Water Distribution

Course Objective

Acquire a general knowledge of water distribution system components and their function in delivering drinking water to the customer.

I. **INTRODUCTION -** Review overall layout of distribution system

- A. Source – treatment plant, well
- B. Relationships between elevated & ground storage tanks, pumping stations, pipelines

II. **KEY ELEMENTS – GENERAL FOCUS**

- A. Pressure
- B. Flow
- C. Force

III. **SYSTEM COMPONENTS**

- A. Pipelines – types, composition
- B. Valves – purpose, location, types: gate, butterfly
- C. Hydrants – purposes, location, types, operation, Hyd. meters
- D. Services – meters, fire sprinklers
- E. Cross Connection / Backflow – purpose, devices

IV. **SYSTEM EXPANSION**

- A. Design - process
- B. Inspection – procedures
- C. Regulations – Health Department, Codes
- D. Local Design & Construction Standards
- E. Fire Flow Test

V. SYSTEM MAINTENANCE

A. Hydrant & Valve Inspection, including valve boxes
B. Flushing – spot & unidirectional
C. Meter testing & change out programs
D. Tank maintenance; painting, cleaning
E. System water sampling, Water quality
F. Miss Utility

VI. REPAIR

A. Damage characteristics – internal, external causes
B. Corrosion, temperature, environmental factors
C. Construction damage

VII. PERSONNEL DEVELOPMENT

A. Organizational structure – general
B. Positions

WATER DISTRIBUTION

Objective:

This session provides exposure to the materials and components used in the design and construction of water distribution systems and the methods used to protect those systems. (4 hours)

I Components

- A. Transmission Main
- B. Distribution Main
- C. Service Connection
- D. Elevated Storage Tanks
- E. Booster Pumps
- F. Valves
- G. Fittings
- H. Meters

II Pressure

- A. High
- B. Low
- C. Minimum for fire flow

III Types of Pipes

- A. Prestressed Concrete
- B. Ductile Iron
- C. Cast Iron
- D. Steel
- E. PVC
- F. Asbestos Cement
- G. Copper service
- H. Plastic service

IV Water Meters

- A. Magnetic
- B. Gear Driven
- C. Domestic use
- D. Fire flow use

V Back Flow Protection

VI Cross Connections

VII Handouts

A. Conceptual sketch from water treatment to domestic faucet
B. Valve sectional view
C. Hydrant sectional view
D. Meter-typical residential use
E. Meter-typical large user
F. Meter-fire flow

VIII Review

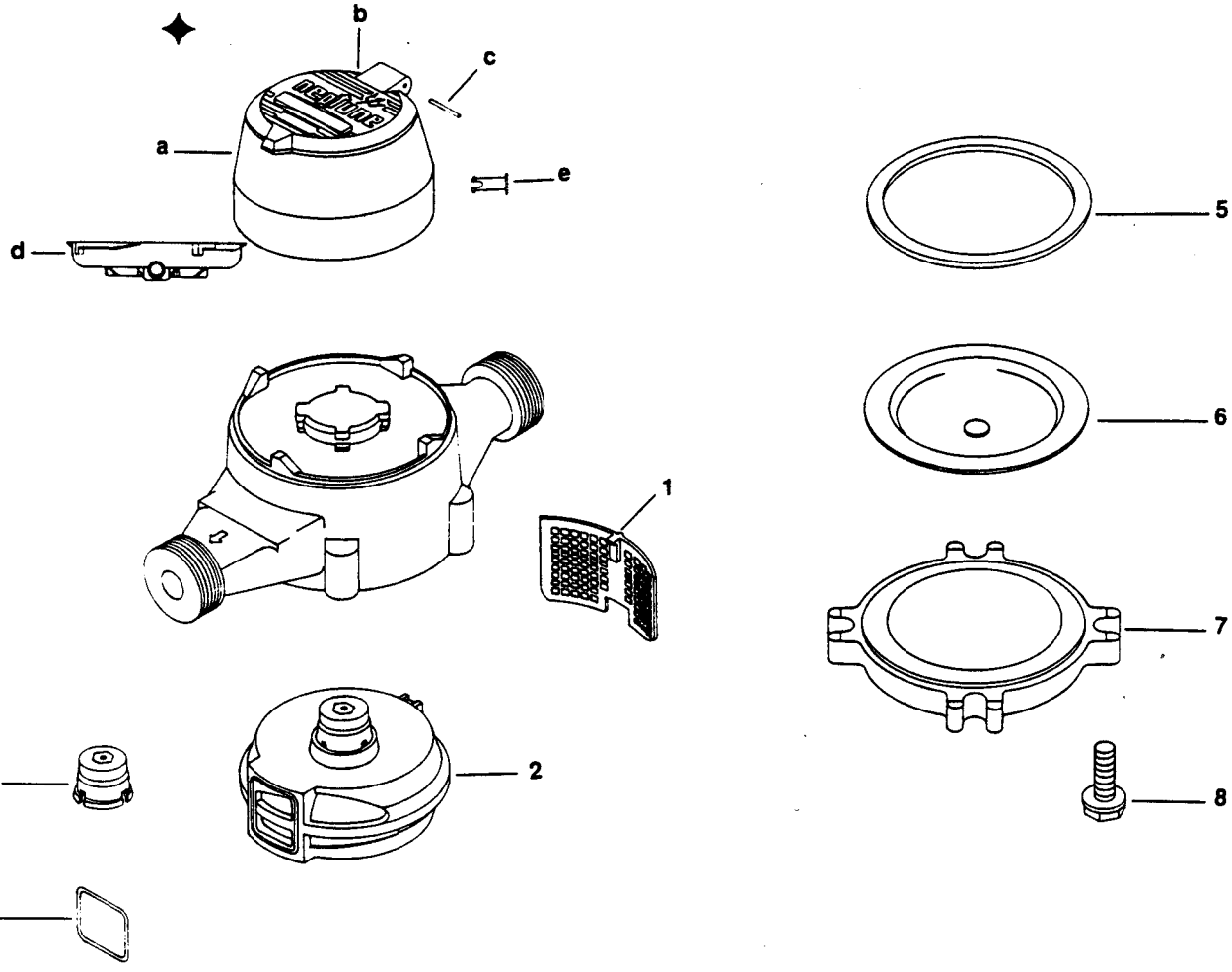
A. Questions and Answers
B. Written Test

WATER DISTRIBUTION

I Components

H. Meters – An instrument for measuring the amounts of water used for residential, commercial, and industrial applications. Water meters are read in the same aspect as a car odometer.

5/8" through 1"



ITEM NO.	DESCRIPTION	PART NUMBER		
		5/8", 5/8" x 3/4"	3/4"	1"
	Register*			
1	Strainer	9399-004	9831-001	9831-002
2	Measuring Chamber Assembly	9400-000	9826-000	9826-100
3	Control Block Assembly	9415-000	9830-000	9231-004
4	O-Ring, Measuring Chamber	9386-001	9386-002	9386-003
5	Gasket, Bottom Cap	8340-028	8340-034	8340-038
6	Liner, Bottom Cap*	9398-001	9832-001	9841-001
7	Bottom Cap, SP	9397-501	–	–
	Bronze	9397-003	9833-004	9842-004
	Cast Iron	9397-010	9833-010	9842-010
8	Bolt and Washer			
	SST-302 (w/ washer)	8353-102	8353-102	8353-102
	SST-316 (w/ washer)	8353-101	8353-101	8353-101

*Refer to back page for additional register information.

*Not required with SP or bronze bottom caps.

Water Distribution

Quiz

Name_____ Date_____

Circle letter of correct answer

1. What materials do most water distribution systems currently utilize for their mains?

   A. Galvanized iron
   B. Cast iron
   C. Ductile Iron and PVC
   D. Wood

2. What is the purpose of an elevated tank?

   A. Advertisement for the elevated tank?
   B. Water treatment
   C. Connection in the shape of a cross
   D. A residential water service with high usage

3. What is a cross connection in a water system?

   A. Connection in the shape of a cross
   B. Tie in of different size pipelines
   C. Connection between a potable water system and a potential contaminate
   D. A residential water service with high usage

4. What is the name of the regulatory agency that has the duty to protect the public through regulating water supplies for public consumption in the state of Virginia?

   A. Environmental Protection Agency
   B. Department of Health
   C. American Waterworks Association
   D. Department of Environmental Quality

5. What is the purpose of a fire flow test in a distribution system?

   A. Flushing of a system through hydrant
   B. Acquiring of water samples

C. Determining pressure and flow in system
D. Put out fire

Water Distribution

Quiz Answer sheet

Name_____ Date_____

Circle letter of correct answer

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WATER METER
DOMESTIC USE

Neptune® T-10®

Sizes: 1½" and 2"

Features & Benefits

Roll-Sealed Register

- Magnetic drive, low torque registration ensures accuracy
- Impact-resistant, flat, glass lens for legibility
- 1:1 Ratio, low flow indicator detects leaks
- Bayonet mount allows in-line serviceability
- Tamperproof seal pin deters theft
- Date of manufacture, size, and model stamped on dial face

Cast Bronze Maincase

- Sturdy, durable, corrosion resistant
- Resists internal pressure stresses and external damage
- Handles in-line piping stress
- Electrical grounding continuity
- Residual value

Nutating Disc Measuring Chamber

- Widest effective flow range for greater utility revenue
- Excellent low flow accuracy
- Corrosion resistant
- Floating chamber design is unaffected by meter position or in-line piping stress
- Three-piece chamber for easy serviceability

Systems Compatibility

- Adaptability to all Neptune Systems provides flexibility

Performance

Every Neptune T-10 water meter meets or exceeds the latest AWWA C700 Standard. Its nutating disc, positive displacement principle is time proven for accuracy and dependability since 1892, ensuring maximum utility revenue.

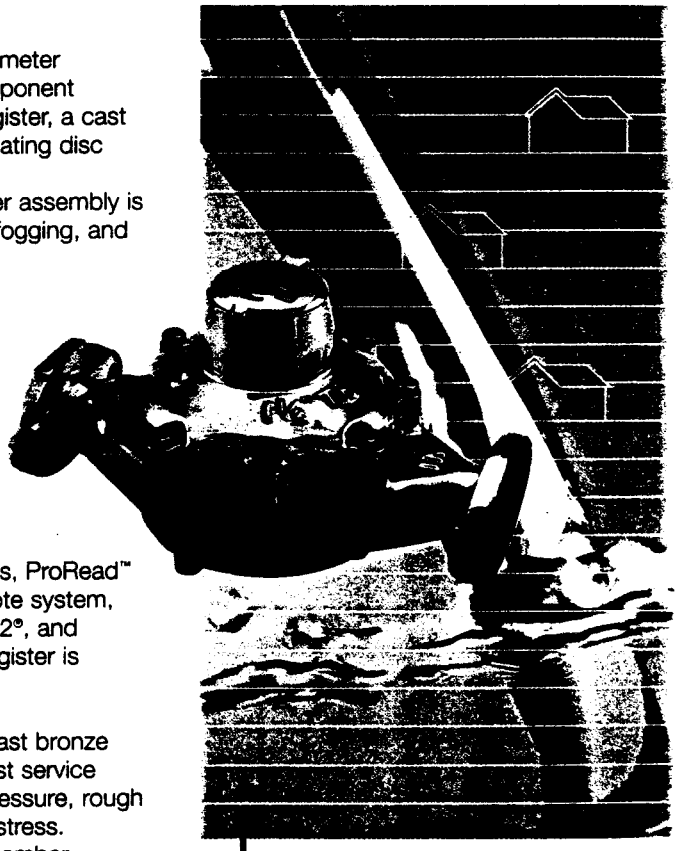
Construction

The Neptune T-10 water meter consists of three major component assemblies: a roll-sealed register, a cast bronze maincase, and a nutating disc measuring chamber.

The direct-reading register assembly is roll-sealed, eliminating lens fogging, and is coupled magnetically to the measuring chamber. The register contains a low flow indicator for leak detection, and for reading convenience, can be mounted on the meter in any of four positions. Also available are remote reading registers for the Neptune ARB® (Automatic Reading and Billing) Systems, ProRead™ ARB, Pulser-RM visual remote system, and TRICON-S®, TRICON-E2®, and FloSearch™ systems. The register is secured to the maincase via a tamperproof seal pin.

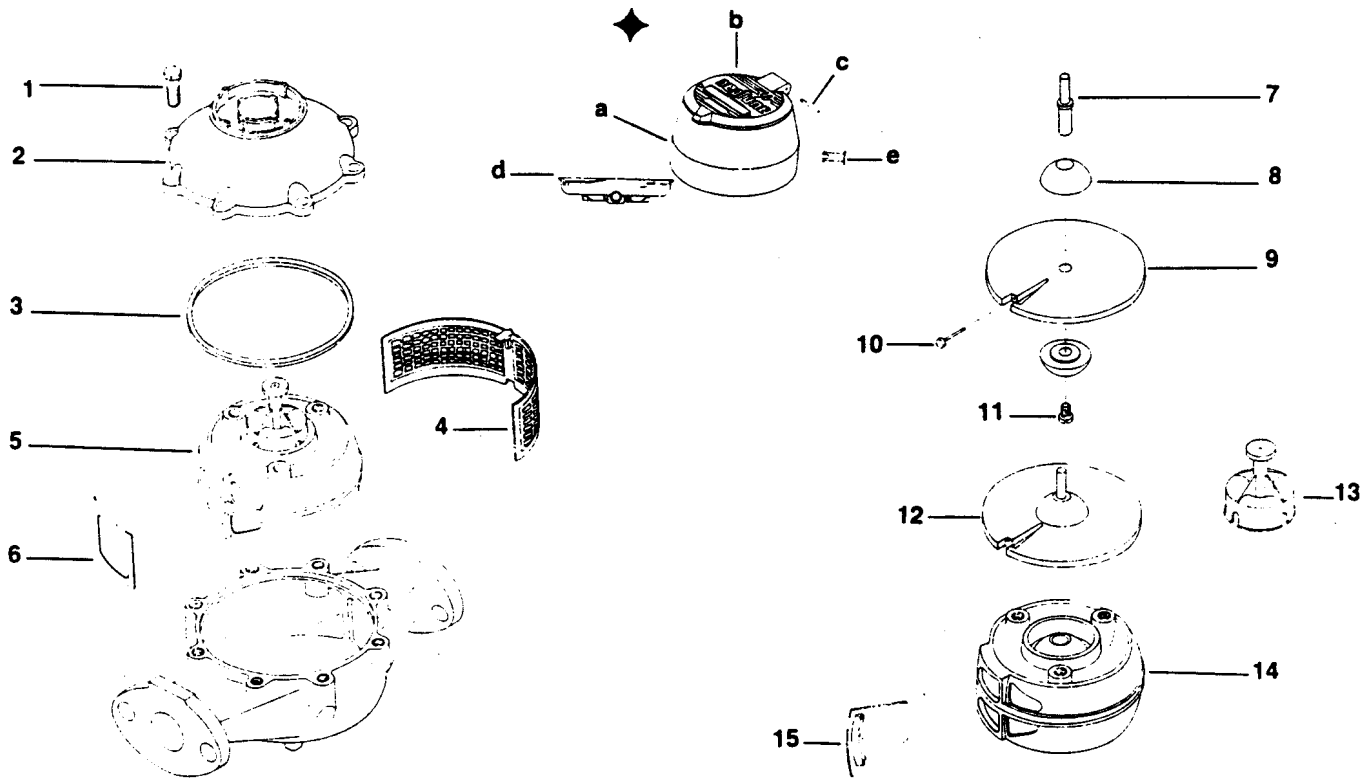
The corrosion-resistant cast bronze maincase will withstand most service conditions: internal water pressure, rough handling, and in-line piping stress.

The innovative floating chamber design of the nutating disc measuring element protects the chamber from frost damage while the unique chamber seal extends the low flow accuracy by sealing the chamber outlet port to the maincase outlet port. The nutating disc measuring element utilizes corrosion-resistant materials throughout and a thrust roller to minimize wear.



Residential Meter

1½" and 2"



ITEM NO.	DESCRIPTION	PART NUMBER	
		SP Chamber	
		1½"	2"
	Register*		
1	Bolts	8307-005	8307-005
2	Cover, Maincase	9082-001	9080-001
3	Gasket, Maincase	9083-001	9083-002
4	Strainer	9084-001	9084-002
5	Measuring Chamber Assembly	9098-500	9098-510
6	Outlet Gasket/O-Ring	8316-607	8316-606
7	Disc Spindle	9091-003	9091-003
8	Disc Half-Ball (two required)	n/a	n/a
9	Disc Plate	n/a	n/a
10	Thrust Roller	9850-100	9850-100
11	Screw	n/a	n/a
12	Ball & Disc Assembly	n/a	n/a
13	Control Block Assembly	9097-000	9097-010
14	Disc Chamber	9090-500	n/a
15	Diaphragm	9086-101	9086-102

*Refer to back page for additional register information.

Register Box Parts

ITEM NO.	DESCRIPTION	Bronze	Plastic	Gold Color
	Register Box Assembled	9131-100	9131-000	
a	Register Box	9133-202	9133-001	
b	Register Cover	9132-202	9132-001	
c	Hinge Pin, Register	8313-403	8350-007	
d	Retainer Ring	9105-001	9105-001	
e	Seal Pin, D/R Register	–	9106-001	9106-002
	Seal Pin, ARB Register	–	9309-501	
	Screw, Pulser Register	8460-011	–	

Roll-Sealed Register Assemblies

Registration	⅝"	¾"	1"	1½"	2"
Cu. Ft.	9107-012	9107-022	9107-032	9107-042	9107-052
Gal.	9107-011	9107-021	9107-031	9107-041	9107-051
M^3	9107-013	9107-023	9107-033	9107-043	9107-053

Register Assemblies

Size	Registration	Direct Read	ARB* 4-Wheel Encoder	ARB* 6-Wheel Encoder	ProRead* 4-Wheel Encoder	ProRead* 6-Wheel Encoder	Pulser*
	Cu. Ft.	R82F11	R52F11	R52F12	R62F11	R62G12	R22F1
⅝"	Gal.	R82G11	R52G11	R52G12	R62G11	R62G12	R22G1
	M^3	R82M11	R52M11	R52M12	R62M11	R62M12	R22M1
	Cu. Ft.	R82F21	R52F21	R52F22	R62F21	R62F22	R22F2
¾"	Gal.	R82G21	R52G21	R52G22	R62G21	R62G22	R22G2
	M^3	R82M21	R52M21	R52M22	R62M21	R62M22	R22M2
	Cu. Ft.	R82F31	R52F31	R52F32	R62F31	R62F32	R22F3
1"	Gal.	R82G31	R52G31	R52G32	R62G31	R62G32	R22G3
	M^3	R82M31	R52M31	R52M32	R62M31	R62M32	R22M3
	Cu. Ft.	R82F42	R52F41	R52F42	R62F41	R62F42	R22F4
1½"	Gal.	R82G42	R52G41	R52G42	R62G41	R62G42	R22G4
	M^3	R82M42	R52M41	R52M42	R62M41	R62M42	R22M4
	Cu. Ft.	R82F52	R52F51	R52F52	R62F51	R62F52	R22F5
2"	Gal.	R82G52	R52G51	R52G52	R62G51	R62G52	R22G5
	M^3	R82M52	R52M51	R52M52	R62M51	R62M52	R22M5

*Registers do not include ARB® remote receptacles or Pulser remote odometers.
When ordering registers for 10 Cu. Ft. registration, add SA68.

For more free information by fax, call Schlumberger Water Division, FAX-BACK System: 1-800-823-4417 and select the document you wish to order.

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T-10 PARTS 3/98
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Neptune®
Tru/Flo™ Compound Meter
Sizes: 2"HP, 3", 4", 6" and 6"x8"

Features & Benefits

- Patented Hydraulic Valve Design*
- Minimum loss of accuracy in the crossover range increases revenue
- Spring loaded valve eliminates need for frequent adjustment and service

Combined Turbine and Disc Measuring Elements

- Industry leading flow ranges at 98.5%–101.5% accuracy ensure maximum revenue
- Direct coupling of rotor to gear train ensures accurate registration
- Unitized Measuring Element (UME) makes maintenance easier and faster with less downtime
- Calibration vane allows in-line service to extend life and ensure accurate registration

Compact Bronze Maincase

- Compact, lightweight design provides for easy installation and in-line serviceability

*U.S. patent nos. 4,437,344 and 4,429,571

Application

The Tru/Flo is designed to register wide-flow ranges where varying flow rates are typical. Tru/Flo meters combine the low-flow sensitivity of a disc-type meter with the high-flow capacity of a turbine-type meter.

Operation

The hydraulic valve transfers flow smoothly between the disc section and turbine section of the meter, minimizing the loss of accuracy in the crossover range. The turbine measuring element registers high flows and the disc measuring element registers low flows, ensuring accurate measurement at all flow rates.

Construction

The Tru/Flo consists of a durable bronze maincase, Neptune Turbine measuring element, Neptune T-10® chamber, a patented hydraulic valve, and two magnetic-driven, roll-sealed registers.

The 6" x 8" Tru/Flo assembly consists of two 8" x 6" concentric reducers, a 6" Neptune strainer, and a 6" Neptune Tru/Flo Compound meter.

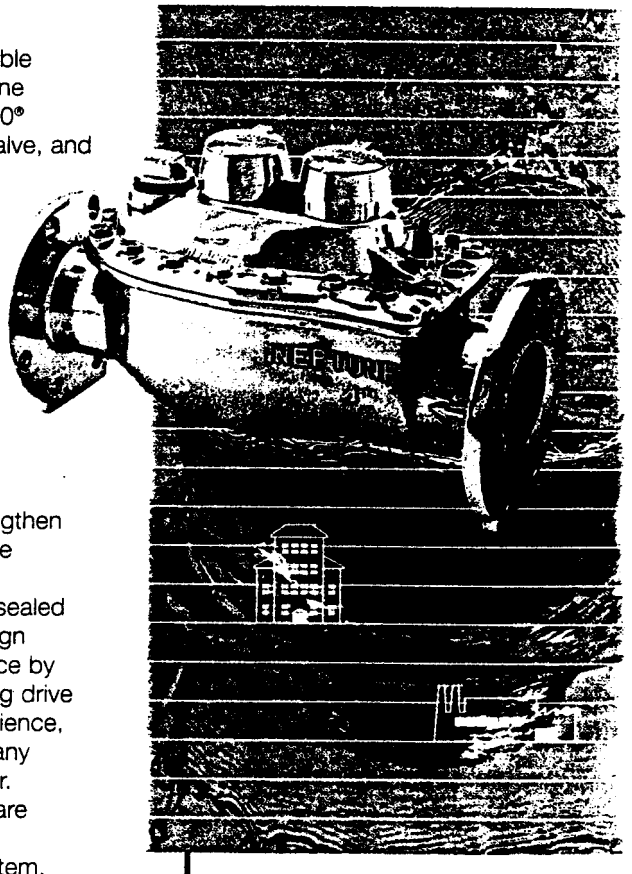
The bronze maincase is corrosion resistant, lightweight, and easy to handle.

A calibration vane allows field calibration of the UME to lengthen service life and to ensure accurate registration.

The two magnetic-driven, roll-sealed registers simplify the meter's design and reduce long-term maintenance by eliminating complicated combining drive mechanisms. For reading convenience, the registers can be mounted in any one of four positions on the meter.

All Tru/Flo Compound meters are adaptable to the Neptune ARB® Systems, Pulser-RM Remote System, TRICON-S®, and TRICON-E2® Transmitter.

All Tru/Flo Compound water meters meet or exceed the latest performance and accuracy requirements set by the AWWA C702, and maximum continuous flow rates may be exceeded by as much as 25% for intermittent periods.



Commercial Meter

Warranty & Maintenance

Schlumberger provides a limited warranty with respect to its Tru/Flo compound meters for performance, materials, and workmanship. Schlumberger further offers optional post-warranty maintenance and UME Exchange programs for extended service life.

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

Specifications

Application

Cold water measurement of flow in one direction

Maximum Operating Pressure

175 psi (1034 kPa)

Maximum Operating Temperature

80°F

Register

Direct reading, center sweep, roll-sealed, magnetic drive with low-flow indicator

Measuring Elements

AWWA Class II Turbine, dual suspension Nutating disc

Options

Register Types

Direct Reading:
- Synthetic polymer box and cover
- Bronze box and cover

Remote Reading*:
- ARB, ProRead™ ARB
- Pulser-RM
- TRICON-S
- TRICON-E2

Reclaim

Companion Flanges

2", 3", 4" Cast Iron or Bronze
6", 6"x8" Cast Iron

Units of Measure

U.S. Gallons Cubic Feet
Imperial Gallons Cubic Metres

Strainer

2", 3", 4", 6" Bronze

*Contact factory for performance specifications

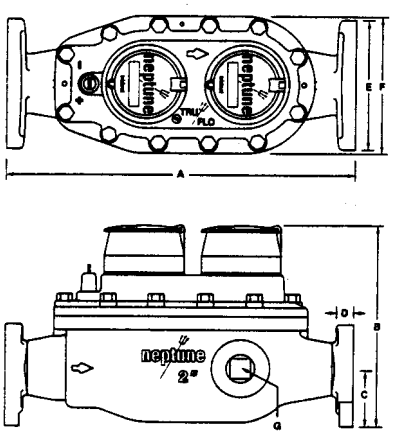
Operating Characteristics: Neptune Tru/Flo Compound

Meter Size	Normal Operating Range @ 100% Accuracy ±1.5%	AWWA Standard	Low Flow @ 95% Accuracy
2"	1/2 to 200 US gpm 0.11 to 45.4 m³/h	2 to 160 US gpm .454 to 36.34 m³/h	1/8 US gpm 0.03 m³/h
3"	1/2 to 450 US gpm 0.11 to 102.2 m³/h	4 to 320 US gpm .91 to 72.68 m³/h	1/8 US gpm 0.03 m³/h
4"	1 to 1000 US gpm 0.23 to 227.1 m³/h	6 to 500 US gpm 1.36 to 113.56 m³/h	1/2 US gpm 0.11 m³/h
6"	1 1/2 to 2000 US gpm 0.34 to 454.2 m³/h	10 to 1000 US gpm 2.27 to 227.12 m³/h	3/4 US gpm 0.17 m³/h
6" x 8"	1 1/2 to 2000 US gpm 0.34 to 454.2 m³/h	16 to 1600 US gpm 3.63 to 363.4 m³/h	3/4 US gpm 0.17 m³/h

Registration

Registration (per sweep hand revolution)		Turbine Side 2", 3", 4"	Turbine Side 6", 6"x8"	Disc Side 2", 3", 4", 6", 6"x8"
1,000	US Gallons		✓	
1,000	Imperial Gallons		✓	
100	US Gallons	✓		
100	Imperial Gallons	✓		
100	Cubic Feet		✓	
10	US Gallons			✓
10	Imperial Gallons			✓
10	Cubic Feet	✓		
10	Cubic Metres		✓	
1	Cubic Foot			✓
1	Cubic Metre	✓		
0.1	Cubic Metre			✓

Register Capacity (6-wheel odometer)		Turbine Side 2", 3", 4"	Turbine Side 6", 6"x8"	Disc Side 2", 3", 4", 6", 6"x8"
1,000,000,000	US Gallons		✓	
1,000,000,000	Imperial Gallons		✓	
100,000,000	US Gallons	✓		
100,000,000	Imperial Gallons	✓		
100,000,000	Cubic Feet		✓	
10,000,000	US Gallons			✓
10,000,000	Imperial Gallons			✓
10,000,000	Cubic Feet	✓		
10,000,000	Cubic Metres		✓	
1,000,000	Cubic Feet			✓
1,000,000	Cubic Metres	✓		
100,000	Cubic Metres			✓



Dimensions

Meter Size	A in/mm	B Std in/mm	B ARB in/mm	B Pul in/mm	C in/mm	D in/mm	E in/mm	F in/mm	G in/mm	Flange Type	Weight lbs/kg
2" HP	15 1/4 387	8 5/8 219	9 229	10 5/8 270	2 1/2 64	13/16 21	5 7/8 149	6 152	1 1/2 NPT 38	2" Oval 150 lb	32 14.5
3"	17 432	10 1/2 267	11 279	13 330	3 3/4 95	5/8 16	7 1/2 191	8 1/2 216	1 1/2 NPT 38	3" ANSI 150 lb	72 32.7
4"	20 508	12 1/2 318	13 330	14 3/4 375	4 1/2 114	11/16 17	9 229	9 1/8 232	2 NPT 51	4" ANSI 150 lb	100 45.4
6"	24 610	15 3/4 400	16 1/4 413	17 3/4 451	5 1/2 140	1 25	11 279	12 3/4 324	2 NPT 51	6" ANSI 150 lb	208 94.3
6" x 8"	55 3/8 1407	15 3/4 400	16 1/4 413	17 3/4 451	5 1/2 140	1 25	11 279	12 3/4 324	2 NPT 51	6" ANSI 150 lb	460 208.5

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