

# TECHNICAL SPECIFICATIONS

*An enclosure is a housing constructed to provide a degree of protection from accidental contact with the enclosed equipment and external environmental conditions.*

## NEMA Type 4X fiberglass enclosures

- All fiberglass enclosures are listed under UL standard 508, (CSA standard 22.2 No. 14-M91). This type of enclosure is suitable for both indoor and outdoor use in corrosive environments and is resistant to UV degradation. Fiberglass material shall meet UL 746C requirements with halogen-free and self-extinguishing characteristics.
- Enclosure is constructed using a hot compression-molded process and a fiberglass reinforced polyester resin compound with a minimum of 20% fiberglass by weight. A cold molded procedure may be used for larger cabinets.
- Fiberglass reinforced polyester exhibits high impact resistance, a superior range of temperature limits, excellent dimensional stability, excellent electrical properties, and excellent moisture and overall chemical resistance.
- Standardizing enclosure performance is accomplished by use of rating systems of various specifying organizations (NEMA, UL, CSA) identifying an enclosure's ability to resist external environmental influences. These ratings have distinct differences even though they are intended to provide information in order to make a safer and informed product choice.
- Any external metal parts shall be 304 stainless steel. Any internal metal parts shall be manufactured using corrosion resistant materials.
- NEMA Type 4X enclosures are fabricated and rated specifically for resistance to corrosive elements.
- Fiberglass Reinforced Polyester is the material of choice in applications where physical strength specifications are average and excellent corrosion resistance is required.
- Advantages of non-metallic enclosures:
  - (1) Unlike metals, fiberglass reinforced polyester is non-corrosive.
  - (2) Enclosures are homogeneous, thus they require little maintenance.
  - (3) Due to their light weight, non-metallic enclosures can be very easily handled, installed and modified.

## Chemical Resistance Table

- See chart below for ratings for specific reagents.
- In most applications, fiberglass reinforced polyester offers the best all around performance in corrosive environments.
- These environmental resistance ratings are based upon tests where the specimens were placed in complete submergence in the reagent listed. If there are any questions for specific suitability in a given environment, prototype samples should be tested under actual conditions.
- The prospective user must determine the application of our product in an environment based upon individual characteristics. We offer no guarantee or warranty as to the applicability of this chart for any particular situation as actual conditions of use are beyond our control. In many applications, several corrosive agents are present and reactions among them are not always documented. Any environment can be rather unique necessitating the identification of all possible corrosive elements that may affect the intended enclosure application.

## Chemical Resistance Ratings

### SALTS

Ammonium sulfate . . . . .	A
Potassium ammonia sulfate . . . . .	A
Ammonium bichromate 20% . . . . .	B
Ammonium carbonate 10% . . . . .	B
Ammonium chloride . . . . .	A
Ammonium nitrate . . . . .	B
Ammonium sulfate 10% . . . . .	A
Ammonium acetate . . . . .	C
Aniline sulfate . . . . .	A
Carbonate of barium . . . . .	C
Chloride of barium . . . . .	A
Calcium chloride, saturated sol. . . . .	A
Calcium hypochlorite . . . . .	B
Calcium sulfate . . . . .	A
Copper (II) chloride . . . . .	A
Copper (III) sulfate . . . . .	A
Iron (III) chloride . . . . .	A
Iron (III) nitrate . . . . .	A
Iron (III) sulfate . . . . .	A
Iron (II) chloride . . . . .	A
Iron (II) sulfate . . . . .	A
Magnesium chloride . . . . .	A
Magnesium sulfate . . . . .	A
Mercuric (II) chloride . . . . .	A
Nickel chloride . . . . .	A
Nickel nitrate . . . . .	A

Nickel sulfate . . . . .	A
Potassium carbonate . . . . .	B
Potassium chloride . . . . .	A
Potassium nitrate . . . . .	A
Potassium sulfate . . . . .	A
Nitrate of silver . . . . .	A
Sodium acetate . . . . .	A
Sodium bicarbonate 10% . . . . .	A
Sodium carbonate 10% . . . . .	B
Sodium chloride . . . . .	A
Sodium hypochlorite 5% . . . . .	B
Sodium nitrate . . . . .	A
Zinc chloride . . . . .	A
Sulfate of zinc . . . . .	A

### **ACIDS**

Acetic acid . . . . .	A
Benzoic acid . . . . .	A
Boric acid . . . . .	A
Chromic acid 30% . . . . .	C
Citric acid . . . . .	A
Formic acid 25% . . . . .	B
Hydrochloric acid 10% . . . . .	A
Conc. hydrochloric acid . . . . .	B
Lactic acid 1% . . . . .	A
Nitric acid 5% . . . . .	B
Nitric acid 50% . . . . .	C
Concentrated nitric acid . . . . .	C
Phosphoric acid 25% . . . . .	B
Phosphoric acid 50% . . . . .	C
Sulfuric acid 25% . . . . .	A
Sulfuric acid 50% . . . . .	C
Tartaric acid . . . . .	A
Oxalic acid, saturated solution . . . . .	A

### **BASES**

Ammonia 5% . . . . .	B
Ammonia 25% . . . . .	B
Barium hydroxide 10% . . . . .	C
Calcium hydroxide . . . . .	C
Hydroxide of sodium 5% . . . . .	B
Hydroxide of sodium 20% . . . . .	C

### **OILS AND GREASES**

Fatty acids . . . . .	A
Oleic acid . . . . .	A
Stearic acid . . . . .	A
Lubricating oil . . . . .	A

### **ORGANIC SOLVENTS**

Acetone . . . . .	C
Amyl alcohol . . . . .	B
Methanol . . . . .	B
Ethyl alcohol . . . . .	B
Benzene . . . . .	B
Butyl acetate . . . . .	C
Carbon bisulfide . . . . .	C
Gasoline . . . . .	A
Petroleum . . . . .	A
Naphtha . . . . .	A
Perchloroethylene . . . . .	B
Toluol . . . . .	B
Ethyl acetate . . . . .	B
Dichlorethylene . . . . .	B
Ether . . . . .	B

### **OTHER AGENTS**

Ethylene glycol solution of 0 to 100% . . . . .	A
Glycerine . . . . .	A
Chlordioxide (bleaching agent) . . . . .	C
Saturated chlorinated water . . . . .	A
Formaldehyde 10 to 40% . . . . .	A
Hydrogen peroxide 5 to 10% . . . . .	A
Normal water . . . . .	A
Distilled water . . . . .	A
Sea-water . . . . .	A
Phenol . . . . .	B

### **LIST OF CONVENTIONAL SYMBOLS**

- A** = EXCELLENT
- B** = LIMITED
- C** = POOR

# TECHNICAL SPECIFICATIONS

## Specification for Allied Moulded enclosures

Fiberglass enclosures will be UL listed to UL standard 508, CSA standard 22.2 No. 14-M91. The resin system will be pigmented gray, unless otherwise approved. The resin system will include a flame retardant agent in order to achieve a flammability rating in accordance with UL 94. The enclosure must be hot compression molded from FRP material containing at least 20% fiberglass by weight. Cold molded hand lay up may also be used. The enclosure body will be a one-piece construction and not contain any glued parts.

Junction and Control enclosures may have either screw, hinged or latched covers. All cover screws and hardware;

including hinges, latches and mounting feet are constructed of 304 stainless steel material. All internal metal parts are fabricated using corrosion resistant materials. All gaskets are seated in a molded channel and not glued or poured onto a flat cover surface.

Cabinets and larger style enclosures are always provided with hinged doors. The closure systems on these cabinets will either be a three point latching system or a system of external stainless steel twist-turn type latches. Door closure systems using a single external handle will also have three internal latch points. This handle may be key lockable or pad lockable. When using the alternative closure method of external stainless steel twist turn latches, no more than four latches shall be required to maintain NEMA 4X integrity. At least one latch must have a padlock provision.

## Physical Properties of non-metallic enclosures

<i>Materials Typical Properties</i>	<i>Test Method ASTM</i>	<i>Polyester Fiberglass Compression Molded</i>	<i>Polyester Fiberglass Hand Lay-up</i>
<b><i>Mechanical:</i></b>			
Flexural Strength (PSI)	D 790	13,000-15,000	33,000
Tensile Strength (PSI)	D 638	5,000-6,000	22,000
Tensile Elongation (%)	--	0.5	2.07
Compressive Strength (PSI)	D 695	14,000-16,000	30,000
Impact Strength IZOD Notched (ft lb/in)	D 256	4-7	--
<b><i>Physical</i></b>			
Specific Gravity Molded	D 792	1.95	1.65
Barcol Hardness	--	40	60-65
Water Absorption (%change in wt. 24/168 hr)	D 570	.11/.25	.025
<b><i>Electrical</i></b>			
Arc Resistance (sec)	D 495	180+	--
High Voltage Arc Resistance (120 sec)	--	No ignition	--
Dielectric Strength (volt/mil)	D 149	397/310	--
Volume Resistivity (ohm/cm)	D 257	8.62 x 10 <sup>14</sup>	--
<b><i>Thermal</i></b>			
Service Temperature Range (°F)	--	-40 to 266°	-31 to 266°
Heat Distortion (temp. C degrees, 264 psi load)	D 648	431 F/222 C	428 F/220 C
Flame Resistance	D 635	94V-0	94V-0

## EMI/RFI Specifications

- Standards governing electromagnetic compatibility commonly refer to EMI/RFI, or electromagnetic interference/radio frequency interference.
- Applicable standards used are based on MIL-STD-285 to perform attenuation measurements of EMI/RFI shielded enclosures. The applicable North American standards for the overall assembly, including internal electronics, can vary with the application in which the product is intended to be installed.
- For a complete list of applicable standards, your local testing authority (for example, UL, CSA) should be contacted.
- Such interference is caused by stray voltages and/or currents coupling between electronic systems creating undesirable effects. These undesirable effects can vary between a brief annoyance, to more serious situations, such as a phone interfering with the controls of a machine tool. With the increased emphasis on electronic technology, electromagnetic interference/radio frequency interference is a growing concern.
- Electromagnetic pulses (EMPS) may adversely affect electronic and other control systems. These disturbances may cause erratic operation, and either component failure or a reduction in component life.
- Allied Moulded can provide custom EMI/RFI shielded enclosures to meet many applications. Requests for EMI/RFI shielded enclosures should be directed to the Allied Moulded customer support group.
- Refer to AM specification sheet.

## Properties

Shielding Material . . . . . Silver Plated Copper Binder. . . . . Acrylic Sheet resistance . . . . . <0.120 ohms/square/mil Attenuation . . . . . 75 dB

## Sheet Resistance < 2 1/2 Ohms/Square/mil 1-1.5 Mil Thick

The probes of an ohmmeter shall be placed on any area of the surface and the measured resistance shall not exceed 0.120 ohms.

## Attenuation 75 dB

A measure of the shielding effectiveness shall be confirmed by an EMI/RFI test. Actual test data confirmed an average attenuation of 75 dB over the frequency range from .01 to 1000 Mhz.

## MIL.SPEC>285

MIL.SPEC>285 is used as a general EMI/RFI test guide. A transmitting antenna is placed inside the enclosure and a receiving antenna is positioned outside. The attenuation is the dB difference between the enclosure OPEN and CLOSE FR power levels.

## Weathering/UV Information

Allied Moulded Products' FRP enclosures are hot compression molded. All products of this type, regardless of manufacturer, are exposed to erosion when used outdoors. Due to the combined effects of environmental elements such as rain, wind and UV rays, the polyester matrix is only superficially eroded and as glass fibers become apparent, the degree of the erosion is microscopic. Please note that this superficial erosion has no effect on the physical characteristics of the enclosure whether electrical, mechanical or chemical. The slight erosion can be avoided if a surface coating such as varnish is applied.

Allied Moulded Products' fiberglass enclosures have been successfully used outdoors and tests on field samples support above results.

## Painting Information

Good surface preparation is critical in painting fiberglass enclosures, since the mold release agents must be removed before painting. It is recommend that the surface be roughed by lightly rubbing with sandpaper before applying the proper primer. Degreasing the surface with an organic solvent such as alcohol or other domestic cleaning agent is required. The surface must be clean and dry prior to applying the appropriate primer and top coat (polyurethane or epoxy).

Allied Moulded has the capabilities to custom mold color matches specific to your requirements.

## Heat Dissipation

Information available upon request.