

Safety Cautions

- Read the entire "Instruction Manual" carefully for important information about safety, handling, installation, operation, maintenance, and parts replacements.
- This equipment is designed and built in accordance with applicable safety standard in effect on the date of manufacture. Unauthorized modifications will void warranty and can result in severe injury, death and property damage. Do not make any modifications to the equipment.
- Only qualified persons are to install, operate or service this equipment according to all applicable codes and established safety practices.
- Use only genuine Toshiba replacement parts and accessories. Improper components could cause the equipment malfunction.
- Do not install this equipment in areas where unusual service conditions exist. Using this equipment in other than usual service conditions can result in equipment failure.
- Do not exceed the ratings specified on the equipment nameplate or system accessories. Underrated equipment can fail during operation causing fire, explosion, severe injury, death, and property damage.

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• The data given in this catalog are subject to change without notice.

KSP-E2368 (AD)4
2008-11(1.5)

Printed in Japan

TOSHIBA
Leading Innovation >>>

HIGH-VOLTAGE VACUUM CONTACTORS AND VACUUM COMBINATION UNITS



NEW SERIES HIGH-VOLTAGE VACUUM CONTACTORS AND VACUUM COMBINATION UNITS

Since the introduction of the first Vacuum Interrupter in 1962, Toshiba has been continuously improving and developing Vacuum Technology. Over 180 thousands Toshiba Vacuum Contactors and Combination Units have been installed, providing reliable services in wide variety of applications worldwide. Consistent with its dedication to the most advanced vacuum technology, Toshiba offers new series of High-voltage vacuum contactors and Vacuum Combination Units with fuses. By adopting an electronics controlled circuit and being designed compactly to ensure reliability, handling ease and safety, the new series of High-voltage Vacuum Contactors and Vacuum Combination Units with fuses are suitable for Motor starters, Transformer feeders and Capacitor switching applications.



FEATURES

Compact and Lightweight

Compact and slim design contactors can be applied to either two-tier motor starters or slim starters per IEC 60470(2000). The Contactors CV-6GA and CV-6HA have the same outline and mounting dimensions, as well as dual voltage ratings (3.6/7.2kV).

Excellent Breaking Performance

Since the higher interrupting capacity and short-time withstand capability, Toshiba Vacuum Contactors are appropriate to fuse combination for large capacity load, and to high-speed breaking.

No Surge Protection Required

Special main contact materials minimize chopping current. No surge suppressor/arrester is required except for special applications.

Conformity to Industrial Standard

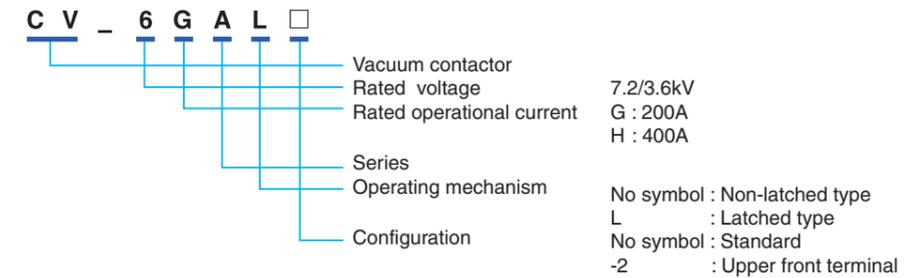
Conforming to international standards such as IEC, BS, AS and JEM, being certified by class NK and TÜV Toshiba Vacuum Contactors can be used widely all over the world.

Low Power Consumption

The control device adopts an IC circuit, the control voltage either AC or DC can be easily changed by switches in the electronic circuit board without changing the coil and/or other parts. Since the economizing resistors are eliminated, the power consumption in holding condition has been reduced.

VACUUM CONTACTORS

Type-Form



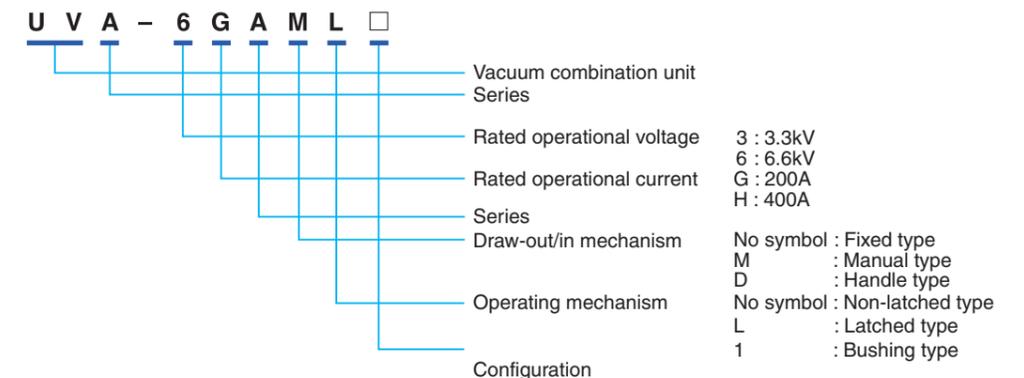
Series

Fixed type 7.2/3.6kV	Ratings		Standard	Special
	200A-6.3kA	Non-latched type	CV-6GA	
	Latched type	CV-6GAL		
400A-6.3kA	Non-latched type	CV-6HA	CV-6HA-2	
	Latched type	CV-6HAL	CV-6HAL-2	

* Note : Other ratings are available, refer to catalog KSP-E2412.

VACUUM COMBINATION UNITS

Type-Form



Series

Type	Ratings			Manual type	Handle type	Fixed type
Standard				3.3kV	200A - 40kA	Non-latched
			Latched	UVA-3GAML	UVA-3GADL	UVA-3GAL
	6.6kV	200A - 40kA	Non-latched	UVA-6GAM	UVA-6GAD	UVA-6GA
			Latched	UVA-6GAML	UVA-6GADL	UVA-6GAL
		400A - 40kA	Non-latched	UVA-3HAM	UVA-3HAD	UVA-3HA
			Latched	UVA-3HAML	UVA-3HADL	UVA-3HAL
			Non-latched	UVA-6HAM	UVA-6HAD	UVA-6HA
			Latched	UVA-6HAML	UVA-6HADL	UVA-6HAL
Bushing	3.3kV	200A - 40kA	Non-latched	UVA-3GAM1	UVA-3GAD1	
			Latched	UVA-3GAML1	UVA-3GADL1	
		400A - 40kA	Non-latched	UVA-3HAM1	UVA-3HAD1	
			Latched	UVA-3HAML1	UVA-3HADL1	
	6.6kV	200A - 40kA	Non-latched	UVA-6GAM1	UVA-6GAD1	
			Latched	UVA-6GAML1	UVA-6GADL1	
		400A - 40kA	Non-latched	UVA-6HAM1	UVA-6HAD1	
			Latched	UVA-6HAML1	UVA-6HADL1	

VACUUM CONTACTORS

RATINGS AND SPECIFICATIONS

Type		CV			
From	Standard	6GA	6HA	6GAL	6HAL
	Upper front terminal	—	6HA-2	—	6HAL-2
Operating Mechanism		Non-Latched		Latched	
Rated Voltage (Ur)		3.6/7.2kV			
Rated Operational Current (Ie)		200A	400A	200A	400A
Thermal Current (Ith)		300A	450A	300A	450A
Rated Frequency		50/60Hz			
Rated Short-time Withstand Current (Ik)		6300A- 1s	6300A- 2s	6300A- 1s	6300A- 2s
Rated peak Withstand Current (Ip)		15.8kA			
Short-circuit Making and Breaking Current (Duty)		6300A "O" - 3min. - "CO" -3min. - "CO"			
Making Current (100times) AC4		2000A	4000A	2000A	4000A
Breaking Current (25times) AC4		1600A	3200A	1600A	3200A
Withstand Overload Current		1200A-30s	2400A-30s	1200A-30s	2400A-30s
6 times of Ie - 30s		4000A-4s	4000A-12s	4000A-4s	4000A-12s
15 times of Ie - 1s		6300A-1s	6300A-2s	6300A-1s	6300A-2s
Coordination with Current-limiting Fuses		Prospective Short-circuit Current 40kA			
Cut-off Current (Peak)		55kA	85kA	55kA	85kA
Rated Insulation Level	Power Frequency Withstand Voltage	22kV-1min. *1			
	Impulse Withstand Voltage	60kV			
Switching frequency (AC3)		1200 op. cycles/hr		300 op. cycles/hr	
Endurance	Mechanical Life	2.5mill.		0.25mill.	
	Electrical Life (AC3)	0.25mill.		0.25mill.	
Rated Control Voltage	Closing	100-110, 115-120, 200-220, 230-240VAC/100-110, 200-220VDC			
	Tripping	24, 32, 48, 100-110, 200-220VDC			
Allowable Control Voltage Fluctuation		85% to 110% of the rated control voltage			
Operating Current (at 100V)	Closing	4.5A (Peak)			
	Holding/Tripping	0.1A (Average)		4.0A (Peak)	
Closing Time		65 - 80ms			
Opening Time		20 - 30ms			
Ratings of Auxiliary Contact	Contact arrangement	3NO-3NC		2NO-2NC	
	Operational voltage	Max. 480V, Min. 48V			
	Thermal Current	10A			
	AC Capacity	700VA (PF. 0.35)			
	DC Capacity	60W (L/R 150ms)			
Application Condition	Installation	Floor Mount Vertical Installation			
	Altitude	1000m or lower			
	Ambient air temperature	-5 to 40°C			
	Relative humidity	45 to 85%			
	Vibration	Max. 20Hz 1G			
Shock		Max. 30G			
Maximum Load	Motor (kW)	750/1500	1500/3000	750/1500	1500/3000
	Transformer (kVA)	1000/2000	2000/4000	1000/2000	2000/4000
	Capacitor (kvar)	1000/2000	2000/2000	1000/2000	2000/2000
Weight		19.0kg	19.5kg	19.5kg	20.0kg
Standard *2		IEC60470 (2000) JEM1167 (1990)			

*1 : Special withstand voltage (32kV-1min.) will be supplied by request.
*2 : CE marking can be available by request.

VACUUM COMBINATION UNITS

RATINGS AND SPECIFICATIONS

Type		UVA				
Form	Non-Latched	Manual type	3GAM	3HAM	6GAM	6HAM
		Handle type	3GAD	3HAD	6GAD	6HAD
	Latched	Manual type	3GAML	3HAML	6GAML	6HAML
		Handle type	3GADL	3HADL	6GADL	6HADL
Rated Insulation Voltage		3.6kV		7.2kV		
Rated Operational Voltage		3.3kV		6.6kV		
Rated Operational Current		200A	400A	200A	400A	
Rated Frequency		50/60Hz				
Rated Interrupting Current (With power Fuses)		40kA				
Rated Insulation Level	Power Frequency Withstand Voltage	16kV-1min.		22kV-1min.		
	Impulse Withstand Voltage	45kV		60kV		
Rated Control Voltage	Closing	100-110V, 115-120, 200-220, 230-240VAC/100-110,200-220VDC				
	Tripping	100-110V, 200-220VDC				
Allowable Control Voltage Fluctuation		85% to 110% of the rated control voltage				
Operating Current (at AC100V)	Closing	4.5A(Peak)				
	Holding/Tripping	0.1A(Average Holding) / 4.0A(Peak Tripping)				
Closing Time		65 - 80ms				
Opening Time		20 - 30ms				
Ratings of Auxiliary Contact	Contact arrangement	Non-Latched 3NO-2NC, Latched 2NO-2NC				
	Operational voltage	Max. 480V, Min. 48V				
	Thermal current	10A				
	AC capacity	700VA(PF. 0.35)				
	DC capacity	60W(L/R 150ms)				
Application Condition	Installation	Floor Mount Installation				
	Altitude	1000m or lower				
	Ambient air temperature	-5 to 40°C				
	Relative humidity	45 to 85%				
	Vibration	Max. 20Hz 1G				
Shock		Max. 30G				
Connection Method		Main and Earthing circuit ; Automatic connection Control circuit ; Manual plug connection				
Position		2 Positions "Connected" and "Disconnected"				
Shutter Provision		Insulation shutter provided				
Control Wire (color and size)		Yellow, 1.25mm ²				
Maximum load	Motor (kW)	750	1500	1500	3000	
	Transformer (kVA)	1000	2000	2000	4000	
	Capacitor (kvar)	1000	2000	2000	2000	
Approx. Weight	Withdrawable portion	70kg	70kg	75kg	75kg	
	Total	90kg	90kg	95kg	95kg	
Standard		IEC60470 JEM1225 (1986)				

VACUUM CONTACTORS

APPLICATION AND SELECTION

OPERATING COIL EXCITATION

Non-Latched
(Continuous Excitation)

Mainly applied to frequent switching operation such as motor.

Latched
(Instantaneous Excitation)

Mainly applied to non-frequent switching operation and/or to the important load which require to be contact closed even by power loss.

PROTECTION COORDINATION

The protection coordination with upper/lower stream relay shall be evaluated by considering total system and load characteristics.

The single-phase protection shall be performed which may be occurred by power fuses.

(Apply 2E-relay or fuse blown detection which is provided on combination unit as standard.)

APPLICATION GUIDE TO SURGE

No surge protection is required except for special application, however the insulation coordination shall be evaluated by following table.

Load	Protection	Notice
Rotating Machine	Not required	<ul style="list-style-type: none"> ●The surge suppressor shall be installed for machine rated at 55kW or below, and/or be subject to inching operation. ●The surge suppressor shall be installed between starting contactor and autotransformer for machine started by autotransformer. ●The suppressor shall be installed for machine which has inferior insulation.
Dry-type Transformer	Not required	The surge arrester shall be installed for transformer rated at 150kVA or below and exciting inrush is interrupted.
Oil-immersed Transformer	Not required	The installation of suppressor and insulation coordination shall be evaluated when the low surge level apparatus are connected on secondary circuit of transformer.
Capacitor	Not required	Refer to the clause for capacitor application.

- The surge suppressor is composed of capacitor and series resistor, and is one of the most excellent protection mediums. The device features suppression as well as a decrease of surge generation. Particularly being free from limitation on the number of operating times, this device is suitable for protecting motors and transformer required performing frequent operations.
- The surge arrester has no effect of suppressing the surge generation, this suppresses overvoltage to within a fixed level.

NOTICE FOR APPLICATION

CAPACITOR APPLICATION

- The current limiting fuses shall be combined for capacitor switching application.
- The series reactor shall be connected, especially back-to-back application.
- Service life of capacitor switching

The switching, opening and closing, of capacitor produces severe condition for contactor, such as high frequency inrush current and interpole recovery voltage higher than twice of normal voltage.

The criteria of maximum number of capacitor switching are shown in the figure below. The vacuum interrupters should be replaced when the number of switching operations reached to point shown in figure.

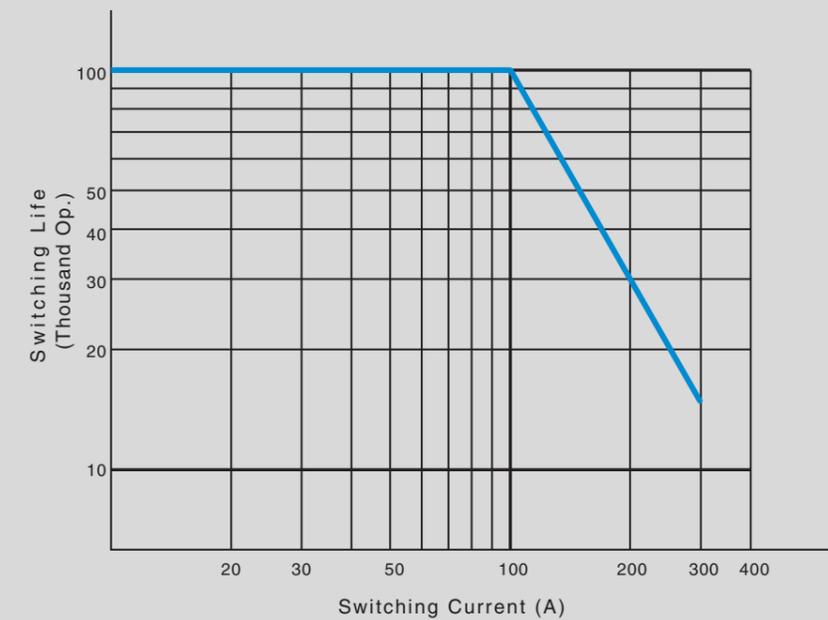


Fig. 1 Capacitor Switching Life (with 6% reactor)

TERMINAL CONNECTION

Either terminals, upper or lower, can be used for power or load side on contactor.

The upper terminals shall be connected to power side on combination unit for the protection coordination.

CONTROL TRANSFORMER

The contactor can be operated with following burden of control transformer.

Type Form (Contactor)	Control Transformer	VT
CV-6GA(L), 6HA(L)	400VA or more	100VA 10P10

VACUUM CONTACTORS

OUTLINE DIMENSIONS

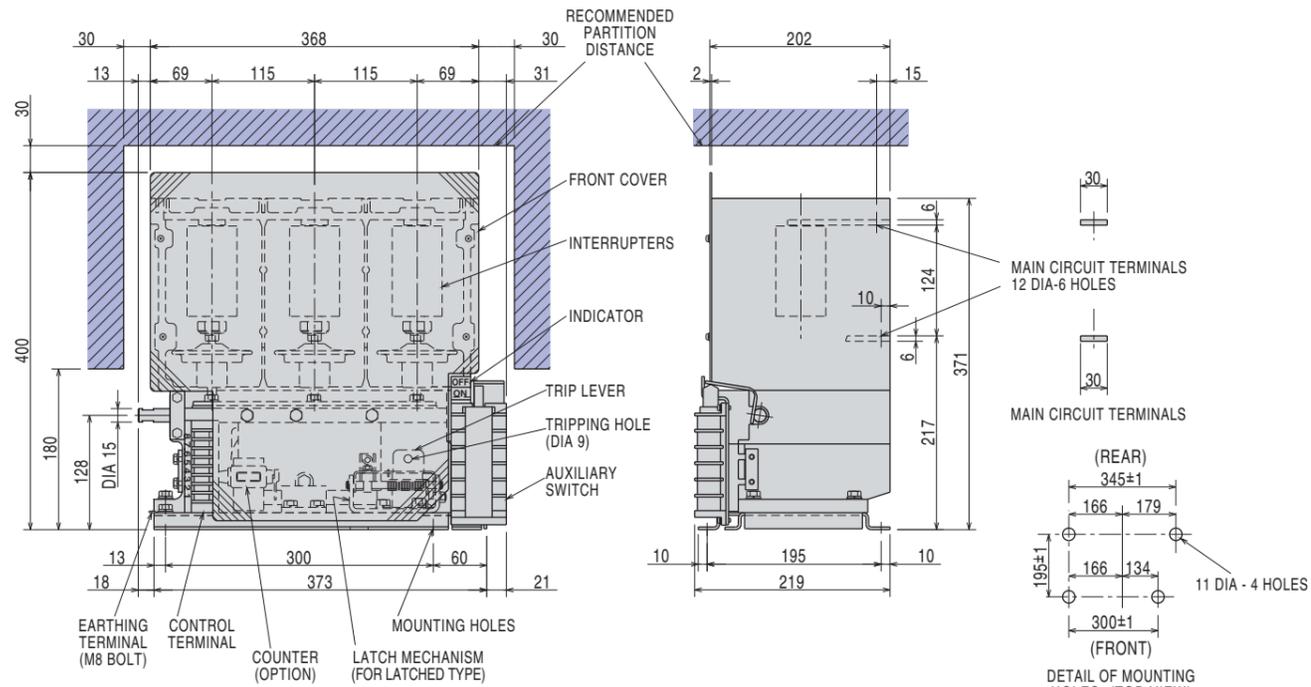


Fig. 2 Types CV-6GA(L)/CV-6HA(L)

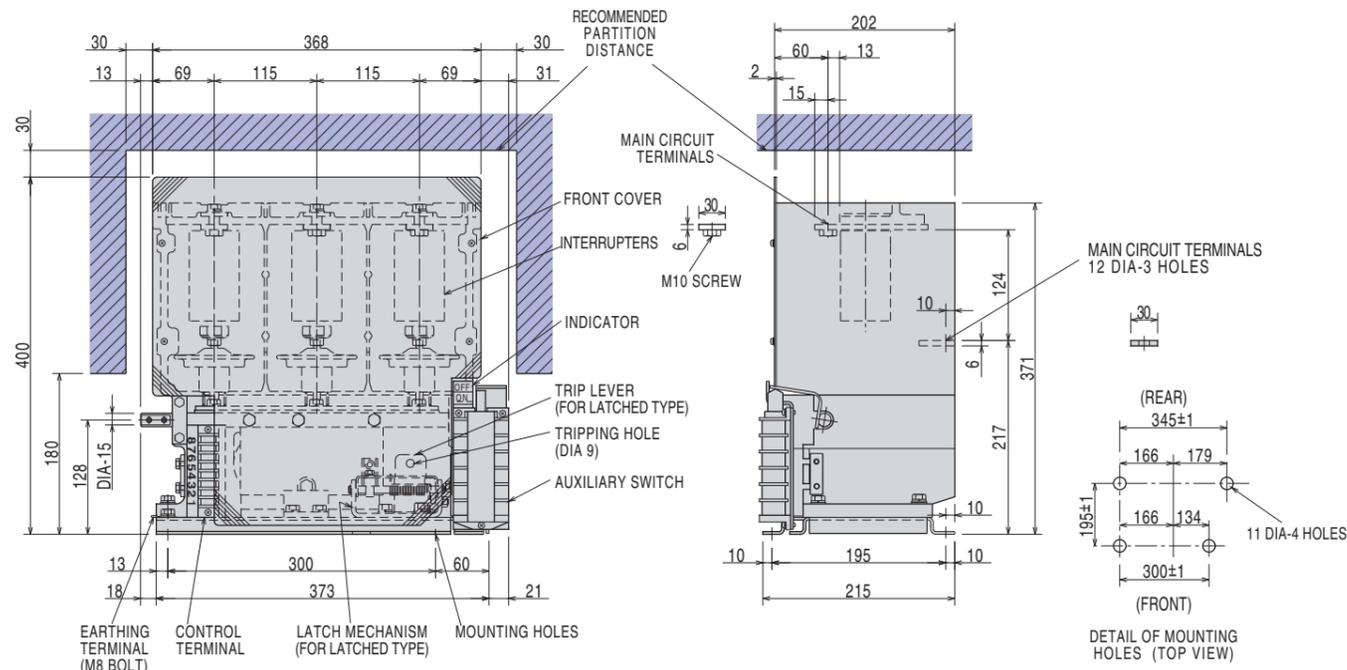


Fig. 3 Types CV-6HA(L)-2

OPERATING CIRCUITS

Non-latched type High-Voltage Vacuum Contactors

The typical operating circuit is shown in Fig. 4 indicating type CV-6GA/6HA contactor. Make sure to use the "NO" contacts of quick operating relay (4) self-holding circuit. Do not use the "NO" auxiliary contacts of vacuum contactor, this may cause the welding of main contacts when the start (ON) button is pushed incompletely. (refer to the marked 1 in figure) Make sure to switch the closing coil on DC side. Should the coil be switched on AC side, a discharging circuit will be formed by rectifiers against coil, resulting in prolonged opening time and lowered breaking performance. (refer to the marked 2 in figure)

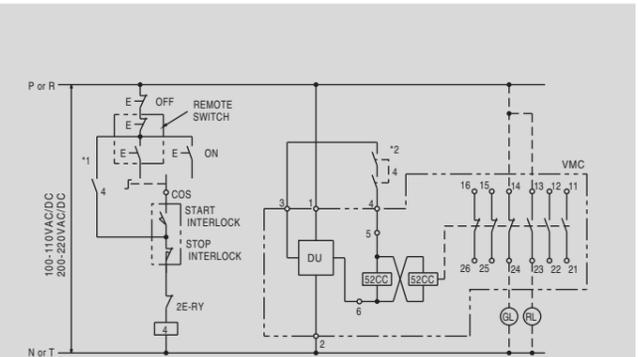


Fig. 4 Non-latched type operating circuit

Latched type High-Voltage Vacuum Contactors

The typical operating circuit is shown in Fig. 5 specifying type CV-6GAL/6HAL contactor. The electrical trip free circuit must be furnished in control circuit. (outside of contactor) A stable DC power source such as battery is recommended for control circuit. If the DC power source is not available, employ the AC closing and capacitor trip device for tripping. Make sure to use the "NO" auxiliary contacts (11-21) of vacuum contactor in trip circuit, and "NC" auxiliary contacts (16-26) of vacuum contactor for control relay circuit.

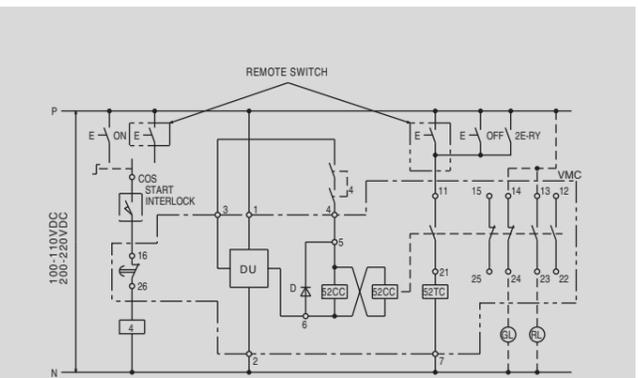


Fig. 5 Latched type operating circuit

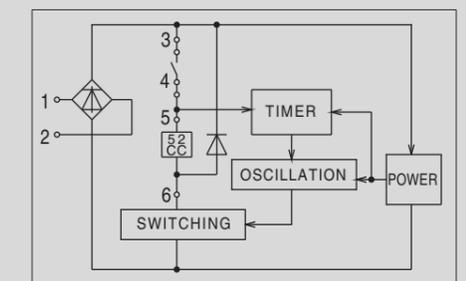


Fig. 6 Configuration of Drive-Unit

VACUUM COMBINATION UNITS

OPERATING CIRCUITS

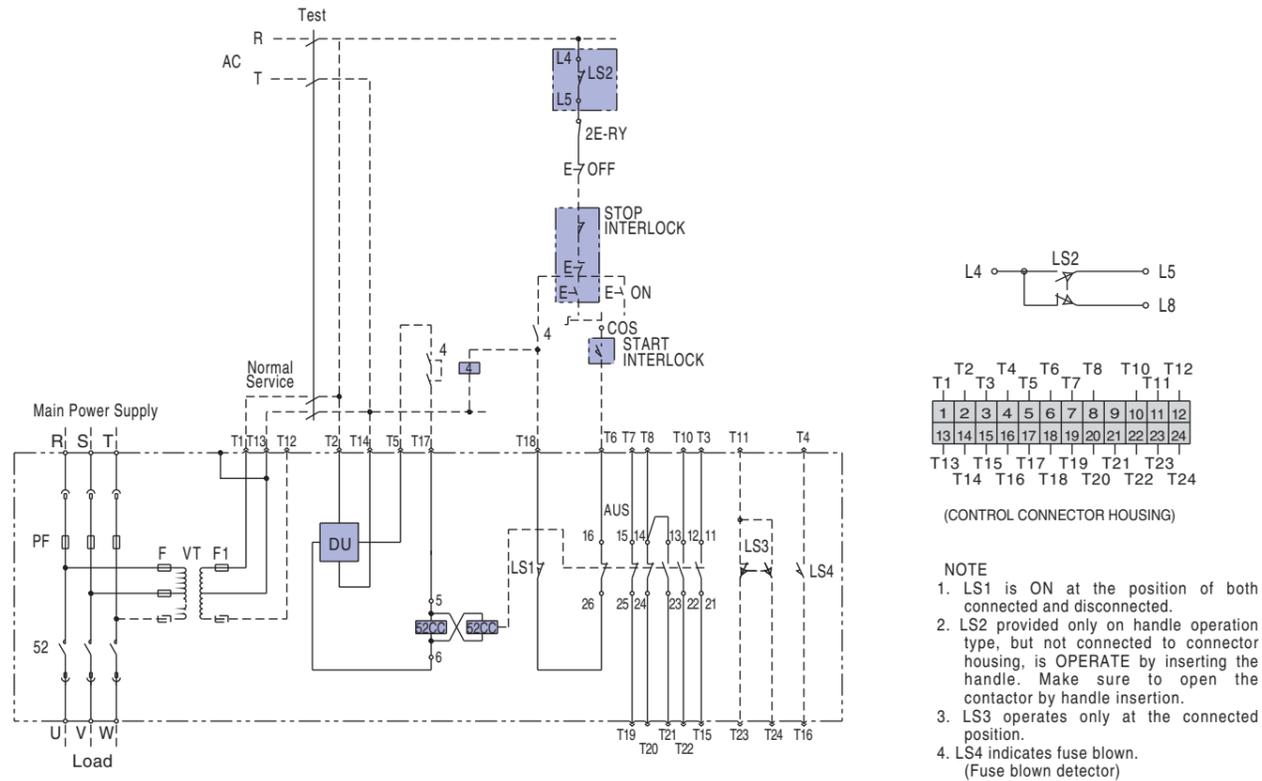


Fig. 11 Non-latched type (AC operation)

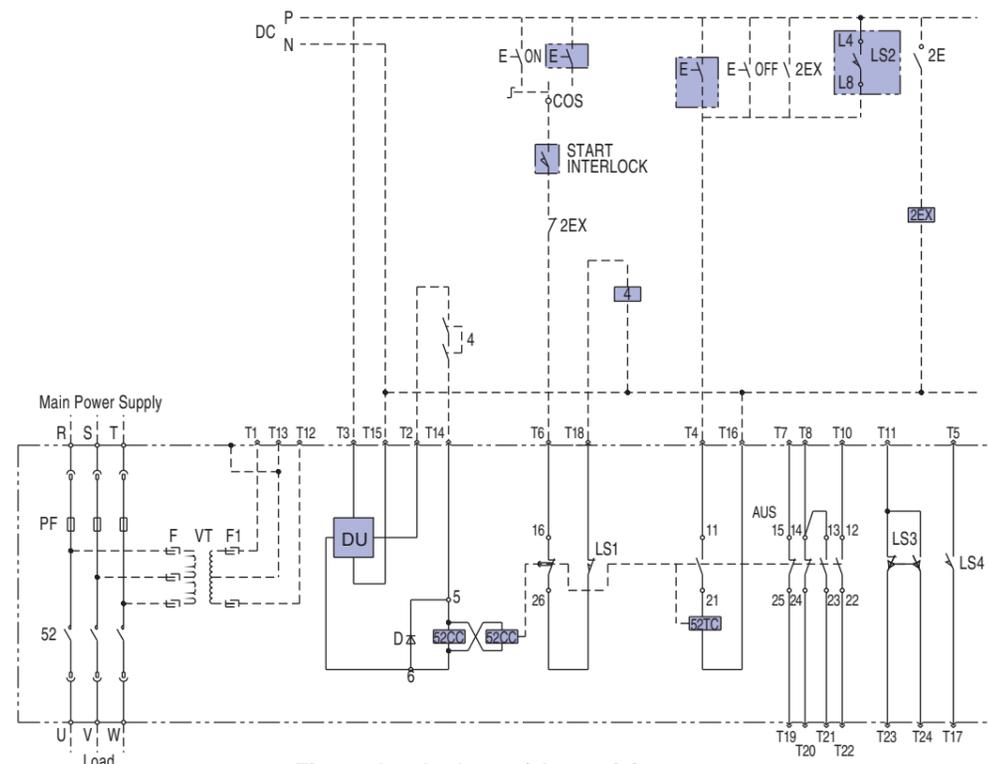


Fig. 12 Latched type (shunt trip)

INTERLOCKS

The electrical and mechanical interlocks are provided on Combination unit as described below to prevent misoperation and to ensure high safety.

- The unit can not be withdrawn from the "CONNECTED" position, while the contactor is "ON".
- The unit can not be inserted into the "CONNECTED" position, while the contactor is "ON".
- The contactor can not be closed, unless the unit is either in the "CONNECTED" or "DISCONNECTED" position.
- ◎ The cubicle door can not be opened, unless the unit is in the "DISCONNECTED" position. (note)
- ◎ The unit can not be inserted into the "CONNECTED" position, unless the cubicle door is closed. (note)
- ◎ The operating handle can not be extracted, unless the unit is either in the "CONNECTED" or "DISCONNECTED" position.
- ◎ The contactor is "OFF" by inserting the operating handle. (Refer to Notes on page 11.)
- ◎ The unit can be padlocked at the "CONNECTED" and "DISCONNECTED" position.

(Note) The front door must be adjusted when the interlocks are employed.

Parts Position	Interlock Position	Shaft Position	Arm Position	Name Plate for ON-OFF Indicator	Inserting Direction of Handle
Draw-out Position					
Disconnected Position	"A"	"B"	"D"	OFF	"B"
Connected Position	"B"	"C"	"E"	ON	"C"

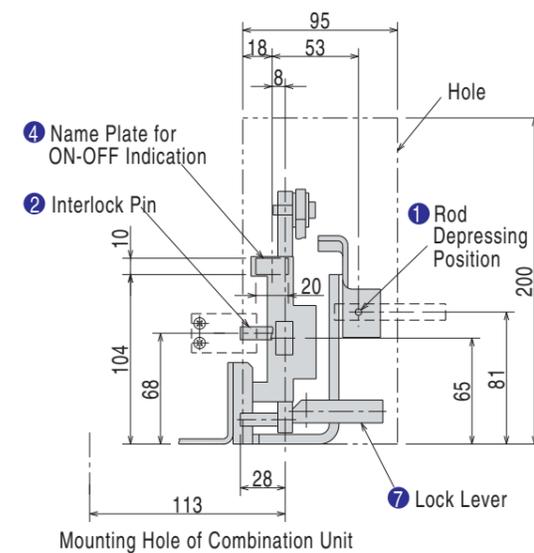


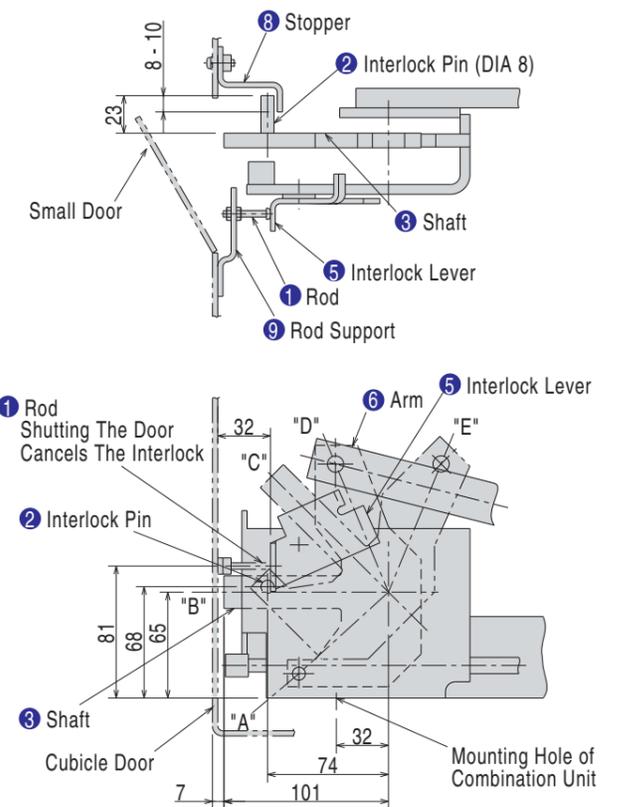
Fig. 13 Withdraw mechanism and hole for handle operation type

How to furnish the front door with interlocks

When performing interlocks between the handle operation type unit and front door, conduct the design by adopting following steps, referring to Fig. 13.

- ◎ Preparation of small door
 - Provide the front door with a small door for handle operation. (approx. size 95X200)
- ◎ Interlock to prevent door opening at connected position
 - The interlock pin in the connected position is at "B" position. Attach a stopper for the interlock pin to door so that the interlock pin can be clasped and the door can not be opened. The stopper may be installed with screws for emergency door open by removing screws.
- ◎ Interlock to prevent handle operation at door opening
 - Provide a rod on door side for interlock lever release and adjust the length of rod.
- ◎ Provide the small hole (approx. 12X22) at location of ON-OFF indication for confirmation of unit position.

Symbol marked ◎ indicate for handle operation type



MODIFICATION

○ : Provided as Standard △ : Option upon request

Name of parts		Contactor		Combination Units			Remarks
		CV	Manual type	Handle type	Fixed type		
Counter		△	△	△	△	Option	
Position switch	LS3	—	○	○	—	Connected position (1NO-1NC)	
	LS7	—	△	△	—	Disconnected position (1NO)	
Blown fuse detector	LS4	—	○	○	○	1NO	
VT (1unit)		—	○	○	△	Provided only on Non-latched	
Additional VT		—	△	△	△	Max. 2VT	
Insulation barrier		—	△	△	—	Partition between power and load terminals	
Insulation fuse barrier		—	△	△	△	For the earthing side	
Shutter padlock provision		—	△	△	—	Padlock not provided	
Position padlock provision		—	△	△	—	Padlock not provided	
Earthing switch		—	—	△	—	For load side cable	

ACCESSORIES PROVIDED AS STANDARD

○ : Supplied — : Not supplied

Name of parts	Contactor		Combination Units			Remarks
	CV	Manual type	Handle type	Fixed type		
Wipe gauge	○	○	○	○	○	For checking contact wear
Trip rod	○	○	○	○	○	For latched type only
Connector housing and pins as loose parts	—	○	○	○	○	Crimping tool No.720725-1 Tyco Electronics AMP. CO.

● Wipe gauge

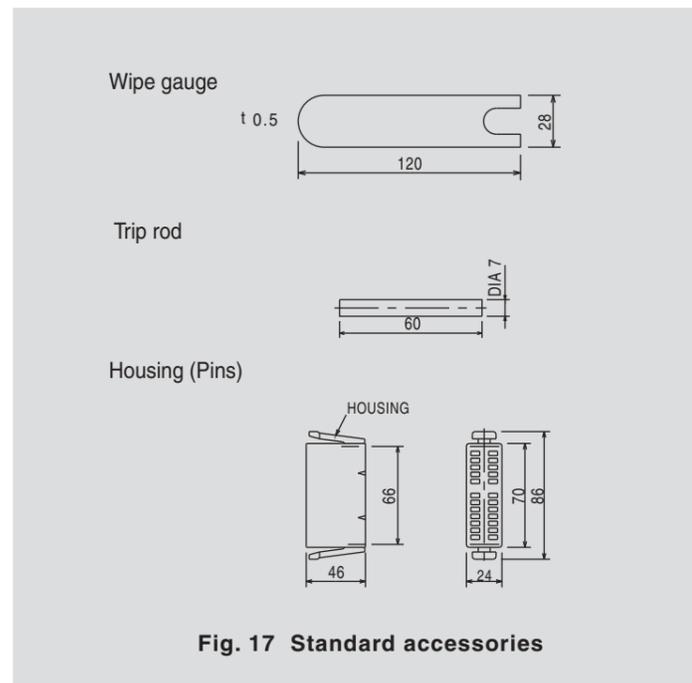
The wipe gauge can be used for checking contact wear of vacuum interrupters. Refer to the instruction manual for using this gauge.

● Trip rod

The trip rod may be used for manual tripping for latched contactor and combination unit, however this operation shall be maintenance purpose or emergency case only.

● Connector housing and pins as loose parts

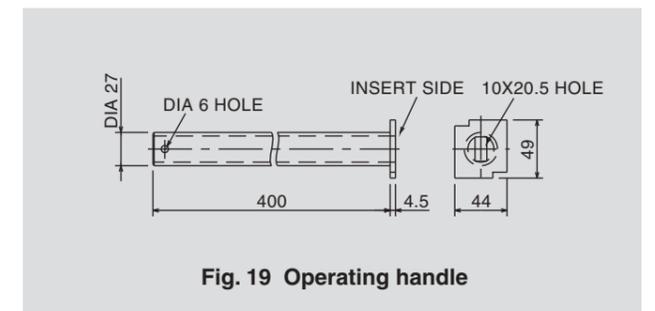
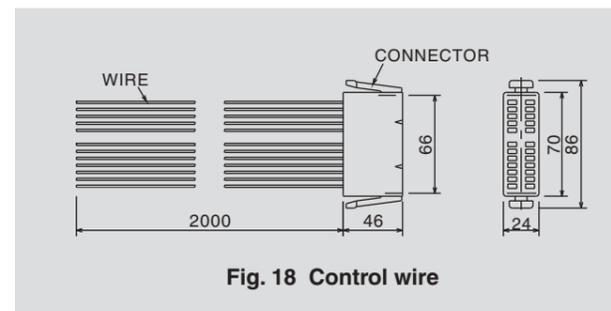
These parts are for the connection of control circuit in combination unit.



OPTIONAL ACCESSORIES UPON REQUEST

△ : Supplied — : Not supplied

Name of parts		Contactor		Combination Units			Remarks
		CV	Manual type	Handle type	Fixed type		
Control wire		—	△	△	△	With plug (2mm ² X 2m)	
Control test wire		—	△	△	△	With plug and socket (2mm ² X 2m)	
Operating handle		—	—	△	—	For Handle type	
Capacitor trip device	LC9	△	△	△	△	For Latched type 100/110VAC for 100-110V coil 200/220VAC for 200-220V coil 100/200VAC for 100-110V coil	
	LC10	△	△	△	△		
	CIT-10Q	△	△	△	△		
CR Surge suppressor		△	△	△	△	NV60K304T1 (See Page 5)	
Mechanical interlock		△	—	—	—	(See Fig. 20)	



● Capacitor trip device

The capacitor trip device will be used for latched contactor when DC power source is not available. The device charges from AC power, and supplies DC power to the trip coil at trip command. The alarm contact is provided on CIT-10Q.

● Mechanical interlock

The mechanical interlock shall be used in the reversing starter to prevent mechanically from closing the forward and reverse contactors simultaneously.

The following vertical pitch interlocks are available for CV-6 series contactors.

Vertical pitch 450mm and 550mm

