

THERMAL RELAYS



Thermal Relays



FTR25
0.1A ... 25A



FTR32
25A - 32A

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EN 60947-4-1
TS EN 60947-4-1
IEC 60947-4-1
CE

Altitude : 2000 m (max)
Relative Humidity : 50% (40°C), 90% (20°C)
Ambient Temperature : between -5°C and + 40°C
Pollution Degree : III

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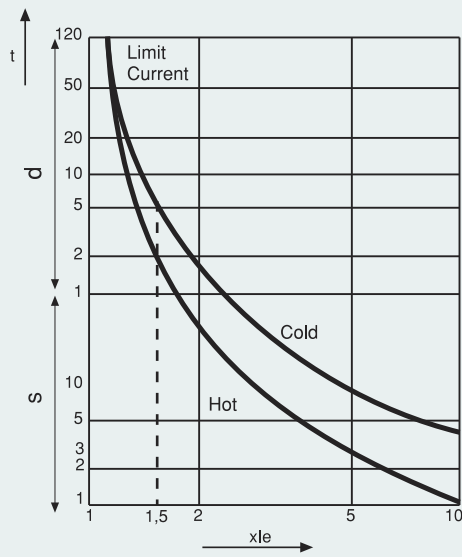


Fig-1: Opening characteristics for cold and hot operating conditions of thermal over current relay

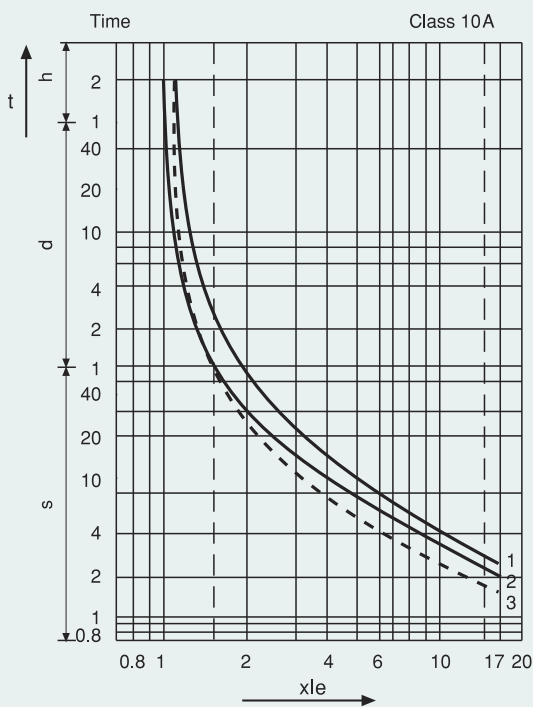


Fig-2: Current time graphic of thermal over current relay
 1: 3-phase balanced operation (cold condition)
 2: 2- phase balanced operation (cold condition)
 3: 3- phase balanced operation (hot condition)

Thermal relays disable the motor via contactor in case of overload or phase cut-off; that is, a contactor equipped with thermal relay becomes a much more useful and advantageous device. Because, addition of a thermal relay to the contactor provides protection for both consumers against over current and for contactor against impacts of over heating due to over current. Federal Thermal Relays are manufactured up to 32A, as compensated against environmental temperature in accordance with TS EN 60947-4-1, IEC60947-4-1 standards and CE.

Each phase in thermal relay is connected to an over current opener. When bimetals heat up, they open the circuit by pushing the differential opening lever. In case of failure of any of the phases, only two of bimetals operate and over current opener gets into service faster than in case of overloading. Thermal relay mechanism compensates changes in environmental temperature and prevents relay from being affected by ambient temperature.

Average value of opening characteristic of thermal over current relay in hot operating condition is below the opening characteristic of the relay in cold operating condition. That is, cold relay at a particular opening current is opened approximately 1/4 later than relay in hot condition. This case is important in terms of safety of relay and device to be protected. According to IEC 60947-4-1, it is required for the relay to break the circuit in 2 minutes at the latest at 1.5 times loading in hot condition.

Average values of opening characteristic for a relay heated by adjustment current is about 10% - 30% of the opening values of the relay operated in cold condition. These values depend on limit current strength between 1.05 - 1.2 times of adjustment current.

As it is seen in Figure-1, opening duration of a relay in hot condition is reduced from 5 minutes to about 2 minutes at 1,5xle. Limit opening values according to IEC 947-4-1 have been stated in terms of opening current values of thermal relay. Accordingly, it is required that thermal relay, which is in 20°C ambient temperature and cold condition, should not open within two hours at 1.05 times of le adjustment current and should open in two hours at 1.2 times in hot condition. Accordingly, limit opening current of the relay is determined as $I_a = (1,05 - 1,2) \times I_e$. Furthermore, the relay is required to open in two minutes at 1.5xle over current value in hot condition and in 2 seconds or 5 seconds at 7.2xle over current value in cold condition, depending on the delay value.

Opening Current	Delay Time	Operating Condition	Explanation
1,05 Ie	> 2 hour	cold	Limit Opening Current
1,20 Ie	< 2 hour	hot	Limit Opening Current
1,50 Ie	< 2 minute	hot	-
7,2 Ie	> 2 second	cold	-

Table 1. Thermal opening currents loaded in 20°C ambient temperature equal for each three current paths and delay times of over current relay.

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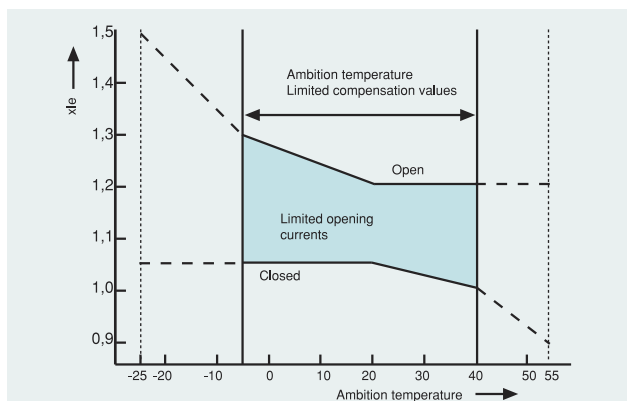
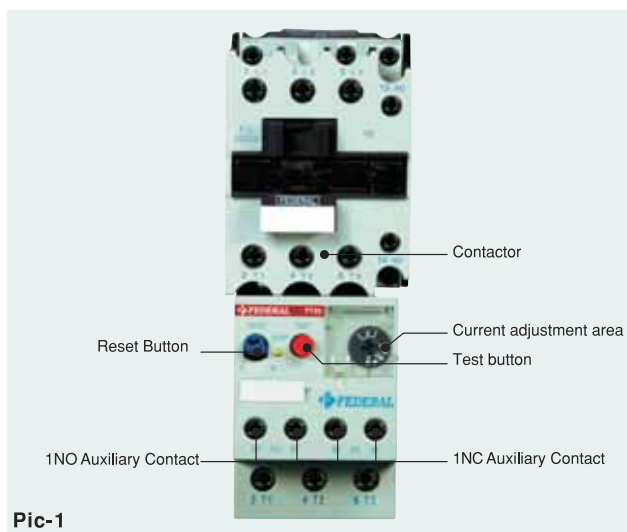


Fig-3: Temperature compensation



Pic-1

Technical Specifications

Type		FTR25	FTR32
Current Adjustment Area	(A)	0.1 ... 25	23 - 32
Opening Class	Class (A)	10	10
Rated Insulation Voltage (Ui)	(V)	690	690
Rated Impulse Withstand Voltage (Uimp)	kV	6	6
Operating Height	m	2000	2000
Temperature Compensation	C	-25...+55	-25...+55
Operating Frequency	Hz	50/60	50/60
Auxiliary Contactor	Ie 220V	2.73	2.73
1NO+1NC	AC15 380V	1.58	1.58

Order Code

Type	Ampere Interval A	Short Circuit Protection		Contactor Type To Be Used	Order Code
		aM	gG		
FTR25	1.8-2.5	4	6	FC09D ... FC32D	9DD-T0001-0025
	2.2-3.2	6	10	FC09D ... FC32D	9DD-T0001-0032
	2.8-4	6	10	FC09D ... FC32D	9DD-T0001-0040
	3.5-5	8	16	FC09D ... FC32D	9DD-T0001-0050
	4.5-6.3	8	16	FC09D ... FC32D	9DD-T0001-0063
	5.5-8	12	20	FC09D ... FC32D	9DD-T0001-0080
	7-10	12	20	FC09D ... FC32D	9DD-T0001-0100
	9-12.5	16	25	FC09D ... FC32D	9DD-T0001-0125
	11-16	20	35	FC09D ... FC32D	9DD-T0001-0160
	14-20	25	50	FC09D ... FC32D	9DD-T0001-0200
	17-22	25	50	FC09D ... FC32D	9DD-T0001-0220
20-25	30	63	FC09D ... FC32D	9DD-T0001-0250	
FTR32	23-32	40	63	FC25D ... FC32D	9DD-T0002-3200

If three-pole thermal relay is loaded as two-pole, opening time increases by 10%; if it is loaded as one-pole, it increases by 20%. Limit current values and opening characteristic have been determined according to 20°C ambient temperature. Opening time varies in different ambient temperatures. As a result, limit current value goes down and relay opens earlier. For example, limit current is 20% less in 50°C ambient temperature. On the contrary, the less ambient temperature is, the more current heat is needed for same opening type at 20°C. Under particular conditions, if relay and device to be protected, for example motor, operate in the same ambient temperature and if their heat is same, dependence of the relay's opening characteristic on ambient temperature would provide an advantage. However, it is not possible to always have these conditions especially in remote-controlled systems and relays in a closed housing. In such a case, the device to be protected and the relay may not be in the same ambient temperature. Moreover, it is not enough to have relay and motor in the same ambient temperature to provide a safe protection. Furthermore, opening limit heat of the relay should be equal to allowed heat of the motor. Usually, it is not possible to meet these two conditions at the same time. Therefore, parallel to temperature change, I adjustment current of the relay needs to be adjusted continuously. Thermal over current relays are equipped with a heating compensation due to temperature changes. In this way, limit opening current remains within (1,05-1,2) \times Ie limit values between -25°C and +55°C even in ambient temperature degrees other than 20°C. In this way, there is no need for a further adjustment in Ie.

While motors operate with tri-phase, motor draws more current than normal if any of the phase conductor cuts off or any of the fuses melts. In order not to have the motor encounter burning risk, phase fault protection feature of the thermal relay gets into service and disables the contactor.

Auxiliary contacts:

Thermal opener enables two contacts, as one closing and one breaking. Breaking contact disables the motor contactor and breaks energy supplied to the motor. Closing contact may be used for different purposes.

Reset button:

Reset button is used in automatic or manual position. In Automatic (A) position, thermal relay automatically enables the contactor after bimetals cool down. In Manual (M) position, reset button should be pressed to re-enable the contactor after bimetals cool down.

Test button:

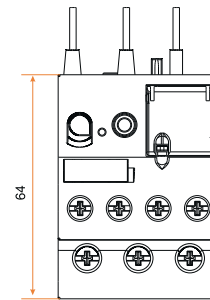
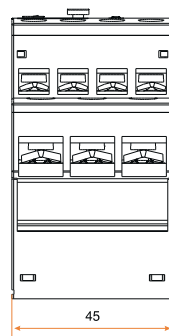
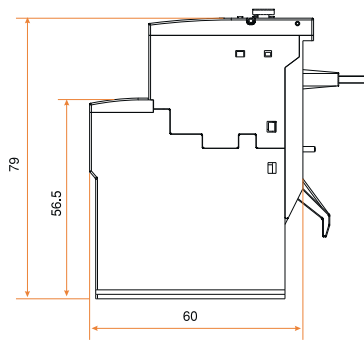
Operating status of the motor contactor is tested by pressing test button.

Stop button:

It is used for disabling the motor contactor in case of emergency.

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