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1. Instruction

1.1 Introduction

Before connecting the regulator to the mains, read the instructions in this handbook, they provide important indications about the safety, use and maintenance. Take carefully this handbook for any information.

This regulator has been manufactured and tested in accordance with international standard, it leaves the factory in perfect safety conditions. In order to maintain these condition and to ensure safe operation, the user must comply with the instructions and remarks given in this manual. After removing the packaging check that the regulator has not been damaged during transport. In case of doubt, do not attempt to fix or use the regulator. If the equipment has fallen down or has been violently shaken during transport, it could suffer internal damages, which may be dangerous. After checking that regulator cannot be safely used, it must be placed out of order and not used before checking of experienced personnel. Causes that bring to put the regulator out of order are the presence of external damages, missed functioning, unproper stocking or transport conditions. Technical Assistance on the regulator must be performed exclusively by COMAR personnel.

1.2 Operator safety

Before to perform any maintenance, the regulator must be disconnected from any power supply source, wait 5 minutes before start any action. During maintenance it is necessary to follow standard safety procedures. Do not touch any printed circuit board for any reason.

This regulator will be assigned only to the use for which it has been specifically made. Each other use has to be considered improper and therefore dangerous

1.3 Instruction for proper installation

Before connect the equipment, check the data plate: this has to be in conformity with the electrical network (the plate is located on the back of the P.F. Regulator).

The regulator is not provided with protection fuse on the power supply, it has to be protected externally by the user. Being the regulator designed for permanent operation (CEI EN 61010-1), the supply have to be interrupted by automatic switch, which has to be placed close the regulator for easy intervention.

For the correct functioning of the equipment, the limit of voltage, current and temperature, imposed by the CEI and IEC standards must never be exceeded. The equipment has to be protected from atmospheric conditions.

1.4 Cleaning

After disconnecting the instrument from the power supply, clean the external surface of the plastic box using a soft cloth dipped in water only.

Never use abrasive or solvents. Never wet the connection terminals

1.5 Warranty

Comar Condensatori S.p.A. guarantees its own products for twelve months from purchase date.

The warranty covers the faults of materials and manufacture and it has to be understand for goods ex-works.

Before the equipment works, all instructions, present on this handbook, have to be meticulously followed. Breakdowns caused from improper use and/or not conformity to enclosed instructions and faults caused from tampering by unqualified technicians aren't covered.

The misuse of any of the previous points will erode the right of warranty.

2. General

2.1 Unit description

The MHD analyser (Meter of Harmonics Distortion) is designed to protect automatic power factor correction units from harmonics current. It can also be used to detect those kind of problems.

The presence of current harmonics on the supply network exposes the capacitors to extreme working conditions, which could lead to premature failure.

MHD checks the current harmonics absorbed by the P.F. correction equipment (through external C.T.) and it is activated when the critical values are reached, by contemporary commutation of the relays "Alarm1" and "Alarm2".

2.2 Mechanical fixing

The MHD should be mounted in a cut-out (drilling template 92x92mm.) using the special fixings supplied.

2.3 Operational hints

The MHD records the RMS value of the fundamental current, the value of the total harmonics current (through digital filtration) and the value of every single odd harmonic (up

to 19a) filtered on the respective gang. The value of the total harmonics current and the value of every single odd harmonic can be viewed on the display (type 2x16 back-lighted LCD).

2.4 Characteristics of the alarm section

The THD(I)% (Total Harmonics Distortion of current) level recorded, is compared with the level of threshold setting.

The calculation of the delay of intervention works accumulating manner, through a counter increasing every second if the distortion exceeds the threshold, decreasing if it does not overcome it. The alarm is activated when are accumulated a count more than a level of time setting.

During alarm condition, the RESET button is illuminated and flashes, while on the display the THD(I)% value as well as ALARM is shown. Furthermore the alarm determines the contemporary commutation of the relays "Alarm 1" and "Alarm 2". Alarm warning condition and the memory condition disappears when the main supply is interrupted.

2.5 Reset mode

The types of reset are as follows:

MAN: manual "Reset" to stop over currents harmonics.

AUTO1: automatic "Reset" to stop over currents harmonics, but by exceeding three alarm conditions within one hour, the reset has to be carried out manually.

AUTO2: automatic and continuous "Reset" to stop over currents harmonics.

3. Technical data

3.1 General data

Rated supply voltage:	85÷265Vac
Range frequency:	1250Hz (25 ^a harmonica)
Rated frequency:	50Hz or 60Hz select during set-up
Rated supply current:	by means of C.T. secondary side 5Amps max., class 1 - 5VA.
Current circuit consumption:	2VA
Current signal (In):	0,5÷5Amps.
Continuous overload admitted:	1,2 In max.
Output relays:	10 Amps 400 Vac resistive load.
Adjournment measurement	2"
Digital monitoring:	by display 2x16 back-lighted LCD
Range measure:	THD(I)% max. = 400%.
Measurement accuracy:	± 1,5% f.s. for 20% f.s. ≤ Irms < 100% f.s. ± 5% f.s. for 10% f.s. < Irms < 20% f.s.
Connection	with terminal fixing screws, cable 2,5mm ² c.s.a.
Mechanical dimensions:	96x96 mm FRONT (DIN 47000) 60 mm thickness
Cut out dimensions:	92x92 mm (tolerance -0 / +1 mm)
Mechanical fixing	with the special accessories supplied included

Plastic case:

Weight:

Protection degree:

Working temperature:

Storage temperature:

Relative humidity:

Type of service

3.2 Settings

Rated frequency

Alarm threshold

Type of connection

Reset modes

Delay of alarm intervention

3.3 Reference standard

Safety

EMC

Protection degree

insulating self-extinguishing material,
V0 class.

300 g

IP 54 front panel - IP20 rear pan

0°C / + 50°C display LCD +5°C / + 35°C

-20°C / +60°C

< 90% at 20°C non condensing
indoor service, not dusty condition.
not place directly under sun light.

50 or 60Hz

10%, 25%, 35%, 40%, 50%, 60%, 75%,
100%, 150%, 200%

Single-phase or Three-phase. The
display show the max. value, between
the three values reached
(three- phase connection).

MAN, AUTO1, AUTO2

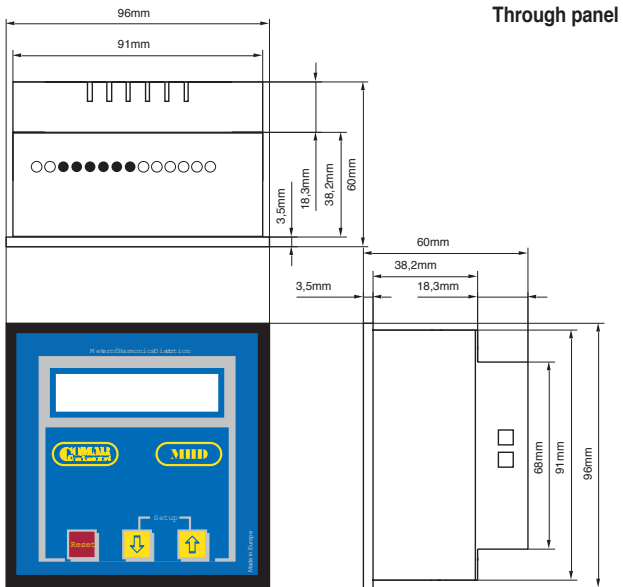
30÷240 secs.

IEC 1010 440V CAT III

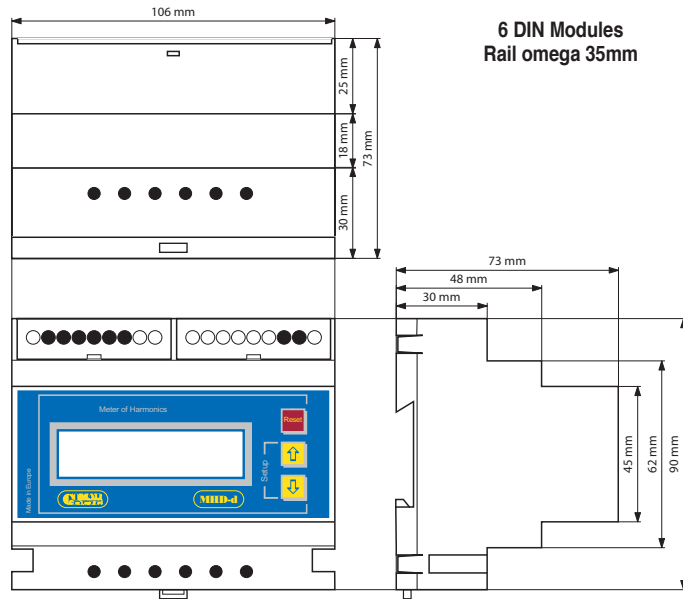
EN50082-1, EN50082-2, EN50011,
EN55022

CEI-EN 605.29

3.4 Mechanical dimensions

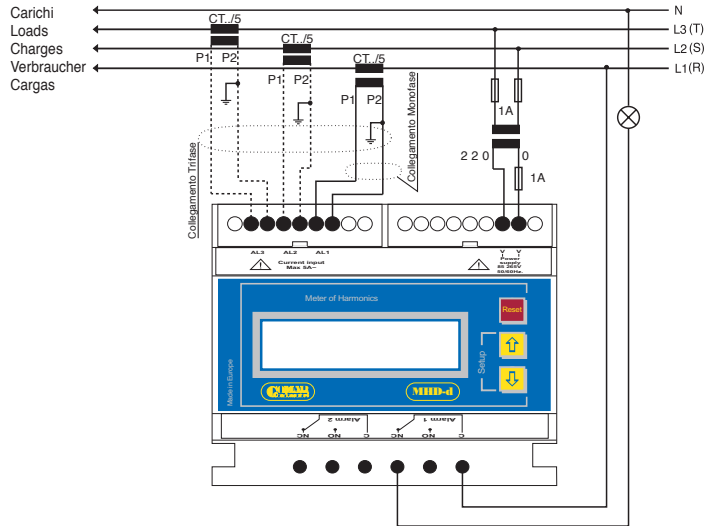
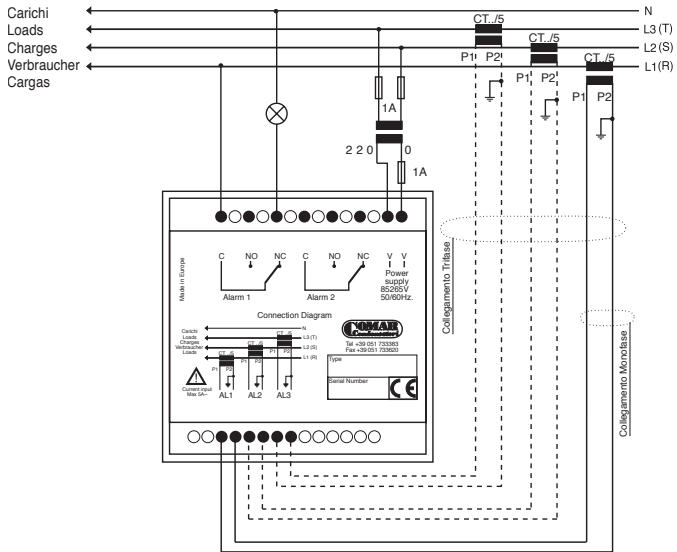


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3.5 Pinout diagram



3.6 How to choose the Current Transformer (C.T)

Use a Current Transformer (C.T.) with 5A at secondary circuit and primary equal or slightly higher than the maximum absorbed by the loads. The C.T. must be chosen in such a way to obtain a good current signal in the secondary circuit. Current values between 0.5 and 5Amps are suitable to obtain good working conditions of the harmonic distortion meter.

The C.T. must be good quality (first class) and with power equal or higher to 5VA. If the C.T. has been mounted far from the equipment, it needs to add the normal demanded the power consumed from the cables of connection (normally 0.2VA per meter of bifilar lines with 2.5mm² section) and the power dissipated by others possible tools connected in the circuit.

The equations, used to calculate the real losses, are the sequents:

$$R = 2 \times \varphi \times L/S \quad (\Omega) \quad \text{Total resistance of amperometric circuit}$$

$$P = (R + 0,08) \times I^2 \quad (\text{VA}) \quad \text{Losses of amperometric circuit}$$

' φ ' is the electrical resistivity (0.018 for the copper)

'L' is the length of amperometric circuit (mt)

'S' is the across section of cables at the secondary of TA

'I' is I_{max}. at the secondary of C.T.

'0.08' are the internal resistance of P.F. regulator

The cables at the secondary of C.T. have to be of 2,5mm² section.

Before doing any work on the C.T. circuit, be sure that the C.T. is short-circuited, otherwise dangerous voltages can rise, add bring to breakdown the C.T.

Connect the secondary of C.T. to the sealed clamps AL1 (single-phase type) or AL1÷AL3 (three-phase type).

3.7 Relay

It has a clean contact to be used either for remote signalling of the alarm condition or incorrect and wrong connection (cumulative alarm). The contact NC - 10A - 400Vac (resistive load), changes condition in the standard operation (NO) and it is closed during missed or wrong operation (NC).

4. Functions

4.1 Powering on

When power is switched on, an internal self test routine has been performed. The display shows the installed s/w release.



MHD Version X.XX

After start-up process, the MHD is working with factory setting.


TOTAL THDI= 5%
MAN


4.2 Harmonics distortion measure

Total harmonics distortion of current and the reset mode, are shown on display.



Through the button  or  it is possible to view sequentially the value of current D(I)% related to every odd harmonic (up to 19a).

HARM=03 DI= 5%
MAN

By pressing the  button together for three seconds, automatic scrolling of the measurements is achieved every 8 seconds (scroll function is visualised to display by A.S. indication).

Automatic scrolling is stopped with push-button .



4.3 Check set-up


By pressing the button  and  it is possible to view the parameters of set-up page.

50 Hz THDI 40%
3PHASE MAN



The instruments is setting to factory for rated frequency 50Hz, alarm threshold THD(I)=40%, single-phase connection, manual reset mode and delay of alarm intervention 90 secs.



4.4 Set-up



Press at the same time for 10 secs the  and  buttons.

The rated frequency value blinking. Use the  button to change the selection.

50 Hz THDI 40%
3PHASE MAN

Push .
The alarm threshold value blinking. Use the  button to change the selection.


Push .
The type of connection blinking. Use the  button to change the selection.

Push .
The reset modes blinking. Use the  button to change the selection.

Push .

Alarm time
90 Seconds

The delay of alarm intervention blinking.


Use the  button to change the selection (30÷240 seconds)


By pressing the  button the values which have been selected will be saved and the analyser works.

4.5 Alarm condition

The type of reset are as follows:
Manual (MAN)


TOTAL THDI= 90%
ALARM MAN

On the display the THD(I)% value as well as ALARM is shows and  button is illuminated and flashes.

When the over currents harmonics to stop and we are accumulated a count under a level of time setting, push .

Automatic 1 (AUTO1)

TOTAL THDI= 90%
ALARM AUTO1

On the display the THD(I)% value as well as ALARM is shown and  button is illuminated and flashes.

Automatic reset to stop over current harmonics and we are accumulated a count under a level of time setting.

The indication of first alarm is visualized by “*” on the display (alarm memory).

TOTAL THDI= 5%
* AUTO1

The indication of second alarm is visualized by “**” on the display (alarm memory).


TOTAL THDI= 5%
** AUTO1

But by exceeding three alarm conditions within one hour, the reset has to be carried out manually

TOTAL THDI= 90%
ALARM MAN




blinking.

When the over currents harmonics to stop and we are accumulated a count under a level of time setting, push .

Automatic 2 (AUTO2)

TOTAL THDI= 90%
ALARM AUTO2









On the display the THD(I)% value as well as ALARM is shown and  button is illuminated and flashes.

Automatic reset to stop over current harmonics and we are accumulated a count under a level of time setting.

Note: alarm warning condition and alarm memory, disappears when the main supply is interrupted.

4.6 Alarm

During alarm condition, the reset button is illuminated and flashes, while on the display the THD(I)% value as well as ALARM is shown. Furthermore the alarm determines the contemporary commutation of the relays “Alarm1” and “Alarm2” (rated 10A 400V resistive load). The relay has a clean contact to be used either for remote signalling of the alarm condition or incorrect and wrong connection (cumulative alarm). The contact NC, changes condition in the standard operation (NO) and it is closed during missed or wrong operation (NC).

Reference	Condition	Display indications	Alarme relay
No supply voltage	V=0		
Low voltage	V<85Vac RMS		
Low current	A<350mA	TOTAL THDI= --,- MAN	
Zero current	A<50mA	TOTAL THDI= --,- MAN	
Alarm	THD(I) > alarm threshold	TOTAL THDI= 90% ALARM MAN	
No alarm	Standard operation	TOTAL THDI= 5% MAN	

5. Working troubles and solution

TROUBLE	SOLUTION
Display off, analyser not working	a) Check if supply voltage is present. b) Check if supply voltage is equal to the rated voltage of the regulator.
Displayed "ALARM" on display	a) The harmonics distortion current recorded, exceeds the threshold alarm setting. b) Reset mode MAN: when the over currents harmonics to stop and we are accumulated a count under a level of time setting, push "Reset" button.
Displayed "-.-" on display	a) Zero current or low current alarm. Check the C.T. and its connection and ensure the minimum secondary current level is least 350mA. b) Total harmonics distortion of current, recorded =0% c) Single-phase connection and Three-phase connection setting (§ 4.3).

If problems persist after all above mentioned solution, switch off the instrument for at least 20 secs. And then switch on again, If the problem is still present please call our technical department.