Sisudiesel

320, 420, 620, 634

engines

Workshop Manual

01 02

CONTENTS

TO THE USER

This Workshop Manual is intended to facilitate workshop operations and repair work.

320, 420, 620 and 634–engines are mainly the same in construction, so the same repair instructions usually apply to different engine types. The differences between the various engine types which affect repair work have been mentioned in technical data and repair instructions. All measurements are in millimetres and valid when the temperature of the parts is +20°C, unless otherwise stated.

Before starting the repair work read the safety instructions in the beginning of this book. Make sure that you have all necessary tools, parts and accessories at your disposal. The special tools mentioned in the work instructions are not all essential, but they speed up and facilitate the work and contribute to successful execution of work. An engine which has undergone repairs must be run in just like a new one.

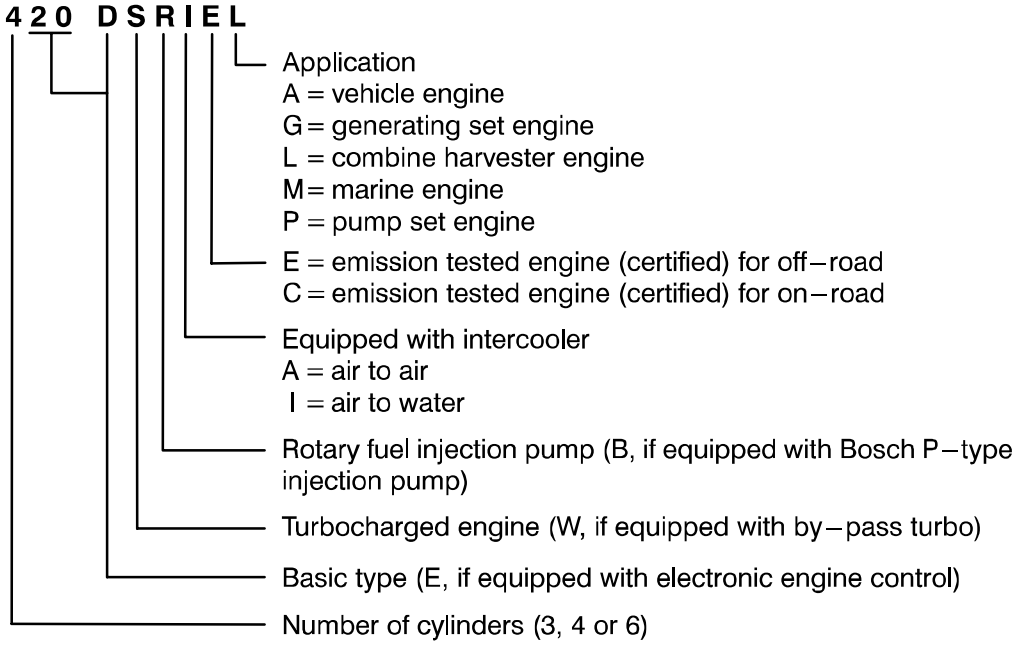
Should the engine require measures not described in this manual, please consult your local agent or the Service Department of Sisu Diesel Inc., Linnavuori, Finland. To facilitate consulting, find out the following facts about the engine before contacting us:

- engine type
- engine number
- application or equipment
- hours operated or kilometres driven.

In this Workshop Manual the regular service procedure is not handled as this is explained in the 20/34–series Operator's Manual.

As Sisu Diesel Inc. is continuously developing the products, all rights are reserved without separate notice to change the adjustments, accessories and service– and repair procedure.

ENGINE TYPE DESIGNATIONS



SAFETY INSTRUCTIONS

In the service– and repair work of the engine there is always the possibility of injury. Before starting the work read and understand the following safety instructions and remarks!

Do not start a repair work that you do not fully handle.

Make sure that the place of the repair and the surrounding gives the possibility for safe working.

Always be sure of the cleanness and the good order of the repairing place.

Do not use faulty or otherwise useless tools.

Remove all finger rings, chains and watch before starting work.

Use up–todate protection equipment when you work. For example eye protection as working with compressed air for cleaning, grinding, hammering or other work.

Use lifting device for lifting and transporting heavy (over 20 kg) pieces. make sure of good condition of lifting hooks and chains. The lifting ears on the engine must not be applied by side forces when lifting.

Never work under an engine that is left handling under a lifting device or lifted up by a jack. Always use strong supports before starting the work.

Use only genuine **Sisudiesel** spare parts.

Start the engine only by using the starting switch in the cabin.

Do not start an engine if the protection covers are removed. **NOTE!** The fan is difficult to see as the engine is running! Make sure that wide clothes or long hear is not caught in the rotating parts of the engine.

If you start the engine indoors, be sure you have proper ventilation.

Never use aerosol type of starting aid while operating the thermostart device (risk for explosion).

When you are operating the engine or working near it, use hearing protectors to avoid noise injuries.

Stop the engine always before service– or repair work.

Avoid touching the exhaust manifold, turbocharger and the other hot parts of the engine.

Open the radiator cap with care when the engine is hot as the cooling system is pressurised. The cooling liquid and lubrication oil of a hot engine causes injuries when touching the skin.

Open fire, smoking and sparks should not be allowed near the fuel system and batteries. (Specially when loading batteries, explosive.)

Always disconnect the minus (–) wire of the battery when doing service or repair of the electric system.

At temperatures on excess of 300°C, e.g. if the engine is burnt by a fire, the viton seals of the engine (e.g. the undermost o–ring of the oil pressure regulating valve) produce very highly corrosive hydrofluoric acid. Do not touch with bare hands, viton seals subjected to abnormally high temperatures. Always use neoprene rubber or heavy duty gloves and safety glasses when decontaminating. Wash the seals and the contaminated area with a 10% calcium hydroxide or other alkali solution. Put all removed material in sealed plastic bags and deliver them to the point stated by the Authorities concerned. **NOTE!** Never destroy viton–seals by burning!

When checking fuel injectors do not let the jet of high pressure fuel contact your skin. The fuel penetrates the skin causing severe injuries. Contact your doctor immediately!

The fuel, lubricating oil and coolant cause irritation in skin contact for long time.

Avoid unnecessary idling of the engine.

Do not let oil and other liquids drop into the soil when servicing the engine.

All the gaskets of the engine are of non–asbestos material.

Be careful when washing the engine with a high pressure washing machine. Do not use high pressure to wash e.g. the electric and fuel equipment or the radiator because they can easily be damaged.

ENGINE SPECIFICATIONS

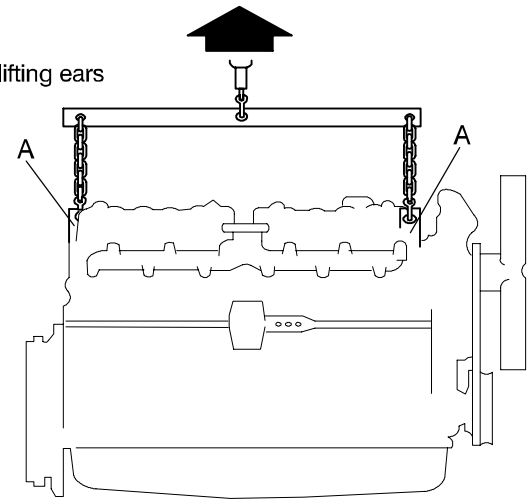
Engine type	320D	320DS	420D	420DS	420DW	420DWI	620D	620DS	634DS
Number of cylinders	3	3	4	4	4	4	6	6	6
Displacement (dm^3)	3,3	3,3	4,4	4,4	4,4	4,4	6,6	6,6	7,4
Cylinder bore (mm)	108	108	108	108	108	108	108	108	108
Stroke (mm)	120	120	120	120	120	120	120	120	134
Compression ratio	16,5/18,5:1								
Combustion	direct injection								
Firing order	1–2–3			1–2–4–3			1–5–3–6–2–4		
Compression pressure bar[1]	24								
Weight kg[2]	275	280	335	340	340	345	500	510	515
Direction of rotation from the engine front	clockwise								

[1]) Minimum value at operating temperature and starting revs. Max permitted difference between cylinders 3,0 bar.
[2]) Without flywheel and electrical equipment.

LIFTING THE ENGINE

Safe lifting of the engine is done with a lifting device where the lifting force effects the lifting ears vertically.

A = Engine lifting ears



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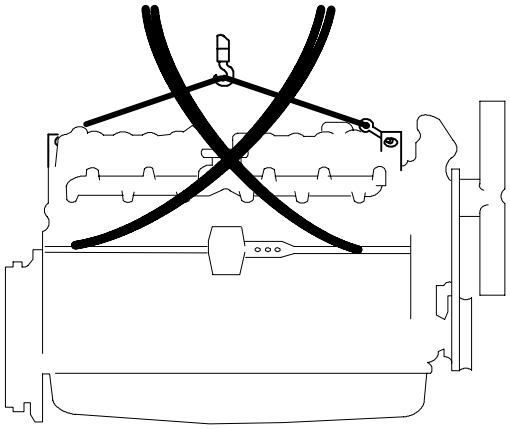

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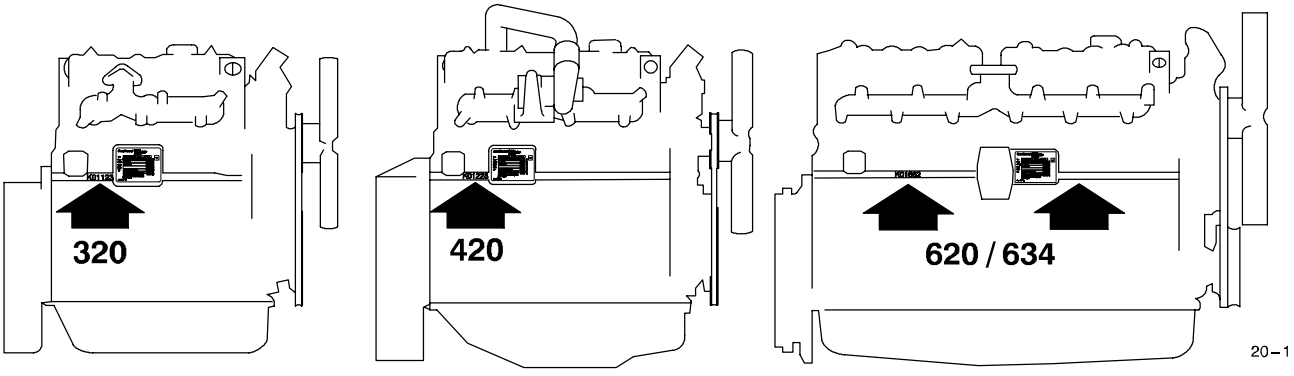
Engine weight: see Engine Specifications

LOCATION OF THE ENGINE SERIAL NO.



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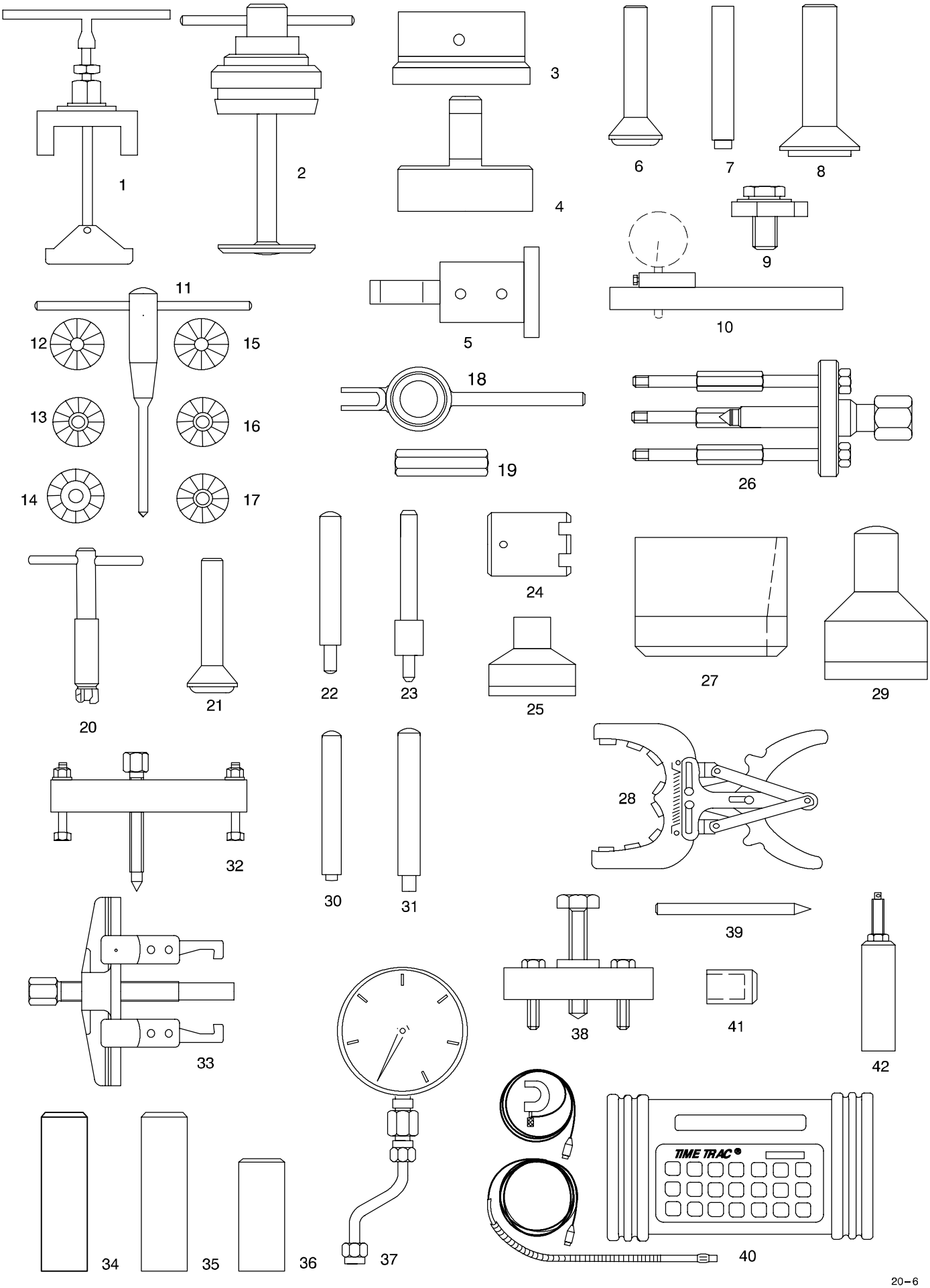
SPECIAL TOOLS

	Order no	Description
1	9051 73100	Puller for cylinder liner
2	9101 65600	Milling cutter for cylinder liner seat
	9045 87600	Spare cutting blade for milling cutter
3	9052 46400	Centring tool for flywheel housing
4	9052 46300	Drift for fitting rear crankshaft seal
5	9030 15200	Drift for fitting front crankshaft seal
6	9052 46620	Drift for 40 mm cup plug
7	9052 46650	Drift for 16 mm cup plug
8	9025 87400	Drift for fitting camshaft cup plug
9	9101 66300	Press tool for cylinder liner
10	9025 79200	Holder for dial gauge
11	9101 66100	T–handle for valve seat milling cutter
12	9101 71100	Milling cutter for facing exhaust valve seat
13	9101 65502	Milling cutter for exhaust valve seat
14	9101 65503	Inner milling cutter for exhaust valve seat
15	9101 75800	Milling cutter for facing inlet valve seat
16	9101 65505	Milling cutter for inlet valve seat
17	9101 65506	Inner milling cutter for inlet valve seat
18	9101 66200	Lever for compressing valve spring
19	9052 47200	Counter nut for lever above
20	9101 66000	Milling tool for injector seat
21	9052 46660	Drift for 36 mm cup plug
22	9101 65800	Drift for removing valve guide
23	9101 65900	Drift for fitting valve guide
24	9024 55800	Spanner for crankshaft nut, 634–engines (620/MF/Steyr–tractors)
25	9101 65700	Spanner for crankshaft nut
26	9052 48800	Puller for crankshaft gears
27	9020 01100	Conical sleeve for fitting pistons
28	9052 46900	Piston ring pliers
29	9025 98900	Drift for fitting dust cover, crankshaft front seal
30	9025 98800	Drift for fitting tension pin in timing gear casing
31	9025 98700	Drift for fitting tension pins in timing gear casing and flywheel housing
32	9101 93200	Coolant pump impeller extractor 620, 634
33	9104 27700	Coolant pump impeller extractor 320, 420
34	9050 40200	Fitting tool for coolant pump axial seal (seal 8353 31202)
35	9051 79300	Fitting tool for coolant pump axial seal (seal 8353 39425)
36	9051 64900	Fitting tool for coolant pump shaft 320, 420
37	9052 47800	Pressure valve testing gauge
38	9052 48900	Extractor for injection pump gear
39	9025 99100	Injection timing check pin (320, 420, 620, 634/Valtra Valmet–tractors)
40	8366 62022	Electronic timing kit
41	9025 99000	Control rod locking bush
42	9051 71300	Extractor for injector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TIME TRAC

TECHNICAL DATA

Cylinder block

Holes for guide pins	13,250...13,320 mm
Main bearing housing diameter	91,000...91,025 mm
Main bearing housing diameter (with bearing 8361 40950)	92,000...92,025 mm
Cylinder liner location, diameter:	
– upper end	124,514...124,554 mm
– lower end	123,000...123,040 mm
Inner diameter of camshaft bushing (fitted)	50,010...50,070 mm
Height of cylinder block	428,170...428,430 mm

Cylinder liners

Protrusion of cylinder liner above cylinder block top face	0,030...0,080 mm
Max. permissible height difference between liners (under same head)	0,02 mm
Outer diameter of cylinder liner guide:	
– at upper end of liner	124,475...124,500 mm
– at lower end of liner	122,961...122,986 mm
Liner bore	108,010...108,032 mm
Height of cylinder liner flange	9,03...9,05 mm
Height of cylinder liner flange, 1st oversize, part no 8366 47933	9,08...9,10 mm
Height of cylinder liner flange, 2nd oversize, part no 8366 47934	9,13...9,15 mm
Height of cylinder liner flange, 3rd oversize, part no 8366 47935	9,23...9,25 mm
Outer diameter of cylinder liner flange	131,700...131,800 mm

Cylinder head

Height of cylinder head	104,800...105,000 mm
Height of cylinder head after repair grinding (minimum)	104,000 mm
Inside diameter of valve guide (not fitted)	9,000...9,015 mm
Outside diameter of valve guide	16,028...16,039 mm
Diameter of valve guide bore in cylinder head	16,000...16,018 mm
Position of valve guide top above cylinder head surface	21 mm
Depth of valve head face below cylinder head surface:	
– inlet valve	0,7±0,05 mm (max 1,70 mm)
– exhaust valve	0,6±0,05 mm (max 1,60 mm)
Angle of valve seat:	
– inlet valve	35° +20'
– exhaust valve	45° +20'
Width of valve seat:	
– inlet valve	2,9...3,7 mm
– exhaust valve	1,3...2,3 mm
Diameter of exhaust valve seat ring	44,070...44,132 mm
Diameter of exhaust valve seat rings recess	44,000...44,025 mm
Diameter of exhaust valve seat ring (overhaul part 8366 52269)	44,270...44,332 mm
Diameter of exhaust valve seal ring recess (overhaul part 8366 52269)	44,200...44,225 mm
Diameter of inlet valve seat ring (8366 47936)	48,570...48,632 mm
Diameter of inlet valve seat ring recess	48,500...48,525 mm
Diameter of inlet valve seat ring (overhaul part 8368 55347)	48,770...48,832 mm
Diameter of inlet valve seat ring recess (overhaul part 8368 55347)	48,700...48,725 mm

(See page 3–3)

Valves, rockers and tappets

With a valve clearance of 1,0 mm:	
– inlet valve opens	0° ±2° B.T.D.C
– inlet valve closes	16° ±2° A.B.D.C
– exhaust valve opens	39° ±2° B.B.D.C
– exhaust valve closes	1° ±2° A.T.D.C
Valve clearance cold and hot:	
– inlet valve	0,35 mm
– exhaust valve	0,35 mm
Angle of valve seat in cylinder head:	
– inlet valve	35° +20'
– exhaust valve	45° +20'
Width of valve seat in cylinder head:	
– inlet valve	2,9...3,7 mm
– exhaust valve	1,3...2,3 mm
Angle of valve face:	
– inlet valve	35° –20'
– exhaust valve	45° –20'
Outside diameter of valve head:	
– inlet valve	48 mm
– exhaust valve	41 mm
Max valve movement:	
– inlet valve	10,9 mm
– exhaust valve	12,1 mm
Inlet valve stem diameter	8,960...8,975 mm
Exhaust valve stem diameter	8,925...8,940 mm
Inlet valve stem clearance	0,025...0,055 mm
– Reject limit	0,30 mm
Exhaust valve stem clearance	0,060...0,090 mm
– Reject limit	0,35 mm
Inside diameter of valve guide before fitting	9,000...9,015 mm
Outside diameter of valve guide	16,028...16,039 mm
Diameter of valve guide bore in cylinder head	16,000...16,018 mm
Protrusion of valve guide top above cylinder head surface	21 mm
Depth of valve face below cylinder head surface:	
– inlet valve	0,7±0,05 mm
– exhaust valve	0,6±0,05 mm
Valve spring free length	69,8 mm
Spring pressure when spring compressed to a length of:	
– 48,6 mm	327±17 N
– 37,4 mm	500±23 N
Rocker arm shaft diameter	19,959...19,980
Inside diameter of rocker arm bearing bush:	
– (when fitted in position)	19,990...20,010 mm
Outside diameter of rocker arm bearing bush	23,035...23,075 mm
Diameter of rocker arm bore	23,000...23,021 mm
Max. permissible push rod deflection (when free)	0,4 mm
Free length of rocker arm spring	80 mm
Spring pressure when spring compressed to a length 58 mm	80...100 N
Outside diameter of tappet	29,939...29,960 mm
Diameter of tappet bore in cylinder block	30,000...30,043 mm
Engines from 96 week 34	
Rocker arm shaft diameter	22,970...22,990 mm
Diameter of rocker arm bore	23,000...23,021 mm

Camshaft

Diameter of camshaft bearing journal no 1	49,925...49,950 mm
Diameter of camshaft bearing journals (others that no 1)	49,885...49,910 mm
Diameter of camshaft bearing journals nos 2, 3 and 4 (620/634–engines)	49,865...49,890 mm
Inside diameter of camshaft bearing bushes (when fitted in position)	50,010...50,070 mm
Diameter of camshaft bearing bores (others than no 1)	50,000...50,025 mm
Camshaft clearance in bearing bush no 1	0,060...0,145 mm

Camshaft clearance in bearing bushes (others than no 1)	0,090...0,140 mm
Camshaft clearance in bearing bushes nos 2, 3 and 4 (620/634–engines)	0,110...0,160 mm
Bearing bush tolerance in block (press fit)	0,025...0,080 mm
Diameter of bearing bush bore in block	55,620...55,650 mm
Camshaft end play with 0,5 mm gasket between cylinder block and timing gear housing and between timing gear housing and front cover	0,5...1,0 mm
Cam height (distance between back of cam and tip of cam):	
– inlet valve	41,180...41,430 mm
– exhaust valve	40,080...40,330 mm
Cam lift:	
– inlet valve	7,38 mm
– exhaust valve	8,28 mm
Camshaft max. permissible deflection (total indicator reading)	0,03 mm

Crankshaft

Crankpin diameter:	
– standard	67,981...68,000 mm
– 1. undersize 0,25 mm	67,731...67,750 mm
– 2. undersize 0,50 mm	67,481...67,500 mm
– 3. undersize 1,00 mm	66,981...67,000 mm
– 4. undersize 1,50 mm	66,481...66,500 mm
Crankpin length	40,000...40,160 mm
Main bearing journal diameter:	
– standard	84,985...85,020 mm
– 1st undersize 0,25 mm	84,735...84,770 mm
– 2nd undersize 0,50mm	84,485...84,520 mm
– 3rd undersize 1,00 mm	83,985...84,020 mm
– 4th undersize 1,50 mm	83,485...83,520 mm
Main bearing housing diameter (in cylinder block)	91,000...91,025 mm
Main bearing shell thickness:	
– standard	2,955...2,965 mm
– 1st undersize 0,25 mm	3,080...3,090 mm
– 2nd undersize 0,50 mm	3,205...3,215 mm
– 3rd undersize 1,00 mm	3,455...3,465 mm
– 4th undersize 1,50 mm	3,705...3,715 mm
– bearing 8361 40950 (see page 5–1 instruction B)	3,705...3,715 mm
Main bearing clearance	0,050...0,127 mm
Length of thrust bearing journal (journal nearest to flywheel):	
– standard (2 standard thrust plates)	45,000...45,080 mm
– 1st oversize (one std and one 0,1 mm overthick thrust plate)	45,100...45,180 mm
– 2nd oversize (one std and one 0,2 mm overthick thrust plate)	45,200...45,280 mm
– 3rd oversize (one 0,1 mm and one 0,2 mm overthick thrust plate)	45,300...45,380 mm
– 4th oversize (two 0,2 mm overthick thrust plates)	45,400...45,480 mm

Other crankshaft journals may not be ground longer.

Crankshaft end float	0,100...0,380 mm
Max. permissible ovality and other deformity of crankpins or journals	0,03 mm
Crankshaft unbalance	1,0 Ncm Max.
Balancing unit ring gear location, diameter (420–engines)	150,220...150,260 mm
Balancing unit ring gear I.D. (420–engines)	150,000...150,040 mm

Flywheel

Flywheel ring gear no. of teeth	133 pcs
Interference fit between ring gear–flywheel	0,425...0,600 mm
Before fitting the ring gear, heat up to a temperature of	150...200°C
Flywheel unbalance	1,0 Ncm Max
Max permissible axial wobble of flywheel clutch face, measured at inner edge of clutch face on diameter 200	0,06:ø200

Balancing unit (420–engines)

Tooth backlash:	
– crankshaft ring gear–balancer weight gear wheel	0,1...0,3 mm
– between the balancer weights gear wheels	0,05...0,250 mm
Balancing weights end float	0,1...0,5 mm
Shaft diameter at bearing surfaces	36,000...36,016 mm
Bearing bushing inner diameter (fitted)	36,050...36,075 mm
Diameter of holes in body for shafts, rear end	36,058...36,083 mm
Diameter of holes in body for shafts, front end	35,958...35,983 mm
Shim thickness, cylinder block–balancer unit	0,2 mm

Timing gears

Tooth backlash:	
Crankshaft–idler gear	0,05...0,25 mm
Idler gear–camshaft gear	0,05...0,25 mm
Idler gear–fuel injection pump gear	0,05...0,25 mm
Max. permissible side wobble of gears	0,05 mm
Idler gear shaft, diameter	54,951...54,970 mm
Inner diameter of idler gear bushing (fitted)	55,000...55,030 mm
Inner diameter of Idler gear hole	60,000...60,030 mm
Camshaft gear hole diameter	32,000...32,025 mm
Camshaft end diameter	32,043...32,059 mm

Timing marks:
Timing marks on gears are in alignment when the 1st cylinder piston is at its top dead centre between compression and power strokes.

On crankshaft gear	2 dots on tooth
On idler gear:	
– against crankshaft gear mark	0 on tooth
– against camshaft gear mark	1 dot on tooth
– against fuel injection pump gear mark	1 dot on notch
On camshaft gear	1 dot on notch
On injection pump gear	1 dot on tooth

Connecting rod

Inside diameter of piston pin bush (with bush pressed into connecting rod)	40,025...40,040 mm
Outside diameter of piston pin bush	44,082...44,120 mm
Interference fit: connecting rod small end bushing–connecting rod	0,057...0,120 mm
Connecting rod small end bore	44,000...44,025 mm
Connecting rod big end bore	71,730...71,749 mm

Big end bearing shell thickness:	
– standard	1,835...1,842 mm
– 1st undersize 0,25 mm	1,960...1,967 mm
– 2nd undersize 0,50 mm	2,085...2,092 mm
– 3rd undersize 1,00 mm	2,335...2,342 mm
– 4th undersize 1,50 mm	2,585...2,592 mm
Big–end bearing clearance	0,046...0,098 mm
End float (side clearance) at big–end on crankshaft	0,200...0,410 mm
Piston pin bushing location perpendicular to longitudinal axis of connecting rod to be within	0,15:100
Piston pin bushing location and big–end bearing location to be parallel to within	0,05:100
Weight marking (letter) at lower end.	
Max. permissible weight difference between connecting rods in the same engine	20 g
Position of connecting rod; weight marking at valve mechanism side (away from the combustion chamber in the piston)	

Piston, rings and pin

Minimum distance between piston and cylinder head (measured with a piece of lead wire thought the injector location hole)	0,900...1,150 mm
Piston diameter:	
– 17 mm from lower edge (320, 420, 620–engines)	107,873...107,887 mm
– 19 mm from lower edge (634–engines)	107,883...107,897 mm
Pin bore in piston	40,003...40,009 mm
Piston pin diameter	39,991...40,000 mm
Width of ring grooves:	
– 1st groove (right–angled ring)	2,560...2,580 mm
– 2nd grove	2,520...2,540 mm
– 3rd groove	4,040...4,060 mm
Side clearance of piston rings in their grooves:	
– 1st ring (right–angled ring)	0,07...0,102 mm
– 2nd ring	0,03...0,062 mm
– 3rd ring	0,05...0,082 mm
– reject limit	0,15 mm
Piston ring height (in direction of cylinder):	
– 1st ring (right–angled ring)	2,478...2,490 mm
– 2nd ring	2,478...2,490 mm
– 3rd ring	3,975...3,990 mm
Piston ring gap (with piston fitted in cylinder)	
– 1st ring (wedge shaped ring)	0,40...0,55 mm
– 1st ring (right–angled ring)	0,30...0,45 mm
– 2nd ring	0,60...0,80 mm
– 3rd ring	0,30...0,60
– reject limit 1st and 3rd ring	1,0 mm
– reject limit 2nd ring	1,5 mm
Max. permissible weight difference between pistons in same engine	25 g

Piston to be heated up to 100°C before fitting gudgeon pin.
Piston position in cylinder: combustion chamber of piston to face towards injector.

Lubricating system

Oil pressure at normal running temperature:	
– at idling speed (min.)	100 kPa (1,0 kp/cm^2)
– at running speed	250–400 kPa(2,5–4,0 kp/cm^2)
Free length of oil pressure valve spring	80 mm
Spring pressure when valve spring is compressed to a length of 52 mm	54+5 N (5,4+0,5 kp)
Diameter of oil pressure valve plunger	19,602...19,635 mm
Diameter of oil pressure valve cylinder	19,700...19,752 mm
Oil filter by–pass valve opens at a pressure difference of	2±0,5 kp/cm^2

Oil pump (320, 420–engines)

Backlash between gears when crankshaft lies firmly against the lower side of main bearings:	
– crankshaft gear–lubricating oil pump gear	0,05...0,25 mm
– between the pump gears	0,16...0,26 mm
Diameter of drive shaft at bearings for body and cover	17,966...17,984 mm
Diameter of shaft holes on body and cover	18,000...18,018 mm
Diameter of gear wheel hole	18,060...18,078 mm
Fixed shaft, diameter	18,028...18,039 mm
Protrusion of fixed shaft end below pump body face	0,5...1,0 mm
Thickness of cover gasket	0,06...0,08 mm

Outside diameter of gear	43,486...43,525 mm
Housing diameter	43,650...43,750 mm
Thickness of gears	24,000...24,027 mm
End play of gears	0,03...0,11 mm
Depth of housing	24,000...24,043 mm
Number of teeth on drive gear (320–engines)	51 pcs
Number of teeth on drive gear (420–engines)	46 pcs

Oil pump (620/634–engines)

Backlash between gears when crankshaft lies firmly against the lower side of main bearings:

– crankshaft gear–lubricating oil pump gear	0,05...0,25 mm
– between the pump gears	0,16...0,26 mm
Diameter of drive shaft at bearings for body and cover	17,966...17,984 mm
Diameter of drive shaft bearing hole on body and cover	18,000...18,018 mm
Hole diameter of gear pressed on drive shaft	18,060...18,078 mm
Diameter of fixed shaft at gear wheel	17,966...17,984 mm
Inner diameter of bearing for gear wheel which rotates on fixed shaft	18,000...18,018 mm
Fixed shaft in pump body, diameter	20,035...20,048 mm
Protrusion of fixed shaft end below pump body face	0,5+0,5 mm
Thickness of cover gasket	0,06...0,08 mm
Outer diameter of gear wheels (620–engines)	43,486...43,525 mm
Outer diameter of gear wheels (634–engines/620–engines J 7891>)	55,824...55,870 mm
Housing diameter (620–engines)	43,650...43,750 mm
Housing diameter (634–engines/620–engines J 7891>)	56,000...56,120 mm
Thickness of gears	32,000...32,027 mm
End play of gears	0,03...0,11 mm
Depth of housing	32,000...32,043 mm
Number of teeth on drive gears	46 pcs

Coolant pump (320, 420–engines)

Outside diameter of bearing	38,087...38,100 mm
Inside diameter of bearing housing in pump body	38,058...38,083 mm
Shaft diameter	15,910...15,920 mm
Impeller hole diameter	15,881...15,899 mm
Diameter of the seal recess in the pump body	36,450...36,489 mm
The impeller is pressed onto the shaft until the distance between the rear face of impeller and the rear face of the pump body is	1,8...2,2 mm
Distance of belt pulley from rear face of body:	
– 320; <E 7535, 420; <E 7054	178,3...178,7 mm
– 320; E 7536>, 420; E 7055>	174,4...174,6 mm
Fan guide diameter	25,00...25,20 mm
Balancing precision of fan	0,3 Ncm max.
Max. permissible eccentricity of fan	±0,3 mm
Belt deflection	15...20 mm

Coolant pump (with separate ball bearings 320– and 420–engines)

Outside diameter of bearing	52 mm
Diameter of bearing housing	51,979...52,009 mm
Shaft diameter at bearing	20,002...20,015 mm
Shaft diameter at impeller	15,907...15,920 mm
Impeller hole diameter	15,881...15,899 mm
Impeller should be pressed onto shaft inside the housing	1,8...2,2 mm
Diameter of fan hub	0,3 Ncm max. (30 pcm)
Max. permissible eccentricity of fan	±0,3 mm
The fan belt tension pushing from the middle, deflection from the line	15...20 mm

Coolant pump (620/634–engines)

Outside diameter of bearing	52 mm
Inside diameter of bearing housing in pump body	51,979...52,009 mm
Shaft diameter at bearing	19,980...19,993 mm
Shaft diameter at impeller	15,907...15,920 mm
Impeller hole diameter	15,881...15,899 mm
Diameter of the seal recess in the pump body	36,450...36,489 mm
Distance between impeller and rear face of pump body	0,8...1,2 mm
Balancing precision of fan	0,3 Ncm max (30 pcm)
Belt deflection	15...20 mm

Pump equipped with reinforced bearing:

Outer diameter of the front bearing	95 mm
Bearing up diameter in water pump wheel	95,000...95,035 mm
Outer diameter of bearings position in pump frame	59,991...60,009 mm

Thermostat

Spare part number	Type	Opening begins at	Fully open at	Max. stroke mm
8361 15646	ø67/79°C	79° ±2°C	94°C	8
8361 15718	ø67/83°C	83° ±2°C	97°C	8
8366 59685	ø67/86°C	86° ±2°C	99°C	8
8360 15156	ø54/79°C	79° ±2°C	94°C	7,5
8363 31590	ø67/83°C	83° ±2°C	95°C	8

Turbocharger

Schwitzer S1A (320 DS)

Shaft end float	max. 0,14 mm
Shaft radial clearance [1])	max. 0,61 mm
Turbine housing attaching bolts	22 Nm
Nut at end of shaft	6,8 Nm

Schwitzer S1B (420 DS) and S1BG by–pass turbo (420DW)

Shaft end float	max. 0,14 mm
Shaft radial clearance[1])	max. 0,51 mm
Turbine housing attaching bolts	22 Nm
Nut at end of shaft	8,1 Nm
By–pass passage opening pressure (S1BG)	1,035 bar

Schwitzer S2B (620/634 DS) and S2BG by–pass turbo (620/634DW)

Shaft end float	max. 0,14 mm
Shaft radial clearance[1])	max. 0,95 mm
Turbine housing attaching bolts	17 Nm
Nut on end of shaft	15,6 Nm

[1]) Measured at nut on end of shaft.

TIGHTENING TORQUES

Object	Nm
Cylinder head bolts	80 Nm+90°+90° (see page 3–4)
Cylinder head studs to cylinder block	30
Main bearing bolts	200
Connecting rod bolts	40 Nm + 90°
Crankshaft nut:	
– 320/420	600
– 620/634	1000
Crankshaft counterweight, 320	160
Crankshaft pulley bolts	30
Flywheel bolts, 10.9	140
Flywheel bolts, 12.9	160
Flywheel housing bolts:	
– outer ring M12	110 (8.8) 150 (12.9)
– inner ring M10	60 (8.8) 80 (12.9)
Idler gear bolts:	
– M10	60
– M14	200
Idler gear retaining screws (with ball bearing):	
– the bigger bolt	180
– the bolts for holding the bearing	22
Balancing weights, 420	60
Piston cooling valve (620/634)	30
Oil pump gear nut	60
Oil pump retaining screws	60
Oil cooler connecting piece	60
Engine–self carrying oil sump (Valtra Valmet–tractors):	
– M12 bolts (320/420)	110 (8.8) 140 (12.9)
– M8 bolts (420/620/634)	30
– M10 bolts (620/634)	90
– M20 bolts (620/634)	600
Coolant pump pulley nut	120
Fan bolts	30
Exhaust manifold bolts	50
Intake manifold bolts	30
Injection pump pressure valve holder	45
Injection pump gear retaining nut	90
Injection pump gear retaining nut (Bosch–P)	200
Injector attaching nuts (on studs)	15
Injector nozzle sleeve	60
Compressor pulley nut (Knorr)	80

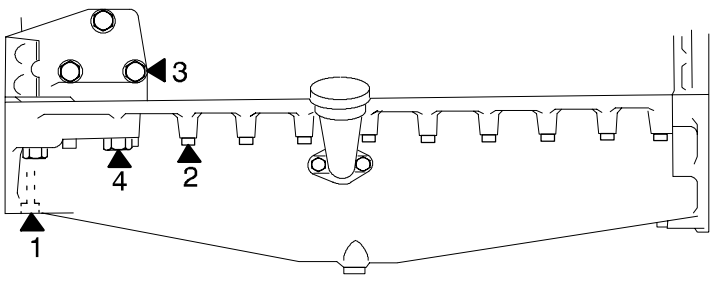
Always use the torque values listed in the following tables when specific torque values are not available.

	M8	M10
Cast iron	35±5 Nm	70±5 Nm
Aluminium	25±5 Nm	50±5 Nm

Use a washer with the aluminium parts.

The bolts of a self carrying oil sump (MF–, Steyr–tractors)

1 M8 ..... 25 Nm
2 M10 ..... 90 Nm
3 M14 ..... 160 Nm
4 M20 ..... 600 Nm



CONSTRUCTION

General

The Sisudiesel 20/34–series engines (3–, 4–, or 6–cylinders) are water–cooled, four stroke, direct–injection in–line diesel engines. All engines are produced as naturally aspirated engines, turbocharged engines and the four– and six cylinder engines also as intercooled.

The engines have a rigid and ribbed cylinder block. The crank mechanism is designed for supercharging. The cylinder liners are wet and supported at the middle. The cylinder head bolts are high tensile bolts.

Cylinder block

The cylinder block is the main body of the engine, to which other engine parts are attached. Wet and replaceable cylinder liners are supported at the middle which reduces vibrations and directs coolant circulation mainly to the upper part of the liners.

The seal between the cylinder liner lower part and the cylinder block is achieved by three o–rings, which are fitted in grooves in the liner. The upper part is sealed by the cylinder head gasket.

The camshaft is located in the cylinder block. The camshaft front bearing location is fitted with a separate bearing sleeve. The remaining bearing locations are machined directly in the cylinder block. The latest 620/634–engines have separate bearing sleeves in all camshaft bearing locations. The drilling for the camshaft rear end is covered with a plug.

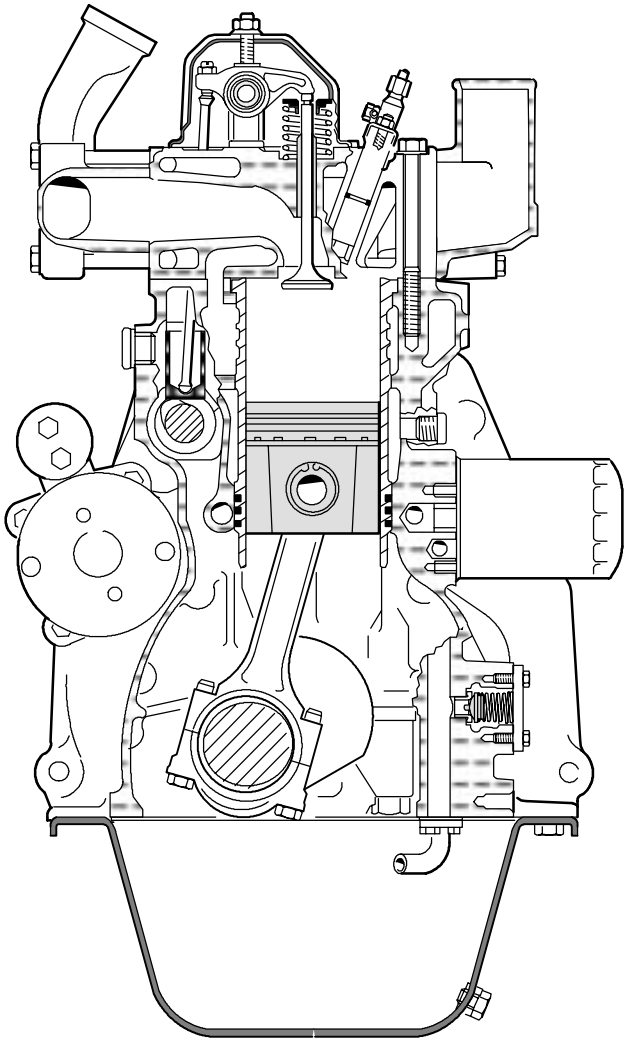
There are spaces on both sides of the rear main bearing for guide bearing shims (the crankshaft thrust bearings).

Flywheel housing

The flywheel housing is fitted at the rear end of the cylinder block. The seal for the crankshaft rear end is placed in a bore in the housing. The starter motor fixing point is fitted in the flywheel housing.

The lower face of the flywheel housing functions as a sealing surface for the oil sump gasket. This means that the lower face of the cylinder block must be level with the flywheel housing. When fitting the flywheel housing, its position is determined by tension pins.

The flywheel housing are delivered according to the requirements set, by the engine application and differet flywheel housings can be mounted on all engine types.



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