Technical Data

Allen-Bradley

CENTERLINE 2100 Motor Circuit Protection

Catalog Numbers 140MG and 140G

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Table 1 - Suffix/Circuit Breaker Frame Explanation

T G A

Circuit Breaker Series	
T	140G Inverse Time Breaker
	140MG MCP

Frame	
G	125 A Fixed
H	125 A Frame and Trip
J	250 A Frame and Trip
K	400 A Frame and Trip
M	800 A Frame and Trip
N	1200 A Frame
R	3000 A Frame

Circuit Breaker Type	
A	High Interrupting Motor Circuit Protector (MCP)
M(1)	High Interrupting Inverse Time
ML(2)	High Interrupting Inverse Time with Electronic Trip (LSI)
MG	High Interrupting Inverse Time with Ground Fault (LSIG)
X(1)	Extra High Interrupting Inverse Time
XL(2)	Extra High Interrupting Inverse Time with Electronic Trip (LSI)
XG	Extra High Interrupting Inverse Time with Ground Fault (LSIG)
U(1)	Ultra High Interrupting Inverse Time (600V only)
UL(2)	Ultra High Interrupting Inverse Time with Electronic Trip (LSI 600V only)
UG	Ultra High Interrupting Inverse Time with Ground Fault (LSIG 600V only)

(1) Electronic (LSI) on K, M, and N Frames
(2) Only available on H and J Frames

Instantaneous Trip Motor Circuit Protectors (MCP) in Combination NEMA Starter

MCP Application

The motor-circuit protector application is valid for the following CENTERLINE® 2100 MCC products:

- Bulletin 2107 full-voltage reversing combination staters
- Bulletin 2113 full-voltage non-reversing combination starters
- Bulletin 2123 two-speed non-reversing combination starters

The information in this publication applies to Allen-Bradley® motor circuit protectors (MCP) when they are used in NEMA (size 1...6) combination starters. The particular motor-circuit protector (trip range) supplied with a unit depends on the horsepower or kilowatt rating and voltage that was specified when the unit was ordered. Tables 3...7 list the various combinations and voltage. When using Tables 3...7, be sure to use the line that applies to your voltage.

Motor-circuit Protector Size and Adjustment

Rockwell Automation has made engineering evaluations for the protective device (MCP) selection, sizing, and setting range that is based on the protection rules/requirements and motor criteria as stipulated in NEC, CEC, NEMA, UL, and CSA standards. For example, evaluations have been made for items such as motor full-load currents (FLC), X/R ratios, locked rotor currents, and nominal utilization voltages. If the motor application has criteria that deviates from those criteria that are stated in the standards, higher FLC, and/or motor inrush currents (greater than 1300% of the nominal FLC) can be experienced. Examples of non-standard motor applications include the following: special motors, non/off standard NEMA or application-rated motors, Design B energy efficient, Design E motors, and IEC N motors.

The motor full-load current determines the magnetic trip setting of the motor circuit protector. We recommend selecting an initial trip setting that is approximately eight times the motor nameplate full-load current. The trip setting can be adjusted to a position that corresponds to the determined magnetic trip current.

Trip Settings	Current	Frame Size
A through I	125 A	G and H
	250 A	J
Electronic Trip	300…3000 A	K, M, N, R

Follow these steps to adjust the trip setting.

1. Verify that the motor-circuit protector operating handle is in the OFF/O position.
2. With a small screwdriver, turn the adjustment pointer clockwise to the determined setting (G, H, and J frames) or adjust DIP switches to the determined setting (K and M frames).
3. Verify that the motor circuit protector does not trip during motor starting.

   If the motor-circuit protector trips when attempting to start the motor, turn the pointer clockwise to successively higher positions, until the motor-circuit protector no longer trips when attempting to start the motor.

IMPORTANT When the devices are energized, motor peak-inrush current can randomly exceed the maximum limit set by the code.

Per NEC guidelines, set the trip setting of the motor circuit protector to greater than 8, but not more than 13 times the motor full-load current. The controller design is based on this requirement. If Design B or E energy efficient motors (or IEC N motors) are used, you can set the motor circuit protectors higher than 13 times the motor full-load current, but must not exceed 17 times. For these applications, consult the factory for controller and motor circuit protector sizing. See the National Electrical Code (NEC) or the Canadian Electrical Code (CEC) standards for more information.

Push-to-trip Mechanism

The push-to-trip mechanism provides a manual means for tripping the motor circuit protector. When you press the button on the motor-circuit protector cover with a small screwdriver, a plunger rotates the trip bar, which causes the motor circuit protector to trip.

Horsepower Ratings

The horsepower ratings for combination starter units that are listed in Tables 3...7 were determined from full-load currents as specified by the NEC/CEC standards.

Acceptable performance occurs when the motor full-load current is within 15% of the value that corresponds to the horsepower and voltages that are listed in the NEC/CEC standards. Contact your local Allen-Bradley distributor or Rockwell Automation sales representative if the motor full-load current is not within these limits.

ATTENTION: The horsepower ratings and corresponding trip settings in Tables 3...7 are valid only when the combination starter units are equipped with an Allen-Bradley electronic overload relay or a Bulletin 592 eutectic alloy overload relay that has correctly sized heater elements.

When correctly selected, this combination of motor circuit protector and overload relay protects against short circuit and ground fault damage. This combination provides coordinated overcurrent protection in the motor branch circuit for continuous-duty rated motors, as defined in the NEC and CEC standards.

A motor circuit protector that has tripped can indicate the interruption of a high fault current. To be sure of protection against fire and/or shock hazard, examine the current carrying parts of the combination starter units, soft starter controller units, and variable frequency drive AC units and replace if damaged. (Refer to NEMA Standards Publication Number ICS 2.2, Maintenance of Motor Controllers After a Fault Condition, and NEMA Standard Publication Number ICS 2, Parts ICS 2-302.)

Table 2 - Default Motor Circuit Protectors Used at Given Horse Power and Voltage Ratings

140MG-		Voltage				
HP	**KW**	**208**	**240**	**380**	**480**	**600**
0.25	0.125	G8P-B70 (7A)	G8P-B70 (7A)	G8P-B30 (3A)	G8P-B30 (3A)	H8P-B30 (3A)
0.33	0.25					
0.5	0.37					
0.75	0.55					
1	0.75	G8P-C15 (15 A)		G8P-B70 (7A)	G8P-B70 (7A)	
1.5	1.1		G8P-C15 (15 A)			H8P-B70 (7A)
2	1.5					
3	2.2	G8P-C30 (30 A)	G8P-C30 (30 A)	G8P-C15 (15 A)	G8P-C15 (15 A)	
5	3.7	G8P-C50 (50 A)				H8P-C15 (15 A)
7.5	5.5		G8P-C50 (50 A)	G8P-C30 (30 A)	G8P-C30 (30 A)	H8P-C30 (30 A)
10	7.5					
15	11	G8P-D10 (100 A)	G8P-D10 (100 A)	G8P-C70 (70 A)	G8P-C50 (50 A)	H8P-C50 (50 A)
20	15		G8P-D10 (100 A)			
25	18.5	G8P-D12 (125 A)	G8P-D12 (125 A)			
30	22	J8P-D15 (150 A)		G8P-D10 (100 A)	G8P-D10 (100 A)	H8P-D10 (100 A)
40	30	J8P-D25 (250 A)	J8P-D20 (200 A)	G8P-D12 (125 A)		
50	37	K8P-D40 (400 A)	J8P-D25 (250 A)			
60	45		K8P-D40 (400 A)	J8P-D20 (200 A)	J8P-D15 (150 A)	J8P-D15 (150 A)
75	55			J8P-D25 (250 A)	J8P-D17 (175 A)	
100	75	M8P-D80 (800 A)		K8P-D40 (400 A)	J8P-D25 (250 A)	J8P-D20 (200 A)
125	90		M8P-D80 (800 A)		K8P-D40 (400 A)	K8P-D40 (400 A)
150	112					
200	150			M8P-D80 (800 A)		
250	187				M8P-D80 (800 A)	M8P-D80 (800 A)
300	224					
350	261					
400	300					

Table 3 - Short-Circuit Current Rating - 208V (cULus Listed)

Controller Type	Device/ Bulletin	Size/Rating		Magnetic-only Trip Settings									Electronic Trip		140MG Catalog Number Default	Unit Combination Short-Circuit Current Rating	140MG Catalog Number Optional	Unit Combination Short-Circuit Current Rating
		Size	HP	A	B	C	D	E	F	G	H	I	Min	Max				
Bulletin 500	2107, 2113, 2123	#1	0.125	21	28	35	42	49	56	63	70	77			G8P-B70	65 kA	H8P-B70	100 kA
			0.25	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			0.33	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			0.5	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			0.75	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			1	45	60	75	90	105	120	135	150	165			G8P-C15	100 kA	H8P-C15	
			1.5	45	60	75	90	105	120	135	150	165			G8P-C15		H8P-C15	
			2	45	60	75	90	105	120	135	150	165			G8P-C15		H8P-C15	
			3	90	120	150	180	210	240	270	300	330			G8P-C30		H8P-C30	
			5	150	200	250	300	350	400	450	500	550			G8P-C50		H8P-C50	
			7.5	150	200	250	300	350	400	450	500	550			G8P-C50		H8P-C50	
		#2	10	150	200	250	300	350	400	450	500	550			G8P-C50		H8P-C50	
		#3	15	300	400	500	600	700	800	900	1000	1100			G8P-D10		H8P-D10	
			20	300	400	500	600	700	800	900	1000	1100			G8P-D10		H8P-D10	
			25	625	703	781	859	938	1016	1094	1172	1250			G8P-D12		H8P-D12	
		#4	30	750	844	938	1031	1125	1219	1313	1406	1500			J8P-D15			
			40	1250	1406	1563	1719	1875	2031	2188	2344	2500			J8P-D25			
		#5	50										400	4000	K8P-D40			
			60										400	4000	K8P-D40			
			75										400	4000	K8P-D40			
	2113	#6	100										800	8000	M8P-D80			
			125										800	8000	M8P-D80			
			150										800	8000	M8P-D80			

Table 4 - Short-Circuit Current Rating - 240V (cULus Listed)

Controller Type	Device/ Bulletin	Size/Rating		Magnetic-only Trip Settings									Electronic Trip		140MG Catalog Number Default	Unit Combination Short-Circuit Current Rating	140MG Catalog Number Optional	Unit Combination Short-Circuit Current Rating
		Size	HP	A	B	C	D	E	F	G	H	I	Min	Max				
Bulletin 500	2107, 2113, 2123	#1	0.125	21	28	35	42	49	56	63	70	77			G8P-B70	65 kA	H8P-B70	100 kA
			0.25	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			0.33	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			0.5	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			0.75	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			1	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			1.5	45	60	75	90	105	120	135	150	165			G8P-C15	100 kA	H8P-C15	
			2	45	60	75	90	105	120	135	150	165			G8P-C15		H8P-C15	
			3	90	120	150	180	210	240	270	300	330			G8P-C30		H8P-C30	
			5	90	120	150	180	210	240	270	300	330			G8P-C30		H8P-C30	
			7.5	150	200	250	300	350	400	450	500	550			G8P-C50		H8P-C50	
		#2	10	150	200	250	300	350	400	450	500	550			G8P-C50		H8P-C50	
			15	300	400	500	600	700	800	900	1000	1100			G8P-D10		H8P-D10	
		#3	20	300	400	500	600	700	800	900	1000	1100			G8P-D10		H8P-D10	
			25	625	703	781	859	938	1016	1094	1172	1250			G8P-D12		H8P-D12	
			30	625	703	781	859	938	1016	1094	1172	1250			G8P-D12		H8P-D12	
		#4	40	1000	1125	1250	1375	1500	1625	1750	1875	2000			J8P-D20			
			50	1250	1406	1563	1719	1875	2031	2188	2344	2500			J8P-D25			
		#5	60										400	4000	K8P-D40			
			75										400	4000	K8P-D40			
			100										400	4000	K8P-D40			
	2113	#6	125										800	8000	M8P-D80			
			150										800	8000	M8P-D80			
			200										800	8000	M8P-D80			

Table 5 - Short-Circuit Current Rating - 380V (units at this voltage are not cULus Listed)

Controller Type	Device/ Bulletin	Size/Rating		Magnetic-only Trip Settings									Electronic Trip					
		Size	HP	A	B	C	D	E	F	G	H	I	Min	Max	140MG Catalog Number Default	Unit Combination Short-Circuit Current Rating	140MG Catalog Number Optional	Unit Combination Short-Circuit Current Rating
Bulletin 500	2107, 2113, 2123	#1	0.125	9	12	15	18	21	24	27	30	33			G8P-B30	65 kA	H8P-B30	100 kA
			0.25	9	12	15	18	21	24	27	30	33			G8P-B30		H8P-B30	
			0.33	9	12	15	18	21	24	27	30	33			G8P-B30		H8P-B30	
			0.5	9	12	15	18	21	24	27	30	33			G8P-B30		H8P-B30	
			0.75	9	12	15	18	21	24	27	30	33			G8P-B30		H8P-B30	
			1	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			1.5	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			2	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			3	45	60	75	90	105	120	135	150	165			G8P-C15	100 kA	H8P-C15	
			5	45	60	75	90	105	120	135	150	165			G8P-C15		H8P-C15	
			7.5	90	120	150	180	210	240	270	300	330			G8P-C30		H8P-C30	
			10	90	120	150	180	210	240	270	300	330			G8P-C30		H8P-C30	
		#2	15	210	280	350	420	490	560	630	700	770			G8P-C70		H8P-C70	
			20	210	280	350	420	490	560	630	700	770			G8P-C70		H8P-C70	
			25	210	280	350	420	490	560	630	700	770			G8P-C70		H8P-C70	
		#3	30	300	400	500	600	700	800	900	1000	1100			G8P-D10		H8P-D10	
			40	625	703	781	859	938	1016	1094	1172	1250			G8P-D12		H8P-D12	
			50	625	703	781	859	938	1016	1094	1172	1250			G8P-D12		H8P-D12	
		#4	60	1000	1125	1250	1375	1500	1625	1750	1875	2000			J8P-D20			
			75	1250	1406	1563	1719	1875	2031	2188	2344	2500			J8P-D25			
		#5	100										400	4000	K8P-D40			
			125										400	4000	K8P-D40			
			150										400	4000	K8P-D40			
			200										800	8000	M8P-D80			
		#6	250										800	8000	M8P-D80			
			300										800	8000	M8P-D80			

Table 6 - Short-Circuit Current Rating - 480V (cULus Listed)

Controller Type	Device/ Bulletin	Size/Rating		Magnetic-only Trip Settings									Electronic Trip		140MG Catalog Number Default	Unit Combination Short-Circuit Current Rating	140MG Catalog Number Optional	Unit Combination Short-Circuit Current Rating
		Size	HP	A	B	C	D	E	F	G	H	I	Min	Max				
Bulletin 500	2107, 2113, 2123	#1	0.125	9	12	15	18	21	24	27	30	33			G8P-B30	65 kA	H8P-B30	100 kA
			0.25	9	12	15	18	21	24	27	30	33			G8P-B30		H8P-B30	
			0.33	9	12	15	18	21	24	27	30	33			G8P-B30		H8P-B30	
			0.5	9	12	15	18	21	24	27	30	33			G8P-B30		H8P-B30	
			0.75	9	12	15	18	21	24	27	30	33			G8P-B30		H8P-B30	
			1	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			1.5	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			2	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			3	45	60	75	90	105	120	135	150	165			G8P-C15	100 kA	H8P-C15	
			5	45	60	75	90	105	120	135	150	165			G8P-C15		H8P-C15	
			7.5	90	120	150	180	210	240	270	300	330			G8P-C30		H8P-C30	
			10	90	120	150	180	210	240	270	300	330			G8P-C30		H8P-C30	
		#2	15	150	200	250	300	350	400	450	500	550			G8P-C50		H8P-C50	
			20	150	200	250	300	350	400	450	500	550			G8P-C50		H8P-C50	
			25	150	200	250	300	350	400	450	500	550			G8P-C50		H8P-C50	
		#3	30	300	400	500	600	700	800	900	1000	1100			G8P-D10		H8P-D10	
			40	300	400	500	600	700	800	900	1000	1100			G8P-D10		H8P-D10	
			50	300	400	500	600	700	800	900	1000	1100			G8P-D10		H8P-D10	
		#4	60	750	844	938	1031	1125	1219	1313	1406	1500			J8P-D15			
			75	875	984	1094	1203	1313	1422	1531	1641	1750			J8P-D17			
			100	1250	1406	1563	1719	1875	2031	2188	2344	2500			J8P-D25			
		#5	125										400	4000	K8P-D40			
			150										400	4000	K8P-D40			
			200										400	4000	K8P-D40			
	2113	#6	250										800	8000	M8P-D80			
			300										800	8000	M8P-D80			
			350										800	8000	M8P-D80			
			400										800	8000	M8P-D80			

Table 6 - Short-Circuit Current Rating - 480V (cULus Listed) (continued)

Controller Type	Device/ Bulletin	Size/Rating		Magnetic-only Trip Settings									Electronic Trip		140MG Catalog Number Default	Unit Combination Short-Circuit Current Rating	140MG Catalog Number Optional	Unit Combination Short-Circuit Current Rating
		Size	HP	A	B	C	D	E	F	G	H	I	Min	Max				
Bulletin 300	2107, 2113 Space Saving NEMA	#1	0.25	9	12	15	18	21	24	27	30	33			G8P-B30	65 kA	H8P-B30	65 kA
			0.33	9	12	15	18	21	24	27	30	33			G8P-B30		H8P-B30	
			0.5	9	12	15	18	21	24	27	30	33			G8P-B30		H8P-B30	
			0.75	9	12	15	18	21	24	27	30	33			G8P-B30		H8P-B30	
			1	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			1.5	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			2	21	28	35	42	49	56	63	70	77			G8P-B70		H8P-B70	
			3	45	60	75	90	105	120	135	150	165			G8P-C15	100 kA	H8P-C15	
			5	45	60	75	90	105	120	135	150	165			G8P-C15		H8P-C15	
			7.5	90	120	150	180	210	240	270	300	330			G8P-C30		H8P-C30	
			10	90	120	150	180	210	240	270	300	330			G8P-C30		H8P-C30	
		#2	15	150	200	250	300	350	400	450	500	550			G8P-C50		H8P-C50	
			20	150	200	250	300	350	400	450	500	550			G8P-C50		H8P-C50	
			25	150	200	250	300	350	400	450	500	550			G8P-C50		H8P-C50	
		#3	30	300	400	500	600	700	800	900	1000	1100			G8P-D10		H8P-D10	
			40	300	400	500	600	700	800	900	1000	1100			G8P-D10		H8P-D10	
			50	300	400	500	600	700	800	900	1000	1100			G8P-D10		H8P-D10	
	2113 Space Saving NEMA	#4	60	750	844	938	1031	1125	1219	1313	1406	1500			J8P-D15			
			75	825	984	1094	1203	1313	1422	1531	1641	1750			J8P-D17			
			100	1250	1406	1563	1719	1875	2031	2188	2344	2500			J8P-D25			

Table 7 - Short-Circuit Current Rating - 600V (cULus Listed)

Controller Type	Device / Bulletin	Size/Rating		Magnetic-only Trip Settings									Electronic Trip		140MG Catalog Number	Unit Combination Short-Circuit Current Rating	140G Catalog Number Optional	Unit Combination Short-Circuit Current Rating
		Size	HP	A	B	C	D	E	F	G	H	I	Min	Max				
Bulletin 500	2107, 2113, 2123	#1	0.125	9	12	15	18	21	24	27	30	33			H8P-B30	42 kA	H15H3-C25(1)	65 kA
			0.25	9	12	15	18	21	24	27	30	33			H8P-B30			
			0.33	9	12	15	18	21	24	27	30	33			H8P-B30			
			0.5	9	12	15	18	21	24	27	30	33			H8P-B30			
			0.75	9	12	15	18	21	24	27	30	33			H8P-B30			
			1	9	12	15	18	21	24	27	30	33			H8P-B30			
			1.5	21	28	35	42	49	56	63	70	77			H8P-B70			
			2	21	28	35	42	49	56	63	70	77			H8P-B30			
			3	21	28	35	42	49	56	63	70	77			H8P-B30			
			5	45	60	75	90	105	120	135	150	165			H8P-C15	50 kA		
			7.5	90	120	150	180	210	240	270	300	330			H8P-C30			
			10	90	120	150	180	210	240	270	300	330			H8P-C30			
		#2	15	150	200	250	300	350	400	450	500	550			H8P-C50		H15H3-C60(1)	
			20	150	200	250	300	350	400	450	500	550			H8P-C50			
			25	150	200	250	300	350	400	450	500	550			H8P-C50			
		#3	30	300	400	500	600	700	800	900	1000	1100			H8P-D10		H15H3-D10(1)	
			40	300	400	500	600	700	800	900	1000	1100			H8P-D10			
			50	300	400	500	600	700	800	900	1000	1100			H8P-D10			
		#4	60	750	844	938	1031	1125	1219	1313	1406	1500			J8P-D15	65 kA		
			75	750	844	938	1031	1125	1219	1313	1406	1500			J8P-D15			
			100	1000	1125	1250	1375	1500	1625	1750	1875	2000			J8P-D20			
		#5	125										400	4000	K8P-D40			
			150										400	4000	K8P-D40			
			200										400	4000	K8P-D40			
		#6	250										800	8000	M8P-D80	50 kA		
			300										800	8000	M8P-D80			
			350										800	8000	M8P-D80			
			400										800	8000	M8P-D80			

Table 7 - Short-Circuit Current Rating - 600V (cULus Listed) (continued)

Controller Type	Device / Bulletin	Size/Rating		Magnetic-only Trip Settings									Electronic Trip		140MG Catalog Number	Unit Combination Short-Circuit Current Rating	140G Catalog Number Optional	Unit Combination Short-Circuit Current Rating
		Size	HP	A	B	C	D	E	F	G	H	I	Min	Max				
Bulletin 300	2107, 2113 Space Saving NEMA	#1	0.25	9	12	15	18	21	24	27	30	33			H8P-B30	35 kA		
			0.33	9	12	15	18	21	24	27	30	33			H8P-B30			
			0.5	9	12	15	18	21	24	27	30	33			H8P-B30			
			0.75	9	12	15	18	21	24	27	30	33			H8P-B30			
			1	9	12	15	18	21	24	27	30	33			H8P-B30			
			1.5	21	28	35	42	49	56	63	70	77			H8P-B70			
			2	21	28	35	42	49	56	63	70	77			H8P-B70			
			3	21	28	35	42	49	56	63	70	77			H8P-B70			
			5	45	60	75	90	105	120	135	150	165			H8P-C15			
			7.5	90	120	150	180	210	240	270	300	330			H8P-C30			
			10	90	120	150	180	210	240	270	300	330			H8P-C30			
		#2	15	150	200	250	300	350	400	450	500	550			H8P-C50			
			20	150	200	250	300	350	400	450	500	550			H8P-C50			
			25	150	200	250	300	350	400	450	500	550			H8P-C50			
		#3	30	300	400	500	600	700	800	900	1000	1100			H8P-D10			
			40	300	400	500	600	700	800	900	1000	1100			H8P-D10			
			50	300	400	500	600	700	800	900	1000	1100			H8P-D10			
		#4	60	750	844	938	1031	1125	1219	1313	1406	1500			J8P-D15			
			75	750	844	938	1031	1125	1219	1313	1406	1500			J8P-D15			
			100	1000	1125	1250	1375	1500	1625	1750	1875	2000			J8P-D20			

(1) For details on 140G-H15H3-_ _ _ breakers, see Table 9.

Inverse Time Circuit Breakers in Combination NEMA Starter, Soft Starter (SMC), and Variable Frequency AC Drive Units

Application

Circuit breaker application is valid for the following CENTERLINE 2100 MCC products:

- Bulletin 2107 Full Voltage Reversing Combination Staters
- Bulletin 2113 Full Voltage Non-reversing Combination Starters
- Bulletin 2123 Two Speed Non-reversing Combination Starters
- Bulletin 2155 Combination Soft Starter Controllers
- Bulletin 2163 Variable Frequency AC Combination Drive Units

The information in this publication applies to Allen-Bradley inverse time, thermal magnetic, or solid-state circuit breakers when they are used in NEMA (size 1...6) combination starter, soft starter controller, and variable frequency AC drive units.

Circuit Breaker Operation

Inverse time circuit-breakers are designed to trip at 100...125% of their continuous current rating. They are also designed to trip, on an inverse-time basis, at overcurrents up to the magnetic or electronic trip current setting of the circuit breaker. The circuit breaker manufacturer sets the continuous current ratings for the thermal magnetic circuit-breakers. The continuous current rating of circuit breakers with solid-state trip mechanisms depends on the installed rating plug.

Allen-Bradley G-frame and H-frame (up to 70 A) circuit breakers have a non-adjustable, instantaneous magnetic-trip mechanism that is set by the circuit breaker manufacturer. All other frame sizes have an adjustable, instantaneous trip mechanism that can be set to a desired current value. See Table 8 for the instantaneous trip ranges and settings.

Circuit Breaker Size and Adjustment

Rockwell Automation has made engineering evaluations for the protective device (circuit breaker) selection, sizing, and setting range that is based on the protection rules/requirements and motor criteria as stipulated in NEC, CEC, NEMA, UL, and CSA standards. For example, evaluations have been made for items such as motor full-load currents (FLC), X/R ratios, locked rotor currents, and nominal utilization voltages. If the motor application has criteria that deviates from the criteria that are stated in the standards, higher FLC and/or motor inrush currents (greater than 1300% of the nominal FLC) can be experienced. Examples of non-standard motor applications include the following: special motors, non/off standard NEMA motors, energy efficient motors, Design B energy efficient, Design E motors, and IEC N motors.

For circuit breakers with adjustable instantaneous trip, determine the desired instantaneous trip current by using the National Electrical Code (NEC) or Canadian Electrical Code (CEC) standard, and the instructions that are provided with the combination starter unit. See Table 8 and choose the trip setting that has the desired trip current. See Table 9 for other optional breaker choices for the given trip current.

Follow these steps to adjust the trip setting.

1. Verify that the circuit breaker operating-handle is in the OFF/O position.
2. With a small screwdriver, turn each trip setting dial clockwise (or adjust DIP switches) to the determined setting.

   If there are multiple dials on the circuit breaker, set all dials to the same value.
3. Verify that the circuit breaker does not trip during motor starting.

Push-to-trip Mechanism

The push-to-trip mechanism provides a manual means for tripping the motor circuit protector. When you press the test button on the circuit breaker cover with a small screwdriver, a plunger rotates the trip bar, which causes the motor circuit protector to trip.

Horsepower Ratings

The horsepower ratings for combination starter units, soft starter controller units, and variable frequency AC drive units that are listed in Table 8 were determined from full-load currents as specified in the NEC/CEC standards.

Acceptable performance occurs when the motor full-load current is within 15% of the value that corresponds to the horsepower ratings and voltages that are listed in the NEC/CEC standards. Contact your local Allen-Bradley distributor or Rockwell Automation sales representative if the motor full-load current is not within these limits.

ATTENTION: The horsepower ratings and corresponding trip settings in Table 8 are valid only when the combination starter units are equipped with an Allen-Bradley solid-state or electronic overload relay or a Bulletin 592 eutectic alloy overload relay with correctly sized heater elements.

When correctly selected, this combination of circuit breaker and overload relay protects against short circuit and ground fault damage. This combination provides coordinated overcurrent protection in the motor branch circuit for continuous-duty rated motors, as defined in the NEC and CEC standards.

The circuit breaker that has tripped can indicate the interruption of a high fault current. To be sure of protection against fire and/or shock hazard, examine the current carrying parts of the combination starter units, soft starter controller units, and variable frequency AC drive units and replace if damaged. (Refer to NEMA Standards Publication Number ICS 2.2, Maintenance of Motor Controllers After a Fault Condition, and NEMA Standard Publication Number ICS 2, Parts ICS 2-302.)

Table 8 - Default Inverse-time Breakers Used at Given Horse Power and Voltage Ratings

140G-[1]		Voltage (breaker trip rating)				
HP	**KW**	**208**	**240**	**380**	**480**	**600[2]**
0.25	0.125	G6C3-C15 (15 A)	G6C3-C15 (15 A)	G6C3-C15 (15 A)	G6C3-C15 (15 A)	H0C3-C15 (15 A)
0.33	0.25					
0.5	0.37					
0.75	0.55					
1	0.75					
1.5	1.1					
2	1.5	G6C3-C20 (20 A)				
3	2.2	G6C3-C30 (30 A)	G6C3-C20 (20 A)			
5	3.7	G6C3-C40 (40 A)	G6C3-C30 (30 A)	G6C3-C20 (20 A)	G6C3-C20 (20 A)	
7.5	5.5	G6C3-C70 (70 A)	G6C3-C50 (50 A)	G6C3-C30 (30 A)	G6C3-C30 (30 A)	H0C3-C20 (20 A)
10	7.5		G6C3-C70 (70 A)	G6C3-C40 (40 A)		H0C3-C30 (30 A)
15	11	G6C3-D12 (125 A)	G6C3-D10 (100 A)	G6C3-C60 (60 A)	G6C3-C60 (60 A)	H0C3-C40 (40 A)
20	15		G6C3-D12 (125 A)	G6C3-C80 (80 A)		H0C3-C60 (60 A)
25	18.5					
30	22	J6F3-D22 (225 A)		G6C3-D10 (100 A)	G6C3-D10 (100 A)	H0C3-C70 (70 A)
40	30		J6F3-D25 (250 A)	G6C3-D12 (125 A)	G6C3-D12 (125 A)	H0F3-D10 (100 A)
50	37	K6H3-D40 (400 A)				
60	45		K6H3-D40 (400 A)	J6F3-D25 (250 A)	J6F3-D20 (200 A)	J0F3-D17 (175 A)
75	55				J6F3-D25 (250 A)	J0F3-D20 (200 A)
100	75	M6H3-D60 (600 A)		K6H3-D40 (400 A)		
125	90	M6H3-D80 (800 A)	M6H3-D80 (800 A)		K6H3-D40 (400 A)	K0H3-D40 (400 A)
150	112					
200	150			M6H3-D80 (800 A)		
250	187				M6H3-D80 (800 A)	M0H3-D60 (600 A)
300	224					M0H3-D80 (800 A)
350	261					
400	300					

(1) See Table 9 for more detailed information about the breaker.

(2) For units that use the 140G-H15 circuit breakers (indicated by THUL catalog string), see Table 7 for correct circuit breaker information.

Table 9 - Inverse Time Table

Amps	Size/Rating	Short-Circuit Current Rating at Given Voltage[1]											
	Circuit Breaker Part No.	208/ 240V	380/ 480V	600V	Protection Type	Magnetic Trip Setting	Min	Mid	Max	Magnetic Trip Setting Min	Magnetic Trip Setting Max	MCC Catalog String Suffix Code
						Fixed	Thermal-magnetic Adjustable			Electronic Trip Adjustable		
15	140G-G6C3-C15	100 kA	65 kA	------	TMF	500	N/A			N/A		TGM
	140G-H6C3-C15	100 kA	65 kA	------		400	N/A			N/A		THM
	140G-H0C3-C15	------	100 kA	35 kA			N/A			N/A		THX
	140G-J15H3-C15	------	------	100 kA	LSI [3]	N/A	N/A			N/A		TJUL
20	140G-G6C3-C20	100 kA	65 kA	------	TMF	500	N/A			N/A		TGM
	140G-H6C3-C20	100 kA	65 kA	------		400	N/A			N/A		THM
	140G-H0C3-C20	------	100 kA	35 kA			N/A			N/A		THX
25	140G-H6H3-C25	100 kA	65 kA	------	LSI [3]	N/A	N/A			25	250	THML
	140G-H0H3-C25	------	100 kA	35 kA		N/A	N/A					THXL
	140G-H15H3-C25	------	------	42 kA[2]		N/A	N/A					THUL
30	140G-G6C3-C30	100 kA	65 kA	------	TMF	500	N/A			N/A		TGM
	140G-H6C3-C30	100 kA	65 kA	------		400	N/A			N/A		THM
	140G-H0C3-C30	------	100 kA	35 kA			N/A			N/A		THX
	140G-J15C3-C30	------	------	100 kA		N/A	N/A					TJU
40	140G-G6C3-C40	100 kA	65 kA	------	TMF	500	N/A			N/A		TGM
	140G-H6C3-C40	100 kA	65 kA	------		400	N/A			N/A		THM
	140G-H0C3-C40	------	100 kA	35 kA			N/A			N/A		THX
	140G-J15C3-C40	------	------	100 kA		N/A	N/A			N/A		TJU
	140G-J15H3-C40	------	------	100 kA	LSI [3]	N/A	N/A			N/A		TJUL
50	140G-G6C3-C50	100 kA	65 kA	------	TMF	500	N/A			N/A		TGM
	140G-H6C3-C50	100 kA	65 kA	------		500	N/A			N/A		THM
	140G-H0C3-C50	------	100 kA	35 kA			N/A			N/A		THX
	140G-J15C3-C50	------	------	100 kA		N/A	N/A			N/A		TJU
60	140G-G6C3-C60	100 kA	65 kA	------	TMF	600	N/A			N/A		TGM
	140G-H6C3-C60	100 kA	65 kA	------		600	N/A			N/A		THM
	140G-H0C3-C60	------	100 kA	35 kA		N/A	N/A			N/A		THX
	140G-H6H3-C60	100 kA	65 kA	------	LSI [3]	N/A	N/A			60	600	THML
	140G-H0H3-C60	------	100 kA	35 kA		N/A	N/A					THXL
	140G-H15H3-C60	------	------	42 kA[2]		N/A	N/A					THUL
	140G-J15C3-C60	------	------	100 kA	TMF	N/A	N/A			N/A		TJU
	140G-J15H3-C60	------	------	100 kA	LSI [3]	N/A	N/A			N/A		TJUL
70	140G-G6C3-C70	100 kA	65 kA	------	TMF	700	N/A			N/A		TGM
	140G-H6C3-C70	100 kA	65 kA	------		700	N/A			N/A		THM
	140G-H0C3-C70	------	100 kA	35 kA			N/A			N/A		THX
	140G-J6C3-C70	100 kA	65 kA	------		700	N/A			N/A		TJM
	140G-J0C3-C70	------	100 kA	35 kA			N/A			N/A		TJX
	140G-J15C3-C70	------	------	100 kA		N/A	N/A			N/A		TJU

(1) Short-circuit current rating that is shown indicates quick-delivery offering.

(2) Except with 2107, 2113, and 2123 units. See Table 7 for combination rating.

(3) Adjustable from 40…100% of breaker rating in 2% increments.

Table 9 - Inverse Time Table (continued)

Amps	Size/Rating	Short-Circuit Current Rating at Given Voltage[1]											
	Circuit Breaker Part No.	208/ 240V	380/ 480V	600V	Protection Type	Magnetic Trip Setting	Min		Mid		Max	Magnetic Trip Setting Min	Magnetic Trip Setting Max	MCC Catalog String Suffix Code
						Fixed	Thermal-magnetic Adjustable					Electronic Trip Adjustable		
80	140G-G6C3-C80	100 kA	65 kA	------	TMF	800	N/A					N/A		TGM
	140G-H6F3-C80	100 kA	65 kA	------	TMA	N/A	400	500	600	700	800	N/A		THM
	140G-H0F3-C80	------	100 kA	35 kA								N/A		THX
	140G-J15F3-C80	------	------	100 kA		N/A	N/A					N/A		TJU
90	140G-G6C3-C90	100 kA	65 kA	------	TMF	900	N/A					N/A		TGM
	140G-H6F3-C90	100 kA	65 kA	------	TMA	N/A	450	562.5	675	787.5	900	N/A		THM
	140G-H0F3-C90	------	100 kA	35 kA		N/A						N/A		THX
	140G-J6F3-C90	100 kA	65 kA	------		N/A	450	562.5	675	787.5	900			TJM
	140G-J0F3-C90	------	100 kA	35 kA										TJX
	140G-J15F3-C90	------	------	100 kA		N/A	N/A					N/A		TJU
100	140G-G6C3-D10	100 kA	65 kA	------	TMF	1000	N/A					N/A		TGM
	140G-H6F3-D10	100 kA	65 kA	------	TMA	N/A	500	625	750	875	1000	N/A		THM
	140G-H0F3-D10	------	100 kA	35 kA								N/A		THX
	140G-H6H3-D10	100 kA	65 kA	------	LSI[3]		N/A					100	1000	THML
	140G-H0H3-D10	------	100 kA	35 kA			N/A							THXL
	140G-H15H3-D10	------	------	42 kA[2]			N/A							THUL
	140G-J6F3-D10	100 kA	65 kA	------	TMA	N/A	500	625	750	875	1000	N/A		TJM
	140G-J0F3-D10	------	100 kA	35 kA										TJX
	140G-J6H3-D10	100 kA	65 kA	------	LSI[3]		N/A					100	1000	TJML
	140G-J0H3-D10	------	100 kA	35 kA										TJXL
	140G-J15F3-D10	------	------	100 kA	TMA		N/A							TJU
	140G-J15H3-D10	------	------	100 kA	LSI[3]		N/A							TJUL
125	140G-G6C3-D12	100 kA	65 kA	------	TMF	1200	N/A					N/A		TGM
	140G-H6F3-D12	100 kA	65 kA	------	TMA	N/A	625	781.25	937.5	1093.75	1250	N/A		THM
	140G-H0F3-D12	------	100 kA	35 kA		N/A						N/A		THX
	140G-H6H3-D12	100 kA	65 kA	------	LSI[3]	N/A	N/A					125	1250	THML
	140G-H0H3-D12	------	100 kA	35 kA		N/A	N/A							THXL
	140G-J6F3-D12	100 kA	65 kA	------	TMA	N/A	625	781.25	937.5	1093.75	1250	N/A		TJM
	140G-J0F3-D12	------	100 kA	35 kA										TJX
	140G-J15F3-D12	------	------	100 kA		N/A	N/A							TJU
150	140G-J6F3-D15	100 kA	65 kA	------	TMA	N/A	750	937.5	1125	1312.5	1500	N/A		TJM
	140G-J0F3-D15	------	100 kA	35 kA		N/A						N/A		TJX
	140G-J6H3-D15	100 kA	65 kA	------	LSI[3]	N/A	N/A					150	1500	TJML
	140G-J0H3-D15	------	100 kA	35 kA		N/A	N/A							TJXL
	140G-J15F3-D15	------	------	100 kA	TMA	N/A	N/A							TJU
	140G-J15H3-D15	------	------	100 kA	LSI[3]		N/A							TJUL

(1) Short-circuit current rating that is shown indicates quick-delivery offering.

(2) Except with 2107, 2113, and 2123 units. See Table 7 for combination rating.

(3) Adjustable from 40…100% of breaker rating in 2% increments.

Table 9 - Inverse Time Table (continued)

Amps	Size/Rating	Short-Circuit Current Rating at Given Voltage[1]											
	Circuit Breaker Part No.	208/ 240V	380/ 480V	600V	Protection Type	Magnetic Trip Setting	Min		Mid		Max	Magnetic Trip Setting Min	Magnetic Trip Setting Max	MCC Catalog String Suffix Code
						Fixed	Thermal-magnetic Adjustable					Electronic Trip Adjustable		
175	140G-J6F3-D17	100 kA	65 kA	------	TMA	N/A	875	1094	1313	1532	1750	N/A		TJM
	140G-J0F3-D17	------	100 kA	35 kA		N/A						N/A		TJX
	140G-J6H3-D17	100 kA	65 kA	------	LSI [3]	N/A	N/A					175	1750	TJML
	140G-J0H3-D17	------	100 kA	35 kA		N/A	N/A							TJXL
200	140G-J6F3-D20	100 kA	65 kA	------	TMA	N/A	1000	1250	1500	1750	2000	N/A		TJM
	140G-J0F3-D20	------	100 kA	35 kA		N/A						N/A		TJX
	140G-J6H3-D20	100 kA	65 kA	------	LSI [3]	N/A	N/A					200	2000	TJML
	140G-J0H3-D20	------	100 kA	35 kA		N/A	N/A							TJXL
250	140G-J6F3-D25	100 kA	65 kA	------	TMA	N/A	1250	1563	1875	2188	2500	N/A		TJM
	140G-J0F3-D25	------	100 kA	35 kA		N/A						N/A		TJX
	140G-J6H3-D25	100 kA	65 kA	------	LSI [3]	N/A	N/A					250	2500	TJML
	140G-J0H3-D25	------	100 kA	35 kA		N/A	N/A							TJXL
300	140G-K6H3-D30	100 kA	65 kA	------	LSI [2]	N/A	N/A					450	3600	TKM
	140G-K0H3-D30	------	100 kA	65 kA		N/A	N/A							TKX
	140G-K15H3-D30	------	------	100 kA		N/A	N/A							TKU
400	140G-K6H3-D40	100 kA	65 kA	------	LSI [2]	N/A	N/A					600	4800	TKM
	140G-K0H3-D40	------	100 kA	65 kA		N/A	N/A							TKX
	140G-K15H3-D40	------	------	100 kA		N/A	N/A							TKU
600	140G-M6H3-D60	100 kA	65 kA	------	LSI [3]	N/A	N/A					900	7200	TMM
	140G-M0H3-D60	------	100 kA	42 kA		N/A	N/A							TMX
	140G-M6I3-D60	100 kA	65 kA	------	LSIG [3]	N/A	N/A							TMMG
	140G-M0I3-D60	------	100 kA	42 kA		N/A	N/A							TMXG
800	140G-M6H3-D80	100 kA	65 kA	------	LSI [3]	N/A	N/A					1200	9600	TMM
	140G-M0H3-D80	------	100 kA	42 kA		N/A	N/A							TMX
	140G-M6I3-D80	100 kA	65 kA	------	LSIG [3]	N/A	N/A							TMMG
	140G-M0I3-D80	------	100 kA	42 kA		N/A	N/A							TMXG
1200	140G-N6H3-E12	100 kA	65 kA	------	LSI [3]	N/A	N/A					1200	12000	TNM
	140G-N0H3-E12	------	100 kA	65 kA		N/A	N/A							TNX
	140G-N6I3-E12	100 kA	65 kA	------	LSIG[4]	N/A	N/A							TNMG
	140G-N0I3-E12	------	100 kA	65 kA		N/A	N/A							TNXG
2000	140G-R12I3-E20	100 kA	100 kA	100 kA	LSIG [4]	N/A	N/A					2000	20000	TRUG
2500	140G-R12I3-E25	100 kA	100 kA	100 kA	LSIG [4]	N/A	N/A					2500	25000	TRUG
3000	140G-R12I3-E30	100 kA	100 kA	100 kA	LSIG [4]	N/A	N/A					3000	30000	TRUG

(1) Short-circuit current rating that is shown indicates quick-delivery offering.

(2) Adjustable from 40…100% of breaker rating in 2% increments.

(3) Adjustable from 40…100% of breaker rating in 4% increments.

(4) Adjustable from 40…100% of breaker rating in 2.5% increments.

Time-current Curves

See Molded Case Circuit Breakers, Motor Protection Circuit Breakers, and Motor Circuit Protectors Technical Data, publication 140G-TD100, to view the time-current curves that are associated with the following equipment.

Topic
Time-current Curves for Bulletin 140MG-G Motor Circuit Protectors, 600Y/347V AC (50/60 Hz), 3…125 A
Time-current Curves for Bulletin 140MG-H Motor Circuit Protectors, 600V AC (50/60 Hz), 3…100 A
Time-current Curves for Bulletin 140MG-H Motor Circuit Protectors 600V AC (50/60 Hz), 125 A
Time-current Curves for Bulletin 140MG-J Motor Circuit Protectors, 600V AC (50/60 Hz), 150…250 A
Time-current Curves for Bulletin 140MG-K Motor Circuit Protectors, 600V AC (50/60 Hz), 300 A, 400 A
Time-current Curves for Bulletin 140MG-M Motor Circuit Protectors, 600V AC (50/60 Hz) 600 A, 800 A
Time-current Curves for Bulletin 140G-G Thermomagnetic Molded Case Circuit Breaker, 600Y/347V AC, 15…30 A
Time-current Curves for Bulletin 140G-G Thermomagnetic Molded Case Circuit Breaker, 600Y/347V AC, 35…50 A
Time-current Curves for Bulletin 140G-G Thermomagnetic Molded Case Circuit Breaker, 600Y/347V AC, 60…100 A
Time-current Curves for Bulletin 140G-G Thermomagnetic Molded Case Circuit Breaker, 600Y/347V AC, 125 A
Time-current Curves for Bulletin 140G-H Thermomagnetic Molded Case Circuit Breaker, 600V AC, 15…30 A
Time-current Curves for Bulletin 140G-H Thermomagnetic Molded Case Circuit Breaker, 600V AC, 35…50 A
Time-current Curves for Bulletin 140G-H Thermomagnetic Molded Case Circuit Breaker, 600V AC, 60…70 A
Time-current Curves for Bulletin 140G-H Thermomagnetic Molded Case Circuit Breaker, 600V AC, 80…100 A
Time-current Curves for Bulletin 140G-H Thermomagnetic Molded Case Circuit Breaker, 600V AC, 110…125 A
Time-current Curves for Bulletin 140G-H Thermomagnetic Molded Case Circuit Breaker, 600V AC (50/60 Hz), 25 A, 60 A, 100 A, 125 A
Time-current Curves for Bulletin 140G-H Thermomagnetic Molded Case Circuit Breaker, Ground Fault Protection Curve, 600V AC (50/60 Hz), 25 A, 60 A, 100 A, 125 A
Time-current Curves for Bulletin 140G-J Thermomagnetic Molded Case Circuit Breaker, 600V AC, 25…50 A
Time-current Curves for Bulletin 140G-J Thermomagnetic Molded Case Circuit Breaker, 600V AC, 60…70 A
Time-current Curves for Bulletin 140G-J Thermomagnetic Molded Case Circuit Breaker, 600V AC, 80…100 A
Time-current Curves for Bulletin 140G-J Thermomagnetic Molded Case Circuit Breaker, 600V AC, 110…150 A
Time-current Curves for Bulletin 140G-J Thermomagnetic Molded Case Circuit Breaker, 600V AC, 160…225 A
Time-current Curves for Bulletin 140G-J Thermomagnetic Molded Case Circuit Breaker, 600V AC, 250 A
Time-current Curves for Bulletin 140G-J Molded Case Circuit Breaker, 600V AC (50/60 Hz), 40 A, 60 A, 100 A, 150 A, 250 A
Time-current Curves for Bulletin 140G-J Molded Case Circuit Breaker, Ground Fault Protection Curve 600V AC (50/60 Hz), 25 A, 60 A, 100 A, 125 A
Time-current Curves for Bulletin 140G-K Molded Case Circuit Breaker, 600V AC, (50/60 Hz) 300 A, 400 A
Time-current Curves for Bulletin 140G-K Molded Case Circuit Breaker, Ground Fault Protection Curve, 600V AC, (50/60 Hz) 300 A, 400 A
Time-current Curves for Bulletin 140G-M Molded Case Circuit Breaker, 600V AC (50/60 Hz) 600 A, 800 A
Time-current Curves for Bulletin 140G-M Molded Case Circuit Breaker, Ground Fault Protection Curve, 600V AC (50/60 Hz) 600 A, 800 A
Time-current Curves for Bulletin 140G-N (-NS) Molded Case Circuit Breaker, 600V AC (50/60 Hz) 1200 A
Time-current Curves for Bulletin 140G-N (-NS) Molded Case Circuit Breaker, Ground Fault Protection Curve
Time-current Curves for Bulletin 140G-R Molded Case Circuit Breaker, 600V AC (50/60 Hz) 2000 A, 2500 A, 3000 A

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
CENTERLINE 2100 Low Voltage Motor Control Centers Instruction Manual, publication 2100-IN012	Provides general instructions for MCC Units.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation® industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/literature/. To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

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Publication 2100-TD032D-EN-P - May 2015
Supersedes Publication 2100-TD032C-EN-P - February 2015