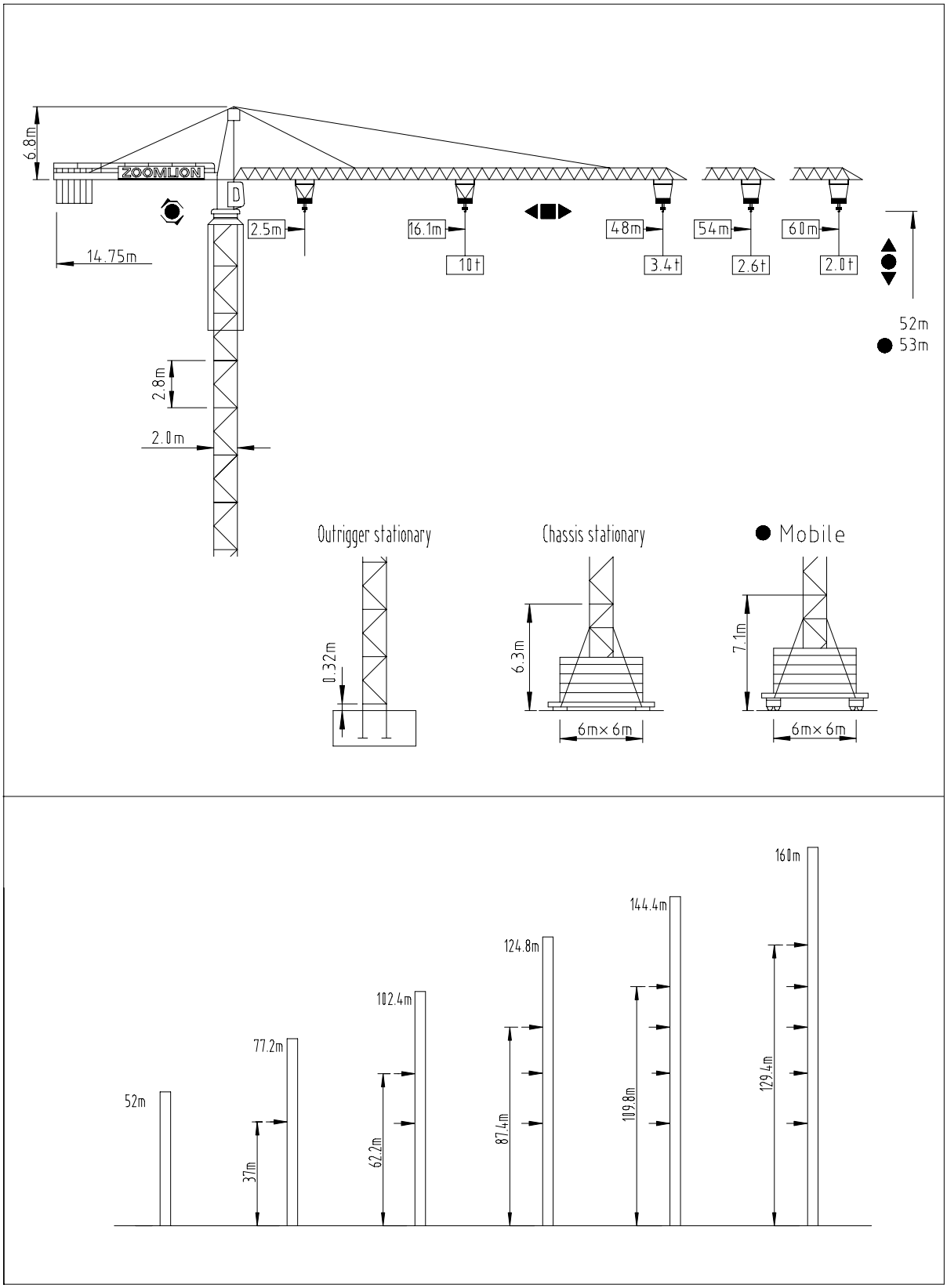
英文/English

1、Diagram



2、Main Standards

GB5144-94	Safety regulations of Tower Crane
GB/T13752-92	Design Specifications of Tower Crane
GB/T9462-1999	Technical Specifications of Tower Crane
GB/T5031-94	Performance Test of Tower Crane
GB/T17806-1999	Methods of Reliability Testing of Tower Crane
GB/T17807-1999	Methods of Structure Testing of Tower Crane
JG/T5037-93	Classification of Tower Crane

3、The resume of "Zoomlion" Tower Crane feature

"Zoomlion" has fifty-years-designing experience of tower crane, is the leadership and the president organization of Tower Crane Technology Association, transferred the technology of tower crane to 80% companies which manufacture tower crane in China, many times organized and undertook national projects which need be tackled key problem, and has been compiling national standards or trade technology standards of tower crane. Because of getting together the classic experts of tower crane, "Zoomlion" is the authority technology center of tower crane in China.

"Zoomlion" has been manufacturing tower crane since 1995. Many years hard working, "Zoomlion" has manufactured series products: 5013、5015、5613、5616、5023、5518、6013、6020、6517、7030、7035, which performance specifications are in line with the market demands. The sale of large and medium size tower cranes is the primacy in China in the past years.

In 1997, based on the mature technology of tower crane, "Zoomlion" developed originality double-purpose crane which is used for hoisting and concrete placing, that realize the equipment has multi-use function, and develop the application range in the construction territory.

No matter technology level and manufacture quality, "Zoomlion" tower crane is at the top of the ladder in China and on the same level in the world.

The technical features of "Zoomlion" tower crane

3.1 Unique technical service

The tower crane research institute provides technical consultation for user at any time with user-oriented telephone, provides non-standard anchor-frame design, and provides consultation for a new equipment foundation without cost. The above are technical advantages of "Zoomlion" because the others companies, which manufacture tower crane, generally cannot provide these technical service.

3.2 Powerful design capacity

Using ADAMS software to analyze its motion and using finite element analysis software I-DEAS to calculate stress, the structure of tower crane comes within reasonable stress, and has well strength, stiffness and fatigue resistance.

During designing, experts strictly check on the general scheme and the key unit, experts of the approved committee discuss and approved by the general scheme and every unit in earnest.

Under elastic design system, "Zoomlion" can design and manufacture a special tower crane for special demand in shortest duration for users.

3.3 Advanced testing measure

"Zoomlion" owns an advanced electricity system laboratory and an advanced mechanism laboratory. The private electrical control system and the transmission mechanisms, which are developed by ourselves, have done reliability test according to national or trade standards. Doing reliability test assures that the electrical control system and the transmission mechanisms are advanced, safety and reliable.

3.4 Performance specifications fully satisfied users demands

It is very convenient for users to work, because of the long distance between 2 anchor points and the great height of the tower above the anchor point. The hoisting weight at the tip is in line with the users execution requirement. (The weight of a tank concrete is about 1.3～1.5 tons, The weight of a large template is about 1.8 tons.)

3.5 Self-contained manufacture measures

Our company owns many advanced equipments such as: preprocessing equipment, perfect process facilities, computer control machining center, large-scale face boring machine and spray painting equipment for large parts. All these equipments assure our tower crane quality excellent.

4、Performance

TC6020A is a self-climbing tower crane with an upper slewing mechanism, a trolley mechanism and a horizontal jib with two shackles. It is optimal designed by Changsha Changsha China National Quality Supervision & Test Center for Construction & Urban-Building Machinery, which is the technology authority organization of tower crane field in China, manufactured by "Zoomlion", strictly supervised and proof-tested by. Its performances are advanced in China; many of them are advanced in the world.

4.1 The performance of the whole crane

The performance specifications of the equipment include rated-hoisting moment, max working radius, max hoisting capacity, max height of hoisting and working speed. The specifications are the important indicator of the capacity and the efficiency of the tower crane. The concrete specifications are shown as following "Main Specifications".

4.2 Working mechanisms

The performance of hoisting mechanism, slewing mechanism, trolleying mechanism and traveling mechanism directly affects the whole performance of the tower crane. Users hope that the crane is stable and reliable in working. The main factor influenced the stability of the crane is inertial impact and electric current impact. "Zoomlion" has solved those knotty problems with advanced technology in the TC6020A tower crane.

4.2.1 Hoisting mechanism

The hoisting mechanism of the TC6020A tower crane is designed to lift 10 tons.

The routine hoisting mechanism lifting 10 tons is adopted the special motor and single-velocity-ratio spur gear reducer. The special motor with two-speed coiling rotor is braked by eddy to regulate the speed.

Versus to the others velocity modulation modes, the motor with coiling rotor, braked by eddy, acquires better performance with series resistors, starts and brakes smoothly. Shifters are switched over smoothly. Fill its shoes correctly with slow speed, but it is forbidden to run long time under slow speed.

Using the velocity modulation modes, it is very outstanding to reduce inertial

impact, prolong the lifetime of the components of the electrical control, prolong the lifetime of the wire rope, and ensure that the mechanism has better stability and long lifetime.

Using the special motor and single-velocity-ratio spur gear reducer, the mechanism has simple structure, high reliability and easy maintenance.

Adopting the technology of big strong drum with LEBUS groove, it is very useful to solve the knotty problem of abnormal orders when the wire rope is arranged on the drum.

According to the demands of users, the technology of frequency altering and stepless speed regulated is adopted in hoisting mechanism, it is very useful to improve the running stability, raise the accuracy of filling its shoes, reduce impact to electric network, simplify the operation.

4.2.2 Slewing mechanism

As opposed to other mechanisms, the inertial impact of the slewing mechanism has the most effect to the crane. The more the jib is long, the more effect is outstanding. It can't solve the knotty problem with the traditional slewing mechanism, which brings about big torsional pendulum impact on the crane. After the motor being powered off, the jib runs for a long time before stopping, lead to difficultly fill its shoes and damage the slewing reducer.

The unique technology of frequency altering and stepless speed regulated is adopted in the routine slewing mechanism of "Zoomlion" tower cranes at first in the world. Using the slewing eddy controller, which "Zoomlion" owns the intellectual property, and technology of frequency altering and stepless speed regulated, the slewing mechanism starts and stops smoothly, fills its shoes fast and correctly.

4.2.3 Trolleying mechanism

The trolleying mechanism, which affects the load filling its shoes, is important mechanism. Using the technology of frequency altering and stepless speed regulated, the speed of the trolley changes in the range of 0～55m/min, it is very efficient to reduce the running impact and improve the operating stability and working efficiency in TC6020A.

4.2.4 Traveling mechanism

A planetary reducer and the technology of frequency altering and stepless speed regulated are adopted in the traveling mechanism. The speed of the traveling mechanism changes in the range of 0～25m/min smoothly without impact.

The motor connects with the planetary reducer, and then connects with the wheel. The mechanism has high reliability and following advantages: the structure is simple, the weight is light, the volume is small, and the figure is good-looking.

4.3 Electrical control system

Adopt PLC in electrical control system to improve reliability and safety. Using PLC (programmable logic controller) as the main control unit, it is very useful to reduce the quantity of logic control components, decrease the failure rate of the control system, and improve the reliability. The system controls the three mechanisms (Hoisting mechanism, Slewing mechanism and Trolleying mechanism) together, collects all the safety-limit signals, and deals with those signals in complicated logic, it is very efficient to optimize the mechanisms motion and avoid false operation. The system can self-diagnose electric faults and give corresponding alarms with different sounds and lights.

The main electric elements are used world-renowned products, it is the key of high reliability of "Zoomlion" tower crane, such as contactor and circuit-breaker of France Schneider, PLC controller of Japan Mistubishi Companies, and frequency converter of Japan Yaskawa Electric Corporation. Those components have over load capacity and stable performance.

In general, the electric fault occupies 70% of all tower crane faults. However, "Zoomlion" tower cranes have fewer faults than others tower cranes, because of advantage of electric system design, fitness parameter of special motor, small impact, world-renowned electric components, and correct use of customers.

4.4 Safety-protection device

According to GB5144 safety regulation of tower crane, "Zoomlion" tower cranes are equipped with safety-protection devices such as moment limiter, overload limit switch, over hoist limit switch,

slewing limit switch, trolley limit switch and anemoscope. In addition, "Zoomlion" tower cranes are equipped with many devices, which are advanced or original created by "Zoomlion" such as automatic hook rate-changed device, original created double-tensile devices of trolley wire rope, trip-proof device of climbing, fast-hitch connectors fixed the slewing mast and jib or counter-jib. All these devices ensure the tower cranes safety and usage facility.

4.5 Structure

By means of optimal design, computer-aided design, three dimensions Pro/E design, modularity design and manufacture, electro-mechanical integration design, man-machine engineering design, Ideas or Adams engineering analyzing, the structure of "Zoomlion" tower crane has gradely strength, stiffness, fatigue failure resistance and well overall performance.

Using special square shaped steel tube in the main stand bars and belly bars of the "Zoomlion" TC6020A tower crane, it is attractive in appearance, good mechanics performance, simple welding technology, high reliability, and more reasonable than seamless steel pipe or angle steel. The square shaped steel tube structure has following advantages: small wind resistance, good stiffness. Using shielded arc welding, it is useful to assure the welding quality, and good-looking welded seam.

5、Patents of ZOOMLION tower cranes

Patent No：95238241.5

Tower crane slewing device with stepless speed regulated and frequency altering

Patent No：98231924.X

Tower crane rope Slipping-proof device

Patent No：01213540.2

Climbing-self system with in a building

Patent No：01213541.0

Climbing-self system with in a building

6、Main Specifications

6.1 Whole performance specifications

<table>
<tr><td colspan="2">Rated hoisting moment (kN.m)</td><td colspan="5">1600</td></tr>
<tr><td colspan="2">Max hoisting moment (kN.m)</td><td colspan="5">1900</td></tr>
<tr><td colspan="2" rowspan="3">Max height of hoisting (m)</td><td colspan="2">Stationary</td><td colspan="3">52</td></tr>
<tr><td colspan="2">Anchorages</td><td colspan="3">160</td></tr>
<tr><td colspan="2">Mobile</td><td colspan="3">53</td></tr>
<tr><td colspan="2" rowspan="2">Working Radius (m)</td><td colspan="2">Min Radius</td><td colspan="3">2.5</td></tr>
<tr><td colspan="2">Max Radius</td><td colspan="3">60</td></tr>
<tr><td colspan="2" rowspan="2">Max hoisting capacity (t)</td><td rowspan="2">Max height of hoisting</td><td>≤80m</td><td colspan="3">10</td></tr>
<tr><td>＞80m</td><td colspan="3">5</td></tr>
<tr><td rowspan="3">QE10100E Hoisting</td><td>Fall</td><td colspan="3">2</td><td colspan="3">4</td></tr>
<tr><td>Lifting Weight / Speed (t/m/min)</td><td>2.5/100</td><td>5/50</td><td>5/50</td><td>10/25</td></tr>
<tr><td>Power (kW)</td><td colspan="5">55/55</td></tr>
<tr><td rowspan="2">BP55 Trolleying</td><td>Speed (m/min)</td><td colspan="5">0～55</td></tr>
<tr><td>Power (kW)</td><td colspan="5">5.5</td></tr>
<tr><td rowspan="2">HPW55 Slewing</td><td>Speed (r/min)</td><td colspan="5">0～0.7</td></tr>
<tr><td>Power (kW)</td><td colspan="5">2×5.5</td></tr>
<tr><td rowspan="2">ZD52 Travelling</td><td>Speed (r/min)</td><td colspan="5">0～25</td></tr>
<tr><td>Power (kW)</td><td colspan="5">2×5.2</td></tr>
<tr><td rowspan="2">Climbing</td><td>Working Pressure (MPa)</td><td colspan="5">31.5</td></tr>
<tr><td>Speed (m/min)</td><td colspan="5">0.56</td></tr>
<tr><td rowspan="2">Counter-weight</td><td>Max Working Radius (m)</td><td>48</td><td colspan="2">54</td><td colspan="2">60</td></tr>
<tr><td>Counter-weight (t)</td><td>15.45</td><td colspan="2">15.45</td><td colspan="2">17.85</td></tr>
<tr><td colspan="2">Total Power (kW)</td><td colspan="5">71.5＋2×5.2 Exclude Climbing</td></tr>
<tr><td colspan="2" rowspan="5">Design wind speed at the top of the crane (m/s)</td><td colspan="3">Climbing</td><td colspan="2">14</td></tr>
<tr><td colspan="3">In Service</td><td colspan="2">20</td></tr>
<tr><td rowspan="3">Out Of Service</td><td>0～20m</td><td colspan="2">36</td></tr>
<tr><td>20～100m</td><td colspan="2">42</td></tr>
<tr><td>100m～</td><td colspan="2">46</td></tr>
<tr><td colspan="2">Working Temperature (℃)</td><td colspan="5">-20～+40</td></tr>
<tr><td colspan="2">Main supply</td><td colspan="5">～380V/50Hz</td></tr>
</table>

6.2 Radius and Capacity

60m Jib

(m)	2.5～16.1		18	20	22	24	26	28
(t)	5.0							
(t)	10		8.78	7.77	6.94	6.26	5.69	5.20
(m)	29.5	32	34	36	38	40	42	44
(t)	5.0	4.53	4.21	3.92	3.66	3.44	3.23	3.04
(t)	4.88	4.42	4.10	3.81	3.55	3.33	3.12	2.93
(m)	46	48	50	52	54	56	58	60
(t)	2.87	2.72	2.57	2.44	2.32	2.20	2.10	2
(t)	2.76	2.61	2.46	2.33	2.21	2.09	1.99	1.89

54m Jib

(m)	2.5～17.5		18	20	22	24	26	28
(t)	5.0							
(t)	10		9.66	8.55	7.65	6.91	6.29	5.76
(m)	30	32.1	34	36	38	40	42	44
(t)	5.0	5.0	4.66	4.35	4.07	3.82	3.59	3.39
(t)	5.30	4.88	4.55	4.24	3.96	3.71	3.48	3.28
(m)	45	46	48	50	52	54		
(t)	3.30	3.20	3.03	2.88	2.73	2.6		
(t)	3.19	3.09	2.92	2.77	2.62	2.49		

48m Jib

(m)	2.5～19		20	22	24	26	28	30	32
(t)	5.0								
(t)	10		9.54	8.47	7.66	6.98	6.39	5.89	5.45
(m)	34	35	38	40	42	44	45	46	48
(t)	5.0		4.53	4.26	4.01	3.79	3.69	3.59	3.4
(t)	5.07	4.89	4.42	4.15	3.90	3.68	3.58	3.48	3.29

7、Component list of Transmission mechanism

QE10100E Hoisting gear	Motor	Power (kW)	55/55
		Rotate speed (r/min)	1425/720
	Steel rope	Diameter (mm)	16
		Max average linear velocity	200
	Brake	Braking moment (N.m)	1250
	Reducer	Gear ratio	15.55
	Rope capacity (m)		400(5 layers)
	Max tractive force (kN)		25
BP55 Trolleying gear	Motor	Power (kW)	5
		Rotate speed (r/min)	1430 (50Hz)
	Steel rope	Diameter (mm)	9.3
		Max linear velocity (m/min)	55
	Reducer	Gear ratio	43
	Braking moment (N.m)		80
	Trolley travel distance (m)		70
HPW55 Slewing gear	Motor	Power (kW)	5.5
		Rotate speed (r/min)	1440(50Hz)
	Reducer	Gear ratio	195
		Output twisting moment (N.m)	10000
	Output gear	Module(mm)	12
		Number of teeth	14
		Coefficient of profile shifting	+0.5
ZD52 Travelling	Motor	Power (kW)	2×5.2
		Rotate speed (r/min)	2800(50Hz)
		Braking moment (N.m)	8.5/32
	Reducer	传动比 gear ratio	140.21
	Diameter of wheel(mm)		φ400
Climbing mechanism	Motor	Power(kW)	7.5
		Rotate speed(r/min)	1440
	Hydraulic pump	Flow(l/min)	10.6 (ESSO AW46)
		Working Pressure (MPa)	31.5
	Climbing hydraulic cylinder	Diameter of cylinder/ Piston(mm)	160/110
		Travel (mm)	1600
		Max pushing force (t)	63
		Speed of climbing (m/min)	0.56
Slewing ring		Diameter(mm)	1600

8、Component list of electrical system

No.	Designation	Code	Brand	Use for	Quantity
1	Programmable Logic Controller	PC	Japan Mistubishi Companies	Whole equipment	
2	Frequency converter	US	Japan Yaskawa Electric Corporation	Slewing mechanism	1
3	Frequency converter	UV	Japan Yaskawa Electric Corporation	Trolleying mechanism	1
4	Frequency converter	DINV	Japan Yaskawa Electric Corporation	Traveling mechanism	1
5	Contactor	KH	France Schneider	Hoisting mechanism	
6	Intermediate relay	KA	Japan OMRON	Whole equipment	
7	Circuit breaker	QF	France Schneider	Whole equipment	
8	Blocking control stand	WCN38B	Custom-made in China	Whole equipment	

9、List of Documents

No.	Designation	Qty	Note
1	Instruction of tower crane	1	
2	Instruction of E-Control	1	Include principle and connection drawings of electric system
3	Drawings of counter-weight blocks	1	
4	Construction drawings	1	
5	Center ballast drawing	1	Provided for mobile tower crane