

Pure silver contacts

# C-TYPE MANUAL SWITCH SERIES

C-type tap changing switches for transformers

~~CD type load changing switches for multi circuits~~

~~CHF type changing switches for high frequency circuits~~

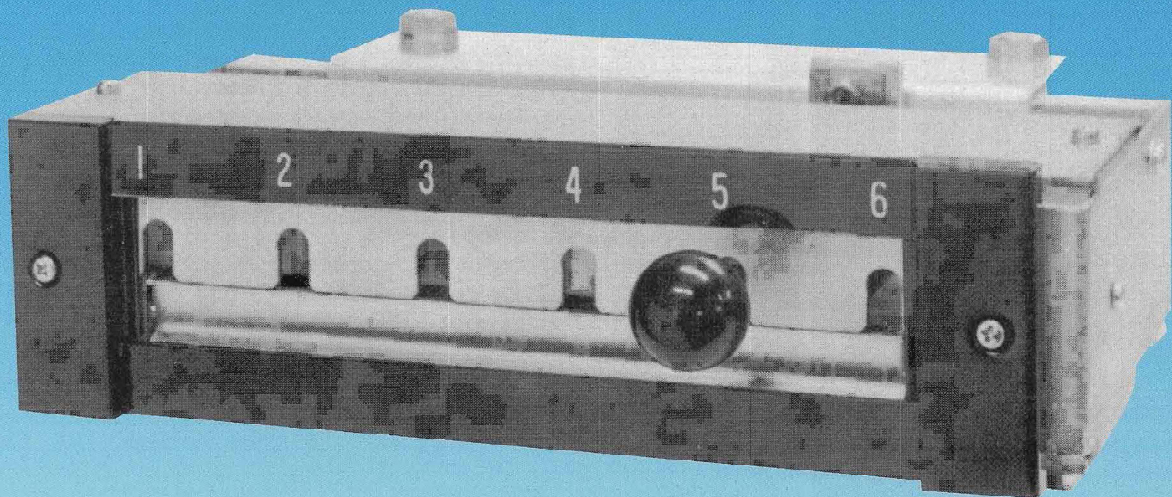
JPN PAT	864124
"	864125
"	1264861
"	1319220
USA PAT	3796845
U K PAT	1396921
GER PAT	2227628
Can PAT	982202
ITALY PAT	956025
F R PAT	7219134

## ■OUTLINE

The C-type manual switches have been accepted in the industry for their superb performance and reliability for offload changeover in various electrical applications.

The special features of these switches, which include extremely low heat-build up around the contacts, very strong mechanical structure and tight electrical insulation, assures trouble free operation in extreme conditions.

The revolutionary developments incorporated in the C-type switch series, which are covered by patents in 7 countries have eliminated many of the faults of the conventional blade type and cam-type changeover switches in use today.



C-type, single phase, 100A, 6 taps

## ■USE

The C-type series of manual switches are best suited for;

- Transformers of electric furnaces, welders, rectifiers etc.
- ~~1Khz - 10Khz high frequency circuits, inverter circuits,~~ electrical test circuits etc
- Changeover of multiple power supply and loads

HAKKO ELECTRIC CO., LTD.

# NO.21



## Pure silver contacts

# C-TYPE MANUAL SWITCH SERIES

### ■ Significant Features

(1) Special attention was given in the manufacture for ease of operation, high heat resistance in both conductive and insulated parts and strength and exchangeability in component parts. This has made these switches easy and safe to operate.

(2) Due to the state of the art design, the expected temperature rise around the contact points are less than half of the limits specified in the JIS standards(see graph 1). Furthermore owing to the use of pure silver on the contacts there is an added safety factor for temperature considerations.

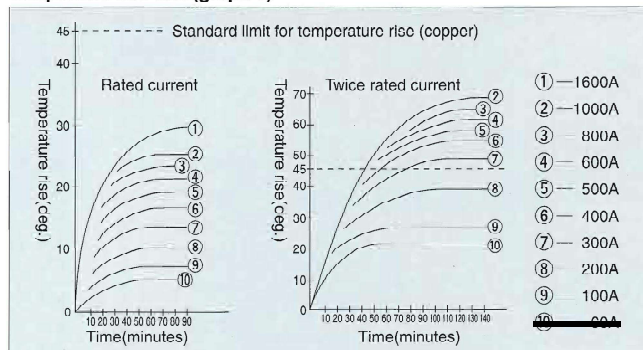
(3) Since the mechanism of the switch is so made for complete transfer of the contacts from one point to another, there is no danger of accidentally connecting more than one circuit together.

(4) Due to the refined structure of the connecting points, the conductivity of the connecting points are hardly affected by heat and distortion of the contact surface.

(5) The relatively thin and rectangular shape of the switch, with all of the terminals aligned in a straight line at the back, offers both economy in space and ease of connection and will reduce the total cost of the Distributor Panel on which the switches will be used.

(6) Due to the simple configuration at the front, it would be very easy to add safety considerations to the switch, such as handle locks, limiter switches etc. This feature will become handy for safety requirements and also for designing the circuitry of the Distributor Panel itself.

### Temperature rise test (graph 1)



### ■ THE STRUCTURE OF THE SWITCHES

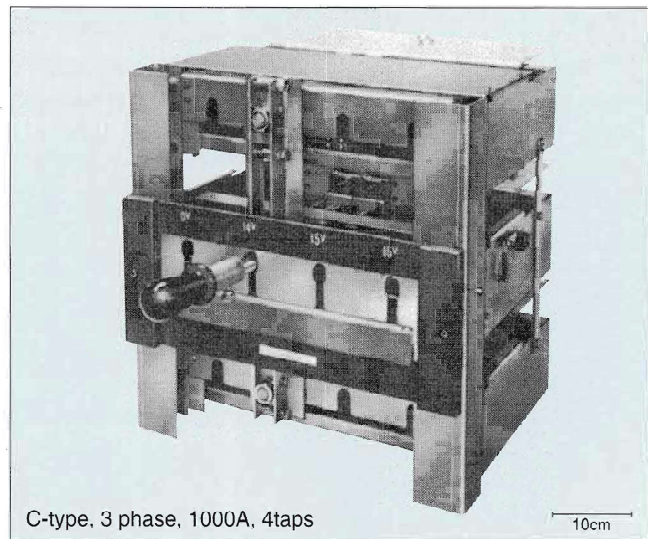
These switches are designed for installation on dead-front type panels, on which power lines are not accessible from the outside. By such design, these switches can be easily installed simply by cutting the panel to the specified size.

Clear numerical markings above the control handles give the front panel a distinct look while all of the connecting terminals are located at the rear in a single line.

The 3 phase unit consists of three single phase units stacked together and is controlled by one single handle for simultaneous switching of three phases, together.

(1) The contacts, both the fixed and movable ones are made of solid copper with pure silver chips wax-jointed on the surface (not so, for 60A and 100A units). For the 200A~500A units, a sub-contact is provided for each main contact to protect the contact surface from arc discharges.

(2) Pressure springs are provided to hold and maintain pressure between the fixed and movable contacts. The springs are made of heat sasoned stainless steel and are highly corrosion resistant. Furthermore since the springs are isolated from the electrical feed and thus are not subject to



high temperatures, the springs are not likely to deteriorate easily and contact pressure over the connections can be maintained for a long time.

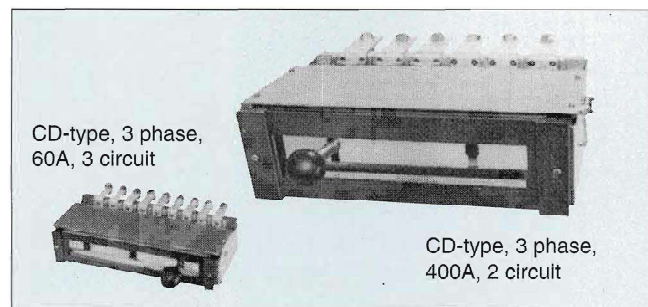
(3) Flexible support of the contacts is another feature of the C type switch series. Such arrangement allows for an even balanced connection of the fixed and movable contacts even when misalignments occur on the contacts.

(4) A toggle mechanism is introduced in the switching operation which amplifies the pressure given by the control handle to the contacts and keeps the pressure in place even after the pressure is released from the control handle. On the release, the same mechanism works to disconnect the contacts after which a spring will ensure the circuit to remain open.

(5) A wiping motion is introduced between the contacts when the switch is put on and off. This is to ensure that the face of the contacts is always kept clean. Caution is taken that the wiping force does not distort the contact face by uneven pressures applied during such motions.

(6) The main components of the switches are made of high-grade steel treated for corrosion and heat and are highly endurable in various working conditions.

(7) Electrical insulation is provided by reinforced polyester resin and epoxy resins both of which are highly resistant to heat, arc discharges and chemicals.



### ■ Water cooled direct coil changeover(JAP PAT.-1191890)

This product taps the water cooled high current secondary coil of high frequency transformers to directly extract current from the coil itself. This is done by direct wax joining of fixed contacts to the coil and eliminates the need for lead and extra wiring that would otherwise be required. This product is custom manufactured depending on the structure and size of the secondary coil.



## ■ OPERATION

A simple movement of the control handle in the outer direction will easily disengage the contacts with the assistance of a spring mechanism.

The control handle and hence the movable contacts can then be smoothly moved horizontally to the desired point to where the switching is intended.

The control handle can be set in the desired tap by simply pushing it in place for immediate contact.

**(Note; This switch is intended for operation under zero load. Please, do not operate with positive loads)**

## ■ RATINGS and SPECIFICATIONS

Model name	Ratings						Specifications					Switch on torque		Weight
	Current (A)	Voltage (Earth) 50/60Hz (V)	Voltage (between taps) (V)	Voltage (common between taps) (V)	Standard number of taps	Number of phases	Terminal screw size (mm)	Size of terminal (mm) w×t	With or without contact for arc discharge	Smallest isolation distance (mm)	Specification for limit switch for signals	For single phase (kg)	For 3 phase (kg)	For single phase, 6-taps (kg)
<del>C60</del>	<del>60</del>	660	<del>660</del>	1,000	2~15	1,2,3	<del>6</del>	<del>12×4</del>	None	<del>8</del>	OMRON V-152-1A5	<del>1.7</del>	<del>6.5</del>	<del>8.8</del>
C100	100	"	500	"	"	"	8	16×3	"	10	"	2.9	6	1.7
C200	200	"	"	"	2~12	"	"	25×4	Provided	14	"	6.3	11	3.8
C300	300	"	660	"	"	"	10	30×5	"	15	"	7.3	13	6.5
C400	400	"	"	2,000	2~10	"	12	40×5	"	19	OMRON Z-15GL	13	17	11.3
C500	500	"	"	"	"	"	"	50×5	"	"	"	16	19	12.3
C600	600	"	"	"	"	"	"	50×6	None	24	"	17	20	13.2
C800	800	"	"	"	2~6	"	12×2	75×6	"	"	"	20	24	19.5
C1000	1000	"	"	"	"	"	"	75×8	"	"	"	22	27	21.3
C1600	1600	"	"	"	2~4	1	12×4	125×8	"	"	"	30		53.0

### ■ Customized requirements

(after consultation with customer)

#### (1) For high voltage applications

For applications above 3 KV (against earth), such as for test circuits, we perform tests of 10,000V/one minute, at wide insulation widths.

#### (2) Special use of limit switch

Special limit switches can be incorporated in the design of our switches to meet customer's demands, such as when a signal is required only when the tap is at a certain point, or when specific ON or OFF indications are required.

#### (3) Circuitry for specific requirements

For instance, if there is a requirement to sequentially and frequently switch a parallel set of capacitors on and off, it is possible to arrange the movable contacts in parallel to serve such a purpose.

#### (4) Tropical use considerations

We are capable of modifying our switches to meet tropical specifications by silver plating of electrical connections, applying silicone varnish to the insulation, use of stainless steel volts, etc. Such modifications are sometimes required for export purposes.

### ■ Options (available on demand)

#### (1) Shutters

Shutters are to blank the neutral grooves that are not in use and are made of steel plates.

#### (2) Handle locks

A lock mechanism can be introduced to the control handle, whereby operation of the handle can be put to a lock by simply turning the grip of the handle clockwise and released by turning the handle again counter clockwise.

#### (3) Handle location indicating limit switch

Such a switch can be installed on each of the tap locations on the front panel so that the location of the control handle can be indicated.

#### (4) Operation indicating limit switch with time delay


This is normally applied together with (2) above. The indication of the status of the switch will be given only after a set time has elapsed.

On the closing of a circuit, the signal indicating ON will be given only after the main circuitry is completely closed. The same applies on the opening of the circuit.

### ● Tap Location indicator Plate

Letters to be specified by the customer can be engraved in a transparent acrylic plate and fixed on the front panel. The letters will appear in white over a black background and will be glued onto the panel surface.

### Indication of type and specifics

  
No. of phase    No. of taps    Model name    Options

No. of phase ; Nothing to be written if single phase. Write 2 for 2 phase and 3 for 3 phase

No. of taps ; Write number of changeover positions

Model name ; Write model name with corresponding current rating

Options ; Write (1) for Shutters

(2) for Handle locks

(3) for Handle location indicating limit switch

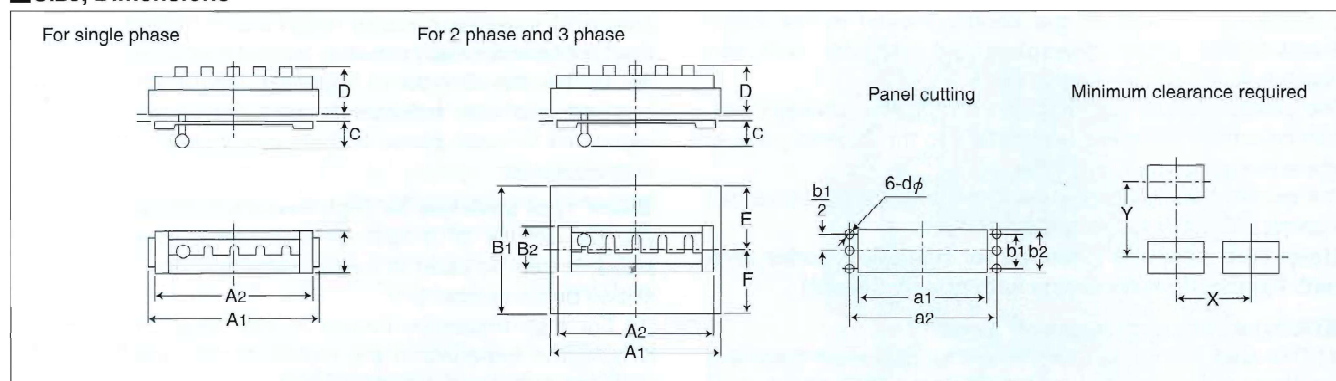
and (4) for Operation indicating limit switch with time delay

If Voltage (Ground) requirements are 600V and above, please indicate Voltage required.

### Example 3φ—6C100—(1)

The above indicates 3 phase 6 taps C-type rated for 100A with shutter.

## Size, Dimensions



### Dimensions for single phase (1φ)

Name	Division	Outer dimensions						Panel cutting requirements					Minimum clearance required	
		A1	A2	B	C	D		a1	a2	b1	b2	d(φ)	X	Y
C60	60	60 + (n-1) × 20	A1-10	45	32	110		A1-26	A1-19	22	40	6	A1+5	80
C100	100	74 + (n-1) × 30	A1-15	62	40	150		A1-43	A1-31	31	50	6	A1+6	95
C200	200	92 + (n-1) × 37	A1-16	82	50	205		A1-51	A1-32	45	68	7	A1+7	120
C300	300	110 + (n-1) × 45	A1-14	101	65	250		A1-60	A1-38	64	87	9	φ	145
C400	400	125 + (n-1) × 55	A1-13	116	75	310		A1-65	A1-41	76	105	φ	A1+8	170
C500	500	125 + (n-1) × 65	φ	φ	80	320		φ	φ	φ	φ	φ	φ	170
C600	600	φ	φ	85	φ	φ		φ	φ	φ	φ	φ	φ	180
C800	800	155 + (n-1) × 90	φ	φ	105	365		A1-64	φ	φ	φ	11	φ	190
C1000	1000	φ	φ	120	φ	φ		φ	φ	φ	φ	11	φ	195
C1600	1600	228 + (n-1) × 140	A1-14	160	180	430		A1-68	A1-44	110	143	11	A1+15	200

Add 40mm to dimension X, when limit switch is added.

### Dimensions for 2, 3 phase (2φ, 3φ)

Name	Division	Outer dimensions								Panel cutting requirements					Minimum clearance required	
		A1	A2	B1	B2	C	D	E	F	a1	a2	b1	b2	d(φ)	X	Y
C60	60	60 + (n-1) × 20	A1	106	82	40	140	100	86	A1-32	A1-18	45	60	7	A1+6	210
C100	100	96 + (n-1) × 30	A1-2	230	100	50	185	121	109	A1-46	A1-24	64	87	9	A1+7	250
C200	200	108 + (n-1) × 37	A1	281	116	60	245	149	132	A1-52	A1-28	76	105	φ	A1+8	300
C300	300	120 + (n-1) × 45	φ	337	150	80	290	175	162	A1-60	A1-30	120	130	11	A1+10	365
C400	400	140 + (n-1) × 55	A1-2	410	165	100	360	215	195	A1-60	A1-31	130	144	13	A1+12	435
C500	500	140 + (n-1) × 65	φ	φ	φ	120	370	φ	φ	φ	φ	φ	φ	φ	φ	φ
C600	600	φ	φ	420	φ	φ	φ	φ	205	φ	φ	φ	φ	φ	φ	445
C800	800	171 + (n-1) × 90	A1	450	180	220	421	240	210	A1-58	φ	145	145	φ	A1+15	500
C1000	1000	φ	A1	φ	φ	φ	φ	φ	φ	φ	φ	φ	φ	φ	φ	φ

(n : No. of taps. In millimeters)

### Performance / test results

Model name /rating	Mechanical endurance test, 10 times/minute	Temperature rise at contacts		Insulation resistance test (1000V megger)	High Voltage endurance test (50Hz) circuit-earth, common tap-tap	Heat Endurance Test
		Rated current	Twice the rated current			
	(Times) (Nothing wrong)	(deg)	(deg)	(over)	(Nothing wrong)	°C (Nothing wrong)
C60	20,000	5	24	200MΩ	3000V per min.	150°C for 1 hour
C100	20,000	7	26	φ	φ	200°C for 1 hour
C200	φ	10	39	φ	4500V per min.	φ
C300	φ	14	48	φ	φ	φ
C400	10,000	17	54	φ	φ	φ
C500	φ	19	58	φ	φ	φ
C600	φ	21	62	φ	φ	φ
C800	5,000	23	65	φ	φ	φ
C1000	φ	25	68	φ	φ	φ
C1600	φ	30	φ	φ	φ	φ

Product Line: ● C type switches ● Class-H dry transformers ● Switchboards, control panels ● High frequency thyristor converters



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