CMG

motors

2nd Edition

Includes installation & maintenance details

PPD series motors

Zone 1 Ex d cast iron units

The PPD series of Zone 1 Group I & IIB Ex d 'flameproof' motors are outstanding examples of the diverse range and product reliability that has built the CMG name. The PPD series from 0.55 to 90 kW is part of CMG's extensive range of electric motors. CMG's world best practices and technologies, plus our international computerised sales, spare parts and service back-up mean we can offer a total commitment to every customer.

You can be sure every product supplied by CMG's Motors, Transmission or Drives divisions... be it an electric motor, geared motor, variable frequency drive, soft starter, or one of our many other associated products...will perform exactly to specification, and deliver reliable performance year after year with minimum maintenance and downtime.

CMG's Technology division is a recognised R & D leader offering professional engineering staff and facilities for design, testing, product development and quality control. When you think Motors, Transmission, Drives, or research and development Technology...think CMG.

NATA
Accreditation No. 14396

Certified ISO 9001 : 2000 by
BVQi
n° 149352

PPD Zone 1, Group I & IIB, T4 Class, Ex d motors Sizes 80 to 280, 0.55 to 90 kW, three phase

CMG's PPD range of Ex d 'flameproof' motors are certified for use in Zone 1 hazardous locations. These motors are designed to contain any sparks within the motor without igniting external vapours. They incorporate features such as a robust cast iron construction and special terminal box to meet the stringent certification requirements.

The complete PPD range covers sizes 80 to 280, three phase 2, 4, 6 & 8 pole, with foot and flange mounting options.

Certification

The PPD range is specially designed and certified for use in a Zone 1, Group I & IIB, T4 class temperature, Ex d area. SAA certification numbers are AUS Ex 3767X, AUS Ex 3768X, and AUS Ex 3769X for frames 80 to 100, 112 to 180, and 200 to 280 respectively.

Standards and specifications

The main dimensions and rated outputs of the PPD series generally conform to Australian Standard AS/NZS1359 (CENELEC kW-frame size allocation table) and International Standards IEC 60034 and IEC 60072. In addition the motor enclosure and temperature rise are tested to comply with AS2380.2-1991.

Operating parameters

PPD series motors are designed with the following parameters:

- Continuous duty (S1)
- Three phase 415 Volts, 50 Hz power supply
- Ambient temperatures up to 40°C
- Installation at altitudes up to 1000 metres

Performance data is based on these parameters and may need adjustment for different conditions.

Motors can be manufactured for any supply between 100 and 1100 Volts and frequencies 40 Hz, 50 Hz or 60 Hz.

F class insulation, T4 surface temperature

PPD series motors have F class insulation and B class temperature rise. This design feature assures cool running of the motor. Certified Ex d T4 class motors have a maximum allowable surface temperature of 135°C.

Degree of protection

Level of enclosure protection for the PPD series is IP66.

Paint finish

Motors are painted with a high quality enamel finish. The standard colour is light grey (RAL 7038), with other colours available on request.

MEPS compliance

PPD motor efficiency levels comply to the minimum efficiency requirements as per AS/NZS 1359.5:2000.

Bearings

Bearings fitted are deep groove ball type and are the same size both ends. Frames 80 to 132 have sealed for life bearings. Frames 160 to 280 have open bearings that are capable of being lubricated by removal of the outer bearing caps at either end. Only accredited and competent personnel should carry out maintenance procedures.

Motor frame	Bearing Size
80	6204ZZ
90	6205ZZ
100	6206ZZ
112	6306ZZ
132	6308ZZ
160	6309
180	6310
200	6312
225	6313
250	6314
280	6317

Terminal box

The terminal box of the PPD series is amply sized to allow for termination of cables and has dual conduit entry designed to accept flameproof glands. Motors, as standard, have two entries, as detailed on page 6.

Thermistors

PPD motors are fitted, as standard, with one set of (3) PTC thermistors and are terminated within the main terminal box (auxiliary terminal boxes are available as an option).

Internal connections

Frame sizes 80 to 112 have three terminals suitable for DOL starting. Frame sizes 132 to 280 have six terminals suitable for DOL or Star/Delta starting.

VVVF drive selection

PPD Ex d hazardous location motors require thermistors when used in conjunction with VVVF drive to ensure the temperature rise remains below the certified T4 level. Ex d/VVVF drive packages are available including a force ventilation option on frames 200 and above. Please contact your nearest CMG office for details of requirements.

Product code specification

When placing an order the motor product code should be specified. The product code of the motor is composed in accordance with the following example:

M	3	2	0 0 1 5 0	3	P P D	/ 4 0 5
1	2	3	4-8	9	10 - 12	13-16

Position 1
M = metric frame size

Position 2
Phase
3 = three phase single speed motor

Position 3
Number of poles
2 = 2 poles **4** = 4 poles
6 = 6 poles **8** = 8 poles

Positions 4 to 8
Rated power output
(kW x 100)

Position 9
Mounting arrangement
3 = B3 **4** = B3/B5
5 = B5

Positions 10 to 12
Series
PPD = CMG PPD series motors

Positions 13 to 16
Supply power
Blank = 415V 50Hz
/385 = 380V 50Hz
/405 = 400V 50Hz

Performance data

PPD series, Three phase, 415 V 50 Hz
IP66, F class insulation , T4 class surface temperature

					415V 50Hz						380V 50Hz*	400V 50Hz*		
kW	**Motor frame**	Speed [r/min]	Efficiency [%]	Power factor cos φ	Current Full Load I_N [A]	Current Locked Rotor I_L/I_N [A]	Torque Full Load T_N [Nm]	Torque Locked rotor T_L/T_N	Torque Break down T_B/T_N	Current Full Load I_N [A]	Current Full Load I_N [A]	Moment of inertia $J=¼GD^2$ [kg·m²]	Weight of foot mount motor [kg]
3000 r/min = 2 poles													
0.75	**80A - 19**	2840	77.5	0.82	1.63	6.2	2.5	2.9	3.0	1.79	1.70	0.0011	28
1.1	**80B - 19**	2840	78.4	0.85	2.3	6.3	3.7	2.3	2.5	2.5	2.4	0.0013	28
1.5	**90S - 24**	2800	80.0	0.85	3.1	6.4	5.1	3.0	2.7	3.4	3.2	0.0019	34
2.2	**90L - 24**	2840	81.6	0.85	4.4	7.1	7.4	3.0	2.8	4.8	4.5	0.0024	37
3	**100L - 28**	2875	84.1	0.86	5.8	7.6	10.0	2.8	3.2	6.3	6.0	0.0044	62
4	**112M - 28**	2905	86.1	0.89	7.3	7.2	13.1	2.2	3.2	7.8	7.6	0.0076	79
5.5	**132SA - 38**	2905	87.2	0.89	9.8	7.2	18.1	2.0	2.9	10.7	10.2	0.016	87
7.5	**132SB - 38**	2910	88.2	0.90	13.2	7.2	24.6	2.0	2.6	14.4	13.7	0.018	134
11	**160MA - 42**	2940	90.7	0.87	19.3	6.6	35.7	1.9	2.8	21.0	20.0	0.051	149
15	**160MB - 42**	2935	91.1	0.89	25.6	6.9	48.8	2.5	2.7	27.9	26.6	0.062	168
18.5	**160L - 42**	2930	91.6	0.90	31.1	7.1	60.3	2.2	2.9	33.9	32.2	0.077	202
22	**180M - 48**	2940	89.8	0.88	38.5	8.0	71.5	2.6	3.2	42.0	39.9	0.092	265
30	**200LA - 55**	2955	92.2	0.89	51	7.8	97.0	2.0	3.2	56	53	0.16	281
37	**200LB - 55**	2945	92.0	0.89	63	6.9	120.0	2.0	3.1	69	65	0.18	352
45	**225M - 55**	2968	93.0	0.89	76	6.9	144.8	1.5	2.5	83	79	0.32	443
55	**250M - 60**	2971	93.0	0.88	93	6.8	176.8	2.0	2.3	102	97	0.39	443
75	**280S - 65**	2973	93.9	0.90	124	6.0	240.9	2.0	2.3	135	128	0.72	585
90	**280M - 65**	2969	94.1	0.90	148	5.7	289.5	1.8	1.9	162	154	0.83	641
1500 r/min = 4 poles													
0.55	**80A - 19**	1415	74.7	0.76	1.35	5.0	3.7	2.3	2.7	1.48	1.40	0.0015	28
0.75	**80B - 19**	1410	75.9	0.76	1.80	4.9	5.1	2.1	2.3	2.0	1.90	0.0019	29
1.1	**90S - 24**	1420	80.5	0.76	2.5	5.5	7.4	2.4	2.3	2.7	2.6	0.0030	35
1.5	**90L - 24**	1415	81.5	0.78	3.3	5.6	10.1	2.5	2.7	3.6	3.4	0.0038	39
2.2	**100LA - 28**	1425	82.9	0.84	4.4	6.8	14.7	1.8	2.9	4.9	4.6	0.0078	47
3	**100LB - 28**	1430	84.7	0.82	6.0	6.8	20.0	1.9	2.8	6.6	6.2	0.0098	50
4	**112M - 28**	1450	86.3	0.84	7.7	7.6	26.3	1.6	2.9	8.4	8.0	0.015	67
5.5	**132S - 38**	1450	87.1	0.83	10.6	6.7	36.2	2.1	3.0	11.5	10.9	0.028	80
7.5	**132M - 38**	1450	88.8	0.85	13.8	7.6	49.4	2.4	3.0	15.1	14.3	0.042	95
11	**160M - 42**	1460	90.0	0.84	20.3	7.1	72.0	2.0	3.3	22.1	21.0	0.099	148
15	**160L - 42**	1460	90.5	0.85	27.0	7.2	98.1	2.5	2.9	29.5	28.0	0.12	166
18.5	**180M - 48**	1470	91.2	0.89	31.8	7.4	120.2	2.0	3.0	34.7	33.0	0.18	210
22	**180L - 48**	1470	91.3	0.90	37.3	7.4	142.9	2.0	3.0	40.8	38.7	0.20	234
30	**200L - 55**	1477	93.1	0.88	51	7.3	194.0	2.1	3.2	56	53	0.34	320
37	**225S - 60**	1481	92.4	0.87	64	7.7	238.6	2.2	3.0	70	66	0.55	360
45	**225M - 60**	1476	93.3	0.89	75	6.9	291.2	1.9	2.8	83	78	0.64	388
55	**250M - 65**	1478	93.7	0.90	91	6.7	355.4	2.1	2.4	100	95	0.84	470
75	**280S - 75**	1486	94.0	0.89	125	6.9	482.0	1.9	2.7	137	130	1.49	600
90	**280M - 75**	1485	94.3	0.90	148	7.3	578.8	1.8	2.9	162	154	1.99	709

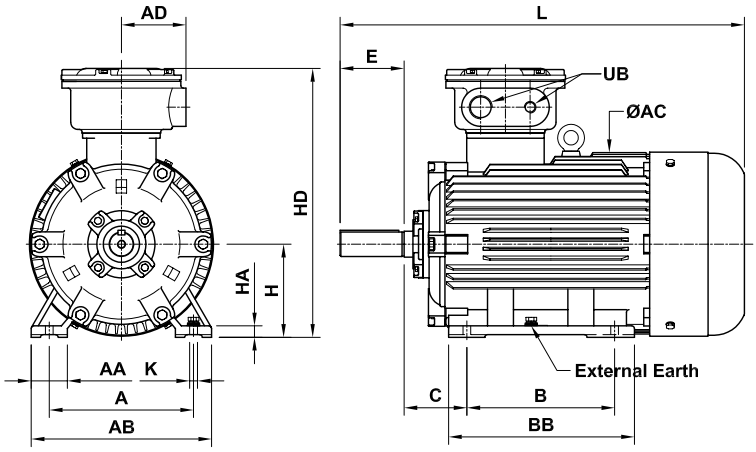
* 380V 50Hz and 400V 50Hz columns denote full load currents for motors **specifically** designed to run at these voltages.

kW	Motor frame	Speed [r/min]	Efficiency [%]	415V 50Hz						380V 50Hz*	400V 50Hz*		
				Power factor cos φ	Current Full Load I_N [A]	Current Locked Rotor I_L/I_N [A]	Torque Full Load T_N [Nm]	Torque Locked rotor T_L/T_N	Torque Break down T_B/T_N	Current Full Load I_N [A]	Current Full Load I_N [A]	Moment of inertia J=¼GD² [kg·m²]	Weight of foot mount motor [kg]
1000 r/min = 6 poles													
0.75	**90S - 24**	920	73.5	0.71	2.0	4.2	7.8	2.6	2.3	2.2	2.1	0.0043	33
1.1	**90L - 24**	935	77.6	0.68	2.9	4.9	11.2	2.8	2.5	3.2	3.0	0.0050	38
1.5	**100L - 28**	940	78.0	0.76	3.5	5.1	15.2	2.6	2.4	3.9	3.7	0.0098	45
2.2	**112M - 28**	940	80.0	0.75	5.1	5.0	22.4	2.3	2.6	5.6	5.3	0.017	60
3	**132S - 38**	965	85.7	0.75	6.5	6.2	29.7	2.2	2.7	7.0	6.7	0.040	85
4	**132MA - 38**	960	86.4	0.76	8.5	6.4	39.8	2.4	2.9	9.3	8.8	0.051	96
5.5	**132MB - 38**	960	87.1	0.80	11.0	6.8	54.7	2.4	3.1	12.0	11.4	0.065	105
7.5	**160M - 42**	960	87.6	0.76	15.6	5.6	74.6	2.0	2.0	17.0	16.1	0.12	143
11	**160L - 42**	970	89.9	0.78	21.9	6.0	108.3	2.3	2.3	23.8	22.7	0.15	165
15	**180L - 48**	975	88.8	0.83	28.2	6.2	146.9	2.2	2.5	30.8	29.2	0.27	207
18.5	**200LA - 55**	978	90.6	0.85	33.4	6.3	180.6	2.0	2.5	36.5	34.6	0.40	264
22	**200LB - 55**	979	89.6	0.84	40.7	6.9	214.6	2.2	2.4	44.5	42.3	0.46	281
30	**225M - 60**	980	91.1	0.83	55	6.8	292.3	2.5	2.6	60	57	0.69	338
37	**250M - 65**	985	92.1	0.89	63	6.7	358.7	2.3	2.6	69	66	1.26	458
45	**280S - 75**	986	92.9	0.87	77	6.0	435.9	1.8	1.8	84	80	1.82	579
55	**280M - 75**	987	93.0	0.88	93	6.4	532.2	2.4	2.5	102	97	2.22	631
750 r/min = 8 poles													
2.2	**132S - 38**	705	82.1	0.70	5.3	4.8	29.8	2.3	16.8	5.8	5.5	0.017	85
3	**132M - 38**	705	82.4	0.74	6.8	5.0	40.6	2.2	12.3	7.4	7.0	0.030	95
4	**160MA - 72**	715	85.6	0.72	9.0	5.7	53.4	2.3	2.8	9.8	9.4	0.050	131
5.5	**160MB - 42**	715	86.4	0.75	11.8	5.7	73.5	2.3	2.8	12.9	12.3	0.090	140
7.5	**160L - 42**	715	87.0	0.75	15.9	5.9	100.2	2.3	2.5	17.4	16.5	0.12	164
11	**180L - 48**	730	87.8	0.75	23.2	6.7	143.9	2.1	2.4	25.3	24.1	0.15	206
15	**200L - 55**	730	88.2	0.76	31.2	6.0	196.2	1.8	2.0	34.1	33.0	0.27	215
18.5	**225S - 60**	730	89.5	0.76	37.8	6.0	242.0	1.8	2.0	41.3	39.2	0.40	288
22	**225M - 60**	730	90.0	0.78	43.6	6.0	287.8	1.8	2.0	47.6	45.3	0.57	337
30	**250M - 65**	730	90.8	0.79	58	6.0	392.5	1.8	2.0	64	61	0.69	365
37	**280S - 75**	740	91.5	0.78	72	6.0	477.5	1.8	2.0	79	75	1.26	515
45	**280M - 75**	740	92.0	0.79	86	6.0	580.7	1.8	2.0	94	90	1.82	620

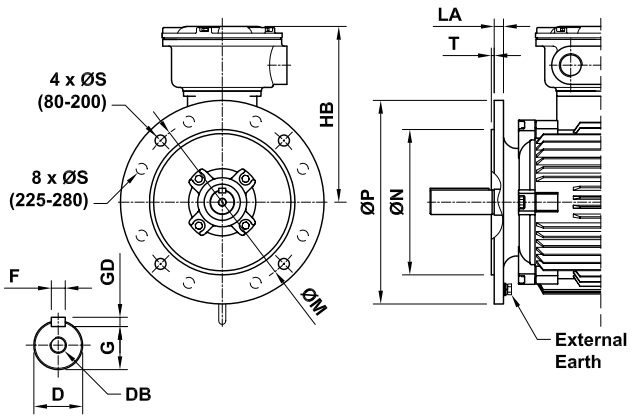
* 380V 50Hz and 400V 50Hz columns denote full load currents for motors **specifically** designed to run at these voltages.

Dimensional drawings

Foot mount B3 (IM1001)



Flange mount B5 (IM3001)



Foot mount B3 (IM1001)

Motor frame	A	AA	AB	AC	AD	B	BB	C	D	DB	E	F	GD	G	H	HA	HD	K	L	UB[1]
80 - 19	125	34	165	160	100	100	135	50	19	M6	40	6	6	15.5	80	10	340	10	330	1xM25,1xM20
90S - 24	140	36	180	180	100	100	135	56	24	M8	50	8	7	20	90	14	345	10	360	1xM25,1xM20
90L - 24	140	36	180	180	100	125	160	56	24	M8	50	8	7	20	90	14	345	10	385	1xM25,1xM20
100L - 28	160	40	200	200	100	140	180	63	28	M10	60	8	7	24	100	14	350	12	430	1xM25,1xM20
112M - 28	190	50	245	220	100	140	185	70	28	M10	60	8	7	24	112	16	375	12	460	1xM25,1xM20
132S - 38	216	60	280	270	125	140	205	89	38	M12	80	10	8	33	132	18	450	12	510	1xM40,1xM20
132M - 38	216	60	280	270	125	178	242	89	38	M12	80	10	8	33	132	18	450	12	550	1xM40,1xM20
160M - 42	254	70	330	320	125	210	275	108	42	M16	110	12	8	37	160	20	500	15	655	1xM40,1xM20
160L - 42	254	70	330	320	125	254	320	108	42	M16	110	12	8	37	160	20	500	15	695	1xM40,1xM20
180M - 48	279	70	355	360	125	241	325	121	48	M16	110	14	9	42.5	180	22	530	15	730	1xM40,1xM20
180L - 48	279	70	355	360	125	279	365	121	48	M16	110	14	9	42.5	180	22	530	15	750	1xM40,1xM20
200L - 55	318	70	390	400	140	305	385	133	55	M20	110	16	10	49	200	25	580	19	805	1xM50,1xM20
225S - 60	356	75	435	450	140	286	375	149	60	M20	140	18	11	53	225	28	650	19	845	1xM50,1xM20
225M - 55[2]	356	75	435	450	140	311	400	149	55	M20	110	16	10	49	225	28	650	19	840	1xM50,1xM20
225M - 60	356	75	435	450	140	311	400	149	60	M20	140	18	11	53	225	28	650	19	870	1xM50,1xM20
250M - 60[2]	406	80	490	500	166	349	430	168	60	M20	140	18	11	53	250	30	735	24	935	1xM63,1xM20
250M - 65	406	80	490	500	166	349	430	168	65	M20	140	18	11	58	250	30	735	24	935	1xM63,1xM20
280S - 65[2]	457	85	545	560	166	368	455	190	65	M20	140	18	11	58	280	35	790	24	1010	1xM63,1xM20
280S - 75	457	85	545	560	166	368	455	190	75	M20	140	20	12	67.5	280	35	790	24	1010	1xM63,1xM20
280M - 65[2]	457	85	545	560	166	419	505	190	65	M20	140	18	11	58	280	35	790	24	1060	1xM63,1xM20
280M - 75	457	85	545	560	166	419	505	190	75	M20	140	20	12	67.5	280	35	790	24	1060	1xM63,1xM20

Flange mount B5 (IM3001)

Motor frame	HB	LA	M	N	P	S	T
80 - 19	260	12	165	130	200	12	3.5
90S - 24	255	12	165	130	200	12	3.5
90L - 24	255	12	165	130	200	12	3.5
100L - 28	250	14	215	180	250	15	4
112M - 28	263	14	215	180	250	15	4
132S - 38	318	14	265	230	300	15	4
132M - 38	318	14	265	230	300	15	4
160M - 42	340	16	300	250	350	19	5
160L - 42	340	16	300	250	350	19	5
180M - 48	350	18	300	250	350	19	5
180L - 48	350	18	300	250	350	19	5

Motor frame	HB	LA	M	N	P	S	T
200L - 55	380	18	350	300	400	19	5
225S - 60	425	20	400	350	450	19	5
225M - 55[2]	425	20	400	350	450	19	5
225M - 60	425	20	400	350	450	19	5
250M - 60[2]	485	22	500	450	550	19	5
250M - 65	485	22	500	450	550	19	5
280S - 65[2]	510	22	500	450	550	19	5
280S - 75	510	22	500	450	550	19	5
280M - 65[2]	510	22	500	450	550	19	5
280M - 75	510	22	500	450	550	19	5

[1] In South Africa and Asia Pacific frames 132 and above have 2 x large size conduit entries.
[2] 2 pole motors only.

Installation and maintenance

CMG PPD series motors are designed and manufactured to be robust and reliable for minimal maintenance. The following items should be taken into consideration to ensure trouble free installation and reliable running throughout the motors' life.

Inspection

On receipt of the motor check the following:

- rating plate details and enclosure are as ordered
- shaft turns freely
- motor was not damaged during transport
- If the winding is meggered to earth, ensure that the thermal protectors are not inadvertently damaged. (The thermistor leads should be shorted together whilst meggering takes place)

Storage

When the motor is not for immediate use store in a clean, dry location, free from vibration. (Bearings are susceptible to damage from vibration.)

Installation

The following items should be considered when installing to ensure motor reliability:

Surroundings

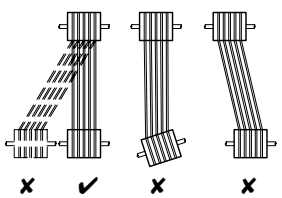
Ensure that the motor is properly protected against ingress of oil, water or dust if construction work is in progress around the motor.

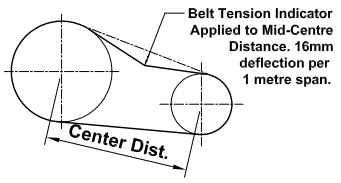
Pulleys and couplings

- Pulleys and couplings should be machined to H7 limits. Both shaft and bore should be cleaned and lubricated. If the fit is still too tight the pulley or coupling should be heated up in air or oil to approximately 93°C.
- Shock methods must not be used in removing pulleys and couplings. Proper wheel or pulley removers should be used to prevent shaft and bearing damage.
- Pulleys and couplings should be balanced before the keyway is cut to eliminate vibration caused by lack of balancing. (Rotor and shaft assemblies have been finely balanced during manufacture, and drive end shafts balanced with a half key.)
- When slide rails are used in conjunction with pulley drives the adjusting screw ends should be positioned between the motor and load at drive shaft end and the other diagonally opposite. This helps speedy and accurate belt aligning, tensioning and replacement.

Belt Drives

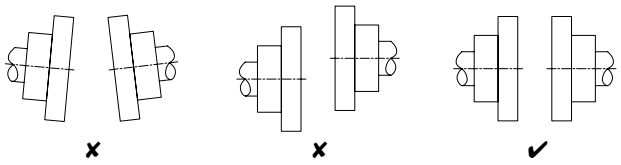
The belt manufacturer's recommendations for installation, alignment and tensioning must be strictly adhered to when fitting belt drives.





Direct Coupling

Care must be taken in checking alignment of driving and driven shafts. The motor and driven equipment must be in alignment from all aspects. Misalignment of pulleys will lead to premature bearing failure.



Running current check

Check the running current of the motor on no load and full load.

Current

Check periodically that the current drawn is balanced and is the same as at the time of installation.

Cable Terminations

Cable terminations should have all incoming supply leads compressed between two nuts.

Insulation testing

When checking for insulation resistance (IR) the test voltage must not be applied across the thermal protection device. The correct procedure is to short the entire protector leads together and apply the test voltage between the shorted leads and earth and/or phases. 'Meggering' across the terminals of the thermal protection device, when not shorted, is likely to cause irreparable damage, and must not be carried out.

Special Requirements

- For Group I applications the motor should be installed in accordance with AS/NZS4871.1:2002.
- If a gland is used then it must be appropriately Standards Australia certified and have an IP rating of at least IP66.
- Any unused cable entries to the terminal box must be blanked off with an appropriately certified conduit stop (temporary plastic stops must be discarded.)
- For any motor operated from a VVVF drive the thermal protection devices must be connected into the motor control circuit so as to disconnect the supply in order to prevent the T4 temperature class from being exceeded.
- The PPD motor range is exempt from routine pressure testing as it has passed the 'four times reference pressure' test and is not of welded construction.
- Repairs/maintenance involving the dismantling of the motor must be carried out in service facilities recognized for that purpose and only accredited and competent personnel should carry out or supervise maintenance procedures.

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