

24 TMU Motor Driven Trolley

The complete motor driven trolley for the [LoadMate](#) electric chain hoist is referred to as the TMU. The TMU includes the C type trolley, and either the Variable Frequency Drive or the Two-speed Motor Drive.



TMU – Variable Frequency Drive



TMU – Two-speed Drive

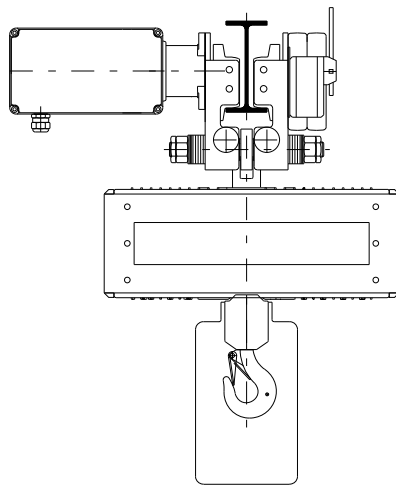
The drive receives its power and control voltages from the hoist via a single electrical cable. The cable is furnished with plug for quick connection. The mating plug receptacle is on the hoist enclosure.

24.1 TMU Trolley Type

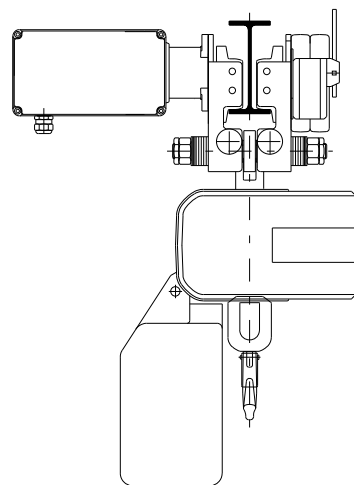
The TMU motor driven trolley uses the C-type trolley. See C-Type Trolley Section for size configuration, features and specifications.

24.1.1 TMU Trolley Mounting Position

The motor driven trolley is available for the [LM](#) electric chain hoists except the [LM1](#). The hoist body position with respect to the girder is perpendicular as standard. A parallel mounting position (90° from standard) is available for [LM5](#) and [LM10](#) hoists only.

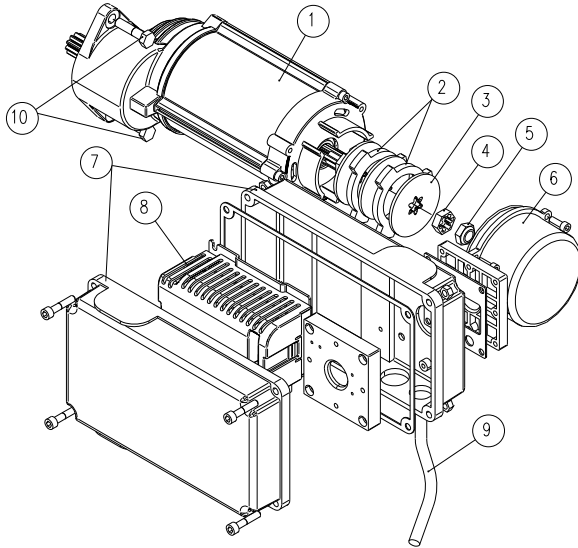


Perpendicular

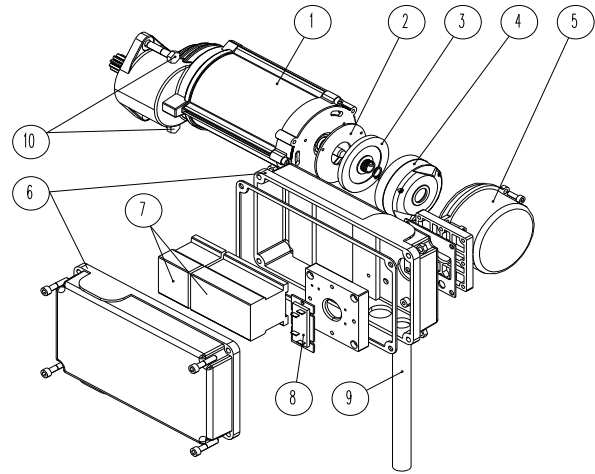


Parallel ([LM5](#) & [LM10](#))

24.2 TMU Drive



TMU Variable Frequency Drive



TMU Two-speed Motor

1. Gear/motor unit	6. Brake cover	1. Gear/motor unit	6. Control enclosure
2. Compact Brake	7. Control enclosure	2. Friction plate	7. Contactors
3. Brake disc	8. Variable frequency drive	3. Brake disc	8. Rectifier
4. Sleeve	9. Electrical cable	4. Brake	9. Electrical cable
5. Nut	10. Mounting screw	5. Brake cover	10. Mounting screws

24.2.1 TMU Motor

The motor insulation is class F and the degree of protection is IP55.

24.2.2 Description of the TMU Gear Reducer

TMU1 & TMU2 Variable Frequency Drive Gear Reducer

A single reduction gear reducer (TMU2) is used together with the 100 Hz inverter duty motor. Generally, this gear motor reducer is used when the capacity of the hoist is greater than 1 ton [1000 kg]. The output pinion is cut into the output shaft of the gearbox. Gears are lubricated with semi-fluid grease.

The 35 Hz inverter duty motor is used without a gear reducer (TMU1). Generally, this gearless motor is used when the capacity of the hoist is 1 ton [1000 kg] or less. The trolley wheels are directly driven from the output shaft of the inverter motor.

TMU Two-speed Motor Gear Reducer

A single reduction gear reducer is always used together with the two-speed motor regardless of the load capacity. The output pinion is cut into the output shaft of the gearbox. Gears are lubricated with semi-fluid grease.

24.2.3 Description of the Brakes

COMPACT Brake

The Compact brake is integrated into the design of the MF06 inverter duty motor and is AC operated - without a separate coil for the brake. An electromagnetic force produced from the energized motor stator winding releases the brake. Since the MF06 inverter duty motor is always operated with the TMU VFD that provides dynamic braking, the Compact brake is essentially a holding brake. The brake sets when the motor decelerates to zero and a spring applies a clamping force.

D.C. Brake

The D.C. Disc brake is mounted to the two-speed motor and utilizes a D.C. coil. The coil releases the brake disc. Several springs apply the clamping force.



24.2.4 Configuration of TMU Variable Frequency Drive

Hoist	Fall	Capacity	Trolley Type	Trolley Drive	Motor Type & Frequency	Travel Speeds
LM05	1 & 2 falls	≤ 1 ton [1000 kg]	C2	TMU1 VFD less gear reducer	MF06MK200 35 Hz	Speed Table A
LM10	1 fall					
LM10	2 fall	> 1 ton [1000 kg]	C3 or C5 See C type trolley section to determine configuration	TMU2 VFD	MF06MK200 100 Hz	Speed Table B
LM16	1 & 2 falls	≤ 3 ton [3000 kg]				
LM20	1 fall					
LM25	1 fall					
LM20	2 falls	> 3 ton [3000 kg]				
LM25						

24.2.5 Specifications of TMU Variable Frequency Drive

The required supply voltage to the inverter is 380V/50Hz-480V/60Hz, regardless of the main power supply voltage. To convert and maintain proper supply voltage to the inverter, an autotransformer is used, except for 415V-50Hz. A line reactor is furnished to protect the inverter against voltage spikes. Both the autotransformer and the line reactor are mounted to the trolley idler side plate under a cover. The VFD controls are totally enclosed under a separate enclosure that is mounted directly to the motor.

- Main power supply: 208, 230, 460 or 575V-60 Hz, 400V/50 Hz,
- Control voltage: 115 VAC (48V optional; std. with 400V)
- Speed control method: 2-step multi-speed (default) or Infinitely variable
- Stopping method: Dynamic braking
- Brake Type: COMPACT Brake
- Acceleration/Deceleration: 2.50 seconds (default)
- Motor overload protection: Bimetal switch (option)
- Protection: IP-55 (NEMA 3R type enclosure)
- Approvals: CSA "C" and "US"

24.2.5.1 Travel Speeds – Variable Frequency Drive

The inverter can be programmed to achieve a wide range of SLOW and FAST travel speeds. The default travel speed of the TMU VFD is 65/16 fpm [20/5 m/min]. The table below shows the all the speeds available. The selection of SLOW speed and FAST speed are independent of each other.

SPEED TABLE A		TMU1 & 35 Hz Motor		SPEED TABLE B		TMU2 & 100Hz Motor	
SLOW Speed		FAST Speed		SLOW Speed		FAST Speed	
Motor Frequency	Trolley Speed fpm [m/min]	Motor Frequency	Trolley Speed fpm [m/min]	Motor Frequency	Trolley Speed fpm [m/min]	Motor Frequency	Trolley Speed fpm [m/min]
8 Hz	26 [8]	35 Hz	121 [37]	29 Hz	20 [6]	100 Hz	66 [20]
9 Hz	29.5 [9]	19 Hz	66 [20]	14 Hz	10 [3]	50 Hz	33 [10]
13 Hz	46 [14]	22 Hz	75 [23]	23 Hz	16 [5]	62 Hz	43 [13]
4 Hz	13 [4]	20 Hz	69 [21]	10 Hz	6.5 [2]	54 Hz	36 [11]
15 Hz	53 [16]	28 Hz	95 [29]	32 Hz	20 [6]	80 Hz	53 [16]
5 Hz	16 [5]	21 Hz	72 [22]	12 Hz	6.5 [2]	58 Hz	40 [12]
6 Hz	20 [6]	23 Hz	79 [24]	16 Hz	10 [3]	66 Hz	43 [13]
7 Hz	23 [7]	25 Hz	85 [26]	18 Hz	13 [4]	70 Hz	46 [14]
19 Hz	66 [20]	41 Hz	141 [43]	50 Hz	33 [10]	115 Hz	75 [23]**
10 Hz	33 [10]	26 Hz	89 [27]	20 Hz	13 [4]	75 Hz	49 [15]
11 Hz	40 [12]	30 Hz	102 [31]	26 Hz	16 [5]	85 Hz	56 [17]
12 Hz	43 [13]	32 Hz	112 [34]	35 Hz	23 [7]	90 Hz	59 [18]
14 Hz	49 [15]	33 Hz	115 [35]	38 Hz	26 [8]	95 Hz	62 [19]
16 Hz	56 [17]	37 Hz	128 [39]	41 Hz	26 [8]	105 Hz	69 [21]**
17 Hz	59 [18]	39 Hz	135 [41]	44 Hz	29.5 [9]	110 Hz	72 [22]**
18 Hz	62 [19]	42 Hz	144 [44]	47 Hz	33 [10]	120 Hz	79 [24]**

** These speeds are available only from a 460V or 575V/60Hz power supply.



24.2.5.2 Technical Characteristics of the Inverter

Technical Characteristics	Description
Power range	0.75 kW
Supply voltage*	380 – 480 VAC ±10%
Nominal supply frequency	48 – 62 Hz
Nominal current	2.4 A
Digital control	S1, S2, DI3
Max output voltage	Equal to supply voltage
Control voltage range	48 or 115 VAC ±10%
Ambient temperature	-10 °C to 50 °C 14 °F to 122 °F
Humidity	95% N. C. (without dripping)
Degree of protection	Inverter + inverter cover IP20
Dimensions (W x H x D)	5.24 x 3.62 x 2.36 in. [133 x 92 x 60 mm]
Altitude	Output current must be reduced 1% for every 100 m over 1000 m. For heights over 3000 m, consult factory.
Pollution degree	Pollution degree 2 according to NEMA ICS-1, IEC664 and UL840
Vibration	IEC68-2-6
Shock	IEC68-2-27

24.2.5.3 Ramp Time Selections

Acceleration/deceleration ramp time	
2.5 sec (default)	The default setting for the acceleration and deceleration ramp time is 2.5 seconds. The acceleration ramp time always equals the deceleration ramp time.
3.5 sec	
3.0 sec	
5.0 sec	
4.0 sec	
4.5 sec	
5.5 sec	

24.2.5.4 Speed Control Mode

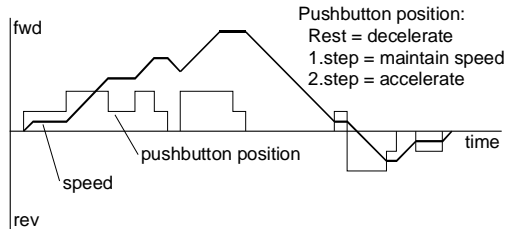
Multi-Speed Control Mode (MS-2)

The TMU VFD features 2-step Multi-Speed Control Mode and dynamic braking stopping method.

- ❑ S1 input is RUN Forward. Frequency output increases to frequency set by DIP switch S2. Operation continues at this frequency (minimum speed).
- ❑ S2 input is RUN Reverse. Frequency output increases to frequency set by DIP switch S2. Operation continues at this frequency (minimum speed).
- ❑ SP2 input/second speed command. Frequency (speed) output increases to frequency set by DIP switch S1. Operation continues at this frequency (maximum speed).
- ❑ Upon removal of SP2 input/second speed command, the frequency (speed) output decreases to frequency set by DIP switch S2. Operation continues at this frequency (minimum speed).
- ❑ Upon removal of S1 input and S2 input (Run Forward/Reverse), the stopping method is Decelerate to Stop. Output frequency decreases and the inverter decelerates to zero. Then the brake sets.

Two-step Infinitely Variable Speed Control (EP-2)

The TMU VFD features Two-step Infinitely Variable Speed Control and decelerates to a stop using dynamic braking.



- ❑ S1 input is RUN Forward. Frequency output increases to frequency set by DIP switch S2. Operation continues at this frequency (minimum speed).
- ❑ S2 input is RUN Reverse. Frequency output increases to frequency set by DIP switch S2. Operation continues at this frequency (minimum speed).
- ❑ AP input is acceleration. Frequency (speed) output increases. The longer this contact is closed, the higher the speed output becomes. Limited only by the setting if DIP switch S2.
- ❑ During running S1 input and S2 input are Hold speed. Frequency output remains constant.
- ❑ Upon removal of S1 input and S2 input (RUN Forward/Reverse), the stopping method is Decelerate to STOP. Output frequency decreases and the inverter decelerates to zero. Then the brake sets.

24.2.6 Configurations of TMU Two-speed Motor

Hoist compatibility with Trolley Type and TMU Two-speed Motor

Hoist	Fall	Capacity	Trolley Type	Trolley Drive	Motor Type
LM05	1 & 2 falls	≤ 1 ton [1000 kg]	C1	TMU Two-speed	MF06MK104
LM10	1 fall				
LM10	2 fall	> 1 ton [1000 kg]	C2		
LM16	1 & 2 falls	≤ 3 ton [3000 kg]	C3 or C5 See C type trolley section to determine configuration		
LM20	1 fall				
LM25	1 fall				
LM20	1 fall	≤ 3 ton [3000 kg]			
LM25	1 fall	≤ 3 ton [3000 kg]			
LM20	2 falls	> 3 ton [3000 kg]			
LM25	2 falls				

24.2.7 Specifications of TMU Two-speed Motor

The trolley control panel is mounted directly to the motor.

- Main power supply: 208, 230, 460 or 575V/60 Hz, 400V/50 Hz,
- Control voltage: 115 VAC (48V optional; std. with 400V)
- Speed control: Two-speed
- Brake Type: D.C. Disc Brake
- Motor overload protection: Bimetal switch (option)
- Protection: IP-55 (NEMA 3R type enclosure)
- Approvals: CSA “C” and “US”

24.2.7.1 Travel Speed – Two-speed Drive

The travel speed of the two-speed motor is 80/20 fpm [25/5 m/min]. For alternate travel speeds, use the TMU Variable Frequency drive.



24.3 TMU Inverter Motor Data

Motor code		MF06MK200		MF06MK200
Speed control		inverter		inverter
Inverter supply voltage		380-480V	440-480V	380-480V
Motor voltage		400 V	460 V	400 V
Motor Frequency		100 Hz	120 Hz	35 Hz
Brake type		COMPACT	COMPACT	COMPACT
Synchronous speed	RPM	3000	3600	1050
Brake torque	lb-ft	1.474	1.474	1.474
Brake torque	Nm	2	2	2
Starting torque	Nm	3.0	2.9	5.4
Electric braking torque	Nm			
Starting current	A	4.2	4.3	2.3
Maximum torque	Nm	3.0	2.9	5.4
Speed at max. torque	RPM	0	0	0
80% of max. torque	Nm	2.4	2.4	4.3
Speed at 80% torque	RPM	2200	2600	750
Current at 80% torque	A	2.1	2.1	3.0
Inertia	kgm ²	0.0004	0.0004	0.0007
Inertia with flywheel	kgm ²			
Power factor, starting		0.72	0.70	0.71
Weight with fan	kg			
Weight	kg	10	10	10
No-load current	A	1.0	1.0	1.0
Iron losses	W			
Stator resistance at 20 °C	Ω	34	34	88
Speed	RPM			
Power	kW			
Current	A			
Starting burden	kgm ² /h			
Power factor				
Efficiency				
Speed	RPM	2855	3430	965
Power	hp	0.4	0.5	0.2
Power	kW	0.3	0.37	0.15
Current	A	1.2	1.2	1.1
Starting burden	kgm ² /h			
Power factor		0.57	0.59	0.50
Efficiency		0.65	0.65	0.60



24.4 TMU Two-speed Motor Data

Motor code		MF06MK200		MF06MK200		MF06MK104		MF06MK104		MF06MK104	
Speed control		2-speed		2-speed		2-speed		2-speed		2-speed	
Motor voltage		208 V		230 V		400 V		460 V		575 V	
Motor Frequency		60 Hz		60 Hz		50 Hz		60 Hz		60 Hz	
Brake type		DC		DC		DC		DC		DC	
Synchronous speed	RPM	3600	900	3600	900	3000	750	3600	900	3600	900
Brake torque	lb-ft	1.474	1.474	1.474	1.474	1.474	1.474	1.474	1.474	1.474	1.474
Brake torque	Nm	2	2	2	2	2	2	2	2	2	2
Starting torque	Nm	2.2	1.7	2.2	1.7	2.2	1.7	2.2	1.8	2.2	1.8
Electric braking torque	Nm						5.6/2.0		5.6/2.0		5.6/2.0
Starting current	A	8.6	2.5	7.8	2.2	3.5	1.0	3.9	1.1	3.1	0.9
Maximum torque	lb-ft	1.6214	1.3266	1.6214	1.3266	1.6214	1.3266	1.6214	1.3266	1.6214	1.3266
Maximum torque	Nm	2.2	1.8	2.2	1.8	2.2	1.8	2.2	1.8	2.2	1.8
Speed at max. torque	RPM	2750	550	2750	550	2150	400	2750	550	2750	550
80% of max. torque	Nm	1.7	1.4	1.7	1.4	1.7	1.4	1.7	1.4	1.7	1.4
Speed at 80% torque	RPM	3080	740	3080	740	2500	570	3080	740	3080	740
Current at 80% torque	A										
Inertia	kgm ²	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
Inertia with flywheel	kgm ²										
Power factor, starting						0.94	0.93	0.91	0.92		
Weight with fan	kg										
Weight	kg	10.5		10.5		10.5		10.5		10.5	
No-load current	A	2	1.8	1.8	1.6	0.9	0.8	0.9	0.8	0.7	0.7
Iron losses	W										
Stator resistance at 20 °C	Ω					69	280	69	280	69	280
Speed	RPM										
Power	kW										
Current	A										
Starting burden	kgm ² /h										
Power factor											
Efficiency											
Speed	RPM	3400	810	3400	810	2800	690	3400	810	3400	810
Power	hp	0.5	0.09	0.5	0.09	0.3	0.05	0.5	0.09	0.5	0.09
Power	kW	0.37	0.07	0.37	0.07	0.3	0.05	0.37	0.07	0.37	0.07
Current	A	2	2	1.8	1.6	1.0	0.8	0.9	0.9	0.7	0.7
Starting burden	kgm ² /h					1.5		1.0			
Power factor						0.7	0.77	0.74	0.78		
Efficiency		0.67	0.12	0.67	0.12	0.67	0.12	0.67	0.12	0.67	0.12