



Powering Innovation



PROTECTION + AUTOMATION + CONTROL

NUMERICAL FEEDER PROTECTION RELAY

JD 100-15

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FEATURES

- ◆ Programmable CT secondary current for 1A / 5A rating
- ◆ Programmable system rated frequency (50/60Hz)
- ◆ Display of Primary current
- ◆ Available in many variants to suite main and back-up over-current protection schemes
- ◆ Available in both Low load and normal load configurations Choice of 6 IDMT curves and definite time with hi-set (two stage characteristics)
- ◆ Cold load pick-up
- ◆ MIPConS for preventing E/F element operation during single-phasing
- ◆ Trip Coil Supervision Protection
- ◆ Multi-short auto re-closer facility
- ◆ Self supervision facility
- ◆ Trip test facility
- ◆ History of 200 latest comprehensive fault
- ◆ Draw-out facility with inbuilt CT shorting
- ◆ Standard dimension – 144mm x 144mm
- ◆ Negative sequence & Broken conductor detection



Application

The JD100 relay provides time graded phase and earth fault protection of Transformer, Feeder & Capacitor bank. MODBUS/IEC103 standard communication protocol over RS485 facilitates interfacing the relay with SCADA systems and RS – 232 / USB communication port provided at the front of the relay allows engineers to program the relay easily. Certain advanced features such as Negative sequence protection, Broken conductor, Cold load pickup, RAPID (Rapid automatic planned imbalance current detection), Local breaker backup and Auto reclose improves the selectivity, sensitivity and stability of the Power system. automatic planned imbalance current detection), Local breaker backup and Auto reclose improves the selectivity, sensitivity and stability of the Power system.

PRINCIPLE OF OPERATION

Over current relaying principles

The relay measures the line current from each of the line CTs and if the current exceeds the set threshold, then relay extends a trip signal after an operating time. The relay's "operating time" is determined by selecting "definite time" or one of the six "inverse time" characteristics. This principle of relaying is equally applicable to both line and earth fault protection elements (51N / 51G).

Cold load pick-up

This feature can be useful in providing better selectivity in the operation of over current relays, by preventing them from operating, during inrush phenomenon.

MIPConS - Management of Imbalance Phasor Control through Supervision

Under the existing practice of operating the distribution network in 2-phase mode (popularly known as single- phasing) for certain strategic purposes, conventional earth fault relays in substations would pick-up and trip the circuit breaker. This operation is considered by the engineers as an undesirable outcome of a planned current un-balance in the system. "MIPConS", when enabled, automatically detects the single-phasing operation and restoration of 3-phase system. Consequently, the feature prevents "earth fault element" from extending trip command under single-phasing conditions.

Trip Test Facility

The trip test will facilitate testing of relay operation without applying the input current. The trip test is useful to test the panel wiring and operation of breaker without any current. The trip contact will operate instantaneously. The phase and earth fault alarm contact will not operate during the trip test.

Restricted earth fault protection

A simple earth fault protection may not provide adequate protection for transformer windings particularly when in the case of "Y" connected winding earthed with an impedance. The efficacy of protection is improved by employing restricted earth fault protection. The said protection scheme is prevalent even under the case of "solidly earthed systems". High-impedance protection scheme requires the residual current derived from the three line CTs to be balanced with the "neutral current" derived out of neutral CT. This unit protection scheme is generally sensitive only to the fundamental harmonic component of the measured current and has an "instantaneous time" as its operating characteristics.

Auto re-close facility

Relay has a multi shot auto re-closer facilitates automation for breaker operation. Auto re-closer can be programmed to provide a maximum of five shots. "Dead time" starts when a trip signal is provided due to the occurrence of a fault involving L-L or L-G or L-L-G or L-L-L or L-L-L-G. After an elapse of a time interval equal to "dead time", closing command will be extended. The "reclaim time" timer starts at the instant when the "dead time" timer expires. If after extending the "breaker close" signal an over current fault was detected before the "reclaim time" timer reached its terminal count, then the relay understands that the fault in the system is still persisting and the over current relay will issue a trip signal. The relay tries to close the breaker for a maximum of the programmed number of shots before it chooses to lockout. The relay can be configured for independent trip sequence as IDMT or Definite time.

TCSR

TCSR monitors trip coil continuously. If the trip circuit (or any coil) that is being supervised develops a snag, then the supervision relay extends an alarm without a delay. The relay monitors the trip coil under all the states of a breaker viz. close, open and during transition. The underlying mechanism of supervision is to perform hi- impedance measurement across two input circuits appropriately wired along with trip coil, 52A and 52B auxiliary contacts. 1-NO & 1-NC contacts have been provided for the purpose of alarm and SCADA. The current rating of these contacts is 5A at 24VDC / 230VAC.

Supervision functions

Self supervision feature allows the operator to take note of any internal failure in the relay. An LED and an output contact is provided for annunciation purposes.

TECHNICAL DATA

RELAY (ISD / IED features)	JD100-15 – PNACSA CONFIGURATION	
Signal frequency	50Hz / 60Hz, site selectable	
Aux. Supply	** A = 1 implies 19V – 65V DC ** A = 2 implies 80V – 265V AC / DC	
Operating characteristics	1) 3.0s Normal Inverse 2) 1.3s Normal Inverse 3) 1.5s Very Inverse 4) 0.8s Extremely Inverse 5) 0.6s Extremely Inverse 6) 13.3s Long Inverse 7) Definite Time	
Rated Current	L = 1 means “suitable for optimal load”	L = 2 means “suitable for low load”
Relay rated current rating (In)	1A / 5A, site selectable Range for 1A: 50mA – 32A (5% to 3200%) Range for 5A: 250mA – 160A (5% to 3200%)	1A / 5A, site selectable Range for 1A: 20mA – 20A (2% to 2000%) Range for 5A: 100mA – 100A (2% to 2000%)
Operating Value	L = 1 means “suitable for optimal load”	L = 2 means “suitable for low load”
Phase OC (IDMT) – Low-set	5% to 1600% of 'In' in steps of 0.5%	2% to 1000% of 'In' in steps of 0.5%
Phase OC (Def time) – Low-set	5% to 2300% of 'In' in steps of 0.5%	2% to 1500% of 'In' in steps of 0.5%
Earth fault (IDMT) – Low-set	5% to 1600% of 'In' in steps of 0.5%	2% to 1000% of 'In' in steps of 0.5%
Earth fault (Def time) – Low-set	5% to 2300% of 'In' in steps of 0.5%	2% to 1500% of 'In' in steps of 0.5%
Negative phase sequence OC(IDMT) – Low-set	5% to 1600% of 'In' in steps of 0.5%	2% to 1000% of 'In' in steps of 0.5%
Negative phase sequence OC(Def time) – Low-set	5% to 2300% of 'In' in steps of 0.5%	2% to 1500% of 'In' in steps of 0.5%
Phase Hi-set	5% to 3200% of 'In' in steps of 0.5%	2% to 2000% of 'In' in steps of 0.5%
Earth fault Hi-set	5% to 3200% of 'In' in steps of 0.5%	2% to 2000% of 'In' in steps of 0.5%
Negative phase sequence OC Hi-set	5% to 3200% of 'In' in steps of 0.5%	2% to 2000% of 'In' in steps of 0.5%
NDR(IDMT)-Low-Set	5% to 150% @ 0.5%	2% to 80% @ 0.5%
NDR(Def time)-Low-Set	5% to 150% @ 0.5%	2% to 80% @ 0.5%
SEF	2% to 80% of 'In' in steps of 0.5%	
REF	2% to 80% of 'In' in steps of 0.5%	
LINE PT (Rated)	63.5 / 110V	
LINE PT	1-999kV	
Broken Conductor Setting	20% to 100% in steps of 0.5	
Broken Conductor minimum current setting	20% to 100% in steps of 0.5	
TMS (Ph, E/F, NSQ & NDR)	0.005 to 5.0 in steps of 0.005	
Operating time		
Definite time (Ph, E/F, NSQ, BC & SEF)	0.00 to 150.00s in steps of 0.01s (0 – Instantaneous)	
REF	< 30ms	
Hi-set operating time (Ph, E/F & NSQ)	0.00 to 20.00s in steps of 0.01s (0 – Instantaneous) < 40ms	
Reset Time	0.00 to 20.00 Sec in step of 0.01 sec	
Accuracy		
Operating value (IDMT, Def time & SEF)	Less than 1.1 time	
Operating value (NSQ IDMT, Def time, BC)	Less than 1.2 time ± 5mA	
Operating value(REF)	±5% or ±3mA whichever is higher	
Drop-off / pick-up (Ph, E/F, SEF, REF, NDR, NSQ & BC)	~90%	
Operating time(IDMT for Ph, E/F, SEF, REF & NDR)	±5% for 3.0s NI, 1.3s NI, 13.3s LI characteristics. ±7% for 0.8s EI, 0.6s EI, 1.5s VI characteristics.	
Operating time(IDMT for NSQ)	±5% for 3.0s NI, 1.3s NI, 13.3s LI characteristics +100ms. ±7% for 0.8s EI, 0.6s EI, 1.5s VI characteristics + 100ms..	
Operating time(Def time for Ph, E/F, SEF, REF & NDR)	± 2% or ±30ms whichever is higher*	
Operating time(Def time for NSQ & BC)	± 2% or ±100ms whichever is higher*	
Operating time for REFR	REFR (instantaneous) < 30 ms.	

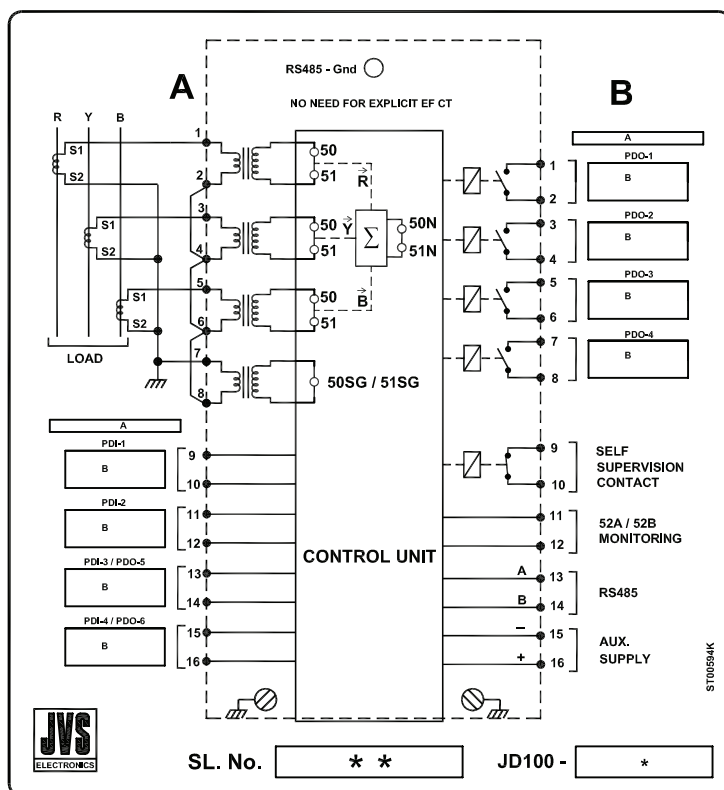
Breaker Monitoring (Site selectable)		
Breaker Monitoring (Site selectable)	1)52A monitoring 2)52B monitoring 3)None	
Breaker Operating time	50ms to 200ms in step of 10ms	
52A/B	Potential free contact	
LBB Setting		
OC(Breaker Failure)	5 to 1600% in step of 0.5%	2 to 1000% in step of 0.5%
Delay Trip Timer	0.05s to 10s in step of 0.01s	0.05s to 10s in step of 0.01s
ARR Setting		
Maximum Re-closing Shots	5	
Dead Time 1 to 5	0.5 s to 250s in step of 0.1 s	
Reclaim Time	10s to 250s in steps of 1s	
Cold Load pickup setting		
Cold Load pickup(CLP)	1 to 15 times of over-current settings in steps of 0.1	
CLP Delay	0.05s to 1.0s in steps of 0.01s	
TCSR		
Measured Current	< 1mA	
Operating Time	0.1 to 2 sec in step of .01s	
Reset Time	< 20ms	
Records		
Number of DR	Two	
Duration of DR	0.37s Pre-fault and 0.36s Post-fault	
Pre-fault selection (in % of DR)	10% , 50% , 90%	
Event record	100 event	
Fault record	200	
Digital Output		
Programmable Potential Free Output	4 (NO type)	
Digital Input		
Potential Digital Input	4	
PDI threshold level	12V / 24V / 36V / 48V / 110V / 220V	
Potential free Contact rating		
TRIP CONTACTS		
Make & carry	1250VA at maximum 10A or 440V AC / 220v DC	
Break capacity	2300VA at maximum 10A or 440V AC / 220V DC	
<i>ALARM & Self Supervision Contacts</i>	5A at 24V DC / 230V AC	
Contact Durability		
Electrical	100,000 operations	
Mechanical	1000,000 operations	
Over load rating (Current input)	2 times rated continuous 20 times rated for 3s 40 times rated for 1s 100times rated for 160ms	
Burden		
Current input	0.4VA per phase (Rated 5A) 0.05VA per Phase (Rated 1A)	
Aux. Voltage input	Less than 10W (Non operated) Less than 13W (Operated)	
Communication		
MODBUS communication over RS232 / USB	Exists	
MODBUS communication over RS485	Exists	
Mechanical		
Weight	5.0 kg (Approximately)	
Case Size	Fascia 144mm x 144mm	
Installation	Flush mounting	
Panel cutout	138mm x 138mm	

*When the energizing quantity is ramped from a non-zero value to the operating value

ANSI-IEC CODES OF PROTECTION

Protection	ANSI	IEC
Non-directional overcurrent protection, low-set stage	51	3I>
Non-directional overcurrent protection, high-set stage	50-1	3I>>
Non-directional overcurrent protection, instantaneous stage	50-2	3I>>>
Earth-fault protection, low-set stage	51N	Io>
Earth-fault protection, high-set stage	50N	IO>>
Negative-sequence overcurrent protection	46	I2>
Circuit breaker failure protection	51BF/51NBF	3I>/Io>BF
Broken Conductor	46BC	-
Auto-reclosing	79	O->I
Condition Monitoring		
Trip circuit supervision	95	TCS
Measurement		
Three-phase current measurement	3I	3I
Negative phase sequence current	I2	I2

TERMINAL DIAGRAM



ORDERING INFORMATION

Relay Model Selection : Please fill the ordering information as per the information provided in below mentioned columns(Select one option from each section and put in grey box)

JD 100 - P N A C S A (Configuration)

Relay Type	Protection(P)	Nature of Load(N)	Automation(A)	Communication(C)	Special Feature(S)	Aux Supply(A)
JD100-15						
	1 30C + E/F(51N)	1 Low 2% to 200%	a NO-ARR, NO-LBB NO-DR, NO-TCSR, NO-DI	1 NO COMMUNICATION	1 NO SPECIAL FEATURE REQUIRED	1 19 to 65 v DC
	2 30C + E/F(51G)	2 Normal (5% to 3200%)	b LBB	2 USB + RS485(MODBUS PROTOCOL)	2 MIPCon5 (For 1/3 phasing system)	2 80 to 265 v AC/DC
	3 30C + E/F(51N) +REF		c ARR	3 RS 232 + RS485(MODBUS PROTOCOL)	3 NSQ + BQ(For 3 Phase system)	
	4 30C + E/F(51N)		d TCSR	4 USB + RS485(IEC 103 PROTOCOL)		
	5 30C + E/F(51N)		e DI	5 RS 232 + RS485(IEC 103 PROTOCOL)		
			f LBB + DR			
			g ARR + DR			
			h LBB + TCSR			
			i ARR + TCSR			
			j LBB + DI			
			k ARR + DI			
			l LBB + TCSR + DR			
			m ARR + TCSR + DR			
			n LBB + DI + DR			
			o ARR + DI + DR			
			p ARR + DI + DR + TCSR			
			q ARR + DI + DR + LBB			
			r ARR + DI + DR + LBB + TCSR			

Example Of Ordering :

Requirement : Numerical relay 3 O/C + 1 E/F(51N) + SEF, low load with TCSR, USB + RS485 over MODBUS protocol, Negative sequence protection + Broken Conductor detection, Aux supply : 19 – 65V DC

The ordering code for the above mentioned relay specification will be : **JD100 -15- 41d431**