

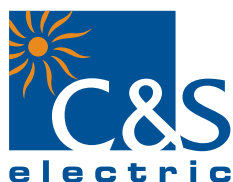
We touch your **electricity** everyday!

FDC1-V5

DC Voltage Relay



Catalog



PMD Division

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1) Introduction

FDC1 range of relays provide reliable and high performance protection.

The FDC1 series of relays are designed to provide under voltage / over voltage Protection for DC systems based on latest micro controller technique. FDC1 are equipped with LCD display to indicate measurements and settings. Keys are provided for HMI settings. FDC1 is a flush mounted type of relay.

2) Application

FDC1 is a DC voltage relay used for supervision of station batteries or starter batteries etc. It provides under and over voltage protection.

3) Features

- ◆ Numerical Relay
- ◆ Configurable protection & delay parameters
- ◆ Voltage supervision each with under and over voltage detection
- ◆ Assignment matrix for output relays for all protection
- ◆ Last 5 fault records

4) Hardware

- ◆ Micro-controller based Numeric Design
- ◆ Voltage Analog Inputs
- ◆ Draw out Relay
- ◆ 12 x 2 Bright LCD Display
- ◆ 3 Push Button on the Front for HMI
- ◆ 4 LEDs for Annunciation
- ◆ Front IP-54 transparent dust cover

5) Protection Features

- ◆ Under Voltage
- ◆ Over Voltage

6) Protection Features Description

Voltage Protection

The relay is equipped with an independent over and under voltage, 2 step over voltage ($U>$, $U>>$) and 2 step under voltage supervision ($U<$, $U<<$) simultaneously with separately adjustable tripping values and delay times.

7) Fault Record

The FDC1 relays can store the last 5 faults that have occurred in non-volatile memory. Fault1 is the latest fault. Each record provides the following information:

- ◆ Origin of Fault (under / over voltage)
- ◆ Magnitude of D.C voltage




Output Contact

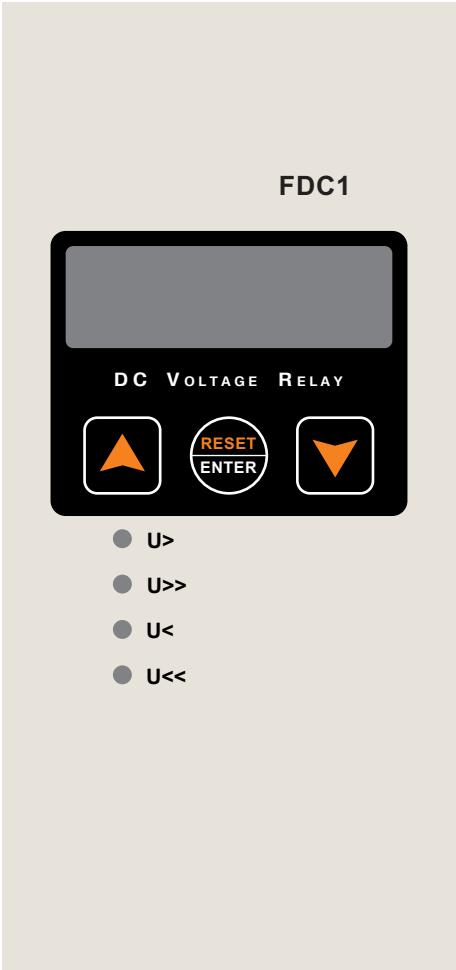
No. of Digital Outputs	:	2 (DO1, DO2)
Type of Outputs	:	Relay
Programmable (DO Assignment)	:	Yes
Relay Reset Type	:	Programmable (Auto/Manual)

8) Human Machine Interface

It comprises of bright LCD display

- ◆ Two push switches for setting values of normal tripping characteristics & other operations for local access.
- ◆ One RESET/ENTER push switch.
- ◆ Four LEDs for over and under voltage.

Keys	Manual Key
	is used to manual reset (after pressing for 3 sec) and also works as ENTER key.
	is used to scroll in upward direction.
	is used to scroll in downward direction.



(Figure 2) (HMI)

LED’s Description

All LEDs are uni colored. The Red LEDs assigned for U>, U>>, U<, U<< start flashing on fault sense & light up to indicate tripping occurred in individual element.

9) Reset

DO Reset Mode

S.No.	Parameter	Display	Setting Range		Default Setting
			Min.	Max.	
1	Digital Output-1	DO 1	Auto	Manual	Manual
2	Digital Output-2	DO 2	Auto	Manual	Manual

10) Relay Testing & Commissioning

The following test instructions should help to verify the protection relay performance before or during commissioning. To avoid a relay damage and to ensure a correct relay operation, be sure that:

- ◆ The auxiliary power supply rating corresponds to the auxiliary voltage on sight.
- ◆ The DC voltage circuits are connected to the relay correctly.
- ◆ All control and measuring circuits as well as the output relays are connected correctly.

11) Secondary Test

Test Equipment

- ◆ Voltmeter with class 1 or better.
- ◆ Auxiliary power supply with the voltage corresponding to the rated data on the type plate.
- ◆ DC voltage supply (adjustable range of V_r).
- ◆ Timer to measure operating time.
- ◆ Test leads and tools.

13) Setting Ranges

S.No.	Features	Setting name	Setting range	Step size
1	Vr	Rated Voltage *	10-250V	1V
2	Over voltage U> & U>>	U> protection blocking	Enable/Disable	-
		U> pickup setting	50 - 250% of Vr	1% x Vr
		U> Definite time setting	0.1 - 60s	0.1s
		U>> protection blocking	Enable/Disable	-
		U>> pickup setting	50 - 250% of Vr	1% x Vr
		U>> Definite time setting	0.1 - 60s	0.1s
3	Under voltage U< & U<<	U< protection blocking	Enable/Disable	-
		U< pickup setting	30 - 125% of Vr	1% x Vr
		U< Definite time setting	0.1 - 60s	0.1s
		U< protection blocking	Enable/Disable	-
		U< pickup setting	30 - 125% of Vr	1% x Vr
		U< Definite time setting	0.1 - 60s	0.1s
4	Relay Assignment	Relay 1, 2		
5	Relay Reset Auto/Manual	Auto / Manual		

* = If rated voltage >200, In that case max. setting range of U> & U>> is 200% (not 250%)

14) Technical Data

Measuring Input

Rated Data	
Thermal withstand capacity in voltage circuit	Continuously : 2 x Vr
Drop out to Pickup Ratio	>97%
Returning Time	30 mSec
Min. Response Time	30 mSec
Protection-Front Panel	IP-54
Weight	Approx. 1.0 Kg

Auxiliary Supply

Auxiliary voltage range	L : 20 - 150V DC
	H : 85-280VAC/110-300VDC
Power consumption	Quiescent approx. 3W, Operating <7W

Measurement Accuracy

Operating Value	± 5%
Operating Time	± 5% or ± 100mSec

Output Relay

Max. Breaking Capacity	250V AC/DC @ 5A
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15.0 Standards

Type Test			
F1	Functional Tests	Internal Design	Performance in line with Specification & Standards
		Specifications & IEC60255-6 IEC60255-3	Pickup/Drop down/Power consumption in Current/Voltage/Aux Supply/Trip timing accuracy: OC/ Directional/NPS/Thermal/OV/Zero Seq/Over Power/ freq/Rate of change of Freq

Climatic Test			
C1	Temperature Dry Cold (Relay operational)	IEC 60068-2-1	-20 deg C, 96 hours
C2	Temperature Dry Cold Transportation & Storage	IEC 60068-2-1	-25 deg C, 96 hours
C3	Temperature Dry Heat (Relay operational)	IEC 60068-2-2	55 deg C, 96 hours
C4	Temperature Dry Heat Transportation & Storage	IEC 60068-2-2	70 deg C, 96 hours
C5	Damp Heat Test (Relay operational)	IEC 60068-2-3	95% @ +55 / +25 deg C, 6 cycle (12hr + 12hr each)

Enclosure			
C6	Enclosure	IEC 529	Front IP54 (Dust5x + Water x4)

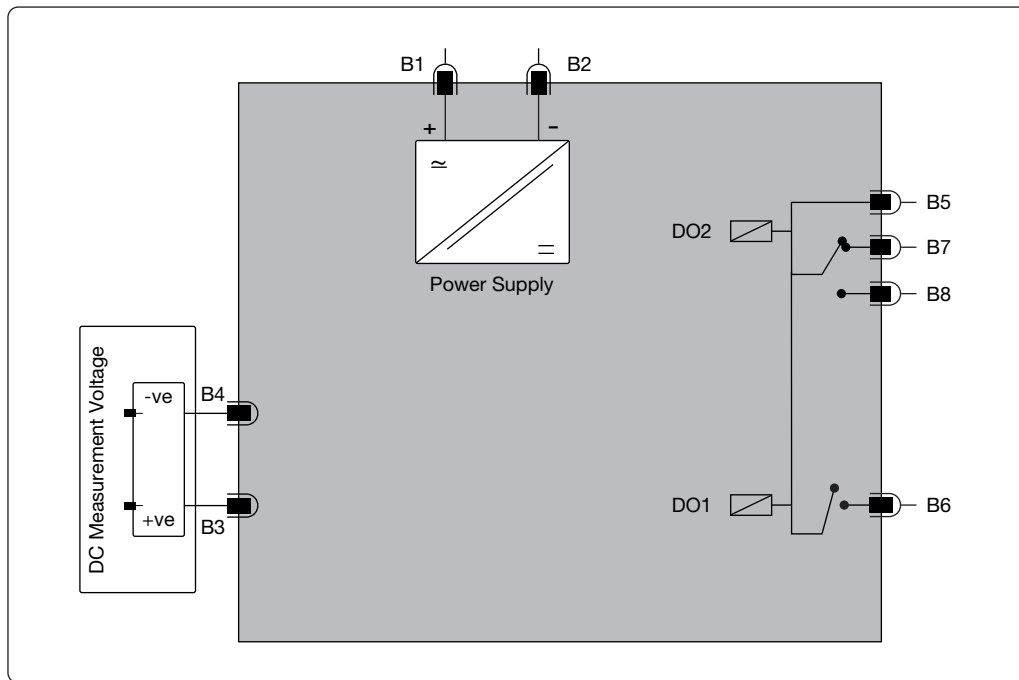
Mechanical Test

Relay Operational			
M1	Vibration response / Endurance test	IEC 60255-21-1	Class I Vibration response (Relay operational) 10Hz~150 Hz - peak displacement 0.035 mm below 58/60 Hz, 0.5 g above, 1 sweep cycle in each axis Vibration endurance (Relay de-energised) 10 Hz~150 Hz 1g, 20 sweep cycles in each axis
M2	Shock Response / withstand test	IEC 60255-21-1	Class I Shock response (Relay operational) 5g 11mS 3 pulse in each axis Shock withstand (Relay de-energised) 15g 11mS 3 pulses in each axis
M3	Bump	IEC 60255-21-1	Bump (Relay de-energised) 10g 16mS 1000 pulses in each axis
M4	Seismic	IEC 60255-21-3	Class I Method A single axis sine sweep 1 Hz~35 Hz—below 8/9 Hz 3.5 mm peak displacement horizontal axis, 1.5 mm vertical axis above 8/9 Hz 1g horizontal, 0.5 g vertical 1 sweep cycle in each axis

Electrical Test			
E1	Insulation Resistance >100MΩ	IEC 60255-5	500V DC, 5 sec between all terminals & case earth, between terminals of independent circuits including contact circuits and across open contacts
E2	DC & AC Supply Voltage (Relay operational)		IEC60255-6 Voltage range, upper & lower limit continuous withstand, ramp up & down over 1 minute
E3	Voltage Dips, Short Interruptions & Voltage variations immunity (Relay operational)	IEC 1000-4-11	IEC60255-113 Dips & 3 Interruptions at 10 sec intervals of duration between 10mS and 500mS at zero crossings & at other points on wave Variation: 100% to 40% over 2s, hold for 1s, return to 100% over 2s
E4	Ripple in DC supply (Relay operational)	IEC 60255-11	12% AC ripple
E5	Dielectric Test (Relay de-energised) No breakdown or flash over Test voltage 45~65 Hz sinusoidal or with DC voltage at 1.4x the stated AC values	IEC 60255-5	2.0 KV @ 1min All circuit to Earth / Between IP & OP except communication terminals
E6	High Voltage Impulse (Relay de-energised)	IEC 60255-5	5 kV peak 1.2/50uS, 0.5 J-3 positive, 3 negative between all terminals to case earth between independent circuits
E7	VT Input Thermal Withstand		1.5xV _n , continuous
E8	CT Input Thermal Withstand		250xI _n half wave 100xI _n for 1 second 30xI _n for 10 second 4xI _n continuously
E9	Contact performance & endurance tests	IEC 60255-14,15 IEC 60255-23	

Electro-magnetic Compatibility			
R1	Electrical fast Transient/Burst (Relay operational)	IEC 60255-22-4 IEC 60100-4-4	Class IV ± 4.0 kV All Circuits. Pulse 5/50msec / Duration 15msec / Period: 300msec/ Pulse Freq: 5KHz / 2KV at I/O
R2	HF Disturbance Test (Oscillatory Waves) 1 MHz Burst (Relay operational)	IEC 60255-22-1	Class III Longitudinal 2.5 kV peak, 2sec between independent circuits & case earth
R3	Electrostatic Discharge (Relay operational)	IEC 60255-22-2 IEC 61000-4-2	Class III 8kV air discharge, 6KV contact No of Discharge : 10 both polarities at 1 sec intervals
R4	Conducted Disturbance RF fields (Relay operational)	IEC 61000-4-6 IEC 60255-22-6	0.15 to 80 MHz (Level-3) Severity Level 10V RMS + sweeps 0.05-0.15 MHz & 80-100 MHz
R5	Radiated RF E-M field immunity test (Relay operational)	IEC 60255-22-3 IEC 61000-4-3	Class III Test method A + sweep 80-1000 MHz or IEC 1000-4-3 80-1000 MHz severity 10 V/m 80% modulated 1 kHz
R6	Surge Immunity capacitively coupled (Relay operational)	IEC 61000-4-5 Class 5 Test level 4 IEC 60255-22-5: 2008 Latest: IEC 60255-26:2013	Short circuit combination wave generator 1.2 uS/50 uS open circuit repetition rate 1 per minute Power supply, CT & VT circuits – 4kV common mode 2 Ohm source 2kV differential mode 12 Ohm source
R7	Power Frequency Magnetic Field (Relay operational)	IEC 61000-4-8	100 A/m for 1 minute in each of 3 axes
R8	Conducted & Radiated RF Interference Emission (Relay operational)	EN55011 IEC 60255-25	CISPR11 / Class A
R9	Power Frequency, conducted common mode	IEC 1000-4-16 IEC 60255-22-7	D.C. to 150 kHz Test Level 4 300V at 16 2/3 Hz and 50 Hz

16) Connection Diagram



(Figure 3)

17) Recommended Terminal Lugs Specifications

Term Blocks	Type/Cable Specifications
Current Inputs	Ring Type lug / 2.5mm ² or 4 mm ² control cable
Auxiliary Supply	Pin Type lug / 1.5 mm ² / 2.5 mm ² control cable
Rear Comm. Port	Pin Type lug / 1.5 mm ² / 2.5 mm ² control cable
Front Comm. Port	USB, Type mini - B to A
Binary Input	Pin Type lug / 1.5mm ² / 2.5mm ² control cable
Binary Output	Pin Type lug / 4.0mm ² control cable
Earth Connections	Ring Type / 2.5mm ² or 4 mm ² contact cable

18) Draw out Process of the Relay

Note : Photographs shown here are for have an idea only.



First Open the Top cover by twisting the lock (as shown in Red circle) on the left side.



Open the 4 mounting screws by using the appropriate screw driver at the corners of the Front plate and than Use the eject handle to bring out the relay from the enclosure.

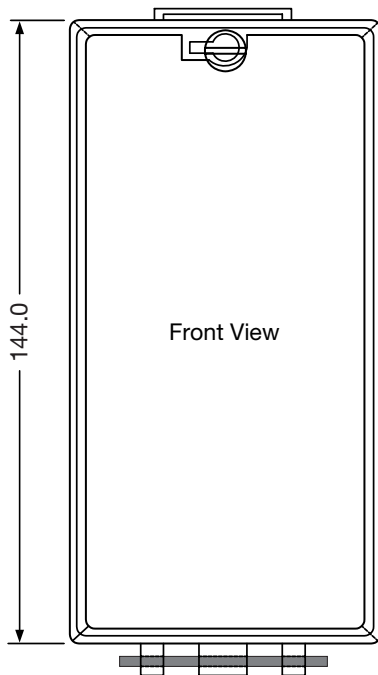


Bring out the relay gently by dragging it outside.

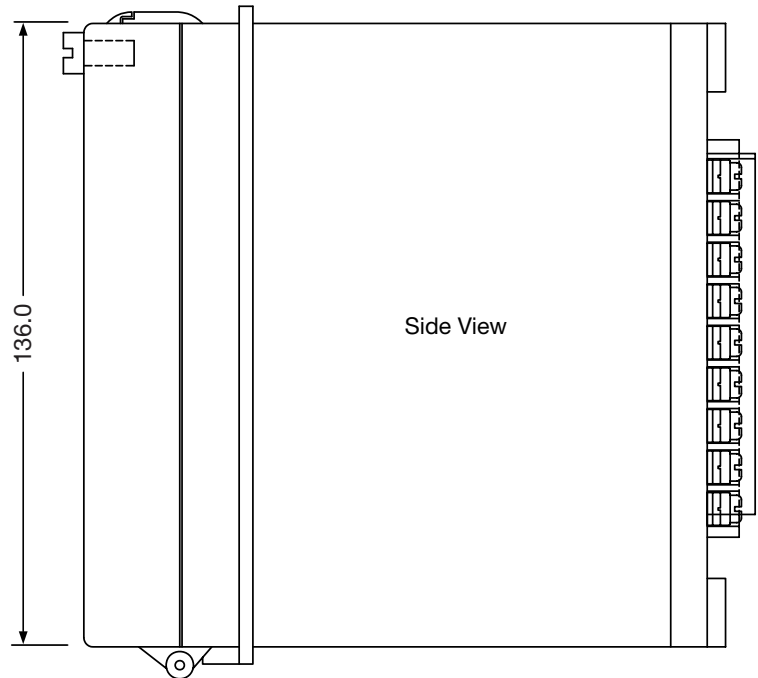
Similarly while bringing in the Relay, Use the eject Handle to drag it inside.

19) Dimensional Details

All the Dim. are in mm (Gen. Tol. ± 1 mm)

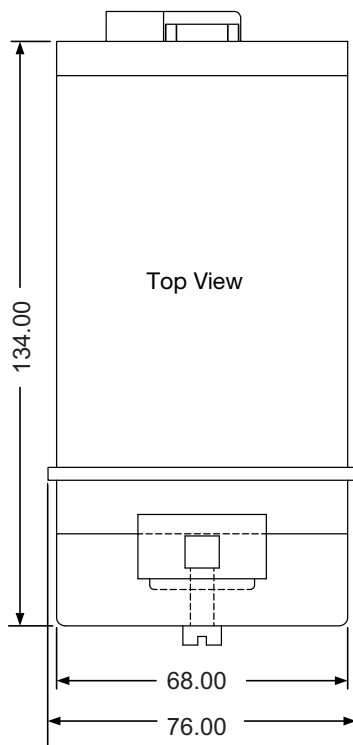


(Figure 5)

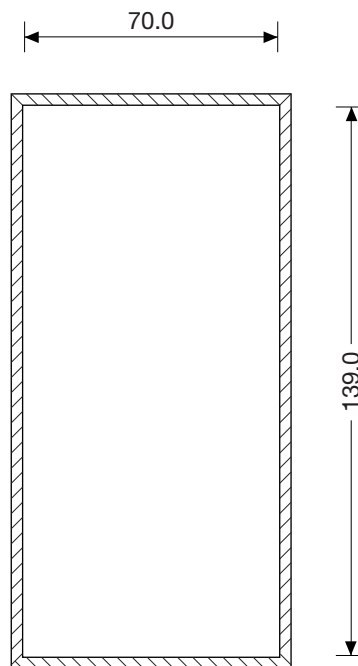


(Figure 6)

20) Panel Cut out Details

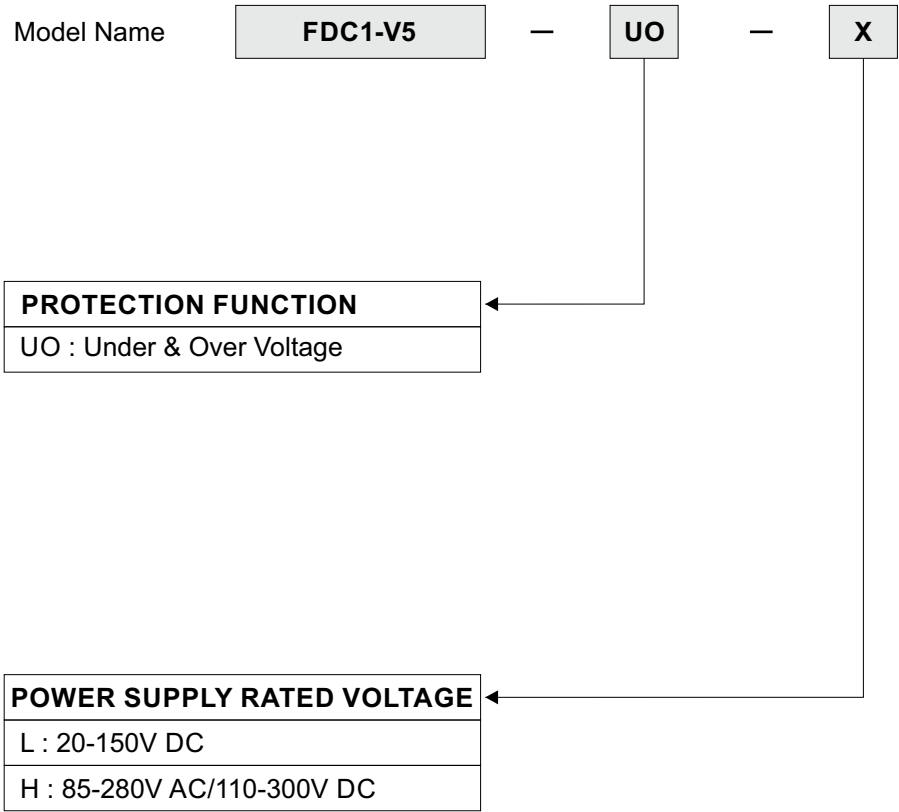


(Figure 7)



(Figure 8)

21) Ordering Information



Revision History

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NOTE

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