AMENDMENTS FOR OTHER GUIDANCE

(Guidance for Approval of Manufacturing Process and Type Approval, Etc.)

- For external opinion inquiry -

2021.06.

Machinery Rule Development Team

- Main Amendments -

(1) Enter into force on 1 July 2022 (the date of application for certification of products or the contract date for ship construction)

◉ To reflect IACS Rec 68(Rev.1 Apr 2021)

Present	Amendment	reason
CHAPTER 1 <Omitted>	**CHAPTER 1** <Same as the present Guidance>	
CHAPTER 2 APPROVAL OF MANUFACTURING PROCESS	**CHAPTER 2 APPROVAL OF MANUFACTURING PROCESS**	
Section 1 ~ Section 4-1 <Omitted> **Section 4-2 Steel forgings *(2018)***	**Section 1 ~ Section 4-1** <Same as the present Guidance> **Section 4-2 Steel forgings *(2018)***	
411. ~ 412. <Omitted>	**411. ~ 412. <Same as the present Guidance>**	
413. Approval tests	**413. Approval tests**	
1. ~ 4. <Omitted>	**1. ~ 4. <Same as the present Guidance>**	
5. Approval tests for intermediated shaft material under special requirements (2017)	**5. Approval tests for intermediated shaft material under special requirements (2017)**	
For alloy steel forgings which has a minimum specified tensile strength greater than 800 N/mm^2 but less than 950 N/mm^2 for use as intermediate shaft material in **Pt 5, Ch 3, 203.** and **Ch 4, 202.** and **Pt2, Ch 1, 601.** of the Rules, where special manufacturing processes are adopted to reduce shaft dimensions or higher permissible vibration stresses is to be required as following additional tests.	For alloy steel forgings which has a minimum specified tensile strength greater than 800 N/mm^2 but less than 950 N/mm^2 for use as intermediate shaft material in **Pt 5, Ch 3, 203.** and **Ch 4, 202.** and **Pt2, Ch 1, 601.** of the Rules, where special manufacturing processes are adopted to reduce shaft dimensions or higher permissible vibration stresses is to be required as following additional tests.	
(1) Torsional fatigue test A torsional fatigue test is to be performed to verify that the material exhibits similar fatigue life as conventional steels. The torsional fatigue strength of said material is to be equal to or greater than the permissible torsional vibration stress(τ_1 and τ_2) given by the formulae in **Pt 5, Ch 4, 202. 1** of the Rules. The test is to be carried out with notched and unnotched specimens respectively. For calculation of the stress concentration factor of the notched specimen, fatigue strength reduction factor(β) is to be evaluated in consideration of the severest torsional stress concentration in the design criteria.	(1) Torsional fatigue test A torsional fatigue test is to be performed to verify that the material exhibits similar fatigue life as conventional steels. The torsional fatigue strength of said material is to be equal to or greater than the permissible torsional vibration stress(τ_1 and τ_2) given by the formulae in **Pt 5, Ch 4, 202. 1** of the Rules. The test is to be carried out with notched and unnotched specimens respectively. For calculation of the stress concentration factor of the notched specimen, fatigue strength reduction factor(β) is to be evaluated in consideration of the severest torsional stress concentration in the design criteria.	- To reflect IACS UR M68(Rev.3 Feb 2021)
(A) Surface condition Mean surface roughness is to be <0.2 μm Ra with the absence of localised machining marks verified by visual examination at low magnification(x20) as required by *Section 8.4* of *ISO 1352*.	(A) Surface condition Mean surface roughness is to be <0.2 μm Ra with the absence of localised machining marks verified by visual examination at low magnification(x20) as required by *Section 8.4* of *ISO 1352:2011*. *(2022)*	
(B) Test procedures are to be in accordance with *Section 10* of *ISO 1352*. Test conditions are to be in accordance with **Table 2.4.2**.	(B) Test procedures are to be in accordance with *Section 10* of *ISO 1352:2011*. Test conditions are to be in accordance with **Table 2.4.2**. *(2022)*	
<hereafter, omitted>	<hereafter, same as the present Guidance>	

AMENDMENTS FOR OTHER GUIDANCE

(Guidance for Approval of Manufacturing Process and Type Approval, Etc.)

2021.05.

Machinery Rule Development Team

- Main Amendments -

(1) Enter into force on 1 June 2021 (the date of application for certification of products)

◉ To reflect Request for Establishment/Revision of Classification Technical Rules(To reflect ISO)

Present	Amendment
CHAPTER 1 ~ CHAPTER 2 <Omitted>	**CHAPTER 1 ~ CHAPTER 2** <Same as the present Guidance>
CHAPTER 3 TYPE APPROVAL	**CHAPTER 3 TYPE APPROVAL**
Section 1 ~ Section 2 <Omitted>	**Section 1 ~ Section 2** <Same as the present Guidance>
Section 3-1 Anti-corrosive Paints	**Section 3-1 Anti-corrosive Paints**
301. Application The requirements in this Section apply to tests and inspections for the type approval of primer coating or marine heavy duty coating upon request.	**301. Application** **1.** The requirements in this Section apply to tests and inspections for the type approval of primer coating or marine heavy duty coating upon request. **2.** If anti-corrosive paints are used in the area where cathodic protection is applied, additional tests may be required to evaluate the effect of cathodic protection. *(2021)* **3.** The requirements in this Section are not applicable to the type approval of **Section 30 Protective Coating Systems for Ballast Tanks** and **Section 33 Protective Coating Systems for Cargo Oil Tanks**. *(2021)*
302. Data to be submitted The following reference data are to be submitted to the Society in addition to those specified in **102.** (1) In-house inspection department, claim handling organization and inspection facilities (2) Reference materials and data relating to the manufacturing process and quality control system: Blending details of key components (including the content of aluminium), matters relating to mixing and storage procedures. (3) Matters relating to packaging, packing and shipment. (4) Instructions for the application of the paint for which brand approval is made: Surface preparation, required thickness of coat, painting procedure, and matters relating to drying process and multiple coatings. (5) In-house test results and real ship service experience of the paint brand for which approval is made. Approval certificates issued by other authorities, if any. (6) Matters relating to falling ball impact test and explosion test.	**302. Data to be submitted** The following reference data are to be submitted to the Society in addition to those specified in **102.** *(2021)* (1) Compositions for every brand of products, including: (a) Product name and identification mark and/or number (b) Materials, components and composition of the coating system, colours (c) Material Safety Data Sheet (2) Manufacturer's instructions and recommendations for use (including Surface preparations, Mixing and agitation, Number and nominal dry film thickness of coat, Method of application, Drying and overcoating method, Limitations and Storage, etc.) (3) Marking of the products including Manufacturer's name or equivalent, Type designation, Lot No. and date of manufacture, Storage condition

Present	Amendment
303. Type tests	**303. Type tests**
1. Test coupons	**1. Test coupons**
(1) ~ (2) <Omitted>	(1) ~ (2) <Same as the present Guidance>
(3) **Surface treatment, primer paint and coating** The surface treatment and painting are to be carried out in accordance with the instruction submitted under the provisions **302.** (4). The film thickness of paint is to be of the minimum recommended by the manufacturer.	(3) **Surface treatment, primer paint and coating** The surface treatment and painting are to be carried out in accordance with the instruction submitted under the provisions **302.** (2). The film thickness of paint is to be of the minimum recommended by the manufacturer.
2. Test details and acceptance criteria	**2. Test details and acceptance criteria**
(1) Approval test for the paint of the brand under approval application are to be carried out in the presence of the Surveyor at the manufacturing plant and approval test items are to be as given in **Table 3.3.1.**	(1) Approval test for the paint of the brand under approval application are to be carried out in the presence of the Surveyor at the manufacturing plant and approval test items are to be as given in **Table 3.3.1.**
(2) The testing procedures and acceptance criteria are to be as given in **Table 3.3.1**. However, in case where these requirements are found impracticable due to special type of paints, separate considerations may be given.	(2) The testing procedures and acceptance criteria are to be as given in **Table 3.3.1**. However, in case where these requirements are found impracticable due to special type of paints, separate considerations may be given.
~~(3) Gasoline immersion test, salt water/gasoline immersion test and salt water/crude oil immersion test may not be required for the paint used for sea water ballast tanks.~~	(3) <Deleted>
(4) During execution of the corrosion resistance tests, the Surveyor may attend and make investigation necessary for verification.	(3) During execution of the corrosion resistance tests, the Surveyor may attend and make investigation necessary for verification.
304. <Omitted>	**304. <Same as the present Guidance>**

<Present>

Table 3.3.1 Test details and acceptance criteria of anti-corrosive paints (continued)

Kind	Test item	Testing procedures	acceptance criteria
Corrosion resistance test	Hot water immersion test	Fill a container with tap water and heat it to a temperature 80 ± 5 °C and keep the test coupon immersed in it continuously for 168 hours and then take it out and examine the condition of the paint. If there is no abnormality, the test coupon is to be examined after being left for 2 hours. The film thicknesses of paint before and after immersion are to be measured with colour photographs taken.	The acceptance criteria for the corrosion resistance tests are to be as given in **Table 3.3.2.**
	Alternate salt water immersion test	After immersing in a 3 % salt water solution under room temperature for a period of 168 hours (7 days), the test coupon is to be taken out and left in air for 168 hours. Taking this as one cycle, the test coupon is to be subjected to 2 such cycles consecutively. Colour photographs and paint film thickness measurements before immersion and on completion of the test are to be taken. *(2021)*	
	Alternate gasoline/salt water immersion test	Two tanks respectively filled with 3 % salt water solution and gasoline are to be prepared and the test coupon is to be immersed in either of them for a period of 168 hours (7 days) and then taken out and immersed in the other tank for another 168 hours. Considering this as one cycle, the process is to be repeated for 2 cycles. Colour photographs and paint film thickness measurements before immersion and on completion of the test are to be taken.	
	Alternate salt water/crude oil immersion test	Tests similar to gasoline/salt water immersion test are to be carried out with 3 % salt water solution and crude oil. Colour photographs and paint film thickness measurements before immersion and on completion of the test are to be taken. *(2021)*	
	Salt water spray test (KS D 9502 or the equivalent International Standards)	Continuous test with salt water spray is to be carried out for a period of 360 hours or more. Colour photographs and paint film thickness measurements before immersion and on completion of the test are to be taken.	
Real ship tests		(A) The paints, which have passed the paint film performance tests successfully, are to be subjected to real ship tests. For the real ship and specific painting areas, the manufacturer may give instructions after obtaining approval of the Society. The painting procedures and surface treatment are to be as instructed by the document under the provision **302.** (4), and after application of the paints, visual inspection of paint coat, taking color photographs are to be carried out in the presence of the Surveyor. In ships having a post-painting period of two years, visual inspection, and taking of colour photographs are to be carried out at time of drydocking in the presence of the Surveyor. (B) If the paint has been applied to a ship which has already been put into service 2 years or more, this paint may be regarded as test sample in (A). (C) The primer coating does not require real ship tests.	Standard blistered or peeled off area of the paint coat is to be 1 % or less of the total painted area.

<Amendment>

Table 3.3.1 Test details and acceptance criteria of anti-corrosive paints (continued)

Kind	Test item	Testing procedures	acceptance criteria
Corrosion resistance test	Hot water immersion test	Fill a container with tap water and heat it to a temperature 80 ± 5 °C and keep the test coupon immersed in it continuously for 168 hours and then take it out and examine the condition of the paint. If there is no abnormality, the test coupon is to be examined after being left for 2 hours. The film thicknesses of paint before and after immersion are to be measured with colour photographs taken.	The acceptance criteria for the corrosion resistance tests are to be as given in **Table 3.3.2.**
	Alternate salt water immersion test	After immersing in a 3 % salt water solution under room temperature for a period of 168 hours (7 days), the test coupon is to be taken out and left in air for 168 hours. Taking this as one cycle, the test coupon is to be subjected to 2 such cycles consecutively. Colour photographs and paint film thickness measurements before immersion and on completion of the test are to be taken. *(2021)*	
	Alternate gasoline/salt water immersion test	Two tanks respectively filled with 3 % salt water solution and gasoline are to be prepared and the test coupon is to be immersed in either of them for a period of 168 hours (7 days) and then taken out and immersed in the other tank for another 168 hours. Considering this as one cycle, the process is to be repeated for 2 cycles. Colour photographs and paint film thickness measurements before immersion and on completion of the test are to be taken.	
	Alternate salt water/crude oil immersion test	Tests similar to gasoline/salt water immersion test are to be carried out with 3 % salt water solution and crude oil. Colour photographs and paint film thickness measurements before immersion and on completion of the test are to be taken. *(2021)*	
	Salt water spray test (KS D 9502 or the equivalent International Standards)	Continuous test with salt water spray is to be carried out for a period of 360 hours or more. Colour photographs and paint film thickness measurements before immersion and on completion of the test are to be taken.	
Real ship tests		(A) The paints, which have passed the paint film performance tests successfully, are to be subjected to real ship tests. For the real ship and specific painting areas, the manufacturer may give instructions after obtaining approval of the Society. The painting procedures and surface treatment are to be as instructed by the document under the provision **302.** (2), and after application of the paints, visual inspection of paint coat, taking color photographs are to be carried out in the presence of the Surveyor. In ships having a post-painting period of two years, visual inspection, and taking of colour photographs are to be carried out at time of drydocking in the presence of the Surveyor. (B) If the paint has been applied to a ship which has already been put into service 2 years or more, this paint may be regarded as test sample in (A). (C) The primer coating does not require real ship tests(Only for products that have already been approved). *(2021)*	Standard blistered or peeled off area of the paint coat is to be 1 % or less of the total painted area.

NOTES: *(2021)*

(1) If real ship tests are not carried out, instead of this **Table 3.3.1**, **Table 3.3.3** and **Table 3.3.4** are to be applied as the testing procedure and acceptance criteria for anti-corrosive paints. In this case, the following requirements are to be satisfied.

(a) Three test specimens for each test item specified in **Table 3.3.3** and **Table 3.3.4** are to be prepared. The dimensions of test specimens not specified in **Table 3.3.3** and **Table 3.3.4** are to be 150 mm × 75 mm × 3 mm. Appropriate protection are to be applied to the edges and the backs of the specimens.

(b) Three specimens are to be tested for each test and two of the three test specimens are to be in compliance with the requirements specified in **Table 3.3.3** and **Table 3.3.4**.

<New>_Table 3.3.3 & Table 3.3.4

Table 3.3.3 Test details and acceptance criteria for the peel resistance of anti-corrosive paints *(2021)*

Test item	Testing procedures	Acceptance criteria	Others
Cross-cut test	**ISO 2409:2020**	Classification 0 to 2	The test should be carried out only if the dry film thickness of the paint system is less than or equal to 250 µm.
Pull-off test for adhesion	**ISO 4624:2016**	1) Minimum pull-off value of 2.5 MPa for each measurement 2) 0 % adhesive failure between steel/metalized steel respectively and the first coat (unless pull-off values are at least 5 MPa)	The test should be carried out only if the dry film thickness of the paint system is greater than 250 µm.
Cupping test	(1) **ISO 1520:2006** (2) Dimension of test specimen : 100 mm × 90 mm × 0.8 mm (3) Each test specimen is to be tested using 6 mm depth of indentation.	Peeling-off area is to be within 1.0 cm^2.	
Falling ball impact test	(1) Dimension of test specimen : 200 mm × 100 mm × 4 mm (2) A mild steel test specimen coated on one side is to be fixed on a steel base with the painted surface facing upwards and subjected to falling ball impact test with a weight of 300 g dropped thrice from a height of 2.4 m. Thereafter the condition of the paint surface is to be checked after leaving the test panel at room temperature for a period of one hour.	No cracks No peelings	
Bend test	(1) **ISO 1519:2011** (2) Dimension of test specimen : 150 mm × 50 mm × 0.3 mm	No cracks No peelings	

Table 3.3.4 Test details and acceptance criteria for the corrosion resistance of anti-corrosive paints *(2021)*

Test item	Testing procedures	Assessment methods	Acceptance criteria	Others
Water immersion	(1) **ISO 2812-2:2018** (2) Test duration: 3000 hr (3) Water : sodium chloride, 5 %(mass fraction) aqueous solution	**ISO 4628-2** (Blistering) **ISO 4628-3** (Rusting) **ISO 4628-4** (Cracking) **ISO 4628-5** (Flaking)	0 (S0) Ri 0 0 (S0) 0 (S0)	
Water condensation	(1) **ISO 6270-1:2017** (2) Test duration: 720 hr			
Salt spray test	(1) Neutral salt spray test of **ISO 9227:2017** (2) Test duration: 1440 hr (3) Test specimen (a) Test specimen(3ea) for corrosion: A scribe line shall be made on each test specimen in accordance with Annex A of **ISO 12944-6:2018** (b) Test specimen(3ea) for cross-cut test or pull-off test	Corrosion at scribe after salt spray test (**ISO 12944-6**, Annex A.2)	Max. 1.5 mm corrosion at scribe as average value	
		Cross-cut test (**ISO 2409:2020**)	Classification 0 to 2	- Only if the dry-film thickness of the paint system is less than or equal to 250 µm -Assessment after 7 days in standard atmosphere as defined in **ISO 3270**
		Pull-off test (**ISO 4624:2016**)	1) Minimum pull-off value of 2.5 MPa for each measurement 2) 0 % adhesive failure between steel/metalized steel respectively and the first coat (unless pull-off values are at least 5 MPa)	- After 7 days reconditioning in a standard atmosphere as defined in **ISO 3270**
Cyclic ageing test	(1) **ISO 12944-6:2018** Annex B (2) Test duration: 1680 hr (3) Test specimen (a) Test specimen(3ea) for corrosion: A scribe line is to be made on each test specimen in accordance with Annex A of **ISO 12944-6:2018** (b) Test specimen(3ea) for cross-cut test or pull-off test	Corrosion at scribe after cyclic ageing test (**ISO 12944-6**, Annex A.2)	Max. 3.0 mm corrosion at scribe as average value	
		Cross-cut test (**ISO 2409:2020**)	Classification 0 to 2	- Only if the dry-film thickness of the paint system is less than or equal to 250 µm -Assessment after 7 days in standard atmosphere as defined in **ISO 3270**
		Pull-off test (**ISO 4624:2016**)	1) Minimum pull-off value of 2.5 MPa for each measurement 2) 0 % adhesive failure between steel/metalized steel respectively and the first coat (unless pull-off values are at least 5 MPa)	- After 7 days reconditioning in a standard atmosphere as defined in **ISO 3270**

AMENDMENTS FOR OTHER GUIDANCE

(Guidance for Approval of Manufacturing Process and Type Approval, Etc.)

- For external opinion inquiry -

2021.08.

Machinery Rule Development Team

- Main Amendments -

(1) Enter into force on 1 July 2022 (the date of application for certification of products or the contract date for ship construction)

◉ To reflect Request for Establishment/Revision of Classification Technical Rules

Present	Amendment	reason
CHAPTER 1 <Omitted> **CHAPTER 2 APPROVAL OF MANUFACTURING PROCESS** **Section 1 ~ Section 3** <Omitted> **Section 4-1 Castings** *(2018)* **401. ~ 402.** <Omitted> **403. Approval tests** **1. ~ 3.** <Omitted> **4. Approval test and acceptance criteria** Kinds of tests, test methods and acceptance criteria are to be as given in Table 2.4.2. However, where accordance with these requirements are difficult, it may be changed with the approval of the Society. *(2019)* **Table 2.4.2 Test Items and Acceptance criteria** *(2019)* **(continued)** Approval test items / Approval testing method / Acceptance criteria Hardness test, Micro structure: <Omitted> Corrosion test: For stainless steel, ISO 3651-2 or ASTM A262 practice E or equivalent method — No crack is to be accepted. Corrosion test: For duplex stainless steel, ASTM G48 Method A or equivalent method - For type 22Cr, at 20℃ during 24 hours - For type 25Cr, at 50℃ during 24 hours — There are to be no pitting at 20 x magnification. The weight loss is to be not exceed 4.0g/m^2. Non-destructive test, Others: <Omitted> **404. ~ 406.** <Omitted>	**CHAPTER 1** <Same as the present Guidance> **CHAPTER 2 APPROVAL OF MANUFACTURING PROCESS** **Section 1 ~ Section 4-1** <Same as the present Guidance> **Section 4-1 Castings** *(2018)* **401. ~ 402.** <Same as the present Guidance> **403. Approval tests** **1. ~ 3.** <Same as the present Guidance> **4. Approval test and acceptance criteria** Kinds of tests, test methods and acceptance criteria are to be as given in Table 2.4.2. However, where accordance with these requirements are difficult, it may be changed with the approval of the Society. *(2019)* **Table 2.4.2 Test Items and Acceptance criteria** *(2019)* **(continued)** Approval test items / Approval testing method / Acceptance criteria Hardness test, Micro structure: <Same as the present Guidance> Corrosion test: For stainless steel, ISO 3651-2 or equivalent Standards recognized by the Society *(2022)* — No crack is to be accepted. Corrosion test: For duplex stainless steel, ASTM G48 Method A or equivalent method - For type 22Cr, at 20℃ during 24 hours - For type 25Cr, at 50℃ during 24 hours — There are to be no pitting at 20 x magnification. The weight loss is to be not exceed 4.0g/m^2. Non-destructive test, Others: <Same as the present Guidance> **404. ~ 406.** <Same as the present Guidance>	- The inadequacy of ASTM A262 application was found through the failure of the corrosion test of castings.

Present

Section 4-2 Steel forgings *(2018)*

411. ~ 412. <Omitted>

413. Approval tests

1. ~ 3. <Omitted>

4. Approval test and acceptance criteria

Kinds of tests, test methods and acceptance criteria are to be as given in **Table 2.4.4**. For solid crank shafts and semibuilt-up crank throws, kinds of tests, test methods and acceptance criteria are to be as given in **Table 2.4.4** and **Table 2.4.5**. However, where accordance with these requirements are difficult, it may be changed with the approval of the Society. *(2019)*

Table 2.4.4 Test Items and Acceptance criteria *(2019)* (continued)

Approval test items	Approval testing method	Acceptance criteria
Hardness test Micro structure	<Omitted>	
Corrosion test	For stainless steel, **ISO 3651-2** or **ASTM A262** practice E or equivalent method	No crack is to be accepted.
	For duplex stainless steel, **ASTM G48** Method A or equivalent method - For type 22Cr, at 20℃ during 24 hours - For type 25Cr, at 50℃ during 24 hours	There are to be no pitting at 20 x magnification. The weight loss is to be not exceed 4.0g/m^2.
Non-destructive test Others	<Omitted>	

<hereafter, omitted>

Amendment

Section 4-2 Steel forgings *(2018)*

411. ~ 412. <Same as the present Guidance>

413. Approval tests

1. ~ 3. <Same as the present Guidance>

4. Approval test and acceptance criteria

Kinds of tests, test methods and acceptance criteria are to be as given in **Table 2.4.4**. For solid crank shafts and semibuilt-up crank throws, kinds of tests, test methods and acceptance criteria are to be as given in **Table 2.4.4** and **Table 2.4.5**. However, where accordance with these requirements are difficult, it may be changed with the approval of the Society. *(2019)*

Table 2.4.4 Test Items and Acceptance criteria *(2019)* (continued)

Approval test items	Approval testing method	Acceptance criteria
Hardness test Micro structure	<Same as the present Guidance>	
Corrosion test	For stainless steel, **ISO 3651-2** or equivalent Standards recognized by the Society *(2022)*	No crack is to be accepted.
	For duplex stainless steel, **ASTM G48** Method A or equivalent method - For type 22Cr, at 20℃ during 24 hours - For type 25Cr, at 50℃ during 24 hours	There are to be no pitting at 20 x magnification. The weight loss is to be not exceed 4.0g/m^2.
Non-destructive test Others	<Same as the present Guidance>	

<hereafter, same as the present Guidance>

reason

- The inadequacy of ASTM A262 application was found through the failure of the corrosion test.

AMENDMENTS FOR OTHER GUIDANCE

(Guidance for Approval of Manufacturing Process and Type Approval, Etc.)

- For external opinion inquiry -

2022. 1.

Machinery Rule Development Team

- Main Amendments -

(1) Enter into force on 1 July 2022 (the date of application for certification of products)

◉ To reflect Request for Establishment/Revision of Classification Technical Rules

Present	Amendment	reason
CHAPTER 1 <Omitted> **CHAPTER 2 APPROVAL OF MANUFACTURING PROCESS** **Section 1 ~ Section 3** <Omitted> **Section 4-1 Castings** *(2018)* **401. ~ 402. <Omitted>** **403. Approval tests** 1. Test samples and specimen *(2021)* (1) Test samples are to be representative of material types and casting methods for which approval is requested. The typical type of material and casting method are to be in accordance with Table 2.4.1. (2) ~(5) <Omitted> **2. ~ 4. <Omitted>** **404. ~ 406. <Omitted>**	**CHAPTER 1** <Same as the present Guidance> **CHAPTER 2 APPROVAL OF MANUFACTURING PROCESS** **Section 1 ~ Section 4-1** <Same as the present Guidance> **Section 4-1 Castings** *(2018)* **401. ~ 402. <Same as the present Guidance>** **403. Approval tests** 1. Test samples and specimen *(2021)* (1) Test samples are to be representative of material types and casting methods for which approval is requested. The typical type of material and casting method are to be in accordance with Table 2.4.1. (2) ~(5) <Same as the present Guidance> **2. ~ 4. <Same as the present Guidance>** **404. ~ 406. <Same as the present Guidance>**	* It is reflected Request for Establishment/Revision of Classification Technical Rules. - In order to recognize the clear material grade, the representative material grades are defined.

<Present>

Table 2.4.1 The type of material and casting method

Kinds	Grade	Casting method
Carbon steel(1)	*RSC* 410 ~ *RSC* 600	- Sand casting - Die casting - Precision casting - Centrifugal casting - Others
Low alloy steel	*RSC* 440*A* ~ *RSC* 550*A*	
Austenitic stainless steel	*RSSC* 13 ~ *RSSC* 21	
22Cr duplex stainless steel(2)	Applicable standards, codes, etc.	
25Cr duplex stainless steel(2)	Applicable standards, codes, etc.	
Carbon steel for low temperature service(1)	*RLCA* ~ *RLCB*	
Nickel alloy steel for low temperature service	*RLC* 2 ~ *RLC* 3	
Martensitic stainless steel for propeller	12*Cr*1*Ni* ~ 16*Cr*5*Ni*	
Austenitic stainless steel for propeller	19*Cr*11*Ni*	
Grey iron(3)	Applicable standards, codes, etc.	
Spheroidal or nodular graphite iron(3)	Applicable standards, codes, etc.	
Others	Applicable standards, codes, etc.	

Notes :
(1) Where carbon steel for low temperature service has passed the tests, the tests for carbon steel may be omitted. *(2021)*
(2) Where 25Cr duplex stainless steel has passed the tests, the tests for 22Cr duplex stainless steel may be omitted.
(3) Where Spheroidal or nodular graphite iron has passed the tests, the tests for grey iron may be omitted.

<Amendment>

Table 2.4.1 The type of material and casting method ***(2022)***

Kinds	Representative grade or Standards	Casting method
Carbon steel(1)	*RSC* 410 ~ *RSC* 600 **Pt 2, Ch 1, 501.** of the Rules	- Sand casting - Die casting - Precision casting - Centrifugal casting - Others
Low alloy steel	*RSC* 440*A* ~ *RSC* 550*A* **Pt 2, Ch 1, 501.** of the Rules	
Austenitic stainless steel	*RSSC* 13 ~ *RSSC* 21 **Pt 2, Ch 1, 503.** of the Rules	
22Cr duplex stainless steel(2)	UNS J93370, J93372, J93345, J93371, J92205	
25Cr duplex stainless steel(2)	UNS J93373, J93404, J93380	
Carbon steel for low temperature service(1)	*RLCA* ~ *RLCB* **Pt 2, Ch 1, 504.** of the Rules	
Nickel alloy steel for low temperature service	*RLC* 2 ~ *RLC* 3 **Pt 2, Ch 1, 504.** of the Rules	
Martensitic stainless steel for propeller	12*Cr*1*Ni* ~ 16*Cr*5*Ni* **Pt 2, Ch 1, 505.** of the Rules	
Austenitic stainless steel for propeller	19*Cr*11*Ni* **Pt 2, Ch 1, 505.** of the Rules	
Grey iron(3)	ISO 185, EN 1561	
Spheroidal or nodular graphite iron(3)	ISO 1083, EN 1563	
Others	Applicable standards, codes, etc.	

Notes :
(1) Where carbon steel for low temperature service has passed the tests, the tests for carbon steel may be omitted. *(2021)*
(2) Where 25Cr duplex stainless steel has passed the tests, the tests for 22Cr duplex stainless steel may be omitted.
(3) Where Spheroidal or nodular graphite iron has passed the tests, the tests for grey iron may be omitted.

Present	Amendment	reason
Section 4-2 Steel forgings *(2018)*	**Section 4-2 Steel forgings *(2018)***	
411. ~ 412. <Omitted>	**411. ~ 412. <Same as the present Guidance>**	
413. Approval tests	**413. Approval tests**	
1. Test samples and specimen *(2021)*	1. Test samples and specimen *(2021)*	
(1) Test samples are to be representative of types of steel and forging processes for which approval is requested. The typical type of steel and forging process are to be in accordance with Table 2.4.3.	(1) Test samples are to be representative of types of steel and forging processes for which approval is requested. The typical type of steel and forging process are to be in accordance with Table 2.4.3.	* It is reflected Request for Establishment/Revision of Classification Technical Rules. - In order to recognize the clear material grade, the representative material grades are defined.
(2) ~(5) <Omitted>	(2) ~(5) <Same as the present Guidance>	
2. ~ 5. <Omitted>	**2. ~ 5. <Same as the present Guidance>**	
414. ~ 416. <Omitted>	**414. ~ 416. <Same as the present Guidance>**	

<Present>

Table 2.4.3 The type of steel and forging process

Kinds	Grade	Forging process
Carbon steel(1)	*RSF* 400*H* ~ *RSF* 600*H* *RSF* 400*M* ~ *RSF* 760*M*	- Open die forging - Closed die forging - Ring forging - Others
Alloy steel	*RSF* 550*AH* ~ *RSF* 650*AH* *RSF* 600*AM* ~ *RSF* 1100*AM*	
Stainless steel	*RSSF* 304 ~ *RSSF* 347	
22Cr duplex stainless steel(2)	Applicable standards, codes, etc.	
25Cr duplex stainless steel(2)	Applicable standards, codes, etc.	
Carbon steel for low temperature service(1)	*RLFA* ~ *RLFC*	
Nickel alloy steel for low temperature service	*RLF* 3 ~ *RLF* 9	
Others	Applicable standards, codes, etc.	

Notes :
(1) Where carbon steel for low temperature service has passed the tests, the tests for carbon steel may be omitted. *(2021)*
(2) Where 25Cr duplex stainless steel has passed the tests, the tests for 22Cr duplex stainless steel may be omitted.

<Amendment>

Table 2.4.3 The type of steel and forging process ***(2022)***

Kinds	Representative grade or Standards	Forging process
Carbon steel(1)	*RSF* 400*H* ~ *RSF* 600*H* *RSF* 400*M* ~ *RSF* 760*M* **Pt 2, Ch 1, 601.** of the Rules	- Open die forging - Closed die forging - Ring forging - Others
Alloy steel	*RSF* 550*AH* ~ *RSF* 650*AH* *RSF* 600*AM* ~ *RSF* 1100*AM* **Pt 2, Ch 1, 601.** of the Rules	
Stainless steel	*RSSF* 304 ~ *RSSF* 347 **Pt 2, Ch 1, 502.** of the Rules	
22Cr duplex stainless steel(2)	UNS S31200, S31803, S32950, S32205	
25Cr duplex stainless steel(2)	UNS S32750, S32550, S32760	
Carbon steel for low temperature service(1)	*RLFA* ~ *RLFC* **Pt 2, Ch 1, 604.** of the Rules	
Nickel alloy steel for low temperature service	*RLF* 3 ~ *RLF* 9 **Pt 2, Ch 1, 604.** of the Rules	
Others	Applicable standards, codes, etc.	

Notes :
(1) Where carbon steel for low temperature service has passed the tests, the tests for carbon steel may be omitted. *(2021)*
(2) Where 25Cr duplex stainless steel has passed the tests, the tests for 22Cr duplex stainless steel may be omitted.

Present	Amendment	reason
Section 5 <Omitted> **Section 6 Aluminium Alloys** **601. ~ 602. <Omitted>** **603. Approval test** **1. <Omitted>** **2. Details of test** (1) Items of the approval test are to be as given in Table 2.6.1 and are to be carried out for each factory in the presence of the Surveyor except otherwise spacially provided. (2) Testing method and acceptance criteria are to be in accordance with the Table 2.6.2. **604. ~ 605. <Omitted>**	**Section 5 <Same as the present Guidance>** **Section 6 Aluminium Alloys** **601. ~ 602. <Same as the present Guidance>** **603. Approval test** **1. <Same as the present Guidance>** **2. Details of test** (1) Items of the approval test are to be as given in Table 2.6.1 and are to be carried out for each factory in the presence of the Surveyor except otherwise spacially provided. (2) Testing method and acceptance criteria are to be in accordance with the Table 2.6.2. **604. ~ 605. <Same as the present Guidance>**	* It is reflected Request for Establishment/Revision of Classification Technical Rules. - It was decided that the test was not necessary and was deleted.

<Present>

Table 2.6.1 Approval Test Items for aluminium alloys ***(2018) (2019)***

Kinds	Grades	Temper	Test items									
			Chemical analysis	Macro-structure	Micro-structure	tensile test at room temp	~~Tensile test at low temp.(1)~~	~~Tensile test of notched round bar(1)~~	~~Tensile test in direction of thickness(1)~~	bend test	~~tear test(1)(2)~~	corrosion resistance test(3)
Rolled Product	5083*P*	*O*	○	○	○	○	~~⊖~~	~~⊖~~	~~⊖~~	○	~~⊖~~	
		*H*111	○	○	○	○				○		
		*H*112	○	○	○	○				○		
		*H*116	○	○	○	○				○		○
		*H*321	○	○	○	○	~~⊖~~	~~⊖~~		○	~~⊖~~	○
	5086*P*	*O*	○	○	○	○				○		
		*H*111	○	○	○	○				○		
		*H*112	○	○	○	○				○		
		*H*116	○	○	○	○				○		○
	5383*P*	*O*	○	○	○	○				○		
		*H*111	○	○	○	○				○		
		*H*116	○	○	○	○				○		○
		*H*321	○	○	○	○				○		○
	5059*P*	*O*	○	○	○	○				○		
		*H*111	○	○	○	○				○		
		*H*116	○	○	○	○				○		○
		*H*321	○	○	○	○				○		○
	5456*P*	*O*	○	○	○	○				○		
		*H*116	○	○	○	○				○		○
		*H*321	○	○	○	○				○		○
	5754*P*	*O*	○	○	○	○				○		
		*H*111	○	○	○	○				○		
Extrude Product	5083*S*	*O*	○	○	○	○						
		*H*111	○	○	○	○						
		*H*112	○	○	○	○						
	5086*S*	*O*	○	○	○	○						
		*H*111	○	○	○	○						
		*H*112	○	○	○	○						
	5383*S*	*O*	○	○	○	○	~~⊖~~	~~⊖~~	~~⊖~~			
		*H*111	○	○	○	○						
		*H*112	○	○	○	○						
	5059*S*	*H*112	○	○	○	○						
	6005*A* S	*T*5	○	○	○	○						
		*T*6	○	○	○	○						
	6061*S*	*T*6	○	○	○	○						
	6082*S*	*T*5	○	○	○	○						
		*T*6	○	○	○	○						

Notes

~~(1) For aluminium alloys used at extremely low temperature such as tanks for liquefied gas carrier etc, tensile test at low temperature, tensile test of notched round bar, tensile test in the direction of thickness(thicker than 100 mm) and teat test are to carried out in addition.~~

~~(2) For tear test, other test may be applied subject to the approval by the Society.~~

(3) Where deemed necessary by the Society, tests related to fatigue tests, weld joint test, corrosion resistance tests and stress corrosion cracking test etc, or submission of reference data relating to these tests may be required.

<Amendment>

Table 2.6.1 Approval Test Items for aluminium alloys ***(2018) (2019) (2022)***

Kinds	Grades	Temper	Test items					
			Chemical analysis	Macro-structure	Micro-structure	Tensile test at room temp	Bend test	Corrosion resistance test(1)
Rolled Product	5083*P*	*O*	○	○	○	○	○	
		*H*111	○	○	○	○	○	
		*H*112	○	○	○	○	○	
		*H*116	○	○	○	○	○	○
		*H*321	○	○	○	○	○	○
	5086*P*	*O*	○	○	○	○	○	
		*H*111	○	○	○	○	○	
		*H*112	○	○	○	○	○	
		*H*116	○	○	○	○	○	○
	5383*P*	*O*	○	○	○	○	○	
		*H*111	○	○	○	○	○	
		*H*116	○	○	○	○	○	○
		*H*321	○	○	○	○	○	○
	5059*P*	*O*	○	○	○	○	○	
		*H*111	○	○	○	○	○	
		*H*116	○	○	○	○	○	○
		*H*321	○	○	○	○	○	○
	5456*P*	*O*	○	○	○	○	○	
		*H*116	○	○	○	○	○	○
		*H*321	○	○	○	○	○	○
	5754*P*	*O*	○	○	○	○	○	
		*H*111	○	○	○	○	○	
Extrude Product	5083*S*	*O*	○	○	○	○		
		*H*111	○	○	○	○		
		*H*112	○	○	○	○		
	5086*S*	*O*	○	○	○	○		
		*H*111	○	○	○	○		
		*H*112	○	○	○	○		
	5383*S*	*O*	○	○	○	○		
		*H*111	○	○	○	○		
		*H*112	○	○	○	○		
	5059*S*	*H*112	○	○	○	○		
	6005*A*S	*T*5	○	○	○	○		
		*T*6	○	○	○	○		
	6061*S*	*T*6	○	○	○	○		
	6082*S*	*T*5	○	○	○	○		
		*T*6	○	○	○	○		

Notes

(1) Where deemed necessary by the Society, tests related to fatigue tests, weld joint test, corrosion resistance tests and stress corrosion cracking test etc, or submission of reference data relating to these tests may be required.

<Present>

Table 2.6.2 Approval Testing Method and Acceptance Criteria for aluminium alloy

Approval test items	Selection of test specimen		Testing method	
	Location	Direction(1)		
Chemical analysis	T(Top part)	-	Ladle analysis and product analysis are to be performed	Chemical composition by ladle analysis is to comply with the requirements in **Ch 8, Pt 2** of the Rules.
	B(Bottom part)			
Macro-structure	T	-	To be as deemed appropriate by the Society	To be as deemed appropriate by the Society
	B			
Micro-structure	T	-		
	B			
Tensile test at room temperature	T	Parallel	in accordance with **Pt 2** of the Rules.	In accordance with **Pt 2** of the Rules.
		Transverse		
	B	Parallel		
		Transverse		
~~Tensile test at low temperature~~	~~T~~	~~Parallel~~	~~The tensile tests are to be carried out at -196 °C by using of the tensile test specimens of same size and the same dimensions for tensile test at room temperature.~~	~~Reference~~
		~~Transverse~~		
	~~B~~	~~Parallel~~		
		~~Transverse~~		
~~Tensile test of notched round bar~~	~~T~~	~~Parallel~~	~~The tensile tests are to be carried out at -196 °C by using of the tensile test specimens of notched round bar with following notch Angle of notch : 60° Root radius of notch : 0.05 mm or less ASTM E 602 or equivalent method.~~	
		~~Transverse~~		
	~~B~~	~~Parallel~~		
		~~Transverse~~		
~~Tensile test in direction of thickness~~	~~T~~	~~direction of~~	~~Test specimens are to be selected in the direction of thickness, and tensile tests are to be carried out. ASTM A 770 or equivalent method.~~	
	~~B~~	~~thickness~~		
Bend test	T	Parallel	Bend test is to be in accordance with recognized national or international standard which the Society considers appropriate.(e.g. **EN 482-2**, etc.) *(2018)*	No crack is to be accepted.
		Transverse		
	B	Parallel		
		Transverse		
~~Tear test~~	~~T~~	~~Transverse~~	~~Tear strength and crack propagation energy are to be determined. Size and dimensions of tear test specimens and tear testing method are to be as deemed appropriate by Society. ASTM B 871 or equivalent method.~~	~~Reference~~
	~~B~~	~~Transverse~~		
Corrosion resistance test	T	Parallel	Test method is to be as specified in **Pt 2, Ch 1, 801. 9.** of the Rules for the Classification of steel ships.	In accordance with **Pt 2, Ch 1, 801. 9.** of the Rules
	B	Parallel		

NOTES:
(1) When the test specimens used for the approval test can not be taken from the test samples because of their dimensions or shapes, the direction of the selection of test specimens to be determined on a case-by-case basis upon mutual consultation by the manufacturer and the Society.
(2) Excess difference in the chemical compositions between ladle analysis and product analysis is not to be accepted.

<Amendment>

Table 2.6.2 Approval Testing Method and Acceptance Criteria for aluminium alloy ***(2022)***

Approval test items	Selection of test specimen		Testing method	
	Location	Direction(1)		
Chemical analysis	T(Top part)	-	Ladle analysis and product analysis are to be performed	Chemical composition by ladle analysis is to comply with the requirements in **Ch 8, Pt 2** of the Rules.
	B(Bottom part)			
Macro-structure	T	-	To be as deemed appropriate by the Society	To be as deemed appropriate by the Society
	B			
Micro-structure	T	-		
	B			
Tensile test at room temperature	T	Parallel	in accordance with **Pt 2** of the Rules.	In accordance with **Pt 2** of the Rules.
		Transverse		
	B	Parallel		
		Transverse		
Bend test	T	Parallel	Bend test is to be in accordance with recognized national or international standard which the Society considers appropriate.(e.g. **EN 482-2**, etc.) *(2018)*	No crack is to be accepted.
		Transverse		
	B	Parallel		
		Transverse		
Corrosion resistance test	T	Parallel	Test method is to be as specified in **Pt 2, Ch 1, 801. 9.** of the Rules for the Classification of steel ships.	In accordance with **Pt 2, Ch 1, 801. 9.** of the Rules
	B	Parallel		

NOTES:
(1) When the test specimens used for the approval test can not be taken from the test samples because of their dimensions or shapes, the direction of the selection of test specimens to be determined on a case-by-case basis upon mutual consultation by the manufacturer and the Society.
(2) Excess difference in the chemical compositions between ladle analysis and product analysis is not to be accepted.

Guidance for Approval of Manufacturing Process and Type Approval, Etc.

(Development Review : Final)

-Ch.3 Type Approval

2022. 2.

Machinery Rule Development Team

Effective Date : 1 January 2022

(The contract date for ship construction)

Present	Amendment	Remark
CHAPTER 3 Type Approval **Section 1 - Section 22 〈same as the Rules〉** **Section 23 Automatic and Remote Control Systems** **2301. - 2303. 〈same as the present Rules〉** **2304. Type test** **1. Hardware** (1) 〈same as the present Rules〉 (2) **Test methods and criteria** (A) 〈same as the present Rules〉 (B) Where tests which do not fully comply with the testing condition and method, and the criteria of **Table 3.23.1**, they may comply with a standard deemed appropriate by the Society such as **IEC**, Korean Industrial Standards(**KS**), etc. (C) - (D) 〈same as the present Rules〉 **Section 24 - 37 〈same as the present Rules〉**	**CHAPTER 3 Type Approval** **Section 1 - Section 22 〈same as the Rules〉** **Section 23 Automatic and Remote Control Systems** **2301. - 2303. 〈same as the present Rules〉** **2304. Type test** **1. Hardware** (1) 〈same as the present Rules〉 (2) **Test methods and criteria** (A) 〈same as the present Rules〉 (B) Where tests which do not fully comply with the testing condition and method, and the criteria of **Table 3.23.1**, they may comply with a standard deemed appropriate by the Society such as **IEC**, Korean Industrial Standards(**KS**), etc. **Table 3.23.1 〈Refer to the next page〉** (C) - (D) 〈same as the present Rules〉 **Section 24 - 37 〈same as the present Rules〉**	(Amended) - In the reflection of UR E10(Rev.8), Publication Year of IEC international standard has been marked.

〈Amendment〉

Table 3.23.1 Environmental Test Items, Testing Conditions and Methods, and Criteria *~~(2020)~~* *(2022)*

No.	Test item	IEC Codes
1-5	〈same as the present Rules〉	
6	Dry heat test	IEC 60068-2-2:2007
7	Damp heat test	IEC 60068-2-30:2005
8	Vibration test	IEC 60068-2-6:2007
9	Inclination test	IEC 60092-504:2016
10-11	〈same as the present Rules〉	
12	Cold test	IEC 60068-2-1:2007
13	Salt mist test(2)	IEC 60068-2-52:2017
14	Electrostatic discharge immunity test	IEC 61000-4-2:2008
15	Electromagnetic field immunity test	IEC 61000-4-3:2020
16	〈same as the present Rules〉	
17	Conducted radio frequency immunity test	IEC 61000-4-6:2013
18	Electrical fast transients / Burst immunity test	IEC 61000-4-4:2012
19	Surge immunity test	IEC 61000-4-5:2017
20	Radiated emission test	IEC 60945:2002 CISPR 16-2-3:2016
21	Conducted emission test	CISPR 16-2-1:2017
22	Flame resistancetest	IEC 60092-101:2018 or IEC 60695-11-5:2016
23	〈same as the present Rules〉	

(Note)
(1) - (2) 〈same as the present Rules〉
(3) For equipment installed on the bridge and deck zone, the test levels shall be increased to 10Vrms for spot frequencies in accordance with **IEC 60945:2002** at 2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz.

Effective Date : 1 July 2022

(The contract date for ship construction)

Present	Amendment	Remark
CHAPTER 3 Type Approval	**CHAPTER 3 Type Approval**	
Section 1 - Section 20 〈same as the Rules〉	**Section 1 - Section 20 〈same as the Rules〉**	
Section 21 Electrical Equipment and Cables	**Section 21 Electrical Equipment and Cables**	
2101. - 2107. 〈same as the present Rules〉	**2101. - 2107. 〈same as the present Rules〉**	
2108. Test method of cables	**2108. Test method of cables**	
1. The details of test are to comply with the recognized code **IEC 60092-350**, etc. given in **Table 3.21.4.** Where deemed necessary, the ambient temperature may be modified.	1. The details of test are to comply with the recognized code **IEC 60092-350**, etc. given in **Table 3.21.4.** Where deemed necessary, the ambient temperature may be modified.	(Amended) - In the reflection of UI SC10(Rev.3), Publication Year of IEC international standard has been marked. (newly added) - Test method of fire resistance cables has been added newly.
2. In addition to 1 above, tests for vertical flame spread of vertically bunched cable are to be carried out in accordance with **IEC 60332-1** or **IEC 60332-3-22**.	**2.** In addition to 1 above, tests for vertical flame spread of vertically bunched cable are to be carried out in accordance with **IEC 60332-1** or **IEC 60332-3-22:2018**. *(2022)*	
3. 〈newly added〉	**3.** Fire resistance cables are to be carried out in accordance with required tests of **IEC 60331-1** or **IEC 60331-2** and tests of **IEC 60331-21**. *(2022)*	
2109. 〈same as the present Rules〉	**2109. 〈same as the present Rules〉**	
Section 22 Cable Laying	**Section 22 Cable Laying**	
2201. - 2202. 〈same as the present Rules〉	**2201. - 2202. 〈same as the present Rules〉**	
2203. Type tests	**2203. Type tests**	
1. Prevention methods of flame spread through cable	**1. Prevention methods of flame spread through cable**	
The type tests for prevention methods of flame spread through cable are to be carried out in accordance with **IEC 60332-3-22**.	The type tests for prevention methods of flame spread through cable are to be carried out in accordance with **IEC 60332-3-22:2018**. *(2022)*	(Amended) - In the reflection of UI SC10(Rev.3), Publication Year of IEC international standard has been marked.

Present	Amendment	Remark
2. 〈same as the present Rules〉	**2. 〈same as the present Rules〉**	(Amended) - In the reflection of REC 73(Rev.1), IEC international standard is amended.
3. Nonmetallic cable trays/protective casings The type tests for cable trays/protective casings made of plastics materials are, according to the purpose and kind, to be carried out in accordance with the requirements given in **Table 3.22.2.**	**3. Nonmetallic cable trays/protective casings** The type tests for cable trays/protective casings made of plastics materials are, according to the purpose and kind, to be carried out in accordance with the requirements given in **Table 3.22.2.** **See the Table 3.22.2 on the next page.**	
Section 23 Automatic and Remote Control Systems	**Section 23 Automatic and Remote Control Systems**	
2301. Application	**2301. Application**	
1. The requirements of this Section apply to tests and inspection for the type approval of the automatic and remote control systems (device, units and sensors, etc) including basic softwares(if any) for use in the marine environment in accordance with the requirements in **Pt 6, Ch 2, 301. 1** of the Rules. However, the automatic and remote control systems that are to be installed less than 5m from magnetic compass are to comply with the requirement in following (1) and fire detection system and gas detection system are to comply with the requirements in following (2) to (4).	**1.** The requirements of this Section apply to tests and inspection for the type approval of the automatic and remote control systems (device, units and sensors, etc) including basic softwares(if any) for use in the marine environment in accordance with the requirements in **Pt 6, Ch 2, 301. 1** of the Rules. However, the automatic and remote control systems that are to be installed less than 5m from magnetic compass are to comply with the requirement in following (1) and fire detection system and gas detection system are to comply with the requirements in following (2) to (4).	
(1) Compass safe distance test for the automatic and remote control systems that are to be installed less than 5 m from magnetic compass is to be carried out in accordance with **IEC 60945 11.2.**	(1) Compass safe distance test for the automatic and remote control systems that are to be installed less than 5 m from magnetic compass is to be carried out in accordance with **IEC 60945:2002 11.2.** *(2022)*	(Amended) - In the reflection of UI SC194(Rev.1), publication year of IEC international standard has been marked.
(2) - (4) 〈same as the present Rules〉	(2) - (4) 〈same as the present Rules〉	
2. - 3. 〈same as the present Rules〉	**2. - 3. 〈same as the present Rules〉**	
2302. - 2303 〈same as the present Rules〉	**2302. - 2303 〈same as the present Rules〉**	

〈Present〉

Table 3.22.2 type tests for cable trays/protective casings made of plastics materials

Test item	Approval test method and acceptance criteria
Impact Resistance Test	The test should be performed according to **IEC 60082-2** using the pendulum hammer.
Resistivity Test	(a) Cable trays/protective casings passing through a hazardous area should be electrically conductive. The cable tray/protective casings should be tested in accordance with **IEC 60093.** (b) The volume resistivity level of the cable trays/protective casings and fittings should be below 10^5 ohm and the surface resistivity should be below 10^6 ohm. The resistance to earth from any point in these appliances should not exceed 10^6 ohm.

〈Amendment〉

Table 3.22.2 type tests for cable trays/protective casings made of plastics materials *(2022)*

Test item	Approval test method and acceptance criteria
Impact Resistance Test	The test should be performed according to ~~IEC 60082-2~~ IEC 60068-2-75:2014 using the pendulum hammer.
Resistivity Test	(a) Cable trays/protective casings passing through a hazardous area should be electrically conductive. The cable tray/protective casings should be tested in accordance with ~~IEC 60093~~ IEC 62631-3-1:2016 and IEC 62631-3-2:2015. *(2022)* (b) The volume resistivity level of the cable trays/protective casings and fittings should be below 10^5 ohm and the surface resistivity should be below 10^6 ohm. The resistance to earth from any point in these appliances should not exceed 10^6 ohm.

Present	Amendment	Remark
2304. Type test **1. Hardware** (1) 〈same as the present Rules〉 (2) **Test methods and criteria** (A) After the drawings and documents submitted in accordance with the requirements in **2302.** have been examined, tests are to be carried out in accordance with the testing condition and method of Table 3.23.1 in the presence of the Society's surveyor, and they are to be proven to satisfy the criteria of **Table 3.23.1.** (B) – (D) 〈same as the present Rules〉 **2. – 3. 〈same as the present Rules〉** **Section 24 – Section 25 〈same as the Rules〉**	**2304. Type test** **1. Hardware** (1) 〈same as the present Rules〉 (2) **Test methods and criteria** (A) After the drawings and documents submitted in accordance with the requirements in **2302.** have been examined, tests are to be carried out in accordance with the testing condition and method of Table 3.23.1 in the presence of the Society's surveyor, and they are to be proven to satisfy the criteria of **Table 3.23.1.** (B) – (D) 〈same as the present Rules〉 See the Table 3.23.1 on the next page. **2. – 3. 〈same as the present Rules〉** **Section 24 – Section 25 〈same as the Rules〉**	

〈Present〉

Table 3.23.1 Environmental Test Items, Testing Conditions and Methods, and Criteria *(2020)*

<table>
<tr><th>No.</th><th>Test item</th><th>testing condition and method</th><th>Criteria</th></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>20</td><td>Radiated emission test</td><td>〈Limits above 1,000 MHz〉
<table><tr><th>Frequency range</th><th>Average limit</th></tr><tr><td>1,000 MHz ~ 6,000 MHz</td><td>54 $\mathrm{dB}\mu\mathrm{V/m}$</td></tr></table>· Distance between equipment and antenna is to be 3 m.
· For the frequency band 156 MHz to 165 MHz the measurement shall be repeated with a receiver bandwidth of 9 kHz (as per IEC 60945).
· Alternatively the radiation limit at a distance of 3 m from the enclosure port over the frequency 156 MHz to 165 MHz is to be 30 $\mathrm{dB}\mu\mathrm{V/m}$ peak. (as per IEC 60945).
· Equipment intended to transmit radio signals for the purpose of radio communication (e.g. wifi router, remote radio controller) may be exempted from limit, within its communication frequency range, subject to the requirements in Pt 6, Ch 2, 406. 2 of Rules for the Classification of Steel Ships.
· Detailed test methods are referred to CISPR 16-2-3 and IEC 60945(for 156 ~ 165 MHz).</td><td>· Radiated emission is to be within limits in the table.</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

(Note)
(1) - (2) 〈same as the present Rules〉
(3) For equipment installed on the bridge and deck zone, the test levels shall be increased to 10Vrms for spot frequencies in accordance with IEC 60945 at 2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz.
(4) 〈newly added〉

〈Amendment〉

Table 3.23.1 Environmental Test Items, Testing Conditions and Methods, and Criteria *~~(2020)~~* *(2022)*

<table>
<tr><th>No.</th><th>Test item</th><th>testing condition and method</th><th>Criteria</th></tr>
<tr><td>20</td><td>Radiated emission test</td><td>
〈Limits above 1,000 MHz〉
<table>
<tr><th>Frequency range</th><th>Average limit</th></tr>
<tr><td>1,000 MHz ~ 6,000 MHz</td><td>54 $\mathrm{dB}\mu\mathrm{V/m}$</td></tr>
</table>
· Distance between equipment and antenna is to be 3 m.
· For the frequency band 156 MHz to 165 MHz the measurement shall be repeated with a receiver bandwidth of 9 kHz (as per IEC 60945).
· Alternatively the radiation limit at a distance of 3 m from the enclosure port over the frequency 156 MHz to 165 MHz is to be 30 $\mathrm{dB}\mu\mathrm{V/m}$ peak. (as per IEC 60945:2002).
· Equipment intended to transmit radio signals for the purpose of radio communication (e.g. wifi router, remote radio controller) may be exempted from limit, within its communication frequency range, subject to the requirements in Pt 6, Ch 2, 406. 2 of Rules for the Classification of Steel Ships.
· Detailed test methods are referred to CISPR 16-2-3 and IEC 60945(for 156 ~ 165 MHz).
</td><td>· Radiated emission is to be within limits in the table.(4)</td></tr>
</table>

(Note)

(1) - (2) 〈same as the present Rules〉

(3) For equipment installed on the bridge and deck zone, the test levels shall be increased to 10Vrms for spot frequencies in accordance with **IEC 60945:2002** at 2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz.

(4) The upper frequency of the radiated emission test may be reduced depending on the highest internal frequency of the EUT, as per **7.6.6.2.2 of CISPR 16-2-3**. If the highest frequency of the EUT is:

— below 108 MHz - emission shall be measured up to 1 GHz,

— between 108 MHz and 500 MHz - emission shall be measured up to 2 GHz,

— between 500 MHz and 1 GHz - emission shall be measured up to 5 GHz,

— above 1 GHz - emission shall be measured up to the lower of 5 times of the highest internal frequency and 6 GHz.

The conditional testing procedure cannot be applied unless the highest internal frequency of the EUT is documented. *(2022)*

Present	Amendment	Remark
Section 26 Fire Protection Materials	**Section 26 Fire Protection Materials**	
2601. – 2603. 〈same as the present Rules〉	**2601. – 2603. 〈same as the present Rules〉**	
2604. Test methods	**2604. Test methods**	
1. – 3. 〈same as the present Rules〉	**1. – 3. 〈same as the present Rules〉**	
4. Smoke and toxicity test Smoke and toxicity test are to comply with the requirements specified in **Table 3.26.8.** (refer to **FTP Code, Annex 1, Part 2** and **Part 5, Annex 4**)	**4. Smoke and toxicity test** Smoke and toxicity test are to comply with the requirements specified in **Table 3.26.8.** (refer to **FTP Code, Annex 1, Part 2** ~~and **Part 5, Annex 4**~~) *(2022)*	(Amended) – The reference number of FTP code has been clarified.
5. – 8. 〈same as the present Rules〉	**5. – 8. 〈same as the present Rules〉**	
Section 27 – 33 〈same as the present Rules〉	**Section 27 – 33 〈same as the present Rules〉**	
Section 34 Fiber Reinforced Plastic Gratings	**Section 34 Fiber Reinforced Plastic Gratings**	
3401. – 3402. 〈same as the present Rules〉	**3401. – 3402. 〈same as the present Rules〉**	
3403. Type tests	**3403. Type tests**	
1. – 4. 〈same as the present Rules〉	**1. – 4. 〈same as the present Rules〉**	
5. Smoke and toxicity test FRP gratings within accommodation, service and control spaces, should have low smoke characteristics as determined by one of the following test procedures. FRP gratings to comply with the requirements of **3401. 1.** should have low smoke and toxicity characteristics as determined by (2) of the following test procedures: (1) 〈same as the present Rules〉	**5. Smoke and toxicity test** FRP gratings within accommodation, service and control spaces, should have low smoke characteristics as determined by one of the following test procedures. FRP gratings to comply with the requirements of **3401. 1.** should have low smoke and toxicity characteristics as determined by (2) of the following test procedures: (1) 〈same as the present Rules〉	

Present	Amendment	Remark
(2) Smoke and toxicity test are to comply with the requirements specified in **Table 3.26.8.** of this Guidance(refer to **FTP Code, Annex 1, Part 2** and **Part 5, Annex 4**). The criteria established for materials used for bulkheads, linings, or ceilings are to be complies with. **Section 35 - 37 〈same as the present Rules〉**	(2) Smoke and toxicity test are to comply with the requirements specified in **Table 3.26.8.** of this Guidance(refer to **FTP Code, Annex 1, Part 2** ~~and **Part 5, Annex 4**~~). The criteria established for materials used for bulkheads, linings, or ceilings are to be complies with. *(2022)* **Section 35 - 37 〈same as the present Rules〉**	(Amended) - The reference number of FTP code has been clarified.

Guidance for Approval of Manufacturing Process and Type Approval, etc.

(Development Review : Final)

2022. 2.

Machinery Rule Development Team

Effective Date : 1 July 2022

(The contract date for ship construction)

Present	Amendment	Remark
CHAPTER 3 TYPE APPROVAL **Section 1 General** 101. - 103. 〈same as the present Rules〉 103. Type test 1. - 3. 〈same as the present Rules〉 4. The type tests may be partly or wholly omitted, subject to the approval by the Society, in cases where the manufacturer has been approved by other Classification Society or an inspection organization recognized by the Society. 5. 〈same as the present Rules〉 106. - 112. 〈same as the present Rules〉 **Section 2 - 20 〈same as the present Rules〉** **Section 21 Electrical Equipment and Cables** 2101. General 1. 〈same as the present Rules〉 2. Items subject to the tests Electrical equipment and cables subject to the type test are to be as the requirements in Table 3.21.1.	**CHAPTER 3 TYPE APPROVAL** **Section 1 General** 101. - 103. 〈same as the present Rules〉 103. Type test 1. - 3. 〈same as the present Rules〉 4. The type tests may be partly or wholly ~~omitted~~ exempted, subject to the approval by the Society, in cases where the manufacturer has been approved by other Classification Society or an inspection organization recognized by the Society. 5. 〈same as the present Rules〉 106. - 112. 〈same as the present Rules〉 **Section 2 - 20 〈same as the present Rules〉** **Section 21 Electrical Equipment and Cables** 2101. General 1. 〈same as the present Rules〉 2. Items subject to the tests Electrical equipment and cables subject to the type test are to be as the requirements in Table 3.21.1. Table 3.21.1 〈Refer to the next page〉	(Amended) - The requirements has been amended to clarify the intention. (Amended) - The PVC insulated cables subject to the type test have been deleted.

〈Present〉

Table 3.21.1 Electrical equipment and cables subject to the type test

Kinds	Electrical equipment and cables subject to the type test
Cables	(1) – (2) 〈same as the present Rules〉 (3) 150㎸ multi-core PVC insulated cables for electronic equipment.

〈Amendment〉

Table 3.21.1 Electrical equipment and cables subject to the type test

Kinds	Electrical equipment and cables subject to the type test
Cables	(1) – (2) 〈same as the present Rules〉 ~~(3) 150㎸ multi-core PVC insulated cables for electronic equipment.~~

Present	Amendment	Remark
2102. 〈same as the present Rules〉	**2102. 〈same as the present Rules〉**	(Amended) 1) Environmental tests are to be applied to electric devices subject to type approval. - Applicable environmental tests in accordance with UR E10 have been expanded to the components. 2) The assessment of Certifications (e.g., CB Cert. & Reports, etc.) issued by an inspection organization for them may be accepted. 3) Since products are manufactured in accordance with standards of each country, the requirement has been deleted.
2103. Type tests Type tests are to be carried out in accordance with the requirements in **2104.** to **2109.** for each product. In case where the Society deemed necessary, however, additional tests and/or an increase in the number of test samples may be required. For products specified in foreign standards, test items and the number of test samples will be decided at each case in accordance with the contents of the standards.	**2103. Type tests** Type tests are to be carried out in accordance with the requirements in **2104.** to **2109.** [1]and **2304.**(where applicable) for each product. In case where the Society deemed necessary, however, additional tests and/or an increase in the number of test samples may be required. [2]The type tests for fuses, circuit breakers and electromagnetic contactors may be partly or wholly exempted, subject to the approval by the Society, in cases where the manufacturer has been approved by an inspection organization recognized by the Society. [3]~~For products specified in foreign standards, test items and the number of test samples will be decided at each case in accordance with the contents of the standards.~~	
2104. - 2109. 〈same as the present Rules〉	**2104. - 2109. 〈same as the present Rules〉**	
Section 22 - 30 〈same as the present Rules〉	**Section 22 - 30 〈same as the present Rules〉**	

Present	Amendment	Remark
Section 31 LED Lighting Fittings and Fluorescent Lighting Fittings of Electronic Ballast Stabilizer Type *(2019)*	**Section 31 LED Lighting Fittings and Fluorescent Lighting Fittings of Electronic Ballast Stabilizer Type *(2019)***	
3101. - 3102. 〈same as the present Rules〉	**3101. - 3102. 〈same as the present Rules〉**	
3103. Type test Type tests are to be carried out in accordance with Table 3.31.1 and supplementary tests may be required where deemed necessary by the Society. Type tests may be partly or wholly omitted, subject to the approval by the Society, in cases where the manufacturer submits the test reports issued by an authorized test laboratory in accordance with the standard approved by the Society.	**3103. Type test** Type tests are to be carried out in accordance with Table 3.31.1 and supplementary tests may be required where deemed necessary by the Society. Type tests may be partly or wholly omitted, subject to the approval by the Society, in cases where the manufacturer submits the test reports issued by an authorized test laboratory in accordance with the standard approved by the Society. Table 3.31.1 〈Refer to the naxt page〉	(Amended) -The mechanical strength test has been deleted and item numbering has been amended.
Section 32 - 37 〈same as the present Rules〉	**Section 32 - 37 〈same as the present Rules〉**	

〈Present〉

Table 3.31.1 Type test items

No.	Item	Test method	Remark
1-13	〈same as the present Rules〉		
14	Mechanical strength test	IEC 60092-306	-
15-17	〈same as the present Rules〉		

〈Amendment〉

Table 3.31.1 Type test items

No.	Item	Test method	Remark
1-13	〈same as the present Rules〉		
~~14~~	~~Mechanical strength test~~	~~IEC 60092-306~~	-
~~15-17~~ 14-16	〈same as the present Rules〉		

Present	Amendment	Remark
Section 39 〈Newly added〉	**Section 39 Electric Power Converters *(2022)*** **3901. Application and general** Electric power converters installed on board are to comply with the requirements of **Pt 6, Ch 1, Sec 12** as well as this guidance. **3902. Type tests** Type tests are to be carried out in accordance with **Table 3.39.1** or **Table 3.39.2** and supplementary tests may be required where deemed necessary by the Society. Type tests may be partly or wholly exampted, subject to the approval by the Society, in cases where the manufacturer submits the test reports issued by an authorized test laboratory in accordance with the standard approved by the Society. **Table 3.39.1, Table 3.39.2 〈Refer to the next pages〉**	(Newly added) -Type approval tests for electric power converters have been newly added.

Table 3.39.1 UPS/Electric power converters for power supply

No.	Test item	Test method	
1	Visual inspection	No.1	Table 3.23.1
2	Electrical power supply failure test	No.3	
3	Electrical power supply variation test	No.4	
4	Dry heat test	No.6	
5	Damp heat test	No.7	
6	Variation test	No.8	
7	Inclination test	No.9	
8	Insulation resistance test	No.10	
9	Cold test	No.12	
10	Electromagnetic compatibility(EMC) test	No.14~21	
11	High voltage test	**IEC 60146-1-1, 7.2, IEC 61800-5-1, 5.2.3.2**	
12	Insulation resistance test	**IEC 60146-1-1, 7.2.3.1**	
13	Temperature rise test	**IEC 60146-1-1, 7.4.2**	
14	Light load test / Functional test	**IEC 62040-3, 6.2.2.3 & 60146-1-1**	
15	Input voltage and frequency tolerance test	**IEC 62040-3, 6.4.1**	
16	Short circuit test	**IEC 62040-3, 6.4.2.10**	
17	Full load test[1)]	**IEC 62040-3, 6.4.3.1 & 6.4.3.2**	
18	Dynamic performance test	**IEC 62040-3, 6.4.3.3**	
19	Stored and restored energy test[1)]	**IEC 62040-3, 6.4.4**	
20	Capacitor discharge test	**IEC 61800-5-1, 5.2.3.7**	
21	Cooling failure test	**IEC 61800-5-1, 5.2.4.5**	

(Note)
1) Only applicable for UPS.

Table 3.39.2 Electric power converters for essential motors

No.	Test item	Test method	
1	Visual inspection	No.1	Table 3.23.1
2	Electrical power supply failure test	No.3	
3	Electrical power supply variation test	No.4	
4	Dry heat test	No.6	
5	Damp heat test	No.7	
6	Variation test	No.8	
7	Inclination test	No.9	
8	Insulation resistance test	No.10	
9	Cold test	No.12	
10	Electromagnetic compatibility(EMC) test	No.14~21	
11	Impulse voltage test[1)]	IEC 61800-5-1, 5.2.3.1	
12	High voltage test	IEC 60146-1-1, 7.2, IEC 61800-5-1, 5.2.3.2	
13	Insulation resistance test	IEC 60146-1-1, 7.2.3.1	
14	Light load test / Functional test	IEC 60146-1-1, 7.3.1 & 7.5	
15	Rated current test	IEC 60146-1-1, 7.3.2	
16	Temperature rise test	IEC 60146-1-1, 7.4.2, IEC 61800-5-1, 5.2.3.8	
17	Safety requirements : Electric, Thermal and Energy	IEC 61800-5-1, 5	

(Note)

1) The tests shall be carried out If not meet the criteria given in Pt 6, from Table 6.1.20 to Table 6.1.22

GUIDANCE FOR APPROVAL OF MAUFACTURING PROCESS AND TYPE APPROVAL, ETC.

(Development Review : External Opinion Inquiry)

2021. 8.

- Main Amendments -

(1) Reflecting IACS URs <ships contracted for construction on or after 2021/07/01>

◉ UR P2.12 (Rev.3 Feb 2021)

Present	Amendment	Reason
CHAPTER 3 TYPE APPROVAL	**HAPTER 3 TYPE APPROVAL**	
Section 17 Flexible Hose Assembly	**Section 17 Flexible Hose Assembly**	
1701. to 1702. <omitted>	**1701. to 1702. <same as the present>**	
1703. Type tests	**1703. Type tests**	
1. <omitted>	1. <same as the present>	
2. For a particular hose type complete with end fittings, the tests, as applicable, are to be carried out on different nominal diameters for pressure, burst, impulse and fire resistance in accordance with the requirements of the relevant Standard. The following Standards are to be used as applicable: (1) ISO 6802 – Rubber and plastics hoses and hose assemblies with wire reinforcements – Hydraulic impulse test with flexing. (2) ISO 6803 – Rubber or plastics hoses and hose assemblies – Hydraulic-pressure impulse test without flexing. (3) ISO 15540 – Fire resistance of hose assemblies – Test methods. (4) ISO 15541 – Fire resistance of hose assemblies – Requirements for test bench. (5) ISO 10380 – Pipework – Corrugated metal hoses and hose assemblies. Other Standards may be accepted where agreed by the Scoeity.	2. For a particular hose type complete with end fittings, the tests, as applicable, are to be carried out on different nominal diameters for pressure, burst, impulse and fire resistance in accordance with the requirements of the relevant Standard. The following Standards are to be used as applicable: (1) ISO 6802 – Rubber and plastics hoses and hose assemblies with wire reinforcements – Hydraulic impulse test with flexing. (2) ISO 6803 – Rubber or plastics hoses and hose assemblies – Hydraulic-pressure impulse test without flexing. (3) ISO 15540 – Fire resistance of hose assemblies – Test methods. (4) ISO 15541 – Fire resistance of hose assemblies – Requirements for test bench. (5) ISO 10380 – Pipework – Corrugated metal hoses and hose assemblies. Other Standards may be accepted where agreed by the Scoeity. <Note> Prototype tests are to be carried out for each size of hose assembly. However, for ranges with more than 3 different diameters, the prototype tests are to be carried out for at least: • the smallest diameter, • the largest diameter, • Intermediate diameters selected based on the principle that prototype tests carried out for a hose assembly with a diameter D are considered valid only for the diameters ranging between 0.5 D and 2 D. For fire resistance tests the specimens shall be selected in accordance with ISO 15540:2016.	UR P2.12.5
<hereafter omitted>	<hereafter same as the present>	

- Main Amendments -

(1) Reflecting IACS URs <ships contracted for construction on or after 2021/07/01>

◉ UR P2.11 (Rev.5 Jan 2021) : Type approval of Mechanical joints

Present	Reason

Section 18 Mechanical Joints

1801. to 1802. <omitted>

1803. Type tests

1. Test items

Testing requirements for mechanical joints are to be as indicated in Table 3.18.1

Table 3.18.1 Test items for mechanical joints *(2017)*

	Test items	Types of mechanical joints			Notes and references
		Compression couplings and pipes unions	Slip-on joints		
			Grip type & Machine grooved type	Slip type	
1	Tightness test	○	○	○	Table 3.18.2
2	Vibration (fatigue) test,	○	○	-	Table 3.18.2
3	Pressure pulsation test1)	○	○	-	Table 3.18.2
4	Burst pressure test	○	○	○	Table 3.18.2
5	Pull-out test	○	○	-	Table 3.18.2
6	Fire endurance test	○	○	○	Table 3.18.2 (If required in Pt 5, Ch 6, 104. 5(5) of the Rules)
7	Vacuum test	○ 3)	○	○	1304. 7 (for suction lines only)
8	Repeated assembly test	○ 2)	○	-	Table 3.18.2

Abbreviations : ○ : test is required.
− : test is not required.

Note
1) for use in those systems where pressure pulsation other than water hammer is expected.
2) except press type.
3) except joints with metal-to-metal tightening surfaces.
4) in the case of bite joint or similar joints.

Amendment	Reason

Section 18 Mechanical Joints

1801. to 1802. <omitted>

1803. Type tests

1. Test items

Testing requirements for mechanical joints are to be as indicated in Table 3.18.1

Table 3.18.1 Test items for mechanical joints *(2017)*

	Test items	Types of mechanical joints			Notes and references
		Compression couplings and pipes unions	Slip-on joints		
			Grip type & Machine grooved type	Slip type	
1	Tightness test	○	○	○	Table 3.18.2
2	Vibration (fatigue) test,	○	○	-	Table 3.18.2
3	Pressure pulsation test1)	○	○	-	Table 3.18.2
4	Burst pressure test	○	○	○	Table 3.18.2
5	Pull-out test	○	○	-	Table 3.18.2
6	Fire endurance test	○	○	○	Table 3.18.2 (If required in Pt 5, Ch 6, 104. 5(5) of the Rules)
7	Vacuum test	○ 3)	○	○	1304. 7 (for suction lines only)
8	Repeated assembly test	○ 2)	○	-	Table 3.18.2

Abbreviations : ○ : test is required.
− : test is not required.

Footnotes
1) for use in those systems where pressure pulsation other than water hammer is expected.
2) except press type and swage type.
3) except joints with metal-to-metal tightening surfaces.
~~4) in the case of bite joint or similar joints.~~

Present	Amendment	Reason
2. to 4. <omitted> 5. Mechanical joint assembly (1) Assembly of mechanical joints should consist of components selected in accordance with preceding 4 (2) and the pipe sizes appropriate to the design of the joints. (2) Where pipe material would effect the performance of mechanical joints, the selection of joints for testing is to take the pipe material into consideration. (3) to (6) <omitted>	2. to 4. <same as the present> 5. Mechanical joint assembly (1) Assembly of mechanical joints should consist of components selected in accordance with preceding 4 (2) and the pipe sizes appropriate to the design of the joints. (2) Where pipe material would affect the performance of mechanical joints, the selection of joints for testing is to take the pipe material into consideration. (3) to (6) <same as the present>	

Present	Reason

1804. Methods of tests

1. The outlines of testing methods in Table 3.18.1 are as given in Table 3.18.2.

Table 3.18.2 The outlines of testing methods of mechanical joints (continued)

Test item	Kinds	Type test method
6. Fire endurance test	mechanical joint assembly	(1) <omitted> (2) If the fire test is conducted with circulating water at a pressure different from the design pressure of the joint (however of at least 5 bar) the subsequent pressure test is to be carried out to twice the design pressure. (3) A selection of representative nominal bores may be tested in order to evaluate the fire resistance of a series or range of mechanical joints of the same design. When a mechanical joint of a given nominal bore (Dn) is so tested then other mechanical joints falling in the range Dn to 2xDn (both inclusive) are considered accepted. (4) Alternative test methods and/or test procedures onsidered to be at least equivalent may be accepted at the discretion of the Society in cases where the test pieces are too large for the test bench and cannot be completely enclosed by the flames. (5) Thermal insulation materials applied on couplings are to be non-combustible in dry condition and when subjected to oil spray. A non-combustibility test according to ISO 1182 is to be carried out.

Amendment

1804. Methods of tests

1. The outlines of testing methods in Table 3.18.1 are as given in Table 3.18.2.

Table 3.18.2 The outlines of testing methods of mechanical joints (continued)

Test item	Kinds	Type test method
6. Fire endurance test	mechanical joint assembly	(1) <same as the present> (2) Clarifications to the standard requirements in ISO19921:2005, Paragraphs 7.2, 7.4, 7.6 and 7.7: (a) If the fire test is conducted with circulating water at a pressure different from the design pressure of the joint (however of at least 5 bar) the subsequent pressure test is to be carried out to twice 1.5 times the design pressure. (b) If the fire test is required in Table 7 to be "8 min dry + 22 min wet" or "30 min dry", i.e. conducted for a period of time without circulating of water, the following test conditions apply:. (i) Test condition "8 min dry + 22 min wet" The test piece is not required to be rinsed with the test medium (water) in preparation for the test as required in Paragraph 7.2 of ISO 19921:2005. The exposure to fire is to be started and continued for 8 minutes with the sample dry; after 8 minutes of dry test condition the piping system is to be filled with water and test pressure is to be increased up to at least 5 bar within 2 minutes, then maintained to at least 5 bar. After further 22 minutes (i.e. 30 minutes from initial exposure to fire) the exposure to fire is to be stopped and a hydrostatic pressure test as specified in 1. is to be carried out. (ii) Test condition "30 min dry" The exposure to fire is to be started and continued for 30 minutes with the sample dry. After 30 minutes the exposure to fire is to be stopped and a hydrostatic pressure test as specified in 1. is to be carried out. <Note> For fire tests in dry condition the pressure inside the test specimen is to be monitored for a rise due to heating of the enclosed air. Means of pressure relief should be provided where deemed necessary. High pressures created during this test can result in failure of the test specimen. Precautions shall be taken to protect personnel and facilities. Paragraph 7.5 of ISO 19921:2005 does not apply to the dry tests and no forced air circulation is to be arranged. For fire endurance test requiring exposure time greater than 30 minutes test conditions are adjusted to meet the extended required total exposure time. In all cases for dry-wet test the minimum dry test exposure time is 8 minutes. (c) A selection of representative nominal bores may be tested in order to evaluate the fire resistance of a series or range of mechanical joints of the same design. When a mechanical joint of a given nominal bore (Dn) is so tested then other mechanical joints falling in the range Dn to 2xDn (both inclusive) are considered accepted. (d) Alternative test methods and/or test procedures considered to be at least equivalent may be accepted at the discretion of the Classification Society in cases where the test pieces are too large for the test bench and cannot be completely enclosed by the flames. (e) Where thermal insulation is acceptable as a means of providing fire resistance, following requirements apply: (i) Thermal insulation materials applied on couplings are to be non-combustible in dry condition and when subjected to oil spray. A non-combustibility test according to ISO 1182:2010 is to be carried out as required by the Fire Test Procedures Code defined in Regulation 3 of SOLAS Chapter II-2 as amended by IMO resolutions up to MSC.421(98). Precautions are to be taken to protect the insulation from being impregnated with flammable oils. (ii) At least the fire endurance and the vibration testing in table 9 are to be carried out with thermal insulation in place. (iii) A service restriction is to be stated on the type approval certificate that the mechanical joints are to be fitted with thermal insulation during the installation in cases where the mechanical joints are used where fire resistance is required, unless mechanical joints are delivered already fitted with thermal insulation before installation.

- Main Amendments -

(1) Reflecting IACS URs <ships contracted for construction on or after 2021/07/01>

◉ UR P3 (Rev.5 Jan 2021) : Air Pipe Closing Devices

Present	Amendment	Reason
Section 19 Air Pipe Automatic Closing Devices	**Section 19 Air Pipe Automatic Closing Devices**	
1901. Application The requirements in this Section apply to tests and inspection for the approval of air pipe automatic closing devices extending above weather decks in accordance with the requirements in **Pt 5, Ch 6, 201.** of the Rules.	**1901. Application** The requirements in this Section apply to tests and inspection for the approval of air pipe automatic closing devices extending above weather decks in accordance with the requirements in Pt 5, Ch 6, 201. of the Rules, the International Convention on Load Lines, 1966 or the Protocol of 1988 relating to the International Convention on Load Lines, 1966, as amended by IMO resolutions up to MSC.375(93).	- UR P3 (Rev.5, Apr 2021)
1902. Design and Materials <omitted>	**1902. Design and Materials** <same as the present>	
1903. Type tests **1. Testing of air pipe automatic closing devices** The following tests, specified in **Table 3.19.1**, for air pipe automatic closing devices by each type and size are to be carried out at the manufacturer's works or other acceptable location by the Society. **2.** Impact and compression loading tests for the floats are to be carried out as specified in **Table 3.19.2.**	**1903. Type tests** **1. Testing of air pipe automatic closing devices** The following tests, specified in **Table 3.19.1**, for air pipe automatic closing devices by each type and size are to be carried out at the manufacturer's works or other acceptable location by the Society. **2.** Impact and compression loading tests for the floats are to be carried out as specified in **Table 3.19.2.**	

Present	Reason

Table 3.19.1 Test methods and acceptance criteria for air pipe automatic closing devices

Kinds	Test Item	Type test method	Acceptance criteria
air pipe automatic closing devices	Tightness test	An automatic closing device is to be subjected to a series of tightness tests involving not less than two(2) immersion cycles under each of the following conditions. (1)to (3) <omitted>	The maximum allowable leakage per cycle is not to exceed 2 ml/mm of nominal diameter of inlet pipe during any individual test.
	Discharge/ Reverse flow thest	The air pipe head shall allow the passage of air to prevent excessive vacuum developing in the tank. A reverse flow test shall be performed. A vacuum pump or another suitable device shall be connected to the opening of the air pipe leading to the tank. The flow velocity shall be applied gradually at a constant rate until the float gets sucked and blocks the flow. The velocity at the point of blocking shall be recorded. 80% of the value recorded will be stated in the certificate.	
	Confirmation of the flow characteristic	<omitted>	<omitted>
<omitted>			

Amendment	Reason

Table 3.19.1 Test methods and acceptance criteria for air pipe automatic closing devices

Kinds	Test Item	Type test method	Acceptance criteria
air pipe automatic closing devices	Tightness test	An automatic closing device is to be subjected to a series of tightness tests involving not less than two(2) immersion cycles under each of the following conditions. (1)to (3) <same as the present>	The maximum allowable leakage per cycle is not to exceed 2 ml/mm of nominal diameter of inlet pipe during any individual test.
	Discharge/ Reverse flow thest	The air pipe head shall allow the passage of air to prevent excessive vacuum developing in the tank. 1. Reverse flow test (1) A reverse flow test shall be performed. A vacuum pump or another suitable device shall be connected to the opening of the air pipe leading to the tank. The flow velocity shall be applied gradually at a constant rate until the float gets sucked and blocks the flow.; and (2) The velocity at the point of blocking shall be recorded. 80% of the value recorded will be stated in the certificate. 2. Alternative to the reverse flow test (1) For pipe heads of 400 mm nominal diameter and above, as an alternative to the reverse flow test, a numerical simulation test based on computational fluid dynamics (CFD), to be carried out in conjunction with limited representative testing to establish the validity of the CFD modelling and results, may be accepted; (2) CFD predictions for air pipe heads can be validated against the available actual reverse flow test results of same size and type of air pipe heads; (3) The accuracy of the CFD modelling and the major assumptions used for the calculation are to be documented; (4) Mesh convergence studies are to be carried out and documented; and (5) The requirement as per the preceding I (2) applies.	To be as deemed appropriate by the Society
	Confirmation of the flow characteristic	<same as the present>	<same as the present>
<same as the present>			

GUIDANCE RELATING TO THE RULES FOR CLASSIFICATION OF STEEL SHIPS

Guidance for Approval of Manufacturing Process and Type Approval, Etc.

2021. 09.

Machinery Rule Development Team

- Main Amendments -

(1) Effective date : 1. Jul. 2022 (Date of which the application for Classification Survey is submitted to the Society)

◉ Test requirement for detonation flame arrester has been amended <MET4600-277-2021>

Present	Amendment	Remark
CHAPTER 3 TYPE APPROVAL **Section 24 Equipment related to Ventilation Systems in Oil Tankers** <omitted> **2403. Devices to Prevent the Passage of Flame** **1. General** (1) to (5) 〈Omitted〉 (6) 〈Newly added〉 <omitted>	**CHAPTER 3 TYPE APPROVAL** **Section 24 Equipment related to Ventilation Systems in Oil Tankers** <same as present> **2403. Devices to Prevent the Passage of Flame** **1. General** (1) to (5) 〈same as present〉 (6) Refer to ISO 16852:2016 for the definition of stable detonation and detailed test methods. *(2022)* <same as present>	(amendment) - Clarification of stable detonation definition and detailed test method requirements

Present	Remark
	Clarified endurance burning test requirement

Table 3.24.4 Type test and inspection for devices to prevent the passage of flame

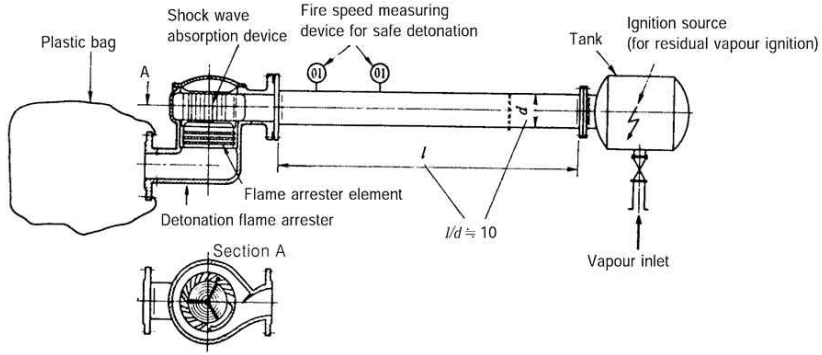
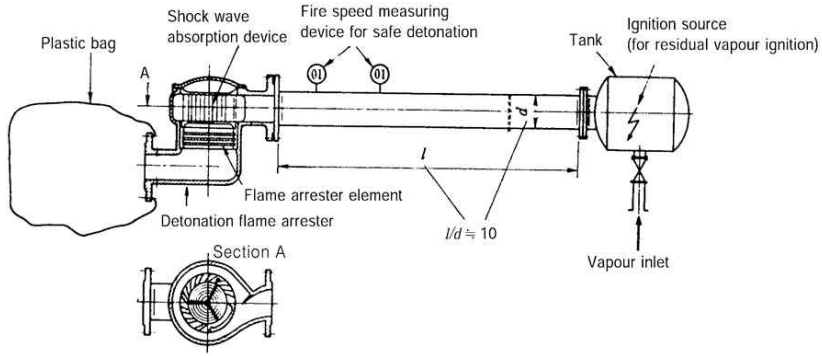
Kind	Test item	Test method
4. Tests for detonation flame arresters located in-line	General	The following tests are to be carried out using the test apparatus which consists of an apparatus producing an explosive mixture, a tank, a plastic bag, a pipe of suitable length and of the same diameter as the flange of the detonation flame arrester, ignition device and a measuring instrument of flame speed , and it is to be ascertained that no flashback occurs and no part of the flame arrester is damaged or shows permanent deformation.  Fig 3.24.3 Example of Testing Equipment for Detonation Flame Arrester
	Detonation test	(i) A detonation flame arrester is to be installed at one end of a pipe, and a plastic bag is to be affixed on the other end of the detonation flame arrester. (ii) The tank, the plastic bag, the pipes and the detonation flame arrester are to be filled with the most easily ignitable propane/air mixture. However, devices are to be tested with ethylene or test media with MESG not more than 0.65mm for Apparatus Group IIB on chemical tankers and with hydrogen or test media with MESG not more than 0.28mm for Apparatus Group IIC on chemical tankers, according to the apparatus group assigned as per column i" of **the Annex 7B-1 Table of Summary of Minimum Requirements of the Guidance Pt 7 Ch 6.** (iii) They are to be ignited in the tank and three detonation tests are to be carried out. The velocity of the flame measured near the detonation flame arrester is to have a value of that for stable detonations.
	Endurance burning test	In case where the distance requirement in the endurance burning test, **3.** of this **Table** cannot be met, an endurance burning test is to be carried out in addition to the requirements in the detonation test.

Table 3.24.4 Type test and inspection for devices to prevent the passage of flame

Kind	Test item	Test method
4. Tests for detonation flame arresters located in-line	General	The following tests are to be carried out using the test apparatus which consists of an apparatus producing an explosive mixture, a tank, a plastic bag, a pipe of suitable length and of the same diameter as the flange of the detonation flame arrester, ignition device and a measuring instrument of flame speed , and it is to be ascertained that no flashback occurs and no part of the flame arrester is damaged or shows permanent deformation.  Fig 3.24.3 Example of Testing Equipment for Detonation Flame Arrester
	Detonation test	(i) A detonation flame arrester is to be installed at one end of a pipe, and a plastic bag is to be affixed on the other end of the detonation flame arrester. (ii) The tank, the plastic bag, the pipes and the detonation flame arrester are to be filled with the most easily ignitable propane/air mixture. However, devices are to be tested with ethylene or test media with MESG not more than 0.65mm for Apparatus Group IIB on chemical tankers and with hydrogen or test media with MESG not more than 0.28mm for Apparatus Group IIC on chemical tankers, according to the apparatus group assigned as per column i" of **the Annex 7B-1 Table of Summary of Minimum Requirements of the Guidance Pt 7 Ch 6.** (iii) They are to be ignited in the tank and three detonation tests are to be carried out. The velocity of the flame measured near the detonation flame arrester is to have a value of that for stable detonations.
	Endurance burning test	In case where the distance requirement(l) in **Fig. 3.24.3** cannot be met, an endurance burning test is to be carried out in addition to the requirements in the detonation test. *(2022)*

Amendments of the Guidance

Guidance for Approval of Manufacturing Process and Type Approval, Etc.

2021. 04

Hull Rule Development Team

Present

CHAPTER 2 APPROVAL OF MANUFACTURING PROCESS

Section 25 Securing Devices

2501. 〈omit〉

2502. Type tests

Table 3.25.2 Test Loads and Test Modes

Item No	Description	Required test modes	Recommended minimal in kN		
			SWL	Proof load	Breaking load
6					
7	Twistlock (single)	Shear load	200	300	400
		Tensile load	250	375	500
		Compression load (bottom)	1200	1400	1600
10	Midlock	Shear load	200	300	400
		Tensile load	250	375	500
		Compression load (bottom)	1200	1400	1600
11	Pedestal socket	Pull-out load	250	375	500
		Tangential load	200	300	400
		Compression load	1200	1400	1600

2503. 〈omit〉

Amendment

CHAPTER 2 APPROVAL OF MANUFACTURING PROCESS

Section 25 Securing Devices

2501. 〈same as current〉

2502. Type tests

Table 3.25.2 Test Loads and Test Modes *(2021)*

Item No	Description	Required test modes	Recommended minimal in kN		
			SWL	Proof load	Breaking load
6					
7	Twistlock (single)	Shear load	210	315	420
		Tensile load	250	375	500
		Compression load (bottom)	1200	1400	1600
10	Midlock	Shear load	210	315	420
		Tensile load	250	375	500
		Compression load (bottom)	1200	1400	1600
11	Pedestal socket	Pull-out load	250	375	500
		Tangential load	210	315	420
		Compression load	1200	1400	1600

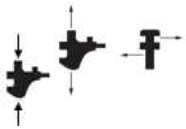
2503. 〈same as current〉

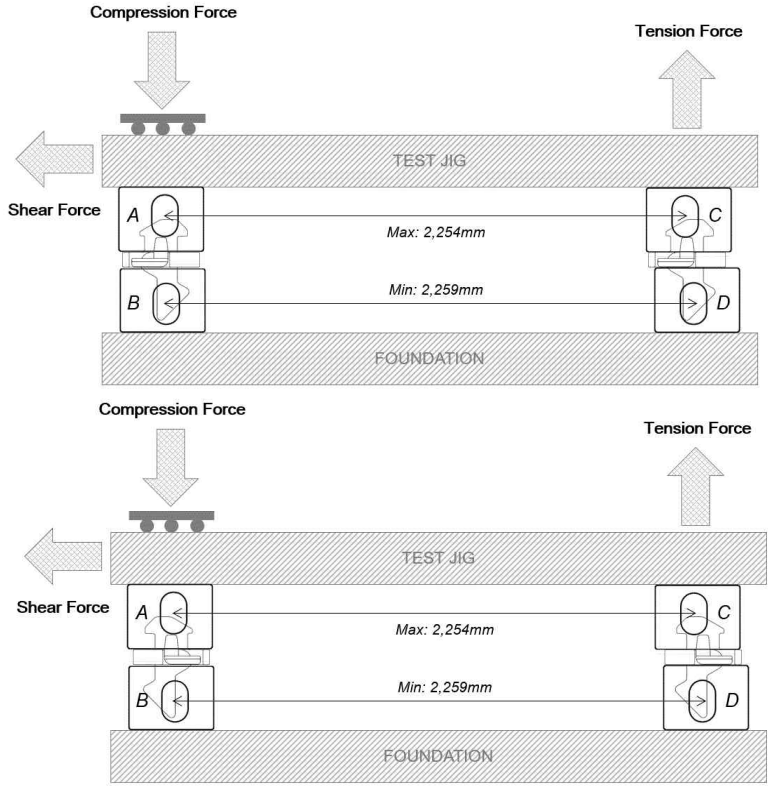
Note

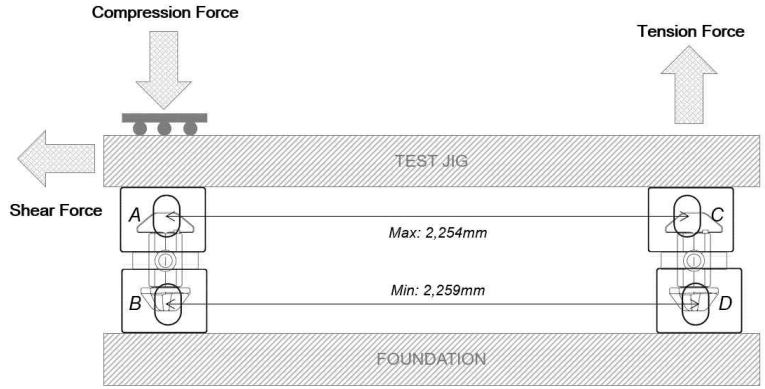
Present	Amendment	Note
〈newly added〉	**2504. Test requirements of additional special feature notation HHS (High Holding Securing)** ***(2021)*** 1. For a ship with **HHS** of additional special feature notation, type tests to determine the breaking or proof loads are to be carried out on at least two samples of each twistlock (manual, semi-automatic, full automatic), midlock and pedestal scoket. The test loads are in accordance with **Table 3.25.4**. 2. Performance of full automatic twistlock is to be tested in both directions for at least three products and the test equipments should be constructed as shown in **Fig. 3.25.2.** Performance of manual and semi-automatic twistlock is to be tested for at least three products and the test equipments should be constructed as shown in **Fig. 3.25.3.** The test loads applied in the function test are to be as given in **Table 3.25.5** 3. In the 2nd step of the function test, the vertical clearance ($\delta v_{\max}$) between the twistlock and the corners of the container is not be more than 15mm, and the value of the vertical clearance measured in the function test can be applied to the evaluation of securing strength. 4. The corner casting material used in the function test should have a mechanical property of RSC480A (or SCW480) or less, and a certificate equivalent to EN 10204 TYPE 3.2 should be submitted for the corner casting material. 5. There should be no permanent deformation other than surface indentation in twistlock and the twistlock should not be detached from the corner casting during the test.	
〈newly added〉	**2505. Test requirements of additional special feature notation HHT (High Holding Twistlock)** ***(2021)*** 1. For a ship with **HHT** of additional special feature notation, only the requirements for twistlock and midlock are satisfied among the requirements of **2504**. above.	

Present	Amendment	Note
〈newly added〉		

Table 3.25.4 HHS/HHT - Test Loads and Test Modes

Item No	Description	Required test modes		Recommended minimal in kN		
				SWL	Proof load	Breaking load
1	Twistlock (single)		Shear load	210	315	630
			Tensile load	250	375	750
			Compression load (bottom)	1200	1800	2400
2	Midlock		Shear load	210	315	630
			Tensile load	250	375	750
			Compression load (bottom)	1200	1800	2400
3	Pedestal socket		Pull-out load	250	375	750
			Tangential load	210	315	630
			Compression load	1200	1800	2400

Present	Amendment	Note
〈newly added〉	 Fig. 3.25.2 Configuration of HHS test equipments (fully automatic twistlock)	

Present	Amendment	Note
〈newly added〉	Table 3.25.5 HHS/HHT - Twistlock function test load | | Shear (kN) | Compression (kN) | Tension (kN) | Duration time (min.) | |---|---|---|---|---| | Step 1 | 150 | 350 | 50 | 2 | | Step 2 | 150 | 350 | 250 | 2 | | Step 3 | 150 | 350 | 300 | 2 | | Step 4 | 150 | 350 | 500 | 2 |  Fig. 3.25.3 Configuration of HHS test equipments (semi-automatic twistlock)	

Present	Amendment	Note
〈correction〉 2502. 6 operational test 2503. operation test 2503. 2 operating test Table 3.25.3 operation test 2503. 3 operational test 2503. 3 (1) operation test 2503. 3 (2) operating test 2503. 4 operating test Table operation test	〈correction〉 operational test / operation test / operating test → Function test	- Terminology correction (refer to ISO)

Present

〈Guidance〉

Ch.3 Type Approval

Section 25 Securing Devices

2501. 〈omit〉

2502. Type tests

1. 〈omit〉

Table 3.25.1 Design Braking Loads and Proof Loads *(2020)*

Item			Min. design breaking load (kN)	
			$SWL \leq 400$	$SWL > 400$
Lashings	Wire ripe		3 × SWL	–
	Rod	mild steel	3 × SWL	
		higher tensile steel	2 × SWL	
	Chain	mild steel	3 × SWL	
		higher tensile steel	2.5 × SWL	
Fittings and securing devices			2 × SWL	SWL+ 400

NOTES:

1. Higher tensile steel is defined for this purpose as steel having a yie N/mm^2
2. ~~Breaking and proof loads for lashings of material other than steel will be~~

2. ~ 6. 〈omit〉

2503. 〈omit〉

Amendment

〈Guidance〉

Ch.3 Type Approval

Section 25 Securing Devices

2501. 〈same as current〉

2502. Type tests

1. 〈same as current〉

Table 3.25.1 Design Braking Loads and Proof Loads *(2021)*

Item						
Lashings	Wire ripe			〈omit〉		〈omit〉
	Rod	mild steel				
		higher tensile steel				
	Chain	mild steel				
		higher tensile steel				
Fittings and securing devices						

NOTES:

1. Higher tensile steel is defined for this purpose as steel having a yield stress not less than 315 N/mm^2

(2. If a material other than steel is intended to be used for lashing equipment, it must be verified that the breaking load, proof load and other mechanical properties of the material are equivalent to that of steel.)

2. ~ 6. 〈same as current〉

2503. 〈same as current〉

Note

Guidance for Approval of Manufacturing Process and Type Approval, Etc.

2022. 02.

Machinery Rule Development Team

- Main Amendments -

(1) Effective date : 1 Jul. 2022 (Date of which contracts for construction are signed)

◉ Reflecting IACS UR M66 (Rev.4), the format for referencing standards has been developed.

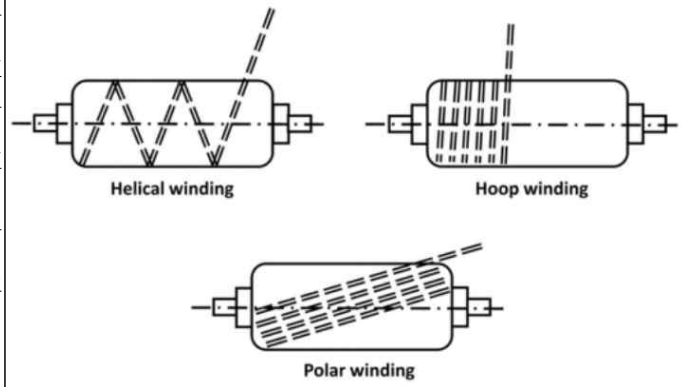
(2) Effective date : 1 Jul. 2022 (Date of the application for certification)

◉ The referencing standards for operational performance test for type tests of hydraulic motors and hydraulic pumps have been newly added.

◉ The requirements for composite material pressure vessels for fuel containment of compressed hydrogen gas have been newly established.

Present	Amendment	Note
# CHAPTER 3 TYPE APPROVAL ## Section 9 Crankcase Explosion Relief valves **901. Application** The requirements in this Section apply to tests and inspections for the type approval of crankcase explosion relief valves intended to be fitted to engines and gear cases in accordance with the requirements of **Pt 5, Ch 2, 203. 4.** of the Rules. This test procedure is only applicable to explosion relief valves fitted with flame arresters. **902. Data to be submitted** The following reference data are to be submitted to the Society in addition to those specified in **102.** (1) Accreditation certificate of test house (2) Details of test vessel and attachment (3) Test data performed previously at the manufacturer's works **903. Type tests** **1. Test houses** The test houses where testing is carried out are to be accredited to a National or International Standard, e.g. **KS Q ISO IEC 17025**, and the test facilities are to be equipped so that they can perform and record explosion testing in accordance with The requirements in this Section. (hereafter, omitted)	# CHAPTER 3 TYPE APPROVAL ## Section 9 Crankcase Explosion Relief valves **901. Application** The requirements in this Section apply to tests and inspections for the type approval of crankcase explosion relief valves intended to be fitted to engines and gear cases in accordance with the requirements of **Pt 5, Ch 2, 203. 4.** of the Rules. This test procedure is only applicable to explosion relief valves fitted with flame arresters. **902. Data to be submitted** The following reference data are to be submitted to the Society in addition to those specified in **102.** (1) Accreditation certificate of test house (2) Details of test vessel and attachment (3) Test data performed previously at the manufacturer's works **903. Type tests** **1. Test houses** The test houses where testing is carried out are to be accredited to a National or International Standard, e.g. **KS Q ISO IEC 17025:2017**, and the test facilities are to be equipped so that they can perform and record explosion testing in accordance with The requirements in this Section. (hereafter, same as the present)	〈Guidance for Approval of Manufacturing Process and Type Approval, Etc.〉 (Amendment) Reflecting IACS UR M66 (Rev.4), the format for referencing standards has been developed. 〈application date: the date of contract for construction on or after 1 July 2022〉

Present	Amendment	Note
CHAPTER 3 TYPE APPROVAL **Section 12 Hydraulic Motors and Hydraulic Pumps** **1201. Application** **1. ~ 2. 〈omitted〉** **1202. Type tests** **1.** The type tests are to be carried out on the hydraulic motors and hydraulic pumps random selected one for each type from the production line. **2.** The items of the type tests are to be, in principle, as follows: (1) Construction instruction (2) Pressure test (3) Operational performance test (A) Performance test (B) Continuous running test (C) Vibration test (D) Temperature rise test (E) Relief valve test (hereafter, omitted)	**CHAPTER 3 TYPE APPROVAL** **Section 12 Hydraulic Motors and Hydraulic Pumps** **1201. Application** **1. ~ 2. 〈same as the present〉** **1202. Type tests** **1.** The type tests are to be carried out on the hydraulic motors and hydraulic pumps random selected one for each type from the production line. **2.** The items of the type tests are to be, in principle, as follows: (1) Construction instruction (2) Pressure test (3) Operational performance test *(2022)* (A) Performance test (refer to KS V6731 (Shop test method for hydraulic pump at hydraulic steering gears for ships), etc.) (B) Continuous running test (refer to KS V6731 (Shop test method for hydraulic pump at hydraulic steering gears for ships), etc.) (C) Vibration test (refer to (KS B) ISO 10055 (Mechanical vibration-Vibration testing requirements for shipboard equipment and machinery components), etc.) (D) Temperature rise test (E) Relief valve test (hereafter, same as the present)	〈Guidance for Approval of Manufacturing Process and Type Approval, Etc.〉 (Amendment) Reflect Request for Establishment/Revision of Classification Technical Rules 'MET4600-12-2021' 〈application date: the date of application for certification on or after 1 July 2022〉

Amendment	Note
# CHAPTER 3 TYPE APPROVAL ## Section 40 Composite Material Pressure Vessels for Fuel Containment of Compressed Hydrogen Gas *(2022)* **4001. General** **1. Application** The requirements in this section apply to the test, etc. on the type approval of composite material pressure vessels for fuel containment of compressed hydrogen gas with an internal volume of 450L or less (hereinafter referred to as "vessels") that supplies hydrogen fuel to fuel cells in accordance with **Ch 2, 704.** of **Guidance for Fuel Cell Systems on Board of Ships**. **2. Definition** The definitions used in this section are as follows. (1) **Type 3** is a fully wrapped vessel in which a metal liner is wrapped with continuous fibers and synthetic resin. (2) **Type 4** is a fully wrapped vessel in which a non-metallic liner is wrapped with continuous fibers and synthetic resin. (3) **Autofrettage** is to causing permanent plastic deformation of a vessel with a metal liner by applying a pressure exceeding the yield point of the metal liner during the vessel manufacturing process. (4) **Full wrapped vessel** is a vessel in which continuous fibers impregnated with resin are wound on a liner by hoop winding or helical winding, etc. (5) **Hoop winding** is a method of winding fibers almost at right angles to the axis of the liner body during the process of filament winding (referring to winding continuous fibers impregnated with resin on a liner). (6) **Helical winding** is a method of winding fibers in a spiral shape around the axis of the liner body during the process of filament winding. (7) **Leakage** means leakage of contents through cracks or defects, but penetration through vessel body satisfying permeability test is not considered leakage. (8) **Liner** is an inner vessel made of metal or non-metal that is covered with fibers and synthetic resins. (9) **Burst pressure** is the highest pressure applied to vessels during the burst test. (10) **Minimum design burst pressure** means the minimum burst pressure specified by the manufacturer in the design of vessel. (11) **Working pressure** is the pressure when the vessel is actually used at a reference temperature of 15 ℃. For reference, there are vessels with a working pressure of 35 MPa or 70 MPa. (12) **Maximum charging pressure** is the maximum pressure during charging that satisfies 1.25 times or less of the working pressure at 85 °C.	〈Guidance for Approval of Manufacturing Process and Type Approval, Etc.〉 (Establishment) Addition of requirements for composite material pressure vessels for fuel containment of compressed hydrogen gas 〈effective date: the application date for certification on or after 01.Jul.2022〉 

Amendment	Note
(13) **Batch** means the following. (A) In the case of metal liners, the batch is a group of metal liners (as liners continuously manufactured with the same design, the same material, the same manufacturing process, the same heat treatment, the same manufacturing equipment, the same time, and the same atmosphere and temperature during heat treatment) in which the length of the manufactured vessels is in the range of ±50% of the batch average value. (B) In the case of non-metallic liners, the batch is a group of non-metallic liners (as liners continuously manufactured with the same design, the same material, the same manufacturing process, and the same manufacturing equipment) in which the length is in the range of ±50% of the average value of the manufactured vessels. (C) In the case of vessels, the batch is a group of vessels (as vessels continuously manufactured with the same design, the same material, the same manufacturing process, and the same autofrettage) in which the length is in the range of ±50% of the average value of the manufactured vessels. (D) In any case, each batch is to be in quantity less than 200 including the number of vessels consumed in the tests. **4002. Data to be submitted** The following reference data are to be submitted to the Society in addition to those specified in **102.** (1) Design information of vessel such as minimum design burst pressure, working pressure, diameter, length, volume, weight, type of valve thread, etc. (2) Design life and design charging cycles of vessel (3) Required information or notices for safe use and inspection of vessels (4) Type of vessel (Type 3, Type 4) (5) Specifications for metal liner materials, mechanical properties such as hardness and chemical composition (6) Pressure range of autofrettage, pressure test pressure, protection system against flames and details of the outer protective coating, etc. (7) Stress analysis report (8) material compatibility data (9) Details of manufacturing process, allowable tolerances, non-destructive tests, product inspection, etc. (10) In the case of Type 3 vessels, data on the extrusion molding, cold working, flow forming, heat treatment and cleaning processes of pipe materials when metal materials are used (11) Allowable defect size (data presented by the vessel manufacturer) for non-destructive tests (ultrasonic test or equivalent), etc.	

Amendment	Note
4003. Design and manufacture **1. General** (1) The design life of vessel is determined by the manufacturer and is not to exceed a maximum of 15 years. (2) Design charging cycle is calculated by the following formula. Design charging cycle = 1000+200•X where: X : Design life(years) (3) Design temperature of vessel is -40℃ to 85℃. (4) At least one thermally-activated pressure relief device is to be installed in a vessel to prevent explosion in case of fire. **2. Materials** (1) Materials are to have uniform quality. (2) Materials that are not in accordance with the design specifications of the vessel manufacturer are not to be used. (3) All materials that come into contact with hydrogen are to be compatible with hydrogen. (4) Dissimilar metal materials that are concerned about corrosion are not to be used in contact with each other. (5) Welded liners are not to be used. (6) Metallic material (Type 3 liner and Type 4 boss) (A) STS 316L is used for stainless steel used for vessels manufacturing, and Al 6061 T6 is used for aluminum alloy. (B) The materials for the boss and closing plug of Type 4 vessel is to be used to maintain performance such as bonding and airtightness to the liner, and materials that can prevent stress corrosion cracking are to be used. (7) Fiber materials (A) Glass fiber, aramid fiber or carbon fiber is used as the structural reinforcement filament material. When carbon fiber is used, appropriate measures such as insulation coating are taken to prevent galvanic corrosion with the metal parts of fuel vessel. Tensile test of carbon fiber is to be carried out in accordance with ASTM D 4018 or equivalent test methods. (B) Fibers for composite materials of vessels is to be used at least the minimum burst pressure ratio in **Table 3.40.1** depending on fiber type.	- TPRD(Thermally-activated Pressure Relief Device)

Amendment	Note

Table 3.40.1 Minimum burst pressure ratio(1)

Materials	Type of vessels	
	Type 3	Type 4
Glass fiber	3.4	3.5
Aramid fiber	2.9	3.0
Carbon fiber	2.25	2.25
Mixed fiber(2)	-	-

Note:
(1) Minimum burst pressure ratio = Fiber stress calculated at minimum burst pressure / Fiber stress calculated at working pressure
(2) When two or more different fibers are mixed and used, the modulus of elasticity of each fiber are to be taken into consideration. Stress ratio verification can be performed using a strain gage.

(8) Resin
(A) Resins for impregnation is thermosetting or thermoplastic. Shear strength test of resins may be conducted by (KS M) ISO 14130 or equivalent tests. Suitable resin materials include epoxies, modified epoxies, thermosetting resins of polyester and vinyl esters, and thermoplastic resins of polyethylene and polyamide.
(9) Materials for non-metallic liners (Type 4)
(A) Materials for non-metallic liners are to be suitable for the conditions of use.
(B) Softening points measured using (KS M) ISO 306 or appropriate methods are to be at least 100 ℃.
(C) Tensile strength and elongation are measured according to ASTM D 638.
(10) Vessel manufacturers are to conduct the tests of ASTM G 142-98 to confirm their suitability in a high pressure hydrogen environment for metal liner materials.

3. Manufacture

(1) Fibers are made by laminating continuous filament winding to liner. The winding of fibers is computerized or mechanically controlled, and fibers maintain a controlled tensile force while winding. While winding fibers, confirm that the following parameters are kept within the tolerance. The work results are kept by the vessel manufacturers for the design life of vessels.
(A) Fiber type
(B) Number of fibers per winding width
(C) Mixing ratio and mixing method of base (epoxy, etc.) and hardener of resin

Amendment	Note
(D) Weight, mixing volume ratio of resin and fiber (E) Winding angle (F) Number of turns (layers) of hoop winding (G) Number of turns (layers) of helical winding (H) Winding width (I) Tension during winding (J) Winding speed (K) Temperature of resin (2) Resins are to be cured after fiber winding is complete. Thermosetting resins are to be cured using heat under controlled time-temperature. The curing cycle (e.g. time-temperature records) during curing is to be documented and kept by the vessel manufacturer for the design life of vessels. (3) For aluminum alloy liners, the maximum curing time and temperature for vessel is to be less than the time and temperature that does not adversely affect the properties of metals, resins, and fibers. For Type 4 vessels, the curing temperature of resin is to be at least 10℃ lower than the softening temperature of plastic liner. (4) Autofrettage for Type 3 vessels is to be performed prior to pressure test. Autofrettage pressure is to be the pressure suggested by the vessel manufacturer, and the vessel manufacturer is to prove that the autofrettage was performed properly. Records of autofrettage are to be kept by the vessel manufacturer for the design life of vessels. (5) After molding, metal liners are to be heat treated to obtain the hardness value determined by the design condition. Local heat treatment is not permitted. (6) If a protective coating is included in the design, the coating is to be tested in accordance with (KS M) ISO 4624, ensuring that the coating process does not adversely affect the mechanical properties of vessels. **4004. Type tests** **1. Test items** (1) Test items at the time of new type approval and test items according to changes compared to design or manufacturing that have received type approval are in accordance with **Table 3.40.2**. (2) Secondary changes compared to the changed design or manufacture are to be regarded as new type approval and test items as a new type approval are to be applied.	

Amendment	Note

Table 3.40.2 Test items according to new and changes

New and changes	Test items for vessels										
	Material test	Burst test	Ambient temperature pressure cycle test	Leak before brake test	Flame exposure test	Defect test	Accelerated stress burst test	Extreme temperature pressure cycle test	Drop test	Permeability test	Tightness test, Boss torque test, Hydrogen gas repeated pressure test
New type approval	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	4	4
Changes of fabric manufacturer		3, 4	3, 4	3, 4			3, 4	3, 4	3, 4		
Material changes of metal liner	3	3	3		3	3	3	3	3		
Material changes of plastic liner	4		4					4		4	4
Material changes of fabric	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4	3, 4		
Material changes of resin						3, 4	3, 4	3, 4	3, 4		
Inner diameter changes ≤ 20%		3, 4	3, 4								
Inner diameter changes 〉 20%		3, 4	3, 4		3, 4	3, 4		3, 4	3, 4		
Changes of length ≤ 50%		3, 4									
Changes of length 〉 50%		3, 4	3, 4		3, 4				3, 4		
Changes of working pressure ≤ 20%(1)		3, 4	3, 4								
Changes of working pressure 〉 20%(1)		3, 4	3, 4	3, 4	3, 4						
Shape changes of dome		3, 4	3, 4								4
Size changes of opening		3, 4	3, 4								
Coating changes	3, 4										
Changes of boss (end plug)											4(2)
Changes of manufacturing process		3, 4	3, 4								
Changes of fire protection system					3, 4						

Note: 3 : Type 3 vessels, 4 : Type 4 vessels

(1) It is to be carried out when there is a proportional change in thickness due to change in diameter or pressure.

(2) If changes of stress at the neck are the same as the original value or decrease, hydrogen gas repeated pressurization test may not be performed.

Amendment	Note
2. Test methods (1) All test vessels collected for type tests are to be subjected to visual inspection and dimensional inspection according to the following prior to type tests. (A) Visual inspection: if vessels have no flaws, dents, cracks, etc. on the internal and external surfaces that interfere with use, and there are no defects and residues (debris, resin, etc.) generated during the manufacturing process that may cause harm to use, it is considered acceptable. (B) Dimensional inspection: If the dimensions of vessels satisfy the design allowable tolerance decided by the manufacturer, it is considered acceptable. (2) Test methods and acceptable criteria for type tests are to be in accordance with **Table 3.40.3**.	

Table 3.40.3 Type tests for composite material pressure vessels for fuel containment of compressed hydrogen gas

Test items			Test methods	Acceptable criteria
Material test	Material tests are carried out according to the following for randomly sampled vessels.			
	Liner tensile test		If liner material is aluminum alloy, one liner according to 10.2 of (KS B) ISO 7866, if liner material is stainless steel, one liner according to 7.1.2.1 of EN 1964-3, if liner material is plastic, two liners according to (KS M) ISO 527-2, tensile test is to be carried out at -40 °C.	If it is within the range suggested by the manufacturer, it is considered acceptable.
	Liner Impact test		For stainless steel liners, liner impact test is to be carried out in accordance with 7.1.2.4 of EN 1964-3.	If it satisfies the criteria of 7.1.2.4 of EN 1964-3, it is considered acceptable.
	Corrosion resistance test		For aluminum alloy liners, corrosion resistance test is to be carried out in accordance with Annex A of (KS B) ISO 7866.	If it satisfies the criteria of Annex A of KS B ISO 7866, it is considered acceptable.
	Stress crack resistance test		For aluminum alloy liners, stress crack resistance test is to be carried out in accordance with Annex B of (KS B) ISO 7866.	If it satisfies the criteria of Annex B of (KS B) ISO 7866, it is considered acceptable.
	Softening temperature test		One randomly sampled plastic liner is to be carried out according to Method A50 of (KS M) ISO 306.	If softening temperature is 100°C or higher, it is considered acceptable.
	Glass transition temperature test		Glass transition temperature tests of resin for three randomly sampled vessels are to be carried out by ASTM D 3418 or an equivalent method.	If test result is within the specifications decided by the manufacturer, it is considered acceptable.
	Resin shear strength test		Resin shear strength test is to be carried out with three specimens according to (KS M) ISO 14130.	If minimum shear strength of composite material measured after boiling in water for 24 hours is 13.8 MPa, it is considered acceptable.
	Protective coating test	Protective coating test is to be carried out on vessel with a protective coating (organic coating or paint, etc.) as follows.		
		Adhesion test	Adhesion test is to be carried out by the test method A or B of (KS M) ISO 4624.	Grade 4 or higher is considered acceptable.
		Flexibility test	Flexibility test is to be carried out at -20 °C with a mandrel of 12.7 mm in method B of ASTM D 522.	If no cracks in the exterior occur, it is considered acceptable.
		Impact resistance test	Impact resistance test is to be carried out according to ASTM D 2794.	If coating passes impact test of 18J at room temperature, it is considered acceptable.
	Light and moisture exposure test		Light and moisture exposure tests are to be carried out for 1000 hours according to ASTM G 154.	If there is no swelling and the adhesion is grade 3 or higher and the maximum loss of gloss is 20% or less according to (KS M) ISO 4628, it is considered acceptable.

Table 3.40.3 Type tests for composite material pressure vessels for fuel containment of compressed hydrogen gas (continued)

Test items		Test methods	Acceptable criteria
Material test	Salt mist test	Salt mist test is to be carried out for 500 hours according to ASTM B 117.	If undercut does not exceed 3 mm from the initial surface and there is no swelling, test and adhesion is grade 3 or higher according to (KS M) ISO 4628.
Burst test		Burst test is to be carried out according to the following methods for three randomly sampled vessels. (1) Fill vessels with a fluid, such as water, and gradually increase the pressure until vessel burst. In this case, a pressure measuring device is to be installed and the pressure in the vessels is to be monitored whether the pressure increase rate exceeds 0.35 MPa/s as follows. (A) At 80 % or more of minimum burst pressure, if the pressurization speed is less than 0.35 MPa/s, pressurize until burst (B) At 80 % or more of minimum burst pressure, if the pressurization speed is 0.35 MPa/s or more and 1.4 MPa/s or less, place vessels between pressure pump and pressure sensor, or hold for 5 seconds at minimum design burst pressure and pressurize until burst	If actual burst pressure of vessel exceeds minimum design burst pressure and satisfies stress ratio requirements specified in the design, it is considered acceptable.
Ambient temperature pressure cycle test		Ambient temperature pressure cycle test is to be carried out according to the following methods for two randomly sampled vessels. (1) Carry out ambient temperature pressure cycle test with a fluid such as water at ambient temperature. (2) Repeatedly apply pressure from pressure of 2 MPa or less to pressure of 1.25 times or more of working pressure. (3) Repetition period is to be less than 10 times per minute, and total number of cycle is to be at least 3 times the design charging cycle.	If there is no burst or leakage, it is considered acceptable. (If burst occurs during cycle test for 9 times the design charging cycle, record the number of cycle until burst, and record the initial location and description of burst.) * If cycle test of 9 times or more of the design charging cycle is carried out for both vessels without burst or leakage, the following Leak before brake (3 vessels) may not be carried out.
Leak before brake test		Leak before brake test is to be carried out according to the following methods for three randomly sampled vessels. (1) Repeatedly apply pressure from pressure of 2 MPa or less to pressure of 1.5 times or more of working pressure. (2) Repetition period is to be less than 10 times per minute, and total number of cycle is to be at least 3 times the design charging cycle.	There is to be no burst, and it is considered acceptable in case of leakage.
Flame exposure test		Flame exposure test is carried out according to the following methods for one randomly sampled vessel. (1) Fill vessel with hydrogen gas to working pressure. (2) Vessel is to be located horizontally 100 mm above flame source.	

Table 3.40.3 Type tests for composite material pressure vessels for fuel containment of compressed hydrogen gas (continued)

Test items	Test methods	Acceptable criteria
Flame exposure test	(3) Valves, fittings and pressure relief devices of vessels are protected by plates to prevent direct heating of the flame. The plates must not come into direct contact with the flame protection system (pressure relief devices, vessel valves, etc.). (4) The temperature of vessel surface is measured with at least 5 thermocouples (installed 2 or more in the local combustion area, 3 or more in the remaining area) at the 25 mm ± 10 mm point of vessel bottom, and the distance between each thermocouple is to be kept below 0.5 m. Temperatures are recorded at intervals of not more than 10 seconds. (5) Take measures to block the wind for constant heat supply. (6) First, at the point below the area (local area) farthest from pressure relief device, ignite with the width of the flame source not more than 250 mm ± 10 mm. At this time, the width of flame source is not to surround the diameter of vessel. (7) After ignition, reach 600°C within 3 minutes and maintain the temperature for 7 minutes thereafter. At this time, maximum temperature is not to exceed 900℃. (8) After ignition of local area, apply a uniform flame with a length of 1.65 m to the entire vessel. In this case, the fuel used as flame source is to be capable of providing uniform heat and sufficient temperature. (9) After ignition, reach 800℃ within 2 minutes and maintain the temperature. At this time, maximum temperature is not to exceed 1,100℃. (10) The test is carried out until all the gas inside vessel is released (pressure of vessel is 1 MPa or less).	If the gas is discharged through thermally activated pressure relief device without burst of vessel, it is considered acceptable. * Record the elapsed time time until the gas starts to be discharged through the pressure relief device, the maximum pressure, and the discharge time until pressure of 1 MPa or less is reached.
Defect test	Defect test is to be carried out according to the following methods for one randomly sampled vessel. (1) Make two defects in the longitudinal direction on the outer wall of sample vessel. The size of one defect is to be 25 mm in length and 1.25 mm in depth, and the size of the other defect is to be 200 mm in length and 0.75 mm in depth or more. (2) Fill the defective vessel with a fluid such as water at ambient temperature, and carry out cycle test from pressure of 2 MPa or less to pressure of 1.25 times or more of working pressure for 3 times the design charging cycle.	If vessel has no leakage or burst under 0.6 times the design charging cycle and there is only leakage during cycle test thereafter, it is considered acceptable.
Accelerated stress burst test	Accelerated stress burst test is to be carried out according to the following methods for one randomly sampled vessel. (1) Pressurize vessel with water at 85°C to pressure of 1.25 times of working pressure. (2) Vessel maintains the pressure and temperature for 1000 hours. (3) Burst test is carried out.	If burst pressure exceeds 85% of minimum design burst pressure, it is considered acceptable.

Table 3.40.3 Type tests for composite material pressure vessels for fuel containment of compressed hydrogen gas (continued)

Test items	Test methods	Acceptable criteria
Extreme temperature pressure cycle test	Extreme temperature pressure cycle test is to be carried out according to the following method for one randomly sampled vessel that is not coated. (1) Fill vessel with a fluid such as water, and maintain it at internal pressure of 2 MPa or less, temperature of 85°C or more, and relative humidity of 95% or more for 48 hours. (Using chamber, etc.) (2) Carry out pressure cycle test for 1.5 times the design charging cycle from pressure of 2 MPa or less to pressure of 1.25 times or more of working pressure under the condition of maintaining temperature of 85℃ or more and relative humidity of 95% or more. (3) After stabilization at ambient temperature, the temperature of vessel and the fluid inside vessel is maintained at -40°C. (4) While maintaining the temperature below -40℃, carry out pressure cycle test for 1.5 times the design charging cycle from pressure of 2 MPa or less to working pressure. Ensure that the minimum temperature of the fluid is maintained during the low-temperature repeat test. (5) Repetition period is not to exceed 10 times per minute in the case of high temperature pressure cycle test. (6) Burst test is to be carried out. For Type 4 vessels, Tightness test is to be carried out and then burst test is to be carried out.	During extreme temperature pressure cycle test, if there is no burst, leakage, or fiber loosening in vessel, and burst pressure of vessel is 85% or more of minimum design burst pressure, it is considered acceptable.
Drop test	Drop test is to be carried out according to the following methods for one randomly sampled vessel. (1) Use one empty vessel with no valve attached, or use up to three vessels for each test. Drop it onto a flat, horizontal concrete pad or hard surface at ambient temperature. A plug may be used to prevent impact damage to the threads and seal surfaces. (2) Drop horizontally from height of 1.8 m from the floor. (3) Fall vertically from height sufficient to generate more than 488 J of momentum (however, do not exceed 1.83 m). (4) Sample vessel is dropped from height where the center of gravity of vessel is 1.8 m so that the dome part of vessel touches the floor at an angle of 45° with the bottom of vessel. In this case, if the length of vessel is long and the height of lower part of vessel is less than 0.6 m, the drop angle is changed to maintain the minimum drop height of 0.6 m and the center of gravity is adjusted to maintain 1.8 m. Drop once at 45° angle then rotate 90° and fall again at 45° angle.	If vessel has no leakage or burst under 0.6 times the design charging cycle and there is only leakage during cycle test thereafter, it is considered acceptable.

Table 3.40.3 Type tests for composite material pressure vessels for fuel containment of compressed hydrogen gas (continued)

Test items	Test methods	Acceptable criteria
Drop test	(5) It is allowed for vessel to bounce back to the concrete floor after first drop, but no measures are to be taken to prevent such secondary impact. (6) After drop test, fill vessel with fluid such as water, and carry out cycle test from pressure of 2 MPa or less to pressure of 1.25 times or more of working pressure for 3 times the design charging cycle.	
Tightness test	Tightness test is to be carried out according to the following methods for one Type 4 vessel randomly sampled. (1) Dry vessel so that there is no moisture. (2) Fill with nitrogen containing detectable gas such as hydrogen or helium and maintain the pressure for at least 3 minutes to working pressure.	If no gas leakage through cracks or defects is detected, it is considered acceptable. * Permeation through vessel body that satisfies permeability test below is not considered leakage.
Permeability test	Permeability test is to be carried out according to the following methods for one Type 4 vessel randomly sampled. (1) Fill hydrogen with working pressure, and put vessel in a 15±2℃ airtight chamber, and record the amount of hydrogen gas permeated for 500 hours or while the steady state is maintained for at least 48 hours.	If the permeation rate of hydrogen gas in the stable state is 6.0 Ncm^3/h/ℓ or less, it is considered acceptable.
Boss torque test	Boss torque test is to be carried out according to the following methods for one Type 4 vessel randomly sampled. (1) Fix the body of vessel so that it does not rotate. (2) Tighten boss to twice the torque suggested by the manufacturer for installing the valve or pressure relief device. (3) Torque is measured first in the tightening direction, then in the loosening direction, and finally in the tightening direction. (4) Tightness test and burst test are to be carried out respectively for vessel.	If the results of tightness test and burst test satisfy each acceptable criteria, it is considered acceptable.
Hydrogen gas repeated pressure test	Hydrogen gas repeated pressure test is to be carried out according to the following methods for one Type 4 vessel randomly sampled. (1) Repeatedly pressurize 1,000 times using hydrogen gas from pressure of 2 MPa or less to pressure not less than working pressure. At this time, the charging time is to be 5 minutes or less, and the temperature at the time of gas release is not to exceed the range of -40°C to 85°C. (2) During the test, measure the temperature of gas using temperature sensor. (3) Check whether the temperature at the time of charging and discharging is within working condition. (4) After hydrogen gas repeated pressure test is completed, tightness test is to be carried out.	If there is no deterioration such as fatigue cracking or discharge of static electricity at the interface between plastic liner and boss, it is considered acceptable.

Amendments of the Guidance for Approval of Manufacturing Process and Type Approval, Etc.

Hull Rule Development Team

- Main Amendments -

(1) Effective date : 1 July 2020 (The contract date for ship construction)

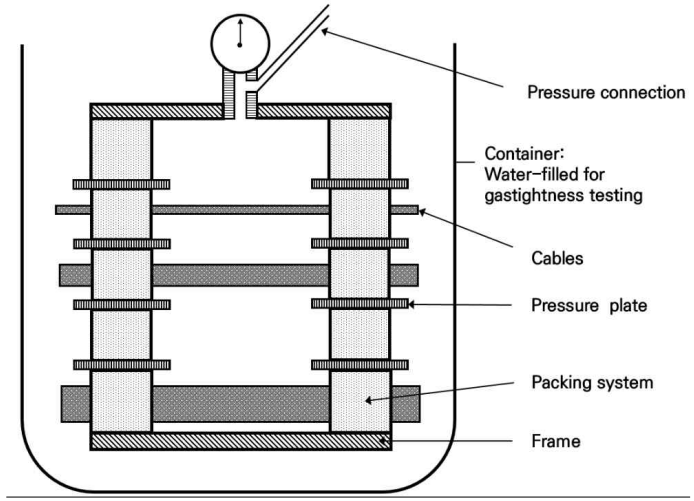
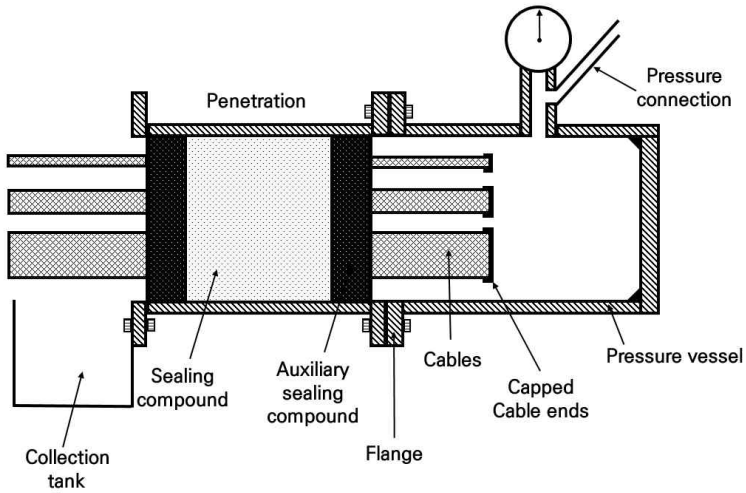
◉ Follow-up measures for IACS UR Z23(Rev.7 Oct 2020)

- Type approval for cables passing through watertight bulkheads and decks is newly added.

(1) Effective date : 1 July 2021

(The contract date for ship construction)

Present	Amendment	Note
CHAPTER 3 TYPE APPROVAL **Section 1 ~ Section 37 〈omitted〉** 〈newly added〉	**CHAPTER 3 TYPE APPROVAL** **Section 1 ~ Section 37 〈same as the current Guidances〉** **Section 38 Cable Transits through watertight bulkheads and decks *(2021)*** **3801. Application** 1. The requirements in this Section apply to tests and inspection for the type approval of cable transits which cables pass through watertight bulkheads and decks in accordance with the requirements in **Pt 6, Ch 1, 508. 1** of the Rules. **3802. Data to be submitted** The following reference data are to be submitted to the Society in addition to those specified in 102. (1) Product details and scope of service (2) Detail drawing of penetration and test layout including type and cross-section of the cables, distance between cables, distance between cable and the sleeve, thickness and length of the sleeve etc. (3) In case of compound system, the mixture ratio of the main composition (4) Work and maintenance manual **3803. Type tests** (1) cable selection The transit(s) is to be tested incorporating a range of different type of cables and is to be provided with an assembly which represents a practical situation which may be found on ships.	- Follow-up measure related to IACS UR Z23(Rev. 7 Oct. 2020)

Present	Amendment	Note
〈newly added〉	(2) Preparation of the specimens Specimens are prepared in accordance with the manufacturer's installation and work instructions and tests shall be conducted with specimens of minimum and maximum fill for each minimum and maximum size based on the cross-sectional area. The arrangement of watertightness and gastightness tests is to be in accordance with Figs. 1 and 2.  Fig. 1 Arrangement for testing the watertightness and gastightness of a packing system  Fig. 2 Arrangement for testing watertightness and gastightness of a sealing compound system	

Present	Amendment	Note
〈newly added〉	(3) Watertightness testing Cable transits through watertight bulkheads or decks are to be so constructed that they are capable of withstanding a hydraulic test pressure conforming to the following conditions. Step 1: the specimen shall be tested for a period of at least 30 minutes under hydraulic pressure equal to the test pressure minimum 1.0 bar, No leaks are to be allowed during this test. Step 2: the specimen shall be tested for an additional 30 minutes against the design pressure (minimum 2.5 bar) of the installation site. The quantity of water leakage shall not exceed 1 liter. A hydrostatic pressure is to be not less than 1.5 times the nominal pressure. (4) Airtightness test If gastightness is required for the cable transits, it is to be so constructed that they are cable of withstanding for a period of at least 30 minutes under hydraulic pressure equal to the test pressure minimum 30 mbar. No leaks are to be allowed during this test and air is to be allowed as the test medium.	