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Contactor Switches

ICS (Indicating Contactor Switch)

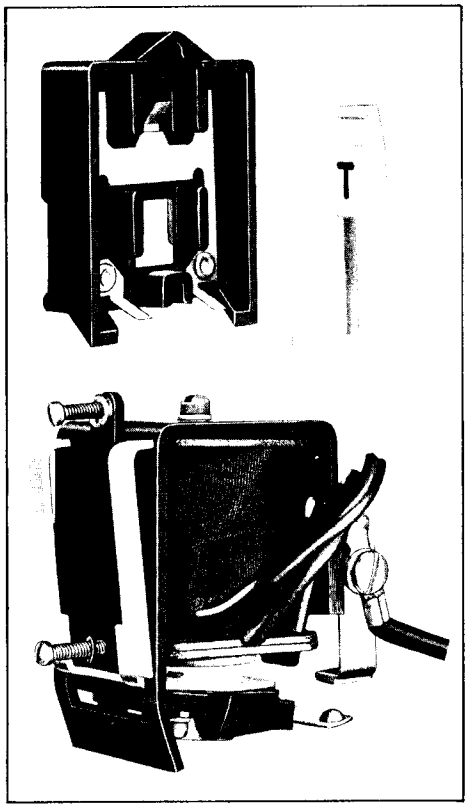


Fig. 1

The dc operated Indicating Contactor Switch has a clapper type magnetic armature to which leaf-spring contacts are attached.

When the switch is energized, the moving contacts bridge the stationary contacts completing the trip circuit. The ICS contacts are connected in parallel with the main relay contacts relieving them of carrying heavy trip currents

During operation two fingers on the armature deflect a spring which allows the operation indicator target to drop. The target is orange in color and readily visible.

Taps are provided on the unit for either 0.2 or 2.0 amperes dc pickup operation.

When using a 125 or 250 volt dc WL auxiliary relay, the 0.2 amp tap is recommended. The 2.0 amp tap should be used on 24 or 48 Vdc circuits.

See Application Guide for ICS and ACS units for futher details – see page 3.

IIT (Indicating Instantaneous Trip)

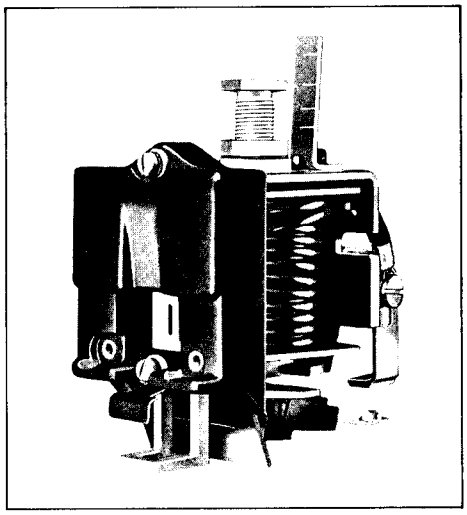


Fig. 2

The IIT is used for high speed protection against heavy fault currents. The unit is similar in construction to the ICS except that it is an ac operated device, and adjustable over a range of 1 to 4 times minimum pickup. Variable pickup is provided by the core screw adjustment on top of the unit.

The IIT unit has a calibrated scale on which is marked four divisional points of the pickup range. Maximum and minimum pickup points are indicated on the scale plate. The specific ampere range of the unit is shown on the relay nameplate.

When the unit is energized above the setting value the target drops. The operating accuracy is within 10% of setting. Ratio of dropout to pickup varies from 65% at minimum setting to 90% at maximum setting.

Operating speed of the IIT unit at two times pickup is:
25 ms avg.
32 ms max.

ITH (High Dropout Instantaneous Unit)

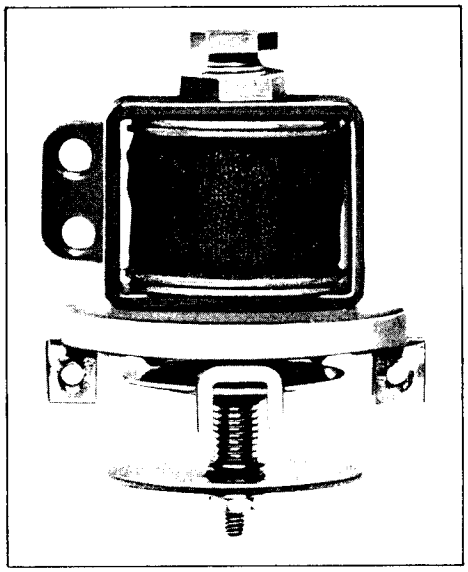


Fig. 3

The ITH is a solenoid operated device with an adjustable core screw which adjusts the ac current pickup of the device over a 2 to 1 range.

When the ITH coil is energized above setting, the moving plunger assembly moves upward carrying the silver disc which bridges three conical shaped stationary contacts. The device will open its contacts when the current in the coil is reduced to 90% of its pickup value.

Operating range of the ITH unit can be increased to a 4 to 1 ratio, or four times the minimum pickup obtainable, by lowering the plunger after the core screw has been set at its maximum rated position.

If the plunger is lowered to increase the pickup current value, then at 300% of minimum trip the dropout ratio is 60% of the pickup current. At 400% of minimum trip the dropout ratio is 45% of the pickup current.

Operating speed of the ITH unit over nominal range (60 Hz base) is as follows:

at 200% of trip setting – less than 1 cycle
at 500% of trip setting – ½ cycle
at 1000% of trip setting – ¼ cycle

IVS (Indicating Voltage Switch)

The dc indicating voltage switch is a small clapper-type device similar in construction to the ICS. (See Figure 1).

A magnetic armature, to which leaf-spring mounted contacts are attached is attracted to the magnetic core upon energization of the switch. When the switch closes, the moving contact bridges three stationary contacts, completing the trip circuit. Also during this operation the indicator target drops.

The IVS has a series resistor and will operate when 80% dc rated voltage is applied to the circuitry.

IVS (Indicating Voltage Switch)

Pickup = 80% of rated voltage
Continuous = 110% of rated voltage

Rated Voltage	Resistor
24 Vdc	250 ohms
48 Vdc	750 ohms
125 Vdc	2000 ohms
250 Vdc	4000 ohms

IIV (Instantaneous Indicating Voltage Switch)

The instantaneous trip unit is a small clapper type device which is ac voltage operated.

The unit has an adjustable range of 120-200 volts. When energized at or above pickup setting, contacts of the unit close and a target drops indicating completion of the trip circuit.

AVS (Instantaneous Indicating Voltage)

Pickup = 80% or less of rated voltage.
Continuous = 110% of rated voltage.

Rated Voltage	Resistor
120 Vac	1500 ohms
230 Vac	2800 ohms
240 Vac	3000 ohms

IIV With Adjustable Resistor

The IIV unit is applied similar to that of an IIT unit, – in conjunction with an inverse time voltage unit. Figure 4 shows its use with a CV relay element.

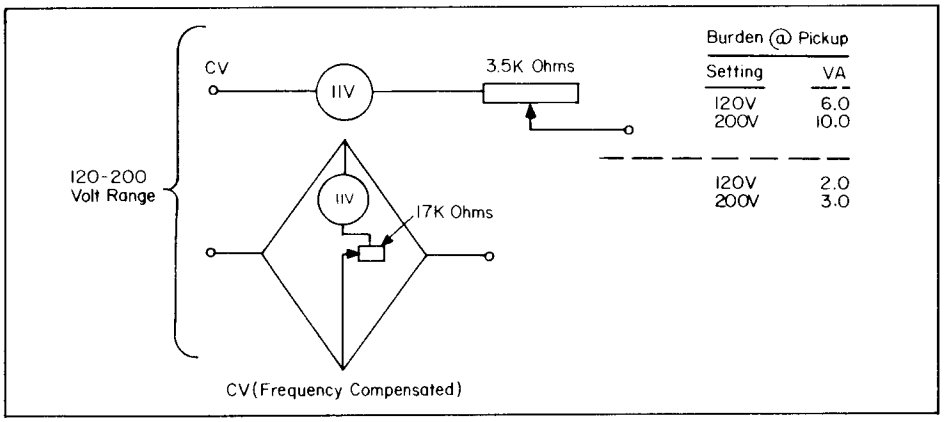


Fig. 4

De-Ion® Contactor Switch (CS)

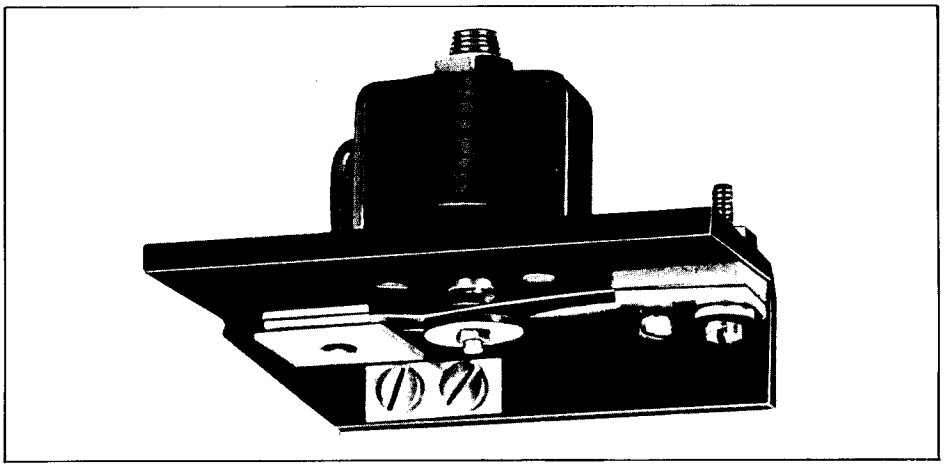


Fig. 5

This unit is used in circuit opening type CO relays. The switch is a small ac solenoid switch whose coil is energized from a small transformer connected in the main current circuit. A cylindrical plunger operates a spring leaf with a silver contact surface on one end and rigidly fixed to the frame on the other.

The overcurrent unit contacts are in the contactor switch coil circuit and when they close, the switch's normally closed contacts open to remove the by-pass around the breaker trip coil. In this manner the breaker is tripped.

The De-Ion Contactor Switch will pickup at 4 amps ac and safely by-pass 100 amps ac through its contacts.

OI (Operation Indicator)

The operation indicator is a small solenoid coil connected in the trip circuit. When the coil is energized, a spring-restrained armature releases the white target which falls by gravity to indicate completion of the trip circuit.

CS (Contactor Switch)

The dc contactor switch is a small solenoid type switch. A cylindrical plunger with a silver disc mounted on its lower end moves in the core of the solenoid. As the plunger travels upward, the disc bridges three silver stationary contacts. The coil is in series with the main contacts of the relay and with the trip coil of the breaker. When the relay contacts close, the coil becomes energized and closes the switch contacts. This shunts the main relay contacts, thereby relieving them of the duty of carrying tripping current. These contacts remain closed until the trip circuit is opened by the auxiliary switch on the breaker. See Figure 7 – Item ①.

IT (Instantaneous Trip)

The instantaneous trip attachment is a small solenoid type element. A cylindrical plunger rides up and down a vertical guide rod in the center of the solenoid coil.

When the coil is energized the plunger moves upward carrying a silver disc which bridges three conical shaped stationary contacts. In this position, a helical spring is compressed and the plunger is free to move while the contact remains stationary. Thus, ac vibrations of the plunger are prevented from causing contact bounce.

A micarta disc screws on the bottom of the guide rod and is locked in position by a nut. Its position determines the pickup current.

ACS (Ac Auxiliary Switch)

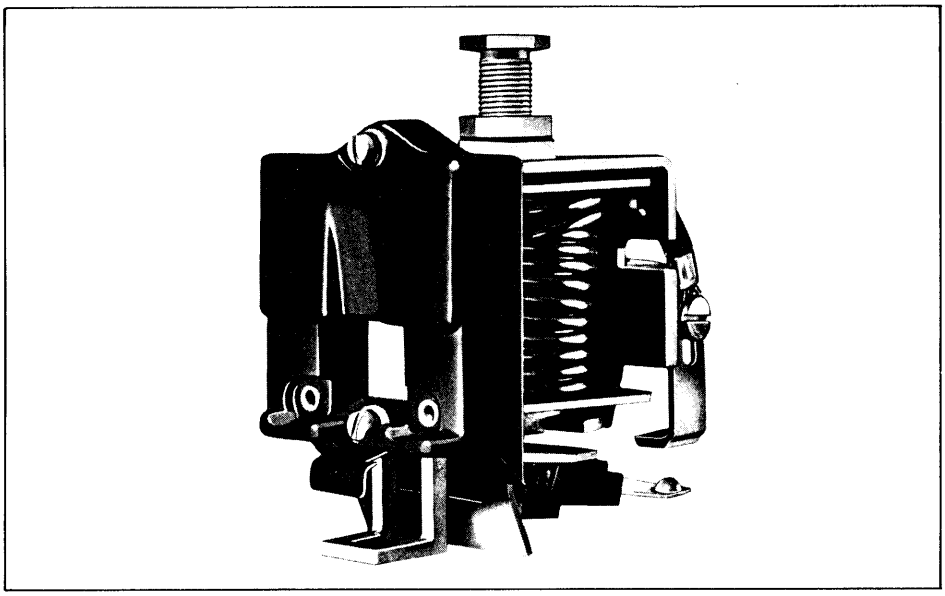


Fig. 6

When ac current is necessary in a control-trip circuit, the ICS (dc) unit is replaced by an ACS indicating contactor switch sealed-in unit.

The ACS unit is similar in construction to an IIT unit except without the calibrated scale. See Application Guide for ICS and ACS units for further details.

Application Guide for ICS and ACS Units In A-C Contact Circuits

An ac indicating contactor switch (ACS) is available where the relay contacts connect to an ac trip or control circuit. Nevertheless, the ICS unit may be satisfactory. The following discussion attempts to guide the user in his choice.

The 0.2/2 ampere ICS unit operates at rated current or below when carrying 60-hertz current, giving a reliable target indication. However, it is ineffective for sealing purposes due to severe chattering. This chatter is audible, particularly right above pickup. A seal around the main contacts relieves those contacts (and spiral spring, where used) from carrying current. Also the seal eliminates the possibility of the main contacts trying to interrupt too much current should they open prematurely. This latter point is not as important with ac, as it is on dc.

Generally, relays with ICS units as a seal may be applied to ac circuits where the trip current does not exceed:

Supply Voltage Ac	Max. Short-Time Trip Current
115	10
230	5
460	2.5

For control applications where the relay must carry current for more than a second the thermal effects on the contact circuit should be considered. Also note that the ICS voltage drop in the 0.2 tap is appreciable, as shown in the following table:

0.2/2A ICS	Current Range	ICS Voltage-Drop Range	Min. Recommended Supply Voltage ①
0.2 tap	0.2-0.3	8-12	115
0.2 tap	0.3-0.5	12-20	230
0.2 tap	0.5-1.3	20-52	460
2 tap	2 and up	2 and up	66

① When connected as a current switch in series with full-rated voltage relay or trip coil.

Where the ICS contact is objectionable, where an effective seal is necessary, or where the 0.2 tap of the ICS results in excessive drop, use one of the following ACS units (ACS is IIT unit less scale plate):

ACS Unit	Current Range	ACS Voltage-Drop Range ②	Min. Recommended Supply Voltage ③
0.15	0.2-0.38	40-76	. . .
0.25	0.38-0.75	27-54	460
0.5	0.75-1.5	14-27	208
1	1.5-3	6.8-14	120
2	3-6	3.4-6.8	66

② This is the voltage range which will operate the ACS coil only.

③ When connected as a current switch in series with full-rated voltage relay or trip coil.

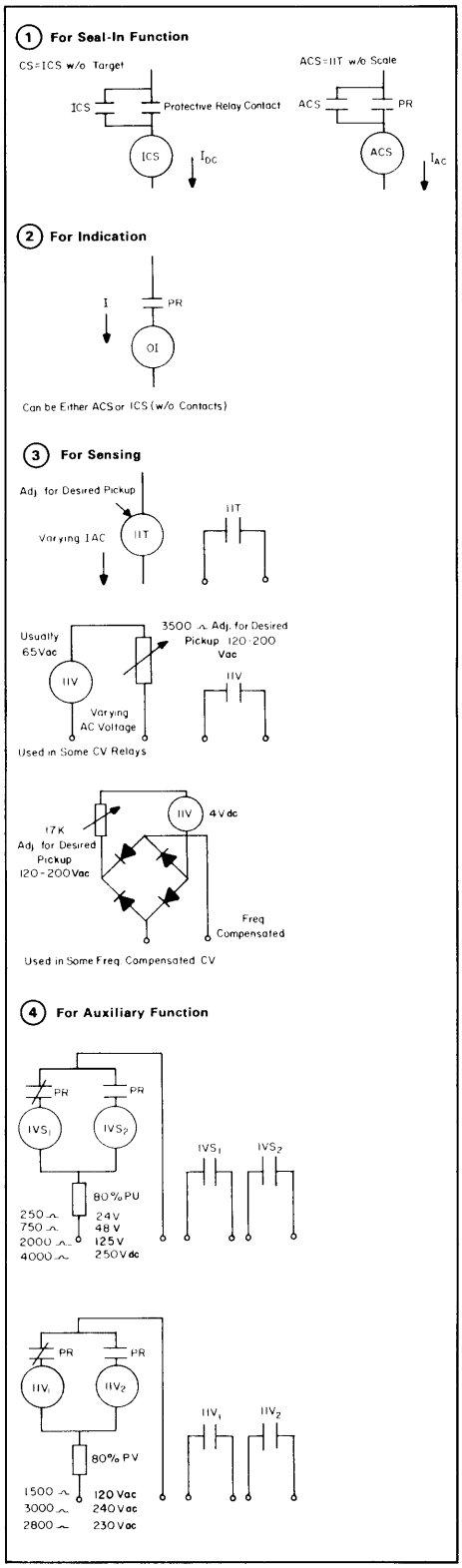


Fig. 7

Unit	Characteristics				Burden in Volt-Amperes at:			Thermal Capacity Ampere Rating (Coil)	
	Contacts ④	Rating	Tap	Ohms	Minimum Setting	Maximum Setting	5-Amp 60 Hertz and Min. Setting	1 Second	Continuous
ICS	Single	.2-2 amp	0.2	6.5 dc	....	....	....	11.5	0.4
			2	0.15 dc	....	....	....	88.0	3.2
Indicating	Single	.02 amp	None	600 dc	....	....	....	1.75	.063
Contactor	Single	.2 amp	None	6.5 dc	....	....	....	11.5	.4
Switch	Single	1 amp	None	0.1 dc	....	....	....	140	5.0
D.C.	Single	2 amp	None	0.15 dc	....	....	....	185	6.4
	Double	.2-2 amp	0.2	6.5 dc	....	....	....	11.5	0.4
			2	0.15 dc	....	....	....	88.0	3.2
	Double	.02 amp	None	600 dc	....	....	....	1.75	.063
	Double	.2 amp	None	6.5 dc	....	....	....	11.5	.4
	Double	1 amp	None	0.1 dc	....	....	....	140	5.0
	Double	2 amp	None	0.15 dc	....	....	....	185	6.4
	Double	.1 amp	None	26 dc	....	....	....	9.0	0.3
IIT	Single	.5-2 amp	....	.....	4.5	32	450	18	.63
	Single	1.5-6 amp	....	.....	4.5	32	50	35	1.25
Indicating	Single	1-4 amp	....	.....	4.5	32	112	44	1.6
Instantaneous	Single	2-8 amp	....	.....	4.5	32	28.0	70	2.5
Trip A.C.	Single	4-16 amp	....	.....	4.5	32	7.0	140	5
	Single	10-40 amp	....	.....	4.5	40	1.1	280	10
	Single	20-80 amp	....	.....	6.5	70	.4	370	12.7
	Single	40-160 amp	....	.....	9.0	144	.14	460	16
	Double	.5-2 amp	....	.....	4.5	32	450	18	.63
	Double	1.5-6 amp	....	.....	4.5	32	50	35	1.25
	Double	1-4 amp	....	.....	4.5	32	112	44	1.6
	Double	2-8 amp	....	.....	4.5	32	28.0	70	2.5
	Double	4-16 amp	....	.....	4.5	32	7.0	140	5
	Double	10-40 amp	....	.....	4.5	40	1.1	280	10
	Double	20-80 amp	....	.....	6.5	70	.4	370	12.7
	Double	40-160 amp	....	.....	9.0	144	.14	460	16
ACS	Single	.1 amp	....	450 ac	4.5	....	....	2.85	0.1
	Single	.15 amp	....	200 ac	4.5	....	....	4.5	.16
	Single	.25 amp	....	71 ac	4.5	....	....	7.0	.25
	Single	.5 amp	....	18.7 ac	4.5	....	....	18.0	.63
	Single	1 amp	....	4.5 ac	4.5	....	....	44.0	1.6
	Single	2 amp	....	1.1 ac	4.5	....	....	70.0	2.5
	Double	.1 amp	....	450 ac	4.5	....	....	2.85	0.1
	Double	.15 amp	....	200 ac	4.5	....	....	4.5	.16
	Double	.25 amp	....	71 ac	4.5	....	....	7.0	.25
	Double	.5 amp	....	18.7 ac	4.5	....	....	18.0	.63
	Double	1.0 amp	....	4.5 ac	4.5	....	....	44.0	1.6
	Double	2.0 amp	....	1.1 ac	4.5	....	....	70.0	2.5
CS	Single	.2 amps	....	This is an ICS without target. See ICS above for ratings.					
	Single	1.0 amp	....						
	Single	.2-2 amp	0.2-2						
	Double	.2 amp	....						
	Double	1.0 amp	....						
	Double	.2-2.0 amp	0.2-2						

④ Contacts will safely close 30 amperes at 250 Vdc and carry this current long enough to trip a circuit breaker.

Unit	Characteristics				Burden in Volt-Amperes at:			Thermal Capacity Ampere Rating (Coil)	
	Contacts	Rating	Tap	Ohms D.C.	Minimum Setting	Maximum Setting	5-Amp 60 Hertz and Min. Setting	1 Second	Continuous
Operation Indicator OI		0.1 amps	....	26.0	....	..	....	9.0	0.3
		0.2 amps	....	6.5	....	..	....	11.5	0.4
		1.0 amps	....	0.1	....	..	....	140	5.0
		2.0 amps	....	0.15	....	..	....	185	6.4
		3.0 amps	....	.1	....	..	....	280	10.0
ITH		.02-.04 amps	....	....	0.44	1.3	1100 ohms	.87	.031
		.032-.064 amps	....	....	0.44	1.3	440 ohms	1.5	.05
AC		.1-.2 amps	....	....	0.44	1.3	1100 Va	4.4	.16
High Dropout		.25-.50 amps	....	....	0.44	1.3	176 Va	11.5	0.4
		.50-1 amps	....	....	0.44	1.3	44 Va	23	0.8
		1-2 amps	....	....	0.44	1.3	11 Va	44	1.6
		2-4 amps	....	....	0.44	1.3	2.75 Va	88	3.2
		4-8 amps	....	....	0.44	1.3	0.65 Va	185	6.4
		6-12 amps	....	....	0.44	1.3	0.31 Va	280	10.0
		8-16 amps	....	....	0.44	1.3	0.17 Va	360	12.7
		16-32 amps	....	....	0.44	1.3	0.04 Va	560	20
		20-40 amps	....	....	0.44	1.3	0.028 Va	560	20

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