Read the operator manual entirely. When you see this symbol, the subsequent instructions and warnings are serious - follow without exception. Your life and the lives of others depend on it!

Illustrations may show optional equipment not supplied with standard unit.
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Trademark and Product Names that appear and are owned by others are trademarks of their respective owners.
Important Safety Information

Look for Safety Symbol

The SAFETY ALERT SYMBOL indicates there is a potential hazard to personal safety involved and extra safety precaution must be taken. When you see this symbol, be alert and carefully read the message that follows it. In addition to design and configuration of equipment, hazard control and accident prevention are dependent upon the awareness, concern, prudence and proper training of personnel involved in the operation, transport, maintenance and storage of equipment.

Be Aware of Signal Words

Signal words designate a degree or level of hazard seriousness.

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is limited to the most extreme situations, typically for machine components that, for functional purposes, cannot be guarded.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury, and includes hazards that are exposed when guards are removed. It may also be used to alert against unsafe practices.

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Be Familiar with Safety Decals

▲ Read and understand “Safety Decals” in the Operator’s Manual thoroughly.

▲ Read all instructions noted on the decals.

Avoid High Pressure Fluids

▲ Escaping fluid under pressure can penetrate the skin, causing serious injury. If hydraulic fluid penetrates the skin under pressure, immediate medical attention is required. See a physician familiar with this type of injury.

▲ Avoid the hazard by relieving pressure before disconnecting hydraulic lines.

▲ Use a piece of paper or cardboard, NOT BODY PARTS, to check for suspected leaks.

▲ Wear protective gloves and safety glasses or goggles when working with hydraulic systems.
Wear Protective Equipment

Great Plains advises all users of chemical pesticides or herbicides to use the following personal safety equipment.

▲ Waterproof, wide-brimmed hat
▲ Waterproof apron.
▲ Face shield, goggles or full face respirator.
▲ Goggles with side shields or a full face respirator is required if handling or applying dusts, wettable powders, or granules or if being exposed to spray mist.
▲ Cartridge-type respirator approved for pesticide vapors unless label specifies another type of respirator.
▲ Waterproof, unlined gloves. Neoprene gloves are recommended.
▲ Cloth coveralls/outer clothing changed daily; waterproof items if there is a chance of becoming wet with spray
▲ Waterproof boots or foot coverings
▲ Do not wear contaminated clothing. Wash protective clothing and equipment with soap and water after each use. Personal clothing must be laundered separately from household articles.
▲ Clothing contaminated with certain pesticides must be destroyed according to state and local regulations. Read chemical label for specific instructions.
▲ Wear clothing and equipment appropriate for the job. Avoid loose-fitting clothing.
▲ Prolonged exposure to loud noise can cause hearing impairment or loss. Wear suitable hearing protection such as earmuffs or earplugs.
▲ Avoid wearing entertainment headphones while operating machinery. Operating equipment safely requires the full attention of the operator.
Handle Chemicals Properly

▲ Read and follow chemical manufacturer’s instructions.
▲ Wear protective clothing.
▲ Handle all chemicals with care.
▲ Agricultural chemicals can be dangerous. Improper use can seriously injure persons, animals, plants, soil and property.
▲ Inhaling smoke from any type of chemical fire is a serious health hazard.
▲ Store or dispose of unused chemicals as specified by the chemical manufacturer.
▲ Before adding chemical to the tank, make sure tank is at least half full. Do not pour concentrate into an empty tank.
▲ Never leave fill hose attached to the sprayer after filling tank. Chemicals in tank can siphon out of tank and contaminate freshwater source.
▲ Always keep handwash tank filled with clean water and have soap available in case of an emergency. Immediately and thoroughly flush any area of the body that is contaminated by chemicals.
▲ Do not touch sprayer components with mouth or lips.
▲ If chemical is swallowed, carefully follow the chemical manufacturer’s recommendations and consult with a doctor.
▲ If persons are exposed to a chemical in a way that could affect their health, consult a doctor immediately with the chemical label or container in hand. Any delay could cause serious illness or death.
▲ Dispose of empty chemical containers properly. By law rinsing of the used chemical container must be repeated three times. Puncture the container to prevent future use. An alternative is to jet-rinse or pressure rinse the container.
▲ Wash hands and face before eating after working with chemicals. Shower as soon as spraying is completed for the day.
▲ Spray only with acceptable wind conditions. Wind speed must be below 5 mph. Make sure wind drift of chemicals will not affect any surrounding land, people or animals.
▲ Never wash out the sprayer tank within 100 feet (30m) of any freshwater source or in a car wash.
▲ Rinse out the tank. Spray rinse water on last field sprayed.
Confined Space

Once used for hazardous fertilizers, or seeds with hazardous treatments, your tank may become a “permit-required confined space” under applicable statutes, regulations, insurance rules or business policy.

▲ When hazardous fumes are present, you can be quickly overcome even with the tank lid open.
▲ Do not enter a tank for material loading, material unloading, tank cleaning or valve maintenance.
▲ Clean tank by power washing from outside the tank top.
▲ Perform valve maintenance by removing meters from bottom of empty tank.
▲ If obstruction removal or repair requires tank entry, have the work performed by a team trained in confined space procedures.

Use A Safety Chain

▲ Use a safety chain to help control drawn machinery should it separate from tractor drawbar.
▲ Use a chain with a strength rating equal to or greater than the gross weight of towed machinery.
▲ Attach chain to tractor drawbar support or other specified anchor location. Allow only enough slack in chain to permit turning.
▲ Replace chain if any links or end fittings are broken, stretched or damaged.
▲ Do not use safety chain for towing.

Keep Riders Off Machinery

▲ Riders obstruct the operator’s view. Riders could be struck by foreign objects or thrown from the machine.
▲ Never allow children to operate equipment.
▲ Keep all bystanders away from machine during operation.

Use Safety Lights and Devices

▲ Slow-moving tractors and towed implements can create a hazard when driven on public roads. They are difficult to see, especially at night.
▲ Use flashing warning lights and turn signals whenever driving on public roads.
▲ Use tractor lights and lights provided with implement.
Check for Overhead Lines

**DANGER**
Sprayer booms contacting overhead electrical lines can introduce lethal voltage levels on sprayer and tractor frames. A person touching almost any metal part can complete the circuit to ground, resulting in serious injury or death. At higher voltages, electrocution can occur without direct contact.

▲ Avoid overhead lines during sprayer operations.

**Transport Machinery Safely**

▲ Maximum transport speed for implement is 20 mph (32 kph). Some rough terrains require a slower speed. Sudden braking can cause a towed load to swerve and upset.

▲ Do not exceed 20 mph (32 kph). Never travel at a speed which does not allow adequate control of steering and stopping. Reduce speed if towed load is not equipped with brakes.

▲ Comply with state and local laws.

▲ Do not tow an implement that, when fully loaded, weighs more than 1.5 times the weight of towing vehicle.

▲ Carry reflectors or flags to mark sprayer in case of breakdown on the road.

▲ Keep clear of overhead power lines and other obstructions when transporting. Refer to transport dimensions under “Specifications and Capacities” on page 16.

▲ Do not fold or unfold the sprayer while the tractor is moving.

**Shutdown and Storage**

▲ Fold sprayer, put tractor in park, turn off engine, and remove the key.

▲ Secure sprayer using blocks and supports provided.

▲ Detach and store sprayer in an area where children normally do not play.
Practice Safe Maintenance

▲ Understand procedure before doing work. Use proper tools and equipment. Refer to this manual for additional information.
▲ Work in a clean, dry area.
▲ Fold the sprayer, put tractor in park, turn off engine, and remove key before performing maintenance.
▲ Make sure all moving parts have stopped and all system pressure is relieved.
▲ Allow sprayer to cool completely.
▲ Disconnect battery ground cable (-) before servicing or adjusting electrical systems or before welding on sprayer.
▲ Inspect all parts. Make sure parts are in good condition and installed properly.
▲ Remove buildup of grease, oil or debris.
▲ Remove all tools and unused parts from Front Fold Boom Sprayer before operation.

Prepare for Emergencies

▲ Be prepared if a fire starts.
▲ Keep a first aid kit and fire extinguisher handy.
▲ Keep emergency numbers for doctor, ambulance, hospital and fire department near phone.

Tire Safety

▲ Tire changing can be dangerous and should be performed by trained personnel using correct tools and equipment.
▲ When inflating tires, use a clip-on chuck and extension hose long enough for you to stand to one side—not in front of or over tire assembly. Use a safety cage if available.
▲ When removing and installing wheels, use wheel-handling equipment adequate for weight involved.
Safety At All Times

▲ Thoroughly read and understand the instructions in this manual before operation. Read all instructions noted on the safety decals.
▲ Be familiar with all sprayer functions.
▲ Operate machinery from the driver’s seat only.
▲ Do not leave sprayer unattended with tractor engine running.
▲ Do not dismount a moving tractor. Dismounting a moving tractor could cause serious injury or death.
▲ Do not stand between the tractor and sprayer during hitching.
▲ Keep hands, feet and clothing away from power-driven parts.
▲ Wear snug-fitting clothing to avoid entanglement with moving parts.
▲ Watch out for wires, trees, etc., when folding and raising sprayer. Make sure all persons are clear of working area.
▲ Do not turn tractor too tightly, causing sprayer to ride up on wheels. This could cause personal injury or equipment damage.
▲ Use only water without pesticides added to calibrate the sprayer. Do not exceed the calibrated sprayer speed and pressure when operating.
▲ When using a PTO pump, be sure that PTO shield is in place on the tractor, PTO coupler bolts are torqued to the correct specification, and torque bar is properly chained to tractor drawbar.
▲ Spray with the boom in the unfolded position only.
▲ The boom has many pinch points during field operation and folding. Keep all bystanders away.
▲ Never use tank for potable water.
Introduction

Great Plains welcomes you to its growing family of new product owners. This front fold boom sprayer has been designed with care and built by skilled workers using quality materials. Proper setup, maintenance and safe operating practices will help you get years of satisfactory use from the machine.

Document Family

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>500-644P</td>
<td>Owner’s Manual (this document)</td>
</tr>
<tr>
<td>500-644P</td>
<td>Parts Manual</td>
</tr>
<tr>
<td>509-200M</td>
<td>Application Guide</td>
</tr>
<tr>
<td>832-038C</td>
<td>Nozzle Calculator (U.S.customary units)</td>
</tr>
<tr>
<td>832-058C</td>
<td>Nozzle Calculator (metric)</td>
</tr>
</tbody>
</table>

Description of Unit

The TSF660 sprayer is capable of spraying at 60 feet. The level float boom is fully suspended starting with vertical spring suspension in a 42-inch hydraulic elevator which provides a wide range of boom height adjustment along with gas shocks that provide side-to-side stability.

Intended Usage

Use these booms as part of a pressurized sprayer system to apply liquid pesticides, herbicides or fertilizers to production-agriculture crops only. Do not modify sprayer for use with attachments other than those approved by Great Plains.

Models Covered

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSF-660-2530</td>
<td>650 Gallon 60-foot 30-inch nozzle spacing</td>
</tr>
<tr>
<td>TSF-660-3620</td>
<td>650 Gallon 60-foot 20-inch nozzle spacing</td>
</tr>
</tbody>
</table>

Using This Manual

This manual will familiarize you with safety, assembly, operation, adjustments, troubleshooting and maintenance. Read this manual and follow the recommendations to help ensure safe and efficient operation.

The information in this manual is current at printing. Some parts may change to assure top performance.

Definitions

The following terms are used throughout this manual.

Right-hand and left-hand as used in this manual are determined by facing the direction the machine will travel while in use unless otherwise stated.

NOTICE

Paragraphs in this format present a crucial point of information related to the current topic.

Read and follow the directions to:
- remain safe,
- avoid serious damage to equipment and
- ensure desired field results.

NOTE:

Paragraphs in this format provide useful information related to the current topic.

Further Assistance

For additional help with understanding these assembly instructions or for any other assembly or setup related questions, please contact our service department at the following address:

Great Plains Service Department
1525 E. North St.
P.O. Box 5060
Salina, KS 67402-5060

Or call us at (800) 270-9302 to speak over the phone with a service representative.

Copies of this machine’s operator manual are available by mail or online. Please visit www.greatplainsag.com and follow the product link for information on your machine.
Assembly

The following headings are step-by-step instructions for assembling the TSF660 Front Fold Boom Sprayer. Begin with Tools Required and Pre-Assembly Checklist to make sure you have all necessary parts and equipment. Follow each step to make the job as quick and safe as possible and produce a properly working machine.

The TSF660 Front Fold Boom Sprayer is shipped via flat bed truck. It is the dealer’s responsibility to unload the new machine. Unload all equipment before beginning assembly. Do not attempt any assembly work while the TSF660 Front Fold Boom Sprayer is on the truck.

Tools Required

Basic Hand Tools

Pre-Assembly Checklist

1. Before assembling, read and understand “Important Safety Information” beginning on page 1.
2. Have at least two people on hand while assembling.
3. Make sure assembly area is level and free of obstructions (preferably an open concrete area).
4. Have all major components.
5. Have all fasteners and pins shipped with TSF660 Front Fold Boom Sprayer.

**NOTICE**

*If a pre-assembled part or fastener is temporarily removed, remember where it goes. Keep the parts separated.*

6. Have a copy of the parts manual on hand. If unsure of proper placement or use of any part or fastener, refer to the parts manual.
7. Check that all working parts are moving freely, bolts are tight, and cotter pins are spread.
8. Check for proper tension and alignment on all drive chains.
9. Check that all safety decals and reflectors are located correctly and legible. Replace if improperly located or damaged. Refer to Safety Decals in the operator’s manual.
10. Inflate tires to recommended pressure as listed on the “Tire Inflation Chart” on page 16. Tighten wheel bolts as specified in “Torque Values” on page 17.
Unload Boom from Truck

1. Using a forklift or tractor, remove boom from truck. Do not remove shipping stands until boom is ready to be assembled.

2. When ready to assemble boom, place sprayer in an open, level area. Make sure there is enough overhead and side clearance to fold and unfold assembled boom.

Remove Shipping Straps

Refer to Figure 1

1. Unbolt and remove shipping strap from frame.

2. Remove transport bumper (1), bolt, and nut from shipping strap.

Refer to Figure 2

3. Reattach transport bumper to top of transport support weldment.

4. Secure transport bumper to transport support weldment with previously removed bolt and nut.
Refer to Figure 3 and Figure 4
5. Unhook swivel bolt snap from stationary ring. Re-hook swivel bolt snap to ring located in outer boom lock plunger rod.

Refer to Figure 5
6. Cut plastic tie from foam marker drop hose, if sprayer is equipped with foam marker.

NOTE:
If the TSF660 is equipped with foam marker, refer to the optional Foam Marker Kit manual for installation information.
Preparation and Setup

Before you Start

Read and understand the owners manual for your sprayer. A basic understanding of how the sprayer works will aid in the assembly, setup, and operation of your sprayer.

Perform these checks before setting up your front fold boom.
1. Read and understand "Important Safety Information" beginning on page 1.
2. Check that all working parts are moving freely, bolts are tight, and cotter pins are spread.
3. Check that all grease fittings are in place and lubricated.
4. Check that all safety decals and reflectors are correctly located and legible. Replace if damaged.

Hitching Tractor to Sprayer

⚠️ DANGER

Crushing Hazard:
You may be severely injured or killed by being crushed between the tractor and front fold boom sprayer. Do not stand or place any part of your body between front fold boom sprayer and moving tractor. Stop tractor engine and set park brake before installing the hitch pin.

⚠️ DANGER

Electrocution Hazard:
To prevent serious injury or death from electric shock, keep clear of overhead power lines when transporting, folding or unfolding boom. Boom is not grounded. Electrocution can occur without direct contact. Do not fold or unfold boom while tractor is moving.

Refer to transport dimensions under “Specifications and Capacities” on page 16.
Predelivery
1. Have tractor delivered to dealership that will be operating sprayer.
2. Confirm row spacing, and set wheel spacing on sprayer. (Axles are adjustable).
3. Hook sprayer to tractor.
4. Install control switch boxes inside of tractor cab, and route power supplies to the tractor battery.
5. The following equipment must be connected to the tractor's battery; Raven 440 Controller, Fasse Valve Hydraulic Control Box, and Optional Foam Marker Control.
   a. To connect the Raven 440 Controller to the tractor battery, see the Raven Installation and Service manual.
   b. To connect the Fasse valve hydraulic control box to the tractor battery, follow the steps below.
      • Use the 6-foot, two-wire red and black cable to connect the hydraulic controls to the tractor battery.
      • Connect the red wire from each cable to the positive terminal and the black wire from each cable to the negative terminal.
   c. Use the 6-foot gray cable to connect the optional foam marker control to the tractor battery.
6. Mount radar gun to tractor frame if applicable and route cable up through cab. If using existing radar on tractor, install Y-cable according to tractor manufacturer's recommendations.
7. Connect all hydraulic hoses to outlets (refer to tractor operator's manual for designated outlet if equipped with a hydraulic pump).
   The hydraulic motor used on all liquid pumps is a 7 gpm motor. If the tractor used on this sprayer does not have the capabilities to adjust the remotes to this flow, then a hydraulic flow divider kit must be installed so that flow can be controlled and to prevent operating the pump at excessive speeds.
8. Place a stop in the neutral position for the tractor hydraulics so that the hydraulic lever can only be moved to the float and down positions. Refer to the tractor operator's manual on information for the neutral stop.
11. Fill sprayer approximately 1/2 full of water. Open tank sump valve and let water circulate throughout the system and check for any leaks.
12. Before installing nozzles, engage pump slowly and circulate water through the system, then turn on boom valves individually to flush out the system.
   On sprayers equipped with a hydraulic pump, start out with the hydraulic lever in the float position, and engage the pump by placing the lever in the down position. Make sure the hydraulic flow control valve is set at a minimum flow.
13. After system has been thoroughly flushed, install nozzles and open boom valves again to check nozzle pattern across the boom.
14. Set the deadhead pressure of the pump in the following ways depending on how pump is driven.
   **Hydraulic Drive Pumps**
   1. To determine the correct flow rate to the hydraulic motor, start out with the hydraulic control valve set at a minimum flow, and the hydraulic lever in the float position.
   2. Open up the sprayer control valve to its maximum setting.
      On the Raven 440 monitor, with the power switch on, the rate switch must be placed in the manual position, and the increase/decrease switch must be pushed to increase for 10-12 seconds.
   3. Start the tractor and engage the pump by placing the hydraulic lever in the down position. Once the system builds pressure, speed up the tractor to normal operating speed. Shut off the boom section switches, and close the agitation valve.
   4. The pump is now at deadhead pressure and the hydraulic control valve must be adjusted up until the spray pressure reaches 80 psi maximum. Mark this setting on the hydraulic control valve for future reference.
   5. Open up the agitation valve.

---

**NOTICE**

*Damage to the pump will occur if the hydraulic lever is returned to the neutral position while the pump is running.*

9. Check all hydraulic functions of the boom/elevator.
10. With boom still unfolded, make sure boom locks are adjusted correctly to just clear the stops.
Ace Pump Flow Limiter (Option)

Refer to Figure 6

The flow limiter is a hydraulic device designed to shut off the flow of hydraulic oil when a specified flow is exceeded. On tractors with load sensing closed center hydraulic systems, this device limits the flow of oil to the Ace motor and prevents failures due to misapplication.

Newer Case-IH, John Deere, New Holland, and CAT tractors, present a great potential to turn the motors beyond their rated speeds. Flows out of the hydraulic valves can exceed 20 gpm while the motors are rated at 4-11 gpm. The flow limiter protects the Ace motor by shutting off when hydraulic flows exceed the motor's capacity.

The flow limiter should not be used on open center or pressure compensating closed center hydraulic systems. The flow limiter should not be used with a restrictor orifice.

To Install:

1. Install the flow limiter in the inlet port of the Ace motor.
2. Close the needle valve on the Ace motor by loosening the jam nut and screwing the needle valve in a clockwise direction all the way down.
3. Connect the hydraulic hoses so that the pump runs with the hydraulic lever in the lower/retract position. Connect return hose to low pressure return port, when available.
4. Shut off boom and agitation valves on the sprayer to deadhead the sprayer pump flow.
5. Adjust the flow control on the tractor to minimum flow setting (turtle).
6. Move the hydraulic lever to the lower/retract position.

**NOTE:**
Always shut the pump off in the float position. This eliminates high pressure being trapped in the return line and protects hydraulic seals. Avoid returning the oil to the remote valve; use the low pressure return port, when available.

7. Adjust the flow control on the tractor until the sprayer system deadhead pressure is within the operating parameters of the pump.
   If the flow limiter stops the flow of oil to the motor:
   a. Move the hydraulic lever to the neutral position. This removes the oil pressure from the flow limiter and allows it to reset.
   b. Adjust the flow control to a lower flow position.
   c. Repeat steps 6 and 7.
8. Set sprayer pressure by opening the agitation valve.
Axle Wheel Spacing Adjustment

⚠️ CAUTION
Axle position must be located correctly to avoid excessive tongue weight or negative tongue weight which could cause mechanical failure resulting in personal injury.

Refer to Figure 7
The wheel spacing of the axle can also be adjusted for differing row spacings.

⚠️ CAUTION
Do not adjust the wheel spacing wider than 120 inches. To do so may cause a falling axle hazard while the sprayer is in service.

Figure 7
Sprayer Axle Assembly
## Specifications and Capacities

<table>
<thead>
<tr>
<th>Model</th>
<th>TSF660</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boom Width</td>
<td>60 feet</td>
</tr>
<tr>
<td>Nozzle Spacing</td>
<td>20 inches, 30 inches</td>
</tr>
<tr>
<td>Number of Nozzles</td>
<td>36 (20 inch spacing), 25 (30 inch spacing)</td>
</tr>
<tr>
<td>Wheel Spacing</td>
<td>60 inches to 120 inches</td>
</tr>
<tr>
<td>Transport Height</td>
<td>12 feet 3 inches</td>
</tr>
<tr>
<td>Transport Width</td>
<td>9 feet (wheels in), 11 feet 3 inches (wheels out)</td>
</tr>
<tr>
<td>Working Width</td>
<td>63 feet</td>
</tr>
<tr>
<td>Length</td>
<td>19 feet 10 inches</td>
</tr>
<tr>
<td>Ground Clearance</td>
<td>28 inches</td>
</tr>
<tr>
<td>Approximate Empty Weight</td>
<td>6950 pounds</td>
</tr>
<tr>
<td>Approximate Full Weight (Full)</td>
<td>12,400 pounds</td>
</tr>
<tr>
<td>Wheel/Tire Size</td>
<td>320/85R38</td>
</tr>
<tr>
<td>Main Tank Capacity</td>
<td>650 gallons</td>
</tr>
<tr>
<td>Pump Capacity</td>
<td>90 gpm @30psi</td>
</tr>
<tr>
<td>Flush and Rinse Capacity</td>
<td>50 gallons</td>
</tr>
<tr>
<td>Foam Marker Capacity (Option)</td>
<td>25 gallons</td>
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</table>

### Tire Inflation Chart

<table>
<thead>
<tr>
<th>Tire Size</th>
<th>Inflation psi</th>
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<tbody>
<tr>
<td>13.6 x 38 6 ply tractor tread</td>
<td>22</td>
</tr>
<tr>
<td>320/85R 38 Radial</td>
<td>52</td>
</tr>
</tbody>
</table>

### Tire Warranty Information

All tires are warranted by the original manufacturer of the tire. Tire warranty information is found in the brochures included with your Operator’s and Parts Manuals or online at the manufacturer’s websites listed below. For assistance or information, contact your nearest Authorized Farm Tire Retailer.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Website</th>
</tr>
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<tbody>
<tr>
<td>Firestone</td>
<td><a href="http://www.firestoneag.com">www.firestoneag.com</a></td>
</tr>
<tr>
<td>Gleason</td>
<td><a href="http://www.gleasonwheel.com">www.gleasonwheel.com</a></td>
</tr>
<tr>
<td>Titan</td>
<td><a href="http://www.titan-intl.com">www.titan-intl.com</a></td>
</tr>
</tbody>
</table>
## Torque Values

<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Bolt Head Identification</th>
<th>Bolt Size</th>
<th>Bolt Head Identification</th>
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<tbody>
<tr>
<td></td>
<td>Grade 2</td>
<td>5.8</td>
<td>Class 5.8</td>
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<td>in-tiap</td>
<td>Grade 5</td>
<td>8.8</td>
<td>Class 8.8</td>
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<td></td>
<td>Grade 8</td>
<td>10.9</td>
<td>Class 10.9</td>
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<tr>
<td>1/8-20</td>
<td>7.4</td>
<td>4.3</td>
<td>M 5 X 0.8</td>
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<tr>
<td></td>
<td>5.6</td>
<td>5.6</td>
<td>M 6 X 1</td>
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<tr>
<td>1/4-28</td>
<td>8.5</td>
<td>6.0</td>
<td>M 8 X 1.25</td>
</tr>
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<td></td>
<td>6.0</td>
<td>6.3</td>
<td>M 8 X 1</td>
</tr>
<tr>
<td>5/16-18</td>
<td>15.0</td>
<td>17.12</td>
<td>M 8 X 1.25</td>
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<tr>
<td></td>
<td>11.0</td>
<td>16.0</td>
<td>M 8 X 1</td>
</tr>
<tr>
<td>5/16-24</td>
<td>15.0</td>
<td>17.12</td>
<td>M 10 X 1.5</td>
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<td></td>
<td>11.0</td>
<td>16.0</td>
<td>M 10 X 0.75</td>
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<td>3/16-14</td>
<td>31.0</td>
<td>39.29</td>
<td>M 12 X 1.75</td>
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**Notes:**
- **a.** in-tiap = nominal thread diameter in inches/threads per inch
- **b.** N·m = newton-meters
- **c.** mm x pitch = nominal thread diameter in mm x thread pitch
- **d.** ft-lb = foot pounds

Torque tolerance + 0%, -15% of torquing values. Unless otherwise specified use torque values listed above.