MINIATURE NEEDLE PRINTER 57 MM FOR
USING TOGETHER WITH REM 370 ANALYSER

The miniature matrix printer MDI 57 is designed for using together with the REM370 power supply analyser. It enables the generation of printouts reporting the recorder state and the measurements performed by this device. The above information can be obtained at the object, without the need for stopping measurements and their registration in the memory, or de-mounting the registering device from the installation.

The printer can print out the wide range of measurement reports, namely:

·   Report from measurement of supply voltage parameters at the angle of the conformity with EN 50160 standard or with the standard defined by the user, consisting on defining other threshold values.

·   Report from measurement of momentary values including:

Values of : voltages U, currents I, active powers P, reactive powers Q, distortion powers D, apparent powers S.

Values of : active power factor PF, power tangents tg, distortion power factor DF.

Values of : voltage shape coefficients CFU and current shape coefficients CFI

for particular phases L1, L2 and L3 and for three-phase system THDU and THDI depending on the analyser configuration.

Values of voltage symmetrical components : zero-sequence component U0, positive-sequence component U1, negative-sequence component U2 and their ratio U2/U1.

Value of zero-sequence cable current I0.

Values of phase-to-phase voltages U12, U23, U31.

Values of peak average summary powers : active Pav, reactive Qav, apparent Sav.

Values of energy: active taken Ep+ and delivered Ep-, reactive taken Eq+ and delivered Eq-, and apparent Es.

·   Report from measurement of momentary harmonics (up to 24) including:

Values of voltages UH0 and currents IH0 for direst component.

Values of voltages UH1 and currents IH1 for basic component.

Values of percent content for higher voltage harmonics UH2 UH24 in relation to basic component or to rms value, depending on configuration.

Values of percent content for higher current harmonics IH2 IH24 in relation to basic component or to rms value, depending on configuration.

·   Bar chart of harmonics content for one of the parameters U_{L1}, U_{L2}, U_{L3}, I_{L1}, I_{L2}, I_{L3} selected before the printout.

·   Report of values for energy counters including:

Values of energy : active taken Ep+ and delivered Ep-, reactive taken Eq+ and delivered Eq-, and apparent Es.

·   Graphs of oscillations for one of the parameters U_{L1}, U_{L2}, U_{L3}, I_{L1}, I_{L2}, I_{L3} selected before the printout.

·   Indicating mark's diagrams of voltages and currents.

Technical specification

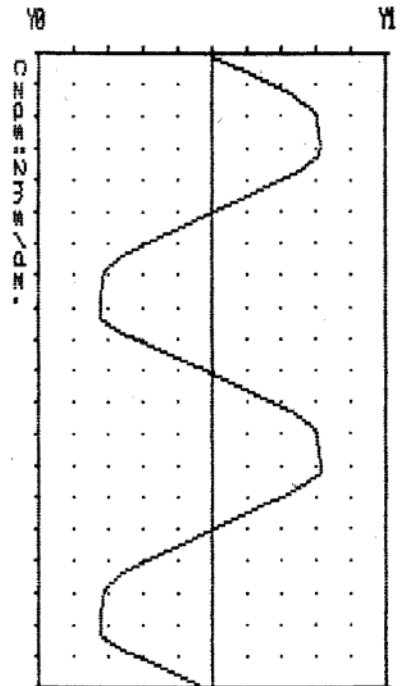|	
Number of text columns	40
Number of graphic columns	211
Characters	Matrix 5x7
Printout speed	1,5 of row per second
Interface RS232	Optical
Paper width	57 mm
Maximum paper roll diameter	50 mm
Supply voltage	230 VAC, +10%, -15%, 50 Hz
Environmental conditions:	
	Ambient temperature 0C - 40C
	Relative humidity 5% - 80%
	(without water vapor condensation)
Dimensions	165 x 141 x 110 mm
Weight	810 g

```
REM-370 nr D01/2002 wer.2.0     swiazda
Data i czas wydruku: 02-05-17 14:17:15
Pomiary wykonano w stacji numer 2
Stacja 2

Napiecie znamionowe Un[V]  230
Przekladniki:
    napieciowe[V/V]    230.0  /  230
     pradowe[A/V]      200.0  / 1.00

POMIARY CHWILOWE        f[Hz]= 50.0

            L1      L2      L3     TOTAL
U[V]       237     236     236     409
I[A]       2.63    4.41m   8.55m   1.53
P[W]       316     27.3m   63.8m   316
Q[VAr]     408     25.1m   258m    408
D[VAr]     241     1.04    2.00    244
S[VA]      623     1.04    2.02    624
PF         0.40    0.02    0.03    0.50
tg         1.52    0.91    4.04    1.52
DF         0.38    0.99    0.99    0.39
CFU[%]     9.69%   97.6%   97.6%
CFI[%]     121%    192%    148%

POZOSTALE POMIARY

    U0[V]=  235      U12[V]= 2.86
    U1[V]=  310m     U23[V]= 3.70
    U2[V]=  408m     U31[V]= 3.64
  U2/U1[%]= 76.0%
    I0[A]= 2.63
                     Ep+= 0.000000k
  Pav[W] = 000       Ep-= 0.000000k
 Qav[VAr]= 000       Eq+= 0.000000k
 Sav[VA] = 000       Eq-= 0.000000k
                     Es = 0.000000k
```

Exemplary printouts (Polish language version) of measured momentary values and curves of current and voltage of phase 1.
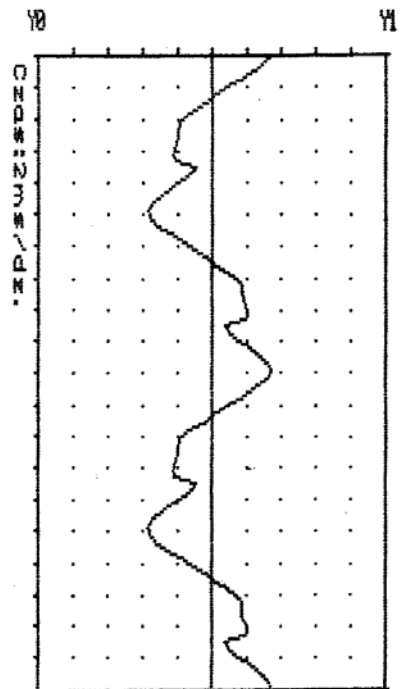
```
REM-370 nr D01/2002 wer.2.0     swiazda
Data i czas wydruku: 02-05-17 14:18:09
Pomiary wykonano w stacji numer 2
Stacja 2

Napiecie znamionowe Un[V]  230
Przekladniki:
    napieciowe[V/V]    230.0  /  230
     pradowe[A/V]      200.0  / 1.00

KSZTALT PRZEBIEGU UL1
YO                                  Y1
```



```
KSZTALT PRZEBIEGU IL1
YO                                  Y1
```


Manufacturer reserves the possibility for introducing changes in construction of products

Exemplary printout (Polish language version) of report from power supply voltage measurements performed for checking its conformity with EN 50 160 standard:

```
----------------------------------------
REM-370 nr 001/2301             gwiazda
Data i czas wydruku: 30-10-02 13:08:12
Pomiary wykonano w stacji numer 1
Kalisz, ul.Kusocinskiego 54. stacja
pomiarowa wschodnia
Napiecie znamionowe Un[V]  15.0k
Przekladniki:
    napieciowe[V/V]    15000.0 / 10.0m
    pradowe[A/V]        1000.0 / 1.00
----------------------------------------
 RAPORT ZGODNOSCI Z NORMA: PN-EN 50160

 POMIARY ROZPOCZETO:  01-01-99 12:23:00
 POMIARY ZAKONCZONO:  07-01-99 12:23:00
 CZAS USREDNIANIA:    10 min.
 POMIAROW ZEBRANO:    N= 1080
----------------------------------------
* - oznacza niezgodnosc wynikow z norma
----------------------------------------
- CZESTOTLIWOSC NAPIECIA SIECI
  WYNIKI:
  50.0Hz-1.00%+1.00%  96%N (min.  95%N)
* 50.0Hz-6.00%+4.00%  99%N (min. 100%N)
----------------------------------------
- NAPIECIE ZASILAJACE

  Un 10.0%+10.0% przez min. 95%N
  z pominieciem przerw U<=1.00%Un
  WYNIKI:
  --------------------------------------
      L1     |     L2     |     L3
  --------------------------------------
*  *  91%N   |    96%N    |  *  95%N
----------------------------------------
- NIESYMETRIA NAPIECIA ZASILAJACEGO

  U1/U2<=2.00% przez min. 95% czasu N
   gdzie: U1-skladowa symetryczna
          kolejnosci zgodnej
          U2-skladowa symetryczna
          kolejnosci przeciwnej
* WYNIK: *  90%N
----------------------------------------
- HARMONICZNE NAPIECIA ZASILAJACEGO

  Srednie wart. skut. poszczegolnych
  harmonicznych musza byc <= od podanych
  ponizej wartosci progowych przez 95%
  czasu wszystkich pomiarow N.
  WYNIKI:
  --------------------------------------
   wartosc  | wzgl. czas pomiaru:
   zadana   |------------------------
   progowa  |   L1   |   L2   |   L3
  --------------------------------------
*  H2<=2.0%H1 |*  92%N |   96%N |*  97%N
   H3<=2.0%H1 |   96%N |   96%N |*  97%N
   H4<=2.0%H1 |   92%N |   96%N |*  97%N
   H5<=2.0%H1 |   92%N |   96%N |*  97%N
   H6<=2.0%H1 |   92%N |   96%N |*  97%N
   H7<=2.0%H1 |   92%N |   96%N |*  97%N
   H8<=2.0%H1 |   92%N |   96%N |*  97%N
   H9<=2.0%H1 |   92%N |   96%N |*  97%N
* H10<=2.0%H1 |   92%N |   96%N |*  97%N
  H11<=2.0%H1 |   92%N |   96%N |*  97%N
  H12<=2.0%H1 |   92%N |   96%N |*  97%N
  H13<=2.0%H1 |   92%N |   96%N |*  97%N
  H14<=2.0%H1 |   92%N |   96%N |*  97%N
  H15<=2.0%H1 |   92%N |   96%N |*  97%N
  H16<=2.0%H1 |   92%N |   96%N |*  97%N
  H17<=2.0%H1 |   92%N |   96%N |*  97%N
* H18<=2.0%H1 |   92%N |   96%N |*  97%N
  H19<=2.0%H1 |   92%N |   96%N |*  97%N
  H20<=2.0%H1 |   92%N |   96%N |*  97%N
  H21<=2.0%H1 |   92%N |   96%N |*  97%N
  H22<=2.0%H1 |   92%N |   96%N |*  97%N
  H23<=2.0%H1 |   92%N |   96%N |*  97%N
  H24<=2.0%H1 |   92%N |   96%N |*  97%N
  --------------------------------------
  THD<=8.00%   |   92%N |   96%N |*  97%N
  --------------------------------------
  gdzie: H1  - srednia wartosc skuteczna
               podstawowej harmonicznej
         THD - liczony wzgledem H1
```

```
========================================
DODATKOWE WYNIKI STATYSTYCZNE:? - oznacza
ilosc wieksza niz 60000
----------------------------------------
-- NA PODSTAWIE TABELI POMIAROW RMS
   TWORZONYCH CO OKRES USREDNIANIA:
- PRZERWY W ZASILANIU  Ilosc rekordow w
ktorych
  Umin lub Usr <  1.00%*Un
----------------------------------------
   dla   |   L1  |   L2  |   L3
----------------------------------------
   Umin  | 12346 | 23456 | 13456
   Usr   |     3 |     3 |     1
----------------------------------------

- ZAPADY NAPIECIA
  Ilosc rekordow w ktorych
  Umin lub Usr < Un-10.0%
----------------------------------------
   dla   |   L1  |   L2  |   L3
----------------------------------------
   Umin  | 13456 | 23456 | 12345
   Usr   |     3 |     3 |     1
----------------------------------------
Najwieksza glebokosc zapadu z wszystkich
wybranych uprzednio rekordow
----------------------------------------
   dla   |   L1  |   L2  |   L3
----------------------------------------
   Umin  | -12.3% | -60.1% | -23.4%
   Usr   | -12.3% | -60.1% | -23.4%
----------------------------------------

- PRZEPIECIA DORYWCZE
  Ilosc rekordow w ktorych
  Umax lub Usr > Un+10.0%
----------------------------------------
   dla   |   L1  |   L2  |   L3
----------------------------------------
   Umax  | 12356 | 12356 | 12356
   Usr   |     3 |     3 |     1
----------------------------------------
Najwieksze przepiecie z wszystkich
wybranych uprzednio rekordow
----------------------------------------
   dla   |   L1  |   L2  |   L3
----------------------------------------
   Umax  | +12.3% | +60.1% | +23.4%
   Usr   | +12.3% | +60.1% | +23.4%
----------------------------------------

-- NA PODSTAWIE TABELI PRZERW I PRZEPIEC

- PRZERWY W ZASILANIU
  Ilosc przerw dla ktorych U<ok. 1.0%*Un
----------------------------------------
czas przerwy t |   L1  |   L2  |   L3
----------------------------------------
   t<1sek.    | 60000?|   900 |   100
1sek.<=t<3min. |     1 | 60000?| 60000?
   t>=3min.   |     1 |     0 |     0
----------------------------------------

- PRZEPIECIA PRZEJSCIOWE
  Ilosc sekund, w ktorych wystapily
  przepiecia o amplitudzie
  U(t) > 1.41*(Un+90.6%)
----------------------------------------
            |   L1  |   L2  |   L3
----------------------------------------
ilosc sekund |    1 |    0 |    2
----------------------------------------

Parametry krytyczne przepiec
----------------------------------------
            |   L1  |   L2  |   L3
----------------------------------------
czas# [ms/s] | 1000 | 1000 | 1000
amplituda [V] |  548 |  485 |  800
----------------------------------------
# -maksymalny, laczny czas przekroczenia
   przebiegu chwilowego powyzej
   ustawionego progu, wybrany z kazdej
   sekundy

 . . . . . . . . . . . . . . . . . . .
              signature
```

Descriptive labels (column between printouts)

- Configuration of recorder used for measurement
- Information on collected measurements and time of averaging
- Examination results of frequency fluctuations
- Examination results of average rms voltage value
- Examination results of average value for asymmetry voltage
- Examination results of averaged contents for particular harmonics
- Examination results of averaged total harmonics distortion coefficient
- Information on number of measurement records, in which breaks have been detected
- Information on number of measurement records, in which drops of voltage have been detected and parameters of critical drops of voltage
- Information on number of measurement records, in which overvoltages have been detected and parameters of critical overvoltages
- Information on number of breaks in supply with their classification according to their duration
- Information on short overvoltages (from 1,2 ms duration) which occurred during examination