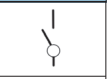
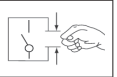
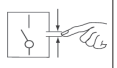
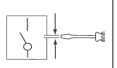
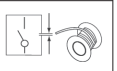
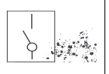
Enclosure Rating	NEMA National Electrical Manufacturers Association (NEMA Standard 250) and Electrical and Electronic Mfg. Association of Canada (EEMAC)	Underwriters Laboratories Inc. (UL50 and UL508)	Canadian Standards Association (Standard C22.2 No. 94)
Type 1	Enclosures are intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment or locations where unusual service conditions do not exist.	Indoor use primarily to provide protection against contact with the enclosed equipment and against a limited amount of falling dust.	General purpose enclosure. Protects against accidental contact with live parts.
Type 3	Enclosures are intended for outdoor use primarily to provide a degree of protection against windblown dust, rain, and sleet; undamaged by the formation of ice on the enclosure.	Outdoor use to provide a degree of protection against windblown dust and windblown rain; undamaged by the formation of ice on the enclosure.	Indoor or outdoor use; provides a degree of protection against rain, snow, and windblown dust; undamaged by the external formation of ice on the enclosure.
Type 3R*	Enclosures are intended for outdoor use primarily to provide a degree of protection against falling rain and sleet; undamaged by the formation of ice on the enclosure.	Outdoor use to provide a degree of protection against falling rain; undamaged by the formation of ice on the enclosure.	Indoor or outdoor use; provides a degree of protection against rain and snow; undamaged by the external formation of ice on the enclosure.
Type 4	Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, and hose directed water; undamaged by the formation of ice on the enclosure.	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.	Indoor or outdoor use; provides a degree of protection against rain, snow, windblown dust, splashing and hose-directed water; undamaged by the external formation of ice on the enclosure.
Type 4X	Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.	Either indoor or outdoor use to provide a degree of protection against falling rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure; resists corrosion.	Indoor or outdoor use; provides a degree of protection against rain, snow, windblow dust, splashing and hose-directed water; undamaged by the external formation of ice on the enclosure; resists corrosion.
Type 6	Enclosures are intended for use indoors or outdoors where occasional submersion is encountered, limited depth, undamaged by the formation of ice on the enclosure.	Indoor or outdoor use to provide a degree of protection against entry of water during temporary submersion at a limited depth; undamaged by the external formation of ice on the enclosure.	Indoor or outdoor use; provides a degree of protection against the entry of water during temporary submersion at a limited depth. Undamaged by the external formation of ice on the enclosure; resists corrosion.
Type 12	Enclosures are intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping noncorrosive liquids.	Indoor use to provide a degree of protection against dust, dirt, fiber flyings, dripping water, and external condensation of noncorrosive liquids.	Indoor use; provides a degree of protection against circulating dust, lint, fibers, and flyings; dripping and light splashing of non-corrosive liquids; not provided with knockouts.
Type 12K	Enclosures with knockouts are intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dropping noncorrosive liquids.	Indoor use to provide a degree of protection against dust, dirt, fiber flyings, dripping water, and external condensation of noncorrosive liquids. Knockouts located in the top or bottom walls, or both.	Indoor use; provides a degree of protection against circulating dust, lint, fibers and flyings; dripping and light splashing of non-corrosive liquids; provided with knockouts.
Type 13	Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil, and noncorrosive coolant.	Indoor use to provide a degree of protection against lint, dust seepage, external condensation and spraying of water, oil, and noncorrosive liquids.	Indoor use; provides a degree of protection against circulating dust, lint, fibers, and flyings; seepage and spraying of non-corrosive liquids, including oils and coolants.

*NFPA 70 (National Electric Code) defines new Type 3RX as providing the same degree of protection as Type 3R, with the addition of protection against corrosive agents.

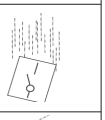
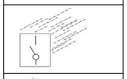
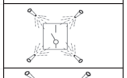
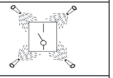
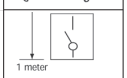
Appendix A

Technical Information

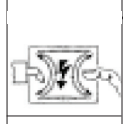
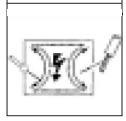
IEC Enclosure Ratings
First Numeral

Protection Against Ingress of Solid Objects		Protection of Persons Against Access to Hazardous Parts with:	Examples
IP	Requirements		
0	No protection.	Non-Protected	
1	Full penetration of 50mm diameter sphere not allowed. Contact with hazardous parts	Back of Hand	
2	Full penetration of 12.5mm diameter sphere not allowed. The jointed test finger shall have adequate clearance from hazardous parts.	Finger	
3	The access probe of 2.5mm diameter shall not penetrate.	Tool	
4	The access probe of 1.0mm diameter shall not penetrate.	Wire	
5	Limited ingress of dust permitted (no harmful deposit).	Wire	
6	Totally protected against ingress of dust.	Wire	

Second Numeral

Protection Against Harmful Ingress of Water		Protection from Water:	Examples
IP	Requirements		
0	No protection.	Non-Protected	
1	Protected against vertically falling drops of water. Limited ingress permitted.	Vertically Dripping	
2	Protected against vertically falling drops of water with enclosure tilted 15° from the vertical. Limited ingress permitted.	Dripping up to 15° from the Vertical	
3	Protected against sprays to 60° from the vertical. Limited ingress permitted.	Limited Spraying	
4	Protected against water splashed from all directions. Limited ingress permited.	Splashing from all Directions	
5	Protected against jets of water. Limited ingress permitted.	Hosing Jets from all Directions	
6	Protected against strong jets of water. Limited ingress permitted.	Strong Hosing Jets from all Directions	
7	Protected against the effects of immersion between 15cm and 1m.	Temporary Immersion	
8	Protected against long periods of immersion under pressure.	Continuous Immersion	

Additional Letter (Optional)

Protection Against Ingress of Solid Objects		Protection of Persons Against Access to Hazardous Parts with:	Example
IP	Requirements		
A (For use with first numeral 0)	Penetration of 50mm diameter sphere up to	Back of Hand	
B (For use with first numerals 0 and 1)	Test finger penetration to a maximum of 80mm must not contact	Finger	
C (For use with first numerals 1 and 2)	Wire of 2.5mm diameter x 10mm long must not contact hazardous	Tool	
D (For use with first numerals 2 and 3)	Wire of 1.0mm diameter x 100mm long must not contact hazardous	Wire	

Technical Information

Motor Current Ratings

Horsepower	60Hz AC Induction Motor					
	Single Phase		Three Phase			
	115V	230V	200V	230V	460V	575V
1/6	4.4	2.2	-	-	-	-
1/4	5.8	2.9	-	-	-	-
1/3	7.2	3.6	-	-	-	-
1/2	9.8	4.9	2.5	2.2	1.1	0.9
3/4	13.8	6.9	3.7	3.2	1.6	1.3
1	16.0	8.0	4.8	4.2	2.1	1.7
1 1/2	20.0	10.0	6.9	6.0	3.0	2.4
2	24.0	12.0	7.8	6.8	3.4	2.7
3	34.0	17.0	11.0	9.6	4.8	3.9
5	56.0	28.0	17.5	15.2	7.6	6.1
7 1/2	80.0	40.0	25.0	22.0	11.0	9.0
10	100	50.0	32.0	28.0	14.0	11.0
15	135	68.0	48.0	42.0	21.0	17.0
20	-	88.0	62.0	54.0	27.0	22.0
25	-	110	78.0	68.0	34.0	27.0
30	-	136	92.0	80.0	40.0	32.0
40	-	176	120	104	52.0	41.0
50	-	216	150	130	65.0	52.0
60	-	-	177	154	77.0	62.0
75	-	-	221	192	96.0	77.0
100	-	-	285	248	124	99.0
125	-	-	359	312	156	125
150	-	-	414	360	180	144
200	-	-	552	480	240	192
250	-	-	692	602	302	242
300	-	-	-	-	361	289
350	-	-	-	-	414	336
400	-	-	-	-	477	382
500	-	-	-	-	590	472

The information in this table was extracted from Table 430.248 and 430.250 of the NEC.

The following values of full load currents are for motors running at usual speeds and motors with normal torque characteristics. The voltages listed are rated motor voltages. The currents listed shall be permitted for system voltage ranges of 110-120, 220-240, 440-480 and 550-600 Volts.

Technical Information

NEMA Ratings – CWM Series contactors to NEMA Comparison

NEMA Ratings	WEC Contactor Series	Maximum Horsepower (UL/CSA)					
		Single Phase		Three Phase			
		115V	230V	200V	230V	460V	575V
00	CWM9N	1/3	1	1 1/2	1 1/2	2	2
	CWM9	1/2	1 1/2	3	3	5	7 1/2
	CWM12	3/4	2	3	3	7 1/2	10
0	CWM18N	1	2	3	3	5	5
	CWM18	1	3	5	5	10	15
	CWM25	1 1/2	3	5	7 1/2	15	15
1	CWM32N	2	3	7 1/2	7 1/2	10	10
	CWM32	2	5	10	10	20	25
	CWM40	3	5	10	10	25	25
2	CWM50N	3	7 1/2	10	15	25	25
	CWM50	3	7 1/2	15	15	30	40
	CWM65	5	10	20	20	40	50
	CWM80	5	15	20	25	50	60
3	CWM95N	7 1/2	15	25	30	50	50
	CWM95	7 1/2	15	25	30	60	75
	CWM105	10	20	30	40	75	75
4	CWM150N	-	-	40	50	100	100
	CWM112	-	-	40	50	100	100
	CWM150	-	-	50	60	125	150
	CWM180	-	-	60	75	150	200
5	CWM300N	-	-	75	100	200	200
	CWM250	-	-	75	100	200	250

This table is for comparison & reference only. CWM Series contactors are not NEMA labeled.

How to dimension control components in a starter

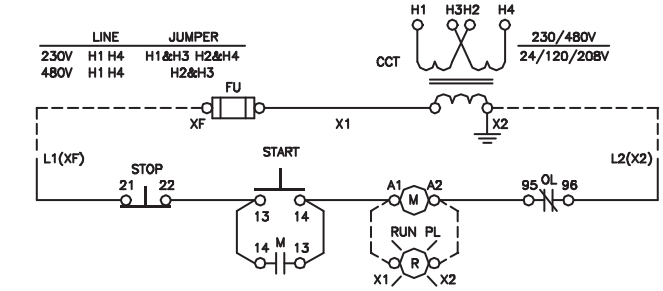
	Across-the-Line Starter	Reversing Starter	Wye-Delta Starter	Autotransformer Starter - tap 65%	Autotransformer Starter - tap 80%
Contactor - K1	FLA	FLA	0.58 x FLA	FLA	FLA
Contactor - K2	-	-	0.58 x FLA	0.42 x FLA	0.64 x FLA
Contactor - K3	-	-	0.33 x FLA	0.23 x FLA	0.16 x FLA
Overload Relay - FT	FLA	FLA	0.58 x FLA	FLA	FLA
Manual Motor Protector - MPW25	FLA				

This table is for comparison & reference only.

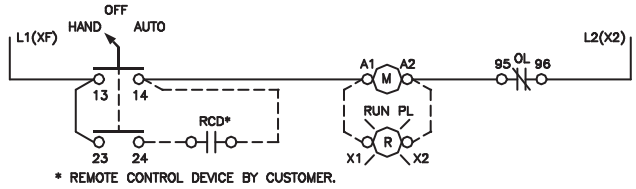
Technical Information

Electrical Wiring Diagrams

Motor Starters Non-Reversing

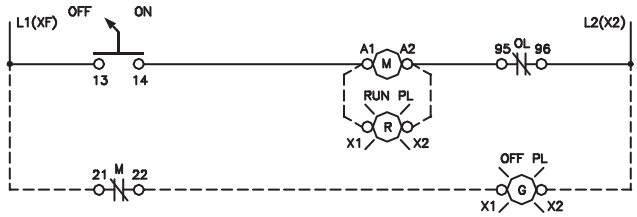


START–STOP PUSHBUTTONS

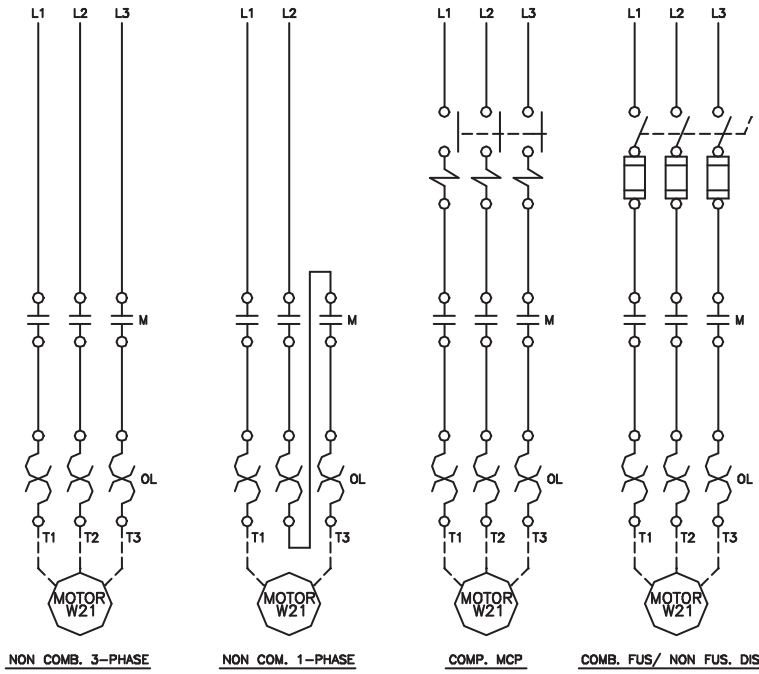


* REMOTE CONTROL DEVICE BY CUSTOMER.

HAND–OFF–AUTO SELECTOR SWITCH



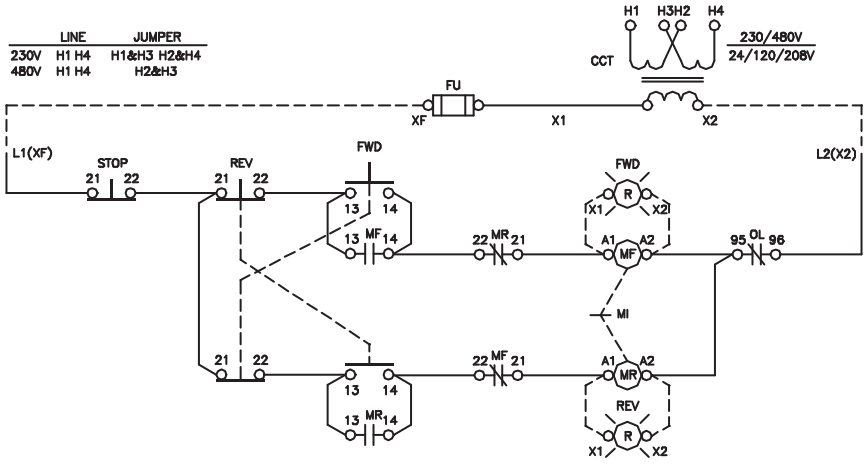
OFF–ON SELECTOR SWITCH



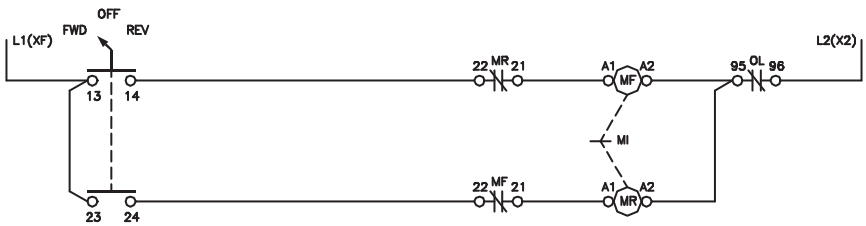
Technical Information

Electrical Wiring Diagrams

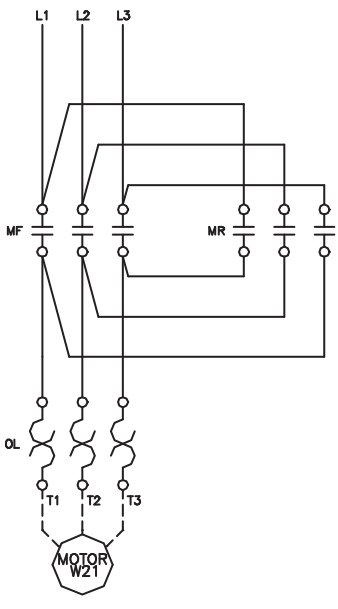
Motor Starters Reversing (1-3PH.)



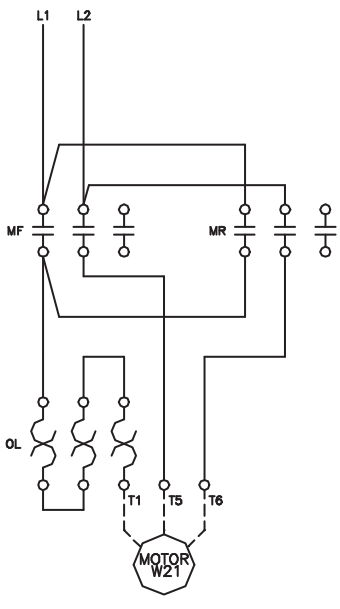
FORWARD–OFF–REVERSE PUSHBUTTONS



FORWARD–OFF–REVERSE SELECTOR SWITCH



NON COMB. 3–PHASE

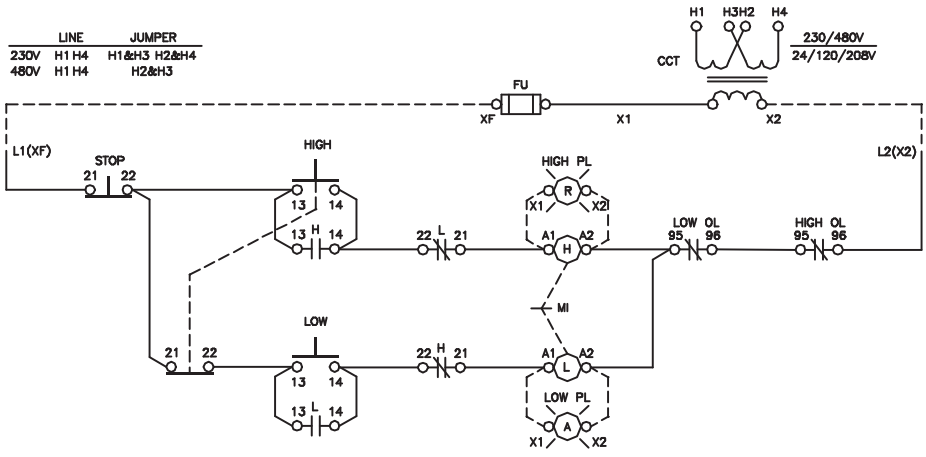


NON COMBINATION
1–PHASE–RECONNECTABLE WINDING
THREE LEAD MOTOR

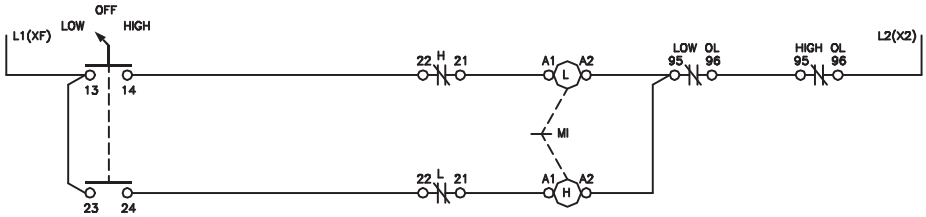
Technical Information

Electrical Wiring Diagrams

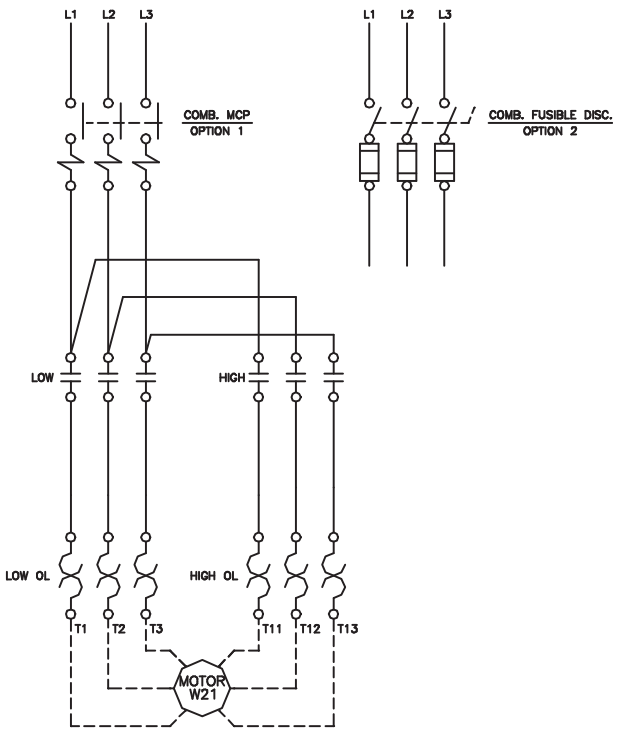
Multi-Speed Two Separate Windings



STOP–LOW–HIGH PUSHBUTTON



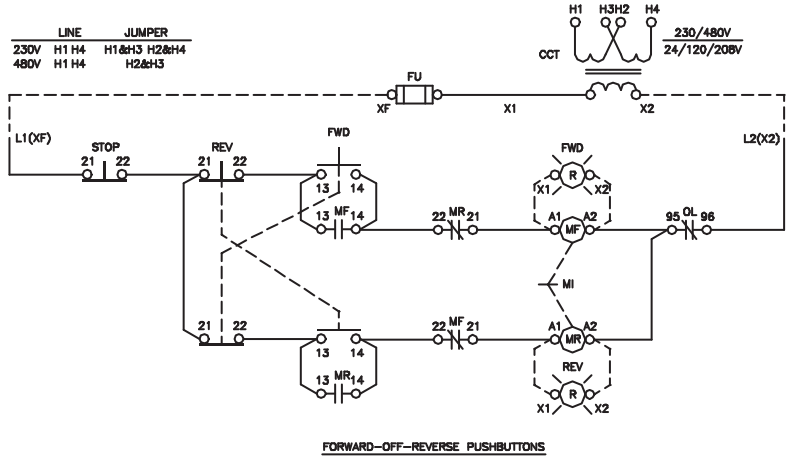
LOW–OFF–HIGH SELECTOR SWITCH



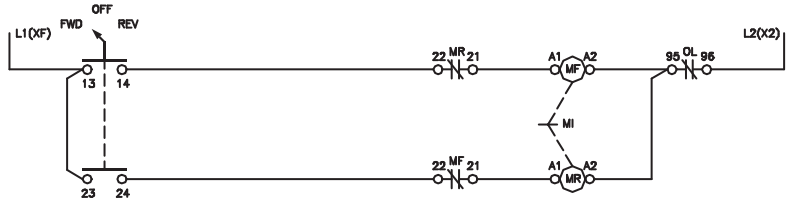
Technical Information

Electrical Wiring Diagrams

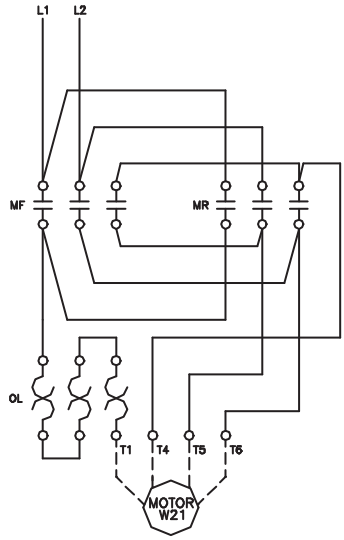
Motor Starters Reversing (1PH)



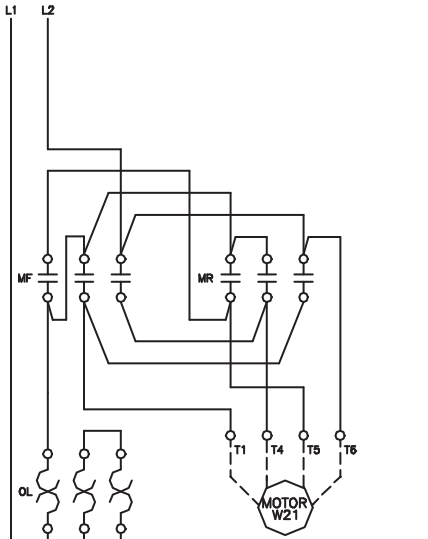
FORWARD–OFF–REVERSE PUSHBUTTONS



FORWARD–OFF–REVERSE SELECTOR SWITCH



NON COMBINATION
SINGLE PHASE–SERIES WINDING
FOUR LEAD REPULSION INDUCTION MOTOR

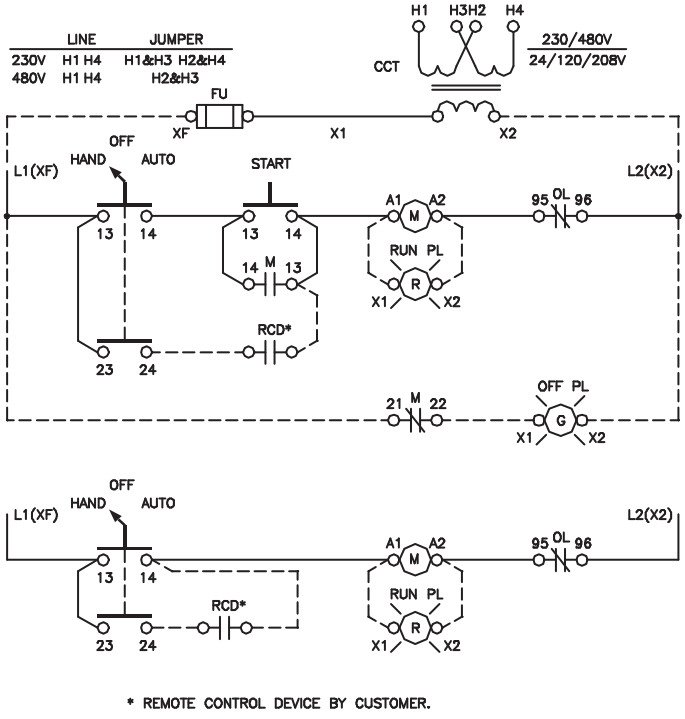


NON COMBINATION
SINGLE PHASE–PARALLEL WINDING
FOUR LEAD CAPACITOR OR SPLIT PHASE MOTOR

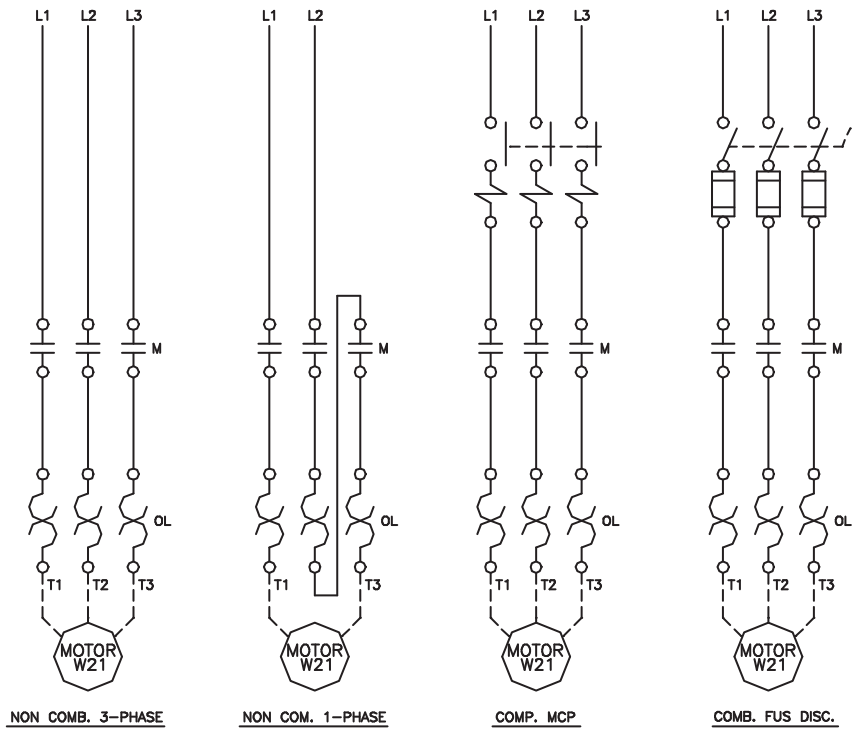
Technical Information

Electrical Wiring Diagrams

Pump Control Panels



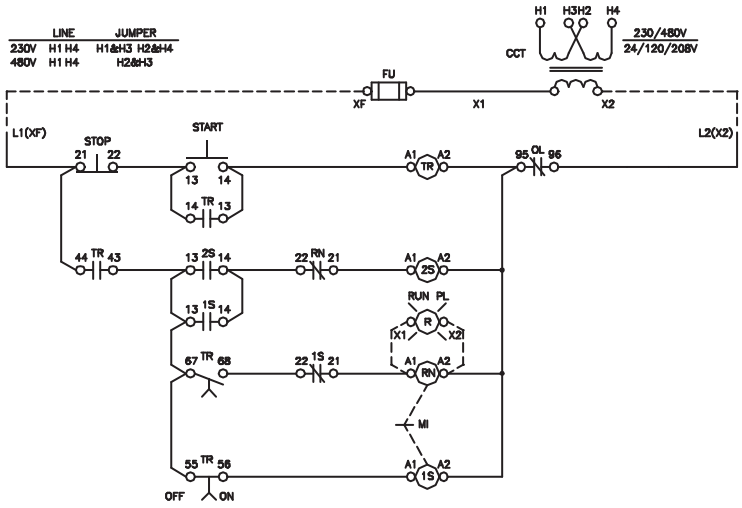
* REMOTE CONTROL DEVICE BY CUSTOMER.

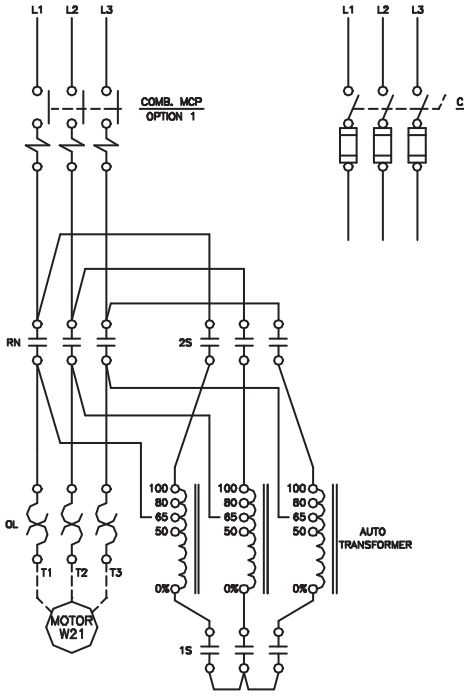


Technical Information

Electrical Wiring Diagrams

Reduced Voltage Starters – Autotransformer

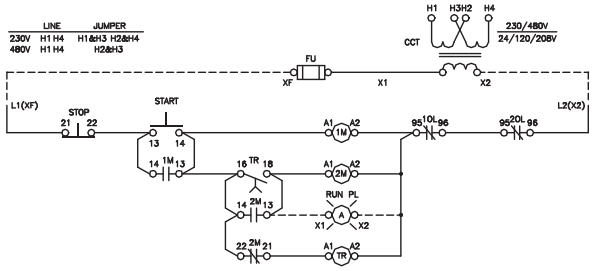


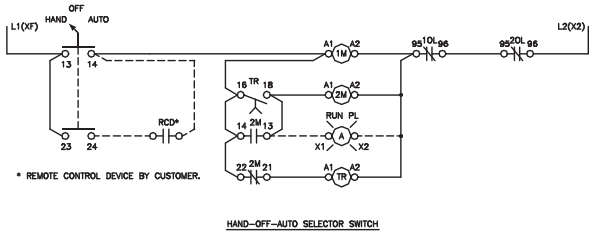


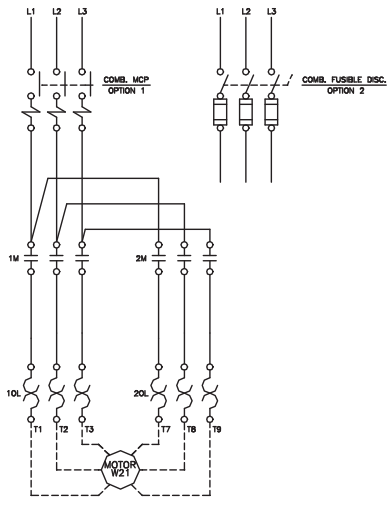
Technical Information

Electrical Wiring Diagrams

Reduced Voltage Starters – Part Winding







Reduced Voltage Starters – Wye Delta