

# NO CLEAN, CLEAR RESIDUE CORED SOLDER WIRES

Multicore Crystal solid fluxes for cored solder wires have been specially formulated to complement No Clean wave and reflow soldering processes. They are also applicable to repair operations carried out after a cleaning process, eliminating the need for further cleaning.

- Halide free version - Crystal 400
- Fast soldering - range of activities to suit all applications
- Good spread on copper, brass and nickel
- Clear residues
- Heat stable - low spitting
- Mild odour

## PRODUCT RANGE

Multicore Crystal 400 is designed for users who require a halide free formulation while Crystal 500 contains a low level of halide. The remaining products in the range contain higher halide levels to maximise soldering power.

Multicore Crystal 400, 500, 502, 505 and 511 cored wires are manufactured with a range of flux contents. Although users will normally be using products with a nominal flux content of 3%, the superior performance of the Crystal products may allow a lower flux content to be specified e.g. 2.2%. This will further improve residue appearance by reducing the quantity. All are available in alloys conforming to national and international standards, including lead free alloys. Some alloys and flux contents may be manufactured to special order.

## RECOMMENDED OPERATING CONDITIONS

**Soldering iron:** Good results should be obtained using a range of tip temperatures. However, the optimum tip temperature and heat capacity required for a hand soldering process is a function of both soldering iron design and the nature of the task and care should be exercised to avoid unnecessarily high tip temperatures for excessive times. A high tip temperature will increase any tendency to flux spitting and it may produce some residue darkening.

The soldering iron tip should be properly tinned and this may be achieved using Multicore Crystal cored wire. Severely contaminated soldering iron tips should first be cleaned and pre-tinned using Multicore Tip Tinner/Cleaner TTC1, then wiped on a clean, damp sponge before re-tinning with Crystal cored wire.

**Soldering process:** Multicore Crystal flux cored wires contain a careful balance of resins and activators to provide clear residues, maximum activity and high residue reliability, without cleaning in most situations. To achieve the best results from Multicore Crystal solder wires, recommended working practices for hand soldering should be observed as follows:

- Apply the soldering iron tip to the work surface, ensuring that it simultaneously contacts the base material and the component termination to heat both surfaces adequately. This process should only take a fraction of a second.
- Apply Crystal flux cored solder wire to a part of the joint surface away from the soldering iron and allow to flow sufficiently to form a sound joint fillet - this should be virtually instantaneous. Do not apply excessive solder or heat to the joint as this may result in dull, gritty fillets and excessive or darkened flux residues.
- Remove solder wire from the workpiece and then remove the iron tip.

The total process will be very rapid, depending upon thermal mass, tip temperature and configuration and the solderability of the surfaces to be joined.

Multicore Crystal flux cored solder wires provide fast soldering on copper and brass surfaces as well as solder coated materials. Activity of the halide activated versions on nickel is also good depending on the state of oxidation of the nickel finish. The good thermal stability of Crystal fluxes means they are also well suited to soldering applications requiring high melting temperature alloys.

The resin and flux systems are designed to leave relatively low residues and to minimise residual activity. This is achieved by ensuring some decomposition and volatilisation takes place during the soldering process. In some situations, this may generate visible fuming but in all cases, rosin fumes must be removed from the breathing zone of operators.

**Cleaning:** Multicore Crystal flux cored solder wires have been formulated to leave pale flux residues and to resist spitting and fuming. In most industrial and consumer electronics applications cleaning will not be required and the product may therefore be used to complement a No Clean wave soldering or reflow process or to allow repairs to cleaned boards without the need for a second cleaning process. Should residue quantity be an important consideration, Multicore X39 flux cored wire may be specified if a halide free product is required or X52 if halide may be tolerated. Crystal 500, 502, 505 and 511 offer good activity and consequently cored wire flux contents and hence residue levels may be reduced in comparison with equivalent conventional products. Should cleaning be required, this is best achieved using Multicore Prozone Solvent Cleaner (separate data sheet available). Other proprietary solvent or semi-aqueous processes may be suitable but saponification is not recommended.

## TECHNICAL SPECIFICATION

A full description of test methods and detailed test results are available on request.

**Alloys:** The alloys used for Crystal cored solder wires conform to the purity requirements of the common national and international standards. A wide range of wire diameters is available manufactured to close dimensional tolerances.

**Flux:** Multicore Crystal solid fluxes are based on modified rosins and carefully selected activators. In use they exhibit a mild rosin odour and leave a small quantity of clear residue.

| CRYSTAL FLUX PROPERTIES                  |         |         |         |         |         |
|--|---------|---------|---------|---------|---------|
| TEST                                     | 400     | 500     | 502     | 505     | 511     |
| Acid Value, mg KOH/g                     | 205-220 | 156-170 | 156-172 | 159-177 | 164-176 |
| Halide content, %                        | Zero    | 0.04    | 0.2     | 0.5     | 1.1     |
| J-STD-004                                |         |         |         |         |         |
| Solder spread, mm <sup>2</sup>           | 210     | 290     | 310     | 315     | 340     |
| Corrosion test                           | Pass    | Pass    | Pass    | Pass    | Pass    |
| SIR Test (without cleaning)              |         |         |         |         |         |
| IPC-SF-818 Class 3                       | Pass    | Pass    | Pass    | Pass    | Pass    |
| Bellcore TR-NWT-000078                   | Pass    | Pass    | Pass    | Pass    | Pass    |
| Electromigration Test (without cleaning) |         |         |         |         |         |
| Bellcore TR-NWT-000078                   | Pass    | Pass    | Pass    | Pass    | Pass    |
| Classification                           |         |         |         |         |         |
| EN 29454-1                               | 1.1.3   | 1.1.2   | 1.1.2   | 1.1.2   | 1.1.2   |
| J-STD-004                                | ROLO    | ROL1    | ROM1    | ROM1    | ROM1    |
| IPC-SF-818                               | LR3CN   | LR3CN   | MR3CN   | MR3CN   | MR3CN   |

| RELATIVE WETTING PERFORMANCE OF MULTICORE CRYSTAL AND HALIDE FREE COMPETITOR PRODUCTS * |                  |                                 |                |
|---|------------------|---------------------------------|----------------|
| PRODUCT   | FLUX CONTENT (%) | AREA OF SPREAD, mm <sup>2</sup> |                |
|   |                  | Oxidised copper*                | Oxidised brass |
| Crystal 400   | 2.2              | 222                             | 209            |
| Multicore 304   | 3.0              | 220                             | 209            |
| Competitor A  | 3.5              | 191                             | 140            |
| Competitor B  | 3.5              | 202                             | 140            |

\* - oxidised for 1 hour @ 205°C

| RELATIVE WETTING PERFORMANCE OF MULTICORE CRYSTAL AND SIMILAR COMPETITOR PRODUCTS * |                  |                                 |                |
|---|------------------|---------------------------------|----------------|
| PRODUCT   | FLUX CONTENT (%) | AREA OF SPREAD, mm <sup>2</sup> |                |
|   |                  | Oxidised copper*                | Oxidised brass |
| Crystal 500   | 2.8              | 300                             | 170            |
| Multicore 381   | 2.9              | 195                             | 110            |
| Competitor C  | 2.4              | 150                             | 85             |
| Competitor D  | 3.1              | 240                             | 120            |

\* oxidised for 1 hour @ 150°C

**Cored wire:** Multicore Crystal cored solder wires are designed to give fast and sustained wetting on both copper and brass. This can be demonstrated using spreading tests on both substrates under standard conditions for the Multicore products and comparable competitor products. After 5 seconds, area of spread is measured to form a comparative index indicating total flux efficacy.

Multicore Crystal flux cored solder wires out-perform competitor products, which required a higher flux content and leave more residues whilst achieving poorer spread.

| RELATIVE WETTING PERFORMANCE OF MULTICORE CRYSTAL AND COMPETITOR PRODUCTS * |      |        |                                |                |
|---|------|--------|--------------------------------|----------------|
| PRODUCT   | FLUX | HALIDE | AREA OF SPREAD mm <sup>2</sup> |                |
|   |      |        | Oxidised copper*               | Oxidised brass |
| Crystal 502   | 2.7  | 0.2    | 220                            | 160            |
| Competitor E  | 2    | 0.4    | 200                            | 150            |
| Competitor F  | 2.4  | 0.4    | 190                            | 180            |
| Competitor G  | 3.5  | 0.4    | 150                            | 120            |
| Competitor H  | 2.7  | 0.5    | 230                            | 150            |
| Crystal 505   | 2.7  | 0.5    | 220                            | 240            |

\* - oxidised for 1 hour @ 205°C

| RELATIVE WETTING PERFORMANCE OF MULTICORE CRYSTAL AND COMPETITOR PRODUCTS * |                  |                    |                                |                |
|---|------------------|--------------------|--------------------------------|----------------|
| PRODUCT   | FLUX CONTENT (%) | HALIDE CONTENT (%) | AREA OF SPREAD mm <sup>2</sup> |                |
|   |                  |                    | Oxidised copper*               | Oxidised brass |
| Crystal 511   | 2.7              | 1.1                | 270                            | 390            |
| Competitor J  | 2.2              | 1.2                | 260                            | 190            |
| Competitor K  | 2.0              | 1.6                | 210                            | 230            |

\* - oxidised for 1 hour @ 205°C

## HEALTH AND SAFETY

**WARNING:** The following information is for guidance only and users must refer to the Material Safety Data Sheets relevant to specific Multicore Crystal flux cored solder wires before use.

**Health Hazards and Precautions:** Inhalation of the flux fumes given off during soldering should be avoided. The fumes are irritating to the throat and respiratory system. Prolonged or repeated exposure to rosin- or modified rosin-based flux fumes may lead to the development of respiratory sensitisation and occupational asthma.

Multicore Crystal solder wires must always be used with suitable fume extraction equipment to remove fumes from the breathing zone of operators and the general work environment.

Solder alloys containing lead give off negligible fume at normal soldering temperatures up to 500°C.

Normal handling of lead alloy wires will not cause lead to be absorbed through the skin. The most likely route of entry is through ingestion but this will not be significant if a good standard of personal hygiene is maintained. Eating, drinking and smoking should not be permitted in the working area. Hands should be washed with soap and warm water after handling solder wire.

**Waste disposal:** Wherever possible, waste solder wire should be recycled for recovery of metal. Otherwise it should be disposed of according to local or national regulations.

### Note

The data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitability for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, **Loctite Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Loctite Corporation's products. Loctite Corporation specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits.** The discussion herein of various processes or compositions is not to be interpreted as representation that they are free from domination of patents owned by others or as a license under any Loctite Corporation patents that may cover such processes or compositions. We recommend that each prospective user test his proposed application before repetitive use, using this data as a guide. This product may be covered by one or more United States or foreign patents or patent applications.