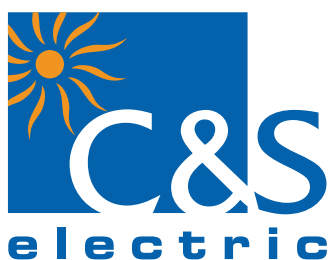


We touch your **electricity** everyday!

robusta 2



UL US LISTED CE RoHS Compliant



Contactors

The future is here

Contactors 7A ~ 38A

C&S robusTa 2 Contactors are designed with several unique features and advantages. robusTa 2 offers high electrical and mechanical life with reliable performance. Compactness, design flexibility, safety and efficient solutions make robusTa 2 Contactors a preferred choice among customers.

It's unique design with in-built 1NO+1NC auxiliary contacts & common accessories assures reliability, space saving and optimum inventory costs.

robusTa 2 Contactors are manufactured in State-of-the-Art fully integrated ISO 9001 certified plant, equipped with world class designing, tooling, component manufacturing, assembling and testing facilities.

The new range of robusTa 2 Contactors conforms to IEC60947-4-1 standards & meets the latest globally acknowledged standards : UL & CE.

C&S Electric Limited is one of India's leading electrical equipment manufacturer and largest exporter of industrial switchgear products. C&S has 17 state-of-the-art manufacturing plants, 20 sales offices and it's products are exported to over 80 countries across the globe.





robust**T**a 2

At a glance



Motor control ~ starting solutions advantages

- Top-notch functional aesthetics
- 3P coordinated Contactor range
 - 3P Contactor 45 mm frame, AC3 rating 7 Amps ~ 38 Amps
- In-built- 1NO + 1NC auxiliary contact
- Saves inventory cost - Common Add -On Accessories
- Compact Modular design for flexibility
- Snap fit design -Easy coil replacement
- Safety first - Power & Control terminals are IP 20 finger touch proof
- Energy Saving magnet coils
- High Mechanical & Electrical life

Industrial Applications

- Motor Controls
- Machine Tools
- Hoists
- Elevator & Escalators
- Power Supply Solutions
- Printing & Packaging Machines
- HVAC
- Solar systems
- Control valves
- Pumps



Front mounted
Auxiliary Contact Block



Coil Surge suppressor



Contactor



Mechanical Interlock



Side mounted
Auxiliary Contact Block



Thermal Overload Relay

robustTa 2

Technical Characteristics

Description	Reference / Condition	Unit	
Environment			
Rated Insulation Voltage (Ui)	Conforming to IEC 60947-4-1 Over Voltage category III, Degree of Pollution: 3	V	
Rated Impulse withstand Voltage (Uimp)	Conforming to IEC 60947	kV	
Degree of Protection	IEC 60529		
Ambient Temperature around device	Storage	°C	
	Operation (0.85 - 1.1 Uc)	°C	
	Permissible (at Uc)	°C	
Flame Resistance	UL 94	°C	
Pole Characteristics			
Rated Operational Current (Ie) (Ue≤440V)	In AC-3, $\phi \leq 40^\circ$	A	
	In AC-1, $\phi \leq 40^\circ$	A	
Rated Operational Voltage (Ue)		V	
Frequency Limits	Of the operational current	Hz	
Conventional Thermal Current (Ith)	$\phi \leq 40^\circ$	A	
Rated Making Capacity (440 V)	Conforming to IEC 60947	A	
Rated Breaking Capacity (440 V)	Conforming to IEC 60947	A	
Average Impedance per pole(max)	at Ith and 50 Hz.	mΩ	
Electrical Durability (millions of operating cycles)		Million	
Maximum operating rate (on load)AC3		Op. Cycles / Hr	
Control Circuit Characteristics			
Rated control circuit voltage (Uc)	50/60 Hz.	V	
Control Voltage Limits	Operation at 50 Hz		
	Operation at 60 Hz		
	Drop out		
Average Consumption 50 Hz at 20° and at Uc	Inrush	VA	
	Sealed	VA	
Average Consumption 60 Hz at 20° and at Uc	Inrush	VA	
	Sealed	VA	
Operating Time	Closing	ms	
	Opening	ms	
Mechanical Durability		Million	
Maximum Operating Rate		Op. Cycles / Hr	
Power Circuit Connections			
Flexible Cable without cable end	1 conductor	mm ²	
	2 conductors	mm ²	
Flexible Cable with cable end	1 conductor	mm ²	
	2 conductors	mm ²	
Solid Cable without cable end	1 conductor	mm ²	
	2 conductors	mm ²	
Tightening Torque		N-m	
Dimensions			
Height x Width x Depth		mm	
Mounting			
Length x Width		mm	



	TC1D0711	TC1D0911	TC1D1211	TC1D1811	TC1D2511	TC1D3211	TC1D3811
	1000	1000	1000	1000	1000	1000	1000
	6	6	6	6	6	6	6
	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
	-60 to +80	-60 to +80	-60 to +80	-60 to +80	-60 to +80	-60 to +80	-60 to +80
	-5 to +60	-5 to +60	-5 to +60	-5 to +60	-5 to +60	-5 to +60	-5 to +60
	-40 to +70	-40 to +70	-40 to +70	-40 to +70	-40 to +70	-40 to +70	-40 to +70
	V0	V0	V0	V0	V0	V0	V0
	7	9	12	18	25	32	38
	25	25	25	32	40	50	50
	up to 690	up to 690	up to 690	up to 690	up to 690	up to 690	up to 690
	25-400	25-400	25-400	25-400	25-400	25-400	25-400
	25	25	25	32	40	50	50
	250	250	250	300	450	550	550
	250	250	250	300	450	550	550
	2.5	2.5	2.5	2.5	2	2	2
	1.8	1.8	1.7	1.5	1.4	1.6	1.6
	600	600	600	600	600	600	600
	24 – 690	24 – 690	24 – 690	24 – 690	24 – 690	24 – 690	24 – 690
	0.65 to 1.2 Uc	0.65 to 1.2 Uc	0.65 to 1.2 Uc	0.65 to 1.2 Uc	0.65 to 1.2 Uc	0.65 to 1.2 Uc	0.65 to 1.2 Uc
	0.85 to 1.1 Uc	0.85 to 1.1 Uc	0.85 to 1.1 Uc	0.85 to 1.1 Uc	0.85 to 1.1 Uc	0.85 to 1.1 Uc	0.85 to 1.1 Uc
	0.3 to 0.6 Uc	0.3 to 0.6 Uc	0.3 to 0.6 Uc	0.3 to 0.6 Uc	0.3 to 0.6 Uc	0.3 to 0.6 Uc	0.3 to 0.6 Uc
	70	70	70	70	70	70	70
	7	7	7	7	7	7	7
	70	70	70	70	70	70	70
	7.5	7.5	7.5	7.5	7.5	7.5	7.5
	12 to 22	12 to 22	12 to 22	12 to 22	12 to 22	12 to 22	12 to 22
	4 to 19	4 to 19	4 to 19	4 to 19	4 to 19	4 to 19	4 to 19
	15	15	15	15	15	15	15
	3600	3600	3600	3600	3600	3600	3600
	0.75 - 10	0.75 - 10	0.75 - 10	0.75 - 10	0.75 – 16	0.75 – 16	0.75 – 16
	0.75 - 10	0.75 - 10	0.75 - 10	0.75 - 10	0.75 – 16	0.75 – 16	0.75 – 16
	0.75 - 10	0.75 - 10	0.75 - 10	0.75 - 10	0.75 – 16	0.75 – 16	0.75 – 16
	0.75 - 10	0.75 - 10	0.75 - 10	0.75 - 10	0.75 – 16	0.75 – 16	0.75 – 16
	0.75 - 10	0.75 - 10	0.75 - 10	0.75 - 10	0.75 – 16	0.75 – 16	0.75 – 16
	0.75 - 10	0.75 - 10	0.75 - 10	0.75 - 10	0.75 – 16	0.75 – 16	0.75 – 16
	1.8	1.8	1.8	1.8	2.5	2.5	2.5
	85 x 45 x 90	85 x 45 x 90	85 x 45 x 90	85 x 45 x 90	85 x 45 x 95	85 x 45 x 95	85 x 45 x 95
	60/70 x 35	60/70 x 35	60/70 x 35	60/70 x 35	60/70 x 35	60/70 x 35	60/70 x 35

Common Add-on Accessories



Auxiliary Contact Block (Side mounted) **TA8-DN**

NO	NC	
2	0	TA8-DN20
1	1	TA8-DN11

Coil Suppressor **TAD4VN**



Auxiliary Contact Block (Front mounted) **TA1-DN**

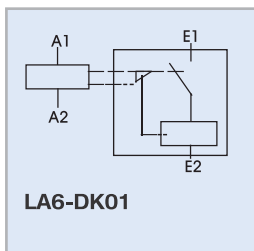
NO	NC	
0	1	TA1-DN01
1	0	TA1-DN10

NO	NC	
1	1	TA1-DN11
0	2	TA1-DN02
2	0	TA1-DN20

NO	NC	
4	0	TA1-DN40
3	1	TA1-DN31
2	2	TA1-DN22
1	3	TA1-DN13
0	4	TA1-DN04



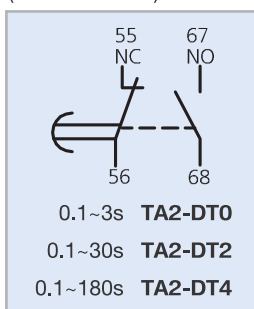
Latch Add-on Block (Front mounted) **LA6-DK01**



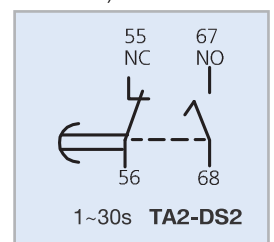
Mechanical Interlock **LA9D09978**



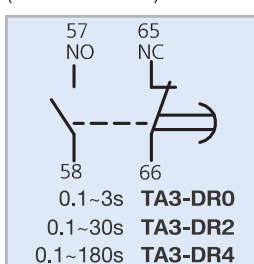
On Delay Timer Block (Front mounted) **TA2-DT2**



On Delay Star Delta Timer Block (Front Mounted) **TA2-DS2**



Off Delay Timer Block (Front mounted) **TA3-DR2**

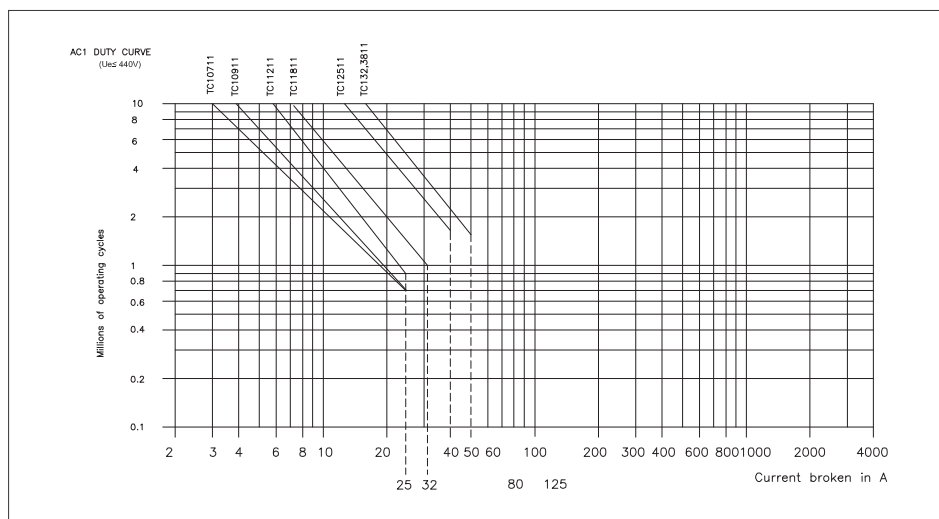


Overload Relay fixing attachment for Contactor

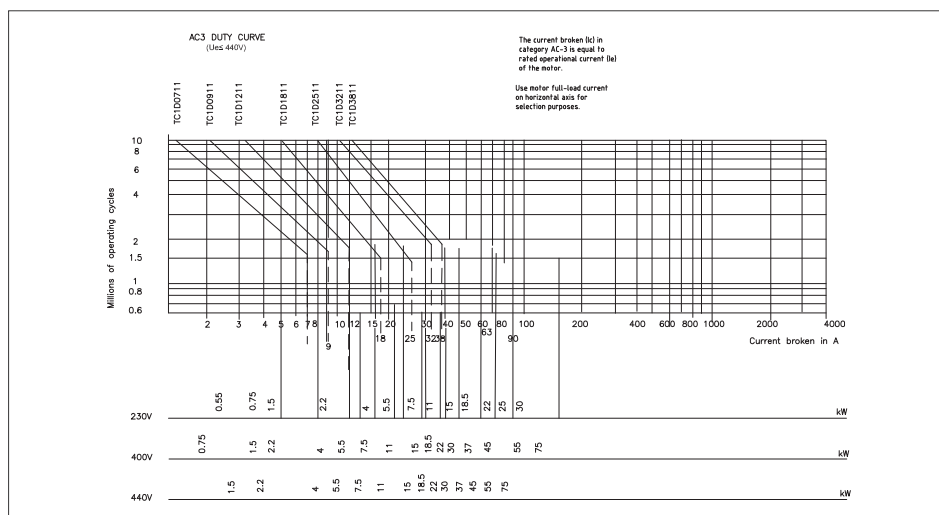


Characteristic Curve

The current broken (I_c) in category AC1 is equal to current (I_e) normal drawn by the load.

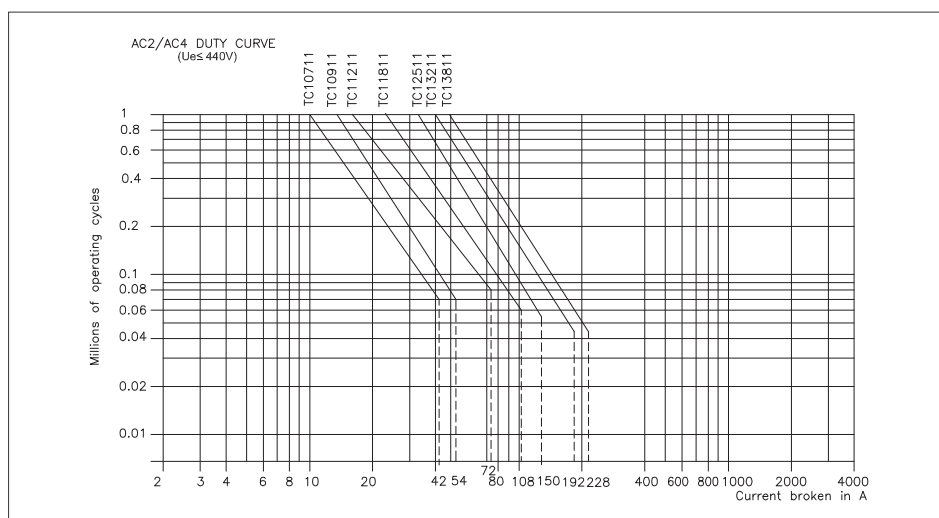


The current broken (I_c) in category AC3 is equal to rated operational current (I_e) of the motor



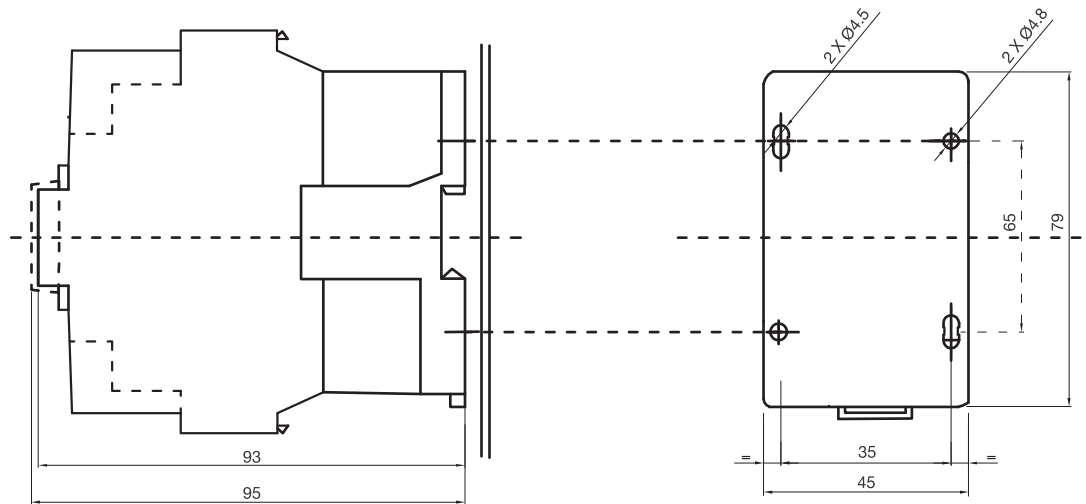
The current broken (I_c) in category AC4 is equal to 6 times I_e . Where I_e is the operational current of the motor

Use motor locked rotor current (6 times full load current) on horizontal axis for selection purposes.

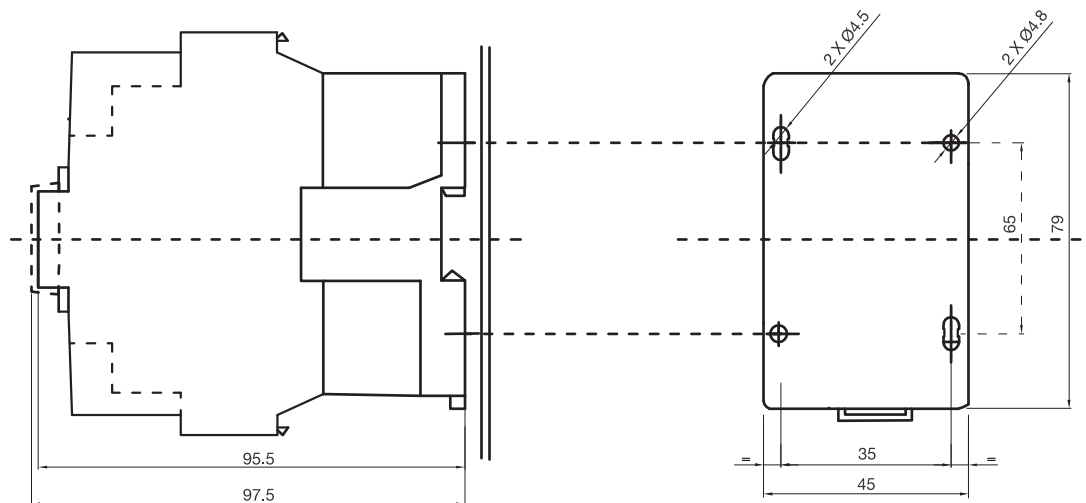


Dimensions

TC1D0711
TC1D0911
TC1D1211
TC1D1811



TC1D2511
TC1D3211
TC1D3811



Thermal Overload Relay

robustTa 2 Thermal Overload Relay provides protection against operational overload & single phasing having prior of site selectable auto or manual facility

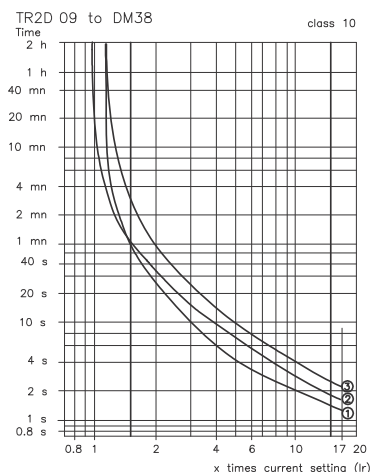
Silent Features

- Built-in single phase protection
- Potential free 1NO and 1NC contacts
- Yellow flag indicator for indication of relay tripping
- Auto / Manual reset facility
- IP 20 finger touch proof



Relay Reference	Relay setting range (A)	Standard power ratings of 3-Phase Motors 50/60Hz, AC3 Category					Back Up		Independent Mounting Kit
		220V	380V	415V	440V	660V	Fuse Rating		
		KW	KW	KW	KW	KW	aM (A)	gL (A)	
TR2D09301	0.10-0.16	-	-	-	-	-	0.25	2	TA7D0964
TR2D09302	0.16-0.25	-	-	-	-	-	0.25	2	
TR2D09303	0.25-0.40	-	-	-	-	-	1	2	
TR2D09304	0.40-0.63	-	-	-	-	0.37	1	2	
TR2D09305	0.63-1.00	-	-	-	-	0.55	2	4	
TR2D09306	1.0-1.6	-	0.37	-	0.55	1.1	2	4	
TR2D093X6	1.25-2.0	-	0.55	0.75	0.75	1.3	4	6	
TR2D09307	1.6-2.5	0.37	0.75	1.1	1.1	1.5	4	6	
TR2D09308	2.5-4	0.75	1.5	1.5	1.5	3	6	10	
TR2D09310	4-6	1.1	2.2	2.2	2.2	4	8	16	
TR2D09312	5.5-8	1.5	3	3.7	3.7	5.5	12	20	
TR2D09314	7-10	2.2	4	4	4	7.5	12	20	
TR2D12316	9-13	3	5.5	5.5	5.5	10	16	25	
TR2D18321	12-18	4	7.5	9	9	15	20	35	
TR2D25322	17-25	5.5	11	11	11	18.5	25	50	
TR2DM32353	23-32	7.5	15	15	15	-	40	63	
TR2DM38355	30-38	10	18.5	22	22	30	40	100	

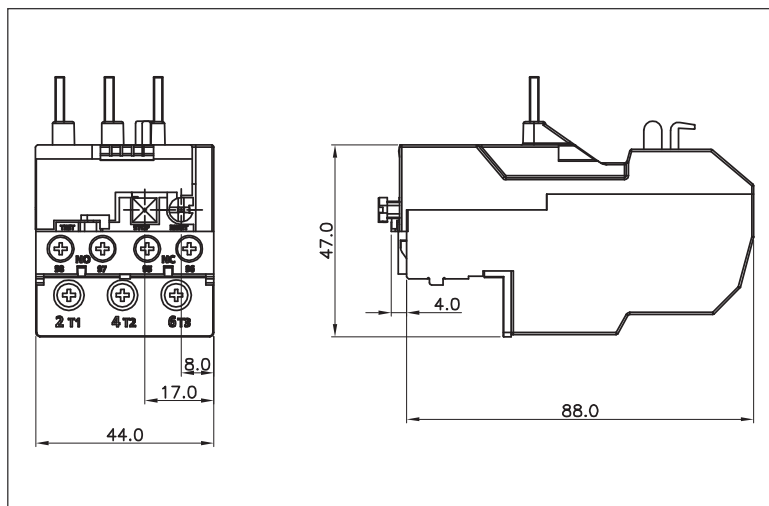
Tripping Curve



3 — Balanced operation, 3-phase, from cold state.
 1 — Balanced operation, 3-phase, after a prolonged period at the set current (hot state).
 2 — Operation, 2-phase, following the loss of one phase, from cold state.

NOTE: Tolerance on operating times ± 30%

Dimensions



Note: Relay fixing attachment for Contactor, Refer page no. 8

Coordination between protection & control components

Coordination: safety and restart after a short circuit

This benefit is obtained by choosing contactors with C&S Electric guaranteed Coordination.

What is coordination?

A contactor is said to be “coordinated” with the upstream protection device when its behavior is controlled in the event of a short circuit.

This behavior can be:

- Type1: guaranteed not to pose a danger to the work force and not to damage the installation. It is accepted the contactor should be destroyed or repaired.
- Type2: type1 + put back into service possible after any maintenance operation (contact separation, for example).



Selection Chart : Fuse Protected Feeders

Type-2 Co-ordination Iq=50kA @ 400/440V Confirming To IS / IEC 60947-4-1; IEC 60947-4-1

1. The full load current (FLC) indicated for 3 Phase motors are of ' Squirrel cage induction motors' at full load
2. Contactors / SCPD s indicated are of minimum ratings. Higher rating of these can be used.
3. Selection chart is for standard 3-phase, squirrel cage motor with average power factor and efficiency.
4. Selection is valid for complete C&S Electric Combinations only. In case these are changed to accommodate another brand / rating of other make, then this Type 2 coordination combination is not assured.
5. All SCPD - fuse ratings are AC-23 A as per IS/IEC 60947-3 & IEC 269 (part 1 & 2)
6. Normal motor starting time (<=5 Sec) is assumed.

DOL Starter Feeders

Standard Power Rating of 3 Phase Motor 50/60 Hz, AC3 Category (400/440V)			Contactor		Overload Relay		SCPD (Fuse Details)	
KW	HP	Full Load Current (A)	Type	AC3 Rating @ 440V	Type	Setting Current (A)	Type	Rating
0.37	0.5	0.88	TC1D0711	07A	TR2-D09305	0.63...1	CHF	4 A
0.55	0.75	1.1	TC1D0711	07A	TR2-D09306	1...1.6	CHF	4 A
0.75	1	1.5	TC1D0711	07A	TR2-D093X6	1.25...2	CDFL00 6A	6 A
1.1	1.5	1.9	TC1D0711	07A	TR2-D09307	1.6...2.5	CDFL00 6A	6 A
1.5	2	3.6	TC1D0711	07A	TR2-D09308	2.5...4	CDFL00 10A	10 A
2.2	3	4.9	TC1D0711	07A	TR2-D09310	4...6	CDFL00 16A	16 A
3.7	5	6.5	TC1D0911	09A	TR2-D09312	5.5...8	CDFL00 20A	20 A
4	5.5	8.5	TC1D0911	09A	TR2-D09314	7...10	CDFL00 20A	20 A
5.5	7.5	11.5	TC1D1211	12A	TR2-D12316	9...13	CDFL00 25A	25 A
9	12	15.5	TC1D1811	18A	TR2-D18321	12...18	CDFL00 35A	35 A
11	15	22	TC1D2511	25A	TR2-D25322	17...25	CDFL00 50A	50 A
15	20	29	TC1D3211	32A	TR2-DM32353	23...32	CDFL00 63A	63 A
18.5	20	35	TC1D3811	38A	TR2-DM32355	28...36	CDFL00 50A	100 A

Star Delta Starter Feeders

Standard Power Rating for 3Ø motor at 415V AC		FLC (Phase Current)	Contactor			Ac3 rating at 440V	Overload Relay		Recommended Back-up HRC Fuse Rating (A)		
KW	HP	I(A)	Main	Star	Delta		Type	Range (A)	Type	Rating	Make
1.5	2	2.3	TC1D0711	TC1D0711	TC1D0711	07A	TR2D09307	1.6 -2.5	CDFL00 6A	6A	C&S Electric Ltd.
3	4	4	TC1D0711	TC1D0711	TC1D0711	07A	TR2D09308	2.5-4	CDFL00 10A	10A	C&S Electric Ltd.
4	5.5	5	TC1D0711	TC1D0711	TC1D0711	07A	TR2D09310	4-6	CDFL00 16A	16A	C&S Electric Ltd.
5.5	7.5	6	TC1D0911	TC1D0911	TC1D0911	09A	TR2D09312	5.5-8	CDFL00 20A	20A	C&S Electric Ltd.
9	12	10	TC1D1211	TC1D1211	TC1D1211	12A	TR2D09314	7-10	CDFL00 20A	20A	C&S Electric Ltd.
11	15	12	TC1D1211	TC1D1211	TC1D1211	12A	TR2D12316	9-13	CDFL00 25A	25A	C&S Electric Ltd.
15	20	16	TC1D1811	TC1D1811	TC1D1811	18A	TR2D18321	12-18	CDFL00 35A	35A	C&S Electric Ltd.
18	25	21	TC1D2511	TC1D2511	TC1D2511	25A	TR2D25322	17-25	CDFL00 50A	50A	C&S Electric Ltd.
22	30	24	TC1D2511	TC1D2511	TC1D2511	25A	TR2D25322	17-25	CDFL00 50A	50A	C&S Electric Ltd.
25	35	30	TC1D3211	TC1D3211	TC1D3211	32A	TR2DM32353	23-32	CDFL00 63A	63A	C&S Electric Ltd.
30	40	33	TC1D3811	TC1D3811	TC1D3811	38A	TR2DM38355	28-36	CDFL00 100A	100A	C&S Electric Ltd.

Glossary

Altitude

The rarefied atmosphere at high altitude reduces the dielectric strength of the air and hence the rated operational voltage of the contactor. It also reduces the cooling effect of the air and hence the rated operational current of the contactor (unless the temperature drops at the same time).

No derating is necessary up to 3000 m.

Derating factors to be applied above this altitude for main pole operational voltage and current (a.c. supply) are as follows.

Altitude	3500 m	4000 m	4500 m	5000 m
Rated operational voltage	0.90	0.80	0.70	0.60
Rated operational current	0.92	0.90	0.88	0.86

Ambient air temperature

The temperature of the air surrounding the device, measured near to the device. The operating characteristics are given :
 - with no restriction for temperatures between - 5 and + 55 °C,
 - with restrictions, if necessary, for temperatures between - 50 and + 70 °C.

Rated operational current (Ie)

This is defined taking into account the rated operational voltage, operating rate and duty, utilisation category and ambient temperature around the device.

Rated conventional thermal current (Ith) (1)

The current which a closed contactor can sustain for a minimum of 8 hours without its temperature rise exceeding the limits given in the standards.

Permissible short time rating

The current which a closed contactor can sustain for a short time after a period of no load, without dangerous overheating.

Rated operational voltage (Ue)

This is the voltage value which, in conjunction with the rated operational current, determines the use of the contactor or starter, and on which the corresponding tests and the utilisation category are based. For 3-phase circuits it is expressed as the voltage between phases. Apart from exceptional cases such as rotor short-circuiting, the rated operational voltage Ue is less than or equal to the rated insulation voltage Ui.

Rated control circuit voltage (Uc)

The rated value of the control circuit voltage, on which the operating characteristics are based. For AC applications, the values are given for a near sinusoidal wave form (less than 5% total harmonic distortion).

Rated insulation voltage (Ui)

This is the voltage value used to define the insulation characteristics of a device and referred to in dielectric tests determining leakage paths and creepage distances. As the specifications are not identical for all standards, the rated value given for each of them is not necessarily the same.

Rated impulse withstand voltage (Uimp)

The peak value of a voltage surge which the device is able to withstand without breaking down.

Rated operational power (expressed in kW)

The rated power of the standard motor which can be switched by the contactor, at the stated operational voltage.

Rated breaking capacity (2)

This is the current value which the contactor can break in accordance with the breaking conditions specified in the IEC standard.

Rated making capacity (2)

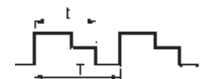
This is the current value which the contactor can make in accordance with the making conditions specified in the IEC standard.

On-load factor (m)

This is the ratio between the time the current flows (t) and the duration of the cycle (T)

$$m = \frac{t}{T}$$

Cycle duration: duration of current flow + time at zero current



Pole impedance

The impedance of one pole is the sum of the impedance of all the circuit components between the input terminal and the output terminal. The impedance comprises a resistive component (R) and an inductive component (X = L). The total impedance therefore depends on the frequency and is normally given for 50 Hz. This average value is given for the pole at its rated operational current.

Electrical durability

This is the average number of on-load operating cycles which the main pole contacts can perform without maintenance. The electrical durability depends on the utilisation category, the rated operational current and the rated operational voltage.

Mechanical durability

This is the average number of no-load operating cycles (i.e. with zero current flow through the main poles) which the contactor can perform without mechanical failure.

(1) Conventional thermal current, in free air, conforming to IEC standards.

(2) For AC applications, the breaking and making capacities are expressed by the rms value of the symmetrical component of the short-circuit current. Taking into account the maximum asymmetry which may exist in the circuit, the contacts therefore have to withstand a peak asymmetrical current which may be twice the rms symmetrical component.

Note : these definitions are extracted from standard IEC 60947-4-1.

Definitions

Contactor utilisation categories conforming to IEC 60947-4

The standard utilisation categories define the current values which the contactor must be able to make or break.

These values depend on:

- the type of load being switched : squirrel cage or slip ring motor, resistors,
- the conditions under which making or breaking takes place: motor stalled, starting or running, reversing, plugging.

AC Applications

Category AC-1

This category applies to all types of a.c. load with a power factor equal to or greater than 0.95 ($\cos \varphi \geq 0.95$).

Application examples: heating, distribution.

Category AC-2

This category applies to starting, plugging and inching of slip ring motors.

On closing, the contactor makes the starting current, which is about 2.5 times the rated current of the motor.

On opening, it must break the starting current, at a voltage less than or equal to the mains supply voltage.

Category AC-3

This category applies to squirrel cage motors with breaking during normal running of the motor.

On closing, the contactor makes the starting current, which is about 5 to 7 times the rated current of the motor.

On opening, it breaks the rated current drawn by the motor; at this point, the voltage at the contactor terminals is about 20% of the mains supply voltage. Breaking is light.

Application examples: all standard squirrel cage motors: lifts, escalators, conveyor belts, bucket elevators, compressors, pumps, mixers, air conditioning units, etc... .

Category AC-4

This category covers applications with plugging and inching of squirrel cage and slip ring motors.

The contactor closes at a current peak which may be as high as 5 or 7 times the rated motor current. On opening it breaks this same current at a voltage which is higher, the lower the motor speed. This voltage can be the same as the mains voltage. Breaking is severe

Application examples: printing machines, wire drawing machines, cranes and hoists, metallurgy industry.

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WAREHOUSES

NATIONAL WAREHOUSE

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DELHI	Khasra No. 915 & 916, 2nd Floor, Near Rice Mill, Village Rithala, Delhi-85 Ph.: (+91 11) 27049211
LUCKNOW	3rd Floor, E-143, Phase-I, Transport Nagar, Kanpur Road, Lucknow - 17 Ph.: (+91 522) 4103460
INDORE	Liberty Agencies 53, Udyog Nagar, Near Musakhedi Square, Ring Road, Indore-452001 Ph.: (+91) 88780-62000 / 64000
KOLKATA	113, Chetla Road, New Alipur, Kolkata - 700 053, Ph.: (+91 33) 22275849 - 51
RANCHI	Plot No. 145/C, Mandir Marg-D, Road No. 4, Ashok Nagar, Distt. Ranchi, Jharkhand - 834002 Ph.: (91 651) 2242202, 2242224
BHUBANESWAR	Rasharaj Geetikunj, Plot No. 224/A, Sec-A, Zone-B, Mancheswar Industrial Estate, Bhubaneswar-751 010 Ph.: (+91 674) 2580788
MUMBAI	E-5, Parasnath Complex. Gala No.8, Village 'VAL' Dapode Road, Taluka Bhiwandi, District, Thane - 421302 Ph.: (+91 2522) 314830
AHMEDABAD	B-25-B/C Meldi Industrial Estate, Opp. West Coast Pharmaceutical, Nr. Gota Over Bridge, Gota, Ahmedabad - 382481 Ph.: (+91 79) 65453044
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