TRAPEN
BULGARIA, 1324 SOFIA, LULIN, BL.717/B/21
Tel.(+359 2) 9251598
(+359 2) 8575135
GSM (+359 888)470189
E-mail:trapen@abv.bg

NAMADIN SANAT CO.
PROCESS CONTROL SOLUTIONS

Namadin Sanat Co.

MICROPROCESSOR SYSTEM MILLOAD

PASSPORT

COMPILER:
(Prof. Dr. D.Marinov)

EXECUTIVE MANAGER:
(Assoc. Prof. Dr. T.Penzov)

SOFIA, 2004

1. PURPOSE OF THE SYSTEM

Microprocessor system MILLOAD is purposed for mill load's measuring of different kind of mills for grinding of cement, raw materials, ores, coals, coke etc in cement, dressing and power industries and other related branches.

2. PRINCIPLE OF THE SYSTEM OPERATION

By means of special remote sensor SRIP, mounted approximately 20mm from the case of rotary mills or special direct sensor SDIP, mounted on the case of stationary mills are measured impact pulses generated at material grinding.
The signal generated from the sensor is sent to microprocessor module, where by software way is formed synthetic "factor of grinding FG", which is related with material resistant layer against the penetration of grinding bodies in the zone, where the sensors is mounted.
The resistance of material layer depends on its thickness , as well as from the size, hardness and grindability of materials. FG reflect one-way and with high sensibility the changes of layer thickness and the qualities of materials.
FG is programmed for each concrete case by the choice of the frequency domain in which the impact pulses are located and by the coefficient, defining the FG range. The rest part of the FG structure is common for all cases and represents firm "know how"
At wet grinding of raw materials and ores when the sensor is mounted in zone of slime formation, respectively pulp formation, the slime viscosity is measured, respectively pulp density. For this aim "factor of slime FS" is synthesized.
The advantages of the used principle of operation are followed:

- FG and FS aren't influenced from the work of near-by mills and other aggregates;
- Measuring of resistant properties of material layer in the zone of sensor mounting and obtaining in time truthful information for their changes;
- Eliminating of uninformation resonance vibrations of mill's case;
- In case of FG change it can control the wearing out of grinding bodies and lining;
- At abruptly FG change it can define a mill breakdowns (destruction of grids and lining, clogging up from inner bodies etc);
- The sensor's signal is sent at distance up to 200m without additional amplification.

3. COMPOSITION OF THE SYSTEM

The delivery of MILLOAD contains:
3.1.Microprocessor module – 1 number (fig.3)
3.2.Impact pulse sensor – 1 numbers (fig.1, 2)
3.3.Install elements of sensor – 1 kit
3.4.Measuring cable – ТЧП 4 x 1mm^2 – 100m
3.5.Passport of the system – 2 numbers
3.6.Instruction for adjustment – 2 numbers
3.7. Instruction for system exploitation – 2 numbers

4. DESCRIPTION OF THE SENSORS

4.1. The sensor for remote measuring of impact pulses SRIP is with dimension 45 x 80 x 42mm and weight 0,9kg. It consists of two elements, in which electrical signals are generated with amplitudes, proportional to the steepness of impact pulses at the grinding of materials. The sensor elements are connected differential for eliminating of parasitic electromagnetic fields. The signal is transmitted through double-core armoured cable with isolated shield. By means of special elements, screens, compound etc it is provided high sensibility and selection at the measuring of impact pulses at distance 15-30mm. In this case the parasitic vibrations and sound signal, provoked from near-by mills and aggregates are avoided.
4.2. The sensor for direct measuring of impact pulses SDIP has dimension 50 x 80 x 65mm and weight 1kg. Constructively it is similar to SRIP as additional are built-in fixing elastic elements and magnets for fastening to the case of the stationary mill.

5. DESCRIPTION OF MICROPROCESSOR MODULE

The microprocessor module consists of:
5.1.Input differential amplifier with programmable gain coefficient 1, 2, 4, 8;
5..2. Analog high frequency filter from 2^{nd} order with cutting frequency 50Hz, that eleminates low frequency oscilations provoked from mill-ovalness as well as from hatchways and bolts closly to the measuring band;
5..3. Two control points after the differential amplifier and after analog filter, which are on the terminal deviece and serve for controlling of the signal;
5..4. Analog amplifier of the filter signal with gain coefficient 2;
5..5. 12-bit ADC;
5..6. Microprocessor for the signal treatment and the forming of "factor of grinding FG", which is transmitted in normal or inverse type to to the analog output 0(4) ÷ 20mA and to the display on the front panel in %;
5..7. Microprocessor for transfer and display's control, etc;
5. 8.Serial channel RS485
5. 9.The front panel of microprocessor module (fig.3) consists of:
5.9.1. 6-decade display for indication of the factor of grinding FG and for a programming;
5.2.2. Line of 4 light diods for indication of situations at operation of the module: greern WRL – blinks through 2s and indicates that the module works; yellow LA – shines at FG under alarm limit; yellow HA – shines at FG upper alarm limit; red ALR – shines at failure of ADC(AdC)
5.2.3. Line of 4 buttons for service of the module into mode of operations, which are described in instruction for adjustment;
5.3. Terminal device for outer connection on the rear part of the module, consisting 16 terminals as following:

№	Designation
5	Serial channel 485
6	Serial channel 485
9	Alarm relay, normal close contact

8 Alarm relay, common point
10 Alarm relay, normal open contact
16 Supply, 220VAC
17 Supply, 220VAC
18 Ground
19 Input of differential impact pulse sensor
20 Input of differential impact pulse sensor
21 Middle point of sensor (analog ground)
22 Control point after analog filter
23 Control point after analog amplifier
24 Analog ground
27 Factor of grinding (FG), analog current output 0 (4)mA
28 Factor of grinding (FG), analog current output 20mA

5.4. PVC box with dimension 55 x 85 x 105mm, into which are installed plates: of the module, of the front panel and of the terminal device.

6. TECHNICAL CHARACTERISTICS AND OPERATING CONDITIONS

6.1.Supply voltage: (220+22, minus 33)V with frequency (50+1, minus 1)Hz
6.2.Power consumption: 10W
6.3.Current output: galvanic isolated
6.4.Contacts of the relay: 6A, 250VAC
6.5.Fuse: 1A
6.6.Nominal operating conditions:
6.6.1. Ambient temperature:

- for the module: 0 ÷ +45° C

- for the sensors: -40 ÷ +100° C

6.6.2. Relative humidity:

- for the module: up to 80%

- for the sensors: 100%

6.6.3. Ambient dust:

- for the module: 5mg/m^3

- for the sensors: without limit

6.6.4. Atmosphere pressure: 86 ÷ 106kPa

7. INSTALATION OF MILLOAD

7.1.The module is inserted on the eurobrace.
7.2.The sensor SRIP is installed on the stand hardly connected to the fundamental or other stationary body as its adopt part is directed from 15 - 30mm against the waterfall side of the mill under 30 - 40°.

7.3. The sensor SDIP is fixed on the case of stationary mill by means of incorporated magnets as it is chosen smooth surface.

7.4. The armoured cable, connecting the sensor with the module is transmitted on the cable stack a far from high voltage cables and high frequency tyristor or transistor motor drivers in order to escape a disturbances.

It is wished the cables to be withdraw in steel pipes for protection from disturbances and outer intervention. At the installation the outer PVC shell of the cable don't must hurt .

8. WARRANTY AND SERVICE

8.1. The system is provided with 18 months warranty from the date of implementation, but not later than two years from the date of delivery.

8.2. The service of MILLOAD out in warranty term is performed by "TRAPEN" company.

9. ADDITIONAL DATA

9.1. MILLOAD is manufactured and sold by "TRAPEN" company.

9.2. Microprocessor module of MILLOAD is manufactured by "UNISIST ENGENEERING" Ltd.

9.3. "UNISIST ENGENEERING" Ltd. is certified to ISO 9001:2000 with certificate for manufacture QBE 99082 and certificate for service QBE 99081, prominent from SGS (Belgium).

9.4. In 2001 the system "MILLCONT of "TRAPEN" Company was awarded with silver medal and certificate at the International Exhibition "IENA 2001" in Neurenberg and with bronze medal and certificate at the 50th International Fair "EUREKA 2001" in Brussels.

Fig.1 Remote sensor SRIP

Fig.2 Direct sensor SDIP

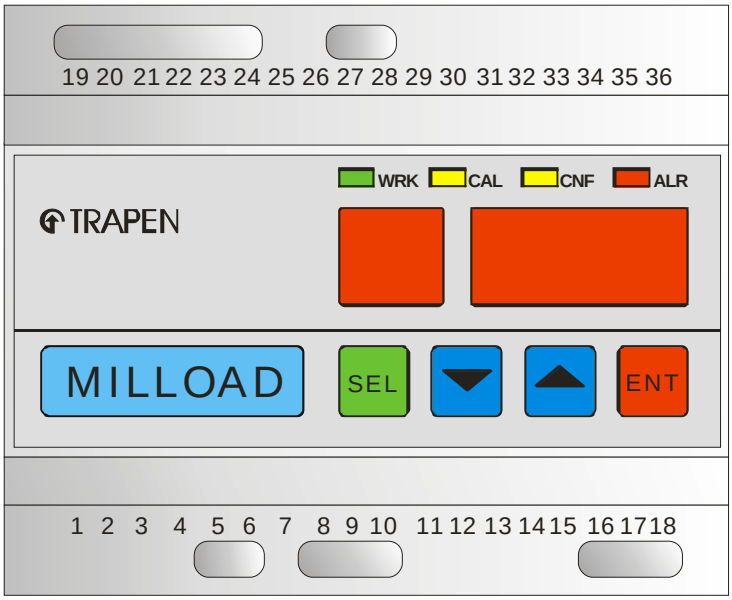


Fig. 3 Front panel of the module

TRAPEN
BULGARIA, 1324 SOFIA, LULIN, BL.717/B/21
Tel.(+359 2) 9251598
(+359 2) 8575135
GSM (+359 888)470189
E-mail:trapen@abv.bg

NAMADIN SANAT CO.
PROCESS CONTROL SOLUTIONS

Namadin Sanat Co.
MICROPROCESSOR SYSTEM MILLOAD

INSTRUCTION FOR ADJUSTMENT

شرکت فنی مهندسی نمادین صنعت
(شماره ثبت ۲۰۳۸۷ سهامی خاص)
PROCESS CONTROL SOLUTIONS
تلفن: ۰۳۱۱-۲۳۳۹۵۶۰
۰۳۱۱-۲۳۵۲۹۷۰
فکس: ۰۳۱۱-۲۳۳۲۸۴۸
www.namadinsanatco.com
info@namadinsanatco.com

COMPILER:
(Prof. Dr. D.Marinov)

EXECUTIVE MANAGER:
(Assoc. Prof. Dr. T.Penzov)

SOFIA, 2004

1. COMMON REVIEW

1.1. For the programming of MILLOAD is developed menu with a shape of reversed tree, containing up to 3 levels for a diverge and one level for a programming;
1.2. At programming the changes are remembered in RAM memory and then are recorded in FLASH memory.
1.3. At programming are used buttons: SEL, ENT, ▼ and ▲.
1.4. In order to protect the recording from undesired or occasionally intervention a code for entry in regime of programming (111) is anticipated .
1.5. The entry in regime of programming is performed by button SEL . By ENT and buttons ▼τ and ▲σ it is written 111, by ENT it is confirmed and entered in regime of programming. The exit from regime is performed by SEL also.
1.6. The moving along the tree below is performed by ENT and above – by SEL. The horizontal moving on the diverge's levels is performed with ▼,▲ and it is confirmed by ENT as at the same time the programming is confirmed.
1.7. In time of programming the parameter initial and level's name are appeared on the display.

2. ESSENCE AND TECHNOLOGY OF PROGRAMMING

2.1. The 1st level has 4 variants, which are selected by buttons ▼and ▲ and ENT:
- ConF – input for programming;
- CAL – input for calibration;
- tESt – input for test;
- inFO – data of the main program.

2.2. From 1st level by mean of ▼and ▲the regime "Configuration" (ConF) is chosen and by ENT it is reached 2nd level, which has 3 variants:
- Co-PU – programming of FG;
- Co – rS – programming of serial channel 485;
- Co – Stor – recording from RAM to FLASH memory

2.3. By the choice of Co-PU from 2nd level and ENT it is reached 3rd level, which has 2 variants:
- PU-F – programming of factor of grinding FG;
- PU-dP – programming of decimal point of FG.

2.4. Programming of the factor of grinding FG (PU – F)
By the choice of PU – F from 3rd level and ENT it is reached 4th level, where are programmed the parameters of FG ;
- Fr – cutting frequency of digital high frequency filter (1 – 1600Hz);
- FO – order of digital filter (2nd, 3rd or 4th);

- CA – gain coefficient of the output amplifier (1, 2, 4 or 8);
- CF – coefficient of FG (50 – 9999);
- tA – average interval of FG (1 – 60s);
- LF – low value of FG (0 – 1999);
- HF – high value of FG (0 – 1999);
- AL – low value of alarm (in the range of FG);
- AH – high value of alarm (in the range of FG);
- iF - Type of FG on the display(- F – FG or - FPrO – FG in % defined by LF and HF);
- rO – range of analog FG output (4 – 20 or 0 – 20mA);
- tO – type of analog FG output, normal or inverse (nor or inv).

RULES FOR ADJUSTMENT OF SOME SPECIFIC PARAMETERS

1. The cutting frequency "F" and the order of filter "F0" are chosen for each mill and they define the frequency zone over Fr of FG and the steepness, by which the zone is limited;
2. The gain coefficients of output amplifiers "CA" are chosen into dependence on amplitudes of the signals, which maximal value, measuring in control points after analog filters (terminal 22), don't must be over ±0,5V. We must take into account that after the analog filters are located amplifiers with gain coefficient 2;
3. The coefficient "CF" defines the FG range of loaded and discharged mill;
4. The difference between HF and LF defines the FG range in % for the display and current output .

2.5. Programming of the serial channel 485 (Co – rS)
By the choice of Co – rS from 2nd level and ENT it is reached 3rd level, which has two variants:
- rS-bdr – for programming the speed of exchange;
- rS-un – for programming № of MILLOAD.

2.5.1. Programming the speed of exchange (rS - bdr)
By the choice of rS-bdr from 3rd level and ENT it is reached 4th level, where is programmed:
- bd – speed of exchange (0,600; 1,200; 4,800; 9,600; 19,20 or 38,40 kbit/s).

Note: The serial channel 485 is programmed by exchange program MODBUS .

2.5.2. Programming № of MILLOAD (rS-un)
By the choice of rS-un from 3rd level and ENT it is reached 4th level, where it is programmed № of MILLOAD:
- un – Number (0 – 255).

2.6. Recording of the programming from RAM in FLASH memory (Co – Stor)
After programming of 4th level it is reached 2nd level of Co-Stor. By ENT it is recorded on FLASH memory as it is obtained a message SurE (are you sure?). By ENT again and the recording is performed as by SEL it is refused.

Note: At the moving from 4th level to 2nd it don't must reach 1st level, because the programming on RAM memory deletes.

3. CALIBRATION OF THE ANALOG CURRENT OUTPUT (CAL)

From 1st level it is reached CAL and by ENT – the 2nd level CA-out. By ENT it is reached 3rd level as a message is obtained on the display CL-XXXX, where XXXX is officer message. On the terminals of the current output a mA-meter is connected and it must show 0,000mA. If the current is bigger than 0,005mA, with ▼it is decreased to 0,000mA. ENT is pushed and on the display a message CL-XXXX is appeared. The current must be 20mA ±0,005mA, in another case with ▼ and ▲ a correction is performed and it is confirmed by ENT.
The recording from RAM on FLASH memory is performed from CL-Stor of 2nd level and ENT is pushed. It obtains a message SurE (Are you sure?) and by ENT the recording is performed.
Notes:
- At calibration MILLOAD must be disconnected from the process;
- At the manufacture of MILLOAD a precise calibration is performed and the user must do a calibration only in exclusive case.

4. TEST REGIME (tESt)

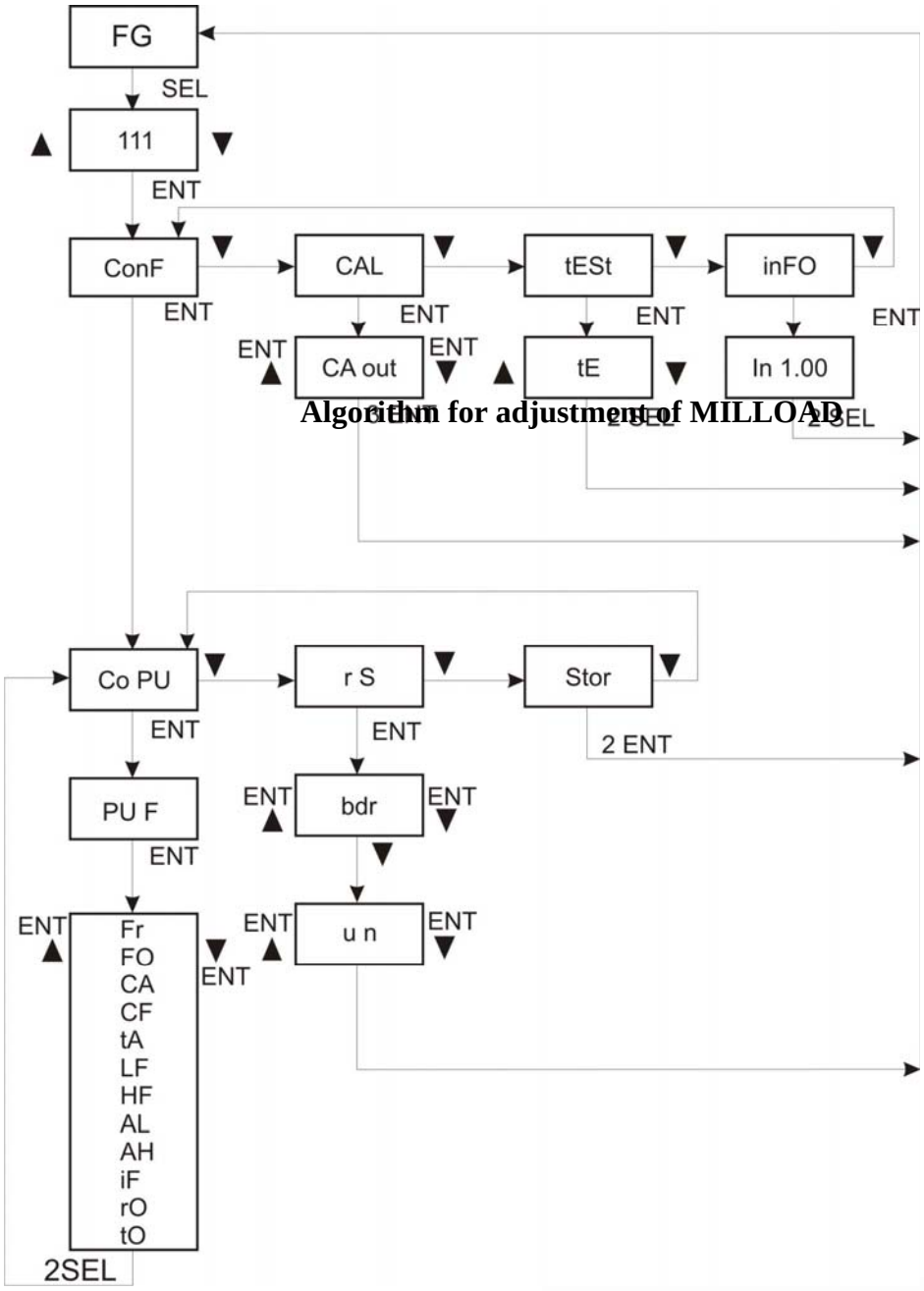
By the choice of tESt from 1st level and ENT it is reached 2nd level for testing of the analog current output as a message tE-XXXX is obtained. By ▼ the output is scanned for 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110 and 120% of the range and these values are measured at the current output..

5. TEST UNDER OPERATION AND FAILURE MESSAGES

Under operation the test programs work, which observe correct work of MILLOAD .At alarm the corresponding light diod shines as followed:
- LA – disturbed FG low alarm limit;
- HA – disturbed FG high diod limit;
- ALR- disturbed work of the microprocessor module. Search a referee of the manufacturer

The alarm relay is activated, if the disturbances are over 1 min and it is deactivated by ENT.

If the alarm drop out the corresponding light diod and the alarm relay are deactivated.



Algorithm for adjustment of MILLOAD