TOYO

Digital Type Protection Relay

DIGITAL Over Current & Earth Fault Relay [50/51 X 3] [50N/51N]

CHARACTERISTICS

Easy coordination between wiring and receiving point of OCR with only 1 set of relay.
With LCD display showing all information about the state of setting and input current value of each phase, also, LED lights indicating the running state.
Selective operating time consists of definite time, normal inverse time, very inverse time, and extremely inverse time.
Protective coordination can be harmonized with 1 set of relay, regardless of distributing and receiving line.
In case of induction relay, 4 sets of relays were required.
But, our relay was structured as **integrated type** with 3 OCR and 1 OCGR; easy to install, with high accuracy and reliability based on digital system.
Detecting faults correctly at the time of short circuit as well.
The relay was electronically structured, therefore it works semi-permanently.
Password Security preventing unexpected human operation and changing of the setting values.
Condenser Tripping Device CTD (optional) is available to ensure enough auxiliary power for complete tripping operation.

SPECIFICATION

Model

CO X 3 + LCO	
TDOG – 31	(Fixed Type with RS485 output)
TDOG – 31D	(Draw Out Type with RS485 output)

Rating

Input	AC 5A
Frequency	50 / 60 Hz ± 5%
Auxiliary Voltage	AC / DC 80 ~ 260V
Ambient Temperature	-10°C / +60°C (without icing)

Current Setting

[CO]	
Overcurrent Range	0.2 ~ 25A (0.1A step)
Instantaneous Range	5 ~ 120A (1A step)
[LCO]	
Overcurrent Range	0.2 ~ 20A (0.1A step)
Instantaneous Range	1 ~ 80A (1A step)
Operating Value	100% (± 10%)
Thermal Withstand	15A / continuous
	400A / 1S (80 times the rated input)

Time Setting & Curve <IEC 60255-3>

CO/LCO Time Lever (tp)	0.1 ~ 40 (0.1 step)
Instantaneous	10~40ms
	(Option: time adjustable version)
Normal Inverse Time	$t = \frac{0.14}{I^{0.02}-1} \times \frac{tp}{10}$
Very Inverse Time	$t = \frac{13.5}{I-1} \times \frac{tp}{10}$
Extremely Inverse Time	$t = \frac{80}{I^{2}-1} \times \frac{tp}{10}$
	$(I = I_f / I_s \ , \ tp = t>)$
Definite Time	$D = tp$
Resetting Value	> 95%
Reset Time	< 100ms

Burden

AC CO	≤ 0.5VA
AC LCO	≤ 0.5VA
AC Aux. Voltage	12VA
DC Aux. Voltage	6W

Contact

Output Relay	Trip: 1a	CO: 1a
		LCO: 1a
Trip Contact Capacity	12A / 250VAC / 28VDC	
Making Capacity	30A	
Contact Material	Silver Alloy	

Indicator (LED)

CPU State	(Self-diagnostic & monitoring)
	RUN (Green)
Communication Indication	COMM (Yellow)
Flicker when inputted OC	PICKUP (Red)
Fault phase / instantaneous	R.S.T.N / INST (Red)

Memory

Up to 32 records of fault data with time stamp

RS 485 Communication

Protocol	Modbus
Comm. Speed	9600 / 19200 bps
Parity	None

Vibration Resistance <IEC 60255-21-1>

Malfunction	10Hz 5mm double amplitude 30s each in X and Y directions 16.7Hz 2.5mm double amplitude 600s each in X, Y, and Z directions

Shock Resistance <IEC 60255-21-2>

Destruction	300m/s² (approx. 30G) 3 times each in 3 directions

Insulation <IEC 60255-5>

Dielectric Withstand	2kv for 1 minute between all terminals and case earth
Insulation Resistance at 500V	> 1,000MΩ
Impulse Voltage Withstand	5KV-1.2/50μs
Surge Transient Simulator	2.5KV 1MHz/200Ω <IEC255-6>
Weight	2.2kg

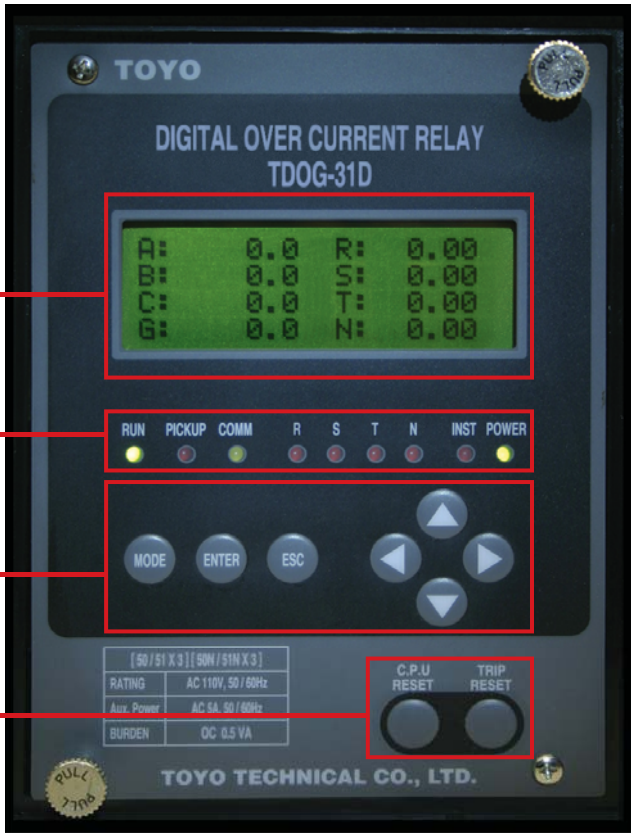
Environmental &EMC Conditions <IEC 61000>

Dust & Drop Resistance	Front cover with IP42 protection level
	Option: IP54 protection level (with extra charge)

■ FRONT INFORMATION

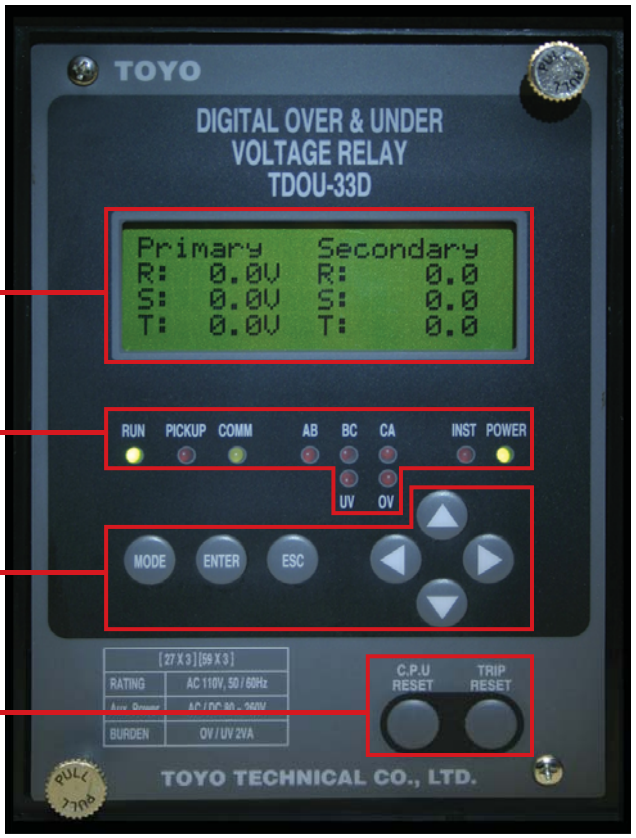
TDOG - 31 / TDOG - 31D

1. **4 X 20 LCD Display**
   State and information display
2. **LED Indicator**
   Trip phase and state indication
3. **Control Key**
   To set and check the state
4. **CPU Reset / Trip Reset**
   To reset CPU / Trip state



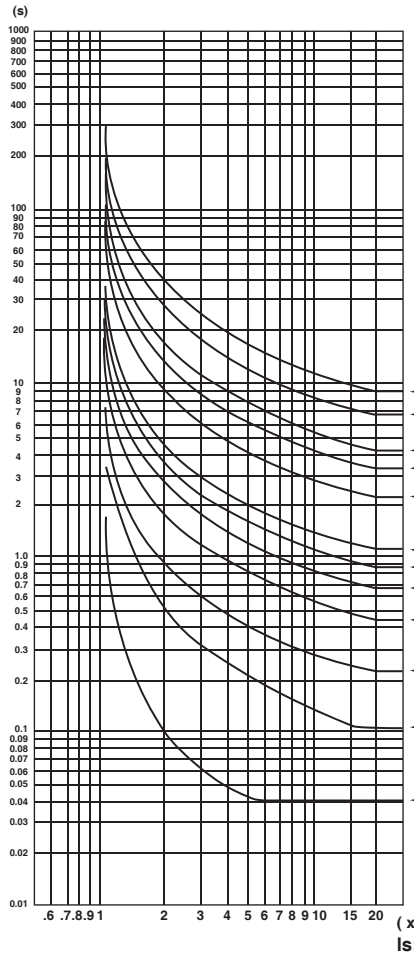
TDOU - 33 / TDOU - 33D

1. **4 X 20 LCD Display**
   State and information display
2. **LED Indicator**
   Trip phase and state indication
3. **Control Key**
   To set and check the state
4. **CPU Reset / Trip Reset**
   To reset CPU / Trip state



■ TIME CURVE: TDOG - 31 / TDOG - 31D

Normal Inverse



$$t = \frac{0.14}{I^{0.02} - 1} \cdot \frac{tp}{10}$$

$I = I_f / I_s$

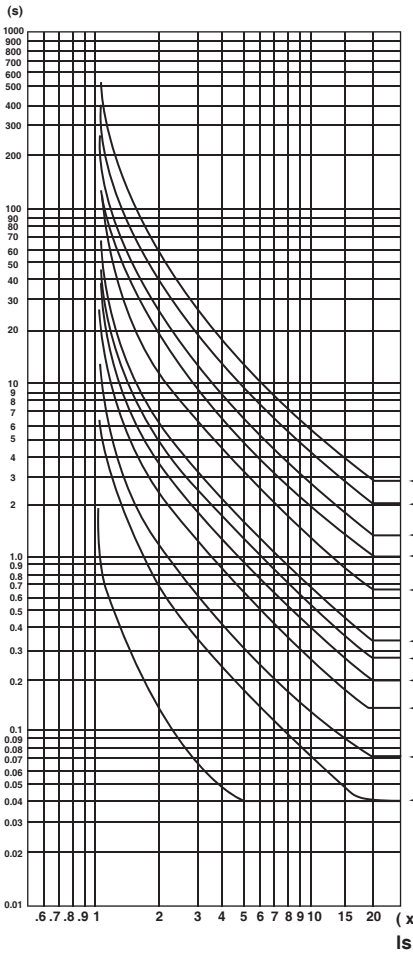
I_f = *fault current*

LEVER (tp)

40
30
20
15
10
5
4
3
2
1
0.5
0.1

Is: Setting Value

Very Inverse



$$t = \frac{13.5}{I - 1} \cdot \frac{tp}{10}$$

$I = I_f / I_s$

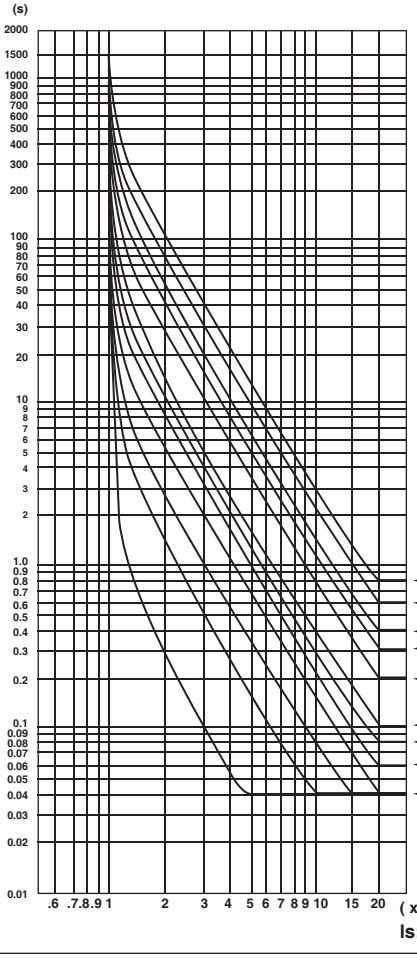
I_f = *fault current*

LEVER (tp)

40
30
20
15
10
5
4
3
2
1
0.1 ~ 0.5

Is: Setting Value

Extremely Inverse



$$t = \frac{80}{I^2 - 1} \cdot \frac{tp}{10}$$

$I = I_f / I_s$

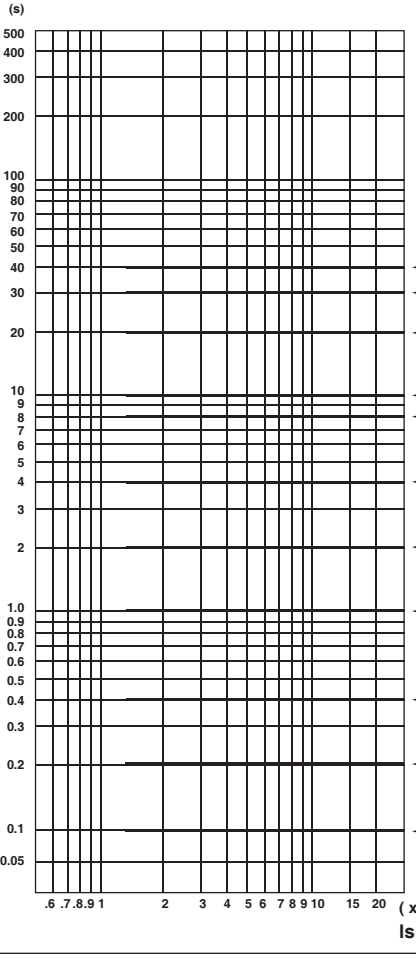
I_f = *fault current*

LEVER (tp)

40
30
20
15
10
5
4
3
0.1 ~ 2

Is: Setting Value

Definite Time



$$t = tp$$

$I = I_f / I_s$

I_f = *fault current*

LEVER (tp)

40
30
20
10
8
4
2
1
0.4
0.2
0.1

Is: Setting Value

DIGITAL Over Voltage & Under Voltage Relay [59/27]

CHARACTERISTICS

Up to now OVR and UVR relays were separately set and operated, but now they are compacted in one relay unit. Therefore, it is very convenient for handling, too.

As assembled with state of the art and multifunction, it is most suitable and applicable for protective coordination. Volt meter being installed, it can be used for measuring.

Electronic indicator can accurately detect troubles, and surely indicate electrical troubles.

Password Security preventing unexpected human operation and changing of the setting values.

Condenser Tripping Device CTD (optional) is available to ensure enough auxiliary power for complete tripping operation.

SPECIFICATION

Model

OV X 3 + UV X 3	
TDOU – 33	(Fixed Type with RS485 output)
TDOU – 33D	(Draw Out Type with RS485 output)

Rating

Input	AC 110V
Frequency	50 / 60 Hz ± 5%
Auxiliary Voltage	AC / DC 80 ~ 260V
Ambient Temperature	-10°C / +60°C (without icing)

Voltage Setting

[OV]	100 ~ 160V (1V step)
[UV]	50 ~ 120V (1V step)
Instantaneous	20 ~ 90V (1V step)
Operating Value	100% (± 10%)

Time Setting & Curve <IEC 60255>

UV/OV Time Lever (tp)	0.1 ~ 10 (0.1 step)
Instantaneous Time	< 60ms (Option: time adjustable version)
Reset Time	< 100ms
Resetting Value	
[OV]	V < 95%
[UV]	V > 105%
UV Inverse Time	$t = \frac{-0.85}{(v/100)^{2.4}-1} \times tp$
OV Inverse Time	$t = (\frac{12.15}{V^2-1} + 0.35) \times tp$
UV/OV Definite Time	t= tp

Operating Time

[OV]	Inverse or Definite Time
[UV]	Inverse or Definite Time

Burden

AC Voltage	≤ 2.0VA
AC Aux. Voltage	12VA
DC Aux. Voltage	6W

Contact

Output Relay	Trip: 1a	OV: 1a
		UV: 1a
Trip Contact Capacity	12A / 250VAC / 28VDC	
Making Capacity	30A	
Contact Material	Silver Alloy	

Indicator (LED)

CPU State	(Self-diagnostic & monitoring) RUN (Green)
Communication Indication	COMM (Yellow)
Flicker when inputted OV/UV	PICKUP (Red)
Display fault phase/instantaneous	AB, BC, CA / OV, UV (Red)

Memory

Up to 32 records of fault data with time stamp

RS 485 Communication

Protocol	Modbus
Comm. Speed	9600 / 19200 bps
Parity	None

Vibration Resistance <IEC 60255-21-1>

Malfunction	10Hz 5mm double amplitude 30s each in X and Y directions 16.7Hz 2.5mm double amplitude 600s each in X, Y, and Z directions

Shock Resistance <IEC 60255-21-2>

Destruction	300m/s² (approx. 30G) 3 times each in 3 directions

Insulation <IEC 60255-5>

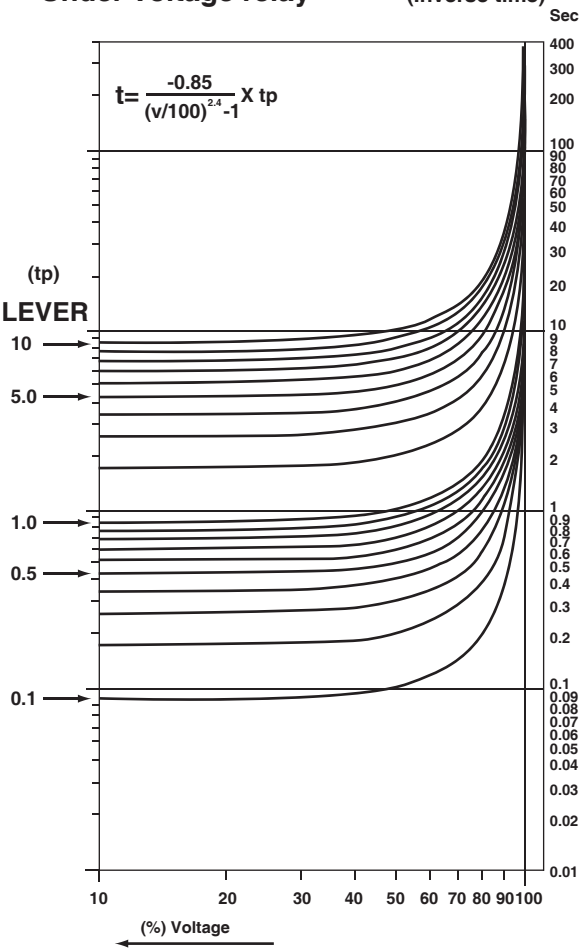
Dielectric Withstand	2kv for 1 minute between all terminals and case earth
Insulation Resistance at 500V	> 1,000MΩ
Impulse Voltage Withstand	5KV-1.2/50μs
Surge Transient Simulator	2.5KV 1MHz/200Ω <IEC255-6>
Weight	2.2kg

Environmental &EMC Conditions <IEC 61000>

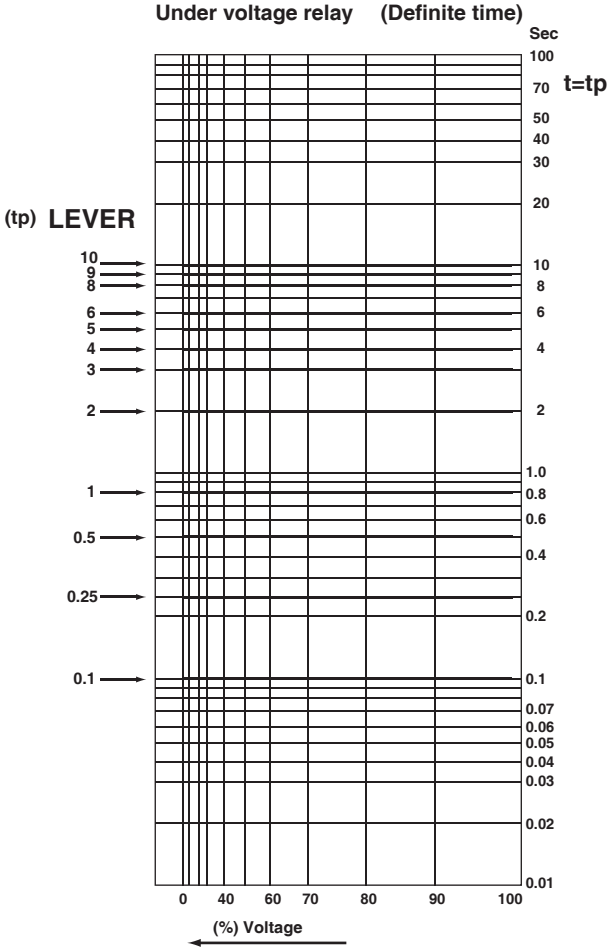
Dust & Drop Resistance	Front cover with IP42 protection level Optional IP54 protection level (with extra charge)

■ TIME CURVE: TDOU - 33 / TDOU - 33D

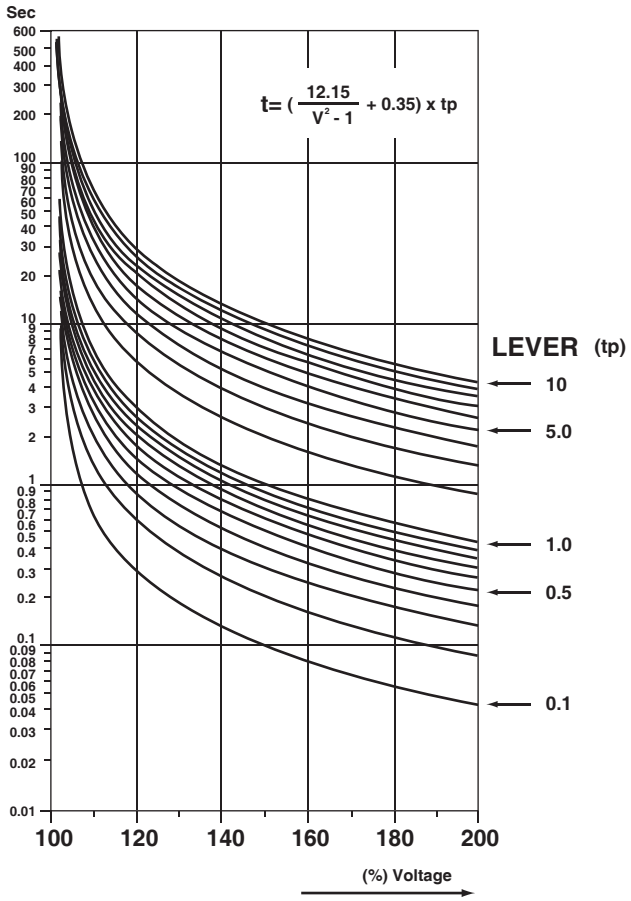
Under voltage relay (Inverse time)



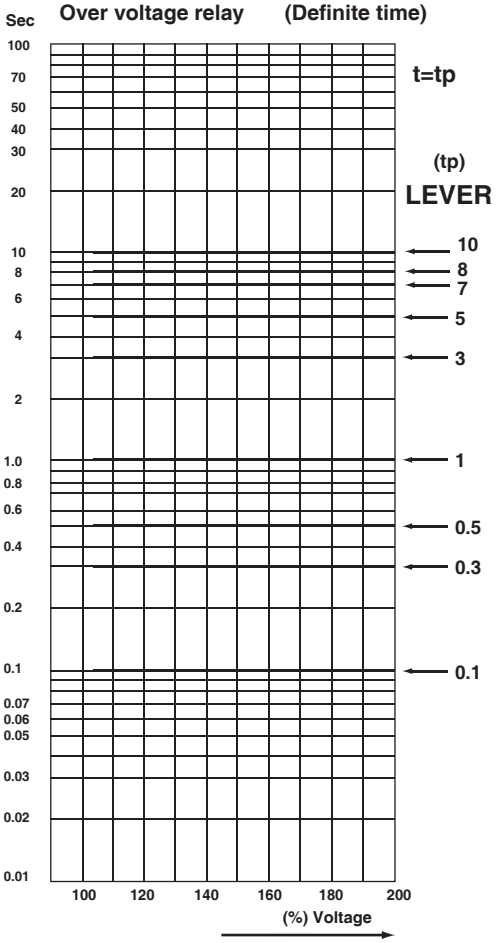
Under voltage relay (Definite time)



Over voltage relay (Inverse time)

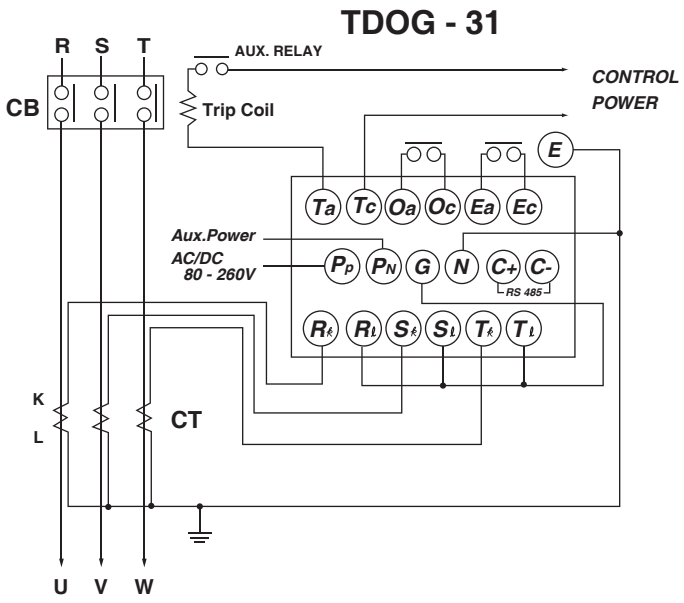


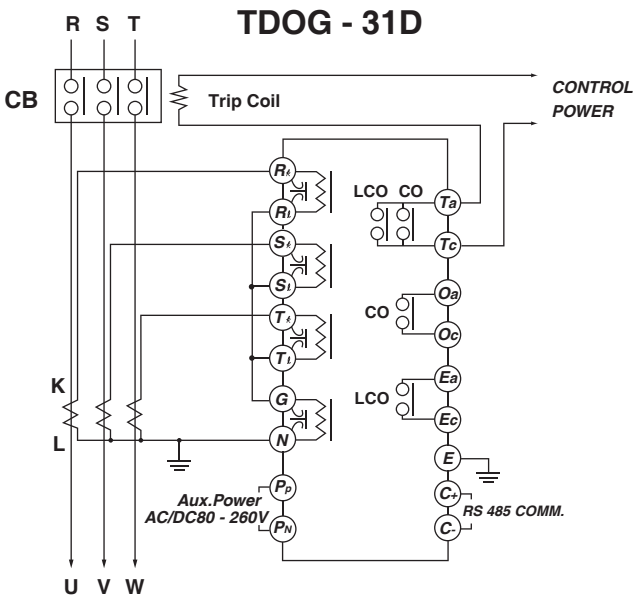
Over voltage relay (Definite time)



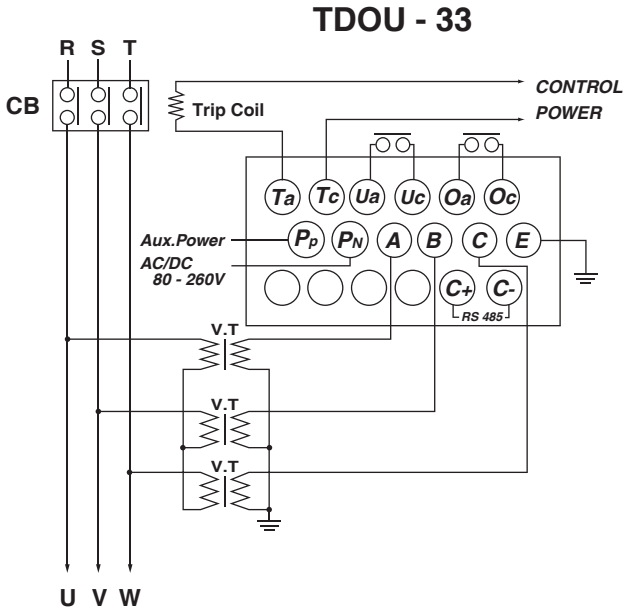
■ WIRING

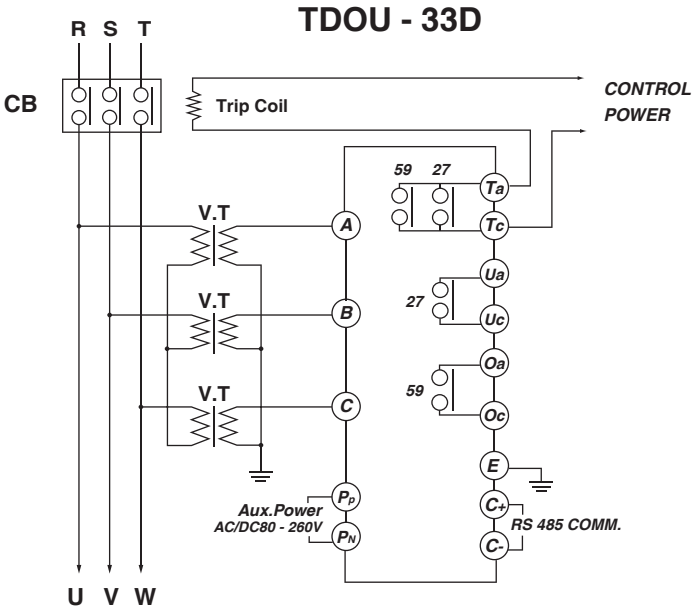
TDOG - 31 / TDOG - 31D





TDOU - 33 / TDOU - 33D

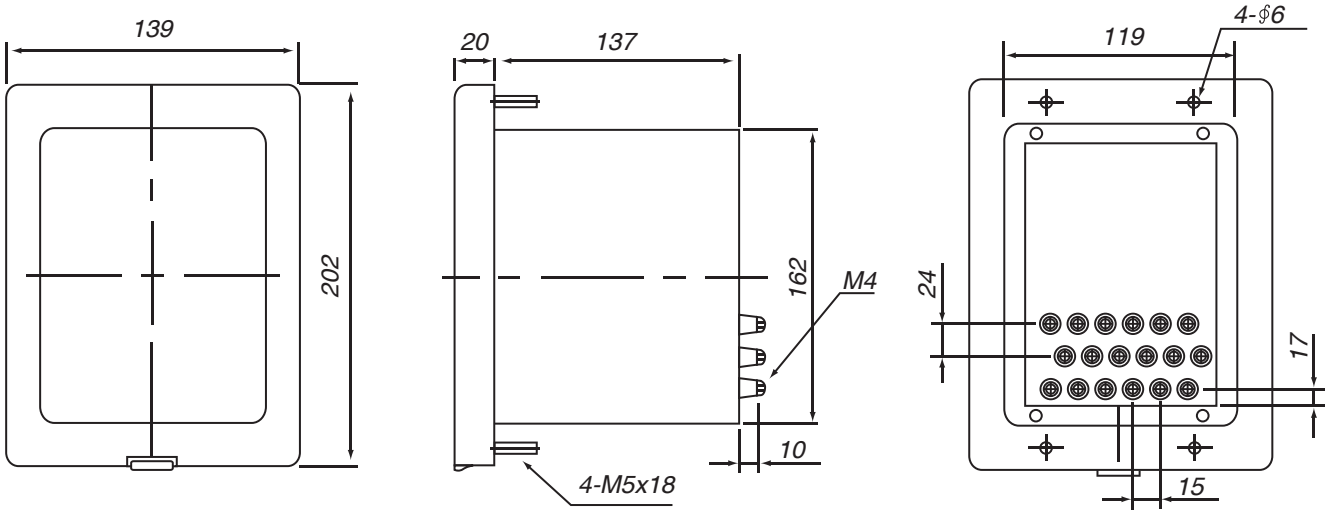




■ DIMENSIONS

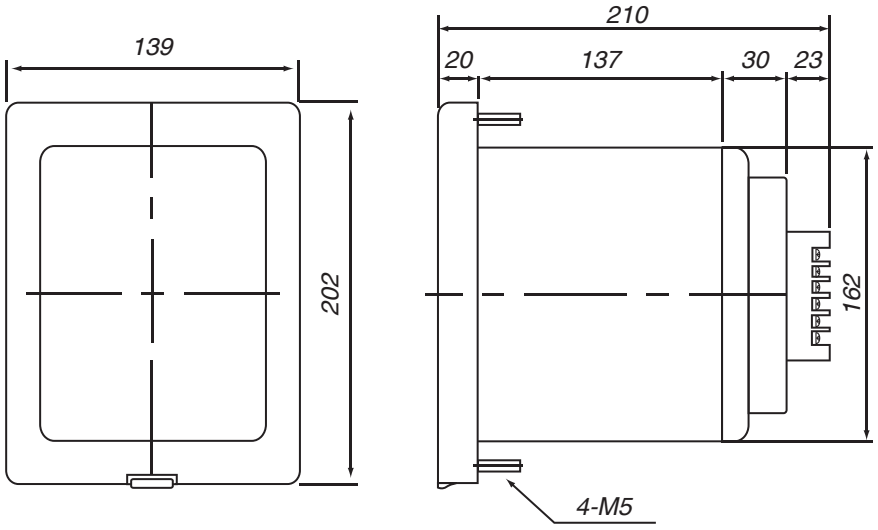
Fixed Type

TDOG - 31 / TDOU - 33

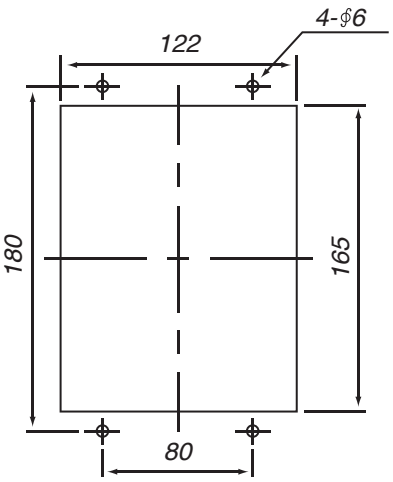


Draw Out Type

TDOG - 31D / TDOU - 33D



PANEL CUT



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