PRODUCT DATA SHEET

CW-305

Halogen-Free, Water-Wash Flux-Cored Wire

Introduction

CW-305 is Indium Corporation's next generation halogen-free water-wash flux-cored wire. **CW-305** is a mild water-soluble flux. When compared to other water-wash cored wire, **CW-305** exhibits low corrosivity. Even though the flux is mild and shows low corrosivity, the residues must be removed after soldering because they can absorb moisture and become conductive. It has been designed for both manual and automated touch-up and component addition. The outstanding feature of **CW-305** is the ease with which the post-soldering residue can be removed by using only a water-wash. Because **CW-305** cleans so well, residue removal may be delayed for up to 48 hours without affecting ionic cleanliness or visual circuit board appearance. **CW-305** contains less than 500ppm total halogen so that it can be considered halogen-free by both J-STD-004B and JEITA ET-7304. **CW-305** passes the more stringent Surface Insulation Resistance (SIR) and Electromigration (ECM) requirement of J-STD-004B.

Features

- **Halogen-free per J-STD-004B**
  To be halogen-free per J-STD-004B, the formula must contain less than 500ppm of any kind of halogen, ionic or nonionically bonded chlorine, bromine, or fluorine. This is new to J-STD-004B since fluxes that conform to the original J-STD-004 or J-STD-004A may still contain halogens that only disassociate at soldering temperatures, but leave a residue that contains ionic halogen.
- Produces bright and shiny solder joints
- Cleans easily in water without the need for saponification or neutralization
- Flux removal may be delayed up to 48 hours without affecting ionic cleanliness
- Suitable for soldering to HASL, ENIG, Immersion Silver, and OSP Copper circuit boards
- Compatible with all tested solder masks

Physical Properties

In the core, **CW-305** has an amber appearance. Upon soldering, **CW-305** smokes very little and has almost no odor. The residue left by **CW-305** is amber in color and can be fully removed with water.

IPC J-STD-004B Classification	ORH0
Acid Value (mgKOH/gram of flux)	0
Rosin-Containing	No
Halide Content %	<0.05
Smoke	Medium
Odor	Mild
Color	Amber
IPC J-STD-006 Compliance	Indium Corporation impurity levels conform to or exceed IPC J-STD-006
Compatible Alloys	All common and specialty alloys†
Copper Mirror IPC J-STD-004B	See Copper Mirror section
Copper Corrosion IPC J-STD-004B	See Copper Corrosion section
SIR J-STD-004B*	Pass
Electromigration J-STD-004B*	Pass

† Common Alloys: SAC305; SACm®0510; Sn995; SAC105; SAC0307; SAC387; 96.5Sn/3.5Ag; 95Sn/5Sb; Indalloy®227; Indalloy®254; 63Sn/37Pb; 60Sn/40Pb; 93.5Pb/5Sb/1.5Ag; 43Sn/43Pb/14B, and all similar alloys.

** Data available upon request.*

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PRODUCT DATA SHEET

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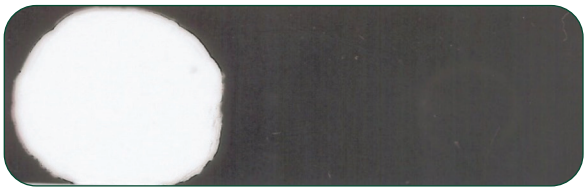
Test Data

Copper Mirror

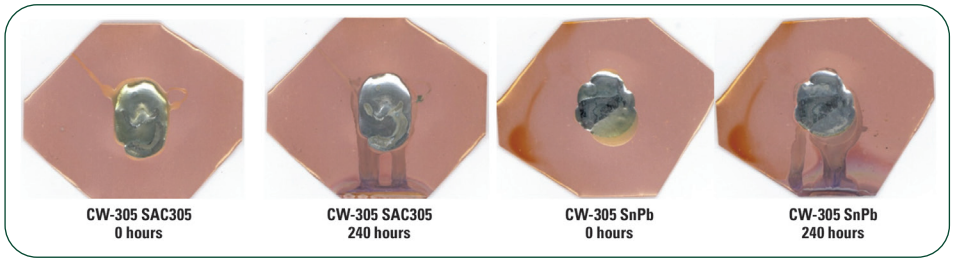
The J-STD-004B copper mirror test is performed per IPC-TM-650 method 2.3.32. To be classified as an "L" type flux, there should be no complete removal of the mirror surface. **CW-305** shows complete removal of the copper mirror and, therefore, is classified as an "H" flux, type "ORH0."



CW-305 as is (undiluted) Standard Rosin

Copper Corrosion

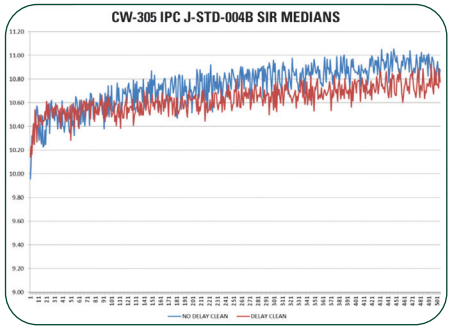
Copper corrosion is tested per IPC-TM-650 method 2.6.15. This test gives an indication of visible reactions that take place between the flux residue after soldering and copper surface finishes. In particular, green copper corrosion (formed as copper-chloride) should not be seen. While green copper chloride is clearly not present, the flux did turn the copper somewhat blue, indicating a reaction product. However, since the residue from this flux is designed to be removed with water and should not be left on the board for 240 hours, this reaction product should not be a concern.

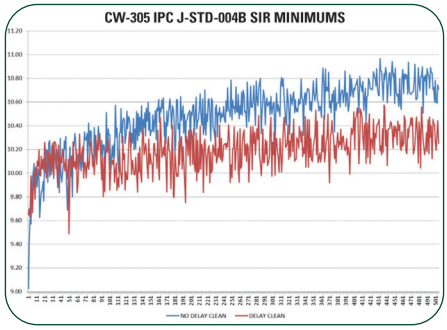


CW-305 SAC305 0 hours | CW-305 SAC305 240 hours | CW-305 SnPb 0 hours | CW-305 SnPb 240 hours

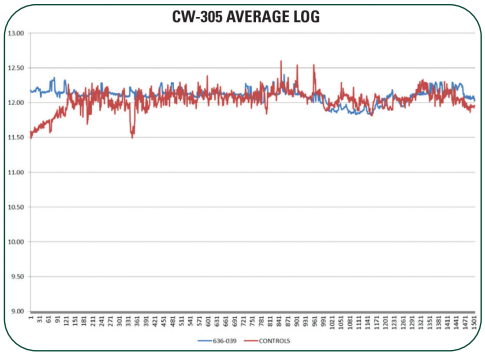
Surface Insulation Resistance (SIR)

The Surface Insulation Resistance test is performed per IPC-TM-650 Method 2.6.3.7, using boards prepared per IPC-TM-650 method 2.6.3.3. All boards soldered with **CW-305** pass the requirements of having exhibited no dendritic growth, no visible corrosion, and a minimum insulation resistance of 100 megaohms (1 x 10^8). The values presented on the two adjacent graphs show the number of Ohms times ten to the power of the vertical axis. The IPC-TM-650 SIR is a 7-day test and gives a general idea of the effect of the flux residue on the electrical properties of the surface of the circuit board. **CW-305** was tested using both immediate residue removal and 48-hour delayed residue removal. As can be seen from the adjacent graphs, both immediate residue removal and delayed residue removal meet the minimum SIR requirements. However, samples with no cleaning delay did perform slightly better than the delayed cleaning samples.





Electromigration (ECM)



The electromigration test is performed to IPC-TM-650 method 2.6.14.1 with boards prepared using IPC-TM-650 method 2.6.3.3. The test conditions for this test are 496 hours at 65°C ± 2°C and 88.5% ± 3.5% RH. To pass this test, there should be no visible corrosion and no dendritic growth that decreases line spacing by more than 20%. In addition, the insulation resistance should not drop more than one order of magnitude after the first 96-hour stabilization period when a bias voltage is applied. **CW-305** passes all of the ECM requirements.

	Control	CW-305 Mean
Initial	3.91E+11	1.51E+12
Final	9.17E+11	1.13E+12

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PRODUCT DATA SHEET

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Performance Test (Spread Test)

	Spread Area (mm^2)	
Spread Test	Copper	Brass
SAC305	44.8	40.7

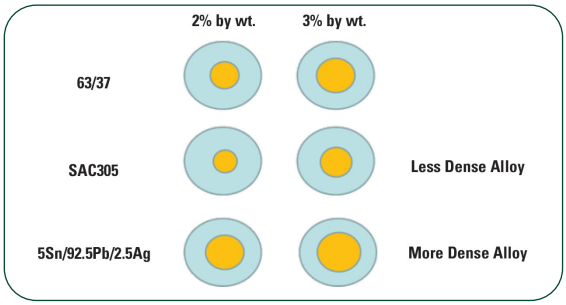
The spread test is not a pass/fail test, but rather is one that measures the relative wetting strength and surface tension characteristics of fluxes. The spread test is performed per IPC TM-650 method 2.6.46A. A 10% solution of flux solids is created and then a known volume is applied along with a known volume of solder, in this case SAC305, to both a brass and copper coupon and reflowed at 508°F. After reflow, the area of solder is measured. The test is performed three times and an average is determined.

Application Recommendations

Choosing the correct soldering tip temperature is a balancing act between optimizing the speed of heating up the solder joint, melting the solder, charring of the flux, and degradation of the soldering iron tip. At lower temperatures, soldering occurs more slowly, but there is less of a chance of damaging circuit boards, ensuring fluxes will not char, and having soldering iron tips that last longer. The recommendations above are for a middle path between performance and safety.

Soldering Iron Temperature		
Alloy Family	Alloy Melting Range	Soldering Iron Temperature
Tin-Lead	170–190°C	340–370°C
Lead-Free	210–250°C	370–400°C
High Lead	280–320°C	400–425°C

Cored Wire Flux Percent



Indium Corporation is capable of coring wire in a variety of flux percents. Flux cores are typically determined by weight percent of flux compared to weight percent of solder. As can be seen by the graphic to the right, 1% more flux by weight adds considerably more flux by volume. The trade-off: higher flux contents make soldering faster, easier, and reduce defects, but increase the amount of residue that can be seen cosmetically and that may interfere electrically. The most common nominal flux contents are 2% by weight and 3% by weight.

Water-Soluble Flux Residue Removal

Water-wash fluxes are designed to have their post-soldering residues removed from the circuit board. This is because, even though the residues may not be corrosive, they can be conductive, especially in humid environments. Some very aggressive water-wash fluxes must be removed immediately after soldering to prevent damage to the circuit board. However, washing boards soldered with **CW-305** may be delayed for up to 48 hours. While the exact method of cleaning, batch or inline, is not important, what is important is ensuring that the equipment used is capable of complete flux removal.

Ionic Cleanliness Testing

Ionic cleanliness testing was developed at a time before no-clean fluxes became practical and popular. In those days, virtually ALL flux residues were removed from circuit boards as a means of ensuring both electrical integrity and a clean cosmetic appearance. The most common ionic testing specification used at the time was MIL-P-28809. To perform the test, an already cleaned subject circuit board was immersed in an ion-free circulating alcohol/water bath for a set period of time and then the electrical conductivity of the alcohol water solution was measured to determine the quantity of residual ionic material, as expressed as equivalent "µg NaCl/in^2." The more residual ionic material that was present, the less effective the cleaning was and, therefore, a greater potential existed for future electrical failure. The amount of ionic residue varies by flux type, cleaning method, and board complexity.

Cored Wire for Robotic and Laser Soldering

Indium Corporation specializes in making fine diameter wire, typically between 0.008" (0.2mm) and 0.015" (0.375mm) diameter for robotic and laser soldering. To make robotic and laser soldering effective and eliminate peaking and bridging with a mild, halogen-free flux-cored wire such as **CW-305**, higher than normal flux content must be used. The standard range of flux content for lead-free (SAC305 and similar alloys) robotic or laser soldering is 4.0–4.5% by weight.

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PRODUCT DATA SHEET

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Shelf Life

When stored in a cool, dry environment, there is no reason that Indium Corporation's cored wire cannot retain its intended soldering properties for many years. The main causes of degraded cored wire reflow performance are the buildup of a thick oxide layer on the surface of the wire, caused by prolonged exposure to higher than normal temperature and humidity conditions, or the buildup of lead carbonate on high-lead (>85%) alloy cored wire shipped or stored under very high humidity conditions.

	Warranted	Practical*
Tin-Lead Alloys	3 years from DOM	Indefinite
Lead-Free Alloys	3 years from DOM	Indefinite
>85% High-Lead	2 years from DOM	Indefinite

*When stored at less than 40°C and less than 80% RH

Health, Safety, Environmental, and Shipping

REACH

No substances of very high concern (SVHC) are used in this product.

Shipping Classification

Transport in accordance with applicable regulations and requirements. Not regulated under US DOT (United States Department of Transportation).

Not hazardous under shipping regulations. UN–none

Hazard Labels

For all CW-305 Cored Wire:

For Lead-Containing CW-305 Cored Wire:

Additional Information

Commonly Available Diameters and Packaging

Diameter	Spool Weight	63/37 Length	SAC305 Length
0.010" ± 0.002"	1/4lb	966ft	1,097ft
0.015" ± 0.002"	1/4lb	429ft	487ft
0.020" ± 0.002"	1lb	966ft	1,097ft
0.025" ± 0.002"	1lb	618ft	702ft
0.032" ± 0.002"	1lb	377ft	428ft
0.040" ± 0.002"	1lb	242ft	274ft
0.062" ± 0.002"	1lb	101ft	114ft
0.25mm ± 0.05mm	113g	294m	334m
0.38mm ± 0.05mm	113g	131m	148m
0.51mm ± 0.05mm	454g	294m	334m
0.64mm ± 0.05mm	454g	188m	214m
0.81mm ± 0.05mm	454g	115m	131m
1.02mm ± 0.05mm	454g	74m	84m
1.57mm ± 0.05mm	454g	31m	35m

All of Indium Corporation's solder paste and preform manufacturing facilities are IATF 16949:2016 certified. Indium Corporation is an ISO 9001:2015 registered company.

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