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PLUMBING

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The Illusion of Scarcity

The fundamental idea of ecological scarcity belies everything we know about this planet of ours, about economics, supply and demand, price and technological innovation over time. This notion that there are absolute limits-that we are going to run out of everything we have today-rests on mindless linear extrapolation. Take a trend 5% a year, compound it into the future, and you get an absurd result. This is due to the law of compounding. It only takes ten years to double if something is compounding at a 7% rate, and once you start doubling things you can very easily get to absurd results.

The best way to deal with current apocalyptic predictions based on linear extrapolation is to look at some predictions from the past. Look at the forecast about U.S. crop land from 1910. We had 400 million acres of crop-land in this country. We were using one fourth of that simply to produce fodder for the horses necessary to work the land, to produce the crops, to feed the population using the remaining 75% of land. It was predicted that by 1978, given the projected growth of the population and the economy (the projected rates of both were accurate) he calculated the rate of food consumption to dollars of personal income. He then applied the food requirements of our society to the 400 million acres of crop land and found it would take 500 million acres of crop land to produce the fodder to feed the animals needed to produce the food. By using this type of extrapolation one would and did come to the conclusion that we would need more land to feed the animals than we had for growing our entire food supply!

The next example is from the solid fuels planning division in 1918. This division was worried about our basic supply of coal at the time. Coal was approximately 75% of our energy consumption at that time. These planners noted that in 1918 we used 650 million tons of coal. They further noted that the growth rate of coal consumption was 5.4% for the last twenty years, and so they extrapolated forward to 1978 and found that the coal requirements would then be ten billion tons-which was fifteen times more than was used in 1978. Furthermore, it would require 10 million men in the mines (about 50 times more than were actually working the mines in 1978), resulting in acres of coal-carrying railcars all over the country, and everything covered with soot. Now, that linear extrapolation model didn't take into account the technological possibilities in the interim, just as happened the case of farming. For example, with farming we don't need horses much anymore because the entire industry has been mechanized. In the case of the solid fuels planner, he could not foresee the increases in efficiency, technology, and other energy sources, with the net result that in 1978 we actually used less coal than we used in 1918. The same has happened to oil field projections. North Sea oil fields that were projected just twenty years ago to be drying up today, are today producing more barrels per day than when the projections were made!

Any planner in 1920 worth his salt would have predicted that by the year 1950 we would have suffered a complete shortage of iron ore. It was all there in the numbers-the available reserves, the rate we were using them, and so forth. But what couldn't be seen was that some major technological changes, driven by price, changed supply and demand relationships. We found we could get the iron ore we need out of taconite, which has a 75% lower iron ore content than the ore bodies we were using in 1920. The predicted scarcity was averted because linear forecasters cannot predict the effect technology, substitution or the impact of prices has on people, driving their ingenuity and their innovative capacity to find solutions to problems that are anticipated. These examples are used to urge caution about such projections today. The problems projected can most often be overcome by technological advances, recycling, etc. The average production of corn in 1910 was 20 bushels an acre. In 1978, 450 bushels were being produced per acre. The fish catch in the world appeared to, level out at 70 million tons in 1970, and on the basis of linear forecasting you would expect we would have a growing protein shortage in the world. But we don't and the reason is U.S. soybean production, which has doubled in fifteen years.

The basic conclusion is that ecological scarcity is a state of mind rather than an assured reality. If we are to halt the gradual drift into statism developing in this country today (which follows inexorably from the logic of scarcity), and the subsequent loss of economic welfare, national wealth, liberties and national living standards that would go with it, then the basic idea of absolute limits and ecologically-based scarcity needs to be questioned, discredited and finally purged from those in government.

TYPE II MARINE SANITATION DEVICES

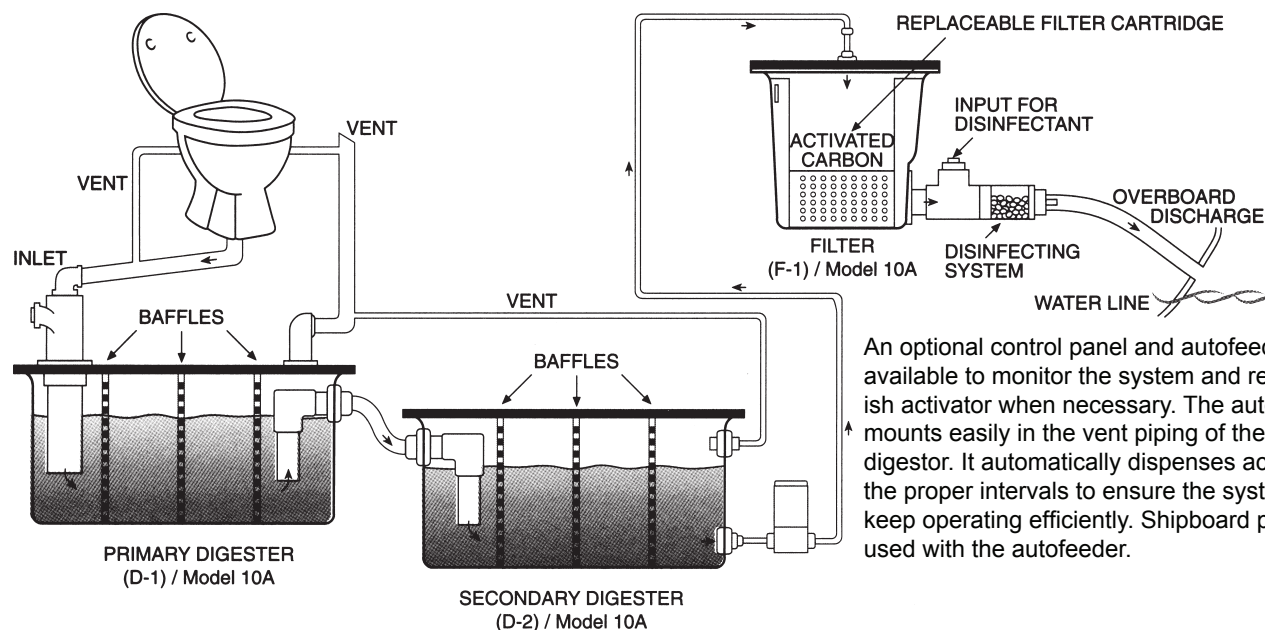
Every engineer appreciates that design is a process of choices. For some, choices mean tradeoffs—a little more strength, but added weight. Smart choices produce advantages. As you look at some of the choices made in the design of The HUMPHREY, consider how each choice saves money for you:

- **FLEXIBLE** - By choosing to use a modular design instead of large, bulky, all-in-one units, we give you ease of installation with greater flexibility in placement. HUMPHREY units can be stacked for compactness, or installed remotely from each other. The system is flexible, so you don't have to take your boat apart. Most systems can be installed in a matter of hours, depending on your particular application.
- **WORKABLE** - HUMPHREY components are usually small enough to pass through existing passageways—facilitating easy installation and minimizing costly down time.
- **LIGHTWEIGHT** - If weight is a critical constraint in your application, The HUMPHREY offers you the best solution. Our weight-to-performance ratio is outstanding any way you figure it.
- **NON-CORROSIVE** - By choosing to use non-corrosive materials (including a special space-age polymer yielding strength and durability), we offer you an MSD truly compatible with the harsh marine environment, instead of another source of rust to deal with below decks.

- **COST-EFFECTIVE** - HUMPHREY systems effectively treat waste for pennies a day per person. And with few moving parts, there are fewer opportunities for maintenance problems. Nevertheless, replacement parts are readily available and very inexpensive.
- **CUSTOMER-FRIENDLY** - By choosing to go with field-proven technologies from the start, we have been able to concentrate on how the product works for our customer. From listening to our customers, we have upgraded, refined and expanded the product into today's user-friendly model line which exceeds USCG requirements for effluent quality.

Now if you think the choices made in The HUMPHREY are to your advantage, please call us and let us provide whatever information you need... to make your own SMART CHOICE.

Sewage flows from the head(s) directly into the Primary digester (D1), a Secondary digester (D2), and a Filter (F1). As the sewage makes it way through a series of baffles in each digester, it is broken down and dissolved by natural bacterial action. The resulting effluent is then pumped through the filter when the float switch in the final compartment of the secondary digester is activated. Here the effluent is further purified and deodorized before passing through the disinfecting system, where final purification takes place. Periodically, a biodegradable activator is introduced into the head. Humphrey Activator consists of a yeast compound to stimulate bacteria growth and an enzyme compound to liquify solids. Activated carbon filters may be washed, reused and eventually replaced after service life has expired.

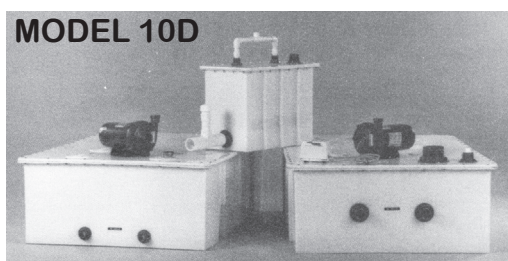
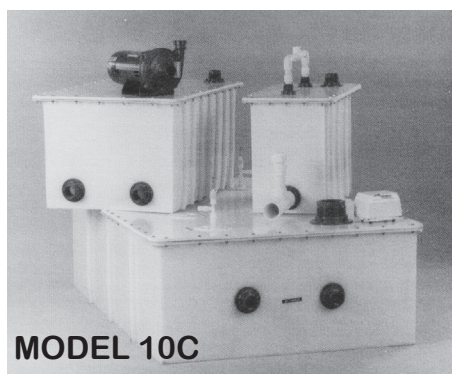
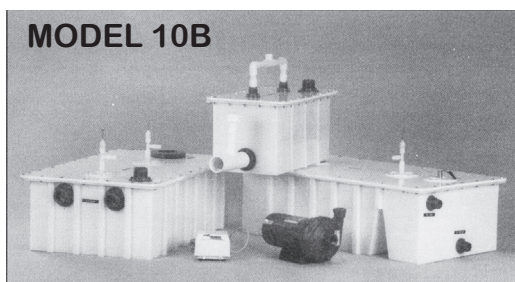
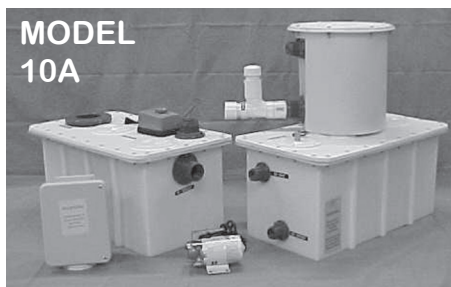


An optional control panel and autofeeder are available to monitor the system and replenish activator when necessary. The autofeeder mounts easily in the vent piping of the primary digester. It automatically dispenses activator in the proper intervals to ensure the system will keep operating efficiently. Shipboard power is used with the autofeeder.

The Humphrey Type II MSD's are fully certified by the USCG and are IMO* approved. Each Humphrey unit exceeds the effluent standard set by Pollution Act Federal Water (33 CFR 159) and carries our Certification Number to ensure absolute compliance with Federal laws. Because of the possibility of future changes in the law, The Humphrey is designed to yield effluent actually higher in quality than currently required by the USCG.

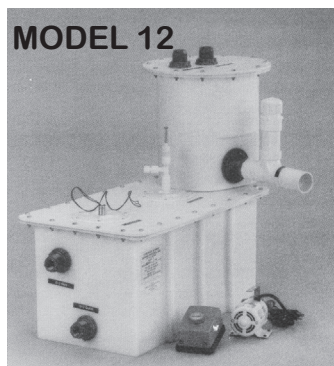
* The Model 12, designed for use by camp and small boat owners, was never submitted for IMO approval.

All Humphrey Sewage Treatment Systems start with field-proven technologies. The product that will serve you is the result of continuous upgrading and refinement. We will be eager to hear how The Humphrey is performing in your particular environment. It is by listening to customers like you that we have developed and refined a user-friendly model line fully prepared to meet water quality requirements in the 21st Century.



HUMPHREY - THIS IS THE WAY WE CHOOSE TO DO IT!

- **I.M.O. */ USCG approved** (No. 159.015/5403/0) meets or exceeds Federal standards (33 CFR 159)
- **Outstanding size-to-performance ratio** you can fit several Humphreys **inside** other Type II designs
- **Modular design creates flexible installation options** stack or separate components, creating space where you need it.
- **True marine-construction, using non-corrosive materials** Do you really want another source of rust below decks?
- **Low maintenance** periodic flush of activator & a spot check; uses fresh or salt water
- **Significant weight savings** equal or superior performance from smaller, lightweight units
- All add up to **reduced total operating costs!**



*** NOTE:**
Certified by the USCG, the Model 12 was designed for use by camp and small boat owners, and thus was not submitted for IMO approval. It is favored by camp owners in Louisiana as an ideal solution for compliance with new state regulations.

SEWAGE TREATMENT FOR ALL CAPACITIES

TYPE	FLOW RATE		COMPONENT SIZES			WT. in lbs.		POWER DRAW per 6 second flush	
	GPD	CREW	D-1	D-2	FILTER	DRY	WET	12VDC	110VAC
Model 12	2,770	3 man	n/a	27L x 15W x 12H	24L x 15W x 12H	40#	115#	6 amp	6 amp
Model 10A	5,760	8 man	27L x 15W x 12H	27L x 15W x 12H	24L x 15W x 12H	66#	225#	6 amp	6 amp
Model IOAB	5,780	15 man	42L x 25W x 12H	27L x 15W x 12H	24L x 15W x 12H	84#	336#	6 amp	6 amp
Model IOB	7,200	30 man	42L x 25W x 12H	42L x 25W x 12H	27L x 15W x 12H	158#	750#	n/a	11.2 amp
Model 10C	9,000	50 man	60L x 40W x 18H	42L x 25W x 18H	24L x 15W x 18H	208#	3000#	n/a	11.2 amp
Model 10D	11,160	75 man	60L x 40W x 18H	60L x 40W x 18H	42L x 25W x 18H	414#	4000#	n/a	11.2 amp

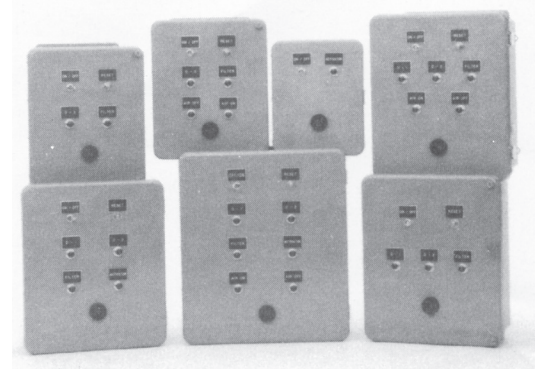


model 12
model 10A
model 10B

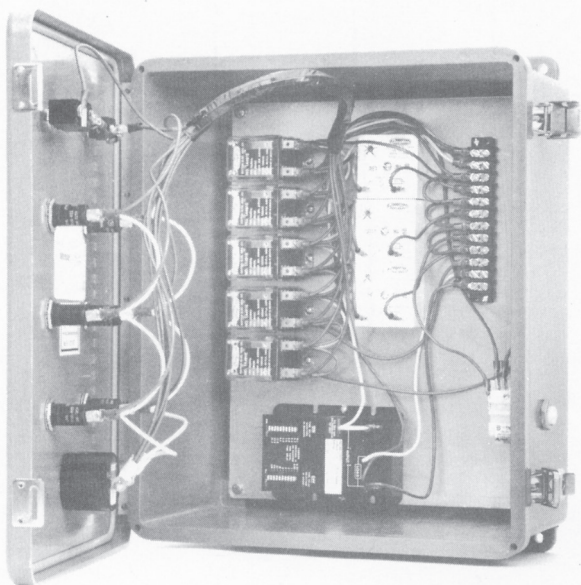
MORE IMPROVEMENTS FROM HUMPHREY MARINE!

Humphrey Marine has been a recognized leader in the field of sewage treatment for years. Now in keeping with a tradition of providing economical and dependable service Humphrey Marine introduces a line of monitor panels and automatic feeders for Humphrey sewage treatment systems.

The Humphrey Monitor Panel provides you with an early warning alarm of any blockage problems associated with your Humphrey Marine Sanitation Device. Both visual and audible alarms are used so you can find a problem before it gets out of hand. Humphrey Marine believes in the old adage an ounce of prevention is worth a pound of cure. Your crew will be happier, if there is a problem, when you have on board diagnostics with the Humphrey Monitor Panel. The monitor panel can save your crew from a potentially unpleasant cleanup situation and in some instances can save your company the expense of a service call. The monitor alarm will not be triggered by the normal wave action that your vessel would encounter. The enclosure is UL listed and made of fiberglass to eliminate rust and corrosion. It is simple to install and can be mounted in a remote location such as the engine room, helm, or any location where someone is normally on duty. Many models are available to fit your specific needs. Just one more effort by Humphrey Marine to provide the most affordable, reliable and user friendly marine sanitation devices available today!



The Humphrey Autofeeder uses a simple design that mounts easily in the vent piping of the primary digester. The Humphrey Autofeeder will automatically dispense the Humphrey activator in the proper intervals to ensure that your system will keep operating at peak efficiency. Shipboard power is used with the autofeeder and in the event of a power failure the autofeeder will automatically dose the system to make sure that it did not miss a scheduled cycle. The autofeeder will resume the normal cycle after initially dosing the system when power is restored. Your crew has enough to worry about in the operation of your vessel - let the Humphrey Autofeeder take care of this task for you. The Autofeeder can also be used with the Humphrey Monitor Panel to sound an alarm when the Activator level is too low and needs replenishing. Let Humphrey Marine monitor your system for you!





Marine Application Systems

The Seahorse "Mariner Series" Marine Sanitation Device is a self-contained biological treatment system that is sized to fit almost any application.

The Seahorse MSD's can meet any crew requirements for USCG, IMO, International, Local and State regulations. Units can also be custom designed to fit in many tight spaces.

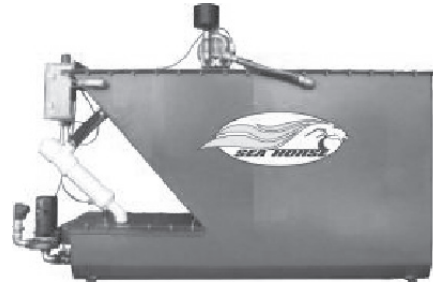
The Mariner Series comes complete with NEMA 4 waterproof enclosures with high level alarm, and discharge pump.

Seahorse also provides a complete line of products to help you maintain your system properly.

Features & Benefits:

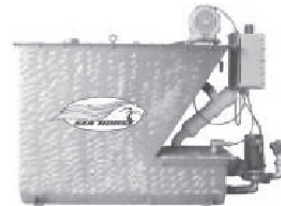
- USCG /IMO Certified Type II MSD
- Low Maintenance - few moving parts and no special tools required
- Crew sizes from 1 to 450+
- Certified to treat up 8500 GPD per single system
- Meets or exceeds all EPA, State or International requirements
- Standard Configurations and customs designs
- Operates in Fresh and Saltwater
- Carbon Steel, Stainless Steel, and Aluminum Construction
- Standard carbon steel unit

MARINER SERIES



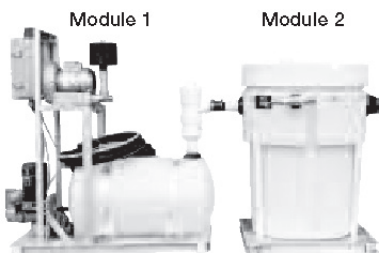
Model #	Crew Size	H	L	W
100 Compact	3	4'	5'-6"	2'
100	3	5'	5'-6"	1'-10"
200	6	5'	7'	2'
300	12	5'	7'	2'-6"
400	18	5'-6"	9'-6"	2'-6"
500	23	7'	9'-6"	

Larger Models,
Stainless Steel and
Aluminum Units
Available



RETROFIT SERIES

MODEL 200 RT

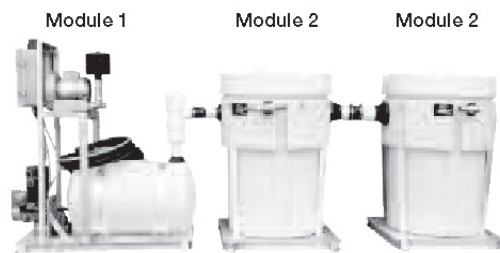


Modular construction design allows for ease of installation and configuration.

SPECIFICATIONS

Crew Size: 6 (Black water only. 1.6 gpf)
Module 1 - H 41" x L 48" x W 29"
Module 2 - H 46" x L 36.5" x W 31"

MODEL 300RT



SPECIFICATIONS

Crew Size: 12 (Black water only. 1.6 gpf)
Module 1 - H 41" x L 48" x W 29"
Module 2 - H 46" x L 36.5" x W 31"
Module 2 - H 46" x L 36.5" x W 31"

PATENTED - PROVEN - U.S.C.G. CERTIFIED TYPE II MSD

The OWENS KLEEN TANK is a self-contained "extended aeration" biological system that is ready for operation when site electrical and mechanical connections are in place. The KLEEN TANK small boat models can be designed to fit small, hard to fit areas and have a capacity range from 33 GPD to thousands of gallons per day. Easy maintenance, long lasting reliability and optimum effluent compliance make the KLEEN TANK the educated choice for marine sanitation devices.

CONSTRUCTION

- Constructed of Carbon Steel or Stainless
- Seam Welded
- Sandblasted to near white metal
- Corrosion Protected
- Coal Tar Epoxy inside
- 3-Part Polyurethane Paint System outside
- Stainless Steel weir basket - self cleaning
- Regenerative Blower TEFC - quiet (optional)
- Float Controlled Effluent Pump (optional)
- Patented Floating Skimmer
- Upflow Filter w/ Backwash System
- Easy Access Covers
- Easy Access / Non-Corrosive Valve Controls
- Low Maintenance Disinfection System
- Alarm System (optional)
- Nationwide Single Source Supplier for Repair Parts
- Exterior Mounted Filter Cleaning Valve

SIZED TO DO THE JOB

Model (small boat)	Crew Size	Dimensions			Empty Wt.	Full Wt.
		L	W	H		
A	3	4'-6"	2'-0"	4'-6"	400	950
A* lowboy	3	4'-6"	2'-5"	3'-6"	400	950
B	6	5'-10"	2' 5"	4'-6"	500	1465
C	10	6'-8"	3'-1"	4'-6"	990	2015
D	16	8'-9"	3'-1"	5' 8"	1105	3090
E	20	9'-2"	3'-1"	5'-8"	1317	3682
F	32	9'-9"	4'-0"	5'-8"	1550	5100
575	50	9'-0"	5'-0"	7' 1"	3500	9571
750	65	10'-0"	5'-0"	7'-1"	4000	12613
1125	100	13'-4"	5' 0"	7'-1"	4600	16,225

All unit application sizing (Crew Size) is based on:
 1. Low Flush Toilets. 1-1/2 gallon/flush
 2. 24 Hour Occupancy
 3. Blackwater only. For other Applications Consult Factory.

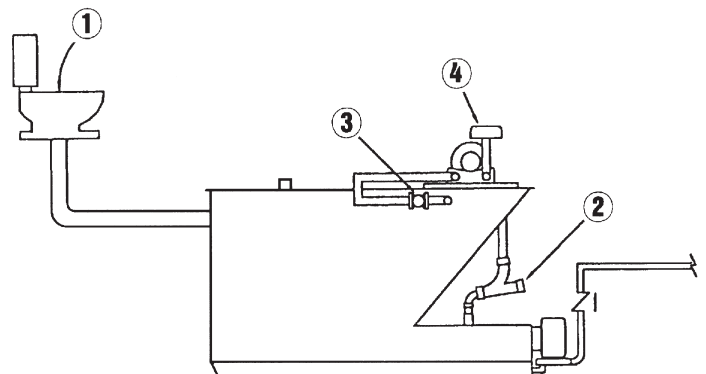
- Modified size for easy placement on vessels. Models C and larger are skid mounted. Add 4" to height and 6" to length for overall dimensions.

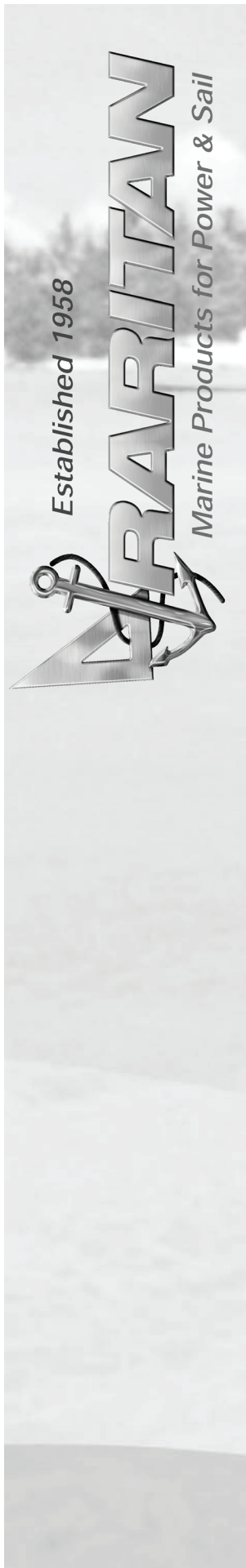
NOTES

1. Standard units are constructed of carbon steel plate. Stainless Steel or aluminum plants are also available, consult factory for prices.
2. Explosion proof or 3 phase equipment available on special order, consult factory.
3. Larger & Special units are available by Special Order. Designs to fit most small and hard to fit areas are also available upon request.
4. U.S.C.G. certified as Type 11 MSD/33CFR 159.15 Under OWENS KLEEN TANK, Certification #159.1038/5/11

KLEEN TANK 4-POINT EASY MAINTENANCE PLAN

1. Every two weeks - add Formula 101 to toilet
2. Every two weeks - add chlorine as required
3. Once a month - clean external up-flow filter
4. by opening the external fluffer valve for 5 minutes
5. Every six months - replace inlet air filter





LECTRA/SAN[®]

LST/MC[™]



Smallest, most popular U.S. Coast Guard certified Type I Marine Sanitation Device for environmentally friendly treatment of waste and legal overboard discharge on inspected and uninspected vessels up to 65 feet.

Benefits

- Microprocessor control (MC) monitors conditions inside the treatment unit and automatically informs users of changes in water conditions
- One-step activation with toilet switch or LST/MC[™] touch pad automatically activates toilet and treatment system
- Light sequence on the Control Indicator Panel indicates system functions and changes in salt and voltage conditions
- Generates its own natural disinfectant from salt water
- Coated electrodes use salt water to kill bacteria and viruses without adding harmful chemicals to the sea
- Discharges with treatment levels that are safe for environmentally sensitive areas
- Eliminates the need for bulky holding tanks in areas that have not been declared No Discharge Zones by the U.S. EPA
- Treats each flush as waste is generated
- Can be used with two marine toilets
- Easy to install
- Can be used with both manual and electric toilets
- Each unit is assembled by hand, individually tested and backed by Raritan's one-year Limited Warranty and legendary technical support team

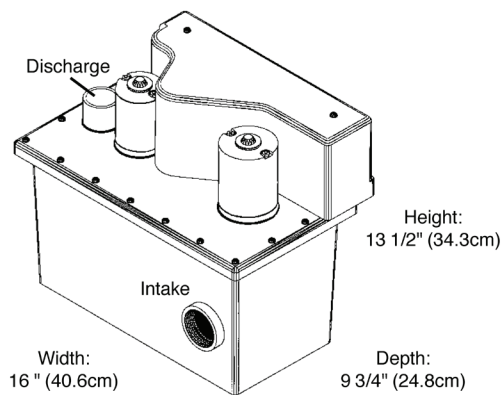
Options

- Available for 12, 24 and 32V DC
- Optional toilet sensor starts treatment unit when manual toilet is flushed
- Optional control available for use with two toilets
- Optional salt feed systems available when using fresh or brackish water

Raritan manufactures equipment for pleasure boats throughout the world. Products include marine toilets, waste treatment systems, icemakers and water heaters.

Committed to the environment and preserving sea life, Raritan designs products to help maintain an environmental balance and ensure the quality of marine waters. In addition, the company has achieved ISO 9001:2000 certification for quality.

Innovation Through Experience



Approximate Shipping Weight: 20 lbs (9 kg)

The LST/MC utilizes improved electrodes which temporarily convert salt water into a powerful bactericide. The treated waste water then safely and conveniently reverts back to its original state of salt and water. No unnatural or harmful chemicals enter our environment.

The design of the treatment tank optimizes the thoroughness of treatment by forcing the bactericide and bacteria into direct contact, effectively killing viruses and bacteria.

The Lectra/San can be installed with one or two marine toilets to form a complete sanitation system. Pressing the "PUSH TO FLUSH" touch pad activates the treatment cycle. The toilet(s) can be interfaced with the LST/MC to provide one touch toilet flushing and treatment activation. The Control Indicator Panel provides visual monitoring of a variety of diagnostics.

Operation

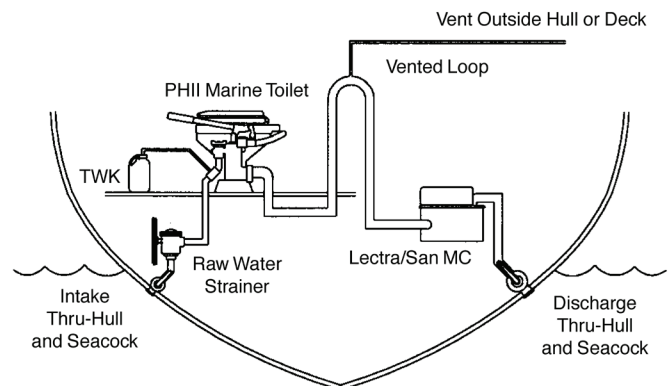
The flushing action of the toilet discharges waste into the first chamber of the Treatment Tank. Here the waste is macerated and receives its first treatment. Specially coated electrode plates create an electrical field and convert salt water into hypochlorous acid, a powerful bactericide. Once the treatment solution reacts with bacteria and waste, it reverts back to salt and water.

The next time the toilet is flushed and new untreated discharge water enters the first chamber, some of the treated discharge enters the second chamber. While the new waste is being treated in the first chamber, the contents of the second chamber are stirred and treated again. Each successive flush moves the previous toilet discharge through the Lectra/San and eventually overboard or into a holding tank. When the discharge enters the marine environment, virtually all bacteria and viruses have been eliminated.

USCG TYPE I MSD CERTIFICATION

#159.015/107/1

Sample Installation



Lectra/San MC with Vented Loop (Above Waterline)

"One of the great mistakes is to judge policies and programs by their intentions rather than their results."

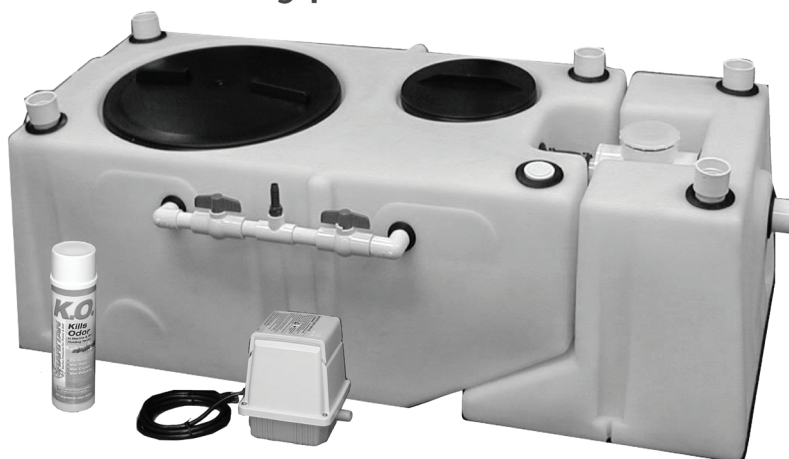
— Milton Friedman

"A society that puts equality before freedom will get neither. A society that puts freedom before equality will get a high degree of both."

— Milton Friedman

MANAGERM

Type II MSD



Effective reliable treatment of onboard sewage for up to 12 persons per day. The Managerm is an aerobic biological sewage treatment system. The System uses air, water and the natural occurring bacteria to biologically convert waste to water and carbon dioxide (a harmless odorless gas)

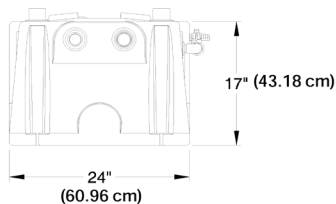
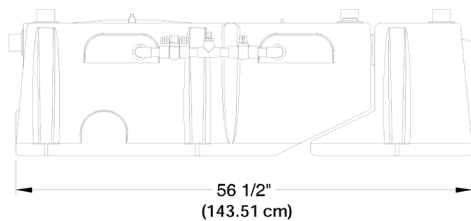
- USCG Certified Type II Marine Sanitation Device also compliant with IMO Resolution MEPC2(VI)
- Tank constructed of lightweight corrosion resistant polyethylene
- Easy installation - Simple maintenance
- No foul odors
- No moving parts in contact with sewage
- Quiet, durable aeration pump included
- Low cost
- Uses very little electricity
- Operates with fresh, brackish and salt water
- No special tools are required for installation
- For use on inspected and uninspected vessels
- Works best with macerating toilets

Raritan manufactures equipment for pleasure boats throughout the world. Products include marine toilets, waste treatment systems, icemakers and water heaters.

Committed to the environment and preserving sea life, Raritan designs products to help maintain an environmental balance and ensure the quality of marine waters. In addition, the company has achieved ISO 9001:2000 certification for quality.

Innovation Through Experience

MANAGERM



Specifications

MODEL # 6400121

Capacity -

12 persons/day

Weight -

Dry - 100 lbs. (45.36 Kg)

Wet - 575 lbs. (260.8 Kg)

Water -

Salt, Fresh or Brackish.

(Salt content must not exceed 4%)

Ambient Temperature Operating range -

Min. 40°F (4.5°C)

Max. 120°F (49°C)

Electrical -

Aeration pump - 120 VAC 1 amp. 50/60 HZ

Operation

The ManaGerM is a flow through system for black water only. It is an extended aeration bioreactor with a secondary disinfecting tank.

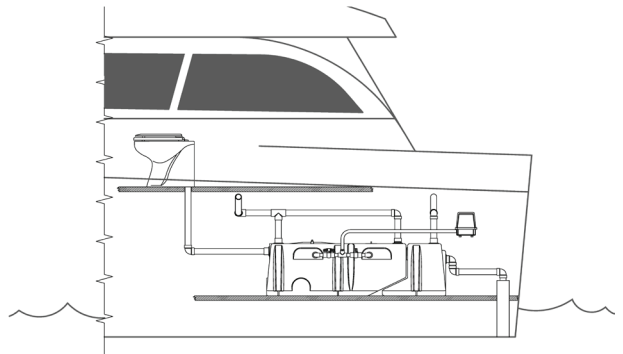
The ManaGerM has two tanks. The first tank has two chambers - the first chamber converts waste into water (H₂O) and carbon dioxide (CO₂) - the second chamber allows solids to settle and clarified water to pass on to the secondary tank,

Water displaced from the first tank moves through the tablet dispenser and into the secondary tank where disinfection takes place.

The ManaGerM works best with macerating and eductor (jet-type) toilets.

Sample Installation

The ManaGerM is intended for installations at or above the waterline of the boat. The outlet of tank is designed to drain, not pump upward.



Random Science Trivia

- If you could tap the energy released by an average-sized hurricane, it would be enough to satisfy all U.S. energy needs for six months.
- In any given year, about 26,000 meteorites land on the Earth's surface, the vast majority dropping into the oceans. Only seven people in recorded history have been hit by one.
- When glass breaks, the cracks travel faster than 3,000 mph.
- Gold is so rare that all of the pure gold produced in the last 500 years would fit inside a 50-foot cube.
- At least 100,000 separate chemical reactions occur in the human brain every second.
- About 70% of Earth is covered with water, yet just 1% of it is drinkable.
- Sound travels through steel 15 times faster than it travels through air.
- To escape the Earth's gravitational pull, a spacecraft has to move faster than seven miles per second-a speed that would take you from New York to Philadelphia in under 20 seconds.
- Rain contains vitamin B12.
- According to a University of Michigan study, men are six times more likely to be struck by lightning than women are.
- If you could capture a comet's entire 10,000-mile vapor trail in a container, the condensed vapor would occupy less than one cubic inch of space.
- Earth moves through space at a speed of 660,000 mph eight times faster than the speed of a bullet.



crown head™ II

Crown head dependability, quiet design reduces noise.

Diaphragm intake pump will not be damaged by running dry.

Crown Head II a reliable, mid-priced electric macerating toilet.

Freshwater Solenoid Model (C2F*)

- Whisper Flushsm design for quiet operation
- Less maintenance and odors than raw water models

Remote Intake Pump Model (C2R12 or C2R12)

- Diaphragm intake pump can be run dry without damage
- Reduces noise levels
- Easier access to intake pump

All Crown Head II Models

- Suitable for the most demanding boaters in any size vessel
- Proven, dependable design (same efficiency as the crown head)
- Efficient flushing action – includes powerful centrifugal macerating pump
- Simple and flexible installation for mounting above or below waterline
- Easy to clean and maintain
- Pump cover that neatly hides components
- Remanufactured pump exchange program available
- Can be used with on-board treatment systems (such as the Lectra/San[®]) and/or holding tanks
- Each unit is assembled by hand, individually tested and backed by Raritan's one-year Limited Warranty and legendary technical support team

Options

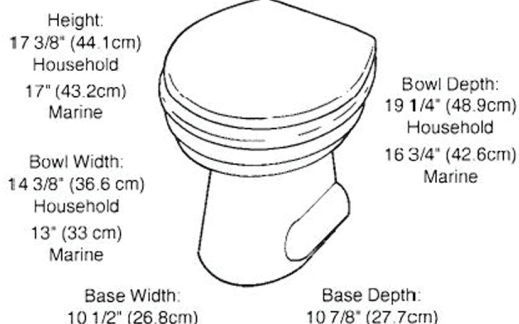
- Available for 12, 24, 32V DC or 120/240V AC
- Choice of full-size household-style bowl or marine-size bowl
- Available in white or bone

Raritan products are chosen by powerboat, sailboat, houseboat, and RV owners and manufacturers the world over for their dependability, environmental responsibility, simplicity of installation, operation, and maintenance. The product line includes house-hold style toilets, marine toilets, marine sanitation devices and systems, cleaning products, icemakers, water heaters, and rudder angle indicators.

To view our complete line, to obtain installation and servicing guides, visit raritaneng.com.

THE MOST DEPENDABLE NAME ON THE WATER

crown head™ II

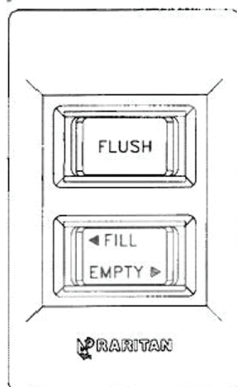


The advanced crown head II was designed without compromising the high level of efficiency of the crown head. This was accomplished by redesigning the way water is delivered to the bowl. The raw water model uses a remote-mounted pump, while the on-board pressurized freshwater model is connected to the pressurized water system. As a result, the boater benefits from the same level of performance with quieter operation.

A newly designed pump cover blends with the porcelain bowl, creating a streamlined one-piece look. This cover neatly hides all the components while at the same time allows immediate access to the macerator and discharge pump.

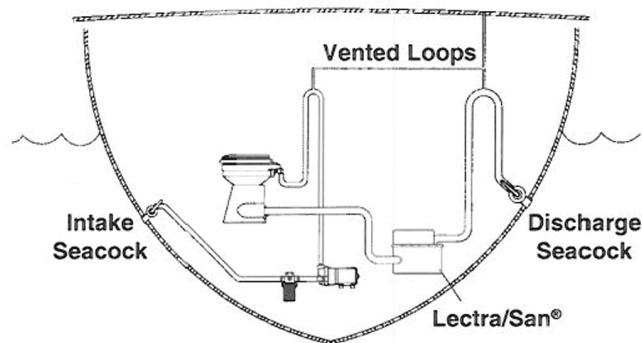
The crown head II is built of the highest quality materials, is reliable and easy to maintain.

Optional Control



The crown head II optional control allows for selection of momentary operation or independent operation of incoming water and macerator.

Crown Head II Using Sea Water and Connected to a Lectra/San



Specifications

Units Voltage	Intake pump Models	Freshwater Solenoid Model
	Amp draw @ nominal voltage	Amp draw @ nominal voltage
12 VDC	28	19
24 VDC	14	9.5
32 VDC	11	7.5

Additional parts required: Fuses or circuit breakers, wire terminal ends, four stainless steel mounting bolts (minimum 1/4" [6mm]) or lag screws and washers, 1 1/2" (38mm) I.D. sanitation hose, and 3/4" (19mm) I.D. sanitation hose and hose clamps. For pressurized fresh water flushing, a manual ball valve (3/4" IPS) is also recommended.

Approximate Shipping Weight: 60 lbs (27 kg)

Product Models

C2 Crown head II	Straight Discharge (standard)	Bowl Color	Remote Intake pump (standard)	Specify Voltage
9	90 Discharge	A White bowl, marine-size (standard)	F Freshwater Solenoid	12
		W Bone bowl, household-style		24
				32
				24T 120/240

To order the correct unit for your installation make one selection from each column above.

Model samples:

C2912 - Crown Head II, white bowl marine size, 90° discharge 12V

C2WF12 - Crown Head II, white bowl household-style, freshwater solenoid, 12V

Additional models are available. Call Raritan Technical Support for assistance in ordering the model that best suits your application.



THE MOST DEPENDABLE NAME ON THE WATER

ATLANTES FREEDOM™



NEW 8/05

Powerful bronze cutting blades designed to “shred” most objects

Two bowl sizes: standard household or elongated

Freedom from clogged toilets and marine size bowls, excellent performance even in commercial applications.

Standard Features

- One piece china bowl
- Anti-clog “power shred” discharge system

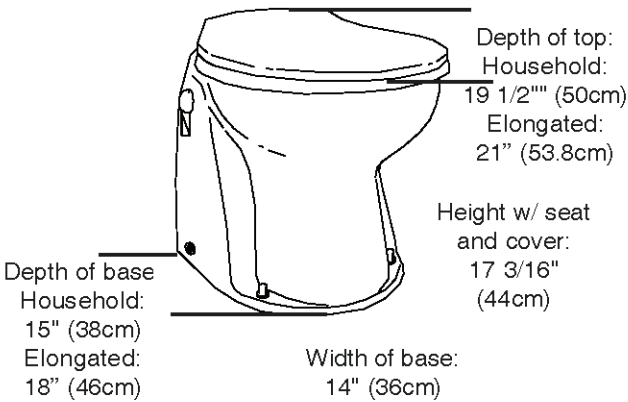
Benefits

- Quiet “whisper flush” models available
- Simple flexible installation
- Heavy duty attractive stainless steel flush handle
- Low power consumption
- Three modes of operation - Fill, dry flush or fill and flush
- Handle with timer operation has “fail-safe” mode
- Easy to clean and maintain
- Diaphragm intake pump can be run dry
- Pressurized freshwater or raw water intake models
- Microprocessor control and solid state circuit breaker
- No fuses or relays inside the unit

Options

- Available in 12, 24, 32V DC 120/240 VAC
- Elongated (white and bisque) or Household size (white, bone and black) bowls
- Wall switch and timer control models available

ATLANTES FREEDOM™



Three basic models, all are available in Remote, Integral or Pressurized Freshwater:

- A7 - Momentary operation activated by the sturdy stainless steel handle.
- A8 - Timed operation activated by the sturdy stainless steel handle. Equipped with a "fail-safe" mode if timer fails.
- A9 - Timed operation activated by a wall touch pad. Allows for water saver feature using as little as 1 quart of water per flush.

Product Models

A	Bowl Style		Bowl Color	Pump style	
	Household (standard)	L Elongated Bowl			
			7 Stainless Handle	Integral pump (standard)	12 Specify
			8 Stainless Handle with Toilet Control (for timed operation)	R Remote Sea water Pump	24 Voltage
			9 Wall Switch with Water Saver Feature	F Freshwater Solenoid	32
					24T 120/240

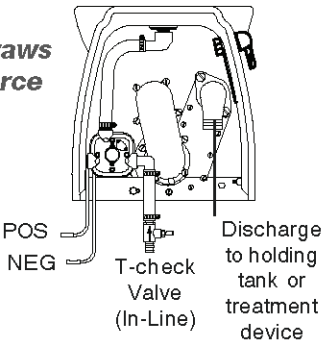
To order the correct unit for your installation make one selection from each column above.

Model samples:

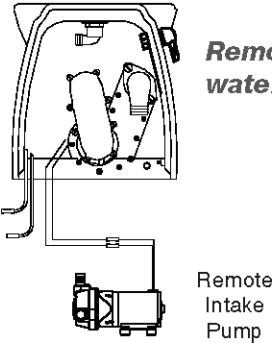
- A712 - Atlantés, Stainless Handle, white bowl, integral intake pump, 12V
- AL9AR24 - Atlantés, Elongated Bowl, Wall Switch, Bisque, remote intake pump, 24V

Simple Installation in all applications

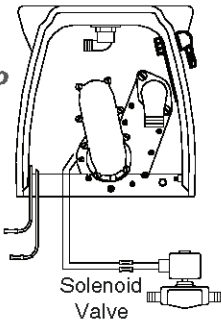
Integral Intake pump draws water from outside source



Remote Intake pump draws water from outside source



Freshwater Solenoid connects to onboard water pressure system



Specifications

Units Voltage	Intake pump Models	Freshwater Solenoid Model
	Amp. draw @ nominal voltage	Amp. draw @ nominal voltage
12 VDC	20	11
24 VDC	10	5.5
32 VDC	8	4.5

8600 Series MasterFlush Toilets

Bringing style, quality and versatility together.



Model 8679
MasterFlush Toilet

Rarely does one marine toilet fit a wide array of floor plans with equal ease. With the choice of heights, colors, flush controls and discharge plumbing, the 8600 series of MasterFlush™ toilets from Dometic now allows boatbuilders to install a fixture of unparalleled performance in virtually any bath.

The contemporary shape features a flat back to accommodate installation against interior walls. 8600 series toilets come in low-profile and standard-height units. Discriminating owners may choose from additional options: toilet or toilet/bidet combination units (available late 2010); white or bone colors.

Dometic 8600 series macerator toilets offer two flush settings to help manage water use. The "Normal" flush setting consumes 0.85 gal. (3.2 liters) of water and adds a small amount of water to the bowl after every flush, and "Dry Bowl" flushing uses only 0.45 gal. (1.7 liters) per flush and does not add water to the bowl.

The ceramic styling of the Dometic 8600 series matches that of Dometic's 4600 series VacuFlush® toilets. This advantage provides boat designers the added ability to offer choices in toilet technology across boat model lines without altering the decor or floor plans of the baths.

Key Benefits

- Powerful macerator flush.
- Flat back-style ceramic fixture – fits nicely against interior walls.
- Standard and low-profile heights.
- Ultra-quiet – integral water trap reduces macerator sound (tall models only).
- Through-the-floor and through-the-wall discharge fittings.
- "Soft close" seat action.
- "Normal" or "Dry Bowl" flush options.
- Standard Dometic electronic touchpad or popular Vimar and Gewiss switch options.
- 12 V DC or 24 V DC operation.

Sealand®
by Dometic GROUP

Gossip
A gossip always get caught in their own mouth-trap.

A closed mouth gathers no foot.

Technical Specifications for 8600 Series MasterFlush™ Toilets

Model	Description	Voltage
8639	Low-profile macerator toilet	12 V DC
8630	Low-profile macerator toilet	24 V DC
8679	Standard-height macerator toilet	12 V DC
8670	Standard-height macerator toilet	24 V DC

Available in white and bone colors.
Specifications subject to change without notice.

Minimum System Requirements

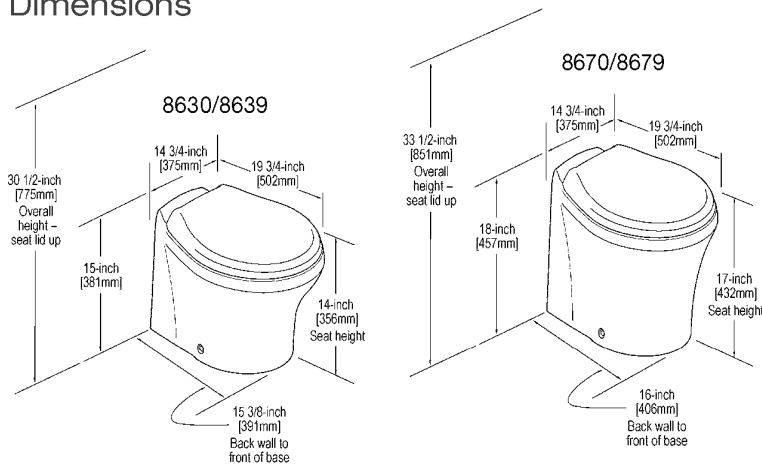
Electrical	Circuit breaker	20 amps/12 V DC; 15 amps/24 V DC
	Wiring	12 ga. (up to 20 ft./6.1 m from breaker)
Water Supply	Fitting	0.5 in. NPT
	Flow rate	2.0 gpm/7.6 lpm min. at toilet
Discharge	ID	1.5 in./38 mm or 1 in./25 mm minimum
	Horizontal run*	98 ft./30 m maximum
	Vertical run*	9.8 ft./3 m maximum
	Tank capacity	30 gal./114 liters recommended
Required Components	Electric flush switch**	Dometic, Vimar or Gewiss

* Horizontal and vertical run distances are not cumulative. Check for adequate discharge flow if installation nears one of these limits.

** Purchased separately.

Specifications subject to change without notice.

Dimensions



Flush Settings

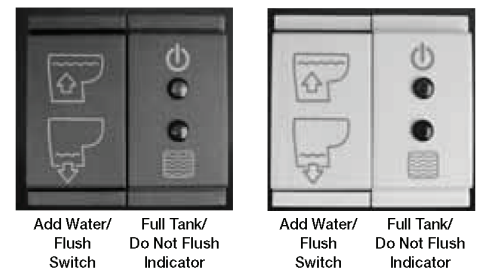
Change from “Normal” to “Dry Bowl” flush option by pressing “flush” switch for about five seconds. When “power on” light begins flashing, release “flush” switch. Flush setting has been changed. Change back to “Normal” setting in the same manner.

Dometic Touchpad



Standard Dometic panel includes “add water” and “flush” functions, “power on” and “full tank” indicator lights. Also available in white.

Vimar Switches, Indicators



Gewiss Switches, Indicators



Available in black only.

Sealand
by Dometic GROUP



Attitude

Growl all day and you'll feel dog tired at night.

The people who get on in this world are the people who get up and look for the circumstances they want and, if they can't find them, make them. George Bernard Shaw

THETFORD

- Large and convenient single-pedal flush.
- Attractive styling that's easy to clean.
- Pulsating flush provides superior, near instantaneous, full-bowl washdown.
- The worthy successor to Aqua-Magic Galaxy/Starlite!
- Many features make it the easiest RV toilet ever to install and service, including front shroud that pulls off for easy access to mounting bolts and pedal mechanism.
- Taller for a built-in higher comfort level.
- Easy-off Seat and Cover Pod for easy cleaning and service.
- 3-Year Warranty if bought after Jan. 1, 2001.

Bravura



BABIES KEEP FALLING ON MY HEAD

"Joseph Figlock was passing an apartment block in Detroit in 1915 when he was knocked unconscious. A baby had fallen fourteen stories and landed on him. Both survived. One year later, Figlock was passing the same apartment block-and once again he was hit by a falling child ... and survived!"

-One in a Million

High Profile Dimensions

Length - 20 3/16 in.(51.3 cm)

Width - 16 9/16 in.(42.1 cm)

Height - 17 7/8 in.(45.4 cm)

Low Profile Dimensions

Length - 20 3/16 in.(51.3 cm).

Width - 16 9/16 in.(42.1 cm)

Height - 14 in.(35.6 cm)

How smart are you really?

This Test has been used for over 50 years and has has pretty much done it with great accuracy. If you don't score high, remember, you can always improve. It has been said Bill Gates once took this test and scored a 3 on it. Share your score with friends! Good Luck!

1. Do they have a 4th of July in England?
2. How many birthdays does the average man have?
3. Some months have 31 days; how many have 28?
4. How many outs are there in an inning?
5. Is it legal for a man in California to marry his widow's sister?
6. Divide 30 by 1/2 and add 10. What is the answer?
7. If there are 3 apples and you take away 2, how many do you have?
8. A doctor gives you three pills telling you to take one every half hour. How many minutes would the pills last?
9. A farmer has 17 sheep, and all but 9 die. How many are left?
10. How many animals of each sex did Moses take on the ark?
11. How many two cent stamps are there in a dozen?

ANSWERS

1.) Yes, 2.) 1 3.) 12 4.) 6 5.) How could he if he's dead 6.) 70 7.) 2 8.) 60 minutes 9.) 9 10.) 0, Moses wasn't on the Ark 11.) 12

Traveler® China Toilets

Traveler china toilets provide all the comforts of home in a gravity discharge toilet for houseboats and commercial vessels.

- **Efficient.** Effective rim flush action uses about a pint (.5 liter) of fresh water per flush from on-board demand system. Integral anti-siphon vacuum breaker protects potable water supply. Requires no electricity.
- **Fresh, clean.** Freshwater operation means there are none of the nasty odors common to saltwater flushing toilets. Our exclusive self-cleaning flush ball with Teflon® seal locks out holding tank odors.
- **Proven reliability.** By eliminating the accumulation of impurities and saltwater residue, overall life of system components is extended.
- **Easy to install.** Designed to mount over a 4-bolt 3" (76mm) closet flange. Water connection is 1/2" (13mm) MPT.

Traveler 510 Plus

Just like home.

New styling features improved rim wash, a deeper bowl, increased seat height and a household-size seat for enhanced comfort. Available in five exciting colors!

Model	Item Number	Color
510+	651001	White
510+	651003	Bone
510+	651006	Platinum
510+	651008	Ebony
510+	651011	Teal

Also available in a low-profile model.

Traveler 2010

European styling with full-size comfort.

Featuring a deep bowl with an adult-sized seat, the model 2010 toilet is comfortable as well as stylish.

Model	Item Number	Color
2010	421001	White
2010	421003	Bone
2010	421008	Ebony

Also available in a low-profile model.

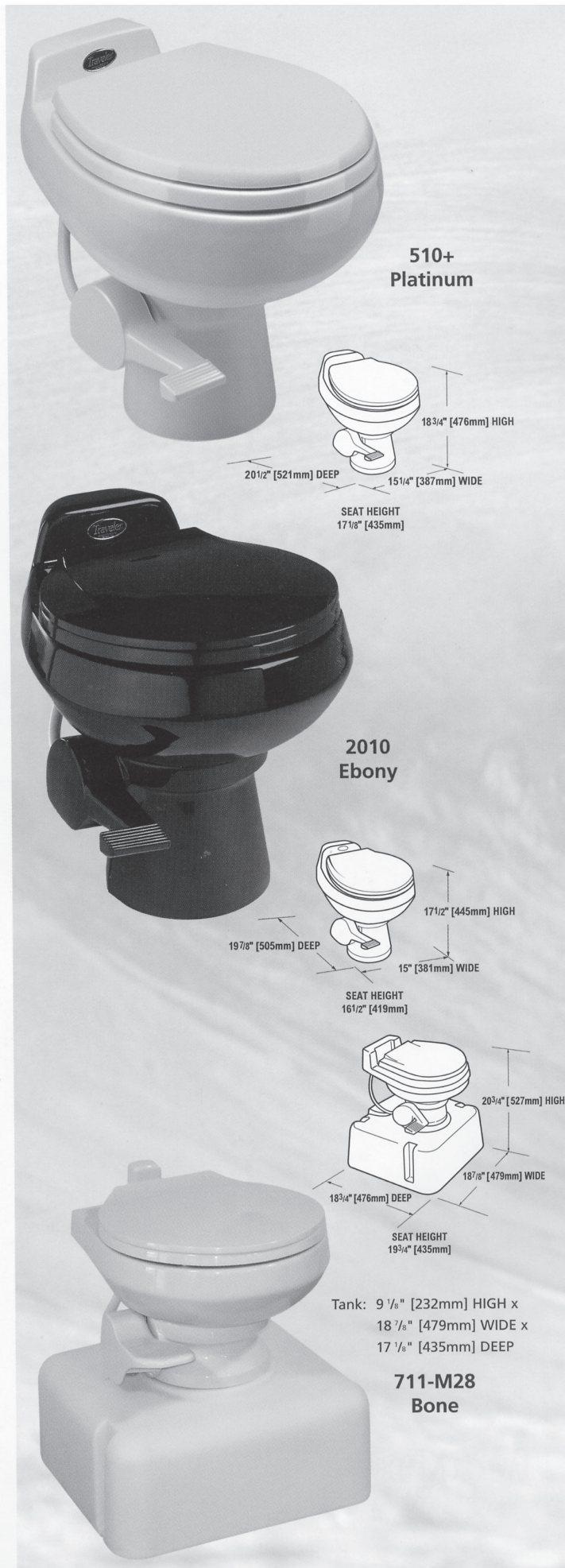
Traveler® 711-M28 Marine Sanitation System

Complete self-contained freshwater system.

- **Freshwater operation eliminates odors.** China bowl is rinsed with fresh water from on-board demand system, so there are none of the unpleasant odors associated with a saltwater flushing toilet. Integral anti-siphon vacuum breaker protects potable water supply.
- **Efficient.** Effective rim flush action uses about a pint (.5 liter) of fresh water per flush. Requires no electricity.
- **Ideal replacement for recirculating toilets.** No recirculating chemical smell!
- **Easy to use.** Water level and flushing action controlled by single pedal control.
- **Proven reliability.** Teflon® seal keeps tank odors in tank. Holding tank is molded of durable linear low density polyethylene with 9.5 gallon (36 liters) capacity. Discharge connection is 1 1/2" (38mm) hose insert. Vent connection is for 5/8" (16mm) hose. Water connection is 1/2" (13mm) MPT.

Model	Item Number	Color
711-M28	371103	Bone

China product dimensions may vary $\pm 3/8"$ [10mm].



AQUA MATIC



Compact

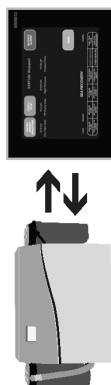


Modular

The revolutionary Aqua Matic is engineered to be easier to use and more reliable than conventional watermakers. Featuring the latest technology, the Aqua Matic is able to regulate and monitor functions without the need of an operator. With one touch, the Aqua Matic will start and finish water production automatically, allowing boaters more time to relax and enjoy their cruise.

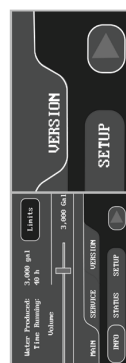
The **Aqua Matic Compact** is a horizontal one-piece frame configuration with external Booster Pump and Sea Strainer, for easy installation into tight spaces. All components within the frame are readily accessible for ease of maintenance.

The **Aqua Matic Modular** is designed for separate system component placement if there is insufficient space for the Compact system.



2000 Remote Compatibility

The new Aqua Matic is NMEA 2000 compliant, giving you the power to monitor and communicate with your system through any NMEA compatible display.



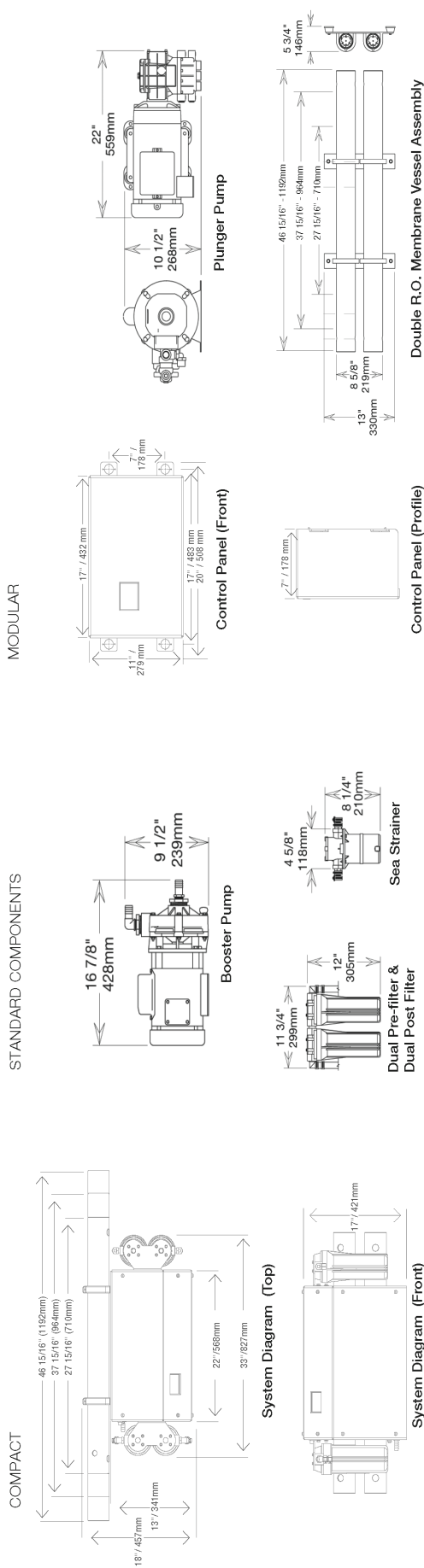
One touch operation & full color touch screen
Equipped with an automated pressure regulating system and Fresh Water Flush, the Aqua Matic can fully operate and perform self maintenance functions without the need of an operator.



Oil free high pressure pump (optional)

The Aqua Matic's Super Duplex Radial Axial Pump is water lubricated and requires no oil changes. It has a maintenance schedule every 8,000 hours, saving you time and money.

Dimensional Drawings



Specifications

	Model #	Production/hr.	Production/24hrs.	Aqua Matic compact*	Aqua Matic modular*
PRODUCTION & WEIGHT	450-1	19 Gal / 71 L	450 Gal / 1,703 L	153 lbs / 69 kg	149 lbs / 68 kg
	700-1	29 Gal / 110 L	700 Gal / 2,650 L	156 lbs / 71 kg	152 lbs / 69 kg
	900-1	38 Gal / 142 L	900 Gal / 3,407 L	158 lbs / 72 kg	154 lbs / 70 kg
	900-2	38 Gal / 142 L	900 Gal / 3,407 L	165 lbs / 75 kg	161 lbs / 73 kg
	1400-2	58 Gal / 221 L	1,400 Gal / 5,300 L	171 lbs / 76 kg	167 lbs / 76 kg
	1800-2	75 Gal / 284 L	1,800 Gal / 6,814 L	176 lbs / 80 kg	172 lbs / 78 kg

* Weights based on single phase motor. For three phase motors subtract 9 lbs.

ELECTRICAL	Phase	Pump Motor	Voltage VAC	Hz	Normal Operating Amps	Start Up Current
Plunger Pump Radial Axial Pump	Single	HP / Booster	110-115 / 220 -230	50 / 60	110 / 220	110 / 220
	Single	HP / Booster	110-115 / 220 -230	50 / 60	30 / 15	90 / 45
Plunger Pump / Radial Axial Pump	Three	HP / Booster	220-230 / 380-460	50 / 60	35 / 17.5	95 / 48
					220 / 380 - 440	220 / 380 - 460
					11 / 5.5	30 / 15

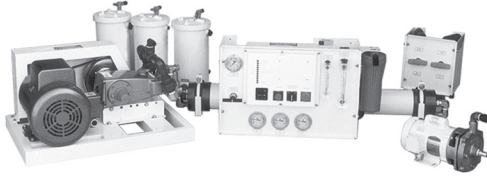
* HP: High Pressure

Circuit Breaker Size	Operating AC Voltage	Phase	Recommended circuit breaker
Plunger Pump Radial Axial Pump	110-115 / 220-230	Single	40 Ampere / 20 Ampere
	110-115 / 220-230	Single	45 Ampere / 25 Ampere
Plunger Pump / Radial Axial Pump	220 / 380 / 460	Three	15 Ampere / 10 Ampere / 10 Ampere

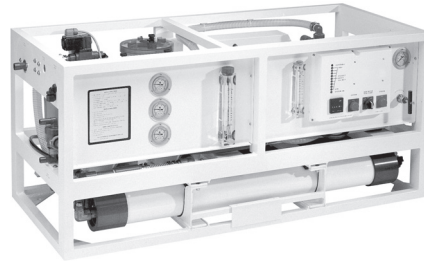


Commercial & Industrial Series Coral Sea Series

1,395 to 4,190 U.S. Gallons Per Day
5,280 to 15,860 Litres Per Day



SRC Coral Sea - Six Piece Modular



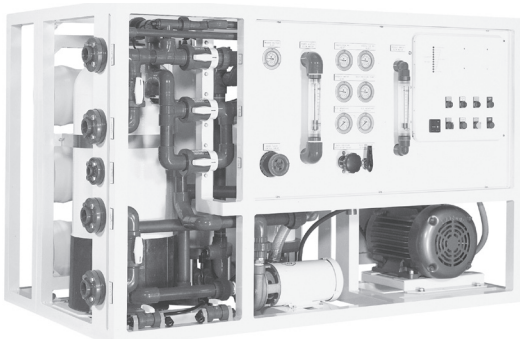
SRC Coral Sea - Two Piece Horizontal



SRC Coral Sea - Three Piece Vertical

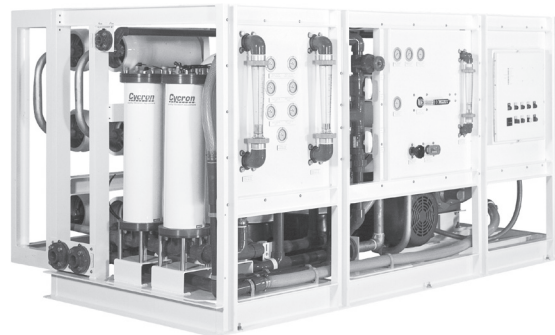
Tasman Sea Series

4,700 to 17,500 U.S. Gallons Per Day
17,791 to 66,245 Litres Per Day



North Sea Series

10,000 to 44,000 U.S. Gallons Per Day
37,854 to 166,558 Litres Per Day



Aqua Whisper™ 170

7 Gallons Per Hour / 170 Gallons Per Day
26 Litres Per Hour / 644 Litres Per Day



Specifications: Aqua Whisper 170
(Please specify voltage, cycles, and phase upon ordering)

ELECTRICAL POWER REQUIREMENTS:
(FLA = Full Load Amperes at nominal voltage)
High Pressure Pump / Electric Motor (1/3 Horse Power):
DC Amperage Draw: 12 Volt DC - FLA 27 or 24 Volt DC - FLA 13.4
AC Amperage Draw: 110 Volt AC - FLA 7.2 or 220 Volt AC - FLA 2.8

Model No:
SRC AW 170 12 VDC
SRC AW 170 24 VDC
SRC AW 170 110 AC
SRC AW 170 220 AC

Dimensions:
26"Lx11"Hx13.75"D



Installation Kit
Shown w/optional UV
Sterilizer, Charcoal
Filter, and Sea Strainer



Remote Control
(Optional)

Engineered at the leading edge of new technology, the Aqua Whisper 170 contains features not found on any other watermaker in the world. Engineered with a low maintenance design for easy use, the Aqua Whisper 170 is the perfect watermaker for low volume applications. All boaters can now enjoy the convenience of fresh water anytime, anywhere, at an affordable price. Designed to fit in any boat, sail and power, the Aqua Whisper 170 produces up to a 170 U.S. gallons (644 litres) per day or 7 U.S. gallons (27 litres) per hour of pure, clean drinkable water. The compact design, multiple configurations, and low amperage (12 or 24 VDC and 110 or 220 VAC) power requirements are just the beginning.

... Water For Any Need!



With watermaking capacities from 1,395 to 4,190 U.S. gallons (5,280 to 15,860 litres) per day, commercial fishing vessels, small work boats, charter boats as well as onshore facilities such as private residences, villas, and small hotels, make use of Sea Recovery's compact commercial reverse osmosis desalinators.

Constructed of a lightweight, epoxy-coated frame, both the three-piece vertical and two-piece horizontal "Coral Sea" Series units utilize only the highest quality marine-grade materials and components. All models are covered by a one-year warranty.

Upgrading a model to a higher watermaking capacity is done by simply installing additional reverse osmosis membranes to the desalination system. Sea Recovery delivers complete R.O. systems, ready to produce water immediately after installation. All plumbing for onboard use is also included.

Small hotels, large villas, oil platforms and small cruise ships can now produce from 4,700 to 17,500 U.S. gallons (17,791 to 66,245 litres) of fresh water per day. Sold as a complete package, Sea Recovery offers the "Tasman Sea" Series to satisfy these watermaking requirements.

Found throughout the world, these easily maintained reverse osmosis desalinators produce large quantities of fresh water with unsurpassed reliability. The reason can be traced to Sea Recovery's unique engineering abilities and total commitment to high quality products.

Tasman Sea offers the following features:

- *State-of-the-Art Spiral Wound Membranes*
- *Solid State Salinity Controller*
- *Booster Pump*
- *Membrane Cleaning System*
- *Two-Stage Filtration*
- *Multi-Media Filter*
- *Flow Meters*
- *UV Sterilizer (Optional)*

Where there is a need for a commercial reverse osmosis desalinator with tremendous watermaking capacity, Sea Recovery recommends the "North Sea" Series. Producing fresh drinking water at a rate of 10,000 to 44,000 U.S. gallons (37,854 to 166,558 litres) per day. Large hotels, cruise ships, and villages rely on Sea Recovery's largest commercial series desalinators. Sold as complete packages, these systems are among the most dependable and easily maintained reverse osmosis desalinators in the world. Constructed with a lightweight, epoxy-coated frame, the unit utilizes only the highest quality marine-grade materials and components.

North Sea offers the following features:

- *State-of-the-Art Spiral Wound Membranes*
- *Solid State Salinity Controller*
- *Booster Pump*
- *Membrane Cleaning System*
- *Two-Stage Filtration*
- *Multi-Media Filter*
- *Flow Meters*
- *UV Sterilizer (Optional)*

"IT'S NOT A WORD... IT'S A SENTENCE"

A page by people who know the true meaning of "wedded bliss."

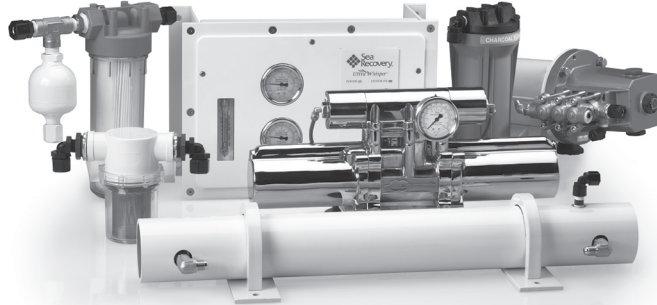
- "Bigamy is having one husband too many. Monogamy is the same." -Erica Jong
- "Marriage is the triumph of imagination over intelligence. Second marriage is the triumph of hope over experience." -Anonymous
- "Marriage is really tough because you have to deal with feelings and lawyers." -Richard Pryor
- "Marriage is a three-ring circus: engagement ring, wedding ring, and suffer-ring." -Anonymous
- "A man in love is incomplete until he has married. Then he's finished." -Zsa Zsa Gabor
- "Love is blind, but marriage restores the sight." —Georg Lichtenberg
- "Politics doesn't make strange bedfellows-marriage does." -Groucho Marx



UltraWhisper™ Modular

8, 13, 17, 21, 25 Gallons Per Hour | 32, 47, 63, 79, 95
Litres Per Hour

The Ultra Whisper Modular (UWM) Desalinator is ideal for sail and power boats with limited onboard power—and even less onboard space. It easily adapts to virtually any boat design and installation location. The components needed for R.O. desalination are custom installed by placing them in any available space onboard, such as under berths and settees, and in closets and engine rooms. Everything that's needed to install the UWM system is included in one complete package. The flexibility of this modular system provides a quiet, efficient water making system that can fit any boat perfectly.



Model No:

SRC UWM 200-1
SRC UWM 300-1
SRC UWM 400-1
SRC UWM 500-1
SRC UWM 600-1

UltraWhisper™ Compact

8, 13, 17, 21, 25 Gallons Per Hour | 32, 47, 63, 79, 95
Litres Per Hour

The Ultra Whisper Compact (UWC) Desalinator allows for easy installation in boats that previously didn't have room for a conventional R.O. system. Now, installation sites can include spaces under berths and settees, and in closets and engine room compartments. And, an open designed frame allows easy access to the system's internal components during regularly scheduled maintenance. Now, small and midsize power or sail boats have a new option for providing fresh, clean water onboard.



Model No:

SRC UWC 200-1
SRC UWC 300-1
SRC UWC 400-1
SRC UWC 500-1
SRC UWC 600-1

"I think that nothing is so important for freedom as recognizing in the law each individual's natural right to property, and giving individuals a sense that they own something that they're responsible for, that they have control over, and that they can dispose of."

— Milton Friedman

"Underlying most arguments against the free market is a lack of belief in freedom itself."

— Milton Friedman

Of the desalination processes currently available, membrane types offer the most economic advantages in the treatment of drinking water because of their low energy consumption. The largest single consumable cost factor in Reverse Osmosis after power cost is membrane replacement cost. Matrix understands the importance of lowering operating cost and will work

with their customers to increase the life span of their RO membranes with proper pretreatment recommendations. However, in some circumstances membrane replacement may be necessary. Matrix offers three quality brands of membranes: FilmTec, Fluid Systems, and Hydraunautics at a low cost to their Customer's.



FILMTEC

Matrix Item #	Manufacturer Part Number	Size (D x L)	Water Type	Flow Rate (GPD)	Rejection (Minimum)
2876	BW-30-4040	4" x 40"	Brackish	1800	98%
4965	BW30HP-4040	4" x 40"	Brackish	2800	97%
2877	BW30-330	8" x 40"	Brackish	7500	98%
2864	SW30-2514	2.5" x 14"	Seawater	100	98.6%
2870	SW30HR-2514	2.5" x 14"	Seawater	65	99.2%
2865	SW30-2521	2.5" x 21"	Seawater	200	98.6%
2871	SW30-2521HR	2.5" x 21"	Seawater	130	99.2%
2866	SW30-2540	2.5" x 40"	Seawater	540	98.6%
2872	SW30-2540HR	2.5" x 40"	Seawater	320	99.2%
2867	SW30-4021	4" x 21"	Seawater	600	98.6%
2873	SW30-4021HR	4" x 21"	Seawater	400	99.2%
2868	SW30-4040	4" x 40"	Seawater	1500	98.6%
2874	SW30HR-4040	4" x 40"	Seawater	1000	99.2%
2869	SW30-8040	8" x 40"	Seawater	6000	98.6%
2875	SW30-8040HR	8" x 40"	Seawater	5000	99.2%
8242	SW30HR-380	8" x 40"	Seawater	6000	99.4%

THRU-HULL CONNECTIONS

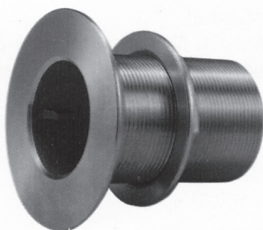


FIG. 331

FIG. 331 - FLUSH MOUNT THRU-HULL CONNECTION

CAST BRONZE - FOR USE WITH PIPE

THE EXTERIOR SURFACE OF THE FLANGE IS MACHINED FLAT AND DESIGNED TO BE COUNTERSUNK INTO THE HULL, RESULTING IN A SMOOTH EXTERNAL FIT WITH NO RAISED PORTION TO INCREASE DRAG.

ORDERING INFORMATION

Pipe Size Inches	Max. Hull Thickness Inches	O.D. Flange Inches	Dealer Pkg. 5 Pcs	OEM Bulk Package	OEM Bulk Pkg. Qty	Weight Pounds
1/2	2-3/16	1-11/16	331 DP4 PLB	331 004 PLB	10	3/8
3/4	2-3/8	2	331 DP5 PLB	331 005 PLB	10	1/2
1	2-9/16	2-1/4	331 DP6 PLB	331 006 PLB	10	3/4
1-1/4	2-15/16	2-7/8	331 DP7 PLB	331 007 PLB	10	1-1/4
1-1/2	3-1/16	2-31/32	331 DP8 PLB	331 008 PLB	10	1-3/8
2	3-3/8	3-7/8	———	331 009 PLB	1	2-1/4



**ILLUSTRATION OF
BEDDING GROOVE**

FIG. 348 - EXTRA LONG THRU-HULL CONNECTION

CAST BRONZE - FOR USE WITH PIPE

FLANGE IS MACHINED TO FIT HULL AND GROOVED TO RETAIN BEDDING COMPOUND.
NECK IS THREADED TO APPROXIMATELY 3/8 INCH FROM FLANGE.

ORDERING INFORMATION

Pipe Size Inches	Max. Hull Thickness Inches	O.D. Flange Inches	Dealer Pkg. 5 Pcs.	OEM Bulk Package	OEM Bulk Pkg. Qty	Weight Pounds
3/4	5	1-7/8	348 DP5 PLB	348 005 PLB	25	7/8
1	4-7/8	2-1/4	348 DP6 PLB	348 006 PLB	10	1
1-1/4	4-5/8	2-3/4	348 DP7 PLB	348 007 PLB	10	1-3/4
1-1/2	4-5/8	3	348 DP8 PLB	348 008 PLB	10	2-1/4
2	4-1/2	3-5/8	———	348 009 PLB	1	2-7/8
2-1/2	4-1/4	4-5/16	———	348 010 PLB	1	3-1/2

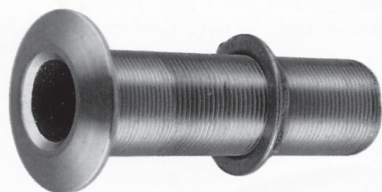


FIG. 348



**ILLUSTRATION OF
BEDDING GROOVE**

FIG. 322 - THRU-HULL CONNECTION

CAST BRONZE-FOR USE WITH PIPE

FLANGE IS MACHINED TO FIT HULL AND GROOVED TO RETAIN BEDDING COMPOUND.
NECK IS THREADED TO APPROXIMATELY 3/8 INCH FROM FLANGE.

ORDERING INFORMATION

Pipe Size Inches Pounds	Max. Hull Thickness Inches	O.D. Flange Inches	Dealer Pkg. 5 Cards	Std. Pkg. 1 Pc.	OEM Bulk Pkg. 25 Pcs.	Weight
3/8	1-3/4	1-7/16	322 DP3 PLB	———	322 003 PLB	1/4
1/2	1-3/8	1-1/2	322 DP4 PLB	———	322 004 PLB	3/8
3/4	1-1/2	1-7/8	322 DP5 PLB	———	322 005 PLB	3/8
1	1-7/8	2-3/16	322 DP6 PLB	———	322 006 PLB	3/4
1-1/4	2	2-3/4	322 DP7 PLB	———	322 007 PLB	1
1-1/2	2-1/4	3	322 DP8 PLB	———	*322 008 PLB	1-1/2
2	2-3/8	3-5/8	———	322 009 PLB	*322 009 PLB	2
2-1/2	2-5/8	4-1/2	———	322 010 PLB	———	2-7/8
3	2-3/4	5	———	322 011 PLB	———	4-5/8

* O.E.M. Bulk Pkg. - 10 pcs

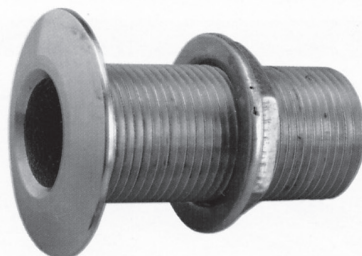


FIG. 322



THRU HULL CONNECTIONS

Cast Bronze - Plain - Polished - Chrome

TYPE	PLAIN	PART NUMBER		N.P.S. SIZE	SHANK LENGTH	FLANGE DIAMETER	WEIGHT, EACH
		POLISHED	CHROME				
A	00TH38	01TH38	02TH38	3/8"	2 1/4"	1 3/8"	0.35 lbs
A	00TH50	01TH50	02TH50	1/2"	2 5/8"	1 13/16"	0.37 lbs
A	00TH50L	01TH50L	02TH50L	1/2"	3"	1 13/16"	0.43 lbs
A	00TH75	01TH75	02TH75	3/4"	2 3/8"	2 1/8"	0.50 lbs
A	00TH75L	01TH75L	02TH75L	3/4"	4"	2 1/8"	0.70 lbs
A	00TH100	01TH100	02TH100	1"	2 3/4"	2 3/8"	0.69 lbs
A	00TH125	01TH125	02TH125	1 1/4"	3 3/4"	3 1/8"	1.60 lbs
A	00TH125L	01TH125L	02TH125L	1 1/4"	4"	3 1/8"	1.70 lbs
A	00TH150	01TH150	02TH150	1 1/2"	3 1/2"	3 3/8"	2.25 lbs
A	00TH200	01TH200	02TH200	2"	4"	3 5/8"	2.75 lbs
A	00TH250	01TH250	02TH250	2 1/2"	4"	4 1/32"	3.25 lbs
A	00TH300	01TH300	02TH300	3"	5"	4 11/16"	5.00 lbs
A	00TH400	01TH400	02TH400	4"	5 1/4"	5 3/4"	13.70 lbs

Completely machined deeper caulking area.

THRU HULL CONNECTIONS –

with Hose Ends

Cast Bronze - Plain - Polished - Chrome

TYPE	PLAIN	PART NUMBER		N.P.S. SIZE	HOSE I.D.	SHANK LENGTH	FLANGE DIAMETER	WEIGHT, EACH
		POLISHED	CHROME					
B	00THH62	01THH62	02THH62	1/2"	5/8"	3 3/8"	1 3/4"	0.51 lbs
B	00THH75	01THH75	02THH75	3/4"	3/4"	3 1/4"	2 1/16"	0.62 lbs
B	00THH100	01THH100	02THH100	1"	1"	3 3/4"	2 3/8"	0.82 lbs
B	00THH1125	01THH1125	02THH1125	1"	1 1/8"	3 3/8"	2 3/8"	0.91 lbs
B	00THH150	01THH150	02THH150	1 1/2"	1 1/2"	3 1/8"	3 5/32"	2.00 lbs
B	00THH150L	00THH150L	02THH150L	1 1/2"	1 1/2"	5 1/4"	3 3/8"	3.70 lbs
B	NA	NA	02THH162	1 5/8"	1 5/8"	3 3/4"	3 3/8"	2.45 lbs
B	00THH200	01THH200	02THH200	2"	2"	3 1/4"	3 1/4"	2.50 lbs
B	00THH250	01THH250	02THH250	2 1/2"	2 1/2"	4 3/8"	4"	5.00 lbs
B	00THH300	01THH300	02THH300	3"	3"	5 1/2"	4 3/4"	8.60 lbs
B	00THH400	01THH400	02THH400	4"	4"	6"	5 3/4"	13.00 lbs

Completely machined deeper caulking area.

THRU HULL CONNECTIONS – Flush Type

Cast Bronze - w/Nut - Plain - Polished - Chrome Plated

PART NUMBER			N.P.T. SIZE	SHANK LENGTH	FLANGE DIA./ THICKNESS		FLANGE ANGLE	WEIGHT, EACH
PLAIN	POLISHED	CHROME						
00TH50F	01TH50F	02TH50F	1/2"	2 ⁵ / ₁₆ "	2 1/2"	3/8"	45 °	0.63 lbs
00TH75F	01TH75F	02TH75F	3/4"	2 ⁵ / ₁₆ "	2 1/2"	3/8"	45 °	0.82 lbs
00TH100F	01TH100F	02TH100F	1"	2 1/2"	3"	3/8"	45 °	1.07 lbs
00TH125F	01TH125F	02TH125F	1 1/4"	3 3/8"	3"	3/8"	45 °	1.50 lbs
00TH150F	01TH150F	02TH150F	1 1/2"	3 3/8"	3 1/4"	3/8"	45 °	1.75 lbs

THRU HULL CONNECTION – FLUSH TYPE w/PERFORATED SCREEN
Cast Bronze - w/Nut - Plain - Polished - Chrome Plated

PART NUMBER			N.P.T. SIZE	SHANK LENGTH	FLANGE DIA./ THICKNESS		FLANGE ANGLE	WEIGHT, EACH
PLAIN	POLISHED	CHROME						
00TH50FS	01TH50FS	02TH50FS	1/2"	2 ⁵ / ₁₆ "	2 ¹ / ₂ "	3/8"	45°	0.63 lbs
00TH75FS	01TH75FS	02TH75FS	3/4"	2 ⁵ / ₁₆ "	2 ¹ / ₂ "	3/8"	45°	0.82 lbs
00TH100FS	01TH100FS	02TH100FS	1"	2 ¹ / ₂ "	3"	3/8"	45°	1.07 lbs
00TH125FS	01TH125FS	02TH125FS	1 ¹ / ₄ "	3 ¹ / ₈ "	3"	3/8"	45°	1.50 lbs
00TH150FS	01TH150FS	02TH150FS	1 ¹ / ₂ "	3 ³ / ₈ "	3 ¹ / ₄ "	3/8"	45°	1.75 lbs

THRU HULL CONNECTION – w/HOSE END AND SHIELD
Cast Bronze - w/Nut - Plain - Polished - Chrome Plated

PLAIN	PART NUMBER		PIPE THD SIZE	FITS HOSE I.D.	SHANK LENGTH	FLANGE DIA.	WEIGHT, EACH
	POLISHED	CHROME					
00THH125S	01THH125S	02THH125S	1 1/4"	1 1/2"	3 3/8"	2 7/8"	1.75 lbs

Can also be used for a Gas Tank Vent.



THRU HULL – NUTS ONLY
Cast Bronze

PART NUMBER	THREAD SIZE	DIA. OF HEX FLAT TO FLAT	WEIGHT, EACH
00THN38	3/8 - 18 NPSM	1"	0.09 lbs
00THN50	1/2 - 14 NPSM	1 1/8"	0.11 lbs
00THN75	3/4 - 14 NPSM	1 5/16"	0.13 lbs
00THN100	1 - 11 1/2 NPSM	1 1/2"	0.19 lbs
00THN125	1 1/4 - 11 1/2 NPSM	1 15/16"	0.34 lbs
00THN150	1 1/2 - 11 1/2 NPSM	2 3/16"	0.46 lbs
00THN200	2 - 11 1/2 NPSM	2 13/16"	0.50 lbs
00THN250	2 1/2 - 8 NPSM	3 5/16"	0.56 lbs
00THN300	3 1/16 - 8 UN2B	4"	0.84 lbs
00THN400	4 - 8 NPSM	5 1/4" Oct.	1.9 lbs

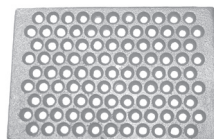
NAVY PUMP STRAINERS – STRAINERS ONLY Bronze

PART NUMBER	DIMENSIONS	FITS STRAINER	WEIGHT, EACH
00NPS100C	2 1/8 x 4 1/2"	00NPS100, 00NPS125	0.400 lbs
00NPS150C	3 3/8 x 5"	00NPS150, 00NPS200	0.902 lbs
00NPS63HC*	1 1/2 x 2 1/2"	00NPS63H	0.102 lbs

* Stainless Steel

Aluminum

PART NUMBER	DIMENSIONS	WEIGHT, EACH
20NPSB100C	2 1/2 x 4 1/2"	0.15 lbs
20NPSB125C	2 1/2 x 4 1/2"	0.15 lbs
20NPSB150C	3 1/2 x 5"	0.19 lbs
20NPSB200C	3 1/2 x 5"	0.19 lbs



A



B

INTAKE STRAINERS

Cast Bronze - With Nut

TYPE	PART NUMBER	I.P.T. SIZE	STEM LENGTH	BASE SIZE	WEIGHT, EACH
A	00IS50	1/2"	2 1/2"	2 3/4 x 3 3/4"	0.81 lbs
A	00IS75	3/4"	2 1/2"	2 3/4 x 3 3/4"	0.94 lbs
A	00IS100	1"	2 1/2"	2 3/4 x 3 3/4"	1.03 lbs
B	00IS100L	1"	3 1/2"	3 1/4 x 4 1/4"	1.20 lbs
B	00IS125	1 1/4"	3"	3 3/8 x 5 3/4"	2.34 lbs
B	00IS150	1 1/2"	3 1/2"	3 3/8 x 5 3/4"	2.80 lbs
B	00IS200	2"	3 1/2"	4 x 6"	3.70 lbs

INTAKE STRAINERS

w/Hose End and Nut

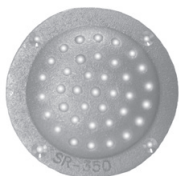
PART NUMBER	I.P.T. SIZE	STEM LENGTH	BASE SIZE	WEIGHT, EACH
00IS100H	1"	2 3/8"	2 3/4 x 3 3/4"	1.03 lbs



ROUND STRAINER

Cast Bronze

PART NUMBER	DIAMETER	COVERS THRU HULL	WEIGHT, EACH
00SR350	3 1/2"	1"	0.38 lbs
00SR400	4"	1"	0.56 lbs
00SR500	5"	1 1/2"	0.67 lbs
00SR600	6"	2 1/2"	1.00 lbs
00SR800	8"	3"	2.37 lbs



INTAKE WATER STRAINERS

Cast Bronze

PART NUMBER	HOSE SIZE	TAPPED N.P.T.	OVERALL HEIGHT	DIA.	WEIGHT, EACH
00IWS1215	1 1/4" & 1 1/2"	3/4"	4 1/2"	6"	6.56 lbs
00IWS150	1 1/2"	1"	4 1/2"	6"	6.40 lbs

INTAKE WATER STRAINERS – PARTS LIST

PART NUMBER	DESCRIPTION	MATERIAL	WEIGHT, EACH
COIWS12150	O Ring Only	Buena	0.02 oz
7AIWS1215S	Spacer Only	Stainless	0.06 oz
COIWS1215G	Gasket Only	Rubber	0.05 oz
00IWS1215C	Body Only	Bronze	5.50 oz
DOIWS1215T	Top Only	Plexi-glass	0.94 oz
70IWS1215W	Wing Bolt Only	Stainless	0.44 oz
00IWS1215X	Washer Only	Brass	0.03 oz
70IWS1215R	Screen Only	Stainless	0.04 oz

SCOOP STRAINERS

Cast Bronze - Plain Finish

PART NUMBER	OUTSIDE DIAMETER	FITS THRU HULL	WEIGHT, EACH
00SS450	4 1/4 x 3"	3/8 - 1/2"	0.65 lbs
00SS500	5 x 3 3/4"	3/4"	0.75 lbs
00SS600	6 x 4"	1"	1.00 lbs
00SS650	6 1/2 x 4 1/4"	1 1/4"	1.44 lbs
00SS850	8 1/2 x 5 1/2"	1 1/2"	2.80 lbs
00SS1100	11 x 7 1/2"	2 - 3"	4.60 lbs



INVERTED VENT CHECK VALVES

PART NUMBER			OUTSIDE SIZE/NPT	OVERALL DIAMETER	LENGTH
ALUMINUM	CAST IRON	BRONZE			
20ACV150	53ICV150	00BCV150	1½"	3 ⁷ / ₁₆ "	5¼"
20ACV200	53ICV200	00BCV200	2"	4 ¹ / ₈ "	6"
20ACV250	53ICV250	00BCV250	2½"	4 ⁷ / ₈ "	7"
20ACV300	53ICV300	00BCV300	3"	5½"	8 ³ / ₈ "
20ACV400	53ICV400	00BCV400	4"	7 ¹ / ₈ "	9½"
20ACV500	53ICV500	00BCV500	5"	8 ³ / ₄ "	10 ⁵ / ₈ "
20ACV600	53ICV600	00BCV600	6"	10 ¹ / ₈ "	11 ³ / ₈ "



Venting improves the efficiency of loading and unloading cargo by eliminating dangerous pressure or vacuum buildup. Inverted Vent Check Valves add a measure of security, preventing deck wash, deck fire and debris from traveling through the vent.

STANDARD COMPONENTS

FLOAT:
Spun Copper standard, other float
material priced on request

FLOAT STOP:
Precision cast to locate the ball

FIRE SCREEN:
Stainless Steel fine mesh

GALVANIZED DEBRIS SCREEN:
Rugged coarse openings

SIZE	MATERIAL	PART NUMBERS				
		FLOAT	FLOAT STOP	FIRE SCREEN	DEBRIS SCREEN	RETAINING RING
1½"	BRONZE	00CV150CF	00BCV150FS	70CV150FS	3BCV150SDS	00BCV150RR
2"	BRONZE	00CV200CF	00BCV200FS	70CV200FS	3BCV200SDS	00BCV200RR
2½"	BRONZE	00CV250CF	00BCV250FS	70CV250FS	3BCV250SDS	00BCV250RR
3"	BRONZE	00CV300CF	00BCV300FS	70CV300FS	3BCV300SDS	00BCV300RR
4"	BRONZE	00CV400CF	00BCV400FS	70CV400FS	3BCV400SDS	00BCV400RR
5"	BRONZE	00CV500CF	00BCV500FS	70CV500FS	3BCV500SDS	00BCV500RR
6"	BRONZE	00CV600CF	00BCV600FS	70CV600FS	3BCV600SDS	00BCV600RR
1½"	IRON	00CV150CF	53 ICV150FS	70CV150FS	3BCV150SDS	53 ICV150RR
2"	IRON	00CV200CF	53 ICV200FS	70CV200FS	3BCV200SDS	53 ICV200RR
2½"	IRON	00CV250CF	53 ICV250FS	70CV250FS	3BCV250SDS	53 ICV250RR
3"	IRON	00CV300CF	53 ICV300FS	70CV300FS	3BCV300SDS	53 ICV300RR
4"	IRON	00CV400CF	53 ICV400FS	70CV400FS	3BCV400SDS	53 ICV400RR
5"	IRON	00CV500CF	53 ICV500FS	70CV500FS	3BCV500SDS	53 ICV500RR
6"	IRON	00CV600CF	53 ICV600FS	70CV600FS	3BCV600SDS	53 ICV600RR
1½"	ALUMINUM	70ACV150SF	20ACV150FS	70CV150FS	70CV150SDS	70ACV150RR
2"	ALUMINUM	70ACV200SF	20ACV200FS	70CV200FS	70CV200SDS	70ACV200RR
2½"	ALUMINUM	70ACV250SF	20ACV250FS	70CV250FS	70CV250SDS	70ACV250RR
3"	ALUMINUM	70ACV300SF	20ACV300FS	70CV300FS	70CV300SDS	70ACV300RR
4"	ALUMINUM	70ACV400SF	20ACV400FS	70CV400FS	70CV400SDS	70ACV400RR
5"	ALUMINUM	70ACV500SF	20ACV500FS	70CV500FS	70CV500SDS	70ACV500RR
6"	ALUMINUM	70ACV600SF	20ACV600FS	70CV600FS	70CV600SDS	70ACV600RR



Inverted Vent Check Valve

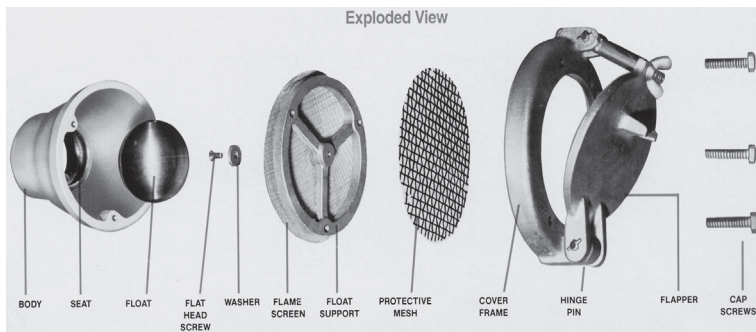
Model 1750



Description: Model 1750 Wager Inverted Vent Check Valves consist of a body, (Steel, Stainless Steel, Cast Iron, Bronze or Aluminum), ball float, valve seat, fine flame screen and heavy protective mesh and cover. Connections are either screwed I PS, flanged ASA, or weld type as required.

The general design utilizes a ball float which in the normally open position rests at the bottom of the assembly on the float support ring. A wash or submerging of the valve will float the ball upwards, positioned by the guides to seat in a machined insert seat at top of body which closes the valve during the period of submergence, after which it automatically falls to the open position.

Exploded View

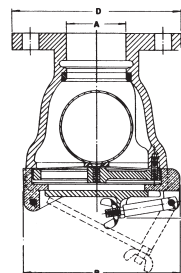


Function: Wager Inverted Vent Check Valves protect tanks and bulkheads from vacuum and pressure build-up during loading and unloading of liquid or dry cargo and assures maximum efficiency during pumping operations. The ball float prevents contamination of tank fluids or dry cargo by sea water during heavy seas. The fine stainless steel flame screen protects tank fluids or dry cargo dust from igniting when subject to deck fires. The protective mesh covers the fine flame screen and prevents any mechanical damage from floating objects in the sea water.

Features:

- 1- OPEN AREA RATIO: Meets latest requirements of ABS, USMA, USCG, and NAVY.
- 2-ACCESSIBILITY OF PARTS: Removal of four or six cap screws (depending on size) facilitates cleaning, inspection and/or replacement.
- 3-POSITIVE SEALING: Machined seat assures positive seal when float is in top position.
- 4 - FLOAT: Copper standard, monel, stainless steel, high density polyethylene available.
- 5 - FLOAT SUPPORT: Assures centering of float in open position. Prevents wear on float and screen assembly.
- 6-COVER: Held open and closed with one toggle bolt.
- 7-BODY MATERIAL: Steel, Cast Iron, Bronze, Stainless Steel, or Aluminum.

Flanged Type 1750-F



A	1-1/2	2	2-1/2	3	3-1/2	4
B	4-11/16	5-11/32	6-1/4	7-1/8	7-13/16	7-13/16
C	6	6-15/16	7-13/32	8-3/8	9-5/8	9-5/8
D	5	6	7	7-1/2	8-1/2	9
Wt.	10	16	21	28	35	36

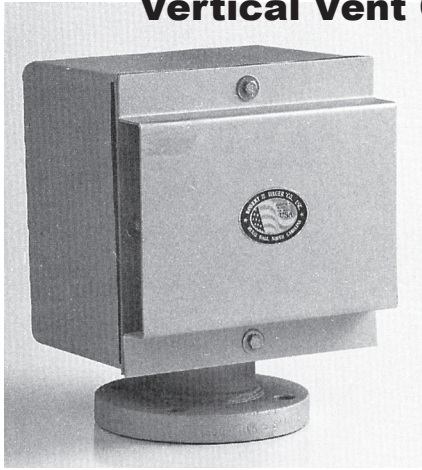
Weld Type 1750-W

A	1-1/2	2	2-1/2	3	3-1/2	4
B	4-11/16	5-11/32	6-1/4	7-1/8	7-13/16	7-13/16
C	6	6-15/16	7-13/32	8-3/8	11-1/4	9-5/8
Wt.	7	10	13	20	25	25

Threaded Type 1750-T

A	1-1/2	2	2-1/2	3	3-1/2	4
B	4-11/16	5-11/32	6-1/4	7-1/8	—	7-13/16
C	6	6-15/16	7-13/32	8-3/8	—	9-5/8
Wt.	7	10	13	20	—	25

Vertical Vent Check Valve



Vertical Vent Check Valve (closed)



Function

The Vertical Vent Check Valve is a “normally open” check valve. In heavy seas, any deck washover will push the float to the closed position, stopping water from entering the lower bulkheads.

To prevent a spark from igniting tank fluids or dry cargo dust, the fine stainless steel flame screen arrests flames from crossing through this barrier. The ball float prevents contamination of tank cargo by sea water during heavy seas.

Purpose

The WAGER Vertical Vent Check Valve is used to protect tanks and bulkheads from vacuum pressure buildup during loading and unloading of liquid and dry cargo.

Description

The Vertical Vent Check Valve was designed to eliminate the need for a “goose neck” on deck for each valve. It is composed of an inner and outer valve body (cold galvanized), float (available in a variety of materials), stainless steel flame screen, and a steel cover.

Special Feature

The component design allows for easy disassembly, to allow cleaning of the venting chamber.

Features

Float (Standard) -
High Density Polyethylene

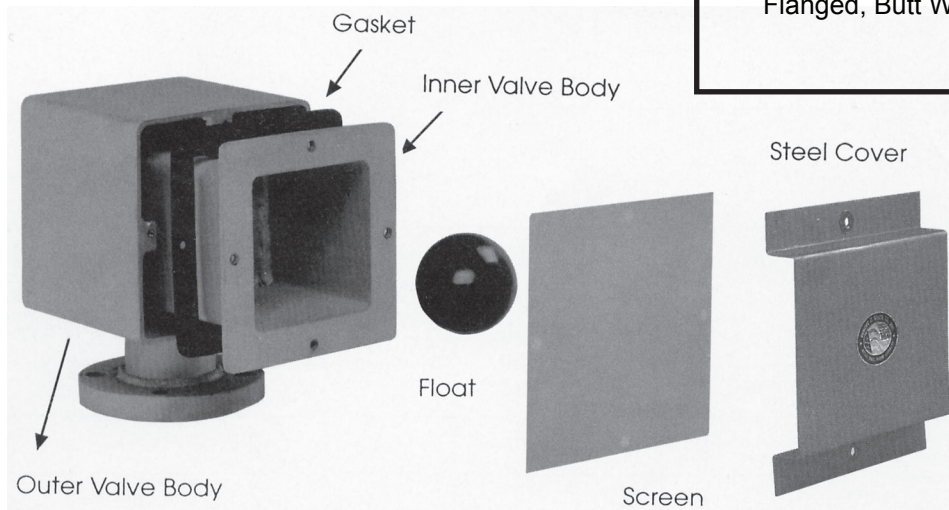
Float (Optional) -
Copper, Stainless Steel, Monel

Body Material - Steel
Optional — Stainless Steel

Cold Galvanized - Standard
Hot-Dip Galvanizing
(upon request)

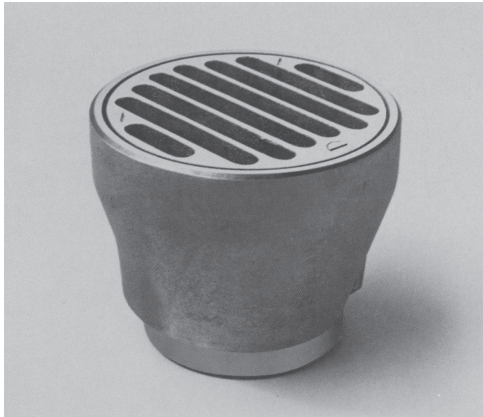
Standard Sizes Available -
2, 2½, 3, 4, 5, 6, 8, 10 inches
(custom sizes available on request)

Connections -
Flanged, Butt Weld, Threaded



Deck Drains

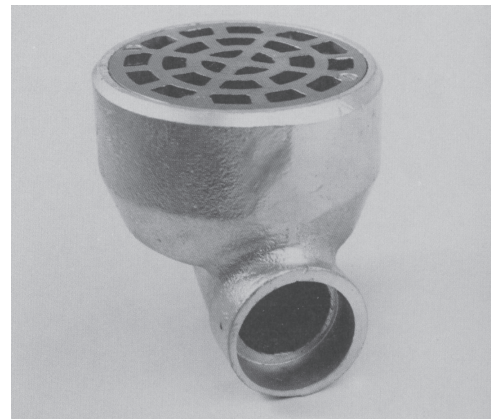
Model 134 Series



Heavy Wall Deck Drains

Cast steel body with cast bronze strainer and baffle. All Drains have a Ratio of 2:1 area through strainer to pipe size area.

Description: Wager Deck Drains are of economical commercial grade, consisting of a galvanized steel body and a bronze strainer plate that is removable, secured by three stainless steel flat head screws. The strainer plate has full openings to provide the desired drainage with pipe of minimum size.



“IT’S NOT A WORD... IT’S A SENTENCE” (CONTINUED)

- “Before marriage, a man yearns for the woman he loves. After marriage, the ‘Y’ becomes silent.” -Anonymous
- “The poor wish to be rich, the rich wish to be happy, the single wish to be married, and the married wish to be dead.” -Ann Landers
- “Marriage teaches you loyalty, forbearance, self-restraint, meekness, and a great many other things you wouldn’t need if you had stayed single.” -Jimmy Townsend
- “Love is an ideal thing, marriage a real thing; a confusion of the real with the ideal never goes unpunished.” -Johann von Goethe
- “It’s a bit dangerous out there, and I guess men have to choose between marriage and death. I guess they figure that with marriage at least they get meals. But then they get married and find out we don’t cook anymore.” -Rita Rudner

DUPLEX INTAKE WATER STRAINER

**NEW
Item**
**Available by
Oct. 2010**

Figs. 0594 - Duplex Intake Water Strainer

Duplex strainers permit continuous engine operation by permitting strainer clean-out while the engine is running. Properly sized, a single side of the strainer will allow adequate flow for cooling. Using an integral valve, either side can be closed and cleaned without affecting coolant flow to the engine through the other side.

CONSTRUCTION:

- Cast Bronze
- 4-Position Control Valve (All Off/Side 1 On/Side 2 On/Both On)
- Many Replacement Parts in Common with Other Perko Strainers (Fig. 0493)

PERKO Duplex Water Strainers are Designed for Easy Installation and Cleaning. Features Include Mounting Lugs Cast into Both Sides to Assure Universal Mounting, 8 Outside Tie Rods and two 316 Stainless Steel Strainer Basket to Minimize Electrolysis. The diameter of the screen holes is 0.079" providing 47% open area, among the highest in the industry for cylindrical strainer baskets. Lugs for the Cast Bronze Covers Permit Easy Removal and Cleaning of the Strainer Baskets. Drain Plugs in the Bottom Castings are Provided for Easily Removing Sediment and Draining for Winterizing.

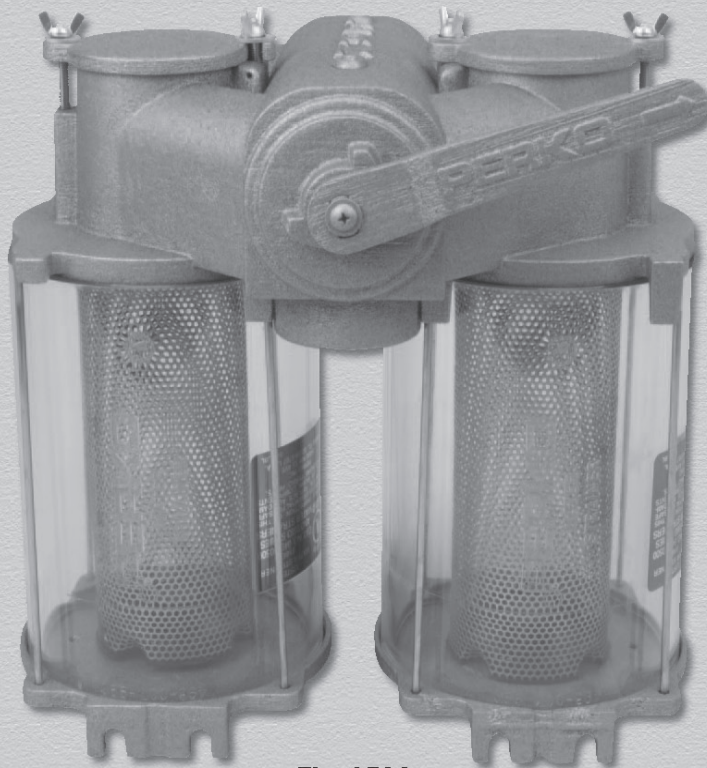
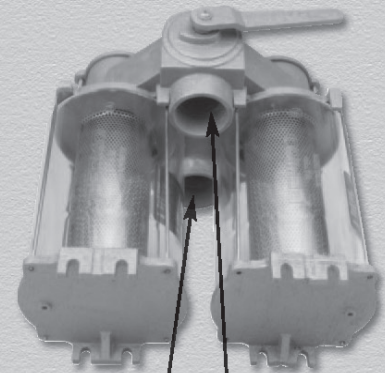


Fig. 0594



Pipe Connections

ORDERING & TECH INFO

Pipe Size Inches	Standard Pkg. - 1 Pc.	Height Overall Inches	Width Overall Inches	Depth Overall Inches	Dimensions Cylinder Inches O.D. x L	Open Area Dimensions Basket Inches	Each Side Open Area Ratio	Ship Wt. Carton Lbs. Std. Pkg.	Spare Gasket Kit* Dealer Pkg. - 5 Kts. 1 Kit. per Bag
1-1/2	0594008PLB	12	16	8-1/2	6 x 8	3-5/16 8-7/16	17:1	61	0594DP899R
2	0594009PLB	16	16	8-1/2	6 x 12	3-5/16 x 12-1/4	13:1	63	0594DP899R
2-1/2	0594010PLB	16	16	8-1/2	6 x 12	3-5/16 x 12-1/4	10:1	63	0594DP899R

DUPLEX INTAKE WATER STRAINER SPARE PARTS ORDERING INFORMATION

For Spare Part No. Insert a Spare Part Code Listed Below in Place of the "PLB" in the Strainer's Catalog Number (i.e., 059400699A, Top Casting for 1-1/2" (#8) Strainer).

Description	Spare Part Code	Sample Part Number	Package	Spare Part Description	Code	Sample Part Number	Package
Top Casting	.99A	059400899A	Boxed	Wing Nuts & Bolts for Cover	.99L	0493DP899L	Bag
Transparent Cylinder	.99C	049300899C	Boxed	Rubber Gasket Kit Consists of:			
Basket Strainer Size 8	.99D	059400899D	Boxed	2 Cover Gaskets & 4 Body Gaskets	99R*	0594DP899R	Bag
Basket Strainer Sizes 9 & 10	.99D	049300999D	Boxed	Tie Rods			
Cover with Gasket	.99E	0049300899E	Boxed	Consists of (4 Each for)	.99P	0493DP899P	Bag

LIGHTWEIGHT INTAKE WATER STRAINER WITH CLEAR BODY

Fig. 0443 - Lightweight Intake Water Strainer

CONSTRUCTION:

- Cast Bronze with Clear Polymer Body
- Our Lightest Weight Strainer
- Many Replacement Parts in Common with Other Perko Strainers (Fig. 0493)

**NEW
Item**

Available by
Oct. 2010

PERKO Water Strainers are Designed for Easy Installation and Cleaning. Features Include Mounting Lugs Cast into Both Sides to Assure Universal Mounting and a 316 Stainless Steel Strainer Basket to Minimize Electrolysis. The diameter of the screen holes is 0.079" providing 47% open area, among the highest in the industry for cylindrical strainer baskets. Hinged Lugs for the Cast Bronze Cover Permit Easy Removal and Cleaning of the Strainer Basket. A Drain Plug in the Bottom Casting is Provided for Easily Removing Sediment and Draining for Winterizing.

FIG. 0443 - DIFFERENTIAL PRESSURE GRAPH

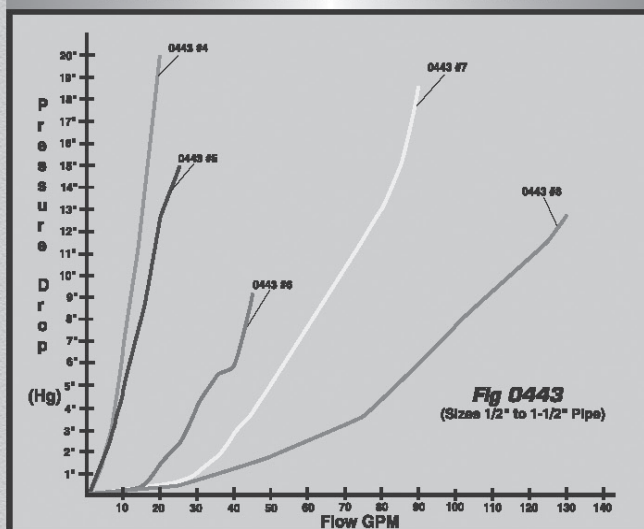


Fig. 0443

ORDERING & TECH INFO

Pipe Size Inches	Standard Pkg. - 1 Pc.	Height Overall Inches	Width Overall Inches	Dimensions Cylinder Inches O.D. x L	Dimensions Basket Inches	Open Area To Pipe Size Ratio	Ship Wt. Carton Lbs. Std. Pkg.	Spare Gasket Kit* Dealer Pkg. - 5 Kts. 1 Kit. per Bag
1/2	0443004PLB	6-1/4	4-1/2	3-1/2 x 4-1/4	1-13/16 x 4-3/8	30:1	3.9	0443DP599R
3/4	0443005PLB	8-5/8	4-1/2	3-1/2 x 6-5/8	1-13/16 x 6-1/4	25:1	4.0	0443DP599R
1	0443006PLB	8-3/4	5-1/2	4-1/2 x 6	2-5/8 x 5-7/8	20:1	6.7	0443DP799R
1-1/4	0443007PLB	9-5/16	5-1/2	4-1/2 x 6-9/16	2-5/8 x 6-1/4	13:1	6.5	0443DP799R
1-1/2	0443008PLB	11-3/4	7-1/4	6 x 8-5/8	3-5/16 x 8-7/16	17:1	11.1	0443DP999R

CLEAR BODY INTAKE WATER STRAINER SPARE PARTS ORDERING INFORMATION

For Spare Part No. Insert a Spare Part Code Listed Below in Place of the "PLB" in the Strainer's Catalog Number (i.e., 049300699A, Top Casting for 1" (#6) Strainer).

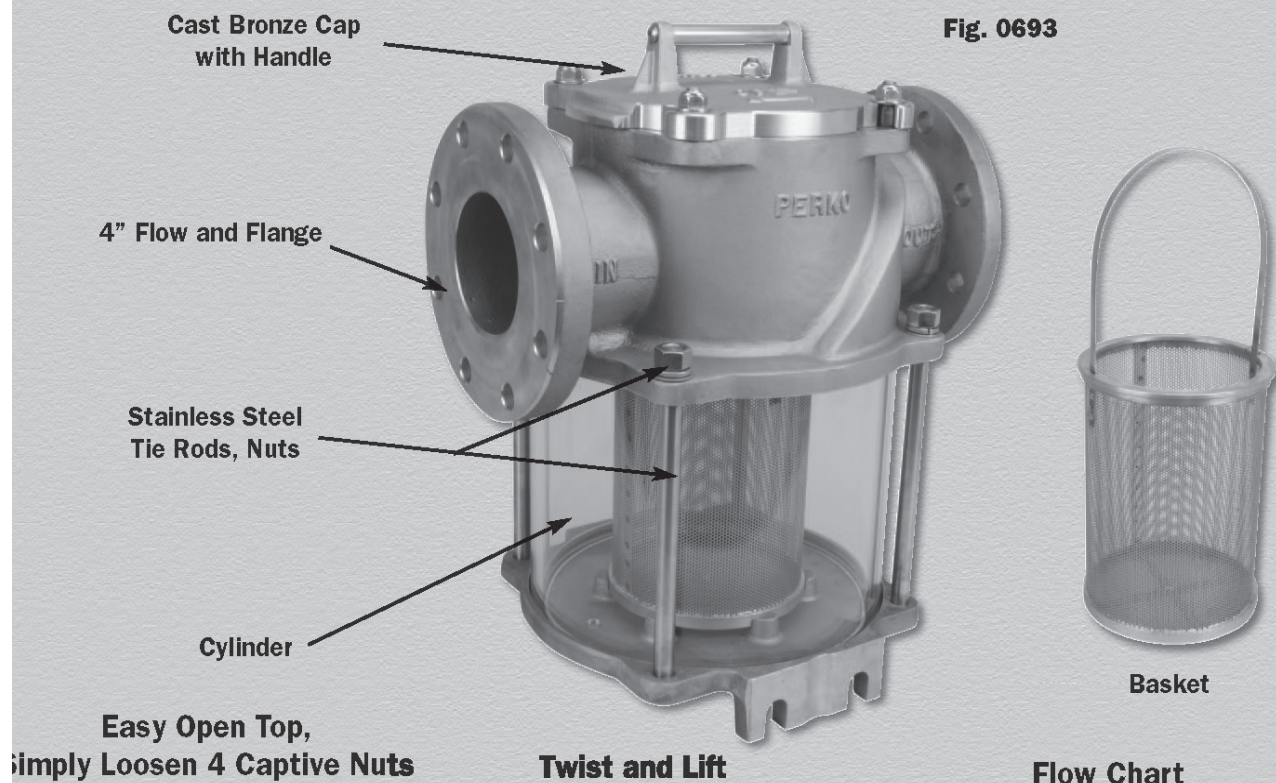
Description	Spare Part Code	Sample Part Number	Package	Description	Spare Part Code	Sample Part Number	Package
Top Casting	.99A	049300499A	Boxed	Hinged Bolt for Cover			
Transparent Cylinder Body	.99C	044300499C	Boxed	With Pin, Nut and Washer	.99L	0493DP599L	Bag
Basket Strainer	.99D	049300499D	Boxed	Rubber Gasket Kit Consists of:			
Cover with Gasket	.99E	049300499E	Boxed	1 Cover Gasket & 1 Body Gasket	.99R*	0443DP599R	Bag
				Nuts and Washers Consists of:			
				4 Each for 0443 Series	.99F	0443DP499F	Bag

PERKO® HEAVY DUTY 4" INTAKE WATER STRAINER


Fig. 0693 - Intake Water Strainer
CONSTRUCTION:

- Cast Bronze

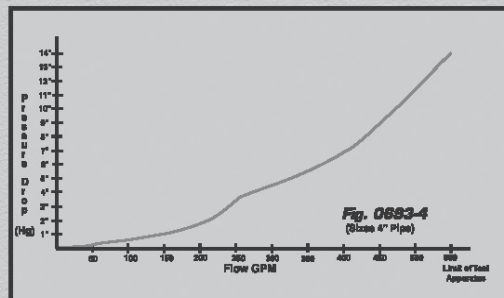
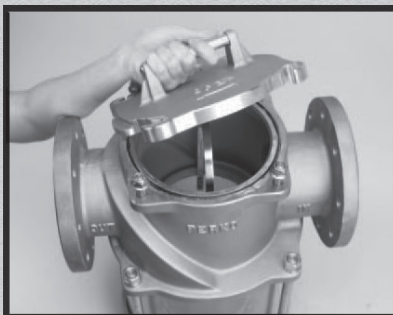
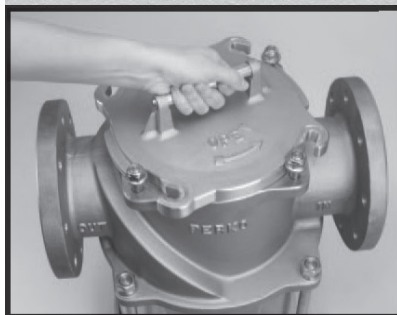
The new Perko Large Boat Strainer Line is designed for easy installation, cleaning and maintenance. Aircraft style mounting nuts hold fast without lock washers. They are held captive by the body and can't be dropped or lost. Once the mounting nuts are loosened, a convenient handle on the top cover allows it to be easily rotated and removed providing quick access to the strainer basket. Four 316 stainless steel tie rods and strainer basket minimize electrolysis. The diameter of the screen holes is 0.079" providing 47% open area, among the highest in the industry for cylindrical strainer baskets. A drain plug in the bottom casting is provided for easy sediment removal or to drain when winterizing. A transparent cylinder provides a visual check for debris.



**Easy Open Top,
Simply Loosen 4 Captive Nuts**

Twist and Lift

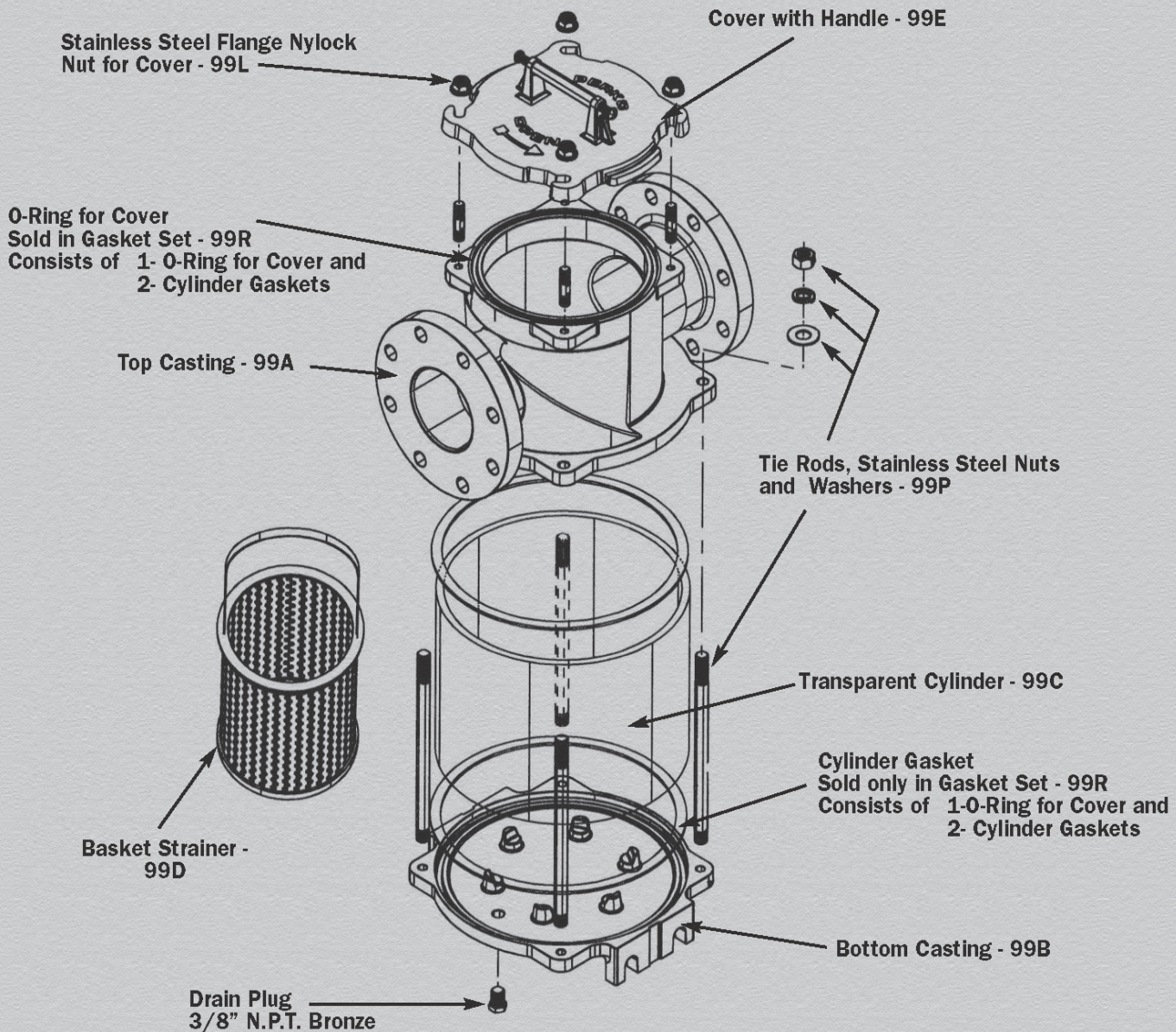
Flow Chart


ORDERING & TECH INFO

Pipe Size Inches	Height Overall Inches	Width Overall Inches	Std. Pkg. 1 Pc.	Dimensions Cylinder Inches	Dimensions Basket Inches	Open Area To Pipe Size Ratio	Ship Wt. Carton Lbs. Std. Pkg.	Spare Gasket Kit* Std. Pkg. 1 Kit
4	17-1/2	16-1/2	0693012PLB	12 O.D. x 8-3/4	6-3/4 x 8-5/8	10:1	135.0	069301299R

*Spare Gasket Kit Consists of: 1 O-Ring for Cover and 2 Cylinder Gaskets

HEAVY DUTY 4" INTAKE WATER STRAINER SPARE PARTS



4" Intake Water Strainer Spare Parts Ordering Information

Description	Spare Part Code	Sample Part Number	Package	Description	Spare Part Code	Sample Part Number	Package
Top Casting	.99A	069301299A	Boxed	Gasket Kit Consists of:			
Bottom Casting	.99B	069301299B	Boxed	1- Rubber O-Ring for Cover and			
Transparent Cylinder	.99C	069301299C	Boxed	2- Rubber Cylinder Gaskets	.99R*	069301299R	Bag
Basket Strainer	.99D	069301299D	Boxed	Tie Rods, Nuts and Washers			
Cover with Handle	.99E	069301299E	Boxed	Consists of (1 Each for 0693 Series)99P		069301299P	Bag
Stainless Steel Flange Nylock Nut for Cover							
Nylock Nut & Stud for Cover	.99L	069301299L	Bag				

PERKO®

INTAKE WATER STRAINERS

PERKO Water Strainers are Designed for Easy Installation and Cleaning. Features Include Mounting Lugs Cast into Both Sides to Assure Universal Mounting, Four Outside Tie Rods and a 316 Stainless Steel Strainer Basket to Minimize Electrolysis. The diameter of the screen holes is 0.079" providing 47% open area, among the highest in the industry for cylindrical strainer baskets. Hinged Lugs for the Cast Bronze Cover Permit Easy Removal and Cleaning of the Strainer Basket. A Drain Plug in the Bottom Casting is Provided for Easily Removing Sediment and Draining for Winterizing. For Applications Requiring Higher Capacity, Use Fig. 0500.

Figs. 0493 & 0500 Intake Water Strainers CONSTRUCTION:

- Cast Bronze

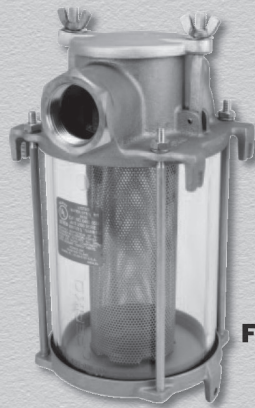


Fig. 0493

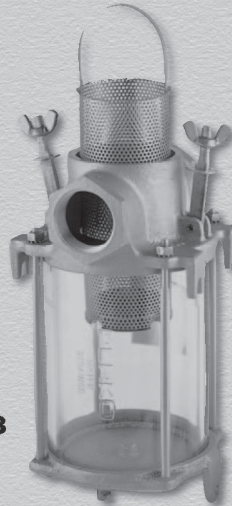


Fig. 0500



ORDERING & TECH INFO

Pipe Size Inches	Height Overall Inches	Width Overall Inches	Standard Pkg. - 1 Pc.	Dimensions Cylinder Inches O.D. x Height	Dimensions Basket Inches O.D. x Height	Open Area To Pipe Size Ratio	Ship Wt. Carton Lbs. Standard Pkg.	Spare Gasket Kit* Dealer Pkg. - 5 Kts. 1 Kit. per Bag
1/2	5-3/4	4-1/2	0493004PLB	3-1/2 x 4	1-13/16 x 4-3/8	30:1	4.9	0493DP599M (or) 99R
3/4	8-3/8	4-1/2	0493005PLB	3-1/2 x 6	1-13/16 x 6-1/4	25:1	5.0	0493DP599M (or) 99R
1	9-1/2	5-1/2	0493006PLB	4-1/2 x 5-1/2	2-5/8 x 5-7/8	20:1	8.1	0493DP799M (or) 99R
1-1/4	10	5-1/2	0493007PLB	4-1/2 x 6	2-5/8 x 6-1/4	13:1	7.9	0493DP799M (or) 99R
1-1/2	11-1/2	7-1/4	0493008PLB	6 x 8	3-5/16 x 8-7/16	17:1	13.7	0493DP999M (or) 99R
2	16	7-1/2	0493009PLB	6 x 12	3-5/16 x 12-1/4	13:1	19.5	0493DP999M (or) 99R
2-1/2	16	7-1/2	0493010PLB	6 x 12	3-5/16 x 12-1/2	10:1	18.0	0493DP999M (or) 99R

ORDERING & TECH INFO

Pipe Size Inches	Height Overall Inches	Width Overall Inches	Standard Pkg. - 1 Pc.	Dimensions Cylinder Inches O.D. x Height	Dimensions Basket Inches O.D. x Height	Open Area To Pipe Size Ratio	Ship Wt. Carton Lbs. Standard Pkg.	Spare Gasket Kit* Standard Pkg. - 1 Kit
2	14-1/2	9	0500009PLB	8 x 10	3-7/8 x 10-1/4	20:1	36.0	0500DP999M (or) 99R
2-1/2	16-1/2	9	0500010PLB	8 x 12	3-7/8 x 12-1/4	18:1	33.5	0500DP999M (or) 99R
3	18-1/2	9	0500011PLB	8 x 14	3-7/8 x 14-1/4	14:1	34.0	0500DP999M (or) 99R

*Spare Gasket Kit Consists of: 1 Cover Gasket and 2 Cylinder Gaskets

INTAKE WATER STRAINER & FLUSHING STRAINER SPARE PARTS ORDERING INFORMATION

For Spare Part No. Insert a Spare Part Code Listed Below in Place of the "PLB" in the Strainer's Catalog Number (i.e., 049300699A, Top Casting for 1" (#6) Strainer).

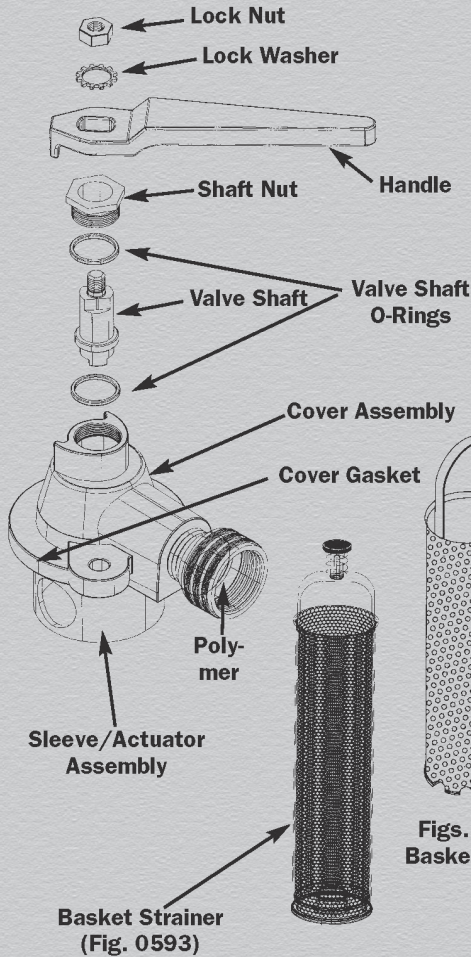
Description	Spare Part Code	Sample Part Number	Package	Description	Spare Part Code	Sample Part Number	Package
Top Casting	.99A	049300499A	Boxed	Cork Gasket Kit Consists of:			
Bottom Casting	.99B	049300499B	Boxed	1- Cover Gasket and			
Transparent Cylinder	.99C	049300499C	Boxed	2- Cork Cylinder Gaskets	.99M*	0493DP599M	Bag
Basket Strainer	.99D	049300499D	Boxed	Rubber Gasket Kit Consists of:			
Cover with Gasket	.99E	049300499E	Boxed	1- Cover Gasket and			
Hinged Bolt for Cover				2- Rubber Cylinder Gaskets	.99R*	0493DP599R	Bag
With Pin, Nut and Washer	.99L	0493DP599L	Bag	Tie Rods, Nuts and Washers			
Cork Cover Gasket Kit (Set of 2)	.99N	0493DP599N	Bag	Consists of (4 Each for 0493 Series)			
				(1 Each for 0500 Series)	.99P	0493DP499P	Bag

* Note: Older model strainers utilizing cork cylinder gaskets must order 99M Cork Gasket Kit and newer model strainers must order 99R Rubber Gasket Kit.

INTAKE & FLUSHING WATER STRAINERS SPARE PARTS

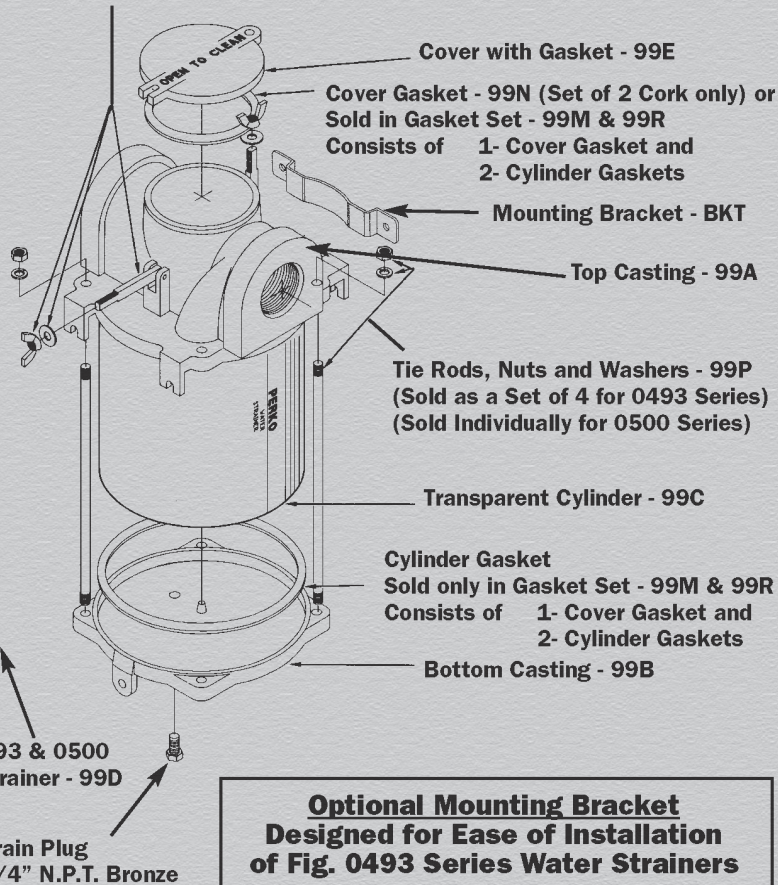
Figs. 0493 & 0500 - Intake Water Strainers and Fig. 0593 Flushing Strainer Spare Parts Ordering Information

Fig. 0593 Flushing Strainer

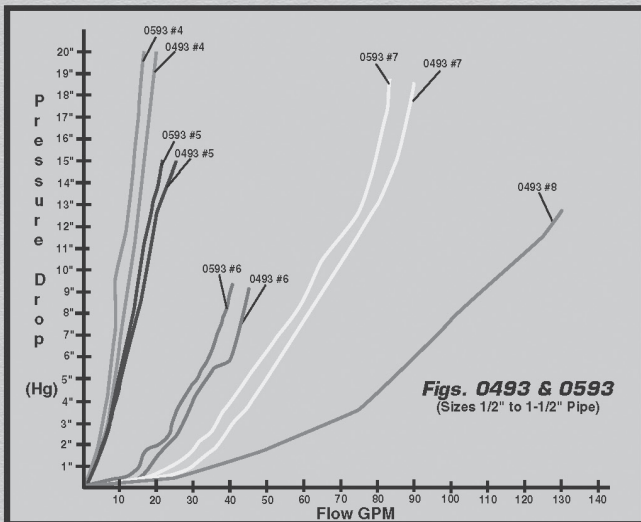


Figs. 0493 & 0500 Intake Strainer

Hinged Bolt for Cover with Pin, Nut and Washers - 99L



FIGS. 0493 & 0593 - DIFFERENTIAL PRESSURE GRAPHS

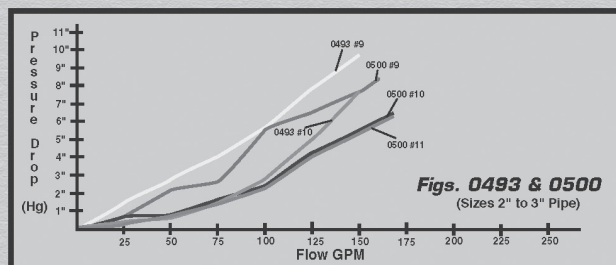


Optional Mounting Bracket Designed for Ease of Installation of Fig. 0493 Series Water Strainers



Part Number	Fits Strainer Size
0493045BKT	4 & 5
0493067BKT	6 & 7
0493089BKT	8 & 9

FIGS. 0493 & 0500 - DIFFERENTIAL PRESSURE GRAPHS



PERKO® FLUSHING STRAINER

PERKO Flushing Strainers are Designed for Easy Installation and Cleaning. Features Include Mounting Lugs Cast into Both Sides to Assure Universal Mounting, Four Outside Tie Rods and a 316 Stainless Steel Strainer Basket to Minimize Electrolysis. The diameter of the screen holes is 0.079" providing 47% open area, among the highest in the industry for cylindrical strainer baskets. Hinged Lugs for the Cast Bronze Cover Permit Easy Removal and Cleaning of the Strainer Basket. A Drain Plug in the Bottom Casting is Provided for Easily Removing Sediment and Draining for Winterizing.

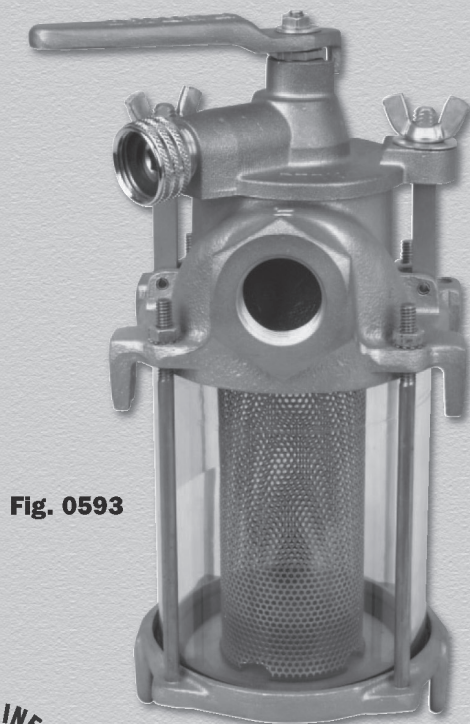


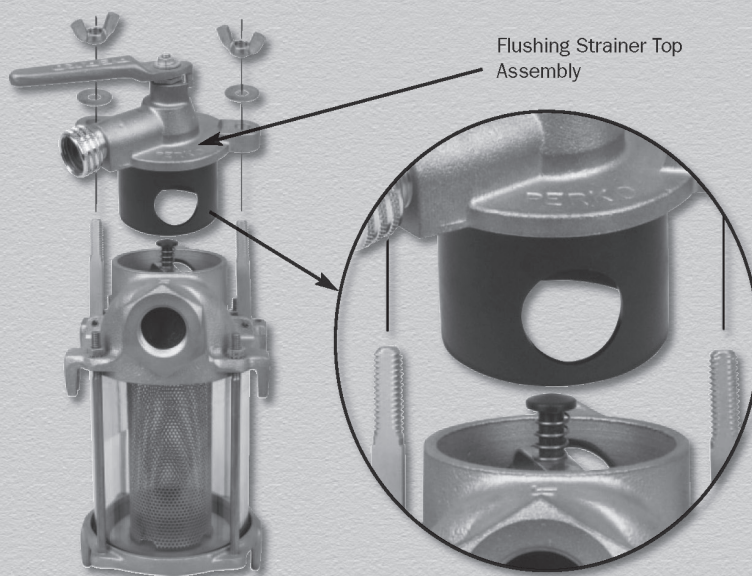
Fig. 0593



Fig. 0593 - Flushing Strainer Fresh Water Flushes your Inboard or Generator Simply and Easily

CONSTRUCTION:

- Cast Bronze
- Available in 1/2", 3/4", 1", or 1-1/4" Pipe Sizes
- Uses Standard Perko Strainer Replacement Parts (Gaskets, Cylinders, Nuts and Tie Rods)
 - Handle Indicates Flow Direction
- Top Casting Removes Easily for Basket Cleaning
 - Reversible Bulkhead Mounting Option
 - Smooth Acting, Low Torque Ball Valve
- Internal Cam Seals Fresh Water Intake During Normal (Through Strainer) Operation
- Can Act as an Emergency Bilge Pump



ORDERING & TECH INFO

Pipe Size Inches	Height Overall Inches	Width Overall Inches	Standard Pkg. - 1 Pc.	Dimensions Cylinder Inches	Dimensions Basket Inches	Open Area To Pipe Size Ratio	Weight Pounds	Spare Gasket Kit* Dealer Pkg. - 5 Kts. 1 Kit per Bag
1/2	5-3/4	4-1/2	0593004PLB	3-1/2 x 4	1-13/16 x 4-3/8	30:1	5.9	0493DP599R
3/4	8-3/8	4-1/2	0593005PLB	3-1/2 x 6	1-13/16 x 6-1/4	25:1	6.2	0493DP599R
1	9-1/2	5-1/2	0593006PLB	4-1/2 x 5-1/2	2-5/8 x 5-7/8	20:1	9.1	0493DP799R
1-1/4	10	5-1/2	0593007PLB	4-1/2 x 6	2-5/8 x 6-1/4	13:1	9.1	0493DP799R

Flushing Strainer Spare Parts Ordering Information

Description	Spare Part Code	Sample Part Number	Package	Description	Spare Part Code	Sample Part Number	Package
Handle (Fig. 0805)	99D	080500599D**	Boxed	Sleeve Assy.	99B	059300499B	Boxed
Valve Shaft	99A	059300499A	Boxed	Cover Assy.	99C	059300499C	Boxed

See Pages 146-147 For Additional Spare Parts Ordering Information and Differential Pressure Graphs.

*Spare Gasket Kit Consists of: 1 Cover Gasket and 2 Cylinder Gaskets.

** For Complete Handle Part Numbers See Fig. 0805 on page 154.

INTAKE, SCOOP & PUMP STRAINERS



FIG. 65 - INTAKE STRAINER

CAST BRONZE WITH MACHINED SLOTS

ORDERING INFORMATION

Pipe Size Inches	Max. Hull Thickness Inches	Dimensions Strainer Inches	Dealer Pkg. 5 Pcs	OEM Bulk Pkg. 10 Pcs.	Weight Pounds
1/2	2-1/4	3 x 4	65 DP4 PLB	65 004 PLB	3/4
3/4	2-3/16	3 x 4	65 DP5 PLB	65 005 PLB	1
1	2-1/2	3 x 4	65 DP6 PLB	65 006 PLB	1-1/4
1-1/4	3	3-1/4 x 4-1/4	65 DP7 PLB	65 007 PLB	1-5/8

Screw Size #8.



FIG. 65

FIG. 66 - SCOOP STRAINER

CAST BRONZE WITH MACHINED SLOTS

ORDERING INFORMATION

For Thru-Hull Sizes Inches	Dimensions Strainer Inches	Dealer Pkg. 5 Pcs	Standard Package - 5 Pc.	Weight Pounds
3/8 & 1/2	3-1/2 x 2-1/2	66 DP1 PLB	66 001 PLB	3/8
3/4 & 1	5 x 3-1/4	66 DP2 PLB	66 002 PLB	7/8
1-1/4 & 1-1/2	6-1/4 x 4-1/4	66 DP3 PLB	66 003 PLB	1-1/4
2	8 x 5-1/8	66 DP4 PLB	66 004 PLB	2

Screw Size #8.



FIG. 66

FIG. 709 - PUMP STRAINER

CAST BRONZE

ORDERING INFORMATION

Hose Size Inches	Length Overall Inches	Width Overall Inches	Dealer Pkg. 5 Pcs.	Weight Ounces
5/8	3-5/8	1-3/4	709 DP PLB	8-3/4

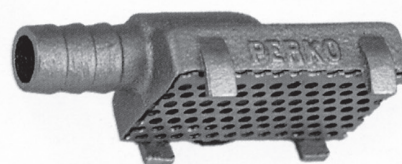


FIG. 709

FIGS. 721 & 722 - PUMP STRAINERS

CAST BRONZE

ORDERING INFORMATION

Pipe Size Inches	Length Overall Inches	Width Overall Inches	Standard Package - 1 Pc.	Weight Pounds
1-1/4	4-3/4	2-3/4	721 000 PLB	1-5/8
1-1/4	4-1/2	2-3/4	722 000 PLB	1-3/8

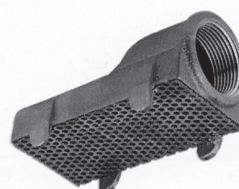


FIG. 721

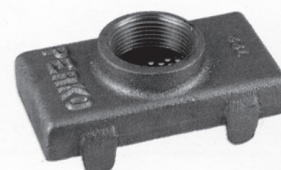


FIG. 722

SEACOCKS



Fig. 834

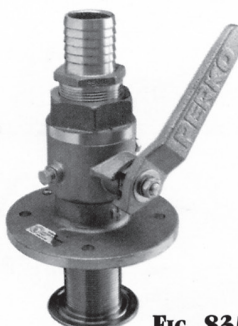


Fig. 835

FIGS. 834 & 835 SEACOCKS - BALL VALVE DESIGN

CAST BRONZE

Fig. 834 - With 90° Curved Hose Adapter

Fig. 835 - With Straight Hose Adapter

INCLUDES THRU-HULL, HOSE ADAPTER, DRAIN PLUG, FOUR PRE-DRILLED MOUNTING HOLES AND BONDING SCREW. PERKO SEACOCKS INCORPORATE A PLASTIC BALL AND SEAT ASSURING A TIGHT SEAL AND EASE OF OPERATION. DRAIN PLUGS FOR WINTERIZING. HANDLES ARE EASILY REMOVED.

ORDERING INFORMATION

Hose Size Inches	Pipe Size Inches	Flange Diameter Inches	Fig. 834 Overall Height*	Fig. 834 Standard Package - 1 Pc.	Fig. 835 Overall Height*	Fig. 835 Standard Package - 1 Pc.	OEM Bulk Pkg.	Bolt Size	Weight Pounds
3/4	3/4	3-1/4	5-7/8	834 005 PLB	5	835 005 PLB	5	5/16	3
1	1	4-3/8	6-3/8	834 006 PLB	5-3/8	835 006 PLB	—	3/8	5-1/8
1-1/4	1-1/4	4-7/8	7-5/8	834 007 PLB	6-1/4	835 007 PLB	5	3/8	8-1/4
1-1/2	1-1/2	5-1/2	8-3/8	834 008 PLB	6-5/8	835 008 PLB	5	3/8	10
2	2	5-3/4	10-3/8	834 009 PLB	7-7/8	835 009 PLB	—	3/8	22
2-1/2	2-1/2	7-1/4	12-1/2	834 010 PLB	10-3/8	835 010 PLB	—	1/2	25
3	3	8	14-3/8	834 011 PLB	12	835 011 PLB	—	1/2	32

* Overall Height is measured from the top of the hose adapter to the bottom of the flange.



Fig. 805

FIG. 805 SEACOCK BODY

CAST BRONZE - BALL VALVE DESIGN

THESE VALVE BODIES ARE OFFERED TO MEET THE NEEDS OF APPLICATIONS THAT REQUIRE EXTRA LONG, SCOOP OR FLUSH TYPE THRU-HULLS.

ORDERING INFORMATION

Pipe Size Inches	Fig. 805 Standard Package - 1 Pc.	OEM Bulk Pkg.	Weight Pounds
3/4	805 005 PLB	5	2-1/2
1	805 006 PLB	5	3-7/8
1-1/4	805 007 PLB	5	5-1/4
1-1/2	805 008 PLB	5	6-3/8
2	805 009 PLB	---	11
2-1/2	805 010 PLB	---	19-3/8
3	805 011 PLB	---	21-1/4

Fig. 805 - SPARE PARTS ORDERING INFORMATION

The Repair Kits Listed Below Consist of: 1 Ball, 2 Ball Seats and 2 O-Rings for the Valve Stem.

Pipe Size Inches	Repair Kit	Pipe Size Inches	Repair Kit	Pipe Size Inches	Repair Kit
3/4	805 005 99B	1-1/2	805 008 99B	3	805 011 99B
1	805 006 99B	2	805 009 99B		
1-1/4	805 007 99B	2-1/2	805 010 99B		

Mueller Steam Specialty

Models 125, 125B

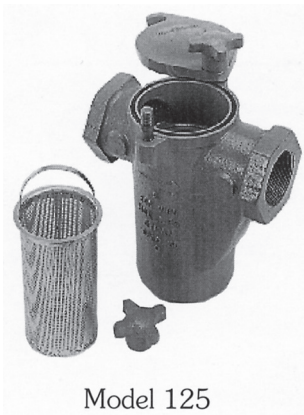
WORKING PRESSURES - NON-SHOCK

125	ANSI 125 lb. Class	200 PSI @ 150° F Knob 150 PSI @ 250° F Buna-N - Bolted
125B	ANSI 125 lb. Class	200 PSI @ 150° F 150 PSI @ 250° F Buna-N - Bolted

Max. temp. can be limited by O-ring material. Consult factory. 100% Hydrostatically Tested.

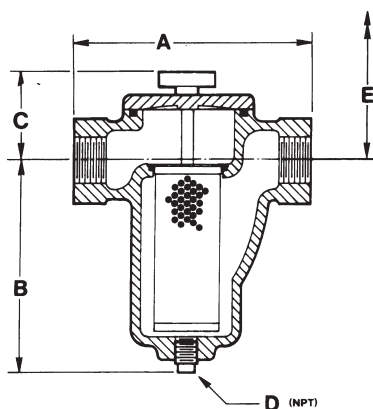
All units rated 200 PSI WOG with knob type closure.

Cast Iron or Cast Bronze Screwed End Simplex Basket Strainer



Model 125

125 Class 125
125B Class 125



Model 125

SERVICE RECOMMENDATIONS

These strainers are used to strain foreign matter from pipe lines and provide inexpensive protection for costly pumps, meters, valves, and similar mechanical equipment. They are available in a variety of materials other than those listed below. In the appropriate material, the Model 125 can be specified for drinking water, cooling water, hot water systems, sea water, etc. Just a few of the applications in the chemical process industry are: brine, paint, heat exchangers, condensers, fuel oil, organic and inorganic chemicals.

FEATURES

These strainers have been designed for applications where easy maintenance and large capacity straining are needed. Service time is minimal because the cover is secured with quick opening, non-yoke type knobs. Both the cover and basket use O-ring seals, eliminating the need to replace gaskets each time the strainer is serviced. This, combined with the machined basket seat, eliminates particle bypass. With the appropriate wire mesh, these strainers can be used to strain particles as small as 5 microns.

CONSTRUCTION

Quick release knob cover is standard, complete with o-ring seal. Swing clamp covers are available for all sizes; consult factory. A plugged NPT connection is provided at location "D" (see page D-7). The standard basket is 304 Stainless Steel with .062 perforations. Standard o-ring material is Buna-N for carbon steel units, Viton for stainless steel units. See chart on D-2 for pressure drop figures.

CAPACITY Minimum 6 to 1 ratio.

GALVANIZING Available on cast iron models. Other coatings are available on application.

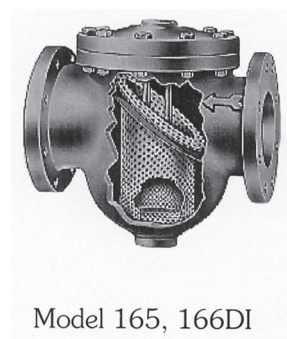
MATERIALS: Body/Cover Cast Iron ASTM A126B
Bronze ASTM B62 (type 85-5-5-5)
O-ring Buna N, Viton Standard for Stainless Steel
For stainless steel, pickling and passivation available upon request. Consult Factory.

SIZE	in mm	3/8 10	1/2 15	3/4 20	1 25	1-1/4 32	1-1/2 40	2 50	2-1/2 65	3 80
A	in	4-9/16	4-9/16	4-9/16	5-5/16	6-5/16	6-5/16	8-1/4	9-5/8	11-1/4
	mm	116	116	116	135	160	160	210	244	286
B	in	4	4	4	4-11/16	6-1/2	6-1/2	7-7/8	8-3/4	11-3/8
	mm	102	102	102	119	165	165	200	222	289
C	in	2-1/2	2-1/2	2-1/2	2-3/4	3	3	3-5/8	4	4-1/2
	mm	64	64	64	70	76	76	92	102	114
D	NPT	3/8	3/8	3/8	3/8	1/2	1/2	3/4	1	1
E	screen in	4-13/16	4-13/16	4-13/16	5-7/8	8-1/8	8-1/8	10-1/8	11-7/16	14-13/16
	removal mm	106	106	106	149	206	206	257	590	376
WEIGHTS										
Cast Iron	lb	4.75	4.75	4	6	10	10	19.5	28.5	47
	kg	2.1	2.1	1.8	2.7	4.6	4.6	8	12	21
Bronze	lb	5.25	5.25	5.25	7.75	12.5	12.5	24.5	36.5	55.5
	kg	2.3	2.3	2.3	3.5	5	5	11	16	25

Approximate Dimensions and Weights. Apply For Certified Drawings.

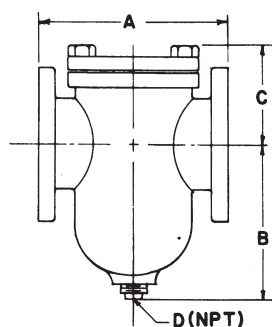
Mueller Steam Specialty

Models: 165, 166DI



Model 165, 166DI

165 Class 125
166DI Class 300



Model 165, 166DI

WORKING PRESSURES - NON-SHOCK			
165	to 12"	ANSI 125 lb. Class	200 PSI @ 150° F 125 PSI @ 406° F
	14"-24"	ANSI 125 lb. Class	150 PSI @ 150° F 100 PSI @ 353° F
166DI	to 16"	ANSI 300 lb. Class	640 PSI @ 100° F 450 PSI @ 650° F

Max. temp. can be limited by gasket material. Consult factory.
100% Hydrostatically Tested.

SIZE		1-1/4" 30	1-1/2" 35	2" 50	2-1/2" 65	3" 80
A	165	6-3/8	6-1/2	8-5/8	7-9/16	8-3/4
	166DI	162	165	219	189	222
B	165	-	-	8-5/8	8-3/8	9-6/16
	166DI	-	-	219	213	243
C	165	4-1/8	4-1/8	5-7/8	5-7/16	5-1/4
	166DI	105	105	149	138	133
D	165	3-5/8	3-5/8	4-3/8	3-3/4	5-1/8
	166DI	92	92	111	95	130
D (NPT)		1/2	1/2	1/2	3/4	3/4

WEIGHTS		1-1/4" 30	1-1/2" 35	2" 50	2-1/2" 65	3" 80
165	lb	-	-	32	28	37
	kg	-	-	14	12	16
166DI	lb	-	-	40	30	52
	kg	-	-	18	13	23

SIZE		3-1/2" 90	4" 100	5" 125	6" 150	8" 200	10" 250	12" 300	14" 350	16" 400	18" 450	20" 500	24" 600
A	165	9	11-3/16	12-1/4	14	17-1/8	22	25-1/4	29-5/8	31-17/8	34	36-5/8	41-1/2
	166DI	229	284	311	356	435	559	645	756	810	964	930	1054
B	165	10-5/8	11-1/2	13-1/4	15-1/2	18-1/8	23-1/4	26-1/2	31-1/4	33-1/2	-	-	-
	166DI	270	292	337	394	460	591	673	793	851	-	-	-
C	165	6-7/8	7-7/8	10-1/4	10-3/8	15-1/2	16	23-3/4	26-3/4	29-1/2	36	40-7/8	46-1/4
	166DI	175	200	260	270	394	406	603	679	749	914	1038	1174
D	165	5-1/4	5-3/8	5	5-5/8	7	9-1/4	11-5/8	12-1/4	13-3/16	16-1/4	17	19-1/8
	166DI	133	143	127	143	178	235	295	311	335	412	432	486
D (NPT)		3/4	1	1	1-1/4	1-1/2	1-1/2	2	2	2	2	2	2

WEIGHTS		3-1/2" 90	4" 100	5" 125	6" 150	8" 200	10" 250	12" 300	14" 350	16" 400	18" 450	20" 500	24" 600
165	lb	53	63	98	122	198	350	716	1010	1320	1916	2468	4550
	kg	24	28	44	55	90	159	325	459	600	870	1121	2068
166DI	lb	67	85	121	212	228	437	811	1122	1463	-	-	-
	kg	30	38	54	96	103	198	367	508	663	-	-	-
166DI	lb	71	90	128	224	240	460	854	1182	1540	-	-	-
	kg	32	40	58	101	109	209	388	537	700	-	-	-

Approximate Dimensions and Weights. Apply For Certified Drawings.
LARGER SIZES AVAILABLE

Cast Iron and Ductile Iron
Flanged End Basket Type Strainer

SERVICE RECOMMENDATIONS

These strainers offer complete protection to pumps, meters, traps, valves, and similar equipment. Installation of a strainer before any mechanical equipment will ensure trouble free service and avoid costly shutdowns, repairs or replacement often caused by the introduction of foreign matter in pipes.

BASKETS

Heavy gauge perforated stainless steel baskets with spot welded seams and handles are normally furnished. Recommended perforations shown below:

STEAM: To 8" 3/64" (.045)
10" up Consult factory
LIQUID: To 4" 1/16" (.062)
5" up 1/8" (.125)

Also available are 5/32", 3/16", and 1/4" perforations as well as a large variety of brass and monel baskets. For finer straining (down to five microns), see Model 125 basket type strainer.

CONSTRUCTION

These strainers are well designed for medium or coarse straining. The angular cutaway design of the baskets allows a straight through flow and results in extremely low pressure loss. All sizes feature the flanged top cover connection and easy basket removal. Bodies can be supplied with tappings for pressure gauges. Tapped and plugged NPT drain connection sizes shown on next page. See chart on page D-3 for pressure drop figures.

SELF CLEANING

In strainers with open bottom baskets, merely open the valve or plug connected to the blowoff outlet to flush off accumulated sediment.

CAPACITY

Generously proportioned bodies with baskets that have an open area many times greater than the corresponding pipe size ensure low pressure loss.

GALVANIZING

Available from stock in all sizes.

MATERIALS: Body

165 Cast Iron ASTM A126-B 2"-24"
166DI Ductile Iron ASTM395 2"-16"
Cover A516-70 Plate
Gasket Non-asbestos

*Note: Also available in Bronze

Mueller Steam Specialty

Model: 690

WORKING PRESSURES - NON-SHOCK	
Steam	WOG
Not Recommended	50 PSI @ 150°F (3.4 bar @ 66°C)

100% Hydrostatically Tested.

Marine Bronze Duplex Strainer

SERVICE RECOMMENDATIONS

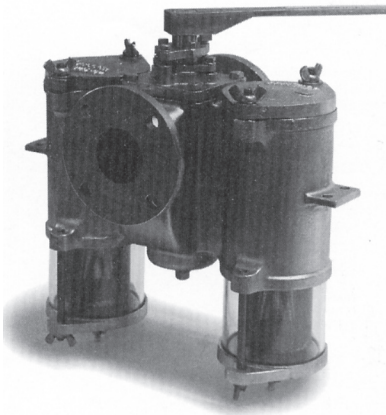
These sight glass duplex strainers are designed to remove debris which can clog and damage engine cooling water systems, both sea water and heat exchanger types, where flow cannot be shut down for gasket cleaning. When equipped with fine mesh lined baskets these strainers can be used to clarify potable water supplies.

FEATURES

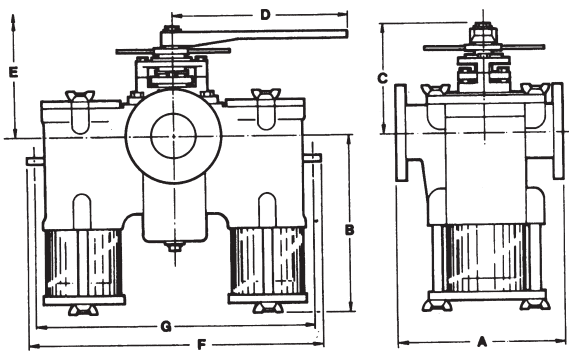
The basket chambers of these duplex strainers are clear acrylic to allow direct visual inspection of the fluid passing through the chamber. The single, tapered plug diverter valve opens the ports to one chamber while simultaneously closing the ports of the other chamber. An adjusting nut lifts the tapered plug off its seat slightly to allow easy manual rotation through a 90° swing and also allows accurate reseating of the plug for a metal-to-metal seal. Both the basket and sight glass chambers are easily accessible by removing two wing nuts for quick cleaning, inspection and replacement. Basket chamber seals are Buna-N O-rings and do not have to be replaced every time the covers are opened.

MATERIAL

Body, Plug Covers	ASTM B-62 Bronze
Sight glass chambers	Acrylic plastic
Cap screws	Silicon bronze
Baskets	Monel
Seals	Buna-N
Stem packing	PTFE



690 Class 125



Model 690

Size <small>in mm</small>		A	B	C	D	E <small>SCREEN REMOVAL</small>	F	G	WEIGHTS
3	in	11-1/16	12-1/2	19-1/2	12	15-7/8	20-5/8	19-1/2	155
80	mm	281	318	495	305	403	524	495	70.4

Approximate Dimensions and Weights. Apply For Certified Drawings.

Mueller Steam Specialty

Model: 691MFA, 692MFB, 692MFD, 692MFH

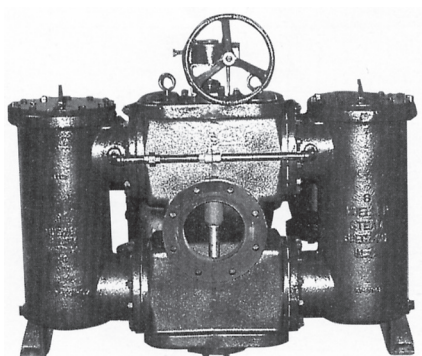
Large Duplex Strainer

WORKING PRESSURES NON-SHOCK WITH CLAMPED COVERS		
691MFA	8" - 16"	WOG 150 PSI @ 150°F (10.3 bar @ 38°C)
692MFB	8" - 16"	WOG 150 PSI @ 150°F (10.3bar @ 38°C)
692MFD	8" - 16"	WOG 150 PSI @ 150°F (10.3bar @ 38°C)
692MFH	8" - 16"	WOG 150 PSI @ 150°F (10.3 bar @ 38°C)

WORKING PRESSURES - NON-SHOCK WITH BOLTED COVERS		
691MFA	8"-12" WOG 150 PSI @ 150°F (10.3 bar @ 38°C) Buna-N 150 PSI @ 250°F	14"-16" WOG 150 PSI @ 150°F (10.3 bar @ 38°C) Buna-N 150 PSI @ 250°F
692MFB	8"-12" WOG 200 PSI @ 150°F (15.5 bar @ 38°C) Buna-N 175 PSI @ 250°F	14"-16" WOG 150 PSI @ 150°F (10.3 bar @ 38°C) Buna-N 150 PSI @ 250°F
692MFD	8"-12" WOG 200 PSI @ 100°F (19.6bar @ 38°C) Buna-N 175 PSI @ 250°F	14"-16" WOG 150 PSI @ 150°F (10.3 bar @ 38°C) Buna-N 150 PSI @ 250°F
692MFH	8"-12" WOG 200 PSI @ 100°F (19 bar @ 38°C) Viton - O-rings 80 PSI @ 400°F (Bolted)	14"-16" WOG 150 PSI @ 150°F (10.3 bar @ 38°C) Viton - O-rings 150 PSI @ 250°F (Bolted)

* Max. temp. can be limited by gasket material.
Consult factory. 100% Hydrostatically Tested.

691M Class 125
692M Class 150



SERVICE RECOMMENDATIONS

These duplex strainers are designed for use in fluid handling systems where the flow cannot be shut down for basket cleaning such as cooling water, pumps, compressors, condensers, fire lines, fuel lines, lubricating systems, salt and fresh water systems, chemical process systems and positive suction head service.

FEATURES

These duplex strainers feature a single shaft drive to operate the flow diverter valves. Quick flow transfer requires less than 90° handle rotation; an automatic actuator is also available. There are no external linkages, sprockets, chains, cranks or wheels. The drive mechanism is completely enclosed, protected from line fluid erosion and corrosion. Valve discs, disc seals and seats are field replaceable. There is absolutely no leakage into the off duty chamber. Baskets are gasketed and securely positioned to prevent particle bypass. The large capacity baskets provide generous open area ratio. The single basket design is easily and quickly cleaned. See page E-3 for pressure drop information.

BASKETS

WATER: 8" UP 1/8" (.125)

CONSTRUCTION

All body parts are cast metal (see materials below). All shafts are supplied in stainless steel. Valve seats are bronze. Standard basket material is stainless steel. Special materials and baskets are available on application. Covers are normally bolted. Clamped covers (limited to 150 PSI @ 100° F) are also available.

MATERIAL

Body	691 M FA	Cast Iron ASTM A126 Grade B
	692MFB	Bronze ASTM B62 (type 85-5-5-5)
	692MFD	Carbon Steel ASTM A216 Grade WCB
	692MFH	Stainless Steel ASTM A351 Grade CF8M

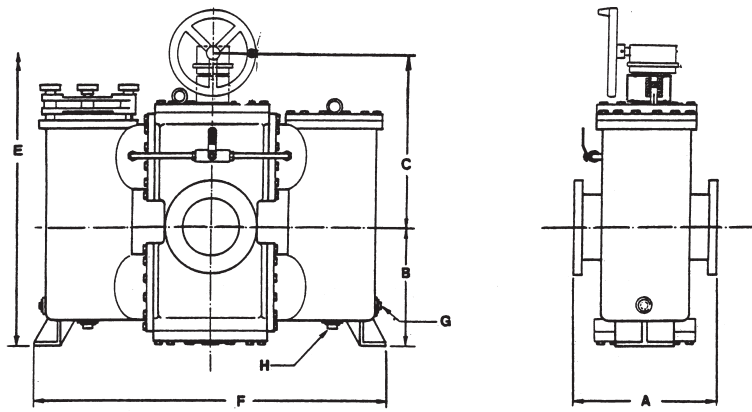
Cover Matches body

O-rings Buna-N

For stainless steel, pickling and passivation available upon request. Consult Factory.

Mueller Steam Specialty

Model: 691MFA, 692MFB, 692MFD, 692MFH

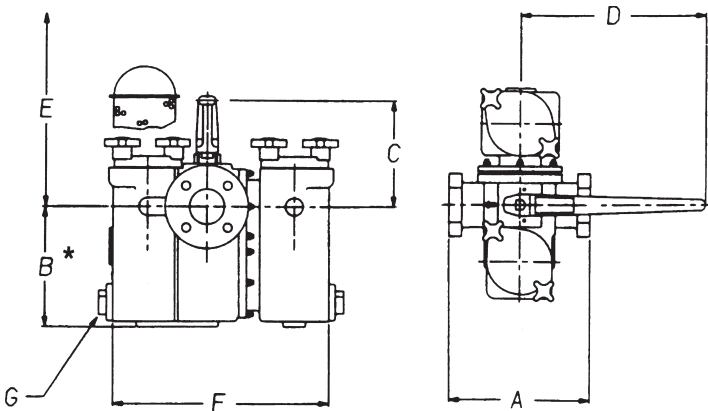


Model 691MFA, 692MFB, 692MFD, 692MFH

Size		in mm	8 200	10 250	12 300	14 350	16 400
A		in	20	24	30	32	36-3/4
		mm	508	610	762	813	933
B		in	19	20-1/2	25-1/2	27-7/8	32
		mm	483	521	648	708	813
C		in	24-9/16	28-3/4	30-3/4	30-1/8	34-3/4
		mm	623	730	781	765	883
D	HANDLE	in	18	18	18	18	18
		mm	457	457	457	457	457
E	SCREEN REMOVAL	in	62	72-1/2	87-1/2	95-1/2	80-1/2
		mm	1575	1842	2223	2426	2045
F		in	54-3/4	61	65-7/8	71	80-1/2
		mm	1391	1549	1673	1803	2045
G	NPT	in	1"	1"	1"	1"	1-1/2
		mm	25	25	25	25	40
H	NPT	in	2"	2"	2"	2"	2"
		mm	50	50	50	50	50
WEIGHTS		lb	1365	1970	2800	3300	4400
		kg	620	894	1272	1500	2000

Approximate Dimensions and Weights. Apply For Certified Drawings.

Model: 791FA



* "B" dimension includes the floor supports when applicable.

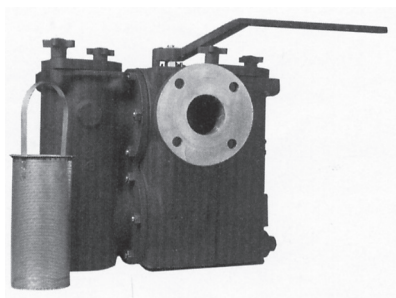
Model 791FA

Mueller Steam Specialty

Model: 791FA

Ball-Plex Cast Iron Duplex Strainer

791FA Class 125



WORKING PRESSURES - NON-SHOCK

ANSI 125 lb. Class	200 PSI @ 150°F 175 PSI @ 250°F Buna-N – O-rings
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* Max. temp. can be limited by gasket and seat material. Consult factory. 100% Hydrostatically Tested.

SERVICE RECOMMENDATIONS

Mueller Steam Specialty Ball-Plex Duplex Strainers are designed for use in fluid handling systems where the flow cannot be shut down for basket cleaning such as cooling water, compressors, condensers, fire lines, fuel lines, lubrication systems, salt and fresh water systems, chemical process systems and pump suction service.

FEATURES

The Mueller Steam Specialty Ball-Plex Duplex Strainers use 3-way balls as diverter valves. This design, with its PTFE seats, provides drop-tight shut-off, eliminating the costly and potentially dangerous leakage into the chamber not in use. The two part body casting allows true-in-line maintainability. All parts of the valve are accessible after removing the basket chamber without removing the strainer from the line. A gear operator is standard on the 4", 5" and 6" units allowing for very easy change over. On models with a handle, the chamber in use is covered by the handle preventing accidental opening of the pressurized chamber and allowing easy access to the side to be serviced.

BASKETS

The large open area ratio of the basket ensures a minimum pressure drop across the unit. Perforated stainless steel baskets are standard on all models unless otherwise specified. Two baskets per chamber are standard on the 5" and 6" units. See page E-3 for pressure drop figures.

WATER: Thru 4" 1/16"(.062)
5" up 1/8" (.125)

MATERIAL

Body Cast Iron ASTM A126-B
Cover Cast Iron ASTM A126-B Seats PTFE
O-rings Buna N

Size		in mm	3/4 19	1 25	1-1/4 32	1-1/2 40	2 50	2-1/2 65	3 80	4†† 100	5†† 125	6†† 150
A		in	6-7/8	6-7/8	9-3/8	9-3/8	10-5/8	13-1/2	13-1/2	16	22	22
		mm	175	175	238	238	270	343	343	406	559	559
B		in	4-15/16	4-15/16	6-3/4	6-3/4	8-3/16	12	12	16-13/16	18-5/8	18-5/8
		mm	125	125	171	171	208	305	305	427	473	473
C		in	4-5/8	4-5/8	4-3/8	4-3/8	7-1/8	8-1/16	8-1/16	15-1/2	17-1/4	17-1/4
		mm	118	118	111	111	181	205	205	394	438	438
D		in	10	10	10	10	20	20	20	14+	14+	14+
		mm	254	254	254	254	508	508	508	356	356	356
E	SCREEN REMOVAL	in	7-3/4	7-3/4	10-3/8	10-3/8	12-5/8	17-21/32	17-21/32	23-1/2	25-11/16	25-11/16
		mm	197	197	264	264	321	448	448	597	653	653
F		in	10-3/16	10-3/16	12-3/4	12-3/4	16-3/8	20-3/8	20-3/8	24-1/2	26-1/4	26-1/4
		mm	259	259	324	324	416	518	518	622	667	667
G	NPT	in	3/4	3/4	1-1/4	1-1/4	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2
		mm	20	20	32	32	40	40	40	40	40	40
WEIGHTS		lb	34	34	65	65	113	218	218	432	786	786
		kg	15.4	15.4	29.4	29.4	51.2	98.8	98.8	195.9	356.4	356.4

Approximate Dimensions and Weights. Apply For Certified Drawings.

+ 4", 5" and 6" units are standard with a gear operator. The handwheel dimension is 10".

†† 4", 5" and 6" units are standard with floor supports. Dimension "B" reflects this standard in those sizes.

Mueller Steam Specialty

Models: 351M, 352M, 358S*, 352-1/2

* 358S supersedes model 353-1/2M, Consult factory.

WORKING PRESSURES - NON-SHOCK		
	STEAM	WOG
351M	150 PSI @ 350°F	200 PSI @ 150°F
352M	300 PSI @ 350°F	400 PSI @ 150°F
358S		400 PSI @ 100°F
352-1/2	250 SWP @ 425°F	

Cast Bronze Screwed, Solder and Sil-Braze End "Y" Type Strainer

351M (Screwed) Class 125
 358S (Solder) Class 125
 352 (Screwed) Class 250



Models 351M Screwed ends (shown)
 352M Screwed ends



Model 358S Solder Joint



Model 352-1/2 Sil-Braze ends

SERVICE RECOMMENDATIONS

These compact strainers can be used extensively to strain foreign matter from pipelines and provide inexpensive protection for costly pumps, meters, valves and similar equipment.

SCREENS

Models 351 M and 352M are furnished with .033" (.84mm) perforated stainless steel screens for steam service; 20 mesh [1/ 32" (.80mm) openings] for water service.

CONSTRUCTION

All models have machined screen seats in the body and cap to assure perfect screen alignment and easy reassembly when servicing is required. Military strainers are furnished in ASTM B-61 bronze; commercial strainers in ASTM B-62 bronze. All sizes feature a straight threaded, gasketed cap.

SELF CLEANING

Self cleaning is accomplished by opening the valve or plug connected to the blowoff outlet.

FEATURES

In addition to the usual commercial applications the 352-1/2 is in complete accordance with Military specifications and conforms to the latest revision of BuShip Drawing 80064-810841499. Unless otherwise specified all sizes of Model 352-1/2 are furnished grooved, less rings.

BLOWOFF OUTLETS

Unplugged, NPT blowoff connections are provided for commercial strainers. BuShip Drawings 80064-810-841499 strainers are supplied without blowoff connections. See chart on next page for blowoff plug sizes in inches.

PRESSURE DROP: Consult Factory.

MATERIAL: 351M, 352M, 352-1/2, 358S

(commercial)

Body and Cap

Screen

Gasket

Bronze ASTM B62

304 SS ASTM A240

Non-asbestos

352-1/2 (military)

Body and Cap

Screen

Gasket

Bronze ASTM B61

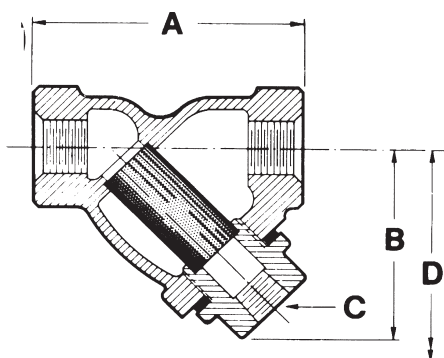
304 SS ASTM A240

Copper

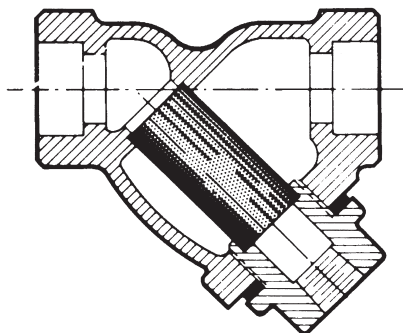
*ANSI B 16.18 states that the maximum operating pressure of 95-5 Tin-Antimony solder sweat connections. 358S rating, 175 PSI @ 250°F & 400 PSI @ 100°F

Mueller Steam Specialty

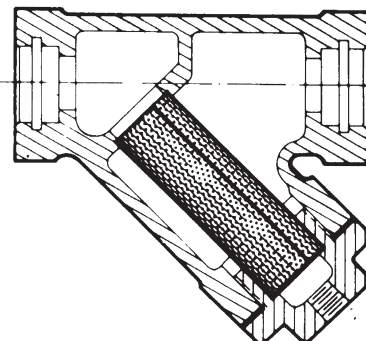
Models: 351M, 352M, 358S*, 352-1/2



Model 351M, 352M



Model 358S



Model 352-1/2

SIZE		in	1/4	3/8	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4
		mm	6	10	15	20	25	32	40	50	65	80	100
A	351M, 352M	in	2-3/4	2-3/4	2-3/4	3	3-3/4	4-7/16	4-15/16	6-1/8	8-1/4	9	
		mm	70	70	70	76	95	113	125	156	210	229	
	358S	in	3	3	3	3-11/16	4-3/4	5-7/16	5-15/16	7-9/16	9-3/4	10-3/8	
		mm	76	76	76	93	120	138	150	192	248	264	
B	352-1/2	in	2-9/16	2-9/16	2-15/16	3-3/8	4-1/8	4-13/16	5-3/8	6-5/8	7-7/8	11-3/4	15-3/16
		mm	65	65	75	86	105	122	137	168	200	298	386
	351M, 352M	in	2-1/4	2-1/4	2-1/4	2-9/16	2-3/4	3-5/8	3-7/8	5-1/8	6	6-3/4	
		mm	57	57	57	65	70	81	98	130	152	171	
C	358S	in	2-1/4	2-1/4	2-1/4	2-9/16	2-3/4	3-5/8	3-7/8	5-1/8	6	6-3/4	
		mm	57	57	57	65	70	81	98	130	152	171	
	352-1/2	in	1-7/8	1-7/8	2-1/8	2-9/16	3-1/8	3-1/8	4-3/16	5-3/8	6-1/2	7	11-3/8
		mm	48	48	54	65	79	90	122	137	165	178	289
D	351M, 352M	in	1/4	1/4	1/4	3/8	3/8	3/4	3/4	1	1-1/4	1-1/2	
		mm	6	6	6	10	10	20	20	25	32	38	
	358S	in	1/4	1/4	1/4	3/8	3/8	3/4	3/4	1	1-1/4	1-1/2	
		mm	6	6	6	10	10	20	20	25	32	38	
E	352-1/2	in	1/8	1/8	1/8	1/4	1/4	3/8	1/2	3/4	1	1	Blind Cover
		mm	3	3	3	6	6	10	15	20	25	25	-
	351M, 352M	in	2-1/2	2-1/2	2-1/2	2-5/8	3-3/8	4-5/8	5	6-7/8	8-3/4	9-3/4	
		mm	64	64	64	67	86	117	127	175	222	248	
F	358S	in	2-1/2	2-1/2	2-1/2	2-5/8	3-3/8	4-5/8	5	6-7/8	8-3/4	9-3/4	
		mm	64	64	64	67	86	117	127	175	222	248	
	352-1/2	in	2-3/4	2-3/4	3	4	4-1/2	5-1/2	6-1/2	8-1/4	10	10-1/2	16
		mm	70	70	76	102	114	140	165	210	254	267	406
WEIGHTS													
	351M, 352M, 358S	lb	.75	.75	.75	1.38	2.13	3.13	4.5	7	12.5	18	
		kg	.34	.34	.34	.62	.96	1.4	2	3.1	5.6	8	
	352-1/2	lb	.75	.75	1	1.75	2.5	4.25	5.5	8.25	15.5	36	
		kg	.34	.34	.45	.79	1.1	1.9	2.5	3.7	7	16	

Approximate Dimensions and Weights. Apply For Certified Drawings.

Darwin Award Winners

1996, Stefan Macko, 55, Mississauga, Ontario

A man falls 23 floors to his death while he was cleaning a bird feeder on his balcony. Inspector D'Arcy Honer of the Peel regional police said, "No foul play is suspected." Macko was standing on a wheeled chair. "It appears the chair moved and he went over the balcony".

TECHNICAL INSTALLATION INFORMATION FOR S.S. WHITE[®] HEAVY DUTY FLEXIBLE REACH RODS

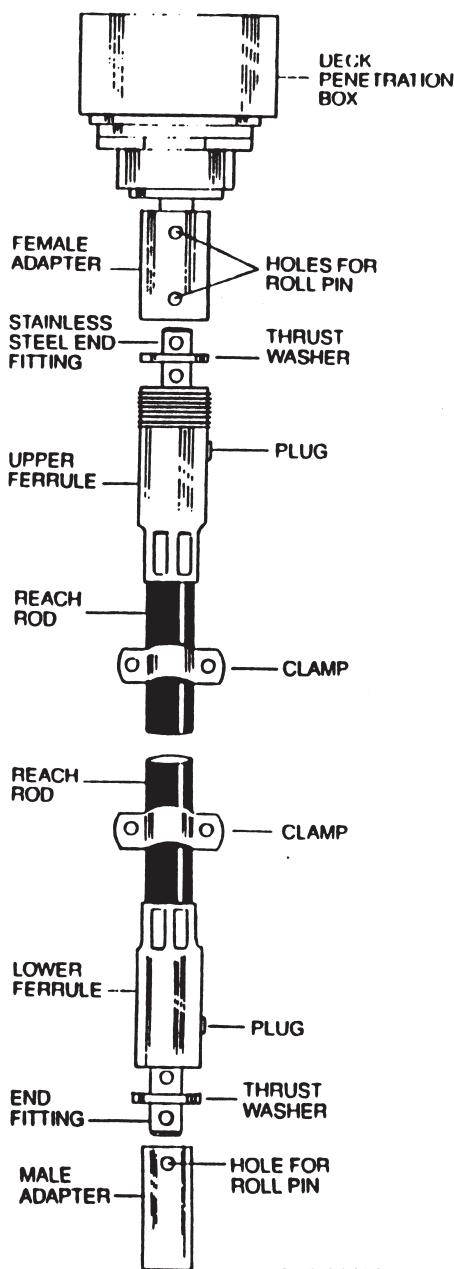
- 1** Consider the following factors before deciding what type flexible reach rod is required for a particular application.

- A. Valve type—gate, globe, butterfly, ball, etc.
- B. Valve size.
- C. Valve operating and breakaway torque.
- D. General condition of valve.

- 2** Apply known factors to chart located in the reach rod brochure and in the original Technical & Installation Data, Revision "C". (Available upon request)

NOTE: As the length of the flexible reach rod increases, the amount of transmitted torque decreases. Example: 30' heavy duty flexible reach rod produces approximately 70% of input torque at the output end. This includes normal routing with a total (not to exceed) 110 degrees of bends.

NOTE: By using an "in line" gear box multiplier (4:1 ratio) the torque loss is eliminated along with a torsional load increase estimate of 3½ times the original input load. Locate the "in line" gear box directly over the valve stem somewhere between 1 to 4 feet. Use a solid shaft to span the distance between the output shaft of the gear box to the valve handle coupling device. Gear box to be securely held in place by welding support struts from a nearby bulkhead or beam to the gear box mounting plate, drill and bolt.



SKETCH I

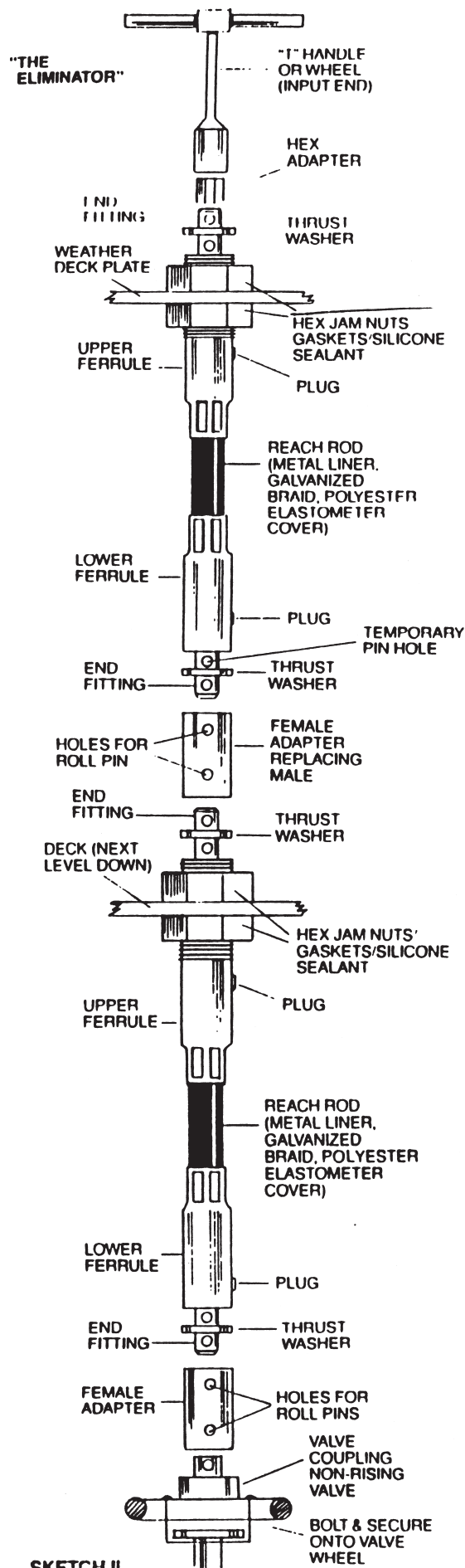
- 3** Determine length of flexible reach rod by measuring the distance between the bottom of the deck penetration box (extended shaft) to the top of the valve stem.

- A. The easiest way to determine the length of flexible reach rod needed is to route a section of heavy duty garden hose through the intended path you wish to take. Then mark and measure.
- B. Consider generous radii for routing.
- C. After you have determined the length of reach rod required, round off the measurement to the nearest shorter foot (do not use inches) and make up the difference with a solid rod extension between the output end of the flexible reach rod and the valve coupling. Example: if your measurement is 13 feet 9 inches, order a 13 foot reach rod.
- D. The end adapters on all reach rods are attached to the end fitting of the shaft with a transverse stainless steel roll pin and all adapters for a particular reach rod size are interchangeable. The end adapters may be removed from the reach rod by driving out the roll pin. They can then be attached to the valve coupling using several methods such as: welding, mating using the "pin" method or whatever is appropriate for a particular attachment application.

- 4** The input end of the reach rod is attached to the output shaft of the deck penetration box by attaching a female adapter to the input end of the reach rod and securing the deck penetration box output shaft to the female adapter by cross-drilling and pinning. (Refer to Sketch I)

NOTE: Use adequate support bracketing to take the weight or *Hanging Load* off the reach rod.

- A. Recommend using bulkhead or standoff clamps to support the reach rod every four (4) feet.



SKETCH II

IMPORTANT: Before hanging the flexible reach rod and adding supporting hardware, it is recommended that a temporary pin be installed through the cross-drilled hole specifically designed for this purpose in the end fitting between the thrust washer and the end adapter at the output end.

Reason: This temporary pin will eliminate normal retraction of the end fitting into the reach rod casing.

NOTE: Remove pin as soon as connection is completed between reach rod and valve coupling.

- 5 When installing a flexible reach rod through a deck or bulkhead in a compartment, there are several ways to accomplish this without destroying the compartment's watertight integrity.

- A. The *super economizer*, better known as the "Eliminator, (Refer to Sketch II)" using only flexible reach rods eliminates deck penetration boxes, bulkhead and deck piercing couplers, right angle gear boxes, universal joints, etc. Using this cost efficient method produces savings several times the price of the flexible reach rods.
- B. Valves located beneath the engine room deck grating occasionally require on-site control along with remote control from above. Simply connect a solid rod to the valve hand wheel coupler and extend upward through the deck grating an extra 3 to 4 feet. Weld a "T" onto the solid rod for on-site control and couple the flexible reach rod above this control point.

6 INSTRUCTIONS

- A. Cut a hole in the deck approximately 1/8 of an inch larger than the threaded upper ferrule at the input end of the reach rod.
NOTE: Occasionally a deck cup with a cap is used when a *flush deck* installation is necessary.
- B. Remove the upper hex jam nut and insert the reach rod from beneath the deck being penetrated. Use a protective gasket material and a waterproof sealant on both sides of the deck penetration. Attach upper hex jam nut and tighten. This will produce a waterproof pressure seal.
- C. Route heavy duty flexible reach rod through the compartment to the next lower deck level. Be sure to support reach rod every four feet.
- D. Cut a hole through the lower deck using same method as described above in 6A.
- E. Follow instructions as described in 6B and 6C.
- F. Route this lower reach rod directly to the valve stem for attachment. Be sure to support reach rod every four feet.

NOTE: If additional deck levels must be penetrated, follow instructions described in 6A, 6B, and 6C.

A Field Guide to the Use of Pipe

1. All pipes are to be made of a long hole surrounded by metal or plastic, centered around the hole.
2. All pipes are to be hollow throughout the entire length; do not use holes of lengths different to the pipe.
3. The inside diameter of all pipes must not exceed the outside diameter, otherwise the hole will be on the outside.
4. All pipes are to be supplied with nothing in the hole, so that water, steam, or other elements can be put inside at a later date.
5. All pipes should be supplied without rust; this can be more effectively applied at the job site. **NOTE:** Some vendors are now able to supply prerusted pipe. If it's available in your area, this new product is recommended as it will save a great deal of time at the job site.
6. All pipes over 500 feet (153 metres) in length should have the words "LONG PIPE" painted on them, so that the drilling crew will not mistake it for a short pipe.
7. Pipes over 2 miles (3.2 kilometres) in length must also have the words "LONG PIPE" painted in the middle, so that the drilling crew will not have to walk the entire length of the pipe to determine whether it's a long or short pipe.
8. All pipes over 6 inches (152 millimetres) in diameter must have the words "LARGE PIPE" painted on them so that the drilling crew will not mistake it for a small pipe.
9. When ordering 90 degree, 45 degree, or 30 degree elbows, be sure to specify right or left hand, otherwise you will end up going in the wrong direction.
10. Be sure to specify to your vendor whether you want level, uphill, or downhill piping. If you use downhill pipes for going uphill, the water will flow the wrong way.