

REPORT

IB-09-8-039

about the experimental testing of sealed devices

Relays type NY24W-K and type PCN-124D3MHZ

(Translation)

Freiberg, 17 June 2009

Hi/Leh



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Editor

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REPORT**IB-09-8-039****about the experimental testing of sealed devices**

(Translation)

1 Order

Danfoss A/S Industri Service – Global Approvals in 6430 Nordborg, DENMARK, engaged with e-mail of 30 April 2009 the IBExU Institut für Sicherheitstechnik GmbH with the experimental testing of the Relays type NY24W-K (Takamisawa) and type PCN-124D3MHZ (Tyco) regarding the proof of type of protection sealed devices according to IEC/EN 60079-15:2005, paragraph 33.5.

2 Test item

Relays

Type:	NY24W-K	PCN-124D3MHZ
Manufacturer:	Takamisawa	Tyco
Voltage coil:	24 V DC	24 V DC
Rated current:	5 A	3 A
Service temperature range:	-25 °C up to +70 °C	-25 °C up to +70 °C

3 Test documents

- E-Mail of the customer of 30 April 09
- Order confirmation Hi/Leh 3067/09 of 12 May 2009
- EN 60079-15:2005 (complies with IEC 60079-15:2005, ed. 3)
- 9 pieces of Relays Takamisawa type NY24W-K (EX-el 153/09)
- 9 pieces of Relays Tyco type PCN-124D3MHZ (EX-el 154/09)

The test items were delivered to IBExU on 04 May 2009.

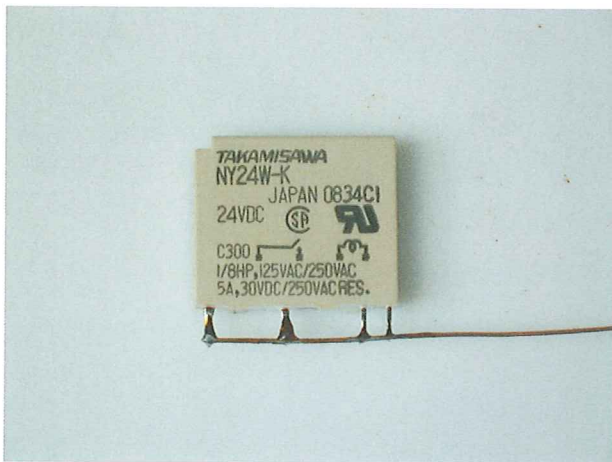
4 Test execution**4.1 Objectives**

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

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.

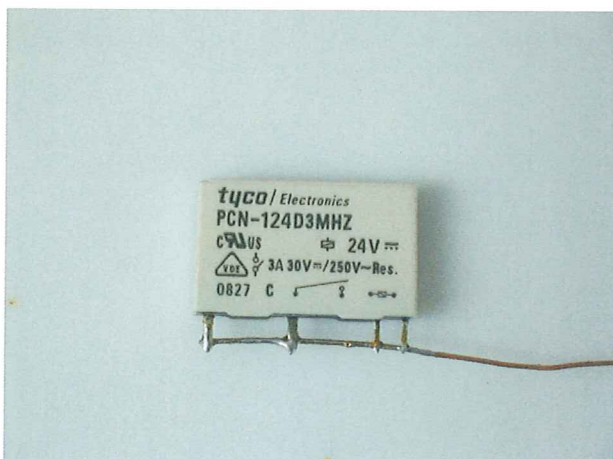
4.2 Description of the test item

- Relay Takamisawa NY24W-K



The enclosure of the Relay type NY24W-K consists of a beige plastic cover and a white plastic base. The underside of the housing is closed with a white casting compound. The relay coil and a contact pair are assembled on the plastic base in the housing inside. In this version the relay functions as closing contact. The switch contacts and the coil contacts are led to the outside as solder legs on the underside of the housing. The free internal volume of the switch chamber is less than 100 cm³ (~0.5 cm³).

- Relay Tyco PCN-124D3MHZ



The enclosure of the Relay type PCN-124D3MHZ consists of a white plastic and a white plastic base. The underside of the housing is closed with a black casting compound. The relay coil and a contact pair are assembled on the plastic base in the housing inside. In this version the relay functions as closing contact. The switch contacts and the coil contacts are led to the outside as solder legs on the underside of the housing. The free internal volume of the switch chamber is less than 100 cm³ (~0.3 cm³).

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, which have been selected arbitrarily. 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 $80\text{ °C} \pm 2\text{ K}$, 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. If the working voltage is 42 V or less, the test voltage does not have to be more than 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 $(25 \pm 2)\text{ °C}$ are suddenly immersed in water at a temperature of $(65 \pm 2)\text{ °C}$ 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 underpressure measured and recorded by differential pressure instrument type GMH 3180-07 of company Greisinger.

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 test at 7 test samples per type was carried out from 20 May until 05 June 2009.

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 -35 °C according to a minimum rated service temperature of -25 °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:

- Nominal voltage U_N : 24 V DC
- Test voltage (mind. 500 V AC): 500 V AC
- Test duration: 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:

- Temperature test sample: 19 °C ±2 K
- Temperature test liquid: 19 °C ±2 K

- Test duration: 2 min
- Immersion depth: 75 mm
- Underpressure: 160 mbar

Result:

At all of the 14 test samples there was no evidence of leakage from the interior of the device.

5 Summary

It was noticed with the examinations that the Relays type NY24W-K and type PCN-124D3MHZ 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.