

File E480533

Volume 1, section 2

Project 4788113041

January 11, 2018

REPORT

On

RECOGNIZED COMPONENT  
Safety-Related Programmable Components and Software  
for Automatic Electrical Controls  
(XAAZ2, XAAZ8)

STMICROELECTRONICS ROUSSET  
ROUSSET CEDEX, 13106 France

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|  |  |
|--|--|
| <b>TEST REPORT</b><br><b>IEC 60730-1</b><br><b>Automatic electrical controls for household and similar use</b><br><b>Controls using software</b>   |  |
| Report Number.....   | 4788113041   |
| Date of issue.....   | 2018-01-11   |
| Revised date.....  |  |
| Total number of pages .....  | 25   |
| Applicant's name :   | STMICROELECTRONICS ROUSSET   |
| Address .....  | 190 Avenue Celestin Coq - Zone Industrielle<br>Rousset Cedex, 13106 France |
| <b>Test specification:</b>   |  |
| Standard.....  | IEC 60730-1:2013 (Fifth Edition)   |
| Test procedure.....  | UL   |
| Non-standard test method.....  | N/A  |
| <b>Test Report Form No. ....</b>   |  |
| Test Report Form(s) Originator.....  | UL(US)   |
| Master TRF.....  | 2014-05  |
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| <b>General disclaimer:</b>   |  |
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|  |   |
|--|---|
| Test Item description .....                                | Embedded software - (Self-Test Software Library – Safety Control), Class B Software<br>Software modules and Software libraries called STL |
| Trade Mark .....   |    |
| Manufacturer .....   | STMICROELECTRONICS ROUSSET<br>190 Avenue Celestin Coq - Zone Industrielle<br>Rousset Cedex, 13106 France                                  |
| Model/Type reference .....                                 | Software modules and Software libraries intended to be embedded in microcontroller STM8 family.   |
| Ratings .....  | Not applicable  |
| Software module(s) and associated version(s) .....         | STL Rev V2.0.0<br><br>See General Product Information   |
| Testing procedure and testing location:                    |   |
| <input checked="" type="checkbox"/> CB Testing Laboratory: | UL International Italia S.r.l.  |
| Testing location/ address .....                            | Via delle Industrie, 6<br>20061 Carugate (MI) ITALY   |
| <input type="checkbox"/> Associated CB Testing Laboratory: | Not applicable  |
| Testing location/ address .....                            | Not applicable  |
| Testing procedure: TMP/CTF Stage 1                         |   |
| <input type="checkbox"/>                                   | Not applicable  |
| Testing procedure: WMT/CTF Stage 2                         |   |
| <input type="checkbox"/>                                   | Not applicable  |
| Testing procedure: SMT/CTF Stage 3 or 4                    |   |
| <input type="checkbox"/>                                   | Not applicable  |

**List of Attachments (including a total number of pages in each attachment):**

None

**Summary of testing:****Tests performed**

(name of test and test clause):

Not Applicable

**Testing location:**

UL (Italian office) along with remote auditing through teleconferences and document review.

**Summary of compliance with National Differences:****List of countries addressed**

EU Group Differences including the following National Differences:

Austria, Belgium, Bulgaria, Cyprus, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

No differences between EN 60730-1:2011 vs IEC 60730-1:2015 (Fourth Edition) and to IEC 60730-1:2013 (Fifth Edition) in regard to the software requirements.

US and Canada

No differences between UL 60730-1 (Fourth Edition) and CAN/CSA E60730-1:2013 (Fourth Edition) vs IEC 60730-1:2010 (Fourth Edition) and to IEC 60730-1:2013 (Fifth Edition) in regard to the software requirements.

No differences between UL 60335-1 (Fifth Edition) and CAN/CSA-E60335-1:2011 (Fifth Edition) vs IEC 60335-1 (5.1 Edition) in regard to the software requirements.

No major differences between vs IEC 60335-1 (5.1 Edition) vs IEC 60730-1:2010 (Fourth Edition) and to IEC 60730-1:2013 (Fifth Edition) in regard to the software requirements.

The product fulfils the requirements of

- IEC 60730-1:2013 (Fifth Edition) Automatic electrical controls for household and similar use – Part 1: General requirements
- EN 60730-1:2016, Automatic electrical controls for household and similar use – Part 1: General requirements
- UL60730-1 (Fifth Edition) Automatic electrical controls for household and similar use – Part 1: General requirements
- CAN/CSA E60730-1:2015 (Fifth Edition) Automatic electrical controls for household and similar use – Part 1: General requirements

As part of this activity it has been also verified and determined that product fulfils the requirements of

- Annex R of IEC 60335-1, Household and Similar Electrical Appliances, Part 1: General Requirements, Edition 5.2
- ANSI/UL 60335-1, Safety of Household and Similar Electrical Appliances, Fifth Edition, dated October 31, 2016
- CAN/CSA- C22.2 NO.60335-1:2016, Safety of Household and Similar Electrical Appliances, Fifth Edition, dated October 2016
- ANSI/UL 1998, Software in Programmable Components, Third Edition, dated December 18, 2013.

**Copy of marking plate:**

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

Not applicable

| <b>TEST ITEM PARTICULARS:</b>   |  |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
|---|--|--------------------------------------|-------------------------------------|-------------|---|-------------------------------------|-----------------------------------|------|------------------|------------|---------------------------|-----|------------|------------|-----------------|----|------------------|------------------|------------|-----------------|--|------------------------------------|-------------------------------------|-----------|------------------|------------|-----------------|-------|------------|--------------------------------------|------------|
| Manufacturer's specified maximum operating ambient :  | Not applicable to embedded software  |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| <b>POSSIBLE TEST CASE VERDICTS:</b>   |  |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| - test case does not apply to the test object .....   | N/A  |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| - test object does meet the requirement .....   | P (Pass)   |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| - test object does not meet the requirement.....  | F (Fail)   |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| <b>TESTING:</b>   |  |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| Date of receipt of test item.....   | N/A – meeting and remote auditing through teleconferences and document review.     |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| Date (s) of performance of tests.....   | N/A – meeting remote auditing through teleconferences and document review.         |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| <b>GENERAL REMARKS:</b>   |  |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| <p>"(See Enclosure #)" refers to additional information appended to the report.<br/>           "(See appended table)" refers to a table appended to the report.<br/>           This Test Report is only applicable to controls using software. This TRF is to be used in conjunction with the IEC 60730-1, fifth edition Test Report.<br/>           Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>  |  |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| <b>Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60730-1:</b>  |  |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... :  | <input type="checkbox"/> Yes<br><input checked="" type="checkbox"/> Not applicable |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| <b>When differences exist; they shall be identified in the General product information section.</b>   |  |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| Name and address of factory (ies)..... :  | STMICROELECTRONICS ROUSSET   |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| <b>GENERAL PRODUCT INFORMATION:</b>   |  |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| <b>Product Description</b>  |  |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| <p>The subject product is an open-source software library called STL intended to be used within a 8-bit STM8 microcontroller and embedded in the end product application software.</p> <p>8-bit microcontrollers family members, covered by this report are:</p>  |  |                                      |                                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| <table border="1"> <thead> <tr> <th>Main stream</th> <th>Standard line<br/>2.95-5.5V, up to 125°C</th> <th>Value line<br/>2.95-5.5V, up to 85°C</th> <th>Automotive<br/>3-5.5V, up to 150°C</th> </tr> </thead> <tbody> <tr> <td>128K</td> <td>STM8S207xx/208xx</td> <td>STM8S007xx</td> <td>STM8AF61xx/62xx/51xx/52xx</td> </tr> <tr> <td>32K</td> <td>STM8S105xx</td> <td>STM8S005xx</td> <td>STM8AF61xx/62xx</td> </tr> <tr> <td>8K</td> <td>STM8S103xx/903xx</td> <td>STM8S003xx/001xx</td> <td>STM8AF62xx</td> </tr> <tr> <th>Ultra Low Power</th> <th>Standard line<br/>1.8-3.6V, up to 125°C</th> <th>Value line<br/>1.8-3.6V, up to 85°C</th> <th>Automotive<br/>1.8-3.6V, up to 125°C</th> </tr> <tr> <td>32/64K LP</td> <td>STM8L151xx/152xx</td> <td>STM8L052xx</td> <td>STM8AL31xx/3Lxx</td> </tr> <tr> <td>8K LP</td> <td>STM8L101xx</td> <td>STM8L051xx/050xx/001xx<br/>STM8TL5xxx</td> <td>STM8AL3036</td> </tr> </tbody> </table> |  |                                      |                                     | Main stream | Standard line<br>2.95-5.5V, up to 125°C | Value line<br>2.95-5.5V, up to 85°C | Automotive<br>3-5.5V, up to 150°C | 128K | STM8S207xx/208xx | STM8S007xx | STM8AF61xx/62xx/51xx/52xx | 32K | STM8S105xx | STM8S005xx | STM8AF61xx/62xx | 8K | STM8S103xx/903xx | STM8S003xx/001xx | STM8AF62xx | Ultra Low Power | Standard line<br>1.8-3.6V, up to 125°C | Value line<br>1.8-3.6V, up to 85°C | Automotive<br>1.8-3.6V, up to 125°C | 32/64K LP | STM8L151xx/152xx | STM8L052xx | STM8AL31xx/3Lxx | 8K LP | STM8L101xx | STM8L051xx/050xx/001xx<br>STM8TL5xxx | STM8AL3036 |
| Main stream   | Standard line<br>2.95-5.5V, up to 125°C  | Value line<br>2.95-5.5V, up to 85°C  | Automotive<br>3-5.5V, up to 150°C   |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| 128K  | STM8S207xx/208xx   | STM8S007xx                           | STM8AF61xx/62xx/51xx/52xx           |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| 32K   | STM8S105xx   | STM8S005xx                           | STM8AF61xx/62xx                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| 8K  | STM8S103xx/903xx   | STM8S003xx/001xx                     | STM8AF62xx                          |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| Ultra Low Power   | Standard line<br>1.8-3.6V, up to 125°C   | Value line<br>1.8-3.6V, up to 85°C   | Automotive<br>1.8-3.6V, up to 125°C |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| 32/64K LP   | STM8L151xx/152xx   | STM8L052xx                           | STM8AL31xx/3Lxx                     |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |
| 8K LP   | STM8L101xx   | STM8L051xx/050xx/001xx<br>STM8TL5xxx | STM8AL3036                          |             |   |                                     |                                   |      |                  |            |                           |     |            |            |                 |    |                  |                  |            |                 |  |                                    |                                     |           |                  |            |                 |       |            |                                      |            |

The 8-bit microcontrollers family members have the following features:

| Feature / Sub-Family                               | STM8S207/208<br>STM8AF<br>(128K) | STM8S105/005<br>STM8AF<br>(32K) | STM8S103/903/003<br>(8K) | STM8L15x/16x/05x/06<br>x<br>STM8AL<br>(64K & 32K) | STM8L101<br>STM8AL/TL5x<br>(8K) |
|--|----------------------------------|---------------------------------|--------------------------|---|---------------------------------|
| Core   | STM8                             | STM8                            | STM8                     | STM8  | STM8                            |
| Technology [nm]                                    | 130                              | 130                             | 130                      | 130 <sup>(1)</sup>                                | 130 <sup>(1)</sup>              |
| Frequency [MHz]                                    | 24                               | 16                              | 16                       | 16  | 16                              |
| Performance [DMIPS]                                | 20                               | 10                              | 10                       | 16 <sup>(2)</sup>                                 | 16 <sup>(2)</sup>               |
| Flash [KB]   | 128                              | 32                              | 8                        | 64 / 32   | 8                               |
| RAM [kB]   | 6                                | 2                               | 1                        | 4   | 1,5                             |
| Data EEPROM [bytes]                                | 2048                             | 640                             | 128                      | 2048  | -                               |
| Flash & EEPROM ECC <sup>(3)</sup>                  | Y                                | Y                               | Y                        | Y   | Y                               |
| Window watchdog                                    | Y                                | Y                               | Y                        | Y   | N <sup>(4)</sup>                |
| Stack HW roll-over limit at end of the RAM [bytes] | 1024                             | 513                             | 513                      | 513   | 513 <sup>(5)</sup>              |
| Clock system difference                            | HSE-24<br>HSI-16<br>LSI ~128kHz  | HSE-16<br>HSI-16<br>LSI ~128kHz | HSI-16<br>LSI ~128kHz    | HSE-16<br>LSE-32,768KHz<br>HSI-16, LSI ~38kHz     | HSI-16<br>LSI ~38kHz            |
| Clock cross reference measurement                  | TIM3/Ch1                         | TIM3/Ch1                        | TIM1/Ch1                 | TIM2/Ch1  | TIM2/Ch1                        |

1) Low power technology

2) CISC MIPS

3) Both embedded Flash and EEPROM feature internal single bit correction, hidden for user

4) WWDG is available at STM8STL15x devices only

5) Stack is not limited for STM8TL15x devices; there is rollover (due to over/underflow) only if the stack overlaps the 4 Kbytes

The STL is called upon power-on initialization and/or periodically within the application to achieve the periodic self-test safety requirements in Annex H.11.12 of IEC/UL/CSA 60730-1, Software Class B:

- CPU registers test
- RAM functional check
- Flash CRC integrity check
- System clock monitoring
- Stack overflow monitoring.

The functions investigated in this report include self-tests of the following microelectronic hardware components:

- CPU Registers
- CPU Program Counter
- Clock
- Variable Memory (RAM)
- Invariable Memory (FLASH memory)

In case of fail detection, FailSafe() routine is called (defined in stm8\_stl\_startup.c file).

By default, there is no specific handling inside the procedure except for debug support and an empty loop waiting for a watchdog reset (the reset can be prevented in debug mode). It is fully upon user responsibility to build up a handler inside this routine and perform all the necessary steps to bring the application in a safe state, while taking a decision on the next cycle in dependency of the severity of the problem found.

The STL consists of the following files:

| STL                   | Structure of the common STL packages |                                 |
|-----------------------|--------------------------------------|---------------------------------|
|                       | File                                 | Description                     |
| Start-up test         | stm8_stl_startup.c                   | Startup STL flow control        |
|                       | stm8_stl_clockstart.c                | Clock system initial test       |
| Run time test         | stm8_stl_main.c                      | Run time STL flow control       |
|                       | stm8_stl_crcrun.c                    | Partial Flash test              |
|                       | stm8_stl_clockrun.c.c                | Partial clock test              |
|                       | stm8_stl_transpRam.c                 | Partial RAM test                |
| Headers               | stm8_stl_classB_var.h                | Definition of Class B variables |
|                       | stm8_stl_lib.h                       | Overall STL includes control    |
|                       | stm8_stl_startup.h                   | Initial process STL header      |
|                       | stm8_stl_main.h                      | Run time process STL header     |
|                       | stm8_stl_param.h                     | STL configuration file          |
|                       | stm8_stl_clockstart.h                | Start-up clock test header      |
|                       | stm8_stl_clockrun.h                  | Run time clock test header      |
|                       | stm8_stl_cpu.h                       | CPU test header                 |
|                       | stm8_stl_crc16Run.h                  | Flash test header               |
|                       | stm8_stl_transpRam.h                 | Run time RAM test header        |
| stm8_stl_fullRam_Mc.h | Start-up RAM test header             |                                 |

| STL    | Header | Common STL procedures     |                          |
|--------|--------|---------------------------|--------------------------|
|        |        | File                      | Description              |
| Source | Cosmic | _classb_cksumXXX.s        | Start-up CRC calculation |
|        |        | _block_cksumXXX.s         | Run time CRC calculation |
|        |        | stm8_stl_cpustart_CSMC.s  | Start-up CPU test        |
|        |        | stm8_stl_cpurun_CSMC.s    | Run time CPU test        |
|        |        | stm8_stl_fullRam_CSMC.s   | Start-up RAM test        |
|        | IAR    | stm8_stl_cpustart_IAR.asm | Start-up CPU test        |
|        |        | stm8_stl_cpurun_IAR.asm   | Run time CPU test        |
|        |        | stm8_stl_fullRam_IAR.asm  | Start-up RAM test        |
|        |        | stm8_stl_crc16_IAR.c      | Start-up CRC calculation |
|        |        |                           |                          |

#### Model Differences –

All 8-bit ARM microcontroller family members use the same STL V2.0.0 package, as indicated in the table above.

Furthermore due to the features of the specific 8-bit microcontroller even if it is not part of the STL, the microcontroller allows:

- ECC on Non-volatile Memory

#### Additional application considerations – (Considerations used to test a component) –

Conditions of Acceptability - When installed in the final use equipment, etc., the following are among the



considerations to be made:

1. The end product control design shall take into consideration in the end product Risk Analysis the information provided in Application note AN3181 to ensure proper use of the STL library.
2. All the evaluation tools (LEDs, UART verbose flow, LCDs) and associated stuff are not matter of this investigation and certification. It serves and is intended for debugging, development and demonstration purpose exclusively. It shall be removed by proper conditional compilation setting applied at the final compilation of the end use application. For more details see associated application note AN3181.
3. This investigation was analytical in nature as no tests were conducted and environmental conditions were not considered. All testing, including required environmental and EMC tests, shall be conducted with the end product control/system evaluation.
4. The STL software library features described in this report have been investigated for use in end use applications that are required to meet software/control Class B requirements per H.11.12 of IEC/UL/CSA 60730-1. It is the responsibility of the end product software or other external components provided in the end product control design to be used in conjunction with this software libraries to annunciate faults and ensure the safety of the overall end application.
5. In case of STL fail detection, the FailSafe() routine is called. By default, there is no specific handling inside the procedure except for debug support and an empty loop waiting for a watchdog reset. It is fully upon user responsibility to build up a handler inside this routine and perform all the necessary steps to bring the application in a safe state.
6. Software fault/error detection time shall be determined and judged as part of the end product control/system evaluation, since it depends on the end use design and execution periodicity of the self-test.
7. Mitigation mechanisms for microelectronic hardware faults specified in Table H.1 that are not covered by this report shall be provided in the end product software and/or hardware.
8. The software library features described in this report have been evaluated by means of:  
For STL V2.0.0, IAR Embedded Workbench® for STM8 IDE (EWSTM8™) with IAR C/C++ Compiler™ version 3.10.1 and ST Visual Develop (STVD) version 4.3.11 with Cosmic STM8 C compiler 32 K version 4.4.6.  
Considerations shall be given in the end use control/system evaluation to review the used compiler. Further testing and evaluation may be needed in case of different compilers.

|        |   |   |     |
|--------|---|---|-----|
| H.6    | Classification, additions   |   | P   |
| H.6.18 | Class of control function (A, B, C)..... :  | B   | —   |
| H.7    | Information in addition to Table 1 provided:  |   | P   |
|        | 66 - Software sequence documentation; clause: H.11.12.2.9; method: X..... :   | Open source code<br>Application note AN3181   | P   |
|        | 67 - Program documentation; clause: H.11.12.2.9, H.11.12.2.12; method: X..... :   | Open source code<br>Application note AN3181   | P   |
|        | 68 - Software fault analysis; clause: H.11.12, H.27.1.1.4; method: X..... :   | Refer to appended table for list of microelectronic component addressed by the STL along with related failure/error<br>Verified by inspection   | P   |
|        | 69 - Software class(es) and structure; clause: H.11.12.2, H.11.12.3, H.27.1.2.2.1, H.27.1.2.3.1; method: D..... :                       | Class B<br>Structure depends on the end use application   | P   |
|        | 70 - Analytical measures and fault/error control techniques employed; clause: H.11.12.1.2, H.11.12.2.2, H.11.12.2.4; method: X..... :   | Refer to appended table for list of microelectronic component addressed by the STL along with related failure/error   | P   |
|        | 71 - Software fault/error detection time(s) for controls with software Classes B or C; clause: H.2.17.10, H.11.12.2.6; method: X..... : | Overall RAM and FLASH run time test duration depends on repetition frequency of the steps, their sizes and size of memory area under test.<br>It depends on the end use application.<br>See also, Execution timing measurement and control, in Application note AN3181 for further manufacturer declaration | P   |
|        | 72 - Control response(s) in case of detected fault/error; clause: H.11.12.2.7; method: X..... :   | In case of fail detection, FailSafe() routine is called (defined in stm8_stl_startup.c file). Program stays in endless loop waiting for watchdog reset alternatively user can build up a handler inside this routine.   | P   |
|        | 93 – Maximum number of reset actions within a time period; clause H.11.12.4.3.6, H.11.12.4.3.4; method: D..... :                        | Not Applicable  | N/A |
|        | 94 – Number of remote reset actions; clause H.17.1.4.3; method: X..... :  | Not Applicable  | N/A |

|             |  |   |     |
|-------------|--|---|-----|
|             | m – Controls with software classes B or C had information provided for safety-related segments of the software. Information on the non-safety related segments was sufficient to establish that they did not influence safety-related segments ..... | STL library is class B software   | N/A |
|             | n – Software sequence was documented and, together with the operating sequence, included a description of the control system philosophy, the control flow, data flow and the timings .....   | Application note AN3181   | P   |
|             | o - Safety-related data and safety-related segments of the software sequence, the malfunction of which could result in non-compliance with the requirements of Clauses 17, 25, 26 and 27, are identified .....                                       | STL are designed to embed mechanisms to mitigate microelectronic failure/error in the end use application                     | P   |
|             | – Included the operating sequence.....   | STL has its own control flow mechanism  | P   |
|             | – Software fault analysis was related to the hardware fault analysis in Clause H.27.....   | STL are linked to specific STM8 family members, as mentioned in product description   | P   |
|             | q - Programming documentation was supplied in a programming design language declared by the manufacturer.....  | Written in assembly and C language<br>Startup and runtime CPU and RAM tests written in Assembler for IAR and Cosmic compilers | P   |
|             | r – Different software classes applied to different control functions .....  | Not Applicable  | N/A |
|             | s - Measures declared are chosen by manufacturer from the requirements of Clauses H.11.12.1.2 to H.11.12.2.4 inclusive .....   | See appended table  | P   |
| H.11        | Constructional requirements  |   | P   |
| H.11.12     | Controls using software  |   | P   |
|             | Controls using software were so constructed that the software did not impair control compliance with the requirements of this standard   |   | P   |
| H.11.12.1   | Requirements for the architecture  |   | P   |
| H.11.12.1.1 | Control functions with software class B or C use measures to control and avoid software-related faults/errors in safety-related data and safety-related segments of the software, as detailed in H.11.12.1.2 to H.11.12.3 inclusive                  | Software Class B; verified by inspection based on manufacturer provided document, application note                            | P   |
| H.11.12.1.2 | Control functions with software class C have one of the following structures:  |   | N/A |
|             | – single channel with periodic self-test and monitoring (H.2.16.7)   | Not Applicable  | N/A |
|             | – dual channel (homogenous) with comparison (H.2.16.3)   | Not Applicable  | N/A |

|             |  |   |     |
|-------------|--|---|-----|
|             | – dual channel (diverse) with comparison (H.2.16.2)  | Not Applicable  | N/A |
|             | Control functions with software class B have one of the following structures:  |   | P   |
|             | – single channel with functional test (H.2.16.5)   | It depends on the end use application   | P   |
|             | – single channel with periodic self-test (H.2.16.6)  | It depends on the end use application   | P   |
|             | – dual channel without comparison (H.2.16.1)   | It depends on the end use application   | P   |
| H.11.12.1.3 | Other structure permitted with equivalent level of safety to those in H.11.12.1.2.....:  | Not Applicable  | N/A |
| H.11.12.2   | Measures to control faults/errors  |   | P   |
| H.11.12.2.1 | Redundant memory with comparison provided on two areas of the same component: data stored in different formats   | Used for safety critical (“Class B”) Variables only   | P   |
| H.11.12.2.2 | Software class C using dual channel structures with comparison: additional fault/error detection means   | Not Applicable  | N/A |
| H.11.12.2.3 | Software class B or C: means for recognition and control of errors in transmission to external safety-related data paths: Means took into account errors of data, addressing, transmission timing and sequence of protocol | Not Applicable  | N/A |
| H.11.12.2.4 | Software class B or C: within the control, measures are taken to address the fault/errors in safety-related segments and data indicated in Table H.1 and identified in Table 1 requirement 68.                             | See appended table  | P   |
| H.11.12.2.5 | Measures others than those specified in H.11.12.2.4 utilized to satisfy the requirements listed in Table H.1   | Not Applicable  | N/A |
| H.11.12.2.6 | Software fault/error detection:  |   | P   |
|             | – occur not later than declared time(s), Table 1, requirement 71   | Overall RAM and FLASH run time test duration depends on repetition frequency of the steps, their sizes and size of memory area under test.<br>It depends on the end use application.<br>See also, Execution timing measurement and control, in Application note AN3181 for further manufacturer declaration | P   |
|             | – acceptability of declared time(s): evaluated during fault analysis of the control  | It depends on the end use application   | P   |
| H.11.12.2.7 | For controls with functions, classified as Class B or C, detection of fault/error:   |   | P   |

|                 |   |   |     |
|-----------------|---|---|-----|
|                 | – results in the response declared in Table 1, requirement 72   | In case of fail detection, FailSafe() routine is called (defined in stm8_stl_startup.c file). Program stays in endless loop waiting for watchdog reset alternatively user can build up a handler inside this routine. | P   |
|                 | – for Class C: independent means capable of performing this response provided   | Not Applicable  | N/A |
| H.11.12.2.8     | Class C, dual channel structure, loss of dual channel capability: deemed to be an error   | Not Applicable  | N/A |
| H.11.12.2.9     | Software referenced:  |   | P   |
|                 | – to relevant parts of the operating sequence   | Application note AN3181   | P   |
|                 | – to the associated hardware functions  | Application note AN3181   | P   |
| H.11.12.2.10    | Labels used for memory locations are unique   | Addressed by the compiler   | P   |
| H.11.12.2.11    | Software protected from user alteration of safety-related segments and data   | Open code   | N/A |
| H.11.12.2.12    | Software and safety-related hardware under its control is initialized to and terminates at a declared state, Table 1, requirement 66 .....  | Refer to H.7 requirement 66   | P   |
| H.11.12.3       | Measures to avoid errors  |   | P   |
| H.11.12.3.1     | For controls with software class B or C the measures shown in Figure H.1 to avoid systematic faults are applied   | Verified by inspection based on manufacturer documents and relevant application note. See appended table  | P   |
|                 | Other methods utilized that incorporate disciplined and structured processes including design and test phases   | Not Applicable  | N/A |
| H.11.12.3.2     | Specification   |   | P   |
| H.11.12.3.2.1   | Software safety requirements  |   | P   |
| H.11.12.3.2.1.1 | The specification of the software safety requirements includes:   |   | P   |
|                 | <ul style="list-style-type: none"> <li>A description of each safety related function to be implemented, including its response time(s): <ul style="list-style-type: none"> <li>- functions related to the application including their related software classes</li> <li>- functions related to the detection, annunciation and management of software or hardware faults</li> </ul> </li> </ul> | Verified by inspection  | P   |
|                 | <ul style="list-style-type: none"> <li>A description of interfaces between software and hardware</li> </ul>   | Application note AN3181   | P   |

|                 |   |   |     |
|-----------------|---|---|-----|
|                 | <ul style="list-style-type: none"> <li>A description of interfaces between any safety and non-safety related functions</li> </ul>   | Not Applicable  | N/A |
| H.11.12.3.2.2   | Software architecture   |   | P   |
| H.11.12.3.2.2.1 | The description of software architecture include the following aspects:   |   | P   |
|                 | <ul style="list-style-type: none"> <li>Techniques and measures to control software faults/errors (refer to H.11.12.2)</li> </ul>  | Application note AN3181   | P   |
|                 | <ul style="list-style-type: none"> <li>Interactions between hardware and software</li> </ul>  | Application note AN3181   | P   |
|                 | <ul style="list-style-type: none"> <li>Partitioning into modules and their allocation to the specified safety functions</li> </ul>  | Application note AN3181   | P   |
|                 | <ul style="list-style-type: none"> <li>Hierarchy and call structure of the modules (control flow)</li> </ul>  | Application note AN3181   | P   |
|                 | <ul style="list-style-type: none"> <li>Interrupt handling</li> </ul>  | May be indirectly addressed via timing and flow control<br>Shall be reviewed in the end use application | N/A |
|                 | <ul style="list-style-type: none"> <li>Data flow and restrictions on data access</li> </ul>   | Application note AN3181   | P   |
|                 | <ul style="list-style-type: none"> <li>Architecture and storage of data</li> </ul>  | Application note AN3181   | P   |
|                 | <ul style="list-style-type: none"> <li>Time based dependencies of sequences and data</li> </ul>   | Indirectly addressed via timing and flow control  | P   |
| H.11.12.3.2.2.2 | The architecture specification is verified against the specification of the software safety requirements by static analysis   | Verified by inspection  | P   |
| H.11.12.3.2.3   | Module design and coding  |   | P   |
| H.11.12.3.2.3.1 | Software is suitably refined into modules. Software module design and coding are implemented in a way that is traceable to the software architecture and requirements. The module design specified: | Verified by inspection of source code   | P   |
|                 | – function(s)   |   | P   |
|                 | – interfaces to other modules   |   | P   |
|                 | – data  |   | P   |
| H.11.12.3.2.3.2 | Software code is structured   | Verified by inspection of source code   | P   |
| H.11.12.3.2.3.3 | Coded software is verified against the module specification, and the module specification is verified against the architecture specification by static analysis                                     | Verified by inspection of source code   | P   |

|                     |  |  |   |
|---------------------|--|--|---|
| H.11.12.3.2<br>.4   | Design and coding standards  | Verified by inspection of submitted manufacturer documents           | P |
|                     | Program design and coding standards is used during software design and maintenance   | Verified by inspection   | P |
|                     | Coding standards :   | Verified by inspection   | — |
|                     | – specified programming practice   | Verified by inspection   | P |
|                     | – proscribed unsafe language features  | Verified by inspection   | P |
|                     | – specify procedures for source code documentation   | Verified by inspection   | P |
|                     | – specify data naming conventions  | Verified by inspection   | P |
| H.11.12.3.3         | Testing  |  | P |
| H.11.12.3.3<br>.1   | Module design (software system design, software module design and coding)  |  | P |
| H.11.12.3.3<br>.1.1 | A test concept with suitable test cases is defined based on the module design specification.   | Verified by inspection of manufacturer provided test report document | P |
| H.11.12.3.3<br>.1.2 | Each software module is tested as specified within the test concept  | Verified by inspection of manufacturer provided test report document | P |
| H.11.12.3.3<br>.1.3 | Test cases, test data and test results are documented  | Verified by inspection of manufacturer provided test report document | P |
| H.11.12.3.3<br>.1.4 | Code verification of a software module by static means includes such techniques as software inspections, walk-throughs, static analysis and formal proof | Verified by inspection of manufacturer provided test report document | P |
|                     | Code verification of a software module by dynamic means includes functional testing, white-box testing and statistical testing                           | Verified by inspection of manufacturer provided test report document | P |
| H.11.12.3.3<br>.2   | Software integration testing   |  | P |
| H.11.12.3.3<br>.2.1 | A test concept with suitable test cases is defined based on the architecture design specification  | Verified by inspection of manufacturer provided test report document | P |
| H.11.12.3.3<br>.2.2 | The software is tested as specified within the test concept  | Verified by inspection of manufacturer provided test report document | P |
| H.11.12.3.3<br>.2.3 | Test cases, test data and test results are documented  | Verified by inspection of manufacturer provided test report document | P |
| H.11.12.3.3<br>.3   | Software validation  |  | P |

|                     |  |  |     |
|---------------------|--|--|-----|
| H.11.12.3.3<br>.3.1 | A validation concept with suitable test cases is defined based on the software safety requirements specification   | Addressed via module testing and integration testing                 | P   |
| H.11.12.3.3<br>.3.2 | The software is validated with reference to the requirements of the software safety requirements specification as specified within the validation concept                  |  | P   |
|                     | The software is exercised by simulation or stimulation of:   |  | P   |
|                     | <ul style="list-style-type: none"> <li>input signals present during normal operation</li> </ul>  | Not Applicable   | N/A |
|                     | <ul style="list-style-type: none"> <li>anticipated occurrences</li> </ul>  | Anticipated failure/error  | P   |
|                     | <ul style="list-style-type: none"> <li>undesired conditions requiring system action</li> </ul>   | Anticipated failure/error  | P   |
| H.11.12.3.3<br>.3.4 | Test cases, test data and test results are documented  |  | P   |
| H.11.12.3.4         | Other Items  |  | P   |
| H.11.12.3.4<br>.1   | Equipment used for software design, verification and maintenance was qualified appropriately and demonstrated to be suitable for purpose in manifold applications          | Verified by inspection of manufacturer provided test report document | P   |
| H.11.12.3.4<br>.2   | Management of software versions: All versions are uniquely identified for traceability   | STL versions:<br>V2.0.0  | P   |
| H.11.12.3.4<br>.3   | Software modification  |  | P   |
| H.11.12.3.4<br>.3.1 | Software modifications are based on a modification request which details the following:  | Verified by inspection of manufacturer provided test report document | P   |
|                     | <ul style="list-style-type: none"> <li>the hazards which may be affected</li> </ul>  |  | P   |
|                     | <ul style="list-style-type: none"> <li>the proposed change</li> </ul>  |  | P   |
|                     | <ul style="list-style-type: none"> <li>the reasons for change</li> </ul>   |  | P   |
| H.11.12.3.4<br>.3.2 | An analysis is carried out to determine the impact of the proposed modification on functional safety.  | Verified by inspection   | P   |
| H.11.12.3.4<br>.3.3 | A detailed specification for the modification is generated including the necessary activities for verification and validation, such as a definition of suitable test cases | Verified by inspection   | P   |
| H.11.12.3.4<br>.3.4 | The modification is carried out as planned   | Verified by inspection   | P   |
| H.11.12.3.4<br>.3.5 | The assessment of the modification is carried out based on the specified verification and validation activities.   | Verified by inspection   | P   |



|  |   |  |     |
|--|---|--|-----|
| H.11.12.3.4<br>.3.6  | All details of modification activities are documented   | Verified by inspection                                 | P   |
| H.11.12.3.5  | For class C control functions: One of the combinations (a-p) of analytical measures given in the columns of table H.9 is used during hardware development .....                         | Not Applicable   | N/A |
| H.11.12.4  | Remotely actuated control functions   |  | N/A |
| All section H.11.12.4, removed, since it is not applicable |   |  |     |
| H.27.1.2   | Protection against internal faults to ensure functional safety  |  | P   |
| H.27.1.2.1   | Design and construction requirements  |  | P   |
| H.27.1.2.1.1   | Fault avoidance and fault tolerance   |  | P   |
|  | Controls incorporating control functions of class B or C are designed according to H.27.1.2 taking into account the failure modes of Cl. H.11.12 for software                           |  | P   |
|  | Systematic errors are avoided   | See H.11.12.3  | P   |
|  | Random faults are dealt with by a proper system configuration   | See H.11.12.3  | P   |
|  | Functional analysis of the application resulted in a structured design with:  | See H.6, H.7, and H.11.12                              | P   |
|  | - Control flow  | See H.6, H.7, and H.11.12                              | P   |
|  | - Data flow   | See H.6, H.7, and H.11.12                              | P   |
|  | - Time related functions required by the application  | See H.6, H.7, and H.11.12                              | P   |
|  | For custom-chips special attention was made to minimize systematic errors   | Not Applicable   | N/A |
|  | System configuration was failsafe or:   | Structure to be determined by end use and application. | N/A |
|  | Incorporated components with direct safety-critical functions guarded by safeguards that cause a completely independent safety shut-down in accordance to H.11.12 software class B or C | Structure to be determined by end use and application. | N/A |
|  | - safeguards are built into hardware and,   | Structure to be determined by end use and application. | N/A |
|  | - safeguards are supplemented by software   | Structure to be determined by end use and application. | N/A |
|  | Time slot monitoring is sensitive to both an upper and a lower limit of the time interval.  | IWDG and WWDG provided                                 | P   |
|  | Faults resulting in a shift of the upper and/or lower limit are taken into account.   | Where applicable to STL                                | P   |

|              |  |   |     |
|--------------|--|---|-----|
|              | In a class C control function when a single fault in a primary safeguard can render the safeguard inoperative, a secondary safeguard is provided   | Not Applicable  | N/A |
|              | The reaction time of the secondary safeguard is in accordance with Clause H.27.1.2.3.  | Not Applicable  | N/A |
| H.27.1.2.1.2 | Documentation  |   | P   |
|              | The documentation was based on H.11.12.3.2   | See H.11.12.3.2   | P   |
|              | The functional analysis of the control and the safety related programs under its control are documented in a clear hierarchical way in accordance with the safety philosophy and the program requirements.   | See H.11.12.3.2   | P   |
|              | Documentation provided for assessment included:  | See H.11.12.3.2   | —   |
|              | <ul style="list-style-type: none"> <li>A description of the system philosophy, the control flow, data flow and timings.</li> </ul>   | See H.11.12.3.2   | P   |
|              | <ul style="list-style-type: none"> <li>A clear description of the safety philosophy of the system with all safeguards and safety functions clearly indicated. Sufficient design information is provided to enable the safety functions or safeguards to be assessed</li> </ul> | See H.11.12.3.2   | P   |
|              | <ul style="list-style-type: none"> <li>Documentation for any software within the system</li> </ul>   | See H.11.12.3.2   | P   |
|              | Programming documentation is supplied in a programming design language declared by the manufacturer..... :   | See H.11.12.3.2   | P   |
|              | Safety related data and safety related segments of the operating sequence are identified and classified according to H.11.12.3   | See H.11.12.3.2   | P   |
|              | There is a clear relationship between the various parts of the documentation   | See H.11.12.3.2   | P   |
| H.27.1.2.2   | Class B control function   |   | P   |
| H.27.1.2.2.1 | Design and construction requirements   |   | P   |
|              | Software complies with software class B  | Verified by inspection; see applicable Class B clauses of this Report | P   |
| H.27.1.2.3   | Class C control function   |   | N/A |
| H.27.1.2.3.1 | Design and construction requirements   |   | N/A |
|              | Software complies with software class C  | Not Applicable, Class B Control                                       | N/A |
| H.27.1.2.5   | Circuit and construction evaluation  |   | P   |

|                  |  |                           |   |
|------------------|--|---------------------------|---|
| H.27.1.2.5.<br>3 | Assessment   | See H.6, H.7, and H.11.12 | P |
|                  | Only the safety related software (software class B and C) as identified according to H.27.1.2.1.2 were subjected to further assessment | See H.6, H.7, and H.11.12 | P |

| <b>TABLE H.1 – MEASURES TO ADDRESS FAULT/ERRORS (Software Class B)</b> |  |  |                |
|--|--|--|----------------|
| Component  | Fault/error  | Declared measures  | Verdict        |
| 1. CPU   | -  | -  | -              |
| 1.1 Registers  | Stuck at   | Functional test  | P              |
| 1.3 Program counter  | Stuck at   | Time slot monitoring   | P              |
| 2. Interrupt handling and execution                                    | No interrupt   | Not applicable   | Not applicable |
|  | Too frequent interrupt   | Not applicable   | Not applicable |
| 3. Clock   | Wrong frequency (for quartz synchronized clock: harmonics/ sub-harmonics only) | Time slot monitoring   | P              |
| 4. Memory  | -  | -  | -              |
| 4.1 Invariable memory  | All single bit faults  | Periodic 8 or 16-bit CRC   | P              |
| 4.2 Variable memory  | DC fault   | Periodic static memory test (March C- or March X test, based on word data) | P              |
| 4.3. Addressing (relevant to variable and invariable memory)           | Stuck at   | See 4.1 and 4.2  | P              |
| 5. Internal data path  | -  | -  | -              |
| 5.1 Data   | Stuck at   | See 4.1 and 4.2  | P              |
| 5.2 Addressing   | Wrong address  | See 4.1 and 4.2  | P              |
| 6. External communication  | -  | -  | -              |
| 6.1 Data   | Hamming distance 3   | N/A  | N/A            |
| 6.2 Addressing   | Wrong address  | N/A  | N/A            |
| 6.3 Timing   | Wrong point in time  | N/A  | N/A            |
|  | Wrong sequence   | N/A  | N/A            |
| 7. Input/output periphery  | -  | -  | -              |
| 7.1 Digital I/O  | Fault conditions specified in Cl.H.27  | N/A  | N/A            |
| 7.2 Analog I/O   | -  | -  | -              |
| 7.2.1 A/D and D/A-converter  | Fault conditions specified in Cl. H.27   | N/A  | N/A            |
| 7.2.2 Analog multiplexer   | Wrong addressing   | N/A  | N/A            |

|  |  |     |     |
|--|--|-----|-----|
| 9. Custom chips<br>e.g. ASIC, GAL,<br>gate array | Any output outside the static<br>and dynamic functional<br>specification | N/A | N/A |
|--|--|-----|-----|

| Table: Manufacturer's Documentation Referenced in this TRF (informative)<br>For STL V2.0.0 |                     |               |
|--|---------------------|---------------|
| Title  | Revision (#/Letter) | Date          |
| Application note AN3181  | Rev 4               | Dec 2017      |
| Manufacturer Testing Report  | V1.3                | 29/11/2017    |
| SDLC workflow:<br>"MCD Appli FW dev workflow v2.1.pdf"                                     | V2.1                | June 14       |
| SDLC details:<br>"MCD software development v3.0.pdf"                                       | V3.0                | November 2014 |
| C Coding rules<br>"MCD Application C standard.pdf"   | V5.0                | November 2017 |
| Versioning<br>"MCD firmware packaging rules.pdf"   | V2.2                | October 2015  |

| 4.1.2   | TABLE: List of critical components |              |                |          |                                       | N/A |
|---|------------------------------------|--------------|----------------|----------|---------------------------------------|-----|
| Object / part No.   | Manufacturer/<br>trademark         | Type / model | Technical data | Standard | Mark(s) of<br>conformity <sup>1</sup> |     |
| N/A   | N/A                                | N/A          | N/A            | N/A      | N/A                                   |     |
| Supplementary information:<br><sup>1)</sup> Provided evidence ensures the agreed level of compliance. See OD-CB2039.<br><sup>2)</sup> Description line content is optional. Main line description needs to clearly detail the component used for testing<br><sup>3)</sup> Only the programmable component(s) and components directly interfacing with them (such as: oscillators, external memory components, monitoring devices, etc.) are to be shown in the table of this Test Report Form. The IEC 60730-1 Test Report Form would include the Critical Components from this Table as well as all the additional Hardware Critical Components related to the Safety Function(s). |                                    |              |                |          |                                       |     |

**List of test equipment used:**

A completed list of used test equipment shall be provided in the Test Reports when a Manufacturer Testing Laboratory according to TMP/CTF stage 1 or WMT/CTF stage 2 procedure has been used.

| Clause | Measurement /<br>testing | Testing / measuring equipment /<br>material used | Range used | Calibration date |
|--------|--------------------------|--|------------|------------------|
| N/A    | N/A                      | N/A  | N/A        | N/A              |

TEST RECORD NO. 1

SAMPLES:

Samples of the Protective Control (Self-Test Software Library - Safety Control), were submitted by the manufacturer.

The software was successfully evaluated to:

- Annex H.11.12 of IEC 60730-1, Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, Fifth Edition, dated 2013-11 (#)
- Annex H.11.12 of EN 60730-1:2016, Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements (#)
- Annex H.11.12 of UL 60730-1, Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, Fifth Edition, dated 2016-08-03
- Annex H.11.12 of CAN/CSA E60730-1:15, Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, Fifth Edition, dated 2015-12-01
  
- Annex R of IEC 60335-1, Household and Similar Electrical Appliances, Part 1: General Requirements, Edition 5.2 (#)
- ANSI/UL 60335-1, Safety of Household and Similar Electrical Appliances, Sixth Edition, dated October 31, 2016
- CAN/CSA- C22.2 NO.60335-1:16, Safety of Household and Similar Electrical Appliances, Fifth Edition, dated October 2016
  
- ANSI/UL 1998, Software in Programmable Components, Third Edition, dated December 18, 2013 (#)

(#) - Note, these standards are not within the scope of XAAZ2/8 but were additionally considered.

The table below lists the software components of this product, including processes, modules, and threads:

Here below the STL package and related files along with its version. All 8-bit microcontrollers family members use the following:

| STL           | Structure of the common STL packages |                                 |
|---------------|--------------------------------------|---------------------------------|
|               | File                                 | Description                     |
| Start-up test | stm8_stl_startup.c                   | Startup STL flow control        |
|               | stm8_stl_clockstart.c                | Clock system initial test       |
| Run time test | stm8_stl_main.c                      | Run time STL flow control       |
|               | stm8_stl_crcrun.c                    | Partial Flash test              |
|               | stm8_stl_clockrun.c.c                | Partial clock test              |
|               | stm8_stl_transpRam.c                 | Partial RAM test                |
| Headers       | stm8_stl_classB_var.h                | Definition of Class B variables |
|               | stm8_stl_lib.h                       | Overall STL includes control    |
|               | stm8_stl_startup.h                   | Initial process STL header      |
|               | stm8_stl_main.h                      | Run time process STL header     |
|               | stm8_stl_param.h                     | STL configuration file          |
|               | stm8_stl_clockstart.h                | Start-up clock test header      |
|               | stm8_stl_clockrun.h                  | Run time clock test header      |
|               | stm8_stl_cpu.h                       | CPU test header                 |
|               | stm8_stl_crcl6Run.h                  | Flash test header               |
|               | stm8_stl_transpRam.h                 | Run time RAM test header        |
|               | stm8_stl_fullRam_Mc.h                | Start-up RAM test header        |



GENERAL:

Test results relate only to the items tested.

The software was verified by meeting, teleconferences and document review on November, 2017 to January, 2018 at UL Italy Office, UL International Italia S.r.l. - Via Delle Industrie, 1 - 20061 Carugate (MI) - Italia

All tests specified in ANSI/UL 60730-1, CSA CAN/CSA E60730-1:15, ANSI/UL 60335-1 and CSA CAN/CSA-C22.2 NO.60335-1:16 were not considered necessary based on provided manufacturer documentation and because the end product application is needed to determine what tests shall be conducted. All testing shall be conducted in the end product installation.

The results of the investigation are deemed acceptable.

Test Record Summary:

The results of this investigation, including construction review and testing, indicate that the products evaluated comply with the applicable requirements in the following standards:

- Annex H.11.12 of IEC 60730-1, Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, Fifth Edition, dated 2013-11 (#)
- Annex H.11.12 of EN 60730-1:2016, Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements (#)
- Annex H.11.12 of UL 60730-1, Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, Fifth Edition, dated 2016-08-03
- Annex H.11.12 of CAN/CSA E60730-1:15, Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements, Fifth Edition, dated 2015-12-01
  
- Annex R of IEC 60335-1, Household and Similar Electrical Appliances, Part 1: General Requirements, Edition 5.2 (#)
- ANSI/UL 60335-1, Safety of Household and Similar Electrical Appliances, Sixth Edition, dated October 31, 2016
- CAN/CSA- C22.2 NO.60335-1:16, Safety of Household and Similar Electrical Appliances, Fifth Edition, dated October 2016
  
- ANSI/UL 1998, Software in Programmable Components, Third Edition, dated December 18, 2013 (#)

(#) - Note, these standards are not within the scope of XAAZ2/8 but were additionally considered.

Therefore, such products are judged eligible to bear UL's Mark as described on the Conclusion Page of this Report.

## CONCLUSION

Samples of the component covered by this Report have been found to comply with the requirements covering the category and the component is found to comply with UL's applicable requirements. The description and test result in this Report are only applicable to the sample(s) investigated by UL and does not signify the product(s) described as being covered under UL's Follow-Up Service Program. When covered under UL's Follow-Up Service Program, the manufacturer is authorized to use the Recognized Marking on such products which comply with UL's Follow-Up Service Procedure and any other applicable requirements of UL LLC. The Recognized Component Mark of UL LLC on the product, or the Recognized Marking symbol on the product and the Recognized Component Mark on the smallest unit container in which the product is packaged, is the only method to identify products investigated by UL to published requirements and manufactured under UL's Recognition and Follow-Up Service.

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