

SERVICE MANUAL

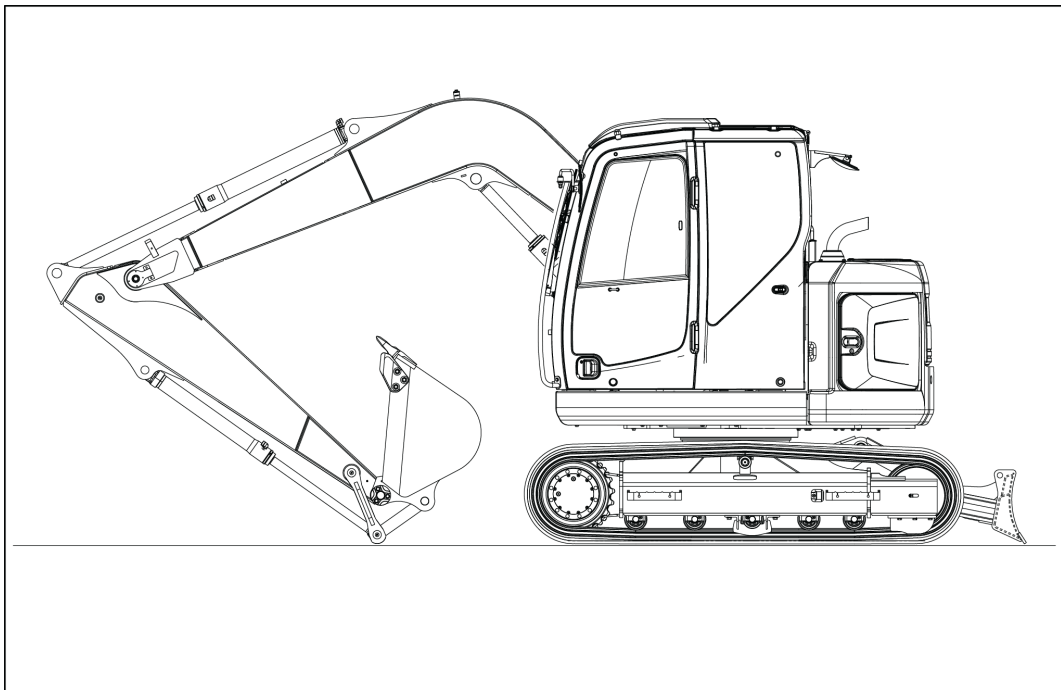
E85CMSR Midi Excavator

Part number 47516729A
English
April 2013





SERVICE MANUAL



E85CMSR

Contents

INTRODUCTION

Engine.....	10
[10.001] Engine and crankcase	10.1
[10.216] Fuel tanks	10.2
[10.202] Air cleaners and lines	10.3
[10.254] Intake and exhaust manifolds and muffler	10.4
[10.400] Engine cooling system	10.5
Hydraulic systems.....	35
[35.000] Hydraulic systems.....	35.1
[35.300] Reservoir, cooler, and filters.....	35.2
[35.106] Variable displacement pump	35.3
[35.102] Pump control valves.....	35.4
[35.304] Combination pump units	35.5
[35.359] Main control valve.....	35.6
[35.355] Hydraulic hand control	35.7
[35.356] Hydraulic foot control.....	35.8
[35.352] Hydraulic swing system	35.9
[35.353] Hydraulic travel system	35.10
[35.354] Hydraulic central joint	35.11
[35.736] Boom hydraulic system	35.12
[35.737] Dipper hydraulic system.....	35.13
[35.738] Excavator and backhoe bucket hydraulic system.....	35.14
[35.741] Dozer blade cylinders	35.15
Frames and ballasting	39
[39.101] Upper frame.....	39.1
[39.103] Swing ring assembly	39.2
[39.140] Ballasts and supports	39.3

<https://www.ebooklibonline.com>

Hello dear friend!

Thank you very much for reading.

Enter the link into your browser.

The full manual is available for immediate download.

<https://www.ebooklibonline.com>

Tracks and track suspension	48
[48.130] Track frame and driving wheels	48.1
[48.100] Tracks	48.2
[48.134] Track tension units	48.3
[48.138] Track rollers	48.4
Cab climate control	50
[50.200] Air conditioning	50.1
Electrical systems	55
[55.000] Electrical system	55.1
[55.100] Harnesses and connectors	55.2
[55.015] Engine control system	55.3
[55.201] Engine starting system	55.4
[55.302] Battery	55.5
[55.011] Fuel tank system	55.6
[55.640] Electronic modules	55.7
[55.512] Cab controls	55.8
[55.036] Hydraulic system control	55.9
[55.051] Cab Heating, Ventilation, and Air-Conditioning (HVAC) controls	55.10
[55.404] External lighting	55.11
[55.510] Cab or platform harnesses and connectors	55.12
[55.408] Warning indicators, alarms, and instruments	55.13
Booms, dippers, and buckets	84
[84.910] Boom	84.1
[84.912] Dipper arm	84.2
[84.100] Bucket	84.3
Dozer blade and arm	86
[86.110] Dozer blade	86.1
Platform, cab, bodywork, and decals	90

[90.150] Cab 90.1

[90.160] Cab interior trim and panels 90.2

[90.120] Mechanically-adjusted operator seat 90.3

[90.105] Machine shields and guards 90.4

[90.116] Fenders and guards 90.5



INTRODUCTION

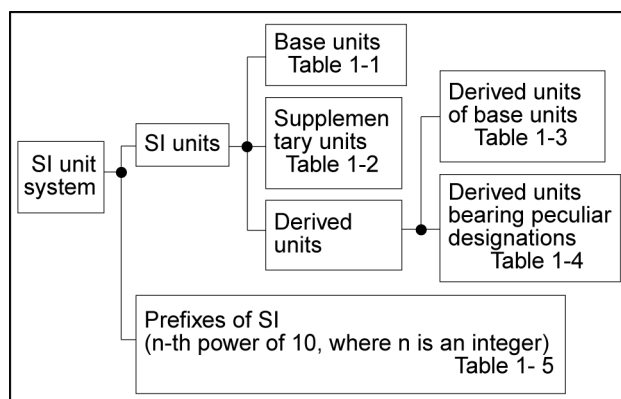
International symbols

Introduction

Although this manual uses the SI units system. Outline of SI units system is described here.

Given here in under are an excerpt of the units that are related to this manual :

1. Etymology of SI Units
English : International system of units
2. Construction of SI unit system



TULI12EXM0626AB 1

Basic units

Table1-1

Quantities	Designation	Sign
Length	Meter	m
Mass	Kilogram	kg
Time	Second	s
Current	Ampere	A
Thermodynamic temperature	Kelvin	K
Gram molecule	Mol	mol
Luminous intensity	Candela	cd

Supplementary units

Table1-2

Quantities	Designation	Sign
Plain angle	Radian	rad
Solid angle	Steradian	sr

Derived units of basic units

Table1-3

Quantities	Designation	Sign
Area	Square meter	m ²
Volume	Cubic meter	m ³
Velocity	Meter per second	m/s
Acceleration	Meter per second/second	m/s ²
Density	Kilogram per cubic meter	kg/m ³

Derived units bearing peculiar designations

Table1-4

Quantities	Unit	Symbol	Formula
Frequency	Hertz	Hz	1Hz = 1/s
Force	Newton	N	kg • m/s ²
Pressure and stress	Pascal	Pa	N/m ²
Energy, work and quantity of heat	Joule	J	N•m
Power	Watt	W	J/s
Quantity of electricity	Coulomb	C	A•s
Electric potential difference, voltage, and electromotive force	Volt	V	W/A

INTRODUCTION

Quantities	Unit	Symbol	Formula
Quantity of static electricity and electric capacitance	Farad	F	C/V
Electric resistance	Ohm	Ω	V/A
Celcius temperature	Celcius degree or degree	$^{\circ}\text{C}$	$(t+273.15)\text{K}$
Illuminance	Lux	lx	l m/m ²

Prefixes of SI

Table1-5

Prefix		Power
Designation	Sign	
Giga	G	10 ⁹
Mega	M	10 ⁶
Kilo	k	10 ³
Hecto	h	10 ²
Deca	da	10
Deci	d	10 ⁻¹
Centi	c	10 ⁻²
Milli	m	10 ⁻³
Micro	μ	10 ⁻⁶
Nano	n	10 ⁻⁹
Pico	p	10 ⁻¹²

Unit conversion table

Table1-6

Quantities	JIS	SI	Remarks
Mass	kg	kg	
Force	kgf	N	1 kgf = 9.807 N
Torque	kgm	N·m	1 kgm = 9.807 N·m
Pressure	Kg/cm ²	MPa	1 Kg/cm² = 0.09807 MPa
Motive power	PS	kW	1PS = 0.7355 kW
Revolution	RPM	min ⁻¹	1 RPM = 1 min⁻¹

Safety rules

ATTENTION: Do not operate or perform any maintenance on this machine until all instructions found in the OPERATOR'S MANUAL and this MANUAL have been thoroughly read and understood. Improper operation or maintenance of this machine may cause accidents and could result in serious injury or death. Always keep the manual in storage.

If it is missing or damaged, place an order with an authorized our Distributor for a replacement. If you have any questions, please consult an authorized our Distributor.

1. Most accidents, which occur during operation, are due to neglect of precautionary measures and safety rules. Sufficient care should be taken to avoid these accidents. Erroneous operation, lubrication or maintenance services are very dangerous and may cause injury or death of personnel. Therefore all precautionary measures, NOTES, DANGERS, WARNINGS and CAUTIONS contained in the manual and on the machine should be read and understood by all personnel before starting any work with or on the machine.
2. Operation, inspection, and maintenance should be carefully carried out, and safety must be given the first priority. Messages of safety are indicated with marks. The safety information contained in the manual is intended only to supplement safety codes, insurance requirements, local laws, rules and regulations.
3. Messages of safety appear in the manual and on the machine : All messages of safety are identified by either word of "DANGER", "WARNING" and "CAUTION".



1. Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury and is represented as follows:
2. Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury and is represented as follows:
3. Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against possible damage to the machine and its components and is represented as follows:
4. It is very difficult to forecast every danger that may occur during operation. However, safety can be ensured by fully understanding proper operating procedures for this machine according to methods recommended by Manufacturer.
5. While operating the machine, be sure to perform work with great care, so as not to damage the machine, or allow accidents to occur.
6. Continue studying the manual until all Safety, Operation and Maintenance procedures are completely understood by all persons working with the machine.

Safety precautions

ATTENTION: *The proper and safe lubrication and maintenance for this machine, recommended by Manufacturer, are outlined in the OPERATOR'S MANUAL for the machine.*

Improper performance of lubrication or maintenance procedures are dangerous and could result in injury or death. Read and understand the MANUAL before performing any lubrication or maintenance.

The serviceman or mechanic may be unfamiliar with many of the systems on this machine. This makes it important to use caution when performing service work. A knowledge of the system and or components is important before the removal or disassembly of any component.

Because of the size of some of the machine components, the serviceman or mechanic should check the weights noted in this manual. Use proper lifting procedures when removing any components.

The following is a list of basic precautions that must always be observed.

1. Read and understand all Warning plates and decal on the machine before Operating, Maintaining or Repairing this machine.
2. Always wear protective glasses and protective shoes when working around machines. In particular, wear protective glasses when using hammers, punches or drifts on any part of the machine or attachments. Use welders gloves, hood/goggles, apron and the protective clothing appropriate to the welding job being performed. Do not wear loose fitting or torn clothing. Remove all rings from fingers, loose jewelry, confine long hair and loose clothing before working on this machinery.
3. Disconnect the battery and hang a "Do Not Operate" tag in the Operators Compartment. Remove ignition keys.
4. If possible, make all repairs with the machine parked on a firm level surface. Block the machine so it does not roll while working on or under the machine. Hang a "Do Not Operate" tag in the Operators Compartment.
5. Do not work on any machine that is supported only by lift, jacks or a hoist. Always use blocks or jack stands, capable of supporting the machine, before performing any disassembly.

ATTENTION: *Do not operate this machine unless you have read and understand the instructions in the OPERATOR'S MANUAL. Improper machine operation is dangerous and could result in injury or death.*

6. Relieve all pressure in air, oil or water systems before any lines, fittings or related items are disconnected or removed. Always make sure all raised components are blocked correctly and be alert for possible pressure when disconnecting any device from a system that utilizes pressure.
7. Lower the bucket, dozer, or other attachments to the ground before performing any work on the machine. If this cannot be done, make sure the bucket, dozer, ripper or other attachment is blocked correctly to prevent it from dropping unexpectedly.
8. Use steps and grab handles when mounting or dismounting a machine. Clean any mud or debris from steps, walkways or work platforms before using. Always face to the machine when using steps, ladders and walkways. When it is not possible to use the designed access system, provide ladders, scaffolds, or work platforms to perform safe repair operations.
9. To avoid back injury, use a hoist when lifting components which weigh 20kg (45lbs) or more. Make sure all chains, hooks, slings, etc., are in good condition and are the correct capacity. Be sure hooks are positioned correctly. Lifting eyes are not to be side loaded during a lifting operation.
10. To avoid burns, be alert for hot parts on machines which have just been stopped and hot fluids in lines, tubes and compartments.
11. Be careful when removing cover plates. Gradually back off the last two capscrews or nuts located at opposite ends of the cover or device and carefully pry cover loose to relieve any spring or other pressure, before removing the last two capscrews or nuts completely.
12. Be careful when removing filler caps, breathers and plugs on the machine. Hold a rag over the cap or plug to prevent being sprayed or splashed by liquids under pressure. The danger is even greater if the machine has just been stopped because fluids can be hot.
13. Always use the proper tools that are in good condition and that are suited for the job at hand. Be sure you understand how to use them before performing any service work.
14. Reinstall all fasteners with the same part number. Do not use a lesser quality fastener if replacements are necessary.
15. Repairs which require welding should be performed only with the benefit of the appropriate reference information and by personnel adequately trained and knowledgeable in welding procedures. Determine type of metal

INTRODUCTION

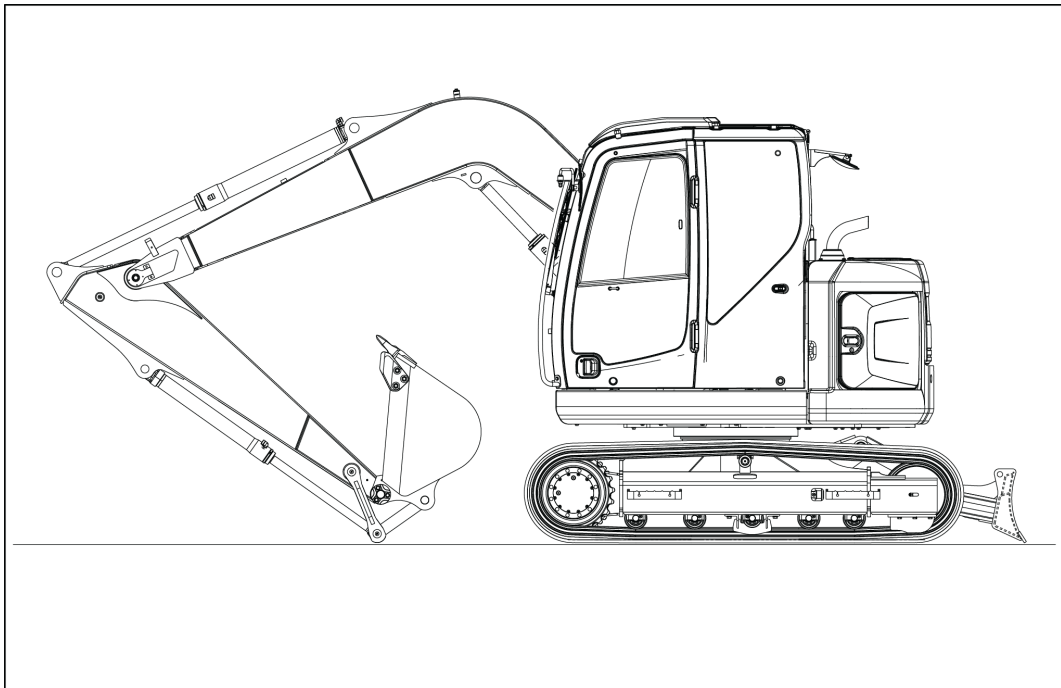
being welded and select correct welding procedure and electrodes, rods or wire to provide a weld metal strength equivalent at least to that of the parent metal. Make sure to disconnect battery before any welding procedures are attempted.

16. Do not damage wiring during removal operations. Reinstall the wiring so it is not damaged nor will be damaged in operation of the machine by contacting sharp corners, or by rubbing against some object or hot surface. Do not connect wiring to a line containing fluid.
17. Be sure all protective devices including guards and shields are properly installed and functioning correctly before starting a repair. If a guard or shield must be removed to perform the repair work, use extra caution and replace the guard or shield after repair is completed.
18. The maintenance and repair work while holding the bucket raised is dangerous due to the possibility of a falling attachment. Don't fail to lower the attachment and place the bucket to the ground before starting the work.
19. Loose or damaged fuel, lubricant and hydraulic lines, tubes and hoses can cause fires. Do not bend or strike high pressure lines or install ones which have been bent or damaged. Inspect lines, tubes and hoses carefully. Do not check for leaks with your hands. Very small (pinhole) leaks can result in a high velocity oil stream that will be invisible close to the hose. This oil can penetrate the skin and cause personal injury. Use card-board or paper to locate pinhole leaks.
20. Tighten connections to the correct torque. Make sure that all heat shields, clamps and guards are installed correctly to avoid excessive heat, vibration or rubbing against other parts during operation. Shields that protect against oil spray onto hot exhaust components in event of a line, tube or seal failure must be installed correctly.
21. Do not operate a machine if any rotating part is damaged or contacts any other part during operation. Any high speed rotating component that has been damaged or altered should be checked for balance before reusing.
22. Be careful when servicing or separating the tracks (crawlers). Chips can fly when removing or installing a track (crawlers) pin. Wear safety glasses and long sleeve protective clothing. Tracks (crawlers) can unroll very quickly when separated. Keep away from front and rear of machine. The machine can move unexpectedly when both tracks (crawlers) are disengaged from the sprockets. Block the machine to prevent it from moving.



SERVICE MANUAL

Engine



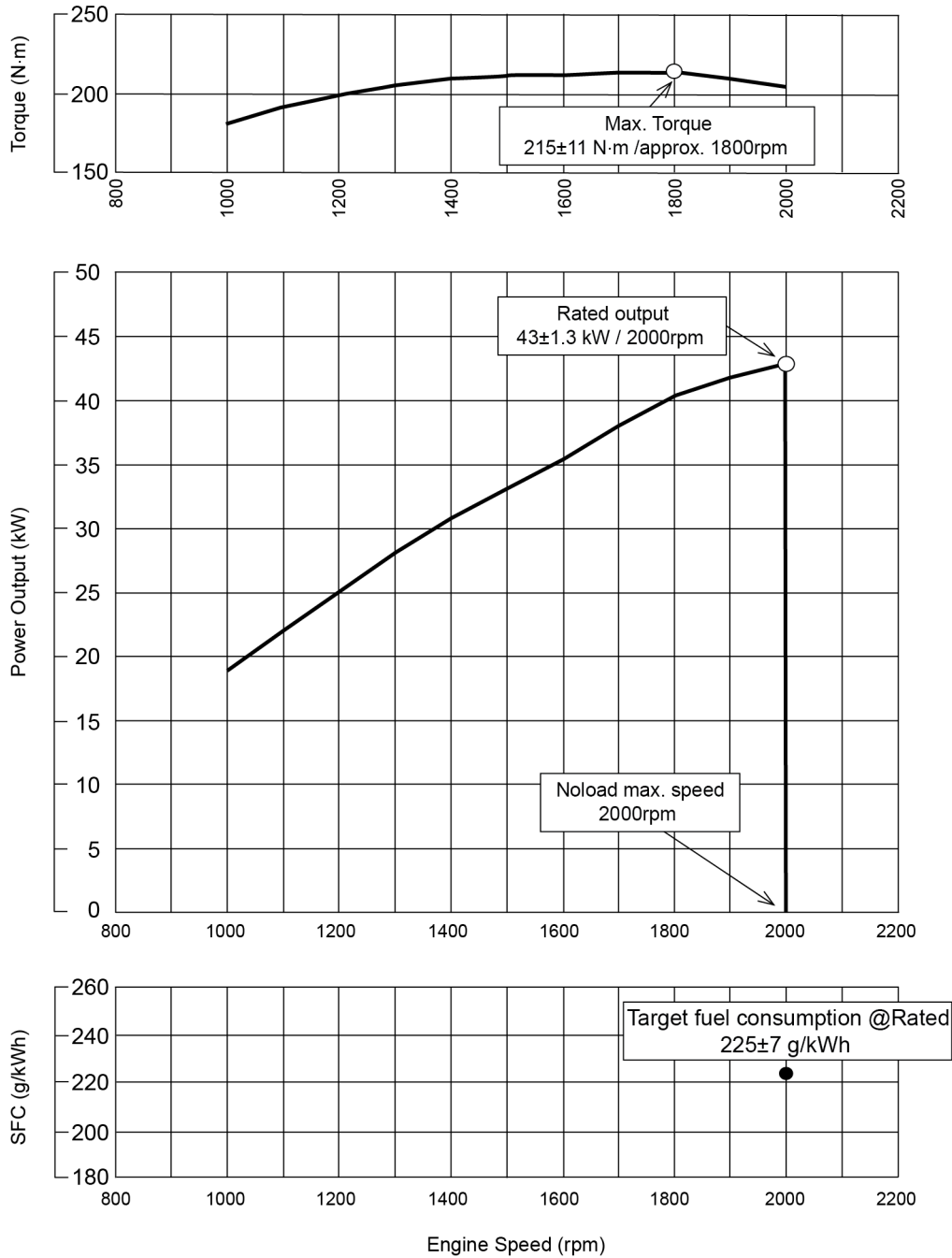
E85CMSR

Engine - General specification

Engine model		ISUZU 4LE2X-S		
Type		Water-cooled, 4-cycle, direct injection type diesel engine with inter cooler turbo-charger		
Number of cylinder-bore X stroke		4-85 mm (3.35 in) X 96 mm (3.78 in)		
Total displacement		2179 cm ³ (133 in ³)		
Compression ratio		17.6		
Rated out put		net 42 kW (57 Hp) / 2000 RPM		
Maximum torque		211 N·m (156 lb ft) / 1800 RPM		
High idling		2000 RPM		
Low idling		1000 RPM		
Thermostat action		Start 82 °C (180 °F) / Full open 95 °C (203 °F)		
Firing order		1-3-4-2		
Compression pressure		3.04 MPa (441 psi) at 200 RPM		
Fuel injection timing		Electronic control type		
Valve clearance		Valve clearance	Open	Close
	Intake valve	0.4 mm (0.016 in) in cold condition	15 ° before top dead point	29 ° after bottom dead point
	Exhaust valve	0.4 mm (0.016 in) in cold condition	40 ° before top dead point	16 ° after top dead point
Starter capacity		3.2 kW X 24 V		
Generator capacity (alternator)		50 A X 24 V		
Cooling fan drive method		475 dia. (18.7 in) suction type seven fans V-belt drive, pulley ratio Crank / Fan=1.12		
Engine oil quantity	Full level	Max: 11.0 l (2.9 US gal), Min: 8.0 l (2.1 US gal)		
	Oil pan only	Max: 10.4 l (2.7 US gal), Min: 7.3 l (1.9 US gal)		
Dry weight		Approx. 217 kg (478 lb)		
Fuel consumption ratio		225 g/kWh (225 g/kWh)		
Allowable inclination		Front / Rear and Right / Left: 35 °		
Dimension (L X W X H)		739 mm (29 in) X 601 mm (24 in) X 771 mm (30 in)		
Rotating direction		Counterclockwise seeing from flywheel side		

Engine characteristic curve (ISUZU 4LE2X-S)

Condition to be measured : Without fan



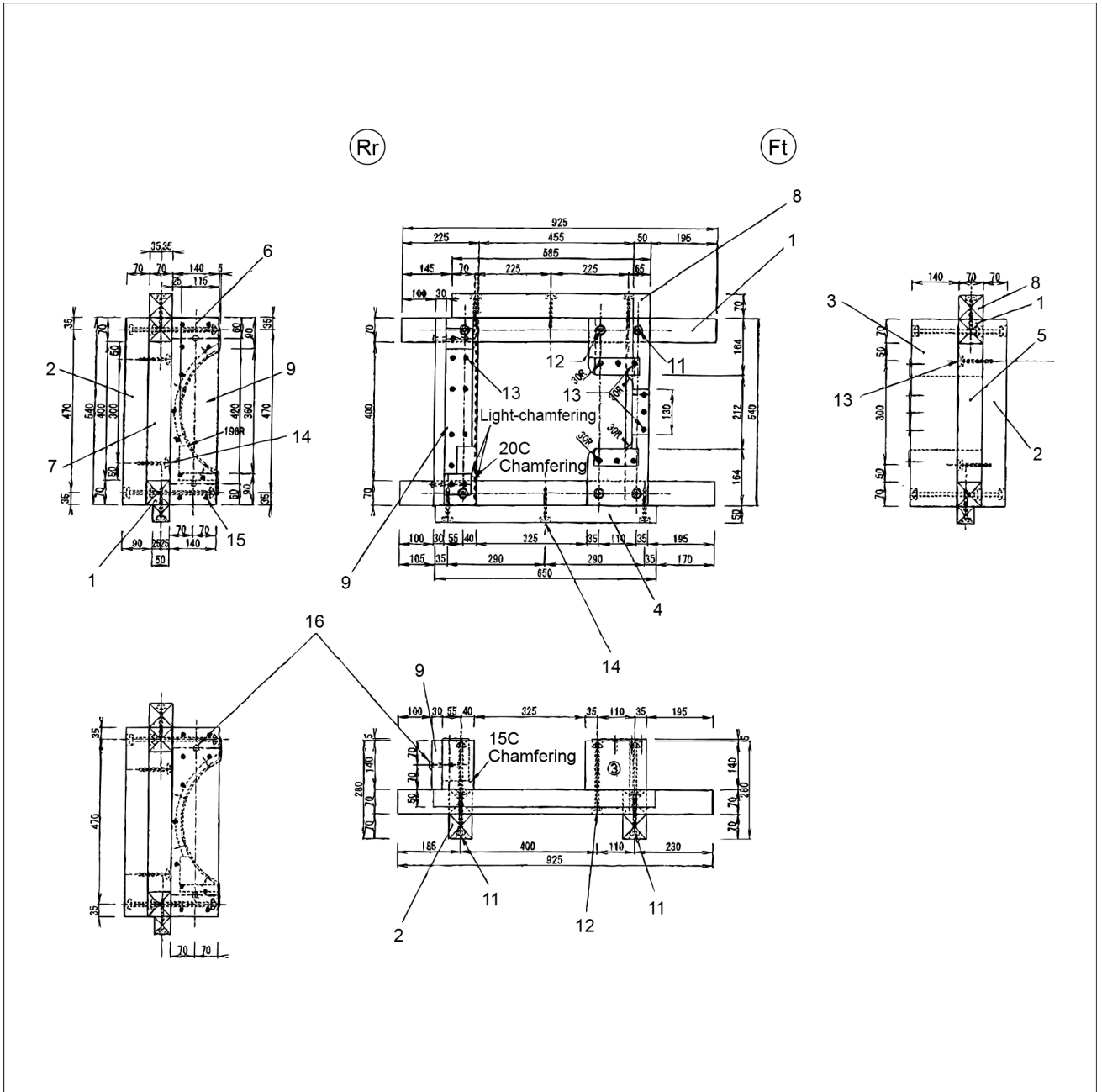
$$\begin{aligned}
 \text{Fuel consumption volume} &= \frac{\text{Fuel consumption rate}}{0.835 \times 1000} \times \text{KW} \times \text{Load factor } (\alpha) \\
 &= \frac{225\text{g/KW}\cdot\text{h}}{0.835 \times 1000} \times 43 \text{ KW} \times (\alpha) \\
 &= 11.6 \alpha \text{ L/h}
 \end{aligned}$$

α : Standard load factor (0.60 ~0.70)

Fuel consumption in regular operation
(load factor : 0.60 ~0.70)
7.0 ~8.1 L/h

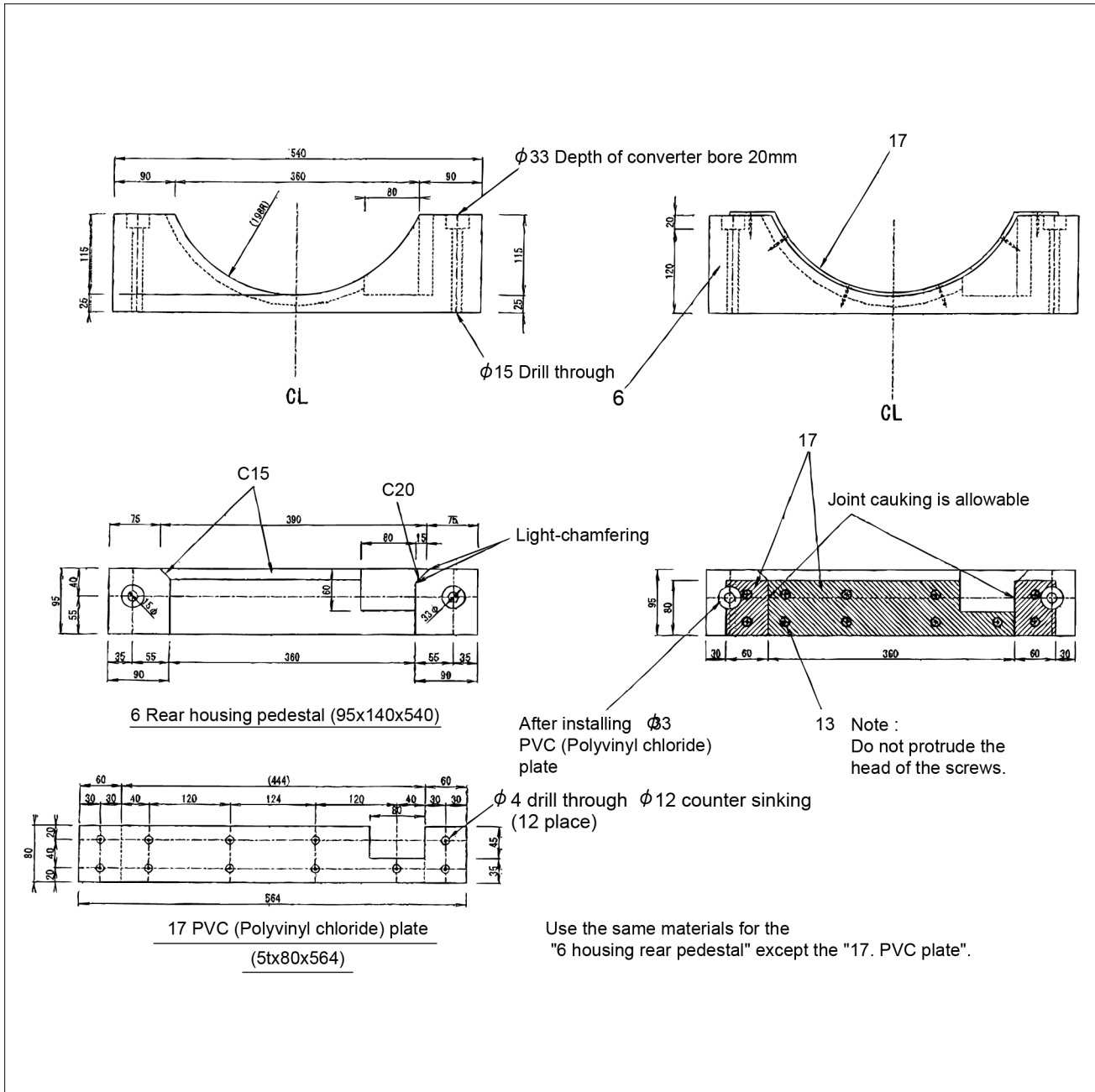
Engine - Special tools

Engine mounting pedestal



SMIL13CEX1880GA 1

Rear housing pedestal (17. PVC plate is proved)





Suggest:

If the above button click is invalid.

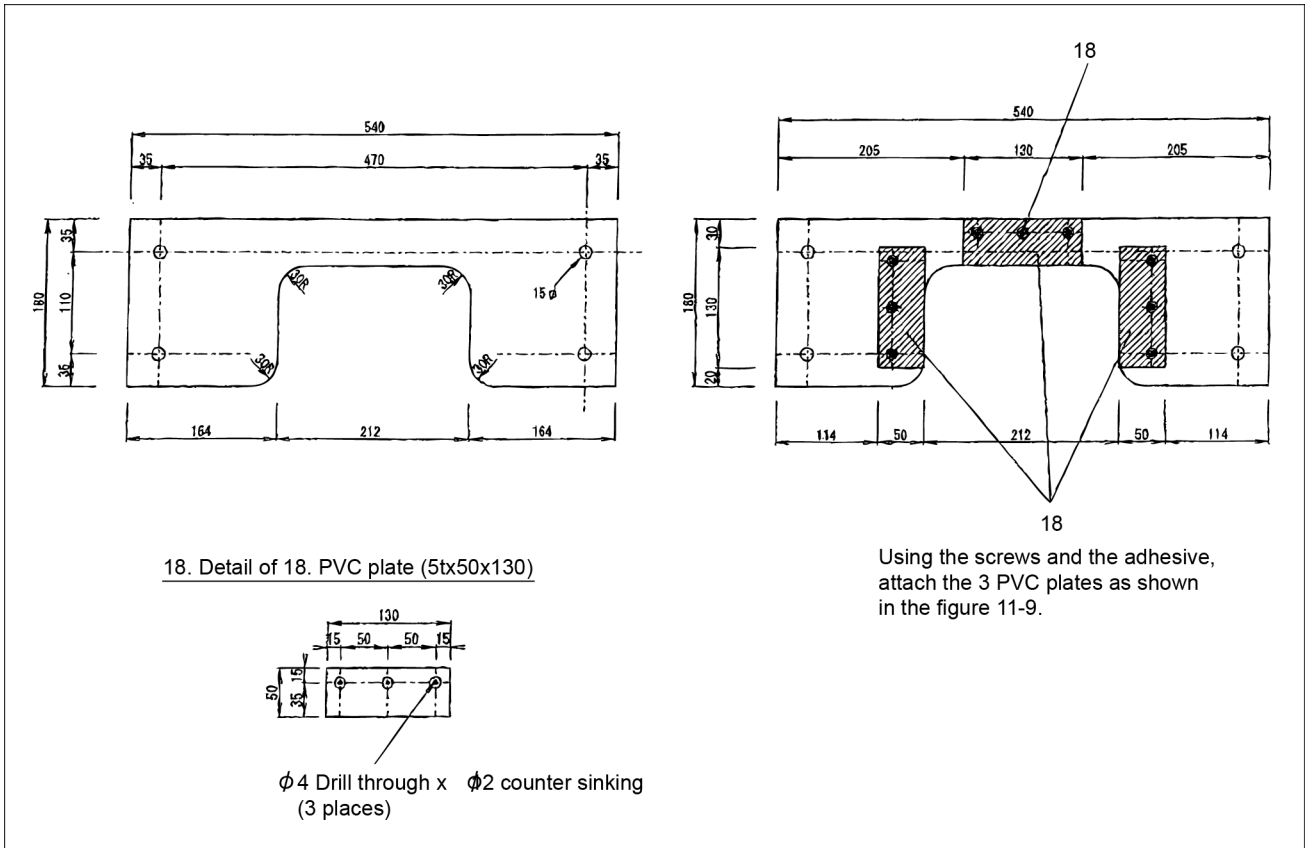
Please download this document

first, and then click the above link

to download the complete manual.

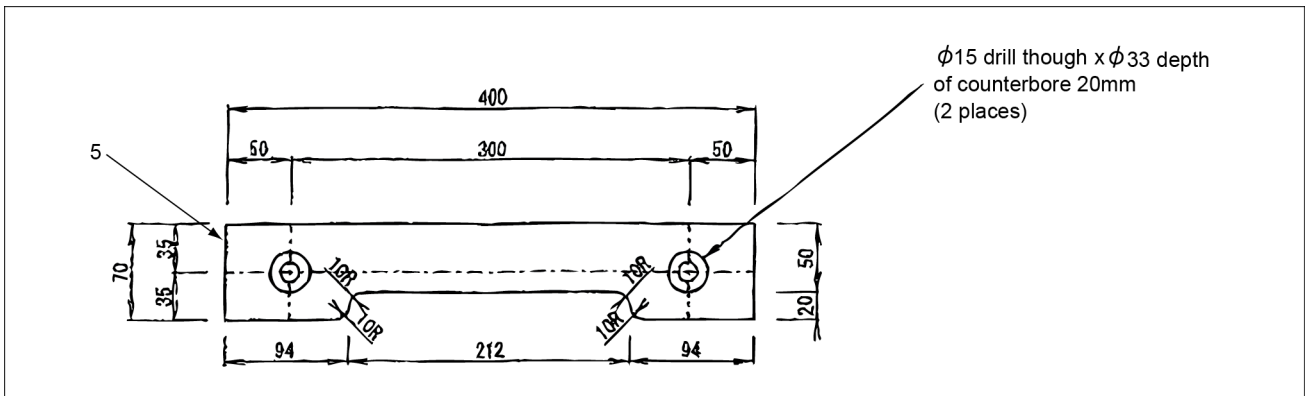
Thank you so much for reading

Front oil pan pedestal (140X180X540)



SMIL13CEX1882FA 3

Detail of front sandwich bar (70X70X400)



SMIL13CEX1883EA 4

<https://www.ebooklibonline.com>

Hello dear friend!

Thank you very much for reading.

Enter the link into your browser.

The full manual is available for immediate download.

<https://www.ebooklibonline.com>