

THE **GOLD** STANDARD IN BALLAST WATER TREATMENT™

Hyde **GUARDIAN****GOLD**®

BALLAST WATER TREATMENT SYSTEM

The Hyde Marine Advantage



- **Long History** – 100+ years in maritime industry and 25+ years in diverse water treatment solutions & UV Treatment technology
- **Proven Partner** – Market/World Leader in (UV) Ballast Water Treatment Systems (BWTS)
- **Experienced** - Pioneer in ballast water research and positioned as a technology leader and industry expert, particularly in the RETROFIT market
- **Reputable & Reliable** - IMO Type Approved with BWTS operating for over 10 years; well positioned to assist with global and U.S. compliance

Key Benefits of HYDE GUARDIAN Gold® BWTS

- **Economic** – low installation, operating, and consumable costs
- **Compatible** - integrates seamlessly with existing ballast system, installed pumps (low pressure drop) and shipboard power system (low power consumption - full power operation of 75kW per 1,000m³/hr)
- **Flexible & Compact** - supplied as a skid-mounted or modular system
- **Easy to use** - simple, automatic operation and minimal shipboard maintenance and effect on crew or vessel operations
- **Easy to install** – retrofittable while in service with no downtime or dry docking
- **Proven** – robust design ensures consistent performance in long-term shipboard use
- **Chemical-free** – no effect on coatings
- **Safe** - low risk for safety of crew and vessel

“System adjustment, commissioning, and product demonstration to class and crew members was completed in just two days by Hyde Marine staff. We were pleased to discover that Hyde Marine’s ballast water treatment system is compact, simple, and reliable. Additionally, all of the system components are easy to access for maintenance.”

- Novoship Site Office Manager following installation of two Hyde GUARDIAN BWTS on two LPG carriers

Key milestones in the evolution of the Hyde Marine technology and product line for ballast water treatment

- 1865 • Hyde Windlass Co. (Bath, Maine)
- 1969 • Hyde Marine (Cleveland, OH)
- 1996 • Hyde Marine and University of Michigan Ballast Water Study
- 1997 • Great Lakes Ballast Water Technology Demonstration Project
- 2000 • First Ballast Water Treatment System M/S Regal Princess
- 2001 • BWT Systems Installed on Four Commercial Ships
- 2003 • First Hyde GUARDIAN System M/S Coral Princess
- 2006 • GUARDIAN Modular System M/S Celebrity Mercury
- 2008 • Six GUARDIAN Systems for Royal Navy CVF Aircraft Carriers
USCG STEP Approval Coral Princess
- 2009 • Hyde GUARDIAN® BWTS IMO Type Approval
- 2013 • Hyde GUARDIAN BWTS USCG AMS Approval
- 2014 • Introduction & IMO Type Approval of Hyde GUARDIAN Gold® BWTS
400th Unit Sold

Introducing the Hyde GUARDIAN Gold® Ballast Water Treatment System

The Hyde GUARDIAN Gold® Ballast Water Treatment System (BWTS) is the new effective and reliable solution that combines efficient filtration and Ultraviolet (UV) disinfection. Standard systems are available for flow rates from 60 m³/hr up to 6,000 m³/hr. With its simple design and ability to be skid mounted, the system can be easily installed in existing ships where retrofits are required in crowded machinery spaces as well as in new ship construction.



The smallest footprint on the market

Control & Power Panels

- Operates entire system with larger touchscreen LCD panel
- All internal wiring & connections come complete on skid system

Compact Filter

- Automatic backwashing
- Provides continuous filtration and flow to ballast tanks

Skid

- Compact configuration
- Self contained
- Easy to install

UV Treatment Chamber & Central Outlet

One of the smallest UV reactor footprints – includes a specific number and size of UV lamps depending on total ballast water flow to be treated

Ballast Water Inlet

Common inlet for ballasting and deballasting

HG250G BWTS



Size Matters

Compact Filter System

As a technical leader in ballast water treatment, Hyde Marine remains on the forefront of testing and innovation. Over ten years ago Hyde Marine tested available filters, and now with advances in filters and the introduction of filters designed specifically for ballast water treatment, the company decided to revisit filter testing in a challenge water that combined low salt content (<1 psu) and was 1000 times more productive than the IMO required organic particle loading count.

The results led to the addition of high performing screen filters that help address the space constrained retrofit market providing a 50% reduction in footprint.

Final screen filters selected provide the following advantages:

- Reduction in power/energy requirements (30% reduction in peak power consumption during backwashing)
- Continuous flow to tanks during ballasting
- Improved ballast times and increased flow to tanks
- Ability to handle heavy organic and sediment loading
- Simple operation and low maintenance requirements
- Corrosion-free materials of construction
- Reduced micron ratings (30-40 micron) to improve removal rates
- Optimized for retrofit installations

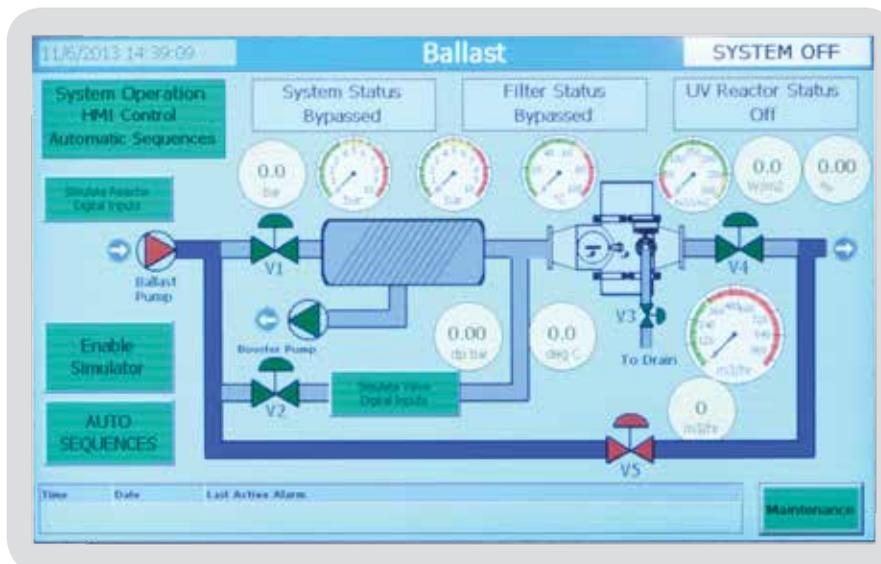


FC200



FC400

Larger Touch Screen



- Improved touch screen Operator Interface (OIT) and upgraded PLC controller with increased speed and memory capacity
- Expanded modes of one-touch operation:
 - Tank Stripping
 - Gravity Ballasting
 - Internal Transfer
 - Emergency Ballasting
 - Maintenance Mode
- One-touch, external access (and download capability) of the data log via USB drive
- GPS interface to receive data from ship signal for inclusion in the data log

Experts in UV Disinfection

The Hyde GUARDIAN Gold® BWTS uses high intensity ultraviolet (UV) treatment for disinfection. With more than 25 years of experience in UV Treatment technology, Hyde Marine carefully designed the UV chamber for minimum pressure drop, optimum dose distribution, and compatibility with the marine operating environment.

UV dosage results from a combination of lamp power, flow path, and exposure time. The flow characteristics through the Guardian UV chamber are optimized to make best use of the UV power provided.

UV Disinfection Advantages:

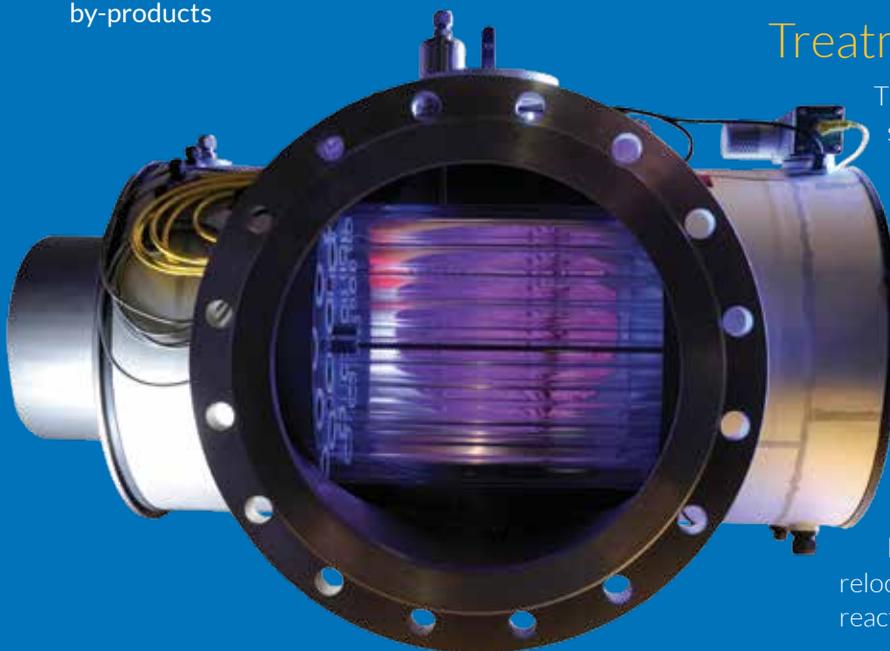
- Automatic operation with very little crew attention
- Effective - not affected by water salinity, temperature, or hold time in the ballast tank
- 100% safe without side effects
- Organisms cannot build resistance against UV
- No increased corrosion risk as with chemical oxidants
- No transportation, storage, or handling of chemicals
- No danger of overdosing or release of residual disinfectant
- **No harmful toxic or significant nontoxic disinfection by-products**

The UV Disinfection Solution

The medium pressure UV lamps in the Hyde GUARDIAN Gold system produce a polychromatic output across the entire germicidal spectrum versus the monochromatic output achieved with low pressure UV lamps. **The UV lamps have an expected service life of 5,000+ operating hours which allows for hundreds of typical ballasting cycles. Hyde Marine systems in service for over 10 years have not experienced issues with lamp failure or breakage.**

Treatment Chamber

The Hyde GUARDIAN Gold UV system includes a specific number and size of UV lamps depending on the ballast water flow to be treated. These lamps are housed in high quality quartz sleeves mounted perpendicular to the flow in the corrosion resistant treatment chamber. The system employs an automatic wiping mechanism to keep deposits from accumulating on the sleeves. Each UV reactor contains a temperature sensor, a UV intensity sensor, and a drain. The reactor chamber has an inspection and access hatch for routine checks and maintenance of reactor internals. Recent improvements include the addition of UV reactor level and moisture sensors for increased safety and relocation of the UV cooling valve to the top of the UV reactor chamber for improved air removal.





A company of firsts

Hyde Marine was in the first group of companies to receive Alternative Management System (AMS) approval from the U.S. Coast Guard (USCG) on April 15, 2013 for its Hyde GUARDIAN BWTS. Additionally, the Hyde GUARDIAN BWTS was among the first to receive IMO Type Approval from Lloyd's Register on behalf of the U.K. Maritime and Coast Guard Agency (MCA) in April 2009. Hyde Marine installed one of the first BWTS aboard a ship (M/S Coral Princess), which subsequently was the first BWTS accepted into the U.S. Coast Guard's Shipboard Technology Evaluation Program (STEP) and was the company's first retrofit installation. **Building upon the ten years of shipboard experience, Hyde Marine now leads the ballast water treatment market in retrofit installations.**

Hyde Marine is in the process of updating AMS approval along with ATEX and other class approvals for the new IMO Type Approved Hyde GUARDIAN Gold BWTS. Additionally, Hyde Marine has applied for testing under an Independent Laboratory in 2014 for USCG Type Approval.

Calgon Carbon's UV Technologies Division and Hyde Marine received ISO 9001:2008 accreditation from the registrar Det Norske Veritas (DNV) and the ANAB National Accreditation Board in 2010.

"Hyde Marine's commitment to providing superior service and support will drive continued success for clients as the industry works to comply with pending ballast water treatment requirements."

- Rob McBurney, Commercial Director of Cammell Laird

APPROVALS HYDE GUARDIAN BWTS HAS ACHIEVED



IMO TYPE APPROVED

USCG AMS APPROVED

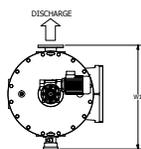
LEAVE NOTHING BUT YOUR WAKE.®

| Hyde GUARDIAN Gold® BWTS | Max Flow (m³/hr) | Filter Model # | UV Model # | Power (KW) nom/max/BW ¹ | Filter | | | | UV | | | | Power Panel | | | | Control Cabinet | | | | Tot.(kg) | |
|--------------------------|------------------|----------------|------------|------------------------------------|---------|--------|--------|------|---------|--------|--------|-----|-------------|--------|--------|------|-----------------|---------|--------|--------|----------|-------|
| | | | | | L1 (mm) | W1(mm) | H1(mm) | kg | L2 (mm) | W2(mm) | H2(mm) | kg | L3 (mm) | W3(mm) | H3(mm) | kg° | Qty | L4 (mm) | W4(mm) | H4(mm) | | kg |
| HG60G | 60 | FC100 | UV8B | 7/10/5 | 390 | 430 | 840 | 105 | 680 | 430 | 930 | 135 | 800 | 400 | 1200 | 135 | 1 | 600 | 210 | 760 | 35 | 410 |
| HG100G | 100 | FC150 | UV16A | 10/15/5 | 420 | 460 | 940 | 130 | 950 | 530 | 1190 | 135 | 1200 | 405 | 1800 | 365 | 1 | 600 | 210 | 760 | 35 | 665 |
| HG150G | 150 | FC150H | UV16A | 10/15/5 | 420 | 460 | 1000 | 190 | 950 | 530 | 1190 | 135 | 1200 | 405 | 1800 | 365 | 1 | 600 | 210 | 760 | 35 | 725 |
| HG250G | 250 | FC200 | UV16B | 18/25/10 | 470 | 500 | 1150 | 290 | 950 | 530 | 1075 | 125 | 1200 | 405 | 1800 | 415 | 1 | 600 | 210 | 760 | 35 | 865 |
| HG300G | 300 | FC200H | UV16C | 24/34/10 | 480 | 520 | 1200 | 320 | 950 | 530 | 1075 | 130 | 1200 | 405 | 1800 | 470 | 1 | 600 | 210 | 760 | 35 | 955 |
| HG450G | 450 | FC250 | UV20A | 36/50/10 | 910 | 750 | 1960 | 550 | 950 | 530 | 935 | 210 | 1200 | 405 | 1800 | 575 | 1 | 600 | 210 | 760 | 35 | 1370 |
| HG500G | 500 | FC250 | UV20A | 36/50/10 | 910 | 750 | 1960 | 550 | 1110 | 630 | 1120 | 210 | 1200 | 405 | 1800 | 575 | 1 | 600 | 210 | 760 | 35 | 1370 |
| HG600G | 600 | FC300 | UV20A | 36/50/10 | 1030 | 850 | 1980 | 725 | 1110 | 630 | 1120 | 210 | 1200 | 405 | 1800 | 575 | 1 | 600 | 210 | 760 | 35 | 1545 |
| HG700G | 700 | FC300 | UV20B | 53/75/10 | 1030 | 850 | 1980 | 725 | 1110 | 630 | 1120 | 205 | 1200 | 405 | 1800 | 990 | 2 | 600 | 210 | 760 | 35 | 1955 |
| HG1000G | 1000 | FC400 | UV20B | 53/75/10 | 970 | 1090 | 2025 | 875 | 1110 | 630 | 955 | 205 | 1200 | 405 | 1800 | 990 | 2 | 600 | 210 | 760 | 35 | 2105 |
| HG1250G | 1250 | FC450 | UV20C | 78/114/10 | 1130 | 1260 | 2125 | 1190 | 1110 | 630 | 955 | 200 | 1800 | 800 | 1800 | 1790 | 1 | 600 | 210 | 760 | 35 | 3215 |
| HG1500G | 1500 | FC450 | UV20C | 78/114/10 | 1130 | 1260 | 2125 | 1190 | 1110 | 630 | 860 | 200 | 1800 | 800 | 1800 | 1790 | 1 | 600 | 210 | 760 | 35 | 3215 |
| HG2000G | 2000 | FC500 | UV20B x 2 | 106/150/10 | 1240 | 1370 | 2210 | 1355 | 1110 | 630 | 955 | 410 | 1200 | 405 | 1800 | 3960 | 4 | 800 | 300 | 1000 | 45 | 5770 |
| HG2500G | 2500 | FC600 | UV20C x 2 | 156/228/15 | 1440 | 1600 | 2385 | 2580 | 1110 | 630 | 955 | 400 | 1800 | 800 | 1800 | 3580 | 2 | 800 | 300 | 1000 | 45 | 6605 |
| HG3000G | 3000 | FC600 | UV20C x 2 | 156/228/15 | 1440 | 1600 | 2385 | 2580 | 1110 | 630 | 860 | 400 | 1800 | 800 | 1800 | 3580 | 2 | 800 | 300 | 1000 | 45 | 6605 |
| HG4000G | 4000 | FC500 x 2 | UV20B x 4 | 212/300/20 | 1240 | 1370 | 2210 | 2710 | 1110 | 630 | 955 | 820 | 1200 | 405 | 1800 | 7920 | 8 | 800 | 300 | 1000 | 90 | 11540 |
| HG5000G | 5000 | FC600 x 2 | UV20C x 4 | 312/456/30 | 1440 | 1600 | 2385 | 5160 | 1110 | 630 | 955 | 800 | 1800 | 800 | 1800 | 7160 | 4 | 800 | 300 | 1000 | 90 | 13210 |
| HG6000G | 6000 | FC600 x 2 | UV20C x 4 | 312/456/30 | 1440 | 1600 | 2385 | 5160 | 1110 | 630 | 860 | 800 | 1800 | 800 | 1800 | 7160 | 4 | 800 | 300 | 1000 | 90 | 13210 |

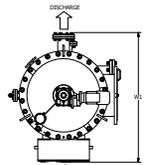
¹ - For reference only. Technical specifications are subject to change without notice. Weights (kg) shown in chart represent totals based on the number of individual components.

[°]Backwash Pump (if included)

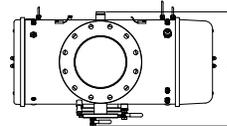
[°]Does not include base frame (70 kg)



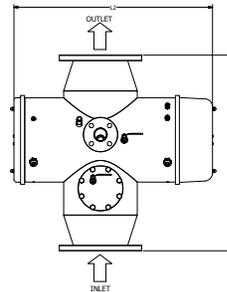
Filter (FC100 - FC200H)



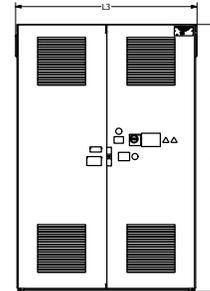
Filter (FC250 - FC600)



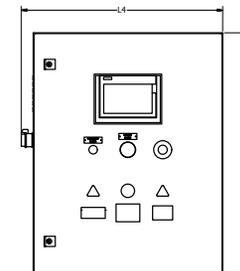
UV



Power Panel



Control Panel



Hyde Marine, Inc.

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Global Service Network

One of the most well-trained, knowledgeable, and experienced networks of global BWTS service providers and technicians available that offer:

- Installation services
- Commissioning services
- Maintenance services
- Repairs, spare parts, and technical support

Service technicians and spare/replacement parts dispatched expediently to all major ports minimizing operational downtime.



Parts Distribution

Spare parts warehoused globally with a 24 hour guarantee delivery for quick replacement to keep your system running smoothly and your ship moving on time.



Commitment to Training

Large investment in training materials, equipment, resources, and top instructors offering:

- On-board crew training during commissioning
- Other in-depth classroom training packages depending on your role with BWTS
- Mobile control panel training consoles for more tangible interactions



Innovations

- Ability to remotely access equipment to conduct on-line software updates, training, and troubleshooting
- Availability of small electronic/virtual technician consoles that can be dispatched to vessels that require immediate (non-emergency) attention/service



Operations Check & Re-commissioning

Hyde Marine can assess your BWTS annually or provide re-commissioning services for vessels that have not started BWTS operation to ensure the system is operating properly and to make sure the crew knows how to operate the equipment.



24 Hour Call Center

For Service, Tech Support, & Parts call:

- 1.855.HYDEBWT
(1.855.493.3298)

Vessel General Permit (VGP) Sampling

Did you Know?

Vessels calling on the United States that discharge and treat ballast water are required to sample two times per year.

In conjunction with an esteemed laboratory partner, Hyde Marine offers an efficient and economical solution for on-board sampling through the B-Box sampling kit.

A Hyde Marine technician will collect the water sample while on site. After the sample has been analyzed at an off-site laboratory, results will be sent to the Owner/Ship Operator.

*2013 Vessel General Permit Ruling; after two successful tests, sampling will only be required once per year.

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Hyde GUARDIAN Gold® Ballast Water Treatment System Standard Product Offering*

| Hyde GUARDIAN Gold® BWTS | Max Flow (m ³ /hr) | Filter Model # | UV Model # | Power (KW) nom/max/BW ^o |
|--------------------------|-------------------------------|----------------|------------|------------------------------------|
| HG60G | 60 | FC100 | UV8B | 7/10/5 |
| HG100G | 100 | FC150 | UV16A | 10/15/5 |
| HG150G | 150 | FC150H | UV16A | 10/15/5 |
| HG250G | 250 | FC200 | UV16B | 18/25/10 |
| HG300G | 300 | FC200H | UV16C | 24/34/10 |
| HG450G | 450 | FC250 | UV20A | 36/50/10 |
| HG500G | 500 | FC250 | UV20A | 36/50/10 |
| HG600G | 600 | FC300 | UV20A | 36/50/10 |
| HG700G | 700 | FC300 | UV20B | 53/75/10 |
| HG1000G | 1000 | FC400 | UV20B | 53/75/10 |
| HG1250G | 1250 | FC450 | UV20C | 78/114/10 |
| HG1500G | 1500 | FC450 | UV20C | 78/114/10 |
| HG2000G | 2000 | FC500 | UV20B x 2 | 106/150/10 |
| HG2500G | 2500 | FC600 | UV20C x 2 | 156/228/15 |
| HG3000G | 3000 | FC600 | UV20C x 2 | 156/228/15 |
| HG4000G | 4000 | FC500 x 2 | UV20B x 4 | 212/300/20 |
| HG5000G | 5000 | FC600 x 2 | UV20C x 4 | 312/456/30 |
| HG6000G | 6000 | FC600 x 2 | UV20C x 4 | 312/456/30 |

*Custom sizes available upon request.

^oBackwash Pump (if included)

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