GB OPERATING INSTRUCTIONS

LEISTER®

LEISTER TWINMAT ▣
Automatic wedge welding machine

Please read operating instructions carefully before use and keep for further reference.

APPLICATION

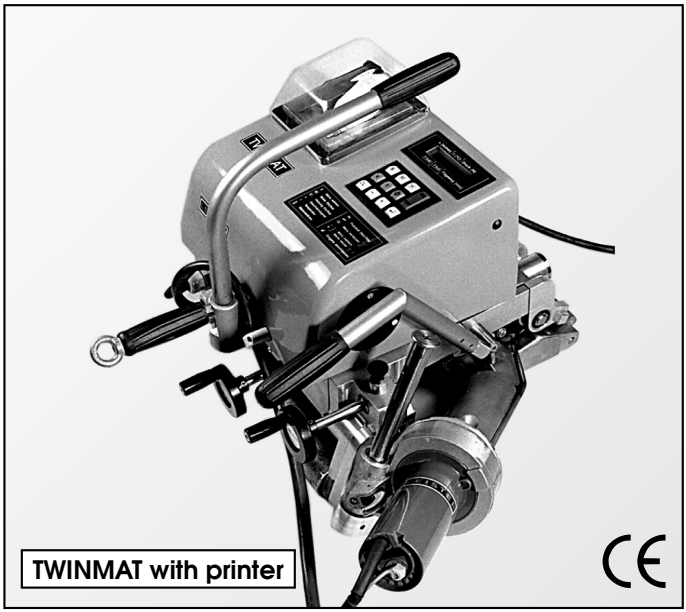
The LEISTER TWINMAT is an automatic wedge welding machine for overlap welding of geomembrane liners for earthwork and civil engineering.

- **Thermoplastic lining membranes**

Polyvinyl chloride plasticised	PVC-P
Polyethylene high density	PE-HD
Polyethylene low density	PE-LD
Chlorinated polyethylene	PE-C
Polypropylene	PP
Ethylene copolymer bitumen	ECB
Ethylene vinyl acetate	E/VA

- **Type of seam**
  Welding seams are produced in accordance with DVS 2225 part 1 and BAM.
  Other dimensions are possible on request.

DVS: *German Welding Association*
BAM: *Federal Institute for Materials Research and Testing, Berlin*



TWINMAT with printer

CE

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WARNING

Danger to life when opening the tool, as live components and connections ar exposed. Unplug the tool before opening it.

Incorrect use of hot air blowers can cause **fire and explosion hazard**, especially near combustible materials and explosive gases.

Do not touch the element housing and nozzle when they are hot as they can cause **burns**. Let the tool cool down. Do not point hot air flow in the direction of people or animals.

CAUTION

The **voltage rating** stated on the tool must correspond to the line/mains voltage.
EN 61000-3-11; Z_{max} = 0.059 Ω + j 0.037 Ω. If necessary, consultate supply authority.

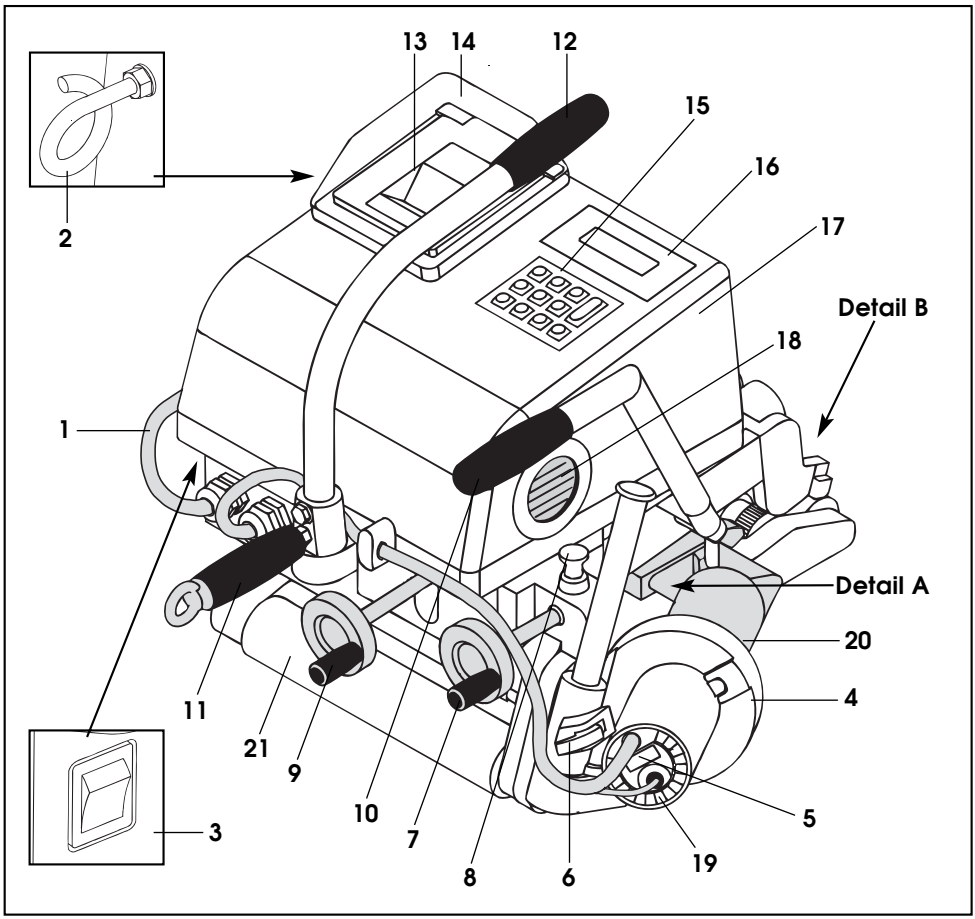
For personal protection on building sites we **strongly recommend** the tool be connected to a **GFCI** (**G**round **F**ault **C**ircuit **I**nterrupter) or a **RCCB** (**R**esidual **C**urrent **C**ircuit **B**reaker) .

The tool must be operated **with supervision**. Warmth can reach combustible materials, which are out of sight.

Protect tool from **damp** and **wet**.

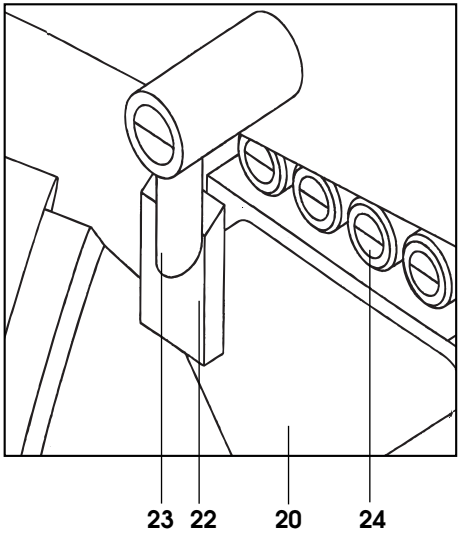
TECHNICAL DATA

Voltage	**V~**	230 or 400 (Mains voltage cannot be switched over)
Capacity	**W**	4600 or 5800
Frequency	**Hz**	50 / 60
Temperature	**°C**	20 – 620 steplessly controlled
Air flow	**l/min.**	max. 500 manual air slide
Drive	**m/min.**	0,5 – 5,0 steplessly controlled (tachogenerator)
Welding pressure	**N**	max. 2500 steplessly adjustable
Operating temp.	**°C**	-5 to 45
Size	**mm**	600 x 690 x 450
Weight	**kg**	32.0
Marking of conformity		CE
Approval mark		GS
Certification scheme		CCA
Protection class II		⧈

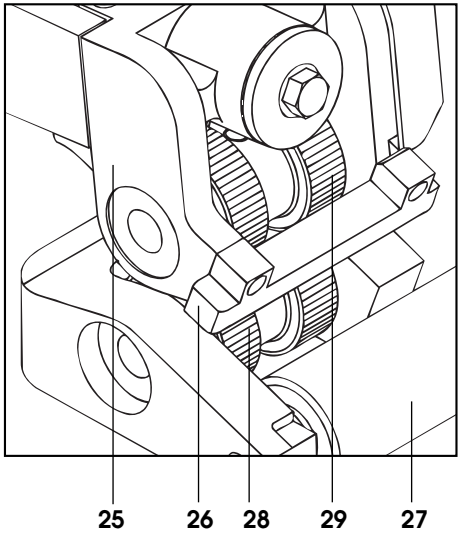


1. Cord to mains
2. Cord holder
3. Main switch
4. Hot air blower
5. On/off switch hot air blower
6. Locking lever for hot air blower
7. On/off hand wheel for upper or lower drive/pressure roller
8. Locking mechanism for control handle
9. Hand wheel for stepless adjustment of the welding pressure
10. Locking lever for welding pressure
11. Handle
12. Carrying handle
13. Printer
14. Printer protection cover
15. Keyboard
16. Display
17. Housing for drive motor and electronics
18. Ventilator grill
19. Air intake opening
20. Hot air wedge
21. Front roller

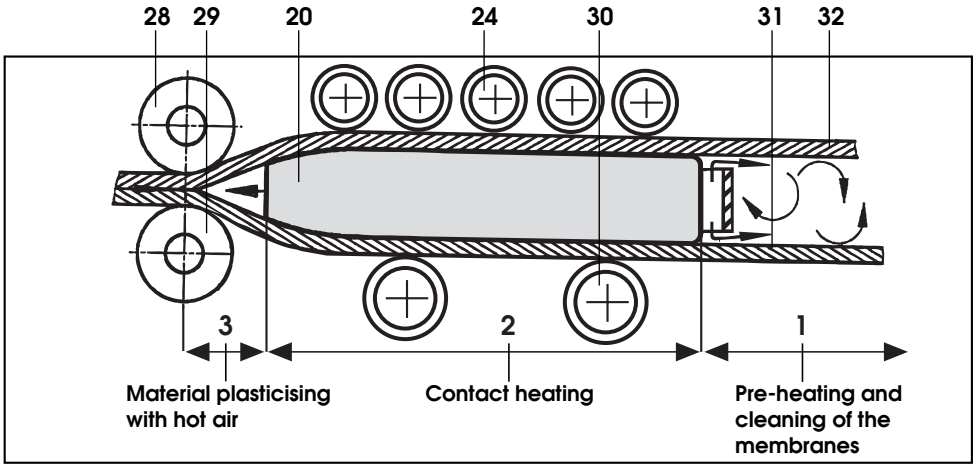
Detail A
Positioning of the hot air wedge



Detail B
Drive/pressure roller system

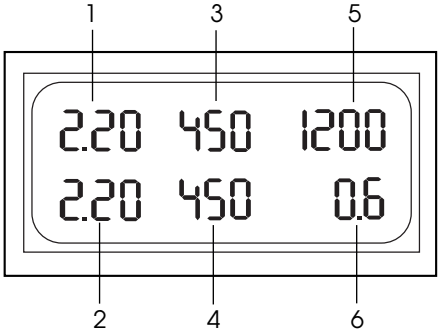


Heating system cross sectional diagram



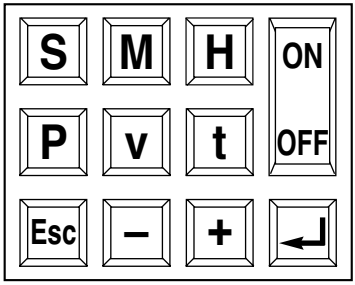
22. Hot air wedge guide
23. Guide/rod arm
24. Pinch rollers
25. Swivel head
26. Sensor beam
27. Back roller
28. Lower drive/pressure roller
29. Upper drive/pressure roller
30. Support rollers
31. Lower geomembrane liner
32. Upper geomembrane liner

Display



1. Welding speed ACTUAL value m/min.
2. Welding speed NOMINAL value m/min.
3. Temperature ACTUAL value °C
4. Temperature NOMINAL value °C
5. Welding pressure ACTUAL value N
6. Seam thickness reduction ACTUAL value mm

Keyboard



M **Drive motor on/off**

H **Heating on/off**

P **Welding programm check**
- *Thickness of material*
- *Seam thickness reduction offset*
- *Speed control*
- *Recording mode*
- *Welding speed*
- *Welding temperature*

ON **START**
Recording of data/
Recording of welding seam geometry
OFF **END**

v **Welding speed**

Esc **Skip to beginning function**

t **Welding temperature**

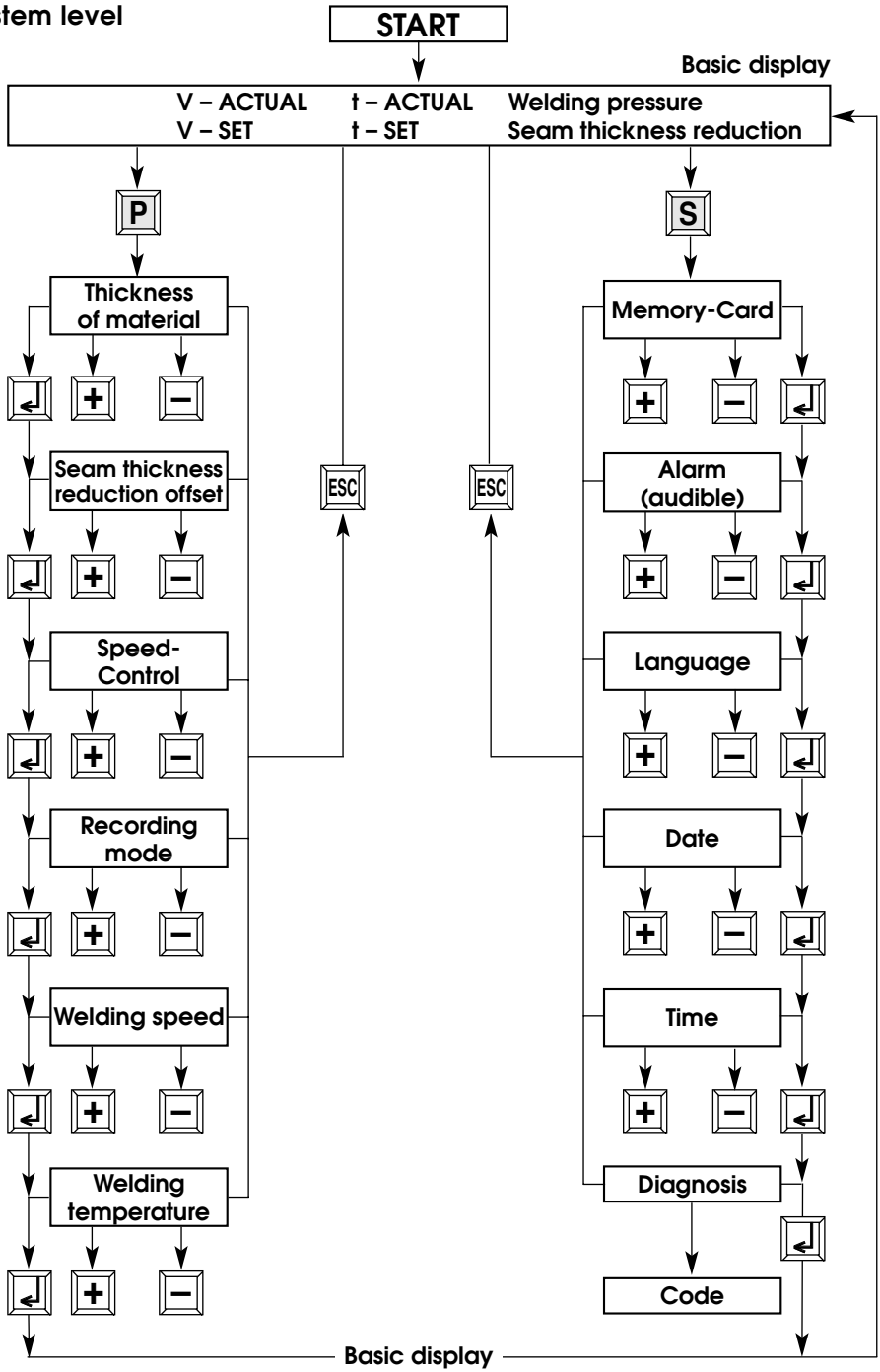
+ **Value increase**

– **Value decrease**

S **Adjustment of system**
- *Memory card*
- *Alarm (audible)*
- *Language*
- *Date*
- *Time*
- *Diagnosis*

↵ **End of entry**
Change of menu

System level



P Thickness of material

Before welding, the operator must enter the thickness of the geomembrane material. The electronic processor requires this value to calculate the relevant seam thickness reduction. Depending on the material thickness, the range of seam thickness reduction is automatically adjusted on the print-out. The material thickness settings should not be changed during the welding process.

P Seam thickness reduction - offset

To get an accurate reading, before welding, the operator must adjust the seam thickness reduction display. The value on the display should read zero. See page 7 **Display (6)**.

As the knurl pressure rollers press into the geomembrane material according to the welding pressure, the electronic processor already interprets this as seam thickness reduction and it should therefore be neutralised accordingly.

P Speed Control System

The automatic adjustment of the welding speed can be set before starting the welding process by using the ON/OFF switch.

P Recording Mode

The print-out mode must be selected before starting the welding process.

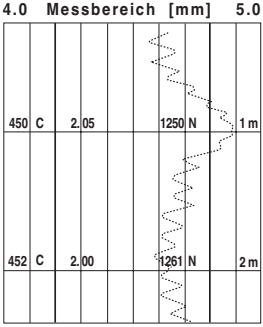
– Graphic mode
  Continuous recording and print-out of the seam thickness reduction over the whole length of the welded seam
– Tolerance mode
  Recording of the seam thickness reduction is only printed out if the seam thickness reduction tolerance has been exceeded.

PRINT OUT

Graphic mode

```
TWINMAT
Software-Rev:
LEISTER, Switzerland
Datum:
Zeit:
Betriebs-Std.

Start          22.11.94      15.39
4.0  Messbereich [mm]  5.0
```



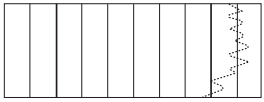

```
4.0  Messbereich [mm]  5.0
Stop           22.11.94      15.40

Schweisstemperatur
        min    447 °C
        max    459 °C
Schweissgeschwindigkeit
     ohne Speed-Control
        min    2.00 m/min
        max    2.10 m/min
Fügekraft
        min    1240 N
        max    1292 N
**************************
        Fügeweg
        min    0.04 mm
        max    0.45 mm
**************************
Umgebungstemperatur  10 °C
Materialdicke        2.50 mm
Nahtlänge            2.40 m
```

Tolerance mode

```
TWINMAT
Software-Rev:
LEISTER, Switzerland
Datum:
Zeit:
Betriebs-Std.

Start          23.11.94      9.24
Toleranzüberschreitung bei 8.10 m
449 C  2.61 m/min  1300 N
3.1  Messbereich [mm]  4.1
```



```
Stop           23.11.94      9.30
Schweisstemperatur
        min    448 °C
        max    453 °C
Schweissgeschwindigkeit
     ohne Speed-Control
        min    1.59 m/min
        max    2.61 m/min
Fügekraft
        min    1275 N
        max    1305 N
**************************
        Fügeweg
        min    0.05 mm
        max    0.38 mm
**************************
Umgebungstemperatur  19 °C
Materialdicke        2.05 mm
Nahtlänge            9.10 m
**************************
```

S **Memory card**

If the welding data needs to be stored on a memory card, before starting the welding process, the operator should set the memory card level to **ON.** (See special operating instructions for Memory Card).

The following data is stored:

– welding speed
– welding temperature
– pressure
– seam thickness reduction
– ambient temperature
– length of welding seam

S **Alarm (audible)**

If there is a deviation from the seam thickness reduction tolerance, an audible signal is activated. This signal can be set to **ON/OFF** on the alarm menu.

S **Language**

The welding operator has a choice of different languages.

- German
- English
- French
- Italian
- Spanish

Depending on the choice, the terms are shown in the selected language on the display. This should not be changed during the welding process.

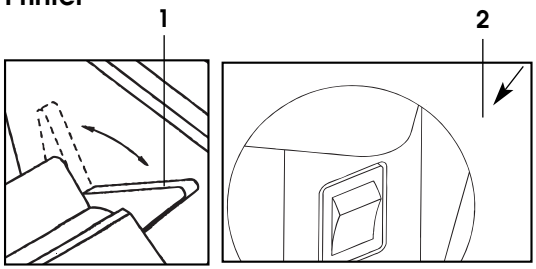
S **Date/ Time**

The welding operator can make changes to time and date on the Date/Time menu.
(Summer/winter time, different time zones).

S **Diagnosis**

Adjustments are made at the factory on the Diagnosis menu. The welding operator has no access to this menu.

Printer



Slacken the paper feed with the **tension lever (1).**

Feed in **paper (2).**
Pay attention to the direction of the arrow.

Tighten the paper feed with the **tension lever (1).**

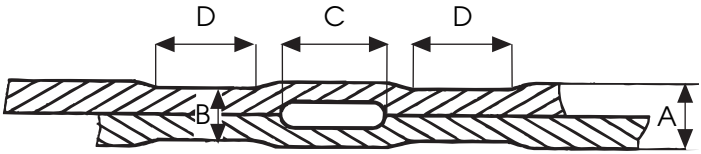
- **Heating system** → The hot air temperature is electronically steplessly adjustable and electronically controlled for heating up the hot air wedge. Digital display of SET and ACTUAL value. The flexible hot air wedge has three heat zones:
  Pre-heating, contact heating, material plasticising with hot air.

- **Welding pressure** → steplessly adjustable, digital ACTUAL value display. The welding pressure is transmitted via the toggle lever to the pressure rollers. During the welding process the pressure is matched linearly to the change in thickness of the membrane (e.g. T-joint).

- **Drive** → electronically steplessly adjustable and electronically controlled. Digital display of SET and ACTUAL value. The power transmission works through a three stage planetary gear. Should rippling occur in the laid-out geomembrane liners, the upper or lower drive/pressure roller can be switched over alternatively.

- **Welding seam geometry** → The proof of quality in a welding seam (peel test, tensile test) depends upon the thickness reduction in the area of the seam. With a seam thickness reduction ranging between 0.4 – 0.8 mm, the welding seam geometry is within the permissable range (DVS 2225 part II, BAM). This permissable range reflects the optimum interaction of welding parameter temperature, welding pressure and speed under changing ambient conditions during the welding process.

Cross-sectional diagram of an overlap weld



Seam thickness reduction = A – B

A : Thickness of upper and lower geomembrane liner
B : Thickness of welding seam
C : Width of test channel 15 +/- 2 mm
D : Width of weld ≥ 15 mm

- **Monitoring the welding seam** → Contactless recording of the seam thickness reduction data, which is displayed digitally for the welding operator during the welding operation. Additionally, the seam thickness reduction is graphically recorded onto a paper print out continuously during the welding operation.

- **Speed control system**
  The influence of weather such as sun, shade, wind and moisture, which cause a temperature change in the lining membrane during the welding process, can lead to weld faults. The TWINMAT speed control system interprets the data from the continuous measurement of the welding seam geometry. Through automatic adjustment of the welding speed, such weld faults are avoided. The welding operation can be done either with or without the speed control system. If the lower seam thickness reduction tolerance is exceeded, the welding speed slows down automatically; if the upper seam thickness reduction tolerance is exceeded, the welding speed is increased.

WELDING PREPARATION

- Check laying out of material: Width of overlap min. 100 mm and max.180 mm. Geomembrane liners must be clean between the overlap as well as above and below.
- Check: Mains supply ≥ 8 kW and a minimum cord cross section

400 V~	up to 50 m	**2x1,5 mm²**
	from 50 m	**2x2,5 mm²**
230 V~	up to 50 m	**2x2,5 mm²**
	from 50 m	**2x4,0 mm²**

- Attach **carrying handle (12)** and **guide rod (11).**
- Connect the automatic hot air wedge welding machine to the mains supply.
- Carry out adjustments in the systems with keys [S] and [↵]
- As required, correct with keys [+] and [−].
- Heating up: Switch on **main switch (3).**
  Switch on **hot air blower (5)**.
  Adjust temperature via the **keyboard (15)** [t] [+] and [−]
  Switch on heating [H] → **ON,** Motor [M] → **OFF**
  Heating up time approx. 5 min.
- Perform a test welding according to the welding instructions of the material manufacturer and the national standards or guidelines. Check the test welding. Adapt the welding temperature (welding parameters) as required.

- Check: – **Drive/pressure rollers (28) (29)** as well as the **hot air wedge (20)** must be clean before beginning operation.
  – Required welding temperature must be achieved.
  – Cable length/cable guide.
  – Paper roll for printer.
- Guide and position the automatic welding machine into the over-lapped geomembrane liners.
- Pull the **lever (10)** (without engaging the hot air wedge).
- Adjust the welding pressure with the **hand wheel (9)**.
- Feed the welding parameter into the program level with the [P] and [↵] keys.
  Make corrections as necessary. Keys [+] and [–]
- Release the **lever (10).**
- Switch on drive motor [M] → **ON.**
- Engage the **hot air wedge (20).**
- Pull the **lever (10)** slowly. Check the **hot air wedge guide (22)** and **guide rod arm (23)** (see detail A page 6).
- Switch [ON] for recording.
  When welding without speed control, the welding speed must be corrected using the [V] and [+] [–] keys if the seam thickness reduction deviates from the tolerance.
- At the end of the welding operation, approx. 10 cm before removal of the hot air wedge, the recording should be stopped. Key [OFF]
- Release the **lever (10),** move the **hot air wedge (20)** out of the overlap and swivel up.
- Switch off the drive motor using key [M] → **OFF.**

WELDING TIPS

- Should waves occur in the laid-out geomembrane material, the upper or lower drive/pressure roller can be switched over alternatively. This allows wrinkle-free welding, so that the overlap width remains constant and the welding process should not have to be interrupted.
  Rippling in the upper geomembrane liner: engage upper **drive roller (29)** only.
  Rippling in the lower geomembrane liner: engage lower **drive roller (28)** only.
- With T-joints or when welding upwards, both drive rollers must be engaged.
- For welding T-joints, a reduction in welding speed of approx. 20% is recommended.

TRAINING

The LEISTER Company and its authorized service centres offer welding courses free of charge world wide. The customer can be trained on site if necessary.

MAINTENANCE

- The **ventilator grill (18)** and **air intake opening (19)** of the tool should be cleaned with a brush when dirty.
- Clean **hot air wedge (20)** with a wire brush.

SERVICE AND REPAIR

- The automatic welding machine should be checked after about 1000 hours running time by your service centre (see page 9 Print-Out).
- Repairs should only be carried out by authorised **LEISTER Service Centres.** They guarantee a correct and reliable **repair service within 24 hours,** using original spare parts in accordance with the circuit diagrams and spare parts lists.

WARRANTY

- For this tool, we generally provide a warranty of one (1) year from the date of purchase (verified by invoice or delivery document). Damage that has occurred will be corrected by replacement or repair. Heating elements are excluded from this warranty.
- Additional claims shall be excluded, subject to statutory regulations.
- Damage caused by normal wear, overloading or improper handling is excluded from the guarantee.
- Guarantee claims will be rejected for tools that have been altered or changed by the purchaser.

Technical data and specifications are subject to change without prior notice.

Your authorized service centre is:

LEISTER Process Technologies, Riedstrasse, CH-6060 Sarnen/Switzerland
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