

Comprehensive
Catalogue

2006



Susol
Super Solution

**Low voltage
circuit breakers**

LS Industrial Systems
www.lsis.biz

A-1. Overview

Range of LS's low voltage circuit breakers	A-1-1
Range of Susol products	A-1-3
Overview of TD/TS family	A-1-5
General	A-1-7
Standards & Approval	A-1-8
Structure	A-1-9
Marking and configuration	A-1-11
Overview of trip units	A-1-13
Switching mechanism	A-1-15
Degree of protection	A-1-16

Range of LS's low voltage circuit breakers

Susol

	Main switchboard	Main / Sub switchboard
Type of circuit breakers	ACB	MCCB
Rated current, In	630~5000A	16~800A
Breaking capacity, Icu	65~100kA	50, 65, 85, 100, 150kA
Service breaking capacity (% Icu), Ics	100%	100%
Rated short time withstand current, Icw	65~85kA	-
Applied standard	IEC 60947-2	IEC 60947-2
Utilization category	B	A
Image of circuit breaker		
Brand name	Ace-MEC	Susol
Image of brand		
Model name	LBA series	TD, TS series

Main / Sub switchboard			Final distribution
MCCB	MCCB	MCCB	MCB
16~1600A	3~1200A	15~600A	1~100A
35, 50, 85kA	35, 50, 85kA	35, 50, 85kA	35, 50, 85kA
75%	50%		
-	-	-	-
IEC 60947-2	IEC 60947-2	UL489	IEC 60947-2 / IEC 60898
A	A		
			
Meta-MEC	Meta-MEC	Meta-MEC	-
			
GB series	AB series	AB-U series	BK series

Range of Susol products

Susol

	160AF	250AF			
Susol TD circuit breakers					
For power distribution					
	TD100	TD160			
	Thermal magnetic trip unit				
	FTU	FTU			
	FMU	FMU			
Susol TS circuit breakers					
For power distribution					
			TS100	TS160	TS250
			Thermal magnetic trip unit		
			FTU (Fixed thermal, Fixed magnetic trip unit)		
			FMU (Adjustable thermal, Fixed magnetic trip unit)		
			ATU (Adjustable thermal, Adjustable magnetic trip unit)		
			Electronic trip unit		
			ETS (Electronic trip unit, Standard)		
Susol TS circuit breakers					
For motor protection			MTU (Magnetic only trip unit)		
Susol switch-disconnectors					
Switch disconnector					
	TD160NA	TS100NA	TS160NA	TS250NA	
	Disconnecting switch unit				
	DSU (Disconnecting switch unit)				

	630AF		800AF
For power distribution			
	Susol TS circuit breakers		
For power distribution			
	TS400	TS630	TS800
	Thermal magnetic trip unit		
	FTU (Fixed thermal, Fixed magnetic trip unit)		
	FMU (Adjustable thermal, Fixed magnetic trip unit)		
	ATU (Adjustable thermal, Adjustable magnetic trip unit)		
	Electronic trip unit		
	ETS (Electronic trip unit, Standard)		
ETM (Electronic trip unit, Multifunction)			
	Susol TS circuit breakers		
For motor protection	MTU (Magnetic only trip unit)		
	Susol switch-disconnectors		
Switch disconnector			
	TS400NA	TS630NA	TS 800NA
	Disconnecting switch unit		
	DSU (Disconnecting switch unit)		

Overview of TD/TS family

Susol

TD series



MCCBs for power distribution		
Frame size		[AF]
Rated current, In		[A]
No. of poles		
Rated operational voltage, Ue	AC	[V]
	DC	[V]
Rated impulse withstand voltage, Uimp		[kV]
Rated insulation voltage, Ui		[V]
Rated ultimate short-circuit breaking capacity, Icu		
AC 50/60Hz	220/240V	[kA]
	380/415V	[kA]
	440/460V	[kA]
	480/500V	[kA]
	660/690V	[kA]
DC	250V	[kA]
DC(2poles in series)	500V	[kA]
Rated service breaking capacity, Ics		[%Icu]

TD100			TD160			TS100		
100			160			100		
16~100			100, 125, 160			40~100		
2*, 3, 4			2*, 3, 4			2*, 3, 4		
690			690			690		
500			500			500		
8			8			8		
750			750			750		
N	H	L	N	H	L	N	H	L
85	100	200	85	100	200	100	120	200
50	85	150	50	85	150	50	85	150
50	70	130	50	70	130	50	70	130
30	50	65	30	50	65	42	65	85
5	8	10	5	8	10	10	15	20
42	65	100	42	65	100	50	85	100
42	65	100	42	65	100	50	85	100
100%	100%	100%	100%	100%	100%	100%	100%	100%

MCCBs for motor protection		
	Frame size	[A]
	Poles	
	Operational voltage, Ue	[V]
	Breaking capacities	
		Icu at 380/415V [kA]
	Trip unit	Magnetic only

-	-	100		
-	-	3		
-	-	690		
		N	H	L
-	-	50	85	150
-	-	●	●	●

Switch-disconnectors			
Rated thermal current, I _{th}		[A]	
Rated operational current, I _e		[A]	
Poles			
Operational voltage, U _e	AC 50-60Hz	[V]	
	DC	[V]	
Rated short-circuit making capacity, I _{cm}		[kA peak]	
Rated short-time withstand current, I _{cw}	1s	[A rms]	
	3s	[A rms]	
	20s	[A rms]	

-	160	100	
-	160	100	
-	2, 3, 4	2, 3, 4	
-	690	690	
-	500	500	
-	3.1	2.8	
-	2200	2000	
-	2200	2000	
-	960	690	

Basic dimensions			
front connection	3-pole	[mm]	
	4-pole	[mm]	

W	H	D	W	H	D	W	H	D
90	140	86	90	140	86	105	160	86
120	140	86	120	140	86	140	160	86

* Applicable to MCCBs equipped with FTU, FMU, ATU

* 2 pole MCCB in 3pole frame size ** 700A only available for TS800FTU

TS series



TS160			TS250			TS400			TS630			TS800		
160			250			400			630			800		
100, 125, 160			125, 160, 200, 250			300, 400			500, 630			700**, 800		
2*, 3, 4			2*, 3, 4			2*, 3, 4			2*, 3, 4			2*, 3, 4		
690			690			690			690			690		
500			500			500			500			500		
8			8			8			8			8		
750			750			750			750			750		
N	H	L	N	H	L	N	H	L	N	H	L	N	H	L
100	120	200	100	120	200	100	120	200	100	120	200	100	120	200
50	85	150	50	85	150	65	85	150	65	85	150	65	100	150
50	70	130	50	70	130	65	85	130	65	85	130	65	100	130
42	65	85	42	65	85	42	65	85	42	65	85	42	85	100
10	15	20	10	15	20	10	20	35	10	20	35	10	20	35
50	85	100	50	85	100	50	85	100	50	85	100	50	85	100
50	85	100	50	85	100	50	85	100	50	85	100	50	85	100
100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

160			250			400			630			800		
3			3			3			3			3		
690			690			690			690			690		
N	H	L	N	H	L	N	H	L	N	H	L	N	H	L
50	85	150	50	85	150	65	85	150	65	85	150	65	100	150
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

160			250			400			630			800		
160			250			400			630			800		
2, 3, 4			2, 3, 4			2, 3, 4			2, 3, 4			2, 3, 4		
690			690			690			690			690		
500			500			500			500			500		
3.6			4.9			7.1			8.5			12		
2500			3500			5000			6300			8000		
2500			3500			5000			6300			8000		
960			1350			1930			2320			2560		

W	H	D	W	H	D	W	H	D	W	H	D	W	H	D
105	160	86	105	160	86	140	260	110	140	260	110	210	320	135
140	160	86	140	160	86	185	260	110	185	260	110	280	320	135

TS 250L	
Ui 750V Uimp 8kV	
Ue(V)	Icu(kA)
220/240 ~	200 kA
380/415 ~	150 kA
440/460 ~	130 kA
480/500 ~	85 kA
660/690 ~	20 kA
250 ----	100 kA
Ics = 100% Icu	
50/60Hz	
	
IEC 60947-2 Cat. A	
LS Industrial Systems	
MADE IN KOREA	



Molded Case Circuit Breakers

The new series of TD and TS circuit-breakers is available in four frame sizes : 160, 250, 630, 800AF

The breakers are able to cover a range of service currents up to 800A and are available in the fixed version and plug-in version.

The breaking capacities, at 380/415V, are classified by following letters:

- N: 50kA for 160 and 250AF
- 65kA for 630 and 800AF
- H: 85kA for 160, 250 and 630AF
- 100kA for 800AF
- L: 150kA for 160, 250, 630, 800AF

TD & TS circuit-breakers are climate-proof. The breakers are intended for use in rooms where there are no excessive operating conditions (e.g. dust, corrosive vapors, gases).

If the circuit-breakers are used in dusty or humid locations, suitable enclosures should be provided. Sufficient fresh air supply must be provided if there are harmful gases (e.g. hydrogen-sulfide vapor) in the ambient air.

All Susol TD and TS circuit breakers offer positive contact indication and are suitable for isolation in compliance with standards IEC 60947-1 and 2.

TD & TS circuit-breakers are suitable for protection of

- Power distribution systems supplied by transformers or generators
- Motor and generator

A switch-disconnector of Susol TD and TS circuit breakers is available for for circuit control and isolation.

Standards & Approval

Susol

MCCB

CE



Susol-TD and TS series circuit breakers and auxiliaries comply with the following international standard:

IEC 60947-1

Low-voltage switchgear and controlgear
- Part 1: General rules

IEC 60947-2

Low-voltage switchgear and controlgear
- Part 2: Circuit-breakers

IEC 60947-3

Low-voltage switchgear and controlgear
- Part 3: Switches, disconnectors, switchdisconnectors and fuse-combination units

IEC 60947-4

Low-voltage switchgear and controlgear
- Part 4-1: Contactors and motor-starters
Electromechanical contactors and motor starters
Switches, disconnectors, switchdisconnectors
- Part 4-2: Contactors and motor-starters
AC semiconductor motor controllers and starters
- Part 4-3: Contactors and motor-starters
AC semiconductor controllers and contactors for non-motor loads

The following certificates are available on a request.

- CE Declaration of conformity
- Certificate of conformance test (CB) - IEC 60947
- Full type test report issued by KEMA
- Certificate of conformance test - CCC (China)
- Letter of origin

CE conformity marking

The CE conformity marking shall indicate conformity to all the obligations imposed on the manufacturer, as regards his products, by virtue of the European Community directives providing for the affixing of the CE marking.

When the CE marking is affixed on a product, it represents a declaration of the manufacturer or of his authorized representative that the product in question conforms to all the applicable provisions including the conformity assessment procedures. This prevents the Member States from limiting the marketing and putting into service of products bearing the CE marking, unless this measure is justified by the proved non-conformity of the product.

IECEE CB SCHEME

The IECEE CB Scheme is the world's first truly international system for acceptance of test reports dealing with the safety of electrical and electronic products. It is a multilateral agreement among participating countries and certification organizations. A manufacturer utilizing a CB test report issued by one of these organizations can obtain national certification in all other member countries of the CB Scheme.

The Scheme is based on the use of international (IEC) Standards. If some members' national standards are not yet completely harmonized with IEC Standards, national differences are permitted if clearly declared to all other members. The CB Scheme utilizes CB Test Certificates to attest that product samples have successfully passed the appropriate tests and are in compliance with the requirements of the relevant IEC Standard and with the declared national differences of various member countries.

The main objective of the Scheme, is to facilitate trade by promoting harmonization of the national standards with international Standards and cooperation among product certifiers worldwide in order to bring product manufacturers a step closer to the ideal concept of "one product, one test, one mark, where applicable".

Structure

Susol

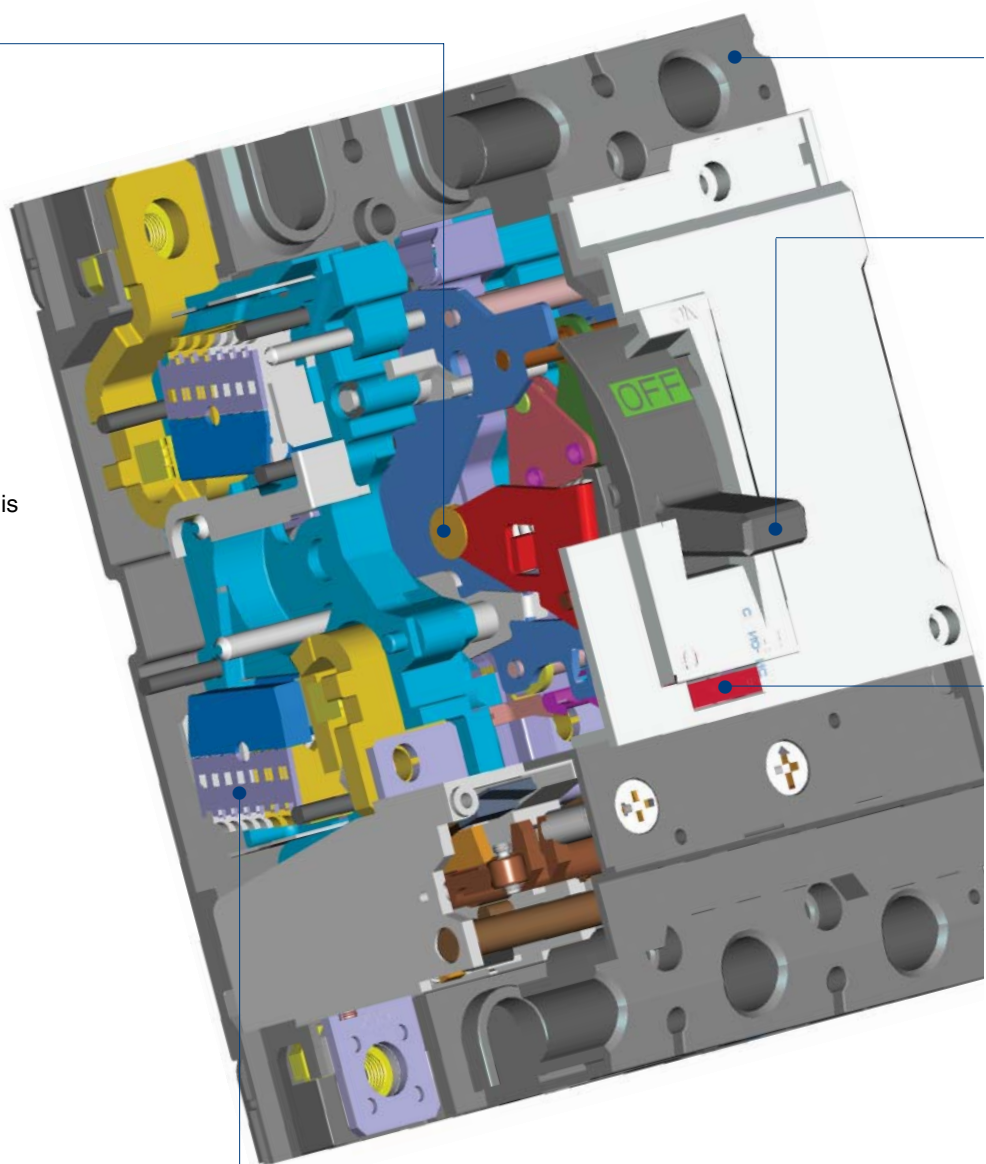
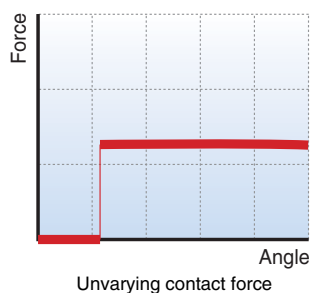
The primary components are: a switching mechanism, an automatic tripping device (and manual trip button), contacts, an arc-extinguishing device, terminals and a molded case.

Mechanism unit

- Unvarying contact force regardless of over travel
- RTA (Rapid Toggle Area)
Open speed of moving contact is rapid by **optimized cam curve** regardless of trip signal



Optimized cam curve



Molded case

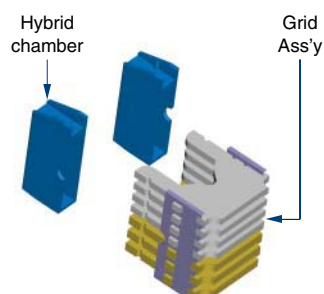
- UL94 V-0 flame retarded
- High strength

Trip button (push to trip)

- Enables tripping mechanically from outside, for confirming the operation of the accessory switches and the manual resetting function.

Arc-Extinguishing unit

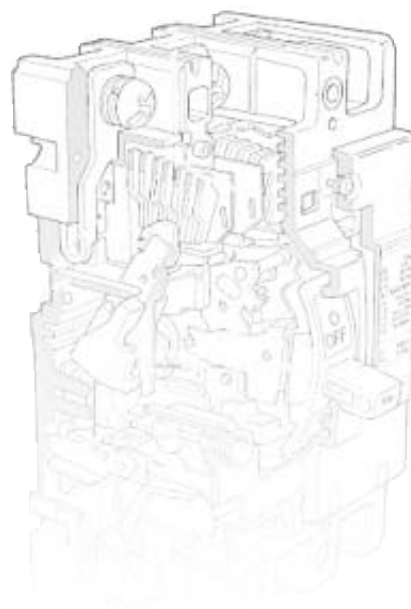
- PASQ Type Quenching Chamber
- Very superior to increasing arc voltage during short time
- PASQ ;
 - Puffer Assisted Self-Quenching
 - Patented by LSIS



Handle

- Function of indications
 - "ON" "OFF" "TRIP"
- Resetting

When the handle indicates "tripped" position it must first be reset by moving the handle to the "OFF" position and then closing is possible
- Trip-Free even if the handle is held at "ON", the breaker will trip if an over current flows
- Suitable for Verification of the main contact position under abnormal conditions because the handle doesn't indicate open position



Marking and configuration

Susol



Rated frequency

Standard

Manufacturer

Utilization category

Symbol indicating suitability for isolation as defined by IEC 947-2



Model (Rating and breaking capacity)

- TS: Series
- 250: Max. Ampere rating
- N: Normal (Standard)
- H: High
- L: Current limiting

Standardized characteristics:

- Ui: Rated insulation voltage
- Uimp: Impulse withstand voltage
- Ue: Rated operational voltage
- Icu: Ultimate breaking capacity
- Ics: Service breaking capacity

	160AF	250AF	630AF	800AF
N	TD100N	TS100N	TS400N	TS800N
-	TD160N	TS160N	TS630N	-
-	-	TS250N	-	-
H	TD100H	TS100H	TS400H	TS800H
-	TD160H	TS160H	TS630H	-
-	-	TS250H	-	-
L	TD100L	TS100L	TS400L	TS800L
-	TD160L	TS160L	TS630L	-
-	-	TS250L	-	-

N	50kA	50kA	65kA	65kA
H	85kA	85kA	85kA	100kA
L	150kA	150kA	150kA	150kA

Product: Molded Case Circuit Breaker

Upstream connections

Fixing hole

Certificate plate

Indication of closed (I/ON) position

Brand name

Operating handle

Indication of open (O/OFF) position

Company logo

"push to trip" button

Rating of trip unit

Trip unit

Fixing hole

Downstream connections

Overview of trip units

Susol

On TS100 to TS800 circuit breakers, the thermal-magnetic and electronic trip units are interchangeable and may be rapidly fitted to the circuit breakers.

It is therefore easy to change the protection of a given circuit following a modification in an installation. On TS400 and 630 circuit breakers, the electronic trip units are interchangeable plug-in modules. Trip unit ETM offers a large number of protection settings.

Each Trip devices has different types of protection depending on the associated trip unit:

- Standard protection,
- Protection of networks supplied by line distribution,
- Protection of long cables,
- Protection of DC networks,
- Protection of motor-starters,
- Service connection circuit breaker (for special subscriber contracts)

Susol TD100, TD160 circuit breakers may be equipped with either FTU or FMU.

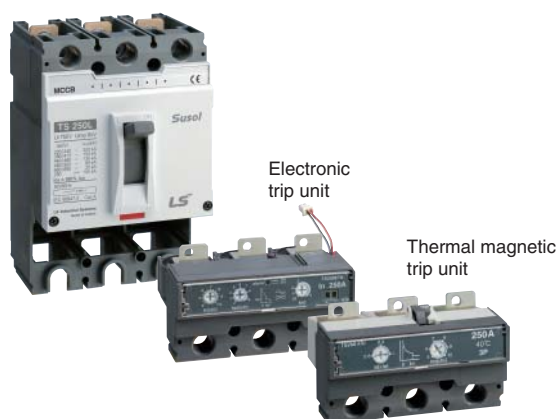
The trip units are not interchangeable types and can be supplied only after fixed with circuit breakers.

Ampere ratings

MCCB frame type			Rated current, In[A]					
		Type of trip unit	Thermal magnetic release				Electronic release	
			FTU	FMU	ATU	MTU	ETS	ETM
	TD100	Built in unit	16, 20, 25, 32, 40, 50, 63, 80, 100	16, 20, 25, 32, 40, 50, 63, 80, 100	-	-	-	-
	TD160		100, 125, 160	100, 125, 160	-	-	-	-
	TS100	Inter changeable trip unit	40, 50, 63, 80, 100	40, 50, 63, 80, 100	-	1.6, 3.2, 6.3, 12, 20, 32, 50, 63, 100	40, 80	-
	TS160		100, 125, 160	100, 125, 160	100, 125, 160	32, 50, 63, 100, 160	40, 80, 160	-
	TS250		125, 160, 200, 250	125, 160, 200, 250	125, 160, 200, 250	100, 160, 220	40, 80, 160, 250	-
	TS400		300, 400	300, 400	300, 400	320	160, 250, 400	160, 250, 400
	TS630		500, 630	500, 630	500, 630	500	160, 250, 400, 630	160, 250, 400, 630
	TS800		700, 800	800	800	630	630, 800	630, 800

Types of trip units

FTU	• Fixed thermal, Fixed magnetic
FMU	• Adjustable thermal, Fixed magnetic
ATU	• Adjustable thermal, Adjustable magnetic
MTU	• Magnetic only
ETS	• Electronic (LSI)
ETM	• Electronic (LSIG, Ammeter, Communication, Zone selective interlocking)
DSU	• Disconnecting switch

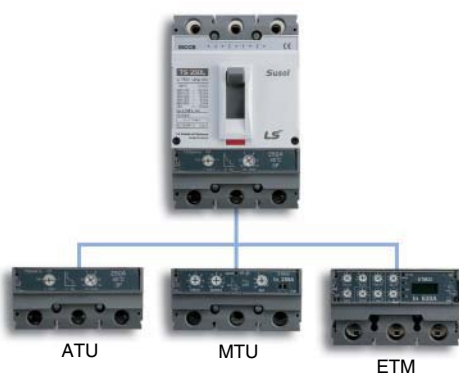


Trip unit identification

TS250 **FMU**

Trip unit function

MCCB frame type



FTU Fixed-thermal, fixed-magnetic

TS250 FTU

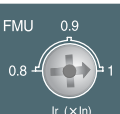


$I_m=2500A$

250A
40°C
3P

FMU Adjustable-thermal, fixed-magnetic

TS250 FMU



$I_m=2500A$

250A
40°C
3P

ATU Adjustable-thermal, adjustable-magnetic

TS250 ATU



$I_m=2500A$

250A
40°C
3P

MTU Magnetic only

TS250MTU



$I_m=2500A$

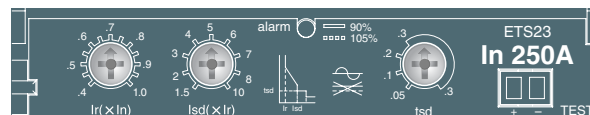
220A
3P

DSU Disconnecting switch

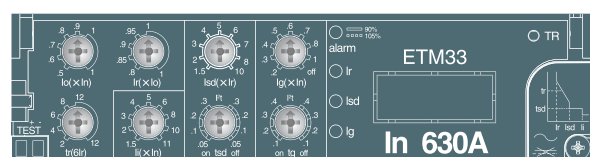
TS250 DSU

3P

ETS Electronic (LSI)



ETM Electronic (LSIG, multi-function unit)



Switching mechanism

Susol

Double contactor structure

Optimize

Repulsion force

Shape of contactor

- Induce easily the arc mobility to grid direction
- Rapidly redeploy the arc from moving contactor
- Prevent contact tip from erosion

Open speed & contact force

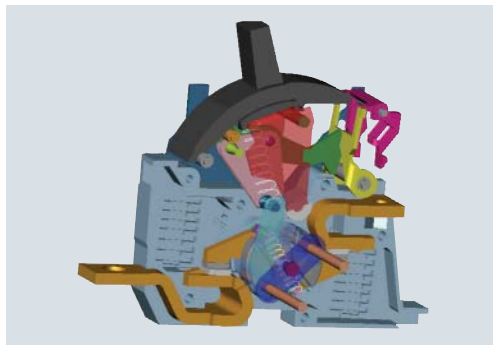


Fig. 3 "ON" position

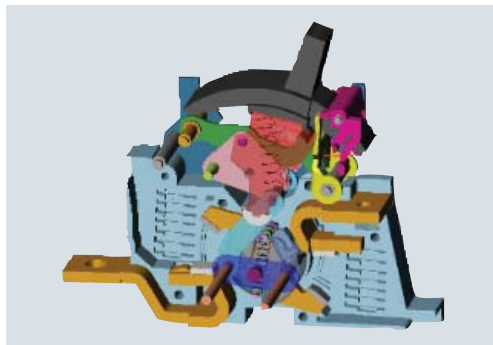


Fig. 4 "OFF" position

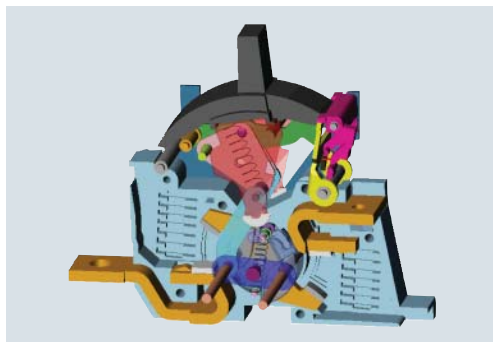
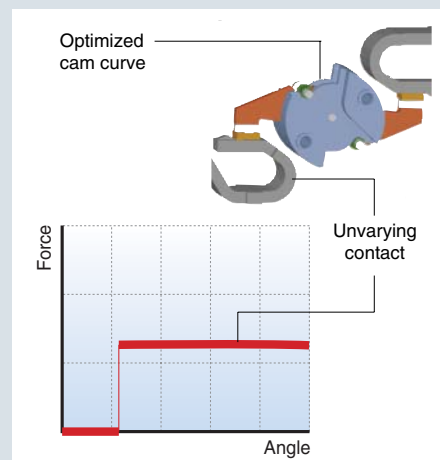


Fig. 5 "TRIP" position

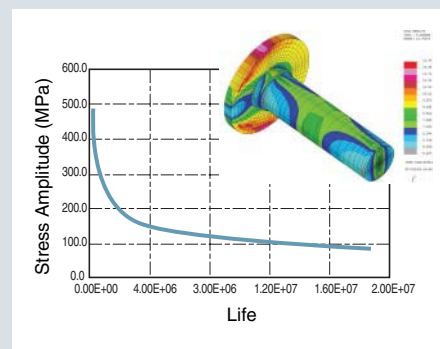
ON position

- Unvarying contact force regardless of over travel
- Open speed of moving contact is rapid by optimized cam curve regardless of trip signal
- Function of trip free



OFF position

- Push to trip in OFF position
 - * Reset pin moment < Main spring moment
- Stability of endurance



TRIP position

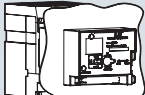
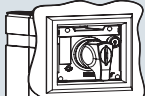
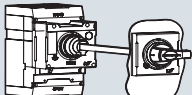
- Enables tripping mechanically from outside, for confirming the operation of the accessory switches and the manual resetting function

Degree of protection

Susol

The table indicates the degrees of protection guaranteed by Susol TD and TS circuit-breakers according to several type of installation. Basically, the fixed parts are always preset with IP20 degree of protection.

IP65 degree of protection can be obtained with the circuit-breaker installed in a switchboard fitted with an extended rotary handle operating mechanism transmitted on the compartment door.

Type	Degree of protection	IP	Protection of persons against access to hazardous parts with:
 Circuit breaker	Full penetration of 12.5mm diameter sphere not allowed. The jointed test finger shall have adequate clearance from hazardous parts	IP20	Wire
 Circuit breaker with terminal cover	The access probe of 2.5mm diameter shall not penetrate.	IP30	Wire
 Plug-in circuit breaker	Full penetration of 12.5mm diameter sphere not allowed. The jointed test finger shall have adequate clearance from hazardous parts. * When the circuit breaker is installed and the supplied covers are mounted.	IP20 or IP30	Wire
 Circuit breaker with cover frame for door cutout	The access probe of 1.0mm shall not penetrate.	IP40	Wire
 Circuit breaker with cover frame and motor operator	The access probe of 1.0mm diameter shall not penetrate.	IP40	Wire
 Circuit breaker with cover frame and rotary direct handle	The access probe of 1.0mm diameter shall not penetrate.	IP40	Wire
 Circuit breaker with cover frame and rotary extended handle	Totally protected against ingress of dust and water jets from any direction	IP65	Wire