PROTECTION RELAYS

U-MLEs-PLv

DC substation protective relay
(double voltage line test) 32, 45, 49, 64, 76, 79, 80

D.C. Feeder protection relay with setting parameters programmable locally or via serial communication. Suitable for protection of D.C. feeders with High-Speed DC Breakers, for railway application.

The relay measures the Line current and voltage through one current transducer and one voltage transducer. The transducers (type MHCO and MHIT) are galvanically insulated.

Via fiber optic and have the following measuring ranges:

- Line voltage : (0 ÷2)Vn
- Line current : (0 ÷10)In
- Insulation voltage 20kVac 1min.

Real time measurements of primary input values can be read continuously both from the display and via ports communication. Relay settings can be done via the front Pannel and via rear serial communication. The associated Circuit Breaker can be controlled via the frontal keyboard and via serial communication. Settings, events and oscillographic recordings are stored in a non-volatile memory (E2PROM). Besides the normal Watchdog and Powerfail functions, a comprehensive program of self-test and self diagnostic provides:

- Diagnostic and functional test with checking of programroutines and memory contents, running every time the auxiliary power supply is switched on.
- Dynamic functional test running during normal operation.
- Complete Test activated by the keyboard or via the communication bus.

MICROELETTRICA

Any internal fault detected is indicated by a fault message on the display and by de-energization of associated I.R.F. output relay.

The relay is available in three different executions:
- Flush mounting.
- Surface mounting.
- 19"Rack mounting.

Protective Functions
- Thermal image protection of the Cable/Line
- 4 Overcurrent levels Forward/Reverse programmable
- 2 Current Step level with di/dt dependance
- 2 Rate of rise level
- 1 Impedance monitoring level with di/dt dependance
- 1 Current monitoring level with di/dt dependence
- 2 Frame Fault Current and Voltage monitoring levels
- 4 Shot Automatic Reclosure
- 2 Overvoltage levels
- 2 Undervoltage levels
- Automatic programmable Line Test
- Energy counter pulse
- C/B Lock
- Remote Trip

Control
- Trip circuit supervision
- Associated Circuit Breaker control (OPEN / CLOSE)
- Breaker failure protection
- Breaker interruption energy $\sum i^2t$

Recording
- Two complete setting programs switchable locally or remotely
- Blocking input and Blocking output for pilot wire selectivity coordination and intertripping scheems
- Event Recording (last 100 events)
- Trip Recording (last 10 trips) complete with cause of tripping and values of the input quantities at the moment of trip
- Oscillographic recording of input quantities

Communications
- Modbus RTU, Modbus RTU on TCP-IP and IEC870-5-103 communication protocols
- RS232 communication port on Front Face
- RS485 or RJ45 (optional) communication port on Back Panel
- Synchronisation with other relays (resolution 1ms)
- CanBus line for control of slave I/O Expansion modules

Technical Characteristics
- Graphic Display (128x64 dots)
- 4 LEDS for: Power on/internal relay fault, Trip / alarm, Trip circuit fault
- 6 Output relays totally user programmable
- 4 Digital inputs user programmable

Mounting
- 2 Module box, totally draw-out execution
- IP44 protection case (on request IP54)
- Totally draw-out execution

Power Supply Ratings
- Autoranging multivoltage power supply
- Type 1 : 24V(-20%) / 110V(+15%) a.c. - 24V(-20%) / 125V(+20%) d.c.
- Type 2 : 80V(-20%) / 220V(+15%) a.c. - 90V(-20%) / 250V(+20%) d.c.

Software
- MSCom2 Program interface for device management

Accessories
- High-Voltage Current/Voltage measuring Transducer with Fiber Optic output : Type MHCO-T/V-I
- High-Voltage Current measuring Transducer with Fiber Optic output : Type MHCO-T-I.
- High-Voltage Voltage measuring Transducer with Fiber Optic output : Type MHCO-T-V
- Voltage measuring reciver with fiber optic input and 3 Analogic outputs : Type MHCO-R-V
- Current measuring reciver with fiber optic input and 3 Analogic outputs: Type MHCO-R-I
- Input/Output Expansion Module:
  UX10-4 - 10 Digital Inputs + 4 Outputs Relay
  UX14DI - 14 Digital Inputs
  UX14DO - 14 Outputs Relay
- Line Test Contactor
- Line Test Resistor
- Rail Earthing Contactor
- Other protection Relay
- SCADA and Communication systems

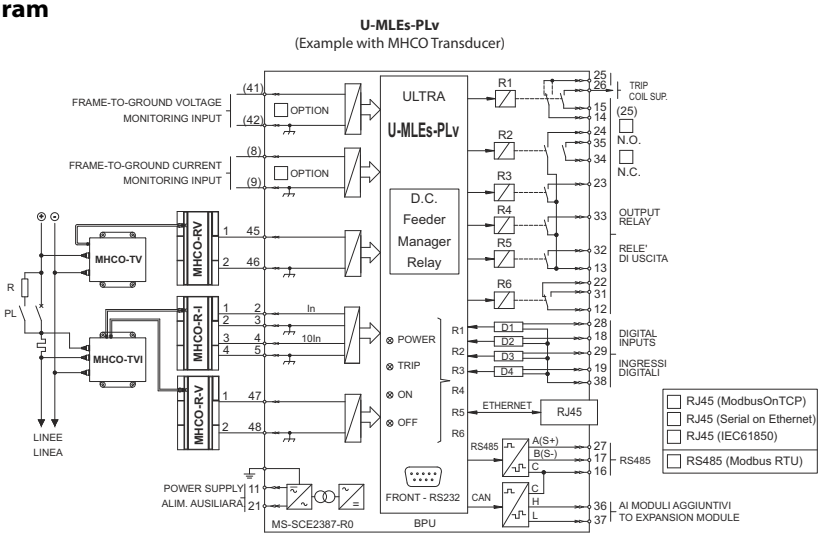
Real Time Measurements		
I = Current V = Voltage P = Power +Wh, = Exported Energy -Wh, = Imported Energy		
F49 (T>): Thermal Image element with prealarm		
Function enabling	Disable / Enable	
Temperature prealarm	Tal = (10 ÷ 100)%Tn	step 1%Tn
Continuous admissible current	Is = (0.5 ÷ 1.5)	step 0.01
Time constant	Kt = (1 ÷ 600)min	step 0.01min
1F - 67/50/51 (1I>): 1st Overcurrent Element		
Function enabling	Disable / Enable	
Time current curves	f(t) = Indep.Definite Time (D), IEC (A/B/C)	
Operation Mode	f(a) = Non Directional - Directional Forward - Directional Reverse	
Setting range	Is = (0.1 ÷ 4)In	step 0.01In
Instantaneous output	≤0.03s	
Independent time delay	ts = (0.02 ÷ 100)s	step 0.01s
2F - 67/50/51 (2I>): 2nd Overcurrent Element		
Function enabling	Disable / Enable	
Time current curves	f(t) = Indep.Definite Time (D), IEC (A/B/C)	
Operation Mode	f(a) = Non Directional - Directional Forward - Directional Reverse	
Setting range	Is = (0.1 ÷ 4)In	step 0.01In
Instantaneous output	≤0.03s	
Independent time delay	ts = (0.02 ÷ 100)s	step 0.01s
3F - 67/50/51 (3I>): 3rd Overcurrent Element		
Function enabling	Disable / Enable	
Operation Mode	f(a) = Non Directional - Directional Forward - Directional Reverse	
Setting range	Is = (0.1 ÷ 10)In	step 0.01In
Instantaneous output	≤0.03s	step 0.01In
Independent time delay	ts = (0.02 ÷ 100)s	step 0.01s
4F - 67/50/51 (4I>): 4th Overcurrent Element		
Function enabling	Disable / Enable	
Operation Mode	f(a) = Non Directional - Directional Forward - Directional Reverse	
Setting range	Is = (0.1 ÷ 10)In	step 0.01In
Instantaneous output	≤0.03s	
Independent time delay	ts = (0.02 ÷ 100)s	step 0.01s
1F - (1ΔI): 1st 1DI Element		
Function enabling	Disable / Enable	
Setting range	DI = (100 ÷ 9990)A	step 10A
Minimum di/dt level to start ΔI	di = (4 ÷ 400)A/ms	step 1A/ms
Instantaneous output	≤0.03s	
Independent time delay	tDI = (0 ÷ 500)ms	step 1ms
Detection reset time delay	tdi = (0 ÷ 100)ms	step 1ms
2F - (2ΔI): 2st 2DI Element		
Function enabling	Disable / Enable	
Setting range	DI = (100 ÷ 9990)A	step 10A
Minimum di/dt level to start ΔI	di = (4 ÷ 400)A/ms	step 1A/ms
Instantaneous output	≤0.03s	
Independent time delay	tDI = (0 ÷ 500)ms	step 1ms
Detection reset time delay	tdi = (0 ÷ 100)ms	step 1ms

1F - (1di/dt): 1st Current Rate of Rise Element		
Function enabling	Disable / Enable	
Setting range	G = (4 ÷ 400)A/ms	step 1A/ms
Instantaneous output	≤0.03s	
Independent time delay	tG = (2 ÷ 500)ms	step 1ms
2F - (2di/dt): 2nd Current Rate of Rise Element		
Function enabling	Disable / Enable	
Setting range	G = (4 ÷ 400)A/ms	step 1A/ms
Instantaneous output	≤0.03s	
Independent time delay	tG = (2 ÷ 500)ms	step 1ms
Rapp: Impedance monitoring with di/dt dependence		
Function enabling	Disable / Enable	
Arc Voltage	Va = (0 ÷ 800)V	step 1V
Internal Resistance	Ri = (0 ÷ 0.250)0	step 0.0010
Total Resistance of the circuit	Rt = (0.001 ÷ 2.5)0	step 0.0010
Internal Inductance	Li = (0.001 ÷ 0.01)H	step 0.001H
Total Inductance of the circuit	Li = (0.002 ÷ 0.05)H	step 0.001H
Resistance trip level	R* = (0 ÷ 100)0	step 0.010
Limit value of di/dt	g = (10 ÷ 500)A/ms	step 1A/ms
Instantaneous output	≤0.03s	
Independent time delay	g = (0 ÷ 100)ms	step 1ms
Iapp: Current monitoring with di/dt dependence		
Function enabling	Disable / Enable	
Current trip level when di/dt = 0	Ia = (500 ÷ 5000)A	step 10A
Current trip level when di/dt ≥ [g]	I* = (400 ÷ 1500)A	step 10A
Limit value of di/dt	g = (30 ÷ 500)A/ms	step 1A/ms
Drop-out percentage	Res = (80 ÷ 100)%Iapp	step 1%Iapp
Instantaneous output	≤0.03s	
Independent time delay	tr = (0 ÷ 5)s	step 0.01s
1F - 64 (1Ig): 1st Frame Fault Element		
Function enabling	Disable / Enable	
Time current curves	f(t) = Indep.Definite Time (D), IEC (A/B/C)	step 10A
Current setting range	Is = (0.1 ÷ 4)Ign	step 0.01Ign
Voltage setting range	Us = (0.01 ÷ 1)Ugn	step 0.01Ugn
Instantaneous output	≤0.03s	step 1%Iapp
Independent time delay	ts = (0.02 ÷ 100)s	step 0.01s
2F - 64 (2Ig): 2nd Frame Fault Element		
Function enabling	Disable / Enable	
Time current curves	f(t) = Indep.Definite Time (D), IEC (A/B/C)	step 10A
Current setting range	Is = (0.1 ÷ 4)Ign	step 0.01Ign
Voltage setting range	Us = (0.01 ÷ 1)Ugn	step 0.01Ugn
Instantaneous output	≤0.03s	step 1%Iapp
Independent time delay	ts = (0.02 ÷ 100)s	step 0.01s

RCL: Automatic Reclosure		
Function enabling	Disable / Enable	
Number of Reclosure	ShN° = 1 / 2 / 3 / 4	
Reclaim time	tr = (1 ÷ 200)s	step 1s
Time first reclosure	t1 = (0.1 ÷ 1000)s	step 0.1s
Time second reclosure	t2 = (0.1 ÷ 1000)s	step 0.1s
Time third reclosure	t3 = (0.1 ÷ 1000)s	step 0.1s
Time fourth reclosure	t4 = (0.1 ÷ 1000)s	step 0.1s
LT: Automatic Line Test (Double Voltage Line test)		
Function enabling	Disable / Enable	
Number of Test	TestN° = 0 / 2 / 3 / 4	
Minimum residual voltage downstream	Vv< = (0 ÷ 1)Vn	step 0.001Vn
Minimum residual voltage upstream	Vm< = (0 ÷ 1)Vn	step 0.001Vn
Minimum residual resistance	RR< = (0 ÷ 500)0	step 10
Minimum line voltage	VFast = (0.5 ÷ 1)Vn	step 0.1Vn
Waiting time after C/B closing	tp = (0 ÷ 30)s	step 1s
Duation of the Line Test	tt = (1 ÷ 10)s	step 1s
Wait time between 2 consecutive tests	tcy = (1 ÷ 60)s	step 1s
Wait time to start recl.after succes fine test	tw = (0 ÷ 10)s	step 1s
1F - 59 (1U>): 1st Overvoltage Element		
Function enabling	Disable / Enable	
Setting range	Us = (0.5 ÷ 1.5)Un	step 0.01Un
Instantaneous output	≤0.03s	
Independent time delay	ts = (0 ÷ 650)s	step 1s
2F - 59 (2U>): 2nd Overvoltage Element		
Function enabling	Disable / Enable	
Setting range	Us = (0.5 ÷ 1.5)Un	step 0.01Un
Instantaneous output	≤0.03s	
Independent time delay	ts = (0 ÷ 650)s	step 1s
1F - 27 (1U<): 1st Undervoltage Element		
Function enabling	Disable / Enable	
Setting range	Us = (0.2 ÷ 1)Un	step 0.01Un
Instantaneous output	≤0.03s	
Independent time delay	ts = (0 ÷ 650)s	step 1s
1F - 27 (2U<): 2nd Undervoltage Element		
Function enabling	Disable / Enable	
Setting range	Us = (0.2 ÷ 1)Un	step 0.01Un
Instantaneous output	≤0.03s	
Independent time delay	ts = (0 ÷ 650)s	step 1s
Wi: Circuit Breaker Energy Maintenence		
Function enabling	Disable / Enable	
Setting range	Ii = (0.1 ÷ 99)In	step 0.1In
Conventional interrupption current	Wi = (1 ÷ 9999)	step 1
RT: Remote Trip		
Function enabling	Disable / Enable	
Independent time delay	ts = (0 ÷ 10)s	step 0.01s

Wh: Energy Counter Pulse		
Function enabling	Disable / Enable	
Energy level	WpP = (10 ÷ 1000)kW	step 10kW
Pulse duration	Pulse = (0.1 ÷ 2)s	step 0.01s
CB-L: C/B Lock		
Function enabling	Disable / Enable	
Breaker Failure Element		
Trip time delay	tBF = (0.05 ÷ 0.75)s	step 0.01s

Connection Diagram



Typical Characteristics		
Accuracy at reference value of influencing factors	1% FS	for measurements
	2% +/- 10ms	for times
Burden on current inputs	0 ÷ 20 mA	
Neutral: 0.03VA at In=1A; 0.2VA at In=5A	<10 VA	
Output Relays	rating 5 A; Vn = 380 V A.C. resistive swictching = 1100W (380V max) make= 30 A (peak) 0.5 sec., break = 0.3 A, 110 Vcc, L/R = 40 ms (100.000 op.)	

Order Code - Example					
U-MLEs-PLv	1	2	1	1	1
	Power Supply	Configuration	1st Expansion	2nd Expansion	Communication Protocol
		R1 (14-25)	module	module	
	1 = Type 1	1 = N.O.	1 = None	1 = None	1 = ModbusRTU (standard)
	2 = Type 2	2 = N.C.	2 = UX10-4	2 = UX10-4	2 = Modbus TCP-IP
			3 = 14DI	3 = 14DI	3 = IEC61850
			4 = 14DO	4 = 14DO	

The technical specifications reported are not binding and they should be agreed in the contract.

For further technical information on our products visit www.microelettrica.com

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