



PROTECTION RELAYS

U-MLEs

D.C. feeder manager relay 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) are galvanically insulated via fiber optic and have the following measuring ranges:

- Line voltage : $(0 \div 2)V_n$
- Line current : $(0 \div 10)I_n$
- Insulation voltage 20kVac 1min.

Real time measurements of primary input values can be read continuously both from the display and via serial communication. Relay programming can be done both via the frontal keyboard and via serial communication. The associated Circuit Breaker can be controlled both 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 program routines 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.

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.



MICROELETTRICA

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 dependance
- 2 Frame Fault Current and Voltage monitoring levels
- Cable insulation monitoring
- 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 $\Sigma i^2 t$

Recording

- Two complete setting programs switchable locally or remotely
- Blocking input and Blocking output for pilot wire selectivity coordination and intertripping schemes
- 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 (8 channels, 32 sample/cycle, 2 sec each)

Communications

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

Technical Characteristics

- Graphical 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.
- IP44 Protection degree (on request IP54)
- Totally draw-out execution

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
- Cable monitoring device A-MSG-1 (Cable Screen-to-Ground or Conductor-to-Screen monitoring) with current output directly supplied to the U-MLEs relay
- Cable monitoring system MSG/N-DIN independent tripping and measurement
- Cable Screen-to-Ground and Conductor-to-Screen monitoring
- Two-channels Digital/Fiber Optic converter for remote intertripping signal Type CFV-BL
- 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
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F49 (T>): Thermal Image element with prealarm

Function enabling	= ON - OFF	
Temperature prealarm	$T_{al} = (10 \div 100)\%T_n$	step 1 %T _n
Continuous admissible current	$I_s = (0.5 \div 1.5)$	step 0.01
Time constant	$K_t = (1 \div 600)\text{min}$	step 0.01min

1F - 67/50/51 (1I>): 1st Overcurrent Element

Function enabling	= ON - OFF	
Time current curves	$f(t) = \text{Indep. Definite Time (D), IEC (A/B/C)}$.	
Operation Mode	$f(a) = \text{Non Directional - Directional Forward - Directional Reverse}$	
Setting range	$I_s = (0.1 \div 4)I_n$	step 0.01I _n
Instantaneous output	= ≤ 0.03s	
Independent time delay	$t_s = (0.02 \div 100)\text{s}$	step 0.01s

2F - 67/50/51 (2I>): 2nd Overcurrent Element

Function enabling	ON - OFF	
Time current curves	$f(t) = \text{Indep. Definite Time (D), IEC (A/B/C)}$.	
Operation Mode	$f(a) = \text{Non Directional - Directional Forward - Directional Reverse}$	
Setting range	$I_s = (0.1 \div 4)I_n$	step 0.01I _n
Instantaneous output	= ≤ 0.03s	
Independent time delay	$t_s = (0.02 \div 100)\text{s}$	step 0.01s

3F - 67/50/51 (3I>): 3rd Overcurrent Element

Function enabling	ON - OFF	
Operation Mode	$f(a) = \text{Non Directional - Directional Forward - Directional Reverse}$	
Setting range	$I_s = (0.1 \div 10)I_n$	step 0.01I _n
Instantaneous output	= ≤ 0.03s	
Independent time delay	$t_s = (0.02 \div 100)\text{s}$	step 0.01s

4F - 67/50/51 (4I>): 4th Overcurrent Element

Function enabling	ON - OFF	
Operation Mode	$f(a) = \text{Non Directional - Directional Forward - Directional Reverse}$	
Setting range	$I_s = (0.1 \div 10)I_n$	step 0.01I _n
Instantaneous output	= ≤ 0.03s	
Independent time delay	$t_s = (0.02 \div 100)\text{s}$	step 0.01s

1F - (1ΔI): 1st 1DI Element

Function enabling	ON - OFF	
Setting range	$DI = (100 \div 9990)\text{A}$	step 10A
Minimum di/dt level to start ΔI	$di = (4 \div 400)\text{A/ms}$	step 1 A/ms
Instantaneous output	= ≤ 0.03s	
Independent time delay	$t_{DI} = (0 \div 500)\text{ms}$	step 1ms
Detection reset time delay	$t_{di} = (0 \div 100)\text{ms}$	step 1ms

2F - (2ΔI): 2nd 2DI Element

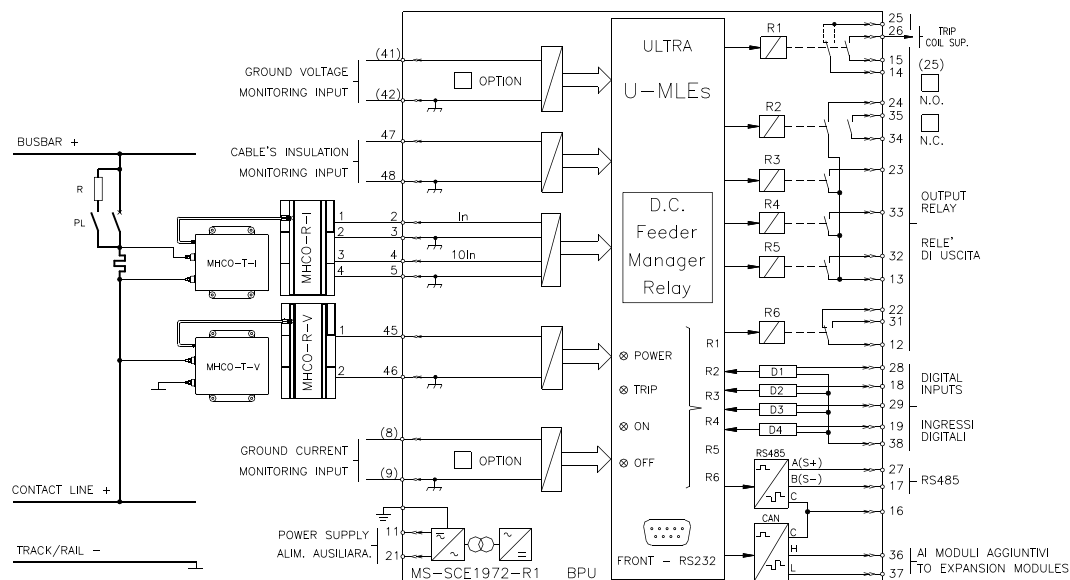
Function enabling	ON - OFF	
Setting range	$DI = (100 \div 9990)\text{A}$	step 10A
Minimum di/dt level to start ΔI	$di = (4 \div 400)\text{A/ms}$	step 1 A/ms
Instantaneous output	= ≤ 0.03s	
Independent time delay	$t_{DI} = (0 \div 500)\text{ms}$	step 1ms
Detection reset time delay	$t_{di} = (0 \div 100)\text{ms}$	step 1ms

1F - (1di/dt): 1st Current Rate of Rise Element		
Function enabling	ON - OFF	
di/dt setting range	$G = (4 \div 400)A/ms$	step 1 A/ms
Instantaneous output	$= \leq 0.03s$	
Independent time delay	$tG = (2 \div 500)ms$	step 1ms
2F - (2di/dt): 2nd Current Rate of Rise Element		
Function enabling	ON - OFF	
di/dt setting range	$G = (4 \div 400)A/ms$	step 1 A/ms
Instantaneous output	$= \leq 0.03s$	
Independent time delay	$tG = (2 \div 500)ms$	step 1ms
Rapp: Impedance monitoring with di/dt dependence		
Function enabling	ON - OFF	
Arc Voltage	$V_a = (0 \div 800)V$	step 1 V
Internal Resistance	$R_i = (0 \div 0.250)\Omega$	step 0.001 Ω
Internal Inductance	$R_t = (0.001 \div 2.5)\Omega$	step 0.001 Ω
Total Resistance of the circuit	$L_i = (0.001 \div 0.01)H$	step 0.001 H
Total Inductance of the circuit	$L_t = (0.002 \div 0.05)H$	step 0.001 H
Resistance trip level	$R^* = (0 \div 100)\Omega$	step 0.01 Ω
Limit value of di/dt	$g = (10 \div 500)A/ms$	step 1 A/ms
Instantaneous output	$= \leq 0.03s$	
Independent time delay	$t_r = (0 \div 100)ms$	step 1ms
Iapp: Current monitoring with di/dt dependence		
Function enabling	ON - OFF	
Current trip level when di/dt = 0	$I_A = (500 \div 5000)A$	step 10 A
Current trip level when di/dt $\geq [g]$	$I^* = (400 \div 1500)A$	step 10 A
Limit value of di/dt	$g = (30 \div 500)A/ms$	step 1 A/ms
Drop-out percentage	$Res = (80 \div 100)\%I_{app}$	step 1 %Iapp
Instantaneous output	$= \leq 0.03s$	
Independent time delay	$t_r = (0 \div 5)s$	step 0.01s
1F - 64 (1Ig): 1st Frame Fault Element		
Function enabling	ON - OFF	
Time current curves	$f(t) = \text{Indep. Definite Time (D), IEC (A/B/C).}$	
Current setting range	$I_s = (0.1 \div 4)I_{gn}$	step 0.01I _{gn}
Voltage setting range	$U_s = (0.01 \div 1)U_{gn}$	step 0.01U _{gn}
Instantaneous output	$= \leq 0.03s$	
Independent time delay	$t_s = (0.02 \div 100)s$	step 0.01s
2F - 64 (2Ig): 2nd Frame Fault Element		
Function enabling	ON - OFF	
Time current curves	$f(t) = \text{Indep. Definite Time (D), IEC (A/B/C).}$	
Current setting range	$I_s = (0.1 \div 4)I_{gn}$	step 0.01I _{gn}
Voltage setting range	$U_s = (0.01 \div 1)U_{gn}$	step 0.01U _{gn}
Instantaneous output	$= \leq 0.03s$	
Independent time delay	$t_s = (0.02 \div 100)s$	step 0.01s
RS-G: Cable insulation (Screen-Ground)		
Function enabling	: ON - OFF	
Setting range	: $R_{L-S} = (100 \div 5000)\Omega$	step 100 Ω
Instantaneous output	: $= \leq 0.03s$	
Independent time delay	$t_{RL-S} = (0.05 \div 100)s$	step 0.01s

RCL: Automatic Reclosure		
Function enabling	ON - OFF	
Number of Reclosure	ShN° = 1 / 2 / 3 / 4	
Independent time delay	tr = (1 ÷ 200)s	step 1s
Independent time delay	tr1 = (0.1 ÷ 1000)s	step 0.1s
Independent time delay	tr2 = (0.1 ÷ 1000)s	step 0.1s
Independent time delay	tr3 = (0.1 ÷ 1000)s	step 0.1s
Independent time delay	tr4 = (0.1 ÷ 1000)s	step 0.1s
LT: Automatic Line Test		
Function enabling	ON - OFF	
Number of Test	TestN° = 0 / 2 / 3 / 4	
Minimum residual voltage	VR< = (0 ÷ 1)Vn	step 0.1 Vn
Minimum residual resistance	RR< = (0 ÷ 500)Ω	step 1 Ω
Minimum Line voltage	VFast = (0.5 ÷ 1)Vn	step 0.1 Vn
Waiting time after C/B closing	tp = (0 ÷ 30)s	step 1s
Duration 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	ON - OFF	
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 (1U>): 2nd Overvoltage Element		
Function enabling	ON - OFF	
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	ON - OFF	
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	ON - OFF	
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 Maintenance		
Function enabling	ON - OFF	
Setting range	Ii = (0.1 ÷ 99)In	step 0.1In
Conventional interruption current	Wi = (1 ÷ 9999)	step 1
RT: Remote Trip		
Function enabling	ON - OFF	
Independent time delay	ts = (0 ÷ 10)s	step 0.01s
Wh: Energy Counter Pulse		
Function enabling	ON - OFF	
Energy level	WpP = (10 ÷ 1000)kW	step 10kW
Pulse duration	Pulse = (0.10 ÷ 2)s	step 0.01s

CB-L: C/B Lock		
Function enabling	ON - OFF	
Breaker Failure Element		
Alarm time delay	tBF = (0.05 ÷ 0.75)s	step 0.01s

U-MLEs - Wiring Diagram



Typical Characteristics

Accuracy at reference value of influencing factors	2% In - 0.2% On	for measurements
	2% +/- 10ms	for times
Input	0 ÷ 20 mA	
Average power supply consumption	<10 VA	
Output relays	rating 5 A; Vn = 380 V	
	A.C. resistive switching = 1100W (380V max)	
	make = 30 A (peak) 0.5 sec.	
	break = 0.3 A, 110 Vcc,	

Order Code - Example

U-MLEs	1	1	1	2
	Power Supply	Configuration	1 st Expansion	2 nd Expansion
		R1 (14-25)	module	module
	1 = Type 1	1 = N.O.	1 = None	1 = None
	2 = Type 2	2 = N.C.	2 = UX10-4	2 = UX10-4
			3 = 14DI	3 = 14DI
			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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