Rainbow FW Specification

|  |  |  |  |
| --- | --- | --- | --- |
| Department: | HACH |  |  |
| Project Name: | Rainbow | Version: | V0.2 |
| Doc Reference Nb.: | RB FW Spec | Date: | 2016-11-08 |

Executive definition & objectives:

**This template is intended for**

Show the firmware spec against the Product Specification from BU.

This document has to contain the product architecture that will later be used as a reference and major input for the Implementation & Validation phase.

For identified critical component the detailed design at component level will be described in Technical Specification.

|  |  |  |
| --- | --- | --- |
| Deliverable Name | Rainbow FW Specification | Toll Gate |
| TG1 |  |
| TG2 |  |
| TG3 |  |
| TG4 |  |
| TG5 |  |
| TG6 |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Status | Draft | In Review | Official |

|  |  |  |
| --- | --- | --- |
| Roles | Function | Name |
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| Approvers | Product Planner  Project Leader |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
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| V0.1 | 2016-10-31 | Paul Li | Creation |  |
| V0.2 | 2016-11-08 | Paul Li | Update to add some requirements mentioned in Shimadzu user manual |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Linked Documents | | | |
| Name | Reference | Author | Comments |
| Rainbow performance specification |  | Liu Hanchao |  |
| Rainbow System PS |  | Diao,jie |  |
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# Purpose

The purpose of this document is the measure and control board software functional requirement specification for the Rainbow project.

# Definitions, Acronyms, and Abbreviations

## Definitions

|  |  |
| --- | --- |
| **Term** | **Definition** |
| EEPROM | Electrical Erasable Programmable Read Only Memory |
| HMI/UI | Human Machine Interface Board |
| LRV | Lower Range Value |
| URV | Upper Range Value |
| AO/CO | Current output |
| HAL | Stm32 Hal driver released by ST |
| CMDs | Commands implemented by communication. |

## Document Conventions

Software requirements are identified using the following in-line table format:

| Ident. | Definition / Motivation | Priority | Source |
| --- | --- | --- | --- |
|  |  | **Stability** |

Each field is described in the following list:

**Ident.** A unique identifier for the Requirement

**Priority** one of: **M**andatory / **D**esirable / **F**uture

**Stability** one of: **C**ommitted (Agreed by approvers) / **N**ot yet agreed / **L**ikely to change

# Non Functional Requirements

## General

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| NFR\_G\_1 | **Microcontroller**  The P for Control board is Stm32f429II  The P for IO/AO board is Stm32f049 | **Stability**  C |

## Software Verification and Validation

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| NFR\_SW\_1 | **Static Code Analysis**  The “*Static Code Analysis*” of C-Code shall be performed with the PC-Lint tool and passed with the warning level 3. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| NFR\_SW\_2 | **Module Test**  The “*Module Test*” in this project scope will check the operations and their relations within the system.  If required, a specific test container environment could be used to simulate the module input signal.  The Module test should be implemented mostly as **code automated test** to make regression tests simpler.  The Module test will be done by the developer and reviewed with the code review procedure  **Code Coverage**  The Module tests shall cover all implemented functions. If the Module test of a single function makes no sense because functionality is only testable together with another function (e.g. in low level hardware interface functions), then it is allowed to test these functions together in one Module test. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| NFR\_SW\_3 | **Code Review**  For the “*Code Review*” procedure a second developer checks the implementation by using the code review questionnaire and his experience about embedded software behavior.  The Code Review shall be carried out for the complete source code. | **Stability**  C |

## Other

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| NFR\_O\_1 | **Dynamic memory**  Dynamic memory allocation shall not be used to avoid allocation/de allocation problems. With exception when those code are reviewed. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| NFR\_O\_2 | **Manufacturing**  The manufacturing shall be able to read and write all the parameters of the device. | **Stability**  C |

# Functional Requirements

## General

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_G\_1 | **EEP Storage**  All the configuration parameter shall be stored in EEPROM. The data shall be protected in case of error data. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_G\_2 | **Write protection**  The system could be configured as write-protected after the data is change. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_G\_3 | **Scheduling**  Shall trigger Subsystems update cyclically. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_G\_4 | **RTC**  Shall enable the RTC and revord the RTC time in data log  The RTC shall be able to be configured outside. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_G\_5 | **CPU Load**  Shall calculate CPU Load during run-time. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_G\_6 | **Watch Dog**   1. Trigger HW-WatchDog cyclically. 2. Supervise deadlocks and long time no execution of tasks. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_G\_7 | **System Reset**   1. Shall support device reset; 2. Shall save all non-volatile data before reset. 3. The reset or startup action shall be stored in event log; | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_G\_8 | **Temperature**  Shall measure environment temperature and colorimeter temperature | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_G\_9 | **Instrument information**   1. S/N 2. Type of instrument, 3. SW version 4. HW version | **Stability**  C |

## Non-Volatile Data Storage

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_NV\_1 | **Non-Volatile Storage**   1. Customer configurations for the transmitter shall be saved within 1 second once the parameter changed. 2. The NV data shall be possible to be initialized by Communication. 3. Faults should be recognized(CRC16 protection) and repaired (Shadow copy). 4. Errors should be recognized 5. Format NV data could be enabled by specific CMDs. 6. Customers are not allowed to format factory calibration data. 7. Cyclic asynchronous saving. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_NV\_2 | **Operation of Non-Volatile Storage**   1. Reset to Default, Provide a method to reset variables to default stored in ROM or NV memory. 2. Load Rom Default. Provide a method to initialize variables with ROM default value. 3. Save As Default. Provide a method to save variables as default which also be saved in NV memory. | **Stability**  C |

## Shell

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_SP\_1 | **Shell**   1. Use USART2 as shell ports, fix setting, 115200, 8, 1, none. 2. Shall support putty as the remote console. 3. Shall support following commands: 4. Read Object 5. Write Object 6. Read Memory 7. Write Memory | **Stability**  C |

## Measurement

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_MEA\_1 | **Deep Flush**   1. The flush volume could be configured below in service mode. 2. volume of water sample (1~10 ml) 3. flush time (30~120 sec) 4. Deep flush could be configured as enabled for each measurement. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_MEA\_2 | **Measure Average**   1. The average measure points shall be configurable 1 ~ 3; 2. Absorbance deviation for measure points. Threshold set to 1% ~ 5%, typically 3%; Deviation between each two of data points exceeds the threshold will trigger additional measure points; 3. Measure maximum points shall be 3~5 respectively; 4. If measure points are not enough for averaging, use the middle points instead of average; and alarm shall be issued for that. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_MEA\_3 | **Retest option:**   1. This option could be enabled or disable. 2. When measurement is out of threshold below, do retest again; use the last test result as final result; which is only enabled when average is not enabled. 3. The Threshold high 4. The Threshold Low | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_MEA\_4 | **Measure Mode**  Two different work mode;   1. Periodic 2. The intervals could be: 0 (continuous), 30min, 60min… and 24hours 3. Starts time: YYYY-MM-DD HH:MM:SS format. ~~Which happens in next day if the time has passed when input the setting, otherwise it begins from current day.~~ 4. If measure failed or no measure results in set time, the device shall use idle time to complement the missed measure times. 5. If the measurement could not be executed in measurement interval time, the measure is executed as continuously. 6. External trigger by any one below only when device is standby 7. UI input trigger, 8. Modbus trigger, 9. Digital input trigger. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_MEA\_5 | **Alarm**   1. User shall be able to configure the alarm value for below alarms. 2. Low low alarm 3. Low alarm 4. High alarm 5. High high alarm 6. User shall also be able to set the times (measured value exceeds the alarm set value) respectly when alarm shall be issued. 7. User shall also be able to set the hysteresis value which is used to clear the alarm. 8. User shall be able to configure the alarm as “hold” which means the device shall not clear the alarm automatically. | **Stability**  C |

## Calibration

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_CAL\_1 | **Calibration Mode**  Two different work mode;   1. Periodic 2. The intervals could be: 1 ~ 7 Days 3. Starts time: YYYY-MM-DD HH:MM:SS format. ~~Which happens in next day if the time has passed when input the setting, otherwise it begins from current day.~~ 4. If calibration failed or no calibration results in set time, the device shall use idle time to complement the missed measure times. 5. External trigger by any one below only when device is standby 6. UI input trigger, 7. Modbus trigger, 8. Digital input trigger. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_CAL\_2 | **Calibration Post Action**  Two different options;   1. Flushing 2. None | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_CAL\_3 | **Calibration Points**   1. Calibration points shall be 1~3 respectively; Data points for zero and slope standard averaging, 2. ~~Absorbance deviation for calibration points. Threshold setting to 1% ~ 5%, typically 3%; Deviation between each two of data points in same standard concentration exceeds the threshold will trigger calibration failure then intermediate data are dropped;~~ 3. ~~If calibration failed 2 times continousely, alarm shall be issued.~~ 4. Absorbance deviation for calibration points. Threshold setting to 1% ~ 5%, typically 3%; Deviation between each two of data points in same standard concentration exceeds the threshold will trigger additional calibration points; 5. Calibration maximum points shall be 3~5 respectively; 6. If calibration points are not enough in same standard concentration will trigger calibration failure then intermediate data are dropped; 7. Alarm shall be issued when calibration failed 2 times continousely | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_CAL\_4 | **Adaption factor**   1. Correction factor respectly for different measure range: Value Range: 0.95 ~ 1.05; To multiple with measurement result after deducted offset; 2. Offset 3. Low range, 0.1~30 mg/L<±0.6 4. Middle/High range, 1~100 mg/L±6 5. Extend range, 10~500 mg/L±60 | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_ CAL \_5 | **Auto Range Adjust**   1. Three different measure ranges implemented in devices, auto range adjust is always enabled. 2. User shall be able to set a preset range. 3. The auto-range adjust is triggerred when measured value is out of range. Calibration with corresponding standards is triggered immediately in order to keep measurement accuracy. | **Stability**  C |

## Schedule

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_SCH\_1 | **Schedule Priority**   1. Three actions below are able to be configured as periodically, and the priorities when scheduled at the sametime:    1. Cleaning (low),    2. Measure (high),    3. Calibration (highest), 2. Each action shall be complementged when missed in schedlued time. Exception when device is in service mode, the missed action shall not be complemented. | **Stability**  C |

## Preheat

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_HEAT\_1 | The target temperature shall be controled with PID to the set value, and the difference shall be controled within±0.5℃. | **Stability**  C |

## 4~20mA Current Output

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_CO\_1 | Shall output current in range 3-23mA. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_CO\_2 | Shall be connected to the Measurement Value against the configured high and low range. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_CO\_3 | Shall be possible to simulate AO in the range from 3 mA to 23 mA. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_CO\_4 | Shall be able to be calibrated with special CMDs and UI | **Stability**  C |

## IO board

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_IO\_1 | The valid signal always is 1 / On  The invalid signal is 0/Off | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_IO\_2 | **Digital Input Functions**  When the analyzer is in standby state. Otherwise the analyzer keeps running current operation.   1. Measurement 2. Cleaning 3. Standard Flushing 4. Calibration 5. Deep Flushing | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_IO\_3 | **Relay Output Functions**   1. Switch on/off continuous: 2. Interval time 3. Holding time, 4. Start time, (start time is in format YYYY-MM-DD HH:MM:SS, ~~which happens in next day if the time has passed when input the setting, otherwise it begins from current day.~~) 5. Alarm:   Switch on when:   1. Low low alarm 2. low, 3. high, 4. high high alarm 5. Event   Switch on when any alarm or error   1. Trigger pretreatment: 2. Start time (start time is in format YYYY-MM-DD HH:MM:SS, ~~which happens in next day if the time has passed when input the setting, otherwise it begins from current day.~~) 3. Measurement delay time , | **Stability**  C |

## Safety Measures

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_SM\_1 | **RAM Test**  RAM test at start up and also at run-time. It includes:   1. Address bus test. 2. Data bus test and. 3. Data retention test.   If this test fails, a software reset is executed. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_SM\_2 | **Rom Test**  Rom test at start up.  A CRC16 check on the entire hex image to be conducted. The resulting value is compared with the checksum stored at the beginning of the image. If this test fails, system is reset. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_SM\_3 | **Voltage Supply Monitoring**  Shall provide a method to check the supply voltage. When supply voltage below the setting, the device shall save all the configure data and then reset.. | **Stability**  C |

## Diagnosis

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_ DIA \_1 | **Leakage Monitoring**  Shall monitor the liquid leakage and issue alarm when leakage is found. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_ DIA \_2 | **Pump Steps** | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_ DIA \_3 | **Reagents usage** | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_ DIA \_3 | **Pipe usage** | **Stability**  C |

## Internal Communication

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_ ICAN\_1 | **DIP-Switch**  DIP-Switch shall be used as the address for internal can communication with UI board. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_ICAN\_2 | 1. Shall provide the internal can bus communication with UI or PC 2. The device is act as the slave which response the CMDs from master. 3. The CMDs support the below functions    1. Read Object    2. Write Object    3. Read Memory    4. Write Memory 4. The can bus communication protocol shall be provided | **Stability**  C |

## Can Open Communication

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_CO\_1 | **CanOpen Slave**   1. Implements the Canopennode in the IO and 4-20mA boards. 2. The eds shall be provided. 3. The hartbeat/sdo/pdo/sync function shall be support. 4. The data exchange shall be limited in 100 ms. 5. The led shall be used to identy the communication status and error status. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_CO\_2 | **CanOpen Master**   1. Implements the Canopensocket in control & measure board. 2. The NMT/ hartbeat/sdo/pdo/sync function shall be support. 3. The master shall be able to found the devices connected. 4. The master shall be able to find the communication or device error and issue the error/warning. 5. The master could be configured outside for the data mapping and IO actions. | **Stability**  C |

## History Data

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_HD\_1 | **Measurement result**   1. Shall save at least 20,000 circulated records. 2. The data log shall include: 3. Time, 4. Measurement data, 5. Original signal (4 ABSs), 6. Temperatures, 7. Accompany calibration curve (offset/slope) 8. Dilution factor (for extend measurement range model) 9. Log shall be read back by special CMDs | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_HD\_2 | **Calibration Data**   1. Shall save at least 5,000 circulated records. 2. The data log shall include: 3. time, 4. slope, 5. offset 6. group data \* max 5    1. 4 raw abs    2. standard concentration    3. Temperature (environment + colorimeter )    4. Timestamp. 7. Log shall be read back by special CMDs | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_HD\_3 | **Event Data**   1. Shall save at least 20,000 circulated records. 2. The data log shall include: 3. Every operation including calibration, cleaning, flushing, priming and configuration change should be recorded. 4. Time 5. Log shall be read back by special CMDs | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_HD\_4 | **History Data Protection**   1. All of data cannot be deleted. If the memory is full, the oldest one will be deleted. 2. Two years of data should be saved. 3. Only OPS (factory) could delete data. | **Stability**  C |

## Maintenance

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_MT\_1 | **Configuration/info Read back**   1. Measurement mode and interval 2. Calibration interval 3. Dilution factor (applied on extend measurement range model) 4. Calibration curves in use and adaptation factor 5. Instrument information | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_MT\_2 | **Real-time Signal**   1. Temperatures 2. Detector current and absorbance 3. Operation step 4. Liquid levels of reagents and standards 5. Pump and valve state 6. IO state 7. Warning/Error information | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_MT\_3 | **Operation interfaces 1**   1. Prime 2. Reset liquid level 3. Drain 4. Restore rom defaults. 5. Fluid control: 6. Pumps 7. Valves 8. Premix stirring bar 9. Heater | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_MT\_4 | **Operation interfaces 2**   1. Service Flush 2. Deep flush 3. Flush 4. Configure flush    1. volume of water sample (1~10 ml)    2. flush time (30~120 sec) | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_MT\_5 | **Operation interfaces 3**   1. Cleaning Mode: 2. Continuous:    1. Interval: 0/6hr/12hr/1~7days,    2. Start time of the first cleaning is in YYYY-MM-DD HH:MM:SS format, ~~which happens in next day if the time has passed when input the setting, otherwise it begins from current day.~~ 3. Manual   Ex-triggered by UI, DI and Modbus command;   1. Post cleaning operation: 2. Flushing 3. Calibration 4. None | **Stability**  C |

## Bootloader

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_BL\_1 | **Reuse Can Port**   1. Shall reuse Can Port to communicate with PC/UI. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_BL\_2 | Shall have CRC16 check for Rom Integration. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_BL\_3 | **Update CB Code**  Shall support updating CB firmware code. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_BL\_4 | **Version Code**  Shall support getting version code.  The version code includes:   1. CB SW-version code. 2. Boot loader version code. | **Stability**  C |

| Ident. | Definition / Motivation | **Priority**  M | Source  R&D |
| --- | --- | --- | --- |
| FR\_BL\_5 | **Update Watch Dog**  Shall manage periodic updates of Watch Dog to prevent Reset during re-programming. | **Stability**  C |

# Review - Check list:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | yes | no | N.A. |
| 1. | Does the specification define all currently known requirements that the product/system finally has to perform? | **X** |  |  |
| 2. | Is the overall description enough detailed to understand the defined requirements? | **X** |  |  |
| 3. | Are all known stakeholders considered? | **X** |  |  |
| 4. | Are all constraints defined? | **X** |  |  |
| 5. | Are all requirements complete, consistent, correct and understandable? | **X** |  |  |
| 6. | Are all requirements necessary? | **X** |  |  |
| 7. | Are all requirements feasible? | **X** |  |  |
| 8. | Are all requirements testable and traceable? | **X** |  |  |
| 9. | Are all commitments correct? | **X** |  |  |
| 10. | Are all non-functional requirements correct? | **X** |  |  |
| 11. | Are all used abbreviations and technical expressions explained? | **X** |  |  |
| 12. | Are all referenced documents in the reference list? | **X** |  |  |
| 13. | Are all requirements referenced? | **X** |  |  |
| 14. | Are all dependencies to other requirement documents considered? | **X** |  |  |
| 15. | Is this template used in a correct manner? | **X** |  |  |
| 16. | Are all open issues transferred to the defects table? | **X** |  |  |

**Remarks:**

**Defects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Checkpoint | Description | Major Defect | done  Date |
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