

Technical note: HMI Coating Service

HMI Products like Magelis GTO and Magelis GTU can be conformal coated as a Service by Schneider-Electric.

Conformal coating will extend its life and enhance its environmental performance capabilities.

The Conformal coating modules are made by application of a varnish on the electronic boards.

- This protection , combined with appropriate installation and maintenance, enables Magelis GTO and Magelis GTU series products to be used in moderate chemical environments such as level G2 described in ISA71.04

Four levels of corrosion severity have been established by Standard 71.04 (see TABLE 1) . The optimum severity level is G1-Mild. At this level , corrosion is not a factor in determining equipment reliability. As the corrosive potential of an environment increases, the severity level may be classified as G2 , G3 or GX (most severe). The effects of humidity and temperature are also quantified in this standard. High or variable relative humidity and elevated temperatures may cause the acceleration of corrosion by gaseous contaminants. Relative humidity of less than 50 percent is specified by the Standard.

TABLE I - ISA Classification of reactive environments

| Severity Level | G1 | G2 | G3 | GX | | |
|---|----------------------|-----------------------------------|---------------|----------|----------|--------|
| | Mild | Moderate | Harsh | Severe | | |
| Copper Reactivity Level (in angstroms, Å)* | < 300 | < 1000 | < 2000 | 2000 | | |
| The gas concentration levels shown below are provided for reference purposes. They are believed to approximate the Copper Reactivity Levels stated above, providing the relative humidity is less than 50%. For a given gas concentration, the Severity Level (and Copper Reactivity Level) can be expected to be increased by one level for each 10% increase in relative humidity above 50% or for a relative humidity rate of change greater than 6% per hour. | | | | | | |
| Gas Concentrations (in ppb) | | | | | | |
| | Contaminant | Gas | Concentration | | | |
| Reactive Species ^{1,2} | Group A | H ₂ S | < 3 | < 10 | < 50 | 50 |
| | | SO ₂ , SO ₃ | < 10 | < 100 | < 300 | 300 |
| | | Cl ₂ | < 1 | < 2 | < 10 | 10 |
| | | NO _x | < 50 | < 125 | < 1250 | 1250 |
| | Group B ³ | HF | < 1 | < 2 | < 10 | 10 |
| | | NH ₃ | < 500 | < 10,000 | < 25,000 | 25,000 |
| | | O ₃ | < 2 | < 25 | < 100 | 100 |

We conducted corrosive gas tests in Magelis GTO and GTU Series as follows. (compliant with IEC60068-2)

Corrosive gas test, IEC standard/ 腐食性ガス試験 IEC規格

| 規格 | 試験の種類 | ガスの種類と濃度 (ppm) | | | | 温度および湿度 |
|--|----------|------------------|-----------------|-----------------|-----------------|------------------|
| | | H ₂ S | Cl ₂ | NO ₂ | SO ₂ | |
| ISO10062 Corrosion tests in artificial atmosphere at very low concentration of polluting gas | Method A | — | — | — | 0.5±0.1 | 25±1℃ 75±3%RH |
| | Method B | 0.1±0.1 | — | — | — | |
| | Method C | 0.1±0.1 | — | — | 0.5±0.1 | |
| | Method D | 0.1±0.1 | 0.02±0.005 | — | 0.5±0.1 | |
| IEC60068-2-42 Basic environmental testing procedure Part2: Test Kc: Sulfur dioxide test for contacts and connections(1982) | — | — | — | — | 25.1±5.1 | 25±1℃ 75±3%RH |
| IEC60068-2-43 Basic environmental testing procedure Part2: Test Kd: Hydrogen sulfide test for contacts and connections | 10~15 | — | — | — | — | 25±1℃ 75±3%RH |
| IEC60068-2-60 Environmental testing—Part2: Tests—Test Kc: Flowing mixed gas corrosion test | Method 1 | 0.1±0.02 | — | — | 0.5±0.1 | 25±1℃ 75±3%RH |
| | Method 2 | 0.01±0.005 | 0.01±0.005 | 0.2±0.005 | — | 30±1℃ 70±3%RH |
| | Method 3 | 0.1±0.02 | 0.02±0.005 | 0.2±0.05 | — | 30±1℃ 75±3%RH |
| | Method 4 | 0.01±0.005 | 0.01±0.005 | 0.2±0.02 | 0.2±0.02 | 25±1℃ 75±3%RH |

In order to be compliant with the international standard, test is performed 2 times for 168h each.

The result is PASS ; (No significant corrosion was seen and it was confirmed that they operated normally.)

Based on this result , IEC60082-2-60 Method 4 is G2 level equivalent of ISA71.04 as follows list:

| | A kind and the density of gas | | | | |
|-----------------------|-------------------------------|------------------|-----------------|-----------------|-----------------|
| | unit | H ₂ S | Cl ₂ | NO ₂ | SO ₂ |
| IEC60068-2-60 Method4 | ppm | 0.01 | 0.01 | 0.2 | 0.2 |
| | | ↓ | ↓ | ↓ | ↓ |
| | ppb | 10 | 10 | 200 | 200 |
| ISA71.04 Group A | G1 (ppb) | 3 | 1 | 50 | 10 |
| | G2 (ppb) | 10 | 2 | 125 | 100 |
| | G3 (ppb) | 50 | 10 | 1250 | 300 |
| | GX (ppb) | 50 | 10 | 1250 | 300 |

Notes : For the values listed here , there are neither guarantees for reproducibility nor meaning other than consequence of measurement.