

Technical Data Sheet

MASTER BOND MB SERIES CYANOACRYLATES

High Strength, Rapid Curing Cyanoacrylate Adhesives for Reliable Cost Effective Bonding

Product Description

Master Bond cyanoacrylate adhesives are high strength, rapid curing, one component systems which offer ultra-fast bonding at room temperature with no mixing or heating required. Only contact pressure is needed after application of the adhesive. They generally bond from within a few seconds to just under a minute, depending on atmospheric humidity and the substrates being bonded. Cyanoacrylates adhere well to many substrates including metals, rubbers, most plastics and ceramics. The bonds produced offer exceptional performance characteristics including resistance to most types of environmental exposures, moderate heat, aging and many different chemicals, as well as high strength and fatigue resistance. Master Bond cyanoacrylates offer versatility, strength, speed of cure as well as cost effectiveness both for production and repair applications.

Master Bond offers methyl, ethyl and various specialty grades of cyanoacrylate adhesives. The methyl grades are recommended for optimal performance on metal-to-metal applications. The ethyl grades offer excellent bonding with rubbers, most plastics and also rubber or plastic to metal applications. Included among the specialty types are medical grades (biocompatible), flexibilized systems, gels and low odor (methoxymethyl) cyanoacrylates.

Master Bond cyanoacrylate adhesives are attractive not only technically but economically. The best quality bonds are usually obtained by using the minimum quantity of adhesive needed to fill the joint. The thinner the adhesive film, the faster the cure and the stronger the bond. Depending on the size of the bond, one ounce of adhesive properly used can provide enough material for as many as 2000 bonds.

Product Advantages

- Rapid curing at room temperature. No heat required. Most bonds formed in under a minute.
- Bonds with only contact pressure. No clamping or fixturing required
- Bonds well to a wide variety of substrates including metals, rubbers, most plastics and ceramics.
- Excellent wetting action with no solvent evaporation or hazardous vapor emission.
- High strength bonds. Tensile strengths up to 4,000 psi.
- Good resistance to weathering.
- Resists many chemicals including gasoline, kerosene & various oils.
- Easily applied. Spreads evenly and smoothly. No mixing required.
- Most surfaces require no special pretreatments.
- Ideal for high speed production. Automatic dispensing equipment readily available.
- Cost effective. Only minimal amounts of adhesive are needed to form strong bonds.
- Meets MIL-A-46050B specification:
 - Type I, class 1— MB300, MB301, MB325
 - Type I, class 2 — MB302, MB303
 - Type II, class 2 — MB301, MB302
 - Type II, class 3 — MB295, MB297
 - Type IA and IIA — Master Bond Accelerator for
- Meets MIL-A-46050C specification:
 - Type I, class 1 — MB303, MB320, MB325
 - Type II, class 1 — MB300

Cyanoacrylate Adhesives.

Product Properties

Basic physical and chemical properties of Master Bond cyanoacrylate adhesives are summarized in table #1. Aside from the properties mentioned it should be noted that ethyl type cyanoacrylates are dissolved by acetone, methyl ethyl ketone, nitromethane and dimethylformamide. Methyl types are dissolved only by strong polar solvents such as nitromethane and also dimethylformamide.

Table #2 summarizes cyanoacrylate bond strengths to a variety of similar and dissimilar substrates. Additionally, information on typical chemical resistance properties is also included. All Master Bond cyanoacrylates form colorless and transparent bonds.

Preparation of Adhesive and Bonding Surfaces

Master Bond cyanoacrylates can be readily applied to various surfaces straight from the bottle as supplied. Simple finger pressure or the equivalent is enough to bond the substrates together. For maximum bond strengths the parts should be cleaned. Cyanoacrylates need tight, closely fitted surfaces for maximum bond strengths. Usually a light sanding followed by solvent wiping of the surfaces with acetone, MEK or alcohol is sufficient. Other than cleaning, special extensive pretreatments of surfaces are generally not required. It should be noted that plastic surfaces sometimes require some mechanical roughening to remove certain mold release agents. A compatible solvent wash with acetone, MEK or alcohol is usually adequate to provide suitable quality bonding surfaces.

Adhesive Application and Assembly

High bond strengths with cyanoacrylates require only a very thin film of adhesive. The exact amount of adhesive to be used for bonding a specific area depends on the type of surface and the materials to be bonded. It is only necessary to apply adhesive to one surface. Generally, the best bond strength can be achieved by using the minimum amount of adhesive required to fill the joint. Pressure should be applied evenly until the adhesive sets up in order to ensure uniform bonding thickness. The thinner the adhesive film, the faster the cure and the stronger the bond. Cyanoacrylates cure by atmospheric humidity. Therefore the higher the humidity the faster the cure. Conversely, in low humidity environments, the rate of cure will be slower.

Handling and Storage

Master Bond cyanoacrylate adhesives should be stored in their original containers in a cool, dry location. The storage temperature should be below 75°F. The shelf life depends on the storage temperature. The maximum shelf life of 12 months is obtained if the original containers are stored in a refrigerator at 35° to 40°F. Exposure to sunlight should be avoided. Containers should be tightly sealed when not in use. When removing an adhesive container from the refrigerator, allow the adhesive to reach room temperature before using it. Excessively aged or outdated adhesive may appear cloudy or milky. If this occurs the material should not be used.

Caution

Cyanoacrylates have been used in industry for years with a truly excellent safety record. Dispensing the adhesive by hand from a bottle as well as with automatic dispensing equipment has given excellent results. As noted earlier, this adhesive cures by the presence of moisture. In light of this, certain precautions must be taken to insure safe and trouble free usage. Use of gloves is mandatory since skin contains moisture and accidental misuse may bond skin. In case this occurs, do not attempt to force bonded surfaces apart. Flush immediately with water until the joined parts can be freed. Should any adhesive material get into the eyes, wash with plenty of water and then consult a doctor. Do not use acetone or rub eyes. Use applicator nozzles and gloves to avoid skin contact. Although most cyanoacrylates are low odor, it is still recommended to use adequate ventilation, especially in a production environment.

Master Bond Inc.

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Table #1: MASTER BOND MB SERIES CYANOACRYLATE APPLICATION SELECTOR GUIDE

*Selected High Strength, Rapid Curing Cyanoacrylate Adhesives for Reliable, Cost Effective Bonding
Partial Listing Only — Other Grades Available*

Ethyl Cyanoacrylate —

| Master Bond Grade | Viscosity RT, cps | Color | Specific Gravity | Hardness Shore A | Refractive Index (ND 20°C) | Dielectric Constant (1,000 Hz) | Set-Up Time Seconds, RT* | Service Temp Range, °F | Applications |
|-------------------|-------------------|-------------|------------------|------------------|----------------------------|--------------------------------|--------------------------|------------------------|--|
| MB295 | 1,300-1,700 | transparent | 1.05 | 85 | 1.47 | 3.6 | 20-40 | -60 to +195 °F | wire tacking, fills gap to 0.007" |
| MB297 | 2,200-2,400 | transparent | 1.09 | 85 | 1.48 | 3.5 | 20-50 | -60 to +195 °F | general purpose, fills gap to 0.008" |
| MB300 | 2-3 | transparent | 1.05 | 85 | 1.45 | 3.7 | 5-20 | -60 to +195 °F | general purpose wicking grade, fills gap to 0.002" |
| MB301 | 30-40 | transparent | 1.05 | 85 | 1.46 | 3.6 | 5-25 | -60 to +195 °F | general purpose tight fit grade, fills gap to 0.004" |
| MB302 | 75-100 | transparent | 1.05 | 85 | 1.46 | 3.6 | 20-40 | -60 to +195 °F | for rubber & plastic bonding, fills gap to 0.005" |

Methyl Cyanoacrylate —

| Master Bond Grade | Viscosity RT, cps | Color | Specific Gravity | Hardness Shore A | Refractive Index (ND 20°C) | Dielectric Constant (1,000 Hz) | Set-Up Time Seconds, RT* | Service Temp Range, °F | Applications |
|-------------------|-------------------|-------------|------------------|------------------|----------------------------|--------------------------------|--------------------------|------------------------|--|
| MB303 | 80-100 | transparent | 1.08 | 90 | 1.49 | 3.6 | 25-45 | -60 to +225 °F | for metals with tight fit, fills gap to 0.005" |
| MB320 | 500-550 | transparent | 1.09 | 85 | 1.50 | 3.6 | 30-45 | -60 to +225 °F | general purpose metal bonding, fills gap to 0.007" |
| MB325 | 15-25 | transparent | 1.08 | 90 | 1.49 | 3.7 | 25-40 | -60 to +225 °F | wicking type metal bonding, fills gap to 0.002" |

Specialty Cyanoacrylate —

| Master Bond Grade | Viscosity RT, cps | Color | Specific Gravity | Hardness Shore A | Refractive Index (ND 20°C) | Dielectric Constant (1,000 Hz) | Set-Up Time Seconds, RT* | Service Temp Range, °F | Applications |
|-------------------|-------------------|-------------|------------------|------------------|----------------------------|--------------------------------|--------------------------|------------------------|---|
| MB297FL | 1,500-1,800 | transparent | 1.07 | 85 | 1.47 | 3.3 | 10-50 | -65 to +185 °F | vibration & shock resistant, fills gap to 0.007" |
| MB297GEL | gel | transparent | 1.10 | 90 | N/A | 3.4 | 60-80 | -60 to +195 °F | general purpose type, fills gap to 0.010" |
| MB297MED | 2,400 | transparent | 1.09 | 85 | 1.48 | 3.5 | 20-50 | -40 to +250 °F | medical grade, Class VI approved, fills gap to 0.008" |
| MB297MED-1 | 1,100 | transparent | 1.06 | 85 | 1.48 | 3.5 | 20-50 | -40 to +250 °F | medical grade, Class VI approved, fills gap to 0.007" |
| MB297MED-2 | 100 | transparent | 1.05 | 85 | 1.48 | 3.5 | 20-50 | -40 to +250 °F | medical grade, Class VI approved, fills gap to 0.005" |
| MB297MED-3 | 5 | transparent | 1.05 | 85 | 1.48 | 3.5 | 20-50 | -40 to +250 °F | medical grade, Class VI approved, fills gap to 0.002" |
| MB350 | 100 | transparent | 1.06 | 85 | 1.47 | 3.6 | 30-45 | -60 to +250 °F | low odor, non-blooming, fills gaps to 0.005" |
| MB356 | 1,600-1,800 | transparent | 1.07 | 85 | 1.47 | 3.6 | 40-60 | -60 to +250 °F | low odor, non-blooming, fills gaps to 0.007" |

*depends on substrates and atmospheric humidity

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Table #2: Bonding Characteristics of Master Bond MB Series Cyanoacrylates

TENSILE SHEAR STRENGTH (psi)

At 20 °C ±2°C after aging 48 hours. Test specimens were bonded after sand blasting followed by wiping of bonding surfaces with acetone.

| Bonding Identical Materials | MB300 (Ethyl) | MB302 (Ethyl) | MB297 (Ethyl) | MB325 (Methyl) | MB320 (Methyl) |
|---------------------------------|------------------|------------------|------------------|-------------------|-------------------|
| Plastics | | | | | |
| ABS-ABS | 1,300* | 1,300* | 1,300* | 1,300* | 1,300* |
| Bakelite-Bakelite | 1,400* | 1,400* | 1,400* | 1,400* | 1,400* |
| Delrin-Delrin | 960 | 1,060 | 1,000 | 640 | 650 |
| Melamine-Melamine | 1,490 | 1,630 | 1,560 | 1,630 | 1,520 |
| MMA-MMA | 2,120 | 2,140 | 2,100 | 2,120 | 2,100 |
| Nylon-Nylon | 920 | 850 | 910 | 780 | 690 |
| PBT-PBT | 1,800 | 1,840 | 1,810 | 1,650 | 1,620 |
| Phenolic-Phenolic | 1,400* | 1,400* | 1,400* | 1,400* | 1,400* |
| Polyacetal- Polyacetal | 850* | 850* | 850* | 850* | 850* |
| Polycarbonate-Polycarbonate | 1,300* | 1,300* | 1,300* | 1,300* | 1,300* |
| Polyester-Polyester | 2,200 | 2,300 | 2,210 | 2,050 | 2,080 |
| Polystyrene-Polystyrene | 600* | 600* | 600* | 600* | 600* |
| PVC (rigid)-PVC (rigid) | 2,800* | 2,800* | 2,800* | 2,800* | 2,800* |
| Rubbers | | | | | |
| Butyl-Butyl | 290* | 290* | 290* | 290* | 290* |
| Chloroprene-Chloroprene | 540* | 540* | 540* | 540* | 540* |
| Natural Rubber-Natural Rubber | 450* | 450* | 450* | 450* | 450* |
| NBR-NBR | 560* | 560* | 560* | 560* | 560* |
| Neoprene-Neoprene | 580* | 580* | 580* | 580* | 580* |
| Nitrile-Nitrile | 550* | 550* | 550* | 550* | 550* |
| SBR-SBR | 480* | 480* | 480* | 480* | 480* |
| Metals | | | | | |
| Aluminum-Aluminum | 1,060 | 1,130 | 1,110 | 1,980 | 1,980 |
| Brass-Brass | 2,130 | 2,550 | 2,410 | 2,980 | 2,960 |
| Chromium- Chromium | 1,060 | 1,350 | 1,280 | 1,840 | 1,910 |
| Copper-Copper | 2,410 | 2,620 | 2,500 | 3,400 | 3,260 |
| Stainless Steel-Stainless Steel | 2,340 | 2,620 | 2,480 | 3,050 | 3,100 |
| Steel-Steel | 2,200 | 2,720 | 2,440 | 3,200 | 3,800 |
| Miscellaneous | | | | | |
| Glass-Glass | 2,700* | 2,700* | 2,700* | 2,700* | 2,700* |
| Porcelain- Porcelain | 2,400* | 2,400* | 2,400* | 2,400* | 2,400* |
| Wood (Oak)-Wood (Oak)** | 2,100* | 2,100* | 2,100* | 2,100* | 2,100* |

*Substrate failure—test bond held

**May require accelerator

TENSILE SHEAR STRENGTH (psi)

At 20 °C ±2°C after aging 48 hours. Test specimens were bonded after sand blasting followed by wiping of bonding surfaces with acetone.

| Bonding Dissimilar Materials | MB300 (Ethyl) | MB302 (Ethyl) | MB297 (Ethyl) | MB325 (Methyl) | MB320 (Methyl) |
|------------------------------|------------------|------------------|------------------|-------------------|-------------------|
| Aluminum-Stainless Steel | 1,420 | 1,700 | 1,670 | 2,090 | 2,060 |
| Delrin-Phenolic | 730 | 820 | 800 | 680 | 640 |
| Melamine-Copper | 1,700* | 1,700* | 1,700* | 1,700* | 1,700* |
| Melamine-Steel | 1,400* | 1,400* | 1,400* | 1,400* | 1,400* |
| NBR-Aluminum | 960 | 1,040 | 1,020 | 990 | 970 |
| Neoprene-Melamine | 350 | 390 | 380 | 420 | 420 |
| Neoprene-Steel | 500 | 560 | 540 | 530 | 520 |
| Nylon-Bakelite | 850 | 990 | 980 | 780 | 780 |
| Nylon-Copper | 1,500* | 1,500* | 1,500* | 1,500* | 1,500* |
| Polystyrene-Bakelite | 560* | 560* | 560* | 560* | 560* |
| PVC (rigid)-Wood (Oak)** | 2,300* | 2,300* | 2,300* | 2,300* | 2,300* |
| Steel-Aluminum | 2,270 | 2,410 | 2,400 | 2,410 | 2,390 |
| Steel-Brass | 1,700 | 2,700 | 2,540 | 2,980 | 2,960 |
| Steel-Butyl | 310* | 310* | 310* | 310* | 310* |
| Steel-Chloroprene | 350* | 350* | 350* | 350* | 350* |
| Steel-Natural Rubber | 340* | 340* | 340* | 340* | 340* |
| Steel-PVC (rigid) | 2,200* | 2,200* | 2,200* | 2,200* | 2,200* |
| Steel-Stainless Steel | 1,200 | 1,770 | 1,740 | 2,190 | 2,170 |

CHEMICAL RESISTANCE

Master Bond cyanoacrylates are not affected by solvents such as gasoline, propane, light oil, alcohol or kerosene. Alkaline materials, however, may somewhat reduce the bonding strength.

| Steel-Steel | psi | psi | psi | psi | pdi |
|-------------------|-------|-------|-------|-------|-------|
| Acetone | 1,200 | 1,560 | 1,290 | 2,700 | 3,760 |
| Kerosene | 2,270 | 2,620 | 2,410 | 2,960 | 3,330 |
| Gasoline | 2,200 | 2,700 | 2,340 | 3,200 | 3,260 |
| 10% — HCL | 1,700 | 1,920 | 210 | 2,180 | 2,340 |
| 10% — NaOH | 110 | 280 | 140 | 140 | 380 |
| Motor Oil | 2,200 | 2,700 | 2,270 | 3,200 | 3,410 |
| Trichloroethylene | 2,270 | 2,700 | 2,440 | 3,100 | 3,330 |
| Water | 2,130 | 2,410 | 2,410 | 3,100 | 3,120 |