

RELION® 611 SERIES

# 611 series

## Type Test Certificate







Document ID: 1MRS757466

Issued: 2019-04-10

Revision: C

Product version: 2.0

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# Section 1      General

|                          |                                                                                                                                                                                                                                                                      |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product/type</b>      | Protection and control product series 611                                                                                                                                                                                                                            |
| <b>Result</b>            | The equipment under test has been tested according to the relevant parts of the standards and it has fulfilled the specified requirements in all parts of the type test. No erroneous operation or malfunction occurred, and no electrical damage could be observed. |
| <b>Manufactured by</b>   | ABB Oy<br>Medium Voltage Products,<br>Distribution Automation<br>P.O. Box 699<br>FIN-65100, Vaasa, FINLAND<br>Phone +358 10 22 11<br>Fax +358 10 22 41094                                                                                                            |
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| <b>Date of issue</b>     | 2016-02-22                                                                                                                                                                                                                                                           |
| <b>Approved by</b>       | ABB Oy<br>Distribution Automation                                                                                                                                                                                                                                    |
| <b>Signature</b>         | Product Manager      Quality Manager<br> <br>Gunder Norrbygård      Asko Koiranen           |

|                   |                                                                          |
|-------------------|--------------------------------------------------------------------------|
| <b>References</b> | IEC publications                                                         |
|                   | Application Manual, REB611      1MRS757455, rev. B                       |
|                   | Application Manual, REF611      1MRS757456, rev. B                       |
|                   | Application Manual, REM611      1MRS757457, rev. B                       |
|                   | Application Manual, REU611      1MRS758335, rev. A                       |
|                   | Cyber Security Deployment Guideline, 611 series      1MRS758337, rev. A  |
|                   | Technical Manual, 611 series      1MRS757454, rev. B                     |
|                   | Installation Manual, 611 series      1MRS757452, rev. B                  |
|                   | Operation Manual, 611 series      1MRS757453, rev. B                     |
|                   | Modbus Communication Protocol Manual, 611 series      1MRS757461, rev. B |
|                   | Modbus Point List Manual, REB611      1MRS757462, rev. B                 |
|                   | Modbus Point List Manual, REF611      1MRS757463, rev. B                 |
|                   | Modbus Point List Manual, REM611      1MRS757464, rev. B                 |
|                   | Modbus Point List Manual, REU611      1MRS758336, rev. A                 |

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|                                         |                    |
|-----------------------------------------|--------------------|
| Engineering Manual, 611 series          | 1MRS241255, rev. A |
| IEC 61850 Engineering Guide, 611 series | 1MRS757465, rev. B |
| Type Test Report, 611 series            | 1MRS082020, rev. B |



## Section 2 Test objects

**Table 1:** *Test objects*

| Type designation | Order number for hardware |
|------------------|---------------------------|
| REF611           | REF611HBBBDA1AA21G        |
| REU611           | REU611HBAABA1NN11G        |

The tests are valid also for other products of 611 series Ver.2.0.

**Table 2:** *Basic modules*

| Description                                         | Type number     | PWB version |
|-----------------------------------------------------|-----------------|-------------|
| <b>REF611HBBBDA1AA21G</b>                           |                 |             |
| CPU0007, CPU module                                 | 2RCA031146A0001 | 2RCA024978  |
| DIS0018, LHMI small, IEC, aluminum front cover      | 2RCA027416A0001 | 2RAA005579  |
| BIO0006, 6BI + 3BO, binary I/O module               | 2RCA025502A0001 | 2RCA024986  |
| AIM0017, 4I + 4BI (Io 0.2/1 A), analog input module | 2RCA007128A0002 | 2RAA005401  |
| PSM0003, PS_L/BO, power supply module               | 2RCA025058A0001 | 2RCA024582  |
| COM0031, COM REDY (3*RJ45), communication module    | 2RCA023019A0001 | 2RCA006780  |
| BPL0001, backplane module                           | 2RCA006836A0001 | 2RAA005308  |
| <b>REU611HBAABA1NN11G</b>                           |                 |             |
| CPU0007, CPU module                                 | 2RCA031146A0001 | 2RCA024978  |
| DIS0018, LHMI small, IEC, aluminum front cover      | 2RCA027416A0001 | 2RAA005579  |
| AIM006, AIM 5 VT + 4BI, analog input module         | 2RCA021397A0001 | 2RCA013877  |
| PSM0004, PS_H/BO, power supply module               | 2RCA025059A0001 | 2RCA024582  |
| COM0001, COM IEC (RJ-45), communication module      | 2RAA005844A0004 | 2RAA005402  |
| BPL0001, backplane module                           | 2RCA006836A0001 | 2RAA005308  |



## Section 3 Type tests

**Table 3:** *Inspection of mechanical structure*

| Description                       | Reference                    | Result                                |
|-----------------------------------|------------------------------|---------------------------------------|
| Markings and mechanical structure | IEC 60255-1 and IEC 60255-27 | OK                                    |
| Enclosure class (flush-mounted)   | IEC 60529                    | IP 54 front side                      |
|                                   |                              | IP 20 rear side, connection terminals |
| Clearances and creepage distances | IEC 60255-5 and IEC 60255-27 | OK                                    |

**Table 4:** *Overload and input tests*

| Description (IEC 60255-1 and IEC 60255-27)                                                                                          | Requirement                                                      |                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------|
| Rated current, $I_n$                                                                                                                | 0.2/1 A <sup>1)</sup>                                            | 1/5 A <sup>2)</sup>                                               |
| Thermal withstand capability <ul style="list-style-type: none"> <li>Continuously</li> <li>For 1 s</li> </ul>                        | $4 \times I_n = 4 \text{ A}$<br>$100 \times I_n = 100 \text{ A}$ | $4 \times I_n = 20 \text{ A}$<br>$100 \times I_n = 500 \text{ A}$ |
| Dynamic current withstand <ul style="list-style-type: none"> <li>Half-wave value</li> </ul>                                         | $250 \times I_n = 250 \text{ A}$                                 | $250 \times I_n = 1250 \text{ A}$                                 |
| Input impedance                                                                                                                     | $<100 \text{ m}\Omega$                                           | $<20 \text{ m}\Omega$                                             |
| Rated voltage, $U_n$                                                                                                                | 60...210 V AC                                                    |                                                                   |
| Burden                                                                                                                              | $<0.05 \text{ VA}$                                               |                                                                   |
| Voltage withstand <ul style="list-style-type: none"> <li>Continuously</li> <li>For 10 s</li> </ul>                                  | 240 V AC<br>360 V AC                                             |                                                                   |
| Binary inputs <ul style="list-style-type: none"> <li>Operational range</li> <li>Current drain</li> <li>Power consumption</li> </ul> | 19.2...300.0 V DC<br>1.6...1.9 mA<br>31.0...570.0 mW             |                                                                   |

1) Residual current

2) Residual current and/or phase current

**Table 5:** *Power supply module tests*

| Test                                       | Description                                                                                                                                                                                                                                                                                                                       | Result                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Auxiliary voltage<br>(IEC 60255-1)         |                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                        |
| • PS_H                                     | 38...300 V DC<br>38...264 V AC                                                                                                                                                                                                                                                                                                    | No influence<br>No influence                                                                                                                                                                                                                                                                                                                                           |
| • PS_L                                     | 12...72 V DC                                                                                                                                                                                                                                                                                                                      | No influence                                                                                                                                                                                                                                                                                                                                                           |
| Immunity to voltage dips<br>(IEC 60255-11) |                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                        |
| • PS_H                                     | Residual voltage 0%:<br><br>38...300 V DC<br><br>Residual voltage 40%:<br>38 V DC<br>300 V DC<br>Residual voltage 70%:<br>38 V DC<br>300 V DC<br>Residual voltage 0%:<br>38 V AC<br><br>Residual voltage 0%:<br>48...264 V AC<br><br>Residual voltage 40%:<br>38 V AC<br>264 V AC<br>Residual voltage 70%:<br>38 V AC<br>264 V AC | 0...50 ms, normal operation<br>>50 ms, restart<br><br>200 ms, restart<br>200 ms, normal operation<br><br>500 ms, restart<br>500 ms, normal operation<br><br>0...46 ms, normal operation<br>>46 ms, restart<br><br>0...58 ms, normal operation<br>>58 ms, restart<br><br>200 ms, restart<br>200 ms, normal operation<br><br>500 ms, restart<br>500 ms, normal operation |
| • PS_L                                     | Residual voltage 0%:<br><br>19.2...72 V DC<br><br>Residual voltage 40%:<br>19.2 V DC<br>72 V DC<br>Residual voltage 70%:<br>19.2 V DC<br>72 V DC                                                                                                                                                                                  | 0...50 ms, normal operation<br>>50 ms, restart<br><br>200 ms, restart<br>200 ms, normal operation<br><br>500 ms, normal operation<br>500 ms, normal operation                                                                                                                                                                                                          |
| Table continues on next page               |                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                        |

| Test                                                           | Description                                                            | Result                           |
|----------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------|
| Interruptions of auxiliary power supply voltage (IEC 60255-11) |                                                                        |                                  |
| • PS_H                                                         | 38 V DC, 5 s                                                           | Shutdown and correct restart     |
|                                                                | 300 V DC, 5 s                                                          | Shutdown and correct restart     |
|                                                                | 38 V AC, 5 s                                                           | Shutdown and correct restart     |
|                                                                | 264 V AC, 5 s                                                          | Shutdown and correct restart     |
| • PS_L                                                         | 19.2 V DC, 5 s                                                         | Shutdown and correct restart     |
|                                                                | 72 V DC, 5 s                                                           | Shutdown and correct restart     |
| Ripple in the DC auxiliary voltage (IEC 60255-11)              | Max. 15 %<br>$f = 2 \times f_n$                                        | No influence                     |
| Gradual shutdown and start up (IEC 60255-11)                   | Shut-down ramp: 60 s<br>Power off period: 300 s<br>Start-up ramp: 60 s | Shutdown and correct restart     |
| Reversal of DC power supply polarity (IEC 60255-11)            | Duration 60 s                                                          | Correct operation after the test |
| Power consumption                                              |                                                                        |                                  |
| • PS_H                                                         | V DC                                                                   | ~12.5 W (nominal)/~15.0 W (max.) |
|                                                                | V AC                                                                   | ~3.5 W (nominal)/~16.0 W (max.)  |
| • PS_L                                                         | V DC                                                                   | ~10.2 W (nominal)/~10.8 W (max.) |

Table 6: Contact tests

| Contact type                 | Test (IEC 60255-1)                                                        | Requirement       |
|------------------------------|---------------------------------------------------------------------------|-------------------|
| Trip contacts                | Making capacity                                                           |                   |
|                              | • Continuous carry                                                        | 8 A               |
|                              | • Make and carry 3.0 s                                                    | 15 A              |
|                              | • Make and carry 0.5 s                                                    | 30 A              |
|                              | Breaking capacity when $L/R \leq 40$ ms, two contacts connected in series |                   |
|                              | • 48 V DC                                                                 | 5 A               |
|                              | • 110 V DC                                                                | 3 A               |
|                              | • 220 V DC                                                                | 1 A               |
|                              | Mechanical withstand capability                                           | 10 000 operations |
| Table continues on next page |                                                                           |                   |

| Contact type    | Test (IEC 60255-1)                | Requirement       |
|-----------------|-----------------------------------|-------------------|
| Signal contacts | Making capacity                   |                   |
|                 | • Continuous carry                | 5 A               |
|                 | • Make and carry 3.0 s            | 10 A              |
|                 | • Make and carry 0.5 s            | 15 A              |
|                 | Breaking capacity when L/R ≤40 ms |                   |
|                 | • 48 V DC                         | 1 A               |
|                 | • 110 V DC                        | 0.25 A            |
|                 | • 220 V DC                        | 0.15 A            |
|                 | Mechanical withstand capability   | 10 000 operations |

**Table 7:** *Electromagnetic compatibility tests*

| Description                                     | Type test value                                                                                                                                   | Reference                                                                                                                                                      |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 MHz/100 kHz burst disturbance test            |                                                                                                                                                   | IEC 61000-4-18<br>IEC 60255-26, class III<br>IEEE C37.90.1-2002                                                                                                |
| • Common mode                                   | 2.5 kV                                                                                                                                            |                                                                                                                                                                |
| • Differential mode                             | 2.5 kV                                                                                                                                            |                                                                                                                                                                |
| 3 MHz, 10 MHz and 30 MHz burst disturbance test |                                                                                                                                                   | IEC 61000-4-18<br>IEC 60255-26, class III                                                                                                                      |
| • Common mode                                   | 2.5 kV                                                                                                                                            |                                                                                                                                                                |
| Electrostatic discharge test                    |                                                                                                                                                   | IEC 61000-4-2<br>IEC 60255-26<br>IEEE C37.90.3-2001                                                                                                            |
| • Contact discharge                             | 8 kV                                                                                                                                              |                                                                                                                                                                |
| • Air discharge                                 | 15 kV                                                                                                                                             |                                                                                                                                                                |
| Radio frequency interference test               | 10 V (rms)<br>f = 150 kHz...80 MHz<br><br>10 V/m (rms)<br>f = 80...2700 MHz<br><br>10 V/m<br>f = 900 MHz<br><br>20 V/m (rms)<br>f = 80...1000 MHz | IEC 61000-4-6<br>IEC 60255-26, class III<br><br>IEC 61000-4-3<br>IEC 60255-26, class III<br><br>ENV 50204<br>IEC 60255-26, class III<br><br>IEEE C37.90.2-2004 |
| Fast transient disturbance test                 |                                                                                                                                                   | IEC 61000-4-4<br>IEC 60255-26<br>IEEE C37.90.1-2002                                                                                                            |
| Table continues on next page                    |                                                                                                                                                   |                                                                                                                                                                |

| Description                                                                                                                                                                                   | Type test value                                                                                                                                                  | Reference                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| <ul style="list-style-type: none"> <li>All ports</li> </ul>                                                                                                                                   | 4 kV                                                                                                                                                             |                                                           |
| Surge immunity test <ul style="list-style-type: none"> <li>Communication</li> <li>Other ports</li> </ul>                                                                                      | 1 kV, line-to-earth<br><br>4 kV, line-to-earth<br>2 kV, line-to-line                                                                                             | IEC 61000-4-5<br>IEC 60255-26                             |
| Power frequency (50 Hz) magnetic field immunity test <ul style="list-style-type: none"> <li>Continuous</li> <li>1...3 s</li> </ul>                                                            | 300 A/m<br>1000 A/m                                                                                                                                              | IEC 61000-4-8                                             |
| Pulse magnetic field immunity test                                                                                                                                                            | 1000 A/m<br>6.4/16 µs                                                                                                                                            | IEC 61000-4-9                                             |
| Damped oscillatory magnetic field immunity test <ul style="list-style-type: none"> <li>2 s</li> <li>1 MHz</li> </ul>                                                                          | 100 A/m<br><br>400 transients/s                                                                                                                                  | IEC 61000-4-10                                            |
| Voltage dips and short interruptions                                                                                                                                                          | 30%/10 ms<br>60%/100 ms<br>60%/1000 ms<br>>95%/5000 ms                                                                                                           | IEC 61000-4-11                                            |
| Power frequency immunity test <ul style="list-style-type: none"> <li>Common mode</li> <li>Differential mode</li> </ul>                                                                        | Binary inputs only<br><br>300 V rms<br><br>150 V rms                                                                                                             | IEC 61000-4-16<br>IEC 60255-26, class A                   |
| Conducted common mode disturbances                                                                                                                                                            | 15 Hz...150 kHz<br>Test level 3 (10/1/10 V rms)                                                                                                                  | IEC 61000-4-16                                            |
| Emission tests <ul style="list-style-type: none"> <li>Conducted</li> </ul> 0.15...0.50 MHz<br><br>0.5...30 MHz<br><br><ul style="list-style-type: none"> <li>Radiated</li> </ul> 30...230 MHz | <79 dB (µV) quasi peak<br><66 dB (µV) average<br><br><73 dB (µV) quasi peak<br><60 dB (µV) average<br><br><40 dB (µV/m) quasi peak,<br>measured at 10 m distance | EN 55011, class A<br>IEC 60255-26<br>CISPR 11<br>CISPR 12 |

Table continues on next page

| Description    | Type test value                                                          | Reference |
|----------------|--------------------------------------------------------------------------|-----------|
| 230...1000 MHz | <47 dB (μV/m) quasi peak,<br>measured at 10 m distance                   |           |
| 1...3 GHz      | <76 dB (μV/m) peak<br><56 dB (μV/m) average,<br>measured at 3 m distance |           |
| 3...6 GHz      | <80 dB (μV/m) peak<br><60 dB (μV/m) average,<br>measured at 3 m distance |           |

**Table 8:** *Insulation tests*

| Description                           | Type test value                                                    | Reference    |
|---------------------------------------|--------------------------------------------------------------------|--------------|
| Dielectric tests                      | 2 kV, 50 Hz, 1 min<br>500 V, 50 Hz, 1 min,<br>communication        | IEC 60255-27 |
| Impulse voltage test                  | 5 kV, 1.2/50 μs, 0.5 J<br>1 kV, 1.2/50 μs, 0.5 J,<br>communication | IEC 60255-27 |
| Insulation resistance<br>measurements | >100 MΩ, 500 V DC                                                  | IEC 60255-27 |
| Protective bonding resistance         | <0.1 Ω, 4 A, 60 s                                                  | IEC 60255-27 |

**Table 9:** *Mechanical tests*

| Description                  | Requirement | Reference                                                                         |
|------------------------------|-------------|-----------------------------------------------------------------------------------|
| Vibration tests (sinusoidal) | Class 2     | IEC 60068-2-6 (test Fc)<br>IEC 60255-21-1                                         |
| Shock and bump test          | Class 2     | IEC 60068-2-27 (test Ea shock)<br>IEC 60068-2-29 (test Eb bump)<br>IEC 60255-21-2 |
| Seismic test                 | Class 2     | IEC 60255-21-3                                                                    |



**Table 10:** *Environmental tests*

| Description                | Type test value                                                                                             | Reference                      |
|----------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------|
| Dry heat test              | <ul style="list-style-type: none"> <li>96 h at +55°C</li> <li>16 h at +85°C<sup>1)</sup></li> </ul>         | IEC 60068-2-2                  |
| Dry cold test              | <ul style="list-style-type: none"> <li>96 h at -25°C</li> <li>16 h at -40°C</li> </ul>                      | IEC 60068-2-1                  |
| Damp heat test             | <ul style="list-style-type: none"> <li>6 cycles (12 h + 12 h) at +25°C...+55°C, humidity &gt;93%</li> </ul> | IEC 60068-2-30                 |
| Change of temperature test | <ul style="list-style-type: none"> <li>5 cycles (3 h + 3 h) at -25°C...+55°C</li> </ul>                     | IEC60068-2-14                  |
| Storage test               | <ul style="list-style-type: none"> <li>96 h at -40°C</li> <li>96 h at +85°C</li> </ul>                      | IEC 60068-2-1<br>IEC 60068-2-2 |

1) For relays with an LC communication interface the maximum operating temperature is +70°C







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