TeSys basics

Focus on contactors and breakers < 65 A

May 2013

Schneider Electric

Content

Focus on contactors

“ I have this contactor to change, what should I take ? ”

This training is designed to enable you to choose the right contactor for your customer

You will first get to know:

“What is a contactor ?”

You will then understand:

“What is required to choose a contactor ?”

Finally you will learn:

“How to choose a Schneider Electric TeSys contactor ?”

What is a contactor ?

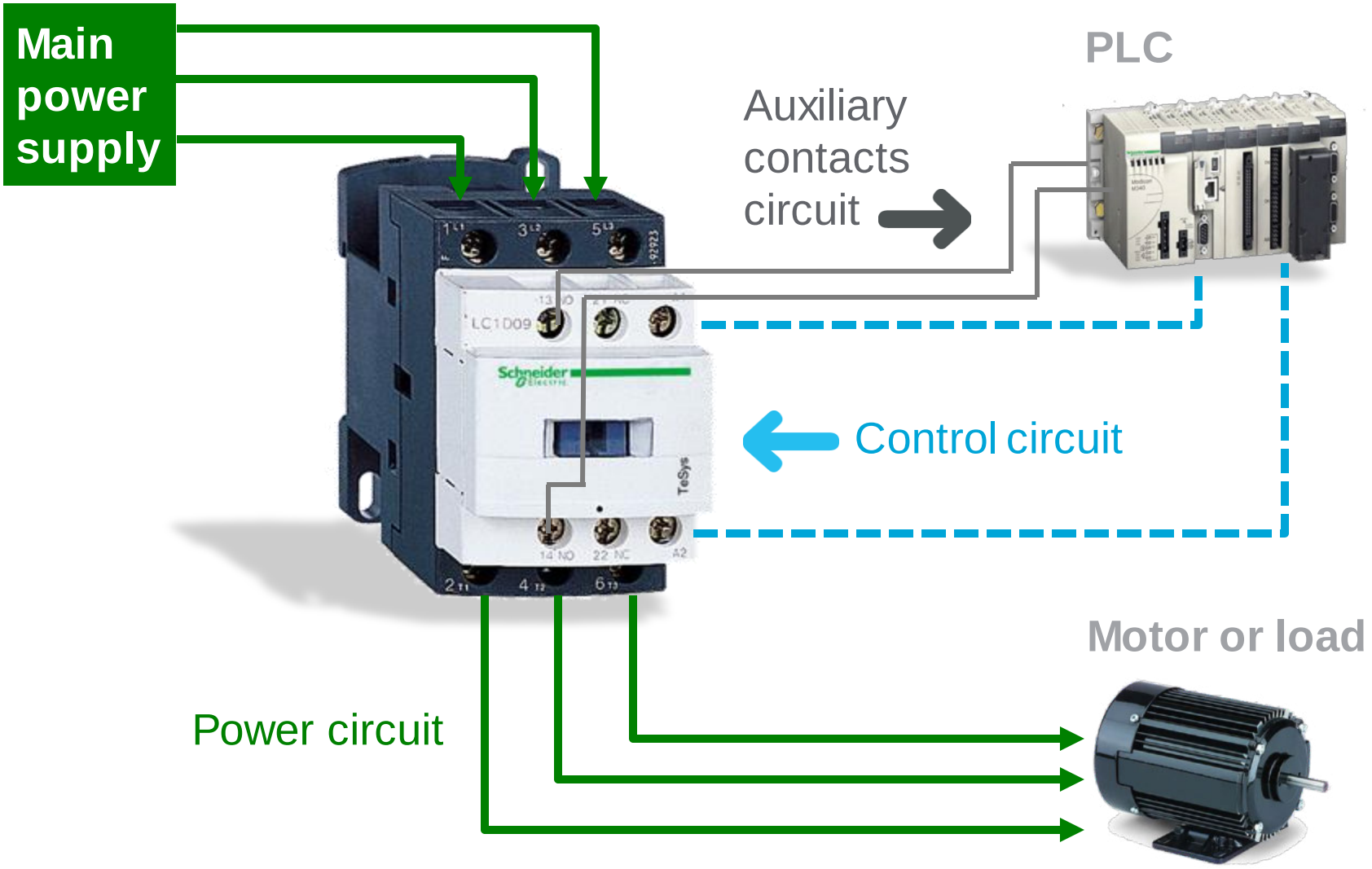
A contactor is:

- designed to switch on/off the current on a electrical circuit
- remotely operated through a control circuit (not manually on the product itself)
- mainly used on motors (AC3 standard) also used on resistive loads (AC1 standard)
- can operate millions of time

AC3
motor application

AC1
resistive load Application

TeSys D contactor and its environment



5 key questions to ask to choose a **contactor**

1. The number of poles of the power circuit: **3P** or **4P**
2. The kind of use is key to know: **AC3** or **AC1**
3. The **current** of the power circuit has to be known

WARNING: this current is different between AC3 and AC1 !!

- **The voltage** of the power circuit has to be controlled:
  - If it is above 500 V, a compatibility check is required in catalogue

4. The **voltage** of the control circuit has to be specified
5. The **number** and the type of auxiliary contacts

Usual values

Power circuit

The power circuit is defined by its current **rating**, its **voltage** and the number of **poles**:

• Ex.: 3 Poles (3P) 9 A **440 V AC**
- usually voltage of power circuit is not given

Ex.: 3P 9 A is assumed to be **440 V AC**

Control circuit

Coil specifications – is defined by its **voltage**:

• Ex.: **24 V DC**

• Ex.: **48 V DC** low consumption

• Ex.: **230 V AC**

The auxiliary

contacts circuit is defined by:

• **Type** of contacts:
- Normally Open = **NO**
- Normally Closed = **NC**

• **Number** of embedded auxiliary contacts: **1** or **2**

How to choose a **TeSys D** contactor

2

(from 9 up to 65 A)

How to select a **TeSys D** contactor

LC 1 D 09 P7

LC1
Schneider-Electric 3P contactor

D
TeSys D range

09
9 A AC3

P7
230 V AC

All TeSys D contactors have **2** embedded auxiliary contacts: **1 NO and 1NC**

How to choose a **TeSys D** contactor

is TeSys D 3P contactor, 9 A AC3, 230 V AC coil with 1 NO and 1NC auxiliary contacts

TeSys D contactor offer structure

	Contactor	Reversers	Auxiliaries
AC std	LC1D	LC2D	CAD
DC std	LC1D	LC2D	CAD
DC low consumption	LC1D	LC2D	CAD
			Connexion type: screw clamp, spring, fast on, lugs, Everlink Coil: AC, DC,

Core offer

Learning by examples

Main coils in the TeSys ranges

LC1D12 P7	3P contactor, 12 A AC3, 230 V AC control circuit
LC1D09 B7	3P contactor, 9 A AC3, 24 V AC
LC1D09 M7	3P contactor, 9 A AC3, 220 V AC
LC1D12 BD	3P contactor, 12 A AC3, 24 V DC
LC1D18 ED	3P contactor, 18 A AC3, 48 V DC
LC1D18 BL	3P contactor, 18 A AC3, 24 V DC low consumption coil

To remember

7 AC standard coil

D DC standard coil

L DC low cons. coil

Learning by examples

4 Poles contactors: contactors with 4 poles

LC1D **T** 20P7 → **4P** contactor, 20 A **AC1**, 230 V AC control circuit

T
as **T**etra = 4

Reversers: 2 contactors mounted to pilot a 2 way motor

LC **2** D18P7 → **3P reversing contactor**, 18 A AC3, 230 V AC control circuit

2
2 x 3P contactors

Learning by examples

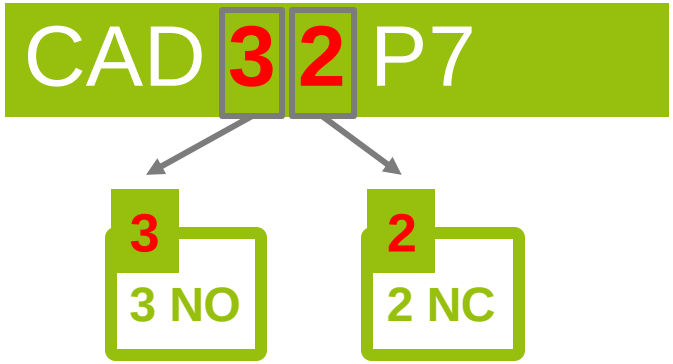
Terminal type: by default **screw clamp** but other different terminals are available

LC1D09P7	**Screw clamp**
LC1D093P7	Spring terminal
LC1D096P7	Lugs-ring terminal
LC1D099P7	Faston terminal
LC1D40AP7	**EverLink screw connector**
LC1D40A3P7	Spring terminal
LC1D40A6P7	Lugs-ring terminal

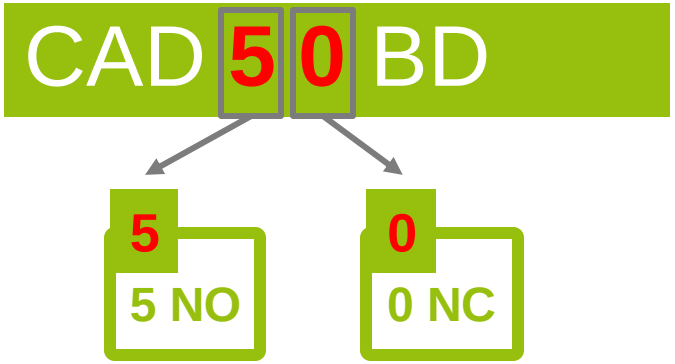
TeSys D and auxiliary contactor

Auxiliary contactors:

- Are used to pilot other contactor control circuit
- Have 5 poles: **5 NO** or **3 NO** and **2 NC**



TeSys D auxiliary contactor with 3 NO and 2 NC contacts, 230 V AC coil



TeSys D auxiliary contactor with 5 NO and 0 NC contacts, 24 V DC coil

All TeSys D aux. contactors have a 10 A AC1 500V circuit

Learning by examples : TeSys D

3-pole contactors

3-pole contactors

Standard power ratings of 3-phase motors 50-60 Hz in category AC-3 (θ ≤ 60 °C)							Rated operational current in AC-3 440 V up to	Instantaneous auxiliary contacts		Basic reference, to be completed by adding the control voltage code *(2)*	Weight *(3)*
220 V 230 V	380 V 400 V	415 V	440 V	500 V	660 V 690 V	1000 V				Fixing *(1)*	
kW	kW	kW	kW	kW	kW	kW	A				kg
Connection by screw clamp terminals											
3	5.5	5.5	5.5	7.5	7.5	–	12	1	1	LC1 D12●●	0.325
Power connections by EverLink® BTR screw connectors *(4)* and control by spring terminals											
11	18.5	22	22	22	30	–	40	1	1	LC1 D40A●● *(5)*	0.850

a.c. supply														
Volts	24	42	48	110	115	220	230	240	380	400	415	440	500	
LC1 D09...D150 (D115 and D150 coils with built-in suppression as standard, by bi-directional peak limiting diode).														
50/60 Hz	B7	D7	E7	F7	FE7	M7	P7	U7	Q7	V7	N7	R7	S7	
LC1 D80...D115														
50 Hz	B5	D5	E5	F5	FE5	M5	P5	U5	Q5	V5	N5	R5	S5	
60 Hz	B6	–	E6	F6	–	M6	–	U6	Q6	–	–	R6	–	

LC1 D80...D115													
50 Hz	B5	D5	E5	F5	FE5	M5	P5	U5	Q5	V5	N5	R5	S5
60 Hz	B6	–	E6	F6	–	M6	–	U6	Q6	–	–	R6	–

TeSys D offer structure synthesis

	DOL	Reversers	Auxiliaries	
AC std	LC1D	LC2D	CAD	
	3P: 9,12,18A, 25,32,38A 40,50,65A	3P:	5NO	CAD50x7
	4P: 20,25,32, 40 A 60,80A LC1DT20x7	4P:	3NO – 2NC	CAD32x7
DC std	LC1D	LC2D	CAD	
	3P	3P:	5NO	CAD50xD
	4P	4P:	3NO – 2NC	CAD32xD
DC low ernergy	LC1D	LC2D	CAD	
	3P	3P:	5NO	CAD50xL
	4P	4P:	3NO – 2NC	CAD32xL
			Connexion type: screw clamp, spring, fast on, lugs, Everlink Coil: AC, DC,	

Intermediate Quiz

3P contactor, 9 A, 230 V AC std coil, screw clamp

Q1

3P reverser, 25 A, 24 V DC low cons coil, screw clamp

Q2

4P contactor, 32 A, 24 V AC std coil, lugs-ring terminal

Q3

3P contactor, 60 A, 230 V AC std coil, EverLink BTR screw connector

Q4

4P contactor, 20A, 24V DC std coil, spring terminal

Q5

Based on what you've learnt so far, try to build a reference with the given technical characteristics

Intermediate Quiz

3P contactor, 9 A, 230 V AC std coil, screw clamp

Q1 LC1D09P7

3P reverser, 25 A, 24 V DC low cons coil, screw clamp

Q2 LC2D25BL

4P contactor, 32 A, 24 V AC std coil, lugs-ring terminal

Q3 LC1DT326BD

3P contactor, 65 A, 230 V AC std coil, EverLink BTR screw connector

Q4 LC1D65AP7

4P contactor, 20A, 24V DC std coil, spring terminal

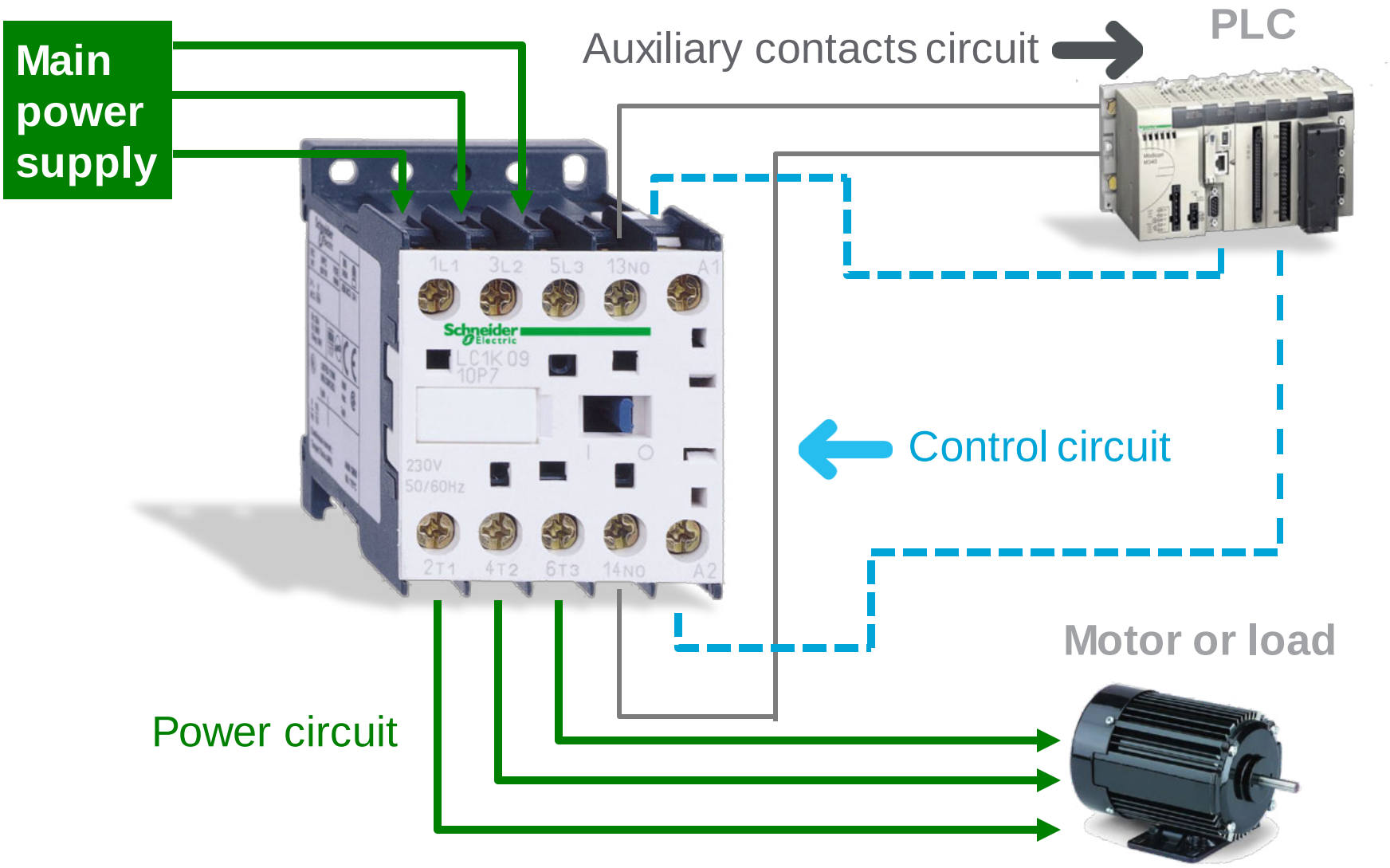
Q5 LC1DT203BD

Based on what you've learnt so far, try to build a reference with the given technical characteristics

How to choose a **TeSys K** contactor

(from 6 up to 16 A)

TeSys K contactor in brief



How to select a **TeSys K contactor**

LC1 K 06 10 P7

LC1	K	06	10	P7
Schneider Electric 3P contactor	TeSys K range	6 A AC3	10 => 1 NO 0 NC OR 01 => 0 NO 1 NC	230 V AC coil

All TeSys K contactors have **1** embedded auxiliary contacts:
1 NO
or
1NC

To remember

TeSys K reference name follow the same rules as TeSys D

is TeSys K 3P contactor, 6 A AC3,
230 V AC coil with 1 NO auxiliary contact

TeSys K contactor offer structure

	Contactor	Reversers	Auxiliaries
AC std	LC1K	LC2K	CA2K
DC std	LP1K	LP2K	CA3K
DC low consumption	LP4K	LP5K	CA4K
AC silent	LC7K	LC8K	Connexion type: screw clamp, spring, fast on, solder pins Coil: AC, DC,

Core offer

TeSys K differences with **TeSys D**

Specific name for low consumption coils

LP4K0610**BW3** → is a TeSyS K 3P contactor, 6 A AC3, 24 V DC
low consumption coil with 1 NO auxiliary contact

4P contactors
The AC1 curent value is not given in the reference name

LC1K12**00** **4** P7 → is a TeSys K **4P** contactor, 20 A AC1, 230 V AC coil,

4
4 = Tetra

TeSys K differences with TeSys D

Specific terminal for TeSys K range: solder pin for mounting on **Printed Circuit Board (PCB)**

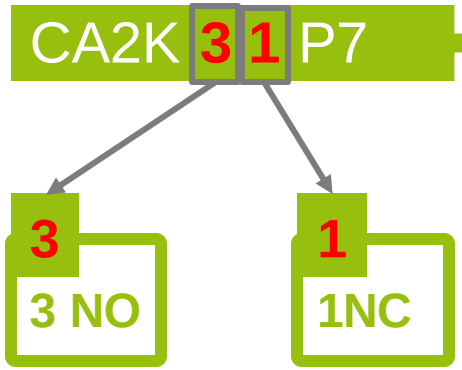
LC1K12015P7 →

Specific terminal number TeSys range: Faston terminal

LP1K09107BD →

TeSys K auxiliary contactors: 4 poles

CA2K **3** **1** P7 → is a TeSys K auxiliary contactor, with **3 NO** contact and **1 NC** contact, 230 V AC coil



Learning by examples : TeSys K

3-pole contactors for standard applications

Standard power ratings of 3-phase motors 50-60 Hz in category AC-3			Rated operational current in category AC-3 440 V up to	Instantaneous auxiliary contacts		Basic reference, to be completed by adding the voltage code (1) (2)	Weight
220 V 230 V	380 V 415 V	440/500 V 660/690 V					
kW	kW	kW	A				kg
Screw clamp connections							
2.2	4	4	9	1	–	LC1 K0910●●	
				–	1	LC1 K0901●●	

a.c. supply

Contactors LC1 K (0.8…1.15 Uc) *(0.85…1.1 Uc)*

Volts	12	20	24 (2)	36	42	48	110	115	120	127	200/208		220/230	230	230/240
50/60 Hz	J7	Z7	B7	C7	D7	E7	F7	FE7	G7	FC7	L7		M7	P7	U7
Volts	256	277	380/400		400	400/415		440	480	500	575	600	660/690		
50/60 Hz	W7	UE7	Q7	–	V7	N7		R7	T7	S7	SC7	X7	Y7	–	–

Up to and including 240 V, coil with integral suppression device available: add **2** to the code required. Example: **J72**.

Up to and including 240 V, coil with integral suppression device available: add 2 to the code required. Example: J72.

Contactors LC7 K (0.85…1.1 Uc)

Volts	24	42	48	110	115	220	230/240
50/60 Hz	B7	D7	E7	F7	FE7	M7	U7

TeSys K offer structure synthesis

	DOL			Reversers		Auxiliaries	
AC std	LC1K			LC2K		CA2K	
	3P:	6 A, 9 A, 12 A, 16 A		3P: 6 A, 9 A, 12 A, 16 A		4NO	CA2K40x7
	4P:	9 A, 12 A	LC1K09004x7	4P: 9 A, 12 A		3NO – 1NC	CA2K31x7
						2NO – 2NC	CA2K22x7
DC std	LP1K			LP2K		CA3K	
	3P:	6 A, 9 A, 12 A		3P: 6 A, 9 A, 12 A		4NO	CA3K40xD
	4P:	9 A, 12 A		4P: 9 A, 12 A		3NO – 1NC	CA3K31xD
						2NO – 2NC	CA3K22xD
DC low ernergy	LP4K			LP4K		CA4K	
	3P:	6 A, 9 A, 12 A		3P: 6 A, 9 A, 12 A		4NO	CA4K40xBW3
	4P:	9 A, 12 A		4P: 9 A, 12 A		3NO – 1NC	CA4K31xBW3
						2NO – 2NC	CA4K22xBW3
AC silent	LP7K			LP7K			
	3P:	6 A, 9 A, 12 A		3P: 6 A, 9 A, 12 A			
				4P: 9 A, 12 A			

Connexion type: screw clamp, spring, lugs-ring, fast on, solder pins

Intermediate Quiz

3P contactor, 6 A AC3, 230 V AC coil, screw clamp terminal with 1NO aux. contact

Q1

3P reverser contactor, 6 A AC3, 220 V AC coil, solder pin terminal with 1NC aux. contact

Q2

3P contactor, 9 A AC3, 24 V DC coil, Faston terminal with 1NO aux. Contact

Q3

3P contactor, 12 A AC3, 48 V DC low consumption coil, spring terminal, with 1 NO aux. contact:

Q4

4P contactor, 20 A AC1, 230 V AC coil, screw clamp terminal with 1NC aux. contact:

Q5

Based on what you've learnt so far, try to build a reference with the given technical characteristics

Intermediate Quiz

3P contactor, 6 A AC3, 230 V AC coil, screw clamp terminal with 1NO aux. contact

Q1 LC1K0610P7

3P reverser contactor, 6 A AC3, 220 V AC coil, solder pin terminal with 1NC aux. contact

Q2 LC2K06015M7

3P contactor, 9 A AC3, 24 V DC coil, Faston terminal with 1NO aux. Contact

Q3 LP1K09107BD

3P contactor, 12 A AC3, 48 V DC low consumption coil, spring terminal, with 1 NO aux. contact:

Q4 LP4K12103EW3

4P contactor, 20 A AC1, 230 V AC coil, screw clamp terminal with 1NC aux. contact:

Q5 LC1K12004P7

Based on what you've learnt so far, try to build a reference with the given technical characteristics

Focus on
motor circuit-breakers

“ I have this breaker to change, what should I take ? ”

This training is designed to enable you to choose the right motor circuit breaker for your customer

You will first get to know:

“What is a motor circuit breaker?”

You will then understand:

“What is required to select a motor breaker?”

Finally you will learn:

“How to choose a TeSys motor circuit breaker ?”

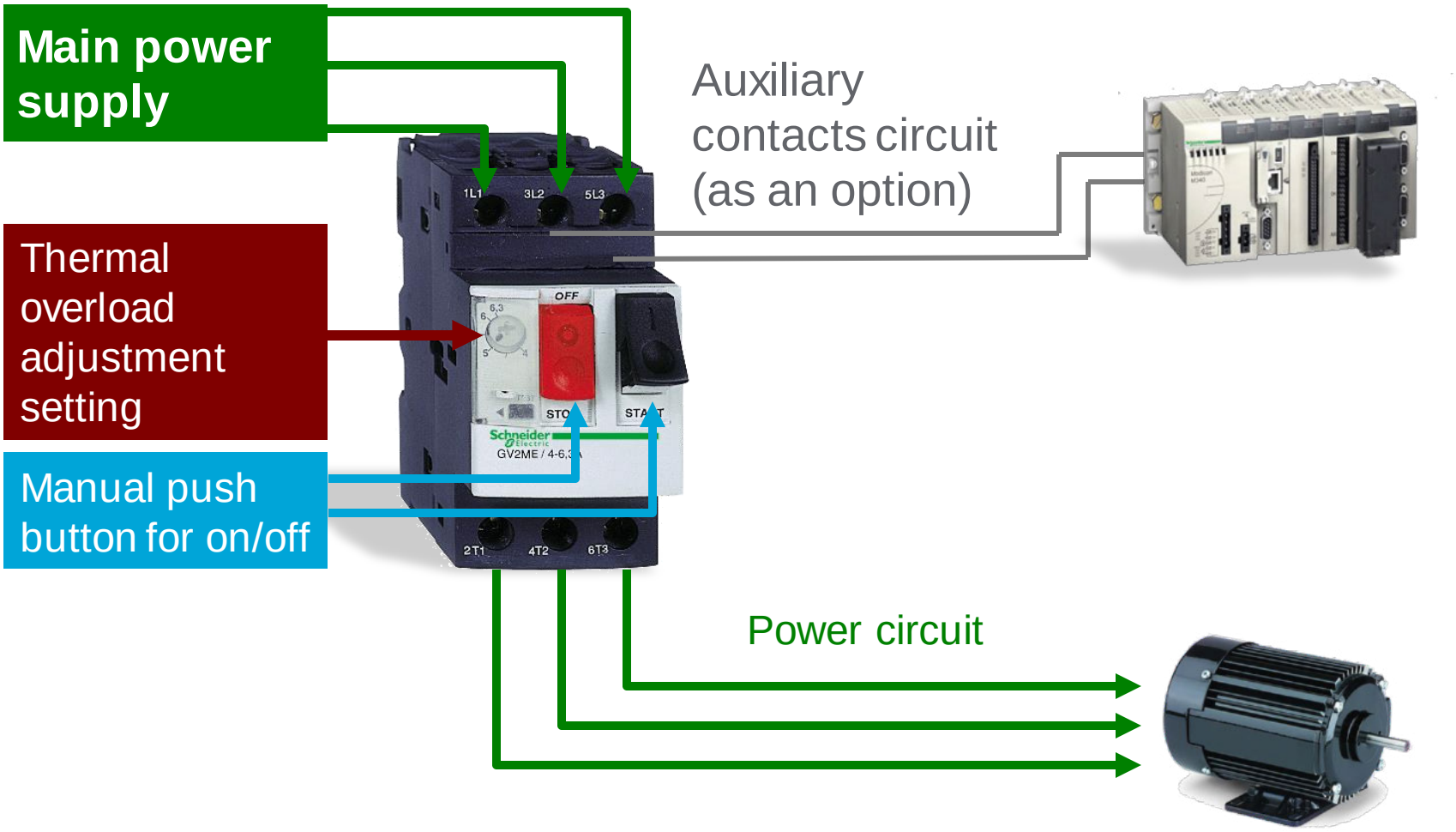
What is a **motor circuit-breaker ?**

A motor circuit-breaker is:

- **Main functions**
  - Ensures short circuit protection
    (to protect circuit cables and motor coils)
  - Can ensure thermal protection
    (to protect motor and cables from overload)

- **Secondary functions**
  - Has the ability to switch on/off the current of the electrical circuit
    (manual operation)
  - Can operate thousands of times as a switch

What is a **motor circuit-breaker ?**



2 key questions to ask to choose a **motor breaker**

1 The nominal current of the motor:

- This parameter is linked to the motor power and is key to perfectly adjust the thermal protection of the breaker to the motor

2 The short circuit current at installation point:

- This current is linked to the power supply

The breaking capacity value of the motor breaker must exceed the short circuit current at installation point, if not protection against short circuit is not ensured

Usual values of required parameters

The nominal current of the motor

- Most applications use motors with a nominal current **< 15 A**
- Can go up to 150 A or more (ex. ≈ 2000 A for windturbine application)

Short circuit current at installation point

- Most application are **< 25 kA**
- Can go up to 50 kA or more in some big industrial installations, when motors are close to transformers

TeSys GV2 & GV3
motor circuit-breakers

TeSys GV2 - GV3 motor breaker

Thermal and magnetic protection

GV2ME | GV2P | GV3P

Push button

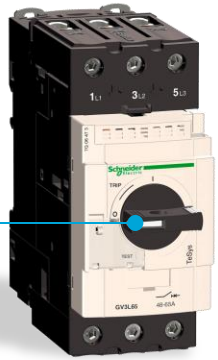
Rotary handle

32 A | 65 A

Magnetic protection only

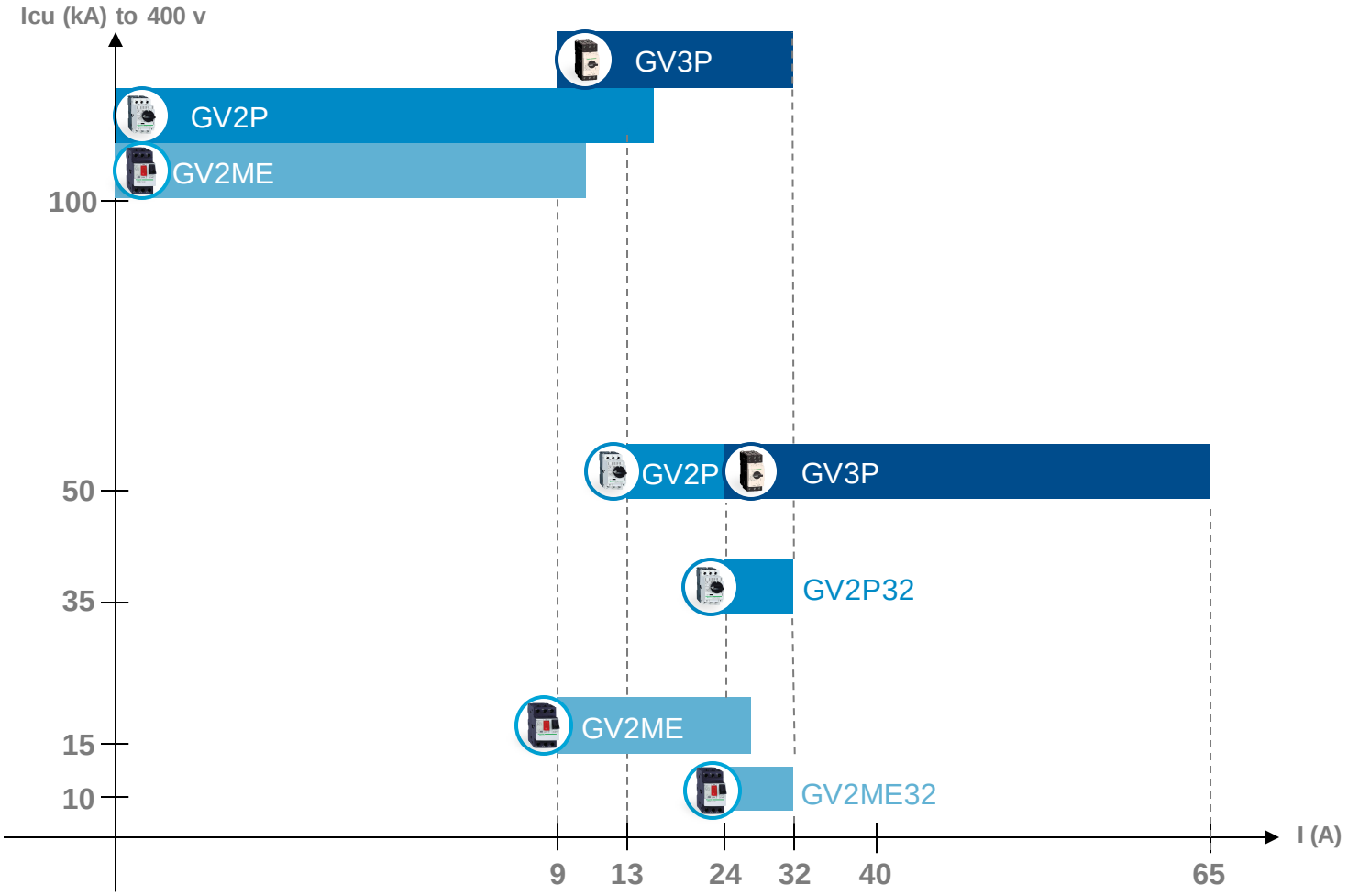
GV2L | GV3L

Rotary handle



32 A | 65 A

TeSys GV2 - GV3 breaking capacity



For more details see "Control and Protection componemts" catalogue 2011/2012 chapter 3

How to select a TeSys motor breaker

GV2ME **08**

GV2ME

GV2ME motor breaker

08

Current rating code

All GV2 and GV3 motor breaker have optionnal auxiliary contacts. See catalogue for more options .

is TeSys GV2ME breaker for motors with 2,5-4A current,100kA Icu, screw clamp terminal.

Learning by examples

Terminal type: by default **screw clamp** but other different terminals are available

GV2ME08	**Screw clamp**	
GV2ME083	Spring terminal	
GV2ME086	lugs-ring terminal	
GV3P40	**EverLink screw connector**	
GV3P401	Without EverLink downstream connector	
GV3P406	Lugs terminal	

Learning by examples : GV2ME

Motor circuit-breakers from 0.06 to 15 kW / 400 V, with screw clamp terminals

GV2 ME with pushbutton control

Standard power ratings of 3-phase motors 50/60 Hz in category AC-3									Setting range of thermal trips (2)	Magnetic tripping current Id ± 20 %	Reference	Weight
400/415 V			500 V			690 V						
P	Icu	Ics (1)	P	Icu	Ics (1)	P	Icu	Ics (1)				
kW	kA	%	kW	kA	%	kW	kA	%	A	A		kg
–	–	–	–	–	–	–	–	–	0.1…0.16	1.5	GV2 ME01	0.260
2.2	★	★	3	50	100	4	3	75	4…6.3	78	GV2 ME10	0.260
3	★	★	4	10	100	5.5	3	75	6…10	138	GV2 ME14	0.260
4	★	★	5.5	10	100	7.5	3	75				
5.5	15	50	7.5	6	75	9	3	75	9…14	170	GV2 ME16	0.260
–	–	–	–	–	–	11	3	75				
7.5	15	50	9	6	75	15	3	75	13…18	223	GV2 ME20	0.260
9	15	40	11	4	75	18.5	3	75	17…23	327	GV2 ME21	0.260
11	15	40	15	4	75	–	–	–	20…25	327	GV2 ME22 (3)	0.260
15	10	50	18.5	4	75	22	3	75	24…32	416	GV2 ME32	0.260

Motor circuit-breakers from 0.06 to 15 kW / 400 V, with screw clamp terminals

GV2 ME with pushbutton control

Standard power ratings of 3-phase motors 50/60 Hz in category AC-3									Setting range of thermal trips (2)	Magnetic tripping current Id ± 20 %	Reference	Weight
400/415 V			500 V			690 V						
P	Icu	Ics (1)	P	Icu	Ics (1)	P	Icu	Ics (1)				
kW	kA	%	kW	kA	%	kW	kA	%	A	A		kg
1.1	★	★	1.5	★	★	2.2	3	75	2.5…4	51	GV2 ME08	0.260
1.5	★	★	2.2	★	★	3	3	75				

Learning by examples : GV2P / GV3P

Motor circuit-breakers from 0.06 to 30 kW / 400 V

Standard power ratings of 3-phase motors 50/60 Hz in category AC-3									Setting range of thermal trips (2)	Magnetic tripping current Id ± 20 %	Reference	Weight
400/415 V			500 V			690 V						
P	Icu	Ics (1)	P	Icu	Ics (1)	P	Icu	Ics (1)				
kW	kA	%	kW	kA	%	kW	kA	%	A	A		kg
GV2 P: control by rotary knob												
Screw clamp terminals												
–	–	–	–	–	–	–	–	–	0.1…0.16	1.5	GV2 P01	0.350
0.06	★	★	–	–	–	–	–	–	0.16…0.25	2.4	GV2 P02	0.350

Motor circuit-breakers from 0.06 to 30 kW / 400 V

Standard power ratings of 3-phase motors 50/60 Hz in category AC-3									Setting range of thermal trips (2)	Magnetic tripping current Id ± 20 %	Reference	Weight
400/415 V			500 V			690 V						
P	Icu	Ics (1)	P	Icu	Ics (1)	P	Icu	Ics (1)				
kW	kA	%	kW	kA	%	kW	kA	%	A	A		kg
GV2 P: control by rotary knob												
Screw clamp terminals												
1.1	★	★	1.5	★	★	2.2	8	100	2.5…4	51	GV2 P08	0.350

11	50	50	15	10	75	–	–	–	20…25	327	GV2 P22	0.350
15	35	50	18.5	10	75	22	4	100	24…32	416	GV2 P32	0.350
GV3 P: control by rotary knob												
Connection by EverLink® BTR screw connectors (3)												
5.5	100	100	7.5	12	50	11	6	50	9…13	182	GV3 P13	0.960
7.5	100	100	9	12	50	15	6	50	12…18	252	GV3 P18	0.960
11	100	100	15	12	50	18.5	6	50	17…25	350	GV3 P25	0.960
15	100	100	18.5	12	50	22	6	50	23…32	448	GV3 P32	0.960
18.5	50	100	22	12	50	37	6	50	30…40	560	GV3 P40	0.960
22	50	100	30	12	50	45	6	50	37…50	700	GV3 P50	0.960
30	50	100	45	12	50	55	6	50	48…65	910	GV3 P65	0.960

Intermediate Quiz

5A 400V motor, at a 15kA short circuit installation point, push button switch, screw clamp terminal

Q1

8A 400V motor, 15kA sc, rotary handle, screw clamp terminal

Q2

2,3A 415 V motor, spring terminal – announce breaking capacity

Q3

47A 400V motor, 40kA sc, lugs terminal

Q4

Based on what you've learnt so far, try to build a reference with the given technical characteristics

Intermediate Quiz

5A 400V motor, at a 15kA short circuit installation point, push button switch, screw clamp terminal

Q1 GV2ME10

8A 400V motor, 15kA sc, rotary handle, screw clamp terminal

Q2 GV2P16

2,3A 415 V motor, spring terminal – give breaking capacity

Q3 GV2ME073

47A 400V motor, 40kA sc, lugs terminal

Q4 GV3P506

Based on what you've learnt so far, try to build a reference with the given technical characteristics