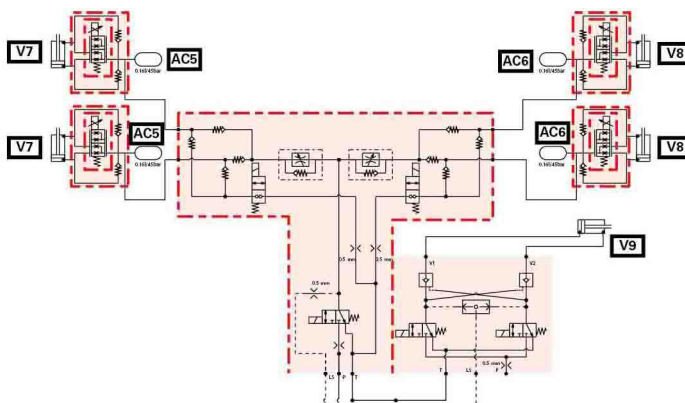
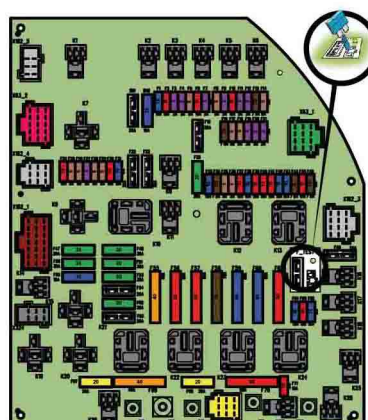


MASSEY FERGUSON

Technician Service Book - MF 5700 S series tractors

Schémas électriques et hydrauliques



Beauvais

AGCO S.A.S. - 41 avenue Blaise Pascal - 60000

Beauvais - France - RC B562 104 539

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English

Foreword

Foreword

All information and specifications in this manual are up to date at the time of publication. However, our ongoing policy to improve our products obliges us to reserve the right to make alterations at any time without notice.

Please note that this manual relates to all models and refers to both standard and optional equipment. You may therefore find details relating to equipment that is not fitted on your tractor.

Massey Ferguson tractors sold in the countries in the European Union and the European Free Trade Association below must meet the requirements of the European Regulation EU 167/2013.

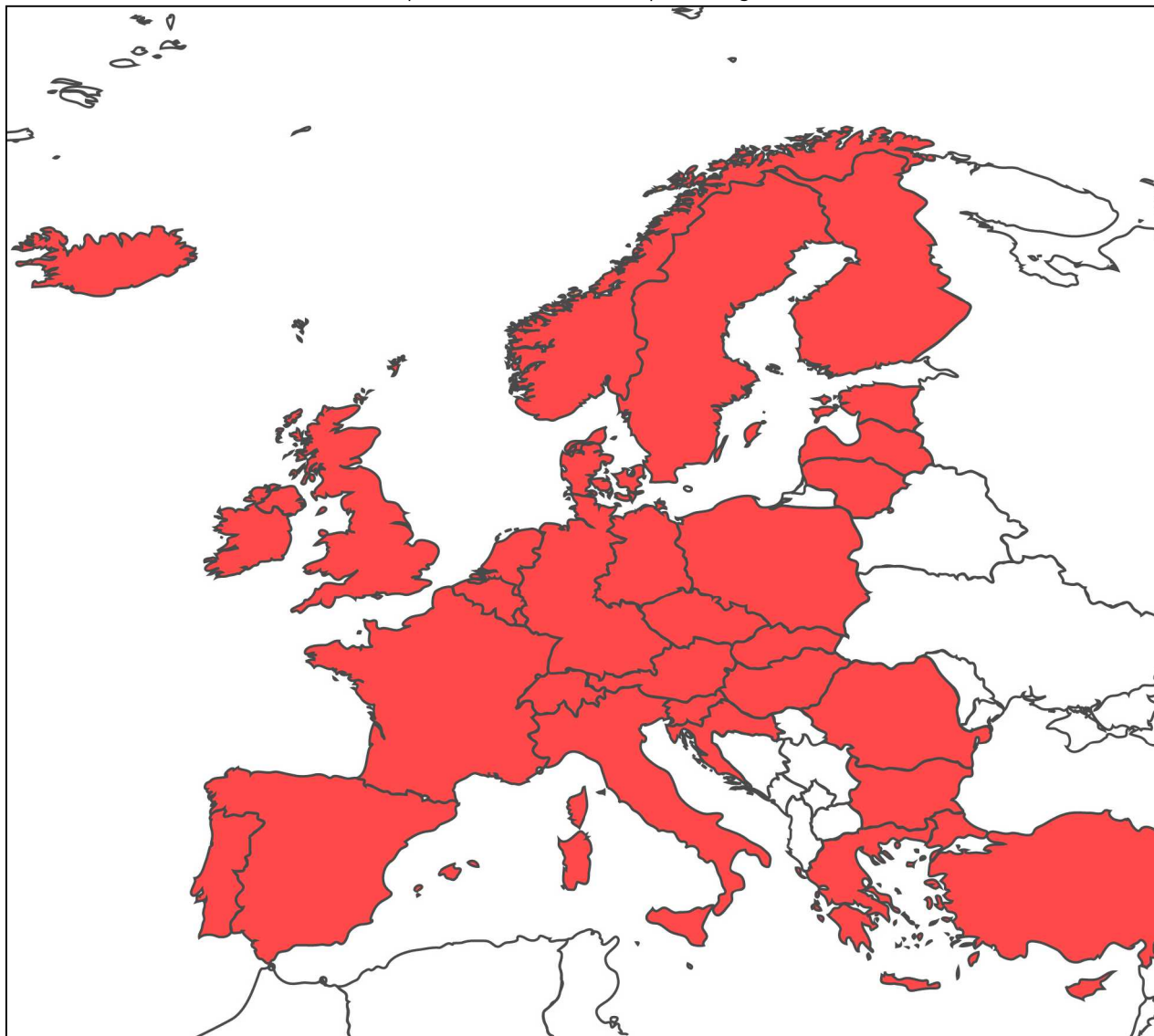


Fig. 1

This regulation prescribes that vehicles be designed, built, and assembled in such a way as to minimize the risk of injury to their occupants and other road users. Thus, when assembly or operation applies only to a tractor subject to this regulation, it is stated in the title: Mother Regulation

Massey Ferguson

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1.1 General specifications

1.1.1 MF 5700 S models

Engine					
Model	MF 5709 S	MF 5710 S	MF 5711 S	MF 5712 S	MF 5713 S
Brand	AGCO Power				
Type	44 AWFC				
Nominal power hp ISO (kW) at an engine speed of 2200 rpm	90 (66)	95 (70)	105 (77)	115 (85)	125 (92)
Maximum power hp ISO (kW) at an engine speed of 2000 rpm	95 (70)	100 (74)	110 (81)	120 (88)	130 (96)
Maximum PTO power HP SAE (kW) at an engine speed of 2000 rpm	75 (55)	81 (60)	90 (66)	101 (75)	109 (80)
Maximum torque, Nm	405 Nm	420 Nm	468 Nm	502 Nm	545 Nm
Displacement in liters	4.4				
Piston travel	120 mm				
Piston diameter	108 mm				
Compression ratio	17,4 bar: 1 bar				
Number of cylinders	4				
Idle speed, hand brake engaged	750 rpm				
Idle speed, hand brake disengaged	850 rpm				
Nominal speed	2100 rpm				
Maximum speed	2260 rpm				
Engine weight	430 kg				
High-pressure pump brand	Bosch				
High-pressure pump type	CB18				
Firing order	1-2-4-3				
Maximum pressure in the high-pressure system	1800 bar				
Injector brand	Bosch				
Injector type	CRI 2.2				
Charge pump type	Manual				

Engine					
Model	MF 5709 S	MF 5710 S	MF 5711 S	MF 5712 S	MF 5713 S
Fuel prefilter filtration capacity	10 μ				
Main fuel filter filtration capacity	5 μ				
Low-pressure system pressure at minimum speed	0,5 bar to 1 bar				
Low-pressure system pressure at maximum speed	0,5 bar to 1 bar				
Recommended oil:	API CJ4 or ACEA E9				
Maximum operating tilt (precautions)	25° pitch				
	20° roll				
Oil/fuel consumption	Maximum 0.2%				
Lubrication system	Gear pump				
Oil cooling system	Oil/water heat exchanger				
Oil pressure at minimum speed	1,5 bar				
Oil pressure at maximum speed	2,5 bar to 5 bar depending on the temperature				
Relief valve adjustment pressure	5 bar (spring pressure)				
Air suction type	Turbocharged with air/air intercooler				
Air preheating type	Grid heater with relay controlled by the ECU				
Number of valves	16				
Valve clearance value	0,35 mm (inlet and exhaust)				
Engine cooling system	Coolant				
Fan type	Vistronic				
Thermostat begins to open at	83 °C				
Coolant temperature	-35 °C to 106 °C				
Air compressor brand for the brake system	Knorr Bremse				
Type of compressor	Piston				
Pressure range:	6,5 bar to 8 bar				
Block preheater	110 or 220 volts				
Fuel preheater	Not available				

Engine					
Model	MF 5709 S	MF 5710 S	MF 5711 S	MF 5712 S	MF 5713 S
Urea preheater	Tank: coolant				
Exhaust fumes recirculation system	Pump module and supply lines: electric				
DOC + SCR system (Diesel Exhaust Fluid (DEF) injection)	DOC with metal substrate (exhaust fumes oxidation catalyzer)				
	SCR Technology with ceramic substrate (exhaust fume treatment)				
Safety system	NOx sensors at exhaust inlet and outlet				
Device brand	Bosch Denox 2.2+				
Type of control	Engine controller EEM4				
Urea solidification temperature	-11 °C				
Oil vapor recirculation system	Closed system breather (CCV)				
Belt: Air conditioning compressor/left-hand alternator	Poly V belt				
Belt: Fan/right-hand alternator	Poly V belt				
Belt: Air compressor	Poly V belt				

Rear axle transmission	
Gearbox type	Dyna-4 GBA 25 or Dyna-6 GBA 25
Number of ratios	4
Number of ranges	4 or 6
Number of gears	16/16 or 24/24
Super creeper gears	13.68/1
Number of gears with super creeper gears	32/32
Maximum speed	40 km/h
Rear axle type	GPA54
Number of pinion/crown wheel teeth	10/47
Rear axle ratio	25.179
4WD ratio	0.775
Final drive type	GPA54
Final drive reduction ratio	(61+14)/14

Rear axle transmission	
Maximum 4WD clutch torque	180 daNm
Number of 4WD disks	6 disks
Main brake type	Multidisc ball ramp
Number of disks per side	5
Braking pressure	-
Parking brake type	Hand brake
Trailer brake type	Hydraulic and/or pneumatic with built-in antifreeze pump
Pneumatic trailer braking pressure	6,9 bar to 8,3 bar
Hydraulic trailer braking pressure	0 to 150 bar
Maximum operating tilt - pitch (front/rear)	25°
Maximum operating tilt - roll (right/left)	22°
Maximum operating tilt - combined	22°
Total loaded weight supported by rear axle	4-wheel drive: 6400 kg
	2-wheel drive: 6000 kg

Two-wheel drive front axle	
Front axle brand	LODI 140 CP

Four-wheel drive front axle	
Brand	DANA
Supplier reference - suspended axle	730/563
Supplier reference - fixed axle	730/563
Suspended front axle weight	-
Fixed front axle weight	278 kg
Number of differential disks	-
Total ratio for fixed and suspended front axle	14.57
Axle type	Suspended or fixed
Total loaded weight supported by front axle	-
Rotational direction	Anti-clockwise
Recommended oil type (beam and final drive)	SAE85W90 (API GL4-MIL L-2105)
Ratio for fixed and suspended axle final drive	6

Four-wheel drive front axle	
Number of pinion/crown wheel teeth	14/34
Maximum steering angle	4-wheel drive: 55°
	2-wheel drive: 52°
Oscillation angle	± 9°
Type of oscillation stop	Mechanical
Suspension type	Hydraulics
Suspension ram diameter	2 mm x 45 mm/35 mm
Suspension ram stroke	140 mm
Hydraulic control unit brand	Husco
Hydraulic control unit nominal pressure	190 bar
Number of accumulators	2
Volume/pressure of accumulators	0,75 l: 70 bar
	2 l: 40 bar
Suspension sensor type	Angular potentiometer.
Steering sensor type	Angular potentiometer.
Brake type	Combined with the rear brake
Factor K	1.339

Spool valves	
System type	Open Center (OC) 57 l/min or 100 l/min Closed Center Load Sensing (CCLS) 110 l/min
Flow rate	57 l/min or 100 l/min (OC) 110 l/min (CCLS)
High-pressure pump type	Bosch Rexroth gear pump(s) (OC) Bosch Rexroth piston pump (CCLS)
High-pressure pump displacement	19 cm ³ (OC 57 l/min) 19 cm ³ + 14 cm ³ (OC 100 l/min) 45 cm ³ (CCLS)
High-pressure pump rotational speed	3042 rpm (OC)
	865 rpm (CCLS)
High-pressure pump maximum flow rate	57 l/min or 100 l/min (OC) 110 l/min (CCLS)
High-pressure pump maximum pressure	200 bar

Spool valves	
Maximum quantity of oil to add for heavy implements	25 l
Maximum exportable oil quantity (without adding oil)	24 l
Maximum exportable oil quantity (adding oil)	49 l
Charge pump type	Suction (OC) 60 cm ³ gear pump (CCLS 110 l/min)
Main relief valve adjustment pressure	195 bar ± 5 bar (OC) 197 bar ± 5 bar (CCLS)
Number of spool valves (maximum)	4
Number of front "push-pull" connectors (maximum)	2
Number of rear "push-pull" connectors (maximum)	8
Maximum flow rate per spool valve	57 l/min or 100 l/min (OC) 100 l/min (CCLS)
Spool valve control type	Mechanical
Recommended oil:	According to MF CMS M 1145 specification

Steering	
Steering type	Hydrostatic
Type of control	Steering wheel
Orbitrol displacement	2-wheel drive: 80 cm ³
	4-wheel drive: 125 cm ³
Steering ram diameter	2-wheel drive: 63 mm x 36 mm
	4-wheel drive: 70 mm x 40 mm
Steering ram stroke	2-wheel drive: 2 x 80 mm
	4-wheel drive: 2 x 108 mm
Working pressure	170 bar - 175 bar
Pressure relief valve adjustment pressure	170 bar - 175 bar
Shock valve adjustment pressure	225 bar - 245 bar
Oil recommended for steering	According to MF CMS M1145 specification

Rear linkage	
Lift ram diameter	85 mm
Linkage travel	737 mm
Maximum lifting capacity at ball joints	4206 kg
Working pressure	180 bar
3-point linkage category	CAT3

Front linkage	
Lift ram diameter	80 mm x 40 mm
Linkage travel	695 mm
Maximum lifting capacity at ball joints	2236 kg
Working pressure	190 bar
3-point linkage category	CAT2

Rear power take-off	
Number of selections possible for rear PTO	540 540/540E 540/540E/1000
Maximum permissible power 540 in 1"3/8 (6 and 21 splines)	125 hp (92)
Maximum permissible power 540E in 1"3/8 (6 and 21 splines)	62.5 hp (46)
Maximum permissible power 1000 in 1"3/8 (6 and 21 splines)	125 hp (92)
Engine speed for 540 PTO	1920 rpm
Engine speed for 540E PTO	1560 rpm
Engine speed for 1000 PTO	1964 rpm
Rotational direction	Clockwise
Clutch type	Multidisc hydraulic
Number of clutch disks	4
Control pressure	21 bar
Splined shaft type	6 and 21 in 1"3/8

Front power take-off	
Number of selections possible for front PTO	1000 rpm
Maximum permissible power	Anti-clockwise: 128 hp (94 kW)
Maximum permissible input-output torque	Anti-clockwise: 449 Nm - 898 Nm
Rotational direction	anti-clockwise
Engine speed if PTO 1000	2000 rpm
Ratio	2
Clutch type	Multidisc hydraulic
Splined shaft type	6 or 21 in 1"3/8

Electric	
Battery brand	TAB
Battery specifications (1 battery)	12 V - 105 A/h Type L5
Maximum current at start-up (SAE standard)	505A
Starter type	12 V Iskra
Starter power	3.2 KW
Alternator type	1 x 120 A or 1 x 175 A
Current available on ISOBUS connector	Not available

Electronics	
Instrument panel	IC1
3 Autotronic 5 DC	Transmission/linkage/suspended front axle
Lighting/linkage controller	Management of the lighting and of the rear linkage
1 EEM4 (ECM Tier 4f AGCO Power)	Engine and SCR Denox 2.2+ system
1 Orbitrol Danfoss valve	Auto-Guide™/SpeedSteer function
Datatronic CCD	On-board computer
Automatic air conditioning module	Air conditioning
CAN switches key pad	Controls for several tractor functions, such as 4WD, differential lock, high beam, Auto-Guide™, Speed-Steer.
AM50 unit	AgCommand™ (telemetry)

Cab and fittings	
Type of cab suspension available	Mechanical
Type of rear-view mirror control available	Manual or electric
Type of air conditioning control available	Manual or automatic
Type and brand of air conditioning compressor	SANDEN with axial pistons
Compressor displacement	154.9 cm ³ /rev.
Refrigerant	R134a
Cab noise level	71 DBA
Roof type	Standard High-visibility Flat

1.2 Forward speeds

1.2.1 Forward speed at 2200 rpm for all models and tire sizes 16.9R34

Forward and reverse travel, transmission Dyna-4

Range	Ratio	GTA2550E	
		Without creeper gears engaged	With creeper gears engaged
1	A	1,93 km/h	0,14 km/h
1	B	2,38 km/h	0,17 km/h
1	C	2,90 km/h	0,21 km/h
1	D	3,57 km/h	0,26 km/h
2	A	4,59 km/h	0,34 km/h
2	B	5,64 km/h	0,41 km/h
2	C	6,88 km/h	0,50 km/h
2	D	8,47 km/h	0,62 km/h
3	A	9,32 km/h	0,68 km/h
3	B	11,46 km/h	0,84 km/h
3	C	13,98 km/h	1,02 km/h
3	D	17,19 km/h	1,26 km/h
4	A	21,50 km/h	1,57 km/h
4	B	26,44 km/h	1,93 km/h
4	C	32,25 km/h	2,36 km/h
4	D	39,66 km/h	2,90 km/h

Forward and reverse travel, transmission Dyna-6

Range	Ratio	GTA2550	
		Without creeper gears engaged	With creeper gears engaged
1	A	1,50 km/h	0,11 km/h
1	B	1,80 km/h	0,13 km/h
1	C	2,11 km/h	0,15 km/h
1	D	2,55 km/h	0,17 km/h
1	E	2,99 km/h	0,22 km/h
1	F	3,60 km/h	0,26 km/h
2	A	4,05 km/h	0,30 km/h
2	B	4,88 km/h	0,36 km/h
2	C	5,72 km/h	0,42 km/h
2	D	6,88 km/h	0,50 km/h
2	E	8,10 km/h	0,59 km/h
2	F	9,74 km/h	0,71 km/h

Range	Ratio	GTA2550	
		Without creeper gears engaged	With creeper gears engaged
3	A	8,23 km/h	0,60 km/h
3	B	9,91 km/h	0,72 km/h
3	C	11,62 km/h	0,85 km/h
3	D	13,98 km/h	1,02 km/h
3	E	16,44 km/h	1,20 km/h
3	F	19,79 km/h	1,45 km/h
4	A	20,78 km/h	1,52 km/h
4	B	25,01 km/h	1,83 km/h
4	C	29,33 km/h	2,14 km/h
4	D	35,29 km/h	2,58 km/h
4	E	40 km/h ^[1]	3,03 km/h
4	F		3,65 km/h

[1] The speed is limited by the engine's electronic management system.

1.2.2 Forward speed at 2200 rpm for all models and 18.4R38 tires

Forward and reverse travel, transmission Dyna-4

Range	Ratio	GTA2550E	
		Without creeper gears engaged	With creeper gears engaged
1	A	2,13 km/h	0,16 km/h
1	B	2,62 km/h	0,19 km/h
1	C	3,19 km/h	0,23 km/h
1	D	3,93 km/h	0,29 km/h
2	A	5,05 km/h	0,37 km/h
2	B	6,21 km/h	0,45 km/h
2	C	7,57 km/h	0,55 km/h
2	D	9,31 km/h	0,68 km/h
3	A	10,25 km/h	0,75 km/h
3	B	12,61 km/h	0,92 km/h
3	C	15,38 km/h	1,12 km/h
3	D	18,91 km/h	1,38 km/h
4	A	23,65 km/h	1,73 km/h
4	B	29,08 km/h	2,13 km/h
4	C	35,48 km/h	2,59 km/h
4	D	40 km/h ^[1]	3,19 km/h

[1] The speed is limited by the engine's electronic management system.

Forward and reverse travel, transmission Dyna-6

Range	Ratio	GTA2550	
		Without creeper gears engaged	With creeper gears engaged
1	A	1,65 km/h	0,12 km/h
1	B	1,98 km/h	0,15 km/h
1	C	2,33 km/h	0,17 km/h
1	D	2,80 km/h	0,20 km/h
1	E	3,29 km/h	0,24 km/h
1	F	3,96 km/h	0,29 km/h
2	A	4,46 km/h	0,33 km/h
2	B	5,37 km/h	0,39 km/h
2	C	6,29 km/h	0,46 km/h
2	D	7,57 km/h	0,55 km/h
2	E	8,91 km/h	0,65 km/h
2	F	10,72 km/h	0,78 km/h
3	A	9,06 km/h	0,66 km/h
3	B	10,90 km/h	0,80 km/h
3	C	12,78 km/h	0,93 km/h
3	D	15,38 km/h	1,12 km/h
3	E	18,09 km/h	1,32 km/h
3	F	21,77 km/h	1,59 km/h
4	A	22,86 km/h	1,67 km/h
4	B	27,51 km/h	2,01 km/h
4	C	32,26 km/h	2,36 km/h
4	D	38,82 km/h	2,84 km/h
4	E	40 km/h ^[1]	3,34 km/h
4	F		4,02 km/h

[1] The speed is limited by the engine's electronic management system.

1.3 Dimensions and weights

1.3.1 Dimensions and weights

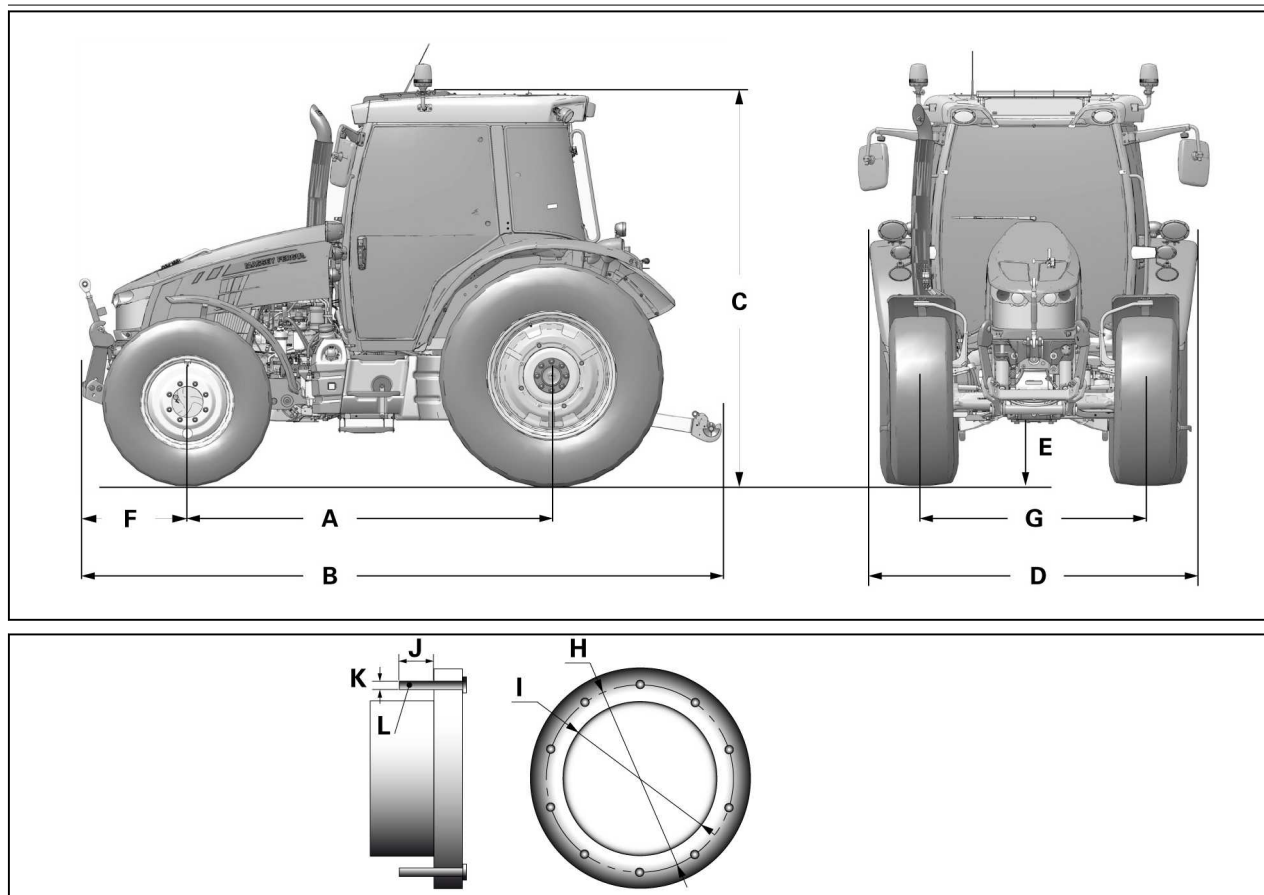


Fig. 1

General specifications: MF 5700 S

Reference	Measured specification	Dimension/weight
(A)	Wheel base	2550 mm
(B)	External length with folded front linkage	4485 mm
	External length with horizontal front linkage	4490 mm
	External length without front linkage with weights	4805 mm
	External length without front linkage without weights	4355 mm
	External length without front linkage with hitch weight	4765 mm
(C)	Height to roof	
	Standard cab (add 208 mm for the rotary beacon on the roof):	2731 mm /2860 mm
	High-visibility cab (add 185 mm for the rotary beacon on the roof):	2745 mm /2874 mm

Reference	Measured specification	Dimension/weight
	Slimline cab (add 194 mm for the rotary beacon on the roof):	2641 mm to 2770 mm
	Height at roof with Auto-Guide™	2777 mm to 3007 mm
(D)	Maximum external width	2010 mm / 2300 mm
(E)	Ground clearance	240 mm to 315 mm
(F)	Front overhang:	
	Without weights	605 mm
	With weights	1015 mm
	With hitch weight	1055 mm
	With front linkage horizontal	1140 mm
	With front linkage folded	735 mm
	With rear linkage horizontal	1200 mm
	Tractor weight (with full fuel tank, without steel wheel weights) ^[1]	
	2-wheel drive	Minimum 4300 Kg / Maximum 5800 Kg
	4-wheel drive	Minimum 4600 Kg / Maximum 5800 Kg
	Total loaded weight supported by rear axle - 40 km/h	7300 kg
	Total loaded weight supported by rear axle - 40 km/h	8500 kg

[1] Dimensions given vary according to tire assembly and the type of cab.

DANA 730 front axle

Reference	Measured specification	Front axle 730
(G)	Distance between flanges	1640 mm
(H)	Center-to-center distance between studs	275 mm
(I)	Centring diameter	220,8 mm
(J)	Stud length	34 mm
(K)	Stud diameter	M18 x 1.5
(L)	Number of studs	8

LODI 140 CP front axle

Reference	Measured specification	140 CP front axle
(G)	Distance between flanges	1506 mm to 2006 mm
(H)	Center-to-center distance between studs	152,4 mm
(I)	Centring diameter	117,42 mm

Reference	Measured specification	140 CP front axle
(J)	Screw length	NC
(K)	Screw diameter	M16 x 1.5
(L)	Number of screws	6

Rear Axle

Reference	Measured specification	GPA54 rear axle
(G)	Distance between flanges for GPA 54	1680 mm
(H)	Center-to-center distance between studs	203,20 mm
(I)	Centring diameter	149,35 mm
(J)	Stud length	41 mm
(K)	Stud diameter	M18 x 1.5
(L)	Number of studs	8

1.4 Attachment points

1.4.1 Attachment points

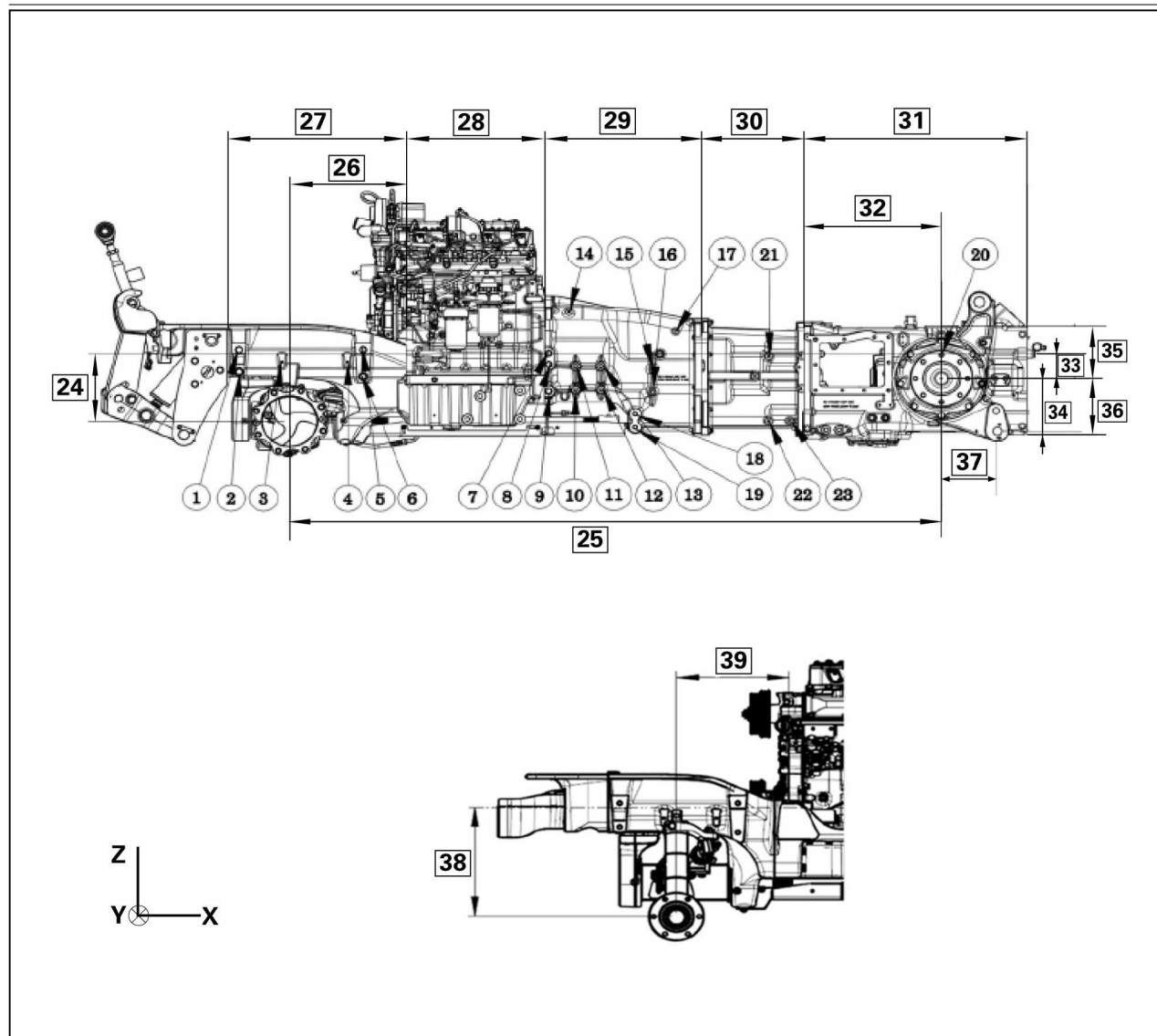


Fig. 2

NOTE: Values x, y and z correspond to reference point 0 of the tractor (engine).

Attachment points		X	Y	Z
(1)	M16x55	-1175 mm	-295 mm	18 mm
(2)	M16x55	-1175 mm	-260 mm	-78 mm
(3)	M8x16	-1008 mm	-260 mm	-35 mm
(4)	M8x16	-752 mm	-260 mm	-35 mm
(5)	M16x55	-692 mm	-295 mm	18 mm
(6)	M16x55	-692 mm	-260 mm	-98 mm
(7)	M16x75	35 mm	-225 mm	2,5 mm
(8)	M16x75	35 mm	-225 mm	-46 mm
(9)	M16x75	35 mm	-225 mm	-161 mm

Attachment points		X	Y	Z
(10)	M16x34	140 mm	-183 mm	-155 mm
(11)	M16x34	140 mm	-223 mm	-53 mm
(12)	M16x34	241 mm	-183 mm	-155 mm
(13)	M16x34	241 mm	-223 mm	-53 mm
(14)	M8x31	113 mm	-205 mm	183 mm
(15)	M16x34	441 mm	-228 mm	-65 mm
(16)	M16x34	441 mm	-228 mm	-165 mm
((17))	M8x23	532 mm	-200 mm	98 mm
(18)	M16x56	374 mm	-166 mm	-259 mm
(19)	M16x56	374 mm	-166 mm	-319 mm
(20)	8xM18	1571 mm	-840 mm	-4 mm
(21)	M16x26	894 mm	-185 mm	-12 mm
(22)	M16x26	894 mm	-157 mm	-290 mm
(23)	M16x26	980 mm	-157 mm	-290 mm

Dimensions	
(24)	292 mm
(25)	2549 mm
(26)	456 mm
(27)	698 mm
(28)	540 mm
(29)	616 mm
(30)	400 mm
(31)	872 mm
(32)	537 mm
(33)	106 mm
(34)	290 mm
(35)	228 mm
(36)	248 mm
(37)	220 mm
(38)	419 mm
(39)	379 mm

1.5 capacities

1.5.1 capacities

Type	Model	Capacity
Fuel tank	All models	180 l
Diesel Exhaust Fluid (DEF) tank	All models	25 l
Cooling system	All models	13.7 l
Engine sump	Fixed axle	16,75 l
NOTE: With replacement of the oil filter.	Suspended axle	15,75 l
Transmission/rear axle	All models	Minimum 65 l Maximum 75 l Extra Maximum 90 l after adding 15 l for large implements or work on a 10% slope.
Quantity to add for work on a slope or for large implements (maximum)	All models	15 l
Front axle beam	All models	5 l
Front final drive	All models	0,8 l
Front power take-off	All models	1,9 l
Refrigerant fluid R134A	Standard roof/flat roof	1050 g
	High-visibility roof	1200 g
Windscreen washer bottle	All models	4 l

1.6 Tightening torques, retaining compounds and sealing products

1.6.1 Retaining compounds and sealing products

General Information

The Loctite compounds mentioned in this manual are referred to by their industrial name.

For repair purposes, use their commercial names or the corresponding Massey Ferguson references listed in the table below.

Loctite product type	Operation
221	Standard threadlock
241	
242	Medium threadlock
270	Strong threadlock
496	Glue (for metals)
510	Standard sealant
518	Sealant for flat surfaces and paper seals
542	Thread sealant
549	Oil-resistant surface sealant
573	Surface sealant (engine, gearbox)
574	
577	Threaded union sealant (prevents loosening and leakages caused by vibrations)
603	Retainer for cylindrical assemblies (bearings, rings etc.)
638	Strong retainer for cylindrical assemblies (bearings, rings etc.)
648	Strong retainer for cylindrical assemblies (resistant to high temperatures)
706	Degreasing cleaner
5206	Metallic surface sealant (gearbox housing, engine sump)
5910	± Flexible surface sealant
5922	Sealant paste for ± flexible unions (sensor attachments etc.)
7100	Leakage detector for pneumatic systems

NOTE: Use the product "Form A gasket 2" when sealing between plastic material and cast iron or steel.

Application method for Loctite products

- Remove all traces of previous sealants and corrosion
 - mechanically: wire brush or emery cloth
 - chemically: "DECAPLOC 88" (Leave the product to take effect then scrape off and wipe clean).
- Degrease the components with dry solvent: preferably use "Super Solvant Sec LOCTITE 706".
- Allow the solvents to evaporate

4. Apply the recommended type of LOCTITE product to the parts:

- For all blind tapped holes, apply a quantity of the product to the last threads at the bottom of the hole.
- for cylindrical fittings, apply the product on the two mating faces using a clean brush.
- for mating faces, apply a bead to one of the two faces, circling the holes, and then tighten as quickly as possible.

NOTE:

- *Do not use too much of the compound, in order to avoid locking adjacent parts.*
- *Do not attempt to retighten after 5 minutes of curing, in order to avoid breaking the film of compound.*
- *If the ambient temperature is less than +10 °C, and to ensure quicker setting of LOCTITE products, (except SILICOMET), use LOCTITE T 747 activator after phase 2 on at least one of the two parts. Excess product outside the joint will not harden (anaerobic products — curing takes place only when there is no oxygen).*

Grease

When grease is used in components in contact with transmission oil, use grease that is miscible with oil to avoid blocking the hydraulic filters.

1.6.2 Tightening torques for screws and nuts

Use the tightening torques recommended for screws and nuts according to the tables below:

- 1 and 2 for metric threads
- 3, 4, 5 and 6 for threads in inches

When a specific torque is required, this is stated in the text.

Tables 1, 3 and 5 indicate the normal tightening torque values to apply to threaded zinc-plated elements, with normal nuts, coarse or fine threads, and with or without a flat washer or lock washer, and weldable nuts with a height greater than or equal to 0.8 d.

Tables 2, 4 and 6 indicate the reduced tightening torque values to apply to threaded elements in assemblies with zinc-plated self-locking locknuts, phosphated or zinc-flake-coated nuts or screws, thin nuts, weldable nuts with a height of less than 0.8 d.

To check these torque values, loosen the threaded element by one quarter turn and then retighten.

These values apply to dry assemblies. If the threads are oiled, reduce the tightening torques.

NOTE:

Read the tensile grade on the screw head and determine the corresponding torque to be applied.

1 - Tightening torque values: zinc dichromate-plated or white zinc-plated metric threads

Nominal dimension	Tensile grade		Tensile grade		Tensile grade	
	ISO 4.6 (SAE 1-BS B)		ISO 8.8 (SAE 5-BS S)		ISO 10.9 (SAE 8-BS V)	
	Torque		Torque		Torque	
	Min.	Max.	Min.	Max.	Min.	Max.
M3	0.5 Nm	0.7 Nm	1.3 Nm	1.7 Nm	1.8 Nm	2.4 Nm
M4	1.2 Nm	1.6 Nm	3.1 Nm	4.1 Nm	4.3 Nm	5.7 Nm
M5	2.2 Nm	3 Nm	6 Nm	8 Nm	8.5 Nm	11.5 Nm
M6	4 Nm	5 Nm	10 Nm	14 Nm	14 Nm	20 Nm
M8	9.5 Nm	12.5 Nm	25 Nm	35 Nm	36 Nm	46 Nm

M10	19 Nm	25 Nm	50 Nm	70 Nm	72 Nm	96 Nm
M12	33 Nm	43 Nm	90 Nm	120 Nm	120 Nm	160 Nm
M16	84 Nm	110 Nm	200 Nm	260 Nm	300 Nm	400 Nm
M20	160 Nm	210 Nm	420 Nm	560 Nm	600 Nm	800 Nm
M24	280 Nm	360 Nm	720 Nm	960 Nm	1000 Nm	1300 Nm
M30	540 Nm	720 Nm	1400 Nm	1800 Nm	2100 Nm	2800 Nm
M36	950 Nm	1250 Nm	2500 Nm	3300 Nm	3600 Nm	4800 Nm

2 - Reduced tightening torque values: phosphated or zinc-flake-coated metric threads

Nominal dimension	Tensile grade		Tensile grade		Tensile grade	
	ISO 4.6 (SAE 1-BS B)		ISO 8.8 (SAE 5-BS S)		ISO 10.9 (SAE 8-BS V)	
	Torque		Torque		Torque	
	Min.	Max.	Min.	Max.	Min.	Max.
M3	0.4 Nm	0.6 Nm	1 Nm	1.4 Nm	1.5 Nm	1.9 Nm
M4	1 Nm	1.3 Nm	2.5 Nm	3.3 Nm	3.4 Nm	4.6 Nm
M5	1.8 Nm	2.4 Nm	4.8 Nm	6.4 Nm	6.8 Nm	9.2 Nm
M6	3.2 Nm	4 Nm	8 Nm	11 Nm	12 Nm	16 Nm
M8	7.6 Nm	10 Nm	20 Nm	28 Nm	29 Nm	37 Nm
M10	15 Nm	20 Nm	40 Nm	56 Nm	57 Nm	77 Nm
M12	26 Nm	34 Nm	72 Nm	96 Nm	100 Nm	130 Nm
M16	68 Nm	88 Nm	160 Nm	210 Nm	240 Nm	320 Nm
M20	130 Nm	170 Nm	340 Nm	450 Nm	480 Nm	640 Nm.
M24	230 Nm	290 Nm	570 Nm	770 Nm	800 Nm	1040 Nm
M30	430 Nm	570 Nm	1100 Nm	1400 Nm	1700 Nm	2200 Nm
M36	760 Nm	1000 Nm	2000 Nm	2600 Nm	2900 Nm	3800 Nm

3 - Tightening torque values: zinc dichromate-plated or white zinc-plated threads in inches

Nominal dimension	Tensile grade		Tensile grade		Tensile grade	
	SAE 1 (ISO 4.6-BS B)		SAE 5 (ISO 8.8-BS S)		SAE 8 (ISO 10.9-BS V)	
	Torque (Nm)		Torque (Nm)		Torque (Nm)	
	Min.	Max.	Min.	Max.	Min.	Max.
#6	0.9	1.3	1.8	2.4	2.5	3.3
#8	1.7	2.3	3.4	4.4	4.7	6.3
#10	2.5	3.3	4.7	6.3	6.7	8.9

1/4	6	8	11	15	16	22
5/16	12	16	22	30	31	(43)
3/8	22	30	(39)	53	55	75.
7/16	35	(47)	64	86	90;	120
1/2	54	72	100	130	140	180
5/8	110	140	200	260	280	370
3/4	190	250	350	460	490	660
7/8	310	410	560	760	800	1060
1	460	620	840	1120	1200	1600
1 1/8	480	640	1050	1390	1700	2200
1 1/4	680	900	1500	2000	2400	3200
1 1/2	1200	1600	2600	3400	4100	5400

4 - Reduced tightening torque values: phosphated or zinc-flake-coated threads in inches

Nominal dimension	Tensile grade		Tensile grade		Tensile grade	
	SAE 1 (ISO 4.6-BS B)		SAE 5 (ISO 8.8-BS S)		SAE 8 (ISO 10.9-BS V)	
	Torque (Nm)		Torque (Nm)		Torque (Nm)	
	Min.	Max.	Min.	Max.	Min.	Max.
#6	0.7	1	1.5	1.9	2	2.6
#8	1.4	1.8	2.7	3.5	3.8	5
#10	2	2.6	3.8	5	5.3	7.1
1/4	4.8	6.4	8.8	12	13	18
5/16	9.6	13	18	24	25	34
3/8	18	24	31	42	(44)	60
7/16	28	38	51	69	72	96
1/2	(43)	57	80	104	110	140
5/8	90;	110	160	210	220	300
3/4	150	200	280	370	390	530
7/8	250	330	450	610	640	850
1	370	500	670	900	960	1280
1 1/8	390	510	840	1100	1360	1760
1 1/4	540	720	1200	1600	1920	2560
1 1/2	960	1300	2100	2700	3280	4320

5 - Tightening torque values: zinc dichromate-plated or white zinc-plated threads in inches

Nominal dimension	Tensile grade		Tensile grade		Tensile grade	
	SAE 1 (ISO 10.9-BS B)		SAE 5 (ISO 8.8-BS S)		SAE 8 (ISO 10.9-BS V)	
	Torque lbf ft		Torque lbf ft		Torque lbf ft	
	Min.	Max.	Min.	Max.	Min.	Max.
#6	0.6	1	1.3	1.8	1.8	2.4
#8	1.3	1.7	2.5	3.2	3.4	4.6
#10	1.8	2.4	3.4	4.6	4.9	6.6
1/4	4.4	5.9	8	11	12	16
5/16	9	12	16	22	23	31
3/8	16	22	29	(39)	(41)	55
7/16	26	35	(47)	63	66	88
1/2	(40)	53	74.	96	100	130
5/8	81	103	150	190	210	270
3/4	140	180	260	340	360	490
7/8	230	300	410	560	590	780
1	340	460	620	830	880	1180
1 1/8	350	470	775	1025	1200	1600
1 1/4	500	660	1100	1470	1800	2400
1 1/2	880	1180	1900	2500	3000	4000

6 - Reduced tightening torque values: phosphated or zinc-flake-coated threads in inches

Nominal dimension	Tensile grade		Tensile grade		Tensile grade	
	SAE 1 (ISO 10.9-BS B)		SAE 5 (ISO 8.8-BS S)		SAE 8 (ISO 10.9-BS V)	
	Torque lbf ft		Torque lbf ft		Torque lbf ft	
	Min.	Max.	Min.	Max.	Min.	Max.
#6	0.5	0.8	1	1.4	1.5	1.9
#8	1	1.4	2	2.6	2.7	3.7
#10	1.5	1.9	2.7	3.7	3.9	5.3
1/4	3.5	4.7	6.6	8.8	9	13
5/16	7	9.4	13	18	18	25
3/8	13	18	23	31	32	(44)
7/16	20	28	37	51	53	71
1/2	32	42	59	77	82	106
5/8	65	83	120	150	160	220

3/4	110	150	210	270	290	390
7/8	180	240	330	450	470	630
1	270	370	500	660	710	940
1 1/8	280	380	620	820	1000	1300
1 1/4	400	530	880	1180	1400	1900
1 1/2	700	940	1500	2000	2400	3200

1.6.3 Tightening torques for hydraulic unions

Use the tightening torques recommended for hydraulic unions according to the tables below:

- 1 for hydraulic unions with 37° flare
- 2 for EO2 hydraulic unions
- 3 for hydraulic unions with metric straight thread
- 4 for hydraulic unions with straight thread in inches
- 5 for steel unions with sealed thread.

When a specific torque is required, this is stated in the text.

The specifications for these tightening torques apply to zinc-plated steel unions used with hoses and rigid hydraulic pipes that ideally include straight thread unions, unions with 37° flare or unions with an "O" ring for bosses.

These values apply to dry assemblies. If the threads are oiled, reduce the tightening torques.

1 - Tightening torques: hydraulic unions with 37° flare

Tensile grade SAE J 514				
Outside diameter of pipe, metric	Outside diameter of pipe, in inches	Thread	Torque	
mm	inch	inch	Min.	Max.
4	1/8	5/16 - 24 UNF	8 Nm	9 Nm
5	3/16	3/8 - 24 UNF	11 Nm	12 Nm
6	1/4	7/16 - 20 UNF	15 Nm	16 Nm
8	5/16	1/2 - 20 UNF	19 Nm	21 Nm
10	3/8	9/16 - 18 UNF	24 Nm	28 Nm
12	1/2	3/4 - 16 UNF	49 Nm	53 Nm
16	5/8	7/8 - 14 UNF	77 Nm	85 Nm
20	3/4	1-1/16 - 12 UN	107 Nm	119 Nm
22	7/8	1-3/16 - 12 UN	127 Nm	140 Nm
25	1	1-5/16 - 12 UN	147 Nm	154 Nm
32	1-1/4	1-5/8 - 12 UN	172 Nm	181 Nm
(40)	1-1/2	1-7/8 - 12 UN	215 Nm	226 Nm
50	2	2-1/2 - 12 UN	332 Nm	350 Nm

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