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November 23, 2004

Hardigg Industries Inc.  
Mr. Judd Havrilla  
147 N. Main St.  
P.O. Box 201  
South Deerfield, MA 01373

Our reference: E251075, 04CA44231

Subject: Report relating to the testing of your iM2400 case to the requirements of IEC60529

Dear Judd,

Project 04CA44231 was opened to cover the testing of your iM2400 case to the requirements of IEC60529. The original goal of the project was to demonstrate compliance with the requirements for ratings of IP54 and IP67. The iM2400 was tested to represent iM2200, iM2300 and iM2400 since they are all of similar construction with the iM2400 having the greatest distances between cover clamps.

Samples were subjected to the dust test (with underpressure), described in Clauses 13.4 and 13.5 of IEC60529, as well as water tests to demonstrate protection against Splashing water (Clause 14.2.4), Powerful Water Jets (IPX6, Clause 14.2.6) and Temporary Immersion in water (IPX7, Clause 14.2.7). It should be noted that the Powerful Water Jet test was added so that the Range of Application, as defined in Clause 6, could be upgraded from Restricted to Versatile.

Since no dust entered the case during the dust test, these results indicate compliance of the iM2400 with the requirements of IEC60529 for an IP6X rating. You may also choose to mark the product IP5X if you wish, as the acceptance criteria are less severe.

In addition, no water entered the enclosure during any of the three water tests. These compliant results demonstrate that the iM2400 can be rated from IPX0 to IPX6/X7.

Based on the combined results for the dust and water tests, the iM2400 case can be rated IP54, IP67 or any combination of first and second characteristic numerals from IP00 to IP67 and IP66/IP67 (the proper way to indicate a Versatile rating).

The complete test results are outlined in the appendix to this letter.

The samples have been returned to you.

An independent organization working for a safer world with integrity, precision and knowledge.

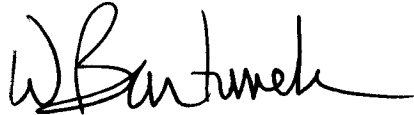


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This letter completes our work under project 04CA44231.

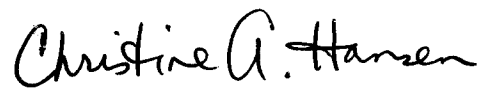
Please let me know if you have any questions concerning the items discussed in this letter or need further assistance.

Sincerely,



Bill Bartunek (ext. 42564)  
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Reviewed by,



Christine Hansen (ext. 42956)  
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Conformity Assessment Services  
Department 3011ANBK

## Appendix A

General - The following tests were conducted in accordance with IEC/EN 60529-1989 on samples of the iM2400 case. These results relate only to the item tested.

IP CODE 6X - PROTECTED AGAINST ACCESS TO HAZARDOUS PARTS WITH A WIRE/ DUST-TIGHT (IEC 529 DATED 89-11, CLAUSES 13.4, 13.6):

### METHOD

A sample of the iM2400 case was supported in the intended mounting position per the client's stated instructions in a closed dust chamber which maintained talcum powder in suspension. The test chamber volume was sufficient to allow uniform distribution of the dust. The effective volume of the test chamber was 2.33m<sup>3</sup>.

The case was considered Category 1. The unit under test was connected to a vacuum pump to maintain the pressure in the case below atmospheric pressure. The connection was made to a specifically constructed opening in the side.

The equipment was exposed to the talcum powder atmosphere until there were at least 80 volume changes where the maximum flow rate was 60 volume changes per hour, the maximum vacuum was 20 mbar and the test duration was 2 hours minimum, 8 hours maximum.

The talcum powder passed through a square meshed sieve having a nominal wire diameter of 0.050 mm and a nominal width between wires of 0.075 mm. The amount of talcum powder installed in the test chamber was 2kg/m<sup>3</sup> of test chamber volume.

## RESULTS

The results of this test comply with the requirements since no talcum powder entered the enclosure.

Sample No.	[Model] [Cat.] No.	Enclosure Category	Internal Enclosure Volume, dm <sup>3</sup>	Flow Rate, dm <sup>3</sup> /h	Test Duration hrs:min	Changes During Test	Vacuum, mbar	Ambient °C	Barometric Pressure mm Hg	Relative Humidity %
1	iM2400	1	26.3	4.81	8	1.464	20	22	744	59

IP CODE X4 - PROTECTED AGAINST WATER SPRAYED FROM ALL DIRECTIONS (IEC 529 DATED 1989-11, CLAUSES 14.2, 14.2.4a, 14.3):

## METHOD

A sample of the iM2400 case was supported by a solid surface. The unit was subjected to spray of water from an oscillating tube as illustrated by figure 4 of IEC 529. The 400 mm radius tube was provided with 25 spray holes over the whole of 180° of the semicircle. The tube was caused to oscillate through 180° each side of vertical. The time of each oscillation was about 12 seconds. The enclosure was mounted on perforated support in the center of the semicircle. The duration of the test was 10 minutes, after the first 5 minutes, the enclosure was turned 90° horizontal angle then the test was continued for the remaining 5 minutes. The flow rate was 1.8 liter/minute ± 5% of water. Water pressure at the nozzle was adjusted to achieve the specified delivery rate. The distance from tube to the tested enclosure surface was maximum 200 mm.

The enclosure under test was not provided with any internal parts.

The temperature of the water did not differ by more than 5K from the temperature of the test specimen.

#### RESULTS

The results of the test were acceptable since no water entered the enclosure.

IP CODE X6 - PROTECTED AGAINST POWERFUL WATER JETS (IEC 529 DATED 1989-11, CLAUSES 14.2, 14.2.6, 14.3)

General - This test was conducted in order for the Range of Application, defined in Clause 6 of IEC/EN 60529-1989, to be upgraded from Restricted to Versatile.

#### METHOD

A sample of im2400 case was supported by a solid surface and placed in its normal upright position. The unit was subjected to a stream of water from a hose with a 12.5 mm internal diameter nozzle delivering 100 liters  $\pm$  5% of water per minute with water pressure at the nozzle adjusted to achieve the specified delivery rate. The core of the substantial stream of water measured approximately 120 mm in diameter at 2.5 m distance from the nozzle. The distance from nozzle to the tested enclosure surface was between 2.5 and 3 meters. The test duration per square meter of the enclosure surface area to be sprayed was 1 minute with a minimum total test duration of 3 minutes.

The enclosure under test was not provided with any internal parts.

The temperature of the water did not differ by more than 5K from the temperature of the test specimen.

#### RESULTS

The results of the test were acceptable since no water entered the enclosure.

TEMPORARY IMMERSION TEST (IEC 529, SUBCLAUSE 14.2.7):

#### METHOD

A sample of the iM2400 case was laid flat on the bottom of a tank designed to be filled with water.

Since the enclosure's height is less than 0.85 m, the lowest point of the enclosure is located 1.0 m below the surface of the water.

After 30 min, the case was removed from the tank, the excess water was removed from the surface and it was opened.

#### RESULTS

The results were found to be acceptable since no water entered the enclosure.