MITSUBISHI ELECTRIC

Numerical Relay MELPRO™-S Series

Feeder Protection Relay

Description

MELPRO-S Series is a numerical type protection relay with a microprocessor for protecting high/extra-high-voltage electric power system.

This series of protection relay will provide stable and effective control and monitoring of electric power systems as well as high-reliable protection.

Features

- **Flexible and reliable protection functions**
  - Fine setting step of protection elements enables flexible use for various applications.
  - 16 kinds of operation time characteristics and wide setting range of time multiplier are available for overcurrent protection element.
  - Fault record function (10 records at a maximum) is provided for fault analysis.
  - Modbus interface using RS-485 is provided for remote communication.
  - Password-protected human-machine interface enables secured operation.

- **Highly Accurate Digital Computation**
  The digital computation using high-speed sampling minimizes the effect of harmonics, etc., and provides highly accurate protection.
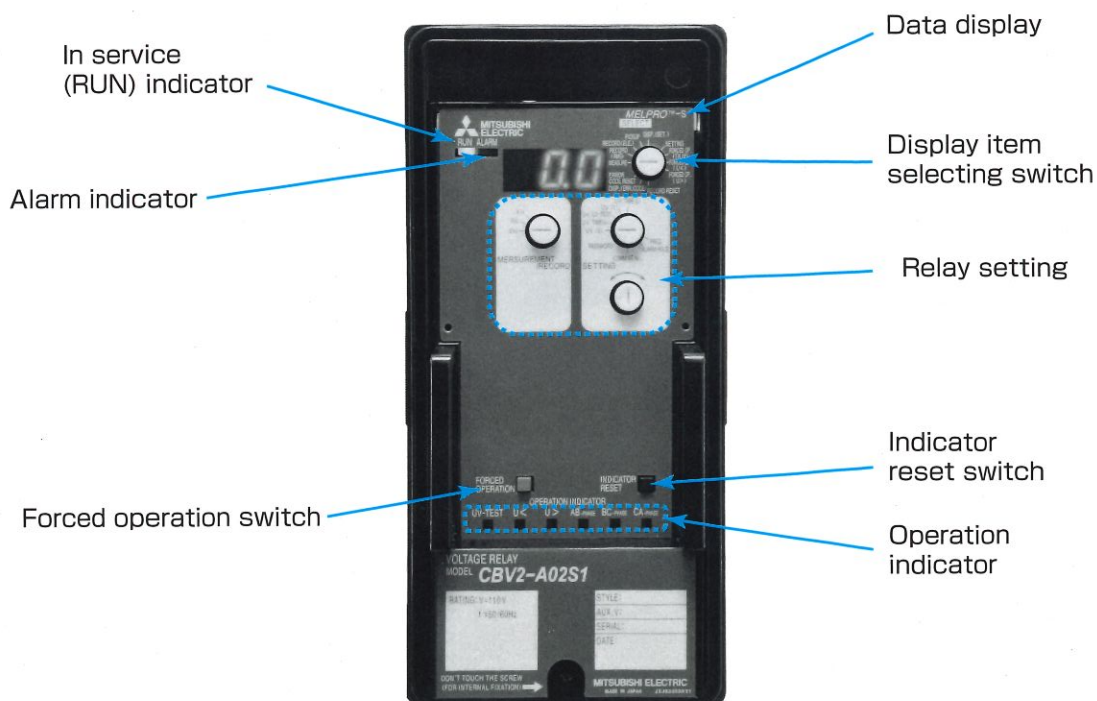
- **Self-diagnosis**
  The continuously monitoring of electronic circuits from input to output can detect internal failure before the failure causes damage on the power system.

- **Compact size**
  The compact relay designed for space-saving is suitable for replacement of existing ones.

- **Energy saving**
  Low power consumption of the relay is effective in miniaturization of CT and VT as well as as energy saving.


Front view (cover removed)

Common Technical Data

I T E M		DESCRIPTION	CONDITION	STANDARD
Environment	Ambient operating temperature	−10℃ to +55℃		IEC60255-6
	Ambient storage and transport temperature	−25℃ to +70℃		IEC60255-6
	Damp heat	+40℃,95%RH,4days		IEC60068-2-78
Ratings	Auxiliary power supply	110VDC,110VAC (Applicable to any voltage above)		IEC60255-6
	Operative range of auxiliary power supply	DC:−15% to +10% (Temporarily −20% to +30%) AC:−15% to +10% (Temporarily −15% to +15%)		IEC60255-6
	Frequency	50/60Hz		IEC60255-6
	VT	See manual of each relay type		
	CT			
Burden	Auxiliary power supply	See manual of each relay type		
	VT			
	CT			
Thermal withstand	VT	1.15VN,3h		
	CT	40IN,1s		
Contact capacity	For trip	Make	110V DC:15A,0.5s 220V DC:10A,0.5s	(L/R=0)	
		Break	110V DC:0.3A 220V DC:0.15A	(L/R≦40ms)	
	For control and alarm	Break	10VA 10W	(COS φ =0.4) (L/R=0.007s)	
		Max. current	5A		
		Max. Voltage	380VAC/125VDC		
Dielectric test	Circuit of 60V or below	500VAC,1min	1)Between each circuit and the exposed conductive parts, the terminals of each independent circuit being connected together 2)Between independent circuits, the terminals of each independent circuit being connected together	IEC60255-5
	Circuit of more than 60V and 500V or below	2000VAC,1min		
	Open contact	1000VAC,1min	Between open contact poles	
Impulse voltage test		5kV, 1.2 μs/50 μs	1)Between each circuit and the exposed conductive parts, the terminals of each independent circuit being connected together 2)Between independent circuits, the terminals of each independent circuit being connected together	IEC60255-5
High-frequency disturbance test	Common mode	2.5kV peak,1MHz with 200Ω source impedance for 2s	Between independent Circuits, and between independent circuit and earth	IEC60255-22-1 class 3
	Differential mode	1.0kV peak,1MHz with 200Ω source impedance for 2s	Across terminals of the same circuit	
Electrostatic discharge test		8kV	Contact discharge	IEC60255-22-2 class 3
		8kV	Air discharge	
Fast transient disturbance test		2.0kV,5ns/50ns,1min		IEC60255-22-3
Vibration test		Refer to class 1		IEC60255-21-1 class 1
Shock response		Refer to class 2		IEC60255-21-2 class 2
Enclosure protection		IP51		IEC60529

VN : Rated voltage   IN : Rated current

Operation Time characteristics of Overcurrent Element
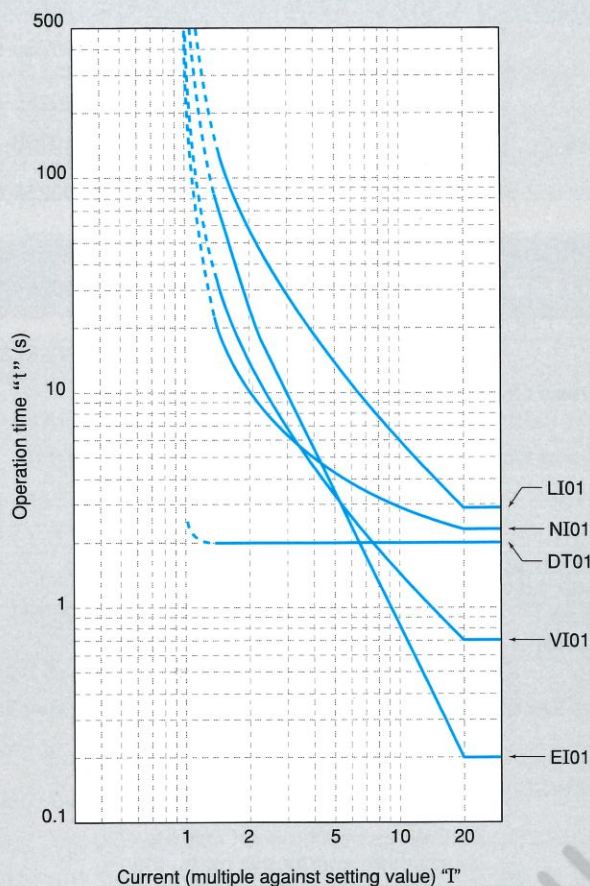
NI01 : Normal inverse time-lag characteristic

$$t = \frac{0.14}{I^{0.02}-1} \times \frac{M}{10} \text{ (s)}$$

VI01 : Very inverse time-lag characteristic

$$t = \frac{13.5}{I-1} \times \frac{M}{10} \text{ (s)}$$

EI01 : Extremely inverse time-lag characteristic

$$t = \frac{80}{I^2-1} \times \frac{M}{10} \text{ (s)}$$

LI01 : Long inverse time-lag characteristic

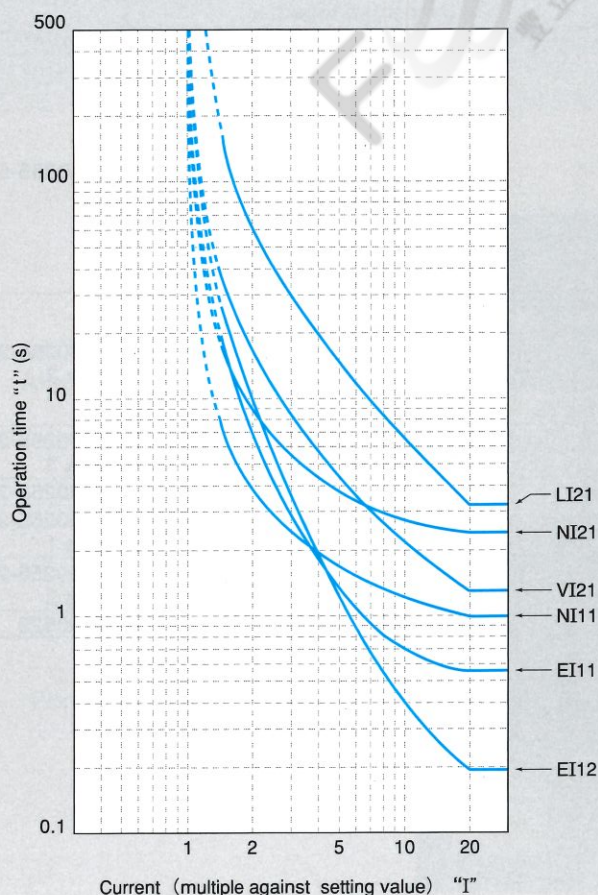$$t = \frac{54}{I-1} \times \frac{M}{10} \text{ (s)}$$

DT01 : Difinite time-lag characteristic

$$t = 2 \times \frac{M}{10} \text{ (s)}$$

t : Oreration time
I : Input current multiplying factor against set value
M : Operation time multiplier(times)

Graph labels: LI01, NI01, DT01, VI01, EI01

Operation time "t" (s) vs Current (multiple against setting value) "I"

NI11 : Normal inverse time-lag characteristic

$$t = \left(\frac{0.0515}{I^{0.02}-1} + 0.114 \right) \times \frac{M}{10} \text{ (s)}$$

EI11 : Extreme inverse time-lag characteristic

$$t = \left(\frac{19.61}{I^2-1} + 0.491 \right) \times \frac{M}{10} \text{ (s)}$$

EI12 : Extremely inverse time-lag characteristic

$$t = \left(\frac{28.2}{I^2-1} + 0.1217 \right) \times \frac{M}{10} \text{ (s)}$$

NI21 : Normal inverse time-lag characteristic

$$t = \left(\frac{2.4}{I^{0.4}-1} + 1.2 \right) \times \frac{M}{10} \text{ (s)}$$

VI21 : Very inverse time-lag characteristic

$$t = \left(\frac{16}{I-1} + 0.4 \right) \times \frac{M}{10} \text{ (s)}$$

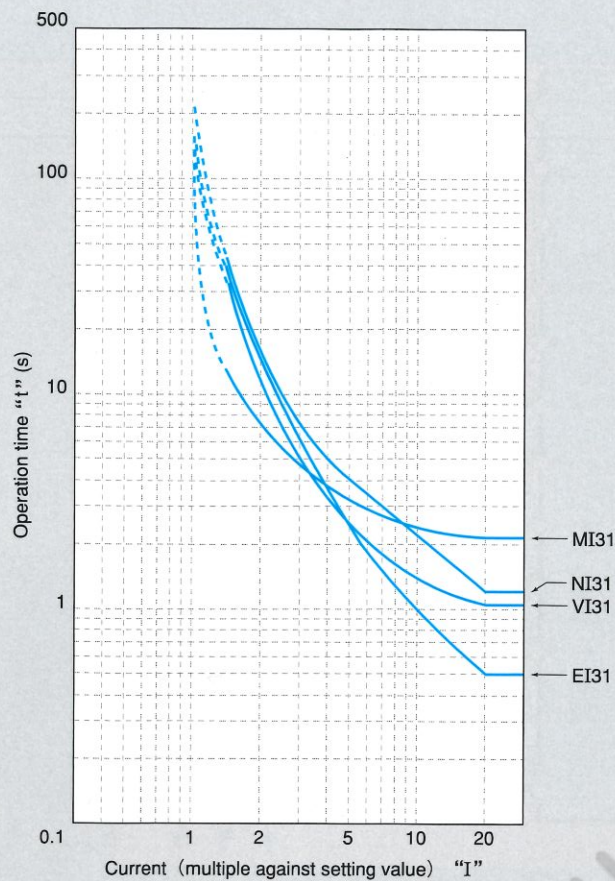LI21 : Long inverse time-lag characteristic

$$t = \frac{60}{I-1} \times \frac{M}{10} \text{ (s)}$$

t : Oreration time
I : Input current multiplying factor Against set value
M : Operation time multiplier

Graph labels: LI21, NI21, VI21, NI11, EI11, EI12

Operation time "t" (s) vs Current (multiple against setting value) "I"

MI31 ： Moderately inverse time-lag characteristic

NI31 ： Normal inverse time-lag characteristic

VI31 ： Very inverse time-lag characteristic

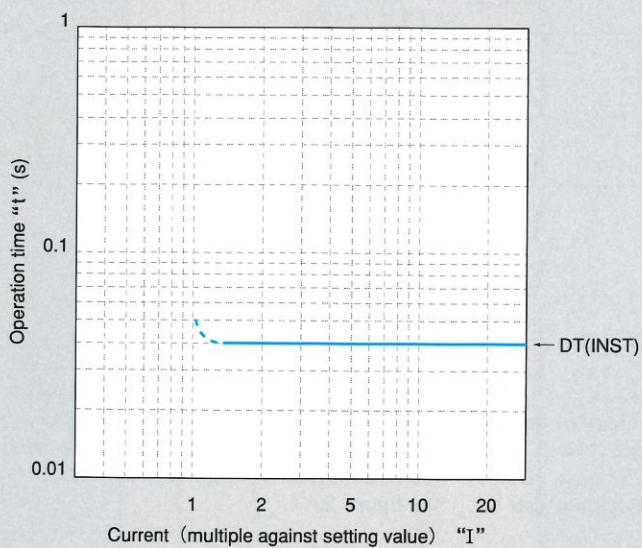EI31 ： Extremely inverse time-lag characteristic

$$t = M\left(A + \frac{B}{I-C} + \frac{D}{(I-C)^2} + \frac{E}{(I-C)^3}\right)$$

t ： Oreration time
I ： Input current multiplying factor against set value
M ： Operation time multiplier

	MI31	EI31	NI31	VI31
A	0.1735	0.0399	0.0274	0.0615
B	0.6791	0.2294	2.2614	0.7989
C	0.8000	0.5000	0.3000	0.3400
D	−0.0800	3.0094	−4.1899	−0.2840
E	0.1271	0.7222	9.1272	4.0505

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DT(INST): Definite time-lag characteristic
          t < 0.04 (s)
t: Operation time
I: Input current multiplying factor
   against set value

Specifications

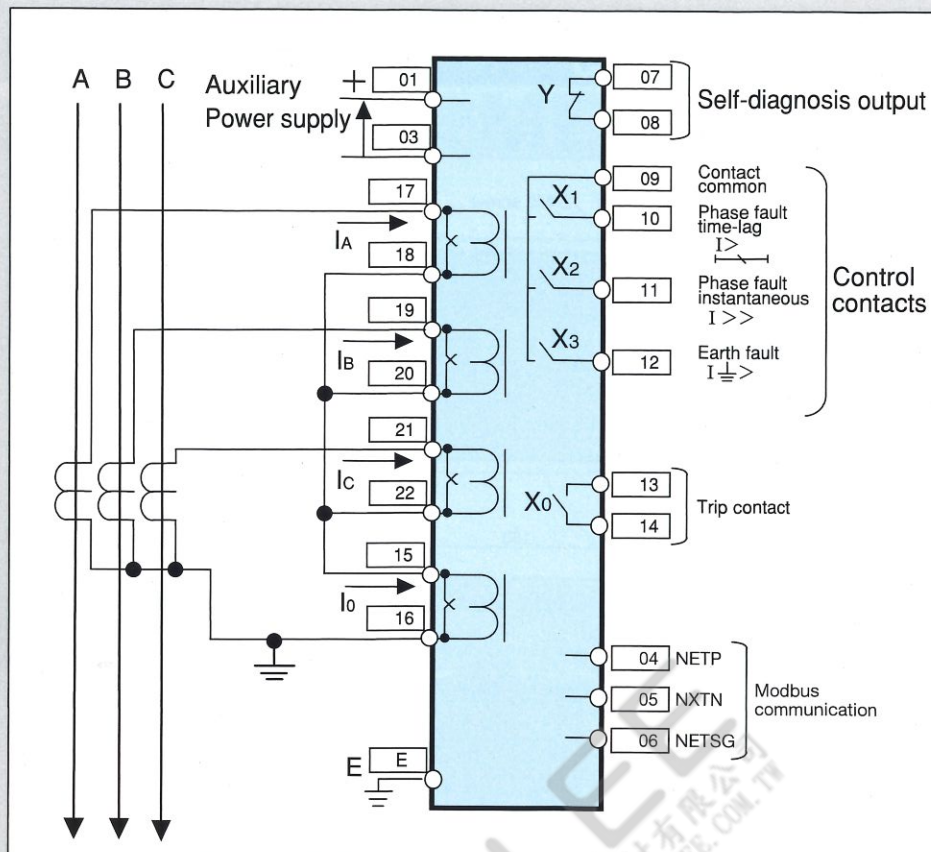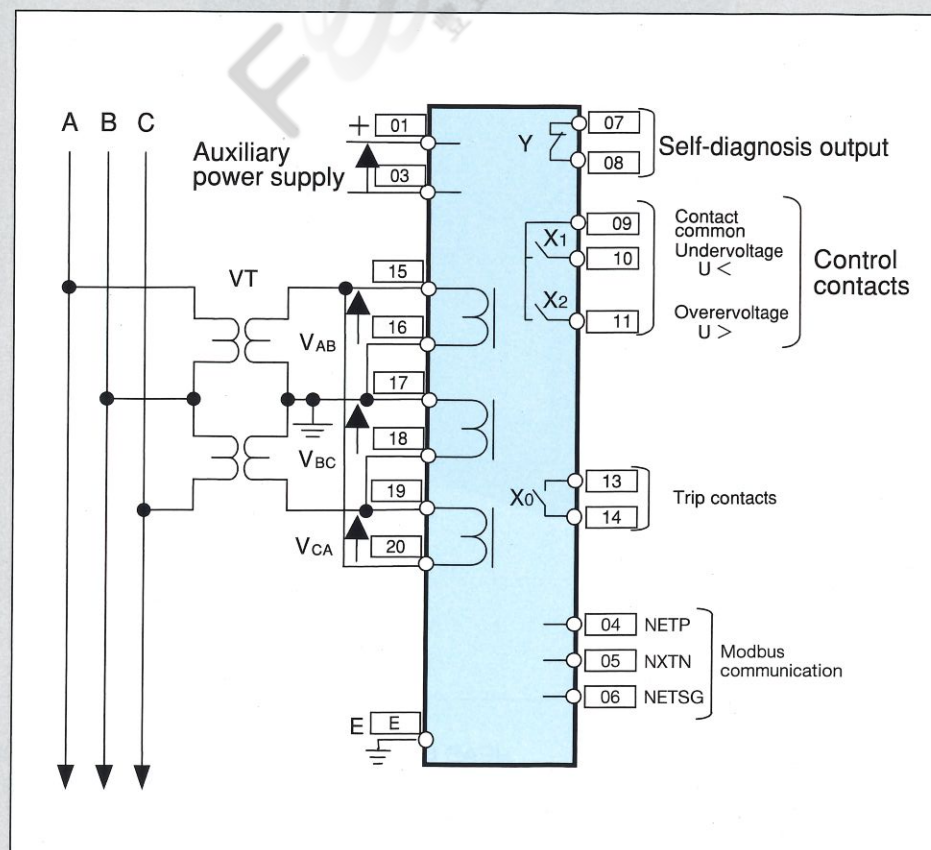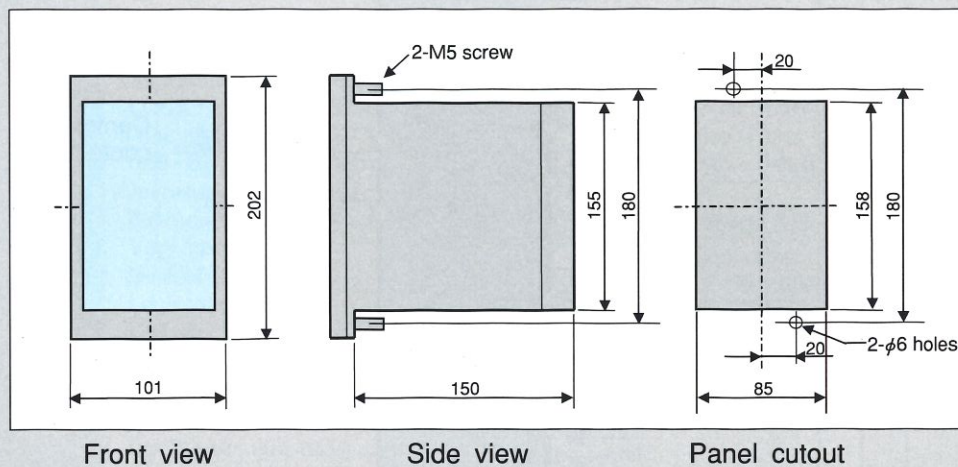| Name		Overcurrent Relay	Voltage Relay
Type		COC4-A02S1	CBV2-A02S1
Ratings	Frequency	50Hz or 60Hz	50Hz or 60Hz
	CT·VT	5A	110V
	ZCT·EVT	—	—
Specifications	Settings	**Phase fault Time-lag (51)** Operation value: LOCK−1.0∼12.0A (0.1A step) Time multiplier: 0.25−0.5∼50.0 (0.5 step) Operation characteristic Extremely inverse Very inverse Normal inverse Long inverse Definite time **Phase fault Instantaneous(50)** Operation value: LOCK−10∼80A (0.5A step) Operation Time: INST (40ms or less) **Earth fault Time-lag (51N)** Operation value: LOCK−0.25∼4.00A (0.05A step) Time multiplier: 0.25−0.5∼50.0 (0.5 step) Operation characteristic Extremely inverse Very inverse Normal inverse Long inverse Definite time **Earth fault Instantaneous(50N)** Operation value: LOCK−2.0∼20.0A (0.5A step) Operation Time: INST (40ms or less)	**Under Voltage (27)** Operation value: LOCK−60∼120V (1V step) Operation Time: INST−0.1∼5.0s (0.1s step) **Over Voltage (59)** Operation value: LOCK−120∼165V (1V step) Operation Time: INST−0.1∼5.0s (0.1s step)
	Protection Elements	$3I >$ (51) $3I \gg$ (50) $Io >$ (51N) $Io \gg$ (50N)	$3U <$ (27) $3U >$ (59)
	Measurement	·Current	·Voltage
Applications		Contains 3-phase overcurrent element and an earth fault overcurrent element; phase fault and earth fault protection of a 3-phase circuit in a resistance earthed neutral system can be achieved with 1 relay. See figure 1.	Contains 3-phase undervoltage element and 3-phase overvoltage element, being used to detect abnormal voltage between lines. See figure 2.

Connection Diagram

Figure1 COC4-A02S1

Figure2 CBV2-A02S1

Numerical Relay
MELPRO-S Series

Front view   Side view   Panel cutout

(Front view: 202, 101)
(Side view: 2-M5 screw, 155, 180, 150)
(Panel cutout: 20, 158, 180, 20, 2-φ6 holes, 85)

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Please note that specifications are subject to change without notice.