



Water Control Devices

WT Series Actuator Operations Manual

WATCH TECHNOLOGIES WT SERIES

Actuator Operations Manual

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06/2016

Contents

Introduction	1
Theory of Operation	1
Installation and Start-up	3
Safety Information	3
Installation – Rising Stem	4
Installation – Horizontal Gearlift	12
Seasonal Start-Up	16
Operation	18
Manual Operation	19
Automated Operation Using Internal RTU	20
Handwheel Operation	20
Maintenance and Troubleshooting	21
Troubleshooting Guide	22
Shut-Down and Storage	23
System Integration and Options	24
Electrical System	24
Gate Blade Position Sensor	25
Solar Panel and Charge Controller	27
RUG3 Remote Terminal Unit	28
WT Actuator and Gearmotor Specifications	29 – 39
Warranty Information	41

Introduction

The WT Series of gate control actuators from Watch Technologies have been developed for the ultimate control of a wide variety of applications.

The WT Series consists of five distinct models to address the needs of both vertical rising stem gate users as well as systems utilizing horizontal shaft gear lifts. A wide variety of drive motors enable the WT Series to align with specific torque requirements. The WT Series can also be configured with an embedded Remote Terminal Unit (RTU) which enables the actuator to function as a stand-alone, smart device that can remotely control gates based upon user-defined control points and water status parameters (flow, level).

Theory of Operation

The philosophy behind each Watch Technologies product is providing long-lived, reliable devices that can be easily installed, maintained, adjusted and upgraded by our customers using simple tools and basic skills.

The actuator system is DC-powered lending itself easily to solar applications particularly useful in retrofit situations where power is not readily available. The power transmission system consists of a high-torque DC permanent magnet gear motor, steel roller chain, and sprockets. In the event of a power loss or failure, the unique removable keyed drive design allows instant conversion to manual operations using a hand wheel.

The system consists of components that are specified for long-life yet are readily available in the unlikely event replacements are required in the future. In addition, the system is designed to allow easy integration of a single actuator or set of actuators into a larger control system.

Table 1 below lists the basic model numbers and general application information for the WT Series. A 'V' designation indicates a rising stem application; 'H' a horizontal gear lift application. Similarly, an 'S' suffix indicates a "Smart" model with an integrated RTU.

Table 1. WT Series Product Models

MODEL	Application	Output Torque Range (ft-lb) ¹	Specifications Page
WT-100V	Vertical Stem	12 – 24	31
WT-100V-S	Vertical Stem w/RTU	12 – 24	31
WT-200V	Vertical Stem	25 – 50	34
WT-200V-S	Vertical Stem w/RTU	25 – 50	34
WT-200H	Horizontal Gearlift	25 – 50	37
WT-200H-S	Horizontal Gearlift w/RTU	25 – 50	37
WT-300V	Vertical Stem	55 – 220	36
WT-300V-S	Vertical Stem w/ RTU	55 – 220	36
WT-300H	Horizontal Gearlift	55 – 220	38
WT-300H-S	Horizontal Gearlift w/RTU	55 – 220	38

This manual is organized into four sections relevant to ownership of a WT Series actuator: [Installation & Start Up](#), [Operation](#), [Maintenance & Troubleshooting](#), and [Shut Down & Storage](#). Within each section, common information is included as well as sub-sections that provide specific information relative to certain models. Please familiarize yourself with all of the information relevant to your model, but most importantly, review the [Safety Information](#) included in the Start Up section below. In addition to the basic actuator life-cycle, the [System Integration & Options](#) section provides key information for integration into a water control system.

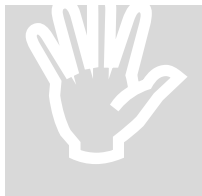
¹ This data is for 1:1 power transmission ratios; WT-300 numbers include both 12VDC and 24VDC systems.

Installation and Start Up

The WT Series of gate control actuators may be installed on the following types of water control gates:

1. Rising stem gates and valves
2. Gear lift operated gates and valve (with or without freestanding pedestal)

If your actuator has been installed by trained Watch Technology personnel, you may skip the following installation section and proceed to the Start Up section.



Safety Information

The WT Series actuators are battery-powered systems with electric shock potential and can develop enough torque to cause serious bodily harm. Before accessing any internal components, ensure that the system is turned off and the battery negative terminal is disconnected.

Use caution when operating the system with the chain guard removed (H Models) or the door open (V Models) as the chain and sprockets will be exposed to fingers, hands, and clothing that can become caught in the drive assembly.

Solar powered systems exhibit electric shock potential. Isolate the panel conductors by removing the negative wire from the charge controller before attempting any adjustments or service.

Installation

Typical installations other than pedestal mounted horizontal systems will require that the actuator be securely mounted to the gate frame or other framework that is solidly secured to the gate frame.

Proper performance of the water control system depends upon condition of the gate or valve prior to installation. A severely bent stem can result in excessive stem nut wear or bent or damaged blade or seal assembly may require excessive torque to move the blade eventually causing abnormal wear to the actuator gear motor. The frame structure must be sufficient to support the weight of the actuator in addition to the torque developed during operation. Additional support members or gusseting might be required, as typical hand wheel operated systems were not manufactured to handle these additional loads. Consult with Watch Technologies if there is any

question regarding the strength of the gate frame or how to look at supporting an actuator.

Common rising stem system installations are depicted in the images below. Note that a typical WT Series actuator may be shown, not necessarily your specific model. This installation guide assumes a retrofit to an installed gate but the same procedure is followed if working on a new gate not installed.

Important

Before attempting actuator installation, perform a concise visual assessment of the gate or valve system. Address any issues such as debris and contamination that may restrict gate blade or stem motion as well as any damage to items such as frames, gear lifts, stems, seals, conduit, wiring, or non-functional limit switches and limit flags. Watch Technologies cannot be held liable for damage to gate or valve systems caused by improper application of our actuators.

Rising Stem Installation Procedure

(Models WT-100V, WT-200V, WT-300V)

With the structural and functional condition of the gate or valve systems verified, the specific mounting surface for the actuator needs to be assessed. The surface needs to be flat within 1/16" across the actuator mounting area and perpendicular to the stem travel. Correct any anomalies by surface grinding or stem alignment before proceeding with installation.

1. Unpack the WT Series actuator, using caution to avoid damaging the powder coated finish. An exploded view of the actuator assembly in **Error! Reference source not found.** below lists the system parts. The actuator is shipped assembled and fully tested; the disassembly required for installation will not affect factory performance if performed as directed below.

WATER CONTROL DEVICES

Item No.	Part Name
1	Lift nut cover, AM-249 R-E
2	Gasket
3	Oil seal
4	Nylon thrust bushing
5	Upper needle bearing set
6	Driven sprocket
7	Bronze lift nut
8	Lower needle bearing set
9	Riser bushing
10	#40 Roller chain
11	Actuator enclosure assembly (AM-110,AM-210,AM-310)
12	Versa-latch
13	Motor mount (AM-145,AM-245)
14	Stainless steel piano hinge
15	Control panel
16	RTX Position sensor sprocket, 40B24 Nylon
17	RTX Position sensor bracket
18	RTX-position sensor-Unimeasure
19	Actuator lid assembly (AM-111,AM-211,AM-311)
20	Removable drive key
21	Drive sprocket
22	Nylon washer, .760x1.25x.125
23	WT-200-12VDC electric motor

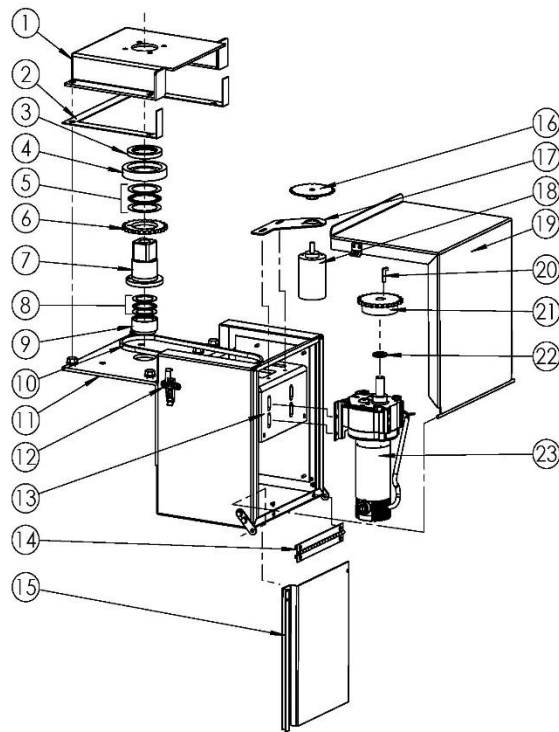


Figure 1. Exploded View of WT Series Vertical Actuator (WT-200v shown)

2. Tools required for installation include the following
 - a. 7/16", 9/16", and 3/4" wrenches or sockets
 - b. #2 Phillips screwdriver
 - c. 5/32" hex key wrench
 - d. Needle-nose pliers
 - e. 8" or larger C-clamps
 - f. Center punch and hammer
 - g. Drill with bits from 5/32" to 1/2" diameter
3. Remove existing hand wheel, lift nut, and associated hardware. Clean the stem threads and mounting surface.



Figure 1. Gate Frame with Hand Wheel and Hardware Removed

4. Prepare actuator for attachment to gate frame by removing lift nut cover, actuator door, thrust washer, roller chain, and lift nut sprocket.
 - a. To remove lift nut cover, remove four $\frac{1}{2}$ -13 cap screws using $\frac{3}{4}$ " wrench or socket. To avoid loss, rethread cap screws back into mounting plate.
 - b. To remove the actuator door, loosen the four $\frac{1}{4}$ -20 cap screws that hold the two hinge plates using a $\frac{7}{16}$ " wrench or socket. After removal of any fastener or padlock from the enclosure latching tabs, slide the door pivot rod out of the hinge plates.
 - c. In order to facilitate removal of the roller chain and lift nut sprocket, the motor drive key might need to be removed, and the chain tension reduced by loosening motor mount lock screws and tensioning screws using $\frac{3}{4}$ " and $\frac{9}{16}$ " wrenches (refer to Figure 2). If necessary, remove master link from roller chain using needle-nose pliers, carefully retaining clip.

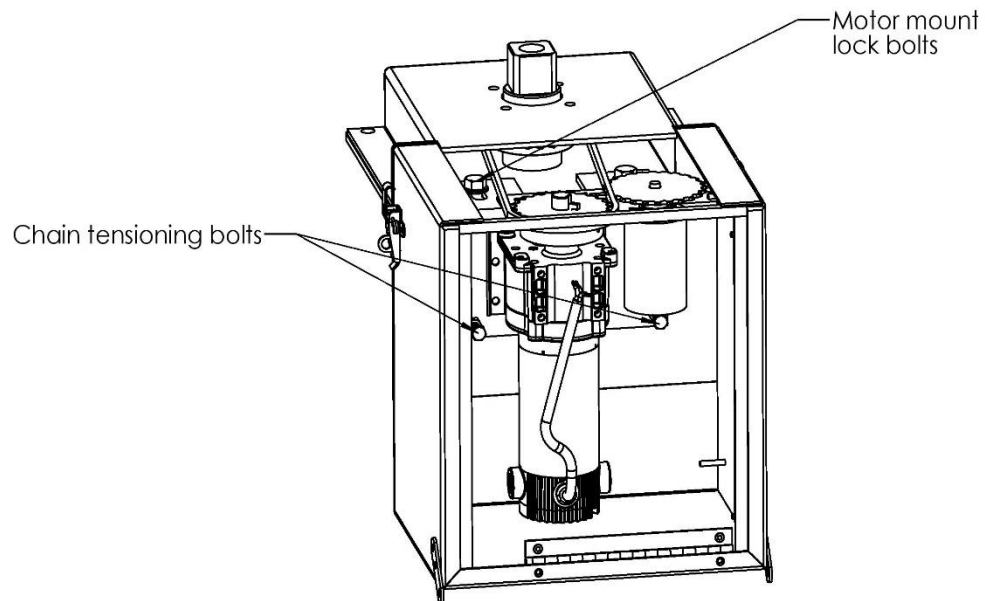


Figure 3. Vertical Actuator Chain Tension Adjustments
(WT-200V shown without enclosure cover and control panel.)

Figure 2. Vertical Actuator Chain Tension Adjustments (WT-200V-S shown)

5. Place actuator along with riser bushing over lift stem and lightly clamp actuator mounting plate to gate mounting surface with the C-clamps, using cardboard or other media to protect the finish. Ensure that the riser bushing is fully seated into the mounting plate. The shoulder of the bushing should rest flush with the top surface of the mounting plate.

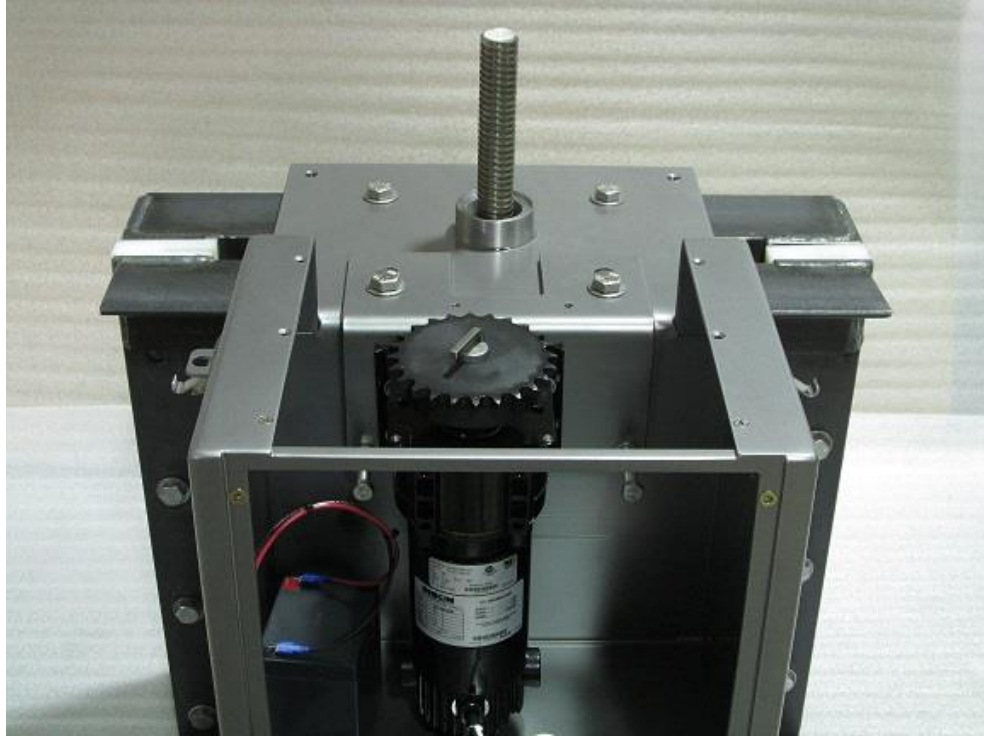


Figure 3. Actuator and Riser Bushing Placed on Yoke of Gate

6. Thread lift nut sprocket onto stem, align with riser bushing by fully seating it into backside bore of sprocket, and tighten into place. **IMPORTANT:** Verify that the sprocket is fully seated and that the riser/sprocket interface is fully lubricated.



Figure 4. Lift Nut Sprocket in Place on Riser Bushing

7. Square actuator to gate frame and clamp firmly verifying alignment and clearance of stem in gate. Verify that the actuator mounting plate is resting solidly on the frame with no interference. Provide any clearance holes needed for motor mount cap screws, etc.
8. Drill mounting holes through actuator mounting plate and the gate yoke or gate top horizontal member. Watch Technologies highly recommends securing the actuator to the gate frame using $\frac{1}{2}$ " stainless steel locking fasteners, with a minimum of three (3) mounting points. Use as large of a bolt pattern as feasible, attempting to balance load evenly around the lift stem. Remove lift nut sprocket if necessary to enable access.
9. NOTE: If necessary, the threads for the two motor mount lock screws may be used to attach the actuator. This is accomplished by marking their location on the gate and drilling $\frac{9}{16}$ " clearance holes. Replace the motor mount lock screws with $\frac{1}{2}$ " cap screws of sufficient length to allow mounting from the gate side and to protrude $\frac{1}{2}$ " above the top surface of the motor mount allowing for $\frac{1}{2}$ " nuts and lock washers. When using this method, ensure clearance

between the nut and the roller chain before placing in service. Use of a jam nut or other low profile nut may be required.

10. Fasten the actuator to the gate using stainless steel fasteners. The use of a copper- or molybdenum-based anti-seize compound to avoid thread galling is encouraged for ease of future service. Torque the fasteners to the supplier's recommendations or if unavailable, use 45 ft-lbs for lubricated fasteners.
11. Thread lift nut sprocket onto stem and seat onto riser bushing. **IMPORTANT:** Verify that the sprocket is fully seated and that the riser/sprocket interface is fully lubricated. Reattach chain. This may require motor mount adjustments (Figure 2) or removal of the chain master link in order to reconnect.

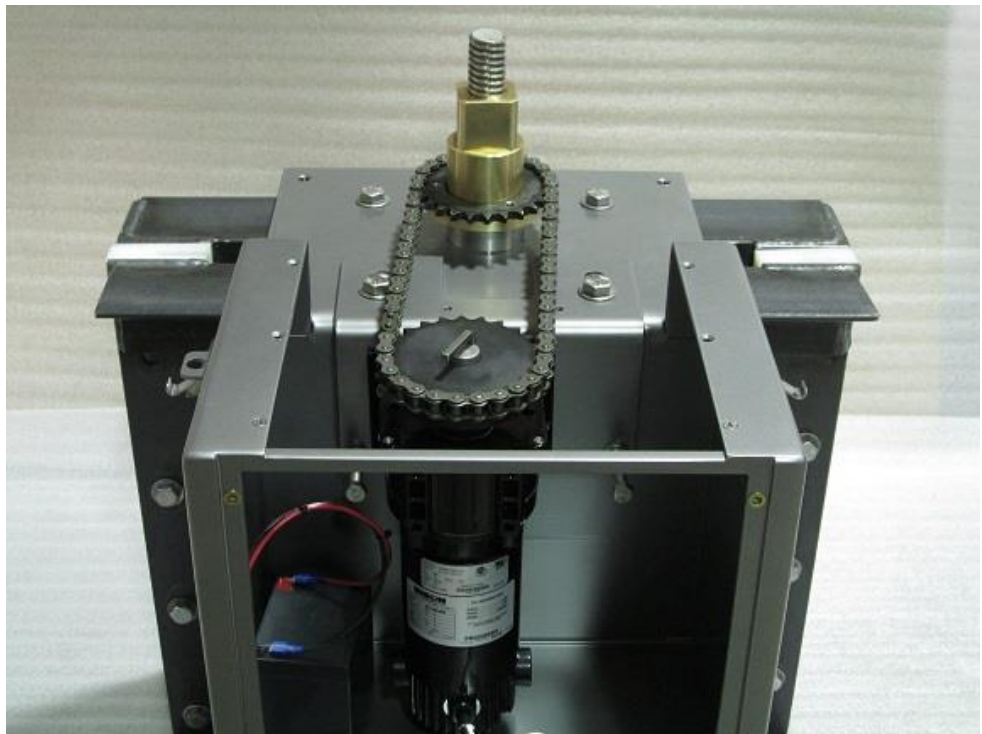


Figure 5. Lift Nut Sprocket and DC Gearmotor with Roller Chain

12. Tension chain as necessary to provide a maximum $\frac{1}{4}$ " deflection at the center of the chain span (Figure 2).
13. Reattach lift nut cover and torque fasteners to specification.

WATER CONTROL DEVICES

14. Reattach electrical panel (if removed) as shown with #8-32 flat head screws with a screwdriver. Place battery inside enclosure and connect battery harness to terminals, verifying correct polarity (Red = positive +; Black = negative -). Secure terminal screws tightly.



Figure 6. Complete WT-200V Interior with Electrical Panel

15. Attach enclosure door and mount hand wheel tightening set screw.



Figure 7. WT-200V with Enclosure Door and Hand Wheel Installed

16. End of rising stem installation procedure. Skip to Limit Switch Installation section.

Horizontal Gear Lift Installation Procedure

Models WT-200H, WT-300H - no pedestal

With the structural and functional condition of the gate or valve systems verified, the specific mounting surface for the actuator needs to be assessed. The surface needs to be flat within 1/16" across the entire mounting surface. Also, the existing gear lift crank shaft must be parallel to the actuator mounting surface within 3° and perpendicular to the front plane of the gate. Correct any anomalies by surface grinding and adjustments before proceeding with installation.

WATER CONTROL DEVICES

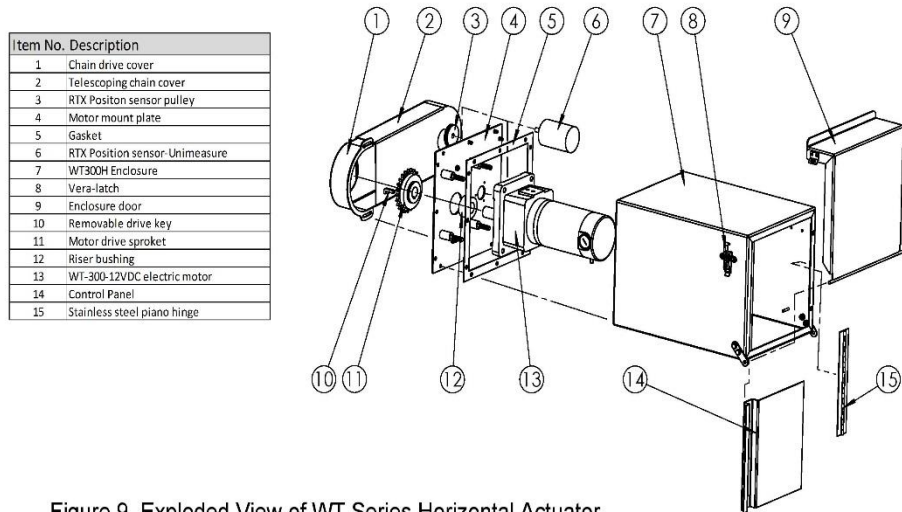


Figure 9. Exploded View of WT Series Horizontal Actuator (WT-300H shown)

1. Unpack the WT Series actuator, using caution to avoid damaging the powder coated finish. An exploded view of the actuator assembly in Figure 9 below lists the system parts. The actuator is shipped assembled and fully tested; the disassembly required for installation will not affect factory performance if performed as directed below.

Figure 8. Exploded View of WT Series Horizontal Actuator (WT-300H-S shown)

2. Tools required for installation include the following
 - a. 7/16", 9/16", and 3/4" wrenches or sockets
 - b. #2 Phillips screwdriver
 - c. 5/32" hex key wrench
 - d. Needle-nose pliers
 - e. 24" straight-edge or level

WATER CONTROL DEVICES

- f. 8" or larger C-clamps
 - g. Center punch and hammer
 - h. Drill with bits from 5/32" to 9/16" diameter
- 3. Prepare actuator for attachment to gate frame by removing actuator door. Set the chain guard components aside for later installation.
 - a. To remove the actuator door, remove the two socket head capscrews (SHCS) that serve as pivot points using a 5/32" hex key wrench. After removal of any fastener or padlock from the enclosure latching tabs, lift the door off and rethread the SHCSs into the enclosure.
- 4. Remove existing hand crank and associated hardware. Identify a secure location for storage. If crank shaft length is not sufficient to use the hand crank in case of actuator failure, order a shaft extender from Watch Technologies.
- 5. Slide telescoping chain guard over crank shaft, and temporarily secure to gear lift housing or base plate. Replace the hand crank with the supplied sprocket and temporarily secure onto the crank shaft with set screws.
- 6. Place actuator on gate mounting surface and lightly clamp actuator using C-clamps, using cardboard or other media to protect the finish. Verify that the actuator base plate is resting solidly on the gate surface with no interference.
- 7. Using straight-edge or level, align actuator sprocket with gear lift sprocket by adjusting actuator and/or gear lift sprocket position. The sprockets should be parallel within 1/8". Clamp actuator firmly in place and tighten gear lift sprocket set screw securely.
- 8. Using the four existing mounting holes within the enclosure, or locating four mounting points more appropriate to your application, mark the gate surface with a marker or by drilling a 5/32" pilot hole through the actuator base plate and frame.
- 9. Progressively drill larger holes until four 9/16" mounting holes exist in the actuator base plate and gate mounting surface.
- 10. Fasten the actuator to the gate using 1/2" stainless steel fasteners. The use of a copper- or molybdenum-based anti-seize compound to avoid thread galling is encouraged for ease of future service.

WATER CONTROL DEVICES

Torque the fasteners to the supplier's recommendations or if unavailable, use 45 ft-lbs for lubricated fasteners.

11. Verify that sprocket alignment has not changed. Make adjustments as necessary.
12. Loosen chain tensioning nuts from motor mount top plate and pivot the plate as needed to attach roller chain between actuator sprocket and gear lift sprocket. If necessary, remove master link from roller chain using needle-nose pliers, carefully retaining clip.
13. Tension the chain by adjusting chain tensioning nuts until $\frac{1}{4}$ " deflection is achieved at center of top span of chain.

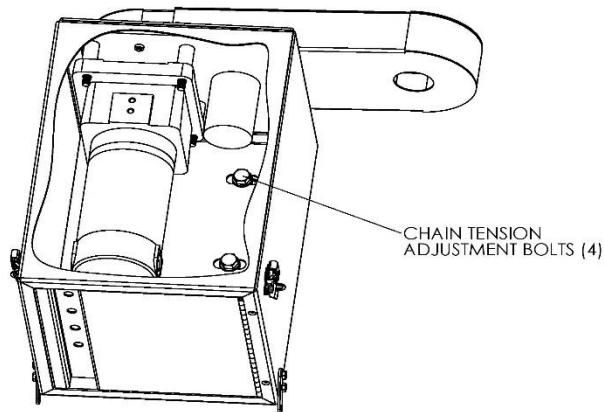


Figure 9. Horizontal Actuator Chain Tension Adjustments

Figure 9. Horizontal Actuator Chain Tension Adjustments

14. Align telescoping chain cover to sprocket and chain providing adequate clearance for crank shaft and chain. Slide flanged chain cover over actuator sprocket and into telescoping cover.
15. Adjust flanged chain cover to provide $\frac{1}{2}$ " clearance to chain. Attach cover to enclosure face using three #12 self-tapping stainless steel screws.

WATER CONTROL DEVICES

16. Attach chain cover plate using four #12 self-tapping stainless steel screws.
17. If necessary for stability, secure telescoping chain cover to gear lift housing or base plate using a stainless mounting bracket.
18. End of horizontal installation section.

Seasonal Start Up

After initial installation or when initializing the system after a seasonal shut down, the following procedures should be followed. During lifetime seasonal start ups, refer to the [Maintenance & Troubleshooting](#) section and perform start of season operations.

WATER CONTROL DEVICES

1. Remove debris from the exterior of the actuator and wipe down the surface to avoid introducing contaminants into the actuator interior. Open enclosure door and set in open position by rotating forward and down (WT-100V, WT-200V, and WT-300V models) or rotating top edge of door over onto back face of enclosure (WT-200H and WT-300H models) as shown in see Figure 10 and Figure 11.

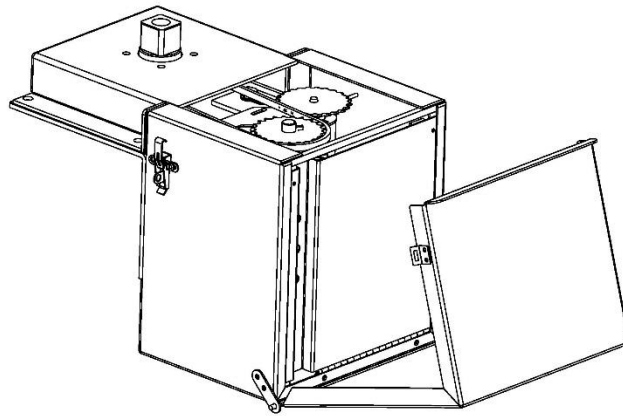


Figure 14. Vertical Actuator with Enclosure Door Open (WT-200V)

Figure 10. Vertical Actuator with Enclosure Door Open (WT-200V-S)

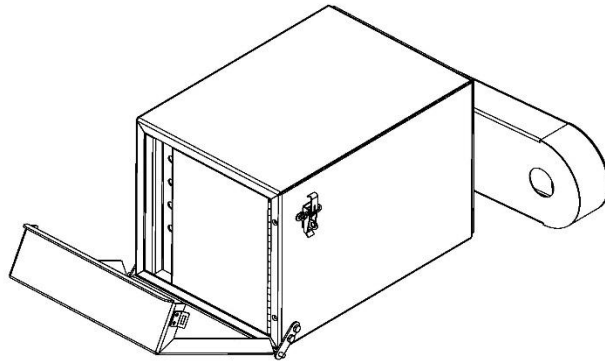


Figure15. Horizontal Actuator with Enclosure Door Open (WT-300H)

Figure 11. Horizontal Actuator with Enclosure Door Open (WT-200H-S)

2. Remove negative battery terminal. Remove chain guard (WT-200H and WT-300H models only) or remove lift nut cover to access roller chain and sprockets. Adjust chain tension and lubricate chain as detailed in Figure 2 or Figure 9 above.
3. Adjust position sensor potentiometer drive sprocket as needed to ensure chain engagement without excessive tension (refer to Figure 2).
4. Reconnect negative battery terminal. Verify proper function of the actuator by performing manual gate blade lifting and lowering as detailed in the [Operation](#) section below. Resolve any identified issues by utilizing the troubleshooting guide in the [Maintenance & Troubleshooting](#) section.

Operation

Detailed RTU
For more detail, refer to
the Rugid RTU Manual

In this section, basic manual operation of a WT Series actuator will be discussed in detail. Minimal detail regarding operation of the optional RUG3 RTU will be presented. For an overview of the RUG3 operation, refer to the RUG3 Integrated RTU area in the [System Integration & Options](#) section. Finally, in the unlikely event of system power loss or device failure, hand wheel operation will be described.

Important

Before attempting actuator operation, perform a concise visual assessment of the gate or valve system. Address any issues such as debris and contamination that may restrict gate blade or stem motion as well as any damage to items such as frames, gear lifts, stems, seals, conduit, wiring, or non-functional limit switches and limit flags. Watch Technologies cannot be held liable for damage to gate or valve systems caused by improper operation of our actuators.

Manual Operation



Figure 12. Front Panel View of WT Series Actuator (WT-200V shown)

1. Ensure that actuator and water control system is ready for operation by reviewing Seasonal Start Up section and verifying that all components are in proper working condition.
2. Remove any locks on enclosure door, open and latch into open position (see Figure 10 or Figure 11).
3. Referring to Figure 12, move the Auto/Man toggle switch to Man position.
4. To drive the gate blade and stem up, hold the Up/Down toggle switch in the Up position. To drive the blade down, hold the switch in the Down position. Note that the Up/Down switch is a momentary switch that returns to the center OFF position when released.

5. If the motor does not run or the stem moves in the opposite direction, consult the Troubleshooting guide below.

Automated Operation Using Internal RTU

Operation of the RUG3 RTU is detailed in the Rugid Operator's Manual provided with the unit. RTU Connections are indicated in the schematic shown in the System Integration section below. External RTUs utilize the same connection scheme.

Non-Motorized Hand Wheel Operation

In the unlikely event of system power loss or malfunction of the motorized drive, the WT Series actuator may quickly be converted to hand wheel or hand crank operation in order to actuate the gate or valve. This is accomplished without removal of the drive chain as detailed below.

1. For rising stem systems (WT-100V, WT-200V, WT-300V), open the enclosure door (Figure 10).
2. On horizontal gear lift systems (WT-200H, WT-300H), remove the flanged chain cover by removing three #12 screws.



Use caution when operating the system with the chain guard removed (H Models) or the door open (V Models) as the chain and sprockets will be exposed to fingers, hands, and clothing that can become caught in the drive assembly.

3. Remove the motor drive key. This may require moving the drive sprocket/chain slightly to remove load from the key. Remove the thumbscrew from the horizontal key. Secure the key (and thumbscrew) in a safe location for reinsertion after motorized function is attained.
4. Close the enclosure door or re-install the flanged chain cover.
5. Attach hand crank or hand wheel, if needed, and tighten set screw.
6. Operate system manually until power is restored or the motorized system is diagnosed and repaired.
7. To return to motorized operation, perform steps 1 and 2. Replace key by rotating chain drive until the sprocket is aligned with the drive block. Tighten thumbscrew on horizontal systems.
8. Install flanged chain cover before resuming operation.

Maintenance and Troubleshooting

Proper maintenance of the actuator will guarantee many hours of reliable, trouble-free operation. Basic maintenance procedures are listed below.

For Seasonal
Operation Only

Before operating the system at the beginning of the season, assess the condition of the actuator both mechanically and electrically.

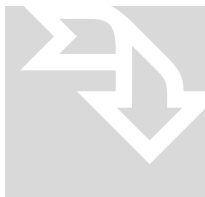
- Verify that all safety features are in place and functional. Such items include latched enclosure doors or secured chain guard panels (if so equipped).
- Inspect all hardware and fasteners. Tighten any loose hardware and verify that the actuator is secured to its mounting surface.
- Clean outer surface to minimize introduction of debris into enclosure. Touch up any damage to exterior powder coated finish.
- Open enclosure door or remove chain guard panels. Remove any internal debris, clean and lubricate the chain drive. Adjust drive chain tension and verify proper engagement of position sensor sprocket (if so equipped).
- Inspect all electrical connections, remove any contamination and tighten as needed.
- Check battery charge status via RTU, charge controller or with a multi-meter. The voltage should read above 12.2VDC (approx. 50% charged) before attempting limited operation. Charge the battery fully before resuming continuous operation.

All Systems

Perform the following ongoing maintenance during the season to maintain peak performance.

- Check drive chain tension and verify proper engagement of position sensor sprocket (if so equipped).
- Clean drive chain if needed and lubricate with non-petroleum based lubricant..
- If installed, verify correct operation and status of RTU and battery charge controller indicators.

Troubleshooting Guide



To resolve common problems encountered with WT Series actuator operation, refer to Table 2 below.

Table 2. WT Series Basic Troubleshooting Guide

Symptom	Probable Cause
Motor does not run in manual Up/Down mode	• Auto/Man Switch not in Man position
	• Limit switch activated (reached limit)
	• Open limit switch circuit (damaged wiring)
	• Fuse blown
	• Dead battery
RTU cannot drive motor	• Auto/Man switch not in Auto position
	• Limit switch activated (reached limit)
	• Open limit switch circuit (damaged wiring)
	• Fuse blown
	• Open connection in RTU wiring
Motor will run in one direction	• Damaged RTU output relay
	• Limit switch activated (reached

only	limit)
	<ul style="list-style-type: none"> • Open limit switch circuit (damaged wiring) • Damaged actuator relay
Excessive noise during operation	<ul style="list-style-type: none"> • Enclosure door or lift nut cover not seated • Actuator not securely mounted to gate • Stem not properly aligned to actuator • Contaminants in drive chain or sprockets • Chain drive sprockets not aligned

Shut Down and Storage

If application of the WT Series actuator dictates seasonal usage only, then proper system shut down procedures and storage conditions can simplify and expedite system start up at the beginning of the next season

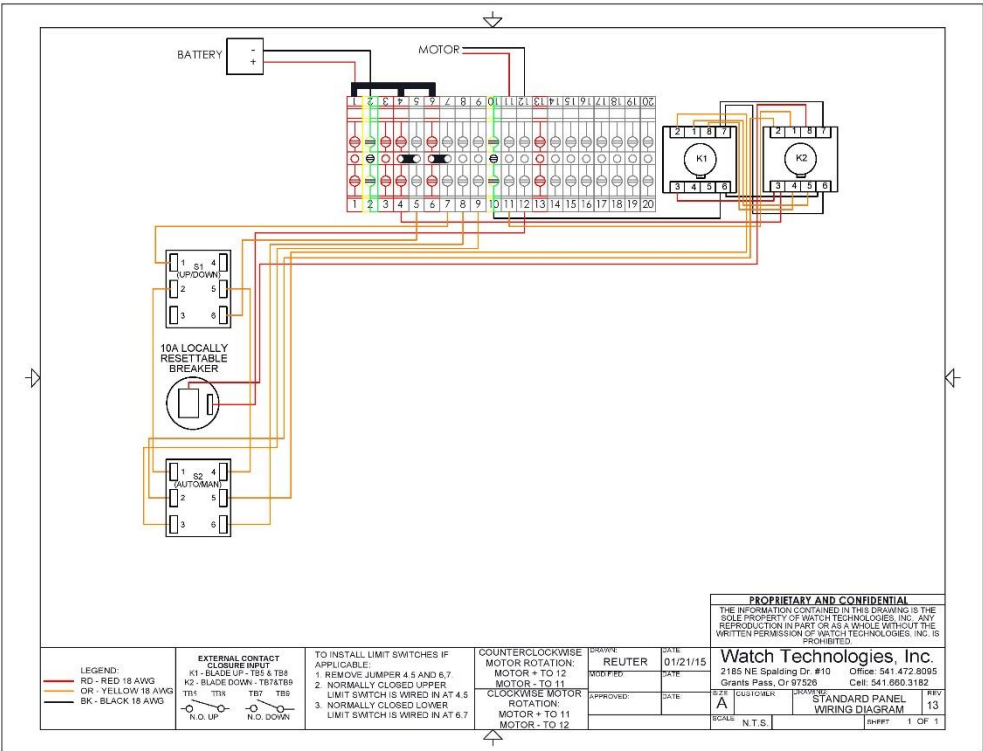
- ☐ Verify that all safety features are in place and functional. Such items include latched enclosure doors or secured chain guard panels (if so equipped).
- ☐ Inspect all hardware and fasteners. Tighten any loose hardware and verify that the actuator is secured to its mounting surface.
- ☐ Clean outer surface to minimize introduction of debris into enclosure. Touch up any damage to exterior powder coated finish.
- ☐ Open enclosure door or remove chain guard panels. Remove any internal debris, clean and lubricate the chain drive.
- ☐ Inspect all electrical connections, remove any contamination and tighten as needed.

WATER CONTROL DEVICES

- Check battery charge status via RTU, charge controller or with a multi-meter. Disconnect negative battery terminal that connects to the system (load terminal on controller), leaving any solar panel connections in place. Verify that the battery charge controller LEDs are indicating proper function.
- Close and secure enclosure door. If feasible, use a waterproof cover that can be secured tightly around the actuator to minimize build-up of dirt and contamination during the off-season.

System Integration & Options

Electrical System Description



The schematic in Figure 13 below depicts a WT Series actuator electrical system. The actuator utilizes a 12 or 24 VDC power source.

Figure 13. WT Series Electrical Schematic

WATER CONTROL DEVICES

Electromechanical relays and limit switches are used to provide a hardware-based control system. Operational safety is ensured by isolating the power source when any system component fails to function properly.

- Coils on the DC relays are energized positively via manual toggle switches or output relays from an RTU. Voltage to the DC gear motor is applied only when coils are energized.
- Limit switches are used in series with the motor and are configured normally-closed (NC) during normal operation. Opening the limit switch circuit either via positive switch action at the designed end of blade travel, broken wire, or broken terminal will disable the motor.
- Terminal blocks provide a convenient method for routing internal wiring and for connecting options such as solar panels and position sensors. The block diagram in Figure 14 below indicates various functions of the wires that are terminated at the block through position 18. Terminal strips typically have additional terminals for additional components.

	1	PV+/Disconn.
K1-8	2	GND
K1-3	3	+12VDC
TB1-6	4	Upper Limit Switch
S1-6	5	Upper Limit Switch
TB1-4	6	Lower Limit Switch
S1-1	7	Lower Limit Switch
S2-6	8	Remote Open (Up)
S2-3	9	Remote Close (Dwn)
K1-7	10	Position GND
	11	Position Sense
	12	Position +5VDC
	13	
K2-1	14	Motor
FUSE	15	Motor

Figure 14. Main Terminal Block Connections

Gate Blade Position Sensor

A factory-installed position sensor should require minimal attention other than chain tensioning or recalibration. Refer to the [Maintenance & Troubleshooting](#) section to address any functional problems with this system.

Previously installed WT Series actuators may still be upgraded to include position sensing. The steps below detail how to perform this upgrade. Mounting brackets for the sensor have changed over time. The pictures

below may not exactly represent the actuator that is being retrofit in place or that was shipped but is certainly very close since nothing major has changed to the present.

Installing the Unimeasure position sensor requires the following steps and tools.

1. Aligning the potentiometer bracket on the motor mount
2. Attaching the bracket to the motor mount
3. Reassembling the potentiometer to the bracket
4. Routing the potentiometer wiring and connecting the 5V regulator

Tools needed:

1. Drill/driver with #2 Phillips bit
2. #2 Phillips Screwdriver
3. 9/16" wrench
4. 3/16" Flat blade screwdriver (to connect wiring to terminal blocks as needed)

Note

To avoid irreparable damage to the potentiometer, it is critical to not turn it beyond its end stops. The device will make audible clicking sounds when this occurs. Ensure that it is at least 2 turns short of the stop in either direction before installation, and that operation of the system will not force it beyond the stop. .

Open the enclosure door and remove the right side chain tensioning cap screw using a 9/16" wrench.

Position potentiometer assembly with sprocket engaged into center of drive chain, and mark outline of bracket on motor mount.



Remove sprocket and potentiometer from bracket noting orientation of wire leads relative to the bracket, clamp bracket onto motor mount, and attach with two self tapping screws (note that the holes may need to be tap drilled to allow threading of standard self-tapping screws).

Reassemble the potentiometer and the sprocket to the bracket. Note, do not over torque the three mounting screws or damage to the device might occur. Tighten the sprocket set screw.

Route wiring harness and connect wires to the 5V DC regulator assembly as per the schematic in Figure 13.

Blank

Solar Panel and Charging Controller

Factory-installed solar charging systems will provide years of maintenance-free operation. If your system did not ship from the factory with a solar charging system, kits are available from Watch Technologies to install into existing actuators. The section below discusses the two available kits and instructions on how to install and operate.

The WT-200 and WT-300 Solar Charging Kits are identical except for the size of the solar panel. The WT-200 includes a 45W panel and the WT-300 includes a 55W panel. Wiring diagrams are provided in the included charge controller manufacturer's documentation. Termination via the internal terminal block is detailed in the schematic in Figure 13.

Typical Solar Charging Kit Components (WT-200 and WT-300):

1. 45W (WT-200) or 55W (WT-300) multicrystalline solar panel
2. Side-of-Pole-mount mounting bracket
3. 12V/24V 8A Battery Charge Controller
4. Charge Controller mounting hardware
5. MC-4 male and female cables for solar panel interconnect
6. Battery-to-charge controller harness

Installation of the Solar Charging Kit

1. Locate a suitable south-facing unobstructed location for location of the panel.
2. Refer to the pole-mount bracket manufacturer's documentation regarding sizing of pole.
3. Install pole and ensure rigid mounting.
4. Mount the solar panel using the hardware provided with the bracket.
5. Using the supplied hardware, install the Charge Controller inside the WT Series actuator enclosure.
6. Route the solar panel leads into the enclosure and terminate onto the Charge Controller noting polarity. Depending upon application, the leads may require extension. Crimp butt connectors are provided for this purpose. Use the same gauge wire as the MC-4 harness.
7. Connect the battery harness between the Charge Controller and the battery, verifying polarity before making final connections.
8. Verify proper function by observing status LEDs on the Charge Controller and referring to the included user's guide.

RUG3 Integrated Remote Terminal Unit (RTU)

Please refer to the Rigid RUG3 operator's manual that was shipped with the WT Series actuator for reference.

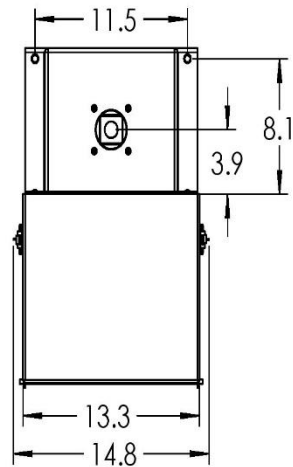
Device Specifications

WT-100V

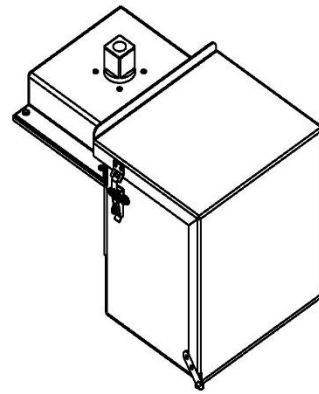
WT-100V Actuator Specifications

Type	Rising Stem
Dimensions, in (mm) (W x H x D)	14.8 x 14.3 x 20.0 (376 x 363 x 508)
Weight, lb (kg)	76 (34.5)
Exterior Finish	Universal Gray Powder Coat
Operating Temperature, F (C)	-20 to 125 (-29 to 52)
Storage Temperature, F (C)	-40 to 140 (-40 to 60)
Maximum Output Torque, ft-lb (N-m)	24 (32)

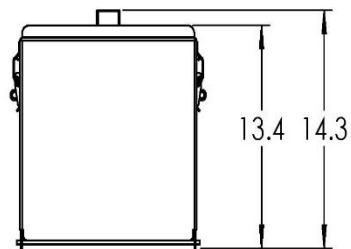
WT-100V ACTUATOR EXTERNAL DIMENSIONS (inches)



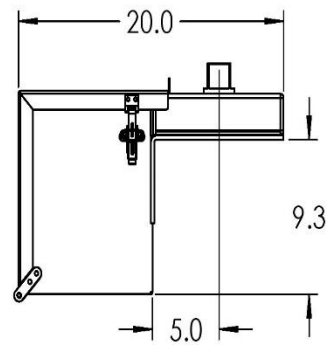
PLAN VIEW



ISOMETRIC VIEW



FRONT VIEW



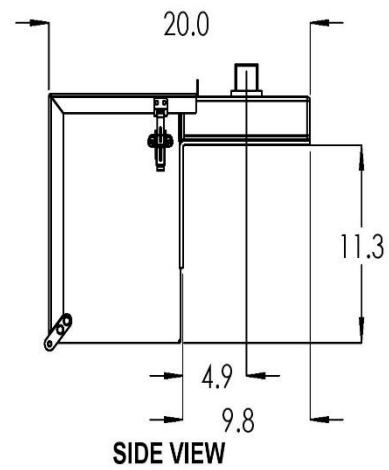
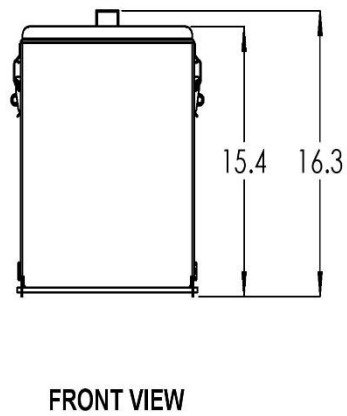
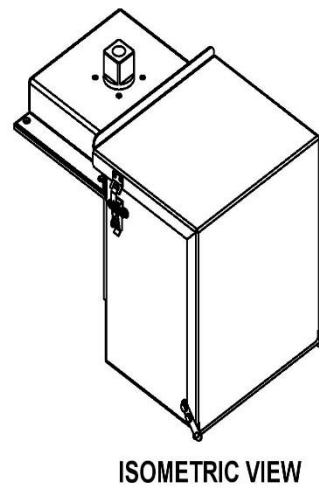
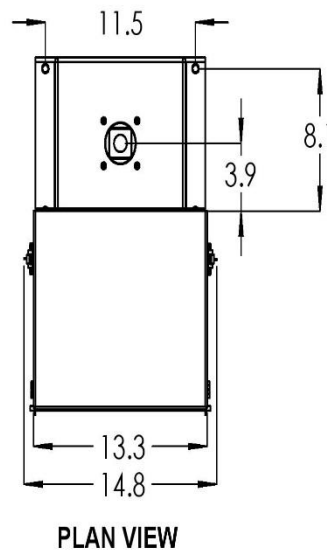
SIDE VIEW

WT-200V

WT-200V Actuator Specifications

Type	Rising Stem
Dimensions, in (mm) (W x H x D)	14.8 x 16.3 x 20.0 (376 x 414 x 508)
Weight, lb (kg)	85 (38.5)
Exterior Finish	Universal Gray Powder Coat
Operating Temperature, F (C)	-20 to 125 (-29 to 52)
Storage Temperature, F (C)	-40 to 140 (-40 to 60)
Humidity (Operating or Storage)	5% to 95% RH
Maximum Output Torque, ft-lb (N-m)	50 (68)
Full-load Output Speed, rpm	11

WT-200V ACTUATOR EXTERNAL DIMENSIONS (inches)

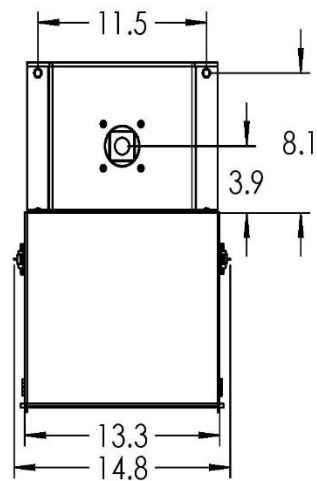


WT-300V

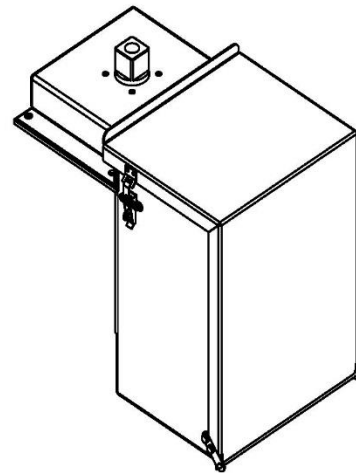
WT-300V Actuator Specifications

Type	Rising Stem
Dimensions, in (mm) (W x H x D)	14.8 x 16.1 x 20.1 (376 x 409 x 511)
Weight, lb (kg)	96 (43.5)
Exterior Finish	Universal Gray Powder Coat
Operating Temperature, F (C)	-20 to 125 (-29 to 52)
Storage Temperature, F (C)	-40 to 140 (-40 to 60)
Humidity (Operating or Storage)	5% to 95% RH
Maximum Output Torque, ft-lb (N-m)	220 (298)
Full-load Output Speed, rpm	19

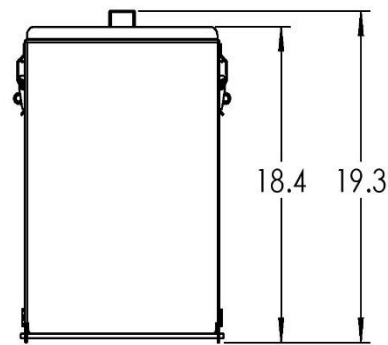
WT-300V ACTUATOR EXTERNAL DIMENSIONS (inches)



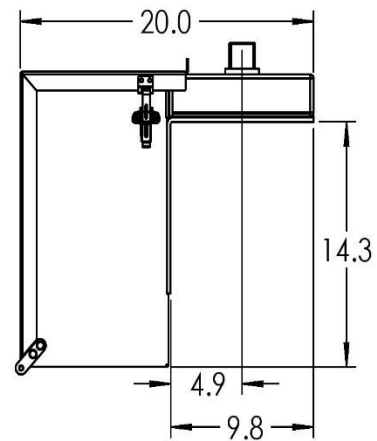
PLAN VIEW



ISOMETRIC VIEW



FRONT VIEW



SIDE VIEW

WT-200H

WT-200H Actuator Specifications

Type	Horizontal Gear Lift
Dimensions, in (mm) (W x H x D)	28.3 x 12.0 x 19.2 (718 x 305 x 490)
Weight, lb (kg)	85 (38.5)
Exterior Finish	Universal Gray Powder Coat
Operating Temperature, F (C)	-20 to 125 (-29 to 52)
Storage Temperature, F (C)	-40 to 140 (-40 to 60)
Humidity (Operating or Storage)	5% to 95% RH
Maximum Output Torque, ft-lb (N-m)	50 (68)
Full-load Output Speed, rpm	11

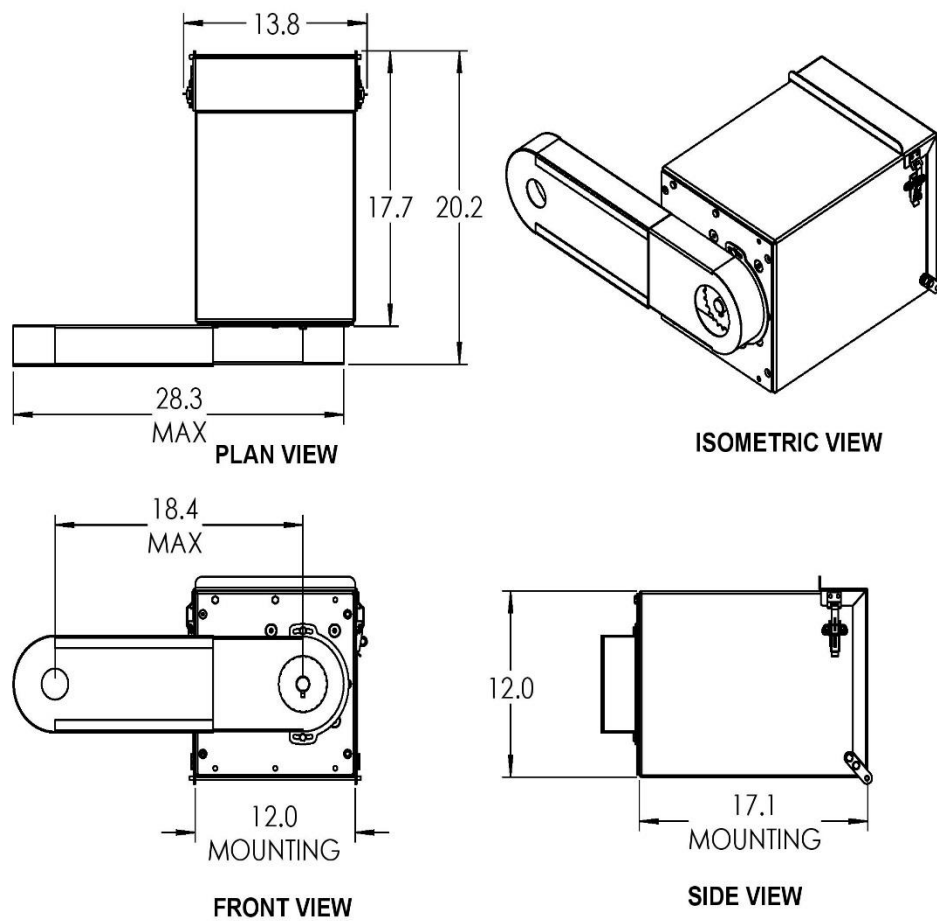
WT-300H

WT-300H Actuator Specifications

Type	Horizontal Gear Lift
Dimensions, in (mm) (W x H x D)	28.3 x 12.0 x 19.2 (718 x 305 x 490)
Weight, lb (kg)	96 (43.5)
Exterior Finish	Universal Gray Powder Coat
Operating Temperature, F (C)	-20 to 125 (-29 to 52)
Storage Temperature, F (C)	-40 to 140 (-40 to 60)
Humidity (Operating or Storage)	5% to 95% RH
Maximum Output Torque, ft-lb (N-m)	220 (298)
Full-load Output Speed, rpm	19

WATER CONTROL DEVICES

WT-20HV, WT-300H ACTUATOR EXTERNAL DIMENSIONS (inches)



Motor Specifications

POWER TRANSMISSION

DC Gearmotors

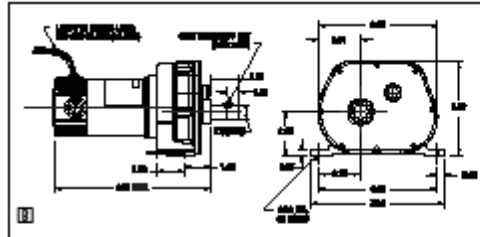
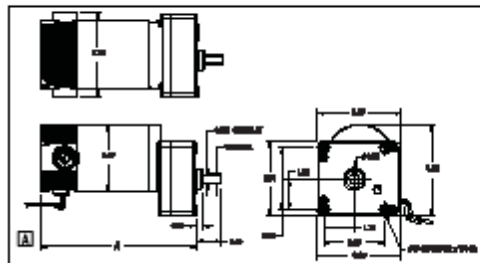
12 and 90VDC Permanent Magnet Parallel Shaft Gearmotors

Dayton



- Enclosure: totally enclosed nonventilated
- Gearcase: die-cast zinc
- Lubrication: grease-filled
- Bearings: porous bronze sleeve on case; ball on motor
- Mounting: all-position
- Rotation: reversible
- Thermal protection: none
- Brushes: externally replaceable
- Ambient: 40°C
- Seals: O-ring type on output shaft
- UL and C-UL Recognized (E47479)

[A] have heat-treated steel and acetal gears; [B] have phenolic and hardened steel gears.



Key	Nominal rpm	Full- Load Torque (ft.-lbs.)	Over- hung Load (lbs.)	Input HP	Full- Load Amps	Gear Ratio	Dim. A (in.)	Item No.	\$ Each
12VDC									
A	6.0	50	50	1/30	2.10	430:1	6.20	1LPV0	✓ 165.00
A	6.0	50	50	1/30	2.10	279:1	6.20	1LPV7	✓ 165.00
A	18	50	50	1/30	2.10	144:1	5.70	1LPV6	✓ 165.00
A	25	40	50	1/30	2.10	108:1	5.70	1LPV5	✓ 165.00
A	41	25	50	1/30	2.10	64:1	5.70	1LPV4	✓ 165.00
A	80	13	50	1/30	2.10	32:1	5.70	1LPV3	✓ 165.00
90VDC									
A	7.0	50	50	1/30	0.31	430:1	6.20	1LPV8	✓ 154.25
A	11	50	50	1/30	0.31	279:1	6.20	1LPV9	✓ 154.25
A	21	50	50	1/30	0.31	144:1	5.70	1LPW0	✓ 154.25
A	29	40	50	1/30	0.31	108:1	5.70	1LPW3	✓ 154.25
A	47	25	50	1/30	0.31	64:1	5.70	1LPW4	✓ 154.25
A	93	13	50	1/30	0.31	32:1	5.70	1LPW5	✓ 154.25

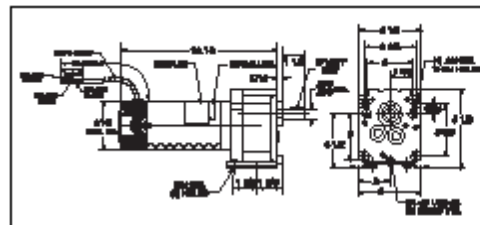
Key	Nominal rpm	Full- Load Torque (ft.-lbs.)	Over- hung Load (lbs.)	Input HP	Full- Load Amps	Gear Ratio	Dim. A (in.)	Item No.	\$ Each
12VDC									
B	6.0	500	250	1/15	6.20	267:1	11.1	1LPK9	✓ 377.50
B	12	250	250	1/15	6.20	133:1	11.1	1LPK7	✓ 377.50
B	20	150	250	1/15	6.20	81:1	11.1	1LPK4	✓ 377.50
B	42	75	250	1/15	6.20	38:1	11.1	1LPK3	✓ 377.50
B	58	75	250	1/10	9.00	55:1	11.1	1LPK2	✓ 377.50
B	85	50	250	1/10	9.00	38:1	11.1	1LPK1	✓ 377.50
90VDC									
B	6.1	500	250	1/15	0.84	267:1	11.1	1LPK1	✓ 377.50
B	13	250	250	1/15	0.84	133:1	11.1	1LPK4	✓ 377.50
B	21	150	250	1/15	0.84	81:1	11.1	1LPK5	✓ 377.50
B	46	75	250	1/15	0.84	38:1	11.1	1LPK6	✓ 377.50

12 and 90VDC Permanent Magnet Parallel Shaft Gearmotors

Dayton



- Enclosure: totally enclosed nonventilated
- Gearcase: die-cast aluminum
- Lubrication: permanent heavy fluid gear oil
- Gears: hardened steel
- Bearings: needle roller and thrust balls on case; ball on motor
- Mounting: all-position
- Rotation: reversible
- Thermal protection: none
- Brushes: externally replaceable
- Ambient: 40°C
- Seals: on input and output shafts
- UL Recognized (E47479)



Normal FL rpm	Full- Load Torque (ft.-lbs.)	Over- hung Load (lbs.)	Input HP	Full-Load Amps at Nominal Volts	Gear Ratio	Item No.	\$ Each
12VDC							
23	280*	150	1/6	9.40	82:1	1Z829	✓ 389.75
31	278	150	1/6	13.98	58:1	1Z822	✓ 389.75
50	183	150	1/6	13.98	36:1	1Z824	✓ 385.50
64	150	150	1/6	13.98	28:1	1Z824	✓ 385.50
94	102	150	1/6	13.98	19:1	1Z811	✓ 385.50
170	57	150	1/6	13.98	11:1	1Z813	✓ 385.50
90VDC							
22	280*	150	1/6	1.27	82:1	4Z118	✓ 441.25
31	220	150	1/6	1.27	58:1	4Z113	✓ 441.25
50	138	150	1/6	1.27	36:1	4Z119	✓ 406.00
64	113	150	1/6	1.27	28:1	4Z112	✓ 406.00
94	77	150	1/6	1.27	19:1	4Z111	✓ 406.00
170	43	150	1/6	1.27	11:1	4Z118	✓ 406.00

(*) Gear limited.



Please enter your zip code to find your nearest Bison Representative and Distributors.

300 SERIES

348 Series PMDC 12V 3/4 > 011-348-3080

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QUICK SPECS

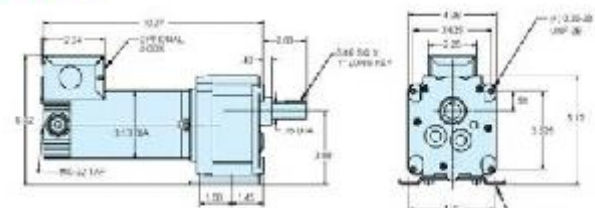
Stages	3	OHL*	500
Approx Weight	16	Torque (in-lbs)	300**
Input HP	1/6	Ratio:1	81.8
Amps	11.00	Enclosure	TENV
Speed 12V	22		

* Maximum overhung load on center of output shaft

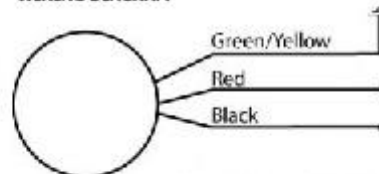
** Output Torque is gear limited

CAD DRAWING

Model 348 DC 12V



WIRING DIAGRAM



To Reverse, interchange Red and Black leads.

PMDC Motors

SPECIFICATIONS

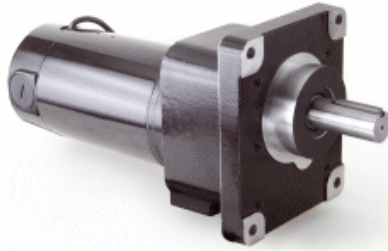
Gearhead Specifications

Housing:	Precision machined die cast aluminum.
Lubrication:	Lifetime oil bath, sealed and gasketed.
Shafts:	Hardened steel.
Mounting:	Face or Base (any angle)
Gearing:	AGMA class 9 heat treated steel. 1st stage helical metal, balance spur metal.
Bearings:	Needle bearings and thrust ball

Motor Specifications

Motor Type:	Permanent Magnet
Rotation:	Reversible.
Insulation:	Class F
Finish:	Powder-coat gloss black.

42A-CG Series Parallel Shaft DC Gearmotor Model 4486



Specifications

Model Number	4486 [CAD Drawings]
Category	42A-CG Parallel Shaft DC Gearmotors
Rated Voltage	24V
Speed (rpm)	38
Motor HP	7/16
Amps	18
Gear Ratio	60
Rated Torque (lb-in)	660
Length XH (inch)	12.0
Weight (lbs)	29
Product Type	42A7BEPM-CG
Accessory Shaft	NO

Solar Panel & Controller Specs

Please refer to documentation from manufacturer included with your shipment.

Warranty Information

Within one-year of purchase, Watch Technologies will repair or replace any component at no charge to the customer. Our actuators are covered against manufacturing defects for a lifetime. Contact our facility to arrange for support.