

KIER-945131

시설그린하우스 기후조절시스템 개발연구 별책 : 첨단 Green-Glasshouse 기술자료

주관연구기관
한국에너지기술연구소

농 립 수 산 부



Experience in almost all climate zones



DACE supplies everything, from small research greenhouses to extensive full computerized turnkey projects. They have been built and operated successfully in almost all climate conditions. Working with DACE means benefiting from our worldwide experience, gained in more than 36 countries.

Project realizations worldwide



Turnkey
greenhouseprojects
Design
Engineering
Contracting

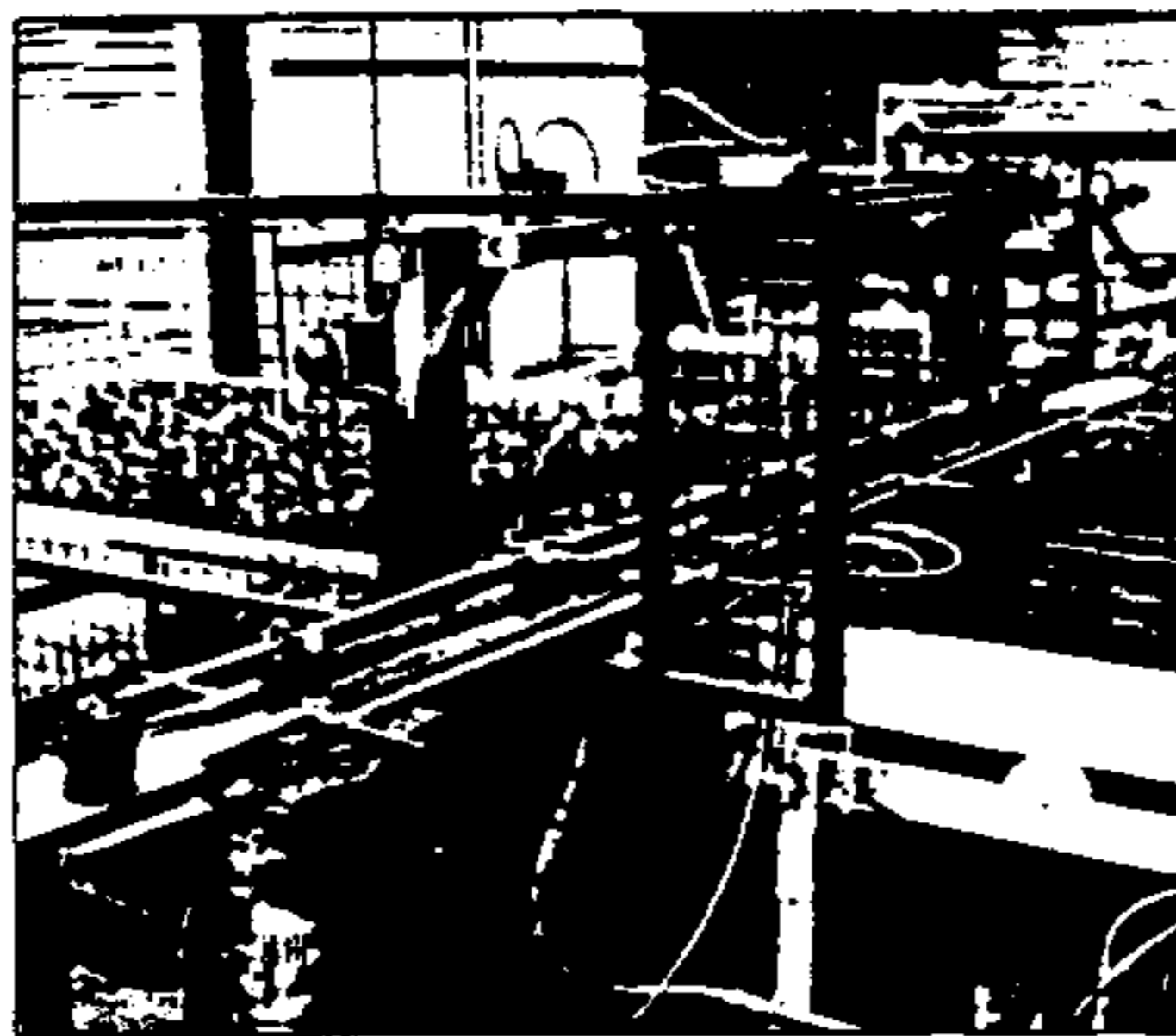


Additional facilities

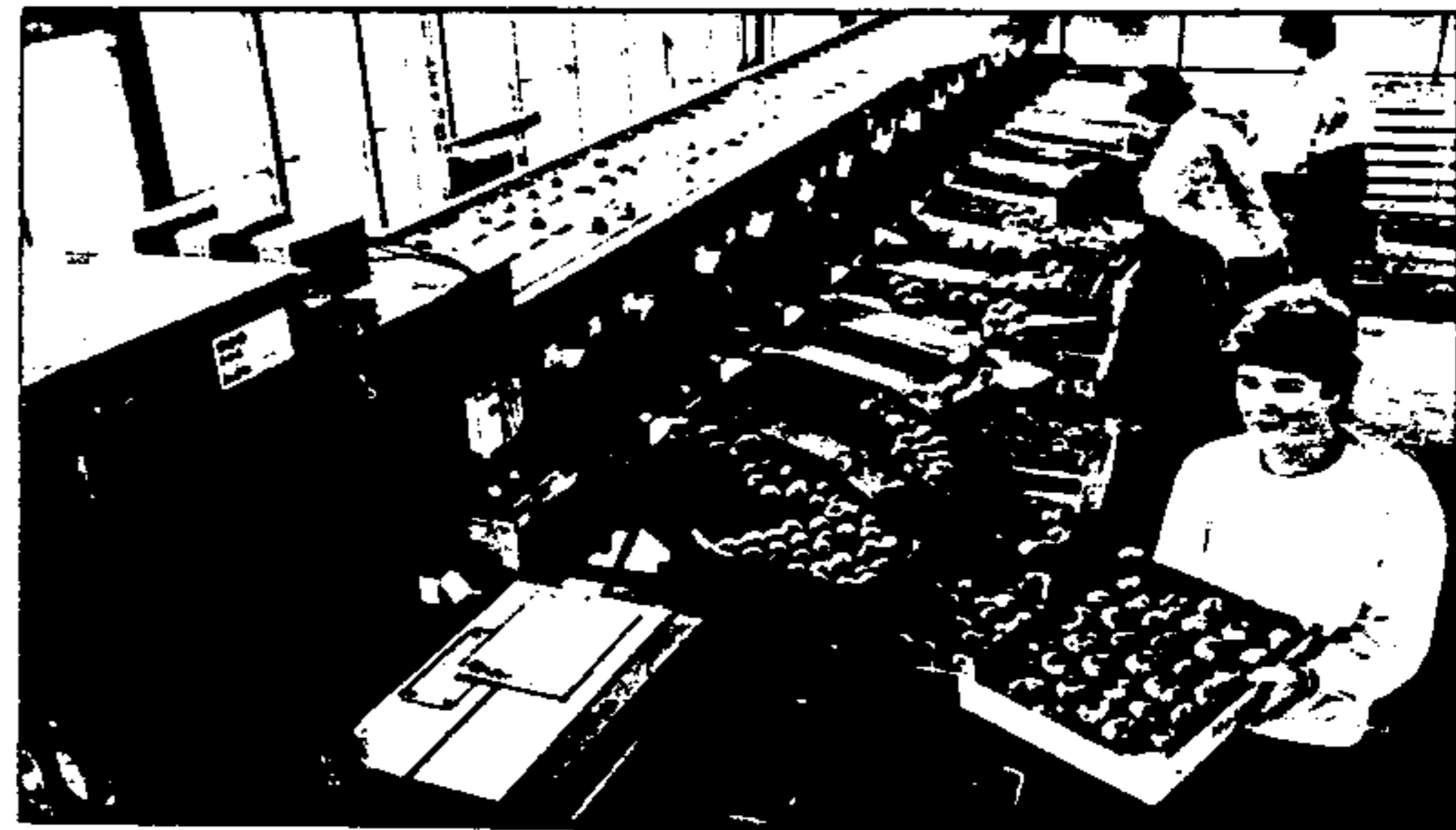


After the greenhouse has been constructed, the climate control equipment installed and tested the project is almost ready to be commissioned. Because after the engineering and

construction of the greenhouse and shipping building the project still has to be equipped with special machinery and equipment. Depending on the needs of the crop, internal transportation and handling systems have been designed to facilitate the rapid harvesting of crops, essential for marketing them in top



condition. All kinds of associated post harvest facilities are available like transport and handling systems, coldstores as well as special machinery designed for grading, packing, handling and storage of the produce.



Climate installations



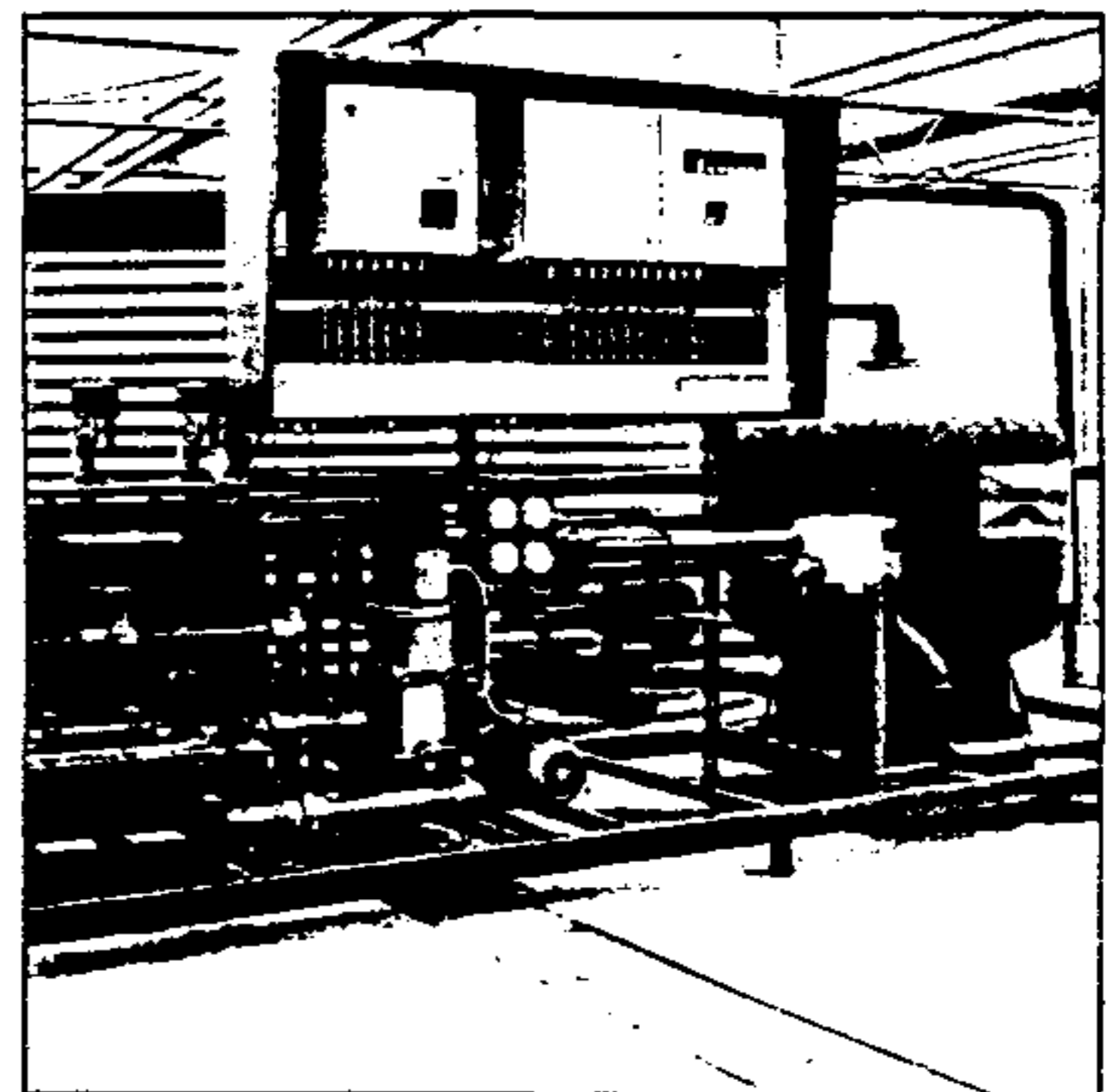
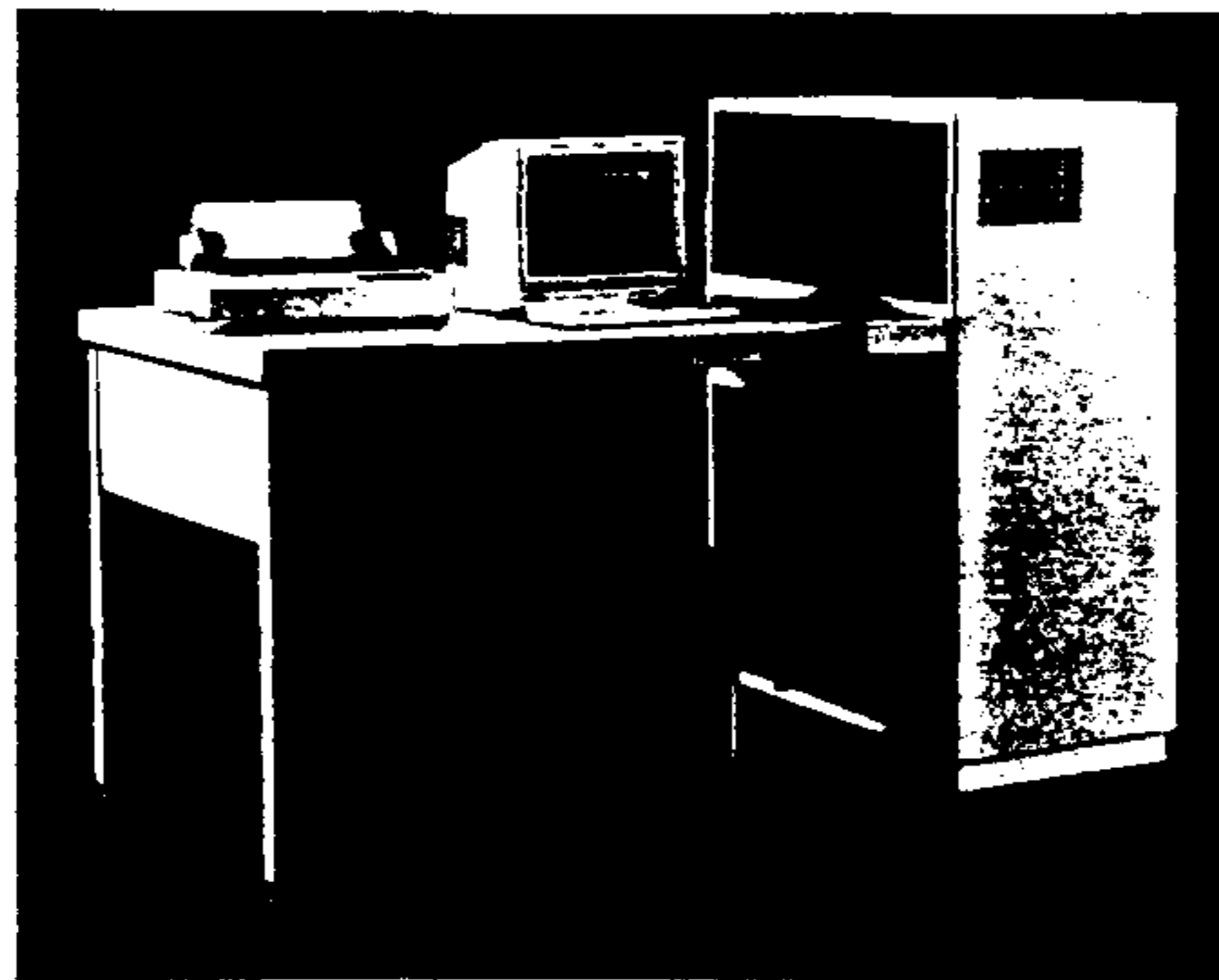
For producing top quality crops you need to maintain an optimal climate for growth, 24 hours a day, every day of the year. To achieve this, we deliver a wide range of

additional equipment like ventilation, heating, cooling and lighting systems. Screening systems to control heat and sunshine, saving energy, providing shade, even blackout conditions. Optimal humidity and watering are achieved by drip irrigation, recirculation systems, high and low pressure overhead irrigation and mist sys-



tems. Ebb/flood systems for bench or concrete floor irrigation, NFT units and hydroponics are also possible.

DACE pays a great deal of attention to providing not only the equipment, but also the latest in climate-computers to measure and control the greenhouse climate precisely. DACE tests all these systems to make sure they work properly before the project is handed over.

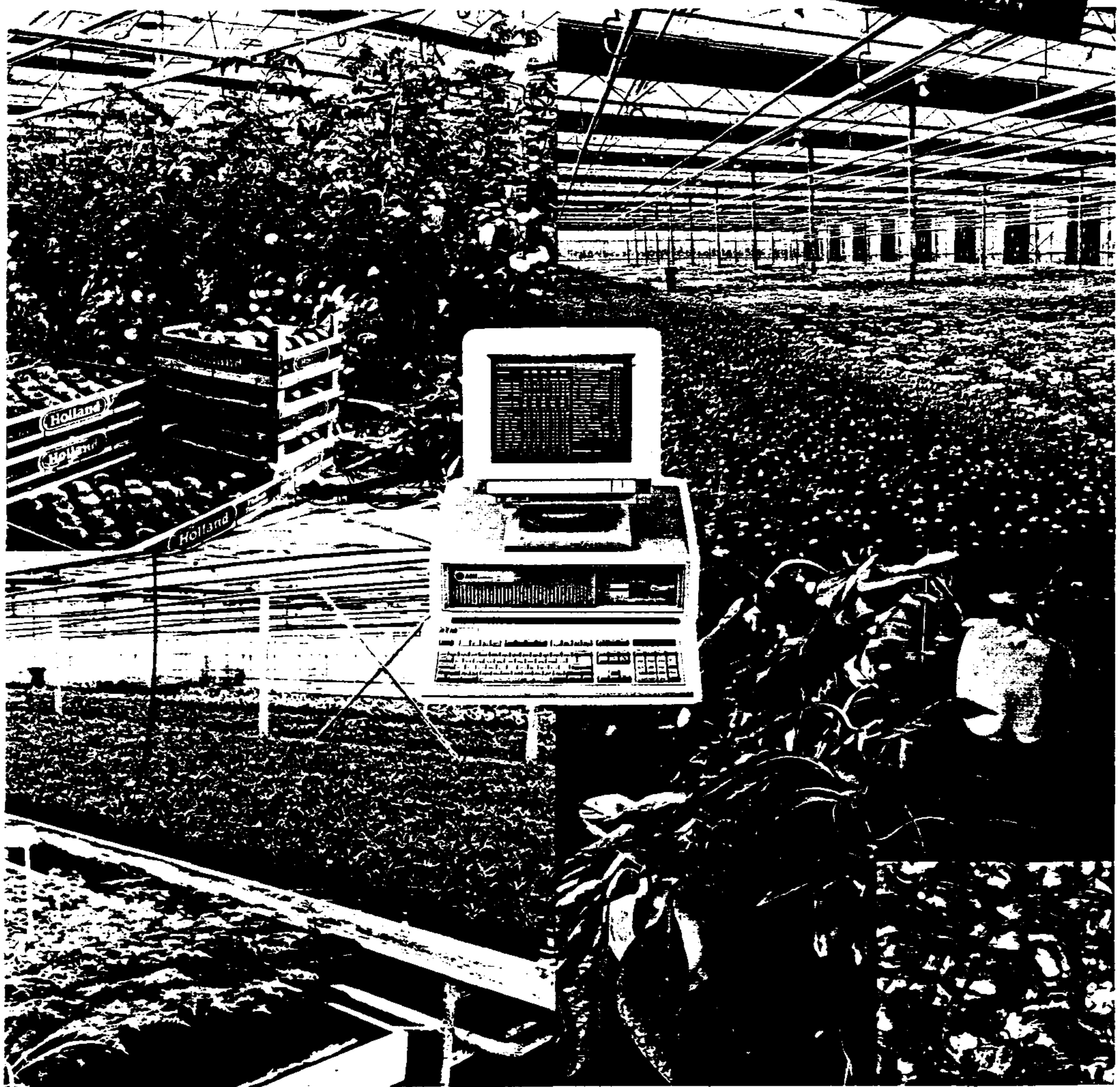




Groesweg 22
5993 NN Maasbree
Phone: (31) 4765 - 2275
Fax: (31) 4765 - 1957
The Netherlands

Climate control & automation "Our skill"

- Measurement and control technics
- Entire project automation
- Climate control computers
- Substrate installations
- Fully automatic single liquid fertilizer dosing (menu-controlled)
- Management computers
- Graphic software

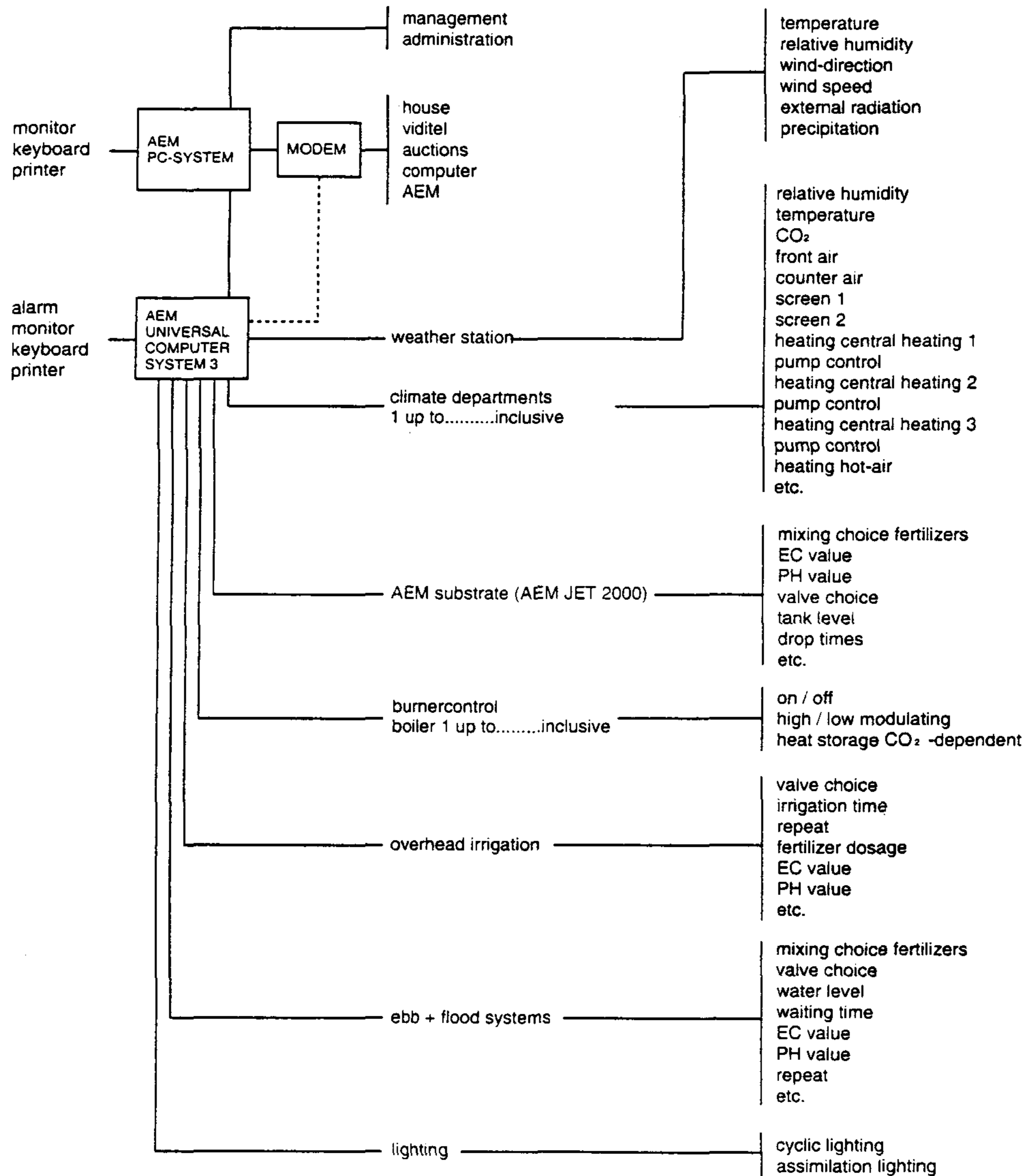


Proven quality, year-long experience, advanced technics, users friendly. Easily to extend, also on long term and payable prices. So: a justified investment!

TIJNEN 0116 10 061 244

AEBT'S ELEKTRO BV - MAASBREE

CLIMATE CONTROL COMPUTERS IN PRACTICE, MAKE YOUR OWN CHOICE



**Business directed approach
by our professional advisers.
You can contact AEM Holland,
department horticulture automation.**

Your dealer:

Phone: (31) 4765 - 2275, Fax: (31) 4765 - 1957

AEM

TUINBOONWEG 100 6212 AZ

AEM

AGRICULTURAL ENGINEERING MAASBREE

FULLY AUTOMATIC LIQUID FERTILIZER DOSAGING UNIT

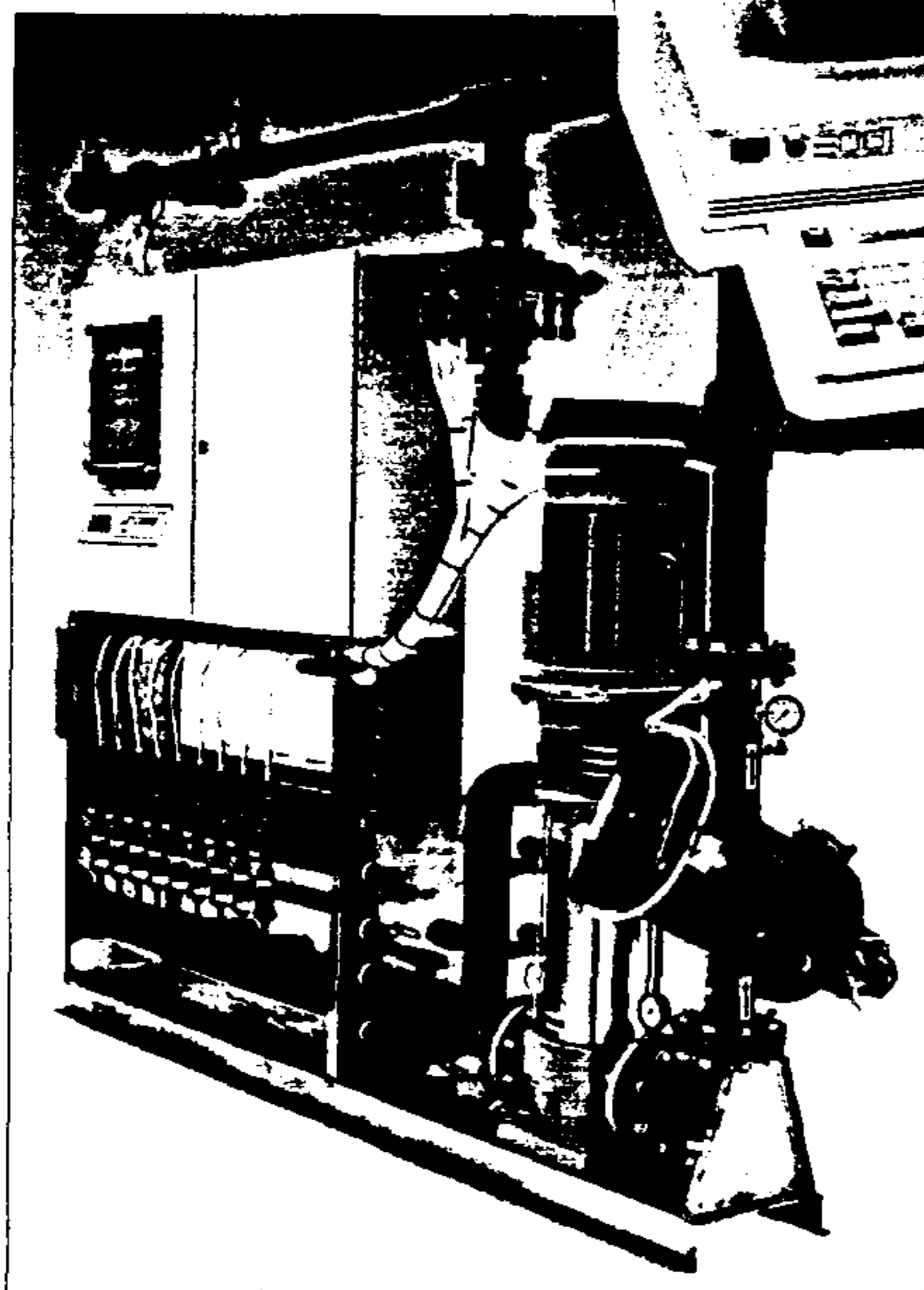
JET 2000 P

Climatisation and Automatisation 'Our skill'

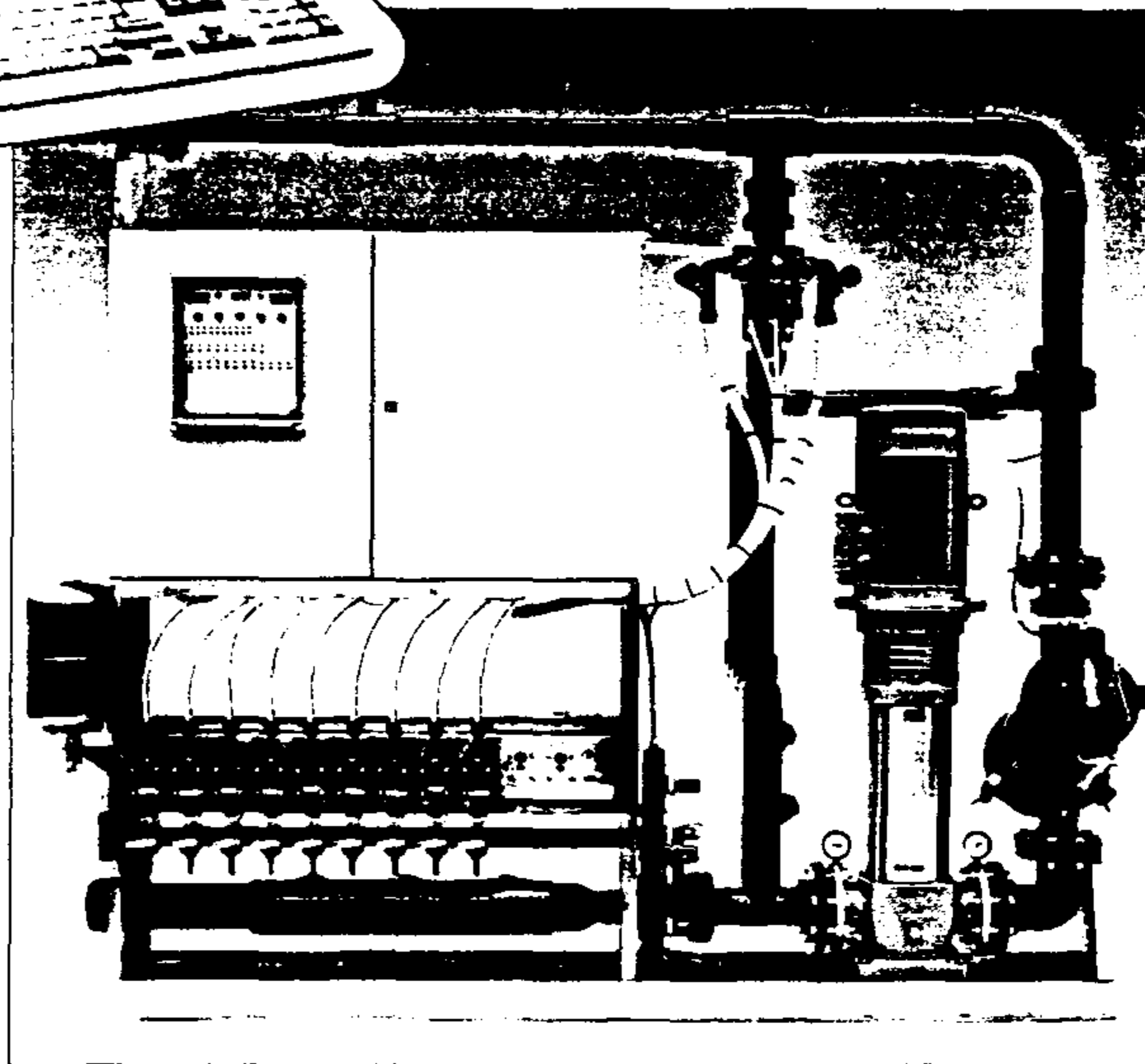
The AEM Jet 2000P is a general-purpose unit which is suitable for use with all types of plants and with any desired product. When the AEM Jet 2000P is employed for the cultivation of different cultures, the user is provided with a large degree of choice. A company which cultivates several cultures at the same time can employ the AEM Jet 2000P to completely automate and control the water and fertilizer dosaging.

Several types of water may not be used at the same time, e.g. drain water, rain water, and tap water. The software program determines and automatically controls the addition of fertilizers in the same water supply.

FORMULAS WHICH ARE FULLY-ADJUSTABLE
VIA THE COMPUTER



FULLY-AUTOMATIC LIQUID
FERTILIZER DOSAGING UNIT



Optimal composition of the feed per substrate group, i.e. via taps, the AEM Jet 2000P controls the composition of the fertilizer which is fed to each group of plants. The supply of the various types of water can thus be controlled completely automatically. The program achieves this by making calculations in millimols and micromols so that the molecule balance of the different types of water can be calculated and so that the amount of liquid fertilizer supplied to the greenhouse/plants can be automatically controlled.

The AEM Jet 2000P is extremely simple to use. The transpiration models enable changes in climate and optimal irrigation to be easily achieved. The AEM Jet computer also organises the climatic and other horticultural requirements in an efficient manner. During the years, AEM has accumulated a significant amount of experience in the field of automation for horticultural projects, with proven quality and using only the most up-to-date techniques. The systems are user-friendly, economical and can be easily expanded to meet future needs. Thus: it is a wise investment!

Designed and manufactured by:
AGRICULTURAL ENGINEERING
MAASBREE B.V.

Groesweg 22, 5993 NN Maasbree
The Netherlands
Phone: (31) 4765-2275
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AEM

AGRICULTURAL ENGINEERING MAASBREE

PRACTICAL APPLICATIONS*

Purpose of the AEM Jet 2000P

To calculate the correct quantities of fertilizer in the available types of water and to add the missing nutritional elements in order to provide the plants with the optional irrigation.

Advantages of using the AEM Jet 2000P on a daily basis:

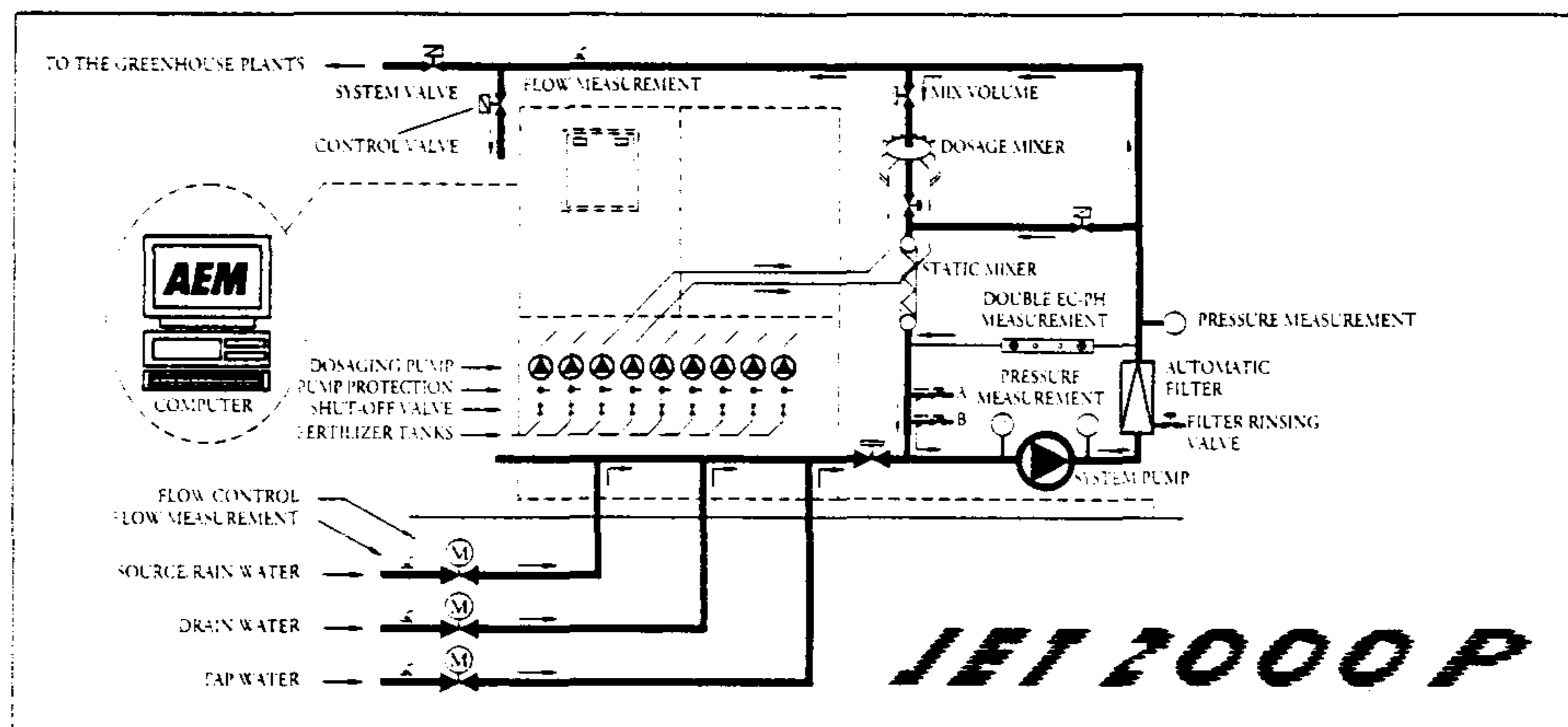
- simple operation
- rapid feedback of data
- different formulas can be easily programmed for the various groups of cultures
- individual doses of the formula can be fed to each tap or group of plants
- the fertilizers are available in liquid form
- no need to weigh and dissolve solid fertilizers
- virtually no maintenance required due to the use of durable materials rust-resistant steel and self-cleaning filter
- information is provided in a more direct manner
- automatic radiation threshold/re-adjustable
- automatic corrections can be easily input by the user
- automatic irrigation, e.g. for drain/radiation/total light/transpiration model
- considerable savings in labour costs

For your plants:

- formula compiled according to type of culture
- the exact dosage is always given
- the formula can be easily modified, e.g. for combatting diseases and for using spore elements (optional)
- accurate adjustments of the desired EC and pH
- analysis of formulas can be input
- rapid auxiliary control

For the environment:

- re-use of rain water
- very small amount of deposits left behind from formulas which have already been prepared
- minimal losses of 'contaminated' water containing nutrients
- recirculation of the substrate drain can be simplified by modifying the formulas via computer



Technical specifications (standard version)

- 1 system pump (capacity according to requirements of company)
- 8 (or more) dosaging pumps for fertilizer dosaging with protection
- 1 automatic-cleaning filter (capacity according to requirements of company)
- 1 EC-control, 2 EC-recorders
- 1 pH-control, 2 pH-recorders
- 1 flow/litre counter per type of water supply (in the case of several types)
- 1 flow/litre counter in the water supply to the greenhouse
- electronic measurement of pressure and control of automatic filter rinsing
- electronic measurement of the air pressure

Dimensions of AEM Jet 2000P

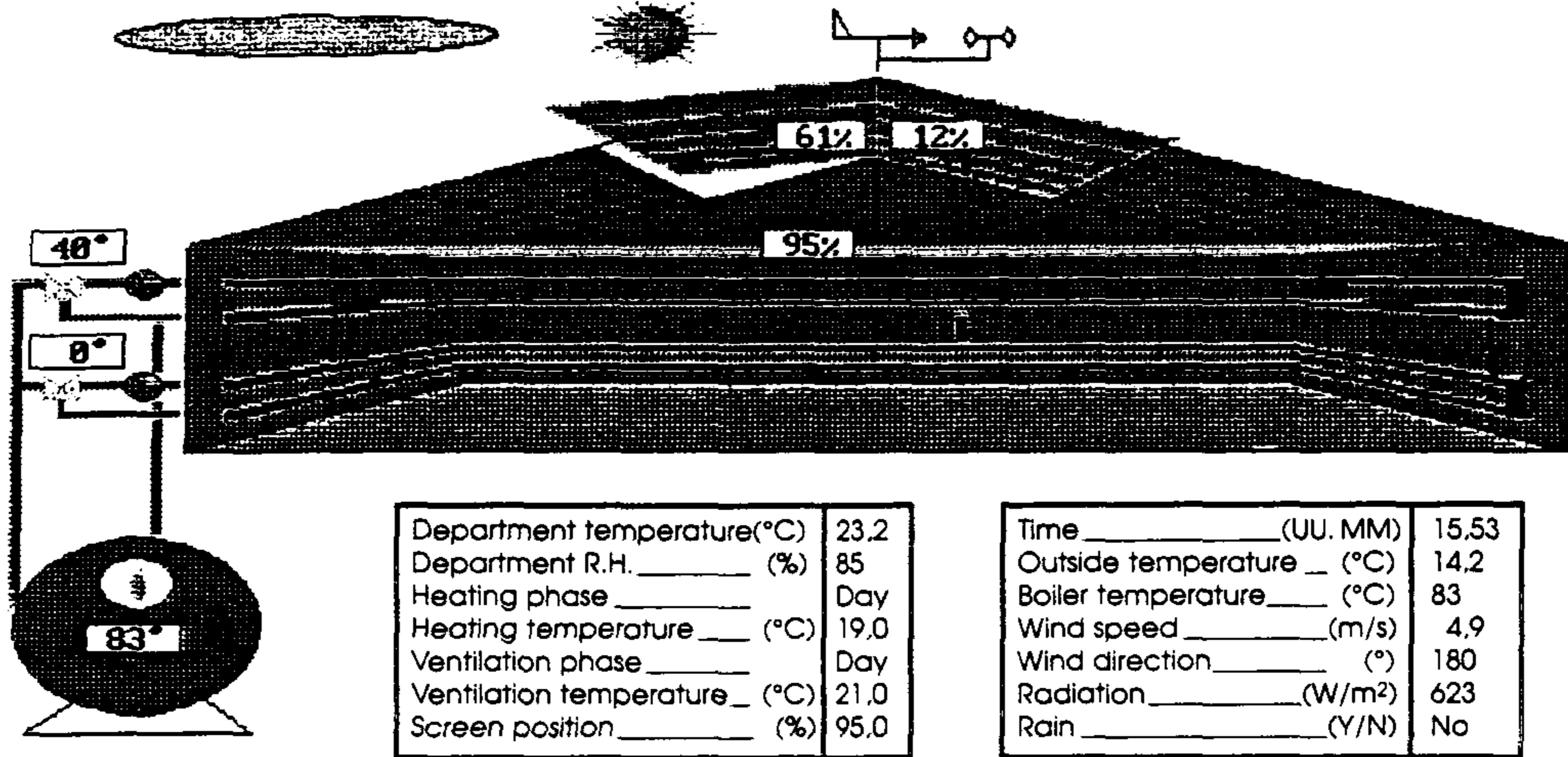
Height ca. 2,20 m
 Depth ca. 1,10 m
 Width ca. 2,50 m
 (all of these dimensions depend on the size of the system)

*) As AEM is continually developing and improving its products, it reserves the right to incorporate changes in the product version and specifications.

Your installer:



CLIMATE CONTROL AND AUTOMATION: OUR SKILL!



Technical information AEM ULTRA UMC.

Enclosure	: steel plate enclosure IP54, 600x380x210 mm.
LCD display	: 4 lines, each 40 characters.
Keyboard	: 20 touch controls.
4 control lights	: supply voltage, alarm, spare and communication.
Supply voltage	: 230 Volt + or - 10 %, 50 Hz.
Backplane	: 3 - 5 - 10 - 13 locks.
Power supply card	: with alarm relay.
Measuring card	: 16 measurements per card.
Measurements	: 0-10 VDC or AEM TOM sensors.
Output card RELAIS8	: 8 relays per card.
Controls	: relay contact 24 VAC or DC, max. 1 Amp. switching current.
Communication	: RS 485, 2 wires with earth screen.

Outside conditions

- outside temperature
- light intensity or radiation
- wind direction
- wind speed
- rain condition
- boiler temperature

Per department 1 to 8 inclusive

- dry bulb temperature
- wet bulb temperature
- ground temperature*
- 1st CH pipe temperature
- 2nd CH pipe temperature*
- front air motor
- counter air motor
- 1st CH mixing valve
- 2nd CH mixing valve*
- 1st CH pump control
- 2nd CH pump control*
- screens

**AEM ULTRA UMC is one
of the many AEM climate control systems.**

AEM analogue alarm and control equipment.
AEM CSR, CBR computer control.
AEM ULTRA UMC computer system.
AEM ULTRA UPC computer system.
AEM SYSTEM III/PC computer system.

At the UMC-K, the functions marked with * are not applicable. A heater control is used instead.

Modifications reserved.

Your dealer:

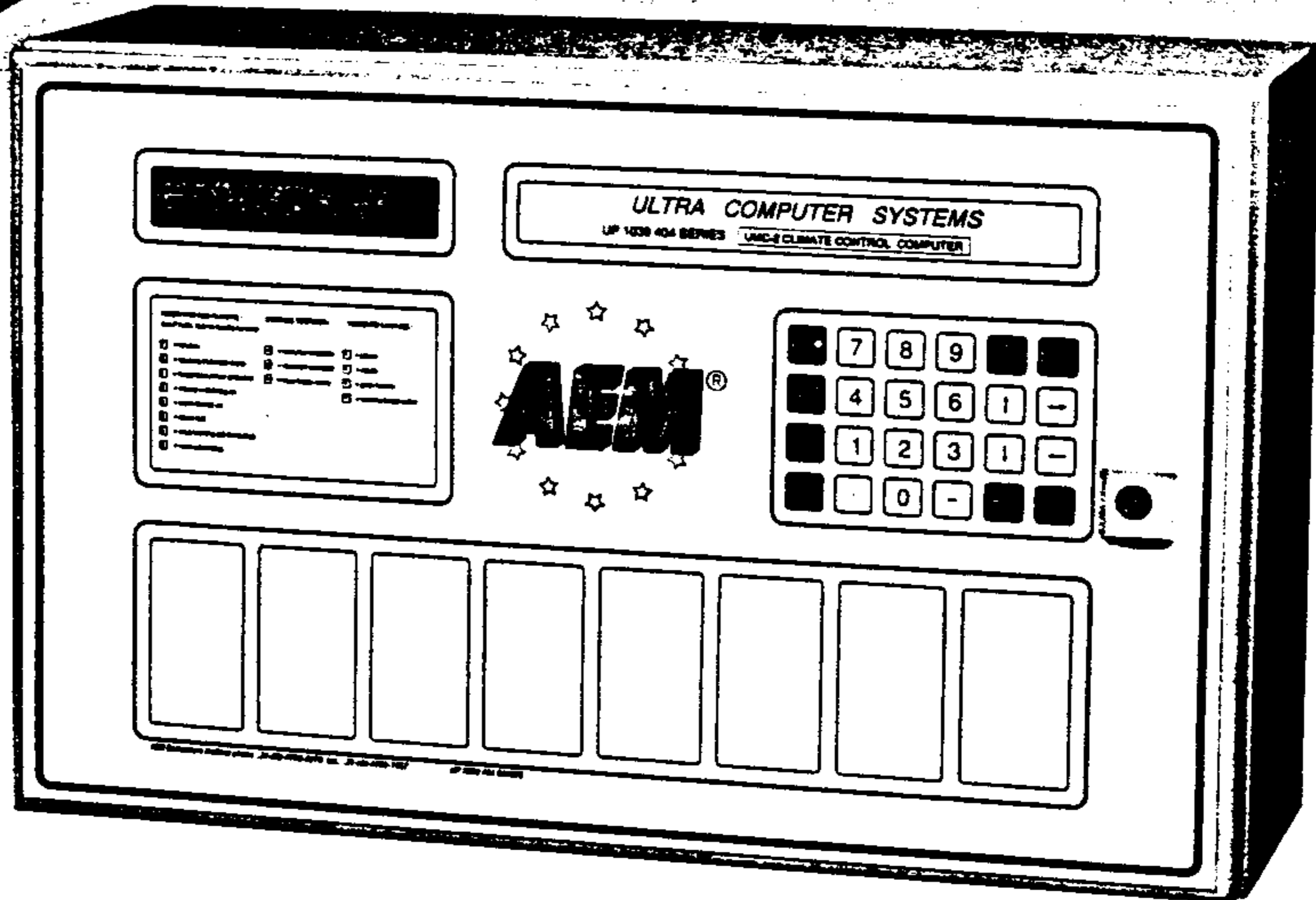


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AGRICULTURAL ENGINEERING MAASBREE

AEM ULTRA UMC

AEM ULTRA UMC CLIMATE CONTROL COMPUTER



Control over the climate in your greenhouse.

Weather conditions always affect your greenhouses. Are you walking in your greenhouses regularly to control the ventilation, screens or heating? Then the AEM ULTRA UMC offers you the perfect solution. With this AEM computer system, you have better control over the climate in your greenhouse and consequently, over the quality and growth of your culture.

Automatic.

The AEM ULTRA UMC reduces weather influences to a minimum. The computer measures the external and internal conditions and then controls the ventilation, heating and screens. You have your hands free for other activities and you are less tied to your greenhouses.

Saving in energy and expenses.

Because the computer system reacts directly to the changing outside conditions, you generate an optimum growing climate and you save in energy and expenses.

Easy to operate and information.

As smart as the system controls the process, as easy is its operation. With just a few keys, you can control the system in such a way, that you have the optimum climate in your greenhouses.

The AEM ULTRA UMC has a display with 4 lines of information. Besides the date, time, boiler- and outside temperature, you can see the information about sunrise and sunset.

This is determined by an astronomic clock system. A second and third display shows information about parameters per department, such as ambient-, pipe- and groundtemperature, the air humidity and the position of the windows, pumps and screen.

The AEM ULTRA UMC system can also be connected to your own PC for remote control and registration of information for graphs.

Extension.

The AEM ULTRA UMC system is built up modular. The UMC system can control the climate separately and automatically from 1 up to 8 departments (optional). If you want to control the climate in even more departments or if you want to have other growth conditions to control, an extension to the AEM ULTRA UPC system is possible. Also, the even more extended AEM System III/PC can be used. The AEM ULTRA UMC is developed on basis of the newest technologies and the practical needs.

Besides, the system has a battery back-up system, that saves all adjustments and information in case of power failure.

**The AEM ULTRA UMC:
a better result for your crop and greenhouse!**

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Aluminum greenhouse heating systems



Alcoa Agro puts the advantages of good heat conductivity of aluminum in practice with especially profiled heating tubes. These offer the possibility to supply a maximum of heat release at a minimum of energy, resulting in better heat flow and better growth.

Balanced climate

In the table you can read that the water contents of the aluminum tubes lies far below that of steel tubes, resulting in a higher reaction speed of the heating system. In this way a balanced climate is created in the greenhouse.

Better directional heat-release

Measurements from TFDL-institute in the Netherlands show that profiled Alcoa heating tubes release heat much more directionally than a traditional round tube (see page three). Alcoa heating tubes offer the big advantage of releasing the heat where it is most effective.

ALUMINUM COMPARED WITH STEEL TUBES

Profile nr.	Tube Ø	Height	Wight incl.water	Water contents	Capacity
73-078	22 mm	50	694 gr.	16 %	67 %
73-083	22 mm	70	707 gr.	16 %	100 %
73-075	22 mm	100	890 gr.	16 %	118 %
*73-101	22 mm	95	1153 gr.	16 %	124 %
Steel	51 mm	-	4100 gr.	100 %	100 %
Steel	33,2 mm	-	2200 gr.	41 %	60 %
Steel	26,4 mm	-	1575 gr.	23 %	52 %
Steel coated	28 mm	-	1337 gr.	30 %	67 %
Steel coated	22 mm	-	930 gr.	18 %	55 %

Water contents and capacity indicated in % of steel tube 51 mm.

* Radiation profile exclusive aimed heat radiation (25 %)

► A L C O A A G R O T H E B P O W E R S O F S I D E S I D E M E

Light in weight

Owing to the low weight of the aluminum tubes combined with small water-contents the heating profiles can be installed as a system that can be hoisted up with the growth of the plants. This offers the big advantage that the heat is being brought to the plants in order to stimulate their growth.

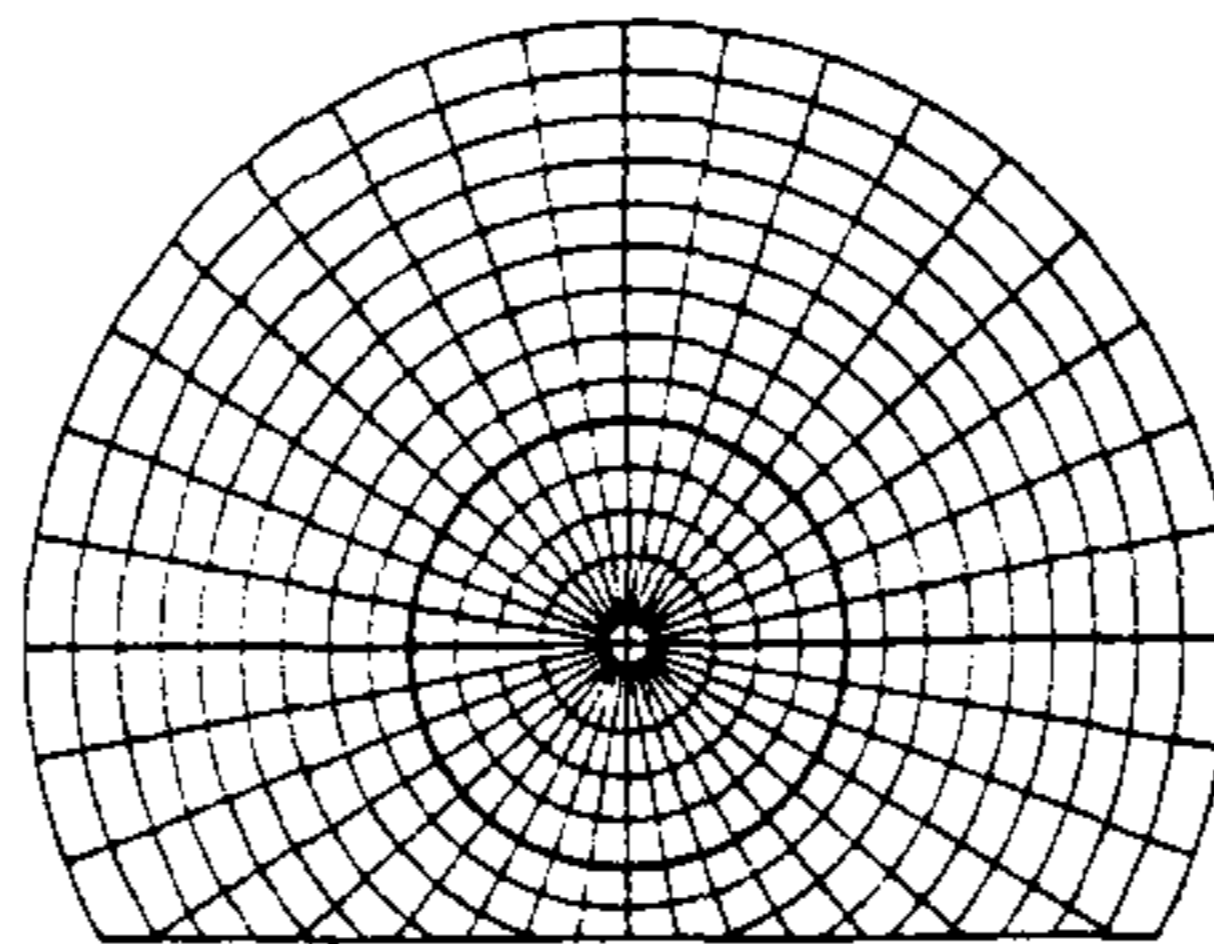
Simple mounting

Mounting the standard 6-metre tubes by means of the specially developed press-couplers and press-pincers is an easy job.

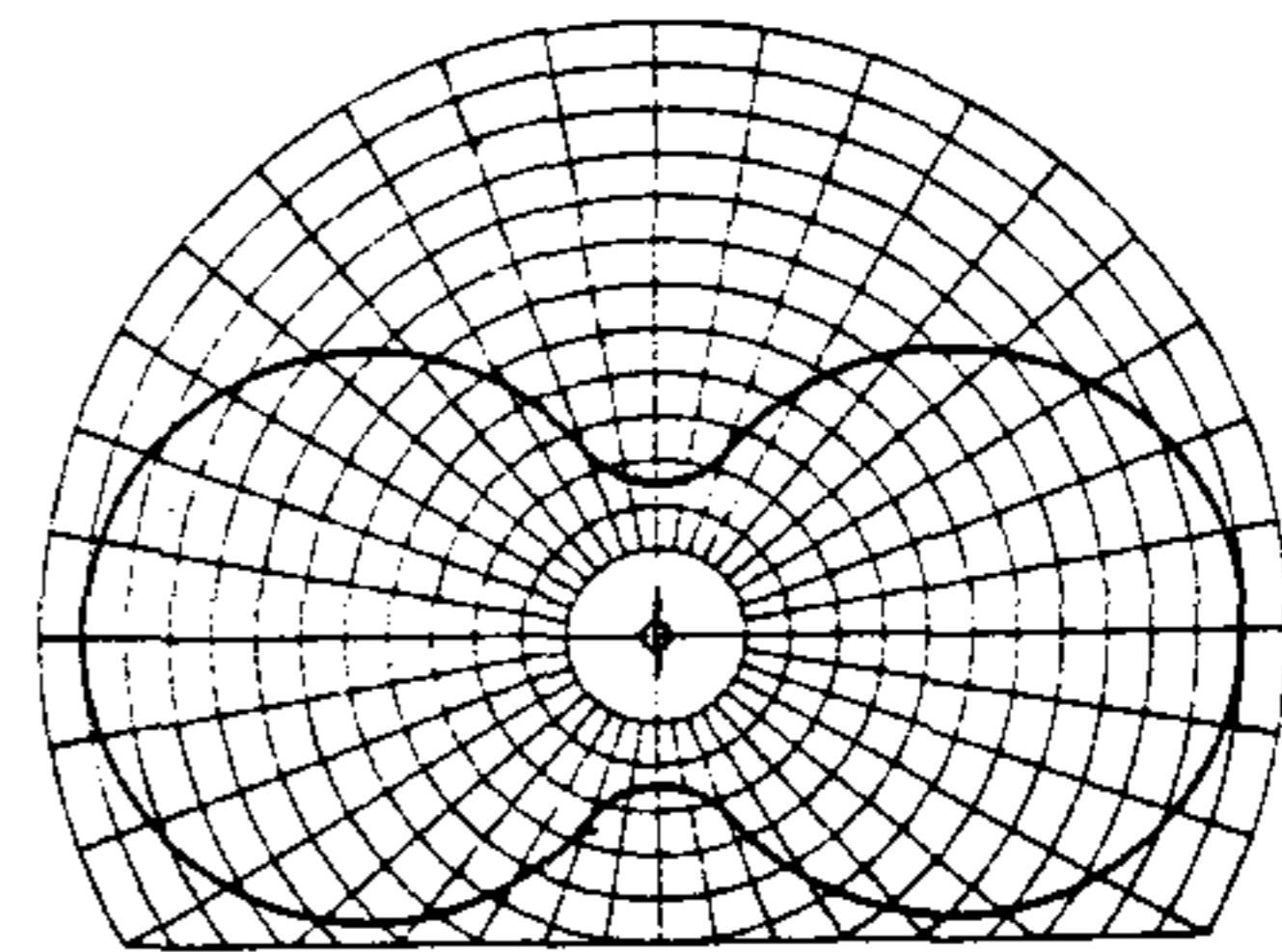


RADIATION-GRAPHICS

measured by TFDL-Institute in Wageningen (NL) 27-01-1983



Direction-diagram radiation level of a round tube, in any unity.



Direction-diagram radiation level of a profiled heating tube, in any unity.

Duration of life time

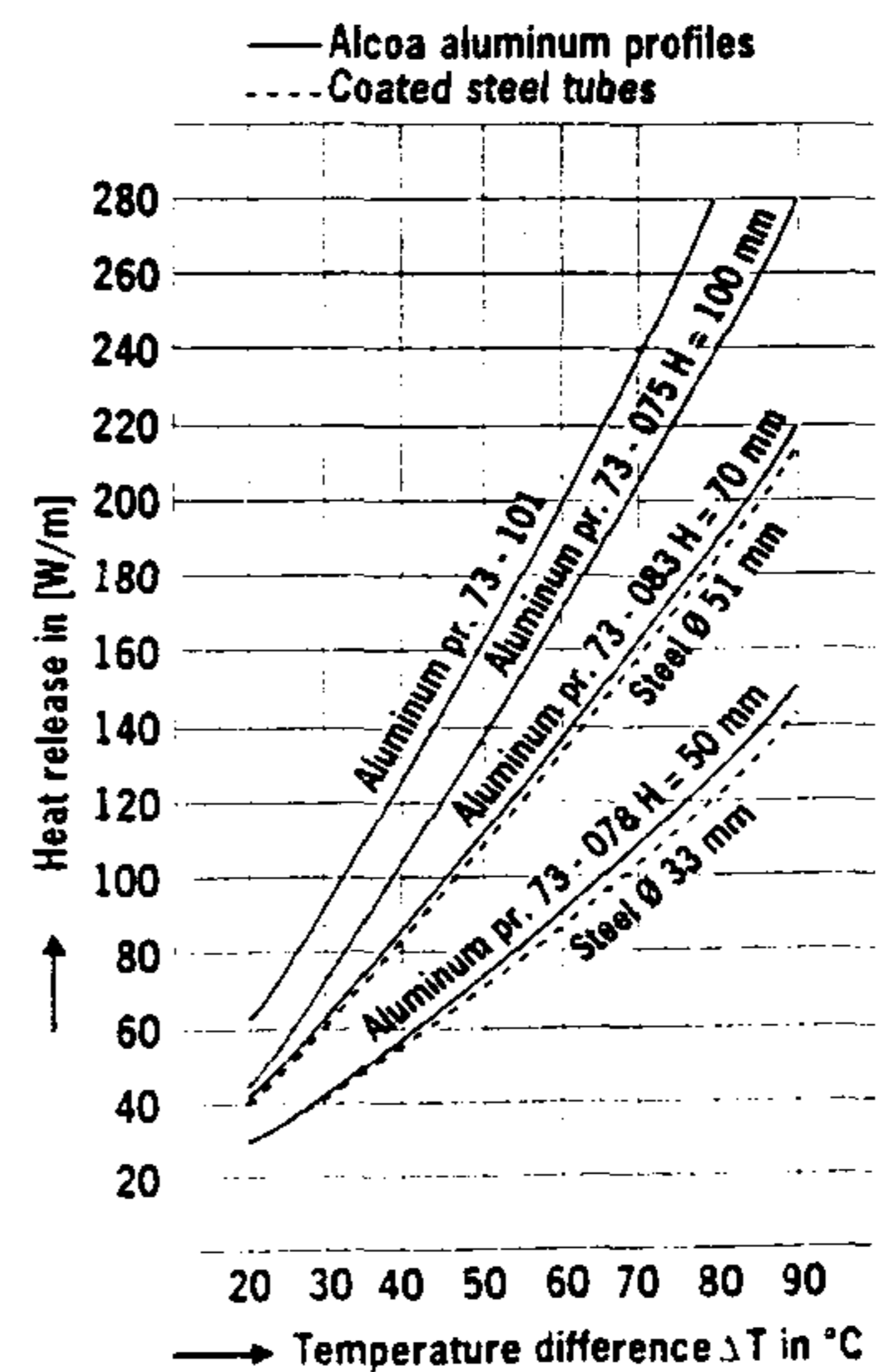
The anodized tubes require no special further treatment under normal circumstances. In Alcoa Agro's directions for use further suggestions are made in the use of the system in order to get the maximum life from the tubes.

Heat capacity

Your installation engineer can calculate exactly how many watts of heat are required with the requirements, greenhouse sizes and K-values in hand. With the help of values mentioned in graphics "heat capacity" it can be shown which type of the tubes covers the requirements. The engineer can also advise on the pump capacity required.

As a result of the reduced diameter of the aluminum tubes, the speed of the water inside the tube will increase. This means that, in spite of lower friction resistance of the smooth inside of the tube, the resistance will ask for more power from the pump. When calculating the pump-capacity please consult your installation engineer and our special pressure-drop table.

GRAPHICS HEAT-CAPACITY of Alcoa heating tubes



$$\Delta T = T_1 - T_2$$

T_1 = average watertemperature between supply and return tube

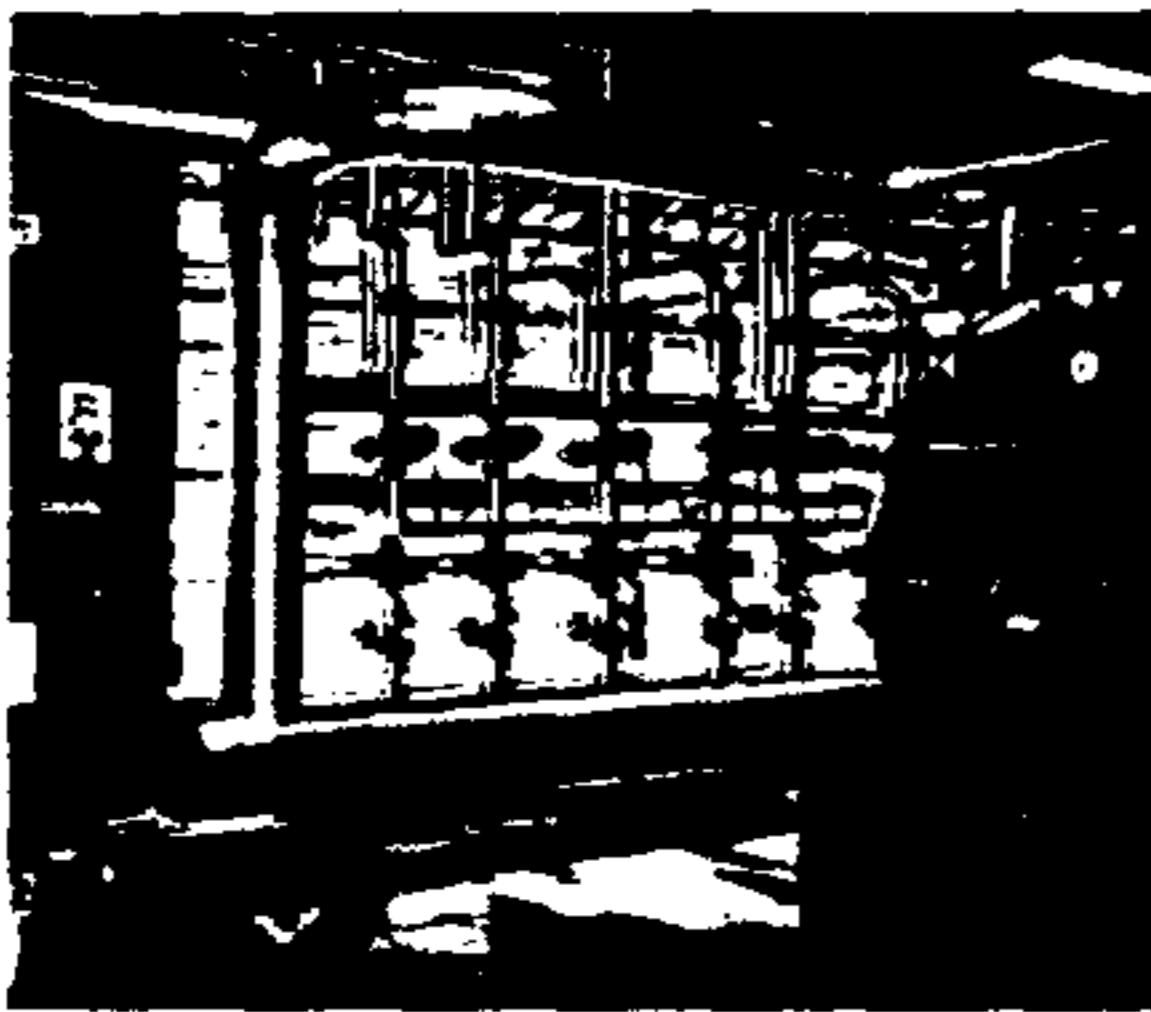
T_2 = temperature around the tube

1.
Heating distribution,
Tjumen, Siberia



2.
Agrisystems'
manufacturing facility

3.
Assimilation lighting in
wide span greenhouse



Greenhouse projects

Although many greenhouses produced by various manufacturers seem to be similar to each other, in fact they deviate greatly.

AGRISYSTEMS has spent a great deal of time improving these greenhouses so that they can be applied in many countries without costly modifications, whether the greenhouse will be in Japan, which should be typhoon-proof, or in Siberia where the complex will be subject to intense cold and extreme snow loads.

The greenhouses are produced in a modern factory in Pijnacker, Holland, and are exported to many countries all over the world.

AGRISYSTEMS is particularly specialized in the turn-key construction of greenhouse projects in territories where few, if any, greenhouses have ever been built.

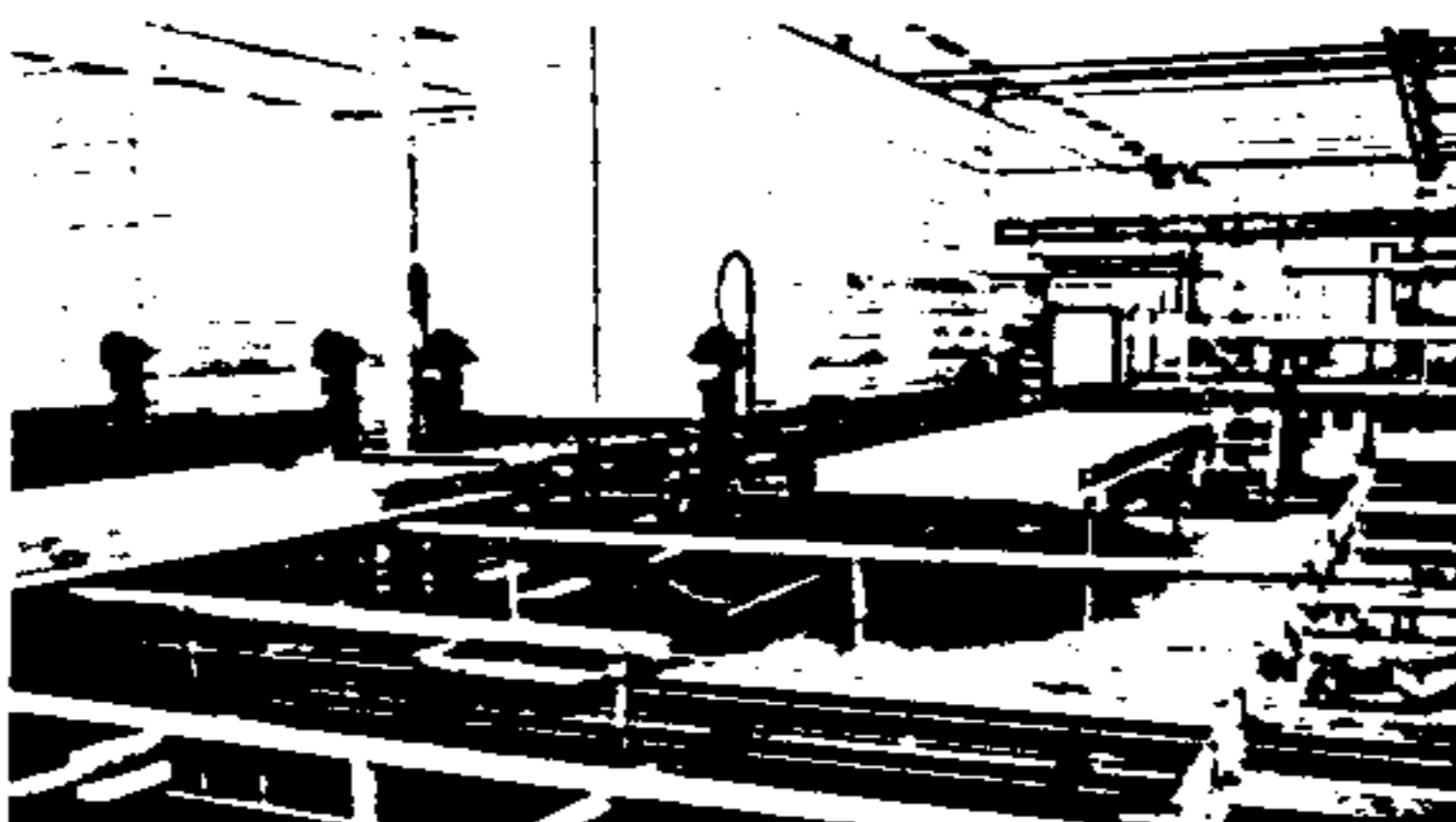
3.

4.
Substrate irrigation unit



5.
Drip irrigation

6.
CAD engineering
greenhouse structure

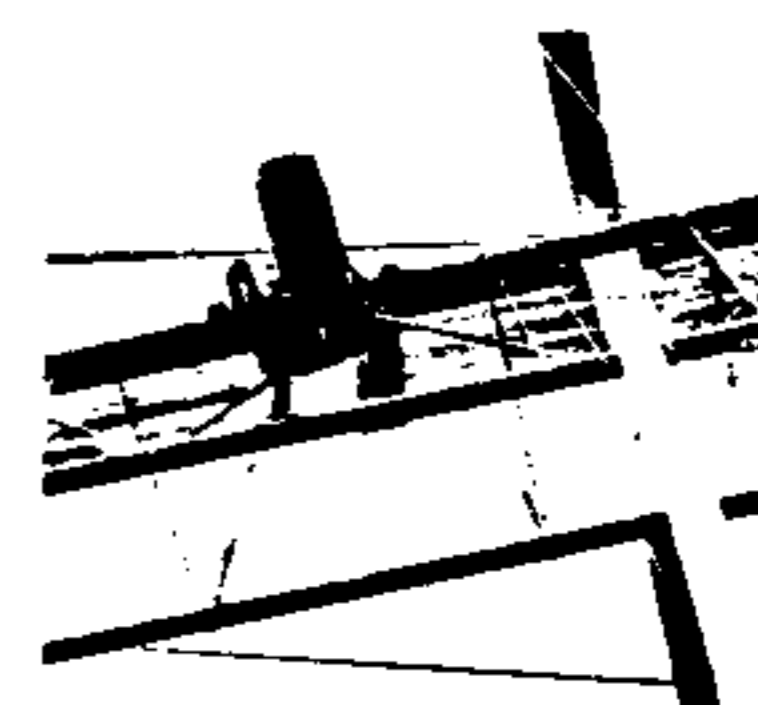


7.
Container stocking device

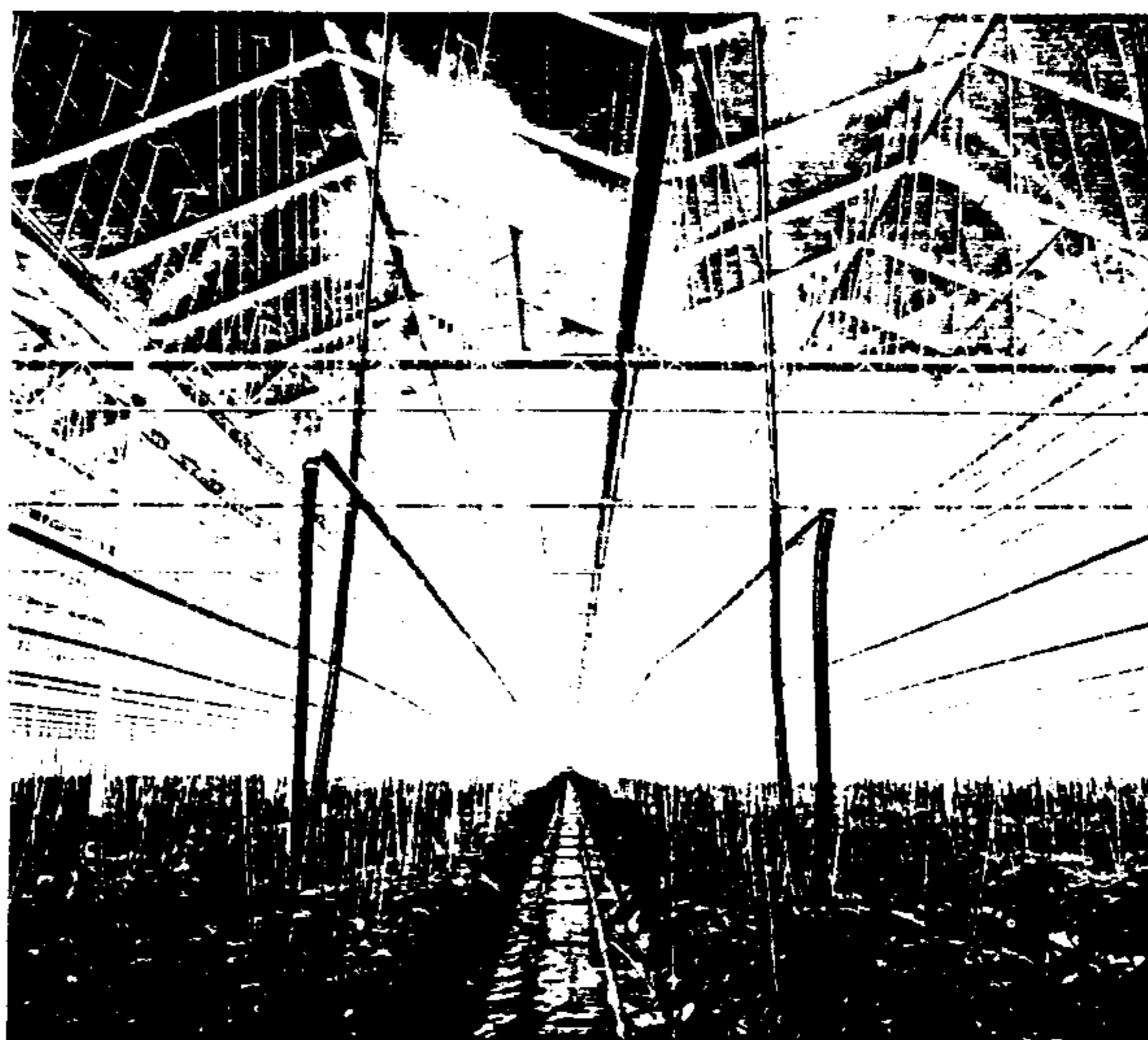
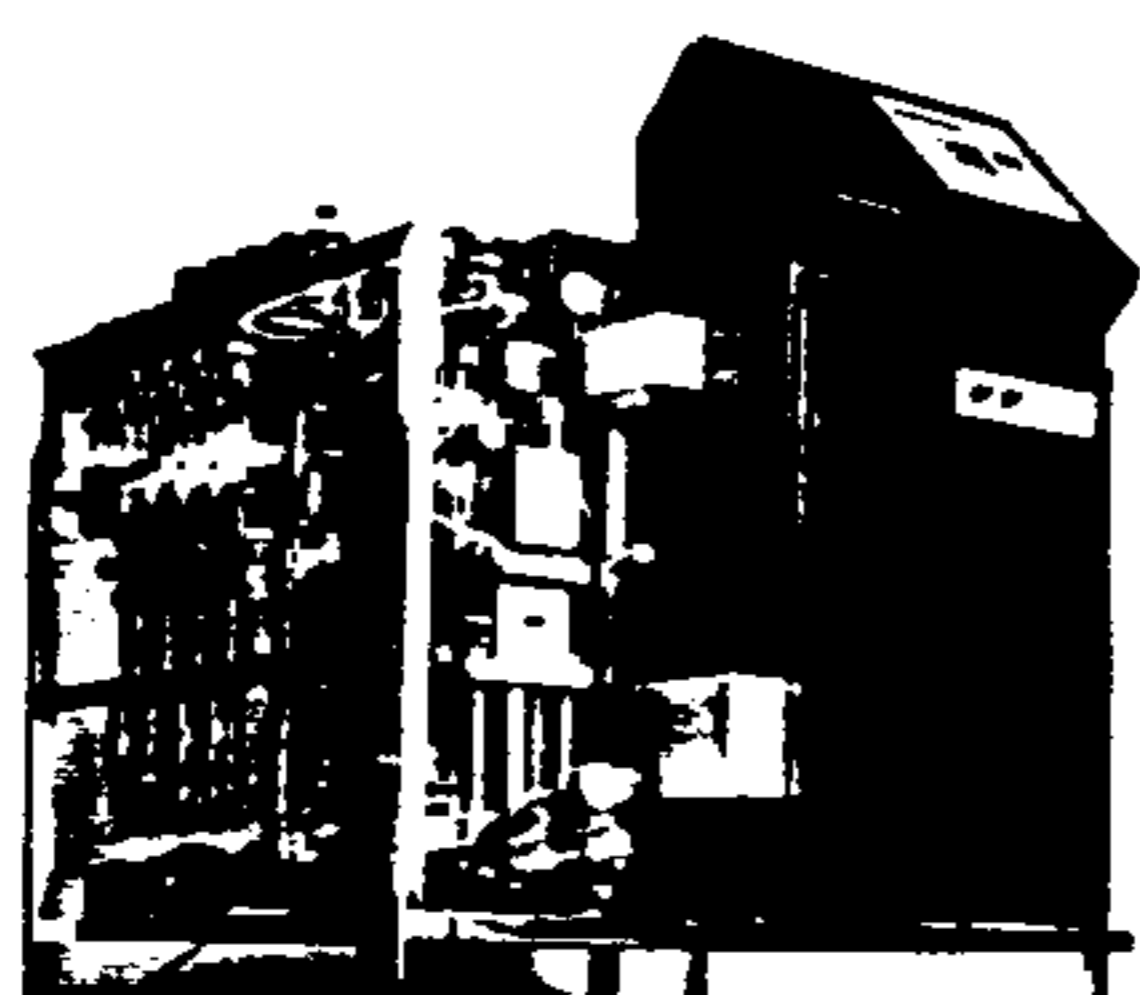
8.
Container with paprika plants



9.
Typical screening actuator



10.
Venlo type greenhouse
(6.4 m span)



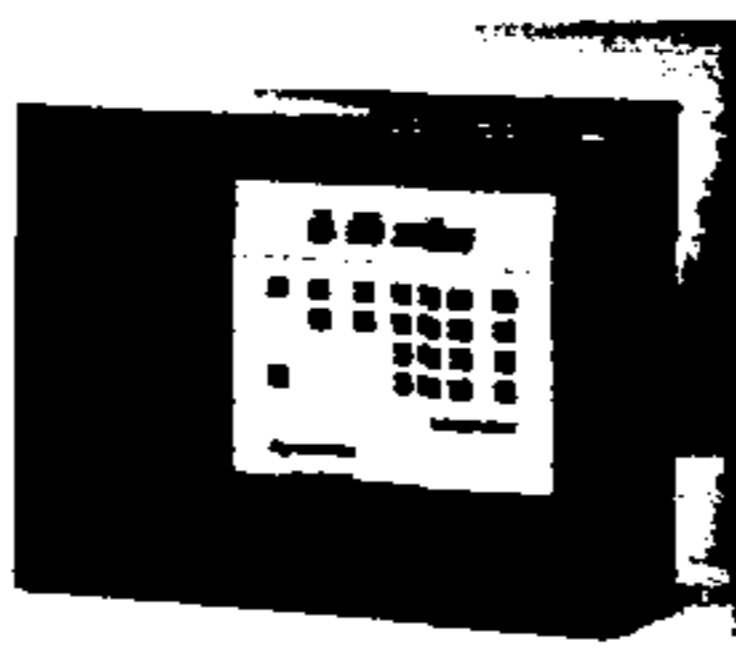
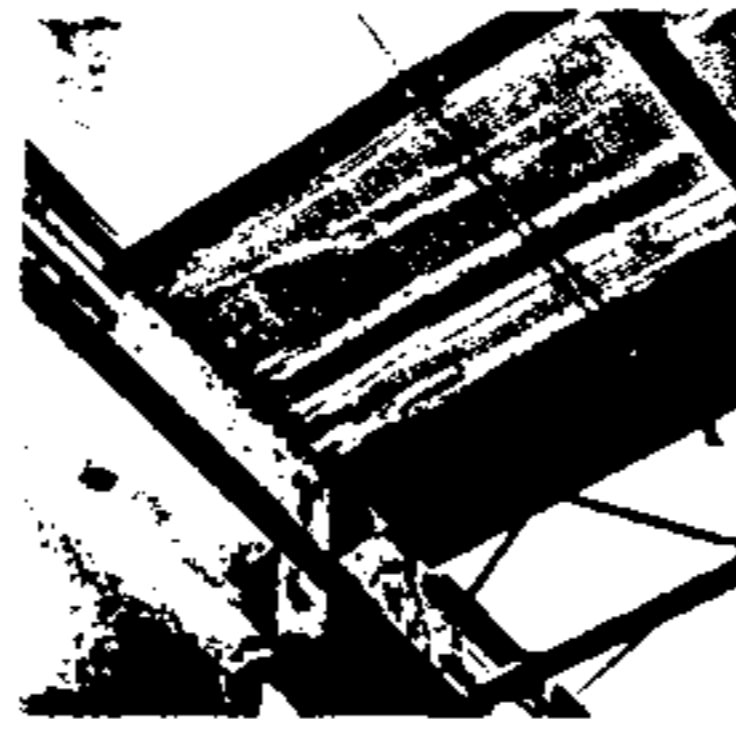


1.
Plant room for greenhouse
central services, Siberia

2.
Shading and energy
conservation

3.
Climate computer

4.
Transportable container system



Product line for greenhouse projects

Customers' demands and AGRISYSTEMS' many years of experience combine to develop practical hardware for the agriculture industry.

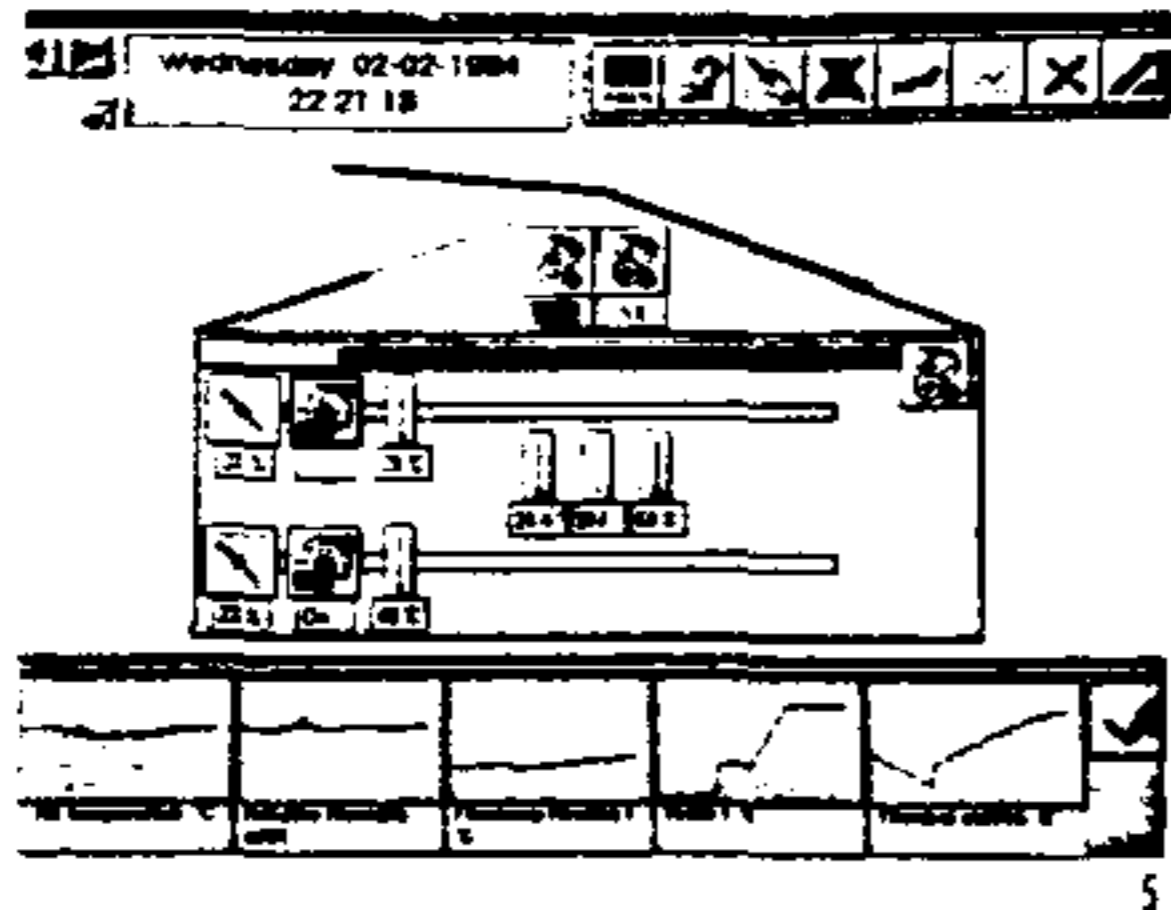
AGRISYSTEMS guard their reputation for quality products to ensure customer satisfaction.

The product line includes :

-
- Screening systems
 - Energy screening
 - Shading systems
 - Vertical screen
 - Heating systems
 - Burners and Boilers
 - CO2 hot air burners
 - CO2 dosing systems
 - CO2 distribution system
 - CO detection
 - Fertilizer substrate system
 - Growing systems
 - Water culture
 - Rockwool Grodan system
 - Fixed bench system
 - Container system

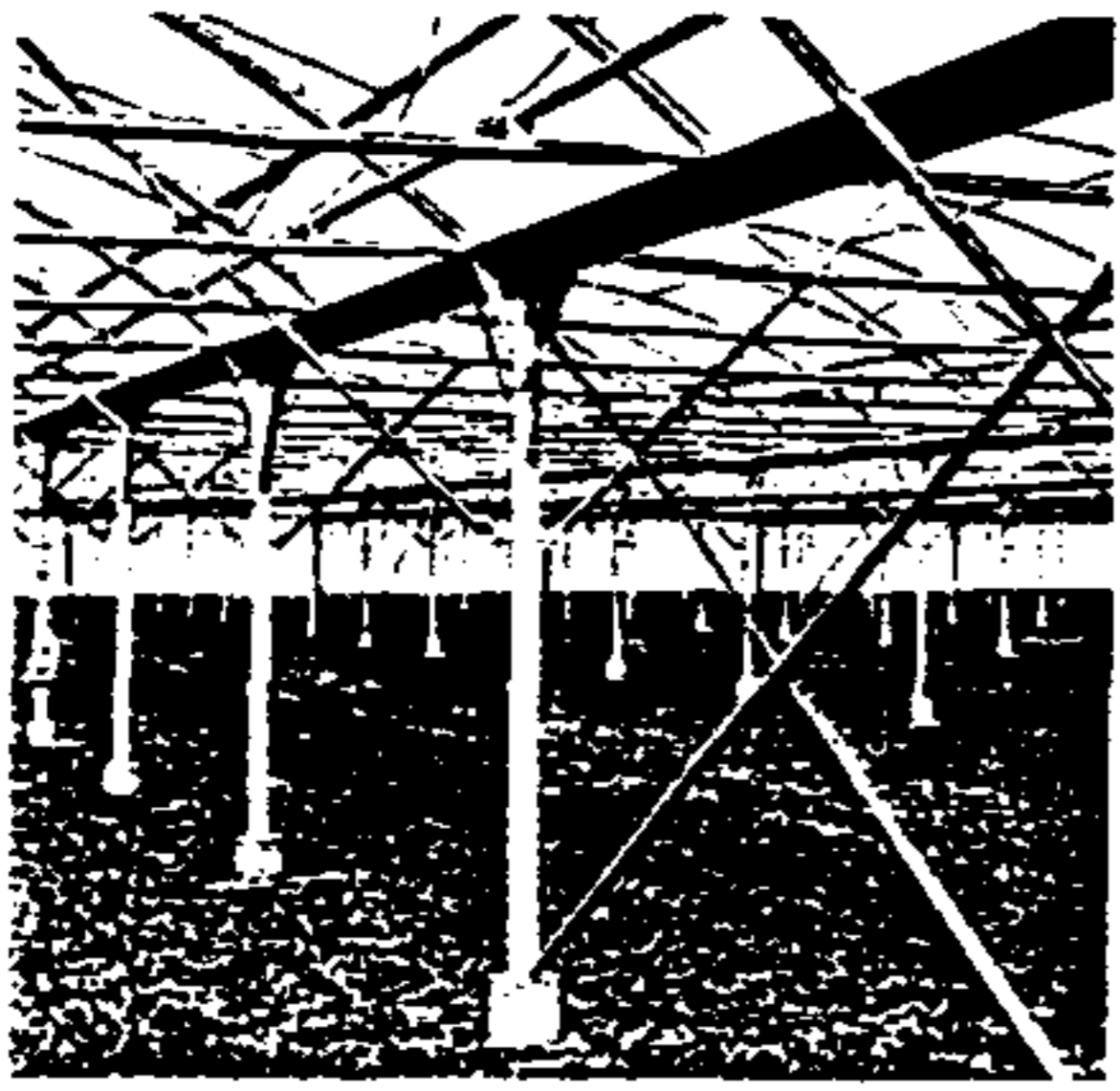


9.



5

5.
Climate
control display



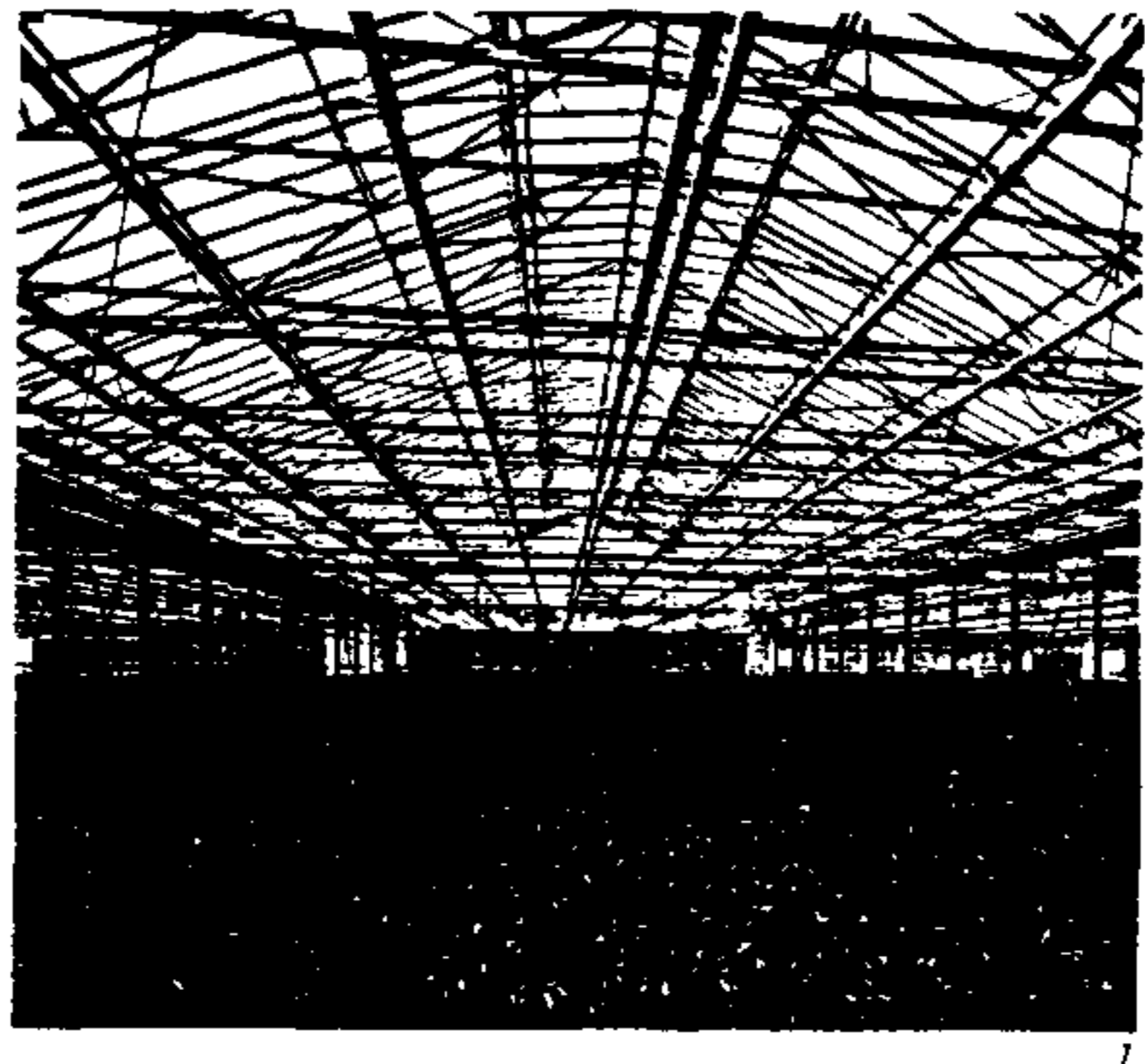
6

6.
Plastic screenhouse



7

7
Wide span
greenhouse

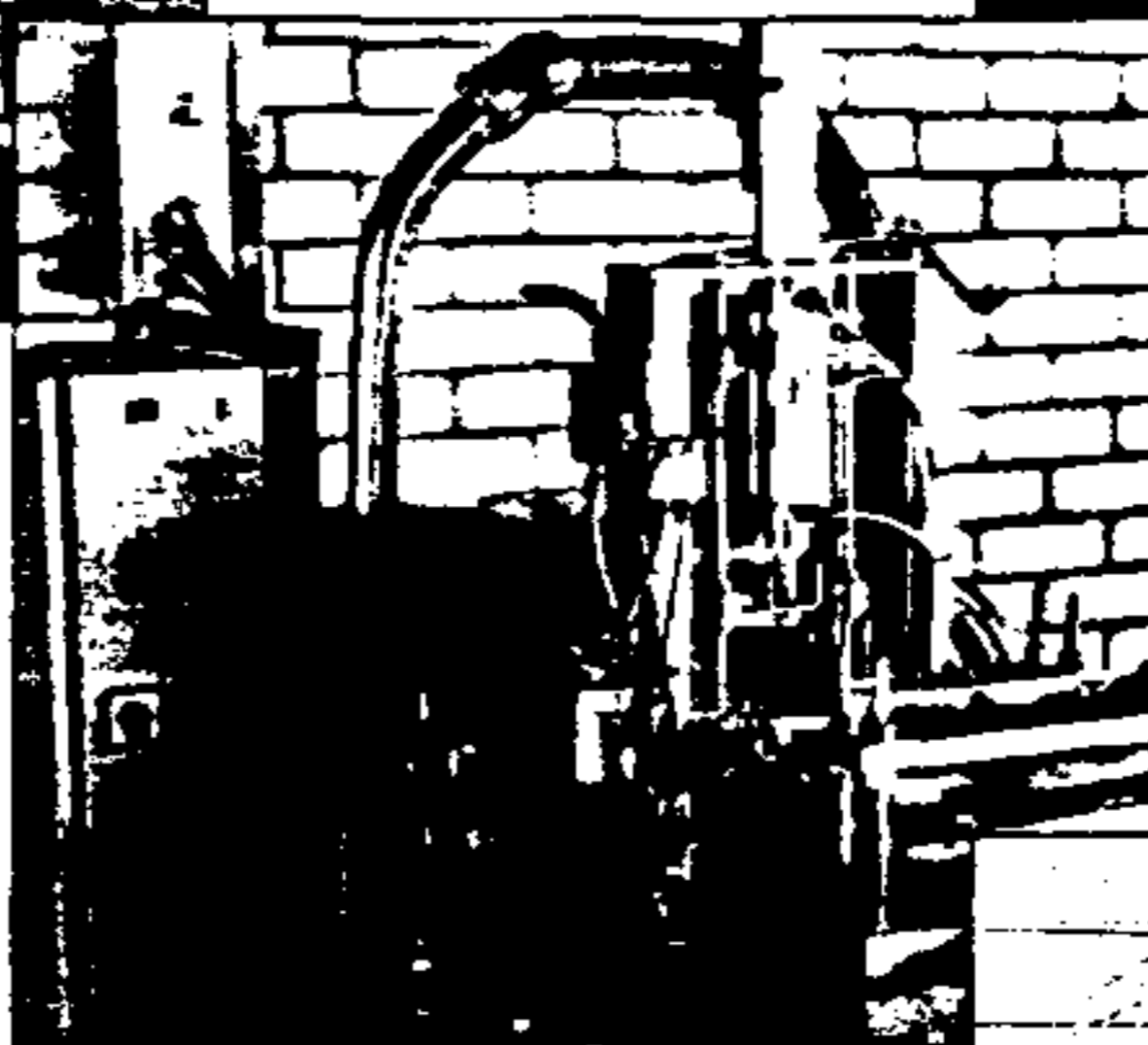
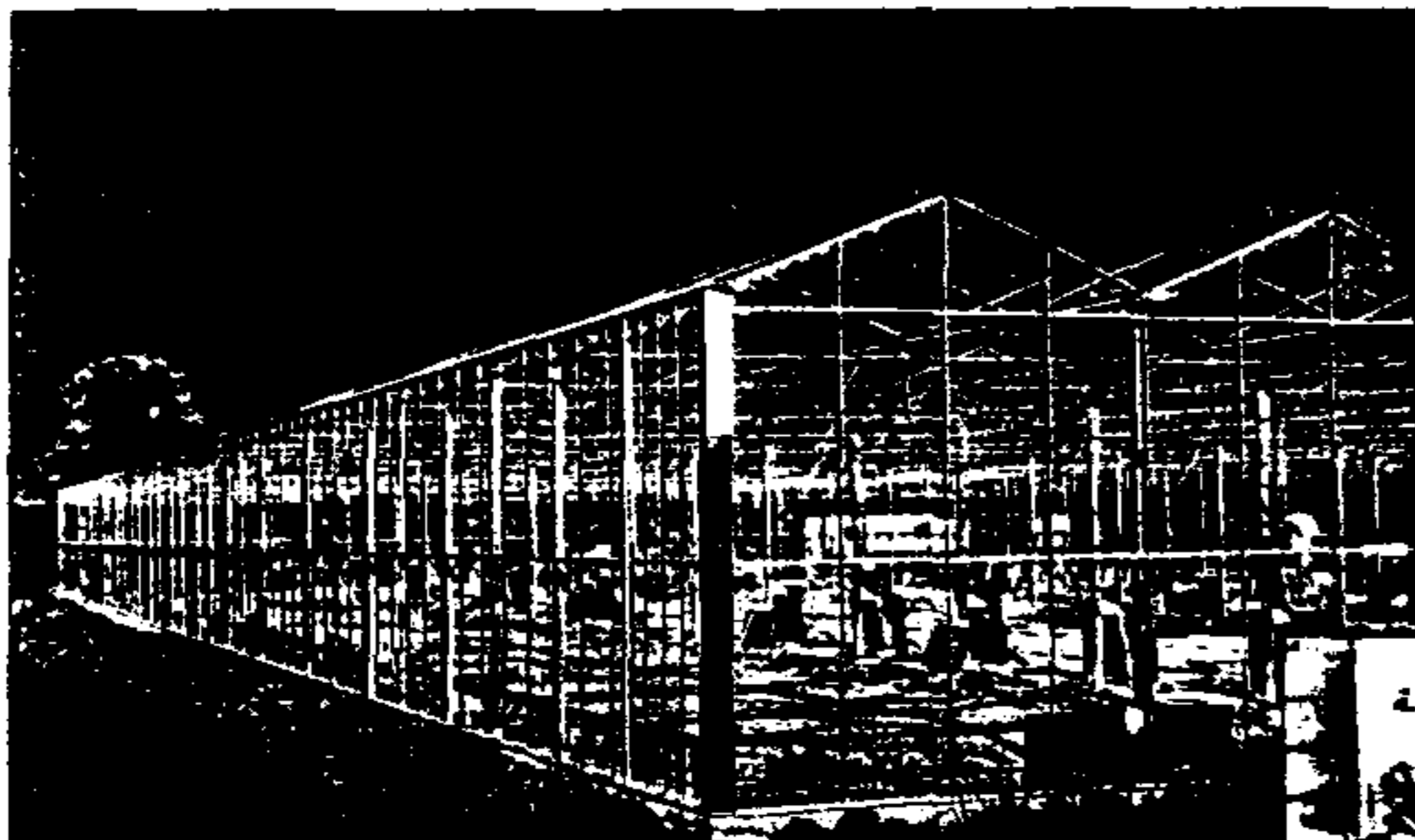


7

-
- Venlo type greenhouses
 - Wide span greenhouses
 - Plastic "screenhouses"
 - Plastic/Fiberglass Multi Span Greenhouses
 - Irrigation systems
 - Overhead
 - Drip
 - Hygro fan
 - Re-circulation ventilators
 - Pad and Fan cooling
 - Assimilation lighting
 - Roof sprinklers/ Roof cleaning system
 - Climate control systems
 - Equipment/Machinery
 - Spraying unit
 - Mono-rail transport
 - Tube rail transport
 - Sorting machines

GREENTEX

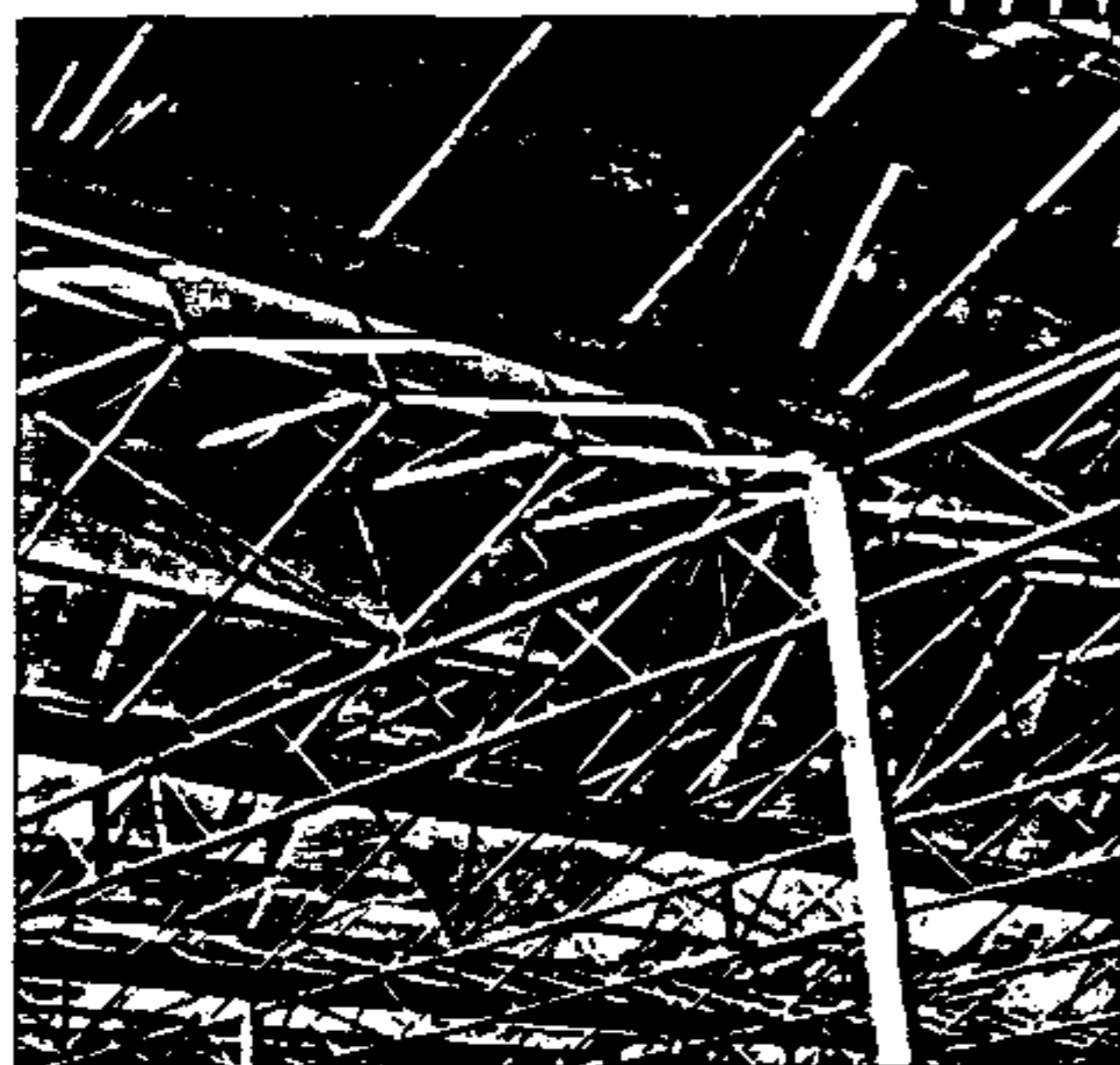
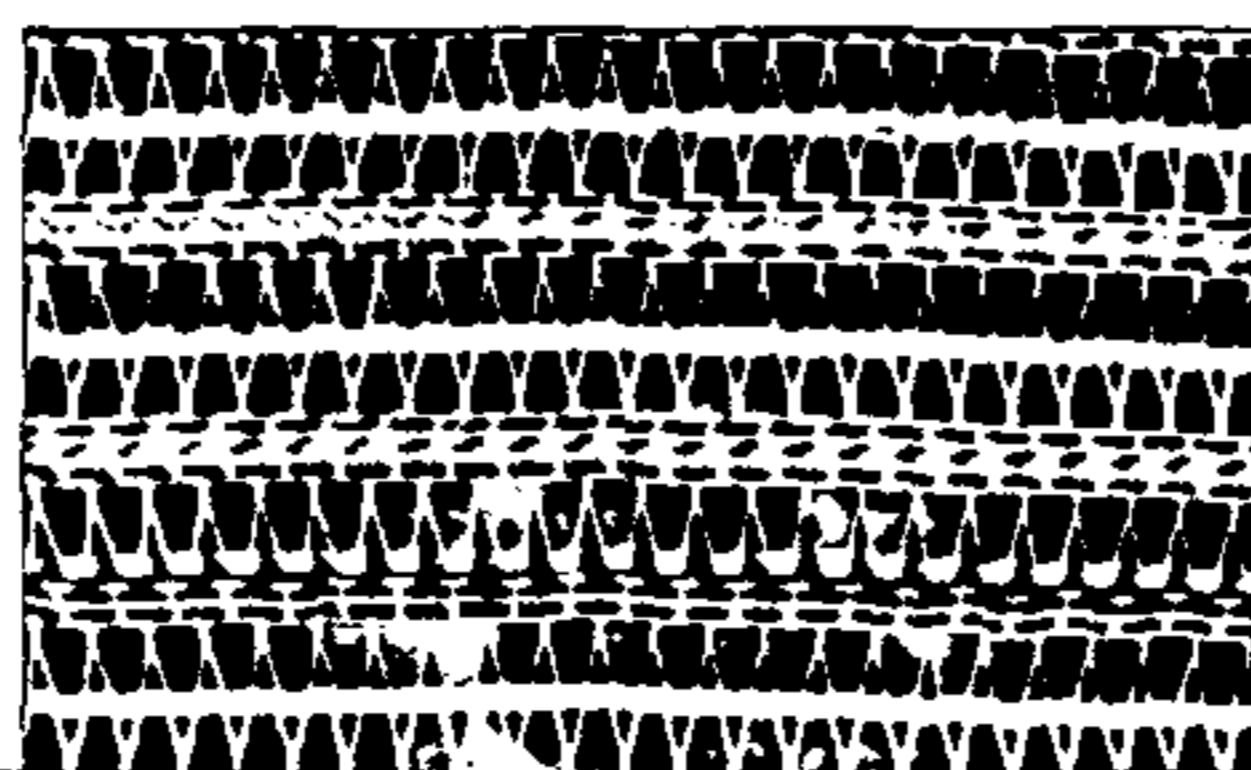
VOOR ONWRIKBARE CONSTRUCTIES
EN KWALITEIT TOT IN IEDER DETAIL



Een kwaliteitsprodukt uit eigen fabriek

- Lichttransmissie ca. 80%
- Duurzaamheid
- Kwaliteit

Drie begrippen, die tezamen met vooruitstrevende ontwerpen
toonaangevend zijn voor GREENTEX



Aluminium gevels en dekken volgens standaard maten voldoen aan de hoogste eisen en normen (NEN 3859). Maar ook afwijkende maten zoals bijvoorbeeld overmaatse luchtramen zijn voor GREENTEX vertrouwd terrein.

De stalen kas-onderdelen worden met de grootste precisie vervaardigd, en volledig volbad verzinkt. Zij garanderen u een betrouwbaar en zeker onderdeel voor uw kas voor jaren.



VERTICLAIR®

FILCLAIR, world leader in plasticulture, introduces a new generation of tunnels : the straight-sided tunnels VERTICLAIR - 7.50 m and 9.60 m tunnels and 15 m and 19.30 bi-tunnels.

This range offers new prospects to nurserymen, horticulturists and market gardeners. 100 % usable, VERTICLAIR brings FILCLAIR's know-how at the producers' service.



THE VERTICLAIR FRAMES

In conformity with AFNOR NFU 57 063 and NFU 57 064 standards in force, the computerized calculation of frames permits an optimization of all components.

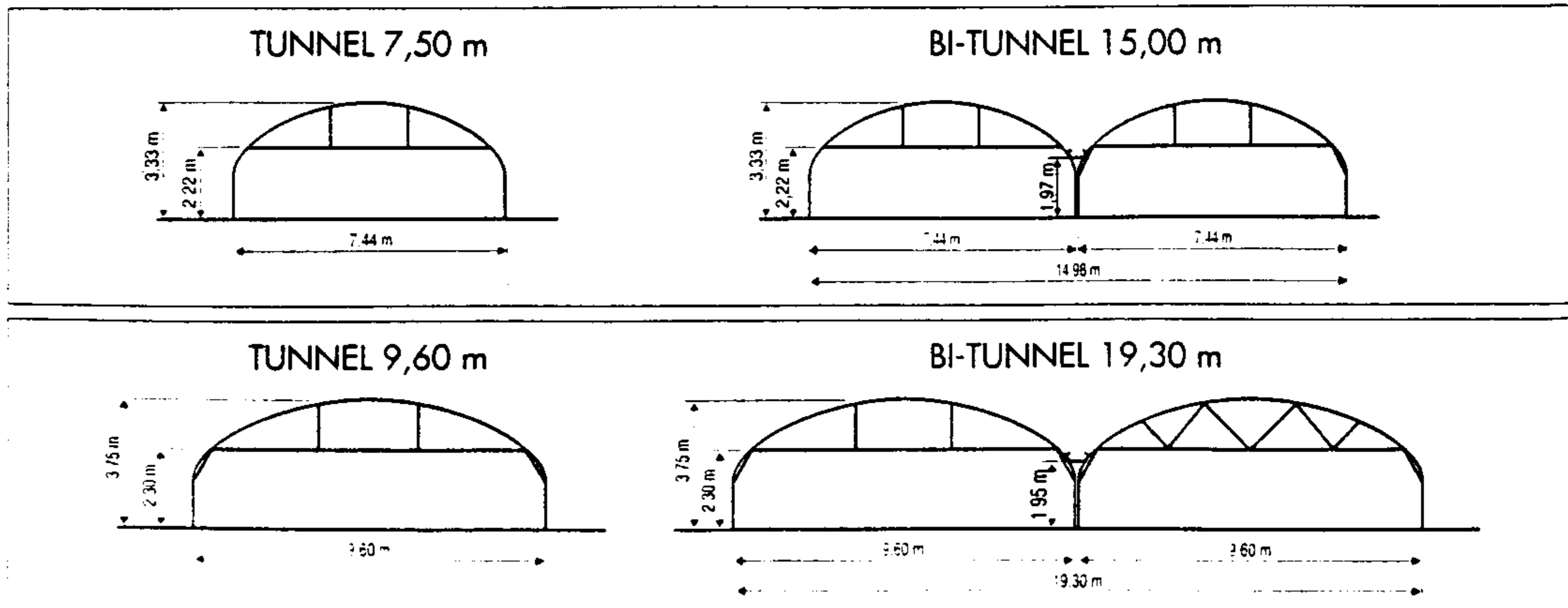
- Frames in galvanized steel pipes "Senzimir" process Z275, 1.5 and 2mm thick. Nuts and bolts coated as per current standards.
- Bended posts and arches in pipe Ø 60mm.
- Purlins in pipes Ø 32mm.
- Connections through crosses as per original FILCLAIR system.
- Horizontal bracing pipes Ø 32mm, 1.5 or 2mm thick according to model.
- Anchoring : by posts-feet pipes diam 55mm to be put into concrete, permitting a telescopic ajustement of bended post.
- Bi-tunnels : the gutters supported at each element, are also in "Senzimir" galvanized steel, 1.5mm thick.

VERTICLAIR 7.50m - 15m

- Distance between elements : 1.5m ; 2m ; 2.25m ; 2.5m. (according to required resistance)
- Option : without posts braces.

VERTICLAIR 9.60m - 19.30m

- Distance between elements : 1.5m ; 2m . (according to required resistance).
- Option : supertriangulated truss.



TUNNEL 7,50 and BI - TUNNEL 15 m TUNNEL 9,60 and BI - TUNNEL 19,30 m



100% USABLE

THE VERTICLAIR GABLE ENDS

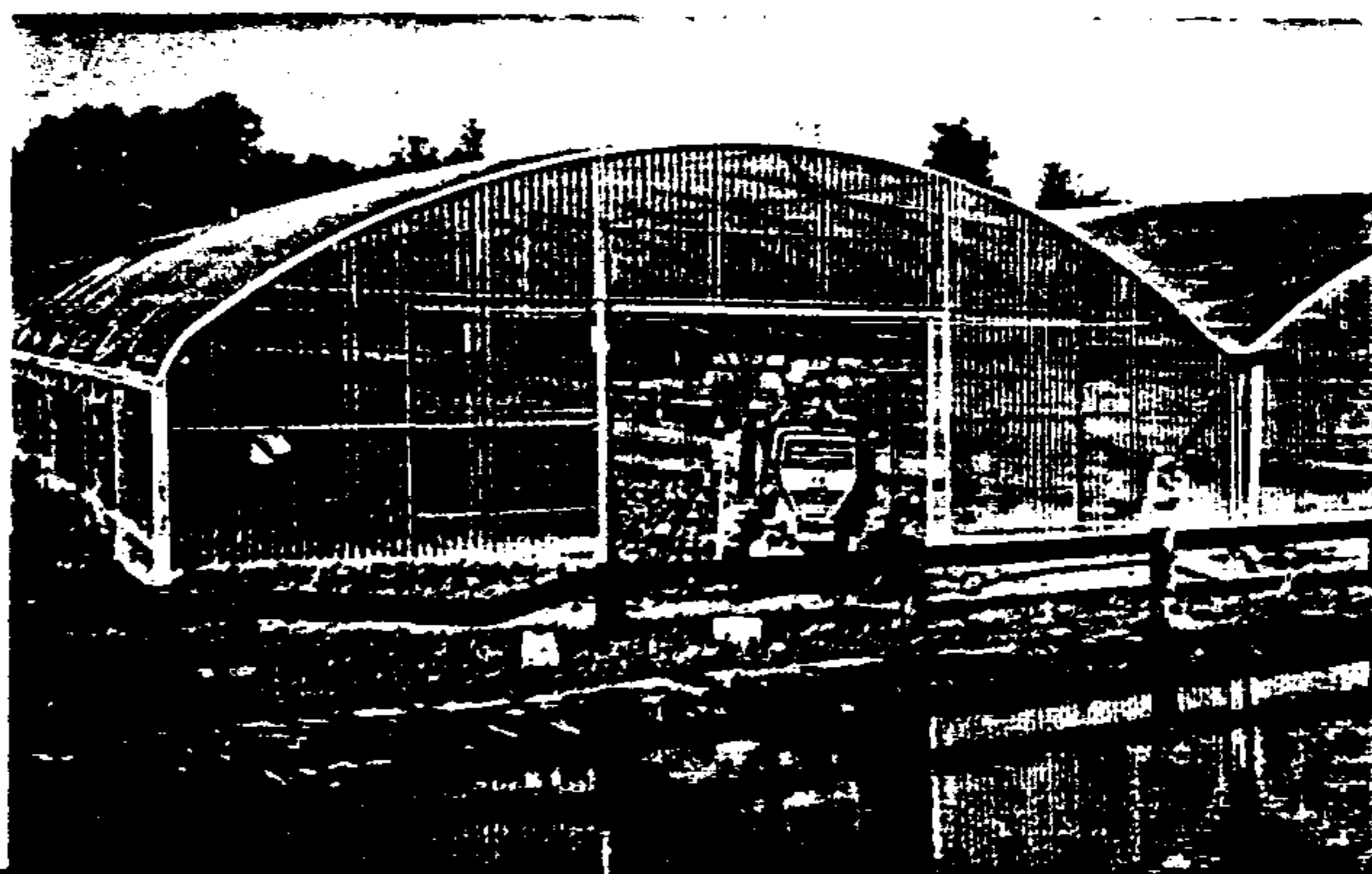


VERTICLAIR 7.50m - 15m

- 100 % raisable ends : 2 halves + 1 central door 1.60 x 2m.
- Upper part of end covered with reinforced PVC film, lower part with film or semi-rigid plates.

VERTICLAIR 9.60m - 19.30m

- 2 models
- End with 2 sliding-doors, free height 2.30 m ; free width 3m. Semi-rigid plates covering.
- Option : film single layer on sides of lower part.*
- 100 % raisable gable-end : 2 halves + 1 central door 1.56 x 2.26m.
- Upper part of end covered with semi-rigid plates, lower part covered with film or plates.



THE VERTICLAIR VENTILATIONS



2 types giving on straight sides a total opening from 1.20 to 1.60m high on the whole length of tunnels and bi-tunnels.

- Continuous side ventilation per gravity (descending motion of film).
 - Continuous ventilation per rolling up (ascending motion of film).
- Standard manual or motorized control.

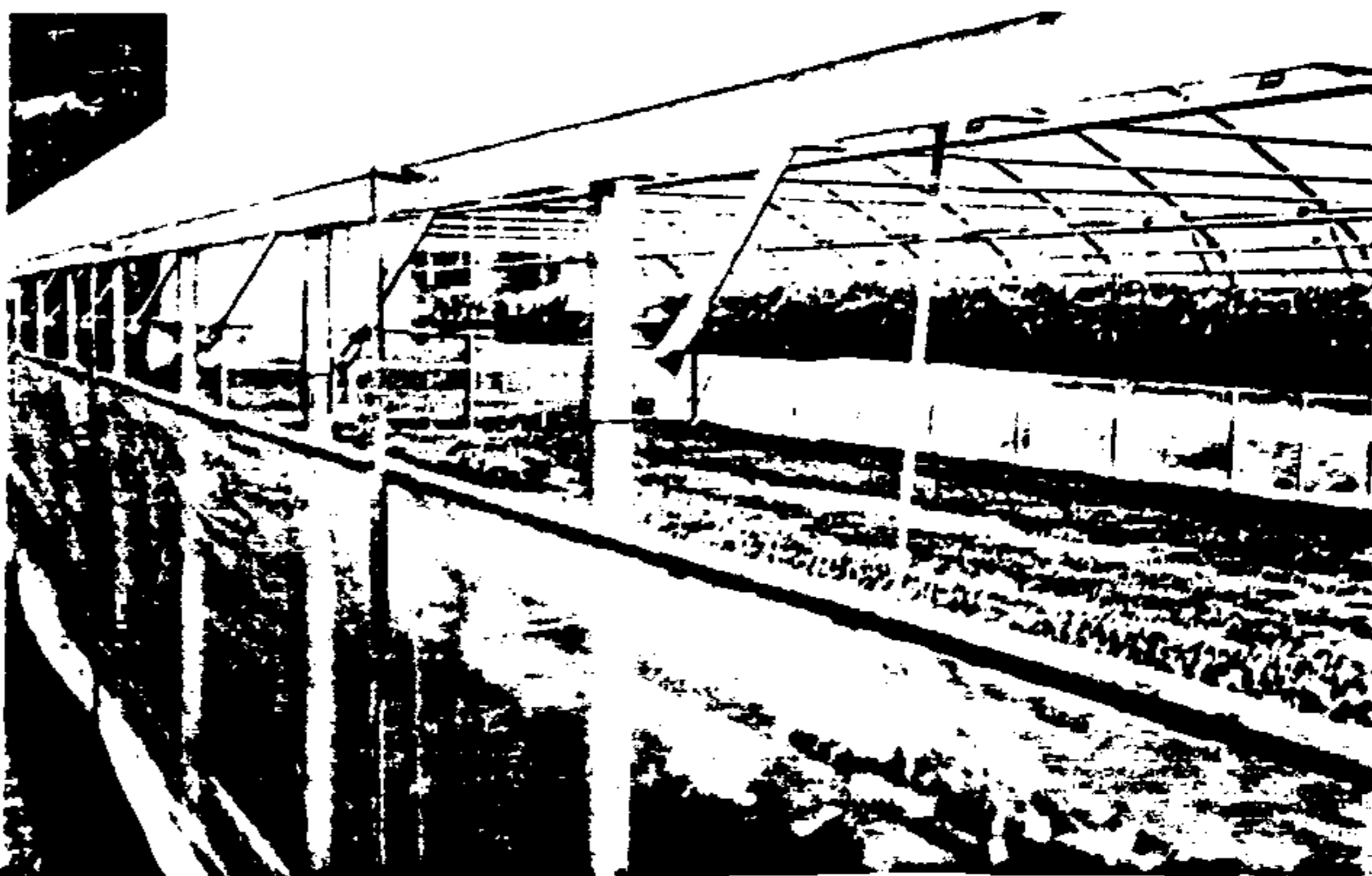
Options

VERTICLAIR 7.50m - 15m

- Ventilation by strip spacing system. Standard manual or motorized control.

VERTICLAIR 9.60m - 19.30m

- Ventilation by swinging opening (2.00 x 0.95m) on upper part of end with manual control.



THE VERTICLAIR COVERS

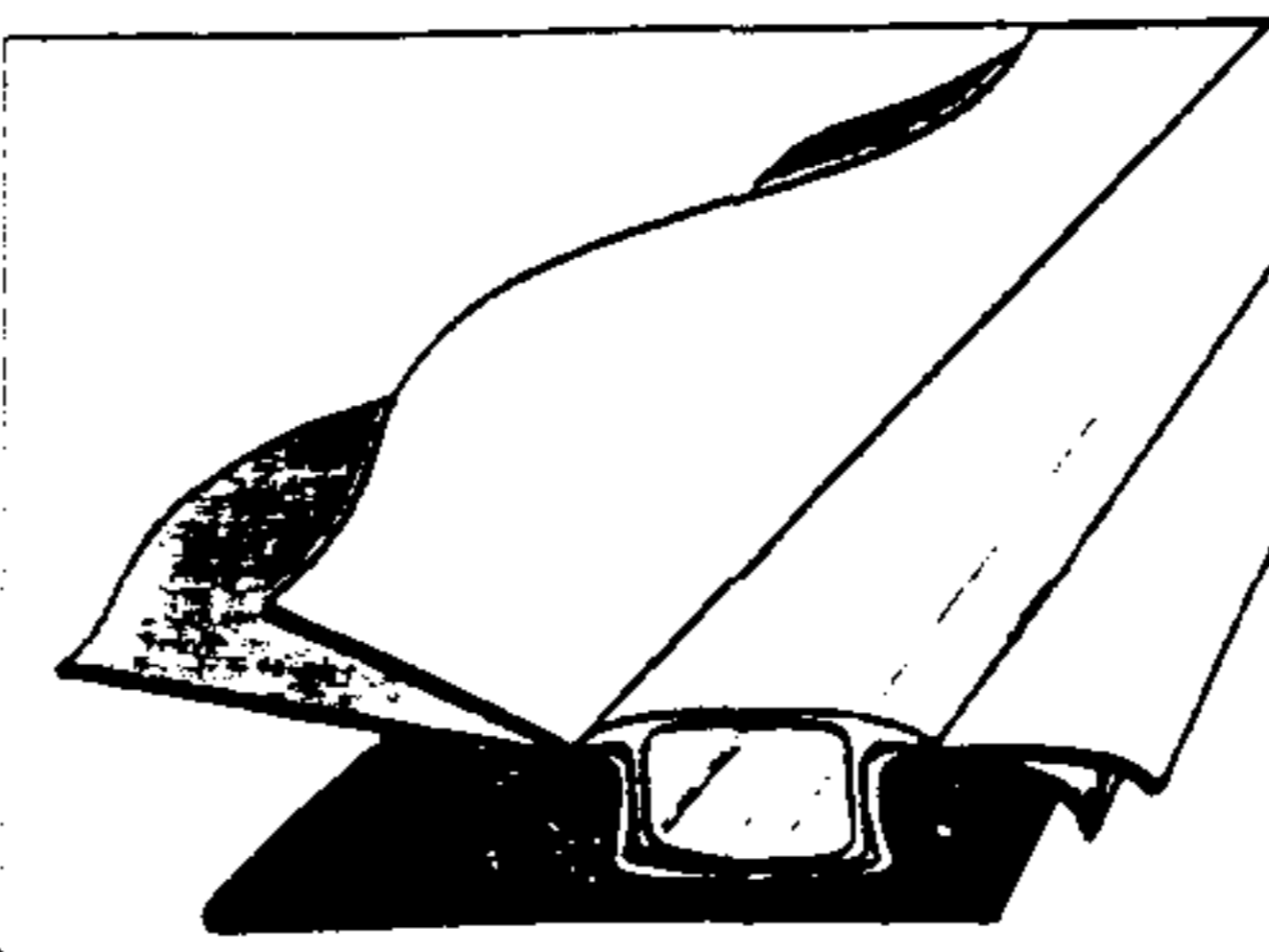


Standard : coextruded crystal TRICLAIR 4 seasons - 200 microns films fixed by FILCLAIR clip for lengthwise covers.

- Lengthwise covers single layer on polyester laces.
- Lengthwise covers double inflated layer (automatic inflation).

Option : VERTICLAIR 7.50 - 15m

- Crosswise - strips cover on polyester laces.

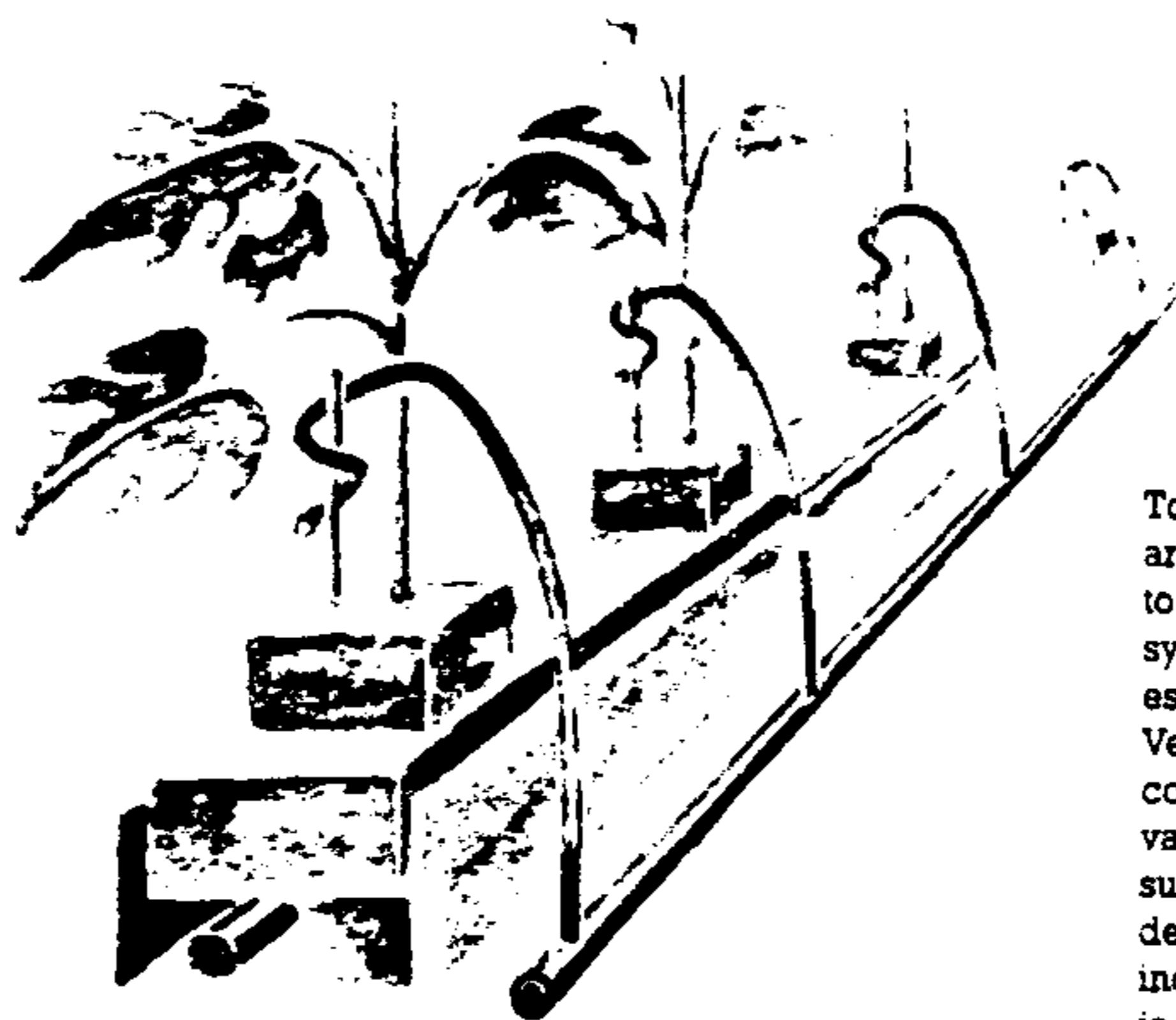


Clip FILCLAIR
alu PVC

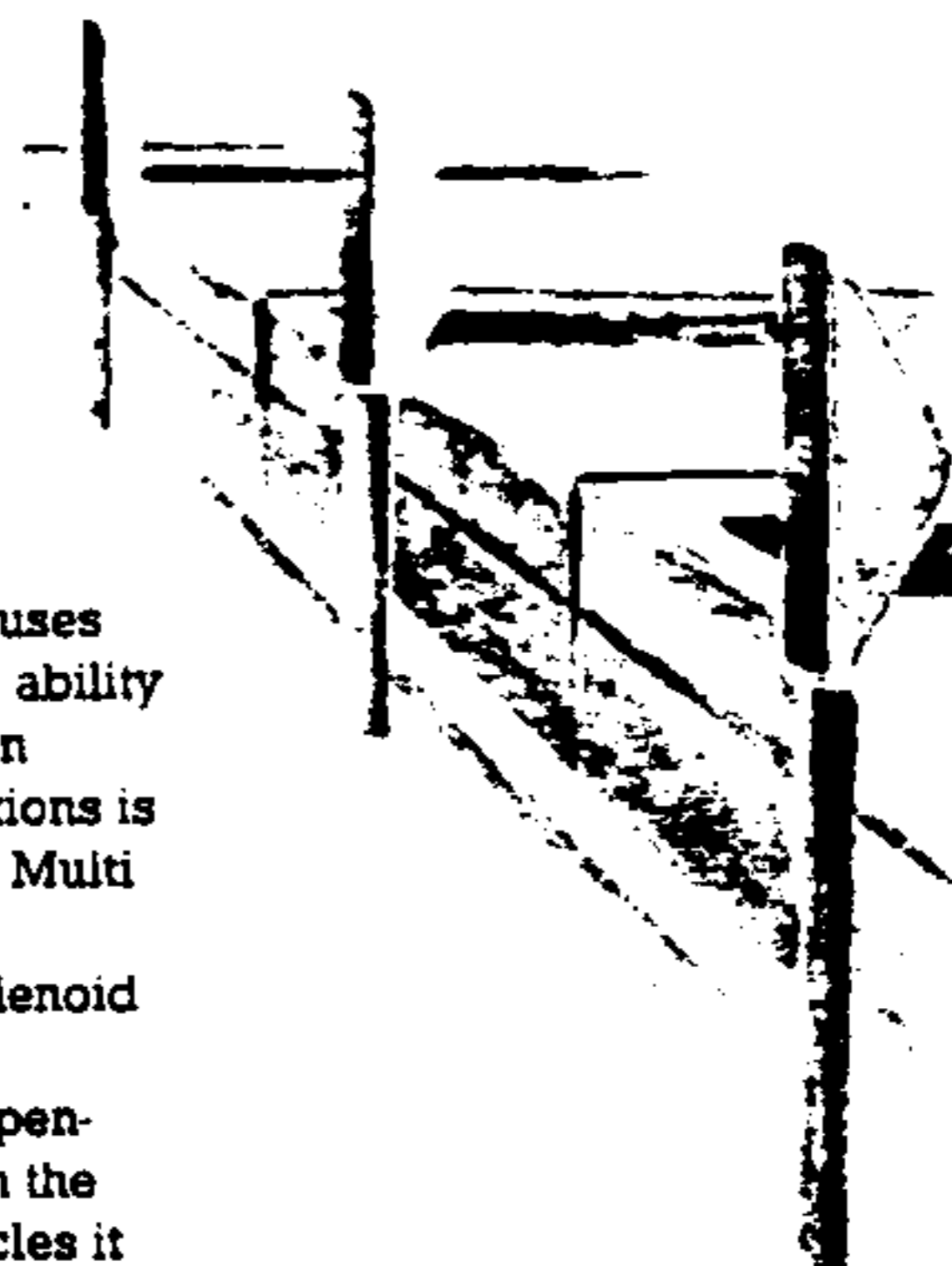


CONNECTION AND CONTROL POSSIBILITIES WITH MGB 941 MULTI VENTURI

DRIP IRRIGATION SYSTEMS



CONTAINER BED SYSTEMS



Today modern greenhouses are of such size that the ability to separate the irrigation system into several sections is essential. The MGB 941 Multi Venturi is capable of controlling up to 100 solenoid valves, which can be subdivided into 10 independent groups. In between the individual irrigation cycles it is possible to set up flushing and delay programs.

The concentration and composition of the nutrient solution is of vital importance. The MGB 941 Multi Venturi can choose between 10 different programmed fertilizer recipes, each containing:

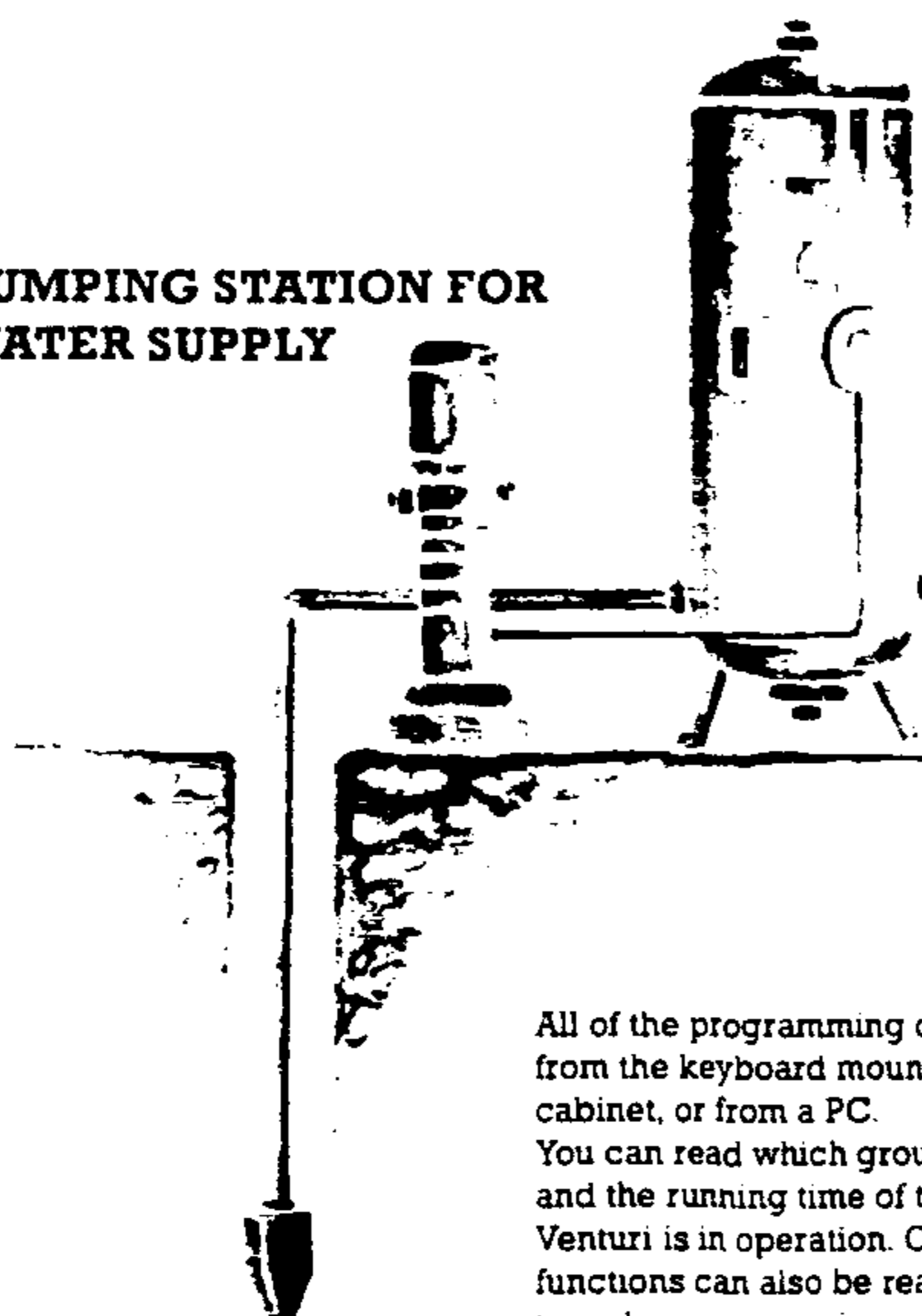
- desired EC, by blending a pre-determined % of stock solution drawn from up to 8 different stock tanks
- desired pH
- irrigation method
- light dependent EC adjustment
- pre-adjustment of EC of incoming return water, by blending with fresh water



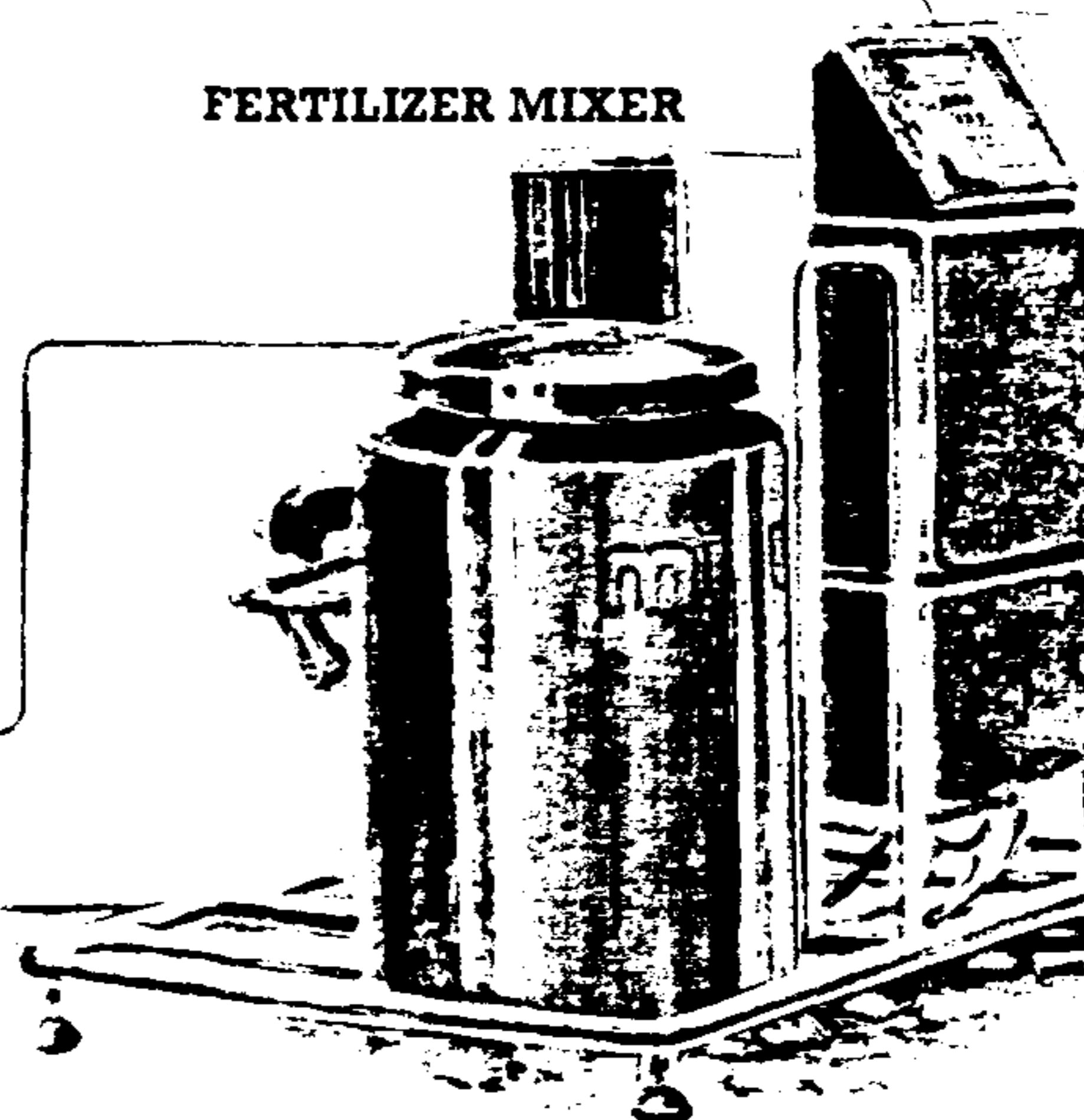
EXTERNAL STARTS

e.g. solar integrator, evaporation sensor, humidity sensor, start tray etc...

PUMPING STATION FOR WATER SUPPLY



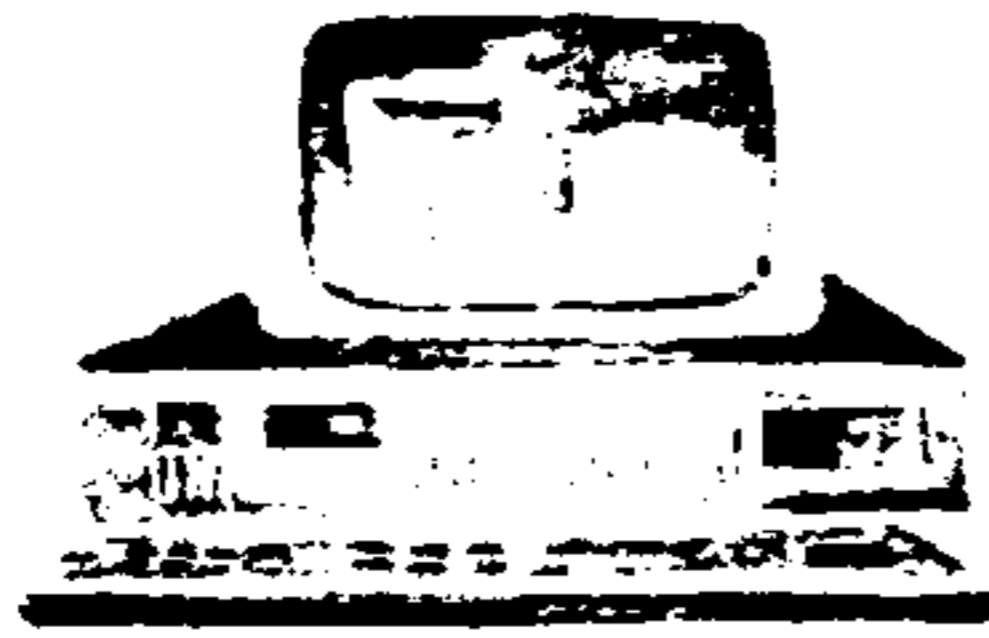
FERTILIZER MIXER



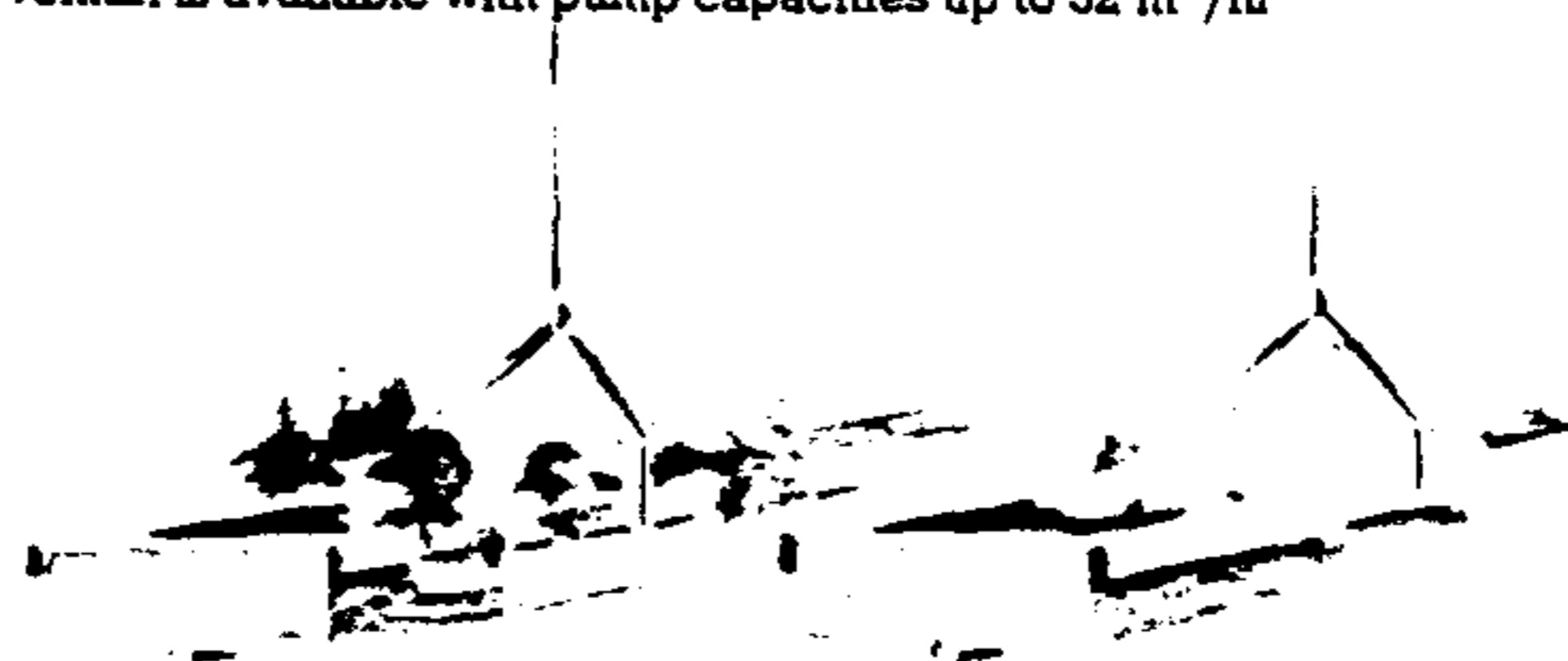
All of the programming of the MGB 941 Multi Venturi is performed from the keyboard mounted on the front cover of the electronic cabinet, or from a PC. You can read which group number, solenoid valve, fertilizer recipe and the running time of the solenoid valve, while the MGB 941 Multi Venturi is in operation. Conductivity levels, pH-values and alarm functions can also be read on the display during operation. In order to make programming easy for the grower all relevant information is shown in the menu. A detailed manual is enclosed with every MGB 941 Multi Venturi.

OVERHEAD IRRIGATION

PC-CONNECTION OF MGB 941 MULTI VENTURI



In sprayline systems the demands made on pump capacity and pressure may be especially heavy. With a few modifications it is possible to adjust the MGB 941 Multi Venturi to these demands. The MGB 941 Multi Venturi is available with pump capacities up to 32 m³ /hr

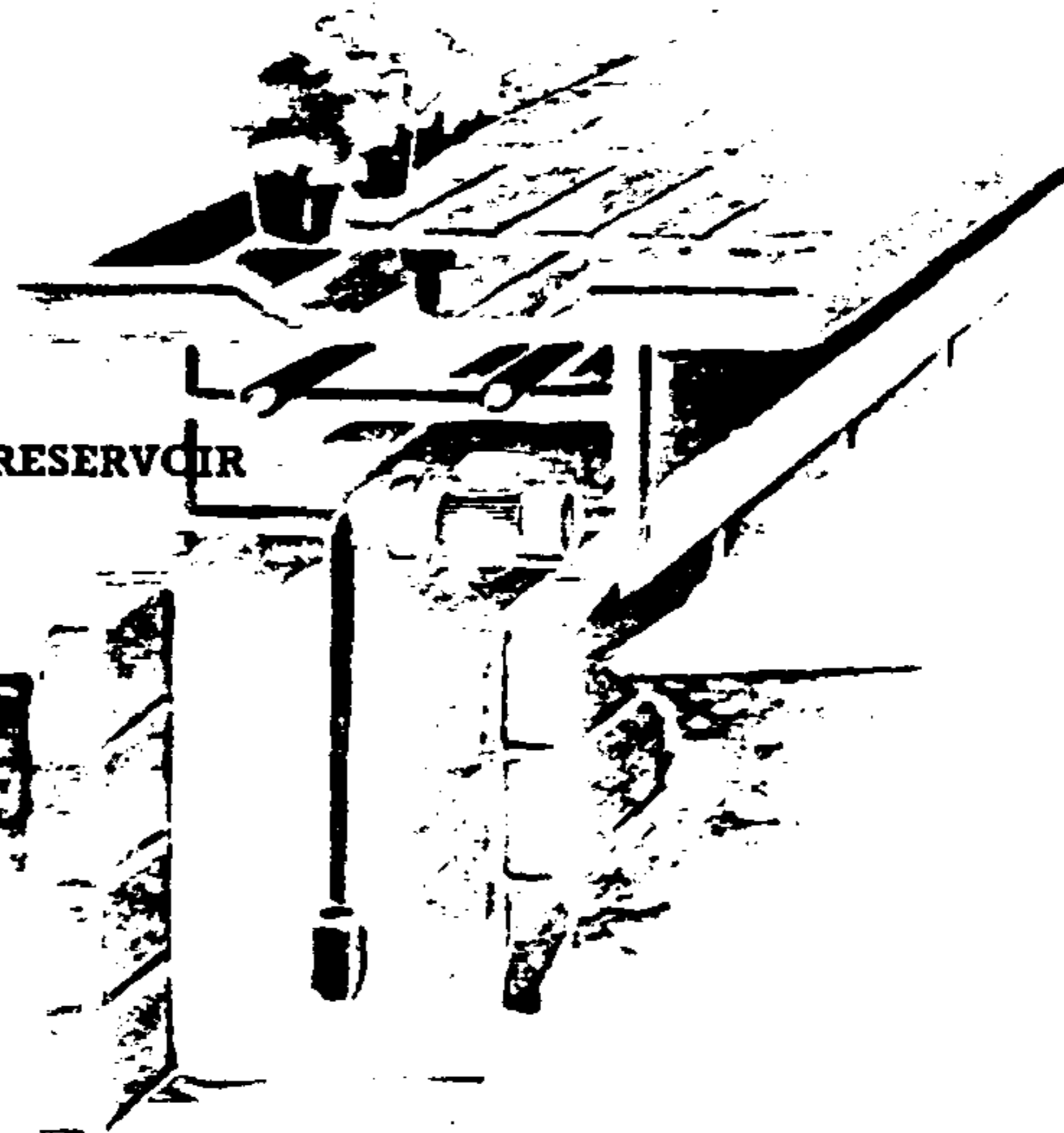


EBB & FLOW SYSTEMS FOR:

- suspended or in-bench troughs
- conventional ebb & flow benches
- concrete floors



COLLECTING RESERVOIR



CONTAINER BED SYSTEMS

In order to meet current and future environmental demands the MGB 941 Multi Venturi has been developed for easy integration into recirculation systems.

The MGB 941 Multi Venturi can choose to draw return water from up to 8 different collection sumps. The EC of the incoming return water can be automatically reduced to a pre-determined value by blending with fresh water.

To meet the different changes in climate and act on the basic parameters contributing to plant growth (temperature, hygrometry, light, water), Serres de France has selected the most efficient equipment available.

Cooling system (photos 1, 2, 3)

In certain climates, in spite of a conventional ventilation system, the temperature difference between the inside and the outside of the greenhouse can reach 10° or more.

The cooling system, uses the natural phenomenon of evaporation to bring down the temperature between the air inside and the air coming into the greenhouse.

Using a system of water run-off on pads (photo 3), a damp area is created. This brings down the temperature through evaporation.

Using the extraction fans (photos 1 and 2) installed on the end walls opposite the pads, a depression is created inside the greenhouse which leads to the air crossing these pads. In contact with water, the hygrometry of the air will increase and the temperature fall.

The installation is operated automatically through a thermostat and a programmer.

Heating (photos 4 and 5)

Our hot air heating equipment consists of very efficient and reliable equipment which has been tested and proven for more than 20 years in all climates.

It is constructed from high quality galvanized steel plate and equipped with burners (oil or gas) supplied by the major European manufacturers.

Its capacity varies between 20,000 and 200,000 Kcal/h.

Irrigation (photos 7 and 8)

A good knowledge of the climatic conditions and the characteristics of the water uses and the crops is essential in the design of an efficient watering system.

Maintenance and the regular supply of water for the development of crops are essential components of irrigation systems and their reliability.

This is why we have selected the best components from the drip, spray or

mist irrigation systems, filtration, fertilization units and their automatic control.

Mobile spray ramp (photo 9)

This is used for mist irrigation in tunnel or multispan greenhouses.

It can irrigate up to 15 m wide and 90 m long by moving along a guide rail through the action of a motor-driven carriage. The speed, spray times and flows can be varied by a programmable timing unit.

Shade screens (photo 6)

Light is essential to plant growth. However, too much light at certain periods of the year can be damaging to certain varieties of plants.

Our shade screens are particularly suitable for use in all climatic locations through the use of multiple option screens (from 40 to 80% shade up to total shade for certain crops). They can be operated manually or automatically.

Climate control (photos 10, 11, 12)

Our mini-computers control and operate our controlled climate equipment: ventilation by the roof-opening system, cooling system, heating, shade screens, irrigation.

Depending on needs and the selected options, they automatically manage the parameters such as temperature, hygrometry, wind speed, rainfall, light, inflation of the tunnel walls and different compartments of the greenhouse.

Plant Benches (photo 18)

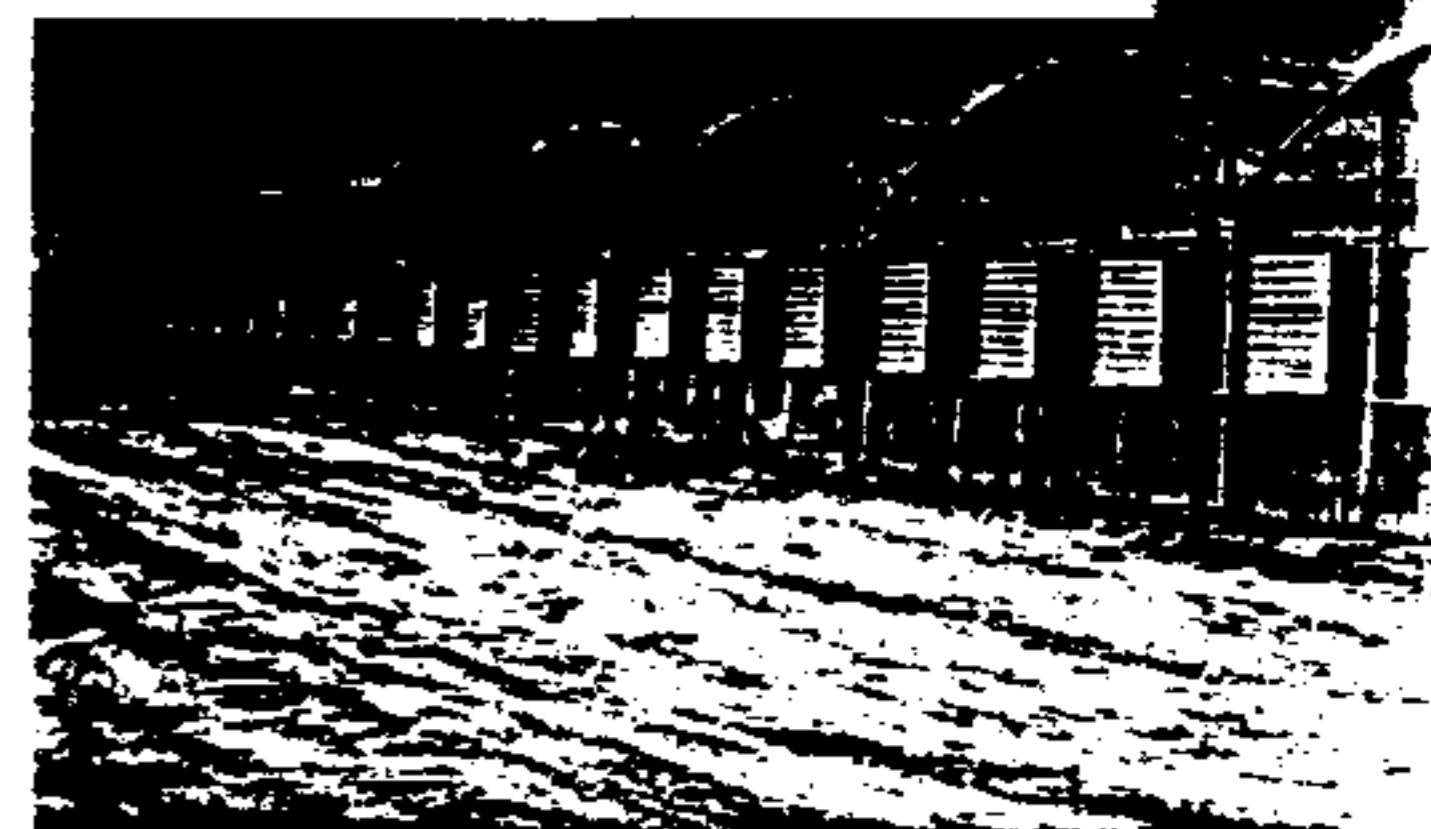
These are designed to provide maximum use of the greenhouse area, optimum diffusion of heat and air circulation between the plants, and simplified handling.

They can be fixed, semi-rolling or rolling.

The frames can be in aluminium or in galvanized plate, the legs fixed or adjustable in height, polystyrene backed, PVC bottom or mesh irrigation.

Insect-proof (photos 13, 14)

This enables insects, transmitters of diseases, such as white fly, green fly, etc. to be kept out. It isolates the crop



for pollination.

Our insect-proof equipment is fitted with a system for opening and closing the vents without damaging netting.

Shade and windbreak netting

(photos 15, 16)

Their strength and their wide technical range allow this netting to be used for various applications such as shade in tunnel, multispan or shade structures (photo 15), windbreaks on side vents (photo 16), protection against hail, etc.

Tobacco equipment (photo 17)

This equipment was designed to be used in tunnels of 9.30 m wide and more. It is used to suspend the tobacco plant on iron wire or lathes at the rate of 33 tobacco plants per m² floor area.

It mainly consists of two end frames with anchoring system, horizontal spacers and raisable struts.

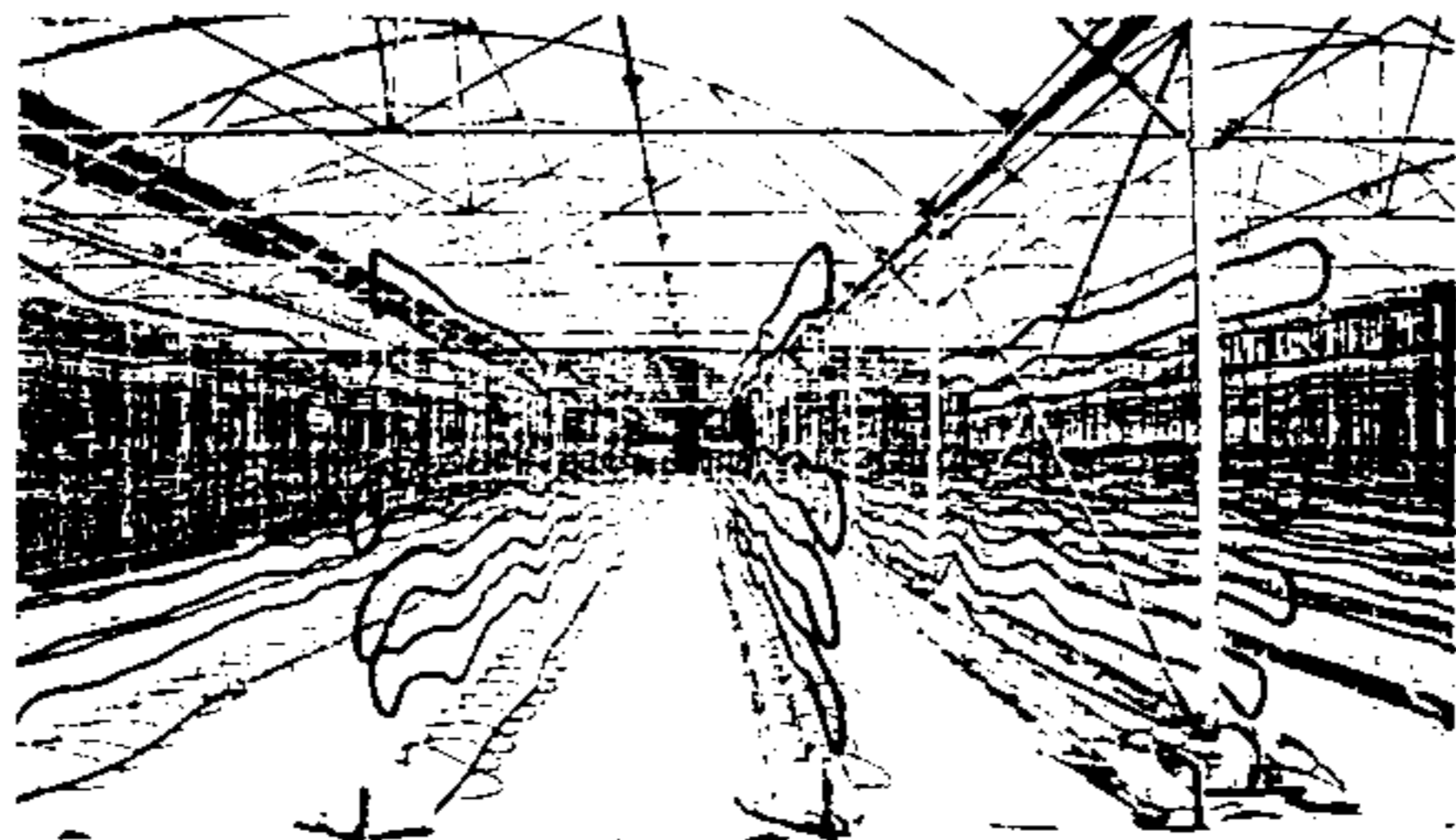
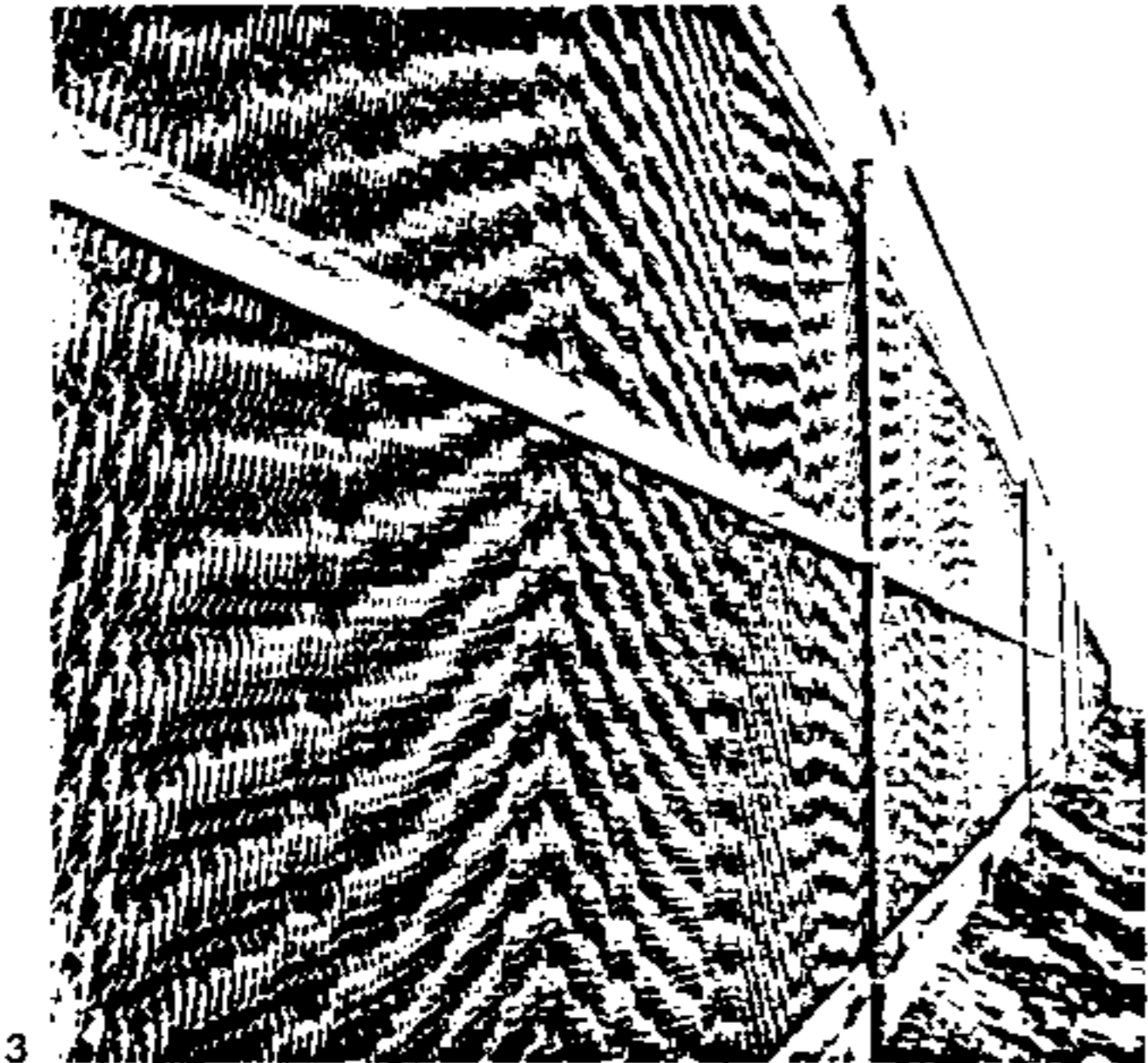
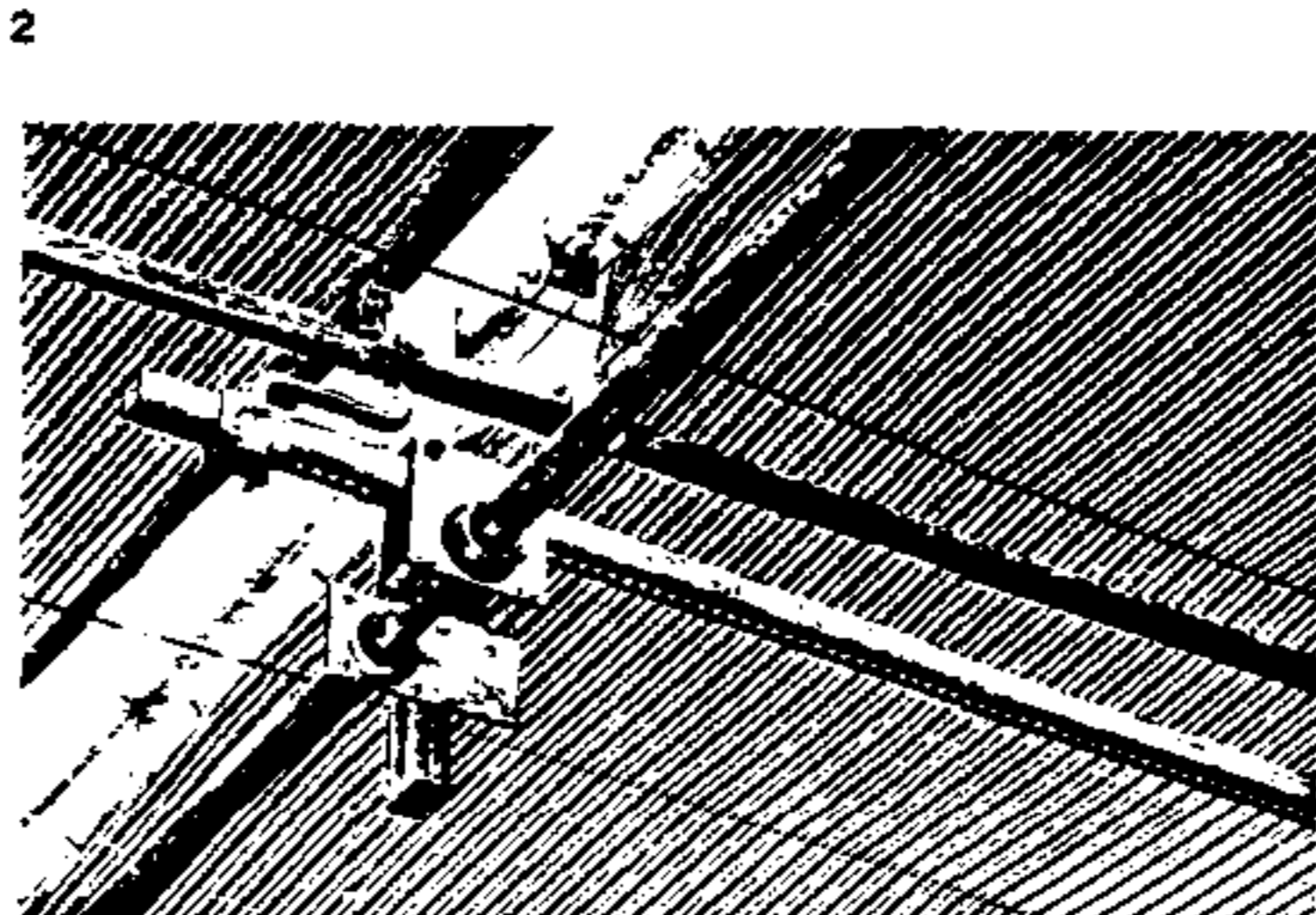
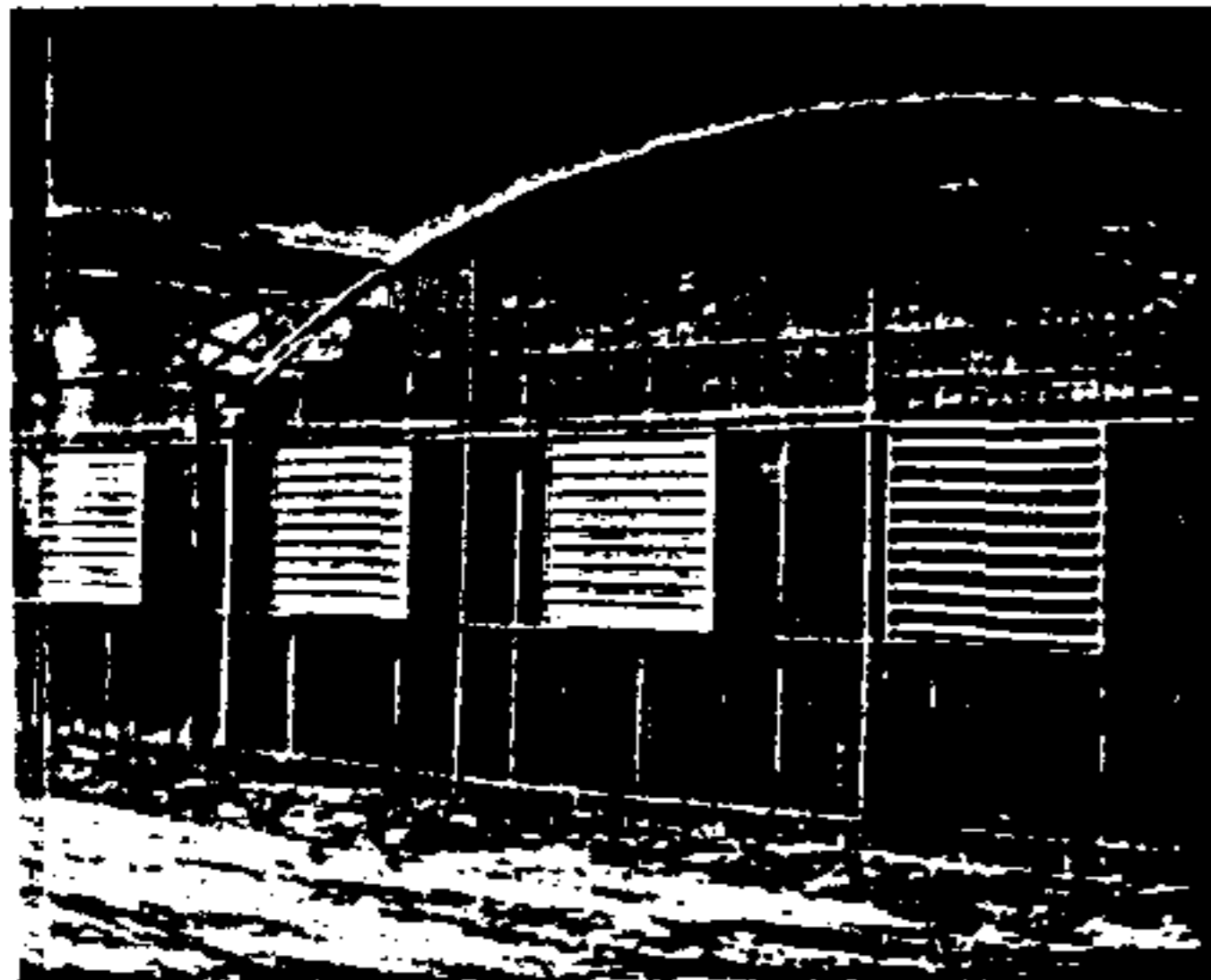
Equipment room (photo 19)

This structure has a simple design and low cost. It is constructed from 6.4 or 8 m multispan elements.

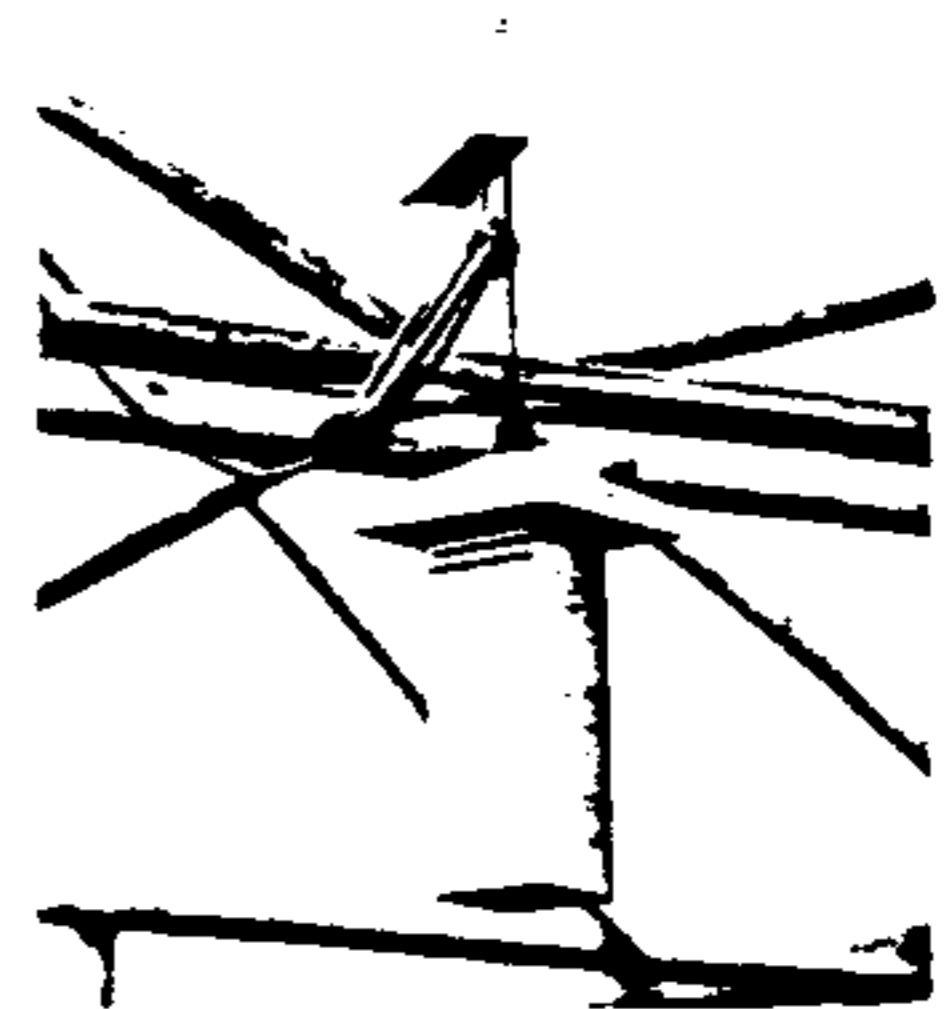
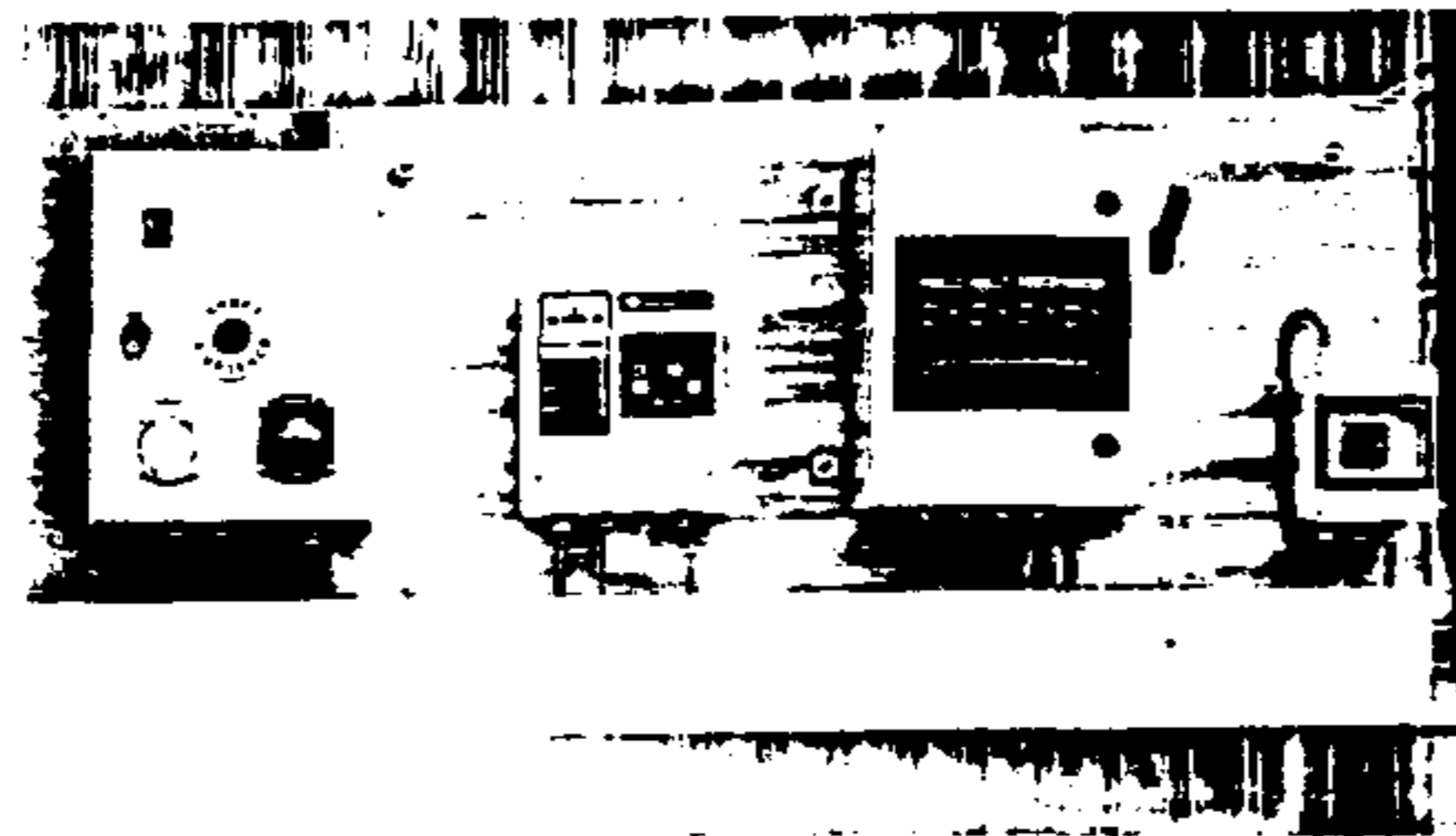
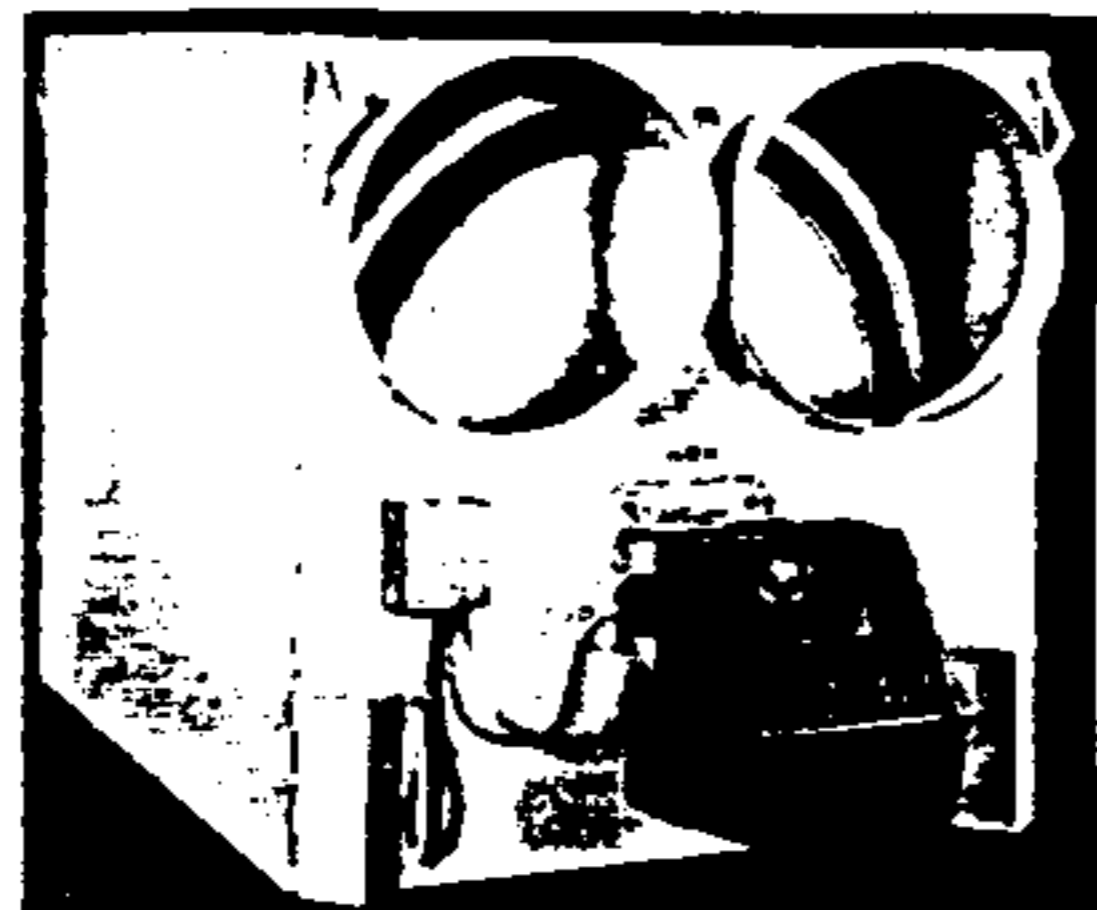
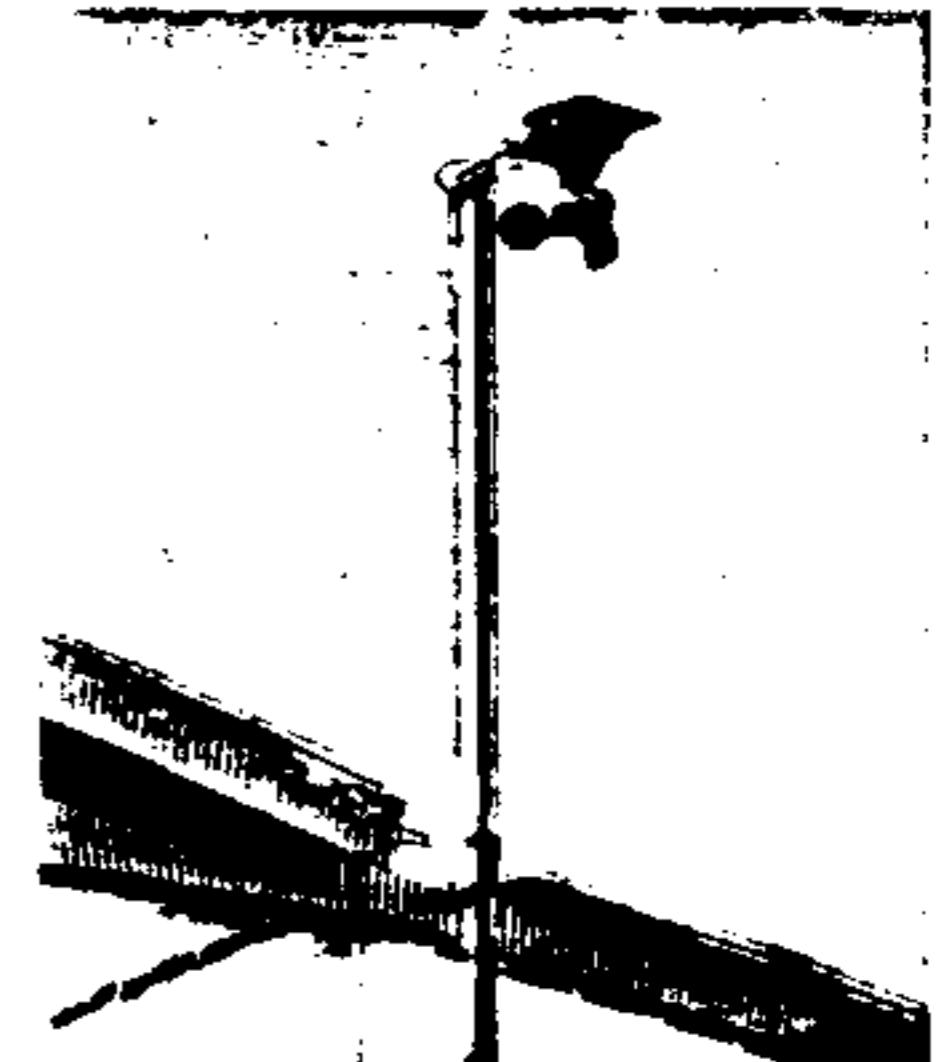
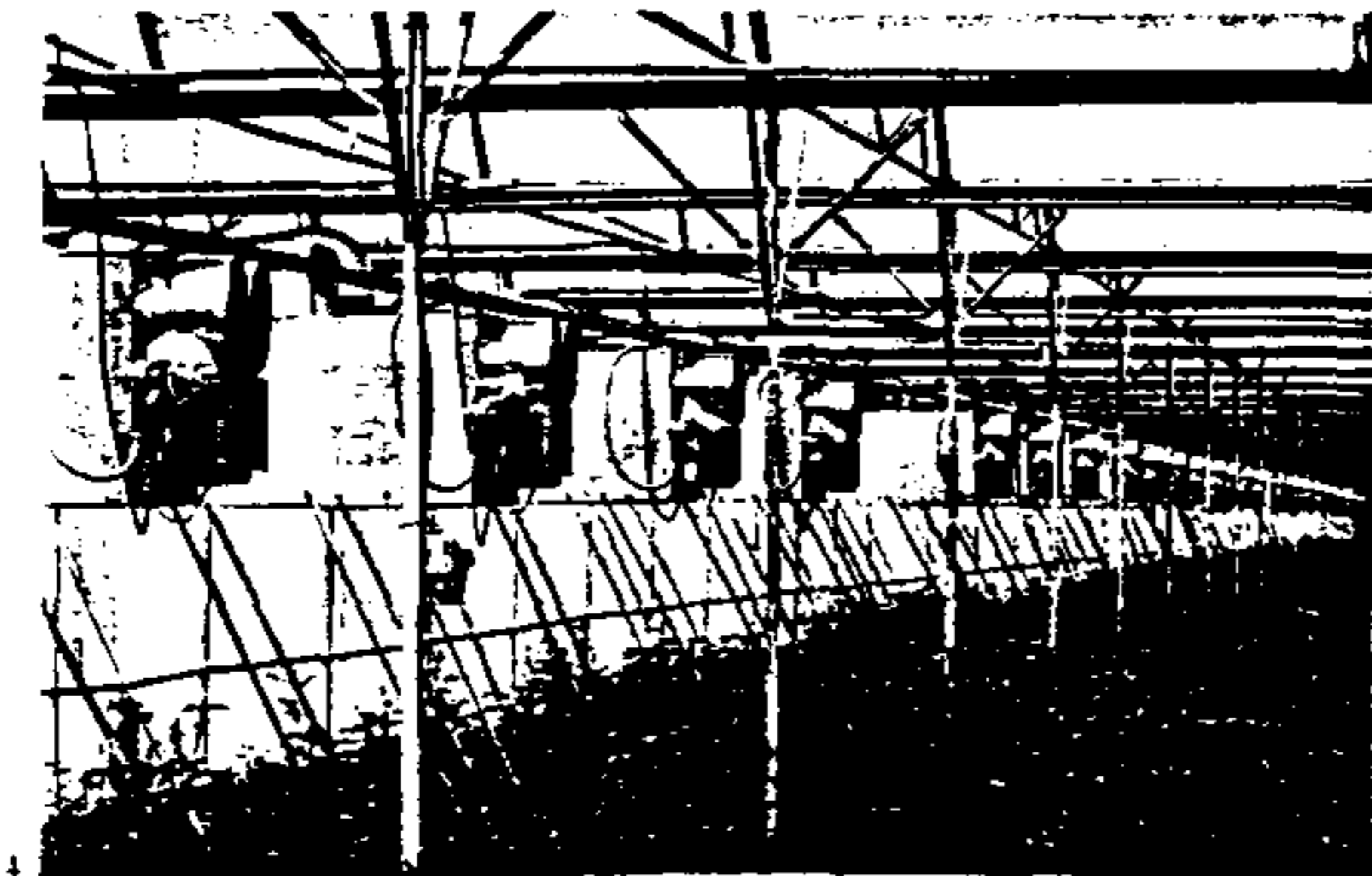
It uses the 2-sheet polyethylene cover (inner film: white/black 160 microns - outer film green/black, 250 microns) by including one or two sheets of glass wool for perfect insulation.

S E Q U I P M E N T .

THE MOST SUITABLE EQUIPMENT



- 1 - Air extraction fan
- 2 - Installation showing extraction fans on end walls opposite pads
- 3 - Pads (cooling system)
- 4 - 5 Hot air heating
- 6 - Automatic controlled shade screen
- 7 - Fertilisation station and low temperature hot water heating
- 8 - Fertilisation station
- 9 - Mobile spray ramp for mist irrigation
- 10 - Computer control
- 11 - Met. sensor
- 12 - Temperature sensor





HORTI SERVICE RESEARCH CENTER

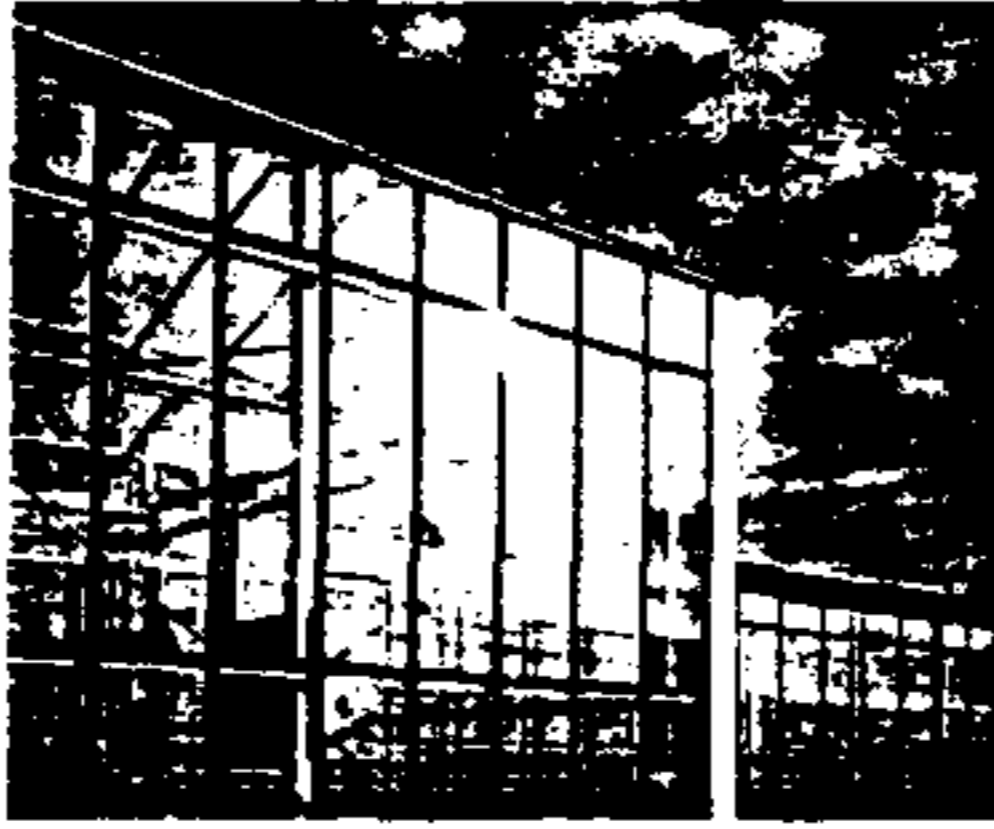
Horti Service beschikt over een eigen onderzoekscen- trum: het Horti Service Research Centrum, gevestigd in het Nederlandse Dorst (Noord- Brabant). Het centrum biedt tuin- bouwtoeleveranciers de gelegenheid tuinbouwbenodigdheden op prak- tijkschaal te testen. De resultaten van het onderzoek zijn ter beschik- king van tuinders.

Het Horti Service Research Center heeft als onderzoekscentrum een unieke opzet. Het is een 'normaal' tuinbouwbedrijf, waar op commer- cieel verantwoorde wijze geteeld wordt met wetenschappelijke opvol- ging. Daarom biedt het onderzoeks- centrum bij uitstek praktijkgerichte faciliteiten voor toeleveranciers.

Doelstellingen

Het Research Center heeft twee doel- stellingen:

- testen en helpen verbeteren van tuinbouwbenodigdheden onder reële omstandigheden; op het gebied van bijv. software, glas, licht etc.
 - het doorgeven van de resultaten aan tuinders die zijn geabonneerd op het *Hortisid* (*) computerprogramma .
- Het project is tot stand gekomen dankzij de deelname van particuliere en overheidsinstellingen; zoals de Landbouwfaculteit van de universi- teit van Gembloux (België), TNO en IMAG, proefstations en bedrijven. Het Research Center werkt echter volstrekt onafhankelijk. Het Horti Service Research Center bestaat uit



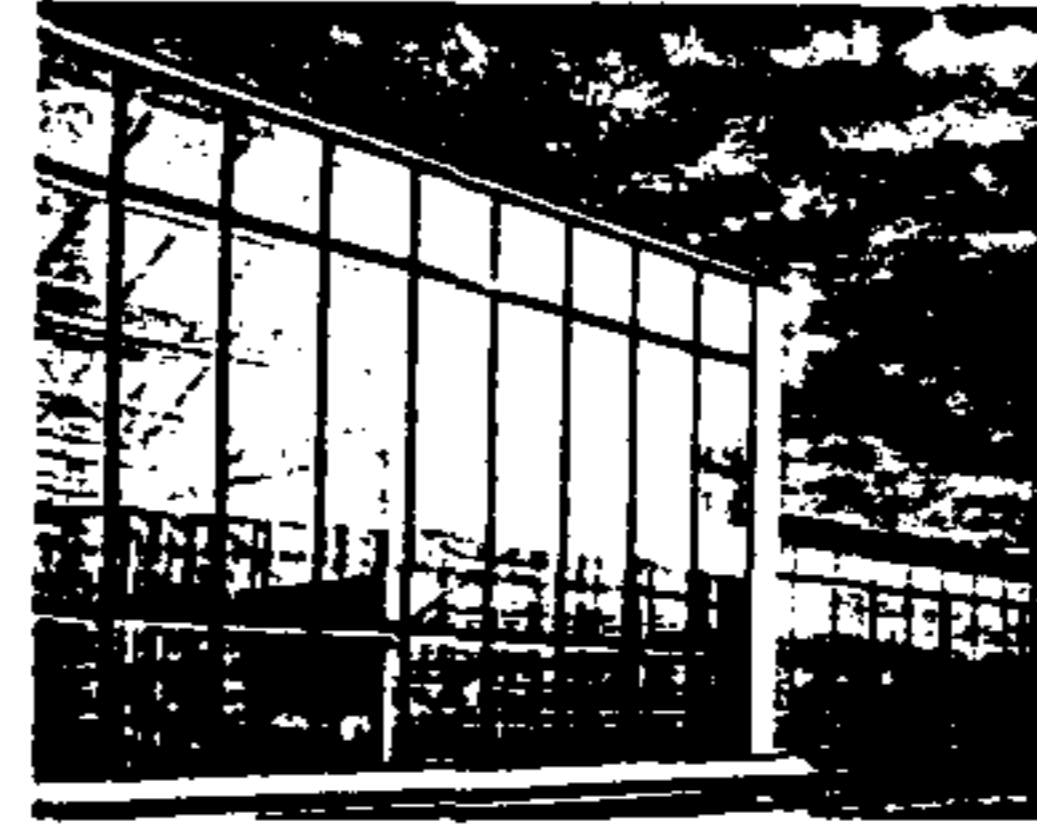
drie volledig onafhankelijke kassen van elk 2.200 m², waarvan één met gewoon glas en twee met Hortiplus. In de kassen gaan wetenschappelijk onderzoek en telen op commerciële basis hand in hand. Onderzoeken worden gedaan op lange termijn.



Aan een project wordt 5 à 6 jaar ge- werkt teneinde verantwoorde con- clusies te kunnen trekken.

Test van Hortiplus

Van de Glaverbel Groep kreeg het Research Center zijn eerste op- dracht: het testen van de mogelijk- heden van Hortiplus, een tuinbouw- glas met lage emissiviteit en het opstellen van de gebruiksaanwijzing ervan. In de kas met gewoon glas wordt geteeld onder 'normale blank- glasomstandigheden'. In de ene



Hortiplus-kas wordt onder dezelfde omstandigheden geteeld, terwijl in de andere kas de teeltoomstandighe- den worden aangepast aan het Hortiplus-glas. Behalve het glas be- schikken de kassen over identieke geavanceerde uitrustingen, inclusief Hortimate (*), het wetenschappelij- ke meetsysteem.

Datanet

Alle gegevens over de klimaat- en waterregeling worden verzameld en geanalyseerd. Tuinders die geabon- neerd zijn op Hortisid, kunnen via het internationale datanet toegang krijgen tot onderzoeksgegevens.

Onderzoek in de praktijk

Goed onderzoek staat of valt bij de omstandigheden waaronder het wordt uitgevoerd. In het Horti Service Research Center kan dat onderzoek onder reële omstandig- heden plaatsvinden. Daarom is het Research Center een aantrekkelijke partner voor tuinbouwtoeleveran- ciers die de kwaliteit van hun pro- dukt willen verbeteren.

(*) Over deze dienst(en) is uitge- breide informatie op aanvraag beschikbaar.

July 1991 016

HORTI
service

Postbus 21, 4849 ZG Dorst, Nederland.
Tel.: +31-(0)1611-1950. Fax: +31-(0)1611-2615.

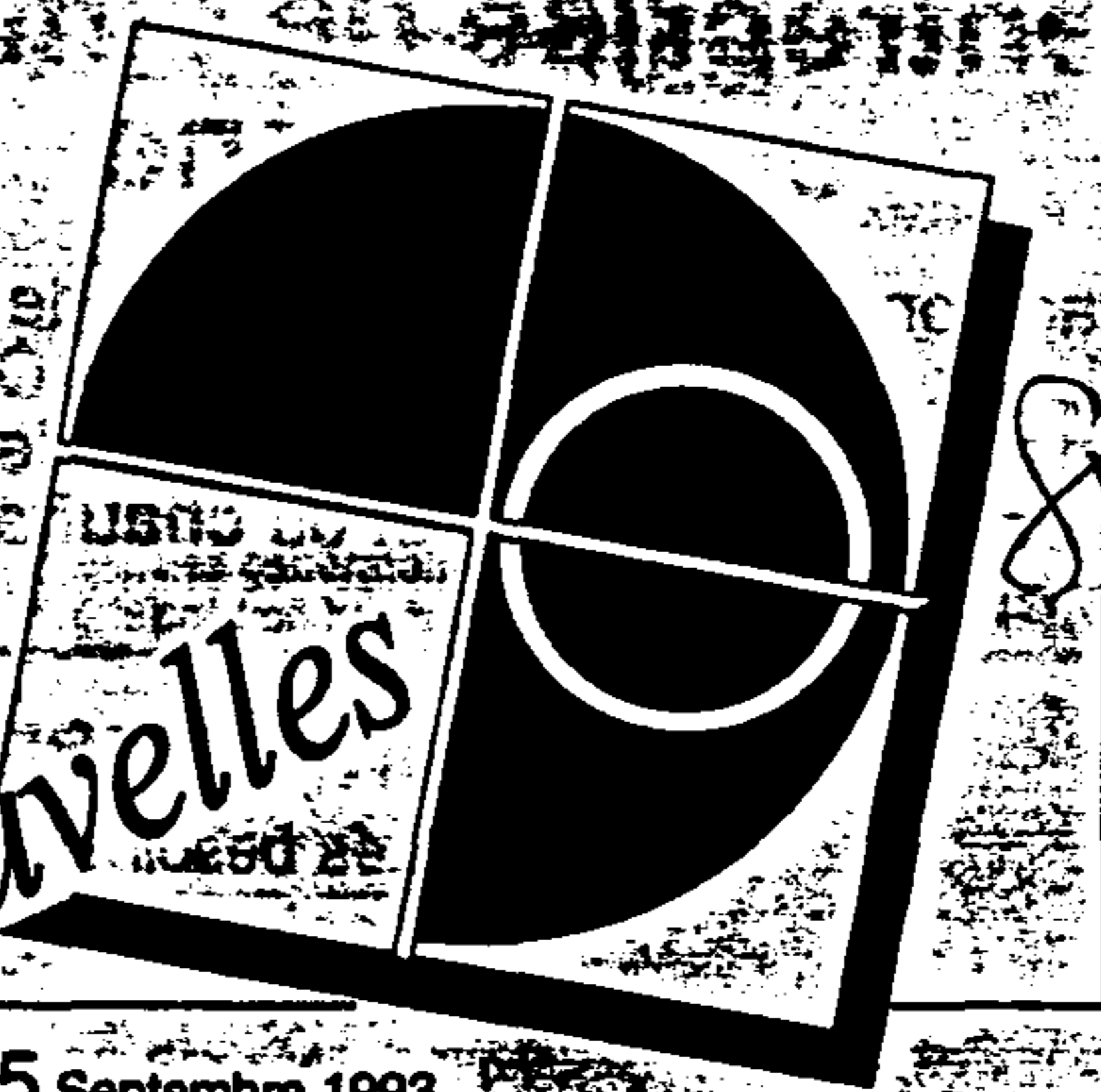


**MEETSYSTEEM OM DE
KLIMAATREGELING
TE HELPEN OPTIMALISEREN**



**EAU
CHAUDE**

Nouvelles



Le journal de Jacques Giordano Industries N° 5 Septembre 1993

CHAUFFAGE DE SERRES AGRICOLES



L'activité chauffage de serre de GIORDANO / VALLAURIS, bien connue depuis 1965, est maintenant intégrée à la Société Jacques GIORDANO Industries à Aubagne.

A l'occasion du salon HORTIMAT à Orléans, le Journal EAU CHAUDE *Nouvelles* présente la gamme de matériel "chauffage et ventilation de serres" GIORDANO.

Pour toute information supplémentaire n'hésitez pas à téléphoner au **NUMERO VERT 05 00 30 40**

CHAUFFAGE BASSE TEMPERATURE - BIG

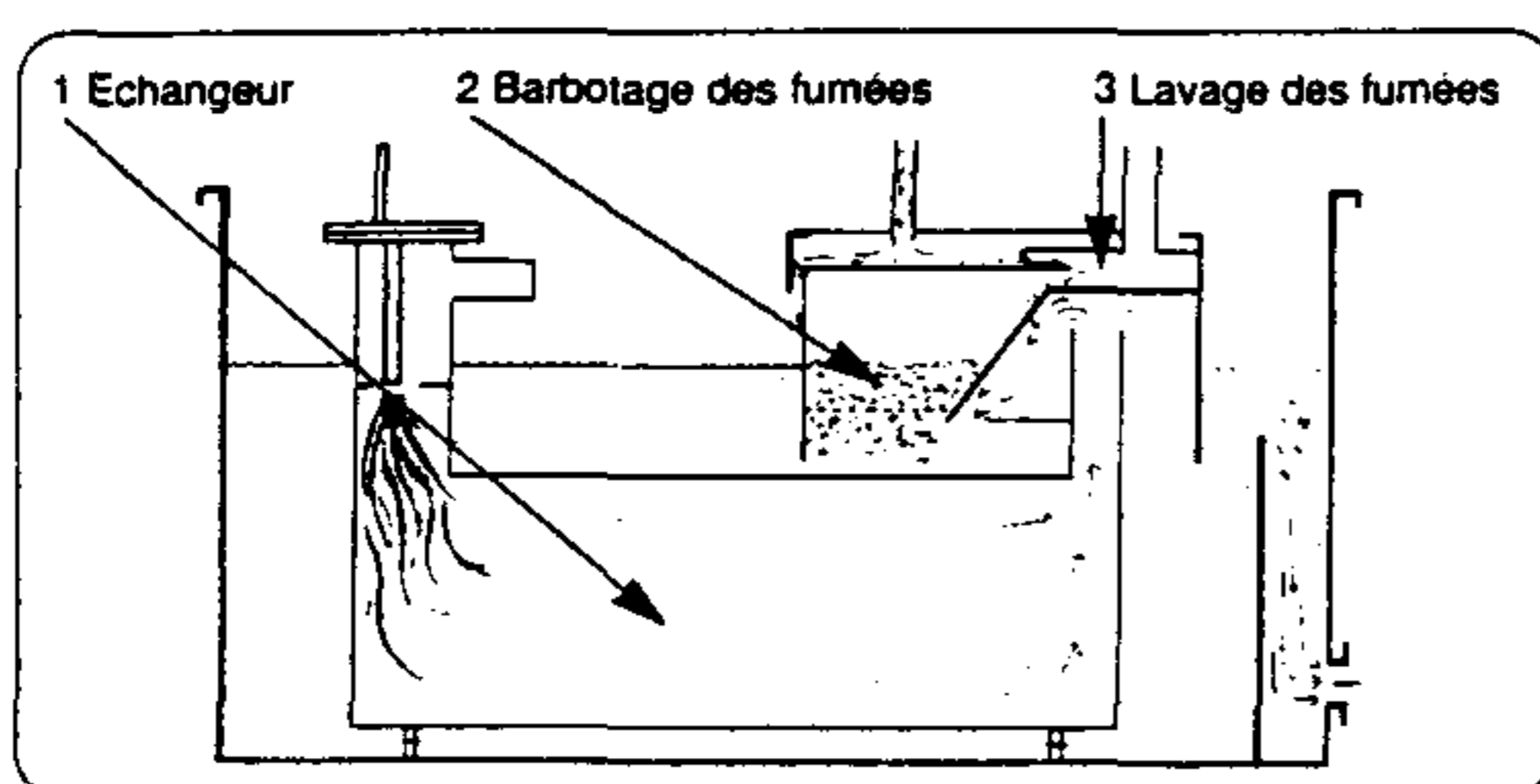
giordano SA en association avec des organismes officiels tels que L'INRA, le CTIFL, le CREAT, ... a permis de démontrer que l'utilisation des solutions basse température pour le chauffage des serres apporte au niveau des cultures une meilleure assimilation de la plante. Elle améliore la précocité et le rendement des cultures tout en permettant une économie d'énergie non négligeable par rapport aux systèmes de chauffage traditionnel.

A partir de ce principe **giordano** SA a conçu et fabriqué un matériel de production d'eau chaude basse température simple, fiable et peu encombrant, le **BRULEUR IMMERGE GAZ - BIG** - Associé à des émetteurs basses températures, il permet une utilisation rationnelle du chauffage et de l'énergie.

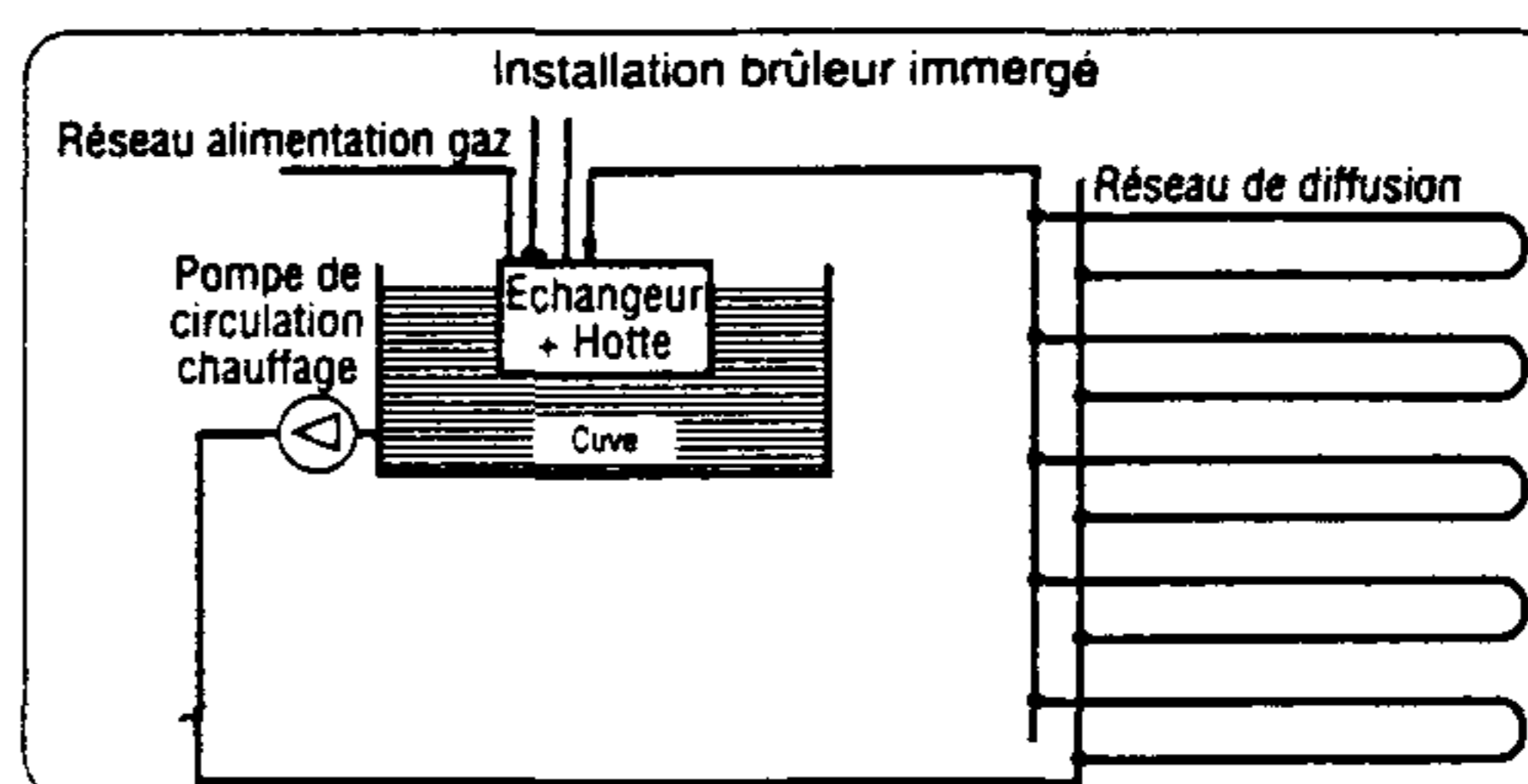
Le procédé de combustion retenu par **giordano** SA, consiste à placer la chambre de combustion et l'échangeur dans une cuve où circule l'eau à réchauffer. En quittant l'échangeur les gaz de combustion barbotent dans cette eau, ils sont ensuite lavés avant leur évacuation. Ce principe de combustion permet des performances élevées avec des rendements supérieurs à 103% sur PCI (essais G.D.F.).

Afin d'améliorer le processus de la photosynthèse, il est possible de pratiquer l'injection de CO₂, à partir des produits de combustion du BIG. Vous disposez alors de CO₂ gratuit. Dans ce cas prévoir l'adjonction d'une Unité de Récupération CO₂ avec détecteur de CO et analyseur de CO₂.

SCHEMA DE PRINCIPE



PRINCIPE D'INSTALLATION



CARACTERISTIQUES TECHNIQUES

TYPE	PUISSANCE UTILE kW	CONSOMMATION		DIMENSIONS			RACCORDEMENT			CHEMINEE Ø mm	POIDS kg	CAPACITE l	POMPE CHAUFFAGE	
		GAZ NAT Nm ³ /h	GAZ GPL Kg/h	Longueur mm	Largeur mm	Hauteur mm	GAZ	HYDRAULIQUE					DEBIT Nm ³ /h	PRESSION mCE
BIG 150	150	14,9	11,7	2100	1000	1600	MALE G 1/2"	FEMELLE PVC Ø 75	MALE G2"1/2	180	350	500	15/70	8,5/5
BIG 300	300	29,8	23,4	2500	2100	1600	MALE G 1/2" x 2	FEMELLE PVC Ø 75	MALE G2"1/2 x 2	180 x 2	720	1000	15/70	8,5/5

Le BIG est livré complet avec pompe de circulation, aquastat de sécurité, thermostat de régulation, armoire électrique, cheminée et abergements, détente gaz secondaire (nature et pression à préciser à la commande) cuve en matériau composite, abergement, échangeur et boîte de lavage en INOX.

giordano SA : VINGT CINQ ANS D'EXPERIENCE AU SERVICE DE LA SERRE

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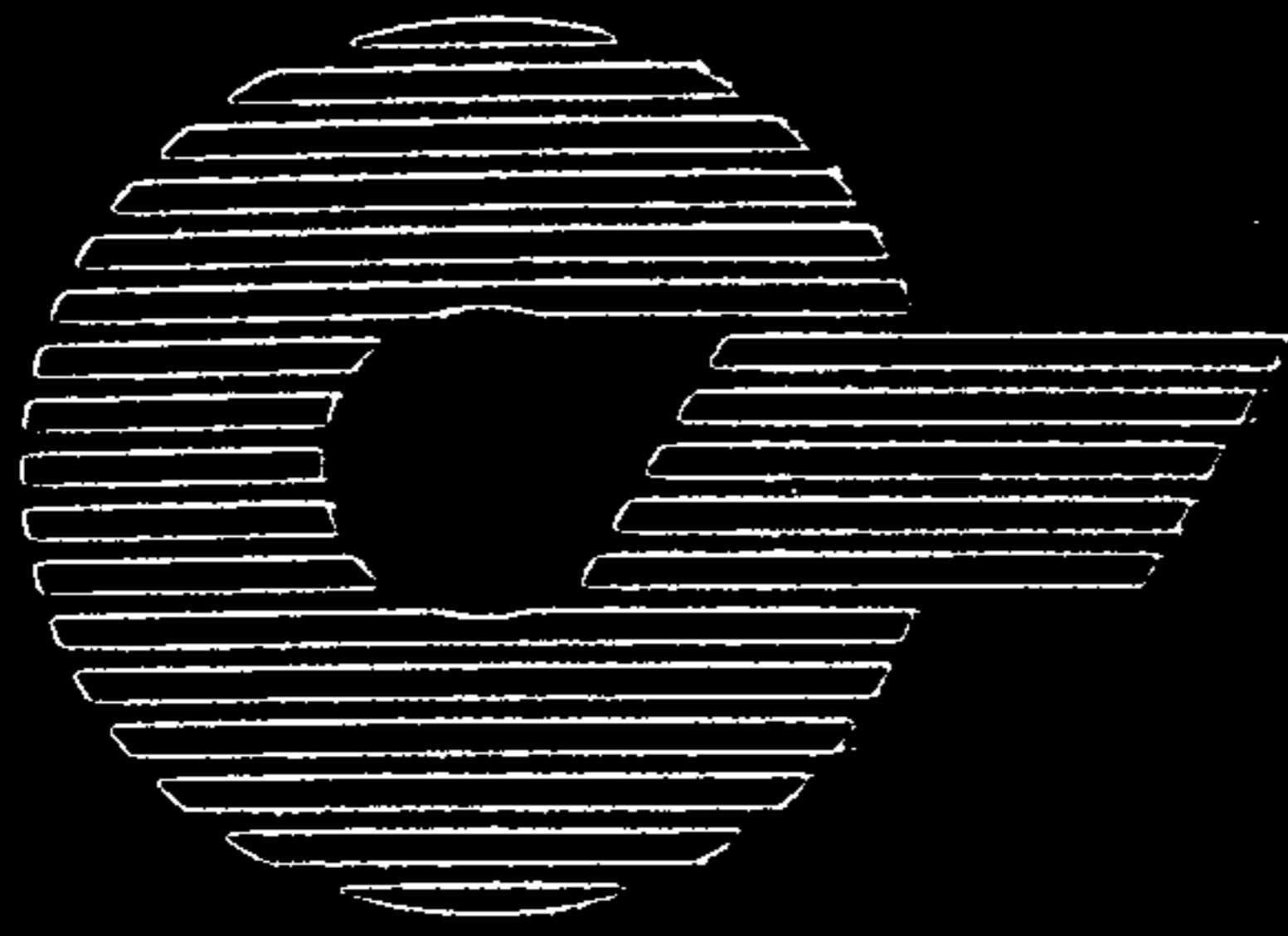


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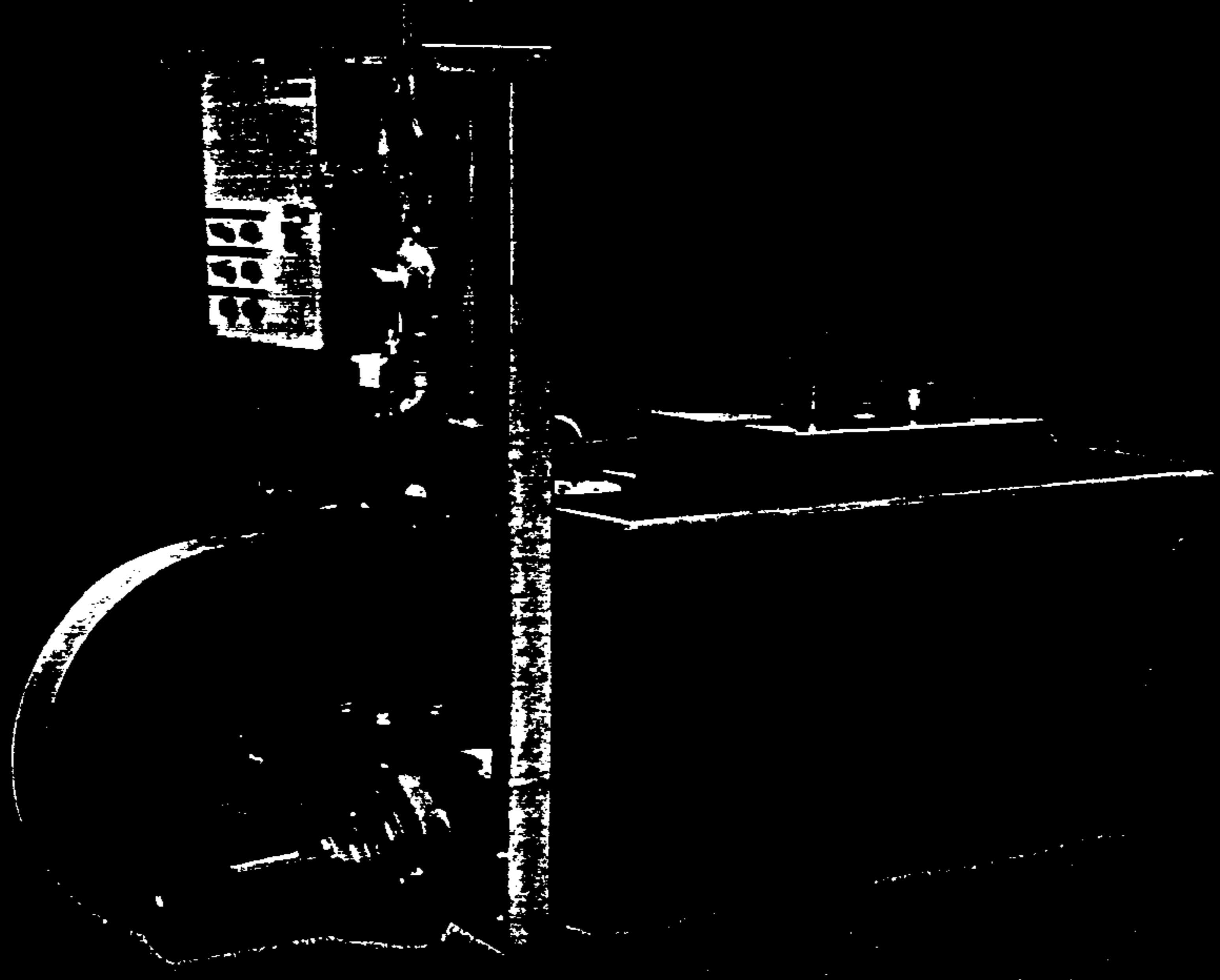
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giordano

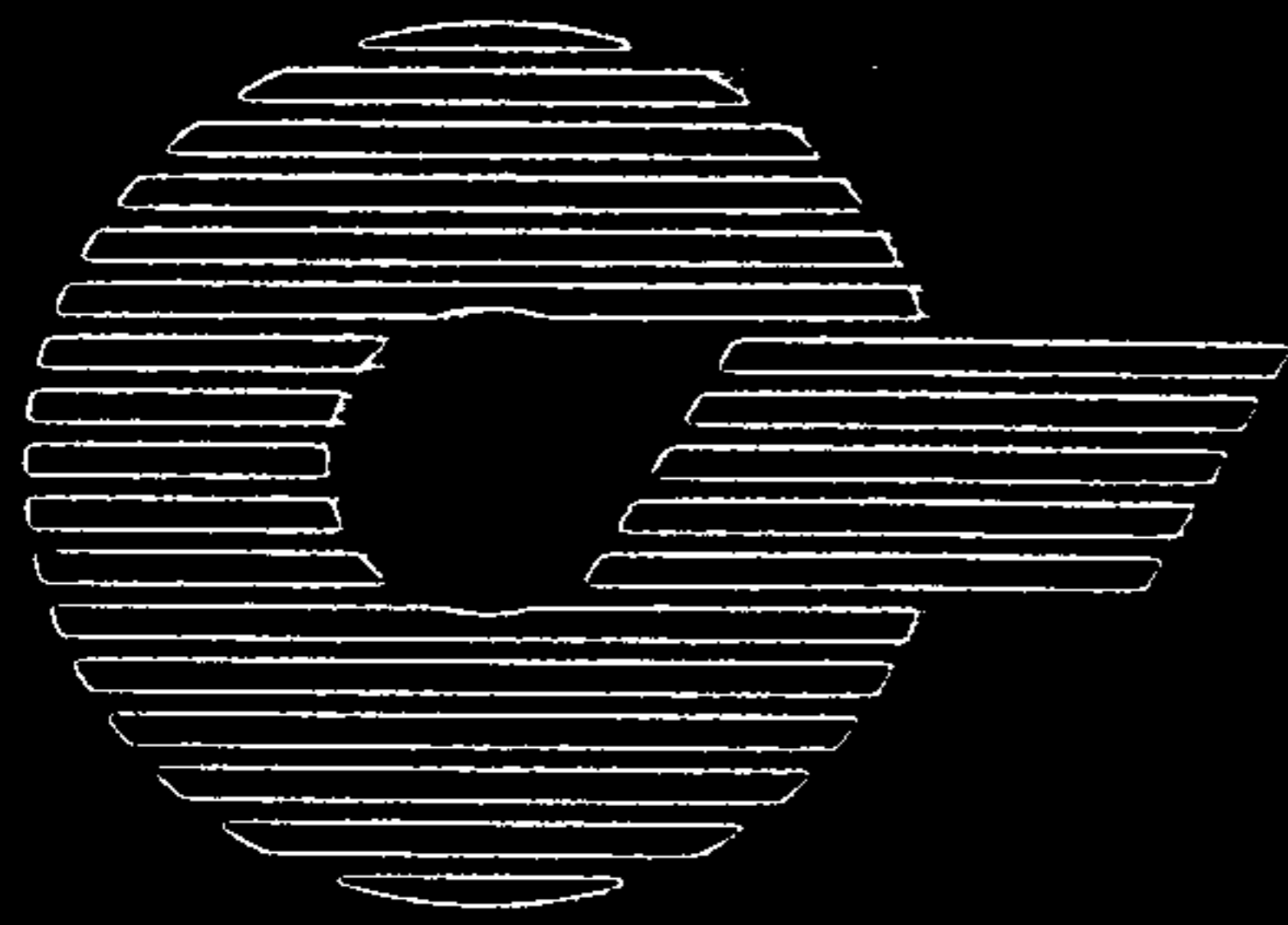
MADE IN ITALY



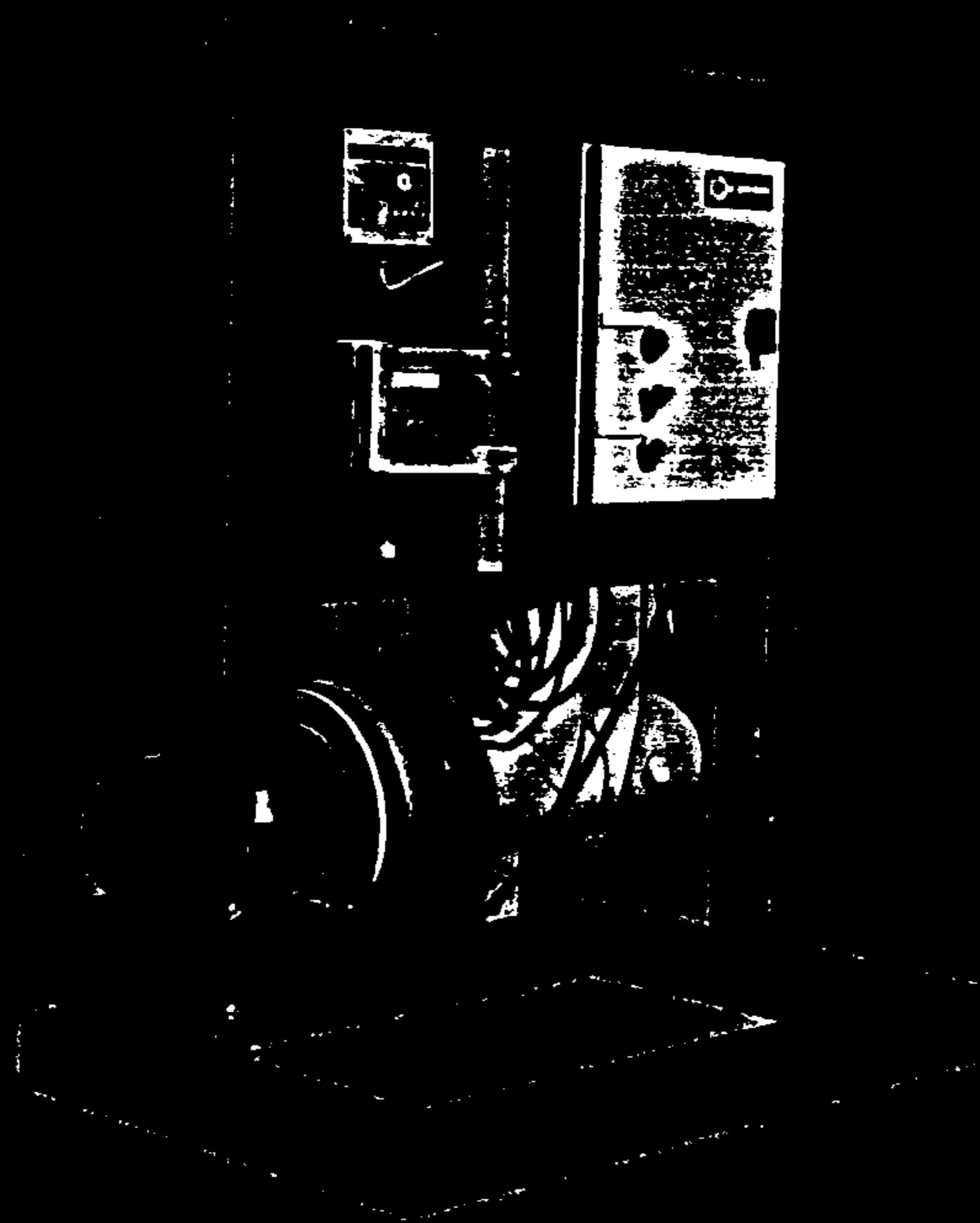
MAQUINES IMMERGES

1972

CODE 37687



giordano



CO2 - FACTEUR DE PRODUCTION - URCO

POURQUOI ?

Pour assurer sa croissance la plante consomme du CO₂. Dans une serre lorsque les trois facteurs température - lumière - hygrométrie sont portés à leur optimum, c'est le CO₂ qui limite le rendement de la photosynthèse. Le fait d'augmenter la teneur en CO₂ par rapport à la teneur normale contenue dans l'air ambiant se traduit par :

AUGMENTATION DES RENDEMENTS, PRECOCITE, MEILLEURE QUALITE.

COMMENT ?

L'unité de récupération de CO₂ **giordano**, URCO, associée à des chaudières haut rendement du type BIG ou chaudière avec récupérateur, valorise tous ces équipements par l'utilisation d'un CO₂ gratuit provenant des gaz de combustion refroidis.

COMBIEN ?

Les besoins en CO₂ dépendent de plusieurs facteurs :

- niveau de concentration souhaité
- période d'injection
- étanchéité de la serre
- climat extérieur
- type et stade de culture
- production CO₂ de la fumure (6 à 15 g/m²/h est un ordre de grandeur en fonction des éléments ci-dessus) (source GDF)

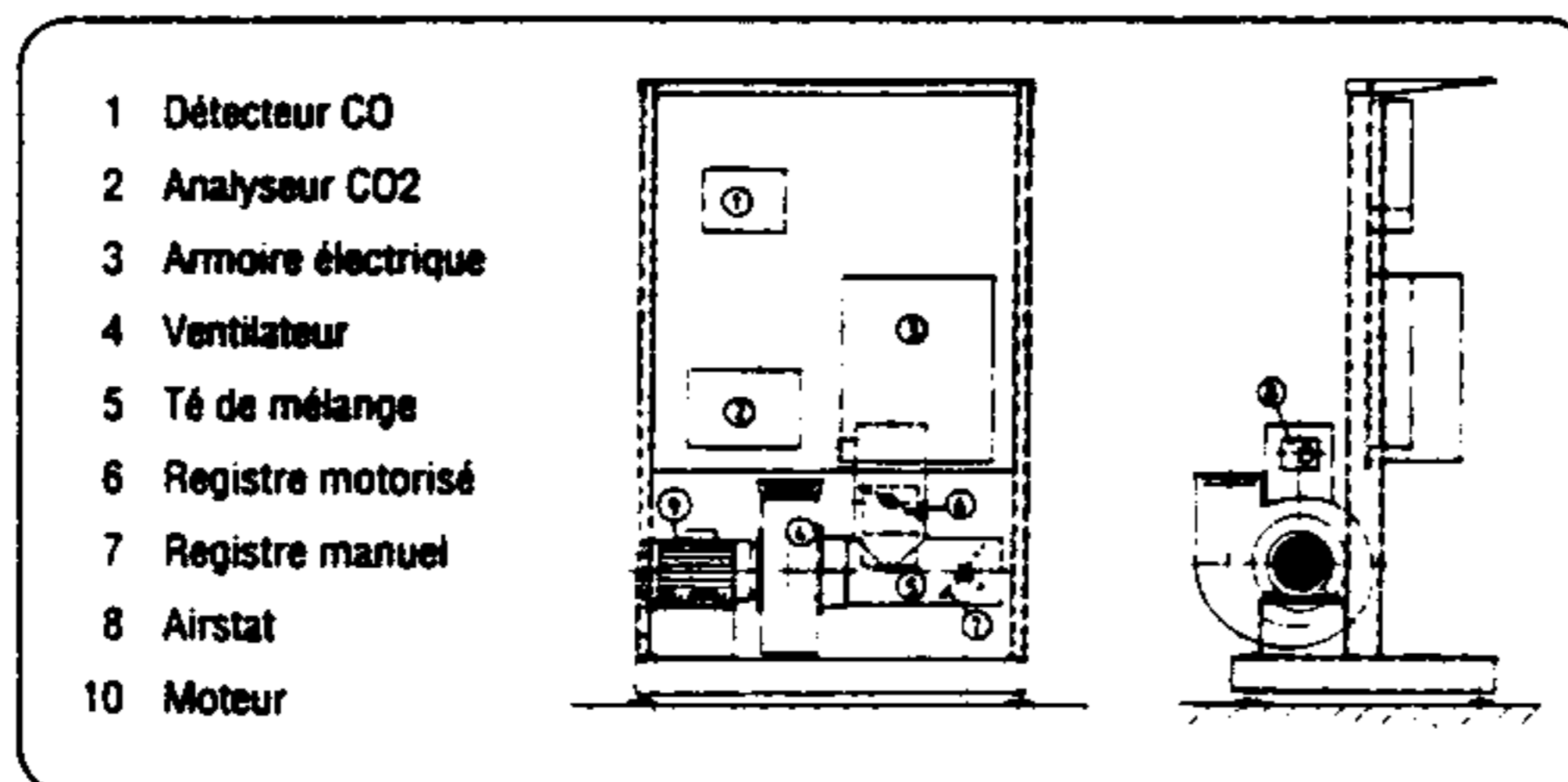
UNITE DE RECUPERATION CO2 **giordano** SA

CARACTERISTIQUES TECHNIQUES

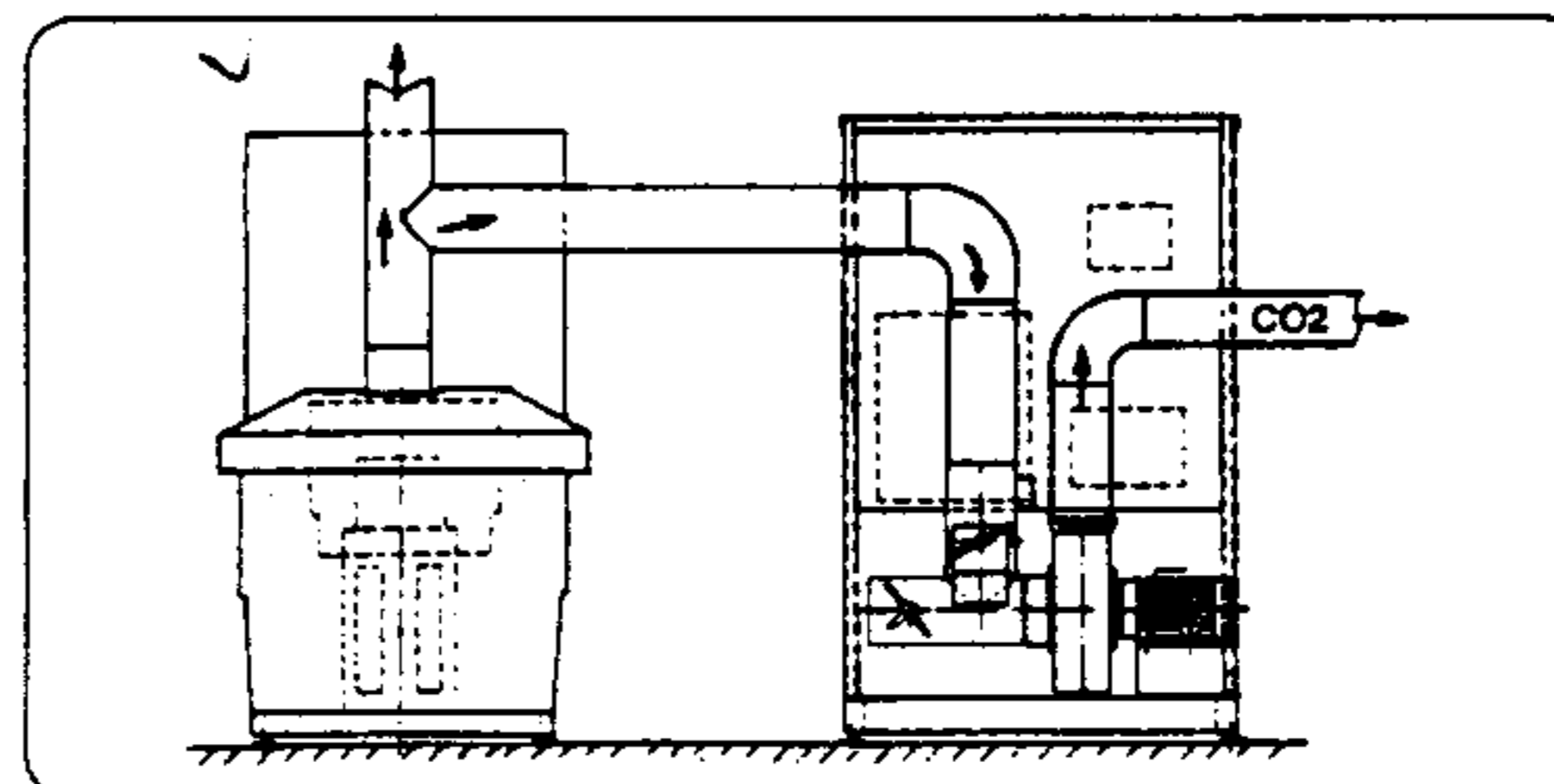
TYPE	DEBIT m ³ /h	PRESSION mmCE	MOTEUR kW	ASPIRATION Ømm	REFOULEMENT Ømm	DIMENSIONS L x l x H mm
UR 160	300/1000	65/50	0,75	160	160	900 x 700 x 1450
UR 200	500/2000	85/50	1,1	200	200	900 x 700 x 1450
UR 250	1000/3500	180/70	1,5	250	250	900 x 700 x 1450
UR 315	1800/6500	250/75	3	315	315	900 x 700 x 1450

Pour couples DEBIT/PRESSION supérieurs nous consulter

DIMENSIONS



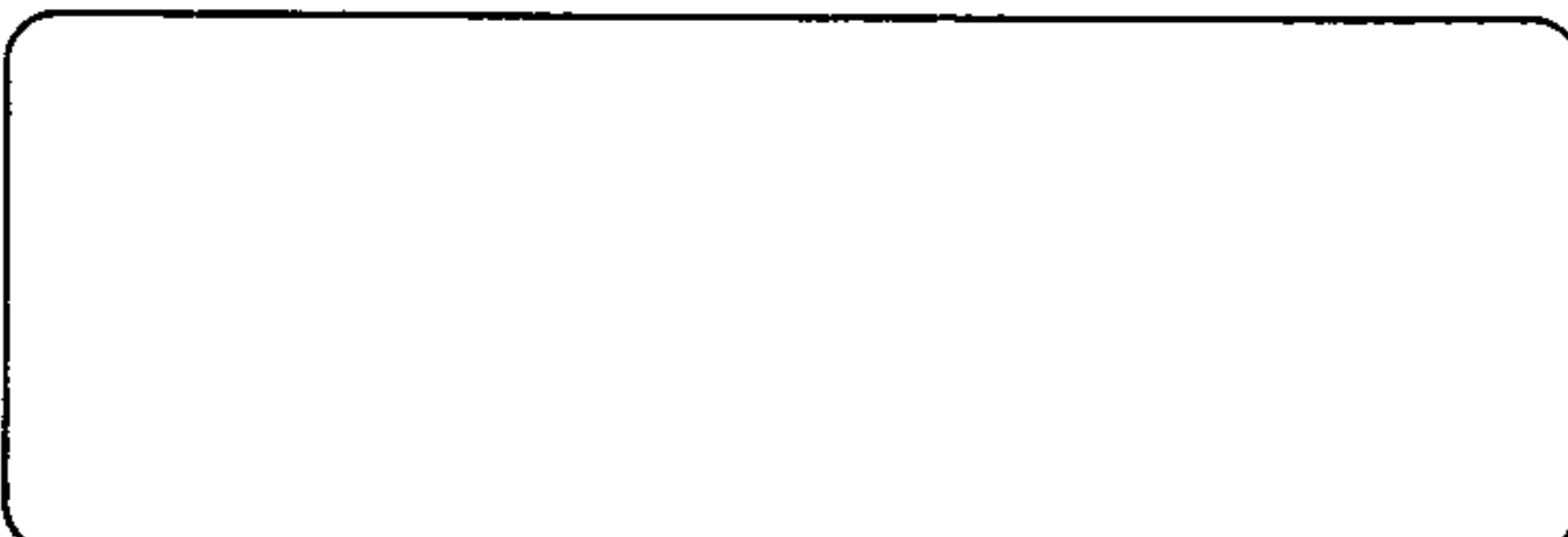
PRINCIPE DE RACCORDEMENT



Tous nos appareils sont livrés avec ventilateur, registre motorisé et té de dilution en polypropylène stabilisé, armoire électrique complète 380 V+N+T, détecteur de CO, airstat sécurité, le tout monté en usine et précablé sur un châssis en tôle peinte et support galvanisé. (Analyseur de CO₂ en option.)

giordano SA : VINGT CINQ ANS D'EXPERIENCE AU SERVICE DE LA SERRE

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INCAA COMPUTERS

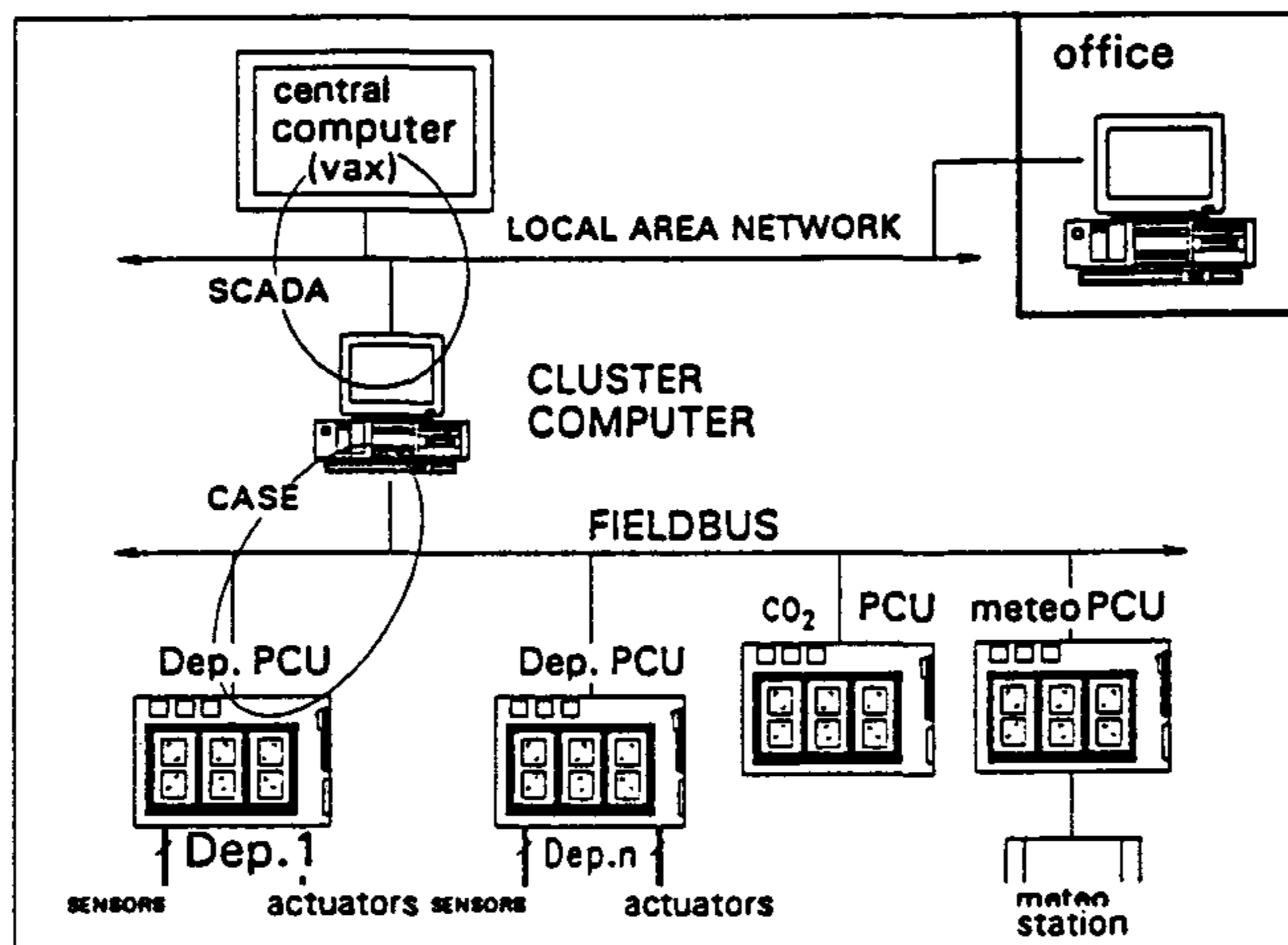


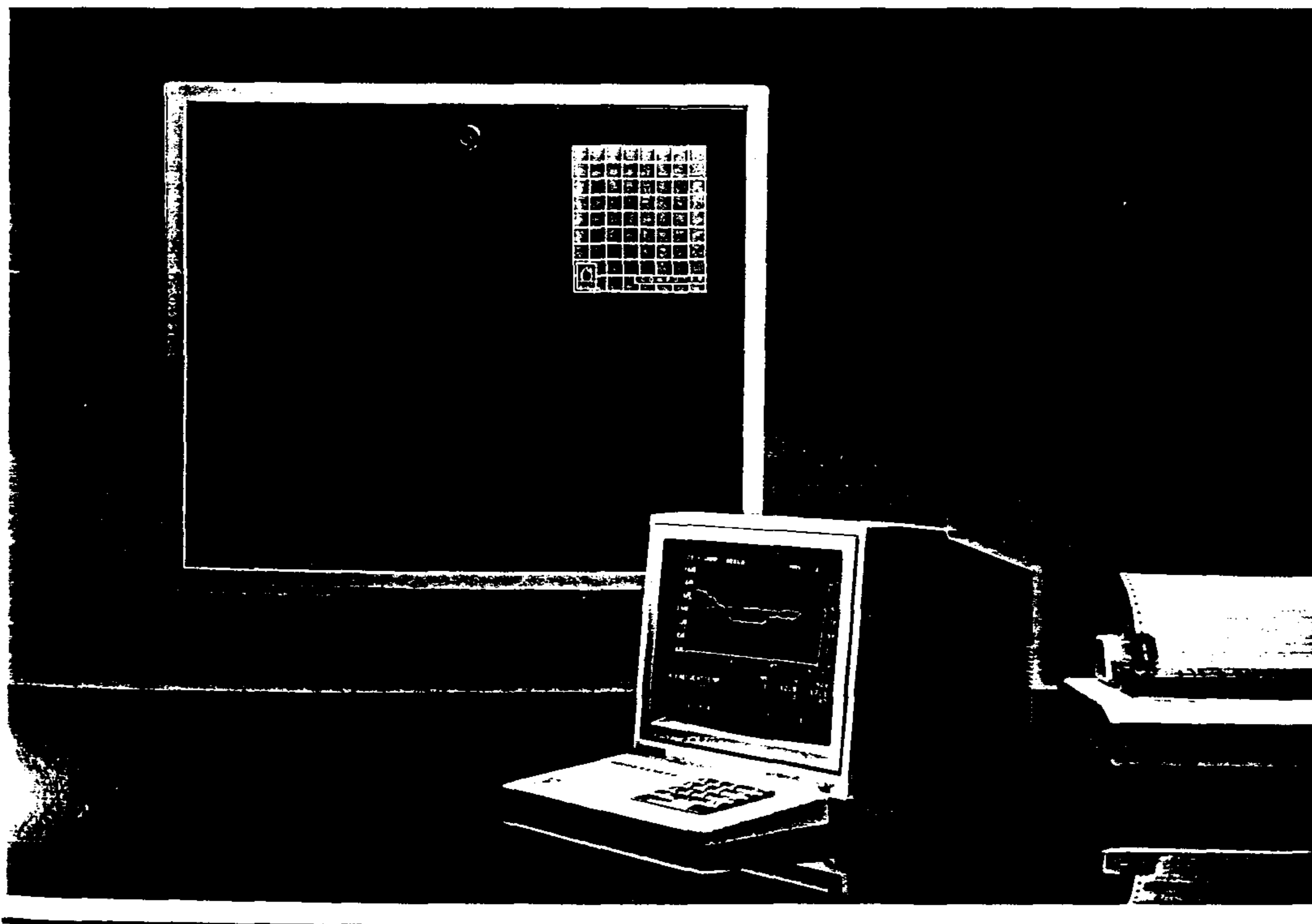
FIGURE 1 : Structure of the Ethernet LAN linking a mainframe configuration, cluster computers and workstations. The field-bus connects the PCUs (Process Control Units) with the cluster computer.

The requested characteristics were among others:

- Distributed intelligence / control.
- Development and test of measuring and control functions by means of an object oriented tool.
- Optimum use of open standards for hardware and software.
- Integrated alarm detection and alarm handling.
- Current source and signal conditioning on ADC input modules. Only 4 wire connection to Pt100 and potmeters, no external power or electronics.
- High measuring accuracy for temperatures, 0,05 °C or better, without the need of regularly calibrations.
- Two wire connection for digital inputs to sense isolated dry contacts without the need of external power.
- Three wire connection for digital inputs to sense proximity switches or infrared detectors. The third wire carries +24V to supply the detector electronics.
- It must be impossible in all situations to activate at the same time the 2 output signals which belong to one position control or one watertemperature control.
- Password and permission category for each operator.
- Each user adjustment will have a permission number.
- Trending facilities, Real-Time and Historical.
- Graphical representation where useful.
- Report generation.
- Full autonomy of the measurement and control functions.
- Capability of executing FORTRAN based programs.
- Easily programmable interfaces for devices with serial communications.

PRIVA CLIMATE COMPUTER CV 150

The computer which any small-scale nursery can certainly afford. There could be no better investment.



Automation in glasshouse horticulture has become quite common. For a computer-controlled and regulated environment offers many direct advantages. A higher output of better quality products thanks to the most optimized environmental conditions, monitored day and night. At lower cost of energy. Thanks to automation, the grower can count on up-to-the-minute information about his operation, so that he can readily respond in an optimum manner in order to adjust the process or adapt his plans to the most recent facts and details. Automation is certainly not only reserved for large-scale nurseries. Especially designed for smaller nurseries or a smaller number of compartments, we have the CV 150 Priva climate computer.

All in one hand

The CV 150 is a fully-fledged climate computer. So in fact it is an excellent alternative for nurseries that have not yet automated, or those which are still operating with analogue control equipment. Once in the possession of a CV 150, you will have all daily activities accurately controlled in a very simple and reliable way. The integration of all those activities aimed at controlling the greenhouse environment is a major advantage of the CV 150. In addition, the system can be coupled to other equipment, such as for example a business computer, to record the climate data automatically.

The CV 150 comes with a video display and keyboard as standard features. A printer is optional. The system is adapted for extension with one or more operator stations, providing you with complete operating and control facilities in several locations. Operating the CV 150 is very easy and effective. Moreover, Priva ensures perfect instruction and assistance. So, in practice, working with the CV 150 will be simplicity itself!

Control programs and possibilities

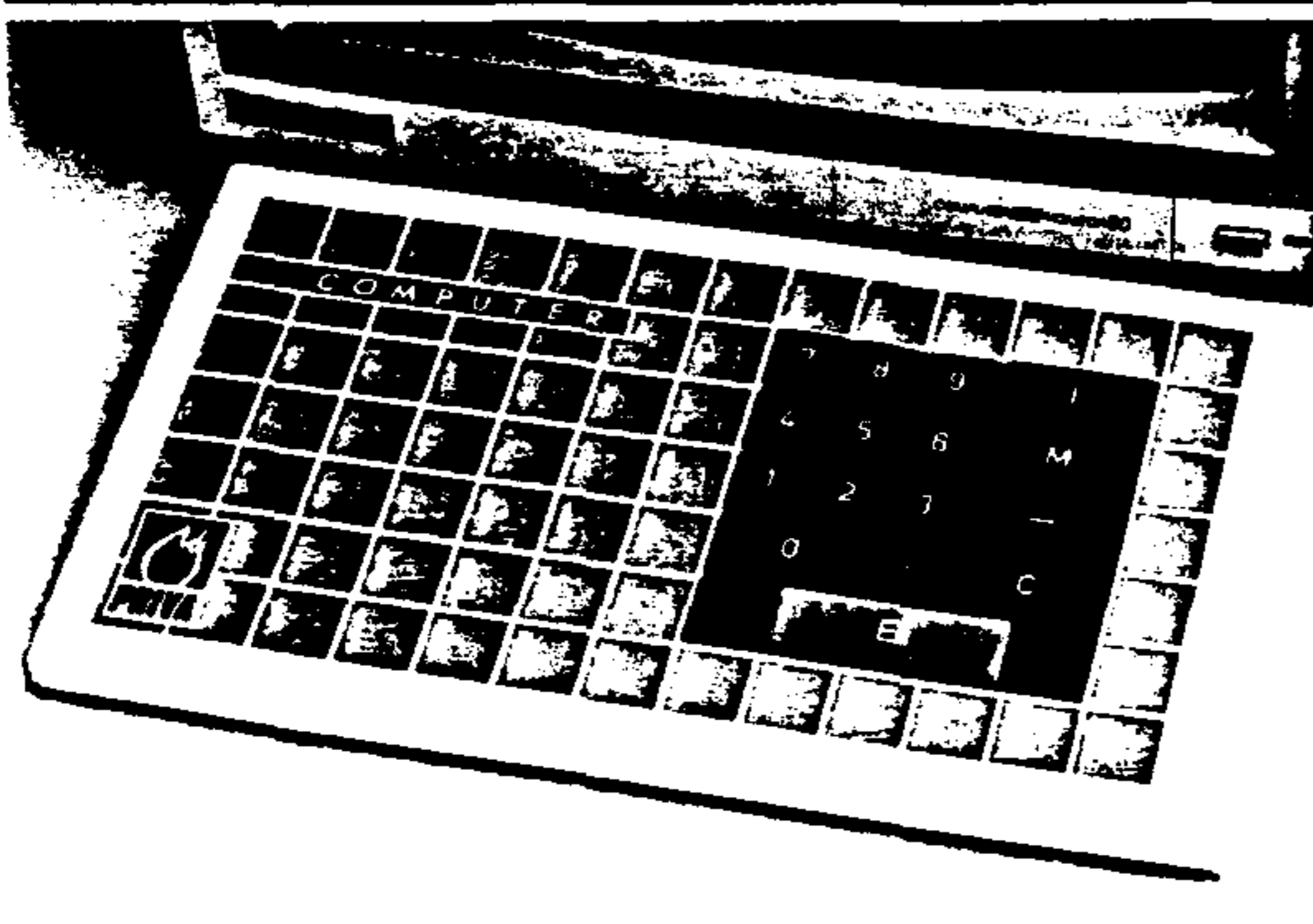
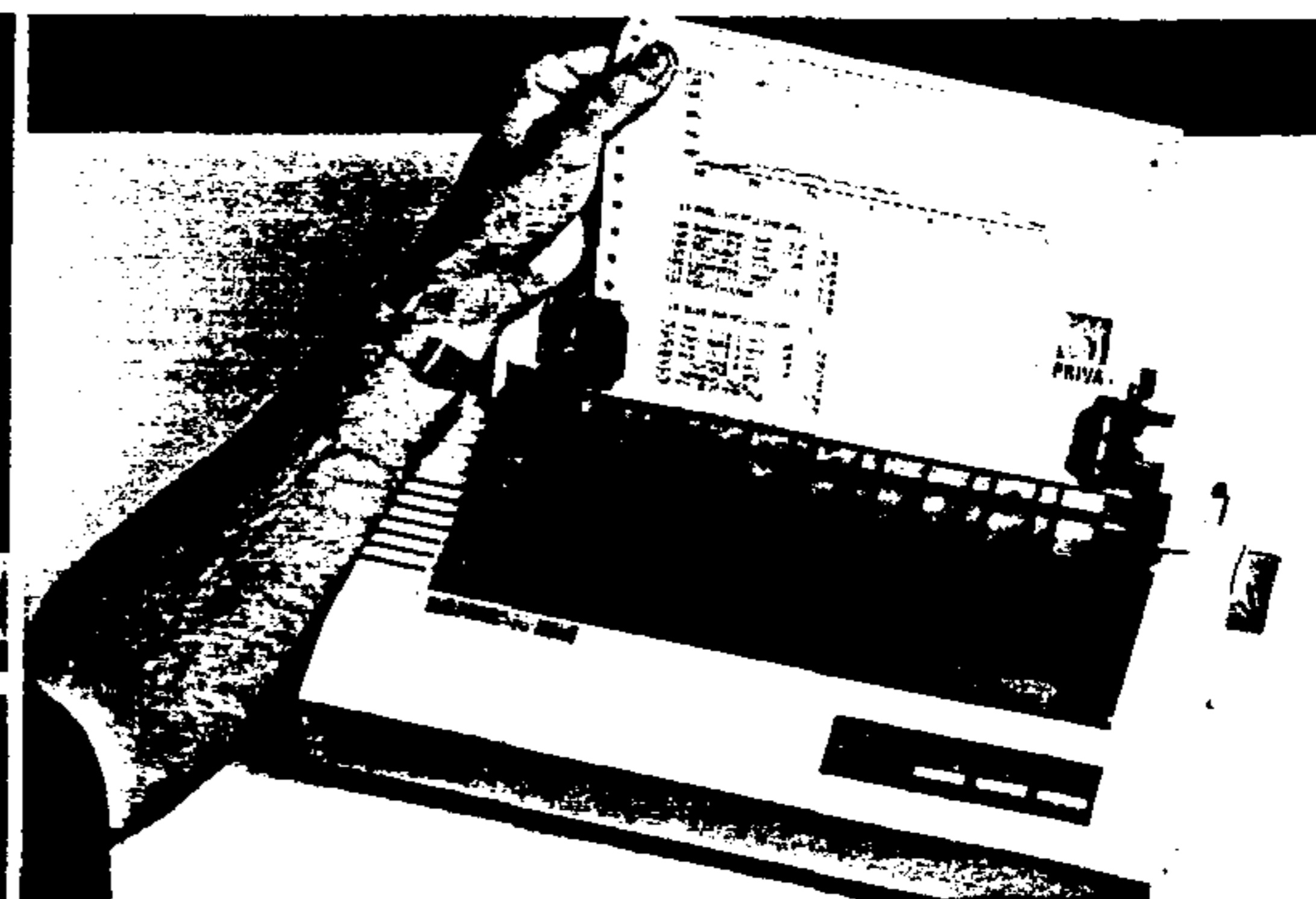
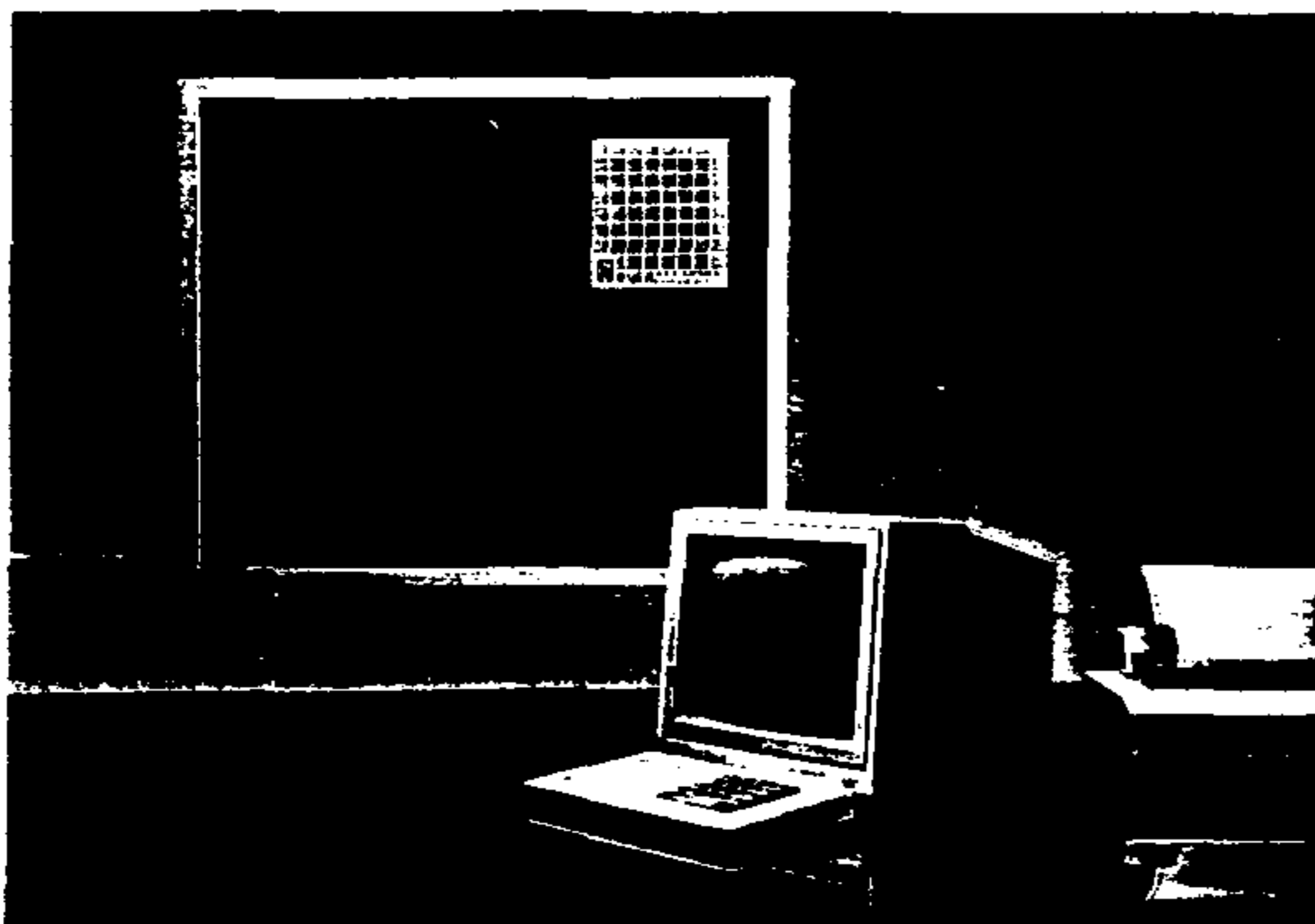
The operation of the CV 150 climate computer can be divided into three functions:

- Optimal control of the greenhouse environment
- Recording of data about the environment
- Monitoring and alarm activation

Control

To enable you to achieve optimum greenhouse environment, all kinds of control programs are available with the CV 150. For instance:

- the mixing valves, circulating pumps, warm-air heaters and vents, as a function of air temperature and air humidity
- the blackout, shading and/or thermal screen system
- CO₂ enrichment, centrally or per compartment
- the circulating fans
- the flue-gas condenser network
- the hot-water distribution line
- the boiler water temperature
- the assimilation lighting



Recording

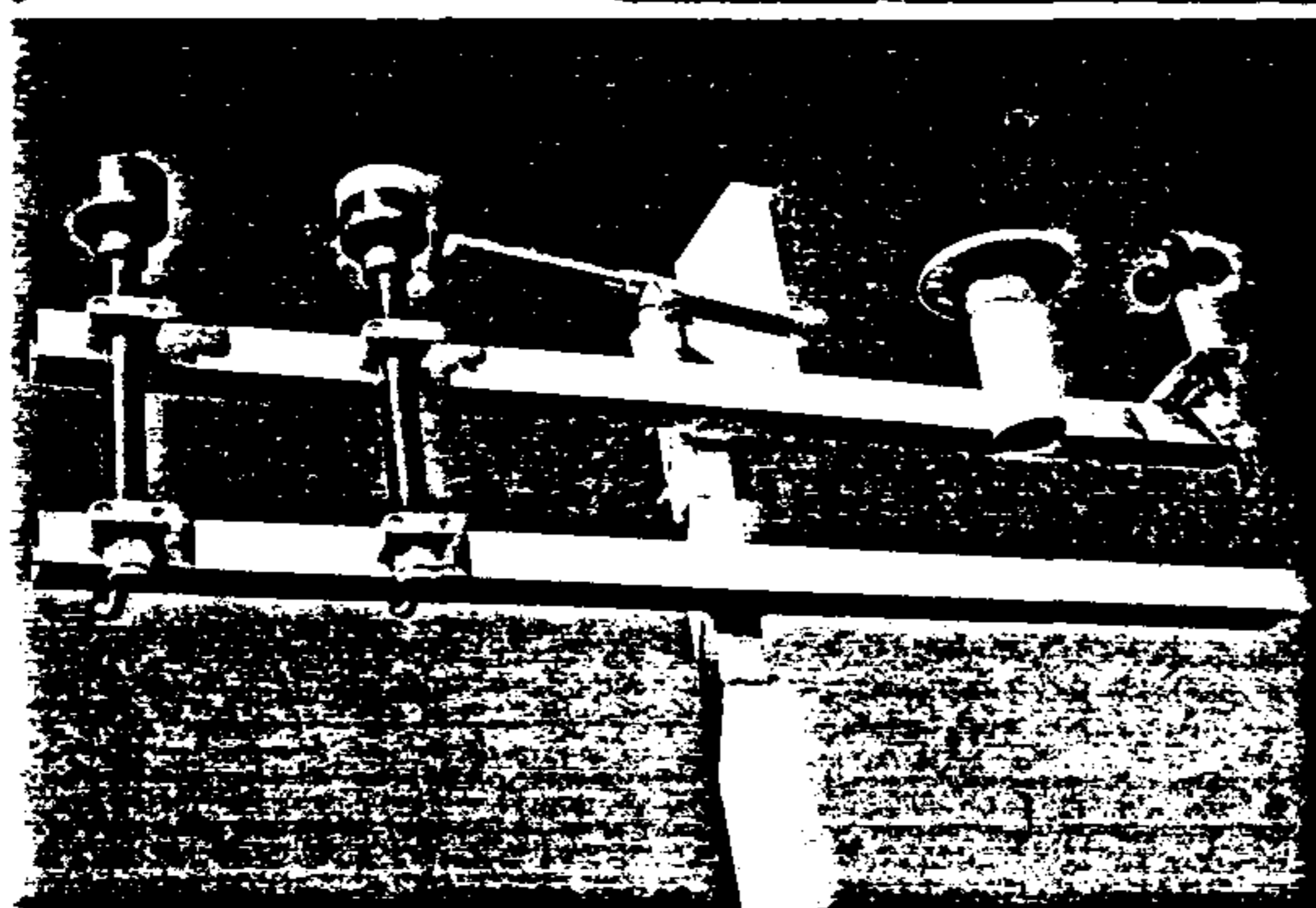
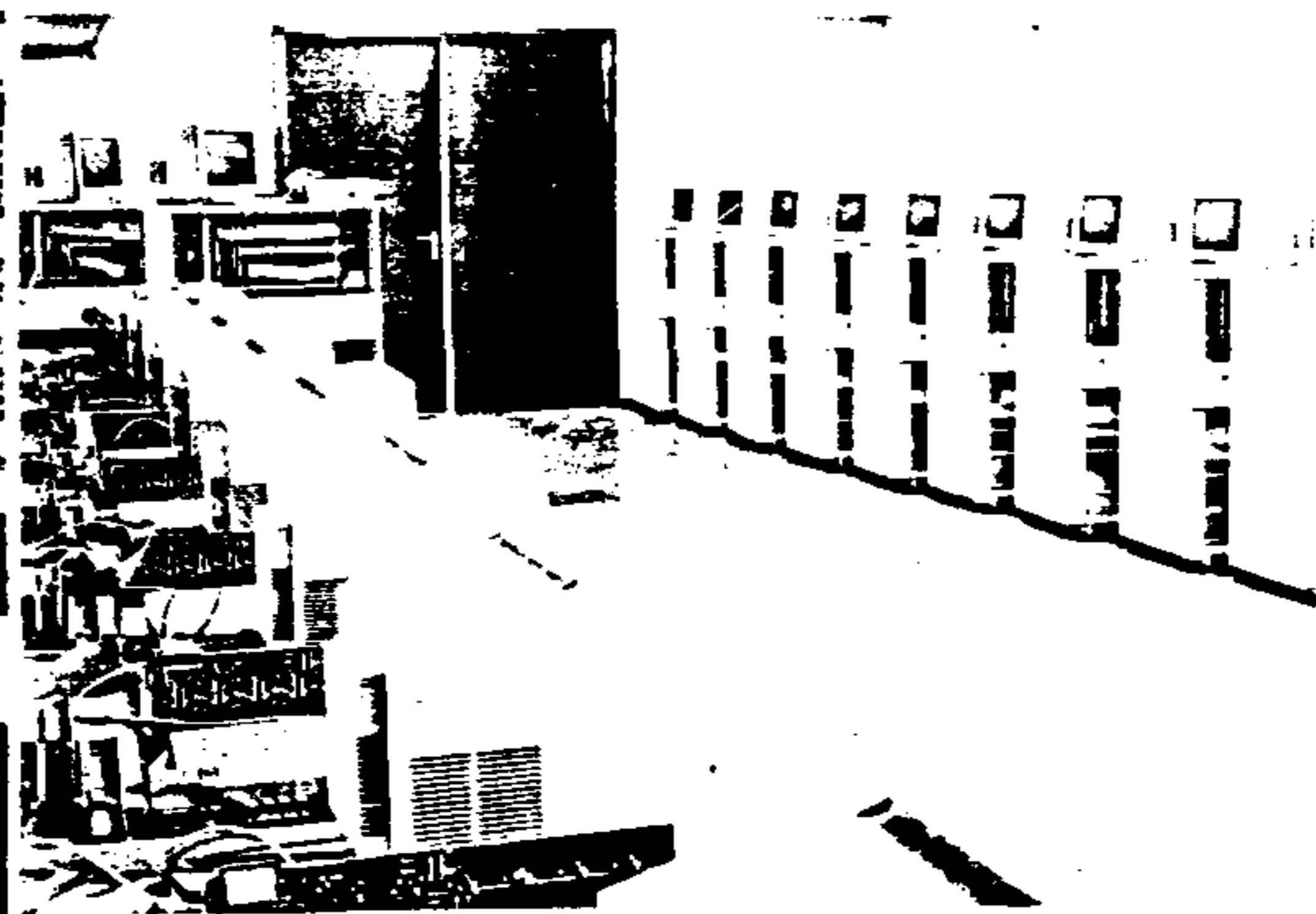
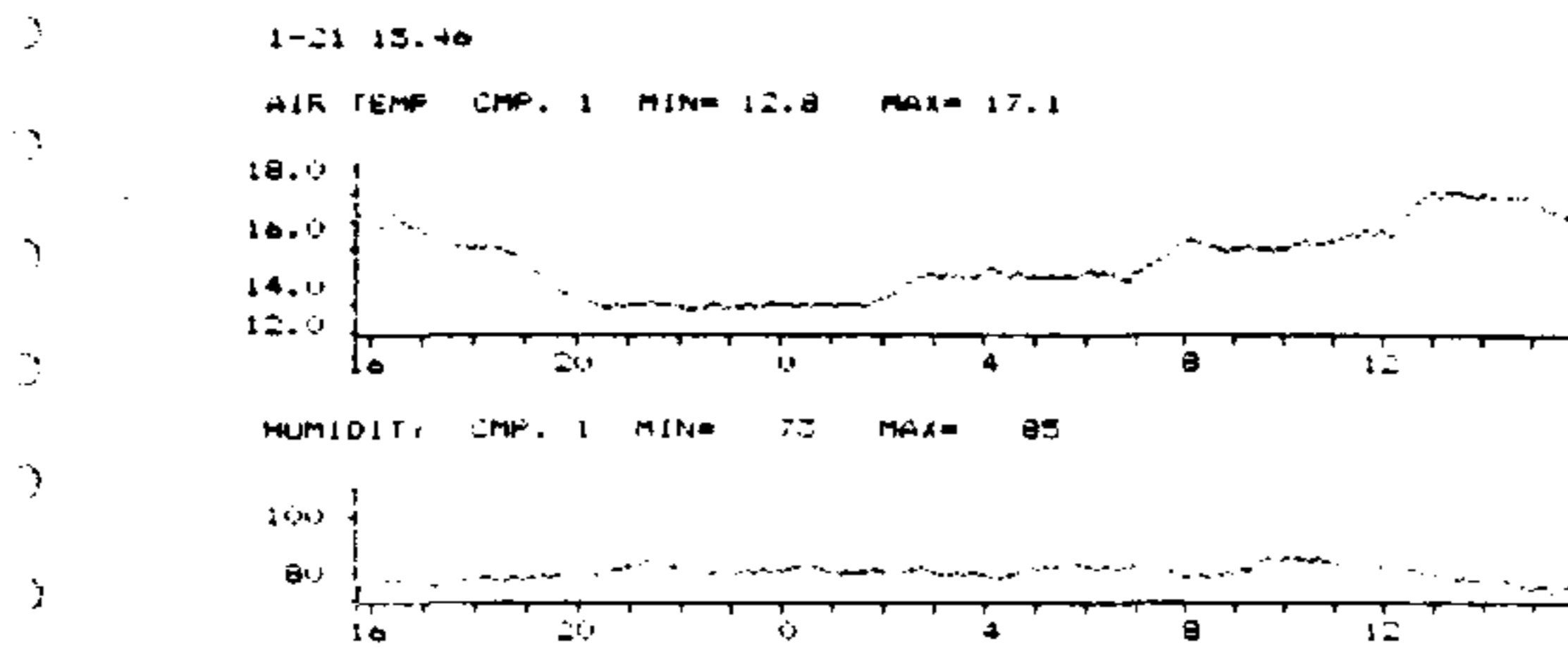
Periodically or at any moment desired, you can call measurement reports on your screen or have them printed (automatically). In numbers indicating the exact values at certain specified moments.

In addition to these numerical reports, Priva has also given much attention to surveys of measured values in graphs. For, this provides at a glance a clear insight into the development of these values.

There are two graphics programs available:

- Graphics on the printer. At a pace you set (for example once every 24 hours), the values requested are printed in graphical form.

- Graphics on the screen. A new and unique possibility for you to continuously follow the development of the most important values for, for example, the last 24 hours, without any additional equipment. The latest measurements are consistently being added to the graph and the oldest disappear. It is even possible to project two graphs simultaneously on the screen, thus greatly facilitating an analysis of the results.



Alarms

Besides providing optimal control features, all kinds of situations are being monitored. For example, any malfunction in the control system is reported immediately, and it is always possible to have an alarm report appear on the monitor screen.

Choosing Priva

Choosing Priva is your best choice for the future. Since with Priva you will be able to keep abreast of the latest developments in the field of control techniques and crop engineering.

Priva is the world's largest supplier of climate computer systems used in glasshouse horticulture. With over 5,000 Priva computers in operation all over the world day and night.

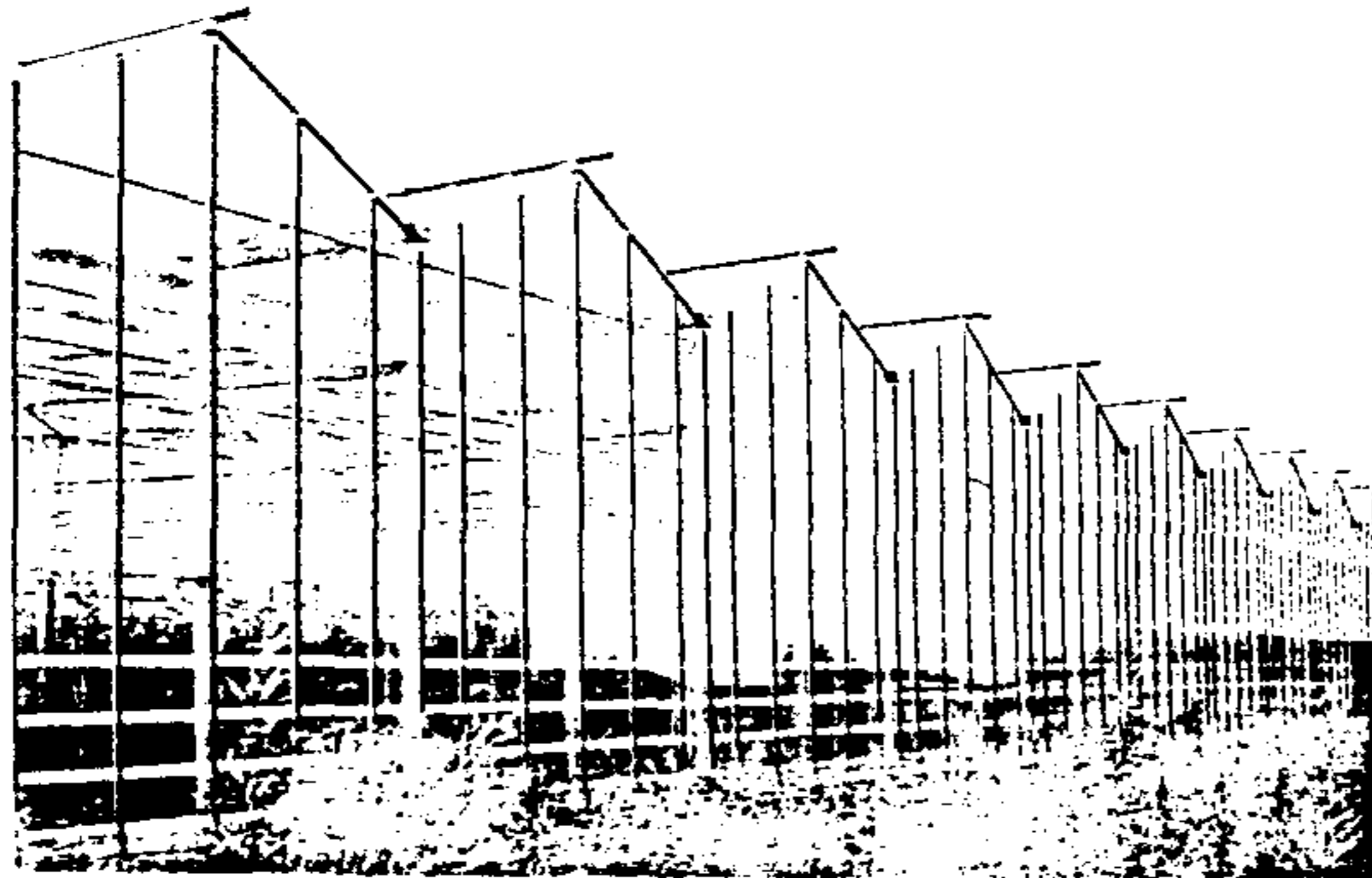
Priva's experience and know-how guarantee the highest standards, both in terms of the equipment and with the latest applied horticultural research translated into excellent control programs developed specially for the horticultural industry and based on many years of experience and knowledge.

More information

More information about the CV 150 and other Priva equipment is available directly from Priva or any one of the selected Priva distributors. Also, you are most welcome to visit us for a demonstration.



Priva Agro BV
Zijlweg 3
P.O. Box 18
2678 ZG De Lier (ZH), The Netherlands
Telephone +31-1745-13921
Fax +31-1745-17195



recommended for modern, sealed greenhouses and also for sensitive crops.

IMPORTANT ADVANTAGES

- In addition to being a source of CO₂, the equipment is also suitable for heating.
- The efficiency of the Priva CO₂ generators is 100%.
- The CO₂ generators have a high air capacity and throw.
- They can be used in practically all types of greenhouses.
- Clean combustion.
- Easy to install.
- The switch panel with printed circuit board form ensures a high level of reliability.
- The CO₂ generators can be switched on sequentially, which prevents peak loading of the electricity supply.
- All gas fired CO₂ generators are equipped with optimum safeguards.

THOROUGH CHECKS AND INSPECTION

Before they leave the factory, every unit is checked thoroughly, tested and adjusted.

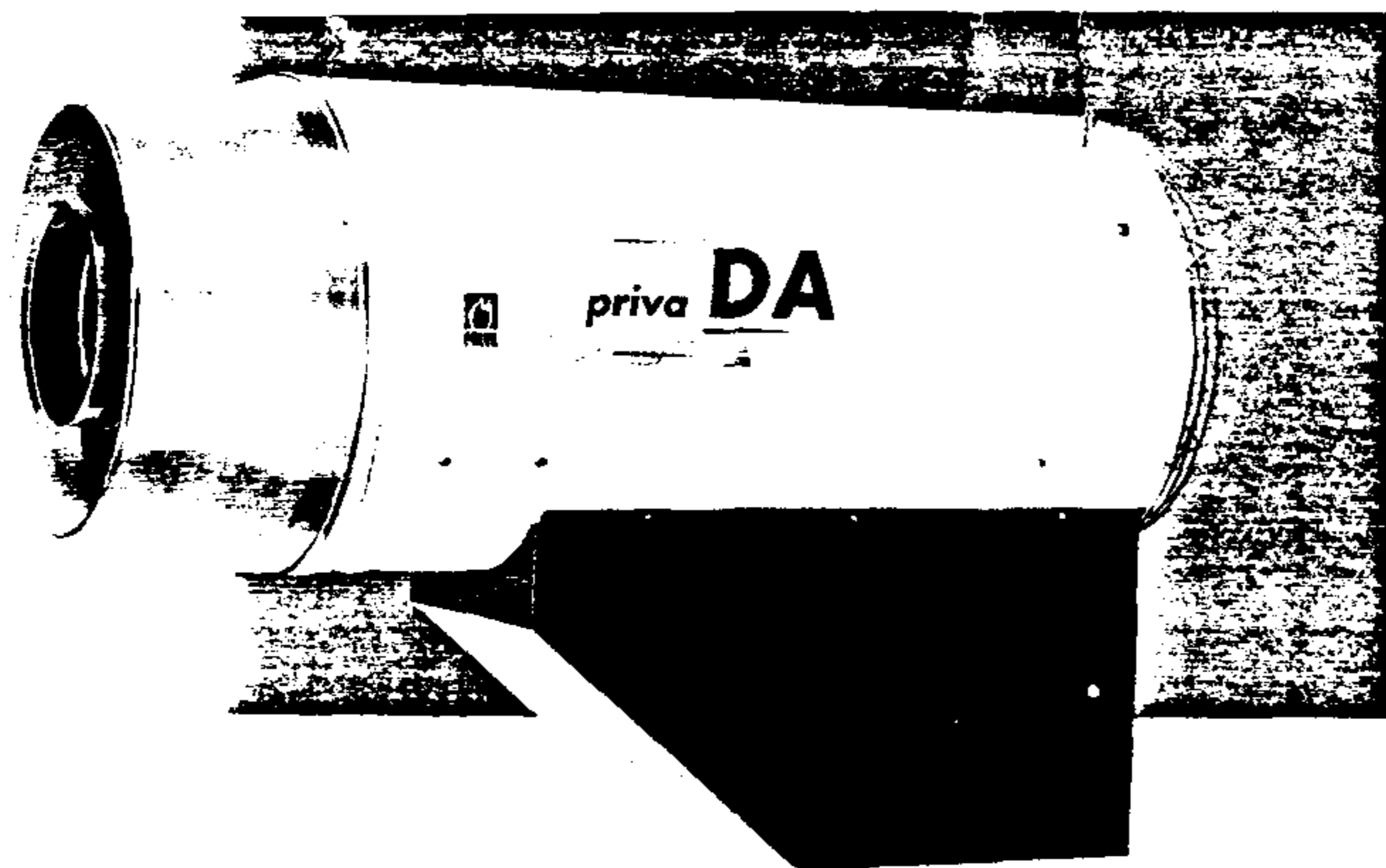
Priva uses special test cabins equipped with the most modern measurement and control equipment.

EXPERT INSTALLATION AND SERVICE

Priva CO₂ generators are sold and installed only by specialised dealers and heating installers. This guarantees a technically perfect installation and rapid, reliable service.

MEASUREMENT AND CONTROL EQUIPMENT

CO₂ dosage is not the only Priva speciality, but there is also the accurate measurement and control of the CO₂ percentage. For this purpose, the Priva range includes special CO₂ meters, CO₂ scanners and computer software.



Priva supplies CO₂ generators from
32.000 to 106.000 Kcal/h.

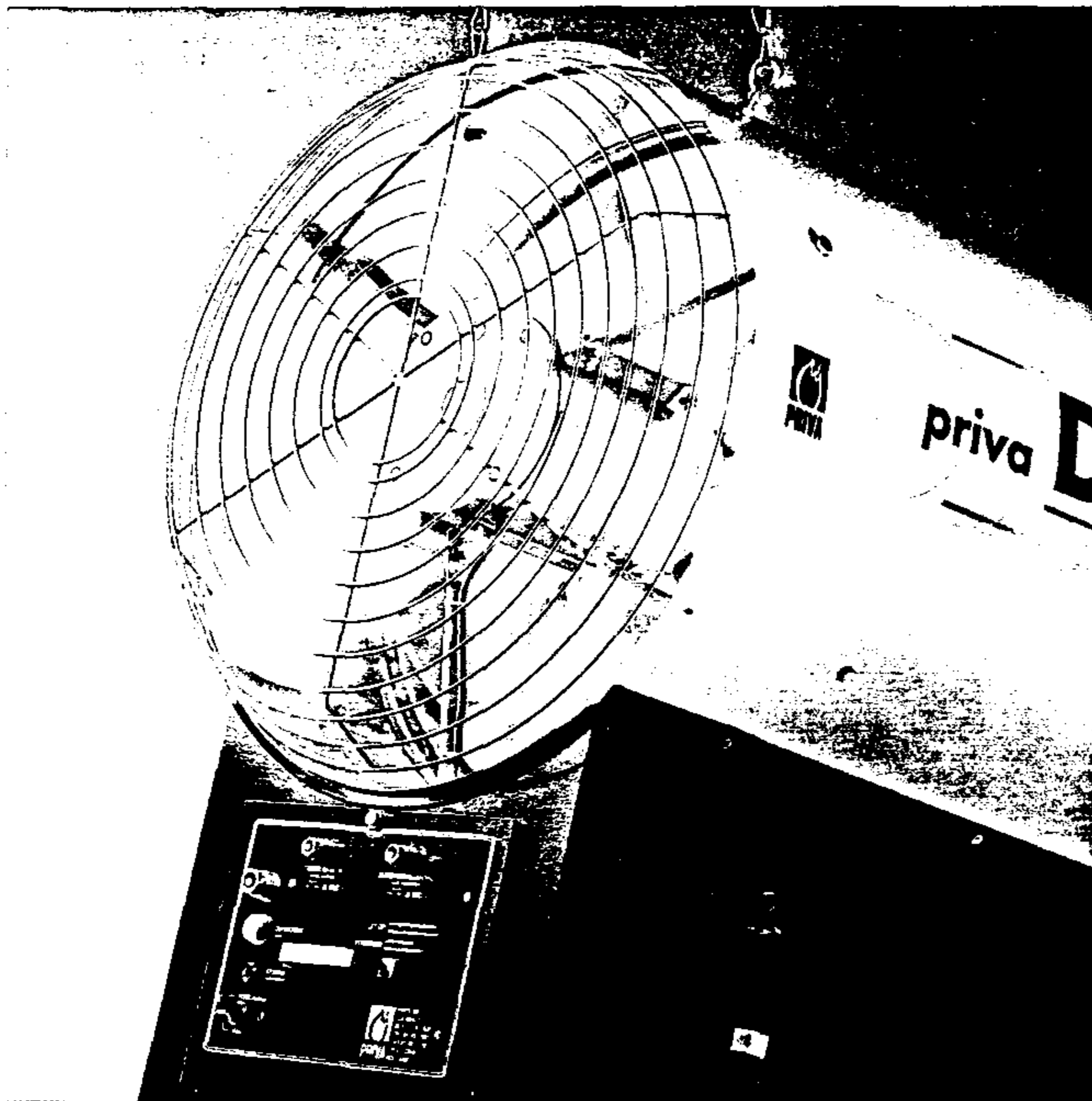


If you do it well, you do it with Priva!

PRIVA AGRO BV - ZIJLWEG 3 - P.O. BOX 18 - 2678 ZG DE LIER (ZH) - THE NETHERLANDS
TELEPHONE +31-1745-13921 - FAX +31-1745-17195

Priva CO₂ generators

CO₂ GENERATORS FOR THE GREENHOUSE INDUSTRY



PRIVA SUPPLIES AN EXTENSIVE RANGE OF GAS FIRED AND OIL FIRED CO₂ GENERATORS THAT ARE SUITABLE FOR THE DOSAGE OF CO₂ AND FOR HEATING THE GLASSHOUSE. THE GENERATORS MEET THE HIGHEST QUALITY REQUIREMENTS SET IN THIS FIELD.



CO₂ is by far the most important nutritional element for a plant. Without CO₂, growth is not possible. The plant produces the greater part of all necessary building materials from water and CO₂ absorbed from the air. For this reason, the CO₂ concentration in the air has a considerable influence on the growth and production of plants. In outside air CO₂ concentration is usually 0.032% or 320 ppm. Increasing this percentage by dosing CO₂ during favourable periods of growth together with sufficient light and heat accelerates growth and increases crop production. Priva CO₂ generators are available for propane, natural gas or paraffine. The combustion gases from these fuels contain a high percentage of CO₂.

MARKET LEADER IN CO₂ GENERATORS

Since the introduction of CO₂ dosage in the early sixties, Priva has been the market leader in the development and manufacture of CO₂ generators for the greenhouse industry. Modern horticulture sets high standards for quality, durability and reliability of the equipment, and, at the same time, energy consumption must be as low as possible.

ALSO FOR HEATING

Priva CO₂ generators are also suitable for heating a greenhouse. Also when heating, the combustion gases are released into the glasshouse and the CO₂ percentage of the greenhouse air is increased. The equipment is often worked harder than when dosing CO₂ alone.

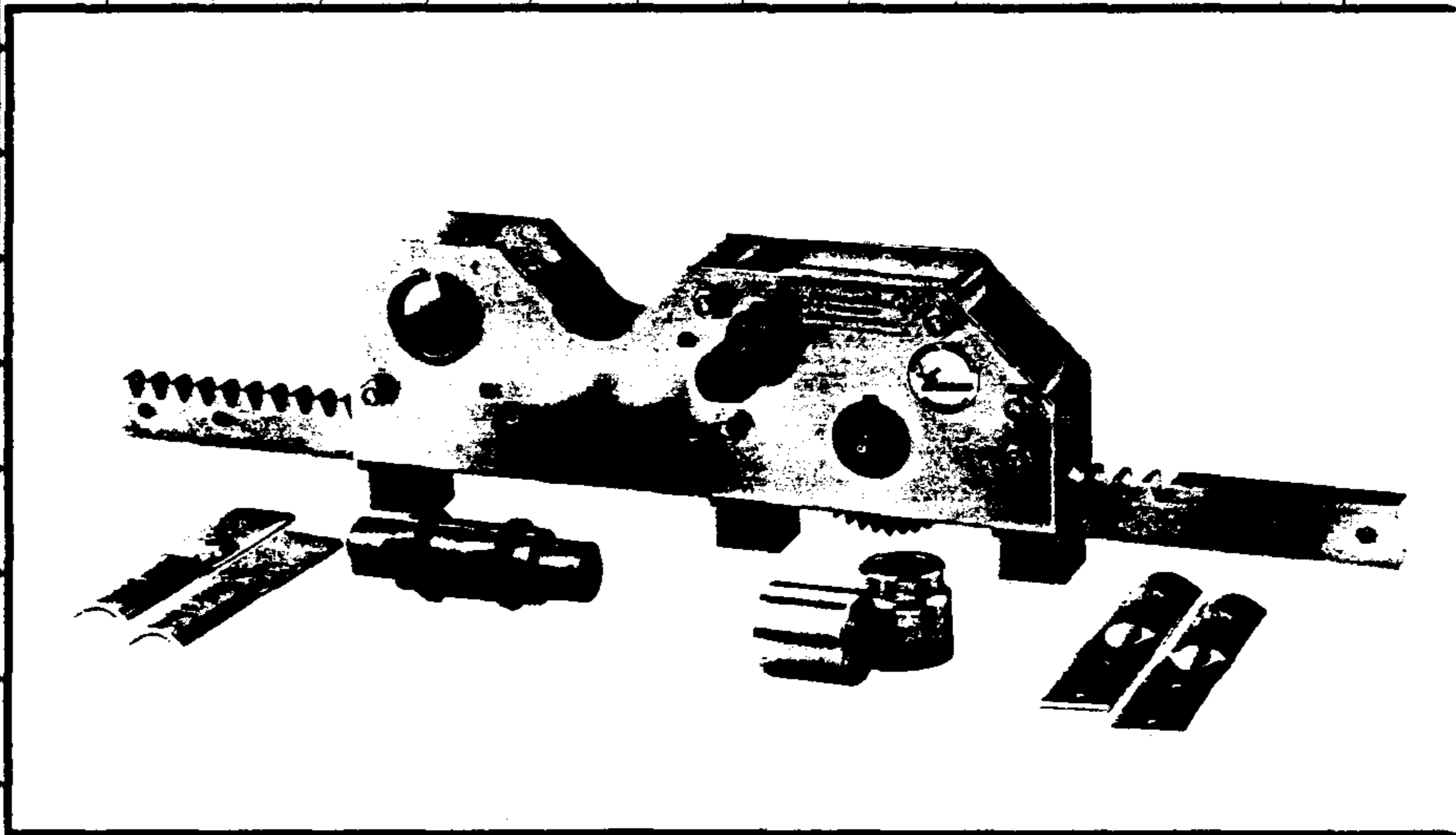
In this case Priva CO₂ generators can be equipped with a mechanical external air supply for the supply of oxygen rich combustion air. This is particularly



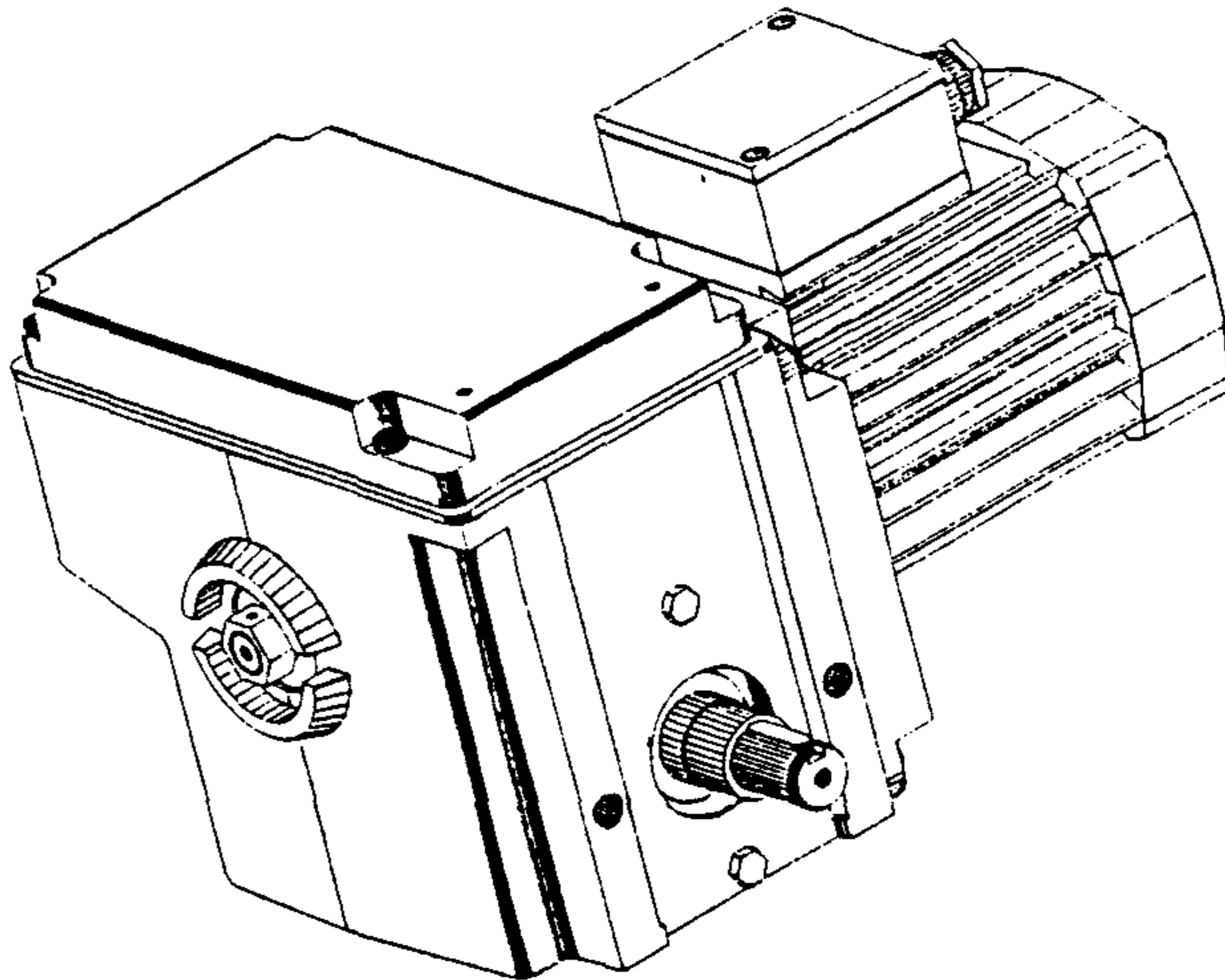
RIDDER machinefabriek b.v.

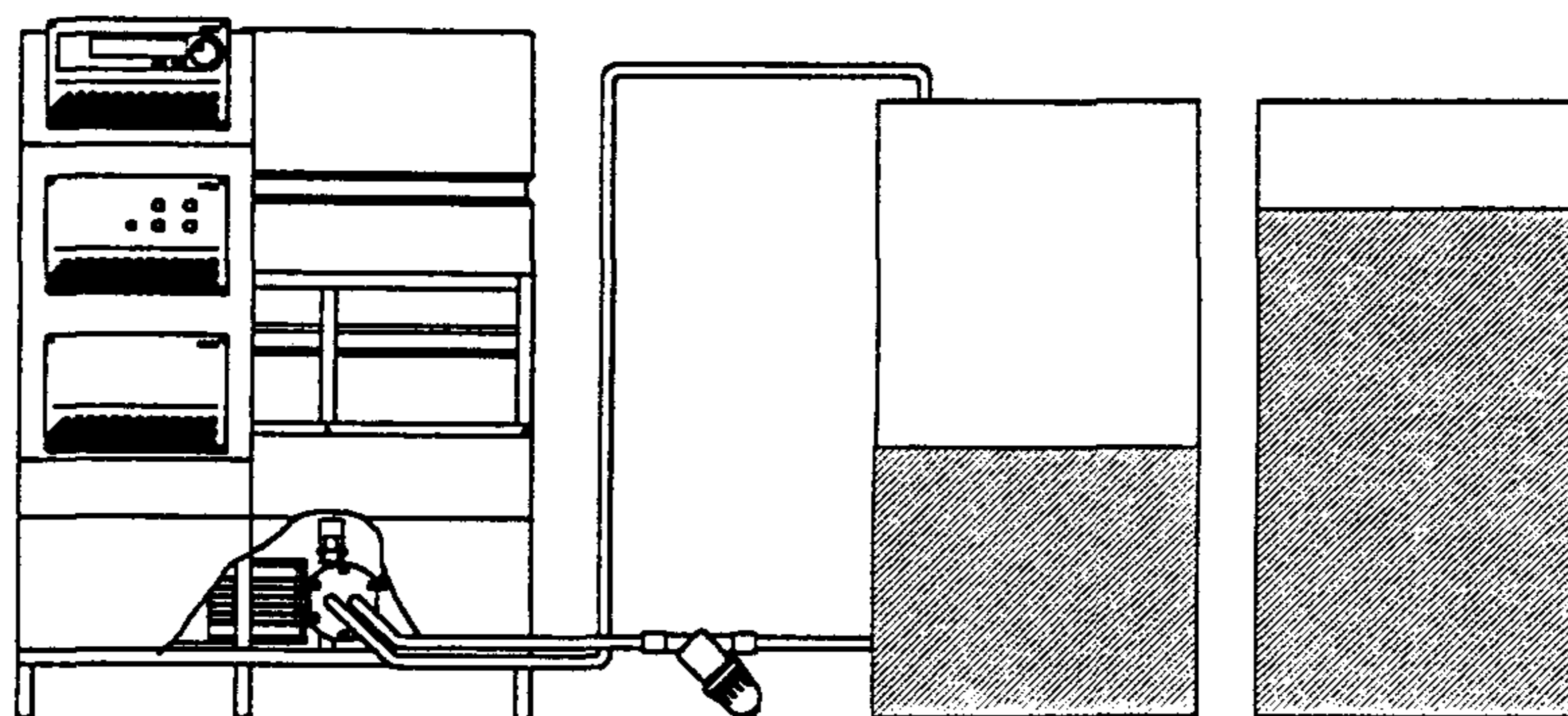
Industrieweg 20 - Postbus 360 - 3840 AJ Harderwijk (Holland) - Tel. (31) 3410-16854* - Fax (31) 3410-16611

TR 25 KC 100



RW45





- ➔ **Exact dosing even with uneven levels in the stock solution tanks**
- ➔ **EC-control in relation to solar radiation**
- ➔ **2 sets of EC- and pH-sensors**
- ➔ **Measurement of EC and pH in fresh water**
- ➔ **Measurement of EC and pH in drainage water**
- ➔ **Advanced alarm functions**
- ➔ **Integrated part of the System 9000 which includes also irrigation and climate control**
- ➔ **Possibility of collecting data on a PC**

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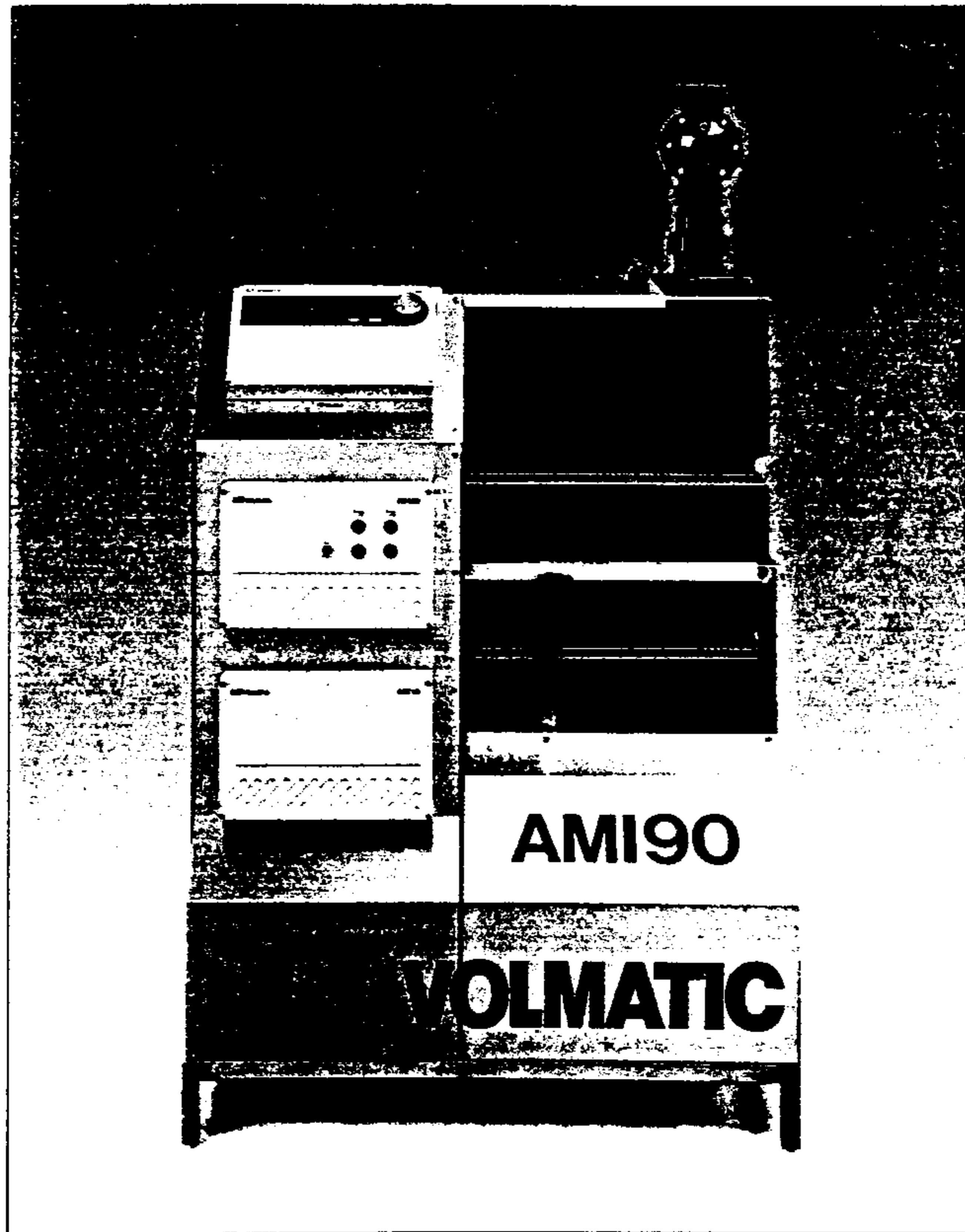
DGT-VOLMATIC A/S

2-4 Vejlesvinget
2665 Vallensbaek Strand
Denmark

Phone no. +45 43 73 11 00
Fax no. +45 43 73 01 10

DGT·VOLMATIC

AMI90

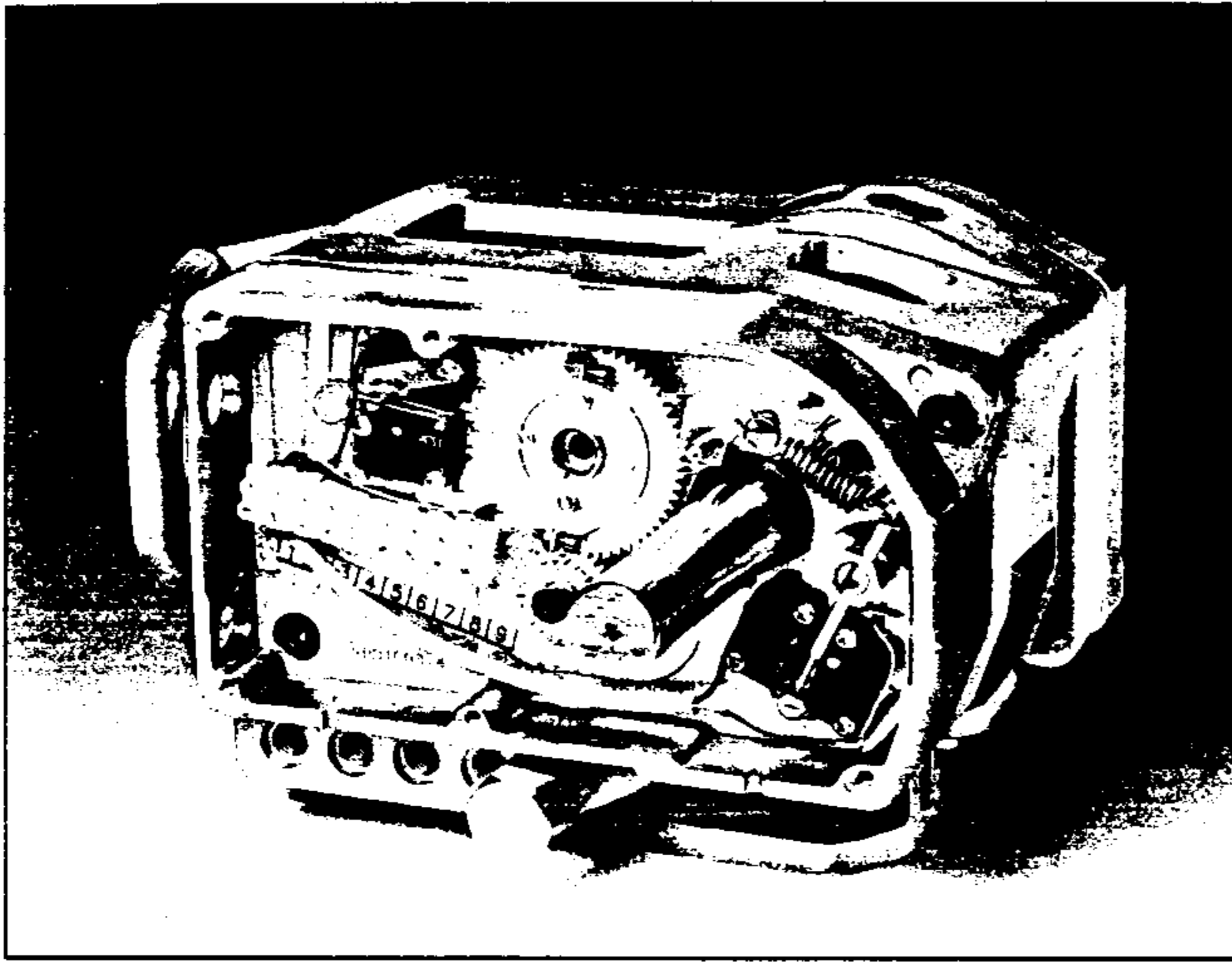


**Exact and reliable
fertilizer mixer**

.....

DGT-VOLMATIC

THE LG 403/5 MACHINE - DECADES OF EXPERIENCE COMBINED WITH HIGH TECHNOLOGY



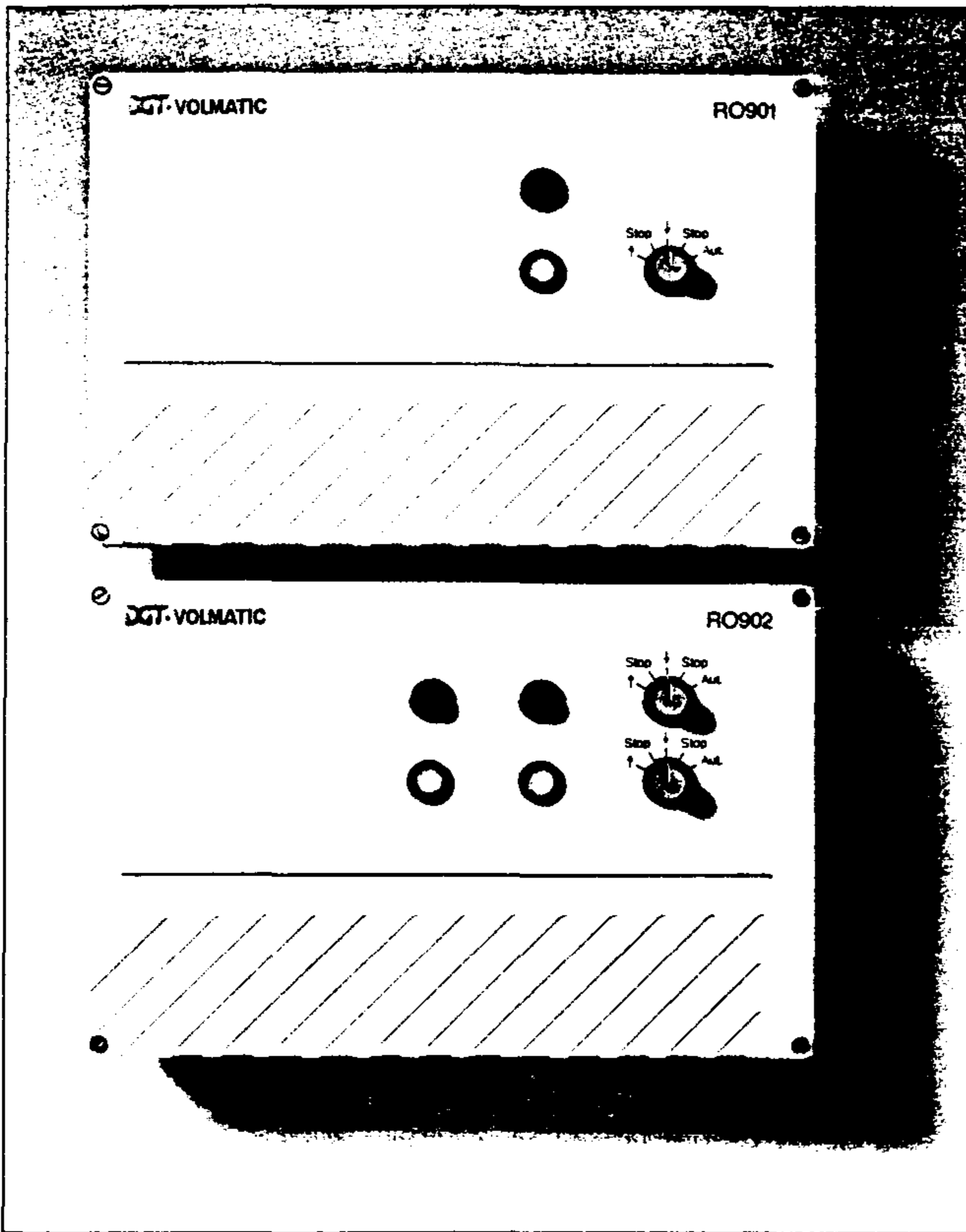
- **Built in limit stop**
- **Mechanical and electrical limit stops for ultimate safety**
- **Torque and travel limitation provides fool-proof operation.**
- **From 1-200 Rev. travel can be adjusted on site.**
- **Torque is easily adjusted by moving just one bolt.**
- **Torque springs available in several versions incl. reversed torque.**
- **Baseplate with adjustment bolts for exact installation.**

.....

DGT-VOLMATIC A/S

2-4 Vejlesvinget
2665 Vallensbaek Strand
Denmark

Phone no. +45 43 73 11 00
Fax no. +45 43 73 01 10



Description:

RO 901/902 is a master relay for 1 or 2 gear motors intended for shading or ventilation systems. RO901/902 is used for manual operation of the gear motor and as power relay for control of f.inst. climate computers.

RO901/902 has built-in overload switch as well as intermediate relay, i.e. the control current is very low (approx. 10 mA).

The relay unit is supplied in a splashproof plastic box. The RO901/902 standard unit will be delivered with overload switch for 1/4 HP motor and for 1/2 HP motor.

RTV 5B/ RTF 5B Temperature/ humidity sensors



DGT·Volmatic has two very accurate sensors, RT 5B, which works with dry + wet sensor principle. The dry sensor indicates the room temperature. RTF 5B is an electronic hygrometer with a built-in room temperature sensor. They are used for measuring of temperature and air humidity, and both are used together with DGT·Volmatic climate computer.

Placing of sensor

The RTV 5B sensor and the RTF 5B sensor are placed in the middle of the greenhouse maximum 2 m from the centre walk. The height of pot plants about 20 cm above plant top. The sensor should be placed in the middle of the transplants when tomatoes/cucumbers are in question. N.B. Be careful that heating pipes and openings between the tables do not affect the sensor.

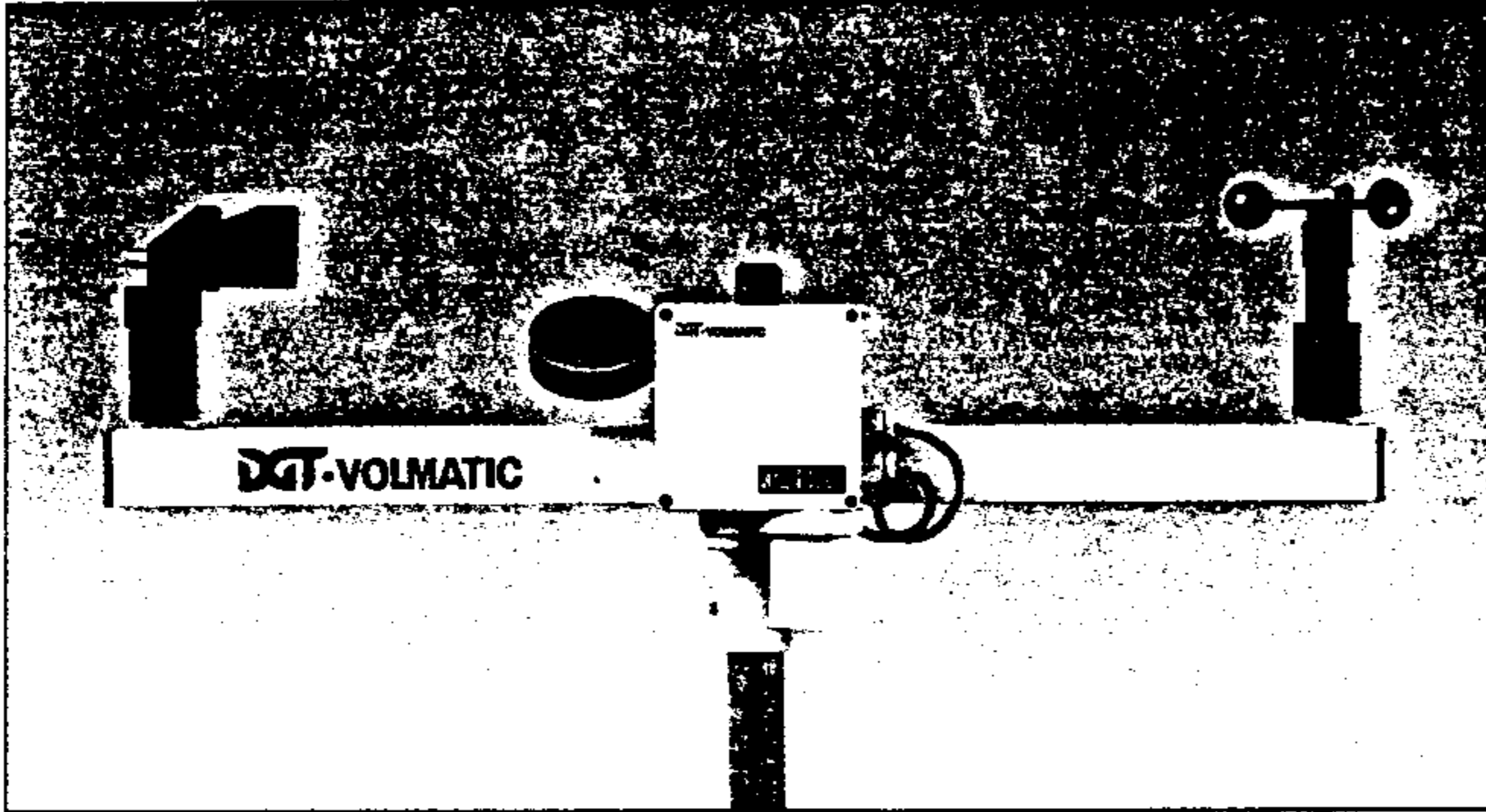
Maintenance

RTV 5B temperature/ humidity sensor

Demineralized water is filled in the tank when it is almost empty (about 14 days) and the "stocking" at the wet sensor is changed every 14th day. The wet sensor element is cleaned for lime if any.

RTF 5B temperature sensor

No maintenance but should be checked at least once a year.

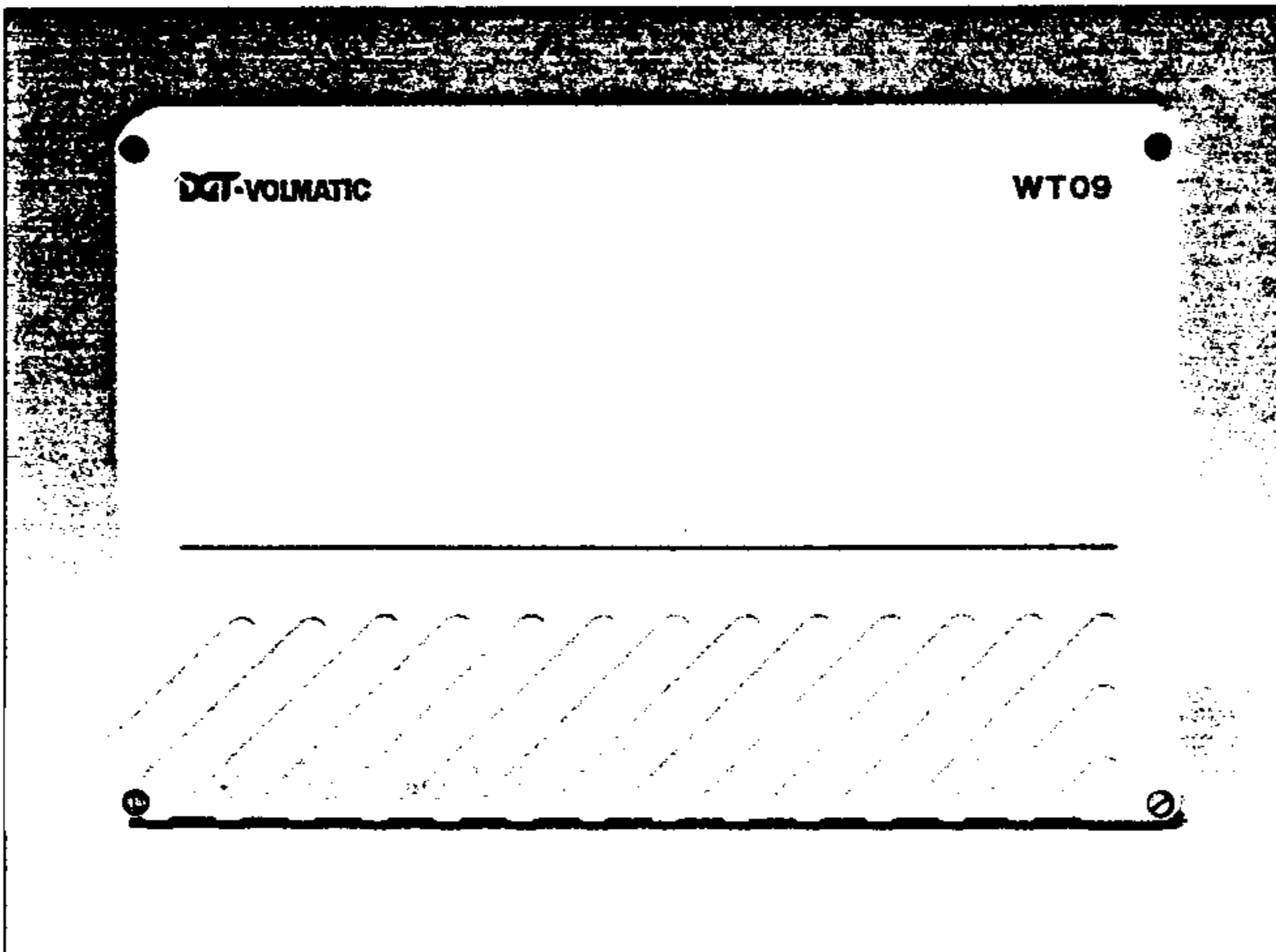


MS900 is the compact meteorological station for the LCC900/LCC90 climate computer series.

On the mast 5 high quality sensors for measuring of the outside climate have been mounted on the mast .

The sensors measure the outside temperature, wind direction, wind speed, solar radiation, and rain.

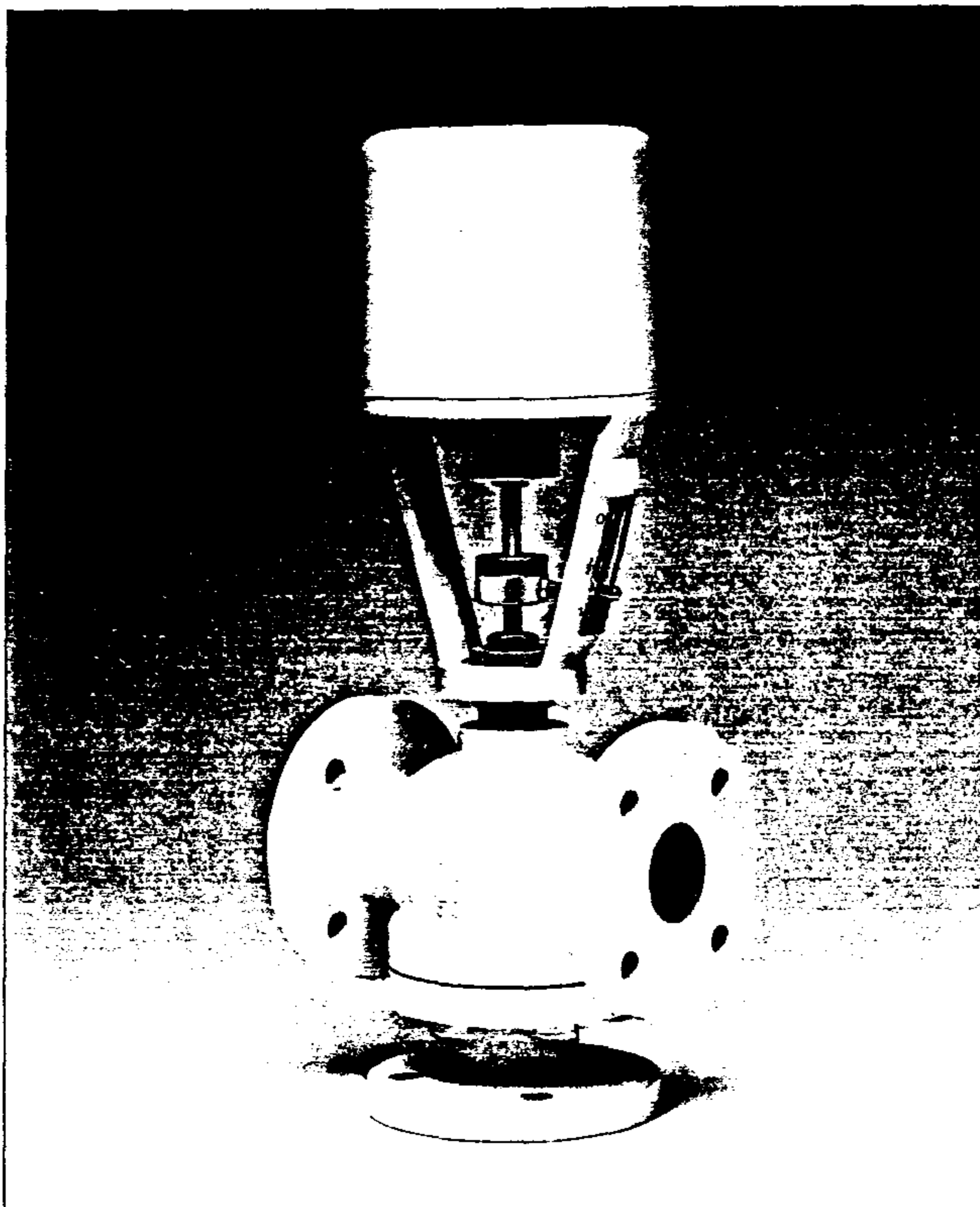
For the measure of light a standard solar cell is used.



The mast is to be placed so that exposure to shadow and wind is avoided. There must also be easy access for inspection.

The outside temperature sensor is screened so that the solar radiation does not influence the sensor.

The wind direction sensor and rain sensor have been placed so that no shadows reach the sensor for measuring of solar radiation which could interfere with the measurements.

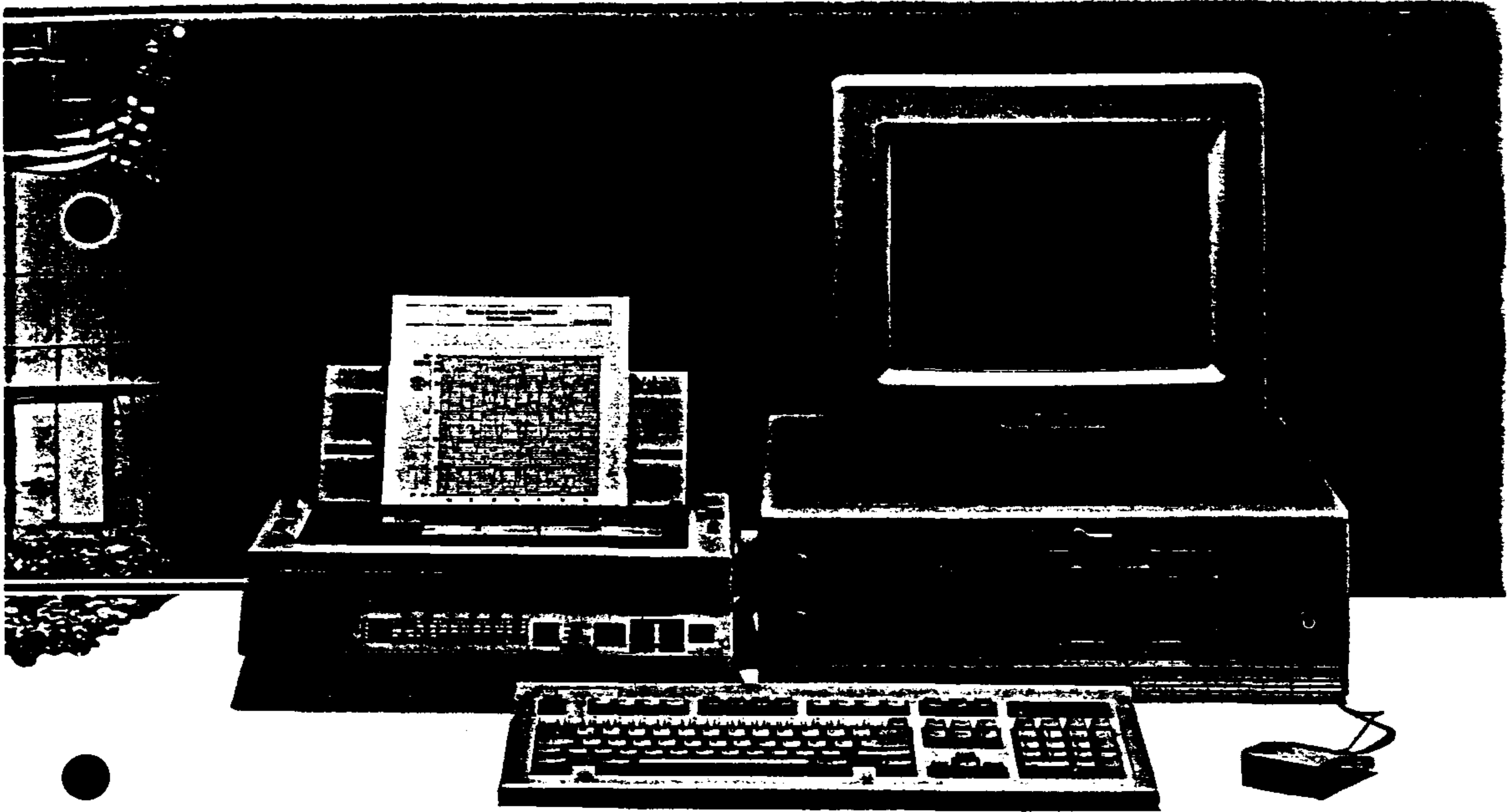
**Reliable heat valve**

DGT-Volmatic's heat valve WV II is a 3-way regulating valve for controlling hot water heating systems. WV II is made to meet the special requirements of heat regulation in greenhouses and with special emphasis on reliability.

WV II has a reliable electric motor which can be supplied with connection for 24 or 220/240 V. The end stop is designed in such a way that it also functions as overload protector. Consequently breakdowns can be avoided in case the cone is jammed by foreign bodies in the water, e.g. iron scales. If the power fails, the valve can be controlled by a simple manual operation.

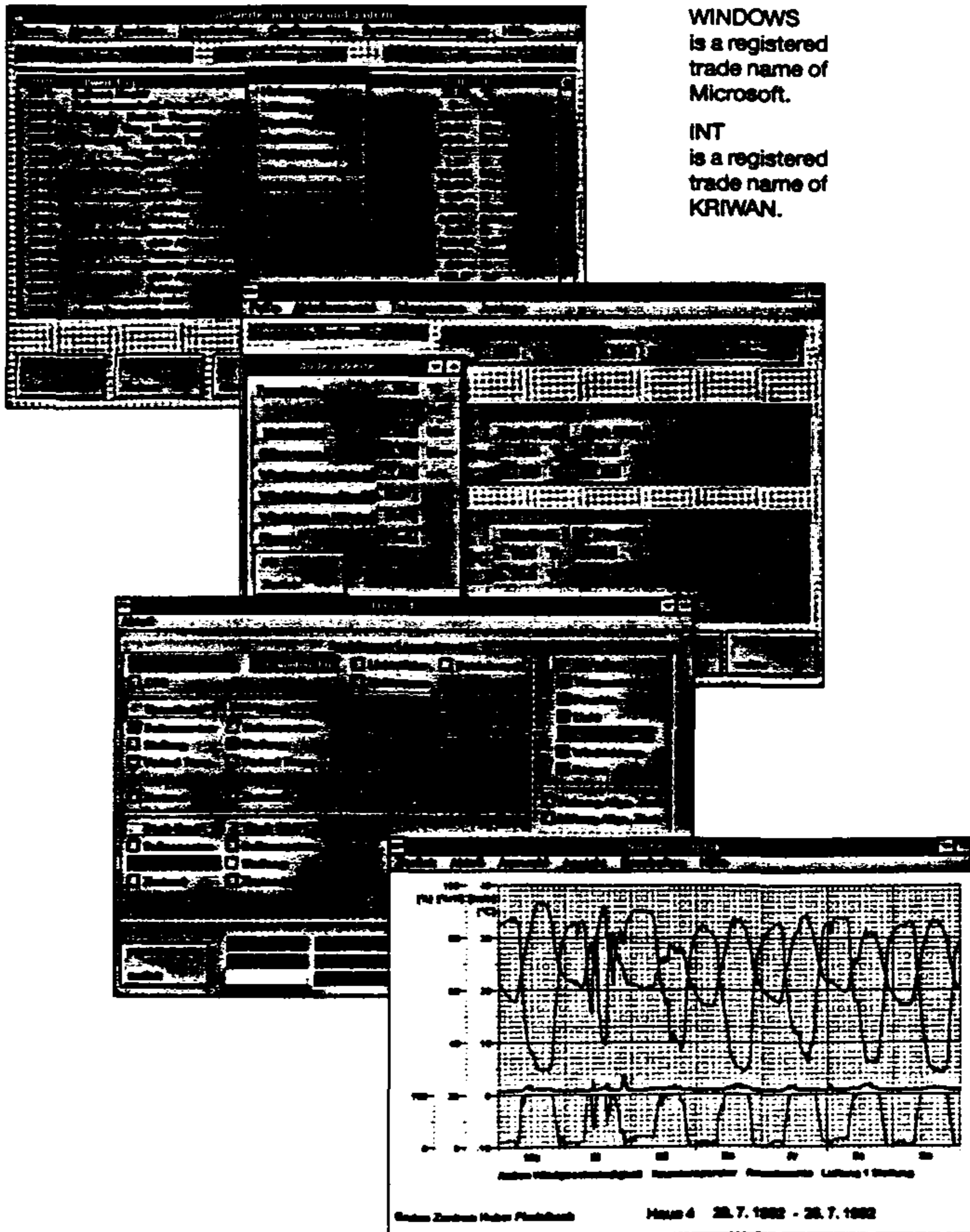
WV II can be supplied in standard sizes as threaded valves with dimensions 15, 20, 25, 32 mm, and flanged valves with dimensions 32, 40, 50, 65, 80, 100, 125 and 150 mm.

All counter flanges conform to DIN 2633.



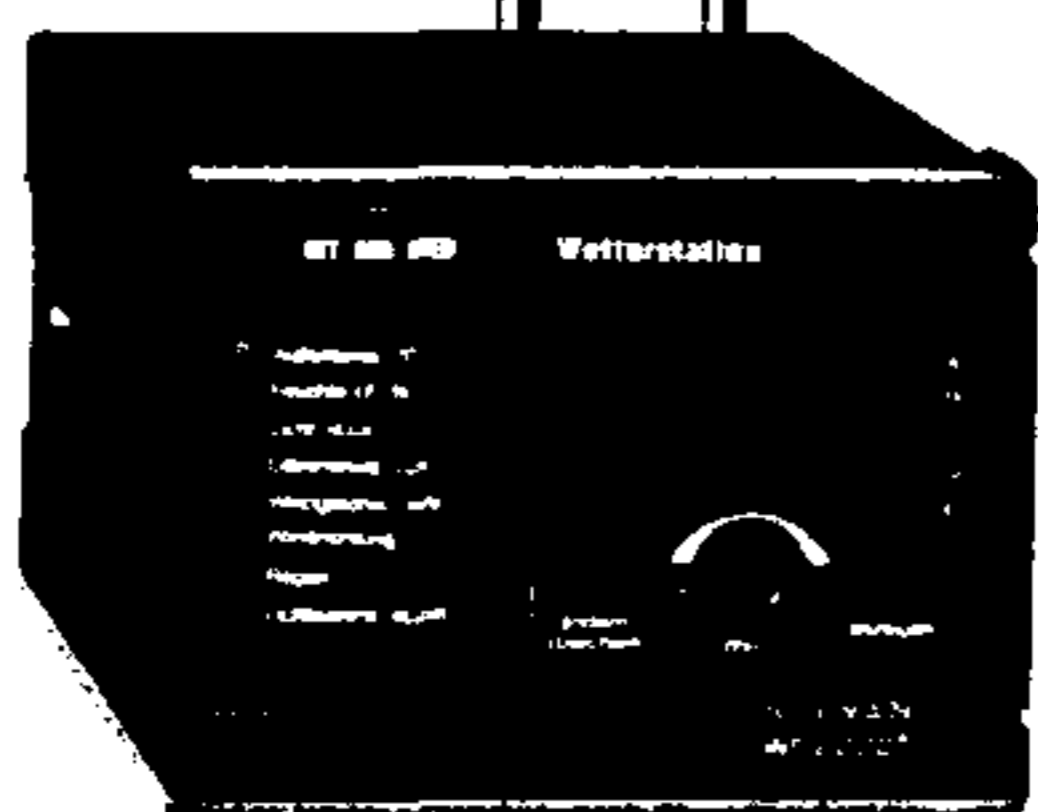
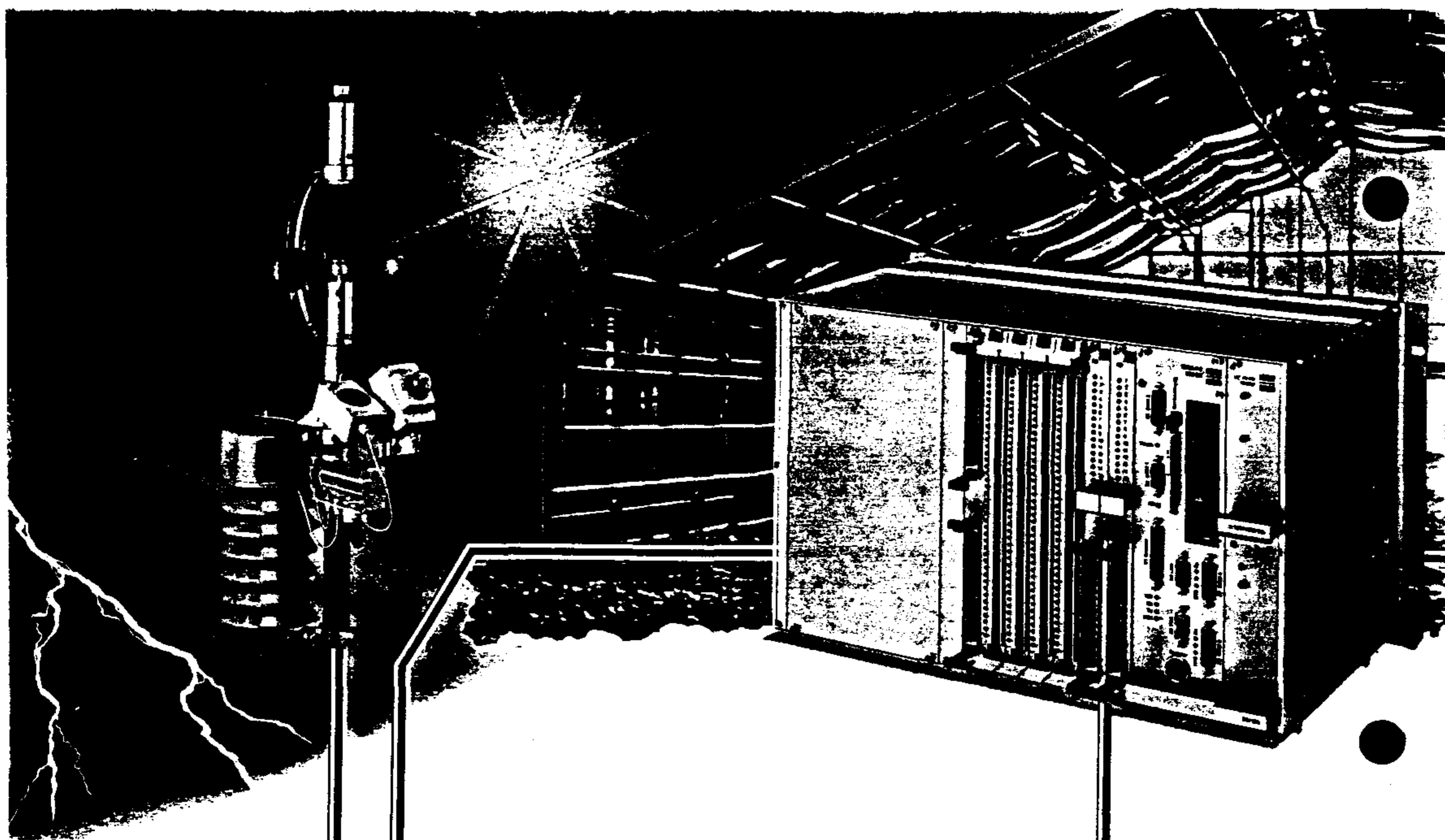
Central master station under Windows®

The central master station uses Windows® software and gives a general view of all operation modes as well as the possibility of controlling and regulating the greenhouse centrally. Limit value violations are signalled by an acoustic alarm and displayed in clear text. The central master station performs the long-term storing of the required data and processes them in tabular or graphic form for statistical analysis.



WINDOWS is a registered trade name of Microsoft.

INT is a registered trade name of KRIWAN.



INT 800 WED weather station with optic fibre link

The weather station sensors are constantly read in by the INT 800 WED computer and their information is transferred to all INT 800 KMS greenhouse computers linked via optic fibre cables. The optic fibre link electrically isolates the weather station from the remaining installation and greenhouse computers, which prevents lightning damage of the latter.

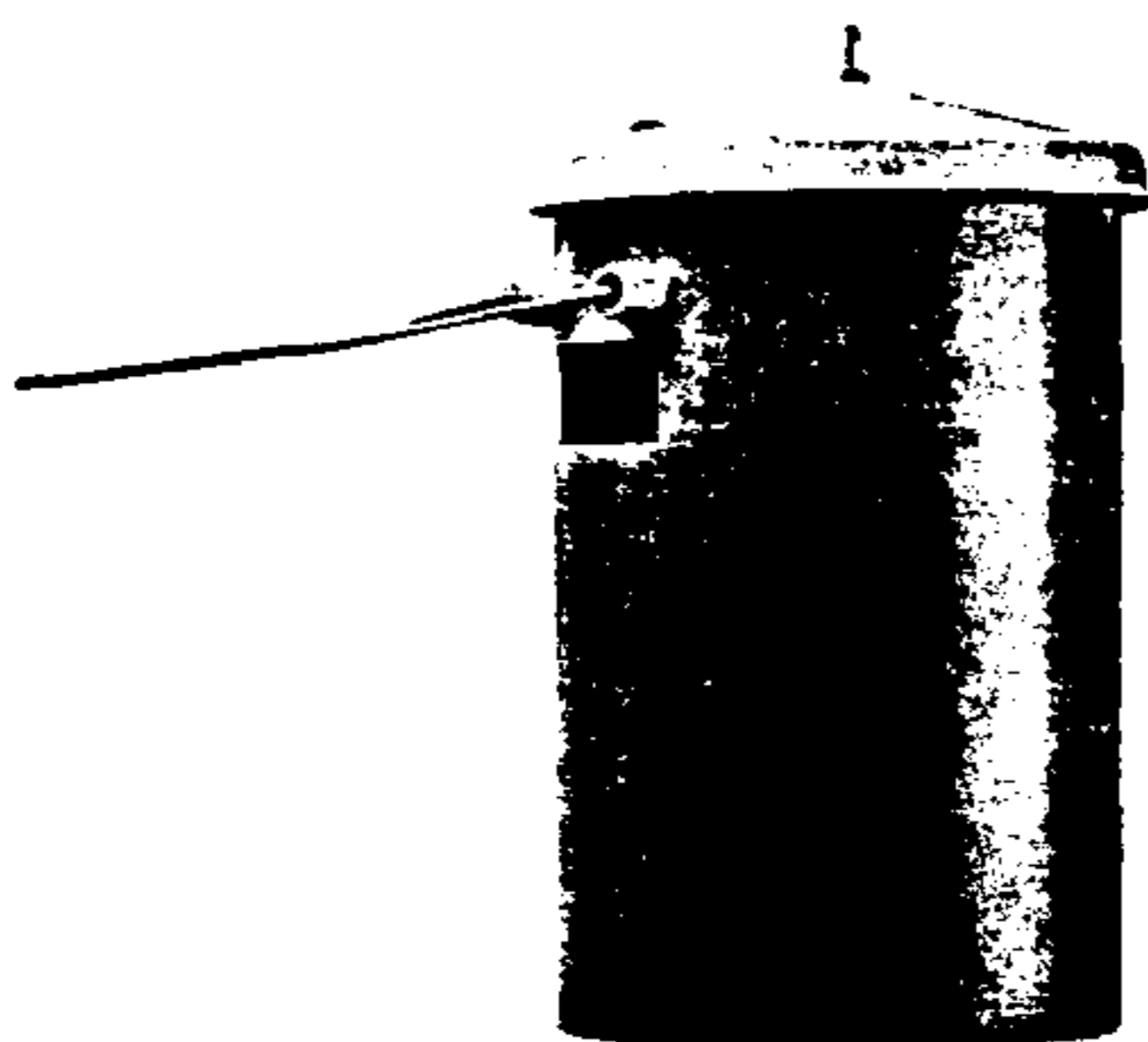
INT 800 KMS Greenhouse computer

One or several INT 800 KMS greenhouse computers control and regulate the climate of your greenhouses. All limit value violations and changes in set values are recorded with exact time and date. Due to the modular layout of hardware and software the computer can always be economically adjusted to the extension of your installation and to new requests. The system expands together with your requirements.

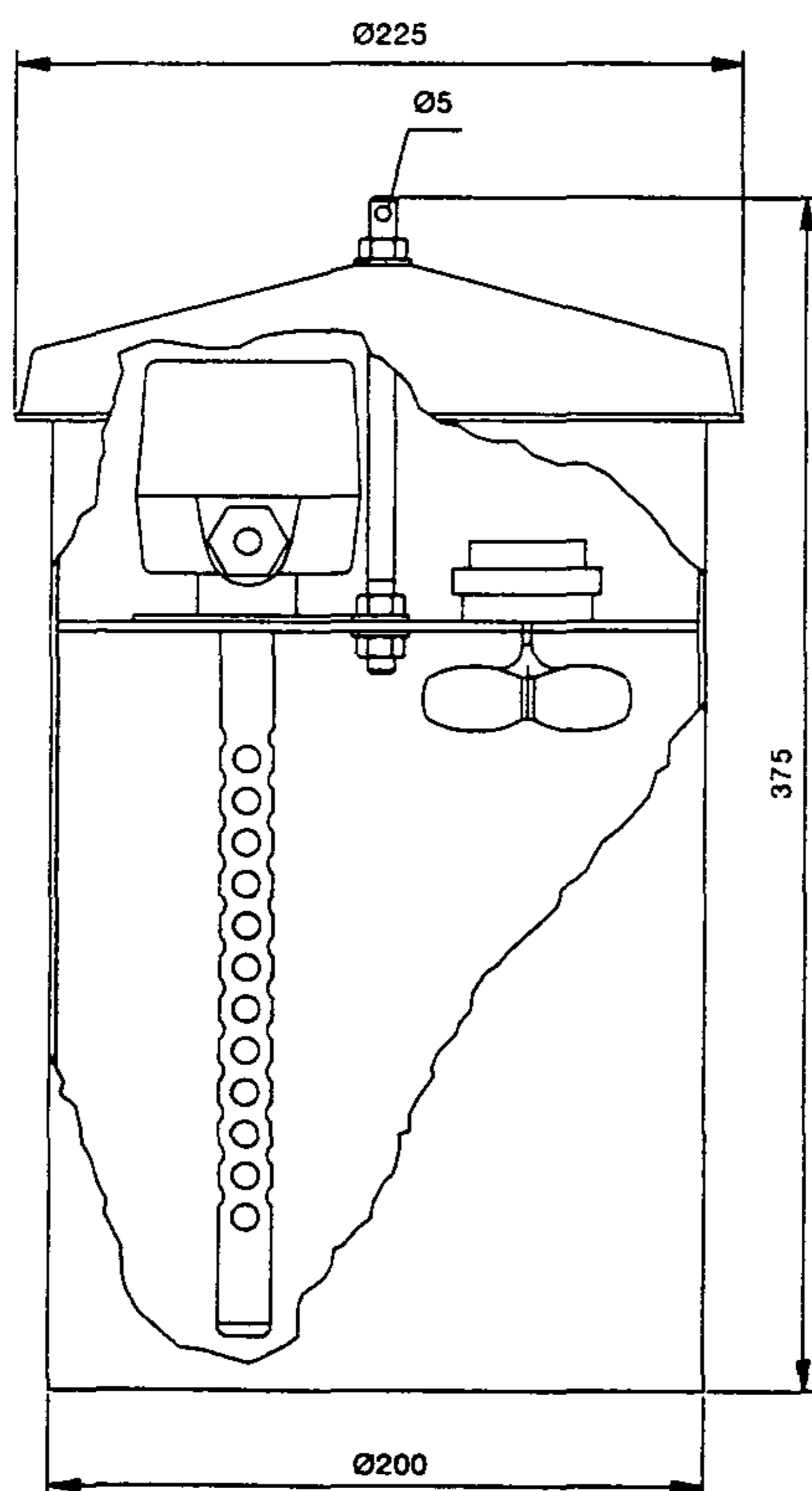


On-the-spot operation

A monitor and a keyboard can be connected to every INT 800 KMS greenhouse computer. By this you can call up all parameters and, of course, directly influence the greenhouse climate condition.



Dimensions (mm):



Humidity and Temperature Sensor Ventilated

Application:

The ventilated temperature and humidity sensor can be used wherever the existing air flow is not adequate for precise measurement of temperature and humidity.

The incorporated ventilator produces a constant air flow, thus causing uniform circulation around the temperature and humidity sensor. The sensors thus respond quickly to changes in temperature and humidity.

Scope of application:

Rooms with static air conditions or low air flow, climatic chambers, greenhouses and all similar buildings and rooms.

Functional Description:

The sensors are incorporated in a housing for protection against ambient interference (solar radiation and weather etc.). The maintenance-free synthetic-fibre measuring element transfers the humidity values directly to a precision wiper-type resistor as a function of its change in length. The winding and wiper of the precision wiper-type resistor are of gold wire alloy. This guarantees minimum transfer resistance and reliable contact.

The harp-shaped measuring element is protected by a perforated sensor tube with a length of 200 mm. The sensors are mounted together with the ventilator on a mounting plate.

Technical Data:

Measuring range humidity	0...100 % r.H.
Measuring accuracy	
- between 40...100 %r.H.	±2.5 %
- between 10...40 % r.H..	±3.5 %
Operating range	20...100 % r.H.
Two-wire output	0...1000Ω
	(linear characteristics)
Admissible load	1.5 VA
Max. voltage	60 V
Admissible ambient temp.	
on the measuring sensor	-20...+80 °C
Temperature coefficient	-0.25 % r.H./K
	referred to 20 °C
Reaction time at v = 2 m/s	1.2 min
Measuring range, temp.	-20...+80 °C
Resistance value NTC	820 Ω at 25 °C
Supply voltage ventilator	AC 50 Hz 24 V
Housing	PVC
Protection class	(acc. to DIN 40050) IP 54
Mounting	Suspendet mounting
Dimensions	approx. 225 x 375 mm
part No.	31 G 152

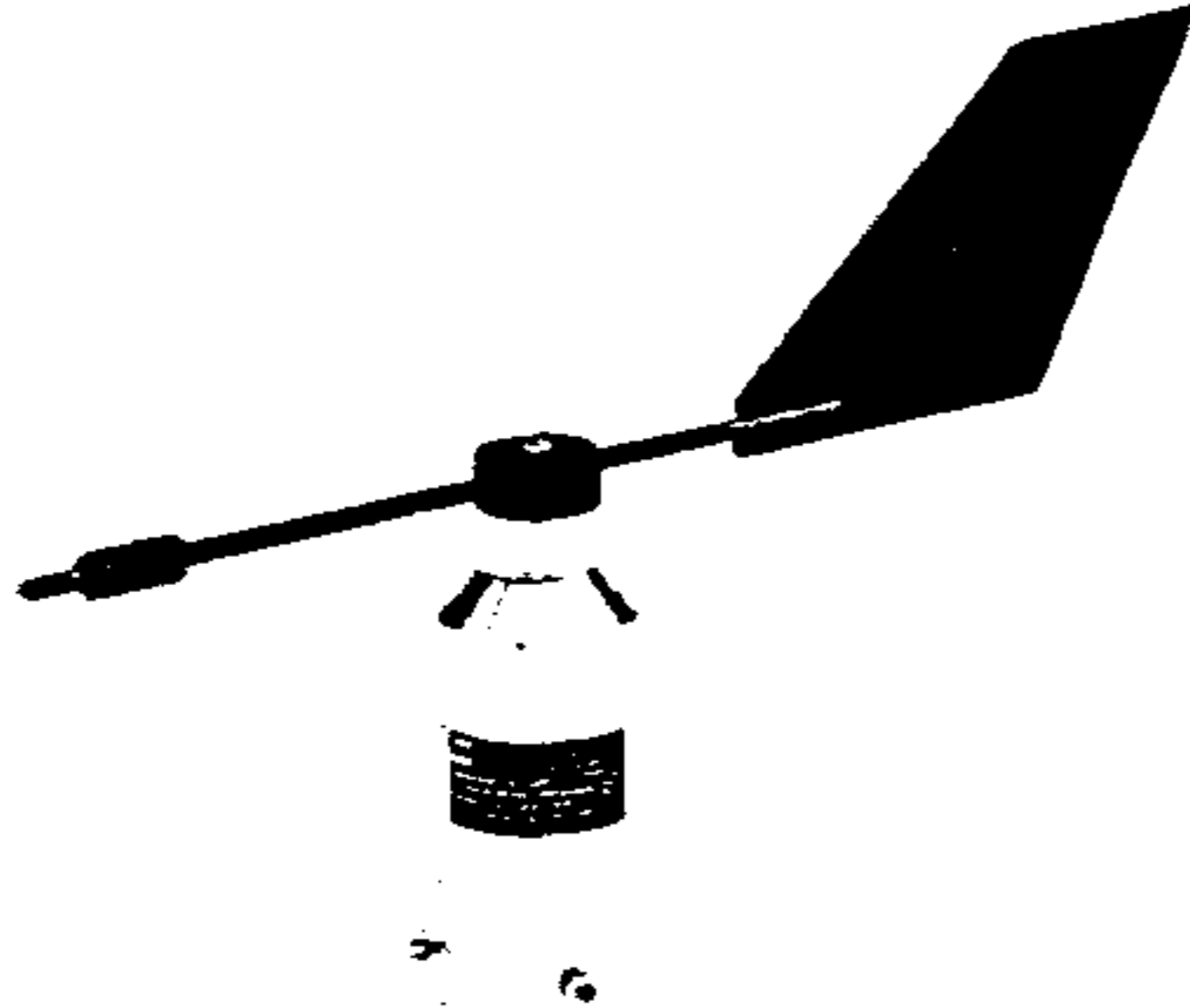
Subject to technical modification

KRIWAN INDUSTRIE-ELEKTRONIK GmbH

Postfach 1280, W-7119 Forchtenberg, Telephone+49-7947-822-0, Tx 74 499

Product
Group **G**

Edition
490.00290.0



Wind Direction Sensor INT 3

Function Description:

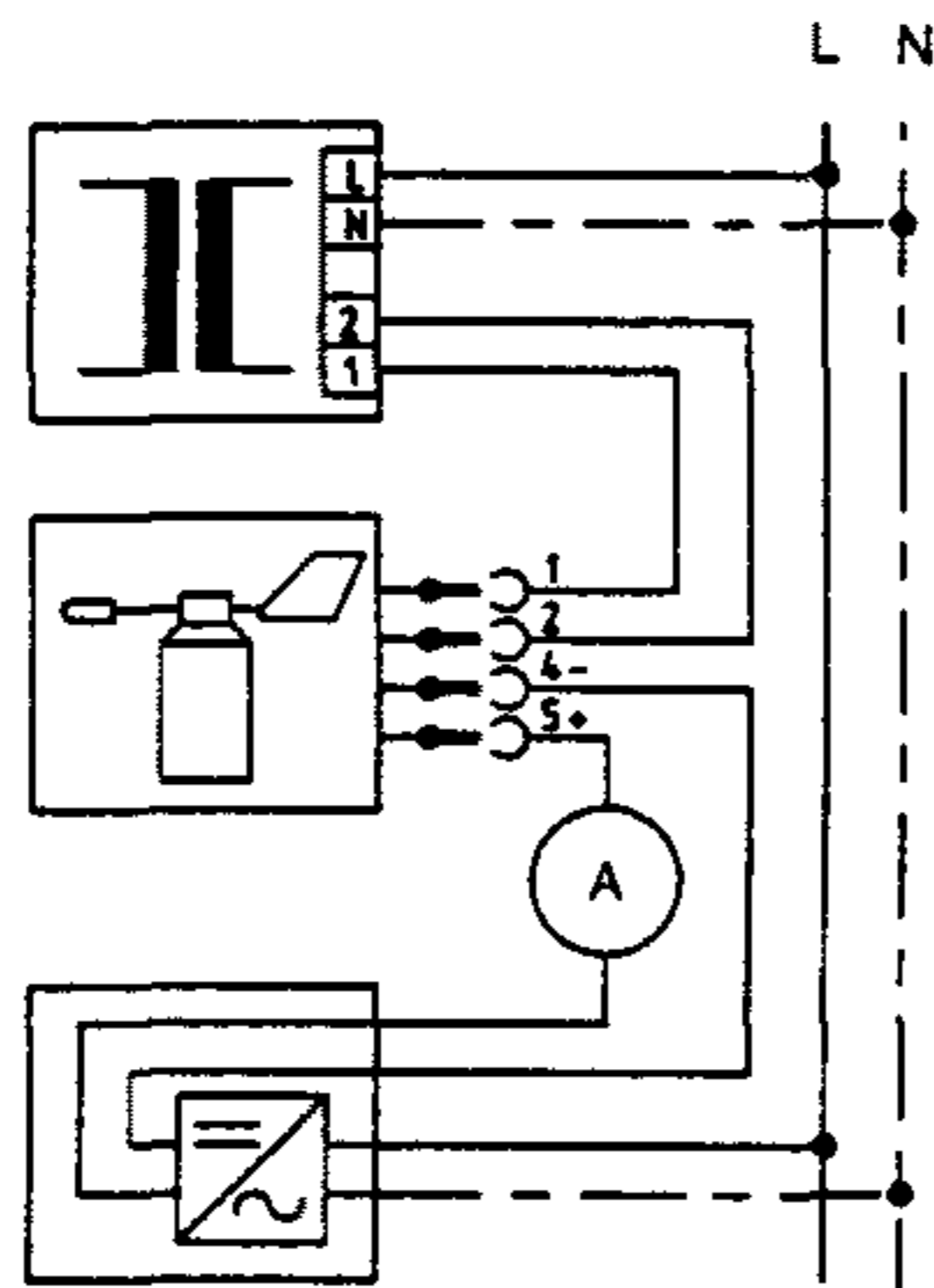
The wind direction sensor is used to detect the wind direction. A self-regulating PTC heater is used to protect against frost and varistors are connected between each of the sensor leads and the housing to protect against static discharge. The signal is generated optically. An internal electronic circuit decodes the optical signal into a polarity-independent two-wire signal. 16 directions can be detected. The information on the wind direction is contained in the system's current consumption. A four-core connection cable is required, 2 wires being for the heating circuit.

Technical Data:

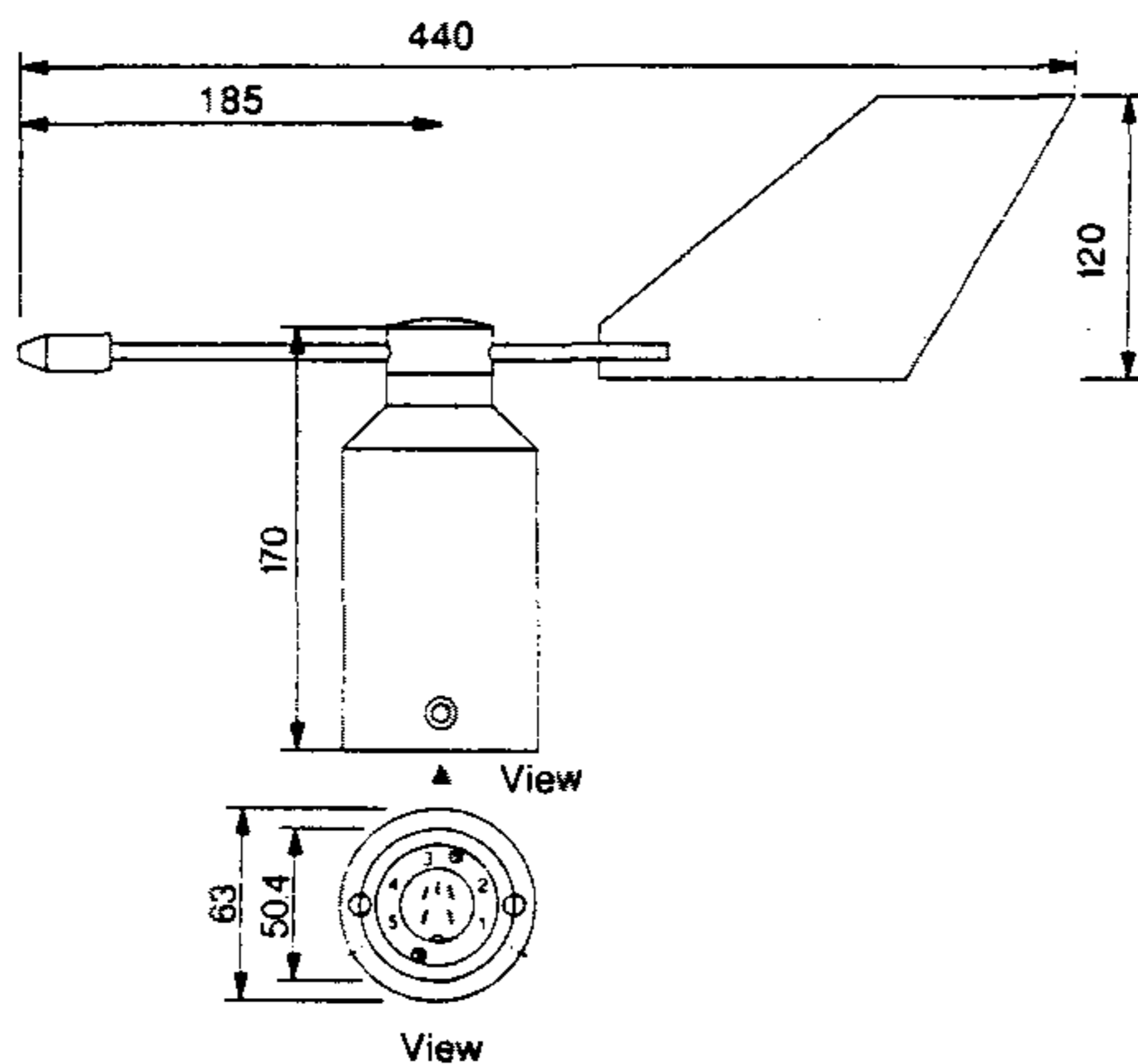
Measuring range	0...360°	
Resolution	22.5° ± 16 directions	
Supply voltage (term. 4-5)	DC 24 V ±30%	
Admissible ambient temp.	-30...+70 °C	
Signal output	current min.	DC 15 mA
	current max.	DC 30 mA
	S	15 mA N 30 mA
	SSW	17 mA NNE 28 mA
	SW	19 mA NE 26 mA
	WSW	21 mA ENE 24 mA
	W	23 mA E 22 mA
	WNW	25 mA ESE 20 mA
	NW	27 mA SE 18 mA
	NNW	29 mA SSE 16 mA
Overvoltage protection	Varistors	
Heating capacity	6...15 VA	
Heating voltage (term. 1-2)	AC 50 Hz 24 V	
Heating current	AC 0.5...1.5 A	
Mounting opening	50 mm Ø ± 1/2" to DIN 2440	
Protection class	(acc. to DIN 40050)	
5-pole connection plug	IP 40	
Mastmounting	IP 54	
part No.	13 N 230	

Connection diagram:

Application with heating transformer



Dimensions (mm):



Technical modifications without notice

Accessories:

Mounting bracket for vane anemometer and wind direction sensor

Mounting opening for tubular steel mast	50 mm Ø ± 1/2" to DIN 2440
Dimensions	220 x 430 mm high
Material	Aluminium casting
part No.	02 N 225

Heating transformer for vane anemometer and wind direction sensor incorporated in plastic housing

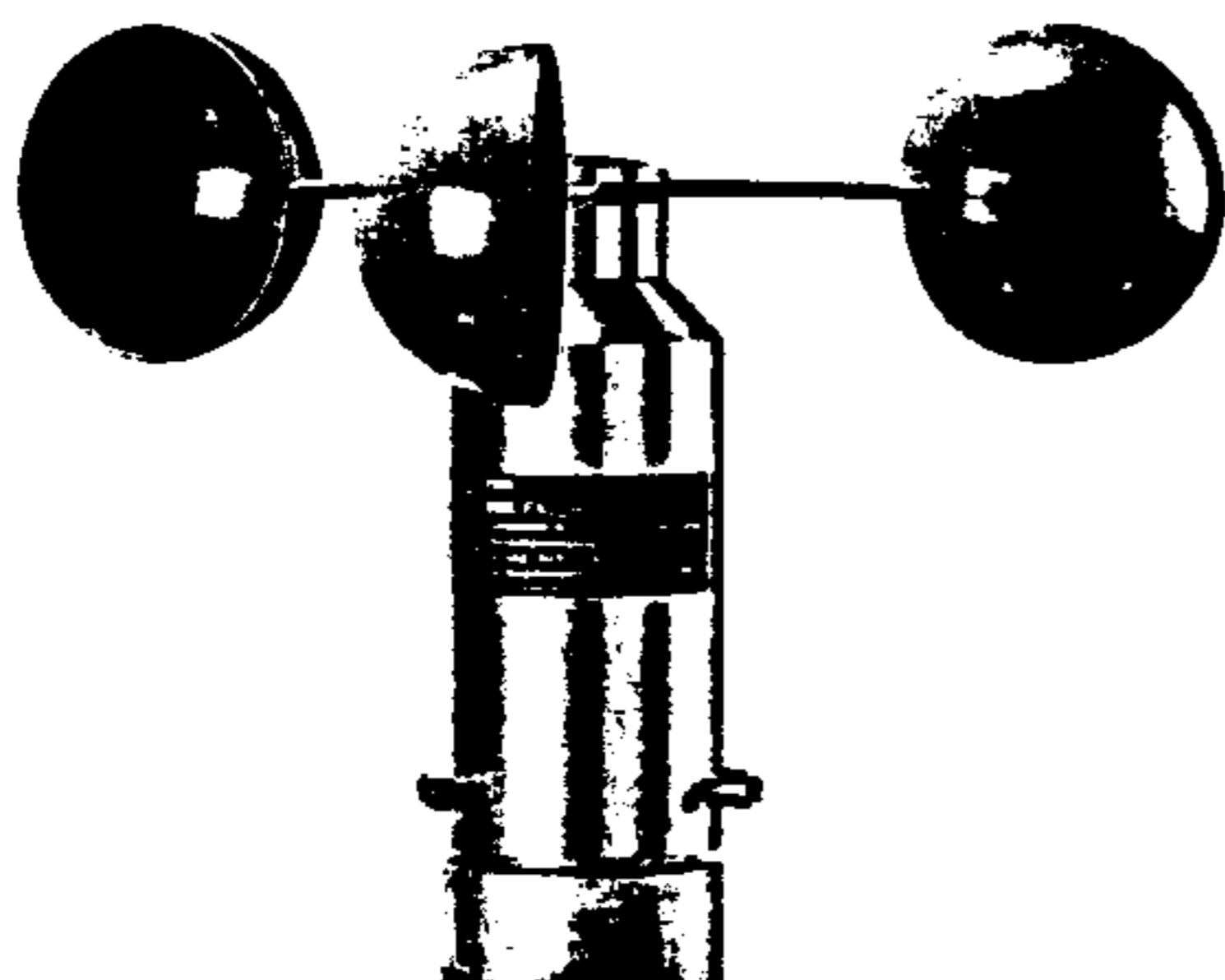
Supply voltage	AC 50 Hz 220 V
Output voltage	AC 50 Hz 30 V, 30 VA
Protection class acc. to DIN 40050	IP 54
Dimensions	150 x 90 x 110 mm high
part No.	52 N 120

KRIWAN INDUSTRIE-ELEKTRONIK GmbH

Postfach 1280, W-7119 Forchtenberg, Telephone+49-7947-822-0, Tx 74 499

Product Group **N**

Edition 490.00289.0



INT 1 Vane Anemometer

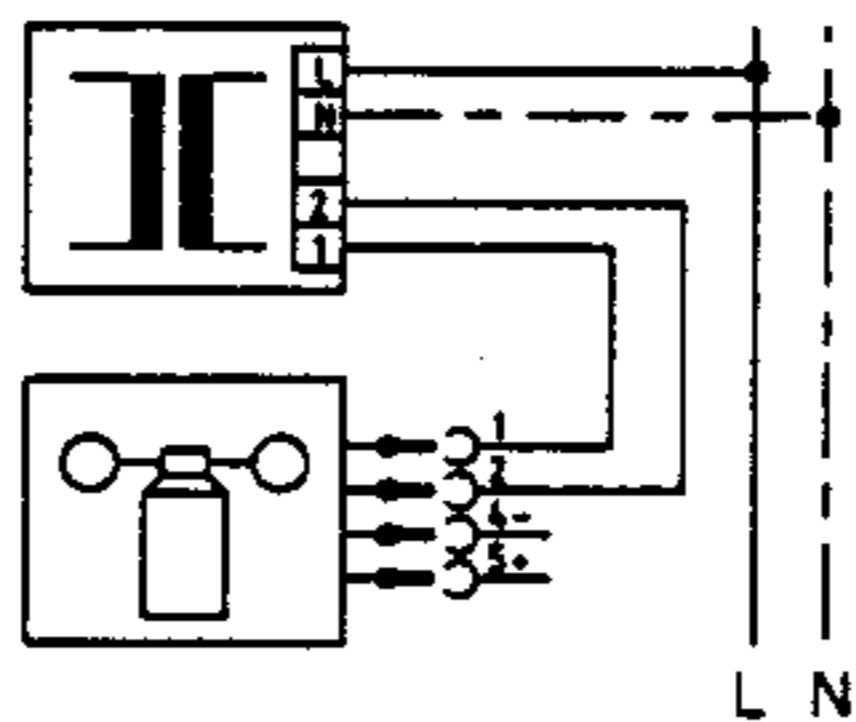
Function Description:

Vane anemometers are used for measuring and monitoring wind speed, e.g. at airports, on greenhouses, ski lifts and cableways, and also inscientific and research applications.

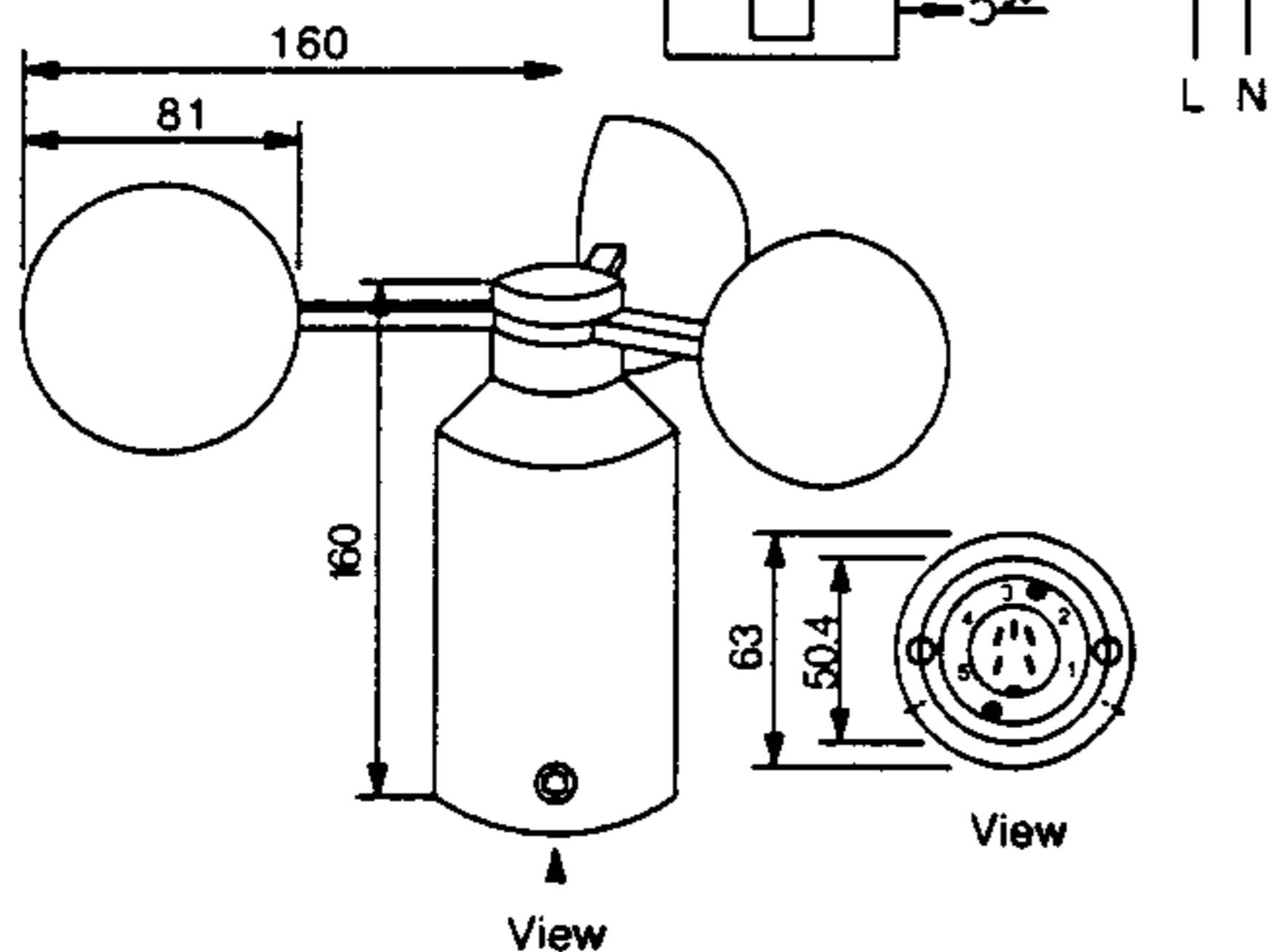
The KRIWAN vane anemometer is of a storm-proof and rain-proof design so that it can be used maintenance-free for all applications. The unit is equipped with an automatically-controlled heater (matching heating transformer: partNo. 52N120) as standard. The anemometer consists of a three-phase tachogenerator with built-in three-phase bridge-connected rectifier. The speed-proportional output voltage can be supplied directly to a measuring instrument or a recorder, or can be used as a switching voltage for the switching amplifier. A 4-core connection cable is required, two wires being for the heating circuit.

Connection diagram:

Application with heating transformer



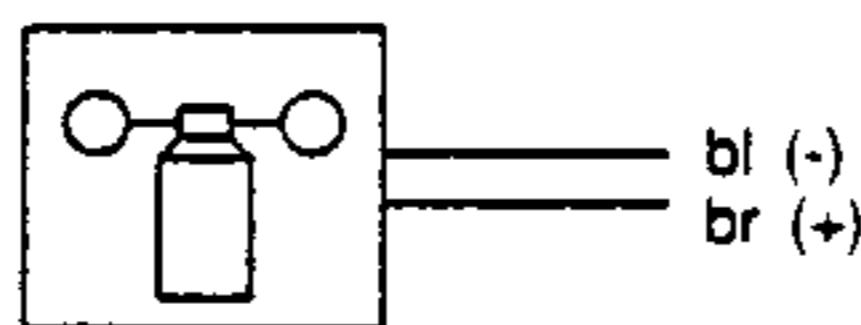
Dimensions (mm):



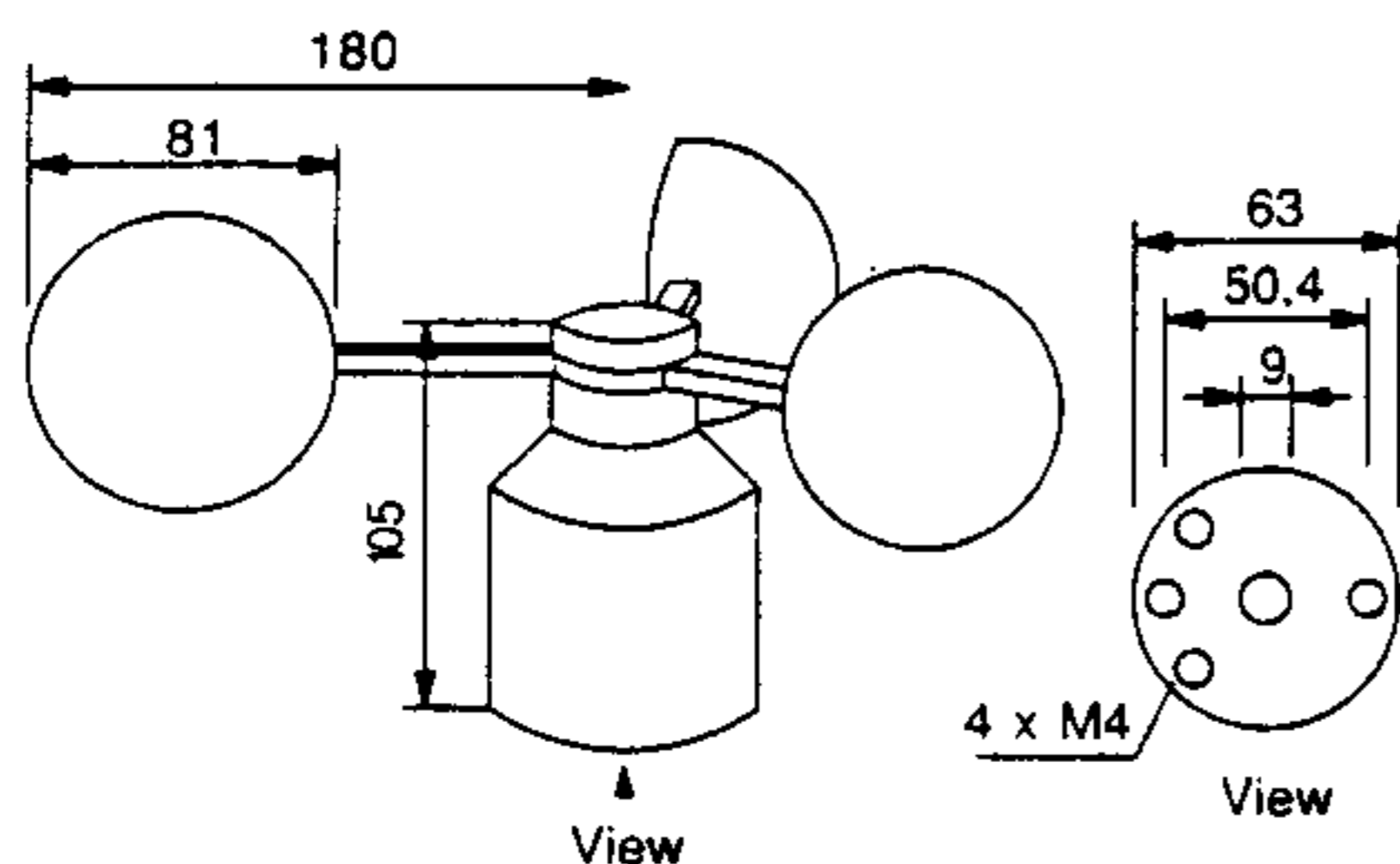
Technical Data:

Windspeed	Measuring range approx. 2...35 m/s $\hat{=}$ wind force 1...12,
Signal output (term. 4-5)	$\hat{=}$ DC 0...16.5 V
Starting speed	approx. 1.5 m/s
Max. admissible load	60 m/s
Admissible ambient temp.	-40...+80 °C
Heating capacity	6...15 VA
Heating voltage (term. 1-2)	AC 50 Hz 24 V
Heating current	AC 0.5...1.5 A
Mounting opening for tubular steel mast	50 mm $\hat{=}$ 1 1/2" to DIN 2440
Protection class	(acc. to DIN 40050)
5-pole connection plug	IP 40
Mastmounting	IP 66
part No.	02 N 222

Connection diagram:



Dimensions (mm):



INT 2 Vane Anemometer

Function Description:

Vane anemometer, as described above, but without heater; for flange mounting.

Technical Data:

Windspeed	Measuring range approx. 2...35 m/s $\hat{=}$ wind force 1...12,
Signal output (term. 4-5)	$\hat{=}$ DC 0...16.5 V
Starting speed	approx. 1.5 m/s
Max. admissible load	60 m/s
Admissible ambient temp.	-20...+80 °C
Mounting	screw-mounted
Connection cable	HO3VV-F, 2 x 0.75 mm ² 5 m long
Protection class	(acc. to DIN 40050) IP 66
part No.	02 N 220

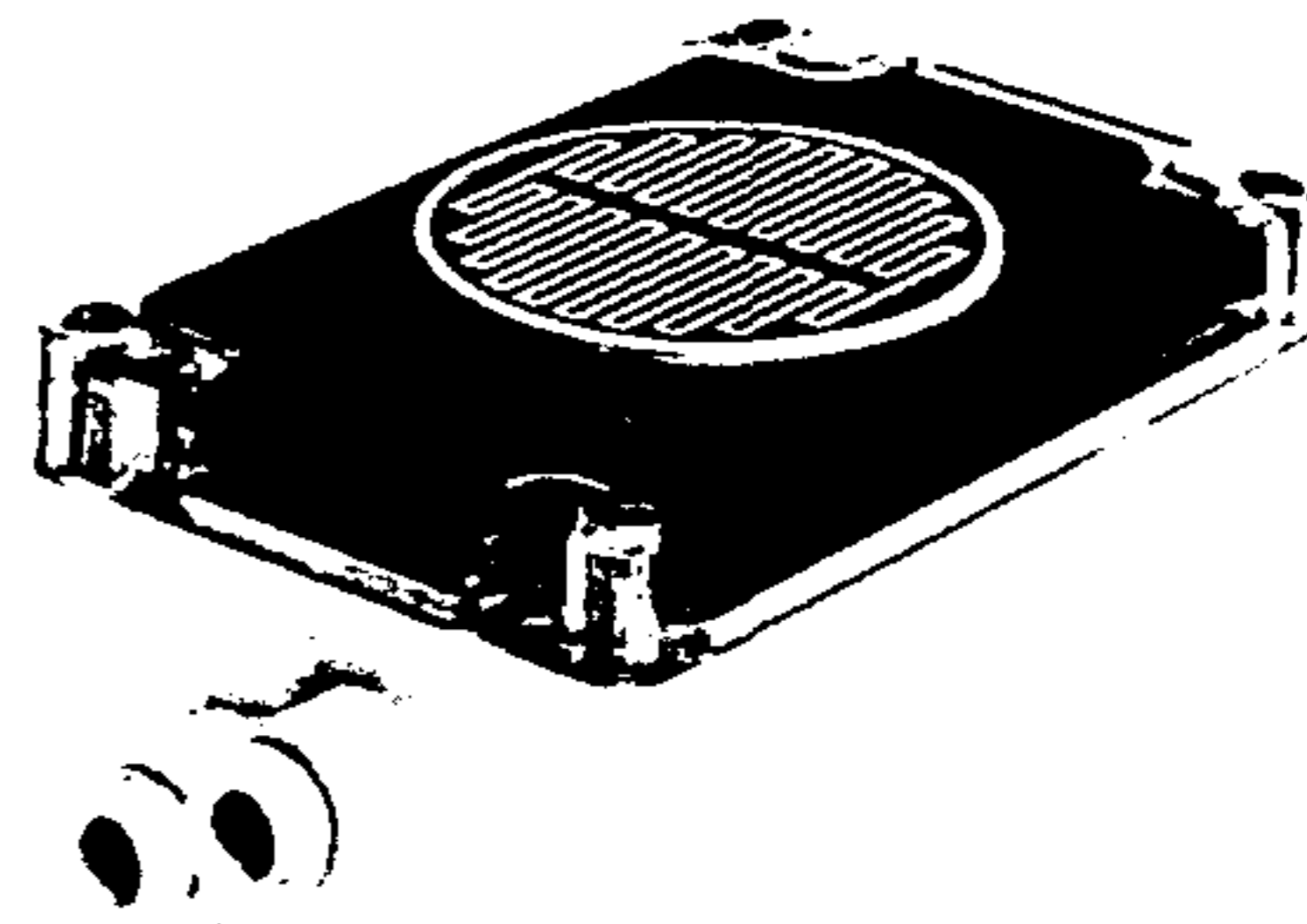
KRIWAN INDUSTRIE-ELEKTRONIK GmbH

Postfach 1280, W-7119 Forchtenberg, Telephone+49-7947-822-0, Tx 74 499

Product Group **N**

Edition
490.00289.0

KRIWAN Rain Detector



Specification

KRIWAN rain detector for precipitation recognition either as rain or snow. With adjustable sensitivity, autonomously-controlled heating, mast mounted.

Part No. 52 G 114

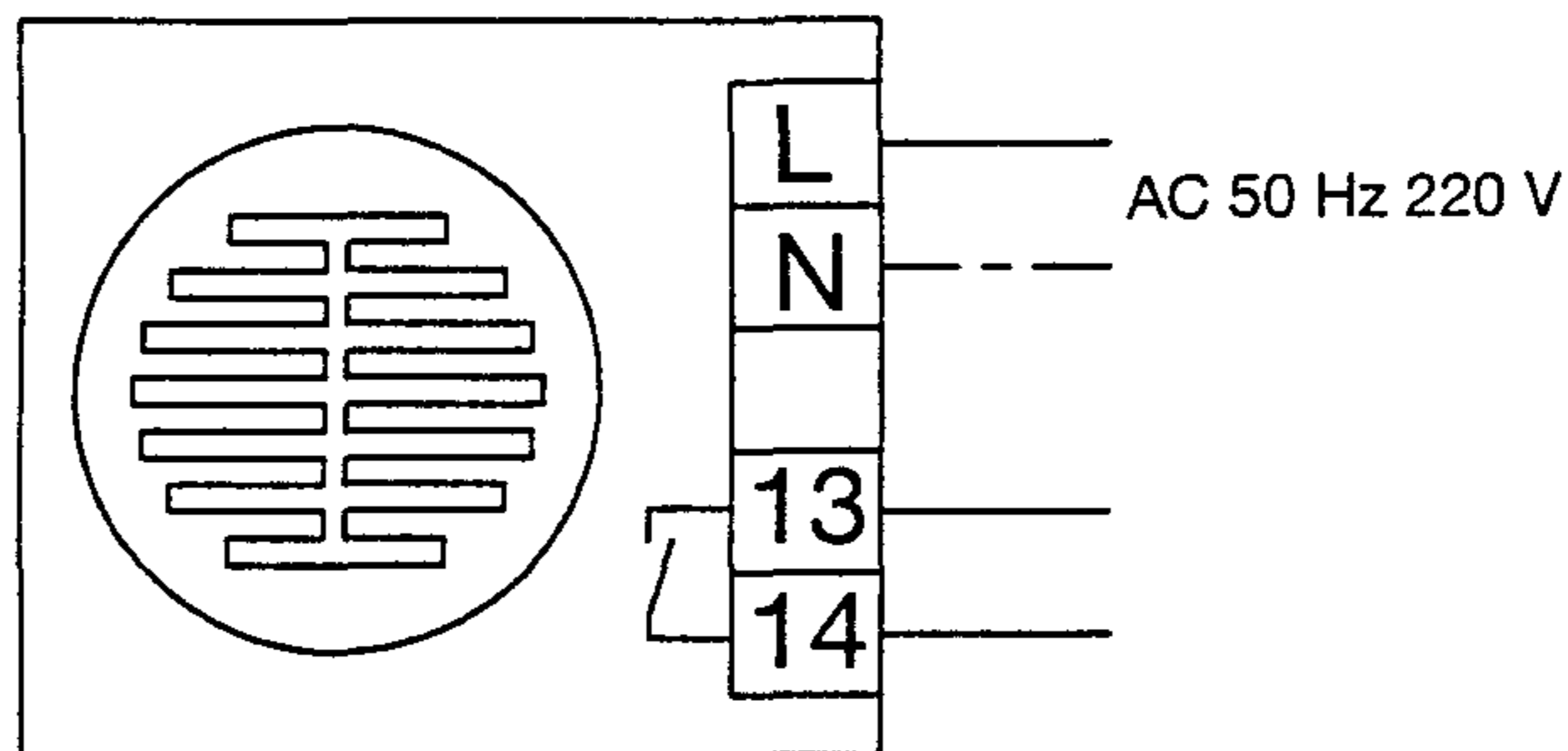
Description

The detector recognizes rain or snow as precipitation and transmits the signal by means of a potential-free relay contact. If the plate resistance drops below the adjustable sensitizing setting, the built-in relay immediately pulls in. At the same time the sensor heating switches on. If the sensitivity threshold is exceeded by 50%, the relay drops out and the heating automatically switches off, which ensures an energy-saving operation.

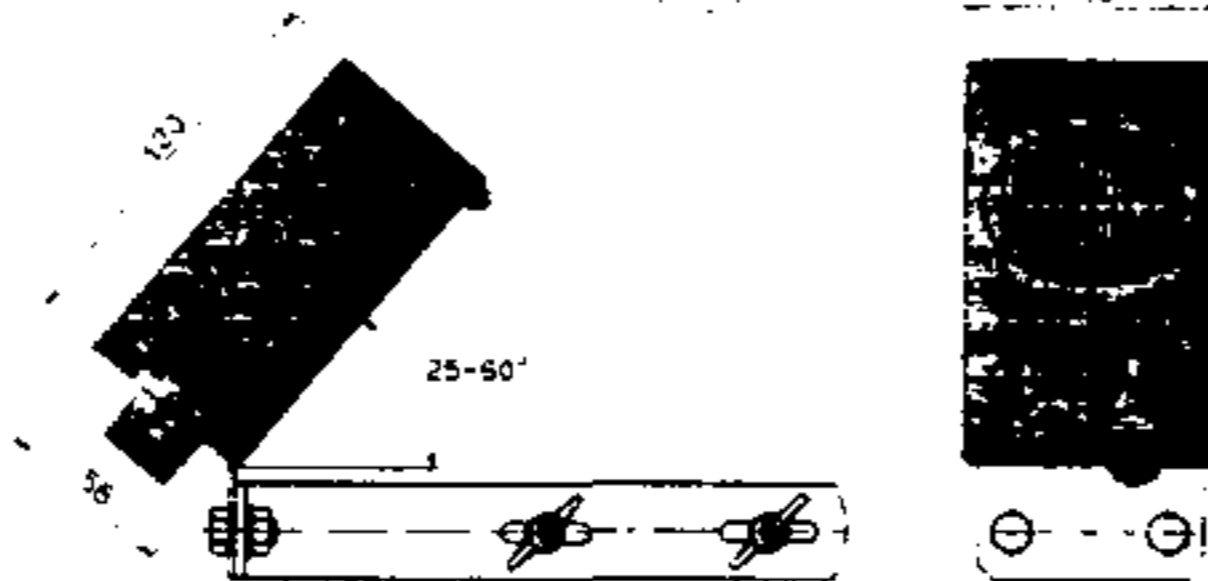
Maintenance

The sensor surface should be cleaned with water at regular intervals, depending on the pollution level.

Connection diagram:



Dimensions:



Dimensions in mm

Technical data

Supply voltage	AC 50 Hz 220 V + 10 %... - 15 %
Internal power consumption	
- no precipitation	3 VA
- precipitation	15 VA
admissible ambient temperature	- 30°C ... + 60°C
Switching point	adjustable (from "dew" to "rain")
Hysteresis	approx. 50 %
Relay output	AC 250 V, max. 5 A, 300 VA ind.
Service life	approx. 10 ⁶ switching cycles
Housing	Makrolon
Protection class	IP 65 (acc. to DIN 40 050)
Part No.	52 G 114

Subject to technical modifications.

KRIWAN

KRIWAN

Light Detector

Omnidirectional

Specification

Omnidirectional light detector with two light measuring ranges: dusk and daylight, mast mounted.

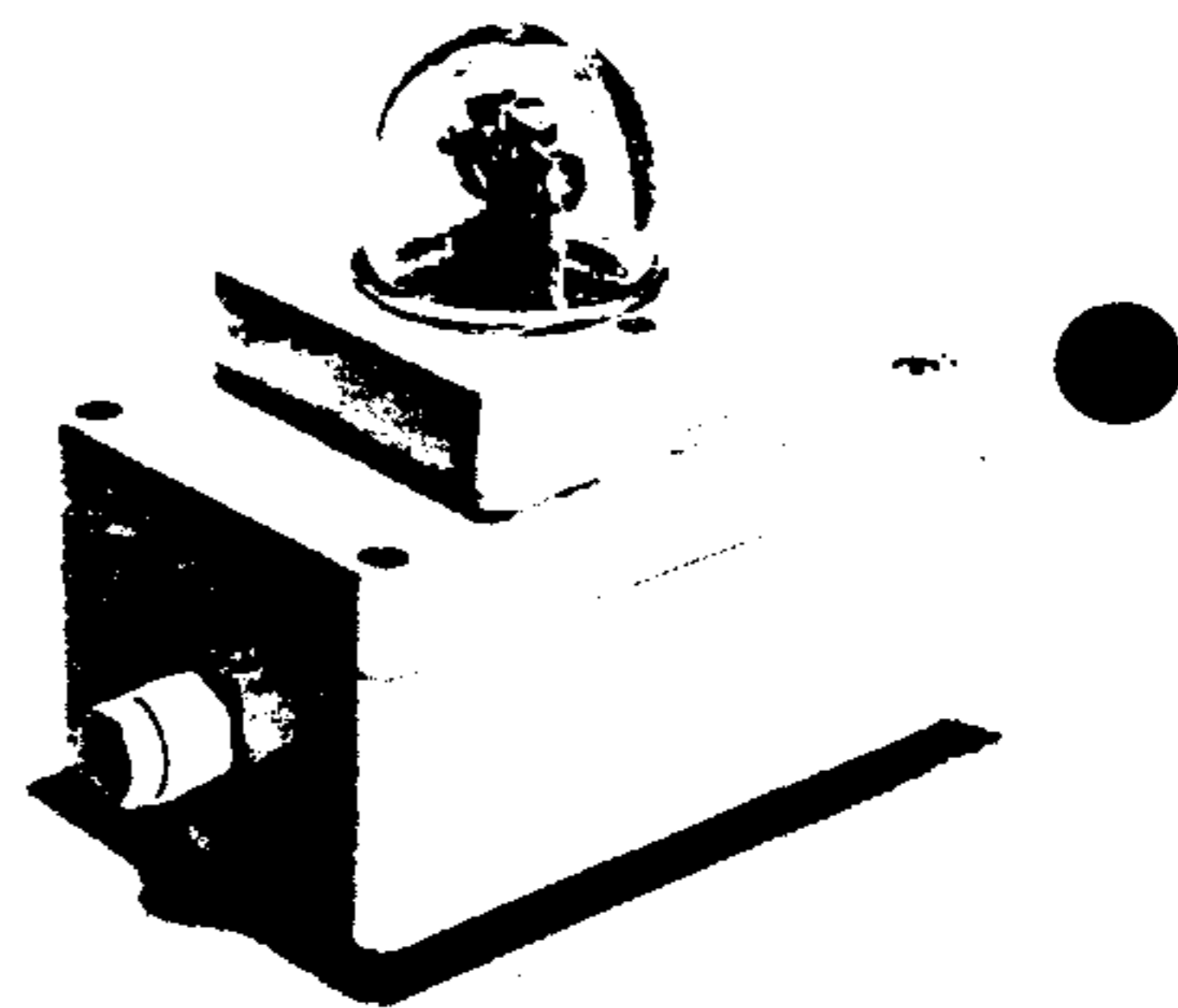
Part No. 13 G 134

Description

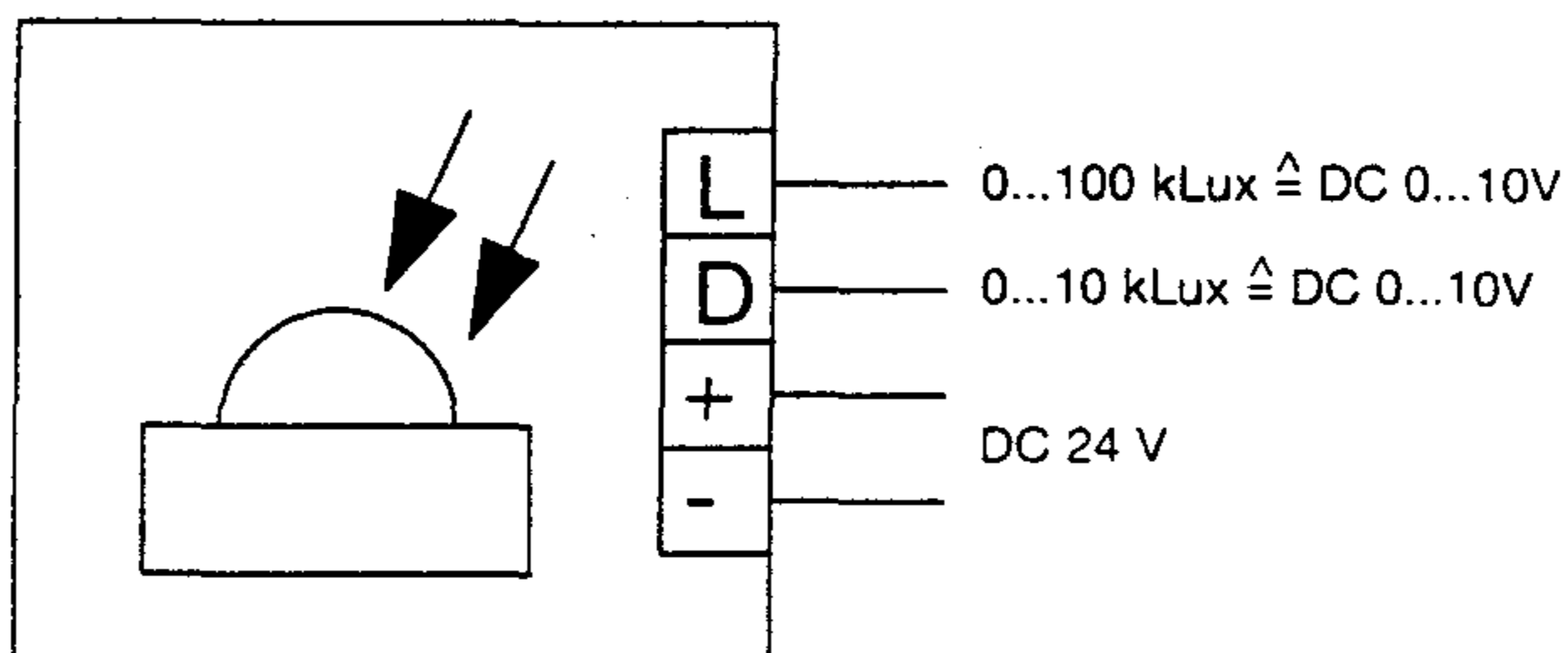
The omnidirectional light detector converts the light intensity of two light measuring ranges into standard signals. Two separate voltage outputs DC 0...10 V are assigned to the ranges 0...100 klux (daylight) and 0...10 klux (dusk). The light detector is constructed in such a way that irrespective of the sun's angle of incidence the actual light intensity is measured. Up to 20 KRIWAN greenhouse controllers (INT 800 HE; LE; SE etc.) can be connected to each sensor output.

Maintenance

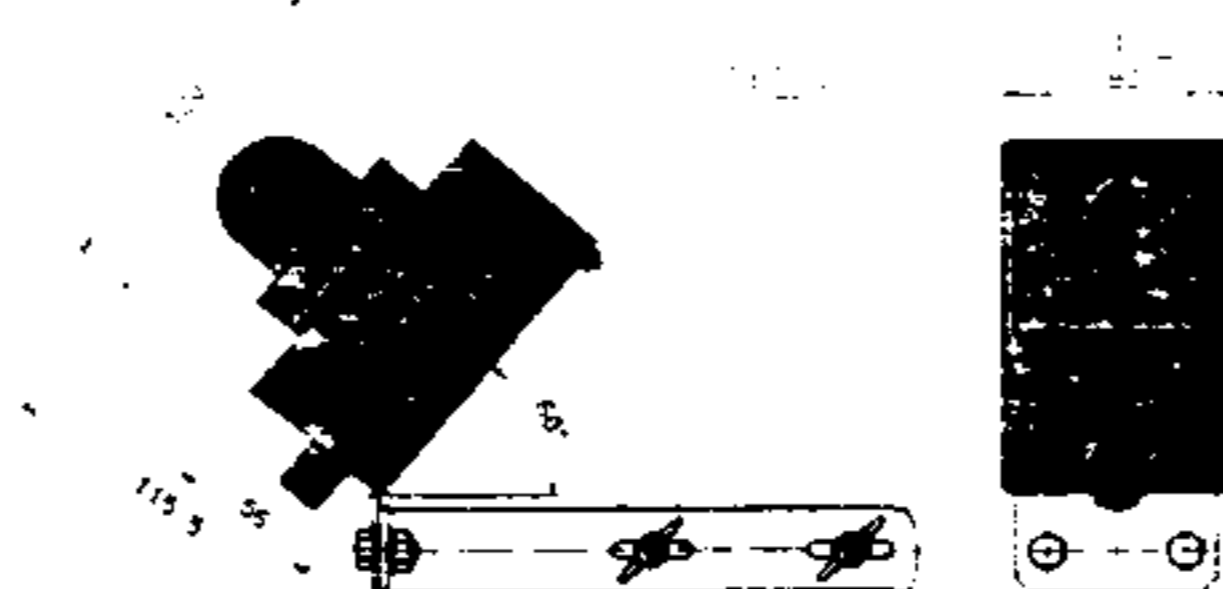
The light dome should be cleaned with water at regular intervals, depending on the pollution level.



Connection diagram:



Dimensions:



mounting position:

← South

Dimensions in mm

Technical data

Supply voltage	DC 24 V + 30 % ... - 20 %
Internal power consumption	< 1.2 VA
Output I (dusk)	$U_A = DC 0...10V$ = 0...10 klux $I_{Amax} 5 mA$
Output II (daylight)	$U_A = DC 0...10V$ = 0...100 klux $I_{Amax} 5 mA$
admissible ambient temperature	- 30°C ... + 60°C
Housing	Makrolon
Protection class	IP 65 (acc. to DIN 40 050)
Part No.	13 G 134

Subject to technical modifications.



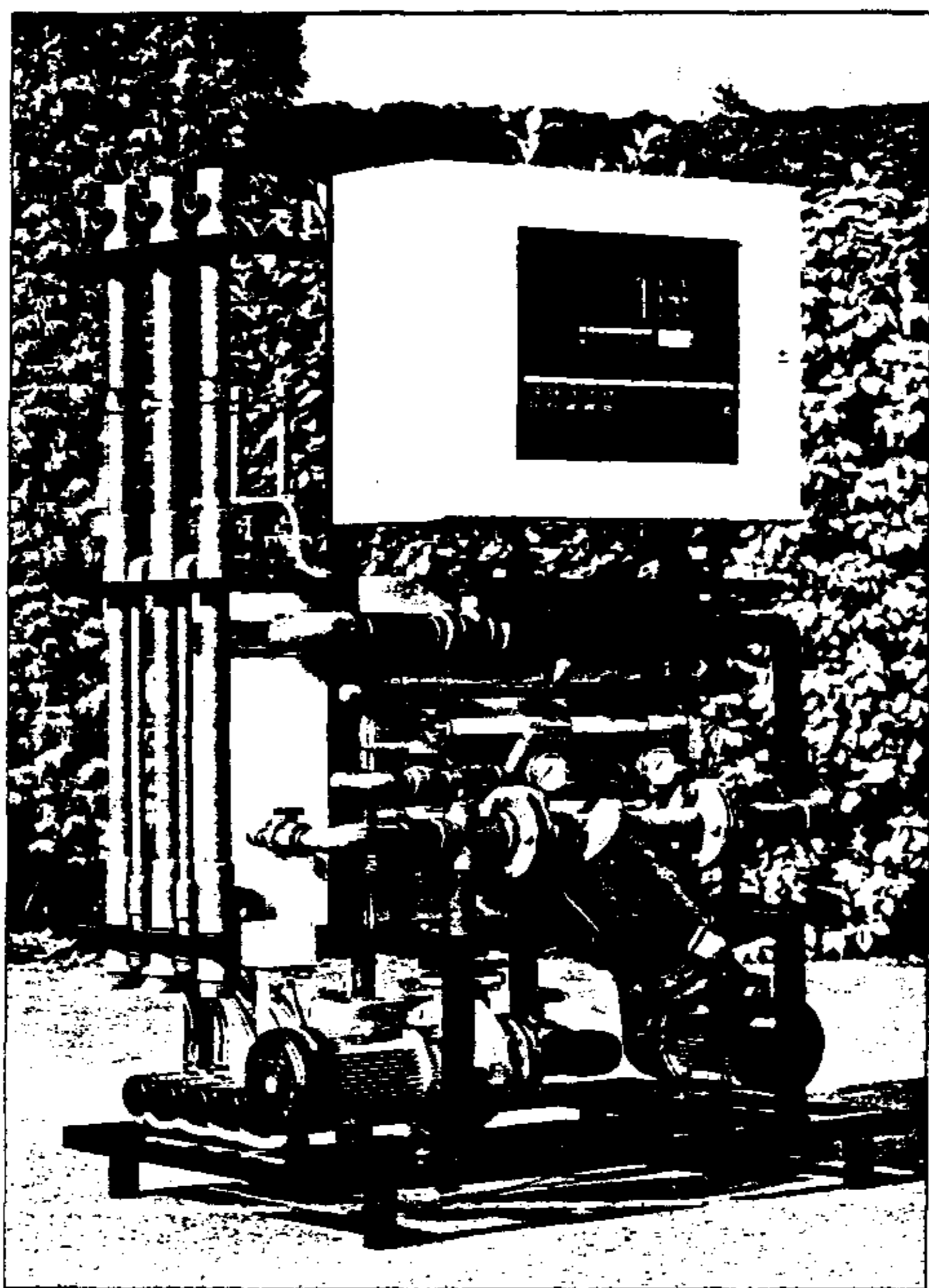
KRIWAN Industrie-
Elektronik GmbH
Postfach 1280
W-7119 Forchtenberg
Tel. +49-79 47-822-0
Tx. 74 499
Fax +49-79 47-71 22

Tomorrow's electronics today.

SIMPLICITY AND TECHNOLOGY

B-E COMPAC-DOS-1

FOR A REASONABLE PRICE



B-E COMPAC-DOS-1

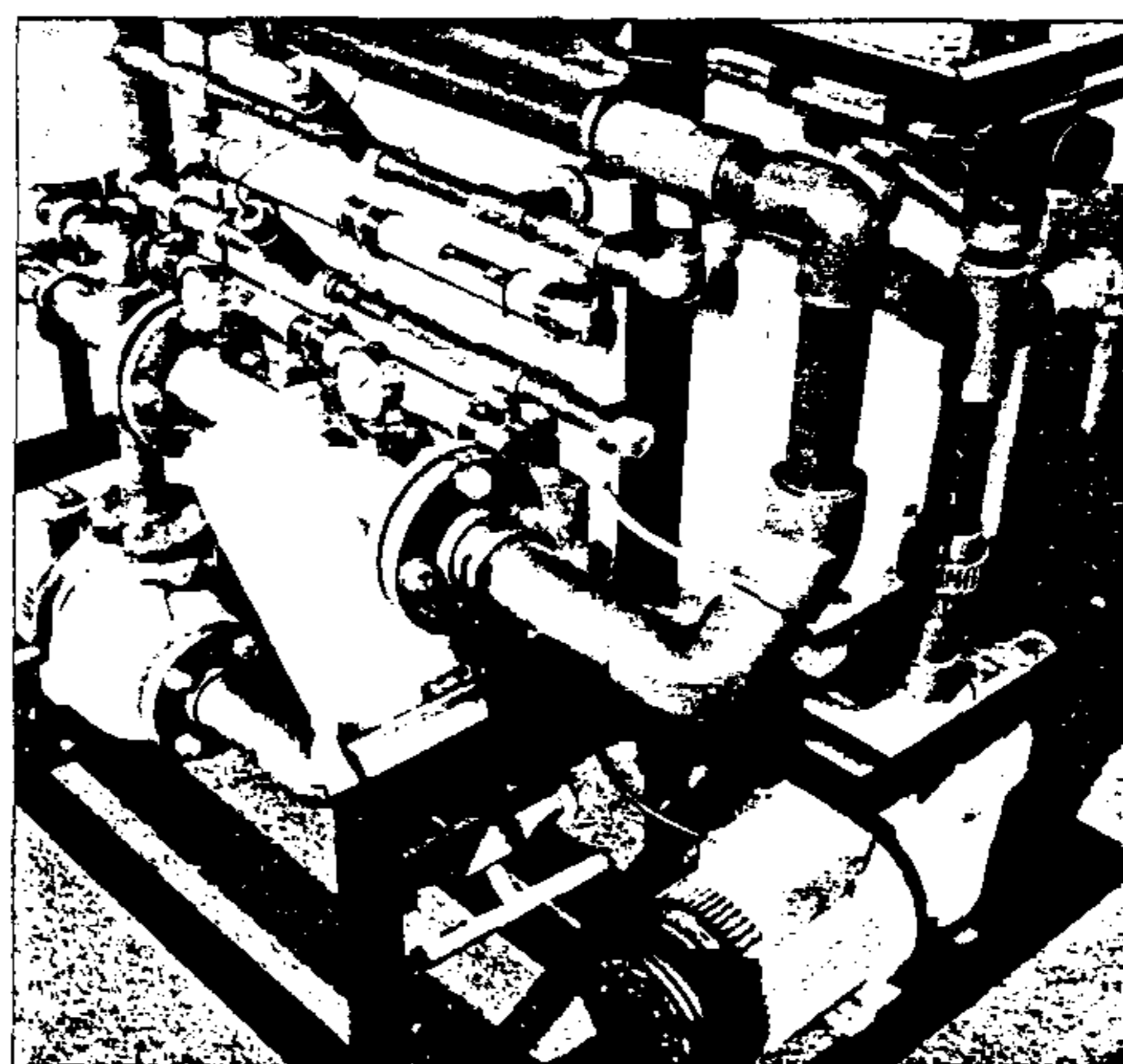
De POWER is in:
a combination of
simplicity and approved
technology for
a reasonable price!

The B-E COMPAC-DOS-1 is again
a beautiful quality product of B-E de Lier
which the possibilities
are unrivalled.

On this standard configuration many
alternatives and extensions are possible.
That's why B-E de Lier is well capable of
delivering a 'customer made' fertilizer
dosage unit.

B-E COMPAC-DOS-1

- Very compact construction
- Necessary floorspace 1 m²
- Lasting materials
- Low noise
- Comfortable handling
- 2 Fertilizer recipes
- Pump capacity 10 m³/hour
- Several options and extensions



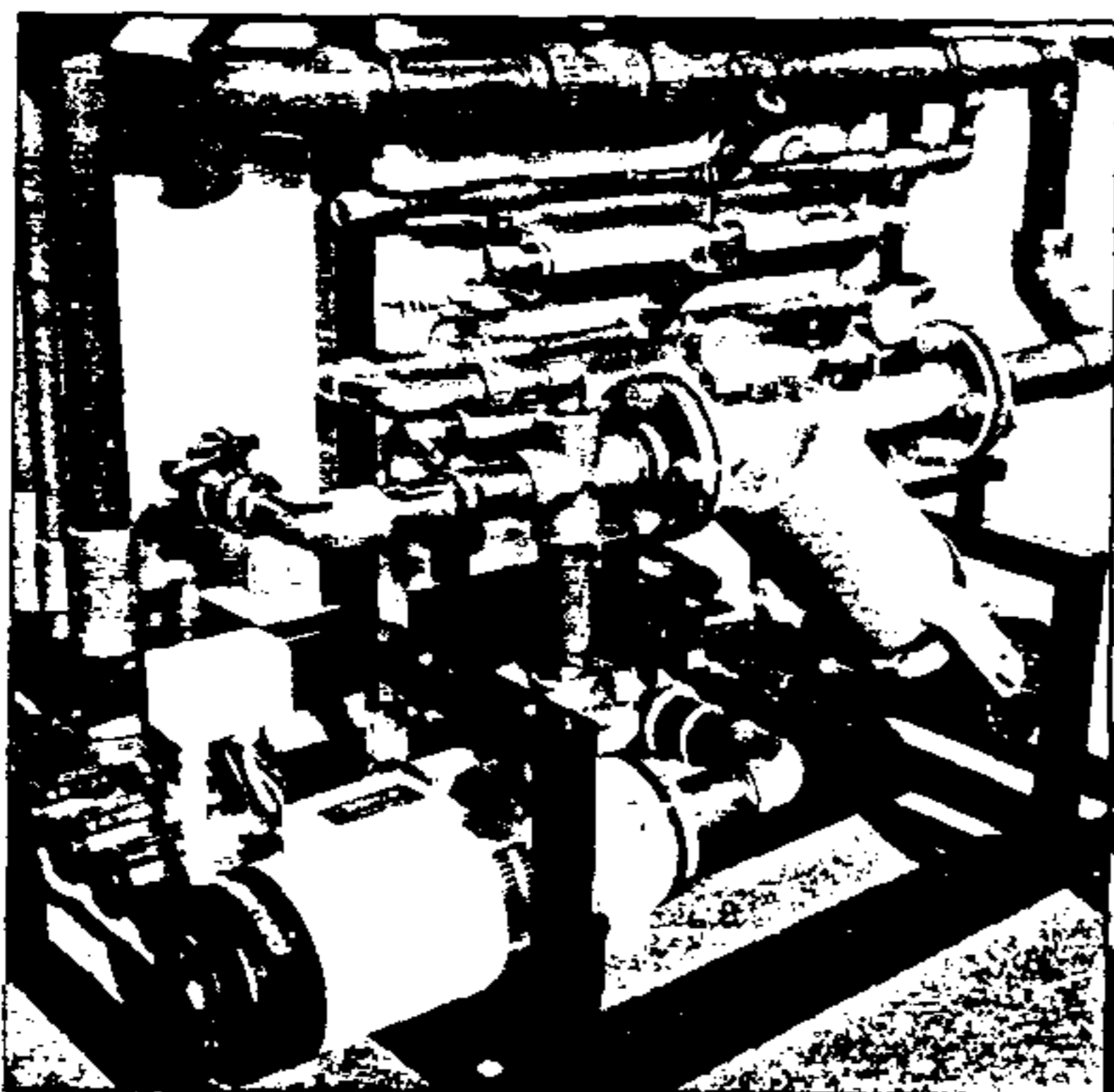
Orderly clean and requiring hardly any service



TO BE HANDLED VERY COMFORTABLY B-E COMPAC-DOS-1

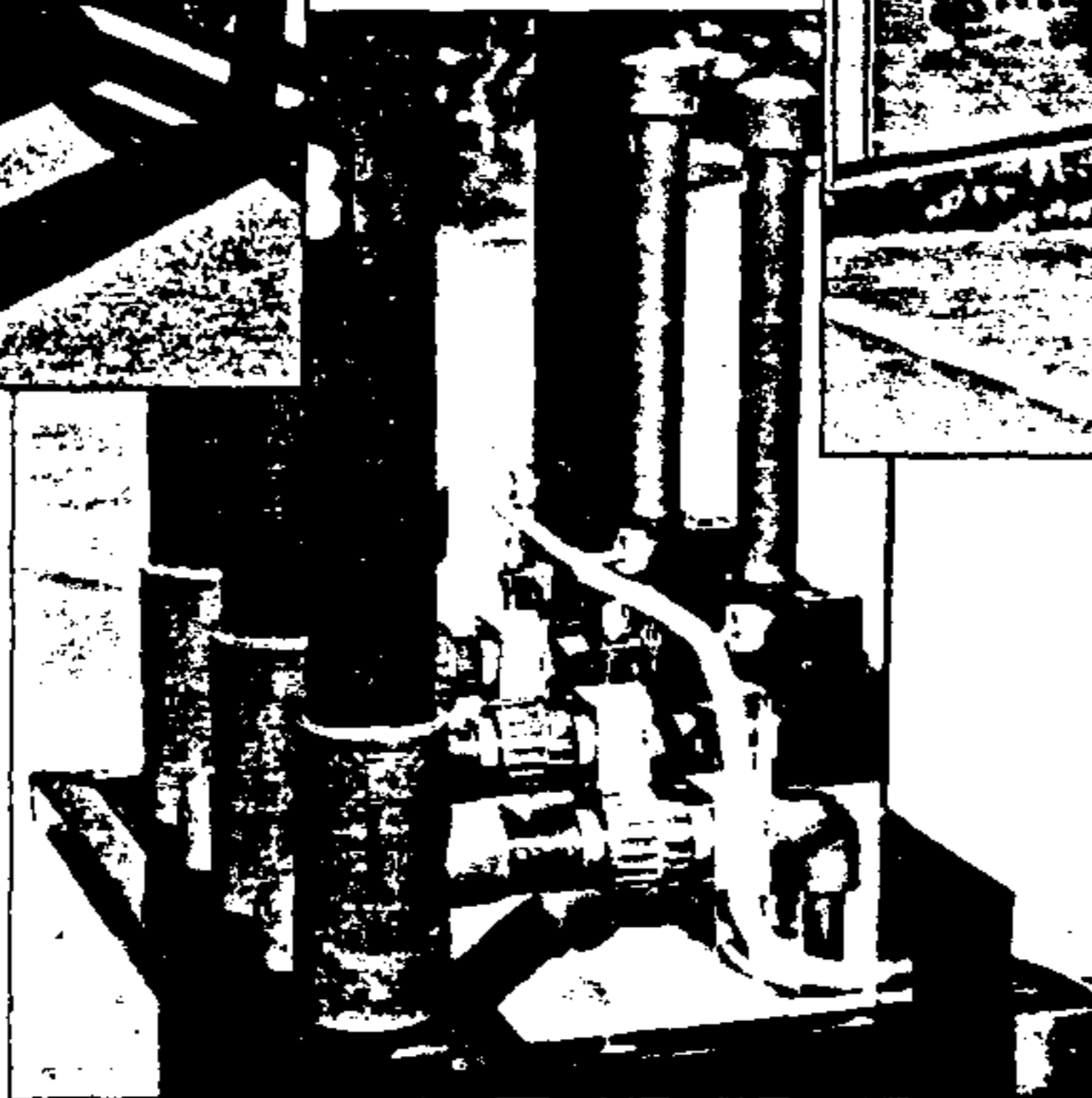
The B-E COMPAC-DOS-1 is a fertilizer dosage unit, which is made on customer's specification for small and middle large greenhouse companies. Something is expressed in the pumpcapacity, that will not exceed 10 m³/hour. The basic B-E Compac-Dos-1 can be extended with many technical options on customer's request. The handling of the dosage unit has been kept extraordinary easy. The pages can be read on the display on the front of the unit. Next to the displaycontrol there are 6 keys. The different functions of EC-control, pH-control, system pump and level pump can be used manually as well as automatically.

B-E de Lier	Page	15:12	28-03-'93					
Radiation W/m ²			0					
Radiation relative %			99					
Zone	1	2	3	4	5	6	7	8
Starts	0	0	0	0	0	0	0	0
Litres	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Active zone/valve								
Flow m ³ /hr						0	00-00	00.0
EC	setpoint	sensor	control					
pH	2.0	1.9	2.0					
	5.5	5.6	5.5					

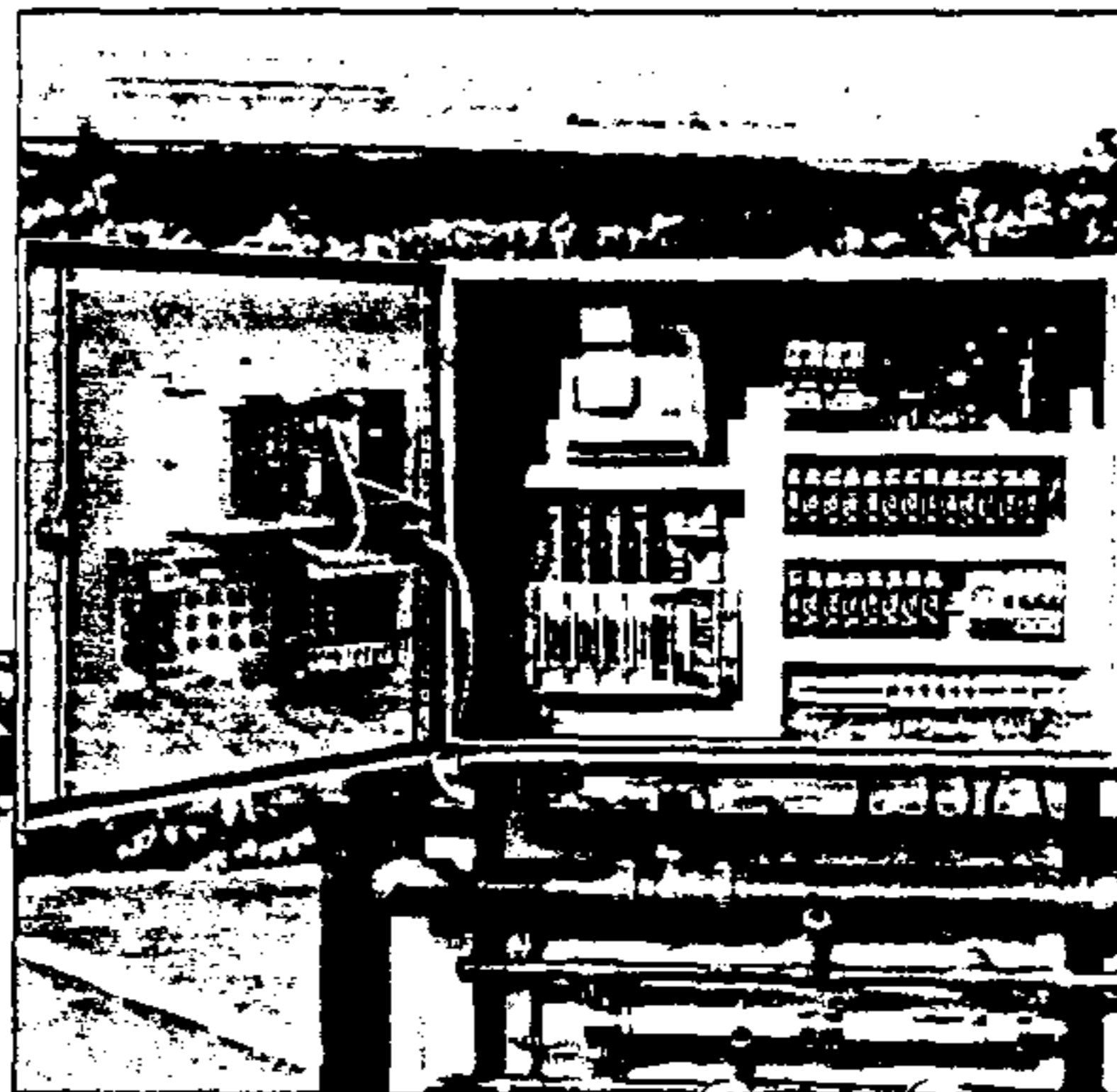


Grundfos, pumps
with a good reputation

8 individual irrigation zones
time/litre control
EC and pH
8 independent starting conditions
present reporting page
past 24 hours' reporting page
page of general data



Extremely precise valve dosage



Pumpswitchpanel and
computer in one box

1 system control
control of max. 10 solenoid valves
control of max. 8 rinsing valves
choice possibility of 2 fertilizer recipes
1 page of alarm setpoints
1 page of regulation setpoints
1 page of general setpoints



TECHNIQUE IN
HORTICULTURE
DE LIER B.V.

Everything for modern agriculture
and horticulture
Your best partner in quality and instruction

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2665 KM Bleiswijk
Tel. 0031-1892-12055
Fax. 0031-1892-12795

FRANCE

9 Rue Bel Air
89190 Flacey
Tel. 0033 86868383
Telex 601429F

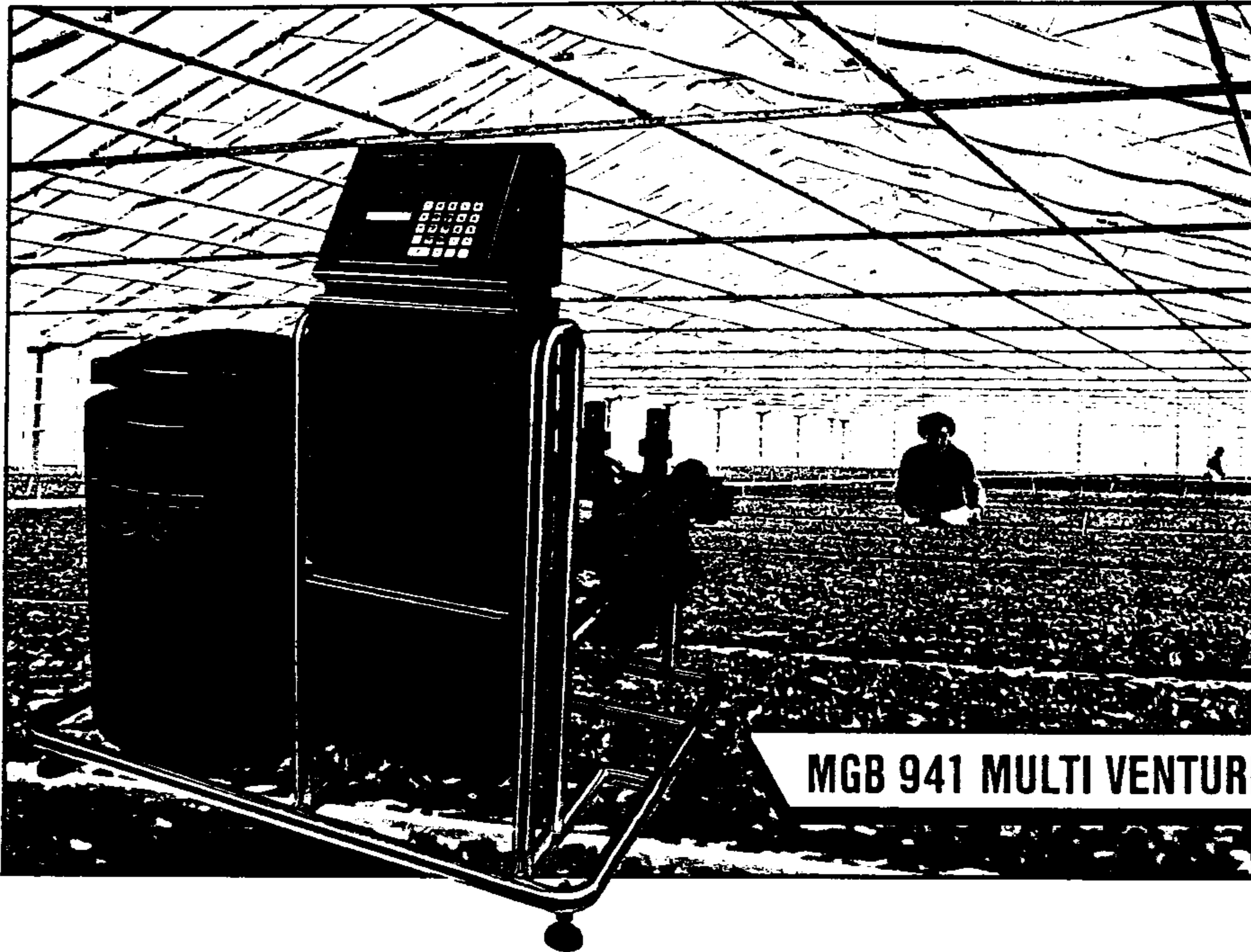
BELGIUM

Mechelsesteenweg 134
2860 St Katelijne Waver
Tel. 0032 15-552979
Fax 0032 15-552952

GERMANY

Robert-Bosch Strasse 1
4172 Straelen
Ref. 0049 2834-1018
Fax 0049 2834-1263

Computerized Fertilizer Mixer



MGB 941 MULTI VENTURI

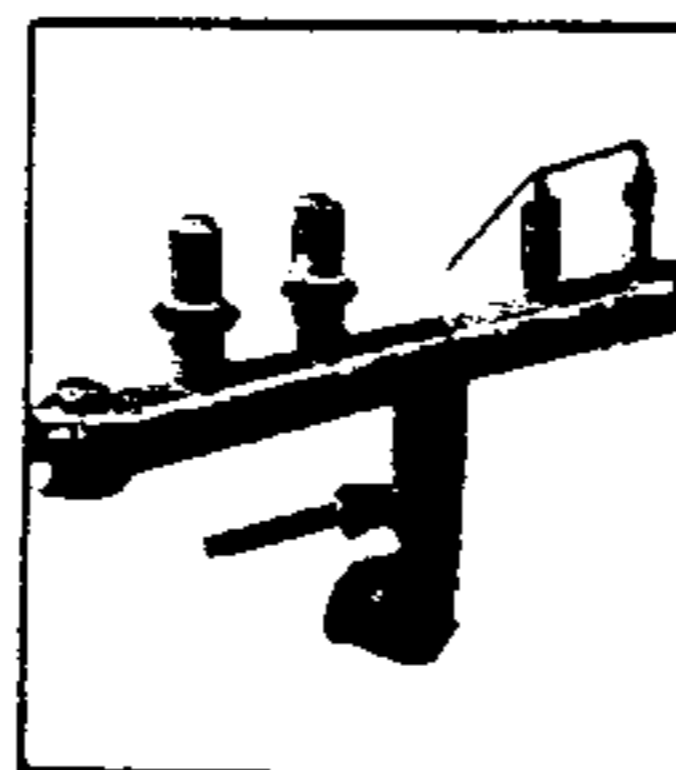
Fertilizer management at your fingertips

The MGB 941 Multi Venturi has been developed with the future in focus. The MGB 941 Multi Venturi combines sophisticated control possibilities with reliability, accuracy and ease of use. It is aimed at the grower who wants full flexibility and control over his crops nutrition and those requiring recirculation facilities now, or in the future.

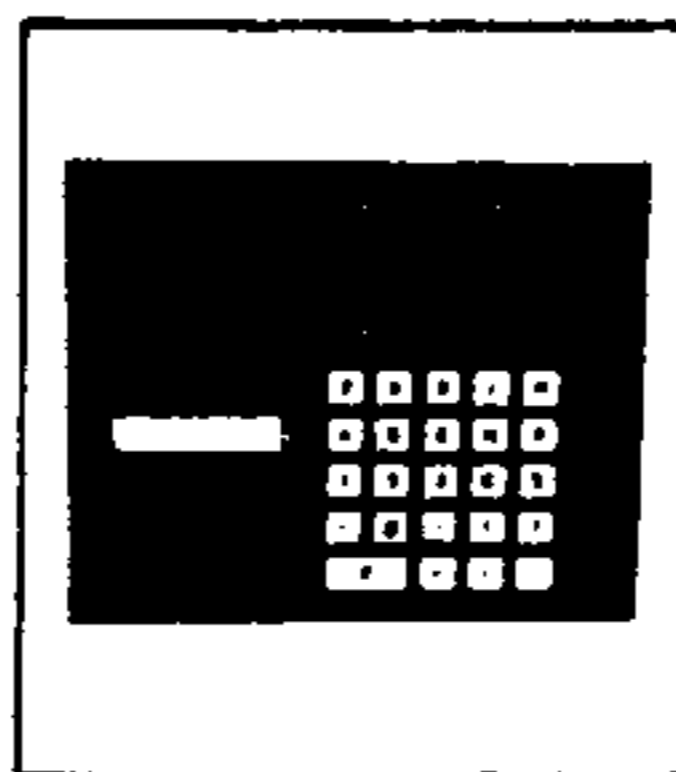
The MGB 941 Multi Venturi

incorporates the following features:

- * ease of programming with full screen display menus
- * automatic EC and pH control, utilising up to 9 stock tanks
- * pre-programmable recipes, which can be linked to any valve
- * accurate dosing of fertilizer solutions through reliable, maintenance free venturi valves. No injection pumps
- * easily incorporated into recirculation systems, with added facility for pre-mixing of drainage and fresh water to a pre-determined EC value
- * drainage water measurement and control
- * pump capacities from 4 to 32 m³ per hour



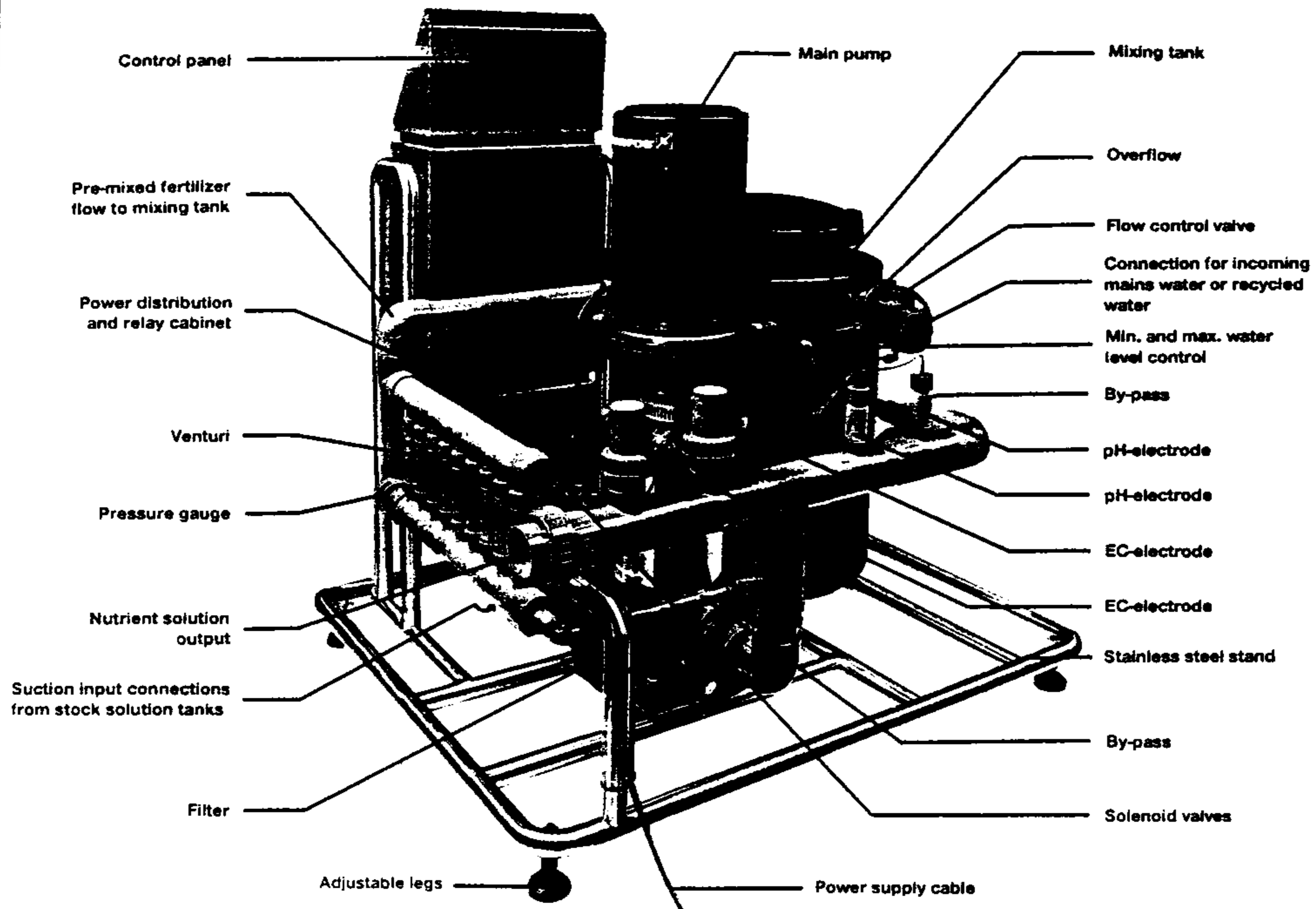
To ensure accurate control and reliability the MGB 941 Multi Venturi is equipped with twin probes for measurement and checking of both EC and pH.



The 8 line display menus make programming easier and provide a simplified overview of the control set points.

AVsystem

Technical Specifications



Dimensions:

- Length: 1200 mm
- Height: 1250 mm
- Depth: 1000 mm

- Weight: 130 kg

Power supply:

- 3 x 380 V 50 Hz 16 A or 230 V single phase or 230 / 380 V three phase

Other voltages according to your requirements

Control:

- Modular software and hardware units
- Memory: Flash PROM
- Microprocessor: 80C188
- LCD Display: 8 lines x 40 characters

Capacity:

- 4 - 32 m³ / hr

Full electronic inputs:

- 16 analog
- 4 digital
- temperature measurement
- 2 conductivity measurements
- 2 pH measurements
- Solar integrator
- flow measurement
- pressure switch

Full electronic outputs:

- 1 main pump
- 8 reservoir pumps
- 100 solenoid valves, which can be started singly or in pairs

Optional:

- An IBM compatible PC can be used as an external workstation for all functions.

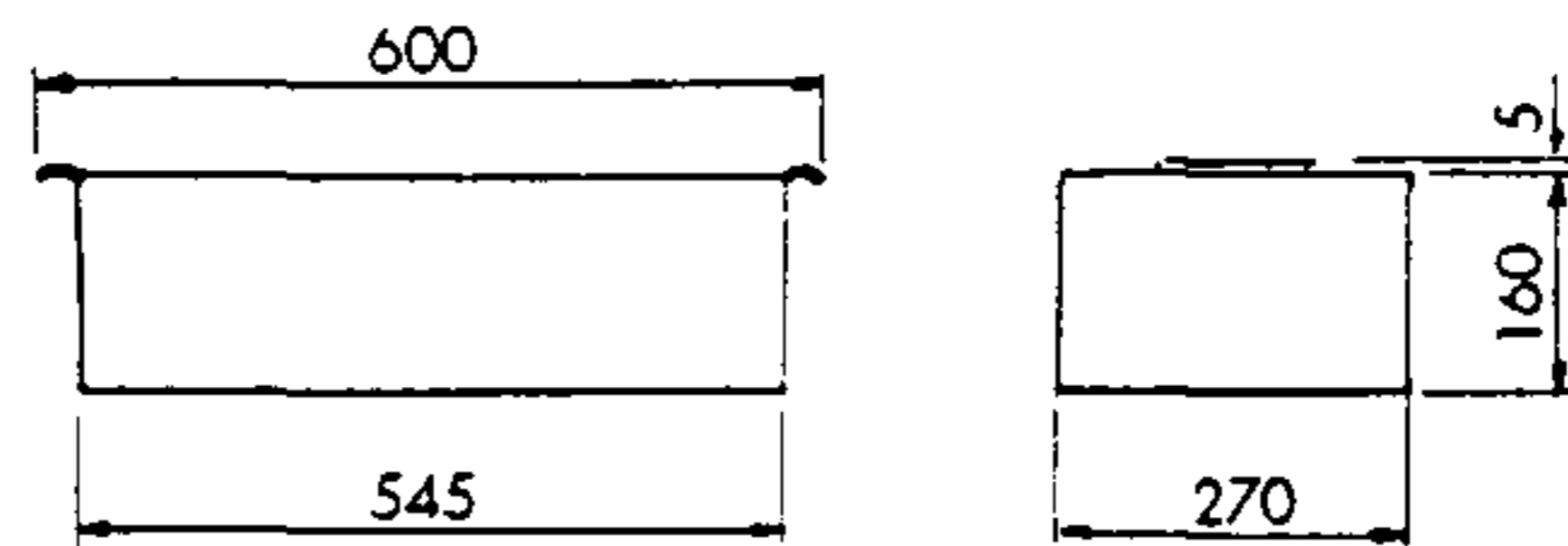
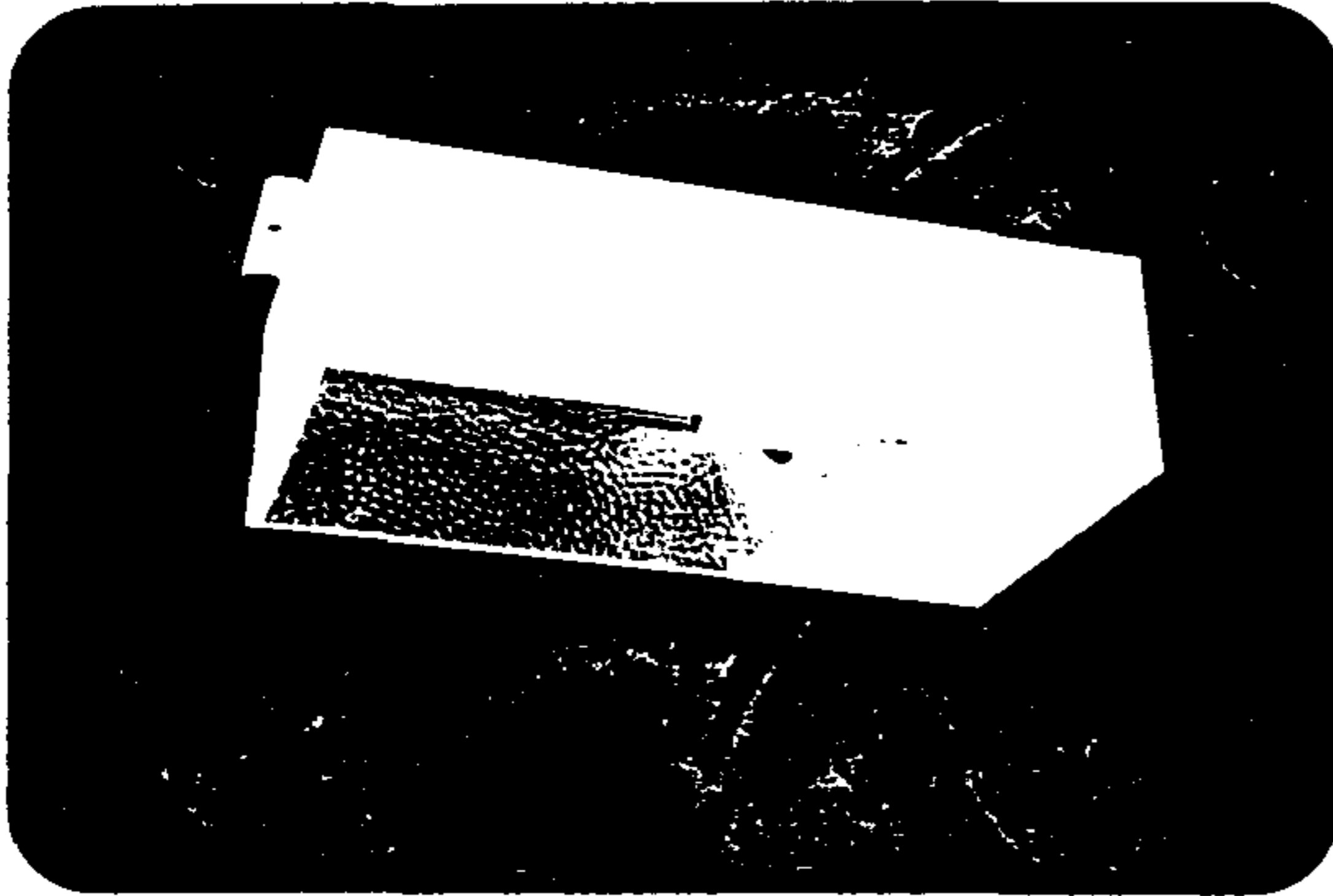
GVI system as

GVI system A/S . Hans Egedes Vej 11B . DK-5210 Odense NV . ☎ +45 66 16 46 45 . Telefax +45 66 16 46 55



Elektro-Valo Oy
23800 Laitila
FINLAND

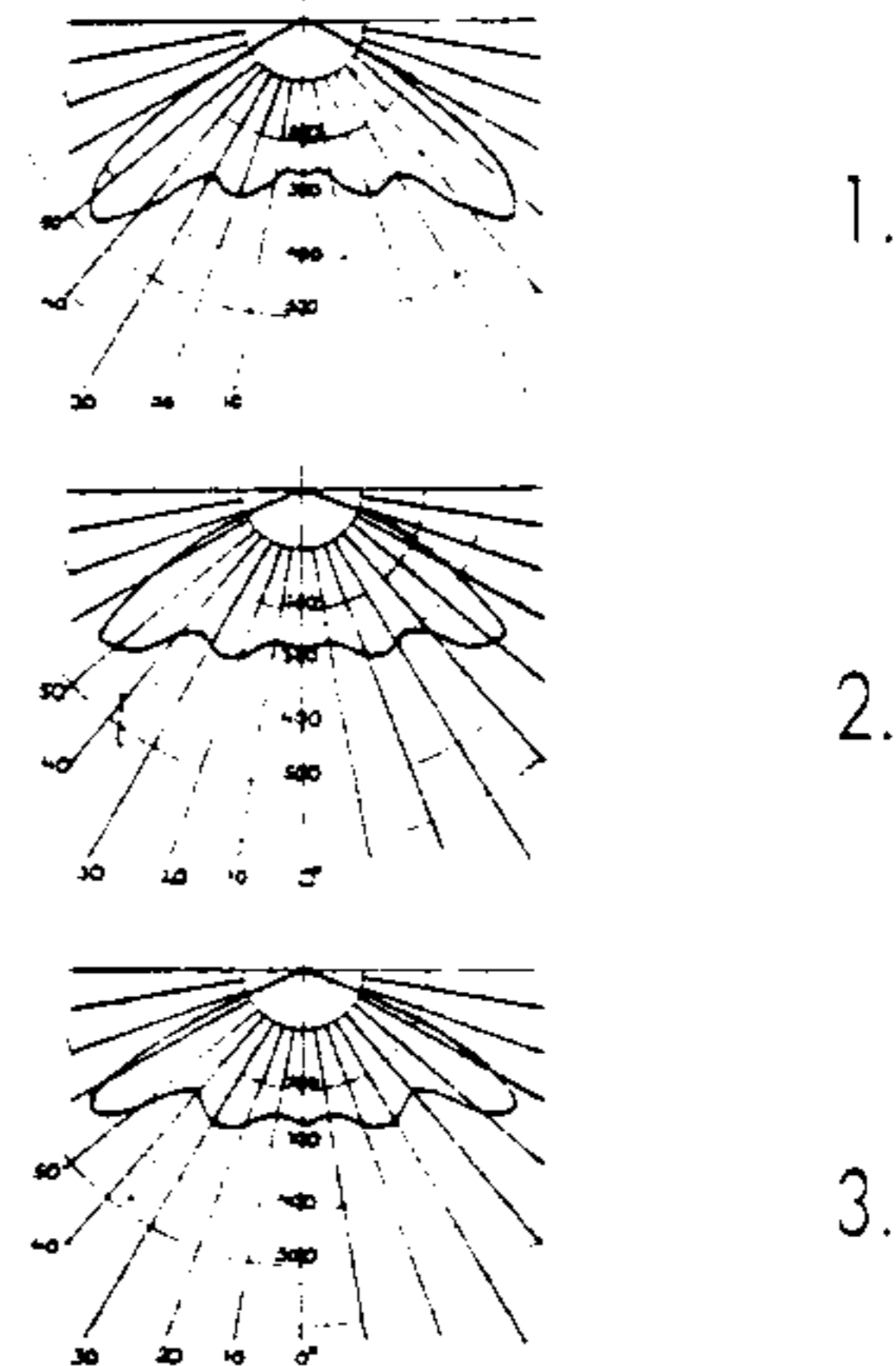
EV-400 SPN, the most flexible assimilation light fitting for greenhouses



It is possible to change the lamphight. This way you can change lightning area. An average beam spread characteristic is from 55 to 65 degrees.

Technical data and features:

- ☆ body electrogalvanized steel
- ☆ baked with epoksplasticpaint
- ☆ reflector polished hammered aluminium
- ☆ mains voltage 230 V
- ☆ spacious connection box
- ☆ IP 23 (drip water protection)
- ☆ quick release from mounting plate
- ☆ quickly mounted and assembled
- ☆ phase of factor (cos ϕ) 0,90
- ☆ suitable for various marks of HPS (High Pressure Sodium) lamps
- ☆ standard version 400 W
- ☆ other types of light fittings on request
- ☆ all electrical parts made in Western Europe



Sales and marketing:

 puutarhaliike
HELLE OY

Rengaskuja 3, 21410 VANHALINNA, FINLAND
Phone +358-21-878313, fax +358-21-878683

THE APPLICATION OF BITBUS IN GREENHOUSES

A special greenhouse has been built in Wageningen, The Netherlands, at the IMAG-DLO (Institute for Mechanisation, Labour and Buildings). It will be used for the research project 'Defining optimal energy utilisation during the use of artificial daylight in greenhouses'.

The building of this greenhouse was also responsible for the development of a new concept in computer automation. The concept was developed by the IMAG-DLO and custom made by INCAA Computers in Apeldoorn.

The project consists of several typically research- oriented aspects while at the same time giving consideration to the need for a carefully controlled environment for actual production. The concept offers solutions for the problems of the researchers and the IMAG market gardeners as well as the maintenance group. Such as flexibility, user-friendliness, availability of information, and maintenance. It has been structured in such a way that it would also be suitable for more general applications, both inside and outside the IMAG, in greenhouses, animal housing and other experimental environments.

This computer automation project is intended to set an example. The structure of the selected solution ought to be able to be used as a model not only for what commercial companies are developing for farmers and market gardeners but also for process control in institutes concerned with agricultural research. The concept would certainly also seem suitable for industrial applications.

INITIAL CRITERIA

Initial criteria for this new concept in process control were:

A high degree of functionality, flexibility and reliability with regard to measurement and control techniques, data processing, model and simulation development and total process management.

New and modern developments in control and data processing must be applied without intimidating the user.

The new design must be suitable for all current types of research companies as well as for small and large set-ups within the IMAG-DLO.

A hierarchical structure was selected that retained the existing decentralised control but was enhanced with new insights into the techniques.

Continuity of the process control in the event of the PC going down is of major importance. The stated requirement was a turnkey package, to include delivery of all hardware, software and firmware and the actual application.

IMPLEMENTATION

The top of the hierarchical structure (Fig.1) is a mainframe (VAX) to which all the PC workstations are coupled via a LAN (Local Area Network). The greenhouse data on the mainframe can be accessed by everyone for analysis and/or simulation purposes. The information is gathered by a cluster computer. This controls a cluster of PCUs (Process Control Units). Each department of the greenhouse has its own PCU. A field-bus connects all the PCUs that are set up at the various compartments. Each PCU has a high degree of autonomy - Distributed Control.

The process is controlled as much as possible at the lowest level of the PCU; installed at its compartment in the greenhouse.

Under this new structure, every researcher can use the IMAG network to optimally control his own work (climate, process, control, machine control) from the PC on his desk without affecting other applications (maximum freedom for each individual versus minimal mutual interference). Later on, the application can be modified or new applications can be added with minimum disruption to the IMAG-DLO users.

Design and manufacturing of computer systems
for industry and science

Postbus 722, 7300 AS Apeldoorn, Holland.
Tel. 055 - 425001. Fax 055 - 429000

N.P.S. SYSTEM - BREAKTHROUGH IN ENERGY SAVING

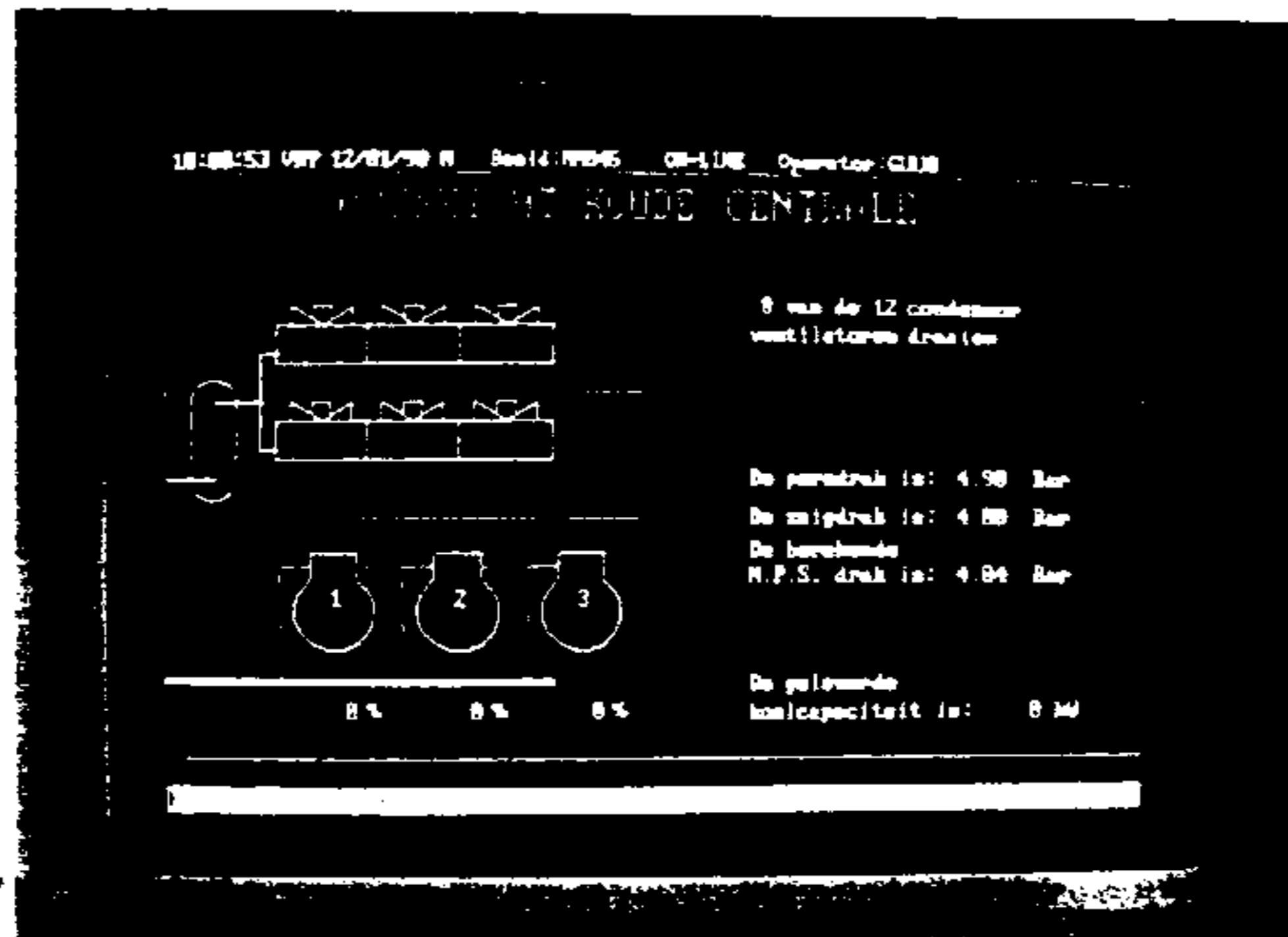
Nijssen Power Saving

Hi-tech at its best.

Control by computer and PLC are used a great deal in our installations.

The combination of cold store technical knowledge and the designing of software ourselves led to a breakthrough in cold store installation energy control: the Nijssen Power Saving System. This system, which was especially developed for centralised installations, corrects the suction pressure which in the past was set to a fixed value.

NPS continually checks the amount of cooling necessary per cell and via the PLC converts this to the optimum



suction pressure for that moment.

In this way the energy supplied is used in the most economical way.

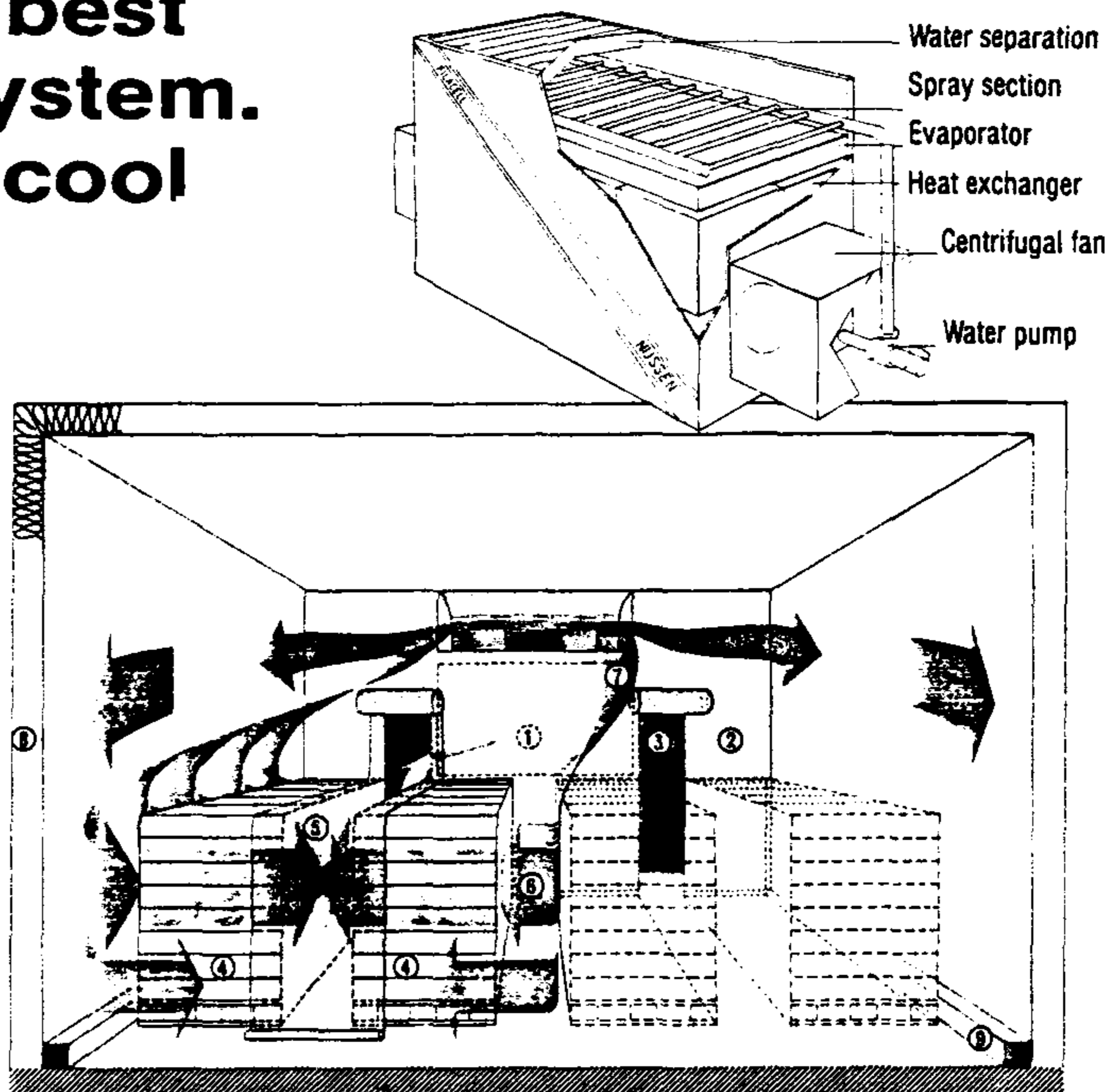
A favourable side effect of this is that a higher humidity level in the store is maintained which improves the product quality. We are very aware of the fact that climate control now, using the present-day techniques, and in the future with the progression still to come, is and will remain the key to improving product quality even further.

Choosing our product is a valuable investment for the future.

GUARANTEED 100% QUALITY MAINTENANCE

The world's best cold store system. The Filacell cool facts.

- No loss of quality
- The humidity is always constant (98 to 99%) and is not affected by moisture produced from the product or load.
- Temperature constant to a minimum of +0.5° C, thus no danger of freezing.
- Harmful micro-organisms and undesirable gases are filtered out of the air.
- Low energy and maintenance costs.
- Storage can be 2 to 3 times longer than with conventional cold store systems.
- The system never has to be defrosted.



- Suitable for all types of product including: green vegetables, soft fruit, cut flowers etc.

1. Filacell cooler. 2. Suction wall. 3. Suction opening. 4. Product stacking. 5. Product covering. 6. Airflow through products. 7. Cooled and humidified air. 8. Cold store insulation panelling. 9. Concrete skirting.

Model	Nom. air capacity in m ³ /hour	Nom. water flow rate in m ³ /hour	Dimensions in mm		
			L	B	H
116c	3.000	8	700	700	1800
216c	6.000	16	1300	700	1800
316c	9.000	24	1900	700	1800
416c	12.000	32	2500	700	1800
226c	12.000	32	1300	1300	2000
326c	18.000	48	1900	1300	2000
426c	24.000	64	2500	1300	2000
526c	30.000	80	3100	1300	2000
336c	27.000	72	1900	1900	2100
436c	36.000	96	2500	1900	2100
536c	45.000	120	3100	1900	2100
636c	54.000	144	3700	1900	2200
736c	63.000	168	4300	1900	2200

- Absolutely the best method for pre-cooling.
- Products cooled by Filacell for export to the furthest destinations are just as fresh on arrival as on the day they were packed and are therefore fit for sale much longer.

This system has already earned its reputation both nationally and internationally.