

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

Contents:

APPLICATION	Page 1	WELDING	Pages 11 – 12
WARNING	Page 2	• welding preparation	
CAUTION	Page 2	• welding procedure	
TECHNICAL DATA	Page 3	• welding tips	
FUNCTIONS	Pages 3 – 4	TRAINING	Page 12
DESCRIPTION OF TOOL	Pages 5 – 10	MAINTENANCE	Page 12
• mechanics		SERVICE AND REPAIR	Page 12
• key board		NOTICE	Page 12
• software system level		Authorized Service	
• printer		Centre	Page 12



WARNING



Danger to life when opening the tool, as live components and connections are 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.



For personal protection on building sites we **strongly recommend** the tool be connected to a **GFCI** (Ground Fault Circuit Interrupter) or a **RCCB** (Residual Current Circuit Breaker) .



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



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

Electrical safety:  double insulated

Order No.		4M1
Voltage	V~	230 or 400 ★
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

★ Mains voltage cannot be switched over

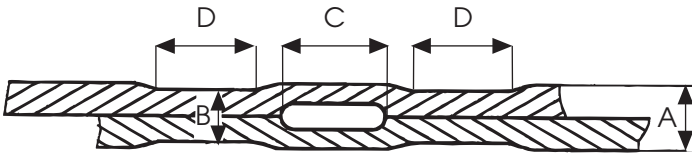
DESCRIPTIONS OF FUNCTIONS

LEISTER Twinmat (4M1)

- **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.

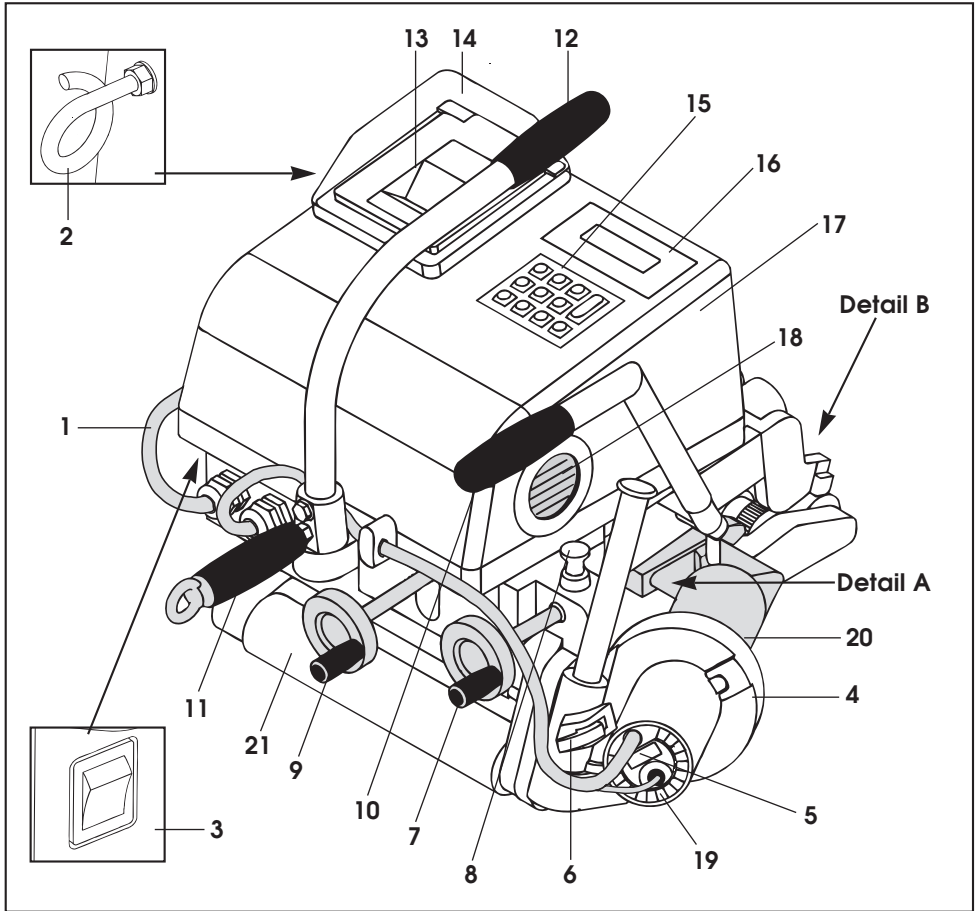
- **Welding seam geometry** → The proof of quality in a welding seam (peel test, tensile test) depends upon the thickness reduction in the area of the seam. With a seam thickness reduction ranging between 0.2 – 0.8 mm, the welding seam geometry is within the permissible range (DVS 2225 part II, BAM). This permissible 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



$$\text{Seam thickness reduction} = A - B$$

- 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.



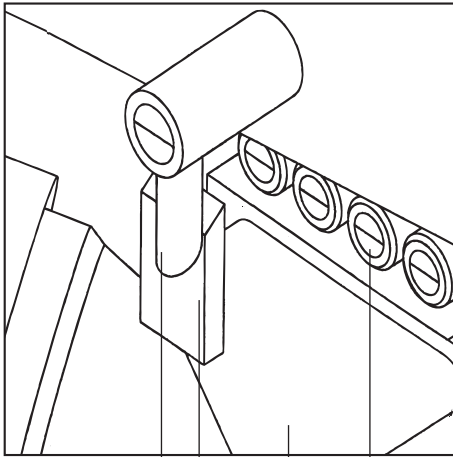
- | | |
|---|---|
| 1. Cord to mains | 11. Handle |
| 2. Cord holder | 12. Carrying handle |
| 3. Main switch | 13. Printer |
| 4. Hot air blower | 14. Printer protection cover |
| 5. On/off switch hot air blower | 15. Keyboard |
| 6. Locking lever for hot air blower | 16. Display |
| 7. On/off hand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

DESCRIPTION OF TOOL

LEISTER Twinmat (4M1)

Detail A

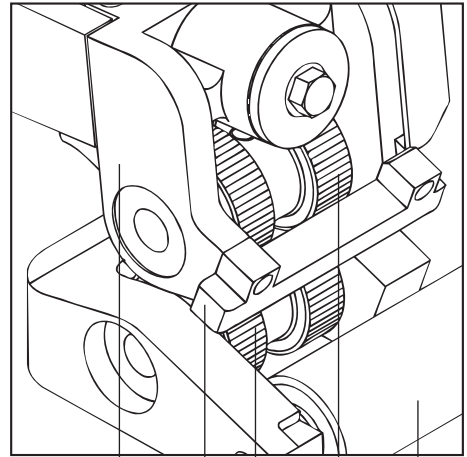
Positioning of the hot air wedge



23 22 20 24

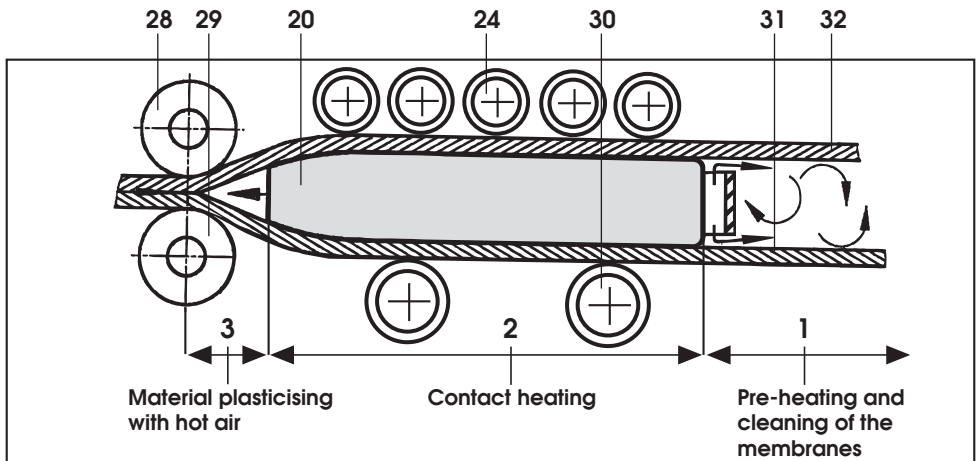
Detail B

Drive/pressure roller system



25 26 28 29 27

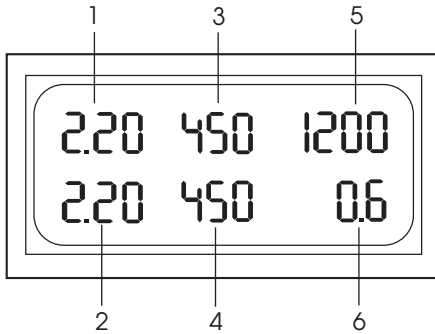
Heating system cross sectional diagram



- 22. Hot air wedge guide
- 23. Guide/rod arm
- 24. Pinch rollers
- 25. Swivel head
- 26. Sensor beam
- 27. Back roller

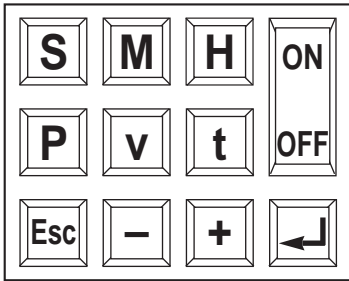
- 28. Lower drive/pressure roller
- 29. Upper drive/pressure roller
- 30. Support rollers
- 31. Lower geomembrane liner
- 32. Upper geomembrane liner

Display



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

Keyboard



Drive motor on/off



Heating on/off

**Welding programm check**

- Thickness of material
- Seam thickness reduction offset
- Speed control
- Recording mode
- Welding speed
- Welding temperature

**START**

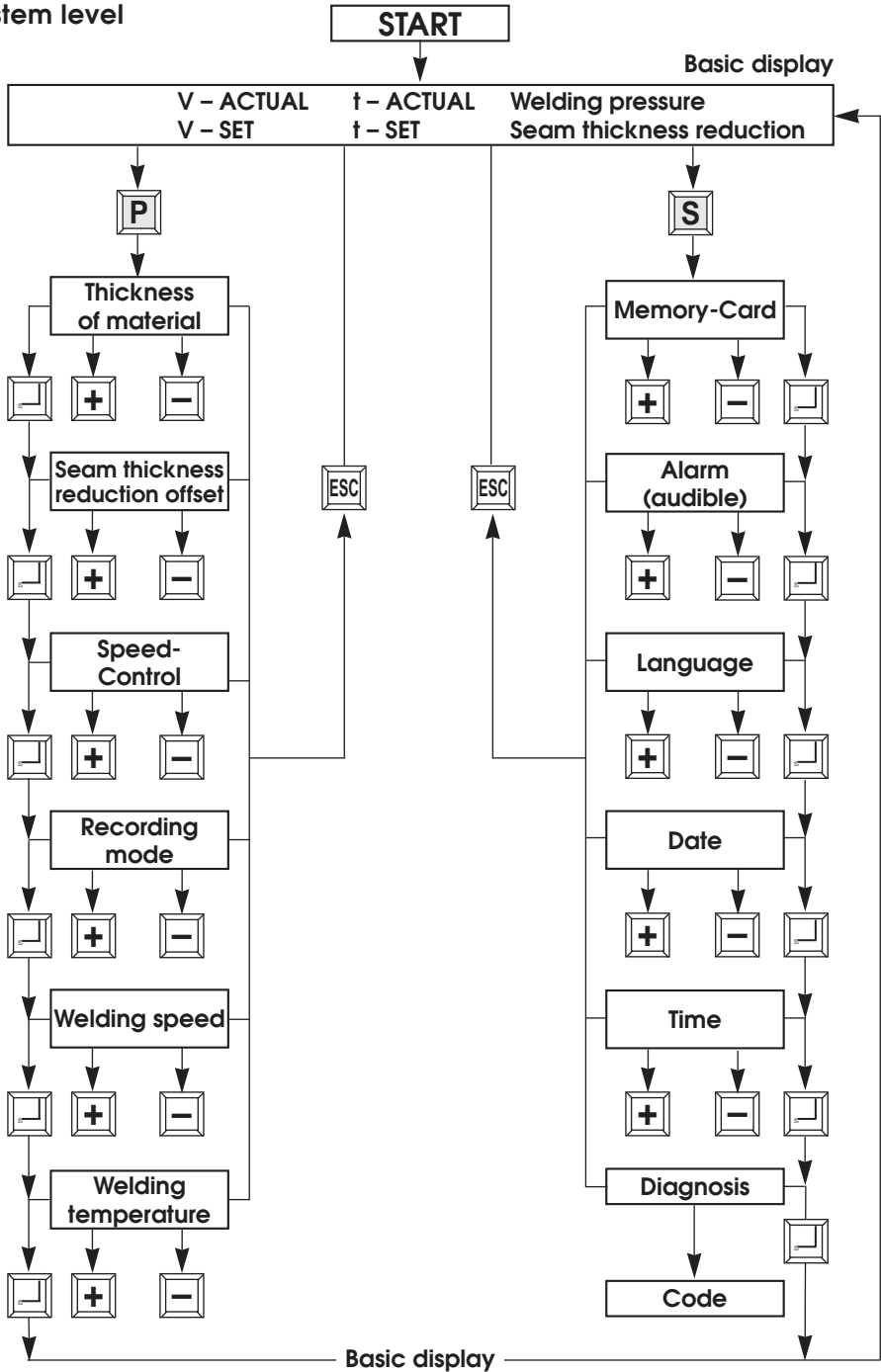
- Recording of data/
 - Recording of welding
 - seam geometry
- END**

**Welding speed****Skip to beginning function****Welding temperature****Value increase****Adjustment of system**

- Memory card
- Alarm (audible)
- Language
- Date
- Time
- Diagnosis

**Value decrease****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
450 C 2.05	1250 N 1m
452 C 2.00	1261 N 2m
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.

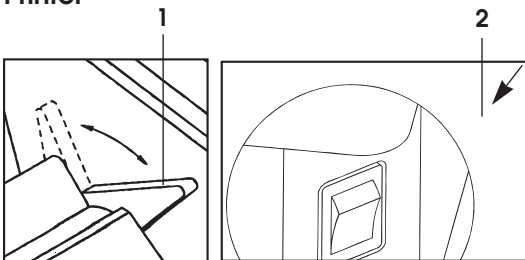
- German
- English
- French
- Italian
- Spanish

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)**.












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  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)**   and 
Switch on heating  → **ON**, Motor  → **OFF**
Heating up time approx. 5 min.

Welding procedure

- 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  and  keys.
Make corrections as necessary. Keys  and .
- Release the **lever (10)**.
- Switch on drive motor  → **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  for recording.
When welding without speed control, the welding speed must be corrected using the  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 .
- Release the **lever (10)**, move the **hot air wedge (20)** out of the overlap and swivel up.
- Switch off the drive motor using key  → **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 authorized **LEISTER service centres** using original spare parts. They guarantee a specialized and reliable **repair service within 24 hours**.

GUARANTEE AND LIABILITY

- Guarantee and liability are in accordance with the guarantee certificate as well as with the currently valid general business and sales conditions.
- LEISTER Process Technologies rejects any guarantee claims for tools which are not in their original condition. The tools must never be altered or changed.

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

Your authorized service centre is: