

R E P O R T

IB-09-8-088

about the experimental testing of sealed devices

***Relays type HF115F 012-1HS3BF(555), HF33F 012-ZS3,
HF43F 012-HS2 and HF115F012-1ZS3B***

(Translation)

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Hi/Leh



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Editor

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R E P O R T**IB-09-8-088****about the experimental testing of sealed devices
(Translation)****1 Order**

The company Danfoss A/S Global Services - Approvals in 6430 Nordborg, Denmark, engaged with e-mail of 20 November 2009 the IBExU Institut für Sicherheitstechnik GmbH with the experimental testing of the Relays type HF115F012-1ZS3B, HF33F 012-ZS3, HF43F 012-HS2 and HF115F 012-1HS3BF(555) regarding the proof of type of protection sealed devices according to IEC/EN 60079-15:2005, paragraph 33.5.

2 Test item

Relays

Type	Voltage coil	Nominal voltage	Rated current
HF115F 012-1HS3BF(555)	12 V DC	250 V AC	16 A
HF33F 012-ZS3	30 V DC	250 V AC	3 A
HF43F 012-HS2	30 V DC	250 V AC	3 A
HF115F012-1ZS3B	12 V DC	250 V AC	16 A

Manufacturer: Hongfa
Service temperature range: 0 °C up to +70 °C

3 Test documents

- Order with E-Mail of 20 November 2009
- Order confirmation Hi/Leh 7669/09 of 04 December 2009
- EN 60079-15:2005 (complies with IEC 60079-15:2005, ed. 3)
- 5 pieces Relays Hongfa type HF115F 012-1HS3BF(555) (EX-el 380/09)
- 5 pieces Relays Hongfa type HF33F 012-ZS3 (EX-el 381/09)
- 5 pieces Relays Hongfa type HF43F 012-HS2 (EX-el 382/09)
- 5 pieces Relays Hongfa type HF115F012-1ZS3B (EX-el 383/09)

The test items were delivered to IBExU on 25 November 2009.

4 Test execution

4.1 Objectives

It was the task, to test experimentally the Relays as sealed devices. Basis of the test are the requirements in IEC/EN 60079-15:2005, Paragraph 33.5, for sealed and encapsulated devices.

In the context of these examinations there was not the task to check the constructive requirements for apparatus in type of protection "n" (apparatus for zone 2) for the compliance with IEC/EN 60079-15.

4.2 Description of the test item

The enclosures of the Relays consist of a black plastic cover and a black plastic base. The bottom is closed with a black casting compound; the connections are led to the outside as solder legs.

- Type HF115F 012-1HS3BF(555)



- Type HF43F 012-HS2



- Type HF33F 012-ZS3



- Type HF115F012-1ZS3B



4.3 Requirements in IEC/EN 60079-15:2005

A sealed device is a device, which is so constructed that it cannot be opened during normal service and is sealed effectively to prevent entry of an external atmosphere. The free internal volume shall not exceed 100 cm³.

4.3.1 *Conditioning*

The type test has to be carried out at four test samples at minimum, which have been selected arbitrarily. Before testing, the devices shall be conditioned for 7 days at a temperature at least 10 K higher than the maximum operating temperature of the device or at 80 °C ±2 K, whichever is the greater, followed by 1 day at 10 K lower than the minimum rated service temperature.

4.3.2 *Voltage test*

The terminals of the device are connected together and a sinusoidal voltage is applied for 1 min between the terminals and the outer surface of the device. Metal foil is placed around the outer surface of the case if the latter is made of plastics material.

The r.m.s. value is not less than the maximum peak output voltage of the device or 2 times working voltage plus 1 kV, whichever is the greater. Where the working voltage is 42 V or less, the test voltage is only 500 V.

Compliance is checked as follows: the voltage test shall not produce electrical breakdown or dangerous discharge. No damage of the encapsulation that could impair the type of protection shall be evident at the visual inspection.

4.3.3 *Tests on devices with free space*

The test can be carried out according to three procedures.

Procedure a):

The test samples at an initial temperature of (25 ± 2) °C are suddenly immersed in water at a temperature of (65 ± 2) °C to a depth of 25 mm for 1 min. No bubbles are allowed to emerge from the samples during this test.

Procedure b):

The test samples are immersed to a depth of 75 mm. The air pressure within the enclosure is reduced by the equivalent of 16 kPa (160 mbar). There shall be no evidence of leakage from the interior of the device.

Procedure c):

Any other test that shows that the devices leak at a rate not greater than 10⁻⁵ ml of air per second at a pressure differential of 1 atmosphere.

4.4 Description of the test equipment

The test equipment consists of the following equipment:

Conditioning

The conditioning occurs in conditioning and refrigeration cabinets which are also used for the thermal endurance tests according to EN 60079-0.

Voltage test

A high voltages-test apparatus of type HP-750/6 (company Hippe) is used for the voltage test. The differential current threshold value on the HV-Test apparatus is set on 1 mA.

Test vessel

As test vessel for the procedure b) a glass exsiccator with sufficient volume is used. The exsiccator is filled to 2/3 with distilled water, so that the test samples are immersed to a depth of 75 mm. The exsiccator is air tightly closed with a glass lid with bushing. The required underpressure is produced and kept during the test time with a membrane pump. The water temperature is heated-up to 65 °C and controlled by means of thermocouple.

All used measuring instruments are included in the Quality Management System of IBExU certified according to ISO 9001. They are checked in regular intervals.

4.5 Test procedure and results

The tests were carried out on 5 test samples per type from 04 December 2009 until 08 January 2010.

4.5.1 *Conditioning*

According to the specifications of the IEC/EN 60079-15, 33.5.1 and a maximum service temperature of +70 °C the test samples were conditioned for 7 days at +80 °C , followed by 1 day at -10 °C according to a minimum rated service temperature of 0 °C.

4.5.2 *Voltage test*

The tests were carried out according to the requirements of IEC/EN 60079-15, 33.5.2. All test items were covered with an Aluminium foil before the test and the connection wires are connected together.

Test parameters:

	Switch contact	Relay coil
- Nominal voltage U_N :	250 V AC	12 respectively 30 V DC
- Test voltage ($2 \cdot U_N + 1000$ V):	1500 V AC	
- Test voltage (min. 500 V AC):		500 V AC
- Test duration:	1 min	1 min

Result:

The voltage test produced no electrical breakdowns or dangerous discharges. No damage of the encapsulation was evident at the visual inspection.

4.5.3 Leakage test

The tests were carried out according to the requirements of IEC/EN 60079-15, 33.5.3.2, procedure b).

Test parameters:

- Immersion depth: 75 mm
- Underpressure: 16 kPa
- Test duration: 1 min

Result:

There was no evidence of leakage from the interior of the device at all 20 test samples.

5 Summary

It was noticed with the examinations that the Relays type HF115F 012-1HS3BF(555), HF33F 012-ZS3, HF43F 012-HS2 and HF115F012-1ZS3B of the company Hongfa have the tightness fixed in IEC/EN 60079-15:2005 according to type of protection sealed device.

The assessment of the constructive design of the Relays regarding the compliance with the requirements of IEC/EN 60079-15 for apparatus of the type of protection „n“ (apparatus for zone 2) was not object of these examinations.

The test result refers exclusively to the Relays specified under chapter 2.