

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

1 YEAR
WARRANTY

OMEGA®

User's Guide



Shop online at omega.com℠

e-mail: info@omega.com
For latest product manuals:
www.omegamanual.info

FTB600B Series
Ultra-Low Flow Sensors

omega.com info@omega.com

Servicing North America:

U.S.A.: Omega Engineering, Inc., One Omega Drive, P.O. Box 4047
Stamford, CT 06907-0047 USA
Toll-Free: 1-800-826-6342 (USA & Canada only)
Customer Service: 1-800-622-2378 (USA & Canada only)
Engineering Service: 1-800-872-9436 (USA & Canada only)
Tel: (203) 359-1660 Fax: (203) 359-7700
e-mail: info@omega.com

For Other Locations Visit omega.com/worldwide

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.

TABLE OF CONTENTS

Section		Page
Section 1	**Description**	**1**
	A. General Description	1
	B. Principle of Operation	1
Section 2	**Material Characteristics**	**3**
	A. Material of Construction	3
	B. Flow Ranges	3
	C. Chemical Compatibility	4
	D. Effects of Various Fluids	4
Section 3	**Operation Parameters**	**5**
	A. Temperature	5
	B. Flow Ranges	5
	C. Recommended Viscosity	6
	D. Filter Recommendations	6
	E. Cleaning	7
Section 4	**Silicone Treatment**	**8**
Section 5	**Infrared Sensor**	**9**
	A. Supply Voltage	9
	B. Frequency Output	9
	C. Frequency Ranges	10
	D. Cable Requirements	10
Section 6	**Installing the FTB600B**	**11**

TABLE OF CONTENTS

FTB600B Series
Ultra-Low Flow Sensors

Section		Page
Section 7	Specifications	14
Section 8	Pressure Drop Curves	15

IMPORTANT: READ INSTRUCTIONS THOROUGHLY BEFORE INSTALLING FLOW METER

Section 1 - Description

A. General Description

The FTB600B is an axial paddle wheel turbine type flow meter based on the Pelton wheel principle. This unique patented design makes the FTB600B a very accurate, repeatable, linear device. Not only is the FTB600B 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, semi-conductor, 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 are molded into the body of the meter along with a pair of miniature circuit boards, providing voltage stabilizers. The wave length of the infrared light is approx. 85 nm.*

This design inherently bleeds off entrained gas, improving the accuracy

of the meter. It also eliminates the need for flow straighteners or special lengths of inlet piping to stabilize turbulent flow.

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

Section 2 - Material Characteristics

A. Material of Construction

Chemical name: Polyvinylidene Fluoride

Trade name – Solef

All wetted parts of the FTB600B 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
2. End caps
3. Flow meter body
4. Strainer
5. Rotor
6. Bearings
7. Helical nozzle (FMK O-ring seal)

B. Chemical Compatibility

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

C. Chemical Compatibility

Always verify chemical compatibility of wetted materials against your application

D. Effects of Various Fluids

- Weak acids – no effects
- Strong acids – attacked by fuming sulfuric & nitric acids at high temperature
- Weak alkalis – no effects
- Strong alkalis – no effects
- Organic solvents – Resistant to most. Slight attack by some. Imbrittled by some amines, keystone and esters. (Ref: Compass Corrosion Guide II)

Section 3 - Operation Parameters

A. Temperature

Since the FTB600B 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 is available in six different sizes, which cover a flow range from 0.1 – 120 lpm (0.3 – 32 gpm)

Specific flow ranges

Size: 0.1 – 2 lpm (.03 – 0.53 gpm)

Size: 0.3 – 9 lpm (.08 – 2.38 gpm)

Size: 0.5 – 15 lpm (.13 – 3.96 gpm)

Size: 1.0 – 30 lpm (.26 – 7.93 gpm)

Size: 2.5 – 75 lpm (.66 – 19.8 gpm)

Size: 4.0 – 120 lpm (1.06 – 32 gpm)

Consult factory for specific applications requiring an extended flow range. 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 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) The FTB600B is factory calibrated with water.

Correction procedure for higher viscosity

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

D. Filter Recommendations

Meter	Micron	Mesh
Size 1:	35	400
Size 2:	50	300
Size 3:	100	80
Size 4:	100	80
Size 5:	100	80
Size 6:	100	80

FTB600B sizes 2 – 6 are fitted with strainers* to help protect against dirt, fiber and other contaminants. Due to space restrictions it is not possible to fit size 1 with a strainer. Removal of the strainer will reduce pressure drop through the flow meter and may also change the linearity of the meter to solid contaminant, which could damage the meter. * The strainer is a 30 mesh filter / 550 micrometer. Cartridge models have no strainer.

E. Cleaning

1. Steam cleaning

Steam sterilization is not possible with FTB600B due to the high temperature of the steam. Steam sterilization will permanently damage the flow meter bearings and printed circuit boards.

2. Chemical cleaning Chemical cleaning the FTB600B is permissible, provided the chemicals are compatible with PVDF (polyvinylidene fluoride).

3. Bi-directional flow

The FTB600B is designed to only provide fluid readings in the forward flow direction. Reverse flow will not unduly restrict fluid flow.

Section 4 - Silicone Treatment

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

Section 5 - Infrared Sensor

A. Supply Voltage

5 – 12 Vdc (6 – 33 mA) or 8 – 24 Vdc (18 – 30 mA). Do not exceed 12 / 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
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 100Hz there is a 6 millisecond “on” time and a 4 millisecond “off” time)
9. TTL/CMOS circuit compatibility. The FTB600B has an operational amplifier output, which has high input impedance and low output impedance.

C. Frequency Ranges:

Model	Freq.(Hz)	K-Factor (1/l)
Size 1:	60 – 1200	36000
Size 2:	40 – 1200	8000
Size 3:	26.66 – 800	3200
Size 4:	20 – 600	1200
Size 5:	18.75 – 562	450
Size 6:	15 – 450	225 Non-cartridge models only

D. Cable Requirements

1. 20 – 22 AWG (American Wire Gauge)

2. 4 conductor-shielded cable.

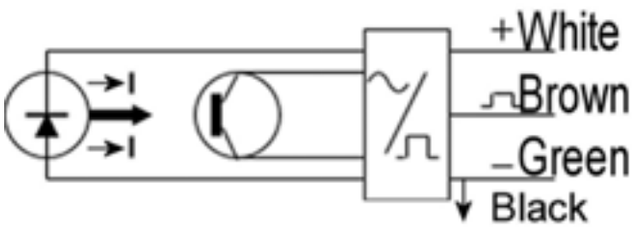
NOTE

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

Section 6 - Installing the FTB600B

- Make sure the fluid is compatible with PVDF (polyvinylidene fluoride) and meets viscosity, pressure and temperature parameters of the FTB600B. The fluid must also meet filtration requirements as listed in 3D.
- Install the FTB600B in the fluid line with the arrow pointing in the direction of the flow.
- While installing the FTB600B 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.
- 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.
- Connect digital display to power supply and enter scaling factors for both the rate and total. Follow the manufacturer's instructions for programming the digital display.
- The FTB600B is now ready for use.

Supply Voltage and Signal Output Connections



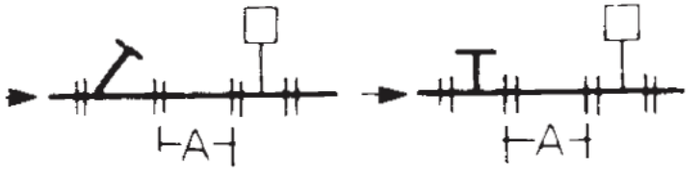
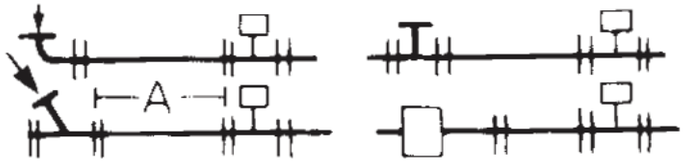
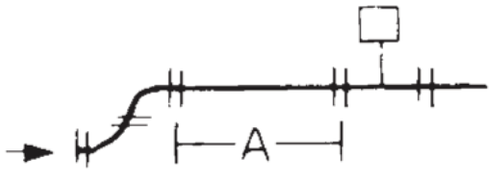
	Typical Piping	Recommended Straight Pipe Length "A"		Remarks
		Without Vanes	With Vanes	
All Fittings In Same Plane		15D	15D	Closed Branch
		20D	15D	Elbow, Tee, Branch Pipe
		25D	15D	Elbow, 2 Planes
		25D	15D	Long-radius Bends

Table 6-1. Piping Table

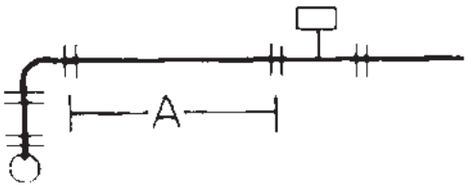
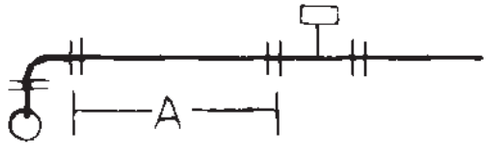
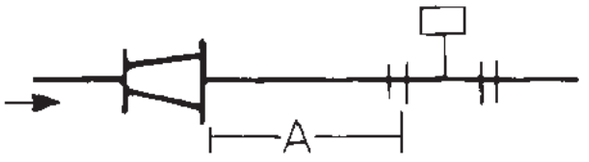
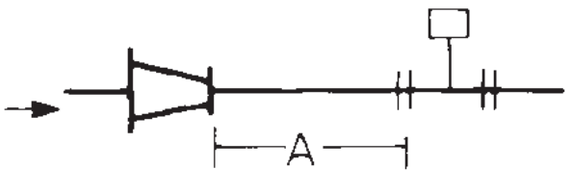
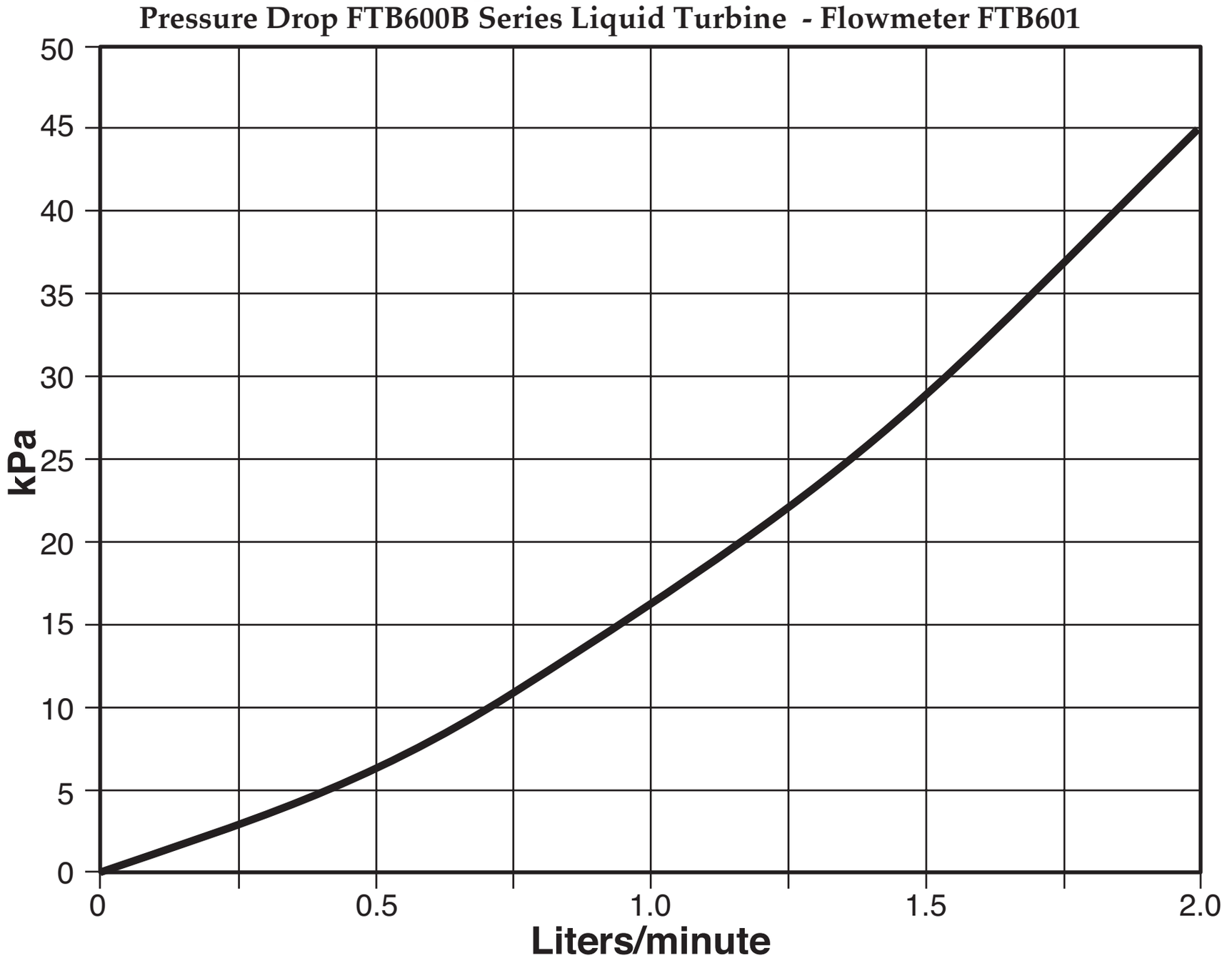
Fittings in Two Planes		30D 25D	15D 15D	Elbow Long-radius bends
		40D 35D	20D 20D	Elbow Long-radius bends
Varied Section		20D	15D	Contracting pipe
		40D	20D	Expanding pipe
Valves		Recommend Meter Be Installed Upstream		Regulating, reducing valves Ball, check valves Shut-off valve

Table 6-1. Piping Table Con't.

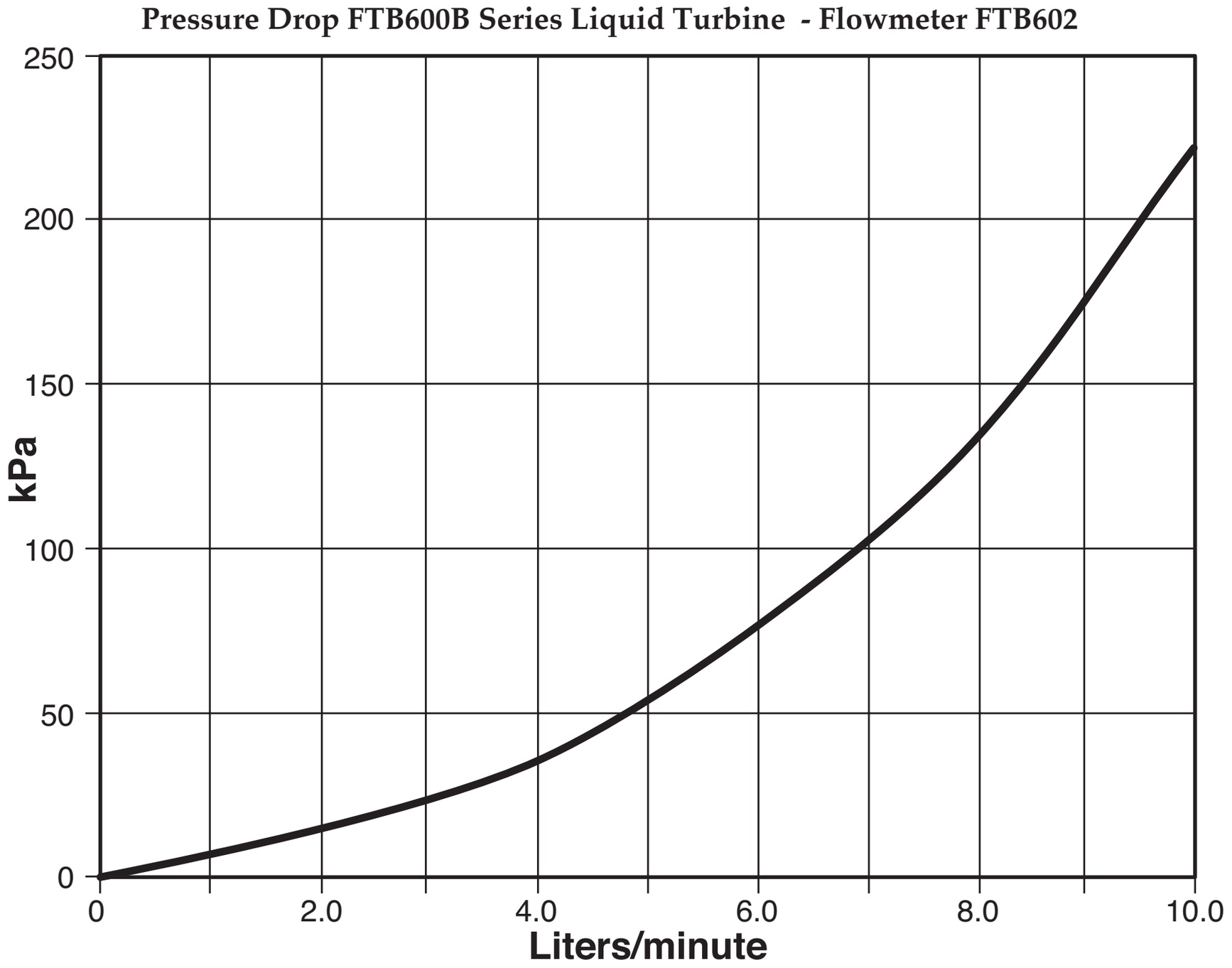
Section 7 - Specifications

Accuracy:	±1% 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 8

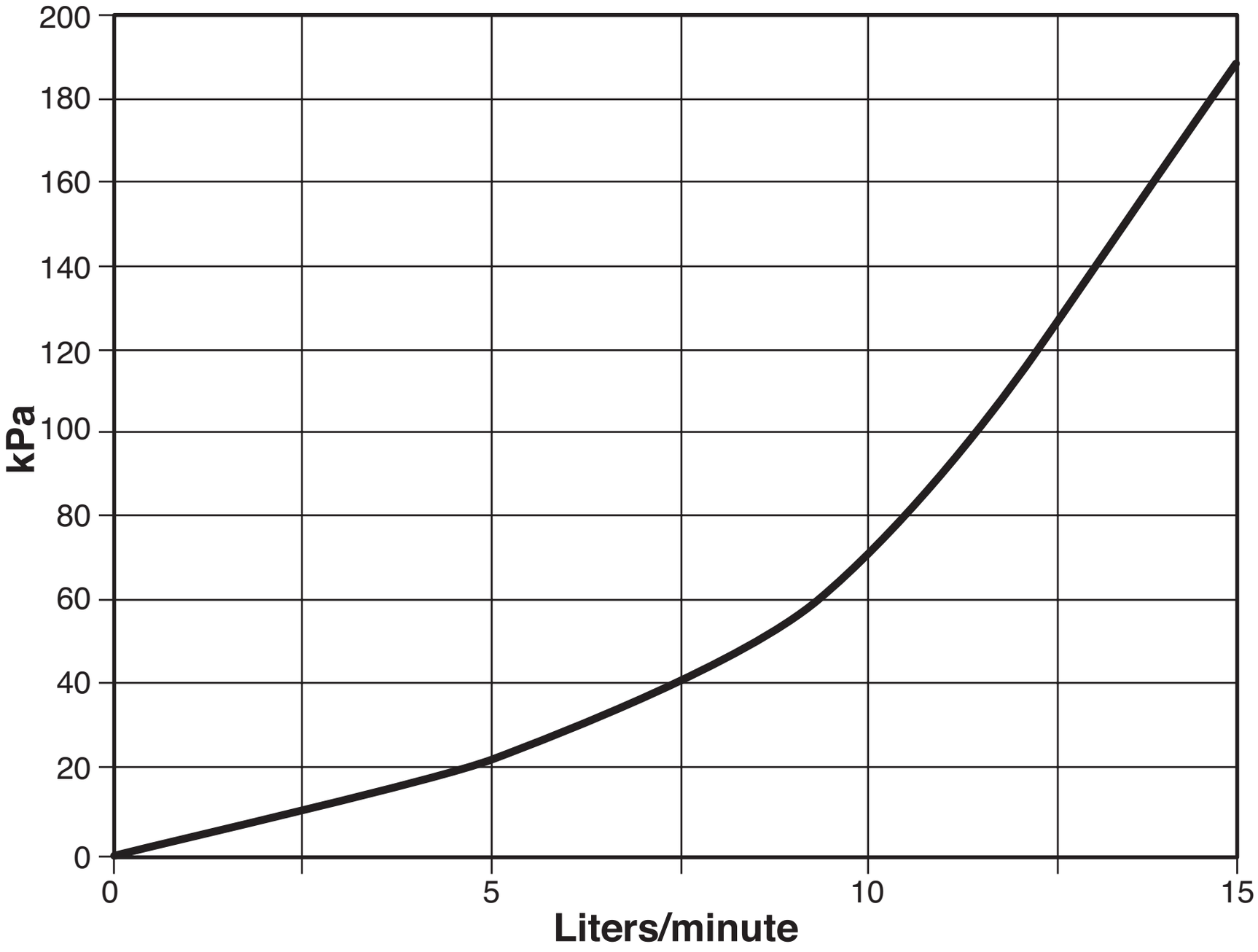
Section 8 - Pressure Drop Curves



FTB600B Series
Pressure Drop Curves

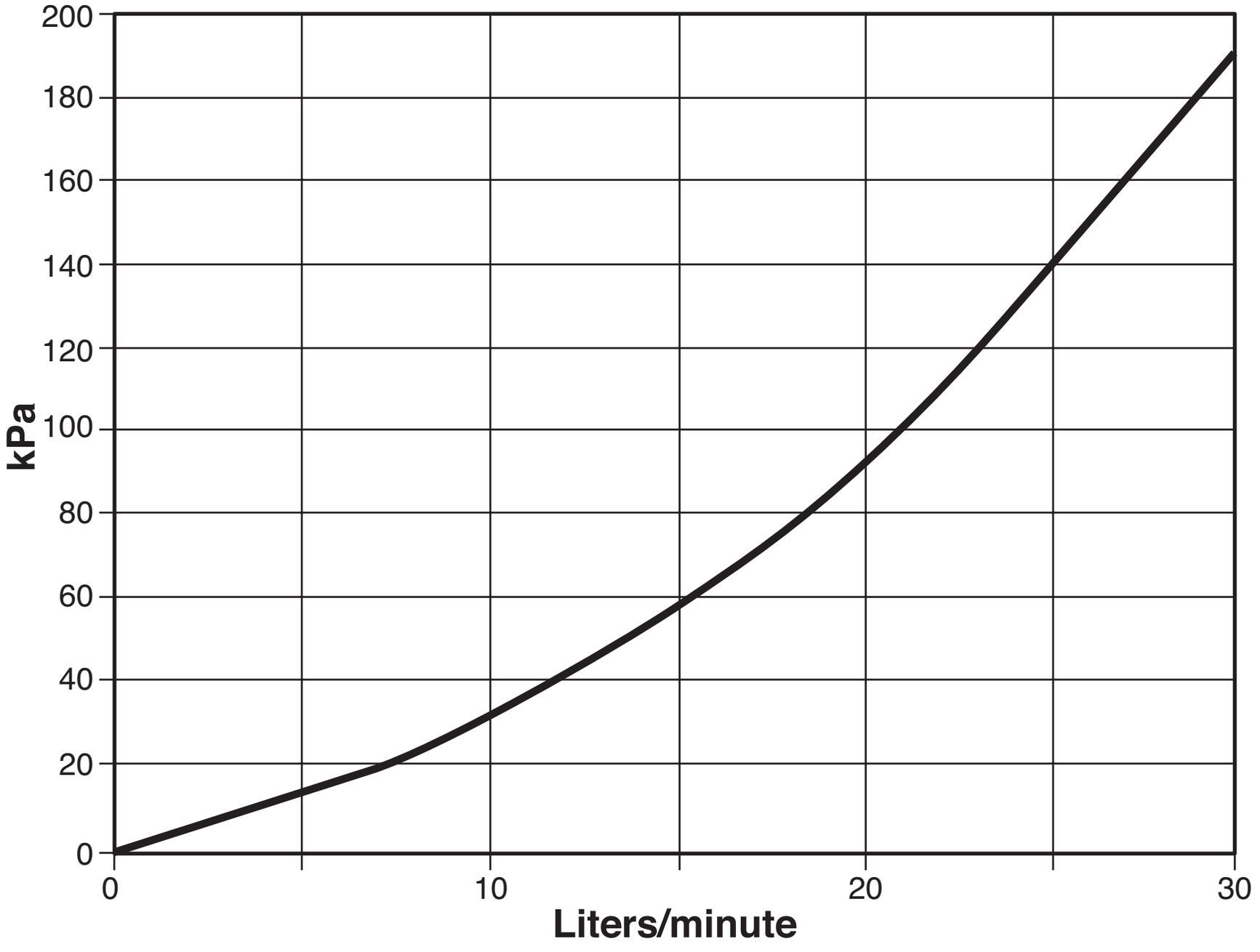


Pressure Drop FTB600B Series Liquid Turbine - Flowmeter FTB603

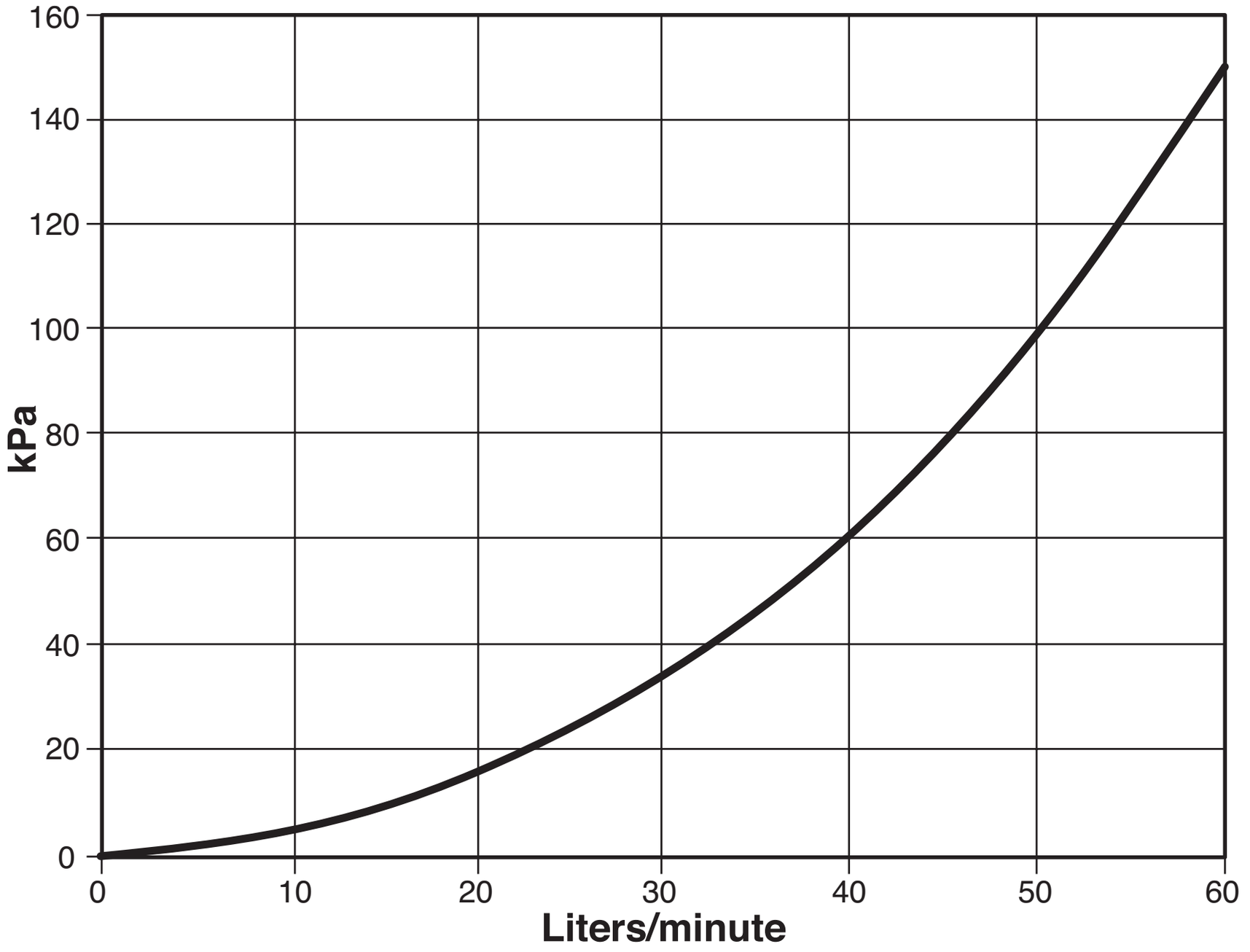


FTB600B Series
Pressure Drop Curves

Pressure Drop FTB600B Series Liquid Turbine - Flowmeter FTB604

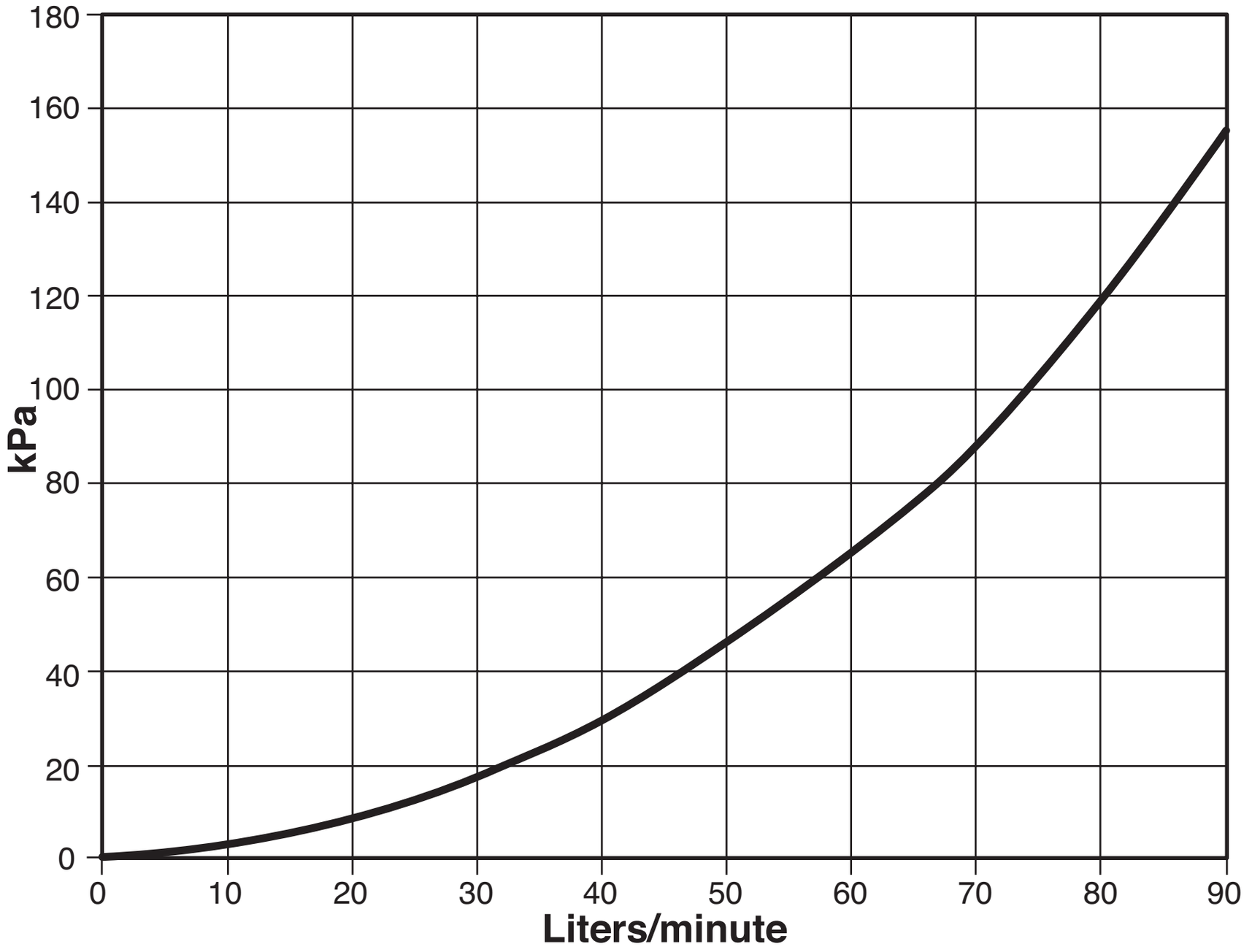


Pressure Drop FTB600B Series Liquid Turbine - Flowmeter FTB605A



FTB600B Series
Pressure Drop Curves

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) 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 2016 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of OMEGA ENGINEERING, INC.

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

Shop online at 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
- ☑ Data Logging 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

M1132/0116

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP