

ISUZU

SERVICE STANDARDS

for

DIESEL ENGINES

ELF · ELFIN · WASP · BELLEL

BELLETT & LIGHT BUSES



ISUZU MOTORS LIMITED

TOKYO, JAPAN

Article 1. The standards contained herein define service standards for Isuzu diesel engines (Models C 180, C 220, DL 200 and DL 201)

Article 2. These service standards consist of items to be inspected, nominal dimensions, values requiring service, standard values as assembled, limits for use and manners of service.

1. The nominal dimensions are standard values as manufactured.
2. The values requiring service are values above which service is required in performance.
3. The standard values as assembled are values to be standards after the service and may be more or less different from the assembled dimensions of new vehicles.
4. The limits for use are limits above which the parts such as are worn should not be used and must be replaced.
5. The manners of service are manners of general service.

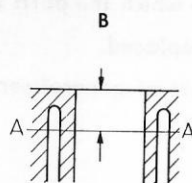
Article 3. Definitions of the terms in the table :

1. The "wear" is the difference (in the dimension of the worn part) between the dimension in the position which is not worn (or the nominal dimension in case there is no such position) and the dimension in the most worn position.
2. The "partial wear" is the difference between the largest value and the smallest value of the wear.

Article 4. When the service of the whole engine is requested, the parts needing any service should be first confirmed by the bench test or the like and the necessary minimum overhaul should be made. When the service of a part of the engine is requested, the corresponding items should be serviced in accordance with these service standards.

ENGINE

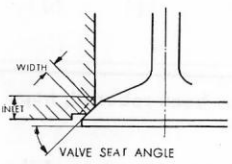
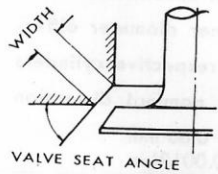
Items to be Inspected	Nominal Dimensions	Values Requiring Service
Time for making the engine overhaul service		
Compression pressure of the cylinder in kg/cm ² (at about 250 r.p.m. with water temperature at 75°C)	C 180	Above 28.0 kg/cm ² (398) PSI
	C 220	Below 19.6 kg/cm ² (279) PSI
	DL 200	Above 27.0 (384) PSI
	DL 201	Below 19.0 (270) PSI
Rate of fuel consumption (km/l)	100%	Less than 60%
Rate of lubricating oil consumption (km/l)	100%	Less than 50%
Engine body (Cylinder block)		
Wear of the inner diameter in the position AA measurement position B: 12 mm (0.47 in), for C 180 B: 14 mm (0.55 in), others	C 180	79 φ mm (3.1126) in
	C 220	83 φ (3.2702)
	DL 200	79 φ
	DL 201	83 φ
Reboring	C 180	79 φ (3.1126)
	C 220	83 φ (3.2702)
	DL 200	79 φ
	DL 201	83 φ
Inside diameter difference in each part of the cylinder after honing		
Wear of the maximum diameter of the cylinder	C 180	79 φ mm (3.1126) in
	C 220	83 φ (3.2702)
	DL 200	79 φ
	DL 201	83 φ



Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
		Overhaul and service the engine.	Full open the throttle valve.
	 Ditto		Registered results while vehicle is new : 100%
	 Ditto		In case of engine only : h/l
		Rebore it.	When it is not rebored, remove the step of upper part.
0.50 mm (0.0197) in		1. When it has been rebored, hope it.	
0.75 (0.0300)		2. Keep the inside diameters of the respective cylinders to be of the same nominal dimensions.	
1.00 (0.0394)		3. Keep the inner diameter difference of the respective cylinders for oversize nominal dimension	
1.25 (0.0493)		to be 0 ~ +0.03 mm (0.0012) in	
1.50 (0.0591)			
Less than 0.02 (0.0008)			
80.70 φ mm (3.1800) in		Use the liner.	 Force fit 0.06~0.08 mm (0.0024~0.0032) in
84.70 φ (3.3372)			
80.70 φ			
84.70 φ			

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Outside diameter of the liner	C 220	
	C 180	
Maximum diameter of the cylinder	C 220	
	DL 200	
	DL 201	
Deformation of fitting surface		More than 0.2 mm (0.0079) in
Hydraulic pressure test (for 3 minutes) in kg/cm ²		

Engine body (Cylinder head)

Sinking of the inlet and exhaust valves		C 180	 3.0 mm (0.1182) in	 More than 4.0 mm (0.1576) in
		C 220	 3.1 (0.1221)	 More than 3.6 (0.1418)
		DL 200	} 2.9 (0.1143)	} More than 4.0
		DL 201		
Width of valve seat (for suction and exhaust valves)		C 180	 1.2 (0.0473)	} More than 2.0 (0.0788)
		C 220	.....	
		DL 200	 1.4 (0.0552)	
		DL 201	 1.4	
Deformation of fitting surface				More than 0.2 (0.0079)
Hydraulic pressure test for 3 minutes kg/cm ²				
Fastening torque of the cylinder head bolts (m/kg)				

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
86.750 ϕ mm (3.4180) in 86.725 ϕ (3.4170)			When it is rebored using the inserted liner, the oversize should be under 1.0mm (0.0394).
	86.6 ϕ mm (3.4120) in 82.6 ϕ (3.2544) 86.6 ϕ		Replace the cylinder body.
Less than 0.05 mm (0.0020) in		Correct it by grinder.	 Max. limit 0.4 mm (0.0158) in
5.0 kg/cm ² (71) PSI		Correct or replace in case of water leaks.	
			Replace the seat ring. The valve seat angle should be 45°.
1.2~1.5 mm (0.0473~0.0591) in		Correct it by valve seat cutter.	
Less than 0.05 mm (0.0020) in		Correct it by grinder.	 Max. limit 0.4 mm (0.016) in
5.0 kg/cm ² (71) PSI		See that there is no detrimental water leakage (in precombustion chamber, preheating plug and suction valve).	
11~12 m-kg (80~87) ft-lb		Fasten at same torque.	

Items to be Inspected		Nominal Dimensions	Values Requiring Service
Main moving parts (Piston)			
Clearance between the cylinder and the piston in the skirt part			
	C 180	79 ϕ mm (3.1126) in	
	C 220	83 ϕ (3.2702)	
Oversize of piston	DL 200	79 ϕ	
	DL 201	83 ϕ	
Main moving parts (Piston pins)			
Fit tightness of piston pin to piston fastening space between that piston pin and piston	C 180 C 220 DL 200 DL 201		
Clearance between pin and the small end bush of connecting rod			More than 0.05 mm 0.0020) in
Wore of the pin	C 180	24 ϕ mm (0.9456) in	
	C 220	25 ϕ (0.985)	
	DL 200	24 ϕ	
	DL 201	25 ϕ	
Main moving parts (Piston ring)			
Clearance between the opposed ends of the piston ring (in the gauge)	C 180 C 220 DL 200 DL 201		First pressure ring

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
Clearance between cylinder bore and the longer diameter of piston is 0.07 mm (0.0028) in			Perform measurement at normal temperature.
0.25 mm (0.0099) in 0.50 (0.0197) 0.75 (0.0296) 1.00 (0.0394) 1.25 (0.0493) 1.50 (0.0591)			
0~0.013 mm (0.0005) in 0.004 (0.0002)		When excessive knocking are present, rectify.	So that pin may be strongly forced in when piston is warmed to 100°C.
Less than 0.02 mm (0.0008) in		Renew bush or pin	The standard valve as assembled is such that pin may state lightly when connecting rod is held.
23.97 ϕ mm (0.9437) in 24.97 ϕ (0.9838) 23.97 ϕ 24.97 ϕ		Renew pin.	
0.2~0.4 mm (0.0079~0.0158) in 0.3~0.6 (0.0118~0.0236) 0.2~0.4	1.5 mm (0.0591) in		

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Clearance between the opposed ends of the piston ring (in the gauge)	C 180	
	Second & third pressure ring	C 220
		DL 200
		DL 201
	C 180	
	Oil scraper ring	C 220
		DL 200
		DL 201
	C 180	
	First pressure ring	C 220
Clearance between the opposed ends of the piston ring (free)		DL 200
		DL 201
	C 180	
	Second & third pressure ring	C 220
		DL 200
		DL 201
	C 180	
	Oil scraper ring	C 220
		DL 200
		DL 201
Tension in kg	C 180	
	First pressure ring	C 220
		DL 200
		DL 201
	C 180	
	Second & third pressure ring	C 220
		DL 200
		DL 201
	C 180	
	First pressure ring	C 220

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
0.23~0.36 mm (0.0091~0.0142) in	1.5 mm (0.0591) in		
0.1~0.3 (0.0039~0.0118)	1.5		
0.25~0.45 (0.0099~0.0177)	1.5		
0.1~0.3	1.5		
(First) 0.1~0.3 (Second) 0.2~0.4 (0.0079~0.0158)		Replace ring.	The standard inner diameter of gauge should be: C 180 — 79.00 ϕ mm (3.1126) in
0.1~0.3	1.0 (0.0394)	In case engine is overhauled and serviced, replace rings.	C 220 — 83.00 ϕ (3.2702)
0.2~0.4			DL 200 — 83.00 ϕ
0.1~0.3			DL 201 — 83.00 ϕ
9.5~12.5 mm (0.3743~0.4925) in			
11.0~14.0 (0.4334~0.5516)			
9.5~12.5			
10.9 (0.4295)			
9.5~12.5 (0.3743~0.4925)			
9.0~12.0 (0.3546~0.4728)			Reference values.
9.5~12.5			
(First) 9.0~12.0 (Second) 7.5~10.5 (0.2955~0.4137)			
8.0~11.0 (0.3152~0.4334)			
6.5~9.5 (0.2561~0.3743)			
8.0~11.0			
1.0~1.4 kg (2.2~3.1) lb	0.5 (1.1)		
1.1~1.4 (2.4~3.1)			
1.0~1.4		Replace ring.	
1.1~1.6 (2.4~3.5)	0.5		
1.0~1.4			
1.0~1.3 (2.2~2.9)			
1.0~1.4			

Items to be Inspected		Nominal Dimensions	Values Requiring Service
Tension in kg	Oil scraper ring	C 180	
		C 220	
		DL 200	
		DL 201	
Clearance between ring groove width and pressure ring		C 180	
		C 220	
		DL 200	
		DL 201	
Clearance between ring groove width and oil scraper ring		C 180	
		C 220	
		DL 200	
		DL 201	
Oversize of the ring		C 180	79 ϕ mm (3.1126) in
		C 220	83 ϕ (3.2702)
		DL 200	79 ϕ
		DL 201	83 ϕ
Setting position of the opposed ends of each ring			
Main moving parts (Connecting rod)			
Play in the forward and rearward direction between the small end and the piston boss (on one side)		C 180	
		C 220	
		DL 200	
		DL 201	
Plating of big end bearing metal			
Clearance between big end bearing metal and crank pin			More than 0.12 mm (0.0047) in
Contact between big end bearing metal and crank pin			

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
1.0~1.4 kg (2.2~3.1) lb 1.2~1.6 (2.6~3.5) 1.0~1.3 (2.2~2.9) 1.2~1.6	0.6 kg (1.3) lb		
0.36~0.074 mm (0.0142~0.0029) in 0.05 (0.0020) 0.05 0.05	0.3 mm (0.0118) in	Replace ring or piston.	Fit with marked surface above.
0.040~0.082 (0.0016~0.0032) 0.04 (0.0016) 0.04 0.04	0.15 (0.0059)		
0.125 mm (0.0049) in 0.25 (0.0099) 0.50 (0.0197) 0.75 (0.0296) 1.00 (0.0394) 1.25 (0.0493) 1.50 (0.0591)			
Alternately 120°			
1.0 mm (0.0394) in 1.0 1.5 (0.0591) 1.0	Reference values.		
Use (the connecting rod bearing) having the projection and plating. See that back surface is in close contact.			
0.06 (0.0024)	Replace bearing metal.		
Correct or replace bearing metal in case contact is bad.			

Items to be Inspected		Nominal Dimensions	Values Requiring Service
Undersize of the big end bearing metal	C 180		
	C 220	53 ϕ mm (2.0882) in	
	DL 200	50 ϕ (1.9700)	
	DL 201	53 ϕ	
Play in the forward and rearward direction of the big end	C 180		More than 0.35 mm (0.0138) in
	C 220		
	DL 200		
	DL 201		
Center distance of the big end and small end	C 180	150 (5.9100)	
	C 220	168 (6.6192)	
	DL 200	170 (6.6980)	
	DL 201	155 (6.1070)	
Twist of the holes of big end and small end (per 100 mm) (3.9370 in)	C 180		More than 0.2 (0.0079)
	C 220		
	DL 200		
	DL 201		
Parallelism of the holes of big end and small end (per 100 mm) (3.9370 in)	C 180		More than 0.15 (0.0059)
	C 220		
	DL 200		
	DL 201		
Weight difference after piston assembly in gram	C 180		
	C 220		
	DL 200		
	DL 201		
Fastening torque in m·kg of connecting rod big end bearing bolt			
Main moving parts (Crank shaft)			
Partial wear of journal and pin	C 180	60 ϕ mm (2.3640) in	More than 0.05 mm (0.0020) in
		51 ϕ (2.0094)	
	C 220	65 ϕ (2.5610)	
		53 ϕ (2.0882)	

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
0.125 mm (0.0049) in			
0.25 (0.0099)			
0.50 (0.0197)			
0.75 (0.0296)			
1.00 (0.0394)			
0.2~0.25 mm (0.0079~0.0099) in		Replace connecting rod.	
± 0.05 mm (0.0020) in			Reference values.
Less than 0.08 mm (0.0032) in		Correct connecting rod or replace it.	
Less than 0.05 (0.0020)			
Less than 20 g (0.701) oz			Be carefull on graded weight classification of connecting rod.
6.5~7 m·kg (47.0249~50.6422) in-lb		Wet bolt with oil and fasten it.	
			Correct it by crankshaft grinding machine.

Items to be Inspected		Nominal Dimensions	Values Requiring Service
Partial wear of journal and pin	DL 200	60 ϕ mm (2.3640) in 50 ϕ (1.9700)	More than 0.05 mm (0.0020) in
	DL 201	65 ϕ (2.5610) 53 ϕ (2.0882)	More than 0.05
Wear of journal	C 180	60 ϕ	
	C 220	65 ϕ	
	DL 200	60 ϕ	
	DL 201	65 ϕ	
Wear of pin	C 180	51 ϕ (2.0094)	
	C 220	53 ϕ	
	DL 200	50 ϕ	
	DL 201	53 ϕ	
Finishing precision of journal and pin (taper and ovality)			
Plating of journal bearing metal			
Clearance between journal and bearing			More than 0.12 (0.0047)
Undersize of journal bearing	C 180	60 ϕ	
	C 220	65 ϕ	
	DL 200	60 ϕ	
	DL 201	65 ϕ	
Play in the forward and rearward direction of the crankshaft	C 180		More than 0.30 (0.0118)
	C 220		
	DL 200		
	DL 201		

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
	58.93 ϕ mm (2.3218) in		
	64.00 ϕ (2.5216)		
	58.93 ϕ		
	63.93 ϕ (2.5188)	Replace crankshaft.	See that the fillet section R on both crank pin and journal to become 3.5 mm.
	49.93 ϕ (1.9672)		
	52.00 ϕ (2.0488)		
	48.93 ϕ (1.9278)		
	51.93 ϕ (2.046)		
Less than 0.02 mm (0.0008) in			
		Use journal bearing metal having the projection and plating. See that back surface is in close contact.	
	0.06 (0.0024)	Replace the bearing.	
	0.125 mm (C 220 only) (0.0049) in 0.25 (0.0099) 0.50 (0.0197) 0.75 (0.0296) 1.00 (0.0394)		
	0.05~0.10 (0.0020~0.0039) 0.10	Replace the thrust bearing	
	0.10		
	0.10		

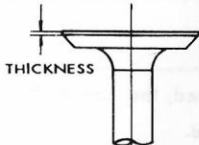
Items to be Inspected	Nominal Dimensions	Values Requiring Service
Play in the forward and rearward direction of camshaft	C 180 C 220 DL 200 DL 201	More than 0.2 mm (0.0079) in

Valve system (Timing gears)

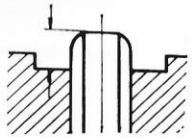
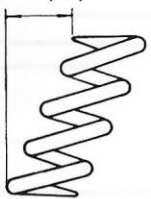
Backlash of timing gear		
Fastening space of crank gear and crankshaft		
Fastening space of cam gear and camshaft		
Clearance between idle gear bush and shaft		More than 0.2 mm (0.0079) in
Partial wear of idle gear shaft	C 180 C 220 DL 200 DL 201	45 ϕ mm (1.7730) in More than 0.1 mm (0.0039) in
Play in the forward and rearward direction of idle gear		0.2

Valve system (Valve)

Wear of suction valve stem	8 ϕ mm (0.3152) in	
Wear of exhaust valve stem	8 ϕ	
Clearance between suction valve stem and valve guide		More than 0.2 mm (0.0079) in
Clearance between exhaust valve stem and valve guide		More than 0.25 (0.0099) in
Fastening space of valve guide and cylinder head	C 180 C 220 DL 200 DL 201	

Thickness of valve		1.3 (0.0512)
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Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
0.05~0.10 mm (0.0020~0.0039) in 0.08 (0.0031) 0.08 0.08		Replace thrust plate.	
Less than 0.10 mm (0.0039) in	0.30 mm (0.0118) in	Replace gears.	
Less than 0.025 (0.0010)			
Less than 0.021 (0.0008)			
0.05 (0.0020)		Replace bush or shaft.	
		Relocate setting positions.	
0.07 (0.0028)		Correct the stepped worn part of thrust collar.	
	7.88 ϕ mm (0.3105) in	Replace valve.	In case valve is replaced due to wear of valve seat, replace also valve guide.
	7.85 ϕ (0.3093)		
0.05 (0.0020)		Replace valve or valve guide.	
0.08 (0.0032)			
0.026~0.061 (0.0010~0.0024)			
0.02 (0.0079)			Paint valve guide with oil and press it in
0.02 0.02			
	1.0 (0.0394)	Replace valve.	

Items to be Inspected		Nominal Dimensions	Values Requiring Service
Height (h) of valve guide and cylinder head		C 180	14 mm
		C 220	(0.5516) in
		DL 200	16
		DL 201	(0.6304)
Spring force in kg		C 180	26.0 kg
		C 220	(57.3) lb
		DL 200	18.5
		DL 201	(40.8)
Outer valve spring	Free height	C 180	53.0 mm
		C 220	(2.0882) in
		DL 200	46.0
		DL 201	(1.8124)
		C 180	42.47
		C 220	(1.6733)
		DL 200	47.3
		DL 201	(1.8636)
Inner valve spring	Spring force in kg	C 180	10.8 kg
		C 220	(23.8) lb
		DL 200	8.3
		DL 201	(18.3)
	Free height	C 180	48.4 mm
		C 220	(1.9070) in
		DL 200	42.9
		DL 201	(1.6903)

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
Reference values.			
	22.0 kg (48.5) lb	Replace valve spring.	As compressed to 40 mm (1.5760) in
	15.7 (34.6)		As compressed to 39 (1.5366)
	13.5 (29.8)		As compressed to 38 (1.4972)
	17.0 (37.5)		As compressed to 39
	51.5 mm (2.0291) in	Ditto	
	44.5 (1.7533)		
	41.2 (1.6233)		
	46.0 (1.8124)		
	1.0 (0.0394)	Replace valve spring.	
	9.20 kg (20.3) lb		As compressed to 38 mm (1.4972) in
	7.05 (15.5)		As compressed to 37 (1.4578)
	7.15 (15.8)		As compressed to 35 (1.3790)
	8.5 (18.7)		As compressed to 37
	47.0 mm (1.8518) in	Ditto	
	41.5 (1.6351)		
	39.5 (1.5563)		
	44.7 (1.7612)		

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Degree of right angle		
	C 180	
Valve clearance for both suction and exhaust valves (while cold)	C 220	
	DL 200	
	DL 201	
Contact surface between the valve stem and the valve rocker arm		
Clearance between valve rocker arm and shaft		More than 0.2 mm (0.0079) in
	C 180	19 ϕ mm (0.7486) in
	C 220	19 ϕ
Wear of valve rocker arm shaft	DL 200	17 ϕ (0.6698)
	DL 201	17 ϕ
Bending of push rod		More than 0.3
	C 180	249 (9.8106)
	C 220	
Length of push rod	DL 200	
	DL 201	
Valve system (Tappet)		
Clearance between tappet and cylinder body		More than 0.1 mm (0.0039) in
	C 180	22.22 ϕ mm (0.8755) in
	C 220	22 ϕ (0.8668)
Wear of the tappet	DL 200	22 ϕ
	DL 201	22 ϕ
Contact surface between the tappet and the cam		

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
	1.0	Replace valve spring	
0.4 mm (0.0158) in	}	Adjust clearance.	
0.5 (0.0197)			
0.5			
0.5			
		Correct the tip of valve stem and the recess at the tip of valve rocker arm.	
0.04 (0.0016)		Replace rocker arm or shaft.	
	18.85 mm (0.7427) in	}	Replace shaft
	18.85		
	16.85 (0.6639)		
	16.85		
		Replace it.	
Reference values			
0.03 mm (0.0012) in		Replace tappet.	
	22.17 ϕ mm (0.8735) in	}	Ditto
	21.95 ϕ (0.8648)		
	21.95 ϕ		
	21.95 ϕ		
		When wear or deformation is severe, replace it.	

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Suction system (Air cleaner)		
Air cleaner		
Suction system (Throttle valve)		
Clearance between valve shaft and bush		More than 0.2 mm (0.0079) in
Wear of valve body		
Lubricating system (Oil pressure)		
	C 180	Less than 2 kg/cm ² (28) PSI
	C 220	
Lubricating oil pressure in (at 1,400 r.p.m.) kg/cm ²	DL 200	
	DL 201	
Lubricating system (Oil pump and oil pressure regulating valve)		
Clearance between the rotor and the vane		
Clearance between the rotor and the vane and cover		More than 0.15 mm (0.0059) in
Clearance between the pump body and the vane		
	C 180	More than 0.2 (0.0079)
Clearance between the driving shaft of pump and the pump body	C 220	
	DL 200	
	DL 201	
	C 180	
Delivery in l/min	C 220	
Revolution number : 1,400 r.p.m.	DL 200	
Discharge pressure : 4 kg/cm ² (56.9) PSI	DL 201	

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
			Disassemble and clean it, or replace the element.
0.04 mm (0.0016) in		Replace valve shaft or bush	
		When wear is severe replace valve or body.	
3~4 kg/cm ² (43~57) PSI 4~4.5 (57~64) 3~3.5 ('62 Model and before) (43~50) 4~4.5 ('63 Model and after) 3~3.5 ('62 Model and before) 4~4.5 ('63 Model and after)		Eliminate oil leakage and clogging in any part.	
0.02~0.14 mm (0.0008~0.0055) in		When wear is severe replace it.	
0.02 ~0.07 (0.0008~0.0028)		Replace vane rotor or cover.	
0.2 ~0.27 (0.0079~0.0106)			
0.014~0.057 (0.0006~0.0016) 0.04 (0.0016) 0.04 0.04			
	More than 10.16 l/min (308) US pint/min		
	More than 8.25 (248) ('62 Model and before) More than 10.16 ('63 Model and after)		
	More than 8.25 ('62 Model and before) More than 10.16 ('63 Model and after)		

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Pressure at the beginning of the action of the oil pressure regulating valve (kg/cm ²)	C 180	
	C 220	
	DL 200	
	DL 201	

Cooling system (Radiator)

Corrosion, damage or in complete connection of radiator and the water pump

Leakage test (air pressure in kg/cm²)

Core operating rate

Less than 80 %

Pressure at the beginning of the action of pressurizing valve (kg/cm²)

Pressure at the beginning of the action of the negative pressure valve (kg/cm²)

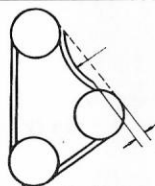
Cooling system (Water pump)

Stagger of water pump ball bearing

Delivery in l/min (Pump 3,000 r.p.m. at the atmospheric temperature)	C 180
	C 220
	DL 200
	DL 201

Clearance between the water pump blade and the pump body	C 180
	C 220
	DL 200
	DL 201

Looseness of fan belt



Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
3.2~3.5 kg/cm ² (46~50) PSI 4.5 (64) 3.5 ('62 Model and before) 4.5 ('63 Model and after) 3.5 ('62 Model and before) 4.5 ('63 Model and after)			Reference values.
		Correct or replace it.	
0.5 kg/cm ² (7.10) PSI		Correct the radiator when bubbles come out.	
		Correct it.	
0.44~0.50 (6.3~7.1)			Reference value.
0.04~0.05 (0.6~0.7)			Reference value.
	0.2 mm (0.0079) in	Replace the bearing.	
55 l/min (14.5) US gal/min 60 (15.9) 60 60			
1.15~1.85 mm (0.0453~0.0729) in 1.2 ~1.3 (0.0473~0.0512) 1.2 ~1.3 1.2 ~1.3		In case pump blade is in contact with the pump body, replace the impeller and the water pump body bearing.	
About 15 mm (0.5910) in		Adjust the tension.	

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Temperature at the beginning of the action of the thermostat (at the atmospheric pressure)		
Temperature at the full opening of the thermostat (at the atmospheric pressure)		
Fastening space between fan center and bearing shaft		
Fastening space between the blade and the pump bearing shaft		
Fastening space between the ball bearing and water pump body		

Fuel system (Piping and others)

Clogging, cracking, loose connection and faulty packing of fuel pipes, fuel injection pipes and nozzle holders

Clogging and damage in fuel filter

Dirts and damage in fuel tank

Fuel system (Feed pump)

Sucking capacity with hand pump

Head : 1 m (3.28) ft

Speed : 100 times/min

Internal diameter of pipe 8 mm (0.3152) in

Length of pipe : About 2 m (6.6) ft

Fuel delivery in cc

Pump 1,000 r.p.m. for 15 seconds

Suction head 1 m (3.28) ft

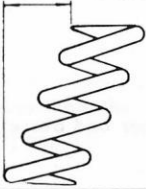
Delivery head 0.3 m (0.9843) ft

Oil leakage 2.0 kg/cm² (28.450) PSI

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
75.0 ± 2.5°C			
80.0 ± 2.5°C			
0.015~0.05 mm (0.0006~0.0020) in			
0.009~0.045 (0.0036~0.0018)			
0.009~0.025 (0.0004~0.0010)			
		Correct or replace them.	
		Clean or replace fuel filter element.	
		Clean or replace fuel tank.	
Suction should begin within 60 times		Correct or replace pump.	
More than 300 cc (0.63) US pints		Ditto	
Slight continuous bubbles from push rod is passable		For other leaks, rectify or replace.	

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Fuel system (Fuel injection pump) Plunger		
Oil tightness of plunger after 5 strokes from the initial pressure of 100 kg/cm ² (1422) PSI		
Oil tightness of delivery valve in seconds the time required for the pressure to drop from the initial pressure of 100 kg/cm ² down to 5 kg/cm ² (1422) PSI (71.1) PSI		
Wear of the piston part of the delivery valve		
Axial play of camshaft		More than 0.2 (0.0079)
Angular interval for the beginning of injection (in the angle of rotation of pump)	90°	More than ±1°
Clearance between tappet and pump body		
Recess in the head part of the lower spring seat		

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
200 kg/cm ² (2844) PSI	125 kg/cm ² (1777) PSI	Replace plunger and barrel.	Continuously operate the pump by hand by using nozzle tester provided with pressure gauge and with plunger in the position of the idling operation. The pressure gauge to be used should be of a size of 100 mm (3.94) in and a maximum graduation of 350 kg/cm ² (4978) PSI according to JIS B 7505. The conduct pipe to be used should be of an inner diameter of 1.6 mm (0.0630) in and a length of 100 mm (3.94) in.
10 sec	5 sec	Ditto	The plunger should be in Bottom Dead Center, The pressure gauge to be used should be of a size of 100 mm and a maximum graduation of 350 kg/cm ² . The conduct pipe to be used should be an inner diameter of 1.6 φ and a length of 100 mm (3.94) in.
		When the wear is severe, replace the delivery valve.	
0.10 mm (0.0039) in		Correct the play.	
±30'		Adjust tappet or replace camshaft or tappet.	
0.02~0.07 mm (0.0079~0.0028) in	0.2 mm (0.0079) in	Replace it.	
	0.2	Replace the lower spring seat.	

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Plunger		
Spring force in kg When compressed to 44 mm (1.7336) in	15.3 kg (33.7) lb	
Free height	51.5 mm (2.0291) in	
Plunger spring		
Right-angularity		
Clearance between the flange of the convex part of plunger and the groove of control sleeve		More than 0.12 mm (0.004728) in
Backlash between control rack and pinion		
Sliding resistance of control rack in g (just after the operation of pump)		
Volume of injection (The nozzle valve opening pressure : 120 kg/cm ² ; (1706) PSI nozzle type : NP-DNOSP 212)	Control rack Position	Number of revolutions of the pump
	11.7 mm (0.46098) in	1,500 r.p.m.
	12.8 (0.5043)	750
	10.0 (0.3940)	1,800
	About 7.8 (0.3072)	300
Volume of injection (The nozzle valve opening pressure : 120 kg/cm ² ; (1706) PSI nozzle type : NP-DNOSP 212)	Control rack Position	Number of revolutions of the pump
	12.0 mm (0.47280) in	1,500 r.p.m.
	12.6 (0.49644)	750
	10.0 (0.39400)	1,800
	About 6.8 (0.26808)	300

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
	13.3 kg (29.3) lb		
	49.5 mm (1.9503) in		
		Replace ring.	
Less than 1.0 mm (0.0394) in	1.5 mm (0.0591) in		
0.02~0.08 mm (0.0008~0.00315) in		Replace control sleeve	
0.06 (0.00236)	0.15 (0.0059)	Replace the rack.	
Less than 150 g (5.29) oz			
Volumes of injection per 1 cylinder	Non-uniformly	Remark	
45.6 cc/min (2.7907) in ³ /min	3.04 cc/100 stroke (0.1805) in ³ /100st	±2.5 %	○
25.1 (1.5361)	3.34 (0.2044)	±4.0	
40.5 (2.4786)	2.25 (0.1377)	±4.5	
2.4 (0.1469)	0.8 (0.0489)	±14.0	
Volumes of injection per 1 cylinder	Non-uniformly	Remark	
59.1 cc/min (3.6169) in ³ /min	3.94 cc/100st (0.2411) in ³ /100st	±2.5 %	
30.4 (1.8605)	4.05 (0.2479)	±4.0	
56.2 (3.4394)	3.12 (0.1909)	±4.5	
2.4 (0.1469)	0.8 (0.0490)	±14.0	

Items to be Inspected	Nominal Dimensions	Values Requiring Service
	Control rack Position	Number of revolutions of the pump
Volume of injection (The nozzle valve opening pressure : 120 kg/cm ² ; DL 200 (1706) PSI nozzle type : N-DNOSD 211)	12.0 mm (0.4728) in	1,500 r.p.m.
	12.6 (0.4964)	750
	10.0 (0.3940)	1,800
	About 7.5 (0.29530)	300
	Control rack Position	Number of revolutions of the pump
Volume of injection (The nozzle valve opening pressure is 120 kg/cm ² DL 201 (1706) SPI nozzle type N-DN4SD24)	12.0 mm	1,500 r.p.m.
	12.6	750
	10.0	1,800
	About 7.5	300

Governor

Pneumatic type (Inspect position of the fuel adjusting rod of the fuel injection pump when fuel injection pump is operated at 500 r.p.m. and the negative pressure is varied by vacuum pump.)

Performance N-EP/MZ60A17NP 12d type	C 180	Effective start of the torque spring
		Effective end of the torque spring
		Effective start of the main spring
		Effective end of the main spring
Performance NP-EP/MZ60A 47NP 24d	C 220	Effective start of the torque spring
		Effective end of the torque spring
		Effective start of the main spring
		Effective end of the main spring
		No load maximum revolution spring

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
Volumes of injection per 1 cylinder	Non-uniformity	Remark	
53.7 cc/min (3.276) in ³ /min	3.58 cc/100stroke (0.218) in ³ /100st	± 2.5 %	
27.3 (1.665)	3.64 (0.222)	± 4.0	
48.6 (2.965)	2.7 (0.165)	± 4.5	
2.4 (0.146)	0.8 (0.049)	± 14.0	
Volumes of injection per 1 cylinder	Non-uniformity	Remark	
53.7 cc/min	3.58 cc/100st	± 2.5 %	
27.2	3.62	± 4.0	
49.7 (3.033)	2.76 (0.168)	± 4.5	
2.4	0.8	± 14.0	
Negative pressure	Control rack position		
35 mm Aq (1.379) in Aq	12.8 mm (0.5043) in		Spring constant of governor main spring : 90 gr/mm (0.1241) oz/in
360 (14.184)	11.7 (0.4610)		
385~425 (15.169~16.745)	11.7		
570~650 (25.610~25.61)	7.3 (0.2876)		
Negative pressure	Control rack position		
95~155 mm Aq (3.743~5.007) in Aq	12.7 (0.5004)		Free length of governor main spring 47.5 mm (1.8715) in
About 280 (13.73)	12.0 (0.4728)		
525~565 (20.685~22.281)	12.0		Spring constant of governor main spring : 90 gr/mm (0.1241) oz/in
761~851 (29.981~33.5294)	6.5 (0.2561)		
About 1,280 (50.162)	6.5		

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Performance N-EP/MZ60 AN15d	DL 200	Effective start of the torque spring Effective end of the torque spring Effective start of the main spring Effective end of the main spring No load maximum revolution spring

Performance NP-EP/MZ60A47NP4d	DL 201	Effective start of the torque spring Effective end of the torque spring Effective start of the main spring Effective end of the main spring No load maximum revolution number
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Performance NP-EP/MZ60A47NP8d	DL 201	Effective start of the torque spring Effective end of the torque spring Effective start of the main spring Effective end of the main spring No load maximum revolution number
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Mechanical type

	Governor type
Performance DL 200 DL 201	N-EP/RSV 350~1,300 AIA301NP37 Adjusting limit : 350~750 r.p.m.

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
Negative pressure	Control rack position		
90~130 mm Aq (3.546~5.122) in Aq	12.6 mm (0.4964) in		Spring constant of governor main spring : 35 gr/mm (0.0483) oz/in
225~285 (8.865~11.2290)	12.0 (0.4728)		
530~560 (20.882~22.064)	12.8 (0.5043)		
600~670 (23.64~26.398)	7.5 (0.2955)		
790~930 (31.126~36.642)	7.5		

Negative pressure	Control rack position		
85~145 mm Aq (3.349~5.713) in Aq	12.6		Free length of governor main spring : 47.5 mm (1.8715) in
About 250 (9.85)	12.0		
430~470 (16.942~18.518)	12.0		Spring constant of governor main spring : 90 gr/mm (0.1241) oz/in
765~855 (30.141~33.687)	5.0 (0.0197)		
About 1,100 (43.34)	5.0		

Negative pressure	Control rack position		
85~145 mm Aq	12.6		Free length of governor main spring : 48.5 mm (1.9109)
About 250	12.0		
560~600 (22.064~23.64)	12.0		Spring constant of governor main spring : 90 gr/mm (0.1241) oz/in
890~985 (35.066~38.809)	5.0		
About 1,210 (47.674)	5.0		

Adjusting part	Control rack position	Number of revolution of the pump
Full load stopper	12.0 mm (0.4728) in	700 r.p.m.
Maximum speed stopper	10.5 (0.4137)	750
No load maximum revolution number	About 6.8 (0.2679)	755~785

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Performance	DL 200	N-EP/RSV 350~1,300 AIA301NP37
	DL 201	Adjusting limit : 350~900 r.p.m.
		N-EP/RSV 350~1,450 AQ 2A301NP39
		Adjusting limit : 350~1,100 r.p.m.

Injection timing regulator (Automatic timer)

			Number of revolution of the pump
C 180	.....	NP-EP/SCD 500 ~1,250A5L	500 r.p.m.
			600
			700
			800
			900
			1,000
			1,100
			1,200
			1,250
Operation of the injection timing regulator			
C 220	.....	NP-EP/SCD 600 ~1,400A 3.5L	500
			600
			700
			800
			900
			1,000
			1,100
			1,200
			1,300
1,400			
			1,350~1,400

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
Full load stopper	12.0 mm (0.4728) in	700 r.p.m.	
Maximum speed stopper	10.5 (0.4137)	900	
No load maximum revolution number	About 6.8 (0.2679)	930~940	
Full load stopper	12.0	700	
Maximum speed stopper	10.5	1,100	
No load maximum revolution number	About 6.8	1,140~1,150	

Advance angle	Advance angle direction
0	Left
0.2~1.2	
0.9~1.9	
1.6~2.6	
2.3~3.3	
2.9~3.9	
3.6~4.6	
4.3~5.3	
5.0±0.5	
0	Left
0~0.5	
0~0.7	
0.2~1.0	
0.5~1.5	
1.0~2.0	
1.5~2.5	
1.7~2.9	
2.3~3.3	
3.0~4.0	
3.5±0.5	

Advance angle direction is as when facing the engine from the front.

Items to be Inspected	Nominal Dimensions	.....	Values Requiring Service						
Operation of the injection timing regulator	DL 200	.....	N-EP/SCD 400 ~1,000A 3.5R	300	.....				
				400	.....				
				500	.....				
				600	.....				
				700	.....				
				800	.....				
				900	.....				
				1,000	.....				
				Operation of the injection timing regulator	DL 201		N-EP/SCD 600 ~1,400A 3.5L	500	
								600	
700									
800									
900									
1,000									
1,100									
1,200									
1,300									
1,400									
				1,350~1,400	.....				
Replacing the lubricating oil (Cam chamber and governor chamber)									

Fuel system (Fuel injection nozzle)

Oil-tightness of the needle valve seat part at
90 kg/cm² (1280) PSI

Oil-tightness of the needle valve shaft part in
seconds (the time required for the oil pressure
added to the nozzle to fall from the initial pressure
of 300 kg/cm² down to the pressure of from
(4266) PSI

250 kg/cm² to 200 kg/cm²)
(3555) PSI (2844) PSI

Spraying and injection (with the nozzle valve
opening pressure adjusted to 120 kg/cm²)
(1706) PSI

1. There should be no flying particles comparatively coarse as seen by the naked eyes.
2. There should be no particles flying off side wise.

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
0 0~0.6 0~1.15 0.6~1.75 1.2~2.3 1.8~2.85 2.4~3.45 3.0~4.0	Right		Advance angle direction is as when facing the engine from the front.
0 0~0.5 0~0.7 0.2~1.0 0.5~1.5 1.0~2.0 1.5~2.5 1.9~2.9 2.3~3.3 3.0~4.0 3.5±0.5	Left		
Replace the oil with the specified lubricating oil.			
When there is leakage from the seat part, correct it or replace the part.			
More than 6.0		Replace the needle valve or the valve seat.	The oil to be used is a light oil of a viscosity of 37 to 40 seconds by red- wood at 20°C.
3. No oil drop should adhere to the nozzle body when the injection is completed.			When the sound of the operation is desired to be quiet, the pressure may be 110 kg/cm ² in so for as (1564.75) PSI
4. The initial injection should be a slight intermitteat injection.		Replace any faulty nozzle.	the spray is not worse. However, the valve open- ing pressures in the same engine should be made identical.

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Electric system (Warning lamp indication)		
Operation of warning lamp or ammeter		
Electric system (Wiring)		
Loose connection, cut or damaged coating of the electric wiring		
Electric system (Dynamo) C 220, DL 200, DL 201 Armature shaft		
Bending of shaft		More than 0.1 mm (0.0039) in
Clearance between shaft and bearing		
Commutator, Hitachi (200 W): GT115-01, 07 G115-08. (300 W) GT123-01, 04		
Wear of commutator diameter	C220 Hitachi (300W) GT123-04 (for C220)	45φ mm (1.7730) in
	Hitachi (200W) ('62 & previous year models) G115-08, GT115-01, GT115-07	37φ (1.4579)
	Hitachi (300W) ('62 & subsent year models) GT123-04 (GT123-01)	45φ
Partial wear of Commutator diameter		More than 0.3 mm (0.0118) in
Depth from commutator surface to mica		More than 0.2 (0.0079)
Commutator surface		
Electric system (Dynamo) Brush		
Brush and brush spring Length of brush	C220 Hitachi (300W) GT123-04 (for C220)	16 mm (0.6304) in
	Hitachi (200W) ('62 & previous year models) G115-08, GT115-01, GT115-07	16
	Hitachi (300W) ('62 & subsent year models) GT123-04 (GT123-01)	16

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
			In case the warning lamp indication is abnormal in the normal operating speed of engine correct the electric system.
		Correct it.	
		Correct it.	
	0.2 mm (0.0079) in	Replace bearing.	
	43φ mm (1.6942) in 35 φ (1.379) 43 φ	Replace it.	
Less than 0.05 mm (0.0020) in		Correct it.	
0.5~0.8 (0.0197~0.0315)		Correct depth.	
		In case the surface is stained or damaged, correct is with an emery cloth or the like.	
	11 mm (0.4334) in 11 11	In case the correct surface of brush with commutator is not complete, in case the brush is badly worn or damaged or in case the manner of brush holder to support brush is not proper, correct it.	

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Brush and brush spring	Hitachi (300W) GT123-04 (for C220)	200 g (7.054) oz
Brush spring	Hitachi (200W) ('62 & previous year models) G115-08, GT115-01, GT115-07	600 (21.16)
Force (g)	Hitachi (300W) ('62 & subsequent year models) GT123-04 (GT123-01)	700

Electric system (Dynamo) Motoring test C 220

Standard current	Hitachi (300W) G123-04
(standard voltage : 12V)	

Electric system (Dynamo) Motoring test DL200, DL201

Standard current	Hitachi (300W) ('62 & previous year models) GT115-08
(standard voltage : 12V)	Hitachi (200W) ('62 & previous year model) GT115-01, GT115-07
	Hitachi (300W) ('62 & subsequent year model) GT123-04, GT123-01

Electric system (Dynamo regulator) Carbon pile type, (120V, 200W, Hitachi R115-03) Performance. DL200, DL201

Adjustment of voltage regulator	Voltage at no load
(at 1700 r.p.m.)	Push up voltage

Cut-out relay	Cut-out speed r.p.m.
	Cut-out voltage
	Closed circuit reversal current

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
			In case pressure of the spring of brush is not uniform or the strength of the spring is not proper, correct it.
	4.0~6.0A		750~950 r.p.m.
	4.0~6.0A		700~900 r.p.m.
	7.0~10.0A		800~1100 r.p.m.
	4.0~6.0A		750~950 r.p.m.
14.5~15.5V			
8~10V			
less than 1300 r.p.m.			Defects at the contact point of cut-out relay should be corrected : Gap at relay point ... 0.7~0.9mm (0.0276~0.0355) in
12.7~13.4V			Gap between moving piece and core 0.7~0.8 (0.0276~0.0315)
less than 5A			Gap between moving piece and yoke..... 0.4~0.5 (0.0158~0.0197)

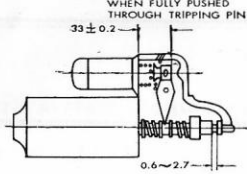
Items to be Inspected	Nominal Dimensions	Values Requiring Service
output at 80% load.		
Electric system (Regulator) Tirril type (12V 200W Hitachi T115-01, 12V 300W Hitachi T123-01), Performance. DL200, DL201		
Adjustment of voltage regulator (at 1700 r.p.m.)	voltage at no load	
Cut-out relay	Cut-out speed r.p.m. Cut-out voltage Closed circuit reversal current	
Output at 80% load		

Electric system (Regulator)
Tirril type (12V 300W Hitachi T123-09), Performance. C220

Adjustment of voltage regulator
(at 1700 r.p.m.)

voltage at no load

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
less than 1700 r.p.m.			
14~15V		Defects at the contact point of field relay should be corrected : Gap between relay point 0.4~0.5 (0.0158~0.0197) Gap between moving piece and 0.6~0.7 (0.0236~0.0276) Gap between moving piece and yoke 0.6~0.7 (0.0236~0.0276)	
less than 1300 r.p.m.		Defects at the contact point of cut-out relay should be corrected : Gap at relay points 0.6~0.7 (0.0236~0.0276) Gap between moving piece and core 0.9~1.0 (0.0355~0.0394)	
12.7~13.7V			
8 A			
less than 1700 r.p.m.			
14~15V		Defects at the contact point of voltage regulator should be corrected : Gap between relay point 0.4~0.5 (0.0158~0.0197) Gap between moving piece and core 0.6~0.7 (0.0236~0.0276) Gap between moving piece and yoke 0.9~1.0 (0.0355~0.0394)	

Items to be Inspected	Nominal Dimension	Values Requiring Service
Electric system (Starting motor)		
Nikko 24V 24 MWA	C 180	
Hitachi 12V S 12-10	C 220	
Hitachi 12V S 12-03	DL 200	
Hitachi 12V S 12-03	DL 201	
Loose fitting		
Function of the magnetic switch		
	C 180	
	C 220	
	DL 200	
	DL 201	
Distance adjusting magnetic switch		
Clearance between pinion Stopper and pinion		

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
		Correct it	
		Correct any fault	
32 ± 0.2 mm (1.2608) (0.0079) in		Measure the dimension when plunger gap is 0 by compressing plunger shaft	
33 ± 0.2 (1.3002) (0.0079)			
33 ± 0.2			
33 ± 0.2			
0.6 ~ 2.7 (0.0236 ~ 0.1063)			

Items to be Inspected	Washers	Nominal Dimension	Values Requiring Service
Electric system (Starter)			
Armature shaft			
Clearance between shaft and bearing	Front and rear cover bearing parts	C 180 14 ϕ mm (0.5516) in 16 ϕ (0.6304)	More than 0.2 mm (0.0079) in
		C 220	
		DL 200	
		DL 201	
Intermediate bearing parts		C 180 25 ϕ (0.9850)	More than 0.25 (0.0099)
		C 220	More than 0.35 (0.0138)
		DL 200	
		DL 201	
Wear of shaft		C 180	More than 0.1 (0.0039)
		C 220	
		DL 200	
		DL 201	
Bend of shaft			
Electric system (Starter)			
Commutator			
Wear of diameter of commutator		C 180 49 ϕ mm (1.9306) in	
		C 220	
		DL 200	
		DL 201	
Partial wear of diameter of commutator			More than 0.4 mm (0.0158) in
Depth from commutator surface to mica			Less than 0.2 (0.0079)
Commutator surface			

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
0.016~0.052 mm (0.0006~0.0020) in 0.03~0.1 (0.0012~0.0039) 0.07~0.141 (0.0028~0.0056) 0.15~0.25 (0.0059~0.0099)			
		Replace bush of pinion shaft	
		0.05 ϕ mm (0.0020) in	Replace shaft
Correct it			
46 ϕ mm (1.8124) in 40 ϕ (1.5760)			
		Replace commutator	
Less than 0.05 mm (0.0020) in		Correct it	
0.5~0.8 (0.0197~0.0315)		Correct it	
In case the surface is stained or damaged, correct it with an emery cloth or the like.			

Items to be Inspected		Nominal Dimension	Values Requiring Service
Electric system (Starter)			
Brush			
Length of the brush	C 180	25 mm (0.9850) in	
	C 220		
	DL 200	20 (0.7880)	
	DL 201		
Spring force in gram	C 180	900~1,100 g (31.7~38.8) oz	
	C 220		
	DL 200	900 (31.7)	
	DL 201		
Starting pinion	C 180	36.2 ϕ mm (1.4263) in	
	C 220		
	DL 200		
	DL 201		
Clearance between starting pinion and gear			
Electric system (Starter)			
Performance			
No load revolution number	C 180		
	C 220		
	DL 200		
	DL 201		
Loading torque	C 180		
	C 220		
	DL 200		
	DL 201		

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
	14 mm (0.5516) in	In case contact surface of brush with commutator is not complete, in case pressure of spring of brush is not uniform or strength of spring is not proper, in case brush is badly worn or damaged or in case manner of brush holder to support is not proper, correct it	
		When there is any remarkable wear or damage, correct it or replace pinion	
	3~6 mm (0.1182~0.2364) in		
	More than 6,000 r.p.m.	Less than 12V 50A	
	More than 6,000 r.p.m.	Less than 12V 50A	
	More than 6,000 r.p.m.	Less than 12V 50A	
	More than 1.0 m·kg (7.2334) ft·lb		
	More than 1.1 (7.957)	Less than 9V 30A	
	More than 1.1	Less than 9V 30A	
	More than 1.1	Less than 9V 30A	

Items to be Inspected	Nominal Dimension	Values Requiring Service
Revolution at loading	C 180	
	C 220	
	DL 200	
	DL 201	
Binding torque	C 180	
	C 220	
	DL 200	
	DL 201	
Electric system (Pre-heating devise)		
Control resistance, glow plug		
Electric system (Batteries)		
Terminals of battery		
Plates, separator, battery troughs, etc.		
Contamination of electrolyte		
Specific gravity of electrolyte (20°C after charging)		
Capacity in Ah (the rate of 20 hours)	C 180	
	C 220	
	DL 200	
	DL 201	
Terminal voltage (single trough)		Less than 1.8 V
Height of the level of electrolyte above plates		
Completion test		
Lapping operation of engine		

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
More than 1,500 r.p.m.			
More than 1,200			
More than 1,200			
More than 1,200			
More than 2.5 m-kg (18.0835) ft-lb			Less than 5 V 750 A
More than 2.5			Less than 5 V 750 A
More than 2.5			Less than 5 V 750 A
When there is any disconnection or shortcircuit correct it			
In case any of them is rusted or corroded, correct it			
In case any of them is damaged, correct it			
In case the contamination is remarkable, replace electrolyte			
1.26	1.20	Adjust it	The temperature coefficient is 0.007 per 10°C
12V 32AH × 2			
12V 100AH			
12V 70AH			
12V 100AH			
More than 2.1V		Charging	
Electrolyte above of the standard level		When liquid surface is low, replenish with distilled water	
Carry it on for more than 30 minutes			

Items to be Inspected	Nominal Dimensions	Values Requiring Service
Compression pressure of cylinder (at 20°C)	C 180	
	C 220	
	DL 200	
	DL 201	
Difference between compression pressures in the respective cylinders (at 20°C)	C 180	
	C 220	
	DL 200	
	DL 201	
Pressure of lubricating oil	C 180	
	C 220	
	DL 200	
	DL 201	
Output test		
Fuel consumption rate test		

Standard Values as Assembled	Limits for Use	Manners of Service	Remarks
25.2 kg/cm ² (358) PSI	}	Correct it	About 240 r.p.m.
24.3 (346)			About 250
24.3			About 250
24.3			About 250
Less than $\pm 5\%$ to the mean value			About 240 r.p.m.
			About 250
			About 250
			About 250
3~4 kg/cm ² (43~57) PSI	}	Adjust it	About 1,400 r.p.m.
4~4.5 kg/cm ² (57~64)			
3~3.5 kg/cm ² ('62 Model and before) (43~50)			
4~4.5 kg/cm ² ('63 Model and after)			
3~3.5 kg/cm ² ('62 Model and before)			
4~4.5 kg/cm ² ('63 Model and after)			
More than 90%			
More than 110%			