



TECHNICAL MANUAL

for
Series
TFS
Centrifugal Separators



Complete information for
Engineering, Installation, Operation & Maintenance
of Tower-Flo® Series TFS Centrifugal Separators

UNITED
INDUSTRIES
INCORPORATED

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Separator Model Number: _____ Separator Serial Number: _____

Warrant only to _____,

the original retail purchaser, that the products which are manufactured by United Industries, Inc. are free from defects in material and/or workmanship for a period of twelve months from the date of documented installation or, in absence of documented installation date, 12 months from the date of factory shipment. The warranty registration card in this manual MUST be completed and returned to United Industries, Inc. in order to establish the date of installation and extend the warranty period. If, within the period provided by this warranty, any such product shall prove defective, it shall be either repaired or replaced.

For repair/replacement, the original retail purchaser shall first contact the installing dealer, as soon as possible after discovery of the defect, but in all events prior to the expiration date of the warranty. Upon notification by the dealer, United Industries, Inc., 202 East Cleveland, Sterling, Kansas 67579 will advise the purchaser of the address to which the defective item may be shipped. The serial number and the date of purchase of the item must be included. Regular UPS cost for shipping replacement part(s) to the customer will be borne by United Industries, Inc.; shipping other than regular service will be at the customer's expense. Customer is responsible for cost of shipping defective part(s) back to United Industries.

If an installing dealer was not involved, then the customer should contact United Industries, Inc.

EXCLUSIONS

1. This warranty shall not apply to any failures resulting from: negligence, abuse, misuse, misapplication, improper installation, alteration or modification, chemical corrosion, or improper maintenance.
2. Any items manufactured by other companies and used by United Industries in its products may carry warranties by the original manufacturers.
3. United Industries is not liable for incidental or consequential damages, loss of time, inconvenience, incidental expenses, labor or material charges in connection with removal or replacement of the equipment.

United Industries is not responsible for any implied warranties or representations by others, and the foregoing warranty is exclusive and in lieu of all warranties provided herein. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

IMPORTANT

Read and fully understand the WARNING labels on the equipment. DO NOT OPERATE this unit if any unsafe conditions exist.

WARNING

THIS CENTRIFUGAL SEPARATOR SYSTEM OPERATES UNDER PRESSURE. DO NOT OPEN WHILE PUMP IS RUNNING AND/OR UNTIL ALL PRESSURE IS RELEASED. SECURELY TIGHTEN SEPARATOR VESSEL OPENING(S) AND PUMP PRE-STRAINER LID ACCORDING TO MANUFACTURER'S INSTRUCTIONS. RAISE PRESSURE SLOWLY. **DO NOT EXCEED THE MAXIMUM WORKING PRESSURE OF THE SEPARATOR VESSEL.**

DANGER! EXTREME CARE MUST BE TAKEN DURING PRESSURE TESTS. FAILURE TO FOLLOW THESE INSTRUCTIONS EXPLICITLY CAN RESULT IN PERSONAL INJURY.

Continuous sidestream filtration or separation for removal of suspended solids is one, very important portion of a total water quality management program, which should also include the services of competent water treatment professionals for proper control of water hardness, pH, and biological contaminants.

EXTEND YOUR WARRANTY!

COMPLETE AND RETURN THIS WARRANTY REGISTRATION CARD WITHIN 10 DAYS OF INSTALLING YOUR CENTRIFUGAL SEPARATOR TO EXTEND YOUR WARRANTY PERIOD!

Congratulations on your selection of a TOWER-FLO® Centrifugal Separator System by United Industries, Inc.!

Your TOWER-FLO Centrifugal Separator is designed and manufactured for years of virtually maintenance-free service. As with any mechanical equipment, however, components can and do fail. If you ever have a problem, Tower-Flo is committed to supporting you and helping you get your separator back in operation as soon as possible, whether it remains under warranty or not.

Your TOWER-FLO Centrifugal Separator is covered by a limited warranty as stated on the previous page. This warranty is for 12 months from the date of documented installation or, in the absence of documented installation date, 12 months from the date of factory shipment. **In order to receive the maximum warranty benefit, you must complete and return the Warranty Registration Card below within 10 days of installation to register your warranty and ensure your warranty rights.** Failure to complete and return this Warranty Registration Card will result in your warranty being limited to 12 months from the date of factory shipment.

For Your Records

Date of Installation _____ Date Warranty Registration Card Mailed _____

Complete the card below. Cut along dotted line. Return to:

Warranty Registration
 Tower-Flo Division
 United Industries, Inc.
 P. O. Box 58
 Sterling, KS 67579

TOWER-FLO® **Manufacturer's Warranty Registration Card**

Separator Serial Number: _____

Purchased by: Company: _____

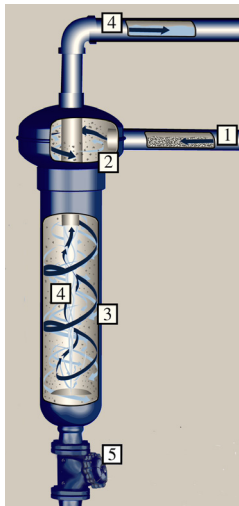
Address: _____

City: _____ State: _____ Zip: _____

Contact Person: _____ Phone: _____

Date of Installation: _____

Your Tower-Flo® Centrifugal Separator has been designed to remove seperable solids 50 microns (0.00194”) or larger from circulated cooling tower / condenser water. In addition to a particle’s size, its shape and buoyancy affects whether or not it can be removed from the water. A centrifugal separator will remove small visible particles, such as dirt, but it may not remove larger, more bouyant materials like leaves or cottonwood seeds. As a general rule, if particles in a water sample sink within 30 seconds, a Tower-Flo Centrifugal Separator will remove these particles in the first pass.



**CENTRIFUGAL FORCE AND GRAVITY
DRIVE DIRT OUT OF RECIRCULATED WATER**

1. A circulating pump drives dirty water into the separator’s tangential inlet, and the water is forced into a spinning action.
2. The spinning motion imparts centrifugal force, throwing the debris to the outside wall of the separator.
3. The friction (caused from the flow rubbing against the separator’s steel body) creates a “shear layer” of low velocity fluid, allowing the debris to fall to the bottom of the separator.
4. The clean water travels through a vortex, out through the center discharge and back to the system.
5. Debris accumulates in the bottom of the separator until either a manual valve or an automatic, time-actuated valve at the bottom of the separator opens, and the debris is flushed to the sanitary sewer.

A Tower-Flo Centrifugal Separator can only remove separable solids that are pumped to it. Repeat, any particle removal device can only remove solids that are pumped to it. In order to work the most effectively, a Tower-Flo Centrifugal Separator must be installed in a manner the promotes movement of solids to the separator for removal.

TOWER-FLO Centrifugal Separators are available in three basic models:

- **Series TFS separator only.**
- Series TFSP separator, automatic purge valve and controls, pump, motor, strainer and motor controls.
- Series TFSR separator, pump, motor, stainer ,motor controls and continuous, zero discharge purge through a recovery bag filter, with bag monitor alarm system, returned to pump suction.

Details of the standard, optional, and additional components for this **Series TFS** Centrifugal Separator are found in **Project Specifications** document found on the following page 6.

150 PSI MAX • 120°F MAX • SEPARABLE SOLIDS TO 50 MICRONS

Model Number	Flow Range GPM	Connection Size	Purge Size
TFS-0125	36 - 67	1-1/4" mpt	1" fpt
TFS-0150	40 - 73	1-1/2" mpt	1" fpt
TFS-0200	59 - 110	2" mpt	1" fpt
TFS-0250	66 - 125	2-1/2" mpt	1" fpt
TFS-0300	125 - 240	3" flng	1" fpt

Model Number	Flow Range GPM	Connection Size	Purge Size
TFS-0400	260 - 480	4" flng	1" fpt
TFS-0500	335 - 615	5" flng	1" fpt
TFS-0600	600 - 1100	6" flng	1" fpt
TFS-0800	1200 - 2200	8" flng	1" fpt
TFS-1000	1600 - 2925	10" flng	1" fpt

TOWER-FLO® **TFS Series** separators are separators only with no optional equipment unless specified. Each centrifugal separator shall be shipped as a complete factory assembled and tested unit.

Project: _____ Date: _____

The TOWER-FLO Centrifugal Separator being specified for this project is a Model **TFS-**_____ with a flow rate range of _____ GPM. _____ unit(s) are specified and each unit shall be equipped with the following components:

COMPONENT SPECIFICATION

- SEPARATOR** **Standard:** _____", _____ inlet and outlet connections, Sch 40 steel construction; exterior primer after wire brush cleaning ; exterior finish coating of industrial grade enamel; 150 PSI maximum operating pressure; 120°F maximum operating temperature, 1/4" plugged ports for inlet/outlet pressure gauges (gauges not included), _____" plugged port for air bleed (valve not included), and _____" fpt purge connection.
- Option:** stainless steel construction.
 - Option:** ASME Code Stamped for MAWP of 150 PSIG @ 210°F.
 - Option:** Maximum operating pressure of _____ PSI.
 - Option:** Maximum operating temperature of _____°F.
 - Option:** Bracket mount for TFS-0150 through TFS-0300.
 - Option:** Foot mount for TFS-0150 through TFS-0300.
 - Option:** Clean out port, 3" x 4" for TFS-0150 through TFS-0300.
 - Option:** Clean out port, 4" x 6" for TFS-0400 through TFS-0600.
 - Option:** Inlet/outlet pressure gauges, 0-60 PSI, with 1/4" t-handle isolation valve.
 - Option:** 22-1/2" mounting stand.
 - Option:** _____" manual purge valve;
 - Option:** _____" automatic purge valve assembly including: 2-way brass ball valve with 24 VAC fail-safe actuator that closes in the event of power failure; 2-way manual brass ball valve for isolation; clear PVC pipe for viewing purge liquid clarity; all fittings for complete installation to separator purge connection; purge control panel for timer controlled purge frequency and duration, in NEMA 4X fiberglass enclosure, with manual purge push-button, requiring either _____ 120/1/60 or _____ 220/1/60 primary power supply, and panel shipped loose for field mounting and field wiring of panel to actuator by others.
 - Option:** Convert automatic purge valve and control to _____ 120/1/50 or _____ 240/1/50.
 - Option:** Inlet isolation valve _____.
 - Option:** Outlet isolation valve _____.

REPLACE THIS PAGE IN O&M PDF WITH DRAWING OF SPECIFIC UNIT SIZE

The Tower-Flo® Series TFS Centrifugal Separator is a simple separator body. It must be supplied with flowing water and a purge valve by others. As with any equipment, proper installation and maintenance will improve performance and life expectancy. The following suggestions are designed to assist you in installing and operating your Tower-Flo Series TFS Centrifugal Separator, however, it does not exclude other methods or procedures proven by your own experience.

STEP 1. UNPACK AND INSPECT THE SEPARATOR SYSTEM

Inspect for signs of physical damage BEFORE accepting and signing the Bill of Lading. Contact the trucking company's claims department immediately if any damage is apparent. Do not operate equipment if there is any damage. Consult Tower-Flo.

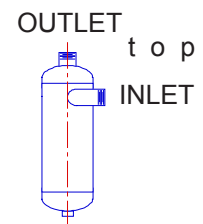
STEP 2. RIGGING

Check weight of the unit and survey handling facilities to assure safe lifting. These units, particularly larger sizes, are bulky and require skilled handling. Caution must be taken not to damage the equipment, especially the pipe connections.

STEP 3. LOCATION

- A) Select a location that allows for convenience, accessibility and serviceability.
- B) **Protect from freezing!** If the separator is to operate year-round, exposure to winter conditions should be a considered in your location decision. Do not place the unit outside in any geographical locations where freezing may take place. The separator risks freezing if the ambient air temperature falls below 32°F (0°C). Even with water flowing through it, the the separator's bottom collection chamber and its purge piping have motionless water that can freeze and rupture.
- C) The TFS should be placed anywhere on the discharge side of a circulating pump. Avoid all unnecessary piping obstructions and loops.

- D) The TFS separator's inlet is the tangential pipe. The outlet is the pipe that runs out of the dome. Vertical installation is recommended for best results (outlet pointing straight up, purge on the bottom). The separator can be tilted if vertical installation is a problem (we suggest that you keep it vertical, however).



- D) If any of the above suggestions create a problem, consult your local Tower-Flo Representative or contact the Tower-Flo Division of United Industries, Inc., for recommendations on alternative locations.

STEP 4. PLUMBING

- A) Selection of material (PVC, black, copper, etc.) for field plumbing is by others and should take into consideration the material's suitability for the operating conditions (i.e. temperature, pressure) or any water treatments or additives (i.e. glycols).
- B) The most important requirement for good solid separation is proper flow rate to the TFS separator. The separator has a flow rate range within which maximum separation performance will occur. Since the TFS separator does not include a factory-matched pump, it is up to the customer to engineer the total dynamic head (TDH) and pipe sizing issues in order to deliver the proper flow rate to the separator. Avoid all unnecessary piping obstructions which will increase TDH.
- 1) Inlet/Outlet pressure gauges are required to judge your system's performance. If the optional gauges were not elected, the TFS Separator has 1/4" ports for the addition of pressure gauges by the customer. Use of brass pet cocks between the separator and pressure gauge are recommended as they will allow the customer to clean and replace the pressure gauge while the separator is in operation.
- C) The TFS Separator **must** be placed on the pressure (discharge) side of a circulating pump. It will not work on the suction side.
- D) Connect piping from water source* to the TFS Separator INLET. If optional isolation valves were not elected, add isolation valve for service.
- E) Install return piping from the TFS separator OUTLET on the top of the separator back to water source*. Install the return at least 10 pipe diameters downstream from the suction connection. If optional isolation valves were not elected, add isolation valve for service.
- F) Install waste piping from the Purge connection on the bottom of the separator to suitable waste line. If allowable, the purge piping should be connected to the sanitary sewer line. Consult local code. Make certain the disposal drain will handle the separator's stated purge flow rate and duration.
- 1) If the optional manual or automatic purge valve was not elected, the customer is responsible for incorporating purge valve and control in the field piping to waste.
 - 2.) If the optional manual or automatic purge valve was elected, install the purge valve assembly which shipped separate for field installation. Purge piping must be supported independently. The clear PVC pipe cannot support the weight of the purge valve. **NOTE:** the standard diaphragm Purge Valve is installed with the directional arrow pointing towards the separator (backwards). This is done intentionally to make the valve a "Fail-Safe" valve.

* NOTE: Tower-Flo® recommends the installation of unions (for threaded steel pipe or solvent welded PVC connections) and valves (if not supplied by Tower-Flo) in these two plumbing connections for ease of isolation, service, or removal should it become necessary for any reason.

- E) After piping is complete, all joints should be leak tested.

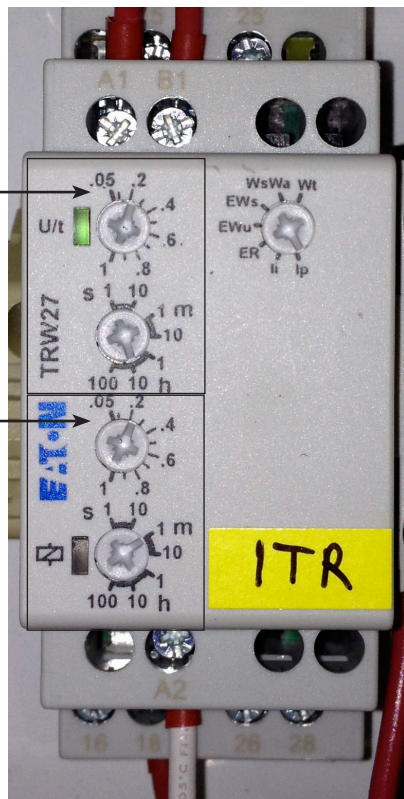
STEP 5. ELECTRICAL

Tower-Flo Series TFS centrifugal separators have no electrical service requirements unless the optional automatic purge valve has been elected.

IF THE OPTIONAL AUTOMATIC PURGE VALVE ASSEMBLY HAS BEEN ELECTED, FOLLOW DIRECTIONS ON NEXT PAGE.

IF THE OPTIONAL AUTOMATIC PURGE VALVE ASSEMBLY HAS BEEN ELECTED:

- A) The control panel is shipped separate for field installation by others. The control panel enclosure is NEMA 4X and is suitable for indoor or outdoor installation. Mount it in a convenient location in sight of the separator (operators may need to push the "MANUAL PURGE" button and the separator should be in sight if this action is required).
- B) Connect the control panel to primary power supply (either 120/1/60 or 220/1/50 as indicated on serial decal).
- C) Make field connection between the control panel and the purge valve actuator.
- D) Select power supply and actuator wire size and conduit following all applicable federal, state, and local codes.
- E) The electrically motorized purge valve is normally closed. If a power failure occurs when the ball valve is open, the valve will close.
- F) The Eaton purge timer (TRW27 pictured below) is mounted in the control panel. It is set to function **Ip** and this setting should never be changed. It has two adjustable time cycles: purge **frequency** and purge **duration**. Both time cycles use two dials for their time setting. The upper dials is a percentage setting adjustable from 5% (.05) to 100% (1). The lower dial is a time-lapse setting adjustable from either: 1 second (1s) to 10 seconds; 1 minute (1m) to 10 minutes (10), or from 1 hour (1h) to 100 hours.



FREQUENCY
Factory set to 20% of 10 hours or every 2 hours.

DURATION
Factory set to 20% of 1 minute or lasting 12 seconds.

The factory setting for purge **frequency & duration** is to purge once every two (2) hours (**frequency**) and to hold the purge valve open for twelve (12) seconds (**duration**) each time it purges. This is accomplished by setting **frequency** to 20% of 10 hours and by setting **duration** to 20% of 1 minute. This means that the accumulated solids visible in the purge sight-tube and gathering in the bottom of the separator will be flushed out for 12 seconds every 2 hours.

Experience with your specific system will dictate when and if there is a need to adjust these settings. The purge valve assembly includes a section of clear PVC piping – a sight-tube – ahead of the purge valve for visual surveillance of dirt purging. By observing the amount of dirt accumulation in the sight-tube and the clarity of the water going to drain during an actual purge, the operator can determine if the purge **frequency** and **duration** are adequate to flush out the actual amount of accumulated debris:

- if the sight-tube is full of debris well before the next purge, **shorten** the **frequency** setting;
- if the sight-tube is nearly empty of debris at the next purge, **lengthen** the **frequency** setting;
- if the purge water runs clear well before the end of a purge, **shorten** the purge **duration**;
- if the purge water still runs dirty at the end of a purge, **lengthen** the purge **duration**;

Expect and plan to adjust your settings from season to season.

START UP PROCEDURE

- A) Close any drain, vent, and purge valves.
- B) Open supply isolation valve(s). Keep the discharge valve(s) closed.
- C) Check for leaks.
- D) Open discharge valve slowly. Pressure should read a relatively high number against the shut discharge valve (referred to as "dead head pressure") and pressure should lower as discharge valve is opened.
- E) On larger separators, Tower-Flo® supplies a vent on the upper dome of the separator. Slightly open the square head plug and let the air out of the separator.
- F) Tower-Flo recommends after a day or so of normal operation to record the normal operating pressure of the separator. Changes in this benchmark start-up pressure can very helpful to any future problem trouble-shooting.

RECORD YOUR START UP CONDITIONS	
Start Up Date	_____
Discharge Pressure	_____
Voltages: L1	_____
L2	_____
L3	_____
Motor Amp Draw	_____

GENERAL OPERATING INFORMATION

- A) Optimal separation occurs at a pressure drop between 3 to 10 PSIG. The concern is **pressure drop** rather than pressure.
 - 1) If the pressure drop is higher than 10 PSIG, the system is circulating water at a higher flow rate than is recommended. A valve on the separator's outlet side can throttle the flow until the pressure drop falls within range. As flow is throttled, the pressure increases and the pressure drop decreases.
 - 2) If the pressure drop is below 3 PSI, the system is circulating water at a lower flow rate than is recommended. The pump and field piping must be re-analyzed to determine actual pump performance and piping TDH.
- B) The centrifugal separator requires particles to be at least 20% heavier than water for optimum separation. A material's buoyancy also plays an important role in the separator's ability to remove solids. Leaves, cottonwood seeds, etc. may be difficult to draw into the pump for removal.

WARNING

USE GOOD JUDGEMENT AND COMMON SENSE AT ALL TIMES!
LOCK OUT PUMP ELECTRICAL POWER BEFORE MAINTAINING!

The TFS Centrifugal Separator does not have moving parts, and it does not require preventive maintenance. It will last many years in normal service.

If checking on any electrical components, make sure all power is off to the unit.

If optional automatic purge valve was elected, the relays, motorized ball, and/or solenoid may eventually wear out, but they do not require preventive maintenance.

If any maintenance is required, be sure that all pump disconnects are locked and tagged in the "Off" position. Insure the pump(s) cannot be restarted by another employee or automatic controller during servicing.

Always follow the start-up procedures found in this manual anytime you restart the system.

IF OPTIONAL AUTOMATIC PURGE VALVE WAS ELECTED, SEPARATOR IS NOT PURGING

1. Is electricity present? Is the "Power On" light illuminated? Is the fuse blown (not supplied by Tower-Flo®)? 120 volt is required to operate the purge valve.
2. Is the motorized ball valve timer set correctly? Check the settings. It may be set to purge as infrequently as every 30 hours.
3. Is the manual brass ball valve upstream of the purge valve closed?
4. Is the purge valve operable? Depress "Push to Test" to manually purge the system. The valve will cycle 180 degrees.
5. Is the purge piping or the valve plugged? Depress "Push to Test" to manually purge the system. You may need to clean out the piping. Shorten the timer cycle times to prevent this from happening in the future.
6. Is one of the two fuses located within the motorized ball valve enclosure blown? If the "Power On" LED light is not on, check Fuse F1. If the "Power On" LED light is on but the "Push to Test" button does not work, check Fuse F2. Disconnect power from the motorized ball valve before removing its cover.

IF OPTIONAL AUTOMATIC PURGE VALVE WAS ELECTED, SEPARATOR IS ALWAYS PURGING

1. Is the motorized ball valve stuck in the "ON" position? Close the manual brass ball valve to see if the purging stops.
2. Is the motorized ball valve lodged open from some debris?