CERTIFICATE

CERTIFICATO – ZERTIFIKAT – CERTIFICADO – CERTIFICAT

The product:

Universal Monitoring Module
(UMM_{FS})

Manufactured by:

Brüel & Kjær Vibro America Inc.
(part of Brüel & Kjær Vibro, a Spectris Company)
2243 Park Place, Suite A
Minden, Nevada 89423 USA

Is 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 7

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
Software Systematic Capability: The UMM embedded dedicated software has been designed, developed and validated as compliance with the requirements for the avoidance of software systematic faults 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

Certified by:

HON CONSULTING

Legal Representative:

Rosati Francesco
President of HON Consulting S.r.l.

CERTIFIED SIL CAPABLE
H-ON
IEC 61508:2010

CERTIFICATE NO:
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The owner of a valid certificate for an assessed product is authorized to affix the following mark to all recognized devices which are identical to the product assessed.

HON CONSULTING
FUNCTIONAL SAFETY TYPE APPROVED
FS

With the following ID number:

117219P01S

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.

Where applicable, the compliance with all requirements established by specific sector standards, such as IEC 61551 or IEC 62061, shall be evaluated considering the constraints each specific application.

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.

Failure rate for Universal Monitoring Module (UMM)

	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:

- The UMM_{FS} order options are listed in the document S1077787.002.
- All failure fates are in FIT (Failure In Time 1 FIT = 1 failure / 10^9 hours).
- The λ_{RES} (RESIDUAL) failure rates includes the NO PART and NO EFFECT failure rates.

The prescriptions contained in the safety manual C107577.001 shall be followed.

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CERTIFICATE

CERTIFICATO – ZERTIFIKAT – CERTIFICADO – CERTIFICAT

The product:

Temperature Monitoring Module
(TMM_{FS})

Manufactured by:

Brüel & Kjær Vibro America Inc.
(part of Brüel & Kjær Vibro, a Spectris Company)
2243 Park Place, Suite A
Minden, Nevada 89423 USA

Is 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 7

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**

Software Systematic Capability:

The TMM embedded dedicated software has been designed, developed and validated as compliance with the requirements for the avoidance of software systematic faults 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**

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President of HON Consulting S.r.l.

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HON CONSULTING
FUNCTIONAL SAFETY TYPE APPROVED
FS

With the following ID number:

117219P02S

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.

Where applicable, the compliance with all requirements established by specific sector standards, such as IEC 61551 or IEC 62061, shall be evaluated considering the constraints each specific application.

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.

Failure rate for Temperature Monitoring Module (TMM)

	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.
- The TMM_{FS} order options are listed in the document S1077788.002.
- All failure fates are in FIT (Failure In Time 1 FIT = 1 failure / 10^9 hours).
- The λ_{RES} (RESIDUAL) failure rates includes the NO PART and NO EFFECT failure rates.

The prescriptions contained in the safety manual C107576.001 shall be followed.

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CERTIFICATE

CERTIFICATO – ZERTIFIKAT – CERTIFICADO – CERTIFICAT

The product:

Rack Connection Module
(RCM_{FS})

Manufactured by:

Brüel & Kjær Vibro America Inc.
(part of Brüel & Kjær Vibro, a Spectris Company)
2243 Park Place, Suite A
Minden, Nevada 89423 USA

Is 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 7

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

Certified by:

HON CONSULTING

Legal Representative:

Rosati Francesco
President of HON Consulting S.r.l.

CERTIFIED SIL CAPABLE H-ON IEC 61508:2010

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

HON CONSULTING
FUNCTIONAL SAFETY TYPE APPROVED
FS

With the following ID number:

117219P03N

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.

Where applicable, the compliance with all requirements established by specific sector standards, such as IEC 61511 or IEC 62061, shall be evaluated considering the constraints each specific application.

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.

Failure rate for Rack Connection Module (RCM)

	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:

- The RCM_{FS} order options are listed in the document S1078950.002.
- All failure fates are in FIT (Failure In Time 1 FIT = 1 failure / 10^9 hours).
- The λ_{RES} (RESIDUAL) failure rates includes the NO PART and NO EFFECT failure rates.

The prescriptions contained in the safety manual C107578.001 shall be followed.

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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)
2243 Park Place, Suite A
Minden, Nevada 89423 USA

Is suitable for the following safety function(s):

Allow the communication between VC-8000 functional safety boards

Has been assessed per the relevant requirements of:

IEC 61508:2010 Parts 1 to 7

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

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Legal Representative:

Rosati Francesco
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HON CONSULTING
FUNCTIONAL SAFETY TYPE APPROVED
FS

With the following ID number:

117219P04N

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.

Where applicable, the compliance with all requirements established by specific sector standards, such as IEC 61511 or IEC 62061, shall be evaluated considering the constraints each specific application.

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.

Failure rate for VC-8000 Backplane

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.
- All failure fates are in FIT (Failure In Time 1 FIT = 1 failure / 10^9 hours).
- The λ_{RES} (RESIDUAL) failure rates includes the NO PART and NO EFFECT failure rates.

The prescriptions contained in the safety manual C107579.001 shall be followed.

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