HC INDUSTRIE GROUP DOO

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MANUAL FOR USE AND MAINTENANCE

SELF-REVOLVIN HYDRAULIC PHOTOVOLTAIC BASE OF TWO AXES

WARNING! READ THE /A INSTRUCTIONS MANUAL /UA\ BEFORE OPERATE

Edition: January 2017

The present operation, assembly and maintenance manual
is part of the harmonization study of the
SELF - REVOLVING HYDRAULIC PHOTOVOLTAIC
BASE OF TWO AXES
with the European Directive for machines safety
98/37/EU

According to the study the machine is able to have CE marking.

This manual is an integral part of the revolving base and should be free and available to anyone who wants to set on, operate, maintain, repair or regulate the machine.

It should be kept close to the machine, in a place free of humidity, dust or high temperature.

In case of destruction or loss, ask for a copy from the manufacturer or the authorized representative.

The manufacturer does not have any responsibility for problems caused by faulty installation and repair. Skilled operators - maintainers only should handle or repair this machine

The present manual has been composed
and published from the manufacturing company
HC INDUSTRIE GROUP DOO

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For the publication of this manual, the company has
cooperated with the technical consultants:

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Picture 1 Slewing Drive

1. INTRODUCTION

1.1 The company

From the beginning of its activities «**HC INDUSTRIE GROUP DOO** company has been directed on the production of machines with the following characteristics:

Manufacturing quality,
Handling facility,
maximum performance of the parts or units that offered to the market and mainly safety of use

For these reasons the products our company offers are manufactured with high specifications and have the CE marking.

Our perennial experience and specialization on machine manufacturing signifies the machines that we dispose to the Greek market excellent regarding to quality, easy handling, technology and to resistance in time. Safety is also an important section for us according to the operation and maintenance of our products.

Excellent customer care is top priority for us including machine equipment and after sales service and it is provided from the experienced staff of our company.

This was immediately perceptible from our customers who correspond like you did and trusted our machines.

Through the continual searching of the perfect with the intention of the best customer care and based on the European orientation of our country we proceed to the certification of our machines, according to the European directive for machines safety 98/37/EK.

This means more safety for the operator.

With yours reliable collaboration and our continual try we hope to continue our collaboration in the future.

1.2 The products

The products that company manufactures are machines for industrial and mechanical production and can be used either in industrial units or individually.

This manual refers to the installation, use and maintenance of a self - revolving hydraulic base of two axes for photovoltaic.

It is harmonised with the European directive for machines safety.

It is accompanied with an after sales guarantee. Its reliable and trustful systems will completely satisfy your demands for many years

2. SAFETY MEASURES AND GENERAL INSTRUCTIONS

In this machine everything has been made in order to assure the safety on your own work.

Prudence, however, is irreplaceable and there is no better rule than obviating the accident.

The revolving photovoltaic base of two axes was manufactured and assembled ac-cording to the regulations of Annex III and V of directive 98/37/EK and the following standards:

- **EN 12100-01 & EN 10100-02 «Safety of machines - Basic directions - General design principles».**
- **EN 349 «Safety of machines - Minimum openings for the avoidance of crash with human body members».**
- **EN 953 «Safety of machines - Safety Guards - General manufacture specifications for steady or mobile safety guards».**
- **EN 954-1 « Safety of machines - Elements with regard to the safety of control unit - Part 1: General design principles».**
- **EN 982 «Safety of machines - Safety requirements for fluid power systems and their components - Hydraulics»**
- **EN 60204-1 «Safety of machines - Electric equipment of machines - Part 1: General requirements».**

3. SYMBOLS USED

A

This safety symbol follows message relative to dangers that should be taken under consideration for the avoidance of an accident.

This symbol follows message relative to information that are reported in the present or in the accompanying handbook and should be taken under consideration

This symbol follows indication. Meeting the symbols above we become more careful for possible accidents or important points regarding the operation and should carefully read the message that follows.

4. INDRODUCTION TO THE MANUAL

We strongly recommend that you read carefully this manual before the first. We prepared it in order for you to reach maximum performance through installation and operation. In this manual there are many information and advices for some parts of the machine that require particular attention and their purpose is to help you for a proper use or the machine. Guarantee is also included with terms and conditions which validate it.

«HC INDUSTRIE GROUP DOO» company does not have any responsibility for damages becoming from improper use.

We are sure that taking all these into account will be easy for you to use your machine that will serves you for a long time satisfying all your demands.

ATTENTION! Guarantee of the machine is connected with the conformity to the directives of this manual.

A

ATTENTION! This manual is an integral part of the machine and should accompany the machine in every transfer or resale. It should be kept in a safe place and the staff has to be aware of it. The staff is also responsible for the good condition and safekeeping of the manual. In case of damage or loss you must ask for a new copy from **«HC INDUSTRIE GROUP DOO»**.

Read carefully before you proceed in the start up, use, maintenance or other interventions on the machine and follow with precision the instructions and the warnings reported below.

Retain the labels placed on the machine and replace immediately those which are lost or becoming illegible.

The operation of the machine should be performed by authorized personnel properly trained on its operation. A trained person is a sufficiently informed one or supervised by a specialized person, in order to avoid the dangers that can be created from the operation of the machine.

5. MARKING

The term marking defines all the indications or signs for the recognition of the type of the machine or device, that has been placed by the constructor of the machine on the device

Every machine has been manufactured having taken all the safety measures for the protection of the operator. Nevertheless, remaining dangers exist, which are pointed out on each machine with proper labels. These labels that are presented below, remark the various dangerous situations.

^ [1] Retain the labels clean and replace immediately if they come unstuck or get destroyed.

5.1 Technical characteristics and technical data label

The label of the technical characteristics is placed in an obvious position and has all the necessary characteristics for the proper installation of the machine (such as type, serial number, year of manufacture, voltage, power, weight).

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Machine Construction

SELF-REVOLVING HYDRAULIC PHOTOVOLTAIK BASE OF TWO AXES

YEAR OF CONSTRUCTION
SERIAL NUMBER TYPE
POWER (kW)
VOLTAGE / FREQUENCY (V/Hz)
WEIGHT (kg)

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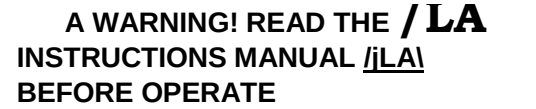
Picture 2: Technical characteristics label

5.2 Marking labels

It is placed on the frame joists of the machine which are used as points of suspension of the machine during transportation



It is placed on the control pane: of the machine

ATTENTION ELECTRIC SHOCK

It is placed above of the main part of the electro-motor and on the electrical panel

FORBIDDEN CLEANING & MAINTAIN DURING OPERATION

It is placed above the points of maintenance of the moving parts

ATTENTION MACHINE IN OPERATION

It is placed on the safe guards of the machine

Picture 3: Marking labels

6. TRANSPORTATION, INSTALLATION AND CONNECTION

Transport of the machine becomes by disassembling it in its main parts (pylon for machine support, main hollow beam, secondary hollow beam, intermediate hollow beams and panel supporting elements) with a truck. The machine is stabilized with belts through transport. Loading and landing of the machine becomes with a forklift of the proportional ability or with a crane. All the necessary precautions should be taken in order to avoid machine damages.

The machine can be placed outdoors without any problem or in places with high temperature alternations. The place that it will be settled haw to have low productivity and to satisfy all the specifications that the law for the photovoltaic defines. In case of rough ground, instability or movement of the machine should be avoided.

The base of the machine should be installed before the machine because the machine will be setted above the base.

The machine (pylon) is anchor mounted on beams inside a well.

Dimension specifications for the manufacture of the base in which the filament with the anchoring screws will be placed have to be shown as in the following picture (Picture 4).

For more details according to the machine installation, consult the accompanied foundation study.

If installation is performed according to the instructions above, base holes will fit in with the anchor screws.

In order to fasten the machine, you have to construct a concrete foundation of C20/25 category with the proper mixing and the foundation will be durable to frost and corrosive influency of salt.

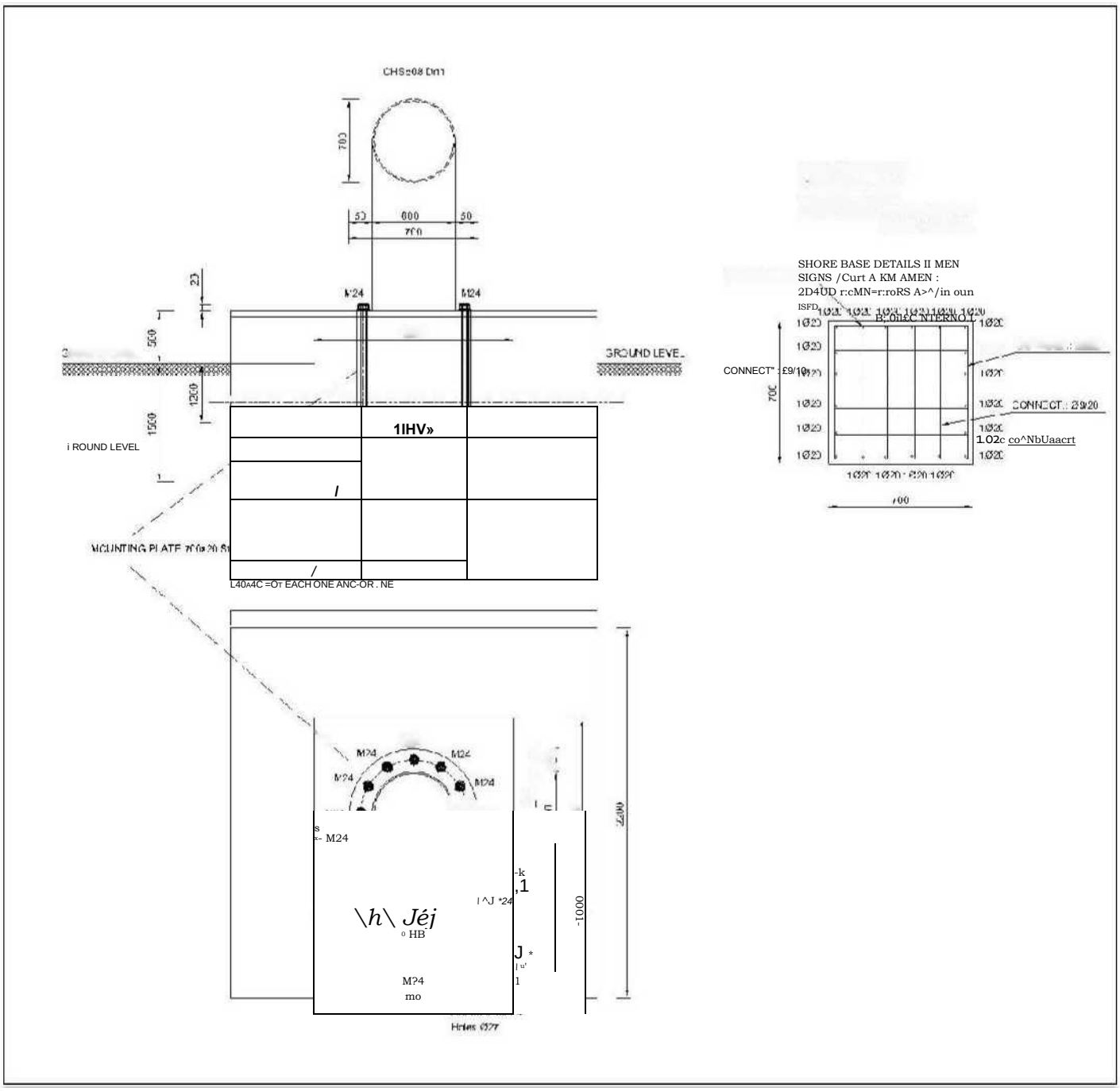
A

ATTENTION! Make sure that the forklift has the proportial ability for the weight of the machine. The weight of the machine is mentioned to the technical characteristics label.

A

ATTENTION! During the installation keep the following safety measures:

- **Evacuation of the place through installation.**
- **Warnings by labeling and tapes for existing dangers during the installation.**
- **The employees should wear proper outfit.**
- **Scaffolds with grating of lifting baskets should be used. The machine has to be supported from the scaffolds during the installation.**
- **All the rules should be kept through weldings (e.g. protective glasses and clothes).**



Picture 4: Installation details

► **Instructions of installation**

In order to install the machine follow the steps below:

Picture 5

Picture 6

1. Construct the well according to the installationinstructions.
2. Place the filament with the anchoring screws in to the well and fill it with concrete.
3. Place the machine by this way that the holes of the base fit in with the anchor screws.
4. Place the anchor and secure with safety nuts.
5. Place some antifouling paste in to the cochleared connection.

Weight of the machine is different in each type.

There has to be free space around the machine in order for the operators to have access in different places and to open the guards but also to have enough space for use, maintenance and effective cleanness.

Benefit current supply 400V/ 50Hz needed.

ATTENTION! Check for electrical cables on the well construction place. Danger for electric shock!

ATTENTION! Installation has to be done only by specialized staff.

ATTENTION! For your safety before connecting of the machine with the supplying line check for:

a) Phase and earth wire connection performance. The protection tube (earth wire) is colored yellow - green with insulation wrapping.

b) The idealism of the supplying tube is certified. More specifically we use tube of 5 X 2,5 mm^2.

c) Electrical network voltage should be accordant to the voltage shown on the label of the technical characteristics.

d) After plug connection the machine is ready for use as long as a trial has been made for the proper operation of all parts of the machine.

The machine is automated, operator is needed only for the power supply. Parts included:

- Self-ruling automation board.
- Automatic hydraulic system.

7. OPERATION / DESCRIPTION

A short description of the machine is following below so that the instructions of use and maintenance are clearer to the operators of the machine.

The referred machine is a base on which special collectors are installed in order to collect solar energy and to convert it into electric power.

The operation is based on the rotation so that a true axis should exist between earth and sun during rotation in order for the collectors to achieve maximum performance and eventually maximum energy collection.

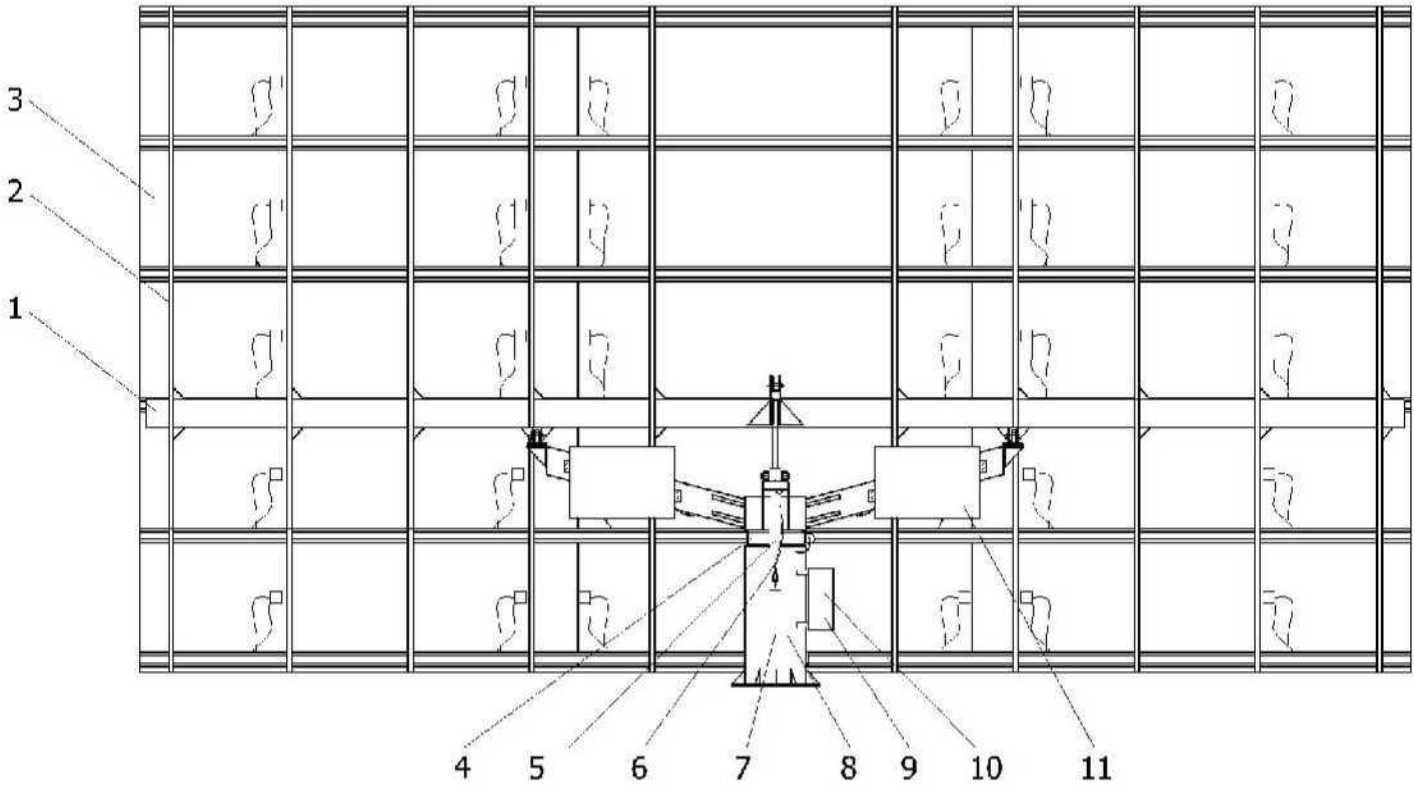
A P.L.C. adjusts the horizontal and vertical revolving so that during sunrise the collectors to be in the direction according to the geographic position and during the day to be revolved according to the sun's orbit.

The operation of the machine is the following:

1. Installation of the machine should be performed only by experienced staff.
2. P.L.C. programming should be performed only by experienced staff.
3. P.L.C. programmed automatic rotation (horizontal and vertical) with two pistons working during the day.
4. Return to the initial position, with the collectors placed to the true vertical axis between earth and sun.
5. Repeat steps 3 and 4 sequentially.

The restoration of the collectors to the initial position becomes after the sundown.

Picture 7 Support



Picture 8: Machine parts <u>Description of the construction</u>

The self-revolving hydraulic photovoltaic base is consisted of following parts:

1. Main base of the collectors support
2. Collector support
3. Collector / panel
4. Slewing Drive
5. Piston for the elevation of the collector base
6. Reference way of the correct position to the astral sun position
7. Pylon for machine support
8. Hydraulic system (pump, oil tank, block with valves, manometer)
9. Automatic board
10. Manometer
11. Base for the main board and inverter installation

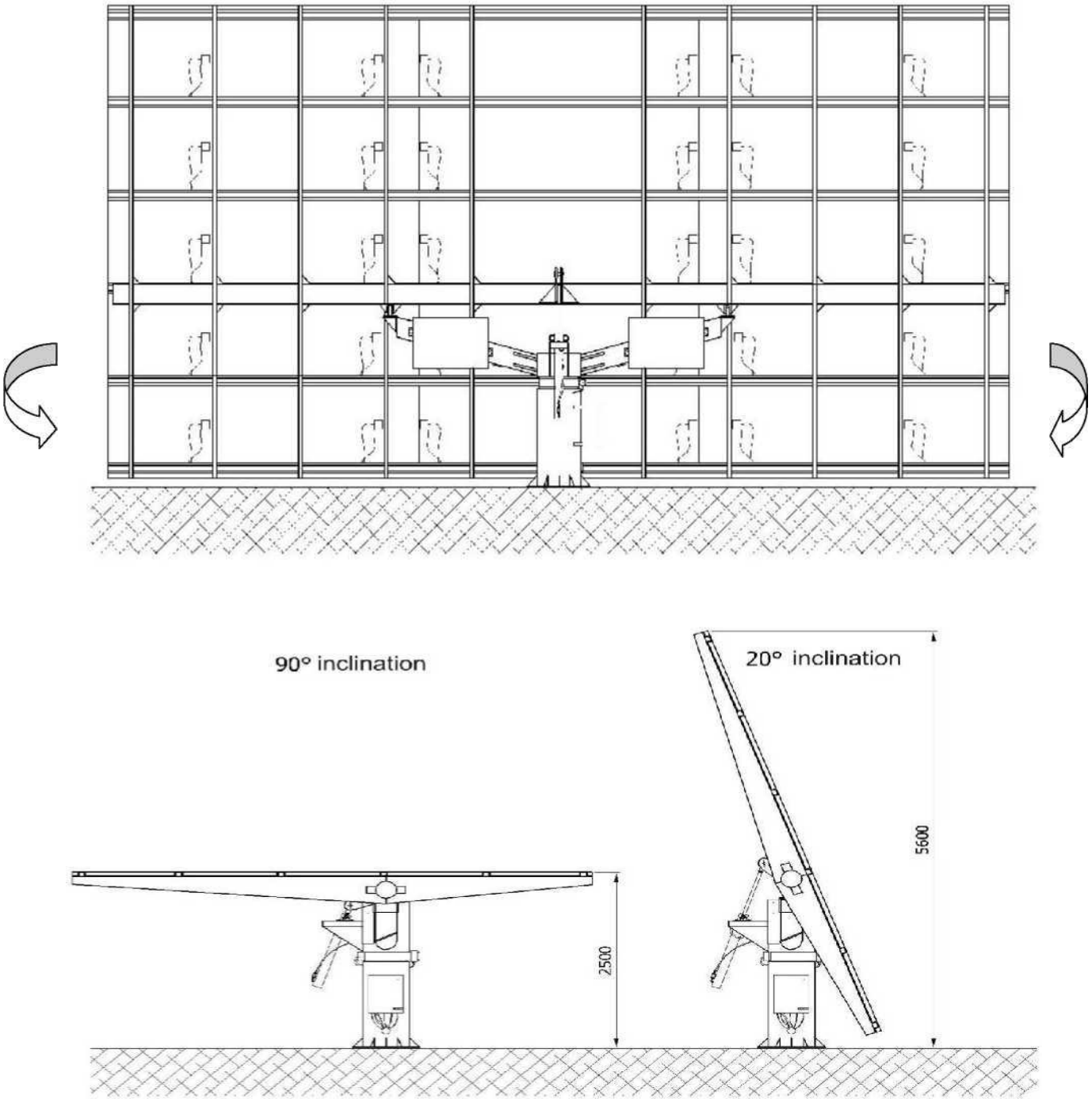
- **Main base of the collectors support**

Collectors (panels) are fixed on this base (1 pic. 6) and fastened with fastners.

- **Collector support**

Vertical supports of the panels are comprised by the collector supports (2 pic. 6) and are welded to the main base of the collector supports.

- **Collector / panel**



Picture 9 Collector / panel

The collectors (panel) collect the solar power and convert it to electric power. The maximum horizontal revolving is 223 degrees in horizontal elevation and between 20 and 90 degrees in vertical elevation (Pic. 9).

Picture 10

To Slewing Drive (4 pic. 6) cooperates with the hydraulic motor and revolves the panel surface according to the sun direction during the day. The whole circuit is commanded by the P.L.C. which moves the base according to the installed software commands (pic. 10).

- **Piston for the elevation of the collectors base**

The piston (5 pic. 6) elevates the base where the collectors are placed on and therefore the collectors around the main base axis (1 pic. 6). Elevation of the piston is controlled by a pulse generator that provides the right place of the elevation (pic. 11).

Picture 11

- **Reference of the correct position to the astral sun position**

The spur gear (6 pic. 6) cooperates with the gear wheel and revolves the supporting pylon according to the sun's direction during the day. The movement becomes by the piston commanded by the programmed P.L.C.

- **Pylon for machine support**

The pylon (7 pic. 6) is 11 mm thick of galvanized steel and is founded with 10 anchors 2 meters inside ground offering stability to the system. Installation is completed very quickly. Smelting of the concrete is simplified with the prefabricated metal patterns (pic. 12).

Picture 12

- **Hydraulic motor**

Hydraulic motor (8 pic.6) moves the pump of the hydraulic circuit. Every hydraulic base has its own P.L.C. and its own hydraulic unit for total independence from the rest of the photovoltaic park (pic. 13).

Picture 13

Picture 14

- **Automatic board**

Every machine has a self ruling automatic board (9 pic. 6) containing locative parts. The board is responsible for the start and the direction programming of the bases according to the sun orbit and the geographic spot of the system (Pic. 14).

Regulation of the parameters becomes from the manufacturer.

- **Manometer**

The manometer (10 pic. 6) checks the pressure in the hydraulic circuit.

8. MAINTENANCE

CLEANING: The machine has been manufactured in order to operate outdoors. There is no special need for the cleaning.

An optical check initially and a detailed one afterwards are recommended through which you verify that there is no damage done to the machine, no rusting existence to the metal parts and that the screwing has not been replaced.

Dust between gear wheel and spur gear is unacceptable as the friction factor grows in order to reduce the lifetime of the spare parts. Cleaning is necessary.

Dust is unacceptable also on the collector surface as it reduces the absorbent ability regarding the solar radiation. Maintainer should be very careful with the collectors.

The maintainer has to wear an appropriate mask during the cleaning of the machine**.**

Extra attention should be given to the dust, an important factor for the corrosion of the machine

Always keep in mind: The cleanest and well maintained the machine is, the longer lifetime it will have.

LUBRICATION: Fill the oil tank of the machine and with special oil for hydraulic lubricating systems. Lubricate where greasers exist.

A

ATTENTION! Only experienced staff should maintain the machine.

A

ATTENTION! For machine operation, use only proper oils recommended by the manufacturer.

A Technical Company will supervise the machine and will be responsible for the good operation and the replacement of any damages may be done.

9. OPERATION

The operation is automated and the interference of the operator is not demanded.

The hydraulic base is leveled in 60 km in order to avoid damages caused from extended winds

10. SAFETY MEASURES

These measures result from the application of the relative standards in the stage of construction and operation of the machine.

The machine is connected with an anemometer so that when the wind comes over the rate that the manufacturer has adjusted, the bases are leveled and the collectors have the minimum resistance to wind. Minimum resistance is achieved when collectors are setted to horizontal position.

- Do not maintain the machine if you have not turned down the switch for the current supply before. You may turn down the main switch in order to ensure the unintentional starting of the machine.
- Always use the right spare parts. Not only get the guarantee of the factory for the spare parts but you ensure the good operation of the machine.
- Only experienced staff has access to the machine's area.
- Do not wash or lubricate by hands the moving parts of the machine.
- Do not maintain - repair the parts of the machine when the motor is in operation.
- All the machines should be handled by capable persons and not under drug influence.

Picture 15

Picture 16

Picture 17

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11. TECHNICAL CHARACTERISTICS

TYPE	T - 8000 PLUS	T - 8000	T - 6600	T - 5300
Ability to collect	10.000 Wp 44-48 pcs	8.000 Wp 36 pcs	6.600 Wp 30 pcs	5.300 Wp 24 pcs
Surface of collectors per base	13x6.6.60m = 85.80 m²	12x5.10m = 61.20 m²	12x4.50m = 54 m²	12x3.50m = 42 m²
Duration	2.500 kg + Panel weight	2.500 kg + Panel weight	2.500 kg + Panel weight	2.500 kg + Panel weight
Horizontal revolving (hydraulic)	223 degrees (with pulse generator)	223 degrees (with pulse generator)	223 degrees (with pulse generator)	223 degrees (with pulse generator)
V VI LIVCII VIV V Cl LIL/II 1II V VAX CL VIXX V 1	20 to 90 degrees (with pulse generator)	20 to 90 degrees (with pulse generator)	20 to 90 degrees (with pulse generator)	20 to 90 degrees (with pulse generator)
Rotation and elevation check	P.L.C. Based on astral facts	P.L.C. Based on astral facts	P.L.C. Based on astral facts	P.L.C. Based on astral facts
Consumption per year	40 kWh	40 kWh	40 kWh	40 kWh
Panel height in horizontal position from the ground Maximum elevation height	2,80 m 5.70 m	2,50 m 4.70 m	2.50 m 4.10 m	2.50 m 3.10 m
Weight (including the panel)	1.050 kg + Panel weight	1.050 kg + Panel weight	1.000 kg + Panel weight	850 kg + Panel weight
Horizontal movement	Hydraulic motor Slewing drive	Hydraulic motor Slewing drive	Hydraulic motor Slewing drive	Hydraulic motor Slewing drive
Vertical movement	Hydraulic piston	Hydraulic piston	Hydraulic piston	Hydraulic piston

CONTAINED	
TYPE	**T-8000 PLUS T - 8000 T - 6600 T - 5300**
Electromotor	370W Three phase 3 X 380 V 1.400 rpm
Electrovalves	NQ6 2 (pieces) X 220 VAC
Current supply	Three phased 3 X 380 VAC
P.L.C. supply	One phased 220 VAC
Security valve for circuit pressure adjustment	
Hydraulic high pressure pump Photovoltaic panel and pylon base are made from galvanized steel	

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MACHINE CONSTRUCTION INDUSTRY
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GOOD OPERATION GUARANTEE

With present the manufacturer guarantees the good operation of the machine that is reported below:

TYPE OF THE MACHINE:	
SERIAL NUMBER:	
YEAR OF CONSTRUCTION:	
DATE OF BUY:	
SUPPLIER:	

The present guarantee stands for 15 years from the date of buy.
The manufacturer guarantees the good operation of the machine.
The present guarantee does not stand as long as:

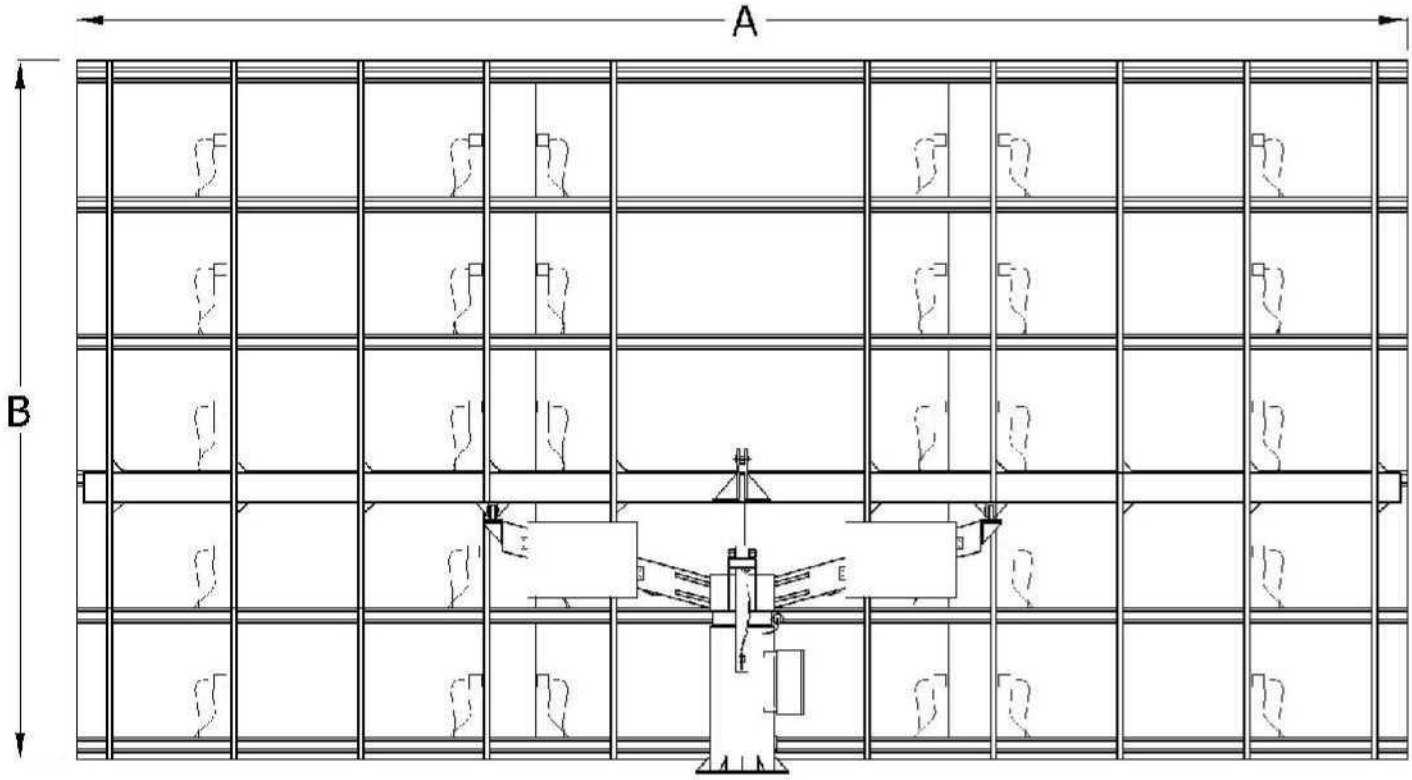
- The machine has been used for a different use from the designed for one.
- Damages where caused by wrong use.
- The instructions for use and maintenance where not obeyed.

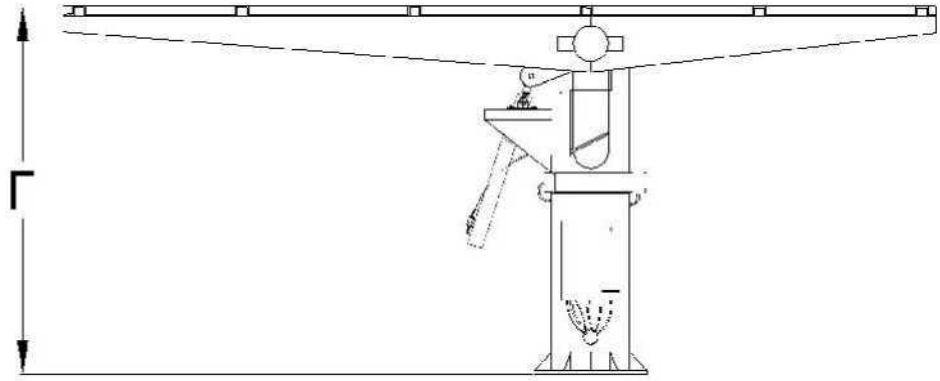
For the installation of each machine we recommend you to collaborate with a registered mechanical for the correct electromechanological installation.

FOR THE MANUFACTURER (The representative - seal and signature

THE CUSTOMER

13. MAXIMUM DIMENSIONS TABLE





Picture 18: Maximum dimensions

External dimensions				
TYPE		**A (mm)**	**B (mm)**	**r (mm)**
T - 8000 T-8000 PLUS		12.000 13.000	5.100 6.600	2.500 2.800
T - 6600		12.000	4.500	2.500
T - 5300		12.000	3.500	2.500

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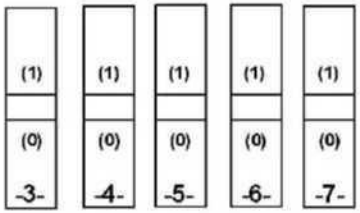
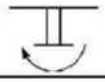
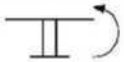
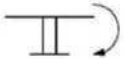
14. ELECTRICAL CONNECTION



AUTOMATED PROGRAM
WHEN THE SWITCH -3- IS IN POSITION (1) TR OPERATES IN AUTO

ATTENTION: In this case switches -4-,-5-,-6-&-7- have to be in (0) position

MANUAL PROGRAM		
WHEN THE SWITCH -3- IS IN POSITION (0) TR OPERATES MANUALLY		
STEP 1	IF SWITCH -3- IS IN POSITION (0) AND -4- IN POSITION (1) THE TR MOVES TO WEST	
STEP 2	IF SWITCH -3- IS IN POSITION (0) AND -5- IN POSITION (1) THE TR MOVES TO EAST	
STEP 3	IF SWITCH -3- IS IN POSITION (0) AND -6- IN POSITION (1) THE TR MOVES ABOVE	
STEP 4	IF SWITCH -3- IS IN POSITION (0) AND -7- IN POSITION (1) THE TR MOVES BELOW	

ATTENTION: Switches -4-,-5-,-6-&-7- have to be in (1) position each one **seperately**

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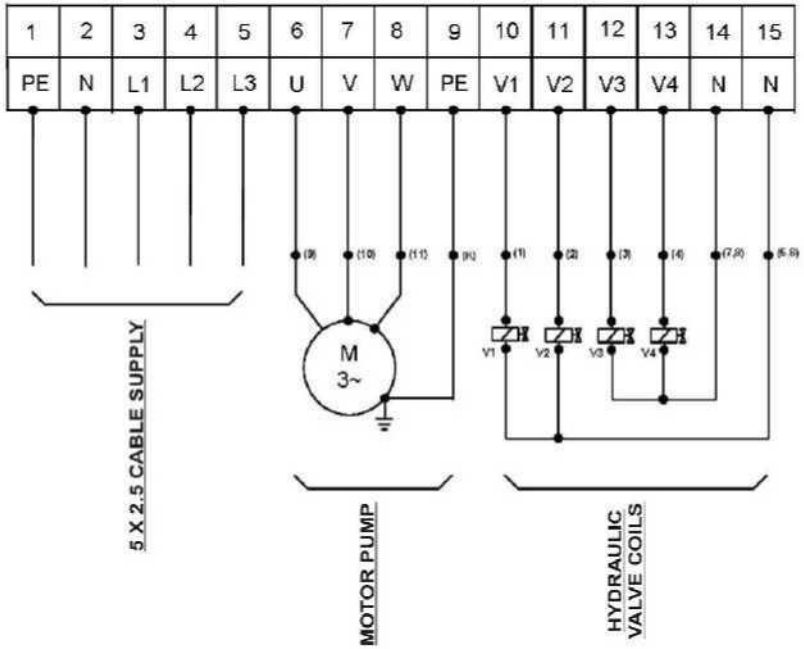

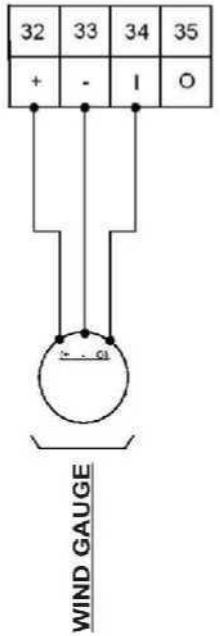

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15. DECLARATION OF CONFORMITY

DECLARATION OF CONFORMITY
DICHIARAZIONE DI CONFORMITA

CE

STAMP OF AGENT

WE DECLARE WITH EXCLUSIVE RESPONSIBILITY THAT THE PRODUCT:

AUTOMATIC HYDRAULIC TRACKING SYSTEM DUAL AXIS

TYPE-SERIAL NUMBER 3

*TO THIS WE PUBLISH THE DECLARATION IS **HARMONIZED** WITH THE FOLLOWING PATTERN*

4
EN 12100-01, EN 12100-02, EN 349 EN 60204-1, EN 953, EN 954-1, EN 982

THE E.E. *AS IT DEFINED FROM THE DIRECTION OF EU.*

98/37/EK

PLACE & DATE