CPB CONTRACTORS

sam Technology Engineers

Contents

1. DESCRIPTION

This manual covers the operation and maintenance of the 2.5 tonne Davit/Jib crane for the Sydney Metro (Western Sydney Airport – Station Boxes and Tunneling Works).

The hoist has a rated safe working capacity of 2.5 Ton, and is designed for lifting and transporting diverse materials or suitable manbox with a weight equal to or less than 2.5 ton.

NOTE: Crane is not to e used in wind speeds exceeding 30 km/h. The crane is to be stowed against rotation bump stop when not in active use.

The following details apply to the hoist:

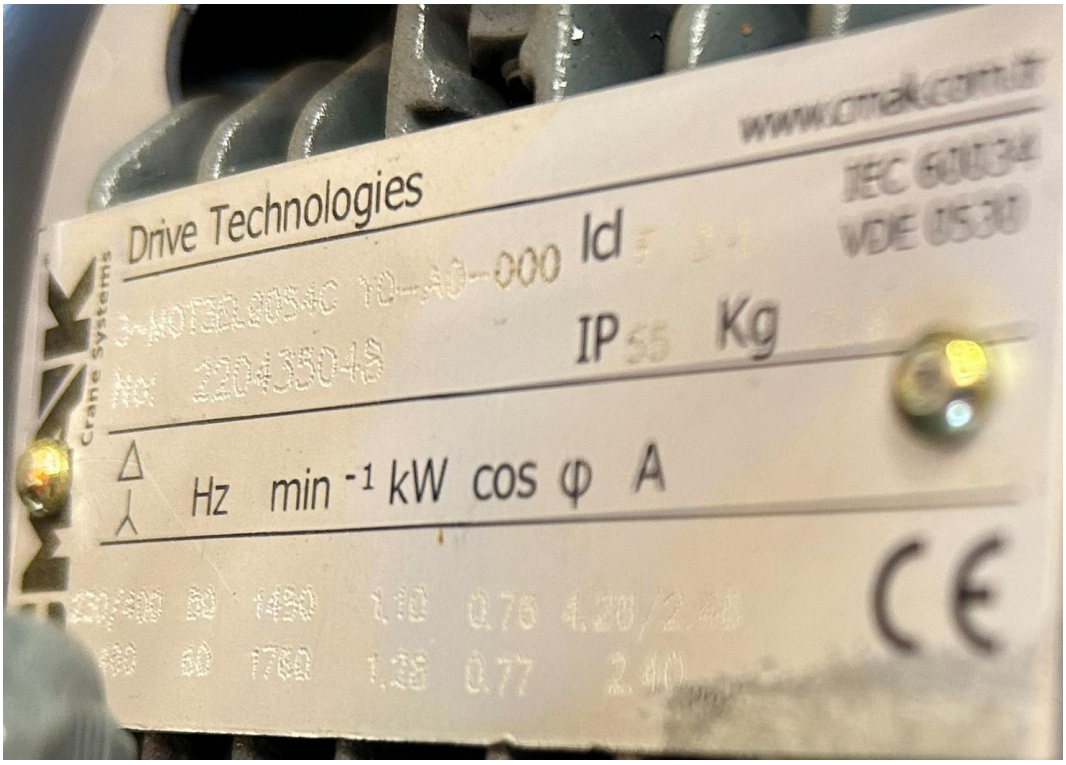
- The hoist consists of:
  - Wire rope drum
  - Hoist motor gearbox assembly
  - Hoist motor brake
  - Secondary hoist drum brake
  - Cross travel drives (motor gear box)
  - Limit switches

- Hoist Identification
  - Type: Electric wire rope hoist with direction crab
  - Manufacturer: Sam Technology Engineers
  - Type of hoist: Single layer wire rope drum
  - Manufacturer number: 10467
  - Year of manufacture: 2023

- Hoisting Motor (refer Appendix A)

- Cross Travel Gear Motor (refer Appendix L)

- Rotation Gear Motor (refer Appendix L)



- The hoist is designed to operate in an outdoor environment.
- The Crane can be driven by using the pendant or primarily the hand-held radio control transmitter. Refer to section 8.2 and Appendix M for more information on the operation of the portable radio control console

2. TECHNICAL DATA

The following technical information for the hoist can be found in the Appendices:

- Refer to Appendix B for the Hoist Mechanical Drawings

3. SAFETY DEVICES AND WARNINGS

NOTE: Only suitably trained and authorized personnel are to operate the crane

NOTE: All safe operating procedures and practices are to be followed when operating the crane

CAUTION: Risk of electrocution exists; only suitably trained and qualified personnel are to access electrical equipment. Isolation of all electrical devices is recommended prior to work being carried out:

- Emergency stop devices are to be tested on a regular basis.
- All limit switches and cam switches are to be tested on a regular basis.

- Over loading is not permitted

4. OPERATION DESCRIPTION

4.1 General

The 2.5 tonne Crane is an electrically driven crane which rotates in the East (Anticlockwise)/West (Clockwise) direction on a centre pin and a roller on a ring located on the column. In the North (Out)/South (In) direction for the travel motion.

The crane is mounted on studs in the concrete base.

The trevel motion is achieved with 2 brake motors along the horizontal beam.

4.2 Equipment

The following equipment is located on the crane:

- Hoist motor/gearbox, brake, rope drum, rotary limit switch
- Secondary hoist independent brake
- A hoist raise over travel limit switch
- Two travel drive motor/gearbox
- Main hoist load cell

4.3 Crane Power supply

Electricity supply is provided from the site distribution board with a three phase 415 VAC supply.

5. MAIN CONTROL PANEL

There is a main control panel located on the base of the column that encapulates the control and protection equipment, including:

- Programmable Logic Controller
- Variable speed drive for rotation
- Indicator lights

6. MOTION (INTERLOCKS) LIMIT SWITCHES

- Travel limit switch, all travel limit switches are contained on one device:
- North end limit switch (stay put type).
- South end limit switch (stay put type).
- Main Hoist limit switches:
- A safety overtravel limit switch for upwards motion and a overtravel limit switch for the downwards motion. Both are located on the winch drum, these switches interface with a safety relay resulting in fail safe isolation of the hoist variable speed drive.

Top limit switch – A rotary cam limit switch is used to adjust the top stop position.

Bottom limit switch – The same rotary cam limit switch is used to adjust the bottom stop position.

Rotary limit switch, all rotation limit switches are contained on one device:
Slow down limit switch (stay put type).
East end limit switch (stay put type).
West end limit switch (stay put type).

7. CRANE RADIO CONTROL

All crane motions can be controlled with the radio control unit.
Radio Control Operation:

Radio control transmitter

"Start/Reset" Process

Ensure electrical power is available and main islotor is switched on.
Ensure the pendant controller is not plugged in.
Ensure there is a charged battery in the remote control hand held unit. Ensure the Emergency Stop button is released by twisting clockwise.
Press the Green pushbutton - momentarily. The “antenna” LED will illuminate when the communication has been established. Press the green pushbutton once to reset the safety circuit. The reset will only occur when all emergency stops and over travel limits have been normalised.

"Emergency Stop" Buttons

The red mushroom-shaped push button, located on radio remote control, disables the Variable Speed Drive circuits and the controls to isolate the crane drives in the event of an emergency situation. This button must be “twisted clockwise” prior to resetting the crane for operation.This switch is not to be used as a form of controlled stopping of the crane. If depressed, all drives will be instantly disabled. To restart the crane simply reset the Emergency stop switch, by ‘twisting clockwise’ to reset, and restart by pressing the "Start/Reset" pushbutton. This button is green on the remote control and marked as I on the pendant controller.

Movement Controls

The six (6) push buttons control the hoist, rotation and travel functions of the crane;

Crane function – The push button is used for up motion. The “D” push button is used for down motion. The “N” push button is used for outward motion. The “S” push button is used for inward motion. The “E” push button is used for anti-clockwise motion. The “W” push button is used for clockwise motion.

Start-up Sequence

- Switch the main isolator on the crane’s Main Control Panel to ON.

- Release the emergency stop button.

- Start the crane by following the start up procedure for the remote control.

8. CRANE PENDANT CONTROL

All crane motions can be controlled with the pendant control unit.
Pendant Control Operation:

Pendant control

"Start/Reset" Process

Ensure electrical power is available and main islotor is switched on.
Ensure that the pendant is correctly pluged in. Ensure the Emergency Stop button is released by twisting clockwise.
Press the start (I) pushbutton - momentarily. The reset will only occur when all emergency stops and over travel limits have been normalised.

"Emergency Stop" Button

The red mushroom-shaped push button located on bottom of pendant controller disables the Variable Speed Drive circuits and the controls to isolate the crane drives in the event of an emergency situation. This button must be “twisted clockwise” prior to resetting the crane for operation.This switch is not to be used as a form of controlled stopping of the crane. If depressed, all drives will be instantly disabled. To restart the crane simply reset the Emergency stop switch, by ‘twisting clockwise’ to reset, and restart by pressing the "Start/Reset" pushbutton. This button is green on the remote control and marked as I on the pendant controller.

Movement Controls

The six (6) push buttons control the hoist, rotation and travel functions of the crane;

Crane function – The  push button is used for up motion. The  push button is used for down motion. The  push button is used for outward motion. The  push button is used for inward motion. The  push button is used for anti-clockwise motion. The  push button is used for clockwise motion.

Start-up Sequence

- Switch the main isolator on the crane’s Main Control Panel to ON.

- Release the emergency stop button.

- Start the crane by following the start up procedure for the remote control.

9. MAINTENANCE

To ensure reliability for operation and trouble-free functioning of the crane, the following instructions have to be observed.
Carefully executed maintenance and inspection provide for a longer operational life and safety of the crane.

- For maintenance and inspection which does not require movement or operation of the crane, the main power supply needs to be isolated and locked out.
- Maintenance requiring movement or operation of the crane may only be executed by suitably qualified, authorized and competent personnel after a risk assessment and safe work procedure has been completed.

10. ROUTINE MAINTENANCE

This section is to be read in conjunction with the original manufacturer's manuals for the equipment concerned.

The following maintenance is to be done by qualified personnel. The appropriate safety and isolation procedures are to be followed.

Table 3 below lists the items that require periodic inspection and maintenance in accordance with supplied manuals.

Some daily/shift inspections are required to ensure the general condition of the crane. As a minimum:

Item	Description	Procedure
1	Fasteners	Present and tightened.
2	Noise	Investigate any unusual noises
3	Wire rope	Condition, damage, wear or corrosion
4	Hook block	Condition, damage and latch operational
5	Rotation and travel elements	Condition, damage, wear, attachment or corrosion
6	Limit switches	Operation during normal operation
7	Emergency stops	Operation, function and reset ability
8	Remote control	Operation, condition and functionality

Table 1 Daily/Pre-start Inspections

11. PERIODIC AND THIRD-PARTY INSPECTION

Crane shall undergo a periodic third-party inspection to provide independent advice on whether the level of maintenance and repairs are in accordance with the standard as per AS 2550.1.
Table 2 shows the recommended time that should not be exceeded for Routine and Periodic Third-Party inspection.
Major inspection as per AS 2550.1 shall be done on the crane to assess its ability for continued safe operation. This inspection shall be performed by a competent person as defined in AS 2550.1. The inspection shall be done after 2/3 of the design life of the mechanical items (10 years) or when the number of cycles of the cranes have been reached in accordance with below Table F1, which is an extract from AS 2550.1.
The maintenance check list, APPENDIX G, is used for all type of inspections.

TABLE F1

RECOMMENDED MINIMUM MAINTENANCE AND INSPECTION SERVICE REQUIREMENTS

Crane classifications	C1	C2	C3	C4	C5	C6	C7	C8
	M1	M2	M3	M4	M5	M6	M7	M8
Operating hours per day	≥0.5	0.5–1	>1–2	>2–4	>4–8	>8–16	>16	>20
Routine maintenance weeks	12	12	12	12	8	8	4	4
Periodic third-party inspection, weeks	52	52	52	52	52	52	52	52

NOTE: Periods may be varied dependent on the operating environment, the frequency and intensity of use (see Clause 7.3).

Table 2: Recommended Maintenance

12. ROUTINE MAINTENANCE INSPECTION

This section is the routine maintenance that is carried out on items every month. The timing of these maintenance items depends on crane usage. Periodic maintenance shall be done in accordance with the manufacturer's recommendations.

Item	Description	Procedure	Reference	Comments
1	Motor & brake inspection	Check motor brake for operation and brake pad wear Motor noise Motor excessive heat	Appendix A	Visual inspection
2	Gearbox	Check Gearbox for Oil leaks Noise Excessive heat Refill oil if below inspection plug.		Visual Inspection Replace oil at supplier's recommendation
3	Main drum brake	Check for defects according to Appendix C	Appendix C	Visual inspection
4	Bearings of Drum, Wheels and Hook block	Check for noise Excessive heat Lubricate every 3 months		Visual inspection
5	Wire rope	Check wire rope for correct lay Check for defects according to Appendix E	Appendix E	Visual inspection
6	Rope reeving	No obstruction Inspect rope sheave Inspect rope condition	Appendix E	Visual inspection
7	Check bolts for drive sub-assemblies	Check fasteners Check condition		Visual inspection
8	Travel wheels	Wear & deformation		Visual inspection
9	Travel gear motors	Inspections according to Appendix L Visual Unusual noise Leaks	Appendix K	According to appendix L
10	Limit switches	Test functionality Check fasteners and adjustment		Testing
11	All functions	Testing		
12	All signage			Visual Inspection
13	Hoist drum bearings	Noise Fasteners		Lubricate

Table 3 – based on AS 2550

13. TROUBLE SHOOTING

Mechanism	Fault	Cause	Solution
Lifting	Hoist does not move	Power supply fault VSD fault Over travel limit activation Load overload	Inspect Check VSD (Appendix D) Inspect Lower load
Lifting	VSD faulting		Inspect power supply Inspect fault code (Appendix D) Inspect load

Lifting	Overload fault	Excessive load Incorrect load measuring Incorrect load measuring	Check actual load Check load on display Calibrate load limiter
Travel	Slow	Mechanical obstruction VSD fault Limit switch	Remove obstruction Inspect VSD code (Appendix D) Adjust/repair
Travel	No motion	Limit switch VSD fault	Inspect/Adjust Inspect VSD code (Appendix D)

14. RADIO CONTROL

Refer to the below tables for trouble shooting of the radio control.
More information can be found in Appendix M

INCIDENT	SITUATION	ACTION
The set does not start-up	Neither of the transmitter indicators and light up	Check the condition of the key or that the selector is in the ON position
		Battery is correctly inserted
		Ensure that the battery is charger or replace it with a charger battery
	Only the led of the transmitter light up	The battery is flat and sould be replaced with a charged battery
	The led on the transmitter switch on, but in the received the led is off (not applicable to GCFI version)	Check that the channel on the transmitter and the receiver is the same
		In case the channel is not the same or if you doesn't know, keep activated the on push button on the transmitter till the RX get on (Max. 1 minute). Make it the nearest you can to the RX
	Both leds and of the transmitter flash	Keyboard of transmitter is locked. Follow the section "Locking the keyboard" to unlock it.
	The led of the transmitter flashes	A channel is active. Check that all actuators of the transmitter are in the stand-by position
	One of the leds of the transmitter flashes quickly twice and then pauses	A contact of the STOP BUTTON is faulty. Contact the Technical Assistance Service
	Led S2 of the Rx is on or flashes and the stop relays are not locked	Fault in standard drivers or stop relays. Contact the Technical Assistance Service
	Led S4 of the Rx generates quick pulses	Fault of the eeprom. Check that it is inserted in its socket in the RX. If it is and it still doesn't work, contact the Technical Assistance Service
After making a changeofchannel, the machine is not working	The led switch on, but the RX is not working	Keep activate the Start push button on the receiver till it starts (Max. 1 minute). Make it the nearest you can to the RX
	the transmitter in pause the re-ceiver continue with the led switch on	There are interferences in the new channel, you must change to another one. If you do not receive the new channel on the receiver, you must keep pressed on the transmitter the Start pushbutton. (Max. 1 minute). Make it the nearest you can to the RX
The transmitter do not allow to make the change of frequencies	The lights and do not blink alternately	Verify the battery's charge
		Check the mode change of frequency configured

INCIDENT	SITUATION	ACTION
Mistaken introduction of the work of channel in a change of frequency	The Introduced channel of work is not the wanted	Repeat the process with the wanted channel of work
The remote control equipment starts up but the machine does not work	The equipment is not connected to the machine	Connect the cable from the remote control to the electric panel of the machine using the corresponding connectors
	The equipment is connected to the machine, but the machine still doesn't work	The fuse/s of the stop relays has/have blown. They should be replace by new fuses of the same value
	The remote control works but the machine still doesn't work	Place the push-button of the cable/cabin instead of the remote control, and if still doesn't work, the problem is with the machine
		If the machine works properly with the cable push-button, contact the Technical Assistance Service
The remote control has a short range, and the machine stops, although it can be reset	The antenna is disconnected, broken or in bad condition	Replace the antenna, contact the Technical Assistance Service
	Although the transmitter is disconnected by locking the STOP BUTTON, the led of the receiver is still on	There are interferences from another apparatus you must change the working channel following the steps described on the "Change of frequencies" Chapter
The Travelling manoeuvre does not respond	The ON/OFF travelling push-button is not pressed	Press the Travelling push-button
The equipment randomly switches off or some relays do not turn on, even through the equipment is still on	The leds remains on but makes a quick pulse	Input to the set is under 50% of the nominal value (230V - 115V or 48V).
	The led remains on but makes two quick pulses	Input to the set is under 45% of the nominal value (230V - 115V or 48V)

15. CONTACT INFORMATION

Sam Technology Engineers Pty Ltd
130-148 Woodpark Road
Smithfield NSW 2164
Telephone: +61 2 9721 5900
E-mail: engineers@samtechnology.com.au
Web: www.samtechnology.com.au

16. TIGHTENING TORQUE

HEX BOLTS - RECOMMENDED TIGHTENING TORQUE
CLASS 8.8

Size	Pitch	Stress Area	Core Area	Tensile Strength	Proof Strength	Shear Strength	Recommended Tightening Torque		
	(mm)	(mm²)	(mm²)	(kN)	(kN)	(kN)	Plain (Nm)	Zinc (Nm)	HDG (Nm)
M6	1.00	20.1	17.9	16.1	11.7	8.6	9.1	6.4	19.1
M8	1.25	36.6	32.8	29.3	21.2	15.7	22.1	15.5	46.4
M10	1.50	58.0	52.3	46.4	33.6	25.1	43.7	30.6	91.8
M12	1.75	84.3	76.2	67.4	48.9	36.6	76.3	53.4	160.2
M14	2.00	115.0	104.7	92.0	66.7	50.3	121.4	85.0	254.9
M16	2.00	157.0	144.0	125.6	91.1	69.1	189.4	132.6	397.8
M18	2.50	192.0	175.0	159.4	115.2	84.0	269.6	188.7	566.1
M20	2.50	245.0	225.0	203.3	147.0	108.0	382.0	268.0	803.0
M22	2.50	303.0	281.0	251.5	181.8	134.9	520.0	364.0	1092.0
M24	3.00	353.0	324.0	293.0	211.8	155.5	661.0	463.0	1388.0
M27	3.00	459.0	427.0	381.0	275.4	205.0	967.0	677.0	2030.0
M30	3.50	561.0	519.0	465.6	336.6	249.1	1313.0	919.0	2757.0
M33	3.50	694.0	647.0	576.0	416.4	310.6	1786.0	1250.0	3751.0
M36	4.00	817.0	759.0	678.1	490.2	364.3	2294.0	1606.0	4818.0
M39	4.00	976.0	912.0	810.1	585.6	437.8	2969.0	2078.0	6235.0
M42	4.50	1120.0	1050.0	929.6	672.0	504.0	3670.0	2568.0	7705.0
M48	5.00	1470.0	1380.0	1220.1	882.0	662.4	5504.0	3853.0	11558.0
M56	5.50	2030.0	1910.0	1684.9	1218.0	916.8	8867.0	6207.0	18621.0
M64	6.00	2680.0	2520.0	2224.4	1608.0	1209.6	13379.0	9365.0	28095.0

Note:

The tightening torque values given in the above table serve only as a guide. A k factor of 0.2 has been used which assumes threads are plain finish, burr free with a light oil coating. It should be noted that these figures are based on the first tightening of single assemblies in isolation.
Please refer to AS4100 for correct tightening methods of AS1252, as the above figures do not apply.

Table 3 Recommended Tightening Torques

APPENDIX A – NORD Hoist Motor Manual

APPENDIX B – Trolley Assemby Drawing

APPENDIX C – Hoist Secondary Brake

APPENDIX D – Variable Speed Drive Manual

APPENDIX E – Hoist Rope Manual

APPENDIX F – Wire Rope Certificate

APPENDIX G - Machinery Startup and Third Party InspectionCheck list

A = Compliant B = Operational (Repairs required) C = Failure
D = Urgent repairs required E = Condemn

Sam Technology Engineers Pty Ltd

Supplier Equipment No: 10467

Equipment data:	
Model No.:	10467
Customer ref No.:	10467
Manufacturer's name:	Sam Technology Engineers Pty Ltd
Year of manufacture:	2023
Owner's name:	CPB
Maximum rated capacity:	2.5 tonne
Classification:	M5

Description	Status Code	Comments/Actions
BRIDGE Tick one		
Structure		
General structure and welds	(A B C D E)	.....
Capacity markings	(A B C D E)	.....
Clearance	(A B C D E)	.....
Other	(A B C D E)	.....
Machinery		
Holding brake	(A B C D E)	.....
Emergency brake	(A B C D E)	.....
Gear case	(A B C D E)	.....
Clearance	(A B C D E)	.....
Sheave(s)	(A B C D E)	.....
Rope drum	(A B C D E)	.....
Electrical		
Motor	(A B C D E)	.....
Control panel enclosure(s)	(A B C D E)	.....
Control operations	(A B C D E)	.....
Limit switches	(A B C D E)	.....
Control brake(s)	(A B C D E)	.....
General wiring and conduits	(A B C D E)	.....
Load cells	(A B C D E)	.....
Rotary Limit	(A B C D E)	.....
Pushbutton pendent	(A B C D E)	.....
Access isolator	(A B C D E)	.....
Other	(A B C D E)	.....

Standard to which test is performed:

Certification:

(a) Equipment general condition description: .....

.....

.....

(b) Remarks:

.....

.....

(c) Recommendation: .....

I recommend that: .....

(i) This equipment be re-examined and tested on or before:

(ii) The following components of the equipment be re-examined and tested as appropriate on or before the date indicated for each item:

Item Date

.....

.....

.....

(d) The examination was:

Routine: .....

Annual: .....

Major: .....

(e) I hereby certify that I have examined and tested as appropriate.

Equipment No.: ..... and I find that the equipment is/is not in a satisfactory condition for safe use.

NOTE: For commissioning of new equipment, it should be certified that the equipment complies with the relevant parts and sections of AS 1418.3.

(f) Number of sheets attached: .....

(g) Competent person's details:

Name: .....

Address: .....

Telephone No.: ..... Facsimile No.: .....

Qualifications: .....

Relevant experience: .....

.....

(h) Signature: ..... Date: .....

APPENDIX H – Overspeed Relay Manual

APPENDIX I – Load Limiting Relay Manual

APPENDIX J – Remote Controller Drawing

APPENDIX K – NORD Travel Drive Manual

APPENDIX L – Electrical Schematic Diagram

APPENDIX M – Radio Remote Control Manual