

HP Turbine Installation and Maintenance Guide





HP Turbine Installation and Maintenance Guide

Copyright

This manual is an unpublished work and contains the trade secrets and confidential information of Neptune Technology Group Inc., which are not to be divulged to third parties and may not be reproduced or transmitted in whole or part, in any form or by any means, electronic or mechanical for any purpose, without the express written permission of Neptune Technology Group Inc. All rights to designs or inventions disclosed herein, including the right to manufacture, are reserved to Neptune Technology Group Inc.

Neptune engages in ongoing research and development to improve and enhance its products. Therefore, Neptune reserves the right to change product or system specifications without notice.

Trademarks used in this manual

T-10 is a registered trademark of Neptune Technology Group Inc. **E-Coder** is a registered trademark of Neptune Technology Group Inc. **R900** is a registered trademark of Neptune Technology Group Inc. **E-Coder)R900i** is a registered trademark of Neptune Technology Group Inc. **E-Coder)R450i** is a registered trademark of Neptune Technology Group Inc.

Other brands or product names are the trademarks or registered trademarks of their respective holders.



Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Professional Installation

In accordance with section 15.203 of the FCC rules and regulations, the MIU must be professionally installed by trained utility meter installers. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

HP Turbine Installation and Maintenance Guide

Literature No. IM HP Turbine 12.15

Part No. 13505-011

Copyright © 2015

Neptune Technology Group Inc.

All Rights Reserved.

Neptune Technology Group Inc.

1600 Alabama Highway 229

Tallassee, AL 36078

Tel: (800) 633-8754

Fax: (334) 283-7293

Contents

1 Introduction

- Product Description 1
 - Options 2
 - Size 2
 - UOM 2
 - Register Types 2
 - Flanges 2
 - Strainer 2
- Key Features 3
 - Roll-Sealed Register 3
 - Lead Free Maincase 3
 - Turbine Measuring Element 3
- Construction 4
- Warranty 4

2 Specifications

- Environmental Specifications 5
- Operating Characteristics 5
- HP Turbine Registration 6
- HP Turbine Dimensions 7

3 Installing the HP Turbine

- Prior to Installation 8
 - Storage 8
 - Unpacking 8
 - Tools Needed 8
 - Safety and Preliminary Checks 8
- Installation Instructions 9
 - Installing Strainer 9
 - Recommended Installation 9
 - Adjusting the Calibration Vane 10
 - Before Operation 11

4 Maintaining the HP Turbine

Neptune's UME Design	12
Performing Maintenance on the Meter	13
Inspect the UME	15
Install the UME	15

5 Contacting Neptune Customer Support

By Phone	18
By Fax	18
By Email	18

A Strainer Cleaning and Maintenance

Cleaning the Strainer	19
---------------------------------	----

B HP Turbine and Fire Hydrant Parts List

1½-Inch to 2-Inch HP Turbine	21
3-Inch to 10-Inch HP Turbine	23
UME	25
Fire Hydrant	28

C Fire Hydrant Meter

Introduction	31
Construction	31
Key Features	32
Roll-Sealed Register	32
Cast Aluminum Maincase	32
Turbine Measuring Element	33
Warranty	33
Specifications	33
Options	34
Operating Characteristics	34
Dimensions	35

D HP Fire Service Turbine Stainless Steel (S) Meter

Introduction	37
Systems Compatibility	37
Construction	38
Key Features	38
Turbine Measuring Element	38
Lead Free Maincase	38
Stainless Steel Strainer	39
Roll-Sealed Registers	39
Warranty	39
Specifications	39
Options	40
Operating Characteristics	40
Dimensions	41
Cleaning the Fire Service Strainer	42

Glossary

Index

Notes:

Figures

Figure	Title	Page
1	HP Turbine	1
2	HP Turbine - Top and Side View	7
3	Recommended Installation - Top View	10
4	Calibration Vane	10
5	4-Inch HP Turbine Meter	12
6	Unitized Measuring Element (UME)	13
7	Tap Seal Pin	13
8	Remove Seal Pin	14
9	Remove Bolts	14
10	Top Plate	14
11	UME	14
12	Inspect O-ring	15
13	Turbine Seal	15
14	Guide Pin	15
15	Top Plate Arrow Aligned with Guide Pin	16
16	Press Down on Top Plate	16
17	Secure Top Plate with Bolts	16
18	External Strainer	19
19	Representative Breakdown of the 1½-Inch to 2-Inch HP Turbine	21
20	Representative Breakdown of the 3-Inch to 10-Inch HP Turbine	23
21	Representative Breakdown of the UME	25
22	Representative Breakdown of the Fire Hydrant	28
23	3-Inch Fire Hydrant Meter	31
24	Fire Hydrant - Top View	35
25	Fire Hydrant - Side View	35
26	6-Inch Fire Service Turbine S Meter	37
27	HP Fire Service Turbine S Dimensions	41
28	FS Turbine S Strainer Cover	42
29	FS Turbine S Strainer Basket	42
30	Check for Defects	42
31	FS Strainer S Basket O-Ring	43

Notes:

Tables

Table	Title	Page
1	Environmental Specifications	5
2	Operating Characteristics	5
3	Meter Registration (Per One Revolution of the Sweep Hand)	6
4	Register Capacity (6-Wheel Odometer)	6
5	HP Turbine Dimensions	7
6	1½-Inch to 2-Inch HP Turbine Parts List	22
7	3-Inch to 10-Inch HP Turbine Parts List	24
8	UME and Register Part Numbers - E-Coder	25
9	UME and Register Part Numbers - ProRead	26
10	UME and Register Part Numbers - ProRead	27
11	Fire Hydrant Part Numbers	29
12	Fire Hydrant Operating Characteristics	34
13	Fire Hydrant Dimensions	35
14	HP Fire Service Turbine S Operating Characteristics	40
15	HP Fire Service Turbine S Dimensions	41

Notes:

1 Introduction

The High Performance (HP) Turbine meter is designed for applications where flow rates are consistently moderate to high. In order to achieve maximum performance in actual service, it is essential that these installation and maintenance instructions are followed. In this book, the figures shown are for the 4-inch HP Turbine meter unless indicated otherwise. Models may vary.

Product Description

The HP Turbine water meter offers some of the widest flow ranges of any turbine meter on the market. All HP Turbine meters meet or exceed the latest performance and accuracy requirements of AWWA C701 and maximum continuous flow ranges may be exceeded by as much as 25% for intermittent periods.



Figure 1 HP Turbine

Options

The HP Turbine has several options.

Size

The HP Turbine meter comes in the following sizes.

- 1½ inch
- 2 inch
- 3 inch
- 4 inch
- 6 inch
- 8 inch
- 10 inch

UOM

The HP Turbine meter uses the following units of measure.

- U.S. gallons
- Imperial gallons
- Cubic feet
- Cubic meters

Register Types

The HP Turbine meter uses the following registers.

- Remote reading systems: ARB® V, ProRead™, E-Coder®)R900i™, E-Coder®, TRICON®/S, TRICON®/E3.
- Reclaim.

Flanges

The HP Turbine meter has several companion flanges to choose from.

- 1½ inch and 2 inch (oval): bronze
- 3 inch, 4 inch, and 6 inch: bronze or cast iron
- 8 inch and 10 inch: cast iron

Strainer

The HP Turbine meter has several strainers to choose from.

- 1½ inch to 10 inch: NSF/ANSI 61 lead free high copper alloy
- 1½ inch to 10 inch: NSF/ANSI 61 lead free Rilsan® nylon-coated ductile iron

Appendix A provides information on cleaning and maintaining a strainer.

Key Features

The HP Turbine meter has the following key features.

- Roll-sealed register
- Lead free maincase
- Turbine measuring element

Roll-Sealed Register

This section lists the features of a roll-sealed register.

- Magnetic drive, low-torque registration ensures accuracy.
- Impact-resistant register design with flat glass allows for readability.
- Low-flow indicator identifies leaks.
- Bayonet mount allows in-line serviceability.
- Tamperproof seal pin deters theft.
- Stamped date of manufacture, size, and model displays on dial face.

Lead Free Maincase

This section lists the key features of the lead free maincase.

- Lead free high copper alloy
- NSF/ANSI 61 compliant
- Compact, lightweight, and easy to handle
- Sturdy, durable, corrosion-resistant
- Internal pressure stresses and external damage resistant
- Residual value

Turbine Measuring Element

This section lists the key features of the turbine measuring element.

- Excellent low-flow sensitivity and wide flow ranges are available at 98.5% +/- 101.5% accuracy.
- Direct coupling of rotor to gear train prevents slippage and ensures accurate registration.
- Unitized Measuring Element (UME) allows for in-line service.
- Hydrodynamically-balanced rotor relieves pressure on the thrust bearings to minimize wear and provides sustained accuracy over an extended operating life.

Construction

Each HP Turbine meter consists of a rugged, lead free, high copper alloy maincase, an AWWA Class II turbine measuring element, and a roll-sealed register. The maincase is corrosion-resistant, lightweight, and compact. Inlet and outlet connections are flanged. Strainers are available to prevent debris from entering the meter and to reduce the effects of uneven water flow due to upstream piping variations.

The unitized measuring element (UME) allows for quick, easy, in-line interchangeability. Water velocity is measured accurately at all flows by a specially-designed assembly. The hydrodynamically-balanced, thrust-compensated rotor relieves pressure on the thrust bearings to minimize wear and provide sustained accuracy over an extended operating life. Direct coupling of the rotor to the gear train eliminates revenue loss due to slippage during fast starts and line surges. A calibration vane allows in-field calibration of the UME to lengthen service life and to ensure accurate registration.

The roll-sealed register eliminates leaking and fogging. A magnetic drive couples the register with the measuring element.

Warranty

Neptune provides a limited warranty with respect to its HP Turbine meters for performance, materials and workmanship.

When desired, owner maintenance is easily accomplished by inline replacement of major components, or a factory-calibrated UME.

2 Specifications

This chapter describes the specifications, operating characteristics, and dimensions for the HP Turbine meter.

Environmental Specifications

This section contains environmental specifications for the HP Turbine meter.

Table 1 Environmental Specifications

Specification	Description
Application	Cold water measurement of flow in one direction
Maximum Operating Pressure	175 psi (1206 kPa)
Maximum Operating Temperature	80° F

Operating Characteristics

This section provides a table of the operating characteristics of the HP Turbine meter.

Table 2 Operating Characteristics

Meter Size	Normal Operating Range @100% Accuracy ($\pm 1.5\%$)	Maximum Intermittent Flow	AWWA Standard
1½ inch	4 to 160 US gpm 0.91 to 35.3 m ³ /h	200 US gpm 45.4 m ³ /h	4 to 120 US gpm 0.91 to 27.3 m ³ /h
2 inch	4 to 200 US gpm 0.91 to 45.4 m ³ /h	250 US gpm 56.8 m ³ /h	4 to 190 US gpm 0.91 to 43.2 m ³ /h
3 inch	5 to 450 US gpm 1.14 to 102.2 m ³ /h	560 US gpm 127.2 m ³ /h	8 to 435 US gpm 1.8 to 98.8 m ³ /h
4 inch	10 to 1200 US gpm 2.27 to 272.5 m ³ /h	1500 US gpm 340.7 m ³ /h	15 to 750 US gpm 3.4 to 170.3 m ³ /h

Table 2 Operating Characteristics

Meter Size	Normal Operating Range @100% Accuracy (±1.5%)	Maximum Intermittent Flow	AWWA Standard
6 inch	20 to 2500 US gpm 4.55 to 567.8 m ³ /h	3100 US gpm 704.1 m ³ /h	30 to 1600 US gpm 6.8 to 306.6 m ³ /h
8 inch	35 to 4000 US gpm 7.95 to 908.5 m ³ /h	5000 US gpm 1135.6 m ³ /h	50 to 2800 US gpm 11.4 to 635.9 m ³ /h
10 inch	50 to 6500 US gpm 11.36 to 1476.3 m ³ /h	8000 US gpm 1817 m ³ /h	75 to 4200 US gpm 17.0 to 953.9 m ³ /h

HP Turbine Registration

This section provides tables for meter registration and register capacity.

Table 3 Meter Registration (Per One Revolution of the Sweep Hand)

	US Gallons	Imperial Gallons	Cubic Feet	Cubic Meters
1½ inch	100	100	10	1
2 inch	100	100	10	1
3 inch	100	100	10	1
4 inch	100	100	10	1
6 inch	1,000	1,000	100	10
8 inch	1,000	1,000	100	10
10 inch	1,000	1,000	100	10

Table 4 Register Capacity (6-Wheel Odometer)

	US Gallons	Imperial Gallons	Cubic Feet	Cubic Meters
1½ inch	100,000,000	100,000,000	10,000,000	1,000,000
2 inch	100,000,000	100,000,000	10,000,000	1,000,000
3 inch	100,000,000	100,000,000	10,000,000	1,000,000
4 inch	100,000,000	100,000,000	10,000,000	1,000,000
6 inch	1,000,000,000	1,000,000,000	100,000,000	10,000,000
8 inch	1,000,000,000	1,000,000,000	100,000,000	10,000,000
10 inch	1,000,000,000	1,000,000,000	100,000,000	10,000,000

HP Turbine Dimensions

This section provides a table of the dimensions and diagrams of the HP Turbine meter.

Table 5 HP Turbine Dimensions

Meter Size	A	B	C STD	C ProRead™	C E-Code®)R900™ and E-Code®)R945™	D	E	F	G	Weight
	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	in (mm)	lbs (kg)
1½ inch	10 (254)	6 ½ (165)	7 1/8 (181)	7 9/16 (192)	7 3/4 (197)	1 3/4 (44)	3/4 (19)	4 ½ (114)	5 3/8 (137)	19 (8.6)
2 inch	10 (254)	6 ½ (165)	7 5/8 (194)	8 1/16 (204.8)	8 1/4 (210)	2 1/8 (54)	13/16 (21)	4 ½ (114)	5 3/8 (137)	20 (9.1)
3 inch	12 (305)	6 (152)	10 (254)	10 7/16 (265.1)	10 5/8 (270)	3 3/4 (95)	5/8 (16)	6 1/4 (159)	7 1/2 (191)	40 (18.1)
4 inch	14 (356)	6 1/2 (165)	10 7/8 (276)	11 5/16 (287.3)	11 1/2 (292)	4 1/2 (114)	3/4 (19)	8 1/8 (206)	9 (229)	52 (23.6)
6 inch	18 (457)	8 5/8 (219)	13 (330)	13 7/16 (341.3)	13 5/8 (346)	5 1/2 (140)	1 (25)	10 1/4 (260)	11 (279)	115 (52.2)
8 inch	20 (508)	9 5/8 (244)	15 1/2 (394)	15 15/16 (404.8)	16 1/8 (409)	6 3/4 (171)	1 1/8 (29)	10 1/4 (260)	13 1/2 (343)	195 (88.4)
10 inch	26 (660)	12 5/8 (321)	15 1/2 (394)	15 15/16 (404.8)	16 1/8 (409)	8 (203)	1 1/4 (32)	10 1/4 (260)	16 (406)	275 (124.7)

Figure 2 shows the dimensions for the HP Turbine meter.

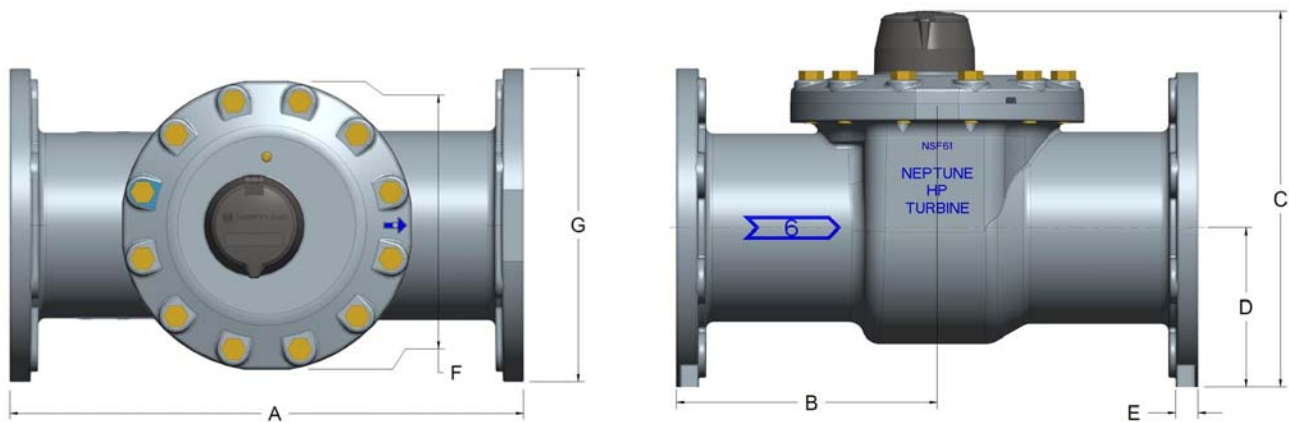


Figure 2 HP Turbine - Top and Side View

3 Installing the HP Turbine

This chapter is designed to step you through the installation process for the HP Turbine meter.

Prior to Installation

Storage

Upon receipt, inspect shipping containers for damage and inspect the contents of any damaged cartons prior to storage.

Once the inspection is complete, store the cartons in a clean, dry environment.

Unpacking

After unpacking the HP Turbine meter, inspect it for damage. If the meter appears to be damaged, notify your Neptune Territory Manager or distributor. If one or more items requires reshipment, use the original cardboard box and packing material.

Tools Needed

The recommended tools you need to successfully install the HP Turbine meter include:

- Flathead screwdriver
- Hammer
- Pliers
- 7/16-inch wrench

Safety and Preliminary Checks

Complete the following safety and preliminary checks before and during each installation:

- Verify that you are at the location specified on the site work order.
- Verify that the site is safe for you and your equipment.

Installation Instructions

All HP Turbine meters operate more accurately and reliably if installed properly. HP Turbine meter performance is directly related to the flow conditions of the water stream entering the meter. If the flow conditions are distorted because of upstream fittings or piping changes, an HP Turbine meter's performance can be adversely affected.

Installing Strainer

Neptune recommends that you install all HP Turbine meters with a Neptune Strainer at the meter inlet. The strainer, in addition to protecting the meter from debris in the line, also corrects the velocity profile of the flow to the meter and reduces the effects of upstream piping variations or other obstructions in the line.

When installing Neptune meters with a strainer, a minimum of four pipe diameters of straight run pipe (can include components that are fully open in their normal operating position) is required upstream and two to four diameters of straight run pipe downstream of the meter and strainer assembly.

If you do not use a strainer, a length of straight pipe equal to eight to ten diameters of the nominal pipe size should be allowed immediately upstream of the meter inlet and two to four diameters downstream.

Recommended Installation

Figure 3 and Figure 5 on page 10 shows the recommended installation of an HP Turbine meter. The installation incorporates a Neptune Strainer attached to the inlet of the meter and includes a downstream tee to facilitate field testing. This illustration also shows an optional bypass that provides uninterrupted service capability during periods of meter service.



When installing an HP Turbine meter assembly, follow normal good piping practices. Centrally locate all gaskets on the flanges with no overlap or interference with the pipe diameter. This is particularly important at the inlet connection to the meter.

The Neptune Strainer located upstream provides protection against meter damage from debris in the lines and virtually eliminates the effects of variations in upstream piping. Neptune specifically recommends the use of a Neptune Strainer of the same line size as the meter.

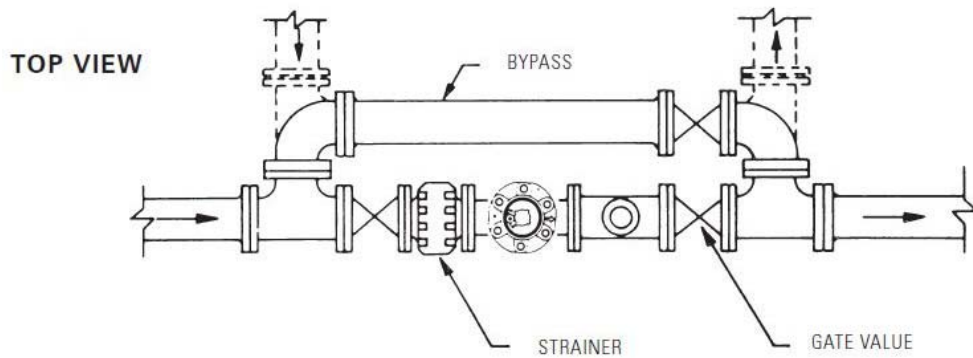


Figure 3 Recommended Installation - Top View

The strainer design provides optimum velocity profile correction at minimum additional head loss.

Turbine meters must operate in a completely filled line at all times. The downstream piping must always provide sufficient back pressure to maintain a full line at the meter.



Caution should be exercised to avoid air in the line, sudden flow surges, or excessive flow rates, as these conditions may cause damage to the turbine measuring element.

Adjusting the Calibration Vane

Neptune equips all HP Turbine meters with a calibration vane. The calibrating adjusting stem is located under the register mounting ring. If field calibration of the turbine element is required, complete the following steps.



Figure 4 Calibration Vane

- 1 Remove seal pin from the register.
- 2 Twist register and lift up to remove.
- 3 Loosen lock nut on adjusting stem by turning counter-clockwise.
- 4 Insert slotted screwdriver into slot in top of adjusting stem and do one of the following. See Figure 4.
 - Turn the adjusting stem toward the plus sign to increase registration.
 - Turn the adjusting stem toward the minus sign to decrease the registration.

Before Operation

Before putting the HP Turbine meter assembly into service, complete the following steps.

- 1 Open the bleed screw on top of the meter to vent air.
- 2 Slowly open the inlet-side valve to pressurize the meter while the outlet-side gate valve is closed.
- 3 Slowly open the outlet-side gate valve until the downstream line is pressurized.



After installation, it is important that the upstream inlet-side valve is put in the full-open position during service. A partially throttled upstream valve can cause the flow profile distortion that can adversely affect meter accuracy. All throttling should be done only on the downstream outlet-side of the meter.

4 Maintaining the HP Turbine

This chapter provides instructions for maintaining the HP Turbine meter. The 3-inch, 4-inch, 6-inch, 8-inch, and 10-inch meters in the HP Turbine product line share similar features and functions.

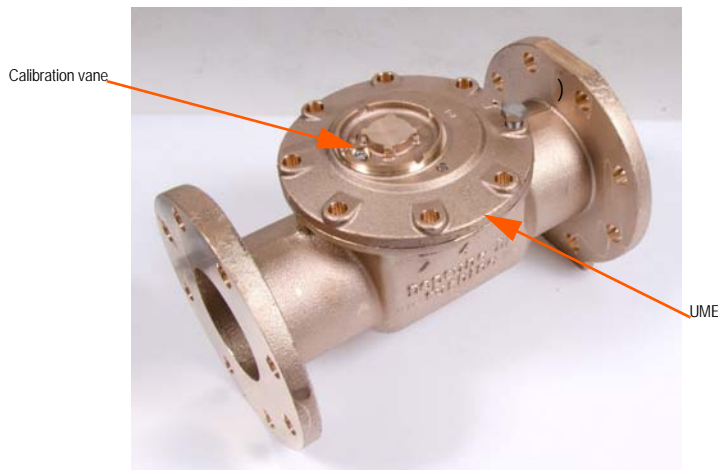


Figure 5 4-Inch HP Turbine Meter

Neptune's UME Design



A precalibrated UME can be ordered from Neptune.

When maintenance is necessary, the complete UME can be quickly and easily interchanged with a factory-calibrated unit. The UME includes the register, cover and turbine measuring element.

To perform maintenance, complete the following steps.

- 1 Close all valves (mainline and bypass).
- 2 Open the bleed screw on top of the meter to vent air.
- 3 Make sure the meter is de-pressurized.
- 4 Remove cover bolts.
- 5 Remove the UME from maincase.



Figure 6 Unitized Measuring Element (UME)

- 6 Install the factory-calibrated UME into the maincase.
See Figure 6.
- 7 Replace cover bolts.

- 8 Tighten cover bolts.
- 9 Open valves.

All new UMEs have been factory tested and do not require field testing.

If no spare unit is available, a factory-calibrated UME can be purchased directly from Neptune or one of its authorized distributors. Neptune encourages all customers to purchase a spare UME to avoid service interruptions.

Performing Maintenance on the Meter

This section provides information on maintaining the HP Turbine meter.



Always wear protective eye wear when working with any product.



Seal pin

Figure 7 Tap Seal Pin

- 1 Remove the seal pin by using a screw driver and hammer.
- 2 Tap on the seal pin until you hear a popping sound. See Figure 7.

- 3 Remove the register.



Figure 8 Remove Seal Pin

- 4 Turn the register over and push the rest of the old seal pin out. See Figure 8.



Figure 9 Remove Bolts

- 5 Remove the bolts. See Figure 9.



Figure 10 Top Plate

- 6 Insert a screwdriver in slot provided between top plate and housing.
- 7 Work the top plate loose. See Figure 10.



Figure 11 UME

- 8 Remove top plate.
The UME is exposed. See Figure 11.

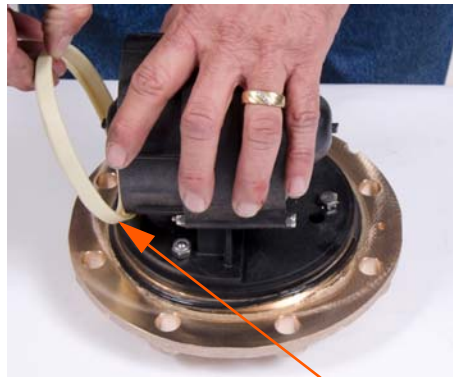
Inspect the UME



O-ring

Figure 12 Inspect O-ring

- 1 Inspect O-ring for damage and replace. See Figure 12.



Turbine Seal

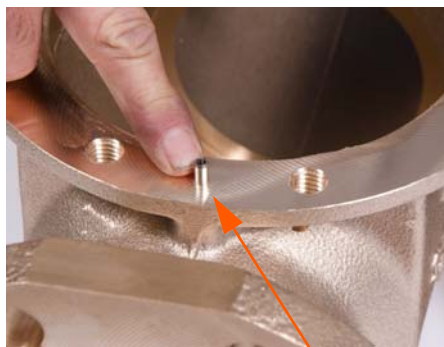
Figure 13 Turbine Seal

- 2 Inspect the turbine seal (if present) for damage and replace. See Figure 13.



Seal tubes can vary for meter size.

Install the UME



Guide pin

Figure 14 Guide Pin

- 1 Line up the arrow on the UME/top plate with the guide pin provided on the HP Turbine housing. See Figure 14.

Figure 15 shows the arrow on the UME/top plate.



Figure 15 Top Plate Arrow Aligned with Guide Pin



Figure 16 Press Down on Top Plate

- 2 Lower the UME onto the HP Turbine maincase.
- 3 Push the cover down until secure. See Figure 16.



Figure 17 Secure Top Plate with Bolts

- 4 Secure the cover to the HP Turbine maincase with bolts. See Figure 17.

5 Contacting Neptune Customer Support

Within North America, Neptune Customer Support is available Monday through Friday, 7:00 AM to 5:00 PM Central Standard Time by telephone, email, or fax.

By Phone

To contact Neptune Customer Support by phone, complete the following steps.

- 1 Call **(800) 647-4832**.
- 2 Select one of the following options.
 - Press **1** if you have a Technical Support Personal Identification Number (PIN).
 - Press **2** if you do not have a Technical Support PIN number.
- 3 Enter the six digit **PIN** number and press **#**.
- 4 Select one of the following options.
 - Press **2** for Technical Support.
 - Press **3** for maintenance contracts or renewals.
 - Press **4** for Return Material Authorization (RMA) for Canadian Accounts.

You are directed to the appropriate team of customer support specialists. The specialists are dedicated to you until the issue is resolved to your satisfaction. When you call, be prepared to give the following information.

- Your name and utility or company name.
- A description of what occurred and what you were doing at the time.
- A description of any actions taken to correct the issue.

By Fax

To contact Neptune Customer Support by fax, send a description of your problem to (334) 283-7497. Please include on the fax cover sheet the best time of day for a customer support specialist to contact you.

By Email

To contact Neptune Customer Support by email, send your message to hhsupp@neptunetg.com.

Notes:

Appendix A: Strainer Cleaning and Maintenance

This appendix provides information on how to clean and maintain the HP Turbine external strainer.

Cleaning the Strainer

To clean the external strainer, complete the following steps.

- 1 Close the isolation valves.
- 2 Vent pressurized air.
- 3 Remove the cover.
- 4 Pull the metal strainer out of the body.
- 5 Clean out the debris if there is any debris in the strainer body.
- 6 Replace the gasket between the cover and the body if necessary.



Figure 19 External Strainer

Notes:

Appendix B: HP Turbine and Fire Hydrant Parts List

This appendix describes the individual parts that make up the HP Turbine meter, the UME and the 3-inch Fire Hydrant meter. For the purposes of this document, the 4-inch HP Turbine and the 3-inch Fire Hydrant are shown in the following images.

1½-Inch to 2-Inch HP Turbine

The following diagram is a representative breakdown of the 1½-inch to 2-inch HP Turbine. Table 6 on page 22 describes each part of the diagram.

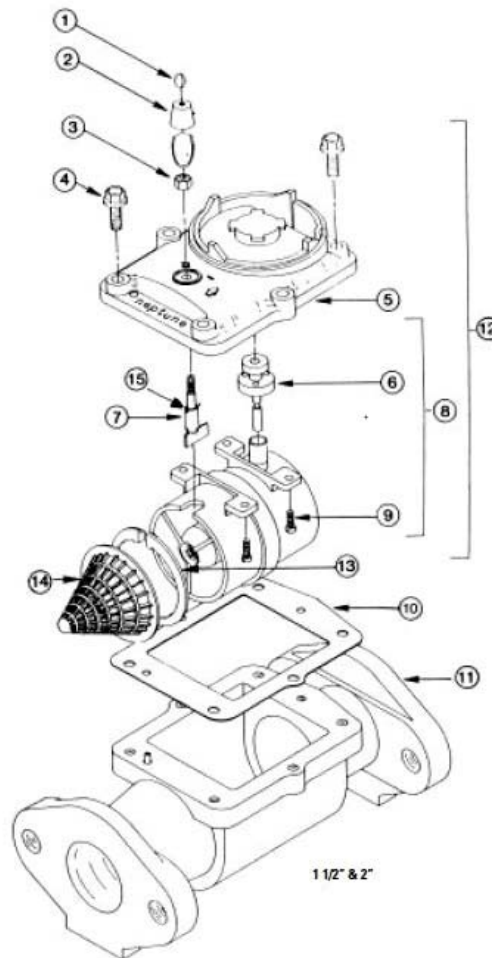


Figure 20 Representative Breakdown of the 1½-Inch to 2-Inch HP Turbine

Table 6 1½-Inch to 2-Inch HP Turbine Parts List

Item	Description	Meter Size & Part Numbers	
		1½-inch HP	2-inch HP
1	16-inch Seal Wire with Lead Seal	41110-501	41110-501
2	Seal Cap	11098-001	11098-001
3	Calibration Nut	8545-417	8545-417
4	Maincase Bolts (qty)	N/A	N/A
5	Cover	9860-002	9860-002
6	Drive Spindle Assembly	9485-012	9485-012
7	Calibration Vane Assembly	11097-110	11097-110
8	Measuring Chamber Assembly	9861-200	9861-200
9	Bolts (qty)	8396-605 (4)	8396-605 (4)
10	Maincase Gasket	9857-003	9857-003
11	Maincase	9854-012	9854-011
12	Cover Assembly	9859-200	9859-200
13	Lock Ring	9856-001	9856-001
14	Flow Conditioner/Strainer	9855-001	9855-001
15	O-Ring	8316-022	8316-022
16	Seal Ring (not shown)	8340-062	8340-062

3-Inch to 10-Inch HP Turbine

The following diagram is a representative breakdown of the 3-inch to 10-inch HP Turbine. Table 7 on page 24 describes each part of the diagram.

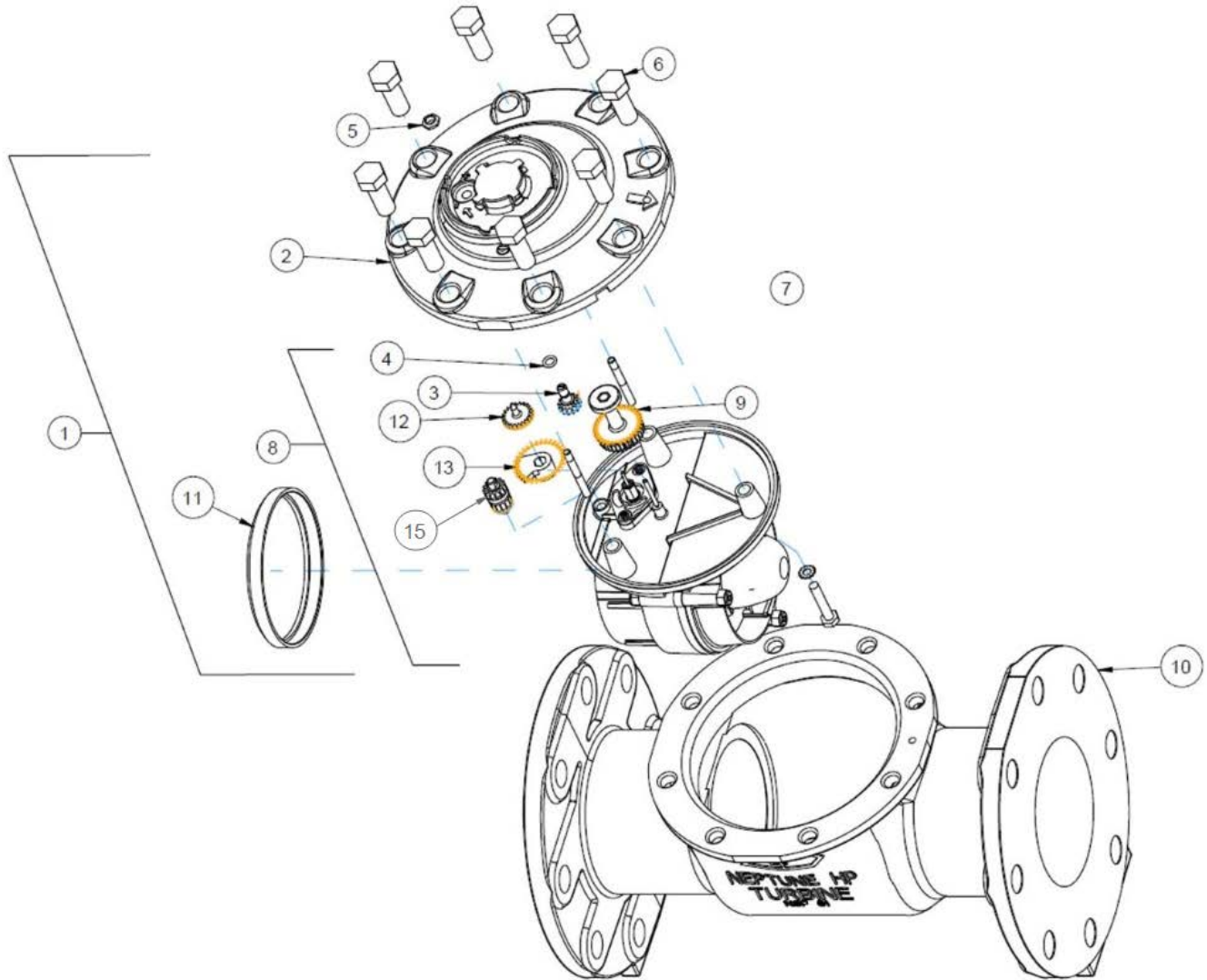


Figure 21 Representative Breakdown of the 3-Inch to 10-Inch HP Turbine

Table 7 3-Inch to 10-Inch HP Turbine Parts List

Item	Description	Meter Size and Part Numbers				
		3 inch	4 inch	6 inch	8 inch	10 inch
1	Cover Assembly	11328-130	11328-230	11328-330	11328-430	11328-530
2	Cover	11361-002	11330-002	11359-002	11359-002	11359-002
3	Calibration Vane Stem Assembly	11354-000	11354-000	11354-000	11354-000	11354-000
4	Calibration Vane Stem O-Ring	8316-022	8316-022	8316-022	8316-022	8316-022
5	Calibration Vane Stem Nut	8545-417	8545-417	8545-417	8545-417	8545-417
6	Maincase Bolts	8329-405	8329-405	8329-421	8329-421	8329-421
7	Maincase O-Ring	8316-270	8316-271	8316-272	8316-272	8316-272
8	Measuring Chamber Assembly	11329-100	11329-200	11329-300	11329-400	11329-500
9	Magnet Gear Assembly	11347-110	11347-210	11347-310	11347-410	11347-510
10	Maincase	11360-003	11327-002	11356-011	11357-002	11358-002
11	Seal Tube	11335-103	N/A	N/A	N/A	N/A
12	Drive Pinion	12769-001	12769-002	12769-003	12769-004	12769-005
13	Calibration Vane Gear	12768-001	12768-001	12768-001	12678-001	12768-001
14	Element Seal (not shown)	N/A	12763-001	N/A	N/A	N/A
15	Calibration Vane Spindle Assembly	11345-100	11345-200	11345-300	11345-300	11345-300

UME

The following diagram is a representative breakdown of the unitized measuring element (UME). Table 8 describes each part of the diagram.

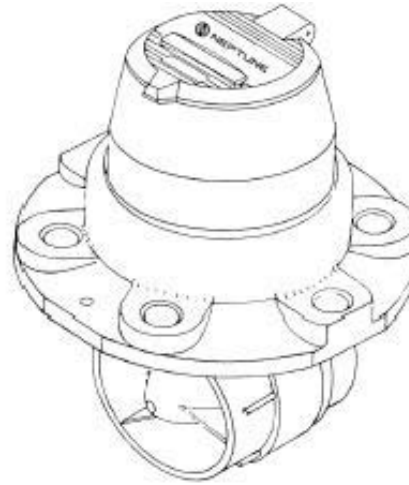


Figure 22 Representative Breakdown of the UME

Table 8 UME and Register Part Numbers - E-Coder

Size	Registration	E-Coder® (Pit)		E-Coder®R9007™ (Pit)	
		Register	UME	Register	UME
1 ½" & 2" HP	Cu. Ft	RH5F11	9700-019	RW5F11	9700-001
	Gal	RH5G11	9700-029	RW5G11	9700-002
	M³	RH5M11	9700-049	RW5M11	9700-004
	Imp. Gal	RH5I11	9700-039	RW5I13	9700-007
3" HP	Cu. Ft	RH5F21	9700-119	RW5F21	9700-101
	Gal	RH5G21	9700-229	RW5G21	9700-102
	M³	RH5M21	9700-148	RW5M21	9700-104
	Imp. Gal	RH5I21	9700-139	RW5I23	9700-107
4" HP	Cu. Ft	RH5F31	9700-219	RW5F31	9700-201
	Gal	RH5G31	9700-229	RW5G31	9700-202
	M³	RH5M31	9700-249	RW5M31	9700-204
	Imp. Gal	RH5I31	9700-239	RW5I33	9700-207

Table 8 UME and Register Part Numbers - E-Coder

Size	Registration	E-Coder® (Pit)		E-Coder®R9007™ (Pit)	
		Register	UME	Register	UME
6" HP	Cu. Ft	RH5F41	9700-319	RW5F41	9700-301
	Gal	RH5G41	9700-329	RW5G41	9700-302
	M³	RH5M41	9700-349	RW5M41	9700-304
	Imp. Gal	RH5I41	9700-339	RW5I42	9700-307
8" HP	Cu. Ft	RH5F51	9700-419	RW5F51	9700-401
	Gal	RH5G51	9700-429	RW5G51	9700-402
	M³	RH5M51	9700-449	RW5M51	9700-404
	Imp. Gal	RH5I51	9700-439	RW5I53	9700-407
10" HP	Cu. Ft	RH5F01	9700-519	RW5F01	9700-501
	Gal	RH5G01	9700-529	RW5G01	9700-502
	M³	RH5M01	9700-549	RW5M01	9700-504
	Imp. Gal	RH5I01	9700-539	RW5I03	9700-507



When ordering registers, please include change gear combination for four-digit register code from the dial face.

Table 9 UME and Register Part Numbers - ProRead

Size	Registration	ProRead™ (Pit) 4-Wheel*		ProRead™ (PIT) 6-Wheel*	
		Register	UME	Register	UME
1 ½" & 2" HP	Cu. Ft	R75F11	9700-011	R75F12	9700-018
	Gal	R75G11	9700-021	R75G12	9700-028
	M³	R75M11	9700-041	R75M12	9700-048
	Imp. Gal	R75I11	9700-031	R75I12	9700-038
3" HP	Cu. Ft	R75F21	9700-111	R75F22	9700-118
	Gal	R75G21	9700-121	R75G22	9700-128
	M³	R75M21	9700-141	R75M22	9700-148
	Imp. Gal	R75I21	9700-131	R75I22	9700-138
4" HP	Cu. Ft	R75F31	9700-211	R75F32	9700-218
	Gal	R75G31	9700-221	R75G32	9700-228
	M³	R75M31	9700-241	R75M32	9700-248
	Imp. Gal	R75I31	9700-231	R75I32	9700-238

Table 10 UME and Register Part Numbers - ProRead

Size	Registration	ProRead™ (Pit) 4-Wheel		ProRead™ (Pit) 6-Wheel	
		Register	UME	Register	UME
6" HP	Cu. Ft	R75F41	9700-311	R75F42	9700-318
	Gal	R75G41	9700-321	R75G42	9700-328
	M ³	R75M41	9700-341	R75M42	9700-348
	Imp. Gal	R75I41	9700-331	R75I42	9700-338
8" HP	Cu. Ft	R75F51	9700-411	R75F52	9700-418
	Gal	R75G51	9700-421	R75G52	9700-428
	M ³	R75M51	9700-441	R75M52	9700-448
	Imp. Gal	R75I51	9700-431	R75I52	9700-438
10" HP	Cu. Ft	R75F01	9700-511	R75F02	9700-518
	Gal	R75G01	9700-521	R75G02	9700-528
	M ³	R75M01	9700-541	R75M02	9700-548
	Imp. Gal	R75I01	9700-531	R75I02	9700-538

* Registers do not include ARB® remote receptacles.

Fire Hydrant

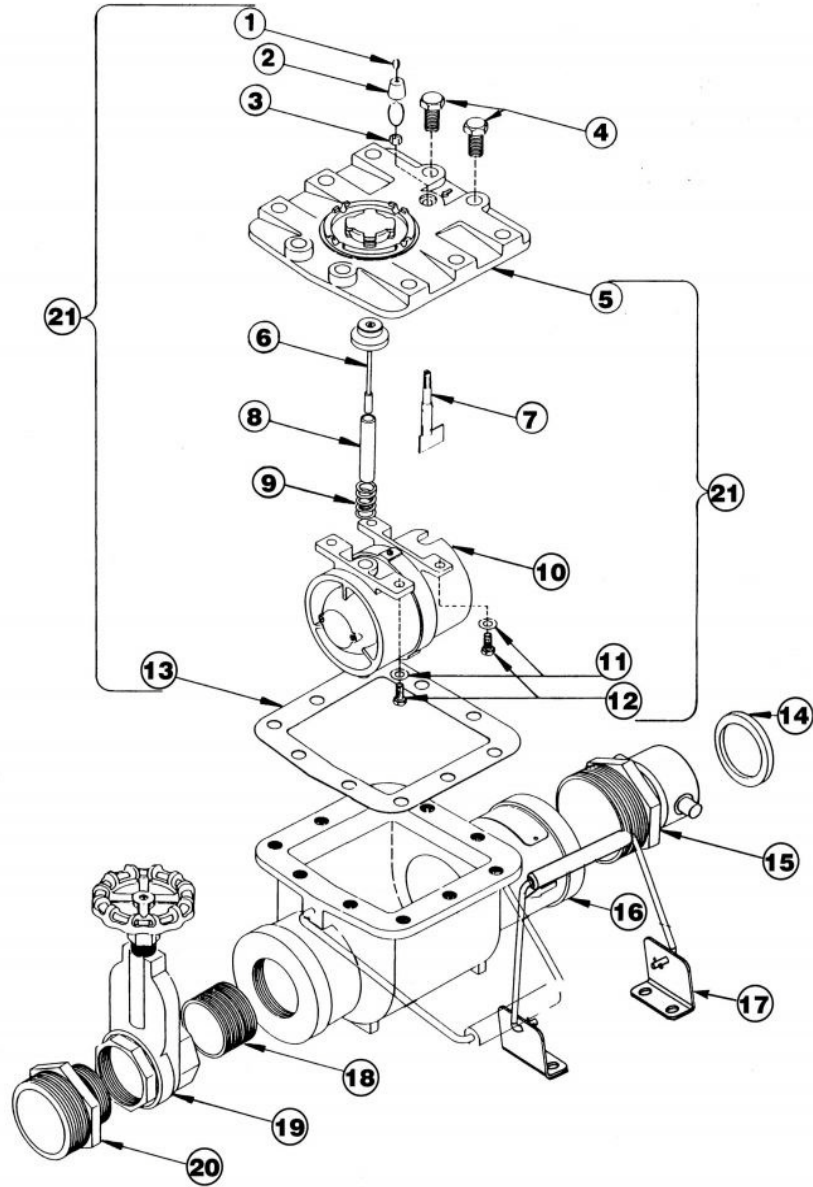


Figure 23 Representative Breakdown of the Fire Hydrant

Table 11 Fire Hydrant Part Numbers

Item	Description	Part Number
1	16" Seal Wire with Lead Seal	41110-501
2	Seal Cap	11098-001
3	Calibration Nut	8545-417
4	Maincase Bolts	8329-421
5	Cover	9639-104
6	Drive Spindle Assembly	9485-001
7	Calibration Vane Assembly	11097-200
8	Drive Sleeve	9484-006
9	Compression Spring	N/A
10	Measuring Chamber Assembly	9439-021
11	Washer	8568-012
12	Bolts	8329-007
13	Maincase Gasket	8341-304
*14	Gasket	8340-029
15	Fire Hose Coupling Assembly	9631-002
16	Maincase	9630-002
17	Bracket/Handle Assembly	12163-000
18	Nipple	8314-701
19	Gate Valve	8368-011
20	Outlet Nipple	N/A
21	Cover Assembly	9482-003

* Item #14 is Included in assembly.

Notes:

Appendix C: Fire Hydrant Meter

This appendix provides information on Neptune's Fire Hydrant meter.

Introduction

The Fire Hydrant meter is designed for mobile use in metering flows from a fire hydrant. The meter measures a wide flow range to maximize revenue. It meets or exceeds the latest performance requirements of AWWA. Maximum flow rate may be exceeded by 25% for intermittent flows.



Figure 24 3-Inch Fire Hydrant Meter

Construction

The Fire Hydrant water meter consists of a lightweight, aluminum maincase fitted with a 2-inch gate valve, a turbine measuring element, and a roll-sealed register.

The aluminum maincase is Xylan[®] coated for corrosion resistance and is lightweight, compact, and easy to handle. This meter features a unique “balanced handle” which makes carrying and installing it easier than any other fire hydrant meter on the market. A 2-inch gate valve enables the user to regulate the water flow without opening and closing the fire hydrant.

The unitized measuring element (UME) allows for quick and easy interchangeability.

Exclusive dual graphite bearings provide equalized rotor loading for accuracy over a broad flow range. The thrust-compensated rotor configuration relieves pressure on the thrust bearings, which minimizes wear and provides sustained accuracy over an extended operating life. A tamper-resistant stainless steel calibration vane allows recalibration of the UME to lengthen service life and to ensure accurate registration.

The roll-sealed register eliminates leaking and fogging. Magnetic drive couples the register with the measuring element.

Key Features

This section provides information on the key features of the Fire Hydrant meter.

Roll-Sealed Register

The key features of the roll-sealed register are:

- Permanently sealed, magnetic drive register assembly eliminates leaking and fogging.
- Locking register lid secures during transportation, protecting register lens.
- Glass lenses ensure readability and scratch resistance.
- Tamperproof design prevents vandalism and allows in-service replacement of register.

Cast Aluminum Maincase

The key features of the maincase are:

- Xylan coating ensures maximum corrosion resistance.
- Lightweight material ensures easy handling.
- Single, balanced carrying handle provides for easy, one-person installation.
- 2-inch gate valve allows safe pressurization of measuring element and regulation of water flow.
- 2½-inch NST brass female fire hose coupling assembly on the inlet side is standard.
- Brass male hole coupling on the outlet side is standard. Includes a 2-inch brass gate valve.
- NSF 372 approved.

Turbine Measuring Element

The key features of the turbine measuring element are:

- Wide flow ranges at 98.5% - 101.5% accuracy ensure maximized revenues.
- Direct coupling of rotor to gear train ensures accurate registration.
- UME makes maintenance easier and faster.
- Stainless steel calibration vane ensures accurate registration and makes calibration easier.

Warranty

Neptune provides a limited warranty with respect to its Fire Hydrant meters for performance, materials, and workmanship.

When desired, owner maintenance is easily accomplished by replacement of major components or a factory-calibrated UME.

Specifications

This section provides the specifications of the Fire Hydrant meter.

- Application: cold water measurement of flow in one direction
- Maximum operating pressure: 150 psi
- Normal operation range: 5-450 gpm (at accuracy of 100 +/- 1.5%)
- Register type:
 - Direct reading, centersweep, roll-sealed magnetic drive with low flow indicator
 - Bronze box with locking cover
- Strainer: plastic
- Registration (per sweep hand revolution):
 - 100 gallons
 - 10 cubic feet
 - 1 cubic meter

- Registration capacity (six wheel odometer):
 - 100,000,000 gallons
 - 10,000,000 cubic feet
 - 1,000,000 cubic meters
- Measuring element: AWWA Class II Turbine

Options

This section provides information on the different options available with the Fire Hydrant.

- Size: 2½-inch outlet (with 2½-inch gate valve)
- Strainer: stainless steel (internal)
- Orifice plate: size for application
- Units of measure:
 - U.S. gallons
 - cubic feet
 - cubic meters
- Connections:
 - Less coupling: 3-inch by 2-inch NPT
 - With coupling: 2-inch NH

Operating Characteristics

The following table provides information on the operating characteristics of the Fire Hydrant meter.

Table 12 Fire Hydrant Operating Characteristics

Meter Size	Normal Operating Range @ 100% Accuracy (+/- 1.5%)	Maximum Intermittent Flow	AWWA Standard
3 inch	5 to 450 US gpm	560 US gpm	8 to 435 US gpm
	1.14 to 102.2 m ³ /h	127.2 m ³ /h	1.8 to 98.8 m ³ /h

Dimensions

This section provides the dimensions of the Fire Hydrant meter.

Table 13 Fire Hydrant Dimensions

3-inch Fire Hydrant	A inches	B inches	C inches	D inches	E inches	Weight Lbs.
Less Coupling	15 ½	7 ½	11 ½	3 7/8	7 ½	23
With Coupling	19 ¼	10	11 ½	2 7/8	7 ½	29

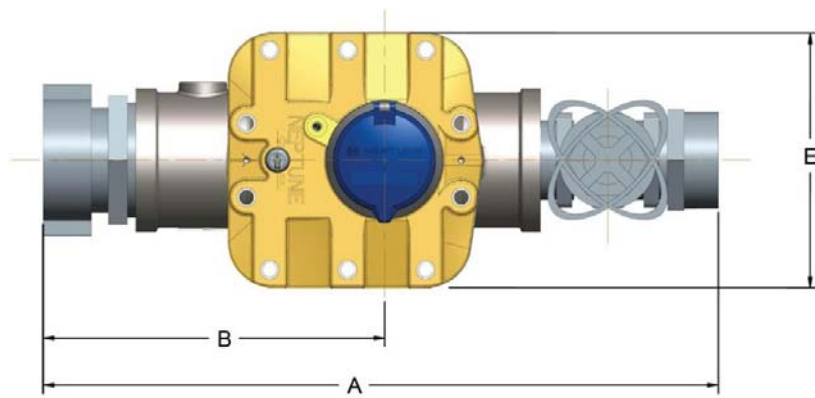


Figure 25 Fire Hydrant - Top View

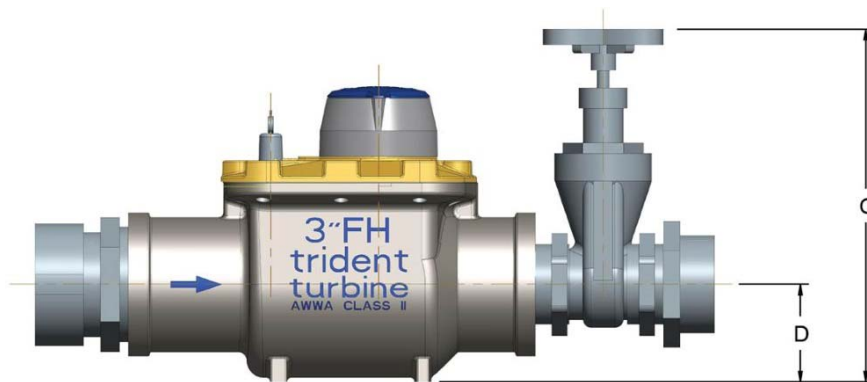


Figure 26 Fire Hydrant - Side View

Notes:

Appendix D: HP Fire Service Turbine Stainless Steel (S) Meter

This appendix provides information on Neptune's Fire Service meter.

Introduction

The High Performance (HP) Fire Service Turbine Stainless Steel (S) meter offers some of the widest flow ranges of any fire service turbine meter on the market. All HP Fire Service Turbine S meters meet or exceed the latest AWWA Standard C703. Maximum continuous flow rates may be exceeded by as much as 25% for intermittent periods.



Figure 27 6-Inch Fire Service Turbine S Meter

Systems Compatibility

All HP Fire Service Turbine S meters are guaranteed adaptable to our ARB® V, ProRead™ (ARB VI), E-Coder®)R900i™, E-Coder®)R450i™, E-Coder®, TRICON®/S, TRICON/E®3, and Neptune reading systems without removing the meter from service.

Construction

The HP Fire Service Turbine S meter consists of a stainless steel fire service strainer, a rugged lead free high copper alloy maincase, an AWWA Class II turbine measuring element, and a roll-sealed register.

The Unitized Measuring Element (UME) allows for quick, easy, in-line interchangeability. Water volume is measured accurately at all flows by a specially-designed assembly. The hydrodynamically-balanced, thrust-compensated rotor relieves pressure on the thrust bearing. Stationary stainless steel shafts minimize wear and provide sustained accuracy over an extended operating life. Direct coupling of the rotor to the gear train eliminates revenue loss due to slippage during fast starts and line surges. A calibration vane allows in-field calibration of the UME to lengthen service life and to ensure accurate registration.

The roll-sealed register eliminates leaking and fogging. A magnetic drive couples the register with the measuring element. For reading convenience, the register can be mounted in any one of four positions on the meter.

Key Features

This section provides information on the key features of the HP Fire Service Turbine S meter.

Turbine Measuring Element

The key features of the turbine measuring element are:

- UL listed
- FM approved
- Wide flow ranges available at 98.5% - 101.5% accuracy
- Interchangeable measuring element
- Calibration vane
- Hydrodynamically-balanced rotor
- Reusable O-ring gasket provides superior seal

Lead Free Maincase

The key features of the maincase are:

- Certified NSF/ANSI 61
- Made from lead free high copper alloy
- Proven lifetime material
- Corrosion-resistant

Stainless Steel Strainer

The key features of the stainless steel strainer are:

- Permits full flow while stopping debris.
- UL/FM approved.

Roll-Sealed Registers

The key features of the roll-sealed register are:

- Low torque registration, magnetic-driven
- Low-flow indicator
- In-line serviceability
- Tamperproof seal design

Warranty

Neptune provides a 10/10 warranty for the strainer body, a life time warranty for the maincase, and a one year AWWA performance guarantee for the turbine measuring element.

Specifications

This section provides the specifications of the HP Fire Service Turbine S meter.

- Application: cold water measurement of flow in one direction
- Maximum operating water pressure: 175 psi (1206 kPa)
- Registers: direct reading, center-sweep, roll-sealed magnetic drive with low flow indicator
- Measuring element: hydrodynamically-balanced rotor, AWWA Class II turbine
- Strainer: stainless steel body, stainless steel basket strainer element NSF/ANSI 61 certified, UL listed, and FM approved
- Bolts: 300 series stainless steel bolts

Options

This section provides information on the different options available with the HP Fire Service Turbine S meter.

- Sizes: 3 inch, 4 inch, 6 inch, 8 inch, and 10 inch
- Strainer: 300 series stainless steel cover
- Units of measure: U.S. gallons, imperial gallons, cubic feet, cubic meters
- Register types:
 - Remote reading system*: ProRead, E-Coder)R900i, E-Coder)R450i, E-Coder, TRICON/S, and TRICON/E3
 - Reclaim
- Companion flanges: cast iron and bronze (3 inch and 4 inch only)

* Consult factory for meter performance specifications when fitted with ARB.

Operating Characteristics

The following table provides information on the operating characteristics of the HP Fire Service Turbine S meter.

Table 14 HP Fire Service Turbine S Operating Characteristics

Meter Size	Normal Operating Range @ 100% Accuracy (+/- 1.5%)	Maximum Intermittent Flow	AWWA Standard
3 inch	5 to 450 US gpm 1.14 to 102.2 m ³ /h	560 US gpm 127.2 m ³ /h	8 to 350 US gpm 1.8 to 79.5 m ³ /h
4 inch	10 to 1200 US gpm 2.27 to 272.5 m ³ /h	1500 US gpm 340.7 m ³ /h	15 to 630 US gpm 3.4 to 143. m ³ /h
6 inch	20 to 2500 US gpm 4.55 to 567.8 m ³ /h	3100 US gpm 704.1 m ³ /h	30 to 1400 US gpm 6.8 to 317.9 m ³ /h
8 inch	35 to 4000 US gpm 7.95 to 908.5 m ³ /h	5000 US gpm 1135.6 m ³ /h	50 to 2400 US gpm 11.4 to 545 m ³ /h
10 inch	50 to 6500 US gpm 11.36 to 1476.4 m ³ /h	8000 US gpm 1817 m ³ /h	75 to 3800 US gpm 17.0 to 863 m ³ /h

Dimensions

This section provides the dimensions of the HP Fire Service Turbine S meter.

Table 15 HP Fire Service Turbine S Dimensions

Meter Size	A in/mm	B in/mm	C in/mm	D in/mm	E in/mm	F in/mm	G in/mm	Width in/mm	Weight lbs/kg
3 inch	14 1/8 359	12 305	10 3/4 273	10 5/8 270	17 1/2 445	26 1/8 664	2 51	13 1/2 343	150 68
4 inch	21 533	14 356	10 3/4 273	10 5/8 270	17 1/2 445	35 889	2 51	13 1/2 343	200 91
6 inch	26 7/8 683	18 457	11 3/8 289	11 1/16 281	21 1/4 540	44 7/8 1140	3 76	19 483	425 139
8 inch	31 5/16 795	20 508	13 29/64 342	11 13/16 300	25 7/8 657	51 5/16 1303	3 76	25 635	600 272
10 inch	30 782	26 660	15 381	14 13/16 376	30 1/16 764	56 1422	3 76	27 1/2 699	750 340

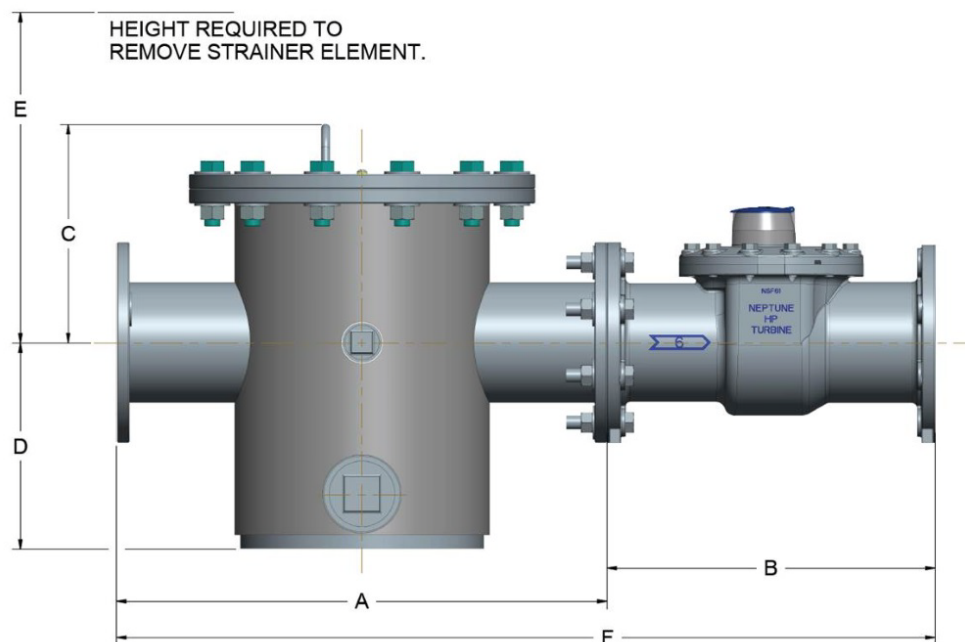


Figure 28 HP Fire Service Turbine S Dimensions

Cleaning the Fire Service Strainer

This section provides instructions on how to clean the strainer in the HP Fire Service Turbine S meter.

- 1 Remove the cover from the strainer housing. See Figure 29.

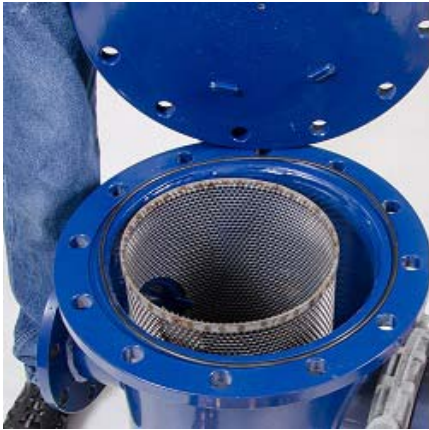


Figure 29 FS Turbine S Strainer Cover



The lid can be heavy.

- 2 Remove the basket from the strainer housing. See Figure 30.



Figure 30 FS Turbine S Strainer Basket

- 3 Flush out any debris that has built up inside of the strainer housing.
- 4 Inspect the basket strainer for any defects. See Figure 31.



Figure 31 Check for Defects

- 5 Reinstall the basket strainer or replace the strainer if it is damaged.



- 6 Inspect the O-ring seal for any signs of nicks and damage. See Figure 32.

Figure 32 FS Strainer S Basket O-Ring

- 7 Reinstall the cover to complete maintenance.

Notes:

Glossary

AWWA	American Water Works Association
HP	High performance.
imperial gallon	Unit for measuring a volume of liquid or the capacity of a container for storing liquid, not the mass of a liquid. Thus, a gallon of one liquid may have a different mass from a gallon of a different liquid.
RMA	Return material authorization.
PIN	Personal identification number.
UL	Underwriters Laboratory
UME	Unitized Measuring Element
imperial gallon	Unit for measuring a volume of liquid or the capacity of a container for storing liquid, not the mass of a liquid. One imperial gallon is equivalent to approximately 1.2 US liquid gallons.
US gallon	US liquid gallon is defined as 231 cubic inches and equates to approximately 3.785 liters.
flange	Projecting rim, collar, or ring on a shaft pipe, or machine housing. Gives additional strength, stiffness, or support.
psi	Pounds per square inch.

Notes:

Index

Numerics

6-Wheel odometer 6

A

accuracy 1, 3
adjusting stem 10
application 5, 35, 41
AWWA 33

B

bayonet mount 3
bearings 34
bleed screw 16
bypass 9

C

calibration vane 4, 10, 35
capacity, register 6
connections 36
construction 4
continuous flow 1
corrosion 34, 40
coupling
 brass male hole 34
 fire hose 34
cover bolts 12
customer support 17

D

damage 8
debris 4, 9
diagrams 7
dimensions 7, 37, 43

E

environmental, specifications 5

F

flanges 2, 9
flow rates 1
fogging 34

G

gasket 9
gate valve 11, 33, 34
gear train 3, 35

H

head loss 10

I

imperial gallons 2
inlet 9
inspect 8
installation 8

L

lead free
 copper alloy 2
 Rilsan nylon-coated ductile iron 2
leaking 34
lock nut 10
low-flow indicator 3

M

magnetic drive 4
maincase 3, 13, 33
maintenance 35
maximum operating pressure 5
meter
 assembly 11
 fire hydrant 33
 HP Turbine 1, 2
 registration 6
mounting ring 10

N

NSF/ANSI 61 2

O

odometer, 6-wheel 6
operate 10
operating characteristics 5, 36, 42
operating pressure 35
O-ring 15

P

pipe 9
piping practices 9
preliminary checks 8

R

range, normal operating 5, 35
register
 capacity 6, 36, 41
 lens 34
 types 2
reshipment 8
RMA 17
roll sealed register 3
rotor 3, 4, 34

S

safety 8
seal pin 3, 10, 13
service interruptions 13
specifications
 environmental 5
 operating characteristic 5
storage 8
strainer 2, 4, 9
sweep hand 6

T

tee, downstream 9
tools and materials 8

top plate 14
turbine measuring element 3
turbine seal 15

U

U.S. gallons 2
UME 4, 13, 33
 design 12
 precalibrated 12
 replacing 13
unpacking 8
upstream 9

V

valve
 gate 11, 33
 inlet 11
 isolation 19
 outlet 11
variations 9
velocity profile 9, 10

W

warranty 4, 35
work order 8

Neptune Technology Group Inc.

1600 Alabama Highway 229
Tallahassee, AL 36078
USA
Tel: (800) 633-8754
Fax: (334) 283-7293

Neptune Technology Group (Canada) Ltd.

7275 West Credit Avenue
Mississauga, Ontario
L5N 5M9
Canada
Tel: (905) 858-4211
Fax: (905) 858-0428

Neptune Technology Group Inc.

Avenida Ejército Nacional No. 418
Piso 12, Despacho 1203
Colonia Polanco V Sección. C.P. 11560
Delegación Miguel Hidalgo
México, Distrito Federal
Tel: +(525) 5203 5294 / +(525) 5203 4032
Fax: +(525) 5203 6503



NEPTUNE
TECHNOLOGY GROUP

TAKE CONTROL

neptunetg.com