Certificate No: LR26198385TA
Issue Date: 09/04/2026
Expiry Date: 08/04/2031

Type Approval Certificate

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

Manufacturer	**Hanjo Co., Ltd.**
Address	20, Namhangseo-ro, Yeongdo-gu, Busan, 49050, South Korea
Type	Metal Expansion Joint
Description	Metallic Double wall Type Expansion Joints HJ-DWS : Double wall single type Expansion Bellows HJ-DWU: Double wall universal type Expansion Bellows
Trade Name	HJ-DWS, HJ-DWU
Application	Marine use for duel fuel engine associated piping system
Specified Standard	Lloyd's Register's Rules and Regulations for the Classification of Ships, July 2025, Part 5, Chapter 12 Lloyd's Register Rules and Regulations - Rules and Regulations for the Construction and Classification of Ships for the Carriage of Liquefied Gases in Bulk, July 2025, Chapter 5.13 Lloyd's Register Rules and Regulations - Rules and Regulations for the Classification of Ships using Gases or other Low-flashpoint Fuels, July 2025, Part B-1-16. Standards of the Expansion Joint Manufacturers Association, Inc.
Ratings	HJ-DWS-1

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Medium (Inner/ Outer) : Natural gas / Air
Construction details : Single, unreinforced
Design pressure (bar) : 10
Design temperature (°C) : 0 ~ + 70
Nominal pipe diameter (Inner/ Outer) : 32A/65A
Convolution pitch/height (Inner, Outer)(mm) : 7/6, 9/8
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.3/0.4
DWG no. BH3-058889-0.1

HJ-DWS-2
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Single, unreinforced
Design pressure (bar) : 10
Design temperature (°C) : 0 ~ + 100
Nominal pipe diameter (Inner/ Outer) : 50A/80A
Convolution pitch/height (Inner, Outer)(mm) :10/8, 11/12
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.4/0.4
DWG no. B91-072348-7.1 & B91-310791-1.1

HJ-DWS-4
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Single, unreinforced
Design pressure (bar) : 10
Design temperature (°C) : 5 ~ +50
Nominal pipe diameter (Inner/ Outer) : 80A/125A
Convolution pitch/height (Inner, Outer)(mm) : 16/10, 16/12
Number of plies (Inner/ Outer) : 2/3
Thickness of ply (mm) : 0.4
DWG no. 2178003-4.1A & 217025-2, Z2170825-2.2

HJ-DWS-5
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Single, unreinforced
Design pressure (bar) : 16

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Design temperature (°C) : 0 ~ +60
Nominal pipe diameter (Inner/ Outer) : 40A/65A
Convolution pitch/height (Inner, Outer)(mm) : 7/6, 9/8
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.3/0.4
DWG no. DAAD116466-HJ

HJ-DWU-1
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0 ~ +60
Nominal pipe diameter (Inner/ Outer) : 50A/80A
Convolution pitch/height (Inner, Outer)(mm) : 7/7,11/10
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.4
DWG no. DAAD046282J-HJ

HJ-DWU-2
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0 ~ +60
Nominal pipe diameter (Inner/ Outer) : 80A/100A
Convolution pitch/height (Inner, Outer)(mm) : 10/8,10/9
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.4
DWG no. DAAD064039G-HJ

HJ-DWU-3
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0 ~+60
Nominal pipe diameter (Inner/ Outer) : 80A/100A
Convolution pitch/height (Inner, Outer)(mm) : 10/8, 10/9

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Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.4
DWG no. DAAD064040E-HJ

HJ-DWU-4
Medium (Inner/ Outer) : Natural gas /Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0 ~+60
Nominal pipe diameter (Inner/ Outer) :50A/80A
Convolution pitch/height (Inner, Outer)(mm) : 7/7, 10.5/9
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.4
DWG no. DAAD096735

HJ-DWU-5
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Universal, unreinforced
Design pressure (bar) : 10
Design temperature (°C) : 5 ~ +50
Nominal pipe diameter (Inner/ Outer) : 80A/100A
Convolution pitch/height (Inner, Outer)(mm) : 10/8, 10/9
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.4
DWGNO. 2192634-8.1A

HJ-DWU-6
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0~ +60
Nominal pipe diameter (Inner/ Outer) : 90A/125A
Convolution pitch/height (Inner, Outer)(mm) : 14/12,14/12
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.6
DWG no. DAAD096156-HJ

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HJ-DWU-7
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0~ +60
Nominal pipe diameter (Inner/ Outer) : 125A/150A
Convolution pitch/height (Inner, Outer)(mm) : 11/10, 12.5/11.5
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.6
DWG no. DAAD096273B-HJ

HJ-DWU-8
Medium (Inner/ Outer) : Natural gas /Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0~ +60
Nominal pipe diameter (Inner/ Outer) :80A/100A
Convolution pitch/height (Inner, Outer)(mm) : 11/9, 12/8.5
Number of plies (Inner/ Outer) : 3/3
Thickness of ply (mm) : 0.4
DWG no. DAAD132677-HJ

HJ-DWU-9
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0~ +60
Nominal pipe diameter (Inner/ Outer) : 90A/125A
Convolution pitch/height (Inner, Outer)(mm) : 14/12, 14/12
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.6
DWG no. DAAD135715-HJ

HJ-DWU-10
Medium(Inner/ Outer) : Natural gas / Air

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Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0~ +60
Nominal pipe diameter (Inner/ Outer) : 80A / 100A
Convolution pitch/height (Inner, Outer)(mm) : 11/9, 12/8.5
Number of plies (Inner/ Outer) : 3/3
Thickness of ply (mm) : 0.4
DWG no. DAAD118736-HJ

HJ-DWU-11
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0~ +60
Nominal pipe diameter (Inner/ Outer) : 90A/125A
Convolution pitch/height (Inner, Outer)(mm) : 14/12, 14/12
Number of plies (Inner/ Outer) : 3/3
Thickness of ply (mm) : 0.4
DWG no. DAAD137568- HJ

HJ-DWU-12
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0~ +60
Nominal pipe diameter (Inner/ Outer) : 90A/125A
Convolution pitch/height (Inner, Outer)(mm) : 14/12, 14/12
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.6
DWG no. DAAD136307- HJ

HJ-DWU-13
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0~ +60

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Nominal pipe diameter (Inner/ Outer) : 100A/150A
Convolution pitch/height (Inner, Outer)(mm) : 10/9, 12.5/11.5
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.6
DWG no. DAAD131992- HJ

HJ-DWU-14
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0~ +60
Nominal pipe diameter (Inner/ Outer) : 80A/100A
Convolution pitch/height (Inner, Outer)(mm) : 10/8, 10/9
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.4
DWG no. PTAA025107-HJ

HJ-DWU-15
Medium(Inner/ Outer) : Natural gas / Air
Construction details : Universal, unreinforced
Design pressure (bar) : 16
Design temperature (°C) : 0~ +60
Nominal pipe diameter (Inner/ Outer) : 80A/100A
Convolution pitch/height (Inner, Outer)(mm) : 10/8, 10/9
Number of plies (Inner/ Outer) : 2/2
Thickness of ply (mm) : 0.4
DWG no. PTAAD369818-HJ & PAAD372539-HJ

Additional Tests Burst test , Hydraulic Test , Cyclic loading test, Fatigue test

Other Conditions 1. The metallic expansion joints are to be made, installed and tested as required by the Rules and found to function under working conditions all the

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attending surveyor's satisfaction.
2. It is noted that this metallic expansion joints intended to convey liquified gas and fuel gas is to be categorized as Class II piping system.
3. Welding and non-destructive testing are to be in accordance with Part 5, Chapter 17 of the Rules, to the attending surveyor's satisfaction.
4. The calculated maximum value of axial and lateral movements at design full cycles are not to be exceeded.
5. Piping system drawings and calculation notes are to be submitted for review wherever bellows are fitted on board LR classed ships.

This certificate is not valid for equipment, the design, ratings or operating parameters of which have been varied from the specimen tested. The manufacturer should notify Lloyd's Register Asia of any modification or changes to the equipment in order to obtain a valid Certificate.

Previous Version: LR22155992TA-01

The Design Appraisal Document BTS/ENG/M260663 and its supplementary Type Approval Terms and Conditions form part of this Certificate.

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