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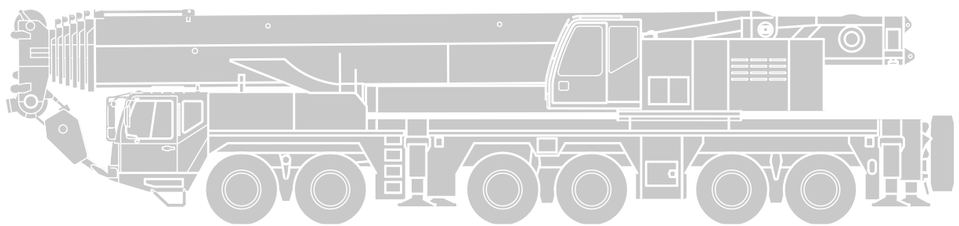
OPERATOR’S MANUAL FOR TRUCK CRANE

TRUCK CRANE OPERATOR’S MANUAL



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ZLJ5420JQZ55V TRUCK CRANE

OPERATOR'S MANUAL

Edition 1 03, 2013

Foreword

Thank you for purchasing our product. Do read, understand and master the recognized safety technical regulations prior to operating the crane.

This manual introduces the safety instructions, technical data and safety operation of truck crane with intent to safely operate the crane for users and optimize the working performance of truck crane during operation. Always keep this manual handy in the driver's or operator's cab.

This manual must be read and understood by all persons who are involved in operation and maintenance of the crane. If there are any questions, please contact service engineer of our company. Our company assumes no liability for your operation of the crane not in terms of this manual.

The operator's manual belongs to the crane. If you transfer the ownership of this crane, the operator's manual should be given to the new users.

Our product and technical documents are subject to technical improvements and will change without notice. Therefore, please acquaint yourself with our latest technology information. These operating instructions have been translated to be best of one's knowledge. Zoomlion assumes no liability for translation errors.

The Chinese version of the operating instructions is solely applicable for factual accuracy. If you find any errors or if any misunderstanding arises when reading these operating instructions, please contact Zoomlion immediately.

Thank you for your trust and support to Zoomlion.

Safety Instruction

The following terms that are used in these operating instructions "Danger", "Warning", "Caution", "Careful", "Note" and "Important" are intended to point out certain important rules of conduct to all persons who work with the crane. The meanings of the terms are as follows:

The term "DANGER" is used to provide a warning about life-threatening hazards.

The term "WARNING" is used to provide a warning about potentially serious personal injury or damage to property.

The term "CAUTION" is used to provide a warning about potential minor or medium personal injury, or damage to machinery or parts.

The term "CAREFUL" is used to provide a warning about damage to property.

The term "NOTE" is used to draw attention to certain matters.

The term "IMPORTANT" is used to highlight certain matters.

The term is used to forbid certain operations which are not conformed to safety regulations. They may lead to life-threatening hazards.

Contents

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OPERATOR’S MANUAL FOR TRUCK CRANE

Chapter 1 Description of crane

1.1 Model and name plates

1.1.1 Model

Model in auto industry: ZLJ5420JQZ55V

Model in engineering industry: QY55V

Chassis model: ZLJ5422JQZ

1.1.2 Name plates

For name plate of the crane, please refer to Fig. 01 – 01.

For name plate of the chassis, please refer to Fig. 01 – 02.

Fig. 01 – 01

Fig. 01 – 02

1.1.3 Name plate installation locations

The name plates of crane and chassis are respectively installed on the right side of operator's cab and the right longitudinal beam of chassis frame. For their exact installation locations, please refer to Fig. 01 – 03 and Fig. 01 – 04 respectively.

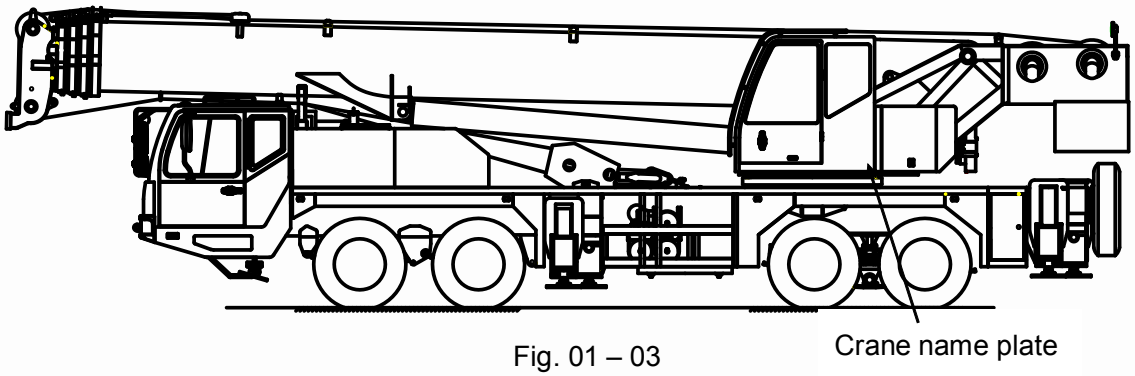


Fig. 01 – 03

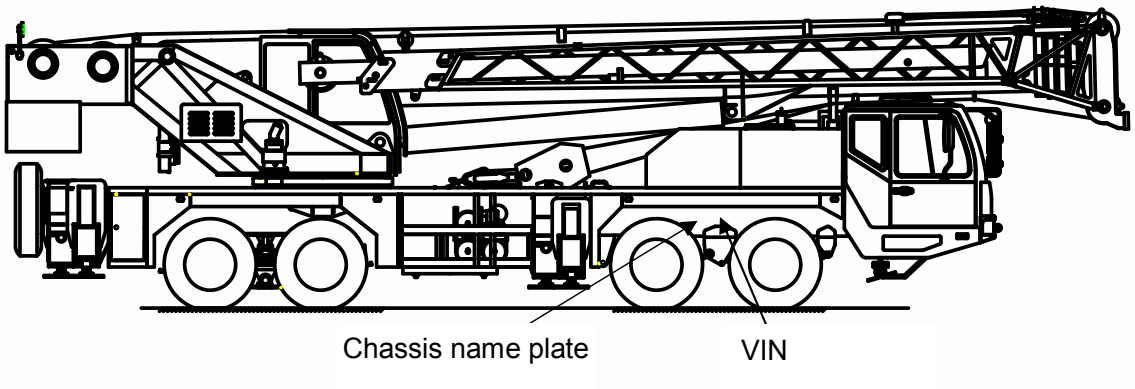


Fig. 01 – 04

1.1.4 Vehicle identification number (VIN) and its locations

The VIN of ZLJ5420JQZ55V truck crane is L5E5H4D3××A××××××, and is stamped in the crane name plate, chassis name plate and right longitudinal beam of chassis frame. For the details, please refer to Fig. 01 – 04.

1.1.5 Engine model and its manufacturer

Engine model: WP10.336

Manufacturer: WEICHAI POWER Co., Ltd.

1.1.6 Engine code, name plate and their locations

The engine code is stamped on the right part of engine near the gear chamber. The exact location is shown in Fig. 01 – 05.

The engine name plate is installed on the left part of engine. The exact location is shown in Fig. 01 – 06.

NOTE

Have the above data available when communicating with us.

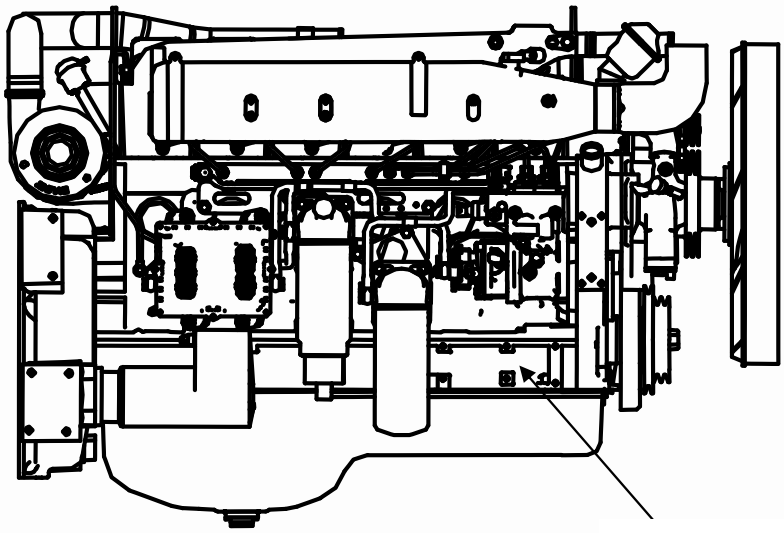


Fig. 01 – 05

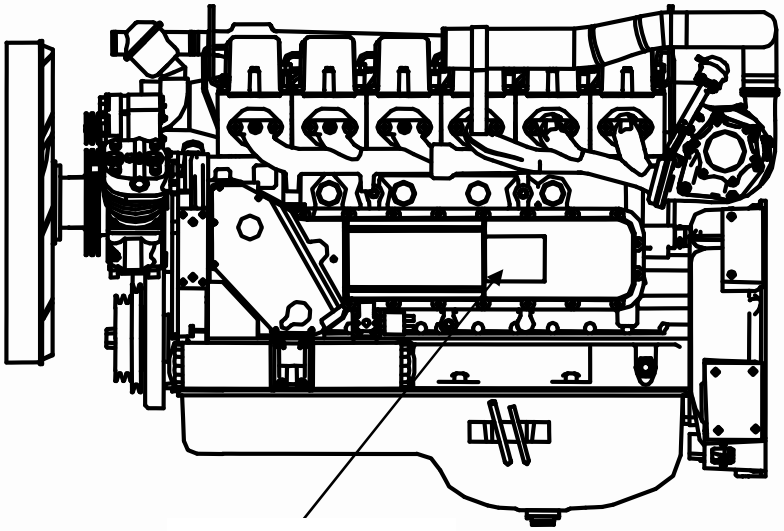


Fig. 01 – 06

1.2 Main components and configurations

1.2.1 Main components

– **Illustration of crane chassis**

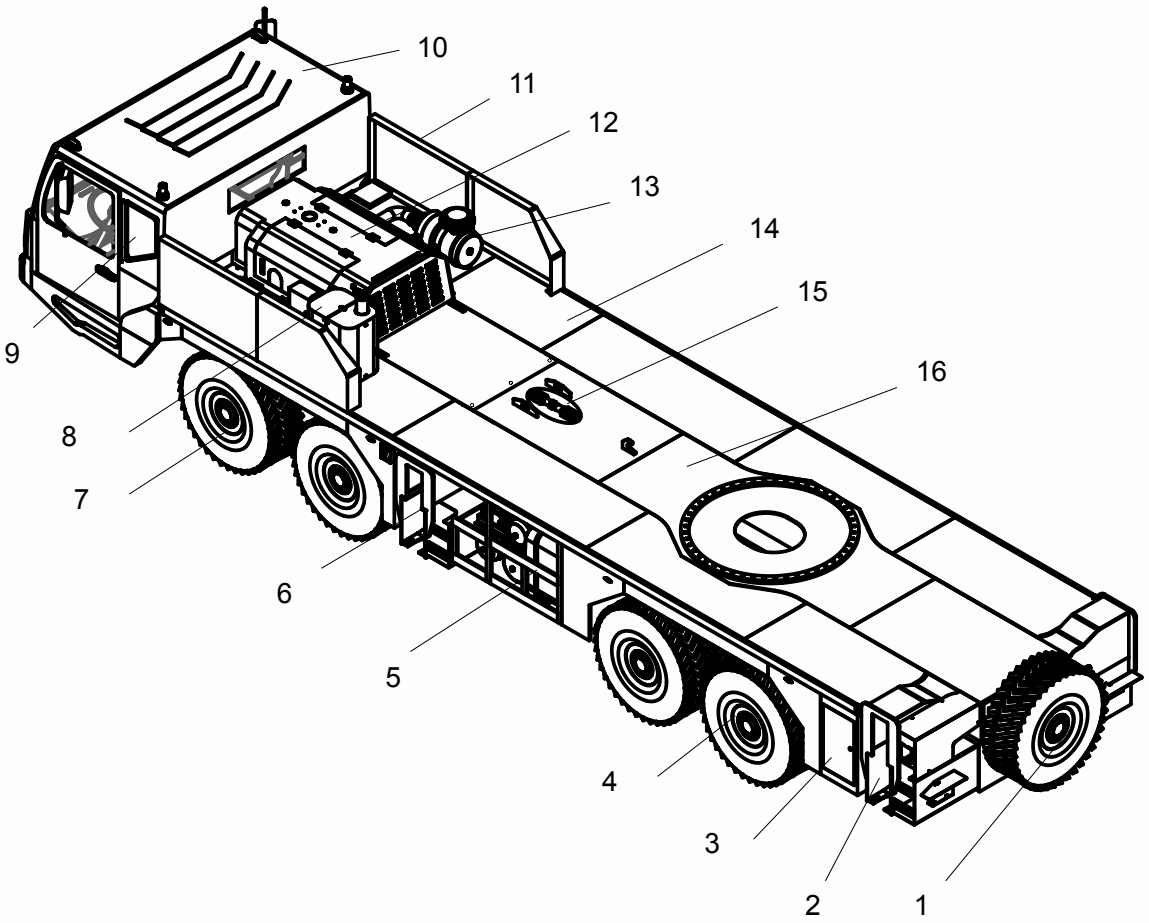


Fig. 01 – 07

1. Spare tire	2. Rear outrigger box	3. Toolbox
4. Rear axle	5. Guard rail	6. Front outrigger box
7. Front axle	8. Exhaust system	9. Clutch
10. Driver's cab	11. Wall panel	12. Engine housing
13. Air intake system	14. Platform	15. Drive shaft
16. Chassis frame assy.		

– **Illustration of complete vehicle**

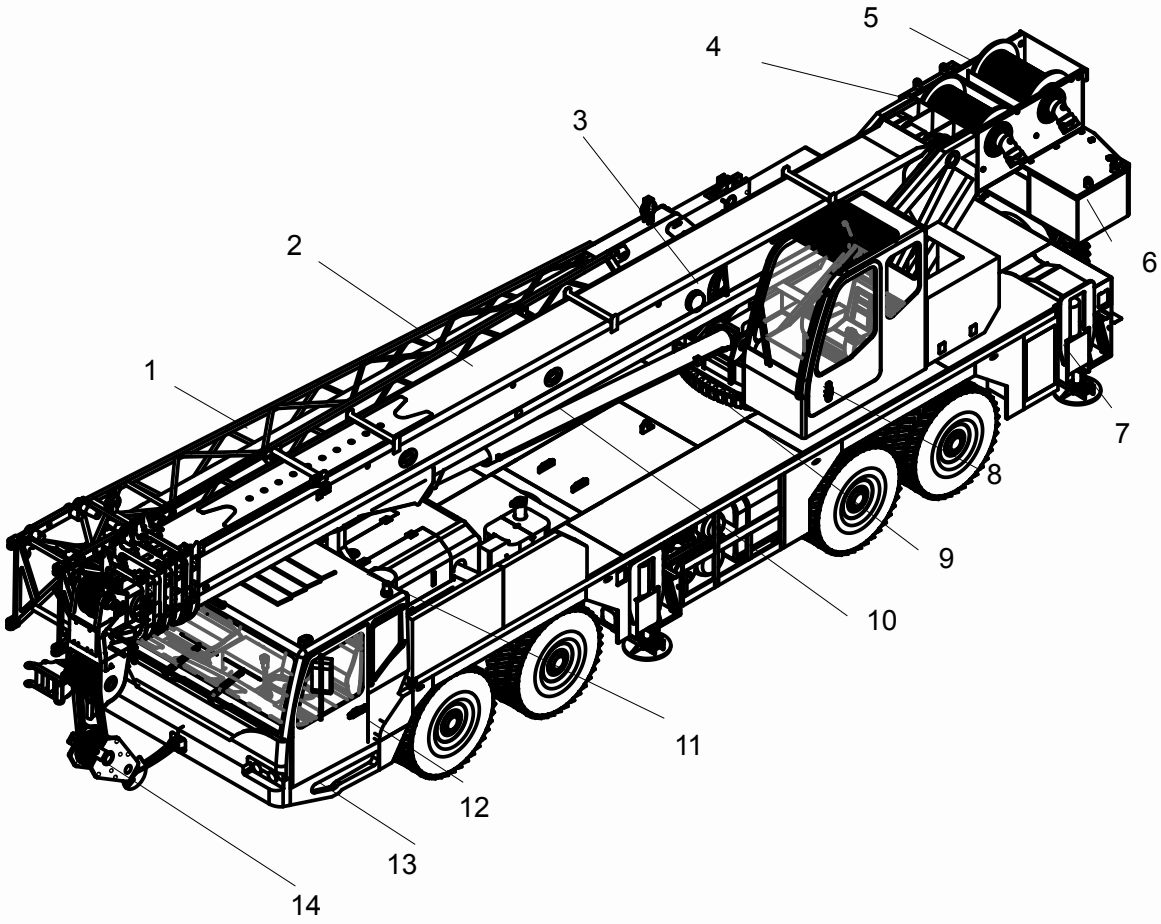


Fig. 01 – 08

1. Jib	2. Main boom	3. Angle indicator
4. Auxiliary winch	5. Main winch	6. Counterweight
7. Sliding beam	8. Operator's cab	9. Slewing gear
10. Derricking gear	11. Auxiliary hook	12. Special purpose chassis
13. The 5th outrigger	14. Main hook	

1.2.2 Product description

– **Crane chassis**

Driver's cab	Low-mounted full-width cab made of steel, with front-mounted instrument console, adjustable steering wheel, and hydraulic cushion seat with upper backrest, manually operated windows on both sides, and sun visor installed inside, providing comfortable working environment for the driver
Chassis frame	Distortion-resistant and load-bearing box-shaped structure welded from high-tensile steel
Engine	Special purpose high-pressure common-rail electron injection diesel engine for construction machinery
Clutch	Dry single-plate pull-type clutch
Transmission	9-speed mechanical transmission with contrate gear output. Main and auxiliary transmissions are with a synchronizer.
Suspension	Front axle with longitudinal leaf spring suspension Rear axle with leaf spring + balance beam + thrust rod suspension Bogie balance suspension is applied.
Wheel	Special wheel rim and inflated tires
Steering system	Including integral circulating ball-type booster steering gear, steering pump and steering drive system
Brake system	It consists of service brake, parking brake (emergency brake) and auxiliary brake. Service brake: dual-circuit compressed air brake, acting on all wheel hubs Parking brake: spring-loaded brake, acting on wheel hubs of intermediate and rear axles Auxiliary brake: engine exhaust brake
Drive shaft	Styre Series drive shaft assy., open-type, contrate gear connected

– **Crane superstructure**

Operator's cab	Steel construction, with adjustable seat with headrest, front-mounted instrument console, pilot-operated joysticks, windshield wiper and washing system
Main boom and telescoping system	1 basic boom and 4 telescopic sections It is made from low-alloy high-tensile steel, providing the boom with good bending-resistance capability. Built-in slide blocks with compensation technology improve the guidance capability and lifting capacity. The boom is telescoped via two telescoping cylinders and two sets of boom extension / retraction wire rope.
Derricking gear	1 front-mounted derricking cylinder with balancing valve
Hoist gear	Consisting of hydraulic motor, winch reducer, hoisting limit switch, lowering limit switch and hoist rope
Slewing gear	Consisting of hydraulic motor, slewing reducer and slewing bearing
Hydraulic system	Open-type, pilot-operated proportional control, with proportional speed-regulating function Driven by quadruple gear pump
Load moment limiter	Composed of mentor, pressure sensor, boom length / angle sensor.

1.2.3 Boom

Including main boom and jib

Main boom includes 1 basic boom and 4 telescopic sections.

Main boom length: 11.4 m – 43 m

Jib length: 9.5 m, 16 m

When the fully extended main boom is fitted with jib (2 offsets: 0° and 30°), the boom length is 59 m (43 m + 16 m)

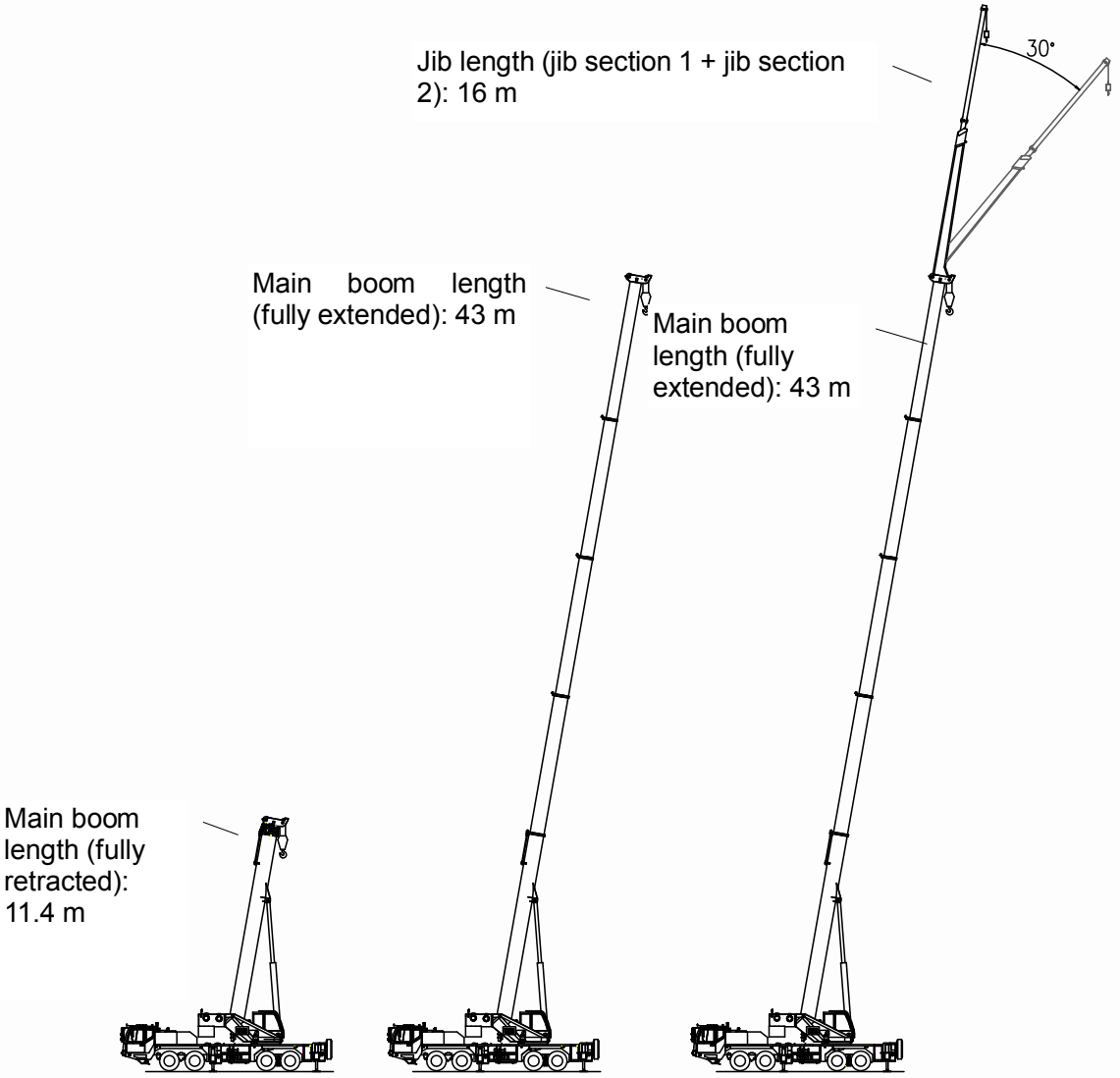


Fig. 01 – 09

1.3 Technical data

1.3.1 Overall view (Unit: Metric mm)

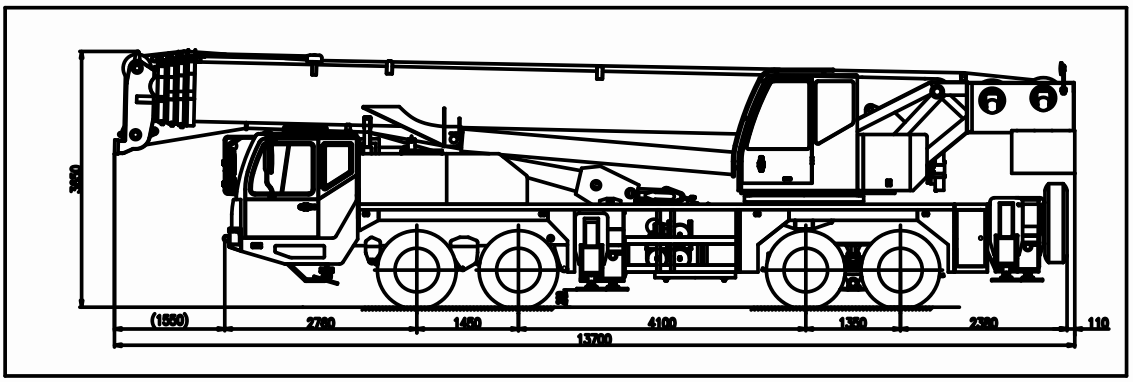


Fig. 01 – 10 – 01

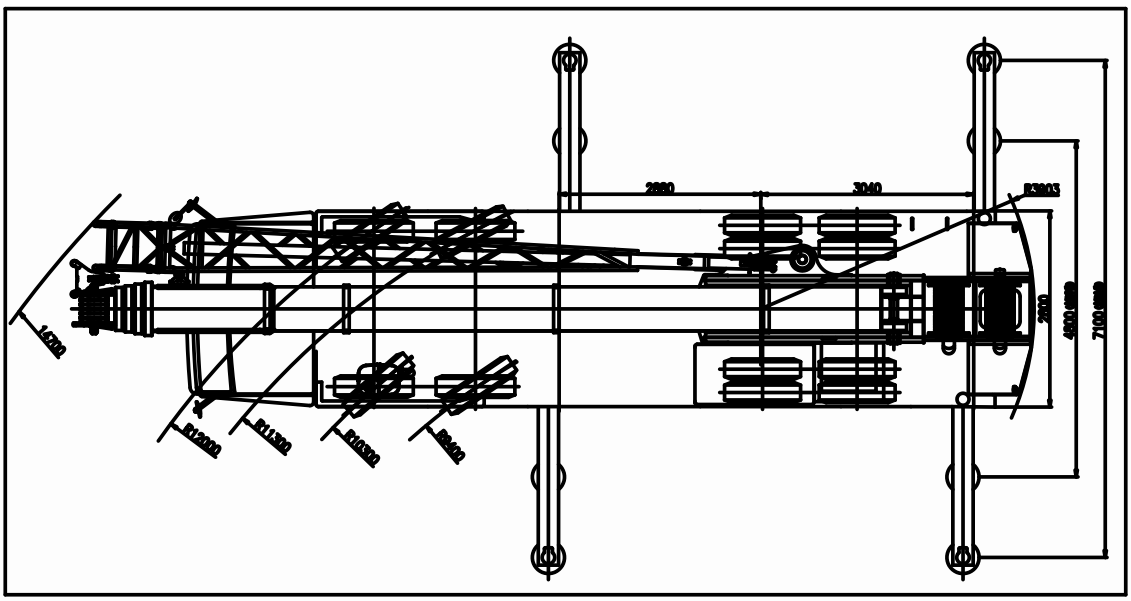


Fig. 01 – 10 – 02

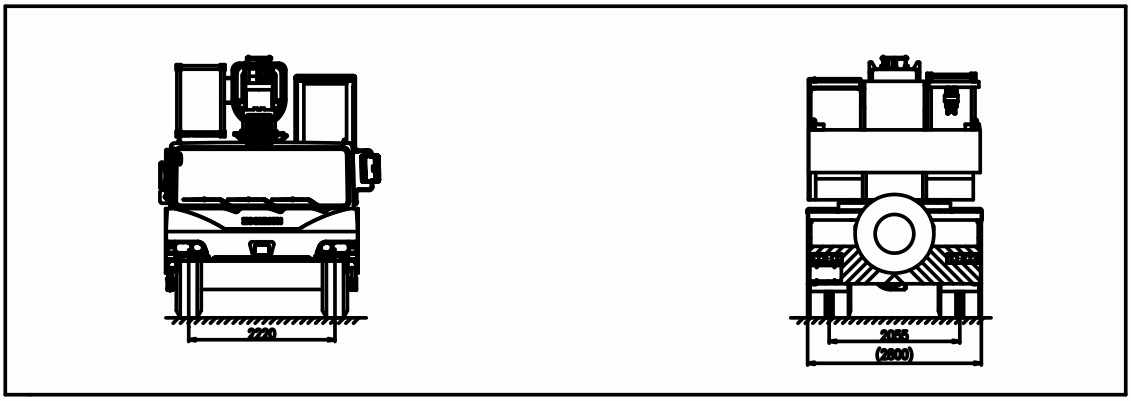


Fig. 01 – 10 – 03

1.3.2 Technical data

Item			Value	Remarks
Work performance	Max. rated lifting capacity	kg	55000	
	Max. load moment of basic boom	kN.m	2009	
	Max. load moment of fully extended boom	kN.m	1050	
	Max. lifting height of basic boom	m	12.6	
	Max. lifting height of fully extended boom	m	43.6	These parameters do not include deflection of main boom and jib.
	Max. lifting height of jib	m	59.5	
	Max. hoist rope speed (main winch)	m/min	120	Drum 4th layer
	Max. hoist rope speed (auxiliary winch)	m/min	120	Drum 2nd layer
	Boom derricking up time	s	50	
	Boom telescoping out time	s	95	
	Slewing speed	r/min	0 - 2.2	
Driving	Max. driving speed	km/h	76	
	Max. gradeability	%	40	
	Min. turning diameter	m	≤ 24	
	Min. ground clearance	mm	260	
	Limits for exhaust pollutants and smoke		Conform to related standards	GB3847-2005 / GB17691-2005 (National Stage III)
	Oil consumption per hundred kilometers	L	43	
	Front / rear overhang angle	°	19 / 12	
	Brake distance	m	≤ 10	Initial speed 30 km/h
Weight	Deadweight in driving condition	kg	42000	
	Complete vehicle kerb mass	kg	41870	
	Front axle load	kg	16000	
	Rear axle load	kg	26000	

Item				Value	Remarks
Dimensions	Overall dimensions (L × W × H)		mm	13700 × 2800 × 3650	
	Outrigger spread (L)		m	5.92	
	Outrigger spread (W)		m	Completely extended: 7.1 m Intermediately extended: 4.8 m	
	Main boom length		m	11.4 - 43.0	
	Main boom angle		°	-2 - 80	
	Jib length		m	9.5, 16.0	
	Offset		°	0, 30	
	Front / rear overhang		mm	2760 / 2380	
	Number of axles			4	
	Wheelbase		mm	1450 + 4100 + 1350	
	Treads	Front	mm	2220	
		Rear	mm	2055	
	Tail slewing radius			3900	
Engine	Model			WP10.336	
	Type			6-cylinder in line, turbo-charged, inter-cooling	
	Fuel type			Light diesel oil	
	Displacement		ml	9726	
	Rated power / RPM		kW/r/min	247 / 2200	
	Max. torque / RPM		N.m/r/min	1250 / 1200 – 1600	
Transmission	Model			9JS150T-B	
	Type			Mechanical stepped speed change	
	Operating method			Mechanical manual operation	
	Number of speeds			9 forward and 1 reverse speeds	
	Speed ratio			Forward speeds: 12.65 / 8.38 /6.22 / 4.57 / 3.40 /2.46 / 1.83 / 1.34 /1.00 Reverse speed:13.22	

Item				Value	Remarks
Steering system	Steering type			Steering wheel	
	Outer diameter of steering wheel		mm	480	
	Steering column			Universal coupling	
	Steering gear	Model		PY-ZJ120C-Z/Y	
		Type		Integral circulating ball-type hydraulic booster steering gear	
	Steering pump	Model		QC32/13-WP-PY	Outer circulation
		Type		Gear pump	
Drive axles	Drive type			8 × 4	
	Speed ratio			5.73	
Number of leaf springs (front / rear)				11 / 11 / 10	
Cab capacity				2	
Fuel tank capacity			L	300	
Hydraulic oil tank capacity			L	680	

1.3.3 Work parameters

– **Max. support strength per outrigger**

When the crane is working within the rated lifting capacity, the max. support strength per outrigger is 55 t.

– **Rope specification and length**

	Standard code	Specification	Length (mm)
Main hoist rope	GB8918-2006	4V*39S+5FC-17.0-1870-left-hand ordinary lay	200000
Auxiliary hoist rope	GB 8918-2006	4V*39S+5FC-17.0-1870-left-hand ordinary lay	130000

– **Standard rope reevings for various boom lengths**

Boom length(m)	11.4 - 15.3	15.3 - 19.3	19.3 - 25.2	25.2 - 37.0	37.0 - 43.0
Reeving	9	8	6	4	3
Boom length(m)	43.0 + 9.5	43.0 + 16.0			
Reeving	1	1			

CAUTION

(1) If rope reevings are less than the values listed in the above table during lifting, load on single wire rope must be checked to make sure that it is no more than the Max. permissible lifting capacity of single wire rope.

(2) Max. permissible lifting capacity of single wire rope is 4600 kg.

1.3.4 Rated lifting capacity tables

Table 1 **Unit: Metric kg**

Working radius (m)	Main boom (m)						
	Outriggers and telescoping cylinder I completely extended, over side and over rear						
	11.4	15.3	19.3	25.2	31.1	37.0	43.0
3.0	55000*	45000*	35000				
3.5	51000*	45000*	35000				
4.0	48000*	45000*	35000	25000			
4.5	45000*	43000*	32500	25000			
5.0	41000*	40000	30000	25000			
5.5	36000	36000	28000	24000	17500		
6.0	32500	32500	26500	22500	17500		
6.5	29500	29500	25000	21000	17500		
7.0	26500	26500	23500	20000	17500	14000	
7.5	23500	23500	22000	19000	16700	13500	
8.0	21000	21000	21000	18000	16000	13000	
9.0	16500	16500	16500	16500	14500	12200	9500
10.0		13500	13500	14500	13500	11500	9300
11.0		11000	11000	12000	12500	10700	9000
12.0		9000	9000	10000	10900	10100	8500
14.0			6300	7300	8100	8500	7500
16.0			4400	5400	6100	6500	6700
18.0				4000	4700	5100	5400
20.0				3000	3600	4000	4300
22.0				2200	2800	3200	3500
24.0					2100	2500	2800
26.0					1550	1950	2200
28.0						1500	1750
30.0						1100	1350
32.0							1000
I	0	3.9	7.9	7.9	7.9	7.9	7.9
II	0	0	0	5.9	11.8	17.7	23.7
Reeving	9	9	8	6	4	4	3
Hook	40 t						

Table 2 **Unit: Metric kg**

Working radius (m)	Main boom (m)						
	Outriggers completely extended and telescoping cylinder I intermediately extended, over side and over rear						
	11.4	15.3	21.2	27.1	33.0	39.0	
3.0	55000*	45000*	25000				
3.5	51000*	45000*	25000				
4.0	48000*	45000*	25000				
4.5	45000*	43000*	25000	17500			
5.0	41000*	40000	25000	17500			
5.5	36000	36000	25000	17500			
6.0	32500	32500	25000	17500	14000		
6.5	29500	29500	25000	17500	14000		
7.0	26500	26500	25000	17500	13500		
7.5	23500	23500	25000	17500	13000	9500	
8.0	21000	21000	23000	17000	12500	9500	
9.0	16500	16500	18500	16000	11500	9500	
10.0		13500	15100	15100	10500	9000	
11.0		11000	12500	13200	9700	8500	
12.0		9000	10500	11200	9000	8000	
14.0			7700	8400	7800	7000	
16.0			5800	6400	6800	6100	
18.0			4400	5000	5400	5400	
20.0				3900	4300	4600	
22.0				3100	3400	3700	
24.0					2700	3000	
26.0					2200	2500	
28.0					1700	2000	
30.0						1600	
32.0						1250	
I	0	3.9	3.9	3.9	3.9	3.9	
II	0	0	5.9	11.8	17.7	23.7	
Reeving	9	9	6	4	4	3	
Hook	40 t						

Table 3 **Unit: Metric kg**

Working radius (m)	Main boom (m)						
	Outriggers completely extended and telescoping cylinder I completely retracted, over side and over rear						
	11.4	17.3	23.2	29.1	35.1		
3.0	55000*	25000					
3.5	51000*	25000	17500				
4.0	48000*	25000	17500				
4.5	45000*	25000	17500				
5.0	41000*	25000	17500	14000			
5.5	36000	25000	17500	14000			
6.0	32500	25000	17000	13500			
6.5	29500	25000	16500	12900	9500		
7.0	26500	25000	16000	12300	9500		
7.5	23500	24000	15500	11800	9500		
8.0	21000	23000	15000	11300	9500		
9.0	16500	19000	14000	10400	9200		
10.0		15700	13000	9600	8500		
11.0		13000	12000	8900	7800		
12.0		11000	11500	8300	7300		
14.0		8200	8800	7300	6300		
16.0			6800	6400	5500		
18.0			5400	5700	4900		
20.0				4700	4300		
22.0				3800	3900		
24.0				3100	3400		
26.0					2800		
28.0					2300		
30.0					1900		
32.0							
I	0	0	0	0	0		
II	0	5.9	11.8	17.7	23.7		
Reeving	9	6	4	4	3		
Hook	40 t						

Table 4 **Unit: Metric kg**

Working radius (m)	Main boom (m)						
	Outriggers intermediately and telescoping cylinder I completely extended, over side and over rear						
	11.4	15.3	19.3	25.2	31.1	37.0	43.0
3.0	50000*	45000*	35000				
3.5	50000*	45000*	35000				
4.0	45000*	41000*	35000	25000			
4.5	38000	37000	32500	25000			
5.0	30000	29500	29500	25000			
5.5	24500	24000	23800	24000	17500		
6.0	20500	20000	19700	21200	17500		
6.5	17500	17000	16700	18000	17500		
7.0	15000	14500	14300	15600	16500	14000	
7.5	13000	12500	12300	13600	14400	13500	
8.0	11500	11000	10800	12000	12800	13000	
9.0	9000	8500	8300	9500	10200	10700	9500
10.0		6700	6500	7600	8300	8800	9200
11.0		5300	5100	6200	6900	7300	7700
12.0		4200	4000	5000	5700	6100	6500
14.0			2400	3400	4000	4400	4700
16.0			1200	2200	2800	3200	3500
18.0				1300	1900	2300	2600
20.0					1200	1600	1900
22.0							1300
24.0							
26.0							
I	0	3.9	7.9	7.9	7.9	7.9	7.9
II	0	0	0	5.9	11.8	17.7	23.7
Reeving	9	9	8	6	4	4	3
Hook	40 t						

Table 5 **Unit: Metric kg**

Working radius (m)	Main boom (m)						
	Outriggers and telescoping cylinder I intermediately extended, over side and over rear						
	11.4	15.3	21.2	27.1	33.0	39.0	
3.0	50000*	45000*	25000				
3.5	50000*	45000*	25000				
4.0	45000*	41000*	25000				
4.5	38000	37000	25000	17500			
5.0	30000	29500	25000	17500			
5.5	24500	24000	25000	17500			
6.0	20500	20000	21600	17500	14000		
6.5	17500	17000	18400	17500	14000		
7.0	15000	14500	15900	16800	13500		
7.5	13000	12500	13900	14800	13000	9500	
8.0	11500	11000	12300	13100	12500	9500	
9.0	9000	8500	9800	10500	11000	9500	
10.0		6700	7900	8600	9100	9000	
11.0		5300	6500	7200	7600	8000	
12.0		4200	5400	6000	6400	6800	
14.0			3700	4300	4600	5000	
16.0			2500	3100	3400	3700	
18.0			1600	2200	2500	2800	
20.0				1500	1800	2100	
22.0					1300	1600	
24.0							
26.0							
I	0	3.9	3.9	3.9	3.9	3.9	
II	0	0	5.9	11.8	17.7	23.7	
Reeving	9	9	6	4	4	3	
Hook	40 t						

Table 6 **Unit: Metric kg**

Working radius (m)	Main boom (m)						
	Outriggers intermediately extended and telescoping cylinder I completely retracted, over side and over rear						
	11.4	17.3	23.2	29.1	35.1		
3.0	50000*	25000					
3.5	50000*	25000	17500				
4.0	45000*	25000	17500				
4.5	38000	25000	17500				
5.0	30000	25000	17500	14000			
5.5	24500	25000	17500	14000			
6.0	20500	22200	17000	13500			
6.5	17500	19100	16500	12900	9500		
7.0	15000	16600	16000	12300	9500		
7.5	13000	14600	15500	11800	9500		
8.0	11500	12900	13600	11300	9500		
9.0	9000	10300	11000	10400	9200		
10.0		8400	9100	9500	8500		
11.0		7000	7600	8000	7800		
12.0		5900	6400	6800	7100		
14.0		4200	4700	5000	5300		
16.0			3500	3800	4100		
18.0			2600	2900	3200		
20.0				2200	2500		
22.0				1600	1900		
24.0				1200	1400		
26.0							
28.0							
I	0	0	0	0	0		
II	0	5.9	11.8	17.7	23.7		
Reeving	9	6	4	4	3		
Hook	40 t						

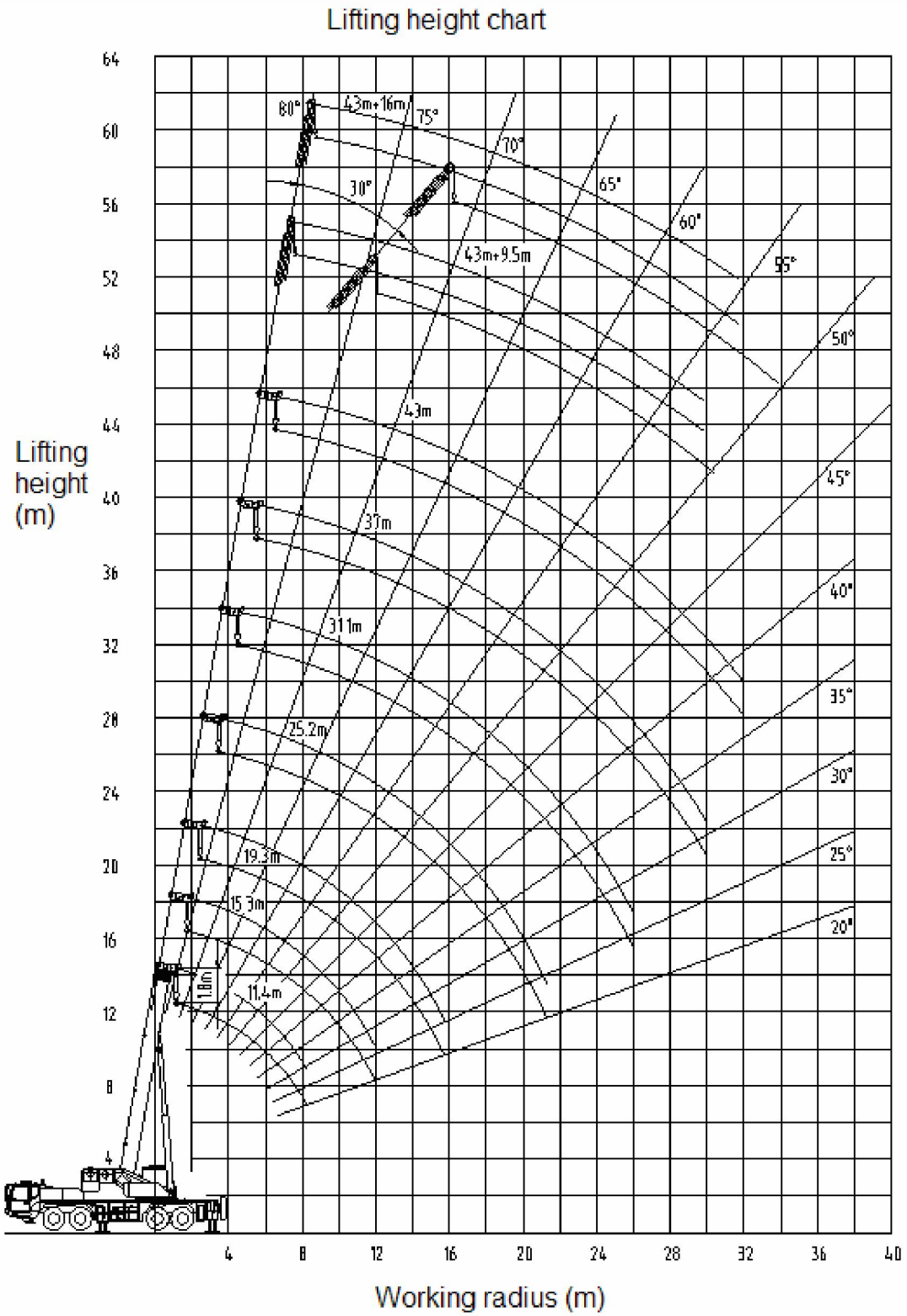
Table 7 **Unit: Metric kg**

Main boom angle (°)	Main boom (m) + jib (m)			
	43 + 9.5		43 + 16	
	0°	30°	0°	30°
80	4500	2150	2800	1000
78	4500	2100	2600	1000
76	4200	2000	2300	1000
74	3800	1950	2150	1000
72	3500	1900	1900	1000
70	3200	1850	1750	950
68	3000	1800	1650	950
66	2700	1750	1550	900
64	2400	1700	1450	850
62	2100	1650	1350	800
60	1800	1500	1250	750
58	1500	1200	1100	700
56	1200	1000	900	600
54	1000	850	750	
52	800	550		
Reeving	1			
Hook	4.5 t			

NOTE

This crane is provided with several rated lifting capacity tables. The operator should select proper rated lifting load referring to resp. lifting capacity tables according to actual working conditions.

1.3.7 Lifting height chart

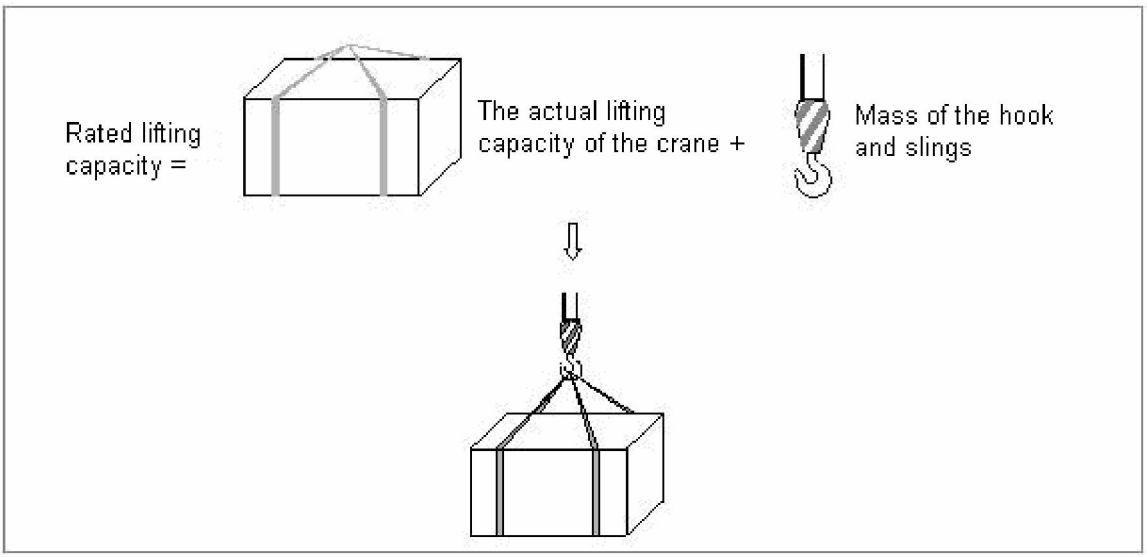


CAUTION

(1) Outriggers are completely or intermediately extended in the above lifting height chart. Do not lift a load without outriggers extended.

(2) When you set up the 5th outrigger, the values given in the lifting capacity tables are suitable to 360° full range operation. The crane can not operate over front without the 5th outrigger extended.

(3) The values given in the lifting capacity tables are the max. permissible lifting capacities under various OMs. The values as given in the tables include the mass of the hook (main hook of 420 kg and auxiliary hook of 120 kg) and slings.



(4) The working radius in lifting capacity table is the distance measured from hook center to slewing center.

(5) If the actual boom length and working radius are between two adjacent values given in the lifting capacity table, the bigger one should be referred to.

For example:

If the crane is working with 18 m main boom at 4.8m working radius, the lifting capacity found out in the rated lifting capacity table of bigger values – 19.30 m main boom and 5.0 m working radius – should be referred to. That is to say, the rated lifting capacity 30000 kg should be referred to.

(6) When lifting a load with main boom with jib assembled, 2000 kg plus the mass of hook block and slings should be subtracted from the rated lifting capacities.

(7) The max. rated lifting capacity for the rooster sheave is 4500 kg. If the rated lifting capacity for the telescopic boom checked from the table is below 4500 kg, take the value in the rated lifting capacity table.

For example:

Rated lifting capacity is 4500 kg when the actual boom length is of 25.2 m and

working radius of 6.5 m.

Rated lifting capacity is 3600 kg when the actual boom length is of 31.10 m and working radius of 20 m.

(8) Do not use the main hook and auxiliary hook to lift load simultaneously.

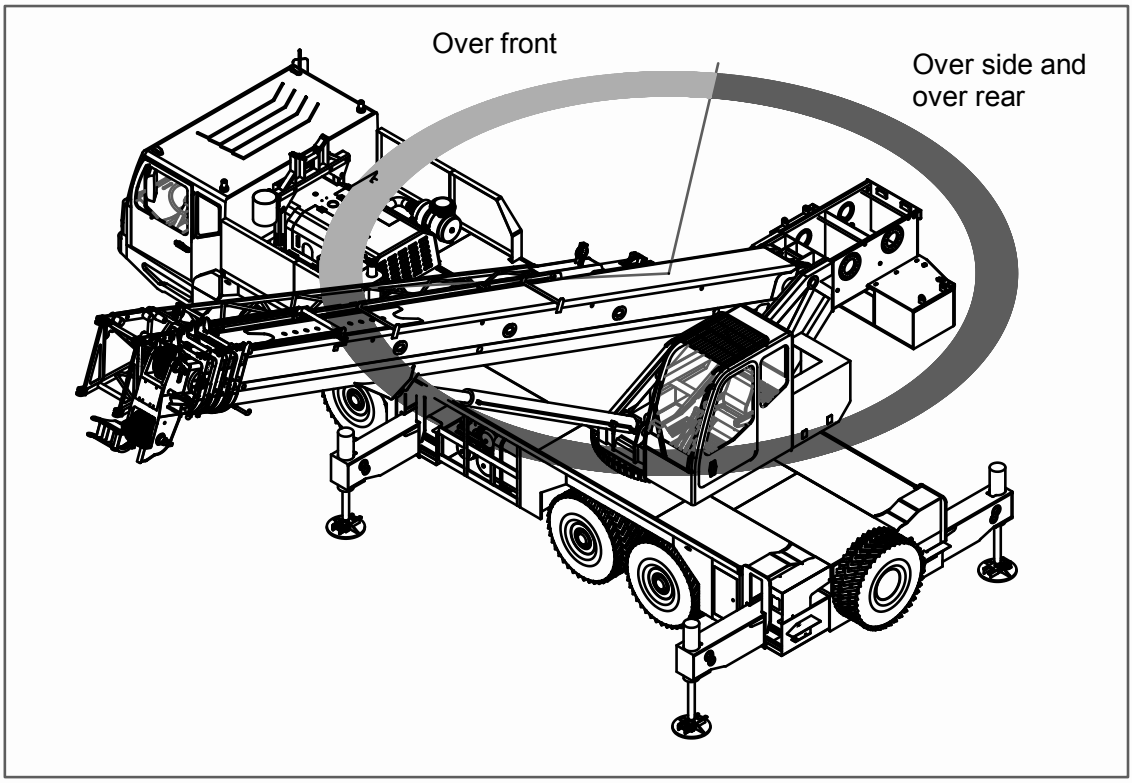
(9) All the working radius and lifting heights in lifting height chart do not include the deflection of main boom and jib.

(10) The values signed with * are suitable for operating over side and over rear with 10 or 12 rope reevings and 50 t hook block.

WARNING

If the boom length is more than 30 m, derrick the boom strictly according to the lifting height chart even without load. Otherwise the crane may topple.

1.3.6 Working areas



ZOOMLION

OPERATOR’S MANUAL FOR TRUCK CRANE

Chapter 2 Safety

2.1 Safety instructions and safety signs

2.1.1 Safety instructions

a) Be sure to comply with all valid national and regional traffic regulations when driving the crane.

b) The operator's cab may not be occupied by passengers while driving the crane.

c) The crane must be made to comply with the relevant local traffic regulations, before it is driven on public streets, roads and other places. The weights, axle loads and dimensions specified in the permits must be maintained.

d) The relevant persons should be trained to ensure safe operation. The crane operator must obtain or receive the necessary information in the *Operator's Manual* in a timely fashion before driving to the work site.

e) Comply with the safety signs on the crane to avoid serious injuries or casualties.

f) All the assembly, commissioning, operation, maintenance and service of crane should only be carried out by special personnel.

DANGER

Do not allow the hook block to impair the driver's field of vision when driving the crane on public roads!

2.1.2 Safety signs

a) The locations of safety signs are as shown in Figure 02 – 01.

b) Points for attention:

1) The signs for all the potential danger referred in this manual have been stuck on specified positions. Do not move the signs without permission!

2) The safety signs on the potentially dangerous parts should be maintained regularly. Once there is any fading or damage, modify or replace them immediately to ensure the signs are always clean, complete, correct and legible.

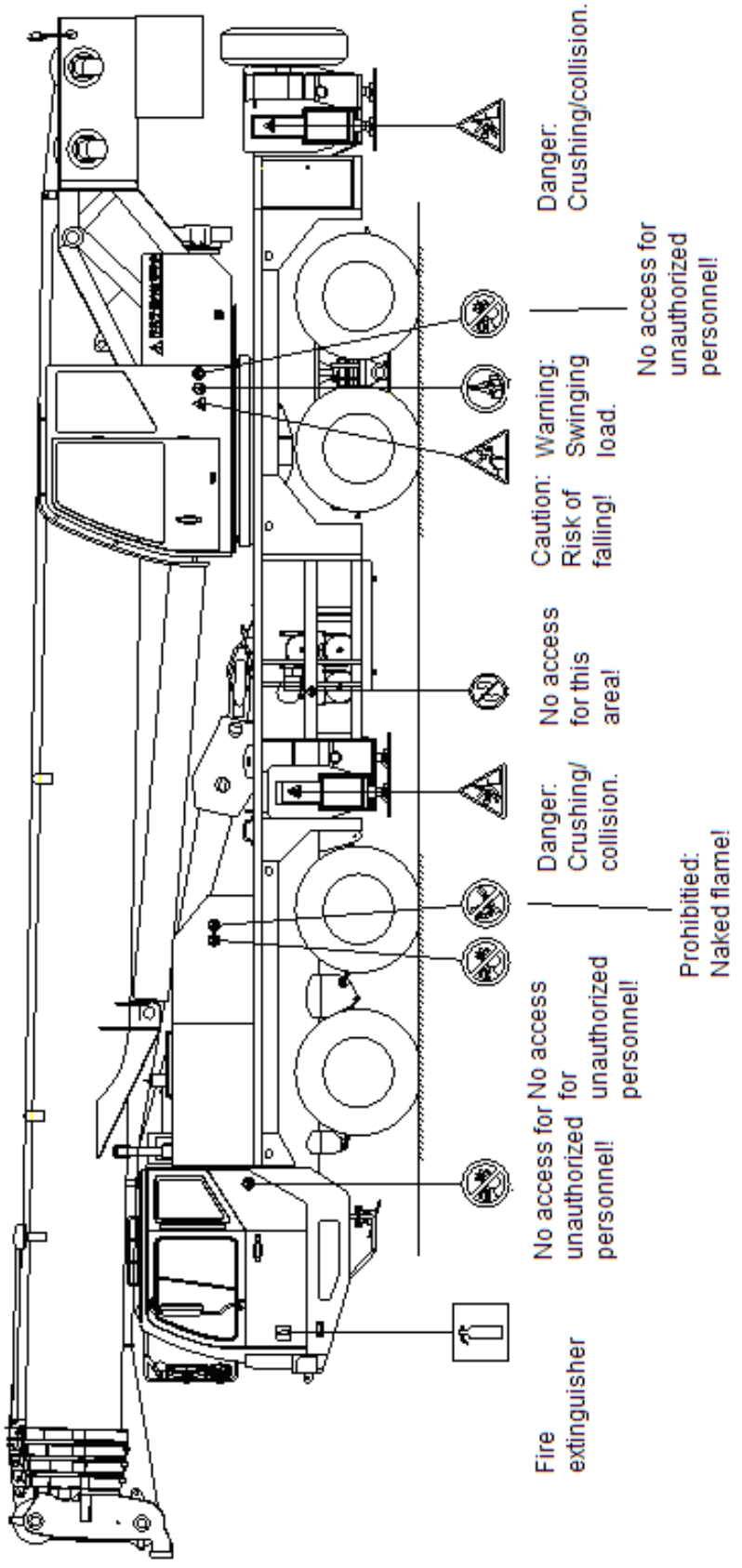

Danger: Crushing/collision.
No access for unauthorized personnel!
Caution: Risk of falling!
Warning: Swinging load.
No access for this area!
Danger: Crushing/ collision.
Prohibitied: Naked flame!
No access for unauthorized personnel!
No access for unauthorized personnel!
Fire extinguisher

Figure 02 – 01

2.2 Planning crane operation

In addition to a perfectly working crane and a well-trained crew, crane operation planning is an important principle for safe crane operation.

The crane operator must obtain or receive the necessary information in a timely fashion before driving to the work site. In particular:

a) Natural environment of work site

b) Work site and travel distance

c) Route

d) Height and width clearance measurements

e) Electric transmission lines (including voltage)

f) Space restrictions at the work site

g) Movement restrictions caused by buildings

h) Weight and dimensions of the loads to be lifted and the required hoisting height and working radius

i) Ground bearing capacity at the work site.

Based on the above information, the crane operator must assemble the equipment required to operate the crane:

a) Load hook / hook block

b) Separate lifting accessories

c) Counterweight

d) Jib

e) Underlay materials for outrigger pads.

⚠WARNING

Crane operation may not be possible or improvisation can result if a crane operator does not have all the required data.

2.3 Break-in instructions

The purpose of breaking-in is to adjust and improve the crane's components' adaptability to environment. The break-in at the initial stage of use will have an important effect on the service life, working reliability and energy-saving performance. Pay attention to the following items during the break-in period:

a) During the initial phase, all components of crane are in break-in state. During the first 100 h, the working load should not be too great and working speed should not be too high, the maximum lifting capacity should not exceed 80% of the rated one and it is not permitted to work at maximum speed.

b) Within the first 600 km mileage, it is forbidden to drive the vehicle at the highest speed and ensure the driving speed should not exceed 55 km/h and the engine RPM doesn't exceed 1800 rpm. Drive the vehicle on even road.

c) When the vehicle is driving for the first 600 – 1500 km, replace the engine oil.

d) Within the first 600 – 2000 km mileage, increase the driving speed or the engine RPM gradually.

e) Do start and stop the vehicle slowly and gently. Shift the transmission frequently to break in it at each gear position.

f) Breaking in the brake linings.

g) To achieve optimum braking performance, all new brake linings must be broken in by activating the brakes. Activate the brakes by pumping them at low to high speed. Hard braking is not permitted. In general, the break-in distance depends on the type of vehicle, but a minimum of 500 km is recommended. During this phase, the maximum brake drum or brake disk temperature may not exceed 200 ^{0}C.

⚠ DANGER

The risk of accident increases when new brake linings are subjected to one or more braking operations over extended period of time or if the vehicle is forced to a stop by hard braking from high speed several times. Hard braking and continuous braking are not permitted!

2.4 General safety technical guidelines

2.4.1 Requirements of the crane operator, rigger and conductor

The primary responsibilities of crane operator, rigger and conductor are to control, operate, adjust the crane and conduct the operation in a manner that is safe for both themselves and others. Many crane accidents are caused by incorrect crane operation. The main operating errors, which are made again and again while operating or driving a crane, are as follows:

a) Slewing too quickly.

b) Quick braking of the load.

c) Diagonal pulling when the load is still on the ground.

d) Loose wire rope formations.

e) Overloading.

f) Crashing into bridges, roofs or high voltage wiring due to insufficient vertical clearance.

g) Unsuitable operation when lifting a load with several cranes at the same time.

About 20% of accidents are caused by improper maintenance:

a) Insufficient lubricating oil, lubricating grease or antifreeze fluid.

b) Broken wire rope, worn parts.

c) Limit switches or load moment limiter not operating properly.

d) Brake or transmission failure.

e) Hydraulic defects (for example: cracked hoses).

f) Loose bolts.

DANGER

In the interest of both yourself and others, make sure you understand how your crane operates and familiarize yourself with all the risks associated with the work to be done.

— **General qualifications for operator**

a) The person who has been trained with the safety knowledge about the crane operation.

b) Healthy and agile.

c) Eyesight (remedied eyesight included) is above 0.7, no color blindness.

d) Hearing is qualified.

e) Know about the safety hazards of entering into the working area.

f) The ability to estimate and monitor load is enough.

g) Be able to estimate and monitor the distance, height, clearance and load correctly.

h) Be familiar with the operator's manual for the crane, and know the working principle, lifting performance, structural performance and the safety device's functions and adjusting methods, as well as master the operation essentials and maintenance skills.

i) Be familiar with safety rules, safety signals and symbols.

a) Be qualified with the work in hearing, eyesight and reaction ability and have the requisite physical to operate the crane safely. Be able to estimate the distance, height and clearance correctly.

j) Know how to administer first aid and know how to use a fire extinguisher. Know how to survive in an emergency.

Make sure that only the personnel who are qualified and authorized are allowed to operate the crane.

⚠ DANGER

(1) Operator should check brakes, hook block, wire rope and safety devices before operation. If there is something abnormal, fix it as soon as possible.

(2) The operator must focus his attention on his work during operation and is forbidden to chat with others. Generally speaking, operator can only follow the signal sent out by appointed persons. However, for a stop signal, the operator should obey it at all times, no matter who send it out. He should refuse to follow signal which violates operation regulations. Stop the crane immediately if somebody is found climbing the crane.

(3) Operator who is in low spirits or poor health is not allowed to operate the crane. Prohibit drinking and driving.

— **General qualifications for rigger**

During operation of the machine, the rigger is responsible for ensuring that the load is slung or released safely and carefully and decides which loading equipment and lifting accessories to be used in accordance with work plan. Rigger is also responsible for conducting safe operation of the crane.

Qualifications for rigger:

b) With crane operation certificate.

c) Be qualified with the work in hearing, eyesight and reaction ability.

d) Be able to estimate and monitor the distance, height, clearance and load correctly.

e) Have been trained in the skill of handling load.

f) Be able to choose the proper loading equipment and lifting accessories according to conditions of the load.

g) Have been trained in hand signals for operation and is familiar to use them.

h) Be able to safely use audio equipment (such as interphone) to send out oral order exactly and clearly.

i) Make sure that only authorized personnel are allowed to carry out work.

— **General qualifications for conductor**

The conductor is to transfer signal from the rigger to operator. He can substitute for the rigger to do conducting and rigging work, but such work can only be done by one person at any time.

Qualifications for conductor:

a) Be qualified with the work in hearing, eyesight and reaction ability.

b) Be able to estimate the distance, height and clearance correctly.

c) Have been trained in hand signals for operating and is familiar to use them.

d) Be able to safely use audio equipment (such as interphone) to send out oral order exactly and clearly.

e) Make sure that only authorized personnel are allowed to carry out work.

2.4.2 Selecting an operating site

It is very important to choose an appropriate location for crane operation in order to minimize safety risks. When selecting the placement location of the crane, observe the following:

a) The operation of the crane can be carried out within the necessary radius (working radius and counterweight slewing radius).

b) Support the crane and other things only on ground with sufficient load bearing capacity.

c) The ground pressure should comply with the permitted and expected value under the crane with a required lifting load.

— **Slopes and ditches**

The crane may not be set up too close to slopes or ditches. Maintain adequate safety clearances in accordance with the type of soil. The formula for calculating the safety clearance is as follows:

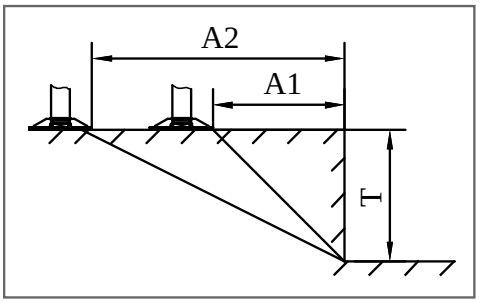
For non-cohesive and soft cohesive ground:

$A_2=2T$

For stiff or semi-solid cohesive ground:

$A_1=T$

T refers to the depth of ditch.



DANGER

If the safety distance can not be maintained, fill and level up the slope and ditch. Otherwise the crane may topple!

— **Permissible ground pressure of outrigger**

When the crane is supported, the outriggers transmit significant forces to the ground. In certain cases, a single outrigger has to transmit almost the entire weight of the crane, plus the load weight, to the ground. The ground must be able to safely absorb this pressure every time. If the outrigger pad area is inadequate, then it must be supported from below according to the load bearing capacity of the ground. The calculation of required support area is follows:

Support area = Crane support force / Load bearing capacity of the ground

Permissible ground pressure is shown in the following table:

Soil type		Permissible ground pressure (kg / cm^2)
A	Back-filled, not naturally compacted ground	0 – 1
B	Natural, clearly undisturbed ground:	
	1. Mud, peat, marshy soil	0
	2. Non-cohesive ground, sufficient compactly layered soil Fine to medium grained sand Coarse-grained sand to gravel	 1.5 2.0
	3. Cohesive ground: Sludgy Soft Firm Semi-compact Hard	 0 0.4 1.0 2.0 4.0
	4. Rock with few fissures, in healthy, unweathered condition and in a favorable location: In cohesive layer order In massive or column-style shape	 15 30
C	Artificially compacted ground:	
	1. Asphalt	5 – 15
	2. Concrete Concrete group B I Concrete group B II	 50 – 250 350 – 550

If there is any doubt about the load bearing capacity of the ground at the placement site, soil tests should be carried out with a special detecting instrument.

CAUTION

Only strong materials may be used for the outrigger pad bases such as properly dimensioned wooden timbers. In order to ensure that pressure is evenly distributed over the base surface, the outrigger pads must be positioned in the center of the support base.

2.4.3 Supporting

a) Before operation, all the wheels must be away from the ground.

b) Before extending the vertical outriggers, extend the sliding beams to the specified positions.

c) All the sliding beams must be extended according to the data in the lifting capacity chart and secured with pins.

d) Before operation, the crane must be leveled. Under any working conditions, the inclination angle α of the crane can not be more than 0.6°. Refer to Figure 02 – 02.

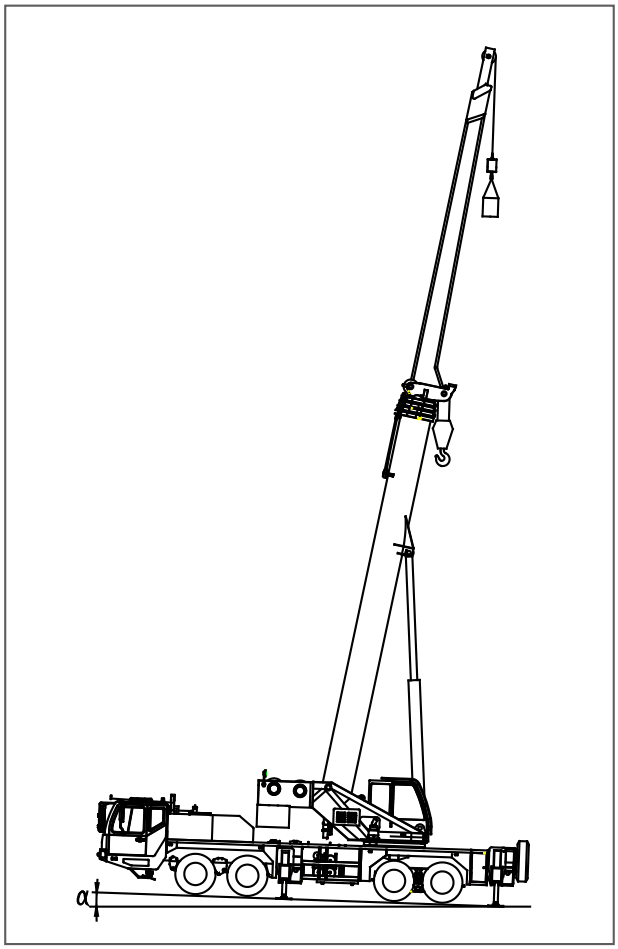


Figure 02 – 02

DANGER

If the crane is positioned at an incline, and if the boom is turned towards the slope, then the radius is increased as a result. It is possible that the crane can topple in extreme cases.

After the crane is supported, check the following safety measures:

a) The placement location has been selected in such a way that the crane can be operated with the least possible radius.

b) The load bearing capacity of the ground is adequate.

c) There is sufficient distance to ditches and slopes.

d) All outriggers have been extended to the specified positions.

e) The outriggers are secured with pins.

f) The outrigger pads are secured.

g) The crane has been leveled.

h) The tires do not touch the ground.

i) It has been ensured that there are no live electrical wires within the working range of the crane.

j) There are no obstacles which will hinder the required crane movements.

2.4.4 Working conditions

a) Pay attention to the ambient temperature in the work site. The suitable temperature range is -20℃ – +40℃.

b) If wind speeds are expected which are larger than the maximum permissible wind speeds (grade 6) for the crane operation or in case of thunderstorms, then the attachments and the boom must be taken down.

DANGER

Operate the crane according to the above instructions, otherwise accidents may occur!

With the following table, the wind force and wind speed can be estimated correctly:

Wind force		Wind speed		Effect of the wind on the land
Beaufort	Description	m/s	km/h	
0	Calm	0 – 0.2	0 – 0.9	No wind, smoke rises vertically
1	Slight air	0.4 – 1.4	1 – 5	Wind direction shown by smoke drift but not by wind vanes
2	Light breeze	1.6 – 3	6 – 11	Wind felt on face, leaves rustle, vanes moved by wind
3	Gentle breeze	3.4 – 5.3	12 – 19	Leaves and small twigs in constant motion, wind extends light flag
4	Moderate breeze	5.5 – 7.8	20 – 28	Raise dust, loose paper, small branches moved
5	Fresh breeze	8 – 10.6	29 – 38	Small trees in leaf begin to sway, crested wavelets on inland water
6	Strong breeze	10.8 – 13.7	39 – 49	Large branches in motion, difficult to use umbrellas, whistling heard in telegraph wires
7	Stiff wind	13.9 – 17	50 – 61	Whole trees in motion, difficult to walk against the wind
8	Gale force wind	17.2 – 20.6	62 – 74	Breaks twigs off trees, impedes progress
9	Gale	20.8 – 24.5	75 – 88	Slight structural damage (roof tiles and chimney covers, etc. blown off)
10	Severe gale	24.7 – 28.3	89 – 102	Trees uprooted, considerable damage occurs

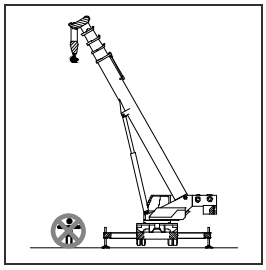
c) Strong electromagnetic fields are likely to be present if the construction site is close to a transmitter. Under this condition, consult a high frequency specialist or contact with the local franchiser or the manufacturer.

DANGER

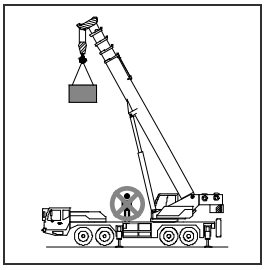
Electromagnetic field can pose direct or indirect danger to persons, equipment and objects, for example, effect on human organs due to radiation and make spark or electric arc occur.

2.4.5 Points for attention for safe operation

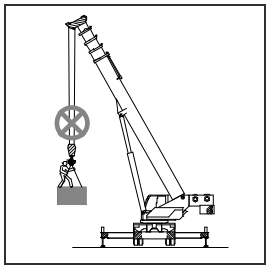
a) No person is allowed to stand under the boom during operation.



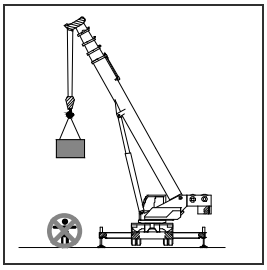
b) No person is allowed to stand on the slewing table during operation.



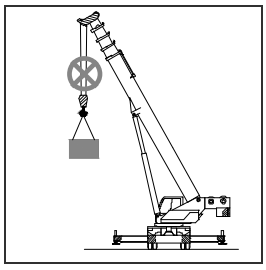
c) Never carry people on the load or on lifting equipment.



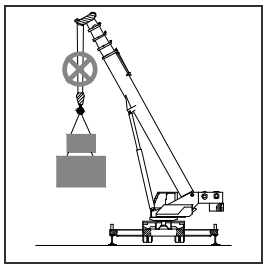
d) Never allow people to stand beneath swaying loads.



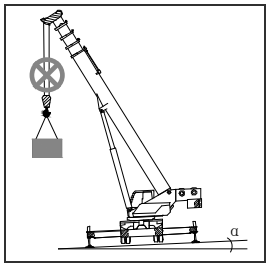
e) Prohibit lifting a load without outriggers extended.



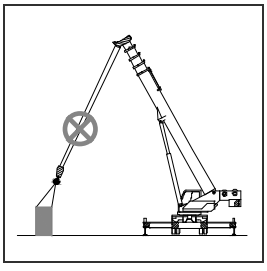
f) Prohibit overloading.



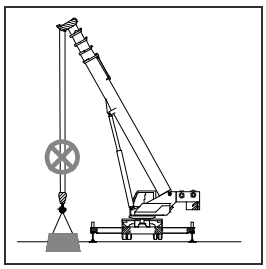
g) The inclination angle α of the crane can not be more than 0.6° during operation.



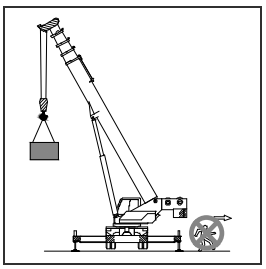
h) Do not pull load at an angle and prohibit lifting staggered load.



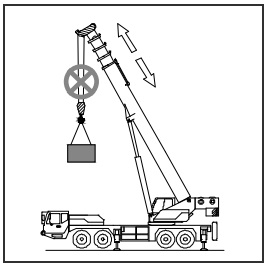
i) Prohibit lifting load buried or frozen on the ground.



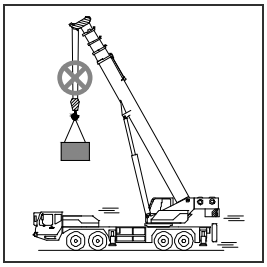
j) The operator is not permitted to leave the operator's cab when the load is suspended in the air.



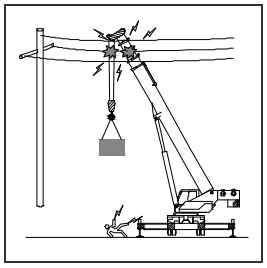
k) It is forbidden to telescope the boom with a load.



l) It is forbidden to drive with a load.



m) When working in the vicinity of power cables, a sufficient safety clearance must be maintained.



n) No standing within slewing radius.

o) Stop the crane in an emergency.

p) Never adjust the brake of hoist gear during lifting a load.

q) Under any conditions, wire ropes on the winding drum are not allowed to be less than 3 windings.

r) Before crane operation, adjust the slings (rope or chain) to make sure the hook block is on the upright position of load gravity center.

s) Prevent the load or lifting equipment from colliding with crane.

t) If it is thundering and lightening during operation, crane operation must be ceased. Telescope the boom in and bring it into a safe condition. Take thunder protection

measures to ensure safety.

u) When starting and stopping the crane operation, ensure the movable parts and movable load in danger zone will not interrupt any persons and objects.

v) When the actual lifting load reaches 90% of the rated one, the warning light will light up and the buzzer will send out slow acoustic warning. At the time, much attention should be paid to the operation.

w) The operation should be stable and gentle. Do not carry out any jerky movements with the joysticks. Avoid any sudden acceleration or braking or conversion operation.

⚠ DANGER

Stop working if one of the following instances occurs:

(1) The crane is overloaded or the load weight is uncertain.

(2) The load may fall off because it is secured or hanged loosely or unevenly.

(3) There is no lining pad between the edges of load and wire rope.

(4) The lighting in the work site is dim and the load or the signal can not be seen very clear.

(5) There is defect or damage of structure and components which will impair the safety operation of the crane, such as failure of brakes and safety devices or damages to wire ropes.

2.5 Hand signals

1. Start

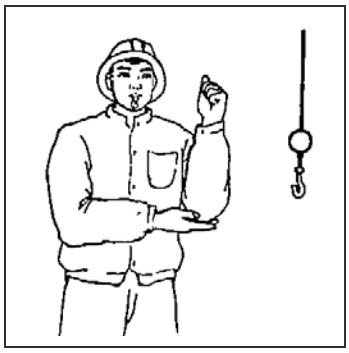
   Hold the right arm stretched vertically upwards. The palm faces forwards.

2. Use main winch

   Tap fist on head, then use regular signal.

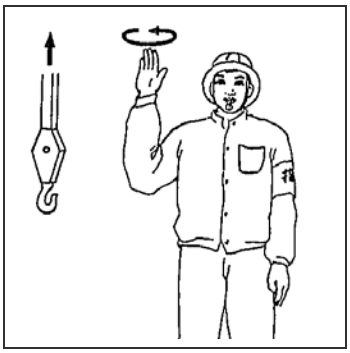
3. Use auxiliary winch

   Tap elbow with one hand, then use regular signal.



4. Lift the load

   With forearm vertical, extended fingers pointing up, move hand in small horizontal circle.

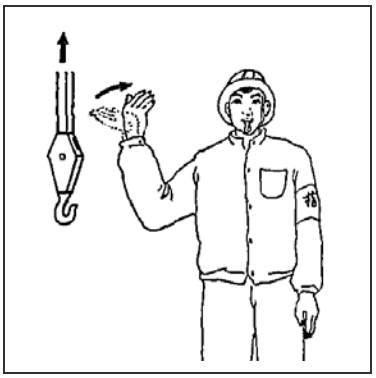


5. Lower the load

   With arm extended downward with a 30° angle to the body, finger pointing down, move hand in small horizontal circle.

6. Lift the load slowly

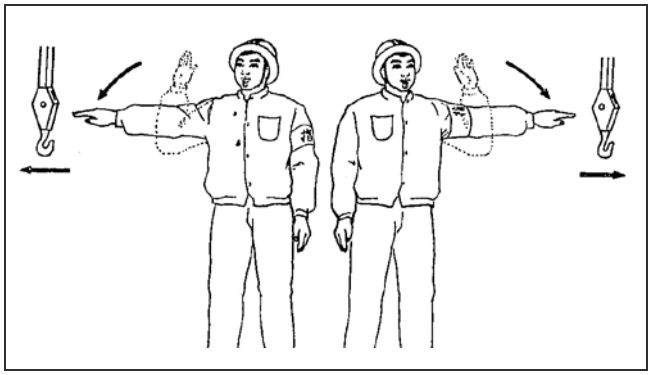
   With forearm vertical, palm of the hand facing upwards, wave hand up repeatedly.



7. Rotate

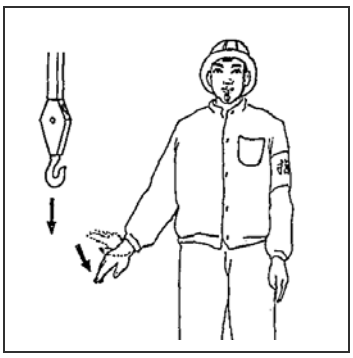
   Turn left: With right forearm vertical, the palm of the hand facing outwards, lower the forearm sideways horizontally, fingers pointing in the direction of rotation.

   Turn right: With left forearm vertical, the palm of the hand facing outwards, lower the forearm sideways horizontally, fingers pointing in the direction of rotation.



8. Lower the load slowly

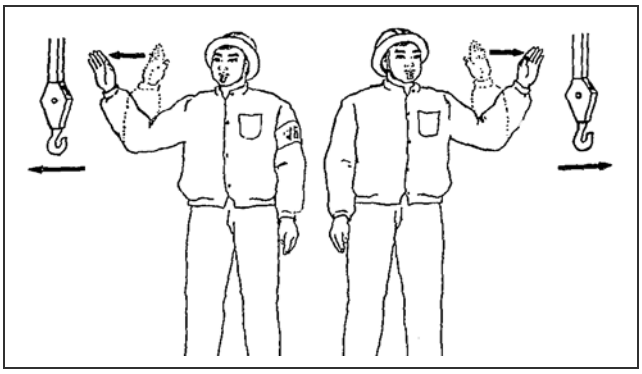
   With arm extended downwards with a 30° angle to the body, palm of the hand facing downwards, wave hand down repeatedly.



9. Rotate slowly

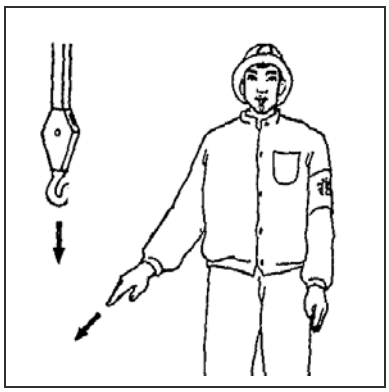
   Turn left: With right forearm vertical, the palm of the hand facing outwards, move forearm horizontally and repeatedly, fingers pointing in the direction of rotation.

   Turn right: With left forearm vertical, the palm of the hand facing outwards, move forearm horizontally and repeatedly, fingers pointing in the direction of rotation.



10. Indicate load lowering position

    Extend the fingers to point at the position the load should fall on.

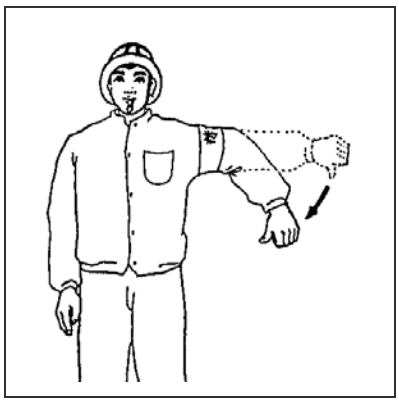


11. Raise boom

    Arm extended, finger closed, thumb pointing upward.

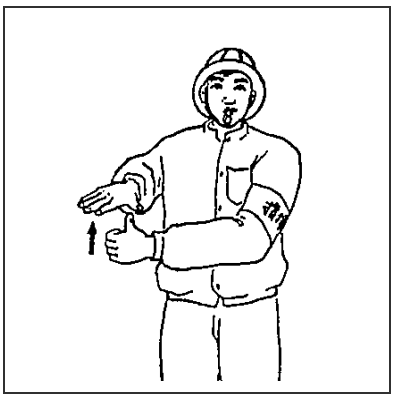
12. Lower boom

    Arm extended, finger closed, thumb pointing downward.



13. Raise boom slowly

    Forearm extends in front of body with palm facing downwards, another hand moves up and down with thumb pointing upwards.

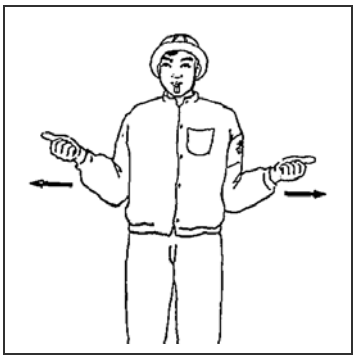


14. Lower boom slowly

    Forearm extends in front of body with palm facing upwards, another hand moves up and down with thumb pointing downwards.

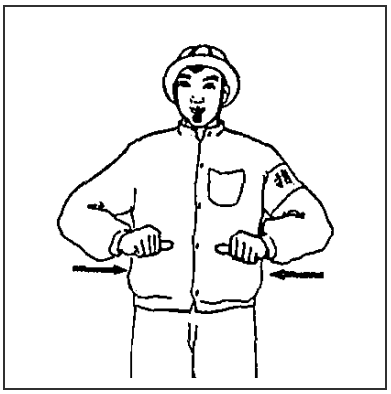
15. Extend boom

    Both fists in front of body with thumbs pointing outwards.



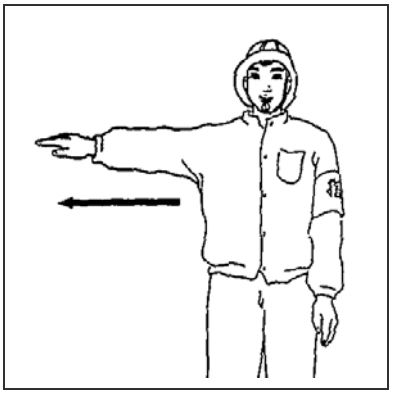
16. Retract boom

    Both fists in front of body with thumbs pointing toward each other.



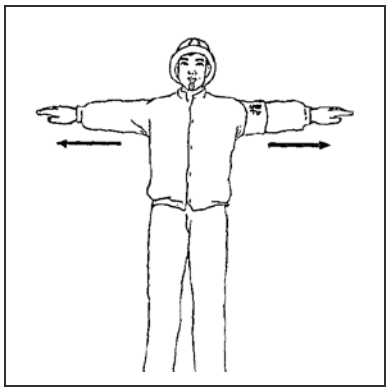
17. Stop

    Arm extended, palm down, and move the arm back and forth horizontally.



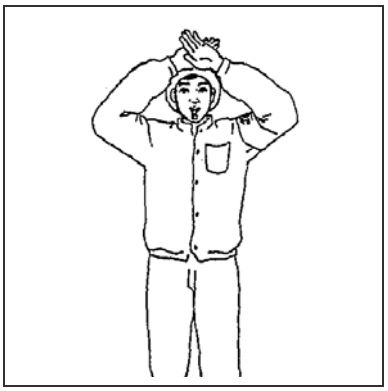
18. Emergency stop

    Both arms extended, palms down, move arms back and forth horizontally.



19. End a movement

    Cross your hands in front of your forehead.



ZOOMLION

OPERATOR’S MANUAL FOR TRUCK CRANE

Chapter 3 Operation – crane chassis

3.1 Driver's cab

3.1.1 Overview

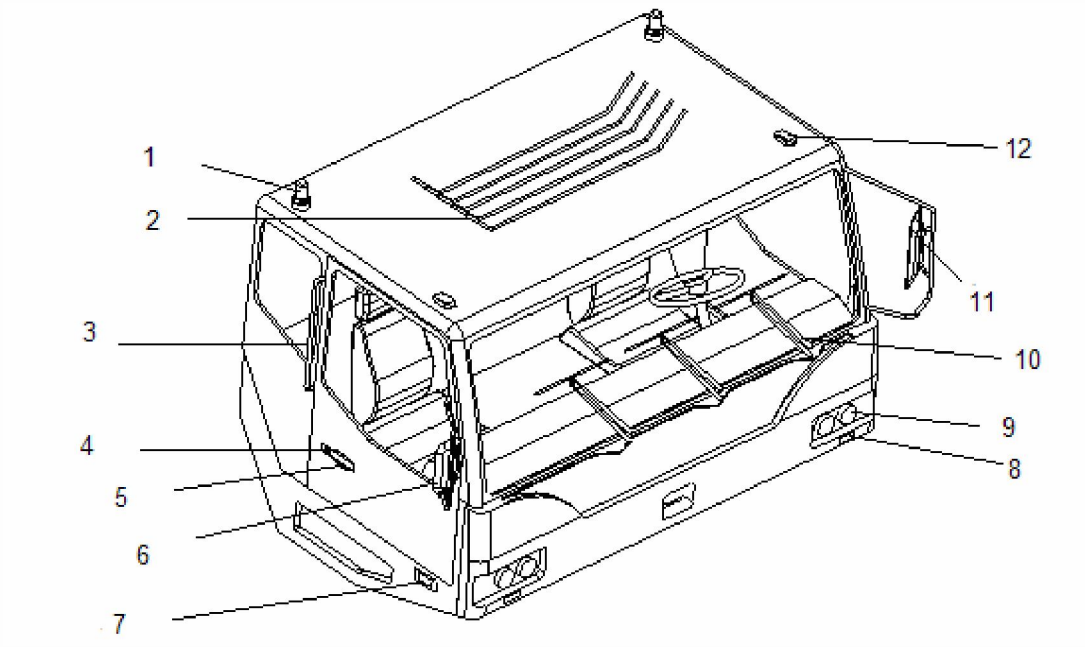


Fig. 03 – 01

1 Rotating beacon (optional)
2 Wire rope holder
3 Handrail
4 Key hole
5 Door handle
6 Mirrors (R)
7 Side turn signal
8 Front fog light
9 Front combination signals
10 Front windshield wiper
11 Mirrors (L)
12 Corner marker light

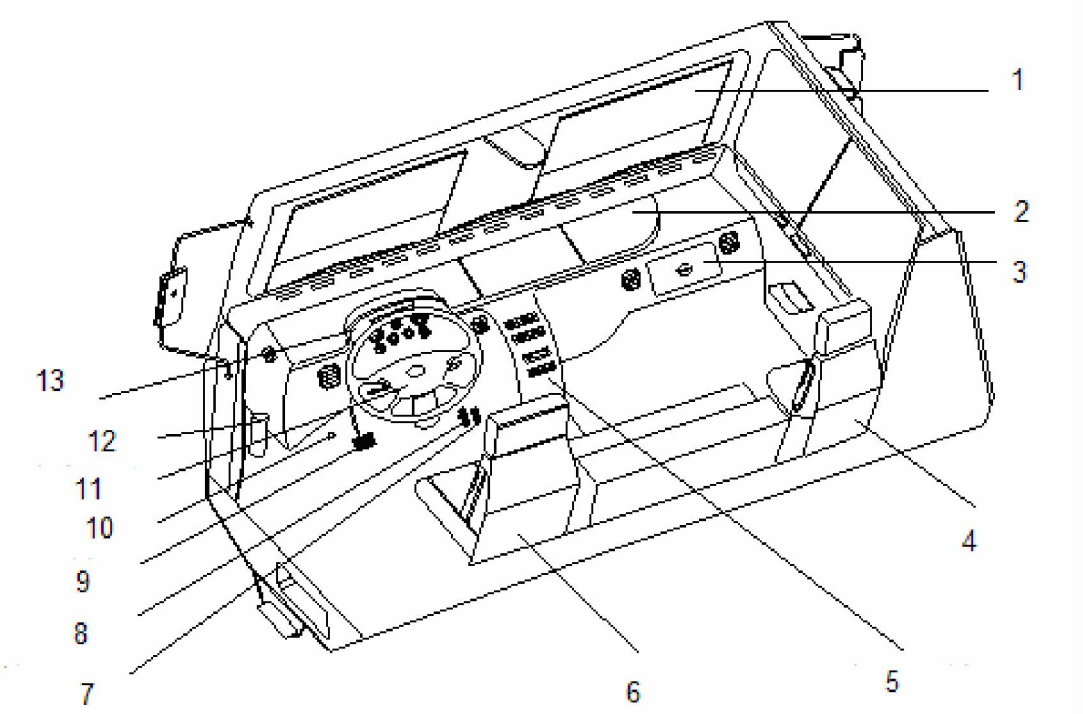


Fig. 03 – 02

1 Sun visor
2 Toolbox
3 Fuse box
4 Co-driver’s seat
5 Center console
6 Driver’s seat
7 Foot pedal (R): Engine control
8 Foot pedal (M): Service brake
9 Foot pedal (L): Clutch
10 Air horn switch
11 Steering wheel assy.
12 Oil reservoir for clutch
13 Instruments console

3.1.2 Steering wheel assy.

Steering wheel assy. is composed of steering wheel, steering wheel adjustment handle, left-hand and right-hand steering column switches, electric horn button and ignition starter switch. See Fig.03 – 03.

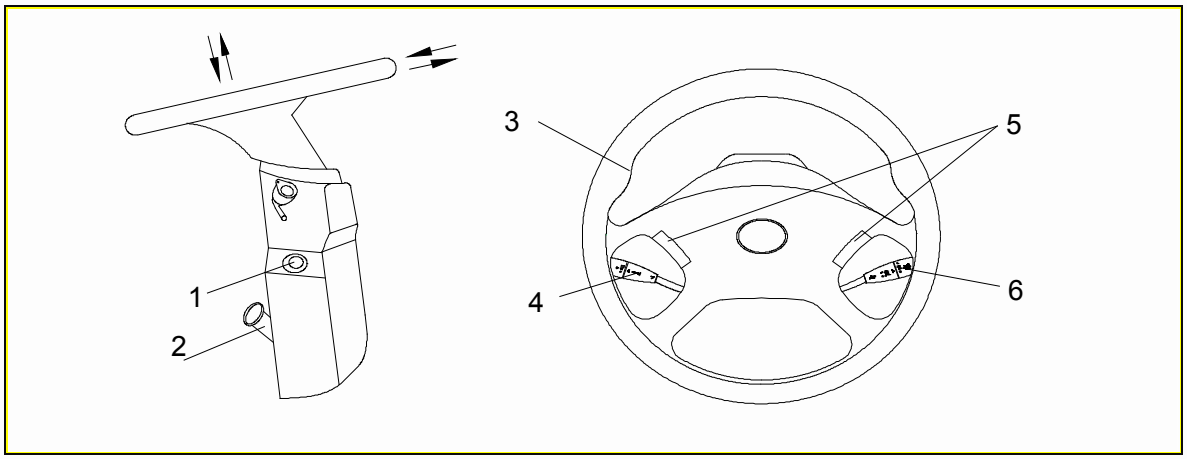


Fig. 03 – 03

1 Ignition starter switch

2 Steering wheel adjustment handle

3 Steering wheel

4 Left-hand steering column switch

5 Electric horn button

6 Right-hand steering column switch

– **Steering wheel adjustment handle**

The angle and height of the steering wheel can be adjusted to suit the driver.

Pull the adjustment handle upwards to adjust the height and angle of the steering wheel.

⚠ CAUTION

(1) Risk of fatal injury if adjust the steering wheel while driving!

(2) Turn the switch downwards to lock the steering wheel after adjustment.

– **Left-hand steering column switch**

As shown in Fig. 03 – 04.

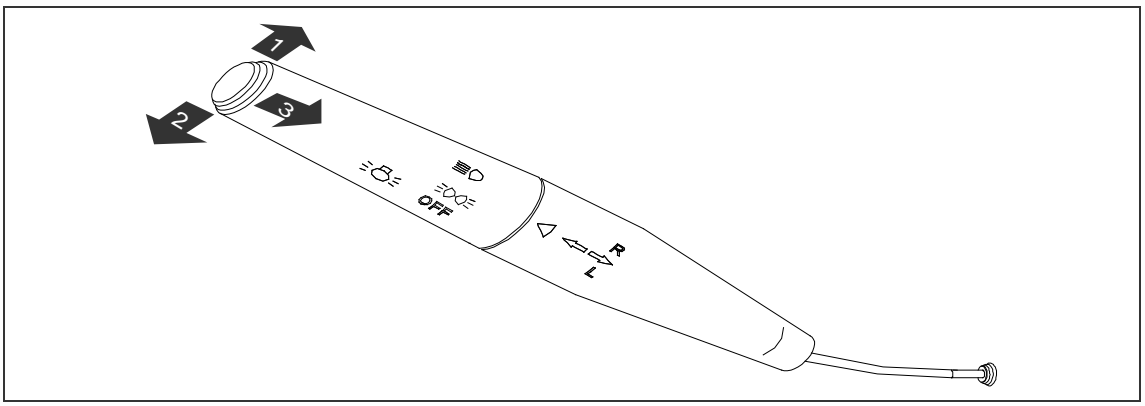


Fig. 03 – 04

a) Turn signal activation (left / right)

Jog steering column forwards (in direction 1): turn signal (right) activation

Jog steering column backwards (in direction 2): turn signal (left) activation

b) Switch between low beam and high beam and operate headlamp flasher

Jog the switch upwards (in direction 3) to turn on the high beam and headlamp.

Jog the switch upwards and downwards continuously to operate headlamp flasher.

No matter what working conditions other lamps are in, once the headlamp flasher is on, the headlamp will light up.

c) Lighting switch

Rotate the end of the steering column switch to the position to activate the front width lamps, rear width lamps, corner marker lights, license plate lamp, operating instrument lamp and low beam.

Rotate the end of the steering column switch to the position to activate the high beam.

– **Right-hand steering column switch**

As shown in Fig. 03 – 05.

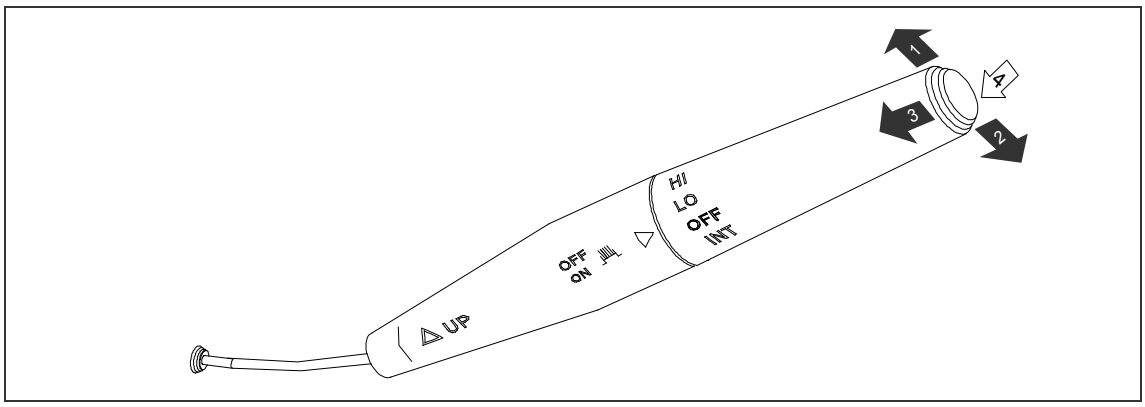


Fig. 03 – 05

a) Windshield wiper activation

Rotate the end of this steering column switch to activate the windshield wiper. The windshield wiper has 4 stages:

INT:	Intermittent
LOW:	Low speed
HI:	High speed
OFF:	Off

b) Windshield wiper washer system activation

Push the button (in direction 4), on the end of this steering column switch, to activate the washer and wiper. They will not stop working until the button is released.

⚠ CAUTION

The spray of washer fluid stops after 15 seconds or if the washer fluid tank is empty. Do not operate the wipers on in sunny days unless you use spray the window with wiper fluid. When the temperature is below freezing, make sure that the wiper blades are not frozen on the window before you set the wipers to ON.

c) Engine exhaust brake activation

Jog the switch backwards (in direction 2) to activate engine exhaust brake.

Jog the switch forwards (in direction 1) to deactivate the engine exhaust brake.

⚠ CAUTION

Depressing the engine control pedal or clutch pedal can deactivate the

exhaust brake temporarily when exhaust brake is activated. However, the exhaust brake will be activated automatically after releasing the engine control pedal or clutch pedal. When the engine RPM is below 1200 rpm, the exhaust brake will be deactivated automatically.

d) Parking signal activation

Jog the switch upwards (in direction 3) to activate the left and right turn signals simultaneously, thus the parking signal is given. Repeat the operation again, the switch will return to neutral position.

– **Electric horn button**

It is in the central area of the steering wheel. Press either of the two buttons on the left or right side of the central area to activate the electric horn (See Fig. 03 – 03).

– **Ignition starter switch**

The 4 positions of the switch (in clockwise sequence) are as follows:

LOCK	All circuits are OFF. You can plug in or pull out the key.
ACC	Battery begins to work to supply electricity to part of the electrical devices.
ON	All circuits, this does not include the starter, are ON.
S	A temporary position, use it to operate the starter. The key will return to ON automatically after you release the key.

⚠ CAUTION

You cannot remove the key until the switch is in LOCK position.

3.1.3 General operating instruments

– **Instrument panel assy.**

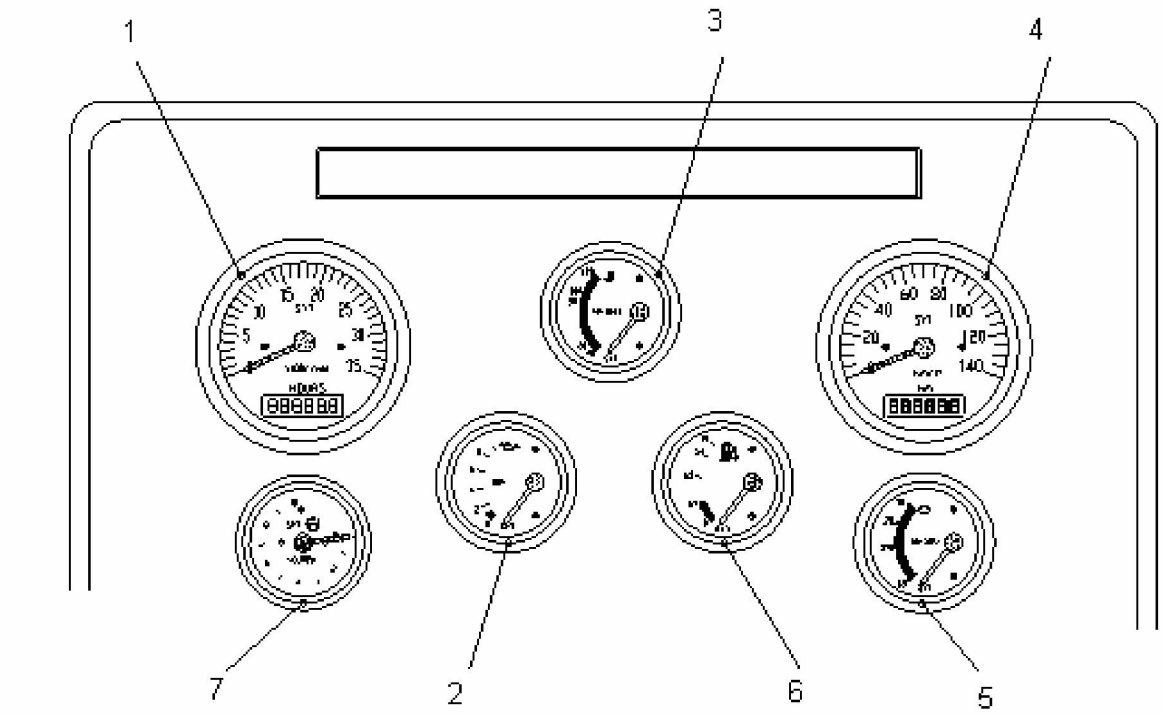


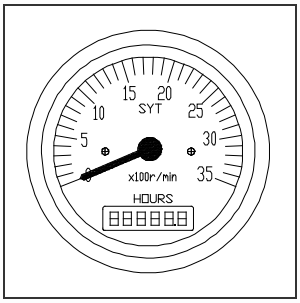
Fig. 03 – 06

1 Tachometer
2 Engine oil pressure gauge
3 Water thermometer
4 Odometer
5 Voltmeter
6 Fuel gauge
7 Barometer

– Instruments

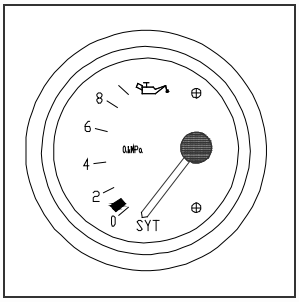
1 Tachometer

Displays engine speed (RPM) and actual running time.



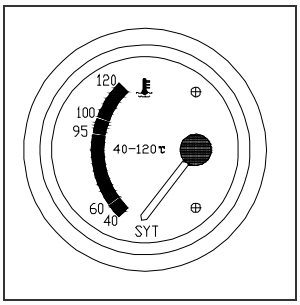
2 Engine oil pressure gauge

Displays the engine oil pressure when the engine is running.



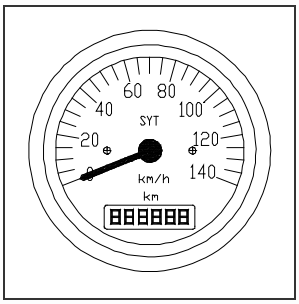
3 Water thermometer

Displays the engine coolant temperature in degrees Celsius (℃).



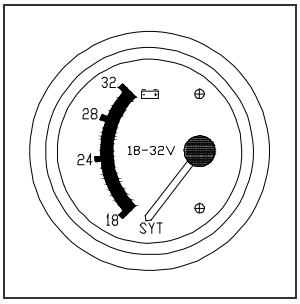
4 Odometer

Displays the speed of the crane in kilometers per hour (km/h) when the crane is moving, and displays the total driving distance of the crane in kilometers.



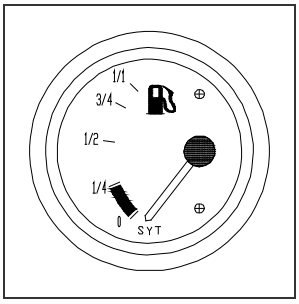
5 Voltmeter

Displays the voltage of generator during engine running and displays the voltage of battery when engine stops.



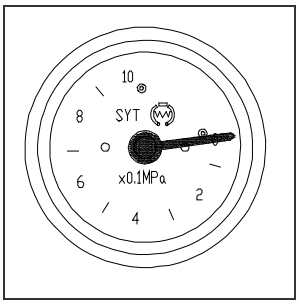
6 Fuel gauge

Displays the fuel reserves.



7 Barometer

The two pointers of the barometer resp. indicate the air pressure of air reservoirs for front axles and intermediate / rear axles.



– **Display unit 1**

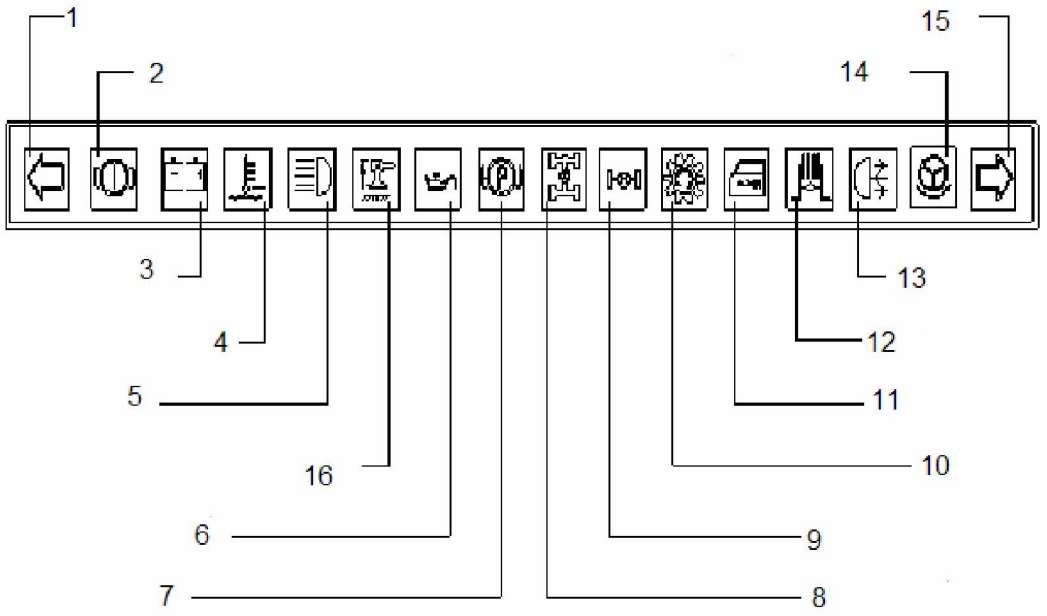


Fig. 03 – 07

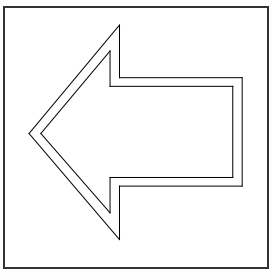
1	Control light	Vehicle direction of travel left
2	Warning light	Brake pressure too low
3	Warning light	Charging monitoring
4	Warning light	Engine coolant temperature too high
5	Control light	High beam
6	Warning light	Engine oil pressure too low
7	Control light	Parking brake closed
8	Control light	Longitudinal differential lock
9	Control light	Transversal differential lock
10	Control light	PTO engaged
11	Warning light	Door opened
12	Control light	Engine exhaust brake
13	Control light	Rear fog light
14	Control light (optional)	Emergency steering
15	Control light	Vehicle direction of travel right
16	Control light (optional)	The 5th outrigger retracting completely

1 Control light

Vehicle direction of travel left

Illuminates:

The vehicle travels left.



2 Warning light

Brake pressure too low

Illuminates:

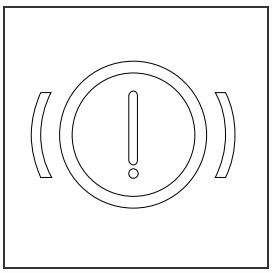
Brake pressure too low

Extinguishes:

Brake pressure increased to the specified value

CAUTION

Do not drive the vehicle if the warning light lights up!



3 Warning light

Charge monitoring

Illuminates:

The ignition starter switch is switched to position ON.

Extinguishes:

– The engine is started.

– The generator begins to charge the battery.

CAUTION

If the warning light does not extinguish during battery charging, there is generator or charging system fault. Stop to check at once!

4 Warning light

Engine coolant temperature too high

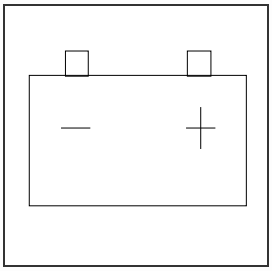
Illuminates:

Engine coolant temperature is too high.

Check the water thermometer and stop the vehicle to check the engine cooling system.

WARNING

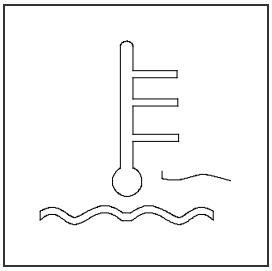
Under this condition, do not stop the engine at once. Run the engine at idle speed for several minutes. Otherwise, the engine oil will be clung to the engine inside because of sudden temperature drop.



5 Control light High beam

Illuminates:

High beam or headlamp flasher is active.



6 Warning light

Engine oil pressure too low

Illuminates:

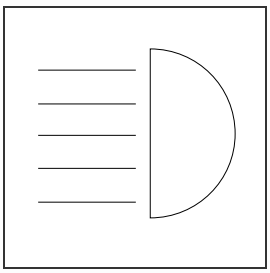
Ignition starter switch is in ON position under normal condition.

Extinguishes:

Engine starts.

⚠ CAUTION

If the warning light illuminates during engine running, the engine oil pressure is too low or the engine oil filter element is soiled. Immediately bring the crane to a standstill and rectify! Otherwise the engine will be damaged seriously!



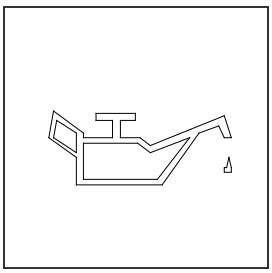
7 Control light

Parking brake closed

Illuminates:

The parking brake is closed.

Do not start the vehicle until the parking brake is released and the control light extinguishes.

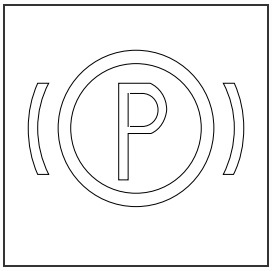


8 Control light

Longitudinal differential lock

Illuminates:

The longitudinal differential lock is activated and locked.

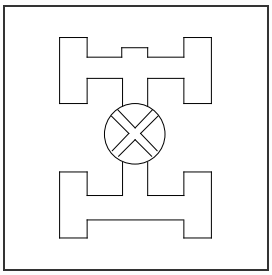


9 Control light

Transversal differential lock

Illuminates:

The transversal differential lock is activated and locked.

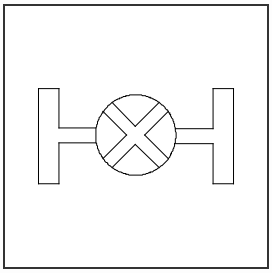


10 Control light

PTO engaged

Illuminates:

The PTO is engaged.



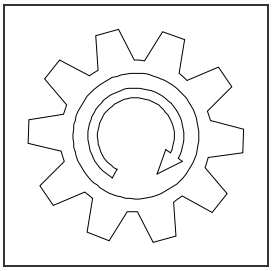
11 Warning light Door opened

Illuminates:

The door is opened.

WARNING

It is very dangerous to drive the vehicle with door opened. Stop the vehicle and check the doors if this light lights up!

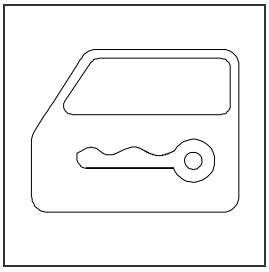


12 Control light

Engine exhaust brake

Illuminates:

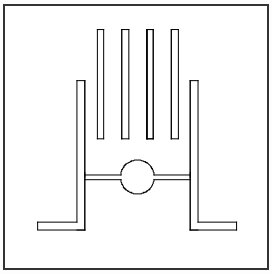
Engine exhaust brake is ready for work or it is active.



13 Control light

Rear fog light

Illuminates:



14 Control light

Emergency steering

It is optional.

Rear fog light is active.

Illuminates:

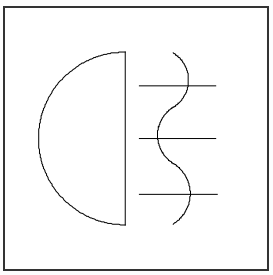
The ignition starter switch is in ON position.

Extinguishes:

The vehicle driving speed is above 15 km/h.

NOTE

If the vehicle is not equipped with emergency steering system, the control light will never illuminate.

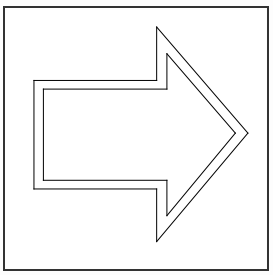


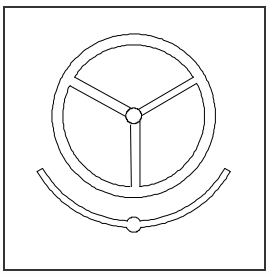
15 Control light

Vehicle direction of travel right

Illuminates:

The vehicle travels right.

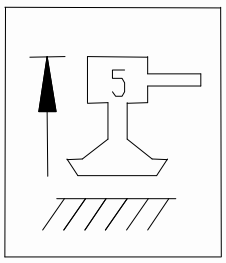




16 Control light

The 5th outrigger retracting completely

It is optional.



3.1.4 Air horn switch

It is located on the outside of clutch pedal and on the left side of driver.

Depressed: Air horn alarms.

Released: Air horn stops alarming.

3.1.5 Foot pedal (R): Engine control

It is an electron pedal.

Depressed: The vehicle accelerates.

Released: The vehicle decelerates.

3.1.6 Foot pedal (M): Service brake

Depress the service brake to decelerate or stop the vehicle.

3.1.7 Foot pedal (L): Clutch

Depress the clutch pedal to disengage the clutch.

3.1.8 Center console

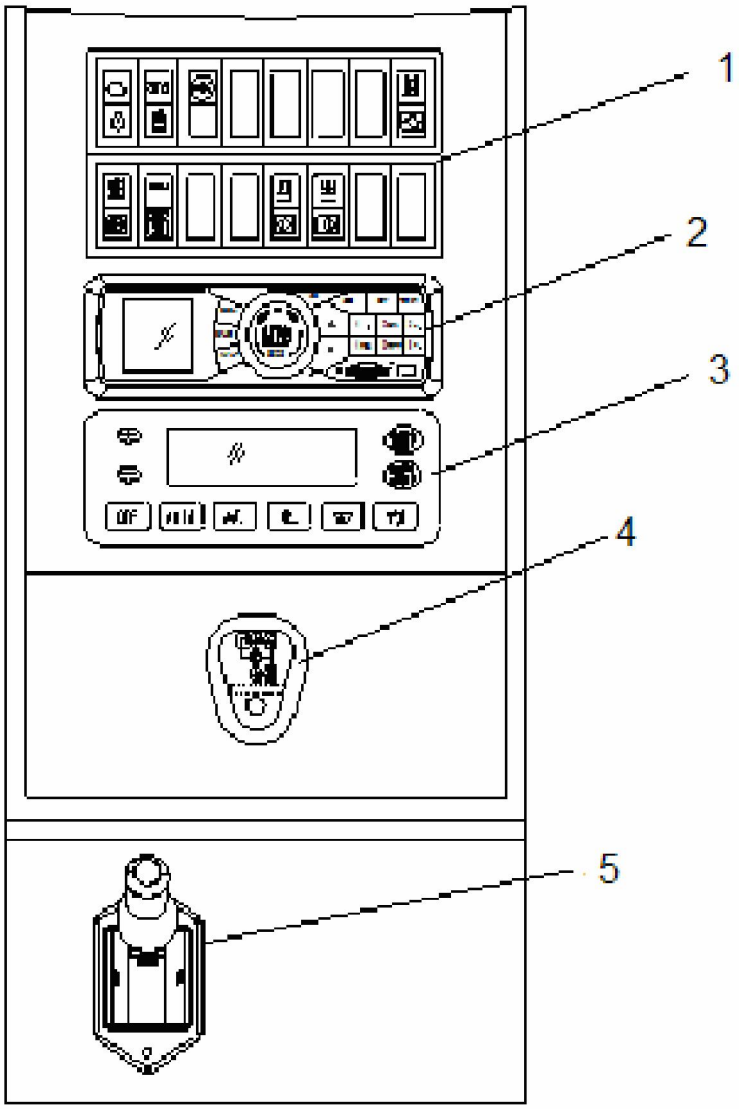


Fig. 03 – 08

1 Keyboard and display unit 2

2 Media player

3 Control panel – A/C and cab heater

4 Range selector

5 Parking brake hand lever

– **Media player**

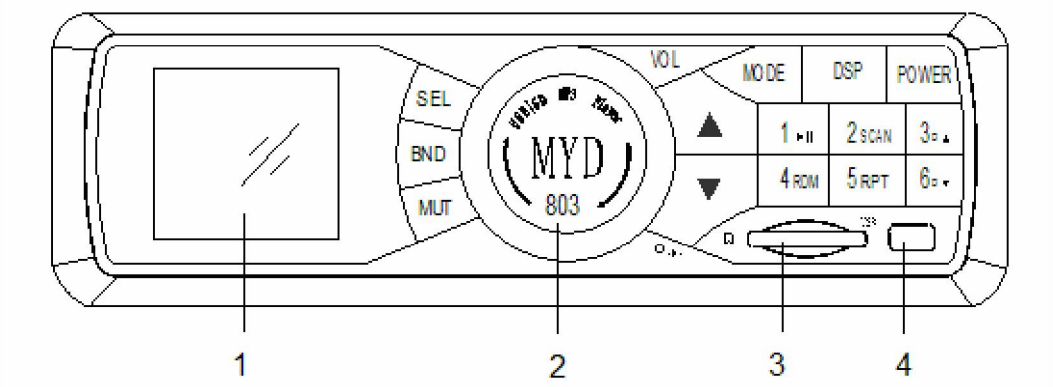


Fig. 03 – 09

1 Display

2 Rotary switch for volume and functions adjustment

3 SD card slot

4 USB port

a) Button Power source

POWER

b) Button

Changeover radio / SD / USB

MODE

c) Button Band control

BND

d) Button

Sound effect selection

SEL

e) Button MUTE

MUT

f) Button Time set

Press and release:

The time will be displayed.

Keep it pressed for 3s:

Buttons ▲ or ▼ can be used to set time.

DSP

g) Button

High-frequency scan (receive) / Skip next

h) Button

Low-frequency scan (receive) / Skip previous

i) Preset button 1 (receive)

Press and release:

Play the first song.

Keep it pressed for a long time:

Pause.

j) Preset button 2 (receive)

Press and release:

Play the second song.

k) Preset button 3 (receive)

Press and release:

Play the third song.

Keep it pressed for a long time:

Select the next file.

l) Preset button 4 (receive)

Press and release:

Play the fourth song.

Press it pressed for a long time:

Play at random.

m) Preset button 5 (receive)

Press and release:

Play the fifth song.

Keep it pressed for a long time:

Repeat.

n) Preset button 6 (receive)

Press and release:

Play the sixth song.

Keep it pressed for a long time:

Select the next file.

Turn the ignition starter switch to "ACC" when using the player without engine running.

– **Range selector**

The range selector is installed on the right-hand side of the driver.

Jog the selector leftwards, rightwards, forwards and backwards to select and changeover the gear.

– **Parking brake hand lever**

Pull the hand lever backwards to activate the parking brake and emergency brake.

– **Keyboard and display unit 2**

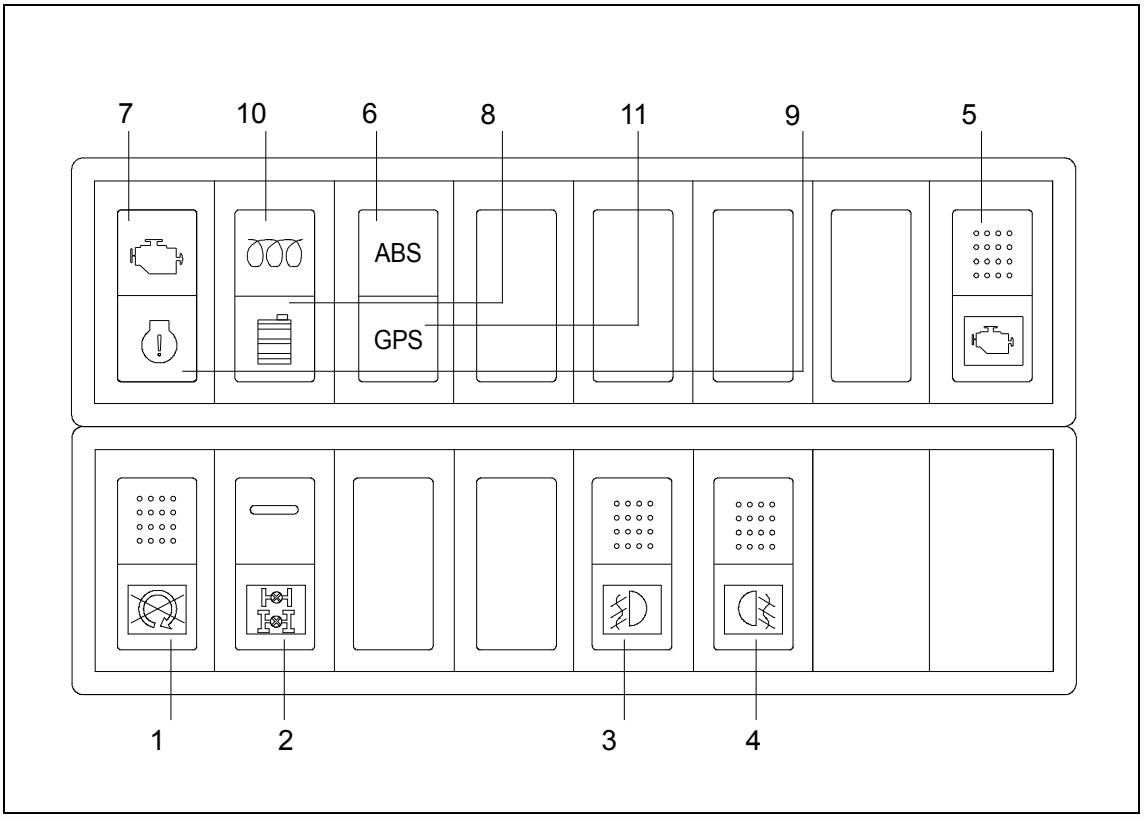


Fig. 03 – 10

1	Button		Engine off
2	Button		Longitudinal and transversal differential locks
3	Button		Front fog light
4	Button		Rear fog light
5	Button		Engine fault diagnosis
6	Warning light		ABS defects
7	Warning light		Engine error code displayed
8	Warning light		Engine coolant level too low
9	Warning light	(not used)	Engine defects (for Cummins engine)
10	Control light		Diesel engine preheating system
11	Control light		GPS state

1 Button Engine off

Keep it pressed for 2 – 3 seconds:

The engine stops running.

2 Button

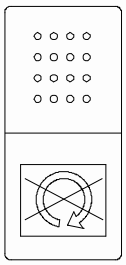
Longitudinal and transversal differential locks

Pressed:

The longitudinal and transversal differential locks are activated.

CAUTION

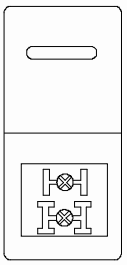
You can operate the button only when the vehicle is stationary.



3 Button Front fog light

Pressed:

The front fog light illuminates.



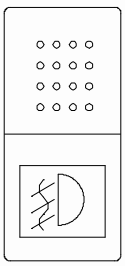
4 Button Rear fog light

Pressed:

The rear fog light lights up.

NOTE

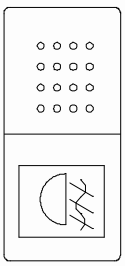
You can operate the button only when the high beam, low beam or front fog light lights up.



5 Button Engine fault diagnosis

Pressed and released:

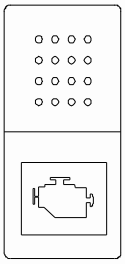
The Warning light “Engine error code displayed” flashes out the error code of engine if the



6 Warning light ABS defects

It is optional.

warning lights 7 or 9 illuminates all the time.



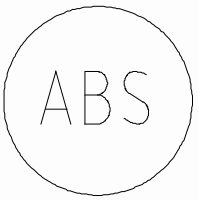
7 Warning light

Engine error code displayed

Illuminates:

Engine defects. Rectify it right away.

It flashes out the error code after the button “Engine fault diagnosis” is pressed.



8 Warning light

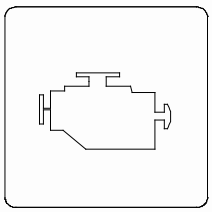
Engine coolant level too low

Illuminates:

Engine coolant level in expansion tank is too low.

WARNING

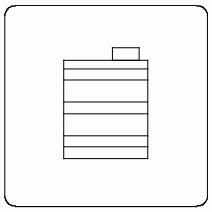
Under this condition, add coolant after it cools down. Otherwise, the engine oil will be clung to the engine inside due to sudden temperature drop.



9 Warning light

Engine defects

Not used.

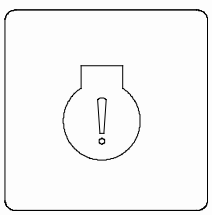


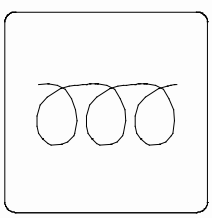
10 Control light

Diesel engine preheating system

Illuminates:

Preheat the engine.





11 Control light GPS state

The control light has 3 states when the ignition starter switch has been placed to position ON:

- **Flashes 3 times and then extinguishes:**

  GPS terminal works normally.

- **Flashes:**

  The crane is to be locked or GPS terminal defects.

- **Illuminates:**

  The crane is locked.

CAUTION

When the control light flashes, stop crane at once to check and repair.

3.1.9 Crane lighting

– **Front combination signals**

Take the lights on the left as an example, the right lights are the same as the left ones. For the details, refer to Fig. 03 – 11.

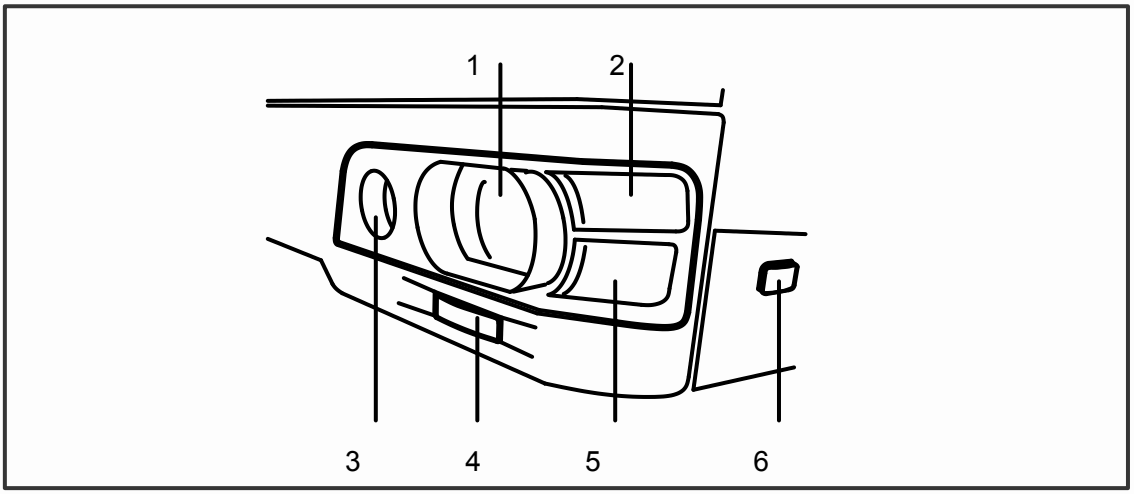


Fig. 03 – 11

1 Front high beam

2 Front turn signal

3 Front low beam

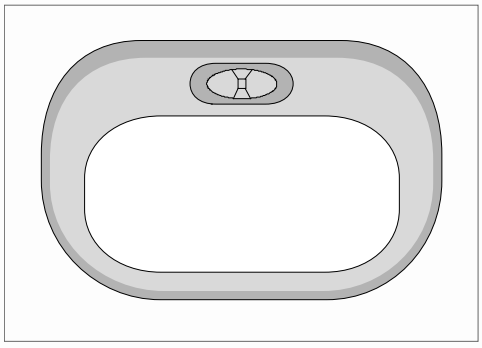
4 Front fog light

5 Front width lamp

6 Side turn signal

– **Interior illumination**

The interior illumination is located at the roof of the driver's cab, including small lamp & its button and door lamp & its button. The direction of small lamp can be adjusted by pressing its edge. The small lamp button is a 2-handed button.



The door lamp button is a 3-handed button:

Center position: off

Left and right positions: on

The door lamp will light up if any door is open. If the doors are closed well, the door lamp will go out. In addition, the door lamp can also be controlled manually.

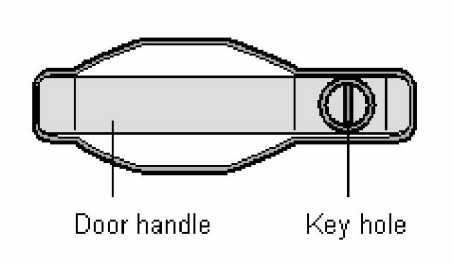
3.1.10 Door – driver's cab

a) Open the door from outside

Hold the handle and pull it outwards.

b) Close the door

The door will be locked automatically when the door is closed.



CAUTION

Ensure the door is closed well before driving.

c) Open the door from inside

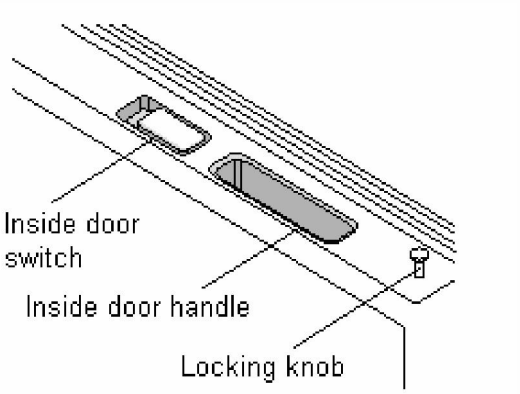
Pull the inside door switch upwards and hold the handle to push the door outwards.

d) Lock the door from inside

The locking knob is on the lower edge of door window.

Press down the locking knob to lock the door from inside.

Pull the locking knob upwards before opening the door.



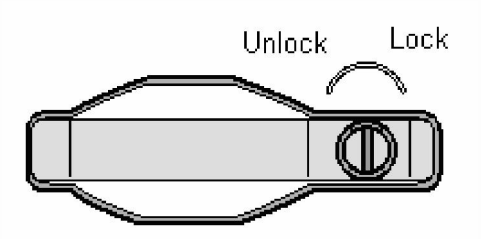
NOTE

If the door is not closed well, the locking knob cannot be pressed down.

e) Lock the door from outside

Insert vehicle key into the key hole. Turn it clockwise to lock the door.

Turn it counterclockwise to unlock the door.

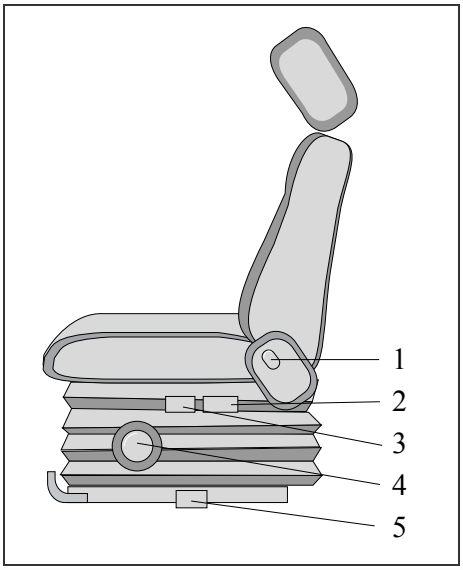


3.1.11 Seats in driver's cab

– **Seat adjustment**

This crane is equipped with suspension seats, which can be adjusted to suitable position before setting off.

When adjusting the stiffness of the seat, please set the red pointer within the range from 40 kg to 130 kg.



1 Switch, adjust backrest setting

2 Handle, adjust seat cushion angle (rear section)

3 Handle, adjust seat cushion angle (front section)

4 Rotary switch, adjust stiffness

5 Switch, adjust horizontal setting

– **Seat belt adjustment**

Adjust and fasten the three-point seat belt to suitable position before setting off.

Insert tongue piece into belt lacer to fasten the belt.

Press the button to unfasten the belt.

⚠ CAUTION

Risk of fatal injury if seat belt is not worn!

All occupants must be belted in before setting off in the crane and during driving.

3.1.12 Attachments

a) Sun visor

The sun visor is located above the front windshield inside driver's cab.

Pull the sun visor downwards to shut out the sunlight.

Push the sun visor upwards to roll it up.

b) Toolbox

The toolbox is in the instrument console of the driver's cab, in which there are two tool boxes in different sizes.

Press the switch to open the toolbox and push down the cover to close it.

c) Cigarette lighter

Press the cigarette lighter and hold it in the position for 3 to 5 seconds, then it can be pulled out to light a cigarette. After using, return it to the cigarette lighter hole.

NOTE

To use the cigarette lighter, the engine must be ON or the ignition must be in the "ACC" position without engine running.

3.2 Before starting up the vehicle

3.2.1 Prerequisites

a) If the crane is used for the first time, ensure there is no damage and abnormity.

b) Always use the correct light diesel oil and engine oil. Make your selection on the lowest ambient temperature where you are to do the work. For the details, please refer to the *Operation and Service Manual for the WP10 Series Diesel Engine* (*National Stage III)*.

3.2.2 General checks before setting off

a) Do a check of the level of coolant and add more if below the cold engine level.

b) Do a check of the diesel oil level and make sure that you have more than is necessary to complete the task.

c) Make sure that the parts in the steering and brake systems are flexible, safe and reliable. Check the liquid levels in steering oil reservoir and clutch liquid reservoir.

d) Check the following parts, such as the bolt for steering shaft universal joint, leaf spring bolt, U-bolt and wheel bolt, for proper seating. And check the leaf spring for crack.

e) Check whether the tire pressure complies with the requirements, and check the tires, door locks, windows and operating mechanisms for functional work.

f) Check the fittings of oil pipes, air pipes and water pipes for leakage and check whether there is condensed moisture in air reservoir.

g) Check the terminal post of battery for tight fit and check whether the electrolyte level adheres to specified requirements.

h) Check the control light of air filter. If it is red, clean or replace the filter cartridge.

i) Place the ignition starter switch to position ON. Check the instruments, switches, lighting, control lights and wipers for functional work and check the outside mirrors for proper positions.

3.2.3 Checks before setting off

a) Check the following instruments for functions:

1) Engine oil pressure displayed in the pressure gauge should be above 0.1 MPa when the engine is running at idle speed. It should be within 0.35 – 0.55 MPa

when the engine RPM is 1200 rpm.

2) The value shown in the barometer should be above 0.55 MPa and the warning light “Brake pressure too low” should be off. Otherwise, the air line system cannot work normally, and thus affect driving safety.

3) The value displayed in the water thermometer should be above 60°C and the pointer should be within the green area.

b) Check whether PTO is disengaged.

c) Check whether the parking brake is released.

d) Start vehicle slowly with low gear. Never engage the clutch when engine is running at excessively high speed (above 1600 rpm).

3.3 Driving the crane

3.3.1 Starting and stopping the engine

a) Starting the engine

1) Checks:

– Check engine oil for correct level and make sure that it is clean.

– Check the coolant level.

– Check the fuel reserve.

2) Before starting the engine, ensure the following prerequisites are met:

– Check whether range selector of the transmission is in neutral “N” position and the parking brake has been applied.

– Insert the ignition starter key into the key hole and turn it to stage 1.

– Check whether the PTO switch is disengaged (at this time, the control light “PTO engaged” extinguishes).

– In winter, the engine will preheat automatically, and at the same time, the control light “Diesel engine preheating system” lights up.

– After the control light “Diesel engine preheating system” extinguishes, apply the engine control pedal softly and turn the ignition starter switch to position S to start the engine.

⚠ CAUTION

(1) Turn the ignition starter switch to position S within 30 sec. after the control light “Diesel engine preheating system” extinguishes.

(2) If you cannot start the engine in a maximum of 15 seconds, wait for 30 sec. Then try to start the engine again. If the engine can not be started for three consecutive times, fix it right away.

⚠ WARNING

In order to avoid inadvertently starting the vehicle, depress the clutch pedal when starting the engine.

3) Preheat the engine and check instruments for functions:

Release the engine control pedal slowly and run the engine at idle speed for several minutes to warm up the engine. At this time, check the instruments and control lights for functions.

⚠ CAUTION

(1) In order to make the engine oil effectively distributed to each part of engine and raise up water temperature to burn the fuel normally, it is necessary to

warm up the engine before starting.

(2) Do not run the engine at high speed without load during warming up. Otherwise, the engine may be damaged and its service life may be shortened.

(3) Do not run the engine at idle speed for a long time, which may weaken engine performance.

(4) It is forbidden to run the engine at high speed with a heavy load when the coolant temperature is below 60 ℃.

(5) The engine oil pressure should not be lower than 0.1 MPa when the engine runs at idle speed. With the engine being warmed up, the oil pressure is going to be stable gradually.

WARNING

Do not run the engine in a place where the combustible gas exists. The gas may be inhaled into the engine through the air intake system to make the engine speed up even overspeed, which may cause fire, explosion and heavy property losses.

b) Stopping the engine

1) Depress the service brake pedal slightly to decelerate the vehicle, at the same time, shift down the transmission to gear 1.

2) When the engine decelerates to the low speed, depress the clutch pedal and the service brake pedal at the same time to bring the vehicle to a standstill at the specified location.

CAUTION

Except in an emergency, do not depress the service brake pedal jerkily!

3) Pull the parking brake control lever backwards to the locking position to park the vehicle and then shift the transmission to neutral position.

4) Run the engine at idle speed for several minutes to cool down the engine.

5) Keep the engine off button pressed for 2 – 3 seconds until the engine stops running.

6) Turn the ignition starter switch to position LOCK and pull it out 30 sec. after the engine is stopped.

7) Do not keep the ignition starter switch in the "ON" or “ACC” position after you park the crane. This will cause the battery to drain.

8) When you park the vehicle on a slope, you must put chocks before or behind the wheels to avoid accident.

9) To prevent an accident when you park the crane in the dark, you must turn on the hazard lights.

3.3.2 Transmission and clutch operation

a) Transmission

1) Description

The crane is fitted with a main transmission and an auxiliary transmission. The main transmission is mechanically manual controlled, and the auxiliary one is pneumatically controlled.

The gearshift pressure should be more than 0.41 MPa.

For details, please refer to Fig. 03 – 12.

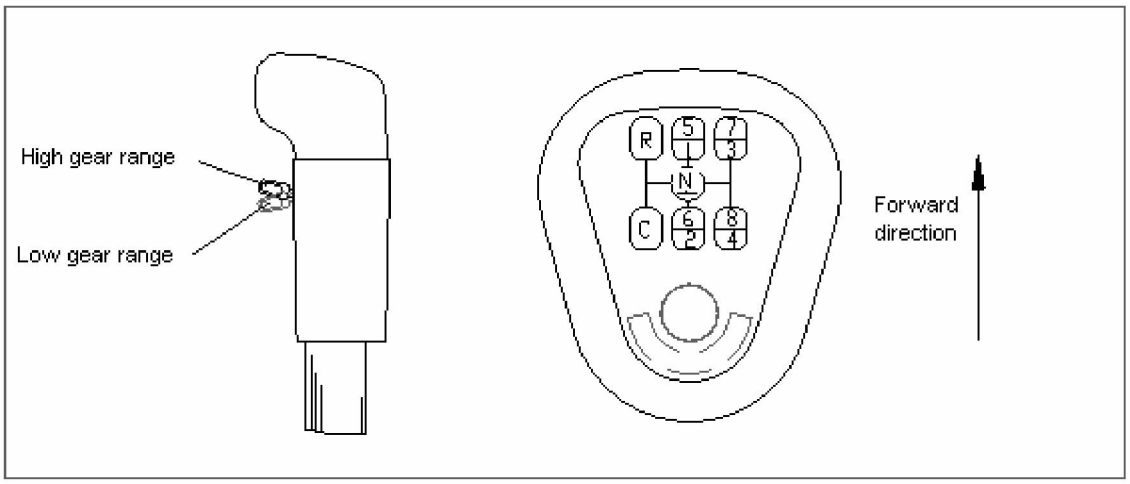


Fig. 03 – 12

2) Gear shifting

– The vehicle starts with gear 1, and the switch “Pre-selection of high / low gear range” should be changed into low gear range.

– When shifting, the clutch must be disengaged completely, and the range selector should be shifted in position.

– Both the high and low gear ranges have neutral positions. When parking the vehicle, the range selector should be shifted in the neutral position of low gear range.

– When it is engaged into creeper gear or reverse gear, stop the vehicle and then change gear to avoid damaging the transmission. When engaging the reverse gear, large force should be used to overcome resistance of the reverse lock.

– Do not skip gears when changing gears between low gear range and high gear range. Otherwise, risk of serious damage to the synchronizer of auxiliary transmission.

WARNING

The switch "Pre-selection of high / low gear range" must be used when changing gear between gear 5 and gear 6.

– When driving on a descending gradient, it is forbidden to shift gear between high and low gear range.

– If there is any abnormal sound in the transmission or it is difficult to shift gear, bring the vehicle to a standstill and rectify it at once.

– Inspect the lubricating oil level of transmission after stopping the vehicle for several minutes.

CAUTION

The temperature of transmission should be within the range of -40 ℃ – 120 ℃ during working. If the temperature is higher than 120℃, the lubricating oil will be decomposed and the service life of transmission will be shortened.

3) Points for attention

– Depress the clutch pedal when shifting gears. During downshifting, accelerate in the neutral position to make the connecting parts run at the same rotational speed.

– Only when the vehicle starts off or it is driving in the off-road condition, can the creeper gear be applied.

WARNING

Do not let the vehicle move forward when transmission is in neutral.

b) Clutch

1) Description

In the drive system, clutch is a part directly connected with the engine. Its function is to effectively engage or disengage its driving and driven parts under driver's operation.

2) Points for attention

– During driving, never place the foot on clutch pedal if it is not used.

– During downshifting, apply the service brake to decelerate the vehicle, and then depress the clutch pedal properly to change into proper gear.

CAUTION

When shifting the gear during driving, depress the clutch pedal and then release it rapidly, otherwise there is a risk of increasing clutch abrasion.

– Do not depress the clutch pedal as possible as you can except braking at low speed.

CAUTION

Only when the compressed air pressure P is above 0.6 MPa, can the clutch be completely disengaged.

3.3.3 Steering operation

Before steering, pay attention to the status around and then decelerate the vehicle:

a) The steering wheel has a mechanical limit. Do not keep the wheel at the limit for 5 seconds. Otherwise, the steering gear may be damaged.

b) If the vehicle is steered insufficiently, do not jerkily depress the service brake pedal or operate the steering wheel in the same direction continuously. The proper way is to decelerate the vehicle gradually and adjust the steering wheel at the same time.

c) If you over-steer, release the engine control pedal or depress the service brake while you turn the wheel in the opposite direction of the turn.

CAUTION

Do not turn the steering wheel quickly in one direction unless it is an emergency. Make your turns smoothly to keep the crane laterally stable.

d) Decrease the speed of the vehicle and move down the transmission gear if you have a sharp turn.

3.3.4 Brake operation

a) Description

The brake system consists of driving brake (service brake), engine exhaust brake and emergency brake (parking brake). The emergency brake can also be selected to park the vehicle in normal condition and on slopes.

b) Operation

1) Driving brake

There are several cases of braking. For details, please refer to the following instructions:

– Normal brake during driving, release the engine control pedal ahead to slow down the vehicle according to the actual road conditions like road surface, traffic, etc., and then continuously or intermittently apply the service brake to slow down or stop the vehicle stably.

– Slow brake after rapid brake: when there is an accident in front, apply the service brake rapidly and then apply it again slowly. Release the pedal slowly according to the distance away from the accident spot and shift gear in accordance with the actual driving speed. At last, apply the engine control pedal to drive at normal speed.

– Cadence brake: depress the service brake pedal and then release it. Repeat

the operation to decelerate the vehicle gradually. The operation should be very gentle.

– Rapid brake: in an emergency, release the engine control pedal immediately and apply the service brake jerkily (sometimes apply the parking brake at the same time) to bring the vehicle to a standstill as soon as possible. As a result, the accident will be avoided.

⚠ CAUTION

If the rapid brake is applied frequently, the abrasion of tires, brake drum and friction lining will be increased and the service life of each part will be shortened. Therefore, do not apply rapid brake except in an emergency, especially in rainy days or on frozen road.

2) Engine exhaust brake

When vehicle is traveling on a long descending gradient, engine exhaust brake is recommended. Under this condition, the vehicle decelerates via engine instead of service brake. In this way, the driving safety can be improved, and the braking performance decreasing and the brake failure, caused by applying service brake frequently to make brake drum overheat, can be avoided.

Before applying engine exhaust brake, release the engine control pedal and jog the right-hand steering column switch backwards, the engine exhaust brake is activated and the control light “Engine exhaust brake” lights up.

⚠ CAUTION

You can depress the engine control pedal or clutch pedal to deactivate the engine exhaust brake temporarily.

3) Emergency brake (parking brake)

If service brake fails or cannot be applied in time during driving, pull the parking brake control lever backwards to the locking position to activate the emergency brake. To release the parking brake, pull back the control lever of parking brake as far as the stop in the control lever's longitudinal direction and push forward.

⚠ CAUTION

(1) Emergency brake (namely parking brake) can also be selected to park the vehicle in normal condition and on slopes.

(2) Deactivate the emergency brake before driving.

c) Points for attention

1) After the engine control pedal is released during driving, do not step on the brake pedal when there is no necessity to brake the vehicle.

2) Do not apply emergency brake when the vehicle is driving on the narrow, frozen or muddy road or in a rainy / snowy day. Under the conditions, such as crossing

the railway, driving under the bridge, or driving on a road with pools of water, or one side of the vehicle is driving on frozen or muddy road, avoid applying the service brake as much as possible. Otherwise the vehicle may be shut down suddenly.

3) After driving across a road with pools of water, depress the brake pedal for several times to eliminate the water on the braking shoe so as to ensure the brake performance.

4) Before driving on a long descending gradient, shift the range selector to low-gear range. Under this condition, the driving speed is mainly controlled by the traction resistance from the engine and with the assistance of engine exhaust brake and service brake. Do not let the vehicle move forward when transmission is in neutral.

5) When the parking brake is used as the auxiliary brake, never pull the control lever to its limit position. When parking the vehicle under any conditions, the parking brake should be pulled back to the position, especially parking the vehicle on a slope. Risk of fatal injury and accident!

3.3.5 PTO operation

a) Engaging the PTO

For details, please refer to Fig. 03 – 13.

1) Open the shutoff gate valve of hydraulic oil tank to connect the hydraulic oil tank and oil line.

2) Start the engine.

3) Check whether the value shown in pressure gauge is within the range of 0.6 MPa – 0.8 MPa after the engine runs stably.

4) Depress the clutch pedal.

5) Apply the parking brake and shift the range selector into the gear 4.

6) Pull up the PTO switch to engage the PTO, and then the control light “PTO engaged” lights up.

7) Release the clutch pedal slowly to make the crane ready to work.

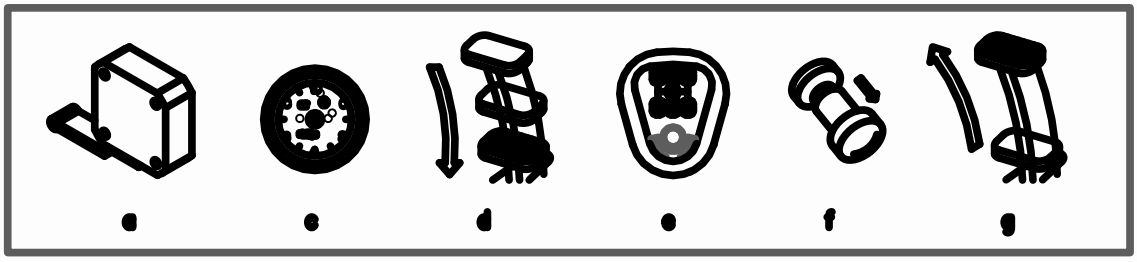


Fig. 03 – 13

b) Disengaging the PTO

For details, please refer to Fig. 03 – 14.

1) Depress the clutch pedal.

2) Press the PTO switch to deactivate the PTO, and then the control light “PTO engaged” extinguishes.

3) Shift the range selector into neutral position.

4) Release the clutch pedal slowly, and then the crane is in non-working state.

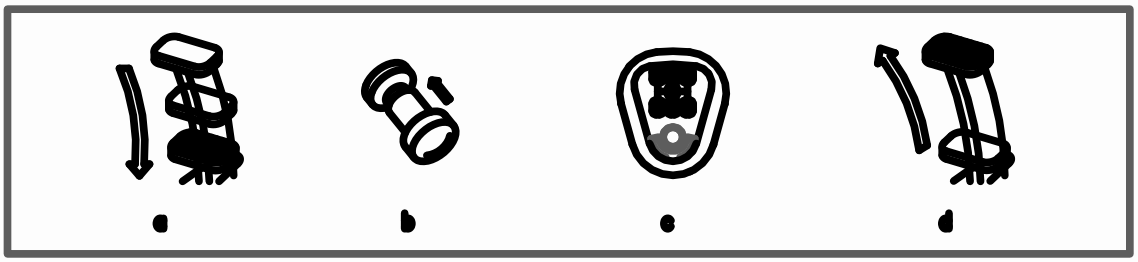


Fig. 03 – 14

CAUTION

(1) Gently depress and release the clutch pedal.

(2) When maintaining or replacing the PTO and oil pump drive device, place a caution board on the ignition starter switch in driver’s cab. Otherwise, it is very dangerous.

WARNING

When taking off power, do not shift the transmission in neutral position and make sure the parking brake is applied.

3.3.6 Towing

There is a towing coupling at both the front and rear ends of the crane. The following towing regulations must be adhered to:

a) Use a strong towing rope to connect with the towing coupling to tow the crane. Start slowly to decrease the impact on towing coupling of the towed crane.

b) The engine of towed crane must be started so as to ensure that the emergency brake and steering operation can be realized. Otherwise, it will be very dangerous.

WARNING

If the engine of towed crane cannot be started, do not tow it.

c) Shift the range selector of the towed crane in neutral position.

d) If the transmission of towed crane malfunctions, dismantle the drive shaft.

e) If the differential gear or rear axle of the towed crane fails, dismantle the left and right half shafts.

CAUTION

The engine exhaust brake system is invalid after the drive shaft or half shaft is dismantled.

3.4 Points for attention

3.4.1 Normal driving

a) Do not skip a gear when you move through the gear cycle.

b) During driving, if abnormal sound, smell, vibration or acceleration happens to the vehicle, or the steering wheel and brake work abnormally, decelerate immediately and stop the vehicle at a safe place for checks. If the cause of malfunction can not be determined or the problem cannot be rectified, send the vehicle to the specialized repair factory.

c) Once the warning lights light up, decelerate immediately and stop the vehicle at a safe place for checks.

d) Pay attention to the display of instruments (including barometer, engine oil pressure gauge, water thermometer, etc.) to ensure they comply with the requirements.

e) Before climbing an ascending gradient, downshift the transmission to reduce the load on the engine and driving system.

f) Points for attention on descending gradient:

1) Check the brake system for functional work before driving on a descending gradient.

2) When the vehicle is driving on a long descending gradient, engine exhaust brake is recommended. Shift the range selector to the low-gear range to make the engine exhaust brake work more efficiently.

3) Prevent the engine from overrunning. Overrunning of the engine refers to the phenomenon that the engine driven by the wheel runs at the engine RPM which exceeds its maximum permissible engine RPM.

CAUTION

(1) The engine is apt to be damaged due to overrunning.

(2) Downshift after decelerating. When downshifting from gear 4, the engine RPM should be below 1500 rpm. When downshifting from gear 3, the engine RPM should below 1200 rpm. Otherwise, overrunning may occur.

g) If the engine stops because the fuel tank is empty, air can go into the fuel system. When this occurs, you should deaerate the fuel system.

WARNING

Do not let the vehicle move forward after engine off.

3.4.2 Off-road driving

When the axles are in the mud (no traction) or on rough terrain, follow these steps:

a) Activate the transversal differential lock and longitudinal differential lock.

b) Shift the range selector to the low gear range and then engage the clutch slowly, otherwise the service life of the crane will be shortened.

c) Make sure that the engine RPM is around maximum.

d) Tow the vehicle or put rigid materials, e.g. pieces of wood or iron plates, below the wheels.

3.4.3 Parking

a) When you park the vehicle, follow the instructions below:

1) In bad weather condition (rain, snow, ice) or on a slope, make sure that there is a lot of clearance in front and to the aft of the vehicle.

2) Apply the parking brake. Always put the chocks before and behind the wheels on a slope.

3) Put the transmission in the "neutral" position of the low gear range.

b) Before you stop the engine, do the items that follow:

1) Depress the engine control pedal 2 or 3 times to increase the engine RPM. This makes the oil flow into each part of the engine.

2) Let the engine idle while you monitor the coolant temperature.

3) Stop the engine, when the coolant temperature is in the correct range.

⚠ CAUTION

Make sure that the hazard lights illuminate when the vehicle is parked on the road at night.

3.4.4 Points for attention when vehicle breaks down

a) If the vehicle breaks down during driving, keep calm to make way for other vehicles and decelerate gradually to park it in a safe area.

b) Activate the hazard warning light and place a warning triangle behind the vehicle to avoid collision.

c) If the brake is invalid due to failure of drive shaft or rear axles, place wheel chocks before and behind the wheels.

d) Examine the vehicle to find the part that caused the malfunction. Be careful of the road conditions while you move around the vehicle.

If you cannot repair the vehicle, tell the servicing and repair facility.

ZOOMLION

OPERATOR’S MANUAL FOR TRUCK CRANE

Chapter 4 Operation – crane superstructure

4.1 Operator's cab

4.1.1 Overview

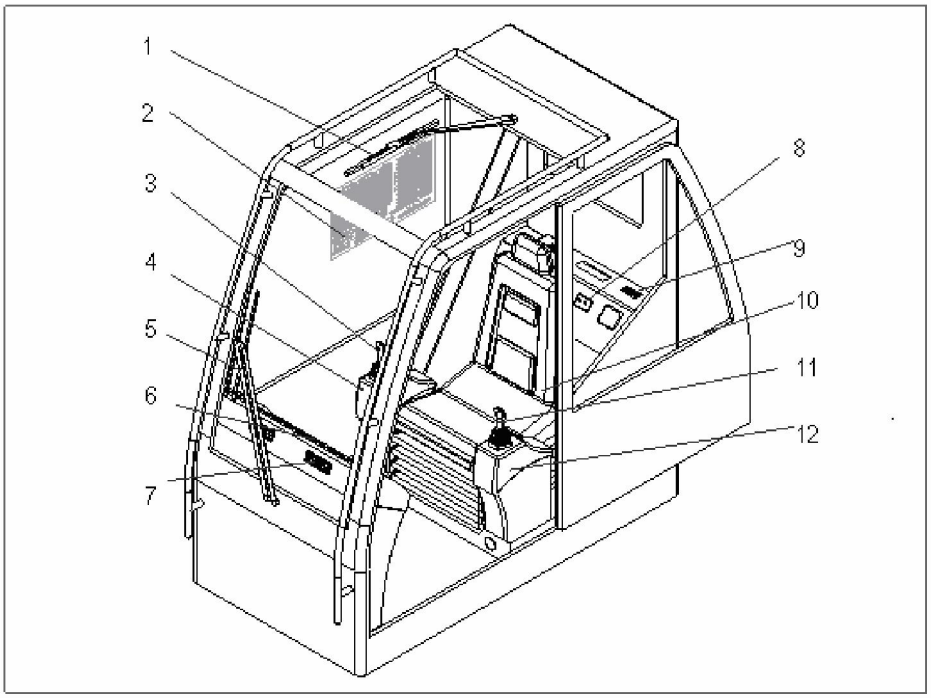


Fig. 04 – 01

1 Roof window wiper
2 Rated lifting capacity table
3 Right joystick
4 Right control box
5 Front windshield wiper
6 Instrument console
7 Front air outlet
8 Control panel for air conditioning and cab heater
9 Rear air outlet
10 Operator's seat
11 Left joystick
12 Left control box

4.1.2 Instrument console

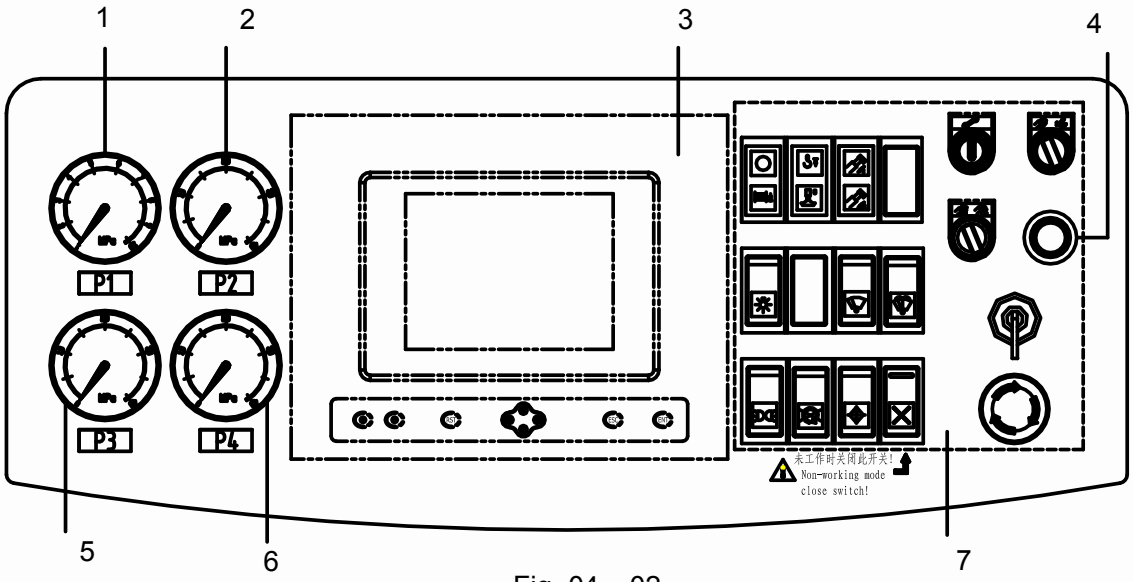


Fig. 04 – 02

1 Pilot pressure gauge

2 Pressure gauge, slewing hydraulic system

3 Load moment limiter

4 Cigarette lighter

5 Pressure gauge, main / auxiliary winch, derricking and telescoping hydraulic system

6 Pressure gauge, standby

7 General operating instruments

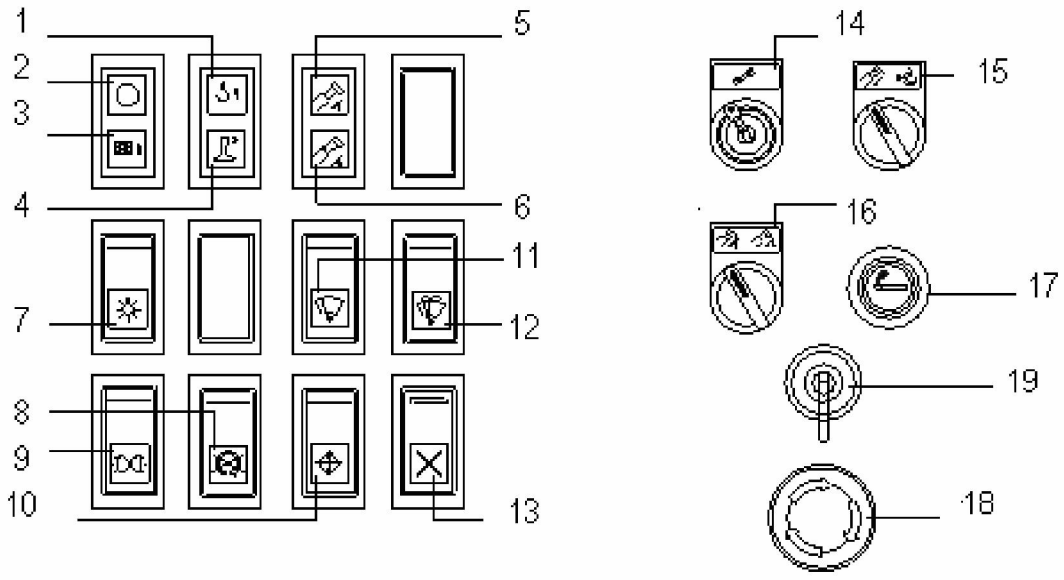


Fig. 04 – 03

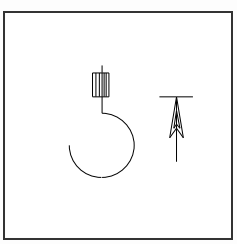
1	Warning light	Main / auxiliary winch approaching upper limit
2	Control light	Power source
3	Warning light	Main / auxiliary winch approaching lower limit
4	Warning light	The 5th outrigger pressure too high
5	Control light	Telescoping cylinder I
6	Control light	Telescoping cylinder II
7	Button	Work lights
8	Button	Engine off
9	Button	Work lights on boom head
10	Button	Oil cooler
11	Button	Front windshield wiper
12	Button	Front windshield washer system
13	Deadman switch	
14	Bypass key switch	
15	Switch	Pre-selection of telescope / auxiliary winch
16	Switch	Pre-selection of telescoping cylinder I / telescoping cylinder II
17	Cigarette lighter	
18	Emergency off switch	
19	Ignition starter switch	

1 Warning light

Main / auxiliary winch approaching upper limit

Illuminates:

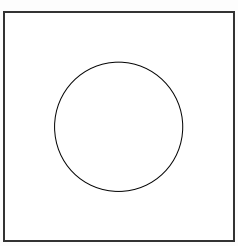
Main / auxiliary winch approaches upper limit. (For the location of the warning light, please refer to the load moment limiter.)



2 Control light Power source

Illuminates:

The ignition starter switch is turned to position I.

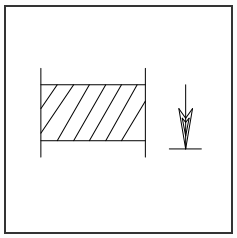


3 Warning light

Main / auxiliary winch approaching lower limit

Illuminates:

Main / auxiliary winch approaches lower limit.

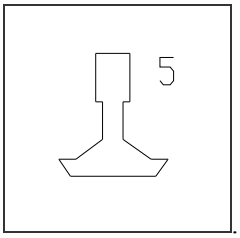


4 Warning light

The 5th outrigger pressure too high

Illuminates:

Pressure of the 5th outrigger exceeds the maximum permissible value.

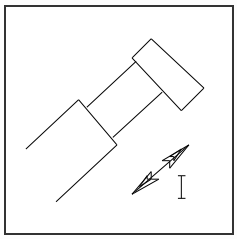


5 Control light

Telescoping cylinder I

Illuminates:

The pre-selection switch “Telescoping cylinder I / telescoping cylinder II” is turned to the left position.

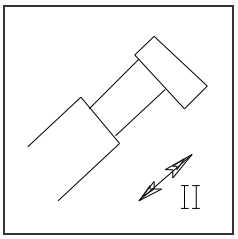


6 Control light

Telescoping cylinder II

Illuminates:

The pre-selection switch “Telescoping cylinder I / telescoping cylinder II” is turned to the right position.



7 Button Work lights

Position 1:

Switch on background lighting.

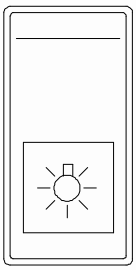
Position 2:

Switch on background lighting, work lights on slewing table and boom.

8 Button Engine off

Pressed for 1 to 2 seconds:

Engine stops. (This switch will be invalid if the deadman switch is activated.)

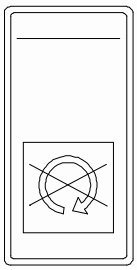


9 Button

Work lights on boom head

Pressed:

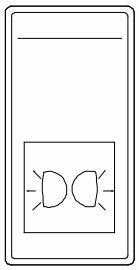
Switch on work lights on boom head.



10 Button Oil cooler

Pressed:

Oil cooler fan begins to work.

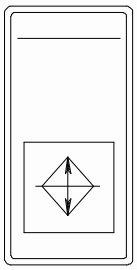


11 Button

Front windshield wiper

Pressed :

The front windshield wiper begins to work.

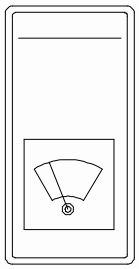


12 Button

Front windshield washer system

Pressed:

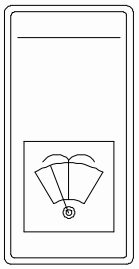
Switch on the front windshield washer system.



13 Deadman switch

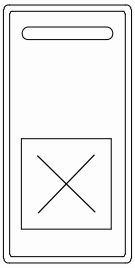
Pressed:

All operations controlled by left / right joystick will be valid even deadman switches on the joysticks are not activated. (Deactivate the switch after operation.)



14 Bypass key switch

If the hook block contacts the hoisting limit switches during its upward movement, or only three windings of ropes are left on the drum, or the maximum permissible load moment is exceeded, or safety devices are not installed during installation



15 Switch

Pre-selection of telescope / auxiliary winch

Left position:

Telescope the boom.

Right position:

Spool up / reel off auxiliary winch.

WARNING

Do not operate the switch when telescoping the boom or using the auxiliary winch.

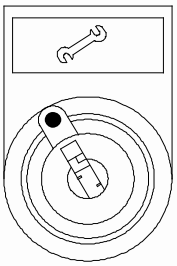
and commissioning, dangerous crane movements will be switched off. Turn the bypass key switch clockwise to bypass the limitation.

The switch can only be activated during commissioning and maintenance.

WARNING

Do not use the bypass key switch when you do usual crane operations.

Otherwise, there will be life-threatening hazards or serious damages to property.



16 Switch

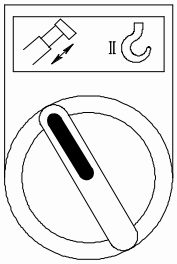
Pre-selection of telescoping cylinder I / telescoping cylinder II

Left position:

Telescope the telescopic section 1 via telescoping cylinder I.

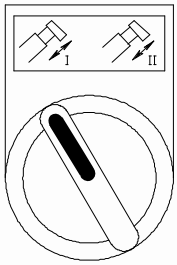
Right position:

Telescope the telescopic sections 2, 3 and 4 via telescoping cylinder II and boom extension / retraction rope.



17 Cigarette lighter

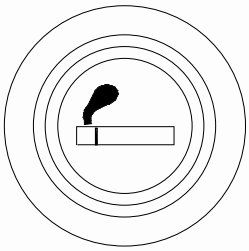
Press it for several seconds and pull it out to light a cigarette.

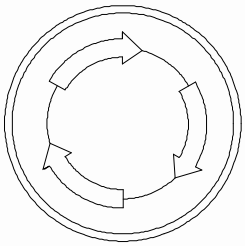


18 Emergency off switch

Pressed:

All superstructure movements are cut off.





19 Ignition starter switch

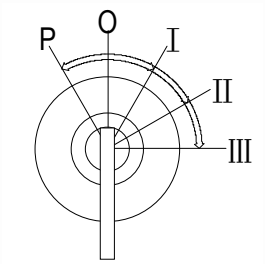
The 4 positions of the switch (in clockwise sequence) are as follows:

- “P” and "O" – All circuits are OFF. You can plug in or pull out the key.
- "I" – Battery begins to work to supply electricity to superstructure control system.
- "II" – This position does not have a function.
- "III" – A temporary position, use it to operate the starter.

  The key will return to position “I” automatically after you release the key when the engine starts. Return key to Position P or Position O first if you want to restart the engine.

CAUTION

You cannot remove the key from the ignition until the switch is in the position "P" or “O”.



4.1.3 Joysticks

Left joystick:

Spool auxiliary winch up, reel auxiliary winch off, telescope telescopic boom out, telescope telescopic boom in, slew to the left and slew to the right.

Right joystick:

Spool main winch up, reel main winch off, derrick main boom up and derrick main boom down.

For details, please refer to Fig. 04 – 04.

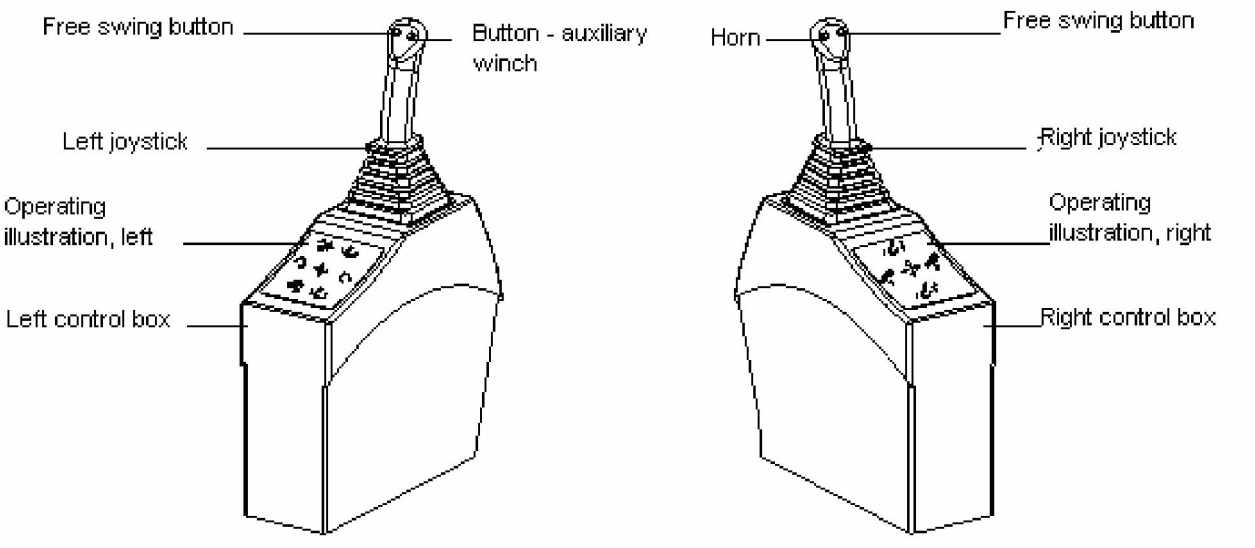


Fig. 04 – 04

Both the left and right joysticks are fitted with free swing button and deadman switch, see Fig. 04 – 05.

Free swing button – Push to operate the FREE SWING. Under this condition, centers of boom, hook and load can be aligned vertically, which prevents the load from being pulled at an angle and ensures safe operation. Push again to release this function.

Deadman switch – This switch sends or stops all command signals that go through the left and right joysticks. Push and hold the deadman switch to operate the functions of the right / left joystick.

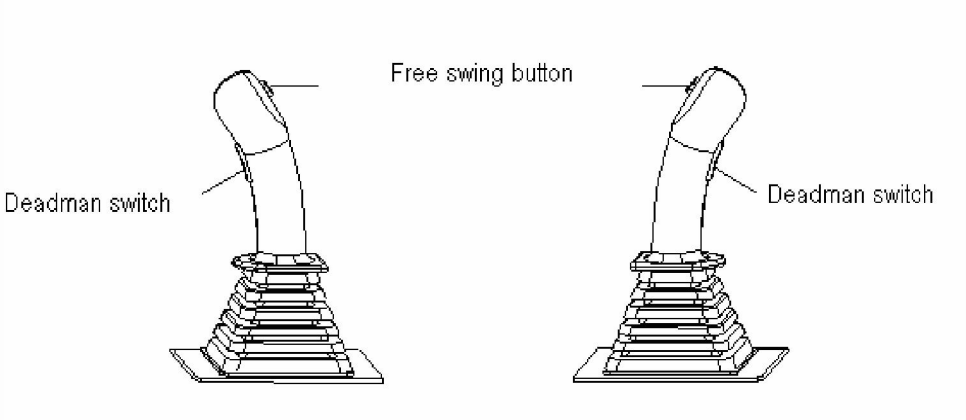


Fig. 04 – 05

WARNING

Do not press the free swing button after the load is away from the ground during lifting operation. Otherwise, there will be life-threatening hazards or serious damages to property.

WARNING

Do not press the button for auxiliary winch "Ⅱ" if auxiliary winch is not used.

4.1.4 Engine control pedal

Depress the engine control pedal to accelerate slewing, derricking, telescoping and hoisting movements.

4.1.5 Operator's seat

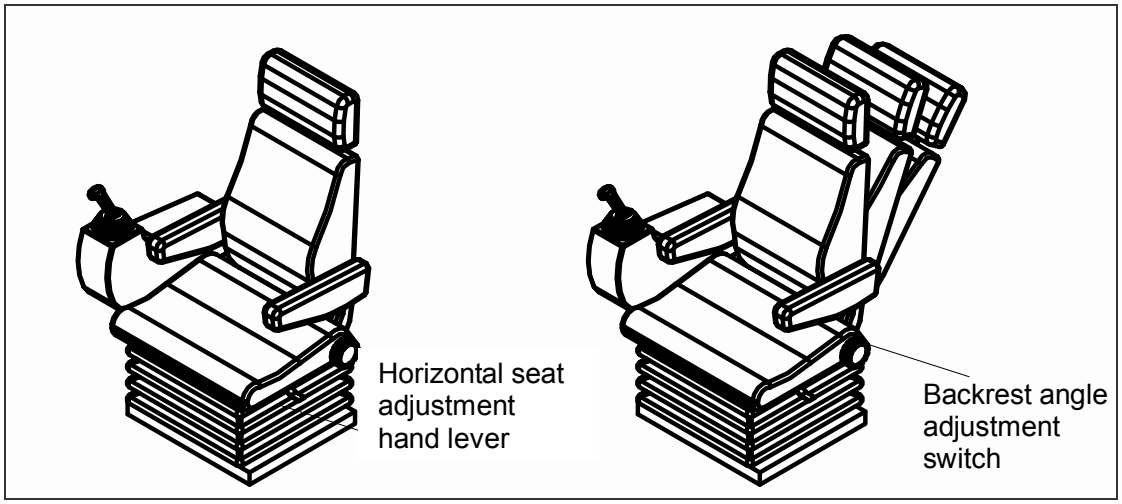


Fig. 04 – 06

4.2 Computer system

The load moment limiter is an electronic computer system for controlling and monitoring mobile cranes.

The load moment limiter calculates data from the pressure sensor, length sensors, angle sensors and other monitoring devices to accurately estimate whether the crane is in safe status, and displays the basic parameters, such as boom length, boom angle, work radius, rated lifting capacity etc., on the LCD.

If the actual load reaches 90% – 100% of the rated one, the warning light lights up and buzzer sends out slow acoustic warning. At this time, the operator should pay much attention to the operation.

If the actual load reaches 100% of the rated one, the warning light lights up and buzzer sends out fast acoustic warning and all dangerous crane movements are switched off.

CAUTION

The load moment limiter can prevent crane toppling or boom destructing and lift-threatening hazards, thus ensures safe operation of the crane. However, do not rely entirely on the load moment limiter. If the rated lifting load displayed on the load moment limiter is different from the one shown in the lifting capacity table, refer to the lifting capacity table.

CAUTION

Setting the operating mode correctly is the vital factor for ensuring correct using of this system and crane. Only the operator who is skillful at operating this crane and system can set the operating mode. In normal situations, the operating mode must be set in accordance with the actual one.

WARNING

The load moment limiter should only be commissioned by technical personnel!

For details, please refer to *Load Moment Limiter Operating Instructions* attached to the crane.

4.3 Starting up the crane

4.3.1 Checks before starting up

Ensure that the following prerequisites are met before starting up:

a) Checking the engine oil level

1) The machine has been leveled.

2) Pull out the dipstick and wipe off it.

3) Re-insert it into oil and pull out again.

4) The oil level must be between the Min. and Max. marks on the oil dipstick.

WARNING

Danger of damaging the engine!

If the oil level has dropped below the Min. mark, add engine oil until the oil level is between the Min. and Max. marks.

Top up engine oil and check again.

b) Checking oil level in the hydraulic oil tank

The oil level must be between the Min. and Max. marks.

Operate the lever for shutoff gate valve of hydraulic oil tank to connect hydraulic oil tank and oil line.

Position of the shutoff gate valve is shown in Fig. 04 – 07.

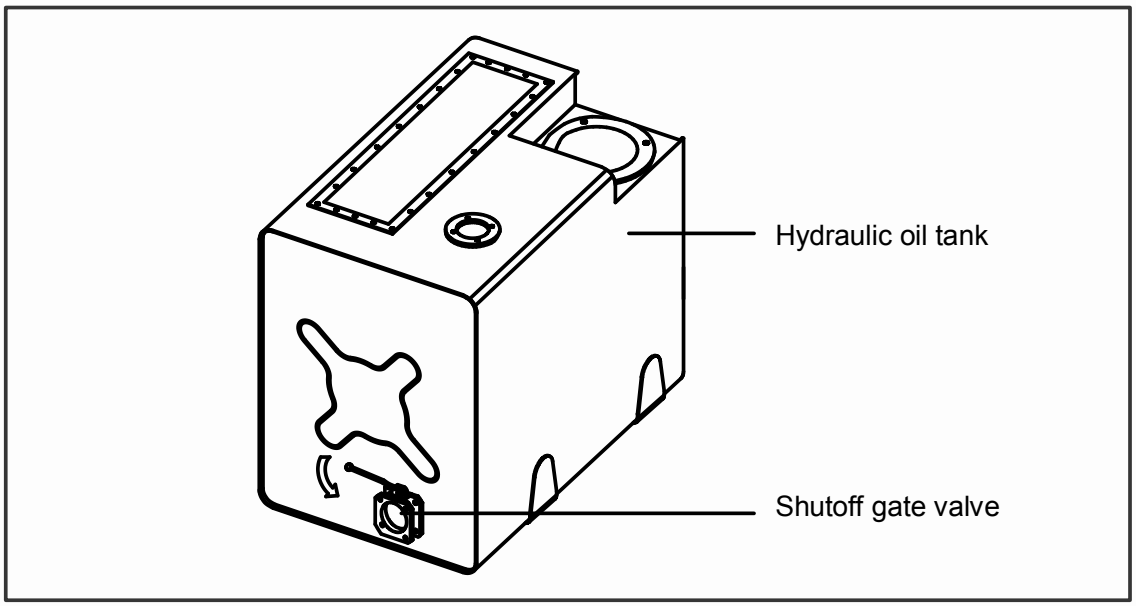


Fig. 04 – 07

c) Checking the fuel reserve

Check fuel reserve on fuel gauge in driver cab. Add it timely once it is not sufficient.

CAUTION

If the fuel tank is empty, always deaerate the whole fuel system before adding fuel.

Do not run the fuel tank dry!

d) Checking the coolant level

Add it timely once the coolant level is too low.

e) Checking general conditions of crane

1) Check lubricating conditions of each moving part of the crane. Add lubricating oil or grease timely to ensure lubricating effect.
2) Check that the crane is properly supported on a level load-bearing surface, and has been set up horizontally.
3) Check that the toothed ring of the slewing bearing is clean.
4) Check that the front and rear parts of oil cooler and A/C radiator have been cleaned and are free of blockage.
5) Ensure that there are no people or objects in the crane danger zone.
6) Make sure that the cable / rope drums and sensors are free of snow and ice.
7) Make sure that there are no loose parts on the superstructure (specially on the telescopic boom).
8) Ensure that the joysticks in operator's cab are in their neutral positions before engaging the PTO.
9) Ensure that all the outrigger control levers are in their neutral positions.
10) Make sure that parking brake is applied.

4.3.2 Starting and stopping the engine

For the starting and stopping of the engine for chassis, please refer to the operating instructions in Chapter 3 "Operation – crane chassis".

Starting and stopping the engine for superstructure should be carried out in accordance with the following operating instructions.

a) Stopping the engine

Press and hold the switch "Engine off" on the instrument panel for 1 to 2 seconds to switch off the engine.

Press the switch "Emergency stop" to switch off the engine in an emergency.

b) Starting the engine

The ignition starter switch can be used to switch on the engine if the following prerequisites are met:

1) PTO has been engaged.

2) The transmission is in the required position.

NOTE

If the emergency off switch is activated in an emergency, turn the switch clockwise to remove the limitation. Otherwise, the ignition starter switch is invalid.

4.4 Safety devices

4.4.1 Level gauge

To ensure the work safety of the crane, it must be properly supported on a level load-bearing surface, and be set up horizontally.

A level gauge on chassis, which is located near outrigger control mechanism, is attached to each side of the vehicle for observing the crane levelness.

After the crane is horizontally aligned, the bubble in the level gauge should be in the exact center position of the level gauge.

CAUTION

Check the level gauge for proper work. If not, adjust the nuts beneath the level gauge.

4.4.2 Angle indicator

The angle indicator is installed on the lower rear part of the basic boom (on the right side of the operator's cab), see Fig. 04 – 08. The operator can observe it clearly from the cab. The angle indicator, which can indicate the included angle between the main boom and the horizontal plane, should be used in combination with rated lifting capacity tables and lifting height charts.

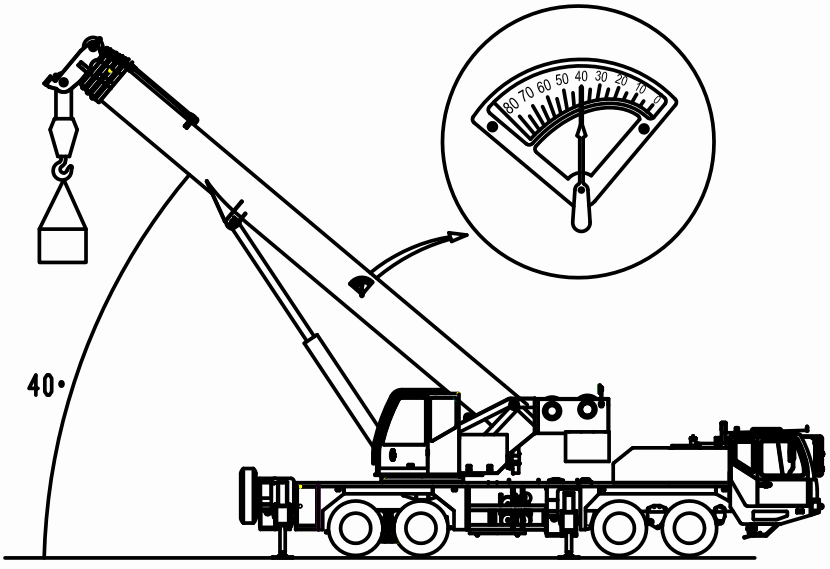


Fig. 04 – 08

4.4.3 Hoisting limit switch

The hoisting limit switch is intended to prevent the hook block from colliding with the rope pulley. When the distance detected between the hook block and the pulley is less than the safety one, the hoisting limit switch is triggered and the dangerous crane movements “Spool up winches”, “Derrick main boom down” and “Telescope boom out” are switched off automatically and acoustic warning will be sent. At this time, only the crane movements “Reel off winches”, “Derrick main boom up” and “Telescope boom in” can be switched on. See Fig. 04 – 09.

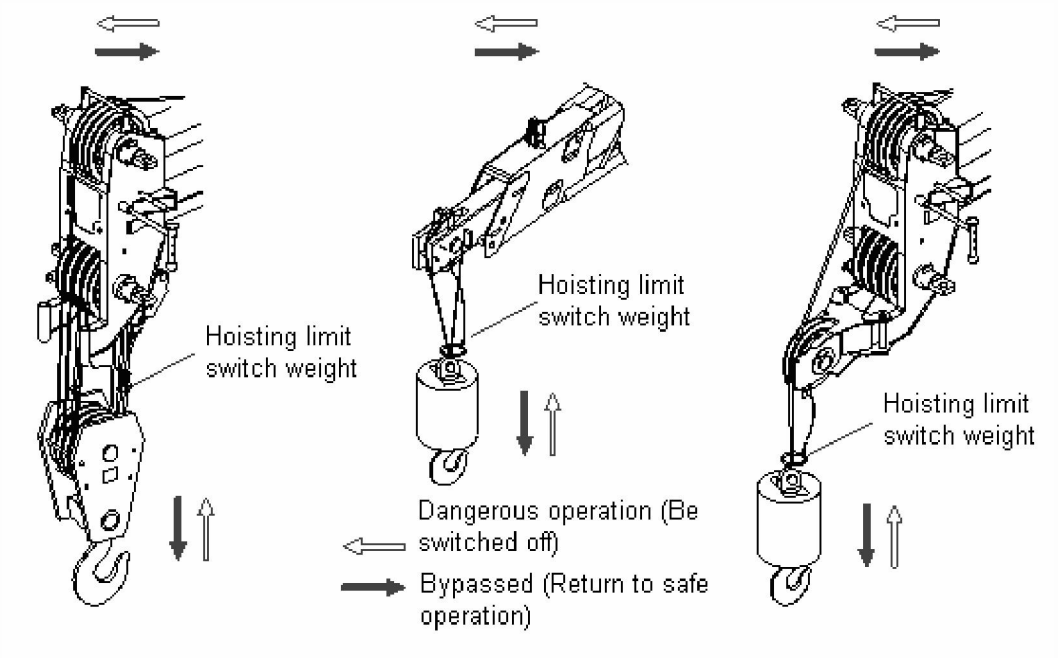


Fig. 04 – 09

Press the bypass key switch to bypass the switch-off.

WARNING

Never use the bypass key switch in normal operation!

Connection and installation of hoisting limit switches on jib and rooster sheave are as follows:

a) When the jib is used, remove the bypass aviation socket on the position “ II ” of the terminal box and install aviation socket which is connected to the hoisting limit switch on the auxiliary winch into the terminal box. And then connect the plug on the jib to the socket on the boom head. See Fig. 04 – 10.

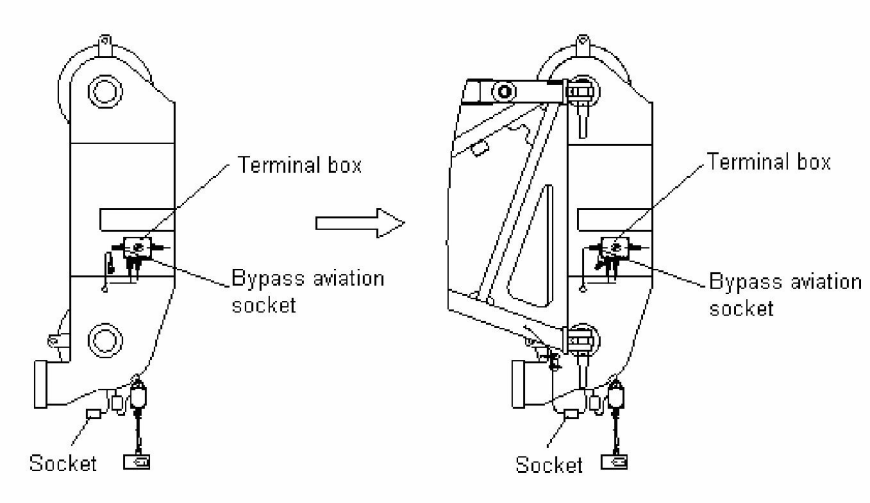


Fig. 04 – 10

b) When the rooster sheave is used, dismantle the hoisting limit switch on the jib and connect the plug on the hoisting limit switch to the socket on the rooster sheave. See the following figure. After the hoisting limit switch on the rooster sheave is installed, remove the bypass aviation socket on the position " 3↑II " of terminal box and connect the aviation socket on the hoisting limit switch on the auxiliary winch into the terminal box. And then, connect the plug on the rooster sheave to the socket on the main boom head. See Fig. 04 – 11.

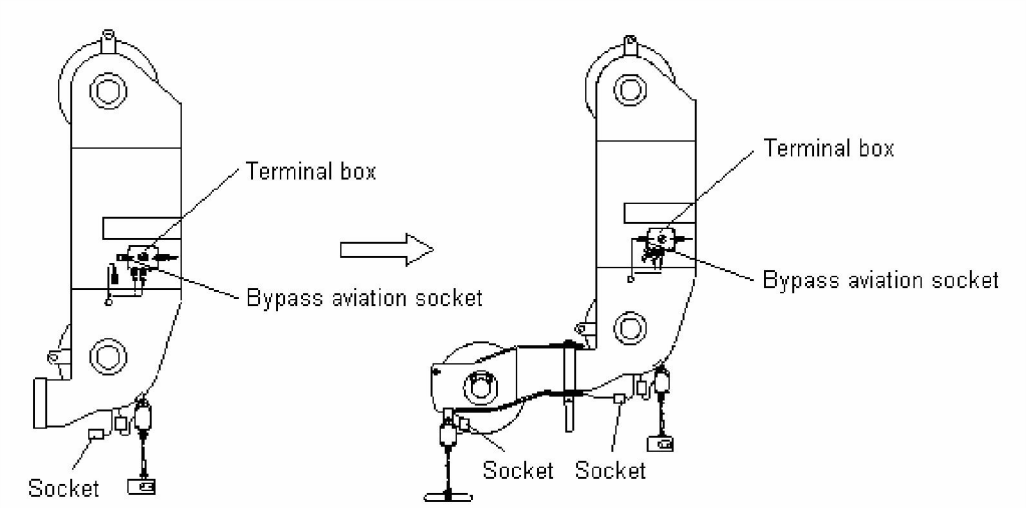


Fig. 04 – 11

4.4.4 Lowering limit switch

In order to prevent the wire rope from being spooled up automatically after being reeled off completely, the lowering limit switches installed beside the winches will automatically switch off the movement “Reel off winches” if there are only 3 rope windings remaining on the winches.

In this case, the acoustic sound will be sent out and only the crane movement “Spool up winches” is permitted. During commissioning and maintenance, activate the bypass key switch to bypass the limitation. See Fig. 04 – 12.

WARNING

Never use the bypass key switch in normal operation!

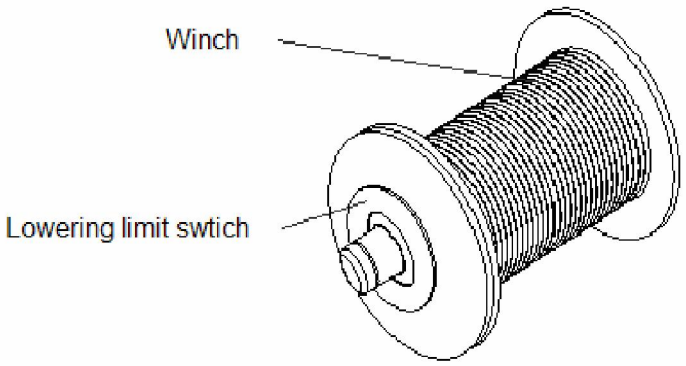


Fig. 04 – 12

4.4.5 Hydraulic safety devices

- **Relief valves in hydraulic system**

  The relief valves in hydraulic system can prevent the pressure in the circuit from excessively rising, thus avoid hydraulic elements from being damaged and hydraulic system from being overloaded.

- **Outrigger locking device**

  If the high-pressure oil pipe which is connected to vertical cylinder is damaged, the two-way hydraulic lock in the outrigger hydraulic circuit can stop the pressure oil in the two chambers of outrigger cylinder to prevent the outrigger from retracting or extending inadvertently, and thus ensure the safe operation of the crane.

- **Locking device for crane movement “Derrick main boom up”**

  If the high-pressure oil pipe in the hydraulic circuit of derricking cylinder is damaged, the balance valve in the hydraulic circuit can stop the hydraulic oil in the derricking cylinder piston side immediately to prevent the boom from falling down inadvertently, and thus ensure the safe operation of the crane.

– **Locking device for crane movement "Telescope main boom out"**

If the high-pressure oil pipe in the hydraulic circuit of telescoping cylinder is damaged, the balance valve in the hydraulic circuit can stop the hydraulic oil in the telescoping cylinder piston-rod side immediately to prevent the telescopic boom sections from retracting inadvertently, and thus ensure the safe operation of the crane.

– **The 5th outrigger overpressure warning system**

In order to prevent the front of vehicle from bending and deformation caused by overpressure on the 5th outrigger, a pressure relay is installed in the 5th outrigger cylinder. When lifting operation is carried out over front, once the pressure detected in the piston-rod side of the 5th outrigger exceeds the maximum permissible value, the warning light "The 5th outrigger pressure too high" lights up and the buzzer sends out acoustic warning.

WARNING

Do not carry out lifting operation over front when the warning light "The 5th outrigger pressure too high" lights up and buzzer sends out acoustic warning.

– **System pressure monitoring**

There are four pressure gauges on the instrument panel in the operator's cab, see Fig. 04 – 13. Functions of the pressure gauges are as follows:

Pressure gauge 1: monitor the pressure of oil circuit in control system.

Pressure gauge 2: monitor the pressure of oil circuit in slewing gear.

Pressure gauge 3: monitor the pressure of oil circuits in main winch, auxiliary winch, derricking gear and telescoping system.

Pressure gauge 4: not used.

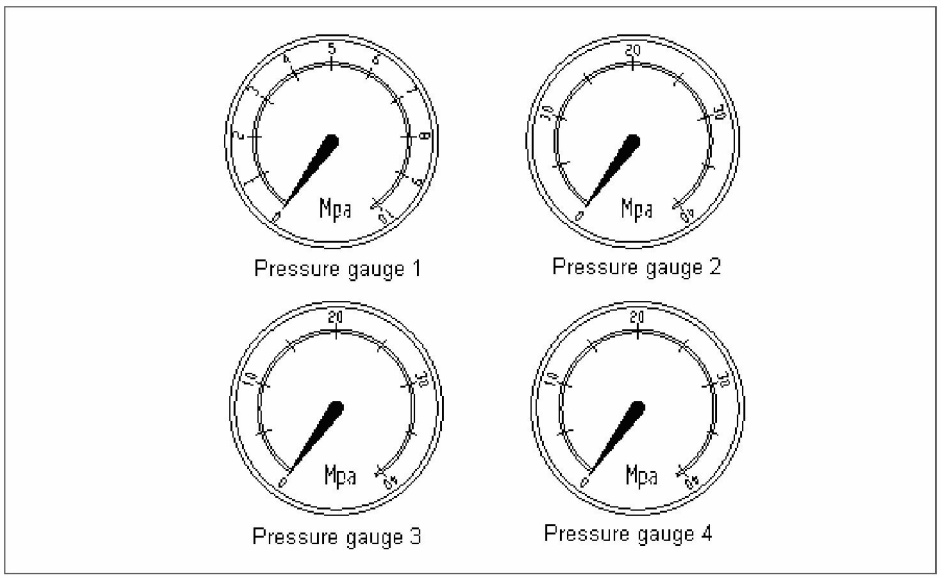


Fig. 04 – 13

Pressure limits are as follows:

Pressure of spooling up oil circuit in main / auxiliary winch: ≤ 23 MPa, pressure of reeling off oil circuit in main / auxiliary winch: 10 – 12 MPa

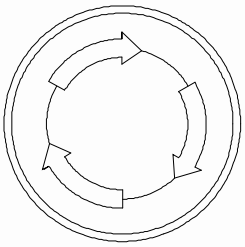
Pressure of derricking up oil circuit: ≤ 23 MPa, pressure of derricking down oil circuit: 10 – 12 MPa

Pressure of telescoping oil circuit: ≤ 13 MPa – 15 MPa

Pressure of slewing oil circuit: ≤ 10 MPa

Pressure of control oil circuit: ≤ 3.5 MPa.

4.4.6 Emergency off switch



The “Emergency off switch” (See the Fig. on the left) is fitted on the instrument console in operator’s cab. If it is activated in an emergency, the engine will be shut down and all movements carried out will be switched off immediately. At this time, the engine can not be started.

After emergency is removed, the switch-off can be bypassed by turning it clockwise.

WARNING

Only use the emergency off switch in the event of a clear emergency!

Use of the emergency off switch for normal operation is not permitted!

4.5 Crane operation

4.5.1 Preparations for crane operation

Ensure that following checks are operated before operation:

a) Assess the load condition.

b) Check the crane location, ground condition and surface bearing condition.

c) Check wire ropes (including wire rope's connections, winding drum and pulleys).

d) Check the liquid level and power source of the crane.

NOTE

(1) Fuel reserve of the fuel tank is more than 1/4 of the tank capacity (Check the fuel gauge).

(2) The oil level in hydraulic reservoir should be between the Min. and Max. marks in the driving condition.

e) Ensure that there are no obstacles in the crane working area and no persons in the danger zone. Check the communication system of operator and conductor to ensure that nothing will hinder the operation.

f) Check safety devices for functional work.

g) Remain the communication between the operator and the rigger.

WARNING

In order to protect the crane and reduce the danger of accidents, always operate the joysticks slowly and sensitively.

DANGER

Ensure that there are no obstacles in the crane working area and no persons in danger zone. Give a short warning signal (horn) before starting a crane movement.

4.5.2 Outrigger – operation

The accelerator control switch, outrigger control levers and level gauge are attached to both sides of chassis frame of the vehicle. You can operate the control levers to extend or retract the outriggers simultaneously or independently. See Fig. 04 – 14.

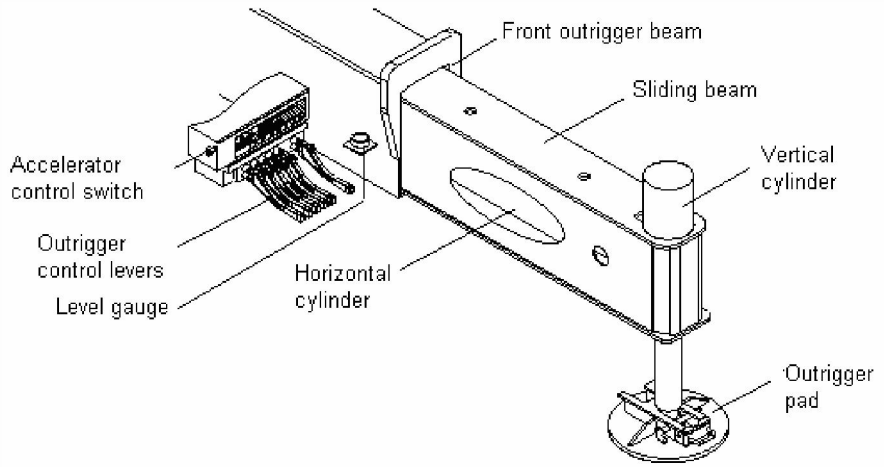


Fig. 04 – 14

WARNING

Extend outriggers before crane operation. Select even and hard working sites. If the working site is soft or uneven, put suitable materials and bases beneath the outrigger pads to ensure crane being level.

– **Outrigger control levers**

Outrigger control levers are shown in Fig. 04 – 15.

a) Outrigger control direction illustrations and points for attention are printed in the outrigger control label.

b) Control lever 1: extend or retract the horizontal or vertical cylinder

1) Move lever 1 upwards: retract horizontal / vertical cylinder.

2) Neutral position: stop the cylinder's movement.

3) Move lever 1 downwards: extend horizontal / vertical cylinder.

c) Control lever 3: select left rear outrigger

Control lever 4: select right rear outrigger

Control lever 5: select left front outrigger

Control lever 6: select right front outrigger

Move levers 3, 4, 5 and 6 together with moving lever 1 to initiate corresponding movements.

1) Move levers 3, 4, 5 and 6 upwards and move lever 1 upwards or downwards:

extend / retract horizontal cylinders.

2) Move levers 3, 4, 5 and 6 downwards and move lever 1 upwards or downwards: extend / retract vertical cylinders.

d) Control lever 2: select the 5th outrigger

Move lever 2 downwards and move lever 1 upwards: retract the 5th outrigger.

Move lever 2 downwards and move lever 1 downwards: extend the 5th outrigger.

CAUTION

During operation of outriggers, turn the accelerator control switch clockwise to increase working speed of outriggers.

WARNING

It is prohibited to extend or retract horizontal cylinders after outrigger pads are in contact with ground!

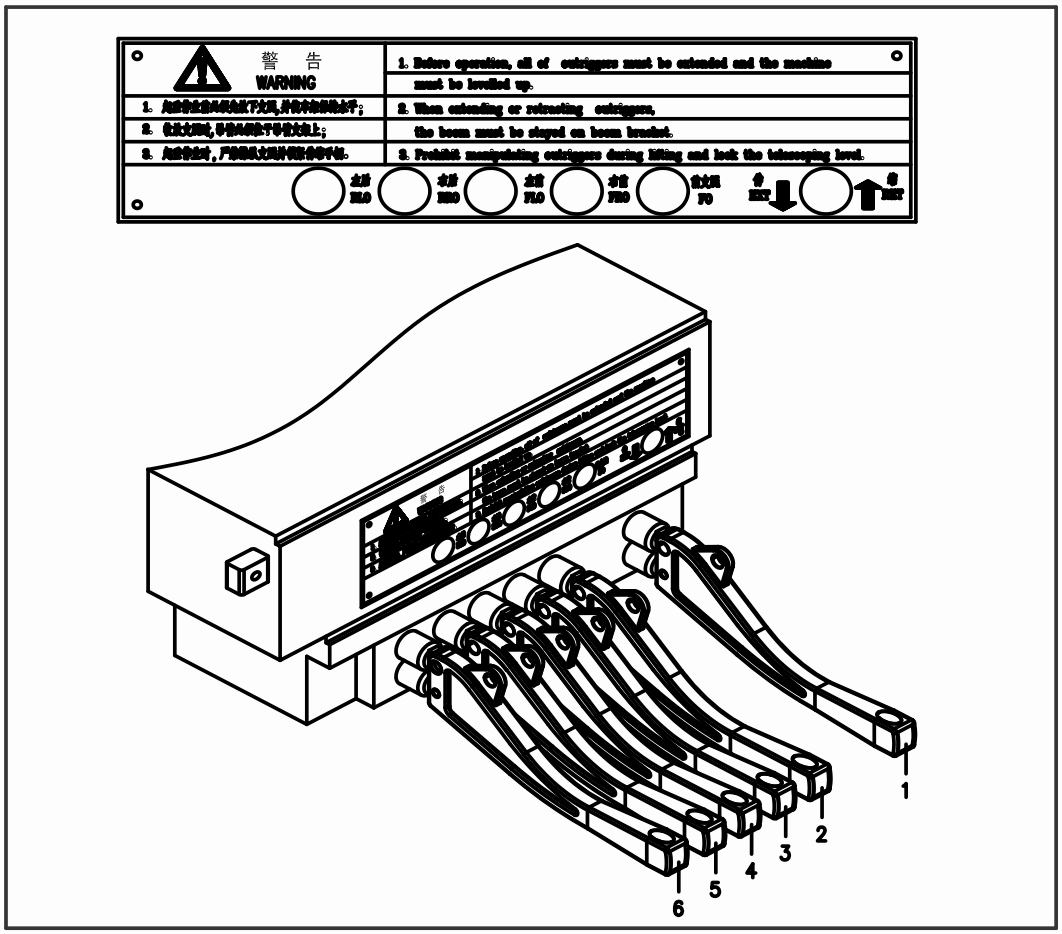


Fig. 04 – 15

– **Outrigger extension**

a) Remove the pins of sliding beam.

b) How to extend the horizontal cylinders:

1) Stand on the left (or right) side of the crane.

2) Move levers 3, 4, 5 and 6 upwards.

3) Move lever 1 downwards till the mark "◁" is completely exposed, that is to say the outriggers are intermediately extended.

4) Continue moving lever 1 downwards to fully extend the sliding beams.

5) Move the levers to neutral positions after the sliding beams are fully extended.

6) Repeat the above operations standing on the other side of the crane.

7) See Fig. 04 – 16.

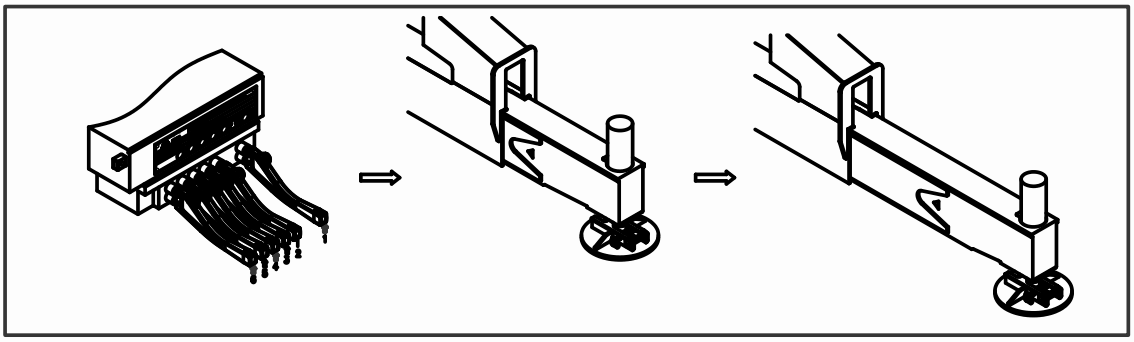


Fig. 04 – 16

WARNING

The marks "◁" on outriggers must completely exposed and the outriggers must be secured with pins if the crane is working with outriggers intermediately extended. Otherwise, the crane may topple.

c) How to extend the vertical cylinders:

1) Stand on the left (or right) side of the crane.

2) Move levers 3, 4, 5 and 6 downwards with moving lever 1 downwards until the vertical cylinders are fully extended to support the crane.

3) Repeat the above operations standing on the other side of the crane.

4) See Fig. 04 – 17.

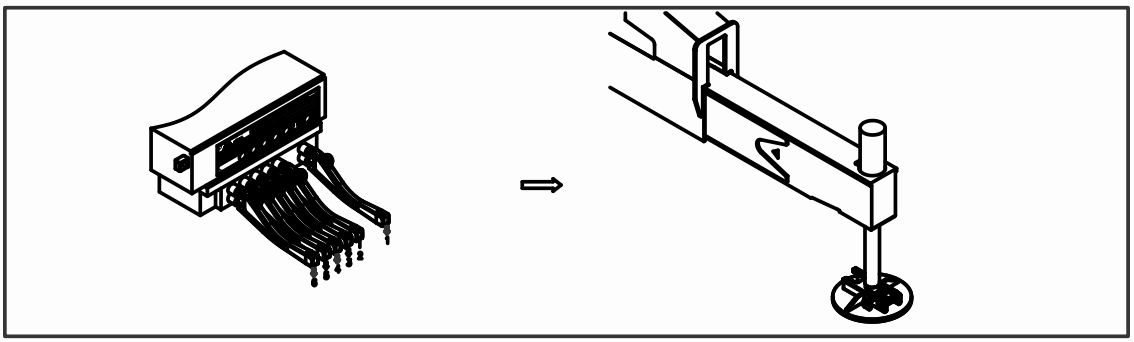


Fig. 04 – 17

d) After all the vertical outriggers are extended completely, observe whether the bubble of the level gauge is in the center to check the complete vehicle for level conditions. If not, level it according to the following instructions:

How to level the vehicle:

If vehicle right side is higher than the left one (See Fig. 04 – 18):

1) Move levers 4 and 6 downwards slowly.

2) Move lever 1 upwards.

3) Observe the level gauge. Once the vehicle is leveled, move levers to neutral positions.

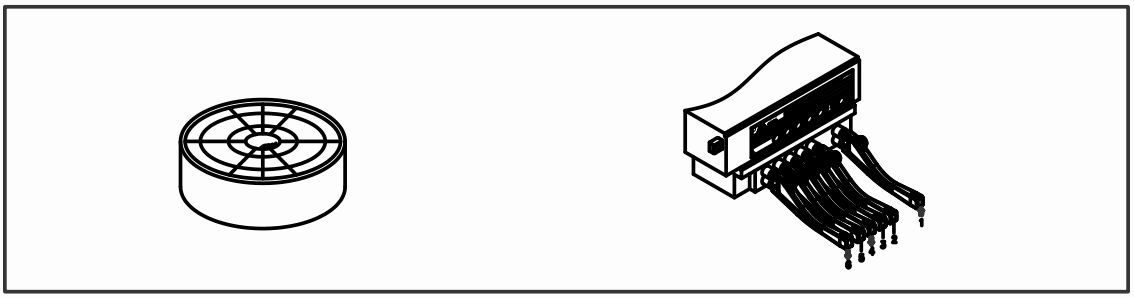


Fig. 04 – 18

e) When the vehicle is leveled, move levers to their neutral positions.

f) When the crane is working over front with the same lifting capacities as over side and over rear, the 5th outrigger should be used.

How to extend the 5th outrigger:

1) Move lever 2 downwards.

2) Move lever 1 downwards until the 5th outrigger is 5 – 10 mm away from the ground. See Fig. 04 – 19.

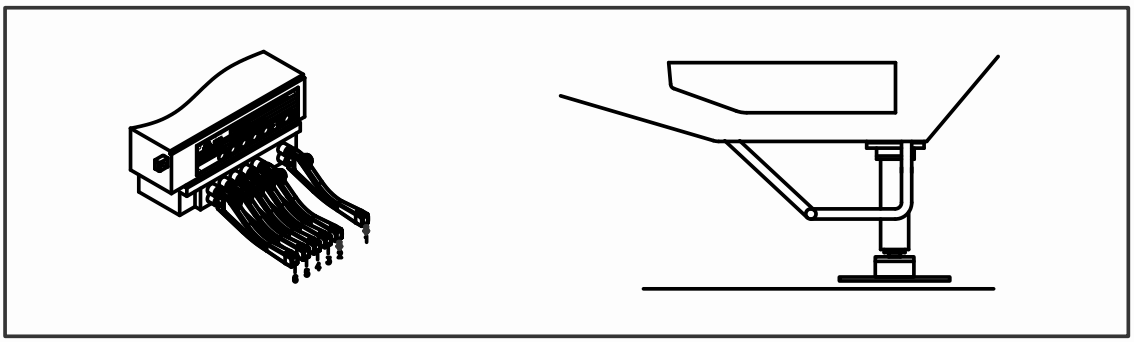


Fig. 04 – 19

g) Secure the pins for outriggers to carry out crane operation.

CAUTION

Lever 1 can return to neutral position automatically after being released, while other levers should be returned manually.

– **Outrigger retraction**

WARNING

After crane operation is finished, telescope in the boom fully and secure it on the boom support. After that, retract the 5th outrigger before retracting all the other outriggers.

a) How to retract the 5th outrigger:

1) Move lever 2 downwards.

2) Move lever 1 upwards until the 5th outrigger is fully retracted. See Fig. 04 – 20.

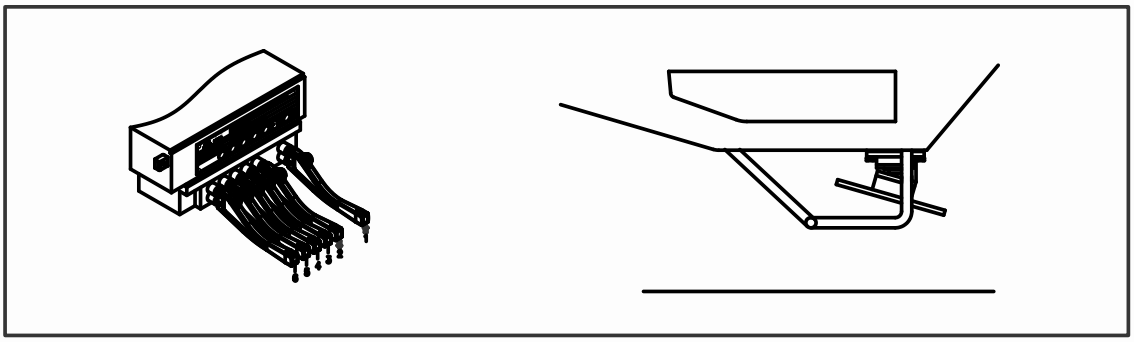


Fig. 04 – 20

b) How to retract vertical cylinders:

1) Stand on the left (or right) side of the crane.

2) Move levers 3, 4, 5 and 6 downwards.

3) Move lever 1 upwards to retract vertical cylinders.

4) Move the levers to neutral positions after the vertical cylinders are fully

retracted.

5) Repeat the above operations standing on the other side of the crane.

6) See Fig. 04 – 21.

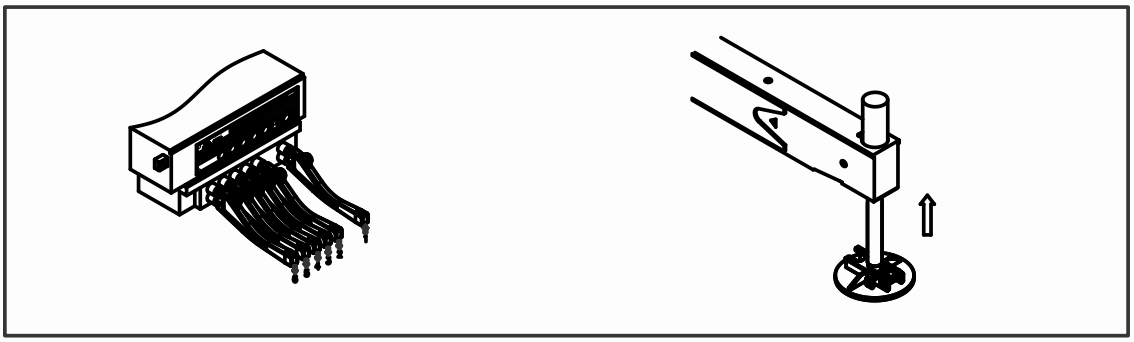


Fig. 04 – 21

c) How to retract horizontal cylinder:

1) Stand on the left (or right) side of the crane.

2) Move levers 3, 4, 5 and 6 upwards.

3) Move lever 1 upwards to retract horizontal cylinders.

4) Move the levers to neutral positions after the horizontal cylinders are fully retracted.

5) Repeat the above operations standing on the other side of the crane.

6) See Fig. 04 – 22.

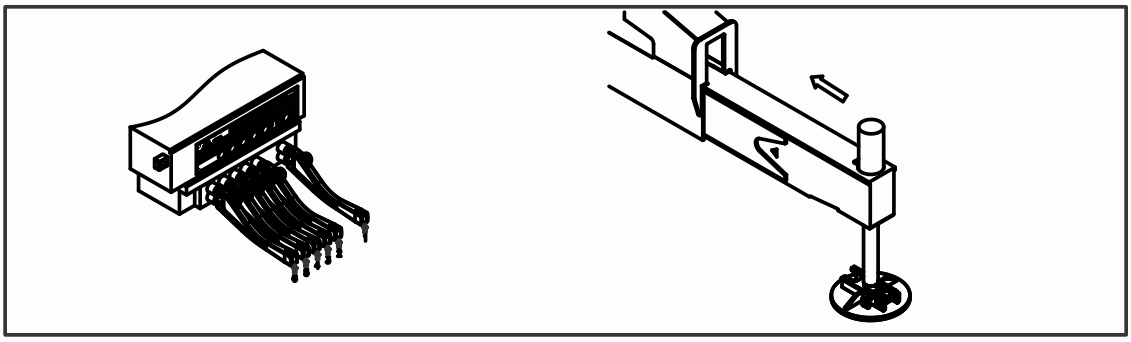


Fig. 04 – 22

d) Secure the pins for sliding beam after outriggers are fully retracted.

– **Installing and removing the outrigger pads**

Outrigger pad is shown in Fig. 04 – 23.

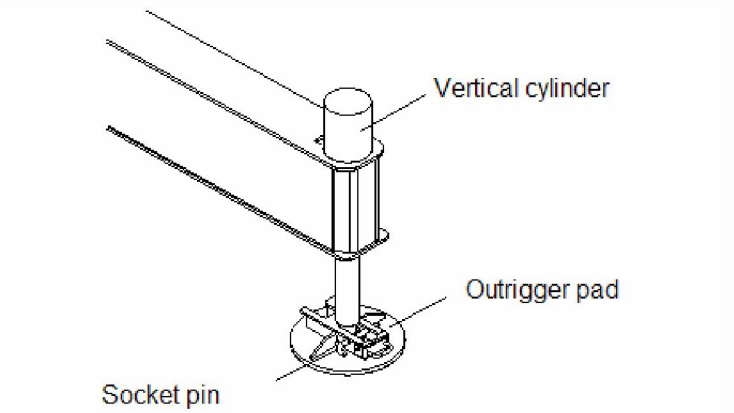


Fig. 04 – 23

a) Installing the outrigger pad

Before the outriggers are extended, withdraw the socket pin and pull outrigger pad outwards until its center aligns with the vertical cylinder. Insert socket pins and secure them.

Weight of outrigger pad: about 35 kg.

b) Removing the outrigger pad

After the outriggers are retracted, withdraw the socket pin and slide outrigger pad inwards until it reaches the limit position. Insert socket pins and secure them.

⚠ CAUTION

(1) Keep enough space when operating the outriggers so as to avoid injuring persons or damaging the crane and other articles.

(2) Outrigger pads should be installed before outriggers are operated.

(3) Ensure that all the outrigger pads (except the 5th outrigger pad) contact with the ground.

(4) The 5th outrigger can only be extended to the position where its outrigger pad is about 5 – 10mm above the ground. It is not permitted that the two front outriggers are away from the ground due to excessive extending of the 5th outrigger.

(5) All the tires should be lifted away from the ground before operation.

(6) Check the level gauge for proper work. If not, adjust the nuts beneath the level gauge.

⚠ WARNING

It is prohibited to operate the outrigger control levers during lifting operation.

4.5.3 Derricking operation

As illustrated in Fig. 04 – 24:

Derricking gear is controlled by the right joystick.

- Deflect the joystick in direction ③ (leftwards)

Results:

– The telescopic boom is derricked up.

- Deflect the joystick in direction ④ (rightwards)

Results:

– The telescopic boom is derricked down.

- Deflect the joystick in neutral

Results:

– The telescopic boom stops derricking.

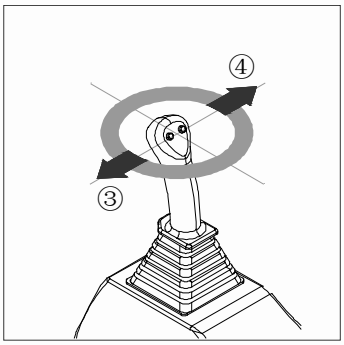


Fig. 04 – 24

Speed of crane movement “Derricking up” is controlled by the deflection of the right joystick and by the accelerator pedal. Depress the accelerator pedal or increase the deflection angle of the joystick to speed up the derricking up movement. (When deflection angle of the joystick is small, accelerator pedal is not recommended.)

Speed of crane movement “Derricking down” can be controlled by the deflection of the right joystick. Increase the deflection angle of the joystick to speed up the derricking down movement. Do not change the derricking speed jerkily to ensure stable crane operations.

CAUTION

The movement “derricking down” cannot be controlled by applying the engine control pedal.

An angle indicator and an angle detector are fitted on main boom. You can read the boom angle from the angle indicator. The angle detector is an electronic device which can transmit information of the boom angle to the load moment limiter and display it on the screen. See Fig. 04 – 25.

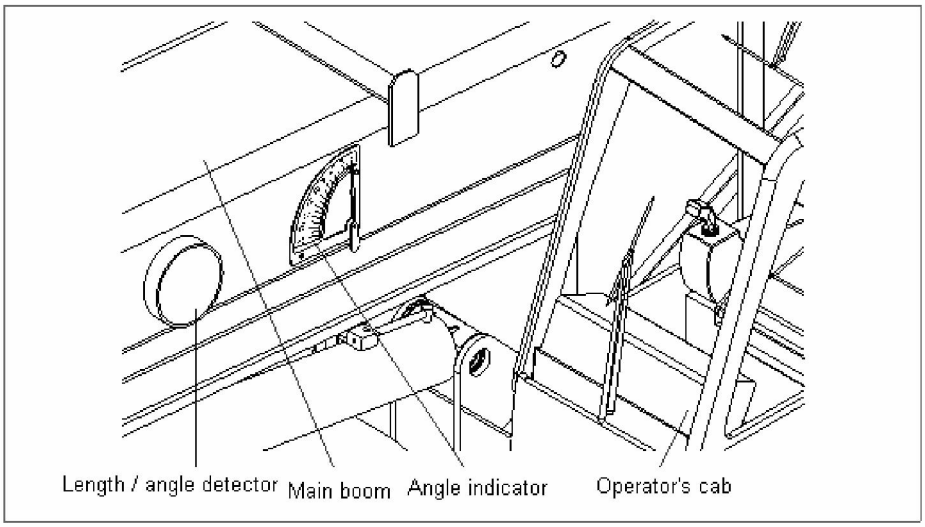


Fig. 04 – 25

WARNING

(1) Derricking operation should be carried out stably. Jerky operation is prohibited!

(2) The derricking angle and working radius should be restricted according to the lifting capacity tables.

4.5.4 Telescoping operation

The boom adopts 5 U-shaped boom sections. The telescoping system is composed of two telescoping cylinders, boom extension rope and boom retraction rope, etc.

The movements “Telescope boom in / out” are controlled by the telescoping cylinders and the wire ropes used together. The telescopic boom section 1 is driven by the telescoping cylinder I and the telescopic boom sections 2, 3 and 4 are driven by the telescoping cylinder II together with the boom extension / retraction ropes to achieve synchronously movements. See Fig. 04 – 26.

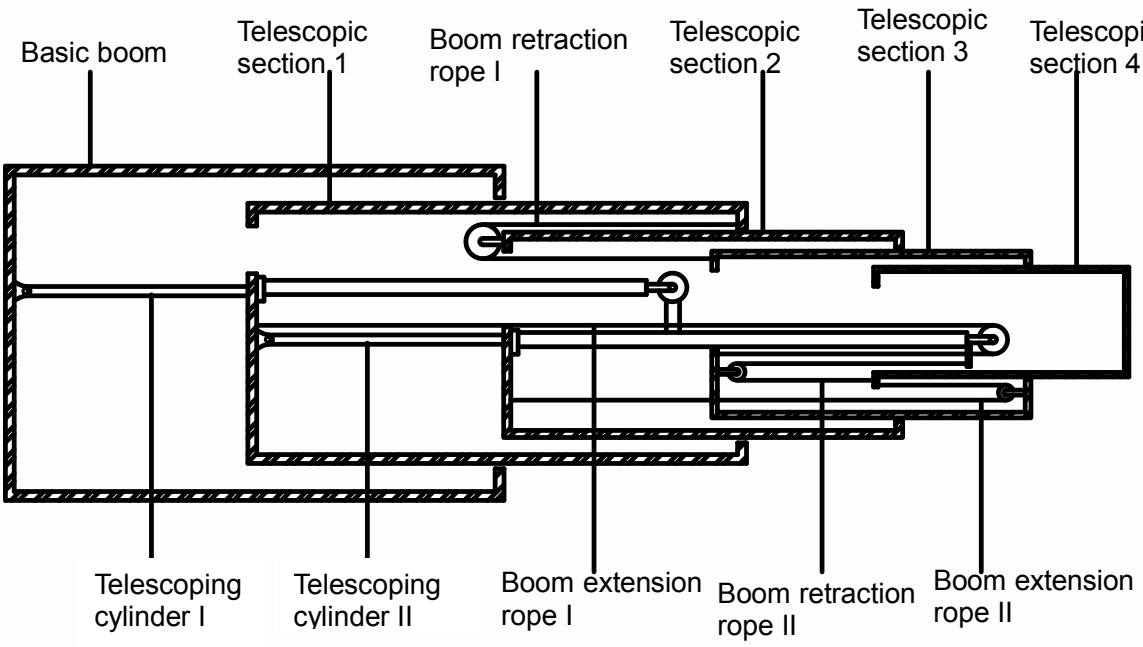


Fig. 04 – 26

a) Turn the pre-selection switch “Telescope / auxiliary winch” to the left position. See Fig. 04 – 27.

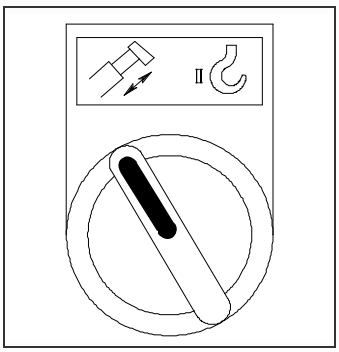


Fig. 04 – 27

b) As illustrated in Fig. 04 – 28:

Telescoping system is controlled by the left joystick.

- Deflect the joystick in direction ① (forwards)

Results:

– The telescopic boom is telescoped out.

• Deflect the joystick in direction ② (backwards)

Results:

– The telescopic boom is telescoped in.

• Deflect the joystick in neutral

Results:

– The telescopic boom stops telescoping.

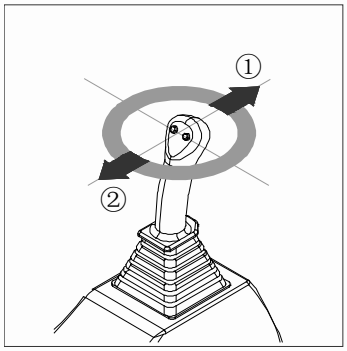


Fig. 04 – 28

CAUTION

(1) If the hook block contacts the weight of hoisting limit switch during its upward movement, the buzzer sends out fast acoustic warning and the crane movement "Telescope boom out" is cut off. Reel off the wire rope a little if the boom still needs to be telescoped out.

(2) Speed of crane movement "Telescoping" is controlled by the deflection of left joystick and by the accelerator pedal. Depress the accelerator pedal or increase the deflection angle of the joystick to speed up the telescoping movement. Do not change the telescoping speed jerkily to ensure stable crane operations.

(3) Telescope the boom stably and at constant speed.

(4) Do not telescope the boom out immediately after the boom is telescoped in. Initiate telescoping movement after 2 seconds.

(5) The bypass key switch can only be activated during commissioning and maintenance. Do not use the bypass key switch in normal operation!

(6) Operator should strictly carry out the telescoping operation according to *Lifting Capacity Tables* and *Lifting Height Chart*. Otherwise, the crane may topple or be damaged.

WARNING

Do not telescope the telescopic boom with a suspended load. Otherwise:

(1) The telescoping cylinder and boom extension / retraction ropes may be

damaged.

(2) The crane may topple.

4.5.5 Lifting / lowering operation

– **Preparations for lifting / lowering**

Read *Rated lifting capacity tables* and *Lifting height chart(s)* before lifting / lowering operation. (Refer to Chapter 1).

How to look up rated lifting capacity in the *Rated lifting capacity table* (See Fig. 04 – 29):

Look up the main boom length according to the lifting height and working radius in lifting height chart.

Look up the rated lifting capacity according to the checked main boom length in rated lifting table.

NOTE

If the jib is fitted, look up the rated lifting capacity according to the boom angle in the table.

For example:

If outriggers are fully extended and the main boom is over side and over rear, look up the rated lifting capacity according to Fig. 04 – 29:

The rated lifting capacity with working radius of R:

If the main boom length is L2 m, the rated lifting capacity is W2 kg.

CAUTION

(1) Look up the corresponding rated lifting capacity according to actual working conditions.

(2) Observe the notes shown below the rated lifting capacity table.

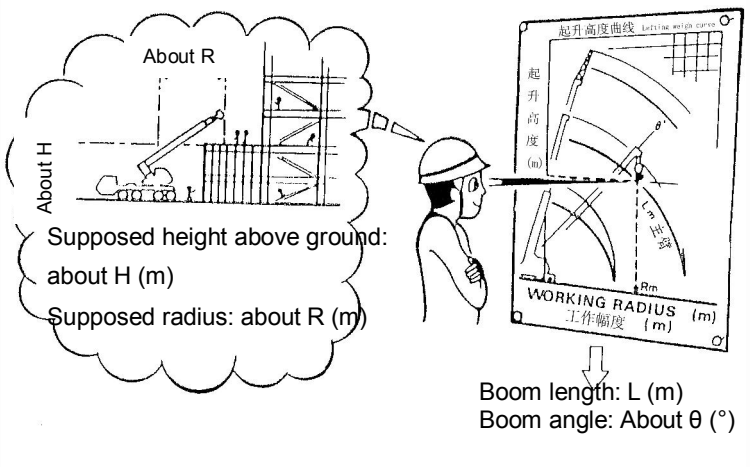


Fig. 04 – 29

CAUTION

The parameters shown in the lifting height chart do not include the deflection of main boom.

Rated lifting capacities are changed in accordance with working radius.

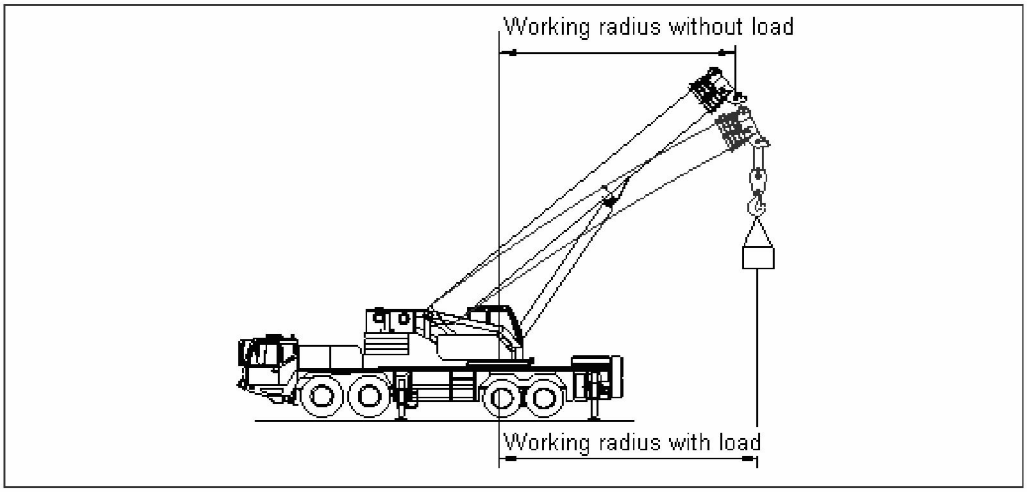


Fig. 04 – 30

Rated lifting capacity table

Working radius (m)	Main boom (m)								
	Outriggers fully extended, over side and over rear						Outriggers intermediately extended		
	L1	L2	L3	L4	L5	L6	11.4	15.3	19.3
							50000	45000	
							50000	45000	35000
R		W2					45000	41000	35000
							38000	37000	32500

NOTE

L2 refers to main boom length. W2 refers to rated lifting capacity.

– **Spooling up / reeling off main winch**

a) Right joystick:

As it is illustrated in Fig. 04 – 32:

Spooling up / reeling off the main winch is controlled by the right joystick.

• Deflect the joystick in direction ① (forwards)

Results:

– Main winch reels off and the load is lowered.

• Deflect the joystick in direction ② (backwards)

Results:

– Main winch spools up and the load is lifted.

• Deflect the joystick in neutral

Results:

– The main winch stops working.

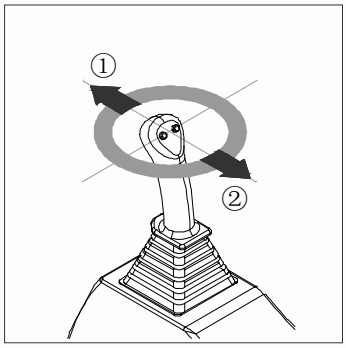


Fig. 04 – 32

b) Main winch is working, referring to Fig. 04 – 33.

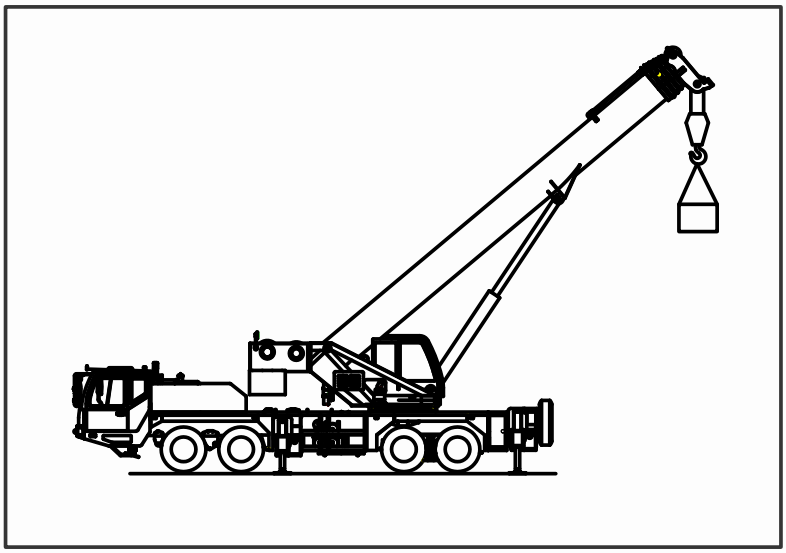


Fig. 04 – 33

– **Spooling up / reeling off auxiliary winch**

a) Turn the switch “Pre-selection of telescope / auxiliary winch” on the dashboard to the right or press the button “auxiliary winch” on the left joystick. See Fig. 04 – 34.

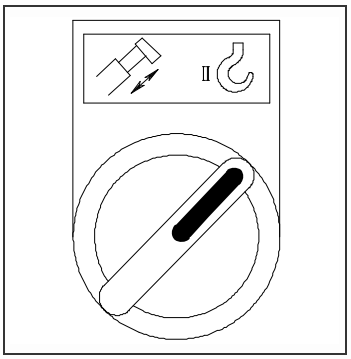


Fig. 04 – 34

b) Left joystick:

As it is illustrated in Fig. 04 – 35:

Spooling up / reeling off the auxiliary winch is controlled by the left joystick.

- Deflect the joystick in direction ① (forwards)

Results:

– Auxiliary winch reels off and the load is lowered.

- Deflect the joystick in direction ② (backwards)

Results:

– Auxiliary winch spools up and the load is lifted.

- Deflect the joystick in neutral

Results:

– The auxiliary winch stops working.

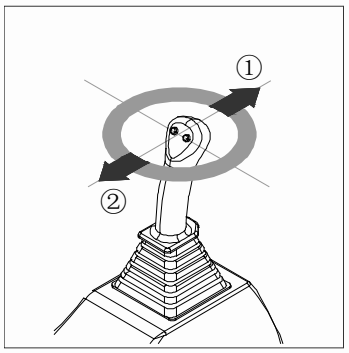


Fig. 04 – 35

c) Auxiliary winch is working, referring to Fig. 04 – 36.

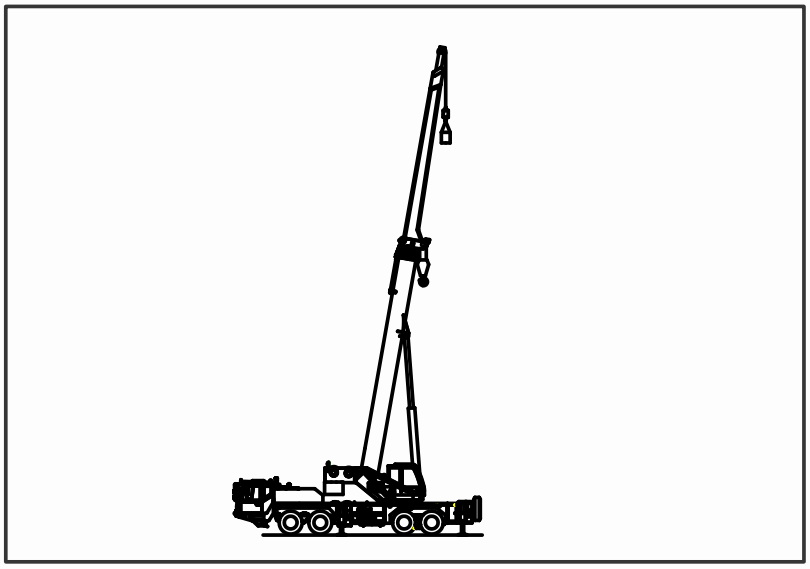


Fig. 04 – 36

Return the joystick to the neutral position slowly and then the winch stops working immediately.

Speed of crane movement “Spooling up / reeling off main / auxiliary winch” can be controlled by the deflection of the right / left joystick and by the engine control pedal. Depress the accelerator pedal or increase the deflection angle of the joystick to speed up the hoisting movement. (When deflection angle of the joystick is small, applying the engine control pedal is not recommended.) Do not change the hoisting speed jerkily to ensure stable crane operations.

If the hook block contacts the hoisting limit switches during its upward movement, the hook block contacts the lowering limit switch during its downward movement or the maximum permissible load moment is exceeded, the buzzer sends out fast acoustic warning and the crane movement “Spool up / reel off winches” is cut off. At this time, the crane can only work towards safe directions till the dangerous operation is deactivated.

⚠ CAUTION

(1) Change the reeving numbers according to the *Rated lifting capacity tables* when choosing different boom lengths. Before changing the reeving numbers, fit the hoisting limit switch weights.

(2) Under any conditions, there must be at least three rope windings remaining on the winding drum.

(3) Lift the load vertically. Do not carry out slewing movement when the load is still on the ground. Do not pull a load at an angle.

(4) When a load is lifted away from the ground, it should first be suspended in the air for a moment. Do not lift the load until the operator confirms that there is no safety hazard. Do not lift the load away from the ground by derricking up or telescoping out the boom.

(5) Do not change the joysticks between “Spool up” and “Reel off” jerkily. The operator should return the joysticks to neutral positions and ensure that the winding drum has stopped rotating before changing between “Spool up” and “Reel off”. Otherwise, the machine will be damaged.

(6) The slings must be of enough strength. The lifting capacity includes the mass of the hook and slings.

(7) Do not stand on the load.

(8) If the hook rotates due to twisted rope, lay down the load on the ground. Don’t lift the load until the rope is totally untangled.

4.5.6 Slewing operation

– **Operation of left joystick for slewing**

As it is illustrated in Fig. 04 – 37:

Slewing gear is controlled by the left joystick.

- Deflect the joystick in direction ④ (leftwards)

Results:

– The crane superstructure slews to the left.

- Deflect the joystick in direction ③ (rightwards)

Results:

– The crane superstructure slews to the right.

- Deflect the joystick in neutral

Results:

– The crane superstructure stops slewing.

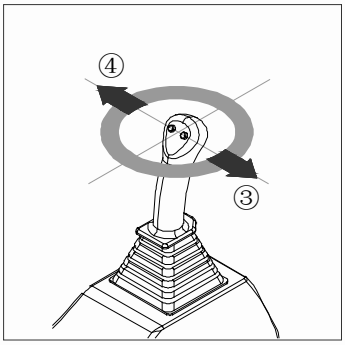


Fig. 04 – 37

Speed of crane movement “Slewing” can be controlled by the deflection of the left joystick and by the engine control pedal. Depress the engine control pedal or increase the deflection angle of the joystick to speed up the slewing movement. (When deflection angle of the joystick is small, applying the engine control pedal is not recommended.) Do not change the slewing speed jerkily to ensure stable crane operations.

CAUTION

(1) Operator's field of vision is greatly restricted over side and over rear during slewing operation. Therefore, operate the crane with maximum care.

(2) Ensure that there are no obstacles in the crane slewing area (within slewing radius R) and no persons in the danger zone. Give a short warning signal (horn) before starting a crane movement.

– **Lockout device for slewing operation**

The lockout device for slewing operation is installed in the front of the slewing table. Ensure that the superstructure is unpinned before initiating the slewing movement. Insert and secure the pin after finishing slewing operation or before driving. See Fig. 04 – 38.

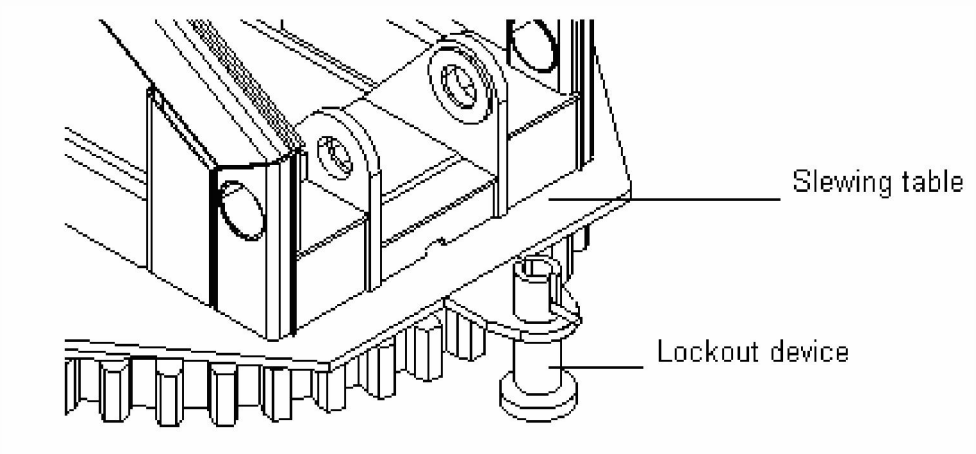


Fig. 04 – 38

CAUTION

(1) Initiate the slewing movements smoothly. Jerky operation is prohibited.

(2) In order to ensure safe operation of a new crane, the user must check bolts of slewing ring and tighten the bolts with 900 N.m tightening torque after initiating for 100 operating hours. Then check and tighten the bolts after 500 operating hours. After that, do the checks every 1000 hours.

(3) The crane can slew with suspended load. Do not carry out slewing movement when the load is still on the ground. Otherwise, it is very dangerous.

(4) Check whether the outriggers are extended intermediately / fully before slewing operation.

(5) Ensure there is enough space for the crane slewing operation.

(6) Lubricate the slewing bearing at regular intervals.

4.5.7 Simultaneous crane movements

The simultaneous crane movements refer to that the crane can carry out 2 movements or more simultaneously.

Ensure that the following preconditions are met when initiating simultaneous crane movements:

– Apply the engine control pedal.

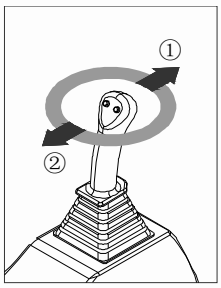
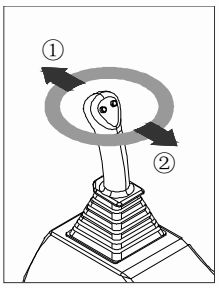
– Do not deflect the joysticks to their limit positions.

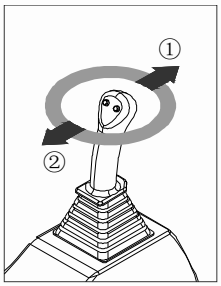
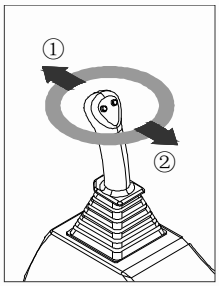
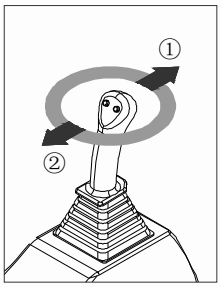
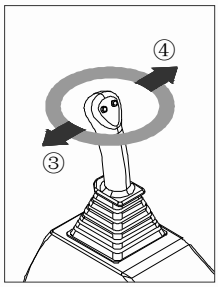
– Do not move a load unless the conditions are safe.

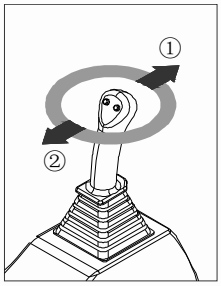
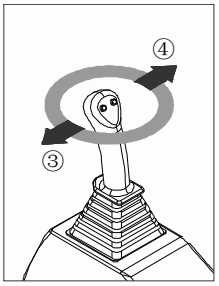
WARNING

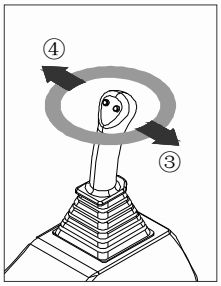
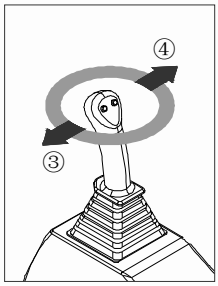
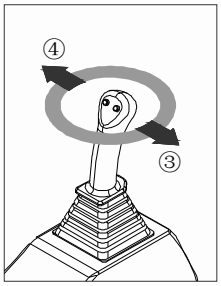
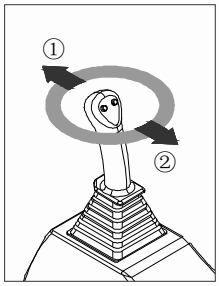
Simultaneous crane movements should only be carried out after the load being lifted away from ground. It is prohibited to telescope the boom with load.

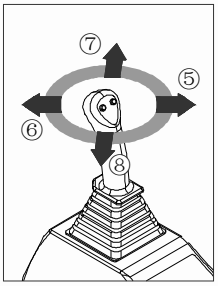
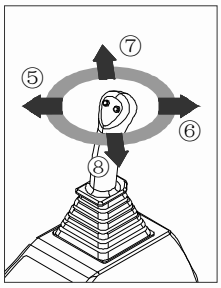
There are 9 simultaneous movements for this crane, which can greatly improve the work efficiency of the crane. For details, please refer to the following table:

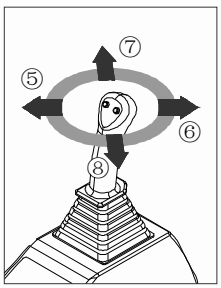
Ser. No.	Simultaneous crane movements	Illustration		Operating instructions
		Left joystick	Right joystick	
1	Main winch + Telescoping			a. Turn the pre-selection switch “Telescope / auxiliary winch” to the left position. b. Operate left and right joysticks at the same time according to left figures to make main winch and telescoping system work simultaneously. c. Left joystick: ① Telescope telescopic boom out. ② Telescope telescopic boom in. d. Right joystick: ① Reel main winch off. ② Spool main winch up.

Ser. No.	Simultaneous crane movements	Illustration		Operating instructions
		Left joystick	Right joystick	
2	Main winch + Auxiliary winch			a. Turn the pre-selection switch “Telescope / auxiliary winch” to the right position. b. Operate left and right joysticks at the same time according to left figures to make main winch and auxiliary winch work simultaneously. c. Left joystick: ① Reel auxiliary winch off. ② Spool auxiliary winch up. d. Right joystick: ① Reel main winch off. ② Spool main winch up.
3	Derricking + Telescoping			a. Turn the pre-selection switch “Telescope / auxiliary winch” to the left position. b. Operate left and right joysticks at the same time according to left figures to make derricking gear and telescoping system work simultaneously. c. Left joystick: ① Telescope telescopic boom

Ser. No.	Simultaneous crane movements	Illustration		Operating instructions
		Left joystick	Right joystick	out. ② Telescope telescopic boom in. d. Right joystick: ③ Derrick main boom up. ④ Derrick main boom down.
4	Derricking + Auxiliary winch			a. Turn the pre-selection switch “Telescope / auxiliary winch” to the right position. b. Operate left and right joysticks at the same time according to left figures to make derricking gear and auxiliary winch work simultaneously. c. Left joystick: ① Reel auxiliary winch off. ② Spool auxiliary winch up. d. Right joystick: ③ Derrick main boom up. ④ Derrick main boom down.

Ser. No.	Simultaneous crane movements	Illustration		Operating instructions
		Left joystick	Right joystick	
5	Slewing + Derricking			a. Operate left and right joysticks at the same time according to left figures to make slewing gear and derricking gear work simultaneously. b. Left joystick: ③ Slew to the right. ④ Slewing to the left. c. Right joystick: ③ Derrick main boom up. ④ Derrick main boom down.
6	Slewing + Main winch			a. Operate left and right joysticks at the same time according to left figures to make slewing gear and main winch work simultaneously. b. Left joystick: ③ Slew to the right. ④ Slew to the left. c. Right joystick: ① Reel main winch off. ② Spool main winch up.

Ser. No.	Simultaneous crane movements	Illustration		Operating instructions
		Left joystick	Right joystick	
7	Derricking + Main winch			a. Deflect the right joystick according to the left figure to make derricking gear and main winch initiate relevant movements simultaneously. b. Right joystick: ⑤ Derrick main boom down / spool main winch up. ⑥ Derrick main boom up / reel main winch off. ⑦ Derrick main boom down / reel main winch off. ⑧ Derrick main boom up / spool main winch up.
8	Slewing + Auxiliary winch			a. Turn the pre-selection switch “Telescope / auxiliary winch” to the right position. b. Deflect the left joystick according to the left figure to make slewing gear and auxiliary winch initiate relevant movements simultaneously. c. Left joystick: ⑤ Slew to the left / spool auxiliary winch up.

Ser. No.	Simultaneous crane movements	Illustration		Operating instructions
		Left joystick	Right joystick	
				⑥ Slew to the right / reel auxiliary winch off. ⑦ Slew to the left / reel auxiliary winch off. ⑧ Slew to the right / spool auxiliary winch up.
9	Slewing + Telescoping			a. Turn the pre-selection switch “Telescope / auxiliary winch” to the left position. b. Deflect the left joystick according to the left figure to make slewing gear and telescoping system initiate relevant movements simultaneously. c. Left joystick: ⑤ Slew to the left / telescope telescopic boom in. ⑥ Slew to the right / telescope telescopic boom out. ⑦ Slew to the left / telescope telescopic boom out. ⑧ Slew to the right / telescope telescopic boom in.

4.5.8 Rope reeving

Before you start to change the wire rope reevings, completely retract the boom and move it to the side or rear of the crane. See Fig. 04 – 39.

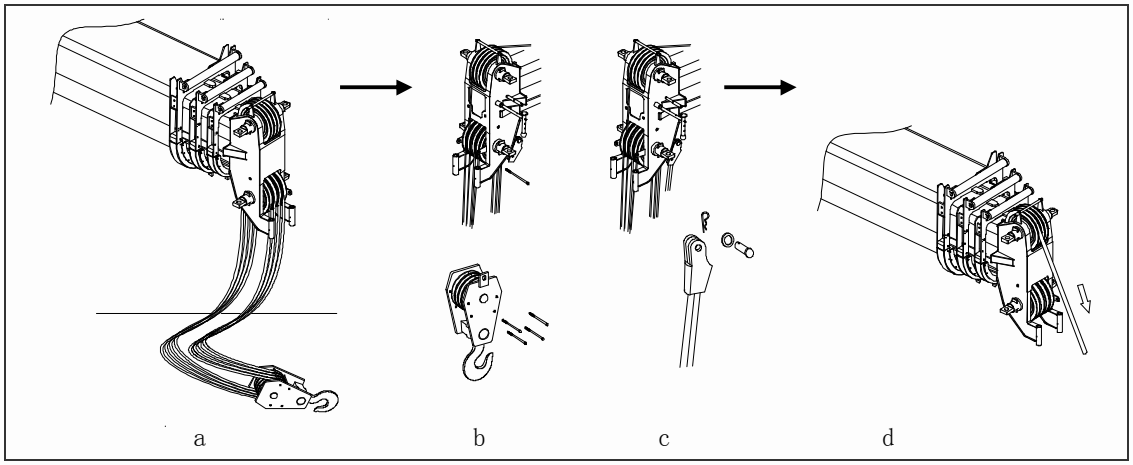


Fig. 04 – 39

Change the wire rope reevings as follows:

(a) Derrick the boom down to put the hook (a) on the ground.

(b) Remove the pins (b) on the hook block and boom head to let the wire rope unreave.

(c) Remove the hoisting limit switch weight (c).

(d) Remove the wedge and socket assembly (beckett).

(e) Dead end the rope on the hook block for an odd reeving number, and on the boom head for an even reeving number.

(f) Change rope reevings (d).

NOTE

(1) You must change the location of the hoisting limit switch weight if you have a different number of wire rope reevings. See Fig. 04 – 40.

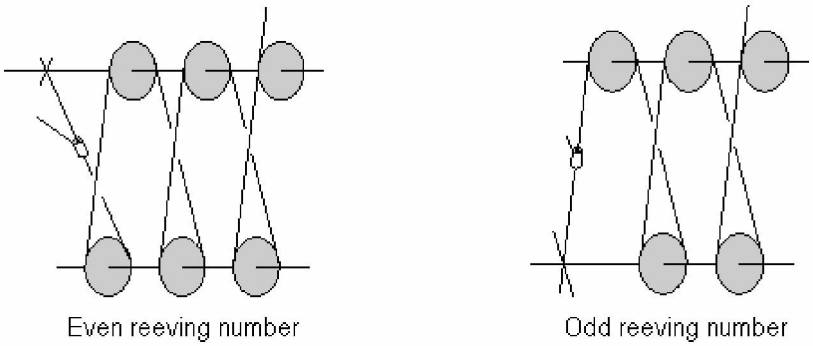


Fig. 04 – 40

(2) Put the wire rope on the winch spool smoothly and in sequence.

(3) Install the socket and wire rope clamp. Refer to Figure 04 – 41.

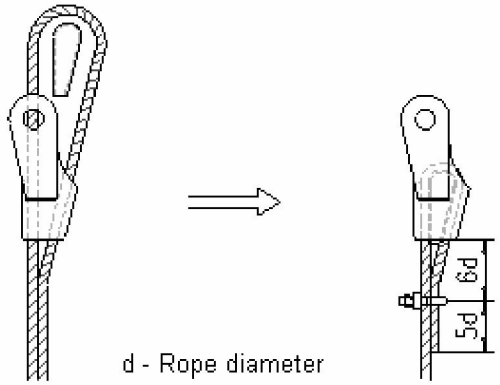


Fig. 04 – 41

ZOOMLION

OPERATOR'S MANUAL FOR TRUCK CRANE

Chapter 5 Equipment

5.1 Safety technical guidelines

a) The hoist rope must be reeved between the rope pulley on the boom head and hook pulley in accordance with the corresponding reevings specified in lifting capacity table;

b) Counterweight plates must be fitted according to lifting capacity tables;

c) The jib which is not in contact with ground during assembly and dismantling must be supported by appropriate and stable materials;

⚠ DANGER

(1) All assembly work must be carried out using suitable aids (scaffolding or lifting platforms, etc.)! If this is not observed, personnel could fall and suffer life-threatening injures;

(2) Do not stand beneath the boom especially when the jib is being pinned or unpinned.

d) Check whether the safety precautions comply with the requirements;

e) Before assembling and dismantling the jib, ensure that the following prerequisites are met:

1) The crane is properly supported and leveled;

2) The telescopic boom is fully telescoped in;

3) Fit the jib according to the rated lifting capacity table;

4) All pinned connections have been secured;

5) All limit switches have been correctly fitted and are fully operational;

6) The hoist rope has been correctly placed in the rope pulleys with the rope securing tubes to prevent it from jumping out;

7) There are no loose parts on the jib.

⚠ DANGER

In winter, the telescopic boom, jib and associated components (limit switches, cable drums, corner marker lights, wind speed sensor etc.) must be kept free of snow and ice.

Incorrectly fitted or faulty limit switches and falling parts (pins, spring-loaded safety pins, ice etc.) can cause injury!

5.2 Jib

5.2.1 General

Jib is one of the important components of truck crane. It is auxiliary equipment used to increase the crane lifting height. With the jib assembled, the load can be lifted to a higher height and the working radius can be enlarged via changing offset.

This crane is equipped with a 2-section jib. Jib section 1 is in lattice-shaped structure and jib section 2 is in box-shaped structure. The jib section 2 is secured to the jib section 1 via pins during driving, and the whole jib is secured to the right side of the main boom via inserted pins.

⚠WARNING

Do not lift a load with the jib until the outriggers are extended!

5.2.2. Assembly

The jib can be assembled below an angle of 0°, or 30° to the telescopic boom according to job requirements.

Assemble the jib below an angle of 0° in the following steps:

a) Extend the outriggers and level the crane with level gauge;

b) Telescope main boom in completely and derrick it down to the rear or the side in the -2° position. Ensure that there is 30m slewing range to the slewing center; See Fig.05-01;

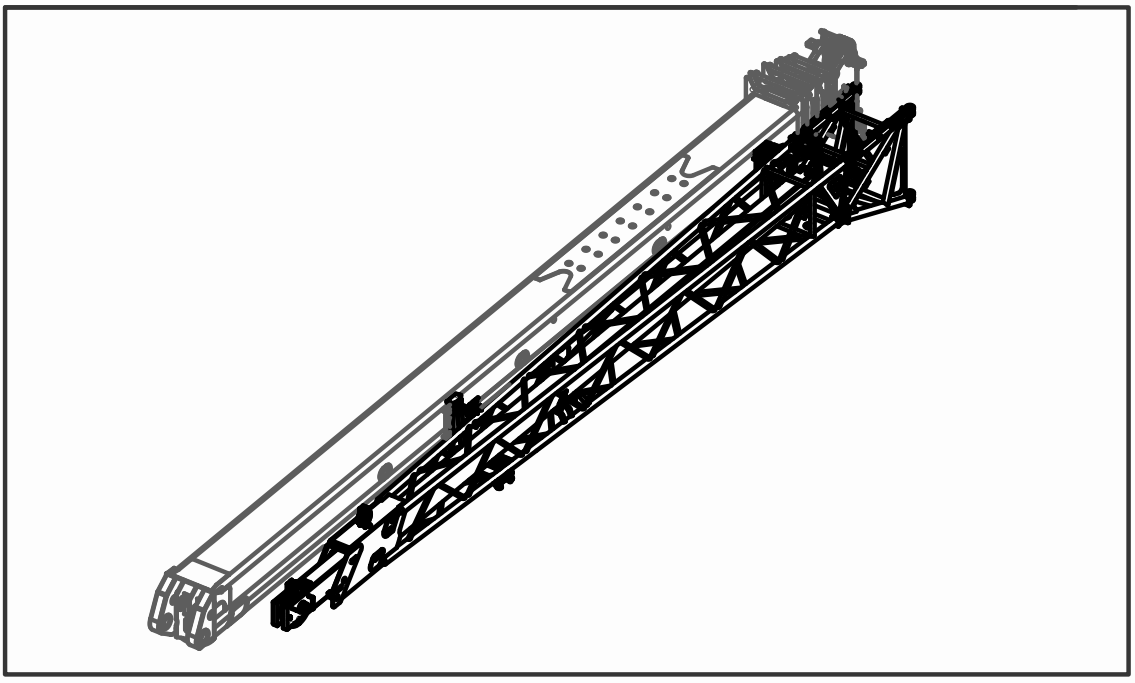


Fig. 05-01

c) Remove inserted pin. Unfold the folded adaptor and secure it with the inserted pin. See Fig.05-02;

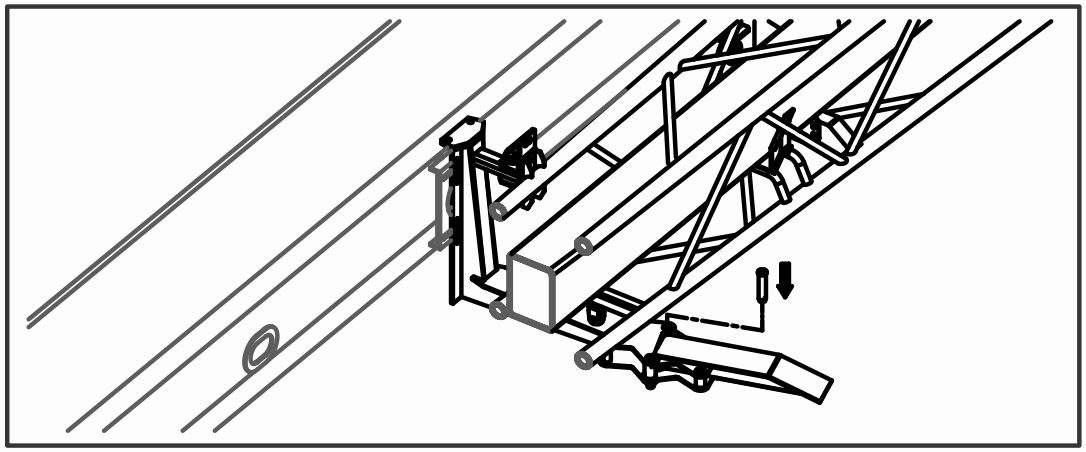


Fig.05-02

d) Unfold the intermediate adaptor and remove the inserted pin I. See Fig.05-03;

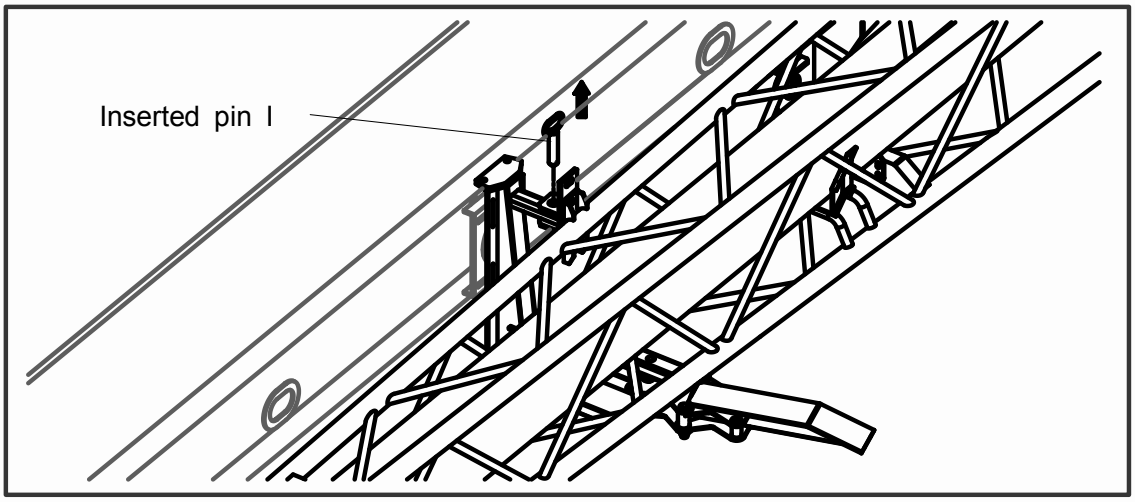


Fig.05-03

e) Rotate the jib around inserted pin II. See Fig.05-04;

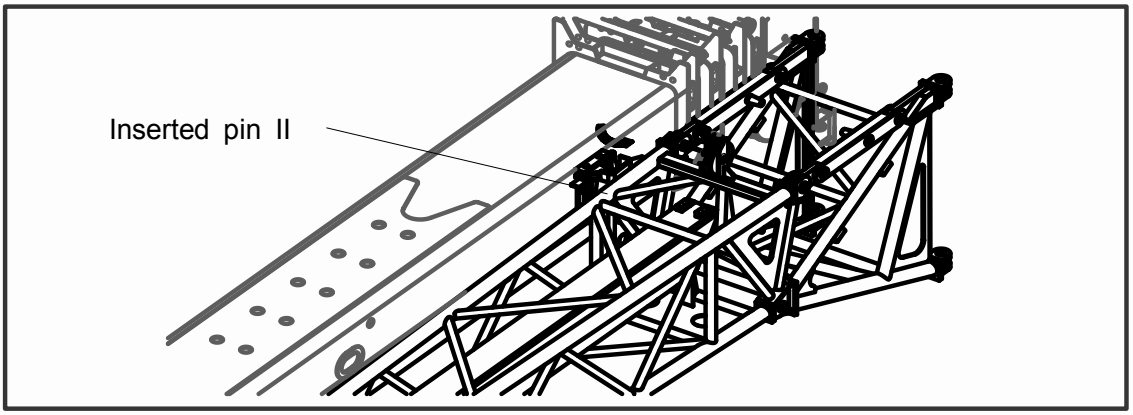


Fig.05-04

f) Unfold the jib till the connecting fork aligns with their holes on the right side of telescopic boom section 4 and secure with inserted pin III and spring-loaded pins; See Fig.05-05;

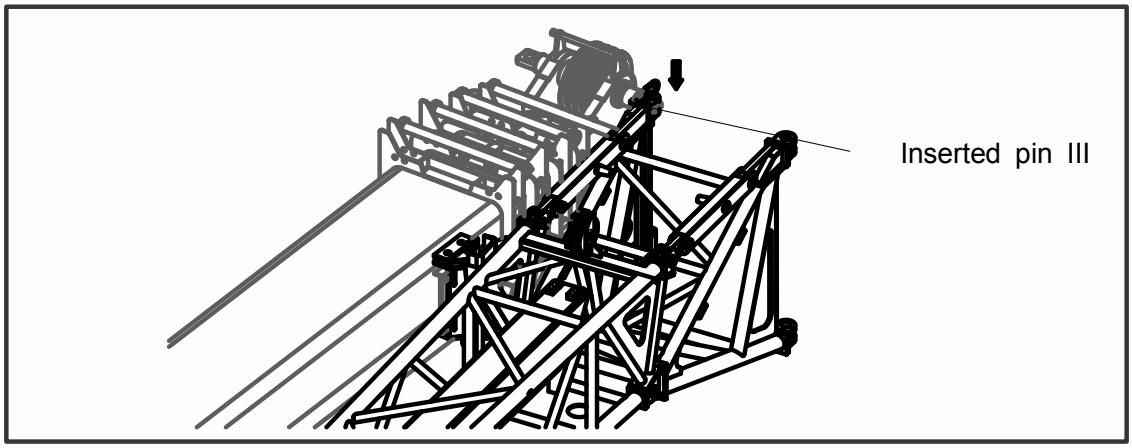
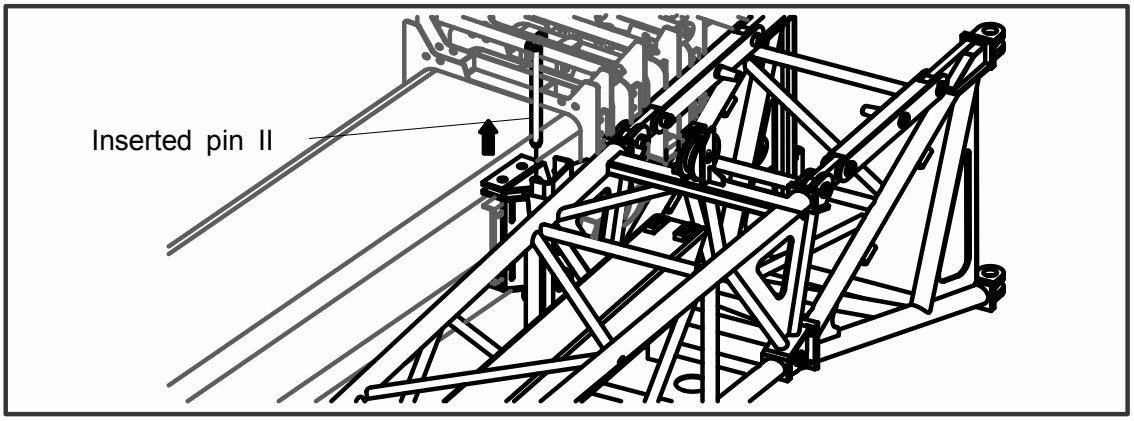


Fig.05-05

g) Remove inserted pin II. See Fig.05-06;



See Fig.05-06

h) Rotate the jib around inserted pin III in the same direction to the front of the main boom. See Fig.05-07;

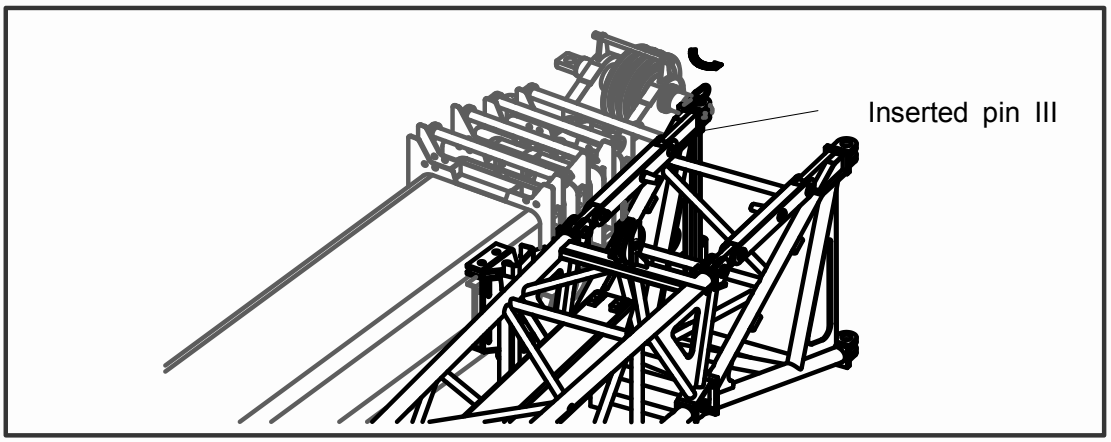


Fig.05-07

i) Unfold the jib till connecting fork aligns with their holes on the left side of telescopic boom section 4 and pin the inserted pin IV and spring-loaded pins. See Fig.05-08;

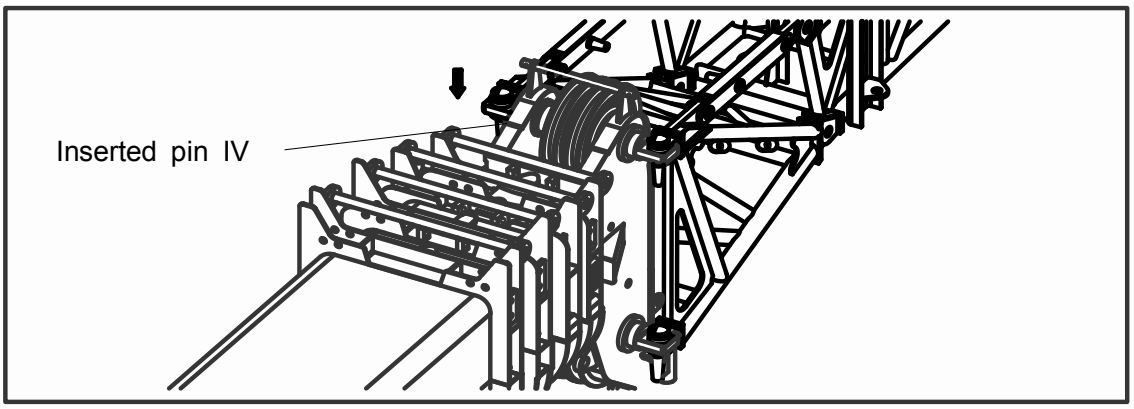


Fig.05-08

j) Remove inserted pin V and spring-loaded pin if jib section 2 is to be used. See Fig.05-09;

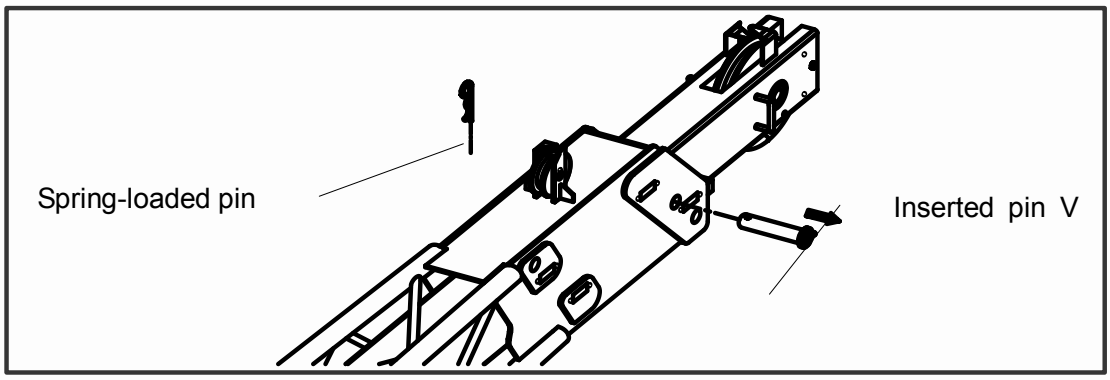


Fig.05-09

k) Unfold the jib section 2 till it touches its retainer, and align it with pin holes. Pin the inserted pin V and spring-loaded pins. See Fig.05-10;

NOTE

The nylon slide blocks on the both sides of the connecting box can be adjusted to make the pulling movement smooth.

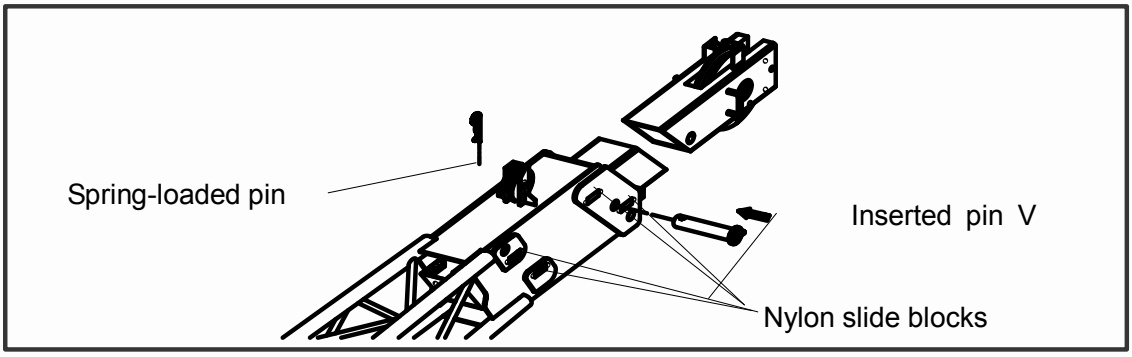


Fig.05-10

l) Reeve in the auxiliary hoist rope; install the auxiliary hook and the hoisting limit switch. Check the jib for proper assembling. At this time, jib assembly is finished.

DANGER

Prohibit standing under the boom during assembly! Otherwise, there will be life-threatening hazards.

5.2.3 Angle settings

Before the assembly, first take out the auxiliary hook from the hook holder.

Assemble the jib below an angle of 30° in the following steps:

a) Move left joystick to reel off the auxiliary hoist rope for 2 m to 3 m at low speed;

b) Change offset to 30°:

1） Unpin the pin and spring-loaded pin at the adjusting plate of adapter at jib end;

2） Derrick the main boom up slowly until the long groove of adjusting plate is supported.

As a result, the offset is set to 30°. See Fig.05-11.

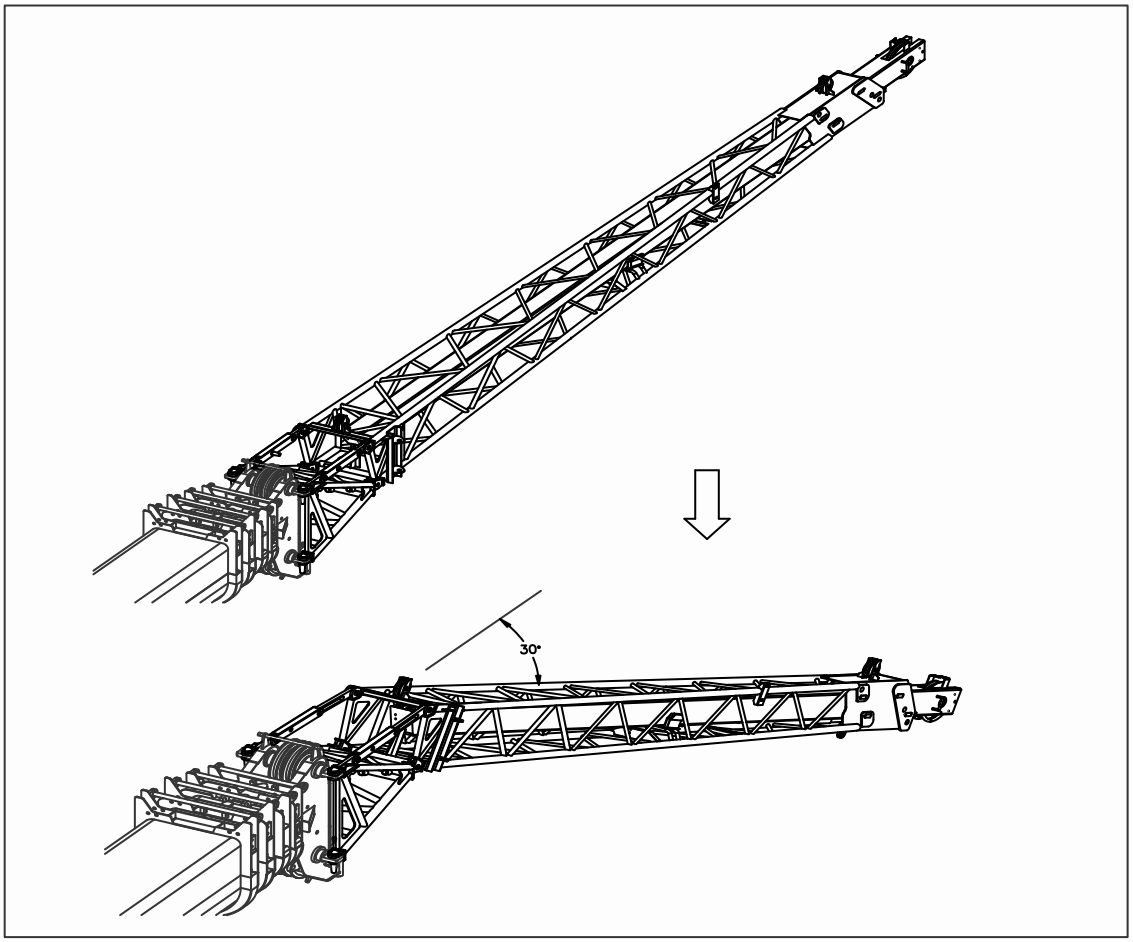


Fig.05-11

5.2.4 Dismantling

Proceed analogously, in the reverse order.

NOTE

When folding the jib, do not wind the hoist rope for auxiliary winch excessively.

5.2.5 Reeving in the auxiliary hoist rope

a) Reeve the auxiliary hoist rope through the hoist rope guide;

b) Reeve the auxiliary hoist rope through the cable guide pulleys and the pulley on the jib head;

c) Reeve over rope guard device I and rope guard device II;

d) When the rope is reeved through the rope guard device II, remove rope guard and spring-loaded pin;

e) Reeve the rope head over the wedge sleeve and connect with the auxiliary hook;

f) Install the rope guard device II;

g) For details, please refer to Fig. 05-12.

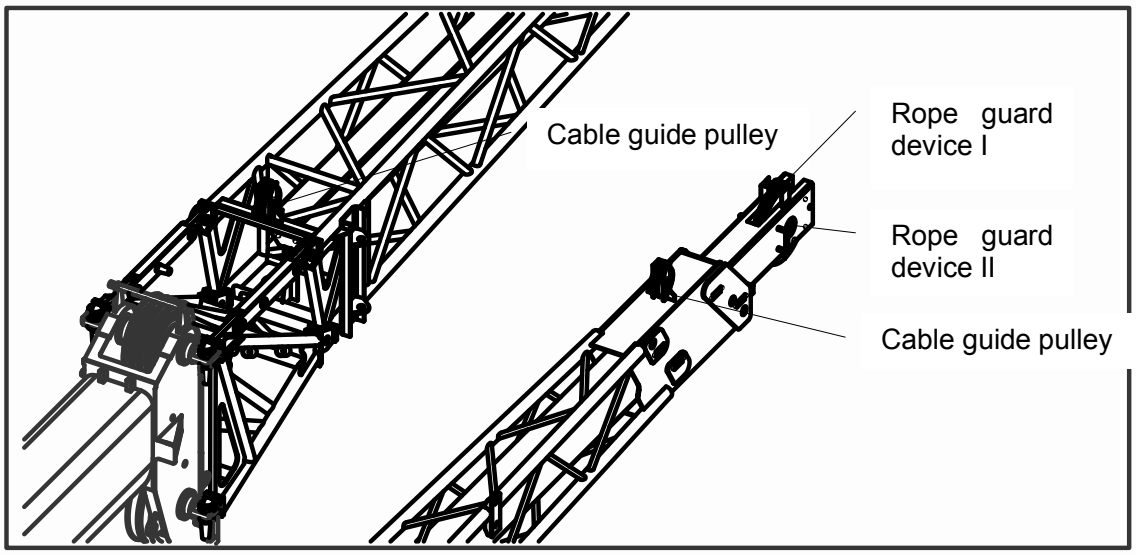


Fig. 05-12

5.2.6 Connection of hoisting limit switch

As for the connection of hoisting limit switch, please refer to Fig.05-13.

Under the jib working condition without using the jib section 2, connect the cable bundle A2 on the hoisting limit switch of auxiliary winch to cable bundle C1 on the box-shaped structure to activate the hoisting limit switch of auxiliary winch. See Fig.05-13-01.

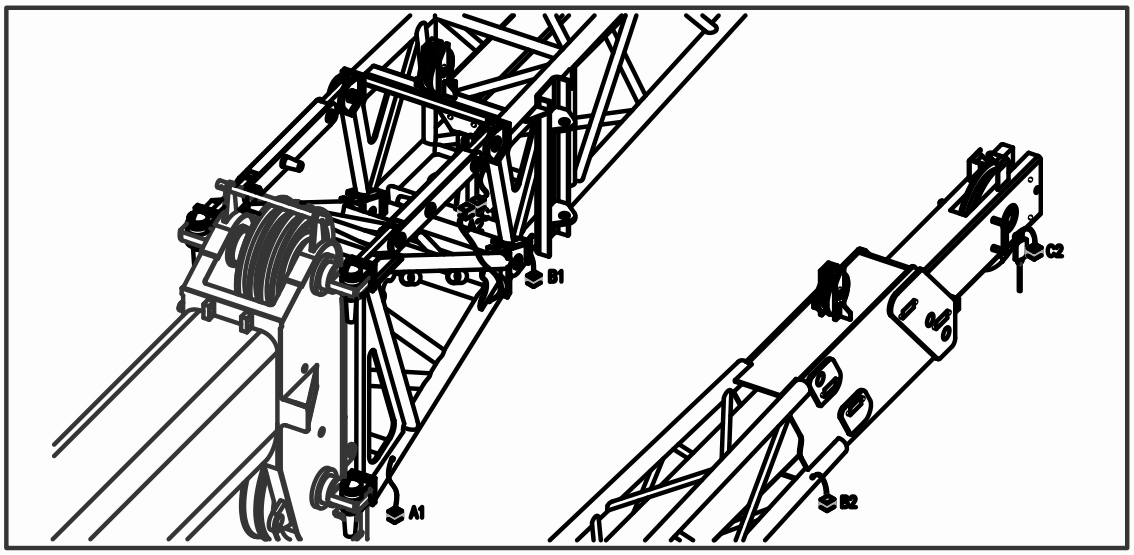


Fig.05-13-01

Under the jib working condition without using the jib section 2, first connect the cable bundle A2 on hoisting limit switch of auxiliary winch to cable bundle B1 on lattice jib. After that, connect the cable bundle B2 on lattice jib to cable bundle C1 on box-shaped jib to activate the hoisting limit switch of auxiliary winch. See Fig.05-13-02.

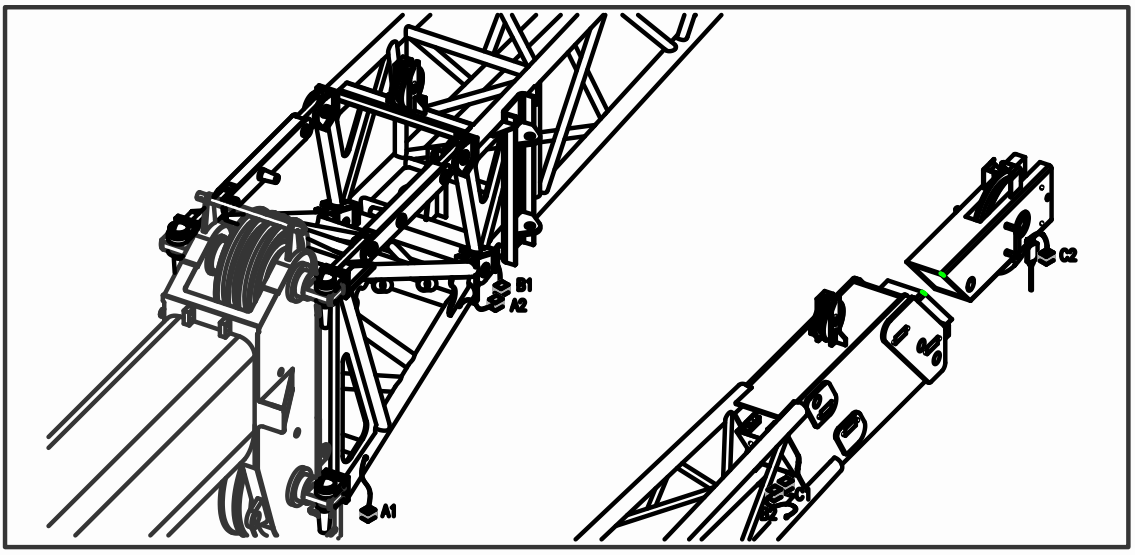


Fig.05-13-02

CAREFUL

Before dismantling the jib, disconnect the cable bundle between the hoisting limiting switch on the auxiliary winch and jib first. Otherwise, the cable bundle may be broken!

5.3 Rooster sheave

The rooster sheave is composed of bracket, rope pulley shaft, pulley and pins. When the crane is not used or in driving condition, it is mounted on the outside of top boom section head.

Rooster sheave is set up for rapid hoists over the boom nose to improve the working efficiency when the loads are light.

5.3.1 Assembly

a) Derrick down the telescopic boom to the rear or to the side in -2° position.

b) Release the securing pin and turn the rooster sheave bracket until connecting pin can be bolted. See Fig.05-14.

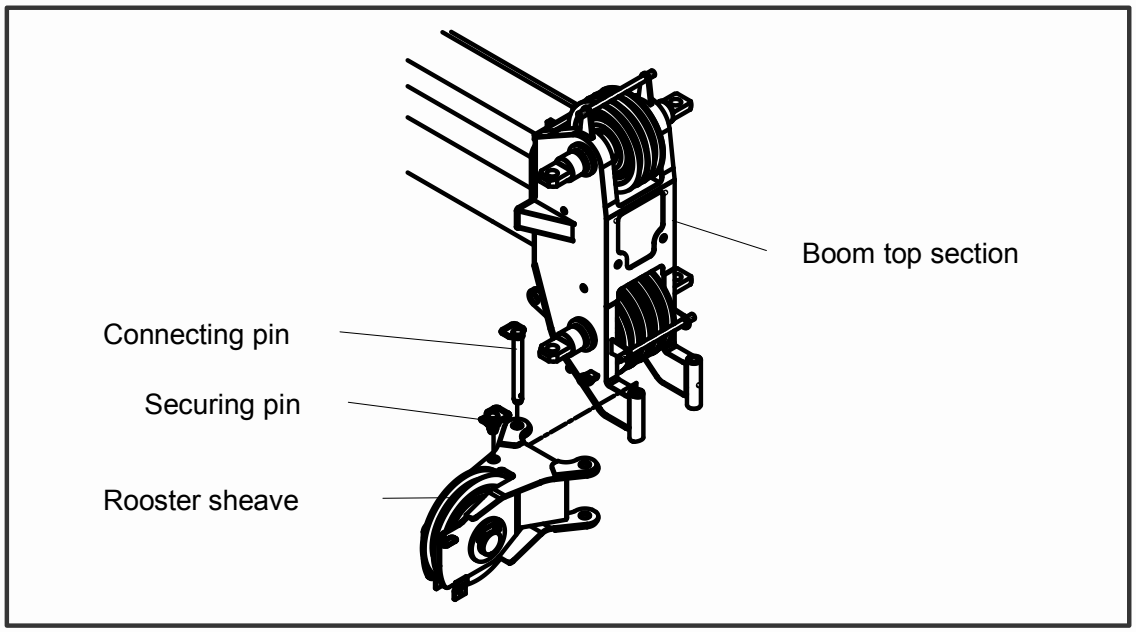


Fig.05-14

c) Run auxiliary hoist rope over the upper pulley on boom head and reeve in the rooster sheave. Attach the auxiliary hook and its hoisting limit switch.

5.3.2 Dismantling

Proceed analogously, in the reverse order.

Turn it to the outside of top boom section and secure it.

ZOOMLION

OPERATOR’S MANUAL FOR TRUCK CRANE

Chapter 6 Additional equipment

6.1 Air conditioning in driver's cab

6.1.1 Operating methods

The control panel is on the center console in the driver's cab.

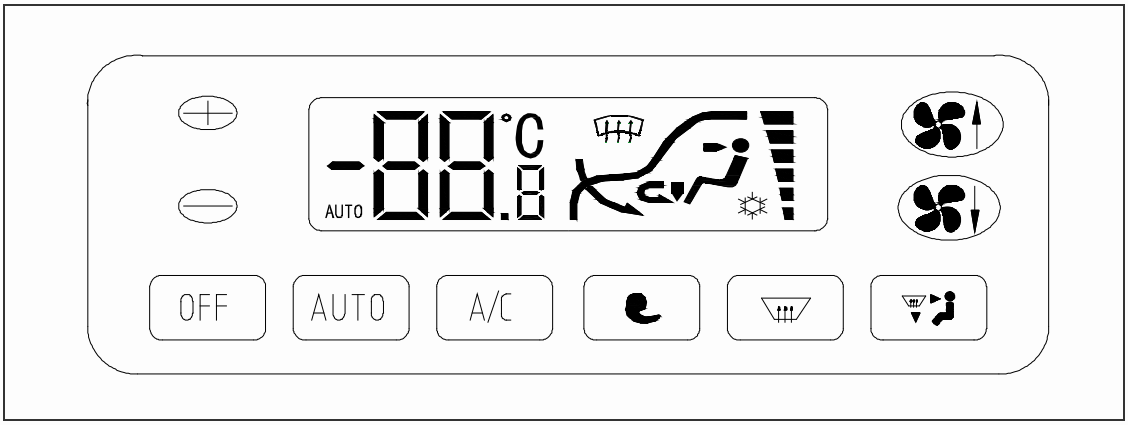


Fig. 06 – 01

a) The description of symbols on display screen are shown as follows:

SET set

AUTO Auto

-88.8°C Temperature

Outer air circulation

Interior air circulation

Footwell air supply

Fresh air

Front window air supply

Refrigeration

Fan speed bar chart:

1 bar – stage 1:

2 bars – stage 2:

3 bars – stage 3:

4 bars – stage 4:

5 bars – stage 5:

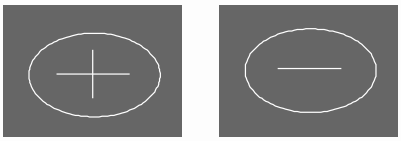
6 bars – stage 6:

Vehicle body:

b) Operating instructions for push-buttons:

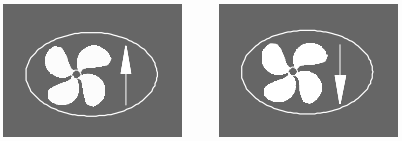
1) Temperature adjustment button

Pressed: set the temperature



2) Fan speed button

Pressed: adjust the fan speed.



3) OFF button

Pressed: air conditioning system is turned off.

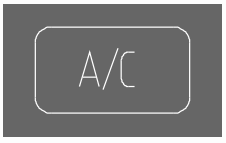
4) AUTO button

Press AUTO: auto operating mode is activated.

Press AUTO twice, press A/C or front window air supply: exit auto operating mode.

5) A/C button

Pressed: A/C begins to refrigerate

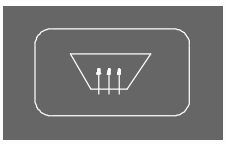


6) Circulation button

Pressed: Changeover interior / outer air circulation

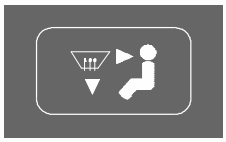
7) Front window air supply button

Pressed: enter the front window air supply mode.



8) Mode button

Pressed: Changeover among different control modes



WARNING

Never use the cab heater during driving if engine coolant temperature is below 70 ℃.

CAUTION

(1) Make sure that the A/C is in the OFF mode when the engine is OFF or at idle speed for a long time. The battery drains in these conditions.

(2) When you move the crane a long distance at low speed, with the A/C in the ON mode, put the transmission in a low gear. This increases the engine RPM and decreases the load on the transmission.

(3) Set the A/C to the OFF position when you do one of the items that follow:

- **Move the crane quickly.**
- **Move up a long hill slope.**

(4) In winter or other periods without using air conditioning, run the air conditioning for several minutes once a month to benefit the lubricating circulation and ensure the system in good state.

(5) Make sure that the refrigerant in the A/C system is at the correct level at regular intervals.

(6) If there are unusual vibrations, noises or smells during operation, stop and examine the crane immediately. Do not operate the crane that has a malfunction.

(7) Keep the surface of the condenser clean. When you clean the condenser, do not use steam. Clean it with compressed air or cold water.

(8) Do not disassemble the belt or pipeline of compressor after using the air conditioning.

(9) In summer, close the shutoff gate valve on the hot-water pipe of heater at the

bottom of driver's cab. Otherwise refrigeration effect may be affected. In winter, open the shutoff gate valve to make hot water enter into the heater.

6.2 Air conditioning in operator's cab

In order to provide a comfortable operating environment for the operator, operator's cab of our crane can be equipped with an air conditioning and cab heater according to customer's requirement. The control panel behind the operator's seat is used to adjust the room temperature.

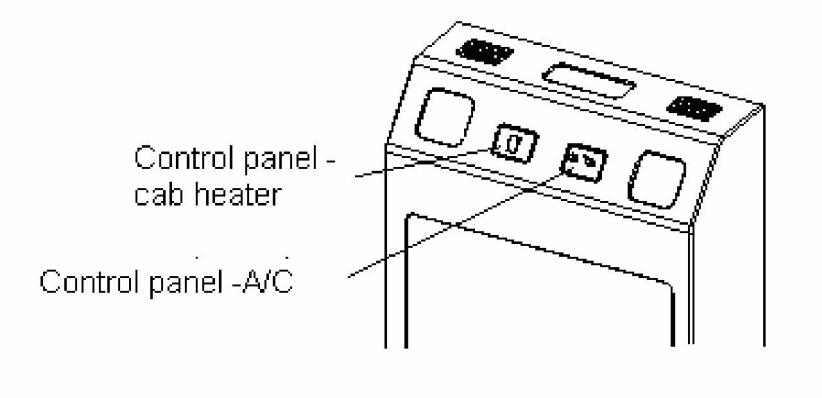


Fig. 06 – 02

6.2.1 Air conditioning

The air conditioning control panel is on the housing of air conditioning interior machine in operator's cab. There are two rotary switches and a control light on the control panel. See Fig. 06 – 03.

a) Temperature control switch

The rotary switch is used to control the temperature in the cab by adjusting the temperature of air blew out.

b) Fan speed switch

This switch controls the speed of the evaporator fan to obtain proper fan speed.

c) Control light

The compressor is started and the cooling system is in working state when the control light lights up.

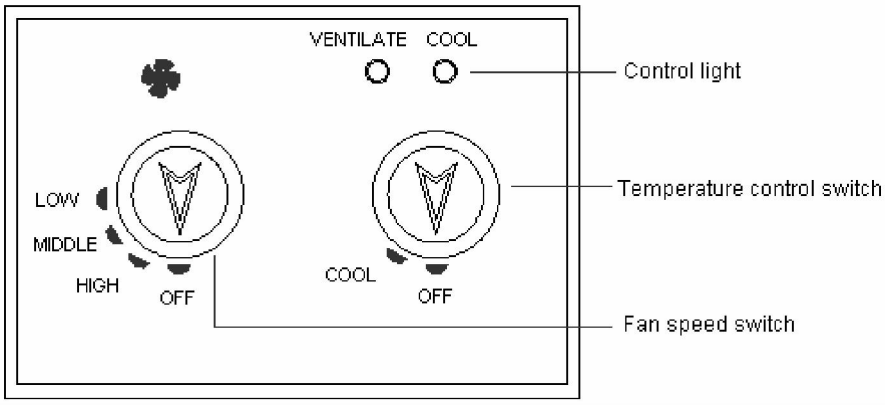


Fig. 06 – 03

– **Operating methods**

When the air conditioning is turned on, turn the fan speed switch to the “HIGH” position and hold it in “HIGH” position for 5 minutes. Then turn the temperature control switch to the “COOL” position. At this time, the temperature in the cab starts to fall down. When the required temperature is obtained, turn the temperature control switch anticlockwise slowly until the control light goes out and the compressor stops working. At this moment, the temperature in the cab is at its set value.

When the temperature in the cab is higher than the set value, the control light lights up, the compressor starts automatically and the cooling system begins to work.

Adjusting the angle of the air outlet can change the direction of the cold wind. Different kinds of air volume can be obtained by setting the fan speed switch respectively in “HIGH”, “MIDDLE” or “LOW” position.

When the air conditioning is used, do not turn the temperature control switch to the “COOL” position otherwise the evaporator may get frost to impair the cooling effect.

⚠ CAUTION

(1) It is forbidden to dismantle the air conditioning system without manufacturer’s permission.

(2) Check the tension of the compressor belt periodically and adjust it in time.

(3) Wash off the dirt on the surface of the radiating rib of the condenser to avoid reducing the cooling effect of system.

(4) When changing the components of air conditioning system, add refrigerant oil according to corresponding requirements. The oil brand of the new refrigerant oil should be the same as that of refrigerant oil used in the compressor.

(5) The brand and type of newly-added refrigerant should be the same as that used in the system when the refrigerant is added or changed.

(6) Evaporator lowers the temperature in the cab at its high gear position, and keeps the temperature in cab at medium gear position or low gear position.

(7) When the components in the system break down, replace them with the spare parts supplied or designated by the manufacturer in order to protect the system against damage.

(8) Under the condition of low temperature & high humidity, do not make the evaporator work at low gear position in order to prevent the evaporator from freezing.

(9) When the air conditioning is not used in winter, run it for 10 minutes every month to make the freezing oil soak the whole system to avoid refrigerant leakage.

– **Requirements for periodic maintenance of air conditioning system**

Item	Maintenance	Repair interval
Condenser fan motor	Check and repair	Once per quarter
Evaporator fan motor	Check and repair	Once per quarter
Condenser	Check condenser for blockage. If necessary, clean it.	Once a month or shorten the maintenance interval depending on actual working condition.
Evaporator	Check the evaporator for functional work and abnormal sound. Clean the air inlet.	Once per quarter or short the maintenance interval depending on actual working condition.
Solenoid clutch	Check it for functional work, and clean it if necessary	Once per quarter
Connectors	Check that the wire connector is fitted tightly	Once a month

Explanation:

a) Evaporator--- the square box in the driver's cab from which the cold air is blown out. There are several air vents on it.

b) Condenser---the device is used for the exchange of the hot air outside the driver's cab. In some vehicle, it is mounted between water tank and fan (without the condenser fan motor) while in the others, it is on the side of the vehicle (with the condenser fan motor).

c) Condenser fan motor---it is mounted with the condenser to help the hot air exchange of the condenser.

6.2.2 Cab heater

The heater control panel is on the housing of air conditioning interior machine in operator's cab. There is a rocker switch on the control panel. The rocker switch has two control lights. One is a power control light, the other is a control light of the switch.

a) Rocker switch

The rotary switch is used to control the heater automatically.

b) Power control light

This control light is used to indicate whether the power is switched on.

c) Control light of the switch

This control light is used to indicate the working state of the heater and the error code.

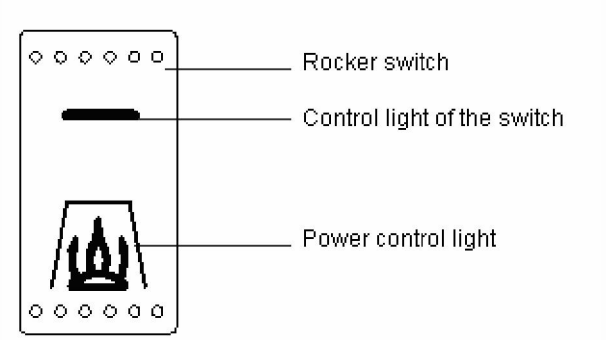


Fig. 06 – 04

– **Operating conditions**

a) Ambient temperature ⩾ -40ºC, altitude ⩽ 3000 m.

b) It can not be immerged into water, and can't wash it with water directly.

c) The heater should use the antifreeze fluid or the diesel oil that is suitable for the ambient temperature.

CAUTION

It is forbidden to use the gasoline.

For the selection of the fuel type, please refer to the following table.

Ambient temperature	Above 5ºC	Above -5ºC	Above -15ºC	Above -30ºC	Above -40ºC
Fuel	0# diesel oil	10# diesel oil	20# diesel oil	35# diesel oil	50# diesel oil

For the selection of the antifreeze fluid, please refer to the following table.

Ambient temperature	Above -25ºC	Above -40ºC
Antifreeze fluid	-25ºC antifreeze fluid	-40ºC antifreeze fluid

– **Operating methods**

The rocker switch has two stages. When the switch is in the stage 1, only the water pump works. When it is in stage 2, both the water pump and heater work. At this time, the fan speed switch is turned on to blow out warm air.

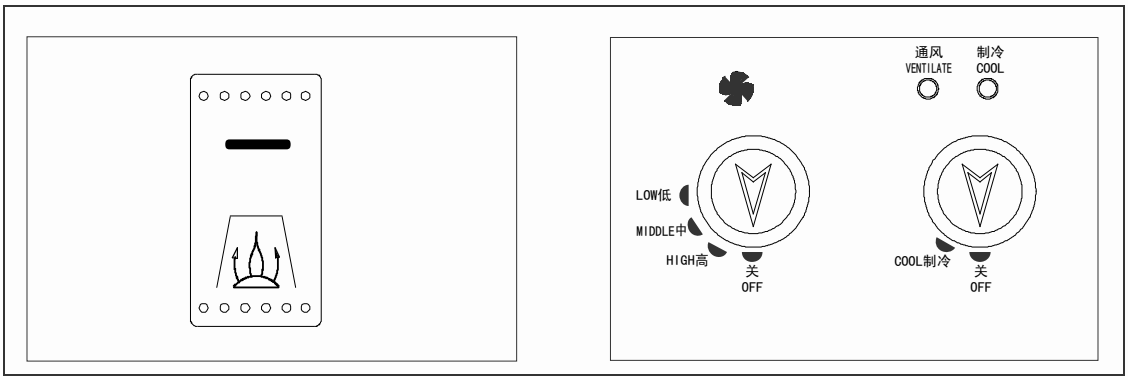


Fig. 06 – 05

When the water outlet temperature reaches 80℃, the heater stops work and the control light of the switch goes out. When the water temperature is lower than 65℃, the heater will work again. The above operations will repeat in cycles.

When the heater is used for the first time in cold seasons, first check the heater condition to ensure there are no foreign matters blocked in the air passage, the heater rotates freely, the combustion-supporting air inlet and the exhaust gas outlet are not blocked with clay etc. and air intake & air exhaust are smooth.

When the heater is not used, the switch should be turned off to stop the heater. At this time, control light of the switch extinguishes after 3 minutes.

CAUTION

Turn the heater off after the control light of the switch extinguishes. Otherwise, the heater can not radiate, and thus it fails.

– **Troubleshooting**

Problem	Cause	Remedy
No warm air blows out.	Fan speed switch on the air conditioning control panel is not turned on.	Turn on fan speed switch on the air conditioning control panel.
The heater does not stop working within 60 seconds after the fuel supply is cut off.	The solenoid valve is dirty or can not be closed completely, or the flame detector is short-circuited.	Clean oil pipe and check the connection, the control box and the flame detector.
The power is unstable.	The wave of power supply is big and unstable.	Check whether the power supply is stable (especially when the stabilized power supply is applied), or replace control panel.
The voltage is too high.	The voltage of heater is higher than 32 V for 5 seconds (for the heater whose rated voltage is 12 V, it means that the voltage is higher than 16 V for 5 seconds).	Check voltage. If the voltage is too high, check voltage regulator of the engine. If it is not too high, replace the control box.
The voltage is too low.	The voltage of heater is lower than 20 V (for the heater whose rated voltage is 12 V, it means that the voltage is lower than 10 V for 5 seconds)	Start the engine and heater, and then check the generator and line voltage. If the voltage is not too low, replace control panel.
The flame detector is short-circuited.	When the heater does not work, the flame detector still show working state.	Check whether the line is short-circuited, replace flame detector or control panel.
When the relay of motor is switched off, it is still electrified.	The contact point is connected, or the control switch fails.	Replace control panel.
The solenoid valve relay is still electrified when it is switched off or the solenoid valve coil breaks off.	The contact point is connected or the coil breaks off, or the control panel fails.	Replace control panel or its coil.
The fuse breaks off.	The fuse breaks off, the wire is disconnected, or the control panel fails.	Reset the fuse, check connection or replace control panel.

Problem	Cause	Remedy
When the relay of solenoid valve is electrified, it can not output signals.	The control panel is damaged.	Replace control panel.
When the motor relay is electrified, it can not output signals.	The relay or control panel fails.	Replace control panel.
The motor can not work.	The main motor can not work after it is electrified or the rotational speed is too low.	Check motor connection. Pull out plug to check motor, if it can not work or the rotational speed is too low, replace motor. Otherwise replace the control panel.
The water temperature sensor is short-circuited.	There is water in sensor or the circuit board is wet.	Replace sensor or control box.
The water temperature sensor breaks.	The sensor line breaks off or the circuit board fails.	Replace sensor or control box.
The flame detector can not be ignited.	The flame detector does not output flame signal.	Check connection of flame detector, replace the detector or control panel.
Extinguish flame during burning.	Extinguish flame during burning and can not burn again.	If the oil tank is short of oil, add oil. If the oil pipe leaks, tighten or replace it. replace short-circuited flame detector and control box.
Strong interference	Other interferences.	Close other interference source, replace control panel.
The ignition plug breaks.	The ignition plug burn out or the line looses.	Fasten connection, replace ignition plug.
The ignition plug is short-circuited.	It is short-circuited.	Check it.
The ignition plug relay has no output signal.	The relay or the control panel fails.	Replace control panel.

6.3 GPS

GPS is the standard equipment for the cranes sold in mainland China. For its installed location, please refer to Fig. 06 – 06.

It is optional for the cranes sold in other regions.

NOTE

If the crane sold in mainland China needs to work beyond the region, please contact local Sales and Service Center of Zoomlion in advance. Otherwise, the GPS may be unable to work normally.

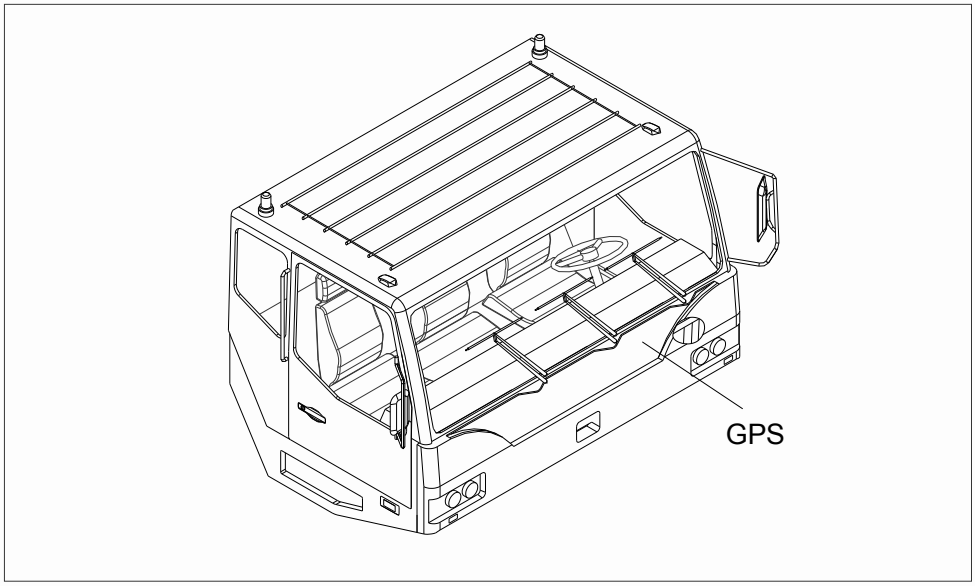


Fig. 06 – 06

Overall view of GPS is shown in the Fig. 06 – 07.

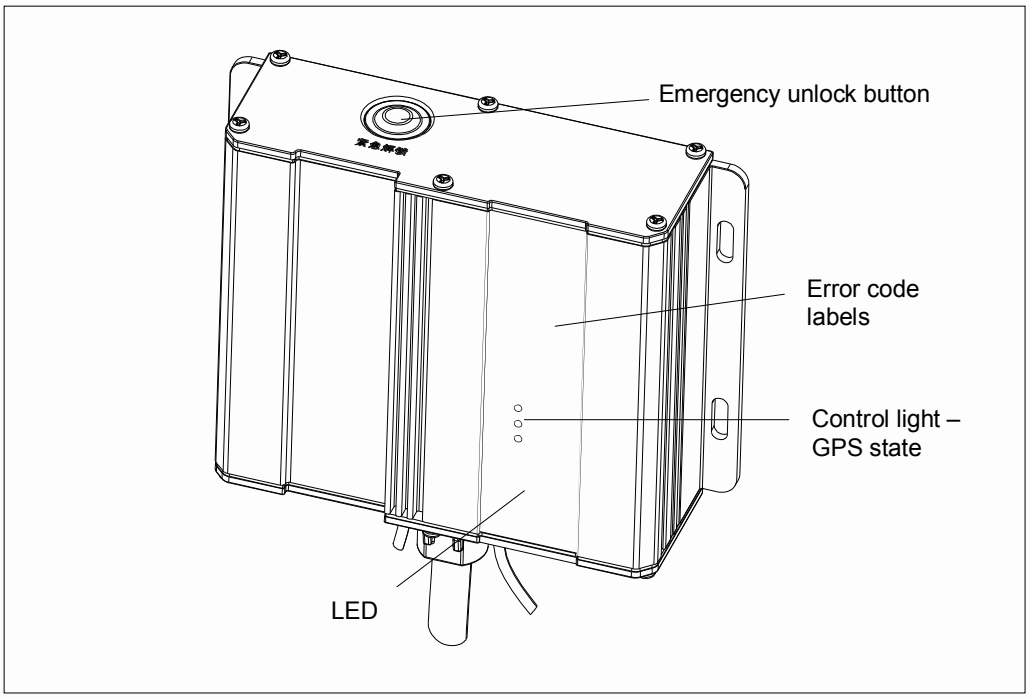


Fig. 06 – 07

6.3.1 Digital display

The LED can display the state of GPS and show the error codes in digit.

The error codes are as follows:

0: Main power defect	**1:** Locked automatically because of no network signal	**2:** Receive locking command from the platform
3: ON position signal fault	**4:** Locked because of CAN bus communication fault	**5:** Note: To be locked
6: SIM card fault	**7:** RS232 communication fault	**8:** LED self-inspection
9: Standby (no label referred)		

NOTE

The information in the above table is for reference only. During actual operation, please refer to the error code labels on the GPS.

6.3.2 Emergency unlock

When the crane enters into areas that without China Mobile network signal coverage or there is SIM card fault (including the condition that it is behind the payment) after a certain time, GPS terminal will lock the crane automatically.

If the crane needs to be operated immediately, unlock the crane temporarily by activating the emergency unlock button.

Please remove the defects according to the actual conditions.

CAUTION

When the crane is locked, the engine RPM will decrease, thus affect the normal operation.

Carry out emergency unlocking operation in the following steps:

a) Dial Zoomlion service hot line 400-800-1680 and provide the VIN and GPS error code. Zoomlion service center will give you the emergency unlock password according to the actual condition.

b) Press the emergency unlock button and hold for 5 seconds, the LED flashes “A”. Release the button, GPS begins to clock the emergency unlocking operation. Press the button within 5 seconds to input the first numeral of the password. The numeral increases as the button is pressed. If the button is pressed for more than 9 times, the numeral returns to 0.

c) The password consists of 4 numerals. If the button is not pressed within 3 seconds, the numeral input in this position is finished. At this time, the LED will display the finished numeral and flashes.

d) Continue to input the next numeral of the password.

e) If 4 numerals are not input completely and the button is not pressed within 10 seconds, the password input is supposed being finished.

When you input the correct password, the LED displays “A”. The emergency unlocking operation is finished successfully.

When you input the wrong password, the LED displays “C” for 10 seconds. The emergency unlocking operation fails.

NOTE

If the emergency unlocking operation fails because of the incorrect password, repeat the above steps.

IMPORTANT

Since the password is calculated according to the current date, ensure the red control light flashes during emergency unlocking operation.

6.3.3 GPS state control light

There are 3 control lights in different colors on the GPS. All the control lights flash under normal condition. When there is abnormity, obey the items in the table to remove the defects.

Abnormal state of control lights		Failures	Causes
Yellow	Illuminates / extinguishes	The GPS is off-line, the command as well as the text message are sent out unsuccessfully.	GSM can not receive mobile network.
Red	Illuminates / extinguishes	GPS can not navigate the crane or the position fixing is inaccurate.	GPS receives weak network signal because the GPS antenna is not connected well.
Green	Illuminates / extinguishes	The GPS is off-line, the command is sent unsuccessfully, but the command can be sent out by text message.	The terminal fails to make connection with the server.

ZOOMLION

OPERATOR’S MANUAL FOR TRUCK CRANE

Chapter 7 Transportation and storage

7.1 Transportation and points for attention

You can move the crane by its power for road-driving or by other carriers for a long distance (train or ship). During transportation, chock the wheels and make the crane safe with wire ropes. Fully close the windows and door to keep rain and moisture out of the cab. Lock the door and windows.

The positions to lift the crane are shown in the Figure 7 – 01. Follow applicable rules while you lift.

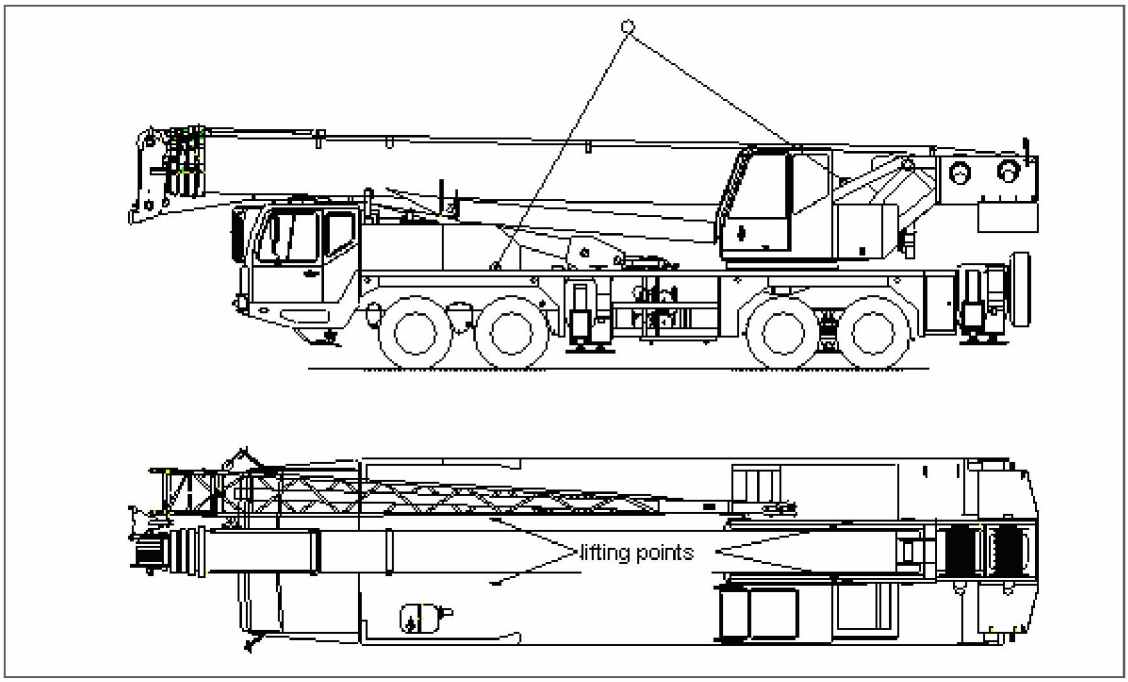


Fig. 07 – 01

WARNING

Before you lift, make sure that the slings / straps have sufficient strength to hold the crane.

7.2 The storage conditions and the points for attention in storage

Do the steps that follow if you do not use the crane for a long time:

a) Lock the doors and the windows and switch off control instruments.

b) Clean contamination off of the crane.

c) Fully retract all the cylinder pistons (except vertical cylinders) to their Min. length.

d) Fully extend the outriggers to lift the tires away from the ground.

e) Inflate the tires to specified pressure and put wooden wedges below the tires.

f) Turn off the engine and cut off the power supply.

g) If the battery is not used over a month, disconnect the connecting wire from the

battery to the electrical system. Charge it (once every three months) in regular intervals.

h) You must lubricate the surfaces of all the exposed metal components to prevent corrosion.

i) Remove all contamination (dust and sand) from the wire ropes and lubricate them with ZG-3 calcium based graphite grease.

j) Keep the crane in a garage. If not, take measures against rain, thunder and freeze.

k) Operate the engine for more than 1 hour every three months. Examine the mechanisms at idle speed to make sure that they operate correctly.

l) If you do not operate the crane for more than 18 months:

   1) Keep the crane clean and do the usual maintenance.

   2) Replace aged seal components.

   3) Do a general inspection of the engine to see if you must replace the coolant, diesel oil, and air filters.

m) Make sure that one person keeps the crane prepared for operation.