850M
Tier 4B (final)
Crawler Dozer
PIN NGC103138 and above

SERVICE MANUAL

Part number 48080037
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CASE CONSTRUCTION

SERVICE MANUAL

850M Long Track (LT) - Tier 4B (final) [NGC103138 -]
850M Wide Track (WT) / Low Ground Pressure (LGP) - Tier 4B (final) [NGC103138 -]

Contents

INTRODUCTION

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INTRODUCTION

(*) See content for specific models

Foreword - Important notice regarding equipment servicing

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All repair and maintenance work listed in this manual must be carried out only by qualified dealership personnel, strictly complying with the instructions given, and using, whenever possible, the special tools.

Anyone who performs repair and maintenance operations without complying with the procedures provided herein shall be responsible for any subsequent damages.

The manufacturer and all the organizations of its distribution chain, including - without limitation - national, regional, or local dealers, reject any responsibility for damages caused by parts and/or components not approved by the manufacturer, including those used for the servicing or repair of the product manufactured or marketed by the manufacturer. In any case, no warranty is given or attributed on the product manufactured or marketed by the manufacturer in case of damages caused by parts and/or components not approved by the manufacturer.

The manufacturer reserves the right to make improvements in design and changes in specifications at any time without notice and without incurring any obligation to install them on units previously sold. Specifications, descriptions, and illustrative material herein are as accurate as known at time of publication but are subject to change without notice.

In case of questions, refer to your CASE CONSTRUCTION Sales and Service Networks.

Safety rules

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Personal safety

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible death or injury.

Throughout this manual you will find the signal words DANGER, WARNING, and CAUTION followed by special instructions. These precautions are intended for the personal safety of you and those working with you.

Read and understand all the safety messages in this manual before you operate or service the machine.

⚠ DANGER indicates a hazardous situation that, if not avoided, will result in death or serious injury.

⚠ WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury.

⚠ CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

FAILURE TO FOLLOW DANGER, WARNING, AND CAUTION MESSAGES COULD RESULT IN DEATH OR SERIOUS INJURY.

Machine safety

NOTICE: *Notice indicates a situation that, if not avoided, could result in machine or property damage.*

Throughout this manual you will find the signal word Notice followed by special instructions to prevent machine or property damage. The word Notice is used to address practices not related to personal safety.

Information

NOTE: *Note indicates additional information that clarifies steps, procedures, or other information in this manual.*

Throughout this manual you will find the word Note followed by additional information about a step, procedure, or other information in the manual. The word Note is not intended to address personal safety or property damage.

Safety rules - Personal safety

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⚠ General safety rules ⚠

Use caution when you operate the machine on slopes. Raised equipment, full tanks and other loads will change the center of gravity of the machine. The machine can tip or roll over when near ditches and embankments or uneven surfaces.

Never permit anyone other than the operator to ride on the machine.

Never operate the machine under the influence of alcohol or drugs, or while you are otherwise impaired.

When digging or using ground-engaging attachments, be aware of buried cables. Contact local utilities to determine the locations of services.

Pay attention to overhead power lines and hanging obstacles. High voltage lines may require significant clearance for safety.

Hydraulic oil or diesel fuel leaking under pressure can penetrate the skin, causing serious injury or infection.

- DO NOT use your hand to check for leaks. Use a piece of cardboard or paper.
- Stop the engine, remove the key, and relieve the pressure before you connect or disconnect fluid lines.
- Make sure that all components are in good condition. Tighten all connections before you start the engine or pressurize the system.
- If hydraulic fluid or diesel fuel penetrates the skin, seek medical attention immediately.
- Continuous long term contact with hydraulic fluid may cause skin cancer. Avoid long term contact and wash the skin promptly with soap and water.

Keep clear of moving parts. Loose clothing, jewelry, watches, long hair, and other loose or hanging items can become entangled in moving parts.

Wear protective equipment when appropriate.

DO NOT attempt to remove material from any part of the machine while it is being operated or while components are in motion.

Make sure that all guards and shields are in good condition and properly installed before you operate the machine. Never operate the machine with shields removed. Always close access doors or panels before you operate the machine.

Dirty or slippery steps, ladders, walkways, and platforms can cause falls. Make sure these surfaces remain clean and clear of debris.

A person or pet within the operating area of a machine can be struck or crushed by the machine or its equipment. DO NOT allow anyone to enter the work area.

Raised equipment and/or loads can fall unexpectedly and crush persons underneath. Never allow anyone to enter the area underneath raised equipment during operation.

Never operate the engine in enclosed spaces as harmful exhaust gases may build up.

Before you start the machine, be sure that all controls are in neutral or park lock position.

Start the engine only from the operator’s seat. If you bypass the safety start switch, the engine can start with the transmission in gear. Do not connect or short across terminals on the starter solenoid. Attach jumper cables as described in the manual. Starting in gear may cause death or serious injury.

Always keep windows, mirrors, and all lighting clean to provide the best possible visibility while you operate the machine.

Operate controls only when seated in the operator's seat, except for those controls expressly intended for use from other locations.

Before you leave the machine:

1. Park the machine on a firm, level surface.
2. Put all controls in neutral or park lock position.
3. Engage the parking brake. Use wheel chocks if required.
4. Lower all hydraulic equipment — Implements, header, etc.
5. Turn off the engine and remove the key.

When, due to exceptional circumstances, you would decide to keep the engine running after you leave the operator's station, then you must follow these precautions:

1. Bring the engine to low idle speed.
2. Disengage all drive systems.
3. **⚠ WARNING**

   Some components may continue to run down after you disengage drive systems.
   Make sure all drive systems are fully disengaged.
   Failure to comply could result in death or serious injury.

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   Shift the transmission into neutral.
4. Apply the parking brake.

⚠ General maintenance safety ⚠

Keep the area used for servicing the machine clean and dry. Clean up spilled fluids.

Service the machine on a firm, level surface.

Install guards and shields after you service the machine.

Close all access doors and install all panels after servicing the machine.

Do not attempt to clean, lubricate, clear obstructions, or make adjustments to the machine while it is in motion or while the engine is running.

Always make sure that working area is clear of tools, parts, other persons and pets before you start operating the machine.

Unsupported hydraulic cylinders can lose pressure and drop the equipment, causing a crushing hazard. Do not leave equipment in a raised position while parked or during service, unless the equipment is securely supported.

Jack or lift the machine only at jack or lift points indicated in this manual.

Incorrect towing procedures can cause accidents. When you tow a disabled machine follow the procedure in this manual. Use only rigid tow bars.

Stop the engine, remove the key, and relieve pressure before you connect or disconnect fluid lines.

Stop the engine and remove the key before you connect or disconnect electrical connections.

Scalding can result from incorrect removal of coolant caps. Cooling systems operate under pressure. Hot coolant can spray out if you remove a cap while the system is hot. Allow the system to cool before you remove the cap. When you remove the cap, turn it slowly to allow pressure to escape before you completely remove the cap.

Replace damaged or worn tubes, hoses, electrical wiring, etc.

The engine, transmission, exhaust components, and hydraulic lines may become hot during operation. Take care when you service such components. Allow surfaces to cool before you handle or disconnect hot components. Wear protective equipment when appropriate.

When welding, follow the instructions in the manual. Always disconnect the battery before you weld on the machine. Always wash your hands after you handle battery components.

⚠ Fire and explosion prevention ⚠

Fuel or oil that is leaked or spilled on hot surfaces or electrical components can cause a fire.

Crop materials, trash, debris, bird nests, or flammable material can ignite on hot surfaces.

Always have a fire extinguisher on or near the machine.

Make sure that the fire extinguisher(s) is maintained and serviced according to the manufacturer's instructions.

At least once each day and at the end of the day, remove all trash and debris from the machine especially around hot components such as the engine, transmission, exhaust, battery, etc. More frequent cleaning of your machine may be necessary depending on the operating environment and conditions.

At least once each day, remove debris accumulation around moving components such as bearings, pulleys, belts, gears, cleaning fans, etc. More frequent cleaning of your machine may be necessary depending on the operating environment and conditions.

Inspect the electrical system for loose connections and frayed insulation. Repair or replace loose or damaged parts.

Do not store oily rags or other flammable material on the machine.

Do not weld or flame cut any items that contain flammable material. Clean items thoroughly with non-flammable solvents before welding or flame-cutting.

Do not expose the machine to flames, burning brush, or explosives.

Promptly investigate any unusual smells or odors that may occur during operation of the machine.

⚠ General battery safety ⚠

Always wear eye protection when you work with batteries.

Do not create sparks or have open flame near a battery.

Ventilate the area when you charge a battery or use a battery in an enclosed area.

Disconnect the negative (-) terminal first and reconnect the negative (-) terminal last.

When you weld on the machine, disconnect both terminals of the battery.

Do not weld, grind, or smoke near a battery.

When you use auxiliary batteries or connect jumper cables to start the engine, use the procedure shown in the operator's manual. Do not short across terminals.

Follow the manufacturer's instructions when you store and handle batteries.

Battery post, terminals, and related accessories contain lead and lead compounds. Wash hands after handling. This is a California Proposition 65 warning.

Battery acid causes burns. Batteries contain sulfuric acid. Avoid contact with skin, eyes, or clothing. Antidote (external): Flush with water. Antidote (eyes): flush with water for 15 minutes and seek medical attention immediately. Antidote (internal): Drink large quantities of water or milk. Do not induce vomiting. Seek medical attention immediately.

Keep out of reach of children and other unauthorized persons.

⚠ Operator presence system ⚠

Your machine is equipped with an operator presence system to prevent the use of some features while the operator is not in the operator's seat.

Never disconnect or bypass the operator presence system.

If the operator presence system is inoperable, then it must be repaired.

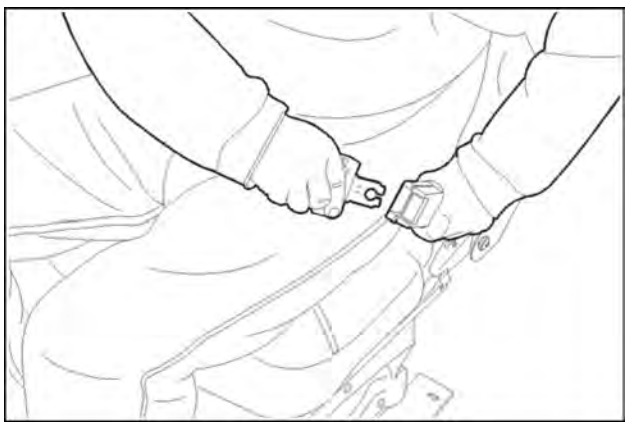
⚠ Seat belts ⚠

Seat belts must be worn at all times.

Seat belt inspection and maintenance:

- Keep seat belts in good condition.
- Keep sharp edges and items than can cause damage away from the belts.
- Periodically check belts, buckles, retractors, tethers, slack take-up system, and mounting bolts for damage and wear.
- Replace all parts that have damage or wear.
- Replace belts that have cuts that can make the belt weak.
- Check that bolts are tight on the seat bracket or mounting.
- If the belt is attached to the seat, make sure that the seat or seat brackets are mounted securely.
- Keep seat belts clean and dry.
- Clean belts only with soap solution and warm water.
- Do not use bleach or dye on the belts because this can make the belts weak.

Pull the right-hand belt from the seat belt retractor. Fasten the metal belt end into the left-hand buckle.



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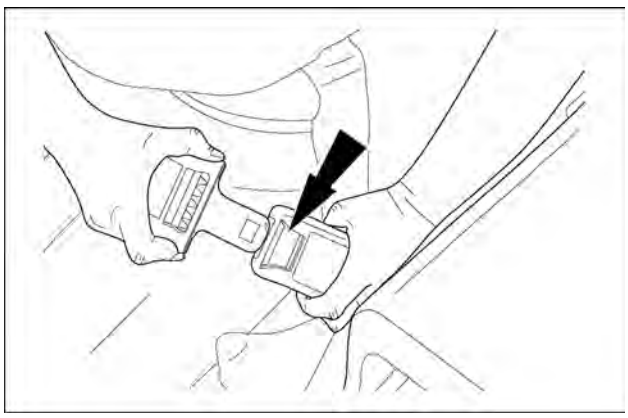
Press the red button on the left-hand seat belt mechanism to release the seat belt.



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⚠ Operator protective structure ⚠

Your machine is equipped with an operator protective structure, such as: a Roll Over Protective Structure (ROPS), Falling Objects Protective Structure (FOPS), or a cab with a ROPS. A ROPS may be a can frame or a two-posted or four-posted structure used for the protection of the operator to minimize the possibility of serious injury. The mounting structure and fasteners forming the mounting connection with the machine are part of the ROPS.

The protective structure is a special safety component of your machine.

DO NOT attach any device to the protective structure for pulling purposes. DO NOT drill holes to the protective structure.

The protective structure and interconnecting components are a certified system. Any damage, fire, corrosion, or modification will weaken the structure and reduce your protection. If this occurs, THE PROTECTIVE STRUCTURE MUST BE REPLACED so that it will provide the same protection as a new protective structure. Contact your dealer for protective structure inspection and replacement.

After an accident, fire, tip over, or roll over, the following MUST be performed by a qualified technician before returning the machine to field or job-site operations:

- The protective structure MUST BE REPLACED.
- The mounting or suspension for the protective structure, operator's seat and suspension, seat belts and mounting components, and wiring within the operator's protective system MUST be carefully inspected for damage.
- All damaged parts MUST BE REPLACED.

DO NOT WELD, DRILL HOLES, ATTEMPT TO STRAIGHTEN, OR REPAIR THE PROTECTIVE STRUCTURE. MODIFICATION IN ANY WAY CAN REDUCE THE STRUCTURAL INTEGRITY OF THE STRUCTURE, WHICH COULD CAUSE DEATH OR SERIOUS INJURY IN THE EVENT OF FIRE, TIP OVER, ROLL OVER, COLLISION, OR ACCIDENT.

Seat belts are part of your protective system and must be worn at all times. The operator must be held to the seat inside the frame in order for the protective system to work.

⚠ Air-conditioning system ⚠

The air-conditioning system is under high pressure. Do not disconnect any lines. The release of high pressure can cause serious injury.

The air-conditioning system contains gases that are harmful to the environment when released into the atmosphere. Do not attempt to service or repair the system.

Only trained service technicians can service, repair, or recharge the air-conditioning system.

⚠ Backup alarm system ⚠

Do not disconnect backup alarm system if so equipped.

⚠ Personal Protective Equipment (PPE) ⚠

Wear Personal Protective Equipment (PPE) such as hard hat, eye protection, heavy gloves, hearing protection, protective clothing, etc.

⚠ Do Not Operate tag ⚠

Before you start servicing the machine, attach a 'Do Not Operate' warning tag to the machine in an area that will be visible.

⚠ Hazardous chemicals ⚠

If you are exposed to or come in contact with hazardous chemicals you can be seriously injured. The fluids, lubricants, paints, adhesives, coolant, etc. required for the function of your machine can be hazardous. They may be attractive and harmful to domestic animals as well as humans.

Material Safety Data Sheets (MSDS) provide information about the chemical substances within a product, safe handling and storage procedures, first aid measures, and procedures to take in the event of a spill or accidental release. MSDS are available from your dealer.

Before you service your machine check the MSDS for each lubricant, fluid, etc. used in this machine. This information indicates the associated risks and will help you service the machine safely. Follow the information in the MSDS, and on manufacturer containers, as well as the information in this manual, when you service the machine.

Dispose of all fluids, filters, and containers in an environmentally safe manner according to local laws and regulations. Check with local environmental and recycling centers or your dealer for correct disposal information.

Store fluids and filters in accordance with local laws and regulations. Use only appropriate containers for the storage of chemicals or petrochemical substances.

Keep out of reach or children or other unauthorized persons.

Applied chemicals require additional precautions. Obtain complete information from the manufacturer or distributor of the chemicals before you use them.

⚠ Utility safety ⚠

When digging or using ground-engaging equipment, be aware of buried cables and other services. Contact your local utilities or authorities, as appropriate, to determine the locations of services.

Make sure that the machine has sufficient clearance to pass in all directions. Pay special attention to overhead power lines and hanging obstacles. High voltage lines may require significant clearance for safety. Contact local authorities or utilities to obtain safe clearance distances from high voltage power lines.

Retract raised or extended components, if necessary. Remove or lower radio antennas or other accessories. Should a contact between the machine and an electric power source occur, the following precautions must be taken:

- Stop the machine movement immediately.
- Apply the parking brake, stop the engine, and remove the key.
- Check if you can safely leave the cab or your actual position without contact with electrical wires. If not, stay in your position and call for help. If you can leave your position without touching lines, jump clear of the machine to make sure that you do not make contact with the ground and the machine at the same time.
- Do not permit anyone to touch the machine until power has been shut off to the power lines.

⚠ Electrical storm safety ⚠

Do not operate machine during an electrical storm.

If you are on the ground during an electrical storm, stay away from machinery and equipment. Seek shelter in a permanent, protected structure.

If an electrical storm should strike during operation, remain in the cab. Do not leave the cab or operator’s platform. Do not make contact with the ground or objects outside the machine.

⚠ Mounting and dismounting ⚠

Mount and dismount the machine only at designated locations that have handholds, steps, and/or or ladders.

Do not jump off of the machine.

Make sure that steps, ladders, and platforms remain clean and clear of debris and foreign substances. Injury may result from slippery surfaces.

Face the machine when you mount and dismount the machine.

Maintain a three-point contact with steps, ladders, and handholds.

Never mount or dismount from a moving machine.

Do not use the steering wheel or other controls or accessories as handholds when you enter or exit the cab or operator's platform.

⚠ Working at heights ⚠

When the normal use and maintenance of the machine requires you to work at heights:

- Correctly use installed steps, ladders, and railings.
- Never use ladders, steps, or railings while the machine is moving.
- Do not stand on surfaces that are not designated as steps or platforms.

Do not use the machine as a lift, ladder, or platform for working at heights.

⚠ Lifting and overhead loads ⚠

Never use loader buckets, forks, etc. or other lifting, handling, or digging equipment to lift persons.

Do not use raised equipment as a work platform.

Know the full area of movement of the machine and equipment and do not enter or permit anyone to enter the area of movement while the machine is in operation.

Never enter or permit anyone to enter the area underneath raised equipment. Equipment and/or loads can fall unexpectedly and crush persons underneath it.

Do not leave equipment in raised position while parked or during service, unless securely supported. Hydraulic cylinders must be mechanically locked or supported if they are left in a raised position for service or access.

Loader buckets, forks, etc. or other lifting, handling, or digging equipment and its load will change the center of gravity of the machine. This can cause the machine to tip on slopes or uneven ground.

Load items can fall off the loader bucket or lifting equipment and crush the operator. Care must be taken when lifting a load. Use proper lifting equipment.

Do not lift load higher than necessary. Lower loads to transport. Remember to leave appropriate clearance to the ground and other obstacles.

Equipment and associated loads can block visibility and cause an accident. Do not operate with insufficient visibility.

Safety rules - Ecology and the environment

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Soil, air, and water quality is important for all industries and life in general. When legislation does not yet rule the treatment of some of the substances that advanced technology requires, sound judgment should govern the use and disposal of products of a chemical and petrochemical nature.

Familiarize yourself with the relative legislation applicable to your country, and make sure that you understand this legislation. Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, anti-freeze, cleaning agents, etc., with regard to the effect of these substances on man and nature and how to safely store, use, and dispose of these substances.

Helpful hints

- Avoid the use of cans or other inappropriate pressurized fuel delivery systems to fill tanks. Such delivery systems may cause considerable spillage.
- In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of these products contain substances that may be harmful to your health.
- Modern oils contain additives. Do not burn contaminated fuels and or waste oils in ordinary heating systems.
- Avoid spillage when you drain fluids such as used engine coolant mixtures, engine oil, hydraulic fluid, brake fluid, etc. Do not mix drained brake fluids or fuels with lubricants. Store all drained fluids safely until you can dispose of the fluids in a proper way that complies with all local legislation and available resources.
- Do not allow coolant mixtures to get into the soil. Collect and dispose of coolant mixtures properly.
- The air-conditioning system contains gases that should not be released into the atmosphere. Consult an air-conditioning specialist or use a special extractor to recharge the system properly.
- Repair any leaks or defects in the engine cooling system or hydraulic system immediately.
- Do not increase the pressure in a pressurized circuit as this may lead to a component failure.
- Protect hoses during welding. Penetrating weld splatter may burn a hole or weaken hoses, allowing the loss of oils, coolant, etc.

Battery recycling

Batteries and electric accumulators contain several substances that can have a harmful effect on the environment if the batteries are not properly recycled after use. Improper disposal of batteries can contaminate the soil, groundwater, and waterways. CASE CONSTRUCTION strongly recommends that you return all used batteries to a CASE CONSTRUCTION dealer, who will dispose of the used batteries or recycle the used batteries properly. In some countries, this is a legal requirement.

Mandatory battery recycling

NOTE: *The following requirements are mandatory in Brazil.*

Batteries are made of lead plates and a sulfuric acid solution. Because batteries contain heavy metals such as lead, CONAMA Resolution 401/2008 requires you to return all used batteries to the battery dealer when you replace any batteries. Do not dispose of batteries in your household garbage.

Points of sale are obliged to:

- Accept the return of your used batteries
- Store the returned batteries in a suitable location
- Send the returned batteries to the battery manufacturer for recycling

Safety rules - Do not operate tag

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⚠ WARNING

Maintenance hazard!
Before you start servicing the machine, attach a DO NOT OPERATE warning tag to the machine in a visible area.
Failure to comply could result in death or serious injury.

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Attach a DO NOT OPERATE (TAG) to the machine in an area that is clearly visible whenever the machine is not operating properly and/or requires service.
Complete the tag information for the "REASON" the tag is attached by describing the malfunction or service required.
Validate the reason for attaching the tag by signing your name in the designated area on the tag.
The tag should only be removed by the person who signed and attached the tag, after validating the repairs or services have been completed.

Tag Components

A. DO NOT REMOVE THIS TAG! - (Warning) The tag should only be removed by the person who signed and attached the tag, after validating the repairs or services have been completed.

B. See Other Side - (Reference to additional information on opposite side of the tag.)

C. CNH Part Number - (Request this part number from you Service Parts Dealer to obtain this DO NOT OPERATE tag.)

D. DO NOT OPERATE - (Warning!)

E. REASON - (Area for describing malfunction or service required before operation.)

F. Signed by - (Signature area - to be signed by the person validating the reason for installation of the tag.)

Torque - Minimum tightening torques for normal assembly

850M	NA

METRIC NON-FLANGED HARDWARE

NOM. SIZE	CLASS 8.8 BOLT and CLASS 8 NUT		CLASS 10.9 BOLT and CLASS 10 NUT		LOCKNUT CL.8 W/CL8.8 BOLT	LOCKNUT CL.10 W/CL10.9 BOLT
	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr		
M4	2.2 N·m (19 lb in)	2.9 N·m (26 lb in)	3.2 N·m (28 lb in)	4.2 N·m (37 lb in)	2 N·m (18 lb in)	2.9 N·m (26 lb in)
M5	4.5 N·m (40 lb in)	5.9 N·m (52 lb in)	6.4 N·m (57 lb in)	8.5 N·m (75 lb in)	4 N·m (36 lb in)	5.8 N·m (51 lb in)
M6	7.5 N·m (66 lb in)	10 N·m (89 lb in)	11 N·m (96 lb in)	15 N·m (128 lb in)	6.8 N·m (60 lb in)	10 N·m (89 lb in)
M8	18 N·m (163 lb in)	25 N·m (217 lb in)	26 N·m (234 lb in)	35 N·m (311 lb in)	17 N·m (151 lb in)	24 N·m (212 lb in)
M10	37 N·m (27 lb ft)	49 N·m (36 lb ft)	52 N·m (38 lb ft)	70 N·m (51 lb ft)	33 N·m (25 lb ft)	48 N·m (35 lb ft)
M12	64 N·m (47 lb ft)	85 N·m (63 lb ft)	91 N·m (67 lb ft)	121 N·m (90 lb ft)	58 N·m (43 lb ft)	83 N·m (61 lb ft)
M16	158 N·m (116 lb ft)	210 N·m (155 lb ft)	225 N·m (166 lb ft)	301 N·m (222 lb ft)	143 N·m (106 lb ft)	205 N·m (151 lb ft)
M20	319 N·m (235 lb ft)	425 N·m (313 lb ft)	440 N·m (325 lb ft)	587 N·m (433 lb ft)	290 N·m (214 lb ft)	400 N·m (295 lb ft)
M24	551 N·m (410 lb ft)	735 N·m (500 lb ft)	762 N·m (560 lb ft)	1016 N·m (750 lb ft)	501 N·m (370 lb ft)	693 N·m (510 lb ft)

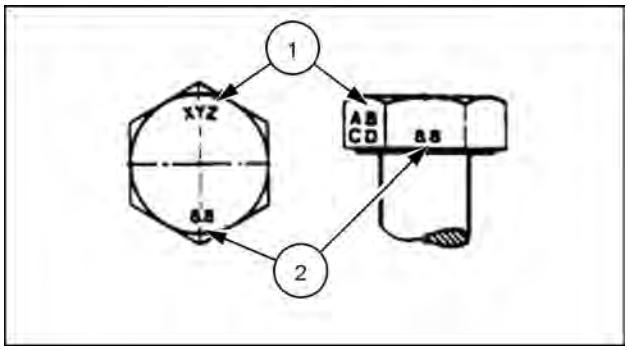
NOTE: *M4 through M8 hardware torque specifications are shown in pound-inches. M10 through M24 hardware torque specifications are shown in pound-feet.*

METRIC FLANGED HARDWARE

NOM. SIZE	CLASS 8.8 BOLT and CLASS 8 NUT		CLASS 10.9 BOLT and CLASS 10 NUT		LOCKNUT CL.8 W/CL8.8 BOLT	LOCKNUT CL.10 W/CL10.9 BOLT
	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr		
M4	2.4 N·m (21 lb in)	3.2 N·m (28 lb in)	3.5 N·m (31 lb in)	4.6 N·m (41 lb in)	2.2 N·m (19 lb in)	3.1 N·m (27 lb in)
M5	4.9 N·m (43 lb in)	6.5 N·m (58 lb in)	7.0 N·m (62 lb in)	9.4 N·m (83 lb in)	4.4 N·m (39 lb in)	6.4 N·m (57 lb in)
M6	8.3 N·m (73 lb in)	11 N·m (96 lb in)	12 N·m (105 lb in)	16 N·m (141 lb in)	7.5 N·m (66 lb in)	11 N·m (96 lb in)
M8	20 N·m (179 lb in)	27 N·m (240 lb in)	29 N·m (257 lb in)	39 N·m (343 lb in)	18 N·m (163 lb in)	27 N·m (240 lb in)
M10	40 N·m (30 lb ft)	54 N·m (40 lb ft)	57 N·m (42 lb ft)	77 N·m (56 lb ft)	37 N·m (27 lb ft)	53 N·m (39 lb ft)
M12	70 N·m (52 lb ft)	93 N·m (69 lb ft)	100 N·m (74 lb ft)	134 N·m (98 lb ft)	63 N·m (47 lb ft)	91 N·m (67 lb ft)
M16	174 N·m (128 lb ft)	231 N·m (171 lb ft)	248 N·m (183 lb ft)	331 N·m (244 lb ft)	158 N·m (116 lb ft)	226 N·m (167 lb ft)
M20	350 N·m (259 lb ft)	467 N·m (345 lb ft)	484 N·m (357 lb ft)	645 N·m (476 lb ft)	318 N·m (235 lb ft)	440 N·m (325 lb ft)
M24	607 N·m (447 lb ft)	809 N·m (597 lb ft)	838 N·m (618 lb ft)	1118 N·m (824 lb ft)	552 N·m (407 lb ft)	

IDENTIFICATION

Metric Hex head and carriage bolts, classes 5.6 and up



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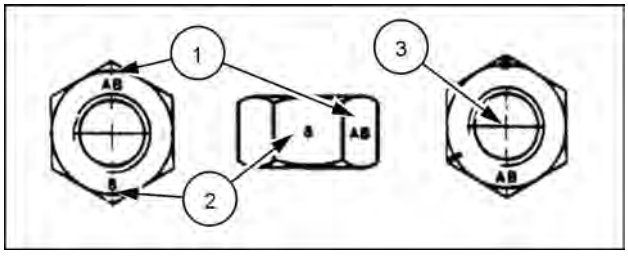
1. Manufacturer's Identification
2. Property Class

Metric Hex nuts and locknuts, classes 05 and up



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1. Manufacturer's Identification
2. Property Class
3. Clock Marking of Property Class and Manufacturer's Identification (Optional), i.e. marks **60°** apart indicate Class 10 properties, and marks **120°** apart indicate Class 8.

INCH NON-FLANGED HARDWARE

NOMINAL SIZE	SAE GRADE 5 BOLT and NUT		SAE GRADE 8 BOLT and NUT		LOCKNUT GrB W/ Gr5 BOLT	LOCKNUT GrC W/ Gr8 BOLT
	UN-PLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UN-PLATED or PLATED SILVER	PLATED W/ZnCr GOLD		
1/4	**8 N·m (71 lb in)**	**11 N·m (97 lb in)**	**12 N·m (106 lb in)**	**16 N·m (142 lb in)**	**8.5 N·m (75 lb in)**	**12.2 N·m (109 lb in)**
5/16	**17 N·m (150 lb in)**	**23 N·m (204 lb in)**	**24 N·m (212 lb in)**	**32 N·m (283 lb in)**	**17.5 N·m (155 lb in)**	**25 N·m (220 lb in)**
3/8	**30 N·m (22 lb ft)**	**40 N·m (30 lb ft)**	**43 N·m (31 lb ft)**	**57 N·m (42 lb ft)**	**31 N·m (23 lb ft)**	**44 N·m (33 lb ft)**
7/16	**48 N·m (36 lb ft)**	**65 N·m (48 lb ft)**	**68 N·m (50 lb ft)**	**91 N·m (67 lb ft)**	**50 N·m (37 lb ft)**	**71 N·m (53 lb ft)**
1/2	**74 N·m (54 lb ft)**	**98 N·m (73 lb ft)**	**104 N·m (77 lb ft)**	**139 N·m (103 lb ft)**	**76 N·m (56 lb ft)**	**108 N·m (80 lb ft)**
9/16	**107 N·m (79 lb ft)**	**142 N·m (105 lb ft)**	**150 N·m (111 lb ft)**	**201 N·m (148 lb ft)**	**111 N·m (82 lb ft)**	**156 N·m (115 lb ft)**
5/8	**147 N·m (108 lb ft)**	**196 N·m (145 lb ft)**	**208 N·m (153 lb ft)**	**277 N·m (204 lb ft)**	**153 N·m (113 lb ft)**	**215 N·m (159 lb ft)**
3/4	**261 N·m (193 lb ft)**	**348 N·m (257 lb ft)**	**369 N·m (272 lb ft)**	**491 N·m (362 lb ft)**	**271 N·m (200 lb ft)**	**383 N·m (282 lb ft)**
7/8	**420 N·m (310 lb ft)**	**561 N·m (413 lb ft)**	**594 N·m (438 lb ft)**	**791 N·m (584 lb ft)**	**437 N·m (323 lb ft)**	**617 N·m (455 lb ft)**
1	**630 N·m (465 lb ft)**	**841 N·m (620 lb ft)**	**890 N·m (656 lb ft)**	**1187 N·m (875 lb ft)**	**654 N·m (483 lb ft)**	**924 N·m (681 lb ft)**

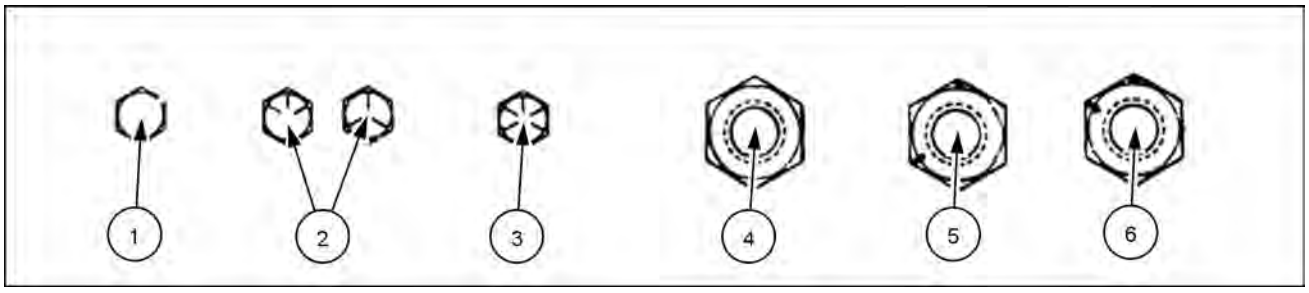
NOTE: *For Imperial Units,* ***1/4 in*** *and* ***5/16 in*** *hardware torque specifications are shown in pound-inches.* ***3/8 in*** *through* ***1 in*** *hardware torque specifications are shown in pound-feet.*

INCH FLANGED HARDWARE

NOM-INAL SIZE	SAE GRADE 5 BOLT and NUT		SAE GRADE 8 BOLT and NUT		LOCKNUT GrF W/ Gr5 BOLT	LOCKNUT GrG W/ Gr8 BOLT
	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD		
1/4	**9 N·m (80 lb in)**	**12 N·m (106 lb in)**	**13 N·m (115 lb in)**	**17 N·m (150 lb in)**	**8 N·m (71 lb in)**	**12 N·m (106 lb in)**
5/16	**19 N·m (168 lb in)**	**25 N·m (221 lb in)**	**26 N·m (230 lb in)**	**35 N·m (310 lb in)**	**17 N·m (150 lb in)**	**24 N·m (212 lb in)**
3/8	**33 N·m (25 lb ft)**	**44 N·m (33 lb ft)**	**47 N·m (35 lb ft)**	**63 N·m (46 lb ft)**	**30 N·m (22 lb ft)**	**43 N·m (32 lb ft)**
7/16	**53 N·m (39 lb ft)**	**71 N·m (52 lb ft)**	**75 N·m (55 lb ft)**	**100 N·m (74 lb ft)**	**48 N·m (35 lb ft)**	**68 N·m (50 lb ft)**
1/2	**81 N·m (60 lb ft)**	**108 N·m (80 lb ft)**	**115 N·m (85 lb ft)**	**153 N·m (113 lb ft)**	**74 N·m (55 lb ft)**	**104 N·m (77 lb ft)**
9/16	**117 N·m (86 lb ft)**	**156 N·m (115 lb ft)**	**165 N·m (122 lb ft)**	**221 N·m (163 lb ft)**	**106 N·m (78 lb ft)**	**157 N·m (116 lb ft)**
5/8	**162 N·m (119 lb ft)**	**216 N·m (159 lb ft)**	**228 N·m (168 lb ft)**	**304 N·m (225 lb ft)**	**147 N·m (108 lb ft)**	**207 N·m (153 lb ft)**
3/4	**287 N·m (212 lb ft)**	**383 N·m (282 lb ft)**	**405 N·m (299 lb ft)**	**541 N·m (399 lb ft)**	**261 N·m (193 lb ft)**	**369 N·m (272 lb ft)**
7/8	**462 N·m (341 lb ft)**	**617 N·m (455 lb ft)**	**653 N·m (482 lb ft)**	**871 N·m (642 lb ft)**	**421 N·m (311 lb ft)**	**594 N·m (438 lb ft)**
1	**693 N·m (512 lb ft)**	**925 N·m (682 lb ft)**	**979 N·m (722 lb ft)**	**1305 N·m (963 lb ft)**	**631 N·m (465 lb ft)**	**890 N·m (656 lb ft)**

IDENTIFICATION

Inch Bolts and free-spinning nuts



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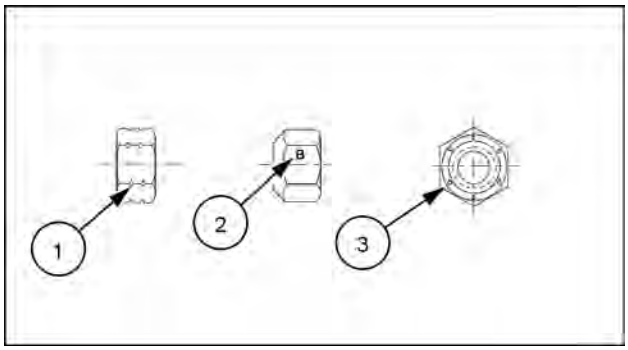
Grade Marking Examples

SAE Grade Identification			
1	Grade 2 - No Marks	4	Grade 2 Nut - No Marks
2	Grade 5 - Three Marks	5	Grade 5 Nut - Marks **120°** Apart
3	Grade 8 - Five Marks	6	Grade 8 Nut - Marks **60°** Apart

Inch Lock Nuts, All Metal (Three optional methods)



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Grade Identification

Grade	Corner Marking Method (1)	Flats Marking Method (2)	Clock Marking Method (3)
Grade A	No Notches	No Mark	No Marks
Grade B	One Circumferential Notch	Letter B	Three Marks
Grade C	Two Circumferential Notches	Letter C	Six Marks

Torque - Standard torque data for hydraulics

850M	NA

NOTICE: *Hydraulic connections require a minimum assembly torque in order to provide zero leakage at rated pressure with adequate fatigue resistance. Too much torque on a hydraulic connection can lead to leakage or failure.*

NOTICE: *There are several different kinds of parallel thread ports, including those using metric threads, inch threads, and British Standard Pipe Parallel (BSPP) threads. None of these port systems are interchangeable, and using the wrong connector in a port will not provide an adequate seal, even if it is possible to install the part.*

NOTE: *Hand install and hand tighten all connections before using tools to set the torque. This will reduce the possibility of thread damage.*

Torques for Metric O-Ring Boss (ORB) stud ends and port connections

Metric Thread	S-Series (Heavy Duty)		L-Series (Light Duty)	
	Ferrous	Non-Ferrous	Ferrous	Non-Ferrous
M8x1	**10.5 N·m (7.7 lb ft)**	**6.3 N·m (4.6 lb ft)**	**8.5 N·m (6.3 lb ft)**	**5 N·m (3.7 lb ft)**
M10x1	**21 N·m (15.5 lb ft)**	**12.5 N·m (9.2 lb ft)**	**15.5 N·m (11.4 lb ft)**	**9.3 N·m (6.9 lb ft)**
M12x1.5	**37 N·m (27.3 lb ft)**	**22 N·m (16.2 lb ft)**	**27 N·m (19.9 lb ft)**	**16 N·m (11.8 lb ft)**
M14x1.5	**47 N·m (34.7 lb ft)**	**28 N·m (20.7 lb ft)**	**37 N·m (27.3 lb ft)**	**22 N·m (16.2 lb ft)**
M16x1.5	**58 N·m (42.8 lb ft)**	**35 N·m (25.8 lb ft)**	**42 N·m (31.0 lb ft)**	**25 N·m (18.4 lb ft)**
M18x1.5	**74 N·m (54.6 lb ft)**	**44 N·m (32.5 lb ft)**	**47 N·m (34.7 lb ft)**	**28 N·m (20.7 lb ft)**
M22x1.5	**105 N·m (77.4 lb ft)**	**63 N·m (46.5 lb ft)**	**63 N·m (46.5 lb ft)**	**38 N·m (28.0 lb ft)**
M27x2	**178 N·m (131.3 lb ft)**	**107 N·m (78.9 lb ft)**	**105 N·m (77.4 lb ft)**	**63 N·m (46.5 lb ft)**
M30x2	**225 N·m (166.0 lb ft)**	**135 N·m (99.6 lb ft)**	**136 N·m (100.3 lb ft)**	**82 N·m (60.5 lb ft)**
M33x2	**325 N·m (239.7 lb ft)**	**195 N·m (143.8 lb ft)**	**168 N·m (123.9 lb ft)**	**101 N·m (74.5 lb ft)**
M42x2	**345 N·m (254.5 lb ft)**	**207 N·m (152.7 lb ft)**	**220 N·m (162.3 lb ft)**	**132 N·m (97.4 lb ft)**
M48x2	**440 N·m (324.5 lb ft)**	**264 N·m (194.7 lb ft)**	**273 N·m (201.4 lb ft)**	**164 N·m (121.0 lb ft)**
M60x2	**525 N·m (387.2 lb ft)**	**315 N·m (232.3 lb ft)**	**330 N·m (243.4 lb ft)**	**198 N·m (146.0 lb ft)**
NOTE: *Final torque tolerance +/– **10%** of the given torque specification.*				

Torques for Metric O-Ring Boss (ORB) port plugs

Metric Thread	Ferrous		Non-Ferrous
	Internal Hex	External Hex	
M8x1	**8.5 N·m (6.3 lb ft)**	**10.5 N·m (7.7 lb ft)**	**6.3 N·m (4.6 lb ft)**
M10x1	**16 N·m (11.8 lb ft)**	**21 N·m (15.5 lb ft)**	**12.5 N·m (9.2 lb ft)**
M12x1.5	**23 N·m (17.0 lb ft)**	**37 N·m (27.3 lb ft)**	**22 N·m (16.2 lb ft)**
M14x1.5	**47 N·m (34.7 lb ft)**		**28 N·m (20.7 lb ft)**
M16x1.5	**58 N·m (42.8 lb ft)**		**35 N·m (25.8 lb ft)**
M18x1.5	**74 N·m (54.6 lb ft)**		**44 N·m (32.5 lb ft)**
M22x1.5	**105 N·m (77.4 lb ft)**		**63 N·m (46.5 lb ft)**
M27x2	**178 N·m (131.3 lb ft)**		**107 N·m (78.9 lb ft)**
M30x2	**225 N·m (166.0 lb ft)**		**135 N·m (99.6 lb ft)**
M33x2	**325 N·m (239.7 lb ft)**		**195 N·m (143.8 lb ft)**
M42x2	**345 N·m (254.5 lb ft)**		**207 N·m (152.7 lb ft)**
M48x2	**440 N·m (324.5 lb ft)**		**264 N·m (194.7 lb ft)**
M60x2	**525 N·m (387.2 lb ft)**		**315 N·m (232.3 lb ft)**
NOTE: *Final torque tolerance +/– **10%** of the given torque specification.*			

Torques for British Standard Pipe Parallel (BSPP) straight-pipe-thread port connections

BSPP Thread	Metric Tube OD		Ferrous		Non-Ferrous	
	S-Series (Heavy Duty)	L-Series (Light Duty)	S-Series (Heavy Duty)	L-Series (Light Duty)	S-Series (Heavy Duty)	L-Series (Light Duty)
G 1/8 A	—	6 mm	—	21 N·m (15.5 lb ft)	—	12.5 N·m (9.2 lb ft)
G 1/4 A	6 mm	8 mm	63 N·m (46.5 lb ft)	53 N·m (39.1 lb ft)	38 N·m (28.0 lb ft)	32 N·m (23.6 lb ft)
	8 mm	10 mm				
G 3/8 A	10 mm	12 mm	95 N·m (70.1 lb ft)	84 N·m (62.0 lb ft)	57 N·m (42.0 lb ft)	50 N·m (36.9 lb ft)
	12 mm					
G 1/2 A	16 mm	15 mm	136 N·m (100.3 lb ft)	105 N·m (77.4 lb ft)	82 N·m (60.5 lb ft)	63 N·m (46.5 lb ft)
		18 mm				
G 3/4 A	20 mm	22 mm	210 N·m (154.9 lb ft)	210 N·m (154.9 lb ft)	126 N·m (92.9 lb ft)	126 N·m (92.9 lb ft)
G 1 A	25 mm	28 mm	400 N·m (295.0 lb ft)	400 N·m (295.0 lb ft)	240 N·m (177.0 lb ft)	240 N·m (177.0 lb ft)
G 1-1/4 A	30 mm	35 mm	525 N·m (387.2 lb ft)	525 N·m (387.2 lb ft)	315 N·m (232.3 lb ft)	315 N·m (232.3 lb ft)
G 1-1/2 A	38 mm	42 mm	660 N·m (486.8 lb ft)	660 N·m (486.8 lb ft)	396 N·m (292.1 lb ft)	396 N·m (292.1 lb ft)

NOTE: *Final torque tolerance is +/– **10%** of the given torque specification.*

Torques for Metric O-Ring Face Seal (ORFS) ports and stud end connections

BSP Thread	Metric Tube OD		Ferrous		Non-Ferrous	
	S-Series (Heavy Duty)	L-Series (Light Duty)	S-Series (Heavy Duty)	L-Series (Light Duty)	S-Series (Heavy Duty)	L-Series (Light Duty)
M10x1	—	**4 mm**	—	**21 N·m (15.5 lb ft)**	—	**12.5 N·m (9.2 lb ft)**
M12x1.5	**4 mm**	**6 mm**	**47 N·m (34.7 lb ft)**	**32 N·m (23.6 lb ft)**	**28 N·m (20.7 lb ft)**	**19 N·m (14.0 lb ft)**
M14x1.5	**5 mm**	**7 mm**	**63 N·m (46.5 lb ft)**	**53 N·m (39.1 lb ft)**	**38 N·m (28.0 lb ft)**	**32 N·m (23.6 lb ft)**
M16x1.5	**7 mm**	**9 mm**	**84 N·m (62.0 lb ft)**	**63 N·m (46.5 lb ft)**	**50 N·m (36.9 lb ft)**	**38 N·m (28.0 lb ft)**
M18x1.5	**8 mm**	**11 mm**	**105 N·m (77.4 lb ft)**	**84 N·m (62.0 lb ft)**	**63 N·m (46.5 lb ft)**	**50 N·m (36.9 lb ft)**
M20x1.5	**10 mm**	—	**147 N·m (108.4 lb ft)**	—	**88 N·m (64.9 lb ft)**	—
M22x1.5	**12 mm**	**14 mm**	**158 N·m (116.5 lb ft)**	**147 N·m (108.4 lb ft)**	**95 N·m (70.1 lb ft)**	**88 N·m (64.9 lb ft)**
M26x1.5	—	**18 mm**	—	**210 N·m (154.9 lb ft)**	—	**126 N·m (92.9 lb ft)**
M27x1.2	**16 mm**	—	**210 N·m (154.9 lb ft)**	—	**126 N·m (92.9 lb ft)**	—
M33x2	**20 mm**	**23 mm**	**400 N·m (295.0 lb ft)**	**400 N·m (295.0 lb ft)**	**240 N·m (177.0 lb ft)**	**240 N·m (177.0 lb ft)**
M42x2	**25 mm**	**30 mm**	**525 N·m (387.2 lb ft)**	**525 N·m (387.2 lb ft)**	**315 N·m (232.3 lb ft)**	**315 N·m (232.3 lb ft)**
M48x2	**32 mm**	**36 mm**	**630 N·m (464.7 lb ft)**	**630 N·m (464.7 lb ft)**	**396 N·m (292.1 lb ft)**	**396 N·m (292.1 lb ft)**
NOTE: *Final torque tolerance +/– **10%** of the given torque specification.*						

Torques for Inch O-Ring Boss (ORB) non-adjustable port and stud end connections

SAE Dash size	UN/UNF Thread size	Inch Tube OD	S-Series (Heavy Duty)		L-Series (Light Duty)	
			Ferrous	Non-Ferrous	Ferrous	Non-Ferrous
2	5/16–24	**3.18 mm** (**0.125 in**) 1/8	—	—	**8.5 N·m** (**6.3 lb ft**)	**5 N·m** (**3.7 lb ft**)
3	3/8–24	**4.76 mm** (**0.187 in**) 3/16	**15.5 N·m** (**11.4 lb ft**)	**9.3 N·m** (**6.9 lb ft**)	**10.5 N·m** (**7.7 lb ft**)	**6.3 N·m** (**4.6 lb ft**)
4	7/16–20	**6.35 mm** (**0.25 in**) 1/4	**37 N·m** (**27.3 lb ft**)	**22 N·m** (**16.2 lb ft**)	**19 N·m** (**14.0 lb ft**)	**11.5 N·m** (**8.5 lb ft**)
5	1/2–20	**7.94 mm** (**0.313 in**) 5/16	**42 N·m** (**31.0 lb ft**)	**25 N·m** (**18.4 lb ft**)	**26 N·m** (**19.2 lb ft**)	**15.5 N·m** (**11.4 lb ft**)
6	9/16–18	**9.52 mm** (**0.375 in**) 3/8	**47 N·m** (**34.7 lb ft**)	**28 N·m** (**20.7 lb ft**)	**32 N·m** (**23.6 lb ft**)	**19 N·m** (**14.0 lb ft**)
8	3/4–16	**12.7 mm** (**0.5 in**) 1/2	**89 N·m** (**65.6 lb ft**)	**53 N·m** (**39.1 lb ft**)	**53 N·m** (**39.1 lb ft**)	**32 N·m** (**23.6 lb ft**)
10	7/8–14	**15.88 mm** (**0.625 in**) 5/8	**121 N·m** (**89.2 lb ft**)	**73 N·m** (**53.8 lb ft**)	**63 N·m** (**46.5 lb ft**)	**38 N·m** (**28.0 lb ft**)
12	1-1/16–12	**19.05 mm** (**0.75 in**) 3/4	**178 N·m** (**131.3 lb ft**)	**107 N·m** (**78.9 lb ft**)	**100 N·m** (**73.8 lb ft**)	**60 N·m** (**44.3 lb ft**)
14	1-3/16–12	**22.22 mm** (**0.875 in**) 7/8	**225 N·m** (**166.0 lb ft**)	**135 N·m** (**99.6 lb ft**)	**131 N·m** (**96.6 lb ft**)	**79 N·m** (**58.3 lb ft**)
16	1-5/16–12	**25.4 mm** (**1.0 in**) 1	**283 N·m** (**208.7 lb ft**)	**170 N·m** (**125.4 lb ft**)	**156 N·m** (**115.1 lb ft**)	**94 N·m** (**69.3 lb ft**)
20	1-5/8–12	**31.75 mm** (**1.25 in**) 1-1/4	**300 N·m** (**221.3 lb ft**)	**180 N·m** (**132.8 lb ft**)	**210 N·m** (**154.9 lb ft**)	**126 N·m** (**92.9 lb ft**)
24	1-7/8–12	**38.1 mm** (**1.5 in**) 1-1/2	**388 N·m** (**286.2 lb ft**)	**233 N·m** (**171.9 lb ft**)	**220 N·m** (**162.3 lb ft**)	**132 N·m** (**97.4 lb ft**)
32	2-1/2–12	**50.8 mm** (**2.0 in**) 2	**388 N·m** (**286.2 lb ft**)	**233 N·m** (**171.9 lb ft**)	**315 N·m** (**232.3 lb ft**)	**189 N·m** (**139.4 lb ft**)
NOTE: *Final torque tolerance +/– **10%** of the given torque specification.*						

Torques for Inch O-Ring Boss (ORB) adjustable stud end and port connections

SAE Dash size	UN/UNF Thread size	Inch Tube OD	S-Series (Heavy Duty)		L-Series (Light Duty)	
			Ferrous	Non-Ferrous	Ferrous	Non-Ferrous
2	5/16–24	**3.18 mm** (**0.125 in**) 1/8	—	—	**8.5 N·m** (**6.3 lb ft**)	**5 N·m** (**3.7 lb ft**)
3	3/8–24	**4.76 mm** (**0.187 in**) 3/16	**10.5 N·m** (**7.7 lb ft**)	**9.3 N·m** (**6.9 lb ft**)	**10.5 N·m** (**7.7 lb ft**)	**6.3 N·m** (**4.6 lb ft**)
4	7/16–20	**6.35 mm** (**0.25 in**) 1/4	**21 N·m** (**15.5 lb ft**)	**21 N·m** (**15.5 lb ft**)	**19 N·m** (**14.0 lb ft**)	**11.5 N·m** (**8.5 lb ft**)
5	1/2–20	**7.94 mm** (**0.313 in**) 5/16	**42 N·m** (**31.0 lb ft**)	**25 N·m** (**18.4 lb ft**)	**26 N·m** (**19.2 lb ft**)	**15.5 N·m** (**11.4 lb ft**)
6	9/16–18	**9.52 mm** (**0.375 in**) 3/8	**47 N·m** (**34.7 lb ft**)	**28 N·m** (**20.7 lb ft**)	**32 N·m** (**23.6 lb ft**)	**19 N·m** (**14.0 lb ft**)
8	3/4–16	**12.7 mm** (**0.5 in**) 1/2	**89 N·m** (**65.6 lb ft**)	**53 N·m** (**39.1 lb ft**)	**53 N·m** (**39.1 lb ft**)	**32 N·m** (**23.6 lb ft**)
10	7/8–14	**15.88 mm** (**0.625 in**) 5/8	**121 N·m** (**89.2 lb ft**)	**73 N·m** (**53.8 lb ft**)	**63 N·m** (**46.5 lb ft**)	**38 N·m** (**28.0 lb ft**)
12	1-1/16–12	**19.05 mm** (**0.75 in**) 3/4	**178 N·m** (**131.3 lb ft**)	**107 N·m** (**78.9 lb ft**)	**100 N·m** (**73.8 lb ft**)	**60 N·m** (**44.3 lb ft**)
14	1-3/16–12	**22.22 mm** (**0.875 in**) 7/8	**225 N·m** (**166.0 lb ft**)	**135 N·m** (**99.6 lb ft**)	**131 N·m** (**96.6 lb ft**)	**79 N·m** (**58.3 lb ft**)
16	1-5/16–12	**25.4 mm** (**1.0 in**) 1	**285 N·m** (**210.2 lb ft**)	**170 N·m** (**125.4 lb ft**)	**156 N·m** (**115.1 lb ft**)	**94 N·m** (**69.3 lb ft**)
20	1-5/8–12	**31.75 mm** (**1.25 in**) 1-1/4	**300 N·m** (**221.3 lb ft**)	**180 N·m** (**132.8 lb ft**)	**210 N·m** (**154.9 lb ft**)	**126 N·m** (**92.9 lb ft**)
24	1-7/8–12	**38.1 mm** (**1.5 in**) 1-1/2	**388 N·m** (**286.2 lb ft**)	**233 N·m** (**171.9 lb ft**)	**220 N·m** (**162.3 lb ft**)	**132 N·m** (**97.4 lb ft**)
32	2-1/2–12	**50.8 mm** (**2.0 in**) 2	**388 N·m** (**286.2 lb ft**)	**233 N·m** (**171.9 lb ft**)	**315 N·m** (**232.3 lb ft**)	**189 N·m** (**139.4 lb ft**)
NOTE: *Final torque tolerance +/– **10%** of the given torque specification.*						

Torques for Inch O-Ring Boss (ORB) port plug

SAE Dash size	UN/UNF Thread size	Ferrous		Non-Ferrous
		Internal Hex	External Hex	
2	5/16–24	**7.5 N·m (5.5 lb ft)**	**12.5 N·m (9.2 lb ft)**	**7.5 N·m (5.5 lb ft)**
3	3/8–24	**14.5 N·m (10.7 lb ft)**	**21 N·m (15.5 lb ft)**	**12.5 N·m (9.2 lb ft)**
4	7/16–20	**21 N·m (15.5 lb ft)**	**37 N·m (27.3 lb ft)**	**22 N·m (16.2 lb ft)**
5	1/2–20	**28 N·m (20.7 lb ft)**	**42 N·m (31.0 lb ft)**	**25 N·m (18.4 lb ft)**
6	9/16–18	**47 N·m (34.7 lb ft)**	**47 N·m (34.7 lb ft)**	**28 N·m (20.7 lb ft)**
8	3/4–16	**89 N·m (65.6 lb ft)**	**89 N·m (65.6 lb ft)**	**53 N·m (39.1 lb ft)**
10	7/8–14	**116 N·m (85.6 lb ft)**	**116 N·m (85.6 lb ft)**	**70 N·m (51.6 lb ft)**
12	1-1/16–12	**176 N·m (129.8 lb ft)**	**176 N·m (129.8 lb ft)**	**106 N·m (78.2 lb ft)**
14	1-3/16–12	**247 N·m (182.2 lb ft)**	**247 N·m (182.2 lb ft)**	**148 N·m (109.2 lb ft)**
16	1-5/16–12	**284 N·m (209.5 lb ft)**	**284 N·m (209.5 lb ft)**	**170 N·m (125.4 lb ft)**
20	1-5/8–12	**357 N·m (263.3 lb ft)**	**357 N·m (263.3 lb ft)**	**214 N·m (157.8 lb ft)**
24	1-7/8–12	**441 N·m (325.3 lb ft)**	**441 N·m (325.3 lb ft)**	**265 N·m (195.5 lb ft)**
32	2-1/2–12	**536 N·m (395.3 lb ft)**	**536 N·m (395.3 lb ft)**	**322 N·m (237.5 lb ft)**
NOTE: *Final torque tolerance +/–* ***10%*** *of the given torque specification.*				

Torques for O-Ring Face Seal (ORFS) hose connectors

SAE Dash size	UN/UNF Thread size	Tube OD	High/Medium pressure applications (greater than 50 bar (725 psi)	Low pressure applications (less than 50 bar (725 psi)
			Swivel nut torque	
4	9/16–18	**6.35 mm** (**0.25 in**) 1/4	**27 N·m** (**19.9 lb ft**)	**27 N·m** (**19.9 lb ft**)
5	5/8–18	**7.94 mm** (**0.313 in**) 5/16	**34 N·m** (**25.1 lb ft**)	**34 N·m** (**25.1 lb ft**)
6	11/16–16	**9.52 mm** (**0.375 in**) 3/8	**44 N·m** (**32.5 lb ft**)	**44 N·m** (**32.5 lb ft**)
8	13/16–16	**12.7 mm** (**0.5 in**) 1/2	**65 N·m** (**47.9 lb ft**)	**65 N·m** (**47.9 lb ft**)
10	1–14	**15.88 mm** (**0.625 in**) 5/8	**100 N·m** (**73.8 lb ft**)	**100 N·m** (**73.8 lb ft**)
12	1-3/16–12	**19.05 mm** (**0.75 in**) 3/4	**150 N·m** (**110.6 lb ft**)	**131 N·m** (**96.6 lb ft**)
14	1-5/16–12	**22.22 mm** (**0.875 in**) 7/8	**163 N·m** (**120.2 lb ft**)	**131 N·m** (**96.6 lb ft**)
16	1-7/16–12	**25.4 mm** (**1.0 in**) 1	**210 N·m** (**154.9 lb ft**)	**131 N·m** (**96.6 lb ft**)
20	1-11/16–12	**31.75 mm** (**1.25 in**) 1-1/4	**280 N·m** (**206.5 lb ft**)	**178 N·m** (**131.3 lb ft**)
24	2–12	**38.1 mm** (**1.5 in**) 1-1/2	**375 N·m** (**276.6 lb ft**)	**210 N·m** (**154.9 lb ft**)
NOTE: *Final torque tolerance +/–* ***10%*** *of the given torque specification.*				