

# ROUGH TERRAIN CRANE

## TR-350M

### *JAPANESE SPECIFICATIONS*

OUTLINE	SPEC. NO.
5-section Boom, 2-staged Power Tilt Jib	TR-350M-1-00203

Control No. JA-02

# TR-350M

## CRANE SPECIFICATIONS

### CRANE CAPACITY

9.0m Boom	35,000kg	at 3.0m	(10 part-line)
15.25m Boom	22,500kg	at 3.5m	( 7 part-line)
21.5m Boom	15,500kg	at 4.5m	( 5 part-line)
27.75m Boom	10,000kg	at 6.0m	( 4 part-line)
34.0m Boom	6,500kg	at 7.0m	( 4 part-line)
7.5m Jib	3,000kg	at 78°	( 1 part-line)
12.8m Jib	2,000kg	at 78°	( 1 part-line)
Single top	3,000kg		( 1 part-line)

### MAX. LIFTING HEIGHT

Boom	34.7m
Jib	47.6m

### MAX. WORKING RADIUS

Boom	31.5m
Jib	34.7m

### BOOM LENGTH

9.0m – 34.0m

### BOOM EXTENSION

25.0m

### BOOM EXTENSION SPEED

25.0m / 119s

### JIB LENGTH

7.5m, 12.8m

### MAIN WINCH SINGLE LINE SPEED

High range: 125m/min (4th layer)  
Low range: 62m/min (4th layer)

### MAIN WINCH HOOK SPEED

High range: 12.5m/min (10 part-line)  
Low range: 6.2m/min (10 part-line)

### AUXILIARY WINCH SINGLE LINE SPEED

High range: 125m/min (4th layer)  
Low range: 62m/min (4th layer)

### AUXILIARY WINCH HOOK SPEED

High range: 125m/min (1 part-line)  
Low range: 62m/min (1 part-line)

### BOOM ELEVATION ANGLE

0° – 83°

### BOOM ELEVATION SPEED

0° – 83° / 50s

### SWING ANGLE

360° continue

### SWING SPEED

3.0rpm

### WIRE ROPE

Main Winch

16mm × 190m (Diameter × Length)

7 × 7 + 6 × WS (36)

Spin-resistant wire rope

Auxiliary Winch

16mm × 105m (Diameter × Length)

7 × 7 + 6 × Fi (29)

Spin-resistant wire rope

### BOOM

5-section hydraulically telescoping boom of box construction

(stages 2,3: synchronized; stages 4,5: synchronized)

### BOOM EXTENSION

3 double-acting hydraulic cylinder

1 wire rope type telescoping device

### JIB

2-staged swingaround boom extension which stores alongside boom base section

(with 2nd stage being a pull-out type).

Hydraulic non-stage offset (5°-45°) type

### SINGLE TOP

Single sheave. Mounted to main boom head

### HOIST

Driven by hydraulic motor and via spur gear speed reducer.

With free-fall device.

Automatic brake (with foot brake for free-fall device)

2 single winches

### BOOM ELEVATION

2 double-acting hydraulic cylinders

### SWING

Hydraulic motor driven planetary gear reducer

Swing bearing

Swing free/lock changeover type

Hand brake

### OUTRIGGERS

Fully hydraulic X-type (floats mounted integrally)

Slides and jacks each provided with independent operation device.

Full extended width 6.6m

Middle extended width 5.2m

Minimum extended width 3.8m

### MAX. OUTRIGGER LOAD

31.8t

### HYDRAULIC PUMPS

2 variable piston pumps

2 gear pumps

### HYDRAULIC OIL TANK CAPACITY

465 liters

### SAFETY DEVICES

Automatic moment limiter (AML)

Over-winding cutout

Working area control device

Winch drum lock

Level gauge

Hook safety latch

Hydraulic safety valve

Telescopic counterbalance valve

Elevation counterbalance valve

Jack pilot check valve

Swing lock

### EQUIPMENTS

Cab heater (with front and side defrosters)

Hydraulic oil temperature indication lamp

Radio

Fan

Oil cooler

Winch drum rotation indicator

Operation pedal for elevating operation

## CARRIER SPECIFICATIONS

### ENGINE

Model MITSUBISHI 6D16(with turbo charger)  
 Type 4-cycle, 6-cylinder, direct-injection, water-cooled diesel engine  
 Piston displacement 7,545cc  
 Max. output 215PS at 2,800rpm  
 Max. torque 65.0kg·m at 1,800rpm

### TORQUE CONVERTER

3-element, 1-stage unit (with automatic lock-up mechanism)

### TRANSMISSION

Automatic and manual transmission  
 Power shift type (wet multi-plate clutch)  
 3 forward and 1 reverse speeds (with Hi/Low settings)

### REDUCER

Axle dual-ratio reduction

### DRIVE

2-wheel drive (4×2) / 4-wheel drive (4×4) selection

### FRONT AXLE

Full floating type

### REAR AXLE

Full floating type (with no-spin differential)

### SUSPENSION

Front Parallel leaf spring type  
 Rear Parallel leaf spring type

### STEERING

Fully hydraulic power steering  
 With reverse steering correction mechanism

### BRAKE SYSTEM

#### Service Brake

Hydro-pneumatic brake  
 Disk brake

#### Parking Brake

Mechanically operated, internal expanding duo-servo shoe type acting on drum at transmission case rear.

#### Auxiliary Brake

Electro-pneumatic operated exhaust brake.  
 Auxiliary braking device for operations

### FRAME

Welded box-shaped structure

### ELECTRIC SYSTEM

24 V DC. 2 batteries of 12V (120Ah)

### FUEL TANK CAPACITY

300 liters

### TIRES

Front 16.00-25-28PR(OR)  
 Rear 16.00-25-28PR(OR)

### CAB

Two-man type  
 With sun visor and trim  
 Rubber mounted type  
 Fully adjustable seat (with headrest, seat belt)  
 Adjustable handle (tilt, telescoping)  
 Roof windshield lock warning

### SAFETY DEVICES

Emergency steering device  
 Spring lock device  
 Rear wheel steering lock device  
 Engine over-run alarm  
 Overshift prevention device  
 Parking brake alarm

## GENERAL DATA

### DIMENSIONS

Overall length	10,985mm
Overall width	2,750mm
Overall height	3,580mm
Wheel base	3,800mm
Tread Front	2,270mm
Rear	2,270mm

### WEIGHTS

Gross vehicle weight	
Total	29,450kg
Front	14,725kg
Rear	14,725Kg

### PERFORMANCE

Max. traveling speed	45km/h
Gradeability (tan θ)	0.6
Min. turning radius	5.2m (4-wheel steering) 8.6m (2-wheel steering)

**TOTAL RATED LOADS**


(1) With outriggers set (360°)  
(i)

A B (m)		Outriggers fully extended										Unit:ton			
		9.0m	15.25m	21.5m	27.75m	34.0m	C E (°)		7.5m		12.8m				
							5°	25°	45°	5°	25°	45°	5°	25°	45°
3.0	35.0	22.5					83	3.0	1.8	1.3	2.0	1.05	2.0	1.05	0.7
3.5	30.0	22.5	15.5				78	3.0	1.8	1.3	2.0	1.05	2.0	1.05	0.7
4.0	26.2	21.5	15.5	10.0			75	2.55	1.8	1.3	1.65	1.05	1.4	0.95	0.7
4.5	23.3	20.0	15.5	10.0			72	2.2	1.65	1.3	1.4	0.95	1.25	0.9	0.7
5.0	21.0	18.6	14.4	10.0	6.5		70	2.0	1.55	1.3	1.25	0.9	1.0	0.75	0.65
5.5	19.0	17.5	13.5	10.0	6.5	6.5	65	1.65	1.3	1.15	1.0	0.85	0.85	0.65	0.6
6.0	17.5	16.4	12.7	10.0	6.5	6.5	60	1.35	1.1	1.0	0.9	0.7	0.7	0.55	0.55
6.5	16.0	15.5	12.0	9.4	6.5	6.5	55	1.15	0.9	0.9	0.75	0.6	0.6	0.5	0.5
7.0		14.6	11.3	8.9	6.5	6.4	50	0.9	0.8	0.75	0.6	0.5	0.4		
8.0		12.3	10.1	8.0	6.4	5.8	45	0.55	0.5	0.45	0.4				
9.0		10.0	9.0	7.3	5.8										
10.0		8.2	8.0	6.7	5.3										
11.0		6.75	6.7	6.2	4.8										
12.0		5.7	5.7	5.7	4.4										
13.0		4.85	4.85	5.2	4.1										
14.0			4.15	4.6	3.8										
15.0			3.55	4.05	3.5										
16.0			3.05	3.6	3.3										
17.0			2.6	3.2	3.1										
18.0			2.2	2.8	2.9										
19.0			1.9	2.45	2.65										
20.0				2.15	2.4										
22.0				1.65	2.0										
24.0				1.25	1.6										
26.0					1.25										
28.0					0.95										
30.0					0.7										
31.5					0.5										

A = Boom length  
B = Working radius  
C = Jib length  
D = Jib offset  
E = Boom angle

Unit:ton

(ii)

A B (m)		Outriggers middle extended												
		9.0m	15.25m	21.5m	27.75m	34.0m	7.5m			12.8m				
														
		E (°)												
3.0	35.0	22.5							3.0	1.8	1.3	2.0	1.05	0.7
3.5	30.0	22.5	15.5						3.0	1.8	1.3	2.0	1.05	0.7
4.0	26.2	21.5	15.5	10.0					2.55	1.8	1.3	1.65	1.05	0.7
4.5	23.3	20.0	15.5	10.0					2.2	1.65	1.3	1.4	0.95	0.7
5.0	21.0	18.6	14.4	10.0					2.0	1.55	1.3	1.25	0.9	0.7
5.5	18.0	17.5	13.5	10.0					1.65	1.3	1.15	1.0	0.75	0.65
6.0	15.2	14.7	12.7	10.0					1.05	0.95	0.9	0.85	0.65	0.6
6.5	12.9	12.7	12.0	9.4					0.55	0.5	0.45	0.45		
7.0		11.0	11.0	8.9										
8.0		8.5	8.5	8.0										
9.0		6.8	6.8	7.3										
10.0		5.5	5.5	6.3										
11.0		4.55	4.55	5.3										
12.0		3.85	3.85	4.5										
13.0		3.15	3.15	3.8										
14.0			2.6	3.2										
15.0			2.1	2.7										
16.0			1.7	2.3										
17.0			1.35	1.95										
18.0			1.1	1.65										
19.0			0.8	1.4										
20.0				1.15										
22.0				0.7										
24.0														

A = Boom length  
 B = Working radius  
 C = Jib length  
 D = Jib offset  
 E = Boom angle

(iii)

Unit:ton

A B (m)		Outriggers minimum extended																	
		9.0m	15.25m	21.5m	27.75m	34.0m	7.5m			12.8m									
		C		D		E (°)		5°		25°		45°		5°		25°		45°	
3.0	35.0	22.5						83	3.0	1.8	1.3	1.3	1.3	2.0	1.05	0.7			
3.5	24.5	22.5	15.5					78	3.0	1.8	1.3	1.3	1.3	-2.0	1.05	0.7			
4.0	18.7	18.6	15.5	10.0				75	2.55	1.8	1.3	1.3	1.3	1.65	1.05	0.7			
4.5	15.0	14.9	14.8	10.0				72	2.1	1.65	1.3	1.3	1.3	1.4	0.95	0.7			
5.0	12.4	12.3	12.3	10.0	6.5			70	1.6	1.3	1.2	1.2	1.25	0.9	0.7				
5.5	10.4	10.3	10.3	10.0	6.5														
6.0	8.9	8.9	8.9	9.0	6.5														
6.5	7.7	7.7	7.7	8.0	6.5														
7.0		6.6	6.6	7.2	6.5														
8.0		5.1	5.1	5.7	6.0														
9.0		4.0	4.0	4.6	5.0														
10.0		3.2	3.2	3.7	4.1														
11.0		2.5	2.5	3.05	3.4														
12.0		1.95	1.95	2.5	2.85														
13.0		1.5	1.45	2.05	2.4														
14.0			1.05	1.65	2.0														
15.0			0.7	1.3	1.65														
16.0				1.0	1.35														
17.0				0.75	1.1														
18.0					0.9														

A = Boom length B = Working radius C = Jib length

D = Jib offset E = Boom angle

**PRECAUTIONS TO BE TAKEN WHEN THE OUTRIGGERS ARE EXTENDED:**

1. The total rated loads shown are for the case when the outriggers are set horizontally on firm ground. The values above the bold lines are based on the crane strength while those below are based on the crane stability.
2. The weights of slings and hooks (330kg for a 35 ton capacity hook, 190kg for a 14 ton capacity hook and 60kg for a 3 ton capacity hook) are included in the total rated loads shown.
3. The total rated load is based on the actual working radius including the deflection of the boom.
4. The chart below shows the standard number of part lines for each boom length. The load per line should not exceed 3.5t for the main winch and 3.0t for the auxiliary winch.

A	9.0m	15.25m	21.5m	27.75m	34.0m	J
H	10	7	5	4	4	1

A = Boom length H = No. of part-line J = Jib / Single top

5. As a rule, free-fall operation should be performed only when lowering the hook alone. If a hoisted load must be lowered by free-fall operation, the load must be kept below 1/5th of the total rated load and sudden braking operations must be avoided.
6. The total rated load for the single top shall be the value obtained by subtracting 250kg from the total rated load of the boom and must not exceed 3.0t.
7. When changing jib offset with the load lifted, consider the working condition, safety, etc and use at 50% or less of the total rated load.

## (2) Without outriggers

Unit:ton

B (m)	Stationary						Creep (travelling at 1.6km/h or less)					
	9.0m BOOM		15.25m BOOM		21.5m BOOM		9.0m BOOM		15.25m BOOM		21.5m BOOM	
	F	G	F	G	F	G	F	G	F	G	F	G
3.0	15.0	9.0	12.0	7.2			11.0	6.7	9.0	5.0		
3.5	15.0	7.6	12.0	7.2	8.0		11.0	5.8	9.0	5.0	6.0	3.3
4.0	13.5	6.3	12.0	6.1	8.0	4.5	10.0	5.0	9.0	4.5	6.0	3.3
4.5	12.1	5.3	11.1	5.25	8.0	4.5	9.0	4.3	8.3	4.0	6.0	3.3
5.0	10.9	4.55	10.15	4.55	8.0	4.5	8.0	3.8	7.65	3.65	6.0	3.3
5.5	9.8	3.9	9.35	3.9	7.5	3.85	7.3	3.3	7.0	3.3	5.75	3.25
6.0	8.9	3.4	8.6	3.4	7.0	3.3	6.6	2.85	6.4	2.85	5.5	2.75
6.5	8.0	2.9	7.8	2.9	6.5	2.8	6.0	2.45	5.9	2.45	5.25	2.35
7.0			7.1	2.45	6.0	2.35			5.5	2.05	5.0	1.95
8.0			5.7	1.7	5.1	1.6			4.8	1.4	4.3	1.35
9.0			4.55	1.1	4.3	1.05			3.85	0.9	3.6	0.85
10.0			3.65		3.5				3.1		2.95	
11.0			2.9		2.9				2.45		2.45	
12.0			2.35		2.3				2.0		1.95	
13.0			1.95		1.85				1.65		1.55	
14.0					1.4						1.15	
15.0					1.05						0.85	
16.0					0.8						0.65	
17.0					0.55							

B = Working radius F = Front G = 360°

**PRECAUTIONS TO BE TAKEN WHEN THE OUTRIGGERS ARE NOT MOUNTED:**

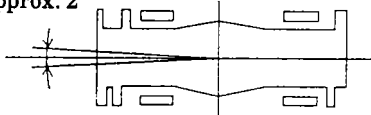
1. The total rated loads shown are for the case when the crane is set horizontally on firm ground. The values above the bold lines are based on the crane strength while those below are based on the crane stability. The foundation, working conditions, etc. should be taken into consideration adequately when using the crane for actual work. (Tire air pressure: 7.75kg/cm<sup>2</sup>).
2. The weights of the slings and hooks are included in the total rated loads shown.
3. The total rated loads are based on the actual working radii into which are included the deflection of the boom and the tires.
4. The chart below shows the standard number of part lines for each boom length . The load per line should not exceed 3.5t (main winch hook).

<b>A</b>	9. 0m	15. 25m	21. 5m	Single top
<b>H</b>	10	7	5	1

A = Boom length H = No. of part-line

5. The total rated load for the single top shall be the value obtained by subtracting 140kg from the total rated load of the boom and must not exceed 3.0t.
6. Free-fall operations should not be performed without outriggers.
7. The 27.75m boom, the 34.0m boom and the jib should not be used without outriggers.
8. "Over front" crane operations should be performed with the boom being inside a 2° area (1° each to the left and right) over front of the carrier.

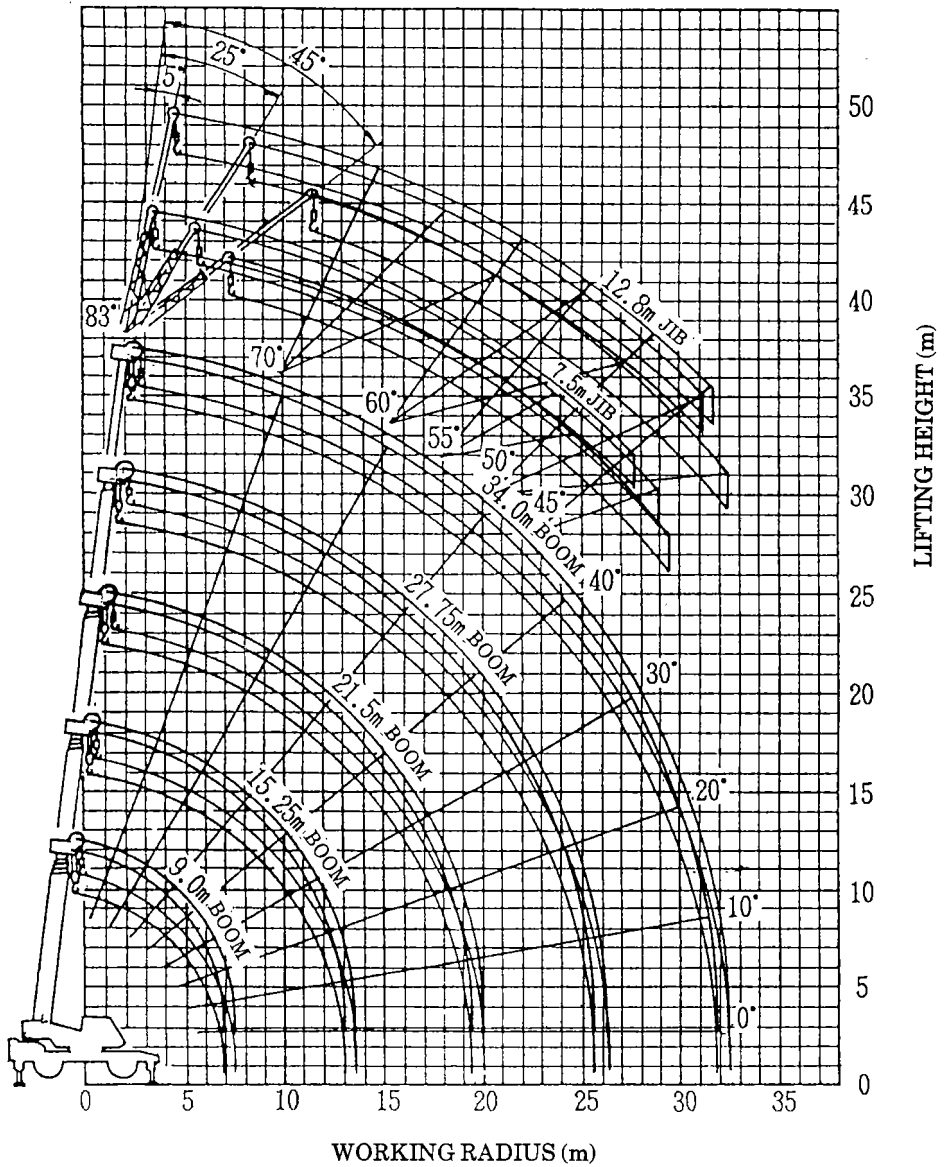
Approx. 2°



9. When creeping while hoisting a load, the swing brake should be applied, the load should be kept as close to the ground as possible but not touching the ground and the speed should be kept at 1.6km/h or less. In particular, any abrupt steering, starting or braking must be avoided.
10. Crane operations should not be performed when creeping while hoisting a load.



**WORKING RADIUS - LIFTING HEIGHT**



**NOTES:**

1. The deflection of the boom is not incorporated in the figure above.
2. The figure above is for the case when the outriggers are fully extended (360°).

**DIMENSIONS** (1/100)

