FUNCTIONAL SAFETY

CERTIFICATE

CERTIFICATO – ZERTIFIKAT – CERTIFICADO – CERTIFICAT

The product:

FS Rack Connection Module
(RCM_{FS})

Manufactured by:

Brüel & Kjær Vibro America Inc.
(part of Brüel & Kjær Vibro, a Spectris Company)
1100 Mark Circle,
Gardnerville, NV 89410, United States

suitable for the following safety function(s):

Rack control signals including bypass, the overall system OK feedback and local reset (Acknowledge).

has been assessed per the relevant requirements of

IEC 61508:2010 Parts 1 to 2

and meets the requirements providing the following:

Systematic Capability: The compliance with the requirements for the avoidance of systematic faults and the requirements for the control of systematic faults have been achieved following the compliance route 1_S.	SC 2
Hardware Safety Integrity: The constraints on hardware safety integrity have been verified in order to achieve a sufficiently robust architecture taking into account the level of element and subsystem complexity following the compliance route 1_H.	Type A
Random Safety Integrity: The estimated safety integrity, for each safety function, due to random hardware safe and dangerous failures rates (excluding "no part" and "no effect" contribution).	See page 2

The architectural constraints and the effects of random failures (PFH/PFD_{AVG}) must be verified for each specific application and safety function implemented by the E/E/PE safety-related system.

Certified by:

BYHON

BYHON Certification Director:

Rosati Francesco

CERTIFICATE No:
BKVA-RCMFS-PNS-B01
Revision: A

Issued:
October 31st, 2023

Valid until:
October 30th, 2026

The owner of a valid certificate for an assessed product is authorized to affix the following mark and relative ID number, to all recognized devices which are identical to the product assessed.

BYHON SIL
ID.N° 117223PN01A

ANSI ACCREDITED
#8914
ISO/IEC 17065
Product Certification Body

The design of each Safety Instrumented Function (SIF) shall meet the requirements listed in the reference standards that shall be selected by taking into account the specific application. Specific activities necessary to investigate and reach a judgment on the adequacy of the functional safety achieved by the E/E/PE safety-related system or compliant items (elements/subsystems) has been conducted by an independent assessor.

The following failure rates data shall be used to the PFH/PFD_{AVG} estimation, taking into consideration all parameters such as redundancy, architectural constraints, diagnostic capability, also introduced by the whole system, including the considerations about the proof test and its effectiveness, mean time of restoration, up to the maintenance capability and its minimum characteristics.

FS Rack Connection Module (RCM_{FS}) failure rates

	λ_S	λ_{DU}	λ_{DD}	λ_{RES}	Type
RCM_{FS} (Common Board Portion)	228	162	80	121	A
POWER SUPPLY CHANNEL (Redundant)	1478	90	0	1262	A

Note:

- RCM_{FS} order options are listed in the document S1078950.002.
- The λ_{RES} (RESIDUAL) failure rates includes the NO PART and NO EFFECT failure rates.
- All failure fates are in FIT (Failure In Time 1 FIT = 1 failure / 10^9 hours).
- The product is capable to be used in Safety Instrumented Systems (SIS) when properly designed into a Safety Instrumented Function (SIF) and configured according to the Safety Manual. The product is SIL 2 capable.

The prescriptions contained in the safety manual C107578.002 shall be followed.

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20-BKV-RCMFS-FSA-02

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October 31st, 2023

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Mod_12_CB Rev05

BYHON
Via Lepanto 23, 59100
Prato (PO)
ITALY

FUNCTIONAL SAFETY

CERTIFICATE

CERTIFICATO – ZERTIFIKAT – CERTIFICADO – CERTIFICAT

The product:

VC-8000 Backplane

Manufactured by:

Brüel & Kjær Vibro America Inc.
(part of Brüel & Kjær Vibro, a Spectris Company)
1100 Mark Circle,
Gardnerville, NV 89410, United States

suitable for the following safety function(s):

To allow the communication between VC-8000 functional safety boards.

has been assessed per the relevant requirements of

IEC 61508:2010 Parts 1 to 2

and meets the requirements providing the following:

Systematic Capability: The compliance with the requirements for the avoidance of systematic faults and the requirements for the control of systematic faults have been achieved following the compliance route 1_S.	SC 2
Hardware Safety Integrity: The constraints on hardware safety integrity have been verified in order to achieve a sufficiently robust architecture taking into account the level of element and subsystem complexity following the compliance route 1_H.	Type A
Random Safety Integrity: The estimated safety integrity, for each safety function, due to random hardware safe and dangerous failures rates (excluding "no part" and "no effect" contribution).	See page 2

The architectural constraints and the effects of random failures (PFH/PFD_{AVG}) must be verified for each specific application and safety function implemented by the E/E/PE safety-related system.

Certified by:

BYHON

BYHON Certification Director:

Rosati Francesco

CERTIFICATE No:
BKVA-BKPFS-PNS-B01
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The owner of a valid certificate for an assessed product is authorized to affix the following mark and relative ID number, to all recognized devices which are identical to the product assessed.

BYHON SIL
ID.N° 117223PN02A

ANSI ACCREDITED
#8914
ISO/IEC 17065
Product Certification Body

The design of each Safety Instrumented Function (SIF) shall meet the requirements listed in the reference standards that shall be selected by taking into account the specific application. Specific activities necessary to investigate and reach a judgment on the adequacy of the functional safety achieved by the E/E/PE safety-related system or compliant items (elements/subsystems) has been conducted by an independent assessor.

The following failure rates data shall be used to the PFH/PFD_{AVG} estimation, taking into consideration all parameters such as redundancy, architectural constraints, diagnostic capability, also introduced by the whole system, including the considerations about the proof test and its effectiveness, mean time of restoration, up to the maintenance capability and its minimum characteristics.

VC-8000 Backplane failure rates

λ_S	λ_{DU}	λ_{DD}	λ_{RES}	Type
160	36	0	219	A

Note:

- The Backplane is a part of the rack chassis, and its order options are listed in the document S1077785.002.
- The λ_{RES} (RESIDUAL) failure rates includes the NO PART and NO EFFECT failure rates.
- All failure fates are in FIT (Failure In Time 1 FIT = 1 failure / 10^9 hours).
- The product is capable to be used in Safety Instrumented Systems (SIS) when properly designed into a Safety Instrumented Function (SIF) and configured according to the Safety Manual. The product is SIL 2 capable.

The prescriptions contained in the safety manual C107579.002 shall be followed.

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Via Lepanto 23, 59100
Prato (PO)
ITALY

FUNCTIONAL SAFETY

CERTIFICATE

CERTIFICATO – ZERTIFIKAT – CERTIFICADO – CERTIFICAT

The product:

FS Temperature Monitoring Module
(TMM_{FS})

Manufactured by:

Brüel & Kjær Vibro America Inc.
(part of Brüel & Kjær Vibro, a Spectris Company)
1100 Mark Circle,
Gardnerville, NV 89410, United States

suitable for the following safety function(s):

Monitoring module for temperature detection in industrial machinery and process safety.

has been assessed per the relevant requirements of

IEC 61508:2010 Parts 1 to 3

and meets the requirements providing the following:

Systematic Capability: The compliance with the requirements for the avoidance of systematic faults and the requirements for the control of systematic faults have been achieved following the compliance route 1_S.	SC 2
Hardware Safety Integrity: The constraints on hardware safety integrity have been verified in order to achieve a sufficiently robust architecture taking into account the level of element and subsystem complexity following the compliance route 1_H.	Type B
Random Safety Integrity: The estimated safety integrity, for each safety function, due to random hardware safe and dangerous failures rates (excluding "no part" and "no effect" contribution).	See page 2

The architectural constraints and the effects of random failures (PFH/PFD_{AVG}) must be verified for each specific application and safety function implemented by the E/E/PE safety-related system.

Certified by:

BYHON

BYHON Certification Director:

Rosati Francesco

CERTIFICATE No:
BKVA-TMMFS-PSE-B01
Revision: A

Issued:
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Valid until:
October 30th, 2026

The owner of a valid certificate for an assessed product is authorized to affix the following mark and relative ID number, to all recognized devices which are identical to the product assessed.

BYHON SIL ✓
ID.N° 117223PS03A

ANSI ACCREDITED
#8914
ISO/IEC 17065
Product Certification Body

The design of each Safety Instrumented Function (SIF) shall meet the requirements listed in the reference standards that shall be selected by taking into account the specific application. Specific activities necessary to investigate and reach a judgment on the adequacy of the functional safety achieved by the E/E/PE safety-related system or compliant items (elements/subsystems) has been conducted by an independent assessor.

The following failure rates data shall be used to the PFH/PFD_{AVG} estimation, taking into consideration all parameters such as redundancy, architectural constraints, diagnostic capability, also introduced by the whole system, including the considerations about the proof test and its effectiveness, mean time of restoration, up to the maintenance capability and its minimum characteristics.

FS Temperature Monitoring Module (TMM_{FS}) failure rates

	λ_S	λ_{DU}	λ_{DD}	λ_{RES}	Type
TMM_{FS} (Common Board Portion)	663	268	105	257	B
INPUT CHANNEL (Redundant*)	124	76	50	0	A
OUTPUT CHANNEL (Onboard Relay)	60	33	2,4	7	A

Note:

- Redundancy shall be considered between channels 1, 2 and 4 with channels 3, 5 and 6.
- TMM_{FS} order options are listed in the document S1077788.002.
- The λ_{RES} (RESIDUAL) failure rates includes the NO PART and NO EFFECT failure rates.
- All failure fates are in FIT (Failure In Time 1 FIT = 1 failure / 10^9 hours).
- The product is capable to be used in Safety Instrumented Systems (SIS) when properly designed into a Safety Instrumented Function (SIF) and configured according to the Safety Manual. The product is SIL 1 capable in simplex configuration and SIL 2 capable in case of redundancy.

TMM_{FS} firmware and MPS configuration software release covered by the present certificate are respectively:

- TMM_{FS} firmware release: 7.10.9102
- MPS Configuration software release: 7.15.0905

The prescriptions contained in the safety manual C107576.002 shall be followed.

CERTIFICATE No:
BKVA-TMMFS-PSE-B01
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FUNCTIONAL SAFETY

CERTIFICATE

CERTIFICATO – ZERTIFIKAT – CERTIFICADO – CERTIFICAT

The product:

FS Universal Monitoring Module
(UMM_{FS})

Manufactured by:

Brüel & Kjær Vibro America Inc.
(part of Brüel & Kjær Vibro, a Spectris Company)
1100 Mark Circle,
Gardnerville, NV 89410, United States

suitable for the following safety function(s):

Monitoring module for vibration applications in industrial machinery and process safety.

has been assessed per the relevant requirements of

IEC 61508:2010 Parts 1 to 3

and meets the requirements providing the following:

Systematic Capability: The compliance with the requirements for the avoidance of systematic faults and the requirements for the control of systematic faults have been achieved following the compliance route 1_S.	SC 2
Hardware Safety Integrity: The constraints on hardware safety integrity have been verified in order to achieve a sufficiently robust architecture taking into account the level of element and subsystem complexity following the compliance route 1_H.	Type B
Random Safety Integrity: The estimated safety integrity, for each safety function, due to random hardware safe and dangerous failures rates (excluding "no part" and "no effect" contribution).	See page 2

The architectural constraints and the effects of random failures (PFH/PFD_{AVG}) must be verified for each specific application and safety function implemented by the E/E/PE safety-related system.

Certified by:

BYHON

BYHON Certification Director:

Rosati Francesco

CERTIFICATE No:
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BYHON SIL
ID.N° 117223PS04A

ANSI ACCREDITED
#8914
ISO/IEC 17065
Product Certification Body

The design of each Safety Instrumented Function (SIF) shall meet the requirements listed in the reference standards that shall be selected by taking into account the specific application. Specific activities necessary to investigate and reach a judgment on the adequacy of the functional safety achieved by the E/E/PE safety-related system or compliant items (elements/subsystems) has been conducted by an independent assessor.

The following failure rates data shall be used to the PFH/PFD_{AVG} estimation, taking into consideration all parameters such as redundancy, architectural constraints, diagnostic capability, also introduced by the whole system, including the considerations about the proof test and its effectiveness, mean time of restoration, up to the maintenance capability and its minimum characteristics.

FS Universal Monitoring Module (UMM_{FS}) failure rates

	λ_S	λ_{DU}	λ_{DD}	λ_{RES}	Type
UMM_{FS} (Common Board Portion)	744	345	179	351	B
INPUT CHANNEL (Common to all types)	144	72	0	19	A
INPUT CHANNEL (Proximitor)	82	39	0	30	A
INPUT CHANNEL (IEPE Probe)	22	12	0	74	A
INPUT CHANNEL (Moving Coil)	1,3	0,6	0	0,6	A
INPUT CHANNEL (2-Wire 4-20mA)	1,2	0,6	0	0,6	A
OUTPUT CHANNEL (Onboard Relay)	60	33	2,4	7	A

Note:

- UMM_{FS} order options are listed in the document S1077787.002.
- The λ_{RES} (RESIDUAL) failure rates includes the NO PART and NO EFFECT failure rates.
- All failure fates are in FIT (Failure In Time 1 FIT = 1 failure / 10^9 hours).
- The product is capable to be used in Safety Instrumented Systems (SIS) when properly designed into a Safety Instrumented Function (SIF) and configured according to the Safety Manual. The product is SIL 1 capable in simplex configuration and SIL 2 capable in case of redundancy.

UMM_{FS} firmware and MPS configuration software release covered by the present certificate are respectively:

- UMM_{FS} firmware release: 7.10.9103
- MPS Configuration software release: 7.15.0905

The prescriptions contained in the safety manual C107577.002 shall be followed.

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