DNV·GL

Certificate No:
TAD000016E

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Lifting, Hoisting, Rotation and Pipehandling Equipment

with type designation(s)
Expandable Pin Assembly

Issued to
Expander System Sweden AB
Åtvidaberg, Östergötlands Län, Sweden

is found to comply with
DNVGL-OS-E101 – Drilling facilities, Edition January 2018
DNVGL-SI-0166 – Verification for compliance with Norwegian shelf regulations, Edition July 2018

Application :

See page 2

Issued at **Høvik** on **2019-11-18**

This Certificate is valid until **2024-11-17**.
DNV GL local station: **Oslo Drilling Systems**

Approval Engineer: **Morten Wiese**

for **DNV GL**
Digitally Signed By: Moen, Jan Olav
Location: DNV GL Høvik, Norway
Signing Date: 18.11.2019, on behalf of

Per Esvall
Head of Section

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

Job Id: **262.1-032483-1**
Certificate No: **TAD000016E**

Manufacturer

Expander System Sweden AB
CIM Number 10125317
ÅTVIDABERG, Sweden
Local office: DNV GL Stockholm

Expander Americas Inc.
223 Industrial Street
DeWitt, IA 52742 USA
Local Office: DNV GL New York

Responsibility

The Expander System Sweden AB takes responsibility that both design and production are in compliance with the Rules, Standards and/or Regulations listed on page 1 of this Type Approval Certificate.

Product description

The Expander system (expandable pin assembly) is a pivot assembly for securing a pair of mounting lugs and stabilizing a machine member. The machine member is often a bearing or a bushing. The system consists of an axle with tapered ends and a locking mechanism on each side. The locking mechanism comprises a sleeve and a bolt or a nut and sometimes a tension washer. When a force is applied to the sleeve via the fastener or the washer, the tapered end of the axle will work as a guide for the sleeve, and it will expand radially. A high tension is established in the contact material of the axle, sleeve and lug ear. The tension causes friction between the tapered axle end and the sleeve, and between the sleeve and lug ear. The friction between these surfaces creates a very strong locking of the expander system.

Reference Standards

- DNVGL-ST-0378 « Offshore and platform lifting Appliances »
- API 8C « Specification for Drilling and Production Hoisting Equipment" 5th ed. 2014.

Application/Limitation

Design Parameter	Range	Description/Options
Straight pin		
Internal thread and bolt	Single bolt	Without internal greasing
	Single bolt	With internal greasing (one or two outlets)
	Multi bolt	Without internal greasing
	Multi bolt	With internal greasing (one or two outlets)
External thread and nut	Single bolt	Without internal greasing
	Single bolt	With internal greasing (one or two outlets)
Through bolt	Single bolt	Without internal greasing
	Single bolt	With internal greasing (one or two outlets)
Pin outside diameter range	20mm – 406.4mm	
Safe Working Load (SWL)	Up to 5000 tonnes	

Stepped pin

Internal thread and bolt	Single bolt	Without internal greasing
	Single bolt	With internal greasing (one or two outlets)
	Multi bolt	Without internal greasing
	Multi bolt	With internal greasing (one or two outlets)
External thread and nut	Single bolt	Without internal greasing
	Single bolt	With internal greasing (one or two outlets)
Pin outside diameter range	20mm – 406.4mm	
Safe Working Load (SWL)	Up to 5000 tonnes	

Type Approval documentation

Drwg./Doc. No.	Rev.	Title
DNV-EXP001	7	Design Calculations
DNV-EXP003	5	Design Calculation Method Application for DNV Type approval
SKM-13-1474		DNV Survey report (prototype test) endorsed by DNV Stockholm, date: 2013-04-18 Type Approval Assessment Report (Expander Americas, Inc.)
535332:2	1	Prototype test report
DNV-EXP101	0	Straight pin, Internal thread and bolt, Single bolt
DNV-EXP102	0	Straight pin, Internal thread and bolt, Multi bolt
DNV-EXP103	0	Straight pin, External thread and bolt, Single bolt
DNV-EXP104	0	Straight pin, Through bolt, Single bolt
DNV-EXP105	0	Stepped pin, Internal thread and bolt, Single bolt
DNV-EXP106	0	Stepped pin, Internal thread and bolt, Multi bolt
DNV-EXP107	0	Stepped pin, External thread and nut, Single bolt
DVR-262.1-014691-J-2	0	DNV Design verification report

Materials

Each product components are to to be Charpy Impact tested according to applicable standards:

Components	Material	Min.Yield Strength	Charpy (min.)
Axle	SS 2541-03/EN 1.6582/34CrNiMo6/AISI 4340 SS 2244-05/EN 1.7225/42CrMo4V/AISI 4140 EN 1.7220/34CrMo4/AISI 4135/SCM435H	500-900 N/mm^2 (depends on mtrl & dimension)	27**J at -20^{0}C 42***J at -20^{0}C
	1.6580/30CrNiMo8/A320L43		
	SS 2387-05/EN 1.4418/X4CrNiMo16-5-1 1.4542/X5CrNiCuNb17-4/ASTMA564 type 630/17-4PH		

Sleeve & Washer	SS 2541-03/EN 1.6582/34CrNiMo6/AISI 4340 SS 2244-05/EN 1.7225/42CrMo4V/AISI 4140 1.7220/34CrMo4/AISI 4135/SCM435H SS 2172/EN 1.0577/St 52-3/S355J2 1.1191/C45E/AISI 1045/S45C 1.1219/C56E2/S55C Imatra 520M Imatra 550M 1.8931/S690Q/Dillimax690B, 1.8928/S690QL/Welldox700E/Dillimax690T ASTM A514 or equivalent 1.6580/30CrNiMo8/A320L43 SS 2387-05/EN 1.4418/X4CrNiMo16-5-1 1.4542/X5CrNiCuNb17-4/ASTM A564 type 630/17-4PH	275-900 N/mm^2 (depends on mtrl & dimension)	N/A
Bolt & Nut	SS 2541-03/EN 1.6582/34CrNiMo6/AISI 4340 SS 2244-05/1.7225 QT/42CrMo4/AISI 4140 1.7220/34CrMo4/AISI 4135/SCM435H 8.8 grade (ISO 898-1) 1.6580/30CrNiMo8/A320L43 SS2387-05/EN 1.4418/X4CrNiMo16-5-1 1.4542/X5CrNiCuNb17-4/ASTM A564 type 630/17-4PH A4-80	540-800N/mm^2 (depends on mtrl & dimension)	27J at -20^{0}C

**) Note: This Charpy impact value is according to DNGL-ST-0378
***) Note: This impact property is according to DNVGL-OS-E101 and API 8C

- Material selection and properties shall comply with applicable standard.
- Method, extent and acceptance criteria of NDE shall be in accordance with applicable standards.
- Axle materials hardened and/or surface treated (for example hard chrome plated, NiCr plated) where applicable according to order specification.

Documentation which are to accompany each product/delivery

- Material certificate 3.1 type (EN 10204:2004)
- Material Traceability List
- GA drawings with relevant dimensions
- NDT reports
- Installation procedure
- Maintenance procedure

Conditions and Comments

- Expandable pin assembly shall be delivered with material certificate equivalent to 3.1 type according to EN 10204:2004. The 3.1 certificate is issued by the manufacturer and is validated by the manufacturer's authorized inspection representative independent of the manufacturing department.

- If DNV GL certification is required (for bigger sizes or SWL) by End user or state authority then product may be proof tested and surveyed during fabrication in accordance with the requirements specified in the applicable standards and followed by issuance of DNV GL Survey report.
- Fatigue analysis: End user shall take into account this in each case. Normally fatigue is not a problem for proper pretensioned pin assembly. Bolts shall provide sufficient preload in order to avoid any rotation or slippage of the mating faces during operation and be designed according to Design Calculation DNV-EXP001 Rev.7.
- It is recommended that End user of the product would perform inspection once per annum in order to ensure that preload is sufficient and no loosening occurs.
- Safe working load (SWL) shall be specified by end user.
- Documentation which are to accompany each product/delivery to be kept by manufacturer over a period of at least 10 years.

Marking of product

For traceability each product shall be marked in accordance with applicable standards.

Certificate Retention Survey

For retention of the Type approval, DNV GL Surveyor shall performe a survey - every second year and before the expiry date of this certificate. This is in order to verify that the conditions for the type approval are complied with, ref DNVGL-CP-0338, DNV GL type approval scheme.

This certificate replaces Type Approval Certificate TAD00000AH and D-5779.

END OF CERTIFICATE