GENERATOR SYNCHRONIZING RELAY

Microelettrica Scientifica
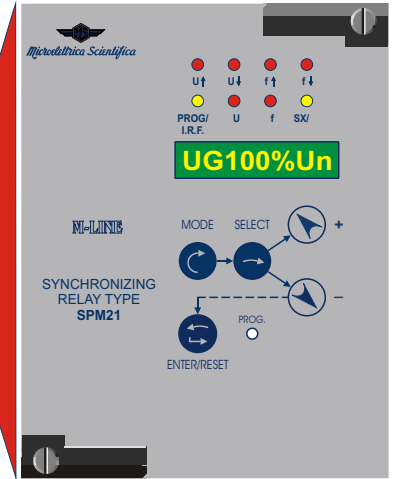
SPM21

N21-R4

M LINE

25, 27, 59, 81, 90

- ❍ **Automatic Synchronization and Synchrochek.**
- ❍ **Fast proportional Voltage and Frequency regulation.**
- ❍ **Phase displacement checking with circuit breaker's closing time control.**
- ❍ **Antimotoring.**
- ❍ **Kicker pulse.**
- ❍ **Event Recording.**
- ❍ **Modbus Communication Protocol.**
- ❍ **UL / CSA listed.**

The SPM21 numerical synchronising relay measures voltage and frequency of two inputs; the voltage, frequency and phase angle of the Generator input (G) are individually compared with those of the Bus input (B) considered as reference.
The relay includes the following programmable functions:

Synchronising of the generator with the reference bus

- ⊙ Normal/Dead Bus operation modes
- ⊙ Adjustable Max Voltage difference
- ⊙ Automatic Adjusting of phase angle for circuit breaker close
- ⊙ Adjustable Max Frequency difference
- ⊙ Adjustable Max Phase displacement
- ⊙ Adjustable Increase/Decrease pulses to speed regulator
- ⊙ Adjustable Increase/Decrease pulses to voltage regulator
- ⊙ Adjustable Min/Max Bus voltage for synchronising operation
- ⊙ Adjustable Min/Max Bus frequency for synchronising operation
- ⊙ Kicker pulse control on steady phase displacement
- ⊙ Fast synchronisation with control pulses proportional to speed and voltage difference
- ⊙ 3 Digital Inputs optically isolated 2kV

- ⊙ Adjustable Operate time delay
- ⊙ Antimotoring control

⊙ **Real Time Measurements =** UG - UB - HzG - HzB -   U -   f -

Connection Diagram

MS-SCE1446-R2

CE
RINA
cULus LISTED
IND.CONT.EQ.
19CN
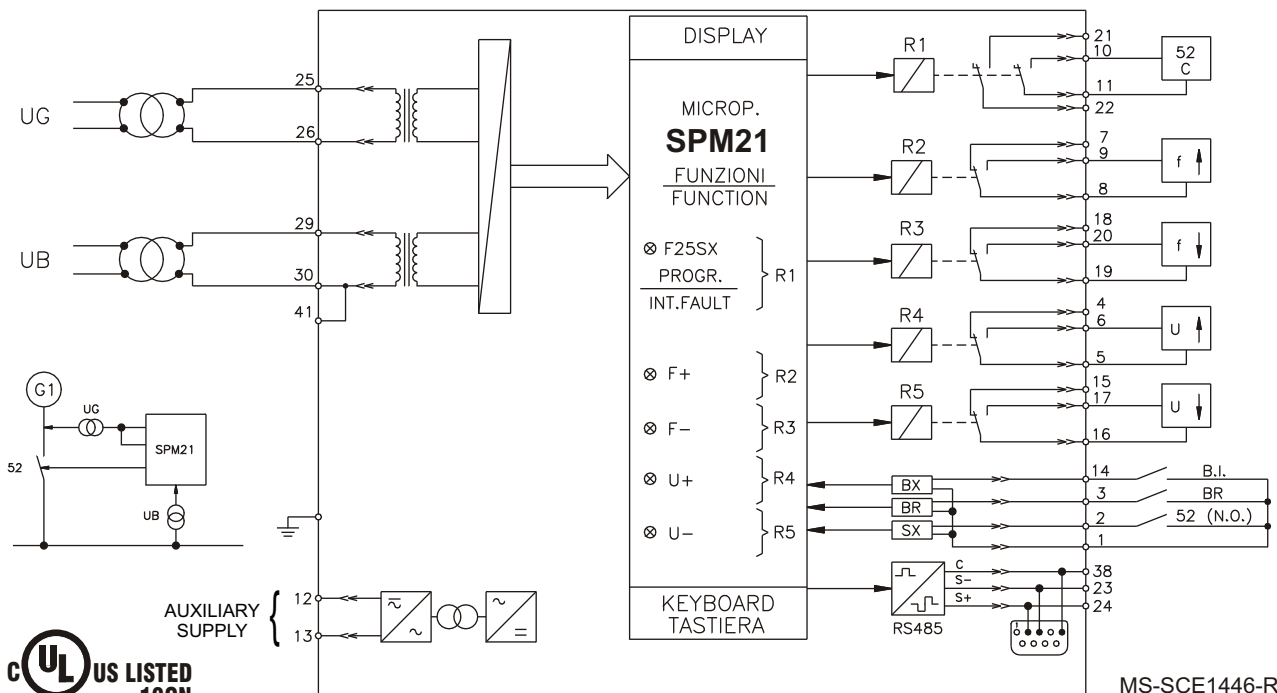
Programmable Input Quantities

- ⊙ **Fn** = System frequency   : (50 - 60)Hz
- ⊙ **Un** = Rated input voltage   : (100 - 240)V,   step 1V

Main Setting Variable

- ⊙ **U<** = Minimum Bus operational voltage level   : (15 - 120)%Un,   step 1%
- ⊙ **U>** = Max Bus operational voltage level   : (20 - 150)%Un,   step 1%
- ⊙ **f<** = Minimum Bus operational frequency level : (45 - 60)Hz,   step 0.1Hz
- ⊙ **f>** = Max Bus operational frequency level   : (50 - 65 / Dis)Hz, step 0.1Hz
- ⊙ **DB** = Dead Bus operation mode   : (ON / OFF)
- ⊙ **U** = Generator/Bus Max voltage difference   : (1 - 20)%U_B,   step 1%
- ⊙ **f** = Generator/Bus Max frequency difference : (0.05 - 0.60)Hz, step 0.01Hz
- ⊙   = Generator/Bus Max phase difference   : (3 - 30)°,   step 1°
- ⊙ **t_s** = Max operate time delay   : (0 - 60)s,   step 0.01s
- ⊙ **t_{CB}** = Circuit Breaker Operate time   : (0.01-0.5-Dis)s step 0,01s
- ⊙ **t_o** = Minimum reclosing time delay   : (0 - 600)s,   step 1s

Speed Regulator Control

- ⊙ **Tf** = Period of pulses   : (0.5 - 60)s,   step 0.1s
- ⊙ **tf<** = Minimum pulse duration   : (0.1 - 60)s,   step 0.1s
- ⊙ **tf>** = Max pulse duration   : (0.1 - 60)s,   step 0.1s
- ⊙ **tf** = Duration of pulse   : = ([tf<] + [Gf] x f) [tf]
- ⊙ **Gf** = Pulse duration gain   : = (0.0 - 9.9)s/Hz,   step 0,1s/Hz

Voltage Regulator Control

- ⊙ **Tu** = Period of pulses   : (0.5 - 60)s,   step 0.1s
- ⊙ **tu<** = Minimum pulse duration   : (0.1 - 60)s,   step 0.1s
- ⊙ **tu>** = Max pulse duration   : (0.1 - 60)s,   step 0.1s
- ⊙ **tu** = Duration of pulse   : = ([tv<] + [Gv] x u)[tu>]
- ⊙ **Gv** = Pulse duration gain   : = (0.0 - 9.9)s/V,   step 0.1s/V

Output Relays

- ⊙ **R1** = Circuit breaker close control   : any internal fault of SPM21 blocks operation of R1.
- ⊙ **R2** = Increase speed control
- ⊙ **R3** = Decrease speed control
- ⊙ **R4** = Increase voltage control
- ⊙ **R5** = Decrease voltage control

Digital Inputs

- ⊙ **SX** (Terminals 1-2)   : status of CB (closed when 1-2 shorted)
- ⊙ **BR** (Terminals 1-3)   : operation lockout of relays R2,R3,R4,R5
- ⊙ **BX** (Terminals 1-14)   : operation lockout of relay R1