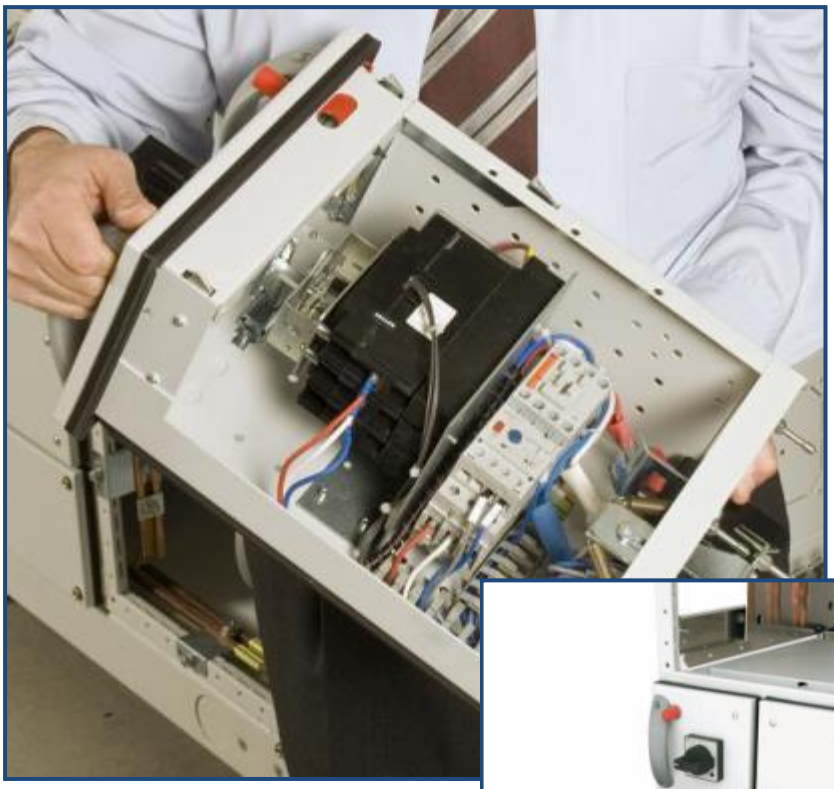
Type 2 Coordination for Premium Efficiency Motor Starters

TemBreak Pro

Combination selections



September 2022

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FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Tembreak **Pro**
Contactor	Sprecher+Schuh **CA7** / **CA9**
Overload relay	Sprecher+Schuh **CEP7** Electronic
Rated operational voltage	400 / 415V AC
Motor types	Premium Efficiency class: IE3
Rated conditional AC current (Iq) :	50 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE:

MOTOR		CIRCUIT BREAKER	CONTACTOR	OVERLOAD RELAY	C/B INSTANT TRIP AMPS & MOTOR FLC		
MOTOR kW	MOTOR AMP RATINGS @ 400V	MOULED CASE CIRCUIT BREAKER	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	AMPERE SETTING RANGE	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	P160N2 / 20A TM	CA7-30	CEP7-1EF BB *	0.2 – 1.0	240	320
0.25	0.85	P160N2 / 20A TM	CA7-30	CEP7-1EF BB *	0.2 – 1.0	240	225
0.37	1.1	P160N2 / 20A TM	CA7-30	CEP7-1EF CB *	1.0 – 5.0	240	174
0.55	1.5	P160N2 / 20A TM	CA7-30	CEP7-1EF CB *	1.0 – 5.0	240	128
0.75	1.9	P160N2 / 20A TM	CA7-30	CEP7-1EF CB *	1.0 – 5.0	240	101
1.1	2.7	P160N2 / 20A TM	CA7-30	CEP7-1EF CB *	1.0 – 5.0	240	71.1
1.5	3.6	P160N2 / 20A TM	CA7-30	CEP7-1EF CB *	1.0 – 5.0	240	53.3
2.2	4.9	P160N2 / 20A TM	CA7-30	CEP7-1EF DB *	3.2 – 16	240	39.2
3	6.5	P160N2 / 20A TM	CA7-30	CEP7-1EF ED	5.4 – 27	240	29.5
4	8.5	P160N2 / 20A TM	CA7-30	CEP7-1EF ED	5.4 – 27	240	22.6
5.5	11.5	P160N2 / 20A TM	CA7-30	CEP7-1EF ED	5.4 – 27	240	16.7
7.5	15.5	P160N2 / 32A TM	CA7-30	CEP7-1EF ED	5.4 – 27	384	19.8
11	22	P160N2 / 32A TM	CA7-30	CEP7-1EF ED	5.4 – 27	384	14.0
15	29	P160N2 / 50A TM	CA7-43	CEP7-1EF FD	11 – 55	600	16.6
18.5	35	P160N2 / 63A TM	CA7-43	CEP7-1EF FD	11 – 55	756	17.3
22	41	P160N2 / 63A TM	CA7-55	CEP7-1EF FD	11 – 55	756	14.8
30	55	P160N2 / 100A TM	CA7-72	CEP7-1EF GE	20 – 100	1200	17.5
37	66	P160N2 / 100A TM	CA7-85	CEP7-1EF GE	20 – 100	1200	14.5
45	80	P160N2 / 160A TM	CA9-116	CEP7-1EF GE *	20 – 100	1600	16.0
55	97	P250N / 160A TM	CA9-146	CEP7-1EF GE *	20 – 100	2080	17.2
75	132	P250N / 250A TM	CA9-190	CTKIT400A	80 – 400	2500	15.2
90	160	P400N / 250A BE	CA9-265	CTKIT400A	80 – 400	3000	15.0
110	195	P400N / 400A BE	CA9-265	CTKIT400A	80 – 400	4800	20.9
132	230	P400N / 400A BE	CA9-305	CTKIT400A	80 – 400	4800	17.7
150	260	P630N / 630A BE	CA9-400	CTKIT400A	80 – 400	6930	22.7
160	280	P630N / 630A BE	CA9-400	CTKIT400A	80 – 400	6930	21.0
185	325	P630N / 630A BE	CA9-400	CTKIT400A	80 – 400	6930	18.1
200	350	P630N / 630A BE	CA9-460	CTKIT400A	80 – 400	6930	16.8
220	385	B800N / 630A BE	CA9-580	CTKIT400A	80 – 400	7560	16.7
250	430	B800N / 630A BE	CA9-580	CTKIT600A	120 – 600	7560	14.9
315	540	B800N / 800A BE	CA9-750	CTKIT600A	120 – 600	9600	15.1
355	610	B1000N / 1000A BE	CA9-750	CTKIT800A	160 – 800	10000	13.9
400	690	B1250N / 1250A BE	CA9-860	CTKIT1000A	200 – 1000	15000	18.5
450	770	B1250N / 1250A BE	CA9-1060	CTKIT1000A	200 – 1000	15000	16.6
500	850	B1250N / 1250A BE	CA9-1060	CTKIT1000A	200 – 1000	15000	15.0

NOTES:

A) Recommended circuit breaker size based on the following starting conditions:

Starting currents approx. 7.5…8 x motor FLC. Start time approx.5 sec.

Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms, that will vary by motor make.

* Overloads separately mounted from contactor, or use Pass thru version.

^ Motor Starters 75kW & above, Kit utilises separate 5P10-5A Current Transformers with 193-1EF*Z overload

B) Other

1) CEP7-1EF overload add-on module available for: Ground Fault, Jam Protection & Remote reset,
Ground Fault requires toroid ;- **-CBCT#

C) Note

Set circuit breaker Ir to 1 (=In), and Overload is set to motor FLC

Rev: 3

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FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Tembreak **Pro**
Contactor	Sprecher+Schuh **CA7** and **CA9**
Overload relay	Allen-Bradley 193-E3 Electronic **E300 w-**Ethernet/IP
Rated operational voltage	400 / 415V AC
Motor types	Premium Efficiency class: IE3
Rated conditional AC current (Iq) :	50 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE:

MOTOR		CIRCUIT BREAKER	CONTACTOR	OVERLOAD RELAY		C/B INSTANT TRIP AMPS & MOTOR FLC	
MOTOR kW	MOTOR AMP RATINGS @ 400V	MOULED CASE CIRCUIT BREAKER	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	Earth Leakage	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	P160N2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	320
0.25	0.85	P160N2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	225
0.37	1.1	P160N2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	174
0.55	1.5	P160N2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	128
0.75	1.9	P160N2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	101
1.1	2.7	P160N2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	71.1
1.5	3.6	P160N2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	53.3
2.2	4.9	P160N2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	39.2
3	6.5	P160N2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	29.5
4	8.5	P160N2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	22.6
5.5	11.5	P160N2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	16.7
7.5	15.5	P160N2 / 32A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	384	19.8
11	22	P160N2 / 32A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	384	14.0
15	29	P160N2 / 50A TM	CA7-43	193 E3-63-24D-IG-60A - # -ETR	Int.	600	16.6
18.5	35	P160N2 / 63A TM	CA7-43	193 E3-63-24D-IG-60A - # -ETR	Int.	756	17.3
22	41	P160N2 / 63A TM	CA7-55	193 E3-63-24D-IG-60A - # -ETR	Int.	756	14.8
30	55	P160N2 / 100A TM	CA7-72	193 E3-63-24D-IG-100A - # -ETR	Int.	1200	17.5
37	66	P160N2 / 100A TM	CA7-85	193 E3-63-24D-IG-100A - # -ETR	Int.	1200	14.5
45	80	P160N2 / 160A TM	CA9-116	193 E3-63-24D-IG-200A- # -ETR	Int.	1600	16.0
55	97	P250N / 160A TM	CA9-146	193 E3-63-24D-IG-200A- # -ETR	Int.	2080	17.2
75	132	P250N / 250A TM	CA9-190	193 E3-63-24D-IG-200A- # -ETR	Int.	2500	15.2
90	160	P400N / 250A BE	CA9-265	193 E3-63-24D-IG-200A- # -ETR	Int.	3000	15.0
110	195	P400N / 400A BE	CA9-265	193 E3-63-24D-IG-200A - # -ETR	Int.	4800	20.9
132	230	P400N / 400A BE	CA9-305	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	4800	17.7
150	260	P630N / 630A BE	CA9-400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	22.7
160	280	P630N / 630A BE	CA9-400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	21.0
185	325	P630N / 630A BE	CA9-400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	18.1
200	350	P630N / 630A BE	CA9-460	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	16.8
220	385	B800N / 630A BE	CA9-580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	7560	16.7
250	430	B800N / 630A BE	CA9-580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	7560	14.9
315	540	B800N / 800A BE	CA9-750	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	9600	15.1
355	610	B1000N / 1000A BE	CA9-750	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	10000	13.9
400	690	B1250N / 1250A BE	CA9-860	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	18.5
450	770	B1250N / 1250A BE	CA9-1060	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	16.6
500	850	B1250N / 1250A BE	CA9-1060	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	15.0

NOTES:

A) Recommended circuit breaker size based on the following starting conditions:
Starting currents approx. 7.5… 8 x motor FLC. Start time approx.5 sec.
Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms, that will vary by motor make.
^ Motor Starters 132kW & above, require external 5P10-5A Current Transformers

B) E/L
-Int- Internal Ground Fault toroid in Sensing module – 500mA to 5 Amp
* to use External toroid, and/or Thermistor protection, -GP42- Control module is required
-Ext- External Ground Fault toroid via 193-CBCT – 20mA to 5 Amp

C)Other
1) 24D denotes 24V DC control voltage
- # - Specify Contactor mount, or E3T / T for separate DIN mount, or P for Pass Thru
If Power & Voltage monitoring is required, change Sensing module to VIG versions

Rev: 2

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FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Tembreak **Pro**
Contactor	Allen-Bradley **100(S)-C** / **100(S)-E**
Overload relay	Allen-Bradley **E100** 193-1EF Electronic
Rated operational voltage	400 / 415V AC
Motor types	Premium Efficiency class: IE3
Rated conditional AC current (Iq) :	50 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE:

MOTOR		CIRCUIT BREAKER	CONTACTOR	OVERLOAD RELAY		C/B INSTANT TRIP AMPS & MOTOR FLC	
MOTOR kW	MOTOR AMP RATINGS @ 400V	MOULED CASE CIRCUIT BREAKER	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	AMPERE SETTING RANGE	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	P160N2 / 20A TM	100-C30	193-1EF BB *	0.2 – 1.0	240	320
0.25	0.85	P160N2 / 20A TM	100-C30	193-1EF BB *	0.2 – 1.0	240	225
0.37	1.1	P160N2 / 20A TM	100-C30	193-1EF CB *	1.0 – 5.0	240	174
0.55	1.5	P160N2 / 20A TM	100-C30	193-1EF CB *	1.0 – 5.0	240	128
0.75	1.9	P160N2 / 20A TM	100-C30	193-1EF CB *	1.0 – 5.0	240	101
1.1	2.7	P160N2 / 20A TM	100-C30	193-1EF CB *	1.0 – 5.0	240	71.1
1.5	3.6	P160N2 / 20A TM	100-C30	193-1EF CB *	1.0 – 5.0	240	53.3
2.2	4.9	P160N2 / 20A TM	100-C30	193-1EF DB *	3.2 – 16	240	39.2
3	6.5	P160N2 / 20A TM	100-C30	193-1EF ED	5.4 – 27	240	29.5
4	8.5	P160N2 / 20A TM	100-C30	193-1EF ED	5.4 – 27	240	22.6
5.5	11.5	P160N2 / 20A TM	100-C30	193-1EF ED	5.4 – 27	240	16.7
7.5	15.5	P160N2 / 32A TM	100-C30	193-1EF ED	5.4 – 27	384	19.8
11	22	P160N2 / 32A TM	100-C30	193-1EF ED	5.4 – 27	384	14.0
15	29	P160N2 / 50A TM	100-C43	193-1EF FD	11 – 55	600	16.6
18.5	35	P160N2 / 63A TM	100-C43	193-1EF FD	11 – 55	756	17.3
22	41	P160N2 / 63A TM	100-C55	193-1EF FD	11 – 55	756	14.8
30	55	P160N2 / 100A TM	100-C72	193-1EF GE	20 – 100	1200	17.5
37	66	P160N2 / 100A TM	100-C85	193-1EF GE	20 – 100	1200	14.5
45	80	P160N2 / 160A TM	100-E116	193-1EF GE *	20 – 100	1600	16.0
55	97	P250N / 160A TM	100-E146	193-1EF GE *	20 – 100	2080	17.2
75	132	P250N / 250A TM	100-E190	193-E200-200A #	20 – 200	2500	15.2
90	160	P400N / 250A BE	100-E265	193-E200-200A #	20 – 200	3000	15.0
110	195	P400N / 400A BE	100-E265	193-E200-200A #	20 – 200	4800	20.9
132	230	P400N / 400A BE	100-E305	CTKIT400A	80 – 400	4800	17.7
150	260	P630N / 630A BE	100-E400	CTKIT400A	80 – 400	6930	22.7
160	280	P630N / 630A BE	100-E400	CTKIT400A	80 – 400	6930	21.0
185	325	P630N / 630A BE	100-E400	CTKIT400A	80 – 400	6930	18.1
200	350	P630N / 630A BE	100-E460	CTKIT400A	80 – 400	6930	16.8
220	385	B800N / 630A BE	100-E580	CTKIT400A	80 – 400	7560	16.7
250	430	B800N / 630A BE	100-E580	CTKIT600A	120 – 600	7560	14.9
315	540	B800N / 800A BE	100-E750	CTKIT600A	120 – 600	9600	15.1
355	610	B1000N / 1000A BE	100-E750	CTKIT800A	160 – 800	10000	13.9
400	690	B1250N / 1250A BE	100-E860	CTKIT1000A	200 – 1000	15000	18.5
450	770	B1250N / 1250A BE	100-E1060	CTKIT1000A	200 – 1000	15000	16.6
500	850	B1250N / 1250A BE	100-E1060	CTKIT1000A	200 – 1000	15000	15.0

NOTES:

A) Recommended circuit breaker size based on the following starting conditions:

Starting currents approx. 7.5…8 x motor FLC. Start time approx.5 sec.

Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms, that will vary by motor make.

* Overloads separately mounted from contactor, or use Pass thru version.

^ Motor Starters 132kW & above, Kit utilises separate 5P10-5A Current Transformers with 193-1EF*Z overload

B) Other

1) 193-1EF overload add-on module available for: Ground Fault, Jam Protection & Remote reset,

2) # - Specify E200 mounting, T for separate DIN mount, or P for Pass Thru

C) Note

Set circuit breaker Ir to 1 (=In), and Overload is set to motor FLC

RCH54.33 Type 2, 50 kA – Circuit breakers, with electronic overload

Rev: 3

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FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Tembreak **Pro**
Contactor	Allen-Bradley **100(S)-C** / **100(S)-E**
Overload relay	Allen-Bradley 193-E3 Electronic **E300 w-**Ethernet/IP
Rated operational voltage	400 / 415V AC
Motor types	Premium Efficiency class: IE3
Rated conditional AC current (Iq) :	50 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

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0.18	0.6	P160N2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	320
0.25	0.85	P160N2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	225
0.37	1.1	P160N2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	174
0.55	1.5	P160N2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	128
0.75	1.9	P160N2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	101
1.1	2.7	P160N2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	71.1
1.5	3.6	P160N2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	53.3
2.2	4.9	P160N2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	39.2
3	6.5	P160N2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	29.5
4	8.5	P160N2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	22.6
5.5	11.5	P160N2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	16.7
7.5	15.5	P160N2 / 32A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	384	19.8
11	22	P160N2 / 32A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	384	14.0
15	29	P160N2 / 50A TM	100-C43	193 E3-63-24D-IG-60A - # -ETR	Int.	600	16.6
18.5	35	P160N2 / 63A TM	100-C43	193 E3-63-24D-IG-60A - # -ETR	Int.	756	17.3
22	41	P160N2 / 63A TM	100-C55	193 E3-63-24D-IG-60A - # -ETR	Int.	756	14.8
30	55	P160N2 / 100A TM	100-C72	193 E3-63-24D-IG-100A - # -ETR	Int.	1200	17.5
37	66	P160N2 / 100A TM	100-C85	193 E3-63-24D-IG-100A - # -ETR	Int.	1200	14.5
45	80	P160N2 / 160A TM	100-E116	193 E3-63-24D-IG-200A- # -ETR	Int.	1600	16.0
55	97	P250N / 160A TM	100-E146	193 E3-63-24D-IG-200A- # -ETR	Int.	2080	17.2
75	132	P250N / 250A TM	100-E190	193 E3-63-24D-IG-200A- # -ETR	Ext.	2500	15.2
90	160	P400N / 250A BE	100-E265	193 E3-63-24D-IG-200A- # -ETR	Ext.	3000	15.0
110	195	P400N / 400A BE	100-E265	193 E3-63-24D-IG-200A - # -ETR	Ext.	4800	20.9
132	230	P400N / 400A BE	100-E305	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	4800	17.7
150	260	P630N / 630A BE	100-E400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	22.7
160	280	P630N / 630A BE	100-E400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	21.0
185	325	P630N / 630A BE	100-E400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	18.1
200	350	P630N / 630A BE	100-E460	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	16.8
220	385	B800N / 630A BE	100-E580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	7560	16.7
250	430	B800N / 630A BE	100-E580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	7560	14.9
315	540	B800N / 800A BE	100-E750	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	9600	15.1
355	610	B1000N / 1000A BE	100-E750	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	10000	13.9
400	690	B1250N / 1250A BE	100-E860	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	18.5
450	770	B1250N / 1250A BE	100-E1060	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	16.6
500	850	B1250N / 1250A BE	100-E1060	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	15.0

NOTES:

A) Recommended circuit breaker size based on the following starting conditions:
Starting currents approx. 7.5… 8 x motor FLC. Start time approx.5 sec.
Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms, that will vary by motor make.
^ Motor Starters 132kW & above, require external 5P10-5A Current Transformers

B) E/L
-Int- Internal Ground Fault toroid in Sensing module – 500mA to 5 Amp
* to use External toroid, and/or Thermistor protection, -GP42- Control module is required
-Ext- External Ground Fault toroid via 193-CBCT – 20mA to 5 Amp

C)Other
2) 24D denotes 24V DC control voltage
-# - Specify Contactor mount, or E3T / T for separate DIN mount, or P for Pass Thru
If Power & Voltage monitoring is required, change Sensing module to VIG versions

Rev: 2

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Tembreak **Pro**
Contactor	Sprecher+Schuh **CA7** / **CA9**
Overload relay	Sprecher+Schuh **CEP7** Electronic
Rated operational voltage	400 / 415V AC
Motor types	Premium Efficiency class: IE3
Rated conditional AC current (Iq) :	70 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE:

MOTOR		CIRCUIT BREAKER	CONTACTOR	OVERLOAD RELAY	C/B INSTANT TRIP AMPS & MOTOR FLC		
MOTOR kW	MOTOR AMP RATINGS @ 400V	MOULED CASE CIRCUIT BREAKER	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	AMPERE SETTING RANGE	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	P160H2 / 20A TM	CA7-30	CEP7-1EF BB *	0.2 – 1.0	240	320
0.25	0.85	P160H2 / 20A TM	CA7-30	CEP7-1EF BB *	0.2 – 1.0	240	225
0.37	1.1	P160H2 / 20A TM	CA7-30	CEP7-1EF CB *	1.0 – 5.0	240	174
0.55	1.5	P160H2 / 20A TM	CA7-30	CEP7-1EF CB *	1.0 – 5.0	240	128
0.75	1.9	P160H2 / 20A TM	CA7-30	CEP7-1EF CB *	1.0 – 5.0	240	101
1.1	2.7	P160H2 / 20A TM	CA7-30	CEP7-1EF CB *	1.0 – 5.0	240	71.1
1.5	3.6	P160H2 / 20A TM	CA7-30	CEP7-1EF CB *	1.0 – 5.0	240	53.3
2.2	4.9	P160H2 / 20A TM	CA7-30	CEP7-1EF DB *	3.2 – 16	240	39.2
3	6.5	P160H2 / 20A TM	CA7-30	CEP7-1EF ED	5.4 – 27	240	29.5
4	8.5	P160H2 / 20A TM	CA7-30	CEP7-1EF ED	5.4 – 27	240	22.6
5.5	11.5	P160H2 / 20A TM	CA7-30	CEP7-1EF ED	5.4 – 27	240	16.7
7.5	15.5	P160H2 / 32A TM	CA7-30	CEP7-1EF ED	5.4 – 27	384	19.8
11	22	P160H2 / 32A TM	CA7-30	CEP7-1EF ED	5.4 – 27	384	14.0
15	29	P160H2 / 50A TM	CA7-43	CEP7-1EF FD	11 – 55	600	16.6
18.5	35	P160H2 / 63A TM	CA7-43	CEP7-1EF FD	11 – 55	756	17.3
22	41	P160H2 / 63A TM	CA7-55	CEP7-1EF FD	11 – 55	756	14.8
30	55	P160H2 / 100A TM	CA7-72	CEP7-1EF GE	20 – 100	1200	17.5
37	66	P160H2 / 100A TM	CA7-85	CEP7-1EF GE	20 – 100	1200	14.5
45	80	P160H2 / 160A TM	CA9-116	CEP7-1EF GE *	20 – 100	1600	16.0
55	97	P250H / 160A TM	CA9-146	CEP7-1EF GE *	20 – 100	2080	17.2
75	132	P250H / 250A TM	CA9-190	CTKIT400A	80 – 400	2500	15.2
90	160	P400H / 250A BE	CA9-265	CTKIT400A	80 – 400	3000	15.0
110	195	P400H / 400A BE	CA9-265	CTKIT400A	80 – 400	4800	20.9
132	230	P400H / 400A BE	CA9-305	CTKIT400A	80 – 400	4800	17.7
150	260	P630H / 630A BE	CA9-400	CTKIT400A	80 – 400	6930	22.7
160	280	P630H / 630A BE	CA9-400	CTKIT400A	80 – 400	6930	21.0
185	325	P630H / 630A BE	CA9-400	CTKIT400A	80 – 400	6930	18.1
200	350	P630H / 630A BE	CA9-460	CTKIT400A	80 – 400	6930	16.8
220	385	B800H / 630A BE	CA9-580	CTKIT400A	80 – 400	7560	16.7
250	430	B800H / 630A BE	CA9-580	CTKIT600A	120 – 600	7560	14.9
315	540	B800H / 800A BE	CA9-750	CTKIT600A	120 – 600	9600	15.1
355	610	B1000H / 1000A BE	CA9-750	CTKIT800A	160 – 800	10000	13.9
400	690	B1250HL / 1250A BE	CA9-860	CTKIT1000A	200 – 1000	15000	18.5
450	770	B1250HL / 1250A BE	CA9-1060	CTKIT1000A	200 – 1000	15000	16.6
500	850	B1250HL / 1250A BE	CA9-1060	CTKIT1000A	200 – 1000	15000	15.0

NOTES:

A) Recommended circuit breaker size based on the following starting conditions:

Starting currents approx. 7.5…8 x motor FLC. Start time approx.5 sec.

Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms, that will vary by motor make.

* Overloads separately mounted from contactor, or use Pass thru version.

^ Motor Starters 75kW & above, Kit utilises separate 5P10-5A Current Transformers with 193-1EF*Z overload

B) Other

1) CEP7-1EF overload add-on module available for: Ground Fault, Jam Protection & Remote reset,
Ground Fault requires toroid ;- **-CBCT#

C) Note

Set circuit breaker Ir to 1 (=In), and Overload is set to motor FLC

Rev: 4

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Tembreak **Pro**
Contactor	Sprecher+Schuh **CA7** and **CA9**
Overload relay	Allen-Bradley 193-E3 Electronic **E300 w-**Ethernet/IP
Rated operational voltage	400 / 415V AC
Motor types	Premium Efficiency class: IE3
Rated conditional AC current (Iq) :	70 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE:

MOTOR		CIRCUIT BREAKER	CONTACTOR	OVERLOAD RELAY		C/B INSTANT TRIP AMPS & MOTOR FLC	
MOTOR kW	MOTOR AMP RATINGS @ 400V	MOULED CASE CIRCUIT BREAKER	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	Earth Leakage	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	P160H2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	320
0.25	0.85	P160H2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	225
0.37	1.1	P160H2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	174
0.55	1.5	P160H2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	128
0.75	1.9	P160H2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	101
1.1	2.7	P160H2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	71.1
1.5	3.6	P160H2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	53.3
2.2	4.9	P160H2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	39.2
3	6.5	P160H2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	29.5
4	8.5	P160H2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	22.6
5.5	11.5	P160H2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	16.7
7.5	15.5	P160H2 / 32A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	384	19.8
11	22	P160H2 / 32A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	384	14.0
15	29	P160H2 / 50A TM	CA7-43	193 E3-63-24D-IG-60A - # -ETR	Int.	600	16.6
18.5	35	P160H2 / 63A TM	CA7-43	193 E3-63-24D-IG-60A - # -ETR	Int.	756	17.3
22	41	P160H2 / 63A TM	CA7-55	193 E3-63-24D-IG-60A - # -ETR	Int.	756	14.8
30	55	P160H2 / 100A TM	CA7-72	193 E3-63-24D-IG-100A - # -ETR	Int.	1200	17.5
37	66	P160H2 / 100A TM	CA7-85	193 E3-63-24D-IG-100A - # -ETR	Int.	1200	14.5
45	80	P160H2 / 160A TM	CA9-116	193 E3-63-24D-IG-200A- # -ETR	Int.	1600	16.0
55	97	P250H / 160A TM	CA9-146	193 E3-63-24D-IG-200A- # -ETR	Int.	2080	17.2
75	132	P250H / 250A TM	CA9-190	193 E3-63-24D-IG-200A- # -ETR	Int.	2500	15.2
90	160	P400H / 250A BE	CA9-265	193 E3-63-24D-IG-200A- # -ETR	Int.	3000	15.0
110	195	P400H / 400A BE	CA9-265	193 E3-63-24D-IG-200A - # -ETR	Int.	4800	20.9
132	230	P400H / 400A BE	CA9-305	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	4800	17.7
150	260	P630H / 630A BE	CA9-400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	22.7
160	280	P630H / 630A BE	CA9-400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	21.0
185	325	P630H / 630A BE	CA9-400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	18.1
200	350	P630H / 630A BE	CA9-460	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	16.8
220	385	B800H / 630A BE	CA9-580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	7560	16.7
250	430	B800H / 630A BE	CA9-580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	7560	14.9
315	540	B800H / 800A BE	CA9-750	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	9600	15.1
355	610	B1000H / 1000A BE	CA9-750	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	10000	13.9
400	690	B1250HL / 1250A BE	CA9-860	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	18.5
450	770	B1250HL / 1250A BE	CA9-1060	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	16.6
500	850	B1250HL / 1250A BE	CA9-1060	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	15.0

NOTES:

A) Recommended circuit breaker size based on the following starting conditions:
Starting currents approx. 7.5… 8 x motor FLC. Start time approx.5 sec.
Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms, that will vary by motor make.
^ Motor Starters 132kW & above, require external 5P10-5A Current Transformers

B) E/L
-Int- Internal Ground Fault toroid in Sensing module – 500mA to 5 Amp
* to use External toroid, and/or Thermistor protection, -GP42- Control module is required
-Ext- External Ground Fault toroid via 193-CBCT – 20mA to 5 Amp

C)Other 3) 24D denotes 24V DC control voltage
- # - Specify Contactor mount, or E3T / T for separate DIN mount, or P for Pass Thru
If Power & Voltage monitoring is required, change Sensing module to VIG versions

Rev: 2

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Tembreak **Pro**
Contactor	Allen-Bradley **100(S)-C** / **100(S)-E**
Overload relay	Allen-Bradley **E100** 193-1EF Electronic
Rated operational voltage	400 / 415V AC
Motor types	Premium Efficiency class: IE3
Rated conditional AC current (Iq) :	70 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE:

MOTOR		CIRCUIT BREAKER	CONTACTOR	OVERLOAD RELAY	C/B INSTANT TRIP AMPS & MOTOR FLC		
MOTOR kW	MOTOR AMP RATINGS @ 400V	MOULED CASE CIRCUIT BREAKER	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	AMPERE SETTING RANGE	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	P160H2 / 20A TM	100-C30	193-1EF BB *	0.2 – 1.0	240	320
0.25	0.85	P160H2 / 20A TM	100-C30	193-1EF BB *	0.2 – 1.0	240	225
0.37	1.1	P160H2 / 20A TM	100-C30	193-1EF CB *	1.0 – 5.0	240	174
0.55	1.5	P160H2 / 20A TM	100-C30	193-1EF CB *	1.0 – 5.0	240	128
0.75	1.9	P160H2 / 20A TM	100-C30	193-1EF CB *	1.0 – 5.0	240	101
1.1	2.7	P160H2 / 20A TM	100-C30	193-1EF CB *	1.0 – 5.0	240	71.1
1.5	3.6	P160H2 / 20A TM	100-C30	193-1EF CB *	1.0 – 5.0	240	53.3
2.2	4.9	P160H2 / 20A TM	100-C30	193-1EF DB *	3.2 – 16	240	39.2
3	6.5	P160H2 / 20A TM	100-C30	193-1EF ED	5.4 – 27	240	29.5
4	8.5	P160H2 / 20A TM	100-C30	193-1EF ED	5.4 – 27	240	22.6
5.5	11.5	P160H2 / 20A TM	100-C30	193-1EF ED	5.4 – 27	240	16.7
7.5	15.5	P160H2 / 32A TM	100-C30	193-1EF ED	5.4 – 27	384	19.8
11	22	P160H2 / 32A TM	100-C30	193-1EF ED	5.4 – 27	384	14.0
15	29	P160H2 / 50A TM	100-C43	193-1EF FD	11 – 55	600	16.6
18.5	35	P160H2 / 63A TM	100-C43	193-1EF FD	11 – 55	756	17.3
22	41	P160H2 / 63A TM	100-C55	193-1EF FD	11 – 55	756	14.8
30	55	P160H2 / 100A TM	100-C72	193-1EF GE	20 – 100	1200	17.5
37	66	P160H2 / 100A TM	100-C85	193-1EF GE	20 – 100	1200	14.5
45	80	P160H2 / 160A TM	100-E116	193-1EF GE *	20 – 100	1600	16.0
55	97	P250H / 160A TM	100-E146	193-1EF GE *	20 – 100	2080	17.2
75	132	P250H / 250A TM	100-E190	193-E200-200A #	20 – 200	2500	15.2
90	160	P400H / 250A BE	100-E265	193-E200-200A #	20 – 200	3000	15.0
110	195	P400H / 400A BE	100-E265	193-E200-200A #	20 – 200	4800	20.9
132	230	P400H / 400A BE	100-E305	CTKIT400A	80 – 400	4800	17.7
150	260	P630H / 630A BE	100-E400	CTKIT400A	80 – 400	6930	22.7
160	280	P630H / 630A BE	100-E400	CTKIT400A	80 – 400	6930	21.0
185	325	P630H / 630A BE	100-E400	CTKIT400A	80 – 400	6930	18.1
200	350	P630H / 630A BE	100-E460	CTKIT400A	80 – 400	6930	16.8
220	385	B800H / 630A BE	100-E580	CTKIT400A	80 – 400	7560	16.7
250	430	B800H / 630A BE	100-E580	CTKIT600A	120 – 600	7560	14.9
315	540	B800H / 800A BE	100-E750	CTKIT600A	120 – 600	9600	15.1
355	610	B1000H / 1000A BE	100-E750	CTKIT800A	160 – 800	10000	13.9
400	690	B1250HL / 1250A BE	100-E860	CTKIT1000A	200 – 1000	15000	18.5
450	770	B1250HL / 1250A BE	100-E1060	CTKIT1000A	200 – 1000	15000	16.6
500	850	B1250HL / 1250A BE	100-E1060	CTKIT1000A	200 – 1000	15000	15.0

NOTES:

A) Recommended circuit breaker size based on the following starting conditions:

Starting currents approx. 7.5…8 x motor FLC. Start time approx.5 sec.

Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms, that will vary by motor make.

* Overloads separately mounted from contactor, or use Pass thru version.

^ Motor Starters 132kW & above, Kit utilises separate 5P10-5A Current Transformers with 193-1EF*Z overload

B) Other

1) 193-1EF overload add-on module available for: Ground Fault, Jam Protection & Remote reset,

2) # - Specify E200 mounting, T for separate DIN mount, or P for Pass Thru

C) Note

Set circuit breaker Ir to 1 (=In), and Overload is set to motor FLC

RCH74.3 Type 2, 70 kA – Circuit breakers, with electronic overload

Rev: 4

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Tembreak **Pro**
Contactor	Allen-Bradley **100(S)-C** / **100(S)-E**
Overload relay	Allen-Bradley 193-E3 Electronic **E300 w-**Ethernet/IP
Rated operational voltage	400 / 415V AC
Motor types	Premium Efficiency class: IE3
Rated conditional AC current (Iq) :	70 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE:

MOTOR		CIRCUIT BREAKER	CONTACTOR	OVERLOAD RELAY	C/B INSTANT TRIP AMPS & MOTOR FLC		
MOTOR kW	MOTOR AMP RATINGS @ 400V	MOULED CASE CIRCUIT BREAKER	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	Earth Leakage	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	P160H2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	320
0.25	0.85	P160H2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	225
0.37	1.1	P160H2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	174
0.55	1.5	P160H2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	128
0.75	1.9	P160H2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	101
1.1	2.7	P160H2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	71.1
1.5	3.6	P160H2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	53.3
2.2	4.9	P160H2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	39.2
3	6.5	P160H2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	29.5
4	8.5	P160H2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	22.6
5.5	11.5	P160H2 / 20A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	16.7
7.5	15.5	P160H2 / 32A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	384	19.8
11	22	P160H2 / 32A TM	100-C30	193 E3-63-24D-IG-30A - # -ETR	Int.	384	14.0
15	29	P160H2 / 50A TM	100-C43	193 E3-63-24D-IG-60A - # -ETR	Int.	600	16.6
18.5	35	P160H2 / 63A TM	100-C43	193 E3-63-24D-IG-60A - # -ETR	Int.	756	17.3
22	41	P160H2 / 63A TM	100-C55	193 E3-63-24D-IG-60A - # -ETR	Int.	756	14.8
30	55	P160H2 / 100A TM	100-C72	193 E3-63-24D-IG-100A - # -ETR	Int.	1200	17.5
37	66	P160H2 / 100A TM	100-C85	193 E3-63-24D-IG-100A - # -ETR	Int.	1200	14.5
45	80	P160H2 / 160A TM	100-E116	193 E3-63-24D-IG-200A- # -ETR	Int.	1600	16.0
55	97	P250H / 160A TM	100-E146	193 E3-63-24D-IG-200A- # -ETR	Int.	2080	17.2
75	132	P250H / 250A TM	100-E190	193 E3-63-24D-IG-200A- # -ETR	Ext.	2500	15.2
90	160	P400H / 250A BE	100-E265	193 E3-63-24D-IG-200A- # -ETR	Ext.	3000	15.0
110	195	P400H / 400A BE	100-E265	193 E3-63-24D-IG-200A - # -ETR	Ext.	4800	20.9
132	230	P400H / 400A BE	100-E305	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	4800	17.7
150	260	P630H / 630A BE	100-E400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	22.7
160	280	P630H / 630A BE	100-E400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	21.0
185	325	P630H / 630A BE	100-E400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	18.1
200	350	P630H / 630A BE	100-E460	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	16.8
220	385	B800H / 630A BE	100-E580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	7560	16.7
250	430	B800H / 630A BE	100-E580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	7560	14.9
315	540	B800H / 800A BE	100-E750	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	9600	15.1
355	610	B1000H / 1000A BE	100-E750	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	10000	13.9
400	690	B1250HL / 1250A BE	100-E860	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	18.5
450	770	B1250HL / 1250A BE	100-E1060	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	16.6
500	850	B1250HL / 1250A BE	100-E1060	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	15.0

NOTES:

A) Recommended circuit breaker size based on the following starting conditions:
Starting currents approx. 7.5… 8 x motor FLC. Start time approx.5 sec.
Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms, that will vary by motor make.
^ Motor Starters 132kW & above, require external 5P10-5A Current Transformers

B) E/L
-Int- Internal Ground Fault toroid in Sensing module – 500mA to 5 Amp
* to use External toroid, and/or Thermistor protection, -GP42- Control module is required
-Ext- External Ground Fault toroid via 193-CBCT – 20mA to 5 Amp

C)Other
4) 24D denotes 24V DC control voltage
-# - Specify Contactor mount, or E3T / T for separate DIN mount, or P for Pass Thru
If Power & Voltage monitoring is required, change Sensing module to VIG versions

Rev: 2

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Tembreak **Pro**
Contactor	Sprecher+Schuh **CA7** / **CA9**
Overload relay	Sprecher+Schuh **CEP7** Electronic
Rated operational voltage	400 / 415V AC
Motor types	Premium Efficiency class: IE3
Rated conditional AC current (Iq) :	70 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE:

MOTOR		CIRCUIT BREAKER	CONTACTOR	OVERLOAD RELAY		C/B INSTANT TRIP AMPS & MOTOR FLC	
MOTOR kW	MOTOR AMP RATINGS @ 400V	MOULED CASE CIRCUIT BREAKER	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	AMPERE SETTING RANGE	C/B INSTANT TRIP AMPS (± 20% *)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	XM30PB / 0.7A	CA7-9	CEP7-1EF BB	0.2 – 1.0	11 A	14.6
0.25	0.85	XM30PB / 1.4A	CA7-9	CEP7-1EF BB	0.2 – 1.0	21 A	19.8
0.37	1.1	XM30PB / 1.4A	CA7-9	CEP7-1EF CB	1.0 – 5.0	21 A	15.3
0.55	1.5	XM30PB / 2.0 A	CA7-9	CEP7-1EF CB	1.0 – 5.0	30 A	16.0
0.75	1.9	XM30PB / 2.6A	CA7-9	CEP7-1EF CB	1.0 – 5.0	40 A	16.8
1.1	2.7	XM30PB / 4A	CA7-16	CEP7-1EF CB	1.0 – 5.0	60 A	17.8
1.5	3.6	XM30PB / 5A	CA7-16	CEP7-1EF CB	1.0 – 5.0	75 A	16.7
2.2	4.9	XM30PB / 8A	CA7-16	CEP7-1EF DB	3.2 – 16	120 A	19.6
3	6.5	XM30PB / 10A	CA7-23	CEP7-1EF ED	5.4 – 27	150 A	18.5
4	8.5	XM30PB / 12A	CA7-23	CEP7-1EF ED	5.4 – 27	180 A	16.9
5.5	11.5	P160H2 / 20A TM	CA7-30	CEP7-1EF ED	5.4 – 27	240	16.7
7.5	15.5	P160H2 / 32A TM	CA7-30	CEP7-1EF ED	5.4 – 27	384	19.8
11	22	P160H2 / 32A TM	CA7-30	CEP7-1EF ED	5.4 – 27	384	14.0
15	29	P160H2 / 50A TM	CA7-43	CEP7-1EF FD	11 – 55	600	16.6
18.5	35	P160H2 / 63A TM	CA7-43	CEP7-1EF FD	11 – 55	756	17.3
22	41	P160H2 / 63A TM	CA7-55	CEP7-1EF FD	11 – 55	756	14.8
30	55	P160H2 / 100A TM	CA7-72	CEP7-1EF GE	20 – 100	1200	17.5
37	66	P160H2 / 100A TM	CA7-85	CEP7-1EF GE	20 – 100	1200	14.5
45	80	P160H2 / 160A TM	CA9-116	CEP7-1EF GE *	20 – 100	1600	16.0
55	97	P250H / 160A TM	CA9-146	CEP7-1EF GE *	20 – 100	2080	17.2
75	132	P250H / 250A TM	CA9-190	CTKIT400A	80 – 400	2500	15.2
90	160	P400H / 250A BE	CA9-265	CTKIT400A	80 – 400	3000	15.0
110	195	P400H / 400A BE	CA9-265	CTKIT400A	80 – 400	4800	20.9
132	230	P400H / 400A BE	CA9-305	CTKIT400A	80 – 400	4800	17.7
150	260	P630H / 630A BE	CA9-400	CTKIT400A	80 – 400	6930	22.7
160	280	P630H / 630A BE	CA9-400	CTKIT400A	80 – 400	6930	21.0
185	325	P630H / 630A BE	CA9-400	CTKIT400A	80 – 400	6930	18.1
200	350	P630H / 630A BE	CA9-460	CTKIT400A	80 – 400	6930	16.8
220	385	B800H / 630A BE	CA9-580	CTKIT400A	80 – 400	7560	16.7
250	430	B800H / 630A BE	CA9-580	CTKIT600A	120 – 600	7560	14.9
315	540	B800H / 800A BE	CA9-750	CTKIT600A	120 – 600	9600	15.1
355	610	B1000H / 1000A BE	CA9-750	CTKIT800A	160 – 800	10000	13.9
400	690	B1250HL / 1250A BE	CA9-860	CTKIT1000A	200 – 1000	15000	18.5
450	770	B1250HL / 1250A BE	CA9-1060	CTKIT1000A	200 – 1000	15000	16.6
500	850	B1250HL / 1250A BE	CA9-1060	CTKIT1000A	200 – 1000	15000	15.0

NOTES:

A) Recommended circuit breaker size based on the following starting conditions:

Starting currents approx. 7.5…8 x motor FLC. Start time approx.5 sec.

Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms, that will vary by motor make.

* Overloads separately mounted from contactor, or use Pass thru version.

^ Motor Starters 75kW & above, Kit utilises separate 5P10-5A Current Transformers with 193-1EF*Z overload

B) Other

1) CEP7-1EF overload add-on module available for: Ground Fault, Jam Protection & Remote reset,
Ground Fault requires toroid ;- **-CBCT#

C) Note

Set circuit breaker Ir to 1 (=In), and Overload is set to motor FLC

Rev: 2

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Tembreak **Pro** and **XMPB**
Contactor	Sprecher+Schuh **CA7** and **CA9**
Overload relay	Allen-Bradley 193-E3 Electronic **E300 w-**Ethernet/IP
Rated operational voltage	400 / 415V AC
Motor types	Premium Efficiency class: IE3
Rated conditional AC current (Iq) :	70 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE:

MOTOR		CIRCUIT BREAKER	CONTACTOR	OVERLOAD RELAY		C/B INSTANT TRIP AMPS & MOTOR FLC	
MOTOR kW	MOTOR AMP RATINGS @ 400V	MOULED CASE CIRCUIT BREAKER	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	Earth Leakage	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	XM30PB / 0.7A	CA7-9	193 E3-63-24D-IG-30A - # -ETR	Int.	11 A	14.6
0.25	0.85	XM30PB / 1.4A	CA7-9	193 E3-63-24D-IG-30A - # -ETR	Int.	21 A	19.8
0.37	1.1	XM30PB / 1.4A	CA7-9	193 E3-63-24D-IG-30A - # -ETR	Int.	21 A	15.3
0.55	1.5	XM30PB / 2.0 A	CA7-9	193 E3-63-24D-IG-30A - # -ETR	Int.	30 A	16.0
0.75	1.9	XM30PB / 2.6A	CA7-9	193 E3-63-24D-IG-30A - # -ETR	Int.	40 A	16.8
1.1	2.7	XM30PB / 4A	CA7-16	193 E3-63-24D-IG-30A - # -ETR	Int.	60 A	17.8
1.5	3.6	XM30PB / 5A	CA7-16	193 E3-63-24D-IG-30A - # -ETR	Int.	75 A	16.7
2.2	4.9	XM30PB / 8A	CA7-16	193 E3-63-24D-IG-30A - # -ETR	Int.	120 A	19.6
3	6.5	XM30PB / 10A	CA7-23	193 E3-63-24D-IG-30A - # -ETR	Int.	150 A	18.5
4	8.5	XM30PB / 12A	CA7-23	193 E3-63-24D-IG-30A - # -ETR	Int.	180 A	16.9
5.5	11.5	P160H2 / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	16.7
7.5	15.5	P160H2 / 32A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	384	19.8
11	22	P160H2 / 32A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	384	14.0
15	29	P160H2 / 50A TM	CA7-43	193 E3-63-24D-IG-60A - # -ETR	Int.	600	16.6
18.5	35	P160H2 / 63A TM	CA7-43	193 E3-63-24D-IG-60A - # -ETR	Int.	756	17.3
22	41	P160H2 / 63A TM	CA7-55	193 E3-63-24D-IG-60A - # -ETR	Int.	756	14.8
30	55	P160H2 / 100A TM	CA7-72	193 E3-63-24D-IG-100A - # -ETR	Int.	1200	17.5
37	66	P160H2 / 100A TM	CA7-85	193 E3-63-24D-IG-100A - # -ETR	Int.	1200	14.5
45	80	P160H2 / 160A TM	CA9-116	193 E3-63-24D-IG-200A- # -ETR	Int.	1600	16.0
55	97	P250H / 160A TM	CA9-146	193 E3-63-24D-IG-200A- # -ETR	Int.	2080	17.2
75	132	P250H / 250A TM	CA9-190	193 E3-63-24D-IG-200A- # -ETR	Int.	2500	15.2
90	160	P400H / 250A BE	CA9-265	193 E3-63-24D-IG-200A- # -ETR	Int.	3000	15.0
110	195	P400H / 400A BE	CA9-265	193 E3-63-24D-IG-200A - # -ETR	Int.	4800	20.9
132	230	P400H / 400A BE	CA9-305	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	4800	17.7
150	260	P630H / 630A BE	CA9-400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	22.7
160	280	P630H / 630A BE	CA9-400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	21.0
185	325	P630H / 630A BE	CA9-400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	18.1
200	350	P630H / 630A BE	CA9-460	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	16.8
220	385	B800H / 630A BE	CA9-580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	7560	16.7
250	430	B800H / 630A BE	CA9-580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	7560	14.9
315	540	B800H / 800A BE	CA9-750	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	9600	15.1
355	610	B1000H / 1000A BE	CA9-750	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	10000	13.9
400	690	B1250HL / 1250A BE	CA9-860	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	18.5
450	770	B1250HL / 1250A BE	CA9-1060	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	16.6
500	850	B1250HL / 1250A BE	CA9-1060	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	15.0

NOTES:

A) Recommended circuit breaker size based on the following starting conditions:
Starting currents approx. 7.5… 8 x motor FLC. Start time approx.5 sec.
Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms, that will vary by motor make.
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B) E/L
-Int- Internal Ground Fault toroid in Sensing module – 500mA to 5 Amp
* to use External toroid, and/or Thermistor protection, -GP42- Control module is required
-Ext- External Ground Fault toroid via 193-CBCT – 20mA to 5 Amp

C)Other
5) 24D denotes 24V DC control voltage
- # - Specify Contactor mount, or E3T / T for separate DIN mount, or P for Pass Thru
If Power & Voltage monitoring is required, change Sensing module to VIG versions

Rev: 2

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Tembreak **XM30 & TBPro**
Contactor	Sprecher + Schuh **CA7** / **CA9**
Overload relay	Sprecher + Schuh **CEP7-1** Electronic
Rated operational voltage	400 / 415V AC
Motor types	Premium Efficiency class: IE3
Rated conditional AC current (Iq) :	85 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE:

MOTOR		CIRCUIT BREAKER	CONTACTOR	OVERLOAD RELAY		C/B INSTANT TRIP AMPS & MOTOR FLC	
MOTOR kW	MOTOR AMP RATINGS @ 400V	MOULED CASE CIRCUIT BREAKER	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	AMPERE SETTING RANGE	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	XM30PB / 0.7A	CA7-9	CEP7-1EF BB	0.2 – 1.0	11	14.7
0.25	0.85	XM30PB / 1.4A	CA7-9	CEP7-1EF BB	0.2 – 1.0	21	19.8
0.37	1.1	XM30PB / 1.4A	CA7-9	CEP7-1EF CB	1.0 – 5.0	21	15.3
0.55	1.5	XM30PB / 2.0 A	CA7-9	CEP7-1EF CB	1.0 – 5.0	30	16.0
0.75	1.9	XM30PB / 2.6A	CA7-9	CEP7-1EF CB	1.0 – 5.0	40	16.8
1.1	2.7	XM30PB / 4A	CA7-16	CEP7-1EF CB	1.0 – 5.0	60	17.8
1.5	3.6	XM30PB / 5A	CA7-16	CEP7-1EF CB	1.0 – 5.0	75	16.7
2.2	4.9	XM30PB / 8A	CA7-16	CEP7-1EF DB	3.2 – 16	120	19.6
3	6.5	XM30PB / 10A	CA7-23	CEP7-1EF ED	5.4 – 27	150	18.5
4	8.5	XM30PB / 12A	CA7-23	CEP7-1EF ED	5.4 – 27	180	16.9
5.5	11.5	B160P / 20A TM	CA7-30	CEP7-1EF ED	5.4 – 27	240	16.7
7.5	15.5	B160P / 32A TM	CA7-30	CEP7-1EF ED	5.4 – 27	384	19.8
11	22	B160P / 32A TM	CA7-30	CEP7-1EF ED	5.4 – 27	384	14.0
15	29	B160P / 50A TM	CA7-43	CEP7-1EF FD	11 – 55	600	16.6
18.5	35	B160P / 63A TM	CA7-43	CEP7-1EF FD	11 – 55	756	17.3
22	41	B160P / 63A TM	CA7-55	CEP7-1EF FD	11 – 55	756	14.8
30	55	B160P / 100A TM	CA7-72	CEP7-1EF GE	20 – 100	1200	17.5
37	66	B160P / 100A TM	CA7-85	CEP7-1EF GE	20 – 100	1200	14.5
45	80	B160P / 160A TM	CA9-265	CEP7-1EF GE *	20 – 100	2080	20.8
55	97	B160P / 160A TM	CA9-265	CEP7-1EF GE *	20 – 100	2080	17.2
75	132	B250P / 250A TM	CA9-265	CTKIT400A	40 – 200	2500	15.2
90	160	P400S / 250A BE	CA9-400	CTKIT400A	40 – 200	3000	15.9
110	195	P400S / 400A BE	CA9-400	CTKIT400A	80 – 400	4800	20.9
132	230	P400S / 400A BE	CA9-400	CTKIT400A	80 – 400	4800	17.7
150	260	P400S / 400A BE	CA9-400	CTKIT400A	80 – 400	4800	15.7
160	280	P400S / 400A BE	CA9-400	CTKIT400A	80 – 400	4800	14.6
185	325	P630S / 630A BE	CA9-580	CTKIT400A	80 – 400	6930	18.1
200	350	P630S / 630A BE	CA9-580	CTKIT400A	80 – 400	6930	16.8
220	385	P630S / 630A BE	CA9-580	CTKIT400A	80 – 400	6930	15.3
250	430	B800P / 800A BE	CA9-750	CTKIT600A	120 – 600	9600	19.0
315	540	B800P / 800A BE	CA9-750	CTKIT600A	120 – 600	9600	15.1
355	610	B1250HL / 1250A BE	CA9-860	CTKIT800A	160 – 800	15000	20.9
400	690	B1250HL / 1250A BE	CA9-860	CTKIT1000A	200 – 1000	15000	18.5
450	770	B1250HL / 1250A BE	CA9-1060	CTKIT1000A	200 – 1000	15000	16.6
500	850	B1250HL / 1250A BE	CA9-1060	CTKIT1000A	200 – 1000	15000	15.0

NOTES:

A) Recommended circuit breaker size based on the following starting conditions:

Starting currents approx. 7.5…8 x motor FLC. Start time approx.5 sec.

Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10mS, that will vary by motor make.

* Overloads separately mounted from contactor, or use Pass thru version.

^ Motor Starters 75kW & above, Kit utilises separate 5P10-5A Current Transformers with **-1EF*Z overload

B) Other

1) CEP7-1EF overload add-on module available for: Ground Fault, Jam Protection & Remote reset,
Ground Fault requires toroid **-CBCT#

C) Note

1) Set circuit breaker set to Ir, and Overload is set to motor FLC

Rev: 2

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Tembreak **XM30 & TBPro**
Contactor	Sprecher+Schuh **CA7** and **CA9**
Overload relay	Allen-Bradley 193-E3 Electronic **E300 w-**Ethernet/IP
Rated operational voltage	400 / 415V AC
Motor types	Premium Efficiency class: IE3
Rated conditional AC current (Iq) :	85 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE:

MOTOR		CIRCUIT BREAKER	CONTACTOR	OVERLOAD RELAY		C/B INSTANT TRIP AMPS & MOTOR FLC	
MOTOR kW	MOTOR AMP RATINGS @ 400V	MOULED CASE CIRCUIT BREAKER	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	Earth Leakage	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	XM30PB / 0.7A	CA7-9	193 E3-63-24D-IG-30A - # -ETR	Int.	11	14.7
0.25	0.85	XM30PB / 1.4A	CA7-9	193 E3-63-24D-IG-30A - # -ETR	Int.	21	19.8
0.37	1.1	XM30PB / 1.4A	CA7-9	193 E3-63-24D-IG-30A - # -ETR	Int.	21	15.3
0.55	1.5	XM30PB / 2.0 A	CA7-9	193 E3-63-24D-IG-30A - # -ETR	Int.	30	16.0
0.75	1.9	XM30PB / 2.6A	CA7-9	193 E3-63-24D-IG-30A - # -ETR	Int.	40	16.8
1.1	2.7	XM30PB / 4A	CA7-16	193 E3-63-24D-IG-30A - # -ETR	Int.	60	17.8
1.5	3.6	XM30PB / 5A	CA7-16	193 E3-63-24D-IG-30A - # -ETR	Int.	75	16.7
2.2	4.9	XM30PB / 8A	CA7-16	193 E3-63-24D-IG-30A - # -ETR	Int.	120	19.6
3	6.5	XM30PB / 10A	CA7-23	193 E3-63-24D-IG-30A - # -ETR	Int.	150	18.5
4	8.5	XM30PB / 12A	CA7-23	193 E3-63-24D-IG-30A - # -ETR	Int.	180	16.9
5.5	11.5	B160P / 20A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	240	16.7
7.5	15.5	B160P / 32A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	384	19.8
11	22	B160P / 32A TM	CA7-30	193 E3-63-24D-IG-30A - # -ETR	Int.	384	14.0
15	29	B160P / 50A TM	CA7-43	193 E3-63-24D-IG-60A - # -ETR	Int.	600	16.6
18.5	35	B160P / 63A TM	CA7-43	193 E3-63-24D-IG-60A - # -ETR	Int.	756	17.3
22	41	B160P / 63A TM	CA7-55	193 E3-63-24D-IG-60A - # -ETR	Int.	756	14.8
30	55	B160P / 100A TM	CA7-72	193 E3-63-24D-IG-100A - # -ETR	Int.	1200	17.5
37	66	B160P / 100A TM	CA7-85	193 E3-63-24D-IG-100A - # -ETR	Int.	1200	14.5
45	80	B160P / 160A TM	CA9-265	193 E3-63-24D-IG-200A -#-ETR	Int.	2080	20.8
55	97	B160P / 160A TM	CA9-265	193 E3-63-24D-IG-200A -#-ETR	Int.	2080	17.2
75	132	B250P / 250A TM	CA9-265	193 E3-63-24D-IG-200A -#-ETR	Int.	2500	15.2
90	160	P400S / 250A BE	CA9-400	193 E3-63-24D-IG-200A -#-ETR	Int.	3000	15.9
110	195	P400S / 400A BE	CA9-400	193 E3-63-24D-IG-200A -#-ETR	Int.	4800	20.9
132	230	P400S / 400A BE	CA9-400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	4800	17.7
150	260	P400S / 400A BE	CA9-400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	4800	15.7
160	280	P400S / 400A BE	CA9-400	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	4800	14.6
185	325	P630S / 630A BE	CA9-580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	18.1
200	350	P630S / 630A BE	CA9-580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	16.8
220	385	P630S / 630A BE	CA9-580	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	6930	15.3
250	430	B800P / 800A BE	CA9-750	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	9600	19.0
315	540	B800P / 800A BE	CA9-750	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	9600	15.1
355	610	B1250HL / 1250A BE	CA9-860	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	20.9
400	690	B1250HL / 1250A BE	CA9-860	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	18.5
450	770	B1250HL / 1250A BE	CA9-1060	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	16.6
500	850	B1250HL / 1250A BE	CA9-1060	193 E3-GP42-24D-I-30A -E3T -ETR	Ext.	15000	15.0

NOTES:

A) Recommended circuit breaker size based on the following starting conditions:
Starting currents approx. 7.5… 8 x motor FLC. Start time approx.5 sec.
Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10mS, that will vary by motor make.
^ Motor Starters 132kW & above, require external 5P10-5A Current Transformers

B) E/L
-Int- Internal Ground Fault torroid in Sensing module – 500mA to 5 Amp
* to use External toroid, and/or Thermistor protection, -GP42- Control module is required
-Ext- External Ground Fault torroid via 193-CBCT# – 20mA to 5 Amp

C)Other
1) 24D denotes 24V DC control voltage
- # - Specify Contactor mount, or E3T / T for separate DIN mount, or P for Pass Thru
If Power & Voltage momitoring is required, change Sensing module to VIG versions

Rev: 2

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Earth Leakage
Contactor	Sprecher+Schuh **CA7** and **CA9**
Overload relay	Sprecher+Schuh **CEP7-1**
Rated operational voltage	400 / 415V AC
Motor types	High efficiency, class: IE2, IE3
Rated conditional AC current (Iq) :	50 kA (rms 14ymmetrical)
Coordination type (AS / NZS 60947.4.1 – 2015)	Type 2 coordination

COMPONENT SELECTION TABLE: Starter components, Earth leakage circuit breakers or separate earth leakage relays

MOTOR		CIRCUIT BREAKER		CONTACTOR	OVERLOAD RELAY		C/B INSTANT TRIP AMPS & MOT FLC	
MOTOR kW	FLC RATINGS @ 400V	CIRCUIT BREAKER	EARTH LEAKAGE Setting Range	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	AMPERE SETTING RANGE	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF BB	0.2 – 1.0	240 A	320
0.25	0.85	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF BB	0.2 – 1.0	240 A	226
0.37	1.1	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF CB	1.0 – 5.0	240 A	174
0.55	1.5	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF CB	1.0 – 5.0	240 A	128
0.75	1.9	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF CB	1.0 – 5.0	240 A	101
1.1	2.7	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF CB	1.0 – 5.0	240 A	71.1
1.5	3.6	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF CB	1.0 – 5.0	240 A	53.3
2.2	4.9	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF DB	3.2 – 16	240 A	39.2
3	6.5	ZS125M / 20A	30mA – 3A	CA7-30	CEP7-1EF ED	5.4 – 27	240 A	29.5
4	8.5	ZS125M / 20A	30mA – 3A	CA7-30	CEP7-1EF ED	5.4 – 27	240 A	22.6
S5.5	11.5	ZS125M / 20A	30mA – 3A	CA7-30	CEP7-1EF ED	5.4 – 27	240 A	16.7
7.5	15.5	ZS125M / 32A	30mA – 3A	CA7-30	CEP7-1EF ED	5.4 – 27	384 A	19.8
11	22	ZS125M / 32A	30mA – 3A	CA7-30	CEP7-1EF ED	5.4 – 27	384 A	14.0
15	29	ZS125M / 50A	30mA – 3A	CA7-43	CEP7-1EF FD	11 – 55	600 A	16.6
18.5	35	ZS125M / 63A	30mA – 3A	CA7-43	CEP7-1EF FD	11 – 55	756 A	17.3
22	41	ZS125M / 63A	30mA – 3A	CA7-55	CEP7-1EF FD	11 – 55	756 A	14.8
30	55	ZS125M / 100A	30mA – 3A	CA7-72	CEP7-1EF GE	20 – 100	1200 A	17.5
37	66	ZS125M / 100A	30mA – 3A	CA7-85	CEP7-1EF GE	20 – 100	1200 A	14.5
45	80	ZS250M / 160A	30mA – 3A	CA9-190	CEP7-1EF GE *	20 – 100	2080 A	20.8
55	97	ZS250M / 160A	30mA – 3A	CA9-190	CEP7-1EF GE *	20 – 100	2080 A	17.2
75	132	ZS250M / 250A	30mA – 3A	CA9-190	CTKIT400A	80 – 400	2500 A	15.2

Notes:

A) Recommended circuit breaker size based on the following starting conditions:

Starting currents approx. 7.5 - 8 x motor FLC. Start time approx.5 sec.

Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms that will vary by motor make.

* Overloads separately mounted from contactor, or use Pass thru version.

^ Motor Starters 75kW & above, Kit utilises separate 5P10-5A Current Transformers with 193-1EF*Z overload

B) Other

1) CEP7-1EF overload add-on module available for: Ground Fault, Jam Protection & Remote reset, Ground Fault requires toroid ;- **-CBCT#

C) Note

Set circuit breaker Ir to 1 (=In), and Overload is set to motor FLC

Rev: 3

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki **ZS** Earth Leakage
Contactor	Sprecher+Schuh **CA7** and **CA9**
Overload relay	Allen-Bradley 193-E3 Electronic **E300 w-** Ethernet/IP
Rated operational voltage	400 / 415V AC
Motor types	High efficiency, class: IE2, IE3
Rated conditional AC current (Iq) :	50 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE: Starter components, Earth leakage circuit breakers

MOTOR		CIRCUIT BREAKER		CONTACTOR	OVERLOAD RELAY	C/B INSTANT TRIP AMPS & MOT FLC		
MOTOR kW	FLC RATINGS @ 400V	CIRCUIT BREAKER	EARTH LEAKAGE Setting Range	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	AMPERE SETTING RANGE	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	320
0.25	0.85	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	226
0.37	1.1	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	174
0.55	1.5	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	128
0.75	1.9	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	101
1.1	2.7	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	71.1
1.5	3.6	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	53.3
2.2	4.9	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	39.2
3	6.5	ZS125M / 20A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	29.5
4	8.5	ZS125M / 20A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	22.6
5.5	11.5	ZS125M / 20A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	16.7
7.5	15.5	ZS125M / 32A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	384 A	19.8
11	22	ZS125M / 32A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	384 A	14.0
15	29	ZS125M / 50A	30mA – 3A	CA7-43	193 E3-63-24D-I-60A - # -ETR	6 – 60	600 A	16.6
18.5	35	ZS125M / 63A	30mA – 3A	CA7-43	193 E3-63-24D-I-60A - # -ETR	6 – 60	756 A	17.3
22	41	ZS125M / 63A	30mA – 3A	CA7-55	193 E3-63-24D-I-60A - # -ETR	6 – 60	756 A	14.8
30	55	ZS125M / 100A	30mA – 3A	CA7-72	193 E3-63-24D-I-100A- # -ETR	10 – 100	1200 A	17.5
37	66	ZS125M / 100A	30mA – 3A	CA7-85	193 E3-63-24D-I-100A- # -ETR	10 – 100	1200 A	14.5
45	80	ZS250M / 160A	30mA – 3A	CA9-190	193 E3-63-24D-I-200A- # -ETR	20 – 200	2080 A	20.8
55	97	ZS250M / 160A	30mA – 3A	CA9-190	193 E3-63-24D-I-200A- # -ETR	20 – 200	2080 A	17.2
75	132	ZS250M / 250A	30mA – 3A	CA9-190	193 E3-63-24D-I-200A- # -ETR	20 – 200	2500 A	15.2

Notes:

A) Recommended circuit breaker size based on the following starting conditions:
Starting currents approx. 7.5…8 x motor FLC. Start time approx.5 sec.
Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms that will vary by motor make.
For 5.5 to 11kW starters 60A Sensing module can be used with CA7-30 contactors

B) E/L
* to use External GF toroid, and Thermistor protection, -GP42- Control module is required

C)Other
1) 24D denotes 24V DC control voltage
- **#** - Specify Contactor mount, or E3T / T for separate DIN mount, or P for Pass Thru
If Power & Voltage monitoring is required, change Sensing module to VIG versions

Rev: 5

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki **ZS** Earth Leakage
Contactor	Sprecher+Schuh **CA7** and **CA9**
Overload relay	Allen-Bradley 193-E3 Electronic **E300 w-** Ethernet/IP
Rated operational voltage	440V AC
Motor types	High efficiency, class: IE2, IE3
Rated conditional AC current (Iq) :	50 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE: Starter components, Earth leakage circuit breakers

MOTOR		CIRCUIT BREAKER		CONTACTOR	OVERLOAD RELAY	C/B INSTANT TRIP AMPS & MOT FLC		
MOTOR kW	FLC RATINGS @ 440V	CIRCUIT BREAKER	EARTH LEAKAGE Setting Range	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	AMPERE SETTING RANGE	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.55	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	349
0.25	0.78	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	246
0.37	1.0	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	192
0.55	1.4	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	137
0.75	1.7	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	113
1.1	2.5	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	76
1.5	3.3	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	58
2.2	4.5	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	42
3	5.9	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	32
4	7.8	ZS125M / 20A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	24.9
5.5	10.5	ZS125M / 20A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	18.3
7.5	14.1	ZS125M / 32A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	384 A	21.8
11	20	ZS125M / 32A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	384 A	15.4
15	26	ZS125M / 50A	30mA – 3A	CA7-43	193 E3-63-24D-I-60A - # -ETR	6 – 60	600 A	18.5
18.5	32	ZS125M / 63A	30mA – 3A	CA7-43	193 E3-63-24D-I-60A - # -ETR	6 – 60	756 A	18.9
22	37	ZS125M / 63A	30mA – 3A	CA7-55	193 E3-63-24D-I-60A - # -ETR	6 – 60	756 A	16.3
30	50	ZS125M / 100A	30mA – 3A	CA7-72	193 E3-63-24D-I-100A- # -ETR	10 – 100	1200 A	19.2
37	60	ZS125M / 100A	30mA – 3A	CA7-85	193 E3-63-24D-I-100A- # -ETR	10 – 100	1200 A	16.0
45	73	ZS250M / 160A	30mA – 3A	CA9-190	193 E3-63-24D-I-200A- # -ETR	20 – 200	2080 A	22.8
55	88	ZS250M / 160A	30mA – 3A	CA9-190	193 E3-63-24D-I-200A- # -ETR	20 – 200	2080 A	18.9
75	120	ZS250M / 250A	30mA – 3A	CA9-190	193 E3-63-24D-I-200A- # -ETR	20 – 200	2500 A	16.7
90	145	ZS250M / 250A	30mA – 3A	CA9-190	193 E3-63-24D-I-200A- # -ETR	20 – 200	2500 A	13.8

Notes:

A) Recommended circuit breaker size based on the following starting conditions:
Starting currents approx. 7.5…8 x motor FLC. Start time approx.5 sec.
Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10mS that will vary by motor make.
For 5.5 to 11kW starters 60A Sensing module can be used with CA7-30 contactors

B) E/L
* to use External GF toroid, and/or Thermistor protection, -GP42- Control module is required
External Ground Fault torroid via 193-CBCT – 20mA to 5 Amp

C)Other
1) 24D denotes 24V DC control voltage
- **#** - Specify Contactor mount, or E3T / T for separate DIN mount, or P for Pass Thru
If Power & Voltage momitoring is required, change Sensing module to VIG versions

Rev: 3

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Earth Leakage
Contactor	Sprecher+Schuh **CA7** and **CA9**
Overload relay	Sprecher+Schuh **CEP7-1**
Rated operational voltage	400 / 415V AC
Motor types	High efficiency, class: IE2, IE3
Rated conditional AC current (Iq) :	65 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE: Starter components, Earth leakage circuit breakers or separate earth leakage relays

MOTOR		CIRCUIT BREAKER		CONTACTOR	OVERLOAD RELAY		C/B INSTANT TRIP AMPS & MOT FLC	
MOTOR kW	FLC RATINGS @ 400V	CIRCUIT BREAKER	EARTH LEAKAGE Setting Range	CONTACTOR TYPE	OVERLOAD RELAY (ELECTRONIC)	AMPERE SETTING RANGE	C/B INSTANT TRIP AMPS (± 20%)	MINIMUM TRIP AMP MULTIPLE OF MOTOR FLC
0.18	0.6	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF BB	0.2 – 1.0	240 A	320
0.25	0.85	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF BB	0.2 – 1.0	240 A	226
0.37	1.1	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF CB	1.0 – 5.0	240 A	174
0.55	1.5	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF CB	1.0 – 5.0	240 A	128
0.75	1.9	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF CB	1.0 – 5.0	240 A	101
1.1	2.7	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF CB	1.0 – 5.0	240 A	71.1
1.5	3.6	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF CB	1.0 – 5.0	240 A	53.3
2.2	4.9	ZS125M / 20A	30mA – 3A	CA7-23	CEP7-1EF DB	3.2 – 16	240 A	39.2
3	6.5	ZS125M / 20A	30mA – 3A	CA7-30	CEP7-1EF ED	5.4 – 27	240 A	29.5
4	8.5	ZS125M / 20A	30mA – 3A	CA7-30	CEP7-1EF ED	5.4 – 27	240 A	22.6
5.5	11.5	ZS125M / 20A	30mA – 3A	CA7-30	CEP7-1EF ED	5.4 – 27	240 A	16.7
7.5	15.5	ZS125M / 32A	30mA – 3A	CA7-30	CEP7-1EF ED	5.4 – 27	384 A	19.8
11	22	ZS125M / 32A	30mA – 3A	CA7-30	CEP7-1EF ED	5.4 – 27	384 A	14.0
15	29	ZS125M / 50A	30mA – 3A	CA7-43	CEP7-1EF FD	11 – 55	600 A	16.6
18.5	35	ZS125M / 63A	30mA – 3A	CA7-43	CEP7-1EF FD	11 – 55	756 A	17.3
22	41	ZS125M / 63A	30mA – 3A	CA7-55	CEP7-1EF FD	11 – 55	756 A	14.8
30	55	ZS125M / 100A	30mA – 3A	CA7-72	CEP7-1EF GE	20 – 100	1200 A	17.5
37	66	ZS125M / 100A	30mA – 3A	CA7-85	CEP7-1EF GE	20 – 100	1200 A	14.5
45	80	ZS250M / 160A	30mA – 3A	CA9-190	CEP7-1EF GE *	20 – 100	2080 A	20.8
55	97	ZS250M / 160A	30mA – 3A	CA9-190	CEP7-1EF GE *	20 – 100	2080 A	17.2
75	132	ZS250M / 250A	30mA – 3A	CA9-190	CTKIT400A	80 – 400	2500 A	15.2

Notes:

A) Recommended circuit breaker size based on the following starting conditions:

Starting currents approx. 7.5 - 8 x motor FLC. Start time approx.5 sec.

Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms that will vary by motor make.

* Overloads separately mounted from contactor, or use Pass thru version.

^ Motor Starters 75kW & above, Kit utilises separate 5P10-5A Current Transformers with 193-1EF*Z overload

B) Other

2) CEP7-1EF overload add-on module available for: Ground Fault, Jam Protection & Remote reset, Ground Fault requires toroid ;- **-CBCT#

C) Note

Set circuit breaker Ir to 1 (=In), and Overload is set to motor FLC

Rev: 3

NHP

FOR DIRECT ON LINE MOTOR STARTING

Circuit breaker	Terasaki Earth Leakage
Contactor	Sprecher+Schuh **CA7** and **CA9**
Overload relay	Allen-Bradley 193-E3 Electronic **E300 w-** Ethernet/IP
Rated operational voltage	400 / 415V AC
Motor types	High efficiency, class: IE2, IE3
Rated conditional AC current (Iq) :	65 kA (rms symetrical)
Coordination type (AS / NZS 60947.4.1 - 2015)	Type 2 coordination

COMPONENT SELECTION TABLE: Starter components, Earth leakage circuit breakers or separate earth leakage relays

MOTOR		CIRCUIT BREAKER		CONTACTOR	OVERLOAD RELAY	C/B INSTANT TRIP AMPS & MOT FLC		
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0.18	0.6	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	320
0.25	0.85	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	226
0.37	1.1	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	174
0.55	1.5	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	128
0.75	1.9	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	101
1.1	2.7	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	71.1
1.5	3.6	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	53.3
2.2	4.9	ZS125M / 20A	30mA – 3A	CA7-23	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	39.2
3	6.5	ZS125M / 20A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	29.5
4	8.5	ZS125M / 20A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	22.6
5.5	11.5	ZS125M / 20A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	240 A	16.7
7.5	15.5	ZS125M / 32A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	384 A	19.8
11	22	ZS125M / 32A	30mA – 3A	CA7-30	193 E3-63-24D-I-30A - # -ETR	0.5 – 30	384 A	14.0
15	29	ZS125M / 50A	30mA – 3A	CA7-43	193 E3-63-24D-I-60A - # -ETR	6 – 60	600 A	16.6
18.5	35	ZS125M / 63A	30mA – 3A	CA7-43	193 E3-63-24D-I-60A - # -ETR	6 – 60	756 A	17.3
22	41	ZS125M / 63A	30mA – 3A	CA7-55	193 E3-63-24D-I-60A - # -ETR	6 – 60	756 A	14.8
30	55	ZS125M / 100A	30mA – 3A	CA7-72	193 E3-63-24D-I-100A- # -ETR	10 – 100	1200 A	17.5
37	66	ZS125M / 100A	30mA – 3A	CA7-85	193 E3-63-24D-I-100A- # -ETR	10 – 100	1200 A	14.5
45	80	ZS250M / 160A	30mA – 3A	CA9-190	193 E3-63-24D-I-200A- # -ETR	20 – 200	2080 A	20.8
55	97	ZS250M / 160A	30mA – 3A	CA9-190	193 E3-63-24D-I-200A- # -ETR	20 – 200	2080 A	17.2
75	132	ZS250M / 250A	30mA – 3A	CA9-190	193 E3-63-24D-I-200A- # -ETR	20 – 200	2500 A	15.2

Notes:

A) Recommended circuit breaker size based on the following starting conditions:
Starting currents approx. 7.5 - 8 x motor FLC. Start time approx.5 sec.
Premium efficiency motors include a current spike ranging 15 - 22 x FLC for 3 - 10ms that will vary by motor make.
For 5.5 to 11kW starters 60A Sensing module can be used with CA7-30 contactors

B) E/L
* to use External GF toroid, and Thermistor protection, -GP42- Control module is required

C)Other
1) 24D denotes 24V DC control voltage
- **#** - Specify Contactor mount, or E3T / T for separate DIN mount, or P for Pass Thru
If Power & Voltage monitoring is required, change Sensing module to VIG versions

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