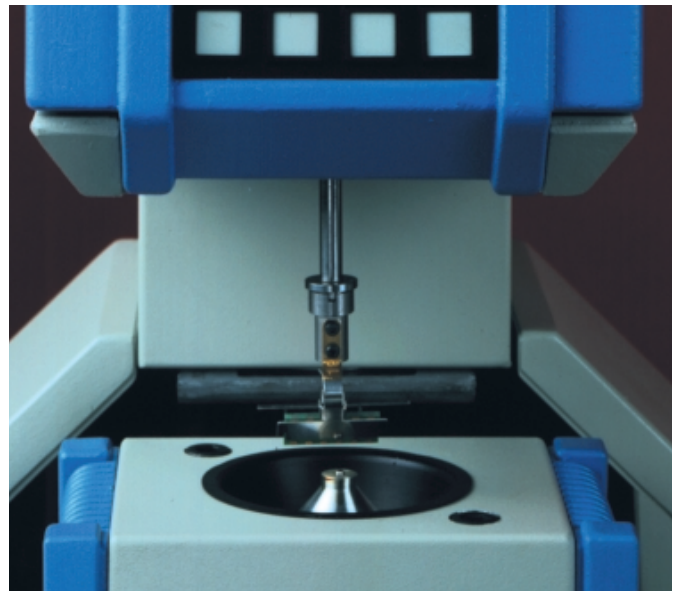
In order to improve quality and reduce defects during the entire soldering process, solderability testing of PCBs as well as components is necessary.

Although a quantitative test does not yet exist for testing PCBs, the **MUST System II** extends the scope of the present microwetting balance test for SMT components to cover SMD pads and PTHs, enabling an accurate evaluation of their solderability to be made.

Test pieces require a series of pads or PTH land areas such that the edge of each pad extends to the edge of the PCB or test piece. The sample is placed into a special clip to allow it to be lowered at an angle of 45° to the solder globule. The sample is immersed in the solder globule to a depth of 0.1mm and the wetting force is registered on a curve indicating the wetting speed and maximum wetting force obtained from the sample. Pass/fail data is then displayed.

The number of pads or PTHs may be pre-programmed so that the solder globule advances automatically to perform the next test. The globule block is lowered between each test to allow the flux and solder pellet to be replaced.

Using this microwetting balance method allows PCB manufacturers and assembly companies to test and guarantee the solderability of the PCBs. Significant cost savings may be achieved as a result of the improved process control, since the quality of the PCBs and components is known before use on the production line, reducing defect rates.



Microwetting balance test for PCBs using solder globule

EQUIPMENT AND ACCESSORIES

The system is supplied complete and ready for use. It includes the MUST unit, keyboard, monitor, all necessary connecting leads, fluxes and chemicals, solder pellets and a complete set of tools. A comprehensive manual describing the operation of the instrument, the theory of the test methods and the use of international standards is also included.



Typical force vs time curve from microwetting balance test

Stand-alone software (part no. STS082) is available for off-line evaluation of test results.

Sixteen specimen clips are provided to facilitate testing of most leaded and surface mount components; a continuous development program ensures that clips will be made available for new components.

SOFTWARE

The software supplied with the **MUST System II** is a windows look-a-like, running under DOS 6.22 for minimal software breakdown and loss of test results.

The parameter files contain hundreds of parameters of various SMD components and default values.

During testing, the operator is guided step by step through the whole test procedure by on-screen prompts.

The test force readings and pass/fail parameters are provided in ASCII format to enable export to other spread sheets such as Microsoft Excel.

INTERNATIONAL STANDARDS

The test parameters stored in the database have been set up in accordance with international standard methods: IEC 68-2-54, IEC 68-2-69, MIL-STD-883 method 2022, ANSI/J-STD-003 and the Japanese standard EIA J ET-7401.

The **MUST System II** may also be used to perform the Edge Dip Test methods included in the following standards: IEC 68-2-20 and 68-2-58, ANSI/J-STD-002 method 208F, and ANSI/J-STD-003.

TECHNICAL SPECIFICATION

Solder temperature	0-350°C (32-662°F)
Dipping speed	0-30 mm sec ⁻¹ (0-1.2 in sec ⁻¹)
Immersion depth	0-30 mm (0-1.2 in)
Dwell time	0-30 sec
Maximum component weight	40 g (1.4 oz) - including clip
Force sampling frequency	1,000 Hz
Globule sizes	2 mm (25 mg) or 4 mm (200 mg)
Solder bath diameter	60 mm (2 3/8 in)
Solder bath capacity	1 kg (2.2 lb)
Power supply	240 V 50 Hz or 110 V 60 Hz
Power consumption	750 watts
Net weight	Machine: 45 kg (100 lb) Monitor: 11 kg (24 lb)
Packed weight	Machine: 52 kg (115 lb) Monitor: 13 kg (29 lb)
Packed size	Machine: 945 x 485 x 685 mm (37 1/4 x 19 x 27 in) Monitor: 450 x 410 x 435 mm (17 3/4 x 16 1/4 x 17 1/4 in)
PC (integrated)	486 processor Minimum 500 Mb HDD 3 1/2 in 1.44 Mb FDD

ORDERING DETAILS

Part number	Line voltage	Line cord	Language
STS20301	240 V	UK	English
STS20302	240 V	EUR	Eng/Fr/Ger
STS20303	110 V	US	English
STS20304	240 V	US	English
STS20305	110 V	US	Eng/Jap
STS02630	Optional high resolution printer 240 V		
STS02640	Optional high resolution printer 110 V		
Printer: 24-pin dot matrix type printer with parallel Centronics type interface capable of printing on 256mm wide continuous form paper and emulating Epson LQ Series printers.			

VIDEO ALIGNMENT SYSTEM OPTION

The **MUST System II Video Alignment System Option** is a visual aid to enable alignment of the test sample and solder globule with greater accuracy which leads to improved reproducibility of test results.

The system can also be used to monitor the wetting of the sample during the test and/or the test can be video recorded for later examination (video recorder is not part of the alignment system).



The MUST System II with Video Alignment Option, showing the video alignment monitor (left of photo), swing-arm containing the video lens and camera head, and the power supply/camera box

The Video Alignment System includes a height adjustable swing arm which contains a miniature camera lens. The arm rotates 180° about the globule block, allowing accurate visual alignment on the monitor of the test sample and the globule in both the x and y planes. The system can also be used to monitor/view the alignment check, during which the globule receptacle steps along the x-axis to verify that the SMD pads or multi-leaded pitch settings are correctly set.



The Video Alignment System, showing the swing-arm containing the video lens and camera head (front left of photo), and the power supply/camera box (back right of photo)

When alignment is complete, the swing arm can be placed in the park position, giving full access to the sample clip and the measuring head.

SYSTEM FOOTPRINT (WITHOUT VIDEO ALIGNMENT OPTION)

