



MARINE SIMULATOR

MODULAR
ELSTEEL
ENCLOSURES

ELSTEEL MARINE SIMULATOR Articulation of Ship Vibrations

Travelling the waters of the world today requires that you can rely on your equipment and its functionality at all times.

Elsteel's panel boards have been designed and developed to protect your equipment in the best possible way.

Panel boards in ships have to endure a lot of stress from a variety of weather conditions exerting a combination of forces upon the ship and its equipment.

The constant vibrations from mechanical equipment will challenge your equipment further.

Elsteel offers you the best solutions for panel boards in the maritime field.

Our unique combination of design and material guarantees that your panels are operational and serviceable during storms and through high temperatures stemming from a combination of engines and turbulent weather conditions.



Our panel boards have been thoroughly tested in our very own Marine Simulator, designed by Elsteel. The simulator is able to generate not only the various vibrations from main engines, generators, compressors, thrusters etc. but can also replicate a ship's movements at sea. This creates an accurate and realistic test environment for the object. Elsteel panel boards have also been type tested by IPH at 50°C ambient, thereby ensuring their suitability in an engine room environment.

When you choose an Elsteel panel board, you can be confident that our product will live up to your expectations and requirements, because you have chosen one of the absolute best and most tested panels in the world!



STANDARDS & RESULTS OBTAINED



- ISO** - International Organization for Standardization
(ISO 6954 in 1984)
(ISO 2372, 2373, 3945) - old
(ISO 7919 and 10816 [6] and [7]) - latest
- DNV** - Det Norske Veritas
- LLOYD'S** - 1st International ship noise and vibration conference
London, June 20-21,2005
- VDI** - Verein Deutscher Ingenieure
(The Association of German Engineers)
(VDI 2056, 2057 and 2063)
- ABS** - (American Bureau of Shipping Incorporated by Act of
Legislature of the state of New York 1862)

- Vibration in all directions is to be less than 10 mm/sec.
(rms velocity value)
- Frequency should lie between 0 - 1000 Hz.
- Usual practice with high-speed ships is, that flare angles of the bow side shell and bulwarks are not to exceed angles of 40 to 45 degrees relative to the vertical.
(Normal value at rough weather, $2\beta \approx 30$ degrees.)

STANDARDS

RESULTS

- Panels are stable for 0-30 mm/sec. velocities.
- Panels can withstand frequencies in X Y Z directions from 0-5000 Hz.
- Panels are stable for 0-30 m/s² accelerations.

Tilting Angles

- At Slow Speeds $2\beta = 25$ degrees
- At High Speeds $2\beta \approx 40$ degrees

SIMULATOR FUNCTIONS

- Wave Motion = Tilting of a Ship
- Main Engine = Main Driving Engine of a ship
- Vibrators = Other Machineries such as Compressors and Generators.



SOME DEFINITIONS

FREE VIBRATION

Free vibration takes place when a system oscillates under the action of forces inherent in the system itself, and when external impressed forces are absent.



NATURAL FREQUENCY

Natural frequency is the frequency of free vibrations in Hz and is a property of the dynamic system established by its mass and stiffness distribution.

FORCED VIBRATIONS


Vibration that takes place under the excitation of external forces is called forced vibration.




RESONANCE.

If the frequency of excitation coincides with the natural frequency of the system, a condition of RESONANCE is encountered, and dangerously large oscillations may result. The failures of major structures occur due to this theory.

TEST PERFORMED	CERTIFICATION AUTHORITY	CERTIFICATE REFERENCE
Techno Module Panels Comply to IEC 60439-1 / IEC 61439-1 & 2		
01. 400A Design Verified with Schneider breakers	ASTA	18361 A
02. 400A Design Verified with Schneider breakers	ASTA	18047
03. 400A type tested with LS breakers (Instant Panel Light)	ASTA	17013
04. 800A Design Verified with Schneider breakers	ASTA	18363 A
05. 800A Design Verified with Schneider breakers	ASTA	18048
06. 800A Design Verified with ABB breakers	ASTA	17545
07. Additional temperature rise test for ASTA-17545 test	IPH	3345.2091256.0969
08. 800A type tested with LS breakers (TM Light Panel)	ASTA	17012
09. 800A type tested with MG breakers (TM Light Panel)	ASTA	16899
10. 1000A Design Verified with GE breakers (TM Light Panel)	IPH	1819.2130777.0451
11. 1600A Design Verified with Schneider breakers	ASTA	18612 A
12. 1600A Design Verified with Schneider breakers	ASTA	17864
13. 1600A Design Verified with ABB breakers	ASTA	17544
14. Additional temperature rise test for ASTA-17544 test	IPH	3345.2091255.0986
15. 1600A type tested with LS breakers	ASTA	17011
16. 1600A type tested with GE breakers	ASTA	16149
17. 2000A type tested with Siemens breakers	ASTA	16783
18. 2000A Design Verified with Terasaki breakers	DEKRA	2148971.101
19. 2500A Design Verified with GE breakers	IPH	1819.2130776.0500
20. 2500A Design Verified with ABB breakers	ASTA	18741
21. 2500A Design Verified with Schneider breakers	ASTA	18362 A
22. 2500A Design Verified with Schneider breakers	ASTA	18613 A
23. 2500A Design Verified with Schneider breakers	ASTA	18046
24. 2500A Design Verified with Schneider breakers	ASTA	17865
25. 2500A Design Verified with ABB breakers	ASTA	18050
26. Additional Temperature rise test for ASTA-18050 test	IPH	3457.2100397.0221
27. Additional Temperature rise test for ASTA-18050 test	IPH	3457.2100397.1032
28. 2500A Design Verified with ABB breakers	ASTA	17543
29. Additional temperature rise test for ASTA-17543 test	IPH	3345.2091254.0982
30. 2500A type tested with LS breakers	ASTA	17010
31. 2500A type tested with GE breakers	ASTA	16150
32. 2500A type tested with MG, ABB, Siemens, Jean Moeller breakers	IPH	513.228.6.384
33. 2500A temperature rise test & short circuit test	IPH	170.265.2.230
34. 3200A Design Verified with ABB breakers	ASTA	18740
35. 3200A Design Verified with MG breakers	ASTA	17615
36. 3200A Design Verified with Terasaki breakers	DEKRA	2148971.100
37. Additional temperature rise test for ASTA-17615 test	IPH	3467.2100399.0218
38. 3200A type tested (AI Busbar) with ABB breakers	CPRI	S2060728
39. 3200A Short circuit test (AI Busbar) with ABB breakers	CPRI	S2060729
40. 3200A temperature rise test & short circuit test	ASTA	12798
41. 3500A Design Verified with Schneider breakers	ASTA	18868
42. 4000A Design Verified with Schneider breakers	ASTA	18614 A
43. 4000A Design Verified with Schneider breakers	ASTA	17756
44. 4000A Design Verified with ABB breakers	ASTA	17542
45. Additional temperature rise test for ASTA-17542 test	IPH	3345.2091253.0999
46. 4000A type tested with Terasaki breakers	IPH	1819.1206.5.668
47. 5000A type tested with ABB & Jean Moeller breakers	IPH	1513.832.0.468
48. 5000A temperature rise test & short circuit test	ASTA	12890
49. 6300A Design Verified with ABB breakers	ASTA	17541
50. Additional temperature rise test for ASTA-17541 test	IPH	3345.2091252.1010
51. 6300A type tested with ABB breakers	IPH	1819.1061.3.431
52. 7100A type tested with ABB breakers	IPH	1819.1061.3.434
53. Short circuit test 80kA/1sec Fully Withdrawable busbar holder (new)	IPH	1819.2130089.0040
54. Short circuit test 80kA/1sec Plug & Power rear busbar holder	IPH	1819.2121286.0680
55. Short circuit test 50kA/3sec for OMH4 busbar holder with 2×10×40 Cu	IPH	1819.209103
56. Short circuit test 65kA/1sec for UBH busbar holder with 1×50×10 Cu	TÜV	19300462 001
57. Short circuit test 63kA for Power Cassette, FTM & Flexi Cu	TÜV	19300462 004, 005
58. Short circuit test 100kA/1sec for 4×10×150 Cu	ASTA	15216
59. Degree of protection IP55 for TM panels	TESTSAFE	29539
60. 12kV impulse test for OMH4, BH, MAB busbar holders	IPH	1819.2130089.0218

TEST PERFORMED	CERTIFICATION AUTHORITY	CERTIFICATE REFERENCE
Techno Module Panels with insulated busbar Comply to IEC60439-1 / IEC61439-1&2		
01. Selected Verif. test for Insulated busbar 2×10×40 Cu with OMH4/ MAB	IPH	1819.2120714.0861
02. Selected Verif. test for Insulated busbar 2×10×80 Cu with OMH6	IPH	1819.2120714.0836
03. Selected Verif. test for Insulated busbar 3×10×100 Cu with OMH6	IPH	1819.2120714.0574
04. Selected Verif. test for Insulated busbar 6×10×80 Cu with OMH8	IPH	1819.2120714.0573
05. 12kV impulse test for OMH14 & MABI busbar holders	IPH	1819.2130089.0218

TEST PERFORMED	CERTIFICATION AUTHORITY	CERTIFICATE REFERENCE
Techno Module Panels Comply to other Standards		
01. 400KVAR Capacitor bank with EPCOS according to IEC 61921/ IEC 61489-1	ASTA	18738
02. Internal Arc fault test according to IEC 61641 & AS/NZS 3439.1 : 2002	TCA	102601 102380/ 102378
03. Internal Arc fault test according to AS/NZS 3439.1 : 2002	TÜV	19300462 002 19300462 003 19300462 006 19300462 007
04. Cold & Damp Heat tests according to IEC 60068-2-1 & 60068-2-30 respectively	RST	P50-11-0101e
05. Vibrations test according to IEC 68-2-6 & IEC 68-2-36	VIPAC	302649-01
06. Seismic test according IEC 68-3-3	VIPAC	302649-02
07. Lloyd's Register type approval certificate for marine, offshore and industrial applications of stainless steel enclosure & 19" cabinets	LR	02/70003 (E2)
08. ABS type approval certificate for shipboard and associated marine & offshore installation	ABS	08-SG366750-PDA
09. Russian Maritime Register of Shipping (RS) Type approval certificate for Marine use	RS	10.00001.270
10. Bureau Veritas (BV) Type Approval Certificate for Marine use	BV	22875/A0 BV
11. Det Norske Veritas (DNV) Type Approval Certificate for offshore use	DNV	E-10273
12. Germanischer Lloyd (GL) Type Approval Certificate for offshore use	GL	19479-11 HH
13.  Mark for selected TM Panel components	UL	20130305-E 207550

TEST PERFORMED	CERTIFICATION AUTHORITY	CERTIFICATE REFERENCE
Box Enclosures		
01  Certificate of compliance for MS & SS Boxes and Terminal Boxes	CSA	227808
02  Certificate of compliance for MS & SS Terminal Boxes	UL	20130311-E 213746
03.  Certificate of compliance for MS & SS Boxes	UL	20130305-E 207550
04. IP 69K certificate for stainless steel box enclosures (special type)	IPH	1819.1575.7.619
05. IP 65 certificate for mild steel box enclosure	UL	129169-02/A1
06. IP 66 certificate for stainless steel box enclosure	TESTSAFE	33814 33836
07. Lloyd's Register Type Approval Certificate for Marine, Offshore and industrial application of Stainless Steel Enclosures & 19" cabinets.	LR	02/70003 (E2)
08. ABS Type Approval Certificate for Shipboard and Associated Marine & Offshore installations.	ABS	08-SG366750-1-PDA
09. Russian Maritime Register of Shipping Type approval certificate for SS and MS Boxes for marine use.	RS	10.00001.270



CERTIFICATE NUMBER: 08 SG366750-PDA
 DATE: 18 December 2008
 ABS TECHNICAL OFFICE
 Singapore Engineering Services

CERTIFICATE OF Design Assessment

This is to Certify that a representative of this Bureau did, at the request of **ELSTEEL (PVT) LTD**

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 of pages attached to this certificate. It will re-specifications used in the assessment are revised

PRODUCT: Power Distribution Module
 MODEL: Techno Module Panel, Powder Coate
 ABS RULE: 2008 Steel Vessel Rules 1-1-4/7.7 &
 OTHER STANDARD: IEC 60439-1:2004 04 Sub-clauses 8: (category 1) & 14.2.5.



Certificate number: 2287040 BV
 File number: ACE216111
 Product code: 27321
 This certificate is not valid when presented without the full unshaded technical description of the machine
 www.veristar.com

TYPE APPROVAL CERTIFICATE

This certificate is issued to

ELSTEEL (PRIVATE) LTD.
 - SRI LANKA

for the type of product

SWITCHBOARDS (LOW VOLTAGE)

Low Voltage Modular Electrical Switchboards & Motor Control Centres for marine use

Requirements:
 Bureau Veritas Rules for the Classification of Steel Ships,
 IEC 60439-1.

This certificate is issued in full of BUREAU VERITAS' (BV) undertaking:
 was found to comply with the relevant requirements mentioned above

This certificate will ex

For BUREAU VERITAS,
 At 8V MUMBAI (ROMBAY), on 18 Jun 2010,
 Shalenda Nath

Shalenda Nath

This certificate remains valid until the date stated above, unless recalled or voided with and the product remains satisfactory in service. This certificate will not be valid which have not been notified to and agreed in writing with BUREAU VERITAS. If this certificate, the product shall be in compliance with the relevant requirements of the Rules for the Classification of Steel Ships, IEC 60439-1:2004 04 Sub-clauses 8: (category 1) & 14.2.5. It is the responsibility of the client to ensure that the product is in compliance with the relevant requirements of the Rules for the Classification of Steel Ships, IEC 60439-1:2004 04 Sub-clauses 8: (category 1) & 14.2.5. It is the responsibility of the client to ensure that the product is in compliance with the relevant requirements of the Rules for the Classification of Steel Ships, IEC 60439-1:2004 04 Sub-clauses 8: (category 1) & 14.2.5.

BV Mod. Ad C 530 May 2009

6.8.3

РОССИЙСКИЙ МОРСКОЙ РЕГИСТР СУДОХОДА
 RUSSIAN MARITIME REGISTER OF SHIPPING

СВИДЕТЕЛЬСТВО О ТИПОВОМ ОДОБРЕНИИ
 TYPE APPROVAL CERTIFICATE

Изготовитель / Manufacturer: **ELSTEEL (PVT) LTD.**
 Адрес / Address: **Spur Road 2, Phase 1, EPZ, Katunayake, Sri Lanka**

Изделие* / Product*
**Модули низковольтных распределительных щитов и пультов "TECHNO MODULE", "TECHNO MODULE LIGHT", "BOXES-MS/SS".
 Low-voltage switchgear and controlgear assemblies "TECHNO MODULE", "TECHNO MODULE LIGHT", "BOXES-MS/SS".**

Код номенклатуры / Code of nomenclature: **11190000**

На основании освидетельствования и проведения испытаний удостоверяется, что упомянутому(ым) изделию(ям) удовлетворяет(ют) требованиям Российского морского регистра судоходства.
 This is to certify that on the basis of the survey and tests carried out the above mentioned item(s) comply(ies) with the requirements of Russian Maritime Register of Shipping.

Правила классификации и постройки морских судов, часть XI, издание 2010 г.
 Rules for the Classification and Construction of Sea-Going Ships, Part XI, Edition 2010.

Настоящее Свидетельство о типовом одобрении действительно до **24.03.2015**
 This Type Approval Certificate is valid until **24.03.2015**

Настоящее Свидетельство о типовом одобрении теряет силу в случаях, установленных в Правилах технического надзора за постройкой судов и изготовлением материалов и изделий для судов.
 This Type Approval Certificate becomes invalid in cases stipulated in Rules for the Technical Supervision during Construction of Ships and Manufacture of Shipboard Materials and Products.

Дата выдачи / Date of issue: **24.03.2010** № **10.00001.270**

Российский морской регистр судоходства / Russian Maritime Register of Shipping
 Лопатин А.Н. / A.Lopatin
 (Подпись, инициалы) / (Signature, initials)

*Дополнительную информацию см. обратную сторону / Additional information see overleaf

Type Approval Certificate



This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the GL Type Approval System.

Certificate No. 19 479 - 11 HH
 Company Elsteel (Private) Ltd.
 Spur Road 2, Phase 1, EPZ
 11420 Katunayake, Sri Lanka

Product Description LV-Switchboard
 Type TECHNO MODULE

Environmental Category A
 Technical Data / Range of Application Modular low-voltage switchgear assembly comprising enclosure, busbar components and withdrawable units.
 Final assembly by Elsteel (Private) Ltd. certified constructors according to ELSTEEL Constructors Manual.

Rated insulation voltage Ui: up to 1000 VAC
 Rated operation voltage Ue: up to 690 VAC
 Rated impulse voltage Uimp: 8/8 kV
 Rated frequency In:
 Rated current at 45°C ambient:
 Main busbar TM panels:
 Main busbar TM tight panels:
 IP-Rating:

Short circuit withstand current Icw:
 Peak withstand current Ipk:

Test Standard Guidelines for the Performance of 1 IEC 61438-1 (Ed.1.0 2009-01), IEC 61438-2 (Ed.1.0 2009-01), IEC 61438-3 (Ed.1.0 2009-01)
 Documents Test report : Summary sheet as per Version 5; issue date 06.05.2011; AS

Remarks Assembly drawings and correspon assembler. Restrictions for forced i

Valid until 2016-06-04

Page 1 of 1

File No. LJ.01

Hamburg, 2011-09-05

Germanischer Lloyd

This certificate is issued on the basis of 'Statements for the Performance of Type Approval'



Type Approval Certificate Extension

This is to certify that Certificate No. 02/70003(E1) for the undernoted products is extended and renumbered as shown.

This certificate is issued to:

PRODUCER Elsteel Denmark A/S
 Fabrikvej 23,
 DK-3000 Helsingør
 Denmark
 PLACE OF PRODUCTION Elsteel Ltd.
 Spur Road 2
 I.P.Z. Katunayake
 Sri Lanka
 Elsteel Poland Spolka Z.O.O
 Ul. Slowackiego 3
 46-040 Ozimek
 Poland

DESCRIPTION Low voltage modular switchboard assemblies & stainless steel cabinets.

TYPE ELSTEEL Techno-module modular system for 690V, 50-60 Hz; bus ratings: 250-7300A.

APPLICATION SSC Stainless steel
 Marine, offshore

STANDARD Type tested to EN
 Enclosure protect
 Enclosure protect

RATINGS For switchboard configuration and assemblies, the as on the tested item

LIMITATIONS For Marine switch bars shall not ext 02/70003(E2)

Certificate No. 02/70003(E2)

Issue Date 20 July 2012

Expiry Date 17 April 2017

Sheet 1 of 2

Lloyd's Register EMEA
 Strandvejen 104; DK-2900 Hellerup

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DET NORSKE VERITAS TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. E-10273
 This Certificate consists of 4 pages

This is to certify that the
Power Switch Board with Bus Bar
 with type designation(s)
TECHNO MODULE

Manufacturer
ELSTEEL(Private)Ltd.
 Katunayake, Sri Lanka

is found to comply with
 Det Norske Veritas' Rules for Classification of Ships, High Speed & Light Craft and Det Norske Veritas' Offshore Standards
 IEC 60439-1

Application
 Type approval regards system design principle.
 Drawings for the actual application is to be submitted for approval in each case.

Rated voltage (V)	415 - 690 - 1000
Rated current (A)	up to 7100
Rated freq. (Hz)	50 or 60

Place and date
 Hovik, 2010-07-08
 for Det Norske Veritas AS
 Mari I Laumann
 Head of Section



Local Office
 Chennai

This Certificate is valid until
 2014-06-30
 Nicolay Horn
 Surveyor

Note: This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

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