

**1 YEAR**  
WARRANTY



# User's Guide



*Shop online at*

**omega.com<sup>®</sup>**

Ω OMEGA<sup>®</sup>

*omega.com*

*e-mail: [info@omega.com](mailto:info@omega.com)*

*For latest product manuals:  
[omegamanual.info](http://omegamanual.info)*



## **FTB600B Series** **Ultra-Low Flow Sensors**

Download from [Www.Somanuals.com](http://www.Somanuals.com). All Manuals Search And Download.

**omega.com®**

ΩOMEGA™

OMEGAnet® On-Line Service  
omega.com

Internet e-mail  
info@omega.com

### Servicing North America:

U.S.A.: ISO 9001 Certified  
One Omega Drive, Box 4047  
Stamford, CT 06907-0047  
Tel: (203) 359-1660  
FAX: (203) 359-7700  
e-mail: info@omega.com

Canada:  
976 Bergar  
Laval (Quebec) H7L 5A1, Canada  
Tel: (514) 856-6928  
FAX: (514) 856-6886  
e-mail: info@omega.ca

### For immediate technical or application assistance:

U.S.A. and Canada:  
Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA®  
Customer Service: 1-800-622-2378 / 1-800-622-BEST®  
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN®

Mexico:  
En Español: (001) 203-359-7803  
FAX: (001) 203-359-7807  
e-mail: espanol@omega.com  
info@omega.com.mx

### Servicing Europe:

**Benelux:**  
Postbus 8034, 1180 LA Amstelveen  
The Netherlands  
Tel: +31 (0)20 3472121 FAX: +31 (0)20 6434643  
Toll Free in Benelux: 0800 0993344  
e-mail: sales@omegaeng.nl

**Czech Republic:**  
Frystatska 184, 733 01 Karvina, Czech Republic  
Tel: +420 (0)59 6311899 FAX: +420 (0)59 6311114  
Toll Free: 0800-1-66342 e-mail: info@omegashop.cz

**France:**  
11, rue Jacques Cartier, 78280 Guyancourt, France  
Tel: +33 (0)1 61 37 2900 FAX: +33 (0)1 30 57 5427  
Toll Free in France: 0800 466 342  
e-mail: sales@omega.fr

**Germany/Austria:**  
Daimlerstrasse 26, D-75392  
Deckenfronn, Germany  
Tel: +49 (0)7056 9398-0 FAX: +49 (0)7056 9398-29  
Toll Free in Germany: 0800 639 7678  
e-mail: info@omega.de

**United Kingdom: ISO 9002 Certified**  
One Omega Drive  
River Bend Technology Centre  
Northbank, Irlam  
Manchester M44 5BD United Kingdom  
Tel: +44 (0)161 777 6611 FAX: +44 (0)161 777 6622  
Toll Free in United Kingdom: 0800-488-488  
e-mail: sales@omega.co.uk

It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification. The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

**WARNING:** These products are not designed for use in, and should not be used for, human applications.

Download from [www.Somanuals.com](http://www.Somanuals.com). All Manuals Search And Download.

# FTB600B Series Ultra-Low Flow Sensors

## TABLE OF CONTENTS

<b>Section</b>	<b>Page</b>
<b>Section 1 Introduction .....</b>	<b>1</b>
A. General Description .....	1
B. Principle of Operation .....	1
C. Material Characteristics of PVDF .....	2
<b>Section 2 Operation Parameters .....</b>	<b>3</b>
A. Temperature .....	3
B. Flow Ranges .....	3
C. Recommended Viscosity .....	4
D. Filter Recommendations .....	4
E. Cleaning .....	5
F. Bi-directional Flow .....	5
<b>Section 3 Silicone Treatment .....</b>	<b>6</b>
<b>Section 4 Infrared Sensor .....</b>	<b>7</b>
A. Supply Voltage .....	7
B. Frequency Output .....	7
C. Frequency Ranges .....	8
D. Cable Requirements .....	8
<b>Section 5 Installation .....</b>	<b>10</b>
<b>Section 6 Specifications .....</b>	<b>14</b>
<b>Section 7 Pressure Drop Curves .....</b>	<b>15</b>



## **FTB600B Series Ultra-Low Flow Sensors**

---

### **NOTES:**

---

**IMPORTANT: READ INSTRUCTIONS THOROUGHLY BEFORE  
INSTALLING FLOW METER**

**Section 1 - Introduction**

**A. General Description**

The FTB600B Series is an axial paddle wheel turbine type flow meter based on the pelton wheel principle. This unique patented design makes the FTB600B Series a very accurate, repeatable, linear device. Not only is the FTB600B Series precise, but it is also a rugged, trouble-free flow meter, which can be used in a wide variety of industries including: medical, pharmaceutical, chemical processing, pulp & paper, semiconductor, biotech, agriculture etc.

**B. Principle of Operation**

Fluid flows through the meter, first passing through a helical nozzle, which causes flow to spiral, rotating in a helical pattern. The spiraling fluid then impacts on the flat blade rotor causing the rotor to spin. The rotor is designed to immediately develop a rotation-induced friction free fluid bearing, thus eliminating any potential bearing wear. An infrared electro-optical transmitter and receiver is molded into the body of the meter along with a pair of miniature circuit boards, providing voltage stabilizers.\* This design inherently bleeds off entrained gas, improving the accuracy of the meter.

\* Clear, transparent & translucent fluids; must transmit infrared light.

## **C. Material Characteristics of PVDF**

(Polyvinylidene Fluoride)

### **1. Material of construction**

Trade name - Kynar

All wetted parts of the FTB600B Series are PVDF, excluding the O-ring. Wetted parts include any part of the meter that will or could come in contact with the fluid.

List of wetted parts:

- |                                       |             |
|---------------------------------------|-------------|
| 1. Barbed fittings                    | 5. End caps |
| 2. Flow meter body                    | 6. Strainer |
| 3. Rotor                              | 7. Bearings |
| 4. Helical nozzle (Viton O-ring seal) |             |

### **2. Chemical Composition**

Polyvinylidene Fluoride is a fluoropolymer consisting of three basic materials (carbon, hydrogen and fluorine)

### **3. Effects of Various Fluids**

- a. Weak acids - no effects
- b. Strong acids - attacked by fuming sulfuric & nitric acids at high temperature.
- c. Weak alkalis - no effects
- d. Strong alkalis - no effects
- e. Organic solvents - Resistant to most. Slight attack by some. Imbrittled by some amines, keystone and esters.

---

## **Section 2. - Operating Parameters**

### **A. Temperature**

Since the FTB600B Series has printed circuit boards molded into the body of the meter it is strongly recommended that 180°F not be exceeded. Exceeding 180°F can cause irreparable damage to the circuit boards.

### **B. Flow Ranges**

The FTB600B Series is available in six different sizes, which cover a flow range from 0.1 to 120 lpm.

Specific flow ranges

FTB601B	0.1 to 2 lpm	(0.03 to 0.53 gpm)
FTB602B	0.3 to 9 lpm	(0.08 to 2.38 gpm)
FTB603B	0.5 to 15 lpm	(0.13 to 3.96 gpm)
FTB604B	1.0 to 30 lpm	(0.26 to 7.93 gpm)
FTB605B	2.5 to 75 lpm	(0.66 to 19.8 gpm)
FTB606B	4.0 to 120 lpm	(1.32 to 32 gpm)

---

**WARNING**

Over range may permanently damage the flow meter.

---





### **C. Recommended Viscosity**

#### **Range 1-5 cSt (w/o correction)**

The effects of changing viscosity on the FTB600B Series are the same as any other turbine flow meter. It is important to remember that a turbine meter is a viscosity dependent device, where as the viscosity increases the linearity of the flow meter will decrease. (Water like viscosities are ideally suited for use with the FTB600B Series) The FTB600B Series is factory calibrated with water.

#### **Correction procedure for higher viscosity**

For viscosities greater than 5 cSt consult the factory. The FTB600B Series can be used on fluids greater than 5 cSt. however, the K-factor (linearity) will change. This requires a recalibration of the FTB600B Series at the known viscosity to determine the new KFactor.

### **D. Filter Recommendations**

<b>Meter</b>	<b>Micron</b>	<b>Mesh</b>
FTB601B	35	400
FTB602B	50	300
FTB603B	100	80
FTB604B	100	80
FTB605B	100	80
FTB606B	100	80

**Section 3 - Silicone Treatment**

Silicone treatment is standard for all types of the FTB600B Series series electronics.

---

## **Section 4 - Infrared Sensor**

### **A. Supply Voltage**

24 Vdc. Do not exceed 24 Vdc. Doing so can cause overheating and eventual failure of all PC boards. Printed circuit boards are non-repairable.

### **B. Frequency Output**

1. Square wave pulse, unscaled (See Figure 4-1)
2. Output impedance 75 ohms
3. Directly proportional to flow rate
4. Output - dc frequency
5. Offset 0.64 volts
6. Peak voltage = Supply voltage - 1.2 volts
7. Peak to peak voltage Supply voltage - 1.2 volts - 0.64 volts
8. Output signal cycle 66.7% (i.e. at 100 Hz there is a 6 millisecond "on" time and a 4 millisecond "off" time)
9. TTL/CMOS circuit compatibility. The FTB600B Series has an operational amplifier output, which has a high input impedance and a low output impedance.

### C. Frequency Ranges for

(non-cartridge models)      pulses/l

<b>Model</b>	<b>Frequency (Hz)</b>	<b>K-Factor</b>
FTB601B	60 to 1200	36,000
FTB602B	40 to 1200	8,000
FTB603B	27 to 800	3,200
FTB604B	20 to 600	1,200
FTB605B	18.75 to 562	450
FTB606B	15 to 450	225

### D. Cable Requirements

1. 20 to 22 AWG (American Wire Gauge)
2. 4 conductor-shielded cable.

---

**NOTE**

---

Avoid influences of strong electromagnetic forces as they can damage components on the PC boards.

---

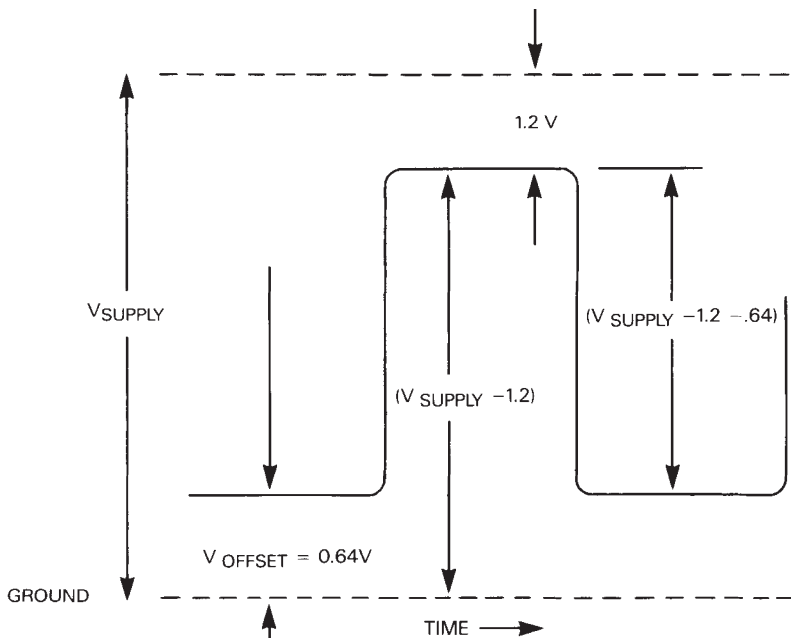
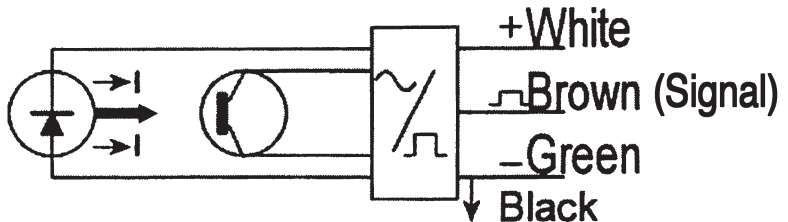


Figure 4-1. Output Frequency Waveforms

**Section 5 - Installing the FTB600B Series in the fluid line.**

- A.** Make sure the fluid is compatible with PVDF (polyvinylidene fluoride) and meets viscosity, pressure and temperature parameters of the FTB600B Series. The fluid must also meet filtration requirements as listed in 3D.
- B.** Install the FTB600B series in the fluid line with the arrow pointing in the direction of the flow.
- C.** While installing the FTB600B Series in the fluid line be careful not to over-torque the end caps (on hose-barbed flowmeters) or other fittings on the flowmeter. Due to the relatively soft composition of PVDF the body or threads can be permanently distorted.
- D.** Attach wires to the readout display with the display and power off. Not only will this help to avoid a potential shock hazard, but it can also help prevent an error in hooking the flow meter to an incorrect 115 Vac supply.
- E.** Connect digital display to power supply and enter scaling factors for both the rate and total. Follow the manufacturers instructions for programming the digital display.
- F.** The FTB600B Series is now ready for use.
- G.** See Table 5-1 for straight pipe recommendations.



Black is used to pull down 'green' to zero if necessary by connecting to ground

Figure 5-1. Supply Voltage and Signal Output Connections

Typical Piping		Recommended Straight Pipe Length "A"		Remarks
		Without Vanes	With Vanes	
All Fittings in Same Plane		15D	15D	Closed branch
		20D	15D	Elbow, Tee, Branch pipe
		25D	15D	Elbow, 2 planes
		25D	15D	Long-radius bends

**Table 5-1. Piping Table**



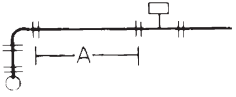
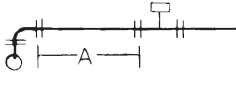
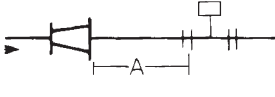
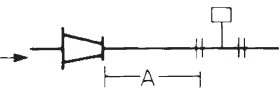

Fittings in Two Planes		30D 25D	15D 15D	Elbow Long-radius bends
		40D 35D	20D 20D	Elbow Long-radius bends
Varied Section		20D	15D	Contracting pipe
		40D	20D	Expanding pipe
Valves		Recommend Meter Be Installed Upstream		Regulating, reducing valves Ball, check valves Shut-off valve

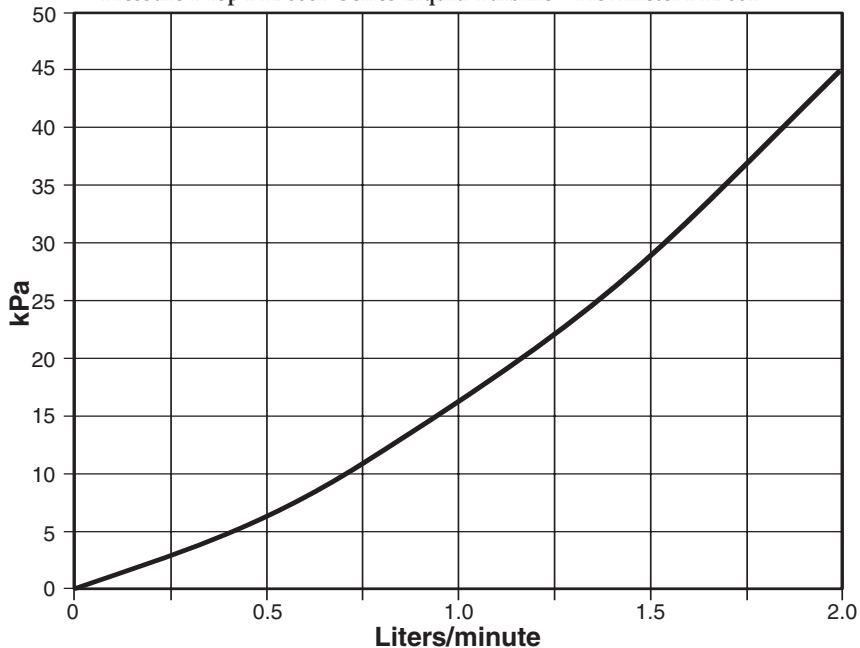
Table 5-1. Piping Table Con't.

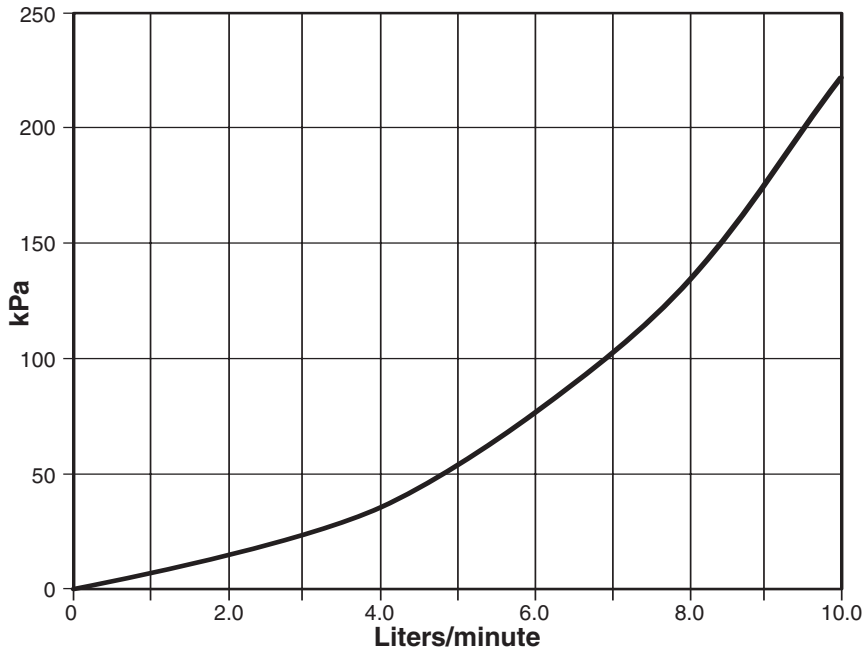
**Section 6 - Specifications**

Accuracy:	±3% of reading
Repeatability:	±0.1% of reading
Linearity:	±1% of reading
Viscosity Range:	1 to 15 centistokes
Working Pressure:	150 PSIG at 175°F
Wetted Materials:	PVDF
Power Supply:	5 to 18 Vdc, 6 to 33 mA
Output Signal:	Unscaled square wave
Pressure Drop:	See Section 7

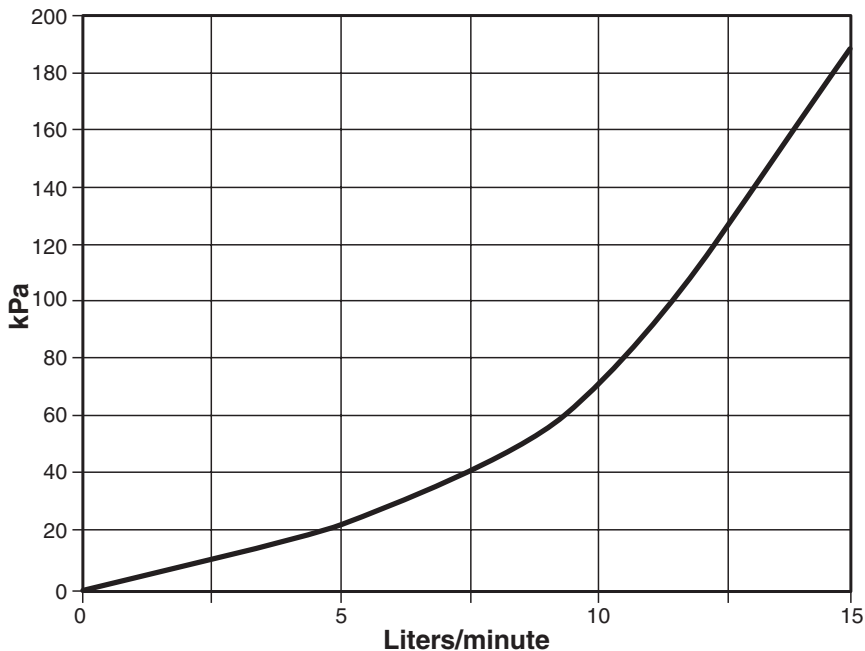
## Section 7 - Pressure Drop Curves

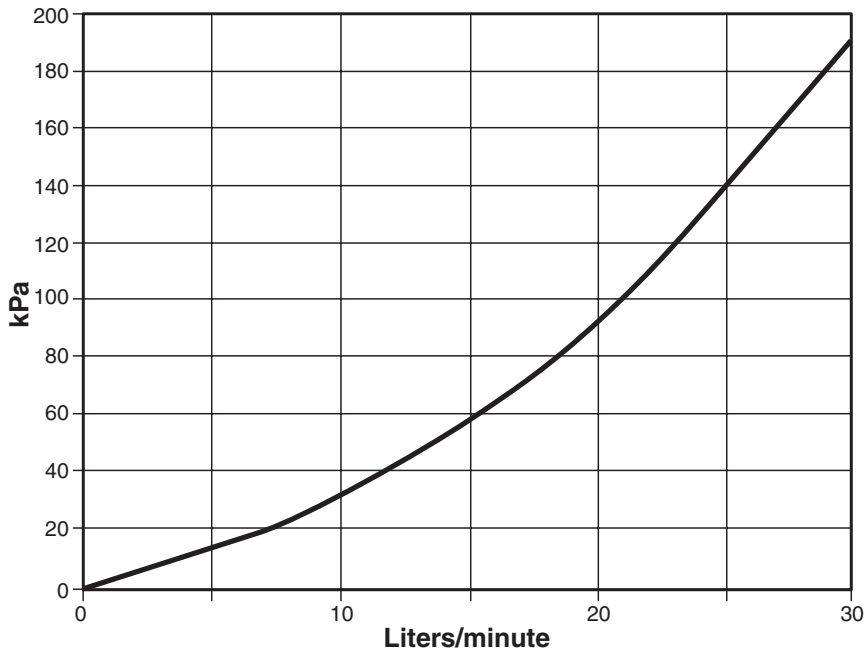
Pressure Drop FTB600B Series Liquid Turbine - Flowmeter FTB601



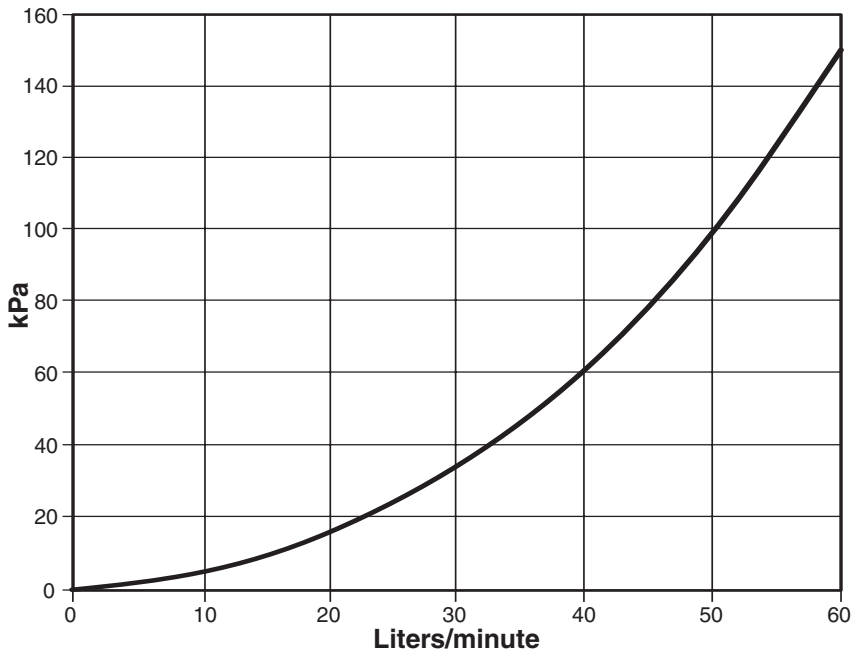
**Pressure Drop FTB600B Series Liquid Turbine - Flowmeter FTB602**

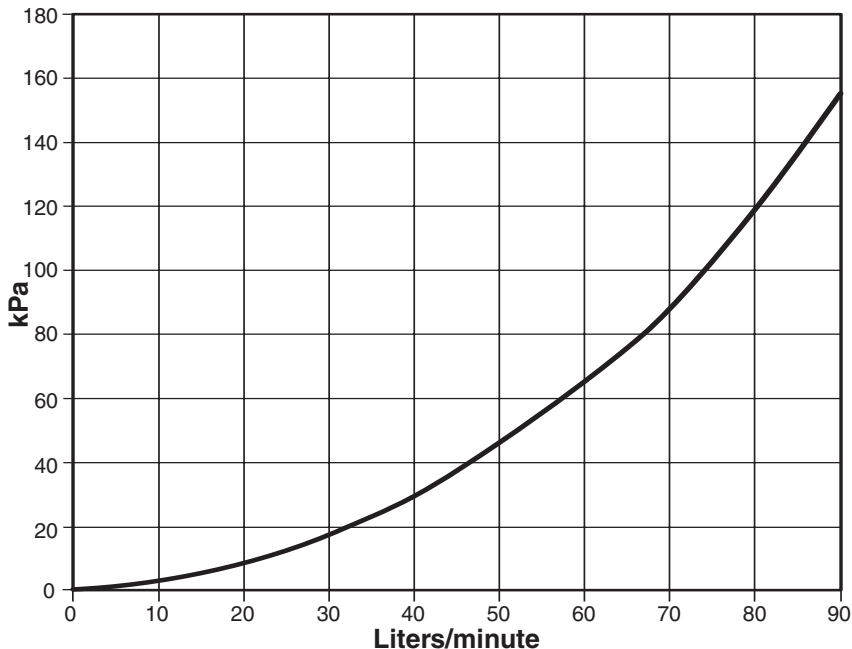
Pressure Drop FTB600B Series Liquid Turbine - Flowmeter FTB603



**Pressure Drop FTB600B Series Liquid Turbine - Flowmeter FTB604**

**Pressure Drop FTB600B Series Liquid Turbine - Flowmeter FTB605A**



**Pressure Drop FTB600B Series Liquid Turbine - Flowmeter FTB606A**



## WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

**OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.**

**CONDITIONS:** Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

## RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

© Copyright 2005 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any other medium without the written permission of OMEGA ENGINEERING, INC.

# Where Do I Find Everything I Need for Process Measurement and Control? **OMEGA...Of Course!**

*Shop online at [omega.com](http://omega.com)*

## **TEMPERATURE**

- ☑ Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- ☑ Wire: Thermocouple, RTD & Thermistor
- ☑ Calibrators & Ice Point References
- ☑ Recorders, Controllers & Process Monitors
- ☑ Infrared Pyrometers

## **PRESSURE, STRAIN AND FORCE**

- ☑ Transducers & Strain Gages
- ☑ Load Cells & Pressure Gages
- ☑ Displacement Transducers
- ☑ Instrumentation & Accessories

## **FLOW/LEVEL**

- ☑ Rotameters, Gas Mass Flowmeters & Flow Computers
- ☑ Air Velocity Indicators
- ☑ Turbine/Paddlewheel Systems
- ☑ Totalizers & Batch Controllers

## **pH/CONDUCTIVITY**

- ☑ pH Electrodes, Testers & Accessories
- ☑ Benchtop/Laboratory Meters
- ☑ Controllers, Calibrators, Simulators & Pumps
- ☑ Industrial pH & Conductivity Equipment

## **DATA ACQUISITION**

- ☑ Data Acquisition & Engineering Software
- ☑ Communications-Based Acquisition Systems
- ☑ Plug-in Cards for Apple, IBM & Compatibles
- ☑ Datalogging Systems
- ☑ Recorders, Printers & Plotters

## **HEATERS**

- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

## **ENVIRONMENTAL MONITORING AND CONTROL**

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments

## Free Manuals Download Website

<http://myh66.com>

<http://usermanuals.us>

<http://www.somanuals.com>

<http://www.4manuals.cc>

<http://www.manual-lib.com>

<http://www.404manual.com>

<http://www.luxmanual.com>

<http://aubethermostatmanual.com>

Golf course search by state

<http://golfingnear.com>

Email search by domain

<http://emailbydomain.com>

Auto manuals search

<http://auto.somanuals.com>

TV manuals search

<http://tv.somanuals.com>