

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Flexible Hoses of Metallic Material with permanently fitted couplings

with type designation(s)
MasterFlex, Annuflex, Pressuremax HP

Issued to
Hose Master, LLC
Euclid, OH, USA

is found to comply with
DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems
DNVGL-OS-D101 – Marine and machinery systems and equipment, Edition January 2018
DNV GL class programme DNVGL-CP-0184 – Type approval – Flexible hoses with permanently fitted couplings

Application :

Product(s) approved by this certificate is/are accepted for installation on vessels classed by DNV GL.

| Type: | Temperature range: | Max. working press.: | Sizes: |
|----------------|--------------------|---------------------------|--|
| MasterFlex | -32°F to +1112°F | 449 to 2700 (see page 2) | 1/4", 3/8", 1/2", 3/4", 1", 1 1/2", 2" |
| Annuflex | -32°F to +1112°F | 449 to 2700 (see page 2) | 1/4", 3/8", 1/2", 3/4", 1", 1 1/2", 2" |
| Pressuremax HP | -32°F to +1112°F | 1675 to 6000 (see page 2) | 1/4", 3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2" |

Issued at **Høvik** on **2020-08-17**

for **DNV GL**

This Certificate is valid until **2022-12-30**.

DNV GL local station: **Houston, Approval CMC**

Approval Engineer: **Andreas Hansen**

Zeinab Sharifi
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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV GL AS, its parent companies and subsidiaries as well as their officers, directors and employees ("DNV GL") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Job Id: **262.1-015532-4**
 Certificate No: **TAP00001K4**
 Revision No: **1**

Product description

Flexible hoses with one wirebraid (Masterflex and Annuflex) or two wire braids (Pressuremax HP) of metallic material with permanently fitted couplings.

Materials:

Masterflex and Annuflex: T321 stainless steel corrugated hose core with T304 stainless steel single outer braid.

Pressuremax HP: T321 stainless steel corrugated hose core with T316L stainless steel double outer braid.
 Coupling: T304 / T316

Coupling types:

Pipe nipple (male), female half coupling, female union, male jic fitting, female jic, c stub end with slip on flange, weld nipples, welded neck fitting, a stub end with slip on flange, elbow, reducer, hex male connector.

Hose and coupling manufacturer:

Hose Master, 1233 East 222nd Street, Cleveland, Ohio

Application/Limitation

Maximum working pressure in psi:

| Size | Type | | |
|--------------|------------|----------|----------------|
| | MasterFlex | AnnuFlex | Pressuremax HP |
| No of braids | 1 | 1 | 2 |
| ¼" | 1800 | 1800 | 6000 |
| 3/8" | 1558 | 1558 | 5000 |
| ½" | 1186 | 1186 | 4500 |
| ¾" | 898 | 898 | 3600 |
| 1" | 718 | 718 | 3000 |
| 1 ¼" | - | - | 2600 |
| 1 ½" | 531 | 531 | 2200 |
| 2" | 449 | 449 | 1675 |

At elevated temperature, maximum working pressure is to be reduced according to reduction factors:

| | | | | | | | | | | | | | | |
|--------|----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Temp | °C | 20 | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 550 | 600 |
| | °F | 68 | 122 | 212 | 302 | 392 | 482 | 572 | 662 | 752 | 842 | 932 | 1022 | 1112 |
| Factor | | 1,00 | 0,95 | 0,85 | 0,77 | 0,71 | 0,67 | 0,63 | 0,60 | 0,58 | 0,57 | 0,56 | 0,55 | 0,50 |

This certificate is valid for the specific assembly of hose and coupling type as specified, assembled and delivered by the holder (named as manufacturer) of this certificate and below assembling locations:

- Hose Master, LLC, Houston, Texas
- Hose Master, LLC, Atlanta, Georgia
- Hose Master, LLC, Reno, Nevada

All hose assemblies delivered under this type approval certificate shall be in compliance with an assembly procedure issued by the certificate holder. The hoses are to be mounted in accordance with the manufacturer’s instructions.

The hoses are not to be used in systems where pressure pulsations may occur.

The following hoses are not to be used in systems exposed to cyclic loading: Masterflex 3/8" and Annulex ¼".

Minimum bend radius in installation is to be in accordance with the manufacturer’s specifications.

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Flexible hoses are only to be used where it is necessary due to vibrations or flexible mounting of the machinery. The hoses shall not replace/be used where permanent piping is possible/required.

The hoses must only be fitted on places where they are always accessible.

It must be possible to shut off from the system all flexible hoses used in lubricating oil and compressed air systems.

Welding shall fulfill requirements in DNV GL Rules Pt.2 Ch.4. All welding for piping components for piping classes I and II shall be carried out in an approved welding work shop by DNV GL.

The hoses are not to be used in LNG/LPG systems.

The hoses are not to be used in seawater applications.

Type Approval documentation

Hose Master Catalogue, Corrugated metal hose & assemblies
Burst pressure test report witnessed by DNV GL, dated 2017-12-13
Pliability test report, dated 2018-09-10 and 2018-10-19
Fatigue test report, dated 2018-09-10
Pressure test report witnessed by DNV GL, dated 2020-07-01

Tests carried out

Burst test, Fatigue test, Pliability (static bend) test

Production testing and Certification

Each hose assembly shall be hydrostatically tested at a hydrostatic pressure of 1.5 times the maximum working pressure and shall be delivered with the pressure test report with reference to the type approval certificate. (No product certificate is required.)

Marking of product

For traceability to this type approval, the hose assemblies are to be marked with:

- Manufacturer's name or trade mark
- Type designation
- Size

Periodical assessment

For retention of the Type Approval, a DNV GL Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the approval are complied with. Reference is made to DNVGL-CP-0338.