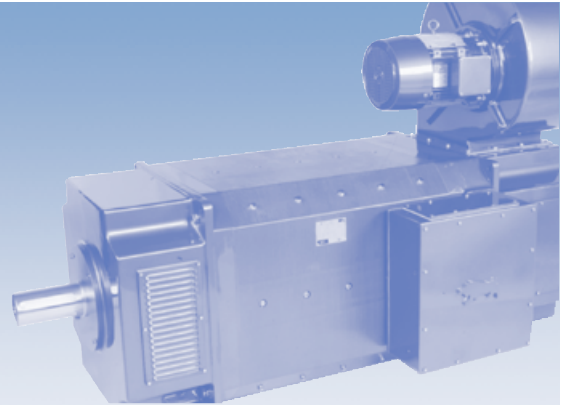


# DC motors



**0.09 - 750kW**



**BULL ELECTRIC**

**BROOK  
CROMPTON**

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# The Brook Crompton - Bull dc motor range

## Introduction

Bull Electric is the specialist dc motor manufacturing arm of the international Brook Crompton organisation. Brook Crompton manufactures one of the world's most comprehensive ranges of motors.

Its factories are located through Europe, Poland and China.

Bull Electric was established in 1898 and is now acknowledged as a leader in dc motor design and manufacture. Its products are in service across the world in most applications which benefit from the high performance of dc drives:

- Mechanical handling
- Elevators
- Steel mills
- Pulp or paper
- Wire drawing
- Plastics manufacturing
- Test equipment
- Exercise machines
- Machinery drives
- Printing

## DC Motor Range

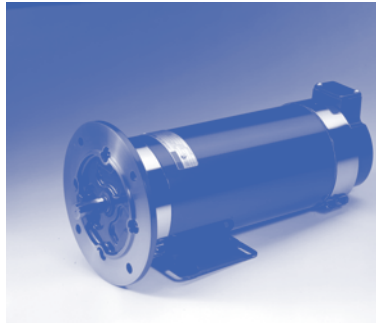
Bull Electric motors cover outputs from 0.09kW to 750kW in frame sizes 63 to 355.

Typical features of the range include:-

- Class H materials but class F temperature rise
- Wide speed range, typically 100:1 (IC06 + IC410), 20:1 (IC01 + IC411)
- Armatures designed to reduce low speed pulsations
- Choice of enclosure
- Wide range of specifications
- Brushwear detection option on MKIII range

## Quality

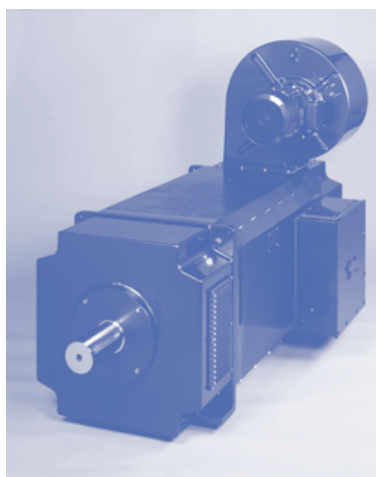
Bull Electric motor manufacturing operations hold BS EN ISO 9001:1984 approval.



1. **0.25-1.5KW**  
**MP Range**  
**Permanent Magnet**  
**IP22, IP44 or IP55**  
**IC01/IC410**



2. **0.09-15kW**  
**MD Range**  
**IP20-IP55**  
**IC01/IC410/IC06**

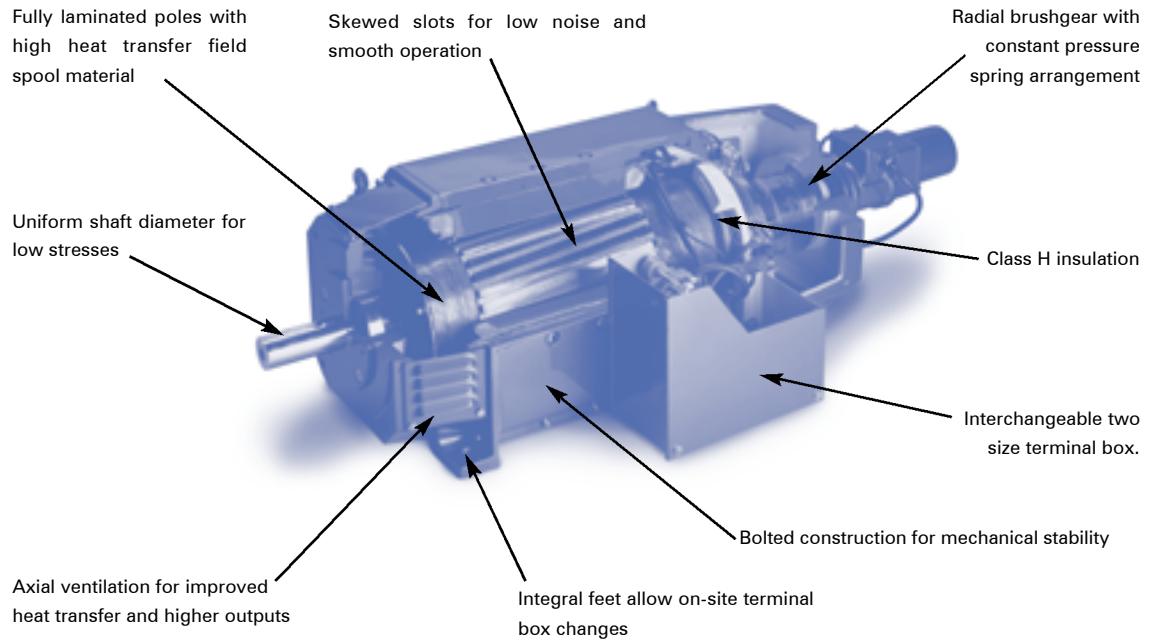


3. **10-750kW**  
**MKIII Range**  
**IP23-IP55**  
**IC06/IC0666**  
**ICW37 A86**  
**IC0040**



BS EN ISO 9000:2000

# MIII range dc motor



## DC Motor Selection

1. Identify Approximate Rating
2. Examine Choice Criteria
3. Identify Range
4. If in doubt, refer to Bull Electric

**Table 1:**

	Range		
Range	MD	MP	MKIII
Specification Pages	11	11	12/13
Performance Data Pages	16/17	18	19
Dimension Pages	22-25	20/21	26/27

## Outputs

0.09-0.24kW	Economy MD Range	0.09kW	
0.18-1.5kW	Economy MP Range		0.18kW
	Field Control MD Range		1.5kW
1.6-11.0kW	Economy MD Range		
	Performance MKIII Range		10kW
11.1-15kW	Economy MD Range	15kW	
	Performance MKIII Range		
16-750kW	Performance MKIII Range		750kW


Above 750kW - Refer to Bull Electric

# Standards and Environment

DC motors can be manufactured to the standards of countries listed below

**Table 2: Standards**

Motors are manufactured to the following standards:					
Range	International	National Standard			N. American*
Standard	IEC	BS	DIN	NF	NEMA
Dimensions	IEC 72-1	BS4999 Part 141	DIN 42673, DIN 42677	NF C51-105, NF C51-120	MG1 Part 4
Mounting	IEC 34-7	BS4999 Part 107	DIN 42950	NF C51-117	MG1 Part 4
Degrees of Protection	IEC 34-5	BS4999 Part 105	DIN 40050	NF C51-115	MG1-1.26B

 Standard motor complies

 Optional

Motors complying with IEC 34-1 also comply with many of the National Standards of other European countries e.g. C.E.I. 203 (Italy), NBN7 (Belgium), NEN 3173 (Netherlands), SEN 2601 01 (Sweden).

\* Motors to NEMA standards have CSA approval and generally comply with Canadian (EEMAC) standards. For full details of NEMA standard motors, refer to Bull Electric.



## Enclosure

All motors have degrees of IP protection as defined in IEC 34-1 (EN 60034 Part 5), as detailed in Tables 3.

## Insulation

All motors are insulated with a Class H insulation system.

## Thermal Rating

Standard motors will operate satisfactory in an ambient temperature range of -10°C (-30°C-MD range) to +40°C (class F temperature rise) and at altitudes up to 1000 metres above sea level.

## High Ambient Temperatures and High Altitude

The ratings listed in this catalogue apply to standard motors operating in ambient temperatures not exceeding 40°C and altitudes up to 1000m above sea level. When operating a standard motor in higher ambient temperatures or at higher altitudes, derating may be necessary in order to maintain it's operating temperature limit. Refer to works.

## Motor Cooling

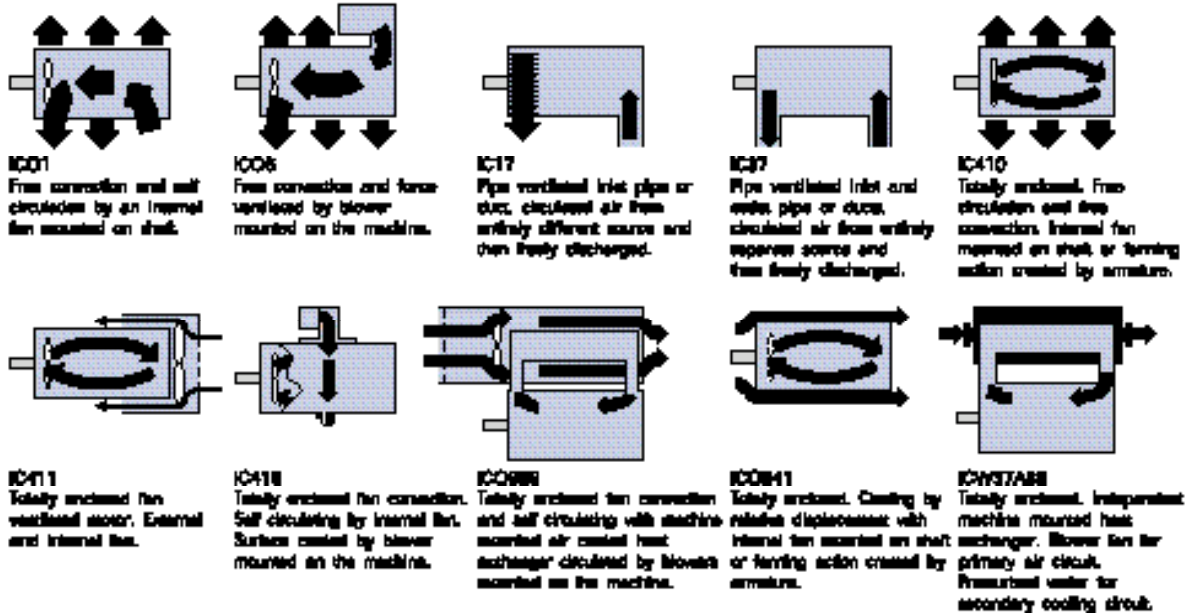
Motors are cooled in accordance with BS EN 60034-6. Methods of cooling are detailed on table 6, page 6.

**Table 3: Enclosure description**

Brief Description			
1st Numeral Protection Against Solid Objects		2nd Numeral Protection Against Liquids	
2	Motor enclosure protected against the harmful ingress of solid objects greater than 12mm diameter	2	Motor enclosure protected against the harmful ingress of vertical drops of water
		3	Motor enclosure protected against the harmful ingress of drops of water falling at 60° to the vertical
4	Motor enclosure protected against the harmful ingress of small objects greater than 1mm diameter	4	Motor enclosure protected against the harmful ingress of splashing water (10L/min @ 1.0 bar)
5	Protection against the harmful ingress of dust	5	Motor enclosure protected against the harmful ingress of water, when water is sprayed against the motor enclosure (12.5L/min @ 0.3 bar)

# Environment

**Table 6: Standard cooling arrangements**



## Cooling

Standard cooling arrangements vary within and between the ranges. Cooling forms shown are the different variations we can offer. They are not all necessarily available for every motor. All confirm with IEC34-6 and BS4999: Part 106.

## Paint

All motors are externally treated for operation in environmentally hostile conditions with good resistance to chemicals and oils. The standard colour for all motors is BS4800 20D45 (Blue). Other colours and paint systems are available, details from Bull Electric.

## Rating Plate

All rating plates are laser etched anodised aluminium.

# Technical information - electrical

## Variable Speed Drives

Variable speed drives may be applied to accelerate or decelerate in either or both directions, against constant torque loads, constant power loads, or loads where both the power and torque vary. They may thus be used to control variables such as speed, flow rate, tension, thickness, density, temperature, etc.

## Constant Torque Applications

The torque required to drive the load is approximately constant regardless of speed and hence the power varies directly with speed. Applications include:

- Extruders
- Conveyors
- Treadmills
- Paper and printing
- Rubber extrusion

## Constant Power Applications

The power required to drive the load does not vary with speed and hence the torque varies inversely with speed. Applications include:

- Re-wind stands
- Machine tools
- Crane hoists
- Wire drawing
- Dynamometers

## Torque and Power

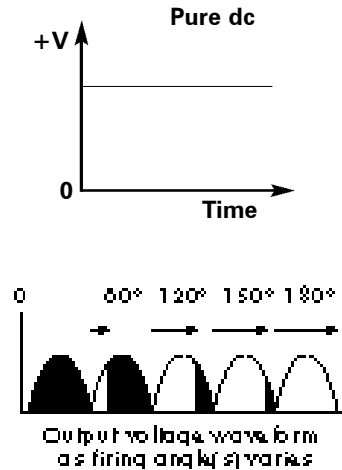
These type of applications vary the torque with the square of the speed and the power with the cube of the speed. In these cases it is usual to supply a drive capable of working against constant torque but to take the reduced torque and power requirements at the lower speeds.

Applications include:

- Centrifugal fans and pumps

## Form Factor

Form factor describes the smoothness of a rectified dc waveform.



The most common sources of dc supply are:

- Battery (pure dc - form factor 1.0)
- Thyristor converter (rectified dc)
- PWM converter

Supplies originating from a thyristor converter are unable to achieve pure dc and hence have a certain amount of waveform ripple. The amount of ripple is designated by a form factor e.g. 1.05. A poor form factor

e.g. 1.4 will significantly affect the performance of small dc motors such as; MP and MD ranges. To offset the impaired performance it is necessary to derate the motor to maintain the temperature rise and reduce the risk of excessive sparking at the commutator.

Form factor can often be improved by the addition of inductance (e.g. a choke) in the armature circuit. If in doubt, please contact your controls supplier.

$$\text{Definition: } FF = \frac{I_{rms}}{I_{av}}$$

Where: FF - Form Factor  
 Irms - Root Mean Square Current  
 Iav - Average Current

## Motor Types

Motors are designed for a variety of applications, two of the common designs (shunt wound and permanent magnet) are detailed below. Designs including compound wound motors are available. Details available from Bull Electric.

## Shunt Wound

Shunt motors with separately-excited fields are the popular choice where speed control is required over a wide range. If the field current is held constant and the armature voltage reduced, then infinite speed range can be obtained down to zero speed with constant torque capability. If the armature voltage is held constant and the field current is reduced, then speed increase over a limited range of 2:1 or 3:1 can be achieved with constant power output capability, commutation and stability being the limiting factors.

Field trimming can be applied in order to equally match two or more similar motors being fed in parallel from the same armature supply source.

# Technical information - electrical

## Permanent Magnet Motor

The permanent magnet motor can be used in variable speed drive applications as a replacement for the separately-excited shunt motor with the advantage that there is no need for field supply, and the field excitation wiring between controller and motor is eliminated. Permanent magnet motors are manufactured with a smaller body diameter than an equivalent wound field motor. However permanent magnet motors do not have the facility of field trimming.

Since current is a standard feature of the variable speed drive and provided the magnitude of peak current is known, motors will be designed for minimal magnet demagnetization. An effect caused by armature reaction.

Where applicable, the motor can be designed to replace the compound-wound motor for direct-on-line starting without demagnetizing the magnets.

It must be borne in mind that the magnet's temperature coefficient is  $-0.2\%/^{\circ}\text{C}$ . This is a reversible characteristic but will result in speed increase as the motor temperature increases. It also reduces the value of peak armature reaction current which will cause irreversible demagnetization if applied under low ambient temperature conditions.

## Protection Devices

To protect the motor windings against a variety of operational malfunctions, motors and associated control gear can be fitted with thermostats\* or thermistors\*. Thermostats are the standard device. They are usually fitted into one of the shunt coils to detect excessive heating of the shunt coils and into an interpole winding to detect excessive load current in the armature circuit or inadequate supply of cooling air.

\* Not applicable to the MP range.

## Thermostats

These are bi-metallic normally closed contact devices and suitable for connection into a 250 volt ac relay circuit, 1 amp resistive. Details available from Bull Electric.

**Table 9: Protection Devices**

Motor Fault	Thermostats	Thermistors
Sustained overload	G	G
Excessive or incorrect duty cycle	A	G
Prolonged reduced or over voltage	G	G
Excessive ambient temperature in motor location	G	G
Restricted or impaired ventilation	G	G

Key: G – good; A – acceptable;

## Thermistors

Thermistors to IEC34-1, DIN 44081/440823 are temperature-dependant, semi-conductor devices. They have a positive temperature co-efficient, usually with a fixed activating temperature of  $160^{\circ}\text{C}$  (other thermistors for different temperature are available).

Other types of temperature detection can be fitted on request. Details available from Bull Electric.

It should be noted that thermal devices are fitted as an aid towards

protection, but due to differences in thermal time constraints between the coils and the devices, they should not be considered as a complete protection system.

## Stall current

All force ventilated motors are suitable for continuous operation at 1% of the rated speed. However, the values of current and duration detailed in Table 10 are permissible with the motor at standstill providing that the forced air ventilating system is in continuous operation.

**Table 10: Stall current values and time duration**

Current (%)	Time (seconds)
180	15
150	30
100	60
50	300
25	Continuously rated

Details of specific applications should be referred to Bull Electric.

## Terminal Box

Position when viewed from the drive end.

**Table 11: Terminal Box Positions**

Type	Right	Top	Left
MP	RB	Std	RB
MD*	Std	RB	Alt
MKIII	Std	Alt	Alt

\*Position of conduit entry, no terminal box fitted.  
Std - Standard  
Alt - Alternative  
RB - Refer to Bull Electric

## Overload/Overspeed

When operating at full field strength, an overload equal to 1.5 times rated torque can be applied in accordance with IEC34-1.

- Occasional excess current - not more than one minute
- Momentary excess torque - not more than 15 seconds
- After any periods of stall, the motor should be run continuously for a minimum of 10 minutes

For variations of the above, please contact Bull Electric for details.



# Technical information - mechanical

## Balance

All motors are dynamically balanced to ISO 2373 (BS4999 Part 142) with key convention to IEC 34-14, i.e. half key. Reduced and special balance\* are available as an option.

Table 13 outlines the limits of vibration in severity (mm/s).

**Table 13: Limits of Vibration**

Grade	Min-1	Maximum R.M.S Velocity (mm/s)		
		Frames 71 to 132	Frames 160 to 225	Frames 250 to 355
N (Normal)	>600 ≤ 3600	1.8	2.8	4.5
R (Reduced)	>600 ≤ 1800	0.71	1.12	1.8
	>1800 ≤ 3600	1.12	1.8	2.8
S* (Special)	>600 ≤ 1800	0.45	N/A	N/A
	>1800 ≤ 3600	0.71		

\*MP and MD ranges only. N/A - Not applicable

## Bearings

Bearing sizes are detailed in Table 14. MP and MD Ranges

- Double shielded or double sealed ball bearings fitted at both ends.

## MKIII Range

### 132 to 280 frames

- Double shield or double sealed ball bearings fitted at commutator (non-drive) end. Bearing lubrication available on request
- Regreasable roller bearing fitted at the drive end

### 355 frames

- Regreasable ball bearing fitted at the commutator (non-drive) end
- Regreasable roller bearing fitted at the drive end

All bearings have sufficient grease to last for at least 2 years continuous use under normal operating conditions.

Details of grease or bearing life are available from Bull Electric.

## Lubrication

MK III range motors are provided with lubrication facilities.

**Table 12: Grease**

Grease Type	Temperature Range
Shell Albida LR2	-20°C to +150°C

## MKIII Range

Brushgear is of the finger contact-constant pressure coil spring type. No adjustment of the brushes is necessary throughout the useful life of the brushes. Finger contact brush boxes suitable for use with a brush wear indicator system can be fitted on request. Details of the brush wear indicator system can be found on page 13.

Full details of brushes for each type of motor can be obtained from Bull Electric Ltd.

## Bearing Loads

Axial and radial loads depend on a variety of factors:

- Motor speed
- Shaft type (length, diameter etc)
- Shaft fitment
- Load thrust direction
- Application

Details for specific motor designs are available from Bull Electric.

## Shafts

Standard shafts are produced from steel to BS970 Part 1, 080M40, with a tensile strength of 550N/mm<sup>2</sup>. Request for special shafts manufactured from other grades of steel should be given at the inquiry stage.

## Brushgear

Easy access to the brushgear for inspection or maintenance is via the non-drive end.

## MP and MD Ranges

Brush boxes are brass with coil spring pressure applied fingers.

**Table 14: Bearing references bearing located at non-drive end**

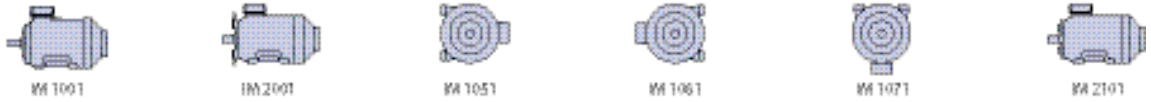
Type	Drive End	Non-Drive End	Type	Drive End	Non-Drive End
<b>MP Range</b>					
80	62042Z	62042Z	-	-	-
<b>MD Range</b>					
71	62032Z	62012Z	112	62062Z	62032Z
90	62052Z	62022Z	132	62082Z	62042Z
<b>MKIII Range</b>					
132	NU309E	6309LLBNR	225	NU313E	6312LLBNR
160	NU309E	6308LLBNR	250	NU314E	6313LLBNR
180	NU310E	6308LLBNR	280	NU318E	6317LLBNR
200	NU312E	6311LLBNR	355	NU324EC	6321LLBNR

N/A - Not available  
NEMA specification motors: alternative bearings available

# Technical information - mechanical

**Table 15: Mounting options (EN 60034-7: 1993)**

**Horizontal shaft:**



**Vertical shaft:**



**Table 16: Approximate shipping specifications**

Type	Net Weight kg	Cubage m <sup>3</sup>	Type	Net Weight kg	Cubage m <sup>3</sup>	Type	Net Weight lb	Cubage ft <sup>3</sup>	Type	Net Weight lb	Cubage ft <sup>3</sup>
<b>MP Range</b>						<b>MKIII - NEMA</b>					
MP80075	14.8	0.02	MP80160	22.7	0.03	K217ATZ	242		M3212ATZ	1014	
MP80115	19.0	0.02	MP80200	26.2	0.03	S2110ATZ	308		L3212ATZ	1256	
<b>MD Range</b>						M2112ATZ	374		S3611ATZ	1474	
MD7175	8.5	0.02	MD112BS	44.0	0.08	L2113ATZ	462		M3612ATZ	1474	
MD9040	11.8	0.02	MD112CS	50.0	0.08	K2510ATZ	488		L3612ATZ	1760	
MD9060	14.0	0.02	MD112DS	60.0	0.09	S2511ATZ	488		S4011ATZ	1980	
MD9085	17.2	0.02	MD132160	75.0	0.06	M2511ATZ	576		M4012ATZ	1980	
MD90130	23.1	0.02	MD132200	94.0	0.06	L2512ATZ	625		L4012ATZ	2332	
MD11285	27.0	0.04	MD132290	126	0.08	S2811ATZ	728		M4411ATZ	3135	
MD112130	36.5	0.04	MD1322MA	90.0	0.15	M2812ATZ	825		LC4412ATZ	3685	
MD112160	42.5	0.05	MD132MB	105.0	0.15	L2813ATZ	913		XC4413ATZ	4070	
MD112200	52.5	0.06	MD132LC	137.0	0.17	S3211ATZ	1014				
<b>MKIII Range - Metric</b>											
132K	110	0.31	225S	670	1.26						
132S	140	0.34	225M	730	1.31						
132M	170	0.37	225L	800	1.35						
132L	210	0.40	250S	900	1.61						
160K	222	0.54	250M	980	1.66						
160S	242	0.56	250L	1060	1.70						
160M	262	0.57	280S	1293	2.14						
160L	284	0.60	280M	1425	2.22						
180S	331	0.70	280L	1675	2.29						
180M	375	0.73	280X	1850	2.42						
180L	415	0.79	355S	2300	3.29						
200S	461	0.99	355M	2750	3.40						
200M	511	1.03	355L	3050	3.51						
200L	571	1.11	355X	3300	3.67						

**Notes:**

- For MD132 frames fitted with double brushgear add 1kg to weight.
- For MD132 frames fitted with interpoles add 3kg to weight.
- For MD132200 frames motors are fitted with interpoles as standard.

# Specification - MP and MD ranges

**Table 17:**  
Small DC motors specification MP and MD range (for specification of MKIII range refer to page 12)

Design Feature	Range		
	MP	MD	MD Extended range
<b>kW Range</b>	Up to 1.7kW	0.09 to 5.5kW	Up to 15kW @ 2100min <sup>-1</sup>
<b>Pole Construction</b>	2 pole ferrite magnets	2 pole, laminated	2 pole, laminated
<b>Voltage<sup>†</sup>:</b>			
<b>Armature</b>	180V or 220 - PWM	180V, 320V or 460V	180V, 320V or 460V
<b>Field</b>	Perment magnets	210V or 360V	210V or 360V
<b>Cooling:</b>			
<b>Standard</b>	IC01	IC01	IC06
<b>Options</b>	IC410 IC418	IC06* IC0410 IC418	- - -
<b>Construction Material:</b>			
<b>Frame Material</b>	Low carbon steel	Low carbon steel	Low carbon steel
<b>Endshield Material</b>	Aluminium or cast iron	Aluminium or cast iron	Aluminium or cast iron
<b>Foot Material</b>	Detachable pressed steel	Aluminium or cast iron Pressed steel - MD71	Aluminium or cast iron
<b>Mounting:</b>			
<b>Standard</b>	Foot & Flange	Foot & Flange	Foot & Flange
<b>Options</b>	Flange or Face	Flange or Face	Flange or Face
<b>Terminal location:</b>			
<b>Standard</b>	Terminal box	Non drive endshield MD71 - loose leads	MD90/112/132 non drive endshield
<b>Option</b>	305mm loose leads	MD71 - terminal box	MD132 - terminal box
<b>Enclosure:</b>			
<b>Standard</b>	IP22	IP22	IP23
<b>Options</b>	IP44 or IP55	IP44 or IP55	IP44 or IP55
<b>Dimensions</b>	Page 20/21	Page 22-24	Page 25

Key: \* MD112 and MD132 frames only † Other voltages can be accomodated, details from Bull Electric

## Optional Extras

A wide range of optional extras are available at extra cost including:

- Tacho REO 444R
- Flange or face mounting
- Compound winding
- Thermostats
- Thermistors
- Heaters
- Brakes

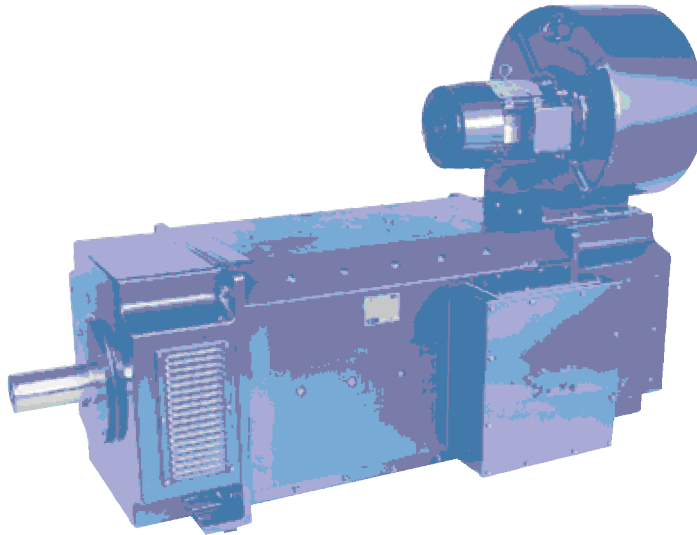
**Table 18: Force ventilation**

Frame Fitted To	Nominal kW	Nominal I <sub>n</sub> (A) @ 50 Hz		Air Quantity flow/pressure (WG)
		3 Phase 415V	1 Phase 220/240V	
<b>MD 112BS</b>	0.09	0.24	0.65	50 l/s
<b>MD112CS</b>				370 Pa
<b>MD112DS</b>				
<b>MD132160</b>	0.033	-	0.15	20 l/s
<b>MD132200</b>				250 Pa
<b>MD132MA</b>	0.25	0.63	1.63	115 l/s
<b>MD132MB</b>				750 Pa
<b>MD132LC</b>				

l/s = litres/sec  
Pa = Pascal

# MKIII Range

## MKIII Range



### General

The MKIII range of dc metric motors provides exceptionally high outputs per unit weight combined with complete flexibility of speed control. MKIII has been designed for use on fixed speed or variable speed applications operating from pure dc or thyristor converter supplies.

The range covers outputs up to 750kW in 355 frame. Motors are continuously rated, having fully laminated frames for fast response up to (200 x p.u./sec) and rugged construction for wide application use.

### Voltage

The preferred armature voltages are 440V and 460V, from either a 3 phase fully controlled thyristor converter\*, or alternatively, from a pure dc source. Voltages between 240V and 600V can be accommodated.

The standard excitation supply is 340V or 370V, however alternative voltages to customers requirements are available.

\* Where 1 phase or 3 phase half controlled supply is being considered, please refer details to Bull Electric.

### Field System

The standard motor is shunt wound, however, a compound winding can be provided on request. (Except for frame size 132).

A compensating winding is available for frame sizes 280 and 355.

### Cooling

Normal ventilation is to IC06 - separate ventilation with fitted fan unit.

Other forms of cooling are available as detailed in Table 19.

### Mechanical Features

The magnet frame is laminated construction. The endshields are of cast iron.

### Mounting

The standard arrangement is foot mounted.

### Terminals

Motor terminals are located in a terminal box.

### Enclosure

The standard enclosure is designed to give IP23 protection, with up to IP55 available.

### Tachogenerators

The following tachogenerators can be fitted on request:-

- REO 444N
- REO 444R
- RDC 14
- BD 2510B

The fitting of alternative types of tachogenerators can normally be accommodated.

Details from Bull Electric Ltd.

### Optional Extras

A wide range of optional extras are available at extra cost including:

- Thermistors
- Thermostats
- Heaters
- Brake motors
- Speed sensing (Tacho or Encoder)
- Compound winding

### Dimensions

Full dimensional data is detailed on pages 26/ 27.

**Table 19: Alternative ventilation**

Code	Description
IC17	Separate ventilation with inlet duct
IC37	Separate ventilation with inlet and outlet ducts
IC410	Totally enclosed self cooled
IC06 66	Totally enclosed with air/air heat exchanger (closed internal air circuit)
	Separate fan for internal and external cooling air
ICW37 A86	Totally enclosed with water/air heat exchanger (separate fan for internal air)

## Brushwear detection system for MKIII DC motors

### All the benefits of DC drives with low maintenance

The Bull Electric Brushwear Detection System enables the user to derive all the benefits of MKIII dc motors with planned maintenance cycles comparable to those of ac machines.

The system is designed to give an indication when brushes are approaching the end of their useful life and should be replaced. This avoids the risk of commutator damage and reduces the need for brush inspection to normal plant maintenance cycles.

- Allows rationalisation of plant maintenance.
- All brush boxes are monitored.
- No detection wires in brushes.
- Avoids commutator surface damage caused by 'Brush Pigtail Scoring'.
- Fully electronic solution.
- Warning light and circuit test facility at users preferred location.

### Specify on new motors or retrofit to old

From Spring 1993, MKIII dc motors have been fitted with a new style brush holder ring. This enables the Brushwear Detection System to be added on request when ordering MKIII motors.

The brush holder rings, incorporating the brush contacts, can also be supplied for retrofitting the system to older MKIII motors.

If in doubt about whether existing motors are suitable for retrofit, please contact Bull Electric with the motor serial number.

For technical specification of the brushwear detection system please contact Bull Electric.



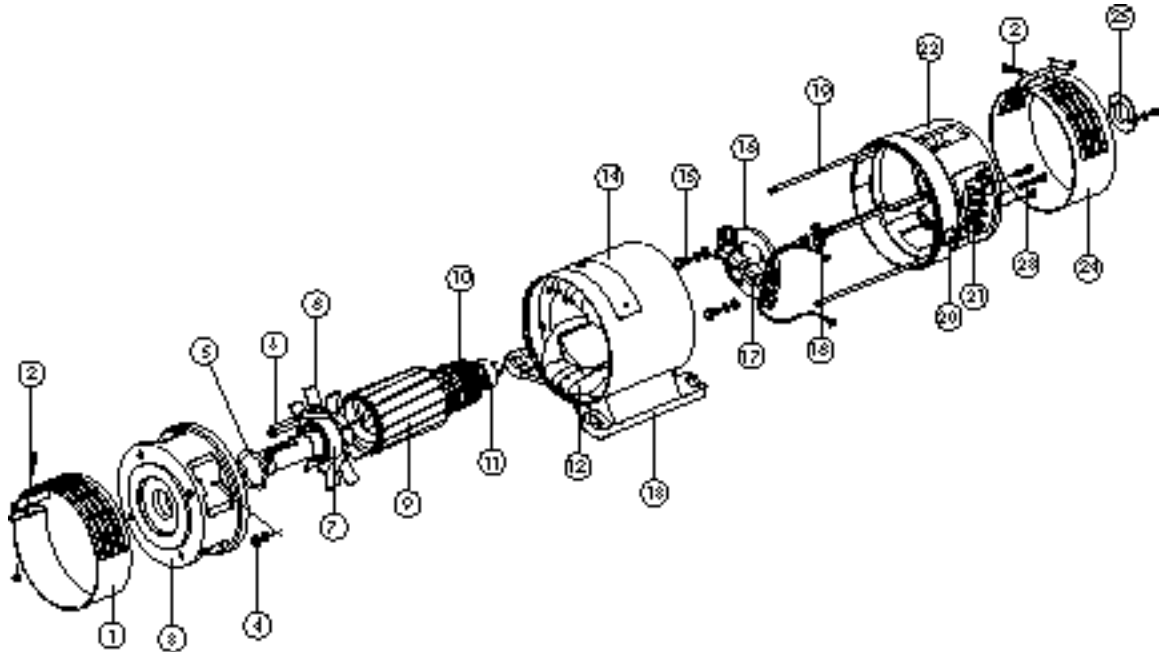
System components



Brush holder ring

# Spare parts, installation and maintenance

## Typical motor



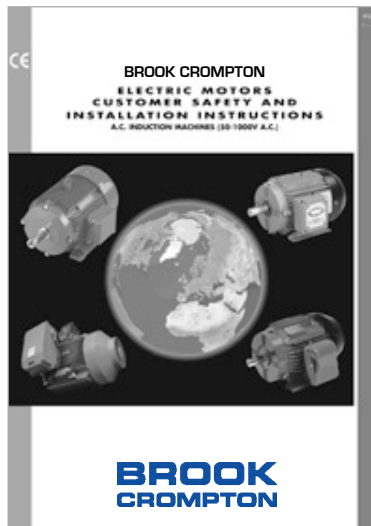
### Parts List

1 Drive end band cover	11 Non-drive end bearing	21 Terminal board
2 Band cover securing nut and screw	12 Field coils	22 Non-drive endshield
3 Drive end endshield	13 Feet	23 Bearing retention screws
4 Endshield securing nut	14 Stator assembly with or without feet	24 Non-drive end band cover
5 Preloaded washer	15 Brushgear securing nuts and screws	25 Non-drive end shaft cover
6 Shaft key	16 Brushgear	
7 Drive end bearing	17 Brushes	
8 Internal fan	18 Bearing retention devices	
9 Armature	19 Frame studs	
10 Commutator	20 Conduit entry	



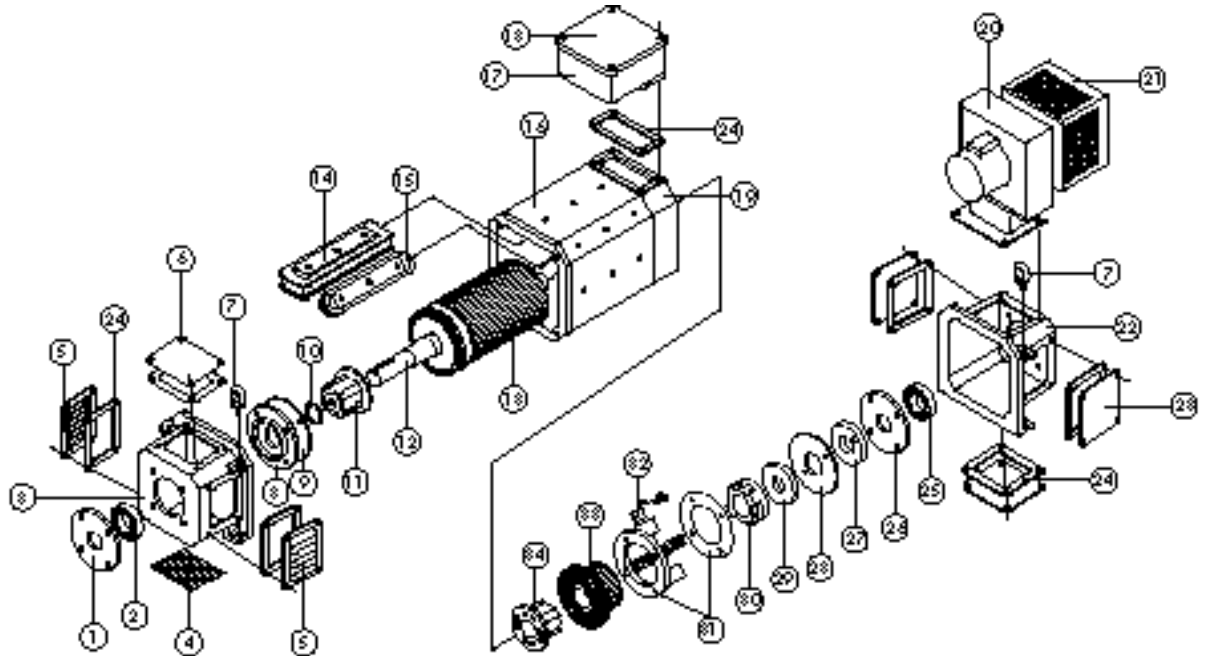
### Warning

All motors are supplied with safety and installation instructions. This should be read carefully on receipt of the motor. It should be passed on with the motor to the end-user.



# Spare parts, installation and maintenance

## MKIII Range



### Parts List

1 Drive end outer bearing cap	13 Armature assembly	25 Non-drive end ball bearing
2 Drive end roller bearing	14 Mainpole assembly	26 Non-drive end bearing cap
3 Drive endshield	15 Interpole assembly	27 Locknut
4 Grill	16 Magnet frame	28 Commutator balancing disc
5 Louvered covers	17 Terminal box	29 Spacer
6 Cover	18 Terminal box lid	30 Commutator support
7 Eyebolt	19 Terminal box housing	31 Brush ring assembly box
8 Drive end inner bearing cap	20 Force ventilation unit	32 Brushes
9 Drive end balancing disc	21 Filter box	33 Commutator
10 Circlip	22 Commutator endshield	34 Commutator pressure casting
11 Drive end pressure casting	23 Cover	
12 Shaft	24 Gasket	

## Performance data - MD range

Plain shunt, separately excited

MD Range

Protection IP22 Voltage:180 and 320Va

Min <sup>-1(16)</sup>	20:1 Speed Range - Cooling IC01 100:1 Speed Range - Cooling IC06						J kgm <sup>2</sup>
	1500		2000		3000		
Form factor	1.4	1.05	1.4	1.05	1.4	1.05	
Type	kW	kW	kW	kW	kW	kW	
MD7175	0.18	0.22	0.25	0.30	0.25	0.30	0.00084
MD9040	0.18	0.25	0.25	0.35	0.25	0.35	0.0012
MD9060	0.25	0.35	0.30	0.40	0.37	0.50	0.0015
MD9085	0.37	0.50	0.37	0.50	0.55	0.75	0.0021
MD90130	0.55	0.75	0.75	1.00	1.10	1.50	0.0030
MD11285	0.75	1.20	0.85	1.35	1.30	2.00	0.0062
MD112130	1.10	1.75	1.10	1.75	1.50	2.40	0.0084
MD112160	1.50	2.40	1.50	2.40	2.20	3.50	0.0098
MD132160	1.80	3.60	2.20	4.40	3.00	5.50	0.0236
MD132200	2.20	4.40	3.00	5.50	4.00	7.50	0.0271
MD132290	3.70	5.00	3.70	5.50	3.50	7.50	0.0393

<sup>(16)</sup> Nominal

Plain shunt, separately excited

MD Range

Protection IP44 Voltage:180 and 320Va

Min <sup>-1(16)</sup>	Cooling IC410 100:1 Speed Range						J kgm <sup>2</sup>
	1500		2000		3000		
Form factor	1.4	1.05	1.4	1.05	1.4	1.05	
Type	kW	kW	kW	kW	kW	kW	
MD7175	*	*	*	*	*	*	0.00084
MD9040	*	*	*	*	*	*	0.0012
MD9060	0.18	0.22	0.18	0.22	0.25	0.30	0.0015
MD9085	0.25	0.30	0.25	0.30	0.37	0.45	0.0021
MD90130	0.30	0.37	0.30	0.37	0.37	0.45	0.0030
MD11285	0.37	0.45	0.37	0.45	0.45	0.55	0.0062
MD112130	0.55	0.67	0.55	0.67	0.55	0.75	0.0084
MD112160	0.75	1.1	1.1	1.5	1.5	2.2	0.0098
MD112200	*	*	*	*	*	*	0.0117
MD132160	1.1	1.5	1.5	2.2	2.2	2.5	0.0236
MD132200	2.0	2.2	2.2	2.8	2.2	3.0	0.0271
MD132290	2.2	2.75	2.5	3.2	*	*	0.0393

<sup>(16)</sup> Nominal



# Performance data - MD range

Plain shunt, separately excited

MD Range

Protection IP23 Voltage: 180, 320 and 460Va

Min <sup>-1 (16)</sup>	Cooling : IC06						J kgm <sup>2</sup>
	100:1 Speed Range						
	1500		2000		3000		
Form factor	1.4	1.05	1.4	1.05	1.4	1.05	
Type	kW	kW	kW	kW	kW	kW	
MD112BS	1.5	2.0	2.0	2.6	3.0	3.7	0.0084
MD112CS	2.0	2.8	2.8	3.8	3.0	5.1	0.0094
MD112DS	2.6	3.6	3.3	4.6	4.0	7.0	0.0117
MD132MA	3.1	5.7	4.2	7.5	5.8	11.0	0.0236
MD132MB	4.0	7.5	5.5	11**	7.5	15.0	0.0271
MD132LC	5.2	10	6.4	15**	*	*	0.0393

<sup>(16)</sup> Nominal

\*\* @ 2100min<sup>-1</sup>

# Performance data - MP range

## Permanent magnet

### MP Range

Protection IP22/55 Voltage: 180, 220 and 320Va

V	IP44/IP55*		IP22		Base speed min <sup>-1</sup>	J kgm <sup>2</sup>
	Cooling : IC410		Cooling : IC01			
	100:1 Speed Range : IC410		20:1 Speed Range : IC01			
	180V	180V/220V	180V	180V/220V		
Form factor	1.6	1.05	1.6	1.05		
Type	kW	kW	kW	kW		
MP80075	0.25	0.37	0.37	0.55	2000	0.0018
MP80115	0.37	0.55	0.55	0.7	2000	0.0031
MP80160	0.55	0.75	0.75	0.95	2000	0.0045
MP80200	0.75	1.1	1.1	1.2	2000	0.0057
MP80200	0.75	1.1	1.1	1.7	2500	0.0057

\* Max speed 3600min<sup>-1</sup>

# Performance data - MKIII range

## Plain shunt, separately excited

### MKIII Range

Protection IP23 Voltage: 440 or 460Va

Type	kW <sup>(18)</sup>	M <sub>N</sub> Nm	Maximum Safe Speed <sup>(19)</sup> Min <sup>-1</sup>	Max. Safe Speed <sup>(20)</sup> Min <sup>-1</sup>	Excitation <sup>(21)</sup> W	Secs <sup>(22)</sup>	Ventilation		J kgm <sup>2</sup>	dB (A)	Fan Unit*
							M <sup>3</sup> /sec	WG (mm)			
132K	6.3	37	5000	6000	430	0.11	0.16	110	0.09	80	1
132S	15.7	81	5000	6000	600	0.13	0.16	110	0.11	80	1
132M	21.7	114	5000	6000	750	0.15	0.16	110	0.13	80	1
132L	33.3	172	5000	6000	900	0.18	0.16	110	0.15	80	1
160K	31	177	4000	5000	890	0.24	0.27	145	0.19	80	2
160S	37	209	4000	5000	970	0.27	0.27	145	0.21	80	2
160M	43	237	4000	5000	1085	0.29	0.27	145	0.24	80	2
160L	47	275	4000	5000	1200	0.31	0.27	145	0.27	80	2
180S	65	343	3750	5000	1280	0.33	0.32	160	0.40	80	3
180M	75	439	3750	5000	1400	0.36	0.32	160	0.46	80	3
180L	91	511	3750	5000	1600	0.39	0.32	160	0.51	80	3
200S	110	576	3500	5000	1630	0.43	0.52	180	0.71	80	4
200M	124	686	3500	5000	1810	0.47	0.52	180	0.81	80	4
200L	139	785	3500	5000	2000	0.50	0.52	180	0.91	80	4
225S	169	928	3000	4000	1750	0.58	0.60	150	1.5	80	5
225M	186	1067	3000	4000	1900	0.62	0.60	150	1.7	80	5
225L	235	1240	3000	4000	2100	0.66	0.60	150	1.9	80	5
250S	239	1320	2500	3000	2150	0.76	0.75	150	2.6	80	5
250M	268	1530	2500	3000	2350	0.81	0.75	150	2.9	80	5
250L	301	1740	2500	3000	2600	0.85	0.75	150	3.3	80	5
280S	290	1840	2000	2300	2750s 1950c	0.92	1.15	175	3.8	84	6
280M	330	2160	2000	2300	3050s 2150c	0.97	1.15	175	4.3	84	6
280L	400	2500	2000	2300	3500s 2450c	1.0	1.15	175	4.9	84	6
280X	–	3000	1750	2000	4000s 2800c	1.05	1.15	175	5.6	84	6
355S	–	3500	1750	2000	3100c	0.75	2.0	200	13	88	7
355M	–	4600	1750	2000	3550c	0.85	2.0	200	16	88	7
355L	–	6100	1750	2000	4400c	0.95	2.0	200	20	88	7
355X	–	7200	1750	2000	4800c	1.0	2.0	200	23	88	7

### Fan Units\*

- \* 1. 0.25 kW, 2 pole, 380/440/3/50HZ. Rated current 0.7 Amps @ 415V, 4 Amps starting
- \* 2. 0.75 kW, 2 pole, 380/440/3/50HZ. Rated current 1.7 Amps @ 415V, 9.8 Amps starting
- \* 3. 1.1 kW, 2 pole, 380/440/3/50HZ. Rated current 2.4 Amps @ 415V, 13.5 Amps starting
- \* 4. 1.5 kW, 2 pole, 380/440/3/50HZ. Rated current 3.0 Amps @ 415V, 17 Amps starting
- \* 5. 2.2 kW, 2 pole, 380/400/3/50HZ. Rated current 4.4 Amps @ 415V, 25 Amps starting
- \* 6. 4 kW 2 pole, 380/440/3/50HZ. Rated current 7.8 Amps @ 415V, 45 Amps starting
- \* 7. 5.5 kW, 4 pole, 380/440/3/50HZ. Rated current 10.0 Amps @ 415V, 71 Amps starting.

<sup>(19)</sup> Maximum safe speed for standard construction

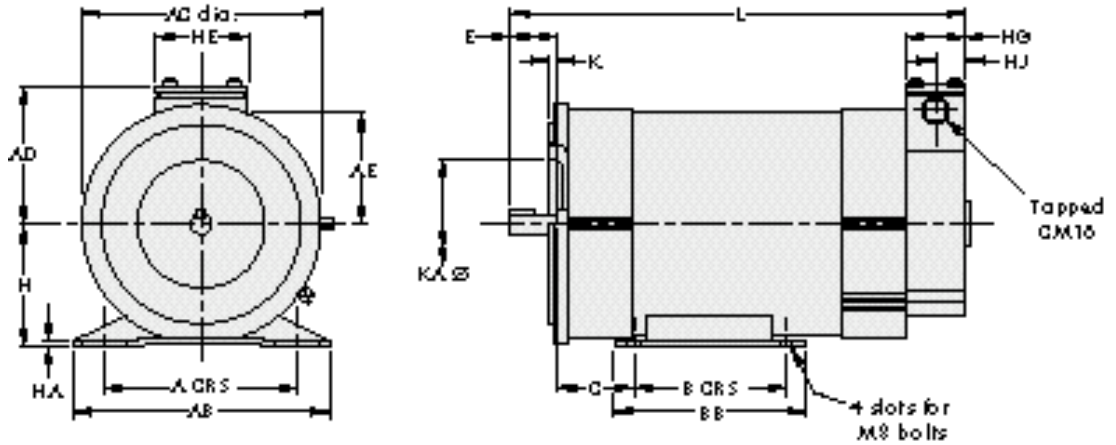
<sup>(20)</sup> Maximum safe speed for high speed construction

<sup>(21)</sup> Excitation when hot

<sup>(22)</sup> Field time constant

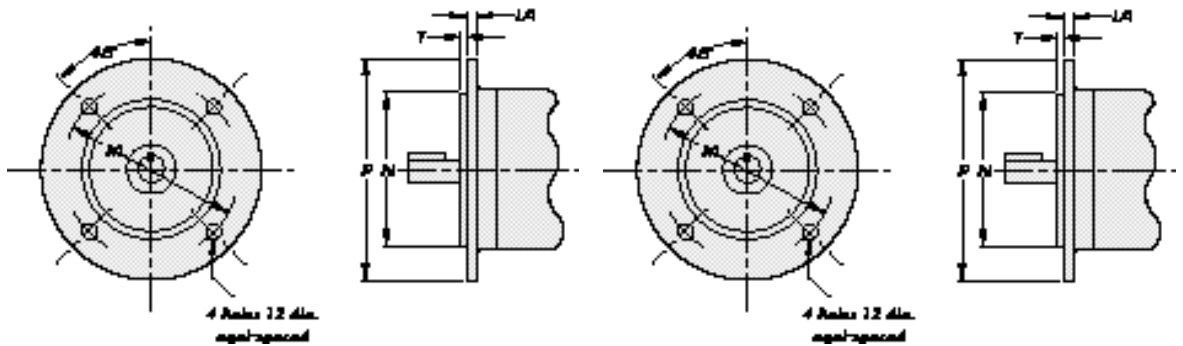
# Dimensions - MP range

## Foot mounting



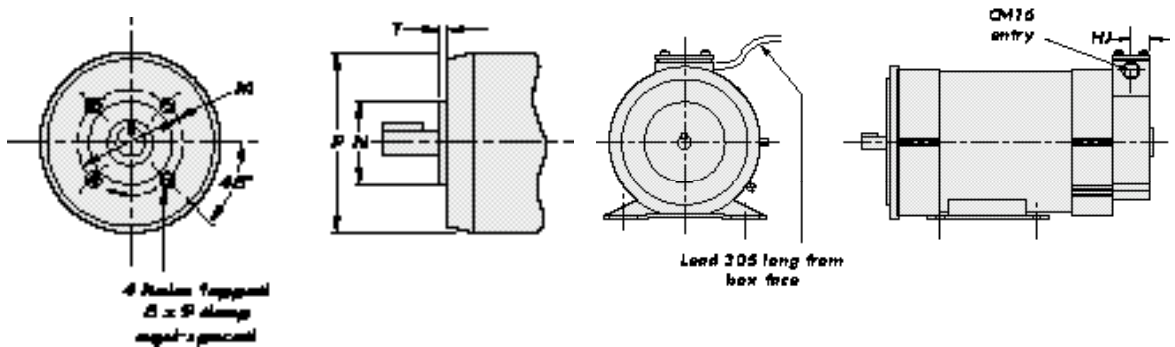
## FF.130 Flange

## FF.165 Flange



## Alternative Face

## Optional Flying lead



# Dimensions - Foot, Flange and Optional Flying Lead

General																						
Type	A	AB	AC	AD	AE	B	BB	C	D Norm	E	ED	F	G Norm	GD	H	HA	HE	HG	HJ	L	K	KA
MP80075	125	165	150	91	72	100	120	50	19	40	25	6	15.5	6	80.0	3	59	38	17	307	5	62
MP80115	125	165	150	91	72	100	120	50	19	40	25	6	15.5	6	80.0	3	59	38	17	347	5	62
MP80160	125	165	150	91	72	100	120	50	19	40	25	6	15.5	6	80.0	3	59	38	17	392	5	62
MP80200	125	165	150	91	72	100	120	50	19	40	25	6	15.5	6	80.0	3	59	38	17	432	5	62

B14 Mounting						
Type	M	N		P	S	T
		Norm	Tol			
FT.85	85	70	-0.046	150	M6	2.5
FT.100	100	80	-0.054	150	M6	3.0
FT.115	115	95	-0.054	150	M8	3.0

Optional Flying Lead	
Type	HJ
MP80075	17
MP80115	17
MP80160	17
MP80200	17

Alternative Shaft						
Type	D Norm	E	ED	F	G Norm	GD
MP80075	14	30	16	5	11.0	5
MP80115	14	30	16	5	11.0	5
MP80160	14	30	16	5	11.0	5
MP80200	14	30	16	5	11.0	5

Flange						
Type	LA	M	N		P	T
			Norm	Tol		
FF 165	10	165	130	-0.063	200	3.5
FF 130	8	130	110	-0.054	160	3.5

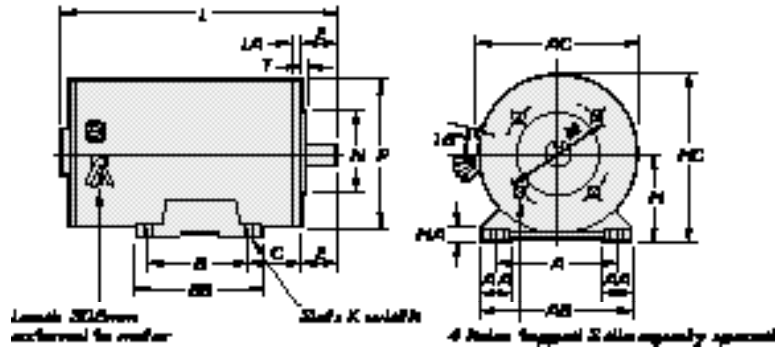
# Dimensions - MD range

## Frame MD7175 – Foot and Face mounting

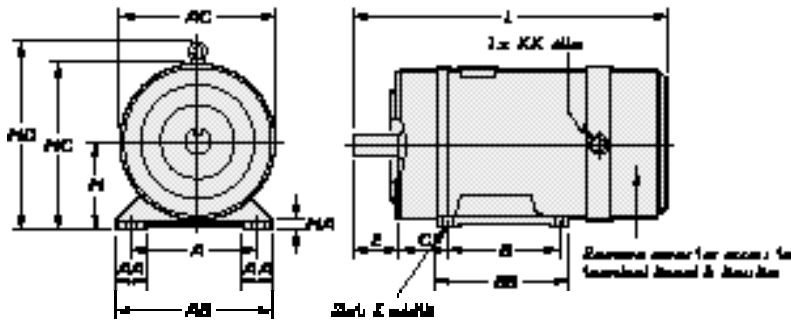
### Foot Mounting

Frame MD7175 – Foot and face mounting

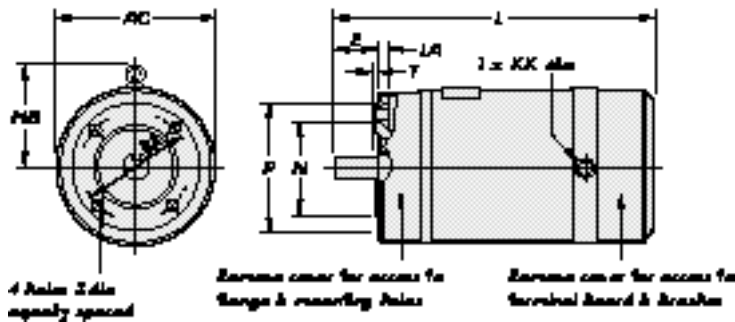
On MD7175 frames a tapped drive-end endshield is also provided, making these machines suitable for foot, face or foot and face mounting.



## Frame MD9040 – 132290



## Flange mounting – B5



# Dimensions - Foot and Face mounting

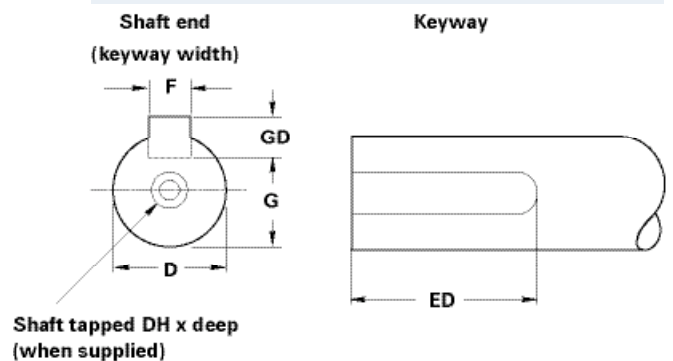
Type	Fixing					Shaft					General										Flange					
	A	B	C	H	K	D	E	F	G	ED	AA	AB	BB	L	HA	AC	HB	HC	HD	KK	M	N	P	S	T	LA
MD7175	112	90	45	71	8	14	30	5	11	16	25	132	110	255	8	129	-	135.5	-	-	85	70	129	M6	2.5	8
MD9040	140	100	56	90	9	24	50	8	20	32	30	170	120	260	10	165	-	172.5	-	CM20	130	110	158	10	3.5	10
MD9060	140	100	56	90	9	24	50	8	20	32	30	170	120	280	10	165	-	172.5	-	CM20	130	110	158	10	3.5	10
MD9085	140	125	56	90	9	24	50	8	20	32	30	170	145	305	10	165	-	172.5	-	CM20	130	110	158	10	3.5	10
MD90130	140	125	56	90	9	24	50	8	20	32	30	170	145	350	10	165	-	172.5	-	CM20	130	110	158	10	3.5	10
MD11285	190	114	70	112	12	28	60	8	24	40	36	226	138	341	12	210	-	217.0	-	CM20	165	130	200	12	3.5	10
MD112130	190	140	70	112	12	28	60	8	24	40	36	226	164	386	12	210	-	217.0	-	CM20	165	130	200	12	3.5	10
MD112160	190	140	70	112	12	28	60	8	24	40	36	226	164	416	12	210	-	217.0	-	CM20	165	130	200	12	3.5	10
MD112200	190	140	70	112	12	28	60	8	24	40	36	226	164	456	12	210	-	217.0	-	CM20	165	130	200	12	3.5	10
MD132160	216	178	89	132	12	38	80	10	33	56	55	256	208	505	14	258	172	261.0	304	CM20	215	180	250	15	4.0	15
MD132200	216	178	89	132	12	38	80	10	33	56	55	256	208	545	14	258	172	261.0	304	CM20	215	180	250	15	4.0	15
MD132290	216	254	89	132	12	38	80	10	33	56	55	256	284	635	14	258	172	261.0	304	CM20	215	180	250	15	4.0	15

Type	Maximum diameter of non-standard shaft extension	
	Drive End	Non-Drive End
MD7175	16	11
MD9040	24	14
MD9060	24	14
MD9085	24	14
MD90130	24	14
MD11285	28	16
MD112130	28	16
MD112160	28	16
MD112200	28	16
MD132160	38	19
MD132200	38	19
MD132290	38	19

## Approximate Shipping Specification

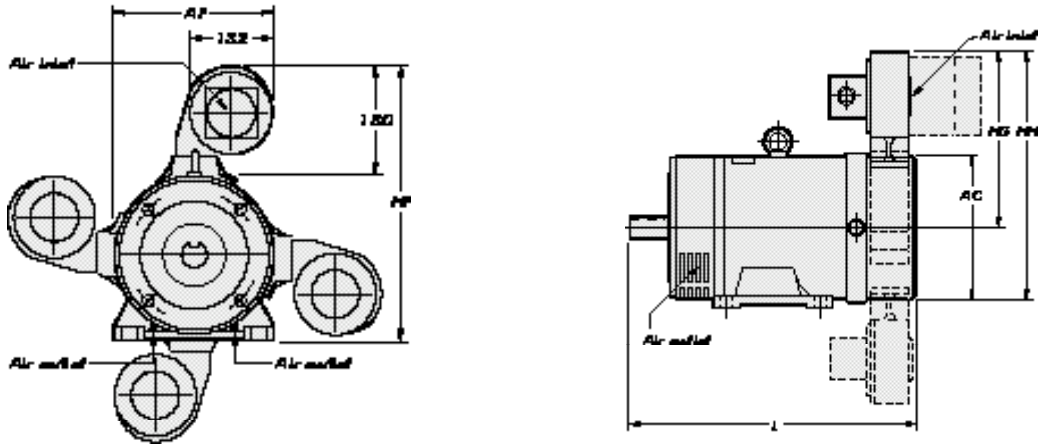
Type	Net weight	
	IM101 kg	IM3001 kg
MD7175	-	8.5
MD9040	11.8	11.0
MD9060	14.0	13.2
MD9085	17.2	16.2
MD90130	23.1	22.1
MD11285	27.0	25.5
MD112130	36.5	35.5
MD112160	42.5	41.0
MD132160	75.0	73.0
MD132200	94.0	92.0

## Shaft extension



# Dimensions - MD range

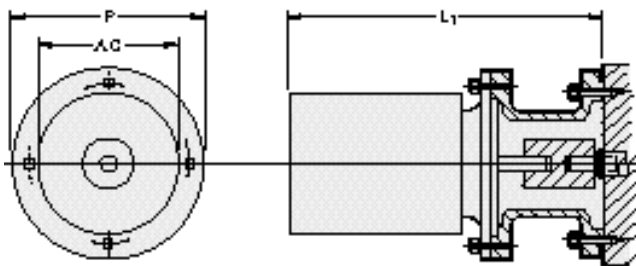
Frame 132160 & 132200 Cooling form IC06, IP00 OR IP20\*



Type	AC	AF	HF	HG	HH	L	Weight ** kg
MD132160	258	261	441	309	438	505	1.6
MD132200	258	261	441	309	438	545	1.6

\* The blowers used as standard incorporate a 3 phase ac motor  
 \*\* Add to weight of basic machine

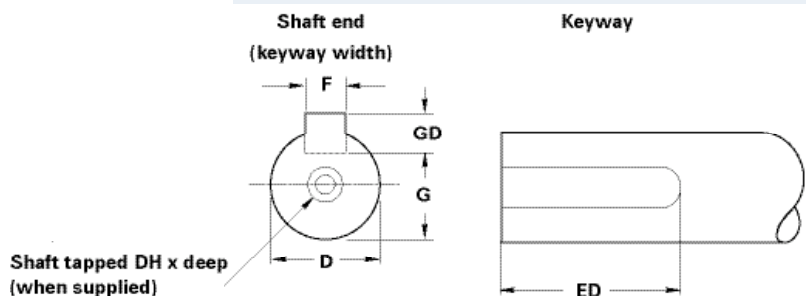
## Tachogenerators



Manufacturer	Ref.	Type	Adaptor Ref.	Coupling	Tacho to adaptor fixing bolts, etc.	L <sub>1</sub>	AC	P	Output V	Weight * kg
Radio Energie	RE0444R	MD90-132	FS32036	Essex L.050	Not supplied M6	208	89	115	0.06V min <sup>-1</sup>	2.5

\* Add to weight of basic machine

## Shaft extension

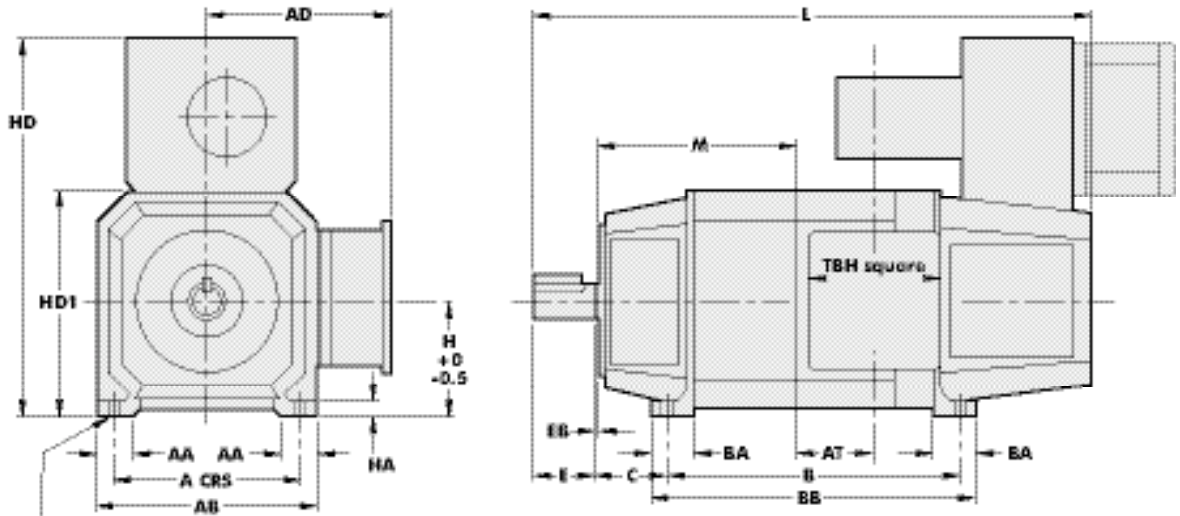






# Dimensions - MKIII range

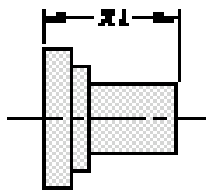
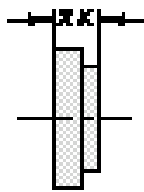
## MKIII Range



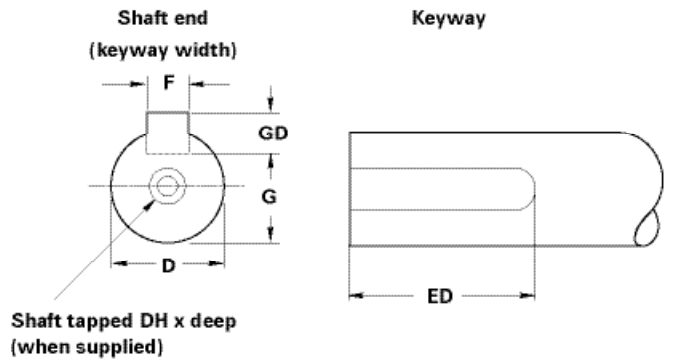
Dim. K Holes

Cable entry can be arranged in any one of four positions at 90° intervals

## Tachogenerator



## Shaft extension



## Approximate Shipping Specifications

Type	Net weight kg	Type	Net weight kg	Type	Net weight kg
132K	110	180M	375	250L	1060
132S	140	180L	415	280S	1293
132M	170	200S	461	280M	1425
132L	210	200M	511	280L	1675
160K	222	200L	571	280X	1850
160S	242	225S	670	355S	2300
160M	262	225M	730	355M	2750
160L	284	225L	800	355L	3050
180S	331	250S	900	355X	3300
		250M	980		

# Standard design, Tachogenerators and Adaptor kit

## Standard design

Type	Fixing					Shaft						General														
	A	B	C	H	K	D	E	F	G	ED	DH	L	AA	AB	BB	HA	EB	AD*	AD**HD	HD1	AT	TBH*	TBH**	B	BA	
132K	216	235	89	132	10	38	80	10	33	-	M12 x 20	523	45	256	285	10	-	222	-	600	260	10.5	245	-	235	53
132S	216	310	89	132	10	38	80	10	33	-	M12 x 20	598	45	256	360	10	-	222	-	600	260	48	245	-	310	53
132M	216	385	89	132	10	38	80	10	33	-	M12 x 20	673	45	256	435	10	-	222	-	600	260	85.5	245	-	385	53
132L	216	460	89	132	10	38	80	10	33	-	M12 x 20	748	45	256	510	10	-	222	-	600	260	123	245	-	460	53
160K	254	396	108	160	14	42	110	12	37	80	M12 x 20	808	69	312	446	18	5	315	-	661	316	101	245	-	396	57
160S	254	426	108	160	14	42	110	12	37	80	M12 x 20	838	69	312	476	18	5	315	-	661	316	116	245	-	426	57
160M	254	461	108	160	14	42	110	12	37	80	M12 x 20	873	69	312	511	18	5	315	-	661	316	133.5	245	-	461	57
160L	254	501	108	160	14	42	110	12	37	80	M12 x 20	913	69	312	551	18	5	315	-	661	316	153.5	245	-	501	57
180S	279	493	121	180	14	48	110	14	43	80	M12 x 20	905	75	352	537	22	5	335	-	739	356	131	245	-	493	70
180M	279	543	121	180	14	48	110	14	43	80	M12 x 20	955	75	352	587	22	5	335	-	739	356	156	245	-	543	70
180L	279	593	121	180	14	48	110	14	43	80	M12 x 20	1005	75	352	637	22	5	335	-	739	356	181	245	-	593	70
200S	318	540	133	200	18	55	110	16	49	80	M12 x 20	1018	82	392	590	22	5	355	415	838	396	158	245	380	540	70
200M	318	590	133	200	18	55	110	16	49	80	M12 x 20	1068	82	392	640	22	5	355	415	838	396	183	245	380	590	70
200L	318	640	133	200	18	55	110	16	49	80	M12 x 20	1118	82	392	690	22	5	355	415	838	396	208	245	380	640	70
225S	356	610	149	225	18	60	140	18	53	110	M16 x 30	1143	80	442	660	22	5	380	440	881	446	188	245	380	610	72
225M	356	660	149	225	18	60	140	18	53	110	M16 x 30	1193	80	442	710	22	5	380	440	881	446	213	245	380	660	72
225L	356	720	149	225	18	60	140	18	53	110	M16 x 30	1253	80	442	760	22	5	380	440	881	446	243	245	380	720	72
250S	406	674	168	250	24	65	140	18	58	110	M16 x 30	1272	88	492	724	25	5	405	465	926	496	218	245	380	674	73
250M	406	729	168	250	24	65	140	18	58	110	M16 x 30	1327	88	492	779	25	5	405	465	926	496	245.5	245	380	729	73
250L	406	784	168	250	24	65	140	18	58	110	M16 x 30	1382	88	492	834	25	5	405	465	926	496	273	245	380	784	73
280S	457	749	190	280	24	85	170	22	76	140	M20 x 33	1470	95	552	809	25	-	463	-	1066	556	152	464	-	749	83
280M	457	814	190	280	24	85	170	22	76	140	M20 x 33	1535	95	552	874	25	-	463	-	1066	556	185	464	-	814	83
280L	457	889	190	280	24	85	170	22	76	140	M20 x 33	1610	95	552	949	25	-	463	-	1066	556	222	464	-	889	83
280X	457	979	190	280	24	85	170	28	76	140	M20 x 33	1700	95	552	1039	25	-	463	-	1066	556	267	464	-	979	83
355S	610	884	254	355	28	110	210	28	100	190	M24 x 33	1697	105	732	1090	30	-	577	-	1400	708	-	540	-	884	175
355M	610	994	254	355	28	110	210	28	100	190	M24 x 33	1807	105	732	1200	30	-	577	-	1400	708	-	540	-	994	175
355L	610	1144	254	355	28	110	210	28	100	190	M24 x 33	1957	105	732	1350	30	-	577	-	1400	708	-	540	-	1144	175
355X	610	1254	254	355	28	110	210	28	100	190	M24 x 33	2067	105	732	1460	30	-	577	-	1400	708	-	540	-	1254	175

\* Standard terminal box

\*\* Large terminal box

## Tachogenerator and Adaptor kit Dimensions

Type	REO 444N			REO 444R			RDC 14			BD 2510		
	XK	XL	Kg	XK	XL	Kg	XK	XL	Kg	XK	XL	Kg
132	38	164	1.8	38	174	2.8	6	64	1.75	-	-	-
160	38	164	1.8	38	174	2.8	6	64	1.75	38	294	12.7
180	38	164	1.8	38	174	2.8	6	64	1.75	38	294	12.7
200	38	164	1.8	38	174	2.8	6	64	1.75	38	294	12.7
225	38	164	1.8	38	174	2.8	6	64	1.75	38	294	12.7
250	38	164	1.8	38	174	2.8	11	69	1.75	38	294	12.7
280	38	164	1.8	38	174	2.8	6	64	1.75	38	294	12.7
355	54	180	1.8	54	190	2.8	6	64	1.75	54	310	12.7