

Catalog Number Explanation

20B D 2P1 A 3 A Y N A E C O NN AD
a *b* *c1...c5* *d* *e* *f* *g* *h* *i* *j* *k* *l* *m* *n*

a

Drive	
Code	Type
20B	PowerFlex 700

b

Voltage Rating				
Code	Voltage	Ph.	Prechg.	Frames
B	240V AC	3	-	0...6
C	400V AC	3	-	0...6
D	480V AC	3	-	0...6
E	600V AC	3	-	0...6
F	690V AC	3	-	5...6
H	540V DC	-	N	5...6
J	650V DC	-	N	5...6
N	325V DC	-	Y	5...6
P	540V DC	-	Y	5...9 ⁽¹⁾
R	650V DC	-	Y	5...9 ⁽¹⁾
T	810V DC	-	Y	5...6
W	932V DC	-	Y	5...6

(1) Frame size 7, 8, 9, and 10 are no longer available for sale.

c1

ND Rating				
208/240V, 60 Hz Input				
Code	208V Amps	240V Amps	Hp	Frame
2P2	2.5	2.2	0.5	0
4P2	4.8	4.2	1.0	0
6P8	7.8	6.8	2.0	1
9P6	11	9.6	3.0	1
015	17.5	15.3	5.0	1
022	25.3	22	7.5	1
028	32.2	28	10	2
042	48.3	42	15	3
052	56	52	20	3
070	78.2	70	25	4
080	92	80	30	4
104	120	104	40	5
130	130	130	50	5
154	177	154	60	6
192	221	192	75	6
260	260	260	100	6

c2

ND Rating			
400V, 50 Hz Input			
Code	Amps	kW	Frame
1P3	1.3	0.37	0
2P1	2.1	0.75	0
3P5	3.5	1.5	0
5P0	5.0	2.2	0
8P7	8.7	4.0	0
011	11.5	5.5	0
015	15.4	7.5	1
022	22	11	1
030	30	15	2
037	37	18.5	2
043	43	22	3
056	56	30	3
072	72	37	3
085	85	45	4
105	105	55	5
125	125	55	5
140	140	75	5
170	170	90	6
205	205	110	6
260	260	132	6
292	292	160	7 ⁽¹⁾
325	325	180	7 ⁽¹⁾
365	365	200	8 ⁽¹⁾
415	415	240	8 ⁽¹⁾
481	481	280	8 ⁽¹⁾
535	535	300	8 ⁽¹⁾
600	600	350	8 ⁽¹⁾
730	730	400	9 ⁽¹⁾
875	875	500	10 ⁽¹⁾

(1) This model is no longer available for sale.

c3

ND Rating			
480V, 60 Hz Input			
Code	Amps	Hp	Frame
1P1	1.1	0.5	0
2P1	2.1	1.0	0
3P4	3.4	2.0	0
5P0	5.0	3.0	0
8P0	8.0	5.0	0
011	11	7.5	0
014	14	10	1
022	22	15	1
027	27	20	2
034	34	25	2
040	40	30	3
052	52	40	3
065	65	50	3
077	77	60	4
096	96	75	5
125	125	100	5
156	156	125	6
180	180	150	6
248	248	200	6
292	292	250	7 ⁽¹⁾
325	325	250	7 ⁽¹⁾
365	365	300	8 ⁽¹⁾
415	415	350	8 ⁽¹⁾
481	481	400	8 ⁽¹⁾
535	535	450	8 ⁽¹⁾
600	600	500	8 ⁽¹⁾
730	730	600	9 ⁽¹⁾
875	875	700	10 ⁽¹⁾

(1) This model is no longer available for sale.

c4

ND Rating			
600V, 60 Hz Input			
Code	Amps	Hp	Frame
1P7	1.7	1.0	0
2P7	2.7	2.0	0
3P9	3.9	3.0	0
6P1	6.1	5.0	0
9P0	9.0	7.5	0
011	11	10	1
017	17	15	1
022	22	20	2
027	27	25	2
032	32	30	3
041	41	40	3
052	52	50	3
062	62	60	4
077	77	75	5
099	99	100	5
125	125	125	6
144	144	150	6

20B

D **2P1** **A** **3** **A** **Y** **N** **A** **E** **C** **0** **NN** **AD**
a *b* *c1...c5* *d* *e* *f* *g* *h* *i* *j* *k* *l* *m* *n*

c5

ND Rating			
690V, 50 Hz Input			
Code	Amps	kW	Frame
052	52	45	5
060	60	55	5
082	82	75	5
098	98	90	6
119	119	110	6
142	142	132	6

d

Enclosure	
Code	Enclosure
A	IP20,NEMA/UL Type 1, with Conformal Coat
F ♣	Open/Flange Mount Front: IP00, NEMA/UL Type Open, with Conformal Coat Back/Heatsink: IP54, NEMA Type 12, with Conformal Coat
G ♣	Stand-Alone/Wall Mount IP54, NEMA/UL Type 12, with Conformal Coat

♣ Only available for Frame 5 & Frame 6 drives, 400...690V.

e

HIM	
Code	Operator Interface
0	Blank Cover
3	LCD Display, Full Numeric Keypad
J ♣	Remote (Panel Mount), IP66, NEMA/UL Type 12 Full Numeric LCD HIM
K ♣	Remote (Panel Mount), IP66, NEMA/UL Type 12 Prog. Only LCD HIM

♣ Available with Frames 5...6 Stand-Alone IP54 drives (Enclosure Code "G").

f

Documentation	
Code	Type
A	Manual
N	No Manual
Q	No Shipping Package (Internal Use Only)

g

Brake	
Code	w/Brake IGBT ‡
Y	Yes
N	No

‡ Brake IGBT is standard on Frames 0-3, optional on Frames 4-6.

h

Internal Braking Resistor	
Code	w/Resistor
Y	Yes ★
N	No

★ Not available for Frame 3 drives or larger.

i

Emission		
Code	CE Filter §	CM Choke
A	Yes	Yes
B #	Yes	No
N	No	No

§ Note: 600V class drives below 77 Amps (Frames 0...4) are declared to meet the Low Voltage Directive and UK Low Voltage Regulations. It is the responsibility of the user to determine compliance to the EMC Directive and to UK EMC Regulations.

Only available for 208...240V Frame 0-3 drives.

j

Comm Slot	
Code	Network Type
C	ControlNet (Coax)
D	DeviceNet
E	EtherNet/IP
N	None

k

Control & I/O		
Code	Control	I/O Volts
A	Standard	24V DC/AC
B	Standard	115V AC
C	Vector Δ	24V DC
D	Vector Δ	115V AC
N	Standard	None

Δ Vector Control Option utilizes DPI Only.

l

Feedback	
Code	Type
0	None
1	Encoder, 12V/5V

m

Future Use	
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n

Special Firmware (Frames 0...6 Only)	
Code	Type
AD ♣	60 Hz Maximum
AE ♣	Cascading Fan/Pump Control
BA ♣	Pump Off (for pump jack)

♣ Must be used with Vector Control option C or D (Position k). Positions m-n are only required when custom firmware is supplied.

Certifications and Specifications

Certifications

Certification ⁽¹⁾	Description	Frames		
		0...4		5...6
		230...480V	600V	
ABS	American Bureau of Shipping MA Certificate 08-HS303172B-3-PDA for auxiliary services on AB Classed vessels and offshore platforms	✓		✓
CE	Certified by Rockwell Automation to be in conformity with the essential requirements of the applicable European Directives and the standards that are referenced below have been applied:	✓	✓	✓
	2014/35/EU (Low Voltage Directive) EN 61800-5-1: Adjustable speed electrical power drive systems – Part 5-1: Safety requirements –Electrical, thermal and energy.	✓	✓	✓
	2014/30/EU (EMC Directive) EN 61800-3 Adjustable Speed electrical power drive systems - Part 3: EMC requirements and specific test methods.	✓		✓
UKCA	Certified by Rockwell Automation to be in conformity with the applicable UK Regulations and the standards that are referenced below have been applied:	✓	✓	✓
	Electrical Equipment (Safety) Regulations (2016 No. 1101) EN 61800-5-1: Adjustable speed electrical power drive systems – Part 5-1: Safety requirements –Electrical, thermal and energy	✓	✓	✓
	Electromagnetic Compatibility Regulations 2016 No. 1091 EN 61800-3 Adjustable Speed electrical power drive systems - Part 3: EMC requirements and specific test methods.	✓		✓
RCM	Certified by Rockwell Automation to be in conformity with the requirements of the applicable Australian legislation and the standards referenced: IEC 61800-3.	✓		✓
c-UL-us	Listed to UL508C and C22.2 No. 14.	✓	✓	✓
EAC	Low Voltage TR CU 004/2011 EMC TR CU 020/2011	✓	✓	✓
Efficiency Class	Ecodesign regulation (EU) 2019/1781, IE2 efficiency class, refer to PowerFlex LV Drive Performance Specifications per Ecodesign Regulation (EU) 2019/1781, publication PFLEX-TD003 for additional information.	✓	✓	✓
SEMI F47	SEMI F47 compliance, 480V units were tested	✓		✓
ATEX	EU-Type-Examination Certificate TÜV 15 ATEX 7715 X for directive 2014/34/EU: Safe turn off of certified ATEX motors used in Group II Category (2) GD potentially explosive atmospheres.	✓	✓	✓
UKEX	Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations (2016 No. 1107) UKEX Type Examination Certificate TÜV 21 UKEX 7034 X for Regulation 2016 No. 1107.	✓	✓	✓
Korean KC Registration	R-R-RAA-Drive See the certificate of registration for specific drive catalog numbers that have this certification.	✓	✓	✓
Lloyd's Register	Lloyd's Register Type Approval Certificate 08-HS303172B-3-PDA (marine certification)	✓		✓
Trentec	Tested by Trentec to be compliant with AC156 Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components and 2003 International Building Code for worst-case seismic level for USA excluding site class F	✓	✓	✓
Designed to Meet Applicable Requirements	CMAA Specification #70 (Crane Manufacturers of America Assoc.)	✓	✓	✓
	NFPA 70 – US National Electrical Code	✓	✓	✓
	NEMA ICS 7.1 – Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable Speed Drive Systems	✓	✓	✓
	IEC 61800-2 – Adjustable Speed Electrical Power Drive Systems - Part 2: General Requirements - Rating specifications for low voltage adjustable frequency AC power drive systems.	✓	✓	✓

(1) See the product certifications website <http://www.rockwellautomation.com> for declarations of conformity, certificates, and other certification details.

Environmental

Category	Specification			
Environment	Altitude:	1000 m (3300 ft) Max without derating		
	Maximum Surrounding Air Temperature without Derating - IP20, NEMA / UL Type Open: Frames 0...6	0...50 °C (32...122 °F), typical. See Installation Instructions for details. 0...40 °C (32...104 °F) for chassis (heatsink) 0...65 °C (32...149 °F) for control (front of backplane)		
	Storage Temperature (all const.):	-40...+70 °C (-40...+158 °F)		
	Atmosphere:	Important: Drive must not be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors, or dust. If the drive is not going to be installed for a time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.		
	Relative Humidity:	5...95% noncondensing		
	Shock:	15G peak for 11 ms duration (±1.0 ms)		
	Vibration:	0.152 mm (0.006 in.) displacement, 1G peak		
	Surrounding Environment Pollution Degree Pollution Degree 1 and 2: Pollution Degree 3 and 4: (See page 12 for descriptions of each pollution degree rating.)	All enclosures acceptable. Enclosure that meets or exceeds IP54, NEMA / UL Type 12 required.		
Sound:	Frame	Fan Velocity	Sound Level	Note: Sound pressure level is measured at 2 meters.
	0	30 CFM	58 dB	
	1	30 CFM	59 dB	
	2	50 CFM	57 dB	
	3	120 CFM	61 dB	
	4	190 CFM	59 dB	
	5	200 CFM	71 dB	
	6	300 CFM	72 dB	

Technical Specifications

Category	Specification						
	Drive	200...208V	240V	380/400V	480V	600V Frames 0...4	600/690V Frames 5...6
	AC Input Overvoltage Trip:	285V AC	285V AC	570V AC	570V AC	716V AC	818V AC
	AC Input Undervoltage Trip:	120V AC	138V AC	233V AC	280V AC	345V AC	345V AC
	Bus Overvoltage Trip:	405V DC	405V DC	810V DC	810V DC	1013V DC	1162V DC
	Bus Undervoltage Shutoff/Fault:	153V DC	153V DC	305V DC	305V DC	381V DC	437V DC
	Nominal Bus Voltage:	281V DC	324V DC	540V DC	648V DC	810V DC	932V DC
	All Drives						
Protection	Heat Sink Thermistor:	Monitored by microprocessor overtemp trip					
	Drive Overcurrent Trip						
	Software Overcurrent Trip:	200% of rated current (typical)					
	Hardware Overcurrent Trip:	220...300% of rated current (dependent on drive rating)					
	Line transients:	up to 6000 volts peak per IEEE C62.41-1991					
	Control Logic Noise Immunity:	Showering arc transients up to 1500V peak					
	Power Ride-Thru:	15 milliseconds at full load					
	Logic Control Ride-Thru:	0.5 seconds minimum, 2 seconds typical					
	Ground Fault Trip:	Phase-to-ground on drive output					
Short Circuit Trip:	Phase-to-phase on drive output						
Electrical	Voltage Tolerance:	See page 13 for full power and operating range					
	Input Frequency Tolerance:	47...63 Hz					
	Input Phases:	Three-phase input provides full rating for all drives. Single-phase operation possible on certain drives and provides 50% of rated current (see Installation Instructions for details). Frames 0...6: Drive can be supplied as 6 pulse or 18 pulse in an engineered package.					
	Displacement Power Factor:	0.98 across entire speed range					
	Efficiency:	97.5% at rated amps, nominal line volts					
	Maximum Short Circuit Rating:	200,000 Amps symmetrical					
	Actual Short Circuit Rating:	Determined by A1C rating of installed fuse/circuit breaker					
	Drive to Motor Power Ratio						
Minimum	Recommended not less than 1:2 ratio						
Maximum	Recommended not greater than 2:1 ratio						
Control	Method:	Sine coded PWM with programmable carrier frequency. Ratings apply to all drives (see the <i>Derating Guidelines</i> in the PowerFlex Reference Manual). The drive can be supplied as 6 pulse or 18 pulse in an engineered solution.					
	Carrier Frequency:	2, 4, 8, and 10 kHz. Drive rating based on 4 kHz. See the Input Protection Device tables in the installation instructions for exceptions.					
	Output Voltage Range:	0 to rated motor voltage					
	Output Frequency Range:	Standard Control – 0...400 Hz., Vector Control – 0...420 Hz					
	Frequency Accuracy						
Digital Input:	Within ±0.01% of set output frequency						
Analog Input:	Within ±0.4% of maximum output frequency						

Category	Specification								
Control (continued)	Frequency Control:		Speed Regulation - w/Slip Compensation (Volts per Hertz Mode) 0.5% of base speed across 40:1 speed range, 40:1 operating range 10 rad/sec bandwidth						
			Speed Regulation - w/Slip Compensation (Sensorless Vector Mode) 0.5% of base speed across 80:1 speed range, 80:1 operating range 20 rad/sec bandwidth						
			Speed Regulation - w/Feedback (Sensorless Vector Mode) 0.1% of base speed across 80:1 speed range, 80:1 operating range 20 rad/sec bandwidth						
	Speed Control:		Speed Regulation - w/o Feedback (Vector Control Mode) 0.1% of base speed across 120:1 speed range, 120:1 operating range 50 rad/sec bandwidth						
			Speed Regulation - w/Feedback (Vector Control Mode) 0.001% of base speed across 120:1 speed range, 1000:1 operating range, 250 rad/sec bandwidth						
	Torque Regulation:		Torque Regulation - w/o Feedback $\pm 5\%$, 600 rad/sec bandwidth						
			Torque Regulation - w/Feedback $\pm 2\%$, 2500 rad/sec bandwidth						
	Selectable Motor Control:		Sensorless Vector with full tuning. Standard V/Hz with full custom capability. Vector Control.						
	Stop Modes:		Multiple programmable stop modes including - Ramp, Coast, DC-Brake, Ramp-to-Hold and S-curve.						
	Accel/Decel:		Two independently programmable accel and decel times. Each time may be programmed from 0 . . . 3600 seconds in 0.1 second increments.						
Intermittent Overload:		110% Overload capability for up to 1 minute, 150% Overload capability for up to 3 seconds.							
Current Limit Capability:		Proactive Current Limit programmable from 20 . . . 160% of rated output current. Independently programmable proportional and integral gain.							
Motor Overload Protection		PowerFlex 700 drives with standard control, which is identified by an N, A, or B in position 15 of the catalog number, only provide Class 10 motor overload protection according to NEC article 430. They do not provide speed sensitive overload protection, thermal memory retention and motor over-temperature sensing according to NEC article 430.126 (A) (2). If such protection is needed in the end-use product, it must be provided by additional means. PowerFlex 700 drives with vector control, which is identified by a C or D in position 15 of the catalog number, provide class 10 motor overload protection according to NEC article 430 and motor over-temperature protection according to NEC article 430.126 (A) (2). UL 508C File E59272.							
Frames 0 . . . 6 Standard Control:									
Frames 0 . . . 6 Vector Control:									
Digital/Analog Input Latency		Signal		Motor Control		Latency			
						Min	Max	Typical	
		Digital Input		Start		FVC	8.4 ms	10.4 ms	8.4 ms
						SVC	9.2 ms	16.0 ms	9.2 ms
				Stop		FVC	10.0 ms	12.4 ms	10.4 ms
						SVC	10.0 ms	12.0 ms	10.4 ms
		Analog Input		Torque 4 kHz PWM		FVC	772 μ s	1.06 ms	840 μ s
				Torque 2 kHz PWM		FVC	1.008 ms	1.46 ms	1.256 ms
Speed				FVC	4.6 ms	8.6 ms	4.8 ms		
Speed				SVC	4.8 ms	12.4 ms	6.4 ms		

Category	Specification	
Encoder	Type:	Incremental, dual channel
	Supply:	12V, 250 mA. 12V, 10 mA minimum inputs isolated with differential transmitter, 250 kHz maximum.
	Quadrature:	90 degrees, ± 27 degrees at 25 °C (77 °F).
	Duty Cycle:	50%, +10%
	Requirements:	Encoders must be line driver type, quadrature (dual channel) or pulse (single channel), 8 . . 15V DC output (4 . . 6V DC when jumpers are in 5V position), single-ended or differential and capable of supplying a minimum of 10 mA per channel. Maximum input frequency is 250 kHz. The Encoder Interface Board accepts 12V DC square-wave with a minimum high state voltage of 7.0V DC. With the jumpers in the 5V position, the encoder will accept a 5V DC square-wave with a minimum high state voltage of 3.0V DC. In either jumper position, the maximum low state voltage is 0.4V DC.

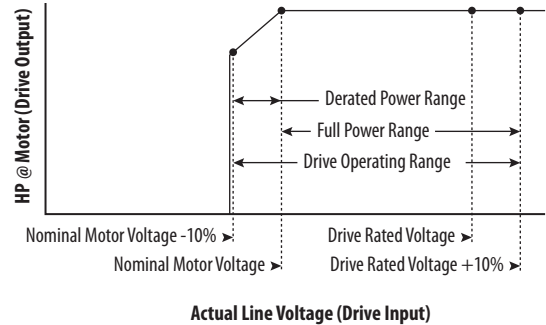
Pollution Degree Ratings according to EN 61800-5-1

Pollution Degree	Description
1	No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.
2	Normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity that is caused by condensation is to be expected, when the drive is out of operation.
3	Conductive pollution or dry non-conductive pollution occurs, which becomes conductive due to condensation, which is to be expected.
4	The pollution generates persistent conductivity caused, for example, by conductive dust, rain or snow.

Design Considerations

Input Voltage Tolerance

Drive Rating	Nominal Line Voltage	Nominal Motor Voltage	Drive Full Power Range	Drive Operating Range
200...240	200	200*	200...264	180...264
	208	208	208...264	
	240	230	230...264	
380...480	380	380*	380...528	342...528
	400	400	400...528	
	480	460	460...528	
500...600 (Frames 0...4 Only)	600	575*	575...660	432...660
500...690 (Frames 5 and 6 Only)	600	575*	575...660	475...759
	690	690	690...759	475...759



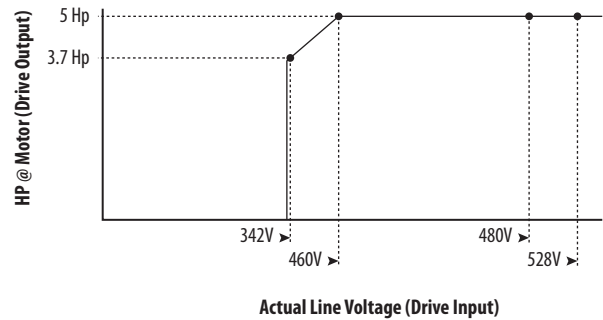
Drive Full Power Range = Nominal Motor Voltage to Drive Rated Voltage +10%.
Rated current is available across the entire Drive Full Power Range

Drive Operating Range = Lowest* Nominal Motor Voltage -10% to Drive Rated Voltage +10%.
Drive Output is linearly derated when Actual Line Voltage is less than the Nominal Motor Voltage

EXAMPLE Calculate the maximum power of a 5 Hp, 460V motor connected to a 480V rated drive supplied with 342V Actual Line Voltage input.

- Actual Line Voltage / Nominal Motor Voltage = 74.3%
- $74.3\% \times 5 \text{ Hp} = 3.7 \text{ Hp}$
- $74.3\% \times 60 \text{ Hz} = 44.6 \text{ Hz}$

At 342V Actual Line Voltage, the maximum power the 5 Hp, 460V motor can produce is 3.7 Hp at 44.6 Hz.



Approximate Watts Loss

The following tables list the watts loss data for drives running at full load, full speed, and default carrier frequency.

Internal watts are those dissipated by the control structure of the drive and will be dissipated into the cabinet regardless of mounting style. External watts are those dissipated directly through the heatsink and will be outside the cabinet for flange mount and inside the cabinet for other mounting types.

Watts Loss – Frames 0...6

Voltage	ND Hp/kW	External Watts	Internal Watts	Total Watts Loss ⁽¹⁾
IP20, NEMA / UL Type 1				
240V	0.5	9	37	46
	1	22	39	61
	2	38	39	77
	3	57	41	98
	5	97	82	179
	7.5	134	74	208
	10	192	77	269
	15	276	92	368
	20	354	82	436
	25	602	96	698
	30	780	96	876
	40	860	107	967
	50	1132	138	1270
	60	1296	200	1496
75	1716	277	1993	
100	1837	418	2255	