Certificate No: LR23183900TA
Issue Date: 02/05/2023
Expiry Date: 06/03/2028
Reference: HMD 10035-03, Issue No. 4

LLOYD'S REGISTER TYPE APPROVAL – DESIGN APPRAISAL DOCUMENT

Issued by: Hamburg Technical Support Office (HPC 1210317/1861024)
Issued to: HKS GmbH
For: Stainless Steel Exhaust Gas Expansion Joint

This Marine Design Appraisal Document supersedes and cancels document number HMD 10035-03, Issue No. 3, dated 25.10.2018

The undernoted documents have been reviewed for compliance with the requirements of the Lloyd's Register Type Approval System Procedure TA14 Version 04 (September 2020) and this Design Appraisal Document forms part of the Certificate.

COMMENTS

1. Expansion joints are to be tested by hydraulic pressure to the surveyor's satisfaction as per Part 5, Chapter 12, Section 8.1 of the Rules and Regulations for the Classification of Ships, as applicable.

2. Temperature, inner pressure, movement and load cycle of the expansion joints are directly related. Therefore deviations from the approved ratings are excluded from the Design Appraisal Document.

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LR031.2022

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DETAILS OF AXIAL EXPANSION JOINTS

Type		AN, ANX, AF, AFX
Material		1.4541/1.4571
Design Pressure, bar	DN 100 – DN 175	2.5
	DN 200 – DN 2400	1.5
Test Pressure, bar	DN 100 – DN 175	3.75
	DN 200 – DN 2400	2.25
Design Temperature, °C		550
Life Cycles		1000

RATINGS OF AXIAL EXPANSION JOINTS

Type	Nominal Diameter [mm]	Axial Movement [mm]	Lateral Movement [mm]	Angular Movement [rad]
AN0100/003/A040/Bs/Bs-150	100	± 20	-	-
AN0125/003/A050/Bs/Bs-200	125	± 25	-	-
AN0150/003/A033/Bs/Bs-340	150	± 16.5	-	-
AN0175/003/A040/B/B-200	175	± 20	-	-
AN0200-2,5-A050-BB-170	200	± 25	-	-
AN0250-2,5-A070-BB-200	250	± 35	-	-
AN0300-2,5-A070-BB-250	300	± 35	-	-
AN0350-2,5-A120-BB-300	350	± 60	-	-
AN0400-2,5-A140-BB-365	400	± 70	-	-
AN0450-2,5-A150-BB-360	450	± 75	-	-
AN0500-2,5-A160-BB-360	500	± 80	-	-
AN0550-2,5-A140-BB-360	550	± 70	-	-
AN0600-2,5-A130-BB-330	600	± 65	-	-
AN0650-2,5-A150-BB-340	650	± 75	-	-
AN0700-2,5-A050-BB-175	700	± 25	-	-
AN0800-2,5-A120-BB-290	800	± 60	-	-
AN0900-2,5-A100-BB-280	900	± 50	-	-
AN1000-2,5-A130-BB-440	1000	± 65	-	-
AN1100-2,5-A140-BB-330	1100	± 70	-	-
AN1200-2,5-A130-BB-340	1200	± 65	-	-

RATINGS OF AXIAL EXPANSION JOINTS, cont.

Type	Nominal Diameter [mm]	Axial Movement [mm]	Lateral Movement [mm]	Angular Movement [rad]
AN1300-2,5-A150-BB-410	1300	± 75	-	-
AN1400-2,5-A090-BB-275	1400	± 45	-	-
AN1500-2,5-A100-BB-275	1500	± 50	-	-
AN1600-2,5-A110-BB-270	1600	± 55	-	-
AN1800-2,5-A110-BB-280	1800	± 55	-	-
AN2000-2,5-A110-BB-310	2000	± 55	-	-
AN2200-2,5-A120-BB-310	2200	± 60	-	-
AN2400-2,5-A120-BB-320	2400	± 60	-	-

DETAILS OF UNIVERSAL EXPANSION JOINTS

Type		AM, AP, APX
Material		1.4541/1.4571
Design Pressure, bar	DN 100 – DN 175	2.5
	DN 200 – DN 2400	1.5
Test Pressure, bar	DN 100 – DN 175	3.75
	DN 200 – DN 2400	2.25
Design Temperature, °C		550
Life Cycles		1000

RATINGS OF AXIAL EXPANSION JOINTS

Type	Nominal Diameter [mm]	Axial Movement [mm]	Lateral Movement [mm]	Angular Movement [rad]
AM0100/003/A080/Bs/Bs-550	100	± 40	-	-
		-	± 40	-
AM0125/003/A060/Bs/Bs-350	125	± 30	-	-
		-	± 30	-
AM0150/003/A060/Bs/Bs-340	150	± 30	-	-
		-	± 20	-

RATINGS OF AXIAL EXPANSION JOINTS, cont.

Type	Nominal Diameter [mm]	Axial Movement [mm]	Lateral Movement [mm]	Angular Movement [rad]
AM0175/003/A064/Bs/Bs-200	175	± 32	-	-
		-	± 40	-
AM0200-2,5-A084-BB-780	200	± 42	-	-
AM0250-2,5-A100-BB-480	250	± 50	-	-
AM0300-2,5-A100-BB-475	300	± 50	-	-
AM0350-2,5-A120-BB-435	350	± 60	-	-
AM0400-2,5-A120-BB-495	400	± 60	-	-
AM0450-2,5-A130-BB-470	450	± 65	-	-
AM0500-2,5-A180-BB-590	500	± 90	-	-
AM0550-2,5-A120-BB-450	550	± 60	-	-
AM0600-2,5-A160-BB-450	600	± 80	-	-
AM0650-2,5-A160-BB-450	650	± 80	-	-
AM0700-2,5-A170-BB-520	700	± 85	-	-
AM0800-2,5-A140-BB-500	800	± 70	-	-
AM0900-2,5-A200-BB-500	900	± 100	-	-
AM1000-2,5-A252-BB-630	1000	± 126	-	-
AM1100-2,5-A130-BB-500	1100	± 65	-	-
AM1200-2,5-A220-BB-970	1200	± 110	-	-
AM1300-2,5-A100-BB-420	1300	± 50	-	-
AM1400-2,5-A200-BB-600	1400	± 100	-	-
AM1500-2,5-A180-BB-1300	1500	± 90	-	-
AM1600-2,5-A200-BB-535	1600	± 100	-	-
AM1800-2,5-A200-BB-535	1800	± 100	-	-
AM2000-2,5-A200-BB-595	2000	± 100	-	-
AM2200-2,5-A200-BB-595	2200	± 100	-	-
AM2400-2,5-A200-BB-605	2400	± 100	-	-

APPROVAL DOCUMENTATION

-	Application Checklist	23.03.2023
-	HKS Type Designation	24.05.2012
AN0100	EJMA Calculation	24.09.2018
AN0125	EJMA Calculation	24.09.2018
AN0150	EJMA Calculation	24.09.2018
AN0175	EJMA Calculation	24.09.2018
AN0200-2,5-A050-BB-170	EJMA Calculation	04.11.2013
AN0250-2,5-A070-BB-200	EJMA Calculation	04.11.2013
AN0300-2,5-A070-BB-250	EJMA Calculation	04.11.2013
AN0350-2,5-A120-BB-300	EJMA Calculation	04.11.2013
AN0400-2,5-A140-BB-365	EJMA Calculation	04.11.2013
AN0450-2,5-A150-BB-360	EJMA Calculation	04.11.2013
AN0500-2,5-A160-BB-360	EJMA Calculation	04.11.2013
AN0550-2,5-A140-BB-360	EJMA Calculation	04.11.2013
AN0600-2,5-A130-BB-330	EJMA Calculation	04.11.2013
AN0650-2,5-A150-BB-340	EJMA Calculation	04.11.2013
AN0700-2,5-A050-BB-175	EJMA Calculation	04.11.2013
AN0800-2,5-A120-BB-290	EJMA Calculation	04.11.2013
AN0900-2,5-A100-BB-280	EJMA Calculation	04.11.2013
AN1000-2,5-A130-BB-440	EJMA Calculation	04.11.2013
AN1100-2,5-A140-BB-330	EJMA Calculation	04.11.2013
AN1200-2,5-A130-BB-340	EJMA Calculation	04.11.2013
AN1300-2,5-A150-BB-410	EJMA Calculation	04.11.2013
AN1400-2,5-A090-BB-275	EJMA Calculation	04.11.2013
AN1500-2,5-A100-BB-275	EJMA Calculation	04.11.2013
AN1600-2,5-A110-BB-270	EJMA Calculation	28.01.2014
AN1800-2,5-A110-BB-280	EJMA Calculation	04.11.2013
AN2000-2,5-A110-BB-310	EJMA Calculation	28.01.2014
AN2200-2,5-A120-BB-310	EJMA Calculation	29.01.2014
AN2400-2,5-A120-BB-320	EJMA Calculation	04.11.2013
AM0100-axial	EJMA Calculation	24.09.2018
AM0100-lateral	EJMA Calculation	24.09.2018
AM0125-axial	EJMA Calculation	24.09.2018
AM0125-lateral	EJMA Calculation	24.09.2018
AM0150-axial	EJMA Calculation	24.09.2018
AM0150-lateral	EJMA Calculation	24.09.2018
AM0175-axial	EJMA Calculation	24.09.2018

APPROVAL DOCUMENTATION, cont.

AM0175-lateral	EJMA Calculation	24.09.2018
AM0200-2,5-A084-BB-780	EJMA Calculation	04.11.2013
AM0250-2,5-A100-BB-480	EJMA Calculation	04.11.2013
AM0300-2,5-A100-BB-475	EJMA Calculation	04.11.2013
AM0350-2,5-A120-BB-435	EJMA Calculation	04.11.2013
AM0400-2,5-A120-BB-495	EJMA Calculation	04.11.2013
AM0450-2,5-A130-BB-470	EJMA Calculation	04.11.2013
AM0500-2,5-A180-BB-590	EJMA Calculation	04.11.2013
AM0550-2,5-A120-BB-450	EJMA Calculation	05.11.2013
AM0600-2,5-A160-BB-450	EJMA Calculation	05.11.2013
AM0650-2,5-A160-BB-450	EJMA Calculation	05.11.2013
AM0700-2,5-A170-BB-520	EJMA Calculation	05.11.2013
AM0800-2,5-A140-BB-500	EJMA Calculation	05.11.2013
AM0900-2,5-A200-BB-500	EJMA Calculation	05.11.2013
AM1000-2,5-A252-BB-630	EJMA Calculation	05.11.2013
AM1100-2,5-A130-BB-500	EJMA Calculation	02.12.2013
AM1200-2,5-A220-BB-970	EJMA Calculation	05.11.2013
AM1300-2,5-A100-BB-420	EJMA Calculation	05.11.2013
AM1400-2,5-A200-BB-600	EJMA Calculation	05.11.2013
AM1500-2,5-A180-BB-1300	EJMA Calculation	02.12.2013
AM1600-2,5-A200-BB-535	EJMA Calculation	02.12.2013
AM1800-2,5-A200-BB-535	EJMA Calculation	02.12.2013
AM2000-2,5-A200-BB-595	EJMA Calculation	02.12.2013
AM2200-2,5-A200-BB-595	EJMA Calculation	29.01.2004
AM2400-2,5-A200-BB-605	EJMA Calculation	02.12.2013

TEST REPORTS

PRJ11100360238-2	PQA Form - Rostock	04.04.2022
PRA 2200087	PQA Form - Litomerice	11.03.2022

DRAWINGS

2906209-6-A, rev. A	HKS-Universal-Expansion-Joint	09.06.2009
3303000, rev. A	HKS-Universal-Expansion-Joint	09.06.2009
LR-AN100, rev. -	AN 0100	15.05.2018
LR-AN125, rev. -	AN 0125	22.02.2018
LR-AN150, rev. -	AN 0150	15.05.2018
LR-AN200 XX, rev. -	AN 0200	23.07.2008
LR-AN250 XX, rev. -	AN 0250	23.07.2008
LR-AN300 XX, rev. -	AN 0300	23.07.2008
LR-AN350 XX, rev. -	AN 0350	23.07.2008
LR-AN400 XX, rev. -	AN 0400	23.07.2008
LR-AN450 XX, rev. -	AN 0450	23.07.2008
LR-AN500 XX, rev. -	AN 0500	23.07.2008
LR-AN550 XX, rev. -	AN 0550	23.07.2008
LR-AN600 XX, rev. -	AN 0600	23.07.2008
LR-AN650 XX, rev. -	AN 0650	23.07.2008
LR-AN700 XX, rev. -	AN 0700	23.07.2008
LR-AN800 XX, rev. -	AN 0800	23.07.2008
LR-AN900 XX, rev. -	AN 0900	23.07.2008
LR-AN1000 XX, rev. -	AN 1000	24.07.2008
LR-AN1100 XX, rev. -	AN 1100	23.07.2008
LR-AN1200 XX, rev. -	AN 1200	24.07.2008
LR-AN1300 XX, rev. -	AN 1300	23.07.2008
LR-AN1400 XX, rev. -	AN 1400	24.07.2008
LR-AN1500 XX, rev. -	AN 1500	25.07.2008
LR-AN1600 XX, rev. 01	AN 1600	25.07.2008
LR-AN1800 XX, rev. -	AN 1800	25.07.2008
LR-AN2000 XX, rev. 01	AN 2000	25.07.2008
LR-AN2200 XX, rev. 01	AN 2200	03.12.2013
LR-AN2400 XX, rev. -	AN 2400	03.12.2013
LR-AM100, rev. -	AM 0100	22.02.2018
LR-AM125, rev. -	AM 0125	15.05.2018
LR-AM150, rev. -	AM 0150	22.02.2018
LR-AM175, rev. -	AM 0175	15.05.2018
LR-AM0200 XX, rev. -	AM 0200	11.11.2013
LR-AM0250 XX, rev. 01	AM 0250	11.11.2013
LR-AM0300 XX, rev. -	AM 0300	13.11.2013
LR-AM0350 XX, rev. -	AM 0350	13.11.2013

DRAWINGS, cont.

LR-AM0400 XX, rev. -	AM 0400	13.11.2013
LR-AM0450 XX, rev. -	AM 0450	13.11.2013
LR-AN0500 XX, rev. -	AM 0500	13.11.2013
LR-AM0550 XX, rev. -	AM 0550	18.11.2013
LR-AN0600 XX, rev. -	AM 0600	18.11.2013
LR-AN0650 XX, rev. -	AM 0650	18.11.2013
LR-AM0700 XX, rev. -	AM 0700	18.11.2013
LR-AM0800 XX, rev. -	AM 0800	18.11.2013
LR-AM0900 XX, rev. -	AM 0900	18.11.2013
LR-AM1000 XX, rev. -	AM 1000	28.11.2013
LR-AM1100 XX, rev. -	AM 1100	02.12.2013
LR-AM1200 XX, rev. -	AM 1200	02.12.2013
LR-AM1300 XX, rev. -	AM 1300	02.12.2013
LR-AM1400 XX, rev. -	AM 1400	02.12.2013
LR-AM1500 XX, rev. -	AM 1500	02.12.2013
LR-AM1600 XX, rev. -	AM 1600	02.12.2013
LR-AM1800 XX, rev. -	AM 1800	02.12.2013
LR-AM2000 XX, rev. -	AM 2000	02.12.2013
LR-AM2200 XX, rev. 01	AM 2200	02.12.2013
LR-AM2400 XX, rev. -	AM 2400	02.12.2013

Supplementary Type Approval Terms and Conditions

Type Approval certifies that a representative sample of the product(s) referred to herein has/have been found to meet the applicable design criteria for the use specified herein. It does not mean or imply approval for any other use, nor approval of any product(s) designed or manufactured otherwise than in strict conformity with the said representative sample.

Type Approval is based on the understanding that the manufacturer's recommendations and instructions and any relevant requirements of the Rules and Regulations are complied with.

Type Approval does not eliminate the need for normal inspection and survey procedures required by the Rules and Regulations. Lloyd's Register EMEA reserves the right to cancel or withdraw this Type Approval Certificate in accordance with the Lloyd's Register Type Approval System Procedure.