



CERTIFICATE NUMBER	21-2176968-PDA
EFFECTIVE DATE	02-Nov-2021
EXPIRY DATE	01-Nov-2026
ABS TECHNICAL OFFICE	Houston ESD - Offshore Equipment

CERTIFICATE OF Product Design Assessment

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

PENFLEX CORPORATION

located at

**105B INDUSTRIAL DRIVE, GILBERTSVILLE, PA, United States,
19525**

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

Product: Expansion Joints
Model: Penflex EX Series
Endorsements:
Tier: 2 - PDA Issued

This Product Design Assessment (PDA) Certificate remains valid until 01/Nov/2026 or until the Rules and/or Standards used in the assessment are revised or until there is a design modification warranting design reassessment (whichever occurs first).

Acceptance of product is limited to the "Intended Service" details prescribed in the certificate and as per applicable Rules and Standards.

This Certificate is valid for installation of the listed product on ABS units which exist or are under contract for construction on or previous to the effective date of the ABS Rules and standards applied at the time of PDA issuance. Use of the Product for non-ABS units is subject to agreement between the manufacturer and intended client.

American Bureau Of Shipping

Sohail A. Mohammed

Sohail Ahmed Mohammed, Engineer/Consultant

NOTE: This certificate evidences compliance with one or more of the Rules, Guides, standards or other criteria of ABS or a statutory, industrial or manufacturer's standards. It is issued solely for the use of ABS, its committees, its clients or other authorized entities. Any significant changes to the aforementioned product without approval from ABS will result in this certificate becoming null and void. This certificate is governed by ABS Rules 1-1-A3/5.9 Terms and Conditions of the Request for Product Type Approval and Agreement (2010)

PENFLEX CORPORATION

105B INDUSTRIAL DRIVE

GILBERTSVILLE PA

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Web: www.penflex.com

Tier: 2 - PDA Issued

Product: Expansion Joints

Model: Penflex EX Series

Endorsements:

Intended Service:

Marine & Offshore Applications- Exhaust Applications.

Description:

Austenitic stainless steel and high nickel alloy flexible metal bellows style expansion joints assemblies configured with weld ends, fixed flanges, and floating flanges and optional internal stainless steel liners.

Rating:

Sizes: 4" thru 24"

Design Pressure: 36 psi

Design Temperature: 70.0 oF

Moments based on 30,000 Non-Concurrent EJMA Cycles. Contact the manufacturer about pressure and temperature ratings and axial/lateral/rotation moment rating for specific bellows design.

See also the attached document.

Service Restriction:

- Unit Certification is not required for this product.
- If the manufacturer or purchaser request an ABS Certificate for compliance with a specification or standard, the specification or standard, including inspection standards and tolerances, must be clearly defined.
- This product has not been tested for cyclic fatigue (ship deformation) as per section 5C-8-5/13.1.2.4 of the ABS Marine Vessels Rules. Accordingly this product is not to be used for applications where ship deformation loads are experienced.

Comments:

- The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product.
- The design and installation of expansion bellows shall be in accordance with recognized standards and be fitted with means to prevent damage due to over-extension or compression as per section 5C-8-5/11.6.4 of the ABS Marine Vessels Rules
- Examination and testing may be performed on expansion joints in accordance with the EJMA standards to the satisfaction of the attending Surveyor and in any case after assembly on board, each expansion joint along with the cargo and process piping system is to be tested as per section 5C-8-5/13.2 of the ABS Marine Vessels Rules, as applicable.
- Expansion Joints to be selected and installed in accordance with the manufacturer's instructions and recommendations.
- Expansion Joints are to bear permanent identification, such as manufacturer's name or trademark, standard of compliance, material identity, pressure rating, etc., as required by the standard of compliance or the manufacturer's specification. Such markings may be cast or forged integral with, stamped on, or securely affixed by nameplate on the component, and are to serve as a permanent means of identification of the component throughout its service life in accordance with 4-6-1/7.1.4 & Table 2 of the ABS Marine Vessels Rules.

Notes/Drawing/Documentation:

- Drawing No. EX-036-4.0-3.3-316-3-RW/RW, 3.5" ND X 4.27" OAL Exhaust Bellows, Revision: A, Pages: 2;
- Drawing No. EX-036-4.0-5.48-316-3-RWRW, 3.5" ND X 6.48", Exhaust Bellows, Revision: A, Pages: 2;
- Drawing No. EX-036-4.0-8.093-316-3-RWRW, 3.5" ND X 9.032", Exhaust Bellows, Revision: A, Pages: 2;
- Drawing No. EX-036-4.5-3.09-316-3-RWRW, 4.0" ND X 5.09", Exhaust Bellows, Revision: A, Pages: 2;
- Drawing No. EX-036-4.5-5.13-316-3-RWRW, 4.0" ND X 7.13", Exhaust Bellows, Revision: A, Pages: 2;
- Drawing No. EX-036-4.5-7.994-316-3-RWRW, 4.0" ND X 9.994", Exhaust Bellows, Revision: A, Pages: 2;
- Drawing No. EX-036-5.56-3.396-316-3-RWRW, 5.0" ND X 5.396", Exhaust Bellows, Revision: A, Pages: 2;
- Drawing No. EX-036-5.56-5.636-316-3-RWRW, 5.0" ND X 7.636", Exhaust Bellows, Revision: A, Pages: 2;

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Drawing No. EX-036-5.56-8772-316-3-RWRW, 5.0" ND X 10.772", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-6.625-2.458-316-3-RWRW, 6.0" ND X 4.468", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-6.625-4.534-316-3-RWRW, 6.0" ND X 6.534", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-6.625-6.610-316-3-RWRW, 6.0" ND X 8.610", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-8.625-2.458-316-3-RWRW, 8.0" ND X 4.468", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-8.625-4.534-316-3-RWRW, 8.0" ND X 6.534", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-8.625-6.610-316-3-RWRW, 8.0" ND X 8.610", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-10.75-4.050-316-3-RWRW, 10.0" ND X 6.05", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-10.75-7.618-316-3-RWRW, 10.0" ND X 9.618", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-10.75-9.402-316-3-RWRW, 10.0" ND X 11.402", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-12.75-4.050-316-3-RWRW, 12.0" ND X 6.05", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-12.75-6.726-316-3-RWRW, 12.0" ND X 8.726", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-12.75-8.510-316-3-RWRW, 12.0" ND X 10.510", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-14.4.050-316-3-RWRW, 14.0" ND X 6.05", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-14.6.726-316-3-RWRW, 14.0" ND X 8.726", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-14.8.510-316-3-RWRW, 14.0" ND X 10.510", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-16.4.050-316-3-RWRW, 16.0" ND X 6.05", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-16.6.726-316-3-RWRW, 16.0" ND X 8.726", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-16.8.510-316-3-RWRW, 16.0" ND X 10.510", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-18.4.050-316-3-RWRW, 18.0" ND X 6.05", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-18.5.834-316-3-RWRW, 18.0" ND X 7.834", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-18.8.510-316-3-RWRW, 18.0" ND X 10.510", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-20.4.050-316-3-RWRW, 20.0" ND X 6.05", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-20.6.726-316-3-RWRW, 20.0" ND X 8.720", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-20.8.510-316-3-RWRW, 20.0" ND X 10.510", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-24.3.341-316-3-RWRW, 24.0" ND X 6.841", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-24.7.307-316-3-RWRW, 24.0" ND X 9.807", Exhaust Bellows, Revision: A, Pages: 2;
Drawing No. EX-036-24.8.629.316-3-RWRW, 24.0" ND X 11.129", Exhaust Bellows, Revision: A, Pages: 2;
Document No. EX-036-4.0-3.3-316-3-RWRW EJMA 10 Derived Calculation, Calculations in accordance with standards of the Expansion Joint Manufacturers Association, Inc 10th Edition.

Terms of Validity:

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STANDARDS

ABS Rules:

Rules for Conditions of Classification, Part I - 2021 - 1-1-4/7.7, 1-1-A3, 1-1-A4, which covers the following:
2021 ABS Rules for Building and Classing Marine Vessels Rules: 5C-8-5/8.4, 5C-8-5/11.6.4, 5C-8-5/13.1.2

Rules for Conditions of Classification, Part I - 2021 - Offshore Units and Structures, 1-1-4/9.7, 1-1-A2, 1-1-A3, which covers the following:

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2021 ABS Rules for Building and Classing Mobile Offshore Units Rules: 4-2-1/11.9

National:

NA

International:

NA

Government:

NA

EUMED:

NA

OTHERS:

Expansion Joint Manufacturer's Association (EJMA), 10th Edition