

TYPE APPROVAL CERTIFICATE**This is to certify:****That the Filter**with type designation(s)
OMEGA

Issued to

Amiad Water Systems Ltd.
Ami'ad, Israel

is found to comply with

Det Norske Veritas' Rules for Classification of Ships Pt.4 Ch.7, Pressure Vessels, 2012**Application :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.****Max. working temp.:** 60° C
Working media: Seawater
Design pressure: 8 barThis Certificate is valid until **2018-12-31**.Issued at **Høvik** on **2016-10-15**for **DNV GL**DNV GL local station: **Rotterdam, Product Certification /Verification**Approval Engineer: **Sinisa Sedlan**.....
Marianne Spæren Marveng
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: **262.1-016809-4**
 Certificate No: **TAP000001W**
 Revision No: **1**

Product description

Automatic filter type OMEGA for filtration of ballast water. The filters are designed with the following main data:

Design pressure: 8 bar
 Design temperature range: 5° C to 60° C
 Medium: Seawater
 Corrosion allowance: 3 mm
 Class: III

Material:

SA-516 Gr. 70: Plates, flanges and nozzles
 SA106 Gr. B: Nozzles

Sizes:

Type:	External diameter
OMEGA I / IE	610 mm
OMEGA II / IIE	762 mm
OMEGA III / IIIE	1219 mm
OMEGA IV / IVE	1371.6 mm
OMEGA-54K 16", 18" & 20"	812.8 mm

Manufacturing of the filters is subcontracted to:

Yixing Taixing Environtec Co. Ltd.
 70 Baihe Chang, Xingjie Yixing
 Jiangsu 214204
 China

Application/Limitation

- The filters may be used for treatment of ballast water.
- Each filter unit delivered according to this type approval is to be certified by DNV GL surveyor and to be delivered with a product certificate when it is required by DNV rules or purchaser.
- Each filter unit is to be hydrostatic pressure tested to minimum 1.3 times design pressure.
- The approval is related to the strength of the parts subjected to pressure. Functionality of the filters are not covered by this type Approval certificate
- The material used shall have certificates according to DNV Rules Pt.4 Ch.7 Sec.2 Table A1.
- Extent of non-destructive testing (NDT) shall be done according to DNV Rules Pt.4 Ch.7 Sec.8 D103.
- All pressure containing parts exposed to seawater shall be protected against corrosion by suitable coating. Coating system has to be approved by society.

Type Approval documentation

Title	Document number	Status
12" OMEGA-I 13.5K Filter	QP-0240 Rev.D	Used for information
12" OMEGA-IE 18K Filter	QP-0241 Rev.D	Used for information
OMEGA-I/IE Bottom Housing 8" BW	DLN1.H080F.001 Rev.A (2 pages)	Type approved
OMEGA-I/IE Bottom Housing 10" BW	DLN1.H100F.001 Rev.B (2 pages)	Type approved
OMEGA-I/IE Bottom Housing 12" BW	DLN1.H120F.001 Rev.A (2 pages)	Type approved
Upper Flange For OMEGA-I/IE Housing BW	DLN1.H120F.001-3 Rev.0	Used for information
Flushing Flange 3" OMEGA-I/IE	DLN1.H120F.001-5 Rev.B	Used for information
Support leg for OMEGA-I/IE Bottom housing 12" BW	DLN1.H120F.001-6 Rev.A	Used for information
OMEGA-I Upper Housing 8" BW	DLN1.H080F.002 Rev.B (2 pages)	Type approved
OMEGA-IE Upper Housing 8" BW	DLN2.H080F.001 Rev.B (2 pages)	Type approved
OMEGA-I Upper Housing 10" BW	DLN1.H100F.002 Rev.B (2 pages)	Type approved
OMEGA-IE Upper Housing 10" BW	DLN2.H100F.001 Rev.B (2 pages)	Type approved

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OMEGA-I Upper Housing 12" BW	DLN1.H120F.002 Rev.B (2 pages)	Type approved
OMEGA-IE Upper Housing 12" BW	DLN2.H120F.001 Rev.B (2 pages)	Type approved
Bottom Partition for OMEGA-I Upper Housing BW	DLN1.H120F.002-2 Rev.0	Used for information
Lid Weld OMEGA-I/IE BW	DLN2-002085 Rev. A	Used for Information
Lid Flange OMEGA-I/IE BW	DLN2-002085-1 Rev.B	Used for information
Omega Filters- BW Name Plate	-	Used for information
14" OMEGA-II 27K Filter	QP-0229 Rev.D	Used for information
14" OMEGA-IIIE 36K Filter	QP-0228 Rev.E	Used for information
10"OMEGA-II Bottom Housing BW	DLN3.H100F.001 Rev.B (2 Pages)	Type approved
12"OMEGA-II Bottom Housing BW	DLN3.H120F.001 Rev.B (2 Pages)	Type approved
14"OMEGA-II Bottom Housing BW	DLN3.H140F.001 Rev.B (2 Pages)	Type approved
Upper Flange For OMEGA-II/IIIE Housing	DLN3.H140F.001-2 Rev.0	Used for information
Support leg for OMEGA-II/IIIE Bottom housing	DLN3.H140F.001-7 Rev.A	Used for information
10" OMEGA-II Upper Housing BW	DLN3.H100F.002 Rev.B (2 Pages)	Type approved
10" OMEGA-IIIE Upper Housing BW	DLN4.H100F.001 Rev.C (2 Pages)	Type approved
12" OMEGA-II Upper Housing BW	DLN3.H120F.002 Rev.B (2 Pages)	Type approved
12" OMEGA-IIIE Upper Housing BW	DLN4.H120F.001 Rev.C (2 Pages)	Type approved
14" OMEGA-II Upper Housing BW	DLN3.H140F.002 Rev.B (2 Pages)	Type approved
14" OMEGA-IIIE Upper Housing BW	DLN4.H140F.003 Rev.C (2 Pages)	Type approved
Bottom Partition for OMEGA-II Upper Housing	DLN3.H140F.002-2 Rev.A	Used for information
Lid Weld OMEGA-II/IIIE BW	DLN4-002076 Rev. D	Used for Information
Lid Flange OMEGA-II/IIIE BW	DLN4-002076-1 Rev.C	Used for information
Omega Filters- BW Name Plate	-	Used for information
24" OMEGA-III 54K Filter	QP-0230 Rev.0	Used for information
24" OMEGA-IIIE 72K Filter	QP-0231 Rev.A	Used for information
14"OMEGA-III/IIIE Bottom Housing	DLN5.H140F.001 Rev.0 (2 Pages)	Type approved
16"OMEGA-III/IIIE Bottom Housing	DLN5.H160F.001 Rev.0 (2 Pages)	Type approved
18"OMEGA-III/IIIE Bottom Housing	DLN5.H180F.001 Rev.0 (2 Pages)	Type approved
20"OMEGA-III/IIIE Bottom Housing	DLN5.H200F.001 Rev.0 (2 Pages)	Type approved
24"OMEGA-III/IIIE Bottom Housing	DLN5.H240F.001 Rev.0 (2 Pages)	Type approved
Upper Flange For OMEGA-III/IIIE Housing	DLN5.H240F.001-1 Rev.0	Used for information
48" Torispherical Head	DLN5.H240F.001-2 Rev.0	Type approved
Support leg for OMEGA-III Bottom housing	DLN5.H240F.001-4 Rev.0	Used for information
14" OMEGA-III Upper Housing	DLN5.H140F.002 Rev.0 (2 Pages)	Type approved
14" OMEGA-IIIE Upper Housing	DLN6.H140F.001 Rev.0 (2 Pages)	Type approved
16" OMEGA-III Upper Housing	DLN5.H160F.002 Rev.0 (2 Pages)	Type approved
16" OMEGA-IIIE Upper Housing	DLN6.H160F.001 Rev.0 (2 Pages)	Type approved
18" OMEGA-III Upper Housing	DLN5.H180F.002 Rev.0 (2 Pages)	Type approved
18" OMEGA-IIIE Upper Housing	DLN6.H180F.001 Rev.0 (2 Pages)	Type approved
20" OMEGA-III Upper Housing	DLN5.H200F.002 Rev.0 (2 Pages)	Type approved
20" OMEGA-IIIE Upper Housing	DLN6.H200F.001 Rev.0 (2 Pages)	Type approved
24" OMEGA-III Upper Housing	DLN5.H240F.002 Rev.0 (2 Pages)	Type approved
24" OMEGA-IIIE Upper Housing	DLN6.H240F.001 Rev.0 (2 Pages)	Type approved
Partition Flange for OMEGA-III Upper Housing	DLN5.H240F.002-1 Rev.0	Used for information
Lid Weld OMEGA-III Filter	DLN5-003344 Rev. 0	Used for Information
Lid Weld OMEGA-III	DLN5-003344-1 Rev. 0	Used for Information
Omega Filters- BW Name Plate	-	Used for information
24" OMEGA-IV 81K Filter	QP-0226 Rev.0	Used for information
24" OMEGA-IVE 108K Filter	QP-0227 Rev.0	Used for information
18"OMEGA-IV/IVE Bottom Housing	DLN8.H180F.001 Rev.0 (2 Pages)	Type approved
20"OMEGA-IV/IVE Bottom Housing	DLN8.H200F.001 Rev.0 (2 Pages)	Type approved

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24"OMEGA-IV/IVE Bottom Housing	DLN8.H240F.001 Rev.0 (2 Pages)	Type approved
Upper Flange For OMEGA-IVE Housing	DLN8.H240F.001-1 Rev.0	Used for information
54" Torispherical Head	DLN8.H240F.001-2 Rev.0	Type approved
Support leg for OMEGA-IVE Bottom housing	DLN8.H240F.001-4 Rev.0	Used for information
18" OMEGA-IV Upper Housing	DLN7.H180F.001 Rev.0 (2 Pages)	Type approved
18" OMEGA-IVE Upper Housing	DLN8.H180F.002 Rev.0 (2 Pages)	Type approved
20" OMEGA-IV Upper Housing	DLN7.H200F.001 Rev.0 (2 Pages)	Type approved
20" OMEGA-IVE Upper Housing	DLN8.H200F.002 Rev.0 (2 Pages)	Type approved
24" OMEGA-IV Upper Housing	DLN7.H240F.001 Rev.0 (2 Pages)	Type approved
24" OMEGA-IVE Upper Housing	DLN8.H240F.002 Rev.0 (2 Pages)	Type approved
Bottom Partition Flange for OMEGA-IVE Upper Housing	DLN8.H240F.002-1 Rev.0	Used for information
Lid Weld OMEGA-IVE	DLN8-002498 Rev. 0	Used for Information
Lid Flange OMEGA-IVE	DLN8-002498-1 Rev.0 (2 pages)	Used for information
Omega Filters- BW Name Plate	-	Used for information
Design calculation	-	Used for information
Surface preparation & coating procedures	IS-Rev. C & ES-Rev. D	Used for information
16" OMEGA-IIIE 36K Filter	QP-0574 Rev.0	Used for information
16" OMEGA-II/IIIE Bottom Housing BW	DLN3.H160F.006 Rev.A (2 Pages)	Type approved
16" OMEGA-IIIE Upper Housing BW	DLN4.H160F.002 Rev.A (2 Pages)	Type approved
16" OMEGA-54K Filter	QP-0565 Rev.0	Used for information
18" OMEGA-54K Filter	QP-0570 Rev.A	Used for information
20" OMEGA-54K Filter	QP-0569 Rev.0	Used for information
16" OMEGA-54K Bottom Housing	DLR9.H160F.001 Rev.A (5 Pages)	Type approved
Bottom Housing Body t=12mm, L=818.2mm	DLR9.H160F.001-1 Rev.A (2 Pages)	Type approved
18" OMEGA-54K Bottom Housing	DLR9.H180F.001 Rev.C (5 Pages)	Type approved
Bottom Housing Body t=12mm, L=818.2mm	DLR9.H180F.001-1 Rev.0 (2 Pages)	Type approved
20" OMEGA-54K Bottom Housing	DLR9.H200F.001 Rev.A (5 Pages)	Type approved
Bottom Housing Body t=12mm, L=818.2mm	DLR9.H200F.001-1 Rev.A (2 Pages)	Type approved
16" OMEGA-54K Upper Housing	DLR9.H160F.002 Rev.A (6 Pages)	Type approved
OMEGA 54K Outlet 16" Half Cone	DLR9.H160F.001-4 Rev.A	Type approved
18" OMEGA-54K Upper Housing	DLR9.H180F.002 Rev.C (6 Pages)	Type approved
18"OMEGA 54K Outlet Half Cone	DLR9-003518-2 Rev.A	Type approved
20" OMEGA-54K Upper Housing	DLR9.H200F.002 Rev.A (6 Pages)	Type approved
20" OMEGA 54K Outlet Half Cone	DLR9.H200F.001-4 Rev.A	Type approved
Upper Housing Body t=14mm, L=1227mm	DLR9-003518-1 Rev.0	Type approved
Upper Flange For OMEGA-54K Housing	DLR9.H180F.002-1 Rev.A	Used for information
Bottom Plate OMEGA 54K	DLR9.H180F.001-5 Rev.0	Type approved
Partition Flange For OMEGA-54K Housing	DAR9-006365 Rev.A	Used for information
Lid Weld OMEGA-54K	DLR9.L020F.001 Rev.A	Used for information
OMEGA 54K 32" Lid	DLR9.L020F.001-1 Rev.B (3 Pages)	Used for information
OMEGA 54K Lifting Lug	DLR9-003519-9 Rev.A	Used for information

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Marking of product

Each filter shall be permanently and legibly marked on nameplate permanently attached to a principal pressure part to show its identity and origin. The marking shall show the following particulars:

- a) the name and domicile of the manufacturer
- b) the manufacturer's type designation and serial number
- c) the year of manufacture
- d) the design pressure
- e) the design temperature (s) in °C
- f) the hydraulic test pressure
- g) DNV's identifying mark.

Periodical assessment

For retention of the Type Approval, a DNV GL Surveyor shall perform periodical assessment every second year and before the expiry date of this certificate, to verify that the conditions for the type approval are complied with.

When possible, this assessment may be harmonised with normal surveys for product certification and / or other surveys and audits carried out.

The main elements of the certificate retention survey are:

- Verification of the TA applicant's production and quality system w.r.t. ensuring continued
- consistent production of the type approved products at the TA applicant's own premises
- Review of Type Approval documentation and assurance that it is still used as basis for production
- Review of possible changes in design, materials and performance
- Assurance of traceability between manufacturer's product type marking and Type Approval Certificate.

Renewal should be applied for in writing before the certificate expires.