

# SERVICE MANUAL

## **T8.320 / T8.350 / T8.380 / T8.410 / T8.435 / T8.380 SmartTrax<sup>™</sup> / T8.410 SmartTrax<sup>™</sup> / T8.435 SmartTrax<sup>™</sup> Continuously Variable Transmission (CVT) Powershift Transmission (PST) Tractor**

*PIN ZGRE05001 and above; PIN ZHRE01013 and above*

**Part number 48115484**

1<sup>st</sup> edition English

April 2017

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## **SERVICE MANUAL**

**T8.320 CVT TIER 4B [ZGRE05001 - ], T8.350 CVT TIER 4B [ZGRE05001 - ], T8.380 CVT TIER 4B [ZGRE05001 - ], T8.380 SmartTrax™ CVT TIER 4B [ZGRE05001 - ], T8.410 CVT TIER 4B [ZGRE05001 - ], T8.410 SmartTrax™ CVT TIER 4B [ZGRE05001 - ], T8.435 CVT TIER 4B [ZGRE05001 - ], T8.435 SmartTrax™ CVT TIER 4B [ZGRE05001 - ]**

## Link Product / Engine

Product	Market Product	Engine
T8.320 CVT TIER 4B [ZGRE05001 - ]	North America	F2CFE613G*B002
T8.320 CVT TIER 4B [ZGRE05001 - ]	Australia New Zealand	F2CFE613G*B002
T8.350 CVT TIER 4B [ZGRE05001 - ]	North America	F2CFE614G*B002
T8.350 CVT TIER 4B [ZGRE05001 - ]	Australia New Zealand	F2CFE614G*B002
T8.380 CVT TIER 4B [ZGRE05001 - ]	North America	F2CFE614D*B002
T8.380 CVT TIER 4B [ZGRE05001 - ]	Australia New Zealand	F2CFE614D*B002
T8.410 CVT TIER 4B [ZGRE05001 - ]	Australia New Zealand	F2CFE614C*B002
T8.410 CVT TIER 4B [ZGRE05001 - ]	North America	F2CFE614C*B002
T8.435 CVT TIER 4B [ZGRE05001 - ]	Australia New Zealand	F2CFE614A*B002
T8.435 CVT TIER 4B [ZGRE05001 - ]	North America	F2CFE614A*B002
T8.380 SmartTrax™ CVT TIER 4B [ZGRE05001 - ]	North America	F2CFE614D*B002
T8.380 SmartTrax™ CVT TIER 4B [ZGRE05001 - ]	Australia New Zealand	F2CFE614D*B002
T8.410 SmartTrax™ CVT TIER 4B [ZGRE05001 - ]	Australia New Zealand	F2CFE614C*B002
T8.410 SmartTrax™ CVT TIER 4B [ZGRE05001 - ]	North America	F2CFE614C*B002
T8.435 SmartTrax™ CVT TIER 4B [ZGRE05001 - ]	Australia New Zealand	F2CFE614A*B002
T8.435 SmartTrax™ CVT TIER 4B [ZGRE05001 - ]	North America	F2CFE614A*B002

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# INTRODUCTION

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## INTRODUCTION

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## **Foreword - Important notice regarding equipment servicing**

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 NEW HOLLAND Sales and Service Networks.

## Safety rules

### 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.

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## Safety rules - General maintenance safety

### 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.

## **Safety rules - Personal Protective Equipment (PPE)**

### **Personal Protective Equipment (PPE)**

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

## Safety rules - Do Not Operate tag

### 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.

## Safety rules - Ecology and the environment

Soil, air, and water are vital factors of agriculture and life in general. When legislation does not yet rule the treatment of some of the substances required by advanced technology, sound judgment should govern the use and disposal of products of a chemical and petrochemical nature.

**NOTE:** *The following are recommendations that may be of assistance:*

- Become acquainted with and ensure that you understand the relative legislation applicable to your country.
- Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, antifreeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use, and dispose of these substances.
- Agricultural consultants will, in many cases, be able to help you as well.

### Helpful hints

- Avoid filling tanks using cans or inappropriate pressurized fuel delivery systems that may cause considerable spillage.
- In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of them 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 draining off used engine coolant mixtures, engine, gearbox and hydraulic oils, brake fluids, etc. Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.
- Modern coolant mixtures, i.e. antifreeze and other additives, should be replaced every two years. They should not be allowed to get into the soil, but should be collected and disposed of properly.
- Do not open the air-conditioning system yourself. It contains gases that should not be released into the atmosphere. Your NEW HOLLAND dealer or air conditioning specialist has a special extractor for this purpose and will have to recharge the system properly.
- Repair any leaks or defects in the engine cooling 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 as penetrating weld splatter may burn a hole or weaken them, allowing the loss of oils, coolant, etc.

## Torque - Minimum tightening torques for normal assembly

### 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)

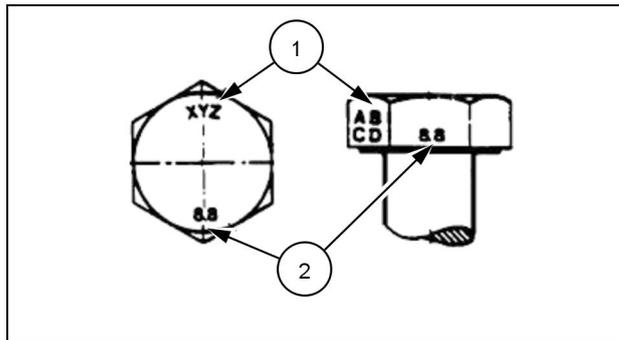
**NOTE:** M4 through M8 hardware torque specifications are shown in pound-inches. M10 through M24 hardware torque specifications are shown in pound-feet.

**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**

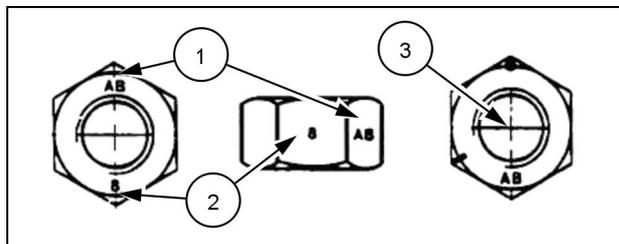
**Metric Hex head and carriage bolts, classes 5.6 and up**



20083680 1

1. Manufacturer's Identification
2. Property Class

**Metric Hex nuts and locknuts, classes 05 and up**



20083681 2

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)

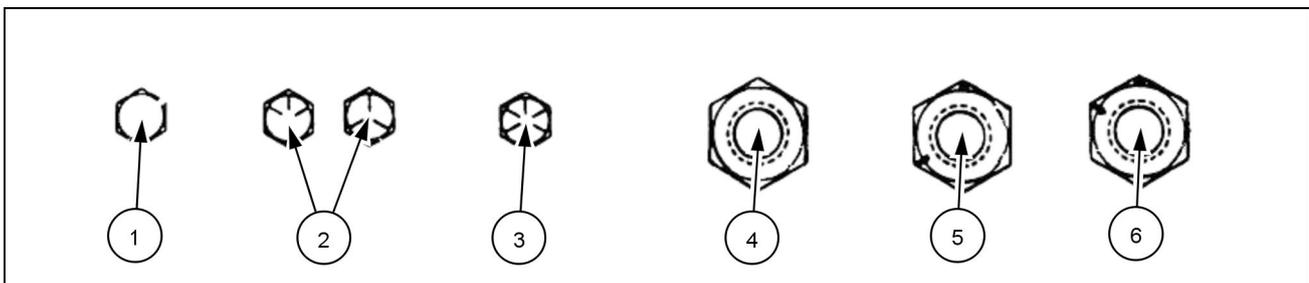
**NOTE:** For Imperial Units, *1/4 in* and *5/16 in* hardware torque specifications are shown in pound-inches. *3/8 in* through *1 in* hardware torque specifications are shown in pound-feet.

**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**

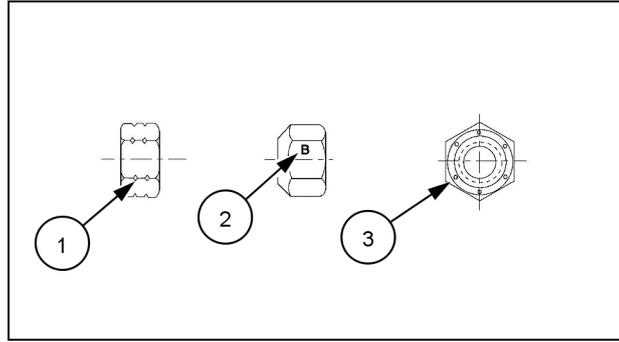


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**Grade Marking Examples**

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

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## Torque - Standard torque data for hydraulic connections

### General information

- Hydraulic connections require a minimum assembly torque in order to provide zero leakage at rated pressure with adequate fatigue resistance. Over-torquing of a hydraulic connection can also lead to leakage or failure. For some connections, NEW HOLLAND requires a different torque value than is listed in the ISO and SAE standards.
- The torque values in this document should be used whenever possible or applicable.

**NOTICE:** Always follow the instructions in this manual for specific torque values when you service components. The information in this section is for general guidance only when a procedure contains no specific torque value.

### Tolerance

- The tolerance for all torque values is  $\pm 10\%$ . This tolerance must include all assembly variation, not only the torque wrench repeatability.

### Lubrication

Application of grease or other lubricants to hydraulic connectors should be avoided. If clean hydraulic oil is already on the connection, it is not required to remove the oil. Generally, application of grease:

- May cause a significant change in the torque required to properly tighten the connection.
- May reduce the connection's resistance to vibration.
- Excessive grease may displace an elastomer seal during tightening.
- Grease extrusion when connection is tightened may be mistaken for leakage.

NEW HOLLAND products generally use O-Ring Boss (ORB) connectors that have Teflon™-coated O-rings, eliminating the need for O-ring lubrication during installation. For connections which are made into aluminum manifolds or with stainless steel connectors, it may be required to apply a lubricant to prevent galling.

Use of **LOCTITE®** and other thread-locking compounds is prohibited. These compounds:

- May cause a significant change in the torque required to properly tighten the connections.
- Reduce the serviceability of the joint.
- May prevent the O-ring from properly sealing if the compound gets on the O-ring.

INTRODUCTION

**Torque values for metric O-Ring Boss (ORB) port connections**

Metric thread	S-Series *		L-Series **	
	Ferrous N·m (lb ft) ± 10%	Non-Ferrous N·m (lb ft) ± 10%	Ferrous N·m (lb ft) ± 10%	Non-Ferrous N·m (lb ft) ± 10%
M8 x 1	10.5 (7.7)	6.3 (4.6)	8.5 (6.3)	5 (3.7)
M10 x 1	21 (15.5)	12.5 (9.2)	15.5 (11.4)	9.3 (6.9)
M12 x 1.5	37 (27.3)	22 (16.2)	27 (19.9)	16 (11.8)
M14 x 1.5	47 (34.7)	28 (20.7)	37 (27.3)	22 (16.2)
M16 x 1.5	58 (42.8)	35 (25.8)	42 (31)	25 (18.4)
M18 x 1.5	74 (54.6)	44 (32.5)	47 (34.7)	28 (20.7)
M22 x 1.5	105 (77.4)	63 (46.5)	63 (46.5)	38 (28)
M27 x 2	178 (131.3)	107 (78.9)	105 (77.4)	63 (46.5)
M30 x 2	225 (166)	135 (99.6)	136 (100.3)	82 (60.5)
M33 x 2	325 (239.7)	195 (143.8)	168 (123.9)	101 (74.5)
M42 x 2	345 (254.5)	207 (152.7)	220 (162.3)	132 (97.4)
M48 x 2	440 (324.5)	264 (194.7)	273 (201.4)	164 (121)
M60 x 2	525 (387.2)	315 (232.3)	330 (243.4)	198 (146)

\* S-Series connectors are used with O-Ring Face Seals (ORFS).

\*\* L-Series connectors are used with 37° flare.

**Torque values for metric O-Ring Boss (ORB) port plugs**

Metric thread	Ferrous		Non-ferrous
	Internal hex N·m (lb ft) ± 10%	External hex N·m (lb ft) ± 10%	N·m (lb ft) ± 10%
M8 x 1	8.5 (6.3)	10.5 (7.7)	6.3 (4.6)
M10 x 1	16 (11.8)	21 (15.5)	12.5 (9.2)
M12 x 1.5	23 (17)	37 (27.3)	22 (16.2)
M14 x 1.5	47 (34.7)	47 (34.7)	28 (20.7)
M16 x 1.5	58 (42.8)	58 (42.8)	35 (25.8)
M18 x 1.5	74 (54.6)	74 (54.6)	44 (32.5)
M22 x 1.5	105 (77.4)	105 (77.4)	63 (46.5)
M27 x 2	178 (131.3)	178 (131.3)	107 (78.9)
M30 x 2	225 (166)	225 (166)	135 (99.6)
M33 x 2	325 (239.7)	325 (239.7)	195 (143.8)
M42 x 2	345 (254.5)	345 (254.5)	207 (152.7)
M48 x 2	440 (324.5)	440 (324.5)	264 (194.7)
M60 x 2	525 (387.2)	525 (387.2)	315 (232.3)

INTRODUCTION

**Torque values for port connections (British Standard Pipe Parallel (BSPP) thread ports and stud ends)**

BSPP thread G- Gas; A- medium coarse threads	Metric tube Outside Diameter (OD) mm (in)		Ferrous		Non-Ferrous	
	S-Series *	L-Series **	S-Series N·m (lb ft) ± 10%	L-Series N·m (lb ft) ± 10%	S-Series N·m (lb ft) ± 10%	L-Series N·m (lb ft) ± 10%
G 1/8 A	–	6 (0.236)	–	21 (15.5)	–	12.5 (9.2)
G 1/4 A	6 (0.236) or 8 (0.315)	8 (0.315) or 10 (0.394)	63 (46.5)	53 (39.1)	38 (28)	32 (23.6)
G 3/8 A	10 (0.394) or 12 (0.472)	12 (0.472)	95 (70.1)	84 (62)	57 (42)	50 (36.9)
G 1/2 A	16 (0.630)	15 (0.591) or 18 (0.709)	136 (100.3)	105 (77.4)	82 (60.5)	63 (46.5)
G 3/4 A	20 (0.787)	22 (0.866)	210 (154.9)	210 (154.9)	126 (92.9)	126 (92.9)
G 1 A	25 (0.984)	28 (1.102)	400 (295)	400 (295)	240 (177)	240 (177)
G 1 1/4 A	30 (1.181)	35 (1.378)	525 (387.2)	525 (387.2)	315 (232.3)	315 (232.3)
G 1 1/2 A	38 (1.496)	42 (1.654)	660 (486.8)	660 (486.8)	396 (292.1)	396 (292.1)

\* S-Series connectors are used with O-Ring Face Seals (ORFS).

\*\* L-Series connectors are used with 37° flare.

**Torque values for metric port connections (Metric face-seal ports and stud ends)**

Metric thread	Metric tube Outside Diameter (OD) mm (in)		Ferrous		Non-Ferrous	
	S-Series *	L-Series **	S-Series N·m (lb ft) ± 10%	L-Series N·m (lb ft) ± 10%	S-Series N·m (lb ft) ± 10%	L-Series N·m (lb ft) ± 10%
M10 x 1	–	4 (0.157)	–	21 (15.5)	–	12.5 (9.2)
M12 x 1.5	4 (0.157)	6 (0.236)	47 (34.7)	32 (23.6)	28 (20.7)	19 (14)
M14 x 1.5	5 (0.197)	7 (0.276)	63 (46.5)	53 (39.1)	38 (28)	32 (23.6)
M16 x 1.5	7 (0.276)	9 (0.354)	84 (62)	63 (46.5)	50 (36.9)	38 (28)
M18 x 1.5	8 (0.315)	11 (0.433)	105 (77.4)	84 (62)	63 (46.5)	50 (36.9)
M20 x 1.5	10 (0.394)	–	147 (108.4)	–	88 (64.9)	–
M22 x 1.5	12 (0.472)	14 (0.551)	158 (116.5)	147 (108.4)	95 (70.1)	88 (64.9)
M26 x 1.5	–	18 (0.709)	–	210 (154.9)	–	126 (92.9)
M27 x 1.2	16 (0.630)	–	210 (154.9)	–	126 (92.9)	–
M33 x 2	20 (0.787)	23 (0.906)	400 (295)	400 (295)	240 (177)	240 (177)
M42 x 2	25 (0.984)	30 (1.181)	525 (387.2)	525 (387.2)	315 (232.3)	315 (232.3)
M48 x 2	32 (1.260)	36 (1.417)	630 (464.7)	630 (464.7)	396 (292.1)	396 (292.1)

\* S-Series connectors are used with O-Ring Face Seals (ORFS).

\*\* L-Series connectors are used with 37° flare.

INTRODUCTION

**Torque values for Inch O-Ring Boss (ORB) port non-adjustable connections**

SAE dash size	UN/UNF thread size	Inch tube OD mm (in)	S-Series *		L-Series **	
			Ferrous N·m (lb ft) ± 10%	Non-Ferrous N·m (lb ft) ± 10%	Ferrous N·m (lb ft) ± 10%	Non-Ferrous N·m (lb ft) ± 10%
2	5/16-24	3.18 (0.125)	–	–	8.5 (6.3)	5 (3.7)
3	3/8-24	4.76 (0.187)	15.5 (11.4)	9.3 (6.9)	10.5 (7.7)	6.3 (4.6)
4	7/16-20	6.35 (0.250)	37 (27.3)	22 (16.2)	19 (14)	11.5 (8.5)
5	1/2-20	7.94 (0.313)	42 (31)	25 (18.4)	26 (19.2)	15.5 (11.4)
6	9/16-18	9.52 (0.375)	47 (34.7)	28 (20.7)	32 (23.6)	19 (14)
8	3/4-16	12.7 (0.500)	89 (65.6)	53 (39.1)	53 (39.1)	32 (23.6)
10	7/8-14	15.88 (0.625)	121 (89.2)	73 (53.8)	63 (46.5)	38 (28)
12	1-1/16-12	19.05 (0.750)	178 (131.3)	107 (78.9)	100 (73.8)	60 (44.3)
14	1-3/16-12	22.22 (0.875)	225 (166)	135 (99.6)	131 (96.6)	79 (58.3)
16	1-5/16-12	25.4 (1.000)	283 (208.7)	170 (125.4)	156 (115.1)	94 (69.3)
20	1-5/8-12	31.75 (1.250)	300 (221.3)	180 (132.8)	210 (154.9)	126 (92.9)
24	1-7/8-12	38.1 (1.500)	388 (286.2)	233 (171.9)	220 (162.3)	132 (97.4)
32	2-1/2-12	50.8 (2.000)	388 (286.2)	233 (171.9)	315 (232.3)	189 (139.4)

\* S-Series connectors are used with O-Ring Face Seals (ORFS).

\*\* L-Series connectors are used with 37° flare.

**Torque values for inch O-Ring Boss (ORB) port adjustable connections**

SAE dash size	UN/UNF thread size	Inch tube OD mm (in)	S-Series *		L-Series **	
			Ferrous N·m (lb ft) ± 10%	Non-Ferrous N·m (lb ft) ± 10%	Ferrous N·m (lb ft) ± 10%	Non-Ferrous N·m (lb ft) ± 10%
2	5/16-24	3.18 (0.125)	–	–	8.5 (6.3)	5 (3.7)
3	3/8-24	4.76 (0.187)	10.5 (7.7)	9.3 (6.9)	10.5 (7.7)	6.3 (4.6)
4	7/16-20	6.35 (0.250)	21 (15.5)	21 (15.5)	19 (14)	11.5 (8.5)
5	1/2-20	7.94 (0.313)	42 (31)	25 (18.4)	26 (19.2)	15.5 (11.4)
6	9/16-18	9.52 (0.375)	47 (34.7)	28 (20.7)	32 (23.6)	19 (14)
8	3/4-16	12.7 (0.500)	89 (65.6)	53 (39.1)	53 (39.1)	32 (23.6)
10	7/8-14	15.88 (0.625)	121 (89.2)	73 (53.8)	63 (46.5)	38 (28)
12	1-1/16-12	19.05 (0.750)	178 (131.3)	107 (78.9)	100 (73.8)	60 (44.3)
14	1-3/16-12	22.22 (0.875)	225 (166)	135 (99.6)	131 (96.6)	79 (58.3)
16	1-5/16-12	25.4 (1.000)	285 (210.2)	170 (125.4)	156 (115.1)	94 (69.3)
20	1-5/8-12	31.75 (1.250)	300 (221.3)	180 (132.8)	210 (154.9)	126 (92.9)
24	1-7/8-12	38.1 (1.500)	388 (286.2)	233 (171.9)	220 (162.3)	132 (97.4)
32	2-1/2-12	50.8 (2.000)	388 (286.2)	233 (171.9)	315 (232.3)	189 (139.4)

\* S-Series connectors are used with O-Ring Face Seals (ORFS).

\*\* L-Series connectors are used with 37° flare.

INTRODUCTION

**Torque values for inch O-Ring Boss (ORB) port plugs**

SAE dash size	UN/UNF thread size	Ferrous		Non-Ferrous
		Internal hex N·m (lb ft) ± 10%	External hex N·m (lb ft) ± 10%	N·m (lb ft) ± 10%
2	5/16-24	7.5 (5.5)	12.5 (9.2)	7.5 (5.5)
3	3/8-24	14.5 (10.7)	21 (15.5)	12.5 (9.2)
4	7/16-20	21 (15.5)	37 (27.3)	22 (16.2)
5	1/2-20	28 (20.7)	42 (31)	25 (18.4)
6	9/16-18	47 (34.7)	47 (34.7)	28 (20.7)
8	3/4-16	89 (65.6)	89 (65.6)	53 (39.1)
10	7/8-14	116 (85.6)	116 (85.6)	70 (51.6)
12	1-1/16-12	176 (129.8)	176 (129.8)	106 (78.2)
14	1-3/16-12	247 (182.2)	247 (182.2)	148 (109.2)
16	1-5/16-12	284 (209.5)	284 (209.5)	170 (125.4)
20	1-5/8-12	357 (263.3)	357 (263.3)	214 (157.8)
24	1-7/8-12	441 (325.3)	441 (325.3)	265 (195.5)
32	2-1/2-12	536 (395.3)	536 (395.3)	322 (237.5)

**Torque values for four-bolt flange connections (Metric Screws, Class 10.9)**

Metric size mm	Imperial size in	Screw code 61	Code 61 N·m (lb ft) ± 10%	Screw code 62	Code 62 N·m (lb ft) ± 10%
13	1/2	M8 x 1.25	34 (25.1)	M8 x 1.25	34 (25.1)
19	3/4	M10 x 1.5	74 (54.6)	M10 x 1.5	74 (54.6)
25	1	M10 x 1.5	74 (54.6)	M12 x 1.75	137 (101)
32	1-1/4	M10 x 1.5	74 (54.6)	M12 x 1.75	137 (101)
				M14 x 1.5	189 (139.4)
38	1-1/2	M12 x 1.75	137 (101)	M16 x 2	310 (228.6)
51	2	M12 x 1.75	137 (101)	M20 x 2.5	575 (424.1)
64	2-1/2	M12 x 1.75	137 (101)	M24 x 3	575 (424.1)
76	3	M16 x 2	310 (228.6)	M30 x 3.5	680 (501.5)
89	3-1/2	M16 x 2	310 (228.6)	–	–
102	4	M16 x 2	310 (228.6)	–	–
127	5	M16 x 2	310 (228.6)	–	–

**Torque values for four-bolt flange connections (Metric Screws, Class 8.8)**

Metric size mm	Imperial size in	Screw code 61	Code 61 N·m (lb ft) ± 10%	Screw code 62	Code 62 N·m (lb ft) ± 10%
13	1/2	M8 x 1.25	29 (21.4)	M8 x 1.25	29 (21.4)
19	3/4	M10 x 1.5	57(42)	M10 x 1.5	57(42)
25	1	M10 x 1.5	57(42)	M12 x 1.75	100 (73.8)
32	1-1/4	M10 x 1.5	57(42)	M12 x 1.75	100 (73.8)
				M14 x 1.5	160 (118)
38	1-1/2	M12 x 1.75	100 (73.8)	M16 x 2	250 (184.4)
51	2	M12 x 1.75	100 (73.8)	M20 x 2.5	500 (368.8)
64	2-1/2	M12 x 1.75	100 (73.8)	M24 x 3	575 (424.1)
76	3	M16 x 2	250 (184.4)	M30 x 3.5	680 (501.5)
89	3-1/2	M16 x 2	250 (184.4)	–	–
102	4	M16 x 2	250 (184.4)	–	–
127	5	M16 x 2	250 (184.4)	–	–

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**Torque values for four-bolt flange connections (Inch Screws, Grade 8)**

Metric size mm	Imperial size in	Screw code 61	Code 61 N·m (lb ft) ± 10%	Screw code 62	Code 62 N·m (lb ft) ± 10%
13	1/2	5/16-18	34 (25.1)	5/16-18	34 (25.1)
19	3/4	3/8-16	63 (46.5)	3/8-16	63 (46.5)
25	1	3/8-16	63 (46.5)	7/16-14	97 (71.5)
32	1-1/4	7/16-14	97 (71.5)	1/2-13	158 (116.5)
38	1-1/2	1/2-13	158 (116.5)	5/8-11	310 (228.6)
51	2	1/2-13	158 (116.5)	3/4-10	473 (348.9)
64	2-1/2	1/2-13	158 (116.5)	–	–
76	3	5/8-11	310 (228.6)	–	–
89	3-1/2	5/8-11	310 (228.6)	–	–
102	4	5/8-11	310 (228.6)	–	–
127	5	5/8-11	310 (228.6)	–	–

**Tapered thread connection tightening**

British Standard Pipe Taper (BSPT) thread size (inch)	National Pipe Thread Fuel (NPTF) thread size (inch)	Turns from finger tight
1/8-28	1/8-27	2 - 3
1/4-19	1/4-18	2 - 3
3/8-19	3/8-18	2 - 3
1/2-14	1/2-14	2 - 3
3/4-14	3/4-14	2 - 3
1-11	1-11 1/2	1.5 - 2.5
1-1/4-11	1-1/4-11 1/2	1.5 - 2.5
1-1/2-11	1-1/2-11 1/2	1.5 - 2.5
2-11	2-11 1/2	1.5 - 2.5

**Torque values for banjo bolt connections (Copper washer style)**

Bolt thread (metric)	Hex size (mm)	Torque N·m (lb ft) ± 10%
M8 x 1.25	13	13 (9.6)
M10 x 1.25	17	16 (11.8)
M12 x 1.5	17	40 (29.5)
M14 x 1.5	19	45 (33.2)
M16 x 1.5	22	48 (35.4)
M18 x 1.5	24	50 (36.9)
M20 x 1.5	27	73 (53.8)
M22 x 1.5	32	73 (53.8)
M24 x 1.5	32	73 (53.8)

INTRODUCTION

**Torque values for O-Ring Face Seals (ORFS) connections**

SAE dash size	UN/UNF thread size	Inch tube OD (mm)	Metric tube OD (mm)	Hex size (mm) (Reference only)	* Swivel nut torque N·m (lb ft) ± 10%	** Swivel nut torque N·m (lb ft) ± 10%
4	9/16-18	6.35	6	17	27 (19.9)	27 (19.9)
5	5/8-18	7.94	8	19	34 (25.1)	34 (25.1)
6	11/16-16	9.52	10	22	44 (32.5)	44 (32.5)
8	13/16-16	12.7	12	24	65 (47.9)	65 (47.9)
10	1-14	15.88	16	30	100 (73.8)	100 (73.8)
12	1-3/16-12	19.05	20	36	150 (110.6)	131 (96.6)
14	1-5/16-12	22.23	22	41	163 (120.2)	131 (96.6)
16	1-7/16-12	25.4	25	41	210 (154.9) ***	131 (96.9)
20	1-11/16-12	31.75	30	50	280 (206.5) ***	178 (131.3)
24	2-12	38.1	38	60	375 (276.6) ***	210 (154.9)

\* High/Medium-pressure applications > 50 bar (725 psi).

\*\* Low-pressure applications < 50 bar (725 psi).

\*\*\* It is recommended to use a four-bolt flange connection instead of O-Ring Face Seals (ORFS) sizes "16" and up.

**Torque values for 37° flare connections - Joint Industry Council (JIC)**

SAE dash size	UN/UNF thread size	Metric tube OD (mm)	Inch tube OD (mm)	Swivel nut torque N·m (lb ft) ± 10%
2	5/16-24	–	3.18	8.25 (6.1)
3	3/8-24	–	4.76	11.5 (8.5)
4	7/16-20	6	6.35	15.5 (11.4)
5	1/2-20	8	7.94	20 (14.8)
6	9/16-18	10	9.52	25 (18.4)
8	3/4-16	12	12.7	52 (38.4)
10	7/8-14	16	15.88	81 (59.7)
12	1-1/16-12	20	19.05	112 (82.6)
14	1-3/16-12	–	22.22	133 (98.1)
16	1-5/16-12	25	25.4	155 (114.3)
20	1-5/8-12	30/32	31.75	180 (132.8)
24	1-7/8-12	38	38.1	225 (166)
32	2-1/2-12	50	50.8	348 (256.7)

**Torque values for 30° flare, 60° cone connections**

Nominal size (mm)	British Standard Pipe Parallel (BSPP) thread size	Hex size (mm)	Swivel nut torque N·m (lb ft) ± 10%
5, 6, 6.3	G 1/4	17	25 (18.4)
8, 9, 10	G 3/8	19	34 (25.1)
12, 12.5	G 1/2	22	64 (47.2)
15, 16, 19	G 3/4	30	132 (97.4)
25	G 1	36	196 (144.6)
31.5, 32	G 1-1/4	46	225 (166)
38	G 1-1/2	50	255 (188.1)
50, 51	G 2	65	316 (223.1)

## General specification - Engine

### Diesel engine

Type	Six cylinder, four stroke cycle, turbocharged, 4 valve per cylinder head, air to air aftercooled
Firing Order	1-4-2-6-3-5
Bore	<b>117 mm</b>
Stroke	<b>135 mm</b>
Piston displacement	<b>8.7 l</b>
Compression ratio	15.9 :1
Cylinder sleeves	Wet type, removable
High engine idle	<b>2240 RPM ± 25 RPM</b>
Rated engine speed	<b>2000 RPM</b>
Low engine idle	<b>900 RPM ± 50 RPM</b>

### Lubrication system

#### All models

Oil pressure	<b>300 – 500 kPa (43 – 75 psi)</b>
System type	Constant pressure with piston oil cooling

### Fuel system

#### All models

Fuel injection pump	
Type	Electronic
Make	High Pressure Common Rail Bosch CP3.3
Fuel injectors	Bosch electronically controlled

### Air intake system

#### All models

Type	Dry type, air induction system, two stage
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### Cooling system

#### All models

Type	Pressure system, thermostat controlled bypass, centrifugal type pump
Radiator	Aluminum furnace brazed
Thermostat	Starts to open at approximately <b>84 °C (183 °F) ± 2 °C (3.6 °F)</b> fully open at <b>94 °C (201.2 °F) ± 2 °C (3.6 °F)</b>
Pressure cap, deaeration tank	<b>120 kPa (17.4 psi)</b>
Fan drive type	Viscous

## General specification - Power train

### Transmission - Powershift

Standard	18 speed full power shift with hydraulically actuated clutches
Speed selection	18 forward and 4 reverse
Optional	23 speed full power shift (includes creeper) with hydraulically actuated clutches
Speed selection	23 forward and 6 reverse
Optional	19 speed full power shift with hydraulically actuated clutches ( <b>40 km/h</b> or <b>50 km/h</b> )
Speed selection	19 forward and 4 reverse
Shift control	Electronically controlled switch actuated
Oil cooler	Transmission, hydraulic, steering and brake fluid

### Transmission - AutoCommand

Type	Hydraulic continuously variable transmission, input coupled	
Pump type	Variable displacement (swash plate)	
Motor type	Fixed displacement (bent axis)	
Number of mechanical ranges	Forward	4
	Reverse	4
Output shaft speed in forward (RPM)	Group 49 tires	<b>40 km/h (24.9 mph) = 2931 RPM</b> <b>50 km/h (31.1 mph) = 3656 RPM</b>
	Group 48 tires	<b>40 km/h (24.9 mph) = 3100 RPM</b> <b>50 km/h (31.1 mph) = 3850 RPM</b>
Maximum reverse speed	Limited to <b>25 km/h (15.5 mph)</b>	

### Brakes

Type	Hydraulic, power-assisted, self-adjusting multiple wet plate type differential brakes
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### Axle differential and planetaries – Mechanical Front Drive (MFD) axles

Axle type	Class 4.75 fixed - 3 pin, 12 bolt	electrically controlled, engaged with spring pressure clutch, disengaged hydraulically Full locking, electronically controlled differential
	Class 4.75 saddle suspended -3 pin, 12 bolt	
	Class 5.0 fixed - 3 pin, 12 bolt	
	Class 5.0 saddle suspended -3 pin, 12 bolt	
	Class 5.0 wide fixed - 3 pin, 12 bolt	
	Class 5.0 wide saddle suspended -3 pin, 12 bolt	

### Interaxle ratio – Front/Rear

#### \*Front axle reduction ratio – T8.320 and T8.350

Class 4.75 fixed and saddle suspended	1.32431	*21.500
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#### \*Front axle reduction ratio – T8.380 and T8.410

Class 4.75 fixed and saddle suspended	1.32716	*21.500
Class 5.0 and class 5.0 wide fixed and saddle suspended	1.32204	*21.583

\* This ratio number can be found on the axle serial number plate.