

Part No.514002110002

Rev: B

Mar 2022



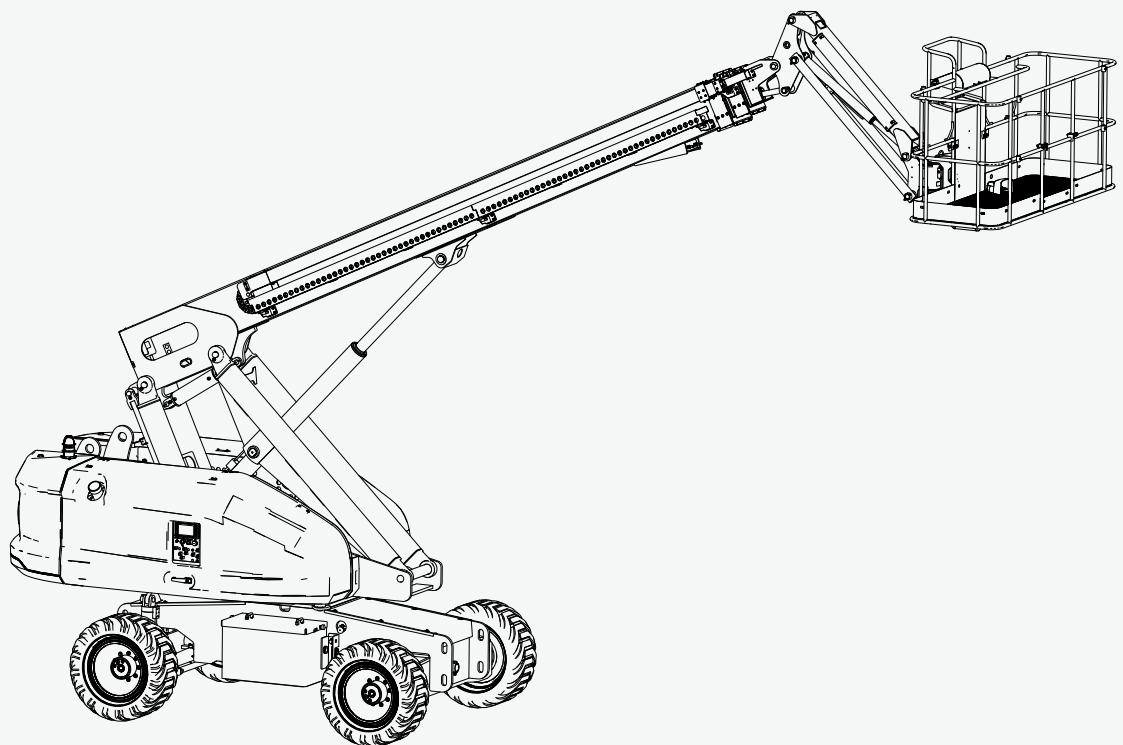
Maintenance Manual

TB18E Plus/TB590E Plus

TB20EJ Plus/TB660EJ Plus

TB20E Plus/TB680E Plus

TB22EJ Plus/TB740EJ Plus



CE **ANSI** **AS/NZS** **SP** **EAC** **UK** **GB**

SINOBOOM

Manual revision history:

REV	DATE	DESCRIPTION	REMARK
A	Oct, 2021	Original issue	
B	Mar, 2022	Revised version, changed to open-circuit variable displacement pump	

Please contact us:

Website : www.sinoboom.com

E-mail : sales@sinoboom.com

Sales Tel : 0086-0731-87116222

Service Tel : 0086-0731-87116333

Address : No.128, East Jinzhou Avenue, Ningxiang High-tech Industrial Park, Changsha, Hunan, China

Zip Code : 410600

Copyright © Hunan Sinoboom Intelligent Equipment Co., Ltd. All Rights Reserved

The final interpretation right of this manual belongs to Hunan Sinoboom Intelligent Equipment Co., Ltd.

APPLICABLE RANGE

Use the following table to identify the specific serial number for models included in this manual. Check the model of your machine before consulting the manual, and then use the correct manual according to the serial number of the model. See the nameplate on your machine to identify the model and serial number. (See *Decals/Nameplate Inspection* of the *Operation Manual* for details.)

Model	Trade Identification		Serial No.
	Metric	Imperial	
TB18E Plus	TB18E Plus	TB590E Plus	From 1400100100 to present
TB20EJ Plus	TB20EJ Plus	TB660EJ Plus	From 1400200119 to present
TB20E Plus	TB20E Plus	TB680E Plus	From 1401000100 to present
TB22EJ Plus	TB22EJ Plus	TB740EJ Plus	From 1400600139 to present

NOTE:

- Product model is applied in product nameplate for distinction of products of different main parameters.
- Product trade identification is applied in marketing and machine decals for distinction of products of different main parameters, and can be classified as metric type and imperial type: The metric trade identification is applicable to machines for countries/regions using metric system or as specially required by customers; The imperial trade identification is applicable to the machines for countries/regions using imperial system or as specially required by customers.

INTRODUCTION

Thank you for choosing and using the machinery of Hunan Sinoboom Intelligent Equipment Co., Ltd. Always read, understand and become familiar with the operation requirements of the machine and its associated safety procedures before operating, maintaining and repairing the machine. Operating the machine without becoming familiar with its specific operation requirements and safety procedures poses serious risks. Operators who follow safety rules and operate the machine carefully and effectively will prevent personal injury, property loss and accidents.

Use this machine only to transport tools to work locations and for performing tasks on the work platform. Operators must be competent and must obtain training to carefully use the machine and follow safety procedures. Only trained and authorized personnel may operate the machine.

This manual guides the operator and authorized personnel in maintaining the machine. The operator is responsible for reading, understanding and implementing the maintenance and safety procedures in this manual and for following the manufacturer's instructions before beginning any work. Read, understand and follow all safety rules and operating instructions. The operator must also consider the machine's uses and limitations and the conditions at the jobsite before using this machine. Strictly following all safety requirements in this manual is critical.

Consider this manual a part of the machine, along with *Operation Manual* and *Parts Manual*, and always keep the manuals with the machine. The owner or administrator of the machine shall offer all manuals and other necessary information provided by the machine manufacturer regarding the daily inspection and maintenance to each of the renters. If the machine is sold, the owner or administrator must pass along the manuals and other necessary information to the purchaser. The owner or administrator of the machine shall also provide the manufacturer's maintenance information to the person responsible for maintaining the machine.

If you have any questions, contact Hunan Sinoboom Intelligent Equipment Co., Ltd..

2 SPECIFICATIONS

MACHINE SPECIFICATIONS

Table 2-1 TB18E Plus specifications

MEASURE	TB18E Plus (METRIC)	TB590E Plus (IMPERIAL)
DIMENSION		
Max platform height	18.1 m	59ft 5in
Max working height	20.1 m	65ft 11in
Max horizontal reach (restricted/ unrestricted)	14.1 m/15.45 m	46 ft 3 in / 50 ft 8 in
Overall length (stowed)	8.93 m	29ft 4in
Overall width (stowed)	2.49 m	8ft 2in
Overall height (stowed)	2.77 m	9ft 1in
Wheelbase	2.49 m	8ft 2in
Ground clearance	0.39 m	1ft 3in
Tire size (spec / type)	Options 36×14-20 (non-marking) 36×14-20 (solid) 355/65D625 (foam-filled)	
Platform dimension (L×W×H)	Options 1.45×0.85×1.1 m 1.83×0.85×1.1 m 2.44×0.91×1.1 m	Options 4ft 9in×2ft 9in×3ft 7in 6ft×2ft 9in×3ft 7in 8ft×2ft 11in×3ft 7in
PERFORMANCE		
Rated platform capacity (restricted/ unrestricted)	454 kg/300 kg	1000 lb / 661 lb
Max number of occupants (restricted/unrestricted)	3/2	
Turntable rotation/continuity	360 °/continuous	
Platform rotation	160°	
Max drive speed (stowed)	4.8km/h	3 mph
Max drive speed (raised)	1.1 km/h	0.68 mph
Drive mode (drive×steer)	4WD×2WS	
Gradeability	35%/19°	
Turntable tailswing	1.45 m	4ft 9in
Max allowable inclination	5°	
Turning radius (inside)	2.4 m	7ft 10.5in

MEASURE	TB18E Plus (METRIC)	TB590E Plus (IMPERIAL)
Turning radius (outside)	5.55 m	18ft 2.5in
Max allowable side force (restricted/unrestricted)	600 N/400 N	134 lbf/90 lbf
Max operating noise level	80 dB	
IP rating	IP65	
POWER		
Hybrid motor (voltage/power)	29 V DC, 15 kW	
Duplex gear pump displacement	16 ml/r + 4 ml/r	
Hydraulic tank capacity	170 L	37.4gal (UK)/44.9gal (US)
Hydraulic system pressure	21Mpa	3045psi
Battery (number×voltage, capacity)	2×24V, 480Ah (lead-acid battery) 2×24V, 528Ah (lithium battery)	
Power system voltage	48 VDC	
Control system voltage	12 VDC	
Charger (input voltage/output current)	100 ~ 240 V AC, 60 A	
GROUND BEARING DATA		
Max tire load	6740 kg	14859 lb
Pressure against ground	675 KPa	97.9 Psi
ENVIRONMENT		
Max allowable wind speed	12.5 m/s	28 mph
Max allowable altitude	1000 m	3280 ft
Allowable ambient temperature (lead-acid battery)	-10°C ~ 40°C	14°F ~ 104°F
Allowable ambient temperature (-lithium battery)	-20°C ~ 40°C	-4°F ~ 104°F
Max allowable RH	90%	
Storage environment	Stored at -20°C to 50°C (-4°F to 122°F) in a well-ventilated environment with 90% relative humidity (20°C [68°F]), and away from rain, sun, corrosive gas, inflammables and explosives.	
WEIGHT		
Gross weight (unladen)	11328 kg	24974 lb

Table 2-2 TB20EJ Plus specifications

MEASURE	TB20EJ Plus (METRIC)	TB660EJ Plus (IMPERIAL)
DIMENSION		
Max platform height	20 m	65ft 7in

MEASURE	TB20EJ Plus (METRIC)	TB660EJ Plus (IMPERIAL)
Max working height	22 m	72ft 2in
Max horizontal reach (restricted/unrestricted)	13.85 m / 15.4 m	45 ft 5 in/50 ft 6 in
Overall length (stowed)	9.99 m	32ft 9in
Overall width (stowed)	2.49 m	8ft 2in
Overall height (stowed)	2.79 m	9ft 2in
Wheelbase	2.49 m	8ft 2in
Ground clearance	0.39 m	1ft 3in
Tire size (spec / type)	Options 36×14-20 (non-marking) 36×14-20 (solid) 355/65D625 (foam-filled)	
Platform dimension (L×W×H)	Options 1.45×0.85×1.1 m 1.83×0.85×1.1 m 2.44×0.91×1.1 m	Options 4ft 9in×2ft 9in×3ft 7in 6ft×2ft 9in×3ft 7in 8ft×2ft 11in×3ft 7in
PERFORMANCE		
Rated platform capacity (restricted/unrestricted)	454 kg/300 kg	1000 lb / 661 lb
Max number of occupants (restricted/unrestricted)	3/2	
Turntable rotation/continuity	360 °/continuous	
Platform rotation	160°	
Max drive speed (stowed)	4.8km/h	3 mph
Max drive speed (raised)	1.1 km/h	0.68 mph
Drive mode (drive×steer)	4WD×2WS	
Gradeability	35%/19°	
Turntable tailswing	1.45 m	4ft 9in
Max allowable inclination	5°	
Turning radius (inside)	2.4 m	7ft 10.5in
Turning radius (outside)	5.55 m	18ft 2.5in
Max allowable side force (restricted/unrestricted)	600 N/400 N	134 lbf/90 lbf
Max operating noise level	80 dB	
IP rating	IP65	
POWER		
Hybrid motor (voltage/power)	29 V DC, 15 kW	
Open-circuit variable pump displacement	35cc/r	

MEASURE	TB20EJ Plus (METRIC)	TB660EJ Plus (IMPERIAL)
Hydraulic tank capacity	170 L	37.4gal (UK)/44.9gal (US)
Hydraulic system pressure	21Mpa	3045psi
Battery (number×voltage, capacity)	2×24V, 480Ah (lead-acid battery) 2×24V, 528Ah (lithium battery)	
Power system voltage	48 VDC	
Control system voltage	12 VDC	
Charger (input voltage/output current)	100 ~ 240 V AC, 60 A	
GROUND BEARING DATA		
Max tire load	6740 kg	14859 lb
Pressure against ground	675 KPa	97.9 Psi
ENVIRONMENT		
Max allowable wind speed	12.5 m/s	28 mph
Max allowable altitude	1000 m	3280 ft
Allowable ambient temperature (lead-acid battery)	-10°C ~ 40°C	14°F ~ 104°F
Allowable ambient temperature (-lithium battery)	-20°C ~ 40°C	-4°F ~ 104°F
Max allowable RH	90%	
Storage environment	Stored at -20°C to 50°C (-4°F to 122°F) in a well-ventilated environment with 90% relative humidity (20°C [68°F]), and away from rain, sun, corrosive gas, inflammables and explosives.	
WEIGHT		
Gross weight (unladen)	11502 kg	25358 lb

Table 2-3 TB20E Plus specifications

MEASURE	TB20E Plus (METRIC)	TB680E Plus (IMPERIAL)
DIMENSION		
Max platform height	20.6 m	67ft 7in
Max working height	22.6 m	74ft 2in
Max horizontal reach (restricted/unrestricted)	13.0 m/14.7 m	42ft 8in / 48ft 2in
Overall length (stowed)	9.63 m	31ft 7in
Overall width (stowed)	2.49 m	8ft 2in
Overall height (stowed)	2.81 m	9ft 3in
Wheelbase	2.49 m	8ft 2in
Ground clearance	0.39 m	1ft 3in

MEASURE	TB20E Plus (METRIC)	TB680E Plus (IMPERIAL)
Tire size (spec / type)	Options 36×14-20 (non-marking) 36×14-20 (solid) 355/65D625 (foam-filled)	
Platform dimension (L×W×H)	Options 1.45×0.85×1.1 m 1.83×0.85×1.1 m 2.44×0.91×1.1 m	Options 4ft 9in×2ft 9in×3ft 7in 6ft×2ft 9in×3ft 7in 8ft×2ft 11in×3ft 7in
PERFORMANCE		
Rated platform capacity (restricted/unrestricted)	454 kg/300 kg	1000 lb / 661 lb
Max number of occupants (restricted/unrestricted)	3/2	
Turntable rotation/continuity	360 °/continuous	
Platform rotation	160°	
Max drive speed (stowed)	4.8km/h	3 mph
Max drive speed (raised)	1.1 km/h	0.68 mph
Drive mode (drive×steer)	4WD×2WS	
Gradeability	35%/19°	
Turntable tailswing	1.45 m	4ft 9in
Max allowable inclination	5°	
Turning radius (inside)	2.4 m	7ft 10.5in
Turning radius (outside)	5.55 m	18ft 2.5in
Max allowable side force(restricted/unrestricted)	600 N/400 N	134 lbf/90 lbf
Max operating noise level	80 dB	
IP rating	IP65	
POWER		
Hybrid motor (voltage/power)	29 V DC, 15 kW	
Open-circuit variable pump displacement	35cc/r	
Hydraulic tank capacity	170 L	37.4gal (UK)/44.9gal (US)
Hydraulic system pressure	21MPa	3046 Psi
Battery (number×voltage, capacity)	2×24V, 480Ah (lead-acid battery) 2×24V, 528Ah (lithium battery)	
Power system voltage	48 VDC	
Control system voltage	12 VDC	
Charger (input voltage/output current)	100 ~ 240 V AC, 60 A	

MEASURE	TB20E Plus (METRIC)	TB680E Plus (IMPERIAL)
GROUND BEARING DATA		
Max tire load	6820 kg	15036 lb
Pressure against ground	700 KPa	102 Psi
ENVIRONMENT		
Max allowable wind speed	12.5 m/s	28 mph
Max allowable altitude	1000 m	3280 ft
Allowable ambient temperature (lead-acid battery)	-10°C ~ 40°C	14°F ~ 104°F
Allowable ambient temperature (-lithium battery)	-20°C ~ 40°C	-4°F ~ 104°F
Max allowable RH	90%	
Storage environment	Stored at -20°C to 50°C (-4°F to 122°F) in a well-ventilated environment with 90% relative humidity (20°C [68°F]), and away from rain, sun, corrosive gas, inflammables and explosives.	
WEIGHT		
Gross weight (unladen)	12025 kg	26510 lb

Table 2-4 TB22EJ Plus specifications

MEASURE	TB22EJ Plus (METRIC)	TB740EJ Plus (IMPERIAL)
DIMENSION		
Max platform height	22.5 m	74ft
Max working height	24.5 m	80ft 5in
Max horizontal reach (restricted/unrestricted)	12.7 m/14.3 m	41ft 8in/46ft 11in
Overall length (stowed)	10.68 m	35 ft
Overall width (stowed)	2.49 m	8ft 2in
Overall height (stowed)	2.81 m	9ft 3in
Wheelbase	2.49 m	8ft 2in
Ground clearance	0.39 m	1ft 3in
Tire size (spec / type)	Options 36×14-20 (non-marking) 36×14-20 (solid) 355/65D625 (foam-filled)	
Platform dimension (L×W×H)	Options 1.45×0.85×1.1 m 1.83×0.85×1.1 m 2.44×0.91×1.1 m	Options 4ft 9in×2ft 9in×3ft 7in 6ft×2ft 9in×3ft 7in 8ft×2ft 11in×3ft 7in
PERFORMANCE		
Rated platform capacity (restricted/unrestricted)	454 kg/300 kg	1000 lb / 661 lb

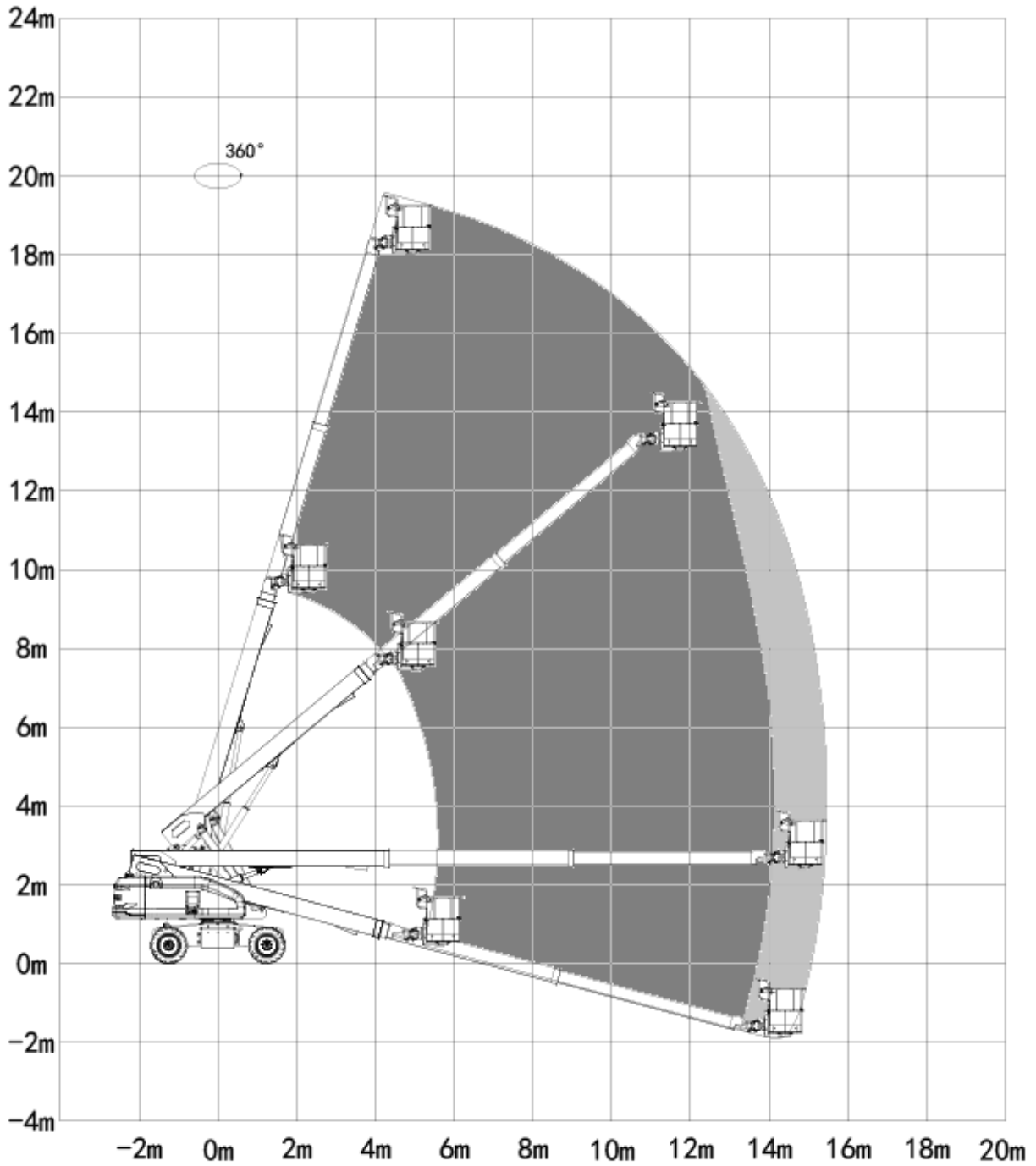
MEASURE	TB22EJ Plus (METRIC)	TB740EJ Plus (IMPERIAL)
Max number of occupants (restricted/unrestricted)	3/2	
Turntable rotation/continuity	360 °/continuous	
Platform rotation	160°	
Max drive speed (stowed)	4.8km/h	3 mph
Max drive speed (raised)	1.1 km/h	0.68 mph
Drive mode (drive×steer)	4WD×2WS	
Gradeability	35%/19°	
Turntable tailswing	1.45 m	4ft 9in
Max allowable inclination	5°	
Turning radius (inside)	2.4 m	7ft 10.5in
Turning radius (outside)	5.55 m	18ft 2.5in
Max allowable side force (restricted/unrestricted)	600 N/400 N	134 lbf/90 lbf
Max operating noise level	80 dB	
IP rating	IP65	
POWER		
Hybrid motor (voltage/power)	29 V DC, 15 kW	
Open-circuit variable pump displacement	35cc/r	
Hydraulic tank capacity	170 L	37.4gal (UK)/44.9gal (US)
Hydraulic system pressure	21MPa	3046Psi
Battery (number×voltage, capacity)	2×24V, 480Ah (lead-acid battery) 2×24V, 528Ah (lithium battery)	
Power system voltage	48 VDC	
Control system voltage	12 VDC	
Charger (input voltage/output current)	100 ~ 240 V AC, 60 A	
GROUND BEARING DATA		
Max tire load	6820 kg	15036 lb
Pressure against ground	700 KPa	102 Psi
ENVIRONMENT		
Max allowable wind speed	12.5 m/s	28 mph
Max allowable altitude	1000 m	3280 ft
Allowable ambient temperature (lead-acid battery)	-10°C ~ 40°C	14°F ~ 104°F

MEASURE	TB22EJ Plus (METRIC)	TB740EJ Plus (IMPERIAL)
Allowable ambient temperature (-lithium battery)	-20°C ~ 40°C	-4°F ~ 104°F
Max allowable RH	90%	
Storage environment	Stored at -20°C to 50°C (-4°F to 122°F) in a well-ventilated environment with 90% relative humidity (20°C [68°F]), and away from rain, sun, corrosive gas, inflammables and explosives.	
WEIGHT		
Gross weight (unladen)	12260 kg	27029 lb

Note:

- a) The platform height plus the operator height (taken as 2m [6ft 7in]) is the working height.
- b) The ground bearing data is approximate, not factoring different options, thus only applicable in adequately safe conditions.
- c) In different areas, hydraulic oil, engine oil, coolant, fuel and lubricant should be added in accordance with the environmental temperature.
- d) In cold weather, auxiliary devices are needed to start the machines.
- e) Rated platform capacity refers to the rated load of the platform, including the loads of persons, materials, tools, platform accessories and other objects on the platform.

TB18E Plus chart of working envelope



TB18E&H Plus (5°)

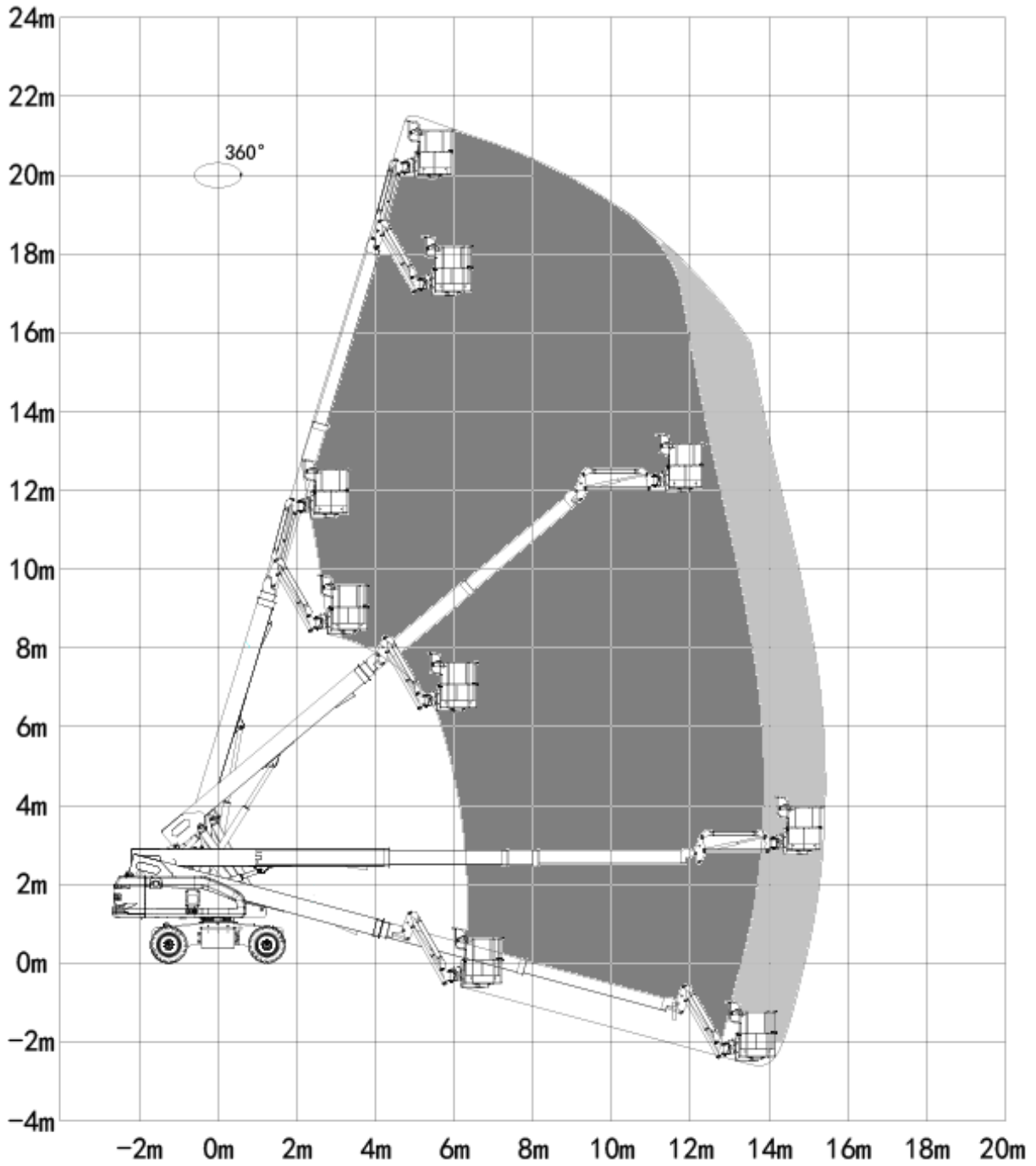


454 kg (1000 lb)



300 kg (661 lb)

TB20EJ Plus chart of working envelope



TB20EJ&HJ Plus (5°)

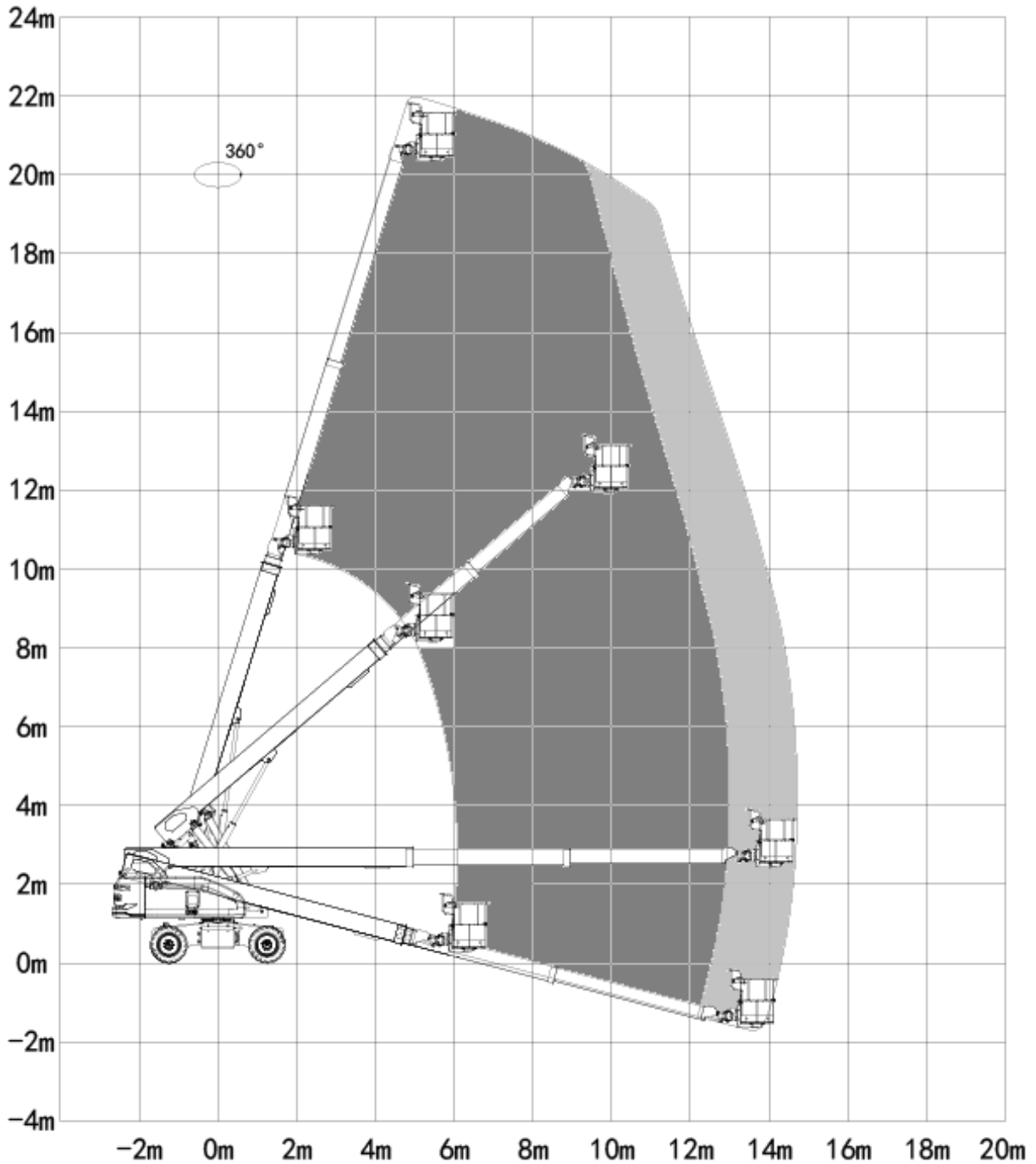


454 kg (1000 lb)



300 kg (661 lb)

TB20E Plus chart of working envelope



TB20E&H Plus (5°)

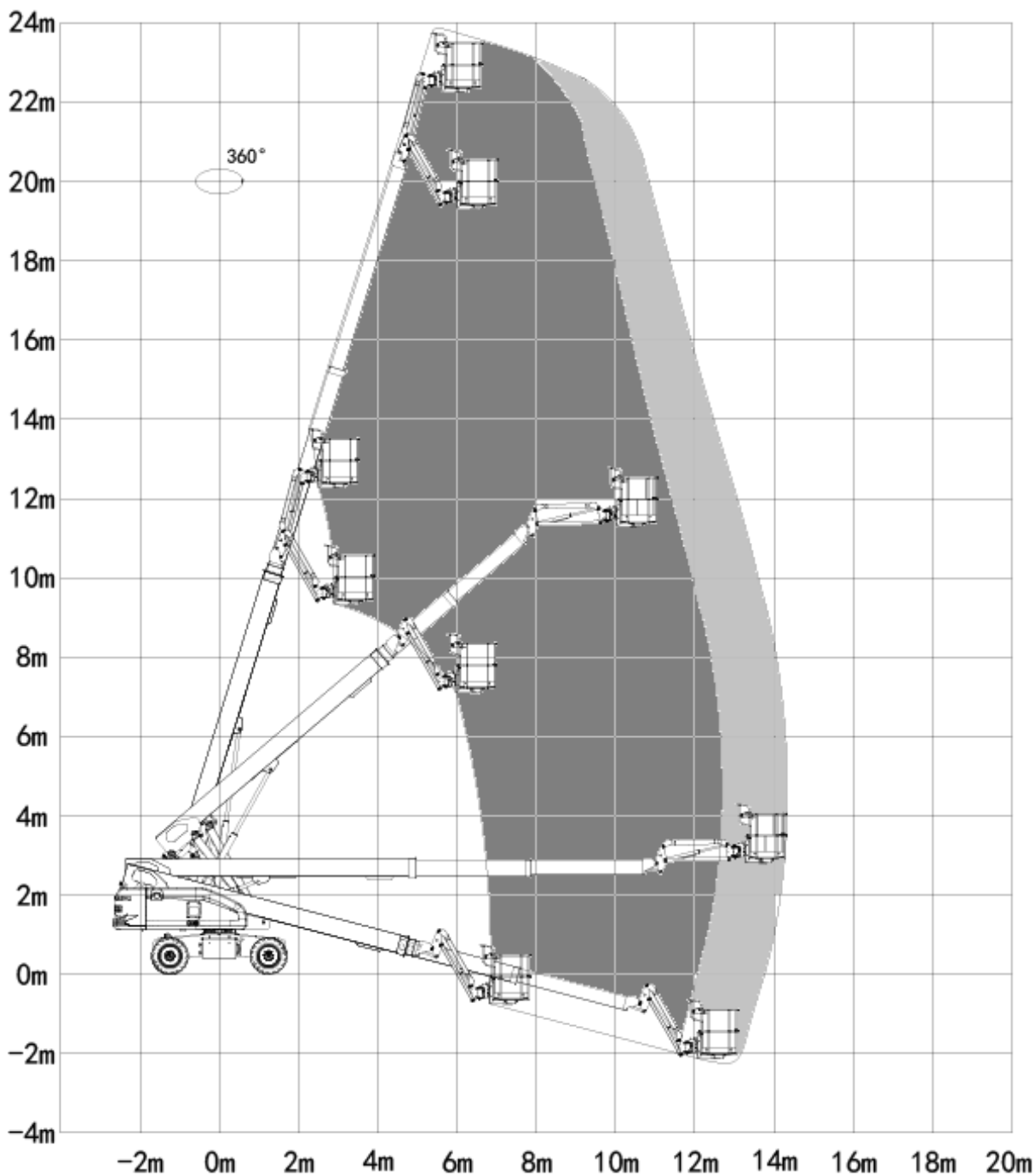


454 kg (1000 lb)



300 kg (661 lb)

TB22EJ Plus chart of working envelope



TB22EJ&HJ Plus (5°)



454 kg (1000 lb)



300 kg (661 lb)

MOTOR SPECIFICATIONS

Table 2-5 Hybrid motor

Power	15kW
Voltage	29V
Torque	34.9Nm (25.768 ft-lb)
RPM	2600rpm
Frequency	88.6Hz
Current	402A

FUNCTION SPEED

Table 2-6

ITEM	TB18E Plus&20EJ Plus	TB20E Plus&22EJ Plus
Boom up	65 ~ 75s	67 ~ 75s
Boom down	65 ~ 75s	67 ~ 77s
Turntable rotate* (360°)	78 ~ 86s	78 ~ 86s
Turntable rotate** (360°)	139 ~ 179s	139 ~ 179s
Boom extend	58 ~ 66s	85 ~ 90s
Boom retract	53 ~ 62s	85 ~ 90s
Platform rotate (160°)	18 ~ 22s	18 ~ 22s
Platform level up	50 ~ 60s	50 ~ 60s
Platform level down	40 ~ 50s	40 ~ 50s
Jib up (TB20EJ Plus&22EJ Plus)	32 ~ 38s	32 ~ 38s
Jib down (TB20EJ Plus&22EJ Plus)	22 ~ 28s	22 ~ 28s
Max drive speed (30m) -non-working	20 ~ 25s	20 ~ 25s
Max drive speed (30m) -working	95 ~ 100s	88 ~ 108s

ITEM	TB18E Plus&20EJ Plus	TB20E Plus&22EJ Plus
Brake distance at full drive speed	S≤1.2m	S≤1.2m

- a) The function speed depends on the start and end point of the movement rather than the controls/ switches.
- b) The test results of drive speed vary with tires of different specifications.
- c) All the speed tests should be conducted from the platform controller, The test results will differ if tested from the ground controller.
- d) All the tests should be conducted with the hydraulic oil temperature between 50–60°C. If the hydraulic oil temperature is too low, the test results will be affected.

Test requirements:

Boom up/down : With the boom fully retracted, raise the boom from the horizontal to the highest and lower from the highest to the horizontal. Test twice.

Turntable rotate* : With the main boom horizontal, fully retracted and centered, rotate the turntable a full cycle. Test twice.

Turntable rotate** : With the main boom horizontal, fully extended and centered, rotate the turntable a full cycle. Test twice.

Boom extend/retract : With the boom fully raised, extend from fully retracted to fully extended position, and retract from fully extended to fully retracted position. Test twice for each.

Platform rotate : With the platform horizontal, rotate the platform from the leftmost to the rightmost, and rotate from the rightmost to the leftmost. Test twice for each.

Jib up/down : With the platform horizontal, raise the jib boom from the lowest to the highest, and lower the jib boom from the highest to the lowest. Test twice for each.

Drive-non-working : With the machine positioned on level surface and in non-working position, switch to engine high idle and drive high speed, fully stroke the drive control handle to drive forward and reverse for 30m respectively. Test twice.

Drive-working : With the machine positioned on level surface and in working position, switch to engine high idle, fully stroke the drive control handle to drive forward and reverse for 30m respectively. Test twice.

Brake distance at full high speed : As in the forementioned testing requirements for the driving in non-working position, when the machine reaches the max speed, immediately release the handle (timing starts) until the machine comes to a full stop. Test twice.

MAJOR COMPONENT WEIGHT

WARNING

UNSAFE OPERATION HAZARD

- Do not move heavy components without mechanical assistance.

WARNING

UNSAFE OPERATION HAZARD

- Do not place heavy components upon any instable surface.

Table 2-7

Component	Metric (kg)	Imperial (lb)
Chassis assembly	3844	8476
Turntable assembly	4762	10500
Boom assembly (TB18E Plus)	2319	5113
Boom assembly (TB20EJ Plus)	2491	5493
Boom assembly (TB20E Plus)	2330	5138
Boom assembly (TB22EJ Plus)	2842	6267
Base boom	496	1093
1st telescopic boom	318	701
2nd telescopic boom	217	478
Jib boom assembly (TB20EJ Plus&22EJ Plus)	161	355
Cable track system	95	209
Telescoping mechanism	284	626
Platform	187	412
Power unit	20	44
Counterweight	2455	5412
Slewing mechanism	246	542
Main boom telescope cylinder	208	459
Main boom level cylinder, upper	39	86
Main boom level cylinder, lower	34	75
Main boom lift cylinder	220	485
Jib boom cylinder (TB20EJ Plus&22EJ Plus)	31	68
Hybrid motor	65	143
Wheel assembly	176	388

Component	Metric (kg)	Imperial (lb)
Drive reducer	38	84
Drive motor	39	86
Electric power assembly	176	388

Note: The weight of components may vary with different options selected.

HYDRAULIC SYSTEM SPECIFICATIONS

Table 2-8

ITEM	SPECIFICATION	
Hydraulic Oil		
Normal temperature region (0°C~40°C [32°F~104°F])	L-HM46	
Cold region (-25°C~25°C [-13°F~77°F])	L-HV32	
High temperature region (> 40°C [104°F])	L-HM68	
Extremely cold region (< -30°C [-22°F])	Special program to be determined	
Hydraulic Pump		
Type	Duplex gear pump (TB18E Plus)	Open-circuit variable pump (TB20EJ&20E&22EJ Plus)
Displacement	16 ml/r + 4 ml/r	35cc/r
Rated operating pressure	25 MPa (3625 Psi)	32 MPa (4640 Psi)
Function Manifold		
Boom function manifold pressure	21MPa (3045 Psi)	
Return Filter		
Return filter bypass pressure	0.4MPa (58 Psi)	
High-pressure Filter		
High-pressure filter bypass pressure	0.7MPa (102 Psi)	

HYDRAULIC HOSE AND FITTING SPECIFICATIONS

HYDRAULIC HOSE TORQUE

Hydraulic hoses must be torqued to the following specifications.

Table 2-9 Hydraulic Hose Torque

METRIC THREAD	L (LIGHT-DUTY)	S (HEAVY-DUTY)
M12 × 1.5	19 ± 1 Nm (14 ± 1 ft-lb)	
M14 × 1.5	26 ± 2 Nm (19 ± 2 ft-lb)	
M16 × 1.5	40 ± 3 Nm (30 ± 2 ft-lb)	
M18 × 1.5	50 ± 4 Nm (37 ± 3 ft-lb)	
M20 × 1.5	-	60 ± 4 Nm (44 ± 3 ft-lb)
M22 × 1.5	70 ± 5 Nm (52 ± 4 ft-lb)	-
M24 × 1.5	-	85 ± 6 Nm (63 ± 4 ft-lb)
M26 × 1.5	90 ± 6 Nm (66 ± 4 ft-lb)	-
M30 × 2	120 ± 8 Nm (89 ± 6 ft-lb)	140 ± 10 Nm (103 ± 7 ft-lb)
M36 × 2	150 ± 12 Nm (111 ± 9 ft-lb)	180 ± 12 Nm (133 ± 9 ft-lb)
M42 × 2	-	260 ± 16 Nm (192 ± 12 ft-lb)
M45 × 2	240 ± 15 Nm (177 ± 11 ft-lb)	-
M52 × 2	250 ± 16 Nm (184 ± 12 ft-lb)	280 ± 18 Nm(207 ± 13 ft-lb)

HYDRAULIC FITTING TORQUE

Hydraulic fittings with metric thread must be torqued to the following specifications.

Table 2-10 Hydraulic Fitting Torque – Metric

THREAD SIZE	INSTALLED INTO ALUMINUM	INSTALLED INTO STEEL	
	ED, O-RING + CIRCLIP	ED, O-RING + CIRCLIP	O-RING
L (LIGHT-DUTY)			
M10×1	18 ± 1 Nm(13 ± 1 ft-lb)	20 ± 2 Nm (15 ± 2 ft-lb)	18 ± 1 Nm (13 ± 1 ft-lb)
M12×1.5	30 ± 2 Nm (22 ± 2 ft-lb)	35 ± 2 Nm (26 ± 2 ft-lb)	30 ± 2 Nm (22 ± 2 ft-lb)
M14×1.5	42 ± 3 Nm (31 ± 2 ft-lb)	48 ± 4 Nm (35 ± 3 ft-lb)	35 ± 2 Nm (26 ± 2 ft-lb)
M16×1.5	55 ± 4 Nm (41 ± 3 ft-lb)	60 ± 4 Nm (44 ± 3 ft-lb)	40 ± 3 Nm (30 ± 3 ft-lb)
M18×1.5	75 ± 5 Nm (55 ± 4 ft-lb)	75 ± 5 Nm (55 ± 4 ft-lb)	45 ± 3 Nm (33 ± 4 ft-lb)
M22×1.5	90 ± 6 Nm (66 ± 4 ft-lb)	130 ± 8 Nm (96 ± 6 ft-lb)	60 ± 4 Nm(44 ± 3 ft-lb)
M27×2	120 ± 8 Nm (89 ± 6 ft-lb)	185 ± 12 Nm (136 ± 9 ft-lb)	100 ± 7 Nm (74 ± 5 ft-lb)
M30×2	140 ± 8 Nm (103 ± 6 ft-lb)	245 ± 15 Nm (181 ± 11 ft-lb)	135 ± 8 Nm (100 ± 6 ft-lb)
M33×2	180 ± 10 Nm (133 ± 7 ft-lb)	320 ± 20 Nm (236 ± 15 ft-lb)	160 ± 10 Nm(118 ± 7 ft-lb)
M42×2	240 ± 15 Nm (177 ± 11 ft-lb)	450 ± 25 Nm (332 ± 18 ft-lb)	210 ± 13 Nm (155 ± 10 ft-lb)
M48×2	280 ± 20 Nm (207 ± 15 ft-lb)	540 ± 30 Nm (398 ± 22 ft-lb)	260 ± 15 Nm (192 ± 11 ft-lb)

THREAD SIZE	INSTALLED INTO ALUMINUM	INSTALLED INTO STEEL	
	ED, O-RING + CIRCLIP	ED, O-RING + CIRCLIP	O-RING
S (HEAVY-DUTY)			
M12×1.5	33 ± 2 Nm (24 ± 2 ft-lb)	43 ± 3 Nm (32 ± 2 ft-lb)	35 ± 2 Nm (26 ± 2 ft-lb)
M14×1.5	42 ± 3 Nm (31 ± 2 ft-lb)	50 ± 4 Nm (37 ± 3 ft-lb)	45 ± 3 Nm (33 ± 2 ft-lb)
M16×1.5	55 ± 4 Nm (41 ± 3 ft-lb)	75 ± 5 Nm (55 ± 4 ft-lb)	55 ± 4 Nm (41 ± 3 ft-lb)
M18×1.5	75 ± 5 Nm (55 ± 4 ft-lb)	95 ± 6 Nm (70 ± 4 ft-lb)	70 ± 5 Nm (52 ± 4 ft-lb)
M22×1.5	90 ± 6 Nm (66 ± 4 ft-lb)	140 ± 8 Nm (103 ± 6 ft-lb)	100 ± 10 Nm (74 ± 7 ft-lb)
M27×2	120 ± 8 Nm (89 ± 6 ft-lb)	185 ± 12 Nm (136 ± 9 ft-lb)	160 ± 10 Nm (118 ± 7 ft-lb)
M30×2	140 ± 8 Nm (103 ± 6 ft-lb)	245 ± 15 Nm (181 ± 11 ft-lb)	210 ± 13 Nm (155 ± 10 ft-lb)
M33×2	180 ± 10 Nm (133 ± 7 ft-lb)	320 ± 20 Nm (236 ± 15 ft-lb)	260 ± 15 Nm (192 ± 11 ft-lb)
M42×2	240 ± 15 Nm (177 ± 11 ft-lb)	450 ± 25 Nm (332 ± 18 ft-lb)	330 ± 20 Nm (243 ± 15 ft-lb)
M48×2	280 ± 20 Nm (207 ± 15 ft-lb)	540 ± 30 Nm (398 ± 22 ft-lb)	420 ± 25 Nm (310 ± 18 ft-lb)

Hydraulic fittings with inch thread (British Standard Pipe [BSP]) must be torqued to the following specifications.

Table 2-11 Hydraulic Fitting Torque – British Standard Pipe (BSP)

THREAD SIZE	INSTALLED INTO ALUMINUM	INSTALLED INTO STEEL	
	ED, O-RING + CIRCLIP	ED, O-RING + CIRCLIP	O-RING
L (LIGHT-DUTY)			
G1/8A	20 ± 1 Nm (15 ± 1 ft-lb)	20 ± 1 Nm (15 ± 1 ft-lb)	-
G1/4A	35 ± 2 Nm (26 ± 2 ft-lb)	40 ± 2 Nm (30 ± 2 ft-lb)	-
G3/8A	50 ± 3 Nm (37 ± 2 ft-lb)	75 ± 5 Nm (55 ± 2 ft-lb)	-
G1/2A	75 ± 5 Nm (55 ± 2 ft-lb)	95 ± 6 Nm (70 ± 4 ft-lb)	-
G3/4A	120 ± 8 Nm (89 ± 6 ft-lb)	185 ± 12 Nm (136 ± 9 ft-lb)	-
G1A	180 ± 10 Nm (133 ± 7 ft-lb)	320 ± 20 Nm (236 ± 15 ft-lb)	-
G1-1/4A	240 ± 15 Nm (177 ± 11 ft-lb)	450 ± 25 Nm (332 ± 18 ft-lb)	-
G1-1/2A	280 ± 20 Nm (207 ± 15 ft-lb)	540 ± 30 Nm (398 ± 22 ft-lb)	-
S (HEAVY-DUTY)			
G1/4A	40 ± 3 Nm (30 ± 2 ft-lb)	43 ± 3 Nm (32 ± 2 ft-lb)	-
G3/8A	55 ± 3 Nm (41 ± 2 ft-lb)	85 ± 5 Nm (63 ± 4 ft-lb)	-
G1/2A	80 ± 5 Nm (59 ± 4 ft-lb)	120 ± 8 Nm (89 ± 6 ft-lb)	-
G3/4A	120 ± 8 Nm (89 ± 6 ft-lb)	185 ± 12 Nm (136 ± 9 ft-lb)	-
G1A	180 ± 10 Nm (133 ± 7 ft-lb)	320 ± 20 Nm (236 ± 15 ft-lb)	-

THREAD SIZE	INSTALLED INTO ALUMINUM	INSTALLED INTO STEEL	
	ED, O-RING + CIRCLIP	ED, O-RING + CIRCLIP	O-RING
G1-1/4A	240 ± 15 Nm (177 ± 11 ft-lb)	450 ± 25 Nm (332 ± 18 ft-lb)	-
G1-1/2A	280 ± 20 Nm (207 ± 15 ft-lb)	540 ± 30 Nm (398 ± 22 ft-lb)	-

Hydraulic fittings with Unified Thread Standard (UNC/UNF) must be torqued to the following specifications.

Table 2-12 Hydraulic Fitting Torque – Unified Thread Standard (UNC/UNF)

THREAD SIZE	INSTALLED INTO ALUMINUM	INSTALLED INTO STEEL
	O-RING	O-RING
L (LIGHT-DUTY)		
7/16-20	21 ± 2 Nm (15 ± 2 ft-lb)	21 ± 2 Nm (15 ± 2 ft-lb)
9/16-18	34 ± 2 Nm (25 ± 2 ft-lb)	35 ± 2 Nm (26 ± 2 ft-lb)
11/16-12	40 ± 3 Nm (30 ± 2 ft-lb)	50 ± 4 Nm (37 ± 3 ft-lb)
3/4-16	50 ± 3 Nm (37 ± 2 ft-lb)	65 ± 4 Nm (48 ± 3 ft-lb)
7/8-14	75 ± 5 Nm (55 ± 4 ft-lb)	110 ± 8 Nm (81 ± 6 ft-lb)
1-1/16-12	110 ± 8 Nm (81 ± 6 ft-lb)	140 ± 10 Nm (103 ± 7 ft-lb)
1-5/16-12	160 ± 10 Nm (118 ± 7 ft-lb)	210 ± 15 Nm (155 ± 11 ft-lb)
S (HEAVY-DUTY)		
7/16-20	21 ± 2 Nm (15 ± 2 ft-lb)	23 ± 2 Nm (17 ± 2 ft-lb)
9/16-18	34 ± 2 Nm (25 ± 2 ft-lb)	40 ± 3 Nm (30 ± 2 ft-lb)
11/16-12	40 ± 3 Nm (30 ± 2 ft-lb)	65 ± 4 Nm (48 ± 3 ft-lb)
3/4-16	50 ± 3 Nm (37 ± 2 ft-lb)	80 ± 6 Nm (59 ± 4 ft-lb)
7/8-14	75 ± 5 Nm(55 ± 4 ft-lb)	125 ± 10 Nm (92 ± 7 ft-lb)
1-1/16-12	110 ± 8 Nm (81 ± 6 ft-lb)	185 ± 15 Nm (136 ± 11 ft-lb)
1-5/16-12	160 ± 10 Nm (118 ± 7 ft-lb)	280 ± 20 Nm (207 ± 15 ft-lb)

HYDRAULIC HOSE AND FITTING TORQUE PROCEDURE

The hydraulic hose and fitting must be torqued to the following requirements when they are installed.

1. Replace the O-ring if damaged. The O-ring cannot be reused if the fitting or hose end has been tightened beyond finger tight.
2. Lubricate the O-ring before installation.
3. Properly seat the O-ring.
4. Position the tube and nut squarely on the fitting. Then tighten the nut as required.
5. Tighten the nut or fitting to the torque specified in the appropriate table.
6. Operate all machine functions and inspect the hose, fittings and related components to confirm there are no leaks.

FASTENER TORQUE SPECIFICATIONS

Unless special torque requirements are stated in this manual or other instructions, torque metric bolts to the values listed in the table below.

Table 2-13 Fastener Torque Specifications – Metric

NOMINAL DIAMETER (MM)	PITCH (MM)	CLASS 8.8	CLASS 10.9	CLASS 12.9
5	0.8	7 Nm (5 ft-lb)	9 Nm (7 ft-lb)	10 Nm (7 ft-lb)
6	1	12 Nm (9 ft-lb)	15 Nm (11 ft-lb)	18 Nm (13 ft-lb)
8	1.25	30 Nm (22 ft-lb)	35 Nm (26 ft-lb)	42 Nm (31 ft-lb)
	1	30 Nm (22 ft-lb)	37 Nm (27 ft-lb)	45 Nm (33 ft-lb)
10	1.5	55 Nm (41 ft-lb)	75 Nm (55 ft-lb)	85 Nm (63 ft-lb)
	1.25	56 Nm (41 ft-lb)	77 Nm (57 ft-lb)	87 Nm (64 ft-lb)
	1	60 Nm (44 ft-lb)	80 Nm (59 ft-lb)	92 Nm (68 ft-lb)
12	1.75	95 Nm (70 ft-lb)	125 Nm (92 ft-lb)	150 Nm (111 ft-lb)
	1.5	100 Nm (74 ft-lb)	130 Nm (96 ft-lb)	155 Nm (114 ft-lb)
	1.25	105 Nm (77 ft-lb)	135 Nm (100 ft-lb)	160 Nm (118 ft-lb)
14	2	150 Nm (110 ft-lb)	200 Nm (148 ft-lb)	230 Nm (170 ft-lb)
	1.5	165 Nm (122 ft-lb)	210 Nm (155 ft-lb)	250 Nm (184 ft-lb)
16	2	230 Nm (170 ft-lb)	300 Nm (221 ft-lb)	360 Nm (266 ft-lb)
	1.5	250 Nm (184 ft-lb)	320 Nm (236 ft-lb)	380 Nm (280 ft-lb)
18	2.5	320 Nm (236 ft-lb)	420 Nm (310 ft-lb)	500 Nm (369 ft-lb)
	1.5	360 Nm (266 ft-lb)	470 Nm (345 ft-lb)	550 Nm (406 ft-lb)
20	2.5	450 Nm (332 ft-lb)	600 Nm (443 ft-lb)	700 Nm (516 ft-lb)
	1.5	500 Nm (369 ft-lb)	650 Nm(479 ft-lb)	770 Nm (568 ft-lb)
22	2.5	600 Nm (443 ft-lb)	800 Nm (590 ft-lb)	980 Nm (723 ft-lb)
	2	650 Nm (479 ft-lb)	850 Nm (627 ft-lb)	1050 Nm (774 ft-lb)
24	3	750 Nm (553 ft-lb)	1050 Nm (774 ft-lb)	1250 Nm (923 ft-lb)
	2	800 Nm (590 ft-lb)	1100 Nm (811 ft-lb)	1300 Nm (959 ft-lb)
27	3	1150 Nm (848 ft-lb)	1500 Nm (1106 ft-lb)	1800 Nm (1327 ft-lb)
30	3.5	1500 Nm (1106 ft-lb)	2000 Nm (1475 ft-lb)	2400 Nm (1770 ft-lb)

Unless special torque requirements are listed in this manual or other instructions, torque Unified Thread Standard bolts (label: UNC) to the values listed in the table below.

Table 2-14 Bolt Torque Specifications Unified – Thread Standard (UNC)

NOMINAL DIAMETER (IN)	OPPOSITE NUT SIZE (S)	CLASS 5	CLASS 8
1/4-20	7/16"	10 Nm (7 ft-lb)	14 Nm (10 ft-lb)
5/16-18	1/2"	21 Nm (15 ft-lb)	29 Nm (21 ft-lb)
3/8-16	9/16"	37 Nm (27 ft-lb)	51 Nm (38 ft-lb)
7/16-14	5/8"	60 Nm (44 ft-lb)	82 Nm (60 ft-lb)
1/2-13	3/4"	90 Nm (66 ft-lb)	130 Nm (96 ft-lb)
9/16-12	13/16"	130 Nm (96 ft-lb)	180 Nm (133 ft-lb)
5/8-11	15/16"	178 Nm (131 ft-lb)	250 Nm (184 ft-lb)
3/4-10	1-1/8"	315 Nm (232 ft-lb)	445 Nm (328 ft-lb)
7/8-9	-	509 Nm (375 ft-lb)	715 Nm (527 ft-lb)

Unless special torque requirements are listed in this manual or other instructions, torque Unified Thread Standard bolts (label: UNF) to the values listed in the table below.

Table 2-15 Bolt Torque Specifications – Thread Standard (UNF)

NOMINAL DIAMETER (IN)	OPPOSITE NUT SIZE (S)	CLASS 5	CLASS 8
1/4-28	7/16"	11.5 Nm (8 ft-lb)	16 Nm (11 ft-lb)
5/16-24	1/2"	23 Nm (17 ft-lb)	32 Nm (24 ft-lb)
3/8-24	9/16"	41 Nm (30 ft-lb)	58 Nm (43 ft-lb)
7/16-20	5/8"	65 Nm (48 ft-lb)	92 Nm (68 ft-lb)
1/2-20	3/4"	100 Nm (74 ft-lb)	145 Nm (107 ft-lb)
9/16-18	13/16"	145 Nm (107 ft-lb)	200 Nm (148 ft-lb)
5/8-18	15/16"	200 Nm (148 ft-lb)	280 Nm (207 ft-lb)
3/4-16	1-1/8"	350 Nm (258 ft-lb)	495 Nm (365 ft-lb)
7/8-14	-	560 Nm (413 ft-lb)	780 Nm (575 ft-lb)

3 SYSTEM DESCRIPTIONS

POWER SOURCE

The machine is powered by a hybrid motor.

The machine uses a 12V battery to drive a 12V power unit to drive the gear pump which provides auxiliary power to the system.

HYDRAULIC SYSTEM

TB18E Plus:

The machine is driven by a hybrid motor, which drives the oil pump to provide high pressure oil to perform boom functions, steering and oscillation control during travelling.

When the hybrid motor operates, the high-pressure oil from the duplex gear pump outlet goes through the electric proportional flow valve and solenoid directional valve on the boom function manifold to drive the hydraulic actuator to work. In response to the boom functions with varying flow demands, the electrical control system outputs high-pressure oil at varying flow rates by changing the motor RPM and operation mode of the duplex gear pump (oil supply by single pump or duplex pump).

TB20EJ&20E&22EJ Plus:

The machine is driven by a hybrid motor, which drives the oil pump to provide high-pressure oil. The entire hydraulic system can be divided into two parts: one for controlling boom functions and turntable rotation, and the other for controlling steer and oscillation function during travelling.

When the motor operates, the open-circuit variable pump, the electric proportional flow valve and the solenoid directional valve on the boom function manifold work together to drive the hydraulic actuator to work. Based on different flow requirements of boom action, high-pressure oil with different flow rates will be output by the electronic control system through adjusting the current of the electric proportional valve and by the open-circuit variable pump through adjusting the angle of swash plate. In order to avoid excessive pressure in the hydraulic system and damage to the hydraulic components, pressure-limiting relief valves are installed in the hydraulic system. In addition, the hydraulic system is equipped with an emergency power unit, which can realize the emergency operation of the boom action.

ELECTRICAL SYSTEM

The system adopts two 24V lead-acid batteries or two 24V lithium batteries in series connection to drive the drive motor and hybrid motor for controlling boom functions, turntable rotation and drive/steer functions, and to provide 12V control power for the whole machine through a DC converter. The battery is charged by an external power supply.

A 12V maintenance-free storage battery is used in the system to provide emergency power supply for the whole machine.

All batteries are charged through external power supply and use the same charger. A power-off switch is fitted to protect the electrical system.

MACHINE CONTROL

The machine functions are controlled by two controllers, one installed on the left side of turntable to control the turntable rotation and boom functions, the other on the platform to control the machine drive, turntable rotation and boom functions. The controller communicates signals through a high-speed data bus.

SAFETY MEASURES

A wide range of sensors and limit switches are used to provide signals for the controller.

- The level sensor measures the inclinations in X axis and Y axis of the chassis. When the inclined angle in X or Y axis exceeds 5°, the alarm will go off and restrict such functions as lift, drive and steer. For more information, please reference [B-10 Inspect Tilt Protection, page 5-14](#).
- The length sensor measures the boom extended length. When the boom extended length exceeds the maximum allowable horizontal reach, the boom is restricted from continuing extending. For more information, please reference [B-9 Inspect Length and Angle Sensors, page 5-13](#).
- The angle sensor measures the boom lift angle. When the boom lift angle exceeds the limits, the boom is restricted from continuing lifting/lowering. For more information, please reference [B-9 Inspect Length and Angle Sensors, page 5-13](#).

- The weight sensor measures the weight on the platform. When the weight on the platform exceeds the rated load, the associated functions will be restricted. For more information, please reference [C-3 Inspect Weighing System, page 5-20](#).