

WedgeRock RS Series Spring Return Actuators

INSTALLATION COMMISSIONING, OPERATION & MAINTENANCE MANUAL

Revision 02
Date 3/16/2020

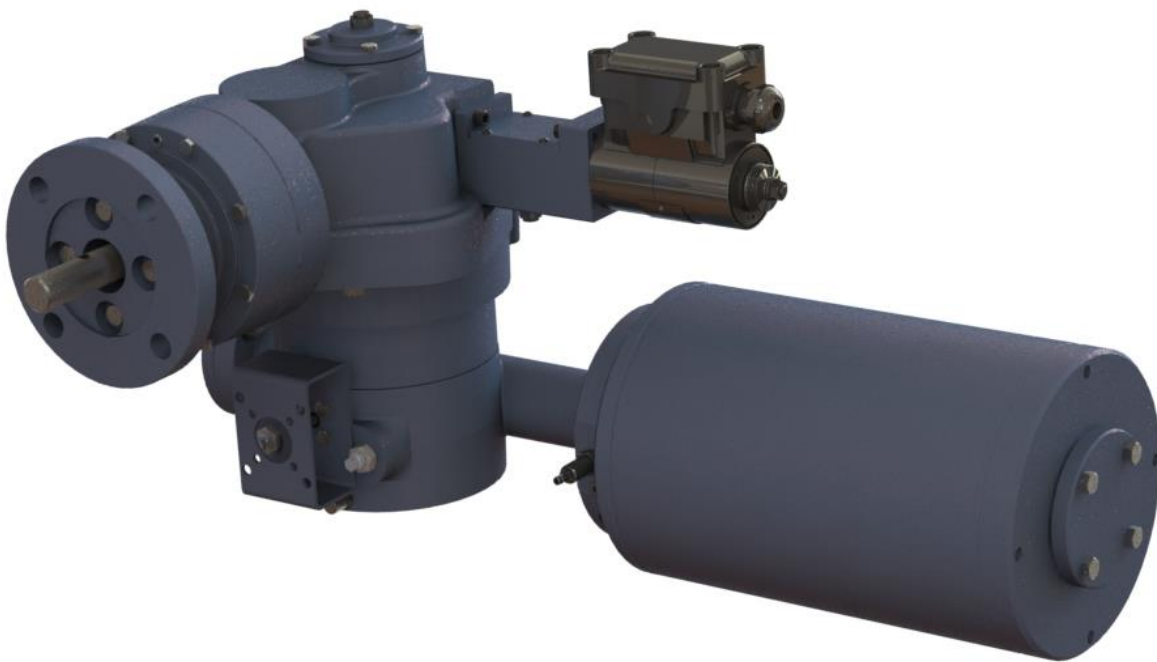


Table of Contents

1.0 INTRODUCTION	4
1.1 PURPOSE	4
1.2 AUDIENCE	4
2.0 SAFETY	5
2.1 GENERAL SAFETY INFORMATION	5
2.2 SAFETY TERMINOLOGY AND SYMBOLS	6
2.3 ENVIRONMENTAL SAFETY	7
2.4 USER SAFETY	7
3.0 TRANSPORTATION, HANDLING, LIFTING, STORAGE, & PACKAGING	9
3.1 INSPECT THE DELIVERY AFTER TRANSPORT	9
3.2 LIFTING AND HANDLING	10
3.3 STORAGE GUIDELINES	11
4.0 PRODUCT DESCRIPTION	12
4.1 GENERAL DESCRIPTION	12
4.2 NAMEPLATE INFORMATION	12
5.0 INSTALLATION	13
5.1 PRE-INSTALLATION	13
5.2 INSTALLATION OF SPRING RETURN ACTUATOR ON TO VALVE	14
5.3 INSTALLATION OF ELECTRIC ACTUATOR ON RS OPERATOR	14
5.4 INSTALLATION OF POSITION INDICATION	14
5.5 POWERING ELECTRIC SOLENOID	15
5.6 ADJUSTING CLOSE TIME WITH DAMPER	15
6.0 REMOVAL	16
6.1 REMOVAL OF SPRING RETURN ACTUATOR FROM VALVE	16
6.2 REMOVAL OF ELECTRIC ACTUATOR FROM RS OPERATOR	16
7.0 COMMISSIONING	17
7.1 POSITION STOPS	17
7.2 PRESSURE RELIEF VENT (PRV)	19
7.3 ELECTRIC ACTUATOR	19
8.0 OPERATION	20
8.1 MANUAL OPERATION	20
8.2 MOTORIZED OPERATION	20
9.0 MAINTENANCE	22
9.1 LUBRICATION	22
9.2 SPARE PARTS	22
9.3 SERVICE	22
10.0 TORQUE CHART	22

Table of Figures

Figure 1: - Example of a Proper Lifting Method	11
Figure 2 - Baseplate	13
Figure 3 - Mounting Bracket	14
Figure 4 - Indicator Drive Shaft	14
Figure 5 - Solenoid Enclosure	15
Figure 6 - Standard Stop Configuration	17
Figure 7 - Sealed Stop Configuration	17
Figure 8 - Pressure Relief Vents	19

1.0 Introduction

1.1 Purpose

The purpose of this manual is to provide necessary information for:

- Installation
- Commissioning
- Operation
- Maintenance



Caution:

Failure to observe instructions contained in this manual could result in personal injury, property damage, and may void warranty. Read this manual carefully before installing and using the product. Additional information will be provided on request.

1.2 Audience

This manual is intended for qualified personnel who are tasked to deal with all aspects of the RS actuator.

2.0 Safety

2.1 General Safety Information

The end user or contractor is responsible for implementing required protective measures on site, such as personal protective equipment, lockout-tagout, or barriers. Safety guidelines provided in this document are intended to supplement site/facility work practice and policy.

All activities addressed in this manual must be carried out by suitably qualified personnel having been authorized by the end user and/or contractor. Prior to working on this product, personnel must have thoroughly read and understood these instructions.




Only WedgeRock approved replacement parts should be used. Modifications or changes to components can invalidate warranty or any actuator qualifications.

2.2 Safety Terminology and Symbols

It is important to read, understand, and follow safety messages and regulations carefully before handling product. Instructions are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product
- Product malfunction
- Environmental contamination

All safety messages are flagged with an exclamation symbol and the word Caution, Warning, or Danger.

Hazard Level	Indication
 Danger:	A hazardous situation which, if not avoided, will result in death or serious injury.
 Warning:	A hazardous situation which, if not avoided, could result in death or serious injury.
 Caution:	A hazardous situation which, if not avoided, could result in minor or moderate injury.
Notice:	<ul style="list-style-type: none"> • A potential situation which, if not avoided, could result in undesirable conditions. • A practice not related to personal injury.

2.3 Environmental Safety

The Work Area

Always keep work area clean.

Waste and Emissions Regulations

Observe safety regulations regarding waste and emissions:

- Appropriately dispose of all waste.
- Clean up spills in accordance with safety and environmental procedures.
- Report all environmental emissions to the appropriate authorities.



WARNING:

If the product has been contaminated in any way, such as from toxic chemicals or nuclear radiation, do NOT send the product to WedgeRock unless it has been properly decontaminated.

2.4 User Safety

Safety Equipment

Use safety equipment according to the company and manufacturers guidance. Recommended personal protective equipment (PPE) in the work area:

- Safety Glasses
- Protective Shoes
- Protective Gloves
- Hard hats when applicable

Precautions before Work

- Make sure of clear path of retreat.
- Make sure product cannot roll or fall over and injure people or damage property.
- Make sure lifting equipment is in serviceable condition.
- Check explosion risk before using electric hand tools.

- Lock and tag out any potentially dangerous energy sources.
- Disconnect electrical power from electric actuator if used to prevent unintended movement.
- Remove signal to solenoid and ensure the RS actuator is in the fail-safe position.

Precautions during Work

- Never work alone.
- Always wear protective clothing and hand protection.
- Stay clear of suspended loads.
- Always lift the product by its lifting device.



Danger:

Do not disassemble the actuator if it is malfunctioning.
There is a possibility of releasing potential energy.
Contact WedgeRock for further instructions.

3.0 Transportation, Handling, Lifting, Storage, & Packaging

3.1 Inspect the Delivery after Transport

Inspect the package

1. Inspect for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. File a claim with the shipping company if anything is out of order. If product has been picked up from distributor, make a claim directly to distributor.

Inspect the unit

1. Remove packing materials from product. Dispose of all packing materials in accordance with local regulations.
2. Inspect product to determine if parts have been damaged or are missing.
3. If applicable, unfasten product by removing screws, bolts, or straps. For personal safety, be careful when handling nails and straps.
4. Contact sales representative if anything is out of order

3.2 Lifting and Handling



WARNING:

Dropping, rolling or tipping units, or applying other shock loads, can cause property damage and personal injury. Ensure unit is properly supported and secure during lifting and handling.



CAUTION:

Risk of injury or equipment damage from use of inadequate lifting devices. Ensure lifting devices (such as chains, straps, forklifts, cranes, etc.) are rated to sufficient capacity.



WARNING

- Risk of serious personal injury or equipment damage. Proper lifting practices are critical to safe transport of heavy equipment. Ensure practices used are in compliance with all applicable regulations and standards.
 - Safe lifting points are specifically identified in manual and general arrangement drawing. It is critical to lift equipment only at designated points. Integral lifting eyes or eye bolts on RS actuators are intended for use in lifting RS actuator assembly only.
 - Lifting points are not designed to lift both the RS actuator and valves or other objects that may be attached.
 - Lifting and handling heavy equipment poses a crush hazard. Use caution during lifting and handling and wear appropriate Personal Protective Equipment (PPE, such as steel-toed shoes, gloves, etc.) at all times. Seek assistance if necessary.
-

Rigging

Threaded holes are located on the ends of the spring can. Install swivel lifting eyes for use. Use a choker hitch around the main body and another sling to a hoist ring on the spring can. Adjust strap length as required. See figure 1.



Figure 1: - Example of a Proper Lifting Method

3.3 Storage guidelines

Storage requirements are dependent on storage duration. The normal packaging is designed only to protect the unit during shipping.

Length of time in storage	Storage requirements
Upon receipt/short-term (less than six months)	<ul style="list-style-type: none"> • Store in a covered and dry location. • Store the unit free from dirt. • Store on a pallet or up off the ground.
Long-term (more than six months)	<ul style="list-style-type: none"> • In addition to the short term requirements, apply rust inhibitor to uncoated faces such as the baseplate and motor adapter if any. Inspect every six months and reapply if needed.

4.0 Product description

4.1 General description

RS actuators are designed for efficient reliable operation. These are typically used for operating quarter turn valves. The RS can be assembled in a “fail close” or “fail open” configuration. Operation can be by a user with a handwheel or by using a standard electric actuator.

A rack and pinion gear with optional planetary gear reduction is used to operate the valve in one direction and compress the spring. A helical spring housed in a spring can operate the valve to the fail-safe position when a wrap spring brake is released. When a solenoid is energized, it is retracted, and the brake is engaged allowing the RS actuator to be operated. When the solenoid is de-energized, it extends and releases the brake, forcing the RS actuator to move to the fail-safe position. Stop bolts are provided to allow for travel adjustment. Direct indication to the valve stem is provided and can be fitted with a position indicator as an option to provide a position signal to the electric actuator. A damper is used to adjust operation time when the actuator is moving in the fail-safe position. Other accessories or options can be provided as required.

4.2 Nameplate information

Every gear actuator has a nameplate that provides information including:

- Model
- Ratio
- Serial Number
- General Arrangement Drawing Number
- Fail-safe direction

5.0 Installation



DANGER:

Spring return actuator must be in its fail-safe position when installing to avoid accidental release of spring. If used, electric spring release solenoid should be disconnected from power supply. If used, pressure pilot spring release mechanism should be disconnected from any source of pressure. Failure to do so can cause unexpected movement resulting in personal injury or death and damage to equipment.



WARNING:

Ensure shaft being driven by gear actuator is not able to rotate while installing gear operator. If installing in the field, valves should be shut with pipeline flow stopped, dampers and gates should be locked or placed in a position that won't allow movement. Failure to do so can cause unexpected movement resulting in personal injury and damage to equipment.

5.1 Pre-Installation

Wipe baseplate underside (mounting surface) and mating flange completely.



Figure 2 - Baseplate

5.2 Installation of Spring Return Actuator on to Valve

1. Verify both the operator and valve are in the fail-safe position.
2. Apply light oil or anti-seize to the valve stem before installing gear operator.
3. Install key into valve stem keyway.
4. Align valve stem with gear operator and slide onto valve flange.
Reference **3.2** for lifting instructions.
5. Align gear operator and valve flange mounting holes.
6. Install mounting bolts and tighten incrementally in a crossing pattern.
7. Tighten bolts to the correct torque based on the size and material installed by the customer.

5.3 Installation of Electric Actuator on RS Operator

If the spring return actuator is designed and configured for motorized service, an electric actuator specified on the general arrangement drawing may be used to operate. Refer to the electric actuator IOM to Install.

5.4 Installation of Position Indication

A position indicator can be used to provide valve position to the electric actuator. Electric actuator may need to be configured for use of an external position indicator depending on manufacturer. A mounting bracket can be provided along with an indicator drive shaft.

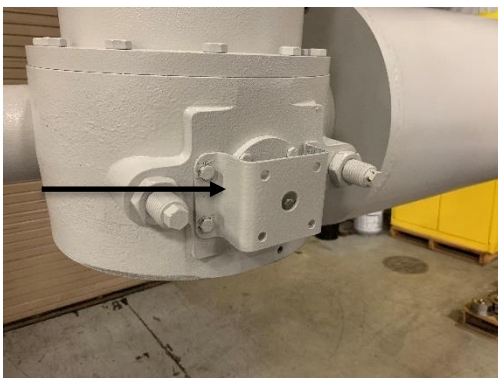


Figure 3 - Mounting Bracket

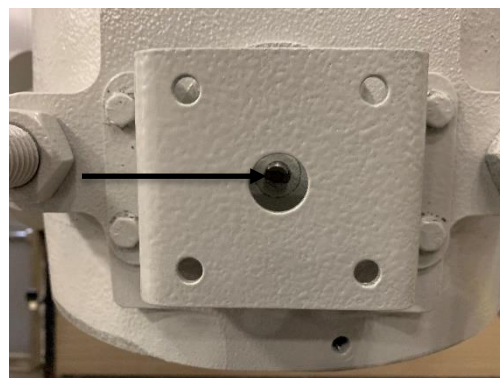


Figure 4 - Indicator Drive Shaft

5.5 Powering Electric Solenoid

Solenoid must be provided power as specified per project. Cable must be installed per local code and properly sealed entering enclosure. Solenoid design may vary depending on project requirements.



Figure 5 - Solenoid Enclosure

5.6 Adjusting Close Time with Damper

Contact WedgeRock for close time adjustment.

6.0 Removal



WARNING:

Ensure the device being operated is secure and the shaft being driven by the RS actuator will not rotate uncontrollably after removal. Do not remove the actuator if the valve is blocked and not in the fail-safe position. Failure to conduct a comprehensive risk assessment of gear removal can lead to personal injury and damage to equipment.

6.1 Removal of Spring Return Actuator from Valve

To disassemble the RS actuator from the valve

1. Disconnect power supply.
2. Remove signal and control lines to solenoid and other accessories.
3. Verify RS actuator is in the fail-safe position.
4. Attach lifting slings as shown in section **3.2**
5. Remove mounting bolts.
6. Remove gear actuator from valve.

6.2 Removal of Electric Actuator from RS Operator



WARNING:

In some configurations, the electric actuator may be relied on for its self-locking features to keep the input shaft from spinning uncontrollably. It is good practice to verify that the RS actuator is completely in its fail-safe position with all potential energy removed before removing the electric actuator. Failure to do so may cause the electric actuator to rotate out of control once bolts are removed.

To disassemble the electric actuator from the RS actuator

1. Slowly loosen bolts holding the electric actuator to the motor flange.
2. With the bolts loosened, verify the actuator housing is free to rotate on the flange and is not under any amount of built up torque.
3. Refer to the electric actuator IOM for further removal instructions.

7.0 Commissioning

7.1 Position Stops

The open and shut stops prevent the actuator from rotating past the open and shut positions of the valve. Each stop allows for $\pm 5^\circ$ of rotation from nominal for a travel range of 80° to 100° .

Stop Bolt Sealing

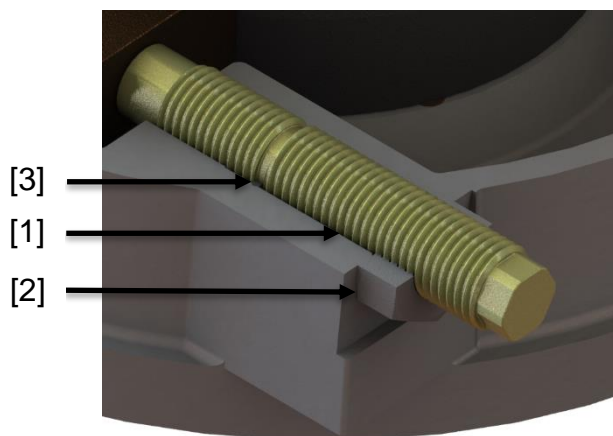


Figure 6 - Standard Stop Configuration

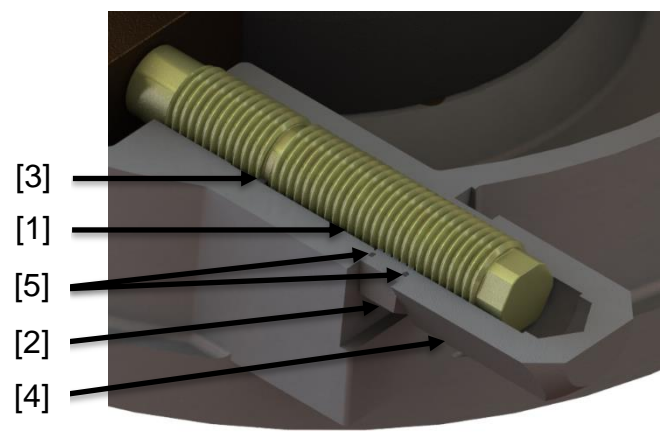


Figure 7 - Sealed Stop Configuration

In the standard configuration, [1] stop bolts include an [3] O-ring that seals against the stop bolt bore in the housing. This arrangement allows the [1] stop bolt to remain sealed from ingress while being adjusted. See Figure 6 - Standard Stop Configuration.

[1] Stop bolts are supplied standard as zinc plated steel. When not suited to the application, a [4] stop bolt cover configuration, completely seals the stop bolt from outside elements. See Figure 7 - Sealed Stop Configuration

Before adjusting stopbolts, the solenoid should be energized to allow for operation of the RS actuator. The valve can be cycled to set the stops using the handwheel in manual applications, and electric actuator or handwheel override in motorized applications.

Adjusting the “Shut” Position Stop

1. Remove [4] stop bolt cover and loosen [2] jam nut (as equipped).
2. Turn hand wheel so valve is in the shut position. The [1] stop bolt may have to be adjusted to allow valve to move to correct position.
3. Adjust the shut position stop bolt until it comes into contact with stop lug inside gear operator.
4. Tighten [2] jam nut to lock [1] stop bolt in place.
5. If [4] stop bolt cover is included, verify [5] O-rings are correctly installed in respective grooves. Tighten [4] stop bolt cover onto [2] jam nut.

Adjusting the “Open” Position Stop

1. Remove [4] stop bolt cover and loosen [2] jam nut (as equipped).
2. Turn hand wheel so valve is in the open position. The [1] stop bolt may have to be adjusted to allow valve to move to correct position.
3. Adjust the open position stop bolt until it comes in contact with stop lug inside gear operator.
4. Tighten [2] jam nut to lock [1] stop bolt in place.
5. If [4] stop bolt cover is included, verify [5] O-rings are correctly installed in respective grooves. Tighten [4] stop bolt cover onto [2] jam nut.

7.2 Pressure Relief Vent (PRV)

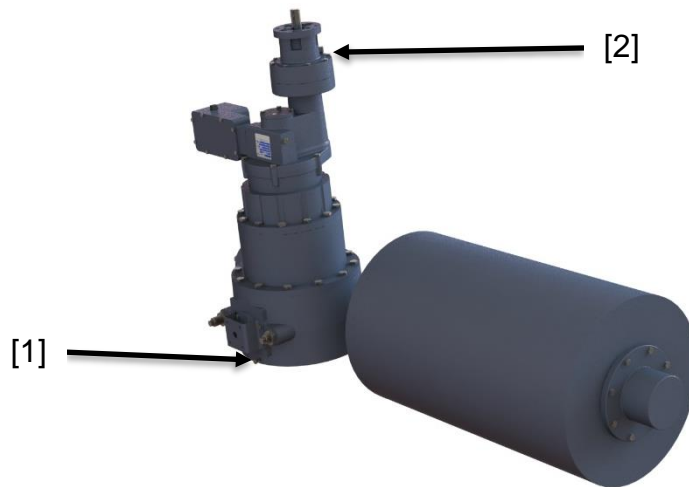


Figure 8 - Pressure Relief Vents

Pressure Relief for Stem Area [1]

Pressure relief is typically provided for stem area to avoid any buildup of pressure due to valve stem leakage per API 6D.

Pressure Relief for Gear Actuator Housing [2]

Pressure relief is typically provided for gear actuator housing to avoid buildup of pressure due to temperature fluctuation (thermal expansion).

7.3 Electric Actuator

If an electric actuator is installed, refer to the electric actuator IOM for commissioning.



CAUTION:

Before running RS actuator against end stops with electric actuator, verify the electric actuator output rotation is correct and torque limits have been set. Failure to do so may result in damage to gear actuator.

8.0 Operation

The RS actuator is operated by rotating the input shaft clockwise or counterclockwise which results in the output hub rotating. Refer to the general arrangement drawing for output rotation direction with a given input rotation.

8.1 Manual Operation

To operate gear manually, a hand wheel, chain wheel, or drive nut may be provided. Ensure input torque does not exceed gear actuator rating provided by WedgeRock.



CAUTION:

Do not replace the factory hand wheel with a different size without consulting the factory. Do not install chain wheels if not installed from the factory. Do not use cheater bars or drive the gear in any way it was not intended as this will void the warranty and may cause damage to the gear actuator, valve stem, drive shafts, or other torque transmitting devices as well as being dangerous to the user.

In manual applications, the handwheel may be configured to only turn in the direction required to compress the spring. To operate to the fail-safe position, the wrap spring brake must be released allowing the spring to operate the valve.

8.2 Motorized Operation

An electric actuator may be used to operate RS actuator. Refer to electric actuator IOM to operate. In motorized applications, the input shaft will be allowed to rotate in both directions. One direction will compress the spring. Rotation will be allowed in this direction until a stop bolt is reached and the input will not be allowed to rotate any further. If operated on the opposing direction, the rotation of the shaft will allow the spring to decompress in a controlled manner. Once the RS actuator reaches its end stop, the shaft rotating in the decompressing direction will continue to be allowed to turn as if it were in neutral. The stop bolt will not keep the input shaft from continuing to turn.

Two optional methods for operation are described below:

Method 1

Standard Operation

- Valve is operated in one direction only by the electric actuator. (Operation compresses the spring.)
- Valve is operated in the opposing direction by the spring when solenoid signal is cut off.

Fail Safe Operation

- Upon loss of signal to solenoid, the spring is released to a fail-safe position.
- When signal returns, normal operation can resume.

Note: In some cases, the actuator cannot continue to drive in one direction indefinitely. If this is the case, with the wrap spring brake still released, the electric actuator can be driven back to its start position without affecting position of the RS actuator or the valve for every cycle.

Method 2

Standard Operation

- Valve is operated both open and shut by the electric actuator. (Operation compresses and decompresses the spring.)

Fail Safe Operation

- Upon loss of signal to solenoid, the spring releases to a fail-safe position.
- When power returns, the electric actuator can either recognize position from a position transmitter or reset by operating to the fail position, then the signal is restored to the solenoid re-engaging the spring. (Operation of the actuator while the solenoid has lost signal will not change the valve position from the fail state.)

9.0 Maintenance

9.1 Lubrication

The RS actuator is lubricated for life at the factory. Added or replacement lubrication will not be necessary throughout its rated life.

9.2 Spare Parts

In general, spare parts are not required for the life of the RS actuator. If spare parts are required, contact your WedgeRock sales representative or go to <https://wedgerock.com/contact/> for information.

9.3 Service

WedgeRock has service personnel available to install, maintain, and repair all WedgeRock products. For more information, contact your WedgeRock sales representative or go to <https://wedgerock.com/contact/> for information.

10.0 Torque Chart

Torque Chart [Grade 5]				
Diameter & TPI	Torque			
	Dry [K=0.20]		Lubricated [K=0.15]	
	[Ft-Lbs]	[Nm]	[Ft-Lbs]	[Nm]
1/4-20	8.0	10.8	6.3	8.5
5/16-18	17	23	13	18
3/8-16	30	41	23	31
7/16-14	50	68	35	47
1/2-13	75	102	55	75
9/16-12	110	149	80	108
5/8-11	150	203	110	149
3/4-10	260	353	200	271
7/8-9	430	583	320	434
1-8	640	868	480	651
1-1/8-7	790	1071	600	813
1-1/4-7	1,120	1519	840	1139
1-3/8-6	1,470	1993	1,100	1491
1-1/2-6	1,960	2657	1,460	1979

Torque Chart [Class 8.8]				
Diameter & Pitch	Torque			
	Dry [K=0.20]		Lubricated [K=0.15]	
	[Ft-Lbs]	[Nm]	[Ft-Lbs]	[Nm]
M6X1.00	7.7	10.5	5.8	7.9
M8X1.25	19	26	14	19
M10X1.50	37	51	28	38
M12X1.75	65	88	49	66
M14X2.00	103	140	77	105
M16X2.00	162	219	121	164
M18X2.50	229	311	172	233
M20X2.50	325	441	244	331
M22X2.50	443	600	332	450
M24X3.00	562	762	422	572
M27X3.00	822	1115	617	837
M30X3.50	1117	1515	838	1136
M33X3.50	1520	2061	1140	1546
M36X4.00	1952	2647	1464	1985