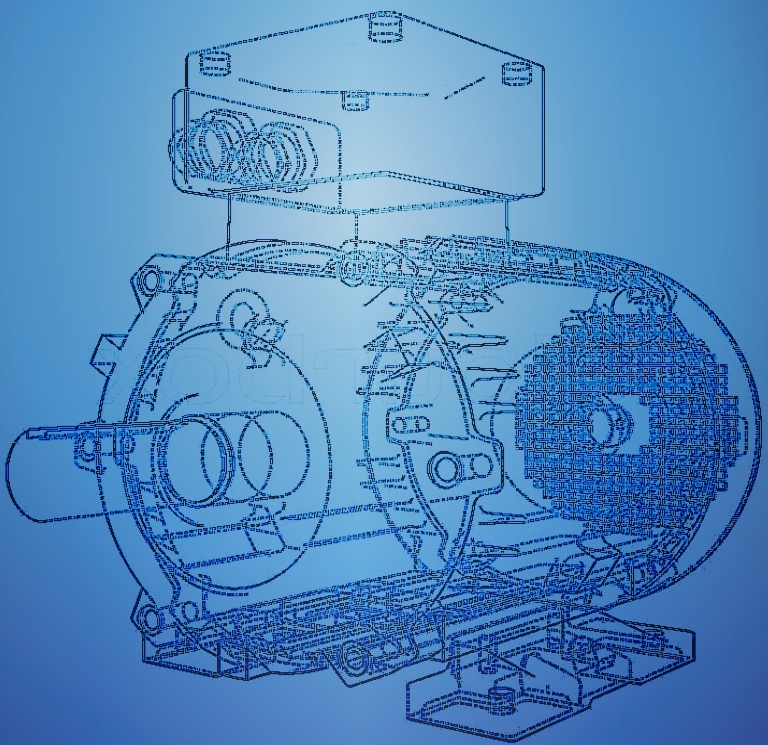
ROTOMAQ

CAST IRON MOTORS

Premium Efficiency IE3



RotoMaq MOTORS

INTRODUCTION

The main dimensions and rated outputs of RotoMaq type RMC motors generally conform to International Standards IEC60034, IEC60072 and Australian Standard AS1359 for efficiency IE3.

RMC motors provide premium efficiency IE3 and are helping to reduce CO2 levels each year but also for reducing the cost of a motor over its lifecycle

Design of Premium Efficiency Motors needs special knowledge, experience and test facilities, equipped with precision instrumentation. The task of design is, to get the efficiency up by minimizing and balancing the single losses, especially those created in the stator coils, the stator iron and the losses within the rotor by slip

Standard RMC motors are three phase squirrel cage TEFC (Totally Enclosed Fan Cooled), with IEC frame sizes from 71 to 355, with CENELEC frame allocation as standard. They combine excellent electrical characteristics with the robust strength of cast iron.

The standard design includes single speed 2,4,6 and 8 pole

All units are supplied with F Class insulation, with temperature rise being limited to less than 80K (unless otherwise marked). This provides the end user with a wide safety margin under general operating conditions.

In addition we also offer motors wound with H Class insulation, and temperature rise still limited to 80K

RMCH - High ambient temperature application

RMCHS - H Class smokespill application

Additional protection is provided by installation of thermistors in all units from 160 frame upward to continuously protect the winding.

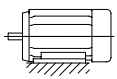
The conservative rating of RotoMaq type RMC motors provides additional operational safeguards, ensures long unit life, and renders this series inherently suitable for most arduous mining, industrial or agricultural applications.

In addition to the standard design, the range includes for request: 2 speed motors, Brake motors - RMCB, Cooling tower motors - RMCC, Pad mount motors - RMCP and motors with airstream rated for axial flow fans - RMCR

MECHANICAL DESIGN

MOUNTING POSITIONS

Foot mount



B3 (IM1001)

V5 (IM1011)

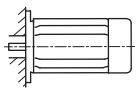
V6 (IM1031)

B6 (IM1051)

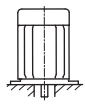
B7 (IM1061)

B8 (IM1071)

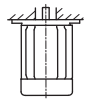
Large flange



B5 (IM3001)

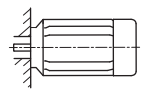


V1 (IM3011)

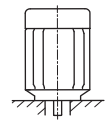


V3 (IM3031)

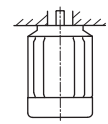
Small flange (face)



B14 (IM3601)

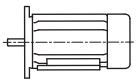


V18 (IM3611)

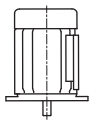


V19 (IM3631)

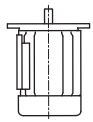
Large flange and feet



B3/B5 (IM2001)

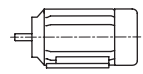


V1/V5 (IM2011)

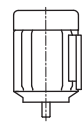


V3/V6 (IM2031)

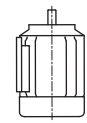
Small flange (face) and feet



B3/B14 (IM2101)



V5/V18 (IM2111)



V6/V9 (IM2131)

Note: Bearing arrangement may require review for vertical shaft mounting

MOTOR PROTECTION

Protective covers

Motors to be mounted with the shaft vertically down must be provided with a suitable cover (available on request) to ensure foreign bodies are prevented from entering the motor.

Special care is necessary in fitting protective covers to ensure air flow is not impeded

To maintain IP rating, special additional measures may be required to protect the motor against the ingress of water or foreign bodies. Please contact RotoMaq Motors for further information.

Against solar radiation

High solar radiation will result in undue temperature rise.

In these circumstances motors should be screened from solar radiation by placement of adequate sunshades which do not inhibit air flow.

Degree of protection

Standard levels of enclosure protection for all RMC frame sizes for both motor and terminal box is IP55 with IP56, IP65 and IP66 available on request.

Enclosure designations comply with IEC or AS60529. The enclosure protection required will depend upon the environmental and operational conditions within which the motor is to operate.

IP standards explanation

IP	5	5
	1	2

International protection rating prefix

First characteristic numeral	*Second characteristic numeral*
4 = Protected against solid object greater than 1.0 mm: Wires or strips of thickness greater than 1.0 mm, solid objects exceeding 1.0 mm	**4** = Protected against splashing water: Water splashed against the enclosure from any direction shall have no harmful effect
5 = Dust protected: Ingress of dust is not totally prevented but it does not enter in sufficient quantity to interfere with satisfactory operation of the equipment.	**5** = Protected against water jets: Water projected by a nozzle against the enclosure from any direction shall have no harmful effect.
6 = Dust tight: No ingress of dust.	**6** = Protected against heavy seas: Water from heavy seas or water projected in powerful jets (larger nozzle and higher pressure than second numeral 5) shall not enter the enclosure in harmful quantities.

MATERIALS AND CONSTRUCTION

Frame size	Frame	Endshields	Terminal Box	Fan	Fan Cowl	Fasteners
71 - 180	Cast iron	Cast iron	Cast iron	Plastic (alloy available) (cast iron available)	Sheet steel	Corrosion protected
200 - 235	Cast iron	Cast iron	Cast iron	Sheet steel blade mounted on cast iron carrier	Sheet steel	Corrosion protected

Shaft

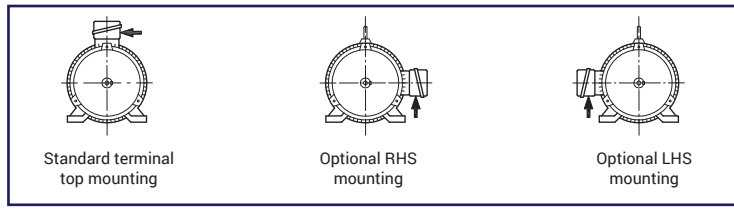
RMC motors have standard shaft extension lengths and are provided with standard key, and drilled and tapped hole.
Non standard shaft extensions are available upon special order, with shaft design outlined on a detailed drawing.
Shaft extension run out, concentricity and perpendicularity to face of standard flange mount motors, comply with normal grade tolerance as specified in IEC 60072-1 .
Precision grade tolerance is available upon special order.

Finish

Standard RMC motor color is RAL 5008. Other colors are also available. All castings and steel parts are provided with a prime coat of rust-resistant paint.
The finishing coat of enamel paint is sufficient for normal conditions, however special paint systems can be provided to accommodate stringent requirements for motors in corrosive environments.
Different colors and paint systems apply for varieties as described later in this catalogue

TERMINAL BOX

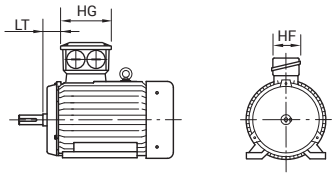
Rotomaq motors have a cast iron terminal box with a one piece nitrile rubber barrier gasket between terminal box and motor, and a flat gasket under the terminal box lid.
As standard the terminal box is the top mounting. Motors are also available with terminal boxes on the left hand side or on the right hand side.



Indicates conduit entry position

Conduit entries for motor frame sizes 71 to 280 are provided tapped, with thread details set out below.

Motor frame sizes 315 and 355 are provided with a blank removable gland plate for machining as required



Motor frame	Dimensions			Entry/pitch		Number of entries
	HF	HG	LT	Standard	Alternative*	
71	135	127	20	M20 x 1.5	M20 x 1.5	2
80[3)]	127	135	40	M20 x 1.5	M20 x 1.5	2
90S[3)]	127	135	45	M20 x 1.5	M20 x 1.5	2
90L[3)]	127	135	60	M20 x 1.5	M20 x 1.5	2
100L	135	127	75	M20 x 1.5	M20 x 1.5	2
112M	135	127	80	M25 x 1.5	M25 x 1.5	2
132S	135	127	100	M25 x 1.5	M25 x 1.5	2
132M	135	127	120	M25 x 1.5	M25 x 1.5	2
160M	200	175	65	M32 x 1.5	M25 x 1.5	2
160L	200	175	90	M32 x 1.5	M25 x 1.5	2
180M	200	175	65	M40 x 1.5	M32 x 1.5	2
180L	200	175	65	M40 x 1.5	M32 x 1.5	2
200	240	195	55	M50 x 1.5	M32 x 1.5	2
225	240	195	90	M50 x 1.5	M40 x 1.5	2
250	270	235	95	M50 x 1.5	M40 x 1.5	2
280	270	235	90	M50 x 1.5	M50 x 1.5	2
315	355	300	90	10 mm Gland plate	M63 x 1.5	Nil/2
355	355	300	125	10 mm Gland plate	M63 x 1.5	Nil/2

* Supplied as standard in South Africa.

1) Dimension LT should be confirmed for optional LHS

2) Frame 71 only available with top mounted terminal box

3) Conduit entry faces to rear of motor for frames 80 & 90

High capacity bearings

For frame sizes 200 to 280 in applications with increased radial force, cylindrical roller bearings can be substituted for ball bearings at the drive end, according to the accompanying table. When a roller bearing is fitted to the D-end, the N-end ball bearing is locked with a circlip to prevent axial movement. Note that the use of roller bearings is not recommended for 2 pole motors.

Permissible radial force - high capacity

			Permissible radial force [N]		
Motor frame	D-end Roller	N-end Ball	4 pole	6 pole	8 pole
200	NU312	6312	5825	6730	7455
225	NU313	6313	6015	7055	7740
250	NU314	6314	7295	8420	9315
280	NU317	6317	13445	15320	16770

Lubrication

RMC motors standard bearings are lubricated with lithium based rolling contact bearing grease suitable for operation within the cooling air temperature range of -20°C to +55°C. For operation outside this temperature rangespecial lubricants are required

Special lubricants or additional maintenance may be required in the case of motors exposed to comparatively high degrees of pollution, high humidity, increased or changed bearings loads, or prolonged continuous operation.

Permissible radial and axial forces – standard B3 mounted motors

Motor frame	Bearing		Permissible radial force [N]				Permissible axial force [N]			
	D-end	N-end	2 pole	4 pole	6 pole	8 pole	2 pole	4 pole	6 pole	8 pole
71	6202-2ZR	6202-2ZR	320	380	-	-	235	320	-	-
80	6204-2ZR	6204-2ZR	465	595	685	-	395	540	650	-
90	6205-2ZR	6205-2ZR	490	620	720	-	415	570	685	-
100	6206-2ZR	6206-2ZR	700	885	1030	1140	570	775	940	1075
112	6306-2ZR	6306-2ZR	960	1230	1415	1575	785	1590	1305	1515
132	6308-2ZR	6308-2ZR	1410	1815	2095	2320	1160	2030	1910	2200
160	6309-2ZR	6309-2ZR	1825	2345	2710	3020	1470	2700	2450	2800
180	6311-2ZR	6311-2ZR	2495	3200	3765	4200	1985	3055	3265	3755
200	6312	6312	2905	3745	4345	4825	2220	3385	3705	4225
225	6313	6313	3265	4010	4725	5205	2460	4120	4120	4730
250	6314*	6314	3570	4635	5370	5960	2730	3775	4560	5220
280-2	6314	6314	3455				2605			
280-4,6,8	6317	6317		8170	9360	10270		4560	5580	6365
315-2	6316	6316	3550				2730			
315-4,6,8	NU319	6319		15720	17925	19660		4835	5890	6770
355-2	6317	6317	3760				2875			
355-4,6,8	NU322	6322		22125	25350	27860		6115	7390	8530

Recommended Grease Replenishment Intervals (Hours) [1)]

Bearing number [2)]	Bearing bore [mm]	Qty of grease [g]	3000 r/min		1500 r/min		1000 r/min		750 r/min	
			Ball	Roller	Ball	Roller	Ball	Roller	Ball	Roller
6312/NU312	60	20	3800	1900	10100	5050	16000	8000	20000	10800
6313/NU313	65	25	3400	1700	9400	4700	15100	7500	20000	10300
6314/NU314	70	30	3000	1500	8800	4400	14300	7150	19500	9750
6315/NU315	75	30	2570	1285	8200	4100	13500	6750	18500	9250
6316/NU316	80	35	2200	1100	7600	3800	12800	6400	17700	8850
6317/NU317	85	40	1800	900	7100	3550	12100	6050	16800	8400
6318/NU318	90	45	1650	825	6600	3300	11500	5750	16000	8000
6319/NU319	95	45	1500	750	5700	2850	9000	4500	14600	7300
6322/NU322	110	60	1200	600	4800	2400	8300	4150	13400	6700

1) Based on maximum grease service life of 20,000 hours

2) Refer to Nameplate / Motor to confirm Bearing size

VIBRATION, BALANCING AND NOISE

Vibration

RMC motors fall within the limits of vibration severity set out in standard IEC 60034-14 which are listed below. As specified in the standard, these values relate to rotating machinery measured in soft suspension.

Vibration severity limit, Level N

Motor frame	71	80	90	100	112	132	160	180	200	225	250	280	315	355
Maximum RMS vibration velocity [mm/s]	1.6	1.6	1.6	1.6	1.6	1.6	2.2	2.2	2.2	2.2	2.2	2.2	2.8	2.8

Balancing

Rotors have been dynamically balanced with a half key. Pulleys or couplings used with motors must also be appropriately balanced.

Noise

Noise levels for RMC motors comply with limits set by IEC 60034.9 and AS1359.109. RMC sound pressure levels at 1 metre (Data relates to motors tested at no load) are set out in the table (above right).

Sound pressure level

	Out put [kW]	0.37	0.55	0.75	1.1	1.5	2.2	3.0	4.0	5.5	7.5	11	15	18.5	22	30	37	45	55	75	90	110	132	160	200	220	250	250	315
Sound pressure level dB (A) at 1 metre	3000 r/min	-	-	65	65	69	69	72	72	76	76	80	80	80	85	87	87	89	89	91	91	92	92	92	92	95	95	95	95
	1500 r/min	61	61	61	61	61	63	63	67	68	71	72	74	74	74	76	76	76	78	81	81	84	86	87	89	92	92	92	92
	1000 r/min	57	57	59	60	60	60	64	64	68	68	70	70	70	70	73	73	76	76	78	78	79	80	85	85	88	88	88	-
	750 r/min	-	-	-	56	56	56	59	59	65	65	65	67	67	68	70	70	70	74	76	76	76	77	82	82	-	-	-	-

ELECTRICAL DESIGN

As standard, RMC motors have the following design and operating parameters. Performance data is based on this standard. Any deviation should be examined and performance values altered in accordance with the information provided in this section.

Three phase, 380V, 50Hz
Ambient cooling air temperature, 40°C

- Altitude : 1000m
- Duty cycle : S1 (continuous)
- Rotation :Clockwise viewed from drive end
- Connection:
  - 220 volt Delta/380volt Star (3kW and below)
  - 380 volt Delta/660 volt Star (4kW and above)

VOLTAGE AND FREQUENCY

RotoMaq motors are designed for a power supply of three phase 380V, 50Hz. Motors can be manufactured for any supply between 100V and 1100V and frequencies other than 50Hz.

Standard motors wound for a certain voltage at 50Hz can also operate at other voltages at 50Hz and 60Hz without modification, subject to the changes in their data (see table right)

Motor wound for 50Hz at rated voltage	Connected to		Data in percentage of values at 50Hz and rated voltage						
			Output	r/min	I_N	I_L/I_N	T_N	T_L/T_N	T_B/T_N
380V	400V	50Hz	100	100	95	110	100	110	110
	380V	60Hz	100	120	98	83	83	70	85
	400V	60Hz	105	120	98	90	87	80	90
	415V	60Hz	110	120	98	95	91	85	93
	440V	60Hz	115	120	100	100	96	95	98
	460V	60Hz	120	120	100	105	100	100	103
400V	380V	50Hz	100	100	105	91	100	90	90
	415V	50Hz	100	100	96	108	100	108	108
	400V	60Hz	100	120	98	83	83	70	85
	415V	60Hz	104	120	98	89	86	75	88
	440V	60Hz	110	120	98	95	91	85	93
	460V	60Hz	115	120	100	100	96	93	98
	480V	60Hz	120	120	100	105	100	100	103
415V	380V	50Hz*	100	100	109	84	100	84	84
	400V	50Hz	100	100	104	93	100	93	93
	440V	50Hz	100	100	94	112	100	112	112
	415V	60Hz	100	120	98	83	83	70	85
	440V	60Hz	105	120	98	90	87	80	90
	460V	60Hz	110	120	98	95	91	85	94
	480V	60Hz	115	120	100	100	96	95	98
525V	550V	50Hz	100	100	95	110	100	110	110
	525V	60Hz	100	120	98	83	83	70	85
	550V	60Hz	105	120	98	90	87	80	90
	575V	60Hz	110	120	98	95	91	85	94
	600V	60Hz	115	120	100	100	96	95	98

* Not applicable for motors with F class temperature rise.

Note: This table is not applicable for hazardous area motors

I_N = Full load current

T_N = Full load torque

I_L/I_N = Locked rotor current/ full load current

T_L/T_N = Locked rotor torque/ full load torque

B/T_N = Breakdown torque/ full load torque

Standard torque values for alternative supplies are obtainable only with special windings. For these purpose-built motors the performance data is the same as for 380V motors except for the currents which are calculated with the accompaying formula:

$$I_X = \frac{380 \times I_N}{U_X}$$

Where:

I_X = Current
I_N = Full load current at 380 volt
U_X = Design voltage

TEMPERATURE AND ALTITUDE

Rated power specified in the performance data tables apply for standard ambient conditions of 40°C at 1000m above sea level. Where temperature or altitude differ from the standard, multiplication factors in the table below should be used.

Ambient temperature [°C]	30	35	40	45	50	55	60
Temperature factor	1.06	1.03	1.00	0.97	0.93	0.88	0.82

Altitude above sea level [m]	1000	1500	2000	2500	3000	3500	4000
Altitude factor	1.00	0.98	0.94	0.91	0.87	0.82	0.77

Effective Power =Rated Power x Temperature Factor x Altitude Factor

Example 1

Effective Power required = 15kW
Air temperature = 50°C (factor 0.93)
Altitude = 2500 metres (factor 0.91)

Rated power required $= \frac{15}{0.93 \times 0.91} = 17.7\text{kW}$

The appropriate motor is one with a rated power above the required, being 18.5kW.

Example 2

Effective Power required = 15kW
Air temperature = 50°C (factor 0.93)
Altitude = 1500 metres (factor 0.98)

Effective power = 11 x 0.93 x 0.98 = 10.0kW

ROTATION

Terminal box location (view from drive end)	Direction of rotation	Sequential connection of L1, L2 and L3
Right or Top (Standard motors)	Clockwise Counter-clockwise	U1 V1 W1 V1 U1 W1
Left (Non-standard motors)	Clockwise Counter-clockwise	V1 U1 W1 U1 V1 W1

DUTY CYCLES

RMC motors are supplied suitable for S1 operation. When the motor is to operate under any other type of duty the following information should be supplied to determine the correct motor size:

- Type and frequency of switching cycles as per duty factors S3 to S7 and duty cycle factor.
- Load torque variation during motor acceleration and braking (in graphical form).
- Moment of inertia of the load on the motor shaft.
- Type of braking (eg mechanical, electrical through phase reversal or DC injection)

Permissible output

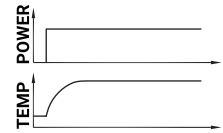
Apply the factors in the accompanying table to the output rating for motors with duty cycles that are not continuous.

		Short-time duty, S2			Intermittent duty , S3							
		30 min		60 min	15%		25%		40%		60%	
Poles		2	4 to 8	2 to 8	2	4 to 8	2	4 to 8	2	4 to 8	2	4 to 8
Duty cycle factor	For frames 80 to 132	1.05	1.10	1.00	1.15	1.40	1.10	1.30	1.10	1.20	1.05	1.10
	For frames 160 to 250	1.20	1.20	1.10	1.45	1.40	1.30	1.25	1.10	1.08	1.07	1.05
	For frames 280 to 355	1.20	1.20	1.10	1.40	1.40	1.30	1.30	1.20	1.20	1.10	1.10

For other duties (S4, S5, S6 and S7) contact RotoMaq for appropriate duty cycle factors

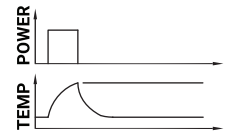
S1 Continuous duty

Operation at constant load of sufficient duration for thermal equilibrium to be reached.



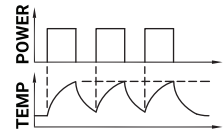
S2 Short - time duty

Operation at constant load during a given time, less than that required to reach thermal equilibrium, followed by a rest (de-energised) period of sufficient duration to allow machine temperatures to reduce to within 2K of the rated inlet coolant temperature



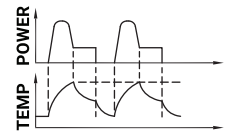
S3 Intermittent periodic duty with insignifcant starting time

A sequence of identical duty cycles where each consists of a period of operating at constant load and a period at rest. The cycle is such that the starting current does not significantly affect the temperature rise



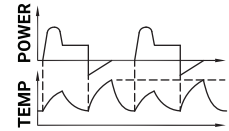
S4 Intermittent periodic duty with signifcant starting time

Sequence of identical duty cycles where each cycle consists of a significant period of starting, a period of operation at full load and a period of rest.



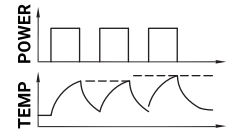
S5 Intermittent periodic duty with influence of running up period and electric braking

As S4, but with each cycle including a period of rapid electric braking



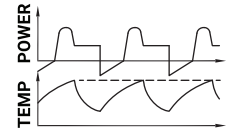
S6 Continuous periodic duty

A sequence of identical duty cycles, each cycle consisting of a period of operation at no-load. There is no rest or de-energised period



S7 Continuous periodic duty with starting and electric braking

As S6, with each cycle including a period of starting and a period of electric braking starting current does nosignificantly affect the temperature rise.



CONNECTION

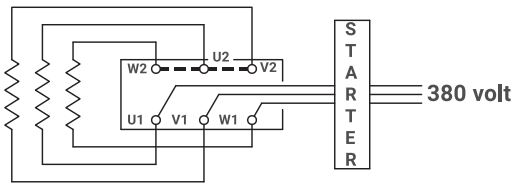
A motor's rated voltage must agree with the power supply line-to-line voltage. Care must therefore be taken to ensure the correct connection to the motor terminals.

Internal connections, voltages and VF drive selection

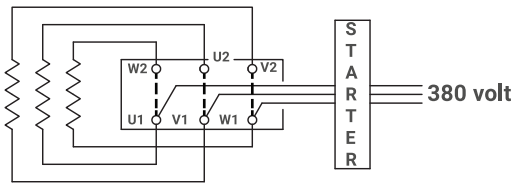
Standard terminal connections for motors 3.0kW and below is 220V delta / 380V star. These motors are designed for 380V Direct On Line (D.O.L.) starting, when connected in the star configuration.
They are also suitable for operation with 220V three phase variable frequency drives, when connected in the delta configuration.

Standard terminal connections for motors 4.0kW and above is 380V delta / 660V star. These motors are designed for 380V Direct On Line (D.O.L.) starting, when connected in the delta configuration.
They are also suitable for operation with 415V three phase variable frequency drives. Alternatively they can be operated D.O.L. in the star configuration from a 660V supply or with a 660V variable frequency drive. In this case the drive must be supplied with an output reactor to protect the winding insulation. These size motors are also suitable for 380V star-delta starting as described below.

Motor connected for D.O.L. starting with bridges in place for star connection (3.0kW and below)



Motor connected for D.O.L. starting with bridges in place for delta connection (4.0kW and above)



STARTING

All of the following starter options are available through division, and are best supplied together with the motor.

D.O.L. Starters

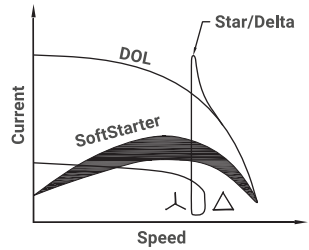
When an electric motor is started by direct connection to the power supply (D.O.L.), it draws a high current, called the 'starting current', which is approximately equal in magnitude to the locked rotor current IL. As listed in the performance data, locked rotor current can be up to 8 times the rated current IN of the motor. In circumstances where the motor starts under no load or where high starting toque is not required, it is preferable to reduce the starting current by one of the following means.

Star - Delta starting

RMC motors 4.0kW and above are suitable for the star-delta starting method. Through the use of astar-delta starter, the motor terminals are connected in the star configuration during starting, and reconnected to the delta configuration when running.
The benefits of this starting method are a significantly lower starting current, to a value about 1/3 of the D.O.L. starting current, and a corresponding starting torque also reduced to about 1/3 of its D.O.L. value. It should be noted that a second current surge occurs on changeover to the delta connection. The level of this surge will depend on the speed the motor has reached at the moment of changeover

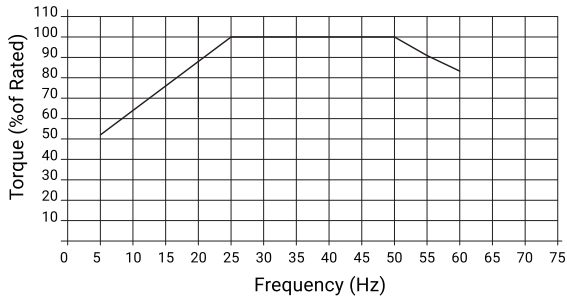
Electronic soft starters

Through the use of an electronic soft starter, which controls such parameters as current and voltage, the starting sequence can be totally controlled. The starter can be programmed to limit the amount of starting current. By limiting the rate of the current increase the startup time is extended. This starting method is particularly suitable for centrifugal loads (fans and pumps).



VVVF Drives

The RMC motor performs excellently without cogging at low speed when operating in conjunction with a VVVF (Variable Voltage Variable Frequency) drive.
VVVF drives are primarily recognized for their ability to manipulate power from a constant 3 phase 50/60Hz supply converting it to variable voltage and variable frequency power. This enables the speed of the motor to be matched to its load in a flexible and energy efficient manner. The only way of producing starting torque equal to full load torque with full load current is by using VVVF drives.
The functionally flexible VVVF drive is also commonly used to reduce energy consumption on fans, pumps and compressors and offers a simple and repeatable method of changing speeds or flow rates.
For operation below 25Hz motor cooling fan efficiency drops significantly. Hence, in constant torque applications, a separately driven cooling fan should be fitted to provide sufficient cooling of the motor.
For operation between 25Hz and 50Hz speed range the motor is capable of delivering full rated torque with its standard fan.
For operation above 50Hz, all RotoMaq motors are capable of delivering constant rated power up to 60Hz. However, most of these motors are suitable to run and deliver constant power at much higher frequencies than 60Hz to a maximum of 100Hz. In the case of applications between 60Hz and 100Hz please contact RotoMaq motors for advice on suitability.
The RotoMaq range of motors will operate without modification on VVVF drives however under certain conditions additional features should be considered (see EDM Concerns). The graph below shows the RMC motors' loadability with a frequency converter.



EDM concerns

Capacitive voltages in the rotor can be generated due to an effect caused by harmonics in the waveform causing voltage discharge to earth through the bearings. This discharge results in etching of the bearing running surfaces. This effect is known as Electrical Discharge Machining (EDM). It can be controlled with the fitment of appropriate filters to the drive.

To further reduce the effect of EDM, an insulated non drive bearing can be used. RotoMaq motors recommends the use of insulated bearings for all motors 315 frame and above

INSULATION

Standard motors are wound with F class insulation and winding designs limit the temperature rise to 80K (unless otherwise noted) for which B Class insulation would normally be sufficient. The use of F class insulation provides an additional safety margin of 25K, as shown in the accompanying table, together with an extended operating life.

Due to their conservative design many sizes in the RotoMaq range of motors have temperature rises considerably less than 80K and therefore provideeven greater safety margins.

Insulation class	B	F	H
Max. permissible winding temp. (°C)	130	155	180
Less ambient temp. (°C)	- 40	-40	-40
Less hotspot allowance (K)	- 10	-10	-15
Equals max. permissible temp.rise (K)	80	105	125
Less max. design temp. rise (K)	- 80	-80	- 80
Equals min. safety margin (K)	-	25	45

THERMAL PROTECTION

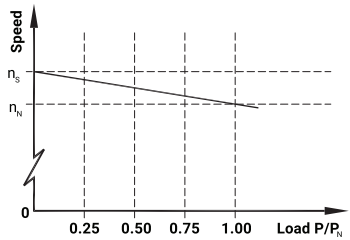
Motors can be protected against excessive temperature rise by inserting, at various positions within the windings, thermal probes which can either give a warning signal or cut off the supply to the motor in the event of a temperature abnormality.

The units fitted to RMC motors, frame sizes 160 and above, are PTC thermistors. These thermovariable resistors, with positive temperature co-efficient, are fitted one per phase, series connected and are terminated in a terminal strip located in the terminal box. Trip temperature is 160°C (180°C for RMCH series). Additional 130°C thermistors can be fitted as an option for alarm connection.

CURRENT AT PARTIAL LOADS

Speed at partial loads

The relationship between motor speed and degree of loading on an RMC motor is approximately linear up to the rated load. This is expressed graphically in the accompanying drawing.



Where

n_N = Full load speed

n_S = synchronous speed

P/P_N = partial load factor

Current at partial loads

Current at partial loads can be calculated using the following formula:

$$I_X = \frac{Pout_X}{\sqrt{3} \times U_N \times \cos_X \times \eta_X} \times 10^5$$

Where

I_X = partial load current (amps)

$Pout_X$ = partial load (kW)

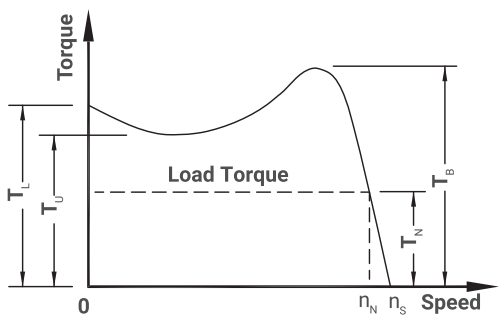
U_N = rated voltage

$\cos\varphi_X$ = partial load power factor

η_X = partial load efficiency (%)

Torque characteristics

Typical characteristics of torque behaviour relative to speed are shown in the torque speed curve example below.



Where:

T_N = full load torque

T_L = locked rotor torque

T_U = pull-up torque

T_B = break down torque

n_N = full load speed

n_S = synchronous speed

RotoMaq motors all exceed the minimum starting torque requirements for Design N (Normal torque) as specified in IEC60034-12, and in most cases meet the requirements of Design H (High torque).

Rated torque can be calculated with the following

$$T_N = \frac{9550 \times P}{n_N}$$

Where:

T_N = full load torque (Nm)

P_N = full load output power (kW)

n_N = full load speed

INSTALLATION, OPERATION AND MAINTENANCE

The RotoMaq RMC series motors are designed and manufactured to be robust and reliable with minimal maintenance. The following items should be taken into consideration to ensure a trouble free installation and reliable running throughout the motor's life.

INSPECTION

RotoMaq motors are delivered through safe and reliable transport in appropriate packing as to remain in as manufactured condition during transit. On receipt of the motor thoroughly inspect the unit for any transit damage, if need be in the presence of an insurance surveyor. Any equipment damage or shortfall should be immediately advised to the nearest RotoMaq motors office.
Check the following:

- Rating plate details and enclosure are as ordered
- Shaft turns freely (in absence of shaft locking clamp)
- Condensation drain holes are in the correct position for the motor mounting application (they should be
- located at the lowest point of the motor when it is in its operating position)
- If the winding is Insulation Resistance (IR) tested to earth, ensure that the thermal protectors are not
- inadvertently damaged. (The thermistor leads should be shorted together whilst IR testing takes place)

STORAGE

When the motor is not for immediate use store as follows:

- Clean and dry location
- Free from vibration (vibration can damage bearings)
- Shaft locking clamps, where supplied, are fitted securely
- Remove shaft locking clamps and turn rotor by one full rotation at least once a fortnight and replace shaft locking clamps
- Anti-condensation heaters, where fitted, should be energised if the environment is likely to be damp

INSTALLATION

The following items should be considered on installation to ensure reliable operation of the motor.

Surroundings

- Ensure that the motor is properly protected against ingress of oil, water or dust especially if construction
- work is in progress around the motor.
- Ensure air intake is not obstructed. Refer to dimension BL in the catalogue.
- When installing hazardous location motors, make sure that the zone and gas group or dust and temperature
- classification on motor nameplate are complied with

Mounting

- Bed plates or slide rails should be firmly fixed to a solid, level foundation to ensure the motor remains rigid and vibration free.
- Shims or packers (if required) must be of adequate size and placed adjacent to and between base fixing screws
- Protective transport coatings on shafts and/or flanges must be removed prior to connection to the driven load
- A light coating of grease to shafts and/or flanges will inhibit corrosion during service and assist removal of pulleys or couplings.

OPERATION

- Before running the motor make sure that the terminal box lid is closed and secured with appropriate clearance to live parts
- Make sure that appropriate earthing is done.
- Make sure that the coupling and/or transmission is adequately guarded for safety.
- Check the mounting bolts and/or flanges are firmly secured.
- Make sure of no loose objects around that may be sucked by the cooling fan on the motor.
- Make sure that the load applied is within the nameplate specification.
- Make sure that the ambient temperature is inside 40ºC or nameplate specification.
- Avoid frequent starting of motor. Refer to motor catalogue or nearest office for recommendation on frequency and duration of starts.
- If a VVVF drive is used on Ex nA motor, make sure that the applied load is inside the limits specified by the loadability curve shown in drawing.
- On Ex e motors, make sure that the starting method employed keeps the starting current and duration within the nameplate figures of I_A/I_N ratio and t_E time.
- Check that the running current on no load and full load are reasonably balanced within 10% of the average and record the figures in the log book for future reference. Note that the current imbalance can be higher, typically 10 times the voltage imbalance if there is an imbalance in supply voltage.
- Brake motors used in hazardous locations must have a limited number of repeat stops to 20 per hour

Number of starts per hour

The number of starts per hour is dependant on the inertia of the driven load and the load torque demand.
A guide to generally acceptable starts per hour would be as per table.
For greater number of starts per hour, please contact your nearest RotoMaq Motors office for advice

Starts per hour				
Frame	2 Pole	4 Pole	6 Pole	8 Pole
71 *	-	40	-	-
80 *	20	40	40	-
90	16	30	40	-
100	16	30	40	40
112	16	30	40	40
132	10	20	25	25
160	10	20	25	25
180	8	15	20	20
200	6	12	12	12
225	5	10	10	10
250	4	8	8	8
280	3	6	6	6
315	3	4	4	4

* 20 Starts / Hour for Ex tD brake Motors

Permitted starting time

In respect to the temperature rise of the motor, starting time (i.e., from rest to operational speed) should not exceed the time indicated in the following table. Motor must be allowed to cool prior to each start.
Note: For Ex e motors tE time stated on motor name plate takes precedence over these times

Frame	Starting method	Maximum starting time [sec]			
		2 Pole	4 Pole	6 Pole	8 Pole
71	D.O.L.	-	26	-	-
80	D.O.L	15	26	40	-
90	D.O.L.	10	15	25	-
100	D.O.L.	12	13	18	40
112	D.O.L.	10	10	18	35
132	D.O.L.	14	12	12	25
160-355	D.O.L.	15	15	20	20
160-355	Star-delta	45	45	60	60

Sealed bearings

The required replacement interval for sealed bearings is generally determined by the grease life which is dependant on operating temperature, operating speed, the limiting speed of the bearing and the type of grease. Under normal operating conditions the following relationship applies:

$$\log t = 6.54 - 2.6\frac{n}{N} - (0.025 - 0.012\frac{n}{N})T$$

Where:
t = Average grease life (hours)
n = Speed (RPM)
N = Bearing limiting speed with grease lubrication (RPM)
T = Operating temperature (°C)

Open (regreasable) bearings

It should be noted that for motors fitted with Ball and Roller bearings, the lubrication intervals for both bearings should be based on the roller bearing data.
The re-lubrication intervals recommended are calculated on the basis of normal working conditions.
Note: Under arduous conditions please contact RotoMaq motors or the bearing manufacturers catalogue.
Air operated grease guns should not be used.
Replenishment of grease media should be by means of a hand held grease gun whilst motor is running with relief plate removed

MAINTENANCE

Reliable, trouble free operation of a motor needs regular maintenance. Exact maintenance needs vary based on the site conditions. To obtain reliable service from the motor, the following maintenance schedule may be used as a guide. An authorised service agent must carry out maintenance of hazardous location motors.

A. Ensure air intake space is unobstructed.
B. On a weekly basis use an air hose to ensure all air ways are clear and free of dust.
C. Once every month, check motor for condensation. Replace drain plugs before starting if they are blocked or found missing.
D. Do not wash the motor down unless it is IP66 rated.
E. On a quarterly basis

E1. Check the motor terminals for tightness and proper contact.
E2. If terminal lug/s are discoloured, re-terminate with fresh lugs.
E3. Check operation of starting equipment, ensuring all terminations are tight.
E4. Check mechanical operation of thermal overload relays, if any.
E5. Check mechanical operation of thermistor relays, if fitted.
E6. Check operation of anti-condensation heaters, if fitted

F. On a six monthly basis, in addition to the items in 'E'

F1. Check winding resistance between supply terminals and compare to original value and enter in log book.
F2. Check supply voltage at motor terminals and record in log book.
F3. Check bearings for abnormal noise/overheating

G. On an annual basis, in addition to the items in 'E' and 'F'

G1. Re-grease the bearings as recommended in the following table. Frames 71-180 use sealed bearings. Frames 200-280 use open re-greasable bearings. When re-greasing bearings ensure that the correct type of grease is used. If in doubt about the existing grease type, clean out the old grease thoroughly from bearings and bearing housings, prior to regreasing.
WARNING: NEVER MIX GREASE OF DIFFERENT TYPES
G2. Completely disassemble stator, rotor apart and clean thoroughly.
G3. Check bearings for wear/damage – replace as necessary.
G4. Check all bolts and nuts for cracks or damage – replace as necessary.
G5. Check all holding down bolts for signs of fatigue or damage – replace as necessary.
G6. After re-assembly, check and record in the log book
Insulation resistance by megger
No load current and voltages
Full load current and voltages
Ensure that these figures compare well with the original records in the log book.
G7. Check and ensure that the cooling fan is operational

PERFORMANCE DATA

THREE PHASE 380V 50HZ, IP55, F CLASS INSULATION, B CLASS TEMPERATURE RISE

Nominal Output	Frame Size	Speed	Efficiency at % full load				Power factor at % full load				Class	Current			Torque			Moment of inertia	Weight of Foot mount motor
			125% Load	100% Load	75% Load	50% Load	125% Load	100% Load	75% Load	50% Load		Full Load I_N	Lock rotor I_L/I_N	t_E time	Full Load T_N	Lock rotor T_L/T_N	Break down T_B/T_N	$J=\frac{1}{4}GD^2$	
[kW]		[r/min]	[%]	[%]	[%]	[%]	[cosφ]	[cosφ]	[cosφ]	[cosφ]		[A]		[sec]	[Nm]			[kg*m²]	[kg]
3000 r/min = 2 poles - CENELEC frame allocations																			
0.75	80 A	2880	74.4	80.7	75.8	72.5	0.88	0.82	0.78	0.67	IE3	1.72	6.1	17	2.40	2.8	4.0	0.001	18
1.1	80 B	2895	76.7	82.7	79.2	77.2	0.89	0.83	0.82	0.72	IE3	2.43	5.9	11	3.63	2.7	3.0	0.001	20
1.5	90 S	2895	79.3	84.2	80.4	77.6	0.88	0.84	0.80	0.70	IE3	3.22	6.7	11	4.95	2.9	3.5	0.001	24
2.2	90 L	2895	79.5	85.9	82.8	81.6	0.90	0.85	0.83	0.74	IE3	4.58	6.4	6	7.26	2.8	2.8	0.001	27
3	100 L	2895	82.0	87.1	83.3	81.2	0.90	0.87	0.84	0.76	IE3	6.02	7.5	7	9.90	2.8	3.4	0.003	35
4	112 M	2915	85.3	88.1	86.1	84.2	0.90	0.88	0.84	0.75	IE3	7.84	7.9	7	13.1	2.7	3.5	0.006	42
5.5	132SA	2930	86.7	89.2	86.0	81.7	0.89	0.88	0.82	0.69	IE3	10.6	7.0	11	17.9	2.4	2.3	0.011	64
7.5	132 SB	2950	86.0	90.1	87.2	85.5	0.91	0.88	0.89	0.84	IE3	14.4	7.2	7	24.3	2.1	2.8	0.013	70
11	160 MA	2950	88.3	91.2	87.4	85.4	0.89	0.89	0.87	0.83	IE3	20.6	7.0	25	35.6	2.2	2.9	0.038	140
15	160 MB	2950	89.4	91.9	89.6	87.3	0.92	0.89	0.92	0.83	IE3	27.9	7.2	10	48.6	1.8	2.6	0.050	154
18.5	160 L	2950	90.1	92.4	90.1	88.5	0.91	0.89	0.90	0.87	IE3	34.2	7.3	10	59.9	2.3	2.9	0.055	162
22	180 M	2960	90.3	92.7	89.9	89.0	0.91	0.89	0.88	0.86	IE3	40.5	6.8	7	70.9	2.3	2.4	0.075	198
30	200 LA	2965	92.6	93.3	92.0	90.2	0.90	0.89	0.89	0.82	IE3	54.9	4.7	7	96.6	2.4	3.3	0.124	260
37	200 LB	2970	92.6	93.7	92.0	90.0	0.90	0.89	0.87	0.80	IE3	67.4	7.6	10	119	2.4	3.1	0.139	280
45	225 M	2970	93.3	94	92.3	90.2	0.90	0.91	0.88	0.83	IE3	80.8	8.3	17	144.7	2.6	2.9	0.233	330
55	250 M	2975	93.7	94.3	92.6	90.4	0.90	0.91	0.88	0.82	IE3	98.5	8.5	17	177	2.6	3.2	0.312	390
75	280S	2980	94.5	94.7	93.9	92.3	0.91	0.91	0.90	0.88	IE3	134	7.5	15	240.4	2.7	3.0	0.597	610
90	280 M	2980	94.7	95	94.2	92.1	0.91	0.91	0.91	0.88	IE3	160	7.9	12	288.4	2.8	3.1	0.675	680
110	315S	2980	95.0	95.2	93.9	92.0	0.89	0.91	0.88	0.84	IE3	195	6.6	-	352.5	2.5	3.0	1.18	960
132	315 MA	2980	95.5	95.4	94.6	93.0	0.90	0.91	0.89	0.87	IE3	234	7.0	-	423	2.6	2.9	1.82	1050
160	315 LA	2980	95.7	95.6	94.9	93.6	0.88	0.91	0.89	0.86	IE3	283	6.4	-	512.8	2.4	2.9	2.08	1080
185	315 LB	2980	95.8	95.7	95.0	93.4	0.91	0.92	0.86	0.80	IE3	326	6.6	-	592.9	2.6	2.9	2.38	1200
200	315 LC	2985	95.8	95.8	95.0	93.4	0.92	0.92	0.86	0.80	IE3	352	6.6	-	640.9	2.6	2.9	2.38	1220
220	315 LD	2985	95.8	95.8	95.2	93.7	0.90	0.92	0.86	0.81	IE3	388	6.1	-	704	2.3	2.6	2.45	1700
250	355 MA	2985	94.5	95.8	94.0	92.5	0.88	0.92	0.88	0.81	IE3	441	6.8	-	801	1.7	3.1	3.00	1720
280	355 MB	2985	94.5	95.8	94.0	92.5	0.90	0.92	0.88	0.81	IE3	493	6.8	-	896	1.7	3.1	3.00	1840
315	355 LA	2985	94.8	95.8	92.8	90.2	0.88	0.92	0.86	0.80	IE3	555	8.1	-	1008	2.8	3.0	3.50	1860
355	355 LB	2985	94.8	95.8	92.8	90.2	0.91	0.92	0.86	0.80	IE3	626	8.1	-	1136	2.8	3.0	3.50	2160
375	355 LC	2985	94.8	95.8	92.8	90.2	0.92	0.92	0.86	0.80	IE3	661	8.1	-	1200	2.8	3.0	3.50	2400

This data is provided for guidance only.

THREE PHASE 380V 50HZ, IP55, F CLASS INSULATION, B CLASS TEMPERATURE RISE

Nominal Output	Frame Size	Speed	Efficiency at % full load				Power factor at % full load				Class	Current			Torque			Moment of inertia $J=\frac{1}{4}GD^2$	Weight of Foot mount motor
			125% Load	100% Load	75% Load	50% Load	125% Load	100% Load	75% Load	50% Load		Full Load I_N	Lock rotor I_L/I_N	t_E time	Full Load T_N	Lock rotor T_L/T_N	Break down T_B/T_N		
[kW]		[r/min]	[%]	[%]	[%]	[%]	[cosφ]	[cosφ]	[cosφ]	[cosφ]		[A]		[sec]	[Nm]			[kg*m²]	[kg]
1500 r/min = 4 poles - CENELEC frame allocations																			
0.37	71B	1450	70.4	80.8	71.6	67.5	0.76	0.79	0.59	0.46	IE3	1.38	4.5	35	3.62	3.3	2.7	0.001	17
0.55	80 A	1450	71.0	80.8	72.2	68.5	0.80	0.79	0.67	0.54	IE3	1.38	4.8	25	3.62	2.5	2.6	0.002	17
0.75	80 B	1435	73.7	82.5	75.9	73.3	0.81	0.79	0.68	0.55	IE3	1.84	5.0	24	4.97	2.4	2.5	0.002	18
1.1	90 S	1435	75.2	84.1	77.9	75.1	0.83	0.80	0.71	0.58	IE3	2.61	5.4	10	7.32	2.8	2.4	0.002	25
1.5	90 L	1435	76.7	85.3	80.7	79.8	0.87	0.81	0.81	0.72	IE3	3.47	5.7	12	9.8	1.8	2.4	0.003	27
2.2	100 LA	1450	81.4	86.7	82.9	81.2	0.86	0.84	0.76	0.65	IE3	4.76	6.6	11	14.5	2.8	3.5	0.005	34
3	100 LB	1450	81.1	87.7	83.2	81.5	0.87	0.85	0.78	0.66	IE3	6.34	8.3	7	19.8	2.9	3.1	0.007	39
4	112 M	1460	84.4	88.6	85.1	83.0	0.86	0.85	0.76	0.64	IE3	8.37	7.6	7	26.2	3.1	3.5	0.010	45
5.5	132 S	1460	86.0	89.6	87.1	85.9	0.87	0.86	0.81	0.71	IE3	11.2	6.8	11	36.0	2.3	3.1	0.021	70
7.5	132 M	1460	87.0	90.4	88.4	87.4	0.88	0.87	0.83	0.74	IE3	15	7.5	9	49.1	2.6	2.9	0.030	80
11	160 M	1470	88.4	91.4	89.3	87.9	0.86	0.88	0.83	0.75	IE3	21.5	6.9	12	72.0	2.0	2.8	0.075	130
15	160 L	1470	89.3	92.1	90.1	88.8	0.87	0.89	0.83	0.76	IE3	28.8	7.2	10	97.4	2.3	2.9	0.092	150
18.5	180 M	1470	90.2	92.6	90.6	89.2	0.90	0.89	0.86	0.77	IE3	35.3	7.0	17	120	2.1	3.0	0.139	190
22	180 L	1475	91.2	93	91.9	90.8	0.91	0.89	0.85	0.76	IE3	41.8	7.7	14	142.4	2.2	3.5	0.158	210
30	200 L	1475	91.2	93.6	91.1	89.5	0.92	0.89	0.84	0.76	IE3	56.6	7.5	20	194	2.2	3.1	0.262	280
37	225 S	1480	93.3	93.9	93.4	92.2	0.91	0.89	0.89	0.84	IE3	69.6	7.2	20	239	1.8	2.9	0.406	320
45	225 M	1480	93.5	94.2	93.4	92.2	0.91	0.89	0.88	0.82	IE3	84.4	7.6	7	290	1.9	2.9	0.469	350
55	250 M	1480	93.9	94.6	93.9	92.7	0.91	0.89	0.89	0.83	IE3	103	8.2	10	354.9	2.4	3.1	0.66	450
75	280S	1485	95.2	95	94.6	93.2	0.95	0.90	0.88	0.78	IE3	138	7.7	20	482.3	2.5	3.2	1.12	600
90	280 M	1490	94.9	95.2	94.7	93.6	0.90	0.90	0.89	0.84	IE3	165	7.3	20	577	2.5	3.3	1.46	670
110	315 S	1490	94.8	95.4	94.1	92.4	0.93	0.90	0.92	0.84	IE3	199	8.2	-	705	2.3	2.8	3.11	960
132	315 MA	1490	95.2	95.6	94.4	92.9	0.92	0.90	0.90	0.85	IE3	238	8.1	-	846	2.2	2.7	3.62	1050
160	315 LA	1490	95.7	95.8	95.1	93.9	0.92	0.90	0.89	0.84	IE3	288	8.2	-	1026	2.3	2.9	4.13	1170
185	315 LB	1490	95.8	95.9	95.3	94.2	0.92	0.91	0.88	0.80	IE3	333	7.5	-	1186	2.7	3.2	4.73	1180
200	315 LC	1490	95.8	96	95.3	94.2	0.92	0.91	0.88	0.80	IE3	356	7.5	-	1282	2.7	3.2	4.73	1220
220	315 LD	1490	95.8	96	95.3	94.4	0.92	0.91	0.89	0.83	IE3	391	6.9	-	1410	2.5	2.9	4.8	1780
250	355 MA	1490	95.8	96	95.3	94.2	0.89	0.91	0.87	0.83	IE3	445	7.0	-	1602	2.1	3.0	6.5	1850
280	355 MB	1490	95.8	96	95.3	94.2	0.89	0.92	0.87	0.83	IE3	498	7.0	-	1795	2.1	3.0	6.5	1900
315	355 LA	1490	95.9	96	95.6	94.6	0.88	0.92	0.88	0.84	IE3	560	5.5	-	2019	1.5	2.9	8.2	2000
355	355 LB	1490	95.9	96	95.6	94.6	0.88	0.92	0.88	0.84	IE3	638	5.5	-	2275	1.5	2.9	8.2	2290
375	355 LC	1490	95.9	96	95.6	94.6	0.88	0.91	0.88	0.84	IE3	674	5.5	-	2404	1.5	2.9	8.2	2350

This data is provided for guidance only

THREE PHASE 380V 50HZ, IP55, F CLASS INSULATION, B CLASS TEMPERATURE RISE

Nominal Output	Frame Size	Speed	Efficiency at % full load				Power factor at % full load				Class	Current			Torque			Moment of inertia	Weight of Foot mount motor
			125% Load	100% Load	75% Load	50% Load	125% Load	100% Load	75% Load	50% Load		Full Load I_N	Lock rotor I_L/I_N	t_E time	Full Load T_N	Lock rotor T_L/T_N	Break down T_B/T_N	$J=¼GD^2$	
[kW]		[r/min]	[%]	[%]	[%]	[%]	[cosφ]	[cosφ]	[cosφ]	[cosφ]		[A]		[sec]	[Nm]			[kg*m²]	[kg]
1000 r/min = 6 poles - CENELEC frame allocations																			
0.37	80 A	940	64.3	73.5	67.6	63.4	0.77	0.72	0.60	0.48	IE3	1.09	3.4	55	3.78	1.8	4.5	0.002	17
0.55	80 B	940	64.7	77.2	68.8	64.7	0.74	0.74	0.58	0.45	IE3	1.50	3.3	40	5.59	1.4	2.1	0.002	19
0.75	90 S	950	72.8	78.9	74.1	70.7	0.78	0.73	0.63	0.50	IE3	2.03	4.6	30	7.54	2.4	2.6	0.003	27
1.1	90 L	950	72.9	81	76.6	74.8	0.81	0.75	0.70	0.57	IE3	2.83	4.5	25	11.1	2.3	2.4	0.004	30
1.5	100 L	955	76.1	82.5	77.6	74.9	0.79	0.75	0.66	0.53	IE3	3.78	5.1	8	15	2.2	3.0	0.007	39
2.2	112 M	960	78.9	84.3	80.2	77.1	0.80	0.76	0.67	0.53	IE3	5.36	5.6	12	21.9	2.7	3.0	0.014	45
3	132 S	970	83.5	85.6	84.5	82.0	0.82	0.76	0.70	0.57	IE3	7.20	6.7	12	29.5	2.3	3.2	0.029	60
4	132 MA	970	83.6	86.8	84.2	82.6	0.81	0.76	0.68	0.58	IE3	9.46	6.7	9	39.4	2.5	3.2	0.036	72
5.5	132 MB	970	84.4	88	85.9	84.3	0.84	0.77	0.76	0.64	IE3	12.7	6.9	9	54.1	2.4	3.0	0.045	77
7.5	160 M	975	87.5	89.1	88.5	87.0	0.79	0.81	0.70	0.59	IE3	16.2	6.0	20	73.5	2.2	2.6	0.088	130
11	160 L	975	88.1	90.3	89.9	89.2	0.80	0.82	0.74	0.65	IE3	23.1	5.8	16	107.7	2.2	2.4	0.116	155
15	180 L	980	88.4	91.2	89.2	87.9	0.85	0.83	0.79	0.69	IE3	30.9	6.0	20	146	2.0	2.7	0.207	180
18.5	200 LA	985	89.2	91.7	89.3	87.5	0.85	0.83	0.78	0.68	IE3	37.8	6.9	20	179	2.4	3.3	0.315	250
22	200 LB	985	89.9	92.2	91.1	90.1	0.85	0.83	0.79	0.70	IE3	44.8	6.6	15	213	2.2	3.5	0.36	284
30	225 M	985	92.3	92.9	92.6	91.4	0.87	0.85	0.84	0.77	IE3	59.1	7.2	25	291	2.1	3.0	0.547	300
37	250 M	990	92.6	93.3	92.9	91.8	0.88	0.86	0.85	0.78	IE3	71.7	6.6	25	357	2.0	3.0	0.834	384
45	280 S	990	93.1	93.7	93.3	92.1	0.88	0.87	0.87	0.80	IE3	85.8	6.9	25	434	2.0	3.1	1.39	530
55	280 M	990	92.6	94.1	93.0	91.9	0.88	0.88	0.88	0.84	IE3	103	6.6	25	531	2.0	3.2	1.65	596
75	315 S	990	94.3	94.6	93.7	92.0	0.88	0.86	0.85	0.79	IE3	143	7.1	-	723	2.1	2.9	4.11	970
90	315 MA	990	94.8	94.9	94.2	94.9	0.89	0.87	0.84	0.75	IE3	170	7.8	-	868	2.5	2.8	4.78	1100
110	315 LA	990	95.1	95.1	94.6	93.4	0.89	0.87	0.85	0.77	IE3	207	7.5	-	1061	2.9	3.1	5.45	1265
132	315 LB	990	94.9	95.4	93.9	92.2	0.88	0.88	0.82	0.72	IE3	244	7.6	-	1273	2.4	3.1	6.12	1300
160	355 MA	990	94.9	95.6	94.8	93.5	0.90	0.88	0.87	0.81	IE3	296	8.3	-	1543	2.0	2.4	9.5	1740
185	355 MB	990	94.9	95.7	94.8	93.5	0.90	0.88	0.87	0.81	IE3	342	8.3	-	1785	2.0	2.4	9.5	1870
200	355 MC	990	95.2	95.8	95.0	94.1	0.90	0.89	0.90	0.86	IE3	365	6.5	-	1929	1.5	2.0	10.4	1945
220	355 LA	990	95.0	95.8	95.0	94.0	0.88	0.89	0.87	0.84	IE3	401	6.4	-	2112	1.9	2.4	12.4	2000
250	355 LB	990	95.0	95.8	95.0	94.0	0.88	0.89	0.87	0.84	IE3	456	6.4	-	2412	1.9	2.4	12.4	2070
280	355 LC	990	95.0	95.8	95.0	94.0	0.88	0.88	0.87	0.84	IE3	516	6.4	-	2701	1.9	2.4	12.4	2200
315	355 LD	990	95.0	95.8	95.0	94.0	0.88	0.88	0.87	0.84	IE3	581	6.4	-	3039	1.9	2.4	12.4	2400

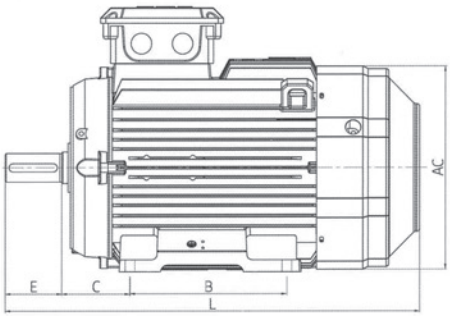
This data is provided for guidance only.
Results are guaranteed only when confirmed by test results.

THREE PHASE 380V 50HZ, IP55, F CLASS INSULATION, B CLASS TEMPERATURE RISE

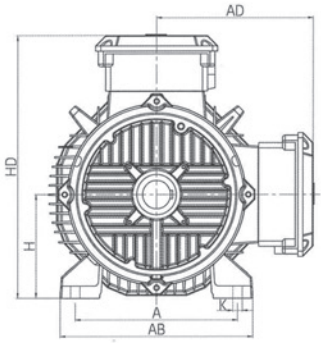
Nominal Output	Frame Size	Speed	Efficiency at % full load				Power factor at % full load				Class	Current			Torque			Moment of inertia	Weight of Foot mount motor
			125% Load	100% Load	75% Load	50% Load	125% Load	100% Load	75% Load	50% Load		Full Load I_N	Lock rotor I_L/I_N	t_E time	Full Load T_N	Lock rotor T_L/T_N	Break down T_B/T_N	$J=\frac{1}{4}GD^2$	
[kW]		[r/min]	[%]	[%]	[%]	[%]	[cosφ]	[cosφ]	[cosφ]	[cosφ]		[A]		[sec]	[Nm]			[kg*m²]	[kg]
3000 r/min = 2 poles - CENELEC frame allocations																			
0.18	80 A	650	64.3	58.7	67.6	63.4	0.77	0.63	0.60	0.48	IE3	0.76	3.4	55	2.64	1.8	4.5	0.002	18
0.25	80 B	650	64.3	64.1	67.6	63.4	0.77	0.63	0.60	0.48	IE3	0.97	3.4	55	3.67	1.8	4.5	0.002	19
0.37	80C	660	64.3	69.3	67.6	63.4	0.77	0.63	0.60	0.48	IE3	1.33	3.4	55	5.35	1.8	4.5	0.002	27
0.55	80D	660	64.7	73	68.8	64.7	0.74	0.63	0.58	0.45	IE3	1.88	3.3	40	7.96	1.4	2.1	0.002	29
0.75	90 S	700	72.8	75	74.1	70.7	0.78	0.69	0.63	0.50	IE3	2.27	4.6	30	10.2	2.4	2.6	0.003	35
1.1	100 LB	690	71.4	77.7	70.4	64.7	0.70	0.71	0.54	0.41	IE3	3.12	4.2	16	15.2	2.3	2.8	0.011	42
1.5	112 M	700	75.6	79.7	77.8	75.0	0.73	0.71	0.59	0.46	IE3	4.14	4.4	25	20.5	2.1	2.6	0.025	55
2.2	132 S	710	80.1	81.9	82.0	79.6	0.79	0.73	0.66	0.52	IE3	5.75	5.3	20	29.6	2.1	3.0	0.031	70
3	132 M	710	81.4	83.5	83.3	81.5	0.79	0.75	0.67	0.54	IE3	7.48	5.6	20	40.4	2.3	3.0	0.040	87
4	160 MA	730	84.4	84.8	85.7	84.1	0.78	0.75	0.66	0.54	IE3	9.82	6.1	30	52.3	2.4	3.3	0.075	112
5.5	160 MB	725	84.9	86.2	87.2	86.3	0.80	0.76	0.71	0.59	IE3	13.1	5.7	25	72.4	2.1	2.9	0.093	120
7.5	160 L	720	84.8	87.3	87.9	87.6	0.82	0.77	0.73	0.62	IE3	17.4	5.8	30	99.5	2.3	2.9	0.126	140
11	180 L	725	86.6	88.6	87.7	86.2	0.80	0.78	0.70	0.57	IE3	24.8	6.0	14	145	1.8	2.3	0.203	185
15	200 L	730	87.7	89.6	89.5	88.6	0.82	0.78	0.75	0.63	IE3	33.5	5.8	25	196	2.0	2.3	0.339	225
18.5	225 S	730	91.5	90.1	91.2	89.3	0.79	0.78	0.72	0.62	IE3	41.0	5.2	40	242	1.8	2.2	0.491	276
22	225 M	730	89.9	90.6	91.7	91.2	0.80	0.8	0.76	0.67	IE3	47.3	4.7	45	288	1.7	1.8	0.547	312
30	250 M	730	90.6	91.3	91.7	90.7	0.80	0.81	0.74	0.63	IE3	63.2	5.6	35	392	2.1	2.4	0.834	400
37	280 S	735	91.1	91.8	92.3	91.6	0.82	0.81	0.77	0.68	IE3	77.5	5.4	45	481	1.8	2.5	1.39	560
45	280 M	735	92.0	92.2	92.4	91.2	0.80	0.81	0.74	0.63	IE3	93.9	6.0	40	585	2.1	3.2	1.65	665
55	315 S	740	93.4	92.5	93.0	91.5	0.84	0.83	0.78	0.68	IE3	112	7.0	-	710	1.9	2.4	4.79	940
75	315 MA	740	94.3	93.1	93.7	92.2	0.83	0.83	0.77	0.67	IE3	151	7.8	-	968	2.2	2.4	5.58	1050
90	315 LA	740	94.7	93.4	94.4	93.1	0.84	0.84	0.79	0.68	IE2	179	7.5	-	1161	2.1	2.5	6.37	1070
110	315 LB	740	94.4	93.7	94.7	93.9	0.86	0.84	0.82	0.75	IE3	218	6.4	-	1420	1.7	2.3	7.23	1090
132	355 MA	740	94.7	94.0	94.5	93.4	0.86	0.84	0.84	0.77	IE3	260	6.3	-	1704	1.5	2.5	7.9	1550
160	355 MB	740	95.3	94.3	95.4	94.6	0.86	0.84	0.85	0.81	IE3	314	6.2	-	2065	1.3	2.5	10.3	1590
200	355 LB	740	95.0	94.6	95.2	94.0	0.87	0.85	0.80	0.80	IE3	387	5.7	-	2581	1.3	2.5	12.3	1850

This data is provided for guidance only.

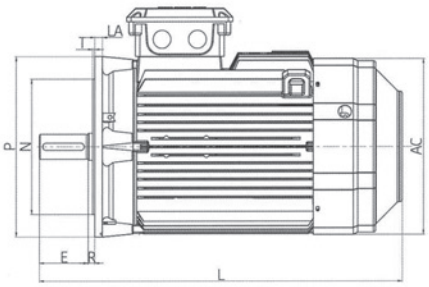
DRAWING DIMENSION



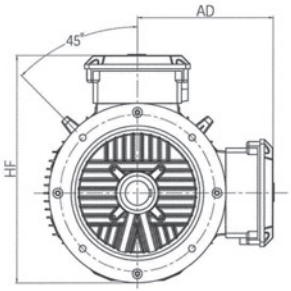
H80-355



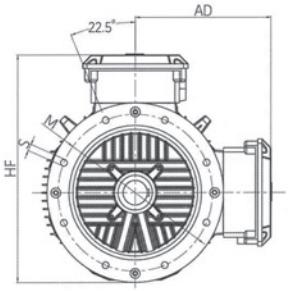
H80-355



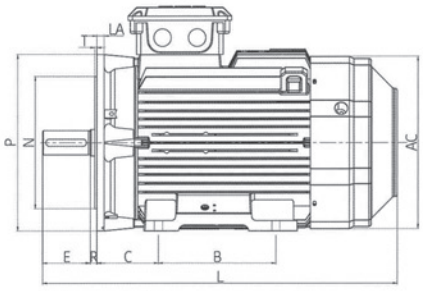
H80-280



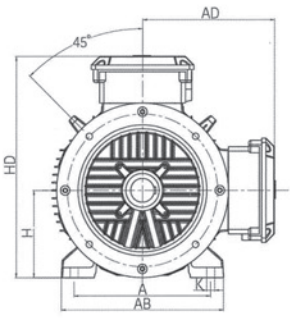
H80-200



H225-280



H80-355



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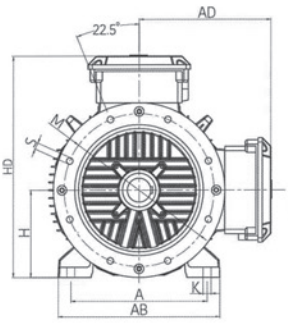
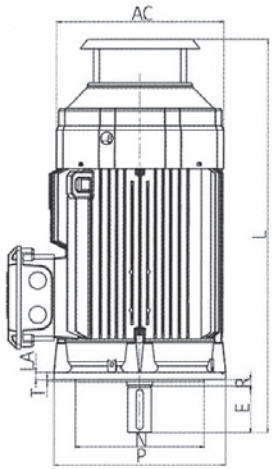


H225-355

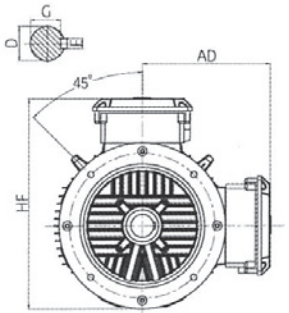
B3, B5, B35 DIMENSION

Type	Pole	A	B	C	D	E	F	G	H	K	M	N	P	R	S	T	AB	AC	AD	HD	HF	LA	L
80M	2,4,6	125	100	50	19	40	6	15.5	80	10	165	130	200	0	4-Φ12	3.5	165	175	145	220	-	12	325
90S	2,4,6	140	100	56	24	50	8	20	90	10	165	130	200	0	4-Φ12	3.5	180	195	165	260	-	12	360
90L	2,4,6	140	125	56	24	50	8	20	90	10	165	130	200	0	4-Φ12	3.5	180	195	165	260	-	12	390
100L	2,4,6	160	140	63	28	60	8	24	100	12	215	180	250	0	4-Φ14.5	4	205	215	180	275	245	13	435
112M	2,4,6	190	140	70	28	60	8	24	112	12	215	180	250	0	4-Φ14.5	4	230	240	190	300	265	14	465
132S	2,4,6	216	140	89	38	80	10	33	132	12	265	230	300	0	4-Φ14.5	4	270	275	210	345	315	14	510
132M	2,4,6	216	178	89	38	80	10	33	132	12	265	230	300	0	4-Φ14.5	4	270	275	210	345	315	14	550
160M	2,4,6	254	210	108	42	110	12	37	160	15	300	250	350	0	4-Φ18.5	5	320	330	255	420	385	15	665
160L	2,4,6	254	254	108	42	110	12	37	160	15	300	250	350	0	4-Φ18.5	5	320	330	255	420	385	15	700
180M	2,4,6	279	241	121	48	110	14	42.5	180	15	300	250	350	0	4-Φ18.5	5	355	380	280	455	430	15	720
180L	2,4,6	279	279	121	48	110	14	42.5	180	15	300	250	350	0	4-Φ18.5	5	355	380	280	455	430	15	760
200L	2,4,6	318	305	133	55	110	16	49	200	19	350	300	400	0	4-Φ18.5	5	395	420	305	505	480	17	815
225S	4	356	286	149	60	140	18	53	225	19	400	350	450	0	8-Φ18.5	5	435	470	355	560	535	20	850
225M	2	356	311	149	55	110	16	49	225	19	400	350	450	0	8-Φ18.5	5	435	470	355	560	535	20	820
225M	4,6	356	311	149	60	140	18	53	225	19	400	350	450	0	8-Φ18.5	5	435	470	355	560	535	20	850
250M	2	406	349	168	60	140	18	53	250	24	500	450	550	0	8-Φ18.5	5	490	510	370	615	595	22	915
250M	4,6	406	349	168	65	140	18	58	250	24	500	450	550	0	8-Φ18.5	5	490	510	370	615	595	22	915
280S	2	457	368	190	65	140	18	58	280	24	500	450	550	0	8-Φ18.5	5	550	580	410	680	650	22	1035
280S	4,6	457	368	190	75	140	20	67.5	280	24	500	450	550	0	8-Φ18.5	5	550	580	410	680	650	22	1035
280M	2	457	419	190	65	140	18	58	280	24	500	450	550	0	8-Φ18.5	5	550	580	410	680	650	22	1035
280M	4,6	457	419	190	75	140	20	67.5	280	24	500	450	550	0	8-Φ18.5	5	550	580	410	680	650	22	1035
315S	2	508	406	216	65	140	18	58	315	28	600	550	660	0	8-Φ24	6	635	645	530	845	-	22	1255
315S	4,6	508	406	216	80	170	22	71	315	28	600	550	660	0	8-Φ24	6	635	645	530	845	-	22	1255
315M	2	508	457	216	65	140	18	58	315	28	600	550	660	0	8-Φ24	6	635	645	530	845	-	22	1285
315M	4,6	508	457	216	80	170	22	71	315	28	600	550	660	0	8-Φ24	6	635	645	530	845	-	22	1355
315L	2	508	508	216	65	140	18	58	315	28	600	550	660	0	8-Φ24	6	635	645	530	845	-	22	1285
315L	4,6	508	508	216	80	170	22	71	315	28	600	550	660	0	8-Φ24	6	635	645	530	845	-	22	1355
355M	2	610	560	254	75	140	20	67.5	355	28	740	680	800	0	8-Φ24	6	730	710	655	1010	-	25	1500
355M	4,6	610	560	254	95	170	25	86	355	28	740	680	800	0	8-Φ24	6	730	710	655	1010	-	25	1530
355L	2	610	630	254	75	140	20	67.5	355	28	740	680	800	0	8-Φ24	6	730	710	655	1010	-	25	1500
355L	4,6	610	630	254	95	170	25	86	355	28	740	680	800	0	8-Φ24	6	730	710	655	1010	-	25	1530
355L1	2	610	630	254	75	140	20	67.5	355	28	740	680	800	0	8-Φ24	6	730	710	655	1010	-	25	1600
355L2	4,6	610	630	254	95	170	25	86	355	28	740	680	800	0	8-Φ24	6	730	710	655	1010	-	25	1630

V5 DIMENSION



H80-355



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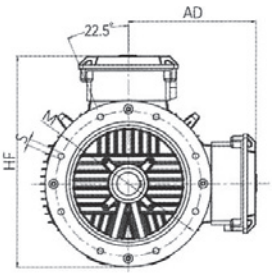
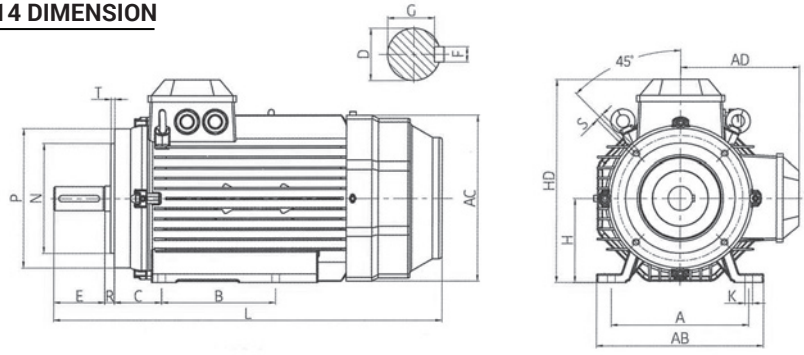


H225-355

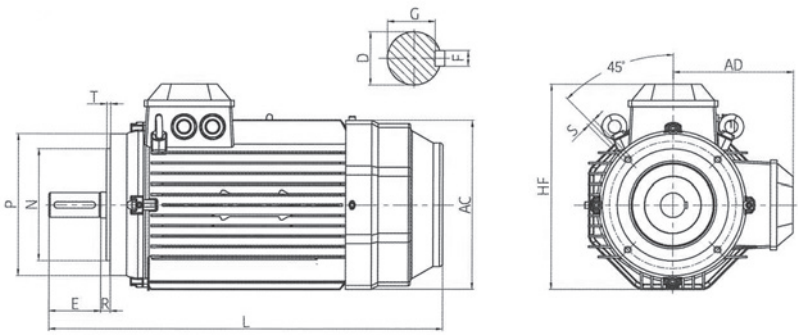
Type	Pole	D	E	F	G	M	N	P	R	S	T	AC	AD	HF	LA	L
180M	2,4,6	48	110	14	42.5	300	250	350	0	4-Φ18.5	5	380	280	500	15	850
180L	2,4,6	48	110	14	42.5	300	250	350	0	4-Φ18.5	5	380	280	500	15	880
200L	2,4,6	55	110	16	49	350	300	400	0	4-Φ18.5	5	420	305	550	17	890
225S	4	60	140	18	53	400	350	450	0	8-Φ18.5	5	470	335	610	20	905
225M	2	55	110	16	49	400	350	450	0	8-Φ18.5	5	470	335	610	20	940
225M	4,6	50	140	18	53	400	350	450	0	8-Φ18.5	5	470	335	610	20	970
250M	2	50	140	18	53	500	450	550	0	8-Φ18.5	5	510	370	650	22	1005
250M	4,6	65	140	18	58	500	450	550	0	8-Φ18.5	5	510	370	650	22	1005
280S	2	65	140	18	58	500	450	550	0	8-Φ18.5	5	580	410	720	22	1160
280S	4,6	75	140	20	67.5	500	450	550	0	8-Φ18.5	5	580	410	720	22	1160
280M	2	65	140	18	58	500	450	550	0	8-Φ18.5	5	580	410	720	22	1160
280M	4,6	75	140	20	67.5	500	450	550	0	8-Φ18.5	5	580	410	720	22	1160
315S	2	65	140	18	58	600	550	660	0	8-Φ24	6	645	530	900	22	1305
315S	4,6	80	170	22	71	600	550	660	0	8-Φ24	6	645	530	900	22	1335
315M	2	65	140	18	58	600	550	660	0	8-Φ24	6	645	530	900	22	1385
315M	4,6	80	170	22	71	600	550	660	0	8-Φ24	6	645	530	900	22	1435
315L	2	65	140	18	58	600	550	660	0	8-Φ24	6	645	530	900	22	1385
315L	4,6	80	170	22	71	600	550	660	0	8-Φ24	6	645	530	900	22	1435
355M	2	75	140	20	67.5	740	680	800	0	8-Φ24	6	710	655	1010	25	1680
355M	4,6	95	170	25	86	740	680	800	0	8-Φ24	6	710	655	1010	25	1710
355L1	2	75	140	20	67.5	740	680	800	0	8-Φ24	6	710	655	1010	25	1680
355L2	4,6	95	170	20	86	740	680	800	0	8-Φ24	6	710	655	1010	25	1710

B34 & B14 DIMENSION



H80-112

Type	A	B	C	D	E	F	G	H	K	M	N	P	R	S	T	AB	AC	AD	HD	L
80M	125	100	50	19	40	6	6	80	10	100	80	120	0	4-M6	3	165	175	145	220	325
90S	140	100	56	24	50	8	20	90	10	115	95	140	0	4-M8	3	180	195	165	250	360
90L	140	125	56	24	50	8	20	90	10	115	95	140	0	4-M8	3	180	195	165	250	390
100L	160	140	63	28	60	8	24	100	12	130	110	160	0	4-M8	3.5	205	215	180	270	435
112M	190	140	70	28	60	8	24	112	12	130	110	160	0	4-M8	3.5	230	240	190	300	465



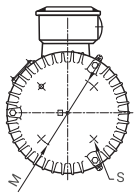
H80-112

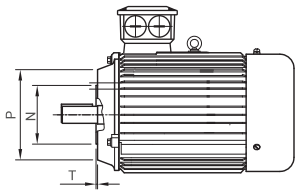
Type	A	A	F	G	M	N	P	R	R	T	AC	AD	HF	L
80M	9	40	6	15.5	100	80	120	0	4-M6	3	175	145	230	325
90S	24	50	8	20	115	95	140	0	4-M8	3	195	165	245	360
90L	24	50	8	20	115	95	140	0	4-M8	3	195	165	245	390
100L	28	60	8	24	130	110	160	0	4-M8	3.5	215	180	285	455
112M	28	60	8	24	130	110	160	0	4-M8	3.5	240	190	320	485

MECHANICAL DESIGN

SMALL FLANGE (FACE) MOUNT B14 (IM3601)

Moungting Positions





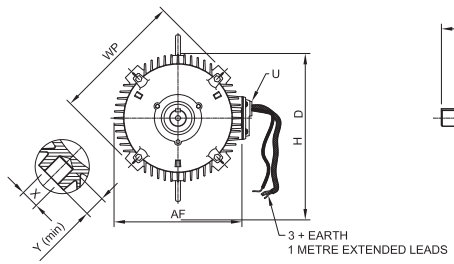
B14A

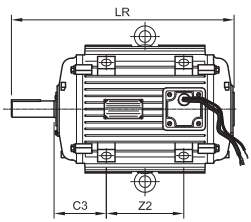
Motor frame	M	N	P	S	T
71	85	70	105	M6	2.5
80	100	80	120	M6	3.0
90	115	95	140	M8	3.0
100	130	110	160	M8	3.5
112	130	110	160	M8	3.5
132	165	130	200	M10	3.5
160	215	180	250	M12	4.0

B14B

Motor frame	M	N	P	S	T
80	130	110	160	M8	3.5
90	130	110	160	M8	3.5
100	165	130	200	M10	3.5
112	165	130	200	M10	3.5
132	215	180	250	M12	4.0

PAD mount airstream rated motors with extended leads





Motor frame	AF	C3	HD	LR	U	WP	X	Y	Z2
100L	210	83	290	325	M25x1.5	220	M12x1.75	21	100
132S	264	108	354	400	M25x1.5	290	M16x2.0	29	125
160M	330	135	430	540	M32x1.5	340	M20x2.5	27	155
160L	330	135	430	580	M32x1.5	340	M20x2.5	27	200
200L	410	174	510	680	M50x1.5	431	M24x3.0	34	224

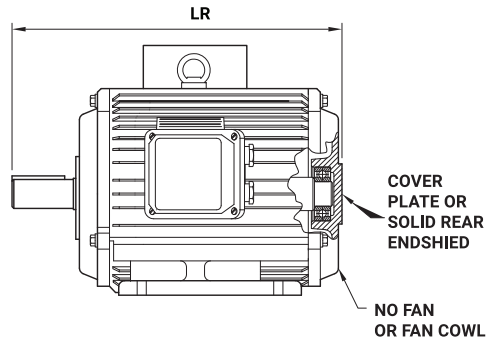
AIRSTREAM RATED MOTORS FOR AXIAL FANS

MOUNTING POSITIONS

RotoMaq Motors offer a comprehensive range of motors specifically built for use with axial flow fans, where the motor is mounted in the airstream.

Provided the airstream ensures ample cooling, the fan and cowl normally fitted to a standard TEFC motor is redundant. Enclosure rating of the motor is also improved with the use of a solid rear endshield.
Due to the elimination of losses associated with the motor fan these motors have a higher efficiency than standard RMC motors.

STANDARD MOUNT (B3, B5, B3/B5)



Motor frame	Dimension [LR]	Motor frame	Dimension [LR]	Motor frame	Dimension [LR]
71	210	160L	580	280M	945
80	240	180M	595	315S*	980
90S	265	180L	630	315S	1010
90L	290	200L	680	315M*	1070
100L	325	225S	725	315M	1100
112M	340	225M*	720	315L*	1140
132S	400	225M	750	315L	1170
132M	435	250M	820		
160M	540	280S	890		

* 2 pole motors only

PAD MOUNT - RMCP

RMCP is RMC style motors with standard mount replaced with pad mount

COOLING TOWER - RMCC

RMCC cooling tower motors are specially developed for operation in air stream rated cooling towers. RMCC motors are available in frame sizes 71 to 355, and rated power outputs of 0.37 to 315kW

APPLICATIONS

RMCC motors are ideally suited to the cooling tower application, in industries such as food and beverage, air conditioning, chemical processing, and petrochemical.

PROTECTION

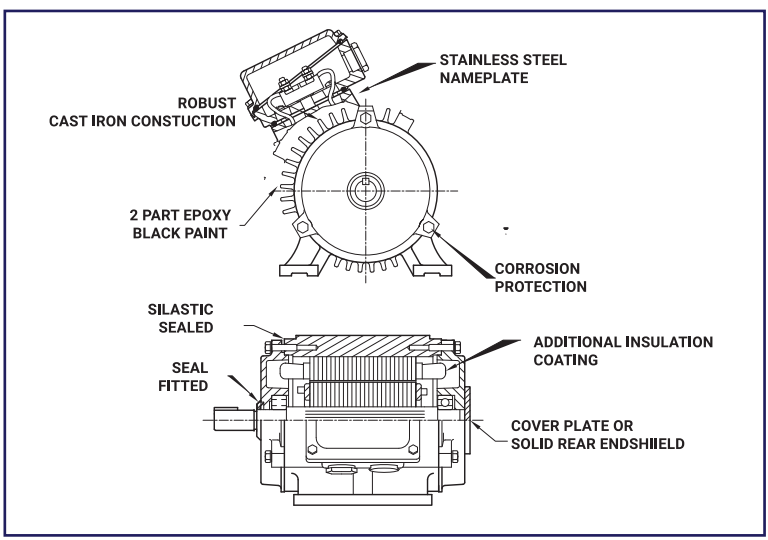
RotoMaq RMCC motors have a protection rating of IP66 for maximum protection against water and dust.

ADDITIONAL ENHANCEMENTS

- 2 part epoxy coated for excellent protection against corrosive solids and liquids
- Stainless steel name plate
- Corrosion protection on threads
- Extra insulation coating (Red Isonel 300)
- Shaft seal fitted
- Silastic sealed
- Non-drive end shaft extension cut and blanking plate fitted. Alternatively, RMCC used as base motor

PAINT

Standard paint finish for RMCC motors is a 2 part epoxy RAL 9005 Jet Black paint. RotoMaq RMCC range of cooling tower motors combine the RMC's standard high strength and high efficiency with significant enhancements to give the perfect motor for cooling tower applications.



ENVIRONMENTAL CONSIDERATIONS

Where environmental factors need special consideration RotoMaq Motors can provide the following modifications:

- Winding temperature monitors and thermistors
- Anti-condensation heaters
- Separately powered cooling fans
- Tropic proofing
- Special paint finish
- Higher International Protection ratings, IP56, IP65 and IP66
- High ambient temperature motors – RMCH with H class insulation

SPECIAL PERFORMANCE

RotoMaq motor has the ability to provide RotoMaq Motors with special windings. These may include:

- 10, 12, 16 and 24 pole single speed windings.
- Three and four speed windings.
- Windings for alternative operating voltages and frequencies.
- Windings designed for increased outputs and short time ratings.

SPECIAL PERFORMANCE

Two types of VVVF drives kit are available for the RMC range to assist in maintaining satisfactory operation

VVVF drive kit A - Separately driven cooling fan (240 & 415V)

This fan should be used when the motor speed is required to be reduced below 25Hz in constant torque mode.

For centrifugal fan or pump, no separate cooling fan is required. For all other loads refer to the loadability curve in the section on VVVF Drives

VVVF drive kit B - Standard motor (EDM)

This kit incorporates a single insulated bearing, normally at the non-drive end, designed to remove the effect of electrical discharge through the bearings.

BRAKE MOTORS - RMCB

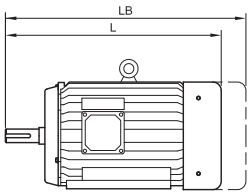
RotoMaq Motor offer a wide range of Brake motors RMCB from frame size 71 through to 180.
4 pole models are stocked as standard. 2, 6 and 8 pole and other non-standard sizes and speeds are available on special order.

Brake motors are designed for use in applications requiring rapid stopping, holding and position control. RMCB motors are available in all mounting arrangements. Brakes are made to the 'Euro' standard mounting dimension, providing interchangeability with other brands. Cast iron brake enclosures for hazardous locations are also available.

DIMENSIONS

The only dimensional variations of RMCB from RMC is the overall motor length, due to the extended length of the cowl. Overall length L is replaced by LB

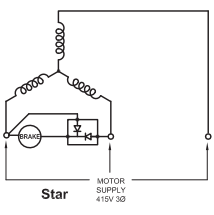
Motor frame	71	80	90S	90L	100L	112M	132S	132M	160M	160L	180M	180L
Brake motor overall length [LB]	296	341	372	397	448	473	573	613	700	745	790	827

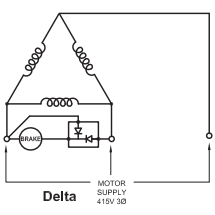


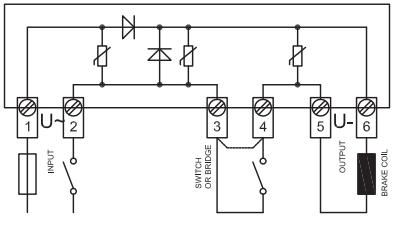
CONNECTION

RMCB motors 3kW and below are connected in 380 volt star connection with brake connected
RMCB motors 4kW and above are connected in 380 volt delta connection with brake connected

The RMCB 3 phase motor is fitted with a CE certified DC brake and half wave rectifier mounted in the terminal box enabling direct connection of the brake to the AC supply. Where response time is important, this time can be improved by switching the brake on the DC current side of the rectifier. These additional terminals are standard on the rectifier fitted to the 160 to 180 frame motors as shown







Output [kW]	Frame Size	Brake Model	Brake weight [kg]	Motor full load torque TN [Nm]	Brake torque [Nm]			Brake torque [% of full load]		
					Nominal	Min	Max			
0.37	71B-4	M4	1.1	2.6	4	1.4	5	150%	50%	190%
0.55	80A-4	M8	1.8	3.7	8	2.8	10	220%	80%	270%
0.75	80B-4	M8	1.8	5.1	8	2.8	10	160%	50%	200%
1.1	90S-4	M16	3.4	7.4	16	5.5	20	220%	70%	270%
1.5	90L-4	M16	3.4	10.3	16	5.5	20	160%	50%	190%
2.2	100LA-4	M32	4.5	14.6	32	11	40	220%	80%	270%
3	100LB-4	M32	4.5	20.0	32	11	40	160%	60%	200%
4	112M-4	M60	7.4	26.7	60	20	75	220%	70%	280%
5.5	132S-4	M60	7.4	36.6	60	20	75	160%	50%	200%
7.5	132M-4	M100	13.6	50	100	35	125	200%	70%	250%
11	160M-4	M150	19.0	72	150	50	185	210%	50%	260%
15	160L-4	M150	19.0	98	150	50	185	150%		190%
18.5	180M-4	M250	33.0	120	250	90	310	210%	80%	260%
22	180L-4	M250	33.0	142	250	90	310	180%	60%	220%

SMOKESPILL - RMCS/RMCHS

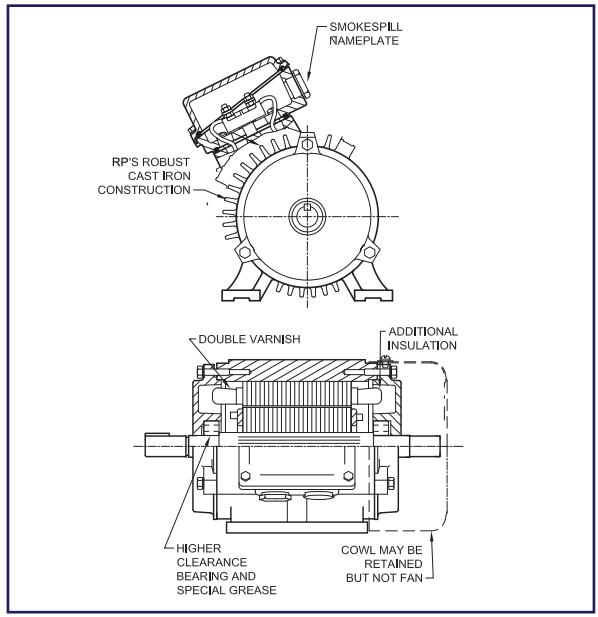
Smokespill application motors are designed to withstand the extreme environmental conditions associated with a building fire. Ventilation systems within public buildings are required to continue providing smoke extraction for 2 hours at smokespill air temperature of 200°C or for 30 minutes at 300°C, designated respectively as rating -1 or rating -2 in accordance.

The standard RMCS range , wound with F class insulation in frame sizes 80A to 180L, meet the rating -1 requirements. RMCHS range, wound with H class insulation in frame sizes 80A to 315L, meet either rating -1 or rating -2 requirements. RMCHS range is also suitable for applications at 300°C for 2 hours.

SMOKESPILL FEATURES

The standard RMC motor is inherently suitable for upgrading to the smokespill application due to its low temperature rise. When RMCS motors are ordered F class motors are modified and when RMCHS motors are ordered H class motors are modified in accordance with our standard operating procedures which include the following:

- C3 internal clearance bearings lubricated with extra high temperature specification grease
- Special name plate specifying smokespill suitability
- Double insulated terminal leads
- Double varnish system for winding crown
- Fan and cowl removed if present on the original motor; cowl may sometimes remain to protect from base shaft
- Motors tested prior to despatch
- Extra High Temperature Grease (Magnalube G)



T.E.A.S.R. (TOTALLY ENCLOSED AIR STREAM RATED - NO FAN OR COWL)

The RMCHS range is normally supplied without fan and cowl, relying on the air flow generated by the driven fan to provide the necessary cooling during normal operation thereby ensuring high temperature operation will not cause the plastic fan to melt.

Motors are normally supplied with the non drive end stub shaft exposed, as it is expected to be shrouded by the fan housing and duct work when installed. If this presents a problem in a specific application, either removal of this shaft can be requested, or the standard fan cowl can be fitted, but without the motor fan.

TERMINATIONS

RMCHS motors can be supplied either with terminal boxes or with extended leads through a gland plate
In either case, it is the installers responsibility to ensure that suitable high temperature leads, conduit and fittings are installed to take the motor leads outside the fan case.

RotoMaq motors can supply terminal boxes and terminal blocks for installation outside the fan drum if required

NAMEPLATES

RotoMaq Smokespill motors are marked with special nameplates labelling its suitability for smokespill duty and stating specific temperature condition ratings and lubrication details

Additional plates for external mounting to fan assemblies are available on request.

PAINT

Standard color finish for the RMCHS range is RAL 7012 Basalt Grey, and RAL 3000 Flame Red for the RMCHS range.
Other colors are available on request.

MAINTENANCE

Because of the safety related nature of smokespill motors proper maintenance schedules are imperative, especially where the motor is used for dual purposes ie. continuous running for normal ventilation as well as for smokespill application.

Serious consideration needs to be given to bearing and insulation deterioration caused by use for extended periods for normal ventilation duty.

It is important that the motor remains within its stated rating both on initial commissioning and after any adjustments to the ventilation system.

TWO SPEED MOTOR

The RotoMaq motors range of RMC two speed motors, includes both constant torque and fan duty designs.

Wound with either a single winding (requiring appropriate switchgear) or separate windings designed for D.O.L. connection on each speed.

Whilst we offer all 2 speed combinations we list below the main two speed fan duty requirements.

High speed [kW]	Low speed [kW]	Frame size	High speed [r/min]	High speed [A]	Low speed [r/min]	Low speed [A]
3000/1500 r/min = 2/4 Poles; Fan duty - single winding (MAE)						
0.8	0.16	80B-4	2730	1.9	1375	0.40
1.2	0.24	90S-4	2825	2.6	1425	0.57
1.7	0.34	90L-4	2870	3.5	1430	0.80
2.4	0.48	100L-2	2900	4.9	1450	1.4
3.3	0.66	112M-2	2925	6.9	1475	2.3
4.4	0.88	132SA-2	2940	8.7	1465	2.5
6.1	1.2	132SB-2	2940	11.5	1465	2.9
8.3	1.7	160MA-2	2955	15.7	1480	4.0
12	2.4	160MB-2	2945	21.2	1470	5.2
17	3.4	160L-2	2940	30.0	1460	7.3
20	4	180M-2	2930	35.3	1470	8.6
24	4.8	200LA-2	2935	42.4	1475	10.3
33	6.6	200LB-2	2940	58	1475	14.2
41	8.2	225M-2	2940	72	1475	17.6
50	10	250M-2	2950	88	1480	21.5
61	12	280S-2	2950	108	1480	25.8
83	17	280M-2	2955	147	1480	36.5
99	20	315S-2	2955	175	1480	42.9
121	24	315MA-2	2955	214	1480	52
145	29	315LA-2	2960	256	1485	62
176	35	315LB-2	2960	311	1485	75
1500/1000 r/min = 4/6 Poles; Fan duty - seperate winding (MBJ)						
0.55	0.18	80B-4	1410	1.5	945	0.80
0.75	0.25	90S-4	1420	1.8	950	1.0
1.1	0.36	90L-4	1420	2.5	950	1.4
1.5	0.5	100LA-4	1430	3.5	960	1.7
2.2	0.75	100LB-4	1440	4.7	960	2.3
3	1	112M-4	1440	6.3	965	3.0
4	1.3	132S-4	1460	8.2	980	3.7
5.5	1.8	132M-4	1465	11	980	4.7
7.5	2.5	160M-4	1470	14.2	980	5.8
11	3.5	160L-4	1470	20.9	980	8.3
15	5	180L-6	1470	27.2	985	10.5
18.5	6.1	200LA-6	1475	33.5	985	12.0
22	7.3	200LB-6	1480	39.5	985	14.5
33	11	225M-6	1485	59	990	20.9
45	15	250M-6	1485	77	990	26.7
55	18	280M-6	1480	94	990	32.2
75	25	315S-6	1480	128	990	44.7
90	30	315MA-6	1480	154	990	54
110	36	315LA-6	1480	188	990	64
132	44	315LB-6	1480	226	990	79

High speed [kW]	Low speed [kW]	Frame size	High speed [r/min]	High speed [A]	Low speed [r/min]	Low speed [A]
1500/7500 r/min = 4/8 Poles; Fan duty - single winding (MAK)						
0.6	0.12	80B-4	1410	1.7	670	0.57
0.8	0.16	90S-4	1430	2.0	700	0.70
1.2	0.24	90L-4	1430	2.9	700	1.0
1.7	0.34	100LA-4	1435	3.7	715	1.4
2.4	0.48	100LB-4	1430	5.0	720	1.8
3.3	0.7	112M-4	1435	6.5	720	2.2
4.4	0.9	132S-4	1455	8.6	730	2.8
6.1	1.2	132M-4	1460	11.9	730	4.0
8.3	1.7	160M-8	1450	15	730	4.2
12	2.4	160L-8	1455	21.2	735	5.7
17	3.4	180M-4	1475	31.0	740	9.1
20	4	180L-4	1475	37.0	740	11.3
24	5	200L-4	1475	41.1	740	11.8
33	6.6	225S-4	1480	56.5	740	15.3
41	8.2	225M-4	1480	72.6	740	20.4
50	10	250M-4	1480	84.8	740	23.5
61	12	280S-4	1485	105	745	27.3
83	17	280M-4	1485	143	740	38.7
99	20	315S-4	1485	170	740	45.5
121	24	315MA-4	1485	208	740	55
145	29	315LA-4	1485	250	740	66
176	35	315LB-4	1485	303	740	80
1500/750 r/min = 6/8 Poles; Fan duty - seperate winding (MBN)						
0.55	0.24	90S-6	945	1.5	700	0.94
0.75	0.32	90L-6	945	2.1	710	1.6
1.1	0.47	100L-6	950	2.7	710	1.6
1.5	0.65	112M-6	960	3.6	710	1.9
2.2	0.95	132S-6	975	5.6	730	3.1
3	1.3	132MA-6	975	7.2	730	4.1
4	1.7	132MB-6	975	9.3	730	5.1
5.5	2.4	160M-6	980	11.4	735	6.4
7.5	3.2	160L-6	980	15.1	735	8.4
11	4.7	180L-8	985	25.7	735	11.0
13	5.5	200L-8	985	24.9	735	11.5
15	6.5	225S-8	985	29.5	735	13.1
21	9	225M-8	985	984	735	17.7
26	11	250M-6	990	47.0	740	21.3
30	13	280S-6	990	56	740	25.8
37	16	280M-6	992	73	742	31.0
53	23	315S-6	990	105	740	44.6
65	28	315MA-6	990	128	740	54
80	34	315LA-6	990	158	740	66
92	40	315LB-6	990	182	740	78

For further technical details regarding the brake, please contact your nearest RotoMaq motors office.