Technical Report

for the testing of the

Safety PLC MOSAIC-Series

Applicant

REER SpA
Via Carcano, 32
10153 Torino (TO)
Italia

Report No.: RT83357T

Version 1.28 of 2025-03-24

Testing Laboratory for Safety Components

TÜV SÜD Rail GmbH
Rail Automation
Barthstraße 16
D-80339 München

Revision history

Revision	Date	Author	Status	Modifications
1.0	2010-11-12	G. Neumann / T. Kreten	Replaced	-
1.1	2011-04-18	T. Kreten	Replaced	
1.2	2011-11-28	G. Neumann	Replaced	2.1; 2.2; 4.1; 5.1.1; 5.7.1
1.3	2012-07-09	J. Dong	Replaced	new modules MCT1/MCT2 and MBU
1.4	2014-06-10	J. Dong	Replaced	61508 2nd Edition New modules MV0/1/2 and MOR4/S8 Software modifications: M1 module SW Rev. 1.2 -> 2.0 MI8/MI16 SW Rev. 0.5 -> 0.7 MI12T8 SW Rev. 0.0 -> 0.2 MO2/MO4 SW Rev. 0.3 -> 0.4 MI8O2 SW Rev. 0.5 -> 0.8
1.5	2015-02-24	J. Dong	Replaced	Modification of MV modules New non-safety bus modules
1.6	2016-01-19	F. Seika	Replaced	Software modification M1, MV0/1/2 and MI8_O2 modules New modules MOS8/16
1.7	2016-03-31	F. Seika	Replaced	Software modification MO2/MO4 SW Rev. 0.4 -> 0.5
1.8	2017-05-11	F. Seika	Replaced	New module MO4LHCS8
1.9	2017-06-29	F. Seika	Replaced	Software modifications: M1 module SW Rev. 3.0 -> 3.1 MI8O2 module SW Rev. 0.9 -> 0.10 MO2/MO4 module SW Rev. 0.5 -> 0.6 MOR4/MOR4S8 SW Rev. 0.1 -> 0.2 MV0/1/2 module SW Rev. 1.1 -> 1.2
1.10	2017-10-12	F. Seika	Replaced	upgrade to 13849-1:2015, EN 62061/A2:2015, add EN 81
1.11	2018-01-16	T. Kreten / F. Seika	Replaced	Details for EN 81 added
1.12	2018-10-04	F. Seika	Replaced	New module M1S New module MI8O4
1.13	2019-02-22	F. Seika	Replaced	Software modifications: M1 module SW Rev. 3.1 -> 4.0 MV0/1/2 module SW Rev. 1.2 -> 2.0 New module MBCCL
1.14	2019-06-27	F. Seika	Replaced	M1S module 802199601/5.0 -> 8040390/5.1 New module MA4 8040324 / 0.0 New module MO4L 8042800 / 0.0
1.15	2019-08-09	F. Seika	Replaced	MOS8/MOS16 module -> SIL 1 / Pl c output

Revision	Date	Author	Status	Modifications
1.16	2019-09-25	F. Seika	Replaced	Software modifications: M1 module SW Rev. 4.0 -> 4.1 M1S module SW Rev. 5.1 -> 5.2 MI8O2 module SW Rev. 0.10 -> 0.11 MI8O4 module SW Rev. 0.0 -> 0.1 MA4 module SW Rev. 0.0 -> 0.1 MO2 module SW Rev. 0.6 -> 0.7 MO4 module SW Rev. 0.6 -> 0.7 MO4L module SW Rev. 0.0 -> 0.1 MO4LHCS8 module SW Rev. 0.0 -> 0.1
1.17	2020-04-02	F. Seika	Replaced	New module MA2 8046353 / 0.2 MV0 module 8040040/2.0 -> 8044649/3.0 MV1T module 8040034/2.0 -> 8044643/3.0 MV1TB module 8040053/2.0 -> 8044650/3.0 MV1H module 8040035/2.0 -> 8044644/3.0 MV1S module 8040036/2.0 -> 8044645/3.0 MV2T module 8040037/2.0 -> 8044646/3.0 MV2TB module 8040054/2.0 -> 8044651/3.0 MV2H module 8040038/2.0 -> 8044647/3.0 MV2S module 8040039/2.0 -> 8044648/3.0 Software modifications: MV0/1/2 module SW Rev. 2.0 -> 3.0 M1S module SW Rev. 5.2 -> 6.0 MA4 module SW Rev. 0.1 -> 0.2 MI8O4 module SW Rev. 0.1 -> 0.2 MO4L module SW Rev. 0.1 -> 0.2 MO4LHCS8 module SW Rev. 0.1 -> 0.2
1.18	2020-04-06	T. Kreten	Replaced	Addition of MR8 Module
1.19	2021-02-12	T. Kreten	Replaced	Report expanded to information provided by Template v18 Addition of MZero Module
1.20	2021-02-23	F. Seika	Replaced	Update of the following standards: EN 81-20 EN 81-50 EN 61784-3
1.21	2021-11-30	M. Findel	Replaced	New module: M1S-COM Updated modules: M1S, MO4L, MI8O4 Update of the following standards: IEC 62061, EN 61496-1
1.22	2023-03-20	T. Kreten F. Seika	Replaced	Extended temperature range: New module M1S RV 8047173 / 8.0 New module M1S-COM RV 8047193 / 8.0 New module MI8O4 RV 8047175 / 0.3 New module MA4 V 8047574 / 0.3 New module MBC V 8047576 Software modifications: M1S module SW Rev. 7.0 -> 8.0 M1S-COM module SW Rev. 7.0 -> 8.0 Report expanded to information provided by Template v25

Revision	Date	Author	Status	Modifications
1.23	2023-06-15	T. Kreten F. Seika	Replaced	New module MBECOM 8024571 / 3.0
1.24	2023-06-16	T. Kreten F. Seika	Replaced	MV0/1/2 module SW Rev. 3.0 -> 3.1
1.25	2023-11-07	F. Seika	Replaced	M1S/M1S-COM module SW Rev. 8.0 -> 8.1
1.26	2024-06-13	F. Seika	Replaced	MZero module SW Rev. 0.0 -> 0.0.1 M1 module SW Rev. 4.1 -> 4.1.2 M1S/M1S-COM module SW Rev. 8.1 -> 8.1.1
1.27	2024-11-08	T. Kreten	Replaced	Update to EN ISO 13849-1:2023 Extended temperature range for M1S and M1S RV, M1S COM and M1S COM RV, MI8O4 and MI8O4 RV, MA4 and MA4 V, MZERO and MV0 Report expanded to information provided by Template v28
1.28	2025-03-24	F. Seika	Active	M1S/M1S-COM module SW Rev. 8.1.1 -> 9.0 MV0/1/2 module SW Rev. 3.1 -> 3.2 Report expanded to information provided by Template v31

Table 1: Revision history

Content

List of Tables

List of Figures

List of Abbreviations

Abbreviation	Description
CAT	Category
DC	Diagnostic Coverage
FMEDA	Failure Mode, Effects and Diagnosis Analysis
FSM	Functional Safety Management
$MTTF_D$	Mean Time To Dangerous Failure
PFD	Probability of Dangerous Failure on Demand
PFH	Average Frequency of Dangerous Failure (h^{-1})
PL	Performance Level
QMS	Quality Management System
SFF	Safe Failure Fraction
SIL	Safety Integrity Level
Maximum SIL	Maximum SIL Limit
ToE	Target of Evaluation

Table 2: Abbreviations

1 Target of Evaluation (ToE)

On 05.10.2009 REER SpA requested TÜV SÜD Rail GmbH to test and certify the Safety PLC MOSAIC-Series. The Project No. related to this request was as follows: 717502811.

On 10.02.2011 REER SpA requested TÜV SÜD Rail GmbH to certify a new additional enclosure.

On 25.10.2011 REER SpA requested TÜV SÜD Rail GmbH to certify the update and the new modules. The Project No. related to this request was as follows: 717505240.

On 07.11.2014 REER SpA requested TÜV SÜD Rail GmbH to certify the modification of MV modules. On 20.02.2015 REER SpA requested TÜV SÜD Rail GmbH to certify the new non-safety bus modules of the Safety PLC MOSAIC-Series. The Project No. related to this request was as follows: 717509941.

On 20.10.2015 REER SpA requested TÜV SÜD Rail GmbH to certify new firmware for M1, MV0/1/2, MI8_O2 and new modules MOS8/16. The Project No. related to this request was as follows: 717511779.

On 17.12.2015 REER SpA requested TÜV SÜD Rail GmbH to certify new firmware for modules MO2/MO4. The Project No. related to this request was as follows: 717511779.

On 22.11.2016 REER SpA requested TÜV SÜD Rail GmbH to certify new module MO4LHCS8. The Project No. related to this request was 717513914.

On 20.06.2017 REER SpA requested TÜV SÜD Rail GmbH to certify new firmware for modules M1, MI8O2, MO2/MO4, MOR4/MOR4S8 and MV0/1/2. The Project No. related to this request was 717515164.

On 04.10.2017 REER SpA requested TÜV SÜD Rail GmbH to upgrade to ISO 13849-1:2015, EN 62061/A2:2015 and the evaluation as PESSRAL according to the standard EN 81. The Project No. related to this request is 717515737.

On 12.03.2018 REER SpA requested TÜV SÜD Rail GmbH to certify the new modules M1S and MI8O4. The project no. related to this request was 717516559.

On 19.01.2019 REER SpA requested TÜV SÜD Rail GmbH to certify the new firmware for modules M1 and MV0/1/2 and new module MBCCL. The project no. was 717518356.

On 12.03.2019 REER SpA requested TÜV SÜD Rail GmbH to certify the modification for the M1S module and the new modules MA4 and MO4L. The project no. was 717518701.

On 06.05.2019 REER SpA requested TÜV SÜD Rail GmbH to certify the SIL 1 / PL c outputs for the MOS8/MOS16 module. The project no. was 717519144.

On 04.09.2019 REER SpA requested TÜV SÜD Rail GmbH to certify the firmware modification for new brand and for MA4. The project no. was 717519810.

On 24.03.2020 REER SpA requested TÜV SÜD Rail GmbH to certify the firmware modification for M1S, MA4,.MI8O4, MO4L, MO4LHCS8, MV0/1/2 modules and new MA2 and MV0/1/2 modules. The project no. was 717520778 and 717520779.

On 03.04.2020 REER SpA requested TÜV SÜD Rail GmbH to certify the MR8 module. The project no. was handled with 717520779.

On 30.10.2020 REER SpA requested TÜV SÜD Rail GmbH to certify the MZero module. In February 2021 also the standards EN 81-20, EN 81-50 and EN 61784-3 were updated. The project no. was handled with 717521944.

On 25.05.2021 REER SpA requested TÜV SÜD Rail GmbH to certify the M1S and the new M1S-COM module. The corresponding project number is 717523950. On 13.10.2021 REER SpA requested TÜV SÜD Rail GmbH to certify the MO4L and the MI8O4 module. The corresponding project number is 717524198. During this, also the standards IEC 62061 and EN 61496-1 were updated.

In March 2023 REER SpA requested TÜV SÜD Rail GmbH to update the MOSAIC to an extended temperature range: 70°C instead of 55°C. The new modules will be: M1S RV, M1S COM RV, MI8O4 RV, MA4 V and MBC V. The project no. was handled with 717527369.

In March 2023 REER SpA requested TÜV SÜD Rail GmbH to certify the firmware modification for the MOSAIC modules M1S and M1S-COM. The project no. was handled with 717527355.

In May 2023 REER SpA requested TÜV SÜD Rail GmbH to certify the new MBECOM module. The project no. was handled with 717527896.

In June 2023 REER SpA requested TÜV SÜD Rail GmbH to certify the firmware modification for MV0/1/2 modules. The project no. was handled with 717527994.

In September 2023 REER SpA requested TÜV SÜD Rail GmbH to certify the firmware modification for M1S/M1S-COM modules. The project no. was handled with 717528901.

In May 2024 REER SpA requested TÜV SÜD Rail GmbH to certify the firmware modification for MZERO, M1 and M1S/M1S-COM modules. The project no. was handled with 717530178.

In September 2024 REER SpA requested TÜV SÜD Rail GmbH to certify the extension of the temperature range of the M1S and M1S RV, M1S COM and M1S COM RV, MI8O4 and MI8O4 RV, MA4 and MA4 V, MZERO and MV0 modules. During this evaluation, also the update to (EN) ISO 13849-1:2023 was performed. The project no. was handled with 717530967.

In February 2025 REER SpA requested TÜV SÜD Rail GmbH to certify the firmware modification for the M1S/M1S-COM and MV0/1/2 modules. The project no. was handled with 717531785.

The ToE is a safety related Programmable Logic Controller (in the following named PLC).

The PLC is a digitally operating electronic system, designed for use in an industrial environment. It uses a programmable memory for the internal storage of user-oriented instructions for implementing specific functions such as logic, sequencing, timing, counting and arithmetic. This programmed application logic (application) is used to control various types of machines or processes through digital inputs and outputs (solid state or relay output). Both the PLC and its associated peripherals are designed to be easily integrated into an industrial control system and easily used in all their intended functions.

2 Scope of Testing

2.1 Test specimen

The MOSAIC-Series consists of

1.) Logic module M1 (master) including two safety related solid state output switching devices (in the following named OSSD) (8 inputs, 2 outputs)

2.) Logic module M1S/M1S RV (master) including four safety related solid state output switching devices (in the following named OSSD) (8 inputs, 4 outputs)

3.) Logic module M1S-COM/M1S-COM RV (master) including four safety related solid state output switching devices (in the following named OSSD) (8 inputs, 4 outputs)

4.) I/O expansion module (slave) MI8O2 (8 inputs, 2 outputs)

5.) I/O expansion module (slave) MI8O4/MI8O4 RV (8 inputs, 4 outputs)

6.) Input expansion module (slave) MA2 (2 analog inputs)

7.) Input expansion module (slave) MA4/MA4 V (4 analog inputs)

8.) Input expansion module (slave) MI12T8 (12 inputs)

9.) Input expansion module (slave) MI16 (16 inputs)

10.) Speed Monitoring expansion module MV0/1/2

11.) Output expansion module (slave) MO2 (2 outputs)

12.) Output expansion module (slave) MO4 (4 outputs, 400mA per channel)

13.) Output expansion module (slave) MO4L (4 outputs)

14.) Output expansion module (slave) MO4LHCS8 (4 single safety OSSD outputs)

15.) Output status expansion module MOS8/16 (8/16 outputs)

16.) Relay-Output expansion module MR2 (2 outputs)

17.) Relay-Output expansion module MR4 (4 outputs)

18.) Relay-Output expansion module MR8 (8 outputs)

19.) Relay-Output expansion module MOR4 (4 safety relay outputs)

20.) Relay-Output expansion module MOR4S8 (4 safety relay outputs, 8 programmable outputs)

21.) Mosaic MSC bus extender modules MCT1 and MCT2

22.) Diagnostic connections to fieldbuses: MBP (PROFIBUS), MBC/MBC-V (CanOpen), MBCCL (CC-Link), MBD (DeviceNet), MBEC (EtherCat), MBECOM (Profinet, ModBus TCP, Ethernet IP, EtherCAT), MBEI (Ethernet IP), MBEP (ProfiNet), MBU (USB), MBEM (Modbus TCP), MBMR (Modbus RTU) and MBEI2B (Ethernet/IP-2PORT) – non-safety related

23.) Programming Tool (PC-based)

24.) MZero module (standalone module without back-bus communication)

The following maximum numbers can be configured:

- 1 master unit M1 / M1S / M1S-COM
- maximum number of slave units: 14
- maximum number of digital inputs:128

- maximum number of safety digital outputs: 16 (32 for M1S)
- maximum number of status outputs: 32 (SIL1 Plc) (48 for M1S))

The overview of the MOSAIC-Series series is depicted in Figure 1 and Figure 2.

Figure 1: System overview of the MOSAIC-Series

Figure 2: Programming tool connection via USB2.0 to MOSAIC-Series

2.2 Nomenclature and Versions of MOSAIC-Series

The products tested are identified by the nomenclature as follows:

Unit	Description	Detail
M1	master unit	8 Digital INPUTS 2 Digital OUTPUTS
M1S **M1S-RV**	master unit	8 Digital INPUTS 4 Digital OUTPUTS
M1S-COM **M1S-COM RV**	master unit	8 Digital INPUTS 4 Digital OUTPUTS
MI8O2	I/O expansions	8 Digital INPUTS 2 Digital OUTPUTS
MI8O4 **MI8O4 RV**	I/O expansions	8 Digital INPUTS 4 Digital OUTPUTS
MA2	analog input expansion	2 Analog INPUTS
MA4 **MA4 V**	analog input expansion	4 Analog INPUTS
MI8	input only expansions	8 Digital INPUTS
MI12T8	input only expansions	12 Digital INPUTS
MI16	input only expansions	16 Digital INPUTS
MO2	output only expansions	2 Digital OUTPUTS
MO4	output only expansions	4 Digital OUTPUTS
MO4L	output only expansions	4 Digital OUTPUTS
MO4LHCS8	output only expansions	4 Safety OSSD OUTPUTS
MOS8/16	output only expansions	8/16 Digital OUTPUTS
MR2	guided contact safety relay output modules	N.O. contacts: 1 N.A. + 2 N.C.
MR4	guided contact safety relay output modules	N.O. contacts: 2 N.A. + 4 N.C.
MR8	guided contact safety relay output modules	N.O. contacts: 4 N.A. + 8 N.C.
MOR4	safety relay expansion module	4 relay outputs
MOR4S8	safety relay expansion module	3 relay outputs 8 test outputs
MV0	speed monitoring expansion module	Only proximity
MV1T	speed monitoring expansion module	1 TTL encoder interface
MV1TB	speed monitoring expansion module	1 TTL encoder interface
MV1H	speed monitoring expansion module	1 HTL encoder interface

MV1S	speed monitoring expansion module	1 Sin/Cos encoder interface
MV2T	speed monitoring expansion module	2 TTL encoder interfaces
MV2TB	speed monitoring expansion module	2 TTL encoder interfaces
MV2H	speed monitoring expansion module	2 HTL encoder interfaces
MV2S	speed monitoring expansion module	2 Sin/Cos encoder interfaces
MCT1 / MCT2	bus extender module	-
MZero	standalone module	16 Digital INPUTS 4 Digital OUTPUTS
diagnostic connections to the main fieldbuses:		**MBP** (PROFIBUS) **MBC/MBC V** (CanOpen) **MBCCL** (CC-Link) **MBD** (DeviceNet) **MBEC** (EtherCat) **MBECOM** (Profinet, ModBus TCP, Ethernet IP, EtherCAT) **MBEI** (Ethernet IP) **MBEP** (ProfiNet) **MBU** (USB) **MBEM** (Modbus TCP) **MBMR** (Modbus RTU) **MBEI2B** (Ethernet/IP-2PORT)

Table 3: Nomenclature

Unit	HW revision	FW revision (up to)
M1	8040430	4.1.2
M1S	802199601 / 8040390	9.0
M1S RV	8047173	9.0
M1S-COM	8046967	9.0
M1S-COM RV	8047193	9.0
MI8O2	8021733 04 / 8040001	0.11
MI8O4	802199701	0.2
MI8O4 RV	8047175	0.3
MA2	8046353	0.2
MA4	8040324	0.2
MA4 V	8047574	0.3
MI8	8021876 03	0.7

MI12T8	8190970	0.2
MI16	8021877 03 / 8040003	0.7
MO2	8021921 03 / 8040004	0.7
MO4	8021922 03 / 8040005	0.7
MO4L	8042800	0.2
MO4LHCS8	8040070	0.2
MR2	8021914 01	-
MR4	8021915 01	-
MR8	8042988	-
MOR4	8040032	0.2
MOR4S8	8040033	0.2
MOS8	8040056	0.0
MOS16	8040057	0.0
MV0	8044649	3.2
MV1T	8044643	3.2
MV1TB	8044650	3.2
MV1H	8044644	3.2
MV1S	8044645	3.2
MV2T	8044646	3.2
MV2TB	8044651	3.2
MV2H	8044647	3.2
MV2S	8044648	3.2
MCT1/MCT2	8023696	-
MZero	8046630	0.0.1
Mosaic Safety Designer	-	1.9.x

Table 4: Versions

2.3 Tests

The MOSAIC-Series was examined with regard to the following testing operations:

I. Functional Safety including
- Functional safety management (FSM) and safety lifecycle
- Applied safety development process
- Analysis of the product structure / architecture (Block-Diagram-FMEA)
- Analysis of the hardware (FMEDA on component or block level, quantitative analysis)
- Analysis of the software
- Verification and validation procedures/activities
- Fault simulations and software tests
- Approval of fault avoidance measures
- Functional tests

II. Electrical Safety

III. Susceptibility to environmental errors including
- Climate and temperature
- IP degree of protection
- Mechanical effects

IV. Electromagnetic compatibility (EMC)
- Immunity

V. Safety information in the product documentation (safety manual, user manual, installation and operating instructions).

VI. Product-Related Quality Assurance in Manufacture and Product Development

3 Standards and Guidelines

The regulations and guidelines which form the basis of the type testing are listed below.

3.1 Guidelines and Directives

No.	Standard	Title
[L1]	2006/42/EC	DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast)

Table 5: Guidelines and directives

3.2 Product Standards

No.	Standard	Title
[N1]	(EN) IEC 61496-1: 2020 Type 4	Safety of machinery - Electro-sensitive protective equipment Part 1: General requirements and tests
[N2]	EN 61131-2: 2007	Programmable controllers – Part 2: Equipment requirements and tests

Table 6: Product standards

3.3 Functional safety

No.	Standard	Title
[N3]	EN/IEC 61508-1: 2010 (SIL 3)	Functional safety of electrical/electronic/programmable electronic safety-related systems Part 1: General requirements
[N4]	EN/IEC 61508-2: 2010 (SIL 3)	Functional safety of electrical/electronic/programmable electronic safety-related systems Part 2: Requirements for electrical/electronic/ programmable electronic safety-related systems
[N5]	EN/IEC 61508-3: 2010 (SIL 3)	Functional safety of electrical/electronic/programmable electronic safety-related systems Part 3: Software requirements
[N6]	(EN) IEC 62061:2021 (Maximum SIL 3)	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems
[N7]	(EN) ISO 13849-1: 2023 (PL e, Cat. 4)	Safety of machinery - Safety-related parts of control systems Part 1: General principles for design
[N8]	EN 81-20:2020	Safety rules for the construction and installation of lifts - Lifts for the transport of persons and goods - Part 20: Passenger and goods passenger lifts
[N9]	EN 81-50:2020	Safety rules for the construction and installation of lifts - Lifts for the transport of persons and goods - Part 50: Design rules, calculations, examinations and tests of lift components

Table 7: Functional safety

3.4 Electrical safety

No.	Standard	Title
[N10]	EN 50178: 1997	Electronic equipment for use in power installations
[N11]	EN 60204-1: 2006	Safety of machinery - Electrical equipment of machines Part 1: General requirements
[N12]	EN 61131-2: 2007	Programmable controllers – Part 2: Equipment requirements and tests

Table 8: Electrical safety

3.5 Communication

No.	Standard	Title
[N13]	EN 61784-3: 2016	Industrial communication networks -- Profiles -- Part 3: Functional safety fieldbuses -- General rules and profile definitions

Table 9: Communication

3.6 Susceptibility to environmental errors

Remark: The following standards were approved by other testing services.

3.6.1 IP Code testing

No.	Standard	Title
[N14]	EN 60529:1989/ A2:2013/ COR2:2015	Degrees of protection provided by enclosures (IP Code)

Table 10: IP Code testing

3.6.2 Electromagnetic capability

3.6.2.1 Electromagnetic immunity

No.	Standard	Title
[N15]	(EN) IEC 61496-1: 2020 (Type 4)	Safety of machinery - Electro-sensitive protective devices Part 1: General requirements and tests

Table 11: Electromagnetic immunity

3.7 Safety information in the product documentation (safety manual, operating instructions)

No.	Standard	Title
[N16]	(EN) IEC 62061:2021 (Maximum SIL 3)	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems

No.	Standard	Title
[N17]	(EN) ISO 13849-1:2023 (PL e, Cat. 4)	Safety of machinery - Safety-related parts of control systems Part 1: General principles for design
[N18]	(EN) IEC 61496-1:2020 (Type 4)	Safety of machinery - Electro-sensitive protective equipment Part 1: General requirements and tests

Table 12: Safety information

3.8 Quality Management System

No.	Reference	Description
[M1]	QMS	Quality Management System TÜV SÜD Rail GmbH
	TR_RA_P_04.50	Test Program Functional Safety & Cybersecurity TR_RA_P_04.51Definition Scope of testing TR_RA_P_04.52Concept Phase & Safety Lifecycle TR_RA_P_04.53Detail Phase Hardware TR_RA_P_04.54Detail Phase Software TR_RA_P_04.55Safety Manual TR_RA_P_04.56Result of Testing
[M2]	D-PL-11190-08-00	DAkkS accreditation according to DIN EN ISO 17025:2018 / EN ISO/IEC 17025:2017

Table 13: Quality Management System

4 Documents provided for testing of MOSAIC-Series

Following documents were provided by REER SpA to be checked and evaluated by the test house.

No.	Title	Document-No./ File identifier	Revision	Date
[D1]	Requirements Specification	MOSAIC_SY	-	15.07.2010
[D2]	Partlist Expansion Board	da_schema_espan-sione.xls	-	12.02.2010
[D3]	Partlist Master Board	da_schema_master.xls	-	-
[D4]	Partlist Memory	da_schema_memoria.xls	-	12.02.2010
[D5]	Partlist MI16	da_schema_mi16.xls	-	12.05.2010
[D6]	Partlist MI8	da_schema_mi8.xls	-	12.05.2010
[D7]	Partlist MI8O2	da_schema_mI8_O2.xls	-	12.05.2010
[D8]	Partlist MO2	da_schema_mo2.xls	-	12.05.2010
[D9]	Partlist MO4	da_schema_mo4.xls	-	12.05.2010
[D10]	FMEA Expansion Board	Fmea_espansione.xls	-	10.05.2010
[D11]	FMEA Master Board	Fmea_Master.xls	-	10.05.2010
[D12]	FMEA Memory	Fmea_memoria.xls	-	10.05.2010
[D13]	FMEA MI16	Fmea_MI16.xls	-	12.05.2010
[D14]	FMEA MI8	Fmea_MI8.xls	-	12.05.2010
[D15]	FMEA MI8O2	Fmea_MI8_O2.xls	-	12.05.2010
[D16]	FMEA MO2	Fmea_MO2.xls	-	12.05.2010
[D17]	FMEA MO4	Fmea_MO4.xls	-	12.05.2010
[D18]	Mosaic PC Designer Requirement Specification	Mosaic_designer.pdf	0.1	12.04.2010
[D19]	SW Requirement Specification for CSCI Master management	Master_SRS.pdf	0.1	16.07.2010
[D20]	SW Test Plan for CSCI Master manage-ment	Master_STP.pdf	0.0	21.07.2010
[D21]	SW Test Report for CSCI Master Man-agement	Master_STR.pdf	0.0	21.07.2010
[D22]	Version Description Document for CSCI Master Management	Master_VDD.pdf	0.0	21.07.2010
[D23]	Master Interface Requirement Specifica-tion	Master_IRS.pdf	0.0	01.07.2010
[D24]	System Integration Plan for CSCI Mas-ter Management	Master_ITP.pdf	0.0	21.07.2010

No.	Title	Document-No./ File identifier	Revision	Date
[D25]	System Integration Report for CSCI Master Management	Master_ITR.pdf	0.0	21.07.2010
[D26]	SW Requirement Specification for CSCI Input Management	MI8_I16_SRS.pdf	0.0	22.04.2010
[D27]	Interface Requirement Specification for CSCI Input Management	MI8_I16_IRS.pdf	0.0	16.04.2010
[D28]	SW Test Plan for CSCI Input Management	MI8_I16_STP.pdf	0.0	16.07.2010
[D29]	SW Test Report for CSCI Input Management	MI8_I16_STR.pdf	0.0	16.07.2010
[D30]	SW Requirement Specification for CSCI Slave Management	MI8_O2_SRS.pdf	0.0	06.05.2010
[D31]	Interface Requirement Specification for CSCI Slave Management	MI8_O2_IRS.pdf	0.0	16.04.2010
[D32]	SW Test Plan for CSCI Slave Management	MI8_O2_STP.pdf	0.0	01.07.2010
[D33]	SW Test Report for CSCI Slave Management	MI8_O2_STR.pdf	0.0	06.07.2010
[D34]	Designer integration	Designer_ITR.pdf	0.0	03.09.2010
[D35]	SOFTWARE DEVELOPMENT AND MAINTENANCE (incl coding rules)	ILA 029 Engl_2010.doc	2.0	13.07.2010
[D36]	Certificate ISO9001:2008 valid until 1.05.2010	Certificato ISO9001-2008 04-06-2009.jpg	-	04.06.2009
[D37]	User manual	8540780	2	30.07.2010
[D38]	Mosaic compliance to IEC61131-2 2007/07	I_O.pdf	0.0	29.07.2010
[D39]	Schematic Base MI8O2	8021733 01 0B	0	19.07.2010
[D40]	Schematic Base M1	8021875 01 0B	0	19.07.2010
[D41]	Schematic Base MI8	8021876 01 0B	0	21.07.2010
[D42]	Schematic Base MI16	8021877 01 0B	0	21.07.2010
[D43]	Schematic Base MO2	8021921 01 0B	0	23.07.2010
[D44]	Schematic Base MO4	8021922 01 0B	0	23.07.2010
[D45]	Schematic Relay MR2	8021917 0B	0	20.04.2010
[D46]	Schematic Relay MR4	8021918 0B	0	20.04.2010
[D47]	Layout MR4	8190921 L2	0	20.04.2010
[D48]	Layout MR4	8190921 L3	0	20.04.2010
[D49]	Layout MR4	8190921 LC	0	20.04.2010
[D50]	Layout MR4	8190921 LS	0	20.04.2010

No.	Title	Document-No./ File identifier	Revision	Date
[D51]	Layout MI16	8190949 L2	0	10.06.2010
[D52]	Layout MI16	8190949 L3	0	10.06.2010
[D53]	Layout MI16	8190949 L4	0	10.06.2010
[D54]	Layout MI16	8190949 L5	0	10.06.2010
[D55]	Layout MI16	8190949 LC	0	10.06.2010
[D56]	Layout MI16	8190949 LS	0	10.06.2010
[D57]	Layout Master	8190951 L2	0	22.07.2010
[D58]	Layout Master	8190951 L3	0	22.07.2010
[D59]	Layout Master	8190951 L4	0	22.07.2010
[D60]	Layout Master	8190951 L5	0	22.07.2010
[D61]	Layout Master	8190951 LC	0	22.07.2010
[D62]	Layout Master	8190951 LS	0	22.07.2010
[D63]	Partlist Master Board	da_schema_master.xls	-	23.07.2010
[D64]	Partlist MI16	da_schema_mi16.xls	-	22.07.2010
[D65]	Partlist MI8	da_schema_mi8.xls	-	22.07.2010
[D66]	Partlist MI8O2	da_schema_mI8_O2.xls	-	22.07.2010
[D67]	Partlist MO2	da_schema_mo2.xls	-	23.07.2010
[D68]	Partlist MO4	da_schema_mo4.xls	-	22.07.2010
[D69]	FMEA Expansion Board	Fmea_espansione.xls	-	22.07.2010
[D70]	FMEA Master Board	Fmea_Master.xls	-	26.07.2010
[D71]	FMEA Memory	Fmea_memoria.xls	-	26.07.2010
[D72]	FMEA MI16	Fmea_MI16.xls	-	26.07.2010
[D73]	FMEA MI8	Fmea_MI8.xls	-	26.07.2010
[D74]	FMEA MI8O2	Fmea_MI8_O2.xls	-	26.07.2010
[D75]	FMEA MO2	Fmea_MO2.xls	-	26.07.2010
[D76]	FMEA MO4	Fmea_MO4.xls	-	26.07.2010
[D77]	SIL	SIL.xls	-	26.07.2010

Table 14: Documentation

4.1 Documents provided for Revision 1.2 of this report

Following additional documents were provided by REER SpA for the changes for MOSAIC PLC System.

No.	Title	Document-No./ File identifier	Revision	Date
[D78]	Impact Analysis	Impact Analysis	0.0	-
[D79]	Software Requirements Specifications for CSCI Input_Management	MI8_I16_SRS.pdf	0.2	08.09.2011
[D80]	Software Test Plan for CSCI Input_Management	MI8_I16_STP.pdf	0.2	04.10.2011
[D81]	Software Test Report for CSCI Input_Management	MI8_I16_STR.pdf	0.2	04.10.2011
[D82]	Version Description Document for CSCI Input_Management	MI8_I16_VDD.pdf	0.2	04.10.2011
[D83]	Software Requirements Specifications for CSCI Slave_Management	MI8_O2_SRS.pdf	0.3	08.09.2011
[D84]	Software Test Plan for CSCI Slave_Management	MI8_O2_STP.pdf	0.1	24.10.2011
[D85]	Software Test Report for CSCI Slave_Management	MI8_O2_STR.pdf	0.1	24.10.2011
[D86]	Version Description Document for CSCI Slave_Management	MI8_O2_VDD.pdf	0.1	17.10.2011
[D87]	Interface Requirements Specification for CSCI Master_Management	Master_IRS.pdf	0.1	15.11.2011
[D88]	System Integration Plan for CSCI Master_Management	Master_ITP.pdf	1.0	14.11.2011
[D89]	System Integration Report for CSCI Master_Management	Master_ITR.pdf	1.0	14.11.2011
[D90]	Software requirements Specifications for CSCI Master_Management	Master_SRS.pdf	1.0	14.11.2011
[D91]	Software test Plan for CSCI Master_Management	Master_STP.pdf	1.0	14.11.2011
[D92]	Software test Report for CSCI Master_Management	Master_STR.pdf	1.0	14.11.2011
[D93]	Version Description Document for CSCI Master_Management	Master_VDD.pdf	1.0	14.11.2011
[D94]	Interface requirements Specifications for CSCI Output_Management	MO4_O2_IRS.pdf	0.0	29.07.2010
[D95]	Software requirements Specifications for CSCI Output_Management	MO4_O2_SRS.pdf	0.1	21.02.2011
[D96]	Version Description Document for CSCI Output_Management	MO4_O2_VDD.pdf	0.1	14.11.2011

No.	Title	Document-No./ File identifier	Revision	Date
[D97]	Mosaic PC Designer – Requirements Specification	Mosaic_designer.pdf	1.0	21.10.2011
[D98]	Mosaic_SY – System Requirements Specification	Mosaic_SY.pdf	1.0	11.11.2011

Table 15: Documentation changes

4.2 Documents provided for Revision 1.3 of this report

Following additional document was provided by REER SpA to be checked after revision 1.2.

No.	Title	Document-No./ File identifier	Revision	Date
[D99]	FMEA MI12T8	FMEA_MI12T8.pdf	-	09.07.2012
[D100]	SIL MI12T8	SIL.pdf	-	09.07.2012
[D101]	Mosaic Designer SW modifications	Mosaic Designer SW modifications.doc	0.0	-
[D102]	Reconstruction integration Plan	Reconstruction_ITP.pdf	0.0	20.03.2012
[D103]	Reconstruction integration Report	Reconstruction_ITR.pdf	0.0	21.03.2012
[D104]	Schematic	ricostruisco28.pdf	-	28.03.2012
[D105]	Schematic	Schema 28.pdf	-	28.03.2012
[D106]	MCT1/MCT2 and MBU description	mosaic_declaration_mbu.pdf	-	03.07.2012

Table 16: Documentation for revision 1.3 of this report

4.3 Documents provided for Revision 1.4 of this report

Following additional document was provided by REER SpA to be checked for revision 1.4 of this report.

No.	Title	Document-No./ File identifier	Revision	Date
[D107]	Safety Plan	Mosaic_SP	1	28.01.2014
[D108]	Impact analysis M1	M1_ImpactAnalys_1.doc	0.0	16.07.2013
[D109]	Slave Impact Analysis	Slave_ImpactAnalys.doc	0.0	03.02.2014
[D110]	System Requirements Specification	Mosaic_SY	2.0	17.02.2014
[D111]	Mosaic PC Designer Requirement Specification	Mosaic_designer	2.0	11.02.2014
[D112]	Designer integration plan	Designer_ITP	2.0	17.02.2014
[D113]	Designer integration report	Designer_ITR	2.0	17.02.2014
[D114]	SW Requirement Specification for CSCI Master management	Master_SRS	2.0	17.02.2014

No.	Title	Document-No./ File identifier	Revision	Date
[D115]	SW Test Plan for CSCI Master management	Master_STP	2.0	20.01.2014
[D116]	SW Test Report for CSCI Master Management	Master_STR	2.0	20.01.2014
[D117]	System Integration Plan for CSCI Master Management	Master_ITP	2.0	17.02.2014
[D118]	System Integration Report for CSCI Master Management	Master_ITR	2.0	17.02.2014
[D119]	MI8/MI16 SRS	MI8_I16_SRS	0.7	18.06.2013
[D120]	MI8/MI16 STP	MI8_I16_STP	0.3	18.06.2013
[D121]	MI8/MI16 STR	MI8_I16_STR	0.7	23.09.2013
[D122]	MI8O2 SRS	MI8_O2_SRS	0.6	29.05.2013
[D123]	MI8O2 STP	MI8_O2_STP	0.5	06.05.2013
[D124]	MI8O2 STR	MI8_O2_STR	0.5	23.09.2013
[D125]	MI12 SRS	MI12_SRS	0.0	12.09.2013
[D126]	MI12 STP	MI12_STP	0.0	12.09.2013
[D127]	MI12 STR	MI12_STR	0.1	01.10.2013
[D128]	MO2/MO4 SRS	MO4_O2_SRS	0.3	12.09.2013
[D129]	MO2/MO4 STP	MO4_O2_STP	0.1	12.09.2013
[D130]	MO2/MO4 STR	MO4_O2_STR	0.1	23.09.2013
[D131]	FMEA MOR4	Fmea_MOR4.xls	0.0	19.09.2013
[D132]	FMEA MOR4S8	Fmea_MOR4S8.xls	0.0	10.06.2013
[D133]	SW Requirement Specification for CSCI Relay Management	MOR4_SRS	0.0	18.02.2014
[D134]	Interface Requirements Specifications for CSCI Relay Management	MOR4_IRS	0.0	29.10.2013
[D135]	SW Test Plan for CSCI Relay Management	MOR4_STP	0.0	24.01.2014
[D136]	SW Test Report for CSCI Relay Management	MOR4_STR	0.0	20.01.2014
[D137]	FMEA MV2H	Fmea_MV2_espansione_HTL_1.xls	0.0	01.10.2013
[D138]	FMEA MV2T	Fmea_MV2_espansione_TTL_1.xls	0.0	01.10.2013
[D139]	FMEA MV2S	Fmea_MV2_espansione_SINCOS_1.xls	0.0	01.10.2013
[D140]	SW Requirement Specification for CSCI Speed Management	MV1_V2_SRS	0.0	18.02.2014

No.	Title	Document-No./ File identifier	Revision	Date
[D141]	Interface Requirements Specifications for CSCI Speed Management	MV1_V2_IRS	0.0	17.06.2013
[D142]	SW Test Plan for CSCI Speed Management	MV0_V2_STP	0.0	20.01.2014
[D143]	SW Test Report for CSCI Speed Management	MV0_V2_STR	0.0	20.01.2014
[D144]	MOR4 8040032	Base: 8023716 0B Relè: 8023715 0B Segnalazioni: 802192701 0B	1 0 0	02.08.2013 10.05.2013 17.09.2010
[D145]	MOR4S8 8040033	Base: 8023714 0B Relè: 8023715 0B Segnalazioni: 80222213 0B	1 0 0	02.08.2013 10.05.2013 08.05.2010
[D146]	MV0 8040040	Base: 802372401 0B	0	30.10.2013
[D147]	MV1H 8040035	Base: 802372501 0B Modulo: 822373001 0B	0 0	30.10.2013 11.11.2013
[D148]	MV1S 8040036	Base: 802372501 0B Modulo: 802372801 0B	0 0	30.10.2013 29.10.2013
[D149]	MV1T 8040034	Base: 802372501 0B Modulo: 802372901 0B	0 0	30.10.2013 11.11.2013
[D150]	MV2H 8040038	Base: 802373101 0B Modulo: 802373501 0B	0 0	30.10.2013 11.11.2013
[D151]	MV2S 8040039	Base: 802373101 0B Modulo: 802373301 0B	0 0	30.10.2013 29.10.2013
[D152]	MV2T 8040037	Base: 802373101 0B Modulo: 802373401 0B	0 0	30.10.2013 11.11.2013
[D153]	User manual	8540780	19	30.07.2010
[D154]	SIL calculation	SIL.htm	0.0	01.10.2013

Table 17: Documentation for revision 1.4 of this report

4.4 Documents provided for Revision 1.5 of this report

Following additional document was provided by REER SpA to be checked for revision 1.5 of this report.

No.	Title	Document-No./ File identifier	Revision	Date
[D155]	Impact analysis for MV modification	MV2_ImpactAnalys.doc	0.0	03.11.2014
[D156]	System Requirements Specification	Mosaic_SY	2.1	15.01.2015
[D157]	Mosaic PC Designer Requirements Specification	PC Designer	2.1	18.11.2014

No.	Title	Document-No./ File identifier	Revision	Date
[D158]	FMEA	Fmea_MV2_espansione_TTL_interna_1	0.0	06.11.2014
[D159]	SIL calculation	SIL.xls	-	06.11.2014
[D160]	Software Requirements Specifications for CSCI Speed Management	MV0_V2_SRS	1.0	06.10.2014
[D161]	Interface Requirements Specifications for CSCI Speed Management	MV0_V2_IRS	0.1	24.09.2014
[D162]	System Integration Plan for CSCI Master Management and related Slaves	MASTER_ITP	2.0.1	18.11.2014
[D163]	System Integration Report for CSCI Master Management and related Slaves	MASTER_ITR	2.0.1	18.11.2014
[D164]	Designer integration Plan	Designer_ITP	2.1	18.11.2014
[D165]	Designer integration Report	Designer_ITR	2.1	18.11.2014
[D166]	Software test Plan for CSCI Speed Management	MV0_V2_STP	1.0	03.11.2014
[D167]	Software test Report for CSCI Speed Management	Mv0_V2_STR	1.0	03.11.2014
[D168]	MV static analysis report	MV2 Version 1.0 Speed_Management.xht	1.0	18.11.2014
[D169]	Requirement tracking list	SY_SRS_ITP_trace.xlsx	0.1	24.11.2014
[D170]	Mosaic manual	MOSAIC_ING_22.pdf	22	19.02.2015
[D171]	Impact Analysis for new bus modules	Impact_Analysis_mosaic_new_models_01_2015.docx	1	06.02.2015
[D172]	Declaration of new bus modules	mosaic_declaration_new_bus_modules.pdf	-	19.02.2015

Table 18: Documentation for revision 1.5 of this report

4.5 Documents provided for Revision 1.6 of this report

Following additional document was provided by REER SpA to be checked for revision 1.6 of this report.

No.	Title	Document-No./ File identifier	Revision	Date
[D173]	Impact analysis for MV2 modification	MV2_ImpactAnalys_1.doc	0.0	22.06.2015
[D174]	Impact analysis for M1 modification	M1_ImpactAnalys_2.doc	0.0	10.07.2015
[D175]	System Requirements Specification	Mosaic_SY_Rev2.2.pdf	2.2	26.05.2015
[D176]	System Requirements Specification	Mosaic_SY_Rev2.3.pdf	2.3	28.09.2015

No.	Title	Document-No./ File identifier	Revision	Date
[D177]	Master Interface Requirements Specification	Master_IRS_Rev0.3.pdf	0.3	26.05.2015
[D178]	MV0 V2 Interface Requirements Specification	MV0_V2_IRS_Rev0.2.pdf	0.2	26.05.2015
[D179]	Master Software Requirements Specification	Master_SRS_Rev3.0.pdf	3.0	19.10.2015
[D180]	MV0 V2 Software Requirements Specification	MV0_V2_SRS_Rev1.1.pdf	1.1	01.09.2015
[D181]	System Integration Plan	Master_ITP_Rev3.0.0.pdf	3.0.0	02.11.2015
[D182]	System Integration Report	Master_ITR_Rev3.0.0.pdf	3.0.0	12.11.2015
[D183]	Software Test Plan Master	Master_STP_Rev3.0.pdf	3.0	19.10.2015
[D184]	Software Test Plan MV0 V2	MV0_V2_STP_Rev1.1.pdf	1.1	02.09.2015
[D185]	Software Test Report Master	Master_STR_Rev3.0.pdf	3.0	15.10.2015
[D186]	Software Test Report MV0 V2	MV0_V2_STR_Rev1.1.pdf	1.1	02.09.2015
[D187]	Static analysis report	verbale_analisi_statica_mv2_ verbale_STR_mv2_V11.docs	1.1	06.08.2015
[D188]	Traceability Matrix	SY_SRS_ITP_trace.xlsx	1.0	24.07.2015
[D189]	Manual	0073134_ING.pdf	24	15.10.2015
[D190]	Mosaic PC Designer	Mosaic_designer_ Rev2.2.pdf	2.2	02.11.2015
[D191]	EMC Test Report	EMC_15_262_ M1 & MV1 & MOS16.pdf	1.0	21.12.2015
[D192]	Impact analysis MI8_O2 modification	MI8_O2_ImpactAnalys.doc	0.0	15.12.2015

Table 19: Documentation for revision 1.6 of this report

4.6 Documents provided for Revision 1.7 of this report

Following additional document was provided by REER SpA to be checked for revision 1.7 of this report.

No.	Title	Document-No./ File identifier	Revision	Date
[D193]	Impact analysis MO2/MO4 FW modification	MO2_O4_ImpactAnalys.doc	0.0	20.01.2016
[D194]	Interface Requirement Specification Mosaic MO4_O2	MO4_O2_IRS_Rev0.1.pdf	0.1	21.12.2015
[D195]	Software Requirements Specification Mosaic MO4_O2	MO4_O2_SRS_Rev0.5.pdf	0.5	17.03.2016
[D196]	Software Test Plan Mosaic MO4_O2	MO4_STP_Rev0.5.pdf	0.5	17.03.2016

No.	Title	Document-No./ File identifier	Revision	Date
[D197]	Software Test Report Mosaic MO4_O2	MO4_STR_Rev0.5.pdf	0.5	18.03.2016
[D198]	System Integration Plan Mosaic	Mosaic_ITP_Rev3.0.2.pdf	3.0.2	17.03.2016
[D199]	System Integration Report Mosaic	Mosaic_ITR_Rev3.0.2.pdf	3.0.2	17.03.2016

Table 20: Documentation for revision 1.7 of this report

4.7 Documents provided for Revision 1.8 of this report

Following additional document was provided by REER SpA to be checked for revision 1.8 of this report.

No.	Title	Document-No./ File identifier	Revision	Date
[D200]	System Requirements Specification	Mosaic_SY_Rev2.4.pdf	2.4	22.12.2016
[D201]	HW Schemes	elec_schemes_8022946_01.pdf	1.0	14.02.2017
[D202]	FMEA	Fmea_MO4LHCS8_V03.xlsm	1.0	10.02.2017
[D203]	HW FIT	FIT_SV_MO4LCHS8_TEST_81 91303.xlsx	1.0	04.01.2017
[D204]	SIL Calculation	SIL_MO4LHCS8.xlsx	1.0	27.03.2017
[D205]	SW Requirements Specification	MO4SS8_SRS_Rev0.0.pdf	0.0	22.12.2016
[D206]	Interface Requirement Specification	MO4SS8_IRS_Rev0.0.pdf	0.0	04.11.2016
[D207]	SW Test Plan	MO4SS8_STP_Rev0.0.pdf	0.0	17.02.2017
[D208]	SW Test Report	MO4SS8_STR_Rev0.0.pdf	0.0	17.02.2017
[D209]	STP, STR Review Report	verbale_STR_mo4ss8_ Rev0.0.doc	0.0	27.03.2017
[D210]	SW Code Review Report	verbale_analisi_statica_ mo4ss8_Rev0.0.docx	1.0	27.03.2017
[D211]	Mosaic PC Designer Requirements	Mosaic_designer_Rev3.1.pdf	3.1	27.03.2017
[D212]	Integration Plan	Mosaic_ITP_Rev3.1.1.pdf	3.1.1	21.03.2017
[D213]	Integration Report	Mosaic_ITR_Rev3.1.1.pdf	3.1.1	21.03.2017
[D214]	ITP, ITR Review Report	verbale_ITR_mo4ss8_ Rev0.0.doc	0.0	27.03.2017
[D215]	Electrical Safety Report	ES_717513914.pdf	1.0	09.05.2017
[D216]	Temperature Test Report	CLI909933A_REV00.pdf	0.0	03.05.2017
[D217]	Shock & Vibration Test Report	VIB909933_A_REV00.pdf	0.0	31.03.2017
[D218]	EMC Test Report	EMC909933A_ MOSAIC MO4LHCS8.pdf	0.0	09.05-2017
[D219]	User Manual	0094657_ING.pdf	31	23.03.2017

Table 21: Documentation for revision 1.8 of this report

4.8 Documents provided for Revision 1.9 of this report

Following additional document was provided by REER SpA to be checked for revision 1.9 of this report.

No.	Title	Document-No./ File identifier	Revision	Date
[D220]	Impact analysis Mosaic revisions	M1+Slaves_ImpactAnalys.doc	0.0	15.05-2017
[D221]	Impact analysis MV0/1/2 Bug Fix	MV2_ImpactAnalys_2.doc	0.0	13.06.2017
[D222]	Mosaic system specifications	Mosaic_SY_Rev2.5.pdf	2.5	18.05.2017
[D223]	Mosaic software requirements	Master_SRS_Rev3.1.pdf	3.1	30.05.2017
[D224]	Master software test plan	Master_STP_Rev3.1.pdf	3.1	30.05.2017
[D225]	Master software test report	Master_STR_Rev3.1.pdf	3.1	30.05.2017
[D226]	Mosaic integration test plan	Mosaic_ITP_Rev3.2.0.pdf	3.2.0	23.05.2017
[D227]	Mosaic integration test report	Mosaic_ITR_Rev3.2.0.pdf	3.2.0	01.06.2017
[D228]	M1 interface requirement specifications	Master_IRS_Rev0.3.pdf	0.3	26.05.2015
[D229]	MI8O2 software requirements	MI8_O2_SRS_Rev0.10.pdf	0.10	29.05.2017
[D230]	MI8O2 software test plan	MI8_O2_STP_Rev0.10.pdf	0.10	30.05.2017
[D231]	MI8O2 software test report	MI8_O2_STR_Rev0.10.pdf	0.10	30.05.2017
[D232]	MI8O2 interface requirement specifications	MI8_O2_IRS_Rev0.1.pdf	0.1	15.10.2015
[D233]	MO2/MO4 software requirements	MO4_O2_SRS_Rev0.6.pdf	0.6	11.05.2017
[D234]	MO2/MO4 software test plan	MO4_O2_STP_Rev0.6.pdf	0.6	17.05.2017
[D235]	MO2/MO4 software test report	MO4_O2_STR_Rev0.6.pdf	0.6	17.05.2017
[D236]	MO2/MO4 interface requirement specifications	MO4_O2_IRS_Rev0.1.pdf	0.1	21.12.2015
[D237]	MOR4/MOR4S8 software requirements	MOR4_SRS_Rev0.2.pdf	0.1	18.05.2017
[D238]	MOR4/MOR4S8 software test plan	MOR4_STP_Rev0.2.pdf	0.1	19.05.2017
[D239]	MOR4/MOR4S8 software test report	MOR4_STR_Rev0.2.pdf	0.1	22.05.2017
[D240]	MOR4/MOR4S8 interface requirement specifications	MOR4_IRS_Rev0.0.pdf	0.0	20.01.2014
[D241]	MV2 software requirements specification	MV0_V2_SRS_Rev1.2.pdf	1.2	13.06.2017
[D242]	MV2 software test plan	MV0_V2_STP_Rev1.2.pdf	1.2	21.06.2017
[D243]	MV2 software test report	MV0_V2_STR_Rev1.2.pdf	1.2	21.06.2017

No.	Title	Document-No./ File identifier	Revision	Date
[D244]	System Integration Plan for CSCI Master Management and related Slaves	Mosaic_ITP_Rev3.2.1.pdf	3.2.1	13.06.2017
[D245]	System Integration Report for CSCI Master Management and related Slaves	Mosaic_ITR_Rev3.2.1.pdf	3.2.1	15.06.2017
[D246]	MV2 interface requirement specification	MV0_V2_IRS_Rev0.2.pdf	0.2	26.05.2015

Table 22: Documentation for revision 1.9 of this report

4.9 Documents provided for Revision 1.10 of this report

Following additional document was provided by REER SpA to be checked for revision 1.10 of this report.

No.	Title	Document-No./ File identifier	Revision	Date
[D247]	User Manual	0094657_ING.pdf	31	23.03.2017

Table 23: Documentation for revision 1.10 of this report

4.10 Documents provided for Revision 1.12 of this report

Following additional document was provided by REER SpA to be checked for revision 1.12 of this report.

No.	Title	Document-No./ File identifier	Rev.	Date
[D248]	Software Requirements Specification - M1S	M1S_SRS_Rev0.0.pdf	0.0	2018-07-10
[D249]	System Requirements Specification MOSAIC	Mosaic_SY_Rev3.0.pdf	3.0	2017-12-13
[D250]	Interface Requirements Specification - M1S	M1S_IRS_Rev0.0.pdf	0.0	2018-07-09
[D251]	Safety Plan MOSAIC	Mosaic_SP_Rev3.pdf	3	2018-07-20
[D252]	Project Plan M1S / MI8O4	M1S_MI8O4_project_plan.pdf	0.0	2017-10-20
[D253]	Climatic Test Report on Mosaic Safety Modules	CLI1118224A_REV00.pdf	00	2018-06-13
[D254]	EMC Test Report on Mosaic M1S and MI8O8	emc_m1s_mi8o4.pdf	Draft	2018-06-13
[D255]	Vibration Test Report on Mosaic M1S and MI8O8	VIB1118224A_REV00.pdf	00	2018-05-25
[D256]	FIT Test Report M1S	FIT_M1S_TEST_8191389.xlsx	00	2018-07-10

No.	Title	Document-No./ File identifier	Rev.	Date
[D257]	FIT Test Report MI8O4	FIT_MI8O4_TEST_8191389.xlsx	00	2018-07-10
[D258]	Software Test Plan	M1S_STP_Rev0.0.pdf	0.0	2018-07-20
[D259]	Mosaic PC Designer Requirements Specification	Mosaic_designer_Rev4.0.pdf	4.0	2018-07-16
[D260]	Mosaic PC Designer Integration Plan	Designer_ITP_Rev3.0.pdf	3.0	2018-07-30
[D261]	Mosaic PC Designer Integration Report	Designer_ITR_Rev3.0.pdf	3.0	2018-07-30
[D262]	FMEA_M1S	FMEA_M1S.xlsm	0	2018-06-11
[D263]	FMEA_MI8O4	Fmea_MI8O4.xlsm	0	2018-06-11
[D264]	SIL Final Calculation	SIL_Finali-MODULI.xlsm	0.1	2018-07-23
[D265]	User Manual	0094657_ING.pdf	34	2018-07-05

Table 24: Documentation for revision 1.12 of this report

4.11 Documents provided for Revision 1.13 of this report

Following additional document was provided by REER SpA to be checked for revision 1.13 of this report.

No.	Title	Document-No./ File identifier	Rev.	Date
[D266]	Impact Analysis Mosaic M1, MVx	M1_ImpactAnalys_3.doc	0.0	2018-12-20
[D267]	System Requirements Specification Mosaic	Mosaic_SY_Rev3.0.pdf	3.0	2018-12-17
[D268]	Requirement Specification Mosaic PC Designer	Mosaic_designer_Rev4.0.pdf	4.0	2018-07-16
[D269]	Software Requirements Specification Master	Master_SRS_Rev4.0.pdf	4.0	2018-12-18
[D270]	Interface Requirements Specification Master	Master_IRS_Rev0.3.pdf	0.3	2015-05-26
[D271]	Software Requirements Specification MV0/MV1/MV2	MV0_V2_SRS_Rev2.0.pdf	2.0	2018-12-10
[D272]	Interface Requirements Specification MVx	MV0_V2_IRS_Rev0.2.pdf	0.2	2015-05-26
[D273]	System Integration Plan Mosaic	Mosaic_ITP_Rev5.1.0.pdf	5.1.0	2019-01-07

No.	Title	Document-No./ File identifier	Rev.	Date
[D274]	System Integration Report Mosaic	Mosaic_ITR_Rev5.1.0.pdf	5.1.0	2019-01-07
[D275]	Software Test Plan Master	Master_STP_Rev4.0.pdf	4.0	2018-12-20
[D276]	Software Test Report Master	Master_STR_Rev4.0.pdf	4.0	2018-12-20
[D277]	Software Test Plan MVx	MV0_V2_STP_Rev2.0.pdf	2.0	2018-12-11
[D278]	Software Test Report MVx	MV0_V2_STR_Rev2.0.pdf	2.0	2018-12-11
[D279]	Designer Integration Plan Mosaic PC Designer	Designer_ITP_Rev4.0.pdf	4.0	2019-01-09
[D280]	Designer Integration Report Mosaic PC Designer	Designer_ITR_Rev4.0.pdf	4.0	2019-01-09
[D281]	Installation and User Guide Modular Safety Integrated Controller	Mosaic_35_ING.pdf	35	2019-01-24
[D282]	Installation and User Guide Mosaic Fieldbus Modules	BUS_USER_MANUAL_ENGLISH.pdf	01	2018-12-19
[D283]	Free of Interference Declaration MBCCL	MBCCL_psd.pdf	-	2019-02-22

Table 25: Documentation for revision 1.13 of this report

4.12 Documents provided for Revision 1.14 of this report

Following additional document was provided by REER SpA to be checked for revision 1.14 of this report.

No.	Title	Document-No./ File identifier	Rev.	Date
[D284]	System Requirements Specification Mosaic	Mosaic_SY_Rev3.1.pdf	3.1	2019-04-19
[D285]	System FMEA MA4	Fmea_MA4.xlsm	0.0	2019-05-13
[D286]	Software Requirements Specification	M1S_SRS_Rev0.1.pdf	0.1	2019-05-02
[D287]	Software Test Plan	M1S_STP_Rev0.1.pdf	0.1	2019-05-03
[D288]	Software Test Report	M1S_STP_Rev0.1.pdf	0.1	2019-05-03
[D289]	Schematic MO4L	8023350 0B.pdf	0.0	2019-03-25
[D290]	Schematic MA4	8023601 0B.pdf	x	2018-06-11
[D291]	Schematic MA4 Base Board	8023602 0B.pdf	x	2018-05-24
[D292]	FMEDA M1S, MA4, MO4L	SIL_Finali-MODULI.xlsm	-	2019-06-04

No.	Title	Document-No./ File identifier	Rev.	Date
[D293]	FIT for M1S, MA4 module	FIT_MA4_BASE.xlsx	0.0	2019-04-29
[D294]	Climatic Tests on MOSAIC safety modules MA4, M1S and MO4L	CLI1279999A_REV00.pdf	0.0	2019-04-08
[D295]	EMC Tests on MOSAIC safety modules MA4, M1S and MO4L	EMC1279999A_REV00.pdf	0.0	2019-04-11
[D296]	Vibration Tests on MOSAIC safety modules MA4, M1S and MO4L	VIB1279999A_REV00.pdf	0.0	2019-05-15
[D297]	Installation and User Guide Modular Safety Integrated Controller	Manuale rev36_ENG.pdf	36	2019-04-29
[D298]	Interface Requirements Specifications MA4C	MA4C_IRS_Rev0.0.pdf	0.0	2019-04-08
[D299]	Software Requirements Specifications MA4C	MA4C_SRS_Rev0.0.pdf	0.0	2019-06-20
[D300]	Software Test Plan MA4C	MA4C_STP_Rev0.0.pdf	0.0	2019-06-20
[D301]	Software Test Report MA4C	MA4C_STR_Rev0.0.pdf	0.0	2019-06-20
[D302]	Mosaic PC Designer Requirements Specification	Mosaic_designer_Rev4.1.pdf	4.1	2019-04-02

Table 26: Documentation for revision 1.14 of this report

4.13 Documents provided for Revision 1.15 of this report

Following additional document was provided by REER SpA to be checked for revision 1.15 of this report.

No.	Title	Document-No./ File identifier	Rev.	Date
[D303]	Impact Analysis	Status_output_ImpactAnalys.doc	0.0	2019-07-15
[D304]	System Requirements Specification MOSAIC	Mosaic_SY_Rev3.1.pdf	3.1	2019-04-19
[D305]	SW Requirements Specification MOS8, MOS16	MOS8_16_SRS_Rev0.0.pdf	0.0	2019-07-15
[D306]	Interface Requirements Specification MOS8, MOS16	MOS8_16_IRS_Rev0.0.pdf	0.0	2019-07-15
[D307]	FMEA MOS8	Fmea_MOS_8.xlsm	0.0	2019-07-09
[D308]	FMEA MOS16	Fmea_MOS_16.xlsm	0.0	2019-07-09
[D309]	Software Test Plan MOS8, MOS16	MOS8_16_STP_Rev0.0.pdf	0.0	2019-07-15

No.	Title	Document-No./ File identifier	Rev.	Date
[D310]	Software Test Report MOS8, MOS16	MOS8_16_STR_Rev0.0.pdf	0.0	2019-07-15
[D311]	Integration Plan MOSAIC	Mosaic_ITP_Rev5.2.0.pdf	5.2.0	2019-06-25
[D312]	Integration Report MOSAIC	Mosaic_ITR_Rev5.2.0.pdf	5.2.0	2019-06-26
[D313]	Installation and User Manual MOSAIC	0118500.pdf	37	2019-07-16

Table 27: Documentation for revision 1.15 of this report

4.14 Documents provided for Revision 1.16 of this report

Following additional document was provided by REER SpA to be checked for revision 1.16 of this report.

No.	Title	Document-No./ File identifier	Rev.	Date
[D314]	Impact Analysis Mosaic Modules Phoenix brand modification LED	Brand_ImpactAnalys.doc	0.0	2019-07-23
[D315]	Impact Analysis Mosaic MA4	MA4_ImpactAnalys.doc	0.0	2019-07-31
[D316]	System Requirements Specification MOSAIC	Mosaic_SY_Rev3.2.pdf	3.2	2019-07-25
[D317]	Software Test Plan MA4C	MA4C_STP_Rev0.1.pdf	0.1	2019-09-09
[D318]	Software Test Report MA4C	MA4C_STR_Rev0.1.pdf	0.1	2019-09-09
[D319]	Integration Plan MOSAIC	Mosaic_ITP_Rev5.3.0.pdf	5.3.0	2019-07-30
[D320]	Integration Report MOSAIC	Mosaic_ITR_Rev5.3.0.pdf	5.3.0	2019-07-30
[D321]	Requirements Specification Mosaic PC Designer	Mosaic_designer_Rev4.2.pdf	4.2	2019-07-29
[D322]	Interface Requirements Specifications Mosaic M1S	M1S_IRS_Rev0.1.pdf	0.1	2019-07-25
[D323]	Software Requirements Specifications Mosaic M1S	M1S_SRS_Rev0.2.pdf	0.2	2019-07-25
[D324]	Software Test Plan Mosaic M1S	M1S_STP_Rev0.2.pdf	0.2	2019-09-11

No.	Title	Document-No./ File identifier	Rev.	Date
[D325]	Software Test Report Mosaic M1S	M1S_STR_Rev0.2.pdf	0.2	2019-09-11
[D326]	Interface Requirements Specifications Mosaic Master IRS	Master_IRS_Rev0.4.pdf	0.4	2019-07-25
[D327]	Software Requirements Specifications Mosaic Master SRS	Master_SRS_Rev4.1.pdf	4.1	2019-07-25
[D328]	Software Test Plan Mosaic Master STP	Master_STP_Rev4.1.pdf	4.1	2019-09-17
[D329]	Software Test Report Mosaic Master STR	Master_STR_Rev4.1.pdf	4.1	2019-09-17
[D330]	Interface Requirements Specifications Mosaic MI8_O2 IRS	MI8_O2_IRS_Rev0.2.pdf	0.2	2019-07-25
[D331]	Software Requirements Specifications Mosaic MI8_O2 SRS	MI8_O2_SRS_Rev0.11.pdf	0.1	2019-07-30
[D332]	Software Test Plan Mosaic MI8_O2 STP	MI8_O2_STP_Rev0.11.pdf	0.11	2019-09-17
[D333]	Software Test Report Mosaic MI8_O2 STR	MI8_O2_STR_Rev0.11.pdf	0.11	2019-09-17
[D334]	Interface Requirements Specifications Mosaic MI8O4 IRS	MI8O4_IRS_Rev0.1.pdf	0.1	2019-07-31
[D335]	Software Requirements Specifications Mosaic MI8O4 SRS	MI8O4_SRS_Rev0.1.pdf	0.1	2019-07-31
[D336]	Software Test Plan Mosaic MI8O4 STP	MI8O4_STP_Rev0.1.pdf	0.1	2019-09-11
[D337]	Software Test Report Mosaic MI8O4 STR	MI8O4_STR_Rev0.1.pdf	1.0	2019-09-11
[D338]	Interface Requirements Specifications Mosaic MO4_O2 IRS	MO4_O2_IRS_Rev0.2.pdf	0.2	2019-07-29
[D339]	Software Requirements Specifications Mosaic MO4_O2 SRS	MO4_O2_SRS_Rev0.7.pdf	0.7	2019-07-30
[D340]	Interface Requirements Specifications Mosaic MO4L IRS	MO4L_IRS_Rev0.1.pdf	0.1	2019-07-31

No.	Title	Document-No./ File identifier	Rev.	Date
[D341]	Software Requirements Specifications Mosaic MO4L SRS	MO4L_SRS_Rev0.1.pdf	0.1	2019-07-31
[D342]	Software Test Plan Mosaic MO4L STP	MO4L_STP_Rev0.1.pdf	0.1	2019-09-11
[D343]	Software Test Report Mosaic MO4L STR	MO4L_STR_Rev0.1.pdf	0.1	2019-09-12
[D344]	Interface Requirements Specifications Mosaic MO4SS8 IRS	MO4SS8_IRS_Rev0.1.pdf	0.1	2019-07-30
[D345]	Software Requirements Specifications Mosaic MO4SS8 SRS	MO4SS8_SRS_Rev0.1.pdf	0.1	2019-07-30
[D346]	Software Test Plan Mosaic MO4SS8 STP	MO4SS8_STP_Rev0.1.pdf	0.1	2019-07-10
[D347]	Software Test Report Mosaic MO4SS8 STR	MO4SS8_STR_Rev0.1.pdf	0.1	2019-07-11

Table 28: Documentation for revision 1.16 of this report

4.15 Documents provided for Revision 1.17 of this report

Following additional document was provided by REER SpA to be checked for revision 1.17 of this report.

No.	Title	Document-No./ File identifier	Rev.	Date
[D348]	Impact Analysis Mosaic MV2 / MV1 / MV0/	MV2_ImpactAnalys_3_rev0.1.pdf	0.1	2020-04-01
[D349]	System Requirements Specification Mosaic	Mosaic_SY_Rev4.0.pdf	4.0	2020-02-13
[D350]	Software Requirements Specifications MV0 / MV1 / MV2	MV0_V2_SRS_Rev3.0.pdf	3.0	2020-03-16
[D351]	Interface Requirements Specifications for Speed Management	MV0_V2_IRS_Rev1.0.pdf	1.0	2019-12-12
[D352]	Software Test Plan for Speed Management	MV0_V2_STP_Rev3.0.pdf	3.0	2020-03-20
[D353]	Software Test Report for Speed Management	MV0_V2_STR_Rev3.0.pdf	3.0	2020-03-20
[D354]	System Integration Plan for CSCI Speed Management and MV0/MV1/MV2 Slaves	MV0_V2_ITP_Rev3.0.pdf	3.0	2020-03-16
[D355]	System Integration Report for CSCI Speed Management	MV0_V2_ITR_Rev3.0.pdf	3.0	2020-03-16

No.	Title	Document-No./ File identifier	Rev.	Date
[D356]	EMC Test Report	EMC1475597A_REV00 MOSAIC.pdf	00	2020-03-27
[D357]	Schematic MV2	sch_0124499.pdf	00	2020-01-07
[D358]	FMEDA calculation	Fmea_MV2.xls	0.1	2020-03-27
[D359]	Impact Analysis Mosaic M1S	M1S_ImpactAnalys.doc	0.0	2019-12-17
[D360]	Software Requirements Specifications for M1S	M1S_SRS_Rev0.3.pdf	0.3	2020-02-14
[D361]	Interface Requirements Specifications for M1S	M1S_IRS_Rev0.1.pdf	0.1	2019-07-25
[D362]	Software Test Plan for M1S	M1S_STP_Rev0.3.pdf	0.3	2020-02-17
[D363]	Software Test Report for M1S	M1S_STR_Rev0.3.pdf	0.3	2020-02-17
[D364]	System Integration Plan for M1S and related Slaves	M1S_ITP_Rev0.3.pdf	0.3	2020-02-20
[D365]	System Integration Report for M1S and related Slaves	M1S_ITR_Rev0.3.pdf	0.3	2020-02-20
[D366]	Impact Analysis Mosaic MA4 MA2	MA4_MA2_ImpactAnalys.doc	0.0	2019-12-17
[D367]	Software Requirements Specifications for Mosaic MA4 MA2	MA4C_SRS_Rev0.2.pdf	0.2	2019-11-18
[D368]	Interface Requirements Specifications for Mosaic MA2 MA4	MA4C_IRS_Rev0.1.pdf	0.1	2019-09-25
[D369]	Software Test Plan for Mosaic MA2 MA4	MA4C_STP_Rev0.2.pdf	0.2	2019-11-14
[D370]	Software Test Report for Mosaic MA2 MA4	MA4C_STR_Rev0.2.pdf	0.2	2019-11-14
[D371]	System Integration Plan for M1S and MA4/MA2 slaves	MA4C_ITP_Rev0.2.pdf	0.2	2019-12-17
[D372]	System Integration Report for M1S and MA4/MA2 slaves	MA4C_ITR_Rev0.2.pdf	0.2	2019-12-17
[D373]	Impact Analysis Mosaic MI8O4	MI8O4_ImpactAnalys.doc	0.0	2020-02-20
[D374]	Software Requirements Specifications for Mosaic MI8O4	MI8O4_SRS_Rev0.2.pdf	0.2	2020-02-21
[D375]	Interface Requirements Specifications for MI8O4	MI8O4_IRS_Rev0.1.pdf	0.1	2019-07-31
[D376]	Software Test Plan for MI8O4	MI8O4_STP_Rev0.2.pdf	0.2	2020-02-25

No.	Title	Document-No./ File identifier	Rev.	Date
[D377]	Software Test Report for MI8O4	MI8O4_STR_Rev0.2.pdf	0.2	2020-02-25
[D378]	System Integration Plan for MI8O4 slave module	MI8O4_ITP_Rev0.2.pdf	0.2	2020-03-10
[D379]	System Integration Report for MI8O4 slave module	MI8O4_ITR_Rev0.2.pdf	0.2	2020-03-10
[D380]	Impact Analysis Mosaic MO4L	MO4L_ImpactAnalys.doc	0.0	2020-02-20
[D381]	Software Requirements Specifications for Mosaic MO4L	MO4L_SRS_Rev0.2.pdf	0.2	2020-02-21
[D382]	Interface Requirements Specifications for MO4L	MO4L_IRS_Rev0.1.pdf	0.1	2019-07-31
[D383]	Software Test Plan for MO4L	MO4L_STP_Rev0.2.pdf	0.2	2020-02-25
[D384]	Software Test Report for MO4L	MO4L_STR_Rev0.2.pdf	0.2	2020-02-25
[D385]	System Integration Plan for MO4L	MO4L_ITP_Rev0.2.pdf	0.2	2020-03-11
[D386]	System Integration Report for MO4L	MO4L_ITR_Rev0.2.pdf	0.2	2020-03-11
[D387]	Impact Analysis Mosaic MO4SS8 (MOLHCS8)	MO4SS8_ImpactAnalys.doc	0.0	2020-02-20
[D388]	Software Requirements Specifications for Mosaic MO4SS8	MO4SS8_SRS_Rev0.2.pdf	0.2	2020-02-24
[D389]	Interface Requirements Specifications for MO4SS8	MO4SS8_IRS_Rev0.1.pdf	0.1	2019-07-30
[D390]	Software Test Plan for MO4SS8	MO4SS8_STP_Rev0.2.pdf	0.2	2020-02-25
[D391]	Software Test Report for MO4SS8	MO4SS8_STR_Rev0.2.pdf	0.2	2020-02-25
[D392]	System Integration Plan for MO4SS8	MO4SS8_ITP_Rev0.2.pdf	0.2	2020-03-11
[D393]	System Integration Report for MO4SS8	MO4SS8_ITR_Rev0.2.pdf	0.2	2020-03-11
[D394]	Requirements Specification Mosaic PC Designer	Mosaic_designer_Rev4.3.pdf	4.3	2020-02-13

Table 29: Documentation for revision 1.17 of this report

4.16 Documents provided for Revision 1.18 of this report

Following additional document was provided by REER SpA to be checked for revision 1.18 of this report.

No.	Title	Document-No./ File identifier	Rev.	Date
[D395]	MOSAIC MR8 RELAYS EXPANSION MODULES	8541360 • 28/02/2020 • Rev.0	0	2020-02-28

Table 30: Documentation for revision 1.18 of this report

4.17 Documents provided for Revision 1.19 and 1.20 of this report

Following additional document was provided by REER SpA to be checked for revision 1.19 and 1.20 of this report.

No.	Title	Document-No./ File identifier	Rev.	Date
[D396]	Installation, Use and Maintenance	8541403 • 10/11/2020 • Rev.0	0	2020-11-10
[D397]	EMC Test Report	EMC1626638A_REV00.pdf	0	2020-11-18
[D398]	MZero FMEDA Summary	SIL_Finali-MODULI.xlsm	0.0	2021-02-10
[D399]	MZero Fault List	FIT_MZERO.xlsx	0.0	2020-11-20
[D400]	MZero FMEDA	Fmea_MZero.xlsm	0.0	2020-09-22
[D401]	Mosaic PC Designer Requirements Specification	Mosaic_designer_Rev5.0.pdf	5.0	2020-10-15
[D402]	Mosaic Safety Plan	Mosaic_SP_Rev3.pdf	3	2018-07-20
[D403]	Mosaic System Requirements Specification	Mosaic_SY_Rev5.0.pdf	5.0	2020-10-15
[D404]	MZero Schematic Add-on Card	MZero_add_on.pdf	0	2020-04-03
[D405]	MZero Impact Analysis	MZero_ImpactAnalys.doc	0.0	2020-10-23
[D406]	MZero Interface Requirements Specifications	MZero_IRS_Rev0.0.pdf	0.0	2020-11-11
[D407]	MZero System Integration Plan	MZero_ITP_Rev0.0.pdf	0.0	2020-12-17
[D408]	MZero System Integration Report	MZero_ITR_Rev0.0.pdf	0.0	2020-12-17
[D409]	MZero Main Schematic	MZero_main.pdf	0	2020-04-03
[D410]	MZero Design Plan	MZero_p_prog_r0.pdf	0	2020-01-21
[D411]	MZero Software Requirements Specifications	MZero_SRS_Rev0.0.pdf	0.0	2020-12-01
[D412]	MZero Software Test Plan	MZero_STP_Rev0.0.pdf	0.0	2020-12-16
[D413]	MZero Software Test Report	MZero_STR_Rev0.0.pdf	0.0	2020-12-16
[D414]	Vibration and Shock Test Report	VIB1616843A_REV00.pdf	0	2020-11-19

Table 31: Documentation for revision 1.19 and 1.20 of this report

4.18 Documents provided for Revision 1.21 of this report

Following additional documentation was provided by REER SpA to be checked for revision 1.21 of this report.

No.	Title	Document-No./ File identifier	Rev.	Date
[D415]	M1S-COM Impact Analysis	M1S_Com_Im-pactAnalys.docx	1.0	2021-09-06
[D416]	MOSAIC Manual	Mosaic_manual_TUEV.pdf	40	2021-10-25
[D417]	MOSAIC Label	8046967_LL.pdf	0	2021-09-21
[D418]	EMC test report	EMC1773049A_REV01.pdf	00	2021-10-11
[D419]	Climatic test report	MOSAIC M1S COMM CLIMATIC CHAMBER TEST_2021.doc	1	2021-11-09
[D420]	Vibration test report	VIB1773049A_REV00.pdf	00	2021-10-08
[D421]	Interface requirements specifications	M1S_IRS_Rev0.2.pdf	0.2	2021-06-09
[D422]	Software requirements specifications	M1S_SRS_Rev1.0.pdf	1.0	2021-09-02
[D423]	System integration plan	M1S_ITP_Rev1.0.pdf	1.0	2021-11-03
[D424]	System integration report	M1S_ITR_Rev1.0.pdf	1.0	2021-11-03
[D425]	Software test plan	M1S_STP_Rev1.0.pdf	1.0	2021-10-27
[D426]	Software test report	M1S_STR_Rev1.0.pdf	1.0	2021-10-27
[D427]	Schematic	802399202 0B.pdf	0	2021-09-24
[D428]	MO4L Impact Analysis	MO4L_ImpactAnalys_Rev0.3.doc	0.0	2021-07-15
[D429]	Interface requirements specifications	MO4L_IRS_Rev0.2.pdf	0.2	2021-06-10
[D430]	Software requirements specifications	MO4L_SRS_Rev0.3.pdf	0.3	2021-06-17
[D431]	System integration plan	MO4L_ITP_Rev0.3.pdf	0.3	2021-09-07
[D432]	System integration report	MO4L_ITR_Rev0.3.pdf	0.3	2021-11-02
[D433]	Software test plan	MO4L_STP_Rev0.3.pdf	0.3	2021-10-28
[D434]	Software test report	MO4L_STR_Rev0.3.pdf	0.3	2021-10-28
[D435]	MI8O4 Impact Analysis	MI8O4_ImpactAnalys_Rev0.3.docx	0.0	2021-07-15
[D436]	Interface requirements specifications	MI8O4_IRS_Rev0.2.pdf	0.2	2021-06-10
[D437]	Software requirements specifications	MI8O4_SRS_Rev0.3.pdf	0.3	2021-06-17
[D438]	System integration plan	MI8O4_ITP_Rev0.3.pdf	0.3	2021-07-02
[D439]	System integration report	MI8O4_ITR_Rev0.3.pdf	0.3	2021-10-28
[D440]	Software test plan	MI8O4_STP_Rev0.3.pdf	0.3	2021-11-02
[D441]	Software test report	MI8O4_STR_Rev0.3.pdf	0.3	2021-10-28

No.	Title	Document-No./ File identifier	Rev.	Date
[D442]	MOSAIC PC designer – requirements specification	Mosaic_designer_Rev6.0.pdf	6.0	2021-05-24
[D443]	System requirements specification	Mosaic_SY_Rev6.0.pdf	6.0	2021-07-23

Table 32: Documentation for revision 1.21 of this report

5 Performance and result of tests

5.1 Test reports

Following test reports were issued by REER SpA or other accredited test laboratories.

No.	Title	Document-No./ File identifier	Revision	Date
[R1]	Review Report on System-FMEA	Review Report FMEDA.pdf	1.0	19.07.2010
[R2]	Review Report on FMEDA on component or block level	Review Report FMEDA.pdf	1.0	19.07.2010
[R3]	Review Report on User Manual	Review Report Manual 13849-1	1.3	30.07.2010
[R4]	Review Report on User Manual	Review Report Manual 61496-1	1.2	30.07.2010
[R5]	HW-FIT[1]	Test report solid state output-rev 1.1 .docx	1.1	17.05.2010
[R6]	SW-FIT1	SW_FIT_REER_Mosaic_rev_1_1TÜV Rail Memo	1.1	20.07.2010
[R7]	Response time measurement	Test report solid state output-rev 1.1 .docx	1.1	17.05.2010
[R8]	Minutes of Meeting	MoM 20091117_tk_gn.docx	1.0	18.11.2009
[R9]	Checklist according to IEC 61508, part 1 (FSM)	Checklist_FSM_HW_61508_Realization_1ed_REER_Mosaic.docx	1.0	20.07.2010
[R10]	Checklist according to IEC 61508, part 2 (Hardware)	Checklist_FSM_HW_61508_Realization_1ed_REER_Mosaic.docx	1.0	20.07.2010
[R11]	Checklist according to IEC 61508, part 3 (Software)	REER Mosaic IEC61508-3-Checklist_v1_0	1.0	08.10.2010
[R12]	Checklist according to EN 61496, part 1 (General requirements and tests)	Checklist EN 61496-1	1.0	25.10.2010
[R13]	Checklist according to EN ISO 13849-1 HW	Checklist 13849 HW	-	25.10.2010
[R14]	Checklist according to EN ISO 13849-1 SW	REER_Mosaic_Checklist_13849_Parameterization_rev1_1	-	08.10.2010
[R15]	Technical Report on the Calculation of the PFH and $MTTF_d$	Review Report FMEDA.pdf	1.0	19.07.2010
[R16]	Technical Report on Vibration- and shock testing	VIBR 10 070	1	06.05.2010
[R17]	Technical Report on environmental testing	STA 10 037	0	14.05.2010

[1] Fault Insertion Test

No.	Title	Document-No./ File identifier	Revision	Date
[R18]	Test report on Electronic equipment for use in power installations	ES_717502811	1.0	03.08.2010
[R19]	Test report on Electronic equipment for use in power installations	SC10060_TRF_CE	1.0	20.07.2010
[R20]	Test Report on EMC Immunity	EMS 10/120	0	07.05.2010
[R21]	Test Report on EMC Emission	EMI 10/82	0	04.05.2010
[R22]	Test report for Safety Components with Solid State Output	Test report solid state output-rev 1.1	1.1	17.05.2010
[R23]	Vibration and Shock Test Report on Safemaster Pro	VIBR 11 006	1	03.02.2011

Table 33: Test results

5.1.1 Test reports for revision 1.2 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R24]	review report reer mosaic safety m1	review_report_2011-11-14_reer_mosaic_safety_m1_v1_2.pdf	1.2	24.11.2011

Table 34: Test results for revision 1.2 of this report

5.1.2 Test reports for revision 1.3 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R25]	LoC MI12T8	20111027_Letter of Conformity_REER_MosaicM12T8.pdf	-	27.10.2011
[R26]	LoC MBEx	20111028_Letter of Conformity_REER_Mosaic MBEx.pdf	-	28.10.2011
[R27]	LoC M1	20111124_Letter of Conformity_REER_Mosaic_M1.pdf	1.0	24.11.2011
[R28]	LoC Technical Report	20111130_Letter of Conformity_REER_TR_RT83357T.pdf	-	30.11.2011
[R29]	Review Report Mosaic Update	RevRpt_2012-04-11_m1_reconstr-test.pdf	1.0	11.04.2012
[R30]	Mosaic MCT EMC Emission Test Report	EMC_12_055 Mosaic MCTx.pdf	-	02.03.2012
[R31]	Mosaic MCT EMC Immunity Test Report	EMS_12_055A MOSAIC MCT.pdf	-	05.03.2012
[R32]	Review Report MCT EMC Test	RevRpt_2012-04-20_MCT_EMC.pdf	1.0	20.04.2012

No.	Title	Document-No./ File identifier	Revision	Date
[R33]	LoC MCT	LoC_2012-04-20_Mosaic_MCT.pdf	-	20.04.2012

Table 35: Test results for revision 1.3 of this report

5.1.3 Test reports for revision 1.4 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R34]	Review Report on FMEDA SIL Second Edition	Review FMEDA SIL Second Edition	1.1	16.09.2013
[R35]	Review Report on FMEDA	Review_Report FMEDA MV2_V1.3 Review_Report FMEDA MOR	1.3 1.0	16.10.2013 10.06.2014
[R36]	HW-FIT[2]	Fault Insertion Test MOSAIC_MV 2013-04-17	1.0	17.04.2013
[R37]	SW-FIT1	FitRep_2013-04-18_Reer_SW_V1_0	1.0	18.04.2013
[R38]	Response time measurement	Fault Insertion Test MOSAIC_MV 2013-04-17	1.0	17.04.2013
[R39]	Minutes of Meeting	MoM 20120731 MV2_Meeting_ReeR_TUeV.pdf MoM 20130227 Mosaic MV.pdf MoM 20130227 Mosaic SW.pdf MoM 20130418 Reer Mosaic .pdf	-	-
[R40]	Review Report M1 Impact Analysis	Review Report_REER_Mosaic_M1_SWv20_rev1_0	1.0	11.09.2013
[R41]	Review Report Software Verification	Review_Report_REER_Mosaic_TestReports_rev1_4	1.4	26.03.2014
[R42]	Checklist according to IEC 61508, part 1 (FSM)	Checklist_61508-1_FSM_2ed_REER_Mosaic	1.1	10.04.2014
[R43]	Checklist according to IEC 61508, part 1 (Lifecycle)	Checklist_61508-1_Livecycle_2ed_REER_Mosaic	1.0	18.04.2013
[R44]	Checklist according to IEC 61508, part 2 (Hardware)	Checklist_61508-2_2ed_REER_Mosaic_V1.1	1.1	17.04.2013
[R45]	Checklist according to IEC 61508, part 3 (Software)	Checkliste_61508-3_2010.docx	1.0	26.03.2014
[R46]	Technical Report on Vibration- and shock testing	VIBR 13_263.pdf	0	11.10.2013

[2] Fault Insertion Test

No.	Title	Document-No./ File identifier	Revision	Date
[R47]	Technical Report on environmental testing	171_13_STAMB	0	16.09.2013
[R48]	Test Report on EMC	EMC_13_166_MOSAIC_MV2_ MOR4S8	-	18.09.2013
[R49]	Additional test report EMC	EMC14-074	-	24.04.2014
[R50]	Review report manual 13849, 61131, 62061	Review Report Manual 13849.docx Review Report Manual 61131.docx Review Report Manual 62061.docx	1.0	03.06.2014
[R51]	Review Report on Environmental and EMC Tests	P717505240 A Reer MOSAIC UPD_Environmental_EMC.doc	1.1	03.06.2014
[R52]	LoC MOR4 series and MV	LoC_2013-10-14_MOR4 series and MV_signed	-	14.10.2013

Table 36: Test results for revision 1.4 of this report

5.1.4 Test reports for revision 1.5 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R53]	Review report software	Review Report_Mosaic Up-date_SW	1.3	05.02.2015
[R54]	Review report FMEDA	Review_Report FMEDA MV1TB_MV2TB	1.0	16.12.2014

Table 37: Test results for revision 1.5 of this report

5.1.5 Test reports for revision 1.6 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R55]	Review report MOSAIC update MV2 M1	Review_Report_Mosaic_ MV2_V1_2.pdf	1.2	19.01.2016

Table 38: Test results for revision 1.6 of this report

5.1.6 Test reports for revision 1.7 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R56]	Review report MOSAIC FW update for MO2/MO4 modules	Review_Report_ Impact_Analysis_V1_1.pdf	1.1	30.03.2016

Table 39: Test results for revision 1.7 of this report

5.1.7 Test reports for revision 1.8 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R57]	Review report MO4LHCS8	Review Report MO4SS8 V1 4.pdf	1.4	25.04.2017
[R58]	Review report FMEDA	Review Report FMEDA V1 2.pdf	1.2	25.04.2017
[R59]	Review report Type Testing	Review Report Type Testing V1 1.pdf	1.2	11.05.2017
[R60]	Test Report IEC 61010-1	ES_717513914.pdf	1.0	09.05.2017
[R61]	FIT Test Report	Test report Fault Insertion Tests_Mosaic_05-05-2017.pdf	1.0	05.05.2017

Table 40: Test results for revision 1.8 of this report

5.1.8 Test reports for revision 1.9 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R62]	Review report M1 and Slaves	Review Report M1 and Slaves V1 0.pdf	1.0	28.06.2017
[R63]	Review report MV2	Review Report MV2 V1 0.pdf	1.0	29.06.2017

Table 41: Test results for revision 1.9 of this report

5.1.9 Test reports for revision 1.10 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R64]	Delta Checklist 13849:2015	Delta Checklist according to ISO 13849.pdf	1.0	11.10.2017
[R65]	Delta Checklist 62061:2015	Delta Checklist according to EN 62061.pdf	1.0	11.10.2017
[R66]	Checklist EN 81-20	Checklist EN 81-20 2014.pdf	1.0	11.10.2017
[R67]	Checklist EN 81-50	Checklist EN 81-50 2014.pdf	1.0	11.10.2017

Table 42: Test results for revision 1.10 of this report

5.1.10 Test reports for revision 1.12 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R68]	Review Report M1S and MI8O4	Review Report MOSAIC M1S MI8O4 V1.1.pdf	1.1	20.07.2018
[R69]	Review Report Test	Review Report MOSAIC Test V1.1.pdf	1.1	20.07.2018
[R70]	Review Report FMEDA	Review Report FMEDA.pdf	1.1	02.08.2018
[R71]	Review Report MSD	Review Report MOSAIC MSD V1.0.pdf	1.0	2018-07-31

No.	Title	Document-No./ File identifier	Revi-sion	Date
[R72]	Checklist Manual	Checklist Manual V1.0.pdf	1.0	2018-07-20
[R73]	Checklist according to IEC 61508, part 2 (Hardware)	Checklist IEC 61508-2 V1.0.pdf	1.0	2018-07-20
[R74]	Checklist according to IEC 61508, part 3 (Software)	Checklist IEC 61508-3 V1.0.pdf	1.0	2018-07-20

Table 43: Test results for revision 1.12 of this report

5.1.11 Test reports for revision 1.13 of this report

No.	Title	Document-No./ File identifier	Revi-sion	Date
[R75]	Review Report M1 and MVx Firmware Modification	Review Report M1 MVx V1.1.pdf	1.1	2019-01-24
[R76]	Review Report MBCCL	Review Report MBCCL V1.0.pdf	1.0	2019-02-22

Table 44: Test results for revision 1.13 of this report

5.1.12 Test reports for revision 1.14 of this report

No.	Title	Document-No./ File identifier	Revi-sion	Date
[R77]	Review Report Mosaic SY, SRS, STP	Review Report Mosaic SY V1.2.pdf	1.2	2019-05-15
[R78]	Review Report Mosaic Project Documents	Review Report Mosaic Modules V1.1.pdf	1.1	2019-06-26
[R79]	Checklist EN ISO 13849	Checklist ISO 13849.pdf	1.0	2019-06-27
[R80]	Checklist EN 61508-2	Checklist IEC 61508-2 Hardware.pdf	1.0	2019-06-27
[R81]	Checklist EN 61508-3	Checklist IEC 61508-3 Software.pdf	1.0	2019-06-27
[R82]	Checklist EN 61496-1	Checklist IEC 61496-1.pdf	1.0	2019-06-27
[R83]	Checklist EN ISO 13849 Manual NMD	Checklist ISO 13849-1 NMD Manual	1.0	2019-06-27
[R84]	Checklist EN 61508 Manual	Checklist IEC 61508 Manual.pdf	1.0	2019-06-27

Table 45: Test results for revision 1.14 of this report

5.1.13 Test reports for revision 1.15 of this report

No.	Title	Document-No./ File identifier	Revi-sion	Date
[R85]	Review Report Mosaic SIL 1, PL c output	Review_SIL1_PLc_Output_V1.0.docx	1.0	2019-08-09
[R86]	Checklist IEC 61508-2 Hardware	Checklist IEC 61508-2 Hardware.pdf	1.0	2019-08-08

No.	Title	Document-No./ File identifier	Revi-sion	Date
[R87]	Checklist EN 61508 Manual	Checklist IEC 61508 Manual.pdf	1.0	2019-08-08

Table 46: Test results for revision 1.15 of this report

5.1.14 Test reports for revision 1.16 of this report

No.	Title	Document-No./ File identifier	Revi-sion	Date
[R88]	Review Report Mosaic SIL 1, PL c output	Review_Mosaic_MA4_Phoenix_ V1.1.pdf	1.1	2019-09-20

Table 47: Test results for revision 1.16 of this report

5.1.15 Test reports for revision 1.17 of this report

No.	Title	Document-No./ File identifier	Revi-sion	Date
[R89]	Review Report Mosaic MVx modification	Review_Mosaic_ MV0_MV1_MV2_V1.3.pdf	1.3	2020-04-01
[R90]	Review Report Mosaic M1S Modification	Review_Mosaic_M1S_V1.1.pdf	1.1	2020-03-31
[R91]	Review Report Mosaic MA4 MA2	Review_Mosaic_MA4_MA2_V1.1.pdf	1.1	2020-03-31
[R92]	Review Report Mosaic MI8O4	Review_Mosaic_MI8O4_V1.2.pdf	1.2	2020-04-01
[R93]	Review Report Mosaic MO4L	Review_Mosaic_MO4L_V1.1.pdf	1.1	2020-04-01
[R94]	Review Report Mosaic MO4LHCS8	Review_Mosaic_ MO4SS8_MO4LHCS8_V1.1.pdf	1.1	2020-04-01
[R95]	Review Report Mosaic MSD	Review_Mosaic_ MSD_V1.8.x_V1.0.pdf	1.0	2020-03-31

Table 48: Test results for revision 1.17 of this report

5.1.16 Test reports for revision 1.18 of this report

No.	Title	Document-No./ File identifier	Revi-sion	Date
[R96]	Review Report of modifica-tions MR8	Review_Report_MR8	1.0	2020-04-06

Table 49: Test results for revision 1.18 of this report

5.1.17 Test reports for revision 1.19 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R97]	Checklist EN 61508-1	Checklist IEC 61508-1 FSM 2ed REER.pdf	1.0	2016-05-13
[R98]	Checklist EN 61508-2	Checklist IEC 61508-2 Hardware.pdf	1.0	2021-01-25
[R99]	Checklist EN 61508-3	Checklist IEC 61508-3 Software.pdf	1.0	2021-01-14
[R100]	Review Report Impact Analysis	Review_MZero_ImpactAnalysis_v1.0.pdf	1.0	2021-01-14
[R101]	Review Report on FMEA	Review_MZero_FMEA_v1.0.pdf	1.0	2021-02-04
[R102]	Review Report Environmental Tests	Review_MZero_EMC_ Vibration_Shock_v1.0.pdf	1.0	2021-01-14
[R103]	Review Report Tool Qualification	Review_MZero_Designer_v1.0.pdf	1.0	2021-01-12
[R104]	Review Report on FIT provided by ReeR SpA	Review_MZero_FIT_v1.1.pdf	1.1	2021-01-26
[R105]	ISO 13849-1 2015 NMD Manual	Review Report Manual EN ISO 13849_V1.1.pdf	1.1	2021-02-01
[R106]	Review Report EN 62061	Review Report Manual EN 62061_V1.1.pdf	1.1	2021-02-01
[R107]	Review Report FMEDA	Review Protocol FMEDA_v1.1.pdf	1.1	2021-02-10

Table 50: Test results for revision 1.19 of this report

5.1.18 Test reports for revision 1.20 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R108]	Checklist EN 81-20:2020	Checklist EN 81-20_v1.0.pdf	1.0	2021-02-18
[R109]	Checklist EN 81-50:2020	Checklist EN 81-50 2020.pdf	1.0	2021-02-19
[R110]	Checklist EN 61784-3: 2016	REER Mosaic Review Report Data Communication_(2021-02-10).pdf	2.0	2021-02-10

Table 51: Test results for revision 1.20 of this report

5.1.19 Test reports for revision 1.21 of this report

No.	Title	Document-No./ File identifier	Revision	Date
[R111]	Checklist IEC 61496-1:2020	CL_IEC61496-1-2020_Delta.pdf	1.0	2021-11-29
[R112]	Checklist IEC 62061:2021	CL_IEC62061-2021_Delta.pdf	1.0	2021-11-29

No.	Title	Document-No./ File identifier	Revi-sion	Date
[R113]	Review protocol impact analysis M1S-COM	RP_M1S_ImpactAnalysis_v1.3.pdf	1.3	2021-11-11
[R114]	Review protocol test report M1S-COM	RP_M1S_TestReports_v1.1.pdf	1.1	2021-11-16
[R115]	Review protocol impact analysis MO4L & MI8O4	RP_MI8O4_MO4L_ImpactAnalysis_v1.2.pdf	1.2	2021-11-10
[R116]	Review protocol test report MO4L & MI8O4	RP_MI8O4_MO4L_TestReports_v1.0.pdf	1.0	2021-11-16
[R117]	Testing at manufacturers premises - Climatic	TMP_climatic_v1.0.pdf	1.0	2021-11-16

Table 52: Test results for revision 1.21 of this report

5.2 Functional Safety Management and Lifecycle Audit

A functional safety management and lifecycle audit was executed to evaluate the management and technical activities during the overall, E/E/PES and software safety lifecycle phases which are necessary for the achievement of the required functional safety of the E/E/PES safety-related systems.

Result:

The analysis of the organization and procedures of REER SpA has shown that the requirements specified in checklists [R9] for SIL 3 according to IEC 61508 (see [N3] to [N5]) are fulfilled.

5.3 System Failure Mode and Effects Analysis (System-FMEA)

The MOSAIC-Series is a Safety PLC for an ESPE consisting of a Master Unit and optional Slave Units.

Fault detection is assured by means of following basic techniques:

- self tests at power up and during operation
- two-channel control logic with cross check
- dynamic signals

In case of over-voltage or under-voltage the OSSDs will be de-energised, too. The restart interlock function will be realised through the application as described in the user manual of the MOSAIC-Series.

The requirements for an ESPE Type 4 are:

- A single fault resulting in a loss of detection capability shall cause the ESPE to go to a lock-out condition within the response time.
- A single fault resulting in an increase in response time beyond the specified value or preventing one or more than one OSSD going to the OFF-state, shall cause the ESPE to go to a lock-out condition immediately, i.e. within the response time, or immediately upon any of the following demand events where fault detection requires a change of state on

- actuation of the sensing device,
- switch off/on,
- reset.

It shall not be possible for the ESPE to achieve an automatic reset from a lock-out condition by interruption and restoration of the main power supply when the fault which initiated the lock-out condition is still present.

Result:

A System-FMEA was not performed justified by the fact that the system architecture is based on the existing certified light curtain architecture (Type 4 according to EN 61496-1). The detailed FMEAs depicted in the documents [D10] to [D17], [D69] to [D76] and [D99] were made by REER SpA and reviewed by TÜV SÜD Rail GmbH. The system MOSAIC-Series meet the requirements according to [N1], [N3] to [N5] and [N7]. These results are recorded in [R15].

The modules MCT1/MCT2 and MBU of the MOSAIC-Series for revision 1.3 of this report were subject to reviews by TÜV SÜD Rail GmbH, see [D106]. The modules were observed to be free of interference versus the functional safety. The EMC test results are listed in chapter 5.14 and 5.15 of this report.

5.4 Failure Mode and Effect Analysis (FMEA) and Hardware Fault Simulations (FIT)

Failure mode and effect analysis was carried out on the MOSAIC-Series at the component level. All component failures and function-related faults in components or component groups were examined to assess their effects on the safe functioning of control unit together with the safety light barriers. These examinations were limited to faults in the part of the hardware which is relevant with regard to functional safety. Component faults in the part of the hardware which is not relevant to functional safety were observed to assess their effect on non-interaction characteristics.

Practical fault simulations were carried out to provide subsequent evaluation of the knowledge obtained from the theoretical failure mode and effect analysis. The performances of these fault simulations provide information on the fail-safe characteristics of the system.

The hardware fault simulation was carried out on-site by TÜV SÜD Rail GmbH. For the fault simulation, a number of representative fault simulations were defined by TÜV SÜD Rail GmbH based on the fault models specified in IEC 61508-2 and EN 61496-1. These faults represent a series of faults which have an identical effect on the functions of the system.

The results of these faults were compared with the required characteristics which had been stipulated in the theoretical failure mode and effect analysis for the fault detection mechanisms and the fault reaction.

Result

All fault models according to [N1], [N3] to [N5] and [N7] were covered. Faults which affect the response time of the ESPE together with the Safety PLC will be detected and lead to a response time of 14.8 ms for the Master unit, 24.2 ms for the Master unit with MI and MO and 29.8 ms for the Master unit with a Relay output unit of the MOSAIC-Series as depicted in the test report [R22].

The FMEDA on component or block level and the FIT1 demonstrated that the system structure of the Safety PLC meets the requirements of the regulations and standards listed in clause 3 of this Technical Report.

The results of the fault insertion tests are given in the test report [R22].

5.5 Testing of fault avoidance measures

Testing of the individual fault avoidance measures in the individual design phases is supposed to demonstrate that the implemented hardware and software are sufficiently fault-free. The following techniques and measures were used:

- Project management
- Documentation
- Structured specification
- Inspection of the specification or walk-through of the specification
- Observance of relevant guidelines and standards
- Structured design
- Modularization
- Use of well tried components
- Computer aided design tools
- Inspection of the hardware
- Functional testing (also under environmental conditions)
- Operational and maintenance instructions
- User- and maintenance friendliness

Result:

The individual measures for the avoidance of failures which provide the required degree of effectiveness are evaluated. The results of the evaluation are documented in the checklists [R10] and [R11]. They meet the requirements according to [N1], [N3] to [N5] and [N7].

5.6 Quantitative analysis

For the quantitative analysis of the MOSAIC-Series the basic failure rate λ (FIT, [10^{-9} h^{-1}]) for each component was calculated. For the failure rate calculation, the part count methodology due to SN 29500 Part 1-14 and the estimation at block level have been used.

The following table depicts the values from the quantitative analysis.

Value	Master	MI8O2	MI16	MI8	MO4	MO2	MI12T8
$MTTF_D$ [a]	361,58	422,33	345,01	448,58	715,70	1016,28	341,62
PFH [h^{-1}]	6,06E-09	5,72E-09	7,09E-09	5,75E-09	3,44E-09	3,16E-09	3,24E-09
SFF [%]	99,5%	99,5%	99,4%	99,3%	99,6%	99,5%	99,7%
DC [%]	97,9%	97,7%	97,8%	97,7%	97,5%	96,8%	99,0%

Table 53: Quantitative analysis – Part 1

Result:

The probability of dangerous failure per hour (PFH) of the MOSAIC-Series calculated is within than the admissible value of IEC 61508-1 for SIL 3 ≥10^{-8} to <10^{-7}.

The mean time to dangerous failure ($MTTF_D$) of the MOSAIC-Series resulting from the calculation is “High” according to EN ISO 13849-1 (see [N7]) (30 years ≤ $MTTF_D$ 2500 years).

The diagnostic coverage (DC) of the MOSAIC-Series calculated is “High” according to EN ISO 13849-1 (99% ≤ DC, with the allowed tolerance of 5%).

The quantitative requirements of SIL 3 are satisfied in case of:

- Proof test interval, T1 = 20 years
- Mean time to restoration, MTTR = 8 h

It is necessary to perform this periodic test to detect dangerous failures.

With the values of $MTTF_D$ and DC, MOSAIC-Series meets the quantitative requirements of Category 4 and PL e according to EN ISO 13849-1.

The calculations are recorded in the documents [R15], [D77] and [D100].

5.7 Software evaluation

The firmware of the MOSAIC-Series was written in C language as a supervisory loop with modules performing the required functions.

The architecture of the software [D19], [D26], [D30] is specified in a hierarchical way and uses state charts, control flow and data flow diagrams. All modules are based on the same SW-architecture.

The master unit M1 contains additional modules to perform the logic calculation.

The I/O modules contain additional modules to perform the self-diagnosis functionality for the inputs and outputs respectively.

The design and module specifications are contained in the same document and contain detailed descriptions of the used data and parameters.

The Interfaces between the different MOSAIC-Series-units are described in separate documents ([D23], [D27], [D31]).

The relay module does not contain SW.

SW architecture and design are based on the safety light curtain SW already used and manufactured.

5.7.1 Analysis of the software

The individual test operations are supposed to demonstrate that the Software architecture specification is complete and correct and that the required safety-related measures for fault control are applied:

- Analysis of requirement specification
- Analysis of software architecture specification
- Analysis of the implemented self-tests.

Result:

The software implemented within the MOSAIC-Series is analysed by means of reviews, checklists and audits including spot checks of the source code [R6], [R8] and [R11]. The software tests as described in clause 5.7.2 demonstrated that the specification is complete and correct and that the measures required for controlling faults are complying with [N3] to [N5].

The SW update for the M1 system for revision 1.2 of this report was subject to reviews by TÜV SÜD Rail GmbH, Rail – Automation, see [R24]. The measures required for controlling faults are complying with [N3] to [N5].

5.7.2 Software tests

Based on the analysis of the software specification and the performed analysis representative Software fault simulations and Software tests were defined and executed by the assessor. These tests should demonstrate the effectiveness of the implemented safety-related measures and the time behaviour.

Result:

The performed fault simulations and Software tests as indicated in test [R6] did not result in any deviations from the anticipated results. The checklist [R11] indicates that the software requirements according to SIL 3 of [N5] and PL e, Cat 4 of [N7] are met.

5.8 Application Programming Tool MOSAIC-Series designer

The application used by the user to program the logic on the MOSAIC-Series M1 system is called “Mosaic designer”. It is programmed by the use of Visual Basic.NET and running on Windows XP. User authentication is configurable including with password protection (multi-level).

The logic blocks are part of the PLC firmware, the tool provides the parameters and sequence of the blocks. MOSAIC-Series-Designer contains a validation rule checker that must verify the entire customer schematic and parameterization. Validation operation is mandatory before MOSAIC-Series connection and upload.

The safety data message, together with headers, sequence and CRC are sent twice, one for every µController of the PLC. MOSAIC-Series µController internally compare the received structure and both accept it if it’s the same. The received structure must be sent back to MOSAIC-Series -Designer from both µC to allow the PC and the user to verify the configuration sent is equal to both received ones.

The user has to check the application on the PLC (application validation).

No forcing of variables is possible.

When the PC is connected in monitoring mode, MOSAIC-Series M1 always executes the required operation without perturbing internal operation and timing. Collected status information is sent to the PC for monitoring in a low level transmission interrupt.

Result:

The analysis and the performed fault insertion tests [R6] for the logic design tool did not result in any deviations from the anticipated results. The applicable requirements of the standards listed in chapter 3 are fulfilled.

The MSD software modifications for revision 1.6.x of this report were subject to reviews by TÜV SÜD Rail GmbH, see [D101] - [D105]. The test result was documented in [R29]. The applicable requirements of the standards listed in chapter 3 are fulfilled.

5.9 Application Standards

The Reer Mosaic is intended for use as a programmable controller and with Electro-sensitive protective equipment (ESPE). This was tested in accordance with [N1], [N2] and the regulations related to this standard.

Result:

The results about the tests according the application standards are documented in reports [D12], [R7] and [R19]. The tests demonstrated that the MOSAIC-Series fulfils the requirements referring to programmable controllers and Electro-sensitive protective equipment (ESPE).

5.10 Electrical Safety

The electrical safety was tested in accordance with [N1] and the regulations related to this standard.

Result:

The results about the electrical safety are documented in reports [R18] and [R19]. The tests demonstrated that the MOSAIC-Series fulfils the requirements referring to the electrical safety.

5.11 Climatic stress tests

The strength of the design versus climatic stress was tested in accordance with [N1] and [N10] and the related standards.

Result:

The individual tests are documented in report [R17].

The test sample worked properly during and after the test.

5.12 Mechanical stress tests

The strength of the design versus mechanical stress was tested in accordance with [N1] and [N10] and the related standards.

Result:

The individual tests are documented in the reports [R16] and [R23].

The test sample worked properly during and after the test.

5.13 Electrical stress tests

The strength of the design versus electrical stress was tested in accordance with [N1] and the regulations related to this standard.

5.13.1 Voltage dips and short interruption

- Port: 24 V DC
- Performance Criterion: A

Result:

The individual tests are documented in report [R20].

The test sample worked properly during and after the test.

5.13.2 Voltage variation

- Port: 24 V DC
- Performance Criterion: B

Result:

The individual tests are documented in report [R20].

The test sample worked properly during and after the test.

5.14 Testing of the noise immunity

The strength of the design versus electromagnetic immunity was tested in accordance with [N1] and the regulations related to this standard.

Result:

The individual tests are documented in report [R20].

The test sample worked properly during and after the test.

The test of MCT modules was analysed and the result is documented in [R32].

5.15 Testing of the noise emission

The emission of noise was tested in accordance with EN 60068-2-1: 1994.

Result:

The individual tests are documented in report [R21].

The test sample worked properly during and after the test.

The test of MCT modules was analysed and the result is documented in [R32].

5.16 Verification of the degree of protection

The degree of protection was tested according to [N14].

Result:

The tests for the MOSAIC-Series are recorded in report [R18]. The requirements in accordance with [N14] are fulfilled.

5.17 Inspection of the technical documentation

The user manual [D37] was examined to verify the completeness of the technical documentation.

Result:

The results are documented in reports [R3] and [R4].

The technical documentation fulfils the requirements in accordance with [L1] and [N1].

5.18 Modification since revision 1.3 of this report

5.18.1 FSM 61508 2nd Edition

A functional safety management and lifecycle audit was executed on 2013-04-17~18 again to evaluate the management and technical activities during modification of existing modules and development of new modules for MOSAIC-Series according to the requirements of IEC 61508:2010.

Result:

The analysis of the maintained organization and procedures of REER SpA has shown that the requirements specified in checklists [R42] and [R43] for SIL 3 according to IEC 61508:2010 (see [N3] to [N5]) are fulfilled.

5.18.2 SW Update

The software version of following modules has been changed:

- M1 module SW has been changed from 1.2 to 2.0
- MI8/MI16 module SW has been changed from 0.5 to 0.7
- MI12T8 module SW has been changed from 0.0 to 0.2
- MO2/MO4 module SW has been changed from 0.3, 0.4 to 0.5
- MI8O2 module SW has been changed from 0.5 to 0.8

The changes between the old and new versions are described and analysed in the impact analyses [D108], [D109], [D155], [D171], [D173], [D174], [D192] and [D200]. The necessary lifecycle phases to be repeated are planned in the impact analyses and conducted by REER SpA, see [D110] to [D154].

Result:

The results documented in the review reports [R40], [R41], [R53], [R54], [R55] and [R56] show the fulfilment of the related requirements in accordance with the standards and regulations given in chapter 3.

5.18.3 MOR4/S8 Modules and MV0/1/2

New safety relay modules MOR4/S8 and speed monitoring modules MV0/1/2 have been developed for the MOSAIC-Series. The management and technical activities have been planned in the safety plan [D107].

The documentation according to the lifecycle phases specified in the safety plan was created by REER SpA and subject to review by TÜV SÜD Rail GmbH.

The FMEDA and quantitative analysis depicted in the documents [D131] - [D132], [D137] - [D139] and [D154] were made by REER SpA and reviewed by TÜV SÜD Rail GmbH. The following table depicts the values from the quantitative analysis.

Value	MOR4	MOR4S8	MV0	MV1T	MV1H	MV1S	MV2T	MV2H	MV2S
$MTTF_D$ [a]	998,56	980,78	500,33	337,72	380,05	269,49	254,88	306,40	184,41
PFH [h^{-1}]	2,90E-09	2,94E-09	5,98E-09	7,08E-09	6,70E-09	7,93E-09	8,18E-09	7,42E-09	9,89E-09
SFF [%]	98,0%	99,6%	99,5%	97,8%	97,8%	97,8%	97,8%	97,8%	97,8%
DC [%]	99,0%	98,9%	99,0%	99,0%	99,0%	99,0%	99,0%	99,0%	99,0%

Table 54: Quantitative analysis MOR4/S8 and MV0/1/2

Hardware and software fault simulation was carried out on-site by TÜV SÜD Rail GmbH. For the fault simulation, a number of representative fault simulations were defined by TÜV SÜD Rail GmbH based on the fault models specified in IEC 61508-2 and on the analysis of the software specification. These faults represent a series of faults which have an identical effect on the functions of the system.

The environment and EMC tests have been conducted for MOR4/S8 and MV0/1/2 modules. The test results [R46] - [R48] were reviewed by TÜV SÜD Rail GmbH.

Result:

The FMEDA on component or block level and the FIT demonstrated that the MOR4/S8 and MV0/1/2 modules meet the requirements of the regulations and standards listed in chapter 3 of this technical report.

The review results of the FMEDA and probabilistic calculation are given in [R34] and [R35]. The results of the fault insertion tests are given in [R36] - [R38]. The review and executed FITs did not result in any deviations.

The quantitative requirements of SIL 3 according to IEC 61508:2010 and Category 4 and PL e according to EN ISO 13849-1 are fulfilled.

The checklist [R45] indicates that the software requirement according to SIL 3 of [N5] and PL e, Cat 4 of [N7] are met.

The review results about the environment and EMC tests for MOR4/S8 and MV0/1/2 modules are documented in [R51]. The related requirements of the regulations and standards listed in chapter 3 of this technical report are fulfilled.

5.18.4 Climatic stress tests

The strength of the design versus climatic stress was tested in accordance with [N1] and [N10] and the related standards.

Result:

The individual tests are documented in report [R47].

The test sample worked properly during and after the test.

5.18.5 Mechanical stress tests

The strength of the design versus mechanical stress was tested in accordance with [N1] and [N10] and the related standards.

Result:

The individual tests are documented in the report [R46].

The test sample worked properly during and after the test.

5.18.6 Electrical stress tests

The strength of the design versus electrical stress was tested in accordance with [N1] and the regulations related to this standard.

5.18.6.1 Voltage dips and short interruption

- Port: 24 V DC
- Performance Criterion: A

Result:

The individual tests are documented in reports [R48] and [R49].

The test sample worked properly during and after the test.

5.18.6.2 Voltage variation

- Port: 24 V DC
- Performance Criterion: B

Result:

The individual tests are documented in reports [R48] and [R49].

The test sample worked properly during and after the test.

5.18.7 Testing of the noise immunity

The strength of the design versus electromagnetic immunity was tested in accordance with [N1] and the regulations related to this standard.

Result:

The individual tests are documented in reports [R48] and [R49].

The test sample worked properly during and after the test.

5.18.8 Testing of the noise emission

The emission of noise was tested in accordance with EN 60068-2-1: 1994.

Result:

The individual tests are documented in reports [R48] and [R49].

The test sample worked properly during and after the test.

5.18.9 User Manual

The updated user manual [D153] was subject to review by TÜV SÜD Rail GmbH.

Result:

The results are documented in report [R50].

The technical documentation fulfils the requirements in accordance with [L1] and [N2], [N6], [N7].

5.19 Modification for revision 1.4 up to 1.8 of this report

The modification is related to

- the changes in MV0/1/2 software which has given the new software revision 1.0
- the new speed management modules MV1TB and MV2TB
- the new non-safety bus modules
- M1 version changed from 2.0 to 2.1
- MV2 version changed from 1.0 to 1.1
- MI8O2 module SW has been changed from 0.8 to 0.9
- the changes in MO2/MO4 software which has given new software revision 0.5
- MO4LHCS8 new output module with 4 safety outputs

The modification has been analyzed in the impact analyses [D155], [D173], [D174] and [D200]. The updated documentation ([D175] - [D219]) was subject to review by TÜV SÜD Rail GmbH.

The FMEDA and quantitative analysis depicted in the documents [D158], [D159], [D202] and [D204] were made by REER SpA and reviewed by TÜV SÜD Rail GmbH. The following table depicts the values from the quantitative analysis.

Value	MV1TB	MV2TB	MO4LHCS8
$MTTF_D$ [a]	277,10	191,61	392,69
PFH [h^{-1}]	7,82E-09	9,66E-09	8,84E-09
SFF [%]	99,8%	99,8%	99,8%
DC [%]	99,0%	99,0%	99,1%

Table 55: Quantitative analysis MV1TB, MV2TB and MO4LHCS8

Result:

The new modules MV1TB, MV2TB and MO4LHCS8 fulfil the quantitative requirements of SIL 3 according to IEC 61508:2010 and Category 4 and PL e according to EN ISO 13849-1.

The modules MBMR, MBEM and MBEI2B of the MOSAIC-Series were subject to reviews by TÜV SÜD Rail GmbH. The modules were observed to be free of interference versus the functional safety [R54].

The modification has been carried out and the verification and validation activities have shown that the changes did not raise any safety related objections, see [R53] to [R61].

5.20 Modification for revision 1.9 of this report

The modifications are related to:

- M1 module SW version changed from 3.0 to 3.1
- MI8O2 module SW version changed from 0.9 to 0.10
- MO2/MO4 module SW version changed from 0.5 to 0.6
- MOR4/MOR4S8 module SW version changed from 0.1 to 0.2
- MV0/1/2 module SW version changed from 1.1 to 1.2

Modified feedback K1_K2 check when the feedback K1_K2 timing is disabled, modified maximum internal contact delay up to 40ms for relay modules and bug fix for MV2 module 4 wires behaviour. The modifications have been analysed in the impact analyses [D220] and [D221]. The updated documentation [D222] to [D246] was subject to review by TÜV SÜD Rail GmbH.

Result:

The modification has been carried out and the verification and validation activities have shown that the changes did not raise any safety related objections, see [R62] and [R63].

5.21 Modification for revision 1.10 and 1.11 of this report

The compliance to new version of standard ISO 13849:2015 [N7] and IEC 62061:2015 [N6] has been verified.

According to EN 81-20:2014 and EN 81-50:2014 design rules for programmable electronic systems (PESSRAL) require that programmable electronic systems comply with the minimum requirements of the safety functions common to all SIL's listed in this standard.

The user manual [D248] was examined to verify the completeness of the technical documentation.

Result:

The results are documented in checklists [R68], [R69], [R70] and [R72].

The MOSAIC-Series fulfils the requirements in accordance with [N6], [N7], [N8] and [N9]

The device under test fulfills the measures and requirements according to EN81-50 related to a programmable electronic system in safety relevant applications for lifts (see EN 81-50 Annex B). It can be used as PESSRAL for the defined safety functions up to SIL 3.

The safety rules (EN 81-20, Chapter 5.11.2.6) specified by EN 81-20 and applicable to the device under test are fulfilled. The device under test can be used to supervise the electrical safety devices (EN 81-20, Annex A).

5.22 Modification for revision 1.12 of this report

The modification is related to

- the new master module M1S
- the new I/O expansion module (slave) module MI8O4

The modification has been analysed in the system requirement specification [D249]. The updated documentation ([D248] - [D265]) was subject to review by TÜV SÜD Rail GmbH.

The new Mosaic safety designer version V1.6.0 has been analysed based on updated documentation [D259] to [D261] by TÜV SÜD Rail GmbH.

The FMEDA and quantitative analysis depicted in the documents [D262] and [D264] were made by REER SpA and reviewed by TÜV SÜD Rail GmbH. The following table depicts the values from the quantitative analysis.

Value	M1S	MI8O4
$MTTF_D$ [a]	161,01	166,47
PFH [h^{-1}]	1,35E-08	1,32E-08
SFF [%]	99,8%	99,7%
DC [%]	99,0%	99,0%

Table 56: Quantitative analysis M1S and MI8O4

Result:

The new/updated modules M1S and MI8O4 fulfil the quantitative requirements of SIL 3 according to IEC 61508:2010 and Category 4 and PL e according to EN ISO 13849-1.

The modules M1S and MI8O4 of the MOSAIC-Series were subject to reviews by TÜV SÜD Rail GmbH, see [R73] and [R74].

The modification has been carried out and the verification and validation activities have shown that the changes did not raise any safety related objections, see [R68] to [R72].

5.23 Modification for revision 1.13 of this report

The modification is related to

- M1 module SW version changed from 3.1 to 4.0
- MV0/1/2 module SW version changed from 1.2 to 2.0
- the new diagnostic connections module MBCCL
- Mosaic safety designer version changed from 1.6.x to 1.6.2.x

The modification has been analysed in the impact analysis [D266]. The updated documentation ([D267] - [D283]) was subject to review by TÜV SÜD Rail GmbH.

Result:

The modification has been carried out and the verification and validation activities have shown that the changes did not raise any safety related objections, see [R75] and [R76].

5.24 Modification for revision 1.14 of this report

The modification is related to

- the M1S module version changed from 802199601 / 5.0 -> 8040390 / 5.1
- the new analog input module MA4 version 8040324 / 0.0

- the new output expansion module MO4L version 8042800 / 0.0

The modification has been analysed in the system requirement specification [D249]. The updated documentation ([D284] - [D301]) was subject to review by TÜV SÜD Rail GmbH.

The new Mosaic safety designer version V1.7.x has been analysed based on updated documentation [D302] by TÜV SÜD Rail GmbH.

The FMEDA and quantitative analysis depicted in the documents [D292] were made by REER SpA and reviewed by TÜV SÜD Rail GmbH. The following table depicts the values from the quantitative analysis.

Value	M1S	MA4	MO4L
$MTTF_D$ [a]	161,01	106,08	238,14
PFH [h^{-1}]	1,35E-08	1,53E-08	1,12E-08
SFF [%]	99,8%	99,5%	99,8%
DC [%]	99,0%	98,8	99,0%

Table 57: Quantitative analysis M1S, MA4 and MO4L

Result:

The new/updated modules M1S, MA4 and MO4L fulfil the quantitative requirements of SIL 3 according to IEC 61508:2010 and Category 4 and PL e according to EN ISO 13849-1.

The modules MA4 and MO4L of the MOSAIC-Series were subject to reviews by TÜV SÜD Rail GmbH, see [R77] and [R78].

The modification has been carried out and the verification and validation activities have shown that the changes did not raise any safety related objections, see [R79] to [R84].

5.25 Modification for revision 1.15 of this report

The modification is related to

- usage of status outputs as SIL 1 / PL c outputs
- MOS8/MOS16 status outputs become SIL 1

The modification has been analysed by the impact analysis [D303] and the system requirement specification [D304]. The updated documentation ([D305] - [D313]) was subject to review by TÜV SÜD Rail GmbH.

The FMEDA and quantitative analysis depicted in the documents [D307] and [D308] were made by REER SpA and reviewed by TÜV SÜD Rail GmbH. The following table depicts the values from the quantitative analysis.

Value	MOS8	MOS16
$MTTF_D$ [a]	985,48	771,88
PFH [h^{-1}]	4,44E-09	6,63E-09
SFF [%]	99,6%	99,6%
DC	High	High

Table 58: Quantitative analysis SIL 1 / PL c outputs

Result:

The status outputs of the modules MOS8 and MOS16 fulfil the quantitative requirements of SIL 1 according to IEC 61508:2010 and PL c according to EN ISO 13849-1.

The delivered documentation [D303] to [D313] for the modules of the MOSAIC Series has been reviewed by TÜV SÜD Rail GmbH. The result has been documented in [R85]. The verification and validation activities have shown that the changes did not raise any safety related objections, see [R86] and [R87].

5.26 Modification for revision 1.16 of this report

The firmware modifications are related to

- new brand on the Mosaic system about LED signalization and EDM function
- bug fixing for the MA4 module

The modifications have been analysed by the impact analysis [D314] and [D315]. The updated documentation [D316] to [D347] was subject of review by TÜV SÜD Rail GmbH. The modification related to new brand on the Mosaic system will only be effective for brand labelling.

Result:

The delivered documentation [D314] to [D347] for the firmware modification of the MOSAIC modules has been reviewed by TÜV SÜD Rail GmbH. The result has been documented in [R85]. The verification and validation activities have shown that the changes did not raise any safety related objections, see [R88].

5.27 Modification for revision 1.17 of this report

The modification is related to

- MV0/1/2 module SW version changed from 2.0 to 3.0
- the MV0 module version changed from 8040040 / 2.0 -> 8044649 / 3.0
- the MV1T module version changed from 8040034 / 2.0 -> 8044643 / 3.0
- the MV1TB module version changed from 8040053 / 2.0 -> 8044650 / 3.0
- the MV1H module version changed from 8040035 / 2.0 -> 8044640 / 3.0
- the MV1S module version changed from 8040036 / 2.0 -> 8044645 / 3.0
- the MV2T module version changed from 8040037 / 2.0 -> 8044646 / 3.0
- the MV2TB module version changed from 8040054 / 2.0 -> 8044651 / 3.0

- the MV2H module version changed from 8040038 / 2.0 -> 8044647 / 3.0
- the MV2S module version changed from 8040039 / 2.0 -> 8044648 / 3.0
- the new analog input module MA2 version 8046353 / 0.2
- M1S, MA4, MI8O4 module SW version changed from 0.1 to 0.2
- MO4L, MO4LHCS8 module SW version changed from 0.1 to 0.2
- Mosaic safety designer version changed from 1.7.x to 1.8.x

The modification has been analysed in the impact analysis [D348], [D359], [D366], [D373], [D380] and [D387]. The updated documentation ([D349] - [D393]) was subject to review by TÜV SÜD Rail GmbH.

The new Mosaic safety designer version V1.8.x has been analysed based on updated documentation [D394] by TÜV SÜD Rail GmbH.

The FMEDA and quantitative analysis depicted in the documents [D358] were made by REER SpA and reviewed by TÜV SÜD Rail GmbH. The following table depicts the values from the quantitative analysis.

Value	MA2
$MTTF_D$ [a]	106,08
PFH [h^{-1}]	1,53E-08
SFF [%]	99,5%
DC [%]	98,8

Table 59: Quantitative analysis MA2

Result:

The modules MA2 and MV0/1/2 of the MOSAIC-Series were subject to reviews by TÜV SÜD Rail GmbH, see [R89] to [R95].

The new MA2 module is derived from already certified MA4 module. MA4 has a main board with 2 channels and an add-on board with the remaining 2 channels. The MA2 module using the MA4 main board only.

The MV0/1/2 speed monitoring modules are modified. Overvoltage and undervoltage detection have been added.

The new/updated MA2 and MV0/1/2 modules fulfil the quantitative requirements of SIL 3 according to IEC 61508:2010 and Category 4 and PL e according to EN ISO 13849-1.

5.28 Modification for revision 1.18 of this report

The actual MR4 module has 4 relays inside with a single PCB. The MR8 will have 2 x MR4 PCBs so 4 x 2 = 8 relays. For the module Reer uses now the same Phoenix Contact enclosure but with double width: (45 mm instead of 22.5 mm).

The modification in this way is not safety relevant, as all components already were certified.

The updated documentation [D395] was subject of review by TÜV SÜD Rail GmbH.

Result:

The verification and validation activities have shown that the changes did not raise any safety related objections, see [R96].

5.29 Modification for revision 1.19 of this report

The new MZero is derived from the existing M1. It reuses the hardware of the M1 as well as almost the whole software package.

The new MZero has different OSSD and input numbers as seen below:

- Inputs: MZero has 16 input instead of 8. Input channels are the same.
- OSSD: MZero has 4 outputs instead of 2. Outputs have the same architecture.
- PC communication: The PC interface changes from MSD (Mosaic Safety Designer) to MZD (MZero designer).
- Mosaic safety designer version changed from 1.8.x to 1.9.x

The modification is not safety relevant, as all components are already certified.

The updated documentation was subject of review by TÜV SÜD Rail GmbH.

The FMEDA and quantitative analysis depicted in the documents [D400] were made by REER SpA and reviewed by TÜV SÜD Rail GmbH. The following table depicts the values from the quantitative analysis.

Value	MZero
$MTTF_D$ [a]	160,81
PFH [h^{-1}]	1,50E-08
SFF [%]	99,7%
DC [%]	98,9

Table 60: Summary quantitative analysis MZero

Result:

The module MZero of the MOSAIC-Series was subject to reviews by TÜV SÜD Rail GmbH, see [R97], [R98], [R99], [R100], [R101], [R102], [R103], [R104], [R105], [R106] and [R107].

5.30 Modification for revision 1.20 of this report

The standards [N8] and [N9] were updated to its newer versions with new checklists. There were no technical changes compared to the older versions. As the communication is internally only, there was no need to make an update to the 2021 version of [N13].

Result:

The module MZero of the MOSAIC-Series was subject to reviews by TÜV SÜD Rail GmbH, see [R108], [R109] and [R110].

5.31 Modification for revision 1.21 of this report

The standards [N1] ([N15], [N18]) and [N6] ([N16]) were updated to its newer versions with new checklists. The technical changes do not have a negative impact on functional safety. As the communication is internally only, there was no need to make an update to the 2021 version of [N13].

Result:

The module M1S, M1S-COM, MO4L and MI8O4 of the MOSAIC-Series were subject to reviews by TÜV SÜD Rail GmbH, see [R111] to [R117]. The verification and validation activities have shown that the changes did not raise any safety related objections.

5.32 Product Modifications related to this Technical Report (TR) v1.22

The product has been modified after release, see clause 1 and clause 2.1.

New models will be added to the existing product series. The new modules will be derived from the existing modules:

-M1S

-M1S COM

-MI8O4

-MA4

-MBC

These actual modules will be modified to create new modules:

-M1S RV

-M1S COM RV

-MI8O4 RV

-MA4 V

-MBC V

In addition to this, the firmware for the modules M1S and M1S-COM has been updated from version 7.0 to 8.0 and analysed according to impact analysis [D467].

The following documents describe the modifications realised for the already certified product:

No.	Title	Document number / ID	Rev.	Date
The following documents were issued by the customer:				
[D444]	Impact Analysis Reer Spa Project:MOSAIC	Impact_Analysis_mo-saic_RV_models_rev_1	1	16.03.2023
[D445]	M1S COM RV Schematics	8024257 0B	-	2022-01-24
[D446]	M1S COM RV BoM	M1S_COM_RV_BOM	-	2022-10-12
[D447]	M1S RV Schematics	8024255 0B	-	2022-01-24
[D448]	M1S RV BoM	M1S_RV_BOM	-	2022-10-12

No.	Title	Document number / ID	Rev.	Date
[D449]	MI8O4 RV Schematics	8024256 0B	-	2022-01-24
[D450]	MI8O4 RV BoM	MI8O4_RV_BOM	-	2022-10-12
[D451]	TEST REPORT SAFETY MODULE CLIMATIC CHAMBER TEST	MOSAIC_RV_Module_temperature_test	-	2023-03-06
[D452]	REPORT ELECTRICAL FAST TRANSIENT (BURST) IMMUNITY: MS1 COM RV	BURST_Report_M1S_COM_RV	-	2023-03-01
[D453]	REPORT ELECTRICAL FAST TRANSIENT (BURST) IMMUNITY: Mosaic M1S RV	BURST_Report_M1S_RV	-	2023-03-01
[D454]	REPORT ELECTRICAL FAST TRANSIENT (BURST) IMMUNITY: MI8O4 RV	BURST_Report_MI8O4_RV	-	2023-03-01
[D455]	REPORT Dips and interruptions on DC power supply: MS1 COM RV	DIP_Voltage_Report_M1S_COM_RV	-	2023-03-01
[D456]	REPORT Dips and interruptions on DC power supply: Mosaic M1S RV	DIP_Voltage_Report_M1S_RV	-	2023-03-01
[D457]	REPORT Dips and interruptions on DC power supply: MI8O4 RV	DIP_Voltage_Report_MI8O4_RV	-	2023-03-01
[D458]	REPORT ELECTROSTATIC DISCHARGE (ESD) IMMUNITY: MS1 COM RV	ESD_Report_M1S_COM_RV	-	2023-03-01
[D459]	REPORT ELECTROSTATIC DISCHARGE (ESD) IMMUNITY: M1S RV	ESD_Report_M1S_RV	-	2023-03-01
[D460]	REPORT ELECTROSTATIC DISCHARGE (ESD) IMMUNITY: MI8O4 RV	ESD_Report_MI8O4_RV	-	2023-03-01
[D461]	REPORT Conducted disturbances induced by RF fields: MS1 COM RV	RF_Report_M1S_COM_RV	-	2023-03-02
[D462]	REPORT Conducted disturbances induced by RF fields: M1S RV	RF_Report_M1S_RV	-	2023-03-02
[D463]	REPORT Conducted disturbances induced by RF fields: MI8O4 RV	RF_Report_MI8O4_RV	-	2023-03-02

No.	Title	Document number / ID	Rev.	Date
[D464]	REPORT SURGE IMMUNITYs: MS1 COM RV	Surge_Report_M1S_COM_RV	-	2023-03-03
[D465]	REPORT SURGE IMMUNITY: M1S RV	Surge_Report_M1S_RV	-	2023-03-03
[D466]	REPORT SURGE IMMUNITY: MI8O4 RV	Surge_Report_MI8O4_RV	-	2023-03-03
[D467]	Impact Analysis Mosaic M1S/M1S_Com FW Modification	M1S_Com_ImpactAnalys_1.docx	1.0	2023-02-02
[D468]	Mosaic system specifications	Mosaic_SY	6.1	2023-02-01
[D469]	M1S Interface requirement specifications	M1S_IRS	0.3	2022-09-05
[D470]	M1S software requirements	M1S_SRS	1.1	2023-02-28
[D471]	M1S software test plan	M1S_STP	1.1	2023-03-01
[D472]	M1S software test report	M1S_STR	1.1	2023-03-01
[D473]	M1S Integration test plan	M1S_ITP	1.1	2023-03-07
[D474]	M1S Integration test report	M1S_ITR	1.1	2023-03-07
[D475]	FMEDA	SIL_Finali-MODULI_@70_C	-	2023-03-10

Table 61: Modification documents for TR v1.22

Result:

No.	Title	Document number / ID	Rev.	Date
The following test documentation was issued by TÜV SÜD Rail GmbH:				
[R118]	Review Report	Review Protocol Impact Analysis Temperature	1.1	2023-03-20
[R119]	Review Report FW Update for M1S/M1S-COM Modules	Review Protocol MOSAIC M1S M1S_Com.pdf	1.0	2023-03-20

Table 62: Modification results for TR v1.22

The Mosaic modules M1S, M1S COM, MI8O4 will have a simple modification on the input channels to reduce the input current. All other components were simply verified if the higher temperature will violate their specifications.

The modification has been carried out and the verification and validation activities have shown that the changes did not raise any safety relevant objections.

The PFH-Value is unchanged, as the calculation still is based on an average temperature within the new limits.

5.33 Product Modifications related to this Technical Report (TR) v1.23

The product has been modified after release, see clause 1 and clause 2.1.

New model MBECOM will be added to the existing product series. It is a not safety related component. The new module is fully derived from the communication part of the existing M1S COM.

The firmware of the communication board (from M1SCOM) has been adapted to be fitted in the new MBECOM module to implement the standalone functioning mode.

The modification has been analysed according to impact analysis [D467].

The following documents describe the modifications realised for the already certified product:

No.	Title	Document number / ID	Rev.	Date
The following documents were issued by the customer:				
[D476]	Impact Analysis Reer Spa Project:MOSAIC	Impact_Analysis_mosaic_RV_models_rev_1	1	16.03.2023
[D477]	Test Report ELECTRICAL FAST TRANSIENT (BURST) IMMUNITY Report	BURST_Report_MBECOM_16_05_2023.pdf	-	2023-05-06
[D478]	Test Report ELECTROSTATIC DISCHARGE (ESD) IMMUNITY	ESD_Report_MBECOM_16_05_2023.pdf	-	2023-05-16
[D479]	Test Report Dips and interruptions on DC power supply	DIP_Voltage_Report_MBECOM_16_05_2023.pdf	-	2023-05-16
[D480]	Test Report SURGE IMMUNITY	Surge_Report_MBECOM_16_05_2023.pdf	-	2023-05-16
[D481]	Test Report Conducted disturbances induced by RF fields	RF_Report_MBECOM_16_05_2023.pdf	-	2023-05-16

Table 63: Modification documents for TR v1.23

Result:

No.	Title	Document number / ID	Rev.	Date
The following test documentation was issued by TÜV SÜD Rail GmbH:				
[R120]	Review Report	Review Protocol Impact Analysis Temperature	1.0	2023-06-14

Table 64: Modification results for TR v1.23

The modification has been carried out and the verification and validation activities have shown that the changes did not raise any safety relevant objections.

5.34 Product Modifications related to this Technical Report (TR) v1.24

The product has been modified after release, see clause 1 and clause 2.1.

The modification is related to:

- MV0/1/2 module SW version changed from 3.0 to 3.1

The modification has been analysed in the impact analysis [D482]. The updated documentation ([D483] - [D489]) was subject to review by TÜV SÜD Rail GmbH.

The following documents describe the modifications realised for the already certified product:

No.	Title	Document number / ID	Rev.	Date
The following documents were issued by the customer:				
[D482]	Impact Analysis Reer Spa Project:MOSAIC	MV2_ImpactAnalys_4.doc	0.0	2023-06-06
[D483]	System Requirements Specification Mosaic Modules	Mosaic_SY_Rev6.1.pdf	6.1	2023-02-01
[D484]	Interface Requirements Specifications Mosaic – Speed Management	MV0_V2_IRS_Rev1.1.pdf	1.1	2022-06-15
[D485]	System Integration Plan Mosaic – Speed Management	MV0_V2_ITP_Rev3.1.pdf	3.1	2023-06-06
[D486]	System Integration Report Mosaic – Speed Management	MV0_V2_ITR_Rev3.1.pdf	3.1	2023-06-06
[D487]	Software requirements Specifications MV0/MV1/MV2	MV0_V2_SRS_Rev3.1.pdf	3.1	2023-06-06
[D488]	Software test Plan Mosaic – Speed Management	MV0_V2_STP_Rev3.1.pdf	3.1	2023-06-06
[D489]	Software test Report Mosaic – Speed Management	MV0_V2_STR_Rev3.1.pdf	3.1	2023-06-06

Table 65: Modification documents for TR v1.24

Result:

No.	Title	Document number / ID	Rev.	Date
The following test documentation was issued by TÜV SÜD Rail GmbH:				
[R121]	Review Report	Review Protocol MOSAIC MVx	1.0	2023-06-15

Table 66: Modification results for TR v1.24

The modification has been carried out and the verification and validation activities have shown that the changes did not raise any safety relevant objections.

5.35 Product Modifications related to this Technical Report (TR) v1.25

The product has been modified after release, see clause 1 and clause 2.1.

The modification is related to:

- M1S/M1S-COM module SW version changed from 8.0 to 8.1

The modification has been analysed in the impact analysis [D482]. The updated documentation ([D483] - [D489]) was subject to review by TÜV SÜD Rail GmbH.

The following documents describe the modifications realised for the already certified product:

No.	Title	Document number / ID	Rev.	Date
The following documents were issued by the customer:				
[D490]	Impact Analysis	M1S_Com_ImpactAnalys_2.docx	1.0	2023-09-14
[D491]	System Requirements Specification - Mosaic	Mosaic_SY_Rev6.2.pdf	6.2	2023-07-25
[D492]	Requirements Specification Mosaic PC Designer	Mosaic_designer_Rev6.2.pdf	6.2	2023-07-26
[D493]	Interface Requirements Specifications - Mosaic M1S	M1S_IRS_Rev0.3.pdf	0.3	2022-09-05
[D494]	System Integration Plan Mosaic M1S and M1S_Com	M1S_ITP_Rev1.2.pdf	1.2	2023-09-15
[D495]	System Integration Report Mosaic M1S and M1S_COM	M1S_ITR_Rev1.2.pdf	1.2	2023-09-15
[D496]	Software Requirements Specifications - Mosaic M1S	M1S_SRS_Rev1.2.pdf	1.2	2023-09-11
[D497]	Software Test Plan Mosaic M1S	M1S_STP_Rev1.2.pdf	1.2	2023-09-12
[D498]	Software Test Report Mosaic M1S	M1S_STR_Rev1.2.pdf	1.2	2023-09-12

Table 67: Modification documents for TR v1.25

Result:

No.	Title	Document number / ID	Rev.	Date
The following test documentation was issued by TÜV SÜD Rail GmbH:				
[R122]	Review Report	Review Protocol MOSAIC M1S Com	1.0	2023-11-07

Table 68: Modification results for TR v1.25

The modification has been carried out and the verification and validation activities have shown that the changes did not raise any safety relevant objections.

5.36 Product Modifications related to this Technical Report (TR) v1.26

The product has been modified after release, see clause 1 and clause 2.1.

The modification is related to:

- MZero module SW version changed from 0.0 to 0.0.1
- M1 module SW version changed from 4.1 to 4.1.2
- M1S/M1S-COM module SW version changed from 8.1 to 8.1.1

The modification is related to the Network function that is in common for all the master modules. The modification has been analysed in the impact analysis [D482]. The updated documentation ([D483] - [D489]) was subject to review by TÜV SÜD Rail GmbH.

The following documents describe the modifications realised for the already certified product:

No.	Title	Document number / ID	Rev.	Date
The following documents were issued by the customer:				
[D499]	Impact Analysis	MZero_ImpactAnalys_1	0.0	2024-04-11
[D500]	Software Test Plan Mosaic MZero	MZero_STP_Rev0.0.1	0.0.1	2024-04-05
[D501]	Software Test Report Mosaic MZero	MZero_STR_Rev0.0.1	0.0.1	2024-04-05
[D502]	System Integration Plan Mosaic MZero	MZero_ITP_Rev0.0.1	0.0.1	2024-04-10
[D503]	System Integration Report Mosaic MZero	MZero_ITR_Rev0.0.1	0.0.1	2024-04-11
[D504]	Impact Analysis	M1_ImpactAnalys_4	0.0	2024-04-04
[D505]	Software Test Plan Mosaic Master Management	Master_STP_Rev4.1.2	4.1.2	2024-04-04
[D506]	Software Test Report Mosaic Master Management	Master_STR_Rev4.1.2	4.1.2	2024-04-04
[D507]	System Integration Plan Mosaic Master and Slaves	M1_ITP_Rev5.1.1	5.1.1	2024-04-04
[D508]	System Integration Report Mosaic Master and Slaves	M1_ITR_Rev5.1.1	5.1.1	2024-04-04
[D509]	Impact Analysis	M1S_Com_ImpactAnalys_3	0.0	2024-04-04
[D510]	Software Test Plan Mosaic M1S	M1S_STP_Rev1.3	1.3	2024-03-29
[D511]	Software Test Report Mosaic M1S	M1S_STR_Rev1.3	1.3	2024-04-02
[D512]	System Integration Plan Mosaic M1S and M1S_Com	M1S_ITP_Rev1.3	1.3	2024-04-03
[D513]	System Integration Report Mosaic M1S and M1S_Com	M1S_ITR_Rev1.3	1.3	2024-04-04

Table 69: Modification documents for TR v1.26

Result:

No.	Title	Document number / ID	Rev.	Date
The following test documentation was issued by TÜV SÜD Rail GmbH:				
[R123]	Review Report	Review Protocol MOSAIC SW	1.0	2024-06-12

Table 70: Modification results for TR v1.26

The modification has been carried out and the verification and validation activities have shown that the changes did not raise any safety relevant objections.

5.37 Product Modifications related to this Technical Report (TR) v1.27

The product has not been modified after release, see clause 1

For the update to EN ISO 13849-1:2023 no additional tests were necessary.

The results are documented in the checklist [R124].

The blow mentioned modules shall operate up to -30°C in normal operation and to reach -40°C for storage temperature.

For the extended temperature range for M1S and M1S RV, M1S COM and M1S COM RV, MI8O4 and MI8O4 RV, MA4 and MA4 V, MZERO and MV0 no modification was needed.

All the electronic components have been verified (checking of datasheets) and they are suitable for use up to -40° in operative conditions.

Also, all the plastic parts (i.e. enclosure, terminals) are suitable for use up to -40°.

MZERO, MV0, M1S, M1S COM, MI8O4, MA4	
Operating temperature:	-30°C...+55°C
Storage temperature:	-40°C...+85°C
M1S RV, M1S COM RV, MI8O4 RV	
Operating temperature:	-30°C...+70°C
Storage temperature:	-40°C...+85°C
MA4 V, MBC V	
Operating temperature:	-10°C...+70°C
Storage temperature:	-20°C...+85°C

Table 71: New temperature range (1.22 and V1.27)

The following documents describe the modifications realised for the already certified product:

No.	Title	Document number / ID	Rev.	Date
The following documents were issued by the customer:				
[D514]	Impact Analysis	Mosaic_low_temperature_impact_analysis	0.0	16.09.2024
[D515]	Datasheets package	Mosaic_modules_datasheets	-	Transferred 21.10.2024
[D516]	Temperature Test Report Project: MOSAIC	MOSAIC_Temperature_Test_Report_Rev0.0	0	21.10.2024

Table 72: Modification documents for TR v1.27

Result:

No.	Title	Document number / ID	Rev.	Date
The following test documentation was issued by TÜV SÜD Rail GmbH:				
[R124]	Delta Checklist to EN ISO 13849-1:2023	Delta_Checklist 13849	1.0	27.09.2024
[R125]	Review protocol Impact analysis	Review Protocol Impact Analysis.	1.1	21.10.2024
[R126]	Review Protocol on Datasheets	Review Protocol Datasheets	1.0	21.10.2024
[R127]	Review Protocol Temperature Tests	Review Protocol Temperature Tests	1.0	21.10.2024

Table 73: Modification results for TR v1.27

The modification has been carried out and the verification and validation activities have shown that the changes did not raise any safety relevant objections.

5.38 Product Modifications related to this Technical Report (TR) v1.28

The product has been modified after release, see clause 1 and clause 2.1.

The modification is related to:

- M1S/M1S-COM module SW version changed from 8.1.1 to 9.0
- MV0/1/2 module SW version changed from 3.1 to 3.2

The modification is related to optimizations and double AGV functionality. The modification has been analysed in the impact analysis [D517] and [D518]. The updated documentation ([D519] - [D532]) was subject to review by TÜV SÜD Rail GmbH.

The following documents describe the modifications realised for the already certified product:

No.	Title	Document number / ID	Rev.	Date
The following documents were issued by the customer:				
[D517]	Impact Analysis M1S	M1S_Com_ImpactAna-lys_4.docx	2.0	2024-12-03
[D518]	Impact Analysis MV2	MV2_ImpactAnalys_5.doc	0.0	2024-10-18
[D519]	System Requirements Specifica-tion MOSAIC Modules	Mosaic_SY_Rev6.3.pdf	6.3	2024-10-18
[D520]	Requirements Specification MOSAIC PC Designer	Mosaic_designer_Rev6.3.pdf	6.3	2024-10-18
[D521]	Interface Requirements Specifica-tions MOSAIC M1S	M1S_IRS_Rev0.4.pdf	0.4	2023-10-19
[D522]	System Integration Plan MOSAIC M1S	M1S_ITP_Rev2.0.pdf	2.0	2024-12-03
[D523]	System Integration Report MOSAIC M1S and M1S_COM	M1S_ITR_Rev2.0.pdf	2.0	2024-12-03
[D524]	Software requirements Specifica-tions MOSAIC M1S	M1S_SRS_Rev2.0.pdf	2.0	2024-11-19
[D525]	Software test plan MOSAIC M1S	M1S_STP_Rev2.0.pdf	2.0	2024-11-20
[D526]	Software Test Report MOSAIC M1S	M1S_STR_Rev2.0.pdf	2.0	2024-11-20
[D527]	Interface Requirements for MOSAIC Speed Management MV0/V2	MV0_V2_IRS_Rev1.1.pdf	1.1	2022-06-15
[D528]	System Integration Plan for MOSAIC Speed Management MV0/V2	MV0_V2_ITP_Rev3.2.pdf	3.2	2024-07-19

No.	Title	Document number / ID	Rev.	Date
[D529]	System Integration Report for MOSAIC Speed Management MV0/V2	MV0_V2_ITR_Rev3.2.pdf	3.2	2024-07-22
[D530]	Software requirements Specifica-tions MOSAIC MV0/MV1/MV2	MV0_V2_SRS_Rev3.2.pdf	3.2	2024-07-22
[D531]	Software Test Plan for MOSAIC Speed Management MV0/V2	MV0_V2_STP_Rev3.2.pdf	3.2	2024-07-15
[D532]	Software Test Report for MOSAIC Speed Management MV0/V2	MV0_V2_STR_Rev3.2.pdf	3.2	2024-07-16

Table 74: Modification documents for TR v1.28

Result:

No.	Title	Document number / ID	Rev.	Date
The following test documentation was issued by TÜV SÜD Rail GmbH:				
[R128]	Review Report	Review Protocol MOSAIC FW	1.0	2025-03-24

Table 75: Modification results for TR v1.28

The modification has been carried out and the verification and validation activities have shown that the changes did not raise any safety relevant objections.

6 Testing Body

This report is based on the accreditation of the testing laboratory for safety components; see table “Quality Management System”.

The following test reports were issued from other accredited laboratories, as integrated part of the test result. This table is valid from version 1.19 and newer.

No.	Issued by and Title	Document number / ID	Rev.	Date
[R129]	TÜV Italia: EMC Test Report on Safety Module M0 16.4	EMC1626638A_REV00.pdf	00	2020-11-18
[R130]	TÜV Italia: Vibration and Shock Test Report on Safety Module M0 16.4	VIB1616843A_REV00.pdf	00	2020-11-18

No.	Issued by and Title	Document number / ID	Rev.	Date
[R131]	TÜV Italia: EMC Test Report on Safety Module M1S-COM, MO4L and MI8O4	EMC1773049A_REV01.pdf	00	2021-10-11
[R132]	TÜV Italia: Vibration and Shock Test Report on Safety Module M1S-COM	VIB1773049A_REV00.pdf	00	2021-10-08

Table 76: Test Reports issued from other laboratories

7 Summary

The test results of clause 4 showed that the ToE, as specified in clause 2.1, fulfils the requirements of the standards and guidelines referenced in clause 3 , if the constraints and conditions defined in the safety manuals are met.

The device under test fulfils the measures and requirements according to EN 81-50 related to a programmable electronic system in safety relevant applications for lifts (see EN 81-50 Annex B). It can be used as PESSRAL for the defined safety functions up to SIL 3.

The safety rules (EN 81-20, Chapter 5.11.2.6) specified by EN 81-20 and applicable to the device under test are fulfilled. The device under test can be used to supervise the electrical safety devices (EN 81-20, Annex A).

Technical Certifier

1093478910
2025.03.24
12:27:41 +01'00'

Project Manager

Franz Seika
2025.03.24
12:07:58 +01'00'