1 YEAR
WARRANTY

User's Guide

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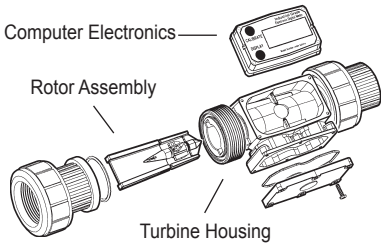
TABLE OF CONTENTS

General Information.....1
Installation 3
Operation.....4
Calibration 5
Maintenance 6
Troubleshooting.....8
Specifications 9
Model Numbers 12
Parts & Accessories.....12
Warranty/Disclaimer 13
Return Requests/Inquiries.....13

GENERAL INFORMATION

This manual will assist you in installing and maintaining your FTB890 Series turbine meter and associated display electronics. The turbine meters can be purchased with or without the display electronics. (See Figure 1)

Figure 1



When purchased with the display electronics, optional accessory modules are available for field installation. Information on these accessories is contained in separate manuals. Calibration details using the display electronics are given in this manual.

When purchased without the display (Suffix - ND) an optional field installable Pulse Output Module (FLSC790-P-ND) is available and described in a separate manual.

For best results, take the time to fully acquaint yourself with all information about all components of your FTB890 Series Turbine Meter System prior to installation and use. If you need assistance, contact the Omega Flow Application Department.

SAFETY INSTRUCTIONS

This symbol is used throughout the manual to call your attention to safety messages.

⚠ WARNING **WARNINGS** alert you to the potential for personal injury.

⚠ CAUTION **CAUTIONS** call your attention to practices or procedures which may damage your equipment.

NOTES give information that can improve efficiency of operations.

It is your responsibility to make sure that all operators have access to adequate instructions about safe operating and maintenance procedures.

Read Me!

For your safety, review the major warnings and cautions below before operating your equipment.

⚠ WARNING

The apparatus enclosure may contain aluminum and is considered to constitute a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact or friction.

⚠ WARNING

Part of the enclosure is constructed from plastic. To prevent the risk of electrostatic sparking the plastic surface should only be cleaned with a damp cloth.

1. This equipment is approved to handle only fluids that are compatible with all materials of construction.
2. When measuring flammable liquids, observe precautions against fire or explosion.
3. When handling hazardous liquids, always follow the liquid manufacturer's safety precautions.
4. When working in hazardous environments, always exercise appropriate safety precautions.
5. Always dispose of used cleaning solvents in a safe manner according to the solvent manufacturer's instructions.
6. During turbine removal, liquid may spill. Follow the liquid manufacturer's safety precautions for clean up of minor spills.
7. Do not blow compressed air through the turbine.
8. Do not allow liquids to dry inside the turbine.
9. Handle the rotor carefully. Even small scratches or nicks can affect accuracy.
10. When tightening the turbine, do not use a wrench or pliers to tighten the turbine. Hand tighten only.
11. For best results, always verify accuracy before use.

Product Description

Omega Industrial Meter Turbines are identified by the internal diameter of the inlet and outlet.

FTB891 - 1/2 inch
FTB893 - 1 inch

Each turbine is designed to work with on-board computer electronics and/or with one of several accessory modules that can interface to a wide variety of reporting and collecting devices. The CMOS microprocessor-based electronics have extremely low power requirements and data retention capabilities in both RAM and ROM. Information is clearly displayed on a large 6-digit LCD readout with two-point floating decimal for totals from .01 to 999,999. All operations are easily accessed with the two buttons on the front panel.

Liquid flows through the turbine housing causing an internal rotor to spin. As the rotor spins, an electrical signal is generated in the pickup coil. The electrical signal provides the output necessary to operate the on-board computer electronics for local indication directly on the turbine or one of several accessory modules that transmit the signal to external equipment.

Upon receipt, examine your meter for visible damage. The turbine is a precision measuring instrument and should be handled as such. Remove the protective plugs and caps for a thorough inspection. If any items are damaged or missing, contact your distributor.

Make sure the turbine model meets your specific needs. Refer to the Specifications Section and confirm the following:

1. The flowrate is within the limits of your model.
2. The liquid is compatible with the turbine's wetted components.
3. The system's pressure does not exceed the turbine's maximum pressure rating.

Each Omega Turbine has a unique identification number that includes the Serial Number, Model Number, Manufacturing Date, and K-Factor. This identification number is etched into the surface of the turbine. Record this identification number in the back of the Owner's Manual and keep for future reference.

SN = Serial Number, a 7-8 digit number that identifies this particular turbine.

MOD= Model number

KF = K-Factor given in pulses per gallon (PPG).

MFD = Manufacturing Date indicating the week and year of manufacture.

INSTALLATION

All Omega turbines are designed to measure flow in only one direction. The direction is indicated by the arrow cast-molded in the turbine outlet. If the opposite direction is desired, and you are using on-board computer electronics, rotate the computer electronics 180 degrees prior to installation.

Flow altering devices such as elbows, valves, and reducers can affect accuracy. The following recommended guidelines are given to enhance accuracy and maximize performance. Distances given here are minimum requirements; double them for desired straight pipe lengths.

Upstream from the turbine, allow a minimum straight pipe length at least 10 times the internal diameter of the turbine. For example, with the FTB893 turbine, there should be 10 inches (25.4 cm) of straight pipe immediately upstream. The desired upstream straight pipe length is 20 inches (50.8 cm).

Downstream from the turbine, allow a minimum straight pipe length at least 5 times the internal diameter of your turbine. For example, with the FTB893 turbine, there should be 5 inches (12.7 cm) of straight pipe immediately downstream. The desired downstream distance is 10 inches (25.4 cm).

A typical back pressure of 5 to 50 PSI (0.34 to 3.4 bar) will prevent cavitation. Create back pressure by installing a control valve on the downstream side of the meter at the proper distance detailed above.

Foreign material in the liquid being measured can clog the turbine's rotor and adversely affect accuracy. If this problem is anticipated or experienced, install screens to filter impurities from incoming liquids.

FTB891

Maximum Particulate Size	
Inches:	0.005
Microns:	125
Mesh:	55
Standard Sieve:	125 µm
Alternative Sieve:	No. 120

FTB893

Maximum Particulate Size	
Inches:	0.018
Microns:	500
Mesh:	28
Standard Sieve:	500 µm
Alternative Sieve:	No. 35

The PVDF Series FTB890 turbines are Factory Mutual Approved and carry a Class 1, Division 1 Approval for hazardous environments. Omega Meters are tested and calibrated at the factory using state-of-the-art calibration test equipment.

To ensure accurate measurement, remove all air from the system before use. To purge the system of air:

1. Ensure some back pressure on the turbine.
2. Open the discharge valve or nozzle and allow fluid to completely fill the system. Make sure the stream is full and steady.
3. Close the discharge valve or nozzle.
4. Start normal operations.

Each turbine contains a removable back coverplate. Leave the coverplate installed unless accessory modules specify removal.

Connections

1. To protect against leakage, seal all threads with an appropriate sealing compound. Make sure the sealing compound does not intrude into the flow path.
2. Make sure the flow direction arrow on housing back is pointed in the direction of the flow.
3. Install union ring over pipe end prior to installing pipe fitting.
4. Install pipe fittings on pipe ends, and tighten.
5. Tighten union ring to the turbine. Make sure O-ring is positioned in housing ends. Do not use a wrench or pliers. Hand tighten only.

NOTE: If connecting to new male threads, burrs and curls can adversely affect accuracy. Correct the problem prior to turbine installation.

It is strongly recommended that accuracy be verified prior to use. To do this, remove all air from the system, measure an exact known volume into an accurate container, and verify the volume against the readout or recording equipment. If necessary, use a correction factor to figure final volume. For best results, accuracy should be verified periodically as part of a routine maintenance schedule. The procedure is found in the Maintenance Section.

The display electronics is normally installed on the turbine housing at the factory unless ordered without it.

If for any reason the display electronics need to be mounted on your turbine, simply mount the display on the turbine with the four screws at the corners of the faceplate. Make sure the seal is fully seated before tightening the screws.

If you ordered the FTB890 Series turbine with an accessory module, please review and thoroughly understand all installation instructions before proceeding.

Avoid electronically “noisy” environments. Install at least 6 inches (15.2 cm) away from motors, relays, or transformers.

OPERATION

Computer Display

All operations are reflected in the LCD readout. The large center digits indicate amounts, where smaller words or “icons” located above and below indicate spcific information regarding totals, flow, calibration and units of measure.

Activate the Meter

Computer is on continuously and always ready to perform. The computer is powered by field replaceable batteries. When display becomes dim, faded or the low battery message appears (see below), the batteries need to be replaced. Reference the Maintenance Section for details.

Batch and Cumulative Totals

The computer maintains two totals. The Cumulative Total provides continuous measurement and cannot be manually reset. The Batch Total can be reset to measure flow during a single use. The Cumulative Total is labeled TOTAL 1, Batch Total is labeled TOTAL 2 BATCH.

When the Cumulative Total reaches a display reading of 999,999 the computer will highlight an X10 icon. This indicates to the operator that a zero must be added to the 6 digits shown. When the next rollover occurs, the computer will highlight an X100 icon. This indicates to the operator that two zeroes must be added to the 6 digits shown.

Press the DISPLAY button briefly to switch between the TOTAL 1, TOTAL 2 BATCH and FLOWRATE. Press DISPLAY briefly to display the TOTAL 2 BATCH. Hold the DISPLAY button for 3 seconds to reset the Batch Total to zero.

When fluid is flowing through the meter, a small propeller icon is highlighted.

Flowrate Feature

To use this feature, press and release DISPLAY until FLOWRATE icon appears. The factory set time base will be highlighted to the right of FLOWRATE (M = minutes, H = hours, D = days). When FLOWRATE is invoked, the display will be indicating rate of flow.

Factory and Field Calibration

All calibration information is visible to the user as icons on the top line of the display, above the numeric digits.

All units are configured with a "factory" calibration. Both gallons and litres are available ("GL" or "LT" will be displayed). While holding the CALIBRATE button, briefly press DISPLAY to toggle between gallons and litres. This factory calibration (indicated with FAC) is permanently programmed into the computer and is not user adjustable.

NOTE: Your computer may have other units of measure programmed into it. If so, holding the CALIBRATE button and momentarily pressing the DISPLAY button will toggle through all factory set units. Other possible units are: IGL (imperial gallon), QT (quart), CF (cubic feet), CM (cubic meter), BL (42 gal. barrel), CC (cubic centimeter) or OZ (ounce).

Switching between different units will not corrupt the Total's contents. For example, in GL mode, the computer totalizes 10.00 gallons, if the user switches to LT mode, the display will read 37.85 litres (the same volume, different unit).

The "field" calibration may be set by the user, and can be changed or modified at any time using the calibration procedure described below in the Calibration Section. Totals or flowrate derived from the field calibration are invoked when the FAC icon is no longer visible on the top line of the display.

CALIBRATION

Verify Accuracy Before Beginning Field Calibration

For the most accurate results, dispense at a flowrate which best simulates your actual operating conditions. Avoid "dribbling" more fluid or repeatedly starting and stopping the flow. This can result in less accurate calibrations.

Make sure you meet the meter's minimum flowrate requirements:

1/2 inch meter	0.6 GPM (2.2 LPM)
1 inch meter	2.5 GPM (9.5 LPM)

The use of a uniformly dependable, accurate calibration container is recommended for the most accurate results. For best results, the meter should be installed and purged of air before field calibration.

Field Calibration with Computer Display

Field Calibration and Factory Calibration are defined in the Operation Section. Factory calibration settings are programmed into each computer during manufacturing, using Stoddard test solvent at 70° F (21° C). Settings are correct for light liquids such as water, gasoline or diesel. Readings using the Factory Calibration (FAC) may not be accurate in some situations, for example, "heavy" liquids such as motor oil under extreme temperature conditions, non-standard plumbing configurations or with fluids other than those mentioned above.

For improved accuracy under such conditions, the computer allows for "field" calibration, that is, user entry of custom calibration parameters. A "single point" calibration may yield acceptable accuracy when used in a non-standard application.

Field Calibration Procedures (Dispense/Display Method)

1. To field calibrate, press and hold the CALIBRATE and DISPLAY buttons for about 3 seconds until you see FLdCAL. Release both buttons and you will see dd000.0. You are now in the field calibration mode.
2. Dispense a known amount of fluid at a flowrate representative of the application. Any amount between .1 and 999.9 units can be used. Display will count up while fluid is flowing through the meter.
3. The DISPLAY button can then be pushed to select the digit location and the CALIBRATE button can be pushed to scroll the desired value at the blinking position. Edit the amount shown with the value that was dispensed above. Values from 000.1 to 999.9 can be entered.
4. When satisfied with the value, press both CALIBRATE and DISPLAY buttons simultaneously. CALEnd will be displayed and unit will go back to normal operation, less the FAC (factory calibration) icon.
5. The meter will now be operating with a custom calibration number unique to the dispense procedure. No unit of measure (gallon, litre, etc.) icon will be highlighted.

NOTE: To return to factory calibration (FAC), press and hold both CALIBRATION and DISPLAY buttons for about 3 seconds, until FAcCAL is displayed. Then release buttons. Unit should return to normal operation and FAC icon is visible.

NOTE: If the field calibration mode is entered and NO fluid is dispensed, then upon leaving, the computer will use data from the last successful field calibration.

MAINTENANCE

Verify Accuracy

Before use, check the turbine's accuracy and verify calibration.

1. Make sure there is no air in the system.
2. Measure an exact known volume into an accurate container.
3. Verify the volume against the readout or recording equipment.

NOTE: If necessary, use a correction factor to figure final volume.

For best results, accuracy should be verified periodically as part of a routine maintenance schedule.

Remove the Turbine

⚠ WARNING

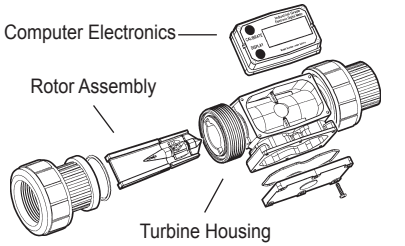
During turbine removal, liquid may spill. Follow the liquid manufacturer's safety precautions for clean up of minor spills.

1. Ensure all liquid is drained from the turbine. Wear protective clothing as necessary.
2. Loosen both union rings at the ends of the turbine.
3. If the turbine is not immediately installed again, cap lines as necessary.

Replace Internal Parts

1. Remove the turbine from the system. See Figure 5.

Figure 5



2. Use your fingers to gently remove the rotor assembly from the groove. Do not use force to remove the rotor assembly.

⚠ CAUTION

Handle the rotor carefully. Even small scratches or nicks can affect accuracy.

3. Use the procedure below to clean the turbine.
4. Install the rotor assembly into the turbine housing. Make sure the pointed end of the rotor assembly is inserted first. (see Figure 5) Guide the assembly into place using a smooth motion, little or no force is required.
5. Reinstall the turbine, purge the system of air, and verify accuracy before use.

Clean the Turbine

During use, the turbine should be kept full of liquid to ensure that drying does not occur inside the turbine. If drying or caking should occur, the rotor will stick or drag, affecting accuracy. To determine if the rotor is stuck or dragging, remove rotor from housing and physically turn rotor.

⚠ CAUTION

Never blow compressed air through the meter. It could damage the rotor.

1. Remove the turbine from the system following the directions above.
2. Carefully clean residue off all parts. Remove internal parts as detailed above. Note orientation carefully for correct assembly. Internal parts can be soaked for 10 to 15 minutes in compatible cleaning solutions. Use a soft brush or small probe to *carefully* remove residue from the rotor.

⚠ WARNING

Follow the liquid manufacturer's instructions for the disposal of contaminated cleaning solvents.

3. When the rotor turns freely, assemble and install it again following the instructions above.

Display Electronics

The display electronics are powered by lithium batteries. If the meter's readout should become dim, blank or the low battery message appears (see below), the batteries should be replaced. Replacement batteries can be ordered from the factory. See details in the Parts Section.

LobAtt

When batteries are disconnected or fail, the Batch and Cumulative Totals values will remain. Factory and Field Calibration Curves are retained in the meter's computer when power is lost.

It is strongly recommended that battery check and terminal cleaning be a part of a routine maintenance schedule. Battery terminals should be cleaned annually. Batteries can be replaced without removing the meter from the piping system.

Replacing the Batteries

1. Remove the corner screws from the meter face and lift the display electronics from the turbine.
2. Remove the batteries.
3. Check the battery terminals and remove any corrosion.

4. Install the new batteries and make sure the positive posts are positioned correctly. When the batteries are installed correctly, the computer powers on automatically and the readout displays information.
5. Make sure the seal is fully seated before placing the computer electronics on the turbine. Tighten the four screws.

TROUBLESHOOTING

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
METER IS NOT ACCURATE	1. Field Calibration not performed properly	Field calibrate again or select Factory Calibration.
	2. Factory Calibration not suitable for liquid being measured	Perform a Field Calibration according to Calibration Section.
	3. Meter operated below minimum flowrate	Increase flowrate.
	4. Meter partially clogged with dried liquid	Remove meter. Clean carefully. Make sure rotor spins freely.
	5. Turbine bearings partially clogged with dried liquid	Remove meter. Clean carefully. Make sure rotor spins freely.
	6. Sealant material wrapped around rotor	Remove meter. Make sure rotor spins freely.
	7. Installed too close to fittings	Install correctly.
	8. Installed too close to motors or electrically "noisy" environment	Install correctly.
	9. Improper connections to recording device	Check all electrical connections. Reference appropriate installation instructions.
	10. Accuracy needs verification	Complete normal accuracy verification procedures. Repeat periodically.
READOUT FADED OR BLANK	1. Batteries weak, dead, or not connected	Remove display electronics. Check and replace batteries if necessary.
	2. Display electronics defective	Contact the factory.
NORMAL FLOWRATE BUT METER DOES NOT COUNT (Meter comes on when DISPLAY button pushed.)	1. Field Calibration not performed correctly	Field Calibrate again or select Factory Calibration.
	2. Rotor stuck or damaged	Remove meter. Make sure rotor spins freely
	3. Sealant material wrapped around rotor	Remove meter. Make sure rotor spins freely
	4. Display electronics defective	Contact the factory.
REDUCED FLOWRATE & METER DOESN'T COUNT (Meter comes on when DISPLAY button pushed.)	1. Meter clogged with dried liquids	Remove meter. Clean carefully. Make sure rotor spins freely.
	2. Below minimum flowrate	Increase flow.

SPECIFICATIONS

All data on FTB891 and FTB893 determined with 1 centipoise stoddard solvent test fluid at 70° F (21° C).

Models **Size**	**FTB891** **1/2 in.**	**FTB893** **1 in.**
Linear Flow Range		
Gallons/minute (GPM)	1.2-12	5-50
Liters/minute (LPM)	4.54-45.4	18.9-190
Extended Flow Range		
Gallons/minute (GPM)	0.6-12	2.5-50
Liters/minute (LPM)	2.2-45.4	9.5-190
Maximum Flow		
Gallons/minute (GPM)	15	75
Liters/minute (LPM)	56.8	284
Fluid Velocity in Extended Range		
Feet/second	0.5-10.6	0.93-18.6
Meters/second	0.2-3.2	0.28-5.7
Maximum Pressure Drop in 10:1 Range		
PSIG	10.0	6.0
bar	0.68	0.40
Frequency Range in Linear Flow Range	45-450 Hz	45-475 Hz
Weight*		
Pounds	.75 lbs.	1.28 lbs.
Kilograms	.340 kg	.580 kg
Ship Weight*		
Pounds	1.13 lbs.	1.70 lbs.
Kilograms	.535 kg	.770 kg

* Computer electronics add 0.2 lbs. (0.1 kg) to total weight.

Performance	**FTB891**	**FTB893**
Linear Range:	10:1 @ ±2% of reading	10:1 @ ±1.5% of reading
Extended Range:	20:1 @ ±5.0% of reading	20:1 @ ±5.0% of reading
Repeatability:	± 0.3%	

Pressure Rating 100 PSIG (6.9 bar)

Wetted Components

Housing:	PVDF
Journal Bearings:	Ceramic (98% Alumina)
Shaft:	Ceramic (98% Alumina)
Rotor and Supports:	PVDF
O-Ring:	FKM (Standard)

Temperature Range

These temperatures are for the turbine without computer electronics. Final operational temperature range is determined by computer electronics or accessory modules.

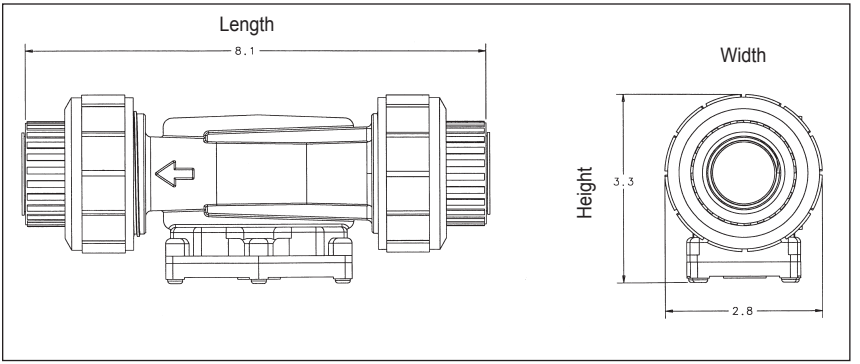
Operating Temperature

-20° to +180° F (-28° to 82° C)

Storage Temperature

-40° to 250° F (-40° to 121° C)

Sample Dimensions for FTB890 Series Model Shown



Dimensions

Models Size	FTB891 1/2 in.	FTB893 1 in.
A = Height:		
Inches	3.2 in.	3.3 in.
Centimeters	8.1 cm	8.3 cm
B = Width:		
Inches	2.1 in.	2.8 in.
Centimeters	5.3 cm	7.1 cm
C = Length:		
Inches	7.3 in.	8.1 in.
Centimeters	18.5 cm	20.5 cm

Computer electronics add 0.7 in. (1.8 cm) to height of turbine.

Display Specifications

Input Pulse Rate:

Minimum Pulse In:	DC
Minimum Coil Input:	10 Hz
Maximum Raw:	1,000 Hz

K-Factor:

Minimum:	.01 pulses/unit
Maximum:	999,999 pulses/ unit

Field Calibration:

Minimum Time:	10 seconds

Readout Totals:

Minimum Display:	0.01
Maximum Display:	999,999

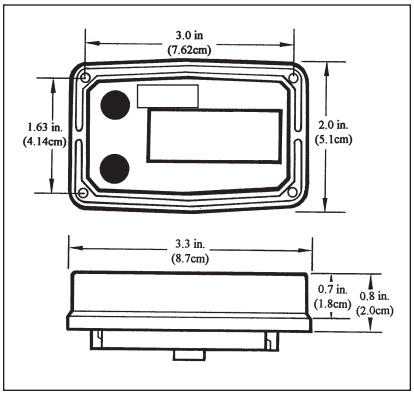
Temperatures:

Operational:	0° to +140° F (-18° to +60° C)
Storage:	-40° to +158° F (-40° to +70° C)

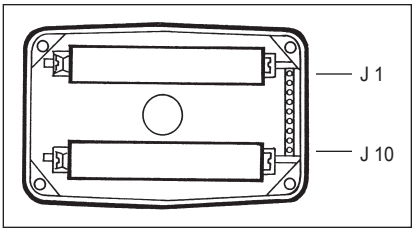
If wider operating temperature ranges are desired, reference information on Remote Kits.

Power:

Internal Power Supply:	2 Lithium Batteries at 3 volts each
Battery Life:	5 years
Optional External Power:	7-30 VDC



Display Electronics Terminal Connections



J-1 Reset
When connected by a jumper wire to Ground (J1-6), this has the same effect as initial power up and zeroes out all totalizers.

J-2 Pulse Signal Output
This supplies a high-level amplified open collector signal. Output will withstand a maximum open-circuit voltage of 60 volts DC and a maximum closed-circuit of 100 mA.

J-3 Not Used

J-4 Pulse Signal Input
Requires a sine or square wave with open-circuit voltage of 3-30 volts P-P, a maximum rise/fall rate of 0.01 V/µ second and a maximum frequency of 750 Hz.

J-5 Power Input
When used with Ground (J1-6), this has reverse polarity protection, but no on-board voltage regulation. Supplied voltage must be 5.75 volts DC ±5%.

J-6 Ground

J-7, 8, 9, 10 Programming interfaces. Not accessable to user-

NOTE: Applicable safety approvals are void if any external connections are made to computer electronics.

MODEL NUMBERS

Model No. w/Display	Model No.* w/o Display	Range GPM (LPM)	Extended Range Low Flow†	FNPT Size
FTB891	FTB891-ND	1.2-12 (4.54-45.4)	0.6-12 (2.2-45.4)	1/2"
FTB893	FTB893-ND	5-50 (18.9-190)	2.5-50 (9.5-190)	1"

* Requires signal output module P/N - FLSC790-P-ND ordered separately.
† Extended low flow range and field calibration for viscosity available on - ND units w/o display.

PARTS & ACCESSORIES

Order Replacement Kits with the part numbers given here.

Part Number	Description
FTB890-ORING	O-Ring (Computer)
FTB891-RK	FTB891 (1/2 inch) Rotor Assembly Replacement Kit
FTB893-RK	FTB893 (1 inch) Rotor Assembly Replacement Kit
FTB891-ORING	O-Ring FKM Union Fitting (1/2 inch)
FTB893-ORING	O-Ring FKM Union Fitting (1 inch)

Field Installable Options and Accessories

Model Number	Description
FLSC790-MA	4-20 mAdc Output Module
FLSC790-P	Pulse Output Module (open collector output)
FLSC790-P-DC	External Power Module for FLSC790-P (9-30Vdc)
FTB790-RK	Remote Display Kit Module
FTB790-RK-FM	FM Approved Remote Display Kit Module
FLSC790-BATT	Replacement Batteries
FLSC790-P-ND	Pulse Output for Models without Displays (-ND suffix) (open collector output)

Except as noted, Options and Accessories are for Display Models only and only one Module may be installed per unit. All models are supplied with 10 ft. cable. Cable may be cut or extended as required. Customer supplied pull-up resistor required, 820 ohm (min).

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 theproduct, 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.

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