CERTIFICATE NUMBER
16-HS1553916-1-PDA

DATE
29 Aug 2018

ABS TECHNICAL OFFICE
Houston ESD - Offshore Equipment

CERTIFICATE OF
Design Assessment

This is to certify that a representative of this Bureau did, at the request of

BASLER ELECTRIC

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate.

Product: **Controller, Digital Universal Controller**
Model: **DGC-2020HD**
AEM-2020
CEM-2020
VRM-2020

This Product Design Assessment (PDA) Certificate 16-HS1553916-1-PDA, dated 29/Aug/2018 remains valid until 17/Aug/2021 or until the Rules or specifications used in the assessment are revised (whichever occurs first).

This PDA is intended for a product to be installed on an ABS classed vessel, MODU or facility which is in existence or under contract for construction on the date of the ABS Rules or specifications used to evaluate the Product.

Use of the Product on an ABS classed vessel, MODU or facility which is contracted after the validity date of the ABS Rules and specifications used to evaluate the Product, will require re-evaluation of the PDA.

Use of the Product for non ABS classed vessels, MODUs or facilities is to be to an agreement between the manufacturer and intended client.

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Tier: 2 - PDA Issued

Product: **Controller, Digital Universal Controller**
Model: **DGC-2020HD**
AEM-2020
CEM-2020
VRM-2020

Intended Service:
Marine and Offshore Applications: Digital Control Systems for control of Diesel Engines and Generators on Ships and Offshore facilities.

Description:
DGC-2020HD: Microprocessor-based controller with integrated programmable logic and load sharing capabilities, designed for genset control, protection and metering for mains fail, paralleled units and systems with multiple buses. There are optional variations DGC-2020HD DIN Rail and DGC-2020HD Panel Mount.

AEM-2020: Analog Expansion Module fitted with 8 analog inputs, 8 resistance temperature device (RTD) inputs, 2 type k thermocouple inputs, 4 analog outputs configurable for 4 to 20 mA and 0 to 10 Vdc ranges, Controller Area Network (CAN) communication protocol, compatible with DGC-2020, DGC-202HD, DECS-250, DECS-250N and IEM-2020.

CEM-2020: Contact Expansion Module fitted with 10 dry contact inputs, 24 contact outputs, programmable, CAN communication protocol, compatible with DGC-2020ES, DGC-202, DGC-202HD, DECS-250, DECS-250N and IEM-2020

VRM-2020: Voltage Regulation Module - a remote module which communicates with the DGC-2020HD to provides excitation to the field of a brushless exciter for automatic voltage regulation.

Rating:
DGC-2020HD:
Voltage: Nominal - 12 VDC or 24 VDC, Range: 6 VDC to 32 VDC;
Power Consumption: Normal Operation - 18.1 W, Maximum - 25 W, Sleep - 12.7 W;
Enclosure Rating: IP 56 (Front Panel);
Environmental: Operating Temperature: -40 °C to 70 °C (-40 °F to 158 °F), The color touch screen maintains operation from –20°C to 70°C (-4 °F to 158 °F); (–4°F to 158°F).

VRM-2020:
Operating Power: Configuration: Single-phase, PMG only, Voltage Range:150 to 300 Vac, Frequency Range: 50 to 300 Hz
Control Power: Nominal: 12 or 24 Vdc, Range 6 to 32 Vdc
Field Output: Continuous Rating: 63 Vdc, 3.5 Adc, Forcing Rating: Up to 120 Vdc at 7.5 Adc for 10 seconds
Voltage Regulation Accuracy: ±0.25% from no load to full load
Environmental: Operating Temperature: -40°C to 70°C (-40°F to 158°F), Storage: -40°C to 85°C (-40°F to 185°F)
Shock: 15 G in 3 perpendicular planes; Vibration: 3 to 25 Hz: 1.5 mm peak amplitude, 25 to 2000 Hz: 5 G.

AEM 2020:
Power Supply: Normal 12 to 24Vdc, Range: 8 to 32Vdc, 5.1 W.
Analog Inputs: 8; Voltage: 0 to 10Vdc, Burden: 9.65 k minimum; Current: 4 to 20 mAdc, Burden: 470 maximum
RTD Inputs: 8, Rating: 100 platinum or 10 copper, Setting Range: -50°C to 250°C / (-58°F to 482°F)
Thermocouple Inputs: 2, Rating: Type K, Setting Range: 0 to 1378°C /(0 to 2507°F)
Analog Outputs: Voltage: 0 to 10Vdc, Current: 4 to 20 mAdc
CAN Bus: Differential Bus Voltage: 1.5 to 3 Vdc, Max. Voltage: -30 to +32Vdc,Communication Rate: 250 kB/s
Environmental: Operating Temperature: -40°C to 70°C (-40°F to 158°F), Storage: -40°C to 85°C (-40°F to 185°F)
Shock: 15 G in 3 perpendicular planes; Vibration: 5 to 29 Hz: 1.5 G peak for 5 min., 29 to 52 Hz: 0.036 in. double amplitude, 52 to 500 Hz: 5 G peak for 7.5 min.

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CEM 2020:
Power Supply: Normal 12 to 24Vdc, Range: 8 to 32Vdc, 14 W.
Contact Inputs: 10 dry contacts, programmable
Contact Outputs: No. 1 through 12: 1 Adc, 30 Vdc Form C, gold contacts; No. 13 through 24: 4 Adc, 30 Vdc, Form C
CAN Bus: Differential Bus Voltage: 1.5 to 3 Vdc, Max. Voltage: -30 to +32Vdc,Communication Rate: 250 kB/s
Environmental: Operating Temperature: -40°C to 70°C (-40°F to 158°F), Storage: -40°C to 85°C (-40°F to 185°F)
Shock: 15 G in 3 perpendicular planes; Vibration: 5 to 29 Hz: 1.5 G peak for 5 min., 29 to 52 Hz: 0.036 in. double amplitude, 52 to 500 Hz: 5 G peak for 7.5 min.

Service Restriction:
- Unit Certification is not required for this product. If the manufacturer or purchaser request an ABS Certificate for compliance with a specification or standard, the specification or standard, including inspection standards and tolerances, must be clearly defined.
- Where the system is installed in classified area, all components in hazardous area must be certified and installed according to approved procedures

Comments:
1) The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product.
2) Prototype testing performed as per ABS Steel Vessels Rules 4-9-8/Table 1 except test # 2, 10, 16. Tests for hardware only. Each configuration and external connection arrangement is to be specifically approved. When incorporated in a system of Category I, II or III in accordance with 4-9-3/7.1 and 4-9-3/Table 1 of the ABS Steel Vessels Rules the documentation detailed in 4-9-3/Table 2 is to be submitted to ABS or to be available for review by ABS as applicable.
3) The specific functional and operational arrangements are to be specifically approved in connection with the design approval of particular generator type/arrangement.
4) The equipment (voltage regulator) in the system for each installation is to be tested for verification of meeting the functional requirements defined in 4-8-3/3.13.2 of the Steel Vessels Rules.
5) Arrangements for electric propulsion generators are to be such that propulsion can be maintained in case of failure of an excitation system or failure of a power supply for an excitation system according to 4-8-5/5.5.1(d) of the ABS Steel Vessels Rules.
6) When excitation control systems are used in propulsion systems are to be inspected when finished and dielectric strength tests and insulation resistance measurements made on the various circuits in the presence of the Surveyor, preferably at the plant of manufacturer.
7) When the DGC-2020HD and associated accessories are installed in the generators, the unit is to be tested in generators' factory as per 4-8-3/Table 3, for generators >= 100 KW.
8) For equipment used for essential and emergency services on vessels not receiving notations ACC, ACCU, or ABCU, facilities without AMCC or AMCCU, all installations are to be functionally tested in accordance with 4-9-8 Table 2 of ABS Steel Vessels Rules to the satisfaction of the surveyor on board and during sea trials.

Notes/Drawing/Documentation:
Document No. SNN-7 (6-18), Basler Electric, AEM-2020 and CEM-2020 Expansion Modules, Pages: 2
Document No. 9421000102, Radiated Immunity Test Report for CEM 2020, Test Facility: Basler Electric Co. Date: 17 December 2007, Pages: 17
Document No. 9421000103, Class A Emissions Test Report for CEM-2020, Test Facility: Basler Electric Co. Date: 18 December 2008, Pages: 22
Document No. 9421100011, Radiated Immunity Test Report of AEM-2020, Test Facility: Basler Electric Co. Date: 30 June & 01 July 2008, Pages: 15
Document No. 290664, CEM 2020 Dielectric Test, Test Facility, Basler Electric Co. Date: 24 October 2014. Pages: 4
Document No. 93483-9421101103, AEM-2020 Temperature Test, Test Facility: Basler Electric Co. Date: 27 June 2008, Pages: 6
Document No. 94518-9421101103, Vibration and Shock Tests for AEM-2020, Test Facility: Basler Electric Co. Date: 12 May 2016, Pages: 22
Document No. 93482-9421001101, DGC 2020 CEM Shock and Vibration Test, Test Facility: Basler Electric Co.

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Tier: 2 - PDA Issued

Date: 14 January 2008, Pages: 11
Document No. 93482-9421000100, CEM-2020 Temperature Test, Test Facility: Basler Electric Co. Date: 20 December 2007, Pages: 5
Document No. 93483-9400201103, AEM-2020 Dielectric Test, Test Facility: Basler Electric Co. Date: 21 May 2008, Pages: 2
Document No. 93483-9421101101, AEM-2020 Salt Fog Test, Test Facility: Basler Electric Co. Date: 02 May 2008, Pages: 9
Document No. 93483-9421101103, AEM-2020, Temperature Test, Test Facility: Basler Electric Co. Date: 27 June 2008, Pages: 6
Document: Basler Electric - Product Certification List, Page 1

Document No. 9503800782_DLS EMC, Test Facility: Basler Electric Co. Pages: 44, Dated: 08 July 2016
Document No. 9503800783_DLS EMC, Test Facility: Basler Electric Co. Pages: 32, Dated: 08 July 2016
Document No. 9503800784_DLS EMC, Test Facility: Basler Electric Co. Pages: 21, Dated: 08 July2016
Document No. ABS Witness Tests Cert (Report Number:CH3149084), Test Facility: Basler Electric Co. Page: 1, Dated: 16 June 2016
Document No. Dielectric Voltage Withstand and IACS High Voltage Test Signed, Test Facility: Basler Electric Co. Pages: 15, Dated: 13 July 2016
Document No. IACS Cold_VRM-2020, Pages: 11, Test Facility: Basler Electric Co. Dated: 08 August 2016
Document No. IACS Damp Heat_VRM-2020, Test Facility: Basler Electric Co. Pages: 12, Dated: 08 August 2016
Document No. IACS Dry Heat_VRM-2020, Pages: 12, Dated: 08 August 2016
Document No.IACS Test Plan 9503800XXX -VRM-2020, Test Facility: Basler Electric Co. Pages:13, Date: 15 August 2016
Document No. IEC 61000-4-6 Conducted Immunity on VRM-2020, Test Facility: Basler Electric Co. Pages: 22, Dated: 19 July 2016
Document No. Power Supply Failure_VRM-2020_(ABS Witnessed) Signed, Test Facility: Basler Electric Co. Pages: 10, Dated: 20 June 2016
Document No. Power Supply Variations_VRM-2020_(ABS Witnessed) Signed, Test Facility: Basler Electric Co. Pages: 11, Dated: 13 July 2016
Document No. Shock & Vibration_VRM-2020_(ABS Witnessed) Signed, Test Facility: Basler Electric Co. Pages: 21, Dated: 21 June 2016
Document No. Voltage Withstand_VRM-2020, Test Facility: Basler Electric Co. Pages: 15, Dated: 08 August 2016
Document No.VRM2020 Spec Sheet and Operational Description, Pages: 40

Terms of Validity:
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STANDARDS

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ABS Rules:
Rules for Conditions of Classification, Part 1 - 2018 Steel Vessels Rules 1-1-4/7.7, 1-1-A3, 1-1-A4, which covers the following:
2018 Steel Vessels: 4-2-1/7.3, 4-2-1/7.5, 4-8-3/3.13.2, 4-9-5/17, 4-9-6/23, 4-9-8/13.1, 4-9-8/15, 4-9-8/Table 1 & 2, 4-9-3/7.1, 4-9-3/Table 1 & 2
2018 Offshore Support Vessels Rules: 4-2-1/7.3, 4-2-1/7.5, 4-8-3/3.13.2, 4-9-5/17, 4-9-6/23, 4-9-8/13.1, 4-9-8/15, 4-9-8/Table 1 & 2
2018 Marine Vessel Rules: 4-2-1/7.3, 4-2-1/7.5, 4-8-3/3.13.2, 4-9-5/17, 4-9-6/23, 4-9-8/13.1, 4-9-8/15, 4-9-8/Table 1 & 2, 4-9-3/7.1, 4-9-3/Table 1 & 2

Rules for Conditions of Classification, Part 1- 2018 Offshore Units and Structures 1-1-4/9.7, 1-1-A2, 1-1-A3, which covers the following:
2018 Mobile Offshore Drilling Units: 4-3-1/15, 4-3-1/17.1, 6-1-7/5.17
2018 Mobile Offshore Units: 4-3-1/15, 4-3-1/17.1, 6-1-7/5.17
2018 Guide for Automatic or Remote Control and Monitoring on Offshore Installations: 1/3.1, 1/3.3

National:
NA

International:
IEC 60068-2-1: 2007 (6th Edition): Environmental Testing Part 2-1: Tests – Test A: Cold
IEC 60068-2-2: 2007 5th Edition: Environmental Testing Part 2-2: Tests – Test B: Dry Heat
IEC 60068-2-6:2007 (7th Edition): Environmental Testing Part 2-6: Tests – Test Fc: Vibration (sinusoidal)
IEC 60068-2-30:2005 (3rd Edition): Environmental Testing Part 1-30 Tests – Test Db; Damp Heat, cyclic (12 h + 12 h cycle)
IEC 61000-6-2: 2005 (2nd Edition): Electromagnetic Compatibility (EMC): Generic Standards-Immunity for Industrial Environments

Government:
NA

EUMED:
NA

OTHERS:
NA

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Product: **Controller, Digital Universal Controller**
Model: **DGC-2020HD**
AEM-2020
CEM-2020
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Product: **Controller, Digital Universal Controller**
Model: **DGC-2020HD**
AEM-2020
CEM-2020
VRM-2020

Intended Service:
Marine and Offshore Applications: Digital Control Systems for control of Diesel Engines and Generators on Ships and Offshore facilities.

Description:
DGC-2020HD: Microprocessor-based controller with integrated programmable logic and load sharing capabilities, designed for genset control, protection and metering for mains fail, paralleled units and systems with multiple buses. There are optional variations DGC-2020HD DIN Rail and DGC-2020HD Panel Mount.

AEM-2020: Analog Expansion Module fitted with 8 analog inputs, 8 resistance temperature device (RTD) inputs, 2 type k thermocouple inputs, 4 analog outputs configurable for 4 to 20 mA and 0 to 10 Vdc ranges, Controller Area Network (CAN) communication protocol, compatible with DGC-2020, DGC-202HD, DECS-250, DECS-250N and IEM-2020.

CEM-2020: Contact Expansion Module fitted with 10 dry contact inputs, 24 contact outputs, programmable, CAN communication protocol, compatible with DGC-2020ES, DGC-202, DGC-202HD, DECS-250, DECS-250N and IEM-2020

VRM-2020: Voltage Regulation Module - a remote module which communicates with the DGC-2020HD to provides excitation to the field of a brushless exciter for automatic voltage regulation.

Rating:
DGC-2020HD:
Voltage: Nominal - 12 VDC or 24 VDC, Range: 6 VDC to 32 VDC;
Power Consumption: Normal Operation - 18.1 W, Maximum - 25 W, Sleep - 12.7 W;
Enclosure Rating: IP 56 (Front Panel);
Environmental: Operating Temperature: -40 °C to 70 °C (-40 °F to 158 °F), The color touch screen maintains operation from –20°C to 70°C (-4 °F to 158 °F); (–4°F to 158°F).

VRM-2020:
Operating Power: Configuration: Single-phase, PMG only, Voltage Range:150 to 300 Vac, Frequency Range: 50 to 300 Hz
Control Power: Nominal: 12 or 24 Vdc, Range 6 to 32 Vdc
Field Output: Continuous Rating: 63 Vdc, 3.5 Adc, Forcing Rating: Up to 120 Vdc at 7.5 Adc for 10 seconds
Voltage Regulation Accuracy: ±0.25% from no load to full load
Environmental: Operating Temperature: -40°C to 70°C (-40°F to 158°F), Storage: -40°C to 85°C (-40°F to 185°F)
Shock: 15 G in 3 perpendicular planes; Vibration: 3 to 25 Hz: 1.5 mm peak amplitude, 25 to 2000 Hz: 5 G.

AEM 2020:
Power Supply: Normal 12 to 24Vdc, Range: 8 to 32Vdc, 5.1 W.
Analog Inputs: 8; Voltage: 0 to 10Vdc, Burden: 9.65 k minimum; Current: 4 to 20 mAdc, Burden: 470 maximum
RTD Inputs: 8, Rating: 100 platinum or 10 copper, Setting Range: -50°C to 250°C / (-58°F to 482°F)
Thermocouple Inputs: 2, Rating: Type K, Setting Range: 0 to 1378°C /(0 to 2507°F)
Analog Outputs: Voltage: 0 to 10Vdc, Current: 4 to 20 mAdc
CAN Bus: Differential Bus Voltage: 1.5 to 3 Vdc, Max. Voltage: -30 to +32Vdc,Communication Rate: 250 kB/s
Environmental: Operating Temperature: -40°C to 70°C (-40°F to 158°F), Storage: -40°C to 85°C (-40°F to 185°F)
Shock: 15 G in 3 perpendicular planes; Vibration: 5 to 29 Hz: 1.5 G peak for 5 min., 29 to 52 Hz: 0.036 in. double amplitude, 52 to 500 Hz: 5 G peak for 7.5 min.

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CEM 2020:
Power Supply: Normal 12 to 24Vdc, Range: 8 to 32Vdc, 14 W.
Contact Inputs: 10 dry contacts, programmable
Contact Outputs: No. 1 through 12: 1 Adc, 30 Vdc Form C, gold contacts; No. 13 through 24: 4 Adc, 30 Vdc, Form C
CAN Bus: Differential Bus Voltage: 1.5 to 3 Vdc, Max. Voltage: -30 to +32Vdc,Communication Rate: 250 kB/s
Environmental: Operating Temperature: -40°C to 70°C (-40°F to 158°F), Storage: -40°C to 85°C (-40°F to 185°F)
Shock: 15 G in 3 perpendicular planes; Vibration: 5 to 29 Hz: 1.5 G peak for 5 min., 29 to 52 Hz: 0.036 in. double amplitude, 52 to 500 Hz: 5 G peak for 7.5 min.

Service Restriction:
- Unit Certification is not required for this product. If the manufacturer or purchaser request an ABS Certificate for compliance with a specification or standard, the specification or standard, including inspection standards and tolerances, must be clearly defined.
- Where the system is installed in classified area, all components in hazardous area must be certified and installed according to approved procedures

Comments:
1) The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product.
2) Prototype testing performed as per ABS Steel Vessels Rules 4-9-8/Table 1 except test # 2, 10, 16. Tests for hardware only. Each configuration and external connection arrangement is to be specifically approved. When incorporated in a system of Category I, II or III in accordance with 4-9-3/7.1 and 4-9-3/Table 1 of the ABS Steel Vessels Rules the documentation detailed in 4-9-3/Table 2 is to be submitted to ABS or to be available for review by ABS as applicable.
3) The specific functional and operational arrangements are to be specifically approved in connection with the design approval of particular generator type/arrangement.
4) The equipment (voltage regulator) in the system for each installation is to be tested for verification of meeting the functional requirements defined in 4-8-3/3.13.2 of the Steel Vessels Rules.
5) Arrangements for electric propulsion generators are to be such that propulsion can be maintained in case of failure of an excitation system or failure of a power supply for an excitation system according to 4-8-5/5.5.1(d) of the ABS Steel Vessels Rules.
6) When excitation control systems are used in propulsion systems are to be inspected when finished and dielectric strength tests and insulation resistance measurements made on the various circuits in the presence of the Surveyor, preferably at the plant of manufacturer.
7) When the DGC-2020HD and associated accessories are installed in the generators, the unit is to be tested in generators' factory as per 4-8-3/Table 3, for generators >= 100 KW.
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Document No. 9421000103, Class A Emissions Test Report for CEM-2020, Test Facility: Basler Electric Co. Date: 18 December 2008, Pages: 22
Document No. 9421100011, Radiated Immunity Test Report of AEM-2020, Test Facility: Basler Electric Co. Date: 30 June & 01 July 2008, Pages: 15
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Document No. 94518-9421101103, Vibration and Shock Tests for AEM-2020, Test Facility: Basler Electric Co. Date: 12 May 2016, Pages: 22
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Voltage Regulation Accuracy: ±0.25% from no load to full load
Environmental: Operating Temperature: -40°C to 70°C (-40°F to 158°F), Storage: -40°C to 85°C (-40°F to 185°F)
Shock: 15 G in 3 perpendicular planes; Vibration: 3 to 25 Hz: 1.5 mm peak amplitude, 25 to 2000 Hz: 5 G.

AEM 2020:
Power Supply: Normal 12 to 24Vdc, Range: 8 to 32Vdc, 5.1 W.
Analog Inputs: 8; Voltage: 0 to 10Vdc, Burden: 9.65 k minimum; Current: 4 to 20 mAdc, Burden: 470 maximum
RTD Inputs: 8, Rating: 100 platinum or 10 copper, Setting Range: -50°C to 250°C / (-58°F to 482°F)
Thermocouple Inputs: 2, Rating: Type K, Setting Range: 0 to 1378°C /(0 to 2507°F)
Analog Outputs: Voltage: 0 to 10Vdc, Current: 4 to 20 mAdc
CAN Bus: Differential Bus Voltage: 1.5 to 3 Vdc, Max. Voltage: -30 to +32Vdc,Communication Rate: 250 kB/s
Environmental: Operating Temperature: -40°C to 70°C (-40°F to 158°F), Storage: -40°C to 85°C (-40°F to 185°F)
Shock: 15 G in 3 perpendicular planes; Vibration: 5 to 29 Hz: 1.5 G peak for 5 min., 29 to 52 Hz: 0.036 in. double amplitude, 52 to 500 Hz: 5 G peak for 7.5 min.

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CEM 2020:
Power Supply: Normal 12 to 24Vdc, Range: 8 to 32Vdc, 14 W.
Contact Inputs: 10 dry contacts, programmable
Contact Outputs: No. 1 through 12: 1 Adc, 30 Vdc Form C, gold contacts; No. 13 through 24: 4 Adc, 30 Vdc, Form C
CAN Bus: Differential Bus Voltage: 1.5 to 3 Vdc, Max. Voltage: -30 to +32Vdc,Communication Rate: 250 kB/s
Environmental: Operating Temperature: -40°C to 70°C (-40°F to 158°F), Storage: -40°C to 85°C (-40°F to 185°F)
Shock: 15 G in 3 perpendicular planes; Vibration: 5 to 29 Hz: 1.5 G peak for 5 min., 29 to 52 Hz: 0.036 in. double amplitude, 52 to 500 Hz: 5 G peak for 7.5 min.

Service Restriction:
- Unit Certification is not required for this product. If the manufacturer or purchaser request an ABS Certificate for compliance with a specification or standard, the specification or standard, including inspection standards and tolerances, must be clearly defined.
- Where the system is installed in classified area, all components in hazardous area must be certified and installed according to approved procedures

Comments:
1) The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product.
2) Prototype testing performed as per ABS Steel Vessels Rules 4-9-8/Table 1 except test # 2, 10, 16. Tests for hardware only. Each configuration and external connection arrangement is to be specifically approved. When incorporated in a system of Category I, II or III in accordance with 4-9-3/7.1 and 4-9-3/Table 1 of the ABS Steel Vessels Rules the documentation detailed in 4-9-3/Table 2 is to be submitted to ABS or to be available for review by ABS as applicable.
3) The specific functional and operational arrangements are to be specifically approved in connection with the design approval of particular generator type/arrangement.
4) The equipment (voltage regulator) in the system for each installation is to be tested for verification of meeting the functional requirements defined in 4-8-3/3.13.2 of the Steel Vessels Rules.
5) Arrangements for electric propulsion generators are to be such that propulsion can be maintained in case of failure of an excitation system or failure of a power supply for an excitation system according to 4-8-5/5.5.1(d) of the ABS Steel Vessels Rules.
6) When excitation control systems are used in propulsion systems are to be inspected when finished and dielectric strength tests and insulation resistance measurements made on the various circuits in the presence of the Surveyor, preferably at the plant of manufacturer.
7) When the DGC-2020HD and associated accessories are installed in the generators, the unit is to be tested in generators' factory as per 4-8-3/Table 3, for generators >= 100 KW.
8) For equipment used for essential and emergency services on vessels not receiving notations ACC, ACCU, or ABCU, facilities without AMCC or AMCCU, all installations are to be functionally tested in accordance with 4-9-8 Table 2 of ABS Steel Vessels Rules to the satisfaction of the surveyor on board and during sea trials.

Notes/Drawing/Documentation:
Document No. SNN-7 (6-18), Basler Electric, AEM-2020 and CEM-2020 Expansion Modules, Pages: 2
Document No. 9421000102, Radiated Immunity Test Report for CEM 2020, Test Facility: Basler Electric Co. Date: 17 December 2007, Pages: 17
Document No. 9421000103, Class A Emissions Test Report for CEM-2020, Test Facility: Basler Electric Co. Date: 18 December 2008, Pages: 22
Document No. 9421100011, Radiated Immunity Test Report of AEM-2020, Test Facility: Basler Electric Co. Date: 30 June & 01 July 2008, Pages: 15
Document No. 290664, CEM 2020 Dielectric Test, Test Facility, Basler Electric Co. Date: 24 October 2014. Pages: 4
Document No. 93483-9421101103, AEM-2020 Temperature Test, Test Facility: Basler Electric Co. Date: 27 June 2008, Pages: 6
Document No. 94518-9421101103, Vibration and Shock Tests for AEM-2020, Test Facility: Basler Electric Co. Date: 12 May 2016, Pages: 22
Document No. 93482-9421001101, DGC 2020 CEM Shock and Vibration Test, Test Facility: Basler Electric Co.

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Date: 14 January 2008, Pages: 11
Document No. 93482-9421000100, CEM-2020 Temperature Test, Test Facility: Basler Electric Co. Date: 20 December 2007, Pages: 5
Document No. 93483-9400201103, AEM-2020 Dielectric Test, Test Facility: Basler Electric Co. Date: 21 May 2008, Pages: 2
Document No. 93483-9421101101, AEM-2020 Salt Fog Test, Test Facility: Basler Electric Co. Date: 02 May 2008, Pages: 9
Document No. 93483-9421101103, AEM-2020, Temperature Test, Test Facility: Basler Electric Co. Date: 27 June 2008, Pages: 6
Document: Basler Electric - Product Certification List, Page 1

Document No. 9503800782_DLS EMC, Test Facility: Basler Electric Co. Pages: 44, Dated: 08 July 2016
Document No. 9503800783_DLS EMC, Test Facility: Basler Electric Co. Pages: 32, Dated: 08 July 2016
Document No. 9503800784_DLS EMC, Test Facility: Basler Electric Co. Pages: 21, Dated: 08 July2016
Document No. ABS Witness Tests Cert (Report Number:CH3149084), Test Facility: Basler Electric Co. Page: 1, Dated: 16 June 2016
Document No. Dielectric Voltage Withstand and IACS High Voltage Test Signed, Test Facility: Basler Electric Co. Pages: 15, Dated: 13 July 2016
Document No. IACS Cold_VRM-2020, Pages: 11, Test Facility: Basler Electric Co. Dated: 08 August 2016
Document No. IACS Damp Heat_VRM-2020, Test Facility: Basler Electric Co. Pages: 12, Dated: 08 August 2016
Document No. IACS Dry Heat_VRM-2020, Pages: 12, Dated: 08 August 2016
Document No.IACS Test Plan 9503800XXX -VRM-2020, Test Facility: Basler Electric Co. Pages:13, Date: 15 August 2016
Document No. IEC 61000-4-6 Conducted Immunity on VRM-2020, Test Facility: Basler Electric Co. Pages: 22, Dated: 19 July 2016
Document No. Power Supply Failure_VRM-2020_(ABS Witnessed) Signed, Test Facility: Basler Electric Co. Pages: 10, Dated: 20 June 2016
Document No. Power Supply Variations_VRM-2020_(ABS Witnessed) Signed, Test Facility: Basler Electric Co. Pages: 11, Dated: 13 July 2016
Document No. Shock & Vibration_VRM-2020_(ABS Witnessed) Signed, Test Facility: Basler Electric Co. Pages: 21, Dated: 21 June 2016
Document No. Voltage Withstand_VRM-2020, Test Facility: Basler Electric Co. Pages: 15, Dated: 08 August 2016
Document No.VRM2020 Spec Sheet and Operational Description, Pages: 40

Terms of Validity:
This Product Design Assessment (PDA) Certificate 16-HS1553916-1-PDA, dated 29/Aug/2018 remains valid until 17/Aug/2021 or until the Rules or specifications used in the assessment are revised (whichever occurs first).

This PDA is intended for a product to be installed on an ABS classed vessel, MODU or facility which is in existence or under contract for construction on the date of the ABS Rules or specifications used to evaluate the Product.

Use of the Product on an ABS classed vessel, MODU or facility which is contracted after the validity date of the ABS Rules and specifications used to evaluate the Product, will require re-evaluation of the PDA.

Use of the Product for non ABS classed vessels, MODUs or facilities is to be to an agreement between the manufacturer and intended client.

STANDARDS

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ABS Rules:
Rules for Conditions of Classification, Part 1 - 2018 Steel Vessels Rules 1-1-4/7.7, 1-1-A3, 1-1-A4, which covers the following:
2018 Steel Vessels: 4-2-1/7.3, 4-2-1/7.5, 4-8-3/3.13.2, 4-9-5/17, 4-9-6/23, 4-9-8/13.1, 4-9-8/15, 4-9-8/Table 1 & 2, 4-9-3/7.1, 4-9-3/Table 1 & 2
2018 Offshore Support Vessels Rules: 4-2-1/7.3, 4-2-1/7.5, 4-8-3/3.13.2, 4-9-5/17, 4-9-6/23, 4-9-8/13.1, 4-9-8/15, 4-9-8/Table 1 & 2
2018 Marine Vessel Rules: 4-2-1/7.3, 4-2-1/7.5, 4-8-3/3.13.2, 4-9-5/17, 4-9-6/23, 4-9-8/13.1, 4-9-8/15, 4-9-8/Table 1 & 2, 4-9-3/7.1, 4-9-3/Table 1 & 2

Rules for Conditions of Classification, Part 1- 2018 Offshore Units and Structures 1-1-4/9.7, 1-1-A2, 1-1-A3, which covers the following:
2018 Mobile Offshore Drilling Units: 4-3-1/15, 4-3-1/17.1, 6-1-7/5.17
2018 Mobile Offshore Units: 4-3-1/15, 4-3-1/17.1, 6-1-7/5.17
2018 Guide for Automatic or Remote Control and Monitoring on Offshore Installations: 1/3.1, 1/3.3

National:
NA

International:
IEC 60068-2-1: 2007 (6th Edition): Environmental Testing Part 2-1: Tests – Test A: Cold
IEC 60068-2-2: 2007 5th Edition: Environmental Testing Part 2-2: Tests – Test B: Dry Heat
IEC 60068-2-6:2007 (7th Edition): Environmental Testing Part 2-6: Tests – Test Fc: Vibration (sinusoidal)
IEC 60068-2-30:2005 (3rd Edition): Environmental Testing Part 1-30 Tests – Test Db; Damp Heat, cyclic (12 h + 12 h cycle)
IEC 61000-6-2: 2005 (2nd Edition): Electromagnetic Compatibility (EMC): Generic Standards-Immunity for Industrial Environments

Government:
NA

EUMED:
NA

OTHERS:
NA