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|  | FCE | Xavier Christmann, Claude Redon, | 8 |  |  |  |
|  | FCE | Pierre-Olivier Pilot, Sabine Flechelle, Audrey Vaché, M. Pastor, N. Bianchi, A. Dorel, Aki Saito, Sabrine Bouazizi, Wail Amri, Hmaza Zetti | 10 |  |  |  |
|  | RBE | S. Papadineti | 1 |  |  |  |
|  |  |  |  |  |  |  |
|  | FCE | Secretary ship | 1 |  |  |  |

**SW Architecture Design & Interface Description :**

**BMM sw UNIT**

OBJECT: This document is the description of the design & interfaces for *BMM* SW unit.

SUMMARY: This document provides a high-level view of the BMM SW unit. The inputs of this document are provided by the software requirement. It is linked to the *DAIMLER\_MMA\_SWarchitectureDesignInterfaceDescription* document.

CONCLUSION: Applicable from **R5.1** SW release

**THIS DOCUMENT CONTAINS HIDDEN TEXT**

EVOLUTION OF THE DOCUMENT

|  |  |  |  |
| --- | --- | --- | --- |
| **Issue** | **Date** | **Author** | **Motive and nature of the modifications** |
| 1.1.1.1 | 31/08/2016 | M. Pastor | Check In modified already present files |
| Start extended description based on mainstream document | | | | |
| 1.1.1.2 | 16/07/2019 | A. Vaché | Update traceability to match PP4G extended platform requirements IDs |
| 1.1.1.3 | 19/07/2019 | A. Vaché | Remove traceability to no more existing requirements |
| 1.1.1.4 | 08/08/2019 | A. Vaché | Solve some traceability issues highlighted by reqtify |
| Start DAI MMA description based on extended document | | | | |
| 1.1.3.1 | 25/08/22 | Andreea Negrea | Duplicate revision |
| 1.1.3.2 | 25/08/22 | Andreea Negrea | Initial revision |
| 1.1.3.3 | 25/08/22 | Andreea Negrea | Add BMM for R3.0 |
| 1.1.3.4 | 06/03/23 | Stefan Dominte | Update for R5.1 release |
| 1.1.3.5 | 06/03/23 | Stefan Dominte | Update after review. |
| 1.1.3.6 | 08/03/23 | Stefan Dominte | Update the runnables list. |
| 1.1.3.7 | 09/03/23 | Stefan Dominte | Traceability updated. |

This document contains **23** pages.

Peer Review associated to this document is ‘*Quality\_Assurance\Peer\_Review\BMM - Design Interface Description Peer Review Workbook.xls’*

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# Documentation

## Upper Level Relevant Documents

This section presents all the documents needed to write the software architecture design document.

|  |  |  |  |
| --- | --- | --- | --- |
| **Nr** | **Document** | **Reference** | **Company** |
|  | TF-A: To Manage the power supply | /RevAS/30\_DES\_Requirements/Technical Functions/  DES\_TF\_A\_To\_Manage\_The\_Power\_Supply | RBE/FCE |
|  | TF-B: To Manage the communication | /RevAS/30\_DES\_Requirements/Technical Functions/  DES\_TF\_B\_To\_Manage\_The\_Communication | RBE/FCE |
|  | TF-C: To Secure PP ECU functioning using Pictus MCU | /RevAS/30\_DES\_Requirements/Technical Functions/  DES\_TF\_C\_To\_Secure\_PP\_ECU\_Functioning\_Pictus | RBE/FCE |
|  | TF-D: To Program MCU | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_D\_To\_Program\_MCU | RBE/FCE |
|  | TF-E: To Manage Diagnostic Requests | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_E\_To\_Manage\_Diagnostic\_Requests | RBE/FCE |
|  | TF-F: To Perform Measurements | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_F\_To\_Perform\_Measurements | RBE/FCE |
|  | TF-G: To Drive the Motor | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_G\_To\_Drive\_the\_Motor | RBE/FCE |
|  | TF-H: To Perform Autotests | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_H\_To\_Perform\_Autotests | RBE/FCE |
|  | TF-I: To Manage the Failure | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_I\_To\_Manage\_The\_Failure | RBE/FCE |
|  | TF-J: To Manage NVM - NVP (Non Volatile Parameters) | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_J\_To\_Manage\_NVM | RBE/FCE |
|  | TF-K: To Ensure ECU Protection and Integration | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_K\_To\_Ensure\_ECU\_Protection\_And\_Integration | RBE/FCE |
|  | TF-L: To Ensure ECU Integration in Environment EMC ESD | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_L\_To\_Ensure\_ECU\_Integration\_In\_Environment\_EMC\_ESD | RBE/FCE |
|  | TF-M: To generate time base | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_M\_To\_Generate\_Time\_Base | RBE/FCE |
|  | TF-N: To evaluate belt data | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_N\_To\_Evaluate\_Belt\_Data | RBE/FCE |
|  | TF-O: To schedule the SW | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_O\_To\_Run\_SW | RBE/FCE |
|  | TF-P: To handle network management | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_P\_To Handle\_Network\_Management | RBE/FCE |
|  | TF-Q: To Provide Data For Expertise | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_Q\_To\_Provide\_Data\_For\_Expertise | RBE/FCE |
|  | TF-R: To Decide Belt Function Execution | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_R\_To\_Decide\_Belt\_Function\_Execution | RBE/FCE |
|  | TF-S: To drive the boost | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_S\_To\_Drive\_Boost | RBE/FCE |
|  | TF-X: To generate time base | /RevAS/30\_DES\_Requirements/Technical Functions/DES\_TF\_M\_To\_Generate\_Time\_Base | RBE/FCE |

## 1.2 Design interface description Documents

This section presents all the documents that are linked to this software architecture design document.

Note: All links are related to S:\drive, to have them functional, please mount the S:\drive on your sandbox.

|  |  |  |  |
| --- | --- | --- | --- |
| **Nb.** | **Document** | **Reference** | **Company** |
|  | EEPROM parameters | SBE\_4G\_NVP\_layout.xls | RBE/FCE |
|  | Design Interface description of AdcIf | N/A | RBE/FCE |
|  | Design Interface Description of Auto Tests Manager | [ATM - Design Interface Description.docx](ATM%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Belt Function Decision | N/A | RBE/FCE |
|  | Design Interface Description of Belt Function Execution | [BFE - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\BFE%20-%20Design%20Interface%20Description%20.docx) | RBE/FCE |
|  | Design Interface Description of Belt Function Selection | [BFS - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\BFS%20-%20Design%20Interface%20Description%20.docx) | RBE/FCE |
|  | Design Interface Description of Belt Movement Monitoring | [BMM - Design Interface Description.docx](file:///C:\Users\alexandru.paval\Documents\Sandboxes\Daimler_MMA_ReVAS\Phase_02\View_Development\Architectures\Application\Description\Associated_Documents\BMM%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Belt Parking Algorithm | N/A | RBE/FCE |
|  | Design Interface Description of Belt Slack Reduction | [BSR - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\BFS%20-%20Design%20Interface%20Description%20.docx) | RBE/FCE |
|  | Design Interface Description of Basic Software Manager | N/A | RBE/FCE |
|  | Design Interface Description of Basic Software Manager Interface | N/A | RBE/FCE |
|  | Design Interface Description of Can Tranceiver Interface | N/A | RBE/FCE |
|  | Design Interface Description of Communication Interaction Layer | [CIL - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\CIL%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Diagnostic Communication Manager Interface | N/A | RBE/FCE |
|  | Design Interface Description of Diagnostic Event Manager Interface | N/A | RBE/FCE |
|  | Design Interface Description of DiagOnCAN services management | [DIA - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\DIA%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Electronic Control Unit Manager | N/A | RBE/FCE |
|  | Design Interface Description of Electronic Control Unit Manager Interface | N/A | RBE/FCE |
|  | Design Interface Description of End of life | [EOL - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\DIA%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Error Handler | [ERH - Design Interface Description.docx](ERH%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Haptic Warning | [HWA - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\DIA%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Memory Integrity Control | N/A | RBE/FCE |
|  | Design Interface Description of Mode Management | [MMG - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\MMG%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Network Management Interface | N/A | RBE/FCE |
|  | Design Interface Description of Non-Volatile Memory Interface | N/A | RBE/FCE |
|  | Design Interface Description of Non-Volatile Parameters | [NVP - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\NVP%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Operating System Interface | N/A | RBE/FCE |
|  | Design Interface Description of Power Abstraction Layer | [PAL - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\PAL%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Pre-Crash Master | N/A | RBE/FCE |
|  | Design Interface Description of Physical Measures Provider | [PMP - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\PMP%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Port Interface | N/A | RBE/FCE |
|  | Design Interface Description of Pre-Tensioning | [PRE - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\PMP%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Production cycle function | N/A | RBE/FCE |
|  | Design Interface Description of Pulse Width Modulation Interface | N/A | RBE/FCE |
|  | Design Interface Description of Reset Cause Management | N/A | RBE/FCE |
|  | Design Interface Description of SBC | N/A | RBE/FCE |
|  | Design Interface Description of System Context Management | N/A | RBE/FCE |
|  | Design Interface Description of Standard Function Recovery (releasing function) | [SFR - Design Interface Description.docx](file:///S:\Architectures\Application\Description\Associated_Documents\SFR%20-%20Design%20Interface%20Description.docx) | RBE/FCE |
|  | Design Interface Description of Serial Peripheral Interface Interface | N/A | RBE/FCE |
|  | Design Interface Description of Startup | N/A | RBE/FCE |
|  | Design Interface Description of System Time Management | N/A | RBE/FCE |
|  | Design Interface Description of Vehicle Dynamics algorithm | N/A | RBE/FCE |

## 1.3 Design Specification Documents

This section presents all the documents that complete this software architecture design document.

Note: All links are related to S:\drive, to have them functional, please mount the S:\drive on your sandbox.

|  |  |  |  |
| --- | --- | --- | --- |
| **Nb** | **Document** | **Reference** | **Company** |
|  | Design document of AdcIf | N/A | RBE/FCE |
|  | Design document of Auto Tests Manager | [ATM - Detailed Design Document.docx](../../../../Components/Application/Autoliv/ATM/Design/ATM%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of Belt Function Decision | N/A | RBE/FCE |
|  | Design document of Belt Function Execution | [BFE - Detailed Design Document.docx](../../../../Components/Application/Autoliv/BFE/Design/BFE%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of Belt Function Selection | [BFS - Detailed Design Document.docx](../../../../Components/Application/Autoliv/BFS/Design/BFS%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of Belt Movement Monitoring | [BMM - Detailed Design Document.docx](file:///C:\Users\alexandru.paval\Documents\Sandboxes\Daimler_MMA_ReVAS\Phase_02\View_Development\Components\Application\Autoliv\BMM\Design\BMM%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of Belt Parking Algorithm | N/A | RBE/FCE |
|  | Design document of Basic Software Manager Interface | N/A | RBE/FCE |
|  | Design document of Belt Slack Reduction | [BSR - Detailed Design Document.docx](../../../../Components/Application/Autoliv/BSR/Design/BSR%20-%20Detailed%20Design%20Document.docx) |  |
|  | Design document of Communication Interaction Layer | [CIL - Detailed Design Document.docx](../../../../Components/Application/Autoliv/CIL/Design/CIL%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of Diagnostic Communication Manager Interface | N/A | RBE/FCE |
|  | Design document of Diagnostic Event Manager Interface | N/A | RBE/FCE |
|  | Design document of DiagOnCAN services management | [DIA - Detailed Design Document.docx](../../../../Components/Application/Autoliv/DIA/Design/DIA%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of End of life | [EOL - Detailed Design Document.docx](../../../../Components/Application/Autoliv/EOL/Design/EOL%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of Error Handler | [ERH - Detailed Design Document.docx](../../../../Components/Application/Autoliv/ERH/Design/ERH%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of Haptic Warning | [HWA - Detailed Design Document.docx](../../../../Components/Application/Autoliv/HWA/Design/HWA%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of Memory Integrity Control | N/A | RBE/FCE |
|  | Design document of Mode Management | [MMG - Detailed Design Document.docx](../../../../Components/Application/Autoliv/MMG/Design/MMG%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of Network Management Interface | N/A | RBE/FCE |
|  | Design document of Non-Volatile Memory Interface | N/A | RBE/FCE |
|  | Design document of Non-Volatile Parameters | N/A | RBE/FCE |
|  | Design document of Power Abstraction Layer | [PAL - Detailed Design Document.docx](../../../../Components/Application/Autoliv/PAL/Design/PAL%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of Physical Measures Provider | [PMP - Detailed Design Document.docx](../../../../Components/Application/Autoliv/PMP/Design/PMP%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of Port Interface | N/A | RBE/FCE |
|  | Design document of Production cycle function | N/A | RBE/FCE |
|  | Design document of Reset Cause Management | N/A | RBE/FCE |
|  | Design document of RTE If | N/A | RBE/FCE |
|  | Design document of System Context Management | N/A | RBE/FCE |
|  | Design document of Standard Function Recovery (releasing function) | [SFR - Detailed Design Document.docx](../../../../Components/Application/Autoliv/SFR/Design/SFR%20-%20Detailed%20Design%20Document.docx) | RBE/FCE |
|  | Design document of Serial Peripheral Interface Interface | N/A | RBE/FCE |

## 1.4 Tier2 Documents

This section presents all the documents that complete this software architecture design document.

|  |  |  |  |
| --- | --- | --- | --- |
| Nb | **Document** | **Reference** | **Company** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## 1.5 HW Data

This section presents all the documents related to the HW components that complete this software architecture design document.

|  |  |  |  |
| --- | --- | --- | --- |
| Nb | **Document** | **Reference** | **Company** |
|  | Infineon-TLE9471-3ES datasheet | TLE9461-3ES-Infineon.pdf | Infineon |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## 1.6 Other Documents

This section presents all the documents that also have been needed to write this software architecture design document.

|  |  |  |  |
| --- | --- | --- | --- |
| Nb | **Document** | **Reference** | **Company** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## 1.7 Glossary And Definition

This section presents all the definitions and/or abbreviations used in this document.

*List of terms in alphabetical order:*

|  |  |
| --- | --- |
| ***Term*** | ***Meaning*** |
| ADC | Analog Digital Converter |
| AEC | Autoliv Error Code |
| API | Application Programming Interface |
| ASDM | Active Safety Domain Master |
| ASIC | Application Specific Integrated Circuit |
| ASY | Active SafetY |
| BSW | Basic SW modules |
| CAN | Controller Area Network |
| C/S | Chip Select |
| COP | Computer Operating Properly |
| eCPL | Electronic Crash Pole Locking |
| DART | Ditch - Airborne - Rough Terrain |
| DFLASH | Data FLASH |
| ECC | Error Code Correction |
| ECU | Electronic Control Unit |
| EOL | End Of Life |
| EEPROM  HES | Electric Erasable and Programmable Read only Memory  Hall Sensors |
| HFPP | High Force Pre-Pre-Tensioning belt function |
| HF-PRE | High Force PRE pre-tensioning |
| HR  HW | Hard Releasing  Hardware |
| I/O | Input/Output |
| IMU | Inartial Measurements Unit |
| ISS | Integrated Safing System |
| LFPP | Low Force Pre-Pre-Tensioning belt function |
| MSA | Motor Start/Stop Automatic |
| MCAL | Micro-Controller Abstraction Layer |
| MCU | Micro-controller Unit |
| NMG | Mode ManaGement |
| NVM | Non Volatile Memory |
| OS | Operating System |
| PCM | Pre-Crash Master |
| PFLASH | Program FLASH |
| PIT | Periodic Interrupt Timer |
| PLL | Phase-locked loop |
| RAM | Random Access Memory |
| RCWM | Rear Collision Warning and Mitigation |
| RML | Left PP ECU |
| RMR | Right PP ECU |
| RMx | Both PP ECU |
| ROM | Read Only Memory |
| RSU | Remote Sensor Unit |
| RTE | Real Time Environment |
| RTOS | Real Time Operating System |
| SFR | Standard Function Recovery |
| SODL | Side Obstacle Detection Left |
| SPI | Serial Peripheral Interface |
| SRS  SW | Supplementary Restraint System  Sofware |
| TBC | To be confirmed |
| TBD | To be defined |
| TF | Technical Function |
| TFLASH | Test FLASH of the Pictus MCU (“one time programmable” memory) |
| W/D | Watchdog |

# Description

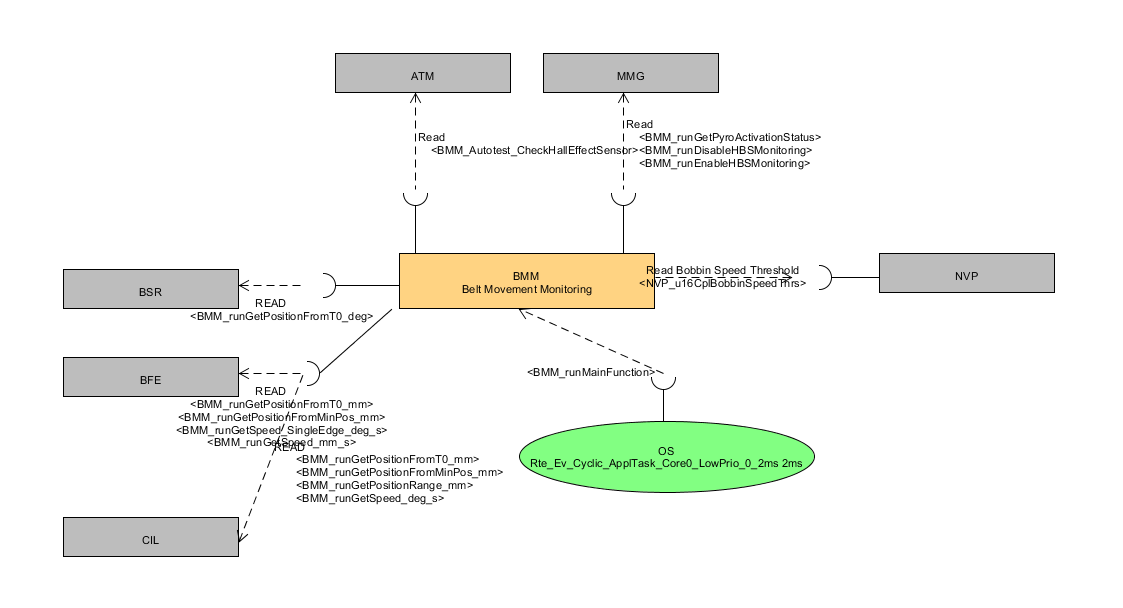
The BMM component is intended to provide information related to the bobbin movement that is to say: direction, position & speed.

Behind that, it is also responsible for permanently detecting the minimum position and the position range of the belt.

In addition, the Bmm component will be in charge of detecting the pyrotechnical device firing.

Actually, the computation of the information related to the belt is partially achieved by the MCU itself (coupled to the hall-effect sensors).

Based on the information provided by the MCU (and the bobbin characteristics), the BMM component will compute the belt position/speed and evaluate the pyro device state.



**Figure 1: BMM - Static description**

# Technical functions

|  |  |  |  |
| --- | --- | --- | --- |
| **Requirements** | **Criteria** | **Levels/Tolerances** | **Source** |
| ARCH\_SW\_BMM\_0005 | Information from Hall effect sensor shall be managed periodically by BMM | BMM\_runMainFunction() |  |
| ARCH\_SW\_BMM\_0010 | Hall effect sensors HW component and the SW module itself has to be initialized | BMM\_runInit() |  |
| ARCH\_SW\_BMM\_0015 | This module shall provide to the rest of the application the displacement of the belt in millimeters from its position recorded by the BMM at product startup. | BMM\_runGetPositionFromT0\_deg |  |
| ARCH\_SW\_BMM\_0020 | This module shall provide to the rest of the application the displacement of the belt in millimeters from its position recorded by the BMM at product startup. | BMM\_runGetPositionFromT0\_mm |  |
| ARCH\_SW\_BMM\_0025 | This module shall provide to the rest of the application the displacement of the belt in degrees from its minimum position (continuously monitored by the BMM). | BMM\_runGetPositionFromMinPos\_deg |  |
| ARCH\_SW\_BMM\_0030 | This module shall provide to the rest of the application the displacement of the belt in millimeters from its minimum position (continuously monitored by the BMM). | BMM\_runGetPositionFromMinPos\_mm |  |
| ARCH\_SW\_BMM\_0035 | This module shall provide to the rest of the application the minimum and maximum displacement of the belt in degrees observed since its initial position recorded at product startup (T0) by the BMM. | BMM\_runGetPositionRange\_deg |  |
| ARCH\_SW\_BMM\_0040 | This module shall provide to the rest of the application the minimum and maximum displacement of the belt in millimeters observed since its initial position recorded at product startup (T0) by the BMM. | BMM\_runGetPositionRange\_mm |  |
| ARCH\_SW\_BMM\_0045 | This module shall provide to the rest of the application the belt speed in degrees per seconds. | BMM\_runGetSpeed\_deg\_s |  |
| ARCH\_SW\_BMM\_0048 | This module shall provide to the rest of the application the belt speed in millimeters per seconds. | BMM\_runGetSpeed\_mm\_s |  |
| ARCH\_SW\_BMM\_0049 | This module shall provide to the rest of the application the belt speed in degrees per seconds dor a single edge period. | BMM\_runGetSpeed\_SingleEdge\_deg\_s |  |
| ARCH\_SW\_BMM\_0053 | The module shall read the period of the HES A signal measured by the eTimer unit. | OS\_ISR\_BMM\_HES\_IT | ALV\_EXT\_TF\_N\_293;  ALV\_EXT\_TF\_N\_214 |
| ARCH\_SW\_BMM\_0054 | The module shall read the period of the HES B signal measured by the eTimer unit. | OS\_ISR\_BMM\_HES\_IT | ALV\_EXT\_TF\_N\_293;  ALV\_EXT\_TF\_N\_214 |
| ARCH\_SW\_BMM\_0055 | The module shall validate the “pyro firing” if 2 consecutive measured HES signal periods are below the period corresponding to the “low pyro firing” event.  Note:  BMM will consider both HES signals period.  Note:  If one HES signal is in defect, BMM will consider 2 consecutive periods of the available HES signal. | OS\_ISR\_BMM\_HES\_IT | ALV\_EXT\_TF\_N\_220; DAI\_EXT\_TF\_N\_303; ALV\_EXT\_TF\_N\_298; ALV\_EXT\_TF\_N\_300; DAI\_EXT\_TF\_N\_302 |
| ARCH\_SW\_BMM\_0057 | By default, the module shall return “NOT ACTIVATED” for the pyro firing status. | BMM\_RUNGETPYROACTIVATIONSTATUS | ALV\_EXT\_TF\_N\_215 |
| ARCH\_SW\_BMM\_0058 | The BMM\_runGetPyroActivationStatus function shall return ACTIVATED if the pyro firing event is validated using the HES signals | BMM\_RUNGETPYROACTIVATIONSTATUS | ALV\_EXT\_TF\_N\_302 |
| ARCH\_SW\_BMM\_0340 | BMM shall check if the current consumption of the hall effect sensor is in the expected range. | BMM\_Autotest\_CheckHallEffectSensor | ALV\_EXT\_TF\_H\_466; ALV\_EXT\_TF\_H\_467; ALV\_EXT\_TF\_H\_2066; ALV\_EXT\_TF\_H\_2067 |
| ARCH\_SW\_BMM\_1060 | This function shall deactivate the interrupt linked to the HES pulses signal | BMM\_runDisableHBSMonitoring |  |
| ARCH\_SW\_BMM\_1080 | This function shall activate the interrupt linked to the HES pulses signal | BMM\_runEnableHBSMonitoring |  |
| ARCH\_SW\_BMM\_1100 | This function shall manage the sensor A and B signals. | OS\_ISR\_BMM\_HES\_IT |  |
| ARCH\_SW\_BMM\_1200 | This function shall compute the timer overflow in order to detect a no movement state of the belt. | OS\_ISR\_BMM\_HES\_TOUT |  |

# Runnables

## BMM\_runMainFunction

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runMainFunction (void) | | | |
| **Object** | | | |
| This function shall manage the information received from the hall effect sensors HW component and the SW module itself. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| NA | NA | NA | NA |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Synchronous server operation 2 ms  Non-reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0005; ARCH\_SW\_BMM\_0006; ARCH\_SW\_BMM\_0007 | | | |

### Called function

|  |  |  |  |
| --- | --- | --- | --- |
| **Requirements** | **Criteria** | **Levels/Tolerances** | **Source** |
| ARCH\_SW\_BMM\_0006 | The AdcIf\_runGetHBS\_A\_V\_100ms function shall be called to get the value measured of Hall Effect Sensor A |  |  |
| ARCH\_SW\_BMM\_0007 | The AdcIf\_runGetHBS\_B\_V\_100ms function shall be called to get the value measured of Hall Effect Sensor B |  |  |

## BMM\_runInit

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runInit (void) | | | |
| **Object** | | | |
| This function shall initialize the hall effect sensors HW component and the SW module itself. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| NA | NA | NA | NA |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Synchronous server operation  Non-reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0010; ARCH\_SW\_BMM\_0011; ARCH\_SW\_BMM\_0008 | | | |

### Data flow

|  |  |  |  |
| --- | --- | --- | --- |
| **Requirements** | **Criteria** | **Levels/Tolerances** | **Source** |
| ARCH\_SW\_BMM\_0008 | NVP parameter NVP\_u16CplBobbinSpeedThrs shall be used in order to adapt the bobbin speed threshold from microseconds (NVP parameter format) to the timer scale. |  | DAI\_EXT\_TF\_J\_154 |

### Called function

|  |  |  |  |
| --- | --- | --- | --- |
| **Requirements** | **Criteria** | **Levels/Tolerances** | **Source** |
| ARCH\_SW\_BMM\_0011 | The  [Port\_SetPinModel](#_Hlk382980435) function shall be called to Set pin P02.6 as ALT5 and  pin P02.7 as ALT5 |  |  |

## BMM\_runGetPositionFromT0\_deg

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runGetPositionFromT0\_deg (s16BeltPosition\_degType \* ps16BeltPosition\_deg) | | | |
| **Object** | | | |
| This function shall provide the displacement of the belt in degrees from its position recorded by the BMM at product startup. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| ps16BeltPosition\_deg | s16BeltPosition\_degType | Out | Displacement of the belt in degrees (1LSB ≡ 1deg)   * Positive: Displacement in the tensioning direction from the startup position * Negative: Displacement in the releasing direction from the startup position |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Synchronous server operation  Reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0015 | | | |

## BMM\_runGetPositionFromT0\_mm

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runGetPositionFromT0\_mm (s16BeltPosition\_mmType \* ps16BeltPosition\_mm) | | | |
| **Object** | | | |
| This function shall provide the displacement of the belt in millimeters from its position recorded by the BMM at product startup. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| ps16BeltPosition\_mm | s16BeltPosition\_mmType | Out | Displacement of the belt in mm (1LSB ≡ 1mm)   * Positive: Displacement in the tensioning direction from the startup position * Negative: Displacement in the releasing direction from the startup position |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Synchronous server operation  Reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0020 | | | |

## BMM\_runGetPositionFromMinPos\_deg

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runGetPositionFromMinPos\_deg (s16BeltPosition\_degType \* ps16BeltPosition\_deg) | | | |
| **Object** | | | |
| This function shall provide the displacement of the belt in degrees from its minimum position (continuously monitored by the BMM). | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| ps16BeltPosition\_deg | s16BeltPosition\_degType | Out | Displacement of the belt in degrees (1LSB ≡ 1deg)  Remark:  The returned value is always positive (minimal positive is equal to 0). |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Synchronous server operation  Reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0025 | | | |

## BMM\_runGetPositionFromMinPos\_mm

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runGetPositionFromMinPos\_mm (s16BeltPosition\_mmType \* ps16BeltPosition\_mm) | | | |
| **Object** | | | |
| This function shall provide the displacement of the belt in millimeters from its minimum position (continuously monitored by the BMM). | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| ps16BeltPosition\_mm | s16BeltPosition\_mmType | Out | Displacement of the belt in mm (1LSB ≡ 1mm)  Remark:  The returned value is always positive (minimal positive is equal to 0). |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Synchronous server operation  Reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0030 | | | |

## BMM\_runGetPositionRange\_deg

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runGetPositionRange\_deg  (s16BeltPosition\_degType \* ps16BeltPosition\_min\_deg, s16BeltPosition\_degType \* ps16BeltPosition\_max\_deg) | | | |
| **Object** | | | |
| This function shall provide the minimum and maximum displacement of the belt in degrees observed since its initial position recorded at product startup (T0) by the BMM. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| ps16BeltPosition\_min\_deg | s16BeltPosition\_degType | Out | Minimum displacement of the belt in degrees (1LSB ≡ 1deg) |
| ps16BeltPosition\_max\_deg | s16BeltPosition\_degType | Out | Maximum displacement of the belt in degrees (1LSB ≡ 1deg) |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Synchronous server operation  Reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0035 | | | |

## BMM\_runGetPositionRange\_mm

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runGetPositionRange\_mm  (s16BeltPosition\_degType \* ps16BeltPosition\_min\_mm, s16BeltPosition\_degType \* ps16BeltPosition\_max\_mm) | | | |
| **Object** | | | |
| This function shall provide the minimum and maximum displacement of the belt in millimeters observed since its initial position recorded at product startup (T0) by the BMM. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| ps16BeltPosition\_min\_mm | s16BeltPosition\_mmType | Out | Minimum displacement of the belt in millimetres (1LSB ≡ 1mm) |
| ps16BeltPosition\_max\_mm | s16BeltPosition\_mmType | Out | Maximum displacement of the belt in millimetres (1LSB ≡ 1mm) |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Synchronous server operation  Reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0040 | | | |

## BMM\_runGetSpeed\_deg\_s

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runGetSpeed\_deg\_s (s32BeltSpeed\_deg\_sType \* ps32BeltSpeed\_deg\_s) | | | |
| **Object** | | | |
| This function shall provide the belt speed in degrees per seconds. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| ps32BeltSpeed\_deg\_s | s32BeltSpeed\_deg\_sType | Out | Belt speed in deg per seconds  1LSB ≡ 1deg/s  Signed 32bits   * Positive: Displacement in the tensioning direction * Negative: Displacement in the releasing direction |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Synchronous server operation  Reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0045 | | | |

## BMM\_runGetSpeed\_mm\_s

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runGetSpeed\_mm\_s(s32BeltSpeed\_mm\_sType \* ps32BeltSpeed\_mm\_s) | | | |
| **Object** | | | |
| This function shall provide the belt speed in millimeters per seconds. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| ps32BeltSpeed\_mm\_s | s32BeltSpeed\_mm\_sType | Out | Belt speed in millimetres per seconds  1LSB ≡ 1mm/s  Signed 32bits   * Positive: Displacement in the tensioning direction * Negative: Displacement in the releasing direction |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Synchronous server operation  Reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0048 | | | |

## BMM\_runGetSpeed\_SingleEdge\_deg\_s

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| Void BMM\_runGetSpeed\_SingleEdge\_deg\_s (P2VAR(s32BeltSpeed\_deg\_sType, AUTOMATIC, RTE\_APPL\_DATA) ps32BeltSpeed\_SE\_deg\_s) | | | |
| **Object** | | | |
| This function shall provide the belt speed in degrees per seconds. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| ps32BeltSpeed\_SE\_deg\_s | s32BeltSpeed\_deg\_sType | Out | Belt speed in degrees per seconds |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Synchronous server operation  Reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0049 | | | |

## BMM\_runGetPyroActivationStatus

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runGetPyroActivationStatus(b8PyroActivationStatusType \* pb8PyroActivationStatus) | | | |
| **Object** | | | |
| This function shall check the pyro activation status | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| pb8PyroActivationStatus | b8PyroActivationStatusType | OUT | Status of pyro |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Server operation  Non Reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0057; ARCH\_SW\_BMM\_0058 | | | |

## BMM\_ Autotest\_CheckHallEffectSensor

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void **BMM\_Autotest\_CheckHallEffectSensor** (u8TestResultType \* pu8TestResult) | | | |
| **Object** | | | |
| This function shall check if the current consumption of the hall effect sensor is in the expected range. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| pu8TestResultType | u8TestResultType | OUT | Status of the test |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Server operation  Non Reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_0340; ARCH\_SW\_BMM\_0345; ARCH\_SW\_BMM\_0346; ARCH\_SW\_BMM\_0347; ARCH\_SW\_BMM\_0348 | | | |

### Called functions

|  |  |  |  |
| --- | --- | --- | --- |
| **Requirements** | **Criteria** | **Levels/Tolerances** | **Source** |
| ARCH\_SW\_BMM\_0345 | AdcIf\_runGetHBS\_A\_V\_100ms be called to get the measured value on the power supply |  | ALV\_EXT\_TF\_H\_467; ALV\_EXT\_TF\_H\_2066; ALV\_EXT\_TF\_H\_2067 |
| ARCH\_SW\_BMM\_0346 | AdcIf\_runGetHBS\_B\_V\_100ms be called to get the measured value on the power supply |  | ALV\_EXT\_TF\_H\_467; ALV\_EXT\_TF\_H\_2066; ALV\_EXT\_TF\_H\_2067 |
| ARCH\_SW\_BMM\_0347 | ATM\_runGetTestResult shall be called to get the status ot specific tests (inhibiting the execution of the present one if failed). |  | ALV\_EXT\_TF\_H\_467; ALV\_EXT\_TF\_H\_2066; ALV\_EXT\_TF\_H\_2067 |
| ARCH\_SW\_BMM\_0348 | ERH\_GetAecStatus shall be called to get the status ot specific aec |  | ALV\_EXT\_TF\_H\_460 |

## BMM\_runDisableHBSMonitoring

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runDisableHBSMonitoring (void) | | | |
| **Object** | | | |
| This function shall deactivate the interrupt linked to the HES pulses signal . | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| NA | NA | NA | NA |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Interrupt function  Non-reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_1060 | | | |

## BMM\_runEnableHBSMonitoring

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void BMM\_runEnableHBSMonitoring (void) | | | |
| **Object** | | | |
| This function shall activate the interrupt linked to the HES pulses signal. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| NA | NA | NA | NA |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Interrupt function  Non-reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_1080 | | | |

## OS\_ISR\_BMM\_HES\_IT

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void OS\_ISR\_BMM\_HES\_IT(void) | | | |
| **Object** | | | |
| This function shall manage the sensor A and B signals. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| NA | NA | NA | NA |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Interrupt function  Non-reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_1100; ARCH\_SW\_BMM\_0053; ARCH\_SW\_BMM\_0054; ARCH\_SW\_BMM\_0055; ARCH\_SW\_BMM\_0349 | | | |

### Called functions

|  |  |  |  |
| --- | --- | --- | --- |
| **Requirements** | **Criteria** | **Levels/Tolerances** | **Source** |
| ARCH\_SW\_BMM\_0349 | Dio\_ReadChannel shall be called to read the level of HES A and HES B pins. |  |  |

## OS\_ ISR\_BMM\_HES\_TOUT

### Definition

|  |  |  |  |
| --- | --- | --- | --- |
| **Prototype** | | | |
| void OS\_ISR\_BMM\_HES\_TOUT (void) | | | |
| **Object** | | | |
| This function shall take into account the timer overflow to compute the pulse measurement duration properly. | | | |
| **Parameters** | | | |
| Name | Type | Direction | Description |
| NA | NA | NA | NA |
| **Returned value** | | | |
| Name | Description | | |
| NA | NA | | |
| **Dynamic aspect** | | | |
| Interrupt function  Non-reentrant | | | |
| **Requirements** | | | |
| ARCH\_SW\_BMM\_1200 | | | |

# MCU resources

The following requirements on resource consumption objectives apply to the module/package:

|  |  |  |  |
| --- | --- | --- | --- |
| **Requirements** | **Criteria** | **Levels/Tolerances** | **Source** |
| ARCH\_SW\_BMM\_9997 | The ROM size consumed by this component shall not exceed 2K bytes. |  |  |
| ARCH\_SW\_BMM\_9998 | The RAM size consumed by this component shall be less than 100 bytes. |  |  |