# TECHNICAL REPORT

# TELETEC CONNECT AB

## ALARM TESTING OF MX-40QZ

REPORT NO. 2011-3137

REVISION NO. 01

NORSK AKKREDITERING
TEST 034

DET NORSKE VERITAS

# TECHNICAL REPORT

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Summary:
One PIR/MW detector, type MX-40QZ, made by Optex Co. Ltd, Japan, has been functionally tested in accordance with the test specifications listed in chapter 1.

The purpose of the testing was to create parts of the documentation needed for type approval by the approval societies.

Test results: See chapter 6, "Summary of test results".

| | |
|---|---|
| Report No.:<br>2011-3137 | Subject Group:<br>R1 |
| Report title:<br>Alarm testing of MX-40QZ | |
| Work carried out by:<br>Raymond Berntzen | |
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**Indexing terms**

| | |
|---|---|
| Key words<br>Type approval tests<br>Alarm systems<br>Intrusion alarm equipment | Service Area<br>Verification<br>Market Sector<br>General Industry |

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# 1 SCOPE OF WORK

One PIR/MW detector, type MX-40QZ, made by Optex Co. Ltd, Japan, has been functionally tested in accordance with parts of the following test specification:

- EN 50131-2-4:2008, Alarm systems – Intrusion and hold-up systems, Part 2-4: Requirements for combined passive infrared and microwave detectors.
- Clauses 6.1 – 6.8 and 6.10
- Security grade 2.

Reference standard:

- EN 50131-1:2006+A1:2009, Alarm systems – Intrusion and hold-up systems, Part 1: System requirements.

Internal procedures:

- ONO-6-ALA-5-i1, Alarm procedure.

The results presented in this report apply to the items tested, and are not necessarily applicable for the whole production series.

The purpose of the testing was to create parts of the documentation needed for type approval by the approval societies.



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# 2 MISCELLANEOUS INFORMATION

## 2.1 Test laboratory

The tests were carried out in the Environmental Test Laboratory at Det Norske Veritas, Høvik, Norway.

Ambient conditions in the laboratory:

| Parameter | Required (IEC 60068-1) | Actual |
|---|---|---|
| Barometric pressure (mbar) | 860 – 1060 | 983 – 1042 |
| Temperature (°C) | 15 – 35 | 18.8 – 23.5 |
| Humidity (% RH) | 25 – 75 | 30 – 38 |

The AC supply at the laboratory is generally configured as an IT network. However, the AC supply mains in the EMC test room (used for radiated emission measurements and immunity to an electrical field) is configured as a TNS network.

For details about the test facilities and instruments used, see Chapter 7.

## 2.2 Laboratory accreditation

NORSK AKKREDITERING, No. TEST 034
P06 – Electromagnetic Compatibility
P17 – Environmental Testing
P18 – Behaviour
P20 – Safety Testing
According to NS-EN ISO/IEC 17025. Valid through 2013-04-22.

## 2.3 Test period

The detectors were received for test 2010-11-15. The tests were carried out between 2010-11-24 and 2011-03-15.

## 2.4 Measurement uncertainty

In stating passed/failed as a result of a test, the measurement uncertainty may affect this statement. For all tests the given results are based on a shared risk principle with respect to the measurement uncertainty.

## 2.5 Attending representatives

No client representative was present during the testing.



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# 3 EQUIPMENT UNDER TEST

## 3.1 Equipment submitted for tests

Overall designation of product:

| EUT sample no. | Make | Type | Date code | PCB marking |
|---|---|---|---|---|
| #1 | Optex Co. Ltd. | MX-40QZ | 1025H | 43-0499-32 |
| #2 | Optex Co. Ltd. | MX-40QZ | 1025H | 43-0499-31 |
| #3 | Optex Co. Ltd. | MX-40QZ | 1043HK | 43-0499-41 |

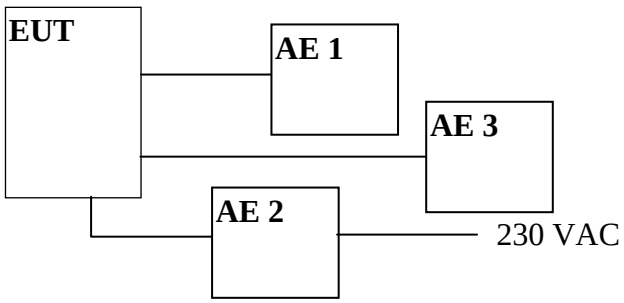
The above will from now on be referred to as EUT (Equipment Under Test). Two samples were provided (EUT sample 1 and 2) and when referring to a specific specimen, it is denoted e.g. EUT sample 1. In addition a modified sample was received (EUT sample 3).

## 3.2 Test configuration

Auxiliary equipment (AE):

| AE no. | Description | Make | Type | Ser. no. | SW ver. / Other info |
|---|---|---|---|---|---|
| 1 | Multimeter | Fluke | 189 | -- | -- |
| 2 | Power supply | Mascot | 719 | -- | -- |
| 3 | Multimeter | Fluke | 189 | -- | -- |

The block diagram describes the setup for normal operation and monitoring of the EUT.



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The following cables interconnected the different units of the EUT, and the EUT and the auxiliary equipment:

| Cable No. | Description | Type | No. of leads | Shielded | Length (m) |
|---|---|---|---|---|---|
| 1 | Multimeter AE 1 – EUT alarm | 0.22 mm² | 2 | No | 1 |
| 2 | Power supply AE 2 – EUT power | 0.22 mm² | 2 | No | 1 |
| 3 | Multimeter AE 3 – EUT tamper | 0.22 mm² | 2 | No | 1 |

Coupling networks and cabling modifications were applied as required to perform the tests according to the relevant standards.

## 3.3 Inputs/outputs tested

Power supply input, alarm output and tamper output.

## 3.4 Modifications

In order to pass the tests, the EUT was modified as described below:

| Mod. No. | Modified during test | Modification |
|---|---|---|
| 1 | Functional testing | The EUT failed the walk tests across and within the detection boundary. The EUT was then modified by increasing the sensitivity. The walk test was then repeated successfully. |
| 2 | Functional testing | Updated manual. |
| 3 | Functional testing | New label. |



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# 4 EVALUATION OF PERFORMANCE DURING TESTING

## 4.1 Performance monitoring

The detector was powered by the AE 2 power supply (12 VDC) during the tests. The detector was monitored using the LEDs on the detectors and AE 1 and AE 3.

Unless otherwise stated in the relevant chapter, the testing was carried out with the following settings:

| | | |
|---|---|---|
| LED ON/OFF | : | ON |
| PULSE COUNT | : | 2 |
| MICROWAVE RANGE | : | LONG |

## 4.2 Functional testing

Separate extensive functional tests were performed. See chapter 5.

By applying a basic detection test according to EN 50131-2-4:2008, section 6.2, an alarm condition was simulated. Registration of the alarm status from the detector was performed by the use of both the multimeter and the LED on the detector.

## 4.3 Acceptance criteria

In order to pass each test, the EUT shall meet the following criteria:

Perform in compliance with the performance criteria stated in the product standard and not generate any unwanted signals.

Not show signs of other malfunctions.



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# 5 FUNCTIONAL TESTING – EN 50131-2-4:2008

The numbers in the below table allocated to each test are the same as the numbers given in the EN 50131-2-4:2008 regulations.

Possible test case verdicts: P = Pass, F = Fail, NA = Not applicable. Placed in the column "Verdict".

| Clause | Requirement - test | Result | Verdict |
|---|---|---|---|
| **6** | **Testing** | | |
| 6.1 | General test conditions | | |
| 6.1.1 | Standard conditions for testing | See chapter 2.1 in this report. | **P** |
| 6.1.2 | General detection testing environment and procedures | Optex installation instructions, No.59-0967-X 1012-15 was used during testing. | |
| 6.1.3 | Testing environment | The detection tests were performed in a large room with wooden walls and floor. The background temperature was 20.2 °C during these tests. | **P** |
| 6.1.4 | Standard walk test target | The SWT was 1.85 m in height and 76 kg with close-fitting clothing. No metallic objects were worn or carried by the SWT. | **P** |
| 6.1.4.1 | Standard walk test target temperature | The temperatures were measured and calculated as specified in the standard. See clause 6.1.4.2.<br>Walk test velocity control was performed using a moving light source guiding system. | **P** |
| 6.1.4.2 | Standard walk test target temperature differential | The average temperature difference between the standard walk test target and the background was 4.2 °C during the walk testing. This was achieved by placing 1 sheet of 0.22 mm HDPE directly over the detector window. | **P** |
| 6.1.5 | Testing procedures | The detector mounting height was 2.0 m and it was connected to the nominal voltage supply by using AE 2. The intrusion signal from the detector was monitored using the LED on the detector and AE 1. | **P** |
| 6.2 | Basic detection test | | |



Reference to part of this report which may lead to misinterpretation is not permissible.

| Clause | Requirement - test | Result | Verdict |
|---|---|---|---|
| 6.2.1 | Basic detection targets (BDT) | A close-in walk test was carried out as the basic detection test. | **P** |
| 6.2.2 | PIR basic detection test | The basic detection test produced an intrusion signal. | **P** |
| 6.2.3 | Microwave basic detection test | The basic detection test produced an intrusion signal. | **P** |
| 6.3 | Walk testing | | |
| 6.3.1 | General walk test method | Security grade 2 was used during testing as specified by the customer. Walk test velocity control was performed using a moving light source guiding system. | |
| 6.3.2 | Verification of detection performance | The detector was set to pulse count 2 and microwave range to long.<br>Walk testing was performed according to the manufacturers claimed performance. | |
| 6.3.3 | Detection across and within the detection boundary | | |
| 6.3.3.1 | Verify detection across the boundary | The detector failed during the verification of the detection across the boundary. With the modification described in chapter 3.4 implemented all points across the boundary in an upright position at 1.0 m/s were detected. | **P** |
| 6.3.3.2 | Verify detection within the boundary | The detector failed during the verification of the detection within the boundary. With the modification described in chapter 3.4 implemented all points within the boundary in an upright position at 0.3 m/s were detected. | **P** |
| 6.3.4 | Verify the high-velocity detection performance | Walk testing at high velocity, 2.0 m/s, in an upright position was detected. | **P** |
| 6.3.5 | Verify the intermittent movement detection performance | Not required for grade 2. | **NA** |
| 6.3.6 | Verify the close-in detection performance | Walking upright 2.0 meters from the detector at 0.4 m/s was detected. | **P** |
| 6.3.7 | Verify the significant reduction of specified range | Not required for grade 2. | **NA** |



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| Clause | Requirement - test | Result | Verdict |
|---|---|---|---|
| 6.4 | Switch-on delay, time interval between signals and indication of detection | The first intrusion message was generated after 14 seconds. The interval between intrusion signals was about 1 second. There was no indication when the LED indicator was disabled. | **P** |
| 6.5 | Self tests | Not required for grade 2. | **NA** |
| 6.6 | Immunity of individual technologies to incorrect operation | | |
| 6.6.1 | Immunity to airflow | The detector did not generate any signal when air was blown over the face of the detector. | **P** |
| 6.6.2 | Immunity to visible and near infrared radiation | The detector did not generate any signal when light was directed on the front window of the detector. | **P** |
| 6.6.3 | Immunity to microwave signal interference by fluorescent lights | The detector did not generate any signal when a fluorescent light was used 0.5 m above and 2.0 m in front of the detector. | **P** |
| 6.7 | Tamper security | | |
| 6.7.1 | Resistance to and detection of unauthorized access to the inside of the detector through covers and existing holes | A screwdriver was needed to open the access cover to the inside of the detector. The tamper detection device operated before access was gained to the inside of the detector. | **P** |
| 6.7.2 | Detection of removal from the mounting surface | Not required for grade 2. | **NA** |
| 6.7.3 | Resistance to or detection of re-orientation of adjustable mountings | No adjustable mountings. | **NA** |
| 6.7.4 | Resistance to magnetic field interference | The presence of the magnet Type 1 did not prevent correct generation of any signal. | **P** |
| 6.7.5 | Detection of detector masking | Not required for grade 2. | **NA** |
| 6.7.6 | Immunity to False Masking Signals | Not required for grade 2. | **NA** |
| 6.8 | Electrical tests | | |



Reference to part of this report which may lead to misinterpretation is not permissible.

| Clause | Requirement - test | Result | Verdict |
|---|---|---|---|
| 6.8.1 | Detector current consumption | The current consumption during alarm with LED on was 14.1 mA at 12 VDC.<br>The current consumption during alarm with LED off was 10.3 mA at 12 VDC.<br>The microwave range setting did not affect the current consumption.<br>The quiescent current consumption was 15.8 mA at 12 VDC.<br>The manufacturer states 12 mA as minimum and 18 mA as maximum current consumption at 12 VDC.<br>The measured currents do not exceed the manufacturer's stated values by more than 20 %. | **P** |
| 6.8.2 | Slow input voltage change and input voltage range limits | An intrusion signal was generated by the basic detection test after the supply voltage was raised from 0 V to 9 V.<br>At 16 V the basic detection test generated an intrusion signal.<br>Fault signal for low voltage is not required for grade 2 = NA. | **P** |
| 6.8.3 | Input voltage ripple | The detectors did not generate any unintentional signals during the voltage ripple test. An intrusion signal was generated by the basic detection test. | **P** |
| 6.8.4 | Input voltage step change | The supply voltage was stepped from 12 V to 16 V and from 12 V to 9 V.<br>No unintentional signals were generated during the tests. | **P** |
| 6.8.5 | Total loss of power supply | Total loss of power supply generated an intrusion signal. | **P** |
| 6.9 | Environmental classification and conditions | Not performed by DNV. | |
| 6.10 | Marking, identification and documentation | | |



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| Clause | Requirement - test | Result | Verdict |
|---|---|---|---|
| 6.10.1 | Marking and/or identification | The label on the EUT received for test did not contain all the required information. A new label was provided. See Picture 7 for new label.<br>From EN 50131-1:<br>- Name of manufacturer or supplier = OK<br>- Type = OK<br>- Date of manufacture or batch number or serial number = year/week on label on PCB = OK<br>- Standard to which the component claims compliance = OK<br>- Security grade = OK<br>- Environmental class = OK | **P** |
| 6.10.2 | Documentation | Optex installation instructions, No.59-0967-X 1012-15 rev. 2.<br>a) options, functions, inputs, signals or messages, indications = OK<br>b) diagram of the claimed detection boundary superimposed upon a scaled 2 m squared grid = OK<br>c) recommended mounting height and changes to the detection boundary = OK<br>d) adjustable controls = OK<br>e) disallowed field adjustable control settings or combination of these = NA<br>f) settings needed to meet the requirements of the standard = OK<br>g) alignment adjustment = NA<br>h) warning not to obscure the field of view = OK<br>i) nominal voltage, maximum and quiescent current consumption = OK<br>j) significant reduction of range = NA for grade 2 | **P** |



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| Clause | Requirement - test | Result | Verdict |
|---|---|---|---|
| | | From EN 50131-1:<br>- Name of manufacturer or supplier = OK<br>- Description = OK<br>- Standard to which the component claims compliance = OK<br>- Certification body = not certified = NA<br>- Security grade = OK<br>- Environmental class = OK | |

# 6 SUMMARY OF TEST RESULTS

With minor modifications (see chapter 3.4) the EUT passed all tests.



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# 7 TEST FACILITIES AND INSTRUMENTS

In addition to the instruments listed under each immunity test the following test facilities and instruments were used during the functional tests:

| Instrument No. | Instrument Description | Make | Model | Serial number |
|---|---|---|---|---|
| 314 | Function Generator | Hewlett Packard | 33120A | US3601 0427 |
| 320 | Power Supply | Mascot | 719 | NA |
| 321 | Fan Heater | ELY | F104 | NA |
| 341 | Rigid steel wire (IP 4X) | Testing Ljubljana | T5-51 | 03/96 |
| 343 | Digital luxmeter | HIOKI | 3423 | 1232947 |
| 528 | Scope probe | Tektronix | P6139A | NA |
| 614 | Flowmeter/trykkmåler | TSI | 8385-M-S | 00080236 |
| 714 | Digital Multimeter | Fluke Corporation | 189 | 80460180 |
| 857 | Digital Multimeter | Fluke Corporation | 189 | 83330174 |
| 1089 | Digital Oscilloscope | Tektronix | TDS 3032B | B031428 |
| 1175 | Digital Multimeter | Fluke Corporation | 189 | 90450104 |
| 1228 | IR thermometer | Fluke | 66 | 26672620503 |
| 1275 | HDPE Infrared Transmissive Plastic Film | Kube electronics | Type 2058a | - |
| 1277 | Measuring tape | Hultafors | Fibar | |
| 1278 | Measuring tape | Biltema | 16221 | |
| 1280 | Lamp for detector testing | | H4 60/55W | |
| 1281 | Panes of glass for detector testing | | | |
| 1282 | Light guide | DNV | - | - |
| 1283 | Control unit for light guide | DNV | | |
| 1284 | Frequency generator for light guide | Rockland | 5100 | 00022 |
| 1291 | Magnet for detector testing, Model 1 | Deutche Techna | ALNiCo D10,2 mm x 40 mm | NA |
| 1380 | Stop watch | Cielo | WT035 | -- |
| 1411 | Fluorescent light for detector testing | Lampex | 590502 | - |



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# 8 APPENDIX I - PICTURES



Reference to part of this report which may lead to misinterpretation is not permissible.

**Picture 1 MX-40QZ**

**Picture 2 MX-40QZ**


**Picture 3 MX-40QZ**


**Picture 4 MX-40QZ**



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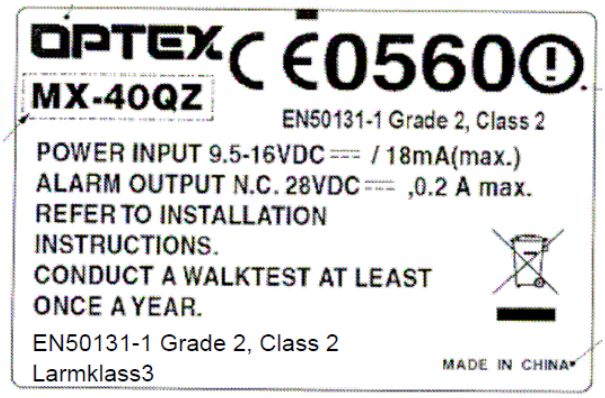
**Picture 5 MX-40QZ**


**Picture 6 MX-40QZ PCB details**




**Picture 7 New label**

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