

Marking Systems for
Products and Packing

Electrolytic Marking Systems
Laser Marking Systems
Branding / Stamping
Inkjet Systems
Dot Printing
Identification Systems
Special Purpose Machines



OPERATING INSTRUCTIONS EU EXPERT 300/500 Manual unit for electrolytic marking

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Euexp_e.doc
Version 03/99

Safety tip



- Only authorised persons may open the machine. Unplug the machine before opening.
- In handling the electrolyte you expose yourself to organic and inorganic oxide substances in conjunction with natural water.
- Please request a safety manual for each Electrolyte number 91/155/EWG.

Application

The below described unit is designed to mark products with metal, electrically conductive surfaces in conjunction with electrolyte. Proper functioning of this unit depends upon correct treatment and maintenance of the system. The operation and maintenance instructions must be studied carefully by all operating personnel before the system is used.

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Liability

For any error in shipment or damage caused during shipment our liability is limited to those conditions outlined in the Terms of Delivery. Duration of the warranty is stated in the Terms and Conditions. We are not responsible for damage caused from improper handling of the equipment or for damage caused by disregarding the operating instructions.





EU - Conformity explanation

Manufacturer: ÖSTLING Markiersysteme GmbH

Address: Brosshauserstraße 27
D - 42697 Solingen

Product description: Marking Control unit

Type: EU EXPERT 300
EU EXPERT 500

The above product is in compliance with the following European guidelines:

Number: 89/336/EEG EMC-Guidelines

Text: EN 50081 -1 Generic Emission Standard
Residential, Commercial and Light Industrial Prem-
ises

EN 50082 -1 Generic Immunity Standard
Residential, Commercial and Light Industrial Prem-
ises

The included Owner's manual constitutes a part of
this statement.

Manufacturer: ÖSTLING Markiersysteme GmbH

Place, Date: Solingen, 18 March 1999

Legally binding signature:

A handwritten signature in black ink, appearing to read 'R. Östling', is written over a horizontal line.

Rolf Östling

This statement is in accordance with the general guidelines, including no assurance of quality.

The safety precautions included in the product documentation are to be heeded.



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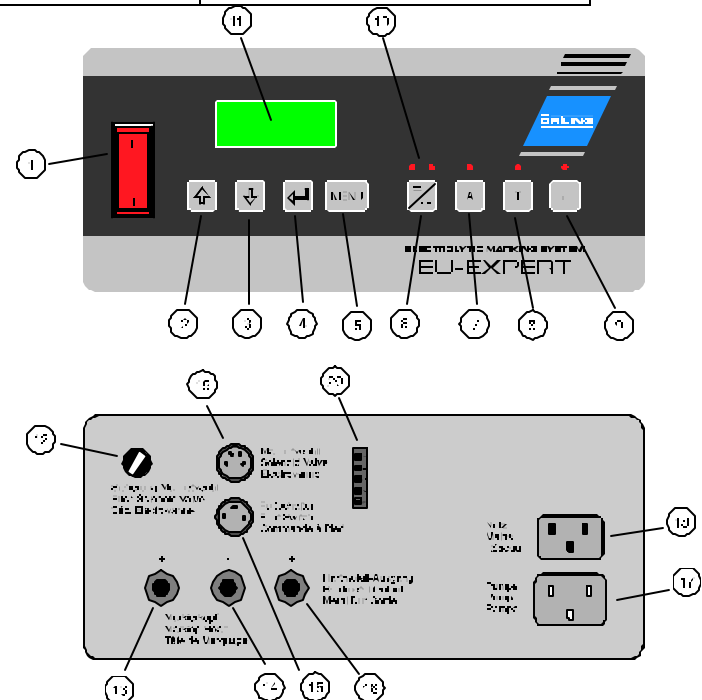
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1.0 Description of function

The systems EU Expert 300 and EU Expert 500 are suitable for marking products with metallically electrically conductive surfaces. It is of no matter whether these surfaces are hardened, steam-treated, burnished, nickel coated, chrome coated, or whether they are large or small, or flat or round. The system's input voltage can be set at 110 V, 120 V, 220 V, 230 V, and 240 V (AC). The output voltage can set infinitely from 0 – 30 V (AC or DC) at a capacity of 310 VA or 510 VA. The mains frequency (50 or 60 Hz) is recognised by the system automatically and displayed in the service menu. The 4 line illuminated display shows operation parameters. This text can be set in English, German or French - other languages available upon request. Signals are available which enable communication with an PLC or with a PC. Available as options are a serial interface and analogue / digital input or output socket.

2.0 Technical Data

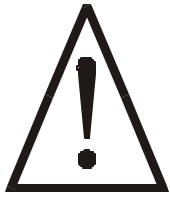
	EU EXPERT 300	EU EXPERT 500
Input voltage (internally adjustable)	110 V, 120 V, 220 V, 230 V or 240 V, AC (50/60 Hz)	110 V, 120 V, 220 V, 230 V or 240 V, AC (50/60 Hz)
Output voltage	0 - 30 V (AC or DC)	0 - 30 V (AC or DC)
Power	310 VA	510 VA
Dimensions (H x W x D)	140 x 380 x 220 mm	140 x 380 x 220 mm
EMC tested	EN 50081-1; EN 50082-1	EN 50081-1; EN 50082-1



2.1 Operating elements

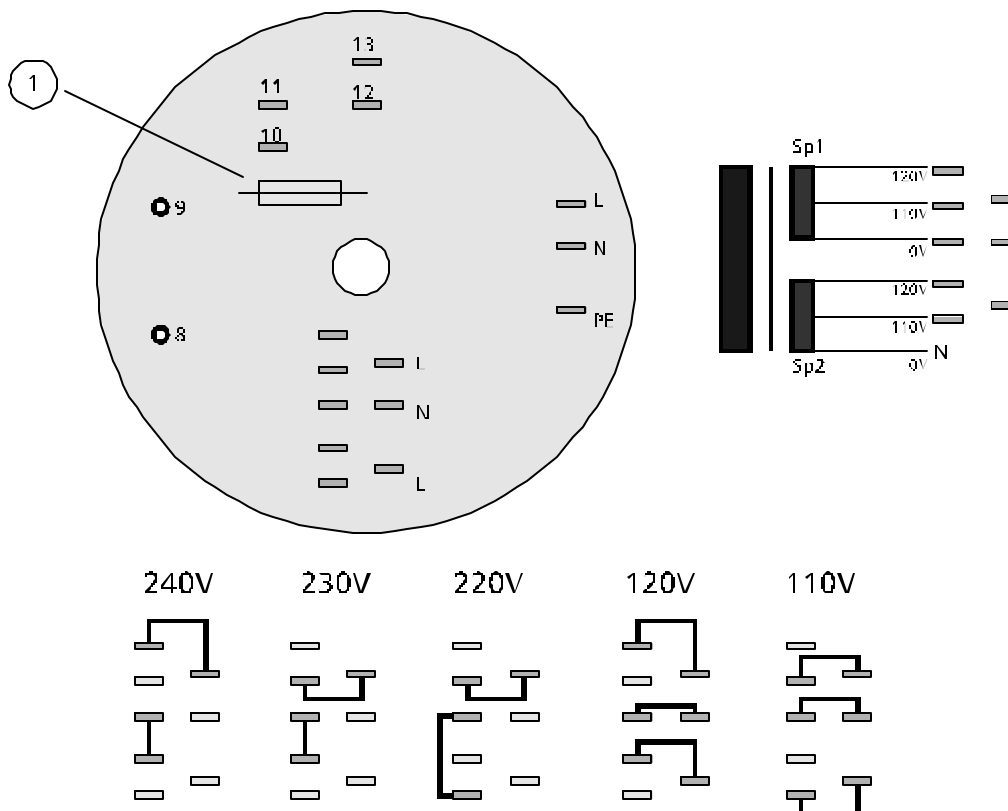
- pos 1 Main switch ON-OFF
- .
- pos 2 Key ↑ (values increased)
- .
- pos 3 Key ↓ (values decreased)
- .
- pos 4 Key ↵ (Enter)
- .
- pos 5 Key MENU
- .
- pos 6 Key =/~ (DC/AC)
- .
- pos 7 Automatic Key
- .
- pos 8 Timing Key
- .
- pos 9 Pump Key
- .
- pos 10 LED DC/AC
- .
- pos 11 4 line LCD Display
- .
- pos 12 Magnet valve fuse
- .
- pos 13 Positive cable connection
- .
- pos 14 Negative cable connection
- .
- pos 15 Foot switch connection
- .
- pos 16 Hard metal output (option)
- .
- pos 17 Pump connection
- .
- pos 18 Main connection cable
- .
- pos 19 Solenoid connection
- .
- pos 20 Clip with I/O-signals
- .

2.2 Setting the input voltage



This work may be carried out by specially trained staff only. Before the required operating voltage can be set, the system must be opened. The mains plug must be disconnected before the system is opened.

Bird's eye view of transformer



The bridges available enable the following input voltages (see drawing): 110 V, 120 V, 220 V, 230 V and 240 V.

The mains frequency in use (50 / 60 Hz) is recognised automatically by the system and displayed in the service menu (see point 5.4).

The 24 V, DC output is additionally secured with a fuse (pos. 1). This prevents the destruction of the internal bridge equaliser in the case of overloading (> 1A) which might be caused for example by short circuiting. The fuse performance can be seen on the label on the transformer.



3.0 Main menu

When switched on the system is in the main menu. All parameters which are important for marking procedure are displayed. The values and adjustments set last are saved also after the system is switched off.

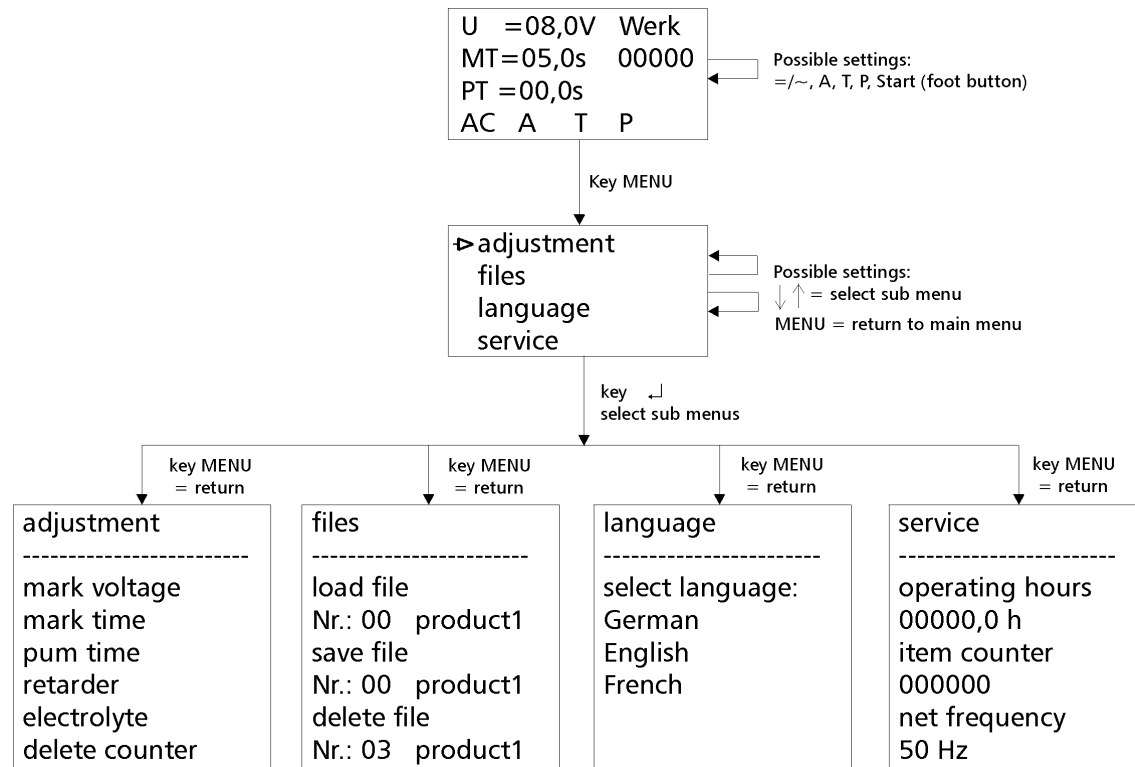
For example this might appear on the display:

U	=08,0V ¹	File ⁷
MT	=05,0s ²	00000 ⁸
PT	=00,0s ³	6744 ⁹
AC	A ⁵ T ⁶ P ¹⁰	

Meaning of displayed parameters:

1	Output voltage U in volts
2	Marking time MZ in seconds
3	Pumping time PZ in seconds
4	Mode of output voltage: AC = alternating current DC = direct current
5	Automatic A (24 V – output) no A means: 24V output is not available and not activated inverted A means: 24V is available but not activated A means: 24V output is available and activated
6	Timer function T no T means: continuous function – output is continuously activated T means: timer function – output is activated after start signal
7	File Up to six-digit file names are displayed here Up to 15 files can be saved
8	Counter Shows the number of marking procedures carried out (max. 99.999)
9	Electrolyte Shows the type of electrolyte if this has already been saved in a file (max. 5 digits)
10	Pump P no P means: pump output not activated P means: pump is activated

4.0 Procedure Diagram



5.0 Programming procedure

- The keys A, T, P and the start input (foot button) can only be activated in the main menu.
- The keys ↑ and ↓ and ↵ have no function in the main menu.
- By pressing the key MENU you go from the main menu into the first sub-menu:

⇒ adjustment
files
language
service

The ↑ ↓ keys move the arrow visible in the display up or down. Press return ↵ to enter the respective sub-menu.

5.1 Sub-menu adjustment

```

⇒  adjustment
    -----
    -----
    mark voltage
    U=08,0V
  
```

In the sub-menu adjustment, the following parameters can be changed:

- mark voltage
- mark time
- pump time for the pump time set, the output for the electrolyte pump (pos. 17) is activated.
- retarder Only after this time lapse is the marking output activated. Necessary with worn marking heads
- electrolyte
- delete counter

Skip through the parameters listed above by pressing the \uparrow \downarrow keys. The menu key returns you to the first sub-menu (see point 4.0). The key \downarrow enters the selected parameter.

5.1.1 Mark voltage

Only the keys \uparrow , \downarrow , \downarrow , MENU and $=/\sim$ can be used.

- The key $=/\sim$ switches between AC and DC. The LEDs above the key show the current condition.
- The key \downarrow moves the arrow \Rightarrow downwards and the marking voltage can be changed. The key \uparrow (pos. 2) increases and the key \downarrow (pos. 3) reduces the marking voltage in steps of 0.2 V.

```

    adjustment
    -----
    -----
    mark voltage
    ⇒ U=08,0V
  
```

- The key MENU (pos. 5) does **not** save the set value. The program then is again at adjustment (the arrow in the display shows this).
- The key \downarrow saves the values set. In the display the arrow \Rightarrow points to ad-

```

⇒  adjustment
    -----
    -----
    mark voltage
    U=08,0V
  
```

justment.

- The key ↓ can now be used to change the mark time.

5.1.2 Mark time

In the sub-menu Mark time, only the keys \uparrow , \downarrow , \leftarrow , MENU and \Rightarrow can be used.

- The key \leftarrow moves the arrow \Rightarrow up and down and the marking time can be changed. The key \uparrow (pos. 2) increases and the key \downarrow (pos. 3) reduces the marking time in steps of 0.1 seconds.

adjustment

mark time
\Rightarrow MT=04,0s

- The MENU key does **not** save the value set. The program is then again at adjustment (the arrow in the display shows this).
- The key \leftarrow saves the values set. The program is then again at adjustment (the arrow in the display shows this).
- Now the pump time can be changed by using the key \downarrow :

5.1.3 Pump time

In the sub-menu pump time only the keys \uparrow , \downarrow , \leftarrow and MENU can be used.

adjustment

pump time
\Rightarrow PT=01,0s

- The key \leftarrow moves the arrow \Rightarrow downwards and the pump time can be changed. The key \uparrow (pos. 2) increases and the key \downarrow (pos. 3) reduces the pumping time in steps of 0.1 s.
- The MENU key does **not** save the value set. The program is then again at adjustment (the arrow in the display shows this).
- The key \leftarrow saves the values set. The program is then again at adjustment (the arrow in the display shows this).
- Now the retarding time can be changed by using the key \downarrow :

5.1.4 Retarder

In the sub-menu retarder only the keys \uparrow , \downarrow , \leftarrow and MENU can be used.

- The key ↵ moves the arrow downwards and the retarding time can be changed. The key ↑ (pos. 2) increases and the key ↓ (pos. 3) reduces the retarding time in steps of 0.1 s.


```

adjustment
-----
----
retarder
⇒ RT=00,0s

```

- The MENU key does **not** save the value set. The program is then again at adjustment (the arrow in the display shows this).
- The key ↵ saves the values set. The program is then again at adjustment (the arrow in the display shows this).
- Now the electrolyte type can be selected by using the key ↓:

5.1.5 Electrolyte

The selection of the electrolyte can only effectively be made in connection with the sub-menu Files, as all parameters set and the electrolyte type are can be stored in a file (see point 5.2).

- The key ↵ moves the arrow ⇒ downwards and the electrolyte type can be selected. Skip through the numbers from 0 to 9 and the letters from A to Z and a to z with the keys ↓ ↑. When the required number appears, confirm it with the key ↵. The marker will jump one space to the right and the next figure can be entered. When all five spaces have been filled with a figure the electrolyte is selected and will appear in the main menu

U	=08,0V	File
MT	=05,0s	00000
PT	=00,0s	6744
AC	A T	P

by pressing the MENU key twice.

```

adjustment
-----
----
electrolyte
⇒ 6744 _

```

- If for example electrolyte 72 is to be fitted, an empty space must be given in the position 3,4 and 5 respectively. The space lies above the zero: i.e. it is only necessary to move with ↑ to zero. The next position is the space.

```

adjustment
-----
----
electrolyte
⇒ 72_ _ _

```

- By pressing the key ↓ the counter can now be deleted.

5.1.6 Delete counter

After a product charge has been marked and the required counter reading has been reached, the counter can be returned to zero.

- The key \downarrow moves the arrow \Rightarrow downwards. With the key \downarrow the counter can be set at zero.

```

adjustment
-----
----
delete counter
=> Counter=00999

```

```

adjustment
-----
----
delete counter
=> Counter=00000

```

Entry into the sub-menu adjustment is reached by pressing the key MENU.

5.1.7 Original settings

By pressing the key MENU when the system is turned on all settings can be returned to original settings.

```

U   =08,0V   Werk
MT  =02,0s   00000
PT  =00,0s
AC

```

Output voltage	U = 08,0 V
Mark time	MT = 02,0 s
Pump time	off; PT = 0,00 s
Retarder	off; RT = 0,01 s
Output current alternating current	AC-LED = on; DC-LED = off
Timer function	off; T-LED = off
Output magnetic valve (24 V)	off; A-LED = off
Output pump (230 V)	off; P-LED = off
Data	original (Werk)
Counter	00000
Language	Geman

5.2 Sub-menu files

In the sub-menu Files all parameters contained in the menu adjustment can be stored in or loaded from files. For recurring products all settings are dealt with once and filed under a file name (e. g. forks, knives etc.). When changing to another product the respective name can be loaded and all the required settings are immediately available. This saves the trouble of making new settings.

```
⇒ adjustment
   files
   language
   service
```

By pressing the key MENU, the menu below appears:
Press the key ↓ to select the sub-menu files.

```
⇒ adjustment
   files
   language
   service
```

The key ↓ opens the sub-menu.

```
⇒ files
   -----
   -----
   load file
   no.: 01  Test
```

By pressing keys ↓ and ↑ it is possible to move between load file, store file

```
⇒ files
   -----
   -----
   load file
   No.: 01  Test
```

```
⇒ files
   -----
   -----
   save file
   No.: 01  Test
```

```
⇒ files
   -----
   -----
   delete file
   No.: 01  Test
```

and erase file:

As immediately after the set up no files are stored, storing files will be described first:

5.2.1 Save file

Press key ↓ for file selection

files

save file
⇒ No.: 00 Werk

The file "original (Werk)" cannot be changed!

Press key ↑ for file no. 1:

```

files
-----
-----
save file
⇒ no.: 01
  
```

By pressing key ↵ any file name (max. six digits) can be entered:

```

files
-----
-----
save file
no.: 01 ⇒ _
  
```

The marker is on the first position and by using the keys ↓ and ↑ the numbers 0 – 9 and the letters A – Z and a – z can be entered. When the desired figure appears in the display it can be confirmed with the key ↵. The marker will then move one position to the right:

```

files
-----
-----
save file
no.: 01 ⇒ F_
  
```

Repeat this process until, for example, the following file name has been given:

```

files
-----
-----
save file
no.: 01 ⇒ Fork_
  
```

If the file name is to be shorter than six digits, then the last spaces must be filled with empty tabs. If the completed file name has been confirmed with ↵, then all parameters are stored: i.e. all settings described in point 5.1 (mark voltage, mark time, pump time, type of voltage, automatic, timer, pump and electrolyte) are stored and can be loaded at any time:

5.2.2 Load file

Change to load file with keys ↓ and ↑ , and enter with key ↵:

	files	

	load file	
⇒	No.: 01	Fork

Select desired file with key ↑ and enter with key ↵.

```

files
-----
-----
load file
⇒ no.: 01 Fork
  
```

The LED figures in the front plate change according to the parameters stored. By pressing the MENU key twice the main menu appears in display. Here all settings appear which have been stored under the program name.

```

U   =08,0V    Fork
MT  =05,0s    00000
PT  =00,0s    6744
AC   A   T   P
  
```

As well as the figures in the display the LED's ~, A, T and P lit up and show the operating situation.

5.2.3 Delete file

Change to delete files with the keys ↓ and ↑ and press key ↵.

```

files
-----
-----
delete file
⇒ no.: 01 Fork
  
```

By pressing keys ↓ and ↑ it is possible to select the file, which should be deleted.

Press key ↵ to delete this file (original parameters are then loaded). The system will continue to operate with the file last loaded.

5.3 Sub-menu language

In the sub menu language, there is a choice of German, English and French. After the setting, all texts appear in the display in the selected language.

Press key MENU for the menu illustrated below:

```

adjustment
files
⇒ language
service
  
```


Press key ↓ for the sub menu language:

```

⇒ language
-----
-----
select language
ENGLISH
  
```

Press key ↵ to open the sub menu:

```

language
-----
-----
select language
⇒ ENGLISH
  
```

Choose from German, English and French with keys ↓ and ↑. Enter desired

```

⇒ Sprache
-----
-----
Sprache wählen
DEUTSCH
  
```

```

⇒ Langue
-----
-----
Choisir langue
FRANCAIS
  
```

```

Einstellungen
Dateien
⇒ Sprache
Service
  
```

```

Reglage
Fichiers
⇒ Langue
Service
  
```

language with key ↵. Immediately the text will appear in the display in the language selected:

Press key MENU and in the display appears:

Press key MENU again for main menu:

GERMAN

```

U  =08,0V  Fork
MZ =02,0s  00000
PZ =00,0s
AC
  
```

ENGLISH

```

U  =08,0V  Fork
MT =02,0s  00000
PT =00,0s
AC
  
```

FRENCH

```

U  =08,0V  Fork
TM =02,0s  00000
TP =00,0s
AC
  
```

5.4 Sub-menu service

In the sub menu Service data important for service can be loaded:

Operation Instruction EU EXPERT 300/500

Operating hours: shows how long the system has been in operation in total

Item counter: shows total number of markings carried out

Net frequency: show current net frequency

The information in this sub menu can only be loaded but cannot be changed.

```

adjustment
files
language
⇒ service
  
```

Press key MENU for menu illustrated below. Use key ↓ to select Service sub

```

⇒ service
-----
-----
operating hours
00034,9 h
  
```

```

⇒ service
-----
-----
item counter
000032
  
```

```

⇒ service
-----
-----
net. frequency
50Hz
  
```

menu.

Press key ↵ to open sub menu.

Use the keys ↓ and ↑ load service parameters: The key ↵ has **no function** here.

Press key MENU to quit the sub menu Service.

6.0 System start up

- The handle serves to carry the unit or to put it on an angle. The two buttons on the side of the handle allow you to adjust the face of the machine by 30° increments.
- The sockets (pos.13 and 14) are provided with a captive insulated head, so that both a cable with a banana plug or with a suitable cable sleeve can be used.
- Push the banana plug of the red positive cable in the socket (pos. 13).
- Connect the other end of the red positive cable to the spade terminal of the marking head (pos. A).
- Push the banana plug of the blue cable into the black socket (pos. 14)
- Connect the other end of the blue negative cable to a conductive base plate, or directly to the product.
- Push the foot switch into the input socket (pos. 15).

Operation Instruction EU EXPERT 300/500

- Power comes to the EU EXPERT 300/500 by means of a main cable, which is to be connected to an input plug (pos. 18). Be sure to see for which input voltage the unit is designed (see type plate).

6.1 Hard metal output (option)



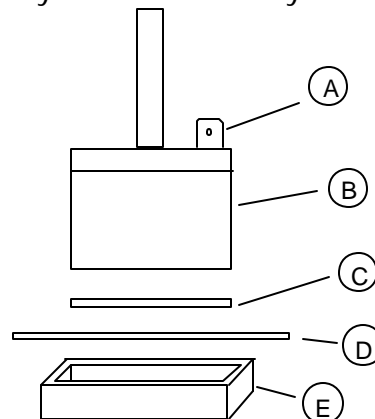
If the system is fitted with a hard metal output there will be a second red laboratory clamp on the reverse side (pos. 16). This output is set permanently for 10 V, AC. This voltage cannot be changed via the keyboard. In addition, the automatic and timer functions are not active here.

6.2 Preparing the marking head

6.2.1 Marking head for black marking

Prepare a bit of black felt with the same size as the marking area of the marking head. For best results we recommend that you soak the felt in clean water then wring it out so that it is moist. Fit the leading net over the felt on the marking head. Place the marking net so that ca. 15 mm stands overlaps the marking head on each side. **Now place the net on top of the marking head and place the net so that you may begin marking.** Now place the felt on the marking head and lay the net so that you may fasten it to the cassette.

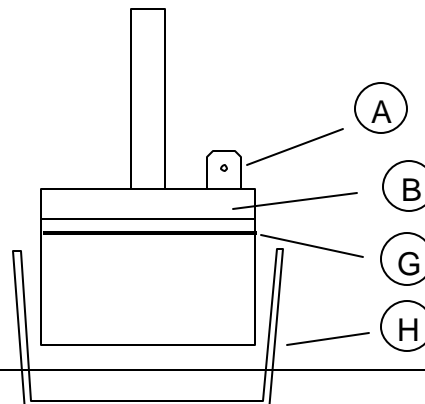
- pos. A Spade terminal
- pos. B Graphite
- pos. C Felt
- pos. D Conductive net
- pos. E Cassette



6.2.2 Marking head for deep marking

Cut a piece of green felt in the width of the marking head. Lay the felt around the marking head and secure it with an O-ring. (pos. G). **No conductive net is needed here.**

- pos. A Spade terminal
- pos. B Marking head
- pos. G O-Ring
- pos. H Felt





6.3 Moisten the felt with electrolyte

Before you use the marking head, we recommend you rinse the felt with clean water so that the felt is wet. After you wring out excess water from the felt, you can effectively use the electrolyte. In order to achieve an optimal marking quality it is important to keep the felt moist.

6.4 Stencil types

Should you need an Östling permanent stencil (e.g. medilon) please turn to point 5 *etching process*.

In order to make your own stencils quickly and professionally, please ask about our customised stencil printing systems. This includes an Östling PT 220, 550, and 24 pin printer as well as all necessary software.

7.0 Etching process

- Depending upon marking needs (point 12) use the DC/AC key (pos. 6) to set the marking type.
AC (Alternating current) for black marking. The right hand light is lit.
DC (Direct current) for a deep mark. The left hand light is lit.
- In the sub menu *voltage setting* (see point 5.1.1) the output voltage can be infinitely set from 0 - 30 V. The display (pos. 11) shows the current setting.
- **Hand-operation**
Marking without the timer
Place the product to be marked on a base plate or similar device. Place the stencil on the product. Press the prepared marking head lightly on the product to be marked. The marking time usually takes between 1-1,5 seconds for the black etching, and 3-5 seconds for deep marking.
- **Attention: In order to prevent a short circuit, be sure that the marking head does not come in contact with the base plate.**
- **Automatic-function**
Marking with the timer
With the foot switch you may begin the built-in timer. With the =/~ key (pos. 6) You may choose alternating current AC and in the submenu *current strength* (see Point 3) you may begin marking with the foot switch. When finished, touch the Automatic key (pos. 7) and Timer (pos. 8). The voltage returns to 0 Volt and is saved only in the sub menu time (pos. 6). At the same time at the outlet Solenoid valve (pos. 19) a Voltage of +24 V, DC is on, with this it is possible to connect a tungsten carbide outlet (Option for Östling semi-automatic machines). In addition the set marking voltage at the output is set for the set marking time. The counter adds the marking process (s. display).
- In the case that a retarding time has been given, the display of MT (Mark time) will change to RT (Retarding Time) by pressing the foot switch. The

retarding time runs out, and only then will the output be made available for the marking voltage.

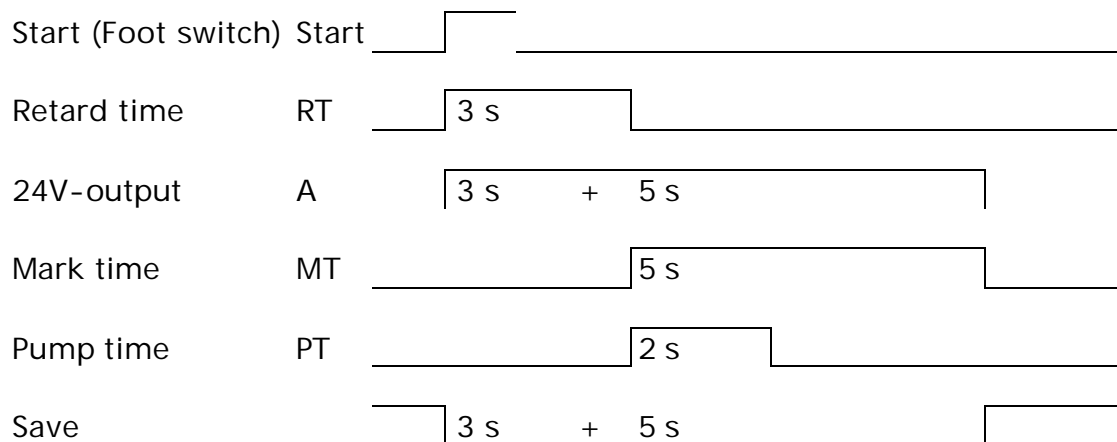
- If a pumping time has been given, the pumping time runs out and a P will appear in the display. While the P is being displayed, the 230 V output for the electrolyte pump is made available.

Note: After marking rinse the marking head and the stencils in clean water.

Example: Diagram of a Marking session

A and T depressed, P not depressed	Marking time	MT	=
5,0 s			
	Pump time	PT = 2,0 s	
	Retard time	RT	=
3,0 s			

Execution diagram:

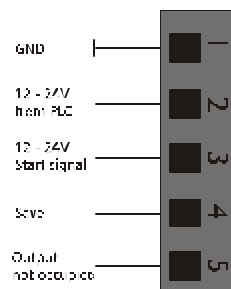


The display shows what is happening at the moment. For example, when the retard time is activated, the display will switch from marking time (MT) to retard time (RT).

8.0 I/O-Signals

To integrate the EU EXPERT into the automatic there is a clamp (pos. 20) on the reverse side which makes it possible to:

- Install a start signal
- To access a STOP signal (see execution diagram)
With an automatic system the signal can be used to stop the conveyor belt. In the case of cable fracture no further operation is possible.





9.0 Maintenance

Regular maintenance is not necessary.

Should there be a problem, however, please contact our service department. Opening the unit without proper authorisation voids the warranty.

10.0 Accessories

In order to further economise your marking system, we offer a hand marking station. This consists of a set plate fastened with T- Nuts, two jiggings and an X-Y-Z stencil holder.

With this hand marking system the product is fastened to the jiggings and the stencil holder assists in fastening the stencil properly to mark the product properly.

For further questions please ask our technicians in order to properly outfit you with the appropriate accessories. They can offer customer specific help and tailor to your specific needs. Several different types of jiggings, marking heads and other accessories are available to customise your operation.

11.0 Trouble shooting

11.1 Problem: No mark at all

Please check:

- Is the main power cable connected and the etching machine switched on?
- Are the electrode cables correctly connected?
- Has the voltmeter been activated?
- Is the over current protection button on the etching unit in the set position?
- Is the marking head moistened with electrolyte?

Note:

- You can only mark products which conduct electricity.
- Painted, anodised or otherwise coated surfaces are not suitable for marking by electrolytic etching.

11.2 Problem: Mark is not clear

- Make sure that the stencil is clean.
- Wash the stencil in water to remove oxides.
- Also make sure that the surface of the product is clean. Wipe off dirt or excess oil with a dry cloth before marking.
- Is the marking head moistened with electrolyte?

- Normal usage yields slight discoloration of the stencil, for this reason we recommend that you change stencils from time to time.



11.3 Problem: Black spots around the mark

- The stencil is old and holes have developed in the red portion of the stencil. Replace the stencil with a new one, or prolong the life of the old stencil by covering over the damaged areas with adhesive tape.

11.4 Problem: Magnetic valve does not activate

- Check the fuse on reverse side of system
- If this fuse is not defective check the fuse on the transformer (see page 5). For this the system must be opened!

Hints:

Please contact us if:

- you have technical problems.
- you need marked samples.
- you need any additional accessories such as marking heads in different sizes, felt, electrolyte for other types of materials, stencil covers, jiggings, etc.
- you need information about our other products such as pad printing, needle embossing, laser marking, or ink-jet-systems.



12.0 Choice of electrolytes

Type of marking	Type of voltage	Voltage	Marking time	Felt	Material	Electrolyte	Remarks
Black-etching	AC	8 V	1-2 s	Black with conductive net	Stainless steel	6744, 70, 72, SP1	Neutralise with N8
					Alloyed Steel	6744	Neutralise with N8
					Steel	676, 74, 67/10/3, 676R74	Corrosion free electrolyte
					Chrome, Nickel	75	The marking time is dependent on coating thickness with chrome products.
					Zinc coated	639, 6578	In case of unclear marking, send us sample.
White-etching	AC	8 V	1-2 s	Black with conductive net	Titanium	6578	Depending of alloy, the hard metal option may be necessary. Neutralise with N8
					Hard metal	332/2	
					Black oxidised (Homo steamed)	114 Soft 119 Medium 117 Strong	
Deep-Etching	DC	approx. 20 -25 V	> 3 s	Green	Brass	DE40, DE90	In the case of deep etching the marking time is dependent on the desired depth. This can last up to a few minutes.
					Aluminium	DE40, DE90	

Electrolyte must be discarded after the marking process is complete !

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