Cobar®

Cobar Europe BV
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Internet http://www.cobar.com

Date....... : 05 Mar 09
Release.. : 4.1

User's guidelines Cobar No-Clean Lead-Free, Tin-Based Solder Paste SAC- Series

Supporting Documents

See the Product Data Sheet (PDS) for the specification of the product concerned. An up to date version of the PDS for most current products is available through our website at **http://www.cobar.com**. Should the PDS of this product not be available through the website, please contact us by e-mail at **info@cobar.com**. See the Material Safety Data Sheet (MSDS) before handling and/or using this product.

Receiving

1. Do not leave shipping containers on the loading dock or other locations. Solder creams are perishable. The shipping container is only designed to protect the material during transit up to 4 days.
2. Immediately upon receipt, unpack shipping container. Refrigerated storage will prolong the shelf-life. Store unopened in a refrigerator, when products will not be used or inspected within the next few days. Recommended storage temperature is 4-10 °C. Temperatures below 4 °C, however, should be avoided. In any case, storage temperatures should not exceed 22-25 °C. Air-conditioned temperatures are usually adequate for storage.

Income inspection

1. Before income inspection, and while jars/cartridges are still closed, allow minimum 8 hours for jars and their content to reach the ambient temperature. DO NOT open frozen/cold containers as moisture may condense on the product and affect performance.
2. Allow the jar/cartridge to reach ambient temperature naturally. Do not place on a hot plate, furnace, reflow oven or any other artificial means to warm. This will adversely affect the performance of the product.
3. Stir the material for 1 minute with a steel spatula (or equivalent). This practice homogenizes the product and prepares it for immediate test.
4. Viscosity measurement, solder ball determinations and eventual other income inspection procedures can now be carried out.

Certificate of Compliance

Product	390-RX Wave Solder Flux	Batch Number	
Date	04-07-00		
Release	00.1		
Sample	0.25 ltr.	Quality Assurance by	
Number of samples	1	Approved by	F.Vos

We hereby certify that the above mentioned product has been duly quality controlled in our laboratories, according to the procedures and instructions as set forth in our ISO 9001 quality management system, KEMA certificate number 45139, as well as our ISO 14001 environmental management system, KEMA certificate number 76588, and that the aforementioned product meets the specifications as stated below:

Test	Description	Spec.
001	Density kg/dm^3 at 20 °C +/- 0.5%	0.812
008	Solids content [% w/w]	1.95
	Halide content [% w/w]	0.000
002	Acide number mg KOH +/- 5%	15.6
	Water content [% w/w]	1

This document has been generated automatically upon a pass-word protected command by an authorized staff-member. Therefore it is considered official without a signature.

Cobar Europe BV

Certificate of Compliance

A Certificate of Compliance (COC) certifies all batches produced by Cobar. The COC on every batch can be obtained through our website at **http://www.cobar.com** (Quality Certified).
This document confirms that the product has been duly quality controlled in our laboratories, according to the procedures and instructions as specified by our ISO 9001 Quality Management system, KEMA certificate number 45139, as well as our ISO 14001 Environmental Management System, KEMA certificate number 76588.
For more details and procedures, please contact Cobar.

Statistical Process Control (SPC)

As a part of Cobar's Quality System, the QC-results of every batch are logged into our Statistical Process Control System (SPC). Under certain conditions the SPC-data can be audited by our customers.

Storage and handling

1. In the case of solder creams packed in cartridges it is recommended to store them in vertical position, with the tip downwards.
2. Refrigerated storage will prolong the shelf-life. Store unopened in a refrigerator when products will not be used or inspected within the next few days. Recommended storage temperature is 4-10 ºC. Temperatures below 4 °C, however, should be avoided. In any case, storage temperatures should not exceed 22-25 °C. Air-conditioned temperatures are usually adequate for storage.
3. Solder cream is a shelf-life item and should be managed as a FIFO-supply.

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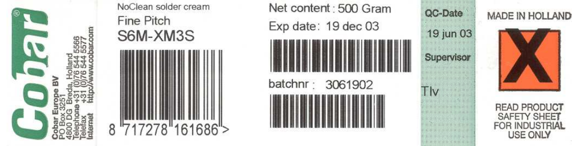
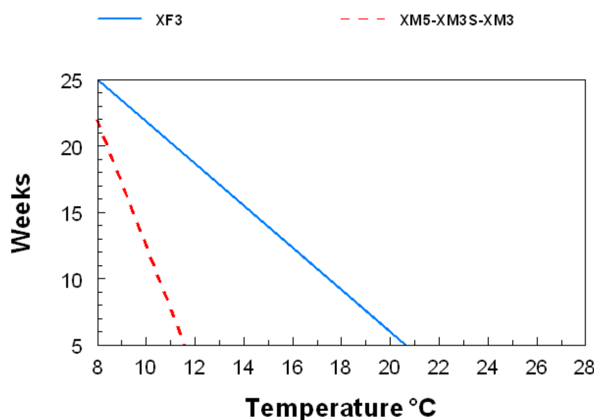
4. Older batches of solder cream should be used prior to new batches. Batch age can be identified by the expiry date on the label on the jar or cartridge.



5. If solder cream must be transported between facilities, care must be taken to ensure that the solder cream is kept at a moderate temperature, approximately 18-25 °C.
6. Before use, and while jars/cartridges are still closed, allow minimum 8 hours for jars and their contents to reach the ambient temperature. DO NOT open frozen/cold containers as moisture may condense on the product and affect performance. DO NOT expose solder paste to accelerated heating!
7. Allow the jar/cartridge to reach ambient temperature naturally. Do not place on a hot plate, furnace, reflow oven or any other artificial means to warm. This will adversely affect the performance of the product.
8. Remove lid and open the jar, respectively remove the tip and cap of the cartridge.
9. In the case of jars, stir the material for 1 minute with a stainless steel spatula (or equivalent). This practice homogenizes the product and prepares it for immediate use.
10. Generally it is not recommended to re-use paste that already has been on a stencil for more than two days. In other cases the un-dried portion of the cream may be returned into the jar after use. Thorough stirring of the returned cream with the remaining portion, however, is a prerequisite.
11. In case no printing has been done for more than four hours, it is highly recommended to perform a total stencil cleaning prior to re-start.

Open jars should preferably be closed immediately after cream has been taken out. Should there be no need for the use of more cream within the next few days, the cream preferably should be stored again in the refrigerator. When handled and stored properly, the minimum shelf-life is: 1,5 months at 20 °C and 3 months at 4-10 °C. For safety aspects during storage and handling we refer to our Material Safety Data Sheet.



Application

The recommended ambient conditions for application of the product by printing or dispensing are 22-28 °C and 30-70% relative humidity. There are many types of printing equipment, squeegees and combinations of stencil design and process conditions.

Therefore the following recommendations should be considered as guidelines for the initial setting of the process. If the solder cream has been prepared properly, it will not be necessary to shear thin the cream prior to printing the first board.

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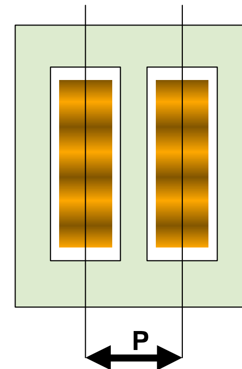
Stencil print

It is highly recommended that Cobar solder creams are printed in a single stroke operation.



Minimum pitch : 0.3 mm/12 mil (center to center) MBGA
: 0.4/16 mil QFP

Smallest chip component : 01005

Stencil

thickness	*pitch*
8 mil (0.20 mm)	: 25 mil (0.635 mm)
6 mil (0.15 mm)	: 20 mil (0.500 mm)
5 mil (0.125 mm)	: 16 mil (0.400 mm)

Pattern size

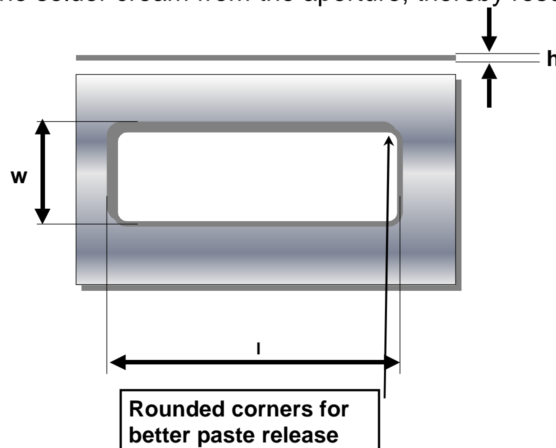
Recommended size 100% of the square surface of the solder pad. A recommended general rule for the design of the aperture width in fine pitch applications is that the width should be maximum 50% of the pitch-size.

Aperture configuration/stencil thickness

For optimal print definition at high speeds it is recommended to consider the relationship between the thickness of the stencil (h) and the total surface area of the walls of the aperture (A_w). In order to reduce the total surface area of the walls of the aperture it is recommended to round off the apertures. This practice will result in a reduced retaining force.
The retaining force of the aperture has a certain relationship to the pulling force of the solder cream once in contact by the substrate or printed circuit board in conjunction with the settings of the printing system, in order to achieve proper release of the solder cream from the aperture, thereby resulting in a proper print definition.

Total surface area of walls = A_w
$2 (w \cdot h) + 2 (l \cdot h) = A_w$
Area of pad= A_p
$(l \cdot w) = A_p$

For proper release
A_p
------.> 0.80
A_w



Paste deposit & beading

Too much paste on the pads should be avoided at all times in order to arrive at zero defects after reflow. Once the right stencil thickness and design are chosen, one should take care that the stencil is always wiped clean by the squeegee or direct imaging device. This is directly related to the pressure on the paste relative to the printing speed. In connection with this also the functioning of the board support needs to be checked. Ideally the deposit thickness of the paste is verified by sampling at random.
Aperture size reduction for chip components by 80-95% is a good practice to eliminate beading of the paste.

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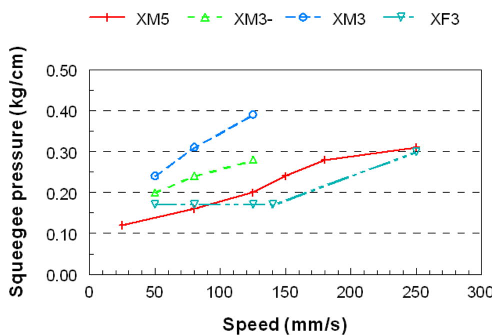
Squeegee
In general stainless steel or polyurethane material, trailing edge squeegees yield somewhat better results than diamond section squeegees.

Angle.............................. : 60° as standard
Hardness .... : 94 durometer (polyurethane)
Off-contact .... : 0 mm
Print pressure .... : setting is depending on the width and the speed of the squeegee. It should be set to a value so that it will wipe the stencil clean in one single stroke. For initial settings of print speeds see the diagram

SP/PR Diagram for Metal Squeegees



Note: Recommended pressures for paste at 23 º C.
Decrease pressure by 5% per 1º C. higher temperature.
Increase pressure by 5% per 1º C. lower temperature.

Print speed...................... : Depending on board configuration, stencil thickness and capabilities of the printing system; for XM3 20 - 100 mm/sec
for XM3S 20 - 120 mm/sec
for XM5S 50 - 250 mm/sec
for XF3 20 - 250 mm/sec

Separation speed............ : MPM printers: Step 6.
Other printers 10 - 20 mm/sec

Initial Downstop for MPM-printers

Squeegee	Down-stop in mm
Metal MPM	1.9 @ 5.5 kg
Metal Teknis	1.0 @ 5.5 kg
Polyurethane trailing edge	1.4 @ 5.5 kg
Polyurethane other	1.0 @ 5.5 kg

Higher pressure requires more down-stop

Proflow

		XM5S	XM3S
Cassette length	Mm	300	300
Print speed	Mm/s	80-150	30-150
Separation speed	Mm/s	10	10
Proflow pressure	Kg	2.5 - 3.0	2.5 - 3.0
Pressure on paste	Bar	1.0 - 1.2	1.2 - 1.4

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Rheopump (MPM) (XM5S only)
Initial filling of pump head
Filling pressure Bar 0.66
Check:
Plungers should go down in both cartridges more or less simultaneously.

Kneading
Number of cycles: 6
Filling pressure: Bar 0.90
Printing pressure: Bar 0.40
Please check:
Negative pressure or pressure not accumulating usually means that a plunger in one of the cartridges has been pushed upwards due to escaping pneumatic air. This can be solved by exchanging the cartridge concerned.

Printing

Pump pressure

Pressure high	0.12 bar
Pressure low	0.09 bar
Print pressure	0.25 bar
Charging pressure	0.60 bar
Filling pressure	0.66 bar
Total force	6.50 kg
Down-stop	1.905 mm
Balance g/d	50/50
Print speed	80 mm
Up delay	2.0
Slow separation	Step 6

After printing 10-20 boards, it may be necessary to wipe the stencil underside to maintain definition. This is a normal practice.

Resuming work
Usual this requires a kneading procedure.

Component placement
The cream will maintain enough tack to permit component placement for up to 8 hours, depending on environmental conditions. It is advisable to conduct suitable tack-time retention tests for your specific line, as ambient temperature and humidity affect tack-time.

Reflow
The printed boards can be reflowed up to 24 hours after printing without adverse effects. However, ambient environmental conditions will also affect open time. Appropriate tests should be conducted to verify the actual open time in your environment. Because of the various types of reflow equipment, different thermal mass and thermal conductivity of the items to be soldered and metallurgy of the solder, the reflow profile must be determined by experimentation. A recommended profile can only be considered as a guideline for the initial setting of the equipment. Further tuning should be focused on both preventing thermal shock of the components and zero-defect soldering. It is not strictly necessary to set up a profile with a distinct soak-zone. One continuous ramp with a controlled slope of increase of 1 ºC/sec up to 160 ºC has yielded good reflow results.

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Cleaning

This solder paste features minimal amounts of residues, which are non-corrosive and have excellent dielectric properties. Therefore they may be left on the assemblies in most of the applications. The residues on stencil, spatulas and other tools as well as misprints may be cleaned in Cobar 425-EC (Low-VOC). For manual and automatic under-stencil cleaning we recommend Cobar 425-EC (Low-VOC).

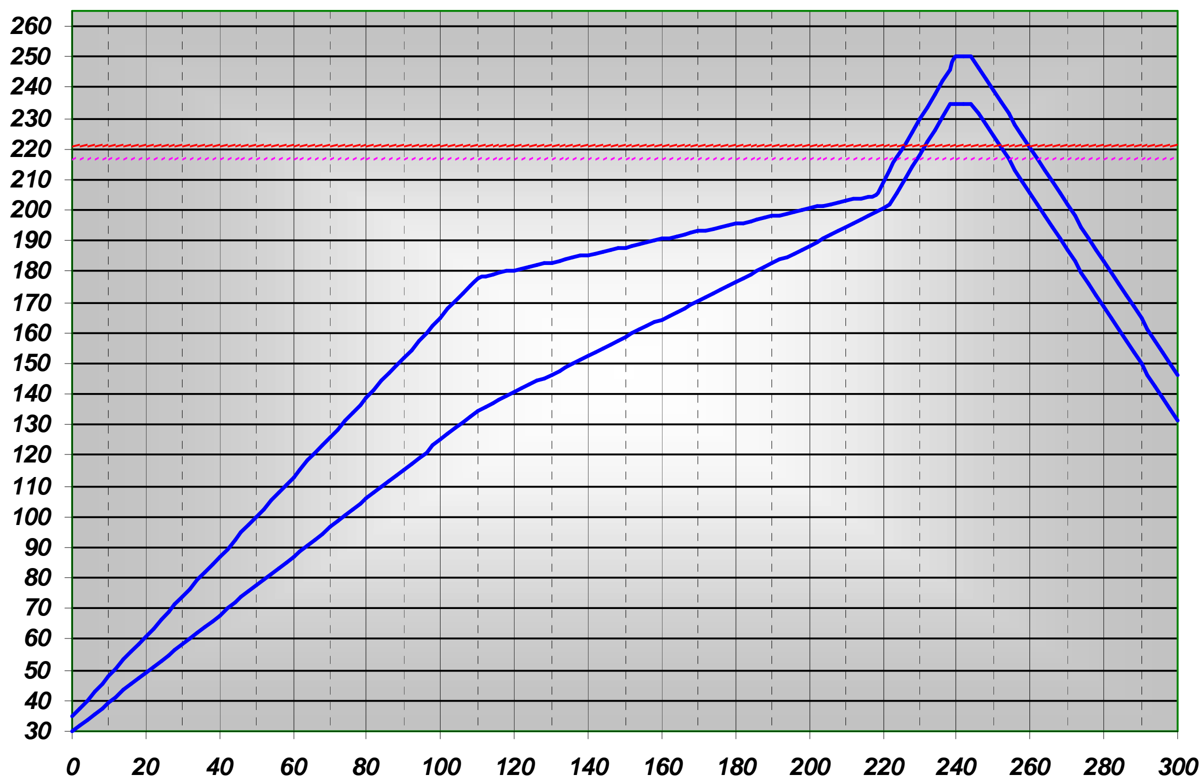
Chemical resistance of non-metallic machine parts to solder paste condensates

Solder pastes contain solvents that dissolve rosins and synthetic resins. They must have the solvency power to maintain a stable product. The potential to dissolve even synthetic resins make it necessary to check the compatibility of non-metallic parts in reflow equipment with the condensate of the solder paste that is or will be used. In general the use of PVC and Viton for parts, wires and cables should be avoided at all times. Materials with good resistance are Polyethylene, Polypropylene, Nylon and Teflon.

Recommended reflow profile

Following process time suggestion should be considered as a minimum energy requirement. It ensures a smooth and complete evaporation of the solvents and optimum activation of the flux. This will provide the best wetting results and minimized, yet fully inerted residues for high reliability applications. Longer process times may provide small improvements in solder quality and a minimized and more inerted residue.

Recommended minimum reflow profile Cobar No-Clean Lead-Free, Tin-Based solder paste



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Key Ambient

Peak Temperature: 235 - 250 ℃
Temperature > 217 ℃: 30 - 50 sec.
Soak: 155 - 175 ℃ or: 175 - 195 ℃
Soaktime: 45 - 100 sec.
Delta T: 1 - 1,3 ℃ / sec

Profile SAC Solder Paste for Reflow in Air (Extended)

Time[sec]		30	60	90	120	150	170	180	190	200
T [C]	35	74	113	152	181	188	193	196	198	201
T [C]	30	59	87	116	141	159	171	177	183	189

Time[sec]	210	220	225	230	240	250	255	260	280	300
T [C]	203	209	221	230	250	239	228	220	183	146
T [C]	195	201	210	218	235	224	213	169	132	132