

# CONTACTOR COMBINATIONS



## DIRECT STARTERS KMPL AND KPL

KMPL9, KMPL12, KMPL16, KMPL22, KPL9, KPL12, KPL16, KPL22



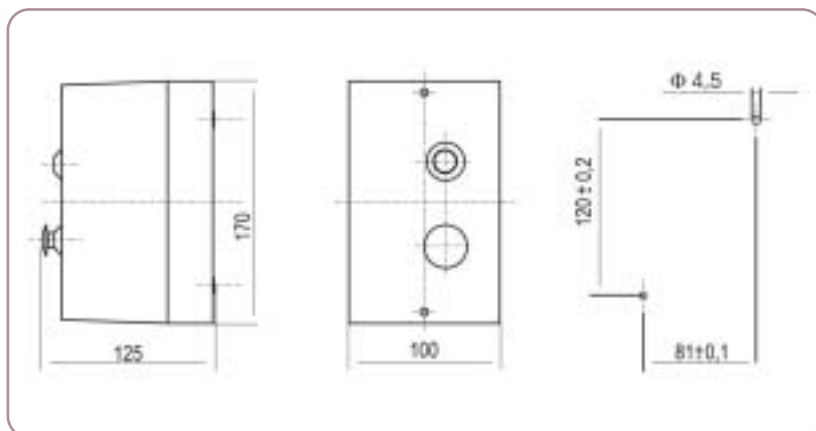
They are used not only for start-up, overload protection and switch-off of electric motors, but also for other loads. A contactor and a corresponding bimetal relay are built into the enclosure of IP55 protection degree. They are switched on with the ON key and switched off with the OFF key which is at the same time also the key for emergency switch off. For the protection against short circuit corresponding back-up fuses should be used. KMPL starters are provided with overload protection while KPL starters are not.

### TEHNIICAL DATA

				KPL9	KPL12	KPL16	KPL22
Type of direct starter without overload protection				KPL9	KPL12	KPL16	KPL22
Type of direct starter with overload protection				KMPL9	KMPL12	KMPL16	KMPL22
Corresponding thermal overload relay				TRB14/KNL			
Standards				IEC/EN 60947-4-1, VDE 0660 Teil 102			
Rated insulation voltage $U_i$ V				690			
Max. permitted powers of three-phase motors at AC-3 utilization category	230V	$P_m$	kW/ HP	2,2 / 3	3 / 4	4 / 5,5	5,5 / 7,5
	400V			4 / 5,5	5,5 / 7,5	7,5 / 10	11 / 15
	500V			5,5 / 7,5	5,5 / 7,5	7,5 / 10	11 / 15
	690V			5,5 / 7,5	7,5 / 10	7,5 / 10	11 / 15
Max.back-up fuse $g_L$ in compliance with VDE 0636			A	25	25	35	50
Control voltage range			$U_c$	85 ... 110			
Operation frequency			op. c. /h	15			
Protection degree				IP55			
Ambient temperature			$^{\circ}C$	-20 ... +40			
Terminal capacity	rigid	S	$mm^2$	0,75 ... 4			2,5 ... 10
	flexible	S	$mm^2$	0,5 ... 2,5			1,5 ... 6

### DIMENSIONS

KPL9, KPL12, KPL16, KPL22  
KMPL9, KMPL12, KMPL16, KMPL22



# CONTACTOR COMBINATIONS

## STAR-DELTA MOTOR STARTERS ZK



Without TRB14/KNL

All required elements for start-up, overload protection and switch-off of an asynchronous electric motor are built-in in the enclosure of IP55 protection degree.

### TECHNICAL DATA

Starter type	Relay type	Permitted motor power					
		230 V		400 V		500 V	
		kW	HP	kW	HP	kW	HP
ZK 12	TRB14-KNL16 / 6 - 10	4	5,5	7,5	10	7,5	10
ZK 16	TRB14-KNL16 / 9,6 - 16	5,5	7,5	11	15	11	15
ZK 22	TRB14-KNL30 / 15 - 25	8	11	18,5	25	18,5	25
ZK 30	TRB14-KNL30 / 24 - 40	12,5	17	25	34	25	34
ZK 40	BR43 / 30 - 43	20	27	37	50	45	60
ZK 65	BR43 / 40 - 63	25	34	55	75	65	88
ZK 95	BRA180 / 75 - 125	40	54	75	100	100	136
ZK 115	BRA180 / 90 - 150	63	86	110	150	147	200
ZK 145	BRA180 / 120 - 200	80	108	132	180	185	252
ZK 180	BRA180 / 120 - 200	92	125	160	220	210	272

## COMBINATIONS FOR REVERSING SWITCH KO-LD , KNL-LD



Type	AC3 operational power rating (kW)			
	230V	400V	500V	690V
KO-LD 7	3	5,5	5,5	5,5
KNL-LD 9	2,2	4	5,5	5,5
KNL-LD 12	3	5,5	5,5	7,5
KNL-LD 16	4	7,5	7,5	7,5
KNL-LD 18	4	9	9	9
KNL-LD 22	5,5	11	11	11
KNL-LD 30	7,5	15	15	15

## COMBINATION STARTERS KMSPL



They are used, above all, for start-up, protection and switch-off of electric motors up to 11 kW power. MS25 motor protection switch with under-voltage release and a corresponding contactor are built in the enclosure of IP55 protection degree.

- it is not necessary to build-in back-up fuses for protection against short-circuit up to motor rated power  $P_m = 1,5 \text{ kW}$  at  $U_e = 400\text{V } 50/60\text{Hz}$
- after each overload and power line failure automatic switch-on is not possible.

Type of combination starter		KMSPL3	KMSPL9	KMSPL12	KMSPL16	KMSPL22
Type of MS25 motor protection switches		MS25-6,3	MS25-10	MS25-16	MS25-16	MS25-25
over-current trip setting range		4 ... 6,3	6,3 ... 10	10 ... 16	10 ... 16	20 ... 25
AC-3 Max. permitted powers of	230 V	1,5	2,2	3	4	5,5
three-phase motors	400 V	2,2	4	5,5	7,5	11
	500 V	3	5,5	5,5	7,5	11
	690 V	4	5,5	7,5	7,5	11

# CONTACTOR COMBINATIONS



## DIRECT-ON-LINE STARTERS up to 30A



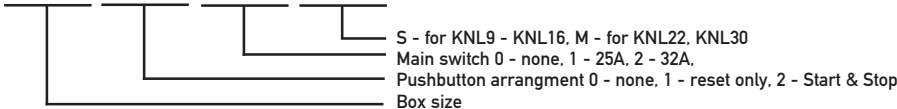
For example direct-on-line starter, motor rating 4kW at 380/400 3ph, contactor with 220/240V coil, enclosure with start/stop buttons & integral main switch: Thermal overload relay TRB14/KNL16...10, contactor KNL9/M7, enclosure D121

1. Locate the kW, HP or full load current of the motor and select the thermal overload relay
2. Choose the contactor with the appropriate coil voltage
3. Choose the enclosure with the required pushbuttons (with or without main switch)

Type	Thermal overload relay			Direct-on contactor *	Enclosure		
	Approx motor rating at 400/415V 3ph		Full load current (A)		VERSIONS		List No
	kW	HP	min-max		Pushbutton arrangement		
TRB14/KNL16	0.06	0.08	0.15 - 0.25	KNL9	Start & Stop Reset only None	-	D120S** D110 D100
	0.12	0.16	0.24 - 0.4				
	0.18	0.25	0.38 - 0.63				
	0.25	0.33	0.6 - 1				
	0.55	0.75	0.96 - 1.6				
	1.1	1.5	1.5 - 2.5				
	1.5	2	2.4 - 4				
	2.2	3	3.8 - 6.3				
	4	5.5	6 - 10	KNL12	Start & Stop Reset only None	with main switch	D121** D111 D101
	4	5.5	6 - 10				
	5.5	7.5	6 - 10	KNL16	Start & Stop Reset only None	-	D120M** D110 D100
	7.5	10	9.6 - 16.11				
TRB14/KNL30	11	15	15 - 25	KNL22	Start & Stop Reset only None	-	D120M** D110 D100
	15	20	24 - 40	KNL30	Start & Stop Reset only None	with main switch	D122** D112 D102

### ORDERING DATA

D1 ... 0.1,2 ... ... 0.1,2,3 ... S, M



Enclosures: IP66, steel back box with polycarbonate front

\* Standard control voltage (50/60 Hz):

B7 24V  
F7 110/125V  
M7 220/240V  
Q7 380/400V

\*\* auxiliary contact ND6-11 included  
\*\*\* other control voltages on request

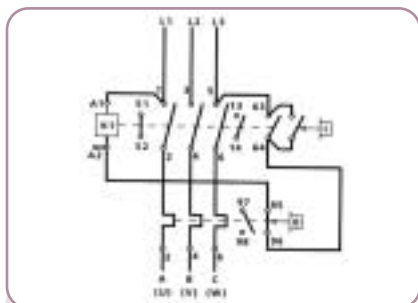
# CONTACTOR COMBINATIONS

## DIRECT-ON-LINE STARTERS up to 30A



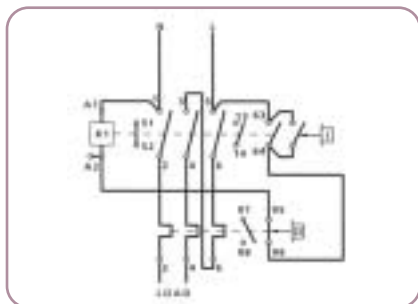
### WIRING DIAGRAMS

#### KNL9 -KNL30 Direct-On Starters

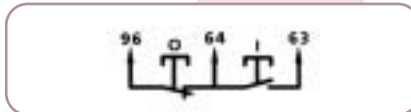


Connections for 3 phase 3 wire supply - as shown above

- Connections for 3 phase 4 wire supply
1. Remove connection 1(L1) - A1
  2. Connect neutral to terminal A1

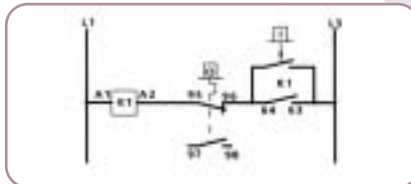


Connections for Single Phase Motors

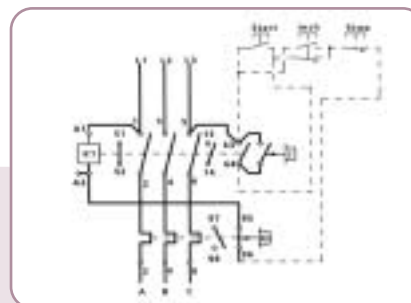


Connections for Remove Push Button Control

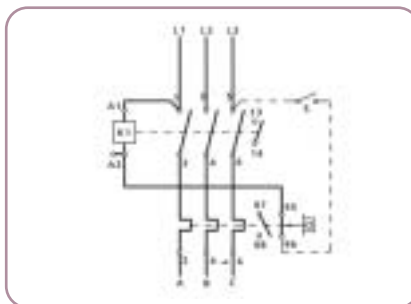
1. Remove connections 96 - 64
2. Connect as illustrated



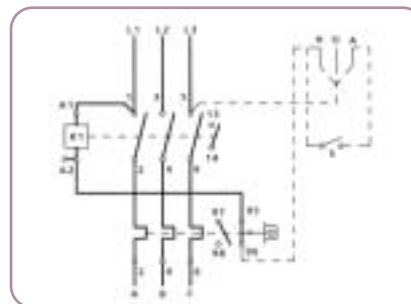
Schematic Diagram



Connections for Remote Start-Inch-Stop Control



Connections for Remove Pilot Switch Control



Connections for Remote Start-Inch-Stop Control

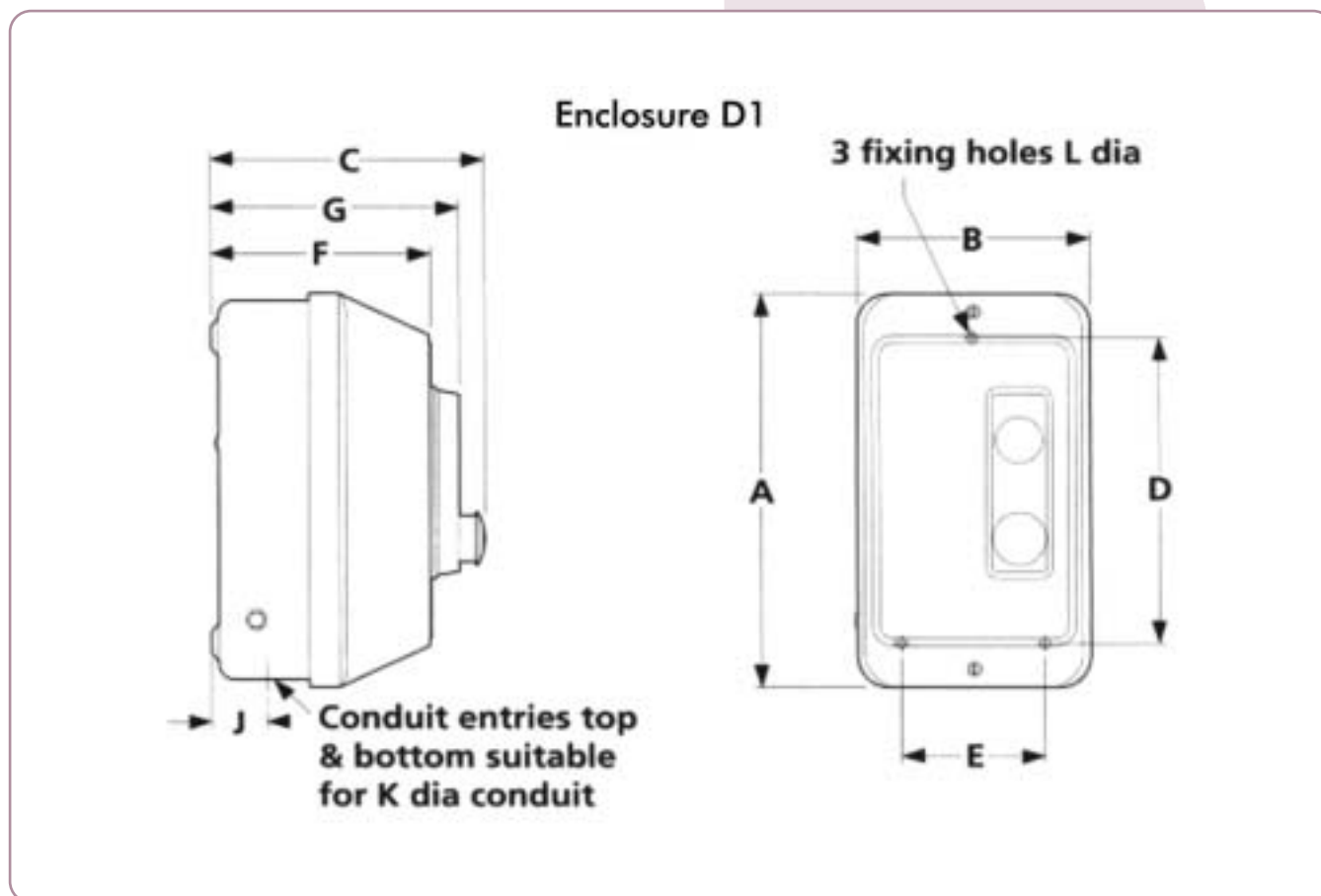
# CONTACTOR COMBINATIONS



## DIRECT-ON-LINE STARTERS up to 30A

### DIMENSIONS (mm)

Enclosures for contactors & direct-on starters (box size D1)



IP66	A	B	C	D	E	F	G	H	J	K	L
KNL9 - KNL30 (enclosure D1)	212	124	146	164	76	117	132,5	-	29,5	3x20	5,5
KNL9 - KNL30 + main switch (enclosure D1)	212	124	156	164	76	117	132	146	29,5	3x20	3x5,5

# CONTACTOR COMBINATIONS

## REVERSING STARTERS up to 30A

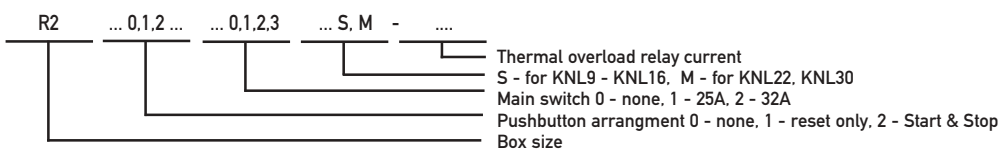


For example reversing direct-on starter, motor rating 4kW at 380/400 3ph, contactor with 380/400V coil, enclosure with 3 push buttons & integral main switch:

Thermal overload relay TRB14/KNL16/10, contactor combination RS9/Q7, enclosure R221

1. Locate the kW, HP or full load current of the motor and select the thermal overload relay
2. Choose the contactor with the appropriate coil voltage
3. Choose the enclosure with the required pushbuttons (with or without main switch)

Typ	Thermal overload relay			Reversing contactor *	Enclosure		List No
	Approx motor rating at 400/415V 3ph		Full load current (A)		VERSIONS		
	kW	HP	min-max		Pushbutton arrangement		
TRB14/KNL	0.06	0.08	0.15 - 0.25	RS9	I, II & 0 Reset only None	-	R220S R210 R200
	0.12	0.16	0.24 - 0.4				
	0.18	0.25	0.38 - 0.63				
	0.25	0.33	0.6 - 1				
	0.55	0.75	0.96 - 1.6				
	1.1	1.5	1.5 - 2.5				
	1.5	2	2.4 - 4				
	2.2	3	3.8 - 6.3	RS12	I, II & 0 Reset only None	with main switch	R221 R211 R201
	4	5.5	6 - 10				
	4	5.5	6 - 10				
	5.5	7.5	6 - 10	RS16	I, II & 0 Reset only None	-	R220M R210 R200
	7.5	10	9.6 - 16				
	11	15	15 - 25	RS22	I, II & 0 Reset only None	-	R220M R210 R200
	15	20	24 - 40	RS30	I, II & 0 Reset only None	with main switch	R222 R212 R202



\* Standard control voltage (50/60 Hz):

- B7 24V
- F7 110/125V
- M7 220/240V
- Q7 380/400V

\*\* other control voltages on request

Enclosures: I, II & 0 versions supplied with separate legends FOR/REV, UP/DOWN, OPEN/CLOSE, LEFT/RIGHT  
KNL9-KNL30 are IP66, comprising Stell back box with polycarbonate front

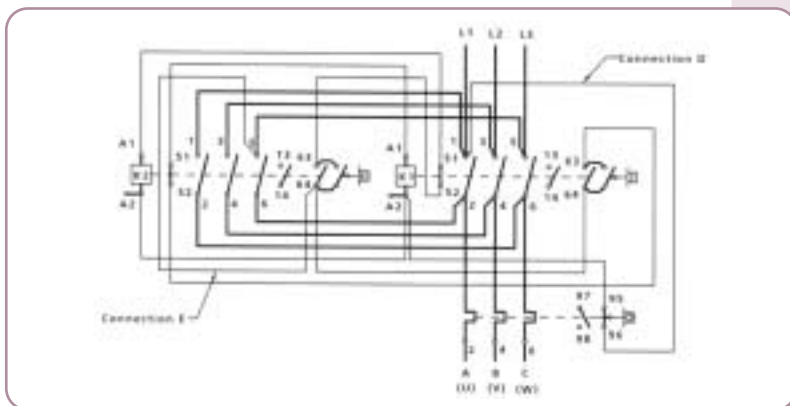
# CONTACTOR COMBINATIONS



## REVERSING STARTERS up to 30A

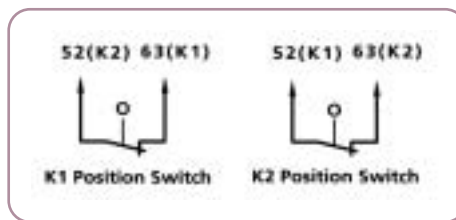
### WIRING DIAGRAMS

#### KNL9 -KNL30 Reversing Starter



Connections if overtravel position switches are required

1. Remove connections 52 to 63
2. Connect as illustrated



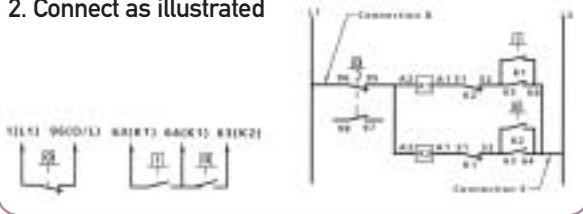
NOTE: Auxiliary contact 13-14 fitted to KNL9-KNL16 contactors only as standard

#### CONTROL CIRCUIT SUPPLY ARRANGEMENTS

SUPPLY	CONNECTION
Phase to Phase	Connect as shown
Phase to Neutral	Omit connection D Connect neutral to terminal 96
Separate	Omit connections D and E Connect separate coil supply to terminal 96 on overload and terminal 64 on contactor K2

#### Connections for Remote Push Button Control

1. Omit connection D
2. Connect as illustrated



#### Push to Run

A simple push-to-run arrangement can be achieved in either directions by changing the top adder start switches.

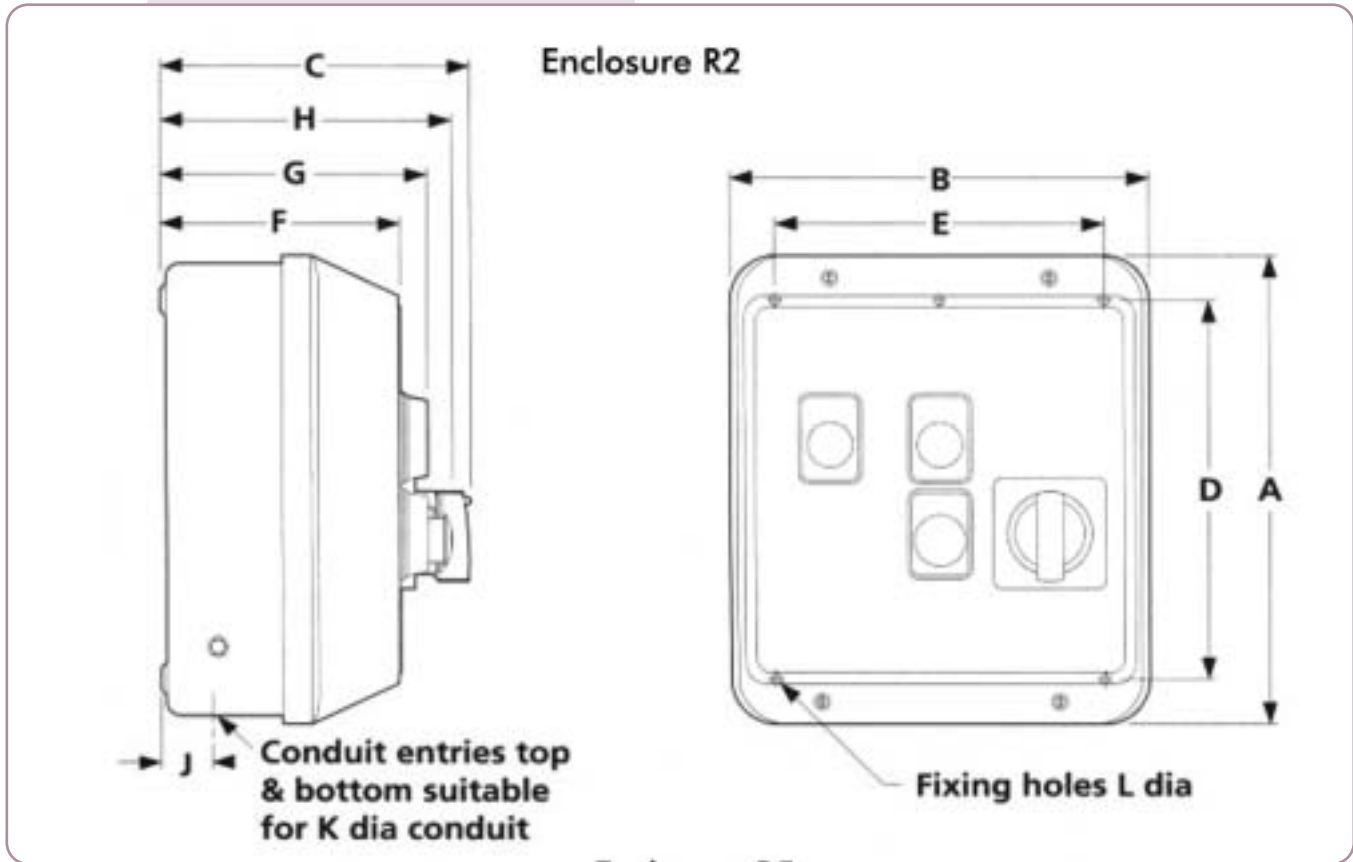
# CONTACTOR COMBINATIONS

## REVERSING STARTERS up to 63A



### DIMENSIONS (mm)

Enclosures for contactors & direct-on starters (box size D1, D2)



IP66	A	B	C	D	E	F	G	H	J	K	L
KNL9 - KNL30 (enclosure R2)	260	230	160	210	108	132	147	-	27,5	2x20 1x25	3x5,5
KNL9 - KNL30 + main switch (enclosure R2)	260	230	171	210	180	133	148	161	28,5	2x20 1x25	4x5,5

# CONTACTOR COMBINATIONS



## STAR-DELTA STARTERS up to 25kW

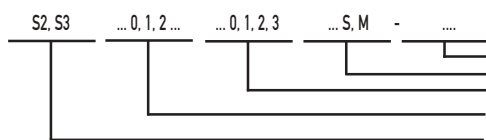


For example star-delta starter, motor rating 7.5kW at 380/400 AC3, contactor with 380/400V coil, enclosure with start/stop push buttons & integral main switch:  
Thermal overload relay TRB14/KNL16/10, contactor SD16/Q7, enclosure S321

1. Locate the kW, HP or Full Load Current of the motor and select the thermal overload relay
2. Choose the contactor combination with the appropriate coil voltage
3. Choose the enclosure with the required pushbuttons (with or without main switch)

Type	Thermal overload relay			Star-delta contactor *	VERSIONS	Enclosure	
	Approx motor rating at 400/415V 3ph		Full load current (A)				List No
	kW	HP	min-max		Pushbutton arrangement		
TRB14/KNL16	2.2	3	2.4 - 4	SD16	Start & Stop	-	S220S
	4	5.5	3.8 - 6.3		Reset only		S210
	7.5	10	6 - 10		None		S200
	11	15	9.6 - 16		Start & Stop		S321
TRB14/KNL30	18.5	25	15 - 25	SD22	Reset only	-	S311
					None		S301
					Start & Stop		S320
	22	30	15 - 25	SD30	Reset only	with main switch	S310
					None		S303
					Start & Stop		S323
25	34	24 - 40		None		S313	
						S303	

### ORDERING DATA



Thermal overload relay current  
S - for KNL9 - KNL16, M - for KNL22, KNL30  
Main switch 0 - none, 1 - 25A, 2 - 32A, 3 - 63A  
Pushbutton arrangement 0 - none, 1 - reset only, 2 - Start & Stop  
Box size

\* Standard control voltage (50/60 Hz):

B7 24V  
F7 110/125V  
M7 220/240V  
Q7 380/400V

\*\* auxiliary contact NDL6-11 included  
\*\*\* other control voltages on request

### STAR-DELTA APPLICATION

For star-delta units, the thermal overload relay is connected in the delta loop and carries the motor winding current only in the delta mode.

For ease of selection the ratings shown in the table are the equivalent motor (nameplate) currents.

Star-delta units are fitted with an electronic timing relay with a minimum adjustment range from 3 to 45 seconds.

Timers have an additional built-in delay period between the "star" contactor opening and the "delta" contactor closing.

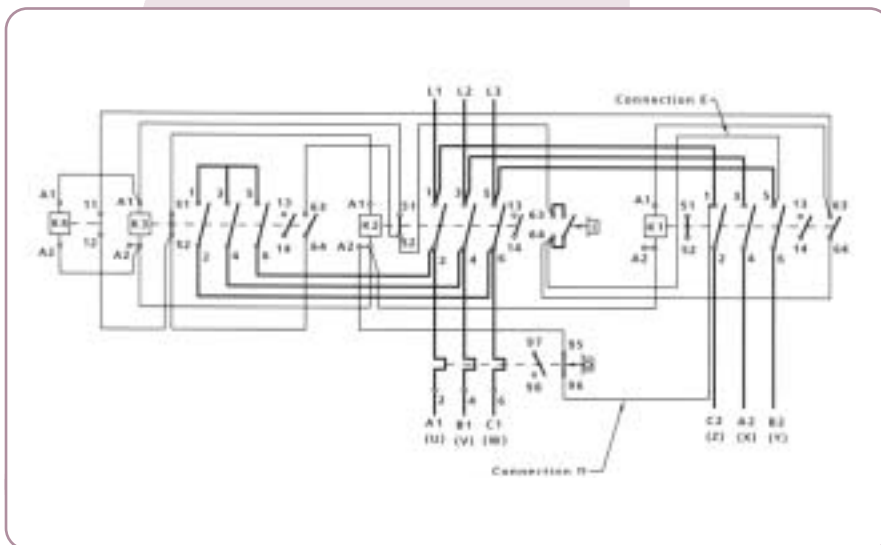
# CONTACTOR COMBINATIONS

## STAR-DELTA STARTERS up to 25kW

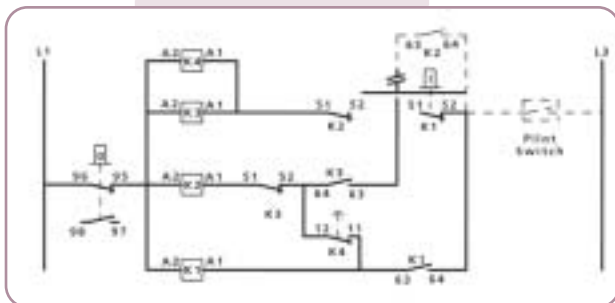
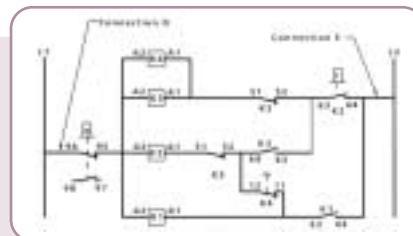


### WIRING DIAGRAMS

#### KNL16 -KNL30 Star-delta starters

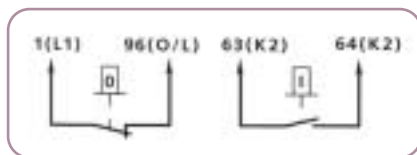


Schematic diagram  
(Push Button Control)



#### Connections for Remote Push Button Control

1. Omit connection D
2. Connect as illustrated



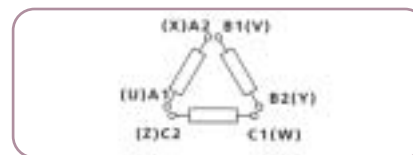
NOTE: Auxiliary contact 13-14 fitted to KNL16 contactors only as standard

#### CONTROL CIRCUIT SUPPLY ARRANGEMENTS

SUPPLY	CONNECTION
Phase to Phase	Connect as shown
Phase to Neutral	Omit connection D Connect neutral to terminal 96
Separate	Omit connections D and E Connect separate coil supply feed to terminal 96 on overload and terminal 64 on contactor K2

#### Motor Windings

Connect to appropriate terminals on starter



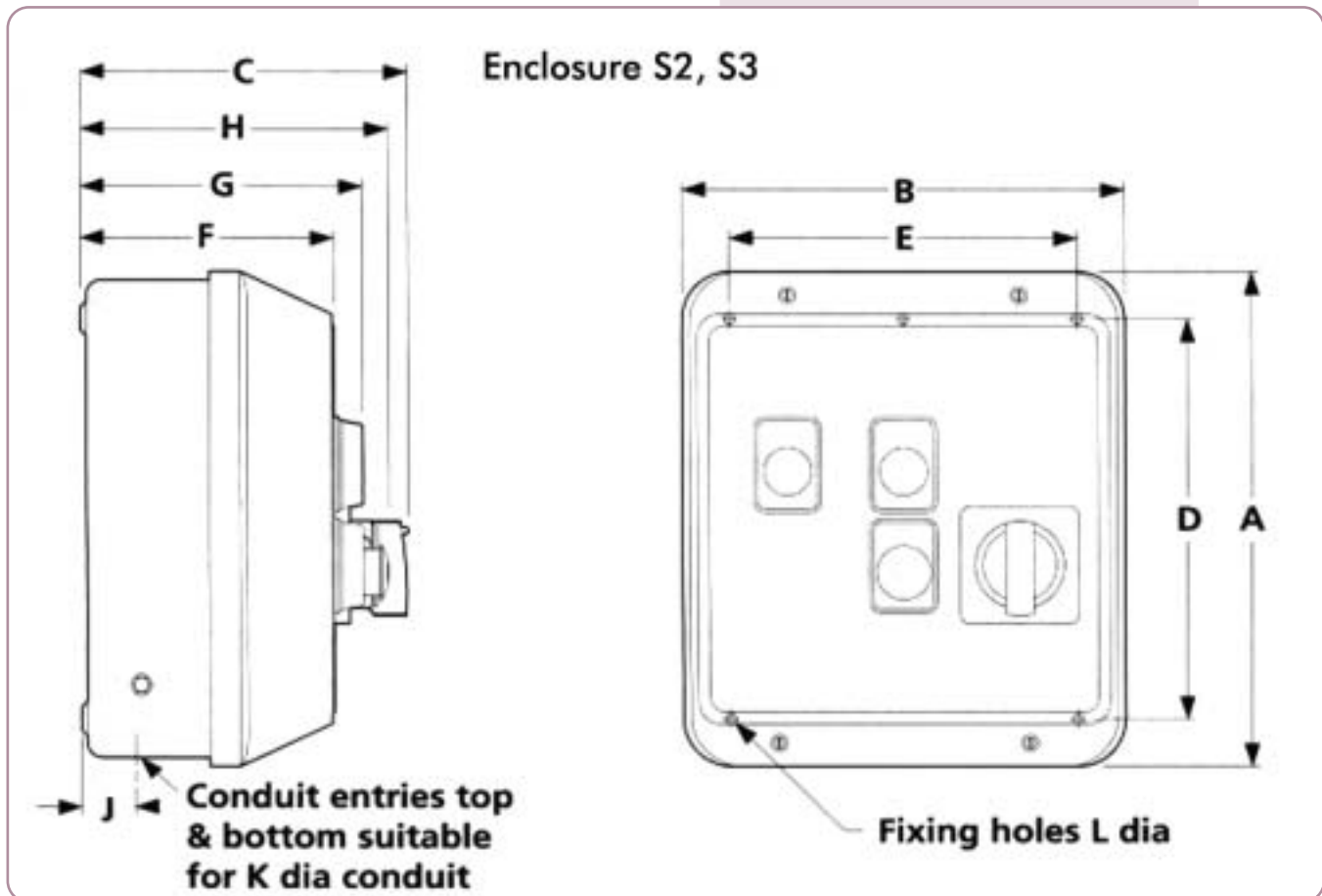
# CONTACTOR COMBINATIONS



## STAR-DELTA STARTERS up to 25kW

### DIMENSIONS (mm)

Enclosures for star-delta starters (box size S2, S3, S4, S5)



IP66	A	B	C	D	E	F	G	H	J	K	L
KNL16 - KNL30 (enclosure S2)	260	230	161	210	180	133	148	-	28,5	2x20 1x25	3x5,5
KNL16 - KNL30 + main switch (enclosure S3)	260	332	171	210	282	133	148	161	28,5	2x20	1x254x5,5